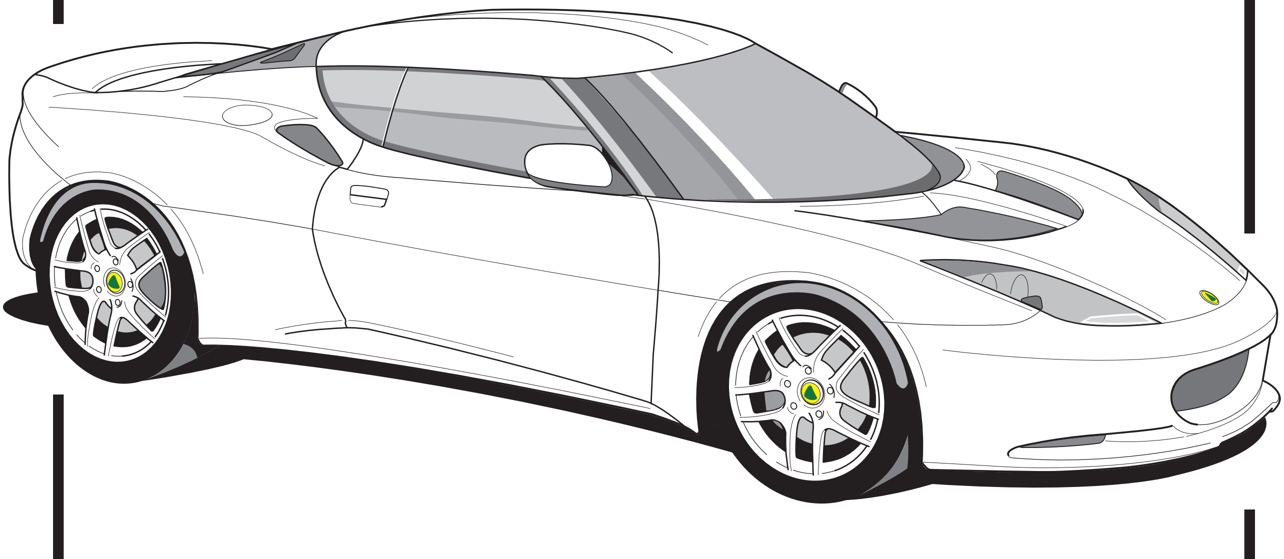
SERVICE NOTES

EVORA



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This publication has been designed for use by Lotus Dealers familiar with general workshop safety procedures and practices. Take all appropriate action to guard against injury to persons or damage to property.

Lotus policy is one of continuous product improvement, and the right is reserved to alter specifications at any time without notice.

Whilst every care has been taken to ensure correctness of information, it is impossible to guarantee complete freedom from errors or omissions, or to accept liability arising from such errors or omissions, but nothing herein contained shall affect your statutory rights.

CONTENTS

LOTUS EVORA

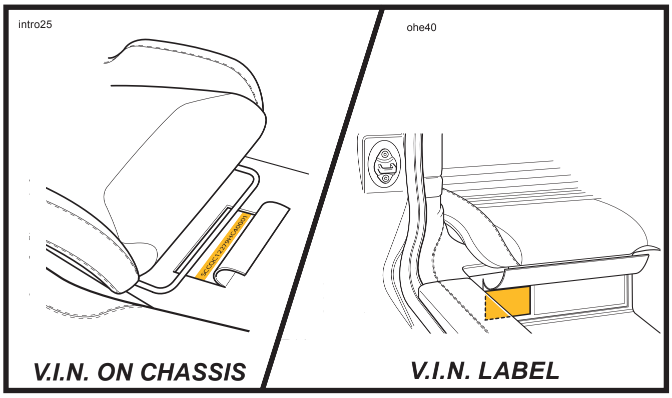
* see separate CD: T000T1516F
# see separate CD: T000T1517F manual T000T1526F auto

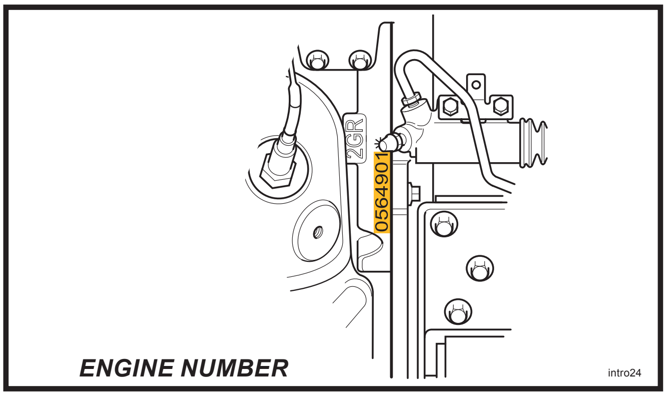
VEHICLE IDENTIFICATION NUMBER & ENGINE NUMBER

The Vehicle Identification Number (V.I.N.) is a unique 17-digit number used to identify the car for licencing, warranty, spares ordering and administrative purposes.

The chassis frame is stamped with the V.I.N. on the crossmember beneath the driver's seat, accessible inside the cabin with the seat slid fully rearwards. Pull back a flap in the carpet to view. The number is also printed on a label stuck to the vertical face of the fuel tank bay, below the front edge of the right hand rear seat cushion or luggage shelf. Pull back a flap in the carpet to view.

It is essential that the complete V.I.N. is quoted in any correspondence concerning the car, or when order ing spare parts.





Engine Number

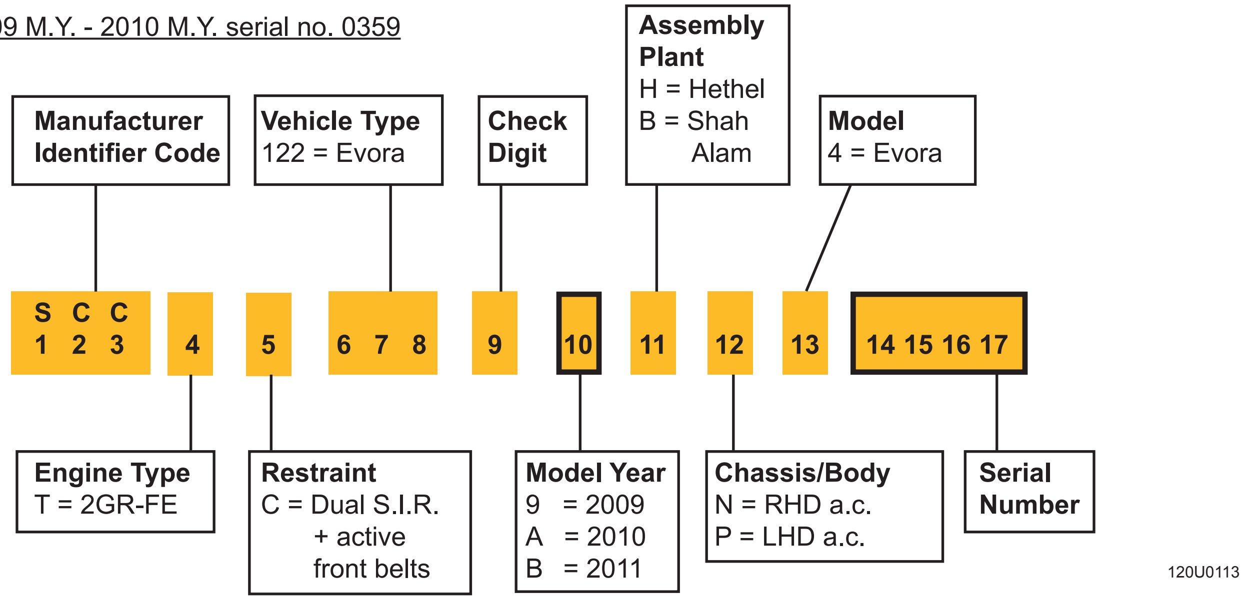
The 6-digit engine serial number is stamped on the LH rear flange of the cylinder block, alongside the clutch housing jointface, and is viewable only from beneath after removal of the engine undertray. The number is repeated on a bar code label applied to the front face of the left hand cylinder head, which may be viewed from above using a mirror.

The full V.I.N. should always be quoted with any vehicle enquiries, together with the engine number if the query is engine related. Factory records are filed against V.I.N., and specification change points are identified by V.I.N. or engine number.

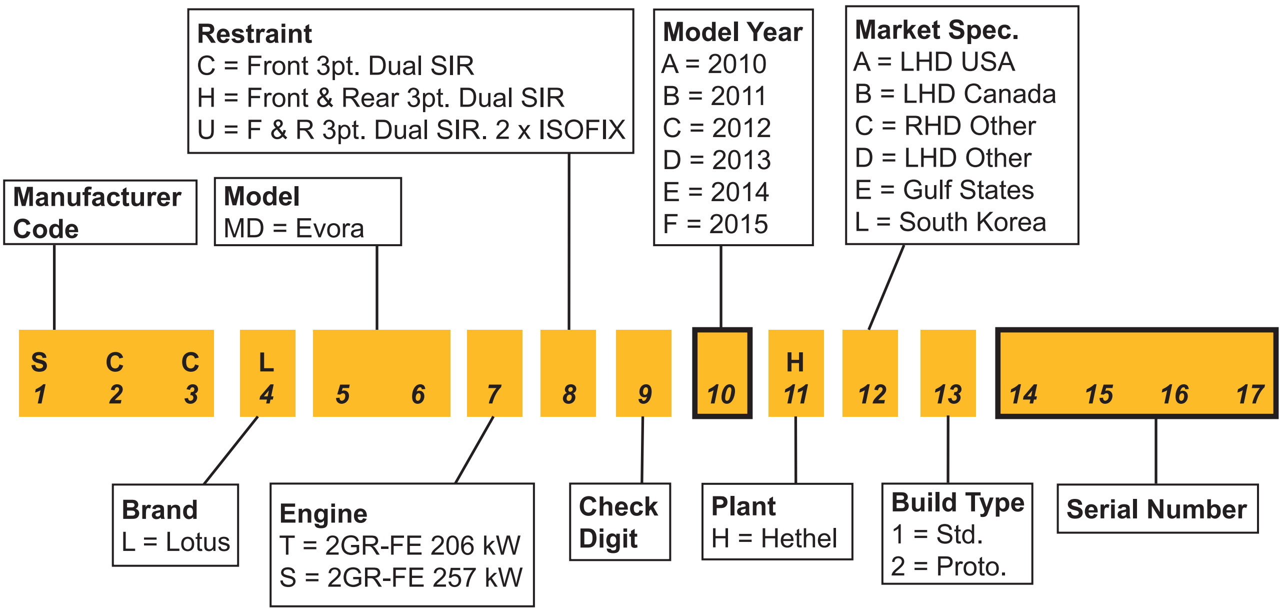
The V.I.N. comprises 17 characters, coded in accordance with European Economic Community (EEC) directives, and with those of the National Highway Traffic Safety Association (NHTSA). For change point identification in Service Notes, Service Bulletins and Service Parts Lists, typically, only characters 10 (model year), and 14 to 17 (serial number) will be quoted. For example 'A 1234' being 2010 model year, serial number 1234.

Note that the serial number sequence re-starts at 0001 for each model year, and is shared with all other Lotus model families (e.g. Elise and Exige).

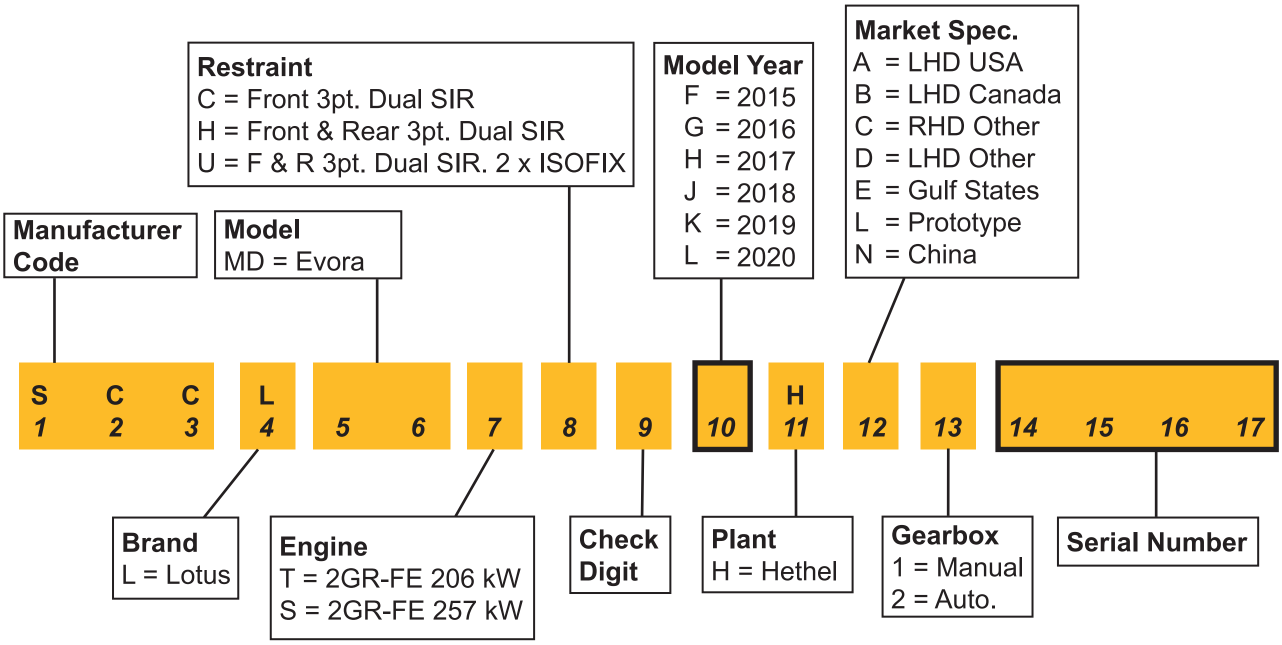
2009 M.Y. - 2010 M.Y. serial no. 0359



2010 M.Y. serial no. 0360 onwards



2015 M.Y. serial no. 0360 onwards



MODEL HISTORY

Evora Introduction:
First deliveries commence June 2009 at '09 VIN serial number 0721.

Evora S and new features for base Evora (Non-USA): December 2011
VIN character 7 = S indicates supercharged engines from ‘11MY VIN BH_11178
S updates only
Harrop HTV1320 supercharger fitted. The exhaust system incorporates an exhaust silencer flap operated by an integrally mounted vacuum by-pass valve controlled by a solenoid. ‘S’ models are fitted with twin front mounted air/oil coolers.
The body styling is unchanged with the following exceptions:
Door mirror covers: painted Phantom Black (Lotus code B123) as standard. Rear undertray: Additional integral underside air scoop used in conjunction with existing NACA ducts. New diffuser panel to accommodate distinctive diffuser finisher and tri-oval tailpipe silencer. Addition of the ‘S’ logo to the existing Evora rear bumper badge.
Brakes:
Discs: Cross drilled brake discs and black painted callipers fitted to supercharged models as standard.
Suspension
Front lower wishbone rear bush stiffness by 10%. The bush change achieved a 12% reduction in Camber Compliance (less camber loss whilst cornering) and a 22% increase in lateral stiffness at the Tyre Contact Patch. The static geometry settings are also revised.
Rear suspension: Both upper and lower wishbone bush stiffness’s are increased by 10%, and the rear anti-roll bar is increased by 0.5mm in diameter. The fitting of the revised components achieve a 19% reduction in Camber Compliance (less camber loss whilst cornering), a 32% increase in lateral stiffness at the Tyre Contact Patch and a 1.5% increase in rear roll stiffness. The static geometry settings are also revised.
Optional Wheels: Front 19” Rear 20” Forged alloy Diamond Cut “Design” fitted with Bespoke Pirelli P-Zero Corsa tyres with specially formulated compound which can be identified with an LS marking on sidewall
Transmission
Sports Ratio Gearbox fitted as standard. Lightweight low inertia flywheel allowing the engine to climb up the rev range more freely therefore making the engine feel sportier when compared to the naturally aspirated engine.
Clutch: New lighter inertia, heavy duty clutch system fitted to manage the 400Nm torque produced by the supercharged engine, consisting of a new clutch cover with revised finger ratios and an upgraded centre plate.
Havoline Multigear MTF HD 75W-80 for Evora S sports ratio gearbox.

All models from BH_11178 onwards
A new ABS module, equipped with revised software providing:
Corner Brake Control (CBC), Drag Torque Control (DTC), Electronic Stability Control (ESC), Anti-lock Braking System (ABS), Hydraulic Brake Assist (HBA), Electronic Brake Distribution (EBD), Electronic Differential Lock (EDL) and Traction Control System (TCS) The collective name for this functionality is ‘Lotus Dynamic Performance Management’ (Lotus DPM). Some of these features are carried over from the existing Evora ABS system specification.
Interior
Heated front seats, interior tailgate release button and additional 12V aux power socket within the centre console under the HVAC controls
Front intake grilles: Front bumper side intake grilles revised and blanking plates removed to allow airflow to the oil coolers but fitted to all variants.
A New pedal is box fitted allowing for a revised clutch pedal ratio as well as a new clutch master cylinder to give a reduced pedal effort. Clutch line damper bolted in the fluid line at the flexi pipe by the slave cylinder. Inertia weights fitted to gearbox crank lever selector, the higher inertia created by the additional weights helps to achieve a more positive gear change. New low loss motion and low friction gearshift cables fitted with less built in tolerance than earlier ‘D’ level cables to assist in a more positive gear change when shifting between all gears.

See TSB 2010/17 for further information.

Introduction of the Evora IPS (Intelligent Precision Shift) Non USA - March 2011
Introduced from '11MY VIN BH_11746
Same vin characters as naturally aspirated Evora

The Evora IPS utilises the Toyota 6 speed U660E conventional fluid filled automatic transmission and torque converter assembly.

The Lotus IPS transmission system allows the driver to switch between conventional 6 speed automatic drive to manual paddle shift mode with the option of 'Sport' mode producing quicker and more pronounced gear shifts as well as optimising shift points for performance.

The same front mounted air/oil coolers used on the Evora 'S' for engine oil cooling are now used to cool the transmission fluid with the sandwich plate/thermostat assembly now mounted remotely to the rear bulkhead.

See TSB 2011/13 for further information

Introduction of the '12 model year Evora range and S with IPS transmission (Supercharged with Intelligent Precision Shift). (Non USA) – August 2011.

VIN character 10 = C Serial number restarts at 0001, common to all.
VIN character 7 indicates the engine specification.
T = naturally aspirated (Manual or IPS).
S = supercharged (Manual or S with IPS transmission) variants.

Body styling: Unchanged with the following exceptions: Door mirror covers: All supercharged models will retain Phantom Black painted covers (Lotus code C123 Cromax Pro painting system) as standard. Exterior door handles: The chrome option has been deleted with only body coloured options available. Diffuser panel: The diffuser panel fitted to the supercharged manual vehicle is also fitted to the S with IPS transmission option to accommodate distinctive diffuser finisher and tri-oval tailpipe silencer.
Badges: The 'S' logo will also be applied to the rear bumper on the S with IPS transmission option. Front bumper: To accommodate the rationalisation of the engine and transmission oil cooler arrangements, the side intake apertures on the front bumper are revised to accept new front grilles and inlet ducts. The grilles are now bolted to the bumper with the corresponding LH/RH ducts located behind them being closed off if an oil cooler is not required on that side. Rear lamp bezels: Supercharged vehicles will have black bezels; naturally aspirated vehicles will continue to use the existing chrome versions.
Seats: New leather seat colours are available dependant on interior pack option selected (Base, Executive Premium or Sports Premium). Ebony black, Ivory white, Venom red, Cognac brown, Imperial blue, Cocoa brown, Ash brown. Rear seats and relevant interior trims are coloured to match.
Interior trims: A new colour (dark grey) introduced in addition to the current grey option, beige colour trim is deleted for '12 model year. Specific interior trims are coloured black to denote 'Supercharged' variant.
In Car Entertainment: For specific markets the Alpine IVA-W520R 2 DIN Mobile Media Station is replaced with the Pioneer AVIC-930BT 2 DIN head unit.
Exhaust: An exhaust silencer incorporating an EP (Engine Protection) valve is now be fitted to all '12MY vehicles as standard equipment. Catalytic converters: The main/under-floor catalytic converter is deleted and replaced with a link pipe.
Engine cooling: Oil cooling for both supercharged manual and IPS transmission vehicles is rationalised with the fitment of only a single larger engine oil cooler mounted ahead of RH front wheelarch. Transmission fluid cooling: Both supercharged and naturally aspirated IPS transmission vehicles is also rationalised with the fitment of a single larger transmission fluid oil cooler mounted ahead of LH front wheel arch.
Brake and Power Assisted Steering pipes: fitted to the RH have been revised to allow for the fitment of an additional cooler hose and revised cooler arrangement.
Manual Transmission: The standard ratio gearbox option is deleted for naturally aspirated vehicles, and the sports ratio gearbox is now fitted as standard.
Brake Discs: Cross drilled brake discs fitted to all supercharged models as standard equipment. Brake Callipers: Red painted callipers replace the black coloured option and are fitted as standard to all supercharged vehicles or included in the 'Sports Pack' option for naturally aspirated vehicles. Bare metal callipers are fitted as standard to naturally aspirated vehicles.
Suspension Wishbones and rear anti-roll bars: '12 model year IPS and S with IPS transmission vehicles are

fitted with the 'S' type wishbones and larger diameter rear anti-roll bar. This will also be implemented as a production running change to naturally aspirated manual vehicles at a later date.
Optional Wheels: New Front 19" Rear 20" Forged wheels are available in both Gloss Black and Stealth Grey which are based on the 19"/20" alloy Diamond Cut designs launched with the Evora S but without the machined faces which are now deleted.

See Technical Service Bulletin TSB 2011/25 for further details.

LIFTING POINTS

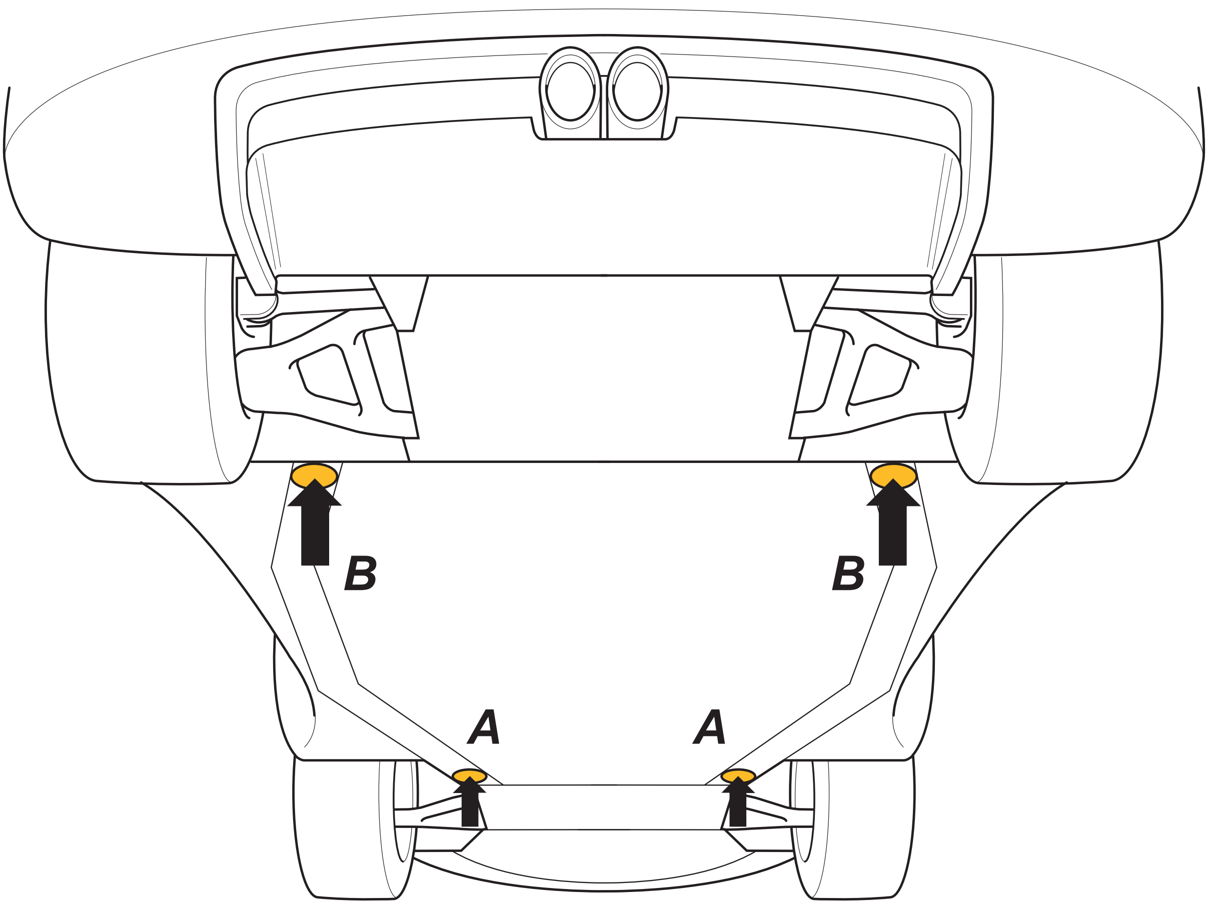
When using a lifting jack or hoist, care must be taken to position the device only beneath the areas shown in the illustration. Each designated point uses a ribbed alloy reinforcement pad integral with the main chassis structure. Use a suitable rubber pad to provide additional protection from surface damage:

A; Identified by an adjacent blue sticker. Beneath the front ends of the chassis main siderails, just behind the rear edge of the front undertray.

B; Identified by an adjacent blue sticker. Beneath each end of the fuel tank bay rear crossmember, just ahead of the front edge of the engine bay undertray.

If using a single jack for wheel changing purposes, a single rear lifting point (B) may be used to raise both wheels on that side of the car. With the limited vision available under these circumstances, extra care must be taken to position the jack correctly.

Note that in order fully to exploit the benefits of light weight, and to maximise stowage space, the Evora has no provision for spare wheel carriage or lifting jack. A temporary puncture recovery facility is provided in the form of a tyre inflator aerosol stowed in the right hand side of the boot.



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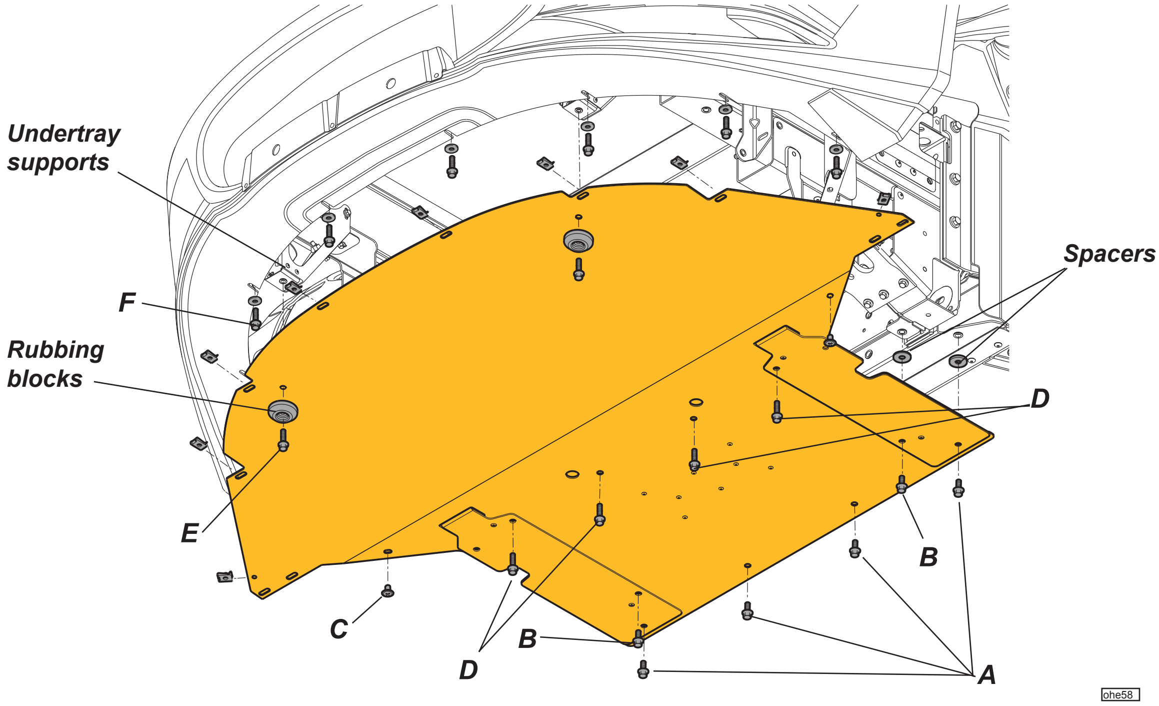
UNDERTRAYS/DIFFUSER

For certain service operations, it may by necessary to remove the front and rear undertrays and/or diffuser panel. The panels contribute to the aerodynamic performance of the car and also help to keep the engine bay clean. Do not run the car without the panels fitted.



Front Undertray

The undertray is fixed in place to various vehicle components, to maintain a flat and level underside profile; spacers of various thicknesses are added between the undertray and its mounting points.

Fixing Points

A. *Rear of front subframe:* retained with 4 M8x20 mm screws running left to right along the rear of the front subframe and torqued to 12Nm. Each screw passes through a 4.6mm thick spacer and into a rivnuts fitted into the subframe.

B. L/H & R/H suspension wishbone rear mounting: retained with 1 M8x20 mm screw on either mount and torqued to 12Nm. Each screw passes through a 3mm thick spacer into rivnuts fitted into the mounts.

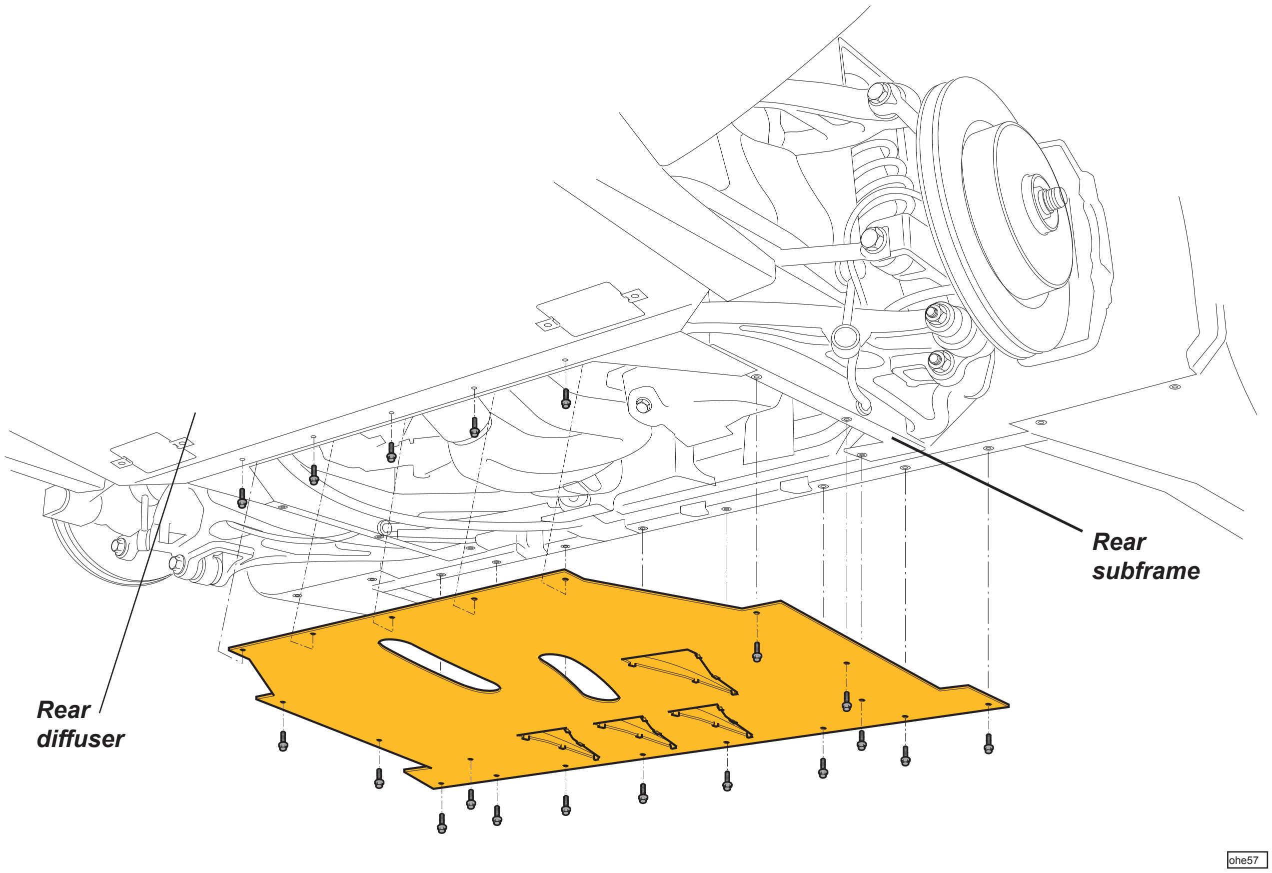
C. *LH & RH wheelarch liner:* retained with 1 push fit scrivet on either side of the front of the wheel arch liner.

D. Suspension wishbone front mounting cross member: retained with 4 M8x30 mm bolts running left to right along the cross member and torqued to 12Nm the furthermost outer bolts pass through 10.6mm thick spacers and the innermost bolts pass through 13.7mm thick spacers fitted into the cross member.

E. LH & RH front undertray supports: retained with 1 M6x16mm bolt on either support and are torqued to 8Nm into rivnuts fitted into the supports. The undertray supports are in turn fixed to the front subframe rails. Each bolt passes through a rubbing block positioned to the underside of the tray. The rubbing blocks protect the undertray in the event of the vehicle grounding.

F. Front bumper: retained with 8 M6x16mm bolts and washers and are torqued to 8Nm. The bolts screw into captive nuts slotted into the undertray.

Rear Undertray



Fixed to the rear subframe and chassis by 19 M8x20 mm screws tightened into rivnuts mounted into the subframe and chassis which are all torqued to 25Nm.

The 5 bolts securing the undertray to the rear of the subframe also pass through the front of the rear diffuser, compressing the undertray between the diffuser and subframe.

TECHNICAL DATA - ENGINE

SECTION TDT

GENERAL		
Type designation		2GR-FE
Configuration		V6
Capacity		3456 cm^3 (210.9 in^3)
Bore		94.0 mm (3.70 in^3)
Stroke		83.0 mm (3.27 in^3)
Valve configuration		4 VPC in pentroof chamber
Camshaft configuration		DOHC per bank
Camshaft drive		Single chain drive to both inlet camshafts. Secondary chain linking each inlet camshaft to its neighbouring exhaust camshaft. All 4 camshafts use hydraulically activated variable timing sprocket hubs under ECU control
Valve operation		Finger followers with hydraulic pivot posts Siamese ports
Compression ratio		10.8:1
Compression pressure	- new minimum	1,400 kPa (14 kgf/cm^2, 199 psi)
	- service minimum	980 kPa (10.0 kgf/cm^2, 142 psi)
	- cyl/cyl max. variance	100 kPa (1.0 kgf/cm^2, 15 psi)
Firing order		1,2.3,4,5,6
Evora & Evora IPS		
Spark plugs		Denso FK20HR11 (Iridium)
Spark plug gap		1.0 - 1.1 mm (0.040 - 0.045 in)
Evora S & Evora S-IPS		
Spark plugs		NGK ILFR7B8
Spark plug gap		0.8 mm (0.031 in)
Engine management ***(All variants)***		Lotus T6 controller
Ignition system		Direct ignition using individual plug top coils
Fuel system		Port injection. Sychronous and non-synchronous operation Hot wire airflow sensor
Fuel requirement		Minimum 95 RON - Optimum 98 RON
Evora & Evora IPS		
Intake system		Single throttle valve 2 stage intake tract length
Evora S Evora S-IPS		
Intake system		Harrop HTV1320 supercharger utilising Eaton TVS Technology ™
Maximum boost pressure		0.5 bar
Maximum continuous engine speed	- std	6,600 rpm
	- Sport mode	7,000 rpm
Maximum transient engine speed	- std	6,800 rpm
	- Sport mode	7,200 rpm
Evora		
*Normal warm idle speed	- a.c. off	640 rpm
	- a.c. on	690 rpm
Evora S		
*Normal warm idle speed	- a.c. off	680 rpm
	- a.c. on	730 rpm

*Idle speeds may vary if sport mode is active

Evora & ***Evora IPS***

Net power (ECE 85)		206 kW @ 6,400 rpm
Net torque (ECE 85)		350 Nm @ 4,600 rpm

Evora S Evora S-IPS

Net power (ECE 85)		257 kW @ 7000 rpm
Net torque (ECE 85)		400 Nm @ 4,500 rpm

Exhaust emissions

Evora		*std. gear ratios*	*opt. close ratio*
	- CO	0.169 g/km	0.151 g/km
	- HC	0.049 g/km	0.053 g/km
	- NOx	0.016 g/km	0.030 g/km
	- HC + NOx	0.065 g/km	0.083 g/km
	- CO_2 - Urban	293 g/km	321 g/km
	- Extra urban	154 g/km	173 g/km
	- Combined	205 g/km	224 g/km
Evora S	- CO_2 - Urban	329 g/km – 18" / 19" Wheels	
		326 g/km – 19" / 20" Wheels	
	- Extra urban	171 g/km – 18" / 19" Wheels	
		174 g/km – 19" / 20" Wheels	
	- Combined	229 g/km – 18" / 19" Wheels	
		229 g/km – 19" / 20" Wheels	
Evora IPS	- CO_2 - Urban	308 g/km	
	- Extra urban	154 g/km	
	- Combined	210 g/km	
Evora S-IPS	- CO_2 - Urban	333 g/km	
	- Extra urban	161 g/km	
	- Combined	224 g/km	

<u>CYLINDER BLOCK</u>

Material		Aluminium alloy with 'cast in' cast iron cylinder liners
Configuration		60°V, right hand bank offset 36.6mm forward RH bank; cylinders 1,3,5 from front LH bank; cylinders 2,4,6 from front
Bore diameter	- std	94.000 to 94.012 mm (3.7008 to 3.7013 in.)
	- service limit	94.200 mm (3.7087 in.)
Deck face flatness tolerance		0.07 mm (0.0028 in.)

<u>CYLINDER HEAD</u>

Material		Aluminium alloy
Head face flatness tolerance		0.10 mm (0.004 in.)
Manifold face flatness tolerance		0.10 mm (0.004 in.)
Valve guide bore in head	- std	10.285 to 10.306 mm (0.4049 to 0.4057 in.)
	- 05mm o/s	10.335 to 10.356 mm (0.4069 to 0.4077 in.)
Valve guide standout	- inlet	9.1 to 9.9 mm (0.36 to 0.39 in.)
	- exhaust	9.3 to 9.7 mm (0.3661 to 0.3819 in.)
Maximum oil clearance	- inlet	0.08 mm (0.0031 in.)
	- exhaust	0.10 mm (0.0039 in.)

VALVES & SPRINGS

Valve stem diameter	- inlet		5.470 to 5.485 mm (0.2154 to 0.2159 in.)
	- exhaust		5.465 to 5.480 mm (0.2151 to 0.2157 in.)
Overall length	- inlet	- std	5.465 to 5.480 mm (0.2151 to 0.2157 in.)
		- min	105.35 mm (4.1476 in.)
	- exhaust	- std	110.40 mm (4.3464 in.)
		- min	109.90 mm (4.3268 in.)
Valve seat contact width	- inlet		1.1 to 1.5 mm (0.043 to 0.059 in.)
	- exhaust		1.2 to 1.6 mm (0.047 to 0.063 in.)
Valve head margin (thickness between head face and 45° face)			
	- std		1.00 mm (0.040 in.)
	- minimum		0.50 mm (0.020 in.)
Valve spring free length			45.46 mm (1.790 in.)

CAMSHAFTS

Endfloat	- std	0.08 to 0.13 mm (0.0031 to 0.0051 in.)
	- service limit	0.15 mm (0.006 in.)
Maximum oil clearance	- front journal	0.15 mm (0.006 in.)
	- except front	0.09 mm (0.0035 in.)

PISTONS

Diameter 10mm below pin centreline		- std	93.960 to 93.980 mm (3.6992 to 3.6999 in.)
		- miniumum	93.830 mm (3.6941 in.)
Bore oil clearance	- std		0.020 to 0.052 mm (0.0007 to 0.0020 in.)
	- service limit		0.060 mm (0.0024 in.)
Gudgeon pin oil clearance	- std		0.001 to 0.007 mm (0.00004 to 0.0003 in.)
	- service limit		0.015 mm (0.0006 in.)

CRANKSHAFT

Main journal diameter	60.988 to 61.00 mm (2.4011 to 2.4016 in.)
Main journal max. runout	0.06 mm (0.0024 in.)
Main journal maximum taper and out-of-round	0.02 mm (0.0008 in.)
Crankpin diameter	52.992 to 53.000 mm (2.0863 to 2.0866 in.)
Crankpin maximum taper and out-of-round	0.02 mm (0.0008 in.)

OIL PUMP

Rotor tip clearance	- std	0.060 to 0.160 mm (0.0024 to 0.0063 in.)
	- service limit	0.16 mm (0.0063 in.)
Annulus to housing clearance	- std	0.250 to 0.325 mm (0.0098 to 0.0128 in.)
	- service limit	0.325 mm (0.0128 in.)
Rotor/annulus side clearance	- std	0.030 to 0.090 mm (0.0012 to 0.0035 in.)
	- service limit	0.090 mm (0.0035 in.)
Hot oil pressure	- idle	80 kPa (0.8 kgf/cm2, 11.6 psi)
	- 6,000 rpm	380 kPa (3.9 kgf/cm2, 55.5 psi)

COOLANT THERMOSTAT

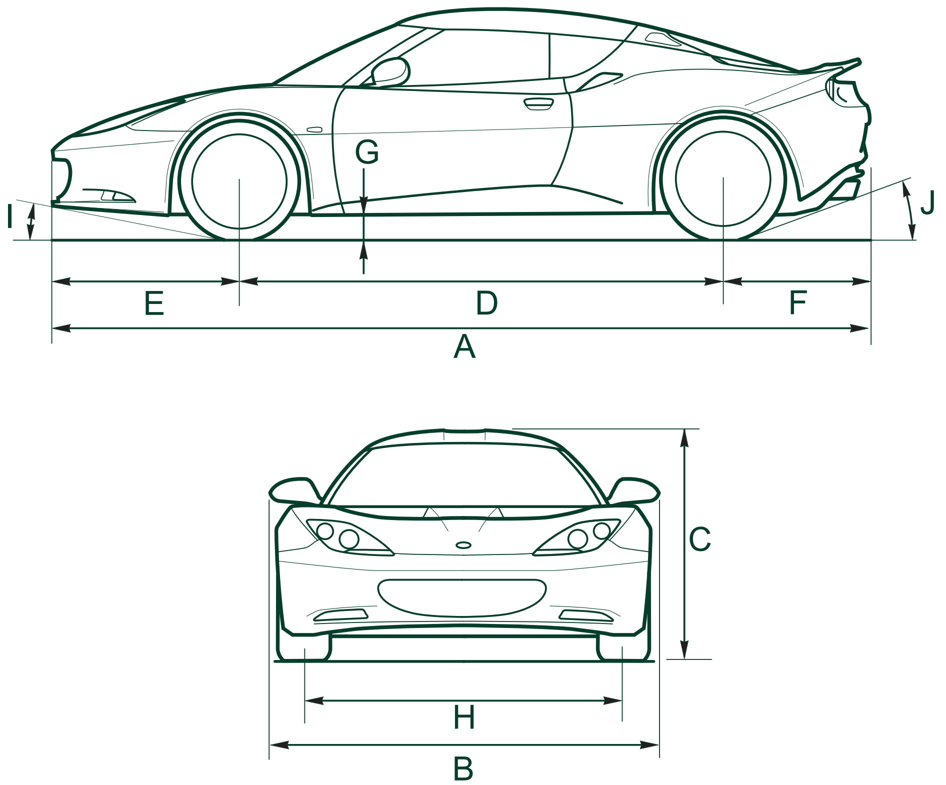
Valve opening temperature	80 to 84°C (176 to 183°F)
Valve lift at 95°C	10 mm

ENGINE OIL COOLER THERMOSTAT (IF FITTED)

Valve opening temperature	72°C (162°F)

TECHNICAL DATA - VEHICLE

SECTION TDU



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DIMENSIONS

		Evora / Evora IPS	Evora S / Evora S-IPS
A. Overall length		4350 mm	4361 mm
B. Overall width	- excl. mirrors	1884 mm	
	- incl. mirrors	1972 mm	
C. Overall height (mid-unladen)		1229 mm	
D. Wheelbase		2575 mm	
E. Front overhang		1000 mm	
F. Rear overhang		776 mm	786 mm
G. Ground clearance (mid-laden)		140 mm	
H. Track	- front	1564 mm	
	- rear	1557 mm	
I. Approach (ramp) angle front		11.5°	
J. Approach (ramp) angle rear		22°	18.5°
Turning circle (between kerbs)		10.7 m	

Dimensions listed where different from base Evora

	Evora	Evora S	Evora IPS	Evora S-IPS		
Unladen weight						
Total	1382 kg	1436 kg	1436 kg	1442kg	>	inc. full
Front	526 kg	558 kg	555 kg	557kg	>	fuel tank
Rear	856 kg	878 kg	881 kg	885kg	>	
Max. weight						
Total	1782 kg	1836kg	1836kg	1842kg	>	incl.
Front	659 kg	679 kg	679 kg	718kg	>	occupants
Rear	1123 kg	1157 kg	1157 kg	1124kg		& luggage

Trailer towing	Not permissible

CAPACITIES, STANDARDS & APPROVED PRODUCTS

Engine Oil
Evora: 2GR-FE Naturally Aspirated Powertrain

Capacity	5.75 litres
Dry - with heat exchanger:	7.1 litres
without heat exchanger:	6.8 litres
Refill- inc. filter, with/without heat exchanger:	6.1 litres
High/low dipstick mark difference:	1.5 litres

Evora S: 2GR-FE Supercharged Powertrain

Capacity - dry:	10.1 litres *Engine oil capacity is 6.1 litres but supercharged cars fitted with front mounted oil coolers contain an additional 4 litres of oil. This oil is not drained during routine servicing.*
Type - all powertrain models:	Fully synthetic
Viscosity:	SAE 0W/40
Quality standard:	API SN: ACEA A3/B4
High/low dipstick mark difference:	1.5 litres

Supercharger Oil (All Supercharged Models)

Capacity:	250 ml
Quality standard:	Ford Material Specification ESE-M99C115A
Approved product:	Nye synthetic oil 605

Transmission Oil (Manual Non Supercharged)

Capacity:	2.3 litres
Viscosity:	SAE 75W/80
Quality standard:	API GL-4
Approved product:	Havoline Multigear MTF 75W-80 (semi synthetic)

Transmission Oil (Manual Supercharged)

Capacity:	2.3 litres
Viscosity:	SAE 75W/80
Quality standard:	API GL-4
Approved products:	Havoline Multigear MTF **HD** 75W-80 (fully synthetic) Texaco Delo Syn-AMT XV 75W-80 (fully synthetic)

Transmission Oil (Automatic Vehicles)

Capacity:	8.6 litres*
Approved products:	Toyota Genuine ATF WS Transmission oil Exxon Mobil JWS 3324 Transmission oil **Transmission and torque converter oil capacity is 5.3 litres, IPS non-supercharged cars are also fitted with front mounted oil coolers and hoses containing an additional 3.3 litres of oil. Not all of this oil can drained during a routine transmission fluid change.*

Brake System Hydraulic Fluid

Capacity:	450 cc
Approved product:	Petronas Tutela Top 4 brake fluid
Lotus approval reference:	PE-00139
Type:	Non-mineral (non petroleum) hydraulic fluid
Specification:	DOT 4

Clutch System Hydraulic Fluid

Capacity:	130 cc
Approved product:	Petronas Tutela Top 4 brake fluid
Lotus approval reference:	PE-00139
Type:	Non-mineral (non petroleum) hydraulic fluid
Specification:	DOT 4

Engine Coolant/Antifreeze

Capacity:	17 litres (includiing 50% concentration of 8.5 litres of antifreeze)
Antifreeze Type:	Ethylene glycol with OAT corrosion inhibitors
Colour:	Red
Approved product:	Petronas Paraflu Up
Lotus approval reference:	PE-00140

Power Steering System (PAS)

Capacity:	1.5 litres
Type:	PAS or Automatic Transmission Fluid (ATF)
Specification:	Dexron **IIII**
Approved product:	Petronas Tutela Starfluid HD-ED

Air Conditioning Refrigerant

Refrigerant gas type:	R134a
Capacity:	0.745 kg +/-25g

Windscreen Washer Bottle

Capacity:	7.0 litres
Fluid type:	Petronas Tutela SC35 windscreen washer fluid
Concentration:	Mixed as per the manufacturers recommendations

Fuel Tank

Capacity:	60.0 litres

Luggage Compartment:

Capacity:	92 litres

WHEELS & TYRES

Tyres - Std

Type		Pirelli P-Zero
Size	- front	225/40 ZR18
	- rear	255/35 ZR19 96Y
Pressure (cold)	- front	2.3 bar (33.5 psi)
	- rear	2.5 bar (36 psi)

Tyres - Optional

Type		Pirelli P-Zero Corsa
Size	- front	235/35 ZR19
	- rear	275/30 ZR 20
Pressure (cold)	- front	2.4 bar (35 psi)
	- rear	2.6 bar (38 psi)

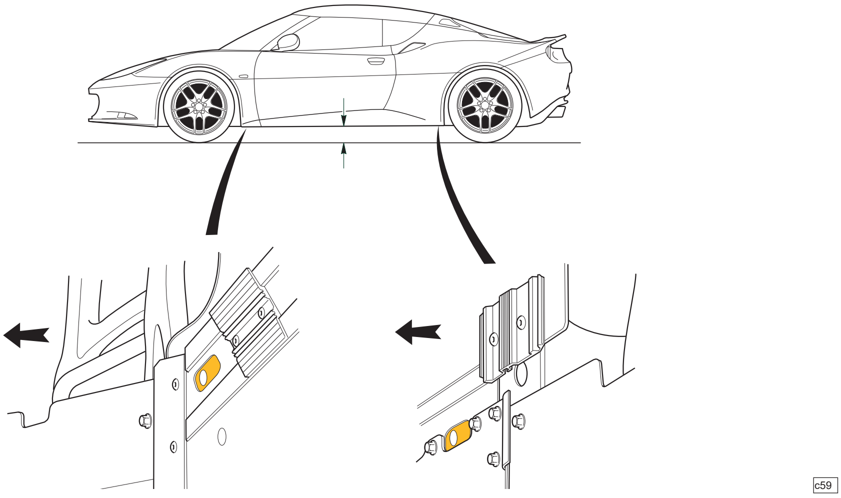
Winter Tyres

Type		Yokohama W.drive V902 'LTS'
Size	- front	215/40 R18
	- rear	245/35 R19
Pressure (cold)	- front	2.3 bar (33 lb/in^2)
	- rear	2.5 bar (36 lb/in^2)
Tyre studding		Not permitted
Tyre chains		RUD-matic DISC snow chains, fitted only on the
rear,		and only on the approved winter tyres.

Wheels

Type	- std	Cast alloy or forged, 5-bolt fixing
Size	- front	8.0J x 18H2 ET52
	- rear	9.5J x 19H2 ET69
Inset	- front	+ 52 mm
	- rear	+ 69 mm
Type	- Optional	forged, 5-bolt fixing
Size	- front	8.0J x 19H2 ET55
	- rear	9.5J x 20H2 ET69
Inset	- front	+ 55 mm
	- rear	+ 69 mm
Wheel bolt torque		105 Nm (77 lbf.ft)

Chassis ride
height points



FRONT SUSPENSION

Type: Independent. Upper and lower lightweight forged alloy wishbones; co-axial coil spring/telescopic damper unit; tubular anti-roll bar

Geometry

Mid-laden ride height (2 x 75 kg occupants + full fuel tank)
- set car to this height before measuring geometry:
  - front 125 mm below front end of chassis siderail
  - rear 147 mm below rear end of chassis siderail

Applicable vehicles			
	Castor	- optimum	+ 5.3°
		- tolerance range	+ 5.05° to + 5.55°; max. side/side 0.3°
Base Models: *From start of production to September 2010 fitted with 'B' level front upper wishbone assemblies. (See Section CK.7 for further information).*	Camber	- optimum	- 0.2°
		- tolerance range	- 0.05° to - 0.35°; max. side/side 0.2°
	Alignment	- optimum	Zero
		- tolerance range	±0.063°; max. side/side 0.038°
	Steering axis inclination		9.4° nominal

Applicable vehicles			
	Castor	- optimum	+ 5.5°
		- tolerance range	+ 5.25°; max. side/side 0.2°
Evora S: *From start of production* **Evora IPS & S-IPS:** *From start of production* **Base Models:** *Built from September 2010 onwards fitted with 'C' level front upper wishbone assemblies. (See Section CK.7 for further information).*	Camber	- optimum	- 0.2°
		- tolerance range	±0.15°; max. side/side 0.2°
	Alignment	- optimum	Zero
		- tolerance range	±0.063°; max. side/side 0.038°
	Steering axis inclination		9.4° nominal

REAR SUSPENSION

Type	Independent. Upper and lower lightweight forged alloy wishbones; co-axial coil spring/telescopic damper unit; tubular anti-roll bar

Geometry

Mid-laden ride height (2 x 75 kg occupants + full fuel tank)

- set car to this height before measuring geometry:	- front 125 mm below front end of chassis siderail - rear 147 mm below rear end of chassis siderail

Applicable vehicles			
Base Models: *From start of production to September 2010 fitted with 'B' level front upper wishbone assemblies. (See Section CK.7 & DJ.7 for further information).*	Camber	- optimum	- 1.55°
		- tolerance range	- 1.4° to - 1.7°; max. side/side 0.2°
	Alignment	- optimum	+ 0.36°
		- tolerance range	+ 0.336° to + 0.432°; max. side/side 0.036°
	Thrust angle	- optimum	Zero
		- tolerance	0.05°

Applicable vehicles				
Evora S: *From start of production* **Evora IPS & S-IPS:** *From start of production* **Base Models:** *Built from September 2010 onwards fitted with 'C' level front upper wishbone assemblies. (See Section CK.7 & DJ.7 for further information).*	Camber	- optimum	- 1.8°	
		- tolerance range	- 1.6°;	max. side/side 0.2°
	Alignment	- optimum	+ 0.6°	
		- tolerance range	+ 0.4°;	max. side/side 0.038°
	Thrust angle	- optimum	Zero	
		- tolerance	0.05°	

ELECTRICAL

Light Bulbs	*Wattage*	*Type*
Headlamps	35	D1S electronic igniter/burner unit
Rear turn indicators	21	P21W
Licence plate lamps	5	C5W
Interior lamp	5	W5W

Note that other lamps are likely to be long life LED type, serviced only by lamp replacement.

System voltage/polarity		12V negative earth
Alternator		100A
Battery (service replacement)	- type	Varta L3B (T6) 572409068
	- rating	72 Ah

TRANSMISSION

Type - Manual

Designation	6 speed manual type EA60
Differential	Open bevel gear

Gear ratio table ('opt' refers to alternative Sport ratio set)

Gear	Internal ratio	Final drive	mph/1000rpm	km/h/1000rpm
1	3.54	3.78	5.6	9.1
2	1.91	3.78	10.4	16.7
3	1.22	3.78	16.3	26.3
3 opt	1.41	3.78	14.1	22.8
4	0.86	3.78	23.1	37.2
4 opt	1.09	3.78	18.2	29.4
5	0.79	3.24	29.4	47.3
5 opt	0.97	3.24	23.9	38.5
6	0.64	3.24	36.3	58.4
6 opt	0.86	3.24	27	43.5
Rev	3.83	3.24		

Type - Automatic IPS

Designation	6 speed automatic type U660E
Differential	Open bevel gear

Gear ratios:

Gear	Internal Ratio	Final Drive
First	3.300:1	3.685:1
Second	1.900:1	3.685:1
Third	1.420:1	3.685:1
Fourth	1.000:1	3.685:1
Fifth	0.713:1	3.685:1
Sixth	0.608:1	3.685:1
Reverse	4.148:1	3.685:1

CLUTCH

Type	Single dry plate. Diaphragm spring cover. Hydraulic release, self adjusting
Friction plate diameter	228 mm
Friction plate clamped thickness - new	8.0 mm
Damper springs	4 off
Hub material	Sintered steel
Clamp load - new	8350N

BRAKES

Brake discs		Cast iron, curved vane ventilated, cross-drilled Rear discs incorporate parking drums
Disc dimensions	- front	350 x 32 mm
	- rear	332 x 26 mm. 185 mm drum
Callipers		A.P. Racing, aluminium alloy body, 4 pistons in opposed pairs. Common casting front/rear
Piston size	- front	Leading; 38.1 mm. Trailing; 41.3 mm
	- rear	Leading; 38.2 mm. Trailing; 36.0 mm
Operation		Tandem master cylinder with dual diaphragm vacuum servo and Bosch Anti-lock system
Parking brake		Cable operated drum brakes incorporated into rear discs

STEERING

Type	Power assisted rack and pinion
Turns, lock to lock	2.86
Gear ratio	47mm rack movement/steering wheel revolution

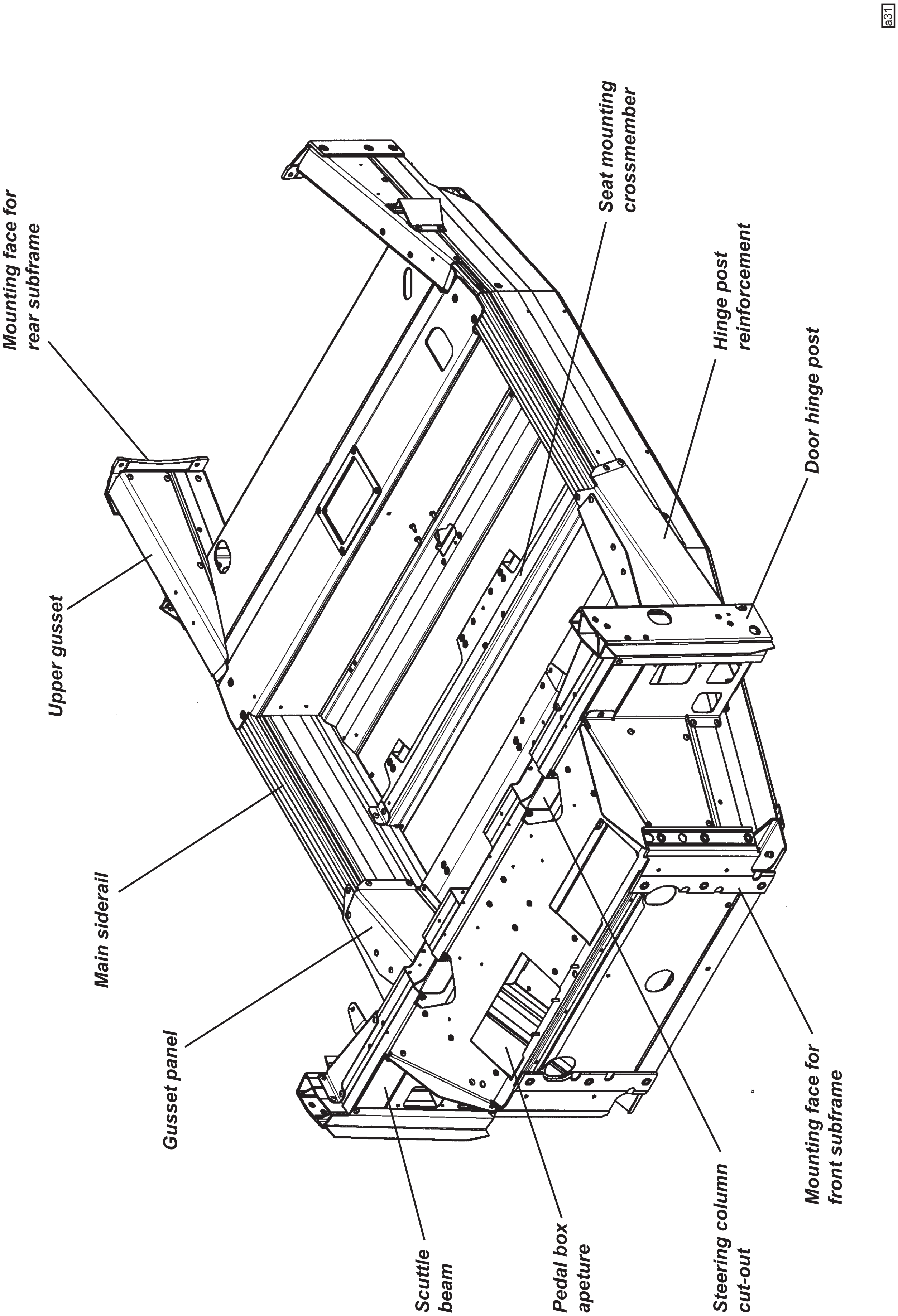
FUEL CONSUMPTION

			Std. gear ratios	*Opt. close ratios*
Evora	1999/100/EC	- urban	12.4 l/100km	13.4 l/100km
		- extra urban	6.5 l/100km	7.2 l/100km
		- combined	8.7 l/100km	9.5 l/100km
Evora S		- urban	14.2 l/100km	
		- extra urban	7.5 l/100km	
		- combined	9.9 l/100km	
Evora IPS		- urban	13.3 l/100km	
		- extra urban	6.6 l/100km	
		- combined	9.0 l/100km	
Evora S-IPS		- urban	14.4 l/100km	
		- extra urban	6.9 l/100km	
		- combined	9.7 l/100km	

CHASSIS

SECTION AJ

EAGLE MAIN CHASSIS TUB



AJ.1 - GENERAL DESCRIPTION

The chassis frame of the Lotus Eagle is constructed primarily from aluminium alloy extrusions and formed alloy sheet, with the various sections bonded together using an epoxy adhesive with secondary drive-in fasteners. The main chassis unit includes the passenger cell, footwells, front bulkhead, front scuttle with door hinge posts and the fuel tank bay. At the rear, the main chassis siderails extend rearwards beyond the fuel tank bay and alongside the engine bay, to terminate in mounting faces for the galvanised steel rear subframe. Similarly, the front bulkhead/toe board provides mountings for the alloy front subframe. A large diameter tubular steel seat belt mounting frame is bolted to the top face of the chassis side members, and incorporates a roof hoop with backstays for additional occupant protection.

The cabin rear bulkhead, body sills (inc. 'B' posts), roof panel, and windscreen mounting frame, are all constructed from glass fibre composite and are bonded to the chassis structure using an elastomeric adhesive. The front and rear outer body clamshells are each constructed from glass fibre composite mouldings, fixed to the body and chassis structure with threaded fasteners to facilitate service access and economic repair.

Two main chassis siderail extrusions, 226mm wide and 80mm deep, each comprising three box sections, run along each side of the passenger compartment between the front and rear subframe mountings. Each member incorporates two bends to allow the siderails to angle inwards afore and behind the seating area in order to accommodate the wheel wells. Each bend is formed by notching the extrusion, bending the outer wall and restoring the three cut faces with bonded and riveted patches. The front joint is reinforced by an inboard gusset panel, and the rear joint by the fuel tank crossmember. At the rear, each siderail is raised above the lower wishbone front pivot by having the siderail lowermost section machined away, and adding a folded upper gusset to the siderail top surface, to reinforce a vertical end face used for attachment of the rear subframe supension tower.

Five crossmembers link the bottom of the two siderails; one at the toe-board, two bonded together at the seat front mountings, one for the seat rear mountings, and one across the front of the fuel tank bay. Two single skin sheet sections are used to complete the cabin floor.

Behind the passenger cell, the siderails are linked by a pair of transverse crossmembers which are used in conjunction with a folded sheet upper panel to form an open bottomed fuel tank cell with a detachable, screw fixed, lower closing panel. Note that this closing panel contributes to the structural integrity of the chassis, such that the vehicle should not be operated without it properly fitted.

The front scuttle structure comprises a scuttle beam, the two door hinge posts and the foowells. A vertical extrusion is used to form each door hinge post, which is secured to the end of the scuttle beam, and, by a rearwards leading tapering channel section, to the chassis siderail. Perforated flat plates are also used to tie the lower ends of the hinge posts to the siderails. The folded sheet footbox links the front of the scuttle beam to the siderails, the toe-board and to vertical strongpoints which are used to terminate the front end of the siderails and provide mounting points for the front subframe.

A galvanised, sheet steel, fabricated rear subframe, provides mountings for the rear suspension, powertrain and exhaust muffler, and is bolted to the rear ends of the chassis siderails. The subframe also serves as a deformable crash structure to provide the necessary energy dissipation in the event of a rear impact. This feature also facilitates accident repair by separating the suspension mounting points from the main chassis structure.

At the front of the car, a front subframe uses the same construction techniques as the main chassis tub, with aluminium alloy extrusions bonded and riveted together to provide mounting points for the front suspension, front body clamshell and cooling radiators, and also houses the heating/a.c. system. The structure consists primarily of a box section extrusion at each side, continuing forwards from the front of the chassis tub to which each side is fixed by a 6 bolt flange. These two longerons, house the mounting points for the top wishbone pivots and carry drop towers down to the lower wishbone pivots. The foremost of these are linked by a lower crossmember which also carries the power steering rack, with the whole area reinforced by a bolted upper crossmember/bulkead panel forming the front of the HVAC chamber. The front ends of the longerons are linked by another crossmember secured at each side by two M8 fixings. The construction of the subframe also serves to dissipate energy and control the rate of deceleration sustained by the occupants in a frontal collision. As at the rear, this feature also facilitates accident repair by separating the suspension mounting points from the main chassis structure.

Note that the whole of the chassis structure as so far described, is machined to allow assembly into right or left hand drive configuration.

The bonded and rivetted main chassis tub described above is considered a non-serviceable single unit, jig built to fine tolerances, to which no structural repairs are approved. Superficial, cosmetic, or non-structural localised damage may be cosmetically repaired as necessary, but in the case of accident damage resulting in significant bending, tearing or distortion of the aluminium structure, especially in respect of the attachment points for the front and rear subframes, the recommended repair is to renew the partial body assembly, which comprises the main chassis tub, with jig bonded composite rear bulkhead, body sills and windscreen frame. Also included are the pipes and cables routed through the body sill mouldings.

AJ.2 - CHASSIS STRAIGHTNESS CHECK

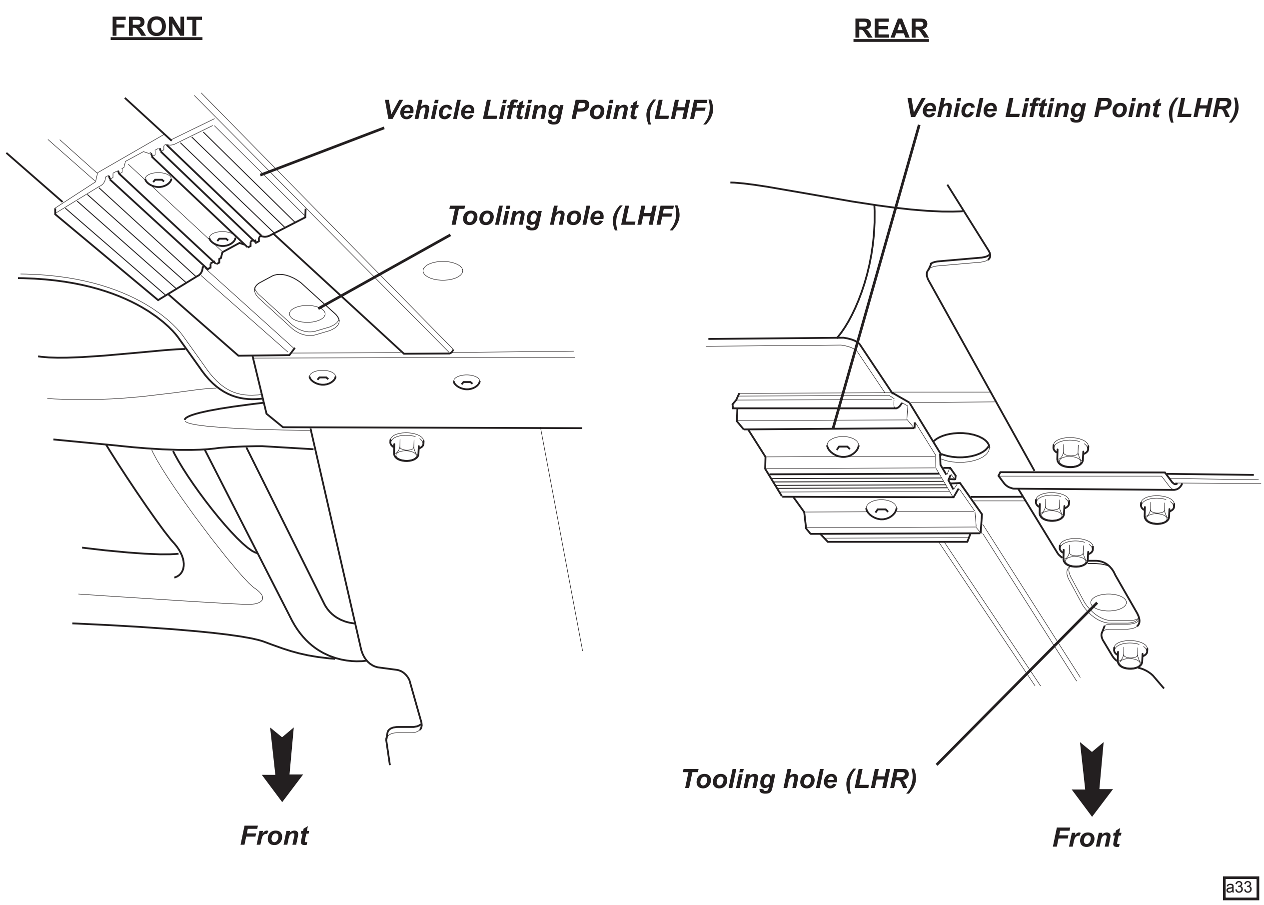
In the absence of visual damage, the chassis may be checked for twist or distortion by utilising the machined tooling indents in the underside of the main side rails. If computer processed laser measuring equipment is not available, manual checks can be made with reference to a completely level ground plane, e.g. an accurately set and maintained suspension geometry ramp/lift. Position the car on the lift, and proceed as follows:

1. Identify the tooling indents in the lower surface of each chassis main side rail. At the front end, just behind the front crossmember, and at the rear, just ahead of the fuel tank bay rear crossmember. Note that three of the machined oval areas are drilled, but not at the right hand rear.

2. Measure the height of each tooling indent above the reference plane and use jacks to adjust the height of the chassis in order to equalise any three of these dimensions.

3. Measure the deviation of the fourth dimension from the other three.
Maximum service deviation = ± 2.0 mm.

4. Repeat operations (2) and (3) for each combination of corners to result in four values for the 'fourth' dimension deviation. If any one of these exceeds the service specification, the chassis should be considered damaged and replaced by a partial body assembly.



AJ.3 - REAR SUBFRAME

The rear ends of the chassis siderails are linked by a fabricated sheet steel subframe which provides mountings for the powertrain, rear suspension, rear body, exhaust muffler and seat belt mounting frame struts. The subframe is aligned to each of the siderails by an 8mm roll pin, and secured by seven M10 x 30, 8.8 grade bolts. It is possible to remove the subframe from the chassis complete with powertrain and suspension attached, although access to some fixing bolts will be restricted, and alignment on refitment may be difficult.

To remove/refit rear subframe

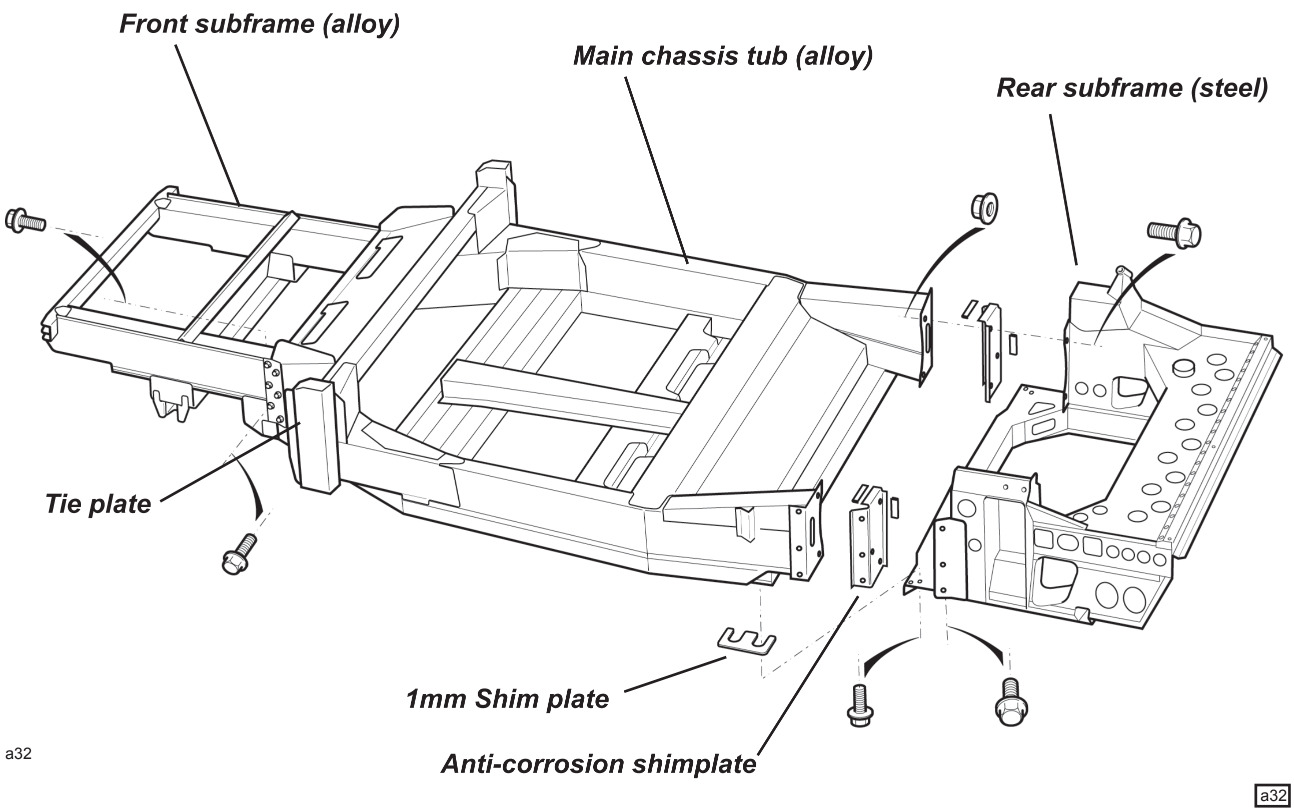
1. Remove rear body and disconnect all pipes, hoses, harnesses and cables.

2. Remove the seat belt mounting frame rear struts.

3. Support the rear subframe before progressively and evenly removing the seven fixing bolts from each side of the frame:
   At each side;
   - Two bolts from beneath into threaded inserts in the chassis rail lower surface;
   - Three bolts into captive nuts in the chassis rail side face;
   - Two bolts from within the engine bay using loose nuts ahead of the siderail closing plate.

4. Withdraw the subframe taking note of the shim plates fitted at each side between the bottom of the siderail and the subframe.

5. On re-assembly, first trial fit the subframe to the chassis, using no shim plates. Locate the subframe by engaging the roll pins into the dowel holes in the chassis rail rear closing plates and secure at each side by temporarily fitting the two bolts and nuts through the closing plates. Measure the gap between the bottom of each chassis siderail and the subframe horizontal surface, and select the appropriate number of 1mm shim plates.



6. Re-assemble the subframe to the chassis using Duralac MSDS anti-corrosion compound (A111C6017S) between the mating faces and inserting the appropriate shim stacks. Fit all fixing bolts and tighten evenly and progressively to a final torque of 45 Nm.

AJ.4 - FRONT SUBFRAME

The front subframe uses the same construction techniques as the main chassis tub, with aluminium alloy extrusions bonded and riveted together to provide mounting points for the front suspension, front body clamshell and cooling radiators, and also houses the heating/a.c. system. The subframe legs are secured at each side to the front face of the chassis tub by three bolts, and reinforced by a tie plate on the outer surface which uses six bolts.

To remove/refit front subframe

Before removing the front subframe, it is recommended to remove all front bodywork, the front suspension assembly and the HVAC equipment in order to allow easier handling of the subframe and to minimise potential component damage.

1. Remove the front clamshell, 'A' panels and front bumper.

2. Recover the a.c. refrigerant and drain the engine cooling radiator. Remove the HVAC unit (see section PN) and disconnect all hoses, pipes, harnesses and cables.

3. Disconnect the steering column from the rack pinion shaft.

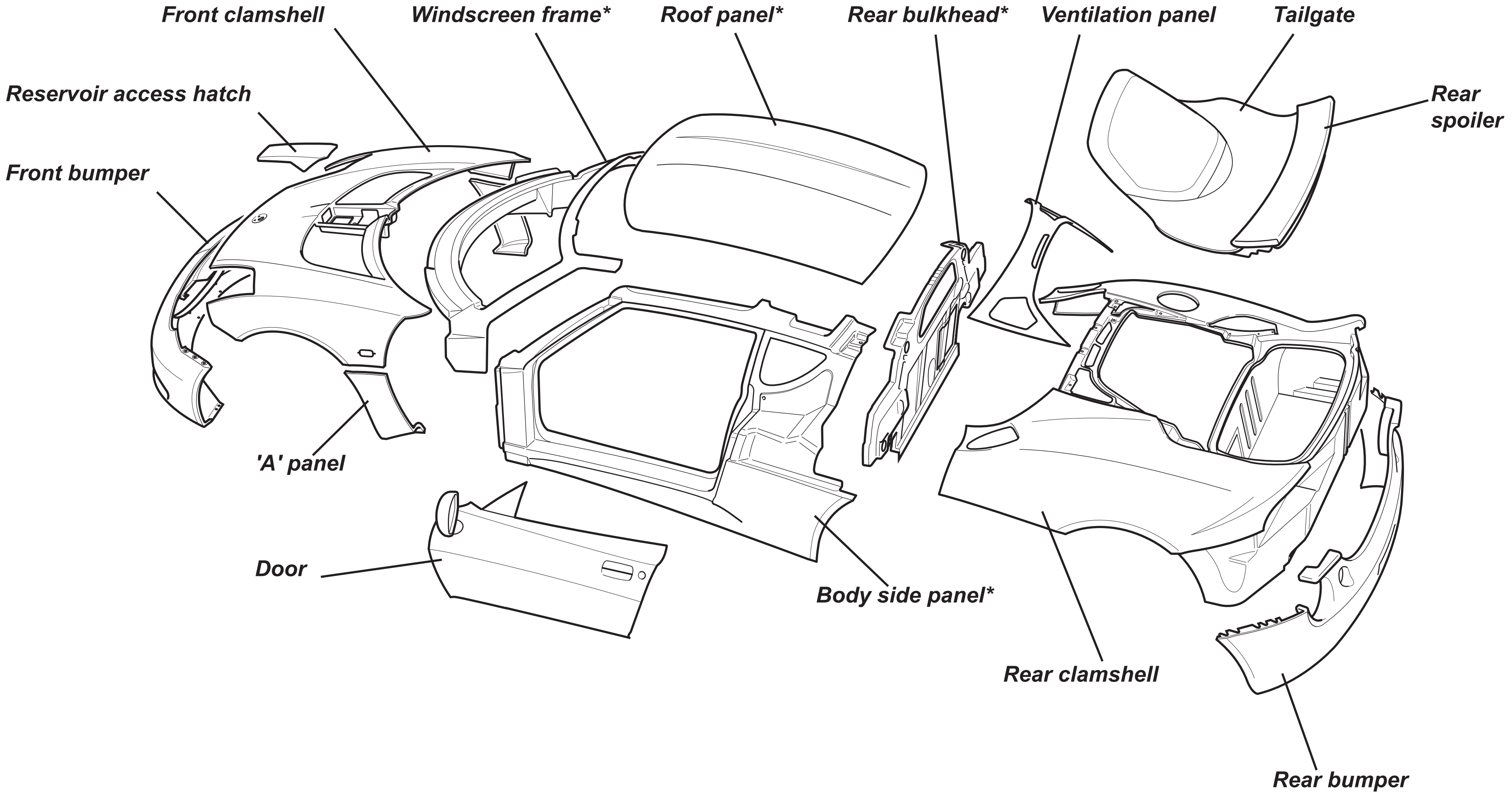
4. Provide support for the subframe before releasing the six bolts securing the tie plate to each subframe leg. Then progressively and evenly release the three bolts securing the inboard side of each subframe leg to the chassis. Withdraw the subframe.

5. On re-assembly, mate the subframe to the chassis and locate with the three bolts and each side. Fit the tie plates to the outboard faces and locate the six bolts at each side. Progressively and evenly tighten all 18 off M10x30 bolts to a final torque of 45 Nm.

BODYCARE & REPAIR

SECTION BU

Evora Composite Body Panels



* denotes panels bonded with elastomeric adhesive

BU.1 - GENERAL DESCRIPTION

The body panels of the Lotus Evora are constructed of composite materials, and contribute to the overall stiffness of the body/chassis structure. The panels are attached to the aluminium chassis and/or other body panels either by elastomeric polyurethane adhesive, where maximum structural integrity is required, or by threaded fasteners, where ease of service access and repair is the greater priority. The windscreen frame incorporates foam cores to create closed box sections for optimum strength and lightness.

BU.2 - LOTUS COMPOSITE BODY FEATURES

Composite structures have the ability to absorb high impact loads by progressive collapse, with impact damage being localised. In vehicle accidents this feature protects the occupants from injurious shock loads and greatly reduces the danger of entrapment by deformation of steel body panels. This behaviour also facilitates repair either by replacing the damaged bonded or bolt on panels, and/or integrating a replacement section with the undamaged area, using recognised approved methods which restore the panel to its original condition without residual strain or distortion.

The manufacturing process enables the thickness of composite mouldings to be varied in order to provide efficient structures of high strength and low weight. Composites will not corrode, so the strength of composite components is retained regardless of age, unless physical damage is sustained. On the Evora, the body construction features a safety cell around the cabin, comprising an assembly of body panels bonded to the chassis and to each other to provide maximum occupant protection combined with light weight. Both ahead of, and behind the cabin, body panels are screw fixed to permit easy removal for access to chassis or powertrain components, or to allow simple and economic accident repair.

A composite panel may return to its original shape after deflection, but beyond a certain level of flexibility, such treatment may result in the formation of surface cracks which may not be immediately apparent due to the masking effect of the paint film. A steel panel similarly treated would become dented or deformed. The cracking may be confined to the surface layer with no reduction in panel strength, but if the damage is more severe the composite structure below the surface may be weakened. Localised repairs can be made in either case. Possible causes of surface cracking include:

- Vehicle collision;
- Inappropriately sitting, leaning heavily or pushing on the body or any composite panel;
- Knocking doors against obstructions when opening;
- Dropping or striking objects against a panel, including footballs and other wayward missiles;
- Unrestrained items in the luggage compartment striking the inside of the rear body;
- Attempting to close the tailgate onto projecting luggage or tools
- Applying excessive force to parts attached to composite panels e.g. mirrors, handles and locks (inc. action by vandals).
- Incorrect jacking, or panel removal procedures.

The composite body panels of the Evora are manufactured by one of several processes dependent on the requirements of the panel concerned:

- All visible external panels, where surface quality is a priority, are produced by Injection Compression System Resin Transfer Moulding (ICSRTM), whereby glass fibre mat cut to shape and preformed when necessary, is placed in a heated, chrome steel surfaced, closed mould, into which polyester resin is injected. After filling, the gap between the two halves of the mould is then reduced in order to compress the moulding and ensure complete material flow and consistent structural quality. Panel thickness varies according to strength/weight requirement. The special 'low profile' resin used ensures minimum shrinkage during the curing process, in order to provide the optimum surface finish.
- For less visible components, including the rear bulkhead, battery box, boot box and some reinforcement panels, a Resin Transfer Moulding process is used with standard polyester resin injected at low pressure into a double sided closed tool containing dry and preformed composite material.
- For panels with a relatively simple shape and a low structural requirement, a Sheet Moulding Compound (SMC) process is used, whereby a pad of material impregnated with resin is placed in a closed tool which applies heat and a low compression to the moulding. A panel of high surface quality is produced, requiring only a minimum of fettling operations.
- The front and rear bumpers are produced by a Reinforced Reaction Injection Moulding (RRIM) process, whereby a mixture of polyurethane resin and milled glass is injected into a closed mould to result in panels with good surface finish and high flexibility.

Whichever production process applies, if repairs can be determined as being more economic than panel replacement, repair methods using either conventional composite techniques, or proprietary plastic component repair systems, can be used to rectify surface or structural damage.

ICS components
Front clamshell outer
Rear clamshell outer
Bodysides
Tailgate inner
Roof
Door inners
Windscreen frame

RTM components
Rear bulkhead
Battery and boot boxes
Clamshell reinforcement panels

SMC components
Tailgate outer
Door outers
'A' post panels
Reservoir access hatch

RRIM components
Front and rear bumpers

BU.3 - BODYCARE

The acrylic enamel paint finish of the Evora is extremely resistant to all normal forms of atmospheric attack. Following the simple maintenance procedure summarised below will help retain the gloss, colour and protective properties of the paint throughout the life of the vehicle. However, car finishes are not immune to damage, and amongst the more common causes of deterioration are:

- Atmospheric contaminants; dust, soot, ash, and acidic or alkaline aerosol mist can chemically attack paint.
- Abrasion; blowing sand and dust, or a dirty washing cloth.
- Tree sap and insect fluids; can form a water-insoluble polymer that adheres to the paint.
- Bird excrement; highly acidic or alkaline, they can chemically etch the paint. Wash off immediately.
- Leaves; contain tannic acid which can stain light finishes.
- Impact damage; granite chippings thrown up from poor or recently dressed road surfaces can subject the body to severe localised impact, and result in paint chips, especially around the vulnerable frontal panels.
- Moisture entrapment; Long term use of a non-breathable car cover can trap moisture and/or induce condensation and promote water penetration of the paint film.

Washing

Lotus recommends hand washing of the painted bodywork. The car is a speciality sports vehicle not intended to be subjected to an automatic car wash. Automatic car washing machines may have a detrimental effect on the paint film and their use will invalidate the terms of the Vehicle Warranty.

Many contaminants are water soluble and can be removed before any harm occurs by thorough washing with plenty of lukewarm water, together with a proprietary car wash additive (household detergent and washing up liquid can contain corrosive salts, and will remove wax and accelerate oxidation). Frequent washing is the best safeguard against both seen and invisible contaminants. Wash in the shade, and use a cotton chenille wash mitt or a sponge rinsed frequently to minimise entrapment of dirt particles. Use a straight back and forth washing motion to avoid swirled micro scratches, and rinse thoroughly.

In order to minimise degradation from road salt, the underside of the chassis should be rinsed with clean water as soon as possible after driving on treated roads. Many fuel filling stations offer pressure washing facilities ideal for this purpose, but to not use on the painted bodywork or vulnerable powertrain components or delicate radiator finning.

Paintwork Polishing

Eventually some loss of gloss, and an accumulation of traffic film, will occur. At this stage, after normal washing, the application of a good quality liquid polish will restore the original lustre of the paint film. Higher gloss of the paint finish, and added protection against contamination, can be obtained by the use of a wax polish; however, this can only be used successfully on a clean surface, from which the previous application has been removed with white spirit or a liquid polish cleaner.

Ventilation

Water lying on the paint surface for a lengthy period will eventually penetrate the paint film. Although the effects will not be visible immediately, a deterioration in the protective properties of the paint film will ultimately result. It is not recommended to store a wet car in a poorly ventilated garage. If good ventilation cannot be provided, storage outside on a hard standing or under a carport is to be preferred.

'Soft Feel' Paint Finish

Special edition models may have specific individual panels, or be completely painted in a 'soft feel' water borne matt paint finish. This have been given a Lotus colour code and description of B141 Matt Black. The paint is produced by Sonnebornne and Reick with a mixing ratio of 10 parts Black Soft Feel 97R:361WSL:103/A to 1 part Jaxalac Curing Agent 90:CA-38.

Limited Warranty & Paint Repairs

This finish is resistant to most normal forms of atmospheric attack provided the special cleaning and maintenance requirements as specified by Lotus are strictly adhered to. However due to the textured matt finish, fading or discolouration of all or part of the matt paint finish may occur during the early life of the vehicle and this is considered normal and is specifically excluded from any warranty given by Lotus.

Please refer to Technical Service Bulletin TSB 2009/10 listing information on the specific warranty period for vehicles finished in matt finish paint as well as TSB 2010/05 for information on the specialist paints and chemicals used as well as clarification on the procedures required when carrying out panel repairs or replacement.

Any damage to the car's paint finish will require specialist and skilled paint repairs. In any event any repairs may result in a build up or 'stepping' between the matt and gloss finishes used on the car and shade variations in the paint finish as the car ages. Again this is considered normal and is excluded from the Limited Warranty.

Cleaning and Maintenance

The special matt paint finish applied to the car requires special cleaning and maintenance procedures to be followed. Paint care products are listed below and available to order from the Lotus Aftersales Department. These should be the only products used on the matt finish soft feel panels.

Lotus approved cleaning products:

Part Number	Description
A000Z9101Z	3M/Sia fine abrasive pads
A000Z9018Z	Go Foam
A000Z9147Z	Armor All Protectant solution

Cleaning Procedure

- Avoid washing the car in direct sunlight.
- Use only automotive specific salt-free detergents with clean water when washing.
- Thoroughly rinse all traces of detergent from the body with clean (preferably demineralised) water and dry with a clean absorbent cloth before attempting to remove any stubborn contamination with specific Lotus approved cleaners.
- Use only Lotus approved Sia fine (grey) abrasive pads in conjunction with Lotus approved automotive detergent in water to remove any insect remains, tar spots and stubborn contamination from the car's matt paint finish.
- Spray the Lotus approved detergent solution onto the affected area and allow to soak thoroughly before gently abrading in small circular movements to remove the contamination. Avoid heavy abrasion as this will mark the car's matt paint surface.
- Dry the area and clean using 'Go-Foam'. When this has been wiped dry, apply only 'Armor All Protectant' solution with a clean micro-fibre cloth, turning the cloth regularly until a clean dry surface is achieved.
- Avoid contact with any wax or other polishing materials on the matt surface when polishing the gloss black stripe areas.
- Similarly, avoid using any abrasive materials when polishing the gloss black stripe areas, as the gloss finish may be damaged.
- Aggressive solvent based cleaners should not be used to clean the car's matt paint finish.
- Wax or abrasive polishes should not be used on the car's matt paint finish as these will mark and contaminate the car's matt paint finish and may prove very difficult to remove.
- Use of cleaning or paint care products not approved by Lotus, or failure to follow the paint care and maintenance procedures may result in detrimental affects to the car's paint finish and could invalidate the Limited Warranty in respect of the car's paint finish.

BU.4 - ACCIDENT DAMAGE ASSESSMENT

The repair method to be employed in the rectification of accident damage to composite panels, is to be assessed reletive to the particular panel and its method of attachment:

Bolt-on Panels:
- Front Clamshell & Reservoir Hatch;
- Front Bumper;
- 'A' Panels;
- Door Shells;
- Rear Clamshell;
- Rear Bumper;
- Tailgate;
- Ventilation Panel;
- Reservoir Hatch.

These panels are secured by threaded fasteners and are easily removed for access to the back of any damaged area for repair by conventional composite techniques. Instructions for the removal and refitment of these panels are contained in section BV.

Bonded-on Panels:
- Windscreen Frame;
- LH & RH Body Side Panels;
- Rear Bulkhead;
- Roof Panel.

These panels are bonded to the chassis or to other panels using a flexible polyurethane adhesive which must be cut before the panel may be removed. In some cases, it may be necessary to partially remove another panel before the subject panel can be released. It is not generally economic to attempt to remove a bonded panel intact for later re-fitment.

The shape, positioning and structure of the windscreen frame is crucial to the fit of the windscreen and adjacent body panels, in addition to its behaviour in a vehicle collision. The only repairs which should be considered for this panel are cosmetic and superficial; any structural damage should be addressed by windscreen frame replacement.

The body side panels include the ‘A’ posts, ‘B’ posts and cantrails, and involve much labour time to replace. Localised repairs should be performed whenever possible, if necessary using a partial section cut from a replacement body side panel. Access to the inner surface should be considered when assessing cut lines.

Note that if damage is such as to require replacement of the chassis, a service replacement chassis is provided only as a 'partial body assembly' which includes jig bonded windscreen frame, body side panels, rear bulkhead and roof. Also included, are the pipes, hoses and cables routed through the sills.

BU.5 - BODY PANEL BONDING MATERIALS

The materials used for bonding the body panels are manufactured by Dow Chemical, and in order to maintain the structural integrity of the vehicle, and in the case of the front crash structure, the safety, it is most important to use only the specified materials. The surface preparation and cleaning and priming operations are crucial to the performance of the adhesive, and must be followed in detail. The products to be used depend on the surface (substrate) onto which they are applied, and the following list identifies each application:

Anodised aluminium (e.g. chassis and components)

Cleaner:	Betawipe VP 04604	Lotus part no. A082B6150V
Primer:	Betapnme 5404	Lotus part no. A082B6337V
Adhesive:	Betaseal 1701	Lotus part no. A082B6281F

Unpainted or painted composite

Cleaner:	Betaclean 3900	Lotus part no. A100B6008V
Primer:	Betaprime 5404	Lotus part no. A082B6337V
Adhesive:	Betaseal 1701	Lotus part no. A082B6281F

Zinc plated and passivated steel

Cleaner:	Betaclean 3900	Lotus part no. A100B6008V
Primer:	Betaprime 1707 (A+B)	Lotus part no. A111B6374V
Adhesive:	Betaseal 1701	Lotus part no. A082B6281F

Glass

Cleaner:	Betabrade F1	Lotus part no. A120B6043V
	or Betaclean 3300	Lotus part no. A120B6042V
	or Betaclean 3900	Lotus part no. A100B6008V
Primer:	Betaprime 5500	Lotus part no. A120B6041V
Adhesive:	Betaseal 1701	Lotus part no. A082B6281F

Uncoated Lexan/Perspex

Cleaner:	Abrasion & dry wipe	
Primer:	Betaprime 5404	Lotus part no. A082B6337V
Adhesive:	Betaseal 1701	Lotus part no. A082B6281F

Residual adhesive (i.e. rebonding to surface after cutting off old panel)

Cleaner, primer & re-activator:	Betawipe 4000	Lotus part no. A082B6355V
Adhesive:	Betaseal 1701	Lotus part no. A082B6281 F

Applicator Bottle

An applicator bottle is available for use with some cleaners and primers, and has a disposable felt pad which should be changed regularly to minimise surface contamination:

Applicator bottle:	A000Z1071F
Cap:	A082B6353S
Felt pad:	A082B6354S

Product Usage

BETAWIPE VP 04604 (A082B6150V):

Description: Activator and cleaning agent used to promote adhesion to the substrate surface. Supplied in a 250ml aluminium container with a YELLOW coloured cap.

Application:
- Wipe on/wipe off type.
- Pour Betawipe VP 04604 into applicator bottle, and immediately refit the yellow cap onto the container.
- Push the applicator head onto the bottle, and fit the felt pad.
- Wet out the felt pan by inverting the applicator bottle and gently squeezing the sides.
- Wipe the pad over the substrate surface using minimal pressure to wet the surface.

- Immediately wipe off the activated/cleaned surface using a clean fibre free cloth, and discard.

Notes: - If the substrate is very dirty, first wipe off the surface with a clean fibre free cloth and discard.
- Do not leave the caps off Betawipe containers. A milky colour indicates moisture absorption, and the material should be discarded.
- Only decant a sufficient quantity of Betawipe for the job concerned, and never pour material back into the container from the applicator bottle.
- Change the felt pad at regular intervals to reduce surface contamination.

BETACLEAN 3900 (A100B6008V)

Description: Degreaser and cleaning agent used for the removal of contamination from the substrate surface. Supplied in 1 litre aluminium container with a BLACK coloured cap.

Application: - Wipe on/wipe off type.
- When substrate is very dirty, first wipe off the surface with a clean fibre-free cloth and discard.
- Dampen a fibre-free cloth with Betaclean 3900, and immediately replace the black cap.
- Thoroughly clean the substrate surface with Betaclean and discard the cloth.
- Wipe off the substrate with a clean fibre-free cloth and discard.

BETABRADE F1 (A120B6043V)

Description: Liquid for removing contaminants from glass surface without scratching.

Application: Betabrade F1 may be applied to either (i) the glass surface, or (ii) a fibre free cloth.
i) Glass surface: Apply small beads of material, approx 3mm dia. x 50mm to the ceramic surface of the glass. Use a fibre free cloth to thoroughly clean the ceramic surface of the glass to be bonded and then wipe off all residual amounts. (A wipe on/wipe off process)
ii) Fibre free cloth: Apply material to the fibre free cloth and thoroughly clean the ceramic surface of the glass to be bonded and then wipe off all residual amounts. (A wipe on/wipe off process)

BETACLEAN 3300 (A120B6042V)

Description: Cleaner for glass and ceramic frit (coating).

Application: Betaclean 3300 may be applied to either (i) the glass surface, or (ii) a fibre free cloth.
i) Glass surface: Spray the material onto the ceramic frit (coating) of the glass around the periphery and then using a fibre free cloth thoroughly clean the surface.
ii) Fibre free cloth: Apply the cleaner to the fibre free cloth and then thoroughly clean the ceramic frit (coating). In both (i) and (ii) above the method is a wipe on/wipe off process.

BETAWIPE 4000 (A082B6355V)

Description: Cleaning agent which acitvates the old adhesive layer to accept new adhesive. Supplied in 15ml aluminium containers with a BLUE cap.

Application: - The residual adhesive bead should be cut with a scalpal to leave an even thickness of approximately 1 to 2 mm.
- Dampen a fibre-free cloth with Betawipe 4000 and immediately replace the blue cap.
- Thoroughly clean the substrate surface with Betawipe and discard the cloth. Do not wipe off.
- Allow 2 - 3 minutes flash off time before applying adhesive.

BETAPRIME 5500 (A120B6041V)

Description: Adhesion promotor used to maximise the performance of the bonding between the cleaned and/or activated surface and the adhesive compound. Supplied in 250 ml aluminium container with GREEN coloured cap.

Application: - Two steel balls inside the container are provided to assist mixing of the contents when shaken. Prior to decanting Betaprime 5500, shake the container for at least 60 seconds to disperse the solid content of the material into suspension.
- Pour the primer into the applicator bottle and immediately replace the green cap.
- Wet out the felt pan by inverting the applicator bottle and gently squeezing the sides.

- Wipe the pad over the activated/cleaned substrate surface to apply a continuous film of primer.
- Allow to dry for a minimum of 15 minutes before applying adhesive. If adhesive is not applied with 72 hours, wipe on/wipe off with Betawipe VP 04604.

Notes: - The appearance of the primed areas should be deep black in colour with no streaks or voids.
To achieve this appearance, apply in smooth continuous uni-directional movement, not short backward and forward movements. The latter technique results in inconsistent film build.
Rework any poor areas after 5 minutes (tack time), applying in the same direction.
- Replace the felt pad if moisture absorption results in hardening.
- Never return unused Betaprime back into the aluminium container.

BETAPRIME 5404 (A082B6337V)

Description: Adhesion promotor used to maximise the performance of the bonding between the cleaned and/or activated surface and the adhesive compound. Supplied in 250 ml aluminium container with RED coloured cap.

Application: - Two steel balls inside the container are provided to assist mixing of the contents when shaken. Prior to decanting Betaprime 5404, shake the container for at least 60 seconds to disperse the solid content of the material into suspension.
- Pour the primer into the applicator bottle and immediately replace the green cap.
- Wet out the felt pan by inverting the applicator bottle and gently squeezing the sides.
- Wipe the pad over the activated/cleaned substrate surface to apply a continuous film of primer.
- Allow to dry for a minimum of 15 minutes before applying adhesive. If adhesive is not applied with 24 hours, re-activate by applying a further coat of Betaprime 5404.

Notes: - The appearance of the primed areas should be deep black in colour with no streaks or voids.
To achieve this appearance, apply in smooth continuous uni-directional movement, not short backward and forward movements. The latter technique results in inconsistent film build.
Rework any poor areas after 5 minutes (tack time), applying in the same direction.
- Replace the felt pad if moisture absorption results in hardening.
- Never return unused Betaprime back into the aluminium container.

BETAPRIME 1707 A+B (A111B6374V)

Description: Adhesion promotor used to maximise the performance of the bonding between the cleaned and/or activated surface and the adhesive compound. Supplied in 250 ml aluminium containers of component A and component B.

Application: - Thoroughly shake component A container to disperse solid material. Remove the lid from the component A container and scrape any sediment from the botton of the container. Replace the container lid and thoroughly shake again to disperse the solid content.
- Pour the required amount of component A into a clean container, and add the same volume of component B. Replace lids immediately. Thoroughly mix the two components for 45 seconds minimum.
- Leave the mixed components to stand for 30 MINUTES. (Discard if unused after 8 hours)
- Pour the pnmer into the applicator bottle and wet out the felt pan by inverting the bottle and gently squeezing the sides.
- Wipe the pad over the cleaned substrate surface to apply a continuous THIN film of primer:
A thin, almost transparent film is all that is required. No attempt should be made to attain a completely opaque covering.
- Allow to dry for a minimum of 4 HOURS, before applying adhesive.

Notes: - To achieve a continuous thin film of Betaprime 1707, apply in a smooth continuous uni-directional movement, not short backward and forward movements. The latter technique results in inconsistent film build.
- Replace the felt pad if moisture absorption results in hardening.
- Never return unused Betaprime back into the aluminium container.

BETASEAL 1701 (A082B6281F)

Description: One component moisture curing adhesive, providing high strength, permanently elastic bonds between various substrates. Supplied in 300 ml aluminium cartridge.

Application: - Remove the cartridge end ensuring there is no damage to the reinforcing sleeve.
- Pierce the neck of the cartridge and screw on the applicator nozzle. Cut the nozzle end to the required diameter and shape.
- Fit the cartridge into an air assisted gun, and extrude a smooth, even and continuous bead of Betaseal to the previously prepared substrate.
- Assemble the joint within 5 MINUTES.

Notes: - If the adhesive has to be touched or manipulated for any reason, use only *wetted* fingers.

Plastic Panel Repair System

For repairs of cracked or damaged panels 'in-situ', plastic panel repair systems may be used such as Wurth Replast, available under Lotus part number T000T1469F. Full instructions are supplied with the kit.

BU.6 - REPLACEMENT OF BONDED-ON PANELS - GENERAL

Bonded body panels are secured using Dow Chemicals products 'Betaseal' or 'Betamate', which are flexible polyurethane adhesives which must be cut in order for a panel to be removed. The recommended method of adhesive cutting is with the use of a pneumatic tool such as are widely available from specialist tool suppliers, and which use a range of differently shaped cutting knives operating with a rapidly oscillating action. These tools may also be used to remove windscreens.

An applicator gun for dispensing Betaseal 1701 adhesive may be obtained directly from PC Cox Ltd, Turnpike Lane, Newbury, Berks. RG14 2LR Tel; +44 (0)1635 264500.

With some panels, it may not be practicable to attempt to removal intact for later refitment; damage to the bonding flange is likely to occur. Consequently, when expedient, the panel can be cut away for better access to the bonded joint. It is not necessary to remove all traces of sealant from the joint faces on the remaining panels or chassis, but any remaining sealant must be securely bonded and no thicker than 1 mm or the fit and joint gaps will be upset. It is essential always to follow the cleaning/priming/bonding operations meticulously if sufficiently strong and durable bonds are to be achieved. Always use the specified materials.

Preferred practice is to paint the body panels prior to bonding into position (as factory build), firstly masking off all bonding surfaces on the panel.

BU.7 - ROOF PANEL

The composite roof panel is an ICS moulding which is last to be assembled, and generally the first panel which needs to be removed. The panel is bonded to the top of the windscreen header rail, cabin rear bulkhead panel, top flanges of the body side panels and seat belt mounting frame.

To replace roof panel

1. Remove the 'A' post covers and the roof lining if this is to be re-used.

2. Remove rear clamshell (see sub-section BV.5).

3. Using a pneumatic knife or cutting wire, cut the adhesive between the roof and header rail, body side panels, rear bulkhead and seat belt frame, and remove the roof.

4. Remove excess sealant from all the bonding areas on the header rail, body side panels, rear bulkhead and seat belt frame. It is not necessary to remove all traces of old adhesive, but any remaining adhesive must be securely bonded and be cut with a scalpal blade to leave an even thickness of 1 - 2 mm.

5. Prepare the bonding surface of the new roof panel with Betaclean 3900 and Betaprime 5404 (see sub-section BU.5). Prepare the surface of the residual adhesive on the body panels and seat belt frame using Betawipe 4000 (see sub-section BU.5).

6. Apply a bead of Betaseal adhesive (see sub-section BU.5) to the bonding surface on the header rail, rear bulkhead, body side panels and seat belt frame, and fit the roof into position. Press all around the whole length of the joint to ensure sufficient spread of adhesive, if necessary using a spatula to smooth or remove any extruded adhesive, and to neaten any visual areas. Where necessary, add adhesive to the jointline to ensure complete weathersealing and neat appearance, and smooth with a spatula.

7. Clamp the panel into position until the adhesive has cured (see sub-section BU.5).

8. Refit displaced parts as necessary.

BU.8 - WINDSCREEN FRAME

The windscreen frame is an assembly of ICSRTM mouldings featuring hollow, foam filled sections, and including a screen bottom landing panel, the two windscreen pillars and the windscreen header rail. The landing panel is bonded to the chassis scuttle, the pillars to the body sides, and the roof panel bonds to the header rail.

Localised damage to the frame should be repaired *in situ* using recognised techniques, but it is unlikely that the complete frame will require replacement without the body sides and/or roof panel also being damaged. Replacement of the windscreen frame will in any case require that the roof panel be removed, and the front section of both body sides be released from the chassis.

The elastomeric adhesive bonding the frame to the scuttle and other body panels requires cutting with a reciprocating knife, if necessary cutting the frame itself to allow improved access to the joint. It is unlikely to be economic to attempt to remove a windscreen frame for re-fitment.

To replace windscreen frame

1. Remove the front clamshell (see sub-section BV.4) and wiper mechanism.

1. Remove the front clamshell, windscreen pillar trims, fascia top panel and headlining.

2. Remove the wiper mechanism and cut out the windscreen (see sub-section BV13).

3. Remove the roof panel (see sub-section BU.10).

4. Cut the adhesive securing both body sides to the chassis 'A' posts.

5. Remove the bracket securing the frame to the pedal box.

6. Cut the adhesive bond securing the frame to the chassis and to the body side panels, and remove the frame from the car.

7. Prepare the old adhesive bead on the chassis and any existing body panels for fitment of the new windscreen frame by removing excess sealant from all the bonding areas to leave a consistent and level bonding surface for the new frame. It is not necessary to remove all traces of old adhesive, but a uniform surface must be available for the new adhesive bead. Any remaining adhesive must be securely bonded and be cut with a scalpal blade to leave an even thickness of 1 - 2 mm.

8. If necessary, replace the foam sealing blocks between scuttle and frame using Betaseal products to clean, prime and bond new blocks into position on the chassis.

9. - Prepare and re-activate the old adhesive bead on the chassis and other components using Betawipe 4000 (see BU.5).
   - Clean and prime the bonding area on the new windscreen frame with Betaclean 3900 and Betaprime 5404 (see sub-section BU.5).
   - Apply a bead of Betaseal 1701 adhesive (see sub-section BU.5) to the whole of the chassis bonding flange on the windscreen frame, and to the body side panel flanges.
   - Spring the body sides apart sufficiently to allow careful positioning of the windscreen frame onto the chassis and locate with the tie bracket to the pedal box.
   - Mate the body sides to the 'A' posts and windscreen frame.
   - Press around all bonded joints to ensure adequate adhesive compression. Ensure the windscreen frame is positioned correctly by measuring from the underside of each top rear end of the frame to the top surface of the chassis siderail. Specification = 744mm. Compare diagonal dimensions to verify squareness. Support the header rail in this position to prevent drooping until the adhesive cures.
   - Ensure complete bonding between the frame and scuttle/foam blocks/other body panels, with no gaps, if necessary extruding more adhesive into the joint.
   - Use a spatula to smooth out or remove any excess adhesive, leaving a neat appearance, especially where the joint will be visible.

10. Do not disturb the frame until the adhesive has fully cured (see sub-section BU.5).

11. Fit the windscreen (see sub-section BV.13), dash panel (BV.12), front clamshell (BV.4), and other components as necessary.

BU.9 - BODY SIDE PANELS

Each body side panel incorporates the complete sill section, lower rear quarter panel ahead of the rear wheelarch, 'A' and 'B' posts, door aperture and rear quarter window aperture. The panel is bonded to the chassis, windscreen frame, rear bulkhead panel and roof.

The sill bottom flange is bonded into a groove in the chassis main side rail and it is necessary to cut the panel to effect its removal: it is not practical to attempt to remove a body side panel intact for later refitment. If damage occurs to the panel which is not repairable 'in situ', the body side panel should be renewed. However, in view of the extensive amount of labour required to replace a body side, localised repairs or integrated sections should be considered wherever possible.

To replace body side panel

1. Remove front and rear clamshells (see sub-sections BV.4, BV.5), doors (BV.8) and roof panel (BU.10).

2. Remove electrical equipment fixed to the inside of the body side in the rear quarter area.

3. Remove the door weatherstrip seal and door latch striker plate.

4. Use a sealant cutting knife to cut the adhesive bead between body side and chassis, windscreen frame and rear bulkhead. Also cut the adhesive around the door hinge faces, the striker plate face and the seat belt mounting frame.

   Note:
   - The bottom edge of the sill locates in a groove in the chassis side frame, and may not readily be cut out with the sill intact. Cut the sill as necessary to release the panel, and then remove the remaining edges of the panel from the chassis using a suitable cutting knife.

5. Remove excess sealant from all the bonding areas on the chassis and body panels. It is not necessary to remove all traces of old adhesive, but any remaining adhesive must be securely bonded and be cut with a scalpal blade to leave an even thickness of 1 - 2 mm.

6. Dry fit the body side panel and fettle if necessary to achieve a good fit.

7. Before preparing the surfaces for bonding, ensure that the necessary pipes and cables are fitted to the chassis side rails and are in good condition:

   RH side: - Engine radiator return pipe
   - A.C. feed and return pipes
   - PAS feed and return pipes
   - Right hand rear brake pipe

   LH side: - Engine radiator feed pipe
   - Heater feed and return pipes
   - Clutch pipe
   - Brake servo vacuum pipe
   - Positive battery cable to front post.

   Check also, by comparison with the displaced part, that the 'B' post reinforcement panel, and all necessary bonded brackets and captive fixings, are correctly attached to the new sill panel.

8. Prepare the bonding surface of the new body side panel with Betaclean 3900 and Betaprime 5404 (see subsection BU.5). Prepare surface of the old adhesive bead on the chassis and body panels Using Betawipe 4000 (see sub-section BU.5).

9. Apply a bead of Betaseal adhesive (see sub-section BU.5) to the bonding surface on the chassis, windscreen frame and rear bulkhead, and fit the body side panel into position, first locating the sill bottom edge into its chassis slot. Press all around the joint and ensure sufficient spread of adhesive, if necessary using a

spatula to smooth or remove any extruded adhesive, and to neaten any visual areas. Where necessary, add adhesive to the jointline to ensure complete weathersealing and neat appearance, especially around the door hinge post apertures, and smooth with a spatula.

10. Clamp the panel into position until the adhesive has cured (see sub-section BU.5).

11. Refit the dash panel, front and rear clamshells, doors, both wheelarch liners and other components as necessary.

BU.10 - REAR BULKHEAD

The rear bulkhead is a Resin Transfer Moulded (RTM) panel and is bonded to the chassis and seat belt mounting frame. The roof panel is bonded to its top flange, and the body side panels to each side flange.

A heat formed polyester fibre heat/acoustic insulator panel is bonded to the rear side of the panel. The cabin rear window is bonded directly to the bulkhead using the same materials and procedure as is used for the windscreen. A screw fixed panel is provided on the right hand side to allow access from the cabin to the alternator, compressor and adjacent engine components.

Replacement of the complete bulkhead panel is unlikely to be required without a complete body rebuild. In the case of localised damage, the panel should be repaired *in situ* using conventional hand lay techniques, if necessary integrating a new section cut from a new bulkhead panel. The position of th e rear bulkhead is critical to the fit of the tailgate and rear body section. If building up a new chassis tub, a jig assembled bulkhead and rear seat belt mounting frame should be used, as a 3 - 5 mm standoff is required between the panel and frame.

Rear Window: In order to minimise noise and heat transmission into the cabin, the rear bulkhead window is a double glazed unit comprising two 4mm, toughened, clear, flat glass panes, separated by a 6mm void filled with Argon gas. An obscuration band is applied to the rear face of both panes, with identification data read from the engine bay side. The unit is bonded to the front face of the rear bulkhead panel using materials supplied by Dow Chemical.

To replace the glass, remove the rear bulkhead trim and use a reciprocating knife to cut the bonding medium. Clean the whole of the bonding surface on the new glass with Betawipe VP 04604 (yellow cap), and prime with Betaprime 5500 (green cap). Clean the corresponding surface on the bulkhead with Betaclean 3900 (black cap) and prime with Betaprime 5404 (red cap).

Apply a bead of Betaseal 1701 to the periphery of the glass, and press into position on the bulkhead to ensure sufficient and uniform compression of the adhesive. Use a spatula to remove excess extruded adhesive and smooth any visual areas. Support the glass in place as necessary until the adhesive has cured suffiently.

Bonding of rear bulkhead: The rear bulkhead panel is positioned by reference to the rear seat belt mounting frame, and should be fitted only as a jig built assembly of bulkhead and frame.

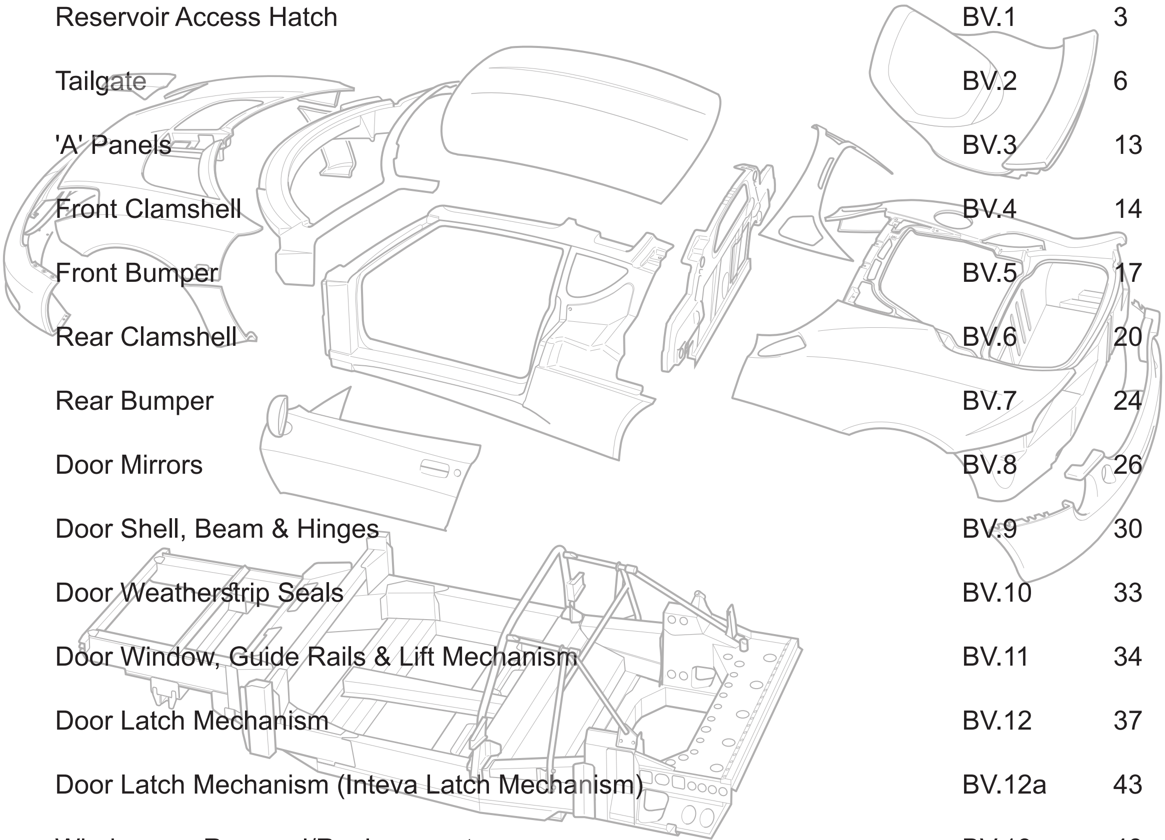
Clean the mating surface on the bulkhead with Betaclean 3900 (black cap) and prime with Betaprime 5404 (red cap) or, where applicable, use Betawipe 4000 to re-activate old adhesive (refer to sub-section BU.5). Clean the mating surface on the chassis with Betawipe VP 04604 (yellow cap), and prime with Betaprime 5404 (red cap), or with Betawipe 4000 to re-activate old adhesive.

Apply a bead of Betaseal 1701 to the bonding path on the chassis, and fit the bulkhead/frame assembly into position by securing the frame with its four bolts to the extruded brackets which form part of the chassis tub. If necessary, apply additional adhesive into the joint and use a spatula to remove any excess extruded adhesive and to smooth any visual areas.

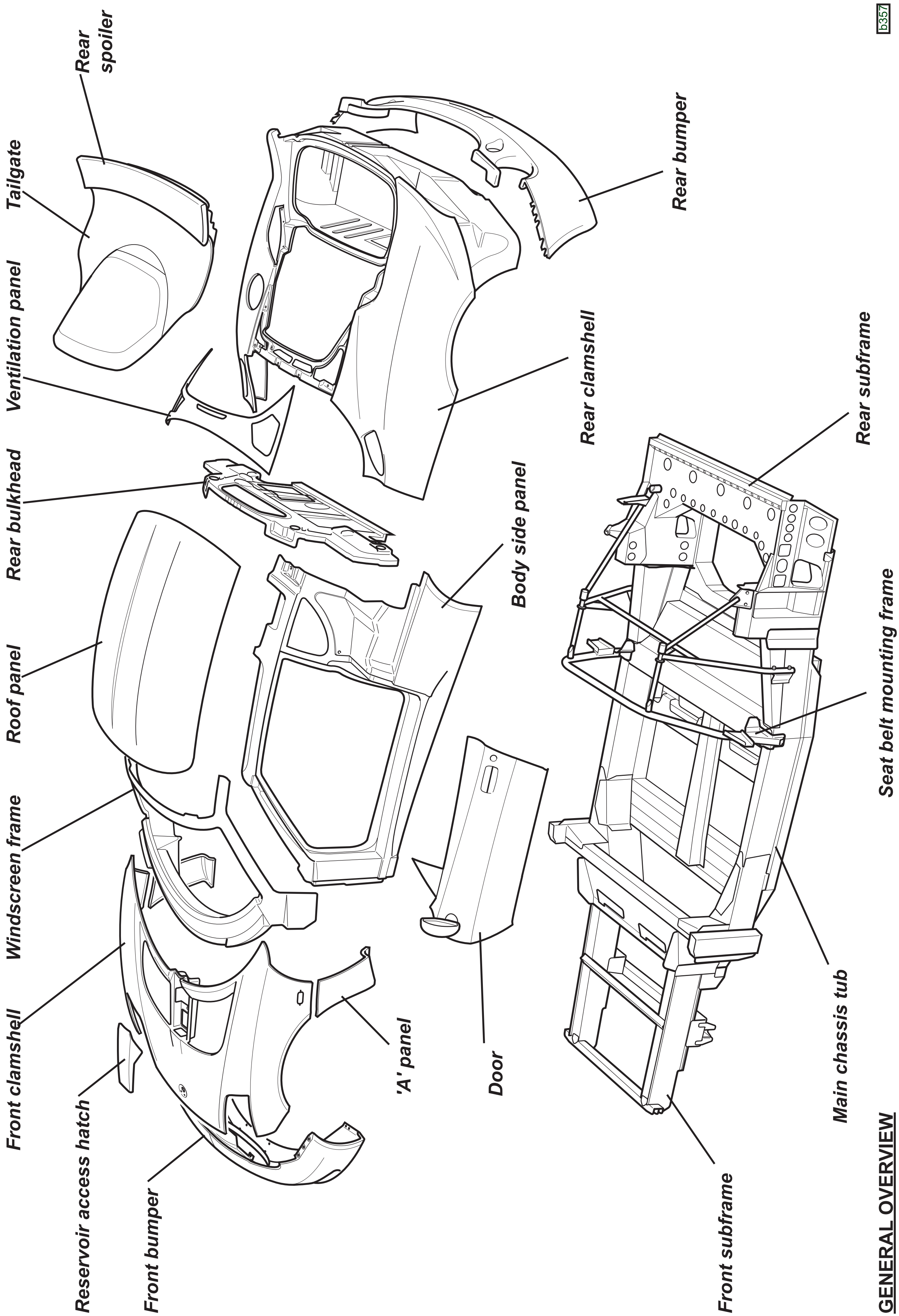
The rear bracing struts should then be shimmed as necessary to avoid corrupting this position. The stays connecting to the front seat belt mounting frame should then be similarly shimmed.

BODY FITTINGS

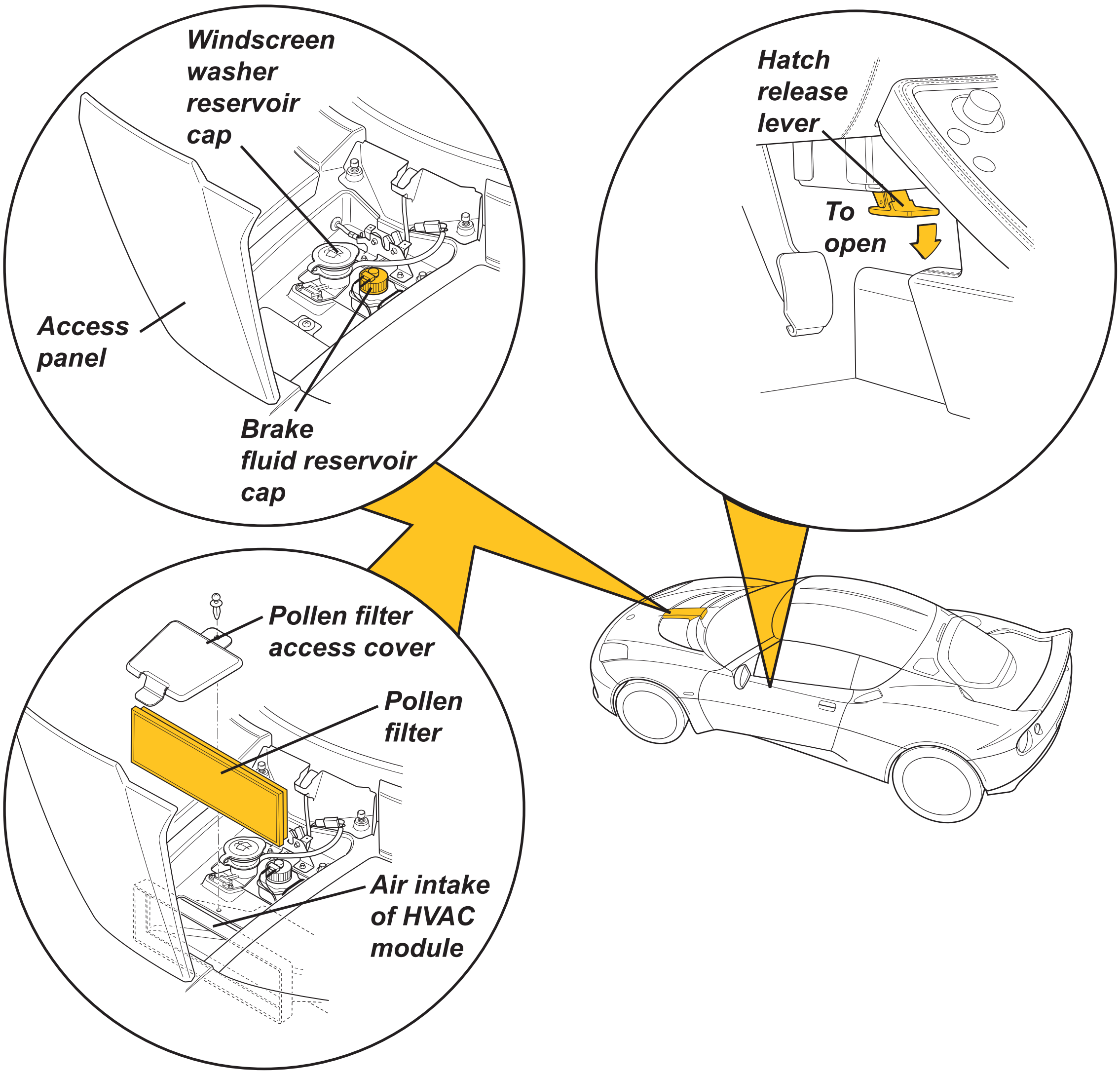
SECTION BV



GENERAL OVERVIEW



BV.1 - RESERVOIR ACCESS HATCH



The Lotus Evora is fitted with a front hinged, composite, access panel assembly positioned in the front clam-shell to provide ready access to the brake/clutch master cylinder reservoir and windscreen washer reservoir filler neck.

The assembly consists of an outer and inner panel, the inner panel has M5 x 12mm threaded big head screws bonded to its internal surface to accommodate the fixings required to retain it securely to the hinge assembly. The inner and outer panels are the bonded together using a twin pack adhesive.

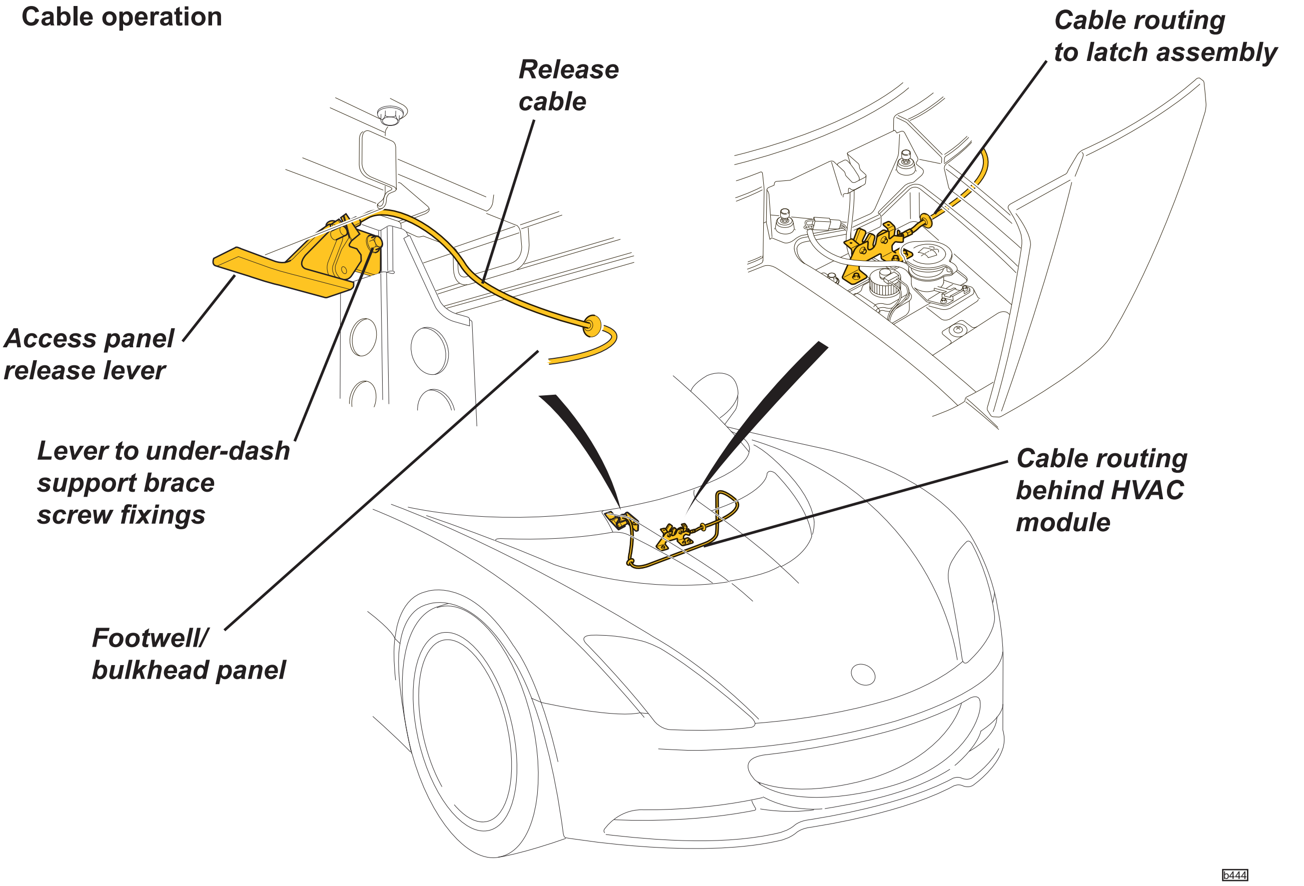
Note: the inner and outer panels are not available separately and the access panel is only available as a complete assembly.

The pollen filter, fitted into the front of the HVAC module inlet duct, is also accessible from the access panel via an aperture provided in the top of the air intake duct assembly.

Remove the cover plate to gain access to the filter. It may be necessary to carefully manipulate the filter to withdraw it from the air intake duct assembly.

To open the hatch, from the inboard side of either footwell, press down the release lever; the hatch may then be raised fully by hand. Return the release lever to its fully raised position. Before closing, check that the reservoir caps are secure, lower the lid, and press firmly over the latch.

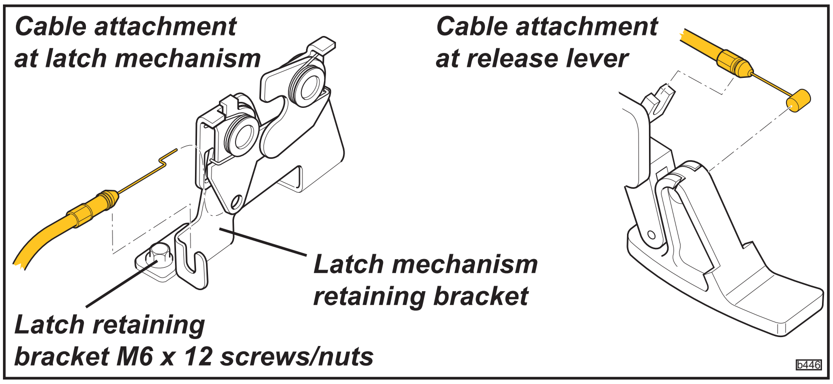
Cable operation



The 'Bowden' type flexible access panel release cable consists of an inner steel cable lined with nylon sleeving to reduce friction which is placed inside a protective plastic outer casing. Ring caps are fitted to both ends of the outer casing which are used to retain the outer casing to the under-dash release lever assembly as well as the clamshell mounted latch release bracket.

The access panel lever is fixed to an under-dash scuttle support brace using M6 x 20 screw (2) and flanged nuts.

The screws also pass through the vertically mounted dashboard support bracket.



The inner portion of the release cable assembly is attached to the lever; the complete cable assembly then passes through a grommet in the front footwell/bulkhead panel. The cable assembly is clipped into position on the outside of the bulkhead panel to ensure it is retained in the correct routing so it is not fouled by the HVAC module casing.

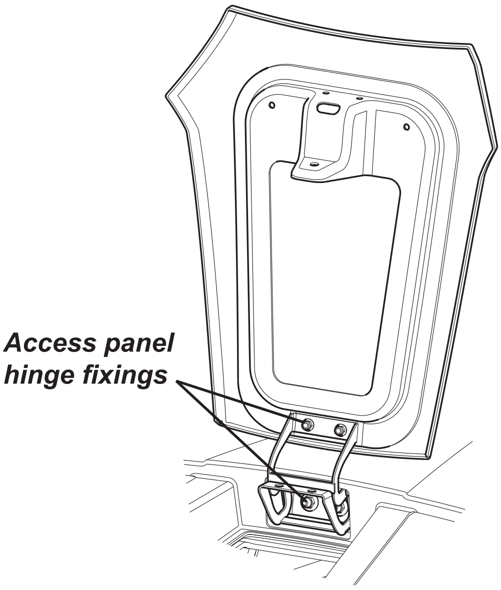
The cable assembly feeds through a machined aperture with an inset grommet on the LH side of section of the clamshell access bay panel.

Note: Cable replacement will require the partial or full removal of the HVAC module to gain access to the clips securing it to the outside of the bulkhead panel.

Access panel adjustment

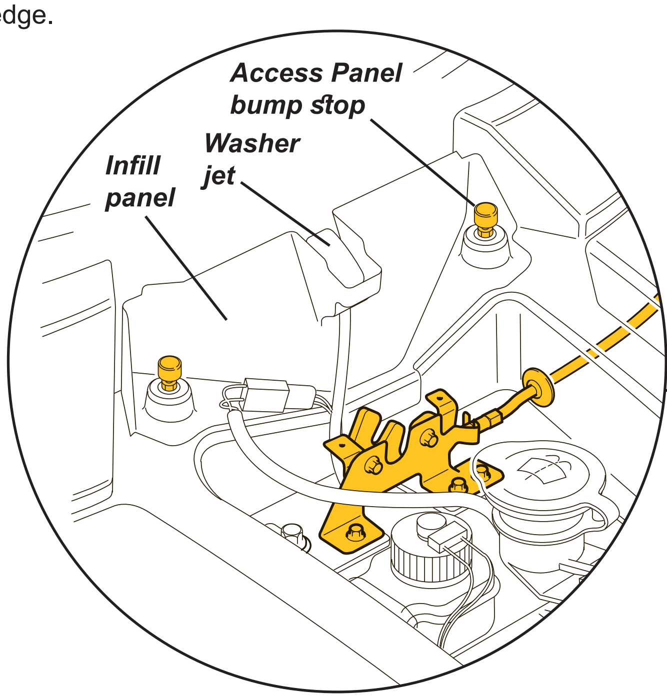
Panel hinge
The hinge stator is secured by two M5 nyloc nuts to a bonded studplate on the clamshell, with sufficient hole tolerance to allow some adjustment of panel height.

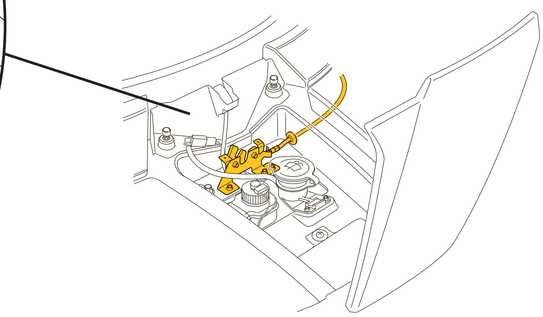
Similarly, the hinge rotor is secured by 2 M5 nyloc nuts to a studplate in the cover, with allowance made for adjustment of shutlines.



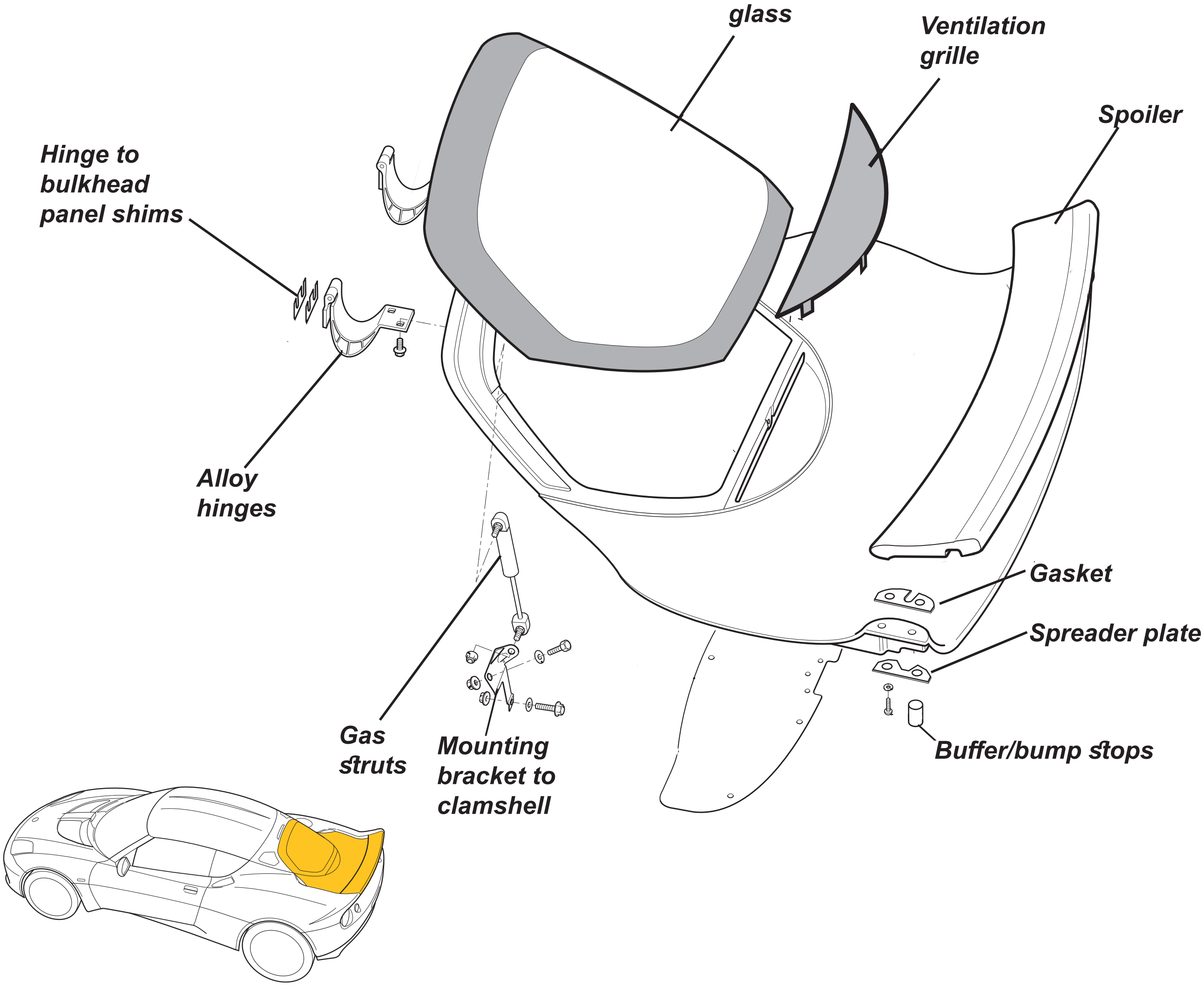
Bump stops
An ABS moulded infill panel is fitted to the rearmost section of the clamshell access bay panel, the panel is fitted with M6 thread inserts to accommodate M6 x 30 screws with rubber caps pushed onto the screw heads to act as bump stops. Flanged nuts are fitted on the shank of the screw threads to act as locking nuts to set the bump stop height as required.

The infill panel is also used to mount the single windscreen washer jet positioning it centrally to the windscreens lower edge.





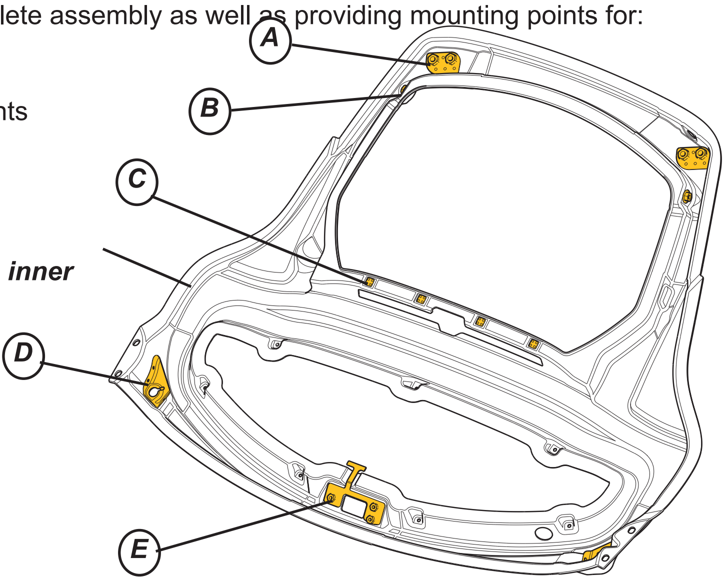
BV.2 - TAILGATE & REAR SPOILER



The two major components of the tailgate assembly are its inner ICSRTM (Injection Compression System Resin Transfer Moulding) and outer SMC (Sheet Moulding Compound) panel. The inner panels profile is shaped to increase both the strength and rigidity of the complete assembly as well as providing mounting points for:

A. Nut plates for tailgate hinges
B. Nut plates for tailgate strut upper mounting points
C. M4 threaded big head studs for trim fixings.
D. Mounting plates for bump stops
E. Bracket for latch assembly

Tailgate inner panel

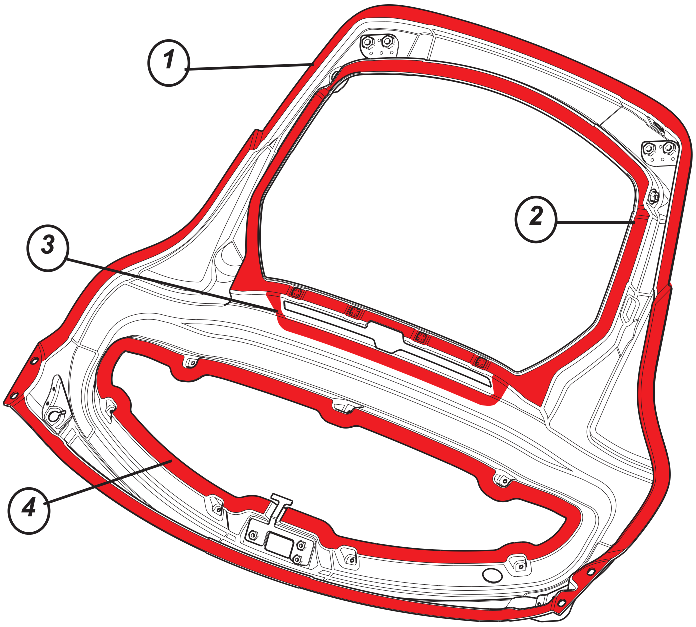


Panel Assembly

The inner and outer panels are bonded together using MA920 Plexus adhesive, the bond paths between both panels being:

1. The outer perimeter.
2. The perimeter of the tailgate glass aperture.
3. The perimeter of the engine ventilation grille aperture.
4. The perimeter of the machined aperture of the inner panel at the contact area the under side of the outer panel (around the luggage compartment area).

During assembly the adhesive is applied as a continuous path around the areas shown above to ensure a water tight seal to prevent water ingress into the luggage compartment.



The composite tailgate assembly is hinged at its leading edge to the rear bulkhead.

An adjustable height downstop buffer is provided at each rear corner of the tailgate for panel height alignment and stability.

Opening of the tailgate is assisted by a pair of gas pressurised struts. The tailgate incorporates a heated window glass, and, to the rear of the glass, an outlet grille for hot air from around the rearmost catalytic converter.

The arms of both extruded alloy hinges are bolted to the tailgate using two specialised M8 x 27 bolts. The bolts incorporate an integral spreader washer under the bolt head as well as a smaller diameter section at the end of the shank terminating in a taper to aid with guidance/fitment.

The extruded alloy hinge arms are bolted to the tailgate with two specialisd M8 x 27 bolts and reach beneath the ventilation panel to the cabin rear bulkhead, to which the hinge stators are secured with two M8 screws. The steel hinge pin is an interference fit into the stator, and supports two top hat synthetic bushes pressed into the bore of the hinge rotor, with an 'E' clip used for retention. Oversize hinge fixing holes allow for the adjustment of tailgate panel shutlines.

Pivot ball pins for the twin gas struts are screwed into captive nuts in the tailgate inner panel, with the lower end of each strut anchored to a steel bracket secured to the clamshell aperture. A spring steel clip secures each strut pivot socket onto its ball pin.

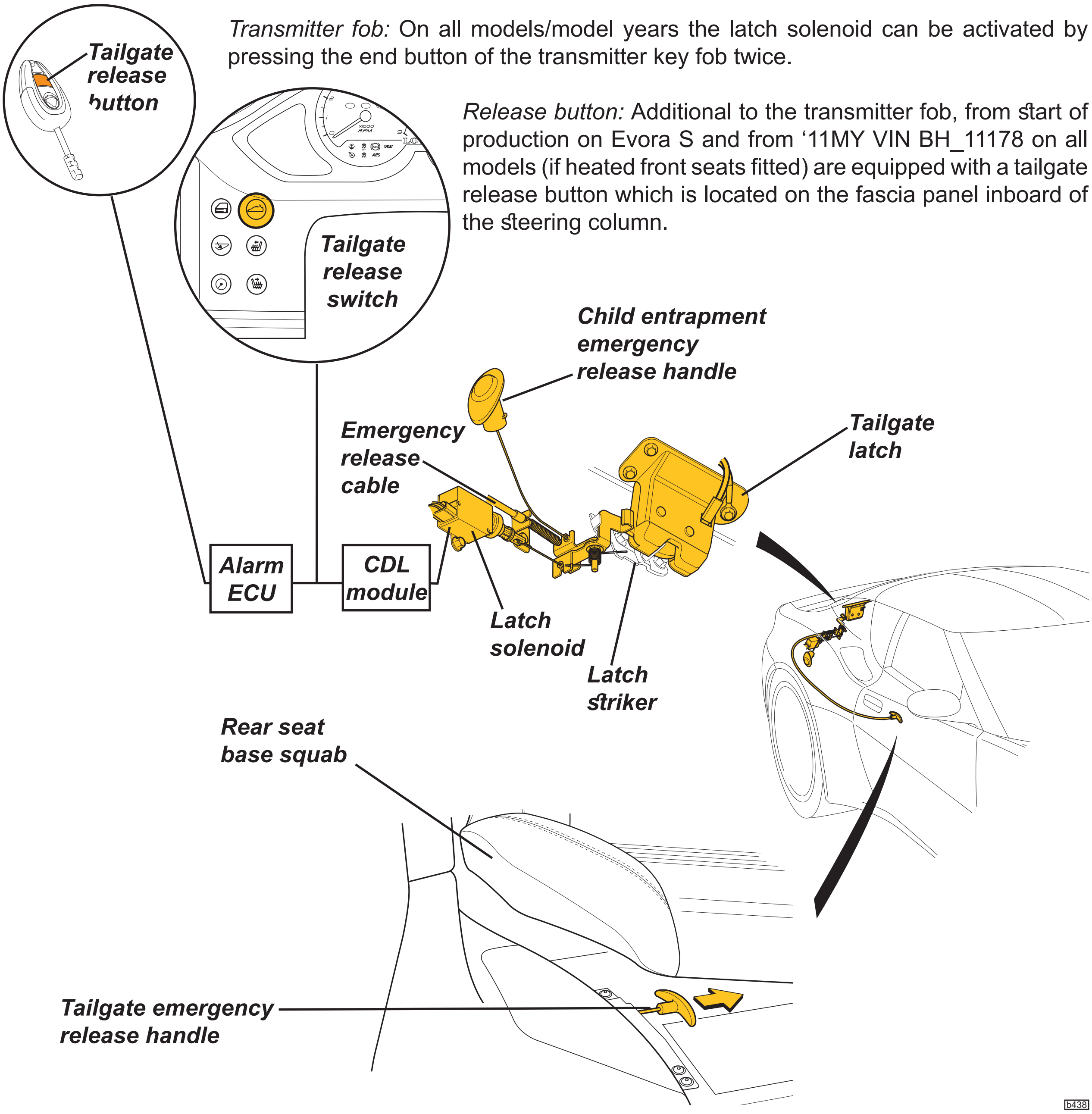
The rear aerofoil is secured to the tailgate with 2 x M6 button head screws at each side, and houses the CHMSL, which comprises 12 red LEDs behind a white diffuser. The CHMSL wiring combined with the latch sensing switch and HRS wiring, form a tailgate harness which exits the tailgate inner skin near the RH hinge, to which it is clipped before penetrating the cabin bulkhead.

The heated, toughened glass screen with pre-applied obscuration band, is bonded to the tailgate with an elastomeric adhesive (see sub-section BV.14).

Tailgate opening methods
The tailgate uses a single latch mounted centrally at its rear end and is released by an electric solenoid mounted in the rear clamshell, detaching it from the latch striker which is also fixed to the rear clamshell.

Transmitter fob: On all models/model years the latch solenoid can be activated by pressing the end button of the transmitter key fob twice.

Release button: Additional to the transmitter fob, from start of production on Evora S and from ‘11MY VIN BH_11178 on all models (if heated front seats fitted) are equipped with a tailgate release button which is located on the fascia panel inboard of the steering column.



Note: Unlatching the tailgate with release button requires the vehicle to be stationary, handbrake applied and the key in the ignition.

Emergency release cable: On all models an emergency release is provided in the form of a mechanical cable from a handle concealed beneath the rear seat cushion (or carpet). The cable, routed around the RHR wheelarch liner, activates the tailgate latch bell crank lever in the same manner as the electrical release solenoid.

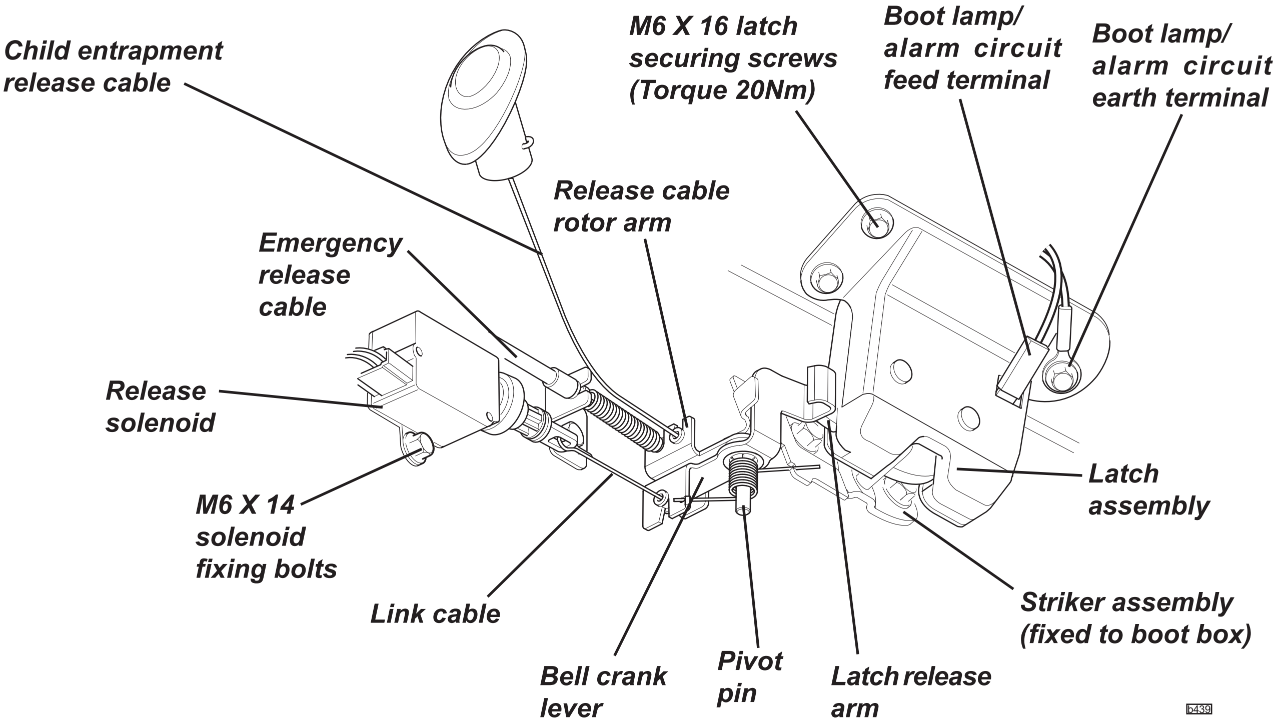
Child entrapment release cable: USA/Canadian vehicles are equipped with an additional emergency release system which can be operated from inside the trunk to facilitate escape in the event that a child should become trapped within the luggage compartment. The emergency release system comprises of an additional cable which, when pulled to the right hand side of the car, activates the tailgate latch bell crank lever in the same manner as the electrical release solenoid. The end of the cable is fitted with a fluorescent yellow/white handle which can be accessed from within the luggage compartment.

Luggage compartment illumination
Two boot lamps (each positioned either side of the striker) will switch on automatically whenever the tailgate is open. Rear fuse box fuse R15 supplies permanent battery voltage to the lamps.

The lamp circuit is earthed via the latch assembly located in the tailgate. When the latch is released the internal micro switch within the unit completes the earth circuit (via the tailgate harness earth return eyelet terminal clamped to one of the latch to tailgate fixing screws) so illuminating the boot lamps.

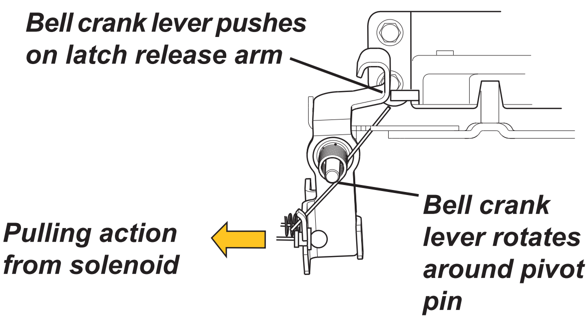
Tailgate alarm sensing
In the same manner as boot lamp illumination, the latch assemblies' micro switch also completes the alarm/immobiliser circuit with regards to luggage compartment intrusion.

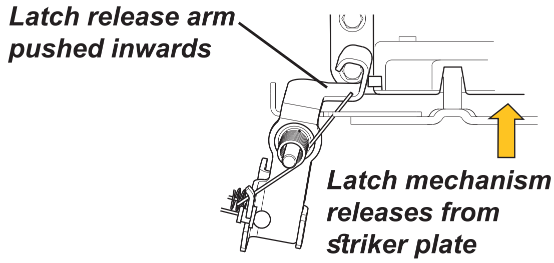
TAILGATE LATCH MAJOR COMPONENTS



Latch release operation
The latch release solenoid is mounted to the right of the striker and uses a short link cable to pull a bellcrank lever also attached to the striker by a pivot pin.

Rotation of the bellcrank lever around the pivot pin pushes the end of the lever against the latch assemblies integral release arm, this activates the pawl mechanism within the latch so releasing it from the striker hoop.





Tailgate removal:

Care Points
- *When storing the tailgate assembly, care should be taken to avoid damage to the tailgate corners; e.g. use a suitable soft floor covering on which to place the panel on.*
- *Removal and refitment of the tailgate is made considerably easier with the assistance of a second person.*

1. Disconnect the tailgate harness at the RH hinge area.

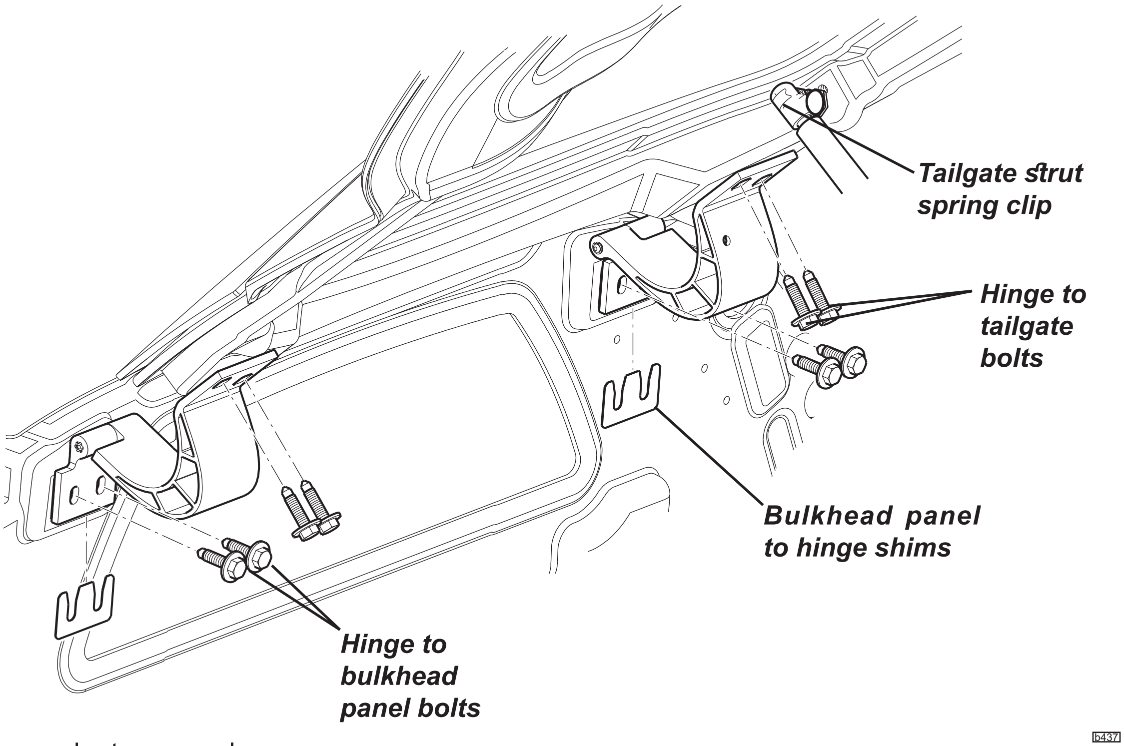
2. Release the spring clip securing each gas strut to the tailgate pivot mounting balls and disengage the struts.

   Care point: With the struts disconnected the tailgate can be hinged into the roof panel, care must be taken to prevent damage to the bodywork.

3. Scribe around the hinge blade on the tailgate to aid refit alignment (if applicable) before supporting the tailgate and removing the hinge M8 x 27 fixing bolts.

   Care point: If removing the hinge to bulkhead panel bolts take care to collect any spacer shims that may fall out during removal and note their location (i.e., RH or LH hinge) for refitment.

4. With the aid of an assistant, carefully remove the tailgate from the vehicle and place on a suitable surface to protect the assembly from paint chipping/damage.



Refitment:
- Is the reverse order to removal,
- Fit all tailgate hinge bolts and tighten but do not torque at this stage.
- Adjusting panel shutlines and height as necessary. Check latch engagement and release, and adjust striker position if necessary.
- Fit shims between hinge and bulkhead panel by sliding from underneath as required, adding or deleting shims to achieve acceptable tailgate latching effort.
- Tighten all tailgate hinge retaining bolts to 35Nm.

Rear spoiler

The rear spoiler is constructed from a single piece blow moulded plastic material and includes an integral metal mounting point for the CHMSL (Centre High Mounted Spot Light).

The spoiler is hollow for lightness as well to allow a pathway for the CHMSL harness which exits the spoiler via an aperture positioned between the R/H tailgate mounting points.

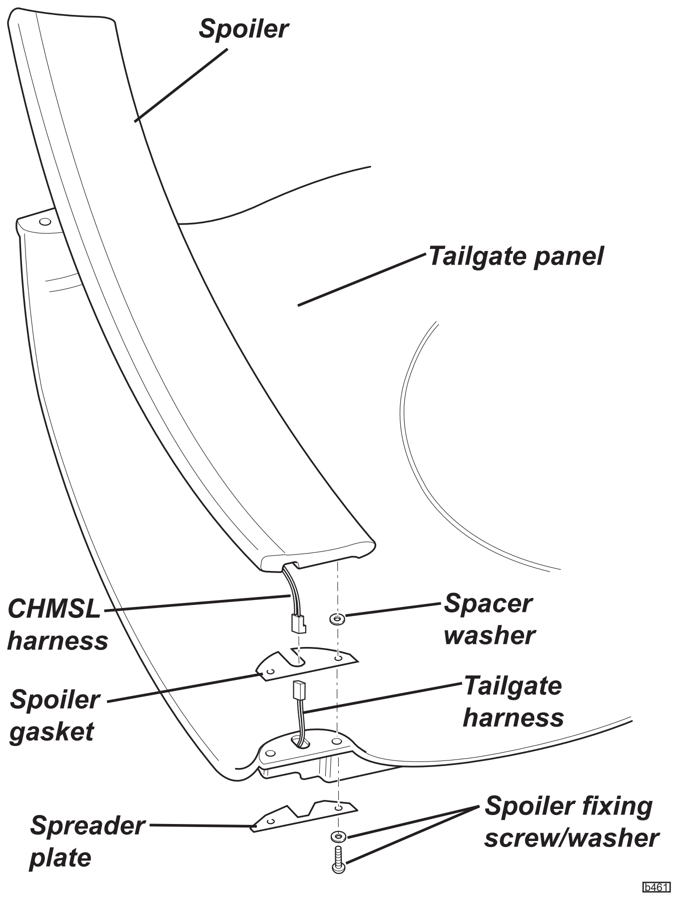
Removal:

Care Points

- *When storing the spoiler, care should be taken to avoid damage to the spoiler corners; e.g. use a suitable soft covering on which to place the panel on.*
- *Removal and refitment of the spoiler is made easier with the assistance of a second person.*

1. With the tailgate open, release the M6 x 20 socket button screws and washers (4) securing the spreader plates and spoiler to the LH/RH side of the tailgate panel.

2. Lift the spoiler away from the tailgate collecting the spoiler gaskets fitted between the spoiler and tailgate.



3. To gain access to CHMSL harness connector, carefully pull the harness away from the tailgate aperture at the R/H side of the spoiler mounting area until the CHMSL connector/tailgate harness is withdrawn from tailgate panel.

4. Disconnect the harness connector and withdraw the spoiler from the tailgate assembly.

   Care point: M6 x 18 x 1MM spacer washers are bonded to the underside of the spoiler directly over each of the 4 tailgate mounting threads. Ensure that these have not become detached during the removal process, re-bond to the spoiler as necessary.

Refitment:

- Is the reverse order to removal, tighten the spoiler to tailgate fixings to 6Nm.

Spoiler/CHMSL renewal:

The CHMSL harness connector is too large to travel through the harness pathway within the spoiler assembly. Therefore if the spoiler or CHMSL is being renewed then it will be necessary to unhinge the CHMSL harness connector block to gain access to the 2 individual terminal pins.

1.Using a suitable terminal pick slide the terminals/wires out of the connector block.

2.Attach a suitable length (800 mm +) of string, wire to the exposed ends of the CHMSL harness terminals

3.Release the M4 fixings securing the CHMSL to spoiler.

4.Detach the CHMSL from the spoiler and carefully withdraw the harness from the spoiler ensuring the string/ wire is still attached the ends of the terminals.

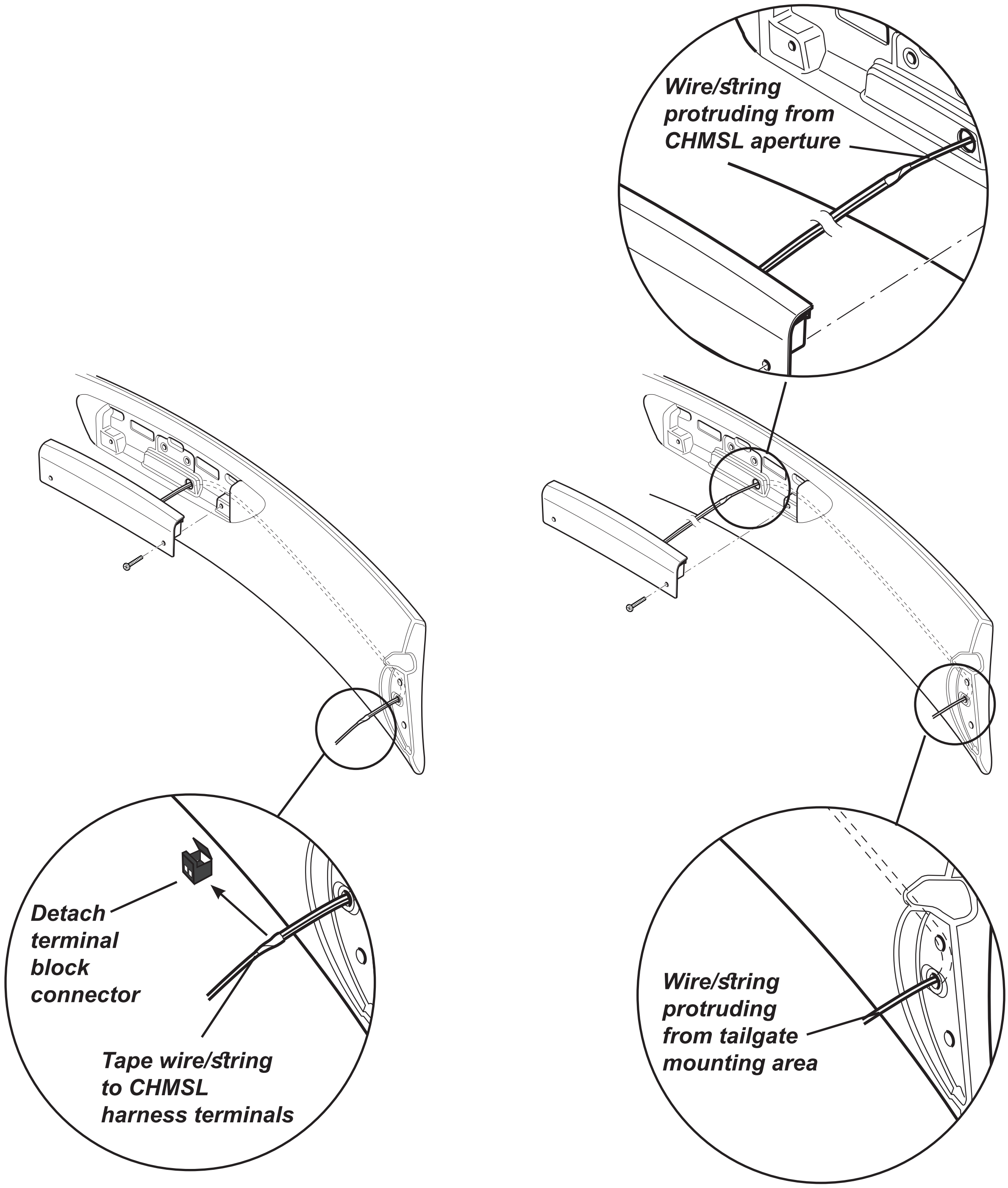
5.Ensure the string/wire is protruding out of both ends of the spoiler before detaching it from harness.

6.Remove the terminal connector from the new CHMSL harness and attach it to the string/wire protruding out of the CHMSL mounting area.

7.Carefully pull the string/wire protruding from the R/H side of the spoiler mounting area until the CHMSL harness terminals are visible.

8.Detach the string/wire and refit the terminals to the connector block.

9.Secure the CHMSL to the spoiler, the assembly can then be fitted to the tailgate as described above.



BV.3 - 'A' PANELS

Each 'A' panel constitutes the body surface below the waistline between the front wheelarch and the door aperture, with each panel screw fixed to the front clamshell and body sill.

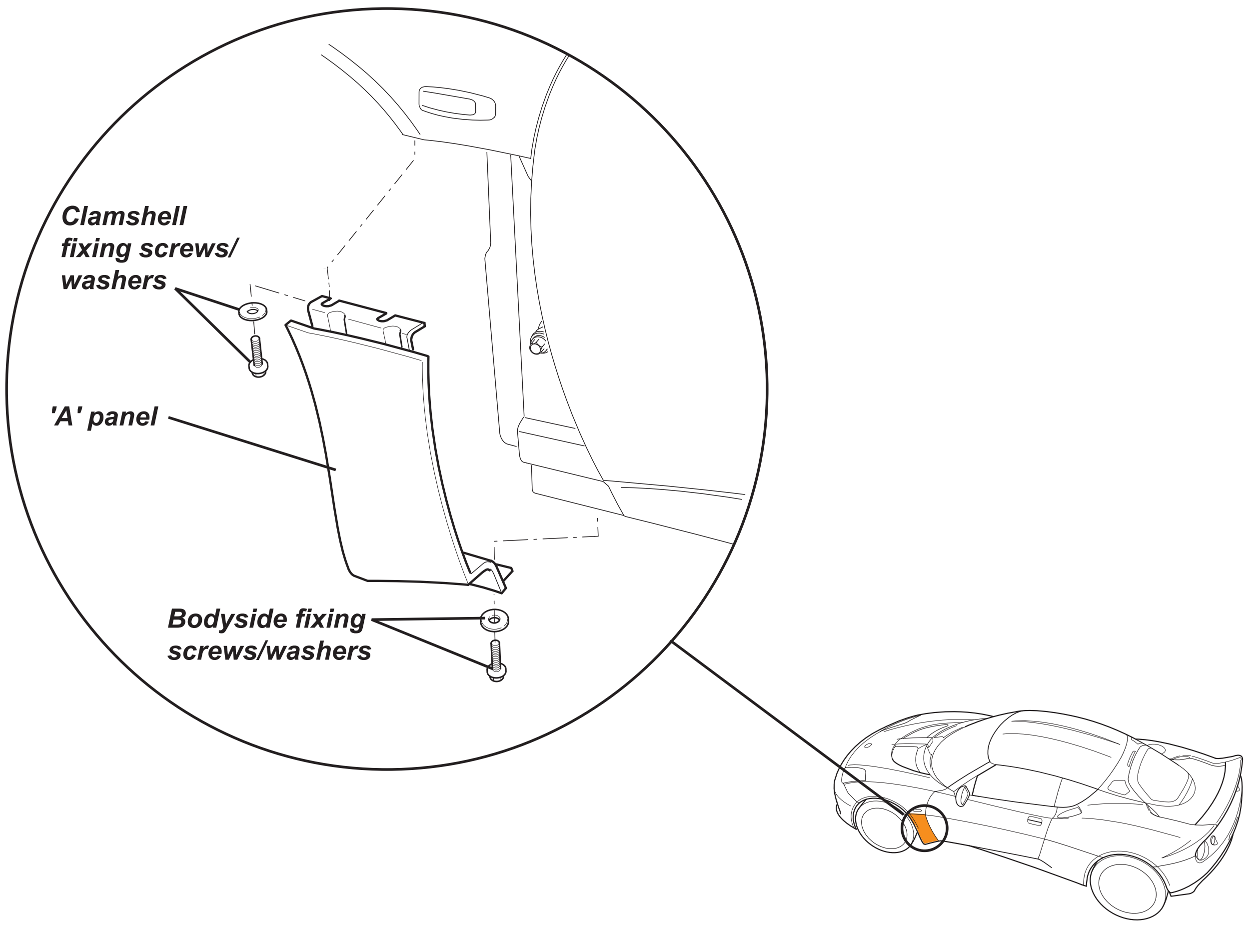
Care Points
- *When storing the 'A' panel to access other ancillary vehicle components, care should be taken to avoid damage to the panel corners; e.g. use a suitable soft floor covering on which to place the panel on.*
- *Unless torque values for any of the fixings shown in the procedure below are specified then they should only be tightened sufficiently to retain the 'A' panel securely to its vehicle mounting points (do not torque tighten to a greater value than the recommended industry standard for the size of the fixing).*

Removal:
1. Slacken or remove the front wheelarch liner; refer to sub-section BV.17 for further information

2. Release the M6 X 20 screws & washers (2) securing the 'A' panel to the rear lower flange of the front clamshell.

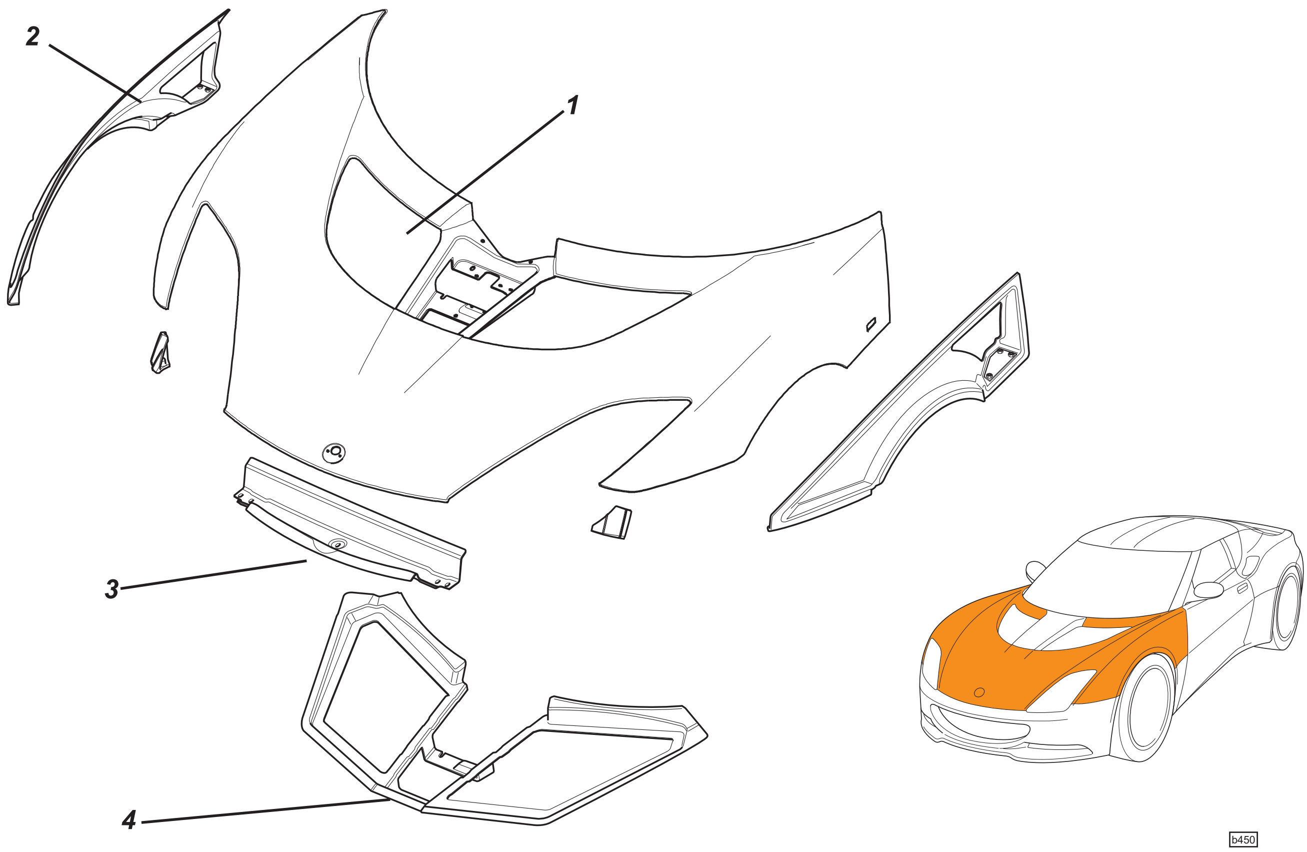
3. Slacken or remove the M6 X 20 screws & washers (2) securing the bottom edge of the panel to the body sill and withdraw the panel.

Refitment:
Is the reverse order to removal.



BV.4 - FRONT CLAMSHELL

The front clamshell assembly comprises of composite moulded panels bonded together to form the front upper bodywork between the base of the windscreen and the front bumper. Incorporated into the panel are apertures for the radiator air outlet grilles and a recess for the brake master cylinder/windscreen washer reservoirs and cabin pollen filter.



To increase overall strength, provide mounting points for ancillary components as well as its fitment to the vehicle the clamshell assembly consists of:

1.Main outer panel
2.LH/RH side inner reinforcement panels - Bonded using Plexus MA920 to the inside wheelarch area of the outer panel
3.Front inner reinforcement panel - Bonded using Plexus MA920 to the front underside of the outer panel
4.Inner panel - Bonded using Betamate 2810 and Plexus MA920 to the underside of the outer panel around outlet grilles

The clamshell assembly is secured by threaded fasteners for ease of access to the HVAC and engine cooling radiator and to allow economical panel repair or replacement. The panel is secured to the front subframe via mounting brackets, and to the front bumper and 'A' panels, with provision being made for height and panel gap adjustment.

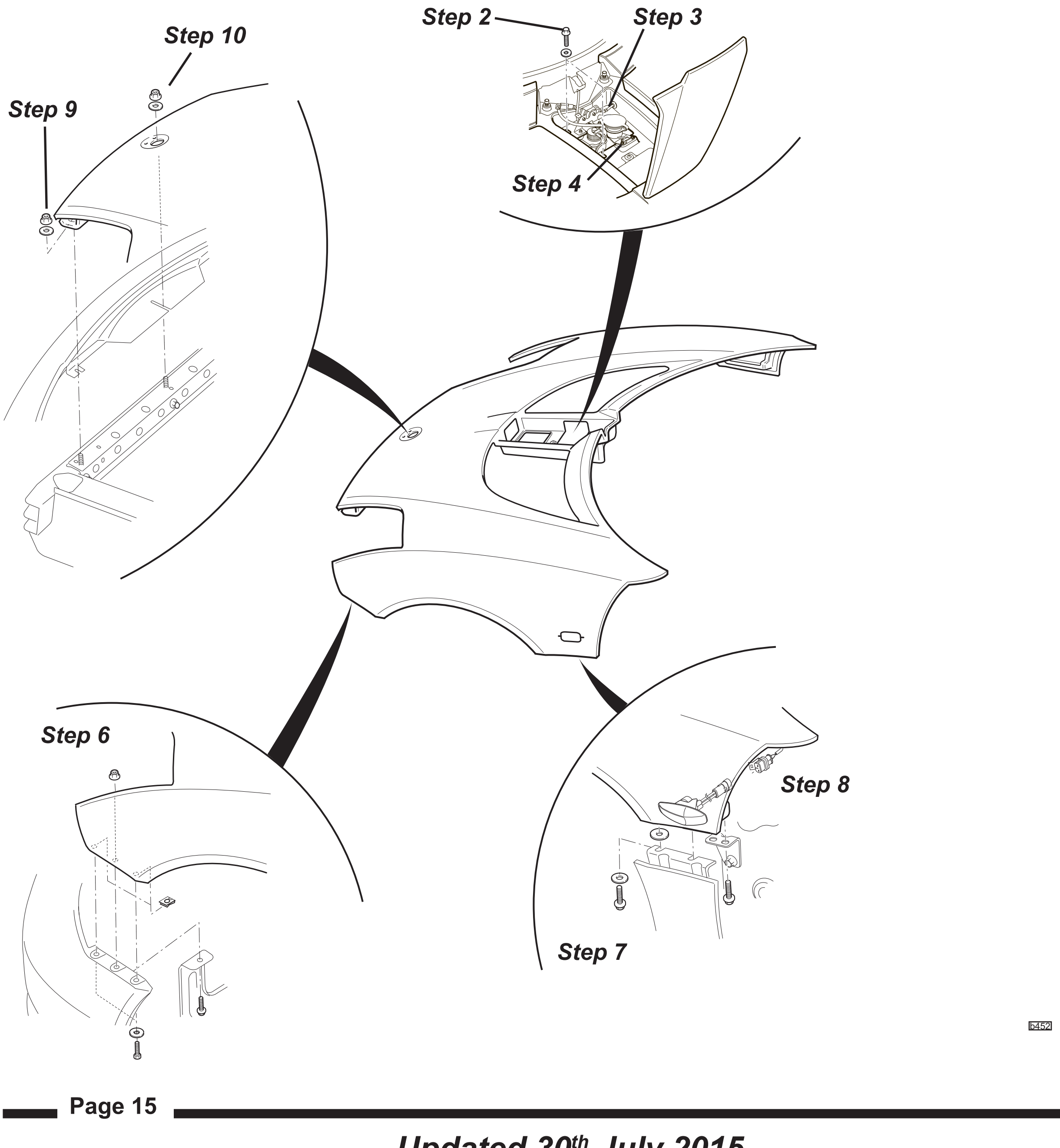
Removal:

Care Points
- *When storing the clamshell to access other ancillary vehicle components, care should be taken to avoid damage to the clamshell corners; e.g. use a suitable soft floor covering on which to place the panel on.*
- *Removal and refitment of the clamshell is made considerably easier with the assistance of a second person.*
- *The clamshell with front access panel may be removed whilst leaving the front bumper in position.*
- *Unless torque values for any of the fixings shown in the procedure below are specified then they should only be tightened sufficiently to retain the clamshell securely to its vehicle mounting points (do not torque tighten to a greater value than the recommended industry standard for the size of the fixing).*

1. Remove both front wheels and wheelarch liners; refer to sub-section BV.17 for further information.

2. Release the M6 X 20 flange headed screws & washers (2) securing the hydraulic fluid reservoir bracket to the clamshell.

3. Disconnect the access hatch release cable from the latch/bracket and feed the cable through the clamshell grommet.



4. Release the M5 X 16 flange headed screws (2) securing the washer reservoir filler neck.

5. Remove both LH/RH headlamp assemblies; refer to service notes section MR.11 for further information.

6. From within the front of each wheelarch, release the central M6 X 16 screw & nut securing the clamshell to the bumper/bumper bracket and the M5 X 16 screws & washers (2) securing the clamshell to the top edge of the bumper.

7. From within the back of each wheelarch, release the M6 X 20 screws/washers (2) securing the clamshell to the top of the 'A' panel, and the M6 X 20 screw/washer (1) securing the clamshell to the chassis bracket.

8. From within the back of each wheelarch, disconnect the side repeater lamp multi-plugs from the main vehicle harness.

9. From the headlamp apertures, release the M6 flange nuts and washers (2 at each side), securing the front edge of the clamshell to the mounting rail.

10. Prise out the nose badge taking suitable precautions to avoid paint damage. From the access hole revealed, remove the single M6 flange nut and washer securing the clam to the mounting rail.

11. Carefully lift the clamshell away from the car and place on a protected surface.

Refitment:

- Refit in reverse order to removal, noting that all fixing points incorporate provision for adjustment of panel height and alignment via slotted holes or shim washers.

- The height of the clamshell front fixing rail is adjustable against the subframe at the three slotted fixing points on the rear face, accessible via the headlamp apertures.

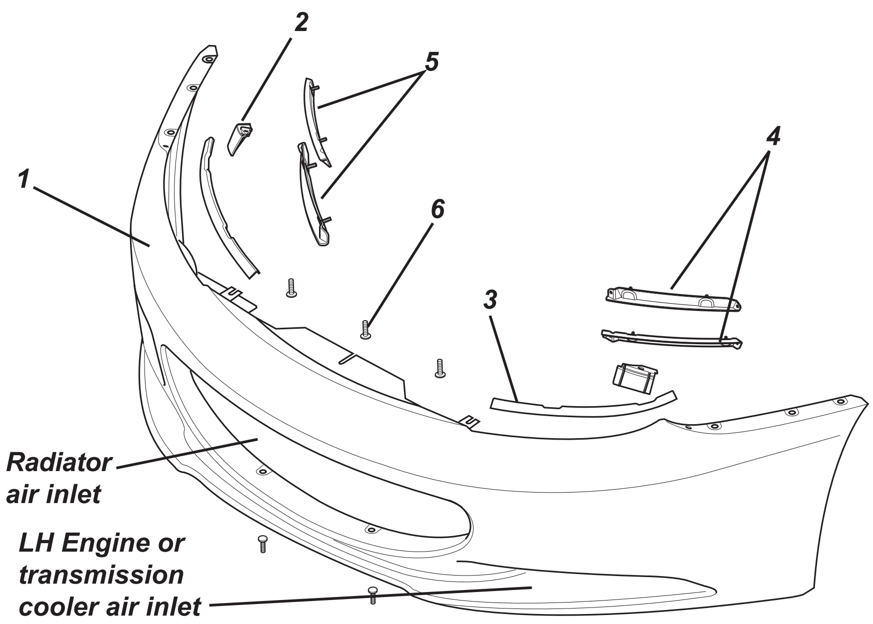
- Clamshell adjustments must be completed before the headlamps are fitted and adjusted to seal correctly against the clamshell apertures.

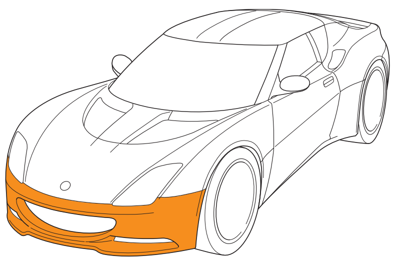
- Check headlamp beam alignment.

BV.5 - FRONT BUMPER

The front bumper assembly is comprised of a main Reinforced Reaction Injection Moulding (RRIM) moulded outer panel as well as supplementary panels inset on the rear-side to increase its overall strength, provide mounting points for ancillary components as well as its fitment to the vehicle.

Incorporated into the assembly is a central aperture for the radiator air inlet. For supercharged and IPS variants open ducts replace the blanking plates fitted behind the applicable LH/RH bumper apertures routing the airflow to the oil and or transmission cooler(s). For aesthetic design and to provide protection from projectile damage grilles are positioned inset of the intake apertures.





1.Main outer panel
2.Bracket mouldings
3.Reinforcement panels
4.LH outer upper/lower duct brackets
5.RH outer upper/lower duct brackets
6.M5 x 12 bighead studs

Items 2- 5 are adhered to the main panel using a 12mm wide double-sided automotive acrylic adhesive tape, the contact surfaces first being cleaned with Betaclean-3900 and then an adhesion promotor applied before tape fitment. Item 6 are bonded to the main panel using Plexus MA920

Note: Bumper shown and parts listed were first fitted for '12MY onwards models.

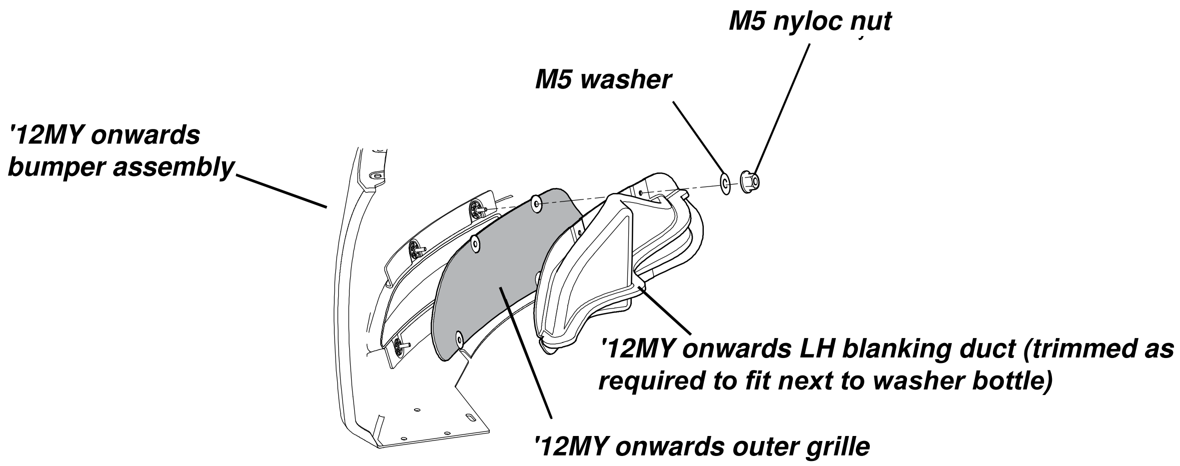
Bumper part level running changes
The bumper assembly was modified as a running change with the LH/RH outer grilles, grille mountings and ducts (if required) being altered to fit the revised bumper brackets now machined with wider integral apertures designed to accommodate the larger oil/transmission coolers fitted as to vehicles from ‘12MY onwards.

Because of part obsolescence pre-‘12MY bumpers are no longer available, therefore in the event that a pre-‘12MY vehicle requires a replacement bumper then the only option is to fit a ‘12MY onwards bumper assembly with revised grille ducting variations.

Also see sub-section BV.20 for a chronology of bumper side intake grilles/ducting arrangements from start of production to ‘12MY.

Retrofitment of '12MY bumper to pre-'11MY VIN BH_11178 (Non-USA), or BH_11174 (USA)
The original pre-'12MY grille and blanking plates are not compatible with the new bumpers new grille mounting points. Therefore the '12MY bumper must be fitted with its '12MY associated grilles and ducting plates.

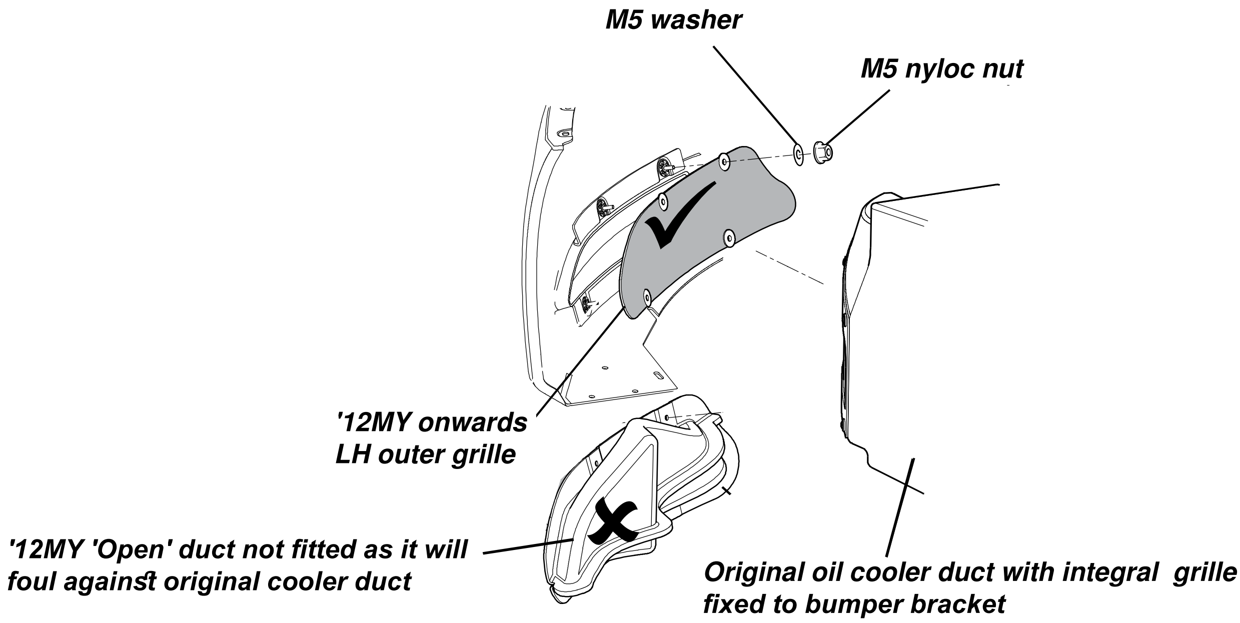
Note: The '12MY onwards ducting plate will foul against vehicles fitted with the early level rectangular washer bottle assembly. The options available are to either fit the latest level washer bottle or trim away some of the duct plate material to provide the required clearance to fit the bumper.



Retrofitment of '12MY bumper to '11MY from VIN BH_11178 (Non-USA), or BH_11174 (USA)
From the start of production supercharged manual or naturally aspirated IPS models were fitted with either dedicated twin engine oil or transmission fluid coolers. The aperture grilles were no longer fitted to the rear-side of the bumper, but instead were attached to the intake apertures of the cooler ducts, the ducts being designed so that the grille would be positioned directly behind the LH/RH bumper apertures.

This duct/integral grille arrangment was also carried over to all manual naturally aspirated vehicles produced at this time.

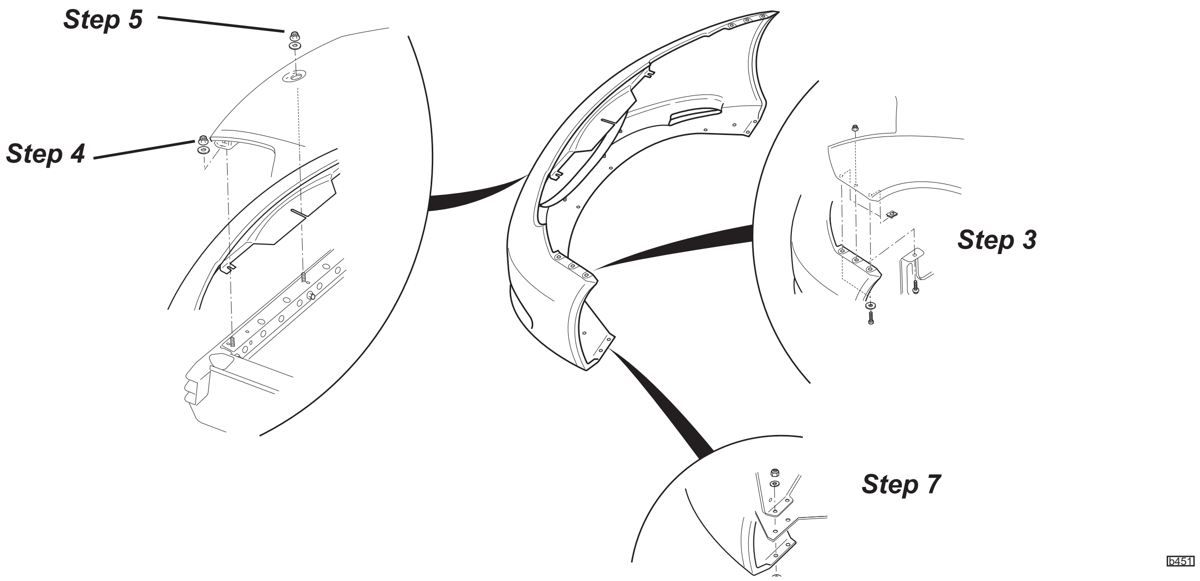
Therefore when retrofitting a '12MY onwards bumper to these vehicles **ONLY** the '12MY grilles can be fitted as the new duct plates will foul against the existing cooler ducting/grille assembly.



Removal:

Care Points

- *When storing the bumper to access other ancillary vehicle components, care should be taken to avoid damage to the bumper corners; e.g. use a suitable soft floor covering on which to place the panel on.*
- *Removal and refitment of the bumper is made considerably easier with the assistance of a second person.*
- *Unless torque values for any of the fixings shown in the procedure below are specified then they should only be tightened sufficiently to retain the bumper securely to its vehicle mounting points (do not torque tighten to a greater value than the recommended industry standard for the size of the fixing).*



1. Remove both front wheels and wheelarch liners; refer to sub-section BV.17 for further information.

2. Remove both LH/RH headlamp assemblies; refer to service notes section MR.11 for further information.

3. From within the front of each wheelarch, release the central M6 x 16 screw & nut securing the clamshell to the bumper/bumper bracket and the M5 x 16 screws & washers (2) securing the clamshell to the top edge of the bumper.

4. From within each headlamp aperture area, slacken the two M6 flange nuts and washers securing the front edge of the clamshell and bumper top flange to the support rail.

5. Prise out the nose badge taking suitable precautions to protect the surrounding paintwork, and slacken the single M6 flange nut securing the centre of the clamshell and bumper.

6. From beneath the car, release the M6 x 16 bolts & washers (8) securing the front undertray to the lower edge of the bumper; refer to service notes introduction section for further information.

7. From beneath the car, release and the M6 x 16 screws, washers and flange nuts securing the LH/RH lower rear corners of the bumper to the support brackets.

7. Withdraw the bumper.

Refitment:

- Is the reverse procedure of removal

- Ensure the bumper foam is fitted to the subframe before replacing the bumper inserting the top flange between the clamshell and support rail.

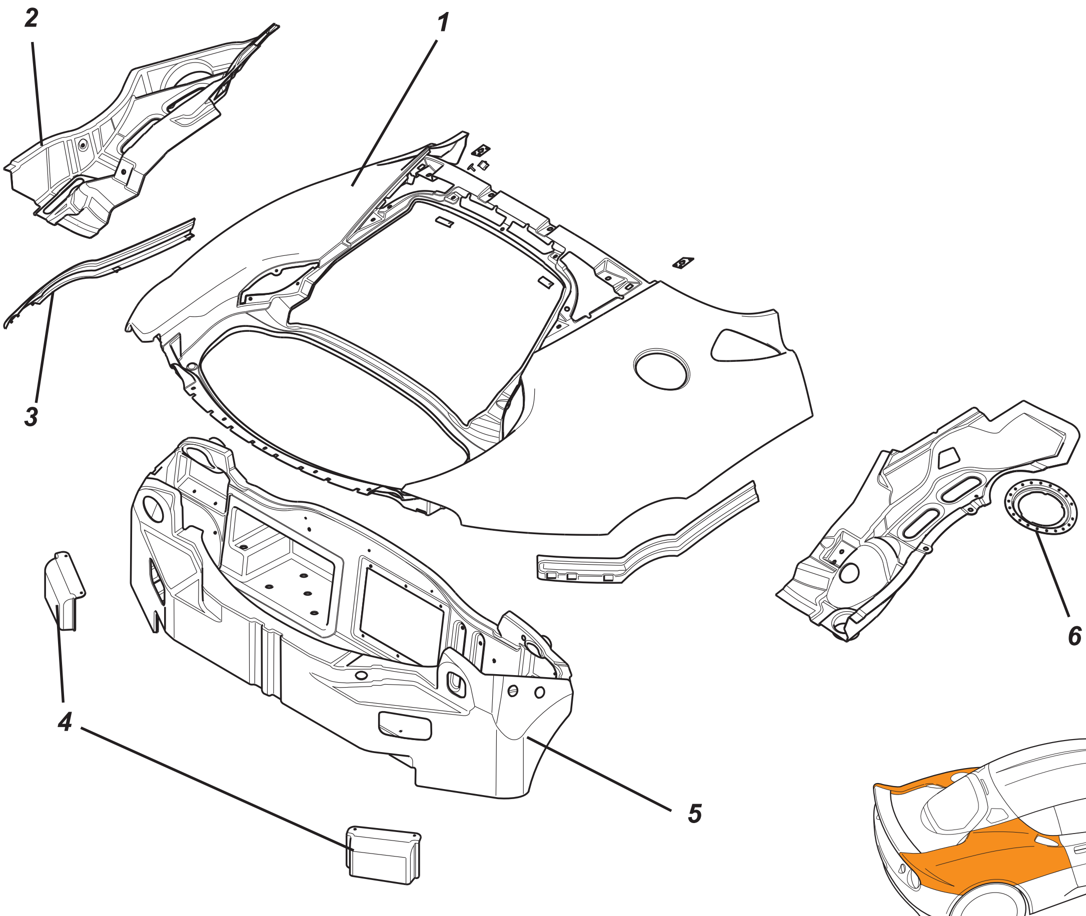
- Check headlamp beam alignment.

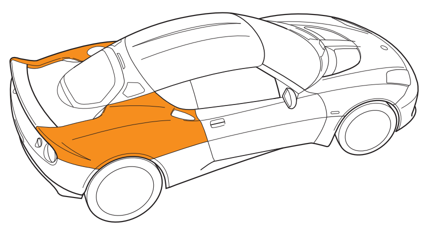
BV.6 - REAR CLAMSHELL

The rear clamshell comprises of composite moulded panels to form the principal body moulding aft of the doors and includes the integral boot box. The separate rear bumper panel is screw fixed to the rear face of the clamshell. The front of the clamshell is secured to the body side mouldings and the back edge of the roof panel, with the back end supported via the boot floor to the rear subframe.

The tailgate hinges reach beneath the top edge of the clamshell to fix onto the rear bulkhead, such that the tailgate needs to be removed before the clamshell may be released. The rear bumper may remain fitted to the clamshell.

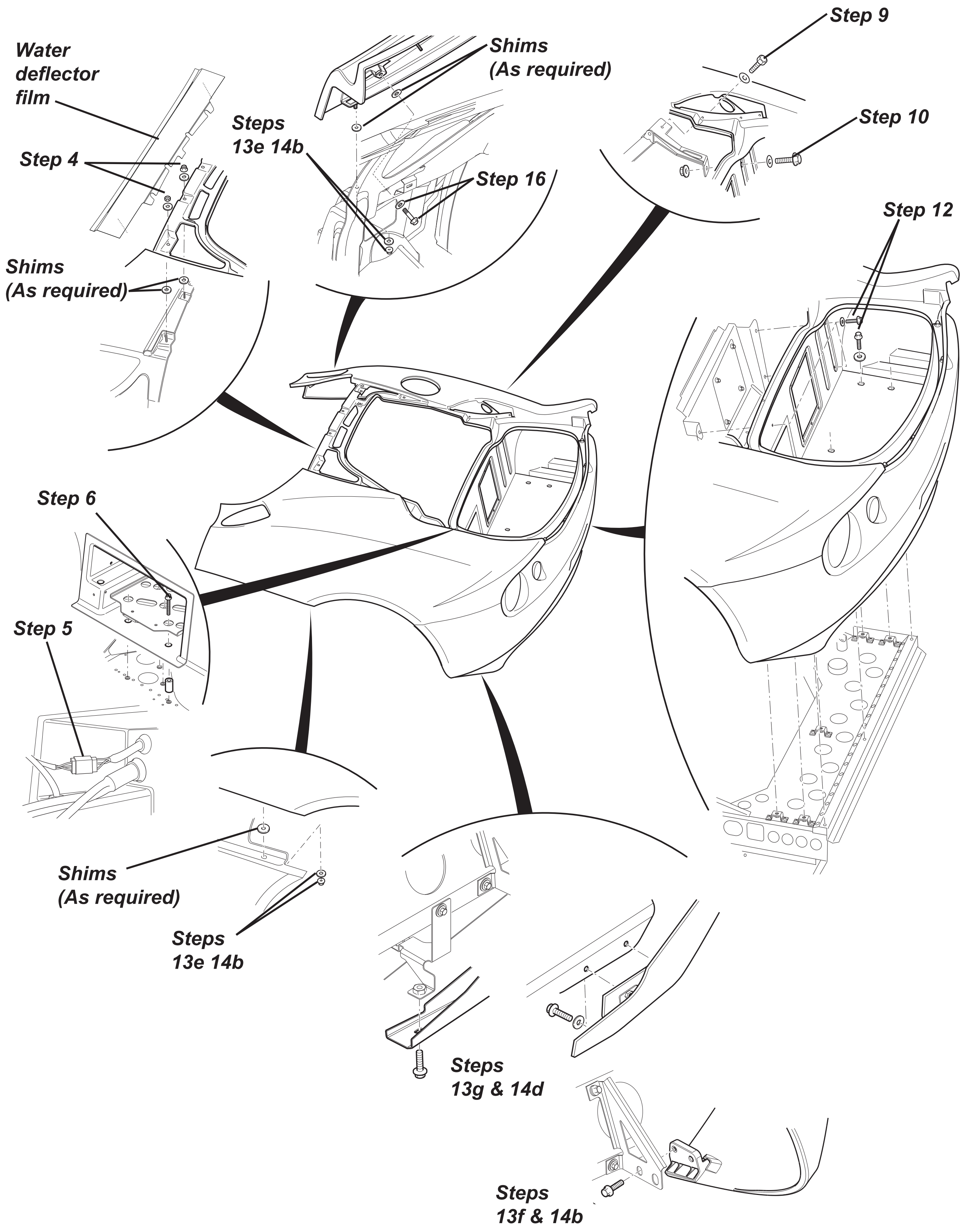
To increase overall strength, provide mounting points for ancillary components as well as its fitment to the vehicle the rear clamshell assembly consists of several supplementary reinforcement panels and brackets, the principal ones being:





1.Main outer panel
2.LH/RH Catwalk reinforcement panels - Bonded to upper undersides of wheelarch areas using Plexus MA920
3.LH/RH side reinforcement panels - Bonded to lower undersides of wheelarch areas using Plexus MA920
4.Ventilation flap valve shields - Bonded to boot box assembly using Betaseal 1701
5.Boot box assembly - Bonded to rear underside of main panel using Plexus MA920
6.Fuel ring adaptor - Bonded to underside of main panel around fuel filler flap aperture using Plexus MA920

Removal Step Guide Illustration
(Also refer to accompanying text on following pages)



Care Points
- *The clamshell assembly may be removed whilst leaving the rear bumper in position.*
- *When storing the clamshell /bumper to access other ancillary vehicle components, care should be taken to avoid damage to the panel corners; e.g. use a suitable soft floor covering on which to place the assembly on.*
- *Removal and refitment of the clamshell/bumper is made considerably easier with the assistance of a second person.*
- *Unless torque values for any of the fixings shown in the procedure below are specified then they should only be tightened sufficiently to retain the clamshell securely to its vehicle mounting points (do not torque tighten to a greater value than the recommended industry standard for the size of the fixing).*

1. Tailgate: Remove the tailgate, both rear wheels and wheelarch liners; refer to sub-section BV.2, BV.17 and service notes section GJ.4 for further information.

2. Remove the latch cover trim and disconnect the emergency release cable from its retaining bracket and the bell crank lever; refer to sub-section BV.2 for further information.

3. Remove the engine bay ventilation/cosmetic panel: refer to sub-section BV.19 for further information.

4. Once the cosmetic panel is removed carefully peel off the water deflector film covering the upper clam/roof join to gain access to the inner M8 nyloc flanged nuts and M8 x 20 x 1.5 washers (2) securing the clamshell to the roof rear flange, and the outer M8 nuts and M8 x 25 x 1.5 washers securing the clamshell to LH/RH bodyside panels. Remove the nuts and washers. Refer to sub-section BV.19 for refitment of deflector film.

5. LH side harnesses: Remove the battery cover, battery and tray, and feed the battery cable harness out through the clamshell grommet, also, if fitted the TPMS/parking aid sensor harness positioned directly above the battery cable harness must be disconnected from its main harness connection and fed out through the upper clamshell grommet; refer to service notes section MR.8 for further information.

6. With the battery removed, release the M8 x 45 bolts (4) securing the battery tray to the clamshell/rear subframe (torque 16NM). Remove the battery tray and collect the spacers 27mm spacers positioned within each bolt hole.

7. RH side harnesses: Unplug the rear harness from the main harness at the RH side of the boot and feed the harness through the RH clamshell grommet. Unplug the cable to the reversing camera and withdraw the cable through the clamshell. Also feed the previously disconnected emergency latch lever through the LH clamshell.

8. Release the No. 8 x 3/4", flg. pozi screws (2) retaining the LH/RH air outlet side grilles at rear corners of the engine bay and remove the grilles.

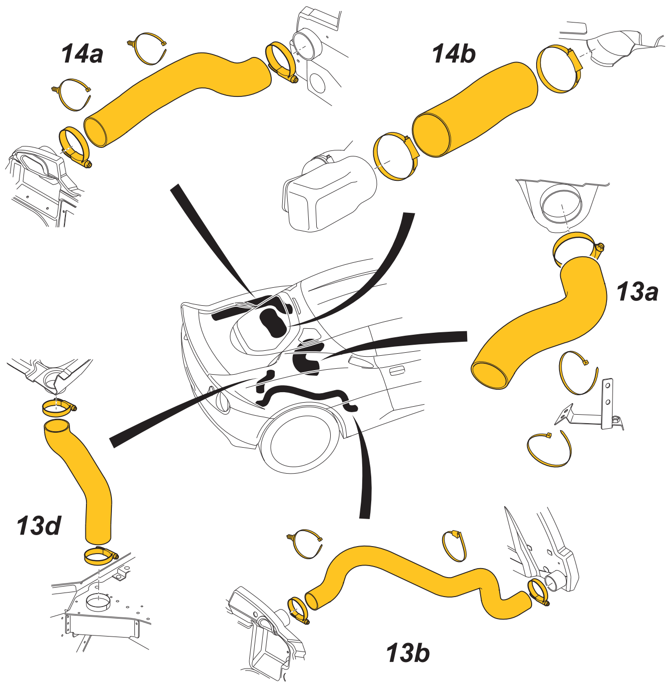
9. With the grilles removed release the M8 x 25 screws and washers securing the clamshell to the LH/RH tailgate strut brackets which are now accessible.

10. If not already removed, pull the front luggage compartment carpet away from the engine bay panel to access the LH/RH M8 x 25 screws and washers securing the LH/RH strut brackets and heat shielding to the clamshell. Release the screws/washers and withdraw the brackets from the vehicle. (Note: LH lower strut bracket screw is secured with an M8 nyloc nut located within the engine bay.

11. From within the engine bay release the M6 x 16 bolt and washer and M8 x 30 bolt securing the coolant reservoir to its LH/RH clamshell securing brackets. Without placing undue strain on the coolant hoses, place the reservoir to one side and unclip the metal breather pipe secured to the lower bracket.

12. Boot box: From inside the boot, release the M8 x 25 screws and washers (8) securing the boot floor to the subframe, and the M6 X 16 bolts and washers (4) in the boot front wall securing the heatshield to the engine bay panel.

13. From within the RH rear wheelarch release:
    a. The cable ties securing the RH intake duct tubing to its subframe mounted retaining bracket.
    b. The cable ties securing the RH ventilation duct tubing to the clamshell inner wheelarch panel as well as the hose clip securing it to the rear side boot box panel.
    c. Retaining clips securing the emergency release cable to the clamshell inner wheelarch panel.
    d. The hose clip securing the subframe heat duct pipe to the clamshell exit vent.
    e. The M6 nyloc nut and washer securing the front wheelarch section of the clamshell to the body side top flange. Reach further forward and above the bodyside sill crash foam with an M10 socket and short ratchet handle to release the similar fixing at the front of this flange.
    f. The M6 x 16 bolt securing the rear bumper to the subframe bracket.
    g. The 2 fixings to the diffuser panel.



14. From within the LH rear wheelarch release:
    a. The cable ties securing the LH ventilation duct tubing to the clamshell inner wheelarch panel as well as the hose clip securing it to the rear side boot box panel.
    b. Hose clips securing engine duct pipe to the clamshell intake grill housing
    c. The M6 nyloc nut and washer securing the front wheelarch section of the clamshell to the body side top flange. Reach further forward and above the bodyside sill crash foam with an M10 socket and short ratchet handle to release the similar fixing at the front of this flange.
    d. The M6 x 16 bolts securing the rear bumper to the subframe bracket.
    e. The 2 fixings to the diffuser panel.

15. Remove the fuel cap and pull the grommet over the filler neck. Re-seal the neck and unplug the flap release solenoid connection; refer to service notes section LN.3 for further information.

16. From within each side of the cabin interior, release the front seat belt upper anchorage from the 'B' post, and pull off the 'B' post top trim; refer to service notes section VE.11 for further information. Pull the weatherstrip seal off the body vertical flange at the rear of the door aperture. Pull the rear quarter trim panel away at its top edge to release the two spring fasteners beneath the quarter window. This should allow sufficient access to the single M6 x 16 screw and washer securing the topshell to the body side just below the front end of the rear quarter window.

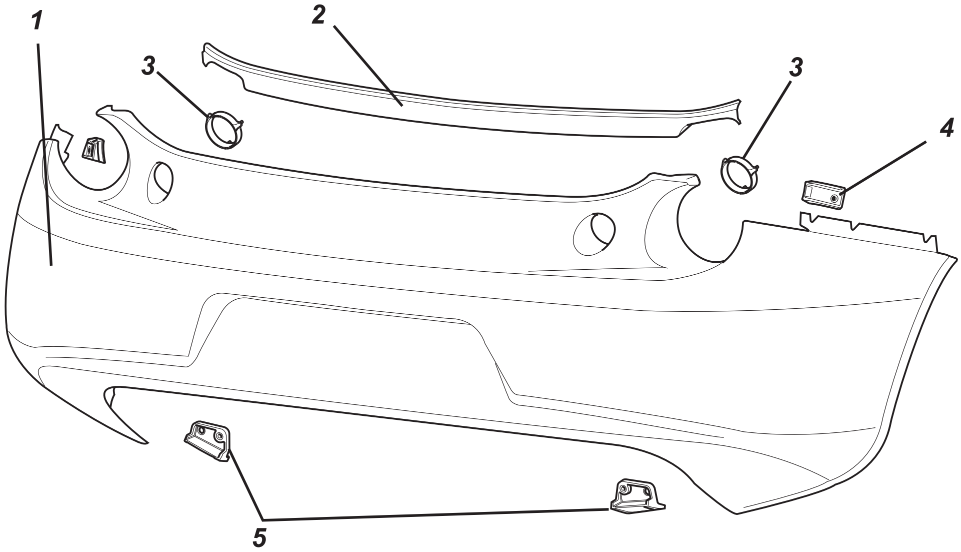
17. Carefully lift the clamshell/bumper assembly from the body and lay aside on a protected surface. Note and retain any shim washers or plates used at the fixing points shown in steps 4, 12 & 13.

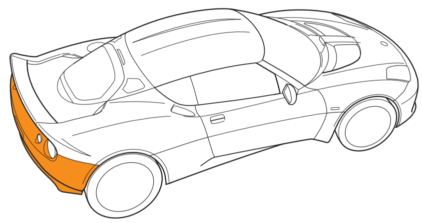
Refitment:
Refit the clamshell in reverse order to removal, taking appropriate precautions to protect surfaces from damage during the installation process. Refit any shim washers or plates noted on disassembly. Assess shutlines and panel heights as early as possible and amend shim stacks as necessary.

Care point: The rear harness of vehicles built between September 2009 and August 2013 were secured with tape retaining it to the inner boot panel. After this time the harness was retained with tie wraps. If you are removing the rear clamshell of a harness secured by tape then please remove the securing tape and replace with tie wraps and re-route the harness upon refitment. Please refer to the electrical service notes section MR.10 - harness routing for further information.

BV.7 - REAR BUMPER

The rear bumper assembly is comprised of a main Reinforced Reaction Injection Moulding (RRIM) moulded outer panel as well as supplementary panels inset on the rear-side to increase its overall strength, provide mounting points for ancillary components as well as its fitment to the vehicle.





1.Main panel
2.Bumper to clamshell closing panel
3.Fog/reverse light brackets
4.Alignment brackets
5.Bumper to subframe mounting brackets

Item 2 is adhered to the main panel using a 12mm wide double-sided automotive acrylic adhesive tape, the contact surfaces first being cleaned with Betaclean-3900 and then an adhesion promotor applied before tape fitment. Items 3 - 5 are bonded to the main panel using Plexus MA920

Removal:

Care Points
- *When storing the bumper to access other ancillary vehicle components, care should be taken to avoid damage to the bumper corners; e.g. use a suitable soft floor covering on which to place the panel on.*
- *Removal and refitment of the bumper is made considerably easier with the assistance of a second person.*
- *Unless torque values for any of the fixings shown in the procedure below are specified then they should only be tightened sufficiently to retain the bumper securely to its vehicle mounting points (do not torque tighten to a greater value than the recommended industry standard for the size of the fixing).*

1.From inside the boot, remove the trim panel from around the latch mechanism, and disconnect the harnesses to the rear fog and reverse lamps, parking sensors and reverse camera (if fitted).

2.Remove both rear wheels and wheelarch liners; refer to sub-section BV17 and service notes section GJ.4 for further information.

3.From within each rear wheelarch, release the M6 X 16 bolts securing the lower edge of the bumper to the subframe bracket.

4.From within each rear wheelarch, release the M6 nyloc nut and washer securing the front top edge of the bumper to the clamshell at the wheelarch area.

5. Release the two fixings at each inner side of the diffuser finisher securing it to the diffuser.

6. Release the two fixings at each underside of the diffuser finisher securing it to the subframe bracket.

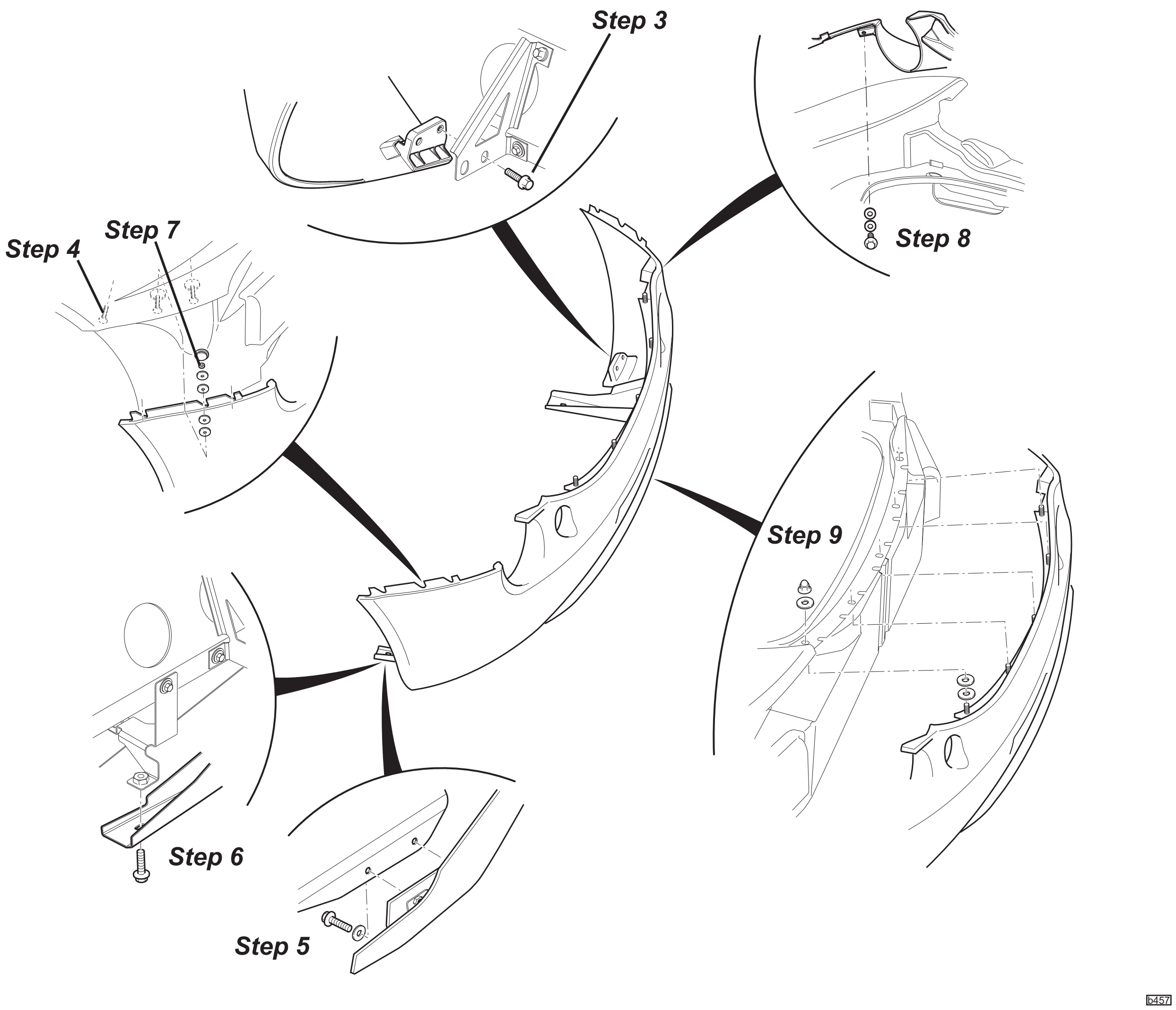
7. From within each side of the boot, remove the two grommets, and release the M6 nyloc nuts and washers securing the bumper top edge to the clamshell.

8. Release the M6 x 16 bolts and washers just outboard of each tail lamp.

9. Release the M6 Black nuts and washers (5) along the rear edge of the boot aperture, clamping the bumper to the clamshell.

10. Carefully withdraw the bumper from the clamshell.

Refitment:
Refit the bumper in reverse order to removal, ensuring that the diffuser finisher panel is first fitted, and adjust the panel heights and gaps as necessary.

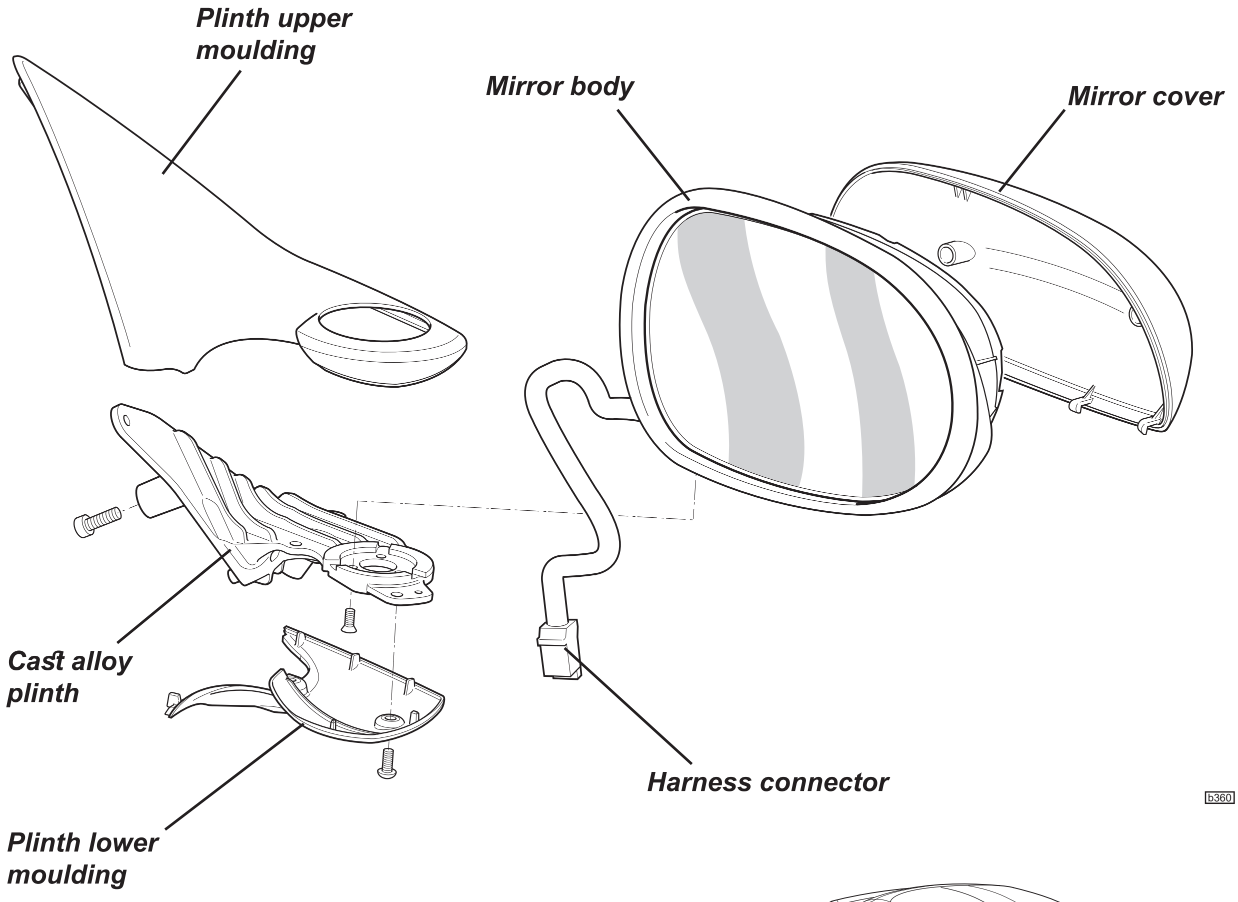


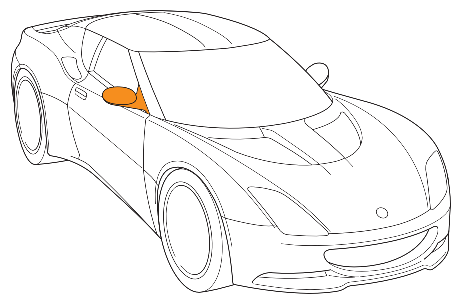
BV.8 - DOOR MIRRORS

The two door mirrors are electrically adjustable, and, only when the engine is running, are heated on demand in conjunction with the HRS for a maximum period of 10 minutes. An optional specification includes an electric fold facility.

Each mirror comprises a cast alloy bracket carrying a black textured plastic housing, and a gimbal mounted glass carrier driven by a pair of electric motors, and to which is attached the mirror glass. A third motor provides the fold function. A sprung attachment of the mirror housing to the plinth allows the mirror to move forwards or backwards on accidental contact, in order to reduce the potential for personal injury or vehicle damage. A body colour painted moulding is clipped to the front of the mirror housing.

This mirror assembly is mounted via a cast alloy plinth to the door cheater panel, with upper and lower black plastic mouldings used for cosmetic enhancement.





Mirror glass
The mirror glass is contained in a plastic carrier which includes the heating element and terminals.

Removal:
1. Press the glass to the inboard side of the mirror fully inwards until moderate resistance is felt.

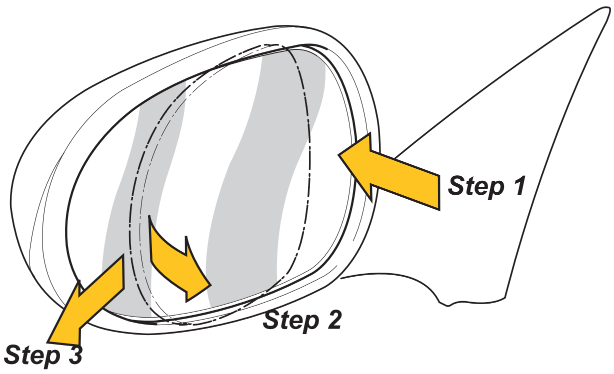
2. The outer edge of the mirror glass will now protrude outwards of the mirror body.

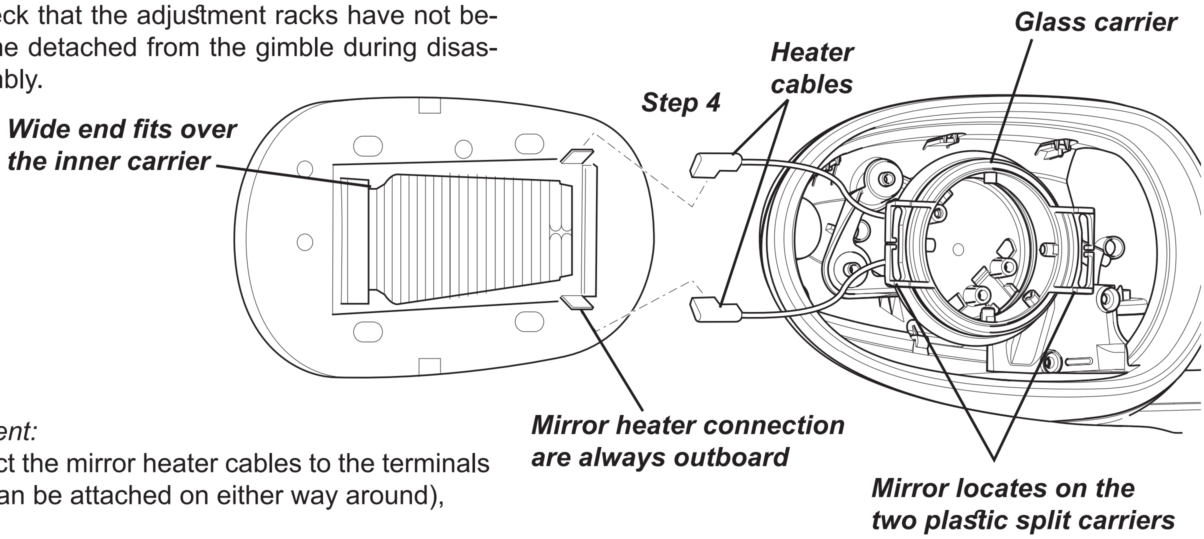
3. Pull the mirror glass outwards whilst still applying pressure to its inboard side (fig 1). This will unclip the mirror glass from its carrier.

4. Unplug the two heater cables from the element connections,

5. Remove the glass.

6. Check that the adjustment racks have not become detached from the gimble during disassembly.



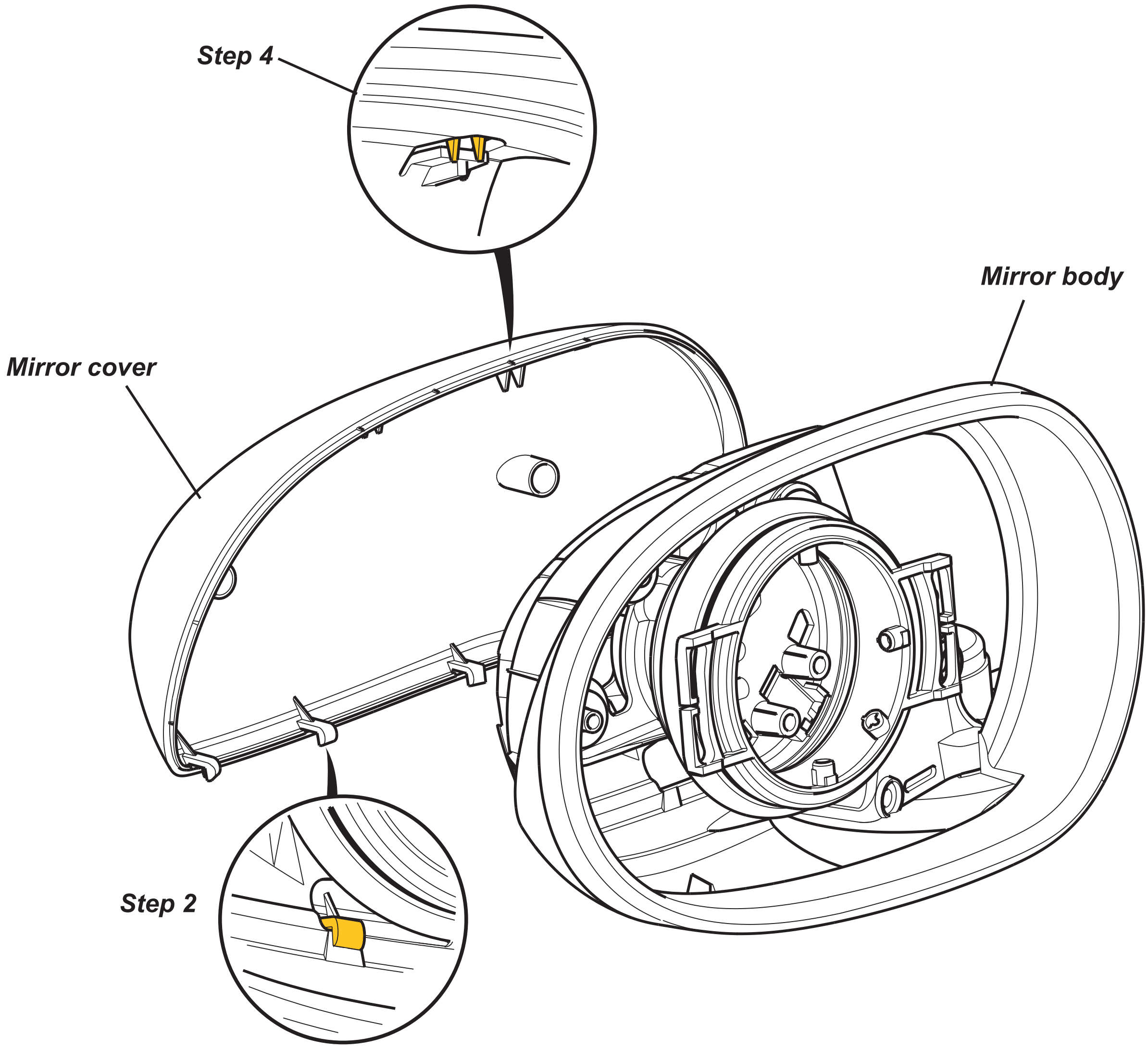


Refitment:
Connect the mirror heater cables to the terminals (they can be attached on either way around),

Hook the mirror glass on the inboard end of the glass carrier, and press the outboard end until the clip is engaged.

Note that convex glass is normally fitted to both sides in order to provide the widest field of vision, but certain markets use flat glass on one or both sides. Be aware that objects viewed in convex mirrors appear more distant than when viewed with flat glass.

Mirror cover
The painted cover is secured to the mirror body by integrally moulded clips.



Removal:
1.Remove the mirror glass from the body (see previous page)

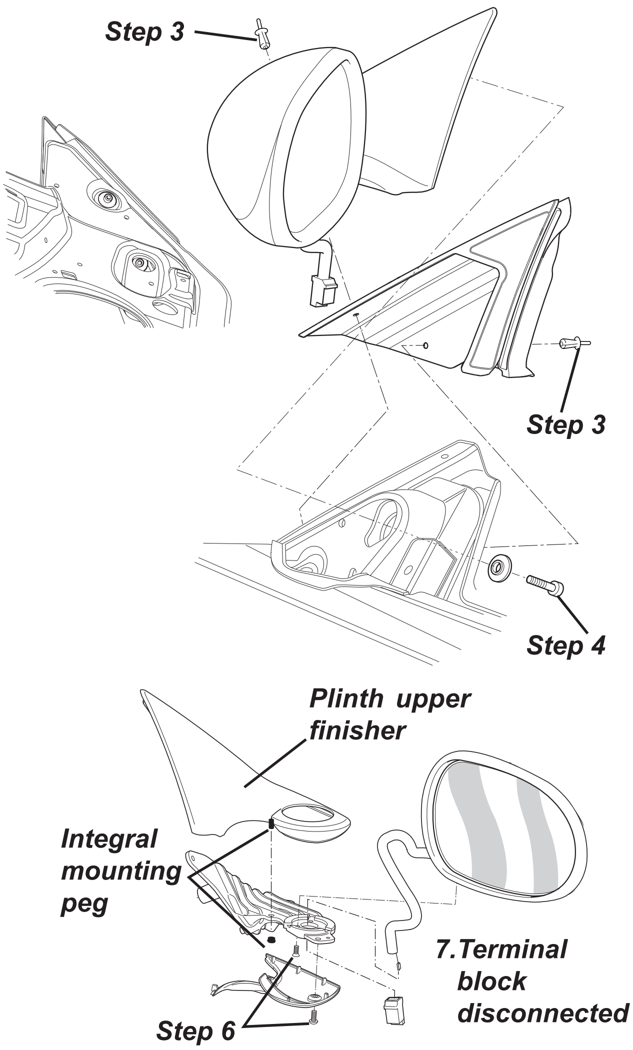
2.Ease the lower clips whilst gently prising the cover away from the mirror body.

3.The upper edge of the cover is located by three integral clips on the cover that are located by tangs on the mirror assembly.

4.Whilst gently prising out the cover from the lower clips push down on the tangs of upper Clips to disengage from cover.

Refitment:
Is the reversal of removal.

Door mirror assembly



Removal:

1. Remove the door trim panel (see service notes section VE.2).

2. Unplug the mirror harness connector, remove the split grommet and back feed the harness into the door shell. Use the harness hole to access and remove the mirror plinth lower fixing screw.

3. Remove the plastic rivets securing the plinth upper finisher and cheater panel seal to the door.

4. Pull back the cheater seal to access and remove the plinth upper fixing screw.

5. Withdraw the mirror assembly whilst feeding the harness through the door shell.

6. Remove the plinth lower cover by releasing the two retaining screws.

7. To allow the mirror to be removed from the plinth, the connector block must first be removed. Record the cable colour against connector cavity before using a suitable terminal extractor tool to depress the retaining barb, and withdraw each terminal from the connector.

8. Remove the three screws around the pivot mechanism and withdraw the mirror from the plinth.

Refitment/renewal:

Upper finisher removal

Note that the plinth upper finisher is heat bonded to the plinth. if replacement is required the old finisher can be removed by cutting the integral mounting pegs and releasing it from the plinth.

Upper finisher replacement

Place the new finisher in position ensuring the mounting pegs pass fully through the holes in the plinth, then using a soldering iron melt the ends of the pegs to secure the finisher in position.

Harness connector block

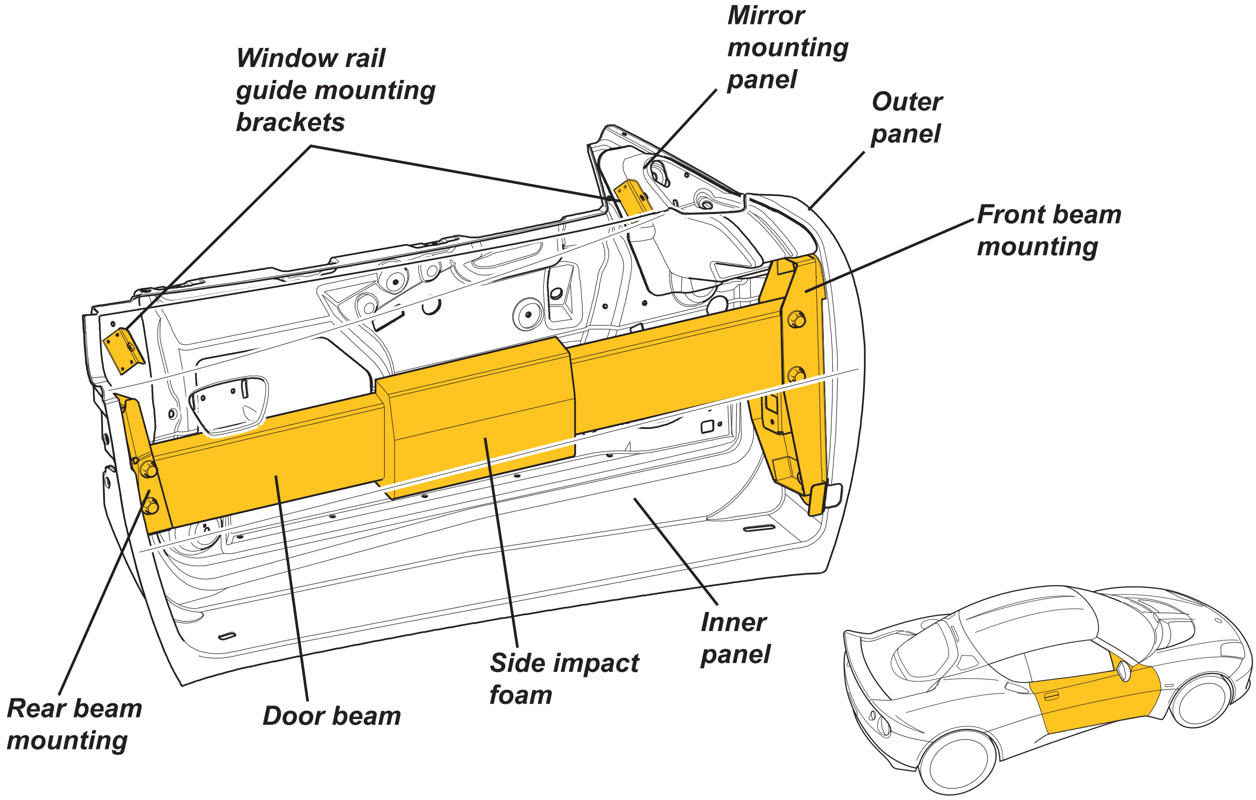
New mirror assemblies may be supplied with an unsuitable connector block. Use an appropriate terminal extractor tool to withdraw each cable from the connector, which may then be discarded.

Feed the harness through the mirror plinth before inserting the terminals into the replacement or original connector block in the following manner.

Connector cavity	Cable colour	Function
1	Not used	Not used
2	Brown	Up/down
3	Orange	Mirror common
4	Pink	Left/right
5	Red	Fold in
6	Blue	Fold out
7	Black	Mirror heater
8	Black	Mirror heater ground

Continue re-assembly in reverse order to removal.

BV.9 - DOOR SHELL, BEAM & HINGES



The door shell assembly comprises of an inner and outer composite panel moulding, bonded together around the periphery, and enclosing a hollow section, extruded alloy, door beam with internal stiffening webs to provide side intrusion protection. A fabricated steel beam mounting is bonded to the inside of the door shell front face, and provides a 2-bolt mounting for the front end of the door beam as well as the door hinges and check strap.

Similarly, another fabricated steel bracket is bonded to the inside of the inner door shell panel rear face, and provides a 2-bolt mounting for the rear end of the door beam and latch assembly. Steel front and rear window rail guide mount brackets and a composite mirror mounting panel are also secured to the inner door panel. A steel door lock cylinder bracket is bonded to the LH outer door panel.

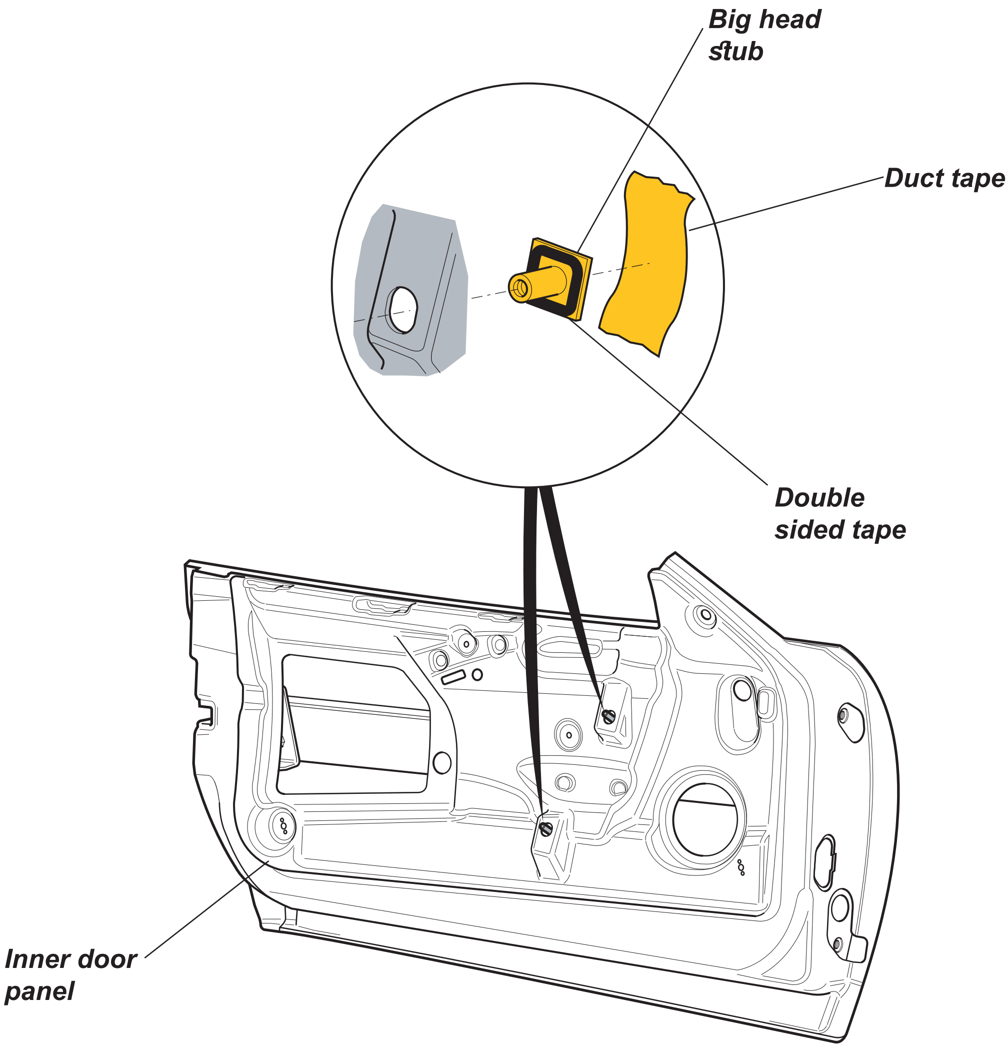
All internal brackets and panels are bonded to the inner and outer door panel using Plexus MA920. The inner/ outer panels and internal components described above are only available only as a complete door shell assembly.

Each door uses two identical hinges, each comprising two steel forgings, one with a single eye for bolting to the door shell hinge post, and one with a double eye for bolting to the chassis hinge post, the oversize holes and hinge to chassis shims provide positional tolerance for door shutline adjustments to be made.

Synthetic bushes and a steel tube provide the maintenance free pivot mechanism, with the two hinge halves being mated by a pivot bolt to allow door removal without losing the alignment settings. The hinges also feature open limiting stops, although this function is incorporated into the check strap.

A check strap is fitted to limit door opening and also to provide a mid-point detent position for convenience in restricted space. The check strap unit is fixed to the inside front face of the door beam mounting with two integral threaded studs secured with M6 flanged nuts and uses spring loaded Nylon jaws to embrace a profiled steel link fixed by a single bolt to the chassis 'A' post.

Door pull handle fixings



The inner door pull handle is secured to the door shell using two M8 bolts each of which is screwed into a big head stud (comprising of a female threaded stud mounted to a rectangular base) which is positioned behind the inner door shell panel.

The rectangular stud base is mounted within manufactured recesses behind the inner panel with the studded section protruding through machined holes.

To allow for tolerance variations between the inner door panel, door trim and pull handle, the studs are not rigidly secured to the panel, but held in position with double sided tape applied around the base of stud.

This initially secures the big head stud to the inner door shell, a length of duct tape is then placed behind the inner panel and stud base for further security.

This allows the stud to move slightly within the panel so that the interior door pull handles bolts can be fully tightened without the potential to become cross threaded.

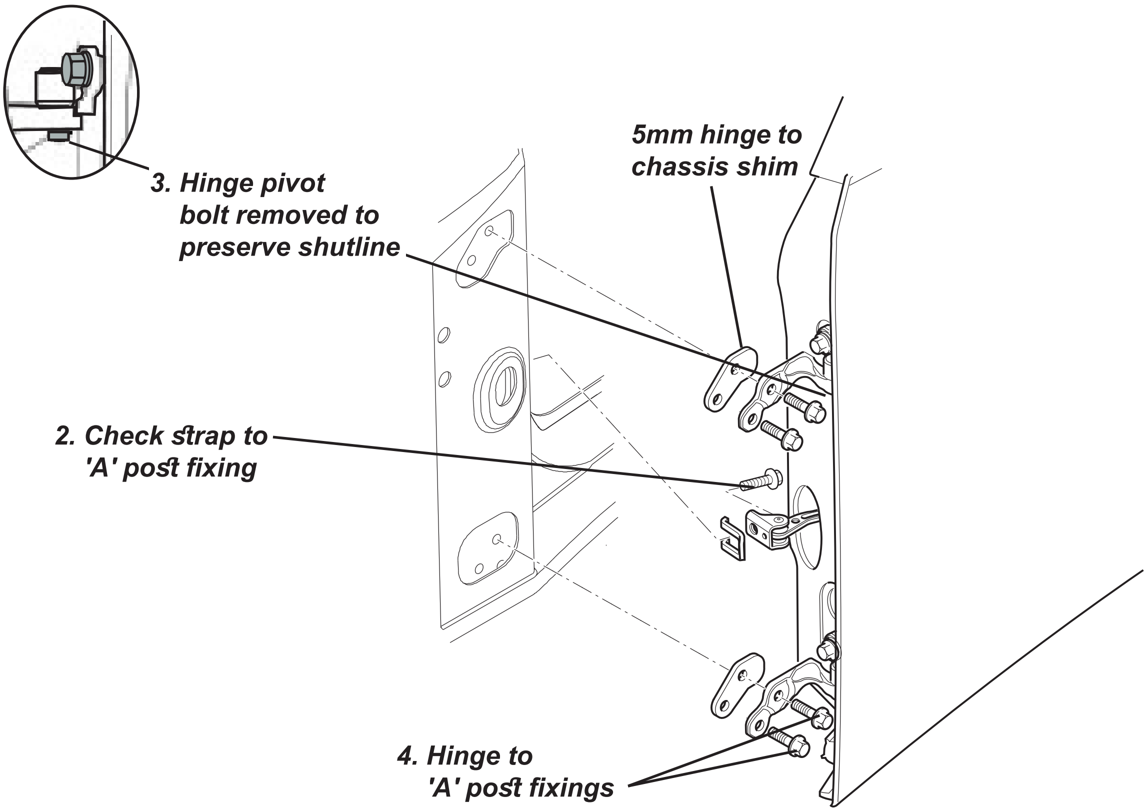
To remove/refit door assembly
The complete door assembly may be removed from the car by the following procedure:

1. Remove the door hinge post trim panel and unplug the door harness connector. Feed the connector through the hinge post aperture; refer to service notes section VE.5 for further information.

2.Release M8 X 25 bolt securing the check strap from the 'A' post (torque 25Nm).

3.To preserve the shutline settings, support the door, remove the pivot bolt from each of the two hinges, and lift the door off the hinge pivot tubes.

4.Refit in reverse order to removal. If shutline adjustment is required, slacken the M10 X 35 bolts and washers securing the hinges to the door and 'A' post, move the door as required, and re-tighten (all hinge bolts torqued to 45Nm).



Check strap
The check strap is secured from inside the door shell beam mounting bracket by two integral M6 studs and flanged nuts.

Removal:
1.Release M8 X 25 bolt securing the check strap from the 'A' post (torque 25Nm).

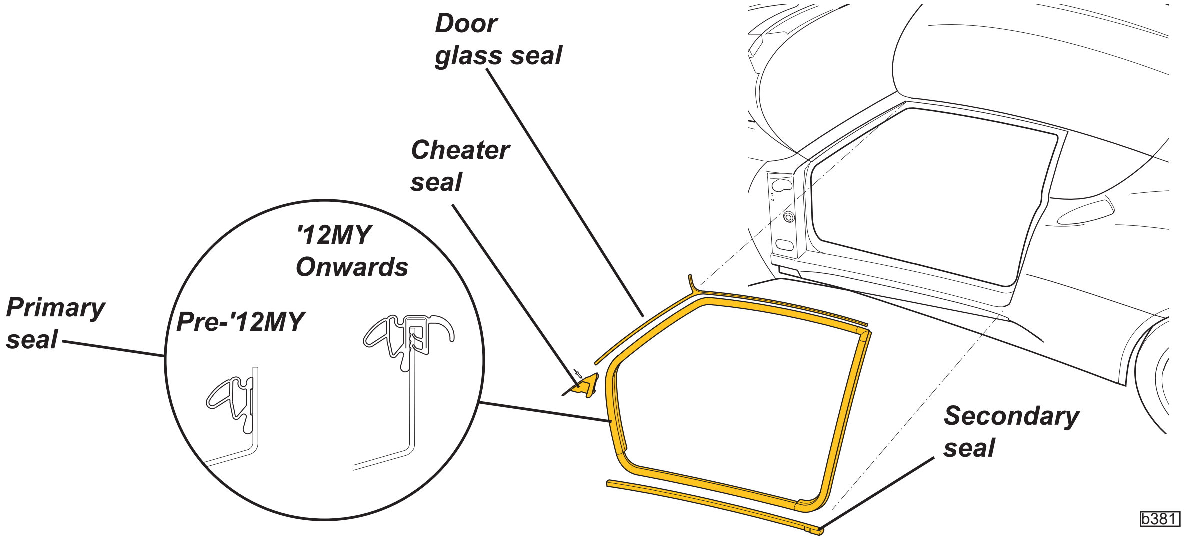
2.Remove the door trim panel and membrane; refer to service notes section VE.5 for further information.

3.Fully raise the window, and release the two M6 flange nuts securing the check strap assembly (torque 10Nm).

4.The check strap can now be withdrawn from within the door shell assembly.

Refitment:
Is the reverse of removal.

BV.10 - DOOR WEATHERSTRIP SEALS



Drop glass waist seal
The door drop glass uses flocked EPDM wipe seals on the inner and outer top edges of the door shell to minimise water ingress into the door. Each main length of seal is bonded to an aluminium 'U' section barbed carrier, which is pressed on to the appropriate door top flange. These two seals are linked around the back of the door shell glass slot, by an integrated moulded capping section secured to the door by two push button fixings. The seal should be removed from the door before attempting to remove the door glass or guide rails.

To remove the seal, lower the door glass fully. Press in the centre pin of the two button fixings to allow them to be withdrawn, and carefully pull the two seals from the door shell flanges.

Door cheater seal
The extension to the top front of the door moulding, designed to provide increased support to the door glass, and also to mount the door mirror, is referred to as the door 'cheater' panel. A moulded rubber seal is fitted around the cheater and secured by Rokut rivets and adhesive strips.

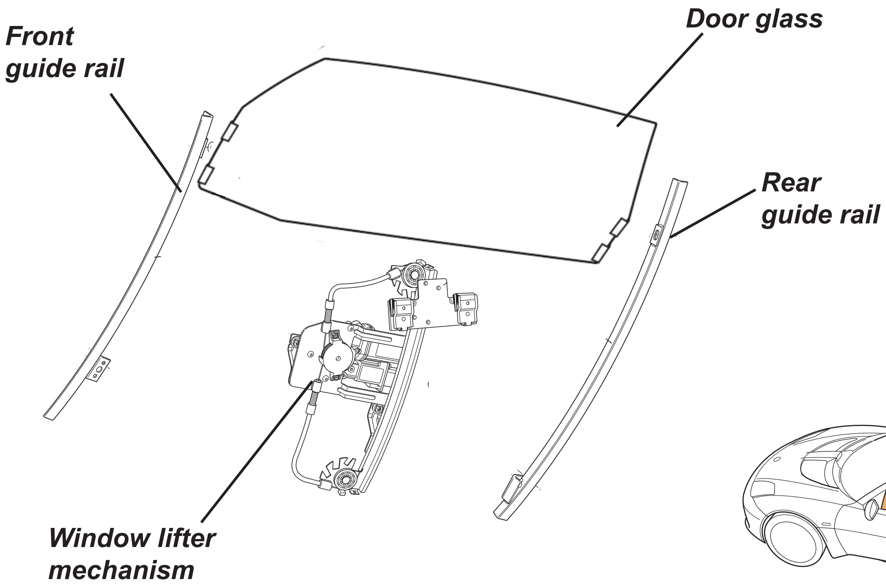
Door primary seal
Each door weatherstrip seal comprises several extruded rubber sections and a right angle corner moulding, all bonded together to form a single service unit. For pre-‘12MY vehicles the top, front and rear sections of the seal incorporate a gripper channel which is pressed onto the body flange. The bottom section is bonded to the sill via a self adhesive strip pre-applied to the seal. Before fitting the seal, thoroughly clean the bonding area on the sill using Betaclean 3900 (A100B6008V). On ‘12MY onwards vehicles all sections of the seal are retained into the body flange by a gripper channel.

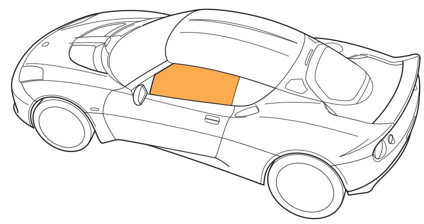
Start fitting the seal from the top rear corner, and ensure that the whole length of the 'U' section is pressed fully on to the body flange. On pre-'12MY seals remove the backing tape and position the lower section against the sill. Use a roller wheel to ensure full adhesion.

Door glass seal
In order to minimise wind noise transmitted into the cabin, a door glass seal is fitted along the cant rail and down the 'A' post. This self adhesive, hollow section rubber extrusion, should be contacted by the door glass in its fully raised position (see BV.11).

Secondary door seal
Attached to the base of the inner door shell by a self adhesive strip, the secondary door seal is designed to reduce the ingress of dirt and water which may otherwise collect on the body sill and ‘B’ post. This protects the door latch from potential contamination as well as preventing dirt transference to clothing whilst entering or exiting the vehicle.

BV.11 - DOOR WINDOW, GUIDE RAILS & LIFT MECHANISM





Door glass
Each door uses a single, 4mm thick, green tinted, tempered glass, curved door window, with a frameless configuration, and an electrically operated lift mechanism.

Guide rails
The glass is guided by a pair of curved steel 'L' section channels, to which it is constrained by two pairs of point contact Nylon guide blocks bonded to the front and rear edges of the glass.

The lower end of each of the guide rails is adjustable in/out via a screw mechanism, to enable the correct weatherstrip seal loading to be achieved, whilst the glass upward travel is limited by an adjustable stop on the lift mechanism.

Door glass lift mechanism
The lift mechanism uses a top hat section steel lift channel, curved to match the window guide rails, and attached to the door shell. An alloy carriage plate, clamped to the bottom of the glass, uses a plastic shoe to slide along one edge of the lift channel.

A multistrand steel cable is attached to the carriage plate and is routed around a pulley at the top and bottom of the lift channel and then around a drum driven by an electric motor. The assembly thus described is secured at 3 points to the door shell.

Door glass auto-drop function
A micro-switch mounted on the lift mechanism closes when the glass is fully raised, and triggers the window automatic drop function when the door is opened.

Note: If the battery supply is interrupted, the one touch down and auto drop features will not function. There will be an increased risk of damage to the door window seals until:

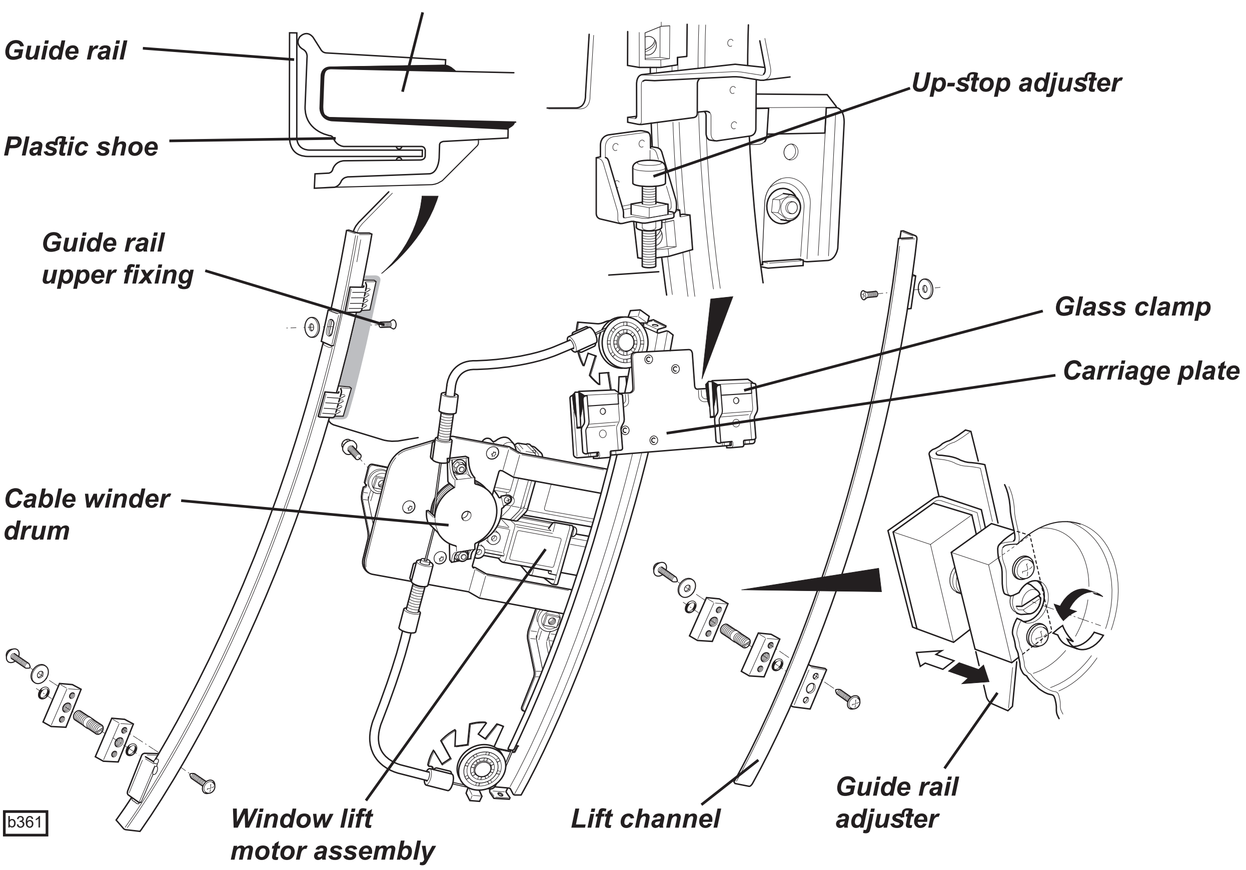
- Each window is fully raised and the switch held for 2 seconds (a click will be heard).
- Each window is fully lowered and the switch held for 2 seconds (a click will be heard).

For additional information on window lift operation and driver controls please refer to service notes section MR.3.

Door glass adjustment
To provide optimum weather sealing, several adjustments are available to position the glass correctly, with sufficient weatherstrip seal loading.

WARNING: To ease door closure, and optimise the sealing of the frameless door glass against the weatherstrips, the control mechanism will automatically drop a fully closed window a small distance when the door is opened (preparatory to closing), and raise it again after the door is shut. This function may be triggered, with ignition on or off, by door latching signals. Whenever working on or near the window mechanism, disconnect the window motor to prevent injury from unexpected operation.

<u>Viewed From Outboard</u>



Glass top edge alignment: When fully raised, the glass top edge needs to be aligned to the roof and cant rail seal. If adjustment is required, the door trim panel and membrane must first be removed for access (see sub-section VE.2). The glass is secured to the carriage plate by two rubber lined clamps; release the two clamp nuts, re-position the glass as necessary and re-tighten.

Glass height adjustment: An adjustable up-stop buffer screw is mounted on the carriage plate, which abuts against a flange at the top of the window lift channel to limit upward travel of the glass. Complete but light contact between the fully raised glass and cant rail seal is required.

Glass inward tilt: After removal of the door trim panel (See sub-section VE.2) and door speaker, the inward or outward tilt of the glass may be adjusted by rotation of the stud located within the guide rail adjuster mechanisms. Adjuster mechanisms are located at the bottom ends of both the front and rear guide rails.

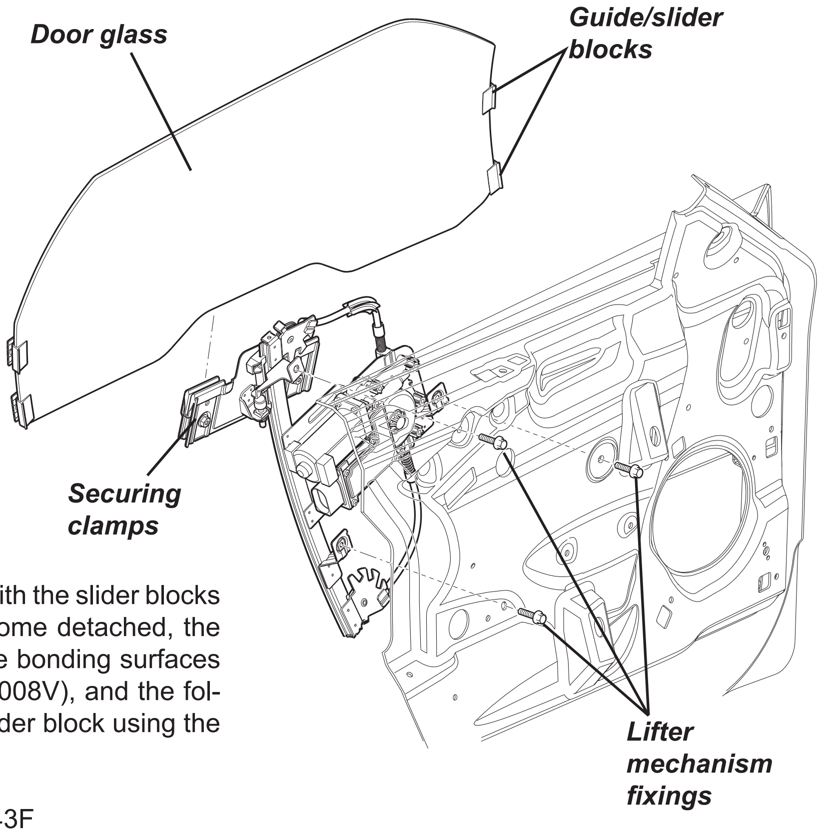
The adjuster mechanism consists of 2 blocks (one having a LH thread and the other having a RH thread) and are joined together by a threaded stud. The guide rail adjuster mechanisms are fixed to the guide rails and the inner door shells. Rotation of the stud will increase or decrease the distance between the adjuster blocks and cause the rails to tilt. Adjust the guide rails until light contact with the secondary door seal is achieved.

Door glass

Removal:
1. Remove the door trim panel and membrane (see sub-section VE.2).

2. Remove the door glass waist seal (see sub-section BV.10).

3. Release the two clamps securing the glass to the lift motor carriage plate, and slide the glass out of the door.



Note: New door glasses are supplied with the slider blocks pre-fitted. If a slider block should become detached, the old adhesive should be cleaned off, the bonding surfaces cleaned with Betaclean 3900 (A100B6008V), and the following products used to re-bond the slider block using the adhesive manufacturer's instructions:

- Permabond Initiator INI 5 A000Z0043F
- Permabond Flexon F246 B089B6125V

Guide rail

Removal:
1. Remove the door glass (see above).

2. Release the single screw securing the top of the rail to the bonded bracket or mirror mounting bracket, noting any shim washers fitted.

3. Release the 2 screws securing the bottom end of the rail to the adjuster screw block, and withdraw the rail from the door.

Window lift mechanism
The lift mechanism is available only as a complete assembly and is secured to the door shell by three fixings. The mechanism may be removed whilst leaving the glass and guide channels in place, but access will be improved if the glass can be fully raised.

Removal:
1. Remove the door trim panel and membrane (see sub-section VE.2).

2. Release the two clamps securing the glass to the carriage plate.

3. Disconnect the harness from the lift motor and micro switch.

4. Release the M6 x12 screws (3) retaining the lift mechanism to the door shell and withdraw from the door.

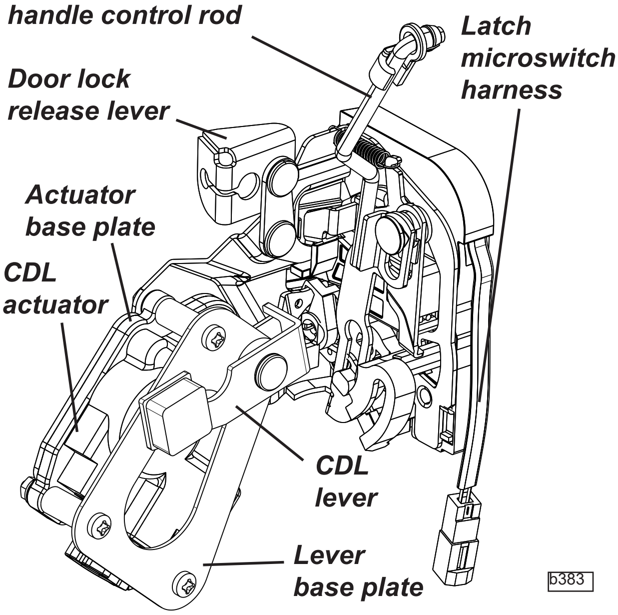
Refitment:
Is the reversal of removal except when re-fitting, adjust the glass height and alignment as detailed on the previous page.

BV.12 - DOOR LATCH MECHANISM PRE-'12MY

The door latch assembly mechanism is fitted inside the rear face of the door, which is reinforced by a steel plate bonded to the composite door shell, and which is also used to secure the rear end of the door beam.

The latch engages with a striker hoop which is secured to a bracket integral with the seat belt mounting frame. The external key lock (fitted only on the LH door) is connected to the latch mechanism by control rod, as are the door sill buttons, and exterior release handles. The interior release handle is connected via a control cable.

Also attached to the latch is a CDL door latch lever assembly which comprises of a mounting plate and lever arm which is linked to the CDL motors actuator lever. The CDL lever arm is weighted to match the total mass of the motors lever arm and linkage assembly.

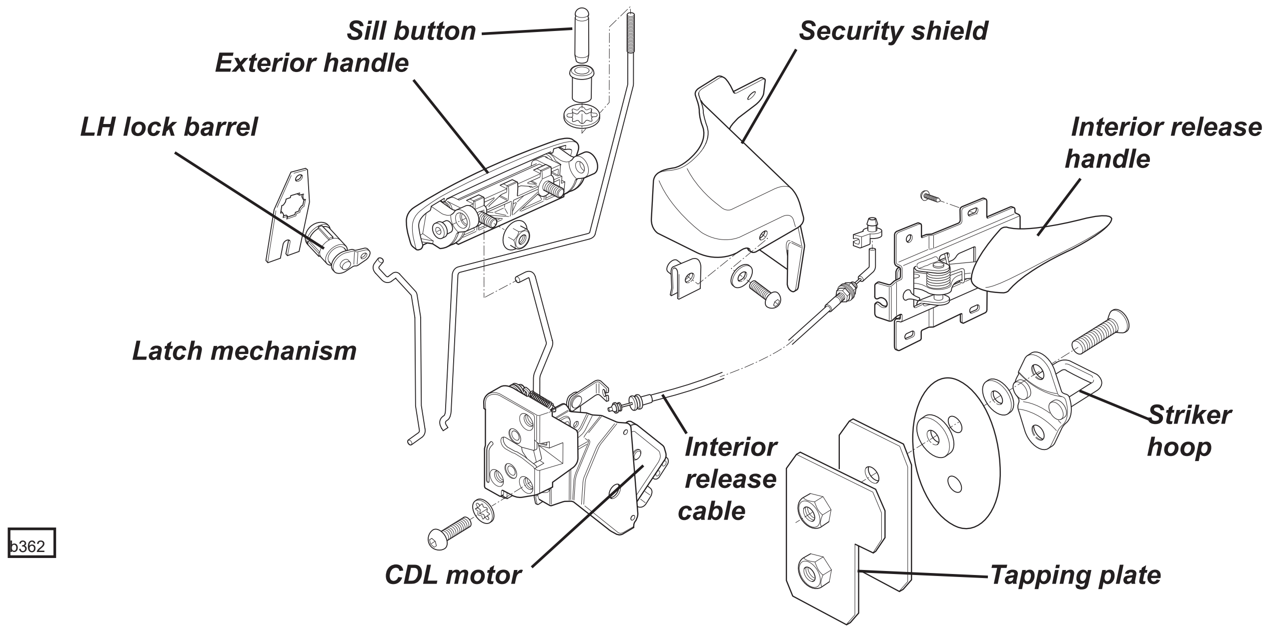


The weighted lever arm ensures that the latches lever arm and attached linkages cannot move position relative to the latch assembly due any extreme external 'g' forces encountered whilst driving.

Note: The CDL door latch lever assembly should be considered a safety critical item and must remain installed to the latch assembly.

The latch contains a microswitch to detect when the door is closed, and which is used to operate the courtesy lamp, alarm system, door glass drop functions, and others. The electrical locking actuator is mounted on a bracket integral with the latch mechanism with which it interacts via a rotary link. A plastic security shield is fitted around the latch mechanism to inhibit illicit interference with the locking system.

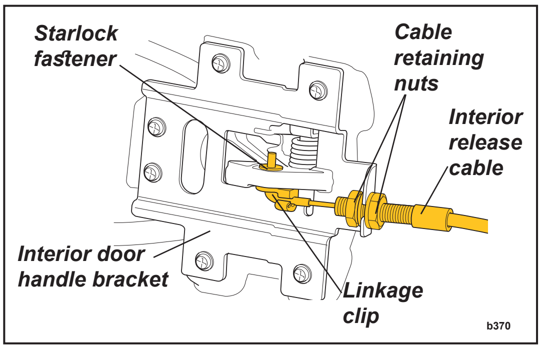
Normal operation of the locking functions is performed electronically via the transmitter fob (see Section MR), but if necessary, the doors can be locked mechanically. The LH door can be locked by using the key in the exterior lock barrel. Both doors can also be locked individually by lifting the exterior release handle (with door open), pressing down the door sill button, and keeping the handle lifted, shutting the door. This action will also disable the interior release handle. Once locked in this way, the RH door can be unlocked only by using the transmitter fob or by raising the door sill button after opening the LH door via the mechanical key.



Latch mechanism

WARNING: The window control mechanism includes an automatic window drop and raise logic to aid door closing and weathersealing. This function may be triggered, with ignition on or off, by door latching signals. Whenever working on or near the window mechanism, disconnect the window motor to prevent injury from unintended operation.

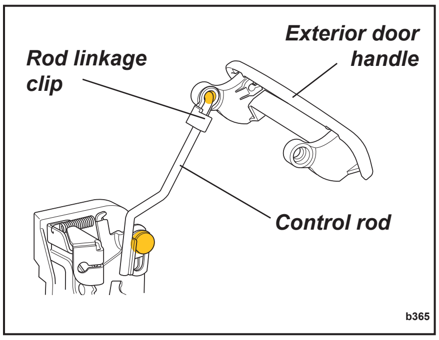
Removal:



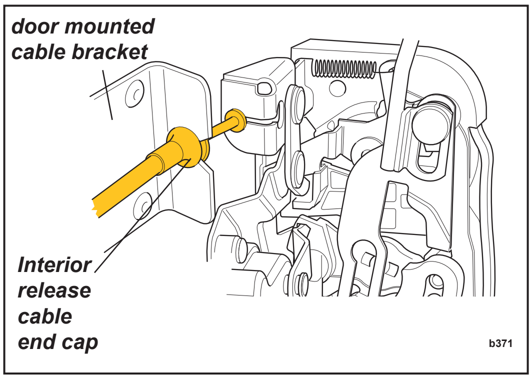
1. Remove the door trim panel (see section VE.2).

   From the rear side of the door trim:

2. Remove the starlock fastener and linkage clip off of the interior release cable.
3. Loosen the interior cable retaining nuts at the handle bracket just enough to remove the cable from the bracket. The door trim panel may now be fully removed from the vehicle.
4. Fully raise the window and unclip the exterior lock rod from the latch (LH door only).



5. From within the door shell, remove the plastic security shield covering the latch assembly to gain access to the release levers.
6. Unclip the control rod from the exterior release handle.
7. Unplug the door harness from the latch assembly.
8. Slide the interior release cable end cap off of the door mounted cable retaining bracket.



9. Unscrew and remove the door sill button. (The button may have been secured with adhesive so it may require covering to protect it whilst using grips or a strap to remove it).
10. Release the three screws from the door shut face securing the latch mechanism, and withdraw the unit together with the sill button control rod and interior release cable still attached.

Refitment:

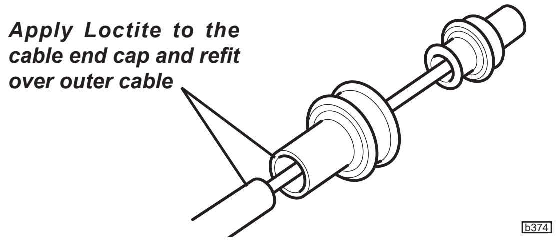
If the latch assembly is being renewed then it is essential to either swap over or renew the latch lever CDL assembly if it has not been supplied with the replacement latch. See CDL door latch lever assembly removal refit section.

If the new latch assembly has not been supplied with latch lever CDL assembly then it will also be necessary to remove and discard the 2 existing screws securing the plastic actuator housing to its metal base plate to accomodate the latch lever CDL baseplate screws.

1. Before installing latch back into the door shell, ensure that the moulded end cap at the end of the release cable is secure to the outer sleeve and does not become detached. This will ensure that the outer cable retains its correct position during the cable setting procedure.

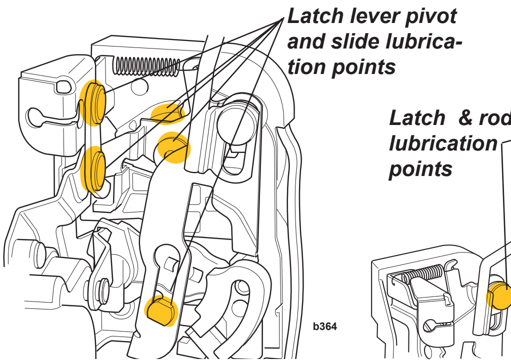
2. If the end cap can be detached then apply a small amount of Loctite® 480 to the cable end cap, wait to cure and retest before fitting to the cable bracket.

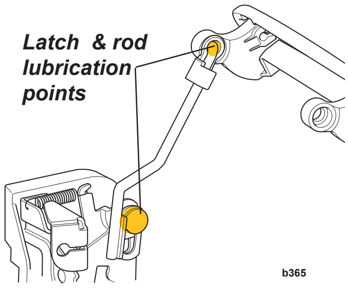
3. On re-assembly, remember to fit the sill button control rod to the latch mechanism (but not the sill button) before installing the mechanism into the door.



4. Before fitting the latch into the door, ensure that all the levers and slides within the mechanism move freely with minimal resistance.

5. Before refitting the security shield ensure that the latch is lubricated using a small amount of a suitable clear PTFE spray grease (such as Lotus part number A132B6038V). Direct at the latches specific slide and pivot points.





6. Fit the latch assembly in place, ensure that the sill control rod is positioned through its aperture in the door shell and secure to the door with its three screws at the door shut face.

7. Slide the end cap of the interior release cable back onto the door mounted cable retaining bracket.

8. Push the sill button control rod downwards to set the latch in the locked position.

9. Hold the interior release cable at the outer sleeve, gently pull the inner cable and check the operation and movement of the latch mechanism and cable is smooth and progressive, (this will replicate the same action as using the interior door handle).

10. The latch mechanism should also fully return as the inner cable is released.

11. Carry out this testing procedure again with the sill control rod raised (unlocked position), the resistance in the cable and latch will increase, but, again it should be smooth and progressive.

12. Refit the exterior door handle rod once you are satisfied that the interior handle latch mechanism is operating smoothly.

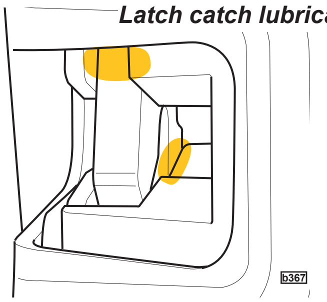
13. With the exterior door handle rod connected, recheck the interior cable and latch operation, if it is still smooth and free in operation, then continue to refit latch assembly.

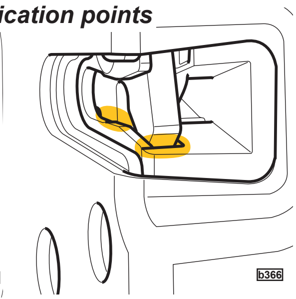
14. If the interior cable and latch operation has tightened or is sticking, then this is an indication that the exterior door handle control rod is either misaligned or incorrectly shaped, placing strain on the latch mechanism causing it to bind. ***Do not continue with reassembly until the cause of the problem has been identified and rectified.***

Further refitment is the reverse of removal except that it is highly recommended to renew the starlock fastener and linkage clip when refitting the interior release cable to the door handle as these fixings may have become damaged or weakened when initially removed.

Note: If a new latch assembly has been fitted, then it will also be necessary to carry out steps 6 -12 as shown in the interior release cable refitment procedure.

Lubricate the latch catch where it makes contact in its housing block using a small amount of a suitable clear PTFE spray grease (such as Lotus part number A132B6038V).





Apply Loctite® 130 to the three screws securing the latch mechanism to the door shut face and tighten to 4 Nm. Once the door panel has been satisfactorily refitted, apply a small amount of Loctite® 130 to the thread of the sill control rod before refitting the button. Screw the button onto the rod; setting the height so that in the rods downwards position only the radii contoured and domed section of the button is visible.

Interior release cable

Note: Access to the door latch interior release lever is limited in situ, it is recommended to remove the door latch assembly to carry out this operation.

WARNING: The window control mechanism includes an automatic window drop and raise logic to aid door closing and weathersealing. This function may be triggered, with ignition on or off, by door latching signals. Whenever working on or near the window mechanism, disconnect the window motor to prevent injury from unintended operation.

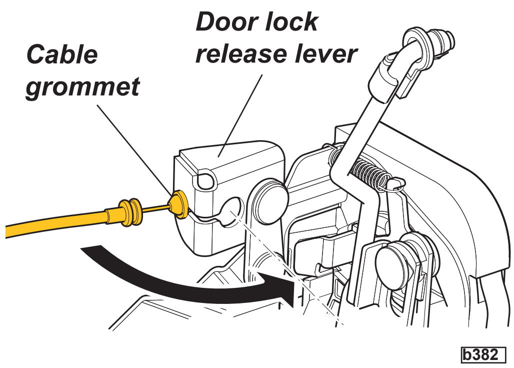
Removal:

1. Remove door trim panel (see section VE.2).

2. Remove the door latch assembly; refer to previous pages.

3. With the latch assembly on a bench pull the release cable grommet and inner cable inwards and away from the aperture retaining it to the door lock release lever.

4. Slide the inner cable and grommet along the machined slot in the lever.



5. The cable can now be removed by pulling it through the levers larger machined hole.

Refitment:

As per removal except for:

1. Ensure that the end cap at the end of outer sleeve of the interior release cable is secure to the sleeve and does not become detached. This will ensure that the cable sleeve retains its correct position during the setting procedure. (See steps 1 & 2 of latch refitment procedure).

2. Holding the outer sleeve of the interior release cable at its retaining nuts, gently pull the inner cable and check the operation of the latch mechanism interior release lever and cable movement is smooth and progressive, (this will replicate the same action as using the interior door handle).

3. The latch mechanism should also fully return as the inner cable is released.

4. Attach the inner cable to the interior handle and secure with a new starlock fixing and linkage clip.

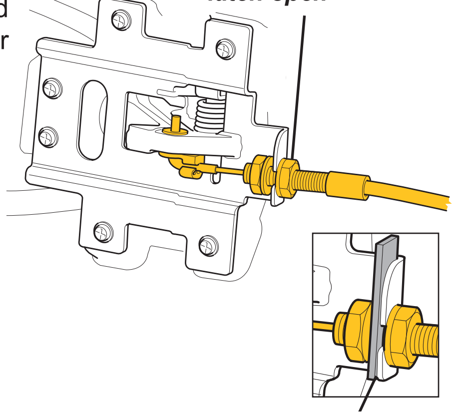
5. Position the outer cable in situ to the interior door handles bracket assembly with the adjustment nuts loosened at either side of the bracket.

6. From the door shut area, set the latch to a closed condition by pushing in the catch using a suitable screw driver.

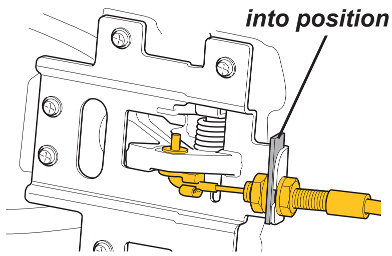
7. Using the rearmost nut only, adjust the cable length to 'trigger' the latch open with the interior release handle at the end of its travel.

8. Using Release handle setting tool T000T1529F and slide over the outer sleeve of the interior cable at its adjusting thread area.

7. Using rearmost nut only, adjust the cable length to 'trigger' the latch open



8. Slide T000T1529F into position



9. Slide the setting spacer over the outer cable sleeve and in between the foremost cable nut and bracket assembly.

10. Tighten the foremost nut to the setting spacer – finger tight, then remove it.

11. Tighten the rearmost nut to the bracket while holding the foremost nut in it's position – finger tight. Lock adjustment by 'pinching' tight with 13mm spanners.

12. The cable has now been adjusted so that the cable will activate the door latch before the door interior door handle is pulled to its fullest extent.

Continue re-assembly once you are satisfied with the operation of the interior door handle and latch assembly.

CDL door latch lever assembly
WARNING: The window control mechanism includes an automatic window drop and raise logic to aid door closing and weathersealing. This function may be triggered, with ignition on or off, by door latching signals. Whenever working on or near the window mechanism, disconnect the window motor to prevent injury from unintended operation.

Removal:
1. Remove door latch assembly (see BV.12). and place on a clean bench

2. Release the 3 M4 nuts and 1 washer retaining the door latch lever base plate to the door latch assembly.

3. The door latch lever CDL assembly with its 3 screws and spacers can now be removed from the door latch assembly.

Refitting:
Is the reverse of removal except:

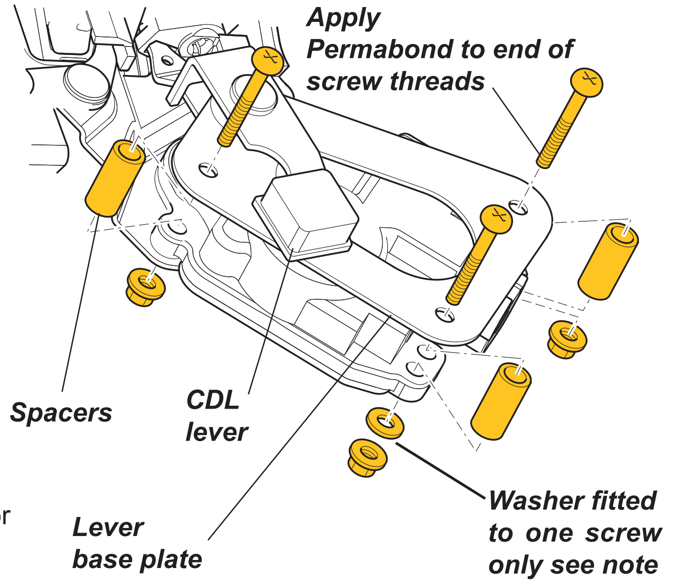
1. Apply a thin film of dielectric grease over the door latch actuators lever pivot area.

2. Refit the 3 M4 screws to the door latch lever CDL base plate and slide the spacers over the screw threads. (Ensure that the screws pass through the correct side of the plate so that the screw heads are positioned on the same side as the CDL lever).

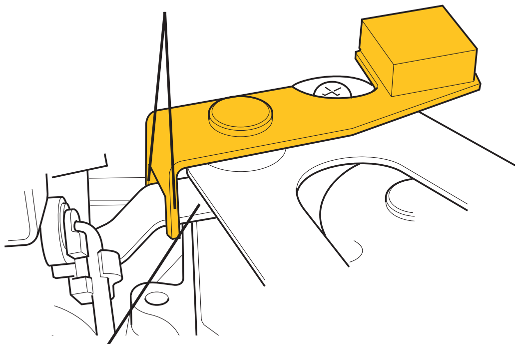
3. When refitting the door latch lever CDL assembly to the latch assembly ensure that the pronged ends of the CDL lever are positioned over either side of the actuator lever.

4. Apply a small coat of Permabond A130 to the end threads of the door latch lever CDL assembly screws.

5. Ensure that the washer is also refitted between the nut and plastic actuator housing on the screw which does not pass through the door latch assemblies' metal base plate.



Step 3. Ensure that the pronged ends of the CDL lever are positioned over either side of the actuator lever.



Step 1. Apply dielectric grease over the latch actuator levers pivot point before refitting door latch lever CDL base plate

Exterior door handle

WARNING: The window control mechanism includes an automatic window drop and raise logic to aid door closing and weathersealing. This function may be triggered, with ignition on or off, by door latching signals. Whenever working on or near the window mechanism, disconnect the window motor to prevent injury from unintended operation.

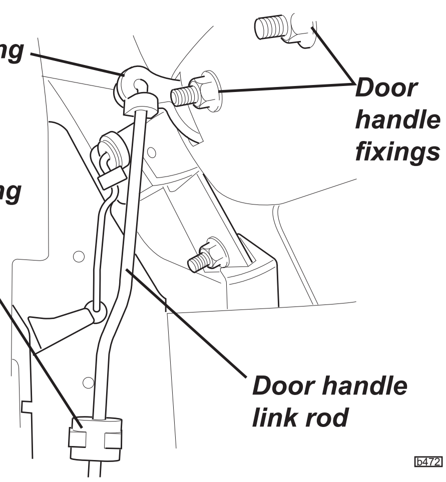
Removal:
1. Remove door trim panel (see section VE.2).

2. Unclip the upper retaining clip securing the control rod to the exterior release handle.

3. Push the retaining clip out of the rearmost handle hole.

4. Release the M6 flanged fixing nuts securing the handle to the outer door shell (torque 4Nm) and remove.

5. Withdraw the handle from the door assembly.



Refitment:
Same as removal except for Inteva latch system in which:

To ensure that the handle operates the latch mechanism correctly, with the handle and link rod fitted:

- Unclip the link rod from the orange coloured lower retaining clip so it can move freely without moving the latch lever arm.

- Ensure the door handle is in the fully closed position, fit the lower clip back around the link rod and close the clip.

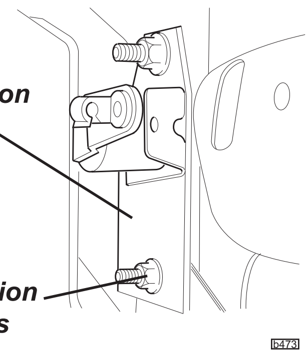
- Test the operation of the exterior release handle before closing the door. From the door shut area, set the latch to a closed condition by pushing in the catch using a suitable screw driver. Activate the latch using the exterior release handle. If the latch activates correctly carry on refitting the door assembly.

Exterior door lock - LH door only

Removal:
1. Remove door latch assembly (see section BV.12 or BV.12a).

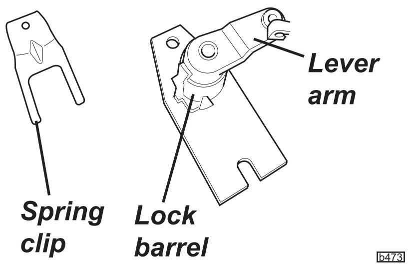
2. Release the M6 flange nuts securing the door lock cylinder mounting plate to the door (torque 4Nm) and withdraw the lock from the door.

3. Pull the spring clip retaining the lock barrel to the mounting plate, the lock can now be removed from the plate



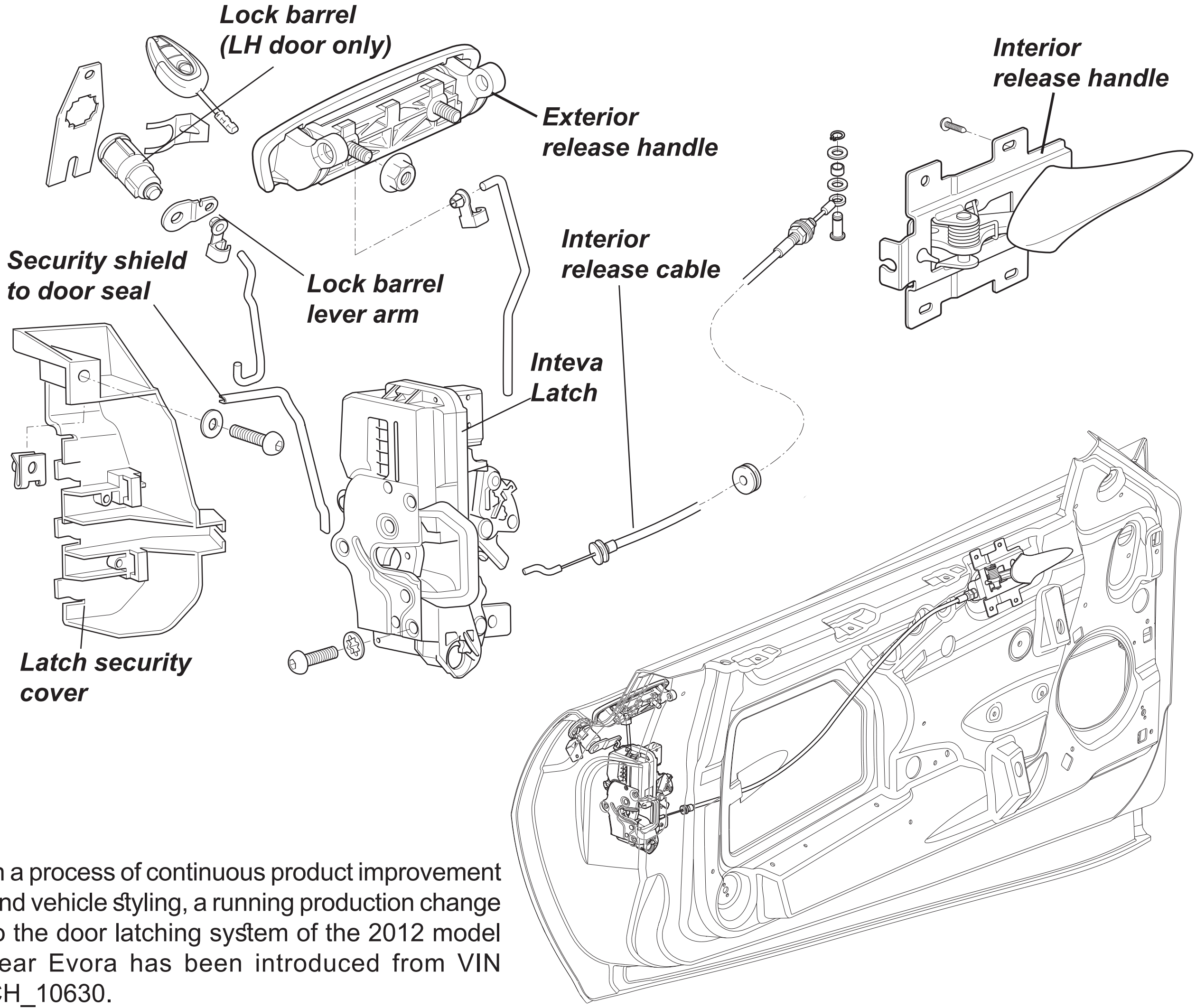
Refitment:
Is the reverse of removal except:

- **If renewing the lock barrel on a vehicle fitted with an Inteva latch system (see section BV.12A) the lock lever arm fitted to the service replacement lock barrel must be removed and replaced with either the original or a new lever arm suitable for the latch system.**



BV12A 'INTEVA' DOOR LATCH OPERATING SYSTEM.

(Information first issued in May 2012 on TSB 2006/06)



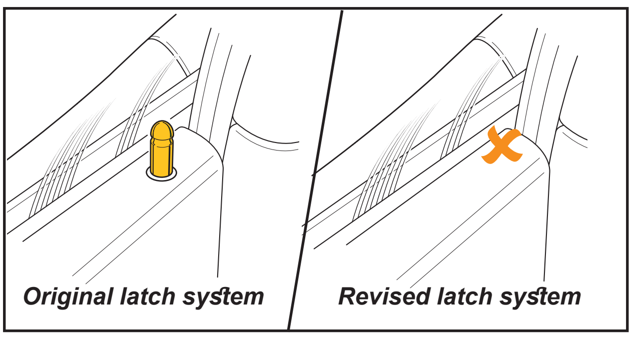
In a process of continuous product improvement and vehicle styling, a running production change to the door latching system of the 2012 model year Evora has been introduced from VIN CH_10630.

The method of opening the doors as described in section 6 (Entry & Comfort) within the main Owner's Handbook using the exterior and interior door release handles remains unchanged.

New Latch Features

Central Door Locking

The door sill button allowing the individual locking of either the driver or passenger door is no longer fitted, but the use of the interior CDL (Central Door Locking) switch to lock both doors from the inside of the vehicle remains as does the Dynamic (drive away) Locking feature as described in the main Owner's handbook and section MR.2 of the service notes,



The interior door release handles are no longer disabled in the event that Dynamic Locking has been selected; simply pulling the door release handle will now automatically unlock the door.

Mechanical Door Locking

In the event of a discharged battery or an inoperative transmitter key it is no longer possible to mechanically lock the right hand door as described in the main Owner's handbook. If it is necessary to lock the right hand door under these circumstances, an emergency latch access hole is located on the right hand end of the door shell rearward of the door trim panel.

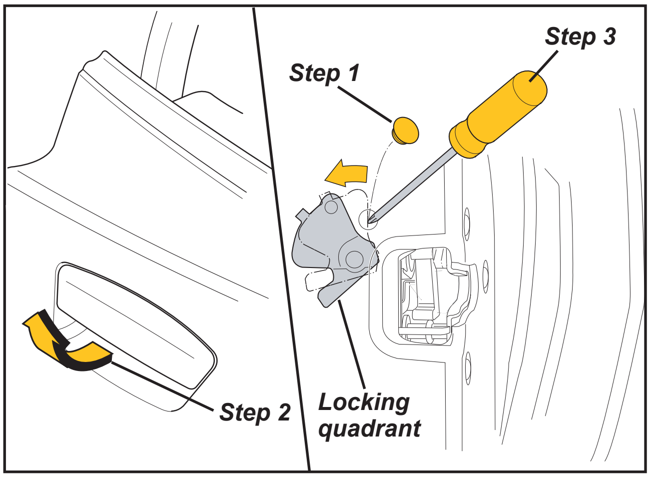
Mechanical Door Locking Procedure

1. With the right hand door open, carefully remove the grommet covering the emergency access hole.

2. Lift the exterior door handle upwards.

3. Using a suitable screwdriver place it approximately 10mm into the access hole.

4. With the exterior door handle still lifted, use a lateral wrist action to rotate the screwdriver so that its tip moves to the left within the door panel. An audible click should be heard as the screwdriver moves the latch locking quadrant into the locked position.



5. Release the exterior door handle, refit the access cover grommet and close the right hand door.

6. Confirm that the door has successfully locked by attempting to open the door using the exterior door handle (as using the Interior door handle to confirm will automatically unlock and open the door).

7. Manually lock the left hand door using the ignition key.

Door Latch
Similar to the latch system prior to VIN CH_10603, The Inteva latch contains an integral microswitch and electrical locking actuator to operate the courtesy lamp, alarm system, door glass drop functions etc. But unlike the previous system the CDL (Central Door Locking) latch assembly is no longer required because the door sill button is no longer fitted.

Latch removal:
WARNING: The window control mechanism includes an automatic window drop and raise logic to aid door closing and weathersealing. This function may be triggered, with ignition on or off, by door latching signals. Whenever working on or near the window mechanism, disconnect the window motor to prevent injury from unintended operation.

1.Remove the door trim panel (see section VE.2).

From the rear side of the door trim:

2.Remove the circlip, cable pin, washers and nylon sleeve retaining the interior release cable to the door handle; refer to sub-section BV.12 for further information.

3.Loosen the interior cable retaining nuts at the handle bracket just enough to remove the cable from the bracket, ***(see cable removal information on page 27)***. The door trim panel may now be fully removed from the vehicle.

4.Slide the door curtain grommet along to the end of the release cable and remove, then peel away the door curtain to gain access to the latch mechanism.

5.Disconnect the door latch flylead from the main door harness.

6.Fully raise the window and unclip the upper retaining clip securing the link rod to the lock lever (LH door only).

7.Unclip the upper retaining clip securing the control rod to the exterior release handle.

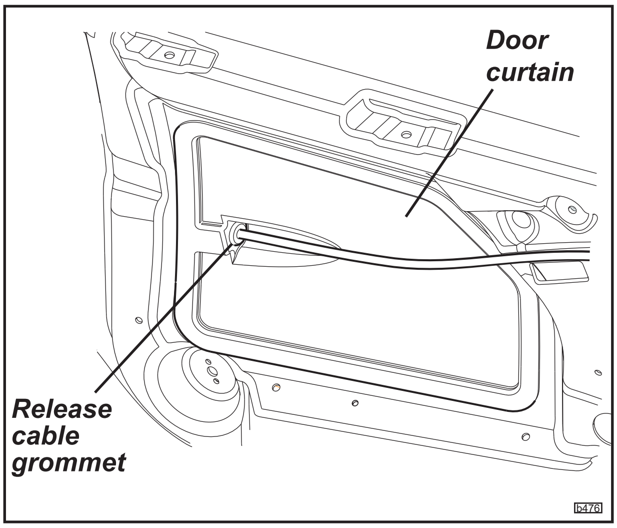
8. Release the three M6 x 20 screws (torque 4Nm) from the door shut face securing the latch mechanism, and the single 4th fixing on the inner door face.

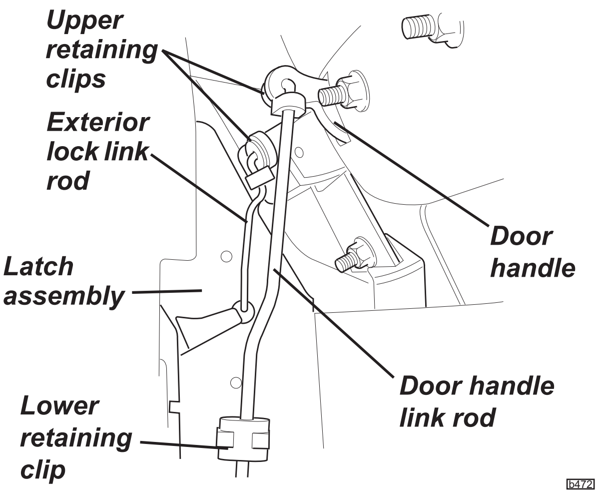
9. Withdraw the latch assembly from the door together with the exterior lock link rod, door handle link rod and interior release cable still attached.

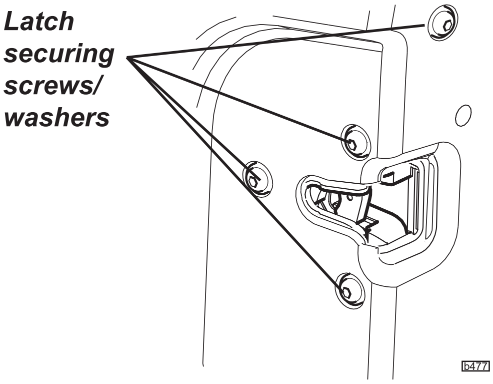
Latch refitment:
Is the reversal of removal.

- Apply Loctite® 130 to the 3 screws securing the latch mechanism to the door shut face and tighten all 4 screws to 4 Nm.

- Please follow instructions on the following page if the latch assembly is being renewed.







Latch renewal

Removal:

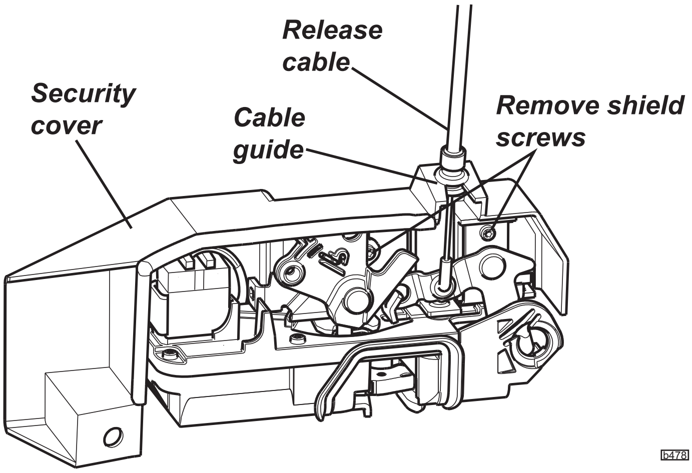
1. Remove latch assembly from the door shell as per the instructions on previous page.

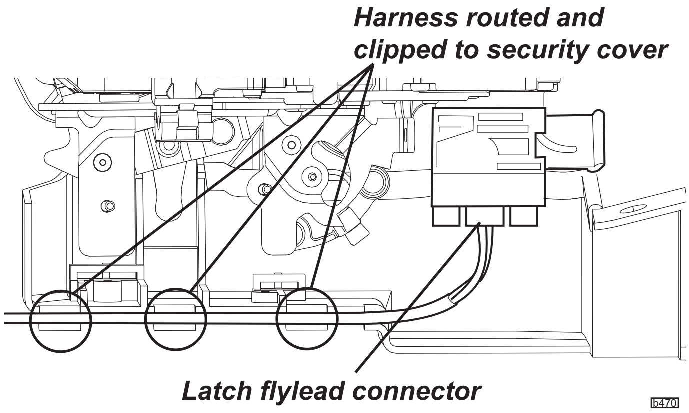
2. Place the assembly on a clean working surface,

3. Pull the release cable away from the shield where it attaches to the cable guide and remove the cable from its grommet on the lever arm.

4. Remove the screws (2) securing the security shield to the latch assembly.

5. Turn the assembly over and disconnect the harness flylead plug from the latch and remove the flylead where it is clipped into the security cover.





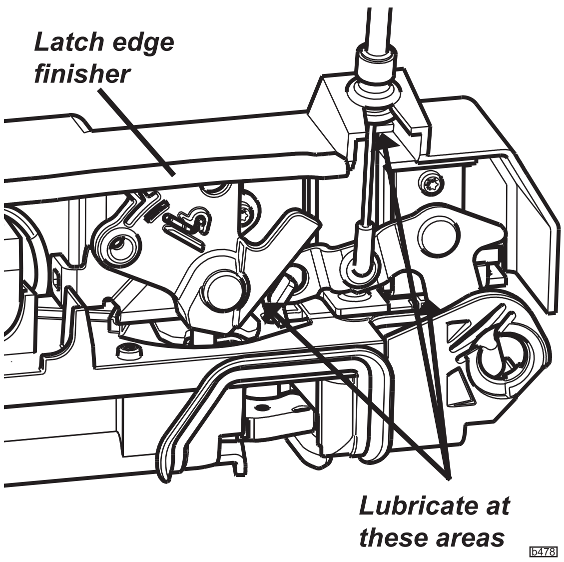
Refitting new latch:
Is the reversal of removal of the old latch except:

- Lubricate metal sliding parts using a small amount of a suitable clear PTFE spray grease (such as Lotus part number A132B6038V).

- If renewing the security shield or edge finisher; apply a small bead of adhesive (such as RTV 108Q or equivalent) around the finisher before fitting it onto the shield.

- Test the operation of the exterior release handle before closing the door. From the door shut area, set the latch to a closed condition by pushing in the catch using a suitable screw driver. Activate the latch using the exterior release handle. If the latch activates correctly continue to refit the door assembly.

- Following steps 2 - 12 from BV.12 (cable refitment), adjust the cables free play to ensure that the interior door release handle activates the latch mechanism at its correct travel.



Interior handle release Cable

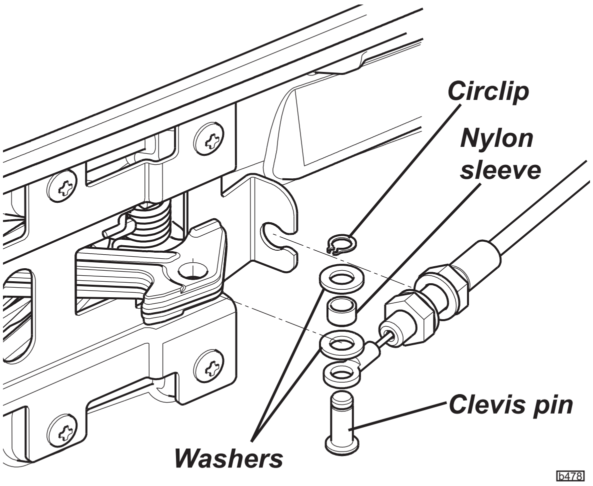
Removal:

1.Remove the latch assembly from the door shell as described on the previous page.

2.Remove the cable from the latch assembly as described also as described on the previous page.

Refitment/renewal:

- Refit the new cable onto the latch assembly and lubricate the inner cable as shown on the illustration on the previous page.
- Refit the cable/latch assembly into the door shell.
- Using the clevis pin, washers, sleeve and circlip, refit the cable onto the interior release handle.



- Confirm that the circlip is fitted into the clevis pin groove fully by ensuring the circlip is free rotate smoothly in its locating groove without binding or becoming displaced.
- Following steps 2 - 12 from BV.12 (cable refitment), adjust the cables free play to ensure that the interior door release handle activates the latch mechanism at its correct travel.

Exterior door lock - LH door only
Refer to sub-section BV.12 for further information.

BV.13 - WINDSCREEN REMOVAL/REPLACEMENT

The Evora windscreen is constructed from two layers of glass, the inside component of which is green tinted, sandwiching a synthetic solar reflecting interlay, to form a 5mm thick laminate. A black ceramic obscuration band with graduated fade out, is applied to the inner surface periphery. The windscreen is bonded to the composite body frame using an elastomeric polyurethane adhesive, and contributes to the structural integrity of the body assembly.

The screen uses rubber extrusions along the top and bottom edges for visual enhancement, and black finished trims over each 'A' pillar. Screen replacement will require new top and bottom filler strips, but the side finishers may be re-used if carefully removed.

Removal:

1. Pull the door glass weatherstrip off the windscreen frame flange along both 'A' pillars.

2. Remove the LH/RH 'A' pillar trims see sub-section BV.18 for further information.

3. If a cutting wire is to be used to release the windscreen bonding, it may not be necessary to disturb the front clamshell. If a vibrating knife is to be used, it is likely that the rearmost fixings for the clamshell will need to be removed to allow tool access to the bottom corners of the screen refer to sub-section BV.4 for further information.

4. Slide the interior mirror stem from the windscreen plinth. Remove the sun visor retaining screws to allow the front of the head lining to drop. Pull each 'A' pillar trim panel out from its three captive 'fir tree' fasteners (a fourth fir tree button at its lower end is inaccessible), to protect from adhesive cutting tool damage, refer to service notes section VE.11 for further information.

5. Remove the windscreen wiper arm, (refer to service notes section MR.9 for futher information) and then attach suction handles to the glass. Using a cutting wire or dedicated vibrating knife of suitable form, cut the adhesive bead around the entire periphery of the screen, taking precautions as necessary to prevent paint or body damage. Note that the top and bottom rubber finisher strips are likely to be cut through during this operation and will require replacement. With assistance, lift the glass from the car.

Windscreen frame preparation:

6. Remove old adhesive from the windscreen frame sufficiently to leave a consistent and flat surface for the new bonding adhesive.

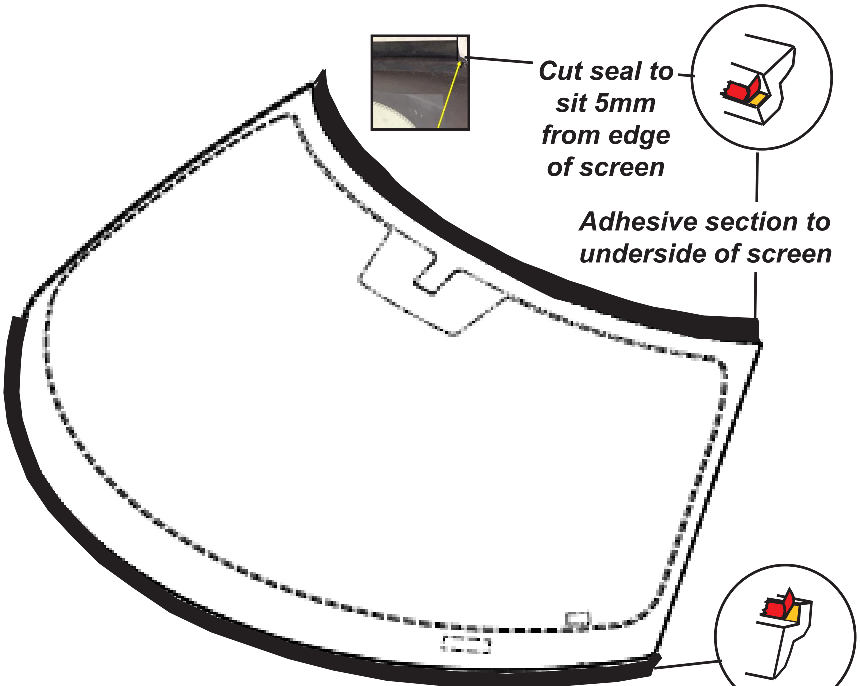
7. Clean the whole of the windscreen periphery bonding surface, including the mirror plinth area with a cleaner degreaser such as Betaclean 3900 (A100B6008V). Allow to dry.

8. Prime the bonding surface of the new mirror plinth and the corresponding glass area with with a suitable glass/plastic adhesive activator (such as Dymax 500E - A111B6187F). Use Dymax 840 adhesive to bond the plinth to the glass following the supplier's directions. Position the plinth centrally and with the bottom, closed end, 7mm from the bottom edge of the obscuration patch.

9. Prime the bonding area on the glass to a width of 25mm with Betaprime 5500 (green cap) A120B6041V, avoiding the VIN window. Allow the primer fully to dry.

10. Fit the new self adhesive filler strip A132U0266F to the inside top edge of the glass, once fitted in position cut 5mm off of both sides as shown

11. Fit the new self adhesive filler strip A132U0402F to the bottom edge of the glass.

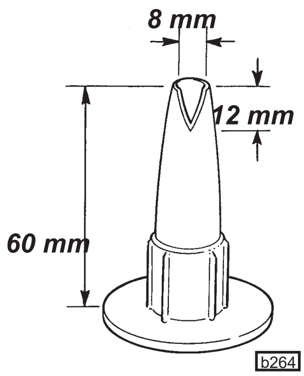


12. Prime and re-activate the prepared surface of the old adhesive on the windscreen frame with Betawipe 4000 (A082B6355V). If the windscreen frame surface is new or without adhesive, prime the frame with Betaprime 5404 (red cap) A082B6337V. Allow a minimum of 5 minutes for the primer to dry. If the screen is not fitted within 48 hours, the primer should be re-applied.

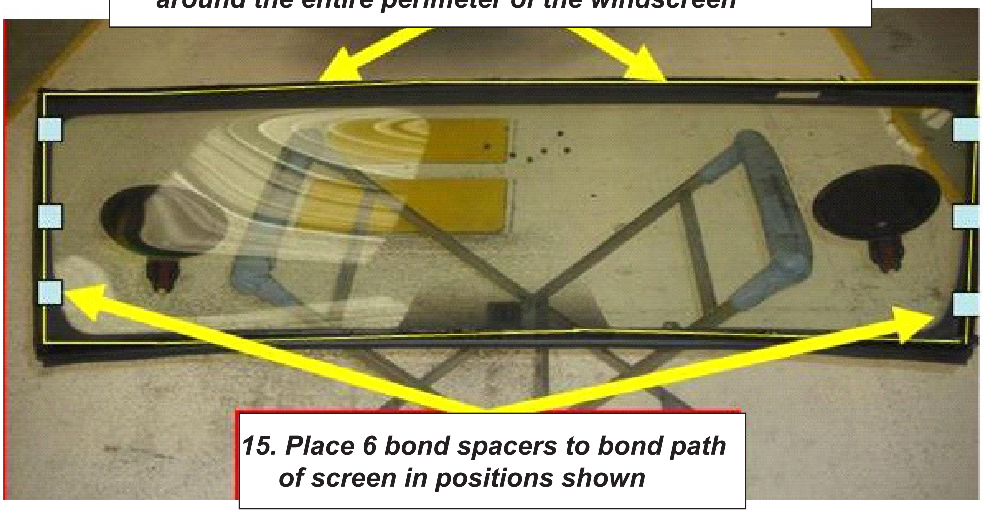
13. Around the windscreen landing path, check the joints between windscreen frame and screen lower landing, and between the roof and body side 'A' pillars, for correct sealing and joint path integrity. If necessary, prepare these gullies for bonding as described above, and fill with adhesive sealant prior to windscreen fitment.

14. Cut the nozzle of the adhesive cartridge (such as Betaseal 17.01) to the dimensions shown to produce a triangular section bead. Holding the cartridge perpendicular to the glass, extrude a bead of adhesive 9mm wide and 13mm high around the screen using the inner edge of the top and bottom filler strips as a guide, and following the centre of the primer band along each side.

15. Insert three 6mm spacer blocks A132U0346F into the inside edge of each 'A' pillar bead.

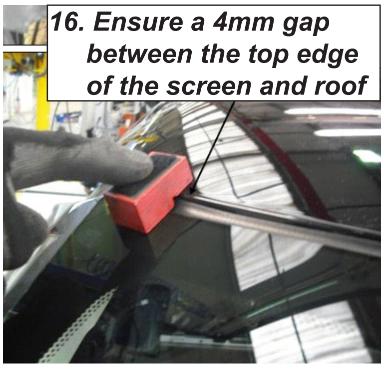


14. Apply a triangular bead 9mm wide and 13mm high around the entire perimeter of the windscreen



15. Place 6 bond spacers to bond path of screen in positions shown

16. Apply suction handles to the glass and with assistance carefully fit the glass onto the frame, taking care to position it centrally (compare dimensions at each side between glass and body edges) and with the upper filler strip in uniform contact with the roof edge (approx 4mm gap between top of screen and roof edge). Press down on the glass around the periphery to compress the joint onto the spacer blocks and then secure in position using duct tape or other methods to support the screen until the adhesive has cured. This will take around 4 hours, with a longer period required in dry atmospheric conditions.



17. Before curing, examine the whole length of the joint for integrity, and if necessary, extrude additional adhesive locally into the joint to ensure complete sealing. Use a spatula or similar tool if required to force the adhesive into the appropriate area. Use a spatula or whetted gloved finger to smooth out or remove any excess extruded material to leave a neat appearance. Alternatively, cut away after curing using a scalpel knife.

18. Check the fitted condition of the lower rubber finisher, and if necessary, adjust the height of the windscreen bottom gutter to align correctly with the screen bottom edge.

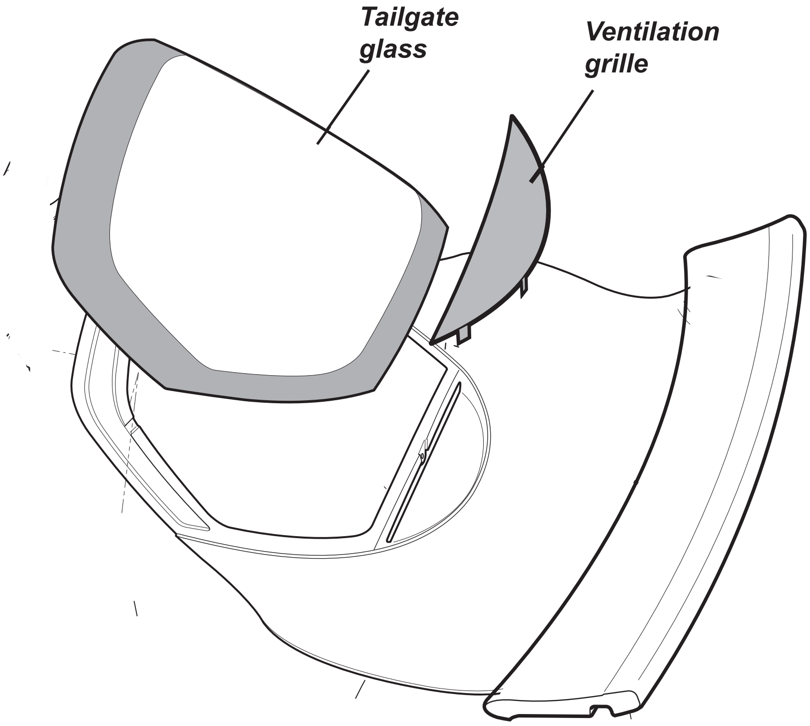
19. After adhesive cure, continue re-assembly in reverse order to disassembly, applying fresh double sided tape to the 'A' pillar finishers.

<u>Spillage of material</u>
a) Any spillage of Betaseal onto un-primed glass can be readily peeled off after it has cured.
b) Any spillage onto the body can be removed with either Wipe Cleaner No.4, or white spirit.

<u>Shelf life</u>
a) Betaseal primer has a useful life of about 24 hrs. after exposure to the air, after which it starts to become spongy. If the material is spongy, DO NOT USE. Always use glass primer immediately on opening, and replace the lid after use.
b) Betaseal has a shelf life of over 6 months at ambient temperature in the original unopened package.

BV.14 - TAILGATE GLASS

The grey tinted, 5mm thick, tempered glass screen, incorporates an electrical heating element and is bonded to the composite tailgate panel using Betaseal flexible polyurethane adhesive. A black ceramic obscuration band with graduated fade out, is applied to the inner surface periphery.



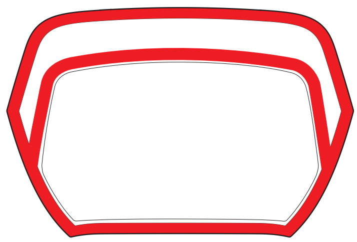
Removal:

1. Apply suction handles to the outside surface of the glass, and disconnect the two heated rear screen connections from the inside.

2. Remove the ventilation grille positioned at the lower edge of the tailgate glass.

3. Using a suitable vibrating cutting knife, cut the adhesive bead around the entire periphery of the screen, taking precautions as necessary to prevent damage to paintwork or body flange.

4. After cutting out the glass, remove old adhesive from the tailgate aperture sufficiently to leave a consistent and flat surface for the new bonding medium.

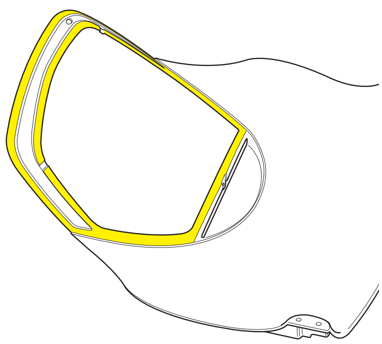


Glass priming bonding path

5. Clean the whole of the bonding surface on the new glass, and the bonding surface on the tailgate aperture, with a suitable cleaner degreaser such as Betaclean 3900 (A100B6008V).

6. Prime the bonding area on the glass to a width of 25mm with suitable glass adhesive primer such as Betaprime 5500 (A120B6041V).

7. Prime and re-activate the prepared surface of the old adhesive on the tailgate with a suitable activator for pre-applied sealant such as Betawipe 4000 (A082B6355V). If the tailgate bonding surface is new or without adhesive, prime the tailgate with a suitable adhesive promotor such as Betaprime 5404 (A082B6337V).

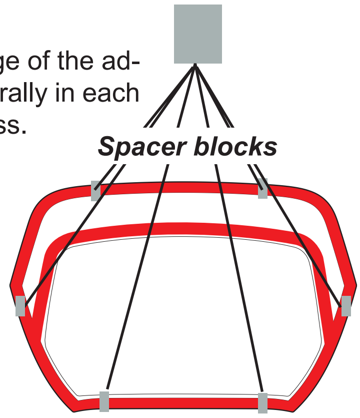


Tailgate re-activating or bonding path

8. Allow a minimum of 5 minutes for the primer to dry. If the glass is not fitted within 48 hours, the primer should be re-applied.

8. Cut the nozzle of the glass adhesive cartridge (such as Betaseal 1701) as shown in sub-section BV.13, and holding the cartridge vertically, Extrude a bead of adhesive 9mm wide and 13mm high around the glass periphery using a finger against the glass edge as a guide. Manipulate the two ends of the bead together for a consistent joint.

9. Use six 4mm spacer blocks (A124U0069F) and position in the inside edge of the adhesive bead, two along the top bead, two along the bottom, and one centrally in each side bead. These spacers are used to control the fitted height of the glass.



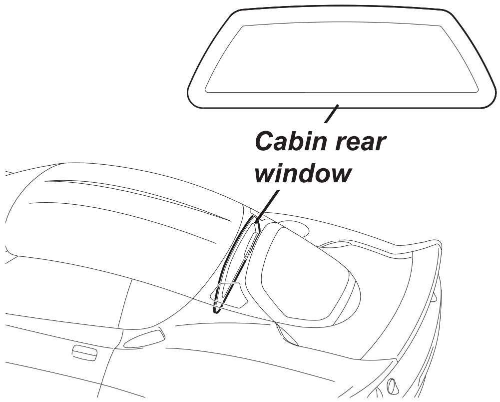
10. Using suction handles, carefully lower the glass onto the tailgate, and position centrally in its aperture. Press around the periphery of the glass to compress the adhesive until contact with the spacer blocks is felt. Carefully examine the integrity of the whole length of the joint, if necessary using a spatula to force extra adhesive into any depleted areas. Wipe off any excess adhesive extruded from the joint, or alternatively, allow the adhesive fully to cure and cut away any excess using a scalpel blade.

11. Position the tailgate horizontally and use duct tape to hold the glass in position until the adhesive is fully cured. This will take approximately 4 hours dependent on atmospheric conditions, with a longer period required in dry atmospheres. Reconnect the HRS cables.

Refer to sub-section BV.13 for spillage of material and shelf life advice.

BV.15 - CABIN REAR WINDOW

The cabin rear window is a double glazed unit to enhance insulation from engine bay heat and noise, and consists of two clear, 4mm thick, tempered glass panes, bonded around the periphery to a 6mm thick synthetic spacer, with the sealed space filled with argon gas. A black ceramic obscuration band with graduated fade out is applied to the forward face of each glass pane. The window is bonded to the cabin rear bulkhead using Betaseal flexible polyurethane adhesive.



1. Remove the rear bulkhead trim panel (see service notes section VE.14).

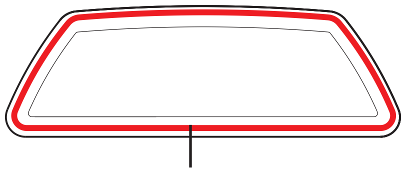
2. From inside the car, use a suitable vibrating cutting knife to cut the adhesive bead around the periphery of the window, taking care to avoid damage to the bulkhead panel.

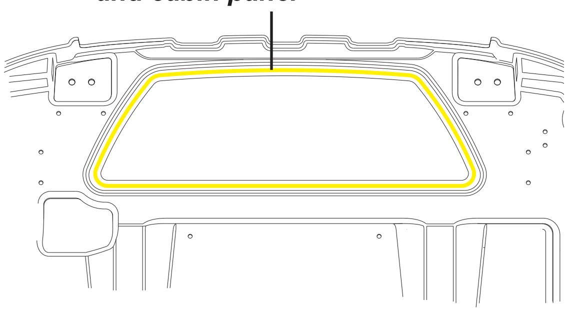
3. After cutting out the glass, remove old adhesive from the bulkhead panel sufficiently to leave a consistent and flat surface for the new adhesive.

4. Clean the whole of the bonding surface on the new glass, and the bonding surface on the panel aperture with a cleaner degreaser such as Betaclean 3900 (A100B6008V). Allow to dry.

5. Prime and re-activate the prepared surface of the old adhesive on the panel with a suitable activator for pre-applied sealant such as Betawipe 4000 (A082B6355V). If the panel bonding surface is new or without adhesive, prime the bonding path with a suitable adhesive promotor such as Betaprime 5404 (A082B6337V).

6. Allow a minimum of 5 minutes for the primer to dry. If the glass is not fitted within 48 hours, the primer should be re-applied.





8. Cut the nozzle of the glass adhesive cartridge (such as Betaseal 1701) as shown in sub-section BV.13, and holding the cartridge vertically, Extrude a bead of adhesive 9mm wide and 13mm high around the glass periphery using a finger against the glass edge as a guide. Manipulate the two ends of the bead together for a consistent joint.

9. Using suction handles, carefully position the glass centrally in its aperture. Press around the periphery of the glass to compress the adhesive. Carefully examine the integrity of the whole length of the joint, if necessary using a spatula to force extra adhesive into any depleted areas. Wipe off any excess adhesive extruded from the joint, or alternatively, allow the adhesive fully to cure and cut away any excess using a scalpel blade.

10. Use duct tape to hold the glass in position until the adhesive is fully cured. This will take approximately 4 hours dependent on atmospheric conditions, with a longer period required in dry atmospheres.

Refer to sub-section BV.13 for spillage of material and shelf life advice.

BV.16 - REAR QUARTER LIGHT WINDOW

To Replace Rear Quarter Light Glass

1. Remove the rear clamshell (see sub-section BV.6).

2. Pull off the top rear section of the door weatherstrip seal, and peel off the front quarter glass seal from the front edge of the quarter light glass.

3. From within the vehicle remove the rear quarter trim panel and 'B' post upper trim (see section VE.11).

4. From inside the car, use a suitable vibrating cutting knife to cut the adhesive bead around the periphery of the window, taking care to avoid damage to paintwork or body flange.

5. After cutting out the glass, remove old adhesive from the quarter light panel sufficiently to leave a consistent and flat surface for the new adhesive.

6. Clean the whole of the bonding surface on the new glass, and the bonding surface on the tailgate aperture, with a cleaner degreaser such as Betaclean 3900 (A100B6008V). Allow to dry.

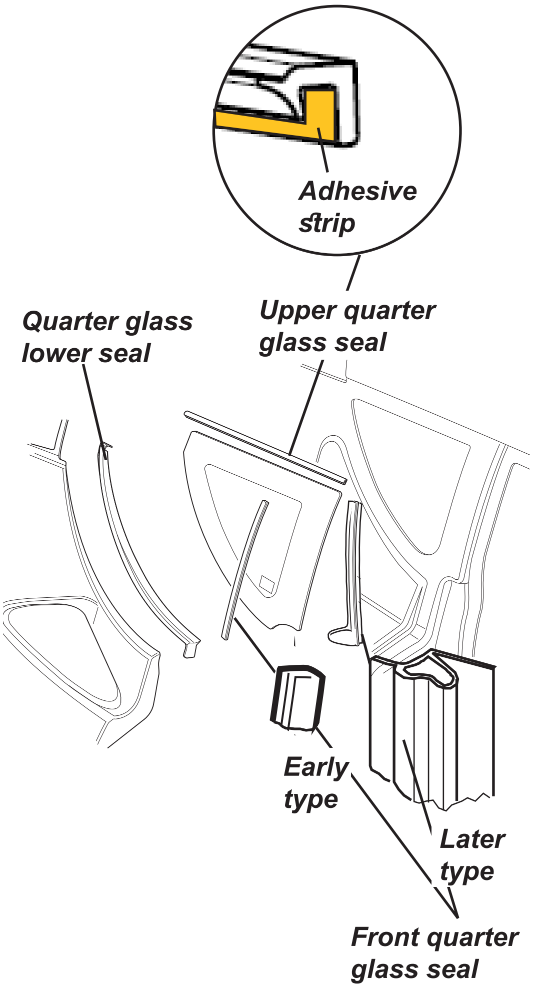
7. Prime the bonding area on the glass with a primer such as Betaprime 5500 (A120B6041V).

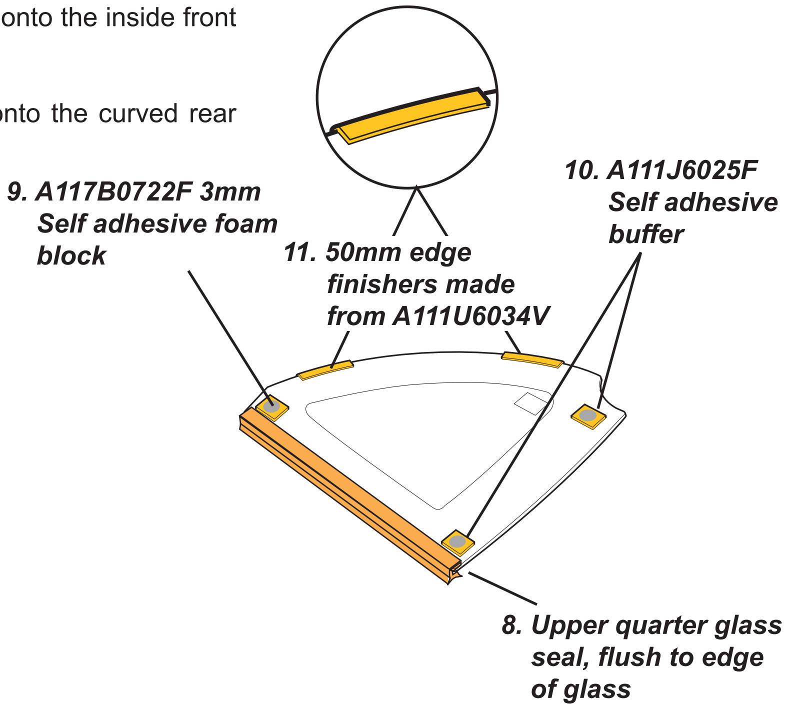
8. Peel off the backing tape and apply a new upper seal to the inside edges of the glass, aligning the cut back feature on the extrusion with the front edge of the glass.

9. Stick 1 x 3mm self adhesive foam block onto the inside upper rear of the glass below upper quarter glass seal.

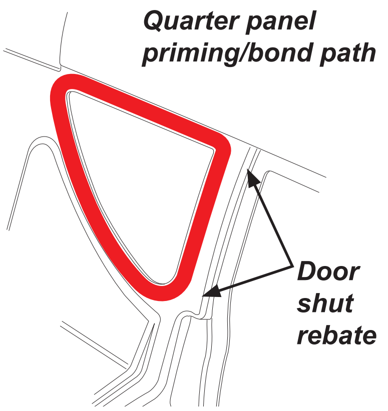
10. Stick 2 x self adhesive buffers inset onto the inside front edge of the glass.

11. Fit 2 x 50mm long edge finishers onto the curved rear glass edge.





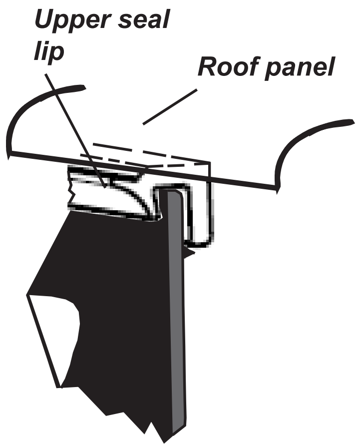
12. Prime and re-activate the prepared surface of the old adhesive on the body with a suitable activator for pre-applied sealant such as Betawipe 4000 (A082B6355V). If the body side panel is new or without adhesive, prime the flange with a suitable adhesive promotor such as Betaprime 5404 (A082B6337V).



13. Allow a minimum of 5 minutes for the primer to dry. If the glass is not fitted within 48 hours, the primer should be re-applied.

14. Cut the nozzle of the glass adhesive cartridge (such as Betaseal 1701) as shown in sub-section BV.13, and holding the cartridge vertically, extrude a continuous bead of adhesive around the periphery of the bodyside panel. Manipulate the two ends of the bead together to form an unbroken ring.

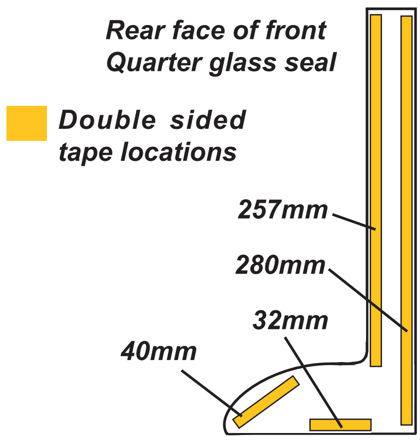
15. Using a suction cup, carefully position the glass onto its aperture, with the finisher strip consistently abuting the roof panel, and the front edge aligned with the door shut rebate.



Press around the periphery of the glass to compress the adhesive until contact with the spacer blocks is felt. Carefully examine the integrity of the whole length of the joint, if necessary using a spatula to force extra adhesive into any depleted areas.

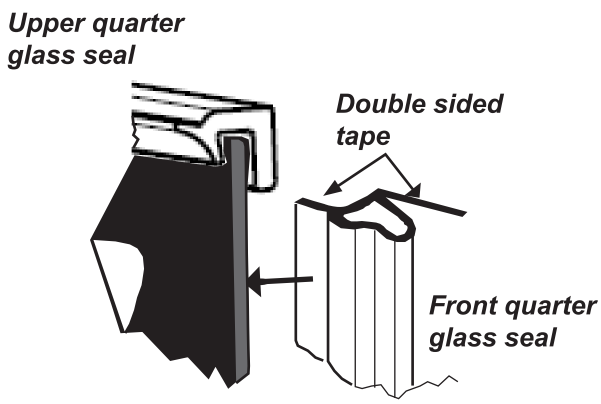
Wipe off any excess adhesive extruded from the joint, or alternatively, allow the adhesive fully to cure and cut away any excess using a scalpel blade.

Use duct tape to hold the glass in position until the Betaseal is fully cured. This will take approximately 4 hours dependent on atmospheric conditions, with a longer period required in dry atmospheres.

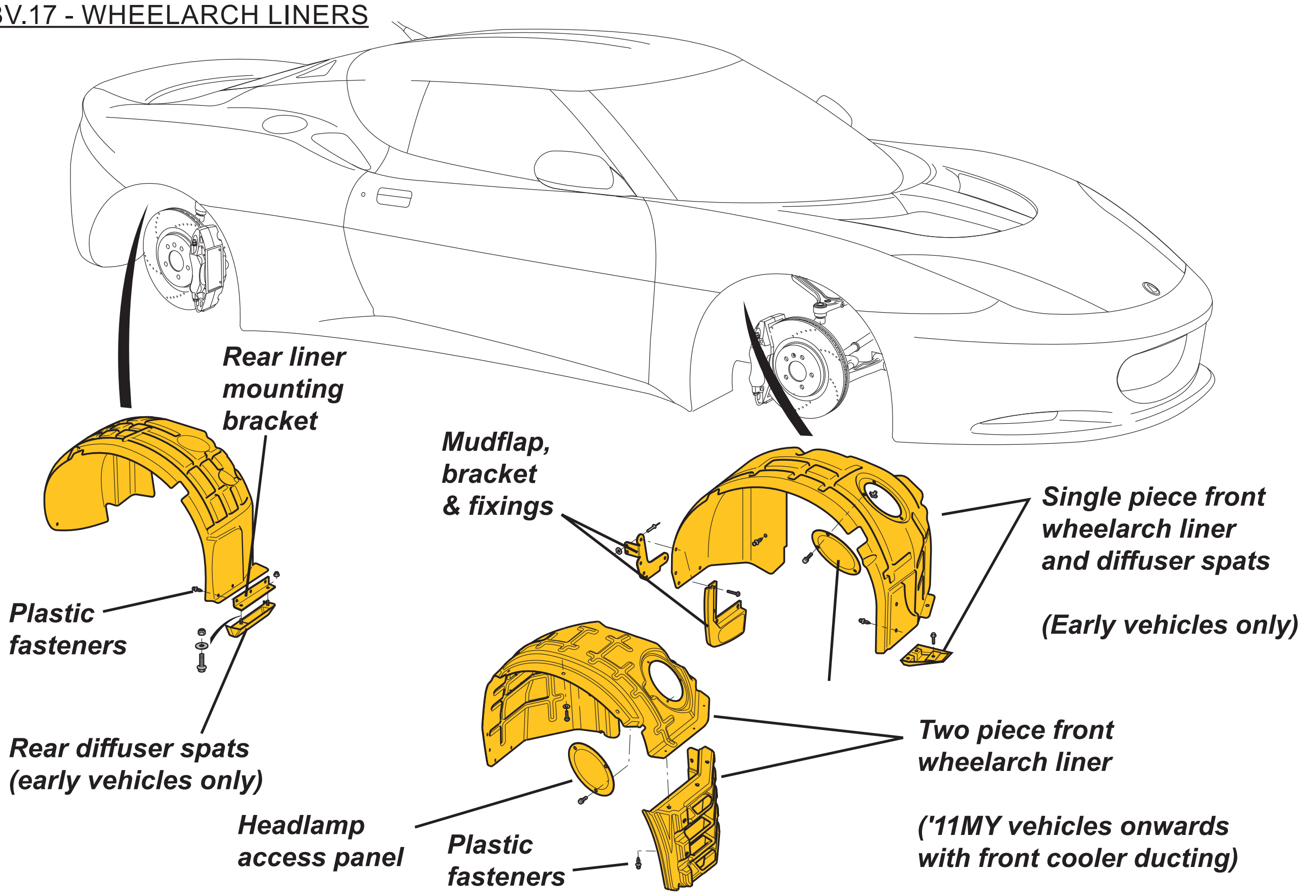


16. Renew or refit front quarter glass seal, interior trim panels and rear clamshell. (If later type seal fitted then apply 4 pieces of 6mm wide double sided tape to the rear face of the seal prior to fitment in the positions shown prior to fitment.

Refer to sub-section BV.13 for spillage of material and shelf life advice.



BV.17 - WHEELARCH LINERS



The front wheelarch liners from start of production were a single piece assembly but with the introduction of the supercharger option from '11MY VIN BH_11174 it was modified to a 2-piece assembly to incorporate venting ducts for the front mounted oil coolers.

Front wheelarch liner

Removal:

Remove the front wheel.

Release the 4 M5 X 16 screws and washers securing the mud flap to its bracket and remove the mud flap.

Release the 8 plastic fasteners securing the wheelarch liner at:

1 rearward of the liner underneath the bodyside panel.

1 either side of spring damper assembly securing the liner to crash structure.

1 forward of the spring damper assembly securing the liner to the radiator outlet duct.

2 securing the liner to the bumper bracket.

2 securing the outer edge of the liner to inner wheelarch/front clamshell.

Refitment:

Is the reversal of removal.

Rear wheelarch liner

Removal:

Remove the rear wheel.

Release the 5 plastic fasteners securing the wheelarch liner at:

1 rearward of the liner securing it to the rear bumper bracket.

1 central securing liner to rear subframe near brake hose bracket.

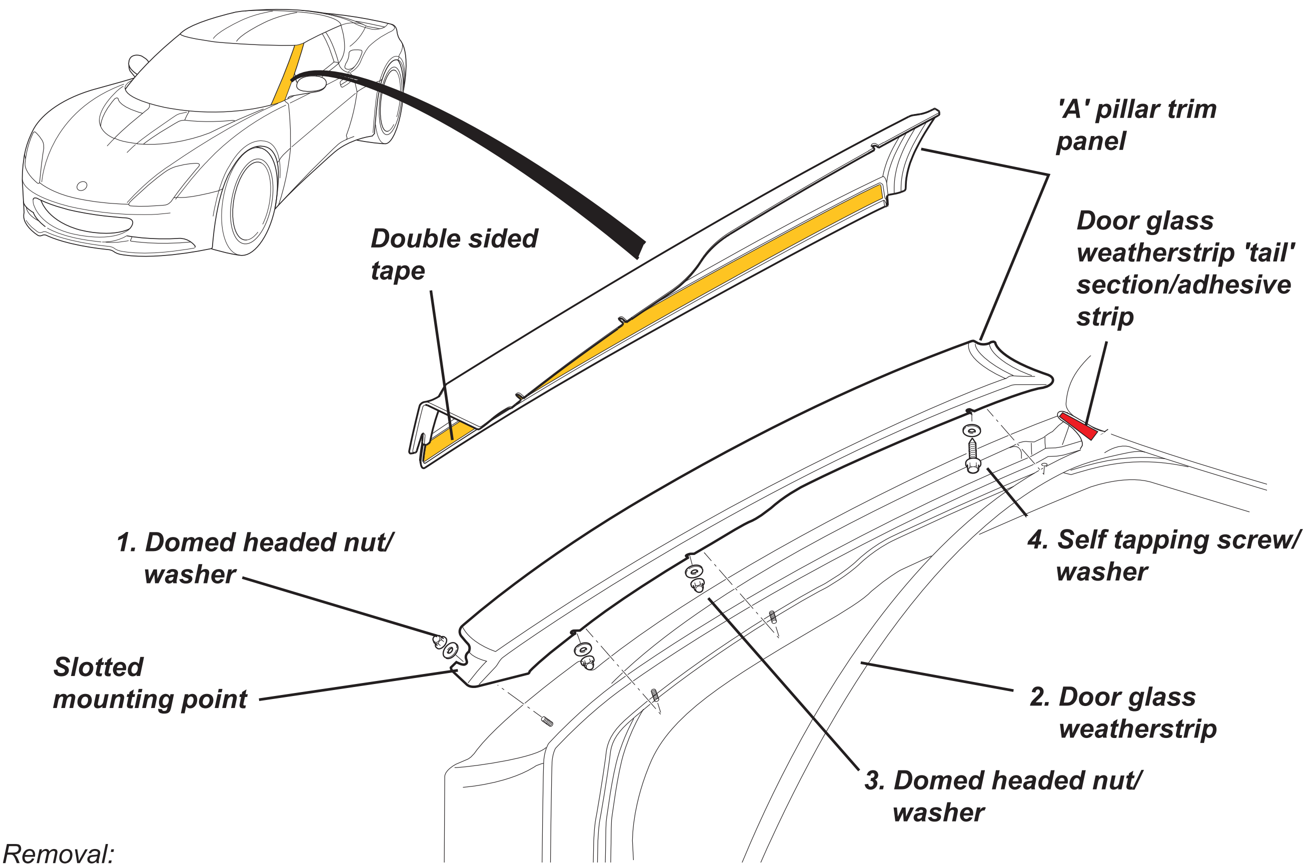
1 central securing liner to rear subframe above upper wishbone.

2 forward securing liner to bodyside bracket.

Refitment:

Is the reversal of removal.

BV.18 'A' PILLAR TRIM



Removal:

1.With the door open, from the rear/underside of the clamshell at the base of the 'A' pillar area, loosen (but do not remove), the M4 domed nut and washer (1) securing the base of the pillar trim to the stud fitted to the bodyside 'A' pillar section.

2.Carefully pull the door glass weatherstrip as required, releasing it from the double sided tape securing it to the 'A' pillar trim,

3.Release the M4 domed nut and washers (2) securing the lower section of the pillar trim to bodyside 'A' pillar section retaining studs.

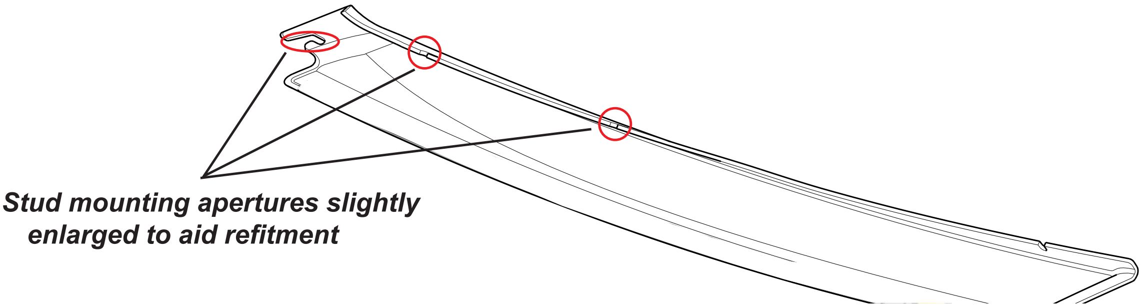
4.Release the No8 x 3/4 self tapping screw and washer (1) securing the upper section of the pillar trim to the bodyside 'A' pillar section.

5.Use a knife blade or similar between the windscreen glass and the pillar trim to gently ease the trim away from the double sided tape securing it to the windscreen, the trim can be withdrawn from the vehicle body, manoeuvring the slotted mounting point at base of the trim from the lowest 'A' pillar mounting stud. Note: The door glass weatherstrip 'tail' section fitted between the underside of the roof panel with a double sided adhesive strip could also be pulled out of position whilst removing the pillar trim.

Refitment:
Is the reverse of removal except:

Note: For the Evora 400 model range, as a production running change the double sided tape was replaced with a self adhesive foam edged tape, a bead of adhesive (Betaseal 1580) is also applied to the inner surface of the pillar trim, inset and parallel to the foam edge tape.

If either fitting a new 'A' pillar trim, or removing and refitting the original, it is recommended to use the later type self adhesive foam edged tape and bonding process as used on the Evora 400 (shown as method 'B' on the following pages), even if the original pillar trim was fitted with double sided tape.

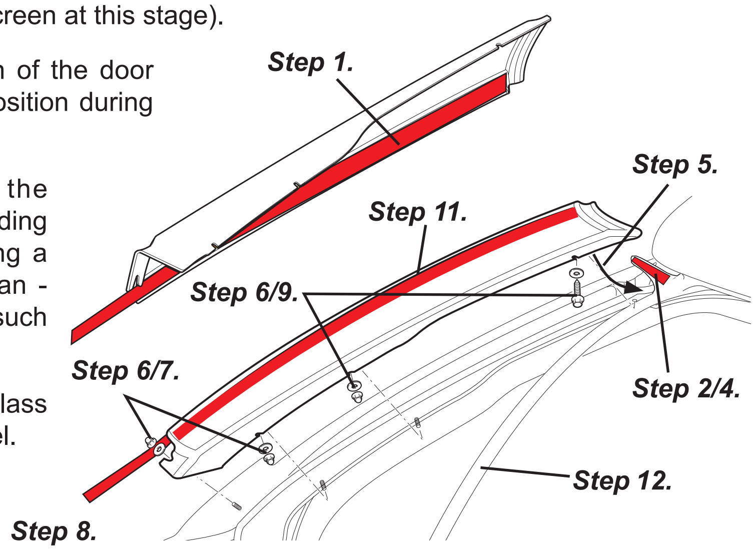


At the time of vehicle production, the ‘A’ pillar trims are fitted prior to front clamshell fitment, therefore the lower trim panel mounting studs fitted to the bodyside 'A' pillar sections are easily accessible which means it is easier to position the ‘A’ pillar trims into position onto all of the lower mounting studs at the same time.

Fitment of the ‘A’ pillar trims whilst the front clamshell is still in place will be made easier by very slightly enlarging the stud apertures on the panel, (but do not enlarge them too much as this may result in the fixing nuts and washers not having enough material surface to fix onto.

Refitting (method A - with double-sided tape)

1. Renew the double sided tape on the underside of the pillar trim (but ensure to cut the tape approx 100mm approximately longer than required so that it protrudes at the lower end of the panel, do not remove the protective backing that will contact the windscreen at this stage).
2. Fit new double sided tape if the tail section of the door glass weatherstrip has been pulled out of position during trim removal.
3. Note: Before fitting new tape to either the weatherstrip or trim panel, clean the tape bonding paths (including the windscreen glass) using a suitable degreaser/cleaner such as Betaclean - 3900, and then apply an adhesion promoter such as 3M 4297.
4. If necessary fit the tail section of the door glass weatherstrip to the underside of the roof panel.
5. Position the top edge of the pillar trim panel under the roof panel and the tail of the weatherstrip seal.



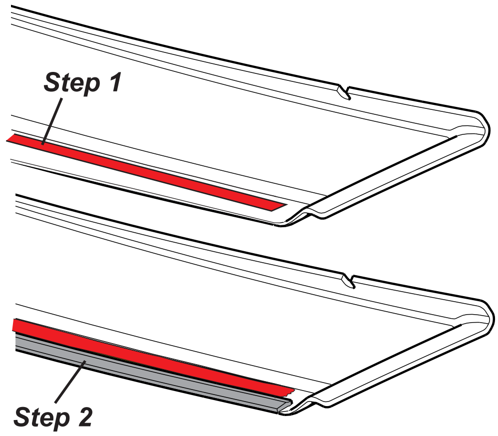
6. Locate the fixing holes over the fixing studs, then loosely fit the doomed head nuts on the pillar studs and loosely fit the self tapping screw and washer into the upper most 'A' pillar mounting hole to retain panel in position.
7. Ensure the trim panel is aligned correctly and tighten the 2 lowest fixings, pressing down on the panel to secure it to the windscreen.
8. Carefully remove the protective backing of the double sided tape hanging down from the lower end of the trim panel whilst pressing down on the panel to secure it to the windscreen.
9. Tighten the remaining fixings.
10. With the ‘A’ pillar trim in position, apply tape to the trim and secure it to the windscreen. Leave the tape on the screen for 35 minutes to ensure trim is bonded to the windscreen.
11. Before refitting new tape to the door glass weatherstrip, clean the weatherstrip and ‘A’ pillar trim bonding paths using a suitable degreaser/cleaner such as Betaclean - 3900 and then apply an adhesion promoter such as 3M 4297 Scotchmount™.
12. Refit the door glass weatherstrip.

Refitting (method B - later type self adhesive foam edged tape and bonding process):

Trim preparation:

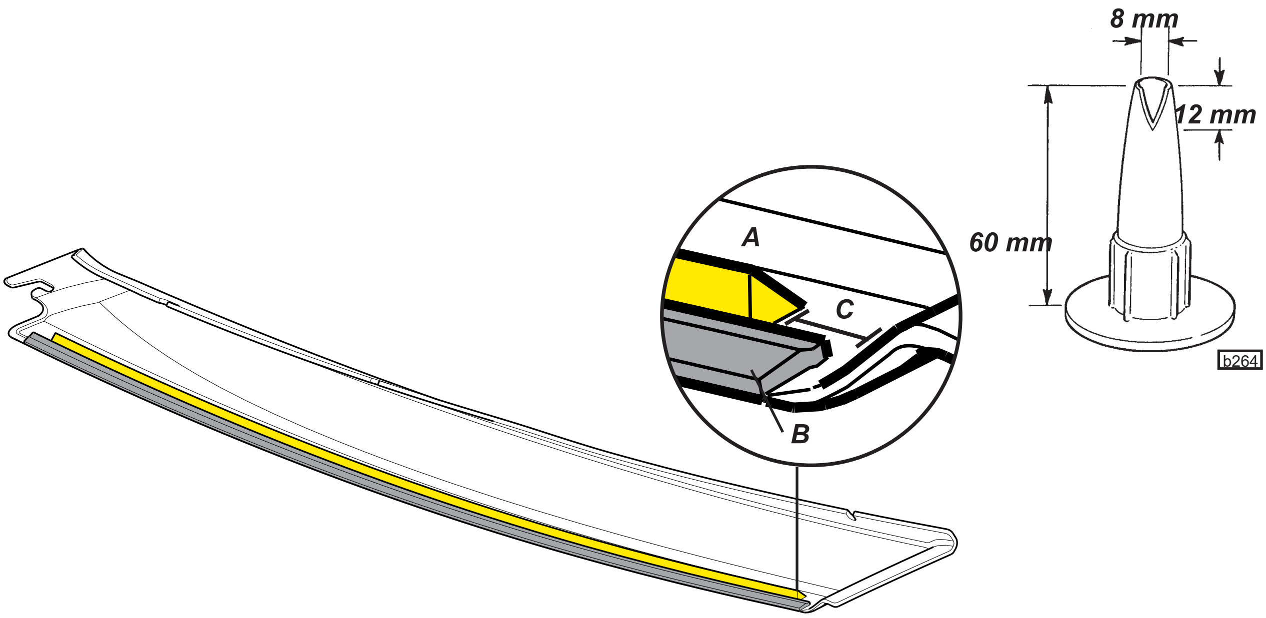
1. Apply a cleaner degreaser such as Betaclean 3900 to the bond path & then dry wipe IMMEDIATELY with lint free tissue or similar.

2. Fit a new strip of foam edge tape to the underside - outermost section of the trim panel, continue to 'Applying Adhesive' section below.



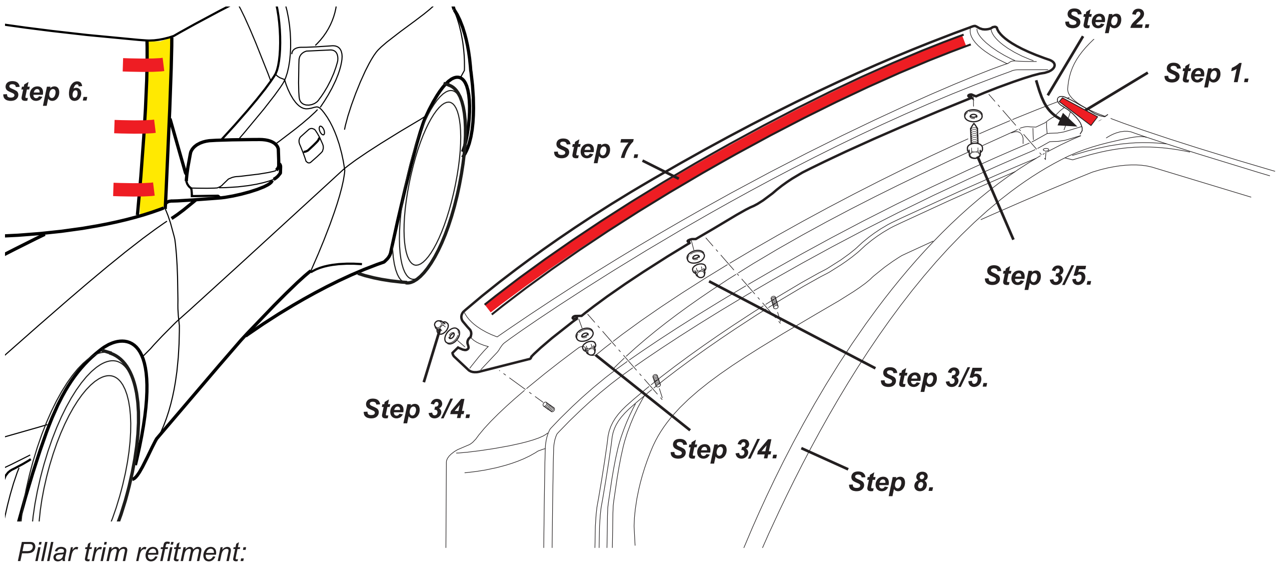
Windscreen preparation:

- If the windscreen surface is new or without adhesive, then apply a cleaner degreaser such as Betaclean 3900 and allow to dry. Prime the bonding area on the windscreen with Betaprime 5500 (green cap), allow the primer fully to dry.
- If the windscreen is not new and 1 - 2 mm of adhesive attached, then prime/re-activate the surface of the old adhesive using Betawipe 4000, allow the primer fully to dry.



Applying adhesive:

- Cut the nozzle of the adhesive cartridge to the dimensions shown to produce a triangular section bead.
- Apply a bead of adhesive (A), 9mm wide and 13mm high inboard of the foam edge strip (B). Do not apply adhesive along the complete length of the trim, ensure that 50 mm at each end of the panel (C) is free from adhesive.



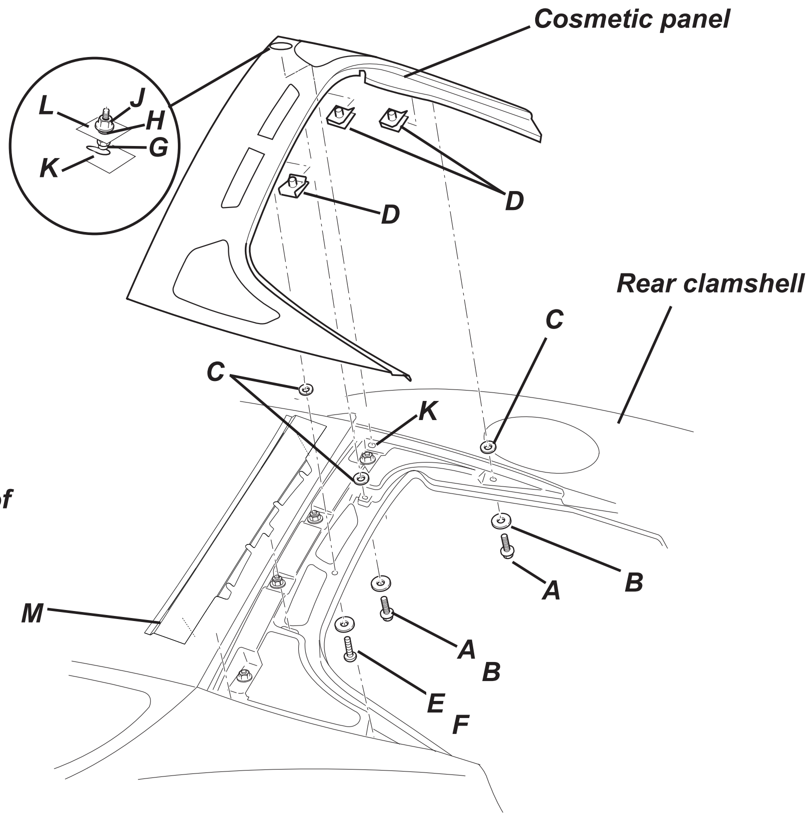
Pillar trim refitment:

Enlarge trim panel mounting holes as shown on previous pages.

1. If necessary fit the tail section of the door glass weatherstrip to the underside of the roof panel, (fit new double sided tape if the tail section has been pulled out of position during trim removal).
2. Position the top edge of the pillar trim panel under the roof panel and the tail of the weatherstrip seal
3. Locate the fixing holes over the fixing studs, then loosely fit the doomed head nuts on the pillar studs and refit the self tapping screw and washer into the upper most 'A' pillar mounting hole to retain panel in position.
4. Ensure the trim panel is aligned correctly and tighten the 2 lowest fixings, pressing down on the panel to secure it to the windscreen.
5. Tighten the remaining fixings.
6. With the ‘A’ pillar trim in position, apply tape to the trim and secure it to the windscreen. Leave the tape on the screen for 35 minutes to ensure trim is bonded to the windscreen.
7. Before refitting new tape to the door glass weatherstrip, clean the weatherstrip and ‘A’ pillar trim bonding paths using a suitable degreaser/cleaner such as Betaclean - 3900 and then apply an adhesion promoter such as 3M 4297 Scotchmount™.
8. Refit the door glass weatherstrip.

BV.19 COSMETIC PANEL

A. M5 x 12 screw
B. M5 x 19 washer
C. M6 x 15 washer
D. Speed clip
E. M6 x 16 screw
F. M6 x 25 washer
G. Keyslot stud
H. 3/16 x 1/2 washer
J. M5 flange nyloc nut
K. Key hole slot in clamshell
L. Mounting point on underside of cosmetic panel
M. Water ingress deflector



Removal:
Release/remove the LH and RH M5 x 12 screws and M5 x 19 washers (4)
Release/remove the central M6 x 16 screw and M6 x 25 washer (1)
Draw the panel rearwards and lift to release from the keyhole slot at each front corner.

Refitment:
Is the reverse of removal except:

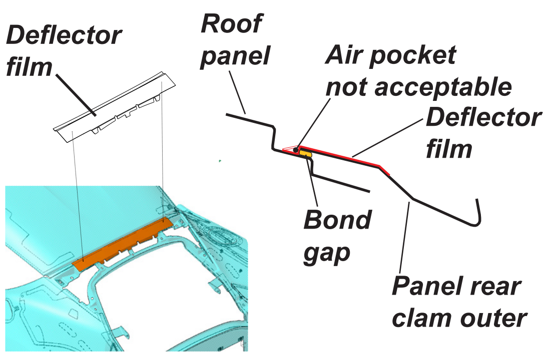
A water deflector film is fitted on the rear clamshell covering the clamshell to roof and bodyside fixings. Before refitting the cosmetic panel ensure that the deflector film is in good condition and has no visual signs of damage or tearing, replace if necessary before refitting the cosmetic panel.

Water Deflector film
- Only fit the original water deflector film if it is still in good condition and adhesive backing is still serviceable.

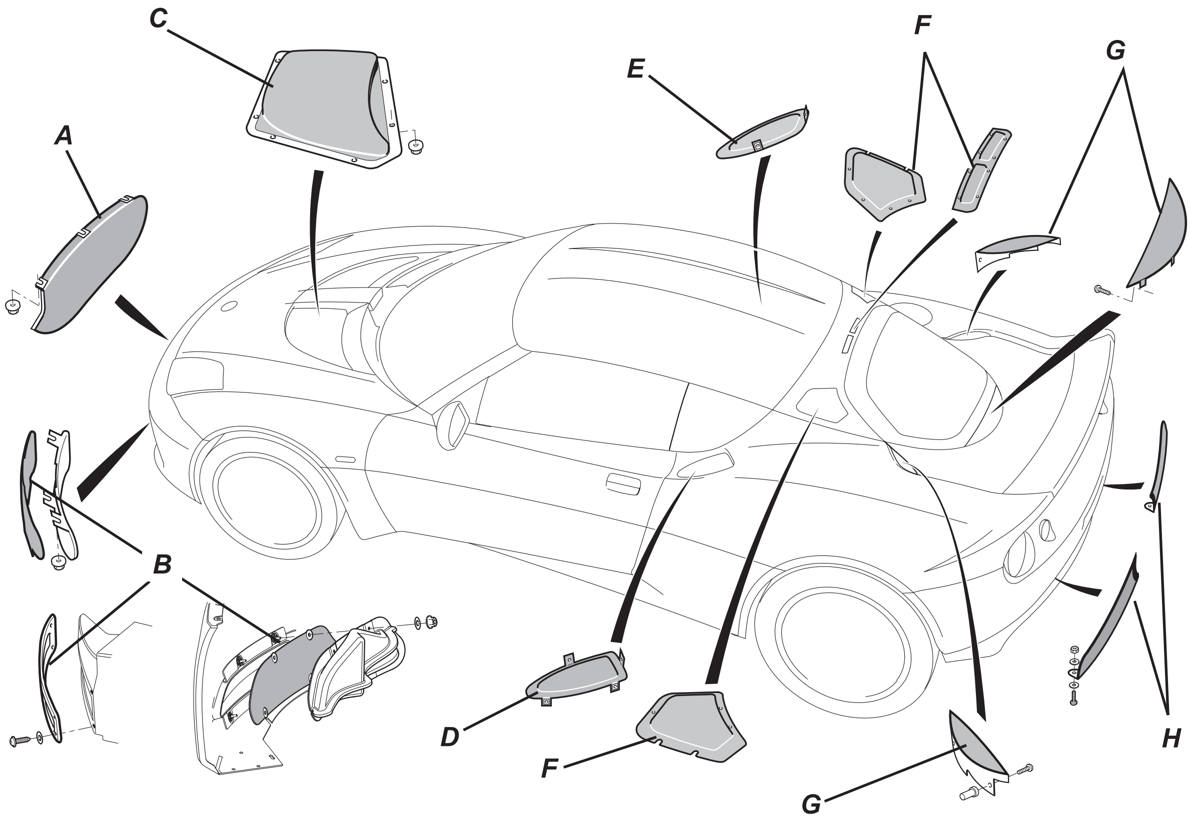
- Deflector film should be aligned with panel roof rear flange across full width of panel.

- To aid fitment spray top of clam with a small quantity of water and fit water deflector film into place.

- Film should be applied from roof panel working rearwards to fully seat against bond gap of rear clamshell, so as not to create an air pocket between the film, clamshell and roof panels.



BV.20 EXTERIOR GRILLES



A. Grille, front intake

B. Grille, front intake, LH & RH (Also refer to following page for grille updates by powertrain and model year).

C. Grille, front exit, RH & LH

D. Grille, engine air intake

E. Grille, engine bay cooling intake

F. Grille, cosmetic panel catalytic converter LH, RH & central hot air outlet vents

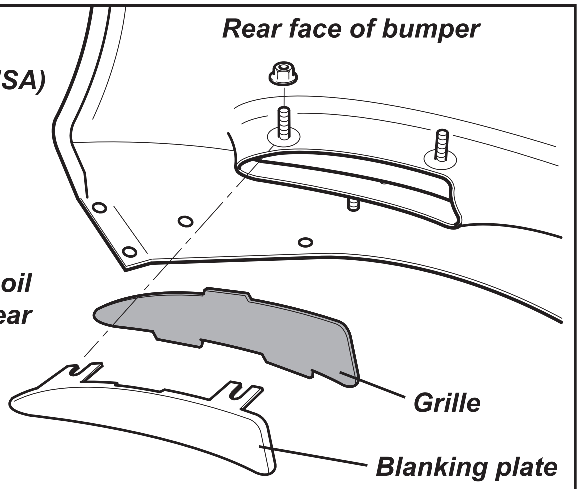
G. Grille, LH, RH and tailgate engine bay hot air outlet vents (RH vent is also the access point for PAS (Power Assisted Steering) reservoir.

H. Grille, diffuser, LH & RH

Variations of bumper side intake grilles/ducting arrangements from start of production to '12MY

From start of production up to '11MY VIN BH_11174 (USA) and all markets from '11MY VIN BH_11178

Vehicles not yet fitted with forward mounted engine oil or transmission fluid coolers. Grille fitted in between rear side of bumper and 'solid' blanking plate.

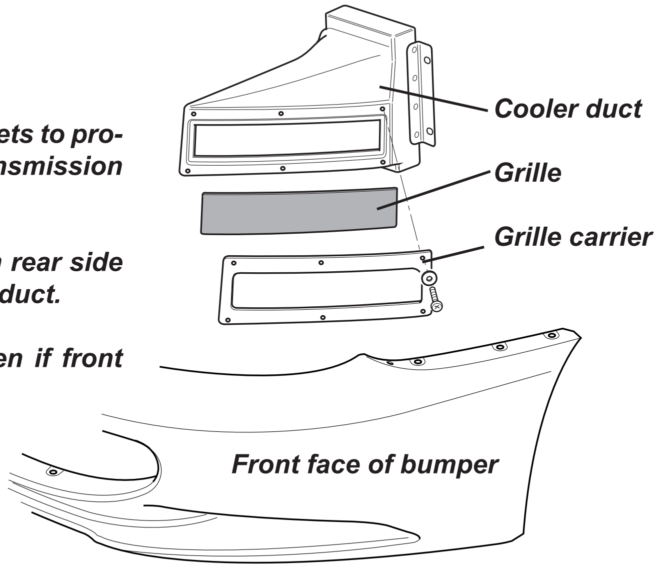


From '11MY VIN BH_11175 (USA) and all markets from '11MY VIN BH_11179

Cooling ducts fitted to the LH/RH bumper brackets to provide ambient air for the front mounted oil or transmission fluid coolers.

Blanking plate deleted and grille removed from rear side of bumper and fitted to the front of the cooling duct.

Note: This ducting arrangement was used even if front mounted coolers were not fitted.



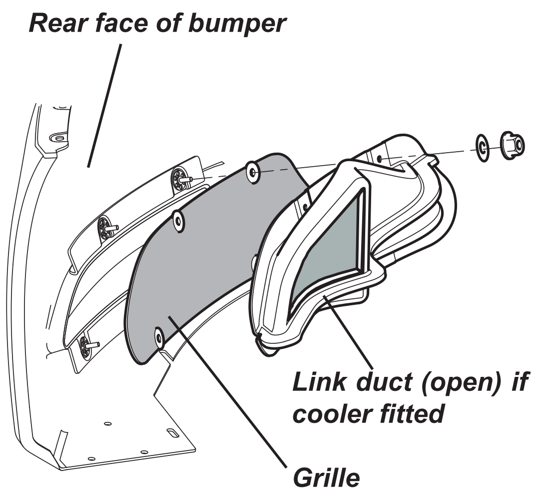
From '12MY all markets

Cooling ducts still fitted to the LH/RH bumper brackets but modified for the new design of front mounted oil or transmission fluid coolers.

New style intake grilles and 'linking' duct plates fitted to rear side of new designed front bumper.

Rear side of '12MY bumper has revised depth and fixing points which are not compatible with older type grilles.

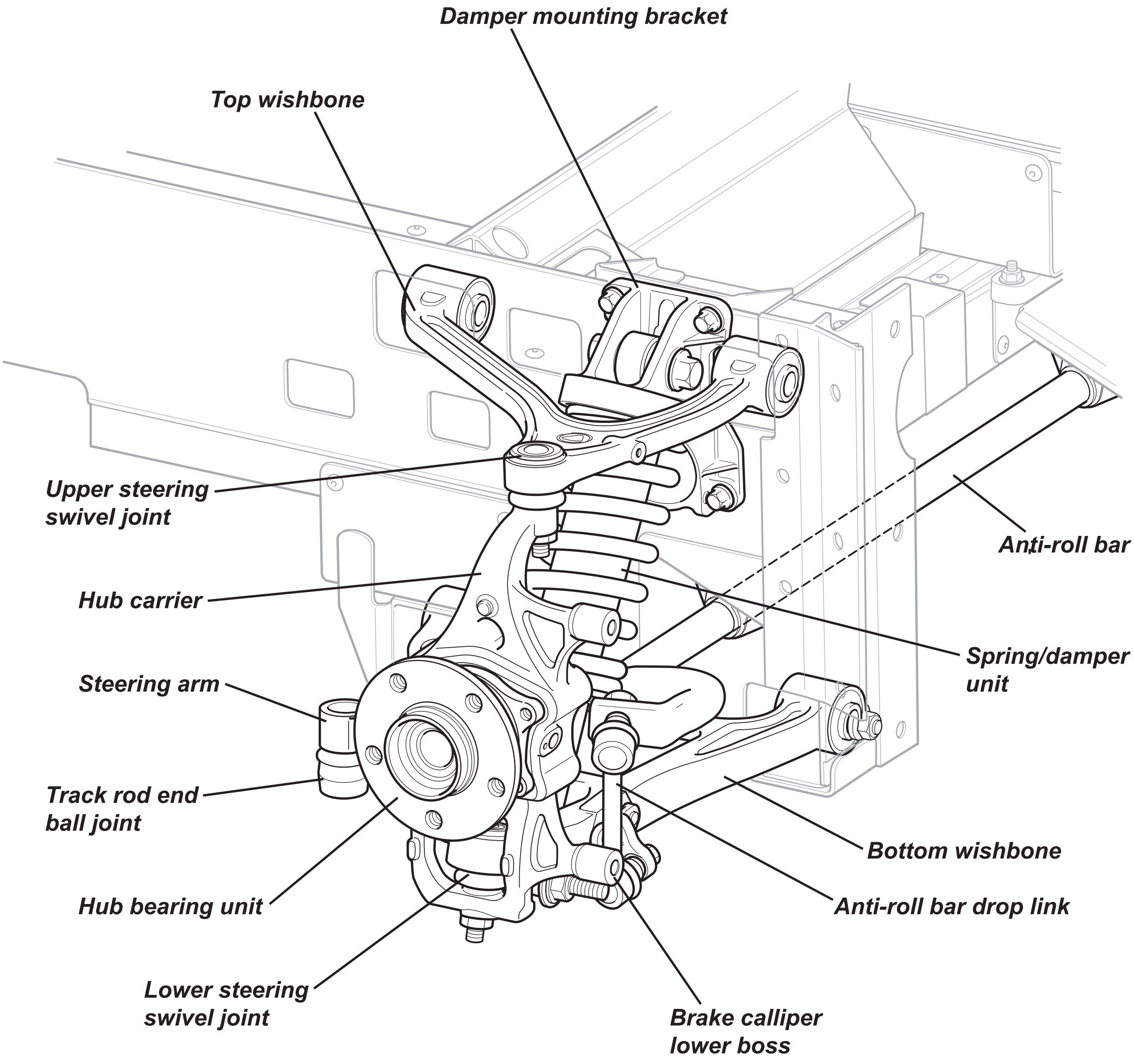
Link duct plates are either 'Open' i.e. have apertures within them if oil or transmission coolers are fitted or 'Closed' i.e. blank if coolers are not fitted.



FRONT SUSPENSION

SECTION CK

General Arrangement



CK.1 - GENERAL DESCRIPTION

The independent front suspension comprises, on each side of the car, upper and lower forged aluminium wishbones, a concentric coil spring/telescopic damper unit, and a tubular anti-roll bar. A forged steel hub carrier, provides a mounting for the hub bearing unit to which the 5-bolt road wheel and brake disc are attached, and also features an integral steering arm and mounting bosses for the brake caliper.

The primary, vehicle weight bearing, lower wishbone, is braced by two integral struts and features an integrated steering swivel lower ball joint, a pair of press fit bonded rubber pivot bushes, and attachment points for a fabricated steel bracket carrying the damper lower end, and a forged steel bracket for the anti-roll bar drop link. The upper wishbone is a simple open 'A' frame, into the apex of which the upper steering swivel ball joint is integrated.

The inboard ends of both wishbones use replaceable bonded rubber pivot bushes for maintenance free articulation, with a compliance profile tuned to provide the vehicle with accurate and responsive dynamic characteristics. Eccentric cams incorporated at the front and rear pivot points for the lower wishbone, provide for the adjustment of both camber and castor.

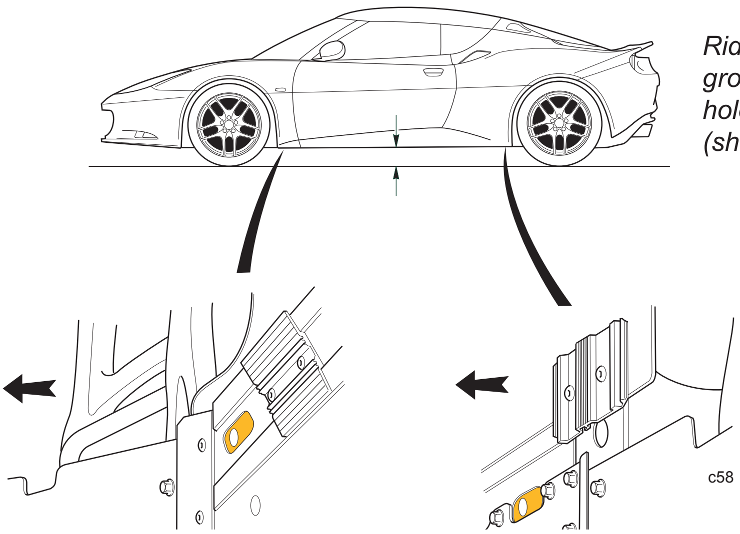
The bottom of the Bilstein monotube telescopic damper fixes to the lower wishbone via a folded steel cradle bolted to both arms of the wishbone, with the damper top end fixing to the subframe via a substantial alloy casting bolted to the subframe longeron. The damper uses a bonded rubber bush in the top eye for noise suppression, and a through bolted spherical steel joint in the lower eye for optimum dynamic response, and is orientated with the damper rod uppermost. The dual rate concentric coil spring abuts against a lower seat on the damper body, and a rubber cushioned upper seat incorporated in the damper top mounting bracket, thus relieving the damper top bush from vehicle weight to the benefit of noise and ride refinement. The dual rate coil spring is mounted with the close coiled end lowermost.

A 28mm o.d. tubular steel anti-roll bar is mounted in rubber bushes to the underside of the subframe and projects through the lower wishbone before connecting to the wishbone rear leg via a short ball jointed drop link and a forged steel bracket.

The hub bearing unit, which is common to all four wheels, is fixed to the hub carrier by 4 bolts, and incorporates a double row ball bearing with the inner race of the outboard bearing formed directly in the hub forging, and the inner race of the inboard bearing retained by a swaging operation on the hub flange. Inboard and outboard grease seals are included in the assembly, with a vehicle speed sensor ring integrated into the inboard seal, whose 48 pole signal is picked up by a sensor mounted in the rear of the hub carrier. This data is used for the anti-lock brake, vehicle stability, engine management and speedometer functions.

CK.2 - GEOMETRY & ADJUSTMENTS

Provision is made for the adjustment of wheel alignment, camber and castor. Under normal service conditions, no periodic scheduled check of the geometry is necessary, although a front wheel alignment check is recommended when the front tyres are replaced. A full geometry check is required only after front suspension component replacement, or if excessive tyre wear is evident, or if steering difficulties are manifest. Before any measurements or adjustments are made it is essential first to set the vehicle to its 'mid-laden' ride height, approximating to driver and passenger and a full tank of fuel. This will require the vehicle to be ballasted, or pulled down on a ramp:



Ride height to be measured from the ground up to the machined tooling holes located in the chassis siderails (shaded in yellow).

Type — Independent. Upper and lower wishbone; co-axial coil spring/telescopic damper; anti-roll bar.

Ride height

Mid-laden ride height (2x75 kg occupants + full fuel tank) - set car to this height before measuring geometry:

- front 125 mm below front end of chassis siderail
- rear 147 mm below rear end of chassis siderail

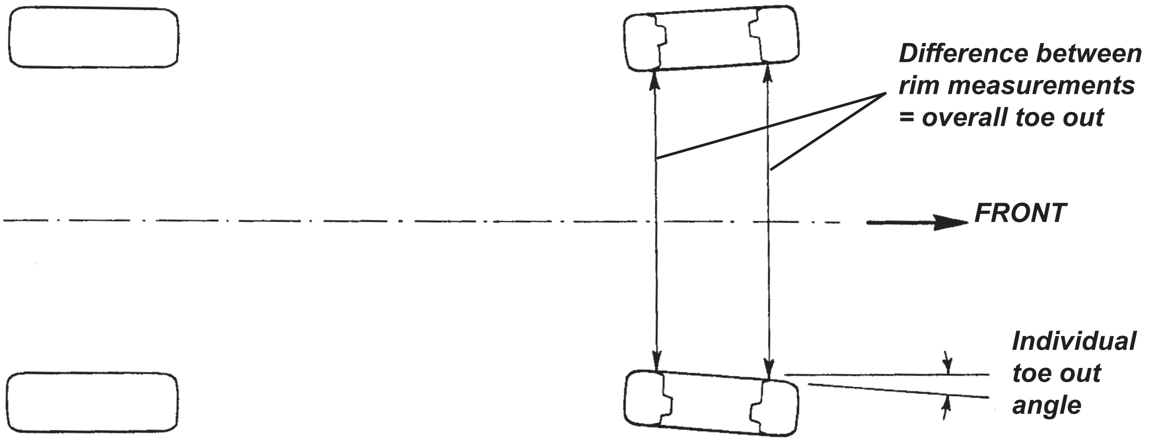
Front suspension steering & geometry settings

Applicable vehicles			
Base Models: *From start of production to September 2010 fitted with 'B' level front upper wishbone assemblies. (See Section CK.7 for further information).*	Castor	- optimum	+ 5.3°
		- tolerance range	+ 5.05° to + 5.55°; max. side/side 0.3°
	Camber	- optimum	- 0.2°
		- tolerance range	- 0.05° to - 0.35°; max. side/side 0.2°
	Alignment	- optimum	Zero
		- tolerance range	±0.063°; max. side/side 0.038°
	Steering axis inclination		9.4° nominal

Applicable vehicles			
Evora S: *From start of production* **Evora IPS:** *From start of production* **Base Models:** *Built from September 2010 onwards fitted with 'C' level front upper wishbone assemblies. (See Section CK.7 for further information).*	Castor	- optimum	+ 5.5°
		- tolerance range	+ 5.25°; max. side/side 0.2°
	Camber	- optimum	- 0.2°
		- tolerance range	±0.15°; max. side/side 0.2°
	Alignment	- optimum	Zero
		- tolerance range	±0.063°; max. side/side 0.038°
	Steering axis inclination		9.4° nominal

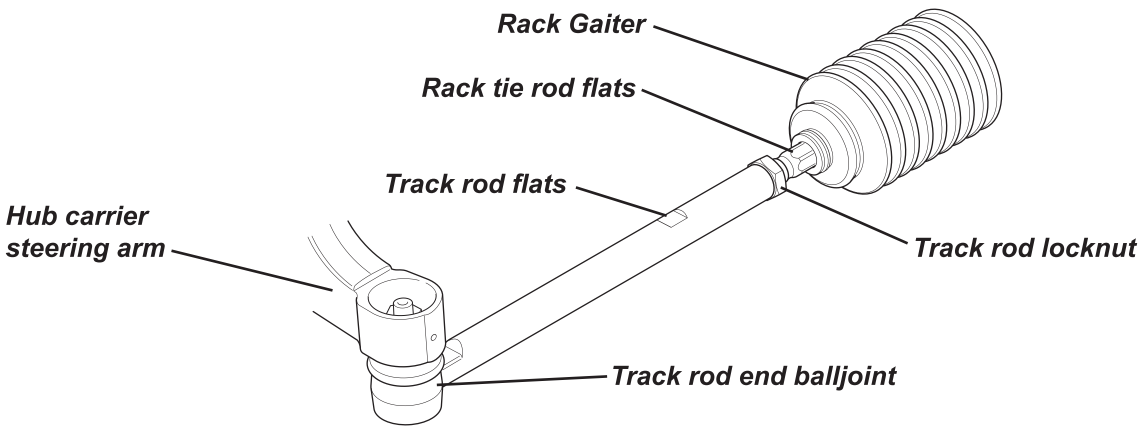
Alignment

Wheel alignment refers to the parallelism of the wheels when viewed from above and is crucial to vehicle stability, handling and tyre wear.



Alignment is measured either by the angle a wheel makes with the vehicle centre line, or the difference in dimension between the wheel rim to wheel rim measurement at the front and rear of the wheel at hub centre height. The wheels are said to 'toe-in' when the wheel paths converge ahead of the vehicle, and 'toe-out' when they diverge. Wheel alignment is designed to vary with both steering angle (Ackerman) and suspension travel (bump steer) and should be measured only 'straight ahead' at the specified ride height.

Front wheel alignment is adjusted be screwing the rack tie rods into or out of the track rods. In order to preserve the required bump steer characteristic and steering symmetry, the effective length of each track rod must remain equal - adjust each tie rod by a similar amount.

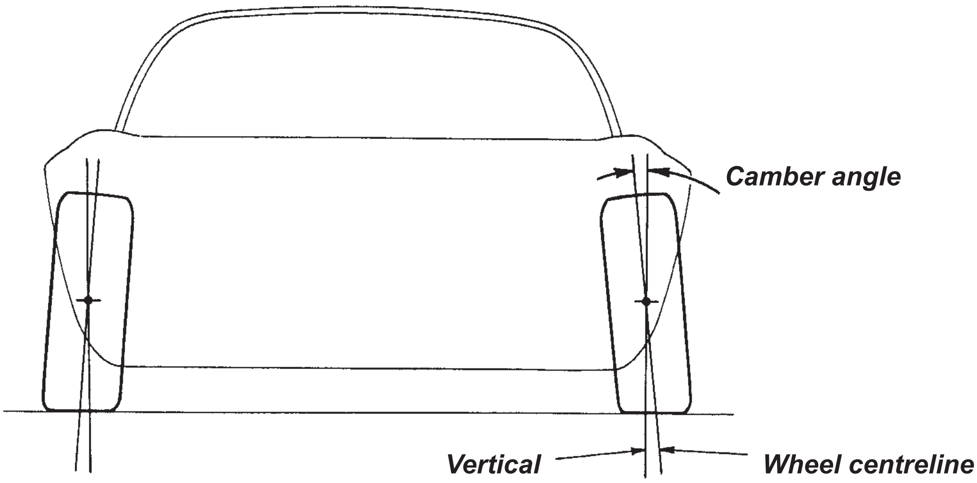


- Hold the track rod using the flats provided, and slacken the locknut. Repeat for the opposite side.
- Turn each tie rod a similar amount. As a guide, turning both tie rods by one quarter of a turn will alter overall toe-out by approx. 2.0 mm.
- When adjustment is correct, hold each track rod and tighten the locknuts to 80 - 82 Nm (58 - 60 lbf.ft).

When slackening or tightening the track rod locknuts, it is important that the torque reaction is resisted using the track rod flats, and that the outer ball joint is not allowed to be stressed.

Camber Adjustment

Camber is the angle from vertical of the wheel when viewed from the front, and is said to be negative when the wheel leans inwards at the top (positive when leaning outwards). The primary purpose of camber is to achieve the maximum efficiency of the tyre under cornering loads and body roll, with the specification closely allied to a particular wheel/tyre combination. The camber angle changes with suspension travel, becoming more negative on bump, and should be measured only at the specified ride height. Incorrect camber can result in handling deficiencies and excessive tyre wear.



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Eccentric cams at the inboard pivots of the lower wishbone provide a means of camber adjustment. The front pivot bolt is inserted from the rear, and the rear pivot bolt from the front, with each bolt head featuring an integral eccentric cam. A corresponding eccentric camplate is clamped beneath the nut, and is keyed to the bolt via a tongue and groove feature to ensure alignment between the two cams. Each cam is constrained by vertical guides integral with the subframe structure, whereas the pivot bolt hole in the subframe is slotted horizontally. Thus by turning the bolt (and eccentric cams) the wishbone pivot point may be moved inboard or outboard.

When adjusting camber, the front and rear pivot bolts should be moved by a similar horizontal distance to minimise the effect on castor (see below) but be aware that the horizontal movement produced by turning the cambolts accords with simple harmonic motion, and is not linear. After adjustment, ensure that the nuts are tightened to 86 Nm (only at ride height).

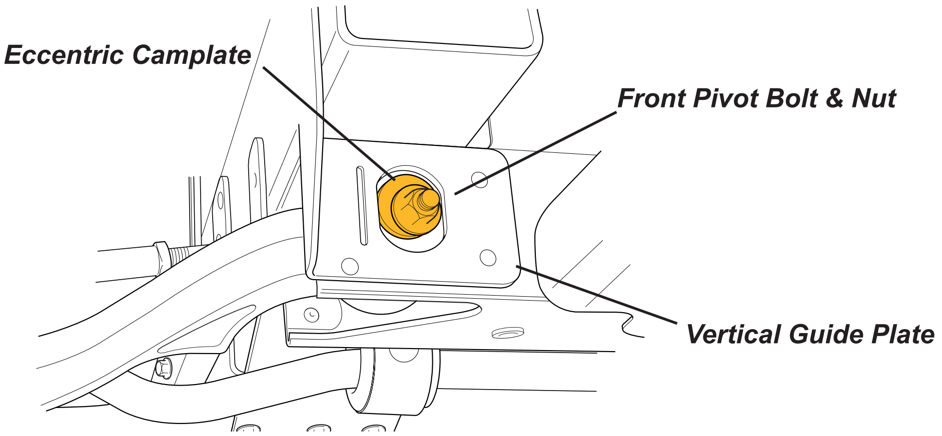
Cambolt Effects

From a midpoint position (i.e. centres of bolt and eccentric on common vertical axis, stamped arrow pointing vertically upwards or downwards);

Foreward cambolt;	90° cambolt rotation moves pivot horizontally by 5mm, and
	- changes camber angle by 0.25°
	- changes castor angle by 1°
Rearward cambolt;	90° cambolt rotation moves pivot horizontally by 5mm, and
	- changes camber angle by 0.7°
	- changes castor angle by 1°

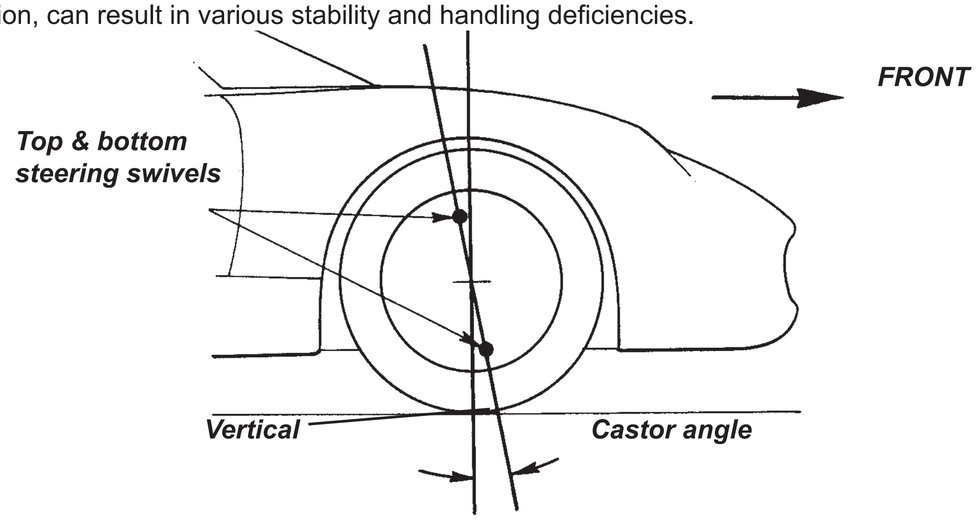
Note:

Forward cambolt;	Moving pivot axis INboard;
	- reduces negative camber
	- increases castor
Rearward cambolt;	Moving pivot axis INboard;
	- reduces negative camber
	- reduces castor
Total adjustment range	- camber 4°
	- castor 0.8°



Castor Adjustment

Castor is the angle from vertical of the steering axis of the wheel when viewed from the side. Its primary purpose is to provide a natural straight running tendency of the steered wheels with forward vehicle motion. Castor angles have a complex interaction with other steering geometries and if unbalanced or outside of specification, can result in various stability and handling deficiencies.



The eccentric cams fitted at both front and rear inboard pivots of the lower wishbone (see 'Camber Adjustment above) are also used to adjust camber. By moving the rear pivot axis outwards, and the front pivot inwards, the lower swivel joint is moved forwards to result in an increase in castor angle. To reduce the effect of this adjustment on camber angle, the front pivot point will need to be moved laterally about three times the distance, and in the opposite direction, to the rear pivot point movement.

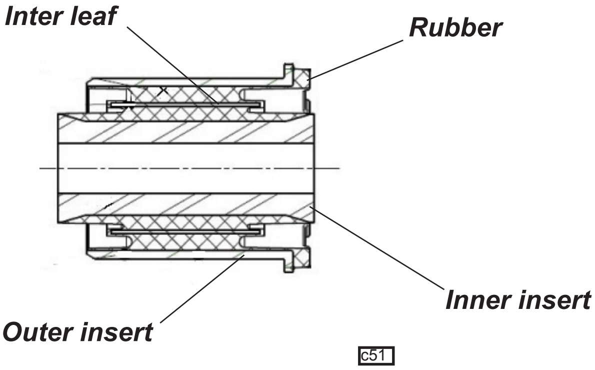
After adjustment, ensure that the nuts are tightened to 86 Nm (only at ride height).

CK.3 - WISHBONE PIVOT BUSHES & SWIVEL JOINTS (ALSO SEE SECTION CK.7)

Pivot Bushes

The upper and lower wishbone pivot bushes are bonded rubber type with a plastic flanged outer sleeve, an alloy inner sleeve, and an aluminium interleaf sleeve within the rubber bush to control the flexing characteristic. The rubber material specification has been selected to optimise the handling/refinement balance. The flanged end of the bush incorporates a snubbing feature to limit the axial distortion of the bush, with each bush arranged to resist braking forces transmitted through the suspension; Both top wishbone bushes are inserted from the front, and both bottom wishbone bushes from the rear. A chamfer is provided in the wishbone bore for this purpose.

The bushes may be pressed out of the wishbone eyes, and new bushes fitted using suitable press tool dollies. Smear the outer surface of the new bush with IPC 'P-80' rubber lubricant emulsion (A082C6042V) to ease fitment, and assemble in the direction detailed above.



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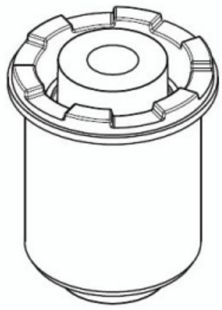
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Steering Swivel Joints

The steering swivel joint housed in the outboard end of both the top and bottom wishbones, uses a steel ball pin located in a synthetic spherical bearing cup pressed into the wishbone and retained by a swaging operation. The joint requires no maintenance other than a visual inspection of the dust gaiter, and is replaceable only as an integral part of the wishbone assembly.

Damper Pivots

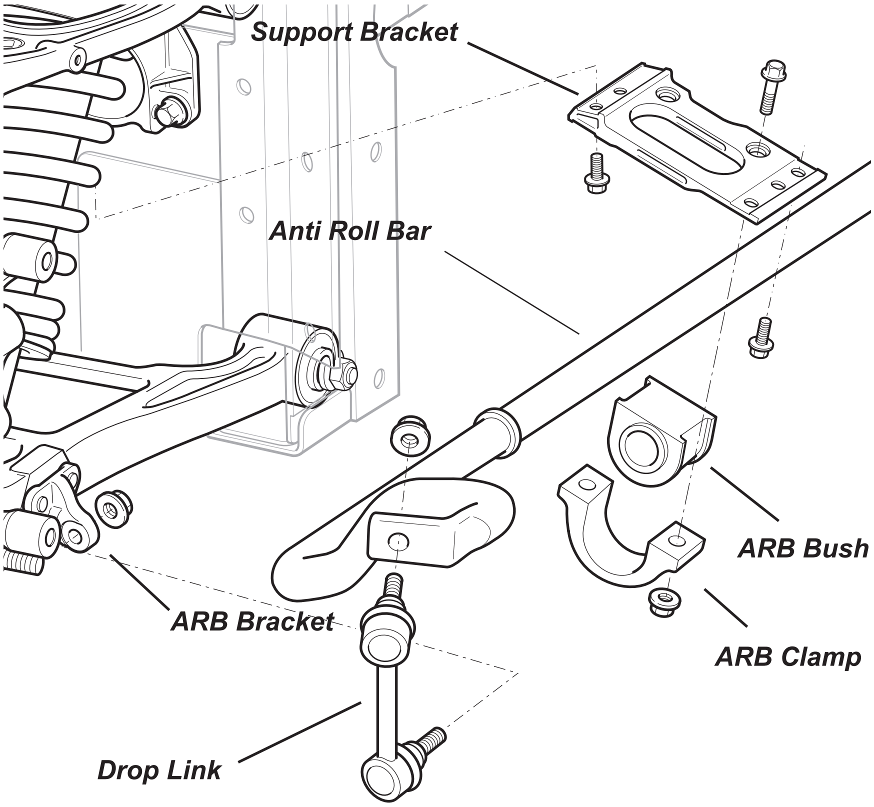
The lower eye of the damper is fitted with a zero compliance, through bolted, spherical joint which may be replaced using suitable press tools. The upper eye houses a bonded rubber bush, with a steel outer sleeve and an alloy inner sleeve. The bush may be replaced using suitable press tools.

CK.4 - ANTI-ROLL BAR

The tubular steel anti-roll bar is mounted beneath the front subframe in rubber bushes retained by extruded alloy clamps. One clamp secures the bar at each side to a bolt fixed, alloy extrusion, bridging the chassis drop towers for the lower wishbone front and rear pivots.

Each end of the bar loops upwards through the lower wishbone and uses a short ball jointed drop link and forged steel bracket to connect to the rear leg of the lower wishbone. At each side, a washer crimped to the bar, bears against the inboard end of the chassis mounting bush to provide lateral location of the bar.

The drop link ball joints require no maintenance, and are replaceable only as part of the drop link assembly. The chassis mounted bushes are lubricated with rubber grease on assembly, but require no routine maintenance.



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CK.5 - SUSPENSION DISASSEMBLY/ASSEMBLY

The suspension may be disassembled without the use of any special tools other than spring compressor clamps if the spring and damper are to be separated. With the car on a wheel free lift and with the front wheels removed:

1. Remove the wheelarch liner(s) as appropriate.

Hub Unit

2. Remove the two bolts securing the brake calliper to the hub carrier, release the flexible hose from the top wishbone, and support the calliper aside without straining the brake hose. Release the single countersunk screw, and remove the brake disc.

3. Release the harness connector from the wheel speed sensor, release the harness from any suspension components, and secure the harness aside. Release the single screw securing the wheel speed sensor, and withdraw the sensor from the hub carrier.

4. Release the four hex. head securing bolts and withdraw the hub unit from the hub carrier. Note that this unit is common to all four wheels.

Hub Carrier

5. Remove the nut securing the track rod ball joint into the steering arm, and use a ball joint splitter to separate the joint from the arm.

6. Remove the nut securing the top swivel joint to the hub carrier, and use a ball joint splitter to separate the joint.

7. Remove the nut securing the lower swivel joint to the hub carrier, and use a ball joint splitter to separate the ball pin from the carrier. Lift the carrier and hub unit from the car.

Damper and Spring

8. If the damper and spring are to be separated, it is recommended to remove the complete assembly of spring/damper/top mounting bracket from the car in order that spring compression may be carried out in the safest manner.
   Remove the 4 bolts securing the top mounting bracket to the subframe, and the single bolt securing the lower end of the damper to the bottom wishbone bracket. Withdraw the assembly to a workbench.

9. Using spring compressor clamps and taking all suitable safety precautions, unload the spring seats and remove the bolt securing the top end of the damper to the mounting bracket.

10. Separate the spring, damper and top bracket, noting the spring top seat cushion, and unload the spring clamps.

Upper Wishbone

11. Release the 'P' clip securing the brake hose to the wishbone, and the front and rear pivot bolts, and withdraw the wishbone from the subframe. The captive nuts for the pivot bolts are retained in channels in the chassis extrusions, replacement of the nutplate for the rear pivot requiring removal of the crash structure joining plate.
    Note that the steering swivel ball joint is retained in the wishbone by a swaging operation, and is serviced only as part of the upper wishbone assembly. For pivot bush replacement, see CK.3.

Lower Wishbone

12. To aid re-assembly, match mark the eccentric cam adjuster positions at both pivot points for the lower wishbone. Release the anti-roll bar drop link from the wishbone, noting that a 5mm hexagonal socket is provided in the end of the ball pin stud to aid this process. Remove both pivot bolts and eccentric cam adjusters, and withdraw the wishbone.
    Note that the steering swivel ball joint is retained in the wishbone by a swaging operation, and is serviced only as part of the lower wishbone assembly. For pivot bush replacement, see CK.3.

13. If necessary, release the four bolts and remove the damper lower fixing bracket from the lower wishbone, and the remaining bolt securing the anti-roll bar drop link bracket.

Anti-Roll Bar

14. At least one of the lower wishbones must be removed before the ARB may be withdrawn. Release the anti-roll bar drop links from the ARB noting that the link assembly is symmetrical end to end. Note that the drop link ball pin self locking nuts should be discarded and renewed for re-assembly. Release the two bolts securing each of the two ARB pivot clamps to the chassis brackets and withdraw the anti-roll bar.

Reassembly

Re-assemble the suspension in reverse order to disassembly with the following notes:

- If the car suffers a suspension impact sufficient to damage a wheel rim, careful attention should be paid to all related suspension components, and replacement parts fitted in any cases of doubt.
- Smear the shank of each pivot bolt with PBC grease to inhibit corrosion and facilitate subsequent servicing, but do not allow grease contamination of the threads.
- Where bolts are threaded into captive nuts with no secondary locking mechanism, apply a suitable thread-locking compound. If separate self-locking nuts are used, assess the locking torque and renew the nuts in any case of doubt. The ARB drop link ball pin self locking nuts should always be renewed.
- Take care to match mark and refit the eccentric cam adjusters on the lower wishbone pivots in their original settings to facilitate subsequent geometry checking and adjustment.
- Lubricate the rubber type anti-roll bar mountings with rubber grease on assembly.
- Refit the plastic bung into the steering arm counterbore to prevent corrosion of the ball joint fixing.
- The damper body is provided with three location grooves for the circlip retaining the spring lower seat. Use the middle position for standard ride height setting. Use spring compressor clamps to assemble the spring/damper/top mounting bracket (spring close coils lowermost), before fitting the complete assembly to the car. Do not omit the spring top seat cushion.
- Pump the brake pedal to reposition the pads before driving the car.

The Service Schedule specifies that the security of the front and rear suspension is checked at each service. For cars used on race tracks, or in similar conditions, suspension components and torque checks should be carried out between sessions. This operation requires that all the principal suspension pivot bolts are torque checked, noting the following points:

Where a bolt is tapped into a housing or weldnut, and relies on a thread locking compound for security, it is important to appreciate that if the bolt is disturbed, the locking compound must be re-applied. The following procedure should be adopted for all such fixings:

- Check the torque of the fixing.
- If the specified torque is attained without the fixing being disturbed (moving), take no further action.
- If the bolt moves, the locking action of the thread adhesive will have been compromised. Remove the bolt completely, clean off all old adhesive using a wire brush and acetone, and apply new adhesive as specified.
- Refit the bolt and tighten to the specified torque.
- If for any reason a bolt is found to have become loose, and the car has been operated for any period in this condition, the bolt should be renewed as a standard precaution and related components carefully inspected for hole ovality, undue stress or wear.

Torque Settings:	Nm	
Upper and lower wishbone pivot bolts	86	
Upper and lower swivel joints to hub carrier	86	
Track rod end to steering arm	45	
Damper to lower wishbone bracket	135	
Damper to top anchor bracket	86	
Damper bracket to lower wishbone	45	
Spring/damper upper anchor bracket to chassis	45	
Hub bearing unit to hub carrier	70	+ Permabond A130
Brake calliper to hub carrier	86	+ Permabond A130
Anti-roll bar alloy mounting clamps to chassis	45	

Anti-roll bar drop links	38
Wheel bolts	105
Speed sensor to hub carrier	5
Brake disc retaining screw	10

CK.6 - FRONT WHEEL BEARINGS

The hub bearing unit, which is common to all four wheels, is fixed to the hub carrier by 4 hex. head bolts, and incorporates a double row ball bearing with the inner race of the outboard bearing formed directly in the hub forging, and the inner race of the inboard bearing retained by a swaging operation on the hub flange. Inboard and outboard grease seals are included in the assembly, with a vehicle speed sensor ring integrated into the inboard seal, whose signal is picked up by a sensor mounted in the rear of the hub carrier.

If there is found to be any discernible free play in the hub bearing, or any roughness or tight spots can be felt, or any untoward noise heard, or any signs of lubricant expulsion are evident, the hub assembly should be replaced - there is no provision for adjustment or replacement of individual bearings.

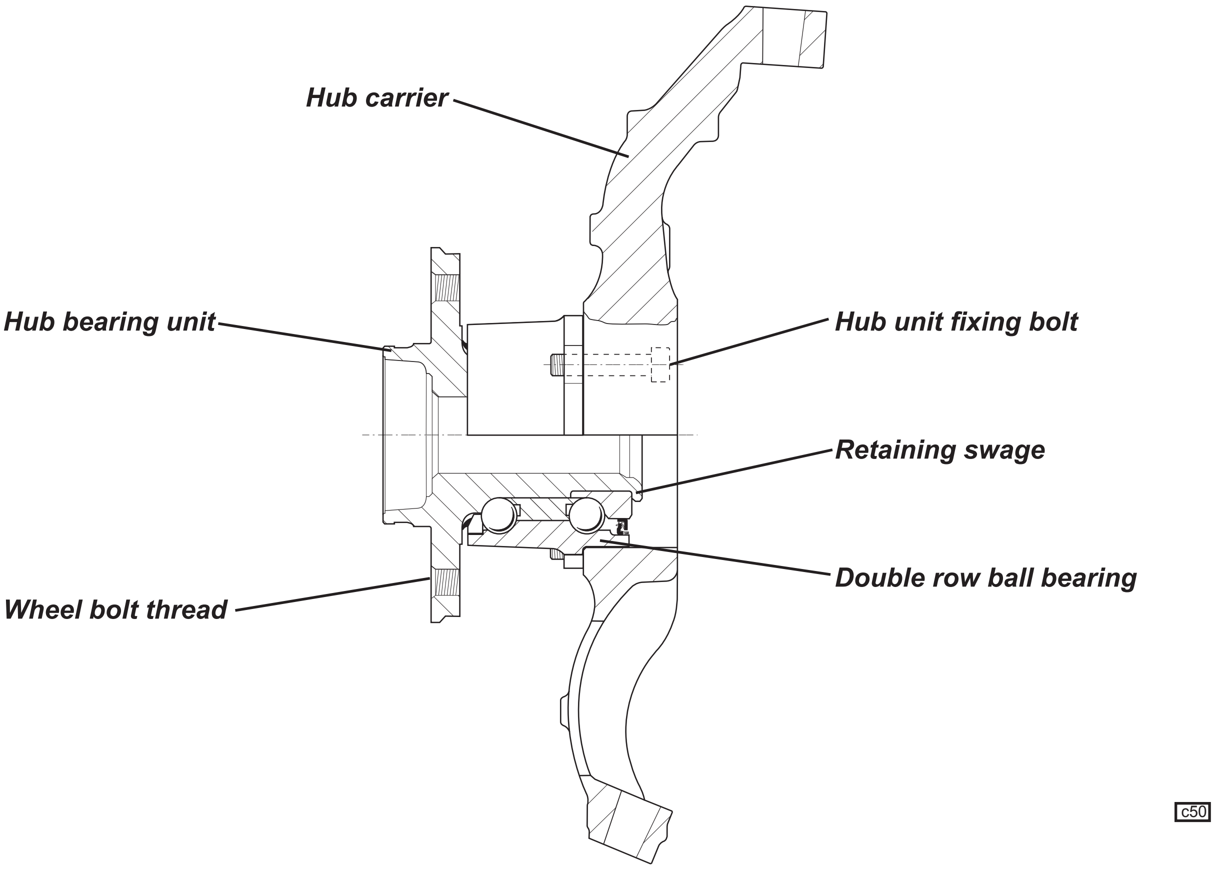
To Replace Hub Bearing Assembly

1. With the wheel removed, release the two fixing bolts, and remove the brake calliper from the hub carrier. Support clear of the brake disc without straining the flexible hose. Release the single countersunk screw and withdraw the brake disc from the hub.

2. Release the four bolts securing the hub bearing unit to the hub carrier.

3. Fit the new hub bearing unit to the hub carrier, apply Permabond A130 (A912E7033) to the threads of the four bolts, and torque tighten to 70 Nm.

4. Refit the brake disc and calliper, using Permabond A130 (A912E7033) on the threads of the calliper fixing bolts and torque tighten to 86 Nm. Pump the brake pedal to re-position the pads before driving the car.



CK.7 SUSPENSION REVISIONS (ALSO SEE SECTION DJ.7).

Upper wishbone assemblies

To enhance the ride and handling characteristics and to allow for future model variations, it was felt that the Evora would benefit with an increase in castor angle.

An increase could not be practically achieved through further cambolt adjustment; therefore the upper wishbones have been modified, repositioning the upper ball joint within the assembly so it is further rearward in relation to the lower ball joint thus increasing the castor angle. (See CK.2 Geometry and Adjustments, cambolt affects, castor adjustment).

Introduction of revised upper wishbone assemblies:

- Running change to the base Evora (naturally aspirated manual models) built from September 2010 VIN BH_11851 onwards approx.
- Evora S and IPS models from the start of production.

Upper wishbone identification

The part number stamped into the wishbone cannot be used for identification purposes as a new number was not allocated to the modified assemblies but instead went from 'B' to 'C' level which is not displayed on the wishbone.

- Original front upper wishbone assembly part numbers: B132C4001/2F
- Modified front upper wishbone assembly part numbers: C132C4001/2F

Note: Fitment of an incorrect wishbone assembly may affect the vehicles ride and handling characteristics as well as resulting in anomalous feedback to the vehicles ECU and ABS modules which could affect the correct activation of the Lotus DPM (Dynamic Performance Management) system.

In the event that the original 'B' level wishbone assemblies are no longer available then 'C' level assemblies must be fitted as a vehicle set and the vehicles steering and geometry adjusted to the revised settings as shown in section CK.2 and DJ.2

Measurement A

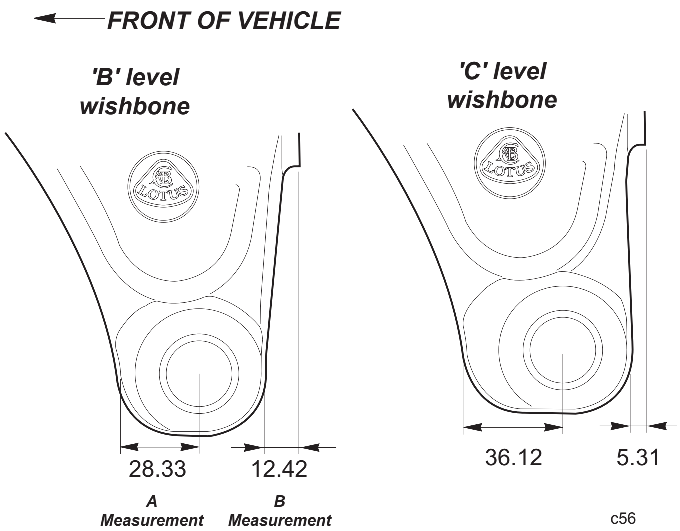
Distance between ball joint centreline to forward outer edge of the wishbone ball joint mounting area:

'B' level - 28.33mm
'C' level - 36.12mm

Measurement B

Distance between ball joint centreline to rear face of wishbone at the brake hose clip mounting point:

'B' level -12.42mm
'C' level - 5.31mm



LHF wishbone viewed from above

Note: The front and rear steering and geometry settings of any base vehicle fitted with 'C' level wishbone assemblies is the same as the Evora S and IPS models as listed in section CK.2 & DJ.2.

Lower wishbone assemblies

Revised wishbones were introduced specifically for the Evora S, although the wishbone dimensions have not altered, an uprated pivot bush is now fitted to the rearward mount resulting in a 10% increase in bush stiffness. The bush change has achieved a 12% reduction in Camber Compliance (less camber loss whilst cornering) and a 22% increase in lateral stiffness at the Tyre Contact Patch. (See CK.3 for further information on pivot bush functionality).

It is intended to fit these revised wishbones to the base and IPS models as a running change, but in the event that it becomes necessary to replace a front lower wishbone, then the replacement assembly selected must be correct for that vehicle.

Note: Fitment of an incorrect wishbone assembly may affect the vehicles ride and handling characteristics as well as resulting in anomalous feedback to the vehicles ECU and ABS modules which could affect the correct activation of the Lotus DPM (Dynamic Performance Management) system.

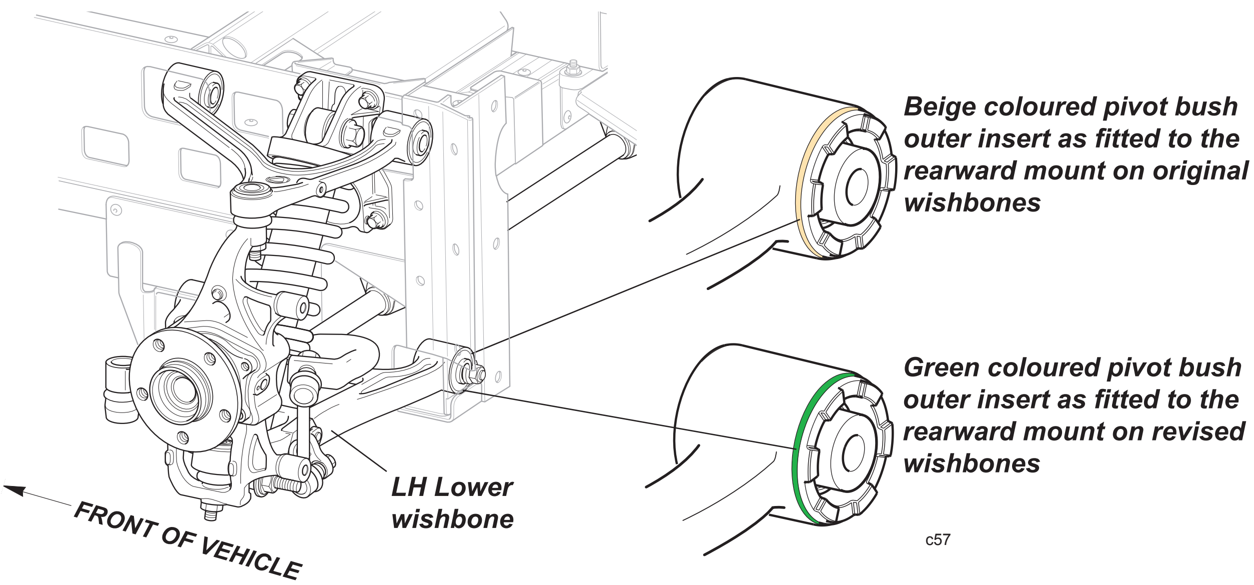
Note: If it is necessary to renew an original front lower wishbone, but assemblies with beige coloured pivot bush inserts are no longer available, then all of the front and rear wishbones must be replaced as a vehicle set with the revised assemblies (with green pivot bush inserts and front upper wishbones with the revised ball joint location).

The vehicles steering and geometry must be adjusted to the revised settings as shown in section CK.2 and DJ.2

Lower wishbone identification

The part number stamped into the wishbone cannot be used for identification purposes, but the revised wishbones may be identified by the colour of the rubber material used for the inner rearmost pivot bush.

- Colour of rearmost pivot bush outer insert on original wishbone (part numbers B132C4003/4F): Beige
- Colour of rearmost pivot bush outer insert on revised wishbone (part numbers A132C4035/6F): Green



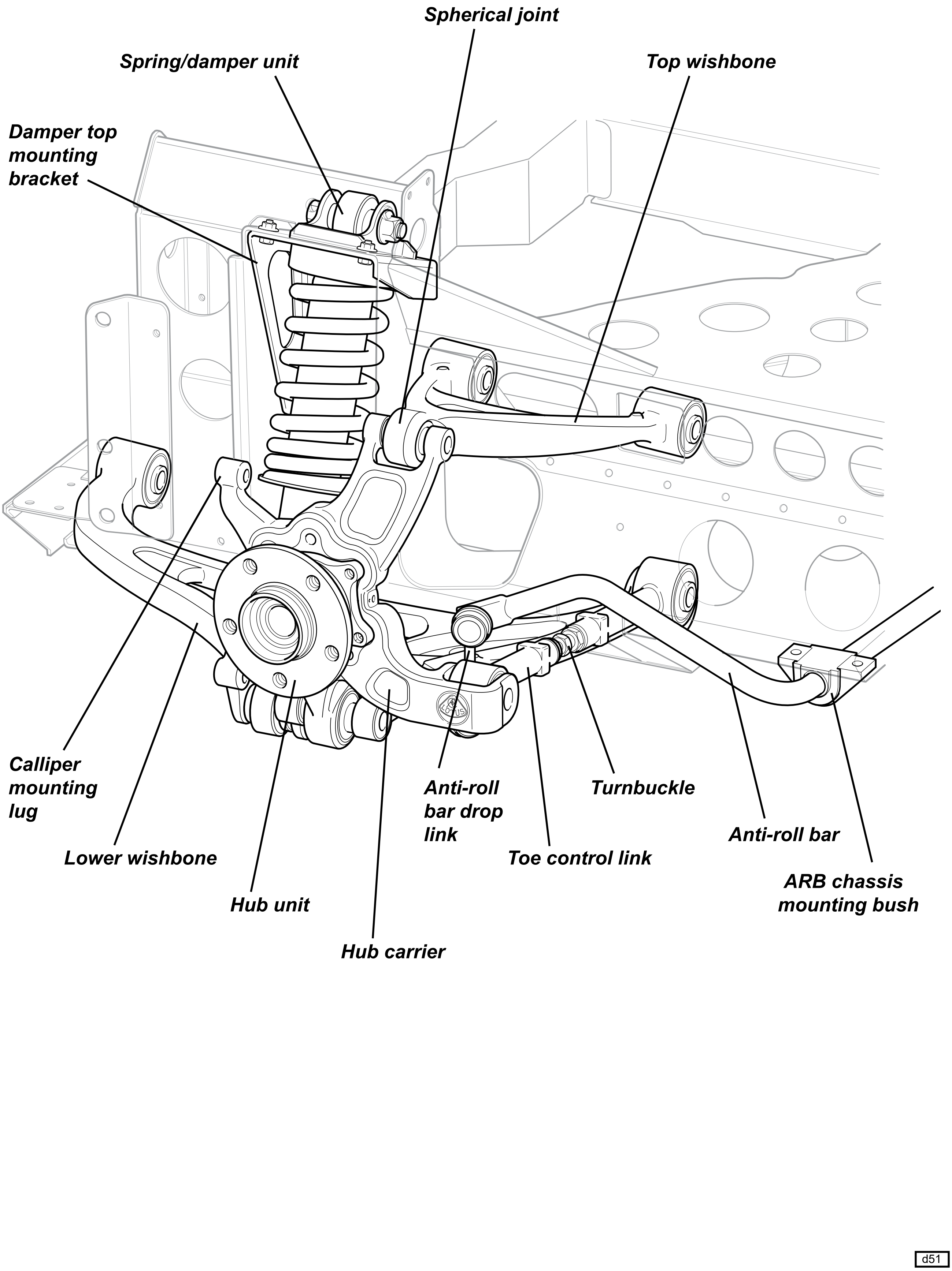
The front and rear steering and geometry settings of any base or IPS vehicle fitted with revised wishbone assemblies with green rear pivot bushes is the same as the Evora S model as shown in section CK.2 and DJ.2.

EVORA 2009 - 2015 MODEL YEARS

REAR SUSPENSION

SECTION DJ

REAR SUSPENSION LAYOUT



DJ.1 - GENERAL DESCRIPTION

The independent rear suspension comprises, on each side of the car, upper and lower forged aluminium wishbones, a forged steel toe control link, a concentric coil spring/telescopic damper unit and a tubular steel anti-roll bar, all being attached to the galvanised steel rear subframe. A forged steel hub carrier provides a mounting for the hub bearing unit to which the 5-bolt road wheel and brake disc are attached and also carries bosses for the cross-axis fixing bolts for the brake calliper.

Lower Wishbone Assembly (also see sub-section DJ.7 Revised Upper and Lower Wishbone Assemblies)
The primary, vehicle weight bearing, lower wishbone, is widely based and substantially cross braced and incorporates separate double shear mounting points for the hub carrier and damper lower eye and a single lug for the anti-roll bar drop link. The outboard end of the wishbone is through bolted to a spherical joint pressed into the lower eye of the hub carrier.

Upper Wishbone Assembly (also see sub-section DJ.7 Revised Upper and Lower Wishbone Assemblies)
The upper wishbone is of simple 'A' form and houses a replaceable through-bolted spherical joint at its outboard end to connect to the hub carrier.

Inboard Wishbone Bushes
The inboard ends of both upper and lower wishbones use replaceable bonded rubber pivot bushes for maintenance free articulation, with the bush compliance profile tuned to provide the vehicle with accurate and responsive dynamic characteristics.

Toe Control Link Assembly
The toe control link is a two-part steel forging incorporating an adjustment turnbuckle, and by connecting a rearward extension on the hub carrier to the chassis subframe, a 'toe-in on compression' bump steer characteristic is produced. Through bolted spherical joints are used in each end of the link and the threaded turnbuckle allows for adjustment of rear wheel alignment. An eccentric cam incorporated at the rear pivot point for the lower wishbone, provides a means of camber adjustment.

Dampers
Bilstein monotube telescopic dampers are used, the bottom of the damper fixes to the lower wishbone in a double shear arrangement, with the damper top end secured to the subframe via a steel bracket bolted inside the subframe tower. The damper uses a rubber bush in the top eye for noise suppression and a through bolted spherical steel joint in the lower eye for optimum dynamic response and is orientated with the damper rod uppermost.

Damper Springs
The Evora uses a concentric coil spring which abuts against a lower seat fixed to the damper body and an upper seat secured to the damper top eye which is also bolted to the subframe, thus relieving the damper top bush of vehicle weight to the benefit of noise and ride refinement. The close coiled end of the spring is mounted lowermost, on the damper body.

Anti-Roll Bar
A tubular steel anti-roll bar is mounted in rubber bushes to the underside of the subframe rearward of the axle line and curves over each toe-link before connecting to the lower wishbone rear leg via a short ball jointed drop link.

Hub Bearings
The hub bearing unit, which is common to all four wheels, is fixed to the hub carrier by 4 bolts, and incorporates a wide spaced double row ball bearing and a vehicle speed sensor ring integrated into the inboard seal, whose 48 pole signal is picked up by a sensor mounted in the rear of the hub carrier. This data is used for the anti-lock brake, vehicle stability, engine management and speedometer functions.

DJ.1A - SERVICE SCHEDULE INSPECTION AND SELF LOCKING TYPE FIXINGS

SERVICE SCHEDULE INSPECTION

The Service Schedule specifies that the security of the front and rear suspension is checked at each service. For cars used on race tracks, or in similar conditions, suspension components and torque checks should be carried out between sessions. This operation requires that all the principal suspension pivot bolts are torque checked, noting the following points:

- Where a bolt is tapped into a housing or weldnut, and relies on a thread locking compound for security, it is important to appreciate that if the bolt is disturbed, the locking compound must be re-applied. The following procedure should be adopted for all such fixings:
- Check the torque of the fixing.
- If the specified torque is attained without the fixing being disturbed (moving), take no further action.
- If the bolt moves, the locking action of the thread adhesive will have been compromised. Remove the bolt completely, clean off all old adhesive using a wire brush and acetone, and apply new adhesive as specified.
- Refit the bolt and tighten to the specified torque.
- If for any reason a bolt is found to have become loose, and the car has been operated for any period in this condition, the bolt should be renewed as a standard precaution and related components carefully inspected for hole ovality, undue stress or wear.

Self Locking Type Fixings

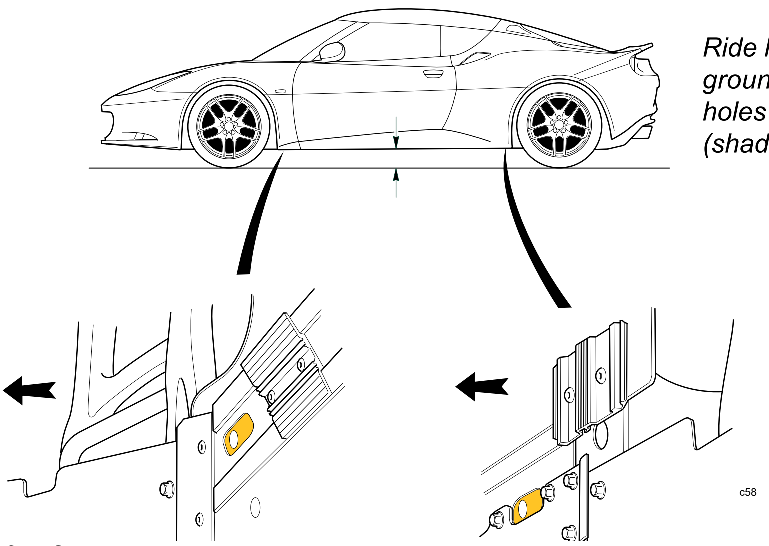
It is recommended to replace any self-locking nuts, i.e. nyloc or torque types that are used in critical areas if they are disturbed or removed as their self locking action will have been compromised.

◁ Click on arrow to return to previous page

DJ.2 - GEOMETRY & ADJUSTMENTS

◁ Click on arrow to return to previous page

Provision is made for the adjustment of wheel alignment and camber. Under normal service conditions, no periodic scheduled check of the geometry is necessary, with a full geometry check required only after suspension repair, or if excessive tyre wear is evident, or handling deficiencies encountered. Before any measurements or adjustments are made, it is essential first to set the vehicle to its 'mid-laden' ride height, approximating to driver and passenger and a half/full tank of fuel. This will require the vehicle to be ballasted or tied down:

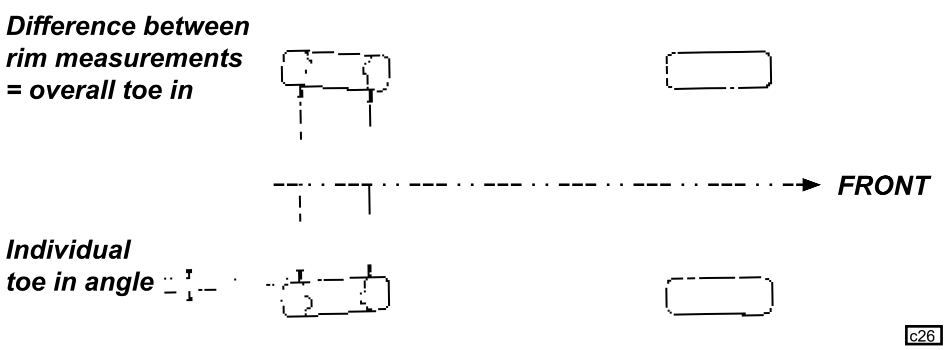


Ride height to be measured from the ground up to the machined tooling holes located in the chassis siderails (shaded in yellow).

Preparation for Geometry Inspection
Measurements should be taken from mid-laden ride height (Equivalent of 2 x 75 kg occupants + full fuel tank) Set car to front and rear ride heights and tyre pressures applicable to the Evora model; refer to Service Notes section TDU - Vehicle Technical Data, for rear suspension setting information.

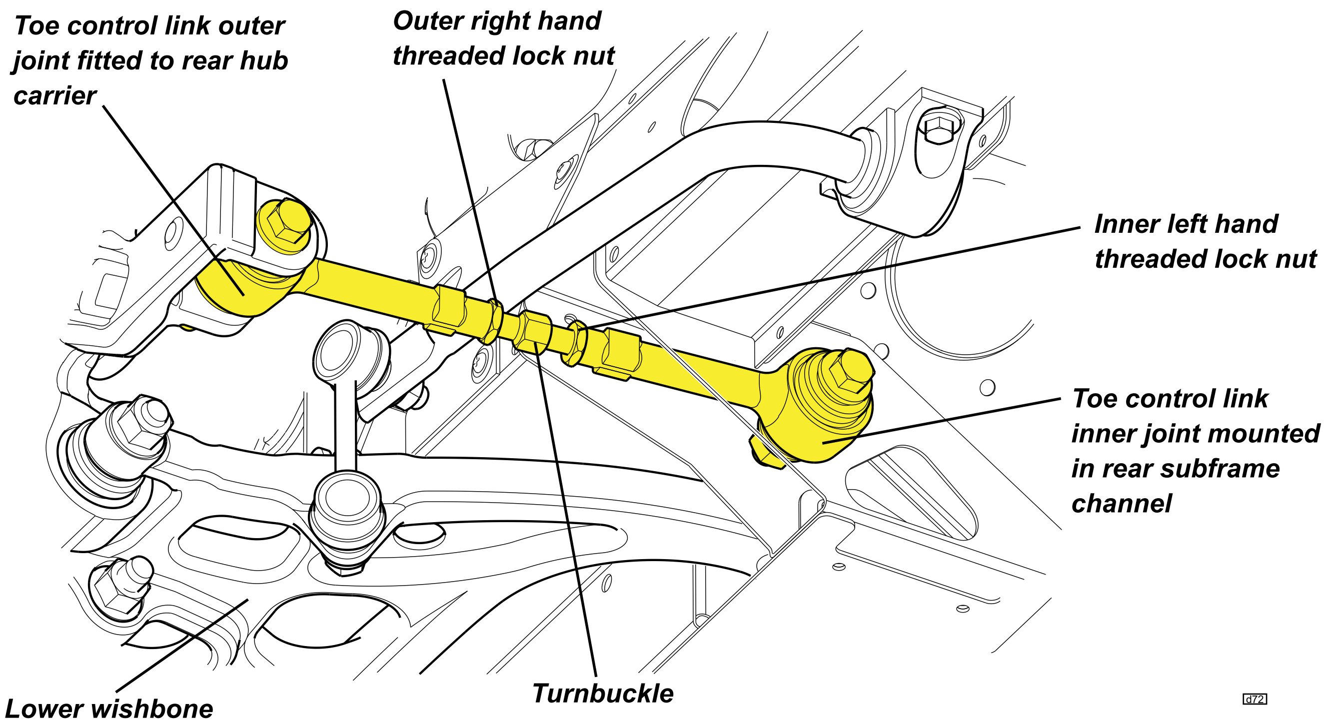
Suspension geometry settings
Please refer to Service Notes section TDU - Vehicle Technical Data, for rear suspension setting information.

Alignment
Wheel alignment refers to the parallelism of the wheels when viewed from above and is crucial to vehicle stability, handling and tyre wear.



It is measured either by the angle a wheel makes with the vehicle centre line, or the difference in dimension between the wheel rim to wheel rim measurement at the front and rear of the wheel at hub centre height. The wheels are said to 'toe-in' when the wheel paths converge ahead of the vehicle, and 'toe-out' when they diverge. Rear wheel alignment should be measured only using equipment which measures **individual** rear wheel alignment relative to the car centreline. Wheel alignment is designed to vary with suspension travel ('bump steer') and the base setting should be measured only at the specified mid laden ride height.

Rear Wheel Alignment
This is controlled by toe control link assemblies (2), each fitted to the left and right hand suspension between the rear subframe and rear hub carriers. Adjustments are by altering the overall length of both toe control links which is achieved by rotating the turnbuckle at the centre of the assembly.

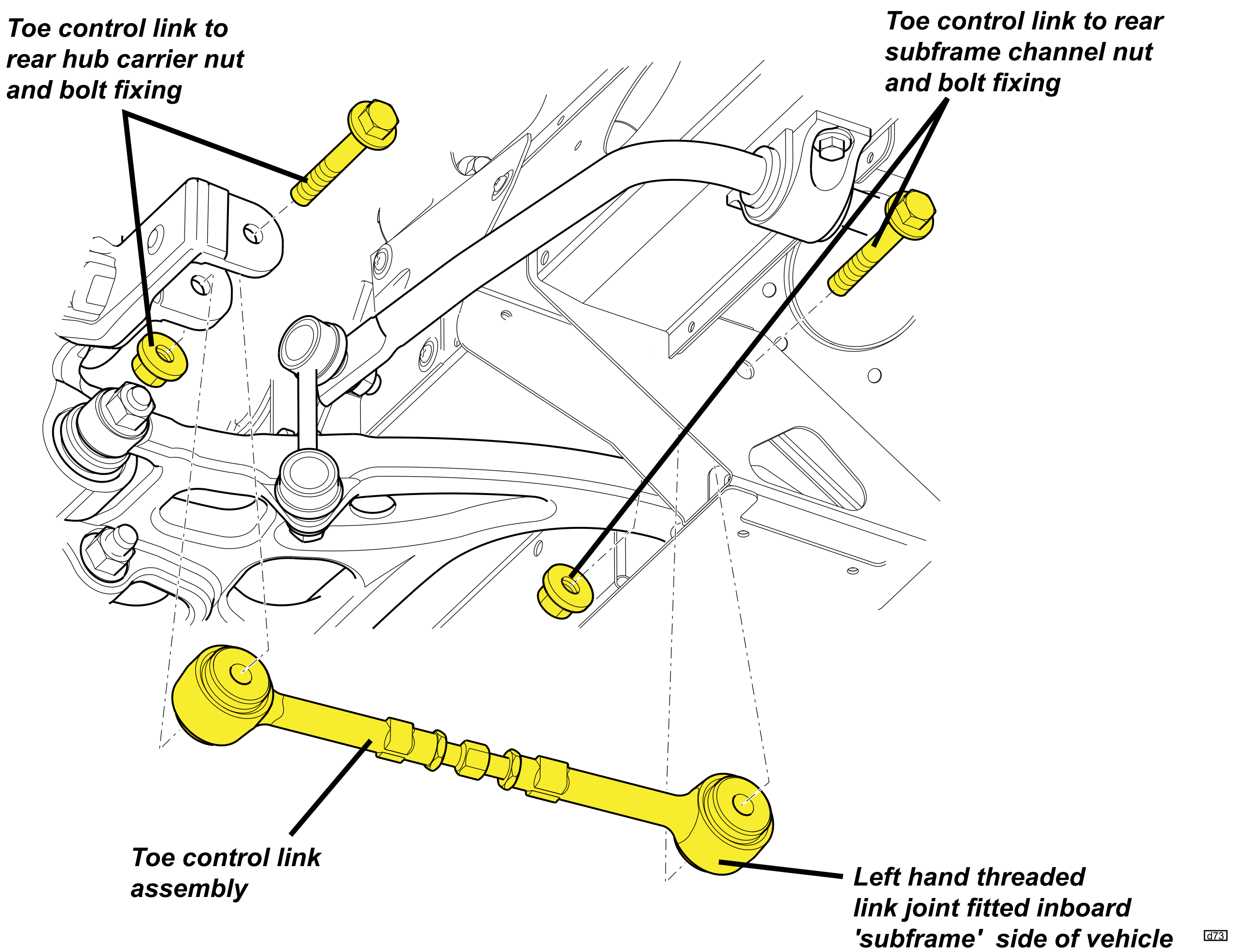


Alignment Adjustment
Preparation:
Ensure the vehicle is at mid-laden ride height, see previous page for information.

1.Slacken both locknuts, and turn the buckle as necessary to increase or decrease the effective length of the link.

Note: As a guide, lengthening the link rod by a turn of one 'flat' (one sixth of a turn) will increase toe-in by approximately 1.6 mm.

2.After adjustment, hold each section of the toe-link in turn using the flats provided, whilst tightening each of the two locknuts to 45 Nm and ensure that the axes of the toe-link pivot bearings are parallel.



Toe Control Link Assembly

Removal (left side described, right side similar):

1.Remove the rear undertray/diffuser assembly, see service notes introduction section for further information.

2.Remove the left hand rear road wheel; see Service Notes section GJ.4 for further information.

3.Release the M14 torque nut and M14 x 90 bolt securing the outer toe control link joint to the hub carrier, withdraw the bolt from the hub carrier and outer link spherical joint.

4.Release the M14 torque nut from its M14 x 75 bolt securing the inner toe link joint to the subframe, remove the bolt from the subframe and inner link spherical joint.

5.Withdraw the toe control link assembly from the rear subframe and suspension upright assembly.

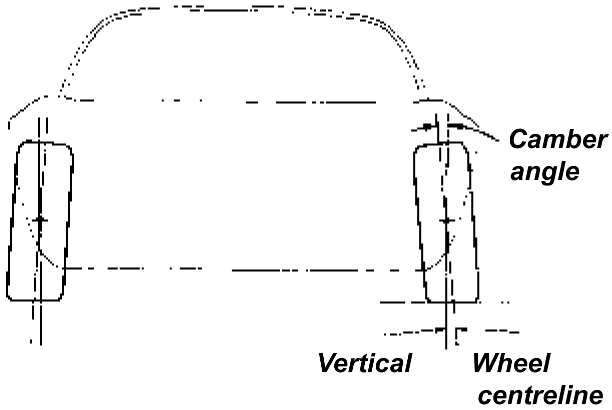
Refitment:

As per removal except:

- Ensure that the left hand threaded link joint of the toe control arm is fitted inboard of the rear subframe.
- Refit the inner and outer link joints bolts in the correct orientation (bolt head facing rearwards of the vehicle).
- Discard the previously removed torque nuts and fit new nuts.
- Ensure that the axis of the toe-link pivot joints are parallel, see note below.
- Tighten both inner and outer M14 fixings to 135Nm.
- If renewing toe control link assembly it will be necessary to perform a geometry check and adjustment (as required as shown on previous pages) using the vehicle mid-laden ride height figures and geometry settings as shown in Service Notes section TDU.

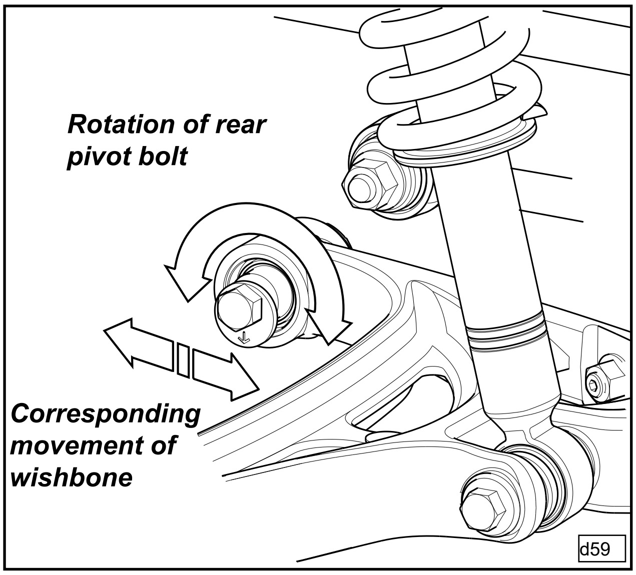
Camber Adjustment

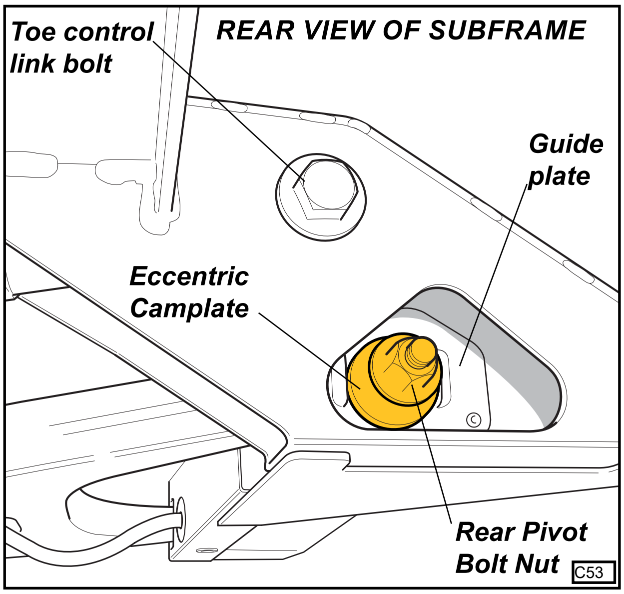
Camber is the angle from vertical of the wheel as viewed from the rear, and is said to be negative when the wheel leans inwards at the top (and positive when leaning outwards).



The primary purpose of camber is to achieve the maximum efficiency of the tyre under cornering loads and body roll, with the specification closely allied to a particular wheel/tyre combination. The camber angle changes with suspension travel, becoming more negative on bump, and should be measured only at the specified ride height; refer to sub-section DJ.2 for further information.

Incorrect camber can result in handling deficiencies and excessive tyre wear.





Rear Pivot Bolt/Camber Adjustment

An eccentric cam at the rear inboard pivot of each lower wishbone provides a means of camber adjustment. The pivot bolt is inserted from the front, with the bolt head featuring an integral eccentric cam, and with a corresponding eccentric camplate clamped beneath the nut on the front side of the rear pivot.

The camplate is keyed to the bolt via a tongue and groove feature to ensure alignment between the two cams. Each cam is constrained by vertical guides in a riveted insert in the subframe, whereas the pivot bolt hole in the subframe is slotted horizontally. Thus by turning the bolt (and eccentric cams) the wishbone pivot axis may be moved inboard or outboard.

After adjusting camber ensure that the pivot bolts are tightened to 86 Nm. Be aware that any camber adjustment will also affect wheel alignment, which must subsequently be checked and/or reset.

If it is neccessary to remove or renew the rear pivot bolt then ensure that upon refitment that the arrow displayed on the eccentric cam of the pivot bolt is pointing vertically downwards.

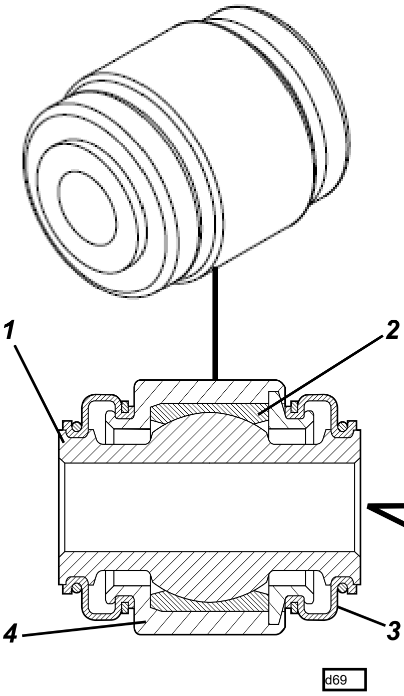
Only tighten the rear pivot bolts with the wishbones in their 'Ride height' positions, see first page of this sub-section for further information.

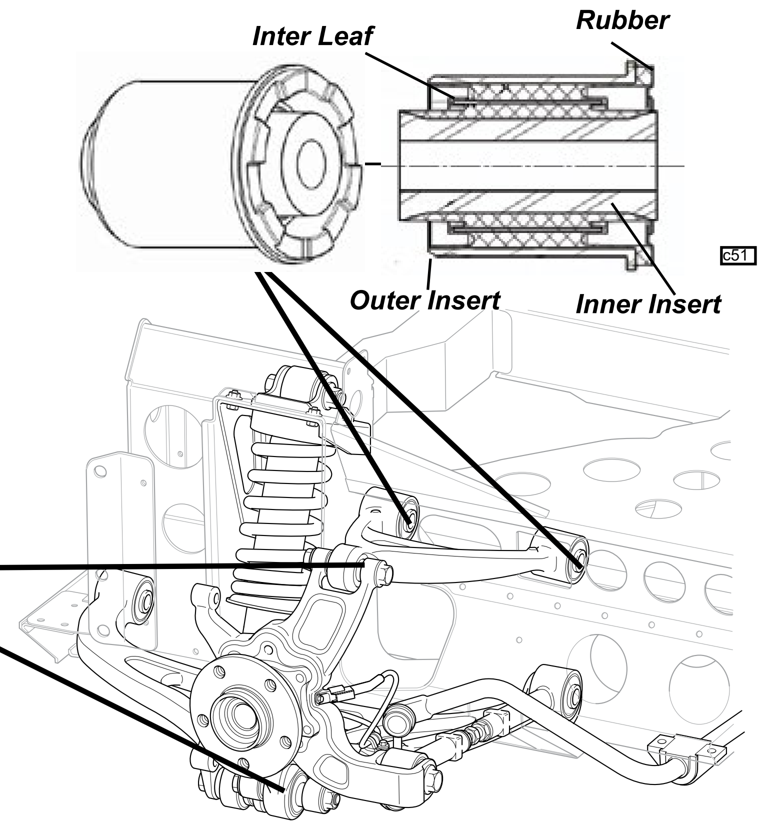
DJ.3 - WISHBONE PIVOT BUSHES & SPHERICAL JOINTS

◁ Click on arrow to return to previous page

Pivot Bushes (also see sub-section DJ.7 Revised Upper and Lower Wishbone Assemblies)
Refer to next pages for removal and refitment information.

The upper and lower wishbone pivot bushes are bonded rubber type with a plastic flanged outer sleeve, an alloy inner sleeve and an aluminium interleaf sleeve within the rubber bush to control the flexing characteristic. The rubber material specification has been selected to optimise the handling/refinement balance. The flanged end of the bush incorporates a snubbing feature to limit the axial distortion of the bush, with each bush arranged to resist braking forces transmitted through the suspension. Both top wishbone bushes are inserted from the front and both bottom wishbone bushes from the rear. A chamfer is provided in the wishbone bore for this purpose.





Spherical Joints
Refer to next pages for removal and refitment information.

Through bolted spherical joints are used at the outboard ends of the upper and lower wishbones, for the lower wishbone the joint is pressed into the hub carrier, for the upper wishbone its pressed into the wishbone itself. Both ends of the toe control links and the lower eye of the dampers are also articulated with spherical joints but service replacements are only available for the wishbones

The joint consists of 4 main components,

1. A hollow steel inner tube to accommodate the through bolt, the tube also incorporates a central spherical section which,
2. The spherical section is completely retained within concave polymide bushing allowing the tube to rotate 360º within its own axis inside the bushing, whilst also allowing it a small degree of radial tilt (up to 14º).
3. Dust seals are fitted either side of the assembly around the inner tube and outer sleeve to prevent the ingress of debris into the joint that may cause its premature wear.
4. The polymide bushing and inner tube is contained within an outer metal sleeve allowing the whole assembly to be pressed into the hub carrier/lower damper mounting.

Hub Carrier Spherical Bush

◁ Click on arrow to return to previous page

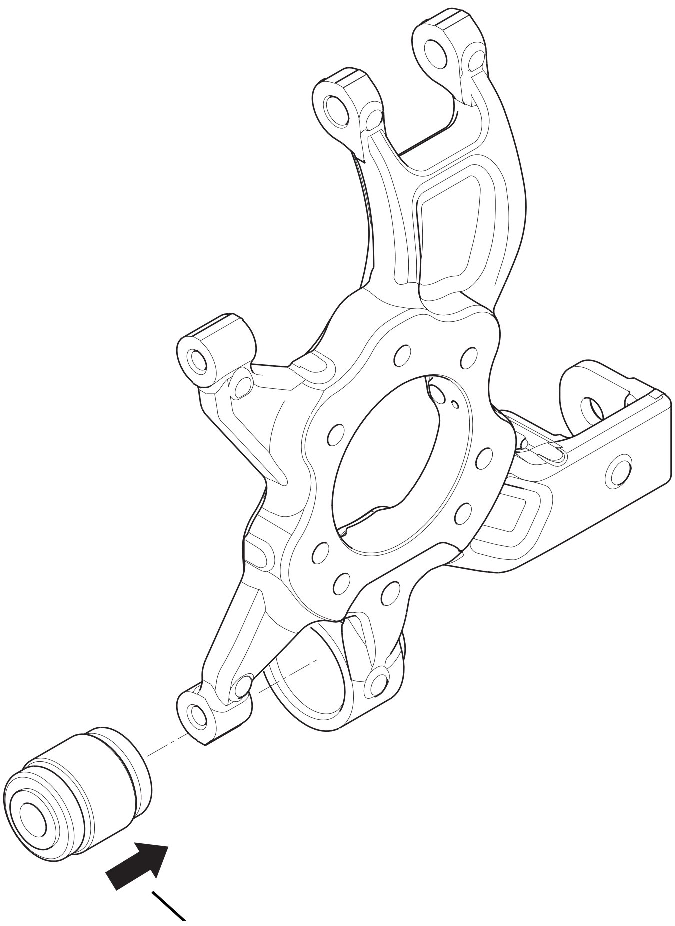
Removal:

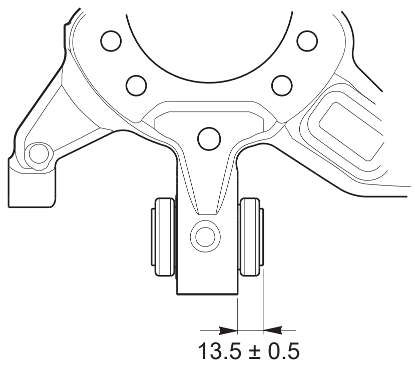
- Remove the hub carrier assembly as described in sub-section DJ.5.

- Using suitable press tools, push out the spherical bush.

Refitment:
Is the reversal of removal, the spherical joint bush should be pressed into the carrier mount in the direction as shown in the illustration below.
- For ease of fitment, spherical joint bush orientation into the carrier should be with the ‘rolled’ edge of the outer sleeve foremost.

- The bush should be pressed into the carrier until the front (rolled edge) of the bush protrudes 13.5 mm ± 0.5mm from the mounting face as shown in illustration below.





Press bush into carrier to the dimension shown

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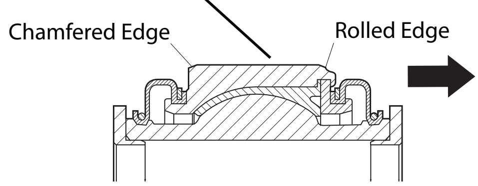
Press rolled edge of bush outer sleeve into hub carrier mount.



Upper Wishbone Spherical Joint Bush

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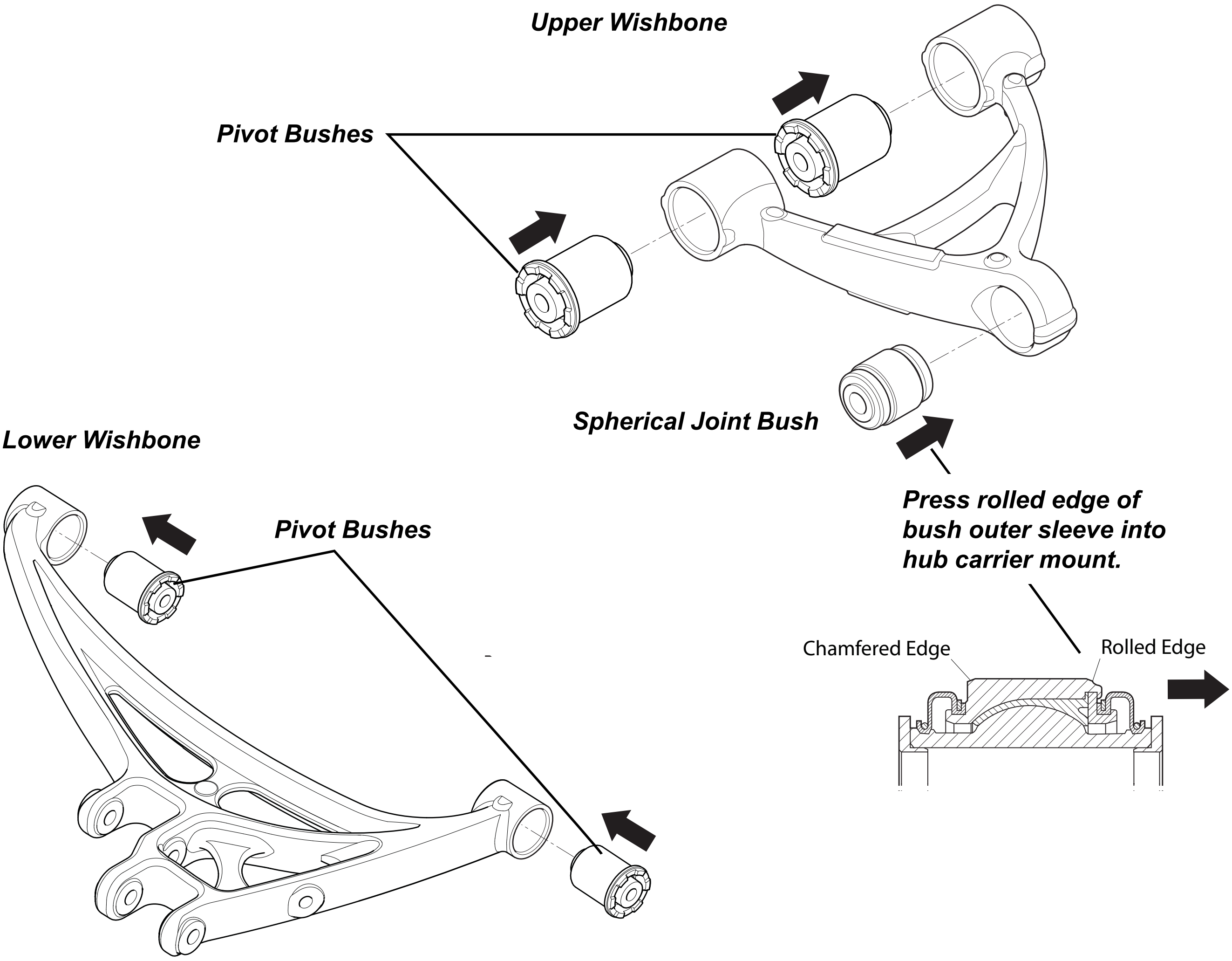
Removal:
- Remove the upper wishbone assembly as described in sub-section DJ.7.
- Using suitable press tools, push out the spherical bush.

Refitment:
Is the reversal of removal, the spherical joint bush should be pressed into the outer wishbone mount in the direction as shown in the illustration below.
- For ease of fitment as well as prevent potential damage to the new spherical joint, the bush orientation into the carrier should be with the 'rolled' edge of the outer sleeve foremost as shown in illustration below.

Upper or Lower Wishbone Pivot Bushes
Removal:
- Remove the upper wishbone assembly as described in sub-section DJ.7.
- Using suitable press tools, push out the pivot bushes.

Refitment:
Is the reversal of removal,
- Smear the outer surface of the new pivot bush with IPC 'P-80' rubber lubricant emulsion to ease fitment.
- The bush should be pressed into the carrier mount in the direction as shown in the illustration below.



Updated 11th January 2021

DJ.4 - ANTI-ROLL BAR

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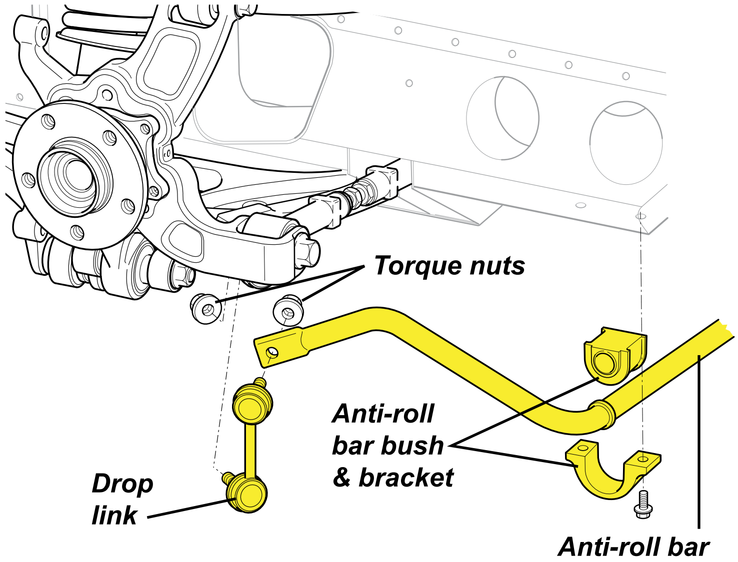


A tubular steel anti-roll bar is mounted beneath the rear subframe behind the axle line in rubber bushes retained by extruded alloy clamps.

One clamp secures the bar at each side to the bottom surface of the subframe longerons via two bolts tapping into a steel nutplate located to the inside the longerons. Each end of the bar curves over the toe-control link before connecting to a machined hole in the lower wishbone rear leg via a short ball jointed drop link.

A pair of washers crimped to the bar, bear against the outboard sides of the mounting bushes to provide lateral location of the bar.

A heatshield wrap consisting of a one piece fibreglass sleeve with an outer laminated aluminium foil is fitted around the roll bar in between the mounting clamp area to insulate the bar and bushes from heat produced by the engine and exhaust system.

The drop link ball joints require no maintenance and are replaceable only as part of the handed drop link assembly.

Removal:

1.Remove the rear undertray, see Service Notes Introduction Section.

2.Release the M10 x 20 screws (4) (torque 45Nm) securing the 2 anti-roll bar clamps and bushes to the rear subframe nut plates.

3.Remove screws and withdraw the clamps and bushes from the anti-roll bar.

4.Release the M12 torque nuts (2) (torque 36Nm) securing the anti-roll bar to the drop link upper joint on the left & right hand side (a 5mm hexagonal socket is provided in the end of each ball pin stud to aid this process) and withdraw the anti-roll bar.

Refitment:

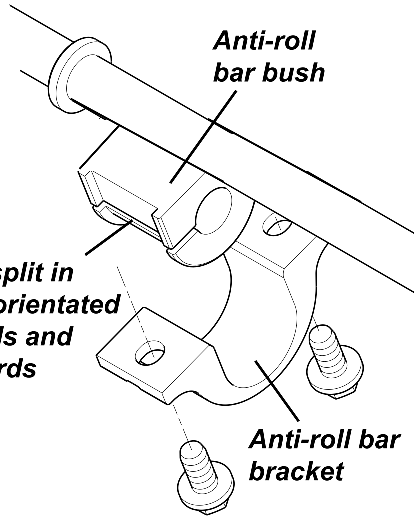
The same as removal except:

- Castrol LMX rubber grease, or equivalent, should be used when fitting the rubber bushes onto the anti-roll bar.
- Ensure the anti-roll bar bush is fitted back onto the bar with manufacturers split orientated towards the rear of the vehicle.
- Renew the anti-rollbar drop link ball pin self torque nuts.

Note if the roll bar is being renewed then inspect the condition of the heatshield sleeve, transfer to the new bar or renew as required.

Anti-Roll Bar Bush
If fitting a new anti-roll bar or bush then ensure that the bush is fitted in the correct orientation with the manufactured split in the bush facing downwards and rearwards of the vehicle.

This will reduce bush and bar wear by ensuring that any water and debris that is thrown up from the road into the path of the bushes can drain away instead of collecting in the bushes clamping split with the subsequent rotational movement of the bar causing both the bar and bush to wear.



Uprated Anti-Roll Bar
From the start of production the Base Evora was fitted with 21mm diameter anti-roll bar and black in colour. For the Evora S the rear anti-roll bar diameter was is increased by 0.5mm and is grey in colour. Revised rear subframe mounts are also fitted to accomodate the increased diameter anti-roll bar.

The fitting of the revised components achieves a 19% reduction in Camber Compliance (less camber loss whilst cornering), a 32% increase in lateral stiffness at the Tyre Contact Patch and a 1.5% increase in rear roll stiffness. These changes improve the dynamic performance of the vehicle, giving improved:

- On-centre connection
- Response linearity
- Effort build-up off centre
- Tracking stability
- Reduced roll angle
- Improved overall vehicle connection feel
- Improved grip level on both standard and option tyres

DJ.5 - HUB UNIT AND HUB CARRIER

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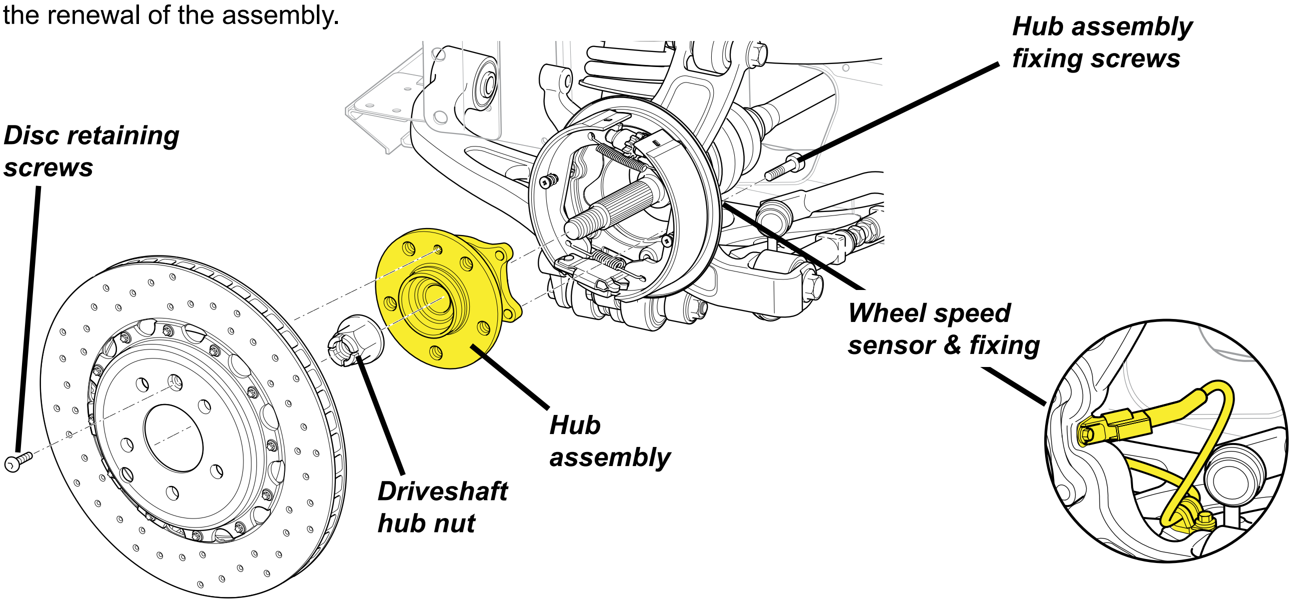
Hub Unit

The unit is non serviceable and any malfunction that results in the failure of any of its functionality will require the renewal of the assembly.



Removal:

This operation will require the vehicle to be placed on a wheel free lift and with the rear wheel(s) removed as required, see Service Notes Introduction Section and Service Notes Section GJ.4 for further information.

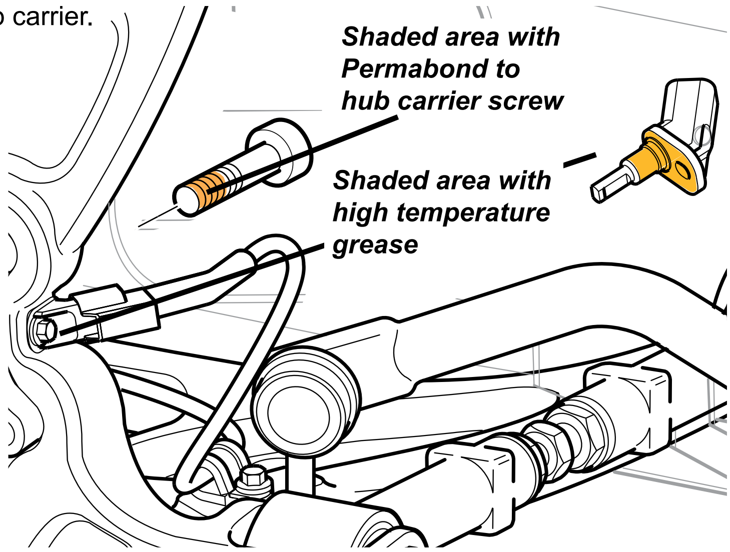
1. With the parking and footbrakes firmly applied, remove the driveshaft nut as required (both right hand threads) see service notes section FL.4. for further information.

2. Release the two bolts securing the brake calliper as required to the hub carrier and support the calliper aside without straining the brake hose see service notes section JL.7 for further information.

3. Check that the parking brake is released, back off the brake shoe adjuster, release the M8 x 12 skt cap head screws (1) securing the brake disc/drum to the hub and remove, see service notes section JL.6.

4. Release the harness connector from the wheel speed sensor, release the harness from any suspension components, and secure the harness aside. Then release the single M5 x 12 screw securing the wheel speed sensor, and withdraw the sensor from the hub carrier.

5. Release the M10 x 33 (4) socket headed hub to carrier screws, then withdraw the hub unit from the hub carrier and driveshaft.



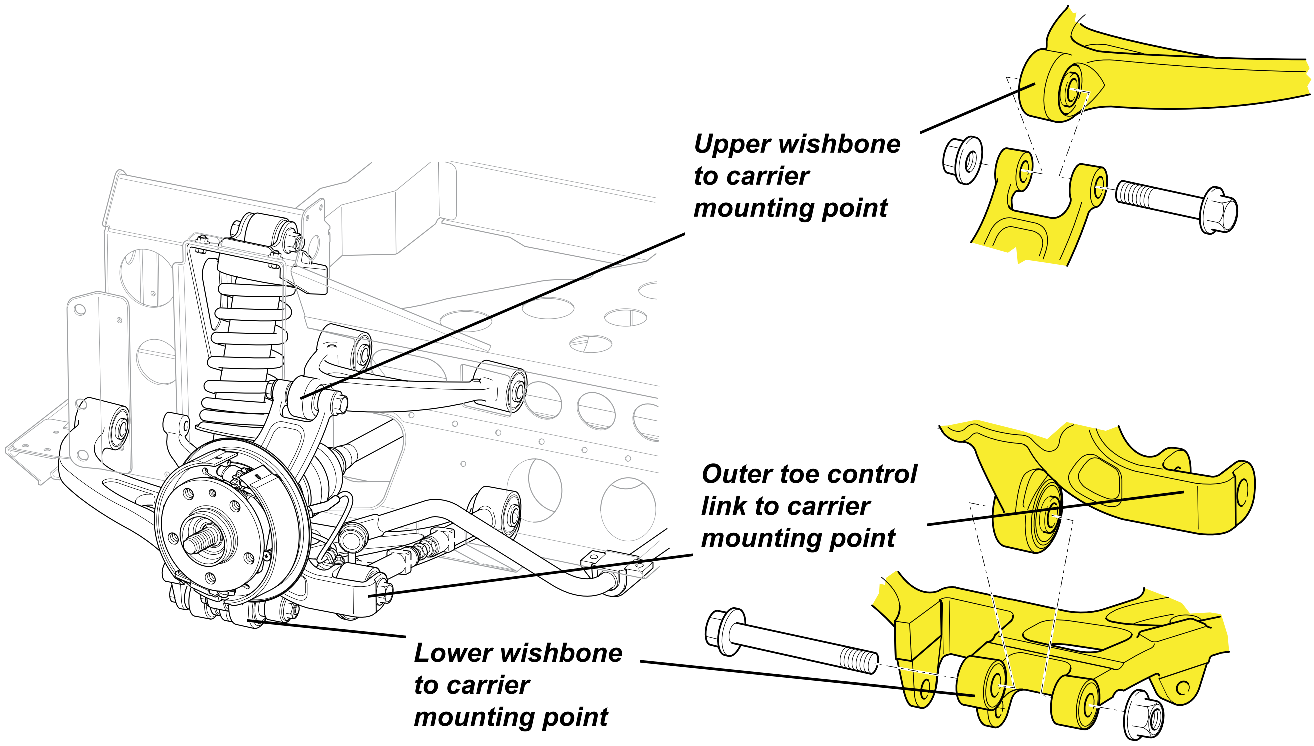
Refitment:

Reverse procedure of renewal except:
- Apply a light film of Permabond A130 to the threads of the hub to carrier screws before refitting and tightening to 70Nm.
- Apply a light coating of Mobiltemp 1 high temperature grease to the wheel speed sensor as shown in the illustration and tighten screw to 5Nm.
- Adjust the parking brake shoes and pump

the brake pedal to reposition the pads before driving the car.

Hub Carrier

If removing as part of the strip down and refitment of the complete suspension assembly then the hub carrier and hub unit can be removed as a complete assembly, refer to previous instructions on the previous pages for hub unit removal, steps 1 - 4 to prepare hub carrier for removal.



1. Release the M14 torque nut and M14 x 90 bolt securing the outer toe control link joint to the hub carrier, withdraw the bolt from the hub carrier and outer link spherical joint, refer to sub-section DJ2 for further information.

2. Release and remove the M14 x 100 bolt and M14 torque nut securing the upper wishbone spherical joint to the hub carrier (135Nm).

3. Release and remove the M14 x 125 bolt and M14 torque nut securing the lower wishbone to the spherical joint on the hub carrier (135Nm).

4. Separate the toe control link, upper and lower wishbones from the carrier, then slide the carrier and hub unit off of the driveshaft splines.

Refitment:

Is the reverse of removal except

- Discard the previously removed torque nuts and fit new nuts.
- Ensure the upper and lower wishbone bolts are fitted in the correct orientation, head of upper bolt facing towards the rear of the vehicle and the head of the lower bolt facing towards the front of the vehicle.

DJ.6 - SPRING AND DAMPER ASSEMBLY

◁ Click on arrow to return to previous page

Note: The upper damper bolt passing through the upper spring/damper mounting retains the road spring in compression, therefore the spring/damper/top mounting bracket should be removed from the car as a complete assembly.

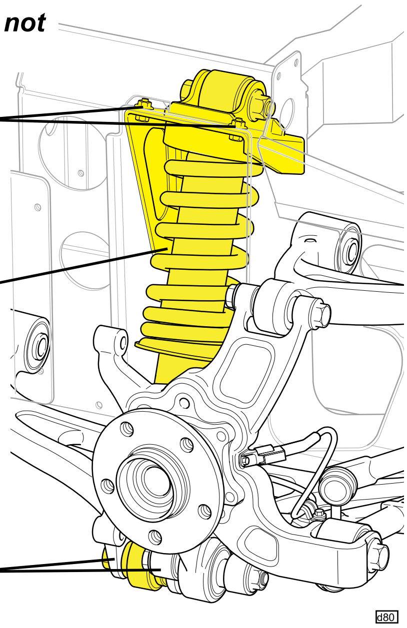
Removal:

1. Raise and support vehicle, see service notes introduction section for further information.

2. Remove the appropriate road wheel, see Service Notes section GJ.4 for further information.

3. Remove the M8 x 20 screws (2) securing the upper section of the top mounting bracket to the to the inside of the subframe tower (24Nm) and the M10 x 20 screw (1) securing the side section of the top mounting bracket to the front face of the tower (45Nm).

4. Remove the M14 x 105 bolt and M14 torque nut (1) securing the lower end of the damper to the bottom wishbone mounting point (135Nm). Pull the assembly outwards so that the base of the damper clears the lower wishbone then withdraw the assembly from the vehicle, collect the spacer washers (2) fitted between either side of the lower damper bush and wishbone mounting point.



Refitment:
Is the reverse of removal except:
- Renew the lower damper to wishbone clevis bracket self torque nut.

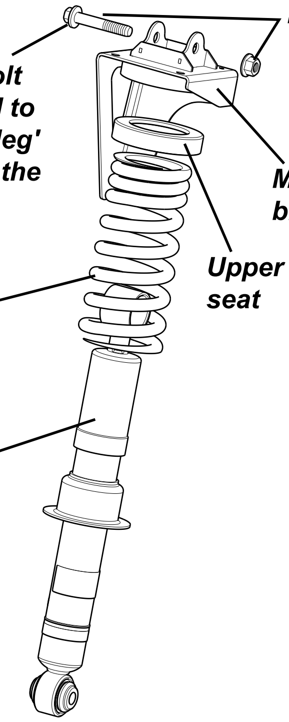
Separating the spring damper assembly:
- Using spring compressor clamps and taking all suitable safety precautions relieve tension from the upper spring seat and mounting.

- Remove the M12 x 70 bolt and M12 torque nut (1) securing the upper end of the damper to the mounting bracket (86Nm).

- The spring/damper mounting and upper spring seat and spring can be pulled away from the damper.

Refitment:
Is the reverse of removal except:

Care point: Ensure that the upper damper mounting bolt is orientated so that the head of the bolt is fitted to the 'Long leg' of the mounting bracket.

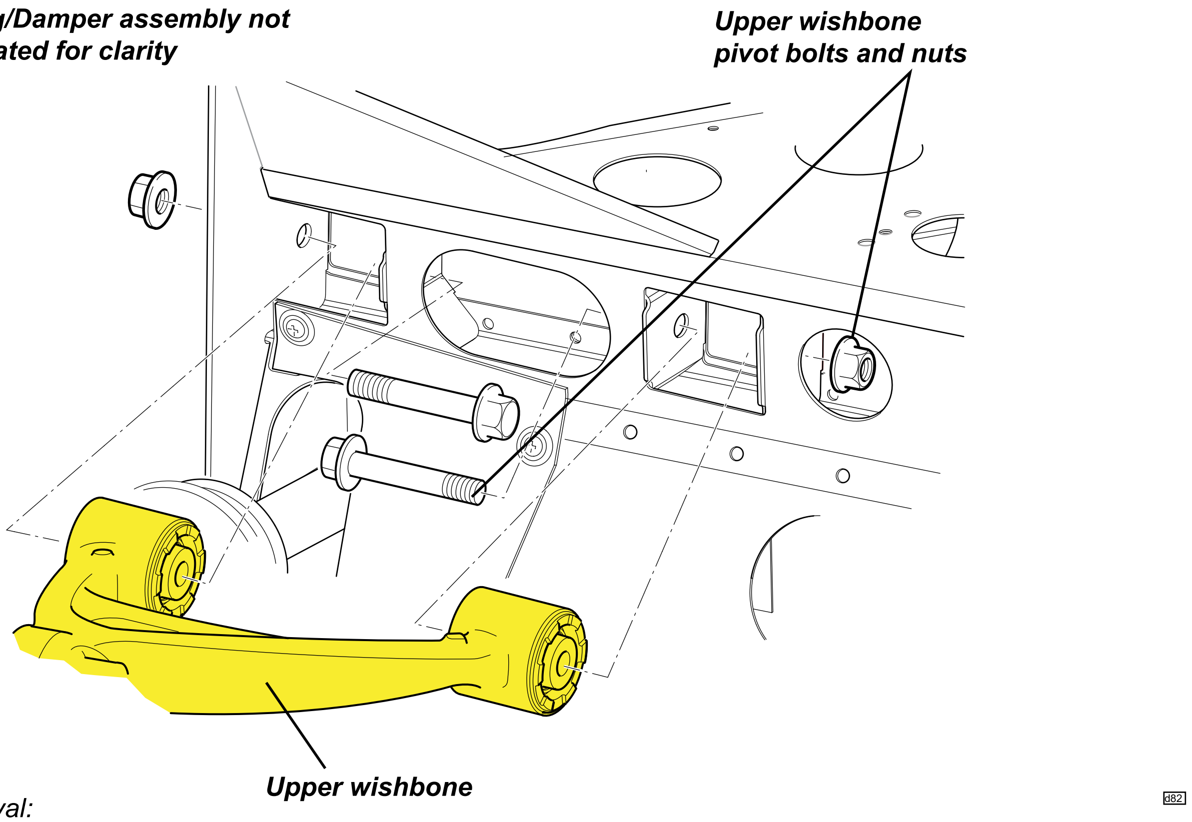


Updated 11th January 2021

DJ.7 - UPPER AND LOWER WISHBONE ASSEMBLIES

◁ Click on arrow to return to previous page

Upper Wishbone



Removal:
1.Raise and support vehicle, see Service Notes Introduction section for further information.

2.Remove the appropriate road wheel(s), see Service Notes section GJ.4 for further information.

3.Remove the rearmost section of the wheelarch liner(s) as required; see Service Notes section BV.17 for further information.

4.Release and remove the M14 x 100 bolt and M14 torque nut securing the upper wishbone spherical joint to the hub carrier, refer to sub-section DJ.5 for further information.

5.Release and remove the M12 x 85 pivot bolts and M12 nuts (2) securing the upper wishbone to its mounting channels in the rear subframe, (torque 90Nm).

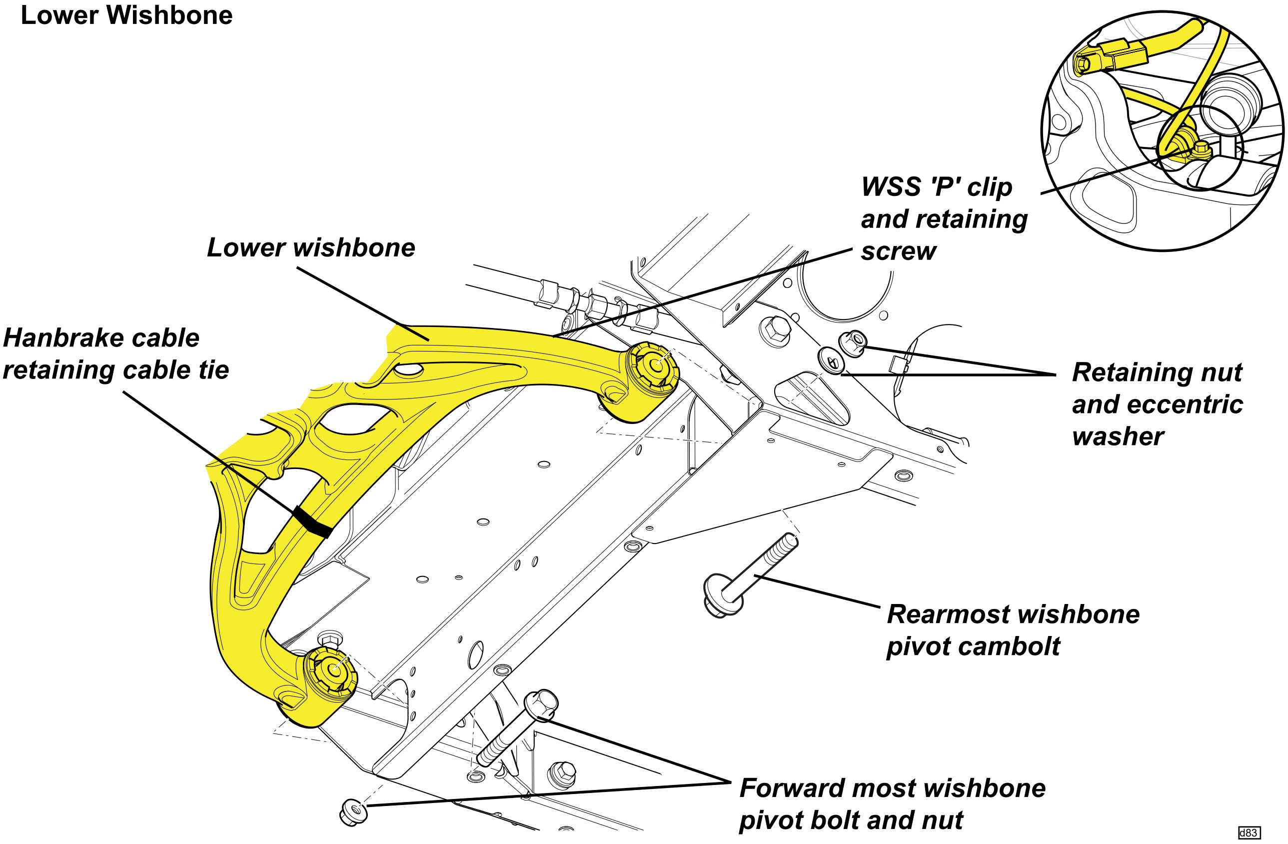
Care point: The forward most pivot bolt nut may be partially obscured by the spring/damper assembly. It may be necessary to partially remove the spring damper assembly to gain access to the pivot nut to achieve satisfactory removal and torque tightening, refer to sub-section DJ.6 for further information.

6.Withdraw the wishbone from the subframe.

Refitment:
Is the reverse of removal except:
- Only torque tighten the pivot bolts once the vehicle/wishbones are in the ride height position, refer to sub-section DJ.2 for further information.

- Refer to sub-section DJ.3 if replacing the wishbone pivot bushes.

Lower Wishbone



1.Raise and support vehicle, see Service Notes Introduction section for further information.

2.Remove the appropriate road wheel(s), see Service Notes section GJ.4 for further information.

3.Cut and discard the cable tie securing the handbrake cable to inner span section of the wishbone assembly.

4.Release and remove the Wheel Speed Sensor (WSS) harness retaining M6 x 16 'P' clip screws (2) securing the sensor harness to the upper side of the wishbone (torque 9Nm).

5.Release the M14 torque nut and M14 x 90 bolt securing the outer toe control link joint to the hub carrier, withdraw the bolt from the hub carrier and outer link spherical joint, refer to sub-section DJ.2 for further information.

6.Release the M12 torque nut securing anti-roll bar drop link lower joint to the lower wishbone, refer to sub-section DV.4 for further information.

7.Remove the M14 x 105 bolt and M14 torque nut (1) securing the lower end of the damper to the bottom wishbone mounting point. Pull the assembly outwards so that the base of the damper clears the lower wishbone and collect the spacer washers (2) fitted between either side of the lower damper bush and wishbone mounting point, refer to sub-section DJ.6 for further information.

8.Release and remove the M14 x 125 bolt and M14 torque nut securing the lower wishbone to the spherical joint on the hub carrier (135Nm), refer to sub-section DJ.5 for further information.

9.To aid re-assembly, match mark the eccentric cambolt adjuster position at the rearmost inner wishbone pivot mounting point.

10.Once marked, release and remove the M12 nut and M12 x 95 cambolt (1) securing the rearmost lower wishbone pivot to the subframe ensuring to collect the eccentric cam adjusters fitted behind the M12 nut, (torque 86Nm).

11. Release and remove the M12 nut and M12 x 85 bolt (1) securing the forward most lower wishbone pivot point to the subframe (torque 90Nm).

12. Withdraw the lower wishbone from the subframe.

Refitment:
Is the reverse of removal except:

- Only torque tighten the pivot bolts once the vehicle/wishbones are in the ride height position; refer to sub-section DJ.2 for further information.
- Secure the handbrake cable to the inner span of the wishbone using a new cable tie.
- Perform a rear suspension geometry inspection and adjustment, refer to sub-section DJ.2 for further information.
- Refer to sub-section DJ.3 if replacing the wishbone pivot bushes.

Revised Upper and Lower Wishbone Assemblies

◁ Click on arrow to return to previous page

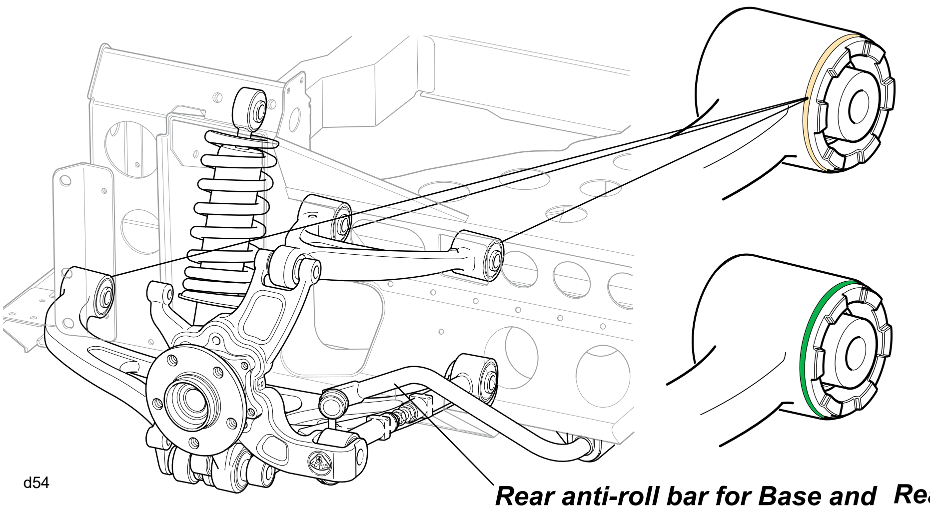
Revised wishbones were introduced specifically for the Evora S, although the wishbone dimensions have not altered, uprated pivot bushes are now fitted resulting in a 10% increase in bush stiffness (see sub-section DJ.3 for further pivot bush information). It is intended to fit these revised wishbones to the base (naturally aspirated manual models) and IPS models as a running change, but in the event that it becomes necessary to replace a rear wishbone, the replacement assembly selected must be correct for that vehicle.

Note: Fitment of an incorrect wishbone assembly may affect the vehicles ride and handling characteristics as well as resulting in anomalous feedback to the vehicles ECU and ABS modules which could affect the correct activation of the Lotus DPM (Dynamic Performance Management) system.

Note: If it is necessary to renew an original level rear wishbone, but assemblies with beige coloured pivot bush inserts are no longer available, then all of the front and rear wishbones must be replaced as a vehicle set with the revised assemblies (with green pivot bush inserts and front upper wishbones with the revised ball joint location).

The vehicles steering and geometry must be adjusted to the revised settings as shown in Service Notes section CK.2 and sub-section DJ.2.

Upper and Lower wishbone identification



Beige coloured pivot bush outer inserts fitted to all mounting points on original upper and lower wishbones.

Green coloured pivot bush outer inserts fitted to all mounting points on revised upper and lower wishbones.

Rear anti-roll bar for Base and IPS models is black in colour and has a 21mm O/D.

Rear anti-roll bar for Evora S is grey in colour and has a 21.5mm O/D.

The part number stamped onto the wishbones cannot be used for identification purposes, but the revised wishbones may be identified by the colour of the rubber material used on both of the inner pivot bushes.

Upper wishbone
Colour of pivot bushes on original wishbones (part number B132D0011F): Beige
Colour of pivot bushes on revised wishbones (part number A132D0059F): Green

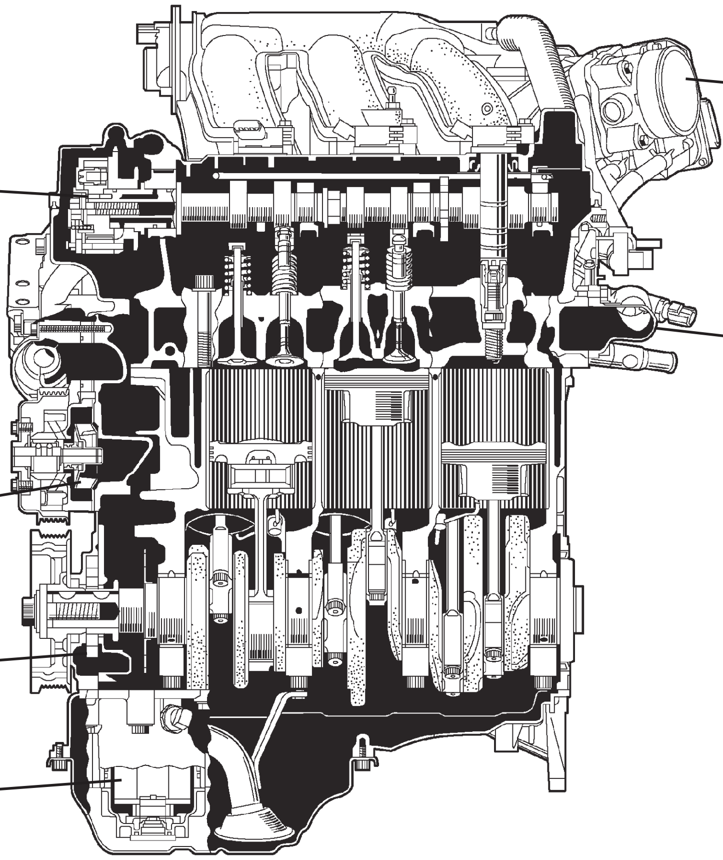
Lower wishbone
Colour of pivot bushes on original wishbones (part numbers B132D4001/2F): Beige
Colour of pivot bushes on revised wishbones (part numbers A132D4037/8F): Green

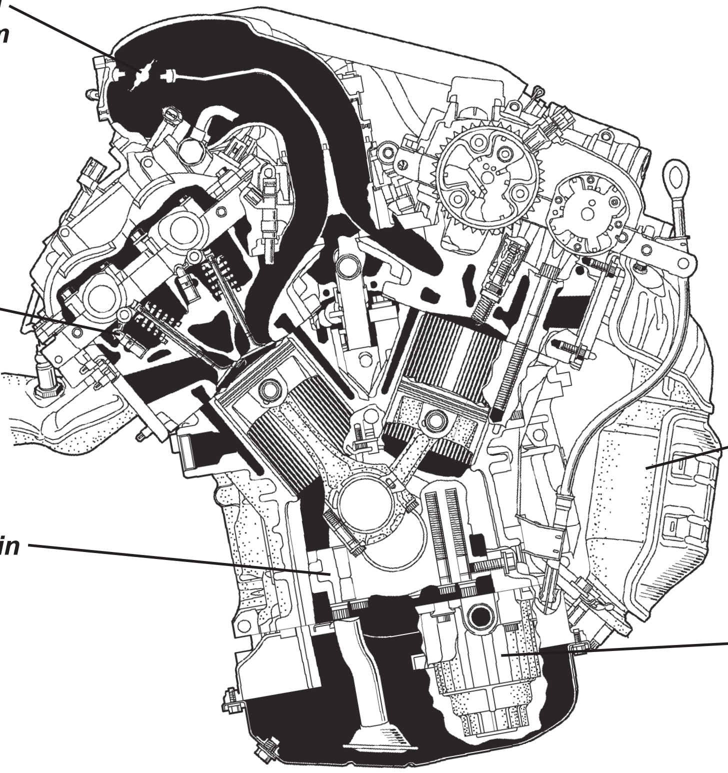
Note: The front and rear steering and geometry settings of any base vehicle fitted with revised wishbone assemblies with green rear pivot bushes is the same as the Evora S and IPS as listed in & service notes section TDU.

ENGINE

SECTION EJ

General Layout





EJ.1 - INTRODUCTION

Terminology
The powertrain of the Evora is mounted transversely, with the crankshaft of the engine running parallel to the rear axle line. The front of the engine is to the right of the engine bay and the rear to the left. When refering to powertrain components, this logic will be used, e.g. the left hand side of the engine is towards the front of the engine bay.

General Description
The 2GR-FE engine fitted to the Evora is supplied by Toyota, and comprises a 3.5 litre 60° V6 unit mounted transversely (front of the engine towards the right) in the 'mid engine' position between the cabin and rear wheel axis. The cylinder block/crankcase and cylinder heads are cast in aluminium alloy with the block featuring an open deck construction and integral cast-in iron liners. The forged steel crankshaft runs in 4 main bearings, with each of the 3 crankpins accommodating two forged steel connecting rods, those of the RH cylinder bank foremost. Each cylinder head houses twin overhead camshafts operating two inlet and two exhaust valves per cylinder, via roller followers mounted in steel fingers, the pivot posts of which provide for zero valve clearances by hydraulic means. The bifurcated ports are arranged with the inlets positioned inside the 'V' and the exhaust ports outboard. The inlet camshafts are driven by a single roller chain from the crankshaft nose, with each exhaust cam driven by a short, link chain from its neighbouring inlet camshaft.

In order to optimise power, economy, emissions and noise, the engine control system includes; dual VVT-i (Variable Valve Timing - intelligent) to provide phase shifting of both inlet and exhaust valve timing; ACIS (Acoustic Control Induction System) to vary the effective intake tract length to the benefit of both high and low speed power output; ETCS - i (Electronic Throttle Control System - intelligent) to facilitate traction control, skid control and cruise control; AICS (Air Intake Control System) to reduce intake noise in the low to mid range of engine speed without sacrificing efficiency at high engine speed. The engine management system is programmed by Lotus using the T6 controller.

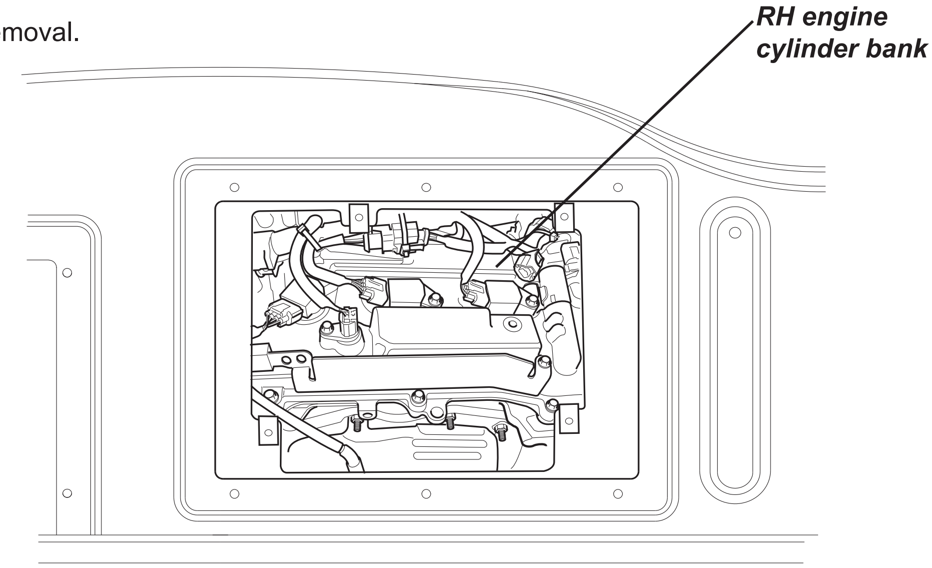
The engine is mated to either a type EA60 6-speed manual or U660E automatic transmission supplied by Toyota, and installed in the engine bay with transmission on the left hand side. Primary mountings for the power unit pick up off the front of the engine and to the top rear of the transmission case, and connect with the suspension towers on the rear subframe via voided elastic isolators. Secondary engine steady mountings are used to control powertrain roll under drive torque and inertia effects, and are fitted low down on either side of the block, attaching to the chassis rear crossmember and to the subframe via elastic isolators.

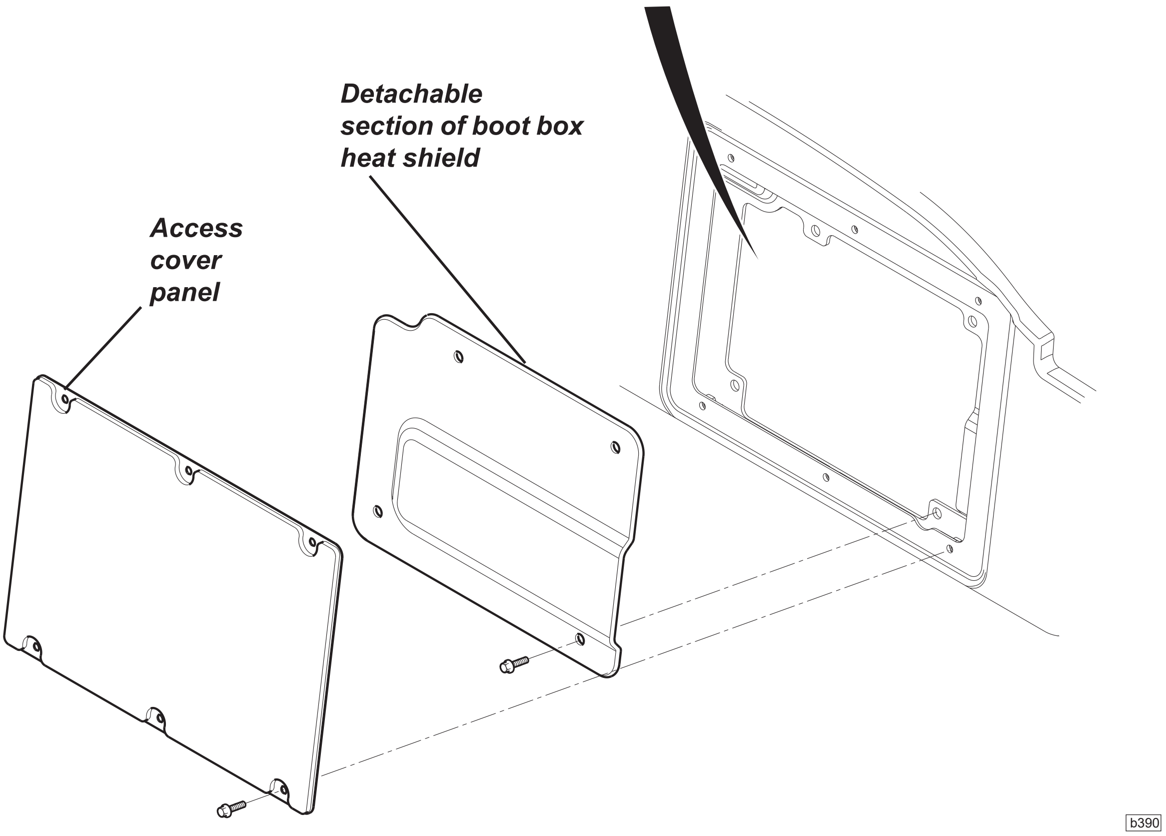
EJ.2 - ENGINE ACCESS PANEL

Located in the rear luggage compartment behind the carpet, this panel can be removed to gain access to the spark plugs in the RH cylinder bank and oxygen sensor on the RH exhaust manifold.

Removal:
1. Release the 6 x fixings securing the access panel to the luggage compartment side wall and remove.
2. Release the 4 M6 x 14 screws retaining the detachable section of the heatshield to bootbox heatshield assembly.

Refitment:
Is the reversal of removal.





EJ.3 - ENGINE OIL MAINTENANCE

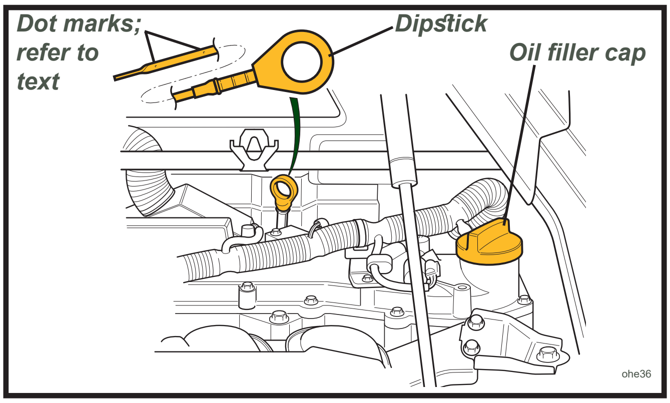
WARNING
- **Engine oil is hazardous to your health and may be fatal if swallowed.**
- **Prolonged and repeated contact with used engine oil may cause serious skin disorders, including dermatitis and cancer.**
- **Use protective gloves to avoid contact with skin as far as possible and wash skin thoroughly after any contact.**
- **Take all suitable precautions to guard against scalding from hot oil and hot surfaces.**
- **Keep out of reach of children.**

Engine Oil Level Check
The engine oil level should be checked regularly, such as every two or three fuel stops. It is especially important to keep a check on the oil level during the car's first 1,000 miles (1,600 km), as the oil consumption will be prone to some variance until the engine components have bedded in.

The best time to check the level is before starting a cold engine, or alternatively, when the oil is warm, such as during a fuel stop. Ensure that the car is parked on a level surface and that a few minutes have elapsed since stopping the engine to allow oil to drain back into the sump. If the engine is run but stopped before reaching normal running temperature, the oil will not readily drain back into the sump, and the dipstick will display an artificially low reading.

Dipstick: The dipstick is identifiable by its yellow loop handle, and is located at the right hand front of the engine.

WARNING
If access to the dipstick is required when the engine is hot, be aware of many hot surfaces including the ducting adjacent to the dipstick itself. Wear appropriate protective clothing to prevent burn injuries.



Withdraw the dipstick, and wipe with a paper towel. Replace the dipstick, if necessary feeding the flexible stem into the tube using the towel, before pressing firmly to ensure that the handle is fully seated. Withdraw the dipstick again to inspect the oil level.

The level should lie between the two dots on the lower end of the dipstick. For optimum engine protection, maintain the level towards the top mark, and do not allow to fall below the mid-point. If driving on a closed circuit track, or exploiting maximum cornering capability, it is especially important to maintain at the upper marking. Adding approximately ½ litre will raise the level from the mid-point to the upper mark.

Topping Up: If topping up is necessary, first remove the engine cover. Unscrew the oil filler cap and add a suitable quantity of the recommended engine oil (see Section TDU) taking care not to spill any oil onto engine or electrical components; use a funnel if necessary.

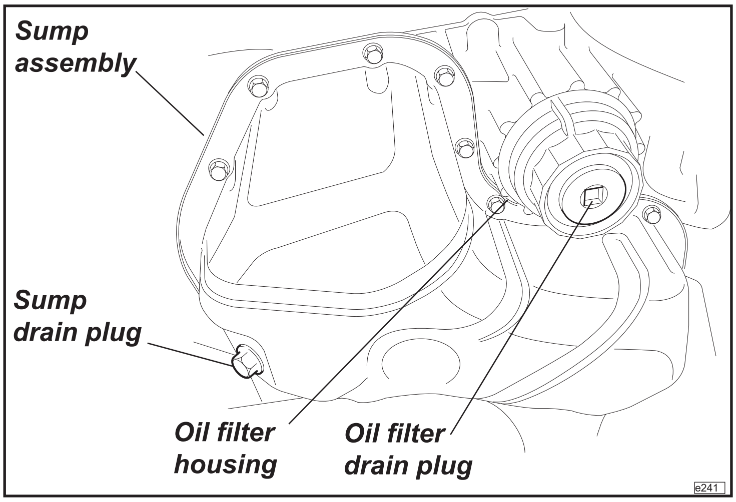
The difference between the top and bottom marks on the dipstick is equivalent to approximately 1.0 litre. Allow several minutes for the oil to drain through to the sump before re-checking the oil level. Do NOT overfill, or lubrication will be degraded and consumption increased as the oil becomes churned and aerated. The catalytic converters may also be damaged by high oil content in the exhaust gas. Refit the filler cap.

Engine Oil Drain Plug & Filter

The engine oil drain plug is located in the base of the pressed steel sump.

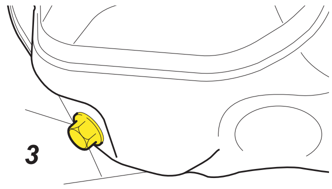
The cartridge type oil filter is mounted at the front of the engine.

The drain plug and oil filter are only accessible only from beneath with the rear undertray removed.



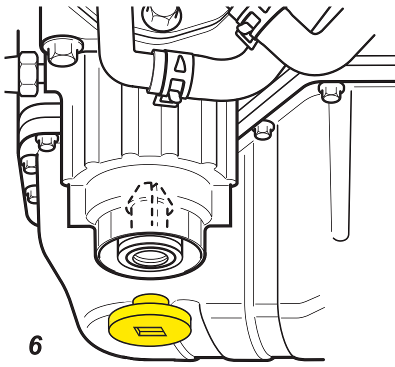
Engine Oil & Filter Change

WARNING
- **Engine oil is hazardous to your health and may be fatal if swallowed.**
- **Take all suitable precautions to guard against scalding from the hot oil.**
- **Prolonged and repeated contact with used engine oil may cause serious skin disorders, including dermatitis and cancer.**
- **Use protective gloves to avoid contact with skin as far as possible and wash skin thoroughly after any contact.**
- **Keep out of reach of children.**



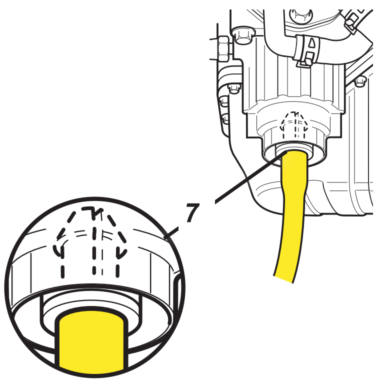
Draining the Engine Oil:

1. Remove the engine bay undertray; refer to service notes introduction section for further information.
2. Place an oil drainer or suitable pan container under the engine.
3. Remove the sump drain plug and allow the oil to drain completely into the drainer/pan.
4. Clean the drain plug and fit a new sealing ring.
5. Refit the drain plug and tightening securely.



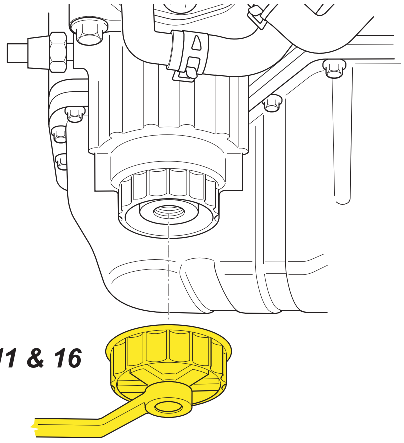
Oil Filter Removal:

6. Unscrew the drain plug from the filter cap and catch the small amount of the oil released into a rag.
7. Connect a length of 15mm internal Ø hose to the plastic drain adaptor supplied with the new filter kit.
8. With the drain plug 'O' ring still in position in the base of the filter cap, insert the drain adaptor into the base of the filter cap, then push upwards until it clicks into position and opens the spring loaded drain valve.
9. Collect the draining oil.
10. Remove the drain tube by pulling sideways and down.



11. Using special filter tool T000T1441F, unscrew the filter cap from the engine mounted filter housing.

12. Discard the filter element and filter cap 'O' ring.



11 & 16

Oil Filter Refitment:

13. Thoroughly clean the filter cap, filter housing (integral to engine) and drain plug.

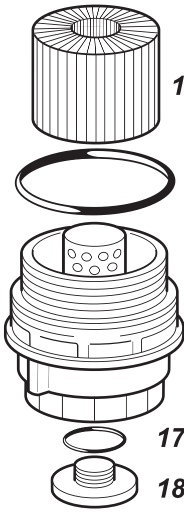
14. Fit the new 'O' ring supplied with the new filter element into the filter cap groove and lubricate with engine oil.

15. Fit the new filter element into the filter cap and install the filter and cap into the filter housing on the engine, ensuring that the 'O' ring does not become displaced.

16. Using special tool T000T1441F, tighten the cap to 25 Nm. Check that there is no clearance between cap and housing.

17. Lubricate the small drain plug 'O' ring supplied with the new filter with engine oil, and fit into the groove in the filter cap.

18. Fit the drain plug and tighten to 13 Nm.

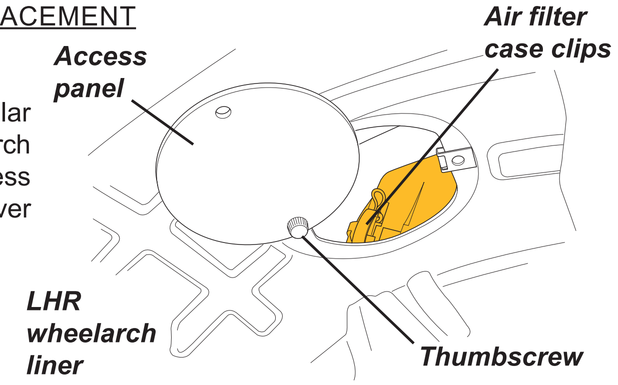


15. Filter element
14. 'O' ring
13. Filter cap
17. 'O' ring
18. Drain plug

Refill with the recommended lubricant (see Section TDU) via the oil filler on the camshaft cover, to the top mark on the dipstick, allowing several minutes for the oil to drain through to the sump before checking the level.

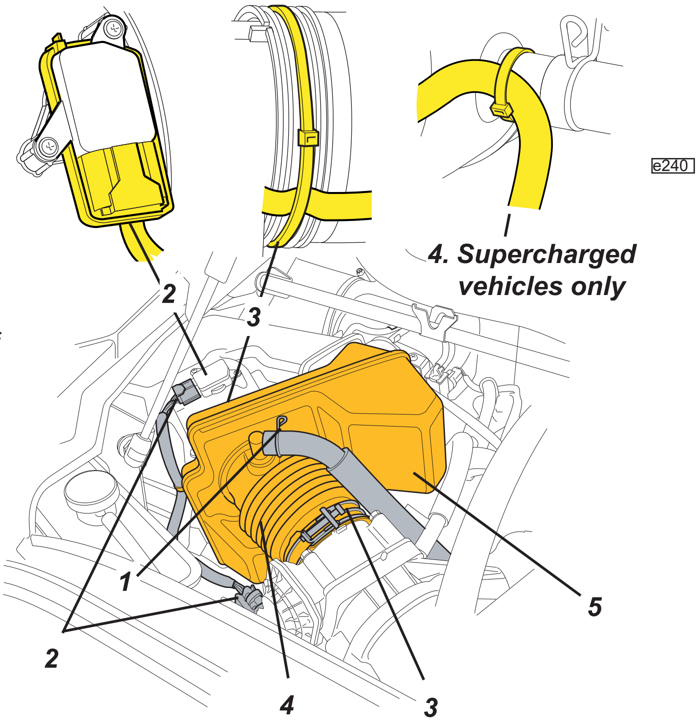
Take care not to overfill. Refit the oil filler cap securely, and check the oil level again when the engine is fully warm.

EJ.4 - AIR CLEANER ELEMENT INSPECTION/REPLACEMENT



Inspection/removal:

Remove the LH rear wheel to gain access to the circular access panel located in the upper underside of the wheelarch liner. Release its two thumbscrews and remove the access panel. (The 2 rearmost airbox clips securing the airbox cover to base clips are now accessible).



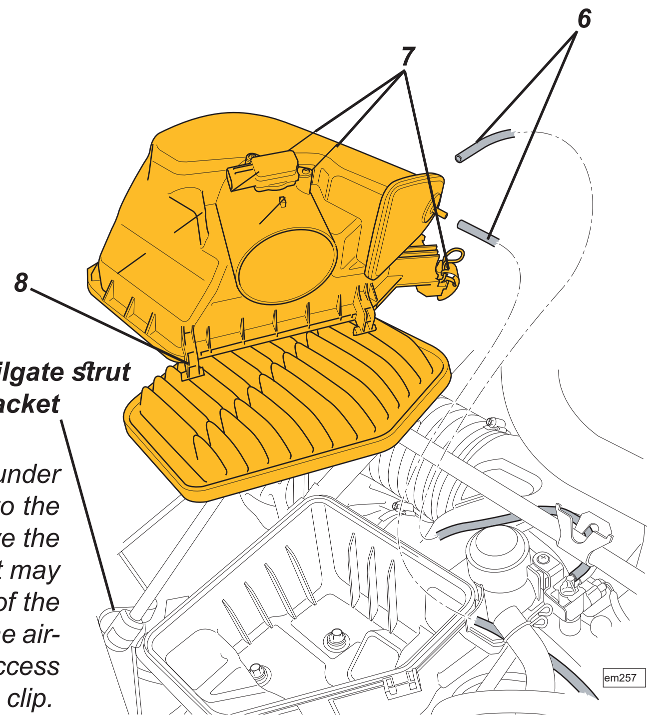
1. Release the rear bank cam cover breather hose from the convoluted intake hose.
2. Unplug the harness connectors from the airflow sensor and throttle body. Note: The TMAF harness connector may be secured to the TMAF sensor, refer to Technical service bulletin TSB 2016/25 for further information. Cut the tie-wrap if fitted.
3. Release the clamps securing the intake hose to both the throttle body and airbox cover outlet. Note: The TMAF harness may be secured with a tie-wrap to the airbox outlet clamp, refer to Technical service bulletin TSB 2016/25 for further information. Cut the tie-wrap if fitted.
4. Push the plenum/hose assemblies' convoluted hose off of the throttle body inlet and airbox cover outlet. Note: For supercharged vehicles The TMAF harness may be secured with a tie-wrap to the engine ventilation hose spigot, refer to Technical service bulletin TSB 2016/25 for further information. Cut the tie-wrap if fitted.
5. The plenum/hose assembly is still partially retained by a tie wrap securing it to engine harness but it can be placed to one side over the rear bank cam cover.
6. Release the two vacuum hoses from the airbox reservoir, one from the intake tract, the other from the intake flap valve solenoid.
7. Release the 3 overcentre clips on the airbox (also see note on refitment).
8. Unhook the airbox cover from the base and withdraw. Thoroughly clean the cover.

Clean around the airbox base before removing the cleaner element, taking care to avoid contaminating the base unit with dust or dirt.

Refitment/replacement:

Re-assembly in reverse order to removal.

If not already done so, it is recommended to secure the TMAF sensor harness with tie-wraps as described in TSB 2016/25.



Note: 2 of the clips are located to the back of the airbox under the clamshell and are not visible. Access is also restricted to the foremost rear clip, if for any reason it is impractical to remove the LH rear wheel to remove the wheelarch access panel then it may be necessary to apply light pressure to the right hand side of the airbox, pushing down on the airbox bracket. This will move the airbox away from the LH tailgate strut bracket allowing enough access between the airbox cover and the strut bracket to fasten the clip.

Airbox casing

Removal:
After removing the upper airbox casing and air filter.

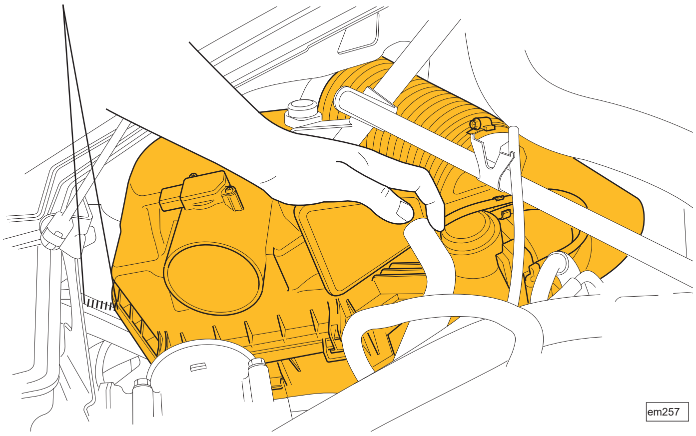
1. Disconnect the harness to the intake flap valve solenoid.
2. Release the fuel hose from the clip retaining it to the side of the lower case.
3. From within the lower case, release and remove the 3 M8x30mm screws securing it to its mounting bracket.
4. It should now be possible to pull the case slightly upwards allowing enough access to detach the fuel hose at its firtree fastener clip which is attached to a bracket located underneath the base of the casing.
5. From above, release the hose clip securing the intake snorkel hose to the airbox main adaptor chamber, and remove the hose.
6. From underneath, release the hose clip securing the intake snorkel hose to the airbox bypass adaptor, and remove the hose.
7. If necessary release the hose clip from the main intake hose and remove the hose from the main adaptor chamber.

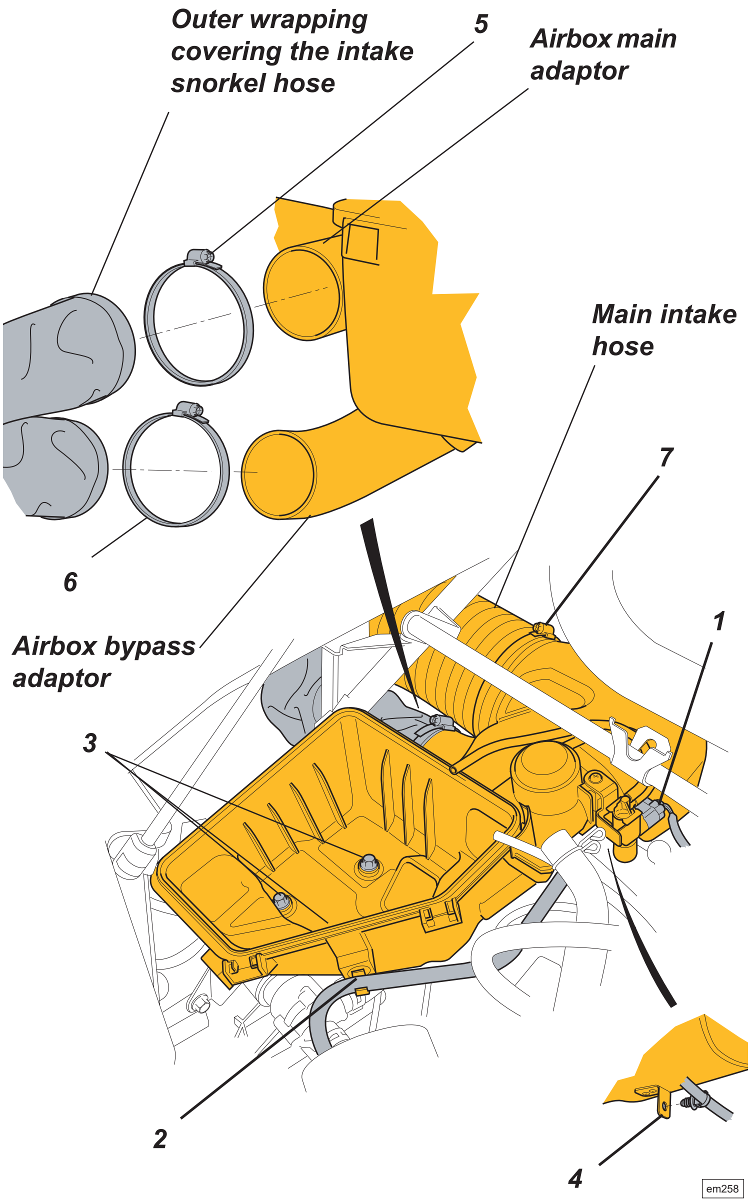
Note: Only necessary if the hose is attached to any other ancillary components in the engine bay, but if not it can be withdrawn with the lower case.

The lower case can now be removed from the engine bay.

Refitment:
Reverse of removal except:

Ensure that the outer wrapping covering the intake snorkel hose is pushed back away from both ends of the hose. This will ensure that the wrapping does not foul the airbox and adaptor inlets when being refitted which may prevent positive fitment of the hose.

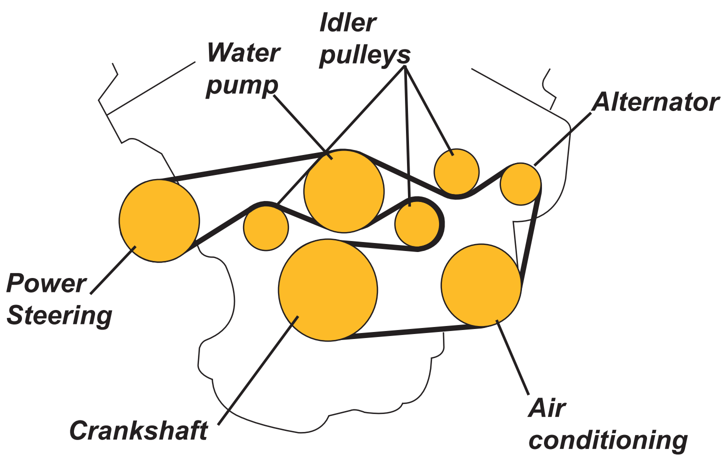




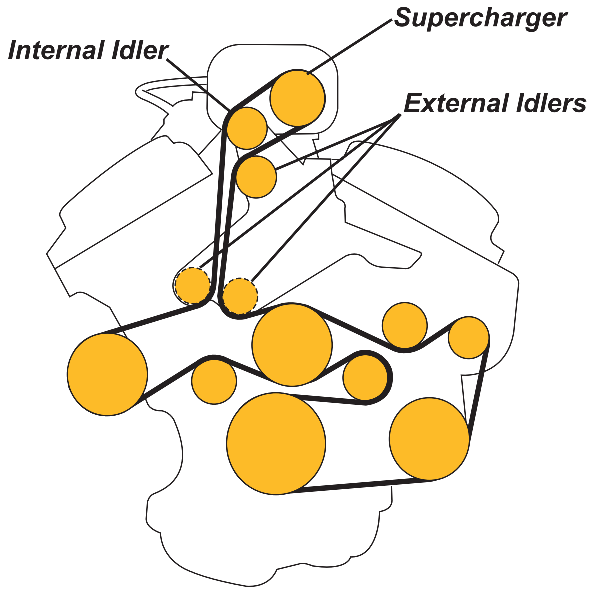
EJ.5 - AUXILIARY DRIVE BELT

A single serpentine multi-rib auxiliary belt is used to transfer drive from the crankshaft nose pulley to the power steering pump, water pump, alternator, a.c. compressor and supercharger assembly (where fitted). An automatic type belt tensioner is provided in the form of an idler pulley mounted on a spring loaded arm. In December 2018, a change interval of 36,000 miles (58,000km)/4 years, (whichever is the soonest) was introduced, but at each service interval, the whole length of the belt, on both the inside and outside surfaces should be examined for any evidence of perishing, cracking, chafing, splitting, tearing, delamination, contamination or other indications of undue wear or deterioration. In any cases of doubt, the belt should be renewed.

Belt run naturally aspirated vehicles

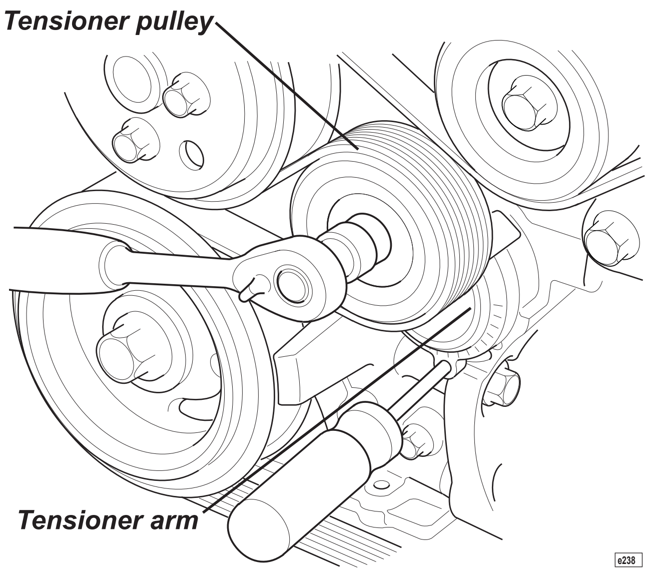


Belt run supercharged vehicles



Auxiliary Belt Replacement

- Remove the rear undertray - see service notes introduction section for further information.
- If the original belt is to be refitted (renewal is recommended), mark the direction of rotation on the belt before removal.
- Using a 14mm hexagonal socket and long bar, rotate the tensioner pulley counterclockwise to relieve the tension on the belt.
- Align the hole in the tensioner arm with the corresponding drilling in the baseplate and insert a 5mm rod or hex key to hold the tensioner in the released position.
- Slide the belt off of the pulleys.



When reinstalling the belt, retain the original direction of rotation, and ensure that the belt ribs are correctly located on each drive pulley, before finally fitting over the tensioner pulley. Rotate the tensioner counterclockwise to relieve tension and remove the locking pin.

EJ.6 - ENGINE REMOVAL/REPLACEMENT

The engine and/or transmission can be removed only as a combined unit, and should be lifted out from above after removing the rear clamshell:

1. *Preparation:* Remove both rear wheels, the diffuser and engine undertray. Remove the rear clamshell (see sub-section BV.6).

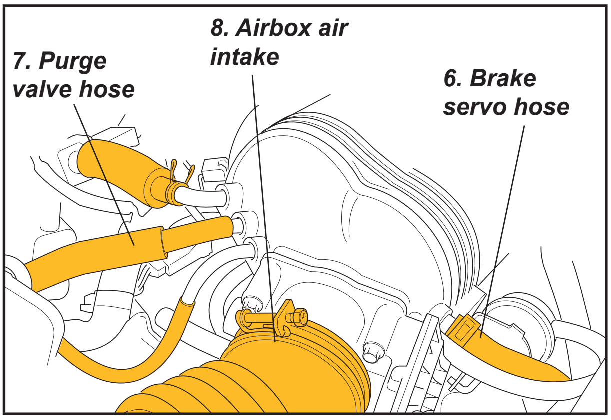
2. *Drain fluids:* Drain the transmission oil and the cooling system. De-pressurise fuel system (see sub-section LN.4). Recover refrigerant gas.

3. *Driveshafts and hub carriers:*
At each side: Remove both LH and RH driveshafts, see Service Notes section FK.5.At each side:

4. *Heat shields:* Drill out the rivets securing the boot box and battery box heatshields from the subframe and remove.

5. *SBMF struts:* Remove both LH and RH struts bracing the Seat Belt Mounting Frame to the subframe to provide better access to the powertrain.

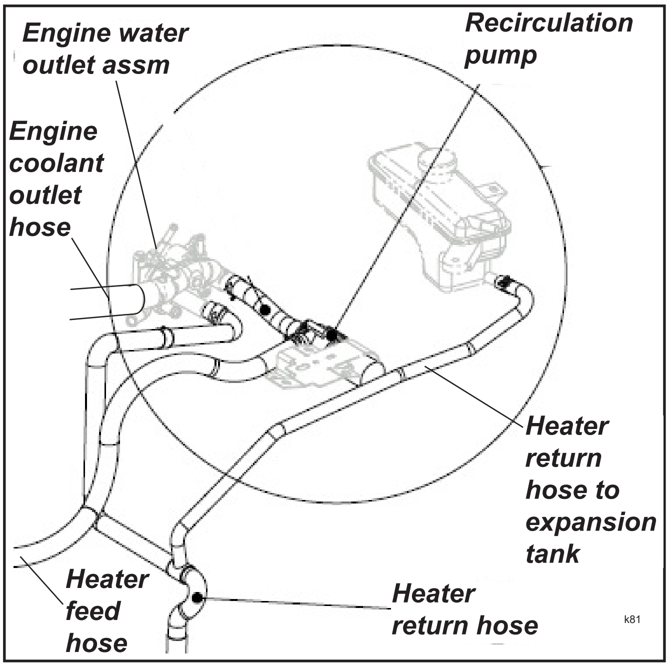
6. *Brake servo:* Release vacuum hose from the engine, and secure all hoses aside.



7. *Purge pipe:* Release the purge valve hose from the inlet plenum (supercharger model shown)

8. *Airbox:* Remove the complete intake air-box together with trunking, see sub-section EJ.3.

9. *Header tank:* Release the header tank bracket from the subframe, release the recirc. pump bracket and hose, heater return hose, radiator return hose.



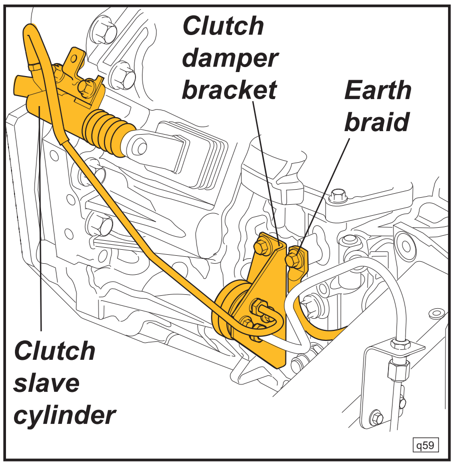
10. *Fuel pipe:* After checking that the fuel system is de-pressurised, and taking suitable precautions to absorb residual fuel, disconnect the fuel feed pipe from the fuel rail, see Service Notes section LN.4.

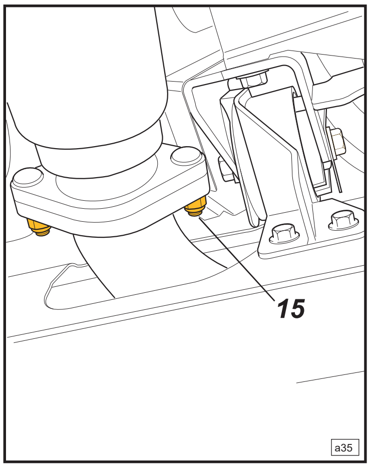
11. *Engine harness:* From the LH rear corner of the cabin, disconnect the engine harness from the ECU and release the adjacent earth braid. Feed the cables and grommet through the rear bulkhead.

12. *Gearchange cables:* Release the gearchange cables from the transmission levers and abutment brackets. Release any cable guides and restraints.

13. *Clutch release:* Remove the 3 M8 x 20 (torqued to 20Nm) securing the clutch damper bracket to the transmission. Remove the 2 M8 bolts (torqued to 12 Nm) securing the clutch slave cylinder to the bell housing. Pull the clutch slave cylinder and the bracket and aside without disturbing the hydraulic line.

14. *Earth braid:* Release the earth braid from the transmission case.





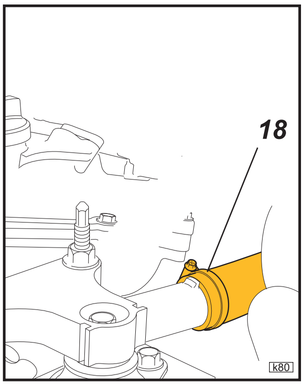
15. *Exhaust:* Release the exhaust downpipe from the catalytic converter.

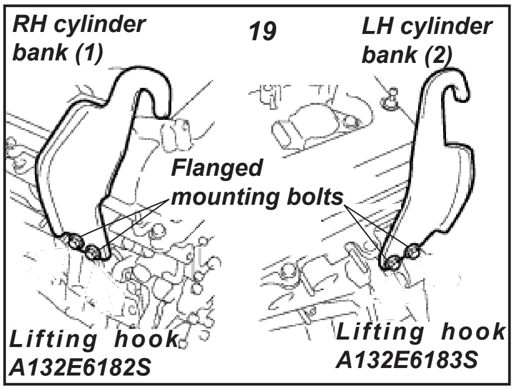
16. *PAS:* Release the feed and return pipes from the PAS pump and collect the draining fluid, see Service Notes section HI.12.

17. *A.C.:* Disconnect the high and low pressure a.c. pipes from the compressor hoses and plug all ports.

18. *Rad. hose:* Release the radiator feed hose from the thermostat housing.

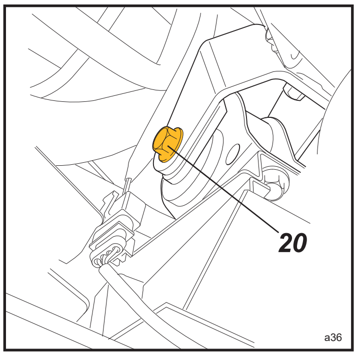
19. *Hooks:* Fit lifting hooks A132E6182S and A132E6183S with mounting bolts A132E6184S to the RH front and LH rear of the engine and support the powertrain on a hoist.

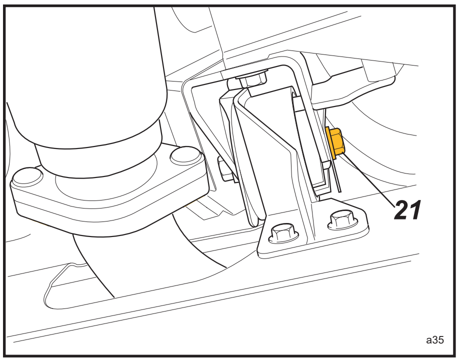




20. *Steady mountings:* Release the bolt securing the front engine mount isolator bush to the chassis bracket (torque 68Nm).

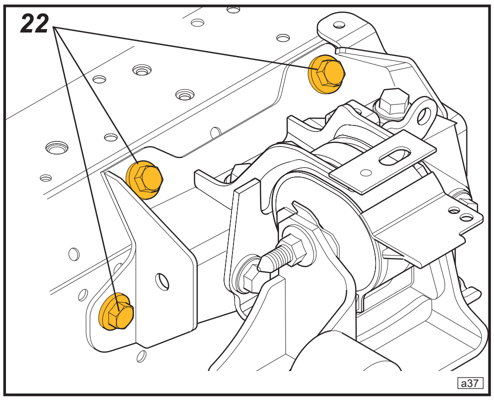
21. *Rear engine mount:* Release the bolt securing the rear transmission insulator bush to the engine mount located at the rear of the subframe (torque 68Nm).

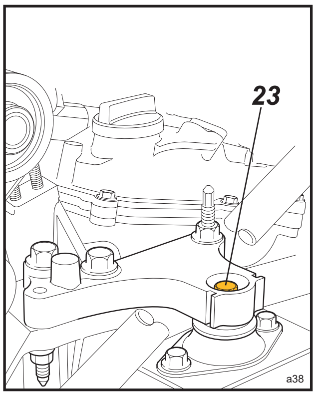




22. *LH engine mount:* Remove the M10 x 25 (4) screws securing the LH engine mounting bracket to the subframe. (Torque 43 - 47Nm).

23. *RH engine mount:* Remove the M10 x 80 bolt securing insulator bracket to subframe mount. (Torque 67 - 73Nm).

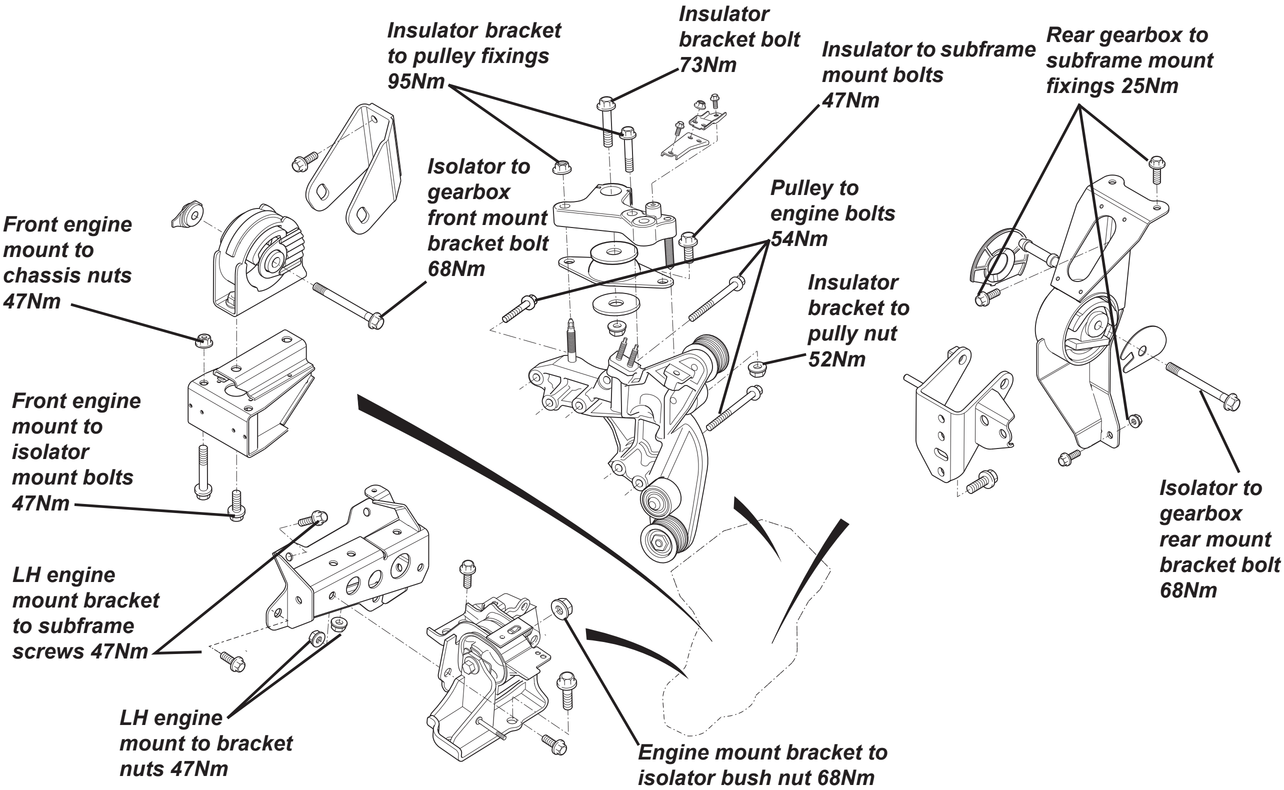




24. *Hoist:* Carefully hoist the powertrain from the chassis, constantly checking for any remaining attachments or snagging. Place the unit on a flat surface and support securely using wooden chocks as necessary.

Powertrain Replacement
To refit the powertrain, reverse the removal procedure, with the following notes:
- Refer to the following torque listing.
- Torque tighten the engine isolator bolts only when all four mountings are secured and the hoist is released.
- Re-charge the air conditioning system (see section PN), refill the power steering and cooling systems, and transmission and engine lubrication.
- After re-assembly of the rear suspension, check camber and wheel alignment.

Engine Mounting Overview



EJ.7 - ENGINE SPECIAL TOOLS

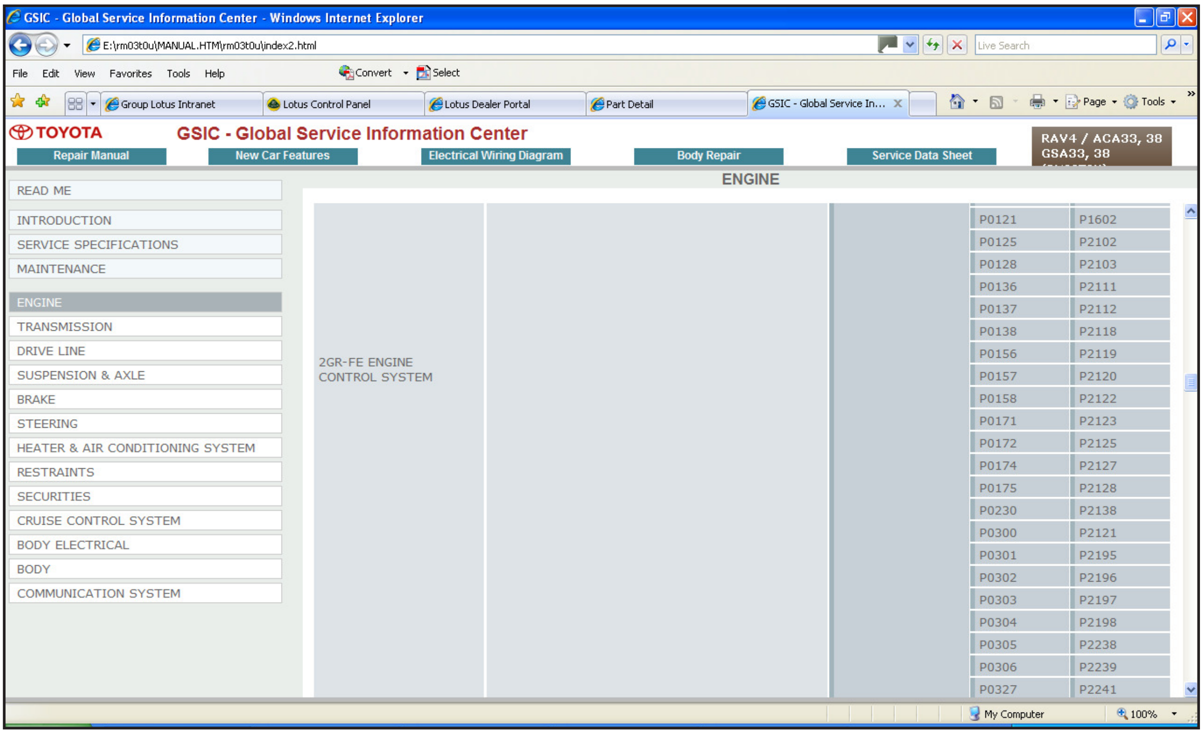
Engine Lifting Hook, RH	A132E6182S
Engine Lifting Hook, LH	A132E6183S
Engine Lifting Hook Bolts	A132E6184S
Wrench Adaptor, oil filter cap	T000T1511S

EJ.8 - ENGINE REPAIR

Engine repair information is contained on CD T000T1516F (Toyota SC03T0U)

Windows XP
Insert disc the Global Service Information Centre will open up the select 'Engine' and from the menu section relating to the 2GR-FE engine, select topic required. Be aware of installation differences for the Lotus application.

From menu section relating to the 2GR-FE engine, select topic required. Be aware of installation differences for the Lotus application.



Windows® 7 onwards
When the CD is used on computers using Windows® 7 or Windows® 10, it will appear to run but will not open, this is because the CD was originally formatted to automatically open on computers using Microsoft® Windows® operating systems up to and including Windows® XP SP1.

Refer to Aftersales publication Isl660, available on the Lotus Dealer Portal which has information on how use the CD on computers using Windows® 7 onwards.

EJ.9 - CYLINDER NUMBERING

Cylinder Numbering - viewed from above:

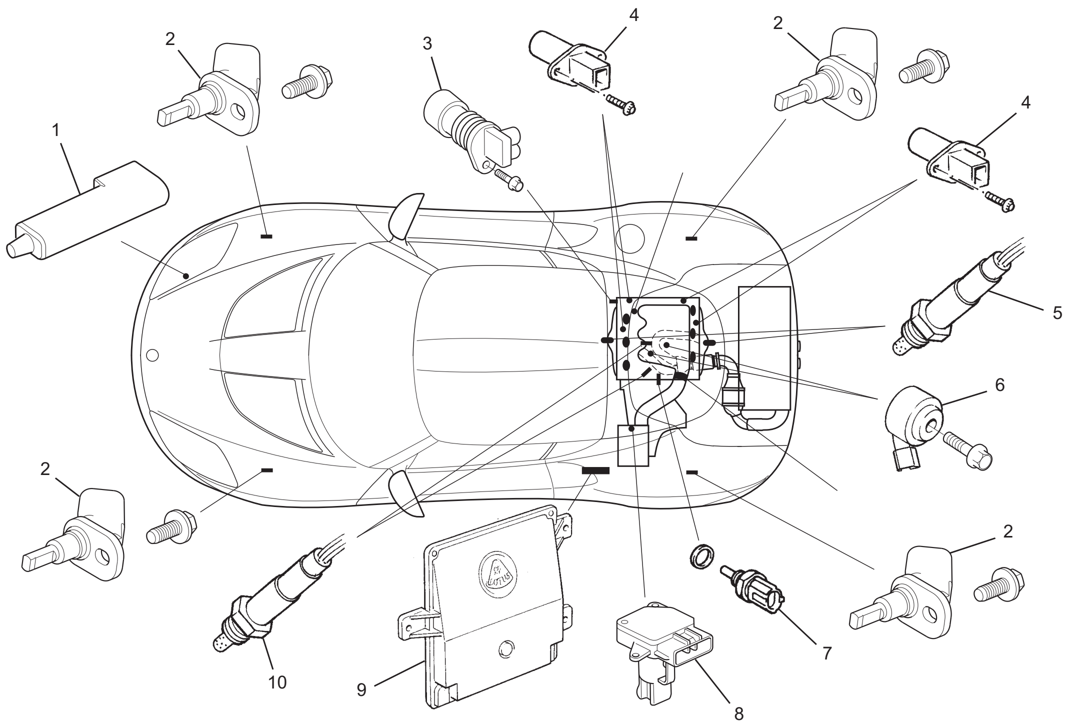
LH cylinder bank (2)

Rear of engine (flywheel end)				***Front of engine (auxiliary drive belt end)***
LH bank	***6***	***4***	***2***	
RH bank	***5***	***3***	***1***	

RH cylinder bank (1)

Firing order: 1 2 3 4 5 6

EJ.10 - ENGINE MANAGMENT COMPONENT LOCATION



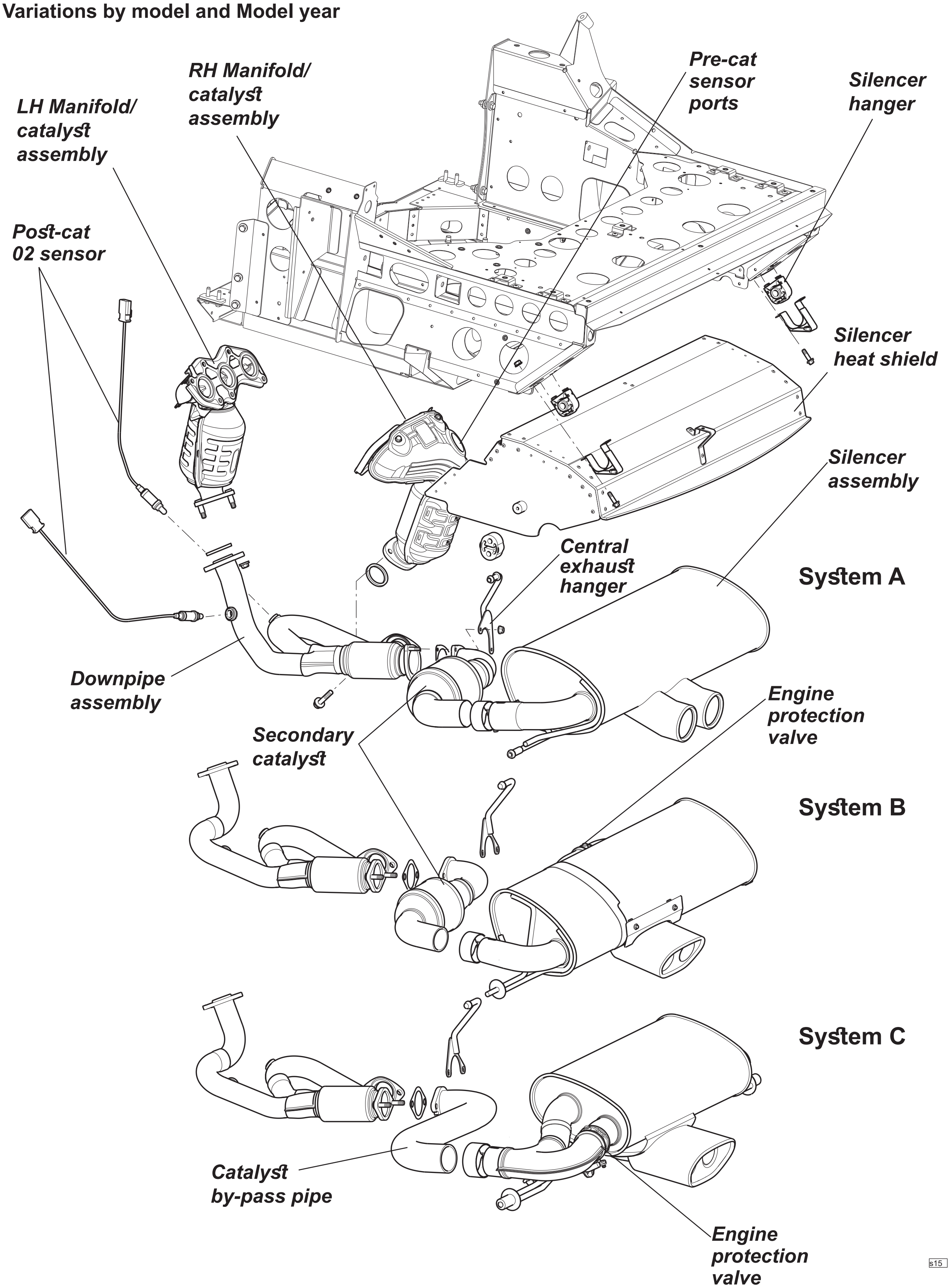
Key to engine management component location drawing

1. Ambient air temperature sensor (located in the radiator lower duct panel).
2. Wheel speed sensors.
3. Crankshaft position sensor.
4. Camshaft position sensor.
5. Pre-catalyst oxygen sensors.
6. Knock sensor.
7. Coolant temperature sensor.
8. Air intake flow meter.
9. Electronic Control Module (ECM).
10. Post-catalyst oxygen sensor.

Further information regarding the location of engine management sensors and diagnostic codes is available in section EMR. Refer to CD: T000T1516F for replacement procedures for any engine management component that is attached to the engine assembly.

EJ.11 - EXHAUST SYSTEM

Variations by model and Model year

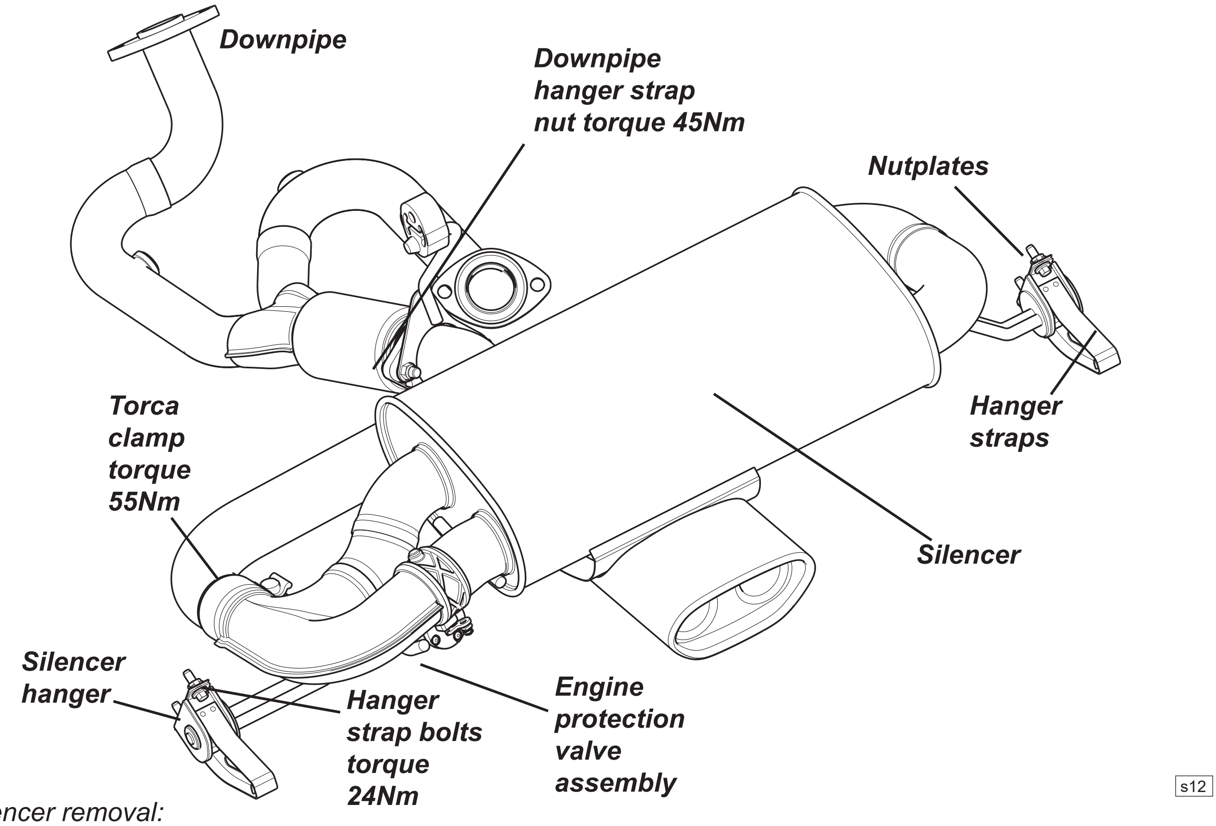


System A - Start of production naturally aspirated vehicles
An exhaust manifold with integral catalytic converter is bolted onto both cylinder heads. Pre-cat O2 sensors are bolted onto the top surface of both manifolds.
Post-cat sensors are bolted into a twin branch downpipe routed underneath the engines sump assembly which links both manifolds to a single secondary under floor catalytic converter.
The secondary catalytic converter is connected to the exhaust silencer inlet pipe.
A heatshield assembly is fitted above the rear silencer assembly to provide thermal protection to the underside of the rear clamshell.

System B - Supercharged variants (Pre-12MY)
The exhaust silencer incorporates an exhaust silencer flap operated by an integrally mounted vacuum by-pass valve controlled by a solenoid mounted to the rear subframe, below the battery tray, regulating vacuum produced via the vacuum chamber within the air box. When this valve is open the exhaust gas passes through only a small section of the silencing system before exiting the tailpipes and with the reduced back pressure this offers, allows the engine to generate full power.

System C -12MY vehicles
For non federal vehicles the secondary under floor catalytic converter is replaced with a link pipe joining the exhaust downpipe to the silencer assembly. The removal of main catalytic converter reduces exhaust back pressure as well as enhancing engine noise characteristics

A modified version of the exhaust silencer incorporating an exhaust silencer E.P. (engine protection) valve fitted to the ‘11my Evora S is now be fitted to all ‘12my vehicles as standard equipment to all markets regardless of the induction or transmission system fitted.



Silencer removal:

1.Remove the undertray/diffuser assembly – see Service Notes introduction section.

2.Disconnect the engine protection valves vacuum hose (if Engine Protection Valve fitted) from the actuator and position it away from any potentially hot components that may damage it.

3.Loosen the downpipe to silencer Torca clamp bolt.

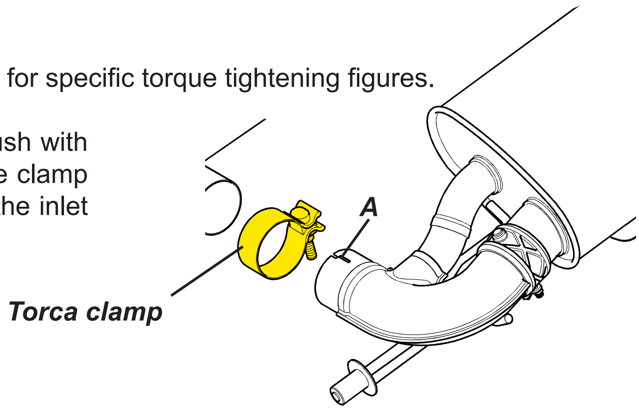
4.Taking care to support the silencer, remove the 4 M8 x 20 bolts securing the exhaust hanger straps to the subframe and retrieve their nutplates positioned on the other side of the subframe.

5.If necessary use a twisting/pulling motion to free the silencer from the downpipe and remove from the vehicle.

Refitment:

Is the reverse of removal, please see illustration above for specific torque tightening figures.

Note: for 'Slip' type clamps, position the new clamp flush with the end of the silencer inlet pipe and orientate with the clamp bolt/split in between the upper and lower slots (A), in the inlet pipe.



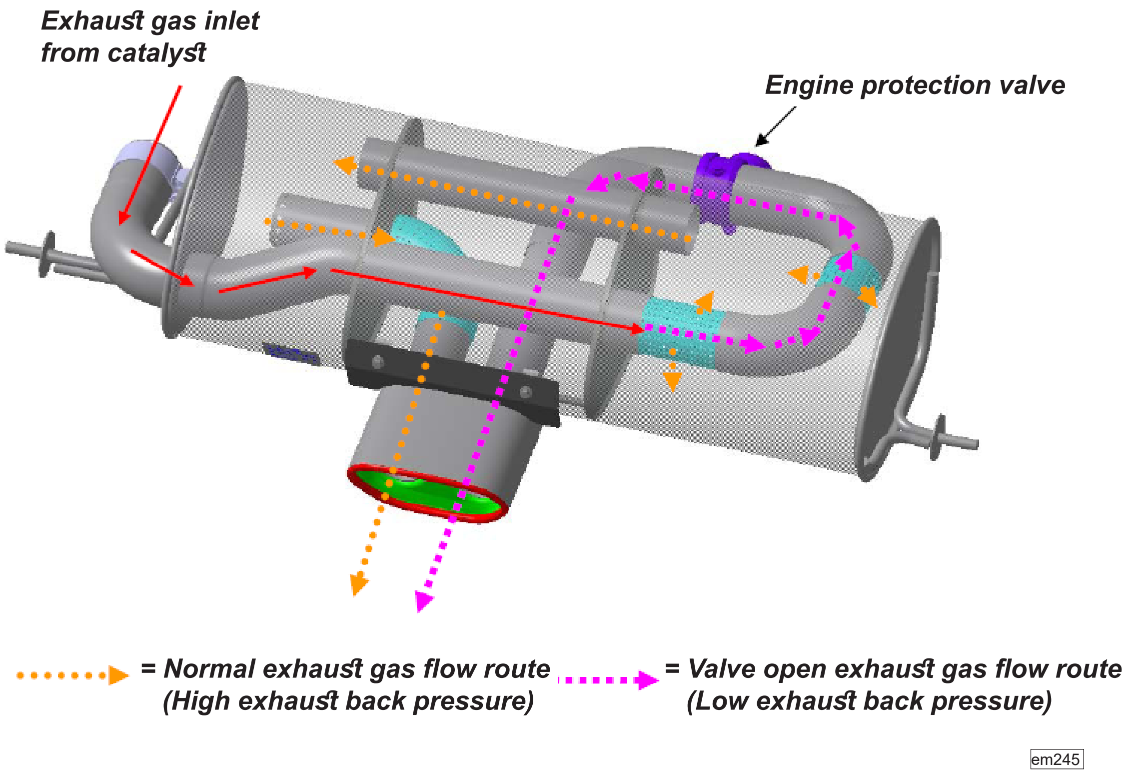
Torca Clamps

If the original exhaust system is removed and refitted for any reason (such as to gain access to other ancillary components etc), then any Torca slip or coupler clamps previously loosened/removed must be renewed to ensure the continued integrity and security of the pipe joints, EVEN IF EXHAUST SYSTEM COMPONENTS ARE NOT BEING RENEWED. Reusing a Torca type clamp may cause the pipe joints to loosen after a period of driving, resulting in exhaust system misalignment, gas leakage etc. Refer to Technical Service Bulletin TSB 2019/07 for further information.

EJ.12 - ENGINE PROTECTION VALVE

Pre-'12MY Supercharged vehicles

The Supercharger exhaust features two silencing routes for exhaust gases to flow through, depending upon the type of driving and mode selected.



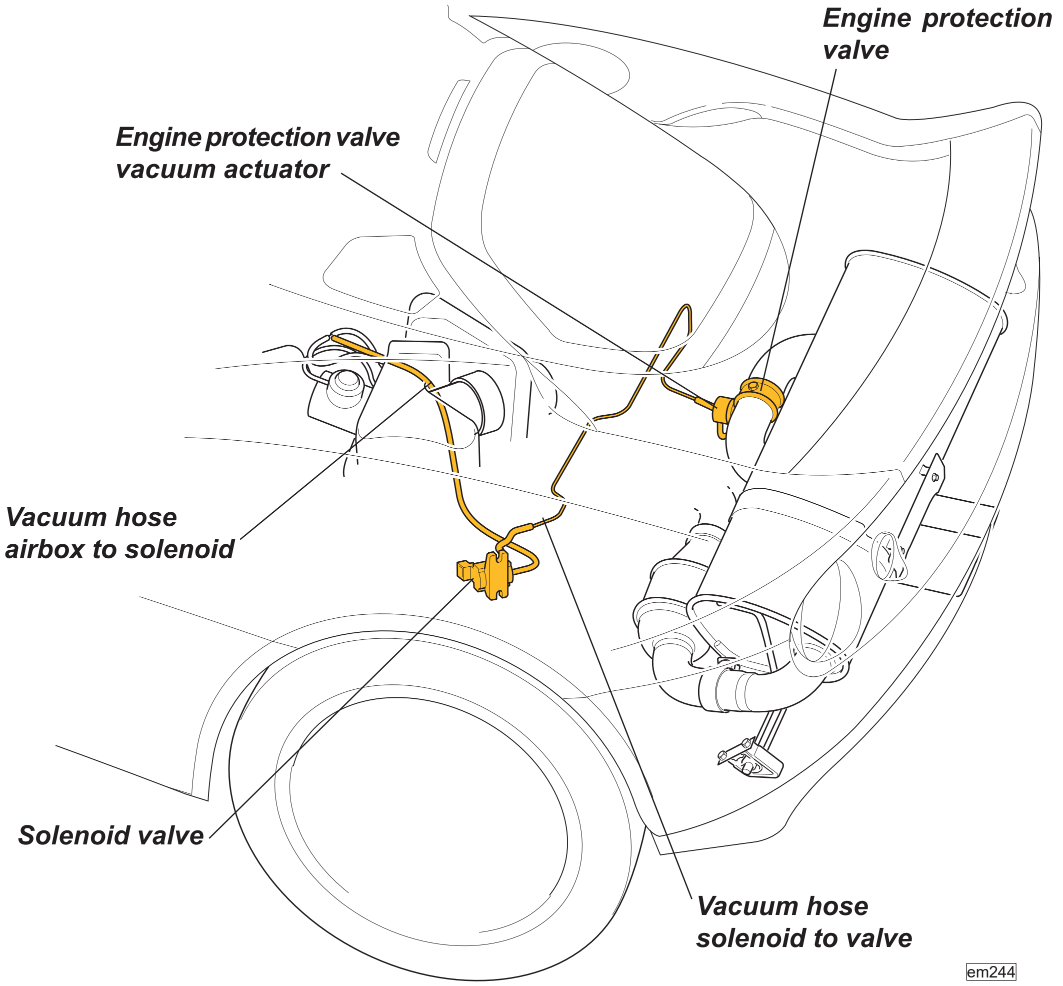
The exhausts primary flow path is through a multi chamber silencing system designed to reduce noise emissions from the exhaust gas. This silencing system generates excessive back pressure at higher engine rpm (and power) which could damage the engine. Therefore, Lotus has engineered a second flow path (by-pass system) that is controlled by a valve. When this valve is open the exhaust gas passes through only a small part of the silencing system before exiting the tailpipes and with the reduced back pressure this offers, allows the engine to safely generate full power. This valve is known as the Engine Protection Valve (EP Valve).

The operation of this EP Valve is controlled by the engine management system, via a solenoid controlled vacuum system. The EP valve is sprung open, and during normal usage the vacuum is applied to the valve to close it. The vacuum generated in the intake system is stored in a vacuum reservoir in the air intake cleaner until it is needed.

Vehicles with a sports button, when activated, will change to operation parameters of the valve, allowing it to be open more of the time. This sports button is not intended for normal usage.

The EP valve has a spring to ensure that it fails open, to protect the engine, in the case of disrupted vacuum feed to the valve.

Nominally the valve remains closed up to 4700 rpm in normal operation, however it is open all the time when the sports button is depressed.



Exhaust Protection Valve
The EP valve flap housing is integrally mounted to the exhaust systems bypass pipe and is not serviceable. Failure of the flap valve will require the renewal of the exhaust silencer assembly.

Testing the EP Flap
Before testing ensure that the exhaust is not hot and use any personal protective equipment as required.

The EP flap should be free to rotate within the bypass assembly. Disconnect the vacuum hose from the actuator and using light finger pressure attempt to rotate the flaps spindle arm. The spindle/flap should be free to turn within the bypass housing. If excessive force is required to rotate the flap within the housing then the rear silencer assembly will require replacement.

Solenoid Valve
The valve is mounted to the inner rear LH of the rear subframe by 2 M5 screws. The unit is powered via the rear ignition relay and activated by the Engine Control Unit (ECU).

Vacuum is drawn through the solenoid valve to the vacuum actuator assembly via a hose and ‘T’ piece connected between the vacuum switching valve to the air intake box vacuum reservoir hose.

Vacuum generated by the intake system overcomes the spring pressure within the vacuum actuator assembly closing the flap within the Exhaust Protection (EP) valve.

Vacuum Testing the Actuator
- Disconnect the vacuum hose from the actuator assembly.

- Connect a suitable vacuum tester to the actuator vacuum port and apply vacuum.
- The valve must close with a vacuum of less than -450mb applied to the actuator.
- The valve should remain closed with the vacuum applied.

If the actuator fails to operate the EP valve or fails to retain vacuum then it must be replaced.

If the EP valve and actuator are operating normally other sources of minor vacuum leaks or failure must be investigated such as:

- Inadequate sealing of the vacuum hoses or air intake plenum.
- Incorrect operation of the vacuum solenoid valve.
- Incorrect operation of the vacuum switching valve.

Actuator Valve Replacement

At its introduction as fitted to the '11MY Evora S, the EPC vacuum actuator was fixed directly to valve housing with 3 rivets and was supplied only as part of the supercharged exhaust silencer assembly.

Although it is possible to separate the vacuum actuator from the valve housing in situ by using a right angled drill to remove the rivets, this will irreparably damage the assembly and it will be necessary to replace it.

In the event that it is necessary to renew the original production vacuum actuator an Aftersales service level replacement is available which can bolted directly onto the valve housing, (please see exhaust section of Service Parts List for part number).

1. Remove the rear undertray/diffuser assembly (see introduction section for further information).

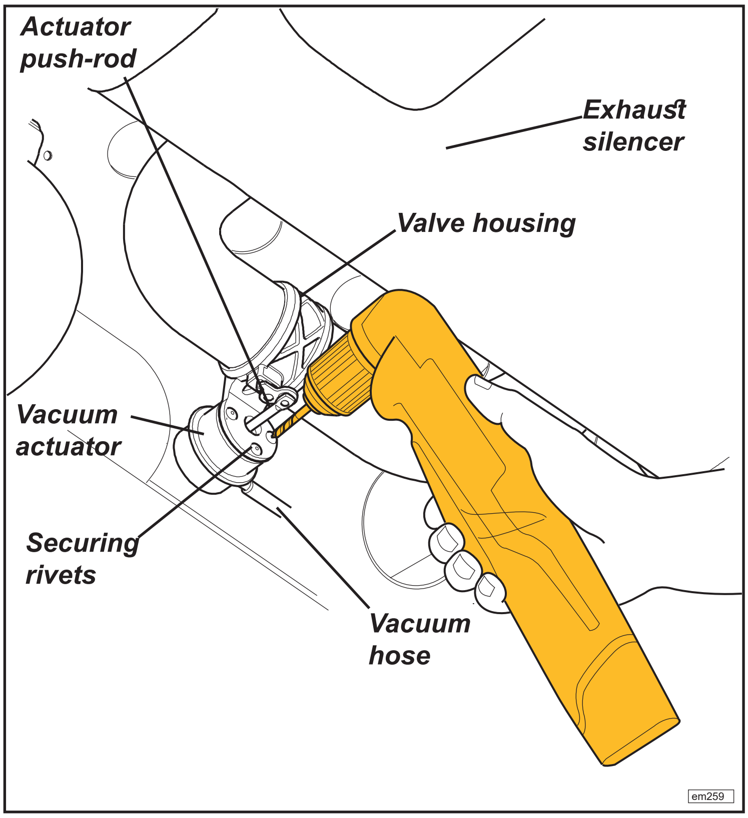
   Ensure you are wearing appropriate personal protection equipment suitable for working around a potentially hot exhaust system.

2. Remove the 'E' clip securing the actuator pushrod to the valves rod lever arm (please retain safely as it will be refitted to service level assembly).

3. Disconnect the vacuum hose from the actuator and position it away from any potentially hot components that may damage it.

4. Using a suitable right angled drill and bit, drill out the 3 rivets securing the actuator to the valve assembly.

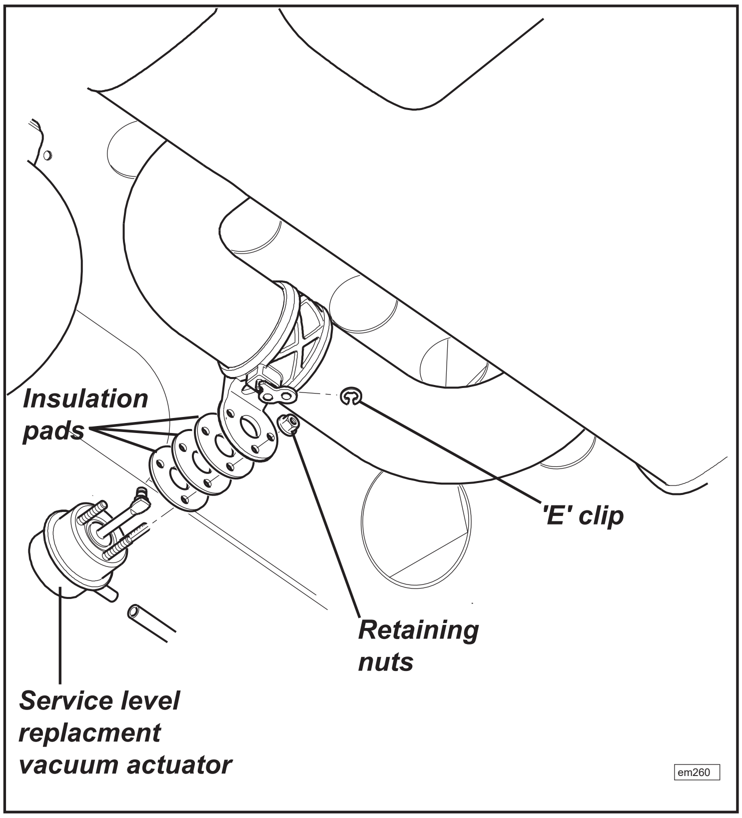
5. Discard the old actuator valve.



Refit the service replacement valve

Refitment is reverse of removal excepting:

- Ensure that the 3 heat insulation pads supplied with the valve are fitted between the actuator and valve body assembly.
- Slide the 3 integral studs in the actuator body through the drilled out rivet holes in the valve body.
- Fit the 3 x M4 nuts supplied in the kit to the studs and tighten
- Refit the 'E' clip to actuator rod and valve rod lever arm
- Refit the vacuum valve
- Refit undertray assembly

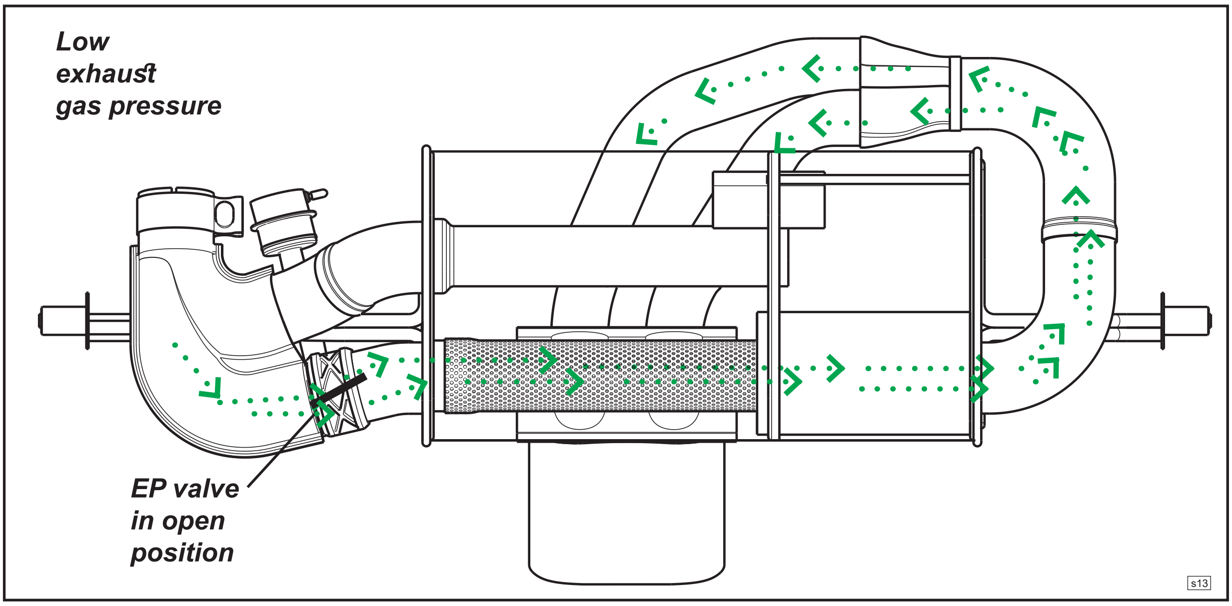


Engine Protection Valve -'12MY vehicles
Post-cat sensors are bolted into a twin branch downpipe routed underneath the engines sump assembly which links both manifolds to a single exhaust silencer inlet which in turn branches into 2 separate inlet pipes (1 loud and 1 quiet) before entering the silencer body.

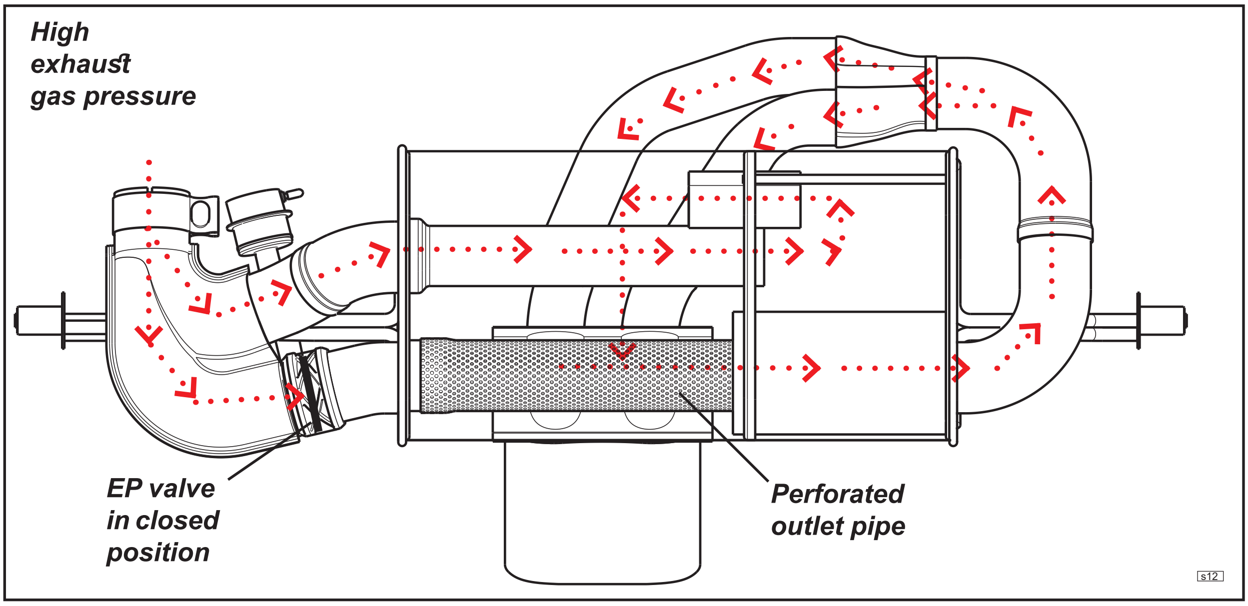
Exhaust gases flowing through the 'quiet' inlet pipe enter the resonator chambers of exhaust silencer before exiting via a single outlet pipe which in turn branch off into 2 tailpipes

Exhaust gases flowing into the 'loud' inlet pipe are normally restricted from entering the silencer by an integral flap valve assembly referred to as the Engine Protection Valve which in normally defaulted to the closed position. See section EM.11 for further information.

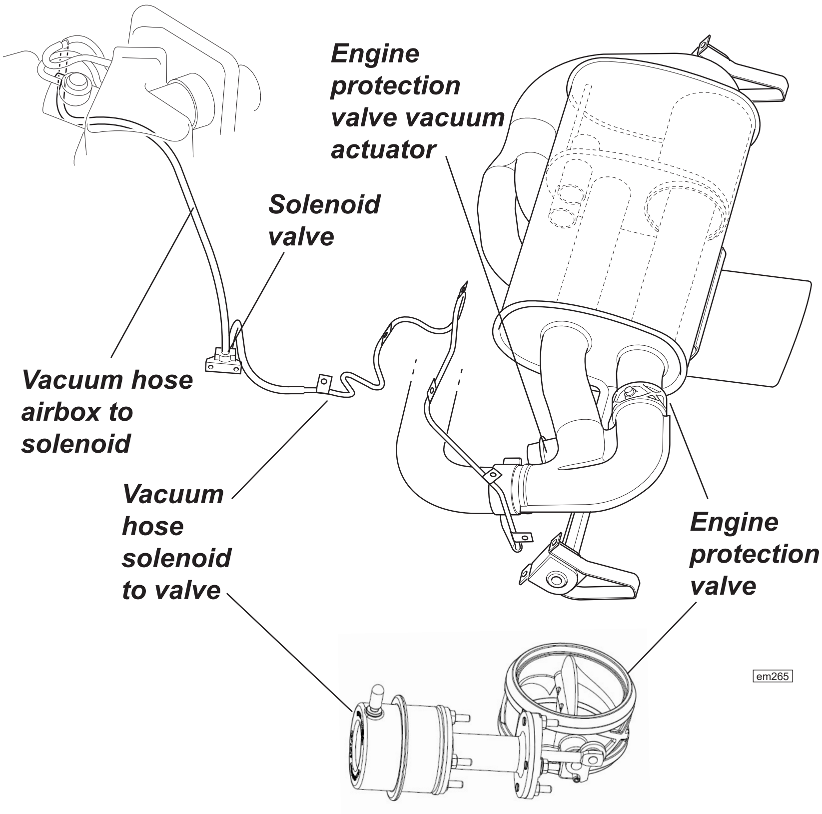
The exhaust features two silencing routes for exhaust gases to flow through, depending upon the type of driving and mode selected.



The exhausts primary flow path is through a multi chamber silencing system designed to reduce noise emissions from the exhaust gas. This silencing system generates excessive back pressure at higher engine rpm (and power) which could damage the engine. Therefore, Lotus has engineered a second flow path (by-pass system) that is controlled by a valve.



When this valve is open the exhaust gas passes through only a small part of the silencing system before exiting the tailpipes and with the reduced back pressure this offers, allows the engine to safely generate full power. This valve is known as the Engine Protection Valve (EP Valve).



The operation of this EP Valve is controlled by the engine management system, via a solenoid controlled vacuum system. The EP valve is sprung open, and during normal usage the vacuum is applied to the valve to close it. The vacuum generated in the intake system is stored in a vacuum reservoir in the air intake cleaner until it is needed.

Actuator Valve

In the event that it is necessary to renew the original production vacuum actuator an Aftersales service level replacement is available which can bolted directly onto the valve housing,

Removal:

1. Remove the rear undertray/diffuser assembly (see introduction section for further information).

2. Ensure you are wearing appropriate personal protection equipment suitable for working around a potentially hot exhaust system.

3. Remove the ‘E’ clip securing the actuator pushrod to the valves rod lever arm (please retain safely as it will be refitted to service level assembly).

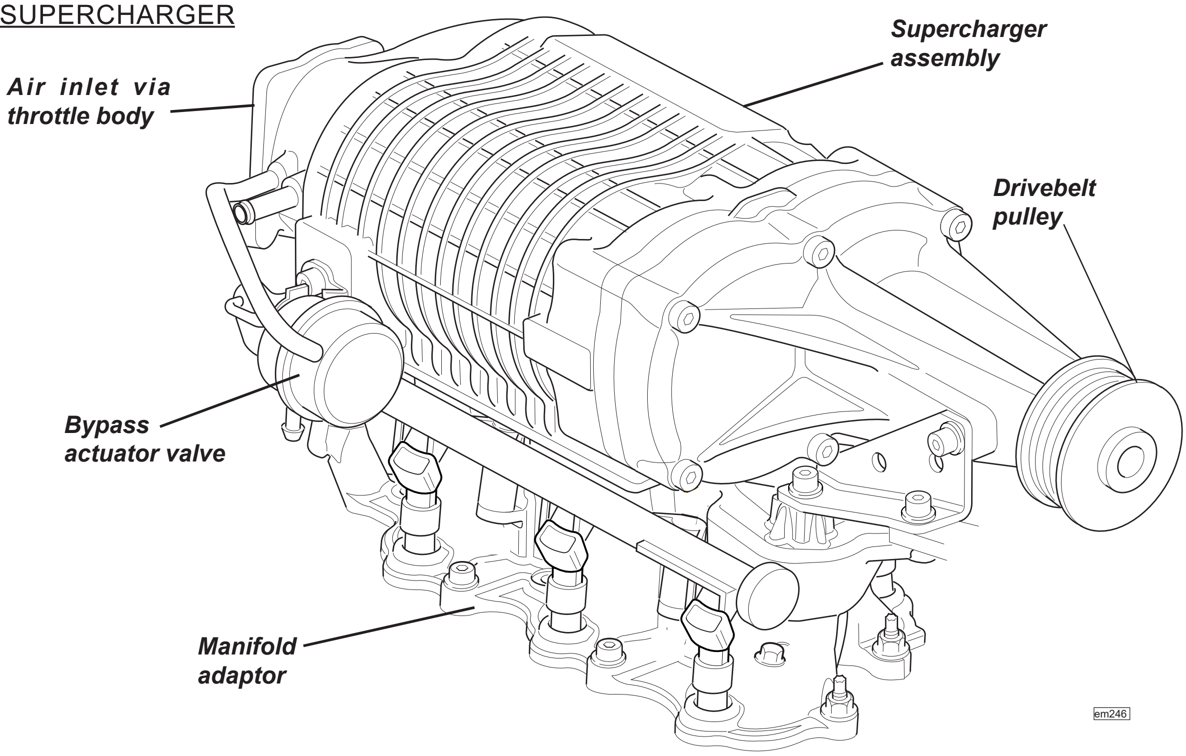
4. Disconnect the vacuum hose from the actuator and position it away from any potentially hot components that may damage it.

5. Remove the 3 M4 nuts securing the vacuum actuator assembly to the extension housing and remove.

Refitment:

Refitment is reverse of removal.

EJ.13 - SUPERCHARGER



The Evora S uses the same Toyota 2GR-FE engine unit as the base Evora, but is equipped with a Harrop HTV1320 supercharger package utilising Eaton TVS technology™ .The supercharger is supplied with a lower manifold adaptor bolted to the engine cylinder heads. Boost pressure is regulated to a maximum of 0.5 bar by a vacuum controlled integral by-pass actuator valve. The supercharger, used in conjunction with higher flow fuel injectors, uprated fuel pump, revised spark plugs and engine management program has increased the net power output to 345 bhp @ 7000 rpm with 400 Nm of torque @ 4500 rpm. The supercharger is driven via an increased length auxiliary drive belt with new bracket/idler assembly fitted to the engine to accommodate the revised configuration.

The air filter, air box and sensors remain unchanged except for the plenum/hose assembly which is not fitted to ‘S’ model because the ‘S’ engine is pressure charged whereas the naturally aspirated engine requires the intake plenum hose to act as a resonator. The supercharger assembly cannot be serviced or repaired. The only items that can be replaced are the vacuum bypass valve, valve hose, inlet manifold adaptor and adaptor gasket. Failure of the supercharger assembly will require its complete replacement.

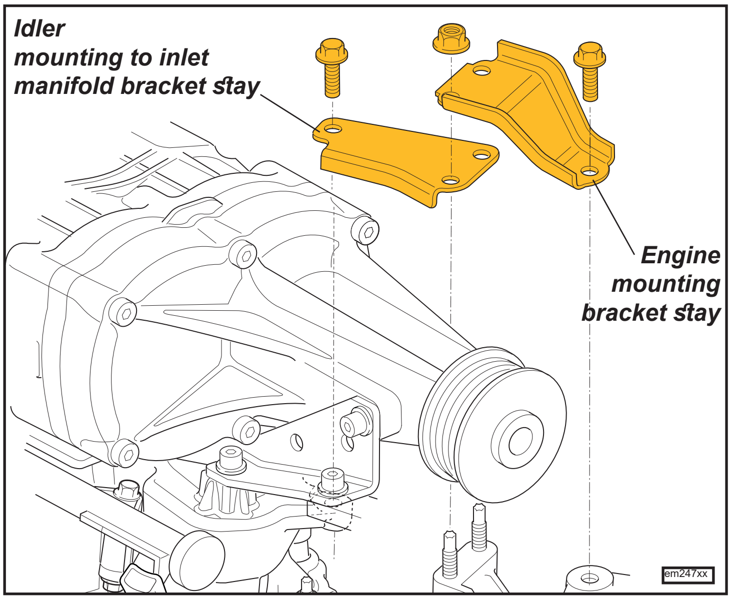
Supercharger Remove/Refit

To remove:

1. Depressurise the fuel system (see sub-section LN.3).

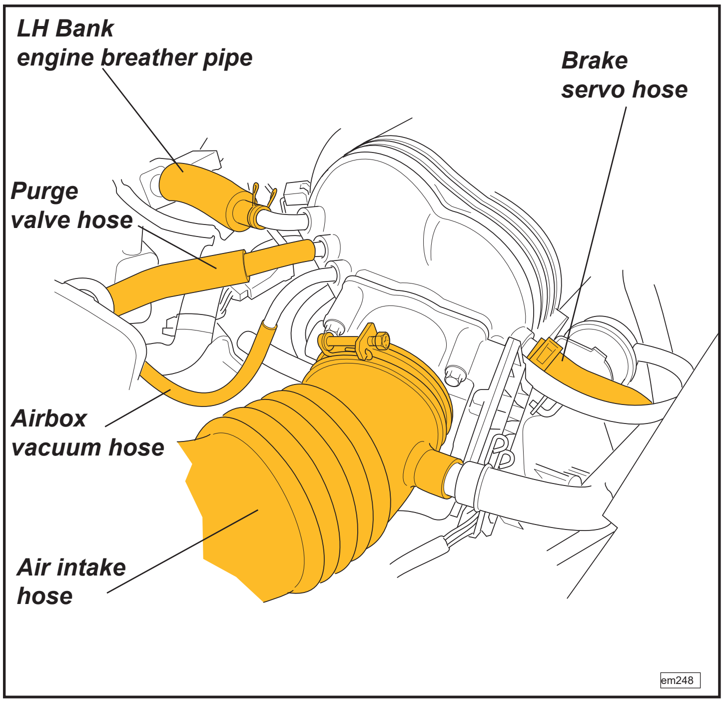
2. Remove auxiliary drive belt from supercharger pulley (see sub-section EJ.4).

3. Remove the stay brackets securing the inlet manifold to the RH engine mounting assembly (bolt & nut torques are 25 Nm).

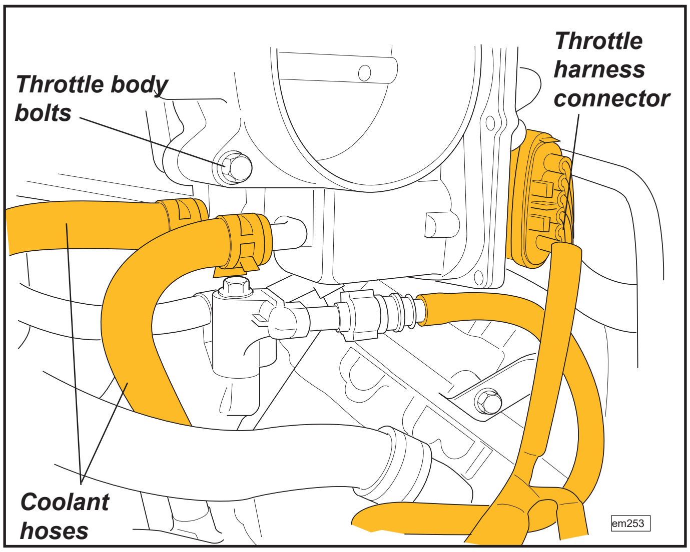


4. From the intake side of the supercharger plenum disconnect:

- Engine breather pipe to the LH cylinder head bank 2.
- Purge valve hose.
- Vacuum hose to airbox.
- Air intake hose to throttle body (also disconnecting RH cylinder head bank 1 engine breather pipe.
- Braking system servo hose.

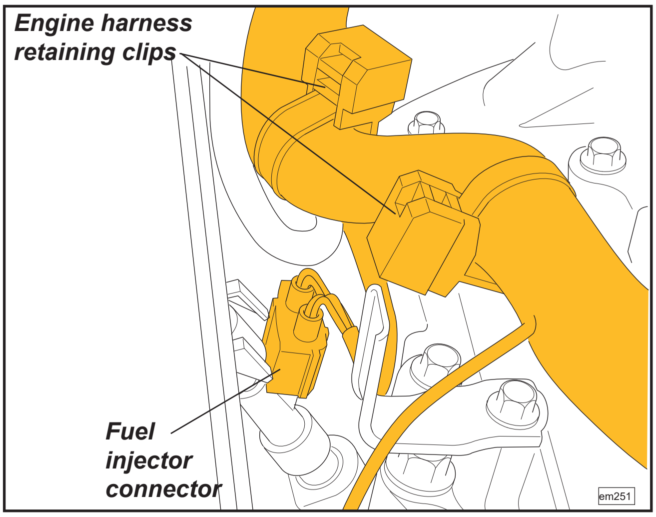


5. Remove the 4 x M8 bolts (torque to 10 Nm) securing the throttle body to supercharger and pull the assembly away from the supercharger. (This will avoid unnecessarily disrupting of the coolant system by disconnecting the bypass hoses attached to the underside of the throttle body),

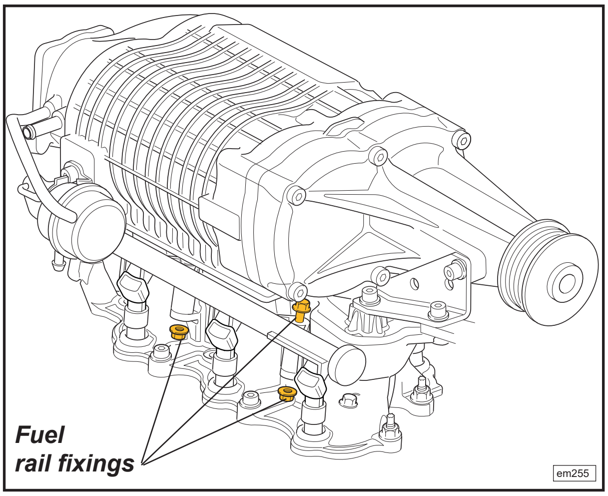


6. Disconnect the fuel pipe at the fuel injector rail (see sub-section LN.8 and Toyota CD disc T000T1516F for full procedural information).

7. Disconnect the 6 fuel injector connectors and pull the engine harness off of its retaining clips on the LH cylinder head and move out of the way from the supercharger/manifold area.



8. Remove the M8 flanged bolt (torque to 20 Nm) securing front cover support bracket to idler pulley assembly.



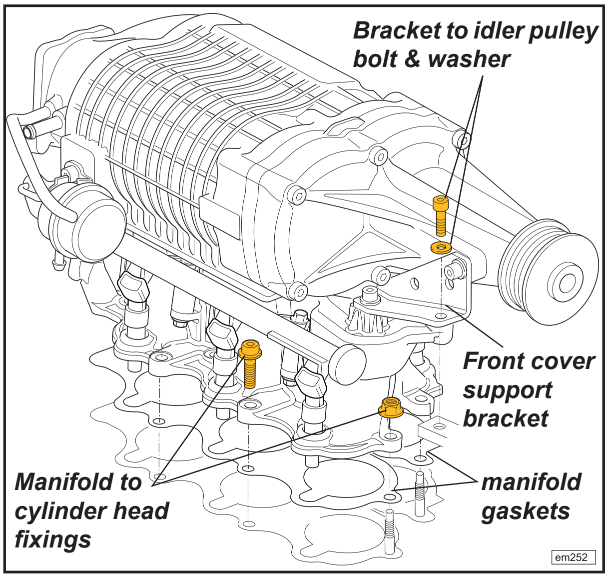
9. Uniformly loosen and remove the 4 bolts and 6 nuts securing the inlet manifold to the cylinder heads.

10. Remove the supercharger/inlet manifold assembly.

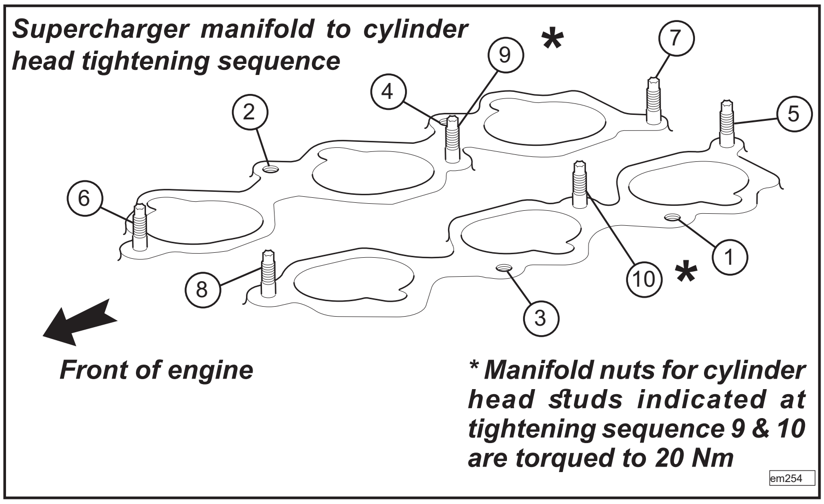
To refit:

Refit is the reverse of removal except:

If fitting a new supercharger, transfer the support bracket to new assembly. (Torque the fixings to 20 Nm)



- Fit a new fuel injector insulator into each manifold adaptor injector port and transfer the fuel injectors & rails to the new assembly.
- Place the fuel rails and injectors into position on the manifold adaptor placing the injectors into position in their respective injector ports.
- Retain the fuel rail into position onto the manifold adaptor with their fixings (but do not tighten at this stage).
- With the fuel rail and injectors in position, ensure that the injectors can rotate smoothly. If not, reinstall the injectors with new 'O' rings.
- Tighten fuel rail fixings to 16 Nm.
- Remove the inlet manifold gaskets from cylinder head, ensure the mating faces of cylinder head and manifold adaptor are clean and free from debris and fit new gaskets.
- Install the supercharger assembly on the cylinder heads.
- Install the manifold carefully into position uniformly tightening the 4 manifold bolts and 4 outer nuts to 25 Nm, the 2 inner manifold nuts are torqued to 20 Nm. (Tightening sequence pattern shown below).



- Refit other auxiliary components in reverse order that they were previously removed.

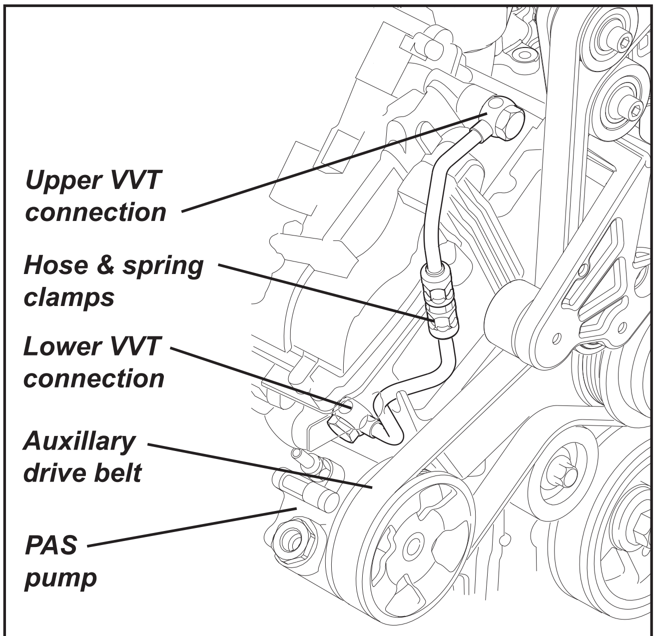
EJ.14 - RH BANK VVT OIL FEED PIPE (SUPERCHARGED MODELS)

The supercharger is driven via an increased length auxiliary drive belt with new bracket/idler assembly fitted to the engine to accommodate the revised configuration, also see sub-section see EJ.4 and EJ.11.

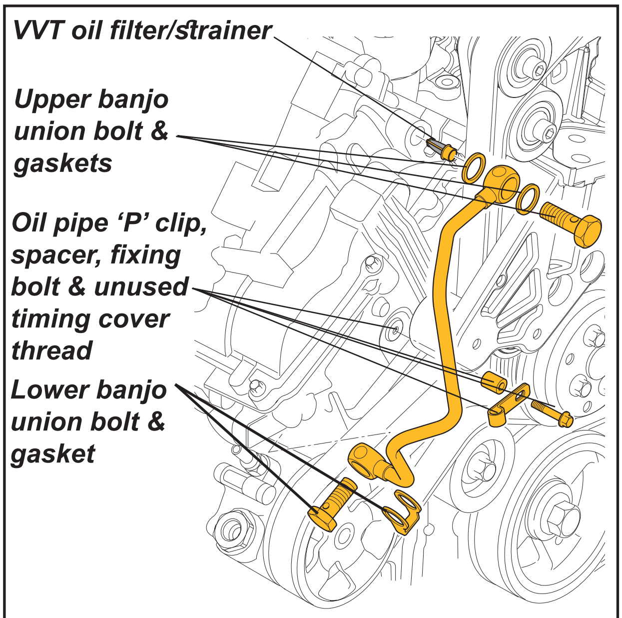
To prevent the risk of the revised auxiliary drive belt fouling on any ancillary engine components, the Variable Valve Timing (VVT) oil feed pipe located on the RH cylinder bank was modified to change its original positioning on the engine as from the introduction of the Evora S, The pipe modification consisted of a small section of hose joining the modified VVT upper and lower pipe union connections together using two 16mm hose or spring clamps.

Originally positioned forward of the cylinder head, the modified 3 piece pipe for the supercharged engine is now routed over the top of the RH camshaft cover, travelling downwards in front of the timing chain cover before terminating at its cylinder head connection located behind the Power Assisted Steering (PAS) pump.

In a process of continuing improvement, a single piece steel VVT pipe with a retaining clip was fitted as a production running change to all Evora 'S' and 'S-IPS' models from approximate '12MY VIN CH_10156.



MODIFIED VVT PIPE FITTED ON 'S' MODELS FROM START OF PRODUCTION



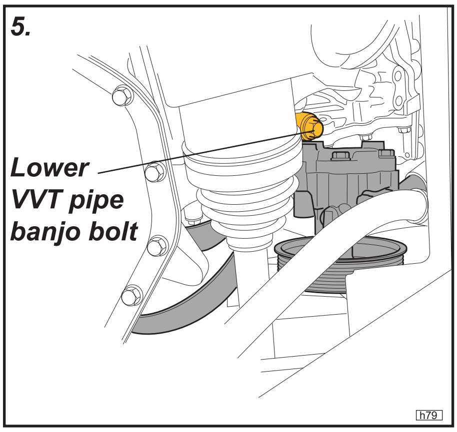
MODIFIED VVT PIPE FITTED FROM '12MY VIN CH_10156

In the event that the VVT pipe requires renewal, it is recommended to replace it with the single piece metal pipe with retaining clip.

Removal:

1. Raise the vehicle and remove the rear undertray – see service notes introduction section for further information.
2. Remove the RHR wheel and wheelarch liner - see service notes section BV.17 for further information.
3. Release the tension from the auxiliary drive belt and remove it from the Power Steering Pump (PAS) pulley – see service notes engine section EJ.4 for further information.
4. Release and remove the upper and lower mounting bolts securing the PAS pump the engine block - see service notes section HI.11 for further information on bolt removal.

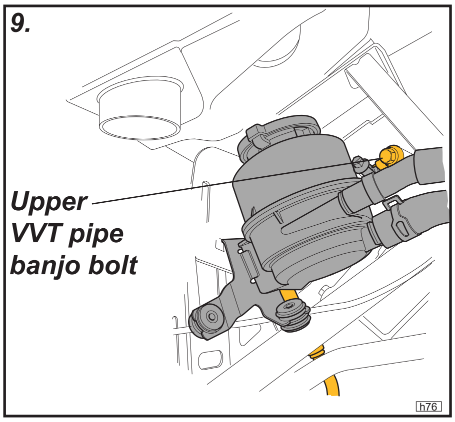
5. Lower the PAS pump to gain access to the lower feed pipe banjo bolt union. Take care not to place any strain on the PAS reservoir or steering rack hoses that are still attached to the pump).



6. Place a cloth on top of the PAS pump and a suitable container below the vehicle to catch any oil which may spill out during the lower banjo bolt removal.

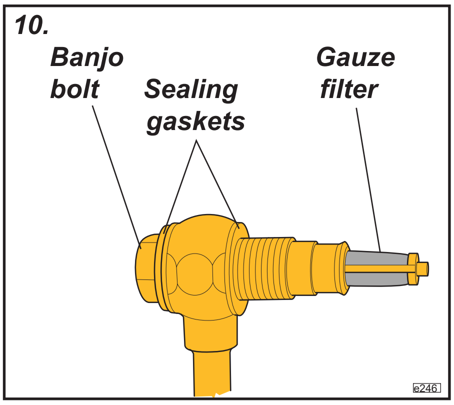
7. Using a 17mm socket/ and ½ breaker bar, release the lower banjo bolt and withdraw it from the pipe/engine assembly, (the union gasket will probably remain attached to the lower pipe assembly).

8. From the RHR wheel arch area release the upper hose clip securing the subframe heat duct pipe to the clamshell exit vent, pull the top section of the pipe to one side to gain access to the rearmost PAS reservoir bracket to back stay fixing bolt. See service notes section HI.12 for further information.



9. Release and remove the 3 M8 bolts and nuts (torque 10NM) securing the PAS bracket to the backstay, taking care not to place any strain on the PAS hoses, position the PAS reservoir downwards slightly to gain access to the upper banjo bolt. See service notes section HI.12 for further information.

10. From the RHR wheelarch area, release the upper union banjo bolt attached to the camshaft cover, withdraw the union and collect the union pipe gaskets and VVT oil filter/strainer which is attached to the end of the banjo bolt.



11. Withdraw the pipe from the vehicle via the wheelarch area.

Replacement/renewal:
Fitment of the latest steel pipe is the reversal of removal of the original pipe except:

- Transfer the 'P' clip from the original oil pipe, or if not fitted, obtain a new clip and fit it around the middle of the new VVT oil feed pipe ensuring to fit it in the correct orientation so that the rear surface of the clip will be facing towards the cylinder head once the new VVT oil pipe is positioned into place.

- Re-using the existing upper banjo bolt fit it into place on the replacement pipes upper union connection using 2 new sealing gaskets.

- Clean the gauze filter previously removed and refit to the end of the fitted banjo bolt.

- Position the new pipe and upper banjo bolt with filter onto the engine, fitting the upper banjo bolt hand tight only.

- From underneath the vehicle, fit the new lower single piece sealing gasket (A132E6244S) around the end of the lower pipe union. Re-using the original lower banjo bolt, place it through the lower pipe union and gasket and hand tighten to the engine block.

- Ensure the pipe orientation is correct and tighten both union connectors to 45Nm.

- From the wheelarch area, align the bolt hole of the ‘P’ clip over the unused M6 threaded hole located in the timing cover at the RH cylinder head bank area just above the rectangular steel inspection plate, closing the clip around the pipe as tightly as possible once the 2 holes are aligned.

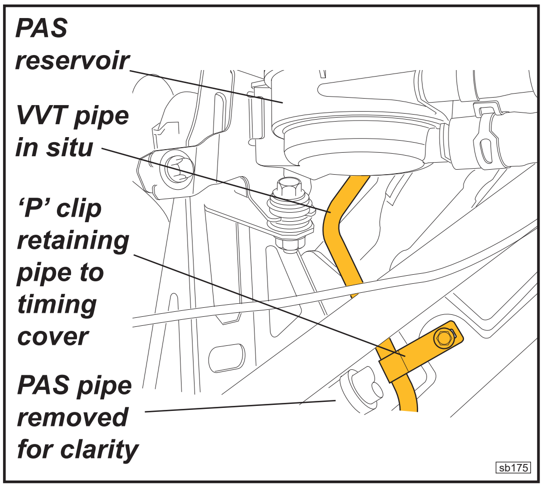
- Position the oil pipe clip spacer (A132E0135F) between the ‘P’ clip and threaded hole in the timing cover.

- Fit the M6 x 30 hex flange bolt through the ‘P’ clip and spacer and into the timing cover threaded hole and torque to 10Nm.

- Refit the PAS reservoir assembly and subframe heat duct pipe.

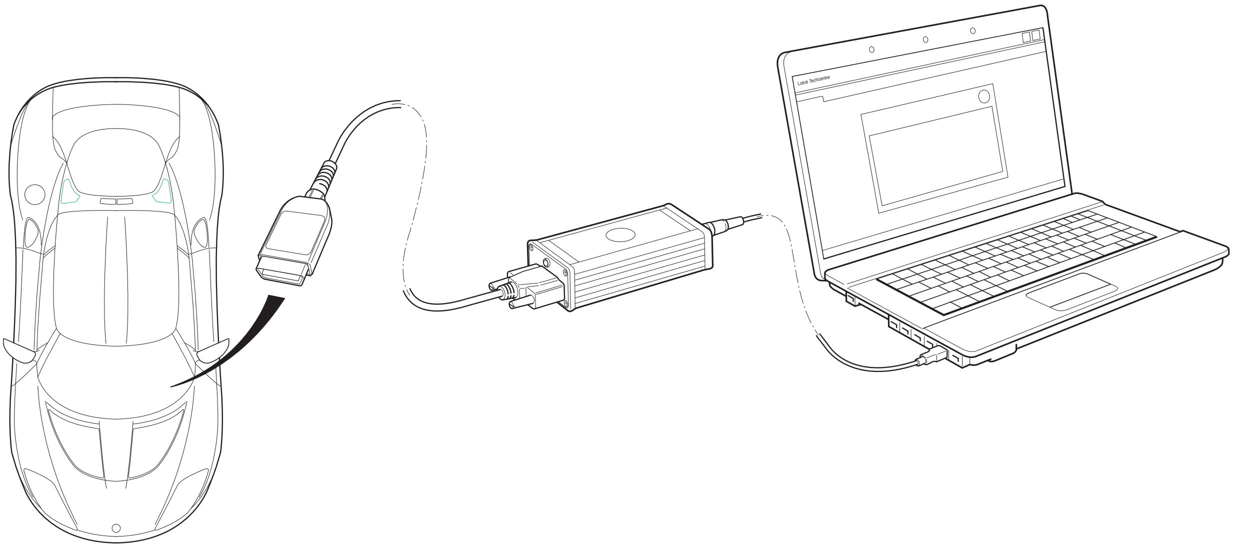
- Refit the PAS pump and auxiliary drive belt.

- Top up vehicle engine oil (if required) Run the engine to normal operating temperature and check for oil leaks, refit the rear undertray assembly and RHR wheelarch liner.



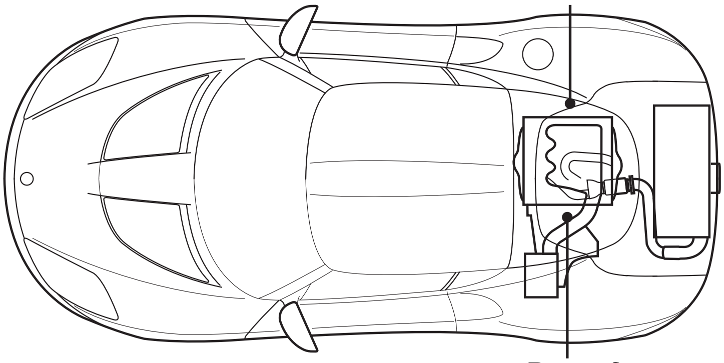
ENGINE MANAGEMENT

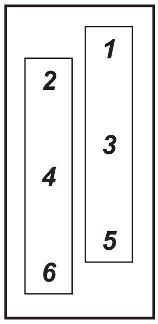
SECTION EMR



NOTES

Cylinder Numbering - viewed from above:





Firing order: 1 2 3 4 5 6

EMR.1 - DIAGNOSTIC TROUBLE CODE (DTC) LIST

MIL Fault codes

Continued...............

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Continued.............

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Continued.................

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DTC	Fault description	Page
P2191	System Too Lean at Higher Load – Bank1	73
P2193	System Too Lean at Higher Load – Bank2	73
P219A	Bank 1 Air-Fuel Ratio Imbalance	80
P219B	Bank 2 Air-Fuel Ratio Imbalance	80

Non-MIL Fault codes

DTC	Fault description	Page
P0480	Fan 1 Control Circuit	46
P0481	Fan 2 Control Circuit	46
P0482	Fan 3 Control Circuit	47
P0537	A/C Evaporator Temperature Sensor Circuit Low	51
P0538	A/C Evaporator Temperature Sensor Circuit High	51
P0564	Cruise Control Multi-function Input Signal	53
P0571	Brake Switch “A” Circuit	53
P0578	Cruise Control Multi-Function Input “A” Circuit Stuck	53
P0579	Cruise Control Multi-Function Input "A" Circuit Range / Performance	53
P0616	Starter Relay Circuit Low	55
P0617	Starter Relay Circuit High	55
P0646	A/C Clutch Relay Control Circuit Low	58
P0647	A/C Clutch Relay Control Circuit High	58
P0806	Clutch Position Sensor Circuit Range/Performance	61
P0807	Clutch Position Sensor Circuit Low	61
P0808	Clutch Position Sensor Circuit High	61
P0826	Up and Down Shift Switch Circuit	62
P0827	Up and Down Shift Switch Circuit Low	62
P0828	Up and Down Shift Switch Circuit High	62
P1113	Air Intake Control Valve Circuit	63
P1809	Noisy Clutch Pedal Sensor	61
P2602	Coolant Pump Control Circuit Low	64
P2603	Coolant Pump Control Circuit High	64
P2612	A/C Refrigerant Distribution Valve Control Circuit Low	74
P2613	A/C Refrigerant Distribution Valve Control Circuit High	74
B1422	A/C Compressor Lock Sensor Circuit	75
U0101	Lost Communications with TCM	76
U0122	Lost Communications with VDCM	76
U0127	Lost Communications with TPMS	76
U0141	Lost Communication with Body Control Module (Integrated Control Module) "A"	82
U0302	Software Incompatible with TCM	77
U0316	Software Incompatible with VDCM	77
U0416	Invalid Data Received From VDCM	81

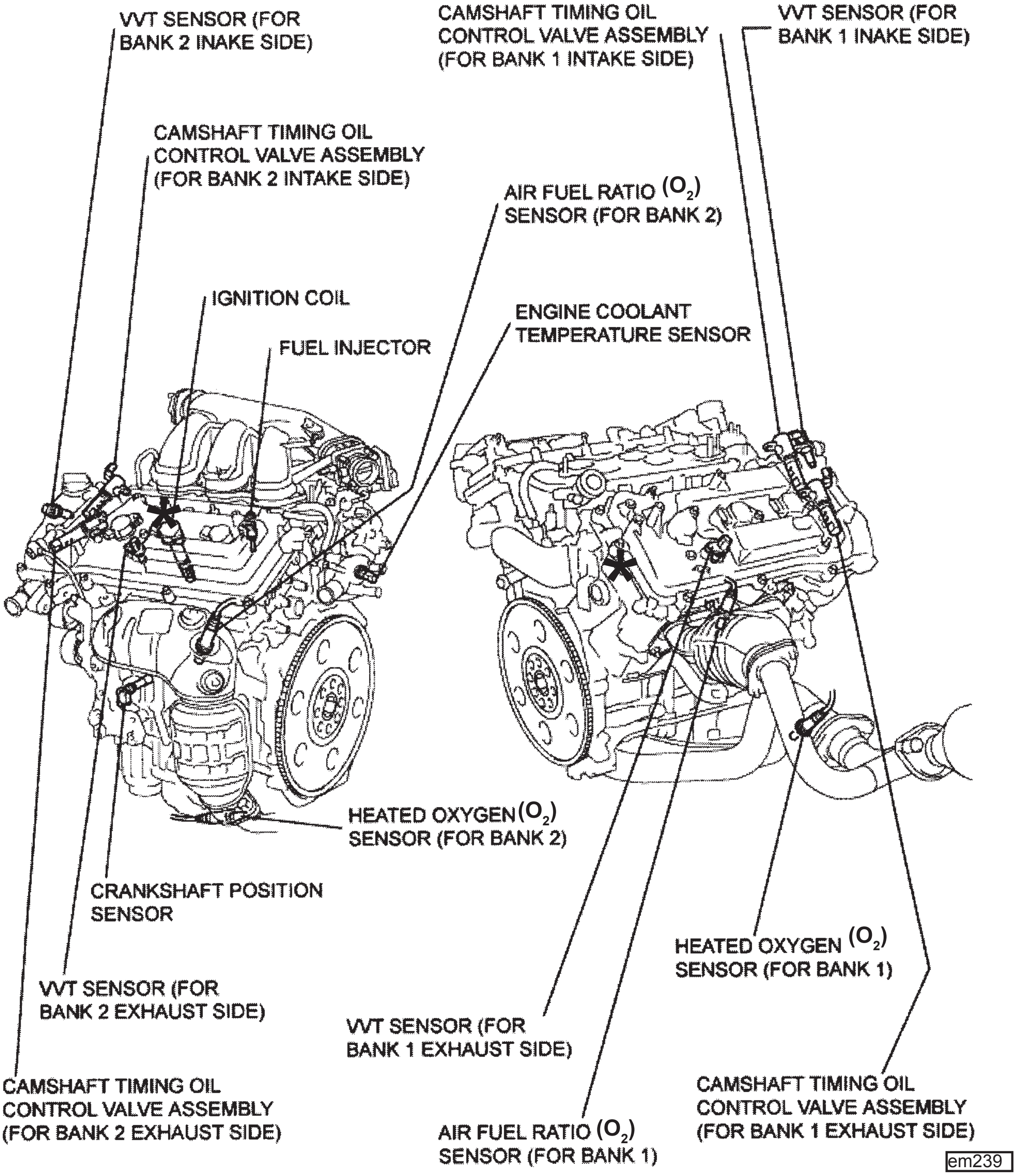
When applicable, reference may be made under the 'Notes' heading to a page in the Toyota service manual. This information should be used only for diagnosis and connection detail of the **sensor**. The Evora uses a Lotus ECU, the connections for which may be found in circuit diagrams in the applicable 'MR' section for the vehicles relevant model year, market and or powertrain. Diagnostic Trouble Codes should be read using the Lotus TechCentre.

EMR.2 - COMPONENT FUNCTION

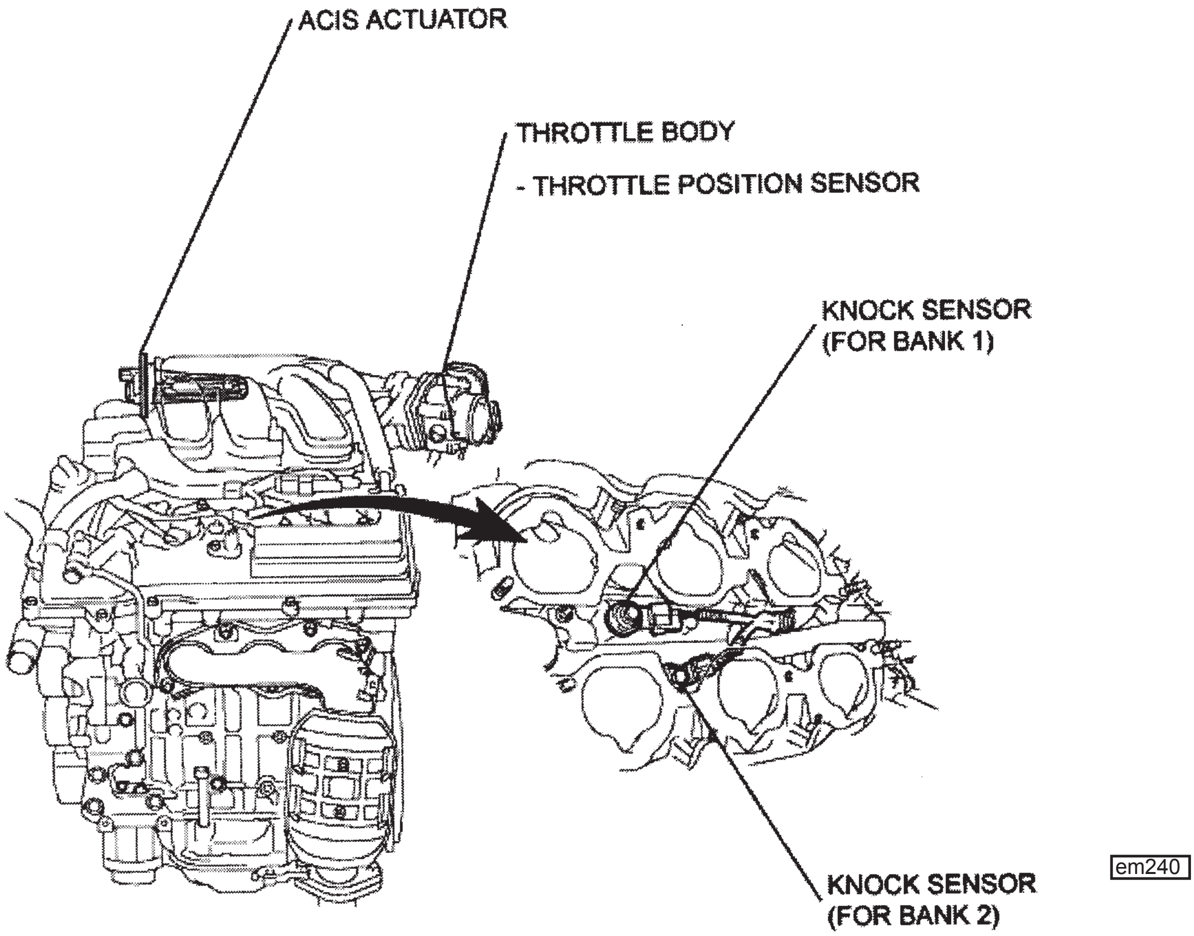
Component	Function
Mass Air Flow Meter	Engine load detection
Intake Air Temperature Sensor	Air temperature detection
Engine Coolant Temperature Sensor	Engine coolant temperature detection
Throttle Position Sensor	Determines engine throttle position
Pedal Position Sensor	Determines pedal position requested by driver
Barometric Pressure Sensor	Barometric pressure detection
O2 Sensor (Front) – Bank 1	Measures oxygen content in exhaust before bank 1 primary catalyst
O2 Sensor (Front) – Bank 2	Measures oxygen content in exhaust before bank 1 primary catalyst
O2 Sensor (Rear) – Bank 1	Measures oxygen content in exhaust after bank 1 primary catalyst
O2 Sensor (Rear) – Bank 2	Measures oxygen content in exhaust after bank 2 primary catalyst
Crankshaft Position Sensor	Determines crankshaft position
Camshaft Position Sensor (Inlet) – Bank 1	Determines bank1 inlet camshaft position
Camshaft Position Sensor (Inlet) – Bank 2	Determines bank 2 inlet camshaft position
Camshaft Position Sensor (Exhaust) – Bank 1	Determines bank 1 exhaust camshaft position
Camshaft Position Sensor (Exhaust) – Bank 2	Determines bank 2 exhaust camshaft position
Knock Sensor – Bank1	Determines bank 1 engine detonation
Knock Sensor – Bank2	Determines bank 2 engine detonation
Fuel Level Sensor	Determines fuel tank level
Air Conditioning Evaporator Temperature Sensor	Evaporator temperature detection
Clutch Pedal Position Sensor	Determines clutch pedal position
Brake Pedal Position Switch	Determines brake pedal position
Cruise Control Multi-function Input	Determines driver request for cruise control
Electronic Throttle Control Motor	Actuates engine throttle
Injector Circuit – Cylinder 1	Regulates fuel injected into cylinder 1
Injector Circuit – Cylinder 2	Regulates fuel injected into cylinder 2
Injector Circuit – Cylinder 3	Regulates fuel injected into cylinder 3
Injector Circuit – Cylinder 4	Regulates fuel injected into cylinder 4
Injector Circuit – Cylinder 5	Regulates fuel injected into cylinder 5
Injector Circuit – Cylinder 6	Regulates fuel injected into cylinder 6
Ignition Circuit – Cylinder 1	Actuates spark plug in cylinder 1
Ignition Circuit – Cylinder 2	Actuates spark plug in cylinder 2
Ignition Circuit – Cylinder 3	Actuates spark plug in cylinder 3
Ignition Circuit – Cylinder 4	Actuates spark plug in cylinder 4
Ignition Circuit – Cylinder 5	Actuates spark plug in cylinder 5
Ignition Circuit – Cylinder 6	Actuates spark plug in cylinder 6
Variable Valve Timing Actuator (Inlet) – Bank 1	Actuates bank 1 inlet camshaft timing control
Variable Valve Timing Actuator (Inlet) – Bank 2	Actuates bank 2 inlet camshaft timing control
Variable Valve Timing Actuator (Exhaust) – Bank 1	Actuates bank 1 exhaust camshaft timing control
Variable Valve Timing Actuator (Exhaust) – Bank 2	Actuates bank 2 exhaust camshaft timing control
Variable Intake Manifold Actuator	Actuates variable intake manifold
Primary Catalyst – Bank 1	Removes pollutants from exhaust
Primary Catalyst – Bank 2	Removes pollutants from exhaust
Secondary Catalyst	Removes pollutants from exhaust
Evaporative Emission Control System Purge Control Valve	Regulates fuel tank vapour flow into inlet manifold
Fuel Pump Relay	Actuates fuel pump
Starter Relay	Actuates engine starter motor

Component	Function
Cooling Fan 1 Relay	Actuates cooling fan 1
Cooling Fan 2 Relay	Actuates cooling fan 2
Air Conditioning Control Relay	Actuates air conditioning compressor
Air Conditioning Control Valve	Regulates air conditioning compressor load
Coolant Recirculation Pump	Actuates coolant recirculation pump
Noise Flap Solenoid	Actuates air intake flap vacuum control
ABS	Provides vehicle wheel speed information
Battery	Provides electrical power
Exhaust Bypass Soleniod	Allows EP valve to draw vacuum from airbox

EMR.3 - COMPONENT LOCATION



* **Ignition coil noise suppression capacitor**


ACIS ACTUATOR
THROTTLE BODY
- THROTTLE POSITION SENSOR
KNOCK SENSOR
(FOR BANK 1)
KNOCK SENSOR
(FOR BANK 2)
em240

EMR.4 - DIAGNOSTIC GUIDE

Camshaft Timing Control (VVT)

P0011	Camshaft Position – Inlet Timing Over-Advanced or System Performance (Bank 1)
P0012	Camshaft Position – Inlet Timing Over-Retarded (Bank 1)
P0014	Camshaft Position – Exhaust Timing Over-Advanced or System Performance (Bank 1)
P0015	Camshaft Position – Exhaust Timing Over Retarded (Bank 1)
P0021	Camshaft Position – Inlet Timing Over-Advanced or System Performance (Bank 2)
P0022	Camshaft Position – Inlet Timing Over-Retarded (Bank 2)
P0024	Camshaft Position – Exhaust Timing Over-Advanced or System Performance (Bank 2)
P0025	Camshaft Position – Exhaust Timing Over-Retarded (Bank 2)

Description

The Variable Valve Timing system (VVT) on the intake camshafts and the exhaust camshafts can vary the timing by approximately 35°. The camshaft relative position is varied by a system of vanes mounted on the drive end of the camshaft. Each VVT oil control valve modulates a spool valve position in accordance with the drive signal duty cycle, this in turns controls the oil pressure applied to the vanes. A 50% duty cycle applied to the valve will hold the valve current timing by preventing oil flow from the VVT controller housing, a duty cycle less than 50% will retard the valve timing, a duty cycle greater then 50% will advance the valve timing. The ECM regulates this duty cycle based on the feedback signal from the respective camshaft position sensor to optimise the camshaft timing.

Component connections

Sensor Connector	Description	ECU Pin	ECU Connector
1	Battery Voltage	-	-
2	VVT Control Valve Inlet (Bank 1)	B2	48 Way (Centre)
1	Battery Voltage	-	-
2	VVT Control Valve Exhaust (Bank 1)	A2	48 Way (Centre)
1	Battery Voltage	-	
2	VVT Control Valve Inlet (Bank 2)	A3	48 Way (Centre)
1	Battery Voltage	-	
2	VVT Control Valve Exhaust (Bank 2)	A4	48 Way (Centre)

Monitor:
- Continuous

Enable Criteria:
- Engine running > 30 secs
- Coolant temperature > 60°C (140°F)

Disable Criteria:
- P0116, P0117, P0118 – Coolant temperature fault codes

Malfunction Criteria:
- VVT error > 5 degrees for time > 2.5 secs

Potential failure modes:
- Static valve timing is incorrect
- VVT camshaft actuator failure
- VVT control valve stuck open / closed
- VVT control valve filter

Diagnostic Mask:
- The MIL will be illuminated if the faults are present for 2 consecutive trips

Crankshaft Position–Camshaft Position Correlation Error

P0016 Crankshaft position – camshaft position correlation – bank 1 sensor A (Inlet)
P0017 Crankshaft position – camshaft position correlation – bank 1 sensor B (Exhaust)
P0018 Crankshaft position – camshaft position correlation – bank 2 sensor A (Inlet)
P0019 Crankshaft position – camshaft position correlation – bank 2 sensor B (Exhaust)

Description
The crankshaft position sensor is used to identify engine position and speed via a pole wheel mounted on the front end of the crankshaft. The camshaft position sensor is used to determine camshaft position from a three vane reluctor on the rear end of the inlet and exhaust camshaft. Fault codes P0016, P0017, P0018, P0019 indicate a mechanical timing error such as incorrectly set, or 'jumped' cam timing.

Monitor:
- Continuous

Enable Criteria:
- Engine running (from cranking up to 4 seconds)

Disable Criteria:
- None

Malfunction Criteria:
- Camshaft out of phase with crankshaft > 16 degrees

Potential failure modes:
- Static valve timing is incorrect
- VVT camshaft actuator failure
- VVT control valve stuck open / closed
- VVT control valve filter

Diagnostic Mask:
- The MIL will be illuminated if the faults are present for 2 consecutive trips

Ambient Air Temperature Sensor

P0071 Ambient Air Temperature Sensor Range/Performance

Description
Indicates when the ambient air temperature is out of range.

Monitor:
- Continuous

Enable Criteria:
- Ignition on

Malfunction Criteria:
- The sensor is showing a reading outside of the range, - 40 to 80ºC.

Diagnostic Mask:
- The service light will be illuminated for 30 seconds at the point the fault occurs, and then illuminated for 30 seconds after engine start if the fault is present.

Camshaft Timing Control (VVT)

P0076 Intake Valve Control Solenoid Circuit Low (Bank1)
P0077 Intake Valve Control Solenoid Circuit High (Bank1)
P0079 Exhaust Valve Control Solenoid Circuit Low (Bank1)
P0080 Exhaust Valve Control Solenoid Circuit High (Bank1)
P0082 Intake Valve Control Solenoid Circuit Low (Bank2)
P0083 Intake Valve Control Solenoid Circuit High (Bank2)
P0085 Exhaust Valve Control Solenoid Circuit Low (Bank2)
P0086 Exhaust Valve Control Solenoid Circuit High (Bank2)

Monitor:
- Continuous

Enable Criteria:
- Engine running

Disable Criteria:
- None

Potential failure modes:
- P0076, P0079, P0082, P0085 - VVT control valve open circuit or short to ground
- P0077, P0080, P0083, P0086 - VVT control valve circuit short to battery voltage
- ECU output circuit failure
- VVT control valve

Diagnostic Mask:
- The MIL will be illuminated if the faults are present for 2 consecutive trips

Intake Air Flow

P0101 Mass or Volume Air Flow Circuit Range/Performance
P0102 Mass or Volume Air Flow Circuit Low Input
P0103 Mass or Volume Air Flow Circuit High Input

Description
The Mass Air Flow (MAF) sensor is incorporated into the airbox, and measures both intake air flow rate and Intake Air Temperature (IAT). The MAF sensor uses a hot wire exposed to the airflow, which is maintained at a constant temperature by a constant current flow. This is achieved within the sensor unit by varying the voltage applied to the hot wire. This voltage is the output signal from the MAF sensor.

Sensor connections

Sensor Connector	Description	ECU Pin	ECU Connector
1	IAT Signal	E3	48 Way (Centre)
2	IAT Ground	J3	48 Way (Centre)
3	Battery Voltage	-	-
4	MAF Ground	J4	48 Way (Centre)
5	MAF Signal	G1	48 Way (Centre)

Sensor characteristics
0 – 330 g/sec
Typical values: 1.5 – 5.0 g/sec (idle), 5.0 – 15.0 g/sec (2500rpm elevated idle no load)

P0101
Monitor:
- Continuous.

Enable Criteria:
- Engine running
- Engine speed >1500rpm
- Engine speed < 3510rpm
- Fuel Learns enabled

Disable Criteria:
- P0122, P0123, P0222, P0223 – Throttle/Pedal position fault codes

Malfunction Criteria:
- Measured MAF is compared to a predicted MAF based on current engine conditions.
- Error > 40% for time > 1.5 secs

Potential failure modes:
- MAF meter
- Air induction system
- Air intake hose connections

Diagnostic Mask:
- The MIL will be illuminated if the faults are present for 2 consecutive trips

P0102
Monitor:
- Continuous.

Enable Criteria:
- Engine running

Disable Criteria:
- None

Malfunction Criteria:
- Voltage at ECU < 0.52V for time > 1.5 secs

Potential failure modes:
- MAF sensor circuit open
- MAF sensor circuit short to ground

Diagnostic Mask:
- The MIL will be illuminated if the faults are present for 2 consecutive trips

P0103
Monitor:
- Continuous.

Enable Criteria:
- Engine running

Disable Criteria:
- None

Malfunction Criteria:
- Voltage at ECU > 4.86V for time > 1.5 secs

Potential failure modes:
- MAF sensor circuit short to ECU supply voltage

Diagnostic Mask:
- The MIL will be illuminated if the faults are present for 2 consecutive trips

Barometric Pressure

P0106 Manifold Absolute Pressure/Barometric Pressure Circuit Range/Performance
P0107 Manifold Absolute Pressure/Barometric Pressure Circuit Low Input
P0108 Manifold Absolute Pressure/Barometric Pressure Circuit High Input

Description
The barometric pressure sensor is located internally within the ECU, and measures atmospheric pressure. This parameter is required to compensate the mass air flow when the vehicle is operated at higher altitudes.

P0106
Monitor:
- Continuous

Enable Criteria:
- Engine running
- Engine speed 2010 – 5490rpm & TPS > 80%
- Engine speed 1500 – 2500rpm & 12.5% < TPS < 22.5%

Disable Criteria:
- P0101, P0102, P0103 – MAF Sensor fault codes
- P0121, P0122, P0123, P0222, P0223, P2135 – Throttle/Pedal position fault codes

Malfunction Criteria:
- Measured Baro is compared to a predicted Baro based on current engine conditions.
- Error > 150kPa for time > 4.5 seconds.

Potential failure modes:
- Sensor failure
- MAF sensor error
- Inlet manifold air leak

Diagnostic Mask:
- The MIL will be illuminated if the faults are present for 2 consecutive trips

P0107, P0108
Monitor:
- Continuous

Enable Criteria:
- Engine running

Disable Criteria:
- None

Malfunction Criteria:
- P0107: Voltage at ECU < 1.08V for time > 1.5 secs
- P0108: Voltage at ECU > 4.98V for time > 1.5 secs

Potential failure modes:
- Sensor failure

Diagnostic Mask:
- The MIL will be illuminated if the faults are present for 2 consecutive trips

Intake Air Temperature

P0111 Intake Air Temperature Sensor 1 Circuit Range/Performance
P0112 Intake Air Temperature Sensor 1 Circuit Low
P0113 Intake Air Temperature Sensor 1 Circuit High

Description
The combined sensor which measures both Mass Air Flow (MAF) and Intake Air Temperature (IAT) is incorporated into the air box. The IAT sensor is a thermistor device which changes resistance with temperature. As air intake temperature decreases the thermistor resistance value increases, and conversely as air temperature increases so the thermistor resistance value decreases.

Sensor connections

Sensor Connector	Description	ECU Pin	ECU Connector
1	IAT Signal	E3	48 Way (Centre)
2	IAT Ground	J3	48 Way (Centre)
3	Battery Voltage	-	-
4	MAF Ground	J4	48 Way (Centre)
5	MAF Signal	G1	48 Way (Centre)

Sensor characteristics

IAT -20°C (-4°F)	13.6 – 18.4 kΩ
IAT 20°C (68°F)	2.21 – 2.69 kΩ
IAT 60°C (140°F)	0.50 – 0.67 kΩ

P0111
Monitor:
- Continuous

Disable Criteria:
- P0116, P0117, P0118 – Coolant temperature fault codes

Enable Criteria 1:
- Engine running < 30 secs
- Coolant temperature < 30°C (86°F)

Malfunction Criteria 1:
- Inlet air temperature > 38°C (100°F) for time > 1.5 secs

Enable Criteria 2:
- Engine running

Malfunction Criteria 2:
- Inlet air temperature erratic by more than 40°C (72°F) for time > 1.5 secs

Enable Criteria 3:
- Accumulated mass air flow > 10000g > 60secs
- Mass air flow >15g/s for 20secs
- Mass airflow change from 15g/s to 6g/s <20secs.
- Mass airflow <6g/s for 20secs

Malfunction Criteria 3:
- Failure to change temperature by 1.2˚C after the enable criteria tests have been completed.

Potential failure modes:
- P0112 – signal short circuit
- P0113 – signal open circuit
- Sensor failure

Diagnostic Mask:
- The MIL will be illuminated if the faults are present for 2 consecutive trips

P0112
Monitor:
- Continuous

Disable Criteria:
- None

Enable Criteria:
- Engine running

Malfunction Criteria:
- Inlet air temperature > 119°C (246°F) for time > 1.5 secs

Potential failure modes:
- Signal short circuit
- Sensor failure

Diagnostic Mask:
- The MIL will be illuminated if these faults are present for 2 consecutive trips.

P0113
Monitor:
- Continuous

Disable Criteria:
- None

Enable Criteria:
- Engine running

Malfunction Criteria:
- Inlet air temperature < –40°C (–40°F) for time > 1.5 secs

Potential failure modes:
- Signal open circuit
- Sensor failure

Diagnostic Mask:
- The MIL will be illuminated if these faults are present for 2 consecutive trips.

Engine Coolant Temperature

P0116	Engine Coolant Temperature Circuit Range/Performance
P0117	Engine Coolant Temperature Circuit Low
P0118	Engine Coolant Temperature Circuit High

Description
The engine coolant temperature sensor is a thermistor device which changes resistance with temperature. As coolant temperature decreases the thermistor resistance value increases, and conversely as coolant temperature increases so the thermistor resistance value decreases.

Sensor connections

Sensor Connector	Description	ECU Pin	ECU Connector
1	Ground	C3	48 Way (Centre)
2	Signal	G2	48 Way (Centre)

Sensor characteristics

-20°C (-4°F)	= 13.84 – 16.33 KΩ
20°C (68°F)	= 2.31 – 2.58 KΩ
80°C (176°F)	= 0.310 – 0.326 KΩ
110°C (230°F)	= 0.1399 – 0.1435 KΩ

P0116
Monitor:
- Continuous

Disable Criteria:
- None

Enable Criteria 1:
- Engine running > 1000 seconds

Malfunction Criteria 1:
- Engine coolant temperature < 40°C (104°F)

Enable Criteria 2:
- Engine running

Malfunction Criteria 2:
- Engine coolant temperature erratic by more than 30°C (54°F)

Potential failure modes:
- Sensor wiring
- Sensor failure
- Thermostat failure

Diagnostic Mask:
- The MIL will be illuminated if these faults are present for 2 consecutive trips.

P0117
Monitor:
- Continuous

Disable Criteria:
- None

Enable Criteria:
- Engine running

Malfunction Criteria:
- Coolant temperature > 119°C (246°F) for time > 1.5 secs

Potential failure modes:
- Signal short circuit
- Sensor failure
- Thermostat failure
- Cooling system problem

Diagnostic Mask:
- The MIL will be illuminated if these faults are present for 2 consecutive trips.

P0118
Monitor:
- Continuous

Disable Criteria:
- None

Enable Criteria:
- Engine running

Malfunction Criteria:
- Coolant temperature > -38°C (-36°F) for time > 1.5 secs

Potential failure modes:
- Signal open circuit
- Sensor failure

Diagnostic Mask:
- The MIL will be illuminated if these faults are present for 2 consecutive trips.

Throttle Position

P0122 Throttle Position Sensor 'A' Circuit Low
P0123 Throttle Position Sensor 'A' Circuit High
P0222 Throttle Position Sensor 'B' Circuit Low
P0223 Throttle Position Sensor 'B' Circuit High

Description
The throttle position sensor (TPS) is mounted on the throttle body, and detects the opening angle of the throttle valve. The TPS has 2 sensor circuits, each of which transmits a signal, VTA1 and VTA2. VTA1 is used to detect the throttle valve angle and VTA2 is used to detect malfunctions in VTA1. The sensor signal voltages vary between 0 V and 5 V in proportion to the throttle valve opening angle, and are transmitted to the VTA terminals of the ECU.

Sensor connections

Sensor Connector	Description	ECU Pin	ECU Connector
1	ETB A	M1	48 Way (Centre)
2	ETB B	L2	48 Way (Centre)
3	Ground	C4	48 Way (Centre)
4	TPS 1B Signal	F3	48 Way (Centre)
5	TPS 1A/B V Ref	E4	48 Way (Centre)
6	TPS 1A Signal	F2	48 Way (Centre)

Sensor characteristics
0% = 0.595 V ± 5%
100% = 4.148 V ± 5%

P0122
Monitor:
- Continuous.

Enable Criteria:
- None

Disable Criteria:
- None

Malfunction Criteria:
- Signal voltage < 0.635V

Potential failure modes:
- Signal short circuit
- Reference voltage open circuit
- Reference voltage short to ground
- Sensor failure

Diagnostic Mask:
- The MIL will be illuminated if fault is present.

P0123
Monitor:
- Continuous.

Enable Criteria:
- None

Disable Criteria:
- None

Malfunction Criteria:
- Signal voltage > 4.765V

Potential failure modes:
- Signal open circuit
- Reference voltage open circuit
- Reference voltage short to ground
- Sensor failure

Diagnostic Mask:
- The MIL will be illuminated if fault is present.

P0222
Monitor:
- Continuous.

Enable Criteria:
- None

Disable Criteria:
- None

Malfunction Criteria:
- Signal voltage < 2.146V

Potential failure modes:
- Signal short circuit
- Reference voltage open circuit
- Reference voltage short to ground
- Sensor failure

Diagnostic Mask:
- The MIL will be illuminated if fault is present.

P0223
Monitor:
- Continuous.

Enable Criteria:
- None

Disable Criteria:
- None

Malfunction Criteria:
- Signal voltage > 4.985V

Potential failure modes:
- Signal open circuit
- Reference voltage open circuit
- Reference voltage short to ground
- Sensor failure

Diagnostic Mask:
- The MIL will be illuminated if fault is present.

Notes: A maximum throttle opening of 15% may be imposed due to a single code. In the case of multiple codes, a mechanically sprung 7% opening may be applied.

Coolant Thermostat ~~(USA only)~~

P0128 Coolant Thermostat (Coolant Temperature Below Thermostat Regulating Temperature)

Description
The thermostat diagnostic is enabled after each cold engine start, and monitors the rate of temperature rise during warm up relative to the measured engine air flow to check thermostat functioning correctly (i.e not stuck open).

Monitor:
- Continuous

Disable Criteria:
- P0116, P0117, P0118 – Engine Coolant Temperature sensor faults

Enable Criteria:
- Engine running
- Start-up Coolant Temperature > -10°C (14°F)
- Start-up Coolant Temperature < 60°C (140°F)

Malfunction Criteria:
- Coolant Temperature does not reach 70°C (158°F) within specific total airflow, during which time the vehicle must be above 20mph for 50% of this warm up time.

Potential failure modes:
- Thermostat failure

Diagnostic Masks:
- The MIL will be illuminated if the fault is present for 2 consecutive trips.

O2 Sensor (Pre Catalyst)

P0131 O2 Sensor 1 Circuit Low Voltage (Bank 1)
P0132 O2 Sensor 1 Circuit High Voltage (Bank 1)
P0133 O2 Sensor 1 Circuit Slow Response (Bank 1)
P0134 O2 Sensor 1 Circuit No Activity Detected (Bank 1)
P0135 O2 Sensor 1 Heater Circuit (Bank 1)
P0151 O2 Sensor 1 Circuit Low Voltage (Bank 2)
P0152 O2 Sensor 1 Circuit High Voltage (Bank 2)
P0153 O2 Sensor 1 Circuit Slow Response (Bank 2)
P0154 O2 Sensor 1 Circuit No Activity Detected (Bank 2)
P0155 O2 Sensor 1 Heater Circuit (Bank 2)

Description
The oxygen sensors separately monitor the oxygen content in the exhaust gases of each bank of the engine. Each sensor is electrically heated to improve response after start.
The sensor consists of a zirconia electrode between two platinum plates. When zirconia comes into contact with oxygen, it becomes an electrical conductor. The exhaust gases pass through louvers in the sensor. One plate is in contact with the outside air and the other plate is in contact with the exhaust gases. The platinum plate in contact with the air is electrically negative due to the oxygen in the atmosphere and the plate in contact with the exhaust gases is electrically positive. This will cause a difference in electrical potential to develop between the two plates. Thus the voltage across the platinum plates ranges approximately from 100 millivolts to 900 millivolts, depending on the oxygen content of the exhaust gases. Thus when the air/fuel mixture is rich, the oxygen sensor output will be high. If the air/fuel mixture is lean, the oxygen sensor output will be low.

Sensor connections

Sensor Connector	Description	ECU Pin	ECU Connector
1 Bank 1	Signal	G3	48 Way (Centre)
2 Bank 1	Ground	J2	48 Way (Centre)
3 Bank 1	Heater	H3	48 Way (Centre)
4 Bank 1	Battery Voltage	-	-
1 Bank 2	Signal	G4	48 Way (Centre)
2 Bank 2	Ground	J2	48 Way (Centre)
3 Bank 2	Heater	H4	48 Way (Centre)
4 Bank 2	Battery Voltage	-	-

Sensor characteristics
Normal operating range is 0 – 1000mV

P0131 (Bank1) or P0151 (Bank2)
Monitor:
- Continuous.

Disable Criteria:
- DFCO (Deceleration Fuel Cut Off)
- AE DE (Acceleration Enrichment Deceleration Enleanment)
- Misfire

Enable Criteria:
- Engine running

Failure Criteria:
- Sensor voltage < 15mV for more than 1.5 seconds consecutively for a specified number of times.

Potential failure modes:
- Low fuel pressure (Lean mixture)
- Malfunctioning sensor
- External water on sensor
- Sensor wire shorted to ground

Diagnostic Mask:
- The MIL will be illuminated if these faults are present for 2 consecutive trips.

P0132 (Bank1) or P0152 (Bank2)
Monitor:
- Continuous.

Disable Criteria:
- None

Enable Criteria:
- Engine running

Malfunction Criteria:
- Sensor voltage > 1200mV for more than 1.5 seconds consecutively for a specified number of times.

Potential failure modes:
- High fuel pressure (Rich mixture)
- Leaking or shorted injector
- Purge valve fault
- Oxygen sensor contamination
- Engine oil contamination
- Sensor wire shorted to heater voltage

Diagnostic Mask:
- The MIL will be illuminated if these faults are present for 2 consecutive trips.

P0133 (Bank1) or P0153 (Bank2)
Monitor:
- Continuous.

Disable Criteria:
- P0116, P0117, P0118 – Coolant temperature sensor faults
- P0101, P0102, P0103 – MAF sensor faults
- P0335, P0500 – Crank or vehicle speed faults
- P0131, P0132, P0134, P0135 – Pre catalyst oxygen sensor faults for Bank1 checks
- P0151, P0152, P0154, P0155 – Pre catalyst oxygen sensor faults for Bank2 checks

Enable Criteria:
- Vehicle speed between 0 – 255 km/h (158.5 mph)
- MAF per stroke between 15 – 48 mg
- Engine speed between 1406 – 3750rpm
- Engine run time > 200 seconds
- Coolant temperature > 60°C (140°F)
- Closed loop fuelling enabled

Monitor:
- Monitored until the required amount of switches (30) in both directions has been achieved or 130 seconds has elapsed.

Malfunction Criteria:
- Set when the sensor fails to switch from a Lean to a Rich condition or switch from a Rich to a Lean condition in a sufficiently timely manner. A selection of switches is used to determine the average times.

Potential failure modes:
- Sensor connector and wiring should be checked for corrosion and loose connections
- Sensor contaminated, possibly from fuel, improper use of RTV, engine oil or coolant

Diagnostic Mask:
- The MIL will be illuminated if these faults are present for 2 consecutive trips.

P0134 (Bank1) or P0154 (Bank2)
Monitor:
- Until either passed or failed.

Enable Criteria:
- Engine run time > 30 seconds
- Engine is not at idle
- Engine is in closed loop fuel control
- O2 sensor ready

Malfunction Criteria:
- Set when the sensor fails to switch above 600mV and below 322mV within a 60 second period.

Potential failure modes:
- Sensor connector and wiring should be checked for corrosion and loose connections.
- Gas leak in exhaust system

Diagnostic Mask:
- The MIL will be illuminated if these faults are present for 2 consecutive trips.

P0135, P0155
Monitor:
- Continuous

Enable Criteria:
- Engine run time > 20 seconds

Malfunction Criteria:
- Set when the heater output is greater than 1900mA or less than 250mA for 1.5 seconds, for 40 consecutive checks.

Potential failure modes:
- Sensor connector and wiring should be checked for corrosion and loose connections.

Diagnostic Mask:
- The MIL will be illuminated if these faults are present for 2 consecutive trips.

O2 Sensor (Post Catalyst)

P0137 O2 Sensor Circuit Low Voltage (Bank 1)
P0138 O2 Sensor Circuit High Voltage (Bank 1)
P0139 O2 Sensor Circuit Slow Response (Bank 1)
P0140 O2 Sensor Circuit No Activity Detected (Bank 1)
P0141 O2 Sensor Heater Circuit (Bank 1)
P0157 O2 Sensor Circuit Low Voltage (Bank 2)
P0158 O2 Sensor Circuit High Voltage (Bank 2)
P0159 O2 Sensor Circuit Slow Response (Bank 2)
P0160 O2 Sensor Circuit No Activity Detected (Bank 2)
P0161 O2 Sensor Heater Circuit (Bank 2)

Description
The oxygen sensors separately monitor the oxygen content in the exhaust gases of each bank of the engine. Each sensor is electrically heated to improve response from start.
The sensor consists of a zirconia electrode between two platinum plates. When zirconia comes into contact with oxygen, it becomes an electrical conductor. The exhaust gases passes through louvers in the sensor. One plate is in contact with the outside air and the other plate is in contact with the exhaust gases. The platinum plate in contact with the air is electrically negative due to the oxygen in the atmosphere and the plate in contact with the exhaust gases is electrically positive. This will cause a difference in electrical potential to develop between the two plates. Thus the voltage across the platinum plates ranges approximately from 100 millivolts to 900 millivolts, depending on the oxygen content of the exhaust gases. Thus when the air/fuel mixture is rich, the oxygen sensor output will be high. If the air/fuel mixture is lean, the oxygen sensor output will be low. The post catalyst oxygen sensor performance is a good indicator of catalyst efficiency.

Sensor connections

Sensor Connector	Description	ECU Pin	ECU Connector
1 Bank 1	Signal	H1	48 Way (Centre)
2 Bank 1	Ground	K4	48 Way (Centre)
3 Bank 1	Heater	K1	48 Way (Centre)
4 Bank 1	Battery Voltage	-	-
1 Bank 2	Signal	H2	48 Way (Centre)
2 Bank 2	Ground	K4	48 Way (Centre)
3 Bank 2	Heater	K2	48 Way (Centre)
4 Bank 2	Battery Voltage	-	-

Sensor characteristics
Normal operating range is 0 – 1000mV

P0137, P0157
Monitor:
- Continuous

Enable Criteria:
- None

Disable Criteria:
- DFCO (Deceleration Fuel Cut Off)
- AE DE (Acceleration Enrichment or Deceleration Enleanment)
- Misfire

Malfunction Criteria:
- Set when the sensor operates below 15mV for more than 1.5 seconds consecutively for a specified number of times.

Potential failure modes:
- Check and rectify any pre catalyst sensor fault code, as they may be causing the fault code to be set
- Sensor wire shorted to ground
- Catalyst

Diagnostic Mask:
- The MIL will be illuminated if these faults are present for 2 consecutive trips.

P0138, P0158
Monitor:
- Continuous

Enable Criteria:
- Engine running

Disable Criteria:
- None

Malfunction Criteria:
- Set when the sensor operates above 1200mV for more than 1.5 seconds consecutively for a specified number of times.

Potential failure modes:
- Check and rectify any front sensor fault code, as they may be causing the fault code to be set
- Catalyst

Diagnostic Mask:
- The MIL will be illuminated if these faults are present for 2 consecutive trips.

P0139, P0159
“O2 Sensor, slow response” can be defined in two ways; 1) “Slow response” and 2) “Delayed response”.

1) Slow Response
Set when the sensor fails to reach 600mV after 5 seconds of Fuel Enrichment or when the sensor fails to drop below 300mV after 5 seconds of DFCO.

Enable Criteria:
- Engine run time > 230 seconds
- > 15 g/sec MAF (only enable criteria when switching rich, > 600mV, in fuel enrichment state)
- DFCO for 'rich to lean' switch

Disable Criteria:
- P0116, P0117, P0118 – Coolant Temperature Sensor faults
- P0261, P0262, P0264, P0265, P0267, P0268, P0270, P0271, P0273, P0274, P0276, P02777 – Injector faults
- P0300, P0301, P0302, P0303, P0304, P0305, P0306 – Misfire faults
- P1301, P1302 – Misfire faults causing emission or catalyst damage

Monitor:
- Continuous, until the test is either passed or failed

Potential failure modes:
- Check and rectify any pre catalyst sensor fault code, as they may be causing the fault code to be set
- Catalyst damage/leak/inefficiency

2) Delayed Response
Set when the sensor fails to switch between 300mV and 600mV within a specified time of the pre cat O2 sensor switch.

Enable Criteria:
- Engine run time > 230 seconds
- Rich for >3 seconds prior to switch lean
- Pre Cat O2 sensor must be rich for >0.5 seconds before post cat O2 sensor switch
- DFCO for 'rich to lean' switch

Disable Criteria:
- P0116, P0117, P0118 – Coolant Temperature Sensor faults
- P0261, P0262, P0264, P0265, P0267, P0268, P0270, P0271, P0273, P0274, P0276, P02777 – Injector faults
- P0300, P0301, P0302, P0303, P0304, P0305, P0306 – Misfire faults
- P1301, P1302 – Misfire faults causing emission or catalyst damage

Malfunction Criteria:
- 3 consecutive switch times >700 ms.

Monitor:
- Continuous, until the test is either passed or failed

Potential failure modes:
- Check and rectify any pre catalyst sensor fault code, as they may be causing the fault code to be set
- Catalyst damage/leak/inefficiency

Diagnostic Mask:
- The MIL will be illuminated if these faults are present for 2 consecutive trips.

P0140, P0160
Monitor:
- Continuous

Enable Criteria:
- Engine run time > 30 seconds
- Engine is not at idle
- Engine is in closed loop fuel control
- Oxygen sensors ready

Disable Criteria:
- None

Malfunction Criteria:
- Set when the sensor fails to switch above 600mV and below 300mV within 60 seconds.

Potential failure modes:
- Check and rectify any front sensor fault code, as they may be causing the fault code to be set
- Sensor connector and wiring should be checked for corrosion and loose connections
- Catalyst
- Gas leak in exhaust system

Diagnostic Mask:
- The MIL will be illuminated if these faults are present for 2 consecutive trips.

P0141, P0161
Monitor:
- Continuous

Enable Criteria:
- Engine run time > 20 seconds

Disable Criteria:
- None

Malfunction Criteria:
- Set when the heater output is greater than 1900mA or less than 250mA for 1.5 seconds, for 40 consecutive checks.

Potential failure modes:
- Sensor connector and wiring should be checked for corrosion and loose connections

Diagnostic Mask:
- The MIL will be illuminated if a fault is present for two consecutive trips.

Fuel Control System Too Lean Or Rich

P0171 System Too Lean (Bank 1)
P0172 System Too Rich (Bank 1)
P0174 System Too Lean (Bank 2)
P0175 System Too Rich (Bank 2)

Description
The oxygen sensor sends a signal to the ECU corresponding to the exhaust gas oxygen content enabling the ECU to maintain a 14.7:1 air/fuel ratio under normal driving conditions. The ECU can make fuel corrections of ± 30% to the calculated fuel demand. This value is then learned by the ECU over time. If the ECU determines a rich condition exists (oxygen sensor above 450mV), it will decrease the calculated fuel demand to maintain a 14.7:1 ratio. If the ECU determines a lean condition exists (oxygen sensor below 450mV), it will increase the calculated fuel demand to maintain a 14.7:1 ratio.

Monitor:
- Continuous

Enable Criteria:
- Fuel Trim condition enabled
- Closed loop fuelling enabled
- MAF < 28 g/sec
- Altitude < 8000 ft (2438 m), Baro > 756 mbar

Disable Criteria P0171 & P0172:
- P0106, P0107, P0108 – Baro sensor faults
- P0131, P0135 – Oxygen sensor faults
- P0300, P0301, P0302, P0303 – Misfire faults
- P0111, P0112, P0113 – Intake air temperature faults

Disable Criteria P0174 & P0175:
- P0106, P0107, P0108 – Baro sensor faults
- P0151, P0155 – Oxygen sensor faults
- P0300, P0304, P0305, P0306 – Misfire faults
- P0111, P0112, P0113 – Intake air temperature faults

Malfunction Criteria P0171 & P0174:
- These codes will set when the relevant engine bank learned fuel correction has been increased to its maximum limit of 25% and the system still cannot maintain an air/fuel ratio of 14.7:1 under normal driving conditions.
- These codes will also be set if the relevant bank fuel learn injector dead time is greater than 450 micro seconds.

Potential failure modes:
- Fuel Pressure too low (restriction in fuel line)
- Air leak in induction system
- Water in fuel
- Exhaust leak / crack before front oxygen sensor
- Injector fault
- Sensor connector and wiring for signs of corrosion or loose connections
- MAF fault
- Vehicle has previously run out of fuel

Diagnostic Mask:
- The MIL will be illuminated if fault is present for two consecutive trips.

Malfunction Criteria P0172, P0175:
- These codes will be set when the relevant bank learned fuel correction has been decreased to its minimum limit of -25% and the system still cannot maintain an air/fuel ratio of 14.7:1 under normal driving conditions.
- These codes will also be set if the relevant bank fuel learn injector dead time is less than -450 micro seconds.

Potential failure modes:
- Fuel pressure too high
- Leaking fuel injector
- Restriction in the exhaust system or air intake / filter
- Erratic throttle position sensor
- MAF fault
- O2 sensor fault
- Ignition fault

Diagnostic Mask:
- The MIL will be illuminated if a fault is present for two consecutive trips.

Fuel Injection System

P0261 Injector Circuit low voltage – Cylinder 1
P0262 Injector Circuit high voltage – Cylinder 1
P0264 Injector Circuit low voltage – Cylinder 2
P0265 Injector Circuit high voltage – Cylinder 2
P0267 Injector Circuit low voltage – Cylinder 3
P0268 Injector Circuit high voltage – Cylinder 3
P0270 Injector Circuit low voltage – Cylinder 4
P0271 Injector Circuit high voltage – Cylinder 4
P0273 Injector Circuit low voltage – Cylinder 5
P0274 Injector Circuit high voltage – Cylinder 5
P0276 Injector Circuit low voltage – Cylinder 6
P0277 Injector Circuit high voltage – Cylinder 6

Description
The ECU has six injector driver circuits, each of which controls an injector. When the engine is running the ECU continuously monitors the injector circuit feedback signals. The monitored feedback signal should be low voltage when the injector is ON and high voltage when the injector is OFF.

Component connections

Injector	ECU Pin	ECU Connector
1	H4	32 Way (Left)
2	H3	32 Way (Left)
3	H2	32 Way (Left)
4	H1	32 Way (Left)
5	G4	32 Way (Left)
6	G3	32 Way (Left)

Monitor:
- Continuous

Enable Criteria:
- Engine running

Potential failure modes:
- Sensor connector or wiring corroded or loose connections

Diagnostic Mask:
- The MIL will be illuminated if these faults are present for 2 consecutive trips.

Limp home:
- Limit maximum engine speed to 4000rpm
- Return the fuel system of the affected bank to open loop fuel control

Notes:
If an injector goes short circuit it is likely that the ECU injector driver will be damaged.

Misfire

P0300 Random/Multiple Cylinder Misfire Detected
P0301 Cylinder 1 Misfire Detected
P0302 Cylinder 2 Misfire Detected
P0303 Cylinder 3 Misfire Detected
P0304 Cylinder 4 Misfire Detected
P0305 Cylinder 5 Misfire Detected
P0306 Cylinder 6 Misfire Detected

Description
A misfiring cylinder can be detected by analysing crank speed variation. As a result of a combustion event there will be a net acceleration of the crankshaft. Subsequent to a misfire event the engine will decelerate over the period following the missed cylinder event.
Speed changes can be characterised by observing changes in the time period for a fixed angle of rotation after firing events. A significant change in this period, assessed by comparison to previous periods, may be attributed to misfire on a known cylinder.

Component connections

Connector	Description	ECU Pin						ECU Connector
1	Supply Voltage	Coil 1	Coil 2	Coil 3	Coil 4	Coil 5	Coil 6	
2	Ignition Coil Feedback	D2	D2	D2	D2	D2	D2	32 Way (Left)
3	Coil Output (Logic)	F4	F3	F2	F1	E4	E3	32 Way (Left)
4	Ground							

Malfunction Criteria
The operation of all the misfire codes is the same, the last digit relates to the misfire involved i.e. a code P0303 indicates there is a problem with cylinder number 3.
P0300 indicates the misfire is random and not linked to one particular cylinder.

Monitor:
- Continuous

Enable Criteria:
- Battery voltage between 10 – 16 V
- Coolant temperature between -10 – 120°C (14 – 248°F)
- Engine speed between 480 – 8010rpm
- Engine speed transient > 15rpm
- Altitude < 8000 ft (2438 m) / Baro > 756mbar
- Fuel level > 5 litres (1.3 US gallons)
- Engine load greater than 14 – 25% depending on engine speed

Disable Criteria:
- DFCO enabled (Deceleration Fuel Cut Off)
- Rough road
- MAF faults

Malfunction Criteria:
- Individual cylinder misfire in excess of 10% of total engine misfire
- P0300 set when more than one cylinder misfiring or when CAM error MIL requested

Limp home (depends on severity and number of cylinders affected):
- Throttle limited and engine continues to run on all cylinders
- Fuel system set to open loop control
- Affected bank shut down and engine speed limited to 4000 rpm

Potential failure modes:
- Injectors or related codes
- VVT system (clearance or timing) or related codes
- MAF meter or related codes
- Connectors and wiring for signs of corrosion or loose connections
- Spark plug / coil / cylinder compression
- PCV system / hoses
- Fuel pressure
- Coolant temperature sensor
- Vacuum hoses
- ECU

Diagnostic Mask:
- The MIL will be illuminated if a fault is present for two consecutive trips.

Knock Control System

P0327 Knock Sensor Circuit Low (Bank 1)
P0328 Knock Sensor Circuit High (Bank 1)
P0332 Knock Sensor Circuit Low (Bank 2)
P0333 Knock Sensor Circuit High (Bank 2)

Description
The knock sensor contains a piezoelectric element which generates a voltage when it becomes deformed. The piezoelectric element sends continuously sends a signal to the ECU, when the cylinder block vibrates due to engine knocking this signal increases. The ECU is able to identify each cylinder. If knock is detected then the ECU will retard the ignition of the relevant cylinder to suppress it.
The knock control sensor cannot differentiate between spark knock and other similar sounding noises.

Sensor connections

Sensor Connector	Description	ECU Pin	ECU Connector
1 Bank 1	Sensor input	D1	48 Way (Centre)
2 Bank 1	Ground	C1	48 Way (Centre)
3 Bank 2	Sensor input	D2	48 Way (Centre)
4 Bank 2	Ground	C2	48 Way (Centre)

Monitor:
- Continuous

Enable Criteria:
- Engine running

Malfunction Criteria:
- P0327 – This code is set when the bank 1 knock sensor signal is < 0.586 V
- P0328 – This code is set when the bank 1 knock sensor signal is > 2.932 V
- P0332 – This code is set when the bank 2 knock sensor signal is < 0.586 V
- P0333 – This code is set when the bank 2 knock sensor signal is > 2.932 V

Potential failure modes:
- Abnormal engine noise, i.e. damaged engine or exhaust system contacting vehicle
- Knock sensor fixing too tight
- Sensor connector / wiring corroded or loose connections
- ECU

Diagnostic Mask:
- The MIL will be illuminated if a fault is present for two consecutive trips.

Engine Speed / Position Sensors

P0335 Crankshaft Position Sensor “A” Circuit Range/Performance

Description
Engine speed is calculated by measuring the time between the ‘teeth’ of the crankshaft sensor trigger disc. The disc has 34 ‘teeth’ and 2 missing ‘teeth’, spaced at 10 degree intervals around the disc. The 2 missing ‘teeth’ are positioned at 155 degrees before cylinder No.1 TDC. The crankshaft sensor signal is also used to determine misfires events.

Sensor connections

Sensor Connector	Description	ECU Pin	ECU Connector
1	Sensor input	A4	32 Way (Left)
2	Ground	B2	32 Way (Left)

Monitor:
- Continuous

Enable Criteria:
- Engine running

Disable Criteria:
- None

Malfunction Criteria:
- 15 crank errors in succession. This can occur due to no crank signal occurring whilst the cams continue to count or if there is a measured consecutive crank error.

Potential failure modes:
- Sensor signal open circuit or short to ground
- Sensor ground open circuit
- Sensor failure
- Crankshaft sensor plate
- ECU

Diagnostic Mask:
- The MIL will be illuminated if this fault is present for two consecutive trips.

Notes:
If a sensor or sensor circuit failure occurs, the engine will not fire or start.

Engine Speed / Position Sensors

P0341 Camshaft Position Sensor "A" Circuit (Bank 1)
P0346 Camshaft Position Sensor "A" Circuit (Bank 2)
P0366 Camshaft Position Sensor "B" Circuit (Bank 1)
P0391 Camshaft Position Sensor "B" Circuit (Bank 2)

Description
The camshaft position input to the ECU is used to determine engine phase, enable sequential fuel injection control and to determine camshaft position for VVT control. The inlet camshaft has three 'teeth' spaced 90° apart, which are detected by the electromagnetic sensor. The valve timing setting is measured in the ECU by measuring time from a (fixed position) crankshaft tooth to a (variable position) camshaft tooth. As the engine speed and the position is known from the crankshaft sensor signal, the camshaft position can be calculated.

Sensor connections

Sensor Connector	Description	ECU Pin	ECU Connector
1 Inlet Bank 1	Signal	A3	32 Way (Left)
2 Inlet Bank 1	Ground	B3	32 Way (Left)
3 Supply voltage	5V	D1	32 Way (Left)
1 Exhaust Bank 1	Signal	D4	32 Way (Left)
2 Exhaust Bank 1	Ground	C3	32 Way (Left)
3 Supply voltage	5V	D1	32 Way (Left)
1 Inlet Bank 2	Signal	A2	32 Way (Left)
2 Inlet Bank 2	Ground	C2	32 Way (Left)
3 Supply voltage	5V	D1	32 Way (Left)
1 Exhaust Bank 2	Signal	D3	32 Way (Left)
2 Exhaust Bank 2	Ground	C4	32 Way (Left)
3 Supply voltage	5V	D1	32 Way (Left)

Monitor:
- Continuous

Enable Criteria:
- Engine running
- Engine speed > 600rpm
- Engine runtime > 4 secs

Disable Criteria:
- None

Malfunction Criteria:
- 15 revolutions of crankshaft without receiving camshaft signal

Potential failure modes:
- Sensor signal open circuit or short to ground
- Sensor ground open circuit
- Sensor failure
- Cam failure
- Camshaft position plate
- ECU

Diagnostic Mask:
- The MIL will be illuminated if a fault is present for two consecutive trips.

Notes:
Fault code P0341 will also be generated if the vehicle fails security checks on start up.

Ignition System

P0351 Ignition Coil “A” Primary/Secondary Circuit
P0352 Ignition Coil “B” Primary/Secondary Circuit
P0353 Ignition Coil “C” Primary/Secondary Circuit
P0354 Ignition Coil “D” Primary/Secondary Circuit
P0355 Ignition Coil “E” Primary/Secondary Circuit
P0356 Ignition Coil “F” Primary/Secondary Circuit

Description
A Direct Ignition System (DIS) is used on the engine. The DIS improves the ignition accuracy, reduces high-voltage loss, and enhances the reliability of the ignition system. The DIS is a 1-cylinder system that ignites one cylinder with one ignition coil. The ECU determines the ignition timing and outputs the ignition signals (IGT) for each cylinder. Based on IGT signals, the power transistors in the igniter cuts off the current to the primary coil, which induces a spark at the spark plug connected to the secondary coil. The igniter will also send an ignition confirmation signal (IGF) as a fail-safe measure to the ECU.

Component connections

Connector Pin	Description	ECU Pin						ECU Connector
1	Supply Voltage	Coil 1	Coil 2	Coil 3	Coil 4	Coil 5	Coil 6	
2	Ignition Coil Feedback	D2	D2	D2	D2	D2	D2	32 Way (Left)
3	Coil Output (Logic)	F4	F3	F2	F1	E4	E3	32 Way (Left)
4	Ground							

Monitor:
- Continuous

Enable Criteria:
- Engine running

Malfunction Criteria:
- No IGF signal to ECM while engine is running

Potential failure modes:
- Open or short in IGF1 – IGF6 circuits from ignition coil to ECU
- Coil failure
- ECU

Diagnostic Mask:
- The MIL will be illuminated if a fault is present for two consecutive trips.

Catalyst System Efficiency

P0420 Catalyst System Efficiency Below Threshold (Bank 1)
P0430 Catalyst System Efficiency Below Threshold (Bank 2)

Description
The ECU compares the waveform of the oxygen sensors located before and after the catalyst to determine whether or not the catalyst has deteriorated. If the catalyst is functioning normally the front oxygen sensor will be switching between rich and lean whilst the rear oxygen sensor should also be switching between rich and lean but more slowly. When both the oxygen sensor waveforms change at a similar rate, it indicates that the catalyst performance has deteriorated. The ECU counts the number of pre and post catalyst oxygen sensor switches and divides one by the other to determine a ratio. If this ratio is too high a fault will be indicated.

Sensor connections
Pre catalyst oxygen sensor

Sensor	Connector	Description	ECU Pin	ECU Connector
1 Bank	1	Signal	G3	48 Way (Centre)
2 Bank	1	Ground	J2	48 Way (Centre)
3 Bank	1	Heater Supply	H3	48 Way (Centre)
4 Bank	1	Battery Voltage	-	-
1 Bank	2	Signal	G4	48 Way (Centre)
2 Bank	2	Ground	J2	48 Way (Centre)
3 Bank	2	Heater Supply	H4	48 Way (Centre)
4 Bank	2	Battery Voltage	-	-

Post catalyst oxygen sensor

Sensor	Connector	Description	ECU Pin	ECU Connector
1 Bank	1	Signal	H1	48 Way (Centre)
2 Bank	1	Ground	K4	48 Way (Centre)
3 Bank	1	Heater Supply	K1	48 Way (Centre)
4 Bank	1	Battery Voltage	-	-
1 Bank	2	Signal	H2	48 Way (Centre)
2 Bank	2	Ground	K4	48 Way (Centre)
3 Bank	2	Heater Supply	K2	48 Way (Centre)
4 Bank	2	Battery Voltage	-	-

Monitor:
- Continuous

Enable Criteria:
- Closed loop fuel control enabled
- Coolant temperature > 60 °C (140 °F)
- Baro > 756 mbar
- Vehicle speed < 130 km/h (81 mph)
- MAF < 48 g/sec & MAF > 2 g/sec
- Air inlet temp > -10°C (14°F)
- Accumulated Mass Air > 1800-4080 grams depending on coolant temperature

Disable Criteria:
- P0101, P0102, P0103 – MAF faults
- P0107, P0108 – MAP / Baro Faults
- P0116, P0117, P0118 – Coolant temperature faults
- P0131, P0132, P0133, P0134, P0135, P0137, P0138, P0139, P0140, P0141 – Oxygen sensor faults B1

- P0151, P0152, P0153, P0154, P0155, P0157, P0158, P0159, P0160, P0161 – Oxygen sensor faults B2
- P0171, P0172, P0174, P0175 – Fuelling faults B1 / B2
- P0300, P0301, P0302, P0303, P0304, P0305, P0306 – Misfire faults
- P0500 – Speed sensor fault

Malfunction Criteria:
- Switch ratio between Pre & Post catalytic converter O2 sensors > 0.6

Potential failure modes:
- Exhaust system leak
- Oxygen sensor faults
- Oxygen sensor heater failure
- Catalyst failure

Diagnostic Mask:
- The MIL will be illuminated if these faults are present for 2 consecutive trips.

Evaporative Emission Control – Leak Detection System

P0441 Evaporative Emission System Incorrect Purge Flow
P0442 Evaporative Emission System Leak Detected (small leak)
P0455 Evaporative Emission System Leak Detected (large leak)
P0456 Evaporative Emission System Leak Detected (very small leak)

Description
During an Evaporative Emission System Leak Detection check, the vacuum in the system is monitored by ECU using the fuel tank pressure sensor. At the appropriate time, the ECU starts the test by closing the canister closure value and opening the purge solenoid with the appropriate duty cycle. This allows the engine to draw a vacuum on the entire evaporative emission system. After a calibrated vacuum level is achieved the purge solenoid is closed, sealing the system. A leak is detected by monitoring any decrease in vacuum level over a calibrated period of time.

Sensor / component connections
Vapour Pressure sensor

Connector Pins	Description	ECU Pin	ECU Connector
1	Ground	K3	48 Way (Right)
2	Signal	B3	48 Way (Right)
3	5V V. Ref	F4	48 Way (Right)

Purge Canister Closure Valve

Connector Pins	Description	ECU Pin	ECU Connector
A	Battery Voltage	-	-
B	CCV Output	A1	48 Way (Centre)

Purge Solenoid

Connector Pins	Description	ECU Pin	ECU Connector
1	Battery Voltage	-	-
2	Solenoid Output	B3	48 Way (Centre)

Enable Criteria:
- Altitude < 8000 ft (2438 m), Baro > 756 mbar
- SUTair (Start up air temperature) > - 10°C (14°F)
- Coolant > 45°C (113°F)
- Air temp < 80°C (176°F)
- Fuel level between 10 – 51 litres (2.64 – 13.5 US gallons)
- Vehicle must be stationary for leak check

- Subsequent checks are made with purge levels > 75% and vehicle moving with part throttle
- Closed loop fuelling control enabled
- Closed loop idle speed control enabled
- Ignition on

Disable Criteria:

• P0171, P0172, P0174, P0175	– Fuel trim too rich or lean soft code
• P0441, P0444, P0445	– Purge faults
• P0446, P0447, P0448	– Canister closure faults
• P0451, P0452, P0453	– Tank Pressure sensor faults
• P0461, P0462, P0463	– Fuel level sensor faults
• P0500	– Vehicle speed faults

Malfunction Criteria

P0441

This code can be caused by the purge value being either stuck closed or open. This test is also completed upon vehicle start up.

Purge valve stuck open: A purge valve that is unable to seal correctly will result in a tank evacuation during the sealing phase of the leak check sequence. In this phase, a pressure rise would normally be expected but when the purge valve is not sealing this causes depression in the tank. When the pressure is below -4mbar a purge valve fault is detected. Upon vehicle start up the tank pressure should not drop below -25mbar as the CCV and purge valve are closed. Is this does occur a fault is detected.

Purge valve stuck closed: A purge valve that is unable to open will not be able to achieve the required depression during the evacuation phase. A positive pressure rise during the leak check evacuation phase will be detected. Additional purge checks will set a purge valve fault code, these require normal driving to complete.

Monitor:

- Until leak check is completed

Diagnostic Mask:

- The MIL will be illuminated if these faults are present for 2 consecutive trips.

P0442

This code is set during the evaporative leak check process if the system calculates the measure of leak is above a specified value (3.1 – 5.7 mbar determined by a table related to fuel level) after the 6.6 second timer has expired.

Monitor:

- Until leak check is completed

Potential failure modes:

- Leak from pipes or connections
- Leaking or damaged seal on filler cap / not fitted correctly
- Canister Closure valve not fully closing

Diagnostic Mask:

- The MIL will be illuminated if these faults are present for 2 consecutive trips.

P0455

This code is set if during the evaporative leak check the system fails to reach the evacuation target pressure. The system will perform additional purge checks to determine the nature of the problem. The additional purge checks will also run if the leak check fails to complete because the calculated vapour concentration is above the limit.

Additional Purge Check Enable Criteria:
- Vehicle not stationary
- Engine Load > 27.3%
- Purge value >= 75%
- Conditions met for > = 7.5 seconds

Monitor:
- Until leak check is completed

Potential failure modes:
- Fuel filler cap not fitted, jammed or not fitted correctly
- Leak from pipes or connections
- Canister Closure valve stuck open

Diagnostic Mask:
- The MIL will be illuminated if these faults are present for 2 consecutive trips.

P0456
This code is set during the evaporative leak check process if the system calculates the measure of leak is above a specified value (2.4 – 4.3 mbar determined by a table related to fuel level) after the 19.7 second timer has expired.

Monitor:
- Until leak check is completed

Potential failure modes:
- Leak from pipes or connections
- Leaking or damaged seal on filler cap / not fitted correctly
- Canister Closure valve not fully closing

Diagnostic Mask:
- The MIL will be illuminated if these faults are present for 2 consecutive trips.

Evaporative Emission Control – Purge, Open / Closed Circuit

P0444 Evaporative Emission System Purge Control Valve Circuit Open
P0445 Evaporative Emission System Purge Control Valve Circuit Closed
P0446 Evaporative Emission System Vent Control Circuit
P0447 Evaporative Emission System Vent Control Circuit Open
P0448 Evaporative Emission System Vent Control Circuit Closed
P0451 Evaporative Emission System Pressure Sensor/Switch Range/Performance
P0452 Evaporative Emission System Pressure Sensor/Switch Low
P0453 Evaporative Emission System Pressure Sensor/Switch High

Description
When the engine is running the ECU continuously monitors the status of the evaporative emission components for open circuit or short. The feedback signal should be low when turned ON and high when turned OFF. The following codes will be set if the above conditions are not met: P0444, P0445, P0447, P0448, P0452, P0453

Sensor / component connections
Vapour Pressure sensor

Connector Pins	Description	ECU Pin	ECU Connector
1	Ground	K3	48 Way (Right)
2	Signal	B3	48 Way (Right)
3	5V V. Ref	F4	48 Way (Right)

Purge Canister Closure Valve

Connector Pins	Description	ECU Pin	ECU Connector
A	Battery Voltage	-	-
B	CCV Output	A1	48 Way (Centre)

Purge Solenoid

Connector Pins	Description	ECU Pin	ECU Connector
1	Battery Voltage	-	-
2	Solenoid Output	B3	48 Way (Centre)

P0444, P0445
Potential failure modes:
- P0444 Purge valve/wiring open circuit
- P0445 Purge valve short circuit

Diagnostic mask:
- The MIL will be illuminated if these faults are present for 2 consecutive trips.

P0446
This code can be caused by the canister closure valve (CCV) being either stuck closed or open.

CCV stuck open:
If the CCV is stuck open then there will be minimal tank depression when the leak test is performed. Addition check will be performed when the vehicle is being driven before the code is set.

CCV stuck closed:
Detection of a stuck closed CCV is implemented by detecting an excessively low tank pressure during normal purge (pressure < 25mbar). Detection of this fault will disable further purging
Additional checks for CCV stuck closed:
- Purge Value > 0%
- CCV Open - requested

Monitor:
- Until leak check is completed.

Diagnostic Mask:
- The MIL will be illuminated if these faults are present for 2 consecutive trips.

P0451, P0452, P0453
This code is set when the ECU detects abnormalities in the fuel tank vapour pressure sensor signal. The ECU analyses the filtered and unfiltered pressure signal at idle after a de-slosh period to determine if there is any difference; a big difference indicates as a fault. The ECU also monitors the signal on gear changes to see if there is any pressure rise as a result of the fuel sloshing around.
These codes are likely to indicate a pressure sensor fault.

Disable Criteria:
- P0500 – Wheel speed sensor fault

Monitor:
- Until leak check is completed

Diagnostic Mask:
- The MIL will be illuminated if these faults are present for 2 consecutive trips.

Fuel Level Sensor

P0461 Fuel Level Sensor "A" Circuit Range/Performance
P0462 Fuel Level Sensor "A" Circuit Low
P0463 Fuel Level Sensor "A" Circuit High

Description
When the engine is running the ECU continuously monitors the fuel level sensor feedback signals. The feedback signal should be low when turned ON and high when turned OFF. The following codes will be set if the above conditions are not meet.

Sensor connections

Sensor Connector	Description	ECU Pin	ECU Connector
1			
2	Fuel level sensor	A2	48 Way (Right)
3	Fuel level sensor ground.	K3	48 Way (Right)

P0462, P0463
Monitor:
- Continuous

Enable Criteria:
- Engine Running

Disable Criteria:
- None

Malfunction Criteria:
- P0462 – Voltage < 0.020V
- P0463 – Voltage > 0.684V for 1.5 secs

Potential failure modes:

- Sensor open or short circuit
- Fuel level sensor

Diagnostic Mask:
- The MIL will be illuminated if these faults are present for 2 consecutive trips.

P0461
The ECU calculates the fuel usage and determines whether the fuel level sensor has responded correctly to this usage. The ECU also monitors the filtered and unfiltered signal at idle after a 20 second de-slosh period and compares the differences.

Monitor:
- Continuous

Enable Criteria 1:
- Vehicle Idling
- Vehicle stationary for 20 seconds

Disable Criteria 1:
- Fuel level < 3.3 litres (0.9 US gallons)

Malfunction Criteria 1:
- Signal fluctuation > 10 litres, 35 times over 7 second period

Enable Criteria 2:
- 12 litres fuel usage in upper region
- 10 litres fuel usage in lower region
- 5 litres fuel usage in mid region

Disable Criteria:
- Vehicle stopped for 30 secs

Malfunction Criteria:
- Checks for three conditions, stuck when full, stuck when empty or stuck midway. The ECU determines if the sensor is stuck by calculating the amount of fuel used during the test period. If the fuel level does not move by more than 1 litre a fault is flagged.

Potential failure modes:
- Fuel level sensor wiring or connector corroded
- Fuel level sensor stuck

Diagnostic Mask:
- The MIL will be illuminated if these faults are present for 2 consecutive trips.

Engine Cooling Fan Control

P0480 Fan 1 Control Circuit
P0481 Fan 2 Control Circuit

Description
Slow Fans – ECM engages fan relay 3 and runs both fans in series through the disengaged fan relays 2 and 1.
Fast Fans – ECM engages fan relays 1 and 2 and runs both of the fans in parallel.

Component connections

Sensor Connector	Description	ECU Pin	ECU Connector
	Slow Fans	F1	48 Way (Right)
	Fast Fans	E2	48 Way (Right)

Monitor:
- Continuous

Enable Criteria:
- Engine running

Disable Criteria:
- None

Potential failure modes:
- Wiring harness problem
- Relay
- ECU

Diagnostic Mask:
- The service light will be illuminated for 30 seconds at the point the fault occurs, and then illuminated for 30 seconds after engine start if the fault is present.

Engine Bay Cooling Fan Control

P0482 Fan 3 Control Circuit

Description
For some hot climate markets cars are fitted with an engine bay cooling fan. The ECM controls the fan relay and diagnoses it for open or short circuit.

Component connections

Sensor Connector	Description	ECU Pin	ECU Connector
		Fan relay	L1
48 Way (Right)			

Monitor:
- Continuous

Enable Criteria:
- Engine running

Disable Criteria:
- None

Potential failure modes:
- Wiring harness problem
- Relay
- ECU

Diagnostic Mask:
- The service light will be illuminated for 30 seconds at the point the fault occurs, and then illuminated for 30 seconds after engine start if the fault is present.

Vehicle Speed Sensor

P0500 Vehicle Speed Sensor “A”

Description
This input to the ECU is from the ABS module via CAN.

Monitor:
- Continuous

Enable Criteria:
- Following conditions must occur for 5 seconds
- Engine speed > 1800rpm and < 5010rpm
- Baro > 756 mbar
- Engine in a mode that indicates that the vehicle must be moving.

Malfunction Criteria:
- KMH < 5 kmh

Potential failure modes:
- ABS module failure
- CAN bus communication error to ABS controller

Diagnostic Mask:
- The MIL will be illuminated if a fault is present for two consecutive trips.

Idle Speed Control

P0506 Idle Air Control System RPM Lower Than Expected
P0507 Idle Air Control System RPM Higher Than Expected

Description
The ECM controls the engine idle speed using a combination of spark advance and throttle blade position adjustment. If this control cannot attain the desired idle speed a fault is diagnosed.

Monitor:
- Continuous

Enable Criteria:
- Engine at idle speed
- Battery voltage between 10 V and 16 V

Malfunction Criteria 1:
- Idle air learn value on upper limit of +1.9g/s
- Idle speed more than 100 rpm below desired idle speed for more than 5 seconds.

Malfunction Criteria 2:
- Idle air learn value on lower limit of -0.9g/s
- Idle speed more than 200 rpm above desired idle speed for more than 5 seconds.

Potential failure modes:
- Induction system air leak
- Excessive engine load from front end accessory drive system, water pump, power steering,

alternator
- Electronic Throttle Control

Diagnostic Mask:
- The MIL will be illuminated if a fault is present for 2 consecutive trips.

Notes:
There will be a different learn value for AC on and AC off. Either could trigger fault

Cold Start Idle Speed Control ~~(USA Only)~~

P050A Cold Start Idle Air Control System Performance

Description
The ECM controls the engine idle speed using a combination of spark advance and throttle blade adjustment. If this control cannot attain the desired idle speed at cold engine temperatures a fault is diagnosed.

Monitor:
- Continuous

Enable Criteria:
- Engine running
- Water temperature < 50 degC
- Battery voltage 10.0 v to 16.0 v

Disable Criteria:
- None

Malfunction Criteria 1: Cold Idle Speed Too Low
- Engine speed error to target < -100 RPM
- Idle speed control adaption > 1.9 g/s
- For more than 25 secs

Malfunction Criteria 2: Cold Idle Speed Too High
- Engine speed error to target > 200 RPM
- Idle speed control adaption < -0.9 g/s
- For more than 25 secs

Malfunction Criteria 3: Cold Idle Speed Too High
- Engine speed error from target > 304 RPM
- Accelerator pedal position < 0.879%
- Vehicle Speed = 0 mph
- For more than 25 secs

Diagnostic Mask:
- The MIL will be illuminated if a fault is present for 2 consecutive trips.

Cold Start Ignition Timing ~~(USA Only)~~

P050B Cold Start Idle Ignition Timing Performance

Description
Check for over-advanced ignition timing whilst cold-start catalyst warm-up strategy active.

Monitor:
- Continuous

Enable Criteria:
- Start up coolant temperature > -9 degC and < 32 degC

Malfunction Criteria:
- This DTC will be set if the final commanded ignition advance timing minus the output advance timing factored by cold start catalyst warm-up strategy is greater than 0 degrees for 1.5 secs continuously

Diagnostic Mask:
- The MIL will be illuminated if a fault is present for 2 consecutive trips.

Engine Oil Pressure Sensor

P0523 Engine Oil Pressure Sensor Switch High

Description
The fault code detects when a warm engine has been switched off and the oil pressure signal remains high

Monitor:
- Continuous

Enable Criteria:
- Engine not rotating
- Engine coolant > 70ºC
- Ignition on

Disable Criteria:
- None

Malfunction Criteria:
- Oil pressure signal > 3.9V

Diagnostic Mask:
- The service light will be illuminated for 30 seconds at the point the fault occurs, and then illuminated for 30 seconds after engine start if the fault is present.

A/C Evaporator temperature sensor

P0537 A/C Evaporator temperature sensor circuit low
P0538 A/C Evaporator temperature sensor circuit high

Description
The A/C system incorporates an evaporator temperature sensor for system control. This is a thermistor device that changes resistance with temperature. As the evaporator temperature decreases the thermistor resistance value increases, and conversely as the evaporator temperature increases so the thermistor resistance value decreases.

Sensor connections

Sensor Connector	Description	ECU Pin	ECU Connector
1	Sensor signal	A3	48 Way (Right)
1	Sensor ground	K3	48 Way (Right)

Monitor:
- Continuous

Enable Criteria:
- Vehicle Running

Disable Criteria:
- None

Malfunction Criteria:
- P0537 – Signal voltage < 0.049V for 1.5 seconds
- P0538 – Signal voltage > 4.399V for 1.5 seconds

Potential failure modes:
- Thermistor wiring open circuit or shorted
- Thermistor fault

Diagnostic Mask:
- The service light will be illuminated for 30 seconds at the point the fault occurs, and then illuminated for 30 seconds after engine start if the fault is present.

Battery Voltage

P0562 System Voltage Low
P0563 System Voltage High

Description
With a battery and alternator functioning as normal the system voltage for a running engine should be around 14V. The ECM monitors this and will diagnose if the voltage is too high or too low.

Monitor:
- Continuous

Enable Criteria:
- Engine running

Disable Criteria:
- None

Malfunction Criteria:
- P0562 – Voltage Too Low < 10V for 10 seconds
- P0563 – Voltage Too High > 16V for 25.5 seconds

Potential failure modes:
- Alternator fault
- Battery fault

Diagnostic Mask:
- The MIL will be illuminated if a fault is present for two consecutive trips.

Cruise Control

P0564 Cruise control multi-function input signal
P0578 Cruise control multi-function input “A” circuit stuck
P0579 Cruise Control Multi-Function Input "A" Circuit Range / Performance
P0571 Brake switch “A” circuit

Description
Cruise control requests are made using a multi-function switch input. Each cruise control function switch selects a different resistive network to a single ECM input. From this input the ECM determines the driver request.
In addition cruise control is cancelled by the application of either the brake pedal or the clutch pedal (see also P0806, P0807 and P0808).

Sensor connections

Sensor Connector	Description	ECU Pin	ECU Connector
1	Cruise control switch input	E3	48 Way (Right)
2	Cruise control ground	K3	48 Way (Right)
1	Brake Switch Ground	-	-
2	Brake Switch Input	C4	48 Way (Right)

P0564, P0578
Monitor:
- Continuous

Enable Criteria:
- None

Disable Criteria:
- None

Malfunction Criteria:
- P0564 – Cruise control multifunction switch open circuit or short circuit
- P0578 – Input other than OFF received for more than 100 seconds

Potential failure modes:
- Cruise switch wiring open circuit or shorted
- Cruise switch fault
- ECU input circuit fault

Notes:
- The service light will be illuminated for 30 seconds at the point the fault occurs, and then illuminated for 30 seconds after engine start if the fault is present.

P0579

Monitor:
- Continuous

Enable Criteria:
- Engine running (RPM>0)

Disable Criteria:
- None

Malfunction Criteria:
Switch state must change more than 20 times in less than 1 second

Potential failure modes:
Cruise switch fault
Cruise switch wiring or connector

Notes:
The service light will be illuminated for 30 seconds at the point the fault occurs, and then illuminated for 30 seconds after engine start if the fault is present.

P0571
Monitor:
- Continuous

Enable Criteria 1:
- KMH > 10 kmh
- PPS > 0.488%

Enable Criteria 2:
- ABS communications working

Disable Criteria:
- None

Malfunction Criteria 1:
- Brake switch on for greater than 25.5 seconds

Malfunction Criteria 2:
- ABS indicating brakes are on but brake switch off for greater than 0.5 seconds

Potential failure modes:
- Brake switch wiring open circuit or shorted
- Brake switch fault

Diagnostic Mask:
- The service light will be illuminated for 30 seconds at the point the fault occurs, and then illuminated for 30 seconds after engine start if the fault is present.

Variant Code Not Programmed

P0610 Variant code not programmed

Description
The ECM programming process includes the vehicle variant code.
If a new ECM has been fitted, the relevant vehicle variant code needs to be programmed using the Lotus TechCentre tool.

Monitor
- During start up

Disable criteria
- None

Potential failure modes
- Variant code not programmed
- Variant code programmed incorrectly

Diagnostic mask
- The MIL will be illuminated if fault is present.

Crank Relay

P0616 Starter relay voltage low
P0617 Starter relay voltage high

Description
When the ignition key is in the crank position battery voltage is applied to the start request input of the ECM. The ECM will then energise the crank relay, via the immobiliser, to allow the starter motor to be engaged. ECM diagnosis is only carried out on the crank relay.

Component connections

Relay Connector	Description	ECU Pin	ECU Connector
2	Main relay via fuse MR1	-	-
4	Crank relay control	G1	48 Way (Right)

Monitor:
- Continuous

Enable Criteria:
- Engine running

Disable Criteria:
- None

Potential failure modes:
- P0616 – Crank relay wiring open circuit or shorted to ground
- P0616 – Fuse MR1
- P0617 – Crank relay wiring shorted to 12V
- Crank relay failure
- Immobiliser failure
- ECU output circuit failure

Diagnostic Mask:
- The service light will be illuminated for 30 seconds at the point the fault occurs, and then illuminated for 30 seconds after engine start if the fault is present.

Fuel Pump Relay

P0628 Fuel Pump “A” Control Circuit Low Voltage
P0629 Fuel Pump “A” Control Circuit High Voltage

Description
The fuel system is of the non-return type. The fuel pump is incorporated into the fuel tank module, which also contains the level sensor, fuel pressure regulator and vapour pressure sensor. The ECM controls the fuel pump operation via a relay, because of this the only fault diagnosis is of the fuel pump relay.

Component connections

Relay connector	Description	ECU Pin	ECU Connector
1	Rear ignition relay via fuse R7	-	-
2	Fuel pump relay control	H2	48 Way (Right)

Monitor:
- Continuous

Enable Criteria:
- Ignition on

Disable Criteria:
- None

Potential failure modes:
- P0628 fuel pump relay wiring open circuit or shorted to ground
- P0628 fuse R7
- P0629 fuel pump relay wiring shorted to 12V
- Fuel pump relay failure
- ECU output circuit failure

Diagnostic Mask:
- The MIL will be illuminated immediately if a fault is present.

VIN Not Programmed or Incompatible – ECU/PCM

P0630 VIN not programmed or incompatible

Description
The ECM programming process includes the Vehicle Identification Number (VIN).
If a new ECM has been fitted this operation is performed using the Lotus TechCentre tool.

Monitor:
- During start up

Enable Criteria:
- Engine running (for up to 4 seconds)

Disable Criteria:
- None

Potential failure modes:
- VIN not programmed
- VIN programmed incorrectly

Diagnostic Mask:
- The MIL will be illuminated if fault is present.

Throttle Actuator Control Range/Performance

P0638 Throttle actuator control range/performance

Description
The single throttle butterfly valve mounted at the inlet to the intake plenum is operated by a stepper motor under the command of the engine ECU. The valve moves through a range of nearly 90° and should display 100% at full throttle and around 2% at idle.

Monitor:
- Continuous

Enable Criteria 1:
- Engine running

Disable Criteria 1:
- Electronic throttle fault P2135, P0122, P0122, P0222 or P0223 present
- Throttle demand transient condition

Malfunction Criteria 1:
- TPS error > 3% for 7.5 secs

Enable Criteria 2:
- Ignition on

Disable Criteria 2:
- Electronic throttle fault P2135, P0122, P0122, P0222 or P0223 present

Malfunction Criteria 2:
- Throttle not able to find closed position during boot

Potential failure modes:
- Blocked throttle body
- Damage to throttle actuator

Diagnostic Mask:
- The MIL will be illuminated if fault is present.

Notes: A mechanically sprung 7% throttle opening may be imposed.

Air Conditioning System

P0646 A/C Clutch Relay Control Circuit Low
P0647 A/C Clutch Relay Control Circuit High

Description
The ECM controls the A/C clutch relay in response to the A/C driver request and ECM control logic.

Component connections

Relay Connector	Description	ECU Pin	ECU Connector
1	Ignition supply via fuse R11		
2	AC clutch relay control	F2	48 Way (Right)

Monitor:
- Continuous

Enable Criteria:
- Engine running

Disable Criteria:
- None

Potential failure modes:
- P0646 – A/C compressor relay wiring open circuit or shorted to ground
- P0646 – Fuse R11
- P0647 – A/C compressor relay circuit shorted to 12V
- A/C compressor relay failure
- ECU output circuit failure

Diagnostic Mask:
- The service light will be illuminated for 30 seconds at the point the fault occurs, and then illuminated for 30 seconds after engine start if the fault is present.

Variable intake manifold circuit (Evora only, not Evora S)

P0661 Variable intake manifold circuit voltage low
P0662 Variable intake manifold circuit voltage high

Description
This circuit opens and closes the variable intake manifold (VIM) in response to changes in the engine speed and load in order to increase the intake efficiency.
When the engine speed is less than 4200 rpm and the engine load is greater than 52%, the ECM turns on the VIM control valve to close the VIM. Under all other conditions, the VIM control valve is usually off and the VIM is open.

Component connections

Connector	Description	ECU Pin	ECU Connector
1	Ignition supply via fuse R8	-	-
2	VIM control valve control	L4	48 Way (Central)

Monitor:
- Continuous

Enable Criteria:
- Engine running

Disable Criteria:
- None

Potential failure modes:
- P0661 – VIM wiring open circuit or shorted to ground
- P0661 – Fuse R8
- P0662 – VIM circuit, ECM side, shorted to battery voltage
- VIM control valve failure
- ECU output circuit failure

Diagnostic Mask:
- The MIL will be illuminated if a fault is present for two consecutive trips.

ECU Power Relay

P0685 ECU Power Relay Open Circuit

Description
The ECU power is controlled by the main power relay. The voltage at ECM pins RM2/RM3/RM4 is compared to the ignition switch input voltage at RB2 to determine if the power relay is open circuit.
As this fault prevents the correct shut down of the ECM, then the fault code is only visible whilst the engine is running.

Monitor:
- Continuous

Enable Criteria:
- Engine running

Disable Criteria:
- None

Potential failure modes:
- Fuse R1
- Relay open circuit

Diagnostic Mask:
- The MIL will be illuminated if a fault is present and the engine is running.

Transmission Control System

P0700 Transmission Control System (MIL Request)

Description
Certain faults within the Transmission Control System can have an exhaust emissions impact. When one of these faults is diagnosed by the TCM the MIL is illuminated by the ECM.

Monitor:
- Continuous

Enable Criteria:
- Engine running

Disable Criteria:
- None

Potential failure modes:
- Check TCM for fault codes

Diagnostic Mask:
- The MIL will be illuminated if a fault is present and the engine is running.

Clutch position sensor circuit

P0806 Clutch position sensor circuit range/performance
P0807 Clutch position sensor circuit low
P0808 Clutch position sensor circuit high
P1809 Noisy Clutch Pedal Sensor

Description
The clutch position sensor is used to identify the position of the clutch (engaged, disengaged or slipping). This information is used to control features such as fuel cut during gear changes, cruise control deactivation and ensuring any torque increase requests from the ESP system only occur with the clutch engaged.
The ECM continuously monitors the clutch position sensor input for malfunctions.

Component connections

Connector	Description	ECU Pin	ECU Connector
A	Ground	K3	48 Way (Right)
B	Clutch position sensor signal	B1	48 Way (Right)
C	Reference voltage	F4	48 Way (Right)

P0806
Monitor:
- Continuous

Enable Criteria:
- Maximum and minimum clutch position measured over 15 gear changes

Disable Criteria:
- None

Malfunction Criteria:
- Voltage difference between maximum and minimum of less than 1.71V

Potential failure modes:
- Clutch sensor failure
- Clutch pedal failure

Diagnostic Mask:
- The service light will be illuminated for 30 seconds at the point the fault occurs, and then illuminated for 30 seconds after engine start if the fault is present.

P0807, P0808
Monitor:
- Continuous

Enable Criteria:
- None

Disable Criteria:
- None

Malfunction Criteria:
- P0807 – Sensor voltage < 0.21V
- P0808 – Sensor voltage > 4.93V

Potential failure modes:
- P0807 – Clutch sensor wiring open circuit or shorted to ground
- P0808 – Clutch sensor ECU input circuit shorted to 5V or 12V
- Clutch sensor failure
- Clutch pedal failure
- ECU input circuit failure

Diagnostic Mask:
- The service light will be illuminated for 30 seconds at the point the fault occurs, and then illuminated for 30 seconds after engine start if the fault is present.

P1809
Monitor:
- Continuous

Enable Criteria:
- Ignition ON
- Manual vehicles only

Disable Criteria:
- None

Malfunction Criteria:
Clutch position changes by more than 50 A/D bits (0.244V) in less than 80ms in a non monotonic manner.

Potential failure modes:
- Faulty clutch sensor
- Faulty clutch sensor connector

Diagnostic Mask:
- The service light will be illuminated for 30 seconds at the point the fault occurs, and then illuminated for 30 seconds after engine start if the fault is present.

Gear Shift Paddles

P0826 Up and Down Shift Switch Circuit
P0827 Up and Down Shift Switch Circuit Low
P0828 Up and Down Shift Switch Circuit High

Description
In IPS and SIPS vehicles gear shift requests can be made using the steering wheel mounted paddles. These switches select a different resistive network to a single ECM input depending on the paddle request. From this input the ECM determines the shift request and passes this to the TCM via CAN.

Sensor connections

Sensor Connector	Description	ECU Pin	ECU Connector
	Paddle switches input	E4	48 Way (Right)
	Paddle switches ground	K3	48 Way (Right)

Monitor:
- Continuous

Enable Criteria:
- None

Disable Criteria:
- None

Malfunction Criteria:
- P0826 – Gear shift paddle position input stuck for more than 100 seconds
- P0827 – Gear shift paddle position input open circuit
- P0828 – Gear shift paddle position input short circuit

Potential failure modes:
- Gear shift paddle switch wiring open circuit or shorted
- Gear shift paddle switch fault
- ECU input circuit fault

Notes:
- The service light will be illuminated for 30 seconds at the point the fault occurs, and then illuminated for 30 seconds after engine start if the fault is present.

Air intake control valve circuit

P1113 Air intake control valve circuit

Description:
The air cleaner is equipped with 2 inlets, one of which is opened or closed by the Air Intake Control Valve (AICV). This system reduces intake noise and increases engine power.
When the engine is operating in the low-to-mid speed range, the ECM deactivates the Vacuum Solenoid Valve (VSV) and allows the AICV to close one of the air cleaner inlets. When the engine speed is greater than a specified value the ECM activates the VSV and the applied vacuum activates the AICV to open both of the air cleaner inlets.

Component connections

Connector	Description	ECU Pin	ECU Connector
1	Ignition supply via fuse R8	-	-
2	VSV control	B1	48 Way (Central)

Monitor:
- Continuous

Enable Criteria:
- Engine running

Disable Criteria:
- None

Potential failure modes:
- VSV open circuit or short to ground
- VSV circuit short to ECU

Diagnostic Mask:
- The service light will be illuminated for 30 seconds at the point the fault occurs, and then illuminated for 30 seconds after engine start if the fault is present.

Coolant Recirculation Pump

P2602 Coolant Pump Control Circuit Low
P2603 Coolant Pump Control Circuit High

Description
During a hot shutdown of the engine, the recirculation pump can continue to pump coolant around the engine. The recirculation pump will run after the engine has been turned off if the enable criteria are matched.
The recirculation pump will also run after a short period of idle to aid heater performance.

Component connections

Connector	Description	ECU Pin	ECU Connector
1	Recirc pump driver	M1	48 Way (Right)
2	Main relay via fuse R4	-	-

Monitor:
- Continuous

Enable Criteria:
- P2602 - continuous
- P2603 - engine running

Disable Criteria:
- None

Potential failure modes:
- P2602 – pump wiring open circuit or shorted to ground
- P2602 – fuse R4
- P2603 – pump circuit, ECM side, shorted to battery voltage
- Pump failure
- ECU output circuit failure

Diagnostic Mask:
- The service light will be illuminated for 30 seconds at the point the fault occurs, and then illuminated for 30 seconds after engine start if the fault is present.

Misfire

P1301 Misfire level causing emissions increase
P1302 Misfire level causing catalyst system damage

Description
When the engine misfire reaches a high enough percentage the engine emission output levels can exceed the allowed limits, this will produce the fault code P1301.
If the misfire percentage is high enough and there is a possibility that the catalyst may be damaged then code P1302 will be set. To prevent catalyst damage the ECM will take action to shut down the engine bank containing the misfiring cylinder and limit the engine speed to 4000rpm, or limit the throttle opening if there is more than one cylinder misfiring.

See misfire faults P0300, P0301, P0302, P0303, P0304, P0305, P0306

Monitor:
- Continuous

Enable Criteria:
- Battery voltage between 10 – 16 V
- Coolant temperature between -10 – 120°C (14 – 248°F)
- Engine speed between 480 – 8010rpm
- Engine speed transient > 15rpm
- Altitude < 8000 ft (2438 m) / Baro > 756mbar
- Fuel level > 5 litres (1.3 US gallons)
- Engine load greater than 14 – 25% depending on engine speed

Disable Criteria:
- DFCO enabled (Deceleration Fuel Cut Off)
- Rough road
- MAF faults

Malfunction Criteria:
- P1301 USA Emissions Failure – Misfire percentage > 2.8% measured over 1000 engine revolutions.
- P1301 ROW Emissions Failure – Misfire percentage > 4.2 % measured over 1000 engine revolutions.
- P1302 Catalyst Damage Failure – Misfire percentage > 10% - 33% depending on engine speed and load, measured over 200 engine revolutions.

Potential failure modes:
- Injector related codes, as these can cause misfire codes to be set.
- VVT codes set
- Sensor connector and wiring for signs of corrosion or loose connections
- Spark plug / cylinder compression
- Cam timing / damage to rocker arm assembly
- Fuel pressure

Diagnostic Masks:
- For a P1301 fault code the MIL will be illuminated immediately.
- For a P1302 fault code the MIL will be illuminated immediately and the ECM will take action to prevent catalyst damage.

Notes:
- Misfire learns are calculated during DFCO (Deceleration Fuel Cut Off)

Throttle Position

P2100 Throttle Actuator Control Motor Circuit/Open
P2102 Throttle Actuator Control Motor Circuit/Low
P2103 Throttle Actuator Control Motor Circuit/High
P2104 Throttle Actuator Control System – Forced Idle
P2105 Throttle Actuator Control System – Forced Engine Shutdown
P2106 Throttle Actuator Control System – Forced Limited Power
P2107 Throttle Actuator Control Module Processor
P2108 Throttle Actuator Control Module Performance
P2119 Throttle Actuator Control Throttle Body Range/Performance

Connector	Description	ECU Pin	ECU Connector
1	Motor A	M1	48 Way (Centre)
2	Motor B	L2	48 Way (Centre)
3	Throttle position sensor ground	C4	48 Way (Centre)
4	Throttle position sensor1 signal	F3	48 Way (Centre)
5	Throttle position sensor voltage	E4	48 Way (Centre)
6	Throttle position sensor2 signal	F2	48 Way (Centre)

Throttle Actuator Control Motor Circuit/Open

P2100 Throttle actuator control motor circuit open

Description
The throttle actuator stepper motor operates on 12 volts.

Monitor:
- Continuous

Enable Criteria:
- None

Disable Criteria:
- None

Potential failure modes:
- Throttle actuator control motor open circuit

Throttle Actuator Control Motor Circuit/Low

P2102 Throttle actuator control motor circuit low

Monitor:
- Continuous

Enable Criteria:
- None

Disable Criteria:
- None

Potential failure modes:
- Throttle actuator control motor short to ground

Throttle Actuator Control Motor Circuit/High

P2103 Throttle actuator control motor circuit high

Monitor:
- Continuous

Enable Criteria:
- None

Disable Criteria:
- None

Potential failure modes:
- Throttle actuator control motor short to supply voltage

Throttle Actuator Control System – Forced Idle

P2104 Throttle actuator control system – forced idle

Description
If a problem is detected which could result in faster engine speed than commanded by the pedal, the actuator is switched out, allowing the throttle valve to default to a 7% mechanically sprung setting. This provides a fast idle speed which may be used to effect a 'limp home' mechanism.

Monitor:
- Continuous

Enable Criteria:
- Engine running

Disable Criteria:
- None

Potential failure modes:
- Electronic throttle fault

Note: This code indicates action taken by the ECU, and will always be accompanied by another code which has caused this action.

Throttle Actuator Control System – Forced Engine Shutdown

P2105 Throttle actuator control system – forced engine shutdown

Description
If a problem is detected which could result in engine speed runaway, or if sufficient control of engine speed is lost, the ECU switches off the fuel injectors in order to stop the engine.

Monitor:
- Continuous

Enable Criteria:
- Engine running

Disable Criteria:
- None

Potential failure modes:
- Electronic throttle fault

Note: This code indicates action taken by the ECU, and will always be accompanied by another code which has caused this action.

Throttle Actuator Control System – Forced Limited Power

P2106 Throttle actuator control system – forced limited power

Description
If a problem is detected which could result in engine speed control difficulties, the ECU will limit throttle opening to a maximum of 15%.

Monitor:
- Continuous

Enable Criteria:
- Engine running

Disable Criteria:
- None

Potential failure modes:
- Electronic throttle fault

Note: This code indicates action taken by the ECU, and will always be accompanied by another code which has caused this action.

Throttle Actuator Control Module Processor

P2107 Throttle actuator control module processor

Description
The ECU contains two processors dedicated to the throttle pedal and throttle valve potentiometers.

Monitor:
- Continuous

Enable Criteria:
- Engine running

Disable Criteria:
- None

Potential failure modes:
- ECU internal fault
- Incorrect ECU programming

Throttle Actuator Control Module Performance

P2108 Throttle actuator control module performance

Monitor:
- Continuous

Enable Criteria:
- Engine running

Disable Criteria:
- None

Potential failure modes:
- ECU internal failure
- Short circuit to throttle actuator

Throttle Actuator Control Throttle Body Range/Performance

P2119 Throttle Actuator Control Throttle Body Range/Performance

Monitor:
- Continuous

Enable Criteria:
- Ignition on

Disable Criteria:
- None

Malfunction Criteria
- Throttle position does not close during start up.
- Throttle position stationary to within 0.01V over 10ms interval

Potential failure modes:
- Wiring/harness issue at throttlebody connector
- Wiring/harness issue at ECU connector
- Throttlebody dirty

Diagnostic Mask:
- The MIL will be illuminated if fault is present.

Pedal Position

P2122 Pedal position sensor ‘D’ circuit low
P2123 Pedal position sensor ‘D’ circuit high
P2127 Pedal position sensor ‘E’ circuit low
P2128 Pedal position sensor ‘E’ circuit high
P2135 Throttle position sensor/switch ‘A/B’ voltage correlation
P2138 Pedal position sensor/switch ‘D/E’ voltage correlation

Connector	Description	ECU Pin	ECU Connector
1	Reference voltage E circuit	F3	48 Way (Right)
2	Reference voltage D circuit	F3	48 Way (Right)
3	Pedal D position sensor signal	B4	48 Way (Right)
4	Ground D circuit	K4	48 Way (Right)
5	Ground E circuit	K4	48 Way (Right)
6	Pedal E position sensor signal	A4	48 Way (Right)

Pedal Position Sensor 'D' Circuit Low

P2122 Pedal position sensor 'D' circuit low

Description
Two potentiometers are built into the throttle pedal unit in order to provide a throttle demand signal to the ECU. Note that the potentiometers operate on 5 volts.

Enable Criteria:
- None

Disable Criteria:
- None

Potential failure modes:
- Signal short circuit (< 0.283 V)
- Reference voltage open circuit
- Reference voltage short to ground
- Sensor failure

Notes: A maximum throttle opening of 15% may be imposed due to this single code. In the case of multiple codes, a mechanically sprung 7% opening may be applied.

Pedal Position Sensor 'D' Circuit High

P2123 Pedal position sensor 'D' circuit high

Enable Criteria:
- None

Disable Criteria:
- None

Potential failure modes:
- Signal open circuit (> 4.487 V)
- Reference voltage open circuit
- Reference voltage short to ground
- Sensor failure

Notes: A maximum throttle opening of 15% may be imposed due to this single code. In the case of multiple codes, a mechanically sprung 7% opening may be applied.

Pedal Position Sensor 'E' Circuit Low

P2127 Pedal position sensor 'E' circuit low

Description
Two potentiometers are built into the throttle pedal unit in order to provide a throttle demand signal to the ECU. Note that the potentiometers operate on 5 volts.

Enable Criteria:
- None

Disable Criteria:
- None

Potential failure modes:

- Signal short circuit (< 0.283 V)
- Reference voltage open circuit
- Reference voltage short to ground
- Sensor failure

Notes: A maximum throttle opening of 15% may be imposed due to this single code. In the case of multiple codes, a mechanically sprung 7% opening may be applied.

Pedal Position Sensor 'E' Circuit High

P2128 Pedal position sensor ‘E’ circuit high

Enable Criteria:
- None

Disable Criteria:
- None

Potential failure modes:
- Signal open circuit (> 4.487 V)
- Reference voltage open circuit
- Reference voltage short to ground
- Sensor failure

Notes: A maximum throttle opening of 15% may be imposed due to this single code. In the case of multiple codes, a mechanically sprung 7% opening may be applied.

Throttle Position Sensor 'A'/'B' Voltage Correlation

P2135 Throttle position sensor ‘A/B’ voltage correlation

Description
Two potentiometers are built into the throttle actuator unit in order to provide a throttle position signal to the ECU. Two processors within the ECU compare the two output signals, which should match within a defined tolerance. Note that the potentiometers operate on 5 volts.

Enable Criteria:
- None

Disable Criteria:
- Throttle position greater than 60%

Potential failure modes:
- TPS1 reading incorrectly
- TPS2 reading incorrectly

Notes: A maximum throttle opening of 15% may be imposed.

Pedal Position Sensor/Switch 'D'/'E' Voltage Correlation

P2138 Pedal position sensor/switch ‘D/E’ voltage correlation

Description
Two potentiometers are built into the throttle pedal unit in order to provide a throttle demand signal to the ECU. Two processors within the ECU compare the two output signals, which should match within a defined

tolerance. Note that the potentiometers operate on 5 volts.
Enable Criteria:
- None

Disable Criteria:
- None

Potential failure modes:
- PPS1 reading incorrectly
- PPS2 reading incorrectly

Notes: A maximum throttle opening of 15% may be imposed.

Exhaust Pressure Regulator Vent Solenoid ~~(Evora S only)~~

P2170 Exhaust Pressure Regulator Vent Solenoid Control Circuit Low
P2171 Exhaust Pressure Regulator Vent Solenoid Control Circuit High

Description:
The exhaust pressure regulator valve should be active while sport mode is on and when the car is over 4500rpm or during the first 4 secs after start up. A fault can only be detected while the solenoid is being used. The diagnostic is an electrical check of the vent solenoid and cannot check the physical position of the exhaust valve. The exhaust valve has been designed to fail open, however detection of either of these two faults will impose a lower rev limit for engine safety.

Enable Criteria:
- Vent solenoid commanded
- Engine running

Monitor:
- Continuous

Malfunction Criteria:
- P2170 – Open circuit or short to ground
- P2171 – Short to 5V

Diagnostic Mask:
- The MIL will be illuminated if a fault is present for two consecutive trips.

Throttle Actuator Control System – High Airflow Detected

P2173 Throttle actuator control system – high airflow detected

Description
The mass air flow is compared with the throttle position to determine whether an incorrect correlation exists.

Enable Criteria:
- None

Disable Criteria:
- MAF fault(s) present

Potential failure modes:
- Throttle plate damage
- Air leak in intake system

Notes: A mechanically sprung 7% throttle opening may be imposed, or the injectors may be shut off to stop the engine.

System Too Lean at Higher Load

P2191 System Too Lean at Higher Load (Bank 1)
P2193 System Too Lean at Higher Load (Bank 2)

Description
The oxygen sensor sends a signal to the ECU corresponding to the exhaust gas oxygen content enabling the ECU to maintain a 14.7:1 air/fuel ratio under normal driving conditions. At higher loads when the system is required to run richer than 14.7:1 air/fuel ratio the oxygen sensor should return a signal greater than 600mV. If either of the oxygen sensor voltages are less than 600mV when the ECU requires the engine to be running rich then above codes are set for the respective banks.

Monitor:
- Continuous

Enable Criteria:
- Engine coolant > 70°C
- Engine not in deceleration fuel cut
- Engine percentage load > 40%
- AFR demand richer than 13.0:1 (lambda 0.9)

Disable Criteria P2191:

• P0131, P0132, P0133, P0134, P0135	– Oxygen sensor faults
• P0301, P0303, P0305	– Misfire faults
• P0261, P0262, P0264, P0265, P0267, P0268 P0270, P0271, P0273, P0274, P0276, P0277	– Injector faults

Disable Criteria P2193:

• P0151, P0152, P0153, P0154, P0155	– Oxygen sensor faults
• P0302, P0304, P0306	– Misfire faults
• P0261, P0262, P0264, P0265, P0267, P0268 P0270, P0271, P0273, P0274, P0276, P0277	– Injector faults

Malfunction Criteria:
- These codes will set if the relevant engine bank oxygen sensor voltage remains below 600mV for more than 2 seconds under high load conditions.

Potential failure modes:
- Fuel Pressure too low (restriction in fuel line)
- Cylinder misfire
- Air leak in induction system
- Water in fuel
- Exhaust leak / crack before front oxygen sensor
- Oxygen sensor connector and wiring (corrosion or loose connections)
- MAF sensor fault

Diagnostic Mask:
- The MIL will be illuminated if fault is present for two consecutive trips.

A/C Refrigerant Distribution Valve

P2612 A/C Refrigerant Distribution Valve Control Circuit Low
P2613 A/C Refrigerant Distribution Valve Control Circuit High

Description:
The A/C refrigerant flow is regulated by the ECM using the distribution valve to control the evaporator to the required temperature and prevent freezing.

Component connections:

Connector	Description	ECM Pin	ECM Connector
1	Control valve driver	K3	48 Way (Centre)
2	Ignition via rear ign relay	-	-

Monitor:
- Continuous

Enable Criteria:
- Engine running

Disable Criteria:
- None

Potential failure modes:
- P2612 – valve wiring open circuit or shorted to ground
- P2612 – loss of power from rear ignition relay
- P2613 – valve circuit, ECM side, shorted to battery voltage
- Valve failure
- ECM output circuit failure

Diagnostic Mask:
- The service light will be illuminated for 30 seconds at the point the fault occurs, and then illuminated for 30 seconds after engine start if the fault is present.

A/C Compressor Lock Sensor Circuit

B1422 A/C Compressor Lock Sensor Circuit

Description:
The ECM monitors the A/C compressor speed. If this speed is lower than the engine speed the ECM will turn off the A/C compressor clutch. This is to prevent belt damage due to slippage.

Component connections:

Connector	Description	ECM Pin	ECM Connector
1	Lock sensor +ve	C1	32 Way (Left)
2	Lock sensor -ve	B1	32 Way (Left)

Monitor:
- Continuous

Enable Criteria:
- Engine running

Disable Criteria:
- P0646, P0647 A/C compressor clutch fault

Malfunction Criteria:
- A/C compressor speed error greater than 10%

Potential failure modes:
- A/C compressor clutch mechanism slipping or seized
- A/C compressor drive belt slipping
- Lock sensor wiring
- Lock sensor failure
- ECM input circuit failure

Diagnostic Mask:
- The service light will be illuminated for 30 seconds at the point the fault occurs, and then illuminated for 30 seconds after engine start if the fault is present.

Lost Communications with TCM

U0101 Lost Communications with TCM

Description:
The ECM communicates with the Transmission Control Module (TCM) via the CAN bus.
If these CAN bus communications have been interrupted the ECM will register a diagnostic code.

Potential failure modes:
- CAN wiring
- TCM control module failure
- CAN bus corruption by another module on bus

Diagnostic Mask:
- The service light will be illuminated for 30 seconds at the point the fault occurs, and then illuminated for 30 seconds after engine start if the fault is present.

Lost Communications with VDCM

U0122 Lost Communications with VDCM

Description:
The ECM communicates with the Vehicle Dynamic Control Module (VDCM) via the CAN bus.
If these CAN bus communications have been interrupted the ECM will register a diagnostic code.

Potential failure modes:
- CAN wiring
- VDCM control module failure
- CAN bus corruption by another module on bus

Diagnostic Mask:
- The service light will be illuminated for 30 seconds at the point the fault occurs, and then illuminated for 30 seconds after engine start if the fault is present.

Lost Communications with TPMS

U0127 Lost Communications with TPMS

Description:
The ECM communicates with the Tyre Pressure Monitor System (TPMS) via the CAN bus.
If these CAN bus communications have been interrupted the ECM will register a diagnostic code.

Potential failure modes:
- CAN wiring
- TPMS control module failure
- CAN bus corruption by another module on bus

Diagnostic Mask:
- The service light will be illuminated for 30 seconds at the point the fault occurs, and then illuminated for 30 seconds after engine start if the fault is present.

Software Incompatible with TCM

U0302 Software Incompatible with TCM

Description:
The ECM checks that its software set matches the Transmission Control Module (TCM) software set. If not the above code will be set in the ECM and a corresponding U0301 will be set within the TCM.
The U0301 within the TCM will force the transmission into mechanical a limphome state.

Potential failure modes:
- The ECM has been programmed with a software set which does not match TCM level.
- The TCM has been programmed with a software set which does not match ECM level.

Diagnostic Mask:
- The service light will be illuminated for 30 seconds at the point the fault occurs, and then illuminated for 30 seconds after engine start if the fault is present.

Software Incompatible with VDCM

U0316 Software Incompatible with VDCM

Description:
The ECM checks that the Vehicle Dynamic Control Module (VDCM) matches the vehicle variant code. If not the above code will be set and the ECM will not respond to torque requests from the VDCM.

Potential failure modes:
- The ECM has been programmed with an incorrect variant code which does not match vehicle VDCM level.
- VDCM error.

Diagnostic Mask:
- The service light will be illuminated for 30 seconds at the point the fault occurs, and then illuminated for 30 seconds after engine start if the fault is present.

Safety Processor Throttle Shutdown

P1104 Safety Processor Throttle Shutdown

The ECU safety processor monitors the vehicles accelerator pedal position and throttle position. For a given accelerator pedal position there is a maximum throttle position that could be expected. If this position is exceeded, it is the throttle blade is open too far. The ECU safety processor shuts the throttle blade and registers a safety processor throttle shutdown fault.

Monitor:
• Continuous

Enable Criteria:
• Ignition ON

Disable Criteria:
• None

Malfunction Criteria:
• Throttle position to accelerator pedal throttle demand more than 32% offset

Potential failure modes:
• Throttle position sensor failure
• Pedal position sensor failure
• Mechanical failure of throttle

Diagnostic Mask:
• The MIL will be illuminated if fault is present.

Notes:
• Throttle will be limited at mechanical limp home.

Brake Throttle Override (BTO)

P1106 Throttle shutdown by BTO

Description:
Brake Throttle Override (BTO) is a function of the ECU that limits the throttle in the case of unintended acceleration.

BTO is active when the following conditions are all valid:
• Vehicle speed > 25 km/h
• Throttle pedal > 10%
• Brake pedal is pressed for more than one second.
• Clutch pedal not operated (heel and toe condition)

Monitor:
• Continuous

Enable Criteria:
• Ignition ON

Disable Criteria:
• None

Malfunction Criteria:
Throttle exceeds BTO limit by 2% for more than 3 seconds

Potential failure modes:
• Electronic throttle fault
• Blocked throttle body
• Wiring/harness issue at throttle body connector

Diagnostic Mask:
• The MIL will be illuminated if fault is present.

Notes:
• Throttle will be limited at mechanical limp home.

Air Fuel Ratio Cylinder Imbalance

P219A Air Fuel Ratio Cylinder Imbalance (Bank 1)
P219B Air Fuel Ratio Cylinder Imbalance (Bank 2)

Description
Lotus' air-fuel ratio cylinder imbalance diagnostic analyzes the pre-catalyst lambda sensor for high frequency fluctuations in air-fuel ratio. The larger the magnitude of the high frequency fluctuations, the greater the air-fuel ratio cylinder imbalance is.

When monitoring conditions are enabled the pre-catalyst O2 sensor voltage reading is converted into an inferred AFR value (note – pre-catalyst O2 sensors are of the narrow band type, hence the AFR reading is only inferred). The difference between consecutive AFR readings is calculated and then added to a running total. After a total 5000 samples (10 seconds) the average AFR difference is calculated by taking the total AFR difference and dividing this value by the number of samples. If the average AFR difference is greater than the diagnostic threshold the test is considered to have failed. Each drive cycle the test is repeated until either 3 pass decisions are made (indicating diagnostic has passed) or 3 fail decisions are made (indicating diagnostic has failed).

Monitor:
- Once per drive cycle

Enable Criteria:
- Engine speed: 1800 – 3600rpm
- Engine load: 20 – 60%
- Mass air flow: 18 – 60g/s
- Mass air per stroke: 140 – 414 mg
- Engine coolant temperature: >50degC
- P1301 misfire diagnostic fails at any point during the drive cycle
- Stable engine speed
- Stable engine load

Disable Criteria P219A:
- P0116, P0117, P0118 – Engine coolant temperature sensor faults
- P0131, P0132, P0133, P0134, P0135 – Oxygen sensor faults
- P0101, P0102, P0103 – Mass air flow sensor faults
- P0335 – Crank sensor fault
- P0500 – Vehicle speed sensor fault

Disable Criteria P219B:
- P0116, P0117, P0118 – Engine coolant temperature sensor faults
- P0151, P0152, P0153, P0154, P0155 – Oxygen sensor faults
- P0101, P0102, P0103 – Mass air flow sensor faults
- P0335 – Crank sensor fault
- P0500 – Vehicle speed sensor fault

Malfunction Criteria:
- Average AFR difference > 13.00.

Potential failure modes:
- Fuel pressure too low (restriction in fuel line)
- Cylinder misfire
- Air leak in induction system (that only affects an individual cylinder)
- Fuel injector fault
- Ignition coil fault

Diagnostic Mask:
- The MIL will be illuminated if fault is present for two consecutive trips.

Lost Communications with BCM/ICM

U0141 Lost Communication with Body Control Module (Integrated Control Module) "A"

Description:
The ECM outputs the engine cranking signal to the BCM (Lotus reference is ICM - Integrated Control Module) for use in drive away door locking. If the connection between the ECM and ICM is interrupted, the ECM will register a diagnostic code.

Potential failure modes:
• Open circuit between ECM pin RG2 & ICM pin D17.
• ICM failure.
• ECM failure.

Diagnostic Mask:
• The service light will be illuminated for 30 seconds at the point the fault occurs, and then illuminated for 30 seconds after engine start if the fault is present.

Invalid Data Received From VDCM

U0416 Invalid Data Received From VDCM

Monitor:
• Continuous

Enable Criteria:
• ABS module fitted

Disable Criteria:
• None

Malfunction Criteria:
More than five consecutive messages received from ABS module with invalid checksum or live counter.

Potential failure modes:
• ABS module failure
• Incorrect ABS module fitted
• ABS module flashed with incorrect calibration
• CAN BUS failure

Diagnostic Mask:
• The service light will be illuminated for 30 seconds at the point the fault occurs, and then illuminated for 30 seconds after engine start if the fault is present.

EMR.5 - CAN BUS DIAGNOSTICS; LOTUS TECHCENTRE

Controller Area Network (CAN) is an electronic standard to allow high speed communication between modules and controllers, via a serial data bus. The bus is a circuit linking the modules to the controller, consisting of a pair of cables, twisted together to reduce electromagnetic interference, and carrying a square wave voltage signal corresponding to '0's and '1's, coded in such a way as to identify and prioritise the individual messages. On the Evora, CAN based systems include; engine management, anti-lock braking and related features, tyre pressure monitoring, instrument pack, and onboard diagnostics.

A 'stand alone' lap top PC loaded with 'Lotus Techcentre' software allows the CAN based serial data to be read. A Vehicle Communication Device (T000T1472F) introduced for the Europa model is used to connect the vehicle to the laptop Lotus Techcentre. Engine programming, live data display and systems diagnosis are all carried out via the Lotus Techcentre.

The minimum specification of the laptop computer for installation of the Lotus Techcentre is as follows:

Processer 1.70 Ghz;
1 GB RAM;
40 GB HDD;
CDRW DVD ROM;
WIN XP PRO or VISTA;
USB interface;
Ethernet or Wireless LAN

Note that this laptop should be dedicated soley to the Lotus Techcentre, with no other software installed. This diagnostic software is designed primarily for use by trained Lotus technicians, and is available as a CD under part number T000T1510F (version 4) or later supercessions. A monthly (Lotus Dealers) or annual (non-Lotus dealers) licence and support fee will also be levied, providing access to Lotus TechCentre Technical Support phoneline on ***0870 9493 668***, and e-mail on ***lotus.support.uk@omitec.com***

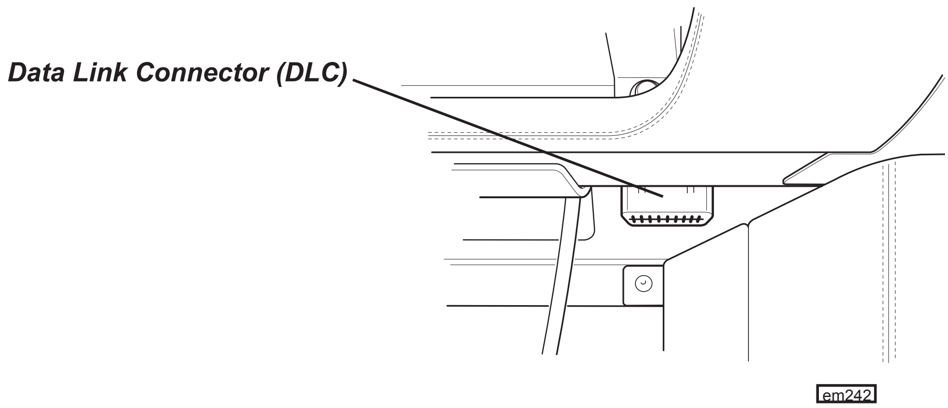
Also required is a unique 18 character licence/registration key without which Techcentre will not function. This key is non transferable to other PC’s.

MODEL/PWRTRAIN/MODELYEAR	ELECTRONIC CONTROL UNIT COMMUNICATIONS COMPATIBLE					ENGINE ECU TYPE	ENGINE ECU PROGRAMMABLE
	EMS	ABS	SRS	TPMS	IP		
ELISE 2ZZ '04 - '05MY	Y	Y	Y	Y	N	T4	Y‡
ELISE 2ZZ '06 - '11MY	Y	Y	Y	Y	N	T4E	Y‡
ELISE 1ZZ '07 - '10MY	Y	Y	Y	Y	N	T4E	Y‡
EXIGE 2ZZ '04 - '05MY	Y	Y	Y	Y	N	T4	Y‡
EXIGE 2ZZ '06 - '11MY	Y	Y	Y	Y	N	T4E	Y‡
EUROPA Z20 LER '06 - '09MY	N	Y	Y	N/A	N	MOTRONIC ME 7.6.2	N
2-11 2ZZ '07 - '11MY	Y	Y	N/A	N/A	N	T4E	Y‡
EVORA 2GR-FE '09MY ONWARDS	Y	Y	Y	Y	Y	T6	Y
ESPRIT V8 918	Y	Y	N	N	N	ESPRIT SPECIFIC	N
ELISE 1ZR '11MY ONWARDS	Y	Y	Y	Y	Y*	T6	Y
ELISE 2ZR '12MY ONWARDS	Y	Y	Y	Y	Y	T6	Y
EXIGE S 2GR-FE '12MY ONWARDS	Y	Y	Y	Y	Y	T6	Y

* If fitted with a Bosch ABS module. ‡ Also see notes on following page for special requirements with regards reprogramming the EMS on any ’04 - ‘07MY vehicles.

Note that TechCentre has no connectivity to Rover powertrain Elise/Exige variants, and that only limited diagnostics are available for the V8 Esprit. No communication is available with the Europa powertrain. Diagnostics for these vehicles are accessible using the Lotus Scan 3 tool T000T1467F (U.K./EU).

TechCentre Connection
TechCentre connection to the car is made via the Vehicle Communication Device (VCD) and the Data Link Connector (DLC) located beneath the driver's side fascia at the outboard side of the footwell.

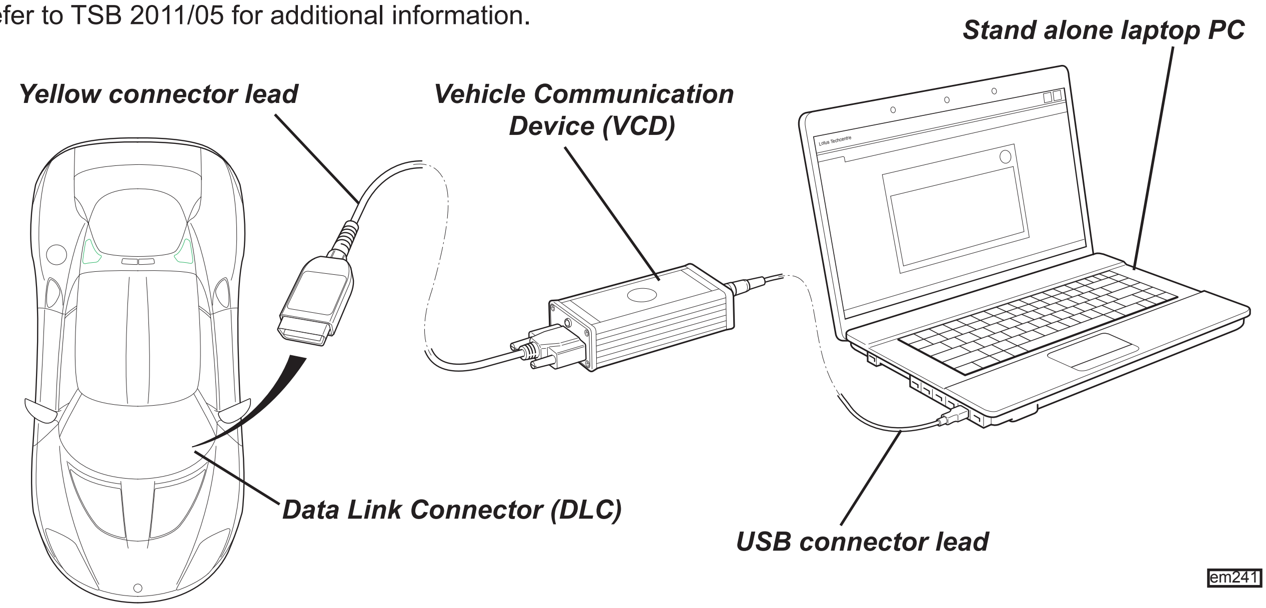


Power for the VCD is taken from the vehicle battery via the DLC and when powered a blue tell tale on the unit will light. Should updated firmware be available for the VCD (usually downloaded as part of an online update)

TechCentre will automatically update the VCD and display a message to confirm.
The VCD, under part number T000T1472F is supplied in a black plastic carry case containing the following:
- VCD
- 16 Pin Yellow connector lead (VCD to Vehicle)*
- USB lead (VCD to PC)
- USB extension lead (VCD to PC) not illustrated

*This lead can be used on all '04MY onwards Toyota power trained models to interrogate the engine management system, read DTC (diagnostic Trouble Codes) or for resetting the MIL (Misfire Indication Light) but will only allow the download of standard EMS programs into vehicles from '08MY onwards.

A ***Green*** connector lead part number T000T1522F is also available separately which can be used to download EMS programs into '04 - '07MY vehicles also using Lotus TechCentre instead of the Lotus Scan 3 tool. Please refer to TSB 2011/05 for additional information.



Use of TechCentre
Instructions for using the TechCentre are available in the 'Technical Information' section displayed on programme start up.

EVORA 2009 - 2015 MODEL YEARS

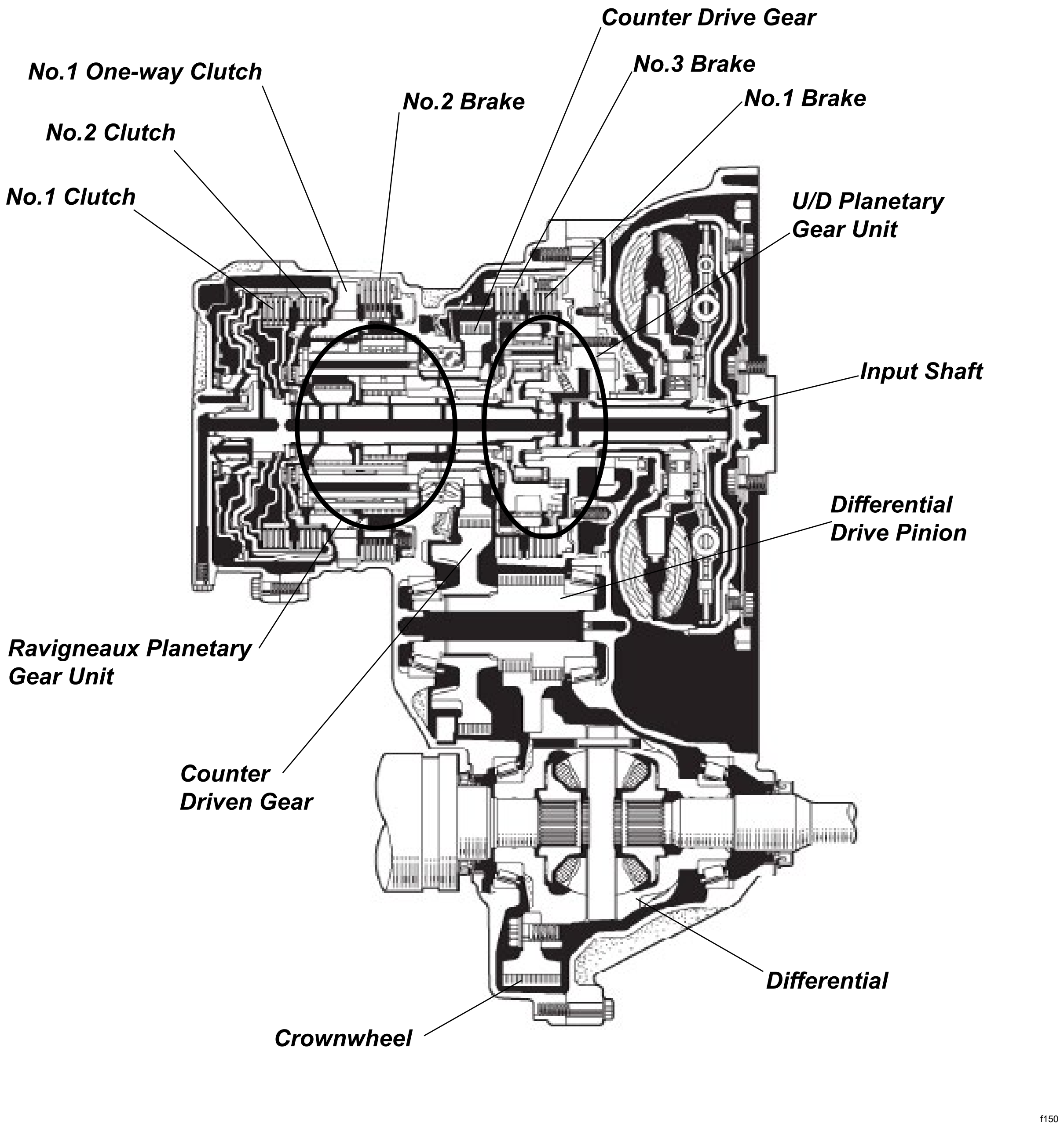
AUTOMATIC TRANSMISSION

SECTION FA

SUB-SECTION & DESCRIPTION	PAGE

Also see separate transmission CD part number: T000T1526F

GENERAL LAYOUT



FA.1 - GENERAL DESCRIPTION

U660E automatic transaxle is used on the 2GR-FE engine models. This automatic transaxle is a compact, lightweight and high-capacity 6-speed Super ECT (Electronically Controlled Transaxle).

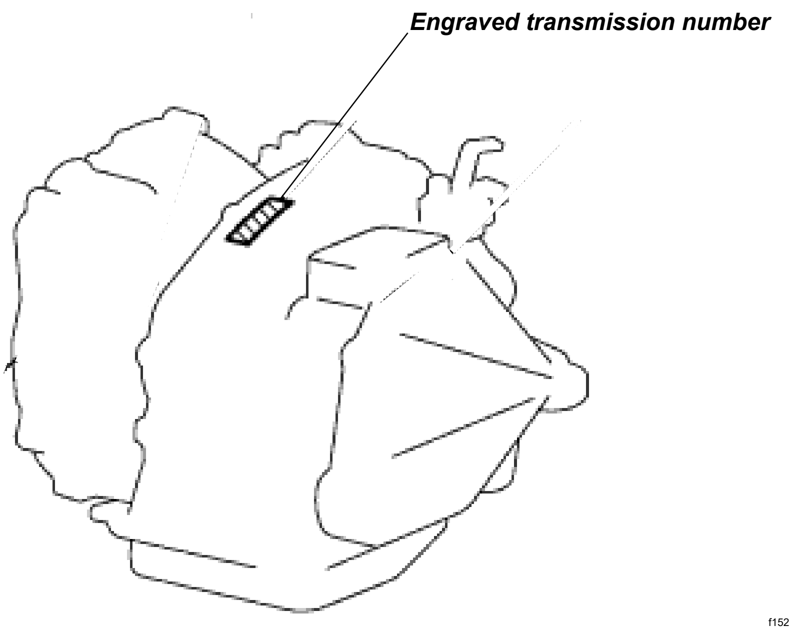
The unit is fully described on CD Lotus part number T000T1526F (Toyota ref. SC0264EA).

Insert the disc into a personal computer, and it will automatically open up to the GSIC – Global Service Information Center page. Select:

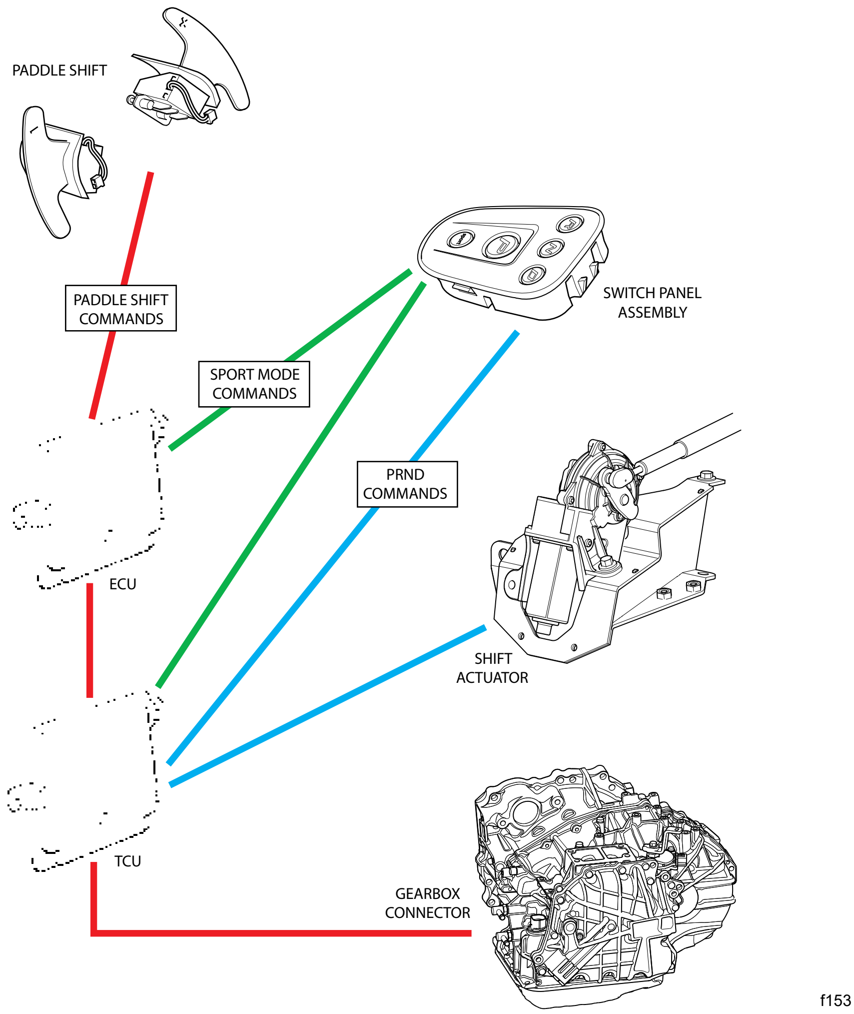
- New Car Features Supplement.
- NM0260E.
- Chassis.
- U660E Automatic Transaxle.

Note the U660E transmission is used by Toyota in combination with the 2GR-FE V6 engine, unlike the manual EA60 transmission it is not necessary to use an adaptor plate between the engine and transmission, or modify the bell housing to mount the starter motor.

The 11 digit transmission serial number is engraved on the top surface of the transmission front case, alongside the jointline with the torque converter housing. Typical example: 2A11B123456



Operating Principle



The Evora IPS utilises the Toyota 6 speed U660E conventional fluid filled automatic transmission and torque converter assembly which is bolted directly onto the 2GR-FE naturally aspirated engine unit.

PRND (Park – Reverse – Neutral – Drive) selections are electronically activated by push button control panel located in the centre console.

A PRND request activates a shift actuator module mounted to the top of the transmission, moving a shift rod which, in turn, alters the position of the transmissions shift lever to engage gear.

Gear changes are controlled by the TCU (Transmission Control Unit) which is situated directly above the engine managements ECM (Electronic Control Module) located behind the access cover in the left hand rear quarter trim panel.

IPS System Modes:
The Lotus IPS transmission system allows the driver to switch between conventional 6 speed automatic drive to manual paddle shift mode with the option of 'Sport' mode producing quicker and more pronounced gear shifts as well as optimising shift points for performance.

IPS Characteristics:
Automatic transmission: Using the PRND selector within the centre console, gear shifts are biased towards refinement, and shifting points are automatically selected to optimise refinement and fuel economy.

Manual sequential gear selection:
Forward gears can be manually selected using the paddle shifters provided within the steering wheel.

FA.2 – GEARCHANGE

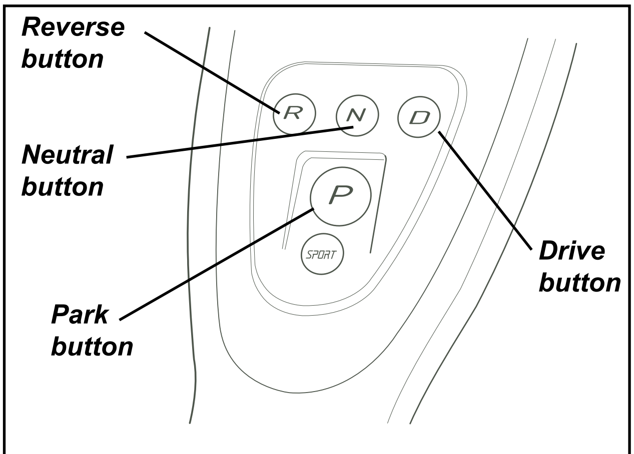
PRND display
A PRND display is located at the top centre of the instrument panel. The PRND selection requested by the driver will be shown as well as the forward gear selected (1-6) by the IPS system.

Automatic transmission using PRND Gear Selector
With ignition switch turned to position II, initial gear selections (Park Reverse Neutral or Drive) are accessed from the buttons on the PRND control panel located in the centre console,

Note: The engine can only be started if either P or N is selected and the footbrake is depressed.

The engine should only be turned off once the vehicle is stationary and P – Park or N – Neutral has been selected. Not doing so may cause serious damage to the transmission.

With the engine stopped (ignition switch in position I) P is automatically selected.



PRND SELECTOR CONSOLE

To remain in Neutral with the engine stopped, select N before turning the ignition switch to position I.

Note: The key cannot be removed from the ignition switch until P has been selected.

PRND Button Functions
P – Park: Select only when the vehicle is stationary to permanently lock the transmission.
Note: Park will be selected automatically when the ignition is switched off and the vehicle speed is below 1.2 mph (2km/h).

NOTICE Never select the Park (P) position whilst the vehicle is in motion. Doing so may cause serious damage to the transmission.

R – Reverse: Select only when vehicle is stationary to engage reverse gear. To avoid unexpected or sudden vehicle movement do not rev the engine or allow it to run above normal idle speed while selecting D or R, or while the vehicle is stationary with any gear selected.

N – Neutral: Select only when the vehicle is stationary to temporarily disengage drive to the rear wheels. It is recommended that the parking brake is applied if neutral is selected.

D – Drive: Select only when the vehicle is stationary to engage forward gears. IPS gear changing shifting points for all six forward gears are controlled and determined by the accelerator pedal position and vehicle speed as well as other information received by the TCU (Transmission Control Unit).

Appropriate Gear Selection using PRND Panel
P – Park: Press button P to select*, vehicle road speed must be below 1.2 mph (2km/h).
R – Reverse: Press button R to select*, vehicle road speed must be below 1.2 mph (2km/h).

NOTICE Never select the Reverse (R) position whilst the vehicle is in forward motion. Doing so may cause serious damage to the transmission.

N – Neutral: Press button N to select*, the footbrake must be depressed if selecting from P – Park. If selecting *from R – Reverse:* vehicle road speed must be below 1.2 mph (2km/h).

D – Drive: press button D to select* from:

P - Park: the footbrake must be depressed.

R – Reverse: vehicle road speed must be below 1.2 mph (2km/h)

N – Neutral: footbrake must be depressed if vehicle road speed is below 1.2 mph (2km/h). If vehicle road speed is over 1.2 mph (2km/h) the footbrake does not have to be depressed.

*To avoid potential damage to the engine and transmission a driver PRND selection, under certain conditions, can only be achieved if the gear selection requested is 'appropriate' to the vehicles current road speed and, if neccessary with the footbrake depressed.

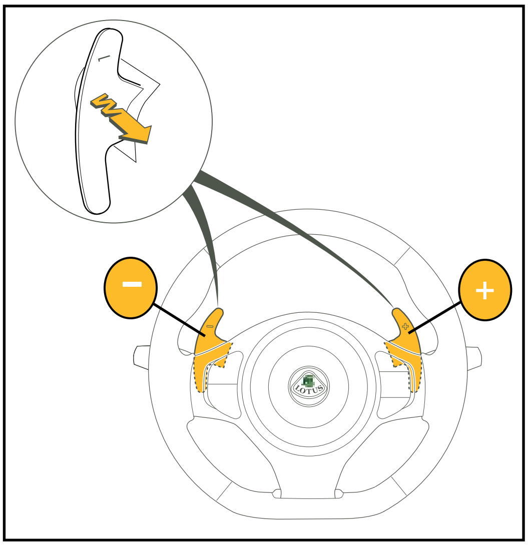
If an appropriate PRND request is selected: the button pressed on the selector console will illuminate bright red. The PRND indicator display situated in the instrument panel will illuminate accordingly to show the gear selected. The transmission will then engage gear.

If an inappropriate PRND request is selected: the button pressed in the selector console will not illuminate. The current gear selection will remain bright red on the PRND panel and the transmission will not engage the gear requested.

Kick-down
When in D – Drive with the accelerator pedal depressed fully, the transmission will downshift to the lowest appropriate gear. Once the accelerator pedal is returned to a normal driving position, the transmission will up-shift to the highest appropriate gear.

Note: Kick-down operation will vary according to road speed, current gear in use and accelerator movement.

Manual Gear Selection Mode
Manual mode can be activated at any speed or gear when the transmission is in D – Drive. Gearshifting can then be manually controlled by the driver using the steering wheel mounted paddle shifters.



Up-shifting: Controlled by the '+' right hand paddle.
Down-shifting: Controlled by the '-' left hand paddle.

Activating Manual Gear Selection
Up-shifting: Manual mode can be activated in current gear by pulling the '+' right hand paddle once towards the driver.

Down-shifting: Manual mode can be activated in current gear by pulling the '-' left hand paddle towards the driver.

Whilst in manual mode the gear selected will also be displayed on the PRND display in the instrument panel.

Note: Kick down function is not available in manual mode.

If not already selected by the driver, lower gears will be automatically selected by the IPS system as the vehicle slows down to a stop.

Remaining in Manual Gear Selection Mode
In non-Sport Mode: Operation of either paddle within 20 second intervals will maintain manual selection mode.

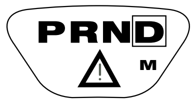
In Sport Mode: The vehicle will stay in manual mode permanently. This will allow the car to reach maximum engine speed without automatically up-shifting. To protect the transmission the IPS system will downshift at the lower rev band when it is at the critical point prior to engine stalling.

Returning to Automatic Transmission

In Sport Mode:
• Select D – Drive button on the PRND console. or;
• Pull '+' up-shift paddle for 2 seconds. or:
. If Sport Mode is deactivated.

Non Sport Mode:
• Select D – Drive button on the PRND console, or;
• Pull '+' up-shift paddle for 2 seconds, or;
• Do not make a gear selection with either paddle shifter for 10 seconds or more.

The manual selector will not select an 'inappropriate' gear shift which could cause the engine to reach its maximum RPM if engaged. A warning triangle symbol will appear on the PRND display until an appropriate gear selection is made.



Sport Mode
Sport Mode selector button is provided to optimise engine response, increase wheel slippage thresholds and remove detection of understeer.

In Sport Mode the gear shift points are optimized for improved vehicle performance and faster gear shifts and, if activated, manual sequential gear mode will remain permanent until the D – Drive button is depressed.

Note: Switching off the Lotus Dynamic Performance Management (Lotus DPM) in conjunction with selection of Sport Mode, will still retain the enhanced engine and transmission Sport features, but without any power induced wheelslip intervention. In all cases, anti-lock braking and HBA (Hydraulic Brake Assist) will be retained.

The Sport Mode switch for IPS models is located in the PRND selector console and can be selected either whilst the vehicle is stationary or whilst driving.

FA.3 - PRND SELECTION

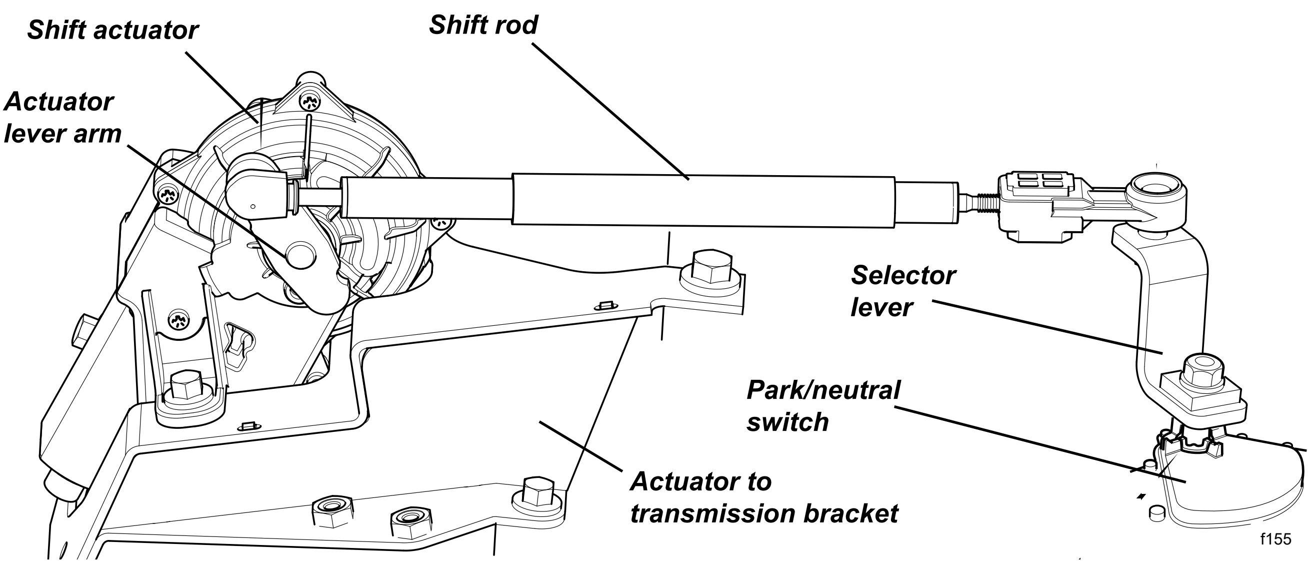
Click on arrow to return to previous pagee

The transmissions shift lever is operated by a 'Shift by wire' actuator.

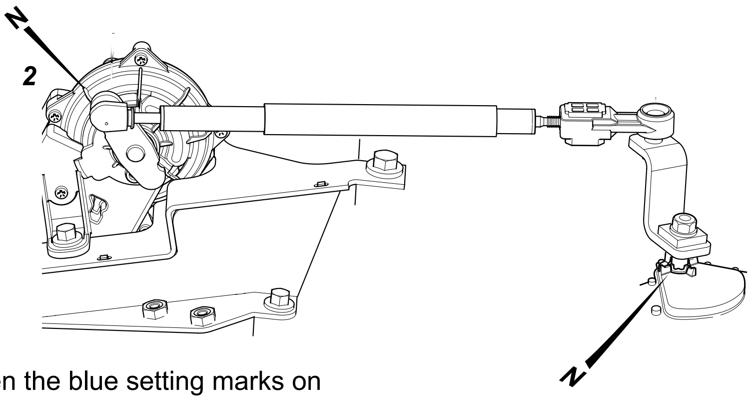
- A PRND command from the drivers switch panel via the TCU activates the shift actuator mounted to the top of the transmission assembly.

- A shift rod connects the actuator's lever arm to the transmission's modified selector lever.

- The motor within the shift actuator rotates an attached lever arm to one of four set positions in relation to the command sent from the switch panel, which in turn rotates the selector lever to the correct PRND position.



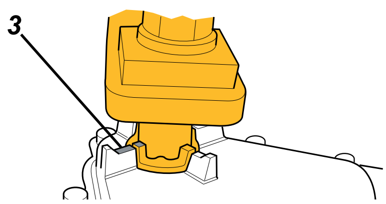
Shift Acutuator Assembly



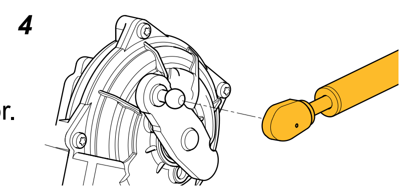
Removal:
1. Using PRND switch panel, set transmission to N – neutral.

2. The actuator lever arm should now be at an 11 o'clock and positioned slightly to the right of the moulded rib on the pinion housing.

3. If neutral has been successfully selected then the blue setting marks on the neutral switch and its housing will line up (see illustration).



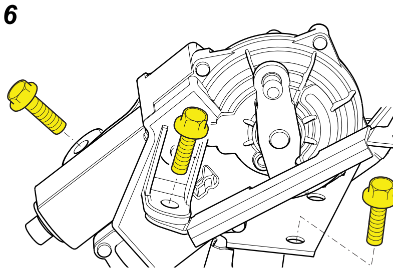
4. Disconnect the shift rod from the actuator lever arm by pulling it off from its ball mounting.



5. Disconnect the wiring harness multi-plug connector from the shift actuator.

6.Release the M8 x 20 screws (3) securing the actuator to it bracket and remove.

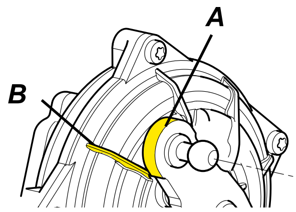
6



Refitting (Including Shift Rod):

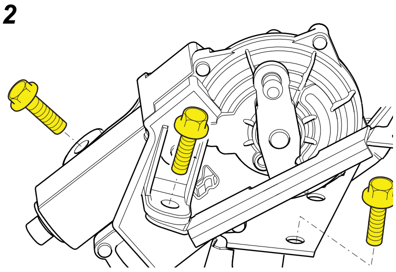
1.Ensure that the actuators lever arm (A), is positioned slightly to the right of the pinion housing moulding, (B).

1



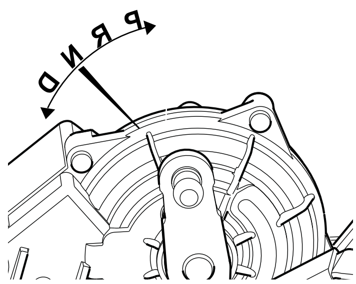
2.Refit the shift actuator assembly to its bracket using its M8 x 20 screws (3), (torque to 24Nm).

2



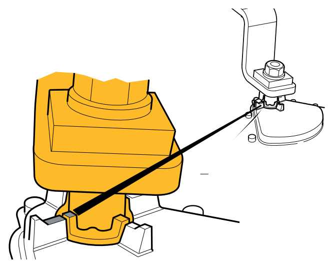
3.Reconnect the wiring harness multi-plug to the actuator, operate the PRND switch panel and check that lever arm rotates when activated but returns to its neutral position with neutral selected as shown in step 1.

3



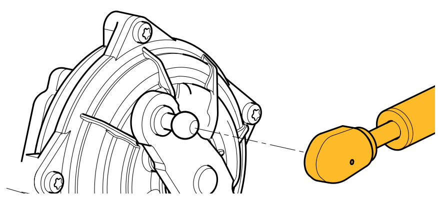
4. Ensure that the blue setting marks on the neutral switch and its housing are aligned, move the selector lever to the required position if necessary.

4



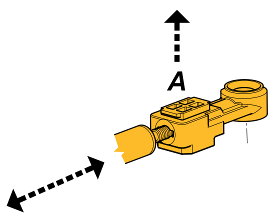
5. Push the fixed end joint of the shift rod onto the ball of the shift actuators lever arm ball mounting

5



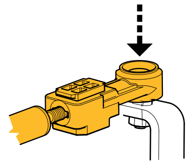
6. From the other end of the shift rod, pull the locking tab (A), upwards, this will allow the select lever joint to move independently of the rod so its length can be adjusted.

6



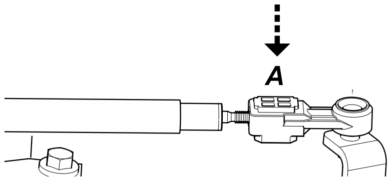
7. If not already fitted, push the locking tab joint section of the shift rod onto the ball of the transmission lever arm ball mounting.

7



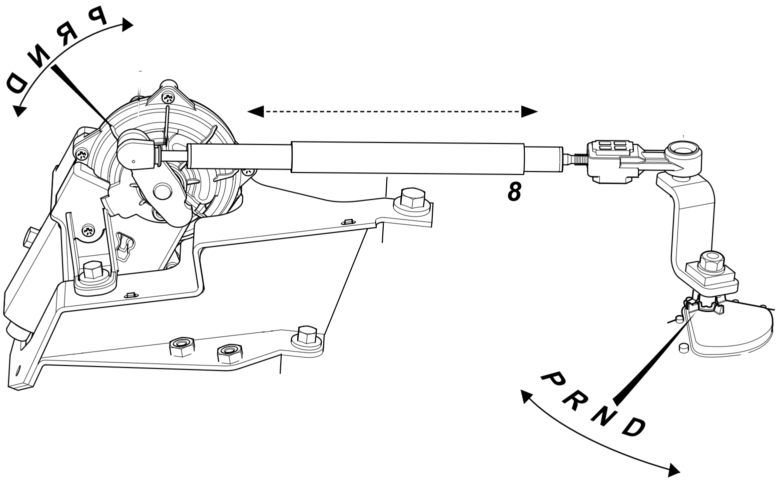
8. Push the locking tab (A), back into the thread of shift rod, this will set the rod to the correct length.

8



9. Operate the PRND switch panel to check the operation of the actuator, shift rod and selector lever. Ensure the actuator lever arm and transmission selector lever return the neutral postion when N- Neutral is selected, (as shown in step 1).

9



10. Using the Lotus 20/20 diagnostic tool it is possible to check that the shift rod has been adjusted correctly by confirming the TCU Learnt Dura values which are displayed within ‘Live Data’. As shown below, if adjusted correctly, the typical % values recorded for PRND should being within the expected value range shown in the right hand column.

10

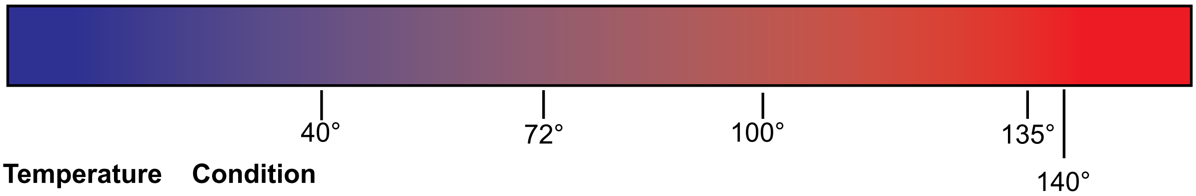
	Typical Value	Typical Range
Learnt Dura Position Drive (%)	20.1	16.2 to 23.9%
Learnt Dura Position Neutral (%)	35.0	31.7 to 38.2%
Learnt Dura Position Reverse (%)	48.6	45.4 to 51.7%
Learnt Dura Position Park (%)	75.4	71.4 to 79.4%

FA.4 - TRANSMISSION FLUID COOLING

◁ Click on arrow to return to previous page

Under normal driving conditions the temperature of the transmission fluid within gearbox can reach 100° Centigrade. Fluid temperate can increase dramatically with an increase in gearbox load, engine speed and ambient temperature.

Transmission fluid operating temperature range

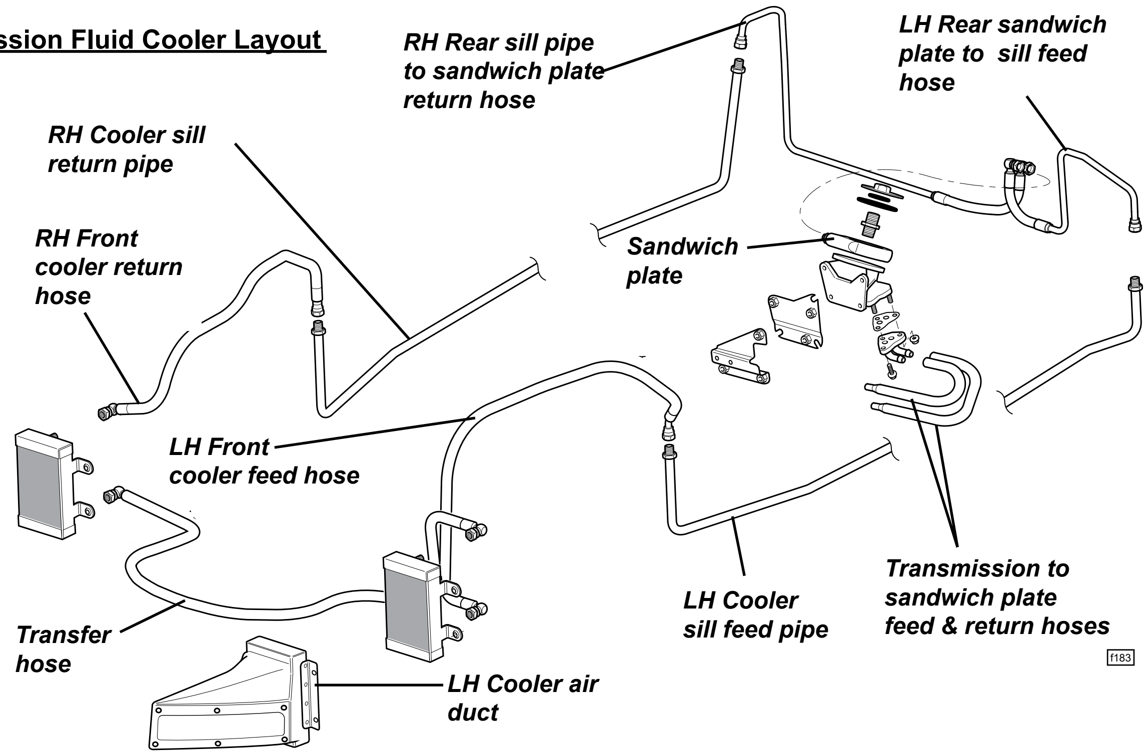


Temperature	**Condition**
40°C – 100°C:	Normal transmission fluid operating temperature range.
72°C:	Sandwich plate assembly opens diverting fluid to front mounted oil coolers.
140°C:	Maximum safe transmission fluid operating temperature. *If the maximum safe fluid temperature is maintained for over 10 seconds, then vehicle power will be reduced and the TCU warning light will be illuminated.*
135°C:	When the transmission fluid temperature decreases the full power is restored and the TCU (Transmission Control Unit) warning light is extinguished

External air to oil coolers are used to prevent the transmission fluid breaking down under extreme temperature as well as ensuring that mechanical and electrical components within the gearbox are not subjected to extreme heat transmitted by the fluid.

‘11MY IPS Models
The same front mounted air/oil coolers used on the ‘11MY Evora ‘S’ for engine oil cooling are used to cool the transmission fluid.

Transmission Fluid Cooler Layout



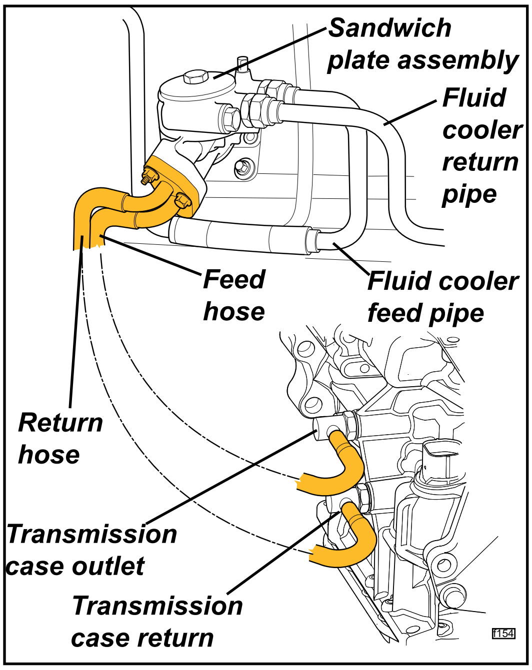
A sandwich plate/thermostat assembly is mounted remotely to the rear bulkhead.

Transmission fluid under pump pressure is forced through an outlet pipe located on the side of the transmission casing, and via a fluid feed hose, enters the inlet port of the sandwich plate/ thermostat assembly.

Once the transmission fluid temperature reaches 72°C the thermostat within the assembly opens diverting transmission fluid around the left hand oil cooler circuit, passing through the coolers with the cooler fluid returning along the R/H sill pipe and back into the sandwich plate assembly.

The fluid via a return hose is sent to an inlet pipe located on the side of transmission case, allowing the fluid to drain back down to the transmissions sump pan.

Each cooler is located into apertures within the bumper brackets which are in turn bolted to the side of the crash structure. Airflow is directed from the front intake grills to the front face of the coolers via air ducts. Louvres in the wheelarch liner front sections allow air to exhaust from the rear of the coolers into the wheelarches.



Left Hand Front Fluid Cooler (Feed) Hose

Removal:
1. Remove the left hand front wheel and wheelarch liner; refer to service notes sections GJ.4 and BV.17 for further information.

2. Unhook the hose from the clip securing it to the upper radiator outlet duct as well as the 2 x swivel clips/tie wraps securing it to the heater feed pipe, (See Fig 1). Cut and remove the 2 x tie wraps securing the feed hose to the cross-over hose, (see Fig 2).

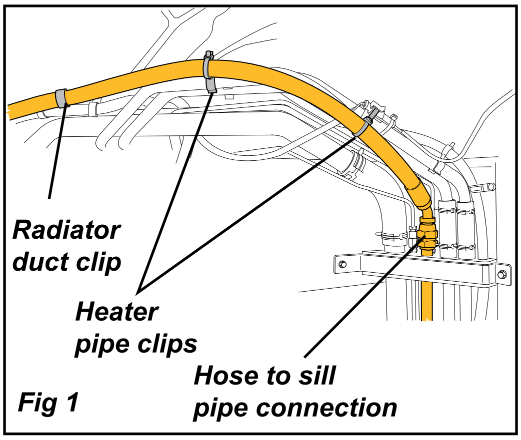


Fig 1

3. Unbolt the hose at the left hand transmission fluid cooler connection, and, using suitable container(s), allow any fluid in the cooler and line to drain down, (see Fig 2).

   Note: To avoid placing unnecessary strain and movement on the sill pipe and fluid cooler, hold the union nuts with an open ended spanner whilst using another spanner or crows foot adaptor on the hose connector unions when loosening or tightening.

4. Unbolt the hose at its connection to the left hand side fluid feed pipe which is located to the rear of the left hand front wheelarch area, (see Fig 1) and remove hose.

Refitment:
Is the reverse order to removal.

1. Ensure the hose route is unhindered, cannot rub on other components and is free of any kinks allowing the transmission fluid to flow freely (see Fig 2).
   Note: The feed hose should be routed so that is postioned in bet the washer r sh

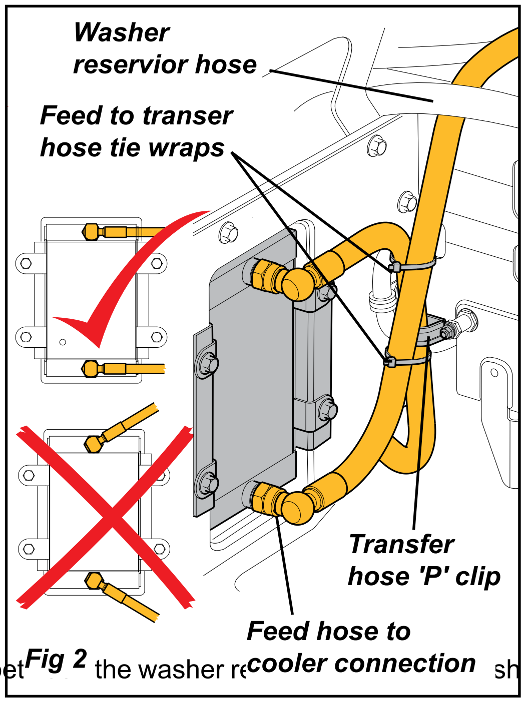


Fig 2

structure and to the left (outwards) of the transfer hose at the area where it passes near the transfer hose 'P' clip (see Fig 2).

Position the hose connection at the sill pipe so that it can follow the heater feed pipe routing without any strain being placed on the hose once it is secured with new cable ties to the heater pipe. (See Fig 1).

2. Tighten the hose at the transmission cooler and sill pipe connections to 40Nm, a 30mm crowsfoot adaptor is required to carry out this operation. (Also see 'Note' in removal step 3 for tightening instructions).

3. If necessary fit new tie wraps to the swivel clips and re-check the hose routing.

4. Ensure the transmission fluid is topped up to allow for the fluid loss encountered during hose removal; refer to sub-section FA.5 for further information.

5. Connect Lotus 20/20 diagnostic tool to the vehicle and run the engine and allow the temperature within transmission to rise to 72°C so that the transmission fluid level within the gearbox can be checked and adjusted and the cooler circuit can be checked for leaks; refer to sub-section FA.5 for further information.

6. Refit the vehicle ancillary components previously removed once the correct transmission fluid level has been achieved.

Fluid Cooler Transfer Hose

Removal:

1. Remove both front wheels and wheelarch liners; refer to service notes section BV.17 for further information.

2. Remove front undershield; refer to service notes section A Introduction for further information.

3. Cut and discard the 2 x tie wraps securing the left hand hose to the transfer hose, remove the nut securing the 'P' clip to bobbin mount at the front subframe, (see Fig 4).

4. Unhook the line from the 3 x plastic clips securing it to the underside of the radiator inlet ducting. Unbolt the transfer hose at the right hand oil cooler, (see Fig 5).

Note: To avoid placing unnecessary strain and movement on the fluid coolers, hold the union nuts with an open ended spanner whilst using another spanner or crows foot adapt on the hose connector unions when loosening or tightening.

5. Lower the hose allowing fluid to drain from the hose and cooler into suitable container(s), (see Fig 5).

6. Unbolt the hose at the upper left hand fluid cooler, (see Fig 4).

Refitment:

Is the reverse order to removal.

1. Ensure the hose route is unhindered, cannot rub on any other components and is free of any kinks allowing the oil to flow freely.

Note, the hose should be routed so that is positioned right (inboard) of the left hand cooler pipe at the P clip mounting area, (see Fig 4).

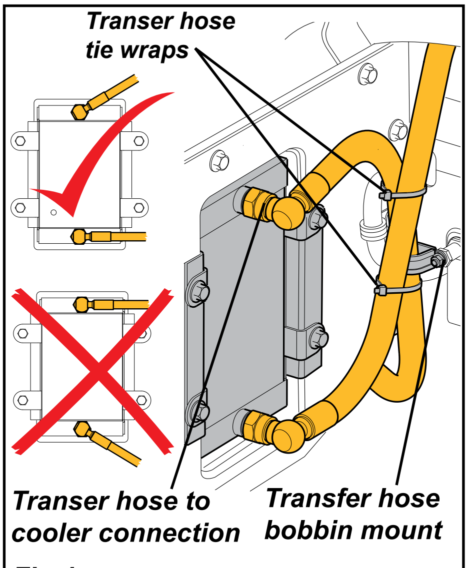


Fig 4

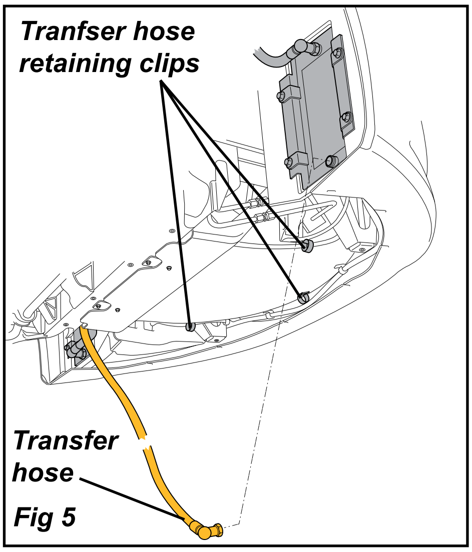


Fig 5

2. Position the feed hose connection parallel to the base of the right hand fluid cooler, (see Fig 6), and tighten to 40Nm, a 30mm crows-foot adaptor is required to carry out this operation. (Also see the 'Note' of removal in step 4 for tightening instructions).

3. Refit the 'P' clip to the bobbin mounting located on crash structure ensuring that the bobbin is not placed under any strain once the bobbin nut is tightened to 8Nm.

4. Ensure the transmission fluid is topped up to allow for the fluid loss encountered during hose removal; refer to sub-section FA.5 for further information

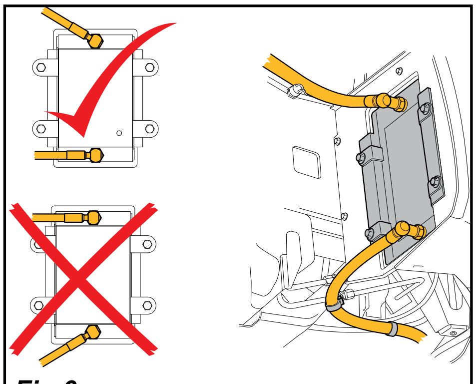


Fig 6

5. Connect Lotus 20/20 diagnostic tool to the vehicle and run the engine and allow the temperature within transmission to rise to 72°C so that the transmission fluid level within the gearbox can be checked and adjusted and the cooler circuit can be checked for leaks; refer to sub-section FA.5 for further information.

6. Refit the vehicle ancillary components previously removed once the correct transmission fluid level has been achieved.

Right Hand Front Fluid Cooler (Return) Hose

Removal:

1. Remove the right hand front wheel and wheelarch liner; refer to service notes sections GJ.4 and BV.17 for further information.

2. Unhook hose from the clip securing it to the upper radiator outlet duct as well as the swivel clip/ tie wrap securing it to the air conditioning expansion valve pipe, (see Fig 7).

3. Unbolt the hose at the fluid cooler connection, (see Fig 8) and, using suitable container(s), allow any fluid in the cooler or line to drain down.

   Note: To avoid placing unnecessary strain and movement on the sill pipe and fluid cooler, hold the union nuts with an open ended spanner whilst using another spanner or crows foot adapt on the hose connector unions when loosening or tightening.

4. Once drained, unbolt the hose at its connection to the right hand side sill return pipe which is located to the rear of the the right hand front wheelarch area, (see Fig 7).

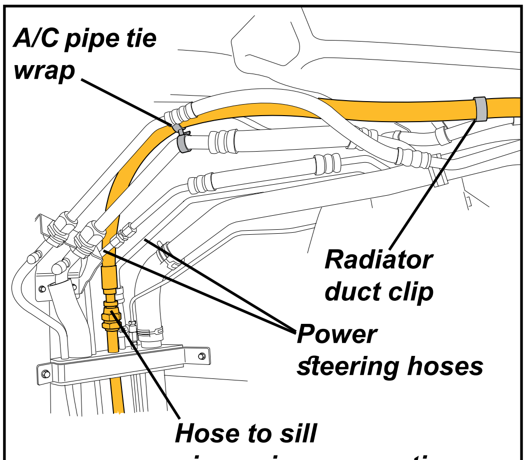


Fig 7

Refitment:
Is the reverse order to removal.

1. Ensure the hose route is unhindered, cannot rub on any other components and is free of any kinks allowing the oil to flow freely.

   Note: Position the hose connection at a slight upwards angle to the cooler so that the hose is not strained or kinked when routed in front (forward) of the air conditioning trinary switch. (See Fig 7 & 8).

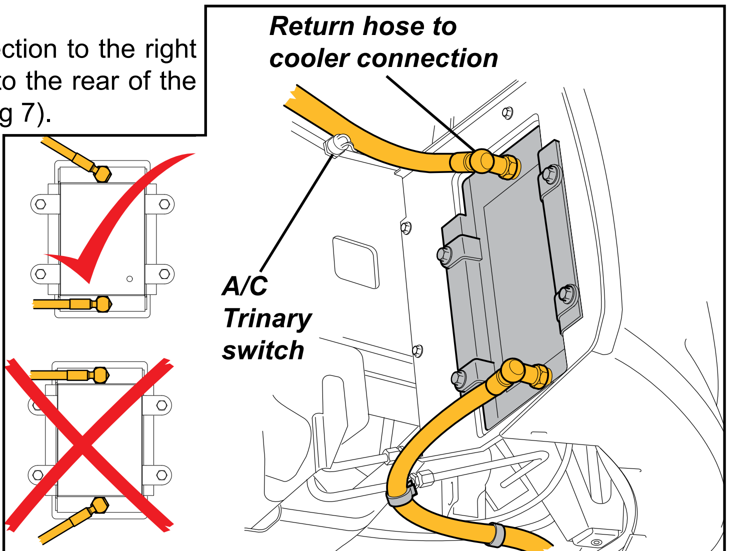


Fig 8

2. Position the hose connection at the sill pipe so it is routed in between the power steering hoses and above the air conditioning expansion pipe without becoming strained or kinked once secured with its tie wrap. (See Fig 7).

3. Tighten the hose connections at the fluid cooler and sill pipe to 40Nm, a 30mm crowsfoot adaptor is required to carry out this operation. (Also see the 'Note' of removal step 3 for tightening instructions).

4. Ensure the transmission fluid is topped up to allow for the fluid loss encountered during hose removal; refer to sub-section FA.5 for further information

5. Connect Lotus 20/20 diagnostic tool to the vehicle and run the engine and allow the temperature within transmission to rise to 72°C so that the transmission fluid level within the gearbox can be checked and adjusted and the cooler circuit can be checked for leaks; refer to sub-section FA.5 for further information.

6. Refit the vehicle ancillary components previously removed once the correct transmission fluid level has been achieved.

Left Hand Rear Fluid Cooler (Feed) Hose

Removal:

1. Remove the rear undertray; refer to service notes section A - Introduction for further information.

2. Remove the left hand rear wheel and wheelarch liner; refer to service notes sections GJ.4 and BV.17 for further information.

3. Remove the air filter housing, charcoal canister assembly and cosmetic engine cover support brace; refer to service notes sections EJ.4 and LN.8 for further information.

4. From underneath the vehicle, release the firtree fixing/cable tie assembly (2) securing the hose to the chassis step/lower edge of the rear bulkhead panel.

5. Remove the fixing retaining the 'P' clip, (see Fig 10) at the hose support bracket, (tightened to 9 Nm), and, if fitted, cut the tie wrap securing the earth lead to the engine harness.

6. Loosen the hose at it's connection point to the left hand rear sill pipe located forward of the rear wheel arch, (see Fig 10). Pull the hose away from the pipe and using suitable container(s), allow any transmission fluid in the cooler pipe or hose to drain down.

   Note: To avoid placing unnecessary strain and movement on the sill pipe, hold the sill pipe union nut with an open ended spanner whilst using another spanner or crows foot adaptor on the hose connector when loosening or tightening.

7. From underneath the vehicle unbolt the left hand oil cooler hose from its connection at the sandwich plate, (see Fig 11).

8. The hose can now be removed from the vehicle be carefully feeding it out of the engine bay from the left hand wheelarch area.

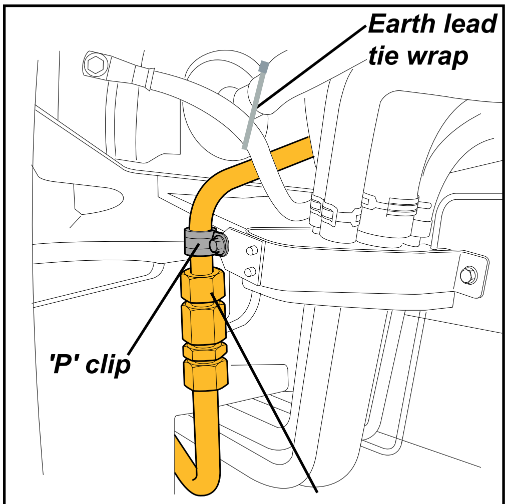


Fig 10

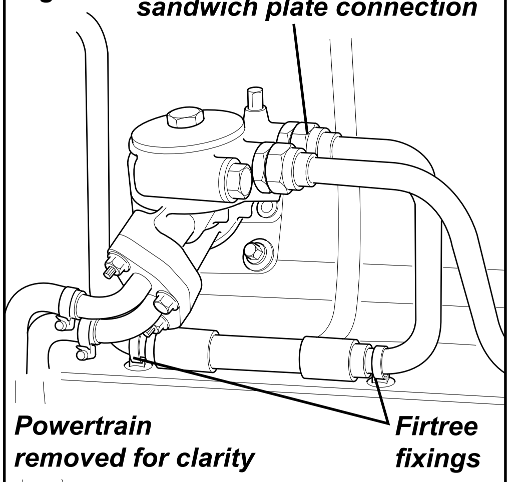
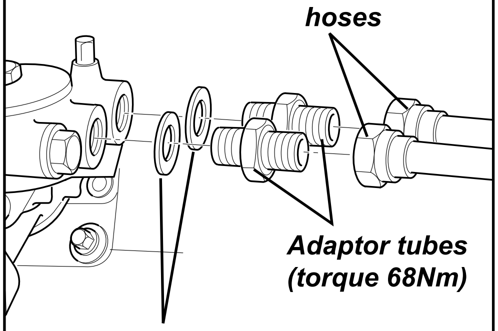


Fig 11

Care point: Dependant upon the sandwich plate orientation it may also be necessary to remove left hand oil cooler pipe connector and sandwich plate adaptor tube to gain sufficient access to the connector of the right hand cooler pipe. (See fig 12).

Note: In the event that the adaptor tubes are disturbed it is recommended that the bonded sealing washers positioned between the tubes and sandwich plate housing face are renewed. Also a thin smear of transmission oil should be applied to the rubber seal section of the washers to prevent tearing damage occurring whilst tightening the adaptors to the sandwich plate, (see Fig 12).

Fig 12



Refitment:
Is the reverse order to removal.

1. Ensure the hose route is unhindered, cannot rub on any other components and is free of any kinks allowing the oil to flow freely.

2. Tighten the hose connections at the sandwich plate and sill pipe to 40Nm, (a 30mm crowsfoot adaptor is required to carry out this operation). Also refer to 'Note' in step 5 for correct tightening procedure.

4. Replace the earth lead tie wrap.

5. Ensure the transmission fluid is topped up to allow for the fluid loss encountered during hose removal; refer to sub-section FA.5 for further information

6. Connect Lotus 20/20 diagnostic tool to the vehicle and run the engine and allow the temperature within transmission to rise to 72°C so that the transmission fluid level within the gearbox can be checked and adjusted and the cooler circuit can be checked for leaks; refer to sub-section FA.5 for further information.

7. Refit the vehicle ancillary components previously removed once the correct transmission fluid level has been achieved.

Right Hand Rear Fluid Cooler (Return) Hose

Removal:
1. Remove the rear undertray; refer to service notes section A - Introduction for further information.

2. From underneath the vehicle, release the firtree fixing/cable tie assembly (2) securing the hose to the chassis step/lower edge of the rear bulkhead panel.

3. Remove right hand rear wheel and wheelarch liner; refer to service notes sections GJ.4 and BV.17 for further information.

4. Remove the fixing retaining the 'P' clip to the hose support bracket located on the subframe, (see Fig 13).

5. Loosen the hose at it's connection point to the right hand rear sill pipe, (see Fig 13) located forward of the rear wheel arch, pull the hose away from the pipe and using suitable container(s), allow any transmission fluid in the hose or sill pipe to drain down.

   Note: To avoid placing unnecessary strain and movement on the sill pipe, hold the sill pipe union nut with an open ended spanner whilst using another spanner or crows foot adaptor on the hose connector when loosening or tightening.

6. From underneath the vehicle unbolt the right hand fluid cooler

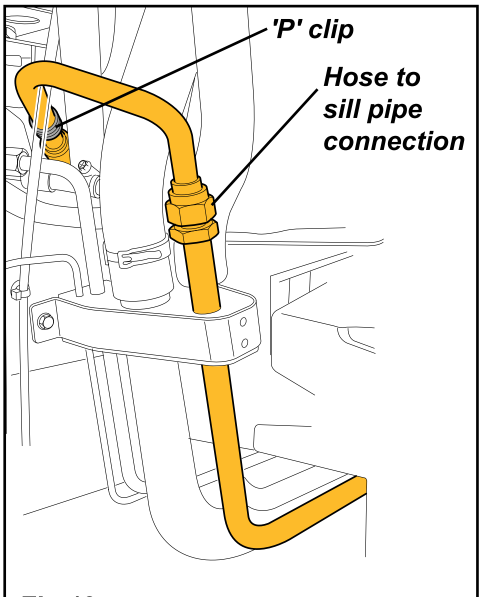


Fig 13

hose (which will be the hose viewed on the left from inside the car) from its connection at the sandwich plate. (See Fig 14).

7. The hose can now be removed from the vehicle be carefully feeding it out of the engine bay from the right hand wheelarch area.

   Care point: Dependant upon the sandwich plate orientation it may also be necessary to remove left hand oil cooler pipe connector and sandwich plate adaptor tube to gain sufficient access to the connector of the right hand cooler pipe. (See fig 15).

   Note: In the event that the adaptor tubes are disturbed it is recommended that the bonded sealing washers positioned between the tubes and sandwich plate housing face are renewed.

   Also a thin smear of transmission fluid should be applied to the rubber seal section of the washers to prevent tearing damage occurring whilst tightening the adaptors to the sandwich plate.

Refitment:
Refit is the reverse order to removal.

1. Ensure the hose route is unhindered, cannot rub on any other components and is free of any kinks allowing the oil to flow freely.
2. Ensure that there is clearance between cooler hose and the fuel filler neck to hose clip, see fig 16.
3. Tighten the hose connections at the sandwich plate and sill pipe to 40Nm (a 30mm crowsfoot adaptor is required to carry out this operation). Also refer to 'Note' within step 5 of pipe removal for the correct tightening procedure.
4. Ensure the transmission fluid is topped up to allow for the fluid loss encountered during hose removal; refer to sub-section FA.5 for further information
5. Connect Lotus 20/20 diagnostic tool to the vehicle and run the engine and allow the temperature within transmission to rise to 70°C so that the transmission fluid level within the gearbox can be checked and adjusted and the cooler circuit can be checked for leaks; refer to sub-section FA.5 for further information.
6. Refit the vehicle ancillary components previously removed once the correct transmission fluid level has been achieved.

Fig 14

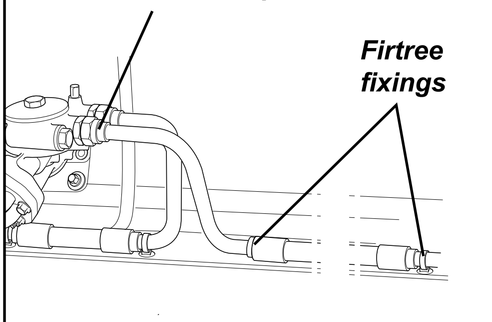


Fig 15

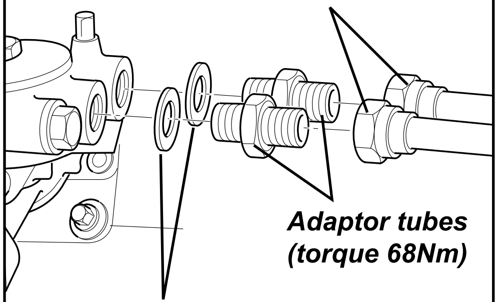
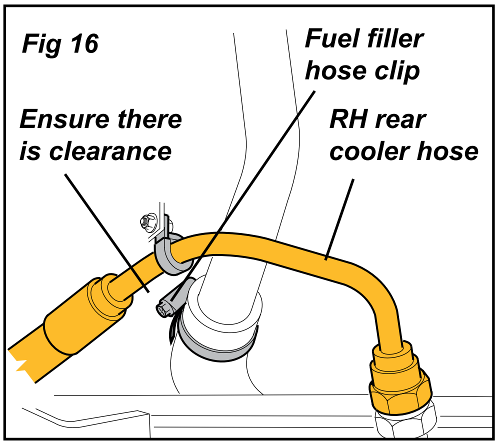
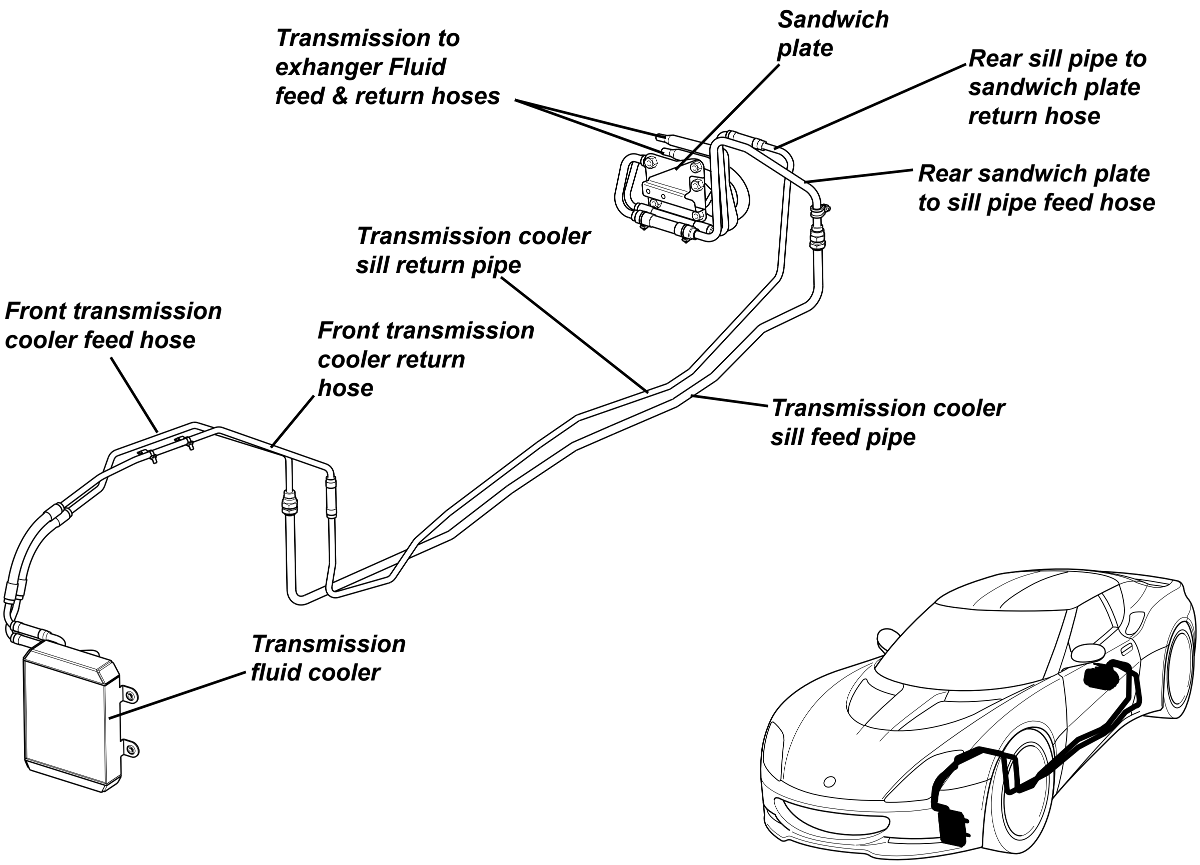


Fig 16



'12MY Onwards IPS & S-IPS Models



For '12MY vehicles onwards the transmission fluid cooling for both supercharged and naturally aspirated IPS transmission vehicles has also been rationalised with the fitment of only a single larger transmission fluid oil cooler mounted ahead of left hand front wheel arch. Air is fed from the outside of the vehicle via the intake and grille attached inset in the front bumper.

Both the feed and return hoses are located to the left hand side of the vehicle and connect into the same sandwich plate configuration mounted remotely to the rear bulkhead in the same manner as pre '12 model year IPS naturally aspirated vehicles.

Using the same principle as '11MY vehicles, the transmission fluid under pump pressure is forced through an outlet pipe located on the side of the transmission casing, and via a fluid feed hose, enters the inlet port of the sandwich plate/thermostat assembly.

Once the transmission fluid temperature reaches 72°C the thermostat within the assembly opens diverting transmission fluid around the left hand oil feed pipes, passing through the lower inlet port of the transmission cooler.

The fluid travels around the cooler where its temperature is reduced by airflow directed from the front intake grill to the front face of the cooler via air ducting. Louvres in the wheelarch liners front section allow air to exhaust from the rear of the cooler into the wheelarch area.

The transmission fluid leaves the cooler via the upper exit port and travels back to the sandwich plate assembly via the return pipes also located in the wheelarches and left hand sill assembly.

The fluid via a sandwich plate return hose is sent to an inlet pipe located on the side of transmission case, allowing the fluid to drain back down to the transmissions sump pan.

Transmission Fluid Cooler

Removal:

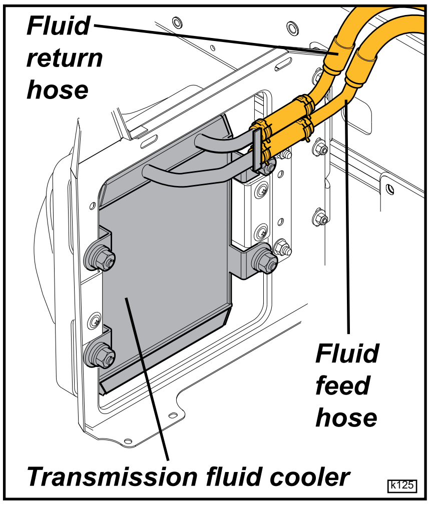
1. Remove the left hand front wheel and wheelarch liner for to gain access to the transmission cooler; refer to service notes sections GJ.4 and BV.17 for further information.

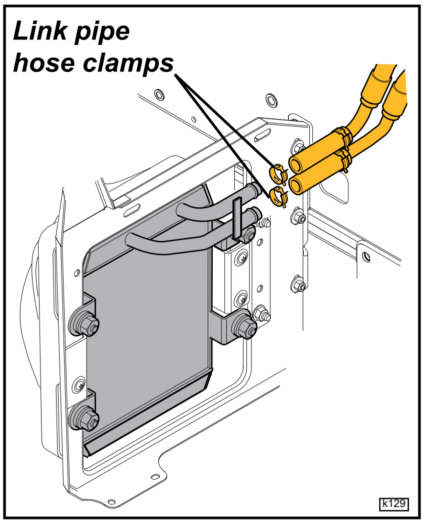
2. Release the spring loaded hose clamps securing the fluid feed and return link hoses to the inlet and outlet tubes of the cooler and disconnect the hoses from the cooler tubes.

4. Lower the hoses and allow the fluid from both hoses and the cooler to drain into a suitable container, plug the cooler hose ports to minimize fluid loss.

5. Release the M8 nuts and washers (4) securing the air ducting and the transmission cooler at it mounting point studs to the bumper support bracket.

6. The cooler and ducting assembly can now be withdrawn from the bumper support bracket, ensure to collect the coolers combined compression sleeves and bushes that may still remain on the mounting studs.





Fitment:

- Place the cooler and duct into position (the main body of the duct assembly passing through the aperture within the bumper support bracket) and the cooler and duct mounting holes fitted over the 4 mounting point studs.

- Care point: ensure the combined compression sleeves and mounting bushes are fitted in position within the oil cooler mounting holes before refitting back onto the bumper support bracket mounting studs.

- Refit the M8 nuts and washers (4) to the mounting studs and torque to 15Nm.

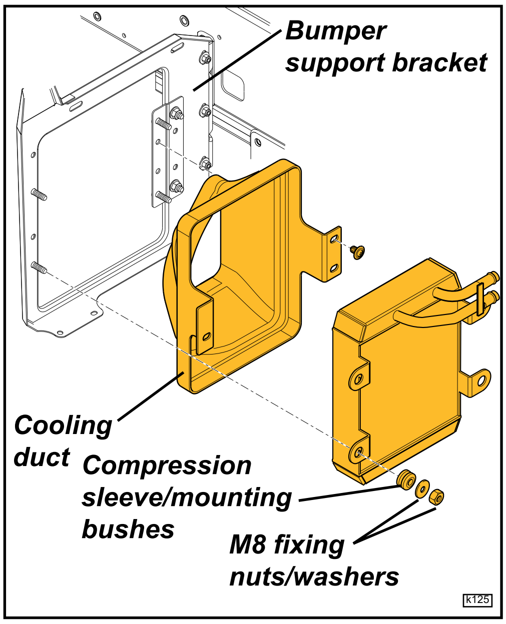
- Push the fluid feed and return hoses back onto the cooler inlet and outlet tubes securing them in position with the spring loaded hose clamps.

- Ensure the hose route of both hoses is unhindered, cannot rub on other components and is free of any kinks allowing the oil to flow freely.

- Ensure the transmission fluid is topped up to allow for the fluid loss encountered during hose removal; refer to sub-section FA.5 for further information

- Connect Lotus 20/20 diagnostic tool to the vehicle and run the engine and allow the temperature within transmission to rise to 72°C so that the transmission fluid level within the gearbox can be checked and adjusted and the cooler circuit can be checked for leaks; refer to sub-section FA.5 for further information.

- Refit the vehicle ancillary components previously removed once the correct transmission fluid level has been achieved.



Left Hand Front Oil Cooler Feed and Return Hoses

Removal:

1. Remove left hand front wheel and wheelarch liner; refer to service notes sections GJ.4 and BV.17 for further information.

2. Unhook the swivel clips securing the hoses to the HVAC heater feed/return pipes.

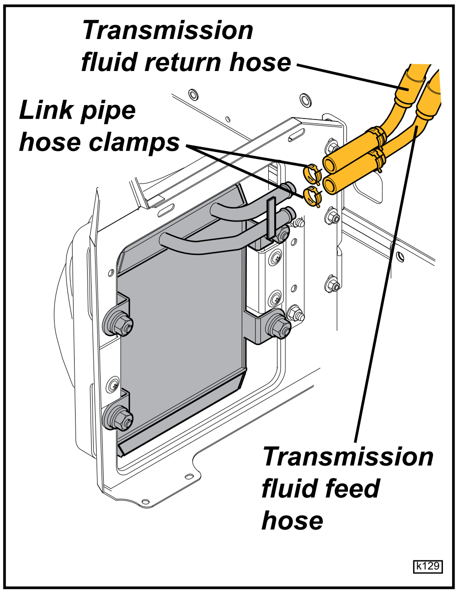
3. *Feed & return hose connections at cooler:* Release the spring loaded hose clamps securing the fluid feed and return link hoses to the inlet and outlet tubes of the cooler and disconnect the fluid feed and return hoses from the cooler tubes.

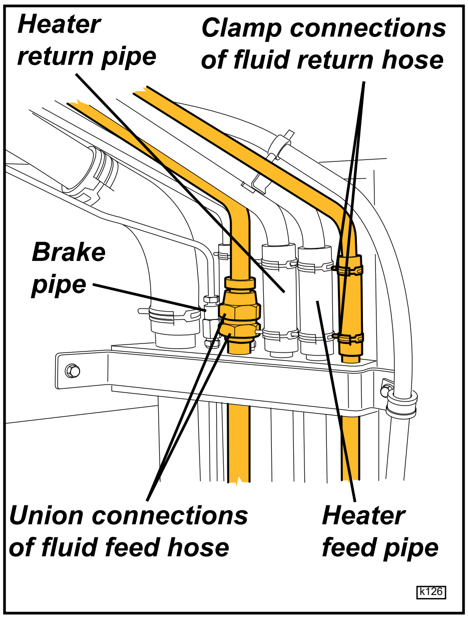
4. *Feed hose within support foam and clamp:* Loosen the hose at its 5/8 BSP union connection to the left hand side fluid feed pipe which is located to the rear of the left hand front wheel arch area contained within the hose support foam and clamp assembly. The union connection is positioned between the ABS module to body side sill brake pipe and heater return pipe.

   Note: To avoid placing unnecessary strain and movement on the sill pipe, hold the sill pipes union nut with an open ended spanner whilst using another spanner or crows foot adaptor on the hose connector union when either loosening or tightening.

5. *Return Hose within support foam and clamp:* Release the spring loaded hose clamp securing the hose to fluid return link hose to the bodyside/sill return pipe. This is located to the rear of the left hand front wheelarch area contained within the hose support foam and clamp assembly. The connection is positioned outermost in the foam, outboard of the heater feed pipe.

6. Once released, pull the hose(s) away from the bodyside sill pipe(s) and using suitable container(s), allow any fluid in the sill pipe(s) or hose(s) to drain down.





Refitment:
Is the reverse order to removal.

- Ensure the hose routes are unhindered, cannot rub on other components and is free of any kinks allowing the oil to flow freely.

- Tighten the Feed hose to sill pipe connection to 40Nm (a 30mm crowsfoot adaptor is required to carry out this operation). Also refer to 'Note' within step 4 of pipe removal for the correct tightening procedure.

- Ensure the transmission fluid is topped up to allow for the fluid loss encountered during hose removal; refer to sub-section FA.5 for further information.

- Connect Lotus 20/20 diagnostic tool to the vehicle and run the engine and allow the temperature within transmission to rise to 72°C so that the transmission fluid level within the gearbox can be checked and adjusted and the cooler circuit can be checked for leaks; refer to sub-section FA.5 for further information.

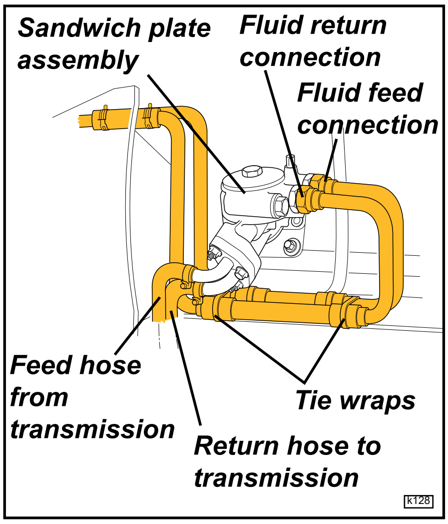
- Refit the vehicle ancillary components previously removed once the correct transmission fluid level has been achieved.

Left Hand Rear Oil Cooler Feed and Return Hoses

Removal:

1. Remove the rear undertray; refer to service notes section A - Introduction for further information.

2. From underneath the vehicle, cut the tie-wraps (2) securing the feed and return hoses together and release the firtree fixing/cable tie assembly (2) securing feed hose to the chassis step/lower edge of the rear bulkhead panel.



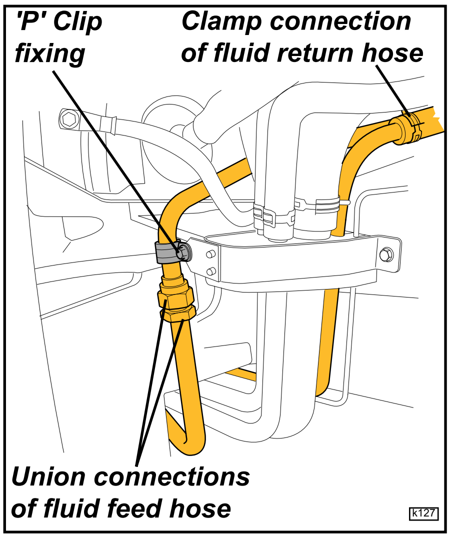
3. Remove right hand rear wheel and wheelarch liner; refer to service notes sections GJ.4 and BV.17 for further information.

4. *Feed Hose:* Removal of the feed hose through the wheelarch area may be easier with the removal of the air filter housing and charcoal canister assembly and cosmetic engine cover support brace; refer to service notes sections EJ.4 and LN.8 for further information.

- From the wheelarch area, remove the M6 x 16 screw retaining the 'P' clip to the hose support bracket located on the subframe,

- Release the hose at its 5/8 BSP connection point to the right hand rear sill pipe.

Note: To avoid placing unnecessary strain and movement on the sill pipe, hold the sill pipes union nut with an open ended spanner whilst using another spanner or crows foot adaptor on the hose connector union when either loosening or tightening.



5. *Return Hose:* Release the spring loaded hose clamp securing the hose to fluid return link hose to the bodyside/sill return pipe. This is located to the rear of the left hand rear wheelarch area.

6. Pull the hose(s) away from the pipe(s) and use suitable container(s), allowing any transmission fluid in the hose(s) or pipe(s) to drain down.

7. *Sandwich Plate Connections:* From underneath the vehicle release the 5/8 BSP connector union(s) securing the hose(s) to the sandwich plate. Note: the union closest to the bulkhead is for the feed hose, the union closest to the transmission is for the return hose.

Refitment:

Is the reverse order to removal.

- Ensure the hose routes are unhindered, cannot rub on other components and is free of any kinks allowing the oil to flow freely.

- Tighten the Feed hose to sill pipe connection to 40Nm (a 30mm crowsfoot adaptor is required to carry out this operation). Also refer to 'Note' within step 4 of pipe removal for the correct tightening procedure.

- Ensure the transmission fluid is topped up to allow for the fluid loss encountered during hose removal; refer to sub-section FA.5 for further information.

- Connect Lotus 20/20 diagnostic tool to the vehicle and run the engine and allow the temperature within transmission to rise to 72°C so that the transmission fluid level within the gearbox can be checked and adjusted and the cooler circuit can be checked for leaks; refer to sub-section FA.5 for further information.

- Refit the vehicle ancillary components previously removed once the correct transmission fluid level has been achieved.

FA.5 - TRANSMISSION FLUID LEVEL CHECKING, ADJUSTMENT AND DRAINING

◁ Click on arrow to return to previous page

Fluid temperature check & adjustment
The Toyota U660E transmission assembly used on the Evora IPS requires the transmission fluid to be within a specific temperature range and with the engine running before it is possible to accurately check and adjust the fluid level. An accurate level reading within the transmission can only be taken under normal driving conditions which requires the fluid to be at a specific temperature as well as ensuring that the fluid has completely circulated around the transmission cooling system, i.e. the external oil lines and cooler(s).

Note: Checking and adjusting the transmission fluid level under any other conditions could result in it being under or overfilled which could cause drivability issues and damage to the transmission.

Checking Fluid Temperature
1.Ensure that electrical systems such as the a.c system, audio system and lighting system are off.

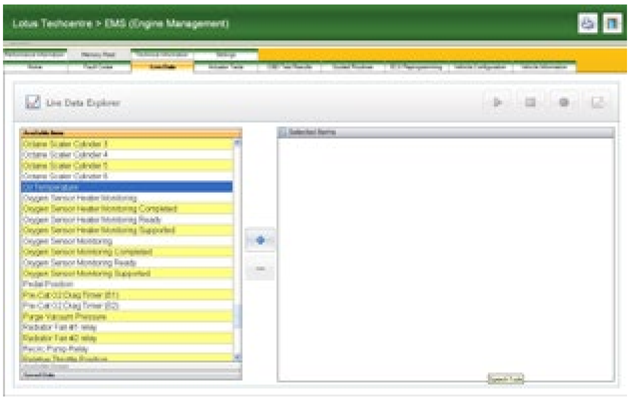
2.Connect Lotus 20/20 diagnostic tool to the vehicle select EMS live data and scroll down to the 'Oil Temperature' option (see screen shots below).

3.Start the engine and allow the temperature within the gearbox to rise to 70º + so that the thermostat in the sandwich plate assembly opens allowing the transmission fluid to circulate around the oil cooler system. Note: a fluid temperature reading of 70º and over is required for the thermostat to open. To raise the fluid temperature it may be necessary to drive the vehicle for a distance of not less than 10 miles (16 km).

- The transmission fluid level is measured with the fluid temperature at 40º centigrade.

Note: Because the transmission fluid has circulated around the cooler system it's temperature will probably now be in excess of 40°C (104°F) or more, turn the ignition switch off and wait until the fluid temperature drops below 45°C (113°F) and proceed to level checking procedure as described on the following page.

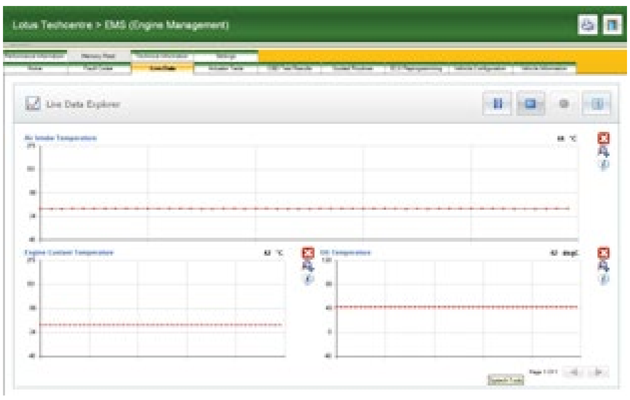
If the fluid temperature drops below 40°C then it will necessary to follow out steps a - d shown below before proceeding to the level checking procedure.



a.Depress and hold down the brake pedal.

b.Start the engine.

c.Slowly select P R N D buttons from the selector allowing the transmission enough time to select each gear, and then go back to P. Slowly selecting PRND will allow enough time for the fluid to circulate through each part of the transaxle.



d.Dependant upon current transmission fluid temperature as well as ambient temperature it may be necessary to drive the vehicle for a short distance to bring the transmission fluid up to 40°C.

Once you are certain that the sandwich plate thermostat has opened allowing the transmission fluid to circulate completely around the external cooling system have then allowed the fluid temperature to drop to 40°C you can then check the fluid level as described on the next page.

Transmission fluid level check and adjustment.
With the transmission fluid at temperature of 40°C (104°F):

1. Remove the rear undertray; refer to Service Notes introduction section for further information.

2. Lower vehicle and restart engine with park selected.

3. Raise the vehicle and from underneath:

- Place a clean and dry container underneath the transmission level/ overflow plug area (situated in the transmission sump). Fig A.

- Using a 6 mm hexagon drive socket, remove the transmission overflow plug and gasket.

Be aware that the fluid that may drain out will be hot.

4. Check the amount of fluid that drains out of the overflow plug hole.

- If only a small amount of fluid (approximately 1 cc) is drained, this is an indication that only residual fluid remaining in the overflow tube, (fig B) has come out. This does not mean that the transmission is overfilled therefore transmission fluid will need to be added continue from step 5.

- If a larger amount of fluid is drained out, (fig D), then wait for the fluid flow to slow down to a drip, (fig C). Then proceed straight to step 7.

5. Adjusting fluid level using transmission refill plug (if accessible)

   With the engine running:

- Remove the refill plug and gasket located on the end of the transmission case, Fig E. Note: The plug is accessible with the left hand rear wheelarch liner removed; refer to Service Notes section BV.17 for further information.

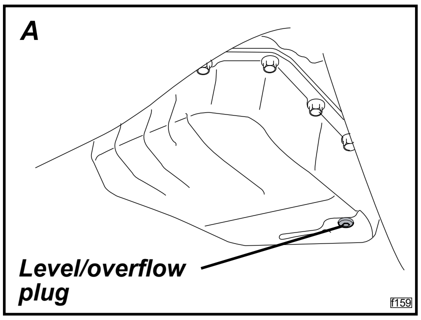
- Add fluid through the refill hole, a list of approved oils can be found in Evora Service Notes, section OK - Maintenance & Lubrication which can be viewed from the Lotus Dealer Portal at http://dealers.lotuscars.com.

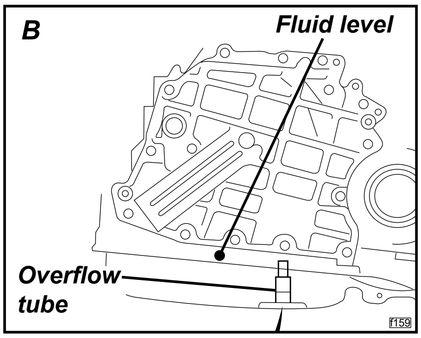
- Continue to add fluid whilst the engine is running until it flows out (as per fig D) wait for it to slow down to a drip (as per fig C), then refit overflow plug. (Torque to 40 Nm) then go to straight to step 7.

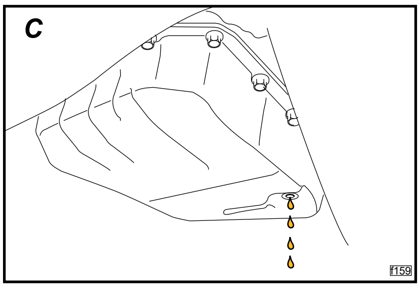
6. Adjusting fluid level using speedometer blanking plug (if refill plug is inaccessible)

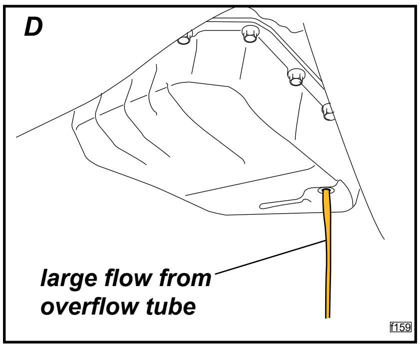
   Turn the engine off.

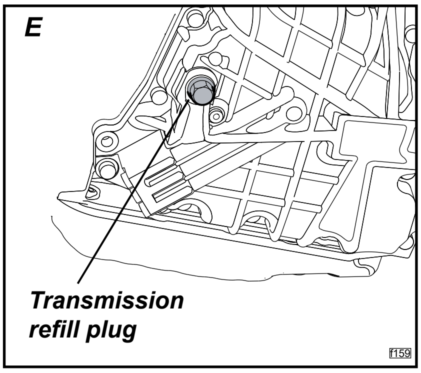
- Place a clean and dry container underneath the transmission level/drain plug area.





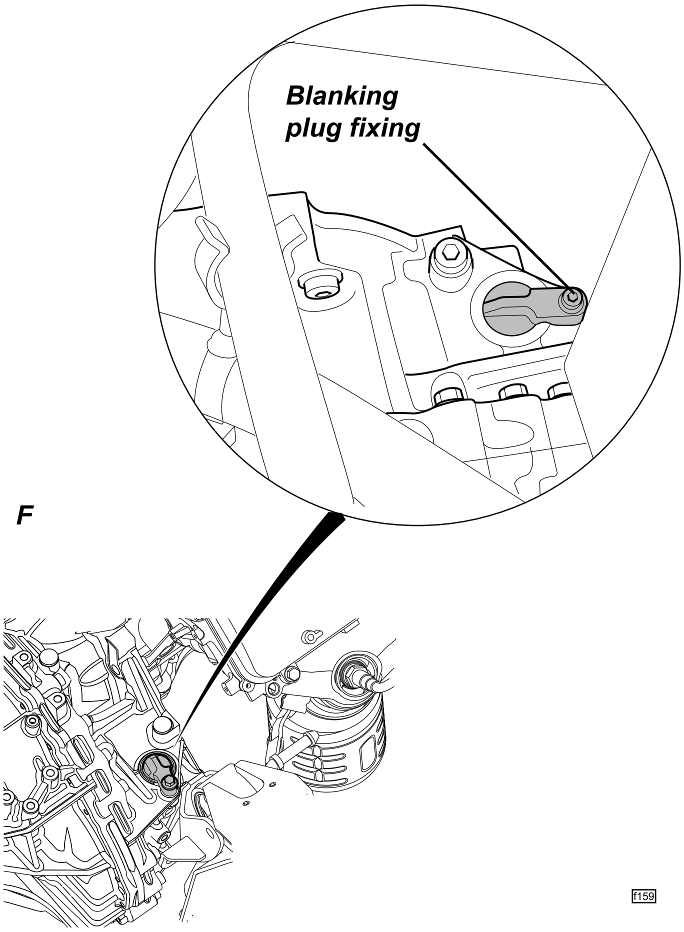


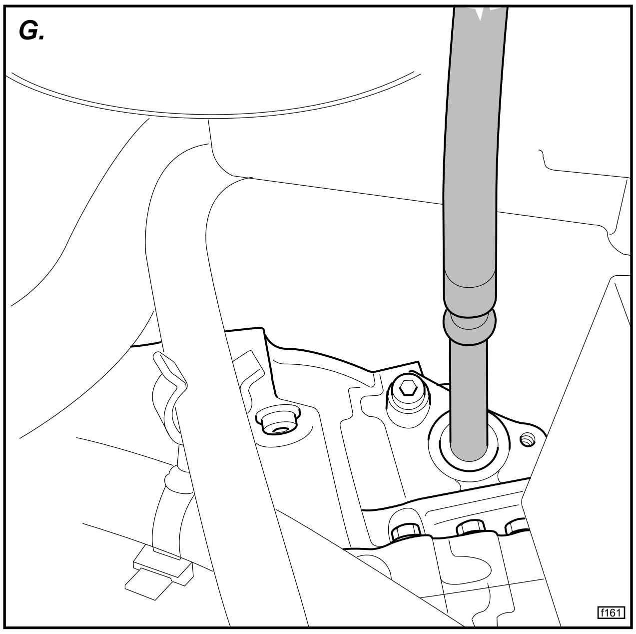




- Refit overflow plug (torque to 40 Nm).
- Remove the air intake hose and plenum assembly to gain access to the speedometer drive blanking plug, Fig F. This is located on top of the transmission case, remove blanking plug fixing, plug and 'O' ring.
- Add a set quantity of fluid (0.5 -1.0 litre) through the speedometer drive hole. Fig G.
- Refit air intake hose and plenum assembly.
- Start engine and leave to idle for 1 minute to allow the fluid to circulate around the transmission.
- Remove the overflow plug whilst the engine is running. If fluid flows out (as per fig D) wait for it to slow down to a drip (as per fig C), then refit overflow plug. (Torque to 40 Nm) then go to straight to step 7.
- If fluid did not flow out, then additional fluid will need to be added. Repeat step 6 again until enough fluid has been added so that it will flow out of the overflow plug before proceeding to step 7.

7. Refit overflow plug and fit a new gasket, (torque to 40 Nm) or;
8. Refit speedometer blanking plug and fit a new 'O' ring (torque to 5.5 Nm).
9. Install refill plug and fit a new gasket, (torque to 49 Nm).
10. Refit the undertray, wheelarch liner and road wheel (if removed).





Draining Transmission Fluid

It is recommended to drain the transmission fluid from the oil pan assembly prior to carrying out certain operations such as powertrain removal, driveshaft removal etc.

. Remove the rear undertray and left hand rear wheelarch liner - see service notes introduction section and BV.17 for further information.

. From the left hand rear wheelarch area remove the transmission refill plug and gasket, (torque to 49 Nm) see fig A.

Note: if the refill plug is not accessible then the speedometer drive blanking plug can be removed instead (see previous page).

. Place a clean and dry container underneath the transmission level/ overflow plug area (situated in the transmission sump).

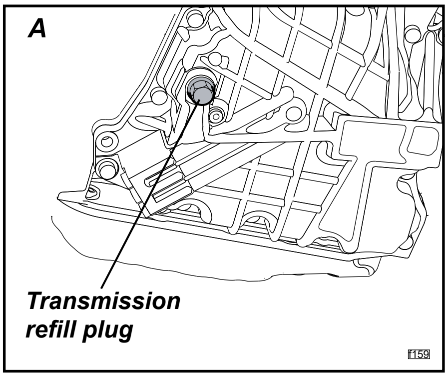
. Using a 6 mm hexagon drive socket, remove the transmission level/ overflow plug and gasket (torque 40 Nm) see fig B.

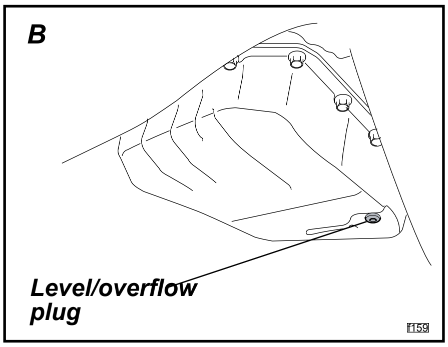
NOTICE Be aware that the fluid that may drain out will be hot.

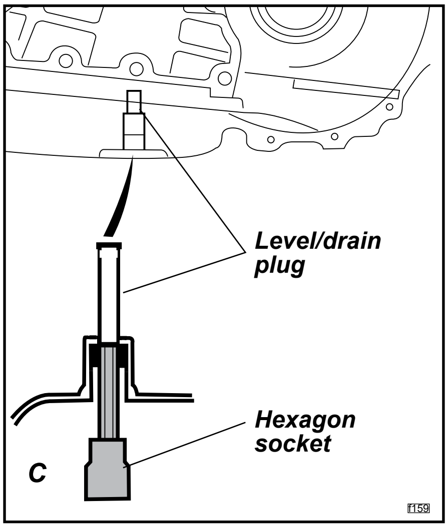
. With the drain plug removed the transmission oil tube is now accessible. Using a 6mm hexagon socket wrench, remove the tube and drain the transmission fluid, see fig C.

NOTICE Be aware that up to 3 litres of hot fluid that may drain out.

. Once drained refit the transmission oil tube (torque 2 Nm) and temporarily refit the refill plug and overflow plug.







Initial filling

. Remove the refill plug and gasket located on the end of the transmission case, see fig A.

. Remove the level/overflow plug located in the sump pan, see fig B.

. Add transmission fluid through the refill hole, a list of approved oils can be found in Evora Service Notes, section OK - Maintenance & Lubrication. Continue to add fluid until it begins to flow out of the overflow plug hole wait for it to slow down to a drip.

. Temporarily refit overflow plug then carry out the transmission fluid level check and adjustment procedure as described on the previous page to ensure that fluid has completely circulated around the cooling system and that the correct fluid level has been achieved.

FA.6 - IGNITION SWITCH AND BATTERY DISCONNECTION

Ignition Switch
The Auto ignition switch incorporates solenoid, which, when energised prevents the switch being returned to the fully off position. As the ignition is turned off, the TCU via pin 73 grounds the key interlock solenoid within the ignition lock. This physically prevents the key barrel being turned back to the fully off position to remove the key.

Once P – Park has been selected from the PRND selector console and the transmission is in park the TCU will de-energise the key interlock solenoid & allow the key to be turned to the fully off position of the lock travel and the key can be withdrawn from the lock barrel.

As the vehicle has Auto Park the transmission will (provided vehicle is stationary) go straight into park when the ignition is turned off, making the interlock system hard to notice as the vehicle will have gone into park before the driver can get to the key removal stage.

However if the driver attempts to remove the key while the vehicle is still moving then the TCU would activate the key interlock solenoid, thereby preventing key removal until the vehicle was stationary and in park.

Disconnecting the Battery
The transmission will default to P- Park rendering the vehicle immobile if the battery is disconnected or becomes discharged.

FA.7 - VEHICLE RECOVERY AND TOWING

Click on arrow to return to previous page

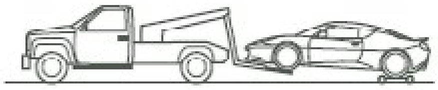
Vehicle towing
The recommended method of recovery is the use of a flat bed transporter as shown in illustration (c).

If towing is necessary, we recommend it is carried out by your Lotus dealer or a professional vehicle recovery service.

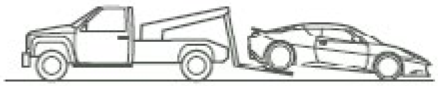
The Evora fitted with IPS transmission must be towed in the methods shown in illustrations (a - b).

If towing using the method shown in illustration (a) then a towing dolly must be placed under the rear wheels.

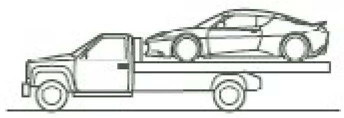
a



b



c



NOTICE Never use the recovery eye to tow the vehicle.

NOTICE Never tow a vehicle with an IPS gearbox with the driving wheels rotating on the ground, as this may cause serious damage to the transmission.

NOTICE Comply with all local legislation applicable to cars being towed.

Recovery eye
A recovery eye is provided with the vehicle tool kit, and stowed in the rear luggage compartment. When required, fit the eye to its anchorage point in the top left hand corner of the radiator air intake aperture, having first removed the protective bung (if fitted), and screw fully into the tapped boss.

The eye is provided to aid vehicle recovery, such as winching onto a flatbed car transporter, but only when the car is able to roll freely.

Preparation for winching:

- Ensure that the vehicles battery is connected and has sufficient charge.
- Turn the ignition key to position II so that the PRND selector buttons can be activated.
- Release the parking brake and ensure that the transmission is in N - Neutral.
- If Neutral cannot be selected then towing dollies must be placed under the rear wheels before winching the vehicle.

FA.8 - TRANSMISSION DIAGNOSTIC TROUBLE CODES

Transmission Malfunction Indicator  (amber)

The transmission warning light is illuminated if a fault is detected within the transmission, an associated control component or if the transmission oil exceeds its recommended maximum temperature.

A bulb check will light the lamp for about 3 seconds following ignition switch on.

- If the temperature of the transmission becomes too high the vehicle will default to a limited power mode and the Transmission Malfunction Indicator lamp will flash.
- If a fault is detected within the transmission, an associated component or if transmission oil temperature continues to rise, then the Transmission Malfunction Indicator lamp will illuminate or flash continuously. Reduce speed immediately and adopt a moderate driving style.
- If a fault is detected within a transmission component which could affect the vehicles emissions, then the engine Malfunction Indicator Lamp (MIL) will also illuminate continuously.
- Even if the Transmission Malfunction Indicator lamp extinguishes, proceed with caution and seek dealer advice without delay and avoid all unnecessary journeys.

NOTICE Continuing to drive with an illuminated Transmission Malfunction Indicator lamp may cause damage to the transmission.

Depending upon the cause, frequency and duration of the tell tale illumination it may be necessary to renew the transmission fluid even if all monitored transmission components are operating correctly.

A 'stand alone' lap top PC loaded with 'Lotus 20/20' diagnostic software allows the CAN based serial data to be read (see section Engine Management section EMR.5 for further information).

DIAGNOSTIC TROUBLE CODE (DTC) LIST

Continued.....

Continued.....

Transmission Fluid Over Temperature

P0218 Transmission Fluid Over Temperature Condition

Description
Indicates when the Transmission fluid temperature is too high.

Monitor:
- Continuous

Enable Criteria:
- Ignition on
- Engine running

Malfunction Criteria:
- Set if the transmission oil temperature sensor is showing a reading of over 140ºC for 10 seconds continuously.

While the fault is set the vehicle will be limited to 130mph and the transmission fault light will flash continuously. The transmission fault light will extinguish once the transmission temperature has fallen below 135ºC, assuming no other faults are present.

Diagnostic Mask:
- The fault will be stored in the TCU.

Vehicle Speed Sensor

P0500 Vehicle Speed Sensor "A"

Description
The vehicle speed error can be set by either a rationality check on the vehicle speed or an error signal being received from the ABS module across the CAN network.

Monitor:
- Continuous

Enable Criteria:
- Ignition on
- Engine running

Disable Criteria:
- EMS communications error
- ESP communications error
- Software Incompatibility with Engine Control Module
- Invalid Data Received from Engine Control Module

Malfunction Criteria:
- 1. If the vehicle is in overrun for an extended period of time with out a plausible vehicle speed being detected. The code will set if the vehicle is in overrun, with a torque demand of less than -30Nm, within the input shaft speed range of 1875 to 5219 rpm but the vehicle speed is reading below 5 kph for 5 seconds or more.
- 2. Error message from the ESP module received across the CAN network.

Potential Failure mode:
- Faulty speed sensor
- Error state in the ESP module

Diagnostic Mask:
- The TCU fault light and ECU MIL will be illuminated if fault is present.

System Voltage

P0562 System Voltage Low
P0563 System Voltage High

Description
With a battery and alternator functioning as normal the system voltage for a running engine should be around 14V. The TCU monitors this and will diagnose if the voltage is too high or too low.

Monitor:
- Continuous

Enable Criteria:
- Ignition on
- Engine running

Disable Criteria:
- EMS communications error
- Software Incompatibility with Engine Control Module
- Invalid Data Received from Engine Control Module

Malfunction Criteria:
- P0562 The fault will set if the battery voltage drops below 10V for longer than 10 seconds
- P0563 The fault will set if the battery voltage goes over 16V for longer than 10 seconds.

Potential Failure mode:
- Alternator fault
- Battery fault

Diagnostic Mask:
- The TCU fault light and ECU MIL will be illuminated if fault is present.

TCU Integrity

P0601 Internal Control Module Memory Checksum Error
P0613 TCM Processor

Description
This code is used by the TCU to check the integrity of the software and calibration data.
P0601 checks that on power up the checksum for calibration data is the same as checksum saved on the previous power down.

P0613 checks the watchdog timer after a defined period to see if it has reset. If the watchdog timer has not reset then the code has entered an unplanned loop or condition stopping it resetting the timer.

Monitor
- P0601 at TCU power up
- P0613 continuously while the engine running

Diagnostic Mask:
- The TCU fault light and ECU MIL will be illuminated if fault is present.

P060A Internal Control Module Monitoring Processor Performance - Safety

Description
The calibration check sum must match the calculated check sum to ensure that there are no errors.

Monitor
- Instant

Malfunction criteria
- Check sum stored does not match the check sum calculated.

Diagnostic mask
- The TCU fault light will be illuminated if fault is present.

TCU Vehicle Options Error

P0610 Variant code not programmed

Description
The TCU programming process includes the vehicle variant code.

If a new TCU has been fitted, the relevant vehicle variant code needs to be programmed using the Lotus Tech-Centre tool.

Monitor
- During start up or after writing the variant code to the module

Potential failure modes
- Variant code not programmed
- Variant code incorrect

Diagnostic mask
- The TCU fault light and ECU MIL will be illuminated if fault is present.

Transmission Range Sensor

P0705 Transmission Range Sensor "A" Circuit (PRNDL Input)

Description
The transmission selector must keep within predefined working limits.

Monitor:
- Continuous

Enable Criteria:
- Ignition on
- P, R, N or D positions requested.

Malfunction Criteria:
- The fault will set if the sensor feedback for the transmission selector position is outside of the range 10 to 95 percent for 1.5 seconds continuously.

Diagnostic Mask:
- The TCU fault light will be illuminated if fault is present.

Transmission Fluid Temperature

P0710 Transmission Fluid Temperature Sensor "A" Circuit
P0712 Transmission Fluid Temperature Sensor "A" Circuit Low
P0713 Transmission Fluid Temperature Sensor "A" Circuit High

Description
A rationality check for monitoring the temperature sensor performance.

P0710

Monitor:
- Continuous

Enable Criteria:
- Ignition on

Disable Criteria:
- Transmission fluid temperature sensor "A" circuit low
- Transmission fluid temperature sensor "A" circuit high

Malfunction Criteria:
- The sensor detects an apparent change in temperature from 28ºC to 75ºC or from 75ºC to 28ºC in less than 1 second.

Potential Failure Modes:
- Open or short in the sensor circuit
- Sensor fault
- TCU fault

Diagnostic Mask:
- The TCU fault light and ECU MIL will be illuminated if fault is present.

P0712

Monitor:
- Continuous

Enable Criteria:
- Ignition on

Malfunction Criteria:
- If the sensor feed back voltage is very low for longer than 1.5 seconds. The sensor feed back is inversely proportional to temperature, so relates to a high temperature.

Potential Failure Modes:
- Open sensor circuit
- Sensor fault
- TCU fault

Diagnostic Mask:
- The TCU fault light and ECU MIL will be illuminated if fault is present.

P0713

Monitor:
- Continuous

Enable Criteria:
- Ignition on
- Communication with IP
- Ambient air temperature sensor feed back greater than -30ºC

Malfunction Criteria:
- If the sensor feed back voltage is very high for longer than 1.5 seconds. The sensor feed back is inversely proportional to temperature, so relates to a low temperature.

Potential Failure Modes:
- Short in the sensor circuit
- Sensor fault
- TCU fault

Diagnostic Mask:
- The TCU fault light and ECU MIL will be illuminated if fault is present.

Turbine Speed Sensor

P0717 Input Shaft Speed Sensor "A" Circuit No Signal
P0718 Input Shaft Speed Sensor "A" Circuit Intermittent

Description
A rationality check for the input shaft speed sensor

P0717

Monitor:
- Continuous

Enable Criteria:
- Ignition on
- Engine running
- Battery voltage over 8 volts
- In gear 2 or higher

Malfunction Criteria:
- The output shaft speed is reading greater than 1000rpm while the input shaft speed is less than 300rpm for 5 seconds.

Potential Failure Modes:
- Sensor fault
- TCU fault

Diagnostic Mask:
- The TCU fault light and ECU MIL will be illuminated if fault is present.

P0718

Monitor:
- Continuous

Enable Criteria:
- Ignition on
- Engine running
- In gear, 1-6 or reverse
- Vehicle speed greater than 30kph

Malfunction Criteria:
- If the raw input shaft speed differs from the filtered input shaft speed by more than 30% more than 20 times in a 5 second period of time.

Potential Failure Modes:
- Sensor fault
- TCU fault

Diagnostic Mask:
- The TCU fault light and ECU MIL will be illuminated if fault is present.

Brake Switch

P0719 Brake Switch "B" Circuit Low
P0724 Brake Switch "B" Circuit High

Description
These faults check the brake signal in the TCU against the signal received by the ECU.

Monitor:
- Continuous

Enable Criteria:
- No brake switch faults reported from ESP/ECU

Malfunction Criteria:
- The P0719 fault will set when the ECU brake switch is active for 2 seconds when the TCU brake switch is not active
- The P0724 fault will set when the TCU brake switch is active for 2 seconds when the ECU brake switch is not active

Potential Failure Modes:
- Open in brake switch circuit
- Brake switch fault
- TCU fault

Diagnostic Mask:
- The service light will illuminate.

Output Speed Sensor

P0721 Output Speed Sensor Circuit Range / Performance
P0722 Output Speed Sensor Circuit No Signal
P0723 Output Speed Sensor Circuit Intermittent

Description
Rationality check for the output shaft speed sensor

P0721
Monitor:
- Continuous

Enable Criteria:
- Ignition on
- Vehicle speed is 15kmh or more

Disable criteria
- DCF0722 has failed
- Force mechanical limp home
- Force neutral state
- Vehicle speed senor error is present
- Output shaft speed error has been detected
- Shift solenoid error has occurred

Malfunction Criteria:
- P0721 compares the output shaft speed to the calculated output shaft speed, if the error is over 10% for 2 seconds the fault will set

Potential Failure Modes:
- Sensor fault
- TCU fault

Diagnostic Mask:
- The TCU fault light and ECU MIL will be illuminated if fault is present.

P0722

Monitor:
- Continuous

Enable Criteria:
- Ignition on
- Engine running
- Vehicle speed is 5kmh or more
- Vehicle battery voltage must be above 8 volts
- Vehicle driving in gear 2 or higher

Malfunction Criteria:
- The output speed sensor is showing output speed of less than 100 rpm while the vehicle is travelling at 10kmh or greater for 10 seconds.

Potential Failure Modes:
- Sensor fault
- TCU fault

Diagnostic Mask:
- The TCU fault light and ECU MIL will be illuminated if fault is present.

P0723

Monitor:
- Continuous

Enable Criteria:
- Ignition on
- Engine running for greater than 5 seconds
- Vehicle speed is 20kmh or more
- Vehicle driving in gear 1 – 6, reverse or neutral.

Disable criteria
- DCF0722 has failed
- Force mechanical limp home
- Force neutral state

- Vehicle speed senor error is present
- Output shaft speed error has been detected
- Shift solenoid error has occurred

Malfunction Criteria:
- The fault will set when the difference between the raw output shaft speed and the filtered number is greater than 30% 20 times in a 5 second period of time.

Potential Failure Modes:
- Sensor fault
- TCU fault

Diagnostic Mask:
- The TCU fault light and ECU MIL will be illuminated if fault is present.

Torque Converter Clutch

P0741 Torque Converter Clutch Circuit Performance or Stuck Off

Description
The torque converter is able to lock the engine to the input shaft. This fault is used to detect when the torque convertor is commanded locked, but a speed difference is detected between the engine speed and the input shaft speed, suggesting that it is unlocked.

Monitor:
- Continuous

Enable Criteria:
- Ignition on
- Engine running
- In gear 2 or higher
- In gear duration greater than 2 seconds
- Vehicle speed over 10kph
- Torque demand over 25Nm
- No lateral G inhibit
- Auto transmission oil greater than 25C
- SLU solenoid request is greater than 60%
- SL solenoid request is greater than 95%
- Input shaft speed greater than 100rpm
- Slip across the torque convertor over 60rpm

Malfunction Criteria:
- The fault will set if a difference across the torque convertor of greater than 60 rpm when the clutch is commanded shut and the SLU pressure switch is on.

Potential Failure Modes:
- Torque converter stuck
- Valve body is blocked
- Line pressure is low

Diagnostic Mask:
- The TCU fault light and ECU MIL will be illuminated if fault is present.

Pressure Control Solenoid

Pressure control solenoid naming convention

A	SLT

P0746 Pressure Control Solenoid "A" Performance or Stuck Off (SLT)

Description
Detects that there is insufficient oil pressure in the transmission.

Monitor:
- Continuous

Enable Criteria:
- Transmission oil temperature > -40 deg C
- Time in gear > 3 sec
- Min vehicle speed > 10 km/h
- Min input shaft speed > 100 rpm

Disable Criteria:
- None

Malfunction Criteria:
- Number of gears slipping > 3
- Percentage error slip > 1%
- Minimum time to detect slip > 1 sec

Potential failure modes:
- Low transmission oil level
- Solenoid mechanical fault
- Transmission oil pump failure
- Transmission clutches damaged

Diagnostic Mask:
- The TCU fault light and ECU MIL will be illuminated if fault is present.

P0748 Pressure Control Solenoid "A" Electrical

Description
Monitors the integrity of the circuit; to detect a short or open circuit for the SLT solenoid.

Monitor:
- Continuous

Enable Criteria:
- Ignition on
- Battery voltage is greater than 8V.

Malfunction Criteria:
- Short circuit detected
- A current of less than 1 amp measured in the circuit while SLT demand is greater than 50%, for 1.5 seconds.

Potential Failure Modes:
- Open or short in the solenoid valve SL1 circuit
- Shift valve SL1 fault
- TCU fault

Diagnostic Mask:
- The TCU fault light and ECU MIL will be illuminated if fault is present.

Shift Solenoids performance

Shift control solenoid naming convention

A	SL1
B	SL2
C	SL3
D	SL4

Description
Monitors the commanded gear against the calculated gear. The Solenoid(s) in error can be identified by comparing solenoids that must be ON/OFF to be in the calculated gear (based on gear ratio across the transmission) relative to those that should be on to enable the gear requested.

P0751 Shift Solenoid "A" Performance or Stuck Off

Monitor:
- Continuous

Enable Criteria:
- Commanded gear does not match calculated gear
- Ignition on
- Transmission learning not active

Malfunction Criteria:
- The fault will set due to an SL1 stuck off when the SL1 request is on, but the SL1 pressure switch is off in the following condition for 1 second or more:
- Vehicle speed is 0kmh
- In gear 1
- Transmission oil temperature is greater than -40C
- Input shaft speed is greater than 2000rpm
- Output shaft speed is 0rpm
- P0753 has been tested and passed
- Engine torque is less than 900Nm

- The fault will set due to an SL1 stuck on when the SL1 request is off but the SL1 pressure switch is on in the following condition for 1 second or more
- vehicle speed greater than 5kmh,
- no SL1 solenoid electrical circuit fault
- transmission oil temperature greater than -40C
- input and output shaft speed are both greater than 100 rpm

Potential Failure Modes:
- Open or short in the shift solenoid valve SL1 circuit
- Shift solenoid fault
- TCU fault

Diagnostic Mask:
- The TCU fault light and ECU MIL will be illuminated if fault is present.

P0756 Shift Solenoid "B" Performance or Stuck Off

Monitor:
- Continuous

Enable Criteria:
- Commanded gear does not match calculated gear
- Ignition on
- Transmission learning not active
- P0753 has been tested and passed

Malfunction Criteria:
- The fault will set due to an SL2 stuck off when the SL2 request is on in the following condition for 1 second or more
- vehicle speed greater than 5kmh
- no SL2 solenoid electrical circuit faults
- transmission oil temperature greater than -40C
- input and output shaft speed are both greater than 100 rpm
- SL2 pressure switch is off.
- The fault will set due to an SL2 stuck on when the SL2 request is off in the following condition for 1 second or more

- vehicle speed greater than 5kmh
- no SL2 solenoid electrical circuit faults
- transmission oil temperature greater than -40C
- input and output shaft speed are both greater than 100 rpm
- SL2 pressure switch is on.

Potential Failure Modes:
- Open or short in the shift solenoid valve SL2 circuit
- Shift solenoid fault
- TCU fault

Diagnostic Mask:
- The TCU fault light and ECU MIL will be illuminated if fault is present.

P0761 Shift Solenoid "C" Performance or Stuck Off

Monitor:
- Continuous

Enable Criteria:
- Commanded gear does not match calculated gear
- Ignition on
- Transmission learning not active
- P0763 has been tested and passed

Malfunction Criteria:
- The fault will set in the following condition for 1 second or more
- vehicle speed greater than 5kmh
- no SL3 solenoid electrical circuit faults
- transmission oil temperature greater than -40C
- input and output shaft speed are both greater than 100 rpm

Potential Failure Modes:
- Open or short in the shift solenoid valve SL3 circuit
- Shift solenoid fault
- TCU fault

Diagnostic Mask:
- The TCU fault light and ECU MIL will be illuminated if fault is present.

P0766 Shift Solenoid "D" Performance or Stuck Off

Monitor:
- Continuous

Enable Criteria:
- Commanded gear does not match calculated gear
- Ignition on
- Transmission learning not active
- P0763 has been tested and passed

Malfunction Criteria:
- The fault will set in the following condition for 1 second or more
- vehicle speed greater than 5kmh
- no SL4 solenoid electrical circuit faults
- transmission oil temperature greater than -40C
- input and output shaft speed are both greater than 100 rpm

Potential Failure Modes:
- Open or short in the shift solenoid valve SL4 circuit
- Shift solenoid fault
- TCU fault

Diagnostic Mask:
- The TCU fault light and ECU MIL will be illuminated if fault is present.

Shift Solenoids electrical

P0753 Shift Solenoid "A" Electrical
P0758 Shift Solenoid "B" Electrical
P0763 Shift Solenoid "C" Electrical
P0768 Shift Solenoid "D" Electrical

Description
These faults monitor the integrity of each of the solenoid circuits to detect a short or open circuit.

Monitor:
- Continuous

Enable Criteria:
- Ignition on
- Battery voltage must be greater than 8V.

Malfunction Criteria:
- Short circuit faults are hardware detected.
- Open circuit faults are detected when the circuit detects less than 1 amp when the solenoid request is greater than 60%.

Potential failure mode:
- Open or short in the solenoid valve circuit
- Shift valve fault
- TCU fault

Diagnostic Mask:
- The TCU fault light and ECU MIL will be illuminated if fault is present.

PRND Button Input Circuit

P0812 Reverse Input Circuit
P081C Park Input Circuit
P081D Neutral Input Circuit
P0853 Drive Switch Input Circuit

Description
Checks that the PRND buttons are functioning correctly.

Monitor:
- Continuous

Enable Criteria:
- Ignition on

Malfunction Criteria:
- If a continuous signal is seen for more than 30 seconds the fault will set.

Potential Failure Modes:
- Button switch stuck on

Diagnostic Mask:
- The TCU fault light will be illuminated if fault is present.

Reverse Output Circuit

P0813 Reverse Output Circuit

Description
Checks the reverse output circuit is functioning correctly

Monitor:
- Continuous

Enable Criteria:
- Ignition on

Malfunction Criteria:
- Monitors the circuit for open or short circuit.

Potential failure mode:
- Open, short or ground detected in the reverse circuit

Diagnostic Mask:
- The service light will be illuminated if fault is present.

Transmission Fluid Pressure Sensor

Pressure Switch naming convention

A	SL1
B	SL2
C	SLU

P0842 Transmission Fluid Pressure Sensor/Switch "A" Circuit Low

Description
Monitors the plausibility of the pressure switch “A” feed back

Monitor:
- Continuous

Enable Criteria:
- Ignition on
- Engine running
- Transmission oil greater than 25C
- In gear 1 to 4
- Vehicle speed greater than 16km/h

Disable Criteria:
- Learning enabled

Malfunction Criteria:
- When SL1 request is greater than 60% and the calculated gear ratio is correct for the requested gear, but the SL1 pressure sensor has not switched high. The error must be continuous for 1.5 seconds.

Potential Failure Modes:
- Open in the switch circuit
- Switch fault
- TCU fault

Diagnostic Mask:
- The TCU fault light and ECU MIL will be illuminated if fault is present.

P0843 Transmission Fluid Pressure Sensor/Switch "A" Circuit High

Description
Monitors the plausibility of the pressure switch feed back

Monitor:
- Continuous

Enable Criteria:
- Ignition on
- Engine running
- Transmission oil greater than 25C
- In gear 5 or 6

Disable Criteria:
- Learning enabled

Malfunction Criteria:
- When SL1 request is less than 10% and the calculated gear ratio is correct for the requested gear, but the SL1 pressure sensor has not switched low. The error must be continuous for 1.5 seconds.

Potential Failure Modes:
- Short in the switch circuit
- Switch fault
- TCU fault

Diagnostic Mask:
- The TCU fault light and ECU MIL will be illuminated if fault is present.

P0847 Transmission Fluid Pressure Sensor/Switch "B" Circuit Low

Description
Monitors the plausibility of the pressure switch “B” feed back

Monitor:
- Continuous

Enable Criteria:
- Ignition on
- Engine running
- Transmission oil greater than 25C
- In gear 4 to 6

Disable Criteria:
- Learning enabled

Malfunction Criteria:
- When SL2 request is greater than 60% and the calculated gear ratio is correct for the requested gear, but the SL2 pressure sensor has not switched high. The error must be continuous for 1.5 seconds.

Potential Failure Modes:
- Open in the switch circuit
- Switch fault
- TCU fault

Diagnostic Mask:
- The TCU fault light and ECU MIL will be illuminated if fault is present.

P0848 Transmission Fluid Pressure Sensor/Switch "B" Circuit High

Description
Monitors the plausibility of the pressure switch “B” feed back

Monitor:
- Continuous

Enable Criteria:
- Ignition on
- Enigine running
- Transmission oil greater than 25C
- In gear 1 to 3

Disable Criteria:
- Learning enabled

Malfunction Criteria:
- When SL2 request is less than 10% and the calculated gear ratio is correct for the requested gear, but the SL2 pressure sensor has not switched low. The error must be continuous for 1.5 seconds.

Potential Failure Modes:
- Short in the switch circuit
- Switch fault
- TCU fault

Diagnostic Mask:
- The TCU fault light and ECU MIL will be illuminated if fault is present.

P0872 Transmission Fluid Pressure Sensor/Switch "C" Circuit Low

Description
Monitors the plausibility of the pressure switch “C” feed back

Monitor:
- Continuous

Enable Criteria:
- Ignition on
- Transmission oil greater than 25C
- In gear 2 or higher
- In gear duration greater than 2 seconds
- Vehicle speed greater than 10kmh
- Torque demand greater than 25Nm
- No lateral G inhibit

Malfunction Criteria:
- When SLU request is greater than 60%, SL request is greater than 95% and the speed difference across the torque convertor is less than 50rpm, the solenoids are know to be working correctly as the torque convertor is locked. Hence if the pressure sensor has not switched high, it must be the sensor at fault. The error must be continuous for 1.5 seconds.

Potential Failure Mode:
- Sensor fault
- Circuit fault

Diagnostic Mask:
- The TCU fault light and ECU MIL will be illuminated if fault is present.

P0873 Transmission Fluid Pressure Sensor/Switch "C" Circuit High

Description
Monitors the plausibility of the pressure switch “C” feed back

Monitor:
- Continuous

Enable Criteria:
- Ignition on
- Engine running
- In gear 2 or higher
- In gear duration greater than 2 seconds
- Vehicle speed greater than 10kmh
- Torque demand greater than 25Nm
- Transmission oil temp greater than 25C
- No lateral G inhibit
- No P0872 fault

Malfunction Criteria:
- When SLU request is less than 30% and the speed difference across the torque convertor is greater than 60rpm, the solenoids are know to be work correctly as the torque convertor is unlocked. Hence if the pressure sensor has not switched low it must be the sensor at fault. The error must be continuous for 1.5 seconds.

Potential Failure Mode:
- Sensor fault
- Circuit fault
- TCU fault

Diagnostic Mask:
- The TCU fault light and ECU MIL will be illuminated if fault is present.

TCM Power Relay

P0886 TCM Power Relay Control Circuit Low

Description
Checks that the TCU power relay is shutting down as expected.

Monitor:
- Continuous

Malfunction Criteria:
- The error will occur if the battery voltage is greater than zero for more than 10 seconds once the shut down timer has expired.

Potential Failure Modes:
- Relay fault
- TCU fault

Diagnostic Mask:
- The service light will be illuminated if fault is present.

Forced Mechanical

P1613 Forced Mechanical Limphome Position

Description
A mechanical limp home state activated by confirmed faults.

Monitor:
- Continuous

Enable Criteria:
- Ignition on

Malfunction Criteria:
Any of the following faults will force a mechanical limphome:
- Output shaft speed status (P0721 / P0722 / P0723) and Vehicle Speed sensor status (P0500 / U0122)
- Battery Voltage Error (P0562 / P0563)
- Input Shaft Speed Error (P0717 / P0718)
- Line Pressure Solenoid Error (P0746 / P0748)
- Transmission Shift Solenoids Error (P0751 / P0753 / P0756 / P0758 / P0761 / P0763 / P0766 / P0768)
- Torque converter Solenoid Error (P0741 / P2757 / P2759 / P2769 / P2770)

- Control Module Options Error (P0610)
- Comms error with Engine Control Module (U0100 / U0301 / U0401)
- Comms error with ESP Control Module (U0122)
- Comms error with Yaw Rate Sensor Module (U0123 / U0513)

Diagnostic Mask:
- The TCU fault light and ECU MIL will be illuminated if fault is present.

Ignition Key Lock Solenoid

P1657 Ignition Key Lock Solenoid Control Circuit

Description
The TCU will detect if the incorrect ignition barrel has been fitted

Monitor
- Constant

Disable criteria
- None

Malfunction Criteria:
- Monitors the circuit for open or short circuit.

Potential failure modes
- The fault will set if an open, short or ground in the circuit is detected.
- Incorrect key barrel fitted

Diagnostic mask
- The service light will be illuminated if fault is present.

Forced Neutral Gear

P172A Forced Gear Neutral

Description
In this the condition the gearbox will be forced into neutral.

Monitor:
- Continuous

Enable Criteria:
- Ignition on

Malfunction Criteria:
Any of the following confirmed faults:
- Range Sensor "A" (P0705) and Range Sensor "B" (P2800) error
- Range Sensor "A" / "B" Correlation error (P2805)
- PRND Feedback Switch(es) error (P1801 / P1802 / P1803 / P1804 / P1805 / P1806 / P1807 / P1808)
- PRND Position control error (P1910 / P1912 / P1913 / P1931)
- Brake pedal error (P0719 / P0724)

Diagnostic Mask:
- The TCU fault light will be illuminated if fault is present.

Safety Processor: Failed to select Neutral

P1780 Safety Processor: Neutral select failed

Description
Operator has requested Neutral but transmission remains in Drive or Reverse

Monitor:
- Continuous

Enable Criteria:
- Ignition on

Malfunction Criteria:
- While the vehicle is in either drive or reverse and a neutral signal is received the fault will set if neutral is not seen within 1.5 seconds of the request. .

Diagnostic Mask:
- The TCU fault light will be illuminated if fault is present.

Park Position Feedback Switch

P1801 Park Position Feedback Switch Circuit Low
P1802 Park Position Feedback Switch Circuit High

Description
Check for the transmission position feedback switch using the transmission selector position sensors.
Monitor:
- Continuous

Enable Criteria:
- Ignition on

Malfunction Criteria:
- If Park has been requested and the shift successfully completed but the Park position feedback switch is off and no other position switch is on; a circuit low fault is detected.
- If Park has not been requested and the shift successfully completed but the Park position feedback switch is on and one of the other position switch is on; a circuit high fault is detected.

Potential failure modes
- Switch fault
- Switch circuit fault
- TCU fault

Diagnostic Mask:
- The TCU fault will be illuminated if fault is present.

Reverse Position Feedback Switch

P1803 Reverse Position Feedback Switch Circuit Low
P1804 Reverse Position Feedback Switch Circuit High

Description
Check for the transmission position feedback switch using the transmission selector position sensors.

Monitor:
- Continuous

Enable Criteria:
- Ignition on

Malfunction Criteria:
- If Reverse has been requested and the shift successfully completed but the Reverse position feedback switch is off and no other position switch is on; a circuit low fault is detected.
- If Reverse has not been requested and the shift successfully completed but the Reverse position feedback switch is on and one of the other position switch is on; a circuit high fault is detected.

Potential failure modes
- Switch fault
- Switch circuit fault
- TCU fault

Diagnostic Mask:
- The TCU fault will be illuminated if fault is present.

Neutral Position Feedback Switch

P1805 Neutral Position Feedback Switch Circuit Low
P1806 Neutral Position Feedback Switch Circuit High

Description
Check for the transmission position feedback switch using the transmission selector position sensors.
Monitor:
- Continuous

Enable Criteria:
- Ignition on

Malfunction Criteria:
- If Neutral has been requested and the shift successfully completed but the Neutral position feedback switch is off and no other position switch is on; a circuit low fault is detected.
- If Neutral has not been requested and the shift successfully completed but the Neutral position feedback switch is on and one of the other position switch is on; a circuit high fault is detected.

Potential failure modes
- Switch fault
- Switch circuit fault
- TCU fault

Diagnostic Mask:
- The TCU fault light will be illuminated if fault is present.

Drive Position Feedback Switch

P1807 Drive Position Feedback Switch Circuit Low
P1808 Drive Position Feedback Switch Circuit High

Description
Check for the transmission position feedback switch using the transmission selector position sensors.

Monitor:
- Continuous

Enable Criteria:
- Ignition on

Malfunction Criteria:
- If Drive has been requested and the shift successfully completed but the Drive position feedback switch is off and no other position switch is on; a circuit low fault is detected.
- If Drive has not been requested and the shift successfully completed but the Drive position feedback switch is on and one of the other position switch is on; a circuit high fault is detected.

Potential failure modes
- Switch fault
- Switch circuit fault
- TCU fault

Diagnostic Mask:
- The TCU fault light will be illuminated if fault is present.

Safety Processor Communications

P185A Safety Processor Communications Fault: Safety to Main direction
P1860 Safety Processor Communications Fault: Main to Safety direction

Description
Check serial link communications between TCU main processor and TCU safety processor.
Monitor:
- Continuous

Enable Criteria:
- Ignition on

Malfunction Criteria:
- Safety processor communications timer has expired setting the fault.

Diagnostic Mask:
- The TCU fault light will be illuminated if fault is present.

PRND Position Selection

P1904 Park Position Select Error – Incorrect feedback switch
P1905 Reverse Position Select Error – Incorrect feedback switch
P1906 Neutral Position Select Error – Incorrect feedback switch
P1907 Drive Position Select Error – Incorrect feedback switch

Description
Compares the selected position to the transmission position feedback signal to ensure the correct position has been reached.

Monitor:
- Continuous

Enable Criteria:
- Ignition on

Malfunction Criteria:
- Once a shift is complete if the position feedback switch does not match the selected position the fault is set.

Potential failure modes
- Selector mechanism lost motion
- Selector mechanism incorrect set up
- Incorrect position motor learn values

Diagnostic Mask:
- The TCU fault light and ECU MIL will be illuminated if fault is present.

Transmission Range Selector

P1909 Transmission Range Selector Position Control Error
P1910 Transmission Range Selector Motor Driver
P1911 Transmission Range Selector Excessive Lost Motion
P1912 Transmission Range Selector Motor Circuit Low
P1913 Transmission Range Selector Motor Circuit High

Description
Monitors the condition of the range selector motor and the associated electrical circuit

P1909

Monitor:
- Continuous

Enable Criteria:
- Ignition on
- Shift actuator learn complete

Malfunction Criteria:
- The range selector feedback shows the actual position of the selector motor to be outside of +/- 5% tolerance of the learnt position.

Potential failure modes
- Lost motion in the connecting rod
- Loose motor mounts
- Incorrectly set rod length

Diagnostic Mask:
- The TCU fault light and ECU MIL will be illuminated if fault is present.

P1910

Monitor:
- Continuous

Enable Criteria:
- Ignition on
- Battery voltage is greater than 8V

Malfunction Criteria:
Either of the following conditions met for 10ms continuously
- Hardware temperature limit exceeded
- Hardware minimum voltage limit

Diagnostic Mask:
- The TCU fault light will be illuminated if fault is present.

P1911

Monitor:
- Continuous

Enable Criteria:
- Ignition on
- Reverse selected
- Reverse position achieved and shift complete

Malfunction Criteria:
- The learns for the reverse position derived from the two directions of travel by the actuator differ by more than 3%.

Potential failure modes
- Lost motion in the connecting rod
- Loose motor mounts

Diagnostic Mask:
- The TCU fault light and ECU MIL will be illuminated if fault is present.

P1912

Monitor:
- Continuous

Enable Criteria:
- Ignition on
- Battery voltage is greater than 8V

Malfunction Criteria:
The following conditions met for 1.5s continuously
- The motor duty cycle is greater than 42% and the motor current is less than 1.2A

Potential failure modes
- TCU fault
- Motor fault

Diagnostic Mask:
- The TCU fault light will be illuminated if fault is present.

P1913

Monitor:
- Continuous

Enable Criteria:
- Ignition on

Malfunction Criteria:
The following conditions met for 10 ms continuously
- Short circuit hardware detected

Potential failure modes
- TCU fault
- Motor fault

Diagnostic Mask:
- The TCU fault light will be illuminated if fault is present.

Safety Processor: Incorrect selection

P1921 Safety Processor: Incorrect selection of Drive
P1925 Safety Processor: Incorrect selection of Reverse

Description
The safety processor monitors for false selection of either drive or reverse.

Monitor:
- Continuous

Enable Criteria:
- Ignition on
- Output shaft speed id greater than 79 rpm
- Transmission start position id in Park or Neutral
- Brake not pressed for at least 1 second

Disable Criteria:
- Brake faults

Malfunction Criteria:
- P1921 - Supervisory processor detected incorrect transition to Drive. The PRND switch drive position changes from off to on.
- P1925 - Supervisory processor detected incorrect transition to Reverse. The PRND switch reverse position changes from off to on.

Diagnostic Mask:
- The TCU fault light will be illuminated if fault is present.

Transmission Range Selector Solenoid

P1929 Transmission Range Selector Solenoid Performance
P1930 Transmission Range Selector Solenoid Control Circuit Low
P1931 Transmission Range Selector Solenoid Control Circuit High

Description
Monitors the performance of the selector solenoid and the condition of the associated electrical circuit.

P1929

Monitor:
- Continuous

Enable Criteria:
- Ignition on
- Reverse requested
- Shift completed
- Shift actuator learn complete

Malfunction Criteria:
- The difference between the commanded position and the final position is less than 2%.

Diagnostic Mask:
- The TCU fault light and ECU MIL will be illuminated if fault is present.

P1930

Monitor:
- Continuous

Enable Criteria:
- Ignition on

Malfunction Criteria:
The following conditions met for 1.5s continuously
- Open circuit
- Short circuit

Diagnostic Mask:
- The TCU fault light will be illuminated if fault is present.

P1931

Monitor:
- Continuous

Enable Criteria:
- Ignition on

Malfunction Criteria:
The following conditions met for 1.5s continuously
- Short to ground

Diagnostic Mask:
- The TCU fault light will be illuminated if fault is present.

Torque Converter Clutch

P2757 Torque Converter Clutch Pressure Control Solenoid Control Circuit Performance or Stuck Off

Description
Checks the Torque converter clutch has not stuck either on or off.

Monitor:
- Continuous

Enable Criteria:
- Ignition on
- Engine running
- Input shaft greater than 100rpm
- In gear selected 2 or higher
- In gear duration greater than 2 seconds
- Vehicle speed greater than 10kmh
- Transmission oil temp greater than 25C
- Engine torque demand greater than 25Nm
- No Lateral G inhibit

Malfunction Criteria:
- The fault will set stuck on if the SLU request is less than 30% but the SLU pressure switch is on and the speed difference across the torque converter is less than 50rpm indicating that the torque converter clutch is still locked.
- The fault will set stuck off if the SLU request is greater than 60% and the SL request is greater than 95% but the SLU pressure switch is off and the speed difference across the torque converter is greater than 60rpm indicating that the torque converter clutch is still unlocked.

Potential Failure Mode:
- Shift solenoid SLU is stuck either open or closed
- Valve body is blocked
- Torque convertor clutch fault
- Line pressure is low

Diagnostic Mask:
- The TCU fault light and ECU MIL will be illuminated if fault is present.

P2759 Torque Converter Clutch Pressure Control Solenoid Control Circuit Electrical

Description
Checks the Torque converter clutch pressure control solenoid control circuit is working correctly

Monitor:
- Continuous

Enable Criteria:
- Ignition on
- Battery voltage greater than 8V.

Malfunction Criteria:
- Short circuit detected
- Open circuit detected by a current flow of less than 1amp and an SLU request of greater than 60%

Potential Failure Mode:
- Open or short in shift solenoid SLU circuit
- Shift solenoid SLU fault
- TCU fault

Diagnostic Mask:
- The TCU fault light and ECU MIL will be illuminated if fault is present.

P2769 Torque Converter Clutch Circuit Low

Description
Checks the Torque converter clutch pressure control solenoid control circuit is working correctly

Monitor:
- Continuous

Enable Criteria:
- Ignition on
- Battery voltage greater than 8V.
- SL request is greater than 95%

Malfunction Criteria:
- Short to ground is detected continuously for 1.5 seconds.

Potential Failure Mode:
- Short in shift solenoid SL circuit
- SL shift solenoid fault
- TCU fault

Diagnostic Mask:
- The TCU fault light and ECU MIL will be illuminated if fault is present.

P2770 Torque Converter Clutch Circuit High

Description
Checks the Torque converter clutch pressure control solenoid control circuit is working correctly

Monitor:
- Continuous

Enable Criteria:
- Ignition on
- Battery voltage greater than 8V.
- SL request is les than 5%

Malfunction Criteria:
- Short to battery or open circuit is detected continuously for 1.5 seconds.

Potential Failure Mode:
- Open in shift solenoid SL circuit
- SL shift solenoid fault
- TCU fault

Diagnostic Mask:
- The TCU fault light and ECU MIL will be illuminated if fault is present.

Transmission Range Sensor

P2800 Transmission Range Sensor "B" Circuit (PRNDL Input)

Description
The transmission selector must keep within predefined working limits.

Monitor:
- Continuous

Enable Criteria:
- Ignition on
- P, R, N or D positions requested.

Malfunction Criteria:
- The fault will set if the sensor feedback for the transmission selector position is outside of the range 10 to 95 percent for 1.5 seconds continuously.

Diagnostic Mask:
- The TCU fault light will be illuminated if fault is present.

P2805 Transmission Range Sensor "A"/"B" Correlation

Description
To check that both of the transmission selector position sensors are working correctly and that the feed back from the sensors correlates.

Monitor:
- Continuous

Enable Criteria:
- Ignition on
- P, R, N or D positions requested

Disable Criteria:
- Transmission Sensor “A” and “B” out of range

Malfunction Criteria:
- The fault will set if the sensor feed back from A and B differ by more than 5 percent.

Potential failure modes
- Transmission Sensor fault
- Transmission Sensor circuit fault
- TCU fault

Diagnostic Mask:
- The TCU fault light will be illuminated if fault is present.

Lost Communication with ECM/PCM "A"

U0100 Lost Communication with ECM/PCM "A"

Description:
The ECM communicates with the Engine Control Module (ECM) via the CAN bus.
If these CAN bus communications have been interrupted the ECM will register a diagnostic code.

Enable Criteria:
- Ignition on for greater than 2 seconds

Potential failure modes:
- CAN wiring
- ECM control module failure
- CAN bus corruption by another module on bus

Diagnostic Mask:
- The TCU fault light and ECU MIL will be illuminated if fault is present.

Lost Communication with Vehicle Dynamics Control Module

U0122 Lost Communications with VDCM

Description:
The ECM communicates with the Vehicle Dynamic Control Module (VDCM) via the CAN bus.
If these CAN bus communications have been interrupted the ECM will register a diagnostic code.

Enable Criteria:
- Ignition on for greater than 2 seconds
- Engine running

Disable Criteria:
- Lost Communication with ECM/PCM
- ESP in diagnostics mode

Potential failure modes:
- CAN wiring
- VDCM control module failure
- CAN bus corruption by another module on bus

Diagnostic Mask:
- The TCU fault light and ECU MIL will be illuminated if fault is present.

Lost Communications with Yaw Rate Sensor

U0123 Lost Communication with Yaw Rate Sensor Module

Description:
The ECM communicates with the Yaw Rate Sensor Module via the CAN bus.
If these CAN bus communications have been interrupted the ECM will register a diagnostic code.

Enable Criteria:
- Ignition on for greater than 2 seconds
- Engine running

Disable Criteria:
- Lost Communication with ECM/PCM
- ESP in diagnostics mode

Potential failure modes:
- CAN wiring
- Yaw Rate Sensor module failure
- CAN bus corruption by another module on bus

Diagnostic Mask:
- The TCU fault light and ECU MIL will be illuminated if fault is present.

Lost Communication with Steering Angle Sensor

U0126 Lost Communication with Steering Angle Sensor Module

Description:
The ECM communicates with the Steering Angle Sensor Module via the CAN bus.
If these CAN bus communications have been interrupted the ECM will register a diagnostic code.

Potential failure modes:
- CAN wiring
- Steering Angle Sensor module failure
- CAN bus corruption by another module on bus

Diagnostic mask
- The service light will be illuminated if fault is present.

Lost Communication with Instrument Panel Cluster

U0155 Lost Communication with Instrument Panel Cluster (IPC) Control Module

Description:
The ECM communicates with the Instrument Panel via the CAN bus.
If these CAN bus communications have been interrupted the ECM will register a diagnostic code.

Enable Criteria:
- Ignition on for greater than 2 seconds
- Engine running

Disable Criteria:
- Lost Communication with ECM/PCM

Potential failure modes:
- CAN wiring
- Instrument Panel Cluster Control module failure
- CAN bus corruption by another module on bus

Diagnostic Mask:
- The TCU fault light and ECU MIL will be illuminated if fault is present.

Software Incompatibility with ECM

U0301 Software Incompatibility with ECM/PCM “A”

Description:
The software compatibility check byte is incorrect, indicating that the software in the ECU is incompatible with the software in the TCU.

Enable Criteria:
- Ignition on for greater than 2 seconds

Potential failure modes:
- The ECU or the TCU has been updated, so software set is no longer compatible with the other module.

Diagnostic Mask:
- The TCU fault light and ECU MIL will be illuminated if fault is present.

Invalid Data Received from ECM

U0401 Invalid Data Received from ECM/PCM “A”

Description:
Signals that are diagnosed by the transmitting module have "Invalid" values defined to enable the receiving module (in this case the transmission control module) to identify there is a fault and that the signal can no longer be used.

Enable Criteria:
- Ignition on for greater than 2 seconds

Diagnostic Mask:
- The TCU fault light and ECU MIL will be illuminated if fault is present.

Invalid Data Received from Yaw Rate

U0513 Invalid Data Received from Yaw Rate Sensor Module

Description:
Monitors the validity of the data received from the Yaw rate sensor

Enable Criteria:
- Ignition on for greater than 2 seconds
- Engine running

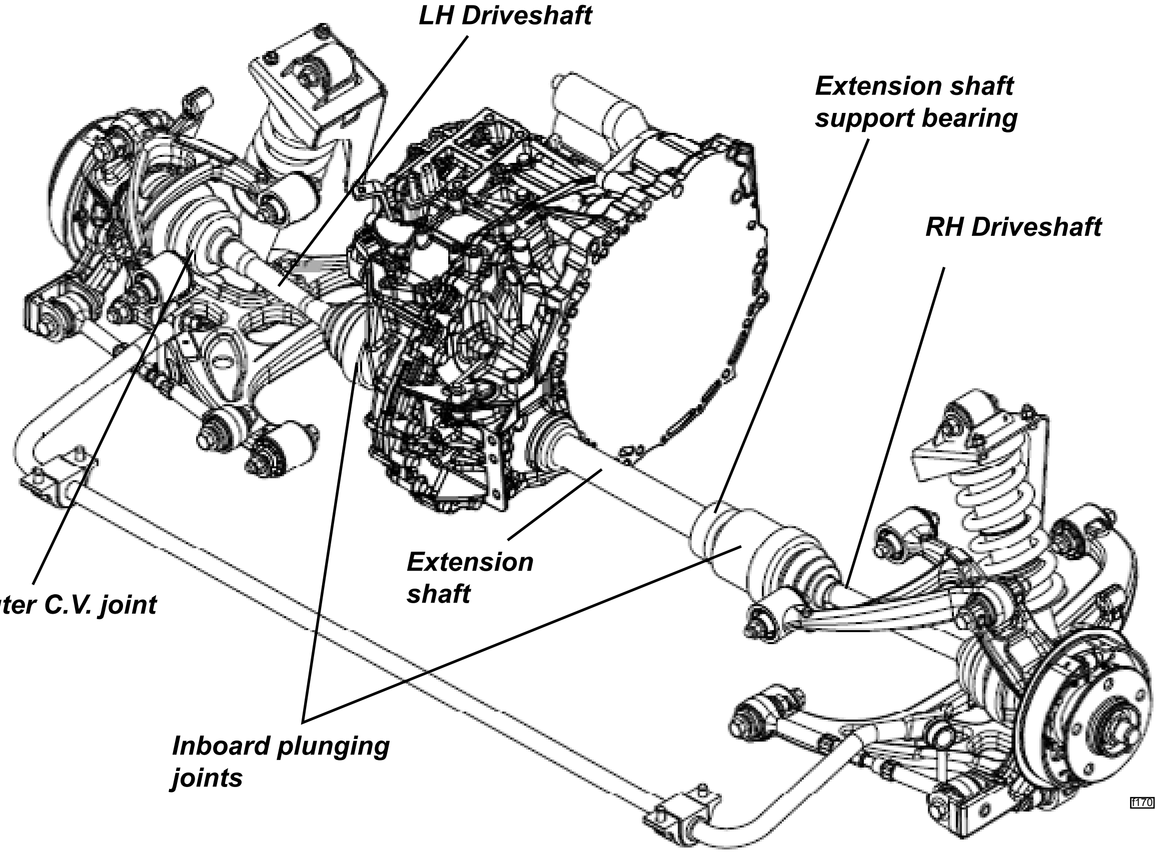
Disable Criteria:
- Lost Communication with ECM/PCM
- ESP in diagnostics mode

Malfunction Criteria:
- Error status has been received from the Yaw rate sensor.
- A lateral acceleration value of greater than +/-0.3g has been received continuously for 3 seconds while the vehicle is stationary.

Potential failure modes:
- CAN wiring
- CAN bus corruption by another module on bus
- Fault with the Yaw rate sensor

Diagnostic Mask:
- The TCU fault light and ECU MIL will be illuminated if fault is present.

FA.9 - DRIVESHAFTS



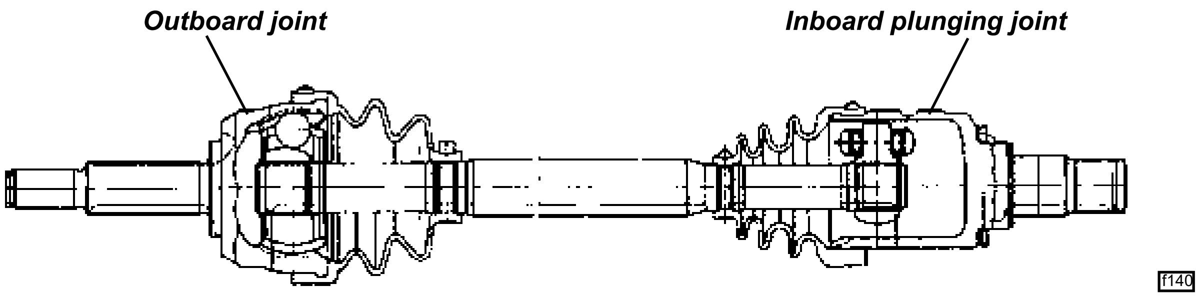
Each of the two driveshaft assemblies comprises a steel shaft with a constant velocity (CV) joint at each end, and is used to transmit the drive from each differential output gear to the rear wheel hub. The longer right hand driveshaft assembly features an outrigger bearing bolted to the right hand side of the cylinder block, with a shaft extending from the inboard CV joint into the transmission housing.

The inboard joints are of a plunging tripod design to accommodate driveshaft length variation with suspension travel, whereas the outboard joints are high efficiency 6-ball fixed length type. Replacement outboard joints include the main driveshaft, outboard C.V. joint and gaiter. Replacement inboard joints include the inner C.V. joint and gaiter kit, with the extended stub shaft of the right hand joint also including the support bearing and mounting bracket.

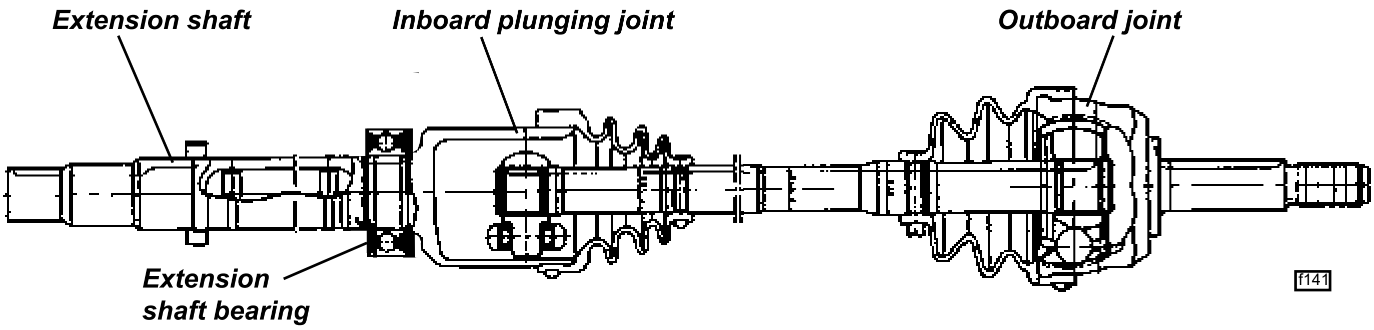
The joints themselves are packed with grease on initial assembly, and are maintenance free. It is however vitally important that the protective gaiters are carefully inspected at service intervals, to check for splits, tears or punctures, since the joint will deteriorate very quickly once contaminated with dirt or water. Damaged gaiters should be renewed immediately, once the serviceability of the joint has been established.

CAUTION: The outboard C.V. joint gaiter can suffer 'pinch' damage if the joint is subjected to extreme articulation off the car, or during driveshaft removal/refitment.

Left Hand Driveshaft Assembly



Right Hand Driveshaft Assembly



Clicking noises, torque reversal 'clonks', or shudder and vibration when accelerating are all possible symptoms of worn C.V. joints. It should not be possible to discern any free play in a joint by manual manipulation, but care must be taken not to confuse this with transmission backlash, which may be considerable. Any symptoms that could be due to worn driveshaft joint assemblies, should be investigated and rectified without delay, since safety considerations are always of paramount importance.

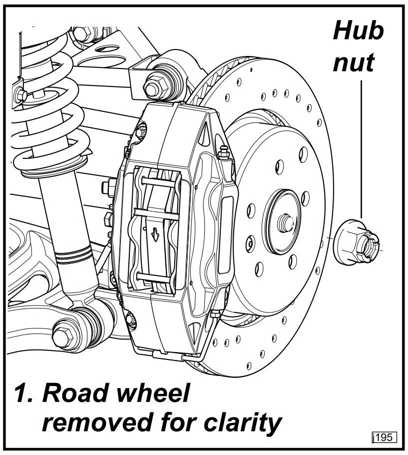
The inboard C.V. joint is equipped with a male splined spigot shaft which engages with the female splines of the differential output sun gear, with the left hand shaft retained by a round section spring circlip on its end, and the right hand shaft retained by the extension shaft support bearing. Each of the two transmission output oil seals runs on a machined shoulder on the C.V. joint spigot shaft, onto which is pressed a dust shield. The stub shaft of each outboard joint is splined into the wheel hub, and retained by a nut on the threaded end of the shaft.

Driveshaft Assembly Replacement

Removing a driveshaft assembly from the transmission will result in some loss of automatic transmission fluid. Therefore to prevent the spread of spilt fluid over the rear undertray it will be necessary to drain off some oil via the transmission drain plug beforehand. At no time during this process should an extension force be applied to the shaft assembly, as the plunging inner joint could be damaged.

Driveshaft Removal

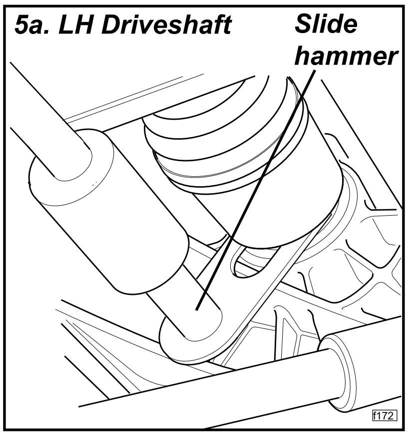
1. *Hub Nut:* With the parking brake and footbrake firmly applied, remove the wheel centre cap and release the driveshaft hub nut (right hand thread on both sides).



2. *Road Wheel:* Remove the appropriate road wheel and the engine bay undertray; refer to Service Notes introduction section and GJ.4 for further information.

3. *Hub Carrier:* To allow the withdrawal of the driveshaft from the hub, release from the hub carrier the lower wishbone, toe-link, and anti-roll bar drop link. If necessary, release the brake hose 'P' clip and the wheel speed sensor harness to allow the hub carrier to be swung upwards to release the driveshaft. Refer to service notes section DJ.5 for further information.

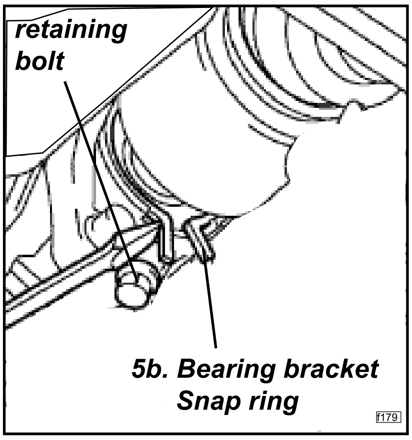
4. *Transmission fluid:* Drain fluid from transmission pan into a suitable container; refer to sub-section FA.5 for further information.



5a. *Left Hand Driveshaft:* The left hand driveshaft inboard joint is retained in the transmission by a round section circlip. The joint may be removed by applying a shock pull to the C.V. joint body using a slide hammer with a forked end as per illustration 5a.

CAUTION: Any attempt to withdraw the inboard joint by pulling on the driveshaft is likely to damage the joint and require its replacement. Apply pressure only to the outer body of the joint.

5b. *Right Hand Driveshaft:* The right hand driveshaft assembly incorporates a bearing pressed onto its extension shaft. the bearing fits into a bearing bracket bolted onto the side of the engine. The extension bearing is secured into place on the bracket by a snap ring and retaining screw and secures the shaft in the transmission. Using a suitable screwdriver, remove the snap ring from the bearing bracket and loosen the retaining screw and withdraw the complete shaft assembly. When withdrawing either driveshaft from the transmission, take care not to damage the output oil seal.



5c. With the driveshaft removed it is possible to access the bearing bracket if required. It is retained to the engine block with 3 bolts which are torqued to 64Nm.

6. *Re-assembly:* Before re-fitting a driveshaft, first renew the round section circlip on the end of the left hand inboard joint spigot shaft, and lubricate the circlip with grease. Also, check the condition of the transmission output seals, and renew if necessary. Lubricate the lip of the seals with transmission oil, and grease the corresponding shoulder on the driveshaft (C.V. joint) to reduce the danger of damaging the seal on assembly.

7. *Driveshaft:* Carefully insert the driveshaft into the transmission, with, on the left hand shaft, the two ends of the circlip positioned lowermost, and rotate the shaft if necessary to engage the splines. Press the inboard joint outer until a click indicates the engagement of the retaining circlip, if necessary tapping the joint outer body using a brass drift and hammer. Pull on the joint body to confirm its security. On the right hand shaft, fit a new snap ring on the extension shaft bearing and install a new securing screw (torque to 45 Nm).

8. *Suspension:* Fit the outer end of the shaft into the hub, and re-assemble the suspension links.
Torque settings: Lower wishbone to hub carrier; 135 Nm. Toe-link to hub carrier; 135 Nm. ARB drop link; 38 Nm.

9. *Hub Nut:* Fit the hub nut and road wheel, apply the parking and footbrake, and tighten the hub nut to 300 Nm.

10. *Lubricant:* With the car on a level working surface, top up the transmission fluid; refer to sub section FA.5 for further information.

11. *Wheel and Undertray:* Refit the road wheel and undertray

FA.10 - TRANSMISSION REMOVAL/REPLACEMENT

◁ Click on arrow to return to previous page

The transmission may be separated from the engine only after removal of the complete powertrain from the car. See service notes section EJ.5 for main details but also refer to:

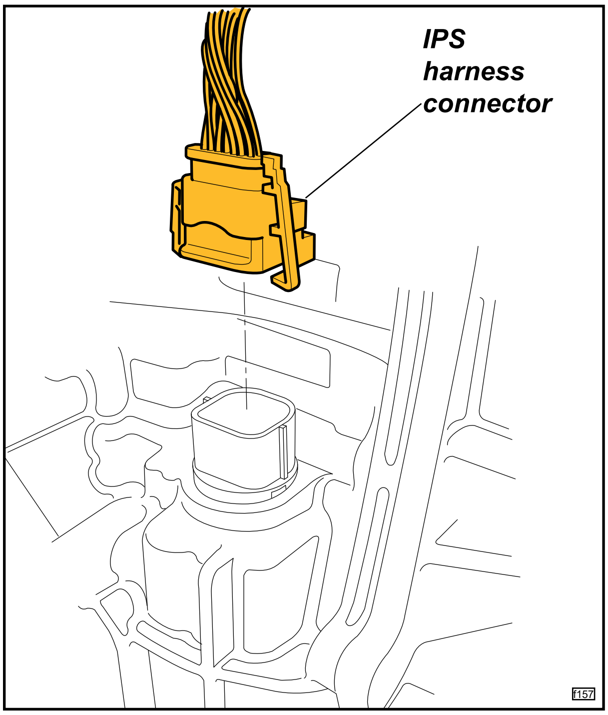
CD Lotus part number T000T1526F (Toyota ref. SC0264EA) Transmission > U660E AUTOMATIC TRANSAXLE > AUTOMATIC TRANSAXLE ASSEMBLY

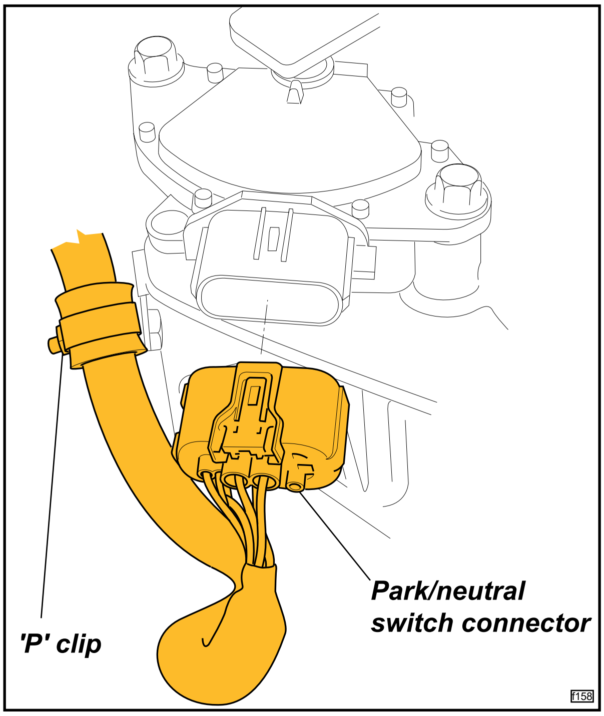
Place a suitable container underneath the oil cooler sandwich plate area disconnect hoses from inlet and outlet pipes located at the side of the transmission; refer to sub-section FA.4 for further information.

Remove shift actuator and bracket to gain access to IPS harness connection located at the left hand side of the transmission casing and unplug; refer to sub-section FA.3 for further information

Disconnect the harness multi-plug connector from the park/neutral switch and unbolt the harness at its 'P' clip connector.

Important
Before driving with the new transmission fitted, refer to sub-section FA.11 – 'Transmission Control Unit Reset & Learns Procedure' shown on the next page.





FA.11 - TRANSMISSION CONTROL UNIT RESET & 'LEARNS' PROCEDURES

◁ Click on arrow to return to previous page

Gear shift quality is determined and controlled by the automatic transmissions TCU (Transmission Control Unit). For the transmission to function correctly the TCU must be matched and adapted to the mechanical and hydraulic characteristics of the transmission, this is known as 'Learning'.

The 3 stages of the Lotus TCU clutch "Learns" procedure are:

1 TCU Reset: Resetting the TCU clears all previous learns matched to the transmission. A TCU reset is only required for events such as:

A. Transmission or TCU replacement

B. Replacement of a faulty component which may have erroneously influenced transmission learning, e.g. a MAF (Mass Air Flow) meter error.

2. Green Learns: A static adaption process that provides some basic Learn values for the transmission

3. In Use Driving Learns: Designed to mature the above Green Learns, this is a dynamic adaption process that frequently optimises the transmission learns, allowing shift quality to be maintained

When to Perform the 'Learns' Procedure

Having replaced an automatic transmission it is important to ensure that the TCU learns from the previously removed failed transmission are cleared from that TCU and that adaptions appropriate for the replacement transmission are learned instead.

Note: This is also required if replacing a faulty component that may have affected transmission Learns. The existing TCU Learns can be cleared by carrying out a TCU Reset using the Lotus 20/20 engine management system diagnostics tool > Special Functions > Reset Control Module.

The static base Green Learns can be installed into the now cleared TCU by carrying out the Green Learn Process using the Lotus 20/20 engine management system diagnostics tool > Special Functions > Green Learn Process. Having carried out the base Green Learn procedure, the transmissions Learns must now be matured/completed.

Performing Procedure

To complete the transmission Learns process, the vehicle must be driven in Sport Mode whilst in manual gear selection mode, following the procedure below:

1.For all TCU learns, the transmission fluid temperature must be between 45 and 95º C.

2.Manually select any gear from 2nd to 6th, then accelerate from a low RPM & low load, slowly increase the load and engine RPM (up to about 60% load (but no greater than 4000 rpm), this increase in speed & load should be done very gradually, typically taking between 45 to 60 seconds for each sweep from 1200 to 4000 rpm).

3.Repeat the above sweep two more times for the gear selected.

4.Then repeat steps 2 & 3 again for all other remaining gears between 2nd and 6th.

- The process can be completed in any sequence of gears.
- Note the above sweeps are not required for 1st gear.
- Note to mature/complete the transmissions Learns, it is important to hold the transmission in a gear and drive
- steadily over the above speed and load range (clutch & brake adaptions will not be learned during shifts).
- Driving a vehicle hard with multiple gear shifts will not improve a transmissions Learns and may lead to reduceshift quality.

5. Torque converter lock up clutch learn:
- Select D, Tour Mode (not in Sport or Race Mode).

- On a level road, hold vehicle at a steady 62 mph (100 km/h) then gently accelerate to 75 mph (120 km/h).

- This will normally be in 6th gear, ensure no gearchange happens during the transition between these to and-from speeds.

6. Finally Select D, Tour Mode (not in Sport or Race Mode) and drive the vehicle gently shifting up and down through all the gears, repeat this 2 to 3 times for each gear change.

7. The transmissions learns should now be complete.

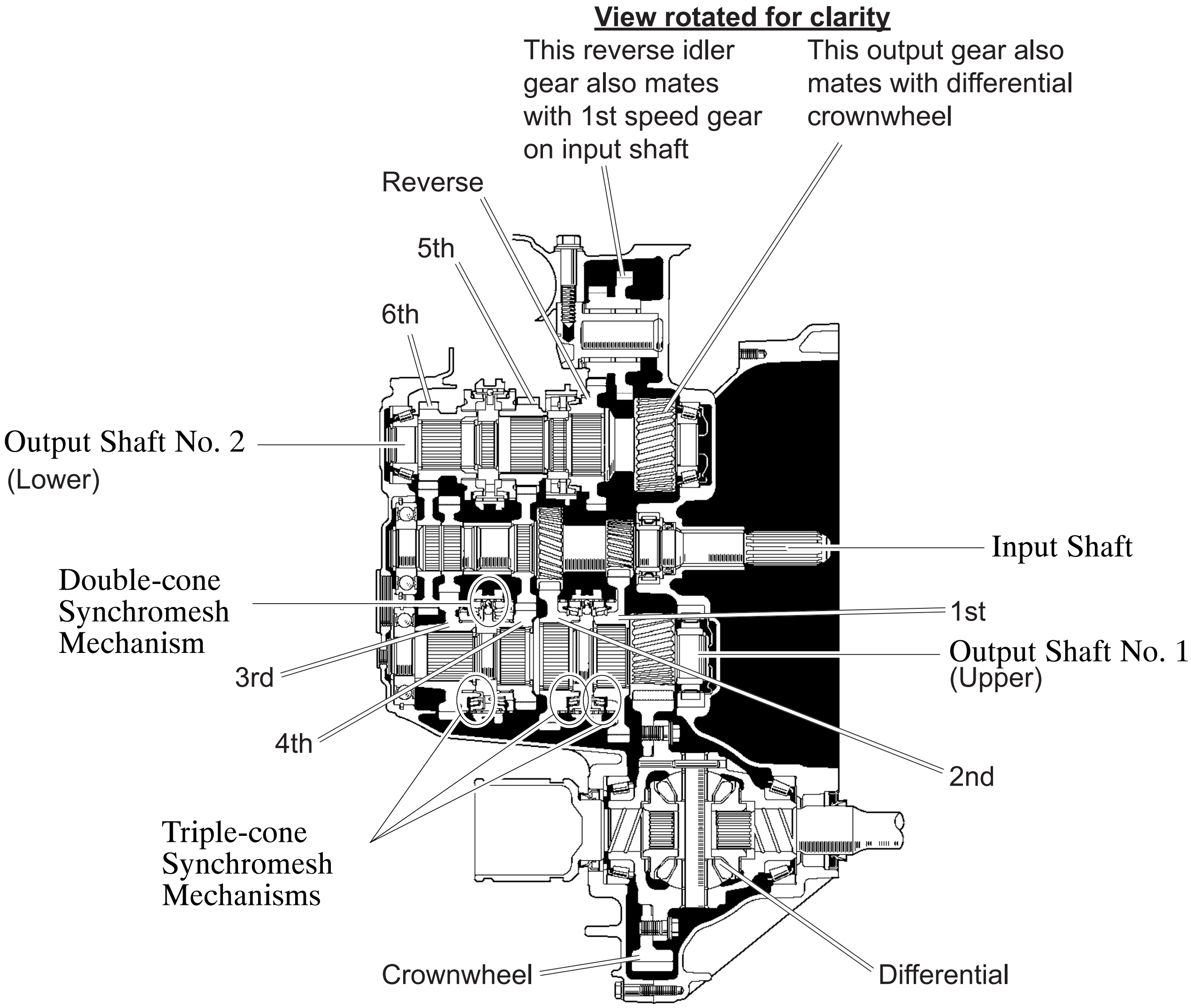
8. To ensure the Transmission Learns are stored in the TCU, Key Off the ignition, press and hold down the P & D buttons for greater than 10 seconds, to force the TCU to power down (the learns are now saved in the TCU).

TRANSMISSION

SECTION FL

*** See separate CD: T000T1517F (Toyota production)**

GENERAL LAYOUT



FL.1 - GENERAL DESCRIPTION

The 6-speed transmission assembly is an 'end on' type, positioned at the left hand side of the powertrain, and is supplied by the Toyota Motor Corporation under the designation EA60. The unit overview is fully described on CD Lotus part number T000T1517F (Toyota ref. SC02J1EA).

Insert the disc into a personal computer, and it will automatically open up to an Avensis menu page. Select:
- New Car Features Supplement.
- 2005.04 Update.
- New Features.
- Manual Transaxle.
- EA60 and EA61 Manual Transaxle (disregard shift lever description).

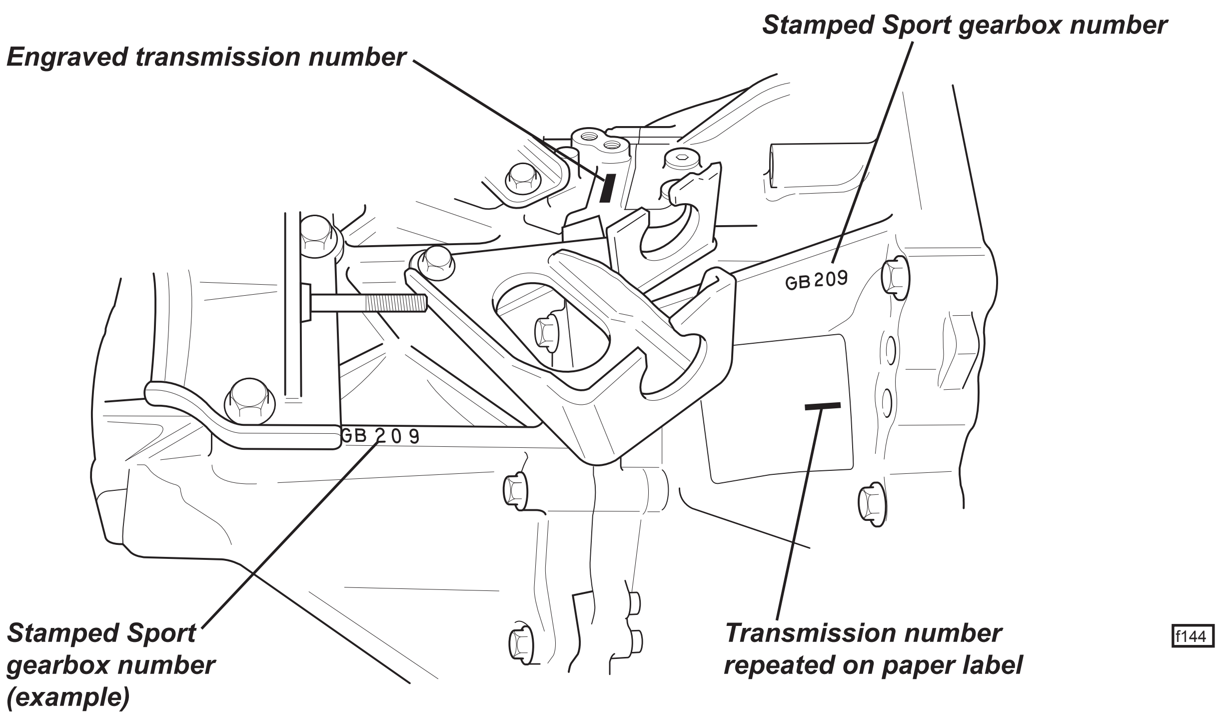
Note: For the location of repair and overhaul information on CD disc please refer to sub-section FL.6

Note that the EA60 transmission is not used by Toyota in combination with the 2GR-FE V6 engine. For the Evora application, a fully machined, cast alloy adaptor plate is interposed between the engine and transmission, the clutch housing of which is machined to accept the mounting of the starter motor via a further adaptor block.

The transmission serial number is engraved on the top surface of the transmission front case, alongside the jointline with the rear case. Typical example: A7H05232

Sport Transmission
The optional Sport Transmission uses lower ratio Lotus gearsets for 3rd, 4th, 5th and 6th speeds, to provide closer gear steps and a more sporting drive characteristic. Road speed per 1000 rpm in 6th gear is reduced from 36.3 mph (58.4 km/h) to 27.0 mph (43.5 km/h), such that top gear performance will be more responsive, although less relaxed when cruising, and with reduced fuel economy.

Sport transmissions may be identified by a secondary gearbox serial number stamped on both the front and rear casings in the locations shown. Standard transmissions have no secondary number.



Gear ratio table ('opt' refers to alternative sport ratio set)

Gear	Internal ratio	Final drive	mph/1000rpm	km/h/1000rpm
1	3.54	3.78	5.6	9.1
2	1.91	3.78	10.4	16.7
3	1.22	3.78	16.3	26.3
3 opt	1.41	3.78	14.1	22.8
4	0.86	3.78	23.1	37.2
4 opt	1.09	3.78	18.2	29.4
5	0.79	3.24	29.4	47.3
5 opt	0.97	3.24	23.9	38.5
6	0.64	3.24	36.3	58.4
6 opt	0.86	3.24	27	43.5
Rev	3.83	3.24		

Operating Principle

The Evora six speed transmission uses a 3-shaft design in order to minimise the packaging space required, and uses a two part alloy housing comprising a front section, including the clutch housing and front bearing support, and a rear section to house the gearbox and shaft rear bearings. Each section includes one half of the final drive casing, through which the vertical split line is positioned.

The input shaft carries the clutch centre plate, and is supported by a roller bearing in the clutch housing, and a ball bearing in the main case. The shaft has integral drive gears for 1st and 2nd speeds, and separate gears spline fixed to the shaft for 3rd, 4th/5th, and 6th speeds. Two output shafts, an upper and a lower, are arranged parallel to the input shaft, with the upper, no 1 shaft supported by a front roller bearing and a rear ball bearing, whereas the lower no. 2 shaft uses a taper roller bearing at each end. Each of the fixed gears on the input shaft drives a free spinning pinion on either the upper or lower output shaft with one of the input gears turning both the 4th (upper) pinion and the 5th (lower) pinion.

Two synchroniser assemblies are spline fixed to each of the two output shafts, and are operated via the selector mechanism to lock the chosen gear to its output shaft, thus transmitting drive in that reduction ratio to the final drive gears. A final drive pinion integral with the front end of each output shaft, engages with a common crownwheel bolted to the differential carrier. The double pinion bevel gear open differential distributes drive to the two driveshafts.

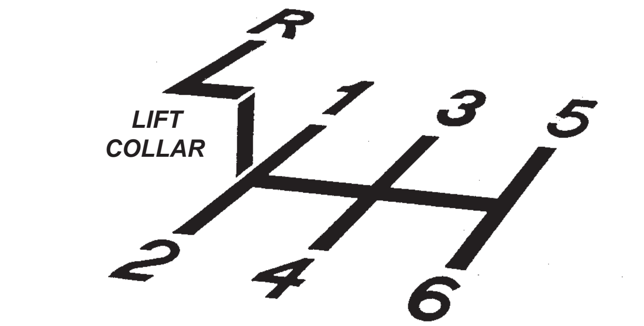
1st/2nd/3rd speeds are equipped with triple cone synchromesh, 4th speed with double cone, and 5th/6th and reverse with single cone synchromesh, reflecting the severity of duty. Reverse gear is provided by meshing of the first gear pinion on the input shaft with an independently pivoted twin geared reverse pinion, which also meshes with the reverse gear on the lower output shaft, the double step gear train thus providing the required reversal of direction.

FL.2 - GEARCHANGE MECHANISM

Prior to '12MY

Two control cables run along the centre of the cabin and beneath the fuel tank and power unit, and transmit the movement of the gearchange lever to the transmission selector housing.

The gear lever is spring biased towards the 3rd/4th gear plane, by springs at both the lever end, and within the transmission. The lever must be moved against light spring pressure to the left before selecting first or second gear, or against similar pressure to the right before selecting 5th or 6th speed.



6-SPEED CHANGE PATTERN

Engaging Reverse Gear:

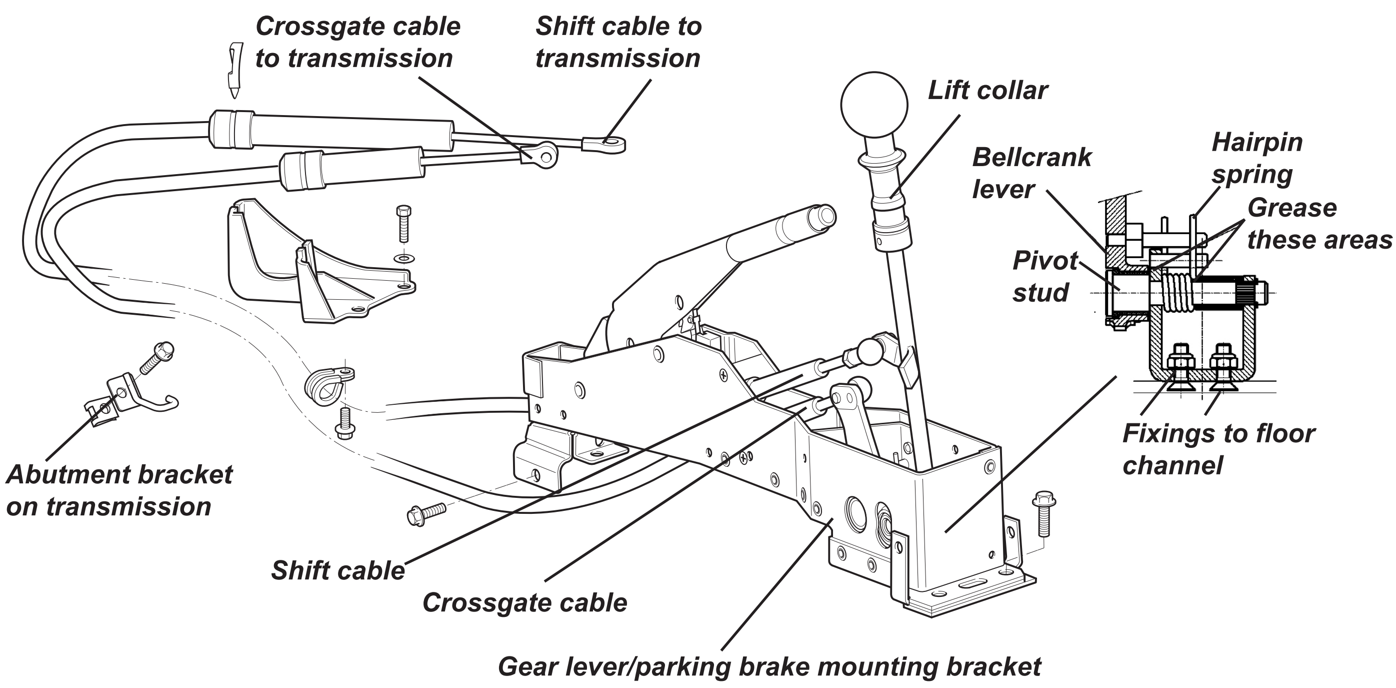
With the vehicle at a **complete standstill**, pause for a moment with the clutch pedal fully depressed before moving the lever to the left, raising the lift collar beneath the knob, and then further to the left over a spring detent before finally pushing forwards to engage the gear.

A two cable mechanism is used to connect the gearchange lever with the transmission, one cable ('shift') to transmit the fore/aft movement of the lever, and a second ('crossgate') cable for the sideways movement. The gearchange lever is pivotted at its base and operates the shift cable directly via a ball joint half way up the lever. The base of the lever has an extended ball pin on the right hand side which engages with a crossgate bellcrank lever, the other leg of which operates the crossgate cable.

An inhibit mechanism prevents the gear lever being moved into the reverse gear plane unless a collar beneath the gear knob is lifted. This action raises a boss at the base of the lever above a curved inhibitor block, allowing the lever full leftward movement.

The front end of both inner cables are equipped with socket joints which engage with ball pins fitted on the gearchange mechanism. The outer cables are retained by a forked plastic block bolted into the gearlever/handbrake mounting frame.

At the transmission end, each outer cable is located in an abutment bracket by a spring 'C' clip, with the eye of the inner cable retained in its selector lever by a washer and 'R' pin. The shift cable connects directly to a lever on the cross-shaft to cause its rotation, the action smoothed by an extension to the lever carrying a damper mass. The crossgate cable connects to a bellcrank lever which imparts an axial motion to the cross-shaft.



Gearchange Cable Adjustment
In order to ensure smooth selection of 1st/2nd gears, it is important to set the crossgate cable adjustment in relation to the fixed position reverse inhibitor block.

- Push the lever to the left to abut against the reverse inhibitor block, and check selection of 1st and 2nd gears. There should be no obstruction to fore/aft movement of the lever.

- If fore/aft baulking occurs, determine whether the 1st/2nd unobstructed plane is too far left or right of where it needs to be (i.e. adjacent to the inhibitor block). For example, if smooth operation can be achieved only when the lever is moved slightly away from the inhibitor, the plane needs to be moved leftwards.

- Remove the gear lever shroud. Release the ball pin from the crossgate bellcrank lever, loosen the locknut and to move the plane to the left, screw the ball joint socket further onto the cable by one turn clockwise. To move the plane to the right, turn counter-clockwise before re-attaching to the bellcrank and testing.

- Once a setting is found which allows smooth fore/aft lever movement whilst abuting against the inhibitor block, secure the ball joint socket with the locknut. Note that adjustment is available also at the transmission end of the cable.

- Raise the reverse inhibit gear lever collar and check that reverse gear can be engaged.

- Refit the shroud and check that all gears can be selected without the lever fouling the shroud aperture. If necessary, fit shim washers behind the reverse inhibitor block to move the lever away from the LH side of the aperture and re-adjust the crossgate cable as necessary.

- If other adjustments have been made, check the alignment of the 3rd/4th lever plane. From the spring loaded neutral position, it should be possible to smoothly engage 3rd and 4th gears without moving the lever across the gate. If necessary, the ends of the centralising hairpin spring may be reprofiled to reset the neutral plane.

Gearchange Cable Replacement
For access to the gear cables, the gear lever shroud and parking brake lever trim panel must be removed, and the gear lever/parking brake support channel released from the chassis tub floor:

- *Remove centre console:* See sub-section VE.5.
- *Remove the engine bay undertray: refer to service notes section AN for further information.*
- *Release cables, front:* Disconnect the front end of each cable by prising off the end socket from its gear lever or crossgate lever ball pin. Release the outer cable abutment clamp from the mounting frame. Also release the parking brake cable from the lever and disconnect the parking brake tell tale switch.
- *Mounting frame:* Release the gear lever mounting frame from the support channel, and withdraw.
- *Release the support channel*: Remove the 12 screws securing the support channel to the floor of the chassis tub to allow the gear cables to be released from the 'P' clips inside the support channel.
- *Release cables, rear:* Release the cables from the transmission levers and abutment bracket by removing the 'R' clips and 'C' clips respectively. Release all cable retaining clips and ties, and remove the cables from the car. *Note removal of the air filter/box casing may be required to gain access; refer to service notes section EJ.4 for further information.*

Refit the cables in reverse order to removal, and check adjustment as detailed above.

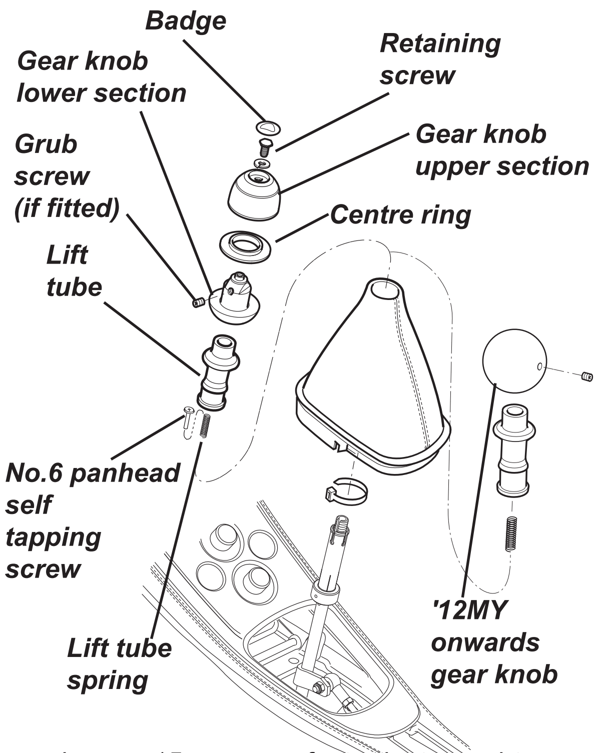
Gear Knob Remove/Refit

Removal: from start of production to '11MY
1. Carefully prise out the badge from the top of the knob, taking care not to damage the leather.

2. Release the socket head screw revealed and lift off the top section of the gear knob.

3. Using the flats provided, use a 15mm spanner to unscrew the lower part of the knob from the gear lever.

   Note: The lower ring of vehicles built from December 2010 onwards (approx) may also be locked onto the gear lever shaft with a grub screw, this should be loosened before attempting to unwind the lower ring.



Refitment:
Preparation: If not already fitted, insert a no.6 pan head self tapping screw into the top end of the lift tube spring protruding from the lever; this acts to prevent binding of the spring in the thread of the knob top section.

- Refit the lower section of the gear knob onto the lever and use a 15mm crowsfoot adaptor and torque wrench to tighten to 15 Nm. **CAUTION: Do NOT overtighten,** or the hollow gear lever may be twisted. If fitted tighten the side mounted grub screw to lock the lower section into position.

- Refit the top part of the knob, with the flats engaged onto the alloy carrier, and retain with the socket head screw, torque tightening to 6 Nm.

- Refit the badge into the gearknob recess, using new double sided tape if necessary.

Removal: from '12MY
The leather multi-piece assembly is replaced by a single piece aluminium knob with the gear speed pattern etched onto the upper surface.

It is screwed into the end of the shifter lever and locked into position so that the gear speed pattern is in the correct orientation using a grub screw passing through the lower forward face of the knob which then tightens into a machined slot in the shifter lever.

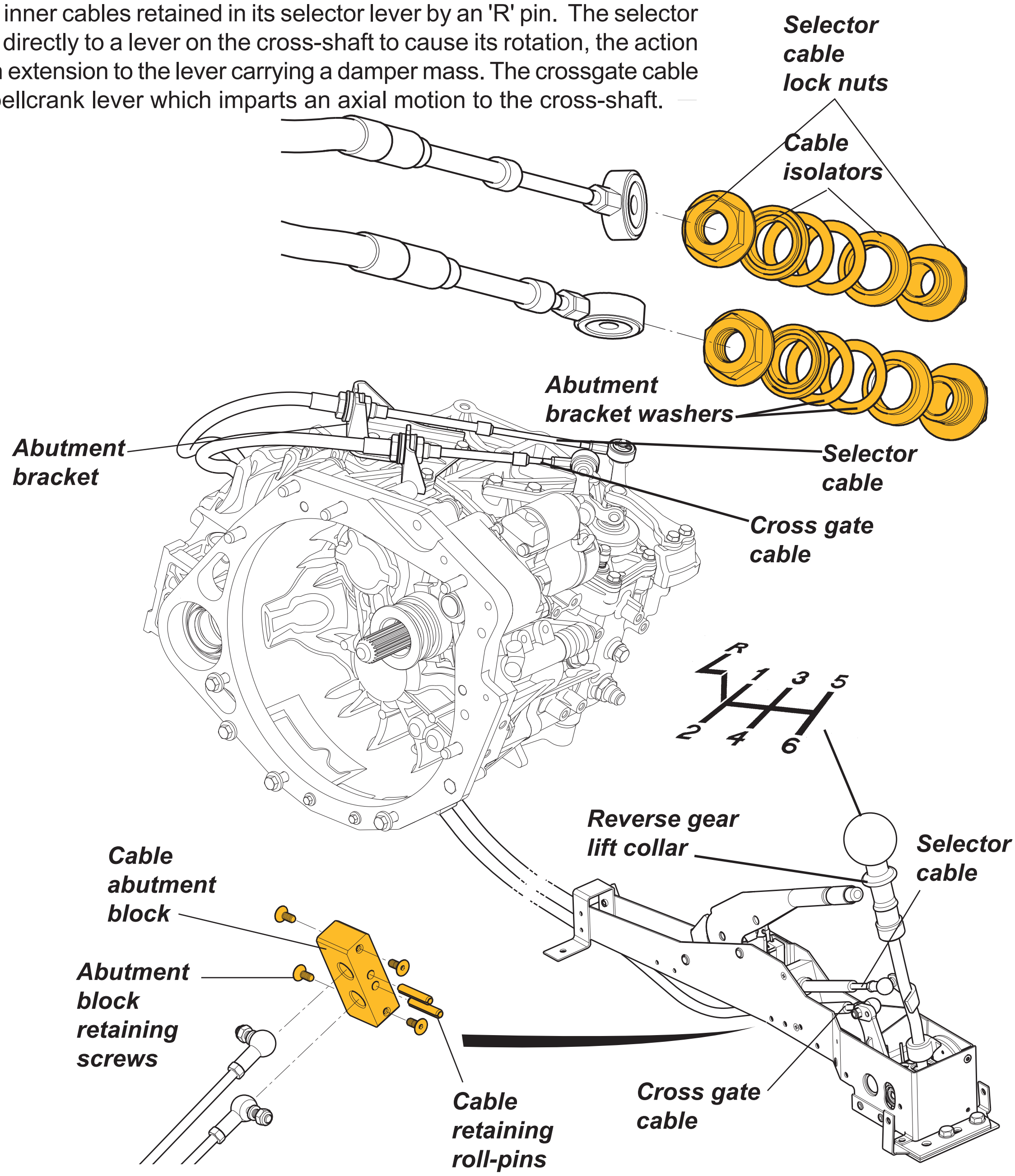
To remove the knob release the grub screw and unwind the knob from the shifter lever.

Refitment:
- Rotate the gear knob clockwise onto gear lever shaft and lift tube spring again If not already fitted, insert a no.6 pan head self tapping screw into the top end of the lift tube spring protruding from the lever; this acts to prevent binding of the spring in the thread of the knob top section.
- Tighten the knob until thread bottoms out on the shift lever.
- Back off gear knob until grub screw in the knob is aligned with slot in gear shift lever.
- Tighten grub screw into the slot of gear shift lever.

Gearchange cables '12MY
The gearchange principle remains unchanged but the the outer cables are retained by a metal block bolted into the gearlever/handbrake mounting frame.

At the transmission end, each outer cable is located in an abutment bracket by 2 nuts, 2 isolators and 2 washers (1 of each being fitted either side of the bracket).

The eyes of the inner cables retained in its selector lever by an 'R' pin. The selector cable connects directly to a lever on the cross-shaft to cause its rotation, the action smoothed by an extension to the lever carrying a damper mass. The crossgate cable connects to a bellcrank lever which imparts an axial motion to the cross-shaft.



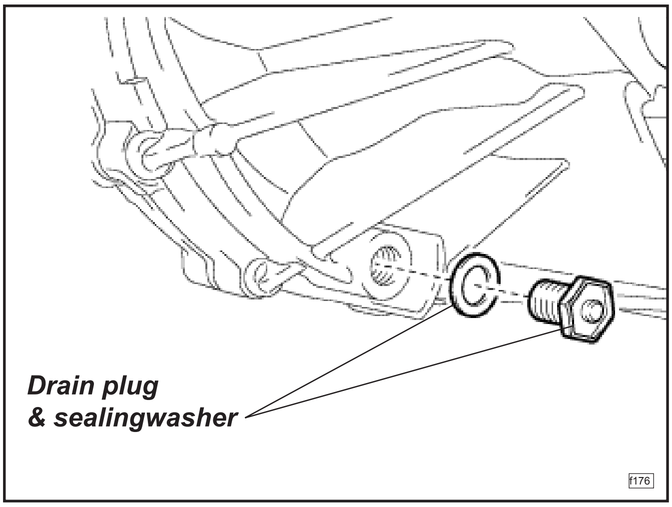
FL.3 - LUBRICATION

The engine and transmission should be inspected for evidence of oil leaks at every service, and the transmission oil renewed at intervals specified in the Maintenance Schedule.

Draining transmission oil

The transmission should be drained after a run when the oil is warm, flows more readily, and the impurities are still held in suspension.

A hex. head drain plug is provided in the bottom of the transmission crownwheel housing. After allowing a sufficient drain period, thoroughly clean the drain plug before applying PTFE tape around the thread, fitting a new sealing washer and tightening to 39 Nm.

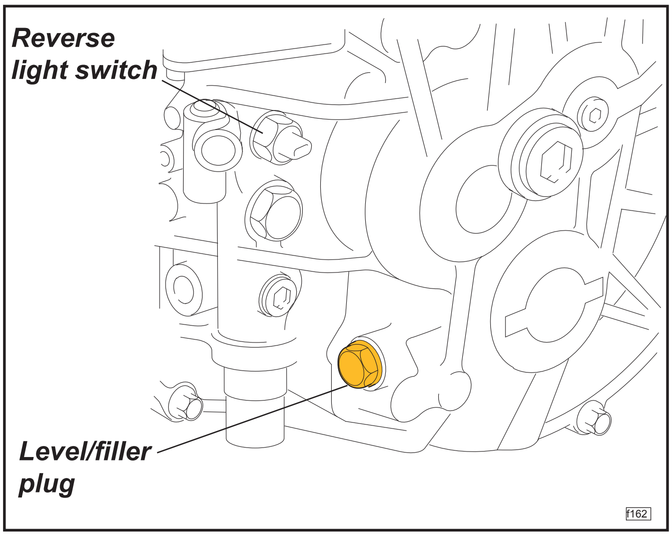


Refiling/topping up transmission oil

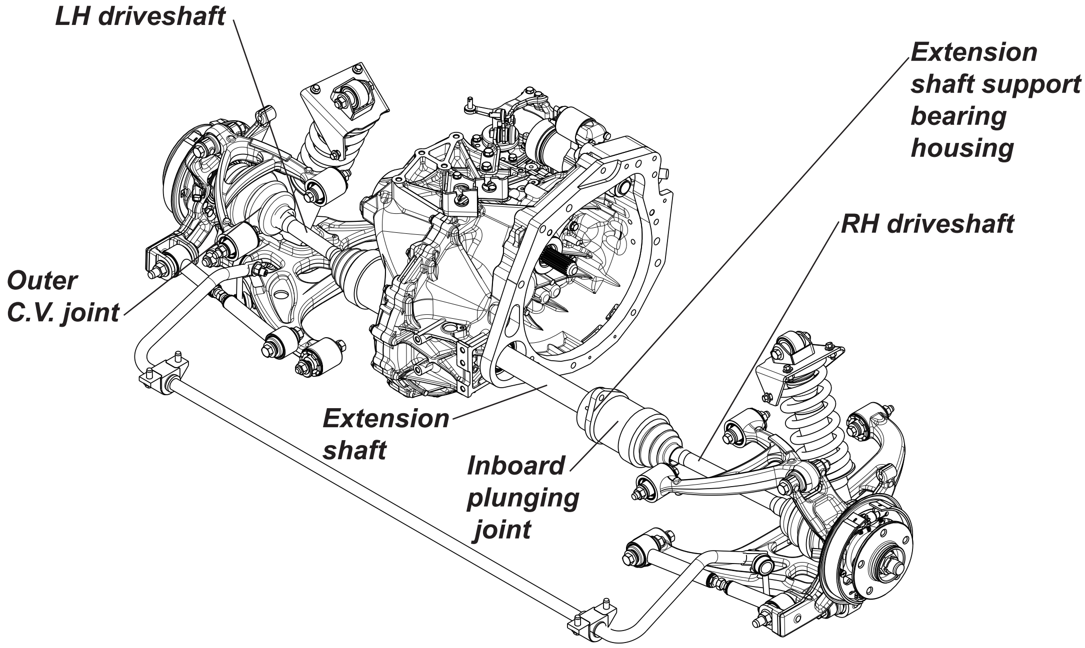
A level/filler plug is located in the left hand side of the transmission case below the reverse light switch.

With the vehicle at normal ride attitude, the oil level should be within 5mm of this filler plug hole. For oil specification refer to Section OK.

After refilling, re-check the oil level at normal running temperature after a run. Finally use a new sealing washer and tighten to 39 Nm.



FL.4 - DRIVE SHAFTS



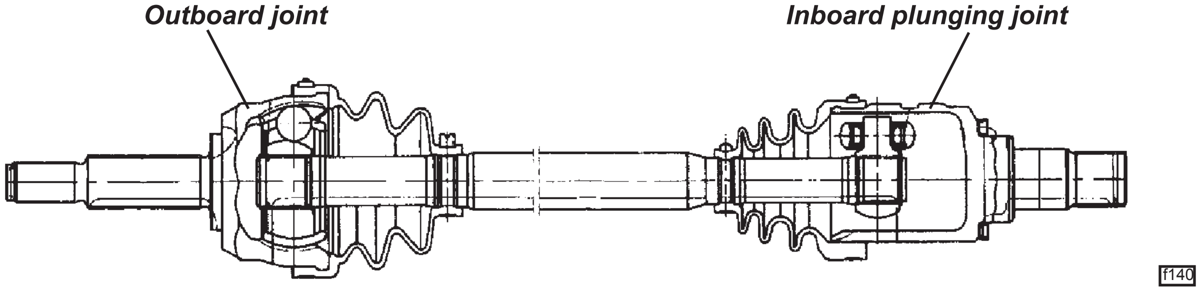
Each of the two driveshaft assemblies comprises a steel shaft with a constant velocity (CV) joint at each end, and is used to transmit the drive from each differential output gear to the rear wheel hub. The longer right hand driveshaft assembly features an outrigger bearing bolted to the right hand side of the cylinder block, with a shaft extending from the inboard CV joint into the transmission housing.

The inboard joints are of a plunging tripod design to accommodate driveshaft length variation with suspension travel, whereas the outboard joints are high efficiency 6-ball fixed length type. Replacement outboard joints include the main driveshaft, outboard C.V. joint and gaiter. Replacement inboard joints include the inner C.V. joint and gaiter kit, with the extended stub shaft of the RH joint also including the support bearing and mounting bracket.

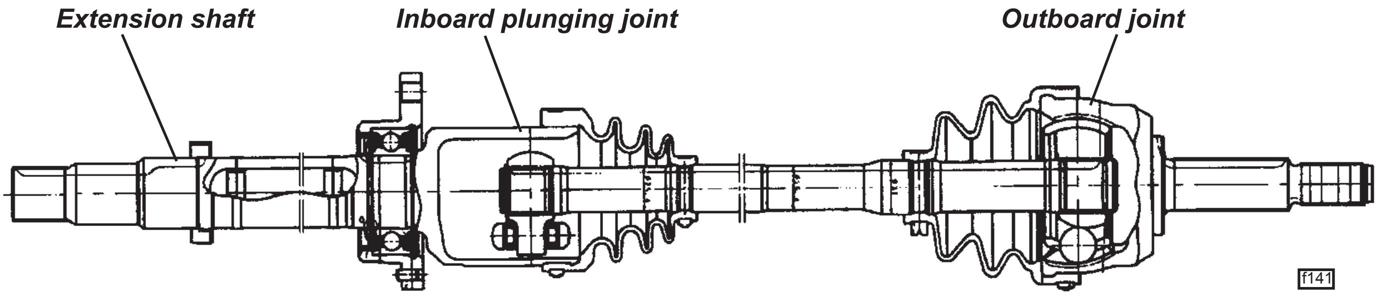
The joints themselves are packed with grease on initial assembly, and are maintenance free. It is however vitally important that the protective gaiters are carefully inspected at service intervals, to check for splits, tears or punctures, since the joint will deteriorate very quickly once contaminated with dirt or water. Damaged gaiters should be renewed immediately, once the serviceability of the joint has been established.

CAUTION: The outboard C.V. joint gaiter can suffer 'pinch' damage if the joint is subjected to extreme articulation off the car, or during driveshaft removal/refitment.

LH Driveshaft Assembly



RH Driveshaft Assembly



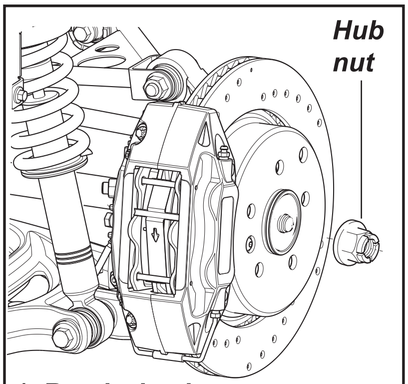
Clicking noises, torque reversal 'clonks', or shudder and vibration when accelerating are all possible symptoms of worn C.V. joints. It should not be possible to discern any free play in a joint by manual manipulation, but care must be taken not to confuse this with transmission backlash, which may be considerable. Any symptoms that could be due to worn driveshaft joint assemblies, should be investigated and rectified without delay, since safety considerations are always of paramount importance.

The inboard C.V. joint is equipped with a male splined spigot shaft which engages with the female splines of the differential output sun gear, with the LH shaft retained by a round section spring circlip on its end, and the RH shaft retained by the extension shaft support bearing. Each of the two transmission output oil seals runs on a machined shoulder on the C.V. joint spigot shaft, onto which is pressed a dust shield. The stub shaft of each outboard joint is splined into the wheel hub, and retained by a nut on the threaded end of the shaft.

Driveshaft Assembly Replacement

Removing a driveshaft assembly from the transmission will result in some loss of transmission lubricant. It may be preferred to drain off some oil via the transmission drain plug beforehand. At no time during this process should an extension force be applied to the shaft assembly, as the plunging inner joint could be damaged.

1. *Hub Nut:* With the parking brake and footbrake firmly applied, remove the wheel centre cap and release the driveshaft hub nut (RH thread at both sides).



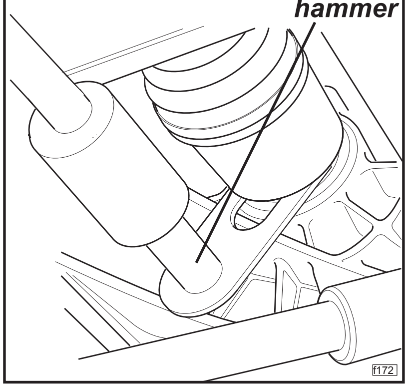
1. Road wheel removed for clarity

2. *Road Wheel:* Remove the appropriate road wheel and the engine bay undertray.

3. *Hub Carrier:* To allow the withdrawal of the driveshaft from the hub, release from the hub carrier the lower wishbone, toe-link, and anti-roll bar drop link. If necessary, release the brake hose 'P' clip and the wheel speed sensor harness to allow the hub carrier to be swung upwards to release the driveshaft.

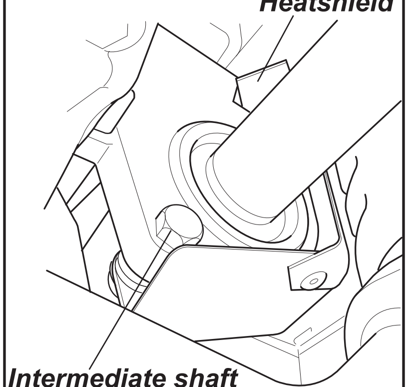
4. *Lubricant:* Remove transmission drain plug and drain off approx. 1 litre of oil into a clean container for re-use.

5a. *LH Driveshaft:* The left hand driveshaft inboard joint is retained in the transmission by a round section circlip. The joint may be removed by applying a shock pull to the C.V. joint body using a slide hammer with a forked end as per illustration 5a.

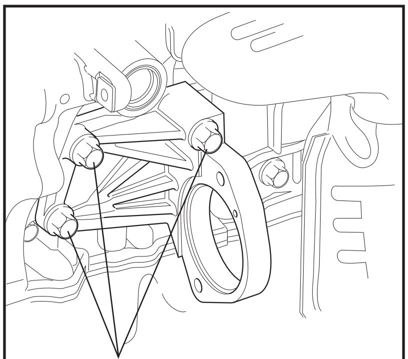
5a. LH Driveshaft


CAUTION: Any attempt to withdraw the inboard joint by pulling on the driveshaft is likely to damage the joint and require its replacement. Apply pressure only to the outer body of the joint.

5b. *RH Driveshaft:* The right hand driveshaft assembly incorporates a bearing and for the extension shaft and it is this which retains the shaft in the transmission. Remove the M10 x 50 bolts and M10 nuts (2) securing the bearing housing and heatshield to the bearing bracket, and withdraw the complete shaft assembly. When withdrawing either driveshaft from the transmission, take care not to damage the output oil seal.

5b. RH Driveshaft


5c. With the driveshaft removed it is possible to access the bearing bracket if required. It is retained to the engine block with 3 bolts which are torqued to 52Nm.



5c. Driveshaft bearing bracket bolts (torque 52Nm)

6. *Re-assembly:* Before re-fitting a driveshaft, first renew the round section circlip on the end of the left hand inboard joint spigot shaft, and lubricate the circlip with grease. Also, check the condition of the transmission output seal, and renew if necessary. Lubricate the lip of the seal with transmission oil, and grease the corresponding shoulder on the driveshaft (C.V. joint) to reduce the danger of damaging the seal on assembly.

7. *Driveshaft:* Carefully insert the driveshaft into the transmission, with, on the left hand shaft, the two ends of the circlip positioned lowermost, and rotate the shaft if necessary to engage the splines. Press the inboard joint outer until a click indicates the engagement of the retaining circlip, if necessary tapping the joint outer body using a brass drift

and hammer. Pull on the joint body to confirm its security. On the right hand shaft, fit the bolts securing the extension shaft bearing and heatshield to the engine mounted bracket, and torque to 45 Nm.

8. *Suspension:* Fit the outer end of the shaft into the hub, and re-assemble the suspension links. Torque settings: Lower wishbone to hub carrier; 135 Nm. Toe-link to hub carrier; 135 Nm. ARB drop link; 38 Nm.

9. *Hub Nut:* Fit the hub nut and road wheel, apply the parking and footbrake, and tighten the hub nut to 300 Nm.

10. *Lubricant:* With the car on the level, top up the transmission oil to the filler/level plug hole - see service notes sub section FL.3.

11. *Wheel and Undertray:* Refit the road wheel and undertray.

Driveshaft C.V. Joint and/or Gaiter Replacement

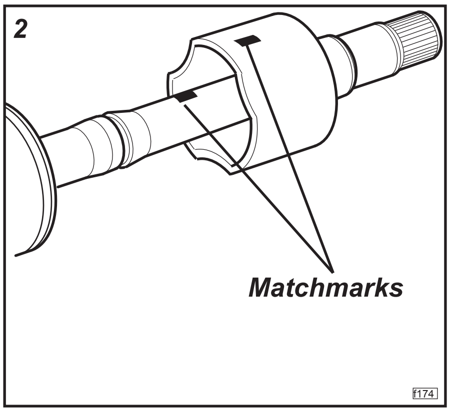
The outboard C.V. joint is supplied complete with main driveshaft to which it is fixed by a spline with a small helix angle to eliminate any potential backlash. Separation of the shaft from the joint should not be attempted. Replacement of the outboard joint gaiter entails removal of the complete driveshaft assembly from the car, and separation of the inboard joint from the shaft.

1. Remove the driveshaft assembly from the car (see above).

2. Remove the clips securing the inboard joint gaiter without damaging the gaiter if it is to be re-used. Pull the gaiter off the joint outer body and match mark the body to the joint spider before disengaging the joint.

3. Match mark the inboard joint spider to the shaft before removing the snap ring from the end of the shaft, and withdrawing the spider assembly.

4. Slide the inboard gaiter off the shaft, remove the outboard gaiter clips and slide off the outboard gaiter.

2


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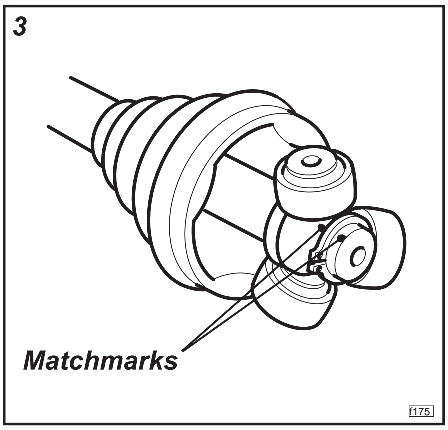


5. *Inspection & Cleaning:* Complete disassembly of either joint is NOT recommended. The separate components are a precision fit and develop their own individual wear patterns, such that any interchanging or re-orientation of parts is likely to result in premature failure.

   If the grease in the joint is contaminated with dirt or water, it is likely that the joint is damaged, and should be replaced. If the grease is not contaminated, the joint should be degreased by soaking in a suitable solvent (NOT petrol), and then carefully inspected. Tilt the ball type inner race or spider rollers to one side to expose each driving surface. Severe pitting, galling, play between ball and its cage window, any cracking or damage to the cage, or pitting, galling or chips in raceways, call for joint replacement.

   If the joint is found to be serviceable, it must be repacked with the special grease provided. Pack the grease into the joint itself and also into the inside of the new gaiter.

   NOTE: The grease provided in the kits is specially formulated for wear resistance and durability. DO NOT use substitutes or mix with other lubricants. The grease specification and quantity also differs for inboard and outboard joints:

Inboard: 180g NKG302
Outboard: 180g NTG2218-M (inboard grease is also supplied in outboard kits, as the inboard joint must be removed before fitting outboard gaiter).

6. Slide the new outboard gaiter and smaller retaining clip onto the shaft. Fit the gaiter into the grooves on the outboard joint body and the driveshaft, and secure with the clips provided.

7. Slide the new inboard gaiter and retaining clips onto the driveshaft. Press the spider onto the driveshaft splines with the match marks aligned, and retain with a new snap ring.

8. Fit the spider into the inboard joint body with the match marks aligned, position the gaiter in the location grooves, and retain with the new clips.

9. Refit the driveshaft to the car (see above).

Extension Shaft Support Bearing

The ball bearing supporting the RH driveshaft extension shaft to the engine block is mounted in a housing which is bolted to a bracket on the engine block. The bearing is sealed and maintenance free, and is included as part of the inboard C.V. joint assembly, but may if necessary be renewed by the following procedure:

1. Remove the RH driveshaft assembly (see above).

2. Using a press, remove the dust shield from the inboard end of the shaft.

3. Remove the circlip from the outboard face of the bearing housing, and press or pull the housing from the bearing.

4. Prise or pull the bearing dust shield off the shaft.

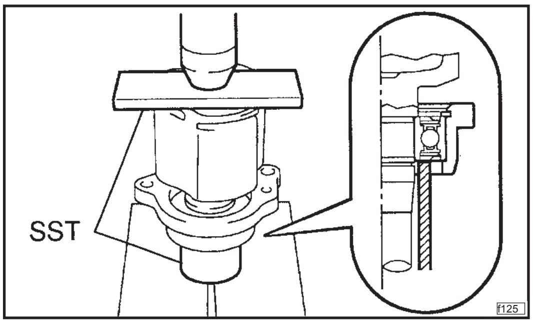
5. Remove the circlip retaining the bearing and press or pull the bearing from the shaft.

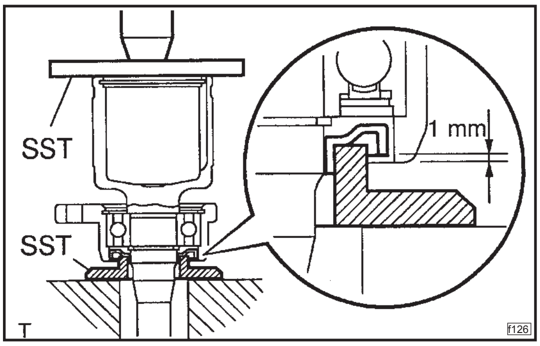
6. Press a new bearing into the housing, and retain with a new circlip. Then use special press tool T000T1438F to press the inner race of the bearing up to the shoulder on the shaft, and retain with a new circlip.

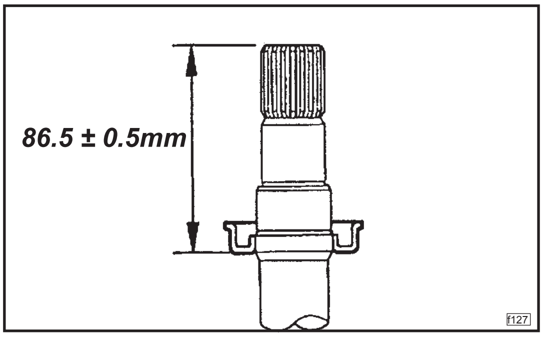
7. Use special press tool T000T1439F to press the bearing dust shield onto the shaft and position as shown in the illustration.

8. Press the inboard dust shield onto the end of the shaft to the dimension shown in the illustration.

9. Refit the driveshaft to the car (see above).





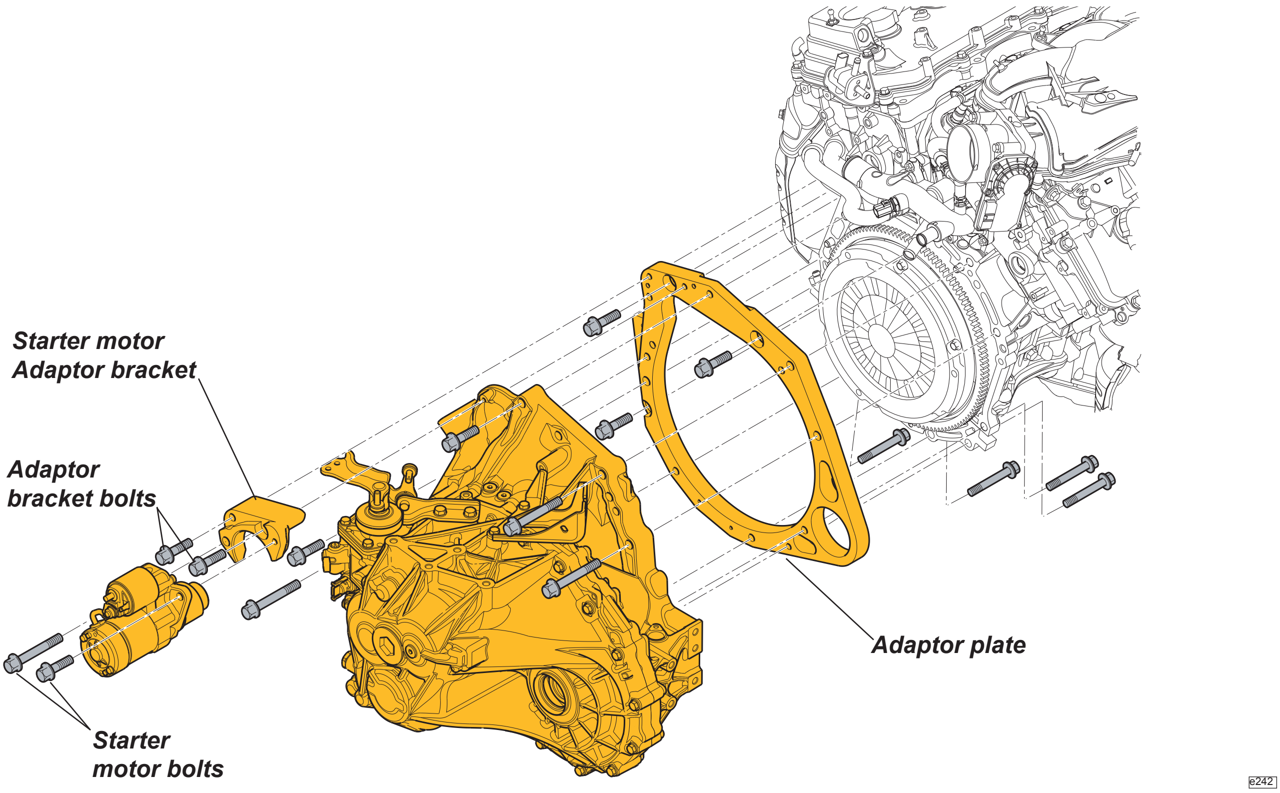


FL.5 - TRANSMISSION REMOVAL/REPLACEMENT

The transmission may be separated from the engine only after removal of the complete powertrain from the car. See sub-section EJ.5.

To separate the engine/transmission assembly

In order to mate the 2GR-FE engine to the EA60 manual transmission for use in the Evora, a Lotus specific fully machined cast alloy adaptor plate is used between the two units. Space to mount the starter motor in the position ordained by the clutch housing, is not available with the 2GR-FE engine, so a special machined casting is used to mount an opposite rotation starter motor alongside the clutch, the housing for which is machined to provide suitable clearance.



After removal of the complete powertrain assembly:

1. Remove the clamp bracket supporting the end of the starter motor body (not shown).

2. Release the two bolts securing the starter motor to the adaptor bracket, and withdraw the motor.

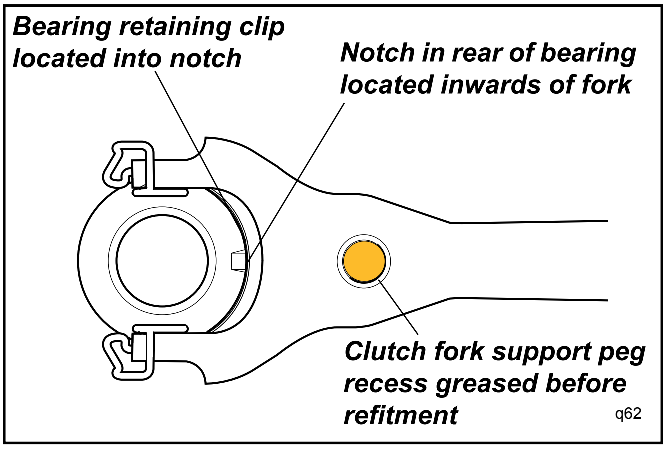
3. Remove the two bolts securing the motor adaptor bracket to the transmission adaptor plate, and remove the bracket.

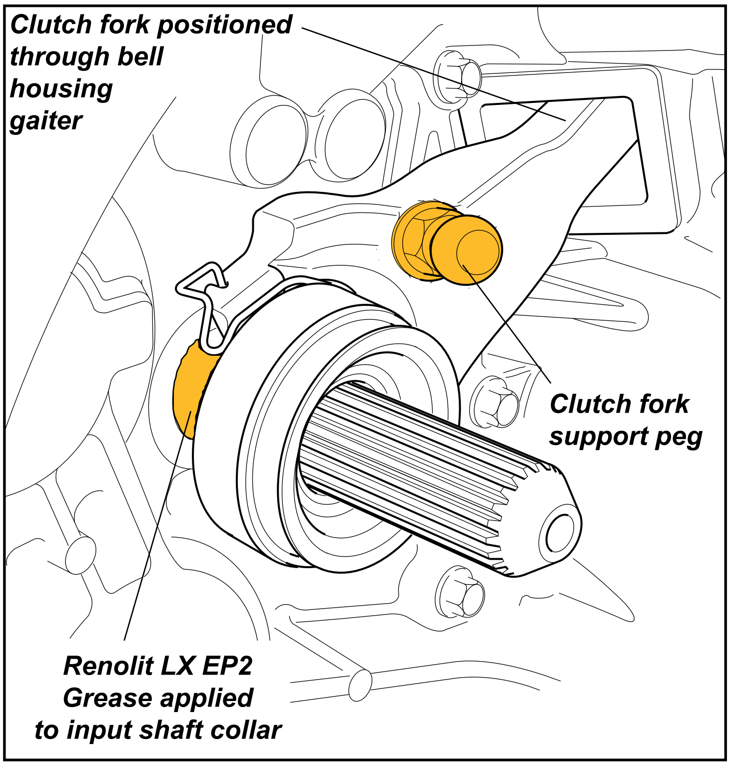
4. Ensure suitable independent support of the engine and transmission units before releasing the clutch housing from the engine:
   - From beneath, remove the two bolts securing the dirt shield in the clutch housing aperture.
   - Remove the 3 bolts from the engine side of the lower section of the adaptor plate.
   - Remove the 5 bolts from the transmission side securing the clutch housing to the engine/adaptor plate.
   - Withdraw the transmission from the engine.

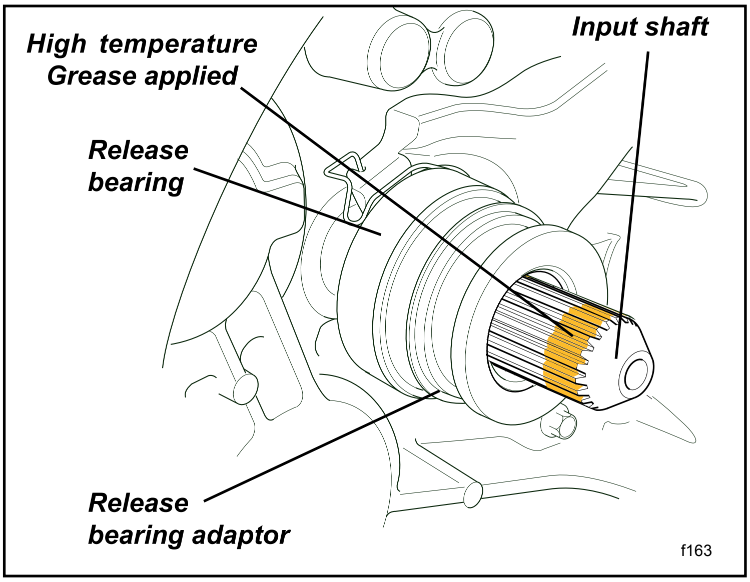
5. If necessary, release the 3 x M12 bolts from the transmission side securing the adaptor plate to the engine, and the single M10 bolt from the engine side of the plate, remove the adaptor plate.

On re-assembly:

- Ensure that the release bearing is correctly fitted to the release fork by ensuring that the notch in the rear of the bearing is inset of the release fork.
- Prior to fitment of the clutch fork and release bearing, apply a small amount of apply a small amount of Renolit LX EP 2 grease to the forks support peg recess.
- Apply a small amount of Renolit LX EP 2 grease to the gearbox input shaft collar.
- From inside the gearbox bellhousing, engage the release bearing around the input shaft collar whilst feeding the opposite end of the fork through the release fork gaiter.
- Align the clutch fork recess against the support peg, then push the fork firmly to fully engage the fork on the support peg.
- Apply a small amount of suitable automotive multipurpose high temperature grease (such as Castrol multipurpose high temperature grease formerly named LMX) over the forward most 10 mm of the splined area of the gearbox input shaft.
- Remove any excess grease that has built up on the chamfer on the input shaft which could contaminate the clutch assembly causing a source of potential clutch judder.
- Ensure the bearing adaptor is located positively against the clutch release bearing.
- Torque all M12 fixings to 65 Nm, and M10 fixings to 45 Nm. Re-seal around the starter motor to reduce the ingress of water into the clutch housing.



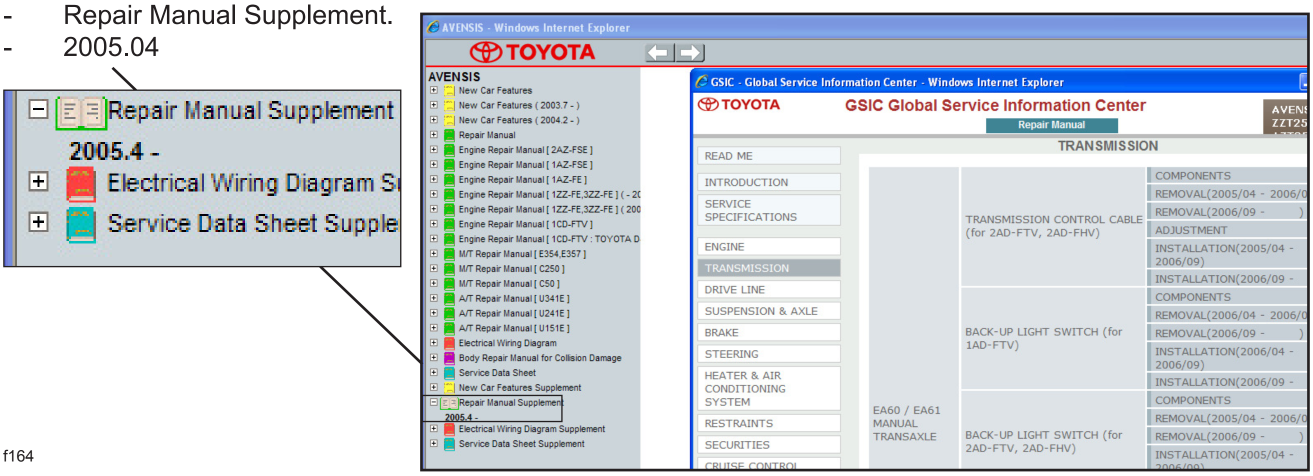




FL.6 - TRANSMISSION OVERHAUL

Insert the disc into a personal computer, and it will automatically open up to an Avensis menu page. For specific information regarding strip down and repair select:

- Repair Manual Supplement.
- 2005.04



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WHEELS & TYRES

SECTION GJ

GJ.1 - GENERAL DESCRIPTION

The single piece, light alloy roadwheels are factory fitted with tyres engineered to provide the optimum balance of ride and handling characteristics. In order fully to exploit the dynamic qualities and packaging opportunities, the wheel and tyre sizes are different front and rear, so that interchanging of wheels and tyres between axles is not permissible. Note that the tyre tread pattern is asymetric across the width, with the sidewalls marked 'side facing inwards' or 'side facing outwards', but the tyre may rotate in either direction.

The tyres should be inspected frequently by the vehicle user, and also at every service, for signs of cuts, abrasions or other damage, and for any uneven tread wear patterns. Uneven treadwear may indicate that the suspension geometry or dampers require attention. Care should be taken when parking to avoid tyre contact with high or sharp edged kerbs, as mistreatment of this nature can cause internal damage to the tyre structure which may not readily be apparent. The alloy wheel rims may also be distorted or damaged by careless parking, and result in wheel imbalance or loss of tyre pressure. Safety considerations should always be paramount when assessing tyre condition and serviceability, and the tyres replaced if any doubt exists, or if the legal tread depth limits are approached.

The cold tyre pressures should be checked every week, or every 1,000 miles (1,700 km), whichever is the sooner, and corrections made as necessary. Under-inflation will cause excessive wear, rapid deterioration of the tyre sidewalls and heavy steering, whereas overinflation results in a hard ride and increased susceptibility to tyre damage. Both conditions will cause a degradation in the vehicle handling qualities. It is important that the tyre pressures are adjusted only when the tyres are cold (driven less than one mile), as the pressures may increase by 0.3 - 0.5 bar (4 - 8 lb/in^2) when the tyres are warmed to normal running temperature. The tyre valve dust cap should always be replaced in order to prevent the ingress of dirt and moisture into the valve, which could cause leakage.

When balancing the wheel and tyre assemblies, the wheels should be located by the centre spigot - NOT by the wheel bolt holes. In order to maintain the correct handling feel and minimum steering wheel shake, it is very important that the radial and lateral run out of the tyres are to the high standard required by Lotus Cars. If any difficulty is experienced with replacement tyres, refer to the tyre manufacturer.

The Pirelli P-Zero & Corsa tyres fitted to the Evora are suitable for all normal weather conditions. The tyre characteristics include good feedback ('feel') from the road surface to the steering wheel, a high level of steering linearity and response, and little performance degradation with the high temperatures which may be reached in sports use. However, tyre performance will decrease at low ambient temperatures, resulting in reduced levels of grip and an increased susceptibility to damage from impacts. In these conditions, especially below -7°C, it is recommended to fit a car set of the recommended winter tyres, see sub-section GJ.6 for further information.

GJ.2 - TYRE PRESSURE MONITORING SYSTEM (TPMS) - **Where fitted**

A sensor incorporated into each of the tyre valves, monitors the air pressure inside the tyre, and supplies an onboard control module located on the LH rear wheelarch with this data by radio transmission. Tyre pressure information is displayed in the instrument cluster right hand screen. A silhouette of the vehicle showing each wheel, will display all four tyre pressures for one minute following ignition switch on.

If any tyre pressure should fall below 75% of the recommended value, an alert message is sent to the instrument panel, and the tyre pressure tell tale will light up amber. The corresponding tyre on the silhouette will be highlighted and the pressure displayed.

If this warning should occur, the car should be stopped as soon as it is safely possible, and the affected tyre examined. If there is no visible damage and a tyre pump is available, the pressure should be corrected (see below), before proceeding with caution to a tyre repair/replacement facility.

Note that the tell tale will automatically be extinguished when the correct pressure is restored. If the tyre is punctured, or no inflation equipment is available, use of the emergency tyre inflator aerosol (see below) should be considered, whilst being aware that the TPMS sensor in the tyre would be disabled by the sealing fluid, and would subsequently require replacement.

The TPMS incorporates self-malfunction recognition, and if a fault is detected, the low tyre pressure tell tale in the instrument panel will flash for one minute, and then remain constantly lit, this sequence being repeated for subsequent ignition cycles; **with the tell tale flashing or lit, there may be no detection of low tyre pressure.**

When removing or replacing a tyre, be aware that the tyre valve includes a pressure transducer and should not be discarded. Take care not to damage the sensor with the tyre bead or tools. If a fault is indicated after wheel or tyre replacement, it is likely that a sensor has been incorrectly fitted or damaged. If a tyre valve/sensor is renewed, or is moved to a different wheel position, the TPMS will automatically identify the new configuration by interpreting signal strength as distance from sensor to receiver.

Note that the pressure sensors are powered by integral batteries, with an average service life of 10 years. It is recommended to renew all pressure sensors at this time interval.

TPMS fault codes

On detection of a fault, the TPMS integrated diagnostics will set an appropriate code which may be read using the Lotus Techcentre:

C0550	TPMS ECU Failure
C0551	TPMS Module not programmed with Vehicle Configuration
C0558	TPMS Vehicle Sensor ID's not programmed
C075A	TPMS Pressure Sensor LF Malfunction / Battery Low / Broken Shock Sensor
C075B	TPMS Pressure Sensor RF Malfunction / Battery Low / Broken Shock Sensor
C075C	TPMS Pressure Sensor LR Malfunction / Battery Low / Broken Shock Sensor
C075D	TPMS Pressure Sensor RR Malfunction / Battery Low / Broken Shock Sensor
C0777	TPMS Sensor Autolocation Failed
C0800	TPMS Module Supply Voltage Below 9V / Above 18V
U2103	TPMS Communications Malfunction

In the first instance, the car should be driven gently at 40 mph in order to optimise conditions for sensor recognition. If the fault persists, the following action should be considered:

550/551/558 – most likely a TPMS module problem; renew
75A/B/C/D – most likely a pressure sensor; renew
777 – Most likely the module but could be a rogue sensor
800 – Check supply voltage and ground connection
U2103 – Could be module, CAN cable connection or engine T4e controller

Tyre and TPMS Transmitter Removal Recommendations

The following steps are recommended to prevent accidentally damaging a TPMS sensor during tyre removal as well as ensuring its continued accurate pressure monitoring and air tight sealing against the wheel rim.

TPMS Transmitter/Tyre Removal:
To prevent damaging the sensor during the tyre removal process it is recommended to release the transmitter from the wheel rim before breaking the tyre bead or removing the tyre from the wheel rim.

1. Remove the valve core and release the air from the tyre.

2. Using a suitable deep socket, remove the conical seal nut from the TPMS transmitter valve stem.

3. Gently bounce the tyre to ensure that the transmitter falls to the bottom of the wheel/tyre assembly.

4. When breaking the wheel/tyre bead ensuring TPMS transmitter is to the bottom of the assembly and away from the tyre changing machines bead breaking arm.

5. Using the tyre changing machine, remove the tyre from the rim in the normal manner.

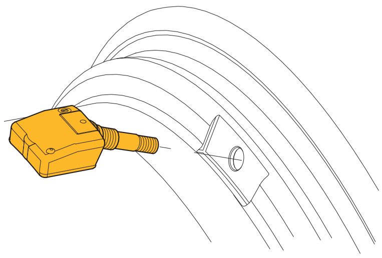
6. The TPMS transmitter can then be safely removed from the tyre.

TPMS Transmitter/Tyre Refitment:
Replacement TPMS transmitters are supplied with a new conical valve stem seal (go straight to step 3), but if the original transmitter is to be refitted then the valve stem seal must be renewed to ensure continued air tight sealing between the valve stem to wheel rim.

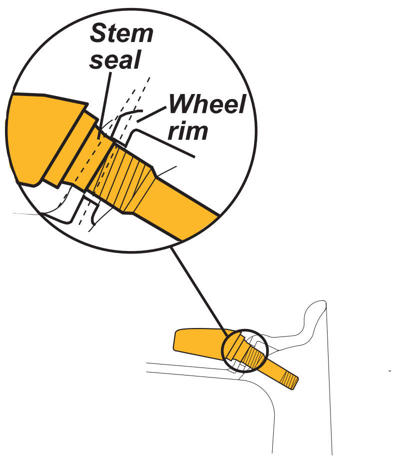
1. Remove old conical seal using pliers to squeeze the seal away from the valve stem, cut it and then remove from the seal.

2. Fit a new seal by placing it on the end of the valve stem, then, using the open end of a Schrader core screw-driver or other suitable tool, push the seal onto the base of the TPMS transmitter stem.

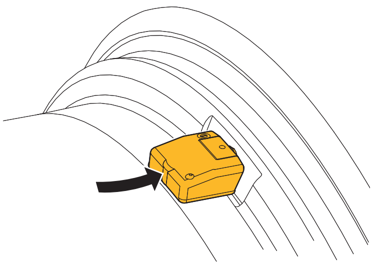
3. From the inside of the wheel rim, place the transmitter valve into wheel rim valve hole.



4. Place one side of the seal (top side of the transmitter case as seen from above) in contact with the valve hole.

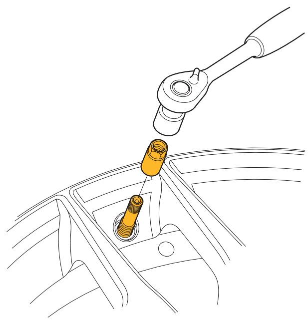


5. Push the rear of the transmitter case to twist the seal into the valve hole. The seal will snap into the hole when it is correctly position.

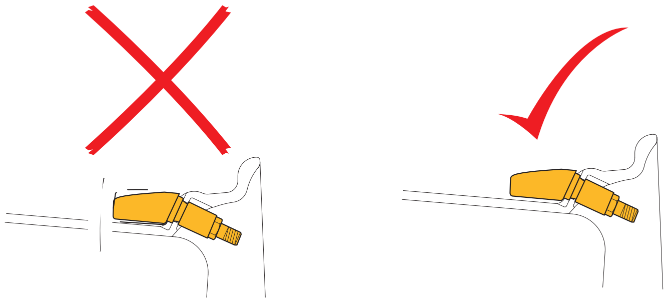


6. Fit the conical seal hut onto the valve stem thread and tighten until it touches the wheel rim.

7. Holding the rear of the transmitter case and using a suitable deep socket tighten the conical seal nut (torque 7.5Nm).



Note: to ensure that the conical nut is torqued correctly so producing an air tight seal between the valve stem and wheel rim it is essential not to push on top of the transmitter cars or lift it up whilst tightening the conical valve nut.



When refitting the tyre on the wheel rim, ensure that the transmitter is placed ahead of the bead fitment arm to prevent potentially damaging the transmitter case during refitment.

Valve Core Replacement
If replacing the valve core ensure that only an electroless nickel plated core is fitted. Using a plain brass core may cause galvanic corrosion occurring between the core and the aluminium valve stem causing eventual loss of tyre pressure.

Valve Cap Replacement
Only plastic valve caps should be fitted to a TPMS tyre valve. The fitment of a metal cap may cause galvanic corrosion between the metal cap and the stem of the aluminium valve. The resulting damage caused to the valve whilst trying to remove the corroded cap could also cause a TPMS system failure.

GJ.3 - WHEELS

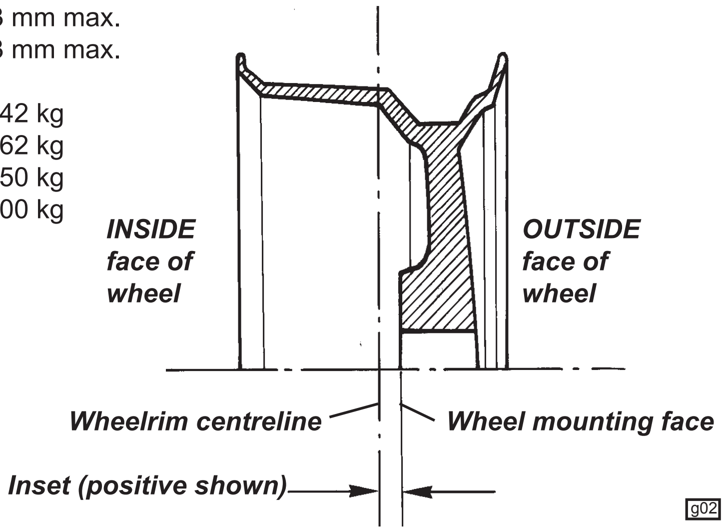
Standard wheels on the Lotus Evora are Lotus styled, cast alloy, 10-spoke arranged in pairs, silver or grey painted, in sizes of 8.0J x 18 front, and 9.5J x19 rear. Optional forged alloy wheels are Lotus styled with 10 equally spaced radial spokes, but are otherwise similar.

At the introduction of the supercharged Evora S, Front 19" Rear 20" Forged alloy Diamond Cut machine faced "Design" wheels were also made available.

Each wheel is located by a central spigot and secured by five bolts, four of which have a spline socket head, and one with a security coded head. A splined extension tool and a coded adaptor are supplied with the vehicle and require a 17mm hex. socket, square drive extension and a torque wrench.

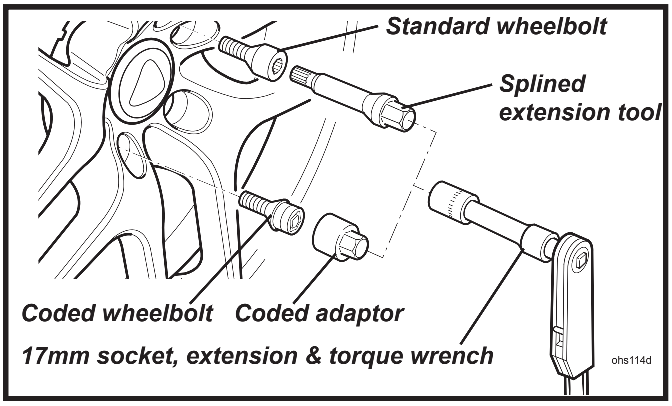
Technical Data

Type	- std	Cast alloy, 10 spokes in pairs, silver or grey, 5-bolt fixing.
	- option.1	Forged alloy, 10 radial spokes, silver or grey, 5-bolt fixing.
	- option.2	Forged alloy, anthracite, gloss black or stealth grey finish with diamond cut machine finish on the 10 radial spokes
Size	- std. & option.1	
	- front	8.0J x 18H2 ET52
	- rear	9.5J x 19H2 ET69
Size	- option.2	
	- front	8.0J x 19H2 ET55
	- rear	9.5J x 20H2 ET69
Inset	- std. & option.1	
	- front	+ 52 mm
	- rear	+ 69 mm
Inset	- option.2	
	- front	+ 55 mm
	- rear	+ 69 mm
PCD		114.3 mm
Wheel bolts	- thread	M12 x 1.5 x 26 mm
	- torque	105 Nm
	- seat	60° taper
Centre spigot hole diameter		68 mm
Radial run-out at bead seat		0.3 mm max.
Lateral run-out at bead seat		0.3 mm max.
Weights	- Front cast alloy	10.42 kg
	- Rear cast alloy	12.62 kg
	- Front forged alloy	9.50 kg
	- Rear forged alloy	12.00 kg



Note that the inset figure is the displacement of the wheelrim centreline relative to the wheel/hub mounting face. A positive inset indicates that the wheelrim centreline lies inboard of the wheel mounting face, whereas a negative inset means the wheelrim centreline is outboard of the mounting face.

GJ.4 - WHEEL BOLTS



The wheel bolts used are of a special design to suit the small diameter fixing tunnels in the wheel centres. The bolts have an M12 x1.5 thread, 60° conical seat, and a 10 spline socket head for which a special extension tool is supplied with the car.

A 17 mm a/f deep socket and 1/2 inch square drive torque wrench should be applied to the extension tool, with a tightening torque of 105 Nm required.

To protect against wheel theft, one of the five bolts securing each wheel is key coded, and requires a correspondingly coded adaptor tool. Fit the adaptor tool onto a 1/2 inch square drive extension, and rotate the adaptor until until full engagement into the bolt head is assured before applying torque. Note that an alignment mark is provided on the coded bolt head and adaptor tool to aid refitting. The spline drive extension and the coded adaptor tool are stowed in the vehicle tool pouch, and should remain with the car at all times to allow servicing or repairs to be performed.

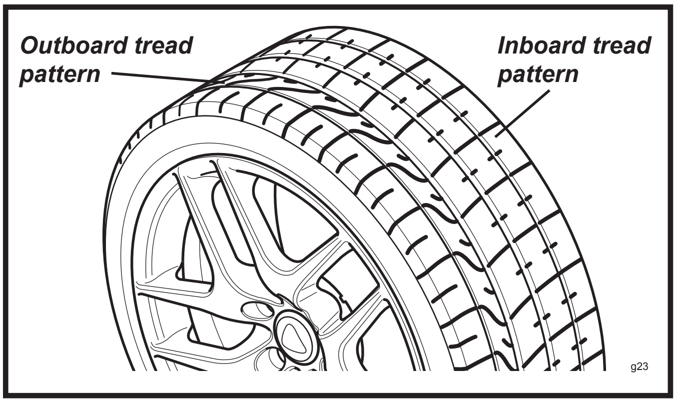
GJ.5 - TYRES

The Pirelli P-Zero tyres fitted to the Evora are standard production tyres suitable for all normal weather conditions. The tyre characteristics include good feedback ('feel') from the road surface to the steering wheel, a high level of steering linearity and response, and little performance degradation with the raised temperatures which may be reached in high speed use.

At the introduction of the supercharged Evora S, Pirelli P-Zero Corsa Front 19" Rear 20" tyres were introduced to fit on the diamond cut Front 19" Rear 20" wheels. These tyres are bespoke to Lotus with a specially formulated compound which can be identified with an LS marking on sidewall. Like the standard Pirelli P-Zero tyres these are suitable for all normal weather conditions, but are only available through the Lotus Cars Aftersales Department.

Tyre performance will decrease at low ambient temperatures, resulting in reduced levels of grip and an increased susceptibility to damage from impacts. In these conditions, especially where average temperatures are below 0°C (32°F), or where snow may be expected, it is recommended to fit a car set of the recommended winter tyres, see sub-section GJ.6 for additional information.

Note that the Pirelli P-Zero tread pattern is asymetrical, so that when fitting tyres, attention must be paid to the sidewall marking, and the side of the car for which the wheel and tyre is intended.



Wear indicators are moulded into the bottom of the tread grooves at intervals around the tyre, indicated by small pointers on the outer tread blocks. The tyres should be replaced before being worn to this minimum legal tread depth.

Tyre type		Pirelli P-Zero
Size	- front	225/40 ZR18
	- rear	255/35 ZR19
Pressure (cold) - normal driving conditions		
	- front	2.3 bar (33.5 psi)
	- rear	2.5 bar (36 psi)
	- high loads and/or speed	
	- front	2.8 bar (40.5 psi)
	- rear	3.0 bar (43.5 psi)

Tyre type		Pirelli P-Zero Corsa
Size	- front	235/35 ZR19
	- rear	275/30 ZR20
Pressure (cold) - normal driving conditions		
	- front	2.4 bar (35 psi)
	- rear	2.6 bar (38 psi)
	- high loads and/or speed	
	- front	2.8 bar (40.5 psi)
	- rear	3.0 bar (43.5 psi)

GJ.6 - WINTER TYRES & SNOW CHAINS

If the car is to be used in very cold climates, or driven on snow covered roads, it is recommended to fit a complete vehicle set of winter tyres developed specifically for such conditions. For the Evora, Lotus recommends the use of Yokohama W.drive V-902 winter tyres in sizes specified below.

Wear indicators are moulded into the bottom of the tread grooves at intervals around the tyre, indicated by small pointers on the outer tread blocks. In order that these tyres maintain their design performance on snow covered roads, the minimum tread depth is designated as 4 mm, which is reflected in the height of a secondary set of wear indicators.

Note that the W.drive tread pattern is asymetrical, so that when fitting tyres, attention must be paid to the sidewall marking, and the side of the car for which the wheel and tyre is intended.

Winter Tyres	- type		Yokohama W.drive V-902
	- size	- front	215/40 R18
		- rear	245/35 R19
Pressure (cold)	- front		2.3 bar (33.5 lb/in²)
	- rear		2.5 bar (36 lb/in²)

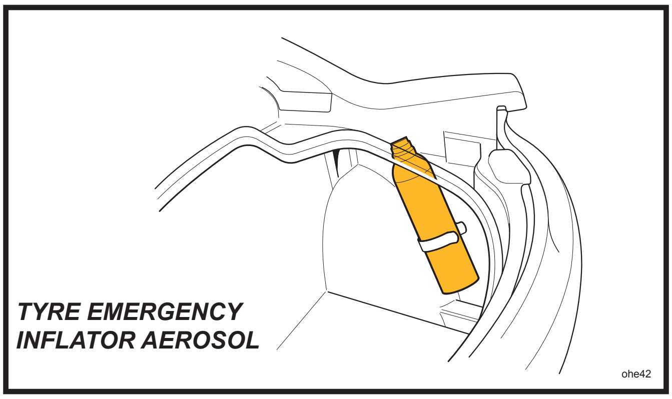
WARNING:

- **When winter tyres are fitted, a maximum speed of 118 mph (190 km/h) must be observed.**
- **The tyres are NOT suitable for studding.**

Snow Chains

In extreme weather conditions, Lotus approves the fitment of RUD-matic DISC snow chains (Lotus part number A132G6004F), used only in conjunction with winter tyres (see above) and fitted only on the rear wheels. Close attention should be paid to the fitting and tensioning instructions supplied with the chains. The chains should be removed as soon as road conditions allow.

GJ.7 - PUNCTURED TYRE EMERGENCY INFLATOR (If fitted)



In order fully to exploit the benefits of light weight, and to maximise stowage space, the Evora has no provision for spare wheel carriage or lifting jack. A temporary puncture sealing facility is provided in the form of an emergency tyre inflator aerosol mounted in a spring clip at the extreme right hand side of the boot. If possible, avoid driving on a deflated tyre, or irreparable damage to the tyre structure may be caused.

When the aerosol is connected to the tyre valve, and the button pressed, a mixture of liquid latex and propellant is injected into the tyre, such that the solidifying latex is forced into the puncture site at the same time as the tyre is inflated, effecting a temporary repair and enabling the car to be driven at low speed to the nearest tyre depot.

WARNING:
- **Use of the aerosol does not constitute a permanent repair, but is designed to allow the car to be driven to the nearest tyre depot. At the earliest opportunity, the tyre should be professionally repaired or replaced dependent on the severity of the damage.**
- **Until the tyre is repaired or replaced, the car should be driven only in a moderate manner, not exceeding 30 mph (45 km/h).**
- **Do not use the aerosol for large holes or repairs, or when the tyre sidewall has been damaged, or if the tyre has been displaced from the rim.**
- **For safety reasons, the aerosol should be carried at all times in the designated stowage position. Never carry in the passenger compartment.**

As soon as a puncture is suspected, the car should be stopped at the first safe opportunity. Continued driving on a deflated tyre will cause irreparable damage to the tyre.

Directions for use of the aerosol: Before using, carefully read all the instructions on the canister, or on any literature accompanying the product. The following instructions apply to the use of Holts Tyreweld:

1. Remove the object causing the puncture, and position the wheel with the puncture site lowermost. Deflate tyre fully.

2. Shake the can vigorously. In cold conditions, warm the can using the car's heater outlets, or by body warmth.

3. Screw the aerosol tube onto the tyre valve, remove the cap, hold the can upright and press the button until the tyre is firmly inflated.

4. Immediately drive for 6 - 12 miles (10 - 20 km) (or to the tyre depot if nearer) in a moderate manner and not exceeding 30 mph (45 km/h), to allow the sealant to spread. Then check and adjust the tyre pressure.

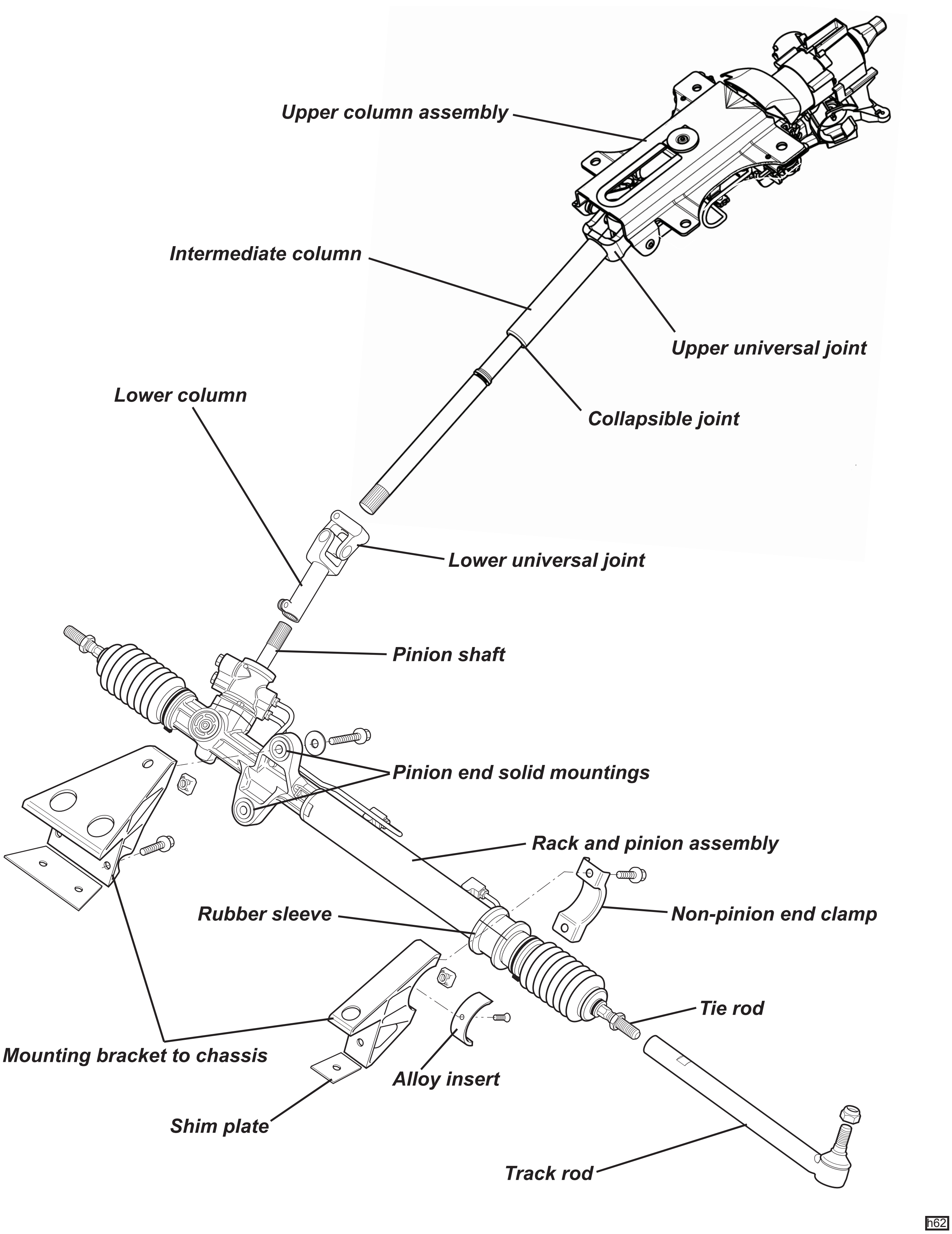
5. Have the tyre professionally repaired or replaced at the earliest opportunity, and until such time, limit speed to 30 mph (45 km/h) with a moderate driving manner. Note that some tyre repairers may make an additional charge for cleaning the sealant off the tyre before repair, and that any subsequent repairs may not be guaranteed. Be aware that the electronic pressure sensor mounted inside the tyre and integral with the tyre valve, could be obstructed by the sealant, and should be renewed.

6. Renew the emergency inflator aerosol.

STEERING

SECTION HI

Column and Rack Assembly



HI.1 - GENERAL DESCRIPTION

The power assisted steering system of the Evora comprises a column assembly, adjustable for height and reach, connected via two universal joints and an intermediate shaft, to a rack and pinion steering gear mounted on the chassis front subframe ahead of the front axle line. Power assistance is provided by an hydraulic pump mounted on the LH side of the engine, driven by the auxiliary belt, with an hydraulic reservoir located at the RH side of the engine bay. The pipes connecting the pump and reservoir to the rack assembly, are routed along the outside of the RH main chassis rail, within the body sill.

The column assembly comprises three sections, upper, intermediate and lower, articulated with two universal joints. The upper section is bolted to the chassis scuttle structure and provides for a steering wheel reach variation of 40 mm, and a vertical adjustment range of 43 mm. A clamping lever is positioned below the column, which is lowered to allow an adjustment to be made, and should be pushed fully upwards to clamp the setting before the car is driven. The intermediate column, like the upper, is telescopic, and in this instance allows for length compression of the column in the event of rack displacement in a vehicle collision. The short lower column connects to the steering rack pinion shaft.

The steering rack assembly consists of an alloy pinion housing/valve body, and a steel tube through which the rack is guided. The pinion housing features two lugs with solid alloy inserts, which bolt to an extruded alloy bracket, itself bolted to the subframe. The non-pinion end of the rack tube is clamped via a split rubber sleeve around the rack housing, to a second extruded bracket, again bolted to the subframe. Short ball jointed tie-rods from each end of the rack connect via length adjustable track rods, to forward facing steering arms integral with the forged steel front hub carriers, with outer pivot points positioned laterally to provide a 32% Ackermann effect, and vertically for a toe-out on bump characteristic. The rack and pinion assembly is geared to provide 47.4mm rack travel for one steering wheel revolution, with 2.86 turns needed from lock to lock.

Steering power assistance is sourced from a belt driven, vane type hydraulic pump, mounted at the right hand front of the engine. Pipework to and from the power rack assembly is routed within the RH body sill, with a fluid reservoir mounted at the RH rear of the engine bay.

Additional PAS fluid cooling

As a production running change an oil pipe cooler loop was incorporated into the return line from rack to reservoir, mounted ahead of the engine coolant radiator within the air intake ducting (see page 6 for schematic).

HI.2 - POWER STEERING RACK OPERATION

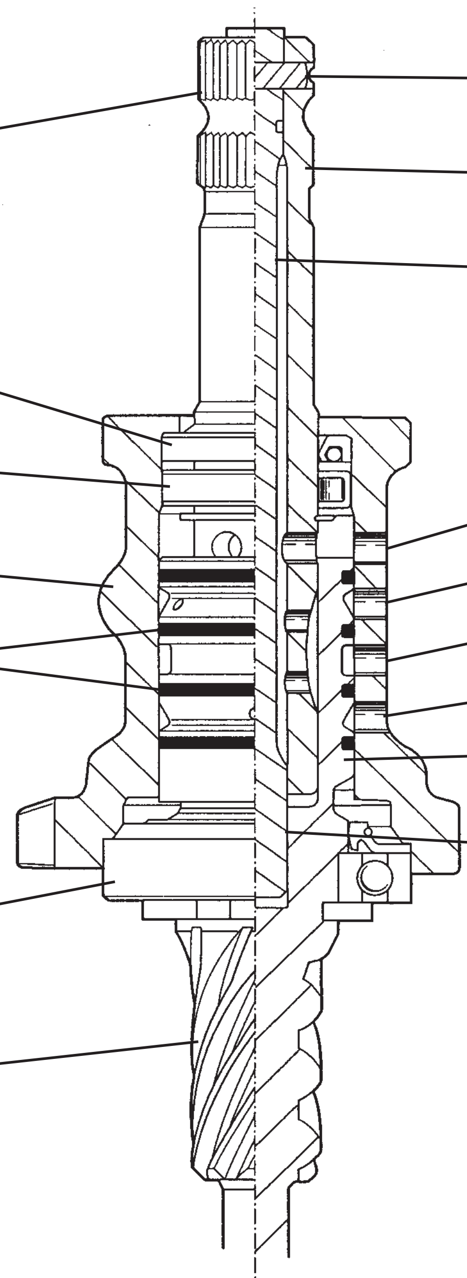
The steering rack assembly comprises the following major components:

- a round section steel bar with rack teeth machined at one end.
- an alloy pinion housing to support and contain the pinion shaft and hydraulic valve body assembly, and also support the pinion end of the rack bar.
- a steel tube pressed into the pinion housing to support the non-pinion end of the rack bar, and provide an hydraulic cylinder for power operation of the rack.

The rack housing contains two seals, between which a piston on the rack bar operates to form two hydraulic cylinders, each of which is linked to the valve body by a steel pipe. By using a pumped oil supply and a mechanism for creating a pressure differential between the two cylinders, a force can be applied to the piston and rack bar to provide steering assistance in either direction.

The valve body, which is integral with the pinion gear housing, contains three main elements:

- an input shaft/valve rotor connected to the steering column;
- a valve sleeve fixed to the pinion gear.
- a torsion bar connecting the two;

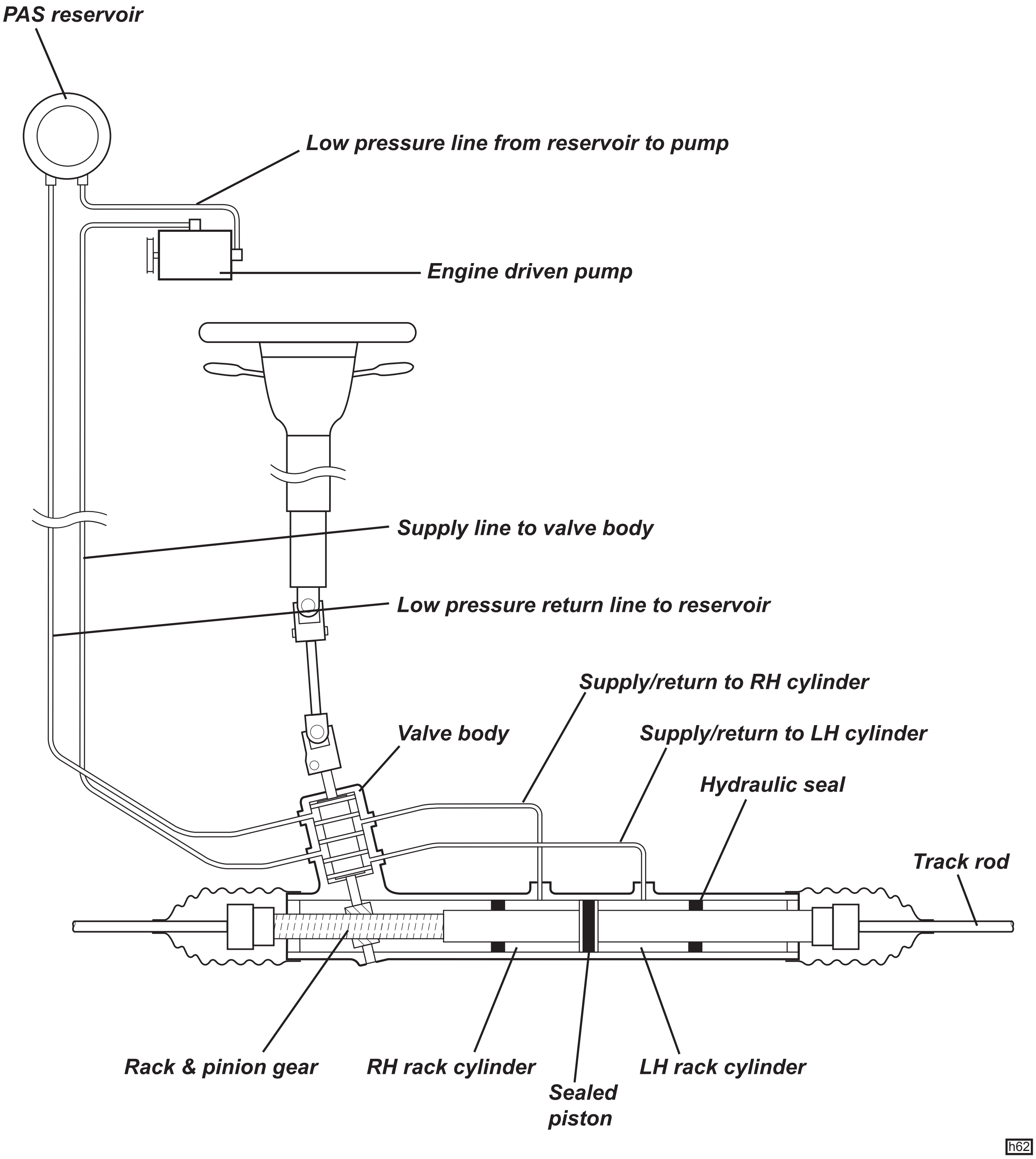


The steering column is clamped to splines on the top end of the rack input shaft, the lower end of which is machined to form a valve rotor, turning within the valve sleeve. The valve sleeve is fixed to the pinion gear and contains hydraulic ports which are controlled by the position of the rotor relative to the sleeve. The rotor and sleeve are connected by the torsion bar, the top end of which is secured inside the top end of the hollow input shaft (rotor), and the bottom end splined into the pinion gear (sleeve). The degree of twist of the torsion bar is determined by the force applied at the steering wheel, and is proportional to the loading at the front tyres. These forces tend to be highest when manoeuvering at low speed (e.g. parking) and result in the greatest angular displacement between valve rotor and sleeve.

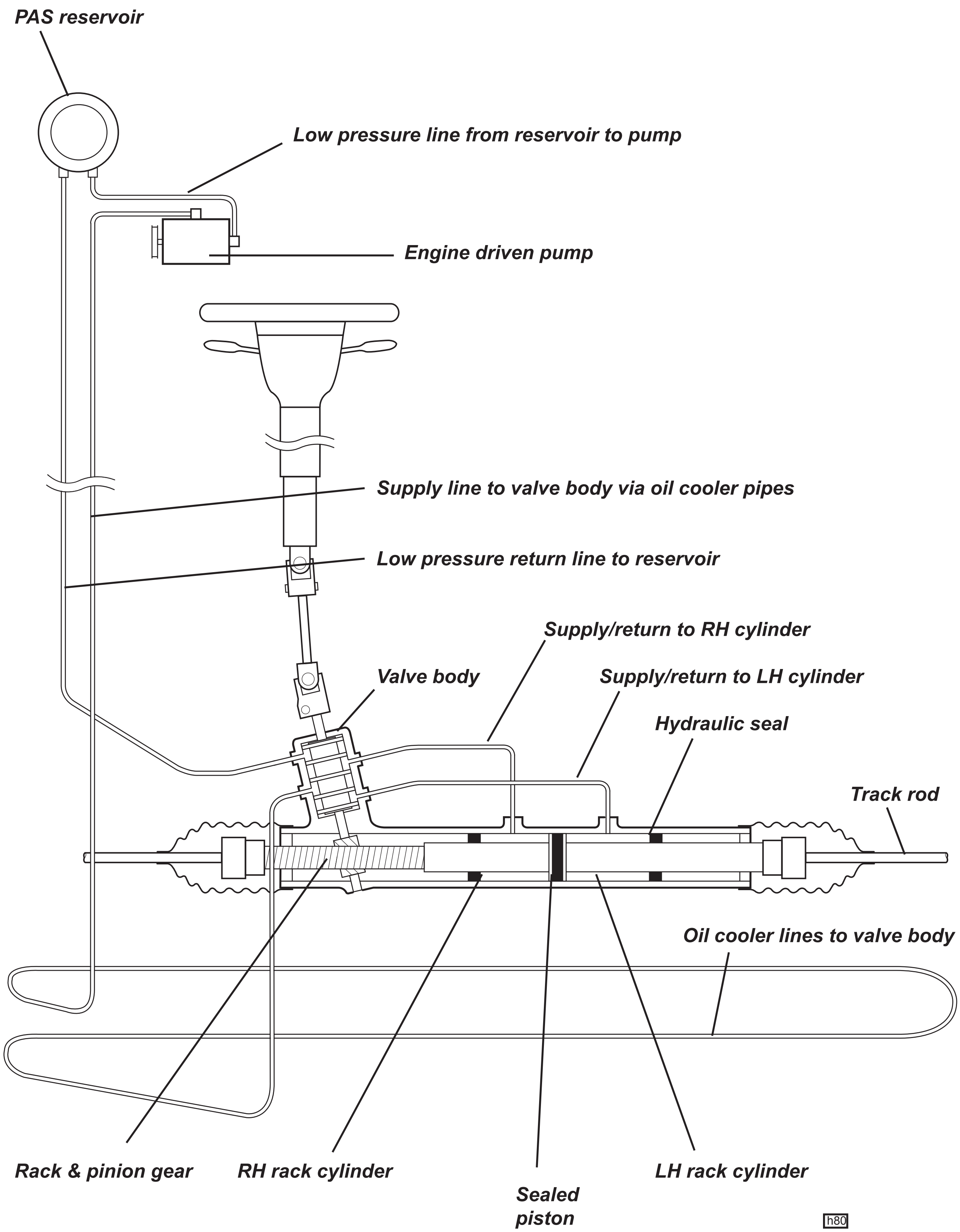
The valve body incorporates 4 ports:

- inlet from the engine driven pump;
- outlet (return) to the reservoir;
- connection to the right hand rack cylinder;
- connection to the left hand rack cylinder.

Power Steering Schematic (RHD without oil cooler shown)

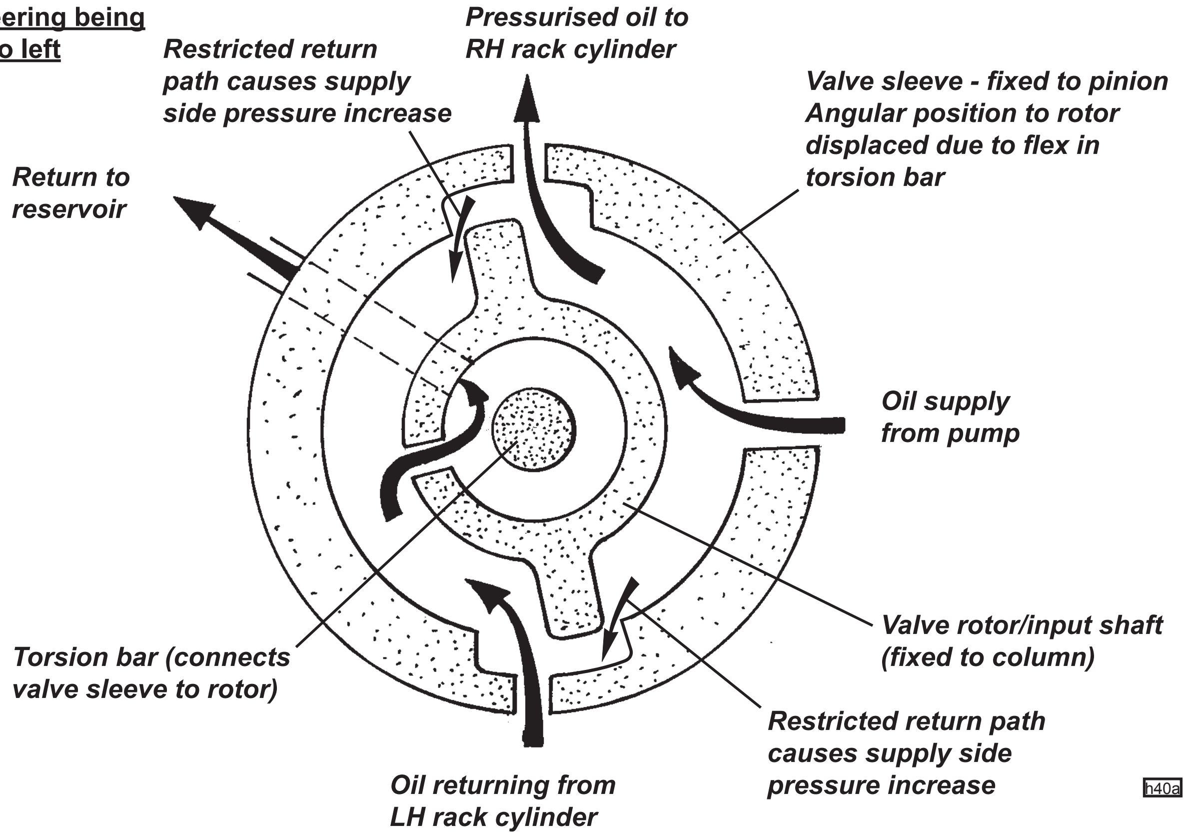


Power Steering Schematic (RHD with oil cooler shown)



The schematic diagram below shows the principle of valve control, although in practice, six pockets are machined in the rotor and sleeve, and the valve system is repeated three times. The valve sleeve is provided with four sealing rings in order to divide the inlet and outlet feeds and connect with ports in the valve body, whilst allowing 360°rotation of the valve assembly.

RHD steering being turned to left



The engine driven pump supplies oil at a controlled rate. A progressive restriction of this oil flow will cause the pressure to increase whilst the flow rate is maintained. Eventually, when the flow is completely restricted, the pressure will rise to the relief valve setting in the pump, causing oil to flow through the relief valve and re-circulate within the pump.

The hydraulic valve in the steering gear provides this restriction according to the force applied at the steering wheel and the loading on the front tyres. The valve is configured as 'open centre' such that when no torque is applied to the steering wheel, there is minimal restriction to the oil supply, resulting in low oil pressure and the freedom to flow to both rack cylinders and through the outlet port back to the reservoir. The pressure differential across the rack piston is zero.

When the steering is turned to the left against some resistance, the input shaft/rotor transmits the motion to the pinion gear/valve sleeve via the torsion bar, which twists in proportion to the effort applied at the wheel and the resistance at the tyres. Effort is high typically at slow vehicle speeds, or when parking. When the bar twists, the angular position of the rotor relative to the valve sleeve alters, with the result that the ports to cylinder 1 become biased towards the pressurised supply, and the ports to cylinder 2 biased to the reservoir return port at low pressure. Hence a pressure differential is created within the rack housing, with higher pressure in cylinder 1 applying a force to the steering rack piston to assist the turn.

If the steering is turned hard against resistance, or the lock stop, the valve will completely close off the return path and cause delivery pressure from the pump to rise until the pressure relief valve in the pump opens; maximum assistance has been reached.

The ultimate degree to which the torsion bar is permitted to twist, is limited by mechanical contact between the input shaft and the pinion gear. This mechanism prevents the torsion bar being over stressed, defines the maximum level of assistance, and provides a safety back up in case of torsion bar failure; steering control would be retained, albeit with a small amount of lost motion.

HI.3 - PAS FLUID CHECK & REFILL PROCEDURE

(See sub-section HI.12 for PAS reservoir removal)

Recommended fluid: PAS or Automatic Transmission Fluid meeting Dexron II
Capacity: 1.5 litre

Fluid Level Check
The PAS fluid reservoir is located at the right hand rear corner of the engine bay with the fluid level visible through the translucent material of the reservoir. The level of fluid will rise as the oil temperature warms during normal operation, and the best time to check the level (part of each routine service) is with the engine warm, immediately after a run.

With a warm engine, the level should be close to the 'MAX' mark, and if cold, close to the 'MIN'. Note that there are two sets of marks on the reservoir, with hot markings on the outboard side, and cold marks in the inboard side, the hot marks being at a slightly higher level. The fluid level will also drop slightly when the engine is running.

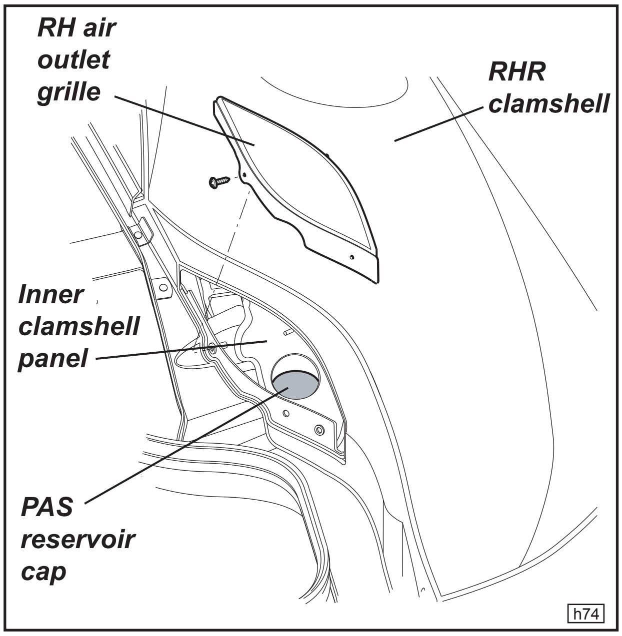
Under normal circumstances, the PAS fluid should not require any topping up, and a drop in level is likely to be an indication of a leak.

If topping up is required:
1. Release the No. 8 x 3/4", flg. pozi screws (2) retaining the RH air outlet side grille at the RH rear corner of the engine bay.

2. Remove the reservoir cap.

3. Using a suitable funnel to aid accurate pouring into the reservoir, slowly add approved PAS fluid. Do not overfill.

4. Replace the cap securely, and refit the grille.



Fluid Change & Bleeding
In the normal course of operation, it is not necessary to change the hydraulic fluid, only to check the level. If, however, the system becomes contaminated with dirt or other fluids, all pipework connections should be released and fluid expelled using low pressure air. Dispel fluid from the rack mechanism by turning the steering to each full lock. Dispel fluid from the pump by cranking the engine for a few moments with ignition disabled.

After draining the fluid, or after the loss of fluid during the course of repairs or hydraulic system disconnection;
- Fill the reservoir with an approved fluid.
- Raise the front of the car and turn the steering wheel slowly from lock to lock several times. Top up fluid level if necessary.
- Lower the car, start the engine and idle for a few minutes, before turning the steering to full lock and holding for 3 seconds, then repeating for the opposite lock. Repeat this sequence several times.
- Stop the engine and check the reservoir level.
- Any foaming or emulsification of the oil is an indication of air in the system. Repeat the above procedure. If symptoms persist, check for air/fluid leaks.

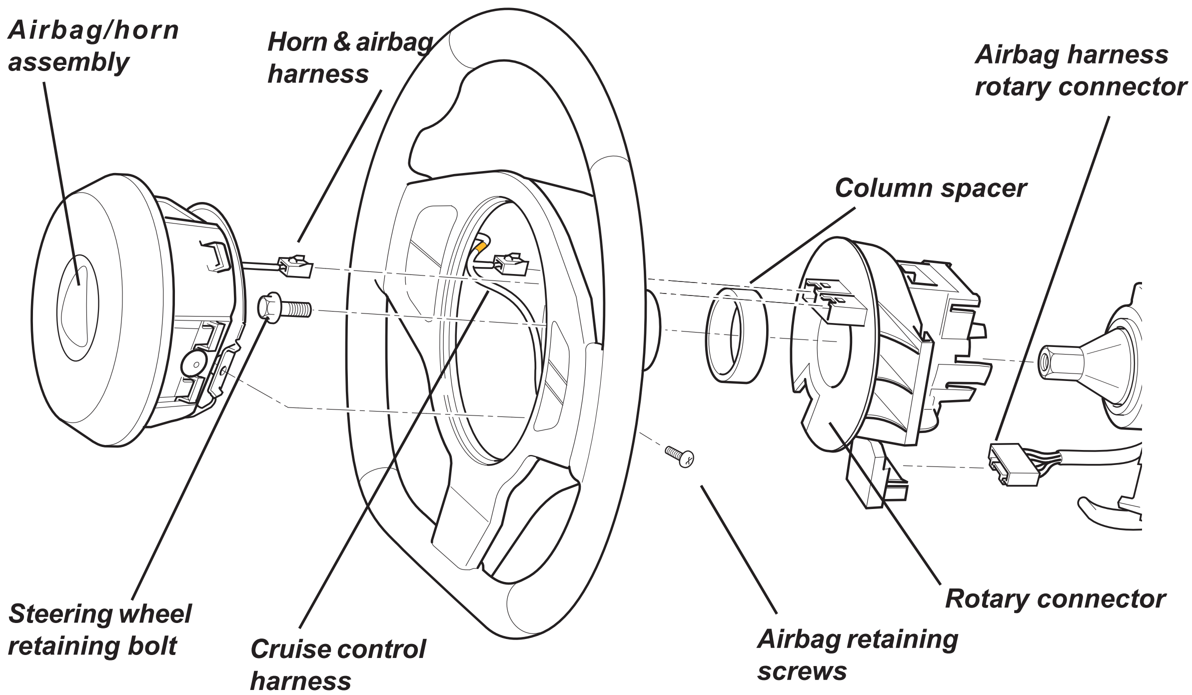
HI.4 - STEERING WHEEL

The alloy three spoke steering wheel features a flattened lower section to facilitate driver access, a leather trimmed rim, buttons for the cruise control (if fitted) and an airbag module which also serves as a press pad to operate the horns. The electrical supply for the steering wheel mounted equipment utilises a rotary coil assembly surrounding the column.

The wheel comprises a cast magnesium rim and spokes, to which is bolted a machined alloy hub, with a screw fixed alloy pressing to carry, via double sided tape, the cruise control buttons and/or trim.

To Remove Steering Wheel

WARNING: The following procedures must be followed in the order listed to temporarily disable the airbag system whilst working in the immediate vicinity of an airbag. Failure to follow this procedure could cause unintended airbag deployment, resulting in personal injury and unnecessary airbag system repairs.



i) Turn off the ignition.
ii) Before disconnecting the battery, use the Lotus TechCentre to read any stored trouble codes.
iii) Disconnect the negative (earth) lead from the battery and tape back to ensure that no contact with the battery negative terminal can be made.
iv) Wait for 30 seconds.
v) Unclip the top part of the column shroud, then remove the lower part after releasing the three retaining screws.
vi) Locate and unplug the airbag harness from the rotary connector. Note that the connector socket is fitted with 'shorting bars' which automatically interconnect the high and low terminals of the airbag to prevent unschedules deployment caused by a voltage differential.

1. On the reverse side of the steering wheel, release the two Torx head screws, accessible via holes in the plastic shroud around the steering wheel hub.

2. Withdraw the airbag module and disconnect the two airbag harness connectors and the two horn leads.

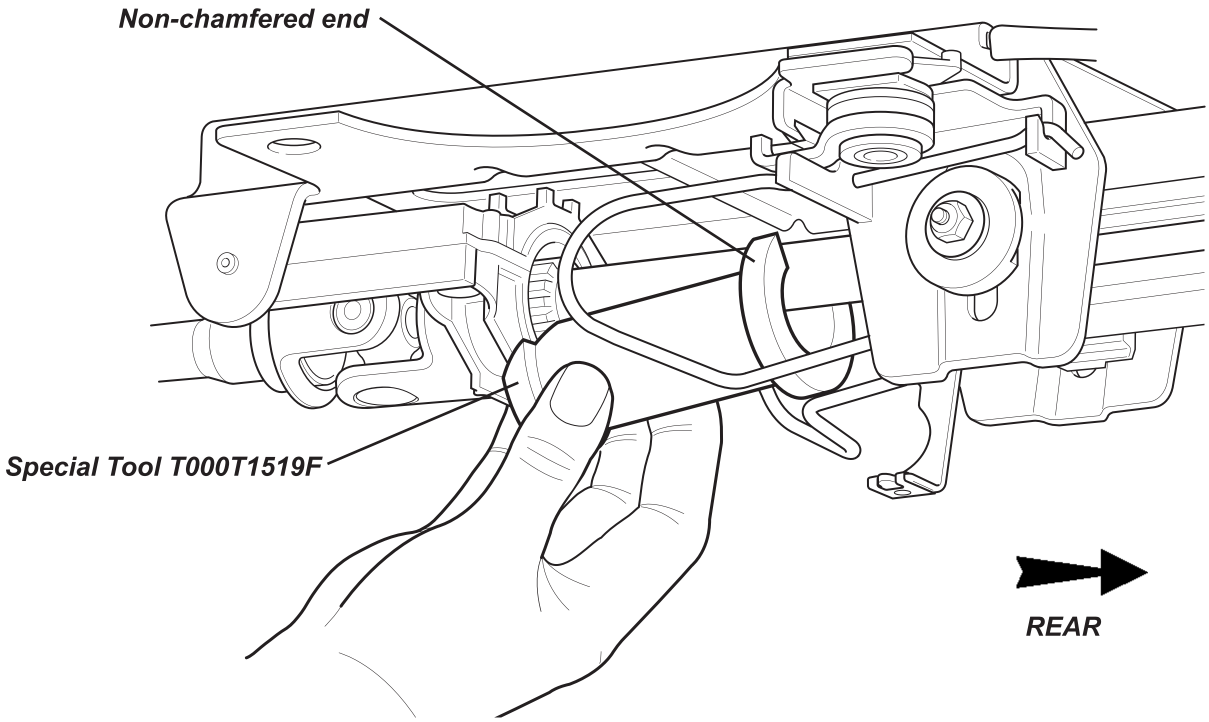
WARNING: When carrying a live airbag module, make sure the bag and trim cover are pointed away from you. In case of an accidental deployment, the bag will then deploy with minimal chance of injury. When placing a live airbag module on a bench or other surface, always face the bag and trim cover upwards, away from the surface. This is necessary so that a free space is provided to allow the airbag to expand in the unlikely event of accidental deployment.

CAUTION: An aluminium spacer washer is fitted between the steering wheel boss and the column upper thrust bearing to ensure that any axial load applied to the column via the steering wheel is transmitted to the upper bearing. If this washer is omitted on re-assembly following steering wheel removal, application of an end thrust to the upper steering column could result in displacement of an upper column intermediate bearing race. Such a consequence is not easily recovered, and could require column replacement.

To guard against this possibility, a service spacer tool T000T1519F is available to be used as a precautionary measure during column servicing. If the steering wheel of an Evora is to be removed, or other column servicing performed, first fit this spacer tool in the following manner:

a) Push down the adjustment release lever beneath the steering column, raise the column fully and pull the steering wheel fully rearwards.

b) From beneath the column, slide the Nylon spacer tool T000T1519F onto the inner column between the bearings of the upper column assembly. Feed the non-chamfered end in first, towards the rear, and then rotate the tool to sit on top of the column.



c) Push the steering wheel forwards to trap the tool in place and then lock the adjustment lever.

3. Unplug the cruise control harness and the airbag/horn harness from the rotary connector.

4. Ensure the wheels are pointing straight ahead, match mark the wheel to the column, and remove the steering wheel retaining bolt. Note that the wheel is located on a steep angle hexagonal taper on the column.
CAUTION: If excessive force is applied to either the steering wheel or column, the break-out inserts securing the column to the fascia bracket may be disturbed, necessitating replacement of the complete column. If necessary, use an appropriate puller.

5. If necessary, remove the cruise control switches and trim by carefully prising away from the double sided tape fixing. Remove the 4 screws to release the cover from the wheel reverse side.

6. Before refitting a steering wheel, ensure that the aluminium spacer ring A132U0523F is fitted between the wheel hub and the column upper bearing. Some early cars may have been built erroneously with this spacer omitted.

7. Refit in reverse order to removal, but before fitting the steering wheel, it is essential to centralise the rotary connector, or the unit will be broken when lock is applied. Turn the connector fully clockwise until it tightens, and then turn back just over two turns until the red marker appears in the square window. Note that this instruction is printed on the rotary connector. Ensure the road wheels are pointing straight ahead and fit the steering wheel with the match marks aligned. Tighten the steering wheel retaining bolt to 50 Nm.
When fitting the jump harness for the cruise controls, ensure the cable is routed through the channel provided in the steering wheel carrier.

8. After re-assembly, check that the airbag tell tale lights for a few seconds with ignition, and then goes out. Reset column position to customer's preference.

Steering Wheel Alignment

Ideally, the steering wheel should align in the straight running position, with the steering rack centralised and with equal track rod lengths. In practice, a minor compromise to track rod lengths may have to be made. To arrive at the optimum setting, proceed as follows:

Note that only one splined joint in the steering system allows a choice of position, this being the connection of the lower column to the rack pinion shaft.

1. Set the front wheel alignment to specification with equal track rod lengths (see sub-section CK.2).

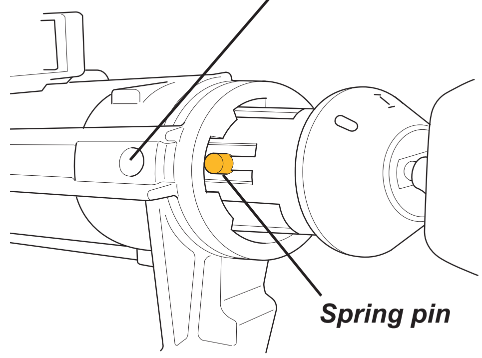
2. With the wheels pointing straight ahead, fit the steering wheel on the column hexagonal taper in the straight ahead position, and secure with the retaining bolt, torque tightening to 50 Nm.

3. Road test the car and mark the actual 'straight ahead' position of the wheel which should deviate from the ideal position by less than 5°. If more than this, the lower column should be released from the rack pinion shaft and re-positioned on the splines before repeating the procedure.

4. Final steering wheel alignment is achieved by asymmetric adjustment of the track rods, retaining the overall toe-out setting.

HI.5 - IGNITION LOCK BARREL

Removal.



1. Remove steering column shroud (see sub-section VE.10).

2. Do not remove ignition switch unless necessary (see cautions on sub-section HI.7).

3. Place key in ignition barrel and turn to position 'I'.

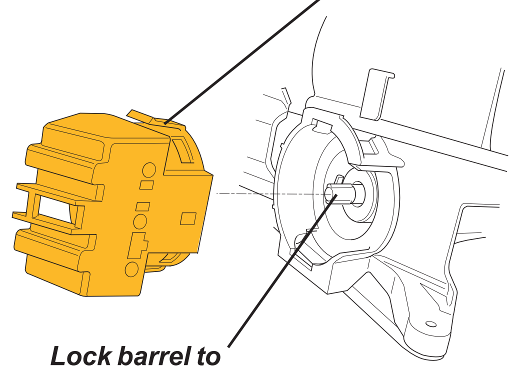
4. depress the spring pin accessible via a hole in the rear of the housing, and withdraw the lock barrel.

Refitment.

Is the reversal of removal, note: the ignition key must be positioned at 'I' before the locating pin can be depressed to allow insertion back into the barrel housing. Ensure the pin is correctly engaged in the housing hole.

HI.6 - IGNITION SWITCH

Removal



1. Remove steering column shroud (see sub-section VE.10).

2. Do not remove lock barrel unless necessary (see cautions on sub-section HI.7)

2. Disconnect the wiring harness multiplug connector from the switch.

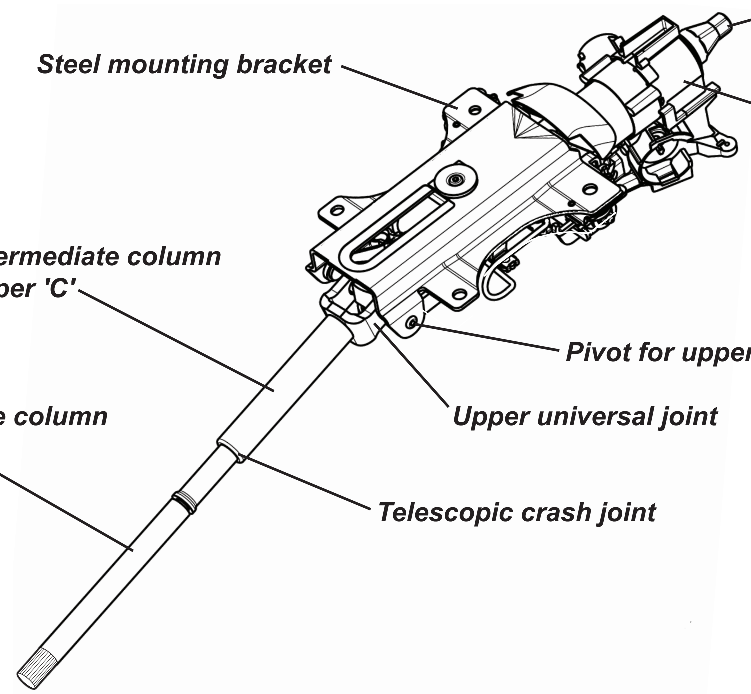
3. Depress the upper and lower switch locking tabs and withdraw the switch from the column housing.

Refitment.

Is the reversal of removal, note: the inset drive within the ignition switch must be adjusted to match the position of the lock spindle before refitting onto the column housing.

HI.7 - STEERING COLUMN ASSEMBLY

The steering column assembly includes a two-piece upper inner column, consisting of two tubes ('A' upper; 'B' lower) with a sliding splined joint to accommodate reach adjustment, articulated via a universal joint to a similarly constructed two-piece ('C' upper; 'D' lower) intermediate column, which allows for telescoping compression in the event of vehicle collision. A third, lower column ('E'), is articulated from the intermediate shaft via a second universal joint, and is splined directly to the rack pinion shaft.



The upper column assembly comprises a steel mounting bracket from which is hung a pivoted alloy carrier for the ball bearing race supporting the lower end (B) of the two-piece upper column.

The upper (steering wheel) end of the column (A) is supported in a steel tube outer column fitted with synthetic plain bushes. The outer column is fixed to the column mounting bracket via a cam operated clamp, which allows vertical and axial movement of the upper outer/inner column assembly, the inner column (A) being free to slide over the splines on the lower column (B).

The upper end of the assembly incorporates an alloy housing to accommodate the steering lock/ignition switch and top bearing.

The lower end of the upper column assembly is articulated via a universal joint to the intermediate column, which itself comprises an upper tube (C) splined over a lower shaft (D) to provide a telescopic length variation of approx. 50mm.

This feature allows for steering column length compression in the event of vehicle collision in order to reduce the potential for occupant injury. For a similar purpose, the mounting bracket for the upper column assembly is constructed in two parts, the forward part being rigidly secured to the scuttle beam, whereas the rearward part is retained to the beam only by open ended slots equipped with special 'break out' inserts. In the event of a heavy forward load being applied to the steering wheel, such as may occur in an accident, the rearward part of the bracket complete with upper column assembly is able to break free from the scuttle, pushing the column (B) through the lower bearing and collapsing the intermediate column. After any such occurence, the complete steering column assembly should be replaced.

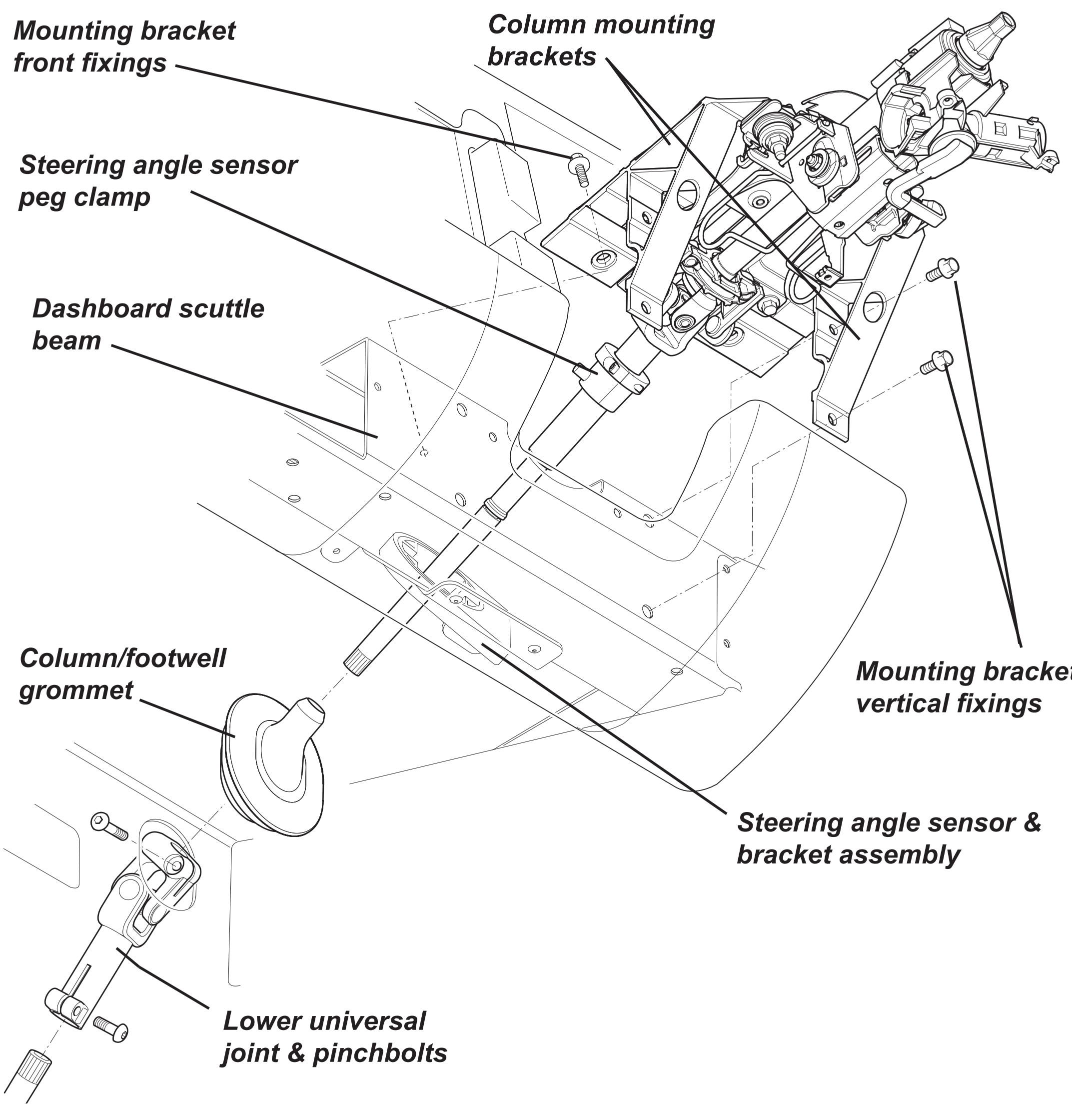
If, in any circumstances, an abnormal load is applied to the steering wheel or upper column assembly, the column shrouds should be removed and the 'break out' inserts carefully checked.

To Remove Steering Column Assembly

WARNING: The driver's airbag is housed in the hub of the steering wheel. Precautions need to be taken for personal safety when working with airbags and associated componentry. Do not attempt to remove the airbag, steering wheel or column without first referring to section WF.

1. Remove the steering wheel (see sub-section HI.4).
2. Remove the rotary connector (see sub-section WF.10).
3. Remove the fascia dash panel (see sub-section VE.7).
4. Release all wiring harness restraints from the column.
5. If necessary, remove the steering lock/ignition key barrel (see sub-section HI.5)
6. If necessary, remove the ignition switch (see sub-section HI.6)

CAUTION: If the lock barrel is removed, on no account should the position of the lock mechanism be disturbed, or irrepairable displacement of the mechanism may occur, necessitating replacement of the complete column assembly.



7. Remove the front undertray and remove the pinch bolt securing the lower universal joint to the column. Match mark the joint and column

8. The column must be withdrawn complete with the two extruded alloy mounting brackets securing it to the scuttle beam. For each of these two brackets, release the single front fixing into the top surface of the scuttle beam, and the two rear fixings into the vertical face; all use threaded inserts in the chassis.

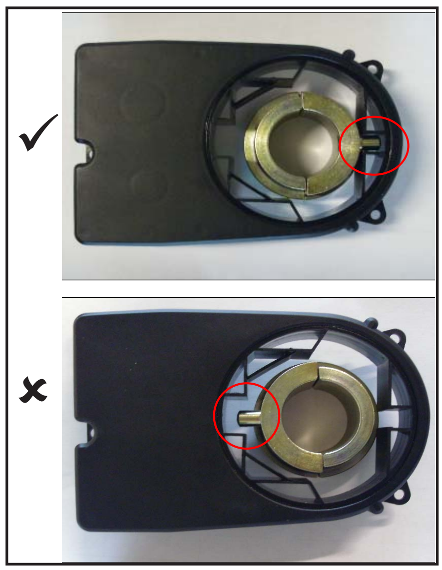
9. Withdraw the column assembly from the pinion shaft and through the steering angle sensor and fascia aperture. (See sub-section JL. - 15 for further information on the steering angle sensor).

To Fit Steering Column Assembly

Continue re-assembly in reverse order to removal with the following notes:

- Slide the toe board gaiter over the intermediate column during installation, and ensure that the steering angle sensor peg locates in the narrow slot in the hub of the steering sensor.

Orientation of steering column peg and steering angle sensor



- Align the match marks before engaging the column into the lower u/j. If a new column is being fitted, note that the flat on the spline of the intermediate shaft must align with pinch bolt axis in the joint.

- Torque tighten fixings as follows:

- Column 'break out' fixings; 24 Nm
- Column to forward fixing holes in extruded scuttle brackets; 24 Nm
- Extruded brackets to scuttle; 24 Nm
- Lower u/j pinch bolts; 25 Nm

Once the steering column is refitted it is essential to recalibrate the steering angle sensor using Lotus Techcentre. Once the correct vehicle by model type, year and market has been identified then select ABS > Guided routines > Steering angle sensor calibration.

Failure to calibrate the sensor could result in impaired traction control/Dynamic Performance Management funtionality and will illuminate the tell-tale light.

Fitting New Steering Column Assembly

If a new column is being fitted, the steering angle sensor peg clamp must be transferred to the new column, with the upper edge of the clamp positioned 29mm from the bottom face of the upper universal joint. Orientation is immaterial.

Aftersales service replacement steering column assemblies are now supplied with an ignition switch already fitted and a plastic sleeve fitted into the lock barrel bore to minimise the risk of the lock mechanism being disturbed in transit or whilst being fitted to the vehicle

CAUTION: Even though the risk of lock mechanism becoming displaced is minimised with the ignition switch in situ, do not remove the plastic sleeve until you are ready to insert the lock barrel.

In the unlikey event that a steering column is supplied without an ignition switch follow the procedure shown on the next page:

a) With the plastic sleeve still in place use the lock spindle to turn the lock mechanism to position 1 (to match the features of the key lock barrel at this position see picture 1). At this position, the column is unlocked.

b) As a precaution, maintain a pulling action on the lock spindle from now until the lock barrel is securely installed.

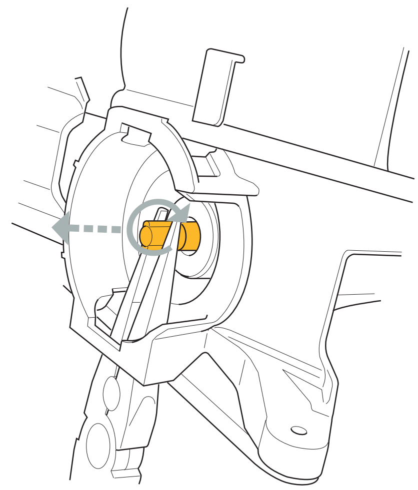
c) Turn the plastic insert a quarter turn clockwise and withdraw. (Picture 2).

d) Fit the lock barrel (see sub-section H.I.5).

e) The lock spindle may now be released.

f) Fit the ignition switch (see sub-section H.I.6).

The column assembly is now safe to fit to onto the vehicle.



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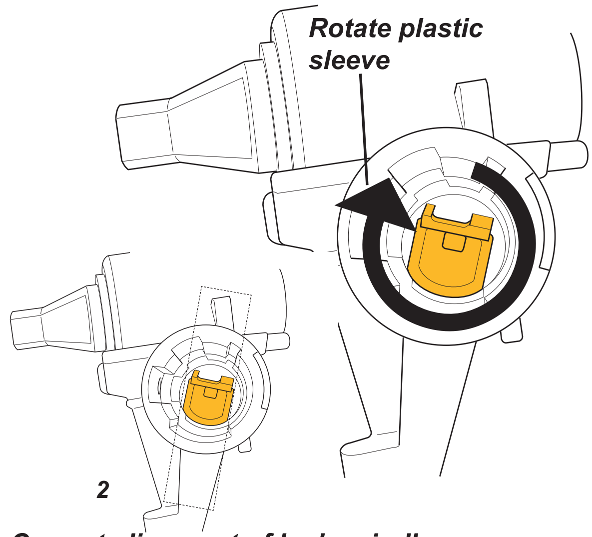


2

Correct alignment of lock spindle

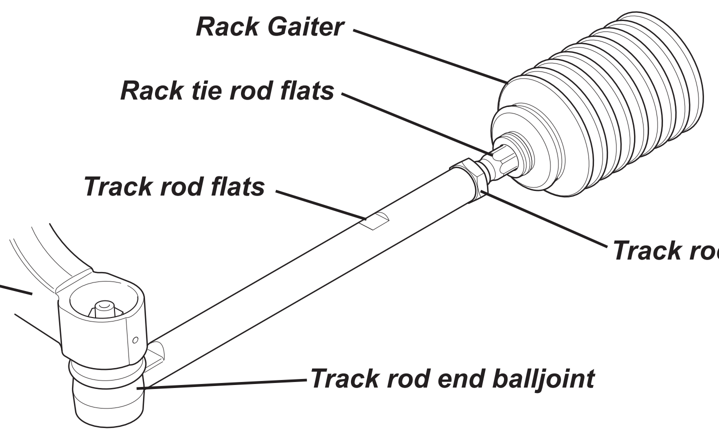
HI. 8 - TRACK ROD ENDS & RACK GAITERS

Front Wheel Alignment

Alignment is measured either by the angle the front wheels make with the vehicle's longitudinal axis, or the difference in dimension between the wheel rim to wheel rim measurement at the front and rear of the wheel at hub centre height. The wheels are said to 'toe-in' when the wheel paths converge ahead of the vehicle, and 'toe-out' when they diverge. Wheel alignment is designed to vary with both steering angle (Ackermann; to minimise low speed, tight turn tyre scrub) and suspension travel (bump steer; to provide consistent handling) and should be measured only 'straight ahead' at the specified mid-laden ride height.

Provision is made for the adjustment of front wheel alignment at the joint between the steering rack tie rods, which are ball jointed to the outboard ends of the rack, and the track rods which incorporate the outer ball joints ('track rod ends') which connect to the steering arms on the hub carriers.

The mid-laden ride height and alignment specification is detailed in sub-section CK.2.



Note that in order to preserve the required bump steer characteristic and steering symmetry, the effective length of each track rod must remain equal; compare dimensions and equalise if necessary before subsequently adjusting each track rod by a similar amount:

1. Slacken the rack gaiter outboard clips.

2. Hold the track rod using the flats provided, and slacken the locknut. Repeat for the opposite side.

3. Turn each track rod a similar amount. As a guide, turning both track rods by one quarter of a turn will alter overall toe-out by approx. 2.0 mm.

4. When adjustment is correct, hold each track rod and tighten the locknuts to 45 Nm. Tighten the rack gaiter clips.

CAUTION: When slackening or tightening the track rod locknuts, it is important that the torque reaction is resisted using the track rod flats, and that the ball joint itself is not allowed to be stressed.

Track Rod Ends

The track rod end ball joints are sealed for life and maintenance free. If replacement is required;

- Remove the ball pin nut and use a ball joint splitter tool to separate the joint from the steering arm.

- Unscrew the track rod from the steering rack tie rod, using the locknut as a refitment position guide.

- On re-assembly, tighten the ball joint to steering arm nut to 45 Nm, and set the front wheel alignment as detailed in sub-section CK.2.

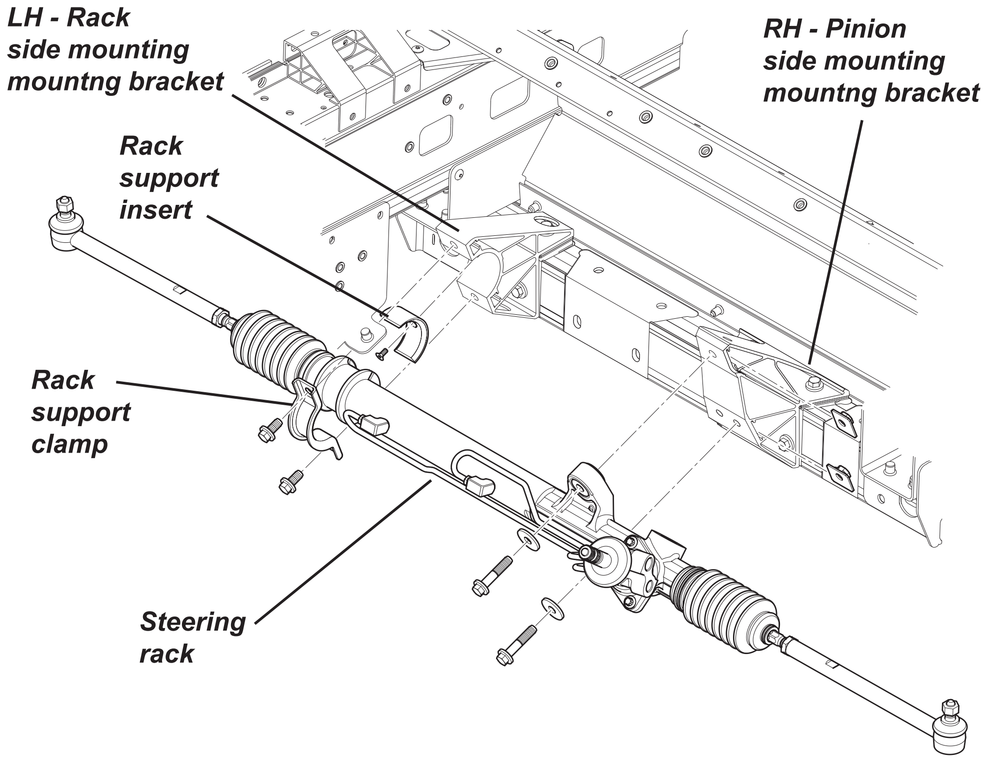
Steering Rack Gaiters

The convoluted gaiters sealing each end of the steering rack housing to the tie rods, should be inspected at service intervals and replaced immediately if found to be torn, cracked or otherwise damaged.

The ingress of dirt or water into the rack housing will cause rapid deterioration of the track rod inner ball joints, rack end bushes and rack and pinion mechanism, requiring replacement of the complete steering gear.

To replace a gaiter, remove the track rod (see above), release the gaiter clips, and slide the gaiter off the housing and tie rod. Check for consequent damage or wear and replace the steering gear assembly if necessary. Fit the new gaiter into position, and secure with new retaining clips.

HI.9 - RACK & PINION ASSEMBLY REMOVAL/REPLACEMENT



The steering rack assembly consists of an alloy pinion housing/valve body, and a steel tube through which the rack is guided. The pinion housing features two solid bushed lugs, which bolt to an extruded alloy bracket, itself secured to the subframe with four bolts threading into a tapping plate. Note that the only approved repairs or adjustments to the steering rack assembly are the replacement of the track rod ends, rack housing gaiters, and the pipes connecting the pinion housing to the rack body.

The RH (pinion) mounting bracket is packaged very close to the HVAC (Heater Ventilation Air Conditioning) unit. From '10MY VIN AH_10901 the HVAC unit was modified increasing its width and the RH mounting bracket was machined to accommodate the increased width.

Therefore if you are renewing the HVAC unit an any Evora prior to '10MY VIN AH_10901 with the latest level Aftersales replacement unit it will be necessary to also renew the RH (pinion) mounting bracket to the latest level for which the part number can be obtained in the Lotus Evora Service Parts List.

LH - Rack Side or RH - Pinion Side Steering Rack Mount Replacement

1.Remove steering rack - see procedure on following pages,

2.Release M10 x 30 flanged headed bolts (4) retaining the RH mount or M10 x 30 flanged headed bolts (2) retaining the LH mount to the lower wishbone longitudinal member of the front subframe.

3.Remove the mount(s) and collect spacer shims located betweens the mount and longitudinal member.

To Refit/Renew

Is the reversal of removal.
- Fit mount and spacer shims to lower wishbone longitudinal member.

Note: If the rack mounting plinths are removed from the front subframe, note that there are shim plates fitted between the plinths and the subframe top surface in order to control the height of the rack and the bump steer characteristic. Shim plates are available in thicknesses of 5, 2 and 1mm, with the standard setting being two 2mm shim plates at each position. Torque tighten the plinth to subframe fixing bolts to 45 Nm.

- Refit the 4 mount bolts and tighten to 45Nm.

- Refit steering rack - see on following pages.

To Remove/Replace Steering Rack Assembly

1. Remove both front wheels, and the front undertray - see service notes introduction section for further information.

2. Release the anti-roll bar from the drop link at each side - see service notes section CK.4 & 5 for further information.

3. At each side, remove the six screws securing the extruded alloy mounting plate to which the ARB clamp is fixed. Captive threaded inserts are used in the subframe. Withdraw the anti-roll bar assembly from the car - see service notes section CK.4 & 5 for further information.

4. Remove the nut securing each track rod end to the steering arm, and use a ball joint splitter to separate the joint - see service notes section HI.8 for further information.

5. Match mark the pinion shaft against the universal joint yoke to aid steering wheel alignment on re-assembly, and remove the pinch bolt - see service notes section HI.7 for further information.

6. Slacken the banjo bolts securing the feed and return pipes to the pinion housing, and collect the draining oil. Removal of the bolts may not be possible at this stage.

7. At each end of the rack housing, remove the two bolts securing the unit to the mounting brackets. Withdraw the pinion shaft from the lower u/j and remove the two banjo bolts as the assembly is withdrawn from below.

To Re-fit/Replace Steering Rack Assembly

Refit in the reverse order to removal, with the following notes:

- Engage the pinion shaft with the column universal joint (match marks aligned) as the housing is positioned. Fit and tighten the u/j pinch bolt to 25 Nm.

- Before securing the rack housing, refit the feed and return pipes to the pinion housing using new or annealed washers. Torque tighten M14 (return) to 18 - 25 Nm; M16 (feed) to 25 - 30 Nm.
- Torque tighten housing fixing bolts (4 off) to 45 Nm.

- Torque tighten track rod end ball pin nuts to 45 Nm.

- Torque tighten the anti-roll bar clamp mounting plate to subframe bolts (8 off) to 24 Nm.

- Torque tighten the anti-roll bar to drop link fixings to 38 Nm.

- Refill the power steering reservoir and bleed the system as detailed in sub-section HI.3

- Check and adjust the front wheel alignment as detailed in sub-section CK.2.

HI.10 - PAS PUMP & TESTING PROCEDURE

The vane type, constant displacement hydraulic pump is mounted on the right hand front of the cylinder block, and is driven by the automatically tensioned multi-rib auxiliary belt from the crankshaft pulley. To check for correct functionality, the steering effort may be checked with the engine running and the car stationary:

PAS Pump Test Procedure

Tools required
PAS Pressure Test Gauge Kit - use a universal kit, or Toyota part number 09640-10010

1. Remove the rear clamshell (see Sub-Section BV.6).

2. Check auxiliary drive belt condition and fluid level. With engine idling, turn the steering from lock to lock several times to raise fluid temperature and check for foaming or emulsification; if necessary, bleed the system (see Sub-Section HI.3).

3. Remove the banjo bolt connecting the pressure outlet pipe to the PAS pump. Fit the adaptor pipe from the test kit into the pump, and connect the gauge inlet pipe to the adaptor.

4. Connect the outlet pipe on the gauge to the banjo connector using the union adaptor.

5. Open the gauge valve, and bleed the system of air (see above).

6. With the engine idling, turn the steering from lock to lock several times to raise fluid temperature (70 - 80°C).

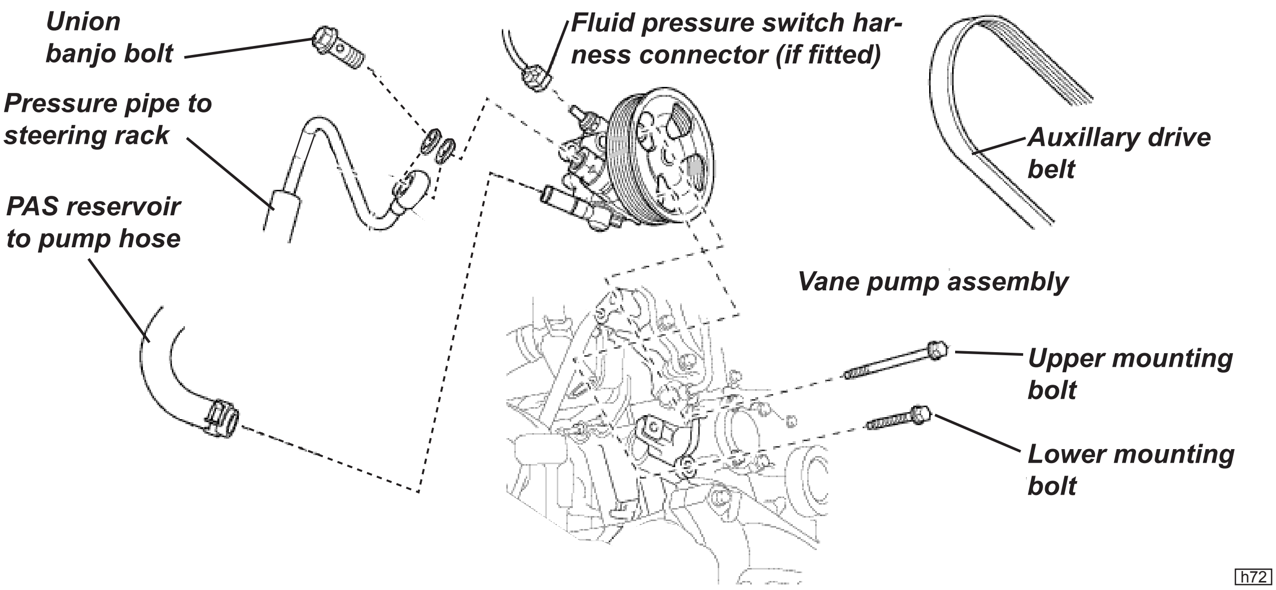
7. With the engine idling, close the gauge valve and observe the gauge reading - **Do not keep the valve closed for more than 10 seconds,** or excessive oil heating will occur.
   Minimum fluid pressure: 7800 to 8300 kPa (1100 to 1200 psi).

8. With the engine idling, open the gauge valve fully and measure the pressure at engine speeds of 1000 and 3000 rpm.
   Maximum difference: 490 kPa (70 psi).

9. With the engine idling and the gauge valve fully open, turn the steering to full lock and measure the fluid pressure. Repeat for the opposite lock - **Do not keep on full lock for more than 10 seconds,** or excessive oil heating will occur.
   Minimum fluid pressure: 7800 to 8300 kPa (1100 to 1200 psi).

10. Disconnect the gauge pipes and refit the banjo union to the pump. Bleed the system of air, see sub-section HI.3.

HI.11 - PAS PUMP REMOVAL & INSPECTION



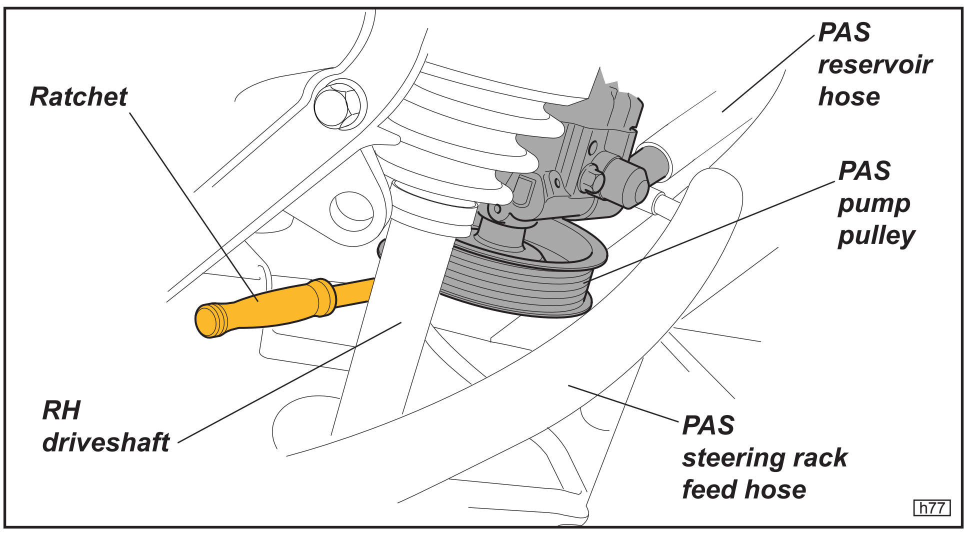
The vane type, constant displacement hydraulic pump is mounted on the right hand front of the cylinder block, and is driven by the automatically tensioned multi-rib auxiliary belt from the crankshaft pulley. The pump is secured to the engine by two bolts,

Removal:

1. Remove the rear undertray (see service notes introduction section).

2. Use a syringe to empty the PAS reservoir of oil and reduce potential spillage (see sub-section HI.3).

3. Relieve the tension on the auxillary belt - see service notes sub section EJ.4 for information. Mark the direction of rotation on the belt before unhooking from the PAS pump pulley.



4. Disconnect the reservoir hose from the pump, and plug both the hose and pump port.

5. Release the banjo union bolt from the high pressure feed pipe bolted to the pump (torque 30Nm), collect both banjo gaskets and plug both the pipe and pump port.

6. Disconnect the harness from the PAS pump pressure switch (only fitted to early start of production vehicles).

7. The pump is secured to the engine by two bolts, accessible between the spokes of the pulley. Remove

the upper and lower bolts (both torqued to 43Nm).

8. Withdraw the pump from underneath the vehicle.

Refitment:
Reversal of removal except:

- Access to the pump bolts from under the vehicle using a torque wrench may be limited. Better access may be achieved by removing the RHR wheelarch liner - see section BV.17, then torque tightening the upper PAS pump using a suitable socket and extension from above the subframe as illustrated. The lower bolt may be accessed via the subframes driveshaft aperture.

- Fit the banjo bolt with two new washers and connect the high pressure pipe to the pumps outlet union, (torque to 30Nm).
  Care point: Removing the PAS pump from the engine block may cause the union bolt securing the high pressure fluid pipe to the pump body to loosen which may potentially cause a power steering fluid leak.

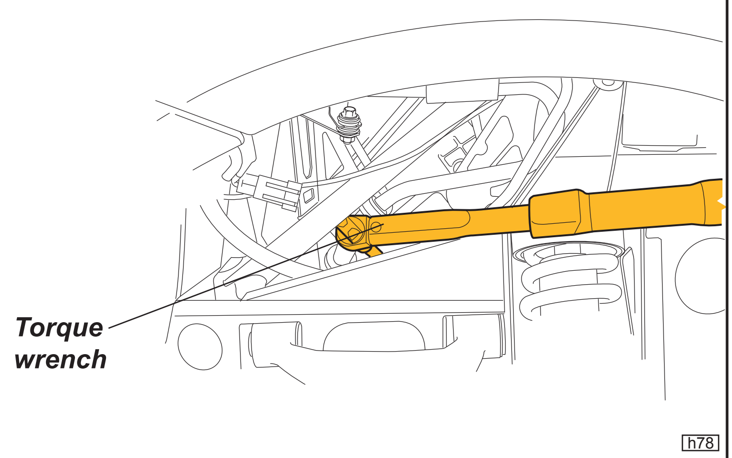
  Once the PAS pump is refitted to the engine, it is essential to check the torque of the high pressure pipe union bolt (torque 30Nm).

  To gain access to the union bolt to check the torque will require the removal of the engine access panel in the luggage compartment; see service notes section EJ.2 for further information.

- Refit the auxiliary drive belt to all pulleys, ensuring that the belt ribs are correlty located on each drive pulley. Rotate the tensioner counterclockwise to relieve tension, and remove the tensioner locking pin.

- Refill and bleed the PAS system, see sub-section HI.3 and check for leaks.

Upper PAS bolt access through RHR wheelarch above subframe



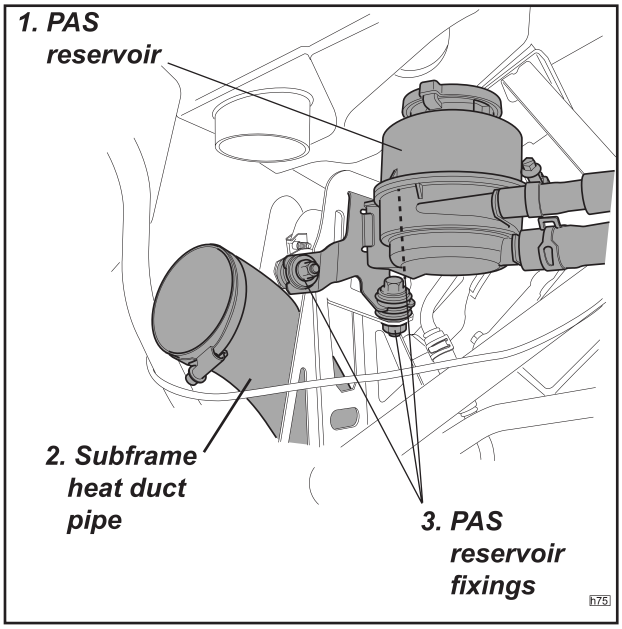
HI. 12 - POWER STEERING RESERVOIR REMOVAL/REPLACEMENT

Removal:
Remove the RHR wheelarch liner – see service notes section BV.17.

1. Use a syringe to empty the PAS reservoir of oil and reduce potential spillage (see sub-section HI.3).

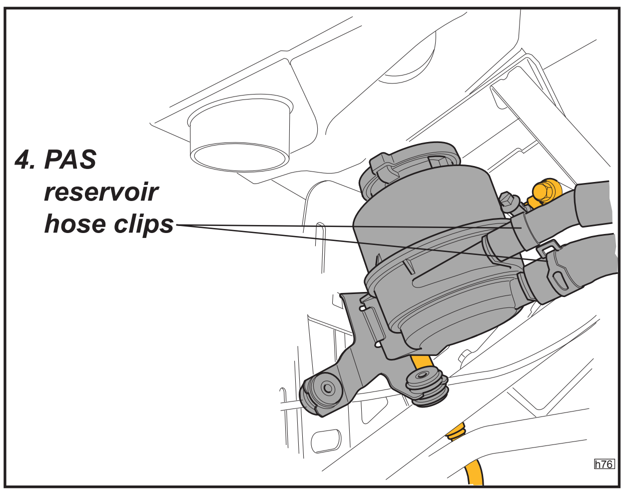
2. Release the upper hose clip securing the subframe heat duct pipe to the clamshell exit vent, pull the top section of the pipe to one side to gain access to the rearmost PAS reservoir bracket to back stay fixing bolt.

3. Release and remove the 3 M8 bolts and nuts (torque 10NM) securing the PAS bracket to the backstay, taking care not to place any strain on the PAS hoses, position the PAS reservoir downwards.



4. Release the clips securing the steering rack return hose and PAS pump hose to the reservoir and allow any excess fluid to drain into a suitable container.

5. Any residual fluid remaining in the reservoir assembly can now be drained into a suitable container.

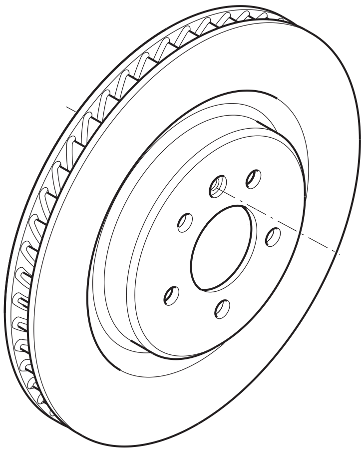


Refitment:
Reversal of removal except:

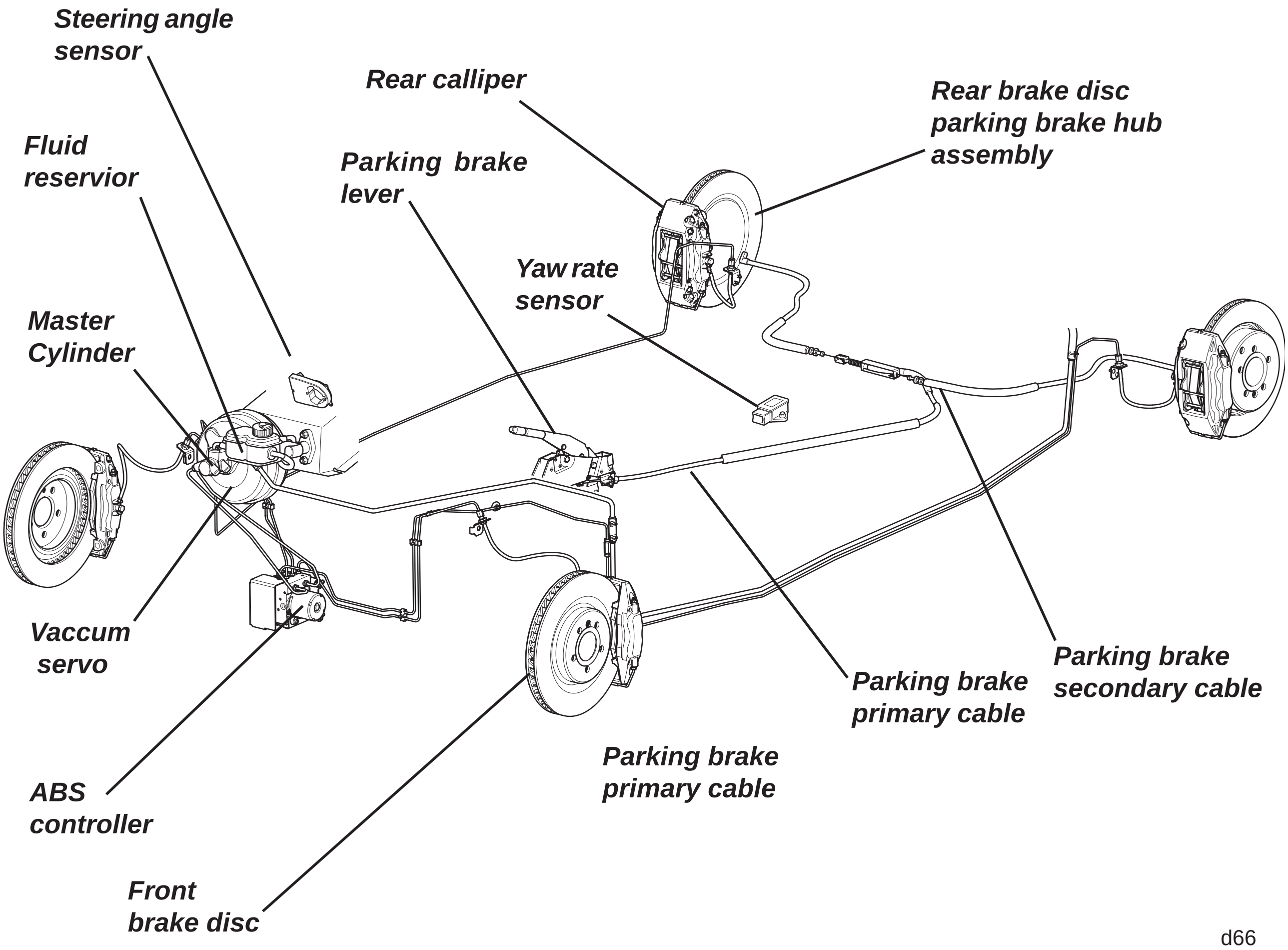
Refill reservoir with suitable PAS fluid and bleed system as necessary – see sub section HI.3 for further information.

BRAKING SYSTEM

SECTION JL



GENERAL LAYOUT



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JL.1 - GENERAL DESCRIPTION

The braking system of the Lotus Evora comprises a four piston calliper and brake disc at each wheel operated by a tandem master cylinder with dual diaphragm vacuum servo power assistance. The dual hydraulic circuit is divided front/rear and modulated by a Kelsey-Hayes microprocessor based anti-lock system. A cable actuated parking brake uses brake shoes operating in drums incorporated into the rear discs.

The brake callipers are supplied by A.P. Racing, and feature lightweight alloy bodies housing four pistons in opposed pairs. The castings for the front and rear callipers are common, but are machined differently to accommodate the differing piston diameters. In the front callipers, the leading pistons are 38.2 mm diameter, and the trailing pistons 41.3 mm. The rear callipers house 38.2 mm leading pistons and 36.0 mm trailing. Each calliper is marked on its inner, inboard face, alongside the pad aperture, with its designated fitting position; 'RF' representing Right hand Front, with others marked as LF, RR, and LR. Each calliper is secured to its hub carrier by two bolts disposed in a plane perpendicular to the disc axis, with the front callipers mounted behind the axle line, and the rear callipers ahead of the axle.

The front cast iron discs are 350 mm diameter, 32 mm thick, with optional cross-drilling to enhance pad cleaning, and include internal curved vanes to draw cooling air from the centre to the periphery, with the vanes curving backwards in relation to the normal direction of rotation. The rear cast iron discs include similar features, but are 332 mm diameter and 26 mm thick, and incorporate integral 185 mm diameter drums for the parking brake shoes. Each disc is sandwiched between the road wheel and hub, and is retained for convenience by a single countersunk screw.

The Continental Teves tandem master cylinder incorporates a front section to supply both front brakes, and a rear section to supply the rear brakes. A translucent fluid reservoir is mounted on a bracket above the master cylinder, and is divided into front and rear chambers separated by a weir. The two chambers are connected to the front and rear master cylinder sections by flexible hose, with a third hose connecting the rear brake reservoir chamber to the clutch master cylinder to supply that system's needs. A fluid level sensor in the filler cap will light a fascia tell tale lamp if the level becomes dangerously low.

The parking brake ratchet lever is mounted between the seats in a fabricated steel structure which also houses the gearchange mechanism. The lever activates a primary cable which exits the cabin at the front of the fuel tank bay, and turns through 90° to connect to a balancing yoke at the front of the engine bay. The yoke forms the abutment for the primary outer cable, with the inner cable continuing through a slot in the yoke to link to the RH secondary cable. The opposite end of the yoke connects to the LH secondary cable, with both secondaries leading to their respective rear wheel parking brake backplates. The interaction of the yoke with the three separate cables results in an automatically balanced force being applied to each of the secondary cables.
At the each brake backplate the secondary cable connects to a lever mechanism which provides a balanced expanding force to the lower ends of the parking brake shoes. The upper ends of the shoes pivot against opposite ends of an adjustable length abutment, with access to the toothed adjuster screw available via a hole in the brake backplate.

The parking brake should be applied by pulling up the lever with high effort, and engaging the highest ratchet setting attainable. When parking the car on a slope, the additional precaution should be taken of leaving the transmission in first or reverse gear and steering the wheels towards the kerb.

The braking system is designed to enhance brake performance during high speed driving, with good fade and pad wear characteristics, with the pads offering a higher friction level when heated to normal working temperature than when cold. Required pedal effort will reduce as cold brakes become heated to normal working temperature, and the braking efficiency will increase significantly as new discs or pads become 'bedded in'. After fitting new brake components, maximum braking efficiency will be achieved if, for the first few hundred miles, needless heavy braking is avoided, and the brake pads are allowed to 'bed in' fully before being used to their full potential.

A Bosch Antilock Brake System (ABS) is used to optimise brake performance in extreme conditions and reduce the tendency of any wheel to lock up. Under most conditions, the maximum braking force is provided by a wheel which is rotating at about 90% of road speed. Apart from the likelihood of increasing the stopping distance, a locked wheel provides no steering force, such that with both front wheels locked, movement of the steering wheel has almost no effect on vehicle direction. With the antilock system, even panic braking results in controlled deceleration and the retention of steering response and is especially advantageous when braking on slippery road surfaces and in bad driving conditions. The ABS control system is self monitoring and has the capability of switching itself off if a fault is detected, allowing the base brake system to operate without anti-lock control.

Under normal circumstances, the hydraulic power brake system of the vehicle operates without input from the ABS, with brake pressures governed by the force applied to the brake pedal in conjunction with vacuum servo assistance. The ABS microprocessor receives signals from wheel speed sensors at each of the four wheel hubs, and interprets this data to determine if any wheel is tending to lock up. If imminent lock up is determined, the microprocessor commands solenoid valves in an electro-hydraulic unit to reduce the pressure in that particular brake circuit in order to restore wheel speed to that providing the maximum braking force consistent with continued wheel rotation.

When the ABS is operating, indication to the driver is provided by a ‘pulsing’ sensation felt at the brake pedal as fluid is pumped between the master cylinder and hydraulic control unit, and also by audible clicking of the relays and switches. These signals indicate to the driver that maximum retardation is being approached and that driving style should be modified to suit the conditions. The minimum stopping distance is achieved by applying the brakes firmly and steadily, and allowing the ABS to modulate hydraulic pressure. The driver should not attempt to emulate this process by ‘pumping’ the brake pedal, as modulation at the pedal will treat all four wheel brakes similarly, rather than the individual wheel control governed by the electronics.

During ABS operation, the wheels may appear to lock momentarily as the wheel speed changes rapidly, and some tyre noise (intermittent screeching) may be heard. This noise is normal and will vary with road and tyre conditions. However, a wheel that completely locks and stays locked for more than one or two seconds is not normal, and indicates that the vehicle should be serviced as soon as possible. The ABS cannot operate properly if the base brake system is faulty, and will also be affected by dragging brakes, faulty wheel bearings or other related faults.

The ABS controller constantly monitors the anti-lock system for faults and lights a fascia tell tale if a problem is detected. Information stored in the computer’s memory may be accessed via the Lotus TechCentre in order to facilitate diagnosis of system faults (see sub-sections JL.17 - 18 -19 for further information).

Hydraulic Brake Assist (HBA)
Hydraulic Brake Assist, is incorporated into the ABS to help produce the minimum stopping distance when emergency braking is demanded. By continuous monitoring of the brake pressure, the ABS control module is able to identify when such an event occurs, and when necessary, increases hydraulic pressure up to the anti-lock activation threshold, thus producing optimum controlled braking.

Electronic Brake Distribution (EBD)
This feature addresses the instability that could be caused under heavy braking due to the tendency of the lightly loaded rear wheels to lock prematurely. Electronic Brake Distribution is incorporated into the ABS to limit the rear brake system hydraulic pressure prior to any anti-lock intervention.

Electronic Differential Lock (EDL)
If hard acceleration is demanded in conditions of variable surface grip, or when cornering forces result in a lightly loaded inside rear wheel, there will be a tendency for drive torque to overcome the grip available, resulting in spinning of the lightly loaded wheel. When this situation is detected by the ABS controller, brake pressure is applied to the spinning wheel in order to transfer drive torque to the opposite wheel, thus maintaining drive and aiding vehicle stability. This feature works in conjunction with Lotus Traction Control.

Electronic Stability Programme (ESP) (where fitted)
This feature enhances vehicle stability in extreme manoeuvres typified by accident avoidance attempts or misjudged cornering demands. Current vehicle behaviour and an analysis of driver intent, are constantly monitored via the wheel speed sensors, a yaw rate and lateral acceleration sensor (mounted on the rear of the cabin floor centre support channel), and a steering angle sensor. When vehicle stability is determined as being at risk, the ABS is utilised to apply a measured braking force to individual wheels as necessary in order to help the driver maintain control of the vehicle.

JL.2 - TELL TALE LAMPS

Two tell tale lamps are provided in the instrument cluster to warn of problems in the brake system.

Brakes Tell Tale

As a bulb check function, this tell tale will glow red for about 3 seconds after ignition switch on, and then go out unless one of the following conditions applies:

i) The parking brake is applied.
ii) The brake fluid level in the master cylinder reservoir is low.

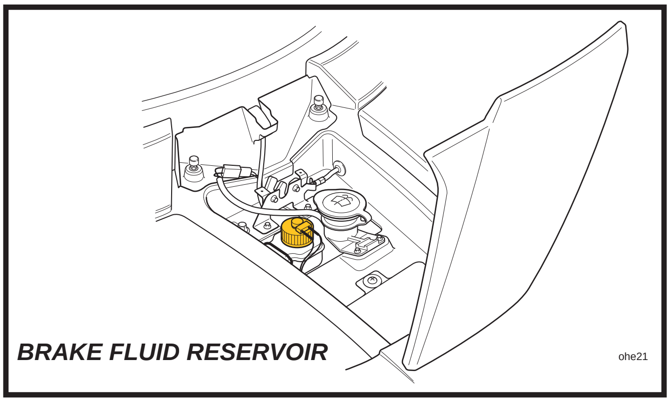
Under normal circumstances, the tell tale should light when the ignition is switced on, and go out when the parking brake is released. If the lamp stays on, or comes on whilst driving, the car should be stopped immediately, as this may be an indication of low brake fluid level caused by a hydraulic leak. A button on the reservoir cap allows the tell tale circuit to be tested.

ABS Tell Tale

The ABS tell tale warns the driver of problems in the anti-lock system. The lamp should light for about 3seconds following ignition switch on, and then go out. If the lamp remains lit, or comes on whilst driving, a fault in the ABS is indicated. The base brake system will continue to operate normally, but without ABS regulation. The car can be driven but should be checked and repaired at the earliest opportunity.

JL.3 - BRAKE FLUID CHECK & CHANGE

Before checking the brake fluid level, ensure that the car is parked on a level surface, and open the front body access panel. The level of fluid in the reservoir may be inspected without disturbing the filler cap, and should be level with the top of the 'MAX' mark moulded on the transluscent reservoir body. The level will fall progressively as the brake pads wear in service, and should be checked at each service interval. A sensor incorporated into the filler cap will light a tell tale lamp in the instrument cluster if the level drops significantly.



BRAKE FLUID RESERVOIR

Non-mineral type brake fluid symbol (yellow & black)

As a bulb check, the tell tale should light for about 3 seconds when the ignition is first turned on, but may also be tested by pressing the button on the filler cap, which action should light the tell tale with the ignition switched on.

The reservoir is mounted on a bracket fixed to the wiper spindle support, and is connected to the master cylinder by flexible hoses. An internal baffle divides the reservoir into two compartments, with one section supplying the front brake circuit, and a second section supplying the rear brakes in addition to, via another flexible hose, the clutch master cylinder. Service wear of the clutch friction plate will cause fluid to be displaced from the self adjusting clutch slave cylinder, back to the reservoir, and will counteract to some extent the dropping of the level due to brake pad wear.

If the reservoir needs topping up, first clean around the cap to reduce the possibility of contamination before unscrewing the cap; it is not necessary to disconnect the level sensor cables. Take suitable precautions to guard against damage to paintwork caused by brake fluid dripping from the level sensor.

Use only a fresh supply of DOT 4 ***non-mineral*** type fluid,identified by a yellow and black symbol. Do NOT use DOT 5 silicone fluid, or any fluid which has been exposed to the atmosphere for more than a brief period, or any fluid suspected of being wet, dirty or contaminated. Do not overfill. Replace the filler cap securely.
Some service operations, such as replacing brake pads, will result in the displacement of fluid from the hydraulic circuit back into the reservoir. In order to prevent fluid overflowing from the reservoir, it may be necessary to remove some fluid using a syringe.

Renewal of Brake Fluid
Brake fluid absorbs water from the atmosphere over a period of time (i.e. is hygroscopic), resulting in a lowering of the boiling point of the fluid, and corrosion of the hydraulic system. For optimum safety and brake performance, the brake fluid should be renewed every twelve months (including clutch release system).

Brake Bleeding Procedure
If the brake fluid is to be renewed, or an hydraulic component replaced, the system should be bled of air using the following procedure:

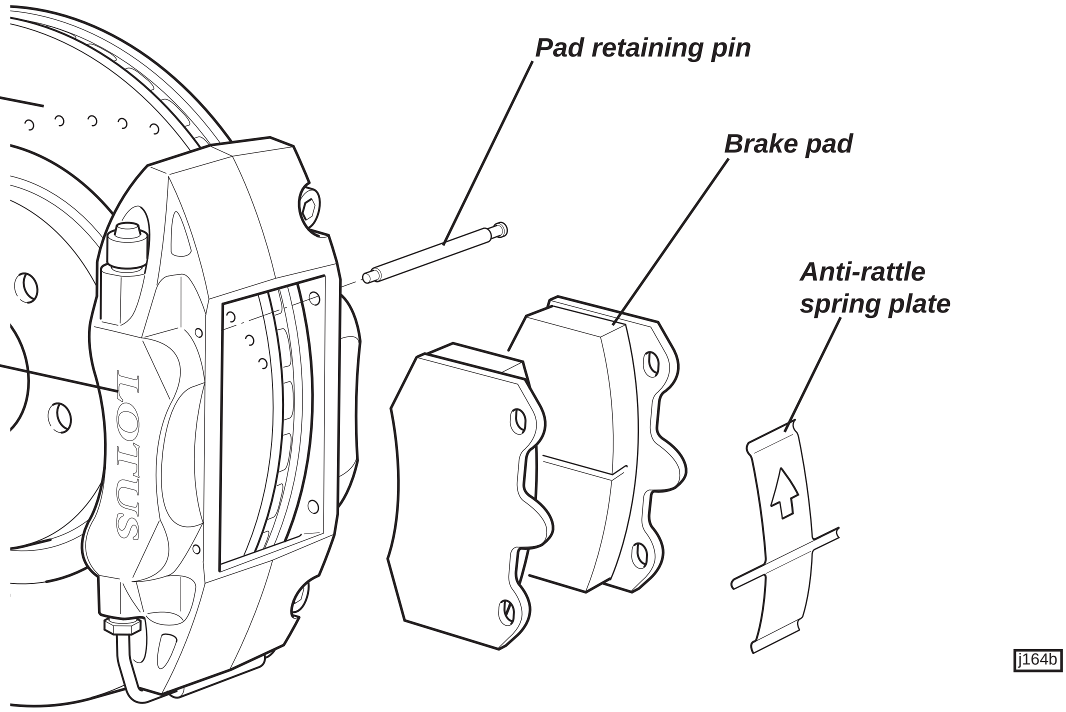
1. Using conventional manual techniques, or low air pressure applied to the reservoir, bleed the system from each calliper bleed nipple in turn until no air bubbles can be seen.
2. Connect the Lotus Techcentre to the diagnostic link, select ABS and follow the brake bleeding instructions. Whilst this automatic process is taking place (with all 4 calliper nipples open), gently cycle the brake pedal up and down whilst keeping the reservoir topped up, to move any air bubbles displaced from the ABS unit down the hydraulic lines. Finish by closing each nipple with the pedal down.
3. Repeat step (1) to purge each calliper feed line in turn.

JL.4 - BRAKE PAD REPLACEMENT (front and rear)

Pad thickness may be checked with the wheel removed without disturbing the calliper.

Standard pad thickness (excluding backplate); 12.0 mm
Minimum pad thickness (excluding backplate); 2.5 mm
If the thickness of any pad is below the specified minimum, the axle set of pads should be renewed.

Front Brake Shown



1. To remove the brake pads; Use a pin punch to tap one of the pad retaining pins towards the inboard side. Unhook and remove the anti-rattle spring plate, and tap out the second retaining pin. Use pliers on the backplate lugs to withdraw the pads from the calliper, noting each pad's position if they are to be refitted.

   Measure the lining thickness and renew the axle set of pads if any lining is below 2.5 mm.

2. Before replacing the pads, inspect the calliper for any signs of fluid leakage from a piston seal or joint, and replace the calliper if any such signs are evident. Clean the pad recess in the calliper taking suitable precautions to protect from dust inhalation. Inspect the brake disc surface condition and thickness (see below) and replace if necessary.

3. If refitting the existing brake pads, refit in their original position.

4. If fitting new pads, the pistons must be pushed back into the calliper using suitable calliper pliers, to provide the necessary space. This action will return fluid to the master cylinder such that some fluid may need to be removed by syringe in order to prevent overflowing. Do not lever between the disc and piston, or damage to both components may be caused. Note that new pads are supplied with an anti-squeal overlay applied to the backplate, and the edge of the pad material should be marked 'FER 4212 FF'.

5. Position the pads in the calliper, and insert the upper pad retaining pin from the inboard side. Tap fully into position using a pin punch, and verify the security of the pin. Renew the pin if in any doubt.

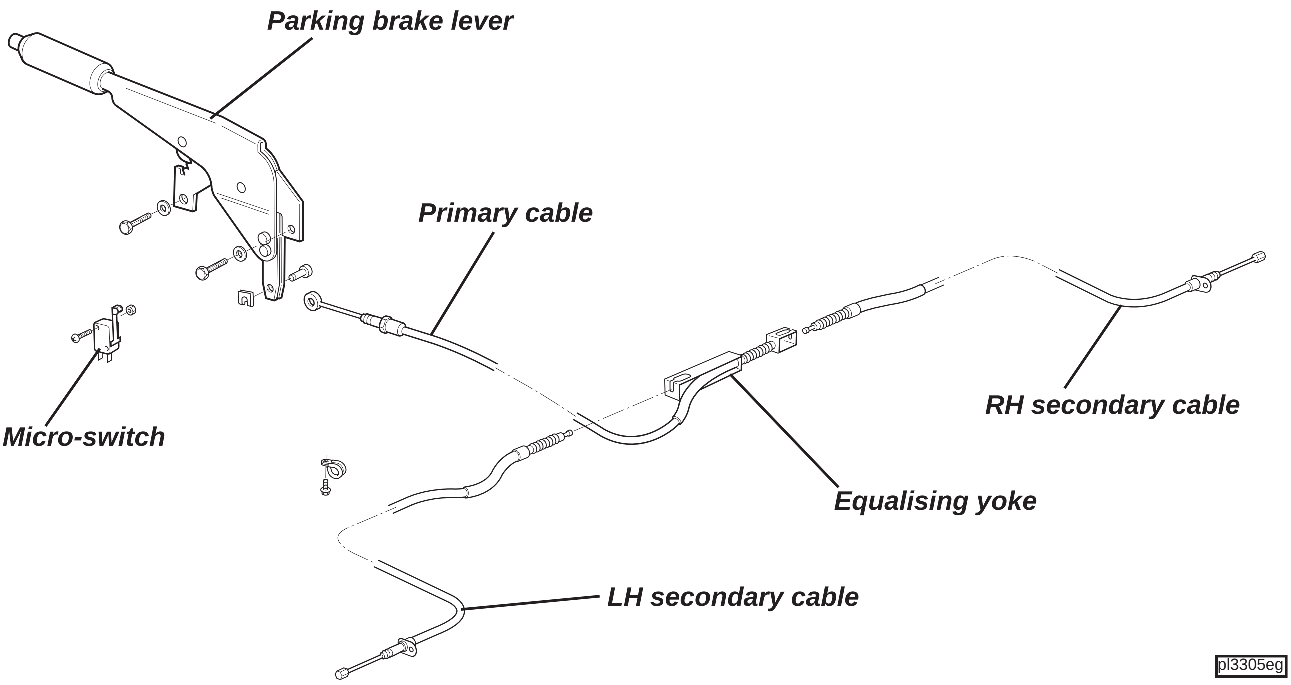
6. Fit the anti-rattle spring plate into position with the top end tucked under the upper pin and the arrow point-

ing upwards on a front calliper, or downwards on a rear calliper. Insert the second pin, pressing down the bottom of the spring plate so as to be captured by the lower pin. Verify pin security.

7. Before driving the car, press the brake pedal several times to bring the pads to their correct running position. Top up the master cylinder reservoir (see above) if necessary, to bring the level to the top of the 'MAX' mark.

8. Ensure the customer is made aware that maximum braking efficiency will be achieved if, for the first few hundred miles, needless heavy braking is avoided, and the brake pads are allowed to 'bed in' fully before being used to their full potential.

JL.5 - PARKING BRAKE MECHANISM



The parking brake ratchet lever is mounted between the seats in a fabricated steel structure which also houses the gearchange mechanism. The lever activates a primary cable which exits the cabin at the front of the fuel tank bay, and turns through 90° to connect to an equalising yoke at the front of the engine bay.

The yoke forms the abutment for the primary outer cable, with the inner cable continuing through a slot in the yoke to link to the RH secondary cable.

The opposite end of the yoke connects to the LH secondary cable, with both secondarys passing through apertures in the rear subframe and routing through the lower wishbone to their respective rear wheel parking brake backplates. The interaction of the yoke with the three separate cables results in an automatically balanced force being applied to each of the secondary cables.

At the each brake backplate the secondary cable connects to a lever mechanism which provides a balanced expanding force to the lower ends of the parking brake shoes which operate within brake drums formed integrally with the rear brake discs. The upper ends of the shoes pivot against opposite ends of an adjustable length abutment,

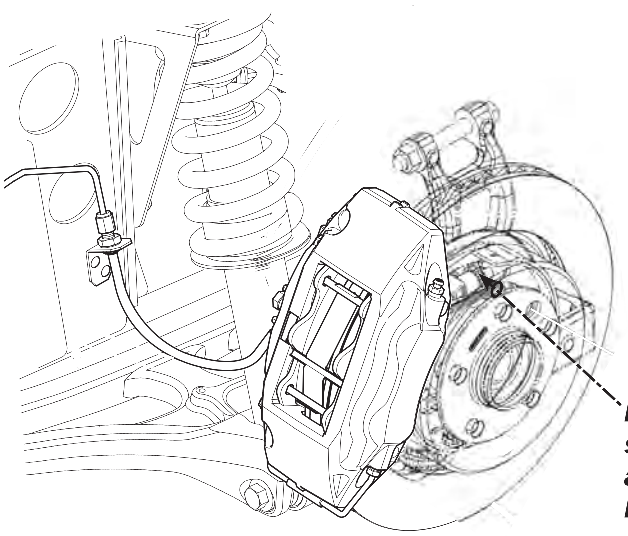
The parking brake should be applied by pulling up the lever with high effort, and engaging the highest ratchet setting attainable. When parking the car on a slope, the additional precaution should be taken of leaving the transmission in first or reverse gear and steering the wheels towards the kerb.

Adjustment

At each service interval, the parking brake should be fully applied, and lever movement assessed by the number or ratchet 'clicks' attainable. The adjustment is satisfactory when 4 or 5 clicks are achieved.

To make an adjustment;

1. Ensure that the parking brake lever is fully off, and the adjuster in the LH secondary cable is fully slackened (shortened).



2. Remove both rear wheels; refer to Service Notes section GJ.4 for further information. Using the access hole in the brake drum and hub flange, turn the adjuster downwards to expand the shoes until the brake drum cannot be turned by hand. Then back off the adjuster the minimum amount necessary to allow free rotation of the drum without rubbing, and then repeat for the opposite side.

3. The cable adjuster may then be tightened to remove slack until the 'click' specification is achieved. Check that there is no brake drag with the lever fully off.

Parking Brake Shoes
Unless the parking brake shoes are mal-adjusted, the shoe material should suffer little wear.

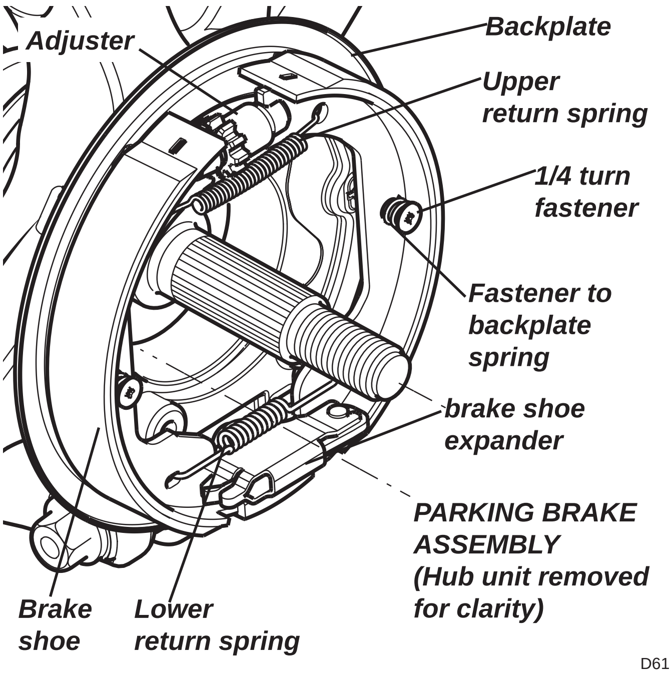
Removal:
1. Remove the road wheels; refer to Service Notes section GJ.4 for further information.

2. Using the access hole in the brake drum and hub flange, turn the adjuster upwards to contract the handbrake shoes away from the discs drum surface to allow easy withdrawal of the disc/drum.

3. Remove the rear brake discs; refer to sub-section JL.6 for further information.

4. Mark the shoes with their fitting position before removing the steady pin and spring from each shoe by turning the pin 1/4 turn. Allow the shoes to fold outboard and release from the adjuster.

5. Remove the upper retraction spring, and lever the shoes from the adjuster mechanism slots.



Refitment:
Is the reversal of removal taking extra attention to:

- Before re-fitting a disc, ensure that the mating face between disc and hub is scrupulously clean.
- Refit the road wheel and when all brakes are assembled, pump the brake pedal to restore brake pad position before driving the car.

Parking Brake Lever

The parking brake lever is mounted in a steel bracket which also houses the gearchange lever. The mounting bracket is bolted to an alloy support channel running down the centre of the cabin floor, to which it is secured by 12 setscrews.

The brake lever ratchet pawl operates a micro switch to light the 'brakes' tell tale lamp in the instrument panel whenever the ignition is switched on and the parking brake is applied. The short front cable is connected to the lever assembly by a clevis pin with spring retaining clip. When carrying out any work in this area, take care not to damage or misroute the electrical main harness.

The two secondary cables are routed through the lower wishbones and into the brake backplates where the cable nipples connect to the actuation levers by a 1/4 turn.

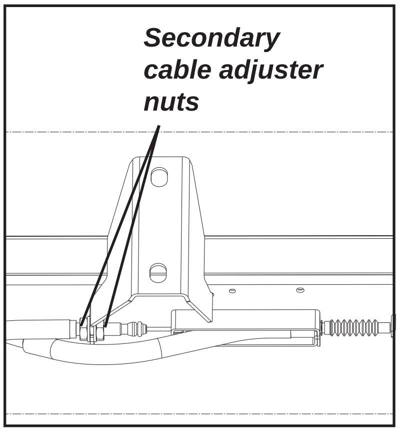
Secondary handbrake cable removal *(LH described - RH similar)*

Removal:

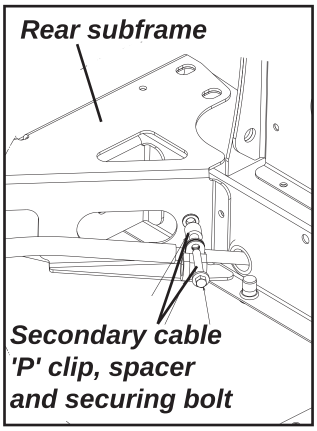
1. Remove the rear undertray; refer to Service Notes Section A for further information.

2. Remove the LHR wheel; refer to Service Notes Section GJ.4 for further information.

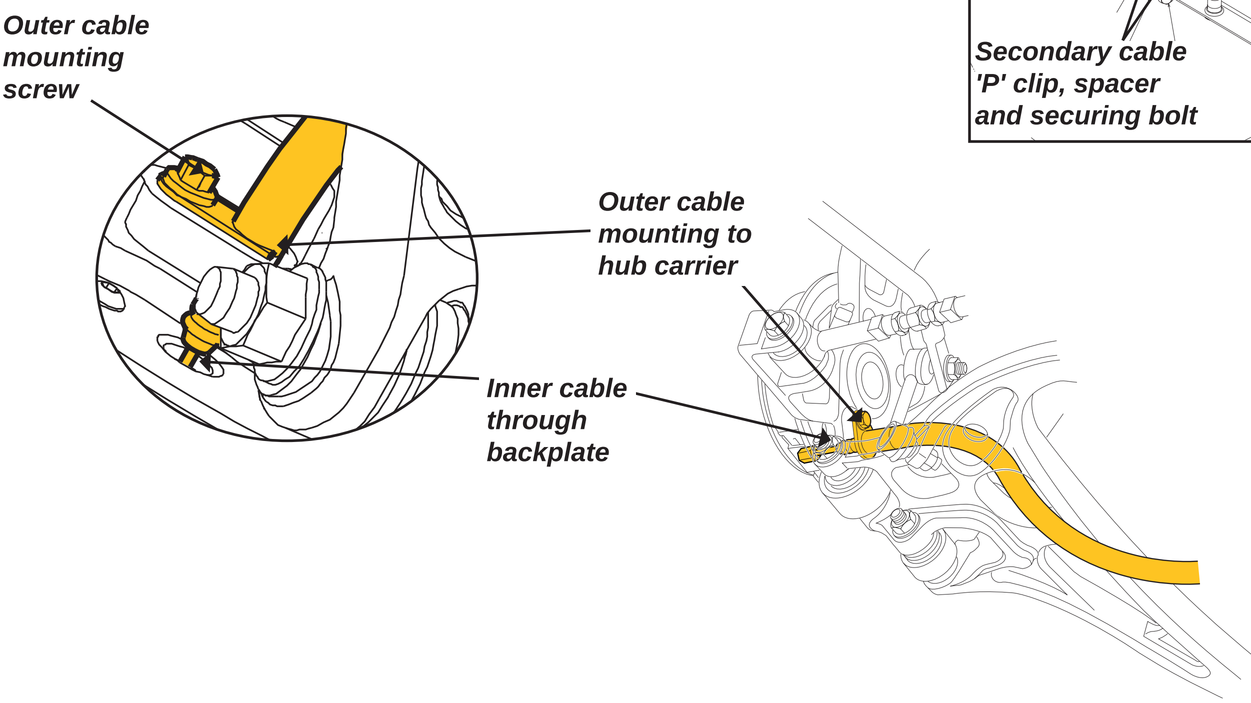
3. Release the LH cable adjuster nuts and fully removing the nut that is positioned inboard of the front engine mounting bracket.



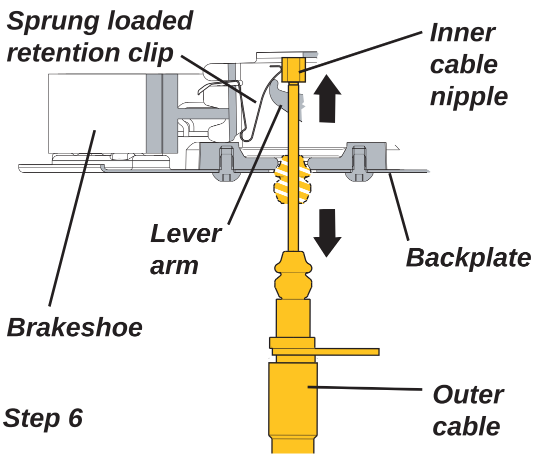
4. Release the M6 x 40 bolt and spacer securing the cable retaining 'P' clip to the subframe.



5. Release the M6 x 12 screw (torque 9Nm) securing the handbrakes outer cable to its mount on the hub carrier.



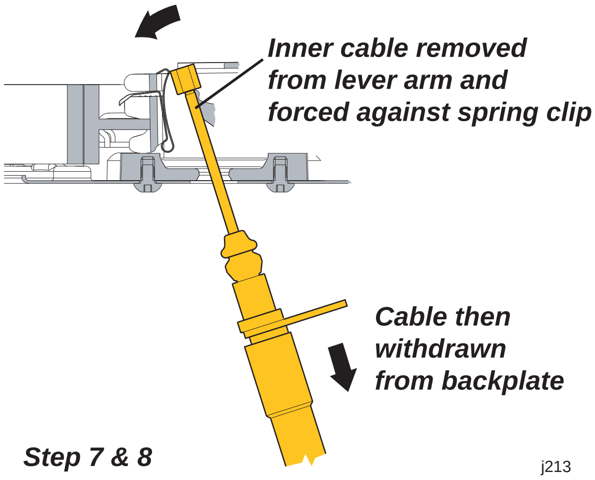
6. Pull back the outer cable from its mounting position to the carrier to expose the inner cable which will increase the 'free play' within the secondary cable assembly.



Step 6

7. Hold the inner cable whilst also pushing it forwards and sideways moving it further into backplate lever mechanism, so that the inner cables nipple can detach from the internal brake shoe lever whilst also pushing against the spring loaded cable retaining plate.

8. Withdraw the inner cable from the backplate.



Step 7 & 8

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Refitment/renewal:
Is the reverse of removal except that the brake shoe adjuster within the disc/hub assembly should be turned downwards to expand the shoes until the brake drum cannot be turned by hand.

Then back off the adjuster the minimum amount necessary to allow free rotation of the drum without rubbing.

The free play in the secondary cable can then be set using the adjuster nuts to achieve the recommended handbrake lever travel of 4-5 ratchet clicks.

JL.6 - BRAKE DISCS

All four wheel brakes use a cast iron brake disc which is sandwiched between the wheel and its hub flange, being centralised by the hub spigot, and transmitting torque via the clamping force of the road wheel bolts. A countersunk screw is used to retain the discs for convenience when servicing.

The 350 x 32 mm front discs and the 332 x 26 mm rear discs are individually sided (LHF, RHR etc) to maximise the internal ventilated directionally curved cooling vanes, and have cross-drilling to aid pad scouring available as an option. The rear discs also incorporate a 185 mm inner drum to accommodate the parking brake function.

The condition of the brake disc friction surface is a major factor in brake performance and feel, with a good surface quality and minimal run-out and thickness variation being required. After an extended lay up, some surface corrosion may develop on the discs which will cause a degradation in braking quality until the surfaces are cleaned up by normal brake action.

Excessive run-out or thickness variation as a result of overheating or extended wear, may cause brake judder and/or extended pedal travel due to pad 'knock off'. Scoring and ridging of the braking surfaces will be exacerbated by operation in dusty or unmetalled road environments, and will degrade braking performance.

No skimming or re-surfacing of the brake discs is recommended. If the disc becomes badly scored, or is out of specification in any way, it should be renewed. NOTE: Ensure that there is no discernible free play in the wheel bearings before attempting to measure brake disc run-out. If disc run-out exceeds the service maximum, check the hub face run-out before replacing the disc.

Brake disc thickness

New	- front	32 mm
	- rear	26 mm
Service minimum	- front	30 mm
	- rear	24 mm

Disc Runout

New maximum	0.06 mm
Service maximum	0.10 mm

Hub Runout

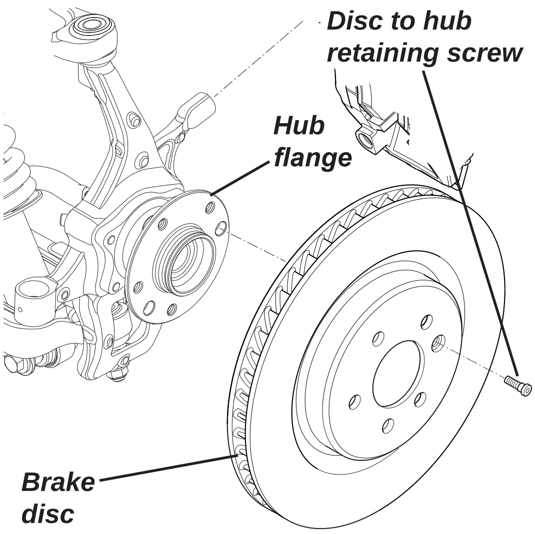
Disc mounting face run-out max.	0.05 mm

Front Disc

Removal:
1. Raise the vehicle and remove the road wheel; refer to Service Notes section A and GJ.4 for further information.

2. Remove the brake calliper from the hub carrier; refer to sub-section JL.7 for further information.

3. Remove the single countersunk screw, and withdraw the disc from the hub.



Refitment/replacement:
- Before re-fitting a disc, ensure that the mating face between disc and hub is scrupulously clean.

- Mount the correctly handed disc (with the curved vanes trailing in normal direction of rotation) onto the hub spigot, align the fixing screw hole, and secure the disc with the screw, tightening to 10 Nm.

- Refit the brake calliper to the hub carrier; refer to sub-section JL.7 for further information.

- Refit the road wheel and when all brakes are assembled, pump the brake pedal to restore brake pad position before driving the car.

Rear Disc

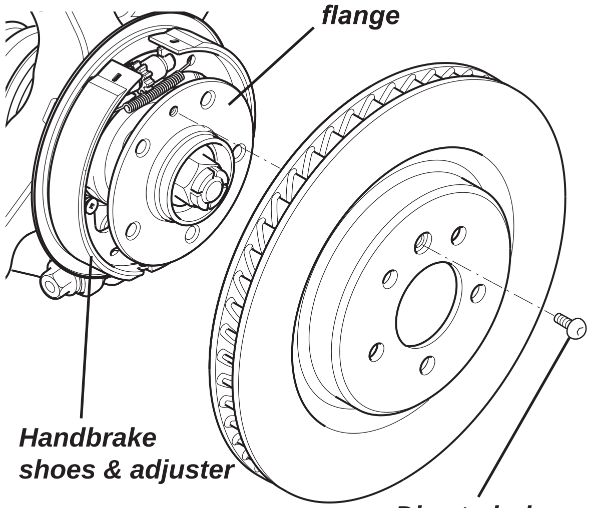
Removal:

1. Raise the vehicle and remove the road wheel, see Service Notes section A and GJ.4 for further information.

2. Using the access hole in the brake drum and hub flange, turn the adjuster upwards to contract the handbrake shoes away from the discs drum surface to allow easy withdrawal of the disc/drum.

3. Remove the brake calliper from the hub carrier; refer to sub-section JL.7 for further information.

4. Remove the single disc to hub countersunk screw, and withdraw the disc from the hub/handbrake shoe assembly.



Refitment/replacement:

- Before re-fitting a disc, ensure that the mating face between disc and hub is scrupulously clean.

- Mount the correctly handed disc (with the curved vanes trailing in normal direction of rotation) onto the hub spigot, align the fixing screw hole, and secure the disc with the screw, tightening to 10 Nm.

- Using the access hole in the brake drum and hub flange, turn the adjuster downwards to expand the shoes until the brake drum cannot be turned by hand. Then back off the adjuster the minimum amount necessary to allow free rotation of the drum without rubbing, and then repeat for the opposite side.

- Refit the brake calliper to the hub carrier; refer to sub-section JL.7 for further information.

- Adjust the handbrake cable if required; refer to sub-section JL.5 for further information

- Refit the road wheel and when all brakes are assembled, pump the brake pedal to restore brake pad position before driving the car.

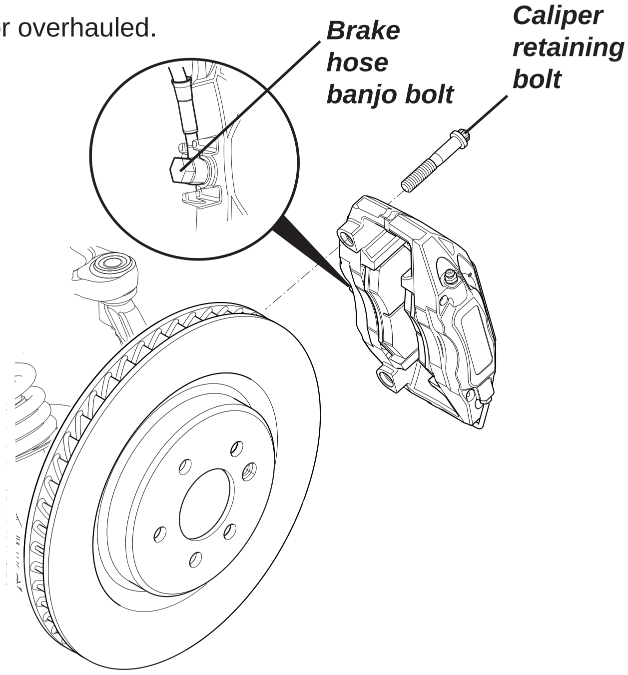
JL.7 - BRAKE CALLIPERS

The brake callipers are supplied by A.P. Racing, and feature lightweight alloy bodies housing four pistons in opposed pairs. The castings for the front and rear callipers are common, but are machined differently to accommodate the differing piston diameters. In the front callipers, the leading pistons are 38.1 mm diameter, and the trailing pistons 41.3 mm.

The rear callipers house 38.2 mm leading pistons and 36.0 mm trailing. Each calliper is marked on its inner, inboard face, alongside the pad aperture, with its designated fitting position; 'RF' representing Right hand Front, with others marked as LF, RR, and LR.

Each calliper is secured to its hub carrier by two bolts disposed in a plane perpendicular to the disc axis, with the front callipers mounted behind the axle line, and the rear callipers ahead of the axle.

The brake callipers are not designed to be dismantled or overhauled.



Front Brake Calliper
Removal - to gain access to remove brake disc:

1. Raise the vehicle and remove the road wheel, see Service Notes section A and GJ.4 for further information.

2. Remove the M12 x 55 (2) bolts securing the brake calliper to the hub carrier mount bracket (torque to 86Nm)

3. Withdraw the calliper complete with pads from the disc.

4. Secure the calliper clear of the disc but without placing strain or kinking the flexible brake hose.

Removal for replacement.

Preparation:
Note: In the event that the remaining brake fluid lines are not being disrupted for any reason, then it may be advantageous to limit brake fluid loss to the individual fluid circuit to the calliper being removed rather than draining the complete braking system.

This will reduce the possibility of accidentally introducing air into the braking system which may be difficult to remove causing a 'spongy' brake pedal and ineffective braking system.

Place a suitable disposable towel around the lower wishbone/balljoint area as well as a container beneath the wishbone area directly below the front calliper/banjo bolt assembly to prevent the accidental spillage of brake fluid onto the floor.

Once the calliper has been withdrawn from the disc, fully release the brake hose banjo bolt and its 2 washers from the calliper assembly.

Note: Because a steel braided brake hose is fitted, it cannot be clamped to prevent brake fluid loss. Therefore it is recommended to ensure that the new calliper is already prepared for fitment to receive the banjo bolt (with new sealing washers) to the new calliper as quickly as possible.

Refitment or renewal:
- Fit the brake hose banjo bolt with new sealing washers to the new brake calliper (handtighten only) this should stop any further brake fluid loss.

- Apply Permabond A130 Blue to the threads of the M12 x 55 (2) calliper fixing bolts.

- Fit the calliper (with or without pads) over the disc and secure to the hub carrier mounting bracket. Torque to 86 Nm.

- Ensure the brake hose route is unhindered, cannot rub on any other components and is free of kinks before torque tightening the banjo bolt to 20Nm.

- Bleed brake assembly as required; see sub-section JL.3 for further information.

- Refit the road wheel and when all brakes are assembled, pump the brake pedal to restore brake pad position before driving the car.

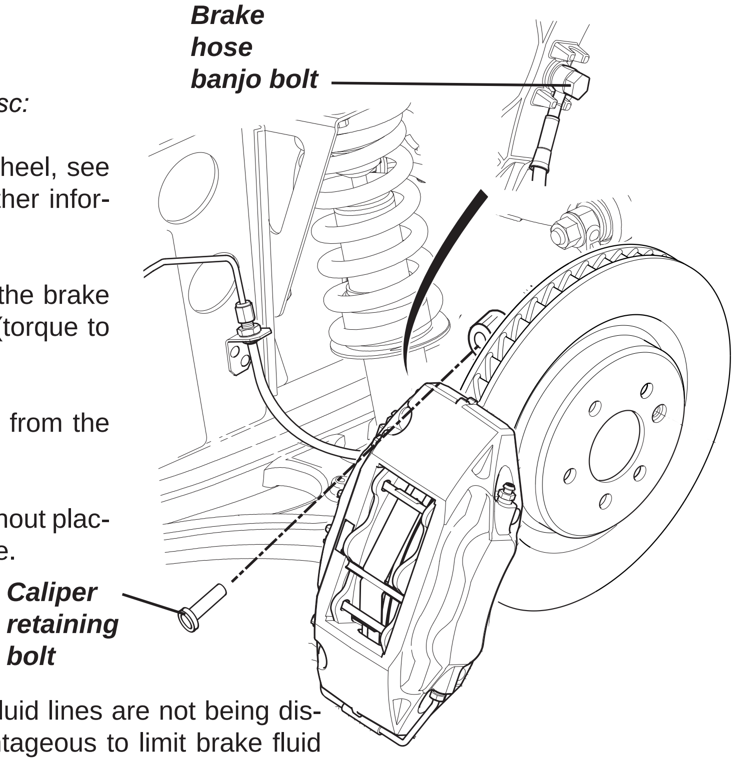
Rear Brake Calliper
Removal - to gain access to remove brake disc:

1. Raise the vehicle and remove the road wheel, see Service Notes section A and GJ.4 for further information.

2. Remove the M12 x 55 (2) bolts securing the brake calliper to the hub carrier mount bracket (torque to 86Nm)

3. Withdraw the calliper complete with pads from the disc.

4. Secure the calliper clear of the disc but without placing strain or kinking the flexible brake hose.



Removal for replacement.

Preparation:
Note: In the event that the remaining brake fluid lines are not being disrupted for any reason, then it may be advantageous to limit brake fluid loss to the individual fluid circuit to the calliper being removed rather than draining the complete braking system.

This will reduce the possibility of accidentally introducing air into the braking system which may be difficult to remove causing a 'spongy' brake pedal and ineffective braking system.

Place a suitable disposable towel around the lower wishbone/balljoint area as well as a container beneath the wishbone area directly below the front calliper/banjo bolt assembly to prevent the accidental spillage of brake fluid onto the floor.

Once the calliper has been withdrawn from the disc, fully release the brake hose banjo bolt and its 2 washers from the calliper assembly.

Note: Because a steel braided brake hose is fitted, it cannot be clamped to prevent brake fluid loss. Therefore it is recommended to ensure that the new calliper is already prepared for fitment to receive the banjo bolt (with new sealing washers) to the new calliper as quickly as possible.

Refitment or renewal:
- Fit the brake hose banjo bolt with new sealing washers to the new brake calliper (handtighten only) this should stop any further brake fluid loss.

- Apply Permabond A130 Blue to the threads of the M12 x 55 (2) calliper fixing bolts.

- Fit the calliper (with or without pads) over the disc and secure to the hub carrier mounting bracket. Torque to 86 Nm.

- Ensure the brake hose route is unhindered, cannot rub on any other components and is free of kinks before torque tightening the banjo bolt to 20Nm.

- Bleed brake assembly as required; see sub-section JL.3 for further information.

- Refit the road wheel and when all brakes are assembled, pump the brake pedal to restore brake pad position before driving the car.

Brake hose/pipe alignment
The routing of all brake hoses and pipes is set during production to ensure that they cannot come into contact with any other ancillary components regardless of the vehicles suspension travel range or steering movement.

This is achieved by positioning every hose/pipe at a suitable distance away from any steering, braking or other ancillary components within close proximity whilst the vehicles suspension is set at mid-laden ride height.

Carepoint: When renewing any brake hose/pipe or refitting as part of another repair procedure it is important to check that there is sufficient clearance between the hose/pipe and any other components whilst the suspension positioned at a mid-laden ride.

Under mid-laden ride height conditions (refer to Service Notes Section TDU for further information), the routing of the LH/RH rear brake hoses (at their lowest point) must allow for 24mm clearance forward of the rear suspension wishbone assemblies. This will maintain a sufficient distance between the brake hose and wishbone under all suspension travel conditions whilst also ensuring its routing will not be subjected to any kinking or twisting.

The brake hose to wishbone clearance can be adjusted by altering its alignment/orientation within its rear subframe mounting bracket.

Procedure:
Release, but do not fully unwind the relevant LH or RH bodyside brake pipe to hose union nut.

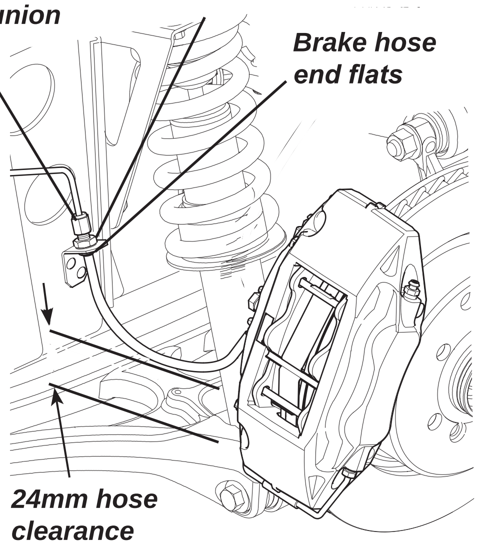
Care point: Although the union nut should only be released so that brake pipes flared end is no longer clamped to the hose, there is still the possibility of dripping brake fluid so please take appropriate precautions to prevent excessive fluid loss which may cause damage to paintwork or contamination to any other ancillary components.

Loosen the M10 nut and shakeproof washer securing the hose to its subframe mounting bracket sufficiently so that the hose end can now be turned within the bracket.

Care point: To avoid placing unnecessary strain or movement on the hose, hold the flats of the brake hose end with an open ended spanner whilst using another spanner or crows foot adapter on the hose locking nut when loosening or tightening.

Slowly and progressively turn the hose clockwise or counter clockwise as required by using a spanner on the flats of the brake hose end until 24mm clearance between the hose and wishbone is achieved at the lowest point of the hoses routing.

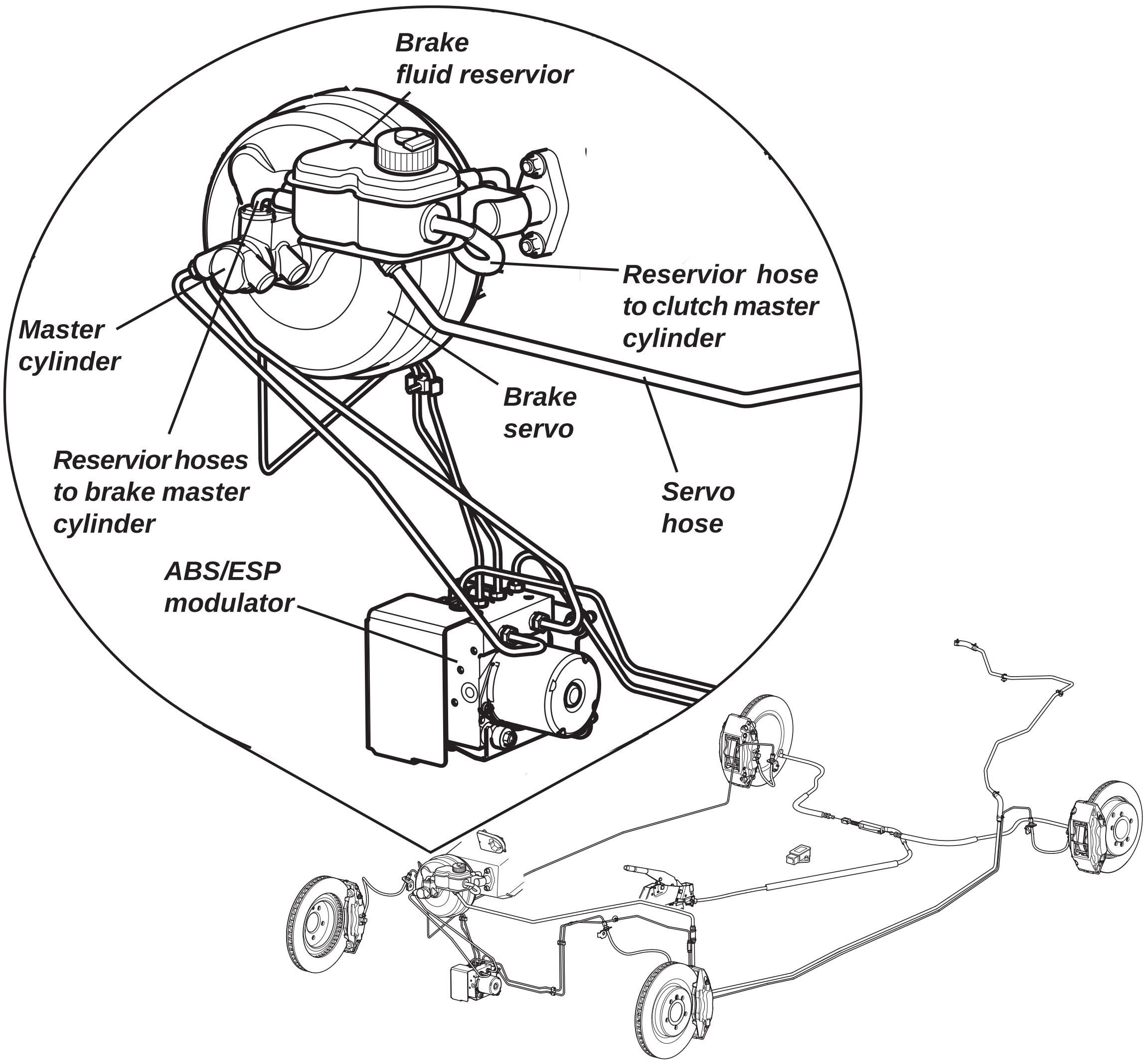
Ensure the hose route is unhindered cannot rub on any other components and is free of any kinks before tightening the M10 locknut to 16Nm.



Tighten the bodyside pipe to hose union nut to 18Nm.

Perform a localised brake bleeding procedure to the brake calliper of any the hose that has been disturbed; refer to sub-section JL.3 for further information.

JL.8 - BRAKE MASTER CYLINDER, RESERVOIR AND HOSES

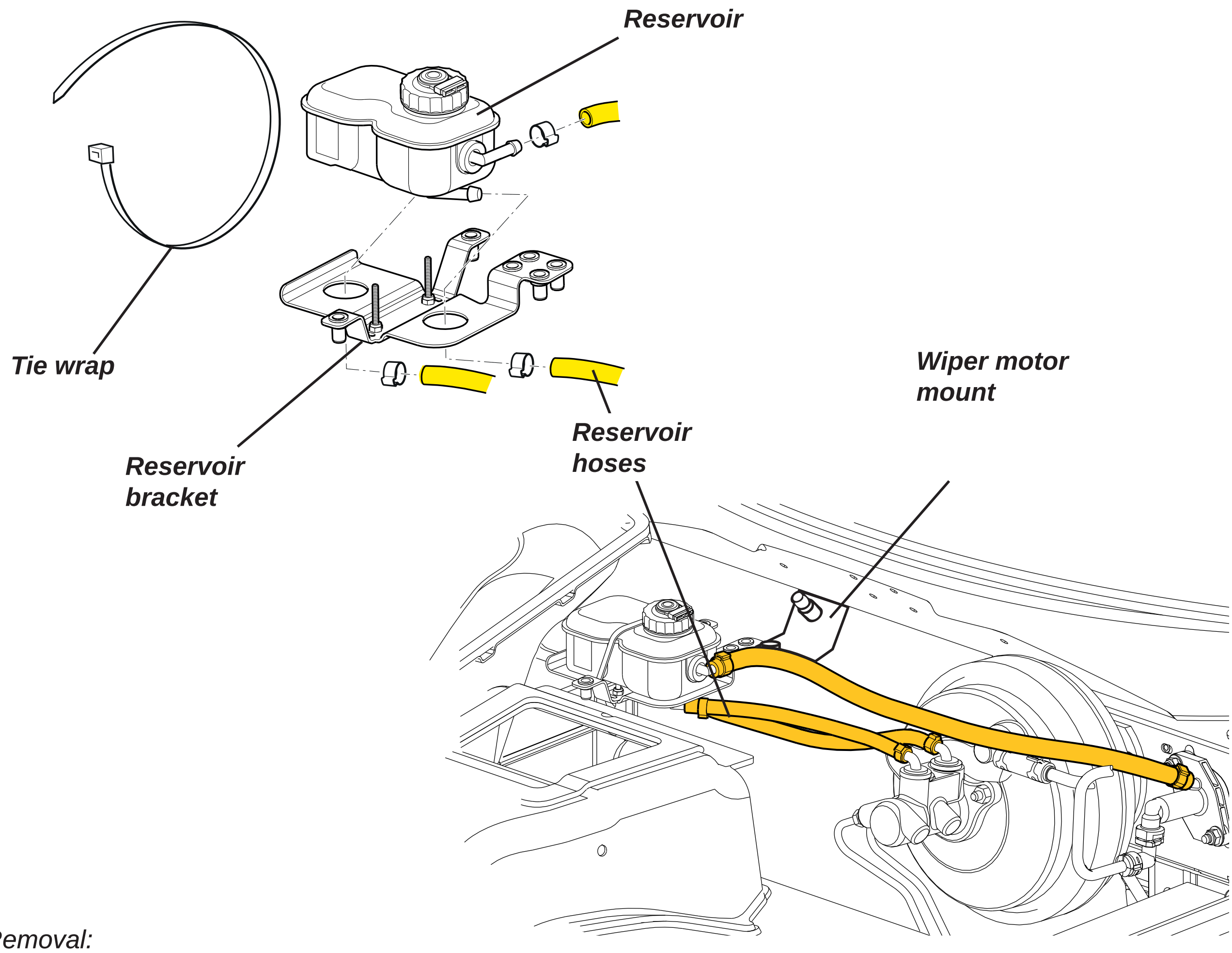


The Continental Teves tandem master cylinder incorporates a rear section to supply both front brakes and a front section to supply the rear brakes. A translucent fluid reservoir is mounted on a bracket above the master cylinder,and is divided into front and rear chambers separated by a weir.

The two chambers are connected to the front and rear master cylinder sections by flexible hose, with a third hose connecting the rear brake reservoir chamber to the clutch master cylinder. A fluid level sensor in the filler cap will light a fascia tell tale lamp if the level becomes dangerously low.

The master cylinder is secured to the front face of the brake servo which itself is bolted to the front of the pedal box. Access is available only after removal of the front clamshell. The master cylinder manufacturer does not recommend any dismantling of the unit, and supplies no replacement parts or internal components. If the cylinder is faulty it should be renewed as a complete assembly.

Brake Fluid Reservoir



Removal:

1. Remove the front clamshell (see sub-section BV.4) and radiator air outlet duct.

2. Disconnect the electrical cables from the reservoir cap and remove the cap from the reservoir body.

3. Syphon fluid from the reservoir to reduce spillage.

4. Release the M6 x 16, hex. flg. hd screws securing the reservoir bracket to the wiper mechanism assembly and carefully lift up the reservoir with its bracket.

5. Carefully remove the clips securing the two hoses connecting the brake master cylinder to the fluid reservoir and for manual gearbox cars the single hose connecting the clutch master cylinder to the reservoir.

6. Pull the hoses off of the reservoir ports and then plug the hoses and reservoir outlet ports to further reduce spillage.

6. The reservoir assembly can be withdrawn from the vehicle, cut and discard the tie wrap securing the reservoir to its mounting bracket if reservoir renewal is required.

Refitment:
Is the reverse of removal except:

Refer to reservoir hose information on following page as well as Technical Service Bulletin TSB 2015/02.

Fill the reservoir with DOT 4 non-mineral type brake fluid and bleed the complete brake system of air using the procedure in Sub-section JL.3.

Reservoir to cylinder hoses
The specification and diameter of the individual hoses supplying fluid to both the brake and clutch master cylinders is identical. The hoses are cut to the required length at the time of production and similarly are supplied in 1 metre lengths as a service replacement item requiring them to be cut to length prior to fitment.

A revised specification reservoir hose was fitted as a production running change from December 2014 (refer to Technical Service Bulletin TSB 2015/02 for further information). The hose diameter was also increased requiring larger spring clips to be fitted.

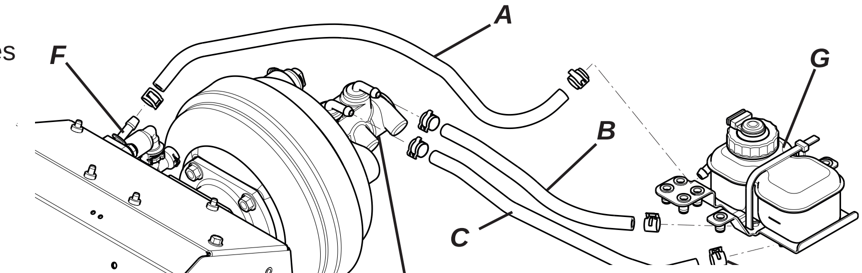
This revised specification hose fitted on production vehicles is now also supplied as a service replacement and as before must be cut to the required length prior to fitment and secured using the larger diameter spring clips.

Note: If carrying out any repairs requiring the disconnection of the reservoir hoses, it is recommended to replace them as well as the associated spring clips to the latest level specifications/part numbers as shown on Technical Service Bulletin TSB 2015/02.

Renewal:
Remove the brake fluid reservoir with bracket from the wiper mechanism assembly as described on the previous page.

Refitment:
Is the reverse of removal except:
Fill the reservoir with DOT 4 non-mineral type brake fluid and bleed the complete brake system of air using the procedure in Sub-section JL.3.

Reservoir hose layout - LHD Vehicles

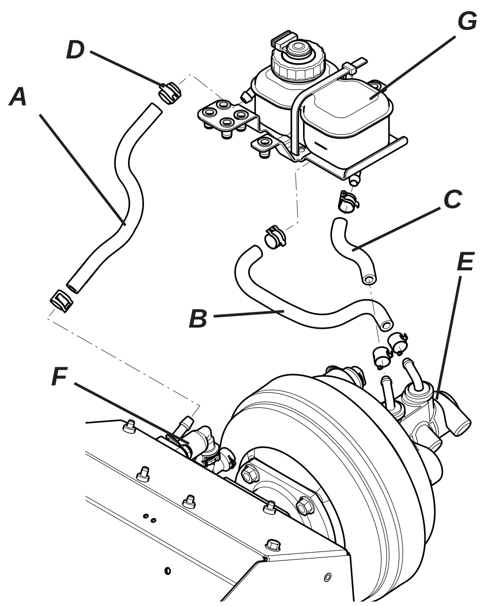


LHD Vehicle

Item	Description	Length
A.	Reservoir to clutch master cylinder	525mm
B.	Reservoir to front of brake master cylinder	241mm
C.	Reservoir to rear of brake master cylinder	337mm
D.	Hose clips	
E.	Brake master cylinder	
F.	Clutch master cylinder	
G.	Brake reservoir	

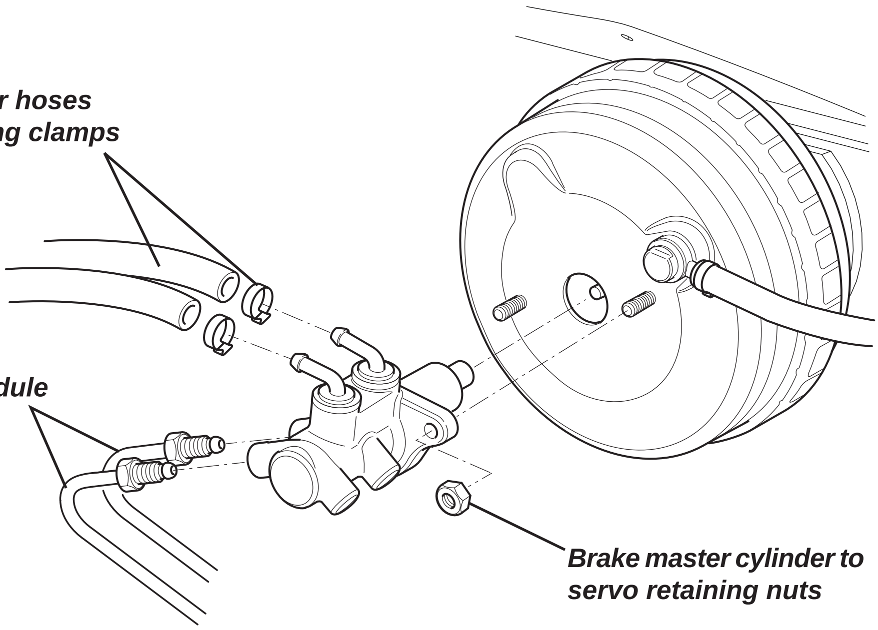
Reservoir hose layout - RHD Vehicles

Item	Description	Length
A.	Reservoir to clutch master cylinder	256mm
B.	Reservoir to front of brake master cylinder	241mm
C.	Reservoir to rear of brake master cylinder	118mm
D.	Hose clips	
E.	Brake master cylinder	
F.	Clutch master cylinder	
G.	Brake reservoir	



RHD Vehicle

Brake Master Cylinder



Removal:

1. Remove the front clamshell (see sub-section BV.4) and radiator air outlet duct.

2. Syphon fluid from the brake fluid reservoir to reduce spillage.

3. Carefully remove the spring clamps securing the two hoses connecting the brake master cylinder to the fluid reservoir

4. Pull the hoses off of the reservoir ports and then plug the hoses and reservoir outlet ports to further reduce spillage.

5. Release the two brake pipes from the master cylinder, and plug the pipes and ports.

6. Release the two nuts securing the master cylinder to the brake servo and remove the cylinder.

Refitment:

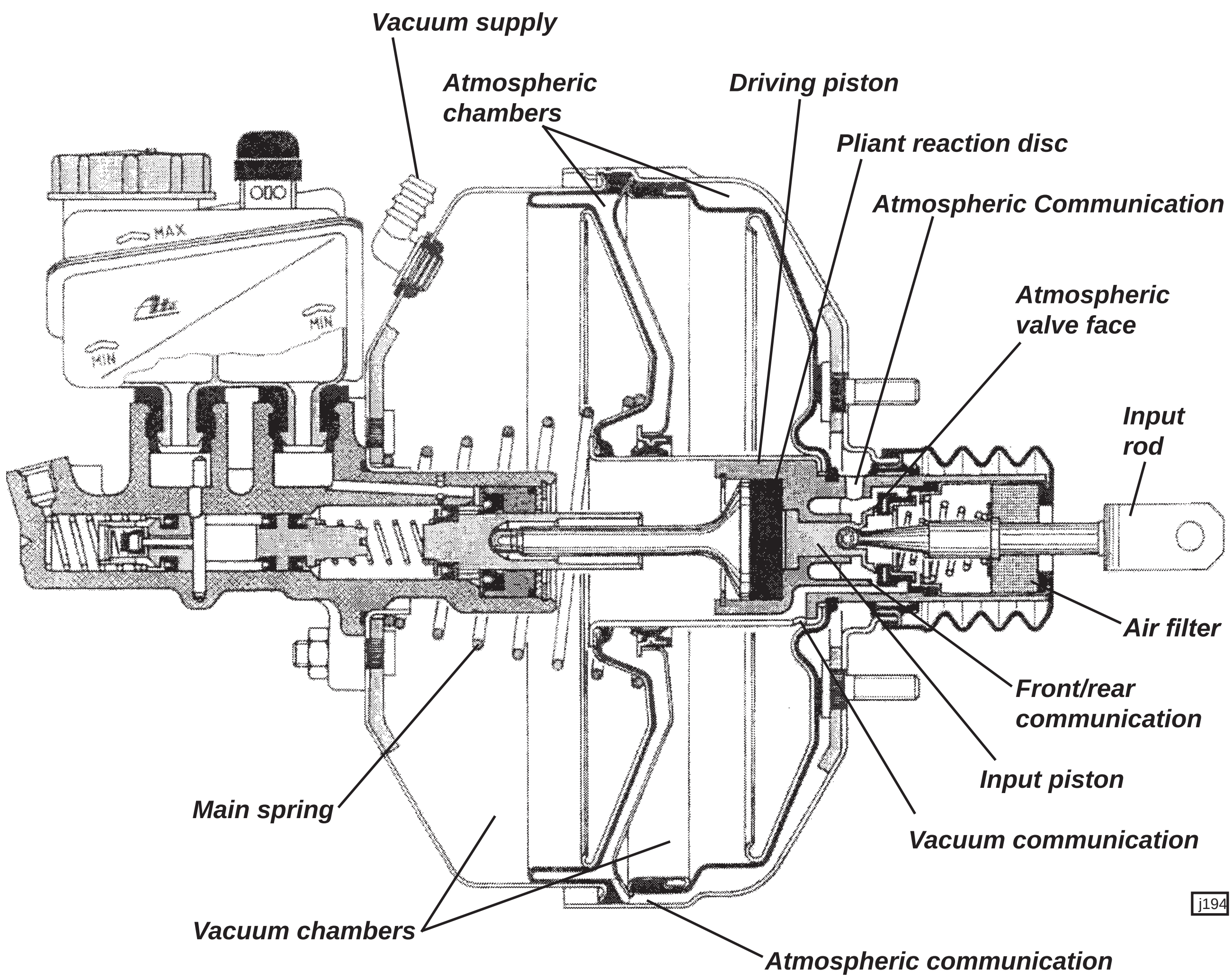
Is the reverse of removal but using new locknuts and tightening to the following torques:
- Master cylinder fixing nuts: 25 Nm
- Brake pipes to cylinder: 16 Nm

Note: If carrying out any repairs requiring the disconnection of the reservoir hoses, it is recommended to replace them as well as the associated spring clips to the latest level specifications/part numbers as shown on Technical Service Bulletin TSB 2015/02.

Fill the reservoir with DOT 4 non-mineral type brake fluid, and bleed the complete brake system of air using the procedure in Sub-section JL.3.

JL.9 - VACUUM SERVO UNIT

Tandem Servo Section (brakes off)

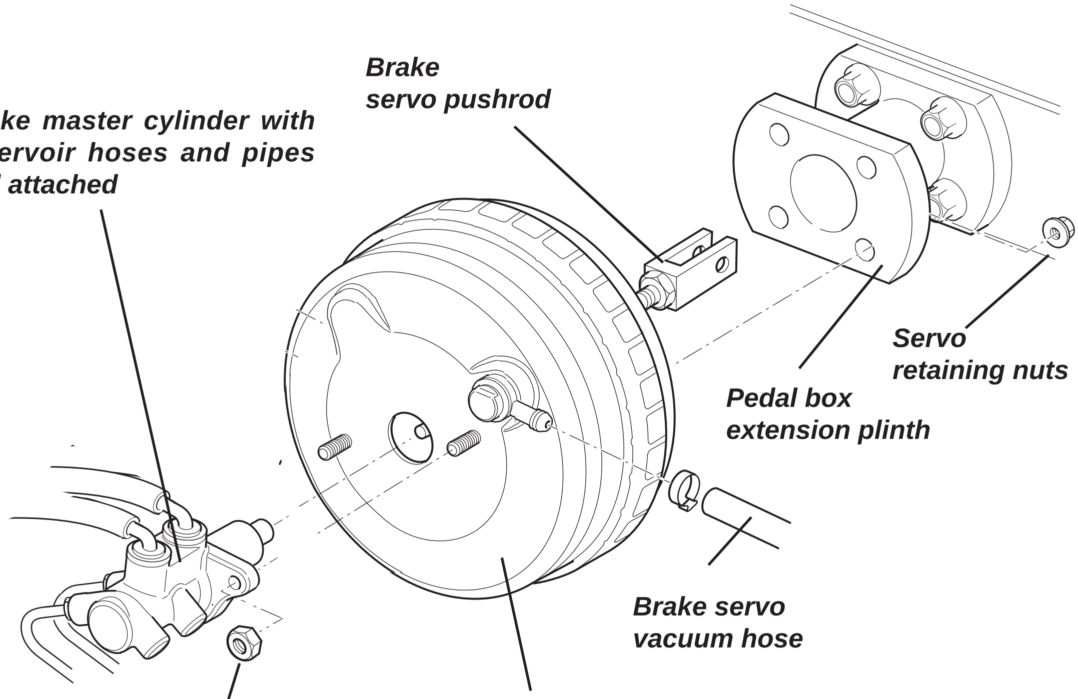


The vacuum brake servo is secured to the front face of the pedal box via a machined alloy spacer, and is operationally interposed between the brake pedal and master cylinder. Engine generated vacuum is used to provide pneumatic assistance to the effort applied at the pedal.

The unit is supplied by Continental Teves and is a dual diaphragm unit combining a 178mm (7 in) and 203mm (8 in) diameter vacuum chamber into a single compact unit to provide a 5:1 assistance ratio. The unit is a non-serviceable sealed unit which if found to be faulty, must be replaced as an assembly. A non-return valve is incorporated into the vacuum hose elbow connector in the front case of the servo unit. The elbow connector valve is a push fit into a grommet in the servo shell, and is supplied complete with the grommet.

Operational Check

As a quick check of servo operation proceed as follows: With the engine stopped, press the brake pedal several times to exhaust the servo unit of vacuum. Keeping the pedal pressed (which should be 'hard' and 'high'), start the engine; The pedal should drop slightly as the servo vacuum builds up, and extra force is produced. If the pedal does not drop, it is most likely that there is a fault in the vacuum supply line. Check the vacuum hose, all connections and the non-return valve. If the vacuum supply is not defective, the servo unit should be replaced.



Removal:

1. Release the master cylinder to brake servo fixing nuts, with care it should now be possible to withdraw the master cylinder from the servo with the reservoir hoses and brake pipes still attached, so not disturbing the brake fluid line.

   Carepoint: Do not place unnecessary strain on either the reservoir hoses or brake pipes, if for any reason any undue force is required to withdraw the brake master cylinder from the servo which may place excessive strain on the brake pipes/hoses then disconnect them from the brake master cylinder, Refer to sub-section JL.8 for further information.

2. From within the driver's footwell, disconnect the servo pushrod from the brake pedal (refer to sub-section JL.10 for further information).

3. Disconnect the brake servo vacuum hose and release the four nuts securing the servo to the pedal box extension plinth. Withdraw the servo assembly.

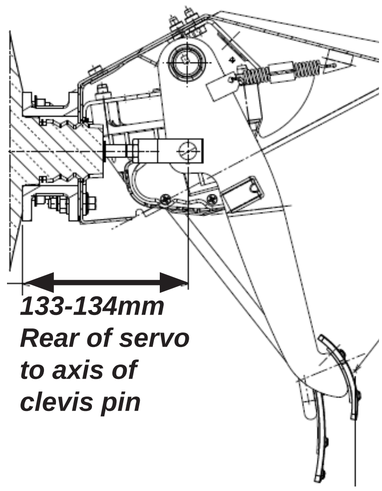
Refitment:

Is the reverse of removal except:

- *Setting brake pedal:* It is essential that the servo piston (and master cylinder piston) is allowed to return fully when the brakes are released, and is not pre-loaded by mal-adjustment of the input pushrod.

- Before replacing a servo unit, first check the adjustment of the clevis on the input pushrod (i.e. the effective length of the pushrod). With the rubber gasket fitted over the four servo mounting studs, the perpendicular distance from the surface of the gasket to the axis of the clevis pin hole should be 133 - 134mm. Refer to LH illustration.

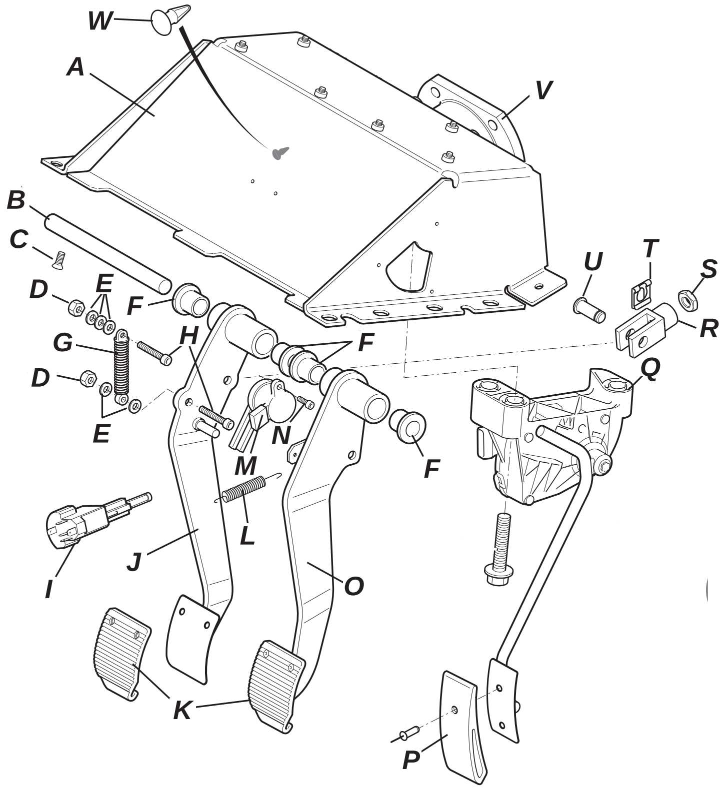
- Replace the servo in reverse order to the above, tightening the servo mounting nuts to 25 Nm, and the master cylinder new fixing nuts to 25 Nm. Check pushrod adjustment and bleed the hydraulic system if it was necessary to disturb the fluid lines, (see sub-section JL.3).



JL.10 - PEDAL BOX ASSEMBLY

(Pre-'12MY manual shown others similar)

A. Pedal housing
B. Pedal pivot shaft
C. Shaft retaining screws
D. Over centre spring retaining nuts
E. Over centre spring retaining washers
F. Pivot shaft bearings
G. Over-centre Spring
H. Over centre spring retaining screws
I. Brake light switch
J. Clutch pedal assembly
K. Clutch/Brake pedal pads
L. Brake pedal return spring
M. Clutch potentiometer
N. Potentiometer retaining screw
O. Brake pedal assembly
P. Throttle pedal pad
Q. Electronic throttle assembly
R. Brake pedal clevis
S. Clevis to brake servo shaft lock nut
T. Clevis pin retaining clip
U. Brake pedal clevis pin
V. Brake servo spacer
W. Clutch pedal downstop pad



The pedal box is fabricated from alloy sheet, and rivetted, bolted and bonded to an aperture in the chassis scuttle. A hollow steel pivot shaft serving the brake and clutch pedals is bolted to a steel mounting plate, itself bolted to the inside of the pedal box. The brake and clutch pedals are fabricated from steel plate, and feature synthetic bushes for maintenance free articulation on the steel pivot shaft, and serrated alloy footpads.

The brake pedal uses a coil pull off spring, and the clutch pedal is equipped with an overcentring coil spring linkage, in order to reduce the pedal effort required to maintain full clutch disengagement. A clutch pedal potentiometer is also fitted in order to provide data for Cruise Control operation, and for the start inhibit function on Canadian market cars; refer to Service Notes Section QJ.2 for further information.

The 'drive by wire' throttle actuation uses a steel rod fabricated pedal to operate an electronic module and provide a signal to the engine ECU, which then actuates the throttle valve stepper motor within programming constraints. The throttle pedal module is secured to a mounting bracket by three bolts. The bracket is fixed in place with 2 bolts fitted vertically upwards into the under surface of the pedal housing and 1 bolt also being utilised to retain the brake servo spacer to the pedal box housing.

The brake light switch is mounted in a right angle bracket fixed to the underside of the pedal housing; the switch plunger abuts directly against the pedal. The switch is retained in the bracket by a quarter turn mechanism.

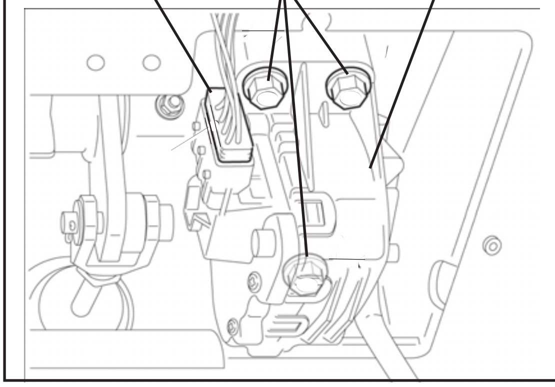
The majority of component part numbers used within the pedal box assembly are common for both LHD and RHD vehicles except for the brake and clutch pedals, the angle profiles for the RHD pedals being more acute than those for LHD vehicles.

Pedals

Throttle pedal removal:
From within the drivers footwell disconnect the harness plug from the module.

Remove the M8 x 45 (3) screws securing the throttle assembly to the pedal box.

Refitment:
Is the reverse of removal ensuring to tighten the throttle assembly to pedal box screws to 25Nm.



Brake or clutch pedal removal:
To remove a brake or clutch pedal from the pivot shaft, the pedal shaft mounting plate must be removed from the pedal box complete with the brake and clutch pedals:

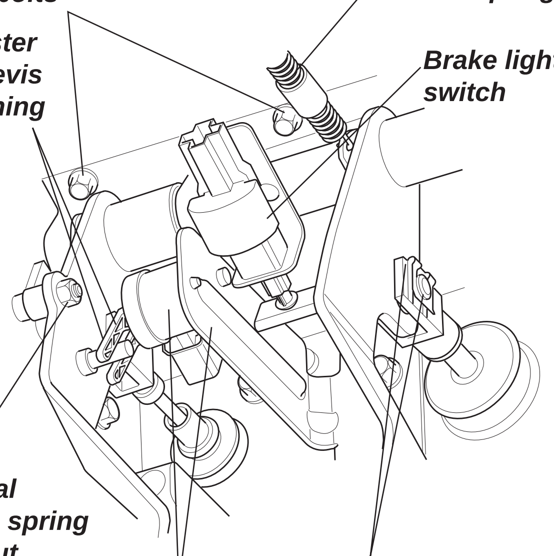
1. Unplug and remove the throttle pedal assembly complete with mounting bracket by releasing the three screws securing the bracket to the pedal box.

2. Disconnect the brake and clutch pedals from their pushrods, and unhook the brake pedal return spring: also refer to Service Notes Section QJ.3 for further information concerning clutch pedal clevis.

3. Unplug and remove the clutch potentiometer switch with mounting bracket, by releasing the two bolts securing the bracket to the pedal box: refer to Service Notes Section QJ.2 for further information.

4. Release the clutch pedal over centre spring anchor bracket from the pedal box side (3 bolts).

5. Remove the 4 remaining fixings securing the pedal shaft bracket to the pedal box, and manoeuvre the pedal assembly from the car.



6. Release the three Torx head screws securing the pedal shaft and withdraw the shaft and pedals

7. Refit the pedals in reverse order to removal, noting that the pivot bushes of the brake and clutch pedals should be lubricated with Syntheso GLK1 or equivalent.

Torque Settings		**Nm**
Brake servo to alloy spacer		25
Pedal shaft bracket to pedal box		16
Throttle pedal mounting bracket to pedal box	- M6	16
	- M8	25

Brake light switch

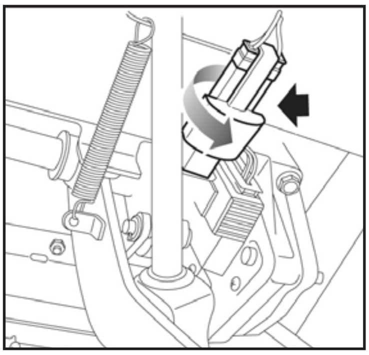
The brake light switch is mounted in a right angle bracket fixed to the underside of the scuttle, and abuts directly against the pedal. The switch is retained in the bracket by a quarter turn mechanism, The switch has 3 settings (as shown below), the correct setting of the brake light switch plunger results in the switches internal contacts closing at the correct time in relation to the brake pedal travel exerted by the driver.

Pedal effort/travel position	Switch Stage	Action
No pedal effort - no pedal travel	Off	Cruise control available (if required).
Initial/light pedal effort - minor pedal travel	1st Stage	Cruise control cancelled (if activated).
Light/moderate pedal effort - increased pedal travel	2nd Stage	Brake lights illuminated coinciding with an ABS module brake fluid line pressure reading of between 2 - 6 Bar.

The brake light switch is mounted in a right angle bracket fixed to the underside of the scuttle, and abuts directly against the master cylinder pedal pushrod quadrant. The switch is retained in the bracket by a quarter turn mechanism, with no adjustment provided or required.

Removal:

1. Rotate the switch 90° counter-clockwise within its mounting bracket and release.

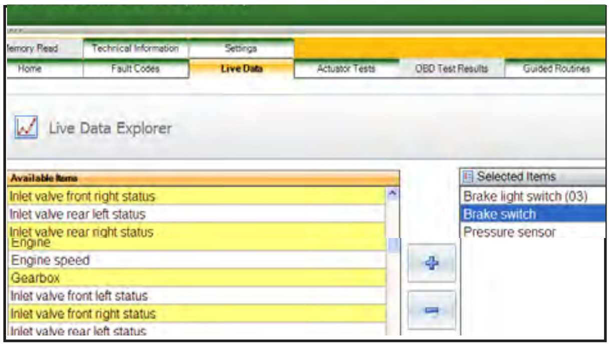


2. Disconnect from the harness connector and remove the switch.

Refitment:

Installation procedure is reverse of removal except that the switch plunger must be adjusted to suit the brake pedal travel characteristics of the specific vehicle it is being fitted to. **PLEASE ALSO REFER TO SWITCH PLUNGER LUBRICATION AS DESCRIBED IN TECHNICAL SERVICE BULLETIN TSB 2015/03 - BRIEF SUMMARY ALSO SHOWN ON FOLLOWING PAGE.**

The switch plunger uses an internal ratchet mechanism which can be adjusted to suit the vehicle allowing for any brake pedal travel tolerance thus ensuring the correct phasing of the internal switch contacts in relation to the switch plunger position and brake pedal position.



Refitment Procedure

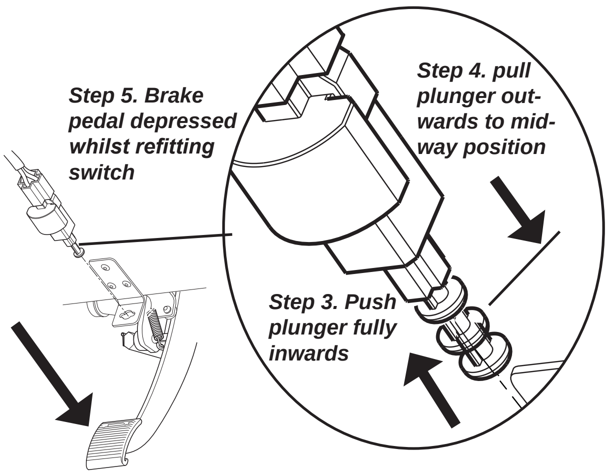
1. With TechCentre connected to the vehicle and the ignition on, select ABS brakes>Live Data:

2. From the ‘Available Items’ table, select:
   - Brake light switch (03).
   - Brake switch.
   - Pressure sensor

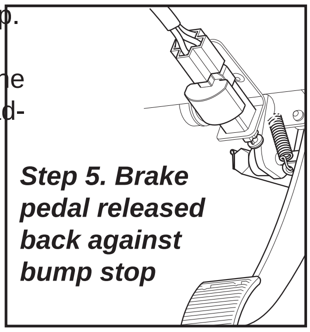
3. With the switch still removed from the pedal box (but harness connected), push the plunger fully inwards towards the switch housing (light resistance will be felt until the plunger overcomes its ratchet mechanism).

4. Pull the plunger outwards to its mid point setting *(approximately half way out from the switch housing, 5 audible clicks should be heard as it is being pulled).* Note: the plunger is on a stiff ratchet mechanism which may take some effort to extend.

5. Using your hand to push down on the brake pedal, refit the brake switch back into the pedal box bracket.



6.Gently release the brake pedal back to its normal position against its bump-stop.


Step 5. Brake pedal released back against bump stop

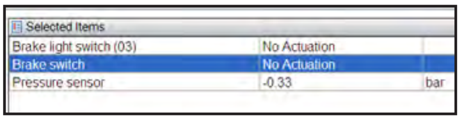
7.Select the ‘play’ option on the live data screen and gently depress and release the brake pedal to simulate normal braking operations and examine the value readings displayed on ABS live data in relation to:

- ‘Brake Switch’ (1st stage)
- ‘Brake Light Switch (03)’ (2nd stage)
- ‘Pressure Sensor’ (ABS brake line pressure).

Normal Values Proportional To Brake Pedal Depression

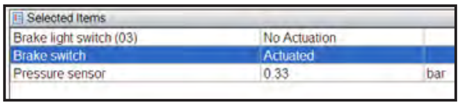
No pedal effort - no pedal travel

- ‘Brake Switch’ (1st stage)	No Actuation
- ‘Brake Light Switch (03)’ (2nd stage)	No Actuation
- ‘Pressure Sensor’ (ABS brake line pressure)	+ or - 0.5 Bar



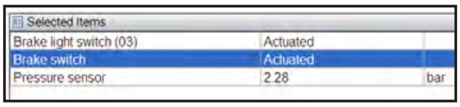
Initial/light pedal effort - minor pedal travel

- ‘Brake Switch’ (1st stage)	Actuated
- ‘Brake Light Switch (03)’ (2nd stage)	No Actuation
- ‘Pressure Sensor’ (ABS brake line pressure)	+/- 0.5 Bar



Light/moderate pedal effort - increased pedal travel

- ‘Brake Switch’ (1st stage)	Actuated
- ‘Brake Light Switch (03)’ (2nd stage)	Actuated
- ‘Pressure Sensor’ (ABS brake line pressure)	+ 2 - 6 Bar

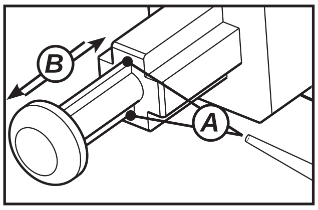


8.If the readings are not within range then remove the brake light switch again repeating step 2 of the adjustment procedure but adjusting the plunger inwards or outwards against its ratched mechanism as necessary until the correct readings are achieved.

Note: Incorrect switch plunger adjustment may result in fault codes relating to ABS, Lotus DPM (Dynamic Performance Management) and cruise control being generated also illuminating the relevant tell tale lamp.

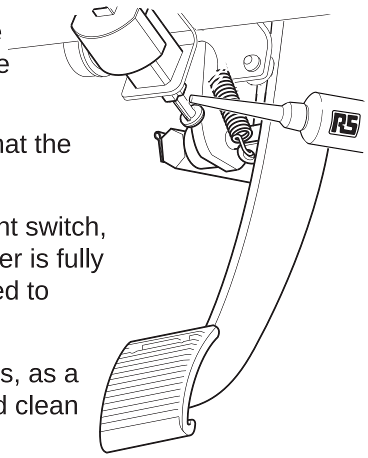
Brake Switch Plunger Lubrication

Conditions within the pedal box environment could over time cause the brake light switch plunger to stick, which under certain conditions could cause the ABS brake light warning tell tale to illuminate. To prevent this a small quantity of RS 494-124 silicone grease should be applied to the switch plunger as shown in the RH illustrations and procedure listed below:



A. Apply the equivalent of a ‘pin head’ amount of silicone grease to either side of the plunger at the base of the switch body and evenly distribute along the complete length of the shaft.

B. Fully actuate the plunger so that it travels inwards into the switch body so that the silicone grease lubricates the internals of the switch mechanism.



Silicone grease should be applied if fitting a new service replacement brake light switch, but if carrying out this procedure to the existing switch in-situ, ensure the plunger is fully extended by depressing the brake pedal and use the application nozzle supplied to accurately apply the grease*.

Care point: Ensure that silicone grease has not spilt onto any of the pedal pads, as a precaution cover the pedal pads prior to carrying out this procedure. Check and clean the pedal pads as necessary after completing this procedure.

*Only RS 494-124 silicone grease should be used for this procedure, other silicone greases may **cause** damage to the internal electrical components of the switch. RS 494-124 silicone grease is readily available in 100g tubes and can be sourced locally.

JL.11 - ABS THEORY OF OPERATION

The Bosch antilock brake system is an ‘add on’ type used to supplement the dual circuit, tandem master cylinder, vacuum servo assisted brakes fitted to the Evora. A single electro-hydraulic unit comprising a hydraulic modulator, hydraulic pump, microprocessor and solenoid valve bank, is flexibly mounted on the forward side of the driver's toebox, and plumbed into the front and rear brake circuit lines from the tandem master cylinder.

The microprocessor receives signals from magnetic wheel speed sensors integrated into each of the four road wheel hubs, and interprets the individual wheel acceleration, deceleration, and comparative wheel speeds. From this data, the processor is able to determine if any wheel is tending to lock up, and if imminent lock up is sensed, the unit commands the relevant solenoid valves firstly to reduce pressure in that particular brake circuit in order to restore wheel speed, and then to modulate pressure to that providing the maximum braking force consistent with continued wheel rotation. The system is able to monitor and independently control each of the four wheel brakes, and is referred to a 4-channel system.

In order to achieve the required pressure modulation, three basic modes are used:
- Pressure hold;
- Pressure reduction;
- Pressure increase;

In order to maintain the safety provision of two entirely independent hydraulic circuits, one for the front brakes, and one for the rear, the hydraulic elements of the control unit are doubled up, with no part of the system shared between the two circuits. For the pressure hold function, four isolation solenoid valves are used, one in the hydraulic circuit for each wheel brake. The pressure reduction function is achieved by a separate dump solenoid valve in each of the four wheel brake circuits, and the pressure increase provided for by a single electric motor operating two hydraulic pumps, one serving the front, and on the rear brake circuit. Separate low pressure accumulators are used for the front and rear circuits.

Electro-Hydraulic Control Unit
The electro-hydraulic control unit comprises an alloy valve block containing the four isolation valves, four dump valves, two hydraulic pumps and two accumulators, with the single pump motor screwed to the housing, and with a solenoid block and ECM unit attached. The complete assembly is flexibly mounted via a bottom spigot and two threaded studs, each of which engage with a rubber grommet in a mounting bracket secured by 4 bolts to the front side of the driver's toebox. A protective alloy shield is secured by two nuts.

The isolation and dump valves share a similar construction, but the spring loaded isolation valves are normally open, and the dump valves normally closed.

Anti-Lock Braking
Maximum braking force is provided from a tyre when there is around 15% slippage, dependent on road surface conditions and tyre characteristics. The function of the ABS is to limit tyre slippage when braking to around this figure in order to provide optimum grip, and also, by preventing wheel lock, to ensure that steering control of the vehicle is retained.

A high brake pedal pressure (or low road surface friction) may initiate the locking of one or more wheels. In the diagram below, a typical control strategy is shown:

1. Normal braking occurs until, as the applied pressure increases, the wheel speed signals received by the ECM indicate that the left hand front wheel (for example) is tending to lock. i.e. its deceleration is too rapid, with too great a speed differential with the other wheels.

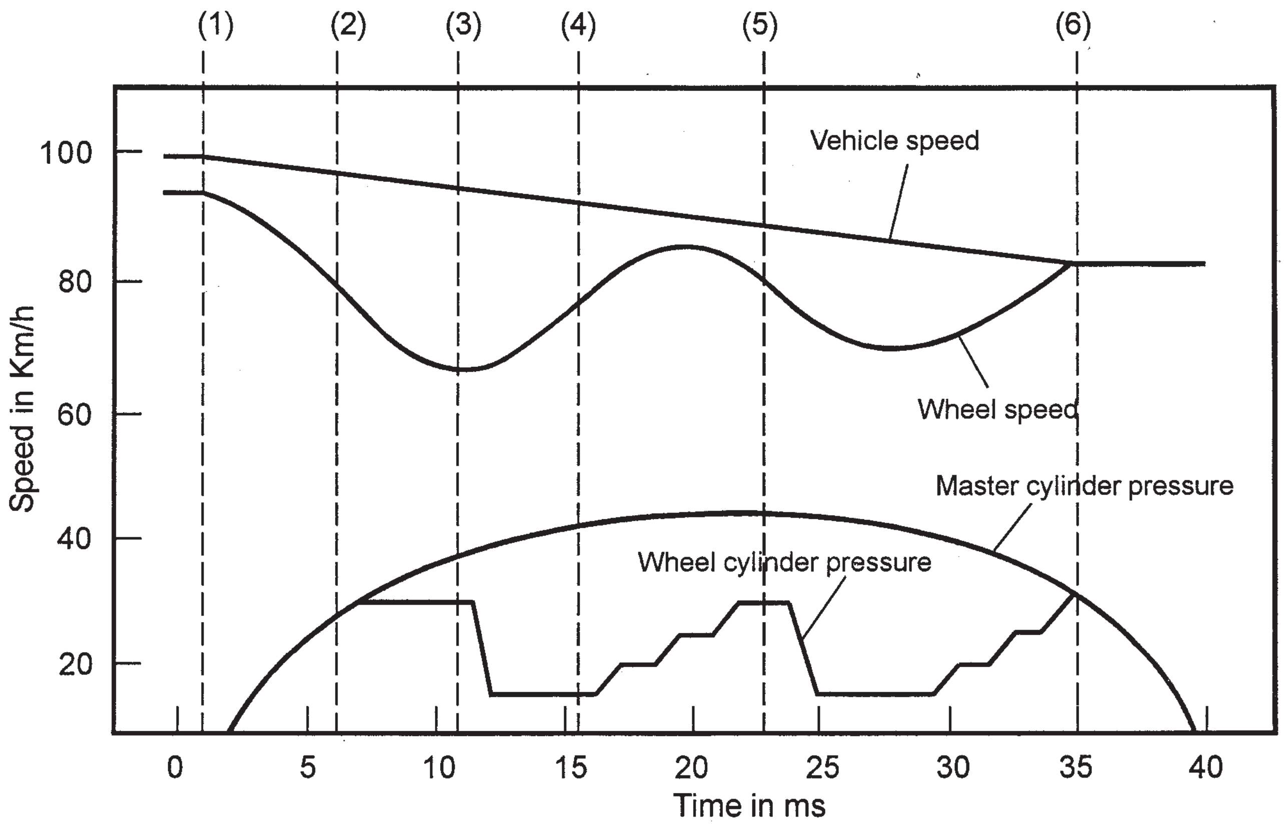
2. The connection between the master cylinder and the LH front brake circuit is interrupted (by the isolation valve), and the rate of slip increase is reduced.

3. If the wheel speed continues to depart significantly from vehicle speed, the dump valve is energised to reduce pressure in the LH front circuit until wheel speed begins to increase. The dump valve is then closed, as is the isolation valve.

4. As wheel speed approaches that providing optimum grip, the isolation valve is pulsed open to allow a stepped pressure increase.

5. As wheel speed begins to drop off and depart from vehicle speed again, a new cycle starts, repeating steps (1) to (4).

6. When wheel speed increases sufficiently to meet vehicle speed, ABS intervention ceases, although monitoring is continued throughout each braking event.

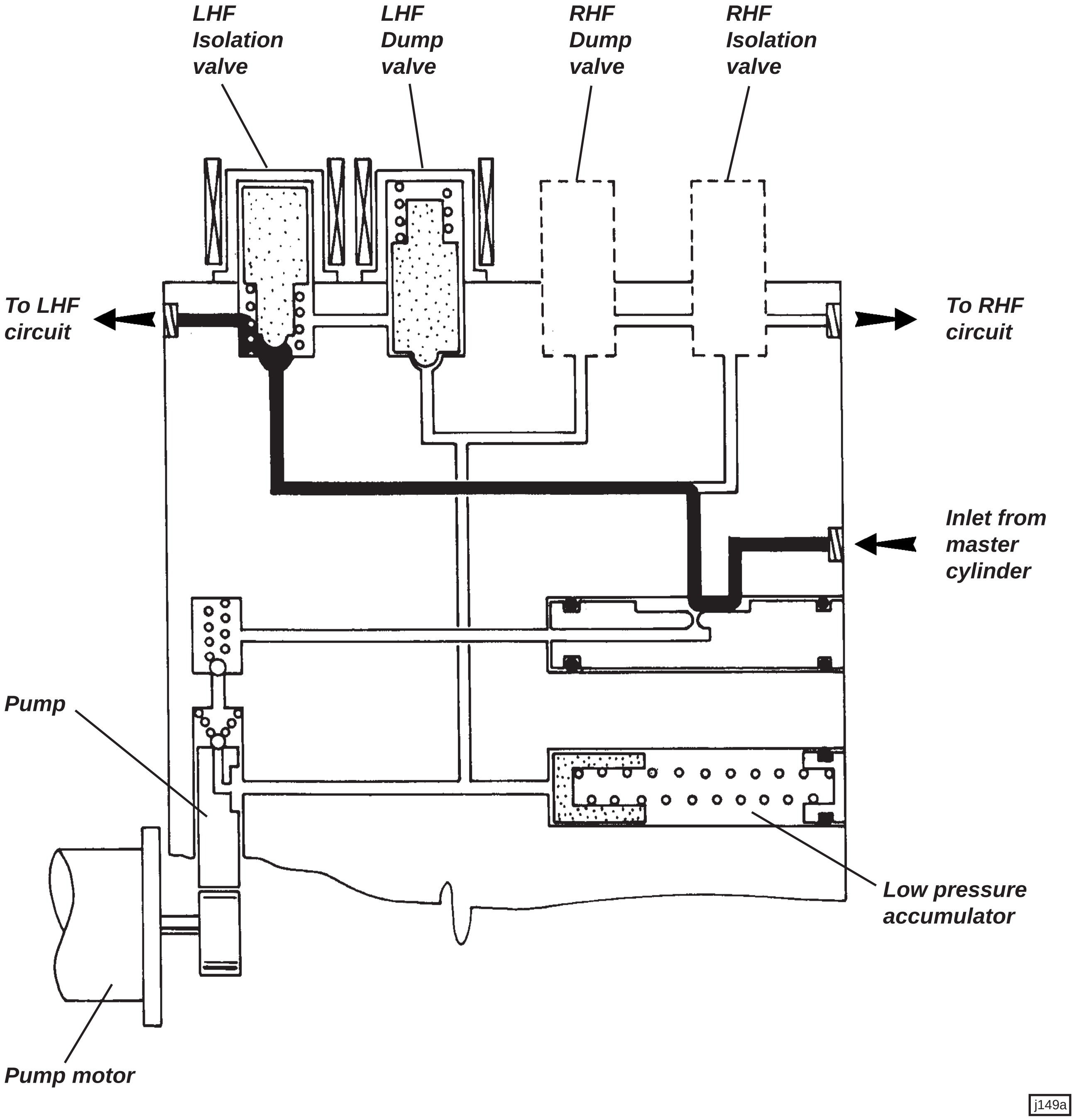


Sequence of Operation
In the following diagrams, one half of the hydraulic modulator is shown schematically, representing the front brake control circuit, with the sequence of operation described for the left hand front wheel brake.

This sequence would be similar for any of the other three wheel brakes. A typical emergency braking event is described where, in this example, the left hand front wheel tends to lock. Note that the complete system is duplicated for the rear brake circuit, which remains completely independent of the front circuit.

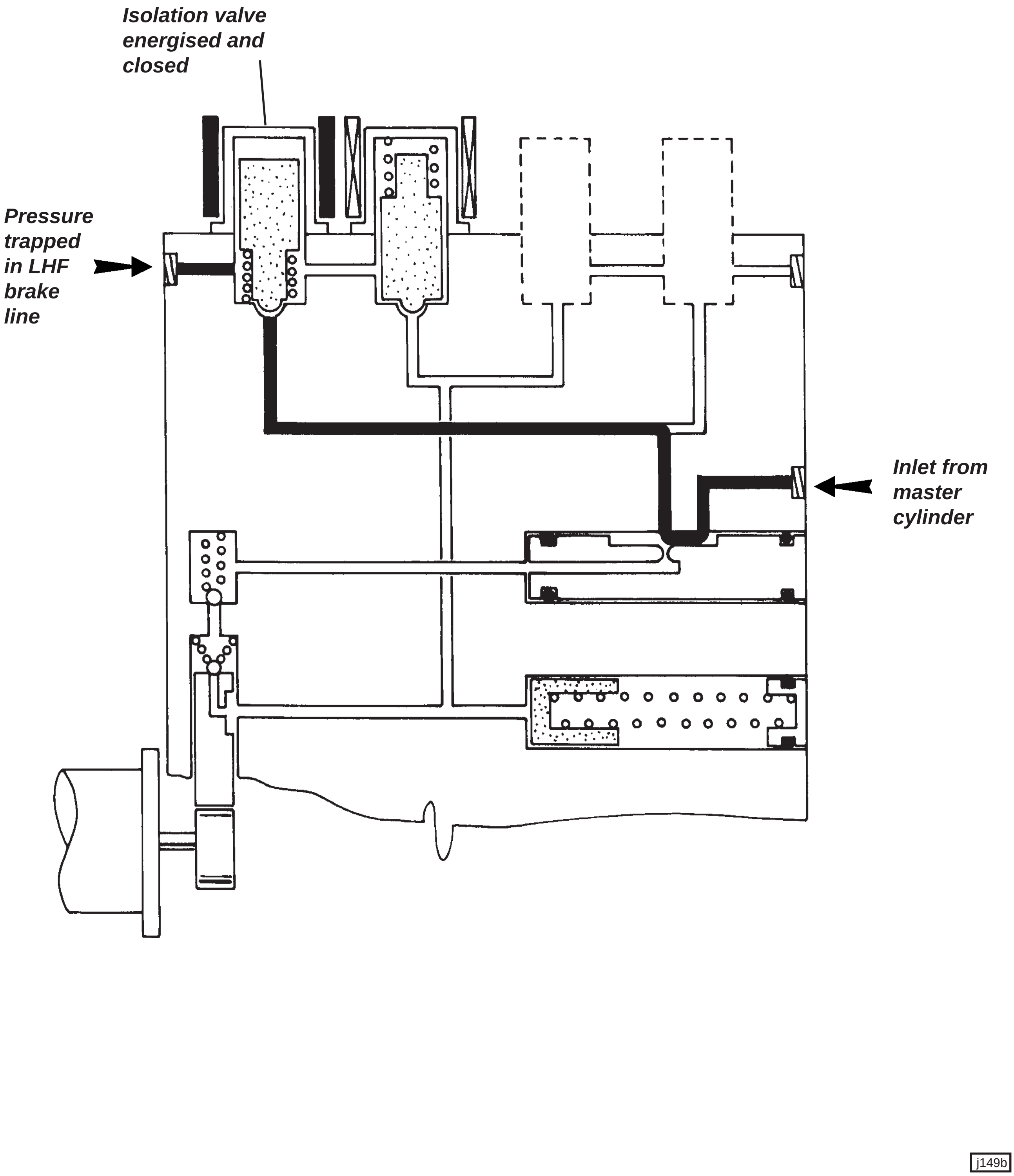
Normal Braking
During normal braking, when the wheel speed sensors indicate no imminent wheel locking, the ABS is inactive. The solenoids are unenergised, so that the isolation valves are sprung open, and the dump valves sprung closed.

Hydraulic fluid from the master cylinder enters the modulator via the inlet port, by-passes the attenuator orifice, passes through the open isolation valve and out to the LH front wheel brake.



Pressure Isolation (Pressure Maintain)
If signals received from the wheel speed sensors indicate imminent lock up of the LH front wheel, the first step in the anti-lock sequence is to isolate that wheel brake circuit from the master cylinder.

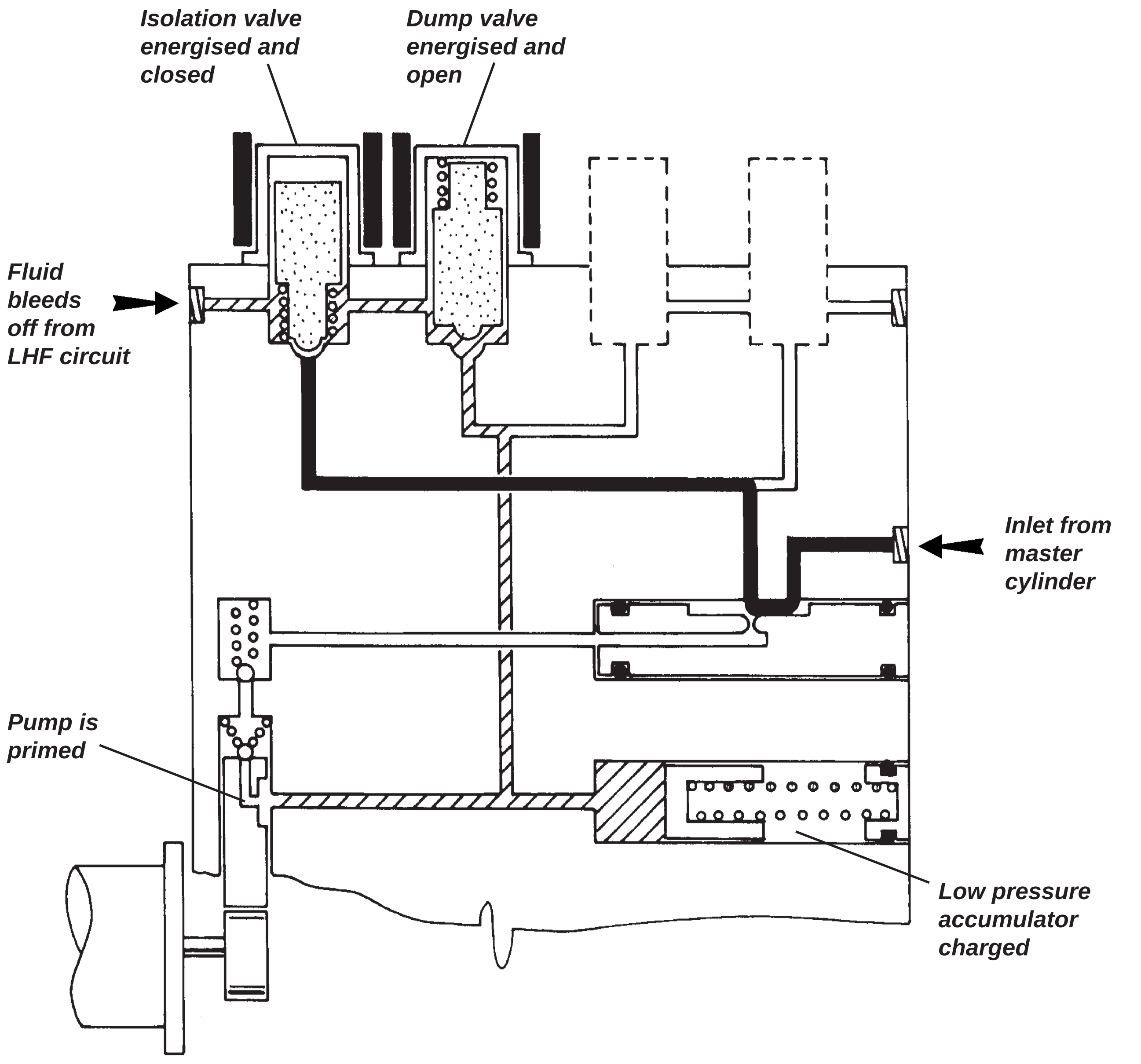
The ECM energises the isolator valve solenoid, which closes the valve against spring pressure and maintains existing pressure in the left hand front brake circuit regardless of any increase in pedal pressure.



Pressure Reduction
Once the LH front wheel brake circuit has been isolated from the master cylinder, the pressure must be reduced in order to allow wheel speed to be restored.

This pressure reduction is achieved by the ECM energising the dump valve solenoid, which then opens against spring pressure and bleeds off some of the fluid into the low pressure accumulator shared with the RH front circuit. Very short activation pulses are used to maintain close control of the pressure reduction, and to limit the reduction to that required to restore wheel speed.

Fluid displaced from the wheel brake circuit is stored in the front brake accumulator against spring pressure, and is also used to prime the hydraulic pump.

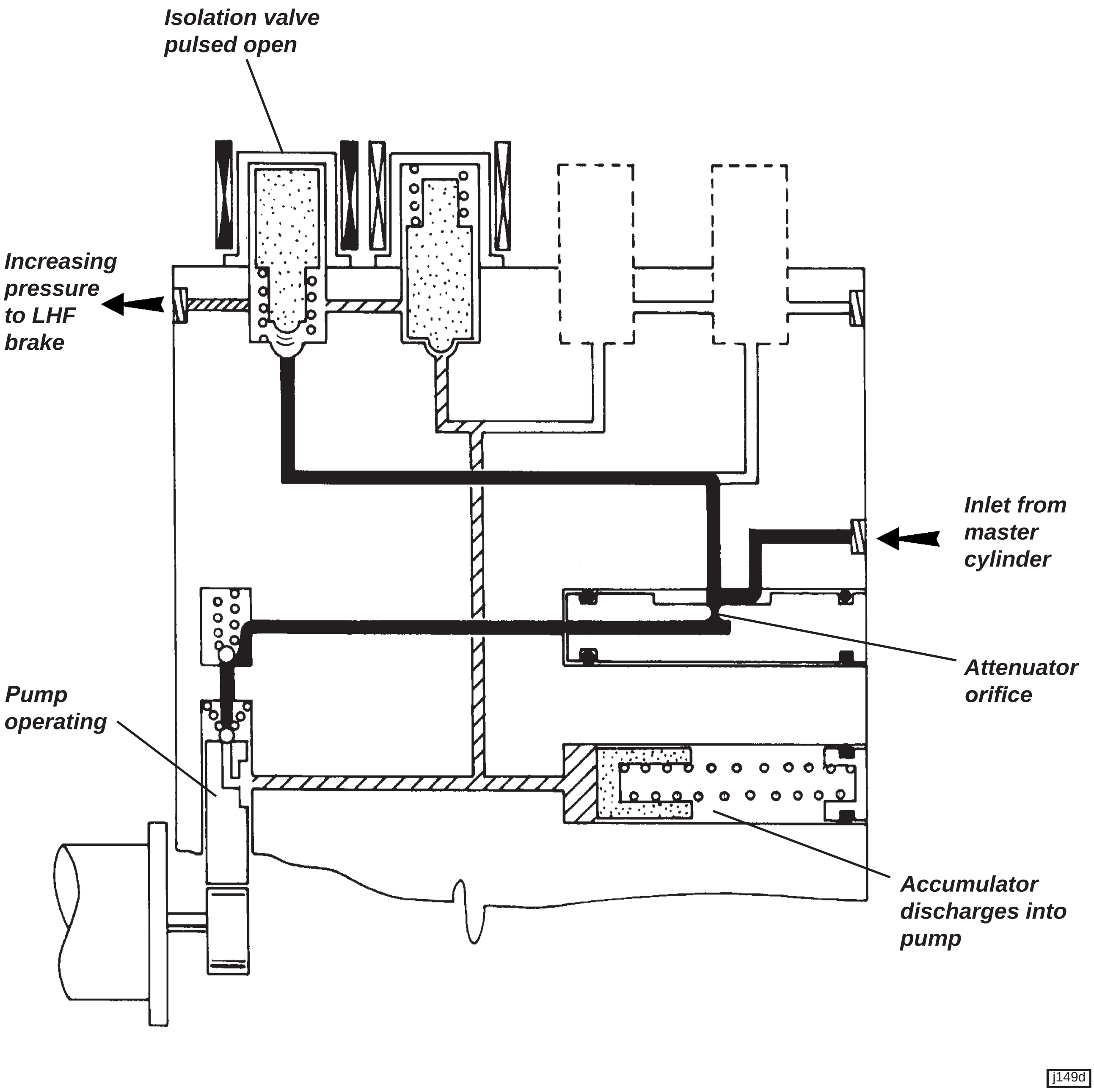


Pressure Increase (Re-apply)
As soon as imminent wheel lock is detected by the ECM, and the ABS control system is activated, the pump motor is energised.

When the dump valve is opened, and fluid is allowed to bleed off from the wheel brake circuit into the low pressure accumulator, this fluid is scavenged by the pump and returned back into the input circuit through an attenuator orifice.

This action is the origin of the ‘pedal pushing back’ sensation felt by the driver, with the pressure pulsations from the pump damped and quietened by the restriction of the orifice. When wheel speed has been restored and the brake pressure is required to increase, the isolation valve is momentarily opened, to allow master cylinder/ pump pressure to raise the pressure in the wheel brake circuit in increments.

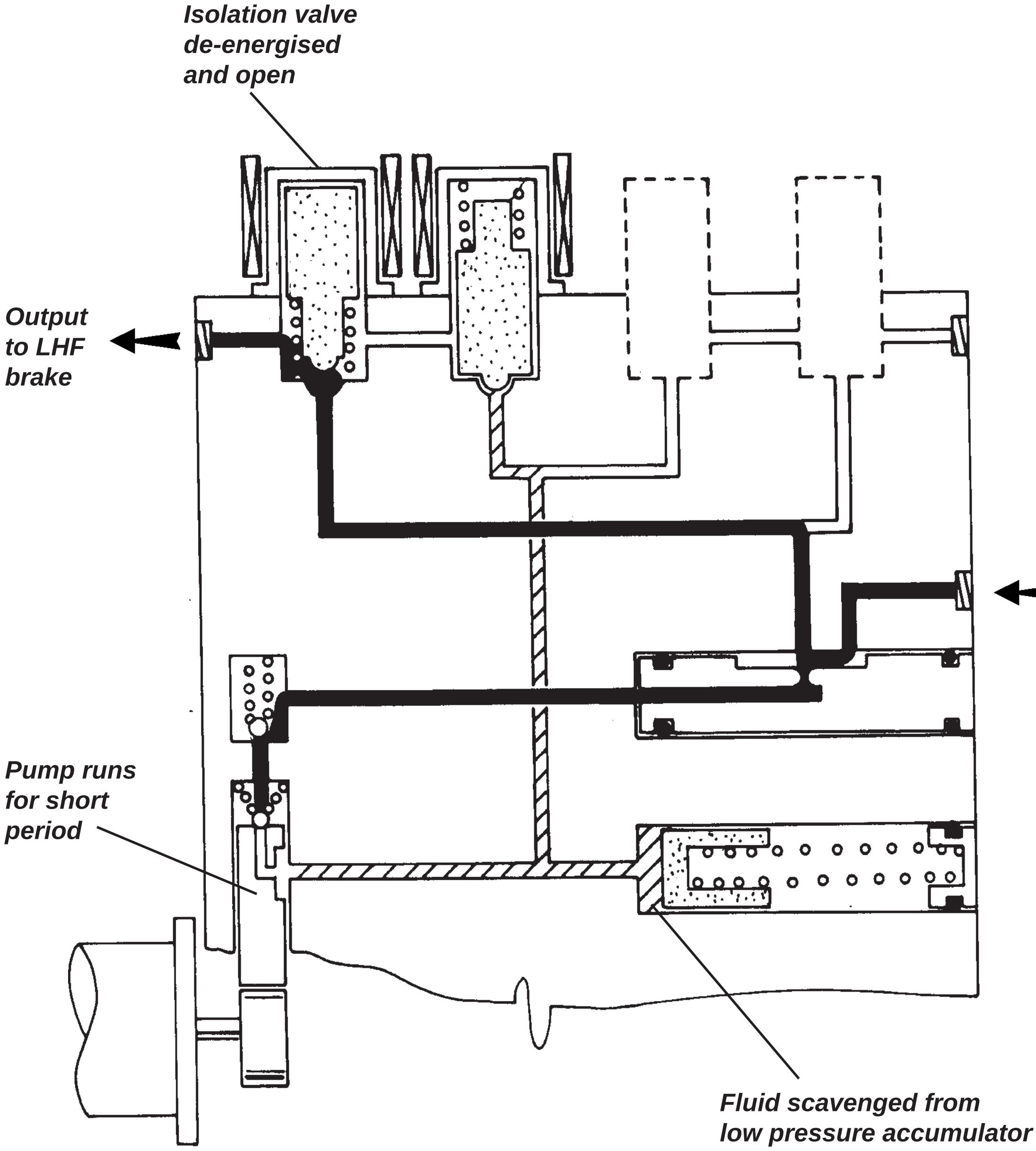
If imminent locking is again sensed, the isolation valve closes, the dump valve opens and the cycle repeats, with the whole process occurring several times a second.



Brake Release

When no further wheel locking is sensed by the ECM, the ABS becomes inactive with the isolation valve open (solenoid de-energised) to allow direct communication between the master cylinder and wheel brake circuit, and the dump valve closed (solenoid de-energised) to seal off the pressure relief circuit.

The pump will remain running for a short time to help drain any fluid from the accumulator, whose piston is returned to its start position under the action of the spring, and return the fluid to the master cylinder reservoir.



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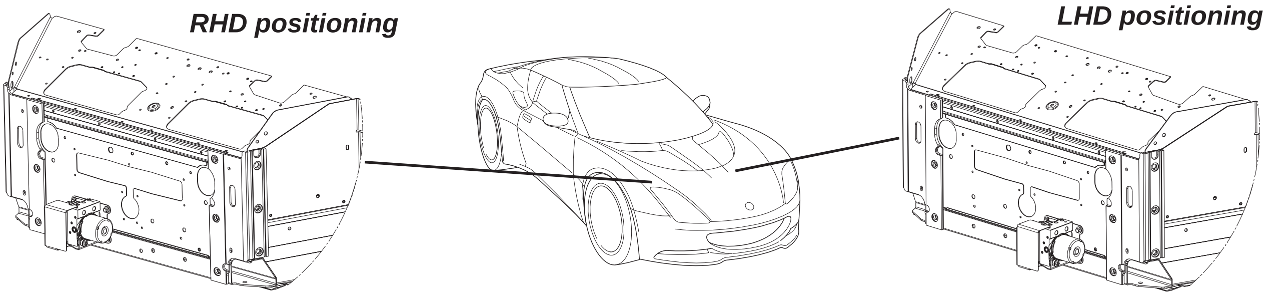
JL.12 - ABS/ESP MODULE UNIT

The ABS module is located on the front side of the driver's footwell, and is accessible from below after removal of the front undertray. It is initially positioned in place onto the support bracket by an integral locating pin fitted to the lower housing of the unit which slides into a grommet located at the base of the bracket.

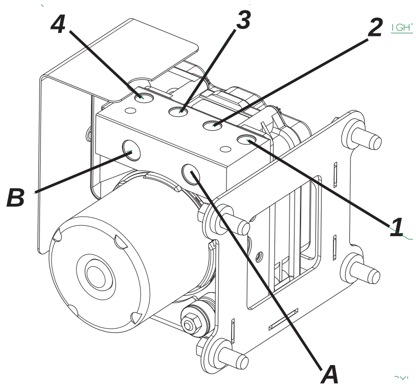
The unit is then positively fixed by 2 threaded pins fitted within isolator bushes which are screwed to the side of the ABS housing; the isolator bushes then slot into recesses located to the side of the bracket and retained by 2 M6 nyloc nuts.

The module/bracket assembly is secured to the chassis by four screws. An aluminium spacer washer is fitted to the shank of each screw between the bracket and footwell. A single 38 pin connector plug with a cam lever is provided to connect the vehicle harness to the control module.



CAUTION: Do not disconnect or connect the main connector plug with the ignition switched on. Switch off the ignition and disconnect the harness before carrying out any electrical welding operations on the car.

Hydraulic pipe connections to the unit comprise two input pipes from the master cylinder (one for the front circuit, one for the rear) and four output pipes, one for each of the wheel brakes. Note that all hydraulic connections are identified by engraved markings on the unit:



Input:
(A) MC1 From master cylinder rear port (front brake circuit)
(B) MC2 From master cylinder front port (rear brake circuit)

Output:
(1) FL Front left
(2) FR Front right
(3) RR Rear right
(4) RL Rear left

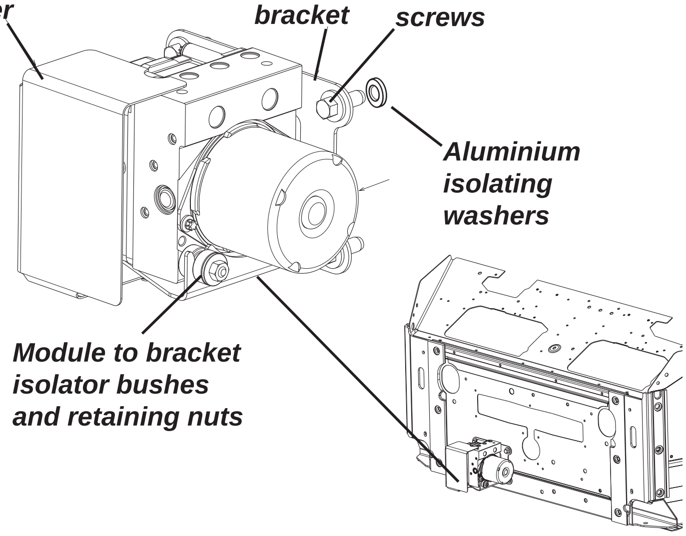
To Remove ABS Module
When removing the unit, beware of dripping brake fluid and take appropriate precautions to prevent damage to paintwork.

1. Raise the vehicle and remove the front undertray; refer to Service Notes Section A - Introduction for more information.

2. Release the M6 (2) flanged nuts (torque 8Nm) securing the modules protective cover to the mounting bracket and remove.

3. Switch off the ignition before pressing the release tab and folding back the cam lever to disconnect the harness plug.

3. Label each of the hydraulic pipes before disconnecting from the unit and immediately capping the pipes and plugging the ports to reduce the spillage of brake fluid, and to prevent the ingress of dirt.



4. Release the M8 x 20 (4) flange screws (torque 24Nm) securing the mounting bracket to the chassis and withdraw the bracket with ABS unit.

5. To remove the unit from the bracket, release the M6 (2) retaining nuts from the studs (torque 9Nm) and slide the unit from its three grommets.

To Refit the Original ABS Module
Is the reversal of removal procedure, taking care to connect the brake pipes correctly:

Mounting bracket to chassis;	24 Nm
Modulator inlet pipes;	18 Nm
Modulator outlet pipes;	16 Nm

- Bleed the unit of air (see sub-section JL.3).

- Verify correct fitment by using 'Lotus Techcentre' to perform an actuator test with the car on a wheel free lift. Check that operation of each solenoid valve affects the appropriate wheel.

Note that the ABS controller is calibrated specifically for the Evora. Do not use parts from other sources.

Please see the special information below if renewing the ABS module.

To Renew the ABS/ESP Module.

ABS/ESP Module Options
Service replacement ABS/ESP modules are supplied 'Wet filled' i.e. pre-filled with brake fluid, to ensure the best possible brake bleeding operation using the generic bleed/fill equipment normally available within a normal vehicle workshop.

A service replacement ABS/ESP unit is available with specific firmware for early start of production non-USA vehicles up to VIN BH_11177 which were not fitted Lotus DPM i.e. fitted with traction control only, see service notes section JL.13. for further details

There is a single part number service replacement unit for all vehicles and all markets as from VIN BH_11178 when ABS/ESP was fitted to all models. (See Service Parts List section 33.03 for part number details)

Preparation of New ABS/ESP Module Prior to Perform Brake Bleed Procedure
Once the new ABS/ESP module is fitted it will be necessary to connect the vehicle to the Lotus Techcentre to perform the 3 operations listed below before carrying out the brake bleed procedure shown in sub-section JL.3:

1. Installation of the correct module program relevant to the vehicle into the new ABS/ESP module.

2. Configuration of the ABS/ESP module to the vehicles specific type, powertrain (such as Naturally Aspirated or Supercharged, Elise/Exige or Evora etc).

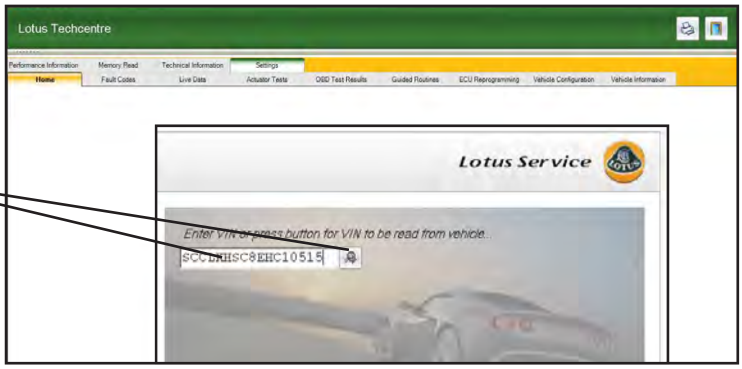
3. Recalibration of the SAS (Steering Angle Sensor) after the succesful completion of steps 1 & 2.

The following 4 pages describe how to perform operations 1 & 2 using Lotus TechCentre, For further information see the 'Lotus TechCentre User Guide', which can be downloaded from the Lotus Dealer Portal at: http://dealers.lotuscars.com

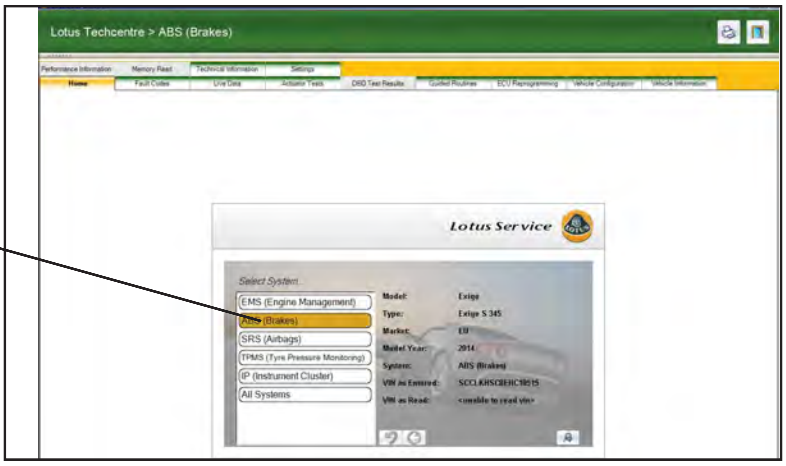
Step1. Installation of the correct module program relevant to the vehicle into the ABS/ESP module.

From the TechCentre home page, enter the actual full 17 digit VIN and click on the magnifying glass icon. (Sample VIN shown, ensure to enter actual vehicle VIN).

To ensure the correct specific vehicle details are found - DO NOT select the vehicle type from the drop down box options



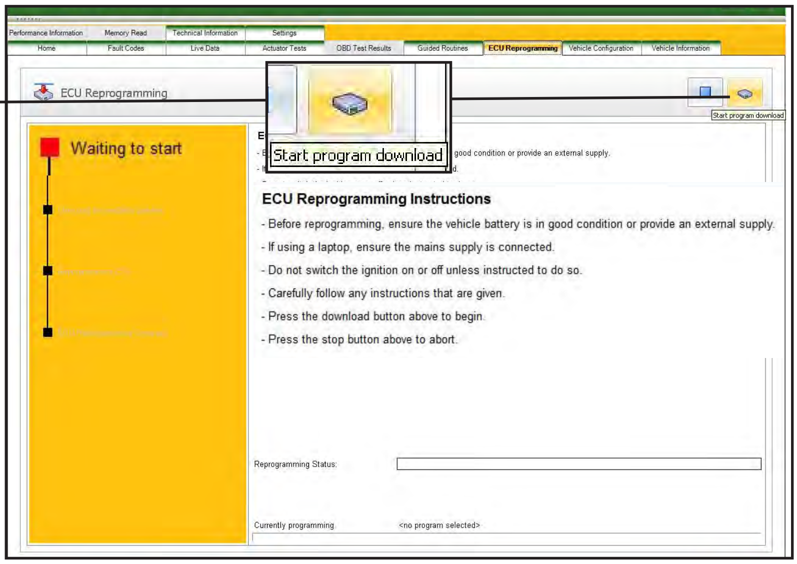
VIN relevant details and readable control units will be displayed - Select ABS (Brakes)



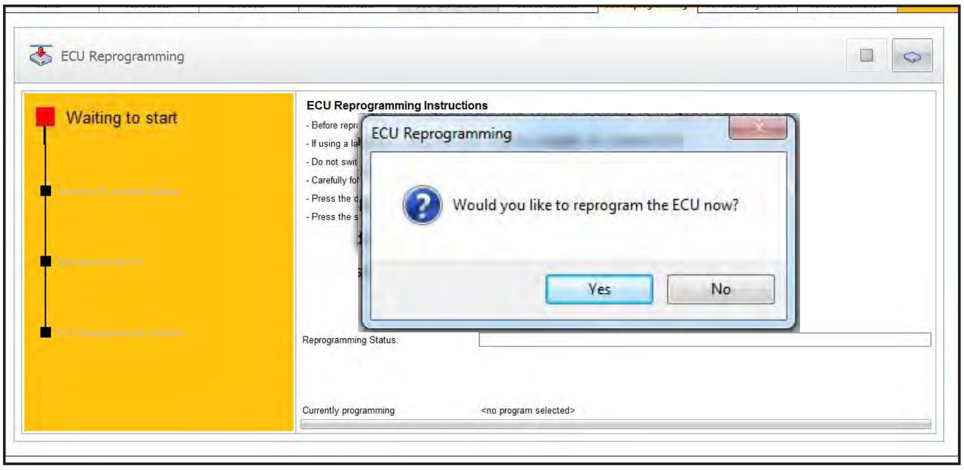
Select the 'ECU Reprogramming' tab

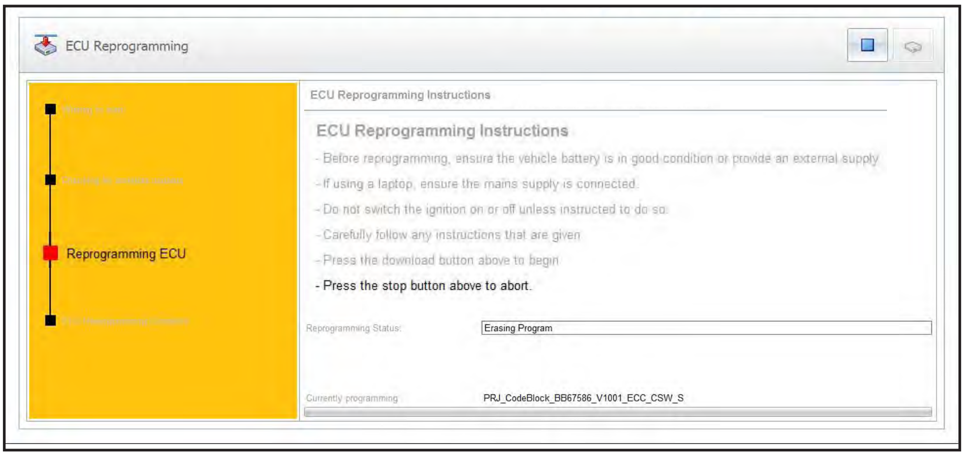
Click on the 'Start Program Download' icon and follow the on screen instructions

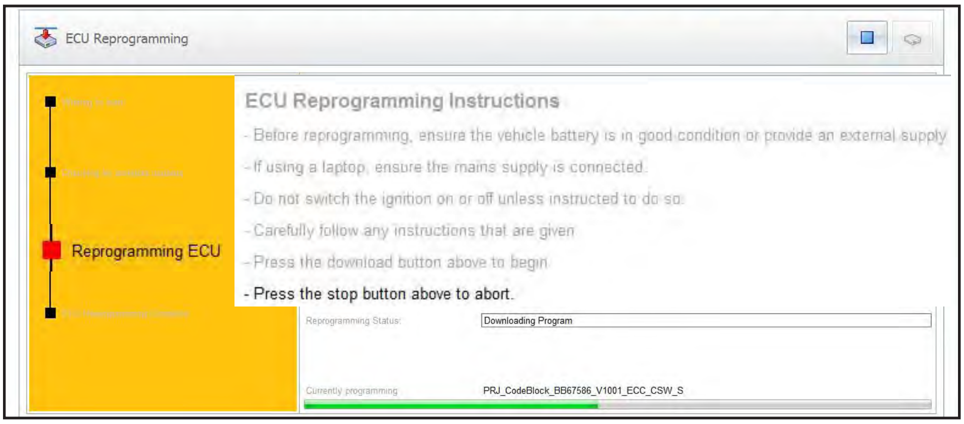
IMPORTANT: BEFORE BEGINING ANY PROGRAM DOWNLOAD ENSURE THE VEHICLES BATTERY IS FULLY CHARGED, OR IF UNSURE CONNECT THE BATTERY TO AN EXTERNAL CHARGER

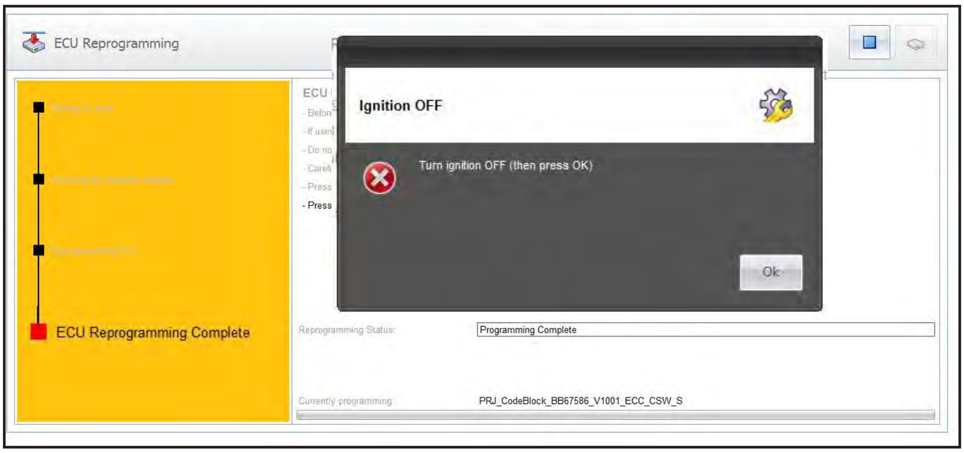


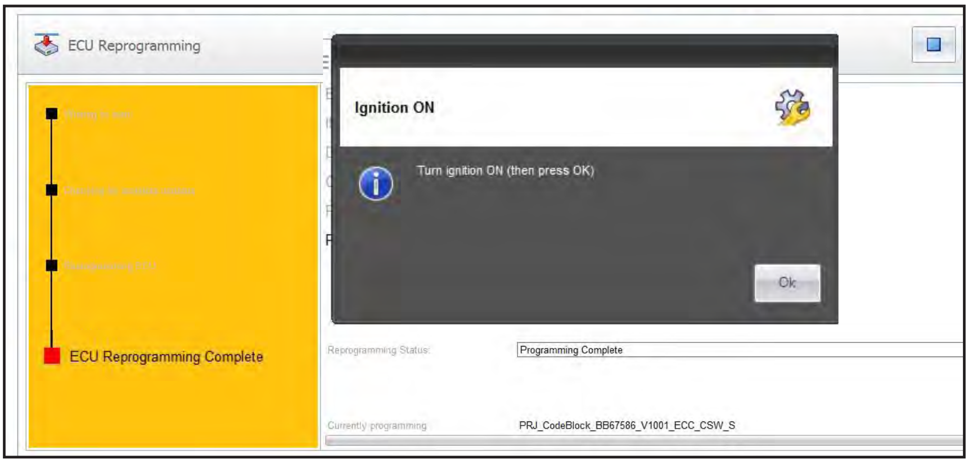
Follow the on screen instructions as shown on this page

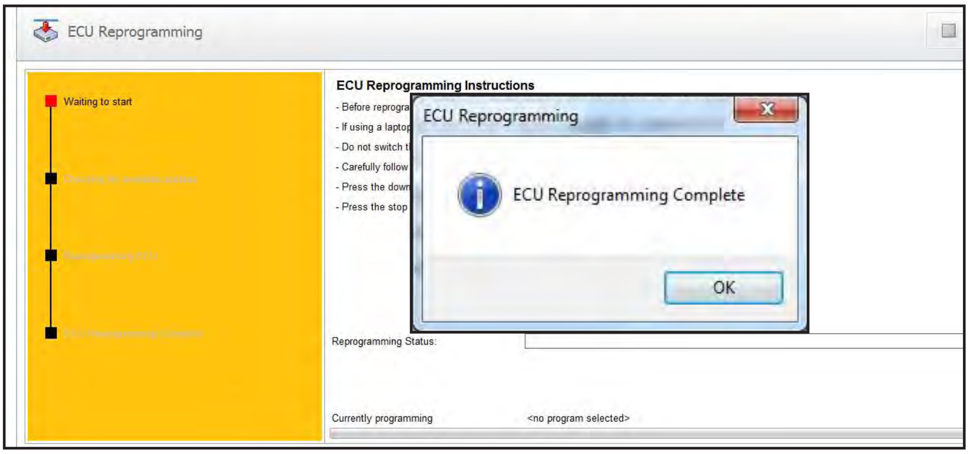








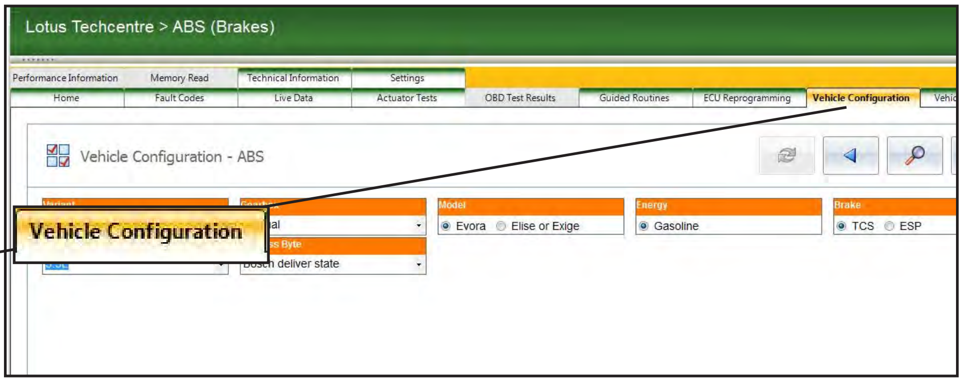




2.Configuration of the ABS/ESP module to the vehicles specific type, powertrain

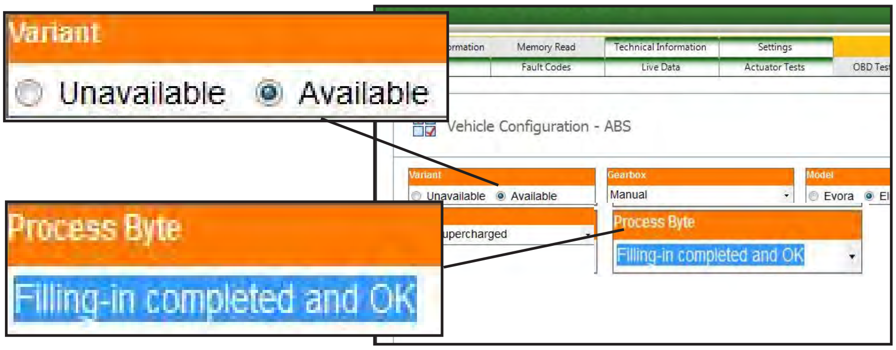
With ABS/ESP module programmed it now has to be configured to the vehicle by selecting specific options available

Select the 'Vehicle Configuration' tab

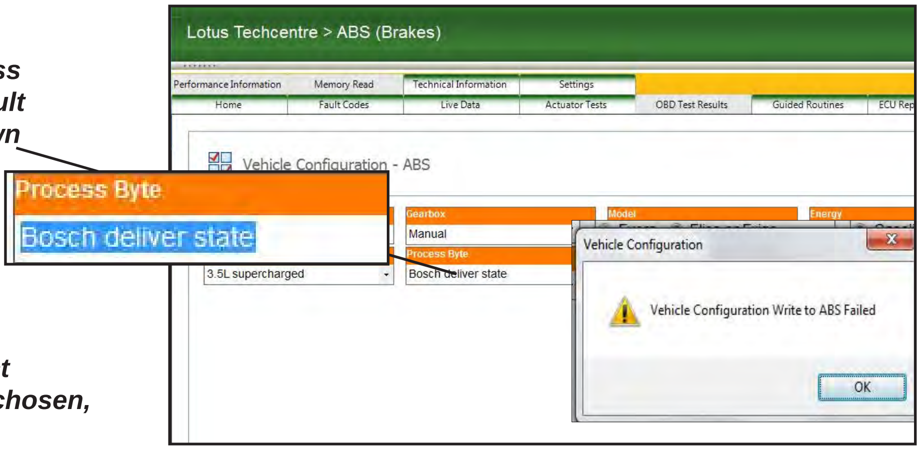


Select the options relevant to the vehicle (such as engine, gearbox & model etc).

Note: Although there are several options available, in all instances the 'Variant' and 'Process Byte' options must be selected as shown.

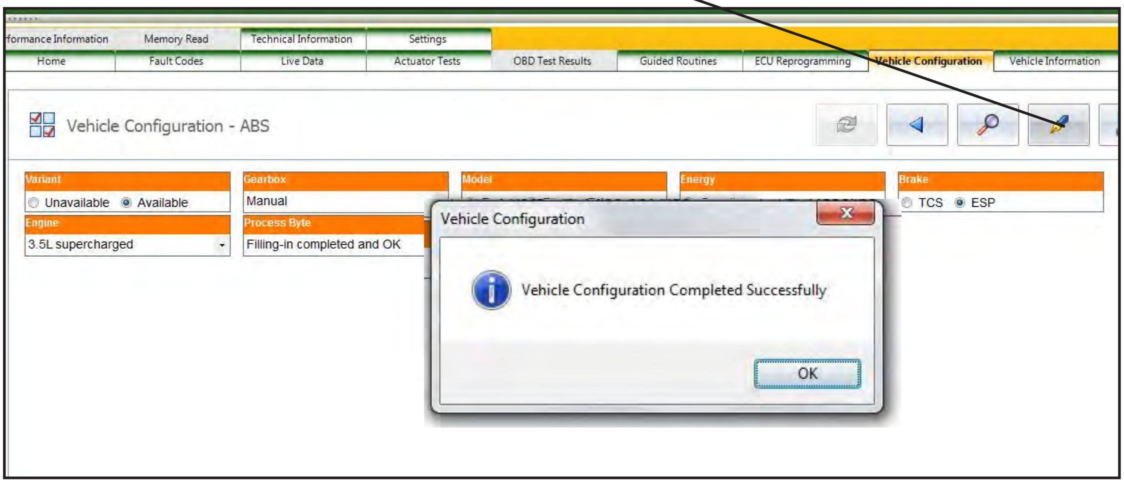


Selecting the 'Bosch deliver state' option from the Process Byte drop down box will result in an error message as shown



Once all the relevant correct vehicle options have been chosen, select the 'Pen' icon.

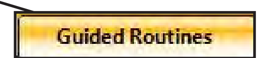
If all the options selected are compatible to the vehicle a 'Configuration successful' message will be displayed

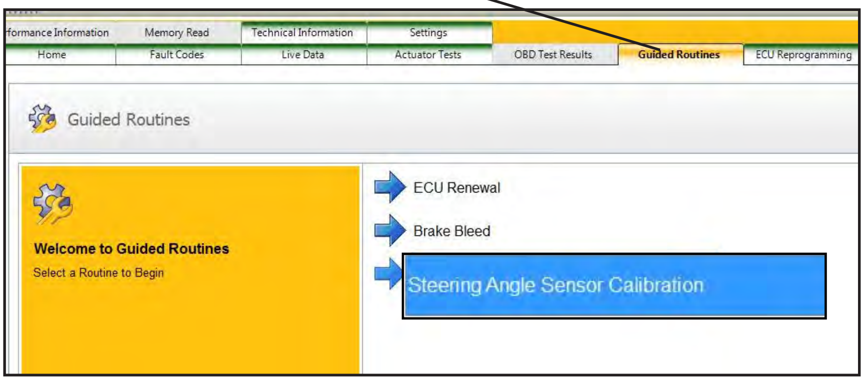


3.Recalibration of the SAS (Steering Angle Sensor)

Once the ABS/ESP module is programmed and configured select guided routines to recalibrate the SAS.

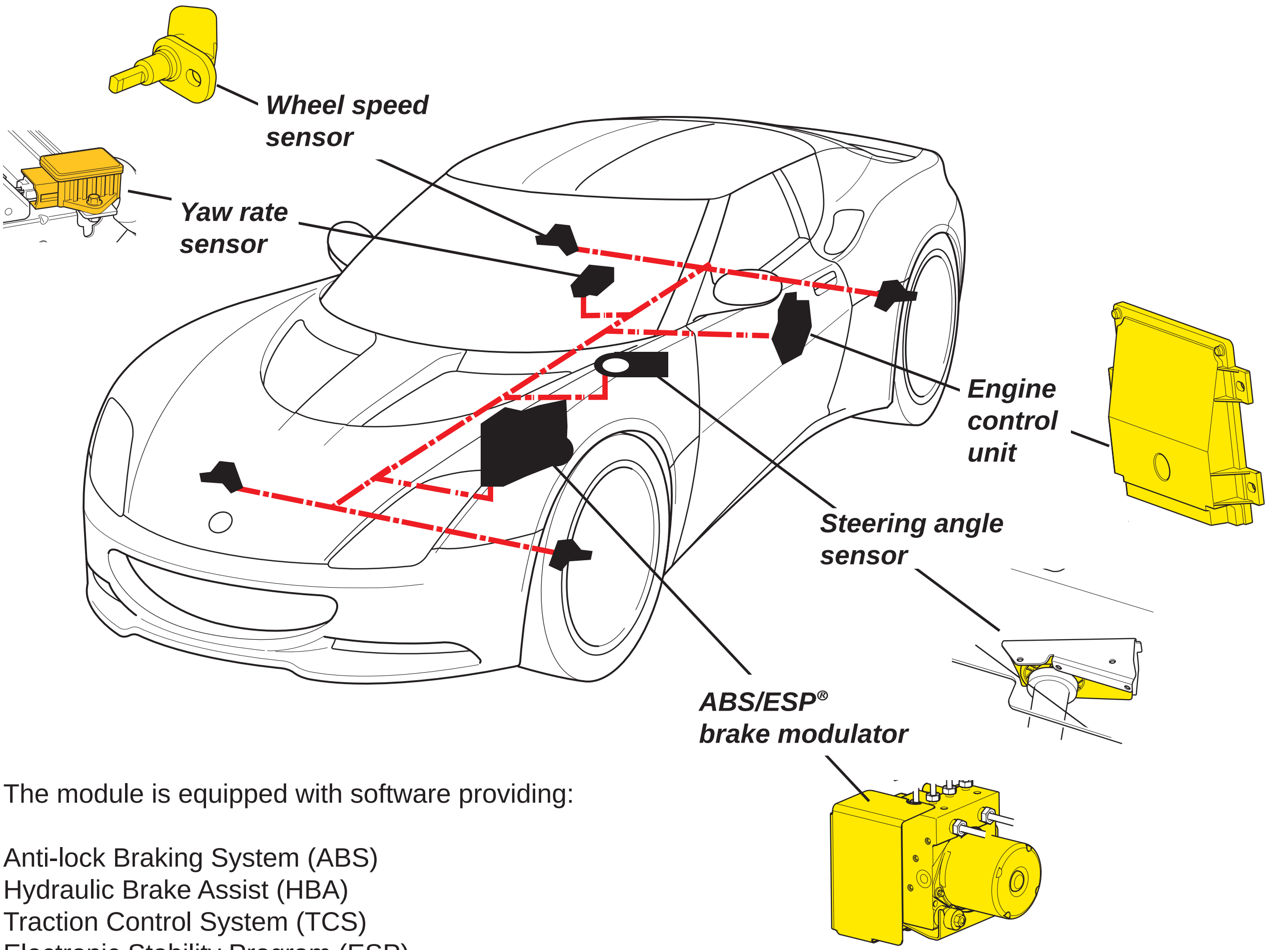
Once successfully recalibrated the ASP/ESP module can be bleed as described in sub-section JL.3





JL.13 - ABS MODULE SPECIAL FEATURES

The Bosch 8.1 ABS/ESP® brake system modulator fitted to the Evora is an integral component to both the braking and engine management control systems. The ABS/ESP® modulator consists of a single electro-hydraulic unit, hydraulic modulator, hydraulic pump, microprocessor and solenoid valve bank



The module is equipped with software providing:

Anti-lock Braking System (ABS)
Hydraulic Brake Assist (HBA)
Traction Control System (TCS)
Electronic Stability Program (ESP)
Electronic Brake Distribution (EBD)
Electronic Differential Lock (EDL)
Corner Brake Control (CBC)
Drag Torque Control (DTC)

The collective name for this functionality is 'Lotus Dynamic Performance Management' (Lotus DPM). These systems utilise input information from the Yaw Rate Sensor, Steering Angle Sensor (SAS), Wheel Speed Sensors (WSS) and Engine Control Unit (ECU) to determine if any excessive degree of wheelspin is occurring or if the vehicles stability is at risk activating the anti-lock braking system (ABS) to apply a measured braking force to individual wheels as necessary or reduce or increase engine torque in order to help the driver maintain control of the vehicle.

Lotus Traction Control (LTC) (all markets)
See section MR. 5

Hydraulic brake assist (HBA) (all markets)
Hydraulic brake assist (HBA) detects an emergency situation by the driver's determination to rapidly stop the vehicle by measuring the gradient of brake pressure build-up. In case of insufficient brake pressure the HBA system increases pressure up to abs activation threshold to ensure the shortest stopping distance possible. These features enhance vehicle stability in extreme manoeuvres typified by accident avoidance attempts

or misjudged cornering demands. Current vehicle behaviour is constantly monitored, and compared with a determination of the driver intent as indicated by data gathered from the driving controls.

Lotus Dynamic Performance Management (Also referred to as ESP for Federal vehicles)
A Bosch ESP 8.1 ABS module is fitted as standard from the beginning of production on Federal vehicles and or all other markets as from vehicle from '11MY VIN BH_11178. With the additional software listed below it is now refered to as Lotus Dynamic Performance Management (Lotus DPM) system:

Corner Brake Control (CBC)
If the driver applies the brake whilst performing a heavy cornering manoeuvre, there is a possibility that the vehicle may oversteer. Corner Brake Control (CBC) reduces the brake pressure to the inside rear brake calliper in an attempt to maintain vehicle stability.

Drag Torque Control (DTC)
The braking effect of the engine can cause the driven wheels to skid as they temporarily lose traction. This can be caused by the driven wheels locking on slippery surfaces during sudden/rapid deceleration which can be caused by the quick release of the accelerator pedal or fast down shifting through the gears. Drag Torque Control (DTC) system attempts where possible to maintain directional stability. The ABS/ESP® control module receives information from the rear wheel-speed sensors as well as the Engine Control Unit (ECU) via the CAN data bus. If wheel slip is detected under these circumstances, it sends a signal to the ECU to increase engine torque, until the driven wheels are turning at a rate appropriate to the vehicles speed.

Electronic Stability Program (ESP®)
The ABS/ESP module monitors the signals from the Yaw Rate and the Steering Angle Sensor sensors and checks 25 times a second, whether the driver's steering input corresponds to the actual direction in which the vehicle is moving. If the vehicle moves in a different direction the ESP® detects the critical situation and reacts immediately – independently of the driver. It uses the vehicle's braking system to "steer" the vehicle back on track. With these selective braking interventions ESP® generates the desired counteracting force, so that the car reacts as the driver intends. ESP® initiates braking intervention, but can also intervene on the engine side to accelerate the driven wheels.

Electronic Brake Distribution (EBD)
This feature addresses the instability that could be caused under heavy braking due to the tendency of the lightly loaded rear wheels to lock prematurely. Electronic Brake Distribution is incorporated into the ABS to limit the rear brake system hydraulic pressure prior to any anti-lock intervention.

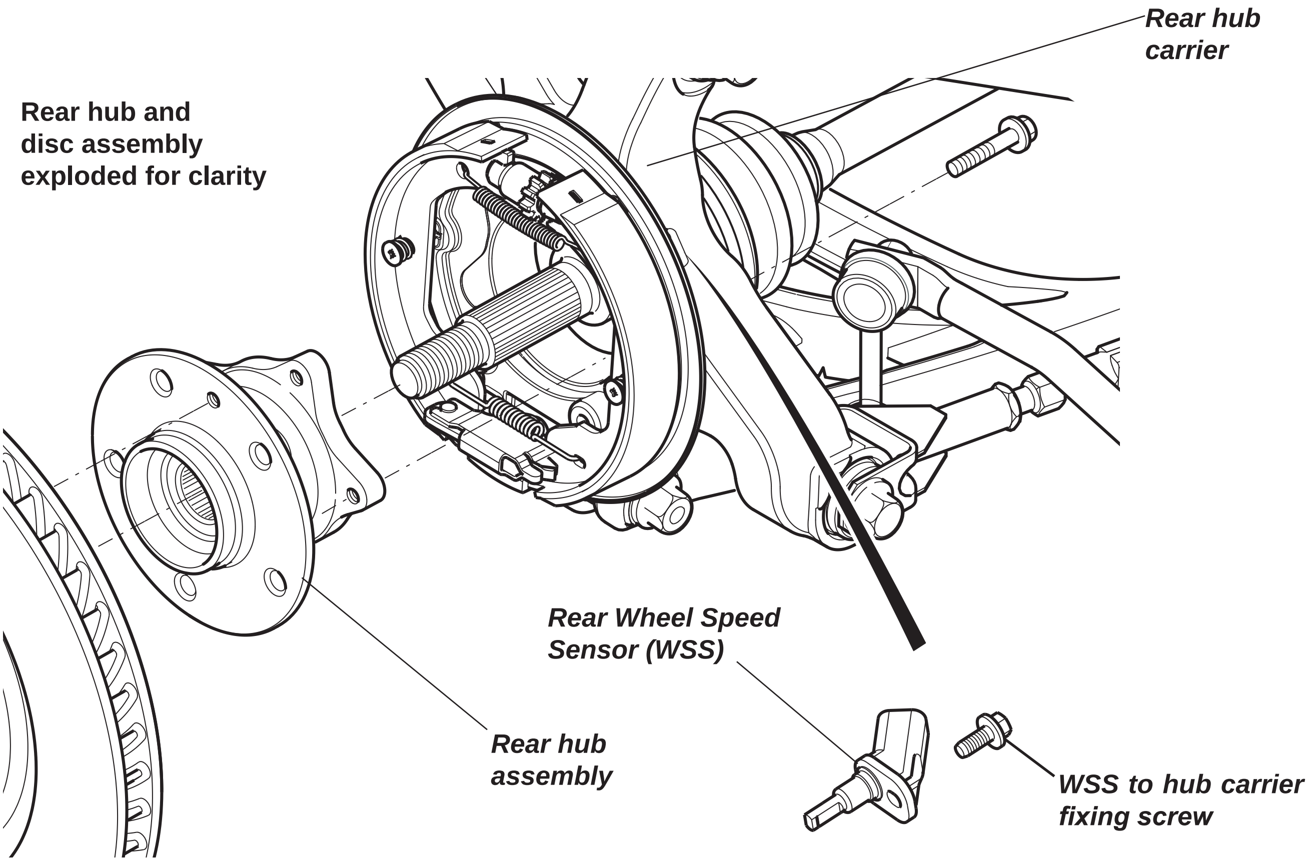
Electronic Differential Lock (EDL)
If hard acceleration is demanded in conditions of variable surface grip, or when cornering forces result in a lightly loaded inside rear wheel, there will be a tendency
for drive torque to overcome the grip available, resulting in spinning of the lightly loaded wheel. When this situation is detected by the ABS controller, brake pressure is applied to the spinning wheel in order to transfer drive torque to the opposite wheel, thus maintaining drive and aiding vehicle stability.

These systems utilise input information from the yaw rate, steering angle and wheel speed sensors to determine if any excessive degree of wheelspin is occurring or if the vehicles stability is at risk activating the anti-lock braking system (ABS) to apply a measured braking force to individual wheels as necessary or reduce engine torque in order to help the driver maintain control of the vehicle.

JL.14 - WHEEL SPEED SENSORS

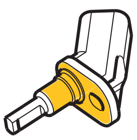
A 48 pole vehicle speed sensor ring is integrated into the hub inboard grease seal, the signal from which is read by a sensor inserted into the rear of the hub carrier and retained by a single button head socket screw.

Wheel speed data is supplied to the ABS control module, which uses the information to modulate brake system pressures, and also outputs a road speed signal to the engine ECM, and to the instrument pack for speedometer operation. Output from each wheelspeed sensor can be checked using the Lotus TechCentre.



Removal:
Release the single M5 x 12 screw securing the wheel speed sensor, and withdraw the sensor from the hub carrier.

Refitment:
Reverse procedure of renewal except:



- Apply a light coating of Mobiltemp 1 high temperature grease to the wheel speed sensor as shown in yellow in the left hand illustration and tighten screw to 5Nm

JL. 15 - STEERING ANGLE SENSOR

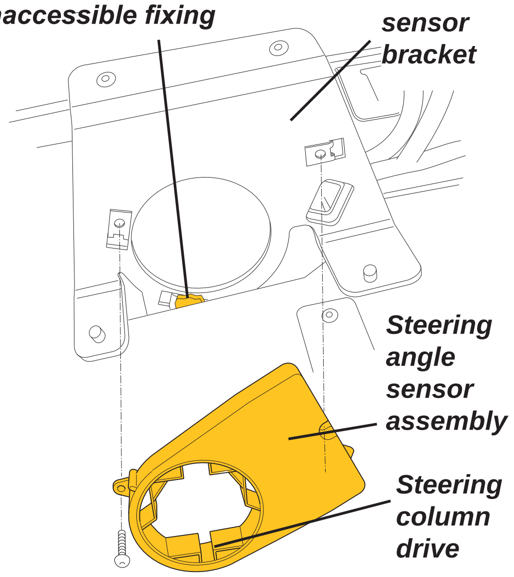
The Lotus DPM system requires information on the overall steering wheel angle. This is measured by the steering angle sensor . The sensor assembly consists of housing with a built in circular switch/drive which is free to rotate within the housing,

The drive has an aperture allowing the inner steering column assembly to pass through it. A two piece collar is clamped around the inner column shaft. The internal aperture of the switch drive has 2 machined reccesses, external pins protruding from the collar fit into these recesses allowing the switch drive to rotate with the inner steering column.

The steering angle sensor is attached to an angled bracket via 3 fixings and the whole assembly is fixed behind the dash cross beam with rivets. An electrical connector on the back of the unit connects the unit to the vehicle main harness so that output signals can be sent to the ABS and engine managment ECM's.

When the inner steering column rotates the sensor, information on the driver's steering input and direction is feed back to the ECM's of the ABS module and Engine Management System. The information received from the sensor is compared to signals sent from the yaw rate and wheel speed sensors to determine if the steering intent of the driver matches that of the actual course and direction of the vehicle.

If the Lotus DPM system considers the vehicles stability is at risk, the ABS module will apply a measured braking force to individual wheels and/or the Engine Management Controller will reduce vehicle torque as necessary in order to help the driver maintain control of the vehicle.



Removal:
1. Remove steering column assembly (see sub-section HI.8).

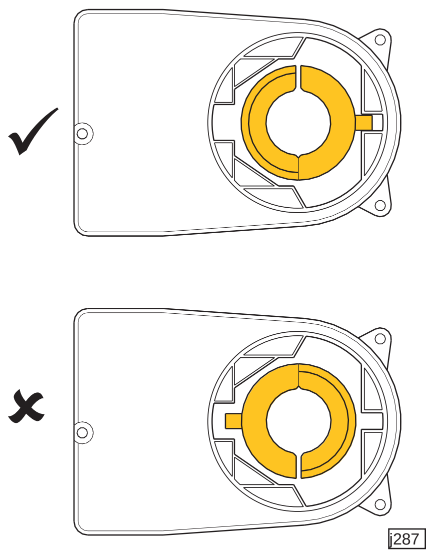
   Note: only two of the three fixings securing the sensor to the mounting bracket are accessible;

2. Release the two accessible cross head screws, and break off the unit from the third fixing.

3. Release the harness connector plug and withdraw.

4. With the access now available, remove the third fixing.

Orientation of steering column peg and steering angle sensor



Refitment:
Is the reversal of removal except:
- The sensor can only be fitted using the two accessible screws.

- During column ensure that the steering angle sensor peg locates in the narrow slot in the hub of the steering sensor as shown on the following page.

- **Care point:** Once the steering column is refitted it is essential to recalibrate the steering angle sensor using Lotus Techcentre. Once the correct vehicle by model type, year and market has been identified then select ABS > Guided routines > Steering angle sensor calibration.

  Failure to calibrate the sensor could result in impaired traction control/Dynamic Performance Management funtionality and will illuminate the tell-tale light.

JL. 16 - YAW RATE SENSOR

The yaw rate sensor measures the rotation of the vehicle. The data from the yaw sensor is compared to the data from the steering angle sensor to determine if intervention from the ABS module to apply a braking force and/or if the vehicles engine management ECM is required to reduce engine torque to assist understeer and oversteer control.

Located beneath the rear of centre console trim, the sensor is mounted to gearchange assembly mounting channel. An electrical connector on the back of the unit connects the sensor to the vehicle main harness so that output signals can be sent to the ABS and engine managment ECM's.

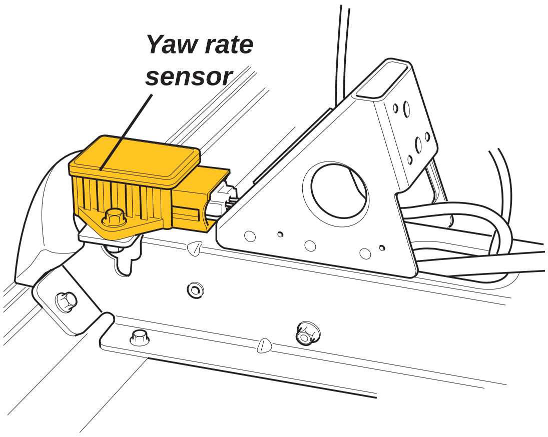
Removal

1. Remove centre console assembly (see sub-section VE.6).

2. Unclip harness connector and unbolt from the mounting channel.

Refitment.

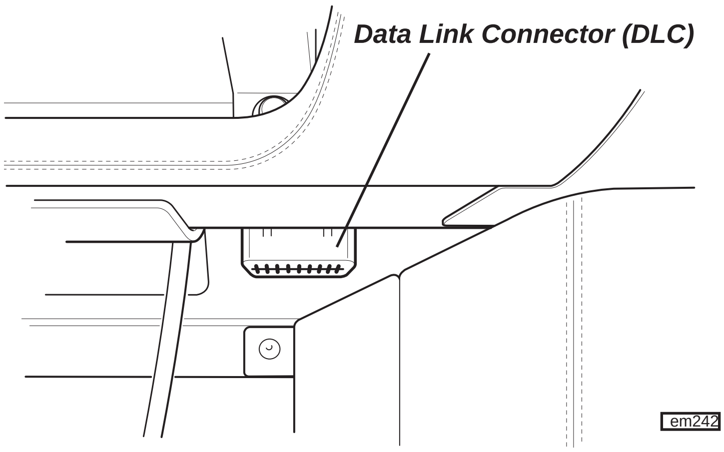
Is the reversal of removal.



JL.17 - DATA LINK CONNECTOR (DLC)

The Data Link Connector (DLC) is a 16 terminal electrical connector plug, complying with SAE J 1962, which provides a means of communication with the ABS and engine management electronic control units. The connector is used in service to connect electronic diagnostic equipment such as the 'Lotus TechCentre' tool which allows system interrogation including the reading of trouble codes.

The DLC is located on the back of the scuttle crossbeam above the outboard side of the driver's footwell.



JL.18 - CAN BUS DIAGNOSTICS; LOTUS TECHCENTRE

Controller Area Network (CAN) is an electronic standard to allow high speed communication between modules and controllers, via a serial data bus. The bus is a circuit linking the modules to the controller, consisting of a pair of cables, twisted together to reduce electromagnetic interference, and carrying a square wave voltage signal corresponding to '0's and '1's, coded in such a way as to identify and prioritise the individual messages. On the Evora, CAN based systems include; engine management, anti-lock braking and related features, tyre pressure monitoring, instrument pack, and onboard diagnostics.

A 'stand alone' lap top PC loaded with 'Lotus TechCentre' software allows the CAN based serial data to be read. A Vehicle Communication Device (T000T1472F) introduced for the Europa model is used to connect the vehicle to the laptop Lotus TechCentre. Engine programming, live data display and systems diagnosis are all carried out via the Lotus TechCentre.

The minimum specification of the laptop computer for installation of the Lotus TechCentre is as follows:

Processer 1.70 Ghz;
1 GB RAM;
40 GB HDD;
CDRW DVD ROM;
WIN XP PRO or VISTA;
USB interface;
Ethernet or Wireless LAN

Note that this laptop should be dedicated soley to the Lotus TechCentre, with no other software installed. This diagnostic software is designed primarily for use by trained Lotus technicians, and is available as a CD under part number T000T1510F (version 4) or later supercessions. A monthly (Lotus Dealers) or annual (non-Lotus dealers) licence and support fee will also be levied, providing access to Lotus TechCentre Technical Support phoneline on ***0870 9493 668***, and e-mail on ***lotus.support.uk@omitec.com***

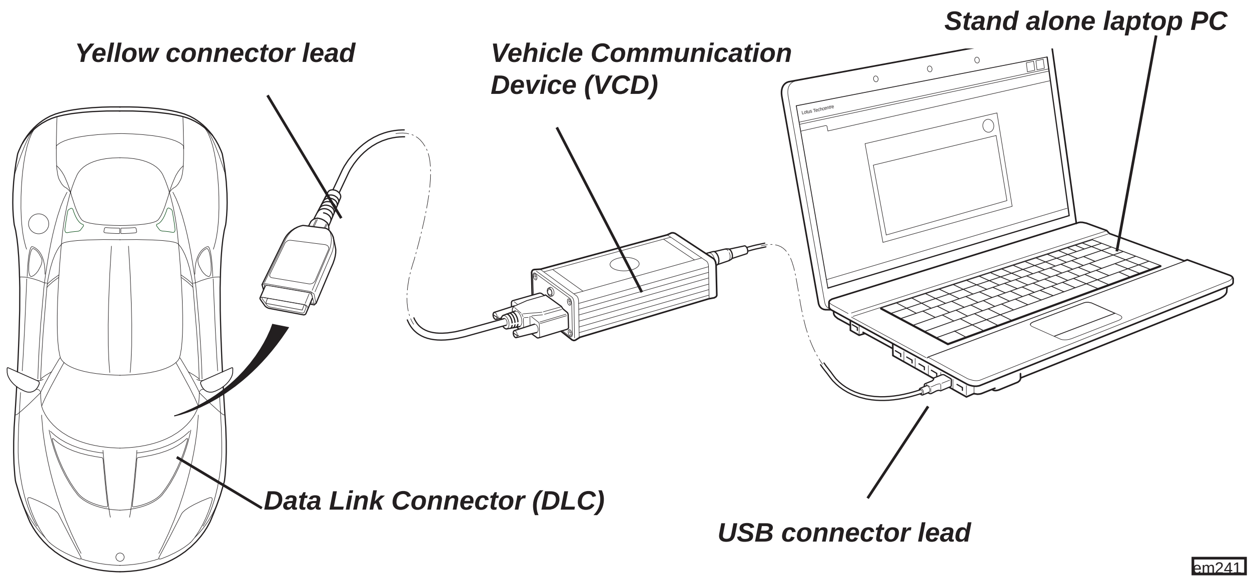
Also required is a unique 18 character licence/registration key without which TechCentre will not function. This key is non transferable to other PC's.

Scope of Lotus TechCentre

Model		Type of Electronic Control Unit					Engine ECU
		Communication compatible					Reprogrammable
		EMS	ABS	SRS	TPMS	IP	08 MY on
Elise	2004 on	Y	Y	Y	Y	N	Y
Exige	2004 on	Y	Y	Y	Y	N	Y
Europa	2006 on	N	Y	Y	N/A	N	N
2-11	2007 on	Y	Y	N/A	N/A	N	Y
Evora	2009 on	Y	Y	Y	Y	Y	Y
Esprit	V8	Y	Y	N	N	N	N

Note that TechCentre has no connectivity to Rover powertrain Elise/Exige variants, and that only limited diagnostics are available for the V8 Esprit. No communication is available with the Europa powertrain. Diagnostics for these vehicles are accessible using the Lotus Scan 3 tool T000T1467F (U.K./EU).

TechCentre Connection
TechCentre connection to the car is made via the Vehicle Communication Device (VCD) and the Data Link Connector (DLC) located beneath the driver's side fascia at the outboard side of the footwell.



Power for the VCD is taken from the vehicle battery via the DLC and when powered a blue tell tale on the unit will light. Should updated firmware be available for the VCD (usually downloaded as part of an online update) TechCentre will automatically update the VCD and display a message to confirm.

The VCD, under part number T000T1472F is supplied in a black plastic carry case containing the following:

VCD
USB lead (VCD to PC)
USB extension lead (VCD to PC) not illustrated

Please Note: 16 Pin Yellow connector lead (VCD to Vehicle) T000T1497F is not supplied and will need to be purchased separately

Use of TechCentre
Instructions for using the TechCentre are available in the 'Technical Information' section displayed on programme start up as well as being available to download from the Lotus Dealer Portal: Dealer Portal at: http://dealers.lotuscars.com. From the homepage go to: Aftersales>TechCentre & Production ECM Program Information.

JL.19 - 'LOTUS TECHCENTRE' CHECKING PROCEDURES

1. Trouble Codes

When the ABS controller detects a fault in the system, the following events occur;

i) The ABS tell tale is lit;
ii) The anti-lock system is switched out;
iii) A trouble code is stored in the non volatile random access memory i.e. memory which is retained when the power supply is interrupted, or the battery disconnected.

Trouble codes may be either Condition Latched, or Ignition Latched:

Condition Latched; With this type of fault, which is generally low or high voltage, the ABS tell tale will light, and the anti-lock system switch out, until such time as conditions return to normal, at which point the light will be extinguished, and the anti-lock be reinstated. The trouble code will be stored only whilst the fault is present.

Ignition Latched; This type of fault, of which are most categories, will cause the tell tale to be lit and the anti-lock to be inhibited until such time as the fault is no longer detected at the moment of a subsequent switching on of the ignition. At this point, the lamp will be extinguished, and the ABS restored, but the trouble code will be retained in the memory for the next 20 drive cycles i.e. ignition switched on and a minimum road speed of 5 mph attained.

Access to diagnostic codes is available by using the Lotus TechCentre laptop PC connected to the Diagnostic Link Connector (DLC - see JL.14). This tool allows the display of any stored trouble codes and sensor readings as well as allowing manual operation of actuators.

The facilities available include:
- Viewing fault codes/wheel speeds/valve activities.
- Clearing fault codes.
- Generating valve/motor activities.
- Reading EEPROM contents.
- Reading ECM identification.
- Updating ECM calibration.

Important Notes
- Whenever the Lotus TechCentre tool is connected, the ABS tell tale is lit and the anti-lock function is in-operative.
- Never connect or disconnect the DLC to/from diagnostic equipment with the ignition switched on.
- Unless using a trickle 'battery conditioner' type charger, disconnect the vehicle battery before charging or boost charging.
- Never disconnect the battery from the vehicle electrical system with the engine running.
- Never use a quick-charger for starting.
- Take care when touching energised parts of the ignition system.
- ECMs must be removed prior to welding operations, or subjecting to oven temperatures above 80°C.
- When voltage testing, use only a high-resistance type meter.
- During test steps which involve the connection of contacts from harness plugs or control units with ground or battery voltage (+12V), exercise great care as incorrect contact can cause permanent damage to the ECM internal circuits.
- When measuring resistance from ground bearing wires to vehicle ground, the nominal value of 'less than 2 ohms' sometimes cannot be achieved. In this case, disconnect the negative (ground) post of the battery and measure the resistance to the vehicle earth lead.
- Always erase trouble codes from any control unit after a test is done.

Abbreviations & Definitions

BATTERY VOLTAGE	System voltage
BRAKE LIGHT SW.	Brake light switch
FL WHEEL SPEED	Front left wheel speed
FR WHEEL SPEED	Front right wheel speed
RL WHEEL SPEED	Rear right wheel speed
RR WHEEL SPEED	Rear right wheel speed
FRONT WHL SPEEDS	Front wheel speed
REAR WHL SPEEDS	Rear wheel speed
VALVE RELAY CMD	Valve relay command
VAVLE RELAY FDBK	Valve relay feedback
RETURN PUMP CMD	Return pump command
RETURN PUMP FDBK	Return pump feedback
FL HOLD SOL. CMD	Front left solenoid hold command
FL HOLD SOL. FDBK	Front left solenoid hold feedback
FL REL. SOL. CMD	Front left solenoid release command
FL REL. SOL. FDBK	Front left solenoid release feedback
FR HOLD SOL. CMD	Front right solenoid hold command
FR HOLD SOL. FDBK	Front right solenoid hold feedback
FR REL. SOL. CMD	Front right solenoid release command
FR REL. SOL. FDBK	Front right solenoid release feedback
RL HOLD SOL. CMD	Rear left solenoid hold command
RL HOLD SOL. FDBK	Rear left solenoid hold feedback
RL REL. SOL. CMD	Rear left solenoid release command
RL REL. SOL. FDBK	Rear left solenoid release feedback
RR HOLD SOL. CMD	Rear right solenoid hold command
RR HOLD SOL. FDBK	Rear right solenoid hold feedback
RR REL. SOL. CMD	Rear right solenoid release command
RR REL. SOL. FDBK	Rear right solenoid release feedback

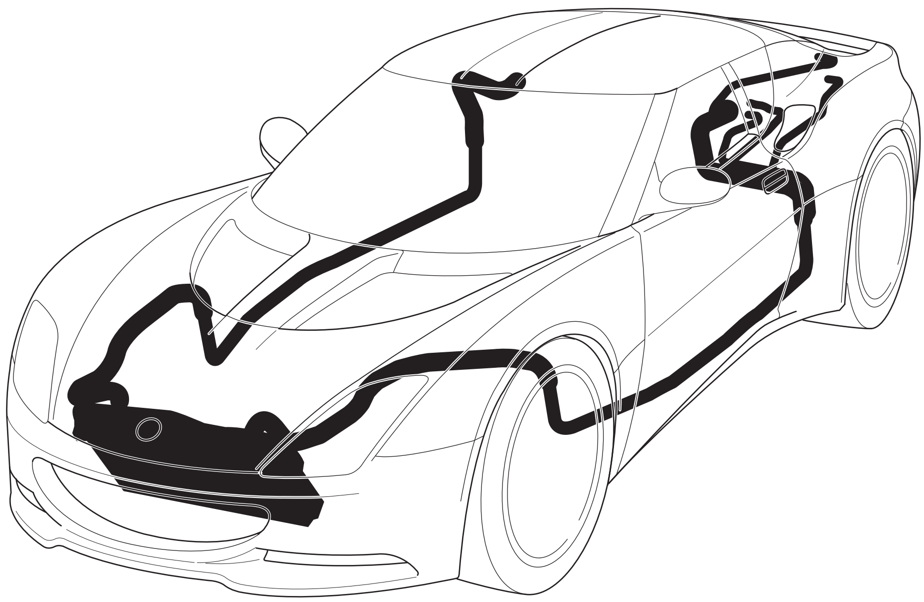
Diagnostic Trouble Codes

DTC	***Diagnostic Trouble Code Storage Condition***
C0200	Wheel Speed Sensor line failure front right
C0201	Wheel Speed Sensor failure front right
C0205	Wheel Speed Sensor line failure front left
C0206	Wheel Speed Sensor failure front left
C0210	Wheel Speed Sensor line failure rear right
C0211	Wheel Speed Sensor failure rear right
C0215	Wheel Speed Sensor line failure rear left
C0216	Wheel Speed Sensor failure rear left
C0222	Wheel Speed monitoring
C0250	Valve deactivation due to overheat protection at EOL
C0256	ABS valve failure
C0266	Reflow pump failure
C0276	Valve relay
C0281	Brake-fluid level
C0286	Cut Valve
C0296	Suction Valve
C0340	Brake light switch - *Refer to Technical Service Bulletin TSB 2015/03*
C0431	Sensor cluster failure (yaw-rate or lateral acceleration)
C0440	SAS Steering Angle Sensor fault
C0443	SAS not calibrated
C0460	Pressure sensor failure
C0607	Internal ECU failure
C0802	ECU voltage failure
C0E03	Emergency braking, VDC Control

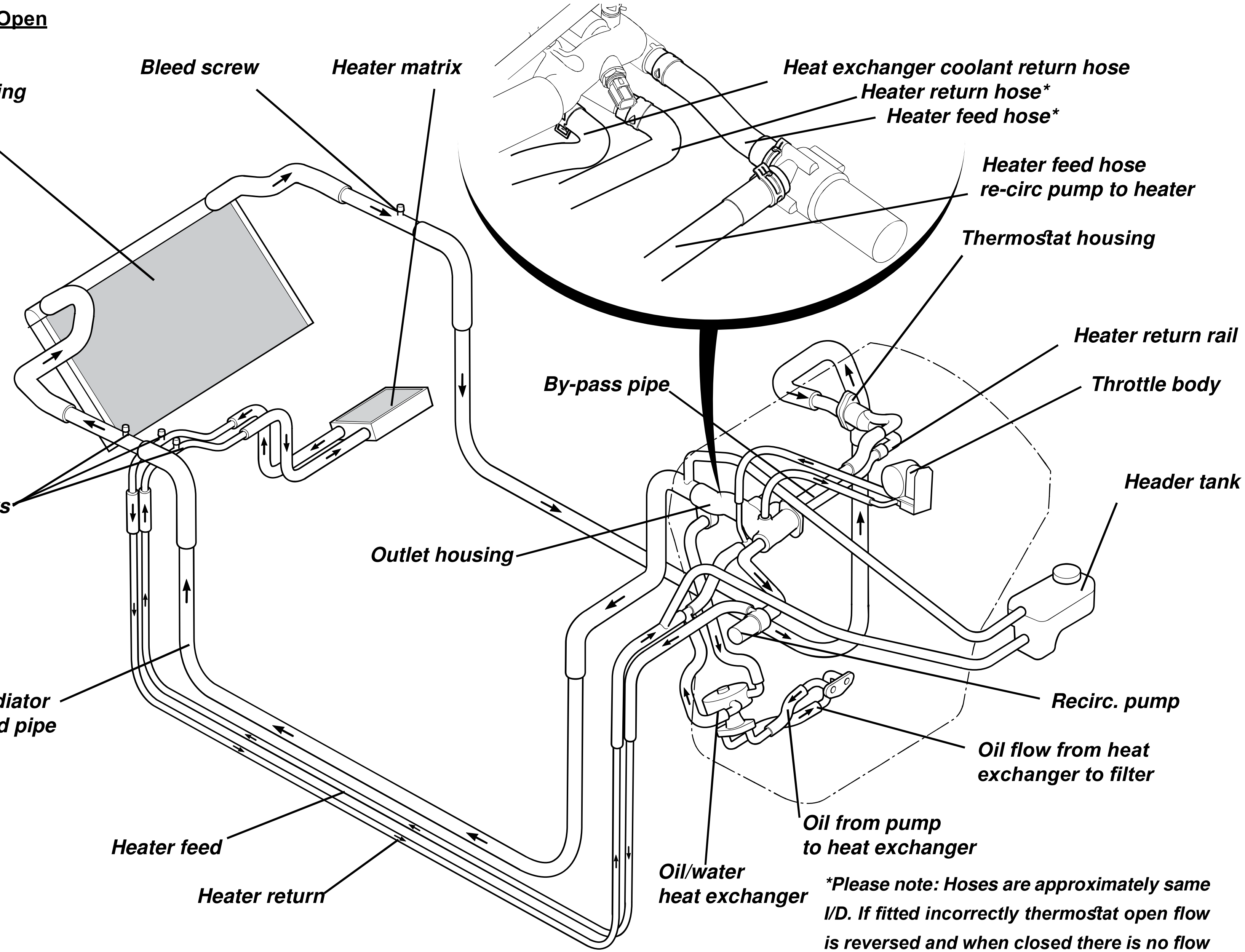
C0E07	ECU ASW error
C1281	Failure variant coding
U0101	CAN Bus failure: no sending on CAN possible
U0111	CAN Bus failure: CAN-BUS off
U0150	Absent CAN-Message EMS
U0151	Absent CAN-Message TCU (only for automatic gearbox)
U0153	Absent CAN-Message SAS
U0160	Absent CAN-Message Sensor cluster (yaw-rate or lateral acceleration)
U0200	Error in CAN-Message EMS

ENGINE COOLING

SECTION KJ

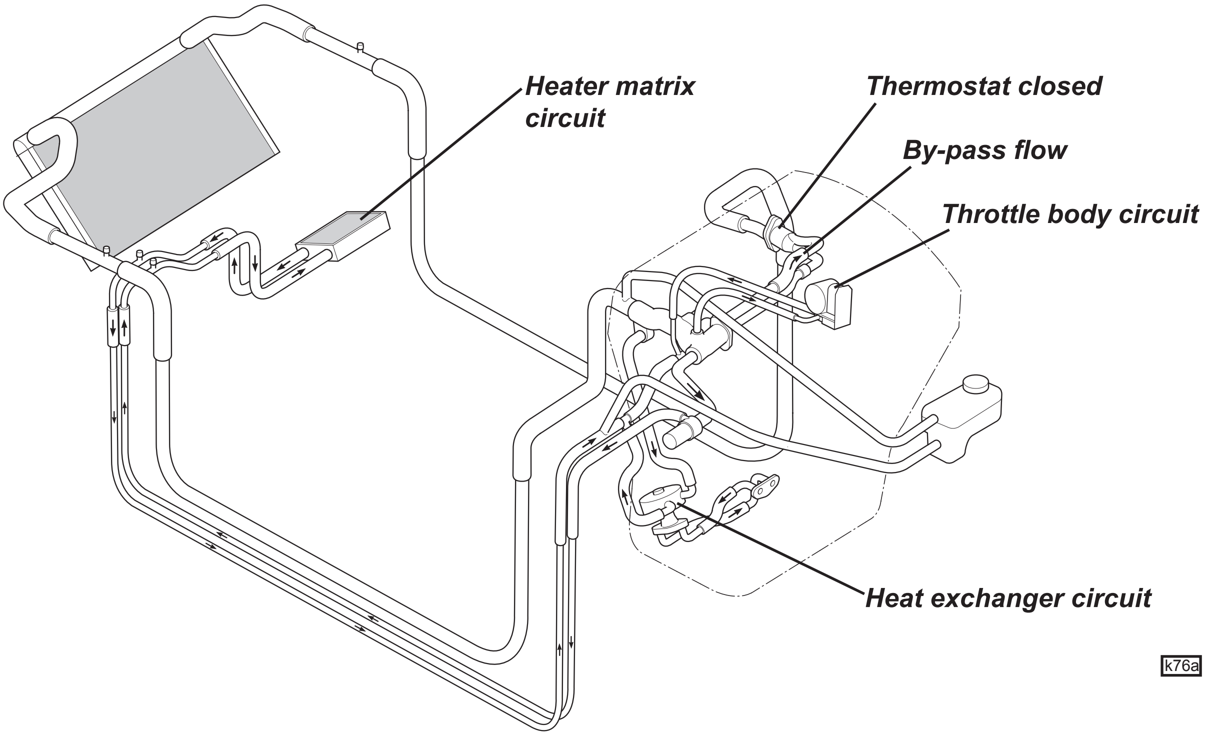


Thermostat Open



*Please note: Hoses are approximately same I/D. If fitted incorrectly thermostat open flow is reversed and when closed there is no flow (No heater output)

Thermostat Closed



KJ.1 - GENERAL DESCRIPTION

The engine liquid cooling system comprises an engine driven water pump, flow thermostat, front mounted radiator with two electric cooling fans, header tank, re-circulation pump, and associated plumbing.

The centrifugal water pump is mounted on the front face of the cylinder block, and is driven by the multi-rib, serpentine auxiliary belt. The pump discharges coolant into a separate volute chamber for each of the two cylinder banks, where, after cooling the cylinders, flow is directed upwards into each cylinder head before exiting into an outlet housing bolted to the rear of the cylinder heads. From this housing, offtakes are provided for the engine cooling radiator, heater matrix, throttle body, radiator by-pass pipe and, if fitted, an oil/water heat exchanger.

A thermostat housing is located on the timing cover above the water pump, and controls the flow of returning coolant from the front mounted radiator.

Thermostat closed circuit (cold engine):
At coolant temperatures below 80°C (176°F) the dual valve thermostat is closed, shutting off the return circuit from the radiator and opening a by-pass valve to admit coolant from a by-pass pipe connected to the outlet housing on the rear of the engine. Coolant exiting the cylinder heads meets a closed radiator circuit and is directed through four subsidiary circuits:

By-Pass: The greater proportion of flow is via the radiator by-pass pipe back to the engine side of the thermostat housing.

Heater: An offtake on the engine outlet housing feeds the heater matrix via a re-circulation pump (see below), pipework running through the RH sill, and a heater by-pass valve mounted to the left of the HVAC unit. Return pipework follows a parallel route and connects to the rear end of the heater return rail. This return rail is routed down the 'V' of the cylinder block, alongside the by-pass pipe, and connects to the engine side of the thermostat housing.

Throttle body: A small offtake on the outlet housing supplies a flow of hot water to the throttle body to inhibit ice formation around the valve in severe climatic conditions. An outlet hose from the throttle body connects to heater return rail.

Oil/water heat exchanger (if fitted): On cars so fitted, an oil/water heat exchanger is fitted on the LH side of the cylinder block and is fed with engine lubricating oil via feed and return hoses linking to the main bearing panel. A hose from the engine coolant outlet housing feeds the heat exchanger, with a return hose linking to the heater return circuit. When the engine is cold, heat is transferred from the quickly warming coolant to the engine oil, whilst at high engine temperatures, the temperature managed coolant acts to extact heat from the hotter lubrication system.

Thermostat open circuit (normal running temperature):
At temperatures above 84°C (183°F), the thermostat fully opens the radiator circuit, and closes the by-pass valve.

From the engine outlet housing at the rear of the engine, a pipe running through the left hand sill directs coolant to the single front radiator, rubber mounted between the two longerons of the front subframe and angled forwards at about 45 degrees. The a.c. condenser is mounted ahead of the radiator, to which it is secured by brackets riveted to each sideframe of the radiator. Cooling air is admitted through the front clamshell intake aperture, and exhausted upwards through ducts in the front clamshell ahead of the windscreen, with airflow augmented when necessary by two electric fans, each with 7 curved blades, mounted on the rear face of the radiator.

The fans are housed in a plastic shroud which incorporates 12 load relief flaps designed to blow open under ram airflow, and be sucked closed when the fans are operating, in order to maximise fan cooling efficiency. The aluminium radiator core uses moulded plastic top and bottom tanks, with the top tank divided in order to direct the incoming coolant downwards through the LH side, and then upwards through the RH side to the outlet spout. A pipe through the RH sill returns coolant to the thermostat housing on the front of the engine, within which coolant flows through the open thermostat and back into the water pump.

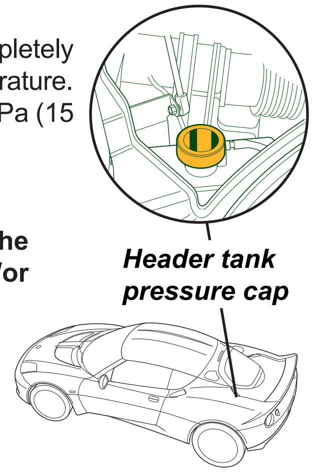
The heater, throttle body and oil/water heat exchanger circuits continue to operate as described above, with a low flowrate through the radiator by-pass circuit.

Header tank
To ensure that the cooling system remains fully filled, whilst providing expansion space for the hot coolant and to facilitate 'topping up' of the system, a translucent header tank is mounted at the LH rear of the engine bay. The tank is connected into the cooling system via a hose which joins into the heater return hose, whilst an air bleed hose from the radiator feed hose near the outlet housing, connects to the air space in the header tank. A threaded, 108 kPa (15 psi) pressure cap is fitted to the neck of the tank.

Re-circulation pump
In order to control engine temperature in conditions of 'heat soak' after stopping a hot engine, an electric re-circulation pump is fitted in the heater take off hose between the engine outlet and heater feed pipework. The pump is enabled for a short period after engine shut down, and is energised under engine ECU control to pump coolant through the heater circuit and limit the potential for localised boiling within the cylinder head. For details of the pump control strategy, refer to sub-section KJ.5

KJ.2 - MAINTENANCE

The engine cooling system uses a header tank to ensure that the system remains completely filled, and also to accommodate expansion of the coolant with increasing engine temperature. The tank is mounted at the left hand rear of the engine bay, and is fitted with a 108 kPa (15 psi) pressure cap to raise the boiling point of the coolant to over 120°C (250°F).



WARNING

- **Do NOT attempt to remove the pressure cap from the header tank when the engine is warm as serious scalding could result from boiling water and/or steam.**
- **Coolant is hazardous to your health and may be fatal if swallowed.**
- **Keep coolant out of reach of children.**
- **Coolant is hazardous to animals and may be fatal if swallowed. Clean up spilled coolant and do not leave in open containers.**

The level of coolant in the translucent header tank will rise as the engine warms up, and fall as it cools down, and under normal circumstances it should not be necessary to add any coolant to the system between scheduled services. If overfilled, the excess coolant will be expelled when the engine is warm. If underfilled, overheating may result.

When the engine is completely cold, and the car is standing on a completely level surface, the coolant level should be inspected. The maximum recommended cold level is 10mm below the horizontal moulded seam running around the tank, with the lowest acceptable level being 25mm below the seam.

If topping up is required, wait until the engine has fully cooled before slowly unscrewing the filler cap and allowing any remaining pressure to escape before finally removing the cap.

In order to maintain protection from freezing damage and metal corrosion, use only an approved coolant mixture (see below) to top up the header tank to the 'FULL' mark. Refit the cap, and turn clockwise until the tab on the cap engages a detent, at which position an abutment prevents any over-tightening.

NOTICE: If the cap is removed when the engine is warm, the coolant may boil and a small coolant loss may occur. The completely cold header tank level should be checked at the first subsequent opportunity.

Anti-Freeze/Corrosion Inhibitor

It is necessary that the coolant contains an anti-freeze with corrosion inhibitor to protect the engine and heat exchangers from both frost damage, and corrosion of the metallic elements. In order to protect against these dangers as well as raising the boiling point of the coolant, the Evora is factory filled with a 50% concentration of Havoline XLC, which is a mono-ethylene glycol coolant using organic acid technology (OAT) to provide increased corrosion protection compared with conventional coolant additives.

A yellow label around the header tank neck identifies the coolant type used. The corrosion inhibiting carboxylic acids in the OAT coolant tend to remain in solution rather than being deposited on the internal surfaces of the cooling system, thus improving heat transfer and extending service life. Havoline XLC is the only recommended coolant product, and at 50% concentration provides freezing protection down to approximately - 40°C. Even in warm climates it is recommended that the concentration is not allowed to fall below 25%, in order to maintain full corrosion protection.

The simplest means of checking the antifreeze concentration is to measure the specific gravity (density) of the coolant at a known temperature, using a hydrometer. The following table provides a general guide:

	Density @	
Concentration	***20°C***	***60°C***
25%	1.039	1.020
33%	1.057	1.034
50%	1.080	1.057

The coolant density reflects the effective level of mono-ethylene glycol, and not the level of corrosion inhibitors present, whose effectiveness diminishes over a period of time. The coolant should therefore be renewed every 4 years to ensure optimum corrosion protection.

In areas where the tap water is extremely hard (exceeding 250 parts per million), use of this water will lead to 'furring up' of the system over a period of time. In such areas, distilled, de-ionised or filtered rain water should be used.

Radiator Fin Cleaning
At service intervals, the matrix of the engine cooling radiator and a.c. condenser should be checked for clogging by insects, leaves and other debris. If necessary, use a water jet from both above and below to clean the fins, taking care not to damage the fragile tubes or distort the finning. At the same time, check the integrity of all cooling system joints, and the condition of all flexible hoses. In snowy conditions, ensure the radiator air exit is cleared of snow before driving the car.

KJ.3 - DRAIN/REFILL PROCEDURE

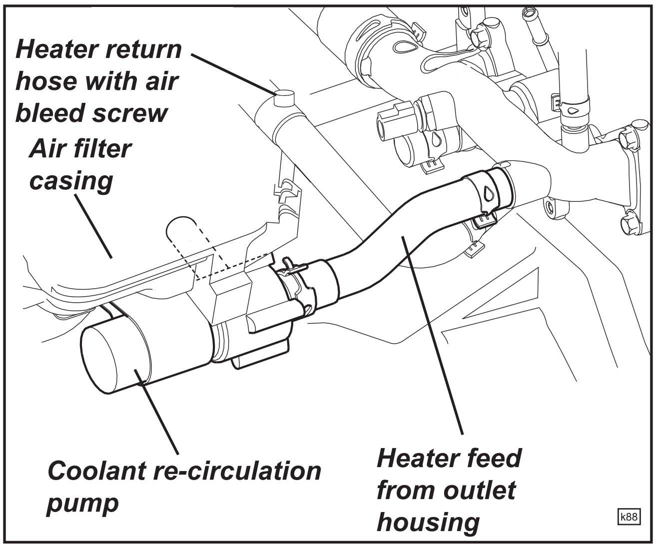
Due to the configuration and routing of the cooling system plumbing, there is no satisfactory low point from which the entire cooling system may easily be self drained.

On early vehicles a threaded plug was provided on the radiator bottom tank, which will drain the radiator, but little more unless the car is tilted nose down to some extent. (Note this plug was deleted as a running change and may not be fitted on later vehicles).

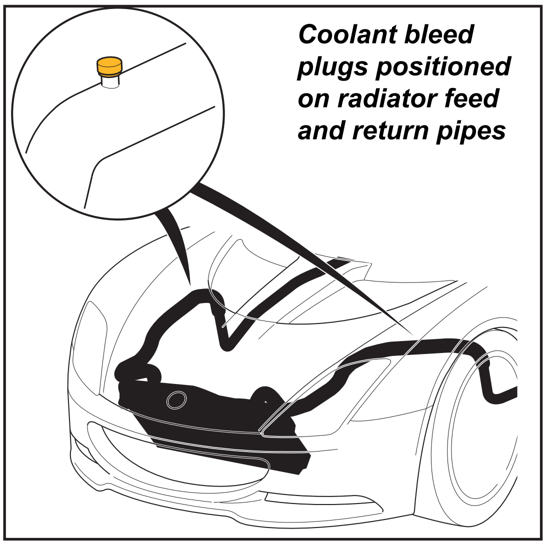
For access to the plug (if fitted), the front undertray must be removed. Each side of the cylinder block is provided with a drain tap, that on the left being near to the back of the a.c. compressor, and on the right, towards the rear end of the block.

If the coolant is to be renewed, draining of the pipework can be assisted by applying a low pressure airline to the header tank filler neck. Note that with ignition off, the heater solenoid shut-off valve is open.

To refill, secure the radiator drain plug, block drain taps and pipework, and fill the system with a recommended coolant mixture (see above) via the header tank. An air bleed plug is located on the heater return hose near its connection with the return rail, and a bleed nipple is incorporated on the by-pass pipe near its joint with the thermostat housing.



An additional bleed plug is provided on the radiator feed and return pipes accessible via a grommet in the LHF wheelarch liner. All bleeds should be opened until a steady stream of coolant flows from each. Start the engine and allow to idle, and periodically open the bleed plugs to allow any trapped air to be expunged.



Top up the header tank when necessary, and fit the pressure cap when required to prevent overflow. When the cooling fans have cut in and then out, stop the engine and allow to cool. Re-check coolant level when fully cold.

KJ.4 - RADIATOR & COOLING FANS

The engine cooling radiator, a.c. condenser and cooling fans are secured together as a package and are mounted between the two longerons of the front subframe, angled forwards at about 45°, condenser lowermost, radiator above and the two cooling fans on the top side of the radiator. The radiator uses an aluminium core, with tubes running vertically between the top and bottom plastic tanks, the upper tank housing both inlet and outlet spouts and an internal midpoint division, in order to provide a 'U' flow route for the coolant and optimise radiator cooling performance.

To protect the radiator structure from potentially damaging vibrations and road shocks, the radiator is provided with two spigots on the bottom tank, and a spigot at the top of each sideframe, with each spigot engaging into a rubber mounting grommet contained in a bracket bolted to the subframe.

Radiator Fans
Mounting rails for the cooling fan cowling run across the top and bottom of the rear face of the radiator, being secured by screws to the radiator sideframes, with forward extensions to carry the a.c. condenser by a single screw at each corner. Each of the two fan motors is secured to the moulded cowling by four screws, but cannot be removed from the cowling without first releasing the fan from the motor shaft, which operation requires that the cowling be removed from the radiator.

Removal of the radiator exit grilles from the front clamshell provides access to the fan harness connectors for diagnostic purposes, but for fan motor or radiator removal, it is necessary to remove the front clamshell.

To replace:
1. Remove the front clamshell; refer to service notes section BV.4 for further information.

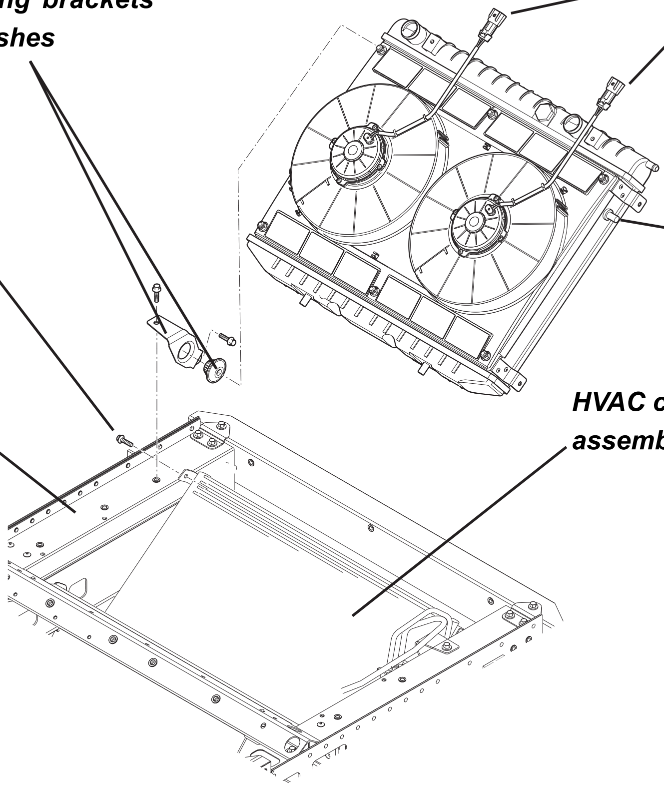
2. Unplug both fan harness connectors.

3. Release the six caphead screws securing the fan cowling to the radiator rails, and withdraw complete with the two motor assemblies.

4. Withdraw the fan from the motor shaft and release the four screws securing the fan motor to the cowling.

5. Refit in reverse order to removal.

Radiator



Removal:
If only the radiator is to be replaced or serviced, it is possible to leave the a.c. condenser *in situ* to avoid the requirement to recover the refrigerant:

1. Remove the front clamshell (see sub-section BV.4)

2. Remove the front undertray and radiator lower duct (note; front fixings to bumper are slotted). Refer to service notes section A - Introduction for further information.

3. Remove the drain plug from the radiator bottom tank (if fitted), and collect the draining coolant using a suitable container.

4. Disconnect the inlet and outlet hoses from the radiator top tank and collect the draining coolant using a suitable container. Remove the header tank cap to speed the operation.

5. Unplug the harness connector plug to each of the fan motors.

6. To avoid the requirement to recover the refrigerant, **provide alternative support** before releasing the 4 fixings securing the a.c. condenser to the radiator; ensure that the a.c. pipes and unions are not stressed; refer to service notes section PN.8 for further information.

7. Release the two brackets securing the top of the radiator to the subframe and ease the spigots on the bottom tank from its mounting grommets. Withdraw the radiator and fan motor assemblies from the car.

8. Refit in reverse order to removal, and refill the cooling system (see sub-section KJ.3).

KJ.5 - CONTROL OF RADIATOR FANS, ENGINE BAY FAN & COOLANT RE-CIRC. PUMP

The radiator fans, engine bay fan and re-circ. pump are all controlled by the engine management ECU using data provided by the engine coolant temperature sensor, a.c. pressure sensor, vehicle and engine speed sensors, ignition circuit status and a timer.

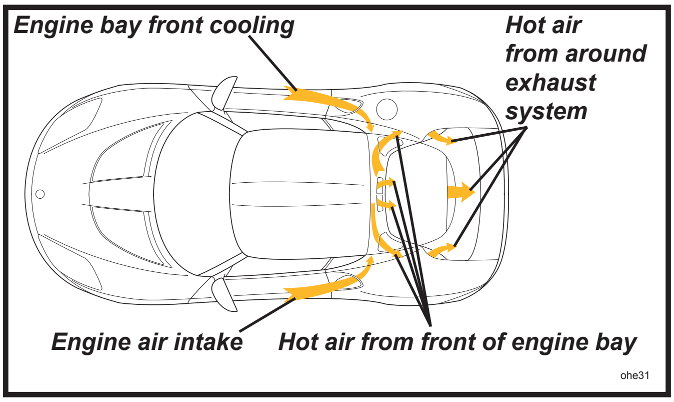
Radiator Fans Control
Two radiator cooling fans are fitted on the top side of the front mounted radiator/condenser package, and are switched as a pair by the engine controller to operate at half speed (connected in series) when coolant temperature reaches 95°C on rise, and switch off at 92°C on fall. If coolant temperature rises to 98°C, the fans will switch to full speed (connected in parallel), reverting to half speed on fall at 96°C.

Note that the temperatures displayed on the instrument panel may differ from the programmed values described above due to damping lag.

The fans are also activated by signals received from the air conditioning controls and pressure sensor; the fans will run at half speed when a.c. is selected, and at full speed for a.c. pressures above 17 bar as detected by the trinary switch.

Certain types of ECU detected engine fault will also cause the fans to be activated as an engine protection measure. If the ECU receives a coolant temperature sensor signal voltage outside of the acceptable range, a default setting equating to 60°C will be substituted, and the cooling fans will run at half speed.

Engine Bay Ventilation
Various intake and outlet vents are provided in the rear body to allow ventilation and cooling of the engine bay.



- Intake vents ahead of the rear wheelarches provide ambient air for the engine air intake, and for engine bay cooling.
- Outlet grilles around the top of the tailgate panel exhaust hot air from around the catalytic converter at the front of the engine bay.
- An outlet grille at the base of the tailgate glass, and to either side, exhaust hot air from around the catalytic converter at the rear of the engine bay.

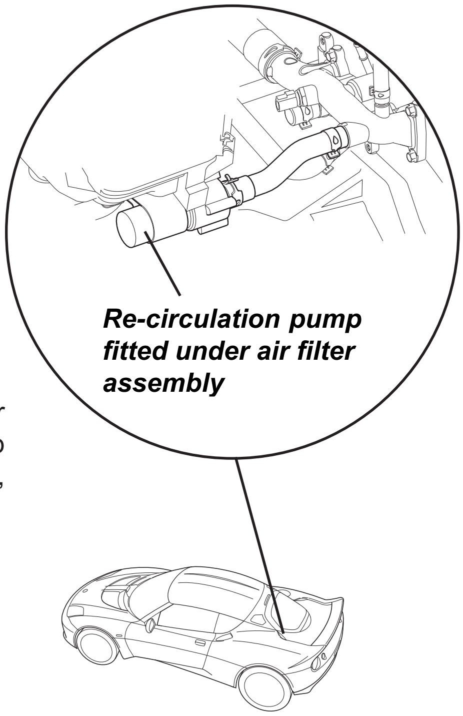
CAUTION
When the engine is running, or when stopped after a fast run, beware of the potential for very hot airflow from these vents and the corresponding high surface temperatures of surrounding body panels and components.

Heat Soak Control
After ignition switch off, the ECU remains live for a minimum period of 5 seconds for normal coolant and air temperatures at time of switch off, extending progressively to a maximum period of 20 minutes for high temperatures.

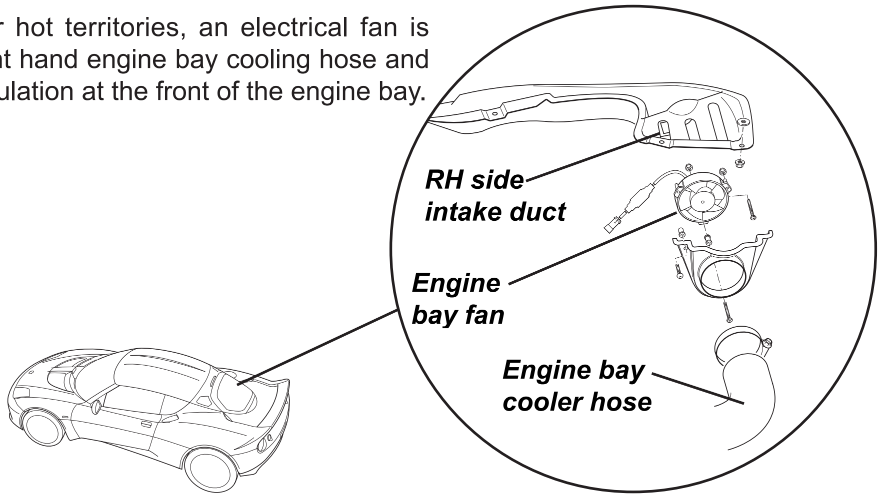
Coolant re-circulation pump
A coolant re-circulation electric pump is mounted on a bracket fixed to the underside of the intake airbox, and is plumbed into the heater supply line close to the coolant outlet housing at the LH end of the engine. When energised, the pump circulates coolant through the heater system, drawing coolant from the cylinder head, and pumping it through the heater matrix and back to the engine.

If, after engine switch off and within the ECU live period, the coolant temperature exceeds 108°C, the re-circ. pump will be activated and will run for a period of 8 minutes.

In order to speed windscreen defrosting/demisting and improve heater efficiency; at ambient temperatures below 15°C the re-circulation pump will run at vehicle stationary idle. At ambient temperatures above 15°C, the running of the pump at stationary idle is delayed by 20 seconds.



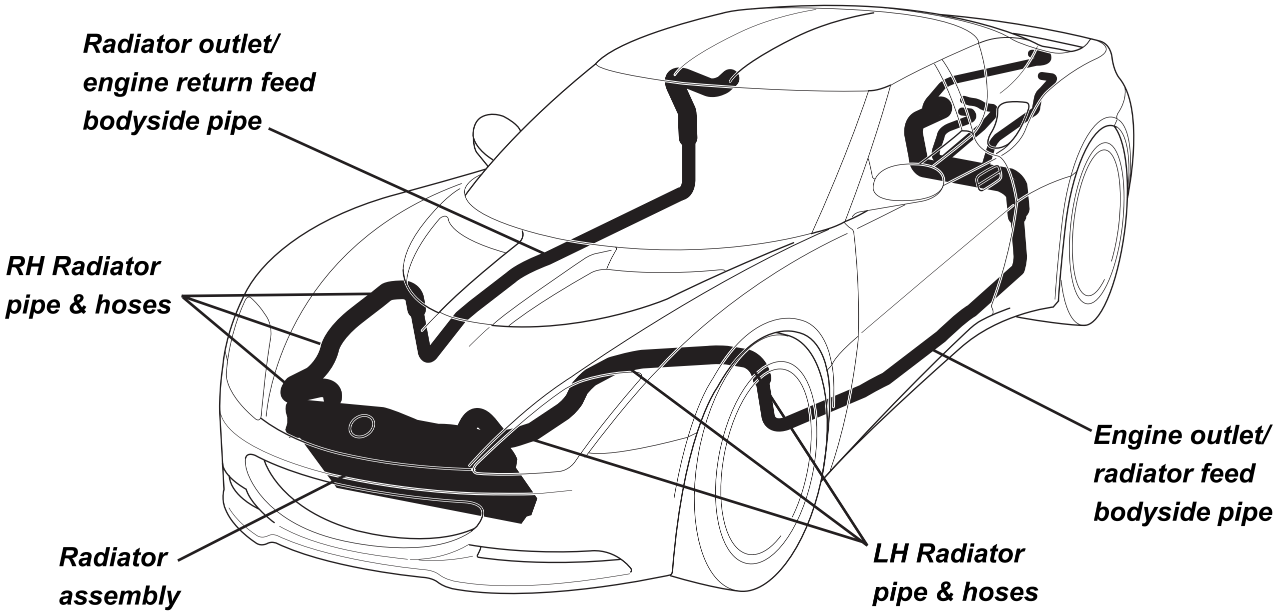
Engine bay fan (if fitted)
For the USA market and other hot territories, an electrical fan is mounted inline between the right hand engine bay cooling hose and side intake duct to boost air circulation at the front of the engine bay.



The fan is ECU controlled, and will operate only when the vehicle is stationary:

- If coolant temperature is over 100°C during idle or at time of ignition switch off, the fan will run for 3 minutes.
- If coolant temperature is over 103°C within 90 seconds of ignition switch off, the fan will run for 2 minutes.
- If the high speed radiator fans are activated during idle, the fan will run for 1 minute.
- If the engine bay fan is triggered whilst the engine is running; after the fan has cycled off, a minimum of 2 minute must elapse before the fan restarts (if triggering conditions still apply).

KJ.6 - RADIATOR FEED & RETURN PIPES



For both the feed and return circuits between the engine and radiator, two alloy pipes are utilised, one routed together with other pipework, along the outside of the chassis main siderail (feed on left, return on right), within the composite body sill moulding, and one pipe over the wheelarch area to link the front end of the sill pipe with the radiator.

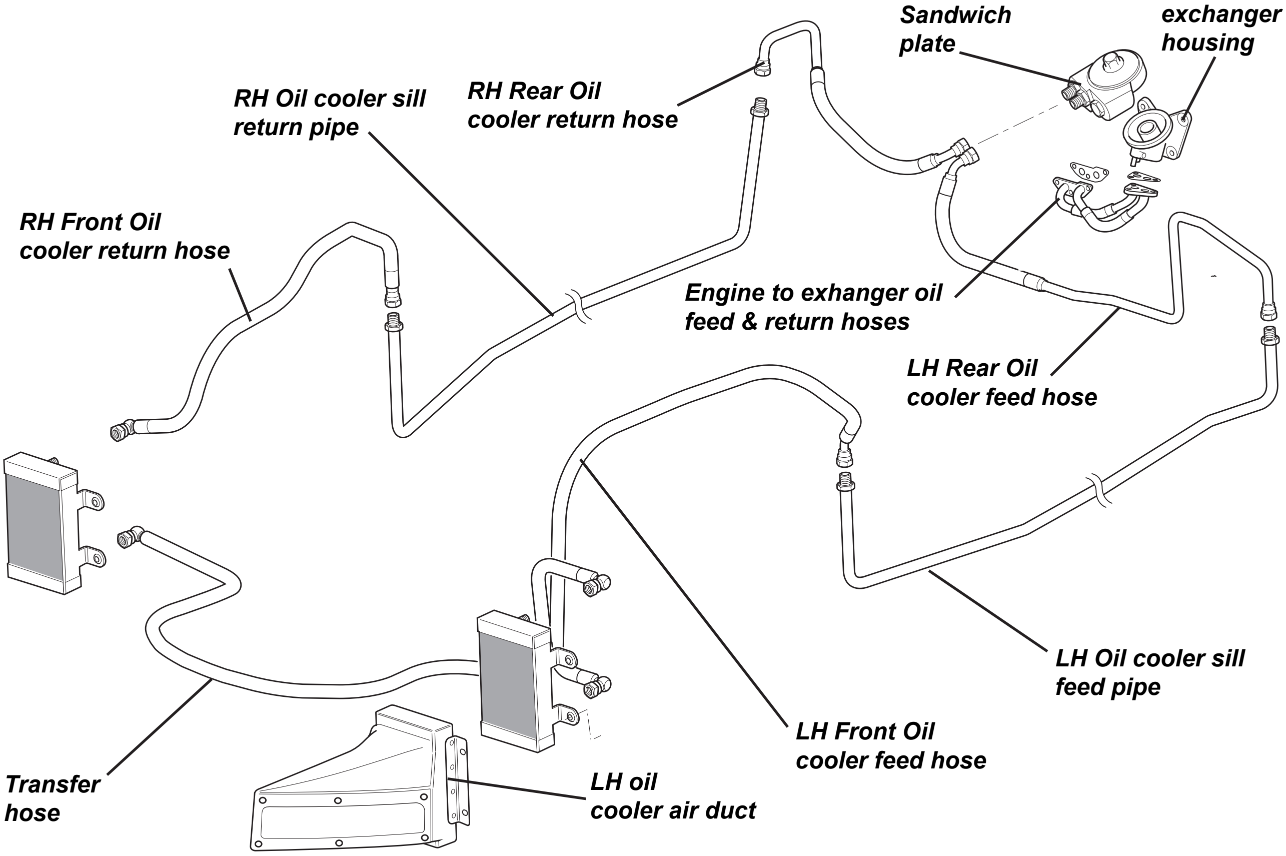
No joints are incorporated in the sill sections, where the pipes are supported in foam blocks clamped to the chassis side. Access to the joints at each end of the sill pipes is available with the appropriate wheelarch liner removed.

Replacement of a sill pipe is not possible without removing or cutting the body sill which is bonded to the chassis. Such a pipe replacement should not however be necessary unless accident damaged together with the body sill.

For full access to the wheelarch area pipes, the front clamshell must be removed.

KJ.7 - OIL COOLERS

Oil Cooler Layout



Front Mounted Air/Oil Coolers (Evora manual '11MY supercharged models)
On cars so fitted, front mounted oil/air radiators are mounted ahead of each front wheel arch and fed with air from intakes inset in the front bumper.

On all cars with front mounted oil coolers, the oil/water heat exchanger is replaced by a sandwich plate incorporating oil take-off feed and return unions. The sandwich plate with the hose connections is bolted on top of the heat exchange housing in replacement of the exchanger.

A thermostat incorporated into the sandwich plate begins to open at 72ºC, and is fully open at 80ºC. When closed, oil can by-pass the oil cooler circuit, but when fully open, all oil is directed from the sandwich plate via the left hand rear flexible hose to the LH sill panel pipe, over the front wheel arch liner via the left hand front hose to the bottom connection on the LH oil cooler.

From an outlet union at the front top of the cooler, another hose runs beneath the radiator intake duct to the bottom of the RH cooler, from the top of which oil is returned via a fourth hose, running over the RH front wheel are, right hand sill, back to the return RH rear union on the sandwich plate.
Each cooler is located into apertures within the bumper brackets which are in turn bolted to the side of the crash structure. Airflow is directed from the front intake grills to the front face of the coolers via air ducts. Louvres in the wheelarch liner front sections allow air to exhaust from the rear of the coolers into the wheelarches.

LH Front Oil Cooler (Feed) Hose

Removal:

1. Remove both front wheels and wheelarch liners; refer to service notes section BV.17 for further information.

2. Unhook the hose from the clip securing it to the upper radiator outlet duct, cut and discard the 2 x tie wraps securing it to the heater feed pipe, (See Fig 1). Cut and remove the 2 x tie wraps securing the feed hose to the cross-over hose, (see Fig 2).

3. Unbolt the hose at the LH oil cooler connection, and, using suitable container(s), allow any oil in the cooler and line to drain down, (see Fig 2).

   Note1: To avoid placing unnecessary strain and movement on the sill pipe and oil cooler , hold there union nuts with an open ended spanner whilst using another spanner or crows foot adaptor on the hose connector unions when loosening or tightening.

4. Unbolt the hose at its connection to the LH side oil feed pipe which is located to the rear of the LHF wheel arch area, (see Fig 1) and remove pipe.

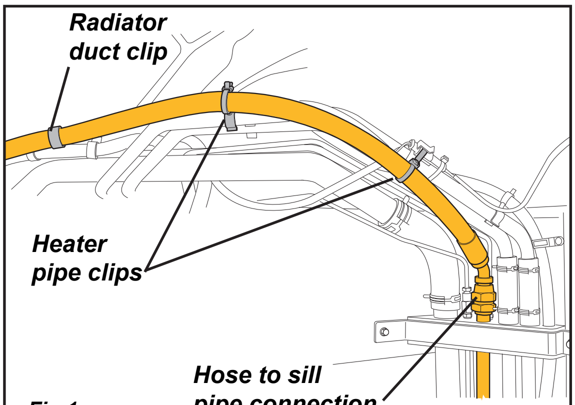


Fig 1

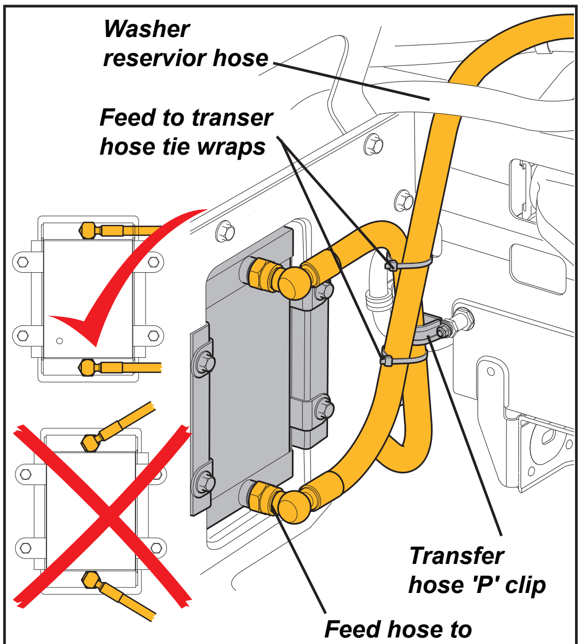


Fig 2

Refitment:
Refit is the reverse order to removal.

1. Ensure the hose route is unhindered, cannot rub on other components and is free of any kinks allowing the oil to flow freely (see Fig 2).

   Note, the hose should be routed so that is postioned in between the washer reservoir hose and crash structure and to the left (outwards) of the transfer hose at the area where it passes near the transfer hose 'P' clip (see Fig 2).

   Position the hose connection at the sill pipe so that it can follow the heater feed pipe routing without any strain being placed on the hose once it is secured with new cable ties to the heater pipe. (See Fig 1).

2. Tighten the hose at the oil cooler and sill pipe connections to 40Nm, a 30mm crowsfoot adaptor is required to carry out this operation. (Also see note 1 of removal step 3 for tightening instructions).

3. Fit new tie wraps and re-check hose routing.

4. Ensure the engine oil is topped up to the maximum mark on the dipstick.

5. Run the engine until hot, the sandwich plate will open at 72°C (162° F)

6. When the sandwich plate is open, the oil cooler pipes will be hot to the touch and the coolers will feel warm.

7. Once the sandwich plate has opened, turn off the engine, leave for 3 minutes allowing time for oil to drain back down to the bottom of the engine and re-check the engine oil level and adjust as necessary.

Oil Cooler Transfer Hose

Removal:

1. Remove both front wheels and wheelarch liners; refer to service notes section BV.17 for further information.

2. Remove front undershield; refer to service notes section A- Introduction for further information.

3. Cut and discard the 2 x tie wraps securing the LH hose to the transfer hose, remove the nut securing the 'P' clip to bobbin mount at the front subframe, (see Fig 4).

4. Unhook the line from the 3 x plastic clips securing it to the underside of the radiator inlet ducting. Unbolt the transfer hose at the RH oil cooler, (see Fig 5).

   Note: To avoid placing unnecessary strain and movement on the oil coolers , hold there union nuts with an open ended spanner whilst using another spanner or crows foot adapt on the hose connector unions when loosening or tightening.

5. Lower the hose allowing oil to drain from the hose and cooler into suitable container(s), (see Fig 5).

6. Unbolt the hose at the upper LH oil cooler, (see Fig 4).

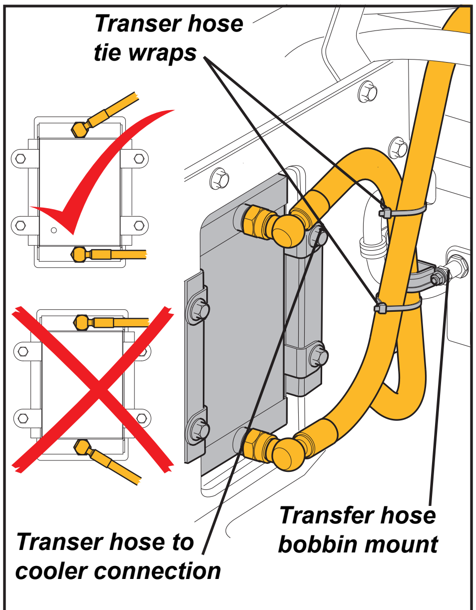


Fig 4

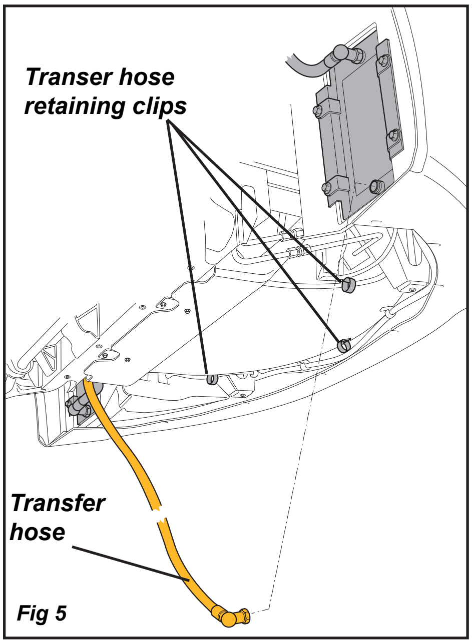


Fig 5

Refitment:
Refit is the reverse order to removal.

1. Ensure the hose route is unhindered, cannot rub on any other components and is free of any kinks allowing the oil to flow freely.

   Note, the hose should be routed so that is positioned right (inboard) of the LH cooler pipe at the P clip mounting area, (see Fig 4).

2. Position the hose connection parallel to the base of the RH oil cooler, (see Fig 6), and tighten to 40Nm, a 30mm crowsfoot adaptor is required to carry out this operation. (Also see note1 of removal step 4 for tightening instructions).

3. Refit the 'P' clip to the bobbin mounting located on crash structure ensuring that the bobbin is not placed under any strain once the bobbin nut is tightened to 8Nm.

4. Ensure the engine oil is topped up to the maximum mark on the dipstick.

5. Run the engine until hot, (the sandwich plate will open at 72°C (162° F).

6. When the sandwich plate is open, the oil cooler pipes will be hot to the touch and the coolers feel warm.

7. Once the sandwich plate has opened, turn off the engine, check for leaks and leave for 3 minutes allowing time for any oil to drain back down to the bottom of the engine and re-check the engine oil level and adjust as necessary.

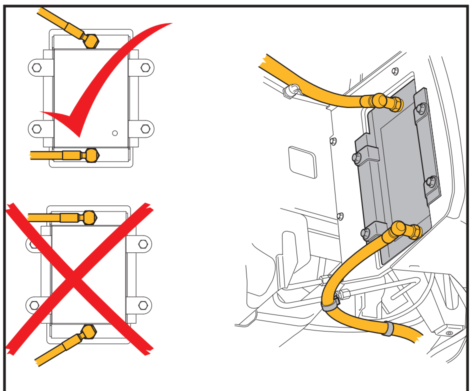


Fig 6

RH Front Oil Cooler (Return) Hose

Removal:

1. Remove both front wheels and wheelarch liners; refer to service notes section BV.17 for further information.

2. Unhook hose from the clip securing it to the upper radiator outlet duct, cut and discard the tie wrap securing it to the air conditioning expansion valve pipe, (see Fig 7).

3. Unbolt the hose at the oil cooler connection, (see Fig 8) and, using suitable container(s), allow any oil in the cooler or line to drain down.

   Note1: To avoid placing unnecessary strain and movement on the sill pipe and oil cooler, hold there union nuts with an open ended spanner whilst using another spanner or crows foot adapt on the hose connector unions when loosening or tightening.

4. Once drained, unbolt the hose at its connection to the RH side return pipe which is located to the rear of the the RHF wheel arch area, (see Fig 7).

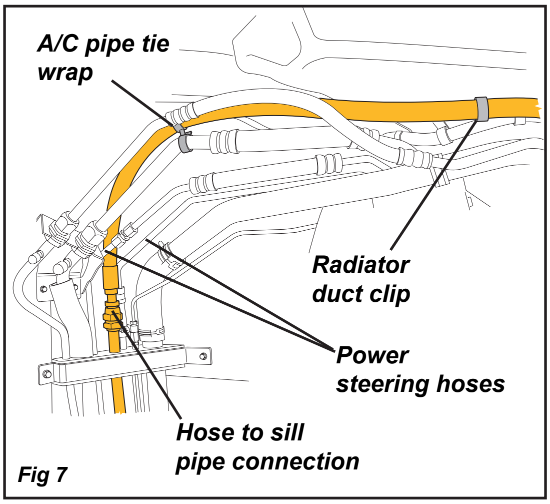
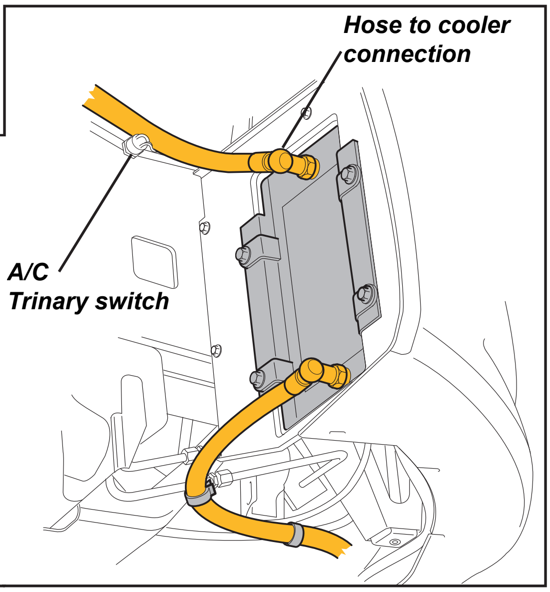


Fig 7



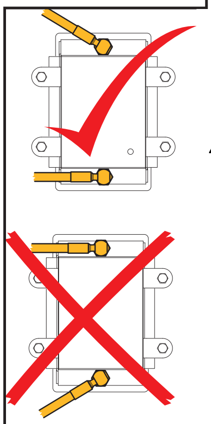


Fig 8

Refitment:

Refit is the reverse order to removal.

1. Ensure the hose route is unhindered, cannot rub on any other components and is free of any kinks allowing the oil to flow freely.

   Note, Position the hose connection at a slight upwards angle to the cooler so that the hose is not strained or kinked when routed in front (forward) of the air conditioning trinary switch. (See Fig 7 & 8).

   Position the hose connection at the sill pipe so it is routed in between the power steering hoses and above the air conditioning expansion pipe without becoming strained or kinked once secured with its tie wrap. (See Fig 7).

2. Tighten the hose connections at the oil cooler and sill pipe to 40Nm, a 30mm crowsfoot adaptor is required to carry out this operation. (Also see note1 of removal step 3 for tightening instructions).

3. Ensure the engine oil is topped up to the maximum mark on the dipstick.

4. Run the engine until hot, the sandwich plate will open at 72°C (162° F).

5. When the sandwich plate is open, the oil cooler pipes will be hot to the touch and the coolers feel warm.

6. Once the sandwich plate has opened, turn off the engine, check for leaks, leave for 3 minutes allowing time for any oil to drain back down to the bottom of the engine and re-check the engine oil level and adjust as neccessary.

LH Rear Oil Cooler (Feed) Hose

Removal:

1. Remove the rear undertray; refer to service notes section A - Introduction for further information.

2. Remove the LH rear wheelarch liner; refer to service notes section BV.17 for further information.

3. Remove air filter housing and charcoal canister assembly and cosmetic engine cover support brace; refer to service notes sections EJ.4 and LN.8 for further information.

4. Support the engine if necessary and remove the front engine mount assembly to gain access to the fixing for the 'P' clip retaining the hose to the lower subframe. (See Fig 9).

5. Remove the 'P' clip fixing and carefully remove any support used to support the engine, allowing the engine/gearbox to be supported by its remaining mounts.

6. Remove the fixing retaining the 'P' clip, (see Fig 10) at the hose support bracket, (tightened to 9 Nm), and cut tie wrap securing the earth lead to the engine harness.

7. Loosen the hose at it's connection point to the LH rear sill pipe located forward of the rear wheel arch, (see Fig 10). Pull the hose away from the pipe and using suitable container(s), allow any oil in the cooler pipe or hose to drain down.

   Note1: To avoid placing unnecessary strain and movement on the sill pipe, hold the sill pipe union nut with an open ended spanner whilst using another spanner or crows foot adaptor on the hose connector when loosening or tightening.

   Note: Evora S VIN's from BH_11383 to BH_11702 are fitted with a compression coupling between the cooler hose and sill pipe connection, (see Fig 10a). This compression connector is not compatible with the '11MY VIN BH_11703 onwards LH oil cooler hose connector. Please refer to the Aftersales Service Parts List, Section 46.03c, to ensure the correct hose is supplied relative the vehicles VIN.

   Also see Technical Service Bulletin TSB 2013/03R for further information.

8. From inside the vehicle remove the rear seat or trim, release the 9 fixings retaining the bulkhead access panel and remove, (see Fig 11).

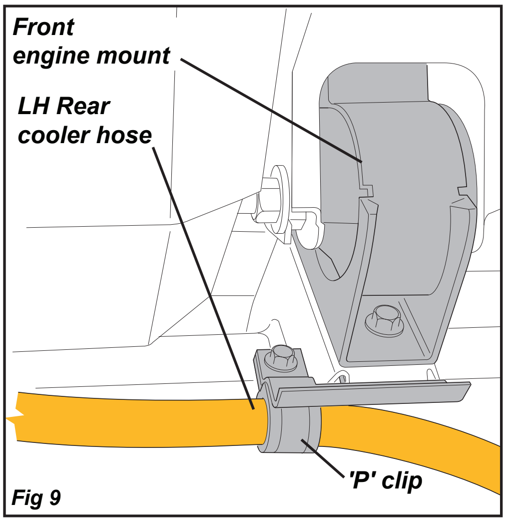


Fig 9

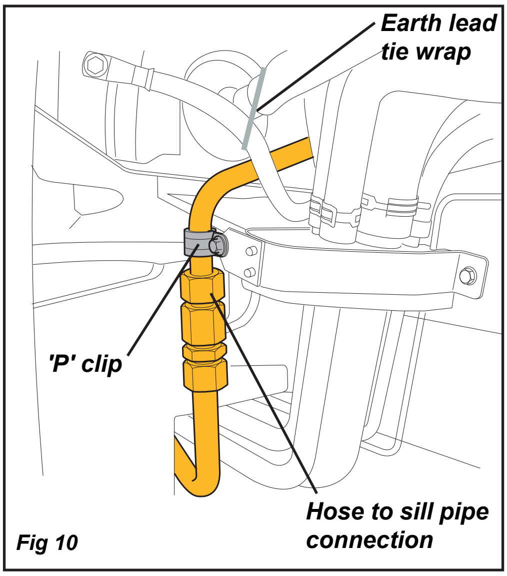


Fig 10

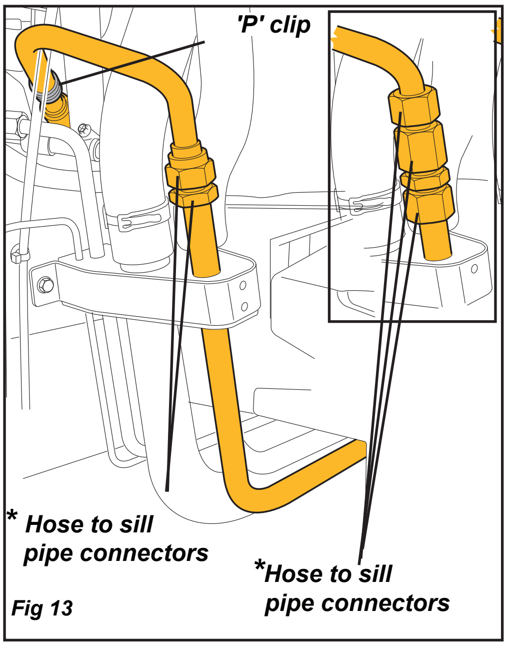


Fig 13

9. Unbolt the LH oil cooler hose (which will be the hose viewed on the right from inside the car) from its connection at the sandwich plate, (see Fig 11).

   Care point: Dependant upon the sandwich plate orientation it may also be necessary to remove LH oil cooler pipe connector and sandwich plate adaptor tube to gain sufficient access to the connector of the RH cooler pipe. (See fig 12).

   Note: In the event that the adaptor tubes are disturbed it is recommended that the bonded sealing washers positioned between the tubes and sandwich plate housing face are renewed. Also a thin smear of engine oil should be applied to the rubber seal section of the washers to prevent tearing damage occurring whilst tightening the adaptors to the sandwich plate.

10. The hose can now be removed from the vehicle be carefully feeding it out of the engine bay from the LH wheel arch area.

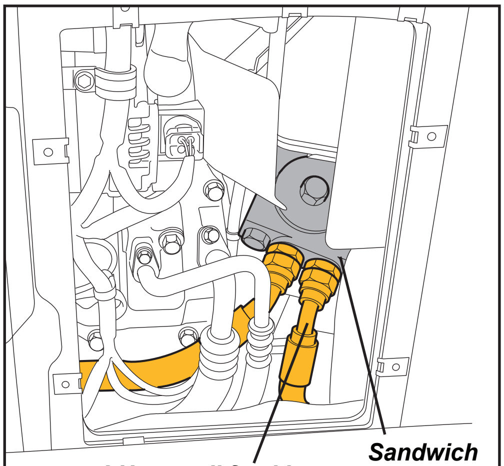


Fig 11

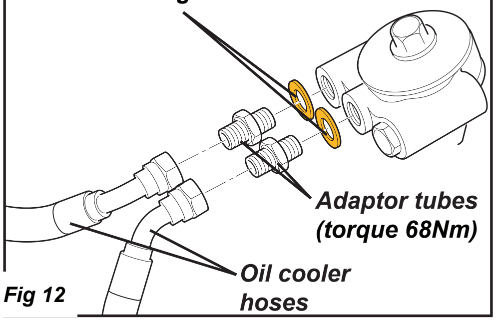


Fig 12

Refitment:
Refit is the reverse order to removal.

1. Ensure the hose route is unhindered, cannot rub on any other components and is free of any kinks allowing the oil to flow freely.

2. Route the new hose through the LH rear wheel arch and position into the sandwich plate so that it's crimped section is pointing directly downwards, (see Fig 11 & 14).

3. Tighten the hose connections at the sandwich plate and sill pipe to 40Nm, (a 30mm crowsfoot adaptor is required to carry out this operation).
   Note: It may be necessary rotate the sandwich plate very slightly from its original position to ensure that the oil hose route and orientation are correct. If this is required then carry out the following steps as also shown in Fig 13:

a. Fit both hoses loosely into the sandwich place with the connection nuts finger tight only.
b. Loosen the sandwich plate cap sufficiently to allow the sandwich plate to turn on the heat exchanger housing, (loosen sufficiently so that the exhanger to sandwich plate 'O' ring will not be damaged when turning, but not too loose that the 'O' ring may become displaced).
c. Gently turn the sandwich plate until positioning and orientation of both cooler hoses is correct.
d. Tighten the sandwich plate cap to 52Nm, (A screwdriver may need to be placed between the left hand side of the sandwich place and the back of the air conditioning compressor to stop the plate moving whilst the cap is re-tightened).
e. Tighten both oil cooler hose connections to 40Nm.

4. Refit the front engine mount, (see Fig 14 on next page for torque settings).

5. Replace earth lead tie wrap.

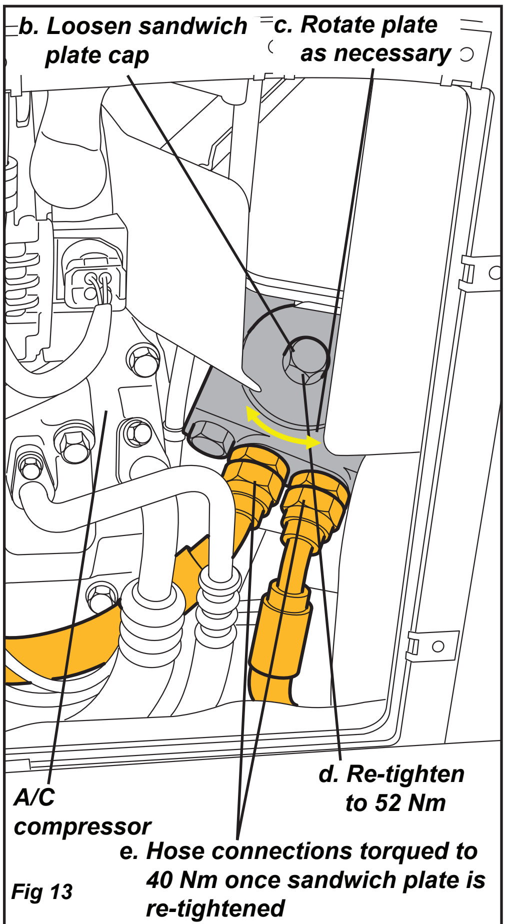


Fig 13

6. Ensure the engine oil is topped up to the maximum mark on the dipstick.
7. Run the engine until hot, the sandwich plate will open at 72°C (162° F).

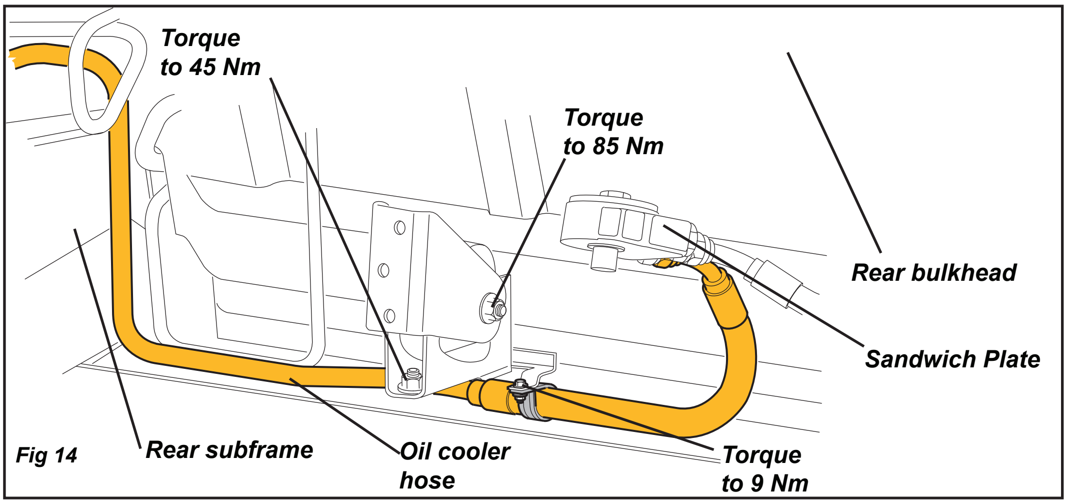


Fig 14

8. When the sandwich plate is open, the oil cooler pipes will be hot to the touch and the coolers feel warm.

9. Once the sandwich plate has opened, check for leaks, turn off the engine, leave for 3 minutes allowing time for any oil to drain back down to the bottom of the engine and re-check the engine oil level and adjust as necessary.

RH Rear Oil Cooler (Return) Hose

Removal:

1. Remove the rear undertray; refer to service notes section A - Introduction for further information.

2. Remove RH rear wheel and wheelarch liner; refer to service notes section BV.17 for further information.

3. Remove the fixing retaining the 'P' clip to the hose support bracket located on the subframe, (see Fig 13).

4. Loosen the hose at it's connection point to the RH rear sill pipe, (see Fig 13) located forward of the rear wheel arch. pull the hose away from the pipe and using suitable container(s), allow any oil in the cooler pipe or hose to drain down.

   Note: To avoid placing unnecessary strain and movement on the sill pipe, hold the sill pipe union nut with an open ended spanner whilst using another spanner or crows foot adaptor on the hose connector when loosening or tightening.

   **Note:* Evora S VIN's from BH_11383 to BH_11702 are fitted with a compression coupling between the cooler hose and sill pipe connection, (see Fig 13). This compression connector is not compatible with the '11MY VIN BH_11703 onwards RH oil cooler hose connector. Please refer to the Aftersales Service Parts List, Section 46.03c, to ensure the correct hose is supplied relative the vehicles VIN.*

   Please see Technical Service Bulletin TSB 2014/02R for further information.

5. From inside the vehicle remove the rear seat or trim, release the 9 fixings retaining the bulkhead access panel and remove, (see fig 14).

6. Unbolt the RH oil cooler hose (which will be the hose viewed on the left from inside the car) from its connection at the sandwich plate. (See Fig 14).

   Care point: Dependant upon the sandwich plate orientation it may also be necessary to remove LH oil cooler pipe connector and sandwich plate adaptor tube to gain sufficient access to the connector of the RH cooler pipe. (See fig 15).

   Note: In the event that the adaptor tubes are disturbed it is recommended that the bonded sealing washers positioned between the tubes and sandwich plate housing face are renewed. Also a thin smear of engine oil should be applied to the rubber seal section of the washers to prevent tearing damage occurring whilst tightening the adaptors to the sandwich plate.

   The hose can now be removed from the vehicle be carefully feeding it out of the engine bay from the RH wheel arch area.

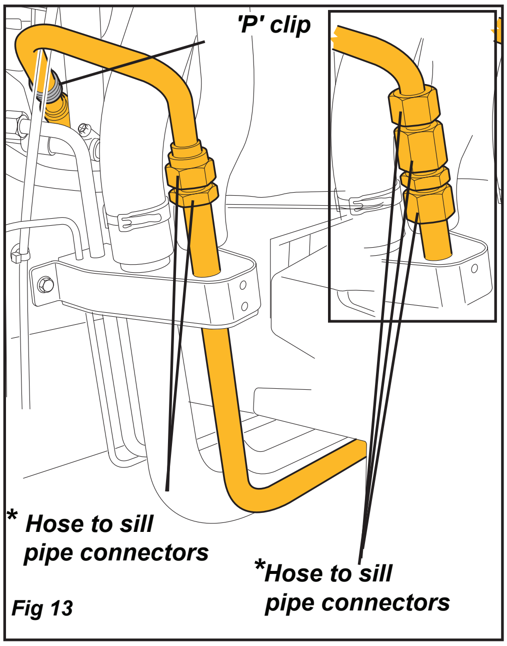


Fig 13

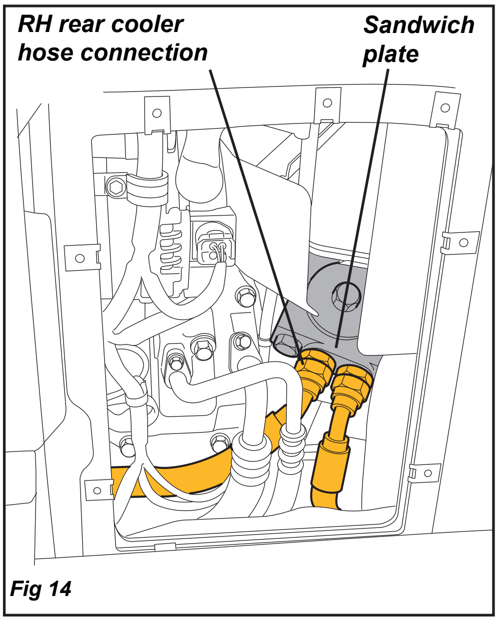


Fig 14

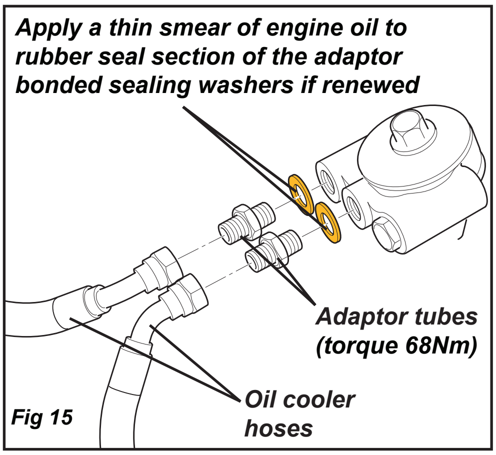


Fig 15

To refit:
Refit is the reverse order to removal.

1. Ensure the hose route is unhindered, cannot rub on any other components and is free of any kinks allowing the oil to flow freely. (See fig 16).

2. Position the hose into the sandwich plate so that the crimped section is pointing at a 45° angle.

   Note: It may be necessary rotate the sandwich plate very slightly from its original position to ensure that the oil hose route and orientation are correct. If this is required then carry out the following steps as also shown in Fig 17:

a. Fit both hoses loosely into the sandwich place with the connection nuts finger tight only.
b. Loosen the sandwich plate cap sufficiently to allow the sandwich plate to turn on the heat exchanger housing, (loosen sufficiently so that the exchanger to sandwich plate 'O' ring will not be damaged when turning, but not loosened too much that the 'O' ring may become displaced).
c. Gently turn the sandwich plate until positioning and orientation of both cooler hoses is correct.
d. Tighten the sandwich plate cap to 52Nm, (A screwdriver may need to be placed between the left hand side of the sandwich place and the back of the air conditioning compressor to stop the plate moving whilst the cap is re-tightened).
e. Tighten both oil cooler hose connections to 40Nm.

3. Ensure that there is clearance between cooler hose and the fuel filler neck to hose clip. If this requires repositioning then access can be gained from bulkhead access panel, (see Fig 18).
   Refer to TSB 2011/07 for further information

4. Tighten the hose connections at the sandwich plate and sill pipe to 40Nm (a 30mm crowsfoot adaptor is required to carry out this operation). Also refer to Note1 within step 5 of pipe removal for the correct tightening procedure.

5. Ensure the engine oil is topped up to the maximum mark on the dipstick.

6. Run the engine until hot, the sandwich plate will open at 72°C (162° F).

7. When the sandwich plate is open, the oil cooler pipes will be hot to the touch and the coolers feel warm.

8. Once the sandwich plate has opened, check for leaks, turn off the engine, leave for 3 minutes allowing time for any oil to drain back down to the bottom of the engine and re-check the engine oil level and adjust as necessary.

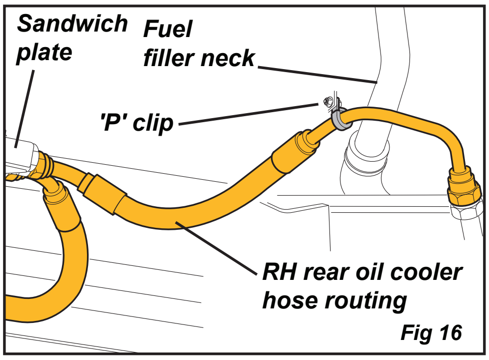
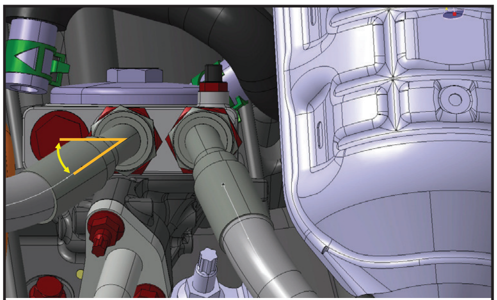


Fig 16


Hose connector angle approx 45°

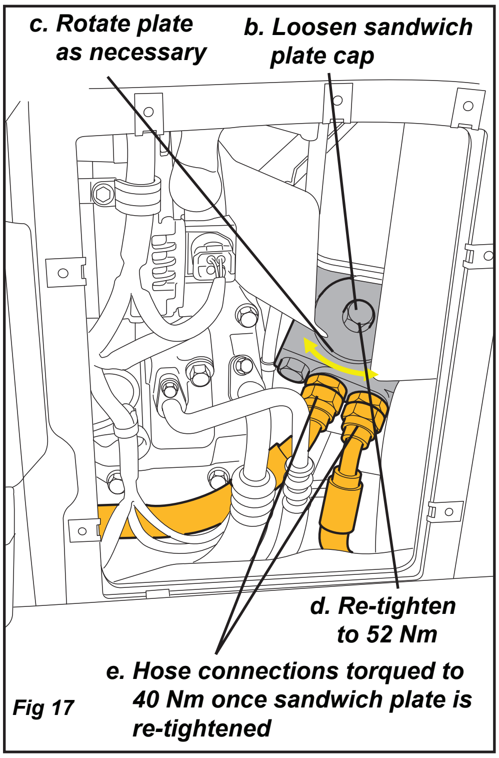


Fig 17

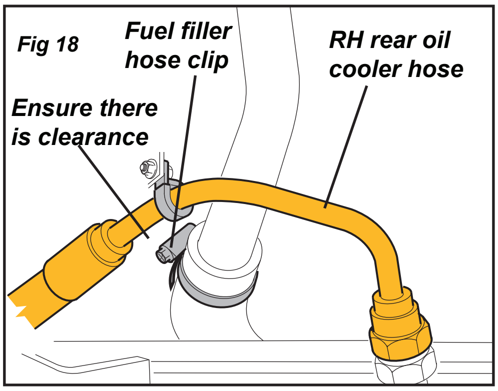
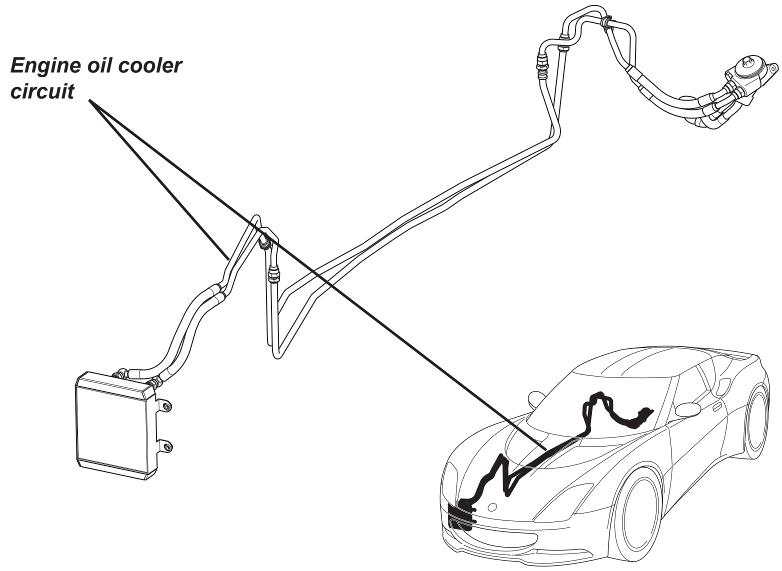


Fig 18

Front Mounted Air/Oil Cooler (Evora manual '12MY supercharged models)

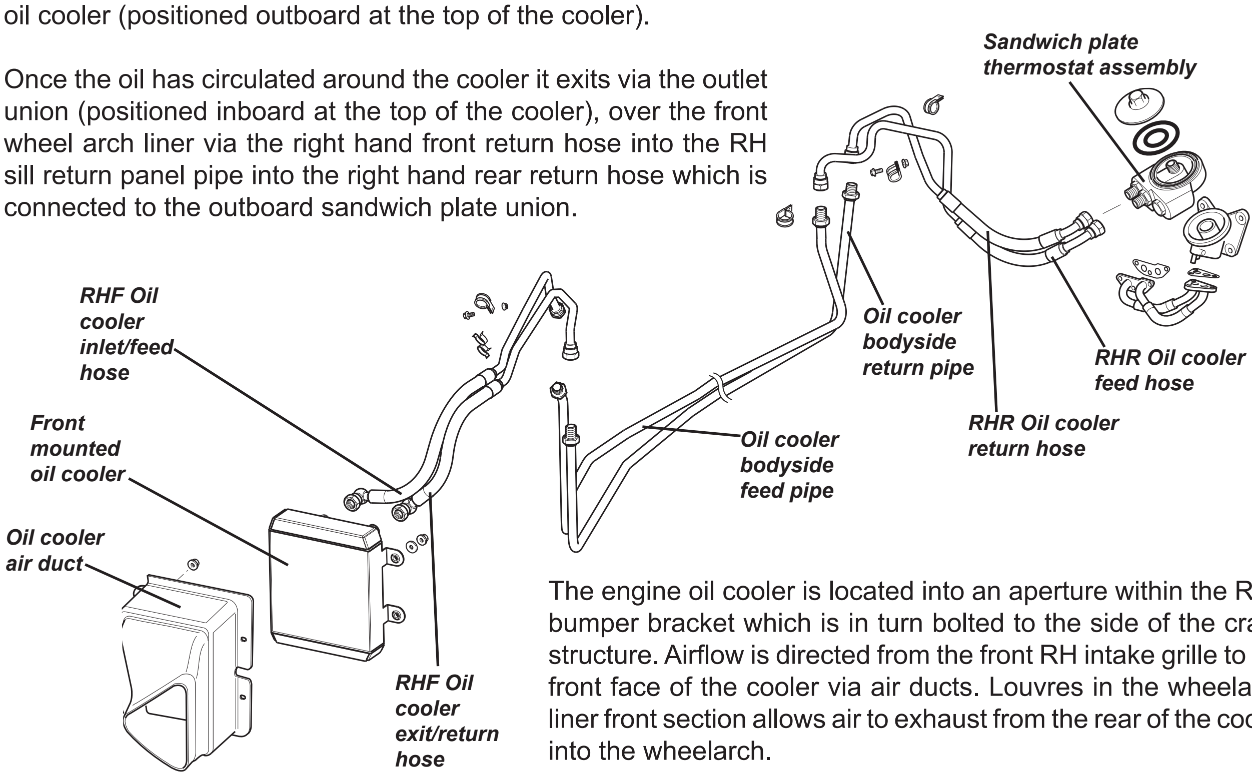


Oil cooling for both supercharged manual, IPS and S-IPS transmission vehicles has been rationalised with the fitment of only a single larger engine oil cooler mounted ahead of RH front wheel arch which feeds air from the outside of the vehicle via the intake and grille attached inset in the front bumper.

Both the feed and return hoses are located to the RH side of the vehicle and connect into the same sandwich plate configuration located on the side of the engine block bolted on the top of the heat exchanger housing as per '11 model year supercharged vehicles.

As per '11MY supercharged vehicles, the thermostat incorporated into the sandwich plate begins to open at 72ºC, and is fully open at 80ºC. When closed, the engine oil can by-pass the oil cooler circuit, but when fully open, all oil is directed from the sandwich plate via the inboard right hand rear flexible hose to the RH sill feed panel pipe, over the front wheel arch liner via the right hand front hose to the inlet feed connection of the RH oil cooler (positioned outboard at the top of the cooler).

Once the oil has circulated around the cooler it exits via the outlet union (positioned inboard at the top of the cooler), over the front wheel arch liner via the right hand front return hose into the RH sill return panel pipe into the right hand rear return hose which is connected to the outboard sandwich plate union.



The engine oil cooler is located into an aperture within the RHF bumper bracket which is in turn bolted to the side of the crash structure. Airflow is directed from the front RH intake grille to the front face of the cooler via air ducts. Louvres in the wheelarch liner front section allows air to exhaust from the rear of the cooler into the wheelarch.

Oil cooler

Removal:

1. Remove RHF wheel arch liner for to gain access to the oil cooler; refer to service notes section BV.17 for further information.

2. Disconnect the oil feed and return hoses from the cooler union connections.

   Care point: Galvanic corrosion may occur between the oil hoses steel union nuts at their connection to the aluminium threads of the front mounted cooler, it is essential to apply a liberal quantity of a suitable release agent around the area of the cooler unions before attempting to release them.

   Note: To avoid placing unnecessary strain and movement on the oil pipe and oil cooler, hold the union nuts with an open ended spanner whilst using another spanner or crows foot adaptor on the hose connector unions when loosening or tightening.

3. Lower the hoses and allow the oil from both hoses and the cooler to drain into a suitable container, plug the cooler hose ports to minimize oil loss.

4. Release the M8 nuts and washers (4) securing the air ducting and the oil cooler at it mounting point studs to the bumper support bracket.

   The cooler and ducting assembly can now be withdrawn from the bumper support bracket, ensure to collect oil coolers combined compression sleeves and bushes that may still remain on the mounting studs.

   Note: Dependant on ducting fitted, it may utilise different mounting points which are not fitted over the bumper support mounting studs, (see RH illustration for details).

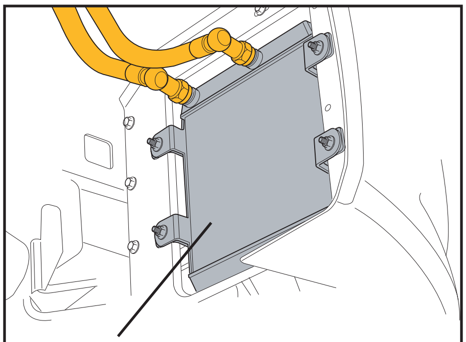
Fitment:

1. Place the oil cooler and duct into position (the main body of the duct assembly passing through the aperture within the bumper support bracket) and the cooler and duct mounting holes fitted over the 4 mounting point studs.

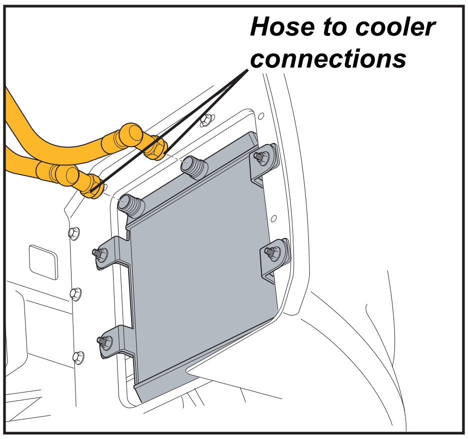
   Care point: ensure the combined compression sleeves and mounting bushes are fitted in position within the oil cooler mounting holes before refitting back onto the bumper support bracket mounting studs.

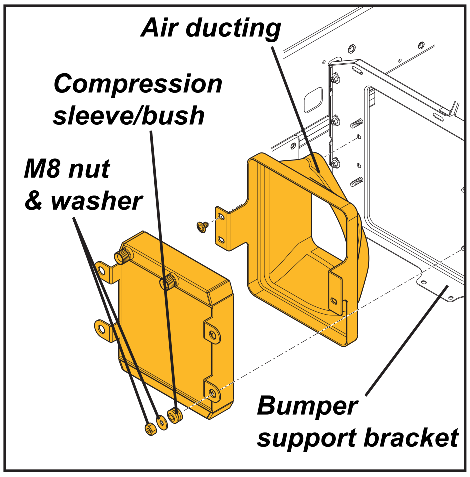
2. Refit the M8 nuts and washers (4) to the mounting studs and torque to 15Nm.

3. Refit the oil hoses to the oil cooler using a crows foot adaptor and torque to 40Nm.

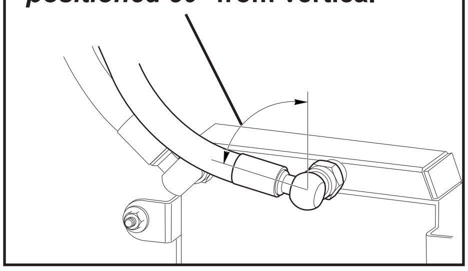


Wheelarch liner removed exposing engine oil cooler





RHF Oil cooler inlet/feed hose positioned 80° from vertical



Note: ensure the outer RH hose is positioned at an 80° angle from vertical as per the RH illustration. Ensure the hose route of both hoses is unhindered, cannot rub on other components and is free of any kinks allowing the oil to flow freely.

3. Ensure the engine oil is topped up to the maximum mark on the dipstick.

4. Run the engine until hot, the sandwich plate will open at 72°C (162° F). When the sandwich plate is open, the oil cooler pipes will be hot to the touch and the coolers will feel warm.

6. Inspect oil line joints, hoses and new oil cooler for leaks and rectify as required if leaks found.

7. Once the sandwich plate has opened, turn off the engine, leave for 3 minutes allowing time for oil to drain back down to the bottom of the engine and re-check the engine oil level and adjust as necessary.

RHR Rear Oil Cooler Feed and Return Hoses

Removal:

1. Remove the rear undertray; refer to service notes section A - Introduction for further information.

2. Remove RH rear wheel and wheelarch liner; refer to service notes section BV.17 for further information.

3. Remove the required retaining 'P' clips M6 x 16 screw and M6 nut securing the hose to the HVAC pipe support bracket located on the subframe, (see LH illustration).

4. Loosen the hose at it's connection point to the RH rear sill pipe located forward of the rear wheel arch, pull the hose away from the pipe and using suitable container(s), allow any oil in the cooler pipe or hose to drain down.

   Note: To avoid placing unnecessary strain and movement on the sill pipe, hold the sill pipe union nut with an open ended spanner whilst using another spanner or crows foot adaptor on the hose connector when loosening or tightening.

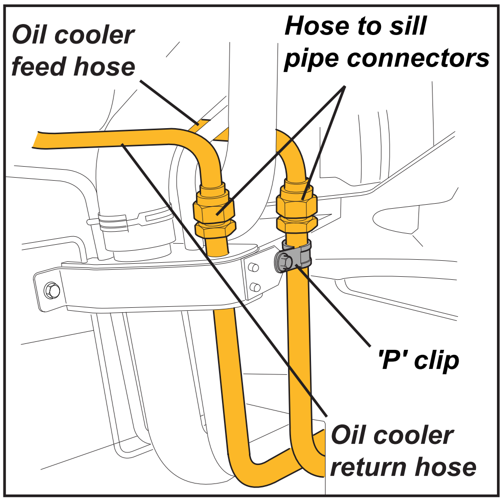
5. From inside the vehicle remove the rear seat or trim, release the 9 fixings retaining the bulkhead access panel and remove, (see LH illustration).

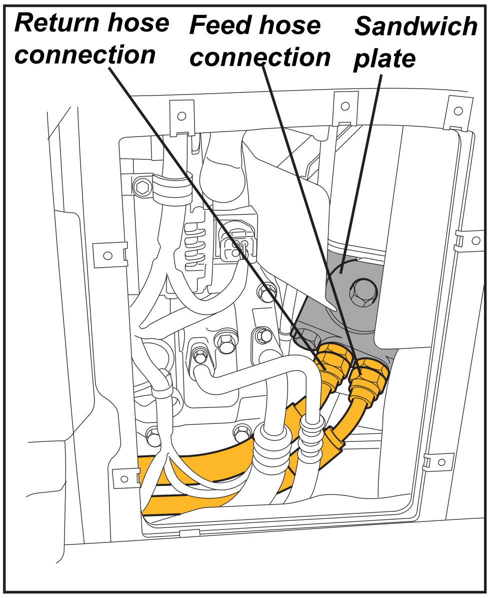
6. Unbolt the required oil cooler hose from its connection at the sandwich plate,

   Care point: Dependant upon the sandwich plate orientation it may be necessary to remove LH oil cooler pipe connector and sandwich plate adaptor tube to gain sufficient access to the connector of the RH cooler pipe or vice-versa, (see fig 15).

   Note: In the event that the adaptor tubes are disturbed it is recommended that the bonded sealing washers positioned between the tubes and sandwich plate housing face are renewed. Also a thin smear of engine oil should be applied to the rubber seal section of the washers to prevent tearing damage occurring whilst tightening the adaptors to the sandwich plate.

7. The hose can now be removed from the vehicle be carefully feeding it out of the engine bay from the RH wheel arch area.





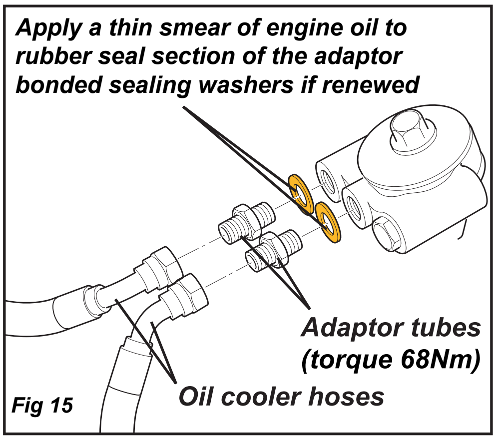


Fig 15

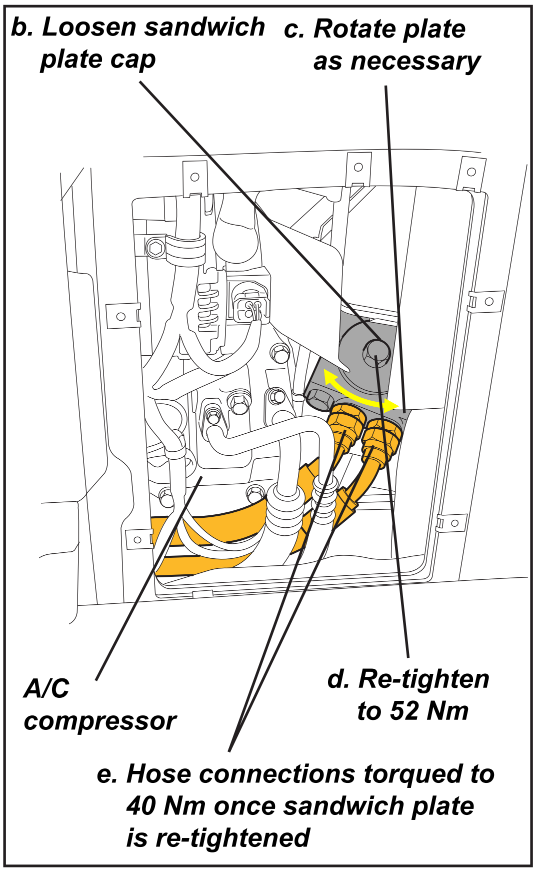
To refit:
Refit is the reverse order to removal.

1. Ensure the hose route is unhindered, cannot rub on any other components and is free of any kinks allowing the oil to flow freely. (See fig 16).

   Care point: Ensure the feed and return hoses are fitted to their correct connections at both the sandwich plate and bodyside pipes and are routed correctly around the fuel filler and coolant hose pipes at the RH wheelarch bodyside area, refer to illustrations on previous page for reference.

2. Position the hoses into the sandwich plate so that their crimped sections are pointing at a 45° angle.

   Note: It may be necessary rotate the sandwich plate very slightly from its original position to ensure that the oil hose route and orientation are correct. If this is required then carry out the following steps as also shown in the RH illustration.



a. Fit both hoses loosely into the sandwich place with the connection nuts finger tight only.
b. Loosen the sandwich plate cap sufficiently to allow the sandwich plate to turn on the heat exchanger housing, (loosen sufficiently so that the exhanger to sandwich plate 'O' ring will not be damaged when turning, but not loosened too much that the 'O' ring may become displaced).
c. Gently turn the sandwich plate until positioning and orientation of both cooler hoses is correct.
d. Tighten the sandwich plate cap to 52Nm, (A screwdriver may need to be placed between the left hand side of the sandwich place and the back of the air conditioning compressor to stop the plate moving whilst the cap is re-tightened).
e. Tighten both oil cooler hose connections to 40Nm.

3. Ensure that there is clearance between cooler hose and the fuel filler neck to hose clip.

4. Tighten the hose connections at the sandwich plate and sill pipe to 40Nm (a 30mm crowsfoot adaptor is required to carry out this operation). Also refer to the note within step 4 of pipe removal for the correct tightening procedure.

5. Ensure the engine oil is topped up to the maximum mark on the dipstick.

6. Run the engine until hot, the sandwich plate will open at 72°C (162° F).

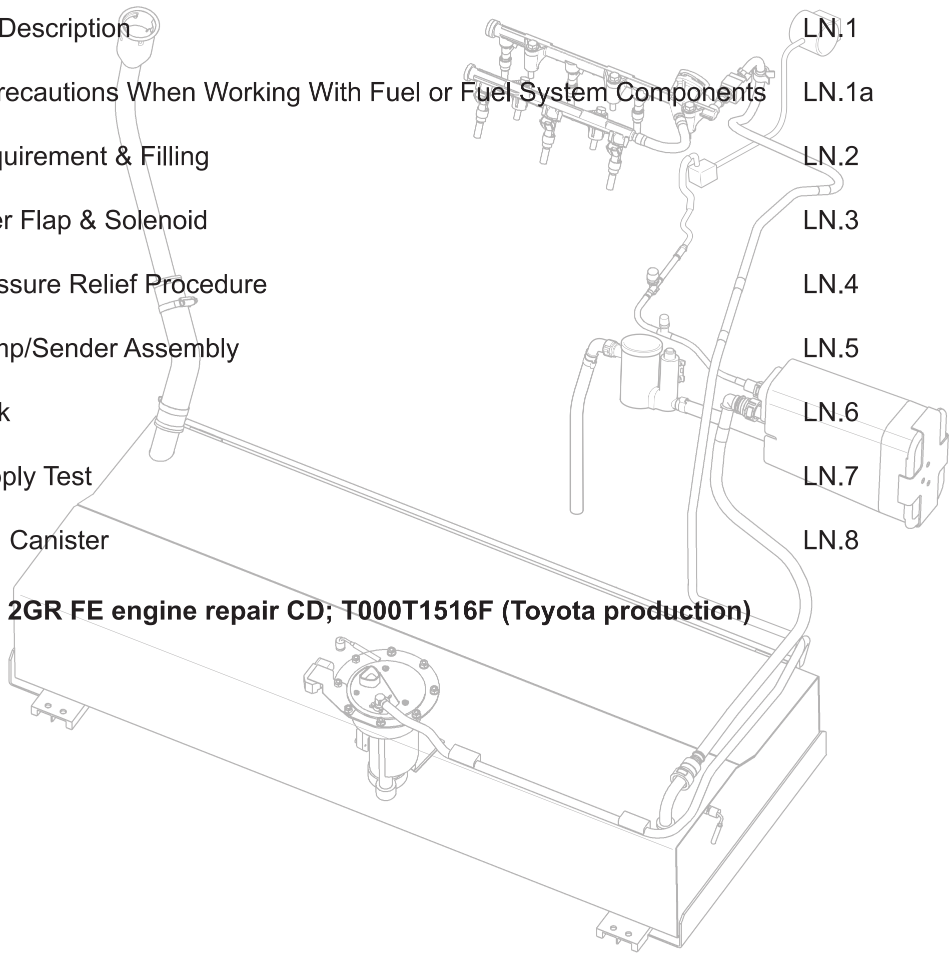
7. When the sandwich plate is open, the oil cooler pipes will be hot to the touch and the coolers feel warm.

8. Once the sandwich plate has opened, check for leaks, turn off the engine, leave for 3 minutes allowing time for any oil to drain back down to the bottom of the engine and re-check the engine oil level and adjust as neccessary.

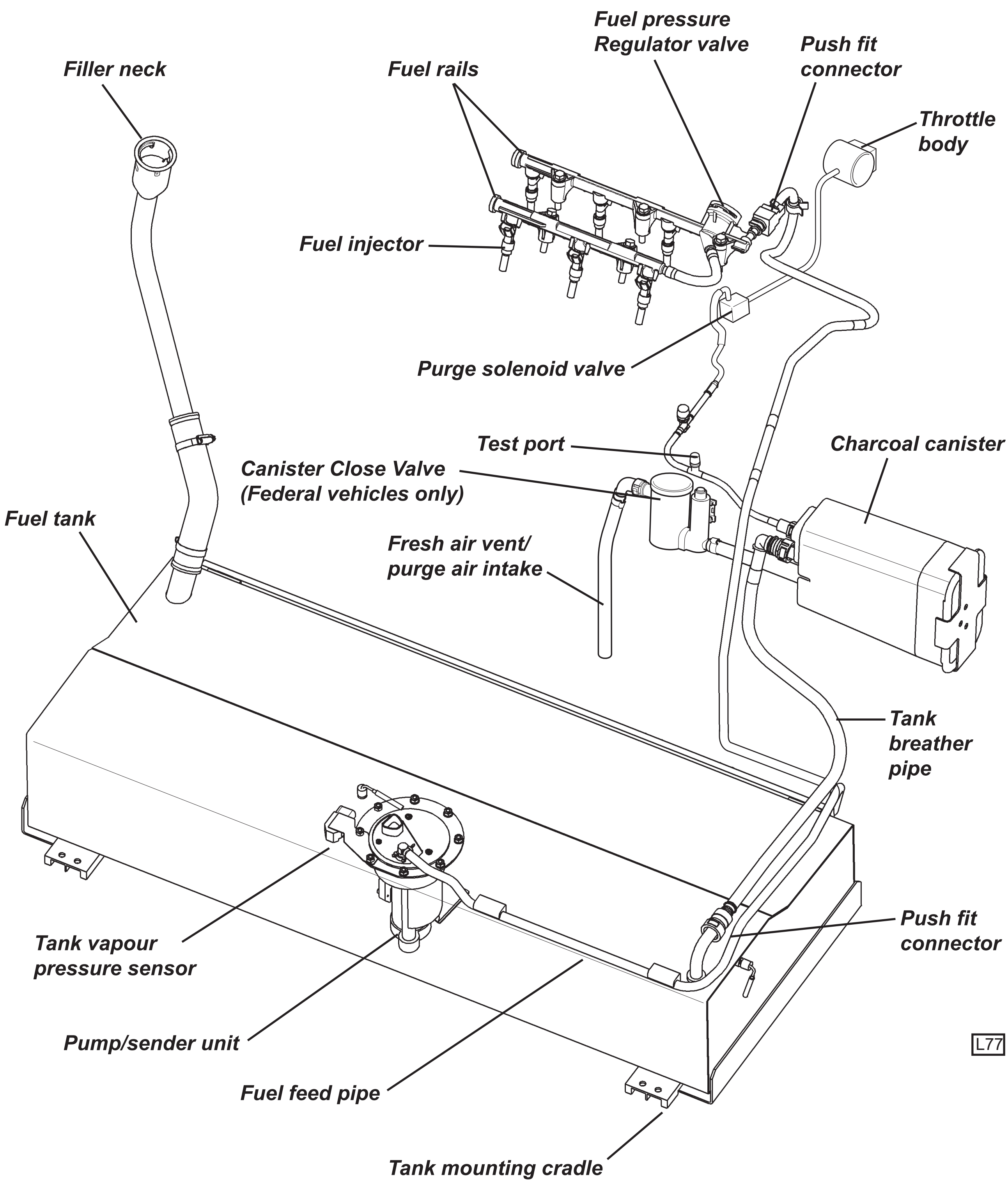
FUEL SYSTEM

SECTION LN

See also 2GR FE engine repair CD; T000T1516F (Toyota production)



Evora Fuel System Layout



LN.1 - GENERAL DESCRIPTION

The 60 litre fabricated stainless steel fuel tank is mounted within an open bottomed chassis crossmember ahead of the engine bay and beneath the floor of the cabin rear compartment. The fuel filler neck is connected to the RH rear corner of the tank, with a breather connection at the LH front corner, and the pump/gauge sender unit mounted centrally in the front upper surface, accessible via removeable panels in the body floor and chassis.

In order to meet stringent vapour emissions legislation, various components are housed within the tank, and include the pump assembly and filter, a fill level vent valve, and two gradient vent valves. The pump assembly supplies fuel to the engine fuel rail at a controlled pressure using a non-circulation system.

Inside the tank, a spring loaded flap at the bottom of the filler pipe, allows fuel to enter the tank but inhibits fuel surge up the pipe during cornering forces or extreme vehicle attitude changes. During the filling process, tank ventilation is provided by a fill level vent valve (FLVV) mounted within the tank to the left of the pump. The FLVV allows venting of fuel vapour to the charcoal canister via pipework connecting to the tank breather spigot at the left hand front top corner of the tank.

When the fuel level reaches the design maximum, a float ball valve shuts off the vent, causing a pressure rise in the filler neck and triggering the nozzle auto-shut off. The float valve will function in a similar manner to reduce fuel spillage in the event of a vehicle roll-over. In order to ensure tank breathing when the car is parked on a side slope with a near-full tank, at which time the FLVV may be closed, a gradient vent valve is fitted at each end of the tank and connected to the same tank outlet spigot. These valves allow a slower rate of vapour escape and also include a low pressure holding valve and roll-over shut-off functionality. Note that with the exception of the fuel pump/sender unit, none of these 'in-tank' components are serviceable other than by fuel tank replacement.

The tank structure incorporates a system of baffles surrounding the pump assembly to ensure that the pump inlet is kept submerged during extreme dynamic forces until the fuel level becomes near empty. The modular fuel pump/gauge sender assembly is mounted inside the tank, clamped to the top surface by eight studs. The pump uses an electric motor to power an integrated turbine, to draw fuel through an intake strainer sock, and pump the fuel through the motor body and a non-return valve, to exit into a filter chamber incorporated into the housing of the pump/sender unit.

After the filter, a pressure regulating valve controls the output line pressure to around 3.2 bar, spilling excess fuel back into the tank, and supplying the pressurised fuel to the outlet port on the top surface. A non-recirculation type of fuel feed system is employed in order to minimise evaporative emissions. The feed pipe is routed along the LH top rear of the fuel tank bay to emerge through the chassis beneath a plastic shroud, and thence into the engine bay. The pipe then continues without a joint until connecting to the LH end of the engine rear bank fuel rail, to which the front bank rail is linked by a short connector hose.

When the ignition is first switched on, the engine management ECU energises the fuel pump for a period of about 3 seconds to prime the system before switching off. If a signal from the crankshaft sensor indicates that the engine is being cranked or is running, the fuel pump feed will be maintained. The pump is switched off immediately the ignition is turned off, or about 3 seconds after a stall. Note that after the ignition is turned off, the ECU will remain live for up to 20 minutes (dependent on coolant temperature), to allow for heat soak management (see sub-section KI.5).

A safety inertia switch is incorporated into the fuel pump electrical circuit, and operates in a severe impact (indicative of a vehicle collision) to switch off the fuel pump feed and minimise the fire risk. The doors will also be unlocked. The switch is mounted on the seat belt mounting frame LH backstay, accessible from the engine bay, and is reset once tripped, by pressing the rubber button on the top of the switch.

An evaporative emissions 'charcoal' canister is mounted at the LH side of the engine bay bulkhead, beneath the air intake duct, and is connected to the tank by a moulded tube. The plastic shroud covering the fuel pipes in the cabin rear compartment, incorporates a removeable plate to allow access to the breather pipe connection to the tank. The purge port of the canister is connected to a solenoid valve mounted on the LH end of the front bank cam cover, and thence to the intake plenum just downstream of the throttle body.

The evaporative emissions control system prevents untreated fuel vapour from the tank reaching the atmosphere, by absorbing the tank vapour in a bed of activated charcoal in the canister. When the engine is running, the engine management ECU opens the purge solenoid valve by duty cycle, and allows intake manifold depression to draw fresh air through the canister via a third port on the canister, purging absorbed fuel from the charcoal, and consuming the resultant vapour in the normal combustion process. In this way, the charcoal bed is 'cleaned' ready to absorb more tank vapour when the engine is stopped.

In order to meet certain markets emission and on-board diagnostics testing standards a Canister Closed Valve (CCV) is fitted in line within the fresh air vent/purge air intake hose fitted to the exit port of the charcoal canister. This is used in conjunction with the fuel tank vapour pressure sensor fitted to a port on the top of the fuel tank.

Fitment of the CCV and fuel tank vapour pressure sensor allows the On Board Diagnostics (OBD) system to perform an evaporative system leak check encompassing the fuel tank, breather hoses, charcoal canister and fuel filler neck/cap.

LN.1a - SAFETY PRECAUTIONS WHEN WORKING WITH FUEL OR FUEL SYSTEM COMPONENTS

The following points listed are the basic safety factors that should be followed when performing fuel system maintenance. If applicable, also continue to adhere to any additional safety guidelines, instructions or policies that are enforced by your workshop controller, dealership or by local legislation.

When either removing or refitting any fuel system components as shown in this service notes section, observe the following instructions to avoid fire as well as personal injury.

- Always relieve the fuel system pressure prior to disconnecting any fuel system component: refer to sub-section LN.3 for further information.
- Even with the fuel system pressure relieved, there may still be some residual pressure, therefore to prevent exposing skin, face and eyes from fuel spray, cover any hoses, pipes or connectors with a suitable cloth before disconnecting any fuel tubes, pipes, hoses or connectors to absorb any excess fuel due to spillage..
- Always disconnect the negative battery cable unless the repair or test procedure requires that battery voltage be applied.
- Always replace worn or disturbed fuel fitting ‘O’ rings or with new ones.
- Where a fuel grade specification hose is used, do not replace with an unsuitable hose or a hose of a lessor grade specification.
- Have a suitable fire extinguisher accessible before beginning any work on the fuel system.
- Wear protective goggles and gloves especially when disconnecting fuel tubes, pipes, hoses or connectors.
- Only perform repairs on a fuel system in a well-ventilated area of the workshop.
- DO NOT work on the vehicle either underground or in an area where fuel vapors may fill the workshop because of poor ventilation.
- If fuel is spilled, then clean up the area using a dry cloth immediately to remove fuel vapors.
- Dry any cloths in a well-ventilated area that have been contaminated with fuel. Once dry, dispose of them according to any applicable local regulations.

Do not avoid fuel spray or fuel vapours coming into contact with a spark or open flame:

- DO NOT smoke near any areas where a vehicles fuel system is being worked on.
- DO NOT work in areas where there are welders, grinders, drills, electric motors, heaters, etc.
- DO NOT use work lamps or any other electrical appliance due to the risk of sparks flying from the power switch or a rise in temperature.
- DO NOT use metal hammers while working, due to the risk of flying sparks.

LN.2 - FUEL REQUIREMENT & FILLING

Fuel Requirement
Use only premium grade UNLEADED fuel with a minimum octane rating of 95 RON. Using fuel with a lower octane rating may cause knocking (pinking) which, if severe, can cause serious engine damage. Light knocking may occasionally be heard for short periods when accelerating or driving up hills, and should cause no concern, although using a lower gear would be advised. If, however, persistent heavy knocking is heard when using the specified fuel, a fault is indicated.

If no unleaded premium grade fuel is available, 91 RON unleaded fuel may be used for short periods, but heavy engine loads and wide throttle openings must be avoided. The use of good quality fuels containing proper detergent additives is advised for good performance and emission control.

The Evora is fitted with 'three way' catalytic converters in the exhaust system in order to reduce the noxious content of the exhaust gases and comply with emission control regulations. It is essential that ONLY UNLEADED FUEL is used. The effectiveness of the catalytic converters decreases after as little as one tankful of leaded fuel or LRP.

Note
- The use of leaded fuel, or lead replacement petrol (LRP), will cause irreversible contamination of the precious metal catalysts and of the exhaust gas sensors used by the computer controlled engine management system.
- Fuel system damage and running problems, resulting from the use of incorrect fuels will not be covered by your New Vehicle Warranty.
- DO NOT push or tow start the car; or turn off the ignition at engine speeds above idle; or run the fuel tank dry: Any of these actions may damage the catalytic converters.

Ethanol E5 & E10 - A mixture of 5% or 10% ethanol (grain alcohol) and unleaded petrol may be used in the Evora but the lower octane rating (typically 93 - 94 RON) will result in slightly reduced performance and economy. If driveability problems are experienced as a result of using ethanol, use 95 RON unleaded petrol. Do not use Ethanol blends with a higher concentration than 10%.

Methanol - Do not use fuels containing methanol (wood alcohol). Use of this type of alcohol can result in performance deterioration and damage to critical parts in the fuel system.

Fuels Containing MMT - Some fuels contain methylcyclopentadienyl manganese tricarbonyl (MMT), which is an octane enhancing additive. Such fuels may damage the emission control system and should NOT be used.

Diesel - The Lotus Evora will not operate on diesel fuel.

Fuel Filling

WARNING:
- **Be aware of the danger of explosion when dealing with petrol and its attendant fumes. Before stopping at a filling station, switch off mobile phones, ensure that all cigarettes are extinguished and that no naked flames or other potential ignition sources are present.**
- **Switch off the engine before refuelling.**
- **Remove the filler cap slowly to allow any pressure to bleed off gradually. Hasty removal may result in a small amount of fuel spray with a possible health or fire hazard.**

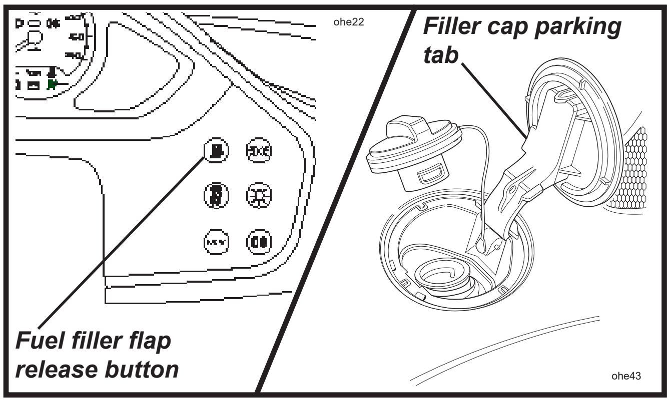
Filler Cap

The fuel filler is located in the right hand rear quarter panel, concealed by a flush fitting hinged flap.

To open the flap, press the release button in the fascia panel outboard of the steering column, with or without the ignition key in position, and the flap will spring fully open.

Unscrew the filler cap. As the cap is turned, any pressure differential between the tank and the atmosphere will be released and a brief hiss may be heard.

Allow the pressure to equalise gradually to avoid the potential for a small amount of spray. Note that the cap is tethered to prevent its loss, and should be hooked onto a tab provided for this purpose, on the hinge of the flap.



To refit, place the cap into the filler neck and turn clockwise until the ratchet mechanism clicks several times. Push the flap closed.

Filling Procedure: Insert the pump nozzle fully into the neck, and fill until the auto-shut off mechanism is triggered. Do not attempt to 'brim' the tank to the top of the filler neck, as expansion of the fuel due to temperature change (e.g. cold underground fuel storage) may cause flooding of the fuel tank breather system charcoal canister, or spillage of fuel.

The total usable fuel capacity is 60 litres (13 imp.gal), but for re-fuelling purposes, from the time the low fuel tell tale is triggered, approximately 50 litres can be accommodated. Note that from the point of low fuel tell tale activation to the gauge reading empty, is around 5 litres.

Note: The remaining balance of approx. 5 litres, should be treated only as an emergency contingent, the use of which may entail intermittent fuel starvation dependent on driving conditions, and potential engine damage. In such a situation, driving style should be modified to minimise engine load and cornering forces.

If maximum engine or handling performance is to be exploited, or severe gradients tackled, a high fuel level should be maintained to ensure the greatest safety margin of fuel supply.

LN.3 - FUEL FILLER FLAP AND SOLENOID

The fuel filler flap lever arm, housing, drain tube and opening solenoid is a non serviceable module referred to as the fuel filler bowl assembly. A body coloured fuel filler flap is then bonded to the lever arm.

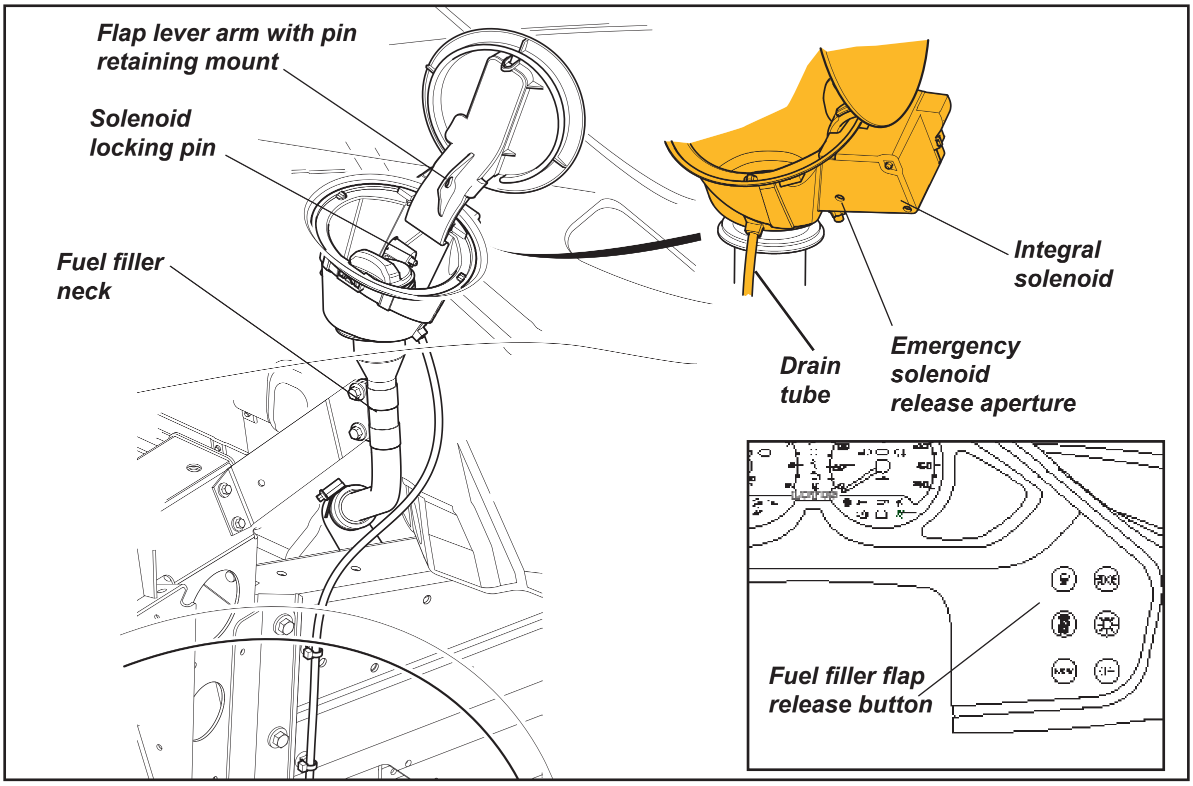
The assembly is located into the correct position on the right hand rear clamshell by moulded clip housings which pass through cut out segments on the clamshell. The fuel filler neck pipe passes through a flexible moulded section incorporated into the base of the bowl.

A 2 diameter stepped grommet positioned around the filler pipe is fed into the base of the lower bowl assembly to prevent fuel from draining down onto the rear wheelarch liner which could be spilt during fuel filling.

The fuel filler flaps lever arm default position is open, but it is retained in the closed position by a solenoid actuated locking pin that slides into a machined aperture within the lever arm.

The flap is opened by pressing the release button in the fascia panel outboard of the steering column, (with or without the ignition key in position).

With the button pressed the fuel flap relay located in the rear fuse box relay station is energised, activating the release solenoid within the bowl assembly, withdrawing the release pin from the fuel flap lever arm and springing it to the open position.



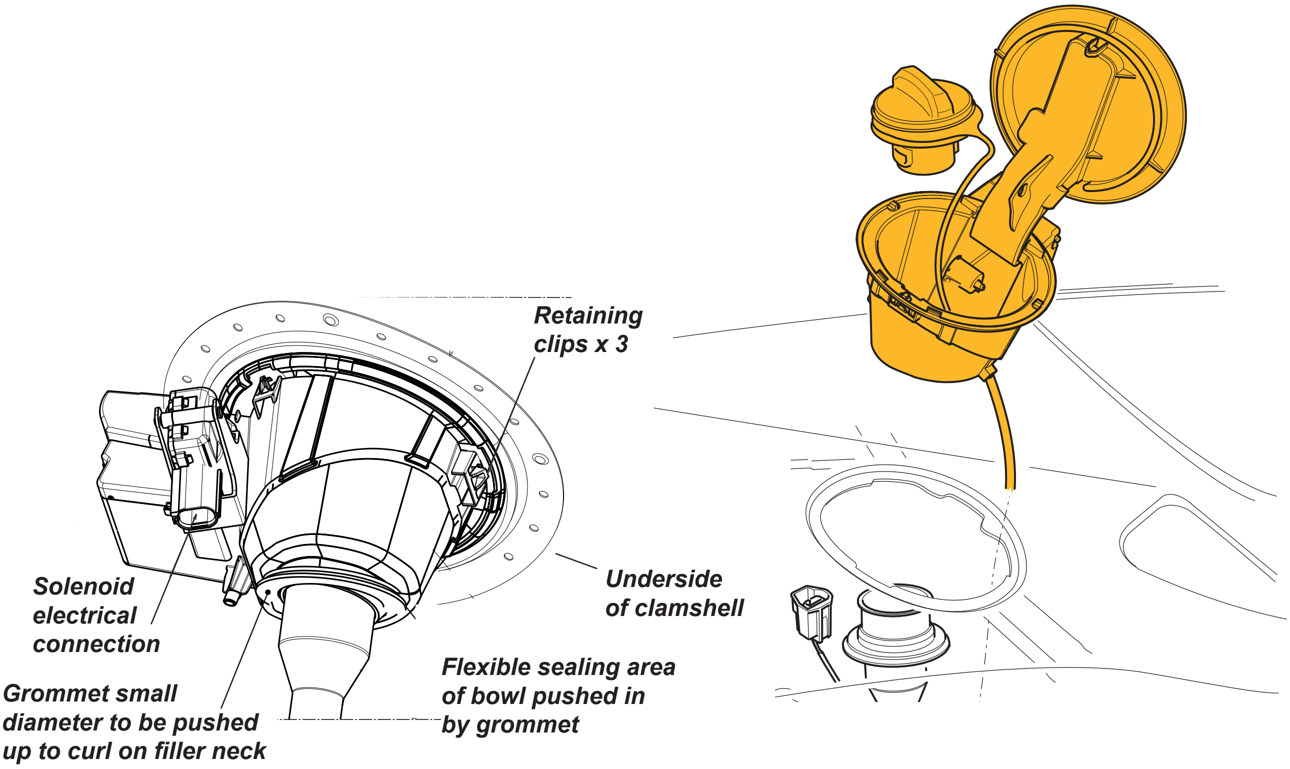
Emergency fuel filler flap opening
In the event that the flap fails to open due to a fault with either the solenoid or another electrical fault, then an emergency procedure can be initiated to release the flap but as this involves removal of the right hand rear wheel arch liner it should be considered as a last resort and not recommended as a customer operation.

- Remove right hand rear wheel arch linerrefer to Service Notes Section BV.17 for further information.
- From the right hand wheel arch area use a suitable pin or screwdriver and position it in the side of the solenoid housing assembly and push the locking pin through the flap lever arm.

Please note this may take several attempts and the cause of the malfunction should be investigated and rectified as soon as possible.

Fuel filler bowl removal:

- Open the fuel filler flap.
- Remove the right hand rear wheelarch liner; refer to Service Notes Section BV.17 for further information.
- From the right hand rear wheelarch area, disconnect the harness connector from the solenoid.
- Unclip the drain tube from the retaining clips pressed into the chassis.
- Remove the fuel filler cap.
- Pull down the fuel filler neck grommet from the base of the bowl assembly.
- Press in the 3 moulded retaining lugs that located the bowl assembly to the rear clamshell.
- Carefully rotate the bowl assembly and tilt to withdraw from clamshell.



Fuel filler bowl refitment;

Is the reverse procedure of removal.

LN.4 - FUEL PRESSURE RELIEF PROCEDURE

The fuel line between pump and injector rail, and the injector rail itself, contain pressurised fuel both when the ignition is switched on, and for a period after switching off. This feature aids engine starting by reducing the time needed to build up operating fuel pressure, and by inhibiting the formation of vapour pockets in the supply line after switching off a hot engine.

WARNING:
For safety precautions when working with fuel or fuel system components: refer to sub-section LN.1a

Fuel Pressure Relief Procedure
This procedure should be used prior to disconnecting any part of the fuel line.

1. Remove the fuel pump fuse R19; refer to Service Notes Section MR.6 for further information.

2. Start the engine, and run until it stops from starvation. Crank the engine for a further few seconds.

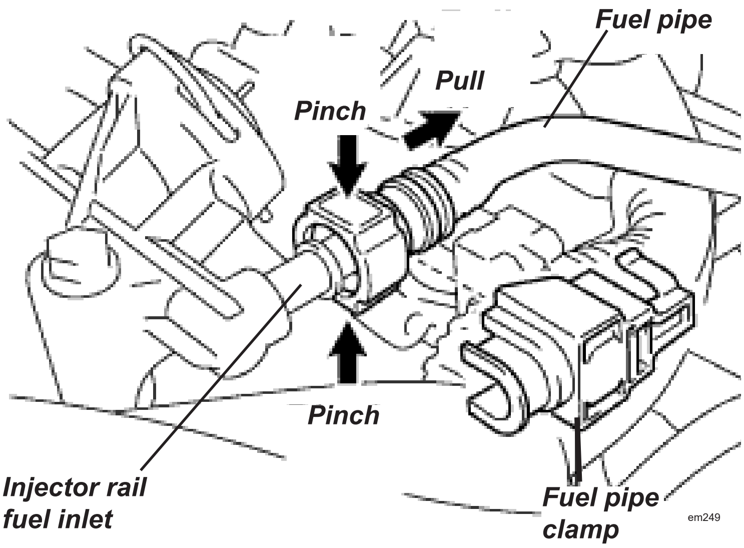
3. If the engine is a non-runner, pull out the fuel pump fuse, and crank the engine for 20 seconds to minimise residual fuel pressure.

4. Disconnect the battery: refer to Service Notes Section MR.8 for further information.

5. Remove the engine cover panel.

6. Release the clamps securing the air intake hose from the hose intake/plenum assembly to both the throttle body inlet and airbox cover outlet and remove the hose: refer to Service Notes Section EJ.4 for further information.

Fuel pipe to injector rail connection



7. Unlatch fuel pipe quick connector at injector rail fuel inlet by pinching the two buttons on the side of connector and pulling away from the rail as indicated above*.

*Carepoints:
- Surround the pipe joint with a shop towel to absorb fuel contained in the pipework before pressing the fuel pipe connector release buttons and separating the joint (by hand only) and pull the fuel pipe away from fuel rail (protect the fuel rail and pipe ends from contamination by covering with clean plastic bags).

- Check that there is no dirt or other foreign objects around the connector before this operation and clean the connector as necessary.

- It is necessary to prevent mud or dirt from entering the quick connector. If mud enters the connector, the O-rings may not seal properly.

- Remove the quick connector by hand.

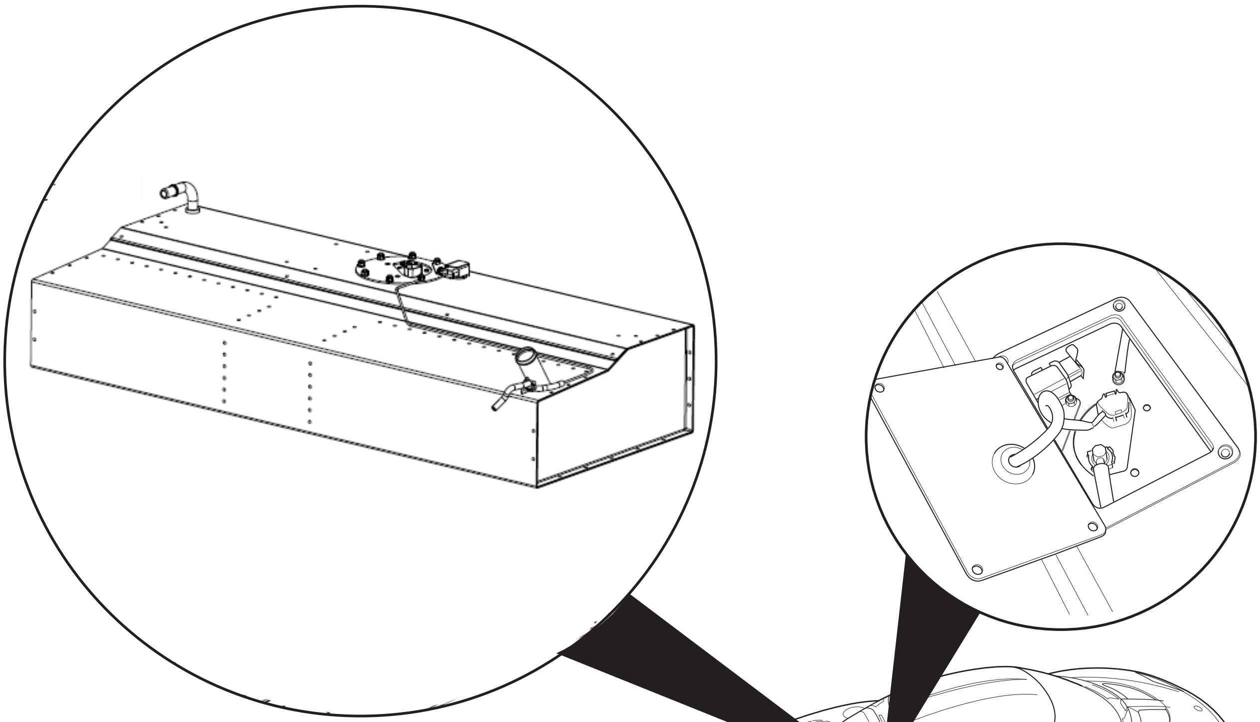
- Do not bend or twist the nylon tube. Protect the connector by covering it with a plastic bag.

- If the pipe and the connector are stuck, try wiggling or pushing and pulling the connector to release it and pull the connector off of the pipe carefully.

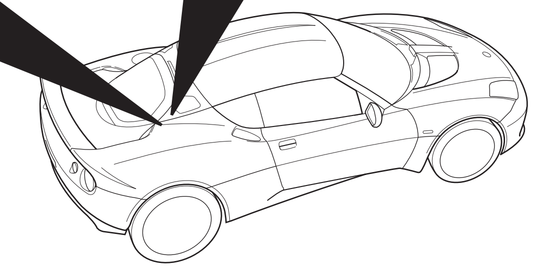
WARNING: Be aware of the possibility of full pressure retention in the fuel line caused by a system fault.

On re-fitting, push the joint firmly together until a click is heard. Pull on the pipe to ensure complete engagement.

LN.5 - FUEL PUMP/TANK SENDER



The fuel pump/gauge sender unit is mounted centrally in the front upper surface of the fuel tank, accessible via removeable panels in the cabin rear compartment body floor and chassis.



The modular fuel pump/gauge sender assembly is mounted inside the tank, clamped to the top surface by eight studs.

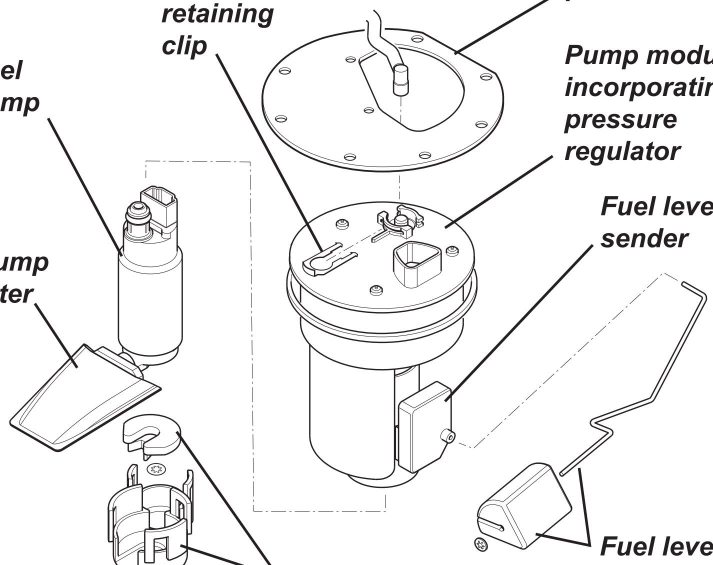
The pump uses an electric motor to power an integrated turbine, to draw fuel through an intake strainer filter, and pumps the fuel through the motor body and a non-return valve, to exit into a filter chamber incorporated into the housing of the pump/sender unit.

Naturally aspirated Evora's use a 100 LPHr pump and supercharged variants use a 140 LPHr version.

After the filter, a pressure regulating valve-located within the pump module controls the output line pressure to around 3.2 bar, spilling excess fuel back into the tank, and supplying the pressurised fuel to the outlet port on the top surface.

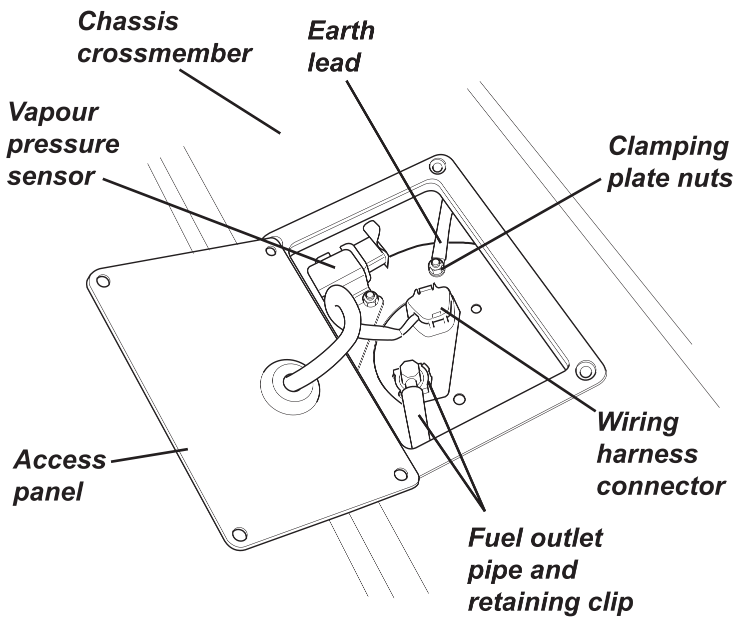
A non-recirculation type of fuel feed system is employed in order to minimise evaporative emissions. Note that for some markets, a fuel tank vapour pressure sensor for on-board diagnostics is fitted alongside the pump/sender in the tank top surface.

The fuel gauge sender is mounted on the side of the pump housing, and uses a float on a pivoted arm to operate two rheostat strips supplying fuel level data to the engine ECU.



To remove/refit fuel pump assembly

Preparation:
- For safety precautions when working with fuel or fuel system components: refer to sub-section LN.1a.



1. Perform steps 1 - 4 of the fuel system de-pressurise procedure as shown in sub-section LN.4.
2. Remove the rear seat on 2+2 models or the luggage net brace and load shelf carpet on 2+0 models to gain access to the fuel tank access panel.
3. Release the M5 x 12 (4) screws (torque 8Nm) securing the access panel and fuel pump wiring harness to the top of the chassis rear crossmember.
4. Pull the access panel away from the crossmember so that the fuel pump harness connector is accessible.
5. Disconnect the wiring harness connector from the socket on top of the fuel pump module (and fuel vapour pressure sensor if applicable); the access panel with harness still attached can now be placed to one side.
6. Using an absorbent cloth to collect residual fuel, slide the yellow retaining clip aside and withdraw the fuel feed pipe from the pump spigot.
7. Release the M6 nyloc nuts and washers (8) securing the fuel pump clamp plate and vapour pressure sensor bracket to the fuel tank, noting the position of the earth lead.

   Carepoint: before removing the fuel pump retaining nuts, it is recommended to pack a piece of clean dry foam or other suitable material around the outer perimeter of the fuel pump clamp plate (between the upper surface to the tank and lower surface of the chassis rear crossmember). Because in the event that a pump retaining nut is accidentally dropped behind the fuel tank during removal the only method of retrieval may be to remove the shear panel assembly.

8. Withdraw the fuel pump clamp plate and pressure sensor bracket from the fuel tank.
9. Taking suitable precautions to catch any dripping fuel, carefully withdraw the pump assembly and tank seal from the tank aperture, taking care not to damage the delicate float arm, pump filter, or other vulnerable parts.

Refitment:
Is the reversal of removal except:

- Before re-fitting the assembly back into the tank, ensure that all connector plugs are secure, and that the top sealing ring is in good condition. To aid subsequent removal, apply a dab of MoS2 grease to each of the retaining studs on the tank before fitting the pump assembly. Feed the unit through the tank aperture and fit the retaining ring and vapour pressure sensor bracket over the eight studs. Note that the cut out and dowel holes in the clamp plate define its orientation in respect to the pump. A flat on the clamp plate must align with the front edge of the tank.

- Fit the earth cable onto the stud positioned at 4 O'clock as viewed from behind. Fit all fixing nuts and nip tighten to 2 Nm in a diagonal sequence before final tightening to 5 - 6 Nm. Ensure the yellow clip is securely engaged with the fuel supply pipe connector.

- *Fuel pump:* If necessary, the fuel pump may be removed from the housing by unclipping the end cap retainer, removing the rubber cushion, unplugging the harness connector, and withdrawing the pump.

- Before re-fitting, ensure that the pump filter is clean, replacing if necessary, and using a new retaining clip. Note that the non-return valve is incorporated into the outlet spout of the pump, and is not individually replaceable.

- *PRV:* The pressure regulator valve may be replaced after unclipping the yellow retainer from the base of the housing, and withdrawing the valve.

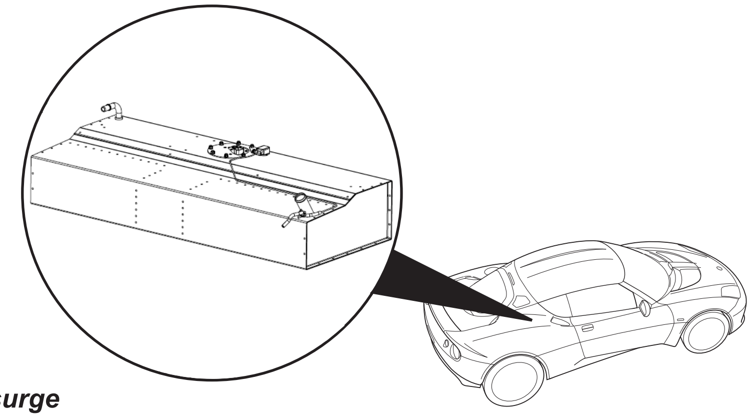
- *Level sender:* The fuel level sender unit may be removed from the housing by unplugging the connector, depressing the retaining barb behind the resistor block, and sliding the block downwards.

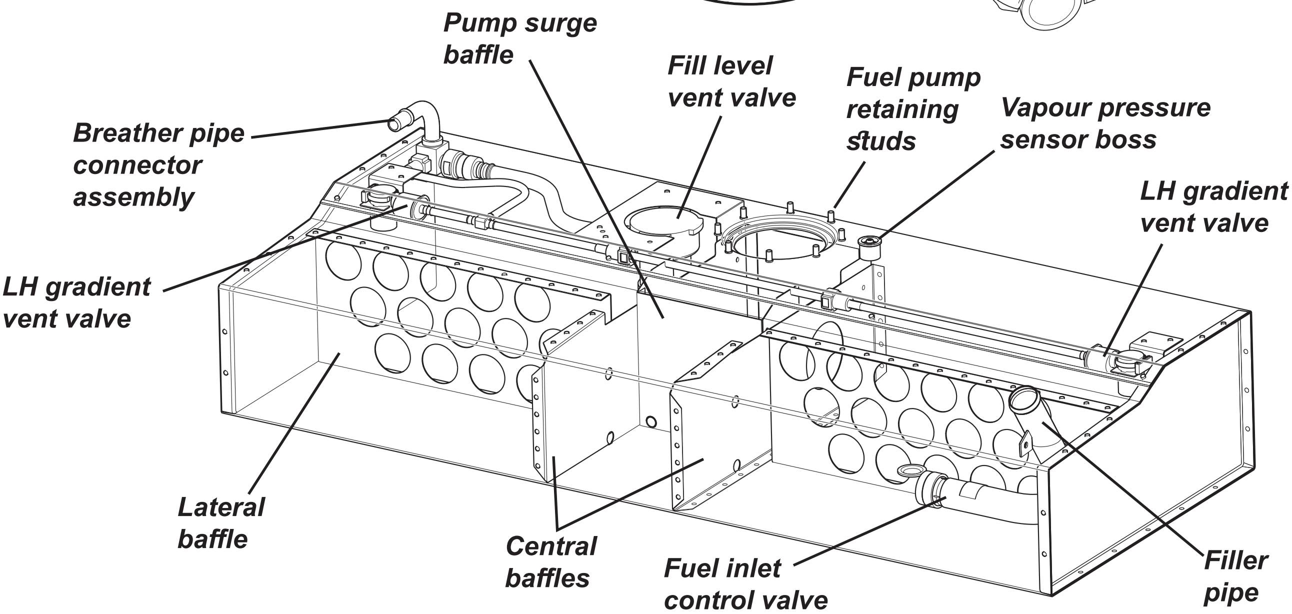
LN.6 - FUEL TANK

The 60 litre fabricated stainless steel fuel tank is mounted within an open bottomed chassis crossmember ahead of the engine bay and beneath the floor of the cabin rear compartment.

The fuel filler neck is connected to the RH rear corner of the tank, with a breather connection at the LH front corner.

The tank is clamped into position by a pair of extruded alloy cradles incorporating transverse restraints, bolted fore/aft across the underside of the chassis bay, with the tank located and protected by a set of foam strips and pads interposed between the tank and chassis.





In order to meet stringent vapour emissions legislation, various components are housed within the tank, and include the pump assembly and filter, a fill level vent valve, and two gradient vent valves. The pump assembly supplies fuel to the engine fuel rail at a controlled pressure using a non-circulation system.

Inside the tank, a spring loaded flap at the bottom of the filler pipe, allows fuel to enter the tank but inhibits fuel surge up the pipe during cornering forces or extreme vehicle attitude changes. During the filling process, tank ventilation is provided by a fill level vent valve (FLVV) mounted within the tank to the left of the pump. The FLVV allows venting of fuel vapour to the charcoal canister via pipework connecting to the tank breather spigot at the left hand front top corner of the tank.

When the fuel level reaches the design maximum, a float ball valve shuts off the vent, causing a pressure rise in the filler neck and triggering the nozzle auto-shut off. The float valve will function in a similar manner to reduce fuel spillage in the event of a vehicle roll-over.

In order to ensure tank breathing when the car is parked on a side slope with a near-full tank, at which time the FLVV may be closed, a gradient vent valve is fitted at each end of the tank and connected to the same tank outlet spigot. These valves allow a slower rate of vapour escape and also include a low pressure holding valve and roll-over shut-off functionality.

Note that with the exception of the fuel pump/sender unit, none of these 'in-tank' components are serviceable other than by fuel tank replacement.

Fuel tank removal
This operation is most easily and safely performed when the fuel level is lowest. If this is not possible, it is recommended to pump out the fuel into a suitable container in order to minimise the tank weight.

Preparation:
- For safety precautions when working with fuel or fuel system components: refer to sub-section LN.1a.

1.Perform steps 1 - 4 of the fuel system de-pressurise procedure as shown in sub-section LN.4.

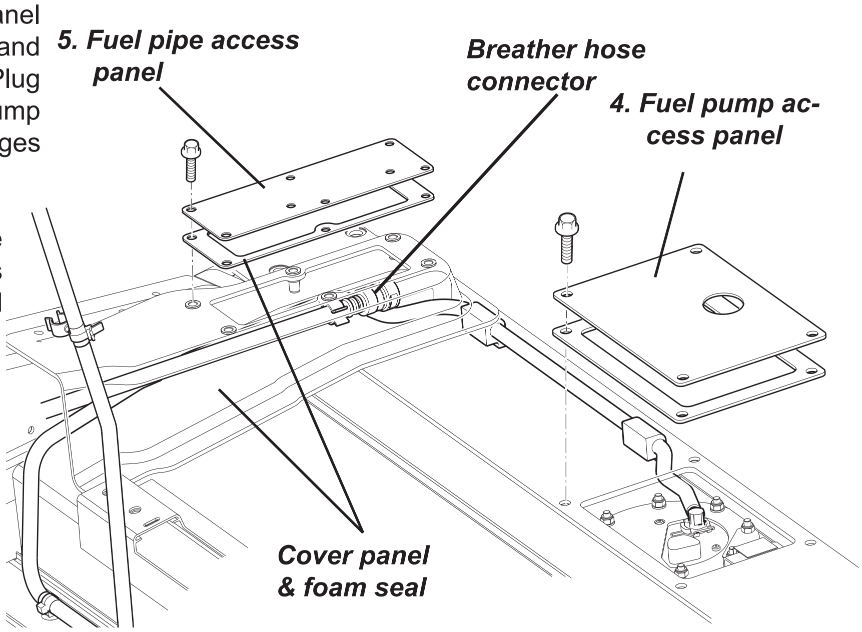
2.Remove the rear seat on 2+2 models or the luggage net brace and load shelf carpet on 2+0 models to gain access to the fuel tank access panel; refer to service notes section VE.13 for further information.

3.Remove both LH and RH rear quarter trim panels; refer to service notes section VE.12 for further information.

4.Remove the fuel pump access panel and disconnect the fuel feed pipe and harness connector from the tank. Plug the fuel tank port; refer to the fuel pump removal instructions on previous pages for further information.

Note: A foam seal with adhesive backing is fitted between the access panel cover, ensure it is in good condition or renew if required.

5.Release the M5 x 16 (6) flanged screws (torque 5Nm) securing the fuel pipe access panel at the left hand side of the body floor compartment, and disconnect the beather pipe from the tank. Plug the tank port.



6.*IPS models:* Remove the right hand rear wheelarch liner.

Manual models: Remove both rear wheelarch liners; refer to service notes section BV.17 for further information.

7.The hose clip from the filler hose to the filler neck should now be accessible with the RHR wheelarch liner removed. release the clip and seal the hose.

8.From the right hand rear wheelarch area, release the M8 x 20 screw and nut (torque 24Nm) securing the earth cable at the fuel filler neck support clamp at its attachment point to the neck/subframe bracket.

9.From within the left hand rear wheelarch and the engine bay area, remove the airbox casing to gain access to the gearchange cables where they attach to the transmission assembly shift lever and abutment bracket; refer to service notes section EJ.4 for further information (manual transmission only).

10.Release the ‘R’ clips securing the gearshift cable connectors to the shift levers as well as the lock nuts and isolator washers fixing the cables to the abutment bracket. Withdraw the cables so that they are free from the transmission assembly so that they do not foul against the fuel tank as it is being lowered from the chassis.

11.Remove the rear undertray assembly; refer to service notes section AN for further information.

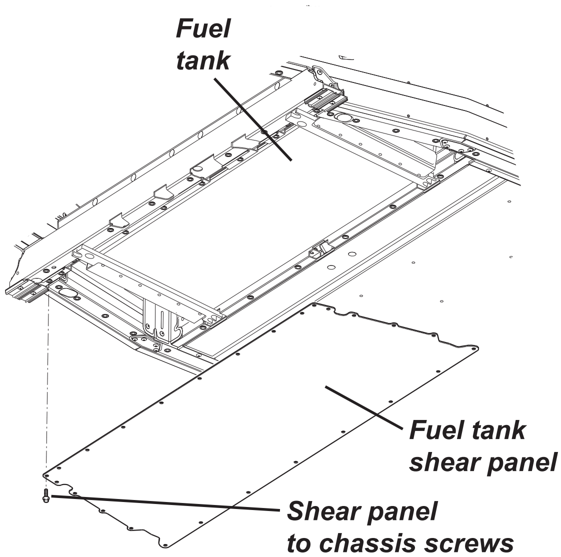
12.Release the parking brake primary cable from the secondary cables, and free from any chassis fixings; refer to Service Notes section JL.5 for further information.

13.From the right hand rear chassis leg, release the nut (torque 16Nm) securing the 4 earth lead eyelets from the main harness to the chassis stud and move the harness to one side.

14.Release the gearchange cables from the chassis fixings to provide sufficient slack to allow tank withdrawal.

15.Release the M8 x 20 (26) flanged screws (torque 24Nm) securing the shear panel to the tank bay and remove.

16.*Cradles:* Provide alternative support for the tank before releasing the four screws from each of the two tank mounting brackets. Lower the tank from the chassis.



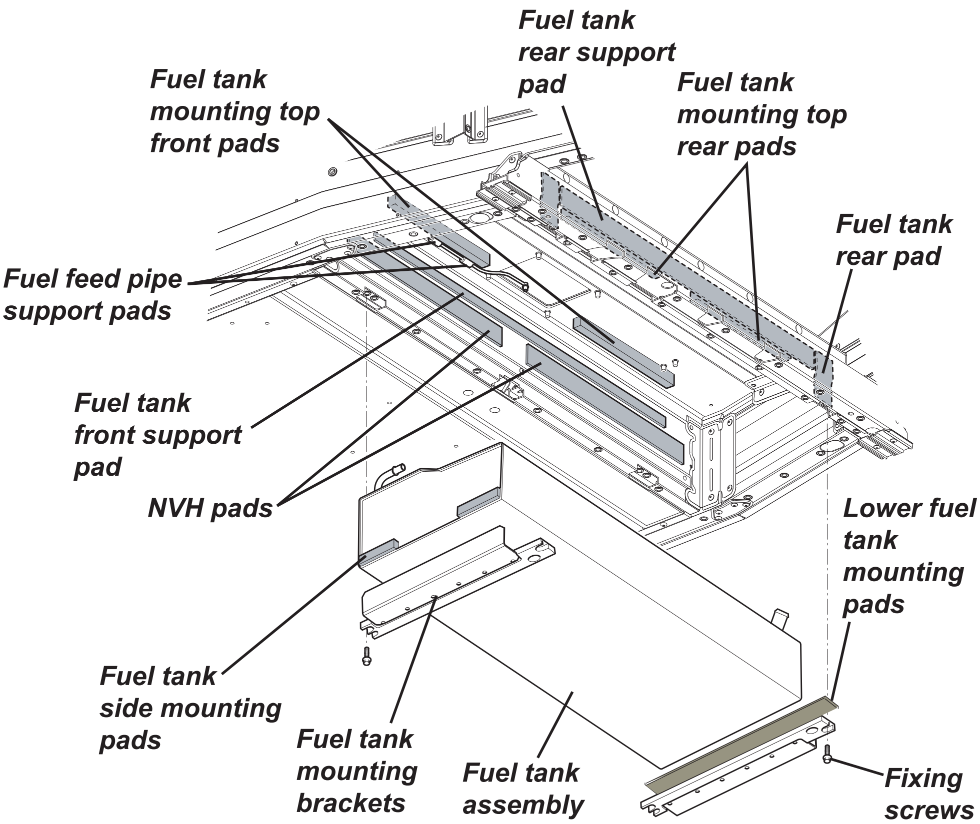
Refitment:
Is the reverse of removal except:

- Before refitting the tank, ensure that all the foam pads are in good condition and firmly adhered in their correct positions to the tank bay panels and fuel tank (as shown in the illustration) and renew if necessary. Check that all apertures are sealed and the fuel feed pipe is in position along the front of the tank bay.

Note: If any of the foam pads require renewal then the corresponding tank bay panel contact surface should be cleaned with an activator and cleaning agent such as Betawipe VP 04604 to promote adhesion of the foams integral self adhesive tape* to the panel.

*All foams except the fuel tank front and rear support pads are supplied with a self adhesive backing, but in the event that these require renewal then an adhesive promoter such as 3M 4298UV should be applied to the full length of the foam and allowed to cure fully before applying double sided foam tape to the pads.

- Carefully raise the tank into position and ensure that it is firmly in contact with the front pad.
- Fit the retaining cradles using Permabond A130 on the bolt threads, and tighten to 24Nm.
- Continue fitment in reverse order to removal.



LN.7 - FUEL SUPPLY TESTING

To Test Fuel Pump
Fuel pressure is controlled by the fuel pump and pressure regulator valve. Base fuel pressure is 3.0 bar and pressure may be checked at the connection from the fuel pump but will require specialist tools. Please refer to separate CD disc T000T1516F or T000T1526F and from main menu select:

Engine> 2FR-FE Fuel > Fuel system > On vehicle inspection > (2009/01 -) Fuel Pressure Check

The procedure for testing fuel pump delivery quantity may also be checked, by measuring the fuel flow/output from a fuel injector, but as per the fuel pump testing methods it will require specialist tools. Please refer to separate CD disc T000T1516F or T000T1526F and from main menu select:

Engine> 2FR-FE Fuel > Fuel injector > inspection (2009/01 -) Fuel injector inspect

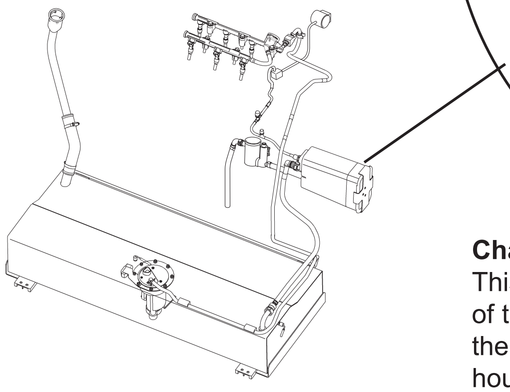
WARNING: Take all necessary precautions to guard against fire and explosion risk when dealing with fuel and fuel vapour.

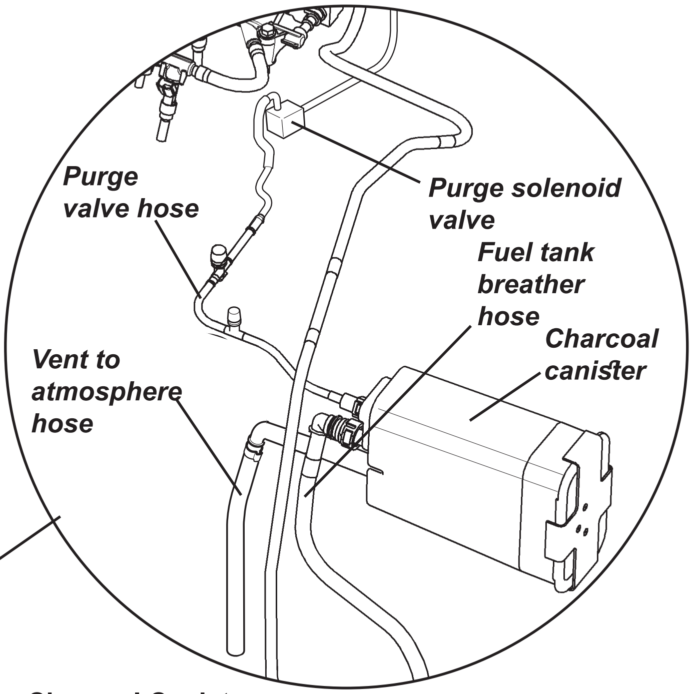
Preparation:
- For safety precautions when working with fuel or fuel system components: refer to sub-section LN.1a.

LN.8 - CHARCOAL CANISTER

In order to prevent fuel vapour venting from the fuel tank to atmosphere, the breather pipe from the tank is routed to a canister filled with activated-charcoal, which absorbs and stores the fuel vapour when the engine is stopped or in the event the engine is running but the purge valve is shut.

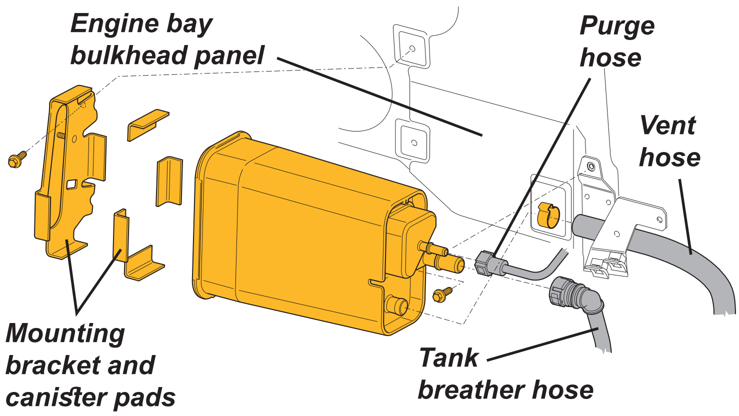
When the engine is running, the canister is connected to the depression in the intake plenum such that fresh air is drawn through the canister to purge the charcoal of its absorbed fuel, with the resultant gas then consumed by the engine in the normal combustion process.





Charcoal Canister
This is mounted on the bulkhead at the left hand front of the engine bay, oriented horizontally with its base to the left, located in a socket bracket, and its top, which houses the three pipework connections, to the right and secured to another bracket by a single M6 screw. Access to the unit is available after removal of the airbox assembly and intake trunking, refer to service notes section EJ.4 for further information.

The right hand end of the bed is ventilated via the lowermost port marked 'AIR', to which is attached a length of rubber hose routed down the front of the engine bay. The breather pipe from the fuel tank uses a press button quickfit connector to join to the mid-positioned spigot on the canister marked 'TANK', within which the port is extended to the far end of the charcoal bed. In this way, vapour from the fuel tank is cleansed of fuel by the charcoal bed before being vented.



A second quickfit type connector is used on the purge pipe spigot positioned uppermost and marked 'PURGE', and which also communicates with the left hand end of the bed. The external pipe from this port incorporates a service test connector before joining the purge solenoid valve mounted on the rear end of the LH camshaft cover.

The outlet pipe from this valve connects to the engine intake plenum just downstream of the throttle valve. The solenoid valve is opened during certain engine running conditions in order to allow intake depression to draw fresh air through the vent pipe and charcoal bed, cleansing the charcoal of fuel before consuming the resultant vapour in the normal combustion process. In this way, the charcoal is prepared for further vapour absorption when the engine is stopped.

Control System
The canister purge valve is controlled by the engine management ECU, which keeps the valve closed (unenergised). At normal running temperatures and engine speeds above idle, the ECU monitors other parameters and sensor data and when appropriate conditions pertain, the ECU will apply a duty cycle to the valve in order to regulate the amount of purging allowed, so as not to corrupt the smooth running of the engine.

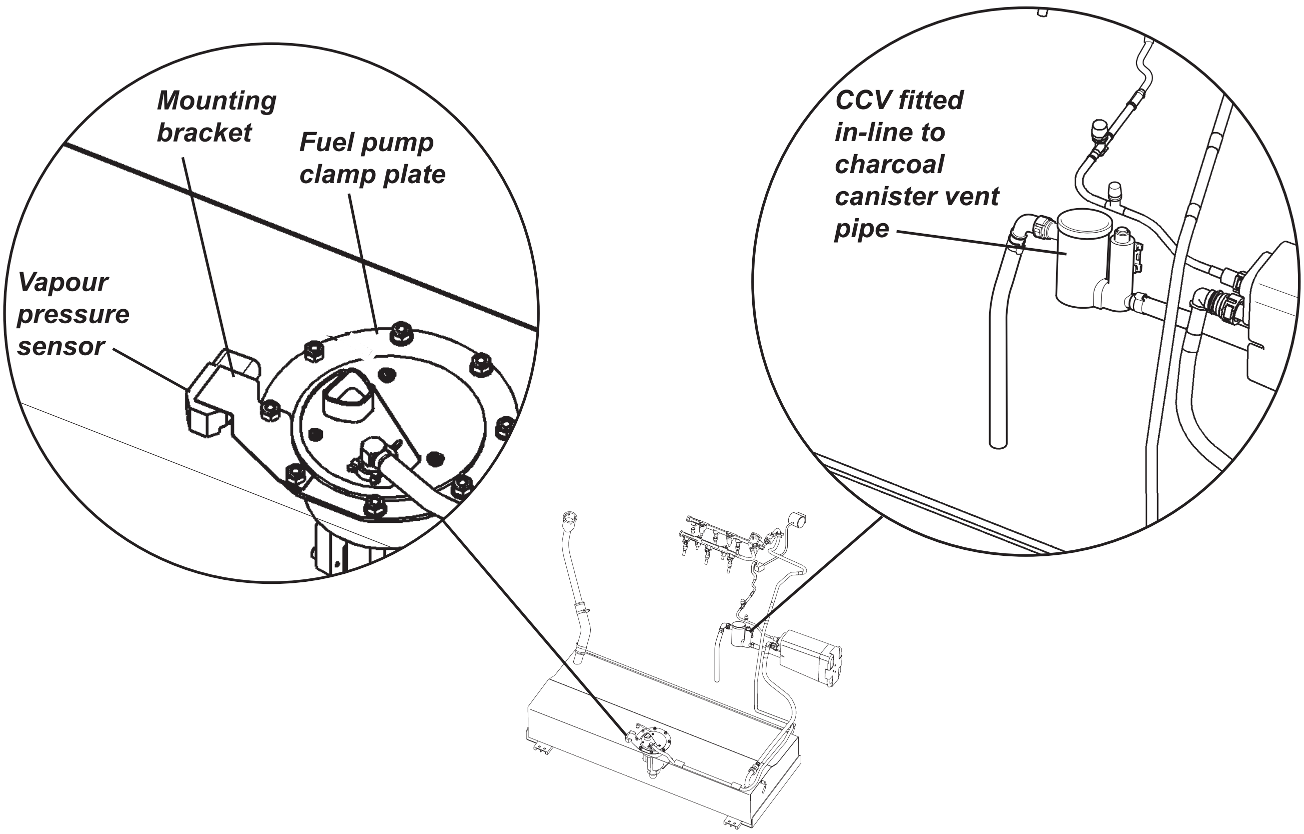
Canister Closed Valve and Vapour Pressure Sensor
In order to meet the Federal market emission and on-board diagnostics testing standards a Canister Closed Valve (CCV) is fitted in line within the fresh air vent/purge air intake hose fitted to the exit port of the charcoal canister. This is used in conjunction with the fuel tank vapour pressure sensor fitted to a port on the top of the fuel tank and held in position by a stepped bracket mounted to two of the fuel pump clamp plate fixings. (Note: The sensor is fitted on every fuel tank regardless of the market but only connected to the main harness for Federal vehicles requiring this functionality).

Fitment of the CCV and fuel tank vapour pressure sensor allows the On Board Diagnostics (OBD) system to perform an evaporative system leak check encompassing the fuel tank, breather hoses, charcoal canister and fuel filler neck/cap.

Note: The ODB system will only perform a system leak check when certain ambient air, engine coolant temperature and other criteria are meet, refer to service notes section EMR for further details.

During an Evaporative Emission System Leak Detection check, the vacuum in the system is monitored by ECU using the fuel tank vapour pressure sensor. At the appropriate time, the ECU starts the test by closing the canister closure value and opening the purge solenoid with the appropriate duty cycle. This allows the engine to draw a vacuum on the entire evaporative emission system. After a calibrated vacuum level is achieved the purge solenoid is closed, sealing the system. A leak is detected by monitoring any decrease in vacuum level over a calibrated period of time.

Any leaks detected or failures relating to one of the components controlling the test will result in the generation of an applicable DTC (Diagnostic Trouble Code) and illumination of the engine MIL (Malfunction Indicator Lamp), refer to service notes section EMR for further details.



ELECTRICS

SECTION MR

MR.1 - PFK 457 VEHICLE SECURITY ALARM

Keys
A mechanical key is used to operate the combined ignition switch/steering column lock, and the emergency manual door locking function via the left hand door. The keyhead incorporates three push buttons by which to operate the electronic immobiliser, alarm system and central door locking.

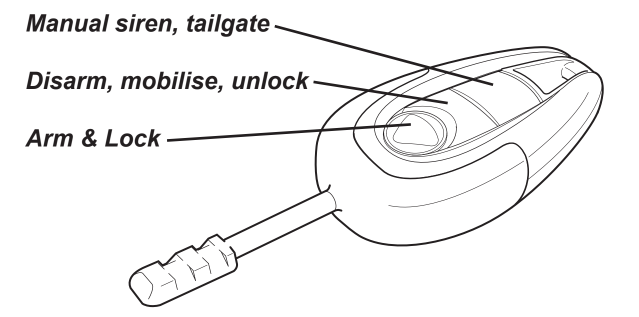
A duplicate key is supplied with the new car and, on receipt, should be separated and kept in a safe place for use in an emergency. The mechanical key code and security system PIN (sPecific Identification Number) are also supplied with the keys, and should be removed from the key ring by the owner, and noted safely with the vehicle documents. These numbers should also be recorded by the selling dealer and kept securely with the vehicle file in the interests of customer service. The codes will be required when ordering or programming replacement or additional keys, and the PIN will allow the security system to be overridden in case of transmitter loss or failure (see later).

Vehicle Security Alarm
The Lotus Evora is fitted as standard with a PFK 457 immobiliser/alarm which includes the following features:

- U.K. approval to Thatcham category 1.
- 'Dynamic coding' of the transmitter keys; Each time the transmitters are used, the encrypted rolling code is changed to guard against unauthorised code capture.
- Passive activation of immobiliser, central locking and alarm system.
- Ingress protection using sensing switches on the latches of both doors, and the tailgate.
- Selectable cockpit intrusion detection using a microwave sensor.
- Self powered siren to maintain protection if the vehicle battery is disconnected.
- Personal protection by 'on demand' activation of the siren.
- Emergency alarm override and transmitter key programming using an alarm sPecific Identification Number (PIN).
- Homesafe and selectable dynamic (drive away) locking.

Transmitter Keys
Two transmitter keys are provided with the car, and combine a mechanical key blade with a three button transmitter unit incorporated into the key head. The mechanical key operates the ignition switch/steering lock and emergency manual door locking.

The transmitter operates the central locking, alarm system and electronic immobiliser. The 4-digit code for the mechanical key, the unique serial number of the immobiliser/alarm, and the system's 5-digit sPecifc Identification Number (PIN), are supplied on plastic tags attached to the key ring of a new vehicle.



TRANSMITTER KEY

Disarming the Alarm/Unlocking
When approaching the car, it is likely that the vehicle is locked and the alarm armed, as indicated by the alarm red tell tale lamp in the speedometer face flashing once every 3 seconds. To disarm the alarm and unlock the doors:

- Press the central, unlock, button on the transmitter key. The first press will unlock the driver's door, and a second press, the passenger's door.
- This command will be acknowledged by a double flash of the hazard lamps.
- The alarm tell tale will be extinguished.
- The interior and mood lights will fade on, and remain lit for up to 2 minutes (if set to the 'courtesy' position).
- The engine will be mobilised (see below).

Auto Re-arm
If a door is not opened and closed within 2 minutes of a disarming command, the doors will passively re-lock and the alarm system re-arm.

Passive Immobilisation
In order to provide a measure of automatic vehicle security, independent of any driver initiative, the system will automatically immobilise the engine's cranking and fuel pump circuits after the ignition has been turned off for 40 seconds, or a similar period has elapsed since the last mobilising command. With the ignition off, the alarm tell tale will indicate that immobilisation is in effect by a brief flash every 1.5 seconds. With ignition on, immobilisation is indicated by a continuously lit tell tale.

To mobilise the car (i.e. allow engine starting) with ignition on or off, press once the transmitter centre button; the alarm tell tale will be extinguished.

Arming the Alarm/Locking the Doors
To lock the doors and arm the alarm, remove the ignition key, shut both doors, and check that the tailgate is properly closed.
- Press once the raised logo button on the transmitter key.
- This command will be acknowledged by a single flash of the hazard lamps.
- Both doors will be locked, and after a settling period of 40 seconds, the engine will be immobilised, and the alarm system armed.
- The alarm tell tale will flash once every 3 seconds.
- The interior and mood lamps (if lit) will fade off.

Note:
i) If the system is armed when a door is not fully shut, three ***triple*** beeps will sound as a warning and the doors will not be locked. Opening a door will ***not*** trigger the alarm.
ii) If the system is armed when the tailgate is not fully closed, three warning ***double*** beeps will be heard, and the doors will not be locked. Opening a door in this instance ***will*** trigger the alarm.

When fully armed, and after the settling period of 40 seconds has expired, the alarm will be triggered by any of the following actions:

- Interruption of the car battery power supply or siren cables.
- Energising the ignition circuit ('hot wiring').
- Opening a door;
- Opening the tailgate;
- Movement detected within the cabin (unless de-selected).

If the alarm is triggered, the hazard warning lamps will flash and the wailing siren will sound for a period of approximately 30 seconds before closing down and resetting, ready for any further triggering input. If a trigger is continuously present (e.g. door left open), the alarm will repeat for a maximum of eight 30 second cycles before excluding the triggering sensor for the remainder of the armed period.

To silence the siren, press once the central, disarm button on the transmitter key. If necessary, press a second time to disarm the alarm. Note that if the vehicle battery has been disabled, it will not be possible to interrupt the siren until completion of the sequence.

Alarm Tell Tale Summary

Brief flash every 3 secs;	Immobilised, alarm armed.
Brief flash every 1.5 secs;	Immobilised, alarm disarmed, ignition off.
Tell tale on;	Immobilised, alarm disarmed, ignition on.
Tell tale off;	Mobilised, alarm disarmed, ready to start.

Turning Off the Interior Movement Sensor
A microwave sensor mounted behind the centre console, will detect substantial physical movement within the cockpit, and trigger the alarm.

If an animal is to be left in the vehicle, or if for any other reason it is desired to exclude the interior movement sensor, press once the transmitter logo button in the normal way to set the alarm, and then press a second time (within 2 seconds) to exclude the interior movement sensor. A single beep will be heard as confirmation. The sensor will automatically re-activate next time the alarm is armed.

Opening the Tailgate
To open the tailgate, press twice the end button on the transmitter key; the latch will release and allow the tailgate to be opened, assisted by pressurised struts. Boot lamps will switch on automatically whenever the tailgate is open.

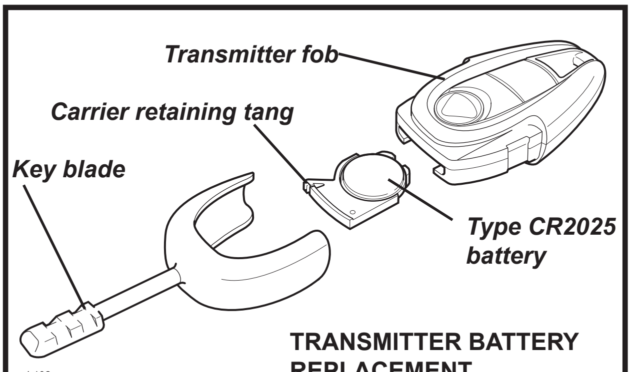
With the ignition switched on, warning of an open or not fully latched tailgate is provided on the right hand screen in the instrument panel via the vehicle silhouette graphic.

To close the tailgate, ensure that no persons or objects will be trapped before pulling down the panel and pressing firmly over the latch to assure its complete engagement. Guard against inadvertently locking the transmitter key in the boot.

Manual Activation of Siren
If, for personal security reasons, it is desired to manually activate the siren at any time when the ignition is off, hold pressed the end button on the transmitter key for 3 seconds. The wailing siren will sound, and the hazard lamps flash for a period of 30 seconds. To stop the siren, press once any of the transmitter buttons. Manual siren activation will not affect the alarm system status.

Transmitter Key Battery Replacement
The transmitter fobs will normally operate within a range of 5 metres from the car, but this may be reduced by the presence of other radio signals in the vicinity.

The transmitters are powered by a long life 3V Lithium battery, type CR2025, readily available from electrical outlets, which with normal use should last for 3 years. To ensure continuity of operation, it is recommended to renew the batteries every 12 months:
- Using a small screwdriver, prise the transmitter fob from the key blade carrier utilising the slot provided on the back of the case.
- At the end face of the fob, prise the retaining tang inwards whilst withdrawing the battery carriage from the fob.
- Remove the old battery and wait for 10 seconds before inserting a new battery, with +ve sign lowermost, and holding the battery only by its periphery.
- Slide the battery carriage back into the fob, pressing firmly to engage the clip, and then clip back onto the key blade.
- The transmitter should now operate normally.



TRANSMITTER BATTERY REPLACEMENT

Emergency Disarming/Mobilising
If the key transmitter is damaged or fails to function, and a spare key is not available, the alarm system's unique sPecific Identification Number (PIN) may be used to disarm the alarm **provided that** access is available to the cabin:
- Turn on the ignition. The alarm tell tale will light.
- If the alarm is armed, accessing the cabin, or turning on the ignition will trigger the alarm until completion of this emergency process.
- Within 10 seconds, turn the ignition off; the tell tale will begin to flash.
- After a number of flashes corresponding to the first digit of the PIN, turn on the ignition. Note that the first

flash may not be of full duration (but is still to be counted) dependent on the waveform position at time of ignition switch off. Note that 10 flashes correspond to a zero digit.

- Turn off the ignition and after a number of flashes corresponding to the second digit of the PIN, turn on the ignition. Repeat this process until all 5 digits have been completed. If, at any stage of the process, a number is entered incorrectly, the system will immediately revert to the start, so that the whole PIN must be re-entered.
- If the PIN is entered correctly, the alarm will now be overridden and the engine mobilised. However, automatic immobilisation will still occur after an ignition off time of 40 seconds, requiring a repeat of the above procedure to mobilise. Note that automatic re-arming of the alarm and automatic door locking cannot occur until a working transmitter is used to operate the alarm.

Programming Additional Transmitters
Two transmitter fobs are provided with the new car. If one transmitter is lost or damaged, a replacement should be obtained immediately, and programmed to the car alarm controller using the alarm system's unique sPecific Identification Number (PIN). A maximum of 6 transmitters may be programmed to the car, any thereafter overwriting the first to have been programmed.
- With the engine immobilised (tell tale flashes briefly once per second), turn on the ignition.
- Enter the PIN as detailed in the emergency disarming process above, followed by the additional two digits 1, 1.
- The tell tale will flash rapidly for one second, then turn off.
- Within 8 seconds, press any button on the transmitter to be programmed. The tell tale will then pulse rapidly and the siren will beep.
- Within 10 seconds press any button on the next transmitter to be programmed (if applicable), and repeat this process for all remaining transmitters.
- When all transmitters have been programmed, wait for 10 seconds, or turn off the ignition.

To disable a lost or stolen transmitter from the system, use the above procedure to programme 6 transmitters, if necessary repeatedly reprogramming the same transmitter if less than 6 programmed transmitters are to be used.

Disconnecting the Car Battery
In order to prevent the alarm being triggered, before disconnecting the vehicle battery, ensure that the alarm is disarmed.

Trigger Report Back and Feature Selection
A facility is provided to identify the source of an alarm triggering event (trigger report back), as well as allowing certain features of the system to be selected or de-selected. The same procedure described above to input a PIN is used, but in this case to input the programming code '123'; the tell tale will then flash rapidly for 1 second, then remain lit. Commencing within 10 seconds, continue this procedure to input the two digits of the feature code, after which the tell tale will flash rapidly for 1 second then beep once or twice to indicate the new status of that feature; one for 'ON', twice for 'OFF'. Selection will alternate each time that feature code is entered. Note that within 10 seconds, a second feature code (or repeat) may be selected from this point by entering only the 2-digit code. To exit programme mode, simply wait for 10 seconds.

Feature	*Code*	*Default*	*1 Beep*	*2 Beeps*
Revert to defaults	123 00			
Trigger report back	123 11	see below		
Unlock with ignition	123 33	OFF	ON	OFF
Lock with ignition	123 34	OFF	ON	OFF
Selective door unlock	123 41	ON	ON	OFF
Audible tones*	123 61	OFF	ON	OFF
Lock with auto re-arm	123 87	ON	ON	OFF
Door open audible warning	123 88	ON	ON	OFF

* When selected, a single beep will sound when the alarm is armed, and a double beep when disarmed. To silence for a single activation, press briefly the transmitter auxiliary (3rd) button prior to pressing the arm or disarm button.

Trigger report back: After the code 12311 has been entered, the tell tale flashes out a code(s) to indicate the source of the alarm trigger:

No. of flashes	*Triggering sensor*
1	Microwave movement sensor
2	Door, bonnet or boot lid
3	Ignition energisation
4	Manual siren activation

Quick Test

To facilitate testing of the alarm system, the unit can be placed into a 'Quick Test' mode by arming the alarm with one transmitter key, and disarming with another. In this mode, the system will shorten the siren time to 2 seconds, the immobiliser arm time to 5 seconds, and the settling time to zero. To exit this mode, simply wait for 2 minutes without any further inputs.

Note that in Quick Test mode, any movement detected by the microwave sensor will trigger only the tell tale and not the siren. The 2 minute timer will not be extended.

Location of Alarm Components

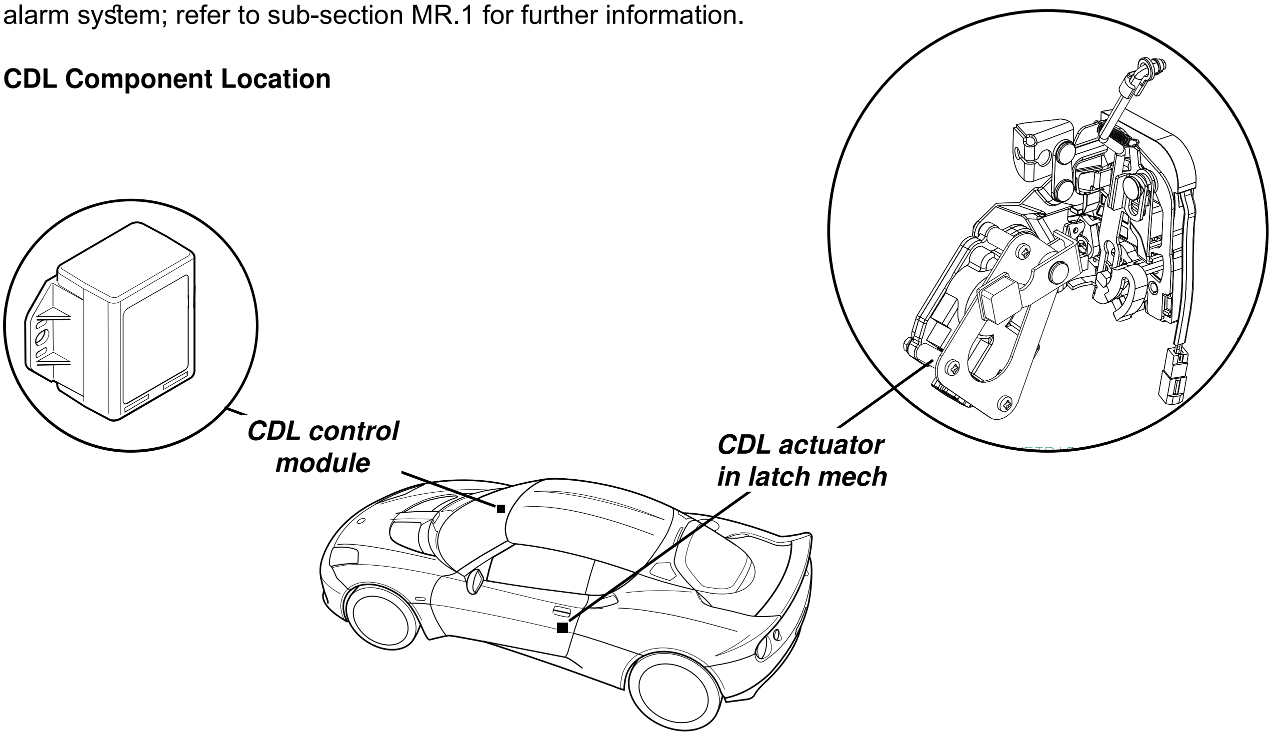
The alarm system components are located as follows:

- Electronic Controller/Immobiliser: Mounted on the top face of the scuttle beam at passenger's extreme end. Accessible after removal of the fascia dash panel.
- Siren Unit: Mounted on the underside of the front subframe LH longeron, ahead of the lower wishbone forward pivot. Accessible after removal of the front undertray.
- Microwave sensor: Mounted behind the centre console.
- Door Sensor: Switch incorporated into each door latch mechanism.
- Tailgate Sensor: Incorporated into the latch mechanism.

MR.2 - CENTRAL DOOR LOCKING

The central door locking (CDL) operates on the driver's and passenger's doors in conjunction with the security alarm system; refer to sub-section MR.1 for further information.

CDL Component Location



A CDL actuator is mounted on a plate integral with the latch mechanism with which it interacts via a rotary link; refer to service notes section BV.12 or BV,12a for further information.

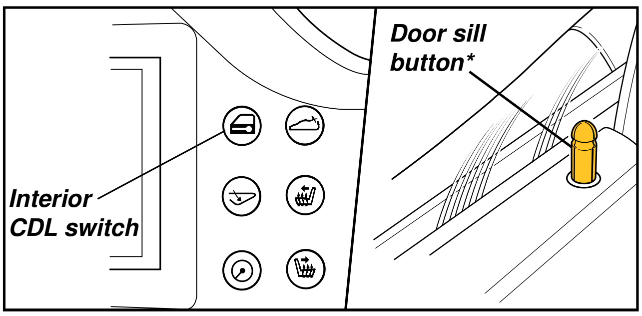
A CDL control module is mounted on the passenger end of the scuttle beam, at the top of the cabin side vertical face, and is accessible after removal of the fascia lower panel.

To open the doors from outside:
To unlock the doors from outside, press the central, unlock button on the transmitter key. The first press will unlock just the driver's door. Press a second time to unlock the passenger's door.

When the door is opened, a fully closed window will drop slightly, preparatory to easing its subsequent closing, and the interior and footwell will be illuminated. If the driver's door is opened whilst the ignition is off but the key is in position, or if the exterior lights are switched on, an audible warning will sound.

On shutting the door, the window will close automatically unless already open by request, and the footwell illumination will be extinguished. The interior lamp will remain lit for 2 minutes, or until the ignition is switched on.

Interior Door Lock Switch
If it is desired to lock the doors from inside the car, for example to deter highjack attempts, press the door lock switch in the cluster inboard of the steering column, with ignition on or off. Both doors will be locked and the switch will light up as a reminder.



Alternatively, each door can be locked individually by depressing the button at the rear end of each door sill, but* (if fitted, also refer to service notes section BV.12 for further information) this action will not activate the lock switch illumination.

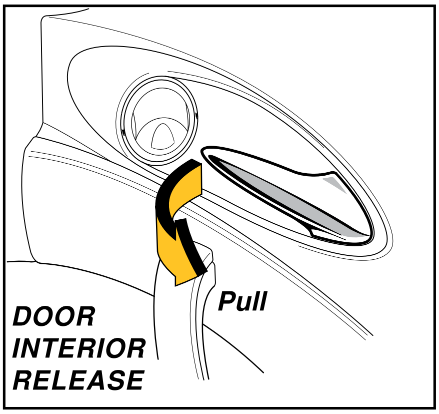
Dynamic (drive away) Locking
This selectable feature will automatically lock the doors when road speed first exceeds 10 mph (15 km/h). The doors will remain locked until either the interior door lock switch is pressed, or each door is unlocked manually by lifting the door sill button.

To select Dynamic Locking, turn on the ignition and hold the interior door locking switch pressed for at least 5 seconds, until a single beep is heard as confirmation. The feature will remain selected throughout further ignition cycles until the switch is again pressed for 5 seconds and a double beep is heard, confirming de-selection.

Note that the lighting up of the interior door locking switch provides a visual indication of the door lock status (locked when lit).

WARNING: Whether locked using the locking switch, sill buttons or 'drive away locking' feature, the interior release handles will be disabled. Before opening, the door must first be unlocked by pressing the interior lock switch, or lifting the door sill button.

To open the doors from inside:
(Please also see Service Notes section BV12a for Inteva door latches)
To open the door from inside, first unlock if necessary by pressing the interior lock switch, or lifting the door sill button, and then pulling the door release handle located towards the front of the door.



On opening the door, a fully closed window will drop slightly to aid subsequent door closing, and the interior and footwell lamps will light. If the driver's door is opened when the ignition is off but the key is in position, or if the exterior lamps are on, an audible warning will sound.

After shutting the door, the window will close automatically (unless already open by request), and the interior lamps will be extinguished after a 2 minute delay.

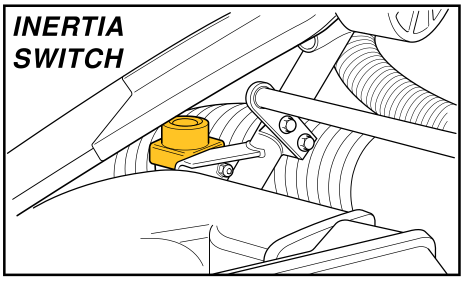
To lock both doors, press once the raised logo button on the transmitter key; refer to sub-section MV.1 for further information.

Locking The Doors Mechanically
(Please also see Service Notes section BV12a for Inteva door latches)
In the event of a discharged vehicle battery, or an inoperative transmitter key, the right hand door may be locked by pressing down the door sill button, and holding the exterior handle raised as the door is closed.

The left hand door may be locked in a similar manner, or alternatively, may by locked by using the key in the exterior lock barrel; insert the key, turn fully clockwise, return to the vertical and withdraw. To unlock, insert the key in the lock, turn fully counterclockwise, return to the vertical and withdraw.

Note:
- Locking the doors mechanically will not arm the alarm system.
- When locking both doors by pressing down the sill buttons, be aware of the potential for inadvertently locking the keys in the vehicle.

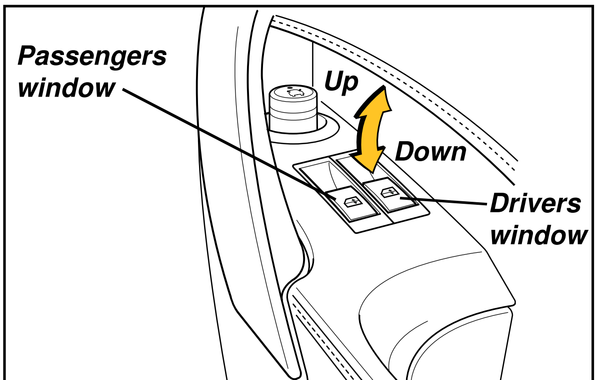
Inertia Switch
The safety inertia switch is designed to operate on impact, typified by vehicle collision, to switch off the fuel pump, and thus minimise any fire hazard. The central door locking will also be triggered to unlock the doors.



The inertia switch is mounted on the backstay at the left hand side of the engine bay, ahead of the airbox, and is reset by pressing the rubber diaphragm button on the top of the unit.

MR.3 - ELECTRIC WINDOWS

The switches for the electric window operation are mounted in the door trim panel armrests, a single switch for the passenger and one for each door for the driver. The switches are operative with the ignition key at position I or II, at which time the icon in the switch will be illuminated.



DOOR WINDOW SWITCHES (RHD SHOWN)

To lower a window, press down the appropriate switch; if held for more than a second, the window will automatically lower fully. Lift the switch to raise the window (no one-touch raising).

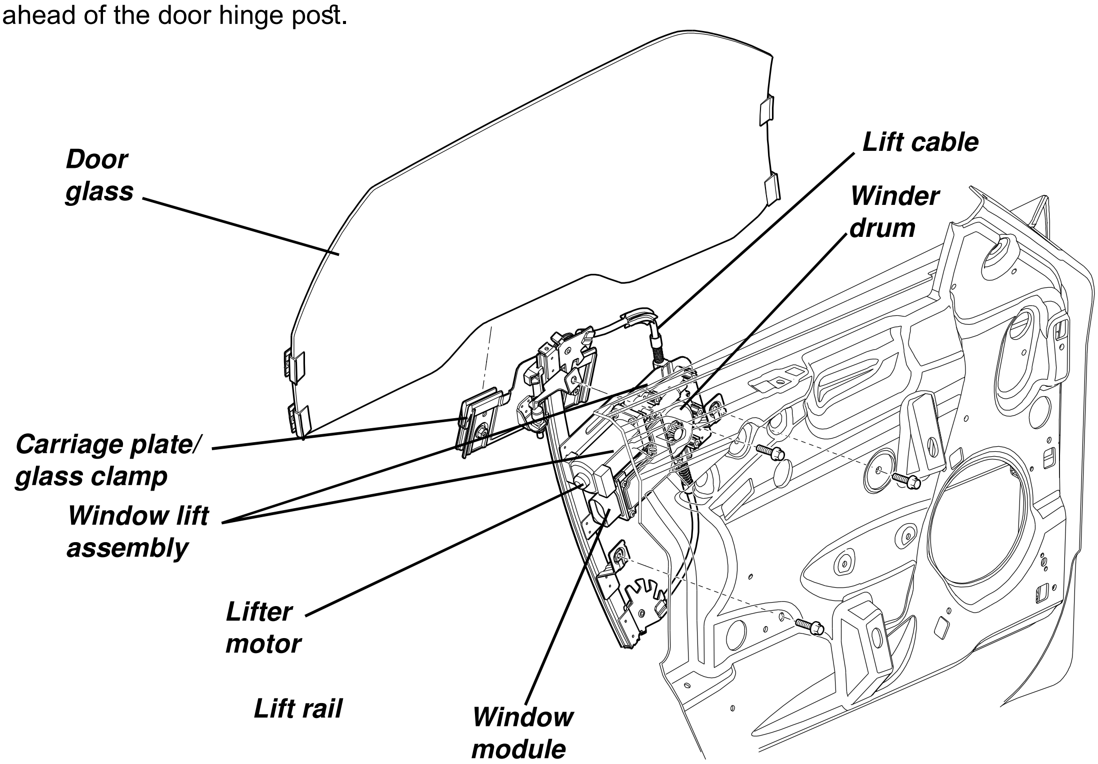
To ease door closure, and optimise the sealing of the frameless door glass against the weatherstrips, a fully raised window will automatically drop a small distance when the door is opened (preparatory to closing), and rise again after the door is shut.

Note: If the battery supply is interrupted, the one touch down and auto drop features will not function. There will be an increased risk of damage to the door window seals until:

- Each window is fully raised and the switch held for 2 seconds (a click will be heard).
- Each window is fully lowered and the switch held for 2 seconds (a click will be heard).

The electric window lift assembly incorperates an integral electric motor, control module and winder drum driving a steel cable around top and bottom guide pulleys to a lift block. A micro-switch mounted on the lift mechanism closes when the glass is fully raised, and triggers the window module to activate the automatic drop function when the door is opened, the window module also controls the one touch down function. Refer to service notes section BV.11 for information on window lifter removal or glass adjustment if required.

The window glass is fixed to the lift block which is guided by a vertical rail. Fuses C9 and C10 protect the window lift motors, and C33 the control switches. The door harnesses are routed to the scuttle area via a grommet in the 'A' post area ahead of the door hinge post.

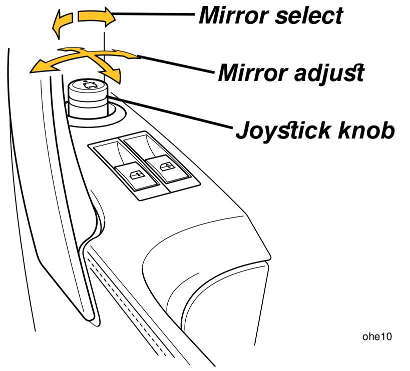


MR.4 - DOOR MIRRORS

Rear view mirrors are fitted on both driver's and passenger's doors, and include the following features:
- Electric adjustment of mirror glass;
- Mirror glass heaters;
- Optional electric fold flat facility;

Mirror adjustment: The mirror control switch is located in the driver's door armrest, ahead of the door window switches, and comprises a combined rotary selector switch and joystick.

To adjust the mirror, turn the ignition key to position I or II, select the right or left hand mirror by turning the knob to the appropriate arrow, then use the knob as a joystick to move the mirror plane in any of four directions.



DOOR MIRROR CONTROL

Note that the mirror glasses are convex to provide a wider field of vision, but by so doing, make objects seem smaller and farther away than when viewed through a flat glass. Take care when judging distances and approach speeds until familiarity has been gained.

Fold flat (if fitted): If necessary, to reduce obstruction when parked, both mirrors may be folded flat against the doors; turn the ignition key to position I or II, select the central 'fold' rotary position on the joystick, and hold the joystick rearwards until both mirrors have stopped moving. To unfold, hold the joystick forwards until mirror movement stops. The field of vision setting will be retained.

Mirror heating: Heating elements in the mirror glasses are energised in conjunction with that of the heated rear screen. The switch is located in the heater control panel, and will light up amber when the heater circuits are operating, but due to the high current demand, this function requires the engine to be running. The circuits will turn off after the switch is pressed a second time, or the ignition is switched off, or automatically after a ten minute period has elapsed.

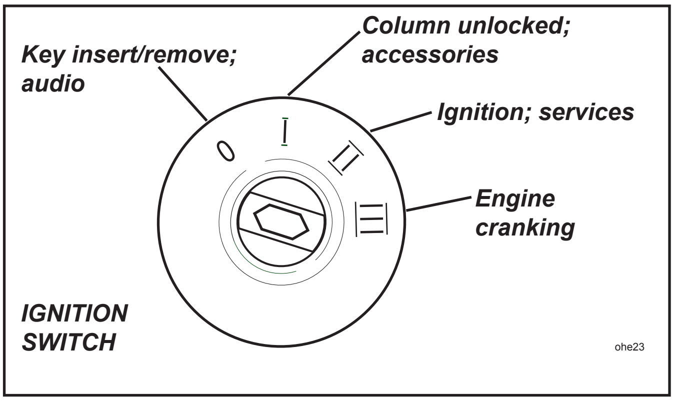
Component Location
A 'mini' relay for the heater circuit is mounted in the front fuse/relay station. Mirror control switch fuse is C33, HRS/mirror heater switch fuse C28, heater relay input fuse MC6, relay output to mirrors fuse C31.

MR.5 - SWITCHES & INSTRUMENTS - DRIVER'S INFORMATION

Ignition Switch/Steering Lock

The switch/lock is located on the right hand side of the steering column. With the key out of the switch, the steering column is locked, and the following electrical circuits will function:

- Locking and alarm system.
- Horns.
- Hazard warning lamps.
- Sidelamps and headlamps.
- Fuel filler flap release.
- Interior lamps.
- Automatic operation of cooling fans and re-circ. pump.
- Glovebox latch.
- Boot auxiliary power socket.



0 With the key inserted into the switch at position '0', the audio system and glovebox lamp are functional.

I To unlock the steering, turn the key clockwise to the 'I' position. If the key is reluctant to turn, wriggle the steering wheel to ease the load on the steering lock. At this 'accessories' position, the following electrical circuits will function in addition to those above:

Auto only: P - Park is automatically selected.

- Power windows.
- Windscreen wiper and washer.
- Interior fan.
- Door mirror adjustment and fold.
- Cabin auxiliary power socket.

II Turn further clockwise to the 'ignition' position to activate all remaining electrical systems (note that some circuits require the engine to be running).

III Turning further clockwise to '**III**' against spring pressure will operate the starter motor. As soon as the engine starts, allow the key to return to position '**II**'. For the correct starting procedure, see the later chapter 'Starting Procedure & Running In'. To stop the engine, turn the key back to 'I'.
Note that in order not to compromise engine starting, all electrical functions operative at position 'I', will drop out whilst the engine is being cranked.

0 To remove the key, turn fully counterclockwise to '0' and withdraw. The steering column lock will be acti vated when the key is withdrawn but may not engage until the steering is turned and the mechanism is aligned.

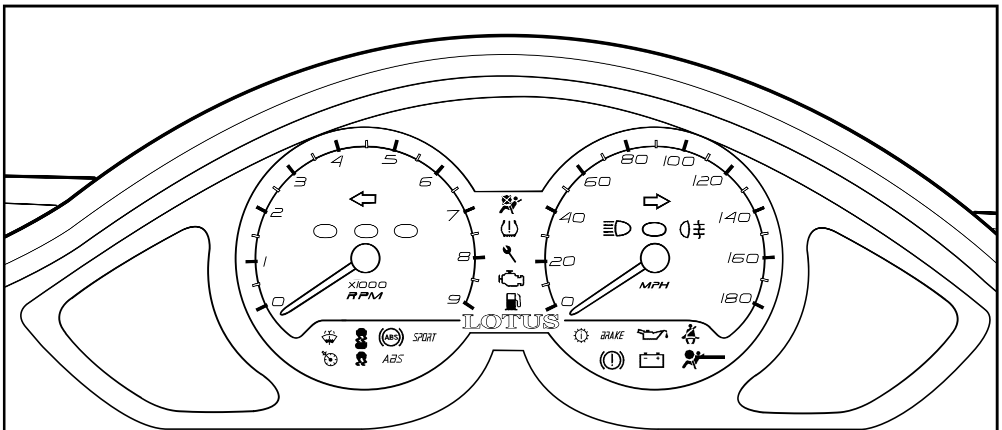
Auto only: the key cannot be removed from the ignition switch until P has been selected.

NOTICE: DO NOT leave the ignition switched on for long periods without the engine running. Although the engine ignition system itself draws no current when the engine is stopped, a battery drain will occur through other circuits even when auxiliary equipment is not being used.

WARNING:

- **Do not push or tow the car unless the key is first used to unlock the column and is then left in the lock. Withdrawing the key will cause the steering to lock.**
- **Never remove the key from the ignition switch or turn off the ignition while the car is moving. Withdrawing the key will cause the steering to lock and may cause an accident resulting in serious injury or death.**

INSTRUMENT PACK



INSTRUMENT PACK

The I.P. (Instrument Pack) is a sealed non-serviceable unit on which the following driver information is displayed:

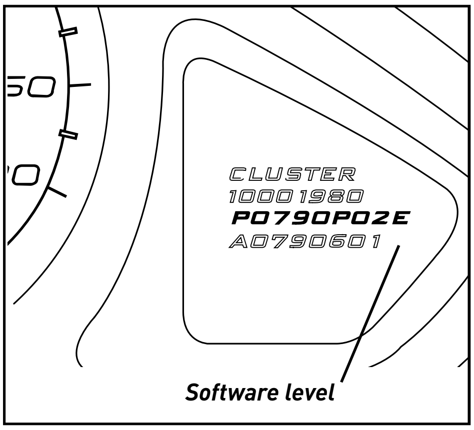
- Speedometer
- Odometer
- Trip recorder
- Tachometer
- Tell Tales
- Fuel level
- Fuel consumption
- Engine coolant temperature
- Ambient air temperature
- TPMS (Tyre Pressure Monitoring System) if fitted
- Clock
- Reversing sensor buzzer (if reverse proximity sensors fitted)

Because the unit of vehicle speed is printed onto its face, instrument packs are produced as either MPH or KPH variants, and installed with non-erasable base software to make them compatible with vehicle by VIN range and airbag system fitted.

Base Software

Although the base software cannot be altered, in the event of an issue with the instrument pack, the version of software fitted can be checked if requested by a Field Service Engineer, to do this:

- Sit in the vehicle, ensure that both doors are closed.
- Press and hold down the info button on the left hand column stalk.
- Insert the ignition key into the ignition switch and turn to position II, ignition services.
- The software level information will then be displayed in the right hand instrument panel screen.



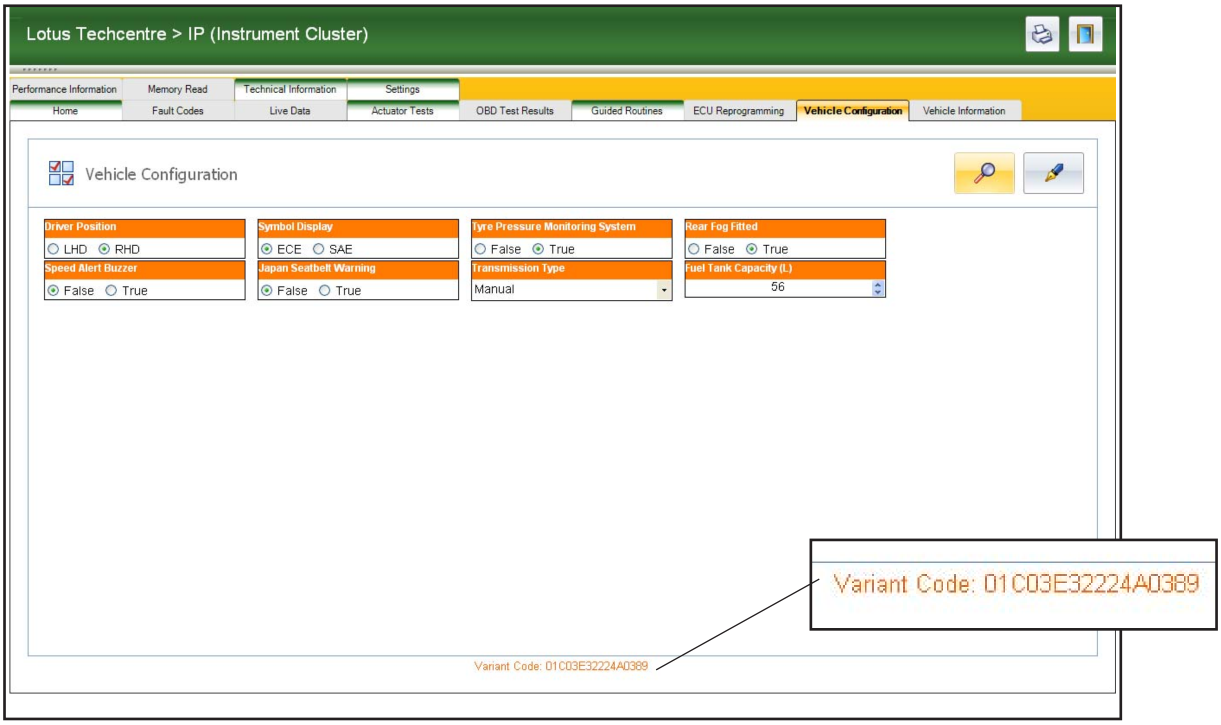
Vehicle Configuration

The instrument pack can provide the correct functionality and display options for any Evora production vehicle regardless of it's model type, tell tale display and options etc required.

The instrument packs functionality and displays are determined by the ‘configuration’ stored in the vehicles Electronic Control Module (ECM) also referred to as its variant code (see section MR.14 for further ECM information).

If the instrument packs display does not appear to be functioning correctly then check the configuration of both the instrument pack and ECM is correct using Lotus TechCentre before carrying out further diagnostic action.

Instrument cluster configuration screen as viewed using Lotus TechCentre



If it is necessary to renew an instrument pack then it is highly recommended that before removing the existing unit that you note down its variant code and current mileage, as this information will have be downloaded onto the replacement pack using the Lotus TechCentre vehicle configuration screens.

Note: Although it is possible to manually enter the variant coding from the option screens available there is a risk of making an error if this option is selected which may affect the display and or functionality of the instrument pack.

If the variant coding has not been recorded or if the instrument pack will not communicate with Lotus TechCentre then it is advised to contact Lotus Cars Technical Publication Department stating the full vehicle VIN requesting the variant code information.

Although vehicle mileage can be reset using Lotus TechCentre, to prevent potential abuse a limitation to this function has been imposed, once the mileage/kilometre display on the odometer exceeds 50miles or 75 kilometres the odometer reading can no longer be altered.

For further information see the ‘Lotus TechCentre User Guide’ which can be downloaded from the Lotus Dealer Portal at:

http://dealers>Aftersales>Miscellanous Technical Information>TechCentre Information.

Instrument Pack removal

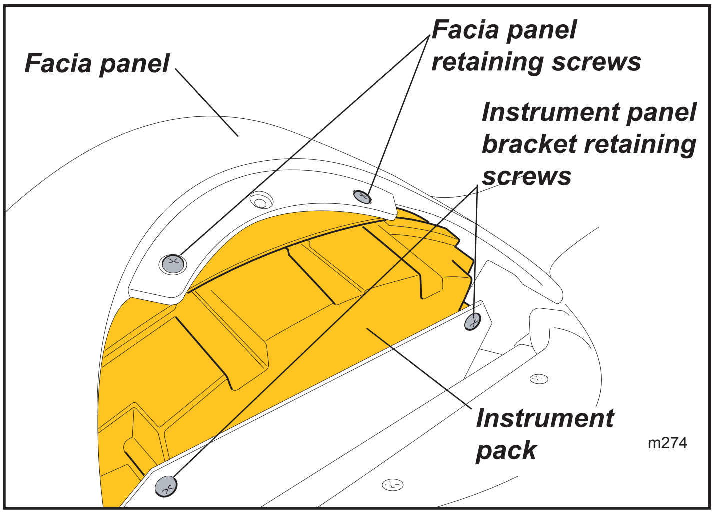
1. Retrieve current odometer and variant coding information as listed on page 10.

2. Using the steering column tilt lever, adjust the steering column down to its lowest setting.

3. Place suitable protection over the upper steering column shroud to prevent marking it withdrawing the instrument pack.

4. Remove the fascias access panel located directly above the instrument panel as well as the left hand/right switch panels (see V.E.7 for further information).

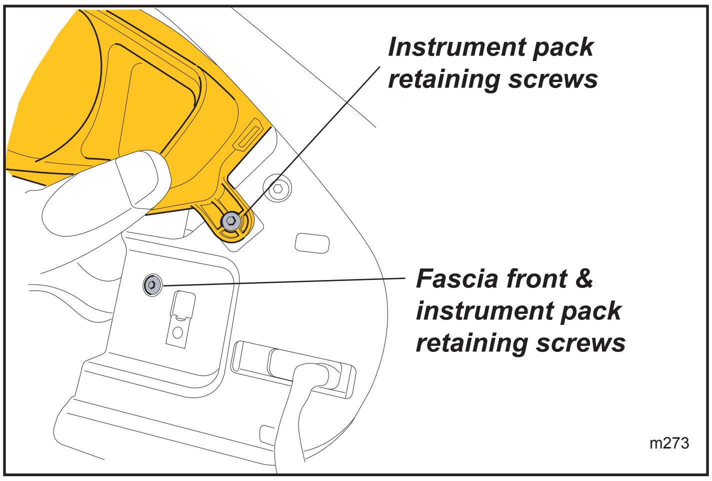
5. Release the 2 screws securing the instrument pack to the top of the fascia panel.



6. Release the 2 screws securing the instrument pack to the front of the fascia panel.

7. Release the 2 screws securing the fascia front and instrument pack bracket to the dashboard.

8. The instrument pack and retaining bracket should now feel 'loose' within the fascia panel.

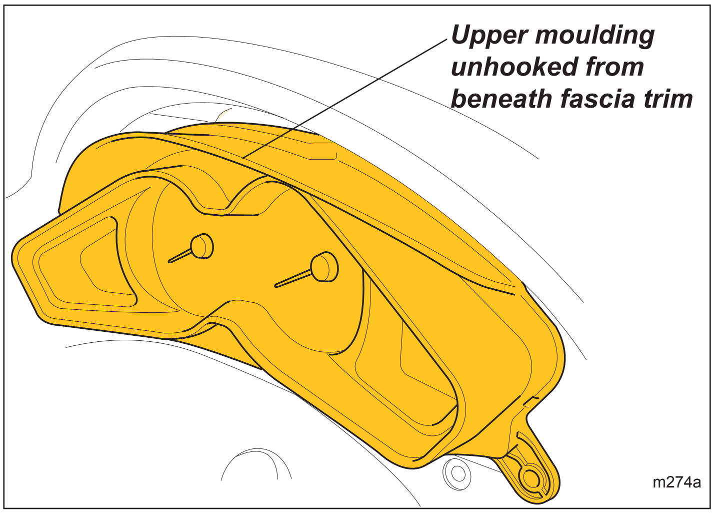


9. Unhook the instrument packs upper moulding from behind the facia trim and tilt slightly forward.

10. This will allow better access to the remaining two upper screws retaining the back of the instrument pack to the bracket.

11. Release these 2 screws, pull the instrument pack further forward and disconnect the 2 harness connectors from the back of the unit.

12. Withdraw the assembly from the fascia panel, taking care not to mark any of the trim surfaces.

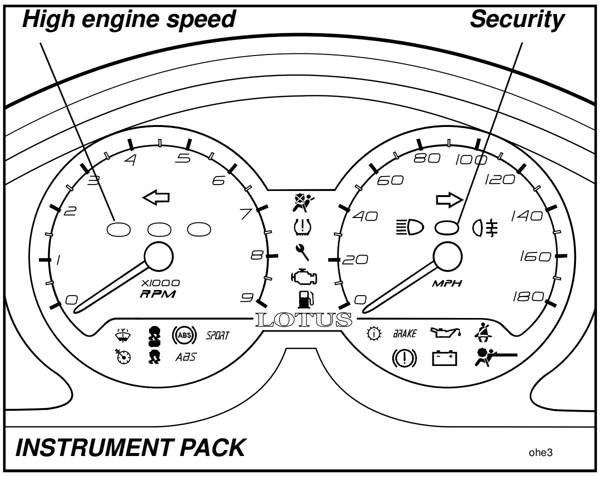


Refitting

Reverse procedure of removal except that if a new instrument pack is being fitted then the current vehicle mileage and variant code must be re-installed into the new pack using Lotus TechCentre.

TELL TALE LAMPS

Tell tale lamps are incorporated into the instrument panel to provide important information about various vehicle systems.



Bulb Check

In order to check that the warning systems are functional, all operative tell tale lamps will light for a few seconds each time the ignition is switched on - refer to the text below for details of this feature relating to particular lamps.

If the lamp does not light as specified, it is possible that the warning circuit or instrument assembly may be at fault; see your dealer without delay, and be aware that there may be no warning of a malfunction with that feature.

Turn Tell Tale ⇦⇨ (green)

A left turn tell tale is incorporated into the upper face of the tachometer, and a right turn tell tale in the speedo face. A bulb check will light the lamps for about 3 seconds following ignition switch on.

When the left hand or right hand turn indicators are operating, the appropriate green tell tale will flash in unison together with an audible tone. If the tell tale fails to light, or flashes at an unusual or irregular rate, check the operation of the turn indicator lamps immediately.

High RPM Tell Tales (red)

Three red tell tale rings are incorporated into the tachometer face to warn that maximum engine speed is being approached. No bulb test function applies.

Maximum engine speed is governed for both the continuous and transient (during acceleration) states, and are detailed in the later section 'Tachometer'.

As the rate of rpm increase is potentially greater in the lower gears, the tell tale trigger points are tailored to accommodate the reaction time available. As maximum rpm is approached, the tell tales will light in the following left to right sequence:
- one red light;
- two red lights;
- three rapidly flashing lights with an audible warning.

When exploiting maximum acceleration, gearchange upshifts should be made immediately the three flashing lights appear.

NOTICE:
- A graduated engine speed limit is imposed on a cold engine to reduce possible damage and wear from a delinquent driving style.
- Using maximum rpm and the above tell tale facility should be restricted to occasions when maximum acceleration is required. Overuse will compromise powertrain service life.
- The engine is not protected from overspeeding caused by erroneous or premature downchanging. Such misuse could result in catastrophic failure, not covered by the vehicle warranty.

High Beam Tell Tale (blue)

This lamp glows blue whenever the headlamp high beams are operating. A bulb check will light the lamp for about 3 seconds following ignition switch on.

Security Alarm Tell Tale (red)

For details of the vehicle security alarm and its tell tale, see sub-section MR.1

Rear Foglamp Tell Tale - where fitted (amber)
This lamp glows amber whenever the rear fog lamp is operating (see 'Rear Fog Lamp Switch'). A bulb check will light the lamp for about 3 seconds following ignition switch on.

Passenger Airbag Off Switch - not USA (amber)
This amber tell tale will light with ignition on, whenever the passenger airbag has been disabled by the key operated switch at the passenger end of the fascia. A bulb check will light the lamp for about 3 seconds following ignition switch on.

Tyre Pressure Monitoring System (TPMS) (amber)
If the car is so equipped, with ignition on, this amber tell tale, together with an audible alert, warns of low pressure in one or more tyres. Stop the car as soon as it is safe so to do, and take appropriate action. A bulb check will light the lamp for about 3 seconds following ignition switch on.

Electrical Fault Tell Tale (amber)
The Engine Control Module (ECM) on the Evora is also used to manage various related electrical systems, and is able to detect certain types of fault, which may or may not be apparent to the driver. If such a fault is detected, which has no detrimental effect on exhaust emissions (see MIL below), this amber tell tale will light for the first 30 seconds after turning on the ignition. Interrogate using the Lotus TechCentre. A bulb check will light the lamp for about 3 seconds following ignition switch on.

Engine Malfunction Indicator Lamp (amber)
The engine Malfunction Indicator Lamp (MIL) is provided to warn the driver that the engine management system has detected a fault which may result in increased noxious emissions from the exhaust. In order to minimise emissions and potential engine damage, various operational limitations may automatically be applied. A circuit check will light the lamp for about 3 seconds following ignition switch on.

i) If the MIL lights continuously whilst driving, immediately reduce speed and adopt a moderate driving style. Seek dealer advice without delay and avoid all unnecessary journeys.
ii) If the MIL flashes, an engine misfire has been detected which is likely to cause overheat damage to the catalytic converters. Slow down immediately and be prepared to stop.
   - If the MIL then stops flashing, and is lit continuously, proceed with caution and seek dealer advice.
   - If the MIL continues to flash, stop the car as soon as it is safe so to do, and switch off the engine. Seek dealer advice.

NOTICE: Continuing to drive the car with a flashing MIL may cause overheat damage to the catalytic converters, possible engine damage, increased emissions, and impaired fuel economy and driveability. In order to comply with emissions regulations, data regarding activation of the MIL is recorded in the engine electronic controller, and may be downloaded by Lotus dealers using the TechCentre.

Low Fuel Level Tell Tale (amber)
A circuit check will light the lamp for about 3 seconds following ignition switch on. Thereafter, this amber tell tale will light, with ignition on, when approximately 5 litres of fuel remain. Refuel at the next opportunity.

Low Washer Fluid Level Tell Tale (amber)
This amber tell tale is provided to warn of low fluid level in the reservoir serving the windscreen and headlamp powerwash jets. A bulb check will light the lamp for about 3 seconds following ignition switch on, but if the lamp then remains lit, or lights after washer use, refill the reservoir with a suitable fluid at the first opportunity.

Cruise Control Tell Tale (amber)
If the car is so equipped, this amber tell tale indicates when the cruise control is enabled. For full details of this system, see later. A bulb check will light the lamp for about 3 seconds following ignition switch on.

Traction Control Off Tell Tale (amber)
Base Evora from start of production (non USA)
This amber tell tale reminds the driver that the traction control has been manually switched off. Lotus Traction Control should aways be active when driving on public roads in normal conditions. To re-activate LTC, press momentarily the LTC off switch and check that the tell tale is extinguished. For LTC details, see later.
A bulb check will light the lamp for about 3 seconds following ignition switch on.

Lotus Dynamic Performance Management Off Tell Tale (amber)
Start of production for USA market (formerly referred to as ESP (Electronic Stability Program)
All non USA vehicles from '11MY VIN0. BH_11178
This amber tell tale reminds the driver that the Lotus Dynamic Performance Management (Lotus DPM) has been manually switched off. Lotus DPM should aways be active when driving on public roads in normal conditions. To re-activate Lotus DPM, press momentarily the Lotus DPM off switch and check that the tell tale is extinguished.
A bulb check will light the lamp for about 3 seconds following ignition switch on.

Traction Control Tell Tale (amber)
Base Evora from start of production (non USA)
This amber tell tale will flicker whenever the Traction Control system is triggered to indicate to the driver that the tractive limit is being broached. A bulb check will light the lamp for about 3 seconds following ignition switch on, but if the tell tale lights constantly, a fault has been detected, and traction control will not be enabled.

Lotus Dynamic Performance Management (amber)
Start of production for USA market (formerly referred to as ESP (Electronic Stability Program)
All non USA vehicles from '11MY VIN0. BH_11178
This amber tell tale will flicker whenever the Lotus Dynamic Performance Management (Lotus DPM) functions are triggered to indicate to the driver that the tractive limit is being breached. A bulb check will light the lamp for about 3 seconds following ignition switch on, but if the tell tale lights constantly, a fault has been detected, and these features will not be enabled. See your dealer without delay.

ABS Tell Tale (ABS) ABS (amber)
A bulb check will light the lamp for about 3 seconds following ignition switch on, but if the lamp then remains lit, or comes on whilst driving, a fault in the anti-lock brake system is indicated. The base brake system will continue to operate normally, but without the anti-lock feature. Heavy braking, or braking on slippery surfaces may cause one or more wheels to lock and result in reduced steering response and possible loss of control.
The car may continue to be driven with appropriate care and anticipation, but should be checked and repaired at the earliest opportunity.

Sport Tell Tale SPORT (amber)
This tell tale will light up amber to indicate that 'Sport' mode has been selected, delivering increased throttle response and a reduced level of traction control. This selection will default off when the ignition is next turned on. A bulb check will light the lamp for about 3 seconds following ignition switch on.

Brake Tell Tale (!) BRAKE (red)
A circuit check will light this lamp for about 3 seconds following ignition switch on. The tell tale will then remain lit if the parking brake is applied. Check that the tell tale is extinguished when the parking brake is released, as driving the car with the brake not fully disengaged will cause overheat damage to the rear brakes.

With the parking brake released, if the tell tale should light at any time after the 3 second check period, stop the car immediately, as the circuit has detected a dangerously low level of brake fluid in the master cylinder reservoir, possibly caused by a hydraulic leak in one of the separate front or rear brake circuits. In the event of a leak there is a danger that air may enter the hydraulic system and cause spongy operation and extended pedal travel. The divided brake circuit should ensure that emergency braking remains, but the car should not be driven until the fault has been identified and rectified.

Note that in order to inhibit false warnings of low fluid level due to surge effects, this circuit incorporates a 10 second delay, requiring that the signal be present for a minimum of this period.

Oil Pressure Tell Tale (red)
This red tell tale warns of low engine oil pressure. The lamp will be lit whenever the ignition is on and the engine is stopped, but should go out as soon as the engine is started. If the lamp fails to go out after engine start up, or comes on when the engine is running, stop the engine immediately and do not restart until the cause has been investigated and rectified.

WARNING: Continuing to run the engine with the oil tell tale lit could cause major engine damage or seizure, resulting in loss of car control and a crash. You or others could be killed or seriously injured.

Battery Charging Tell Tale (red)
This red tell tale will light whenever the ignition is on and the engine is stopped. If it lights any time when the engine is running, it indicates that the battery is not being charged, which may be due to a broken auxiliary drive belt, or an electrical fault.

Stop the car as soon as safely possible and turn off the engine. The auxiliary belt also drives the engine water pump, without which function the engine will overheat very quickly. If it can be determined that the auxiliary belt and water pump are functioning correctly, it may be possible in favourable daylight conditions, to drive a short distance to a repair facility, but do not, under any circumstances, allow the battery to become completely discharged by continuing to drive, as this may result in engine damage and the car being stranded in a dangerous position.

Seat Belt Tell Tale (red)
As a reminder to fasten the seat belts, the seat belt tell tale in the instrument cluster will flash red for about six seconds following ignition switch on, accompanied, if the driver's belt is not fastened, by an intermittent audible tone. Thereafter, if the driver's belt remains unfastened, the lamp will light continuously, but if vehicle speed should exceed 15 mph (20 km/h) the lamp will flash, accompanied by a beeping tone for a period of two minutes, unless curtailed by a speed reduction below 10 mph (15 km/h) before this time.

Airbag Tell Tale (red)
The airbag safety system, including the pre-tensioning seat belts, has a self-diagnostic feature which lights the red tell tale if a fault is detected. As a bulb check, the tell tale will light for about six seconds following ignition switch on, and then go out, but if the lamp remains lit, or comes on at any other time, a fault in the airbag system is indicated, which should be rectified without delay by your Lotus dealer.

Transmission Malfunction Indicator (amber) (IPS versions only)

The transmission warning light is illuminated if a fault is detected within the transmission, an associated control component or if the transmission oil exceeds its recommended maximum temperature.

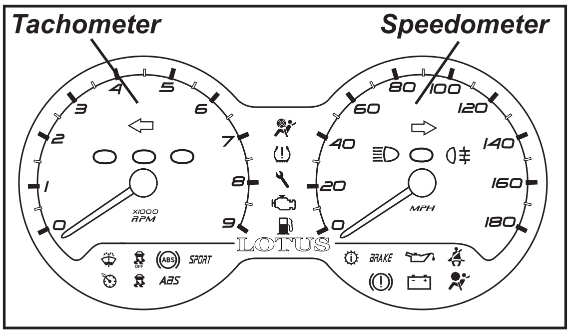
A bulb check will light the lamp for about 3 seconds following ignition switch on.

- If the temperature of the transmission becomes too high the vehicle will default to a limited power mode and the Transmission Malfunction Indicator lamp will illuminate.
- If a fault is detected within the transmission, an associated component or if transmission oil temperature continues to rise, then the Transmission Malfunction Indicator lamp will illuminate continuously. Reduce speed immediately and adopt a moderate driving style.
- If a fault is detected within a transmission component which could affect the vehicles emissions, then the engine Malfunction Indicator Lamp (MIL) will also illuminate continuously. Reduce speed immediately and adopt a moderate driving style. See page 55 of the main handbook for further information regarding the driving style that should be adopted if the MIL lamp is illuminated or flashing.
- Even if the Transmission Malfunction Indicator lamp extinguishes, proceed with caution and seek dealer advice without delay and avoid all unnecessary journeys.

INSTRUMENTS

Speedometer

This analogue display uses an illuminated pointer to indicate road speed in either mph or km/h dependent on market. Each time the ignition is switched on, a re-setting routine will be performed with the pointer sweeping to full scale and back to zero. The scale backlighting and pointer will be illuminated whenever the ignition or sidelamps circuits are active.



Note that a digital speed display in alternative units (mph or km/h) is available in the information panel menu.

Tachometer

This analogue display uses an illuminated pointer to indicate engine speed in revolutions per minute. The engine management system graduates the maximum engine speed allowed during the warming up phase, and once normal running temperature has been reached, limits continuous engine speed to 6,600 rpm (or 7,000 rpm in Sport mode). During maximum acceleration through the lower gears, very short bursts up to 6,800 rpm are allowed (or 7,200 rpm in Sport mode).

Each time the ignition is switched on, a re-setting routine will be performed with the pointer sweeping to full scale and back to zero. The scale backlighting and pointer will be illuminated whenever the ignition or sidelamps circuits are active.

Three red tell tale rings are incorporated into the tachometer face to warn that maximum engine speed is being approached, but as the rate of rpm increase is potentially greater in the lower gears, the tell tale trigger points are tailored to accommodate the reaction time available. The tell tales will light in the following left to right sequence:
- one red light;
- two red lights;
- three rapidly flashing lights with an audible warning.

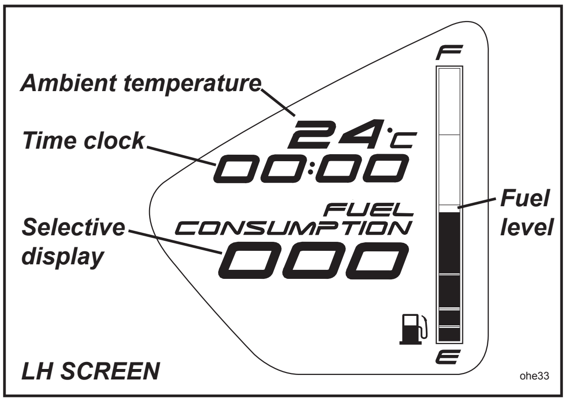
When exploiting maximum acceleration, gear upshifts should be made immediately the three flashing lights appear.

NOTICE:
- The use of wide throttle openings and/or high rpm before normal running temperature has been reached should be avoided. A graduated engine speed limit is imposed on a cold engine to reduce possible damage and wear from a delinquent driving style.
- Do not run the engine continuously at its maximum speed.
- The engine is not protected from overspeeding caused by erroneous or premature downchanging, the consequences of which could be catastrophic failure not covered by the vehicle warranty.
- Use of maximum rpm and the above tell tale facility should be restricted to occasions when maximum acceleration is required. Overuse will compromise powertrain service life.

Odometer

A vehicle total distance travelled indicator, in miles or kilometers, dependent on market, is displayed at the centre top of the instrument panel whenever the ignition key is inserted. See next page for the trip distance function.

Please note, odometer position for IPS models is now used for PRND display and odometer display is moved to RH information screen. (See coolant temperature display information and section FA for further information).



Fuel Level Display
An indication of the level of fuel in the tank is displayed, with ignition on, in the form of a vertical bar graph in the instrument panel left hand screen. The solid bar within the outline, represents the proportion of fuel remaining in the tank. When only 5 litres remains, an amber tell tale in the instrument panel will light. Refuel at the next opportunity.

The total usable fuel capacity is 60 litres (13 imp.gal), but for re-fuelling purposes, from the time the low fuel tell tale is triggered, approximately 50 litres can be accommodated. Note that from the point of low fuel tell tale activation to the gauge reading empty, is around 5 litres.

The remaining balance of 5 litres should be treated only as an emergency contingent, the use of which may entail intermittent fuel starvation and potential engine damage. In such a situation, driving style should be modified to minimise engine load and cornering forces.

If maximum engine or handling performance is to be exploited, or severe gradients tackled, a high fuel level should be maintained to ensure the greatest safety margin of fuel supply.

NOTICE: Do not allow the tank to run completely dry, as this could damage the catalytic converters and fuel pump. Any such consequence would not be covered by the vehicle warranty.

Ambient Air Temperature Display
The outside air temperature is shown on the instrument panel left hand screen whenever the ignition is switched on, with units displayed in degrees Centigrade or Fahrenheit dependent on market. The sensor is mounted by a grommet into the RH side of the engine radiator air intake duct.

If the temperature drops to 4°C (39°F) or below, the display will flash for ten seconds, accompanied by a single audible chime to alert the driver to potentially hazardous road conditions. Note that optimum accuracy will be obtained when the car is moving.

To change the displayed units between Centrigrade and Fahrenheit, see 'Information Switch' below.

Time Clock
A digital 24-hour time clock is displayed in the instrument panel left hand screen whenever the ignition key is inserted. To adjust the clock, see 'Information Switch' below:

Information Switch
A button is mounted on the end of the left hand column stalk, and has different functionality with ignition on and off. With the ignition key inserted, but ignition ***OFF***, the button operates as follows:
Time clock adjustment
- Press the info. button for more than one second, until the hour display flashes.
- Press momentarily the info. button to advance the figure by one hour and repeat as necessary. Alternatively, a rapid double press will automatically scroll the display; press again to stop the scrolling at the desired figure.
- Press the info. button for more than one second until the seconds display flashes. Repeat the above adjustment procedure.
- Press the info. button for more than one second to enter the next mode:

Ambient temperature units
- Current temperature display units will now be displayed. To change from °C to °F, or vice-versa, press momentarily the info. button.
- To retain the displayed units, press the info. button for more than one second to enter the next mode:

Tyre pressure units (if TPMS is fitted)
- Current tyre pressure units will now be displayed. To change from bar to psi, or vice-versa, press monentarily the info. button.
- To retain the displayed units, press the info. button for more than one second to exit the adjustment mode.

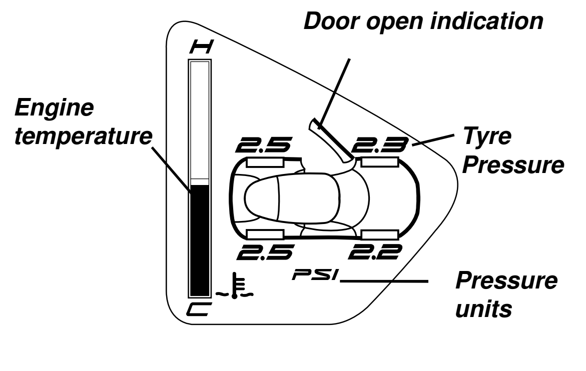
With the ignition ***ON,*** the info. button operates the trip functions as follows:

Trip Recorder
The instrument panel left hand screen allows a menu of trip functions to be displayed, selected by the 'info' switch on the end of the steering column left hand stalk. When the ignition is turned ***ON***, the panel will display the trip distance since the last reset, in either miles or kilometres, dependent on market.
A single momentary press of the info. button will scroll to the next function in the following sequence:

- *Trip distance.*
- *Range;* Driving distance available on current fuel level, based on average fuel consumption since reset.
- *Average fuel consumption;* In mpg or km/l dependent on market. This display will be blank for the first 5 minutes of driving time since reset, to allow data to stabilise.
- *Road speed;* Displayed digitally in alternative units (mph or km/h) to those of the analogue instrument.
- *Trip distance.*

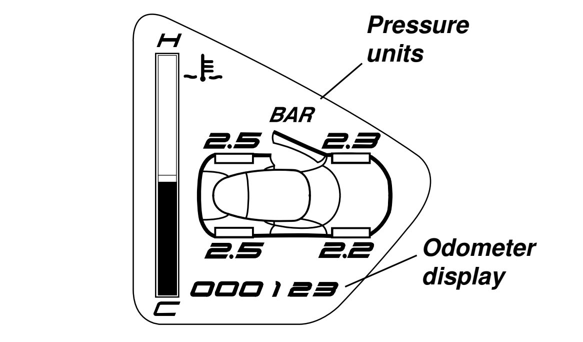
The Trip Distance, Range, and Average Fuel Consumption can all be reset, by selecting that function and then pressing the info. switch for more than one second until the display zeroes.

Coolant Temperature Display
An indication of the engine coolant temperature is displayed, with ignition on, in the form of a vertical bar graph in the instrument panel right hand screen. To optimise display space, the shown scale commences at 60°C (140°F), and finishes at 120°C (250°F).



RH SCREEN MANUAL VEHICLES

ohe34



RH SCREEN IPS VEHICLES

The running temperature will fluctuate a certain amount as the operating conditions change, and during periods of idling or in heavy traffic, the temperature may rise to over 100°C (212°F), with the cooling fans switching on at half speed at approximately 98°C (208°F), and full speed at approximately 103°C (217°F).

In order to prompt closer monitoring by the driver of temperatures over 110°C (230°F), the temperature icon will flash and be accompanied by the message '***Engine too hot***' displayed above the car silhouette.

The pressurised cooling system has a boiling point of over 120°C (250°F), and if the temperature approaches this level, the car should be stopped and the engine allowed to idle for a few minutes whilst the temperature is monitored. If the temperature continues to rise, there is a danger of engine damage; switch off and seek qualified assistance.

NOTICE: After a heavy snowfall, ensure that the radiator cooling outlet grille in the front body is cleared of snow before driving the car, or overheating may result.

Tyre Pressure Monitoring System (TPMS)
On cars so equipped, a sensor incorporated into each of the tyre valves, monitors the air pressure inside the tyre, and supplies an onboard control module with this data by radio transmission. As soon as the car has been driven a short distance, tyre pressure readings will be displayed against the corresponding wheels on

the vehicle silhouette in the instrument cluster right hand screen. If any pressure should fall below 75% of the recommended value, an alert message is sent to the instrument panel, causing the tyre pressure tell tale to light up amber (!) and the corresponding pressure on the silhouette to flash.

If this warning should occur, stop the car as soon as it is safe so to do, and examine the affected tyre. If there is no visible damage and a tyre pump is available, correct the pressure to that stated in the Technical Data section of this handbook, and proceed with caution to a tyre dealer for professional inspection and advice. Note that the tell tale will automatically be extinguished when the correct pressure is restored.

If the tyre is punctured, or no inflation equipment is available, consider using the emergency tyre inflator aerosol (see page 128), but observe the associated **WARNINGS** and be aware that the TPMS sensor in the tyre will be disabled by the sealing fluid, and must subsequently be renewed.

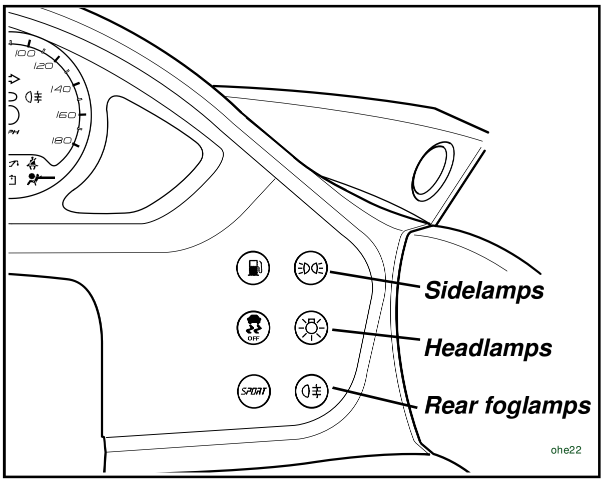
The TPMS incorporates self-malfunction recognition, and if a fault is detected, the low tyre pressure tell tale will flash for one minute and then remain constantly lit, this sequence being repeated for subsequent ignition cycles; **the system may not be able to detect or signal low tyre pressure**. See your dealer without delay.

Be sure to advise any tyre fitters or service technicians that TPMS is fitted, and that any replacement tyre valves include the correct pressure sensors. If a fault is indicated after wheel or tyre replacement, it is likely that a sensor has been incorrectly fitted or damaged. If a tyre valve is renewed, or is moved to a different wheel position, the TPMS will automatically identify the new configuration.

Note that the pressure sensors are powered by integral batteries, with an average service life of 10 years. It is recommended to renew all pressure sensors at this time interval.

Door/Tailgate Open Display
The instrument cluster right hand screen includes a plan view silhouette of the car, which will graphically show when either door is open, or indicate an open tailgate by flashing the corresponding area. This situation will endure until the panel is fully latched.

Lighting Switches
Lighting functions are controlled by a vertical row of three push button switches mounted in the fascia outboard of the steering column. Each switch is pressed once to switch on, and pressed a second time to switch off.



Each switch button incorporates a function symbol which is backlit red with the sidelamps and ignition switched on, and which lights up brightly when the circuit is active.

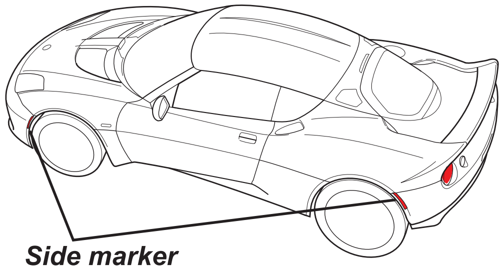
Sidelamp Switch (USA - Parking Lamps Switch)
The topmost outboard switch functions with or without the ignition, and switches on the sidelamps (and side marker lamps) and some switch illumination. To help locate the switch in the dark, when the ignition is on, the button symbol will be backlit red, changing to brightly lit green when the circuit is activated.

Note that the headlamps must be off before the sidelamps can be switched off.

Headlamp Switch (USA - Master Lighting Switch)
The second switch down functions with or without ignition, and switches on the headlamps together with the sidelamps and some switch illumination. The switch button symbol is backlit red with the sidelamps on, and lights up green to indicate when the circuit is active. The steering column lever switch (see later) is used to select main or dip beam.

A second momentary press will switch off the headlamps, but leave on the sidelamps. To switch off both the side and headlamps, hold the switch pressed for more than one second.

Daytime Running Lamps (DRL) - USA markets
When the engine is started, the following 'day time running' lamps will automatically be activated: Front and rear sidelamps, side marker lamps (inset into the front and rear bumpers) and headlamp low beams.



The sidelamps tell tale will also be lit (see previous page). Note that the headlamp main beams will not be operational until the master lighting switch is pressed, which will be confirmed by the corresponding tell tale.(see above).

When the ignition is turned off, the DRLs will switch off automatically, but not if the engine stalls. If the headlamps have been manually selected, the lights will remain lit until the master lighting switch is pressed.

Rear Fog Lamp Switch (where fitted)
The lowermost outboard switch controls the single rear fog lamp, which will operate only when both the ignition and the headlamps are active. The switch button symbol is backlit red with the sidelamps on, and lights up amber to indicate when the circuit is active.

Note that the switch will default to 'off' whenever the headlamps or ignition are switched off, such that the switch must again be pressed when fog lamp operation is required.

In some territories, rear fog lamps may be used legally only in conditions of 'seriously reduced visibility'. Be aware that indiscriminate or forgetful use of the rear fog lamp can cause distraction and discomfort to following traffic.

Homesafe
The Homesafe feature keeps the headlamps lit for a 30 second period after locking/arming the alarm, in order to light the departure route. To activate Homesafe;
- leave the headlamps switched on;
- withdraw the ignition key;
- use the transmitter to lock/arm the alarm.

The master lighting switch will flash during the 30 second period to indicate that Homesafe is operating.

'Lights On' Warning
If the lights are on when the ignition is switched off, a 'lights on' audible warning will sound when the driver's door is opened.

Reversing Lamp, Parking Aids and Reversing Camera
With the ignition switched on, selection of reverse gear will cause:
- The reversing lamp to light.
- If fitted, the parking aid system will sound an audible acknowledgement, and then search for objects at bumper height within the detection zone of about 1.5 m (5 ft) around the rear of the car. When within this range, an intermittent beeping will be heard, which increases in frequency as the distance is reduced, becoming a continuous tone at around 300 mm (1 ft). Be aware that the sensitivity of the system will vary according to the size, position and material/density of an object.
- If fitted, the reversing camera will switch on and display an image on the audio set screen, if and when the set is manually switched on. Note that in order to cover the whole width of the car, the view will be distorted from a conventional image.

Take time to familiarise yourself with the image displayed, the parking aid beeping frequency, and the actual distance being detected before fully utilising these systems.

Hazard Warning Lamp Switch
The hazard warning switch button is located inboard of the audio set, and is backlit red when the sidelamps are switched on. The switch is enabled at all times, and when pressed, causes simultaneous flashing of all the exterior turn lamps. In addition, the switch button graphic will flash, and an accompanying audible tone will sound. Press the button a second time to switch off.

Instrument and Switch Illumination
The fascia mounted push button switches are backlit red whenever the sidelamps and ignition are switched on. The sidelamps switch itself is backlit with the ignition on. Most switches will light up brightly when that circuit is activated.

The brightness of both the backlighting and active states is dimmed with the sidelights on, in order to prevent distraction in the dark. Similarly, the red displays in the instrument panel side screens are dimmed when the vehicle lights are on.

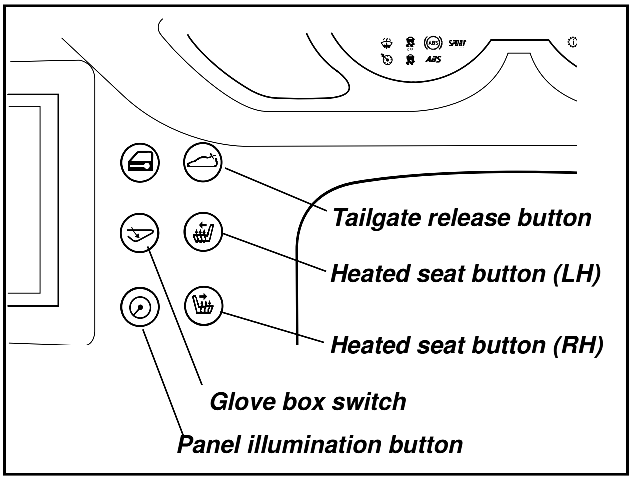
The speedometer and tachometer illumination is provided by white LEDs, with the pointers coloured red. The lighting level of these instruments and that of the heating/ventilation control panel, may be adjusted by a switch button inboard of the steering column:

- To set the nightime level, switch on the sidelamps and press and hold the panel illumination button; the brightness will progressively increase. Release the button at the required level.
- The next press of the button will progressively decrease the brightness. Release at the required level.
- To set the daytime level, repeat the above procedure with the sidelamps switched off.

Heated Front Seats
From '11MY VIN BH_11178 front driver and passenger's heated seat option is available. The seats are heated and thermostatically controlled to maintain a maximum temperature of 37 ± 3 °C.

Single touch switches are located in the fascia panel inboard of the steering column and will illuminate amber when depressed the seats will continue to be heated and the switch remain illuminated until either the seat heater button is pressed for a second time or the ignition is switched off.

The heated seat function will always default to 'off' at the next drive cycle.



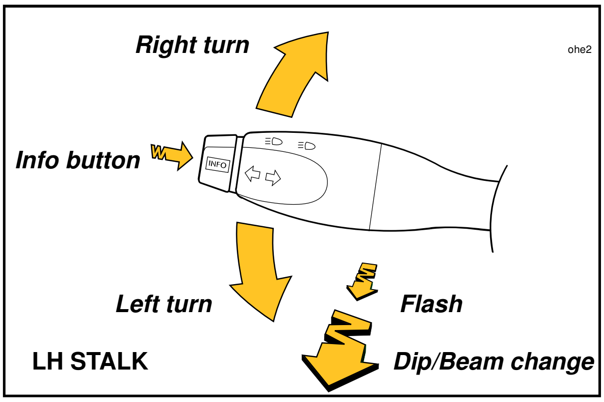
Tailgate Release Switch
Models fitted with the heated seat option are also provided with a tailgate release button on the same switch assembly. The switch is located in the facia panel above the heated seat buttons, inboard of the steering column.

The tailgate can only be opened using this button if the vehicle is stationary with the handbrake applied and the key in the ignition. The functionality of opening the tailgate using the transmitter key remains the same (see section MR.1)

Steering Column Lever Switches
Lever switches are provided on the steering column, one on the left for headlamp functions, and one on the right for windscreen wiping and washing.

Turn Indicators/Headlamp Flash/Dipswitch
Turn Indicators: The turn indicators operate only with the ignition switched on. Move the lever down to indicate a left hand turn, and up for a right turn. The switch will be cancelled when the steering wheel is returned to the straight ahead position.

For convenience, when signalling a lane change, lightly pressing the switch up or down will allow its return under spring action. Pressing the switch for less than a second will trigger three flashes of the indicators.



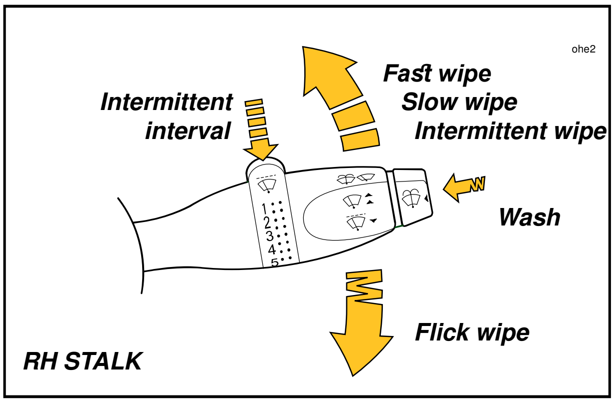
Headlamps: The left hand lever switch is operated by pulling the left hand lever switch towards the steering wheel, to one of two spring loaded positions, and then releasing.

Headlamp Flash: To flash the headlamp main beams with or without ignition, pull the lever switch to the first position; the beams will light until the lever is released.

Dip/Main Beam Switching: When the headlamp switch is pressed (see page 64), the headlamps will switch on in either dip or main beam mode according to the last made selection. To change from one to the other, pull the lever fully towards the steering wheel to the second spring loaded position, and then release. Each such action will cause alternate selection of main and dip beams. Note that with ignition on, the main beam tell tale in the instrument panel will indicate the current status.

Info Button: Momentarily pressing the 'Info' button on the end of the stalk will scroll through a menu of trip functions (see above).

Windscreen Wiper & Washer Control
The right hand lever switch is enabled at ignition key positions I and II, and is operated as follows:



Wiper functions
- To 'flick' wipe the screen, press the lever switch downwards against spring pressure and release. The wiper will sweep the screen once at slow speed. Holding the lever downwards will activate further slow sweeps until released.
- For intermittent wipe, push the lever up to the first position, and select the wipe interval by rotating the numbered collar to one of its six positions, the wipe frequency increasing at higher numbers.
- For slow speed continuous wipe, move the lever upwards to the second position.
- For fast speed continuous wipe, push fully upwards to the third position.

Note: In very cold weather, before attempting to use the wiper, ensure that the blade is not frozen to the screen (use windscreen de-icer fluid), or damage to the blade or circuit fuse may be caused.

Windscreen washer functions
- For short wash/wipe, a momentary press of the button on the end of the stalk will trigger the washer pump and a single sweep of the wiper.
- For a longer wash/wipe, press the end button for longer than one second to operate the washer, and to trigger 3 sweeps of the wiper.

Headlamp Powerwash
With ignition and headlamps on, the headlamp powerwash will be activated for a short burst at the first, and every subsequent fifth request of the screen wash switch. Cycling of either the ignition or headlamp switch will reset this timing.

The powerwash jets are contained in a sliding module which normally sits flush with the surface of the headlamp cover. When activated, a stepper motor with combined pump, operates to lift the module proud of the headlamp to expose the jets and deploy a pair of high pressure water streams to the lamp cover. The module then retracts. Note that this function shares the water reservoir used for the windscreen washers.

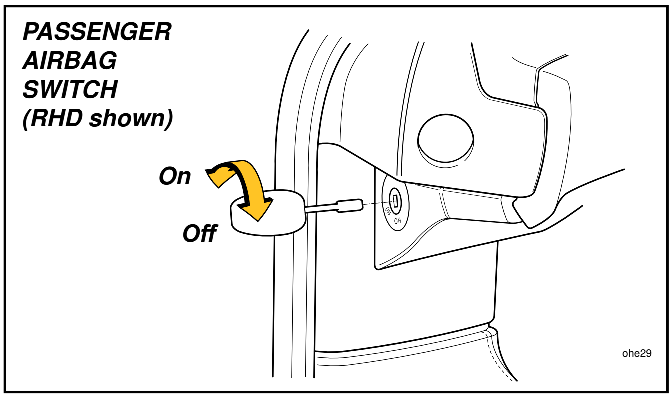
Note:
- The combined washer reservoir has a low fluid level sensor which will activate a tell tale in the instrument cluster.

- The windscreen washer jets have heating elements which are active whenever the ignition is on.

Horn
To sound the twin tone horns, which are operative at all times, press the centre pad on the steering wheel.

Passenger Airbag Defeat (PAB) Switch
If a rearward facing child seat is to be used in the front passenger seat of the Evora, it is essential to switch off the passenger airbag. If an accident should occur and trigger airbag inflation, the back of the seat could be subjected to a force sufficient to seriously injure or kill the child.

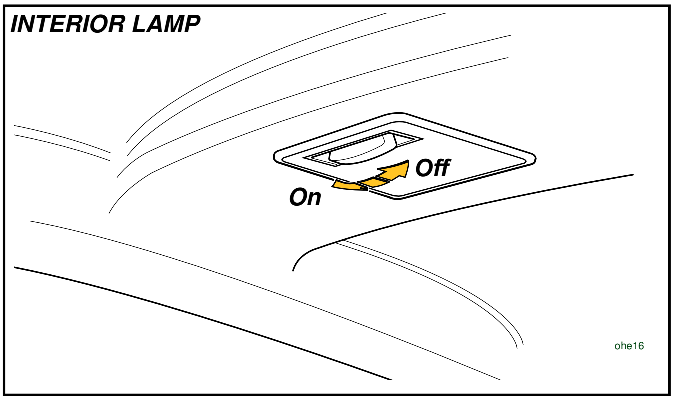
A PAB switch is located at the end of the passenger fascia, accessible only with the door open, and is operated using the mechanical ignition key; insert the key and turn clockwise to the 'OFF' position, and withdraw the key.



With the ignition switched on, a tell tale lamp in the instrument panel will light up amber as a reminder that the passenger airbag has been disabled. To reinstate airbag operation, insert the key in the PAB switch and turn counterclockwise.

Interior Lighting
The main interior lamp is located centrally in the roof and incorporates a three position rocker switch:

- *Forward end depressed;* Lamp is switched off ('0').
- *Rear end depressed;* Lamp is switched on with or without ignition ('I').
  NOTICE: To guard against flattening the battery, ensure that the lamp is not switched on when leaving the car.
- *Switch central;* This is the normal, courtesy position (door symbol).



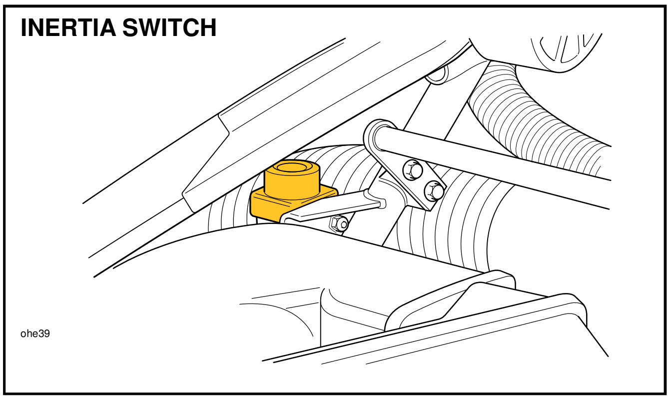
A 'mood lighting' strip crossing the fascia and extending along both door trim panels, is controlled in conjunction with the main interior lamp. Each front footwell also houses a separate lamp to aid ingress.

With the interior lamp switch set to the courtesy position; when the transmitter key button is pressed to unlock the doors, the interior lamp and mood lamps will fade on for a maximum period of 2 minutes. If a door is opened, the footwell lamp will also light. On closing the door, the footwell lamp will be extinguished, but the interior and mood lighting will abide for 2 minutes or until the ignition is switched on.

Similar logic will apply when opening the door to exit the vehicle, with the lighting being extinguished when the doors are locked using the transmitter, or after a period of 2 minutes.

Inertia Switch
The safety inertia switch is designed to operate on impact, typified by vehicle collision, to switch off the fuel pump, and thus minimise any fire hazard. The central door locking will also be triggered to unlock the doors.

The inertia switch is mounted on the backstay at the left hand side of the engine bay, ahead of the airbox, and is reset by pressing the rubber diaphragm button on the top of the unit.



Lotus Traction Control Base Evora from start of production (non USA)
Lotus Traction Control (LTC) is a software programme integrated within the engine management and ABS electronic control units (ECUs) and uses inputs from the wheel speed sensors to determine if wheelspin is occurring. If an excessive degree of wheelspin is detected,

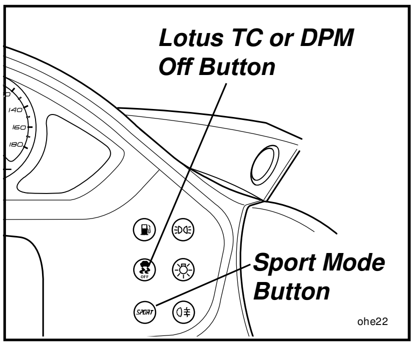
LTC will modulate fuel injector delivery, throttle opening and rear brake application, in order to control engine power output and spinning wheel inertia, until grip is restored. This feature can improve vehicle stability in some extreme conditions of use, especially where variable or differential side/side surface grip prevails, or when maximum vehicle performance is being exploited. Refer also to 'EDL' (see following page).

If the traction control tell tale in the instrument panel is seen to flicker, this is an indication that the LTC has been triggered and electronic intervention is taking place; the tractive limit has been reached and driving style should be modified accordingly.

WARNING: The enhanced vehicle control that this feature provides should not induce any relaxation of caution or vigilance by the driver. Physical limits of cornering and braking still apply, and excessive speed may result in loss of control and an accident. The driver is at all times responsible for the judgement of appropriate speed.

Traction Control 'Off' Button: In certain unusual circumstances, such as loose surfaces, deep snow or when 'rocking' the vehicle free from mud, it may be desirable temporarily to switch off the LTC. An LTC 'off' button is provided in the fascia, outboard of the steering column, and is operative only with the ignition on.

To switch off LTC, hold the button pressed for one second, until the button surround lights up in conjunction with the amber 'LTC off' tell tale in the instrument panel.



WARNING:
- **Lotus Traction Control should always be active when driving on the public highway in normal conditions.**
- **If the system is switched off when driving off-highway, be aware of the consequent change in vehicle behaviour and modify driving style accordingly.**

To re-activate LTC, briefly press the button a second time and check that the tell tale goes out. Irrespective of the system status when the ignition is turned off, LTC will automatically be activated next time the ignition is switched on.

If the on-board diagnostic system detects a fault with the LTC, the tell tale will be lit continuously; see your dealer without delay.

Lotus Dynamic Performance Management (Lotus DPM)
Start of production for USA market (formerly referred to as ESP (Electronic Stability Program)
All non USA vehicles from '11MY VIN0. BH_11178

This is incorporated into the software programme integrated within the engine management and ABS electronic control units (ECUs).

This feature enhances vehicle stability in extreme manoeuvres typified by accident avoidance attempts or misjudged cornering demands. Current vehicle behaviour is constantly monitored, and compared with a determination of driver intent as indicated by data gathered from the driving controls. When vehicle stability is at risk, the ABS is utilised to apply a measured braking force to individual wheels and modulate the fuel injector delivery and throttle opening as necessary in order to help the driver maintain control of the vehicle.

This feature can improve vehicle stability in some extreme conditions of use, especially where variable or differential side/side surface grip prevails, or when maximum vehicle performance is being exploited.

If the Lotus DPM tell tale in the instrument panel is seen to flicker, this is an indication that the system has been triggered and electronic intervention is taking place; the tractive limit has been reached and driving style should be modified accordingly.

WARNING: The enhanced vehicle control that this feature provides should not induce any relaxation of caution or vigilance by the driver. Physical limits of cornering and braking still apply, and excessive speed may result in loss of control and an accident. The driver is at all times responsible for the judgement of appropriate speed.

Sport Mode (if fitted)
In order to cater for the preferences of some sport oriented drivers, a Sport Mode selector button is provided to deliver quicker throttle response, increased wheel slippage thresholds, no throttle reduction on detection of understeer, and a maximum continuous engine speed raised from 6,600 to 7,000 rpm. Note that switching off the Lotus Traction Control (see above) in conjunction with selection of Sport Mode, will retain the Sport features, but without any power induced wheelslip intervention. In all cases, anti-lock braking will be retained.

WARNING: Be aware that selecting Sport Mode and/or LTC OFF, will alter the handling characteristics of the car. Drivers should excercise caution until familiarity has been gained in a controlled safe environment.

The Sport Mode switch is located in the fascia panel outboard of the steering column. To switch on Sport Mode, turn on the ignition, and hold the button pressed for one second until the button surround lights up amber, accompanied by the amber 'SPORT' tell tale in the instrument panel. In order to prevent unintentional acceleration if the button is pressed whilst driving, in these circumstances, the button surround will flash in acknowledgement, but Sport Mode will not be activated until the throttle pedal has been fully released.

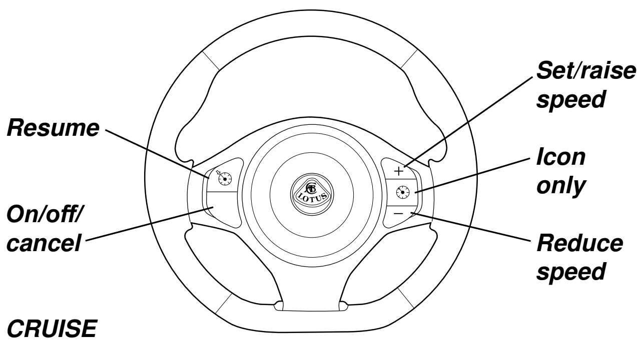
Briefly pressing the button a second time will switch off Sport Mode as soon as the throttle pedal is fully released.

Note that Sport Mode will default to 'off' at the next ignition cycle.

Cruise Control

The cruise control system is operated by four switches mounted on the steering wheel spokes.

- On/off/cancel (lower left).
- Resume (upper left).
- Set/raise speed setting (upper right).
- Reduce speed setting (lower right).



CRUISE CONTROLS

The three operational states of cruise control are:
- Off.
- Enabled (but inactive).
- Active.

To enable cruise control: The system will always default to 'off' whenever the ignition is turned off. To enable cruise control, turn on the ignition, and press the on/off switch; the tell tale in the instrument panel will light to confirm that the system is enabled (although no speed has yet been set). Alternatively, this operation may be combined with that for activation, by pressing the on button followed by the set button (see below).

To activate cruise control: Drive the car to the desired cruising speed and press the set button. The accelerator may now be released, but the set speed will be maintained (road gradient and winds permitting). The accelerator may be used to increase speed temporarily without affecting the setting.

Note; The system cannot be activated below 30 mph (45 km/h) or above 130 mph (210 km/h), or in first or second gear .

Deactivation: Cruise control will be deactivated when any of the following actions occur:
- The brake pedal is depressed;
- The clutch pedal is depressed.
- The on/off/cancel button is pressed.

In each case, normal manual speed control will be restored, but the system will remain enabled.

Resume: To resume cruise, press resume switch. Vehicle speed will automatically adjust to cruise setting.

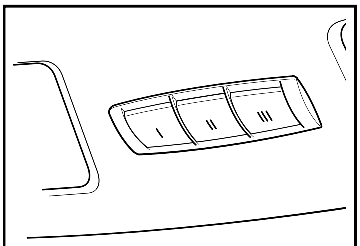
Changing the cruise setting: Whilst cruise is active, the speed setting can be adjusted by holding down the '+' or '-' buttons to accelerate or slow the car to the desired new speed. On release of the button, that speed will then be set. Alternatively, a single short press of either button will increase or decrease the setting by 1 mph (1.5 km/h). If the system is not active, the car can be driven to the desired speed, and the set button pressed.

To disable cruise control: To switch off the system, with cruise inactive, press the on/off switch; the tell tale lamp will be extinguished.

Homelink

The homelink system offers wireless control of non-vehicle based systems, such as requests for garage door opening, perimeter gate opening, and house lights switching.

The Homelink control panel and integrated transmitter unit is located in the roof section of the vehicle and features three switches, labelled I, II and III, for communication with external systems. The Homelink electronic controller must be programmed to match that of the external system through a training and synchronisation process, and is suitable for both rolling and non-rolling codes.

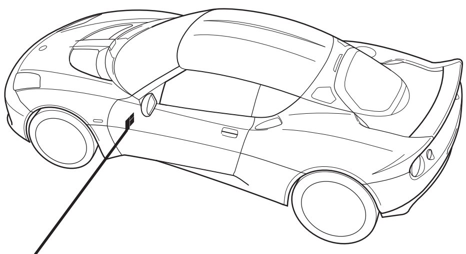

HOMELINK CONTROL PANEL

After programming, and with ignition on, press the appropriate Homelink button when within operating range of the system, to activate the exterior device. The LED on the Homelink control panel will light when a button is pressed as confirmation of switch contact. For full details refer to the separate Homelink literature; LSL560 (RoW) or LSL562 (USA).

MR.6 - COMPONENT LOCATION & FUSE RATINGS

Main Fusebox

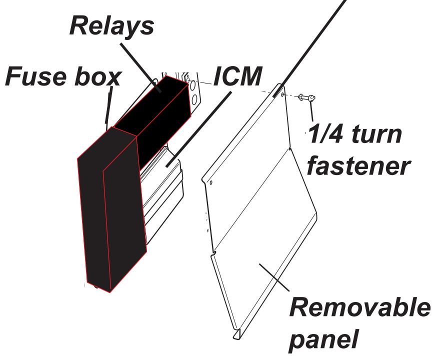
The main fuse and relay boxes are located at the front of the passenger footwell, protected by a removable panel secured by a quarter turn fastener at each top corner, and a location channel on the floor. Forty slots are provided for mini fuses which are numbered, and coloured according to their amperage rating, and may be pulled out from their slots using the fuse extractor tool clipped to the fusebox. Six maxi fuses protecting major circuits are also provided, along with six single contact change over micro relays and two 50A power relays.



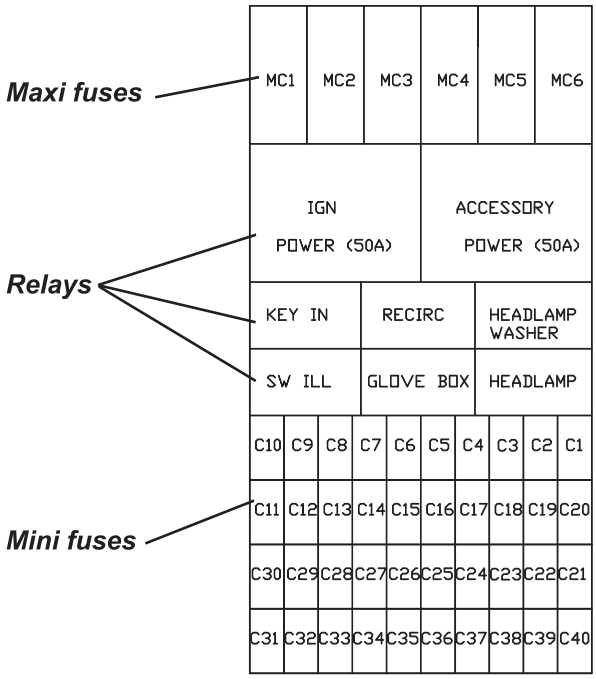
Base Evora from start of production *(manual non supercharged up to '11MY VIN BH_11177)*

Slot	*Rate*	*Circuit*
C1	10A	Horn
C2	5A	Battery services
C3	7.5A	CDL, Alarm B+
C4	20A	Rad fan relay 1
C5	20A	Rad fan relay 3
C6	10A	Radio B+
C7	5A	Key-in relay
C8	2A	Ignition switch†
C9	20A	Driver's window
C10	20A	Pass. window
C11	7.5A	Hazard & Turn
C12	3A	Interior lighting
C13	20A	Int. control mod.
C14	3A	Footwell lamps
C15	5A	LH sidelamps
C16	5A	RH sidelamps
C17	15A	LH headlamp
C18	15A	RH headlamp
C19	15A	Main beam
C20	3A	Rear foglamp
C21	3A	Ign. services
C22	5A	ABS
C23	3A	Homelink
C24	3A	Brake lamps
C25	15A	HL powerwash
C26	5A	Alarm ignition
C27	-	
C28	7.5A	HVAC ignition
C29	5A	Washer jets†
C30	5A	SRS unit
C31	3A	Heated mirrors
C32	5A	Washer pump
C33	5A	Mirror/window sw.
C34	20A	Wiper motor
C35	-	*
C36	20A	Interior fan*
C37	10A	Cabin pwr. socket*
C38	-	*
C39	-	*
C40	-	*

† *Ratings for these fuses are now the same as from the introducton of the Evora 'S' and 'IPS'.*



Slot	*Rate*	*Circuit*
MC1	40A	Battery positive
MC2	40A	B+, ignition
MC3	40A	Accessories
MC4	40A	ABS B+
MC5	25A	ABS B+
MC6	25A	HRS



***Evora IPS**

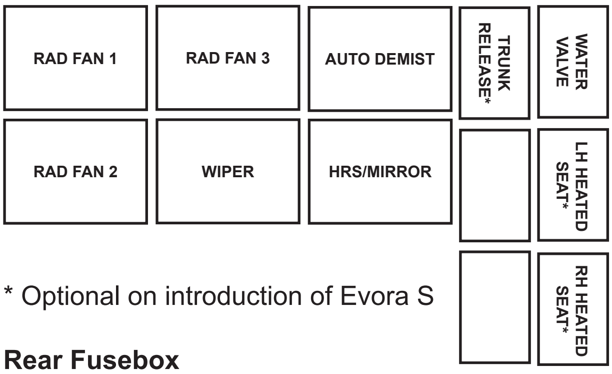
Slot	*Rate*	*Circuit*
C8	5A	Ignition switch
C29	7.5A	Washer jets
C35	20A	Interior fan
C36	10A	Cabin pwr. socket forward
C37	10A	Cabin pwr. socket rear
C38	25A	Heated rear screen
C39	10A	LH heated seat
C40	10A	RH heated seat

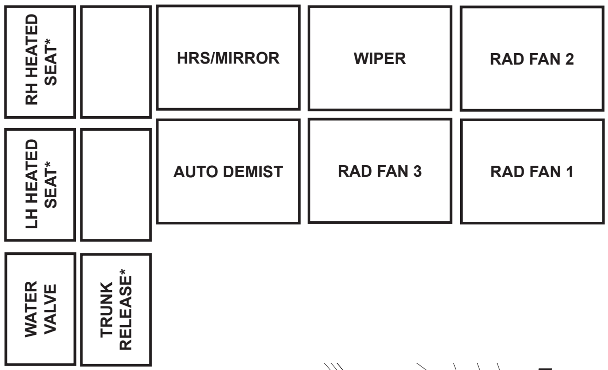
Evora S and *manual non supercharged from '11MY VIN BH_11178)

Slot	*Rate*	*Circuit*
C29	7.5A	Washer jets
C35	20A	Interior fan
C36	10A	Cabin pwr. socket forward
C37	10A	Cabin pwr. socket rear
C38	25A	Heated rear screen
C39	10A	LH heated seat
C40	10A	RH heated seat

Front Relay Blocks
Mounted on the front fusebox panel, is a block of relays, the layout is inverted for opposite drive hands:

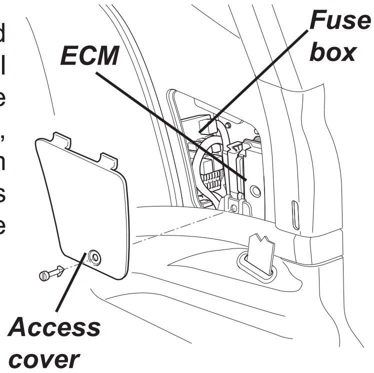
RHD **LHD**





* Optional on introduction of Evora S

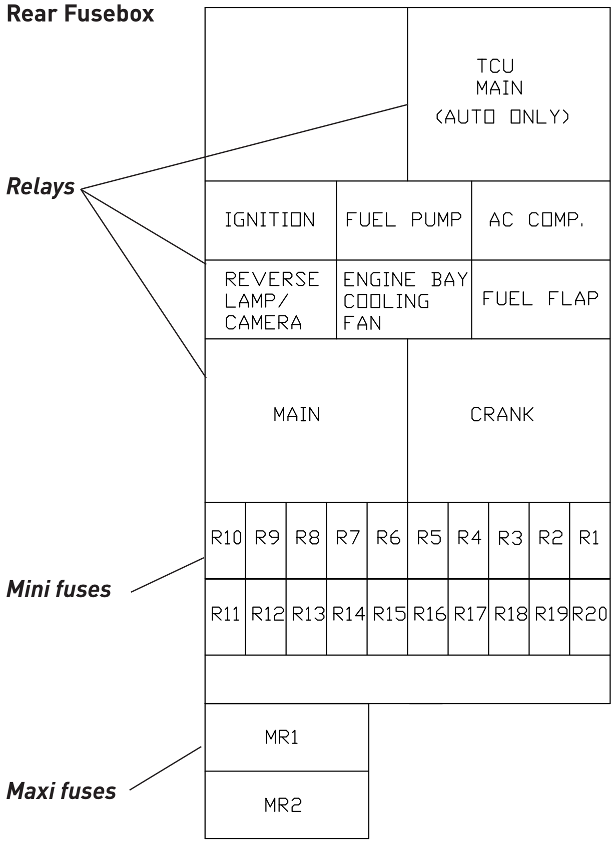
Rear Fusebox
Fuses and relays for the engine bay and rear mounted systems are contained in a fusebox mounted in the cabin, behind the left hand rear quarter trim panel (see MR.14). For access, release the quarter turn fastener on the lower edge of the removable panel, and unhook the top edge. Mini fuses are numbered, and coloured according to their amperage rating and may be pulled out from their slots using the fuse extractor tool clipped to the fusebox. Two maxi fuses protecting major circuits are also provided, along with four single contact change over micro relays, and two power relays.



Base Evora and 'S' from start of production
(manual and supercharged)

Slot	*Rate*	*Circuit*
R1	10A	ECU, fan relay 3
R2	7.5A	Injectors
R3	10A	Ignition coils
R4	2A	Re-circ. pump
R5	-	
R6	-	
R7	5A	ECU ignition*
R8	7.5A	Engine solenoids
R9	5A	O2 heaters
R10	5A	Alternator ign.
R11	7.5A	A.c. compressor
R12	5A	Rev lamp, camera
R13	-	
R14	10A	Engine bay fan
R15	3A	Boot lamps
R16	10A	Boot pwr. socket
R17	20A	Amplifier
R18	5A	Fuel filler flap
R19	10A	Fuel pump
R20	5A	Alternator B+

Rear Fusebox



***Evora IPS**

Slot	*Rate*	*Circuit*
R5	30A	TCU main relay
R6	5A	Gear select lock solenoid
R7	7.5A	ECU ignition
R13	7.5A	Eng Acc Solenoids

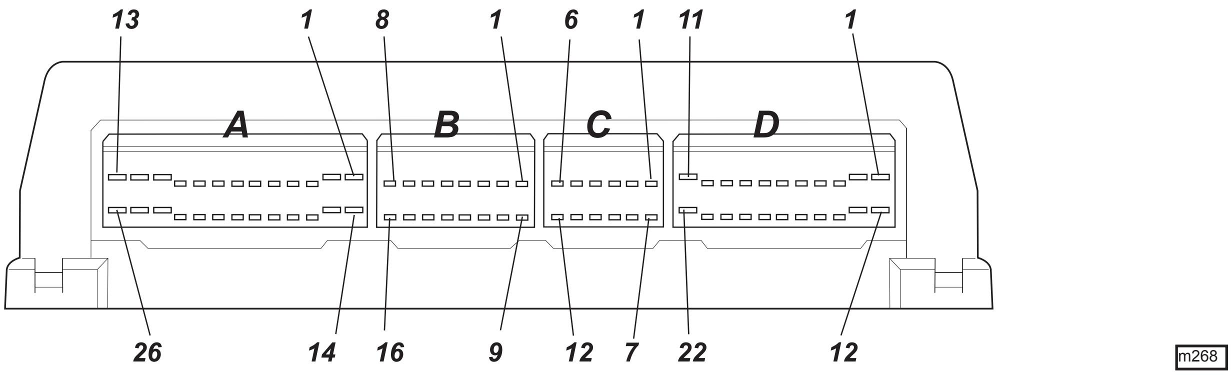
Fuse colours

2A - Black	5A - Orange	15A - Light blue
3A - Violet	7.5A - Brown	20A - Yellow
4A - Pink	10A - Red	25A - Clear

Slot	*Rate*	*Circuit*
MR1	30A	Crank & main rly.
MR2	30A	Busbar R17-R20

Integrated Control Module

Also mounted on the front fusebox panel is the integrated control module (ICM) which is used to perform switching and control functions for many of the circuits. The module uses 4 harness connector blocks designated A,B,C,D, with all connection details identified on the relevant circuit diagram, and summarised below:



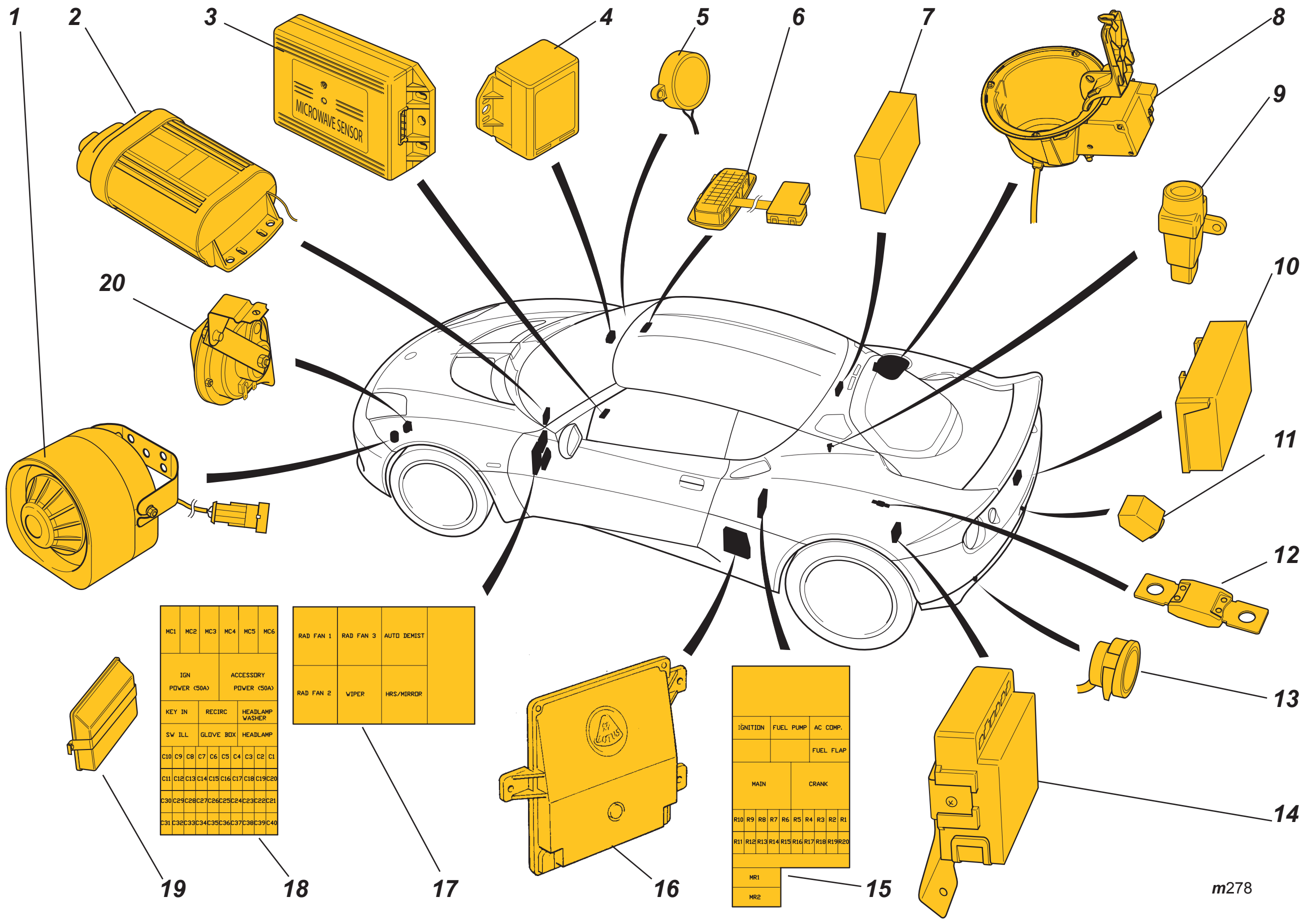
Pin	*Description*
A1	Supply for indicator relays
A2	Left indicators output
A3	-
A4	-
A5	Fog switch input
A6	-
A7	-
A8	Headlamp powerwash output
A9	A.c. recirc. control output
A10	Supply for recirc. & powerwash control
A11	Horn output
A12	Supply for horn & foglamps
A13	Supply for indicator current sense
A14	Right indicators output
A15	Battery ground
A16	-
A17	-
A18	-
A19	LED lighting option input
A20	Left indicator switch input
A21	Right indicator switch input
A22	Intermittent variable input
A23	DRL option input
A24	Battery ground
A25	Fog lights output
A26	Indicators supply after current sensing
B1	Main beam flash input
B2	Recirc. switch input
B3	Hazard switch input
B4	Wiper int. input
B5	Washer monitor input
B6	HRW switch input
B7	A.c. request switch input
B8	Driver door switch input
B9	CDL switch illumination
B10	CDL switch monitor
B11	Lock status input
B12	Unlock status input

Pin	*Description*
B13	-
B14	Passenger door switch input
B15	Headlamp switch input
B16	Sidelamps switch input
C1	Main beam flash power input
C2	Int. fan fast input
C3	Fog switch illum. input
C4	-
C5	Drive away locking output
C6	Sidelights switch illum. output
C7	HRS output
C8	Recirc. switch illum. output
C9	A.c. request output
C10	-
C11	-
C12	Diagnostic comms. KW2000
D1	ICM main supply & main lighting
D2	-
D3	HRS switch illumination
D4	Ignition switch input
D5	Headlamp relay output
D6	Hazard switch illumination
D7	Hazard active illumination
D8	A.c. switch illumination
D9	Headlamps switch illum. output
D10	-
D11	Door open output
D12	Sidelights output
D13	Main beam solenoid output
D14	Int. fan speed input
D15	Horn switch output
D16	-
D17	Eng. man. rpm input
D18	Wiper park input
D19	Wiper relay control output
D20	Auto demist input
D21	Indicators fault monitor input
D22	-

Component Location

1. Alarm siren: Left hand front wing area
2. Alarm ECU: Under dashboard
3. Alarm microwave sensor: Behind centre console
4. CDL module; Passenger side of scuttle beam vertical face.
5. Sounder parking aid (early vehicles only, now incororated into instrument pack
6. Homelink module: Front of headliner above windscreen
7. Reversing camera ECU (if fitted); In boot, on LHS of rear transom.
8. Fuel filler flap solenoid: integral to fuel filler bowl assembly (see section MR.15)
9. Inertia switch: Mounted on the backstay at the left hand side of the engine bay
10. TPMS: module in boot, LH of tailgate latch assembly behind trim cover.
11. Reversing camera (if fitted): mounted on bracket behind centre of rear bumper
12. Mega Fuse: located in-line of battery positive harness
13. Sensor rear parking aid (if fitted): mounted into rear bumper
14. Rear parking aid ECU (if fitted): In boot, on LHS of rear transom.
15. Rear fusebox and relay station: Behind access panel located in left hand rear quarter trim panel
16. ECU (Electronic Control Module) and TCU (Transmission Control Module) behind access panel located in left hand rear quarter trim panel (see MR14).
17. Front relay station: passenger side footwell
18. Front fusebox: passenger side footwell
19. Integrated Control Module (ICM): mounted on the front fusebox panel
20. Horns; one beneath the front end of each front longeron, aligned with apertures in the air intake duct. Accessible after removal of front undertray.

Audio Equipment see section MR.7
Engine management components attached to the engine; see section EMR.
Supplementary Restraint System (SRS); see section WF.
Anti-lock Braking System (ABS); see section JL.



MR.7 - AUDIO EQUIPMENT

Operating instructions for the unit fitted are contained in a separate booklet supplied by the equipment manufacturer. The audio set will operate with the ignition key inserted, and in any of its positions, including the '0' lock position.

On cars fitted with a 2-DIN audio system and 175mm display screen, the following features are also included:
- AM/FM radio;
- CD audio;
- DVD video, operable only with the parking brake engaged;
- i-pod to i-pod video interaction/control;
- MP3 player;
- USB, phono and i-pod inputs located in the glovebox;
- Satellite navigation;
- Integrated microphone for Bluetooth phone operation;
- When set is switched on, automatic display from reversing camera when reverse gear is engaged.
- Note that the screen should be cleaned occasionally with a lint free, spectacle polishing cloth.

Note
- The 'satnav' system includes a road network safety camera database, which may be activated at the owner's request when the system is set up. If using the vehicle in territories where such a feature is illegal, it is the owner's responsibility to ensure that the system is de-activated.
- Note that the quality of radio reception will vary according to audio equipment fitted and local area signal strength.

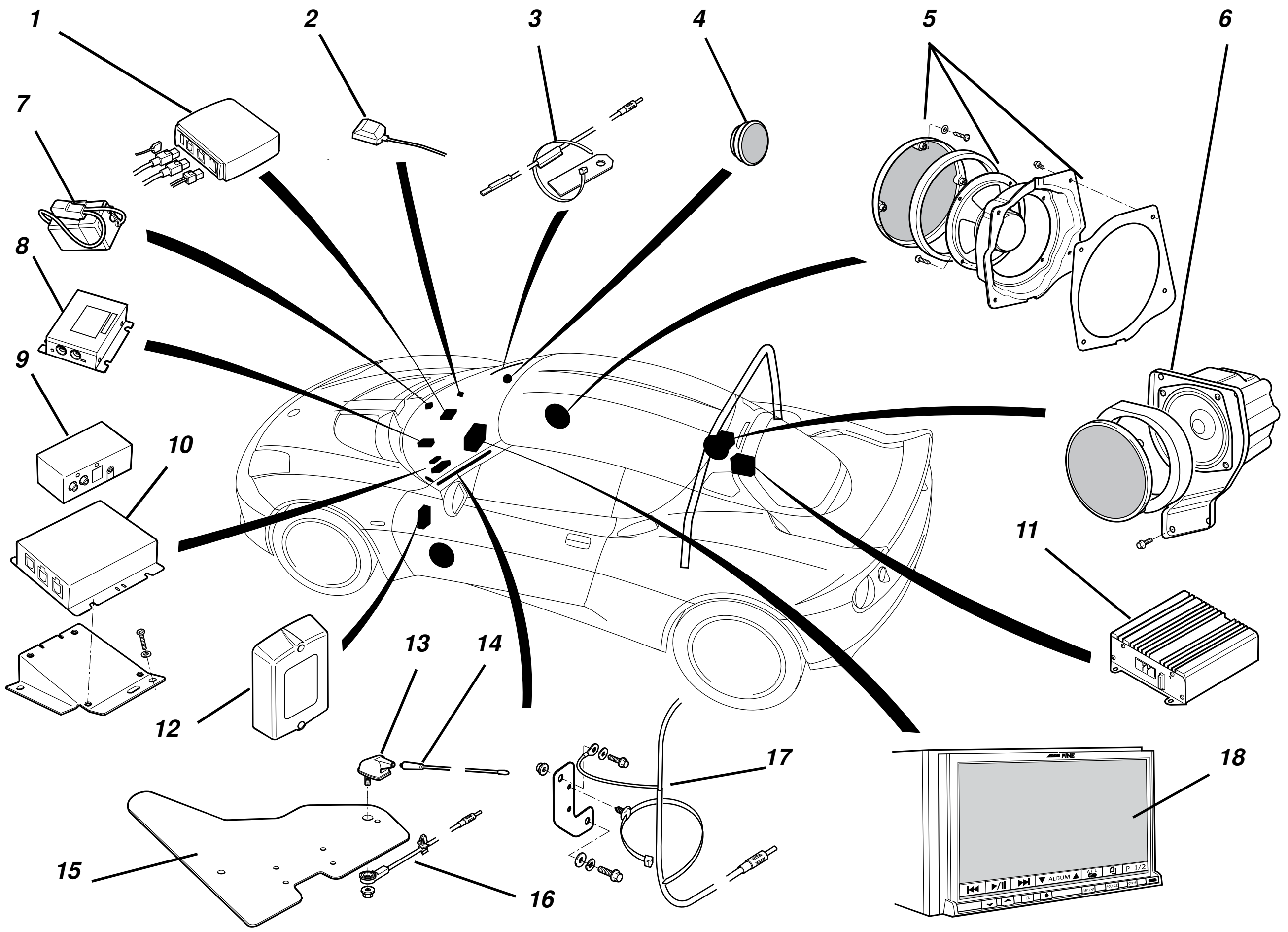
Speakers: A main speaker is fitted into each of the door trim panels, and a high frequency 'tweeter' incorporated into each end of the dash fascia panel. In addition, some cars are fitted with a single sub-woofer, low freqency speaker in the right hand rear quarter trim panel.

Door speakers - Alpine LUK-SB01B (4-speaker base spec.):
145mm aperture, 63mm depth

Door speakers - Alpine LUK-SB02T: (4/5-speaker high spec.):
145mm aperture, 63mm depth
Sub-woofer - Alpine SWE 843 (5-speaker high spec.):
183mm aperture, 111mm depth

Tweeters - Alpine LUK-ST01:
42mm aperture, 12mm depth

Security: Some audio sets feature a removable front panel; For details, refer to the set manufacturer's litera ture.

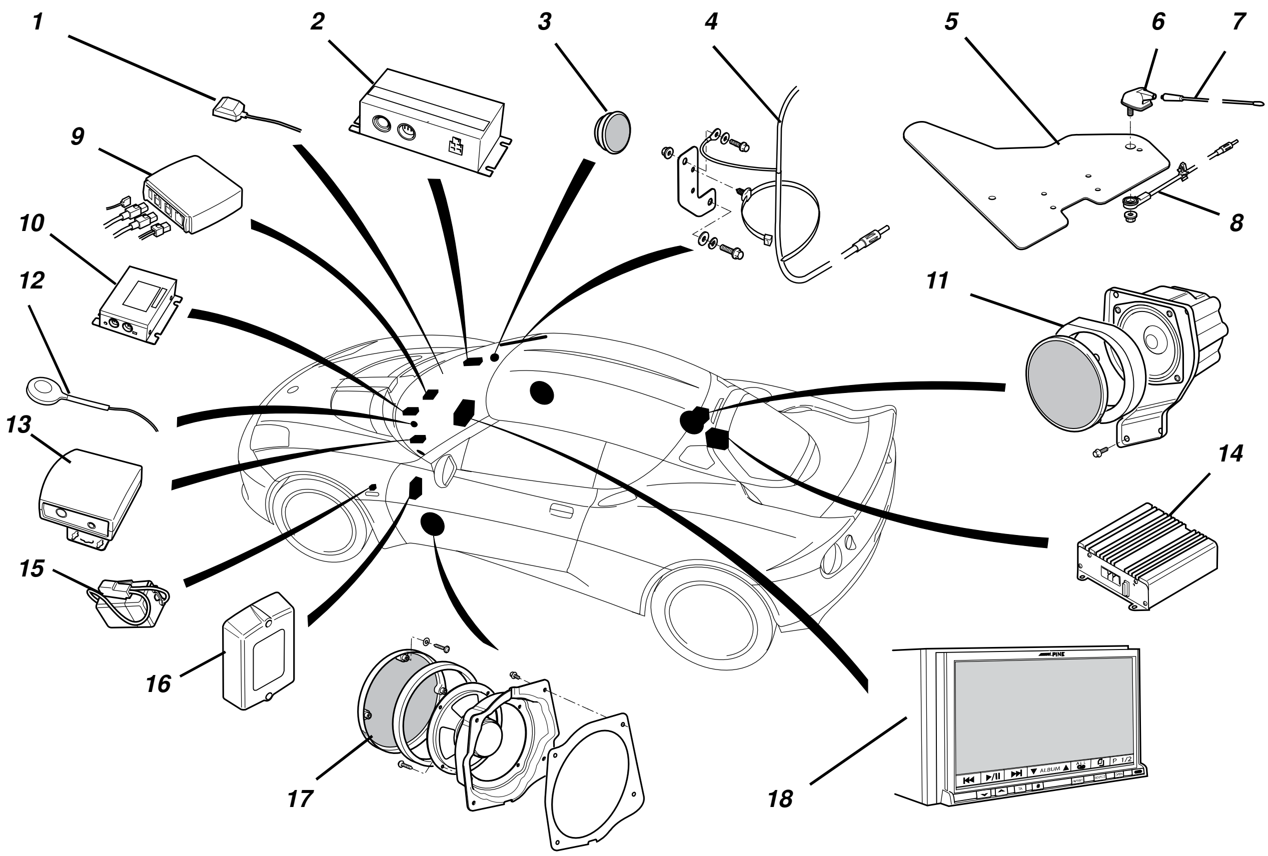


I.C.E COMPONENT LOCATION - EURO/ROW & JAPAN MARKETS

m269

Item	Description	Location
1	Blue tooth module†	Attached to scuttle under dash fasca
2	GPS antenna**†	Attached to scuttle under dash fasca
3	TMC Antenna*	Behind 'A' Pillar trim opposite side to antenna mast
4	Speakers, tweeter	Fascia top panel
5	Speakers, main	Door trim panels
6	Speaker, subwoofer**	Behind RHR quarter panel trim
7	Radio choke	In front of main fusebox
8	Imprint module**	Under scuttle behind passenger lower facia trims
9	Imprint navigation interface†	On top of Navigation module
10	Navigation module†	Attached to scuttle under dash fascia
11	Amplifier*	Behind RHR quarter panel trim
12	Cross over modules	Attached to LH/RH chassis 'A' post area behind lower 'A' post trims
13	Antenna base	Attached to ground plane
14	Antenna mast	Behind passenger 'A' pillar trim
15	Antenna ground plane	Bolted to passenger side scuttle under dash fascia
16	Antenna co-axial cable	In front of scuttle under dash fascia
17	Antenna/co-axial cable††	Behind passenger 'A' pillar trim and in front of scuttle beam
18	Head unit	Behind inboard switch panel attached to main fascia

* Only supplied to specific markets.
** Additional equipment supplied with 'Tech Pack' option.
† Additional items fitted with 'Tech Pack' option with fixed Sat Nav head unit fitted from VIN BH_10948
†† Replaces items 13 -16 from VIN BH_10948



I.C.E COMPONENT LOCATION - FEDERAL MARKETS

m270

Item	Description	Location
1	GPS antenna*†	Attached to scuttle under dash fascia
2	Radio interface module	Attached to scuttle under dash fascia
3	Speakers, tweeter	Fascia top panel
4	Antenna/co-axial cable††	Behind passenger 'A' pillar trim and in front of scuttle beam
5	Antenna ground plane	Behind passenger 'A' pillar trim
6	Antenna base	Attached to ground plane
7	Antenna mast	Behind passenger 'A' pillar trim
8	Antenna co-axial cable	In front of scuttle under dash fascia
9	Blue tooth module†	Attached to scuttle under dash fasca
10	Imprint module*	Under scuttle behind passenger lower facia trims
11	Speaker, subwoofer*	Behind RHR quarter panel trim
12	Antenna, satellite radio*	Attached to chassis 'A' post area behind lower 'A' post trims
13	Tuner, satellite radio*	Attached to scuttle under dash fascia
14	Amplifier*	Behind RHR quarter panel trim
15	Radio choke	In front of main fusebox
16	Cross over modules	Attached to LH/RH chassis 'A' post area behind lower 'A' post trims
17	Speakers, main	LH/RH Door trim panels
18	Head unit	Behind inboard switch panel attached to main fascia

* Additional equipment supplied with 'Tech Pack' option.

† Additional/revised items fitted with 'Tech Pack' option with fixed Sat Nav head unit fitted from VIN BH_10948

†† Replaces items 5 -8 from VIN BH_10948

To remove the audio head unit

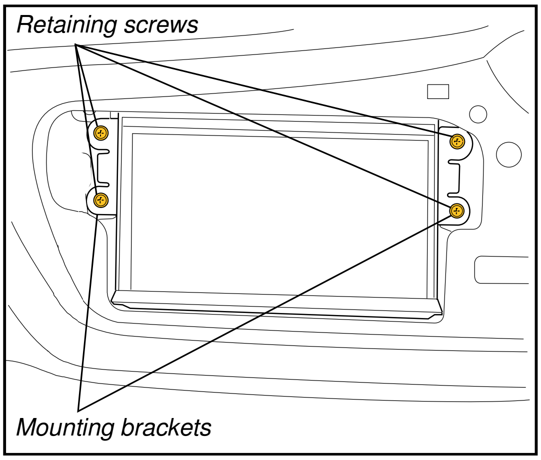
1. Activate unit so that the display screen tilts open.

2. Carefully remove the inboard switch panel. (see sub-section VE.7 step 4).

3. Remove the unit by supporting it at the mounting brackets whilst carefully pulling and twisting it away from the fascia dash panel.

4. Unplug all rear harnesses and pigtail connectors.

Refit in reverse order to removal.

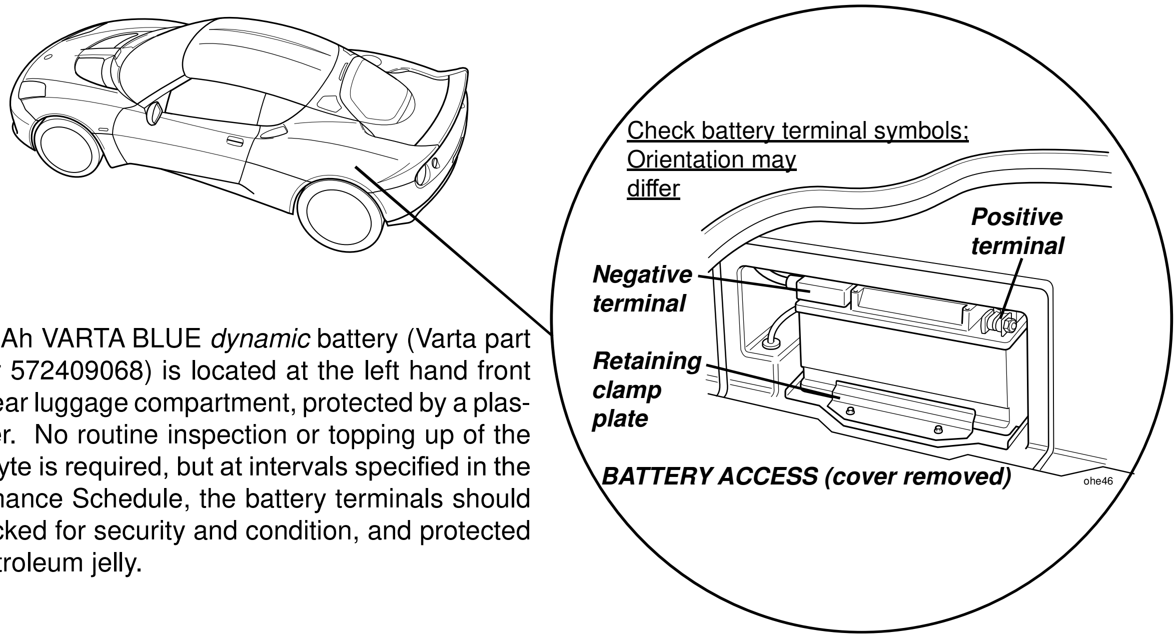


MR.8 - BATTERY, BATTERY CABLES & EARTHING POINTS

Battery

WARNING: POISON/DANGER - CAUSES SEVERE BURNS - KEEP OUT OF REACH OF CHILDREN. Contains sulphuric acid - avoid contact with skin, eyes or clothing. If in contact with skin or eyes; flush with copious amounts of water. Remove contaminated clothing. Seek immediate medical attention. If ingested; seek immediate medical attention . Do not induce vomiting or give fluids to drink. Batteries produce explosive gases. Keep sparks, flames and cigarettes away. Ventilate when charging or using in enclosed space. Always shield eyes when working near batteries.

Battery Access



BATTERY ACCESS (cover removed)

The 72 Ah VARTA BLUE *dynamic* battery (Varta part number 572409068) is located at the left hand front of the rear luggage compartment, protected by a plastic cover. No routine inspection or topping up of the electrolyte is required, but at intervals specified in the Maintenance Schedule, the battery terminals should be checked for security and condition, and protected with petroleum jelly.

To remove the battery, release the three thumbscrews and remove the plastic cover. Release the two screws and remove the retaining clamp from the base of the battery. Withdraw the battery sufficiently to allow the cables to be disconnected (see below).

When lifting out the battery, be aware of the considerable weight, and take all appropriate precautions to safeguard personal health.

Refit the battery, with its terminals to the rear, by reversing the above procedure. Remember to push on the breather pipe (if applicable).

Disconnecting the Battery (also see section FA for information for Evora IPS battery disconnection)

If the battery is to be disconnected, the following precautions should be taken:

i) If the vehicle is fitted with security coded audio equipment, check that the code is available for entering after battery reconnection.

ii) Wait for at least **30 minutes** after switching off the ignition to allow the engine management system to and associated sensors to shut down in the correct sequence.

iii) Ensure that all electrical loads (e.g. lights) are switched off.

iiv) Check that the security alarm is disarmed. If the battery is disconnected when armed, the alarm will be triggered.

v) Disconnect the **negative** (earth; black; '-') battery cable first, and re-connect last. If the battery positive terminal is inadvertently earthed (e.g. when using a spanner) whilst the negative terminal is still connected, the resultant short circuit with heavy sparking and current flow could cause serious burns.

Battery Reconnection

i) Check again that all electrical loads are switched off.
ii) Connect the positive battery cable first, followed by the negative (earth) cable.
iii) Be aware that the vehicle security alarm may be triggered by the action of battery re-connection. Have the alarm transmitter key ready to disarm the alarm (see 'Vehicle Security Alarm').
iv) After reconnection, a change in the engine performance characteristics may be noted for a period whilst the computer controlled engine management system 're-learns' some of its settings.
v) If necessary, enter the security code into audio equipment.

Battery Charging

Under conditions of normal daily use, it should not be necessary to use external battery charging equipment. In a low usage regime, however, it is important to maintain the charge state of the battery using a trickle charger, or an automatic battery management conditioner such as that available through Lotus After Sales. Starting difficulties may be encountered after an unattended period of 3 weeks. A battery conditioner is able to continuously monitor battery charge state and switch on and off automatically in order to maintain the battery in a fully charged condition without danger of damage through overcharging.

If the battery becomes discharged to the extent that the car cannot be started, the recommended course of action is to fit a substitute battery whilst the original battery is trickle charged. If, in an emergency, the car has to be 'jump' started, the subsequent conditions of car use may not allow for sufficient alternator charging of the battery to achieve a fully charged state. The battery should be trickle charged by external means until 12.8 volts is recorded, which process may take 24 hours or longer. Putting the battery into service at a lower state of charge will reduce the time period for which the car can be parked without subsequent starting concerns. A battery left in a fully discharged state for a prolonged period, may not be recoverable to its original condition.

Unless using an automatic battery management charger, the battery should be removed from the car for recharging, to a well ventilated area to avoid a build up of fumes in the luggage compartment and to prevent damage to the car's electrical system. Observe the safety precautions listed above when removing the battery and take care to avoid sharp knocks or shocks, keeping the battery as upright as possible. Beware of the considerable weight of a battery, and take necessary precautions against personal injury.

The recommended bench charge rate is 4 amps. When the battery is fully charged (12.8 volts), allow it to stand for an hour before refitting into the battery well and reconnecting the leads - see above.

Quiescent Drain

With a fully charged battery, a car with no aftermarket electrical equipment fitted, all electrics switched off, and the alarm system either armed or disarmed, will have a quiescent current drain of between 27 - 32 mA dependent on audio and sat. nav. options. Under normal conditions, this should allow a park period of over four weeks before starting difficulties may be encountered.

If current drain is found to significantly exceed specification, the cause must be established by isolating components (e.g. at fusebox) and rectifying faults as necessary.

Battery Cables

Two red cables are connected to the battery positive post. One leads to the solenoid on the starter motor. A second cable leads to the positive post fixed to the back of the cabin bulhead in the LHR wheelarch area, and includes an 'in-line' 150A fuse. This post is linked via a cable routed through the LH sill area to the front mounted positive post on the top of the passenger side scuttle, and from here to the main fusebox/relay panel at the front of the passenger footwell.

A braided earth cable connects the negative battery terminal to the chassis rear earth point, on the inside face of the LH siderail, at the LHF of the engine bay, accessible from beneath. Two further cables link this point to the transmission casing, and to the rear fusebox and ECU mounting bracket at the LHR of the cabin.

WARNING: Before disconnecting a live feed cable from either post, first disconnect the earth cable from the battery. Be aware of the danger of short circuits and sparks caused by a live feed cable contacting the chassis or other metal components.

The rear positive post is mounted on a bracket which also secures the left hand end of the evaporative emissions canister, and is accessible with the wheelarch liner and/or rear clamshell removed. Special care should be taken to prevent sparks in this area. When re-connecting the rear positive post, note that two spacers A075W4020Z should first be fitted onto each stud, before each pair of cables is assembled back to back, with the battery and front fusebox cables on the front stud, and the alternator and rear fusebox cables on the rear stud. Tighten the M8 retaining nuts to 16 Nm.

MR.9 - WIPER MECHANISM

The windscreen wiper mechanism comprises a uni-directional motor with an external rotary link, a connecting rod, and a pair of actuating links which join the connecting rod to the arms of the wiper spindle. This mechanism provides the wiper with a motion which is slowed at each end of its travel in order to ease the inertia loads during direction changes, to the benefit of refinement and durability.

The motor and wheelbox are mounted on a single pressed steel bracket which is bolted to the underside of the windscreen frame.

There are separate assembly part numbers for either LHD or RHD vehicles; this allows adequate clearance for the brake servo/master cylinder assembly.

The windscreen frame is not handed but is machined with additional threaded inserts to accommodate both LHD and RHD wiper motor assemblies.

Removal:
1. Remove the plastic cap covering the wiper arm securing nut.

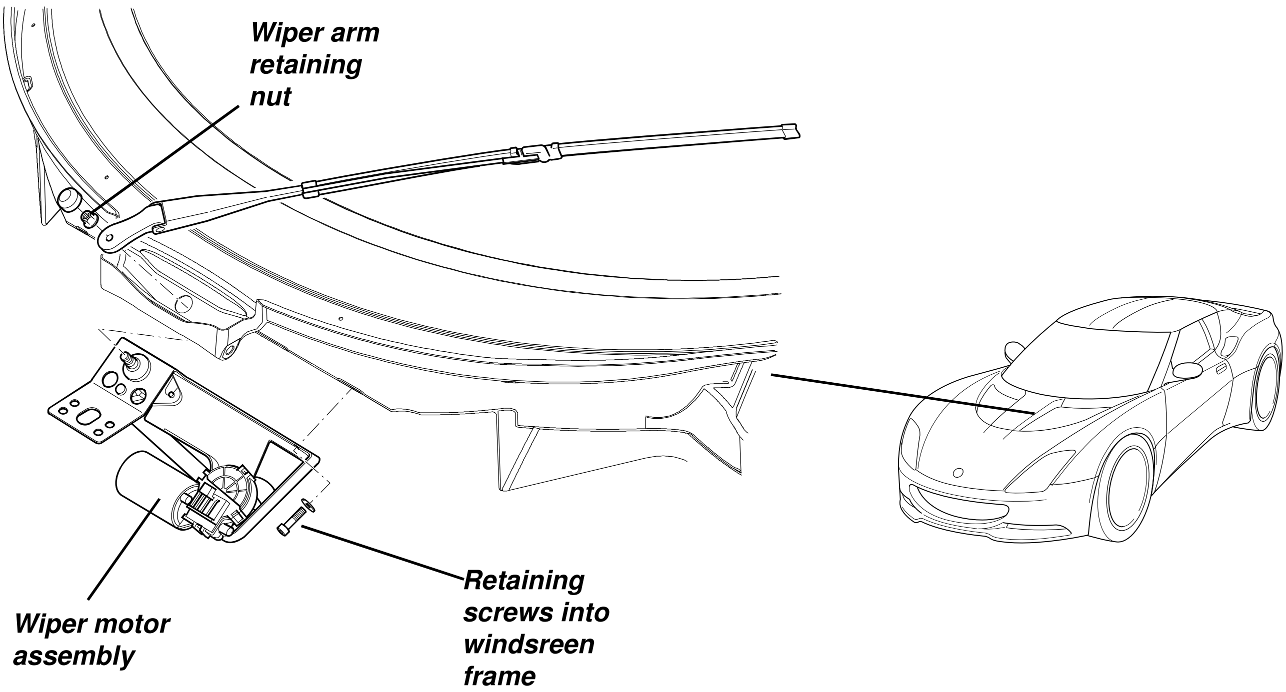
2. Release and remove the M10 nut securing the wiper arm to the motor pivot (torque 22Nm) and remove the wiper arm.

3. Unplug the harness connector from the wiper motor.

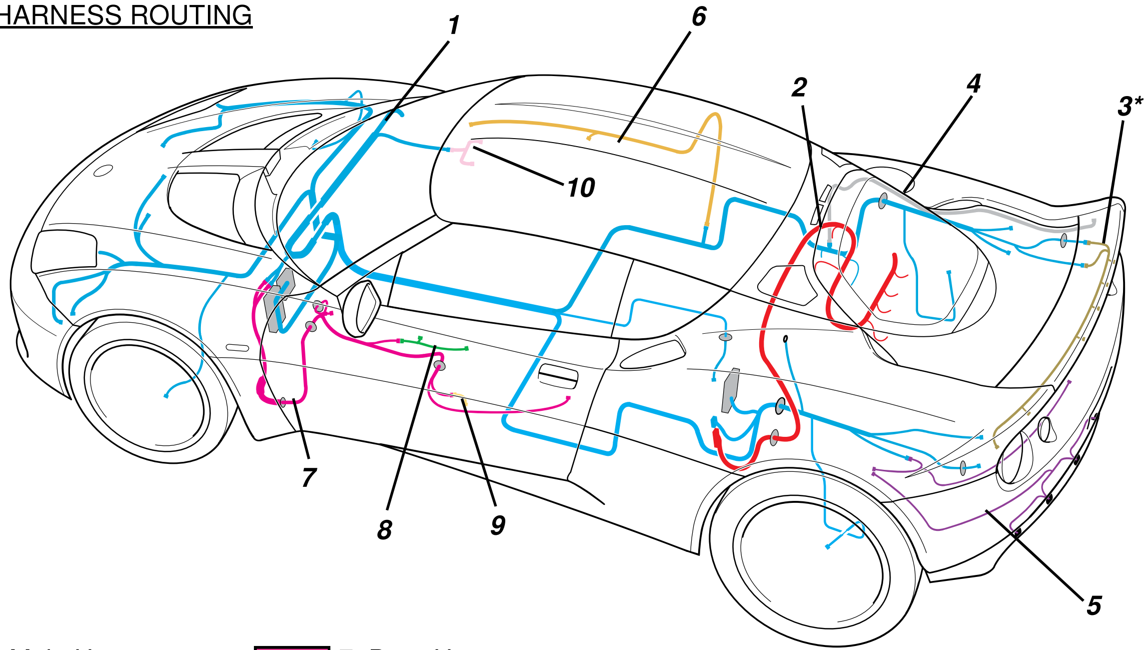
4. Release the M8 x 25 (4) cap headed screws and washers around the wiper spindle that secure the mounting bracket to the windscreen frame, and the single M8 x 25 screw and washer at the motor end of the bracket (all torque tightened to 25Nm).

5. Withdraw the wiper mechanism from the windscreen frame.

Refitment:
Re-assemble in the reverse order to removal, but before fitting the wiper arm switch on the wipers to reset spindle position.



MR.10 - HARNESS ROUTING



1. Main Harness
2. Engine Harness
3. Rear Harness*
4. Tailgate Harness
5. Parking Aid Harness
6. Roof Harness
7. Door Harness
8. Door Switch Panel Harness
9. Window Motor Harness
10. Steering Wheel, Cruise Control Switch Harness

Main Harness

The main harness runs from the main fusebox/relay station at the front of the passenger footwell, up to the center underside of the scuttle, across to the passenger side and through to the top of the scuttle. It then runs across the full width of the scuttle to supply all the fascia components and to each of the separate door harnesses.

At the centre of the front bulkhead, a branch of the main harness penetrates the bulkhead and divides along each side to supply the HVAC functions, ABS, lighting and other front mounted electrical equipment.

From the same junction at the front bulkhead, a further branch runs down the centre of the cockpit, beneath the gearchange mounting channel to supply the fuel pump, with branches also running to each side behind the seat mounting front cross-member and back to each rear quarter area.

The RH branch supplies the roof harness near the 'B' post area and continues through the rear bulkhead to supply the tailgate and rear lighting harnesses (*care point, please see information on next page with regards harness routing to avoid retaining tape coming into contact with LH luggage compartment lamp).

The LH branch connects to the engine management ECU and engine harness, then continues through the bulkhead to supply the parking sensors and TPMS.

Although there may be different harnesses available dependant on vehicle model year, specification etc, the same main vehicle harness is fitted to both RHD and LHD models, with the harness direction reversed at applicable areas to accommodate the connection of driver controls, instruments panels, fuse boxes, electronic throttles etc.

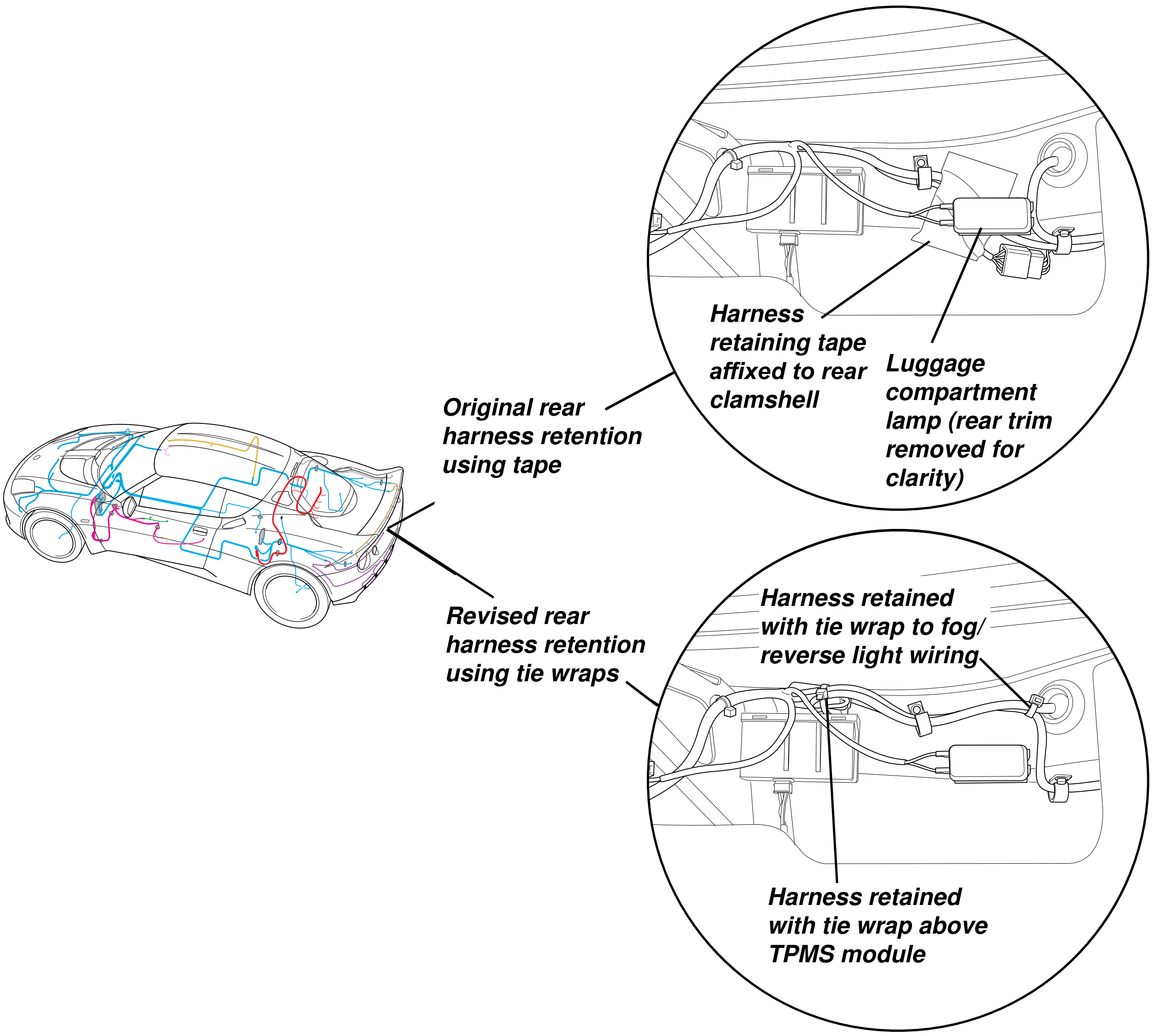
Rear harness care point
Vehicles built between September 2009 and August 2013 had tape retaining the rear harness. After this time the harness was retained with tie wraps.

In the event that either:

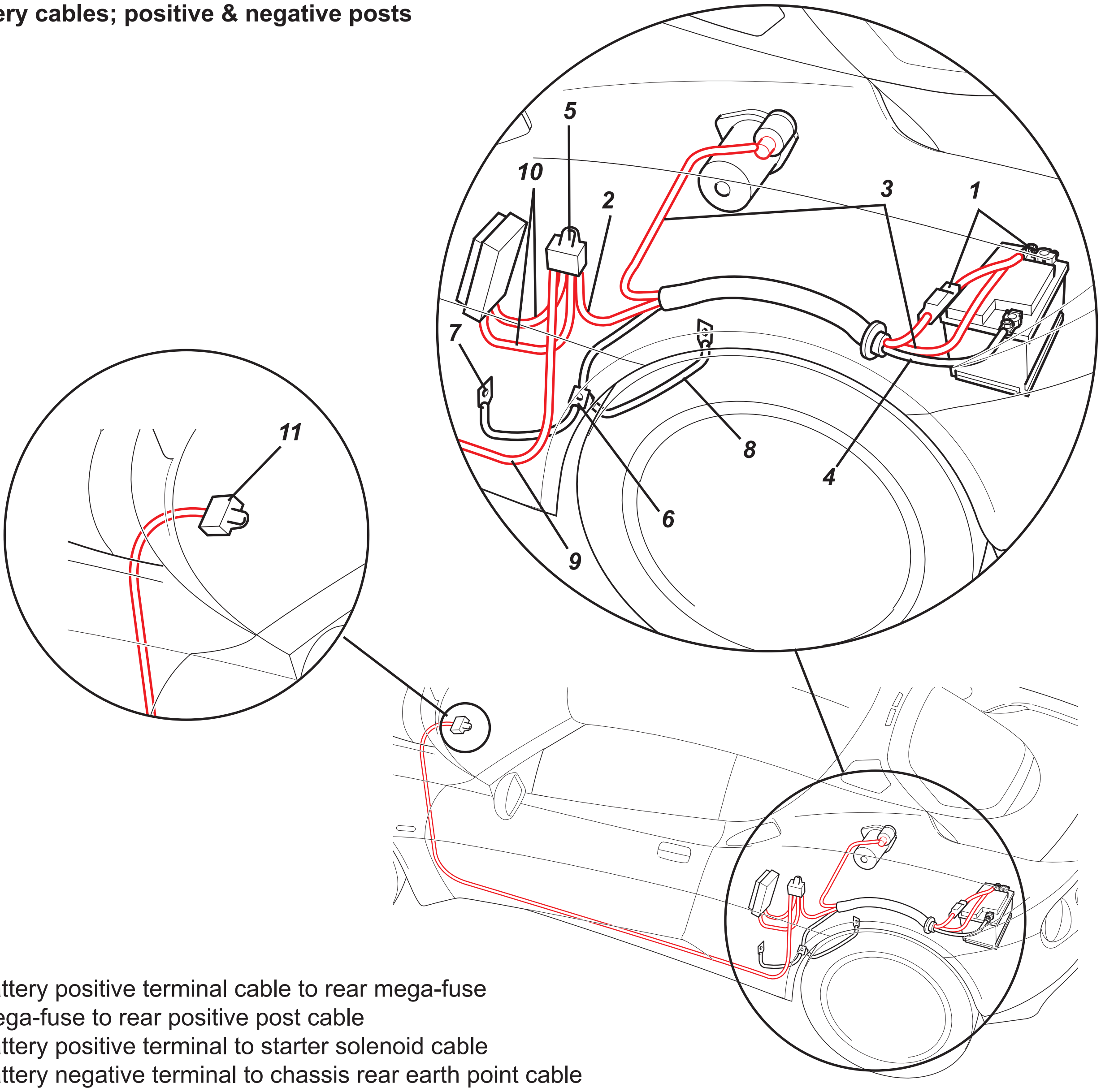
- Rear harness is renewed
- Rear luggage compartment renewed or removed for access
- Rear clamshell removed/renewed

Please remove the harness securing tape and re-route the harness by fitting tie wraps to:

- Fog/reverse connecter and wiring to rear harness above TPMS (Tyre Pressure Monitoring System) module.
- Rear harness to rear fog/reverse lamp wiring at grommet where it exits the rear clam.

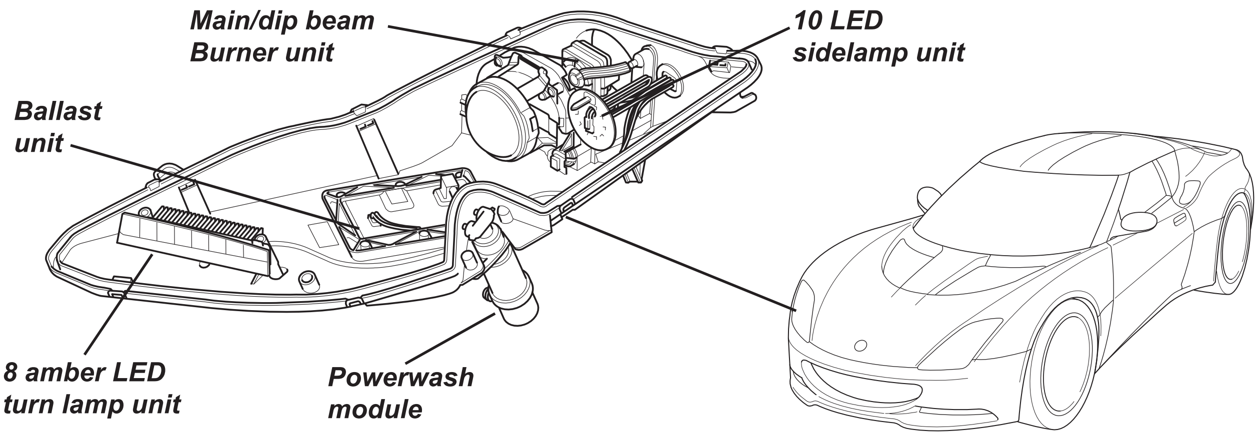


Battery cables; positive & negative posts



1. Battery positive terminal cable to rear mega-fuse
2. Mega-fuse to rear positive post cable
3. Battery positive terminal to starter solenoid cable
4. Battery negative terminal to chassis rear earth point cable
5. Rear positive binding post on underside of wheelarch panel
6. Chassis earth post stud
7. Chassis earth to ECM plate earth cable
8. Chassis earth to engine earth cable
9. Rear positive post to front positive post cable
10. Rear positive post to MR1 & MR2 maxi-fuse (in rear fuse box) cables
11. Front positive post (supplying voltage to MC1 & MC2 maxi-fuse in front fuse box)

MR.11 - HEADLAMP ASSEMBLIES



The Lotus Evora is fitted with High Intensity Discharge (HID)/Xenon headlamp assemblies, the light sources of which utilise a plasma discharge arc between two electrodes to provide a blue-white light for optimal illumination of the roadway. Each headlamp unit uses a D1S electronic igniter/burner unit (equivalent to the bulb), mounted in a specially coated alloy reflector, ahead of which is fixed a glass aspheric lens on an alloy carrier. A shielded high tension harness connects the burner unit to a voltage ballast unit mounted in the base of the headlamp housing. The ballast unit is supplied with battery voltage and outputs around 20,000 volts (up to 80,000 during the start up phase) to the burner, although the power consumption is only 35 Watts.

A bottom pivoted flap is used to mask the upper part of the light beam (i.e. lower part in front of the lamp, prior to beam inversion by the aspheric lens), and allow a single light source to provide both main and dip beams. The flap is sprung and counterweighted in order to default to the vertical, masking, position, and is swung down by a solenoid fixed to the side of the reflector unit, when main beam is selected. Also contained within each headlamp housing is a 10 LED sidelamp, positioned outboard of the headlamp, and an 8 amber LED turn lamp at the front of the housing, fronted by a clear diffuser.

Due to the increased light production of the gas discharge headlamps, and the increased potential for dirt on the lamp cover causing dazzle from refraction, a powerful headlamp washer is fitted. A dedicated high pressure pump is fitted into the windscreen washer bottle, and supplies a powerwash module incorporated into the outer side of each headlamp unit, normally lying flush with the headlamp cover. When the windscreen washer control is operated, the headlamp washer pump is also activated for 2 seconds, the pressure from which causes the telescopic washer module to extend about 20 mm above the headlamp cover and deploy two conical sprays of fluid from a pair of high flow jets. The module then returns under spring action to its flush position.

Note that certain atmospheric conditions may result in some condensation inside the lamp unit. This should have no significant effect on lamp performance and is no cause for concern.

Headlamp Servicing

The only serviceable parts of the Xenon headlamp unit are:

- D1S burner unit*
- Voltage ballast unit
- Powerwash module
- High tension cable

*Only the main/dip beam burner unit can be replaced with the headlamp assembly in situ, all other serviceable parts require removal of the headlamp from the vehicle to gain sufficient access.

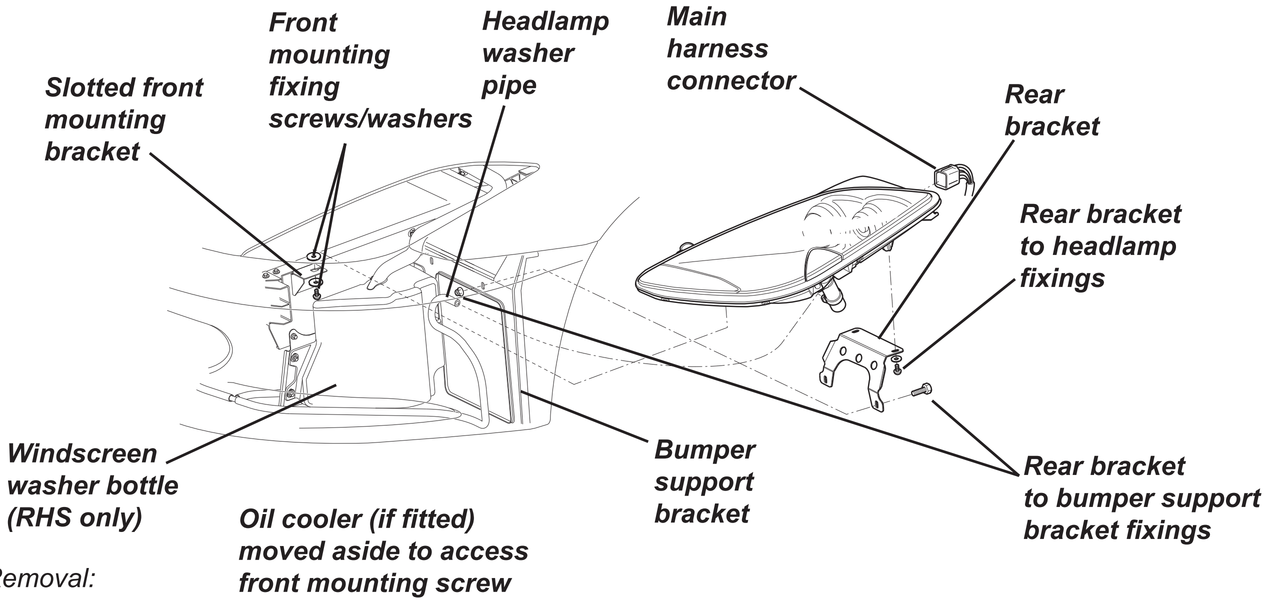
WARNING:
The high voltages produced by the headlamp ballast unit could cause injurious electric shocks. Ensure the battery is disconnected before servicing the headlamp assembly.

Headlamp Assembly Removal

Each headlamp is secured to the front subframe longeron via front and rear mounting brackets. To remove a headlamp assembly:

Preparation:

If the vehicle is fitted with either a front mounted oil or transmission fluid cooler, then this must be withdrawn from the front bumper support bracket to gain sufficient access to the headlamps front mounting screw. Release the fixings securing the oil cooler to the bracket and secure over to one side. Please note it should not be necessary to disconnect the oil cooler hoses, refer to service notes section KJ.7 for further information.



Removal:

1. Disconnect the main harness multi-plug from the headlamp electrical connector and pull washer tubing of the powerwash module fluid inlet pipe.

2. Release (but do not remove) the M6 x 12 button headed screw and washers securing the headlamp to the front subframe mounting bracket (the bracket is slotted to aid with headlamp removal/fitment).

3. Release and remove the M6 x 12 button headed screws and washers (2) securing the headlamp to the rear bracket.

4. Release and remove the M6 X 16 bolts and flanged nuts (2) securing the rear bracket to the bumper support bracket.

5. Withdraw the headlamp assembly.

Refitment:

Is the reverse of removal except:

- When re-fitting, ensure the front clamshell is first fitted and optimised for position before adjusting the head-lamp mounting to obtain a satisfactory fit of the lamp in the aperture.

- It is important that a washers for the mounting screw are located correctly, i.e., one either side of the front mounting bracket, to achieve this in the limited space available it is recommended to either bond the upper washer to the underside of the headlamp housing or loop a piece of plastic strip packaging or loose unzipped cable tie around the fixing screw below the upper washer. The strip or tie can them be withdrawn once the fixing screw is slid back into the slot of the mounting bracket.

- Re-connect the harness and washer tubing and check headlamp beam alignment.

Headlamp Beam Alignment

1. Using beam setting equipment compatible with local regulations, position the machine between 300 and 700mm in front of the LH headlamp, and parallel with the two headlamp units using the sight bar or similar device dependent on the machine design, to ensure cross car match. Use the guides provided on the machine to ensure the correct height and lateral setting.

2. Switch on the headlamp dip beams and check the lateral beam alignment. The 'knee point' of the beam cut off line must lie within a tolerance of 2% to the passenger side, and 0%. Check the vertical alignment of the dip beam which must lie within a tolerance of -0.5% and -2%.

3. If adjustment is required, turn the steering to full lock to facilitate removal of the four screws retaining the access cover in the wheelarch liner.

4. Each headlamp assembly features two adjustment screws, one for vertical, and one for horizontal aim (USA cars - vertical only). To adjust the beam laterally, turn the inboard adjuster screw. Turn clockwise to adjust the beam to the right. Optimum setting is 0%. To adjust the beam vertically, turn the outboard adjuster screw. Turn clockwise to raise the beam. Optimum setting is -1.2%. Re-check lateral alignment.

5. Repeat for the opposite lamp.

6. Re-fit the access cover in the wheelarch liner.

Headlamp beam masking for driving in opposite drive hand territories

The Evora headlamp assemblies do not have an internal masking facility. Therefore if it is necessary to drive a RHD vehicle in an opposite drive hand territory the low beam 'kick up' bias should be masked to prevent dazzle.

Proprietary adaptor kits such as 'Eurolites Headlamp Beam Adaptors' can be purchased from many different motorists stores and used for a limited time period with xenon headlamps.

The correct positioning of any adaptor is critical to ensure that only the dipped headlamps 'kick up' bias beam is masked without affecting the its horizontal beam pattern.

Therefore Lotus has produced beam converter templates that will aid in the fitting of suitable masking/adaptor kits, ensuring that they are positioned correctly on the headlamp lens so masking the 'bias' beam pattern area without disrupting the horizontal pattern.

Template information:

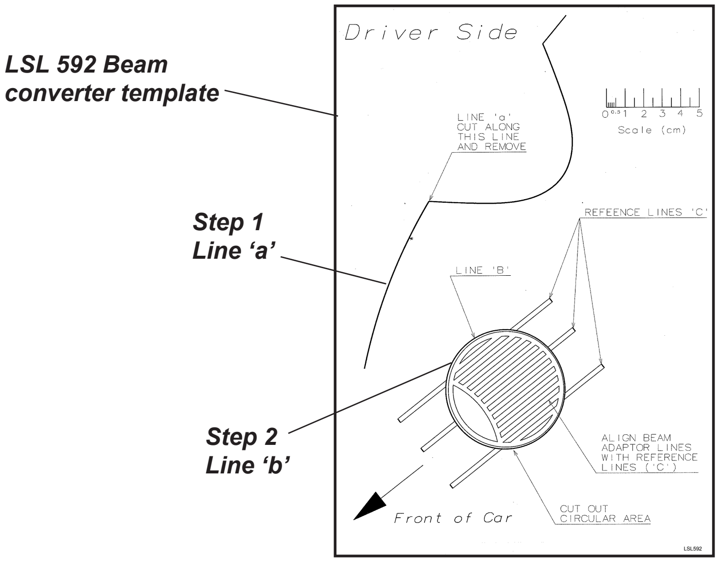
Part Number	Description	Qty
LSL 592	Beam converter template, driver's side - RHD	1
LSL 593	Beam converter template, passenger's side - RHD	1

ACTION:

1. Cut along contour line (a) and remove this portion of the template.

2. Cut out the circular area of the template following line 'b'.

3. Clean lens and activate lamps per Beam Adaptor manufacturer's recommendations which can be found in the included fitting kit.



4. Lay the ‘Drivers Side’ template onto the driver’s side headlamp lens using the inner line of the black ‘frame’ as a guide. Hold in place on the lens with 3 small pieces of masking tape.

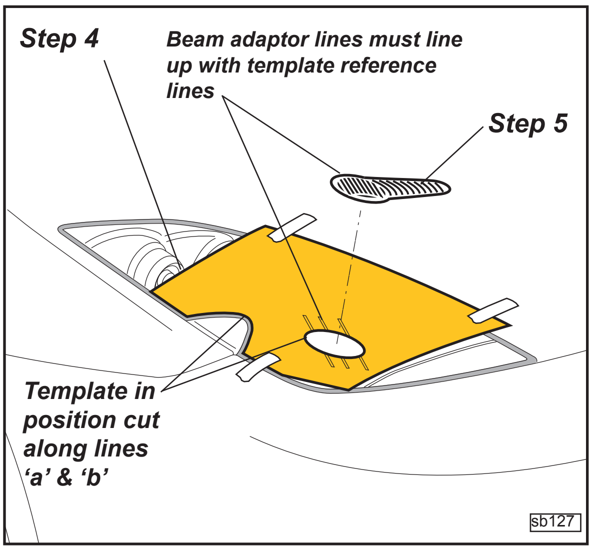
5. Peel off the backing paper from the circular section of the beam adaptor and position centrally inside the circular area of the template ensuring the adaptor lines are in the same orientation as the reference lines ‘c’ on the template.

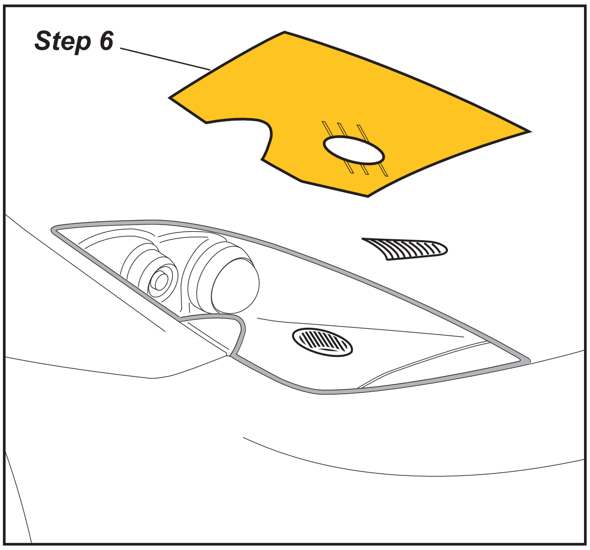
6. Remove the template.

7. Tear off the tail portion of the beam adaptor

Repeat the process using the ‘Passenger Side’ template for the passenger side headlamp.

For removal of the Beam Adaptors, follow the adaptor manufacturer’s instructions and recommendations.





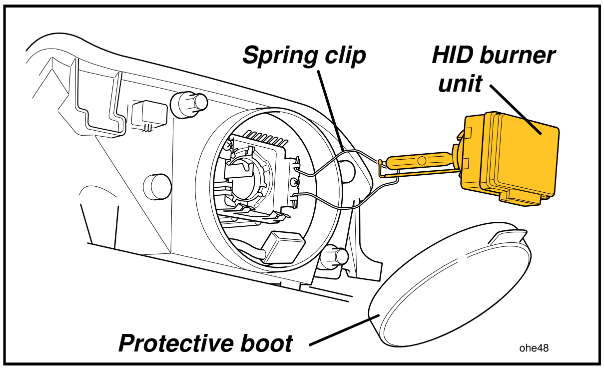
MR.12 - BULB REPLACEMENT

HID Xenon Headlamps
Each HID headlamp unit uses a D1S electronic igniter/burner unit (equivalent to the bulb), mounted in a specially coated alloy reflector, with a ballast unit to output around 20,000 volts to the burner.

WARNING: The high voltages produced by the headlamp ballast unit could cause injurious electric shocks. Ensure the battery is disconnected before servicing a headlamp assembly.

1. Disconnect the battery to protect from potentially injurious shocks. Remove the access cover in the wheelarch liner, and pull off the protective boot from the back of the headlamp housing.

2. Release the spring wire clip and withdraw the burner sufficiently to allow the H.T. cable to be unplugged. Note that touching the glass envelope by hand is likely to lead to premature failure. If necessary, the envelope should be cleaned using white spirit and a paper tissue.



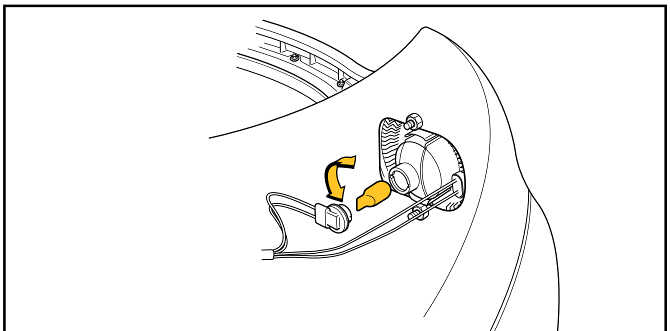
3. After refitting, verify lamp operation and check that the protective boot is correctly fitted onto the lamp body before replacing the wheelarch liner grommet.

Front Turn Indicator & Sidelamp Bulbs
The front turn lamps and sidelamps are provided by light emitting diodes (LEDs) and are incorporated into the headlamp assemblies. These lamps are designed for long life and are serviceable only by replacement of the complete headlamp unit.

Rear Lamp Cluster Bulbs
The outboard lamp cluster contains the tail, brake and turn indicator functions, and is configured as follows:

Annulus; tail and brake lamps.
Centre; turn indicator lamp.

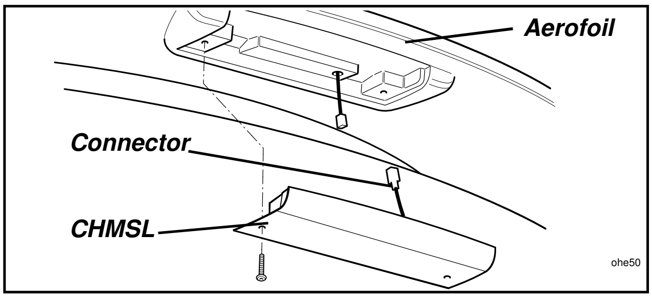
The tail and brake lamps are provided by a ring of light emitting diodes (LEDs), and are serviceable only by complete lamp cluster replacement. Each turn indicator lamp uses a filament type GE921 capless bulb retained in a bayonet type holder. From inside the boot, turn the bulb holder anti-clockwise to release from the lamp body, and withdraw the bulb.



REAR TURN LAMP BULB

Rear Fog and Reverse Lamps
A secondary lamp is mounted inboard of each rear lamp cluster, to provide a rear fog lamp on the driver's side, and a reversing lamp on the passenger side. Both these lamps are sealed units containing a ring of LEDs, which are serviceable only by replacement of the complete lamp. Note that this process requires the rear bumper to be removed (see sub-section BV.7).

Centre High Mounted Stop Lamp (CHMSL)
The CHMSL, mounted to the underside of the rear aerofoil, uses a string of light emitting diodes (LEDs) for optimum visibility. The lamp is a sealed unit with no replaceable bulbs, and may be replaced complete, after releasing the two retaining screws and unplugging the harness connector.

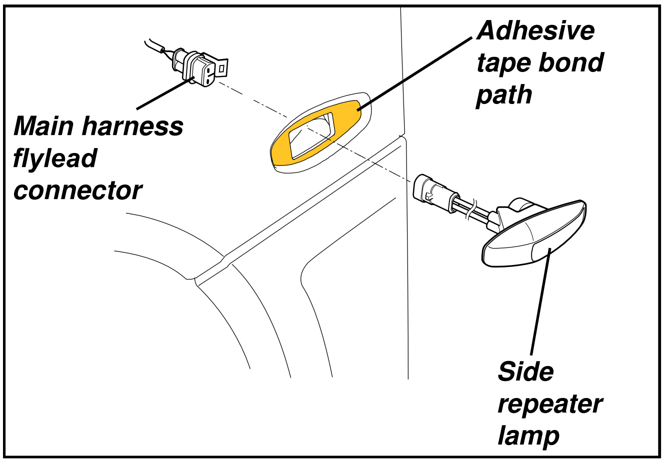


Side Repeater Lamps
The side repeater lamps are mounted in the front clamshell behind each wheelarch, and use durable light emitting diodes (LEDs). The lamps are serviceable only by complete replacement, the lamp being secured by an adhesive gasket.

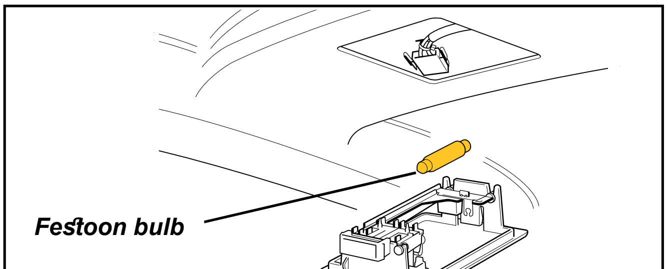
Removal:
1. Carefully prise the lamp away from the 'A' panel so breaking its adhesive bond.

2. Disconnect the lamps flylead connector from the main vehicle harness multiplug and withdraw from the vehicle.

Refitting:
Is the reverse of removal

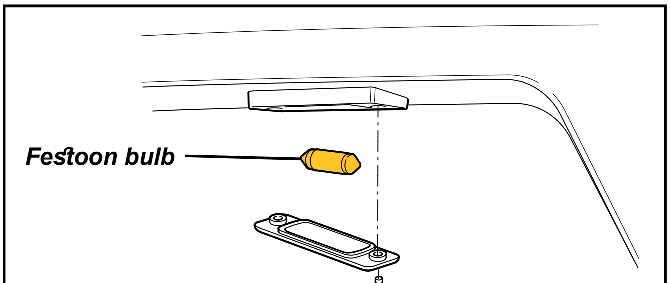


Interior Lamp
To withdraw the interior lamp from the roof trim panel, first ease one end of the lamp from its aperture. Withdraw the lamp sufficiently to allow access to the festoon bulb, if necessary, unplugging the harness connector.



INTERIOR LAMP BULB

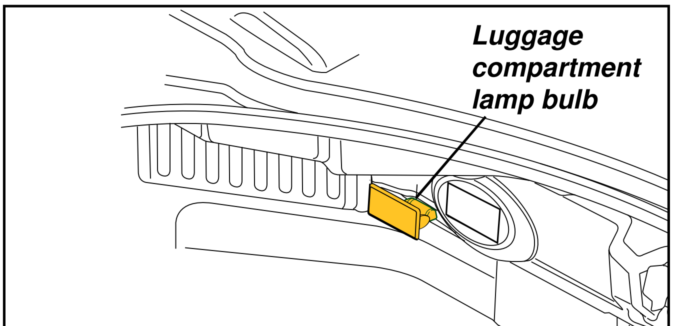
Licence Plate Lamps
To replace a bulb in a rear licence plate lamp, first remove the two screws securing the lamp to the body, and withdraw sufficiently to allow access to the festoon bulb.



LICENCE PLATE LAMP BULB

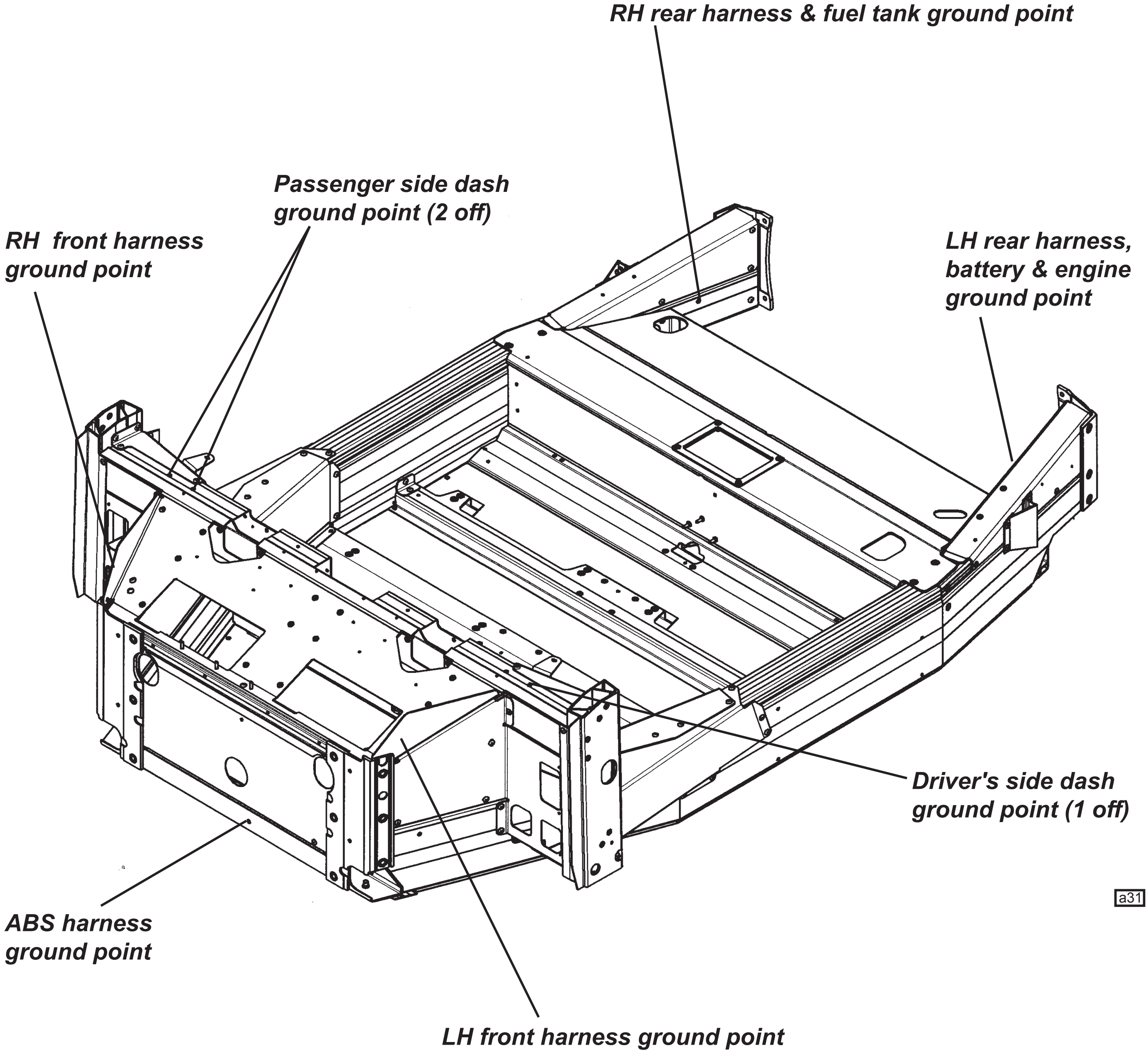
Luggage Compartment Lamps
2 lamps (positioned either side of the latch assembly) are press fitted into the rear luggage compartment trim.

To withdraw the lamp(s) from the trim panel, first ease one end of the lamp from its aperture. Withdraw the lamp sufficiently to allow access to the festoon bulb, if necessary, unplugging the harness connector.

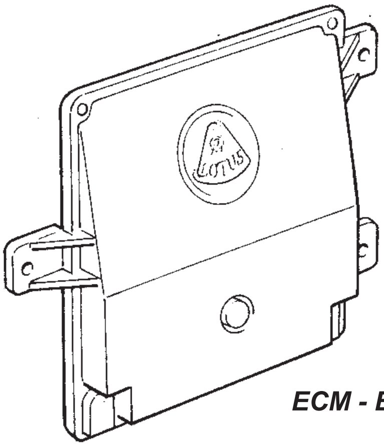


LUGGAGE COMPARTMENT LAMP BULB

MR.13 - GROUND POINTS
(refer to circuit diagram A8)



MR.14 - ECM (ELECTRONIC CONTROL MODULE AND TCU (TRANSMISSION CONTROL UNIT)



ECM - Electronic Control Module

The Electronic Control Module (ECM) or Engine Control Unit (ECU) is a non serviceable unit incorporating microprocessors which process the inputs in real time, not only from the engine management sensors but various other sensors and modules within the vehicle such as the instrument pack, alarm system, Anti Lock Braking system (ABS) and Tyre Pressure Monitoring System (TPMS) etc.

The unit contains the hardware and software (firmware). The hardware consists of electronic components on a printed circuit board (PCB), ceramic substrate or a thin laminate substrate. The main component on this circuit board is a microcontroller chip (CPU). The software is stored in the microcontroller or other chips on the PCB, typically in Erasable Programmable Read Only Memory (EPROM) or flash memory so the CPU can be re-programmed by downloading updated EMS programme or .CRP file. This is also referred to as an (electronic) Engine Management System (EMS).

Firmware and calibration
At the time of assembly the vehicles ECM and Transmission Control Unit (TCU) (if fitted) are downloaded with their relevant firmware and calibration also referred to as its EMS programme or .CRP file.

This ensures that the functionality of the ECM or TCU is correct in relation to its model, model year and the territory the vehicle is being sold into.

Vehicle configuration and variant code
The ECM is then 'configured' dependant on the additional options that the vehicle should be equipped with such as but not limited to fitment of such items as:

- Sports Mode button
- Tyre pressure Monitoring System (TPMS)
- Heated front seats
- Basic Traction control or Electronic Stability Control (ESP also referred to as Lotus Dynamic Performance Management)
- Speed Alert Buzzer (GCC cars only)

The selection of the relevant options will produce a 'variant code' for the vehicle which can be viewed in the EMS vehicle configuration screen using Lotus TechCentre and is also stored in the vehicles build book stored at Lotus Cars.

At this time a self adhesive label is also attached to the casing of the ECM. The label displays an actual label part number and homologation number which will identify the ECM assembly in relation to:

- Model Year
- Engine type, induction system and power output
- Designated vehicle territory
- Calibration number
- Vehicle designation i.e., Elise, Evora etc.

To protect the ECM and TCU from subsequent incorrect programming which could cause poor, non-starting or engine performance issues etc, the EMS programme initially downloaded at the factory cannot be overwritten with any other programme. The only EMS reprogramming possible is to update the 'level' of the existing programme already installed in the ECM.

In the event that the EMS programme downloaded into the ECM that does not match its existing programme then the vehicle will fail to start, the (Malfunction Indicator Light) MIL will illuminate and a fault code will be stored in the ECM.

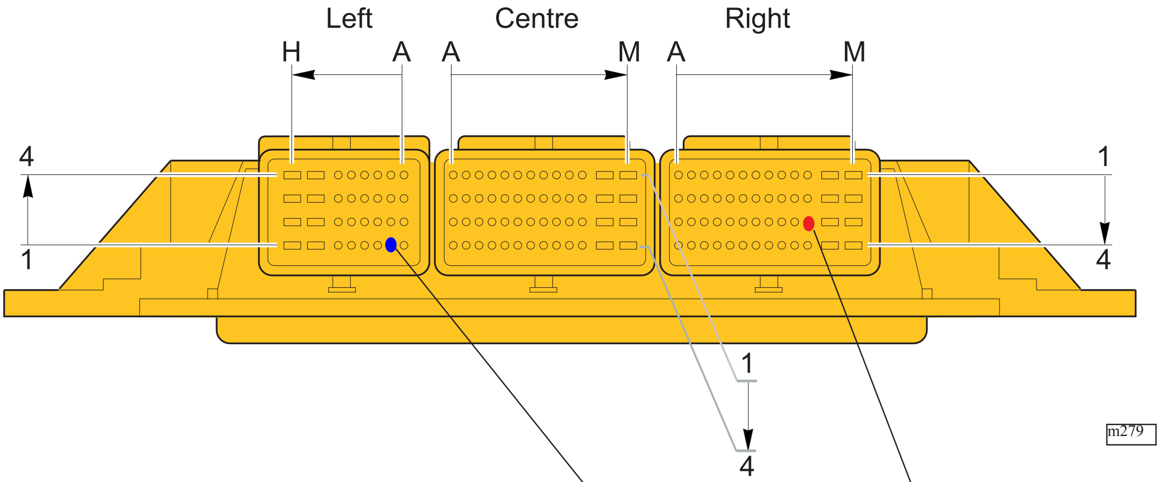
Harness connection and 'Pin out' identification

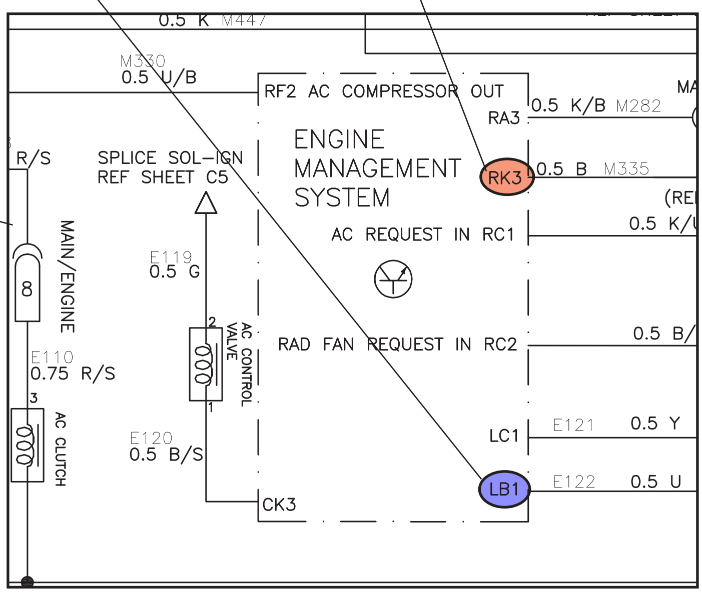
The ECM uses 3 harness connector blocks. The engine harness has 2 multi-plug connectors which connect to the central and left blocks (central and upper as viewed in situ), with the vehicles main harness multi-plug connecting to the right block (lower as viewed in situ).

All harness connection information to the ECM is identified on the relevant circuit diagrams by:

Block: L – Left, C – Centre and R – Right
Column: 1 – 4
Row: A – M

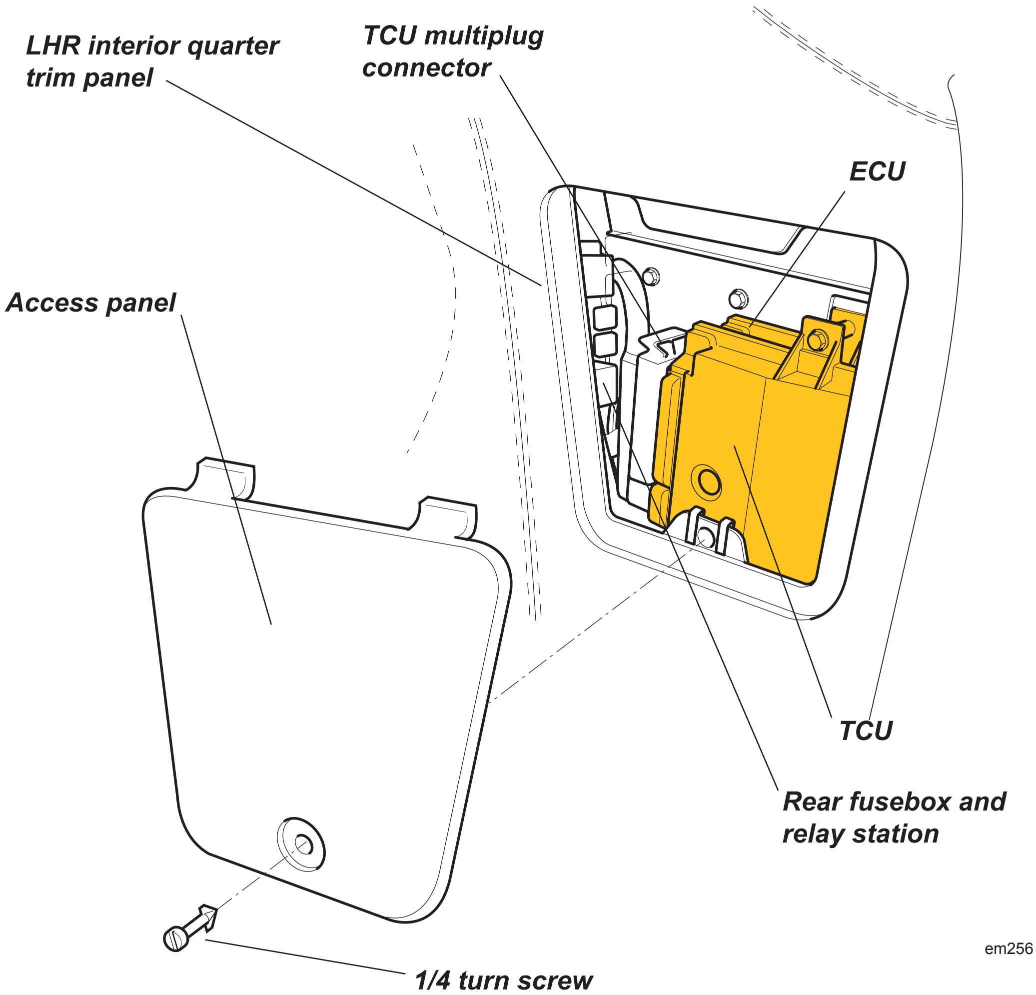
Column and Row numbers and digits are also stamped onto the ECM harness connector blocks as well as the actual harness multi-plugs





Typical example of EMS pin information as displayed in an Evora Circuit Diagram

ECM and TCU Location



The ECM (Electronic Control Module) and TCU (Transmission Control Unit) are both located behind the interior left hand rear quarter panel trim. They can be accessed by releasing the ¼ trim fastener on the lower edge of the access panel and unhooking it from its top edge. The ECU is bolted to a retaining bracket fixed to the inner bodyside.

The TCU (if fitted) is bolted against the ECM.
Rear fuse and relay access may be restricted by these modules and it may be necessary to loosen them from their mounting brackets and move them away from the relay station to gain access to the fuses and relays.

To remove the ECM

Note: If it is necessary to renew an ECM or TCU then it is highly recommended that before removing the existing unit that you note down its current firmware calibration (Program or .CRP file number) and the variant code (Care point, please also see Lotus Technical Service Bulletin TSB 2012/17 for important information relating to variant coding) which can be obtained from the Lotus TechCentre vehicle information and EMS configuration screens.

Before removing the ECM print out the vehicles performance history using TechCentre and file with the vehicles existing records or job card for future reference. This procedure should also be carried out before uploading a new programme as action of downloading a new level programme will delete the existing performance history.

Please note: Lotus Cars may request a copy of a vehicles performance history in the event of a warranty enquiry which is related to potential powertrain abuse.

Note: Do not disconnect the ECU harness connectors for at least 30 minutes after switching off the ignition to allow the engine management system and associated sensors to shut down in the correct sequence.

- Release the ¼ trim fastener on the lower edge of the access panel and unhook the panel it from its top edge and remove.
- Remove the 2 lower and 1 upper M10 flanged nuts securing the ECU to the bracket.
- Pull the ECU slightly forward to release it from the brackets retaining studs.
- Move ECU away from the rear fusebox to gain access to its 3 harness connectors.
- Starting from uppermost connector, unclip and detach them from the ECU.
- The ECU can now be withdrawn from the rear panel.

To refit the ECM

Reverse procedure from removal except for.

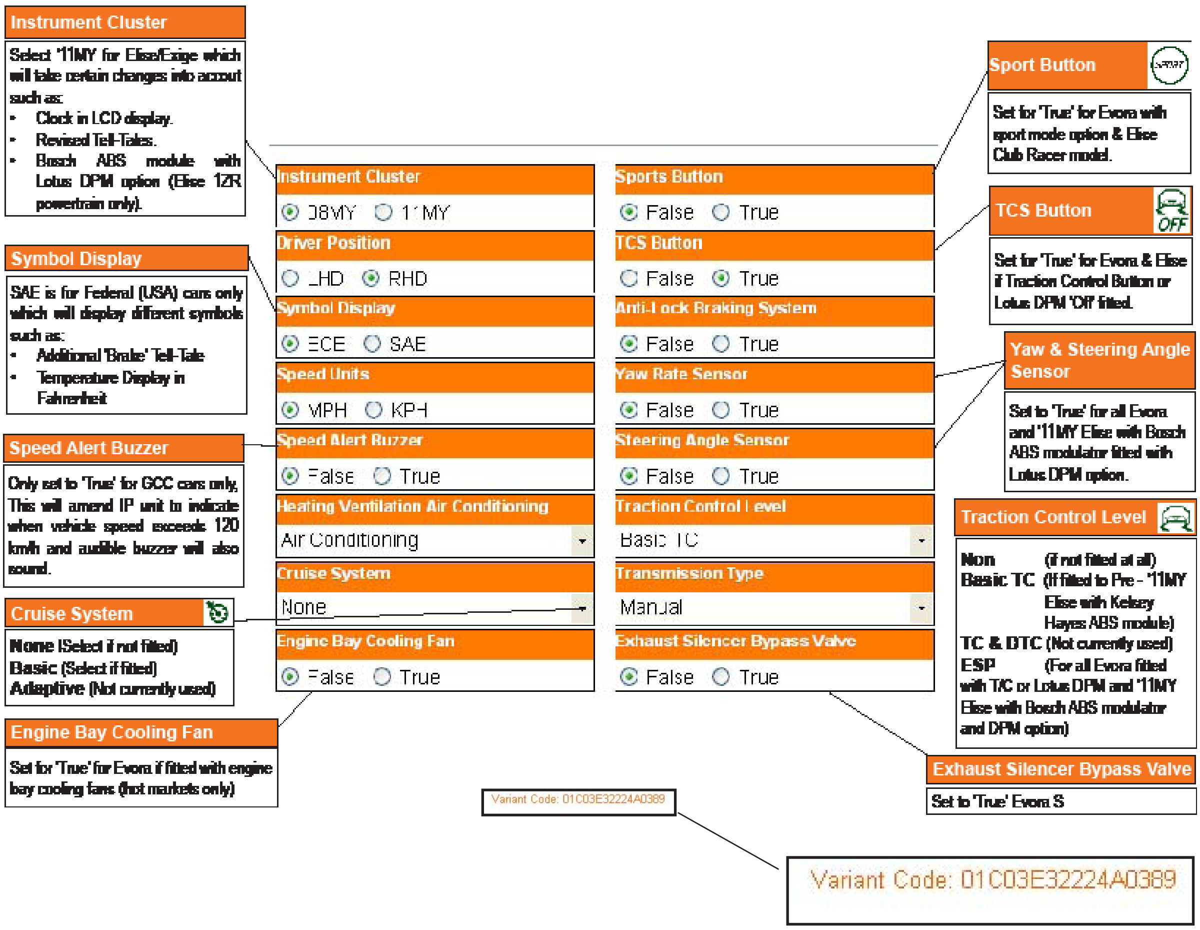
If the ECM or TCU has been renewed then re-enter the correct firmware calibration (Program or .CRP file number) using the ECU Reprogramming option on Lotus TechCentre.

Once the replacement ECM or TCU contains the relevant program it will still be necessary to enter the correct variant coding into the unit so that its functionality is correct relevant to the options fitted to the vehicle:

Care point, please also see Lotus Technical Service Bulletin TSB 2012/17 for important information relating to varinat coding.

The units current variant code can be identified using Lotus TechCentre.

ECM configuration screen 1 of 2 as shown on Lotus TechCentre



Check for any illuminated tell tales that may be displayed on the instrument pack and using Lotus TechCentre interrogate the ECM for any live or pending codes and erase.

Note: Although it is possible to manually enter the variant coding from the option screens available there is a risk of making an error, if this option is selected it may affect the display and or functionality of the instrument pack.

If the varient code has been recorded then it is recommended to use the guided routine option available on Lotus TechCentre.

If the variant coding has not been recorded or if the ECMwill not communicate with Lotus TechCentre then it is advised to contact Lotus Cars Technical Publication Department stating the full vehicle VIN requesting the variant code information.

For further information see the ‘Lotus TechCentre User Guide’, which can be downloaded from the Lotus Dealer Portal at:

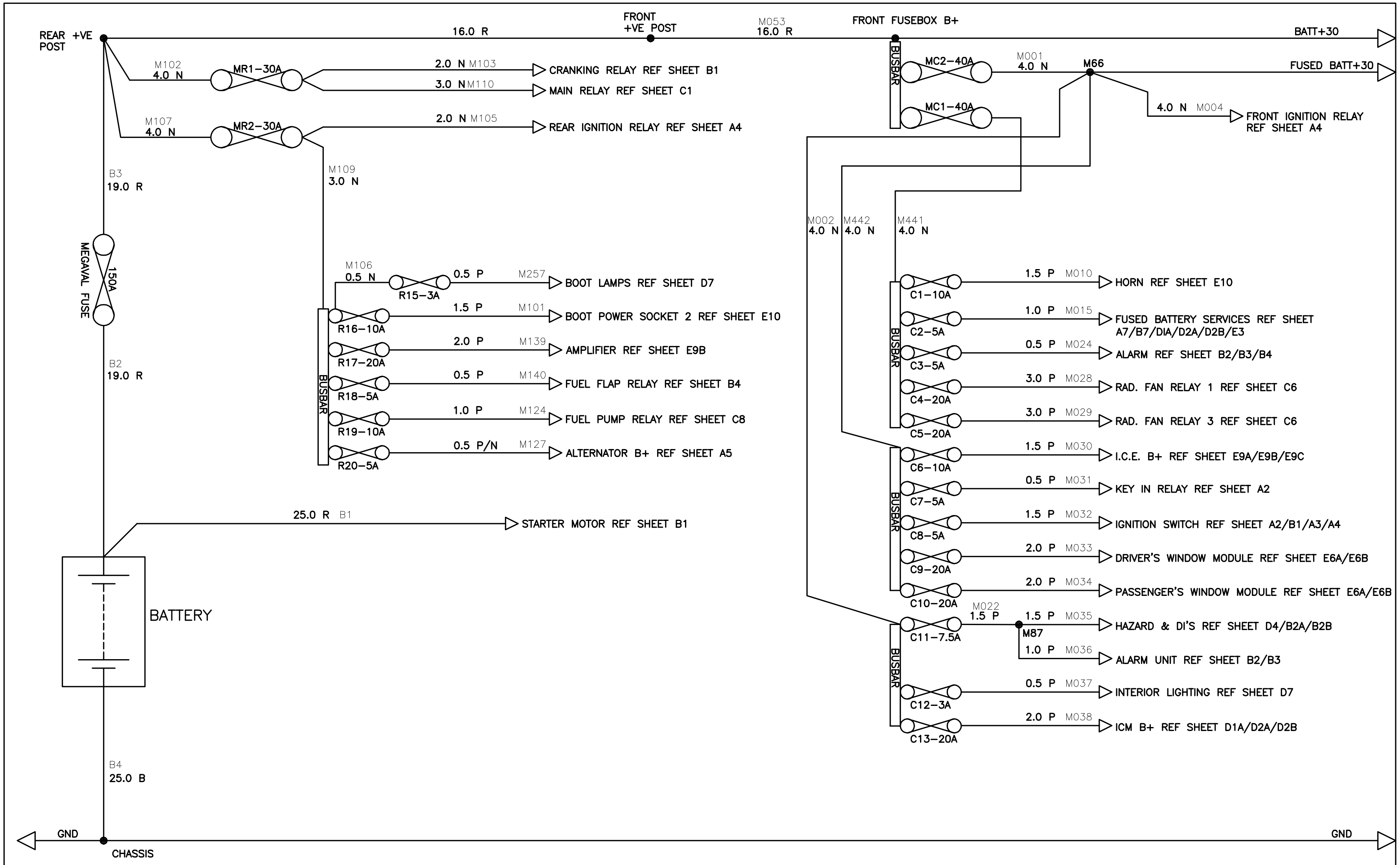
http://dealers>Aftersales>Miscellanous Technical Information>TechCentre Information.

ELECTRICS

SECTION MR.15 CIRCUIT DIAGRAMS NON - USA

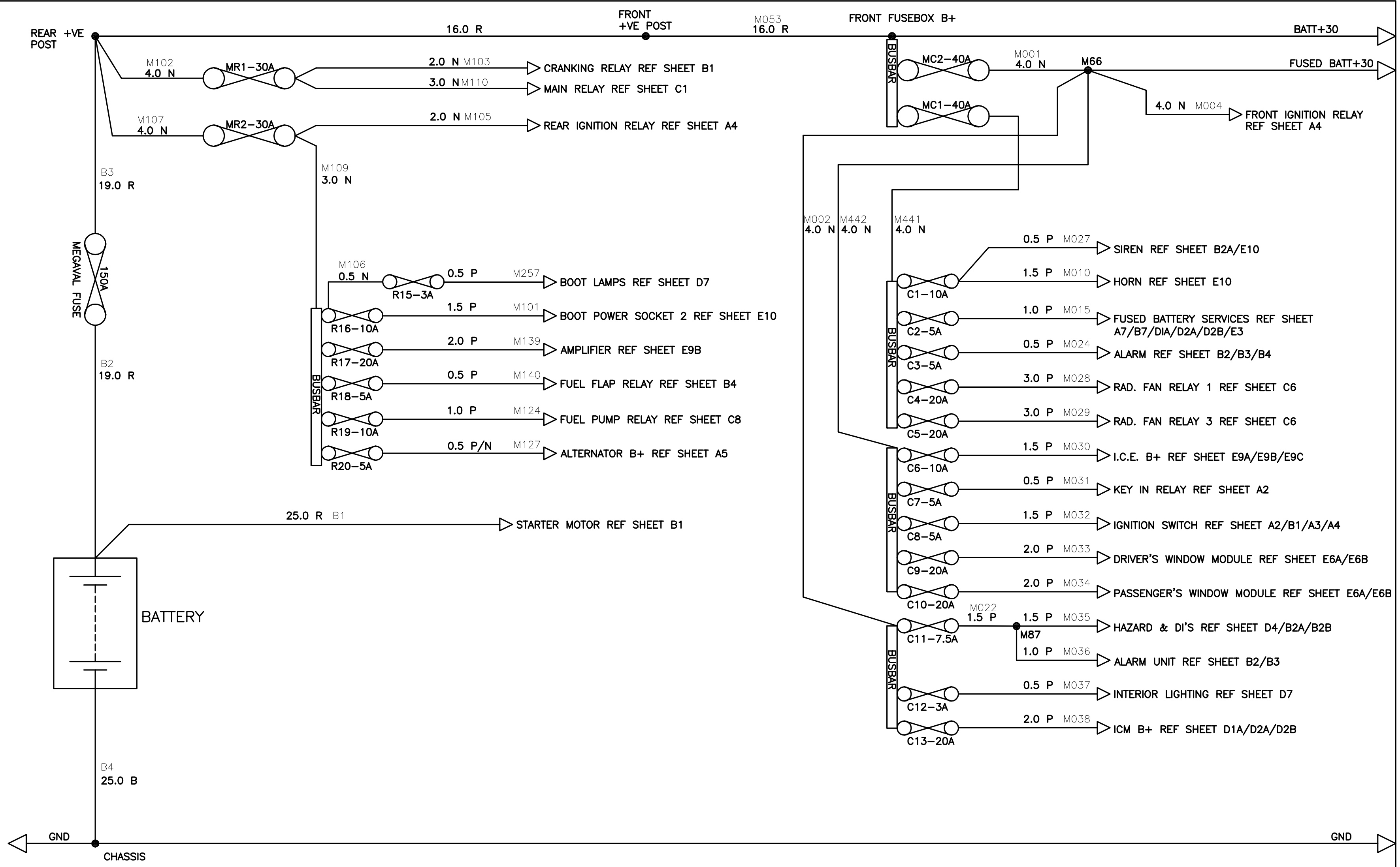
NATURALLY ASPIRATED MANUAL TRANSMISSION

MR.15 - CIRCUIT DIAGRAMS (NON USA)



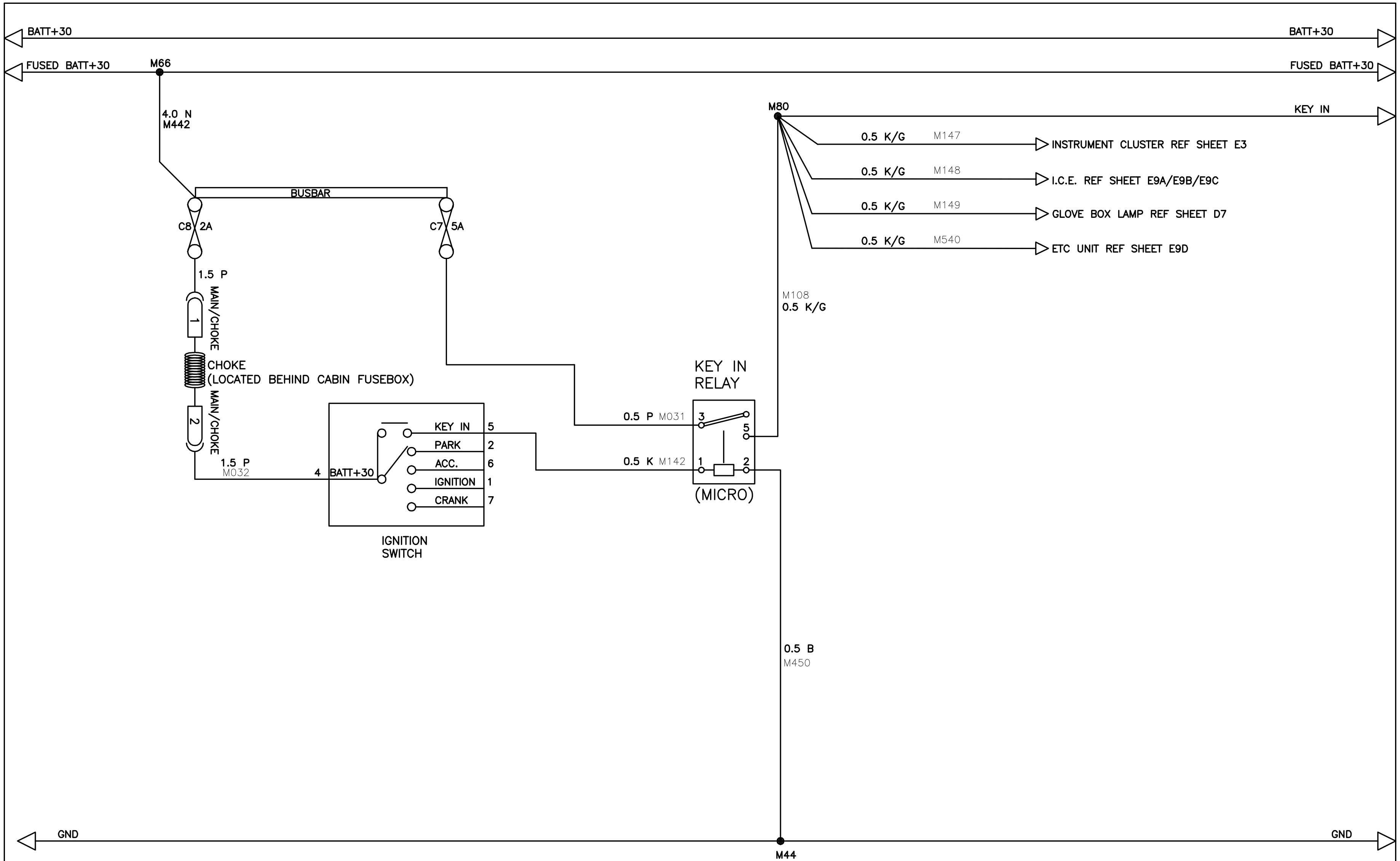
TITLE: CCT-BATTERY SUPPLY		APPROVED		UPDATES	ISSUE
		CHECKED		ALL CARS BEFORE VIN SCCLMDTU4AHE11008	
PROJECT: EAGLE	DRG. No:	DRAWN			
SHEET:A1	ISSUE LEVEL: PR	FIRST RELEASE DATE	29MY09		

CONN NAME
MAIN/ENGINE
MALE CONN
3
FEMALE CONN
CAVITY NUMBER



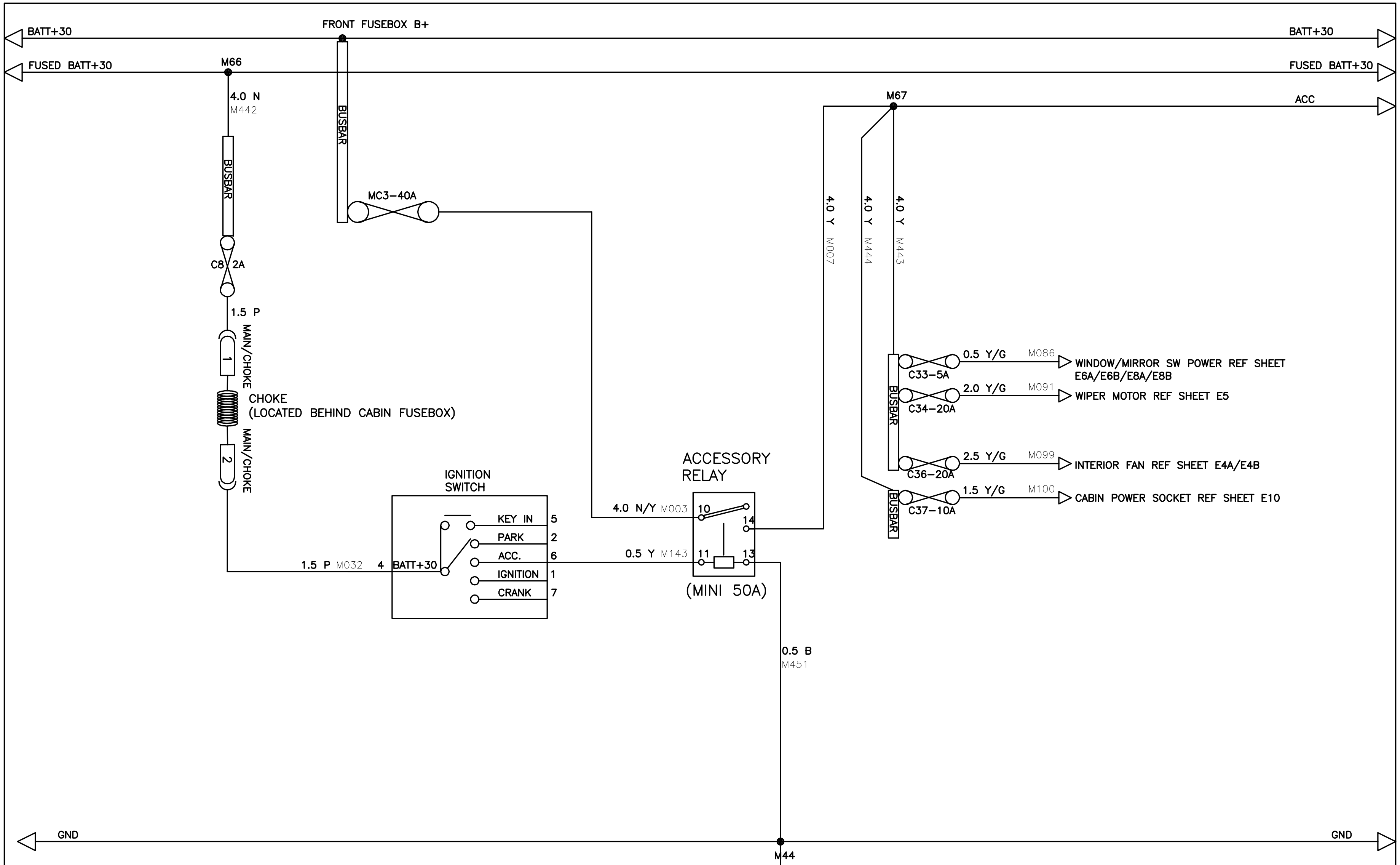
TITLE: CCT–BATTERY SUPPLY		APPROVED		UPDATES	ISSUE
		CHECKED		ALL CARS AFTER VIN SCCLMDTU4AHE11008	
PROJECT: EAGLE	DRG. No:	DRAWN		SIREN POSITIVE SUPPLY MOVED TO FUSE C1	
SHEET:A1 UPDATE	ISSUE LEVEL: PR	FIRST RELEASE DATE	29MY09		

CONN NAME
MAIN/ENGINE
MALE CONN
3
FEMALE CONN
CAVITY NUMBER



TITLE: CCT–KEY IN SUPPLY		APPROVED		UPDATES	ISSUE
		CHECKED			
PROJECT: EAGLE	DRG. No:	DRAWN	N. CHOWLES		
SHEET:A2	ISSUE LEVEL: PR	FIRST RELEASE DATE	18MY09		

CONN NAME
MAIN/ENGINE
MALE CONN
3
FEMALE CONN
CAVITY NUMBER



	TITLE: CCT–ACCESSORY SUPPLY		APPROVED		UPDATES	ISSUE
			CHECKED			
	PROJECT: EAGLE	DRG. No:	DRAWN	N. CHOWLES		
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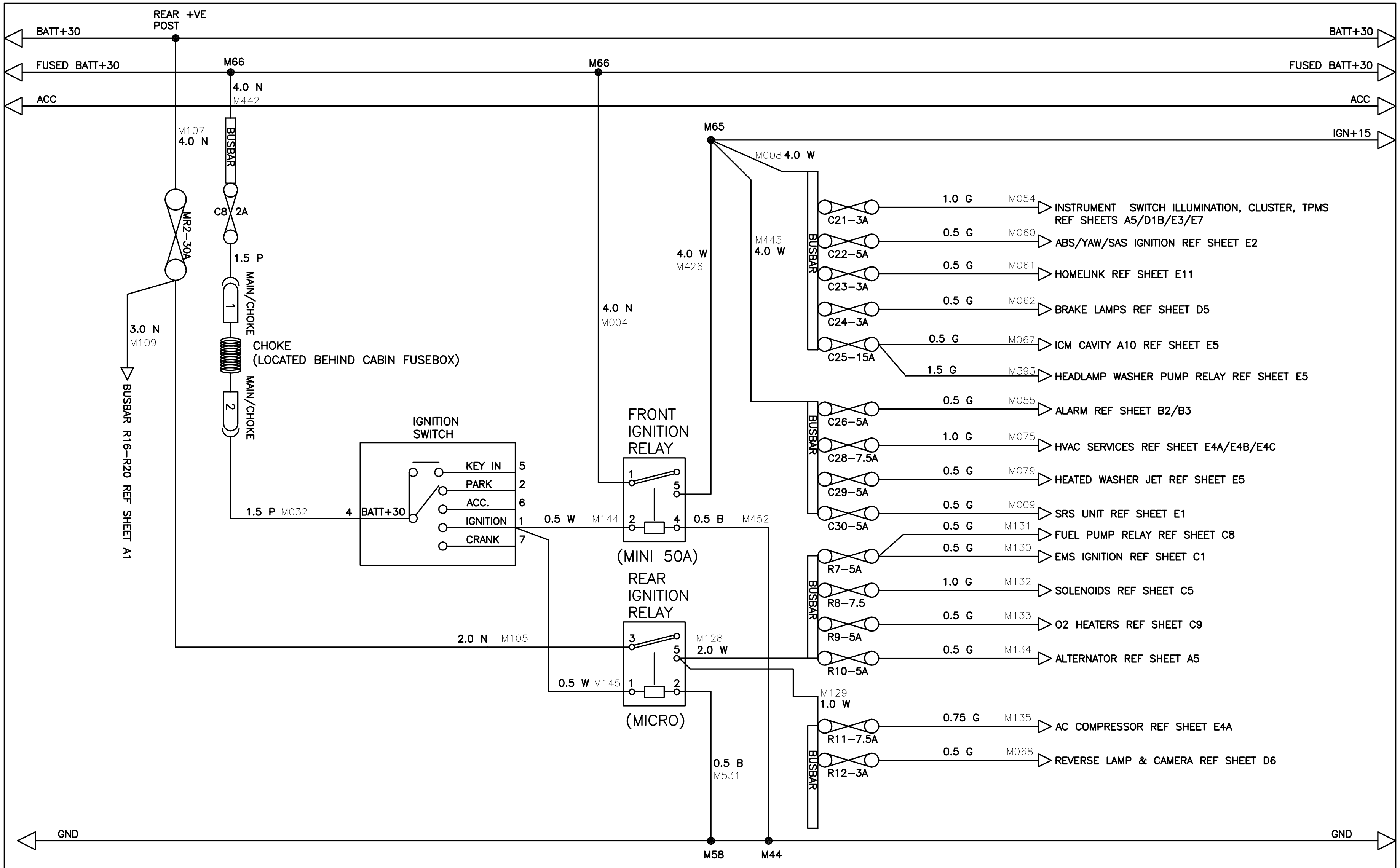
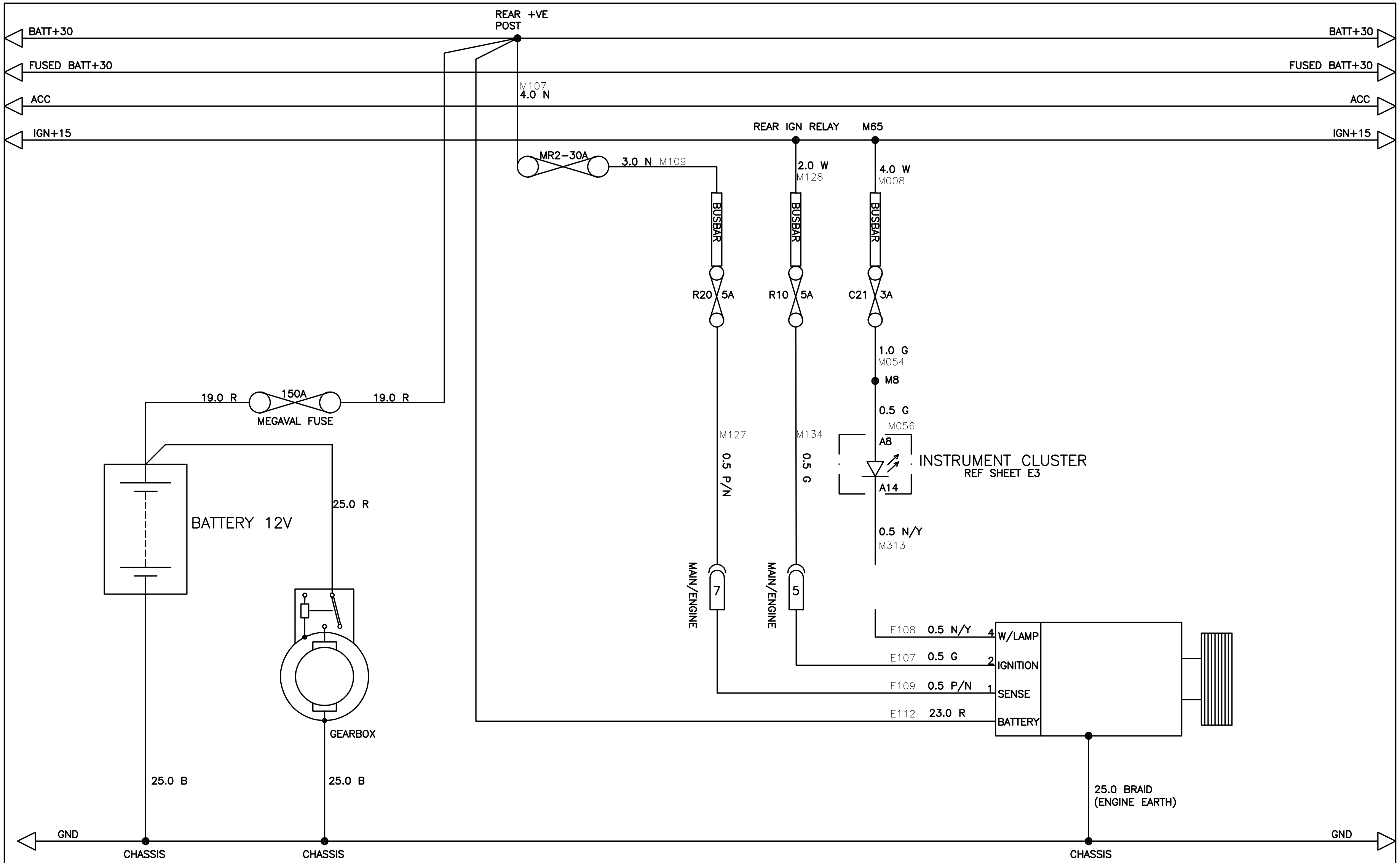
CONN NAME
MAIN/ENGINE
MALE CONN
3
FEMALE CONN
CAVITY NUMBER



TITLE: CCT-IGNITION SUPPLY		APPROVED		UPDATES	ISSUE
		CHECKED		FUSE C28 CHANGED FROM 5A TO 7.5A	
PROJECT: EAGLE	DRG. No:	DRAWN	N. CHOWLES		
SHEET:A4	ISSUE LEVEL: PR	FIRST RELEASE DATE	28JL09		

CONN NAME
MAIN/ENGINE
MALE CONN
3
FEMALE CONN
CAVITY NUMBER



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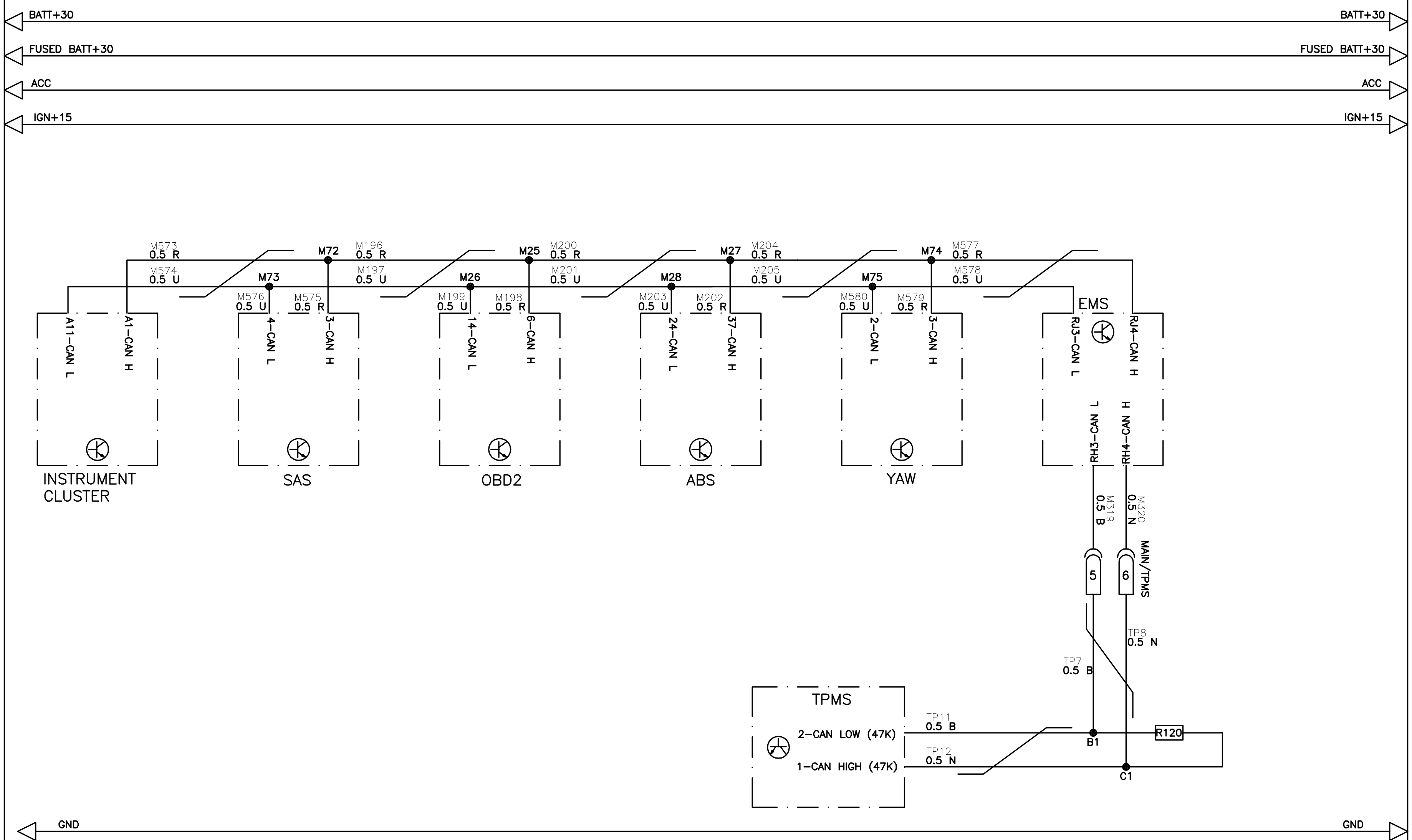
CONN NAME
MAIN/ENGINE
MALE CONN
3
FEMALE CONN
CAVITY NUMBER



TITLE: CCT-CAN NETWORK		APPROVED		UPDATES	ISSUE
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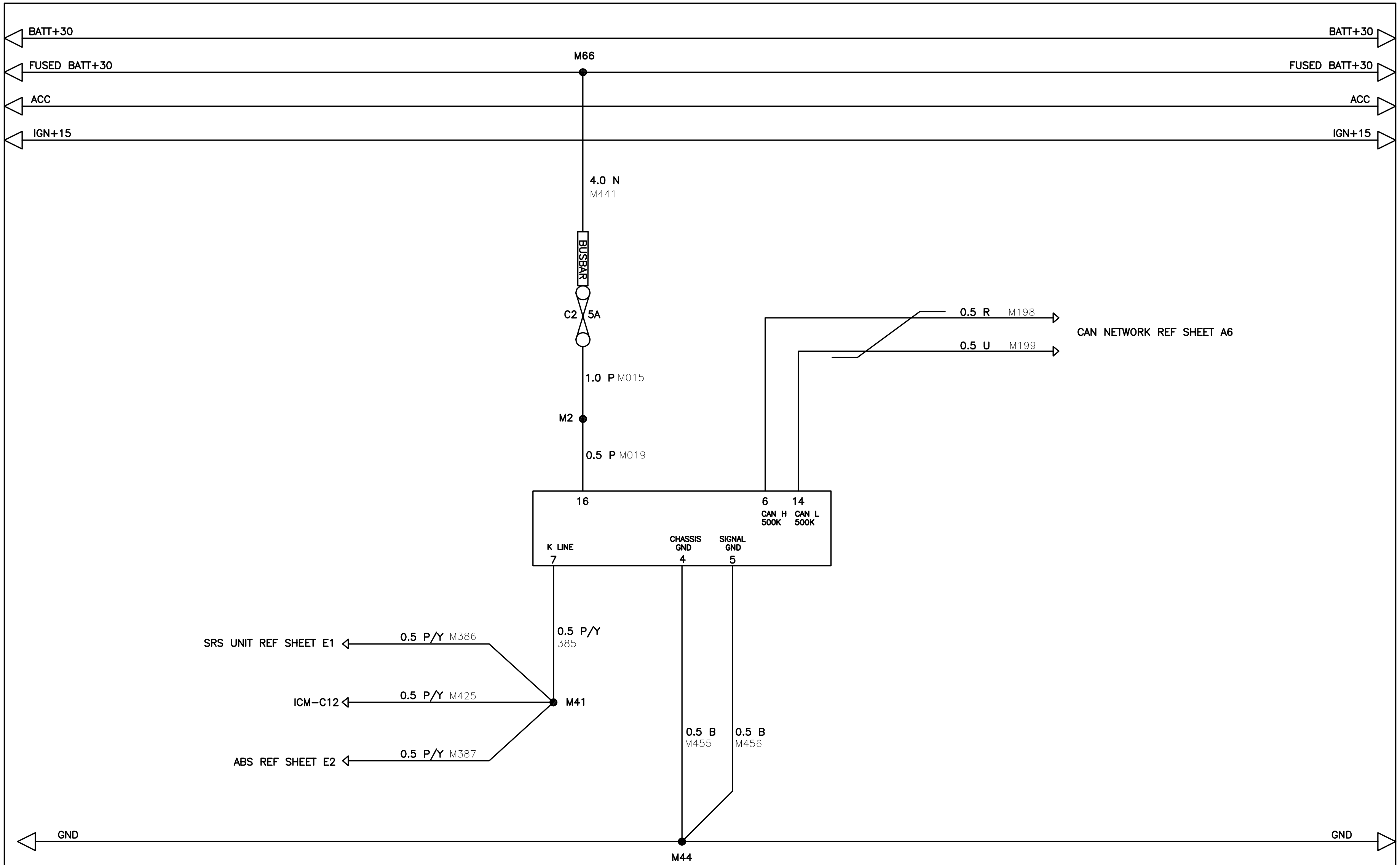
SHEET:A6	ISSUE LEVEL: PR	FIRST RELEASE DATE	18MY09		

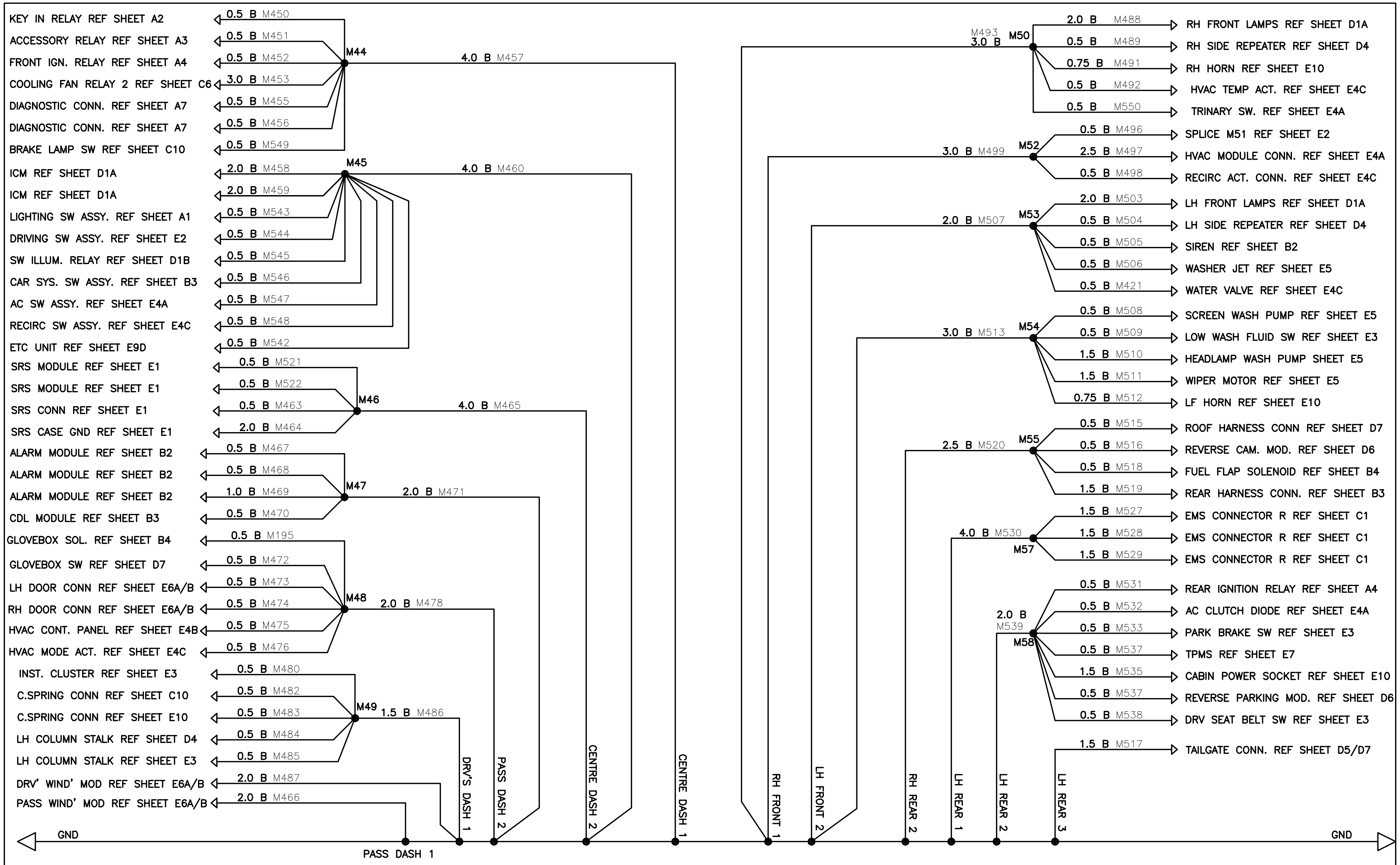
CONN NAME
MAIN/ENGINE
MALE CONN
3
FEMALE CONN
CAVITY NUMBER



TITLE: CCT−DIAGNOSTIC CONNECTOR		APPROVED		UPDATES
		CHECKED		
PROJECT: EAGLE	DRG. No:	DRAWN	N. CHOWLES	
SHEET:A7	ISSUE LEVEL: PR	FIRST RELEASE DATE	18MY09	

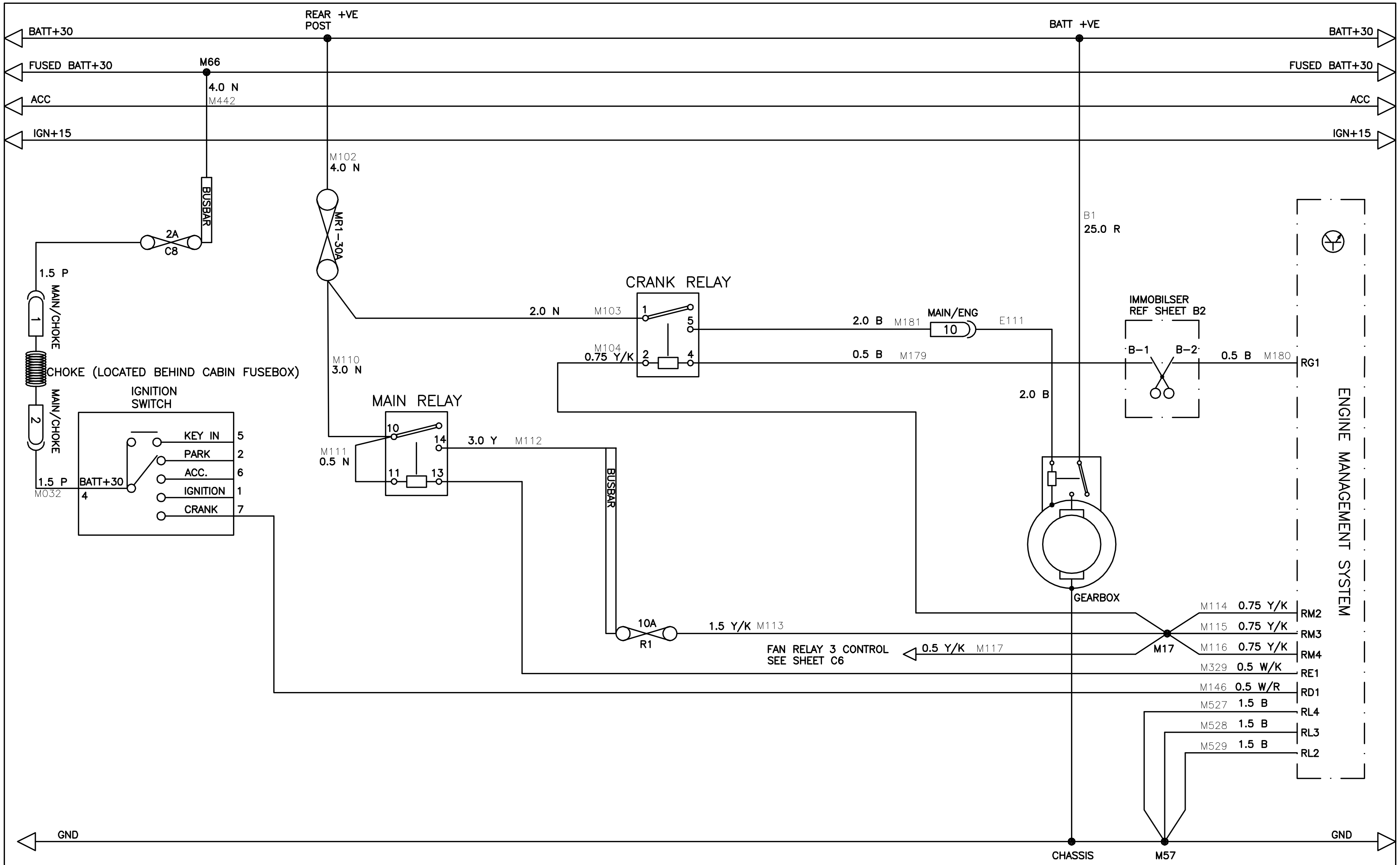
ISSUE

CONN NAME
MAIN/ENGINE
MALE CONN
3
FEMALE CONN
CAVITY NUMBER



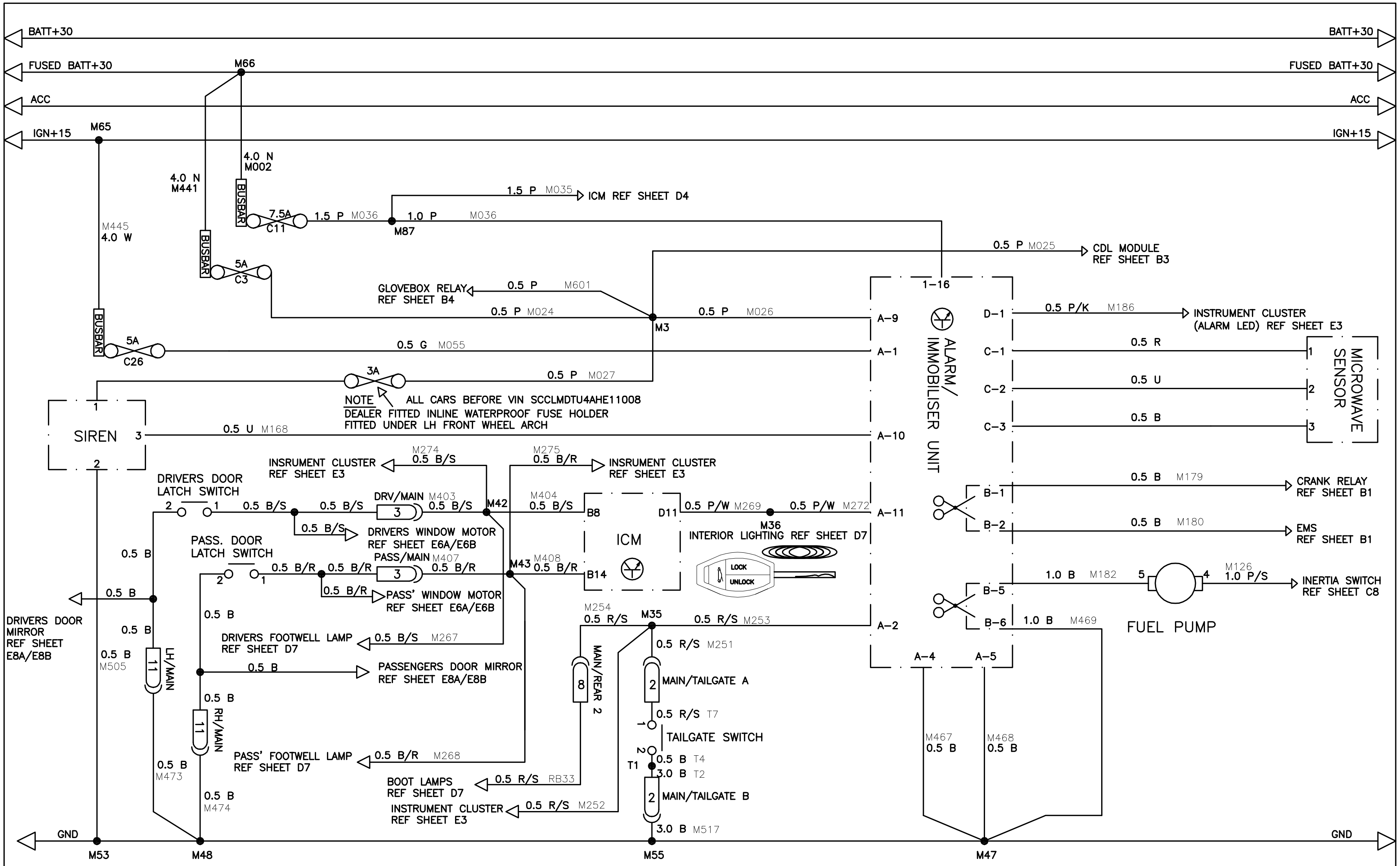
TITLE: GND STRUCTURE PART 1		APPROVED		UPDATES	ISSUE
		CHECKED		WATER VALVE ADDED	
PROJECT: EAGLE	DRG. No:	DRAWN	N. CHOWLES		
SHEET:A8	ISSUE LEVEL: PR	FIRST RELEASE DATE	28JL09		

CONN NAME
MAIN/ENGINE
MALE CONN
3
FEMALE CONN
CAVITY NUMBER



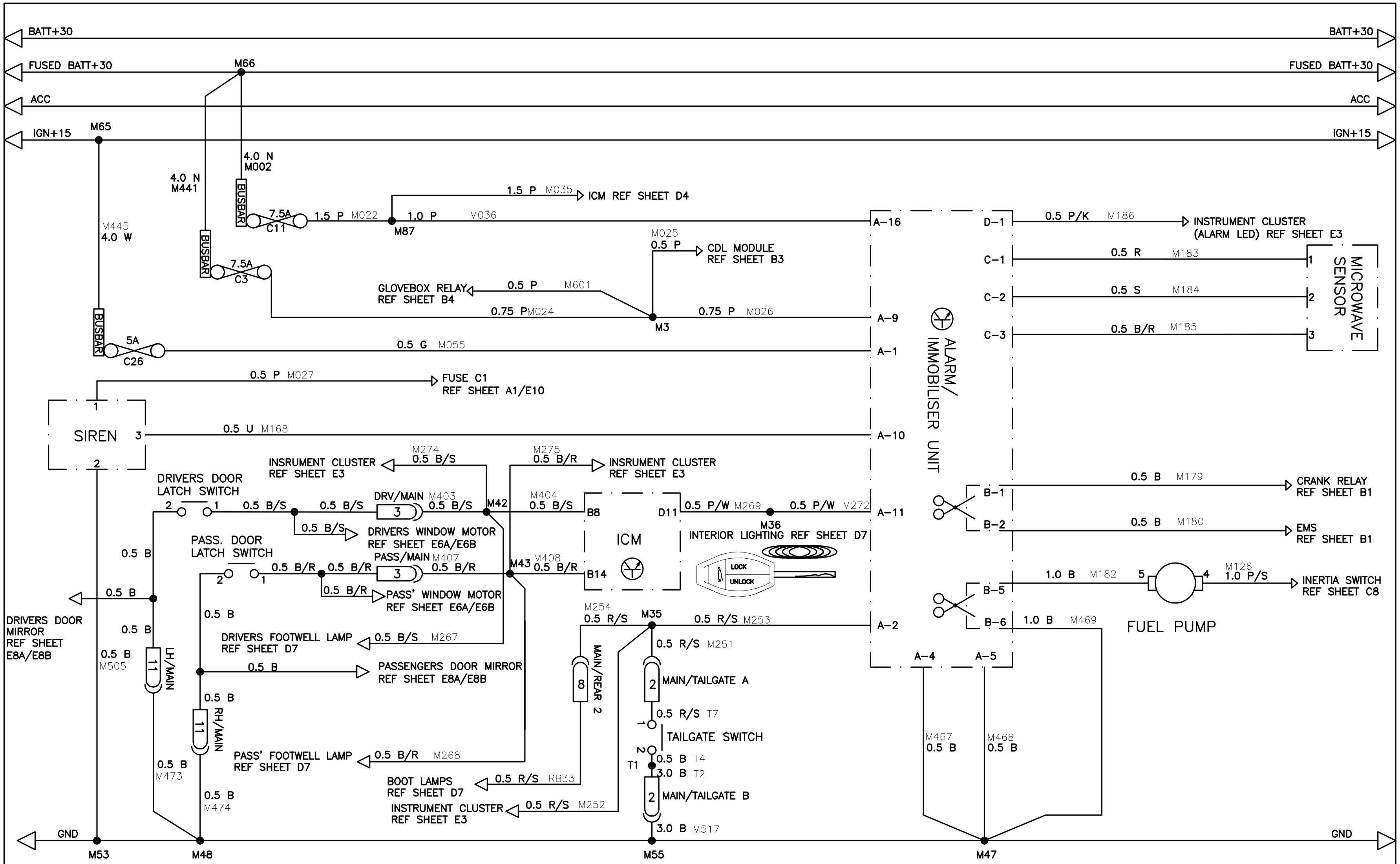
TITLE: CCT-CRANKING		APPROVED		UPDATES	ISSUE
		CHECKED			
PROJECT: EAGLE	DRG. No:	DRAWN	N. CHOWLES		
SHEET:B1	ISSUE LEVEL: PR	FIRST RELEASE DATE	18MY09		

CONN NAME
MAIN/ENGINE
MALE CONN
3
FEMALE CONN
CAVITY NUMBER

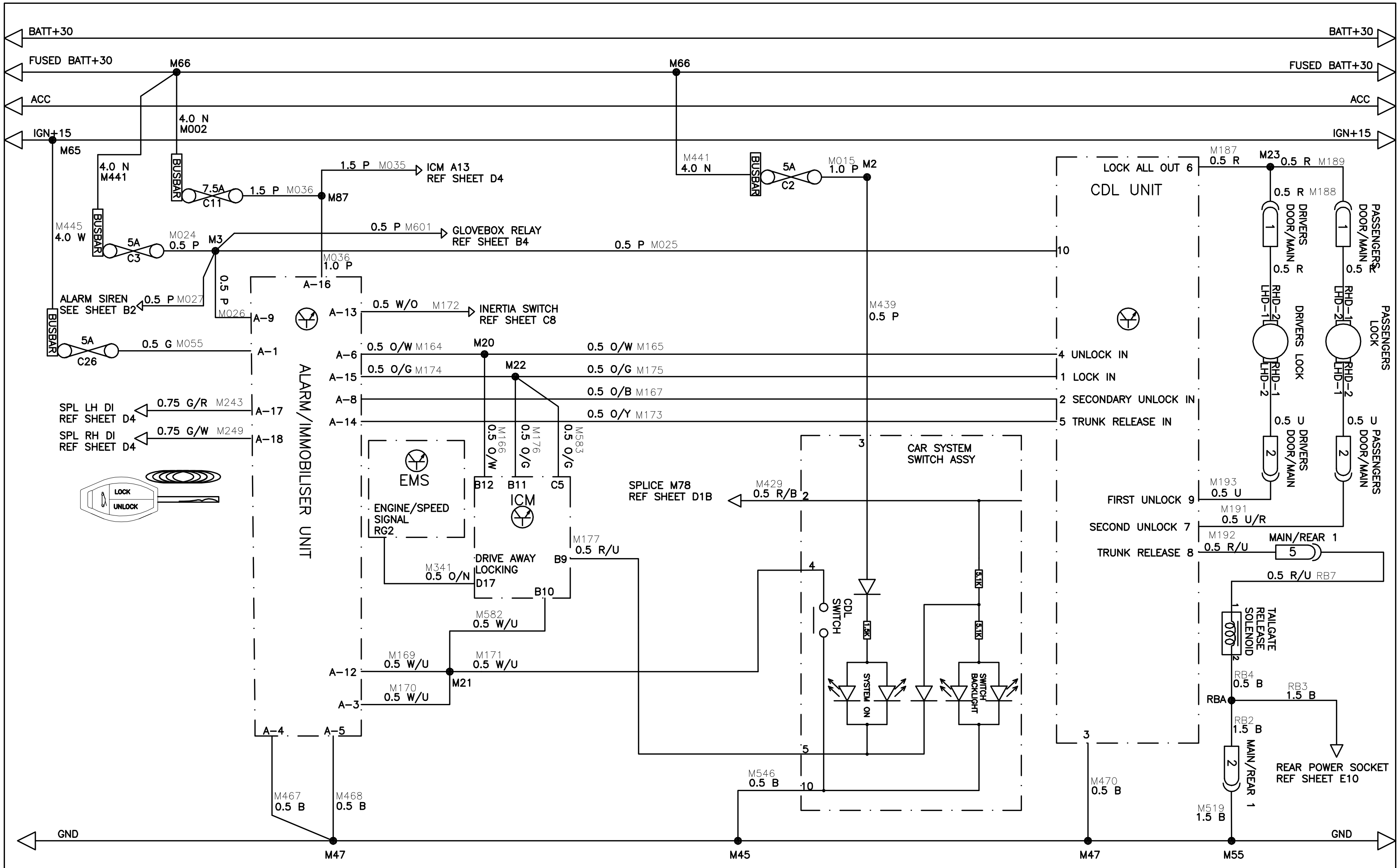


TITLE: CCT–ALARM & IMMOBILSER		APPROVED		UPDATES	ISSUE
		CHECKED		ALL CARS BEFORE VIN SCCLMDTU4AHE11008	
PROJECT: EAGLE	DRG. No:	DRAWN		DEALER FITTED INLINE 3A FUSE TO	
SHEET:B2 UPDATE	ISSUE LEVEL: PR	FIRST RELEASE DATE	05JAN10	SIREN POSITIVE SUPPLY	

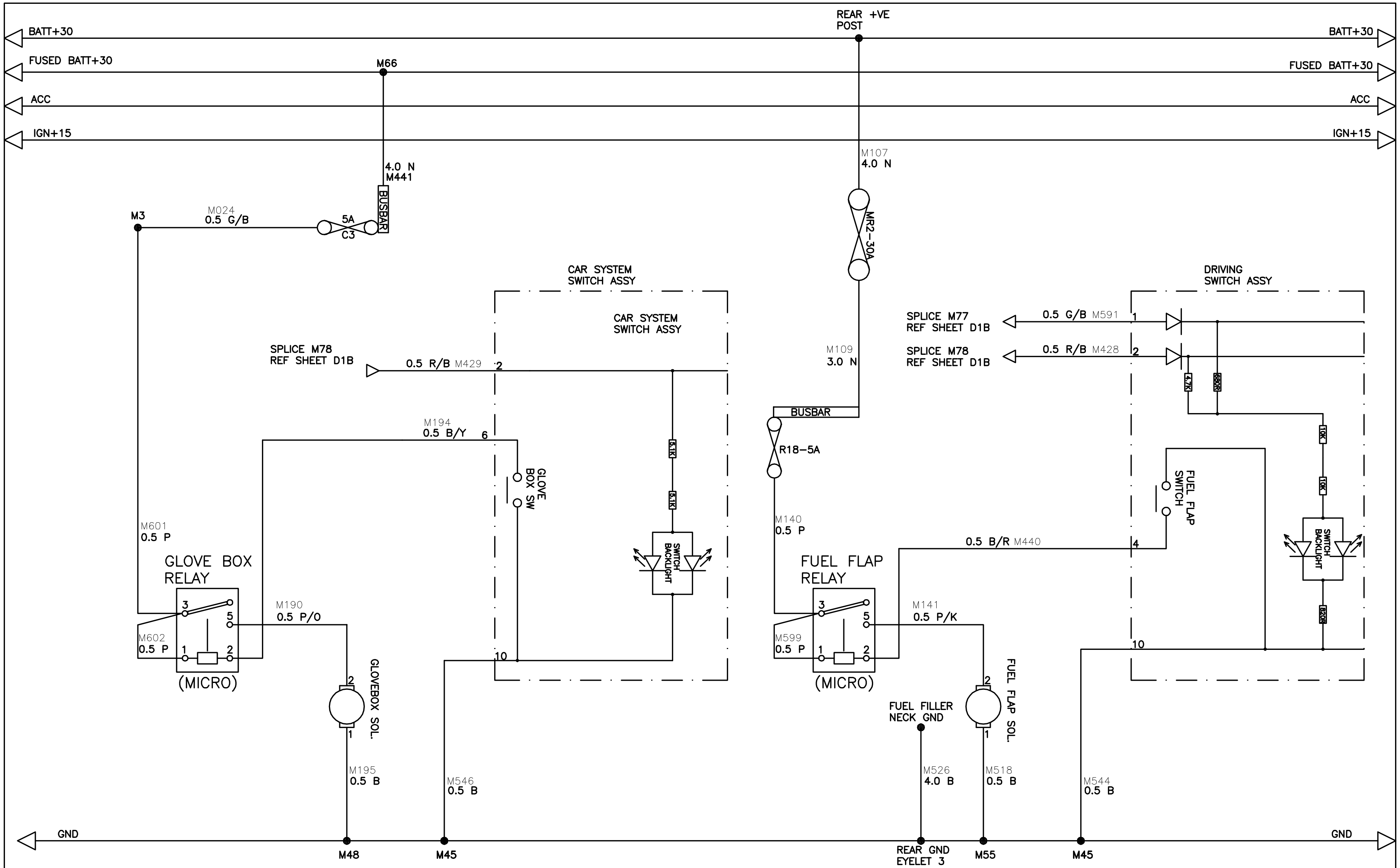
CONN NAME
MAIN/ENGINE
MALE CONN
FEMALE CONN
CAVITY NUMBER



TITLE: ALARM & IMMOBILSER NO TILT SENSOR		APPROVED		UPDATES	ISSUE
		CHECKED		ALL CARS AFTER VIN SCCLMDTU4AHE11008	3
PROJECT: EVORA	DRG. No:	DRAWN		SIREN POSITIVE SUPPLY MOVED TO FUSE C1	
SHEET:B2A	ISSUE LEVEL: PR	FIRST RELEASE DATE	13JAN10		



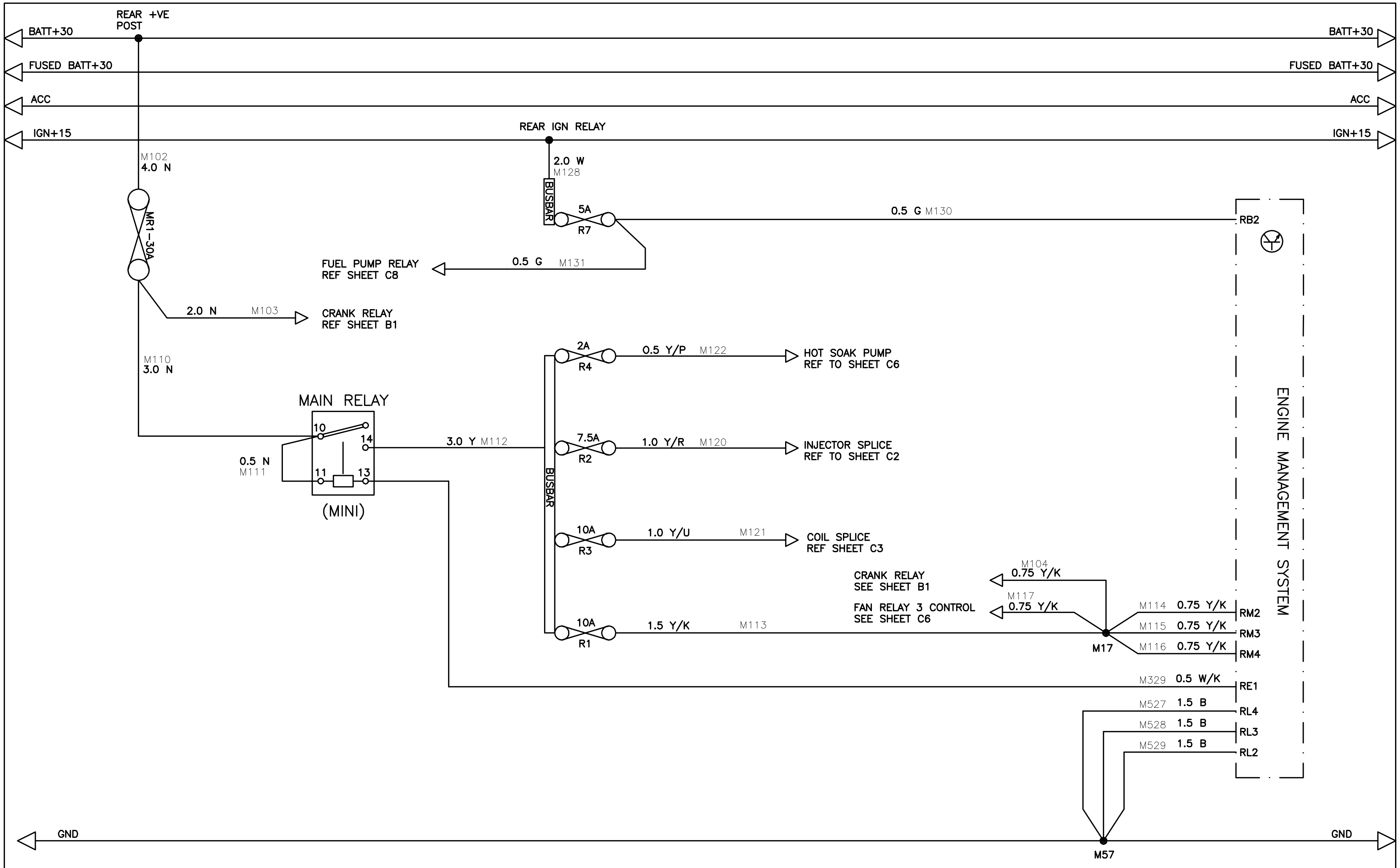
TITLE: CCT-CENTRAL LOCKING		APPROVED		UPDATES	ISSUE	CONN NAME → MAIN/ENGINE; MALE CONN → 3 ← FEMALE CONN; CAVITY NUMBER
		CHECKED				
PROJECT: EAGLE	DRG. No:	DRAWN	N. CHOWLES			
SHEET:B3	ISSUE LEVEL: PR	FIRST RELEASE DATE	18MY09			



TITLE: CCT–FUEL FILLER FLAP & GLOVE BOX LOCK		APPROVED		UPDATES
		CHECKED		
PROJECT: EAGLE	DRG. No:	DRAWN	N. CHOWLES	
SHEET:B4	ISSUE LEVEL: PR	FIRST RELEASE DATE	18MY09	

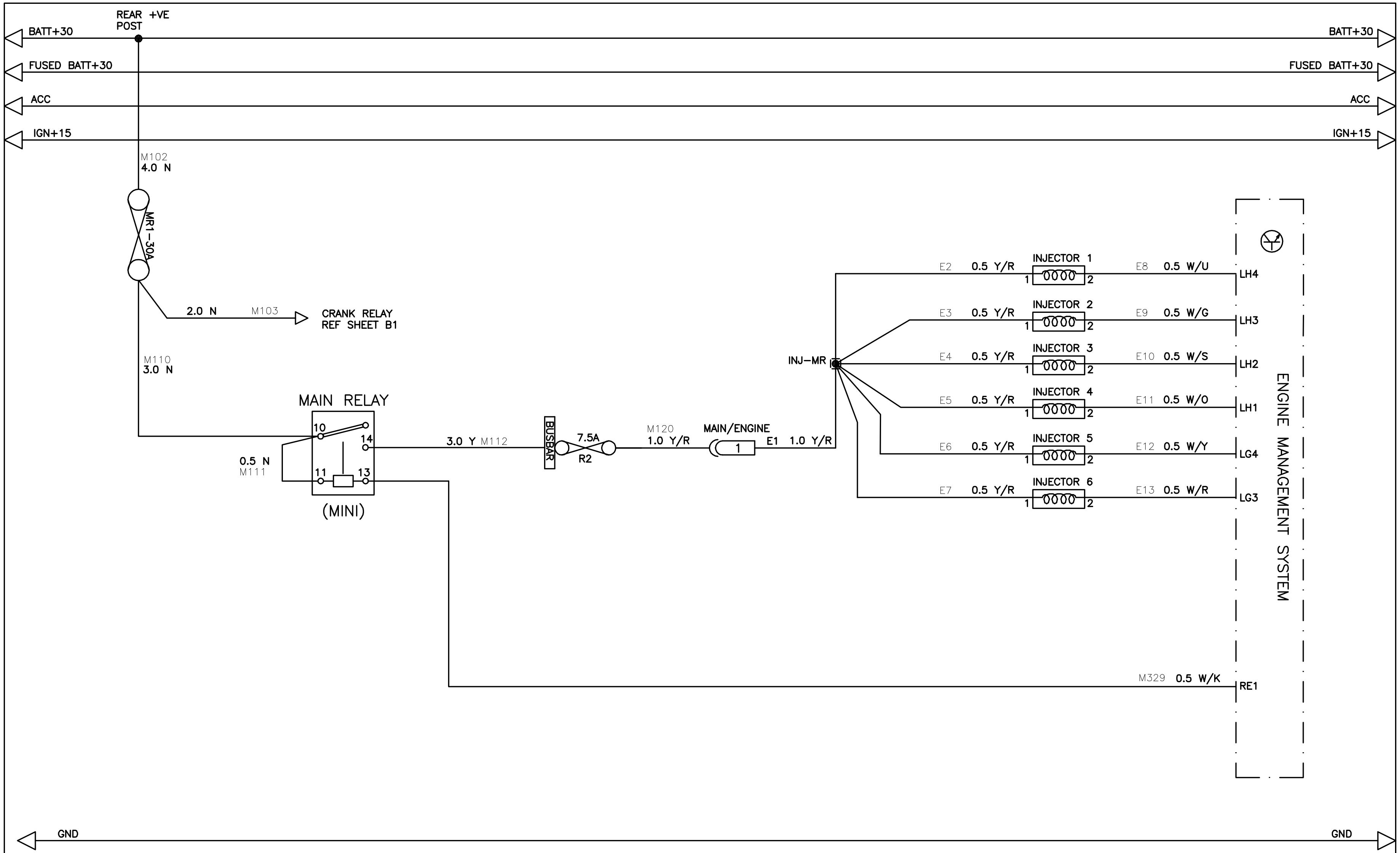
ISSUE

CONN NAME
MAIN/ENGINE
MALE CONN
3
FEMALE CONN
CAVITY NUMBER

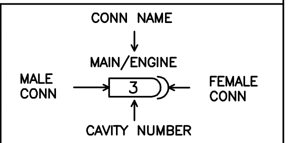


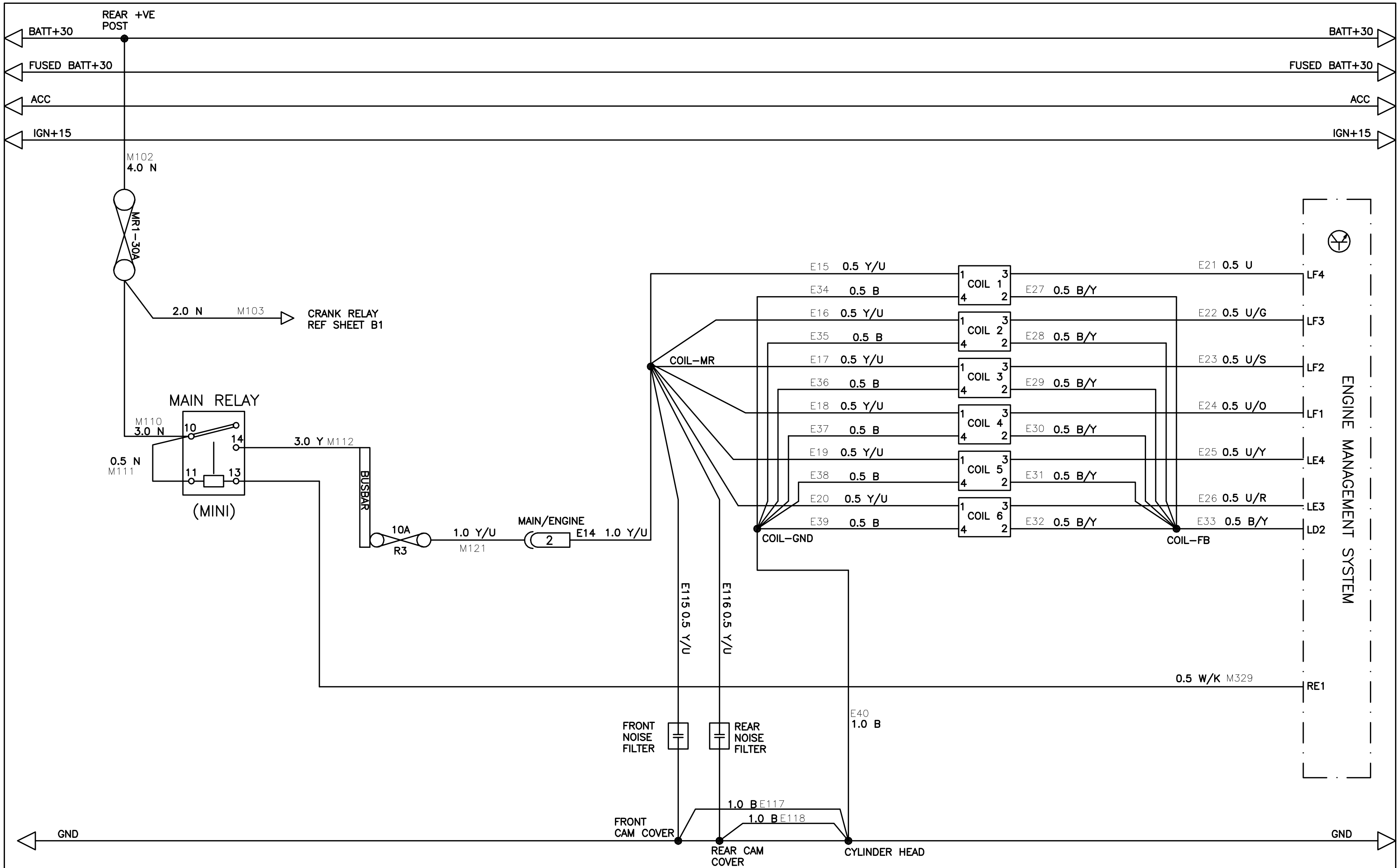
TITLE: CCT–EMS POWER & GND		APPROVED		UPDATES	ISSUE
		CHECKED			
PROJECT: EAGLE	DRG. No:	DRAWN	N. CHOWLES		
SHEET:C1	ISSUE LEVEL: PR	FIRST RELEASE DATE	18MY09		

CONN NAME
MAIN/ENGINE
MALE CONN
3
FEMALE CONN
CAVITY NUMBER

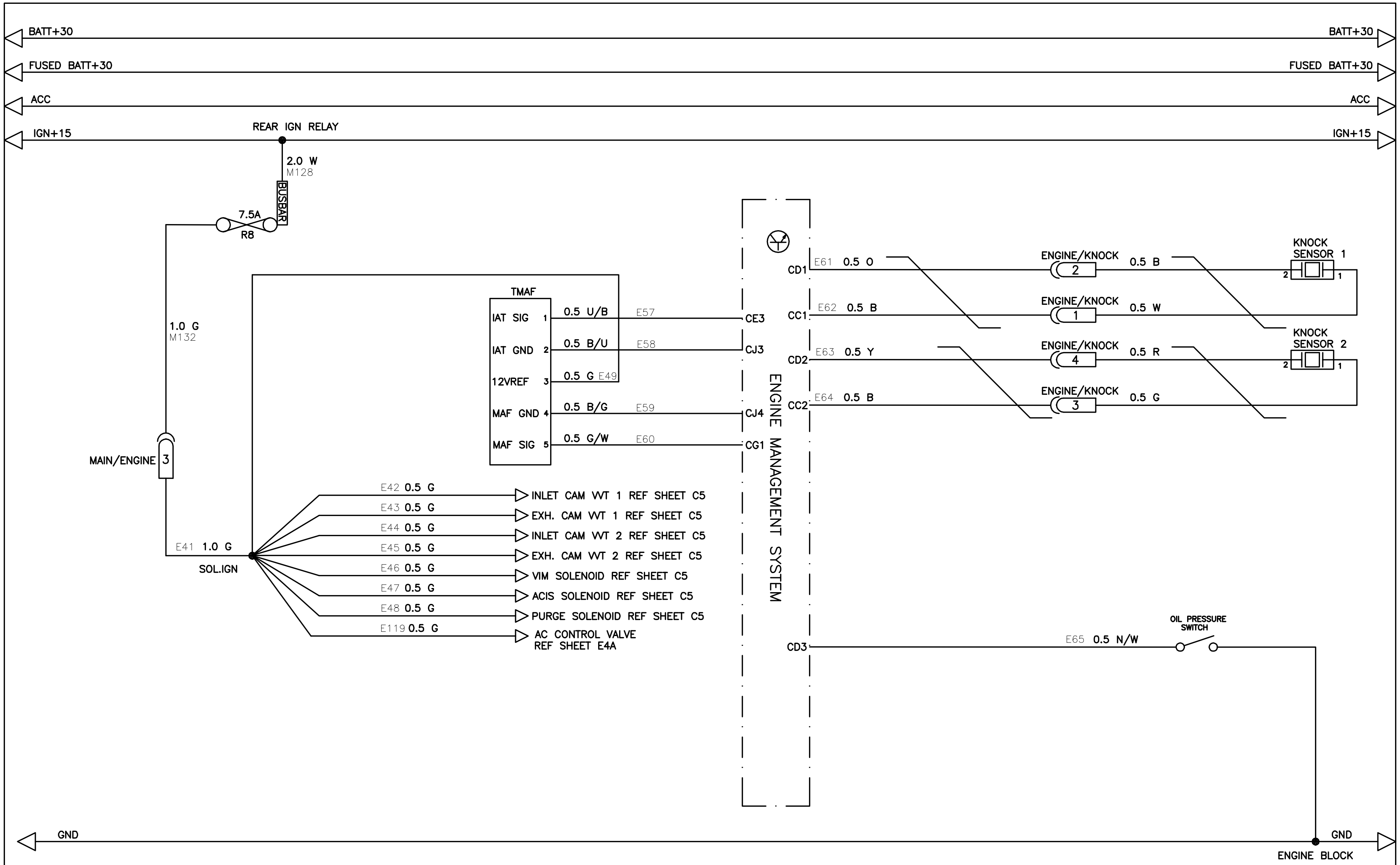


TITLE: CCT–EMS–FUEL INJECTION		APPROVED		UPDATES	ISSUE
		CHECKED			
PROJECT: EAGLE	DRG. No:	DRAWN	N. CHOWLES		
SHEET:C2	ISSUE LEVEL: PR	FIRST RELEASE DATE	18MY09		





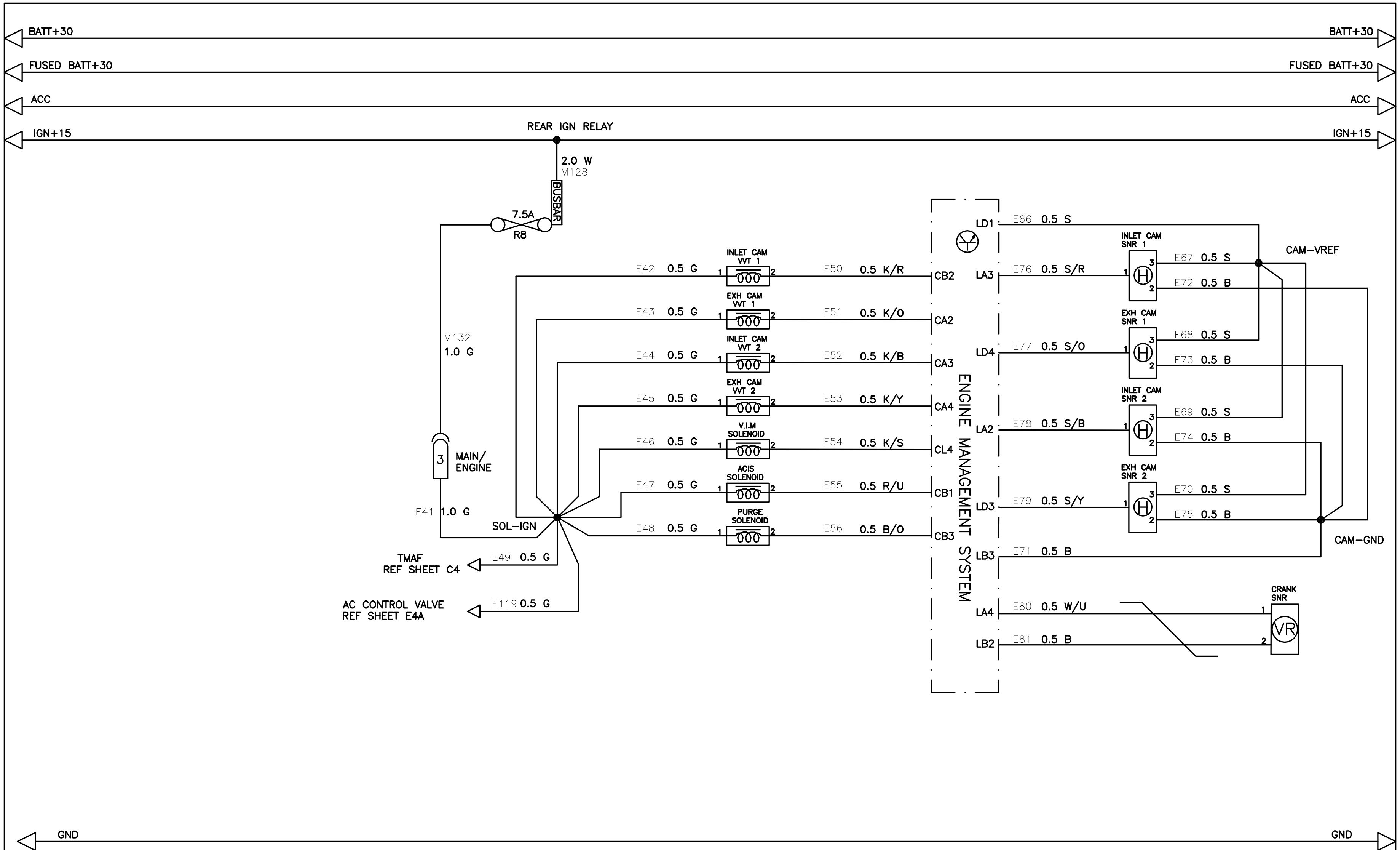
TITLE: CCT-EMS-IGNITION COILS		APPROVED		UPDATES	ISSUE
		CHECKED			
PROJECT: EAGLE	DRG. No:	DRAWN	N. CHOWLES		
SHEET:C3	ISSUE LEVEL: PR	FIRST RELEASE DATE	18MY09		



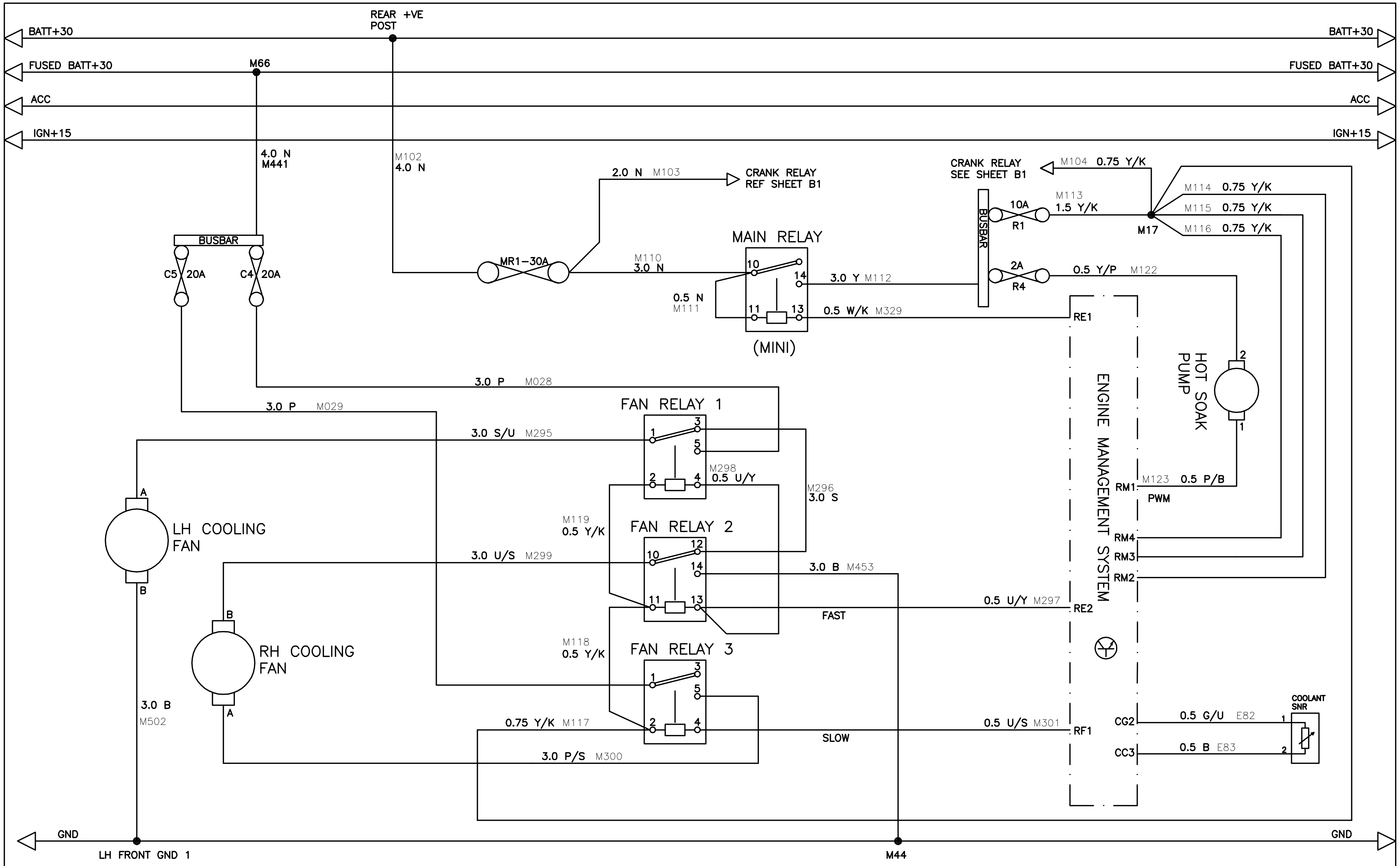
TITLE: CCT-EMS-TMAF, OIL PRESSURE SW & KNOCK SENSORS		APPROVED		UPDATES
		CHECKED		
PROJECT: EAGLE	DRG. No:	DRAWN	N. CHOWLES	
SHEET:C4	ISSUE LEVEL: PR	FIRST RELEASE DATE	18MY09	

ISSUE

CONN NAME
MAIN/ENGINE
MALE CONN
3
FEMALE CONN
CAVITY NUMBER

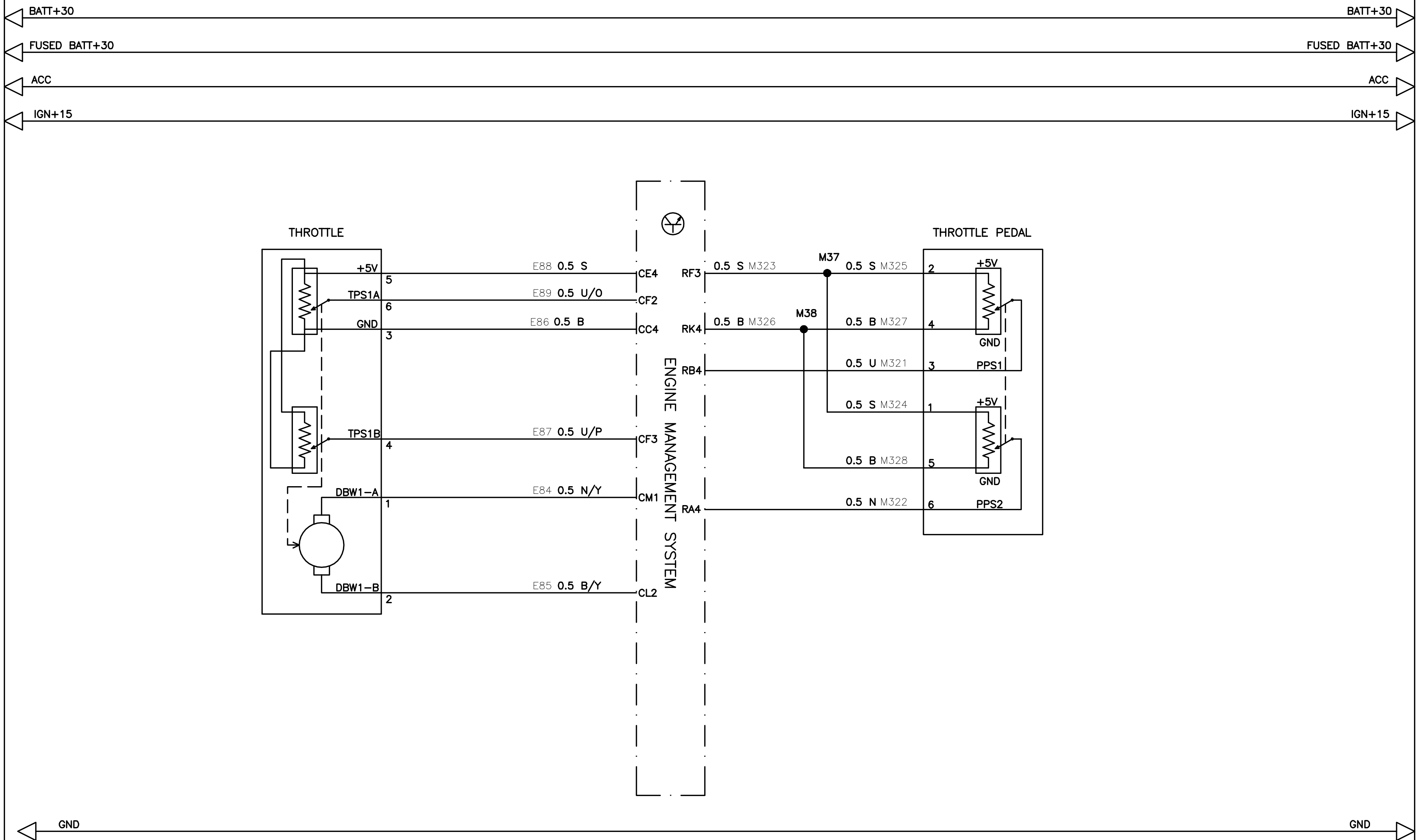


TITLE: CCT-EMS-CAM & CRANK SENSORS & VARIOUS SOLENOIDS		APPROVED		UPDATES	ISSUE
		CHECKED			
PROJECT: EAGLE	DRG. No:	DRAWN	N. CHOWLES		
SHEET:C5	ISSUE LEVEL: PR	FIRST RELEASE DATE	18MY09		

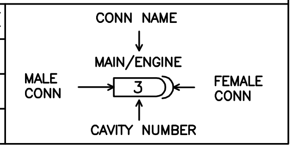


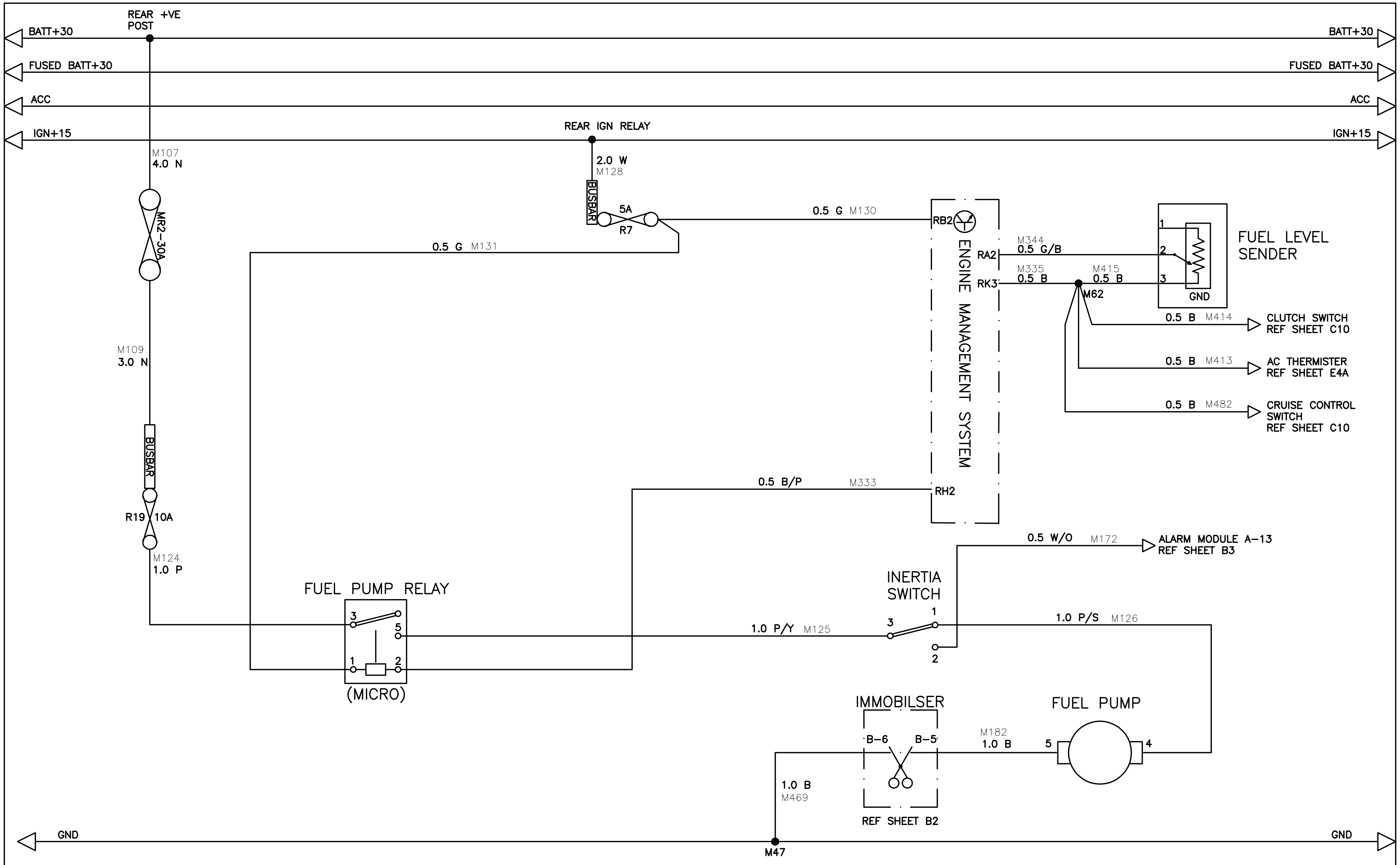
TITLE: CCT–EMS–COOLANT SENSING & FAN CONTROL		APPROVED		UPDATES	ISSUE
		CHECKED			
PROJECT: EAGLE	DRG. No:	DRAWN	N. CHOWLES		
SHEET:C6	ISSUE LEVEL: PR	FIRST RELEASE DATE	18MY09		

CONN NAME
MAIN/ENGINE
MALE CONN
3
FEMALE CONN
CAVITY NUMBER



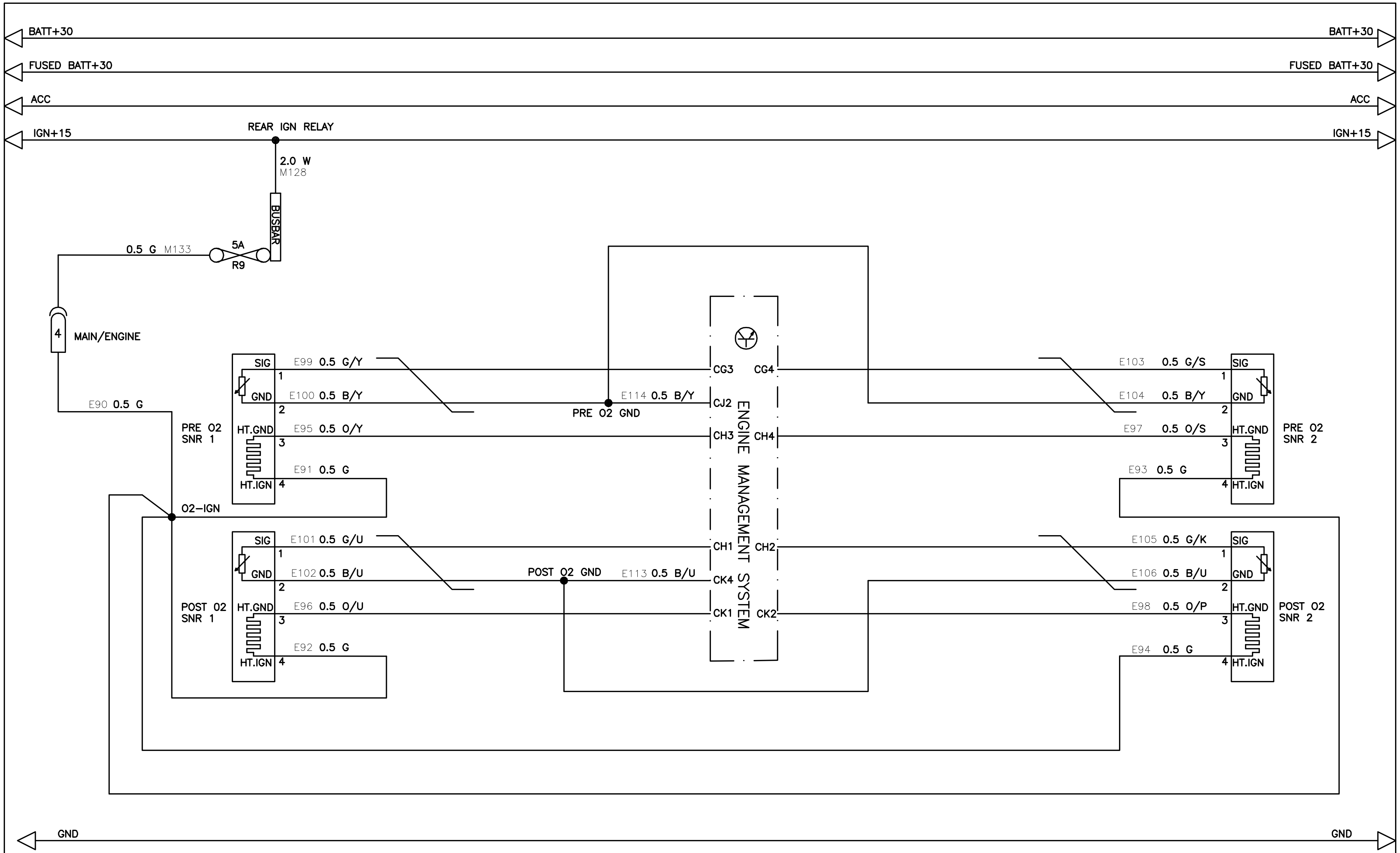
TITLE: CCT-EMS-THROTTLE ACTUATION		APPROVED		UPDATES	ISSUE
		CHECKED			
PROJECT: EAGLE	DRG. No:	DRAWN	N. CHOWLES		
SHEET:C7	ISSUE LEVEL: PR	FIRST RELEASE DATE	18MY09		





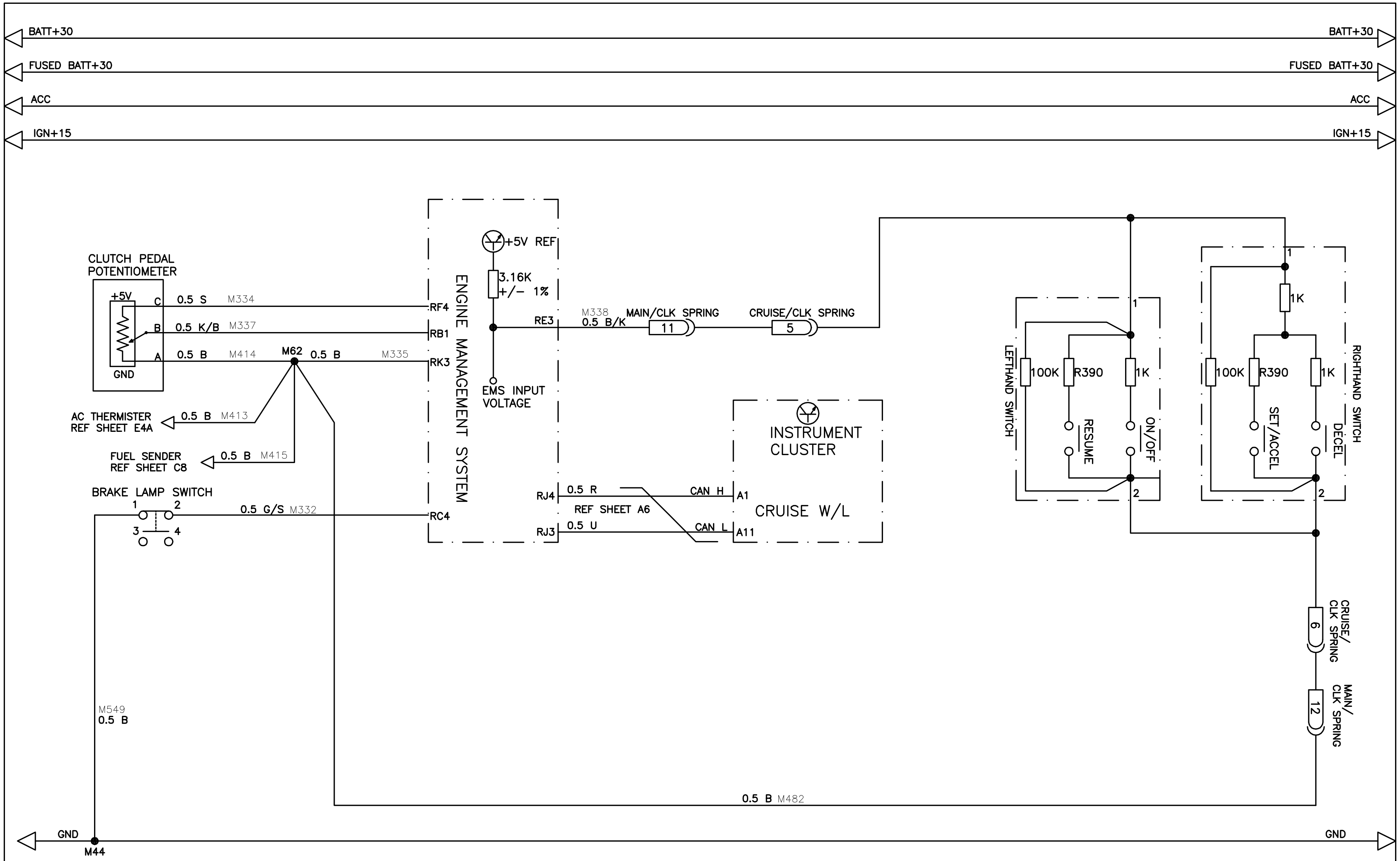
TITLE: CCT-EMS-FUEL PUMP & FUEL LEVEL		APPROVED		UPDATES	ISSUE
		CHECKED			
PROJECT: EAGLE	DRG. No:	DRAWN	N. CHOWLES		
SHEET:C8	ISSUE LEVEL: PR	FIRST RELEASE DATE	18MY09		

CONN NAME
MAIN/ENGINE
MALE CONN
FEMALE CONN
3
CAVITY NUMBER

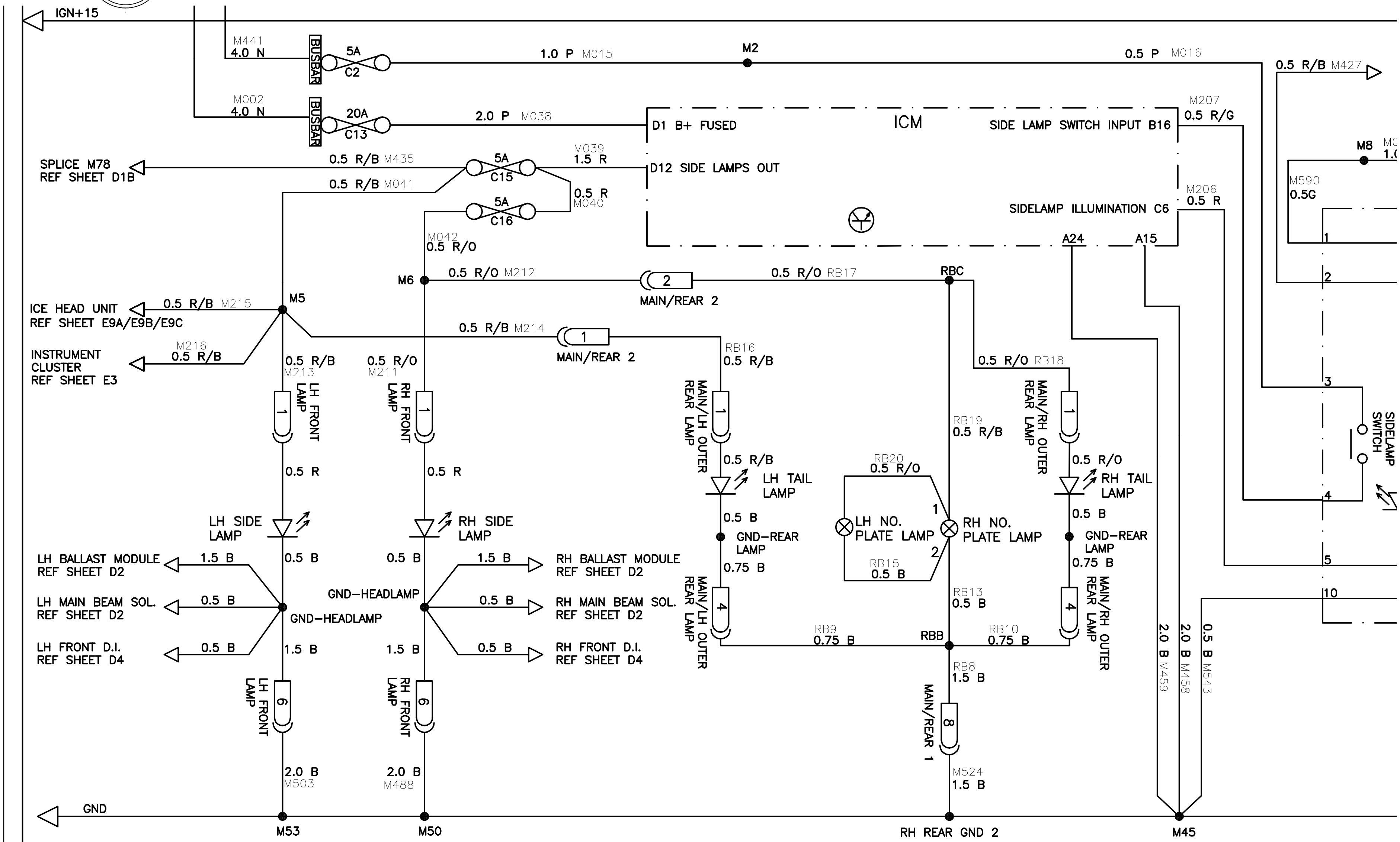


TITLE: CCT–EMS–02 SENSORS		APPROVED		UPDATES	ISSUE
		CHECKED			
PROJECT: EAGLE	DRG. No:	DRAWN	N. CHOWLES		
SHEET:C9	ISSUE LEVEL: PR	FIRST RELEASE DATE	18MY09		

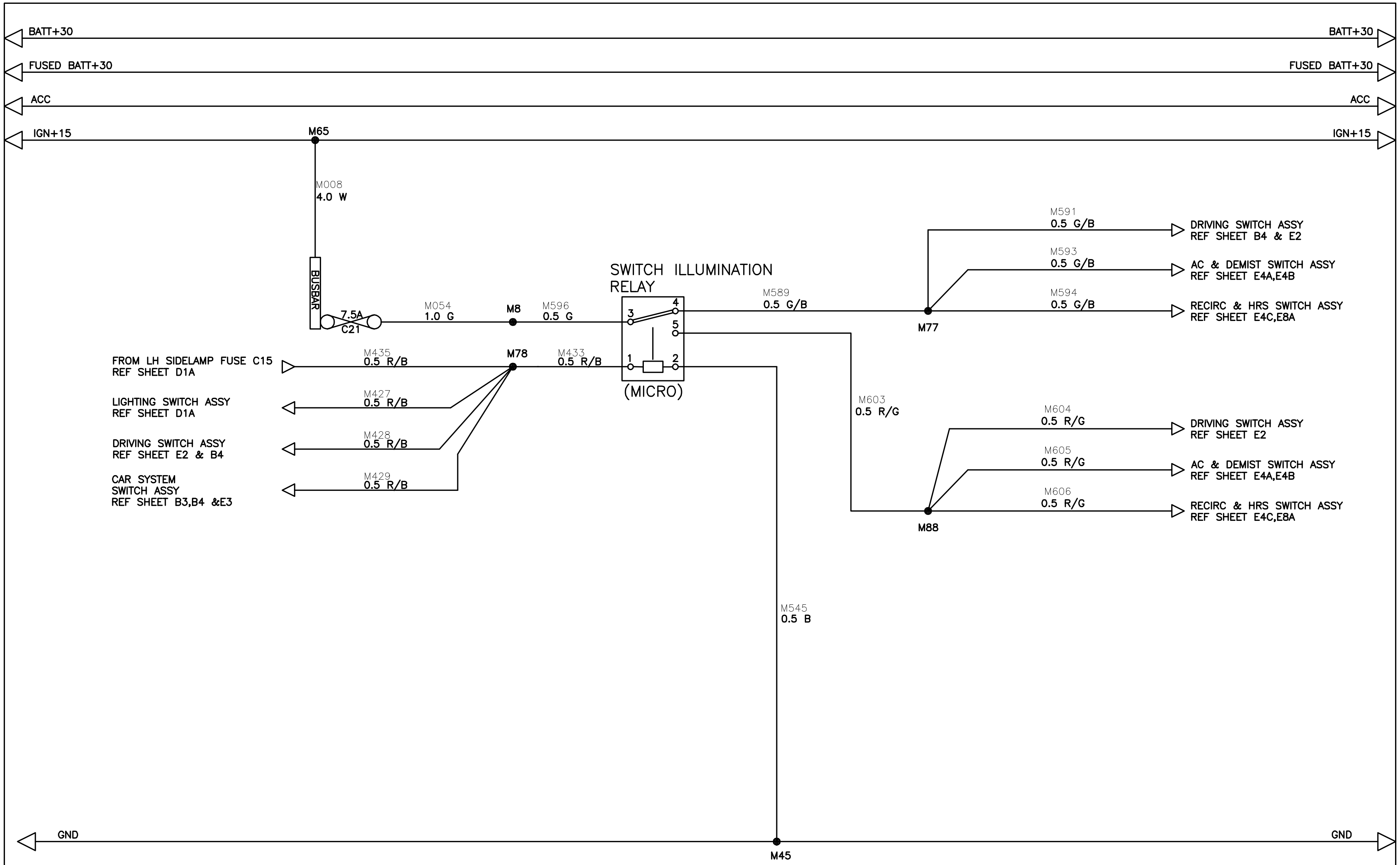
CONN NAME
MAIN/ENGINE
MALE CONN
3
FEMALE CONN
CAVITY NUMBER



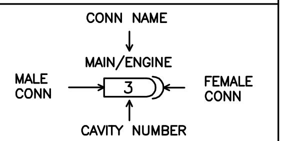
TITLE: CCT-EMS-CRUISE CONTROL		APPROVED		UPDATES	ISSUE	CONN NAME ↓ MAIN/ENGINE
		CHECKED				MALE CONN — 3 — FEMALE CONN
PROJECT: EAGLE	DRG. No:	DRAWN	N. CHOWLES			
SHEET:C10	ISSUE LEVEL: PR	FIRST RELEASE DATE	18MY09			CAVITY NUMBER

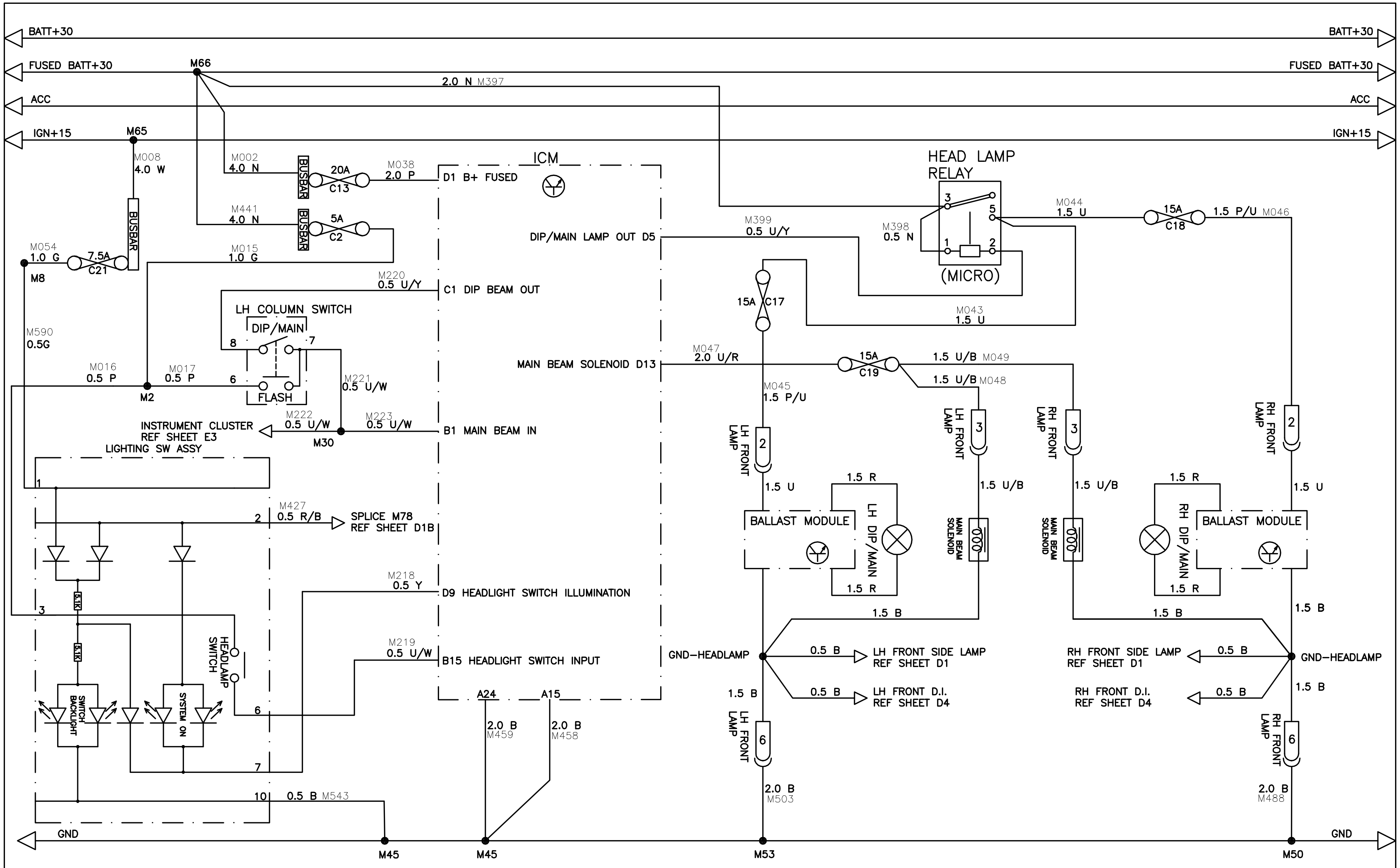


TITLE: CCT-SIDE LAMPS		APPROVED		UPDATES	ISSUE
		CHECKED			
PROJECT: EAGLE	DRG. No:	DRAWN	N. CHOWLES		
SHEET:D1A	ISSUE LEVEL: PR	FIRST RELEASE DATE	18MY09		



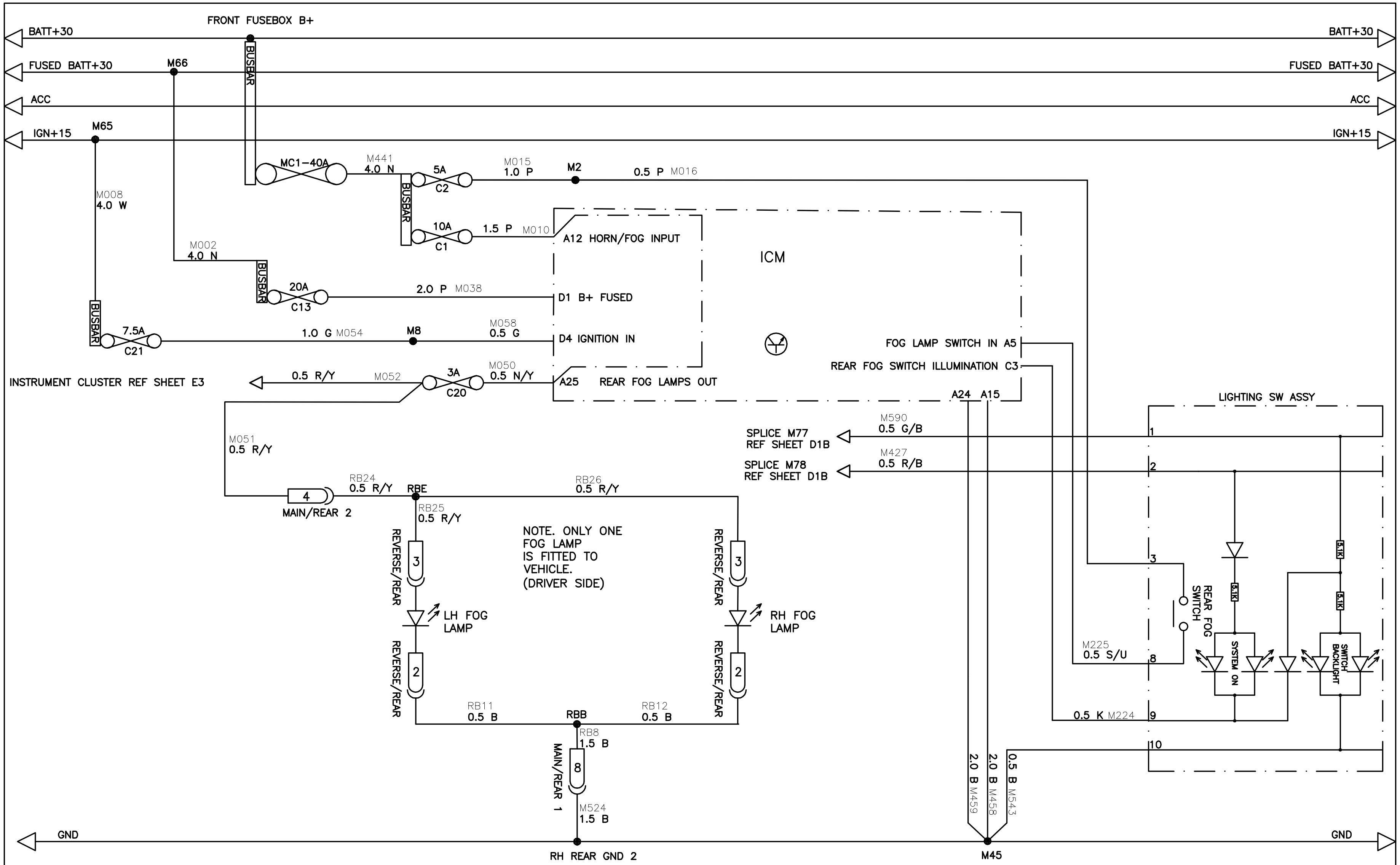
TITLE: CCT–SWITCH ILLUMINATION		APPROVED		UPDATES	ISSUE
		CHECKED			
PROJECT: EAGLE	DRG. No:	DRAWN	N. CHOWLES		
SHEET:D1B	ISSUE LEVEL: PR	FIRST RELEASE DATE	18MY09		



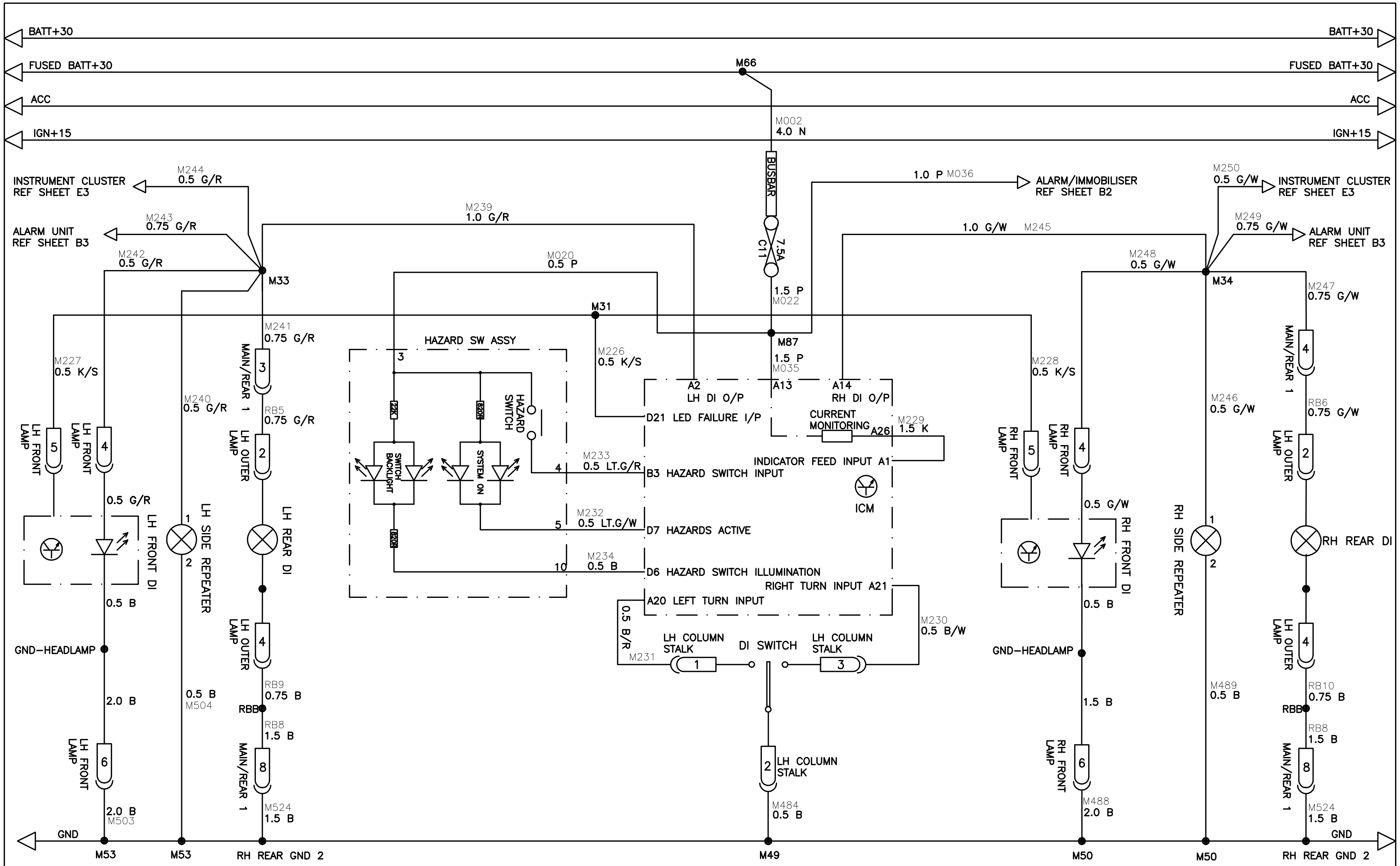


LOTUS	TITLE: CCT–HEADLAMPS (XENON)		APPROVED		UPDATES	ISSUE
			CHECKED			
	PROJECT: EAGLE	DRG. No:	DRAWN	N. CHOWLES		
	SHEET:D2A	ISSUE LEVEL: PR	FIRST RELEASE DATE	18MY09		

CONN NAME
MAIN/ENGINE
MALE CONN
3
FEMALE CONN
CAVITY NUMBER

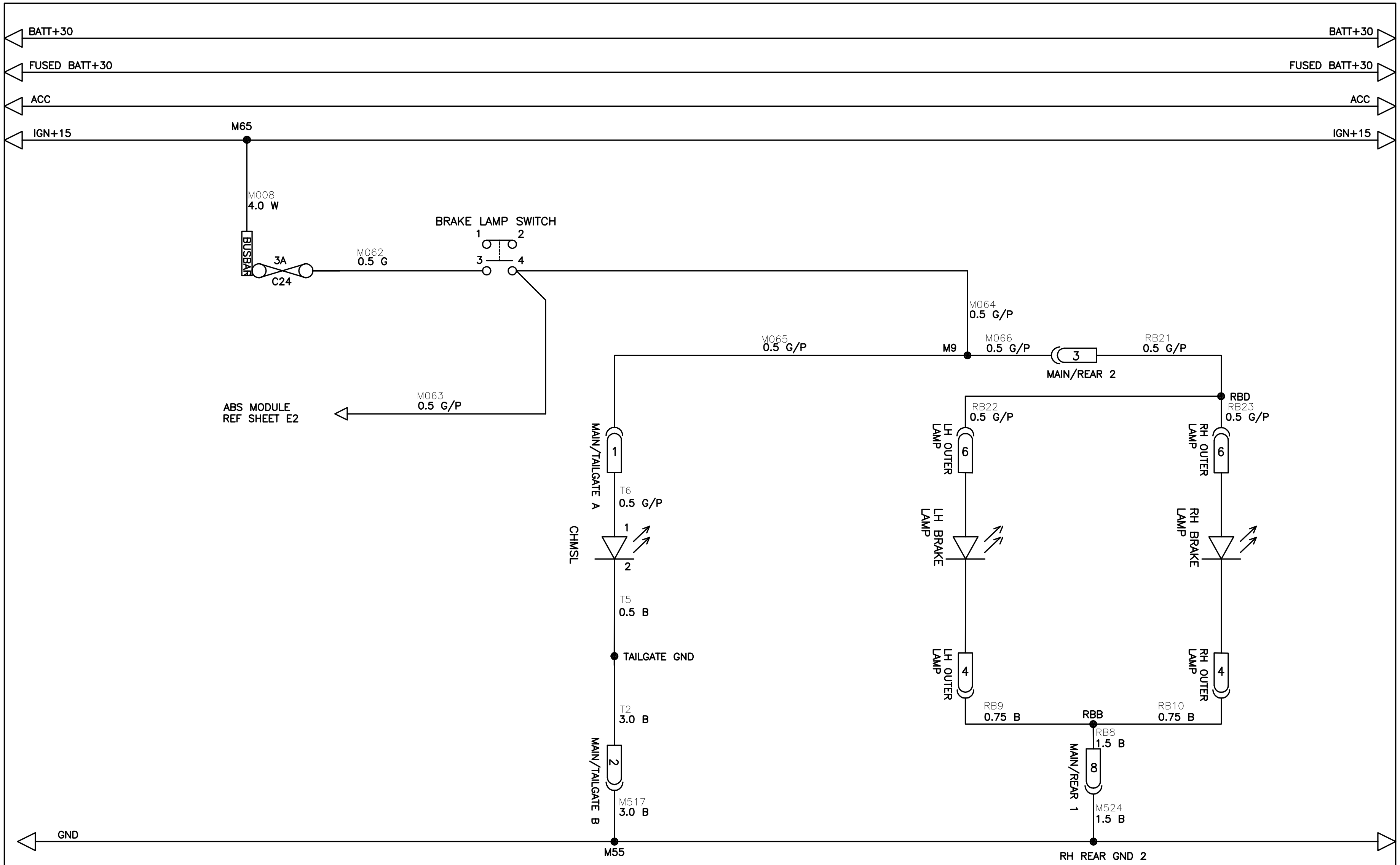


TITLE: CCT-REAR FOG LAMPS		APPROVED		UPDATES	ISSUE
		CHECKED			
PROJECT: EAGLE	DRG. No:	DRAWN	N. CHOWLES		
SHEET:D3	ISSUE LEVEL: PR	FIRST RELEASE DATE	18MY09		

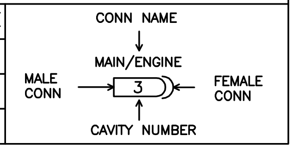


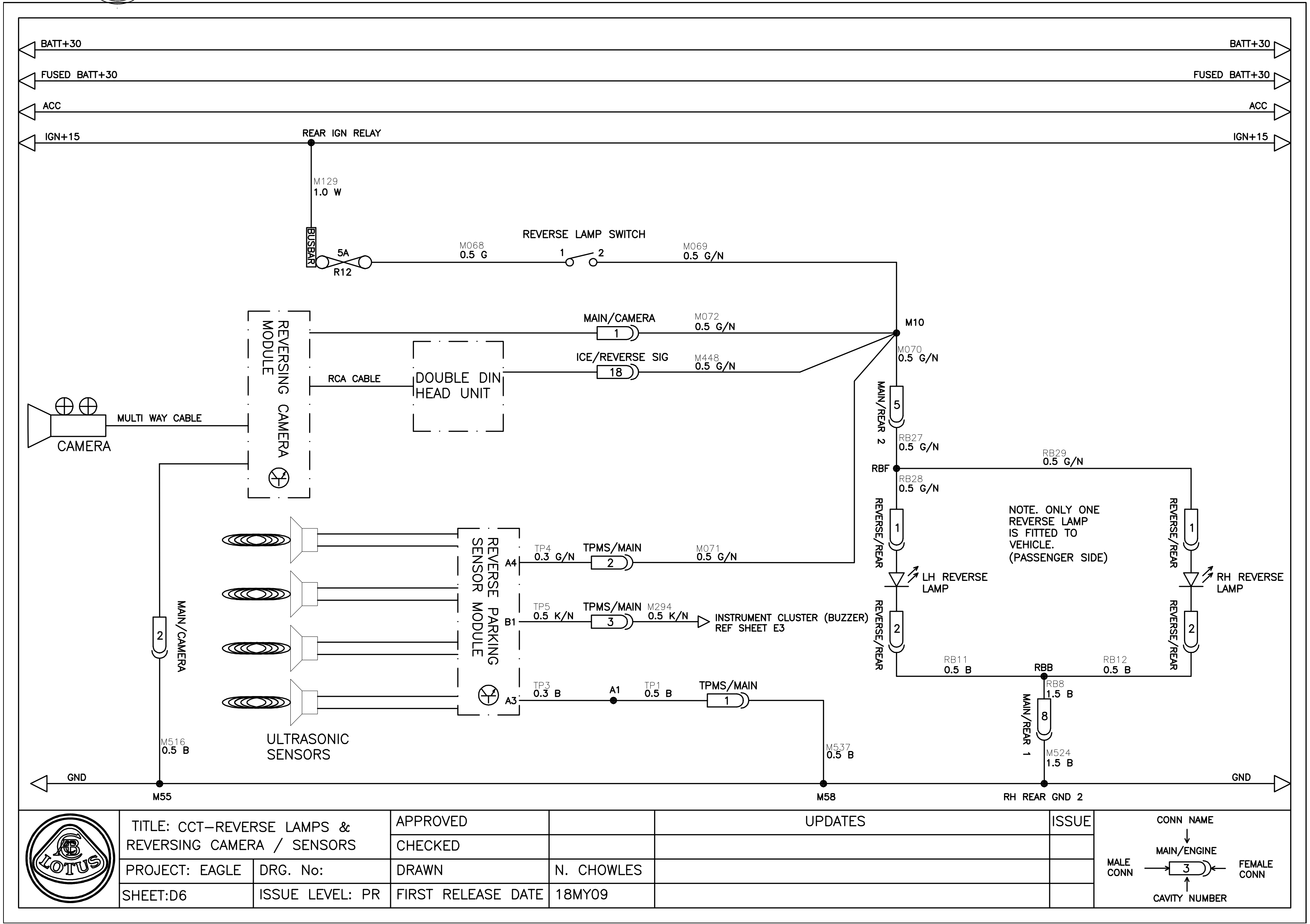
TITLE: CCT-DIRECTION INDICATORS & HAZARDS (ECE)		APPROVED		UPDATES	ISSUE
		CHECKED			
PROJECT: EAGLE	DRG. No:	DRAWN	N. CHOWLES		
SHEET:D4	ISSUE LEVEL: PR	FIRST RELEASE DATE	18MY09		

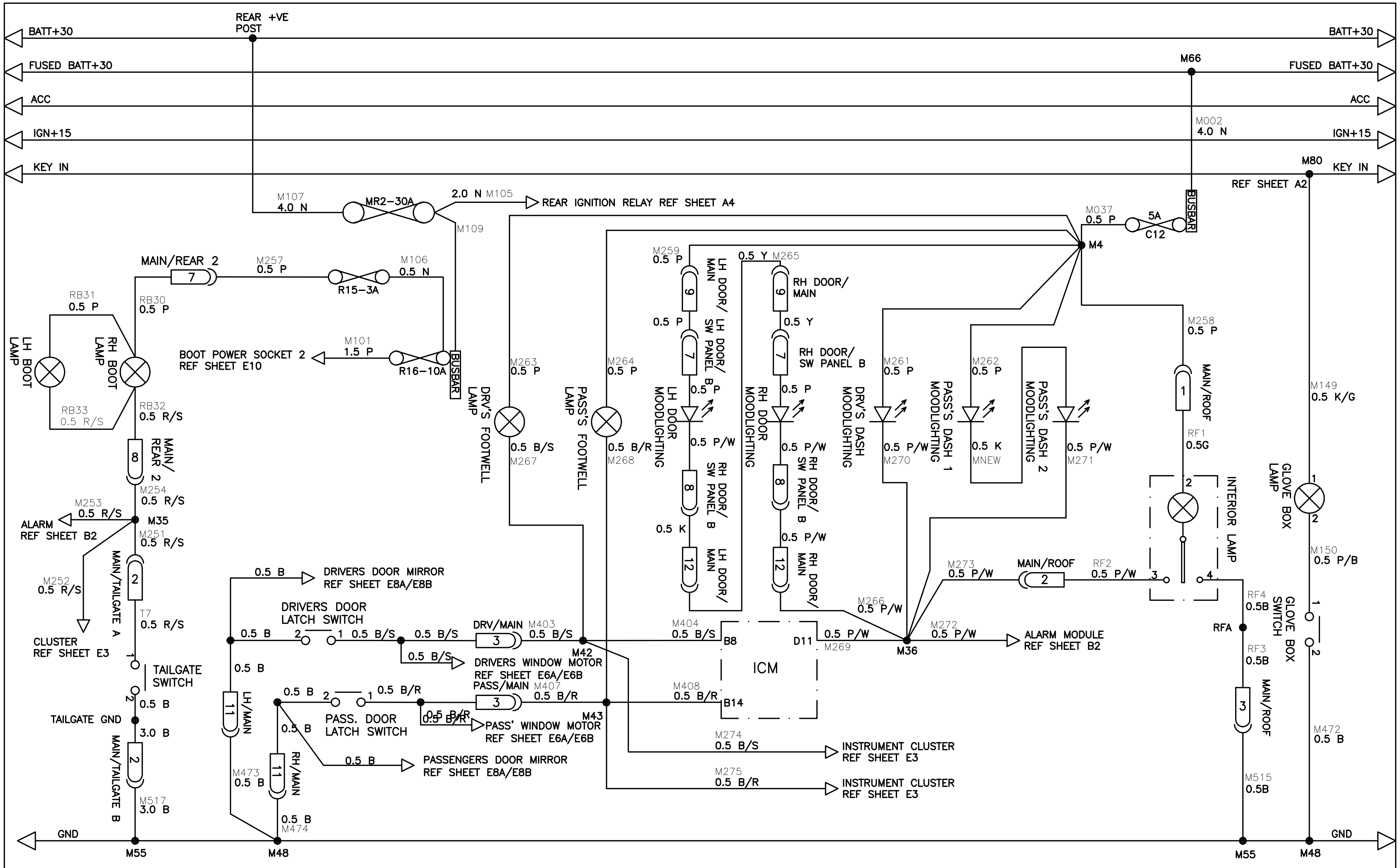
CONN NAME
MAIN/ENGINE
MALE CONN
FEMALE CONN
3
CAVITY NUMBER



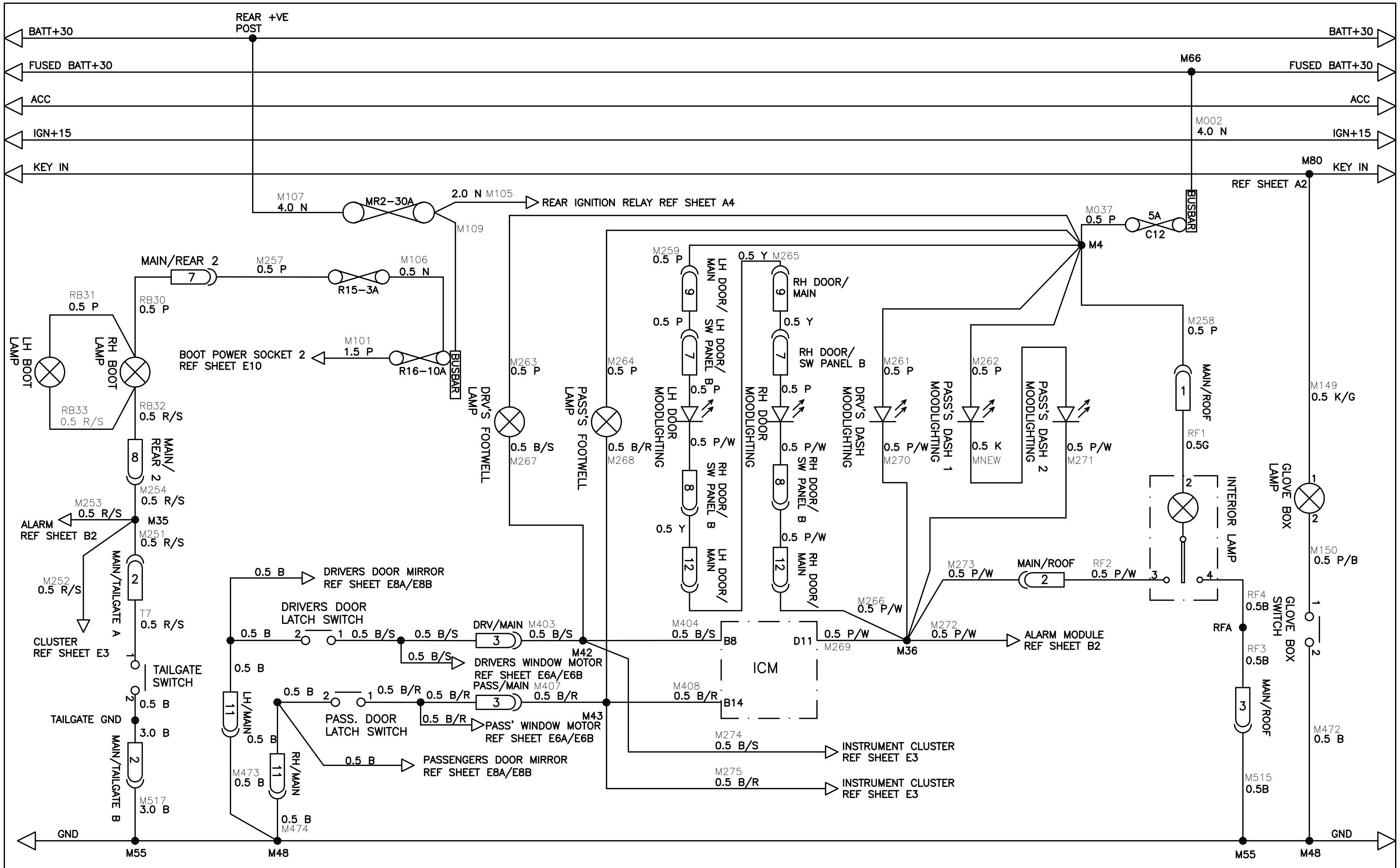
TITLE: CCT–BRAKE LAMPS (ECE)		APPROVED		UPDATES	ISSUE
		CHECKED			
PROJECT: EAGLE	DRG. No:	DRAWN	N. CHOWLES		
SHEET:D5	ISSUE LEVEL: PR	FIRST RELEASE DATE	18MY09		




BATT+30
FUSED BATT+30
ACC
IGN+15
REAR IGN RELAY
M129
1.0 W
BUSBAR
5A
R12
M068
0.5 G
REVERSE LAMP SWITCH
M069
0.5 G/N
REVERSING CAMERA MODULE
MAIN/CAMERA
M072
0.5 G/N
M10
DOUBLE DIN HEAD UNIT
ICE/REVERSE SIG
M448
0.5 G/N
M070
0.5 G/N
RCA CABLE
MULTI WAY CABLE
CAMERA
MAIN/REAR 2
RB27
0.5 G/N
RB29
0.5 G/N
RBF
RB28
0.5 G/N
NOTE. ONLY ONE REVERSE LAMP IS FITTED TO VEHICLE. (PASSENGER SIDE)
REVERSE/REAR
LH REVERSE LAMP
RH REVERSE LAMP
REVERSE PARKING SENSOR MODULE
TP4
0.3 G/N
TPMS/MAIN
M071
0.5 G/N
A4
B1
TP5
0.5 K/N
M294
0.5 K/N
INSTRUMENT CLUSTER (BUZZER) REF SHEET E3
A3
TP3
0.3 B
A1
TP1
0.5 B
RB11
0.5 B
RBB
RB12
0.5 B
RB8
1.5 B
MAIN/REAR 1
M524
1.5 B
MAIN/CAMERA
M516
0.5 B
ULTRASONIC SENSORS
M537
0.5 B
GND
M55
M58
RH REAR GND 2
TITLE: CCT–REVERSE LAMPS & REVERSING CAMERA / SENSORS
PROJECT: EAGLE
DRG. No:
SHEET:D6
ISSUE LEVEL: PR
APPROVED
CHECKED
DRAWN
N. CHOWLES
FIRST RELEASE DATE
18MY09
UPDATES
ISSUE
CONN NAME
MAIN/ENGINE
MALE CONN
FEMALE CONN
CAVITY NUMBER

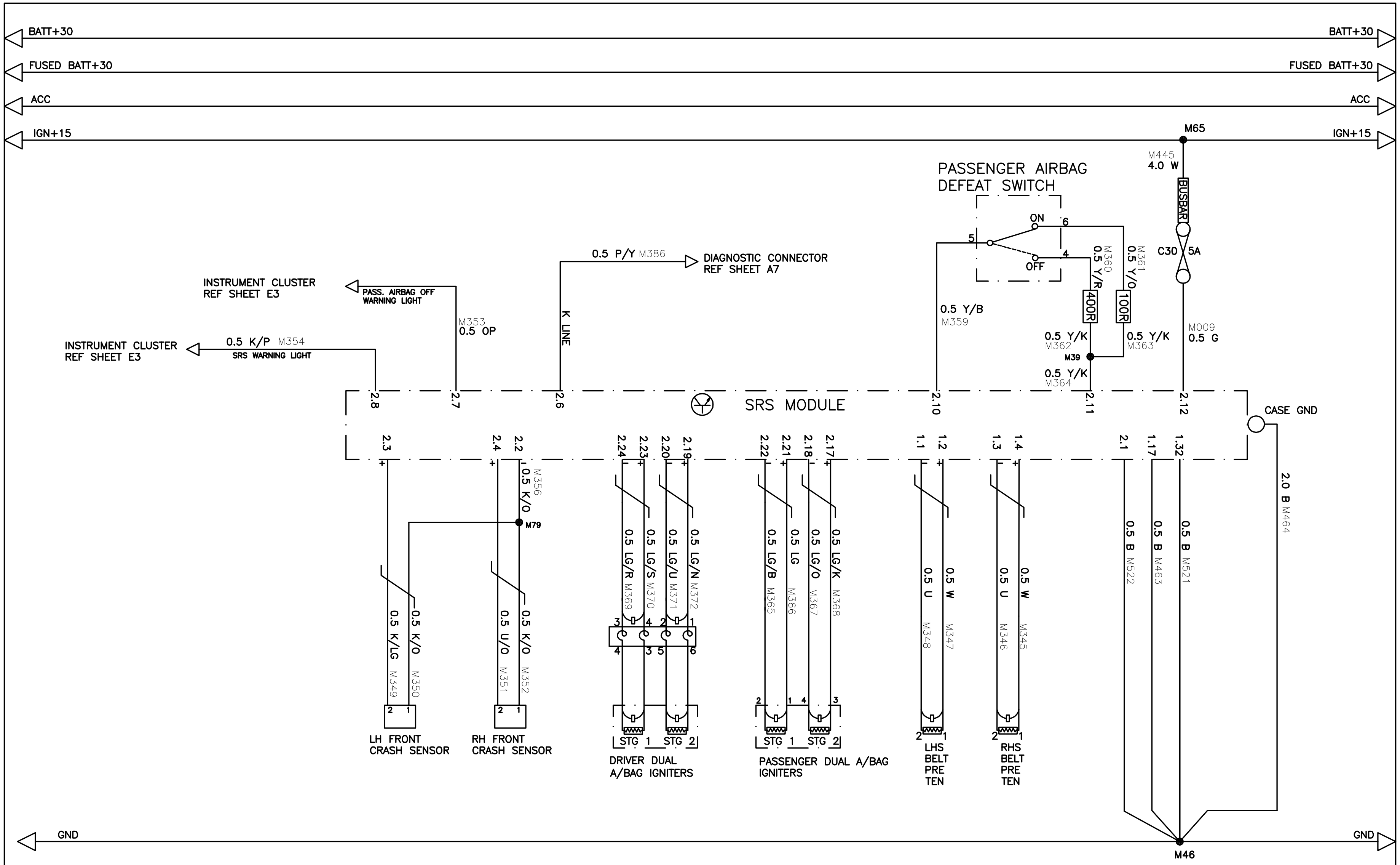


TITLE: CCT–INTERIOR LIGHTING (LH DRIVE)		APPROVED		UPDATES
		CHECKED		
PROJECT: EAGLE	DRG. No:	DRAWN	N. CHOWLES	
SHEET:D7A	ISSUE LEVEL: PR	FIRST RELEASE DATE	18MY09	ISSUE



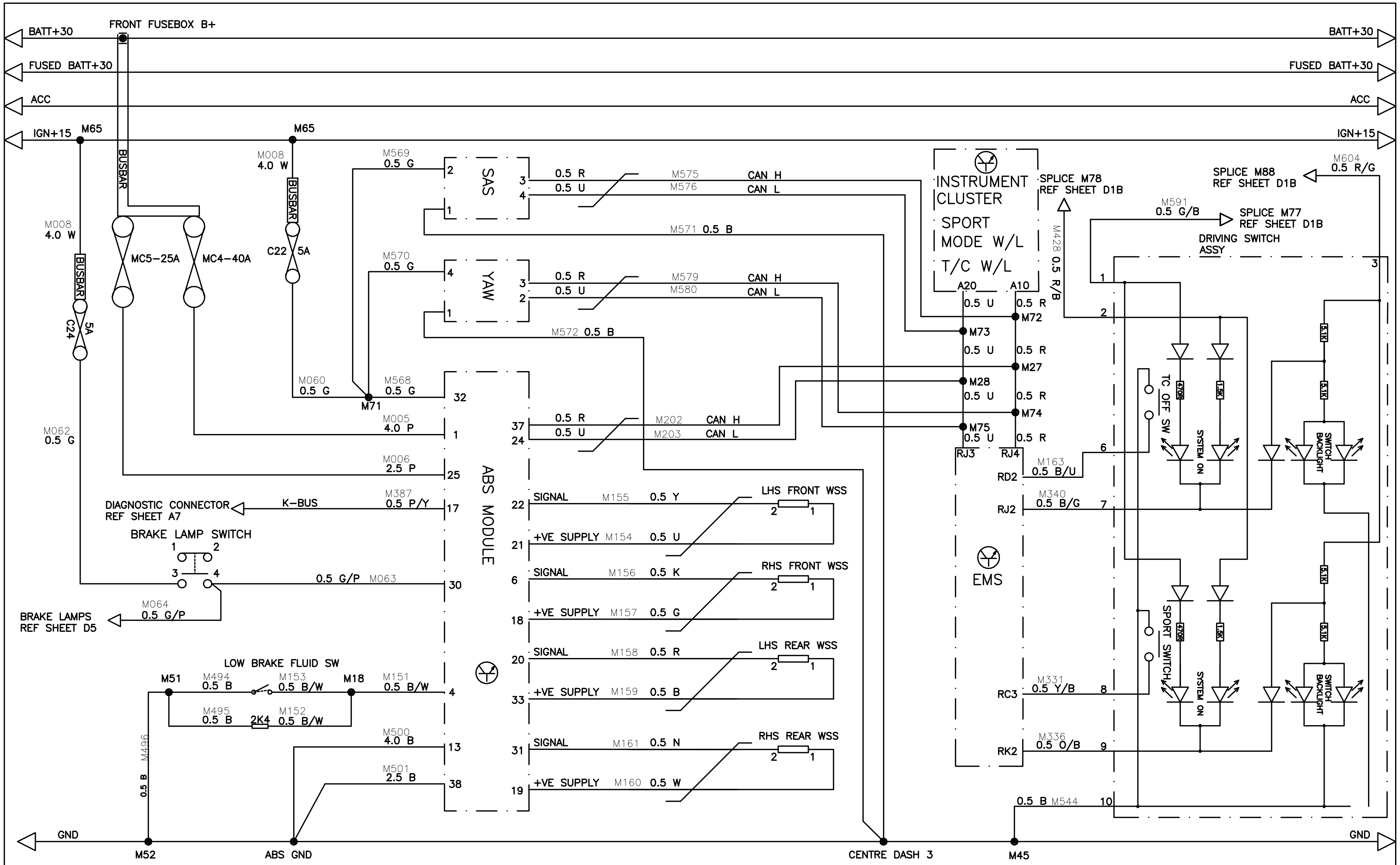
TITLE: CCT-INTERIOR LIGHTING (RH DRIVE)		APPROVED		UPDATES	ISSUE
		CHECKED			
PROJECT: EAGLE	DRG. No:	DRAWN	N. CHOWLES		
SHEET:D7B	ISSUE LEVEL: PR	FIRST RELEASE DATE	18MY09		

CONN NAME
MAIN/ENGINE
MALE CONN
3
FEMALE CONN
CAVITY NUMBER



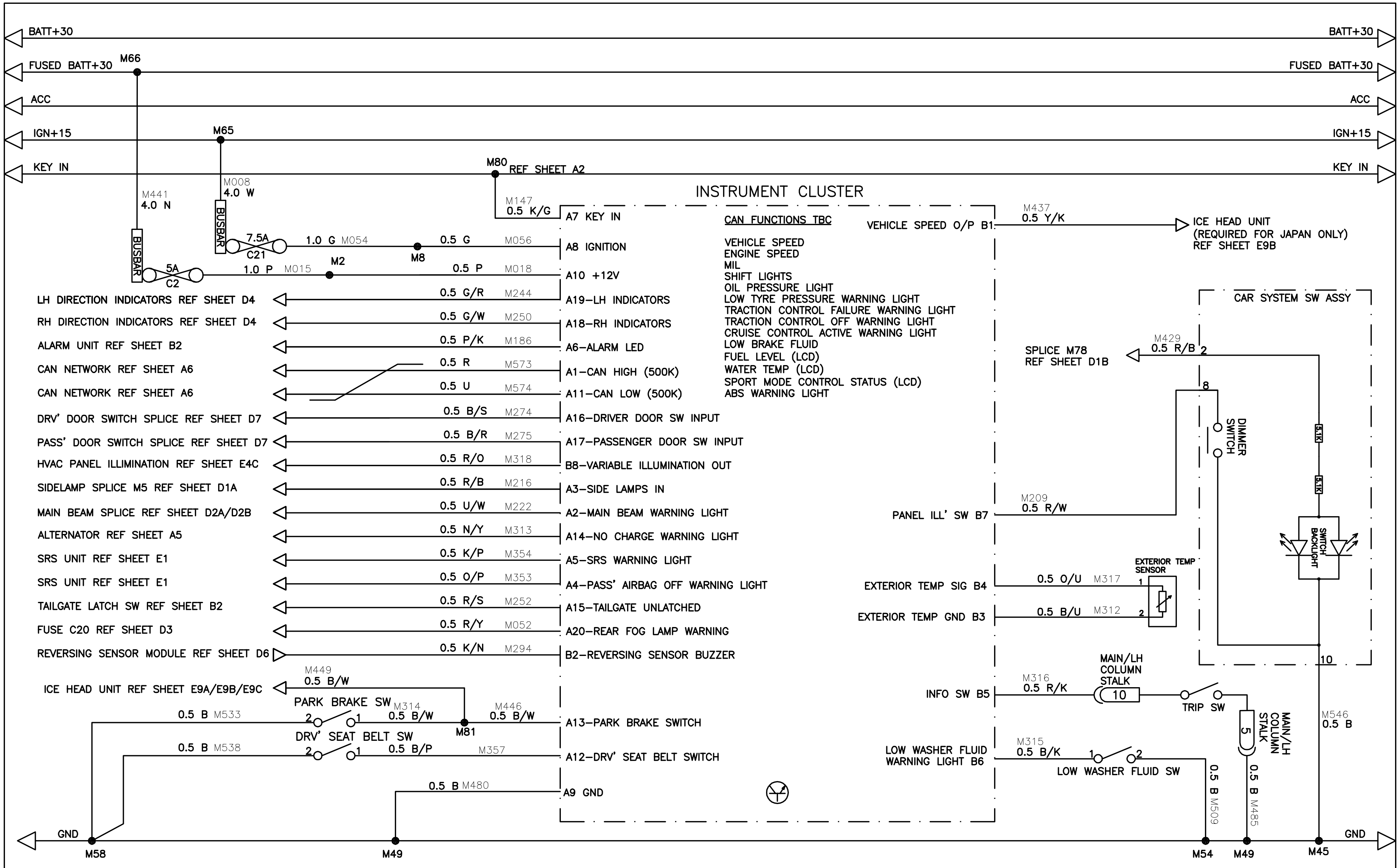
TITLE: CCT-SRS SYSTEM		APPROVED		UPDATES	ISSUE
		CHECKED			
PROJECT: EAGLE	DRG. No:	DRAWN	N. CHOWLES		
SHEET:E1	ISSUE LEVEL: PR	FIRST RELEASE DATE	18MY09		

CONN NAME
MAIN/ENGINE
MALE CONN
3
FEMALE CONN
CAVITY NUMBER



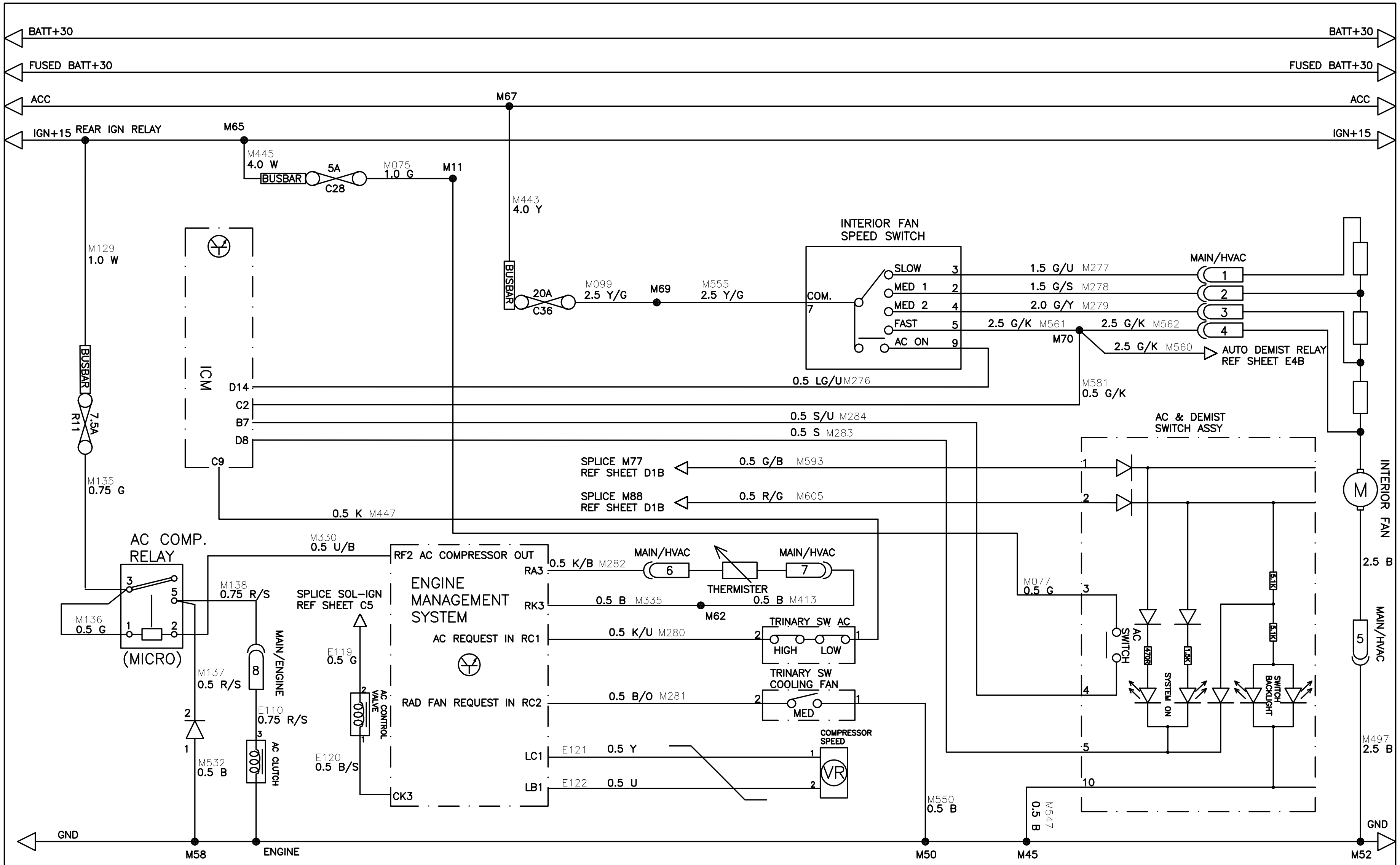
TITLE: CCT–ABS SYSTEM, TRACTION CONTROL & SPORT MODE		APPROVED		UPDATES	ISSUE
		CHECKED			
PROJECT: EAGLE	DRG. No:	DRAWN	N. CHOWLES		
SHEET:E2	ISSUE LEVEL: PR	FIRST RELEASE DATE	18MY09		

CONN NAME
MAIN/ENGINE
MALE CONN
FEMALE CONN
3
CAVITY NUMBER

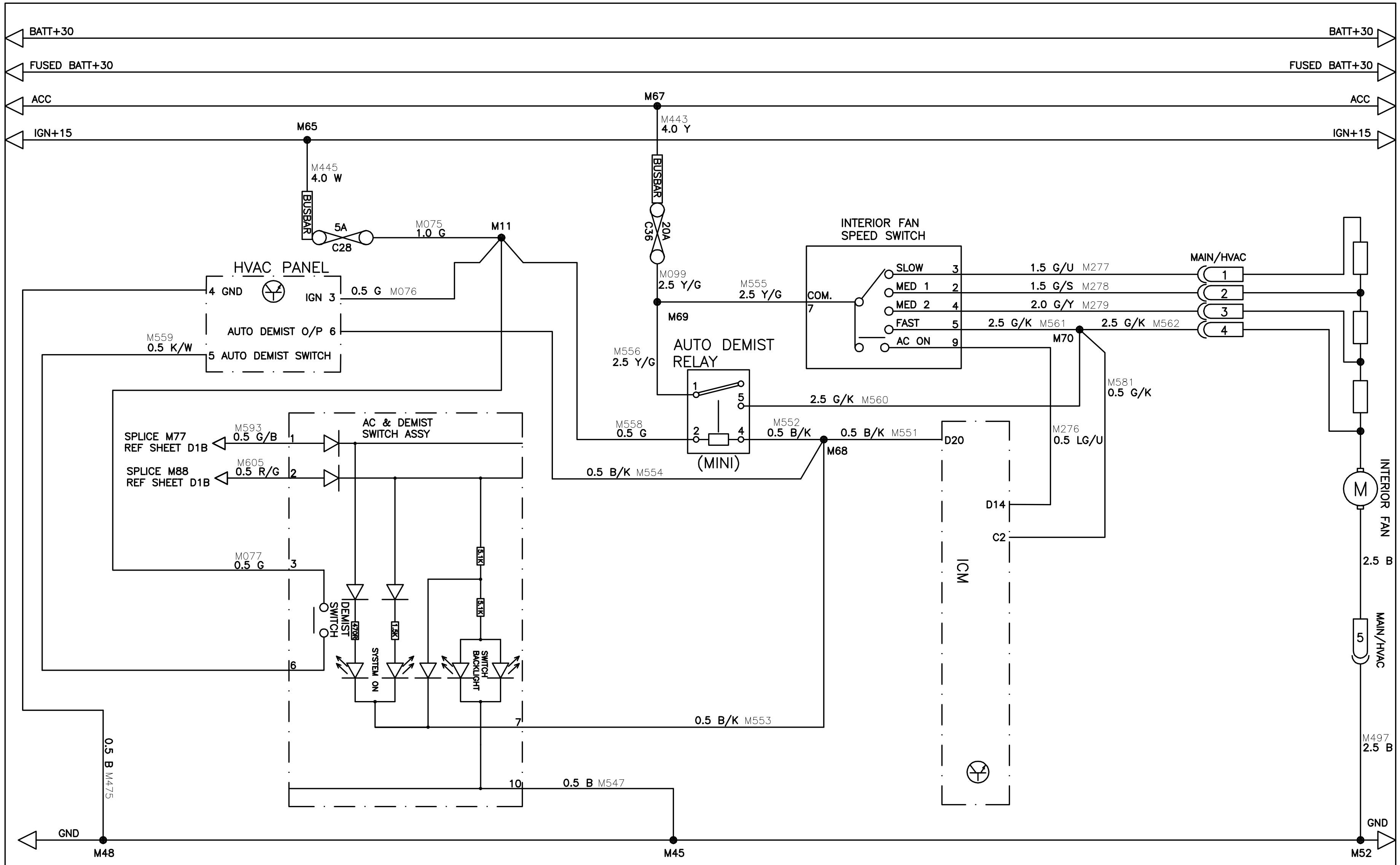


TITLE: CCT–INSTRUMENT CLUSTER		APPROVED		UPDATES / ISSUE
		CHECKED		
PROJECT: EAGLE	DRG. No:	DRAWN	N. CHOWLES	
SHEET:E3	ISSUE LEVEL: PR	FIRST RELEASE DATE	18MY09	

CONN NAME
MAIN/ENGINE
MALE CONN
FEMALE CONN
CAVITY NUMBER

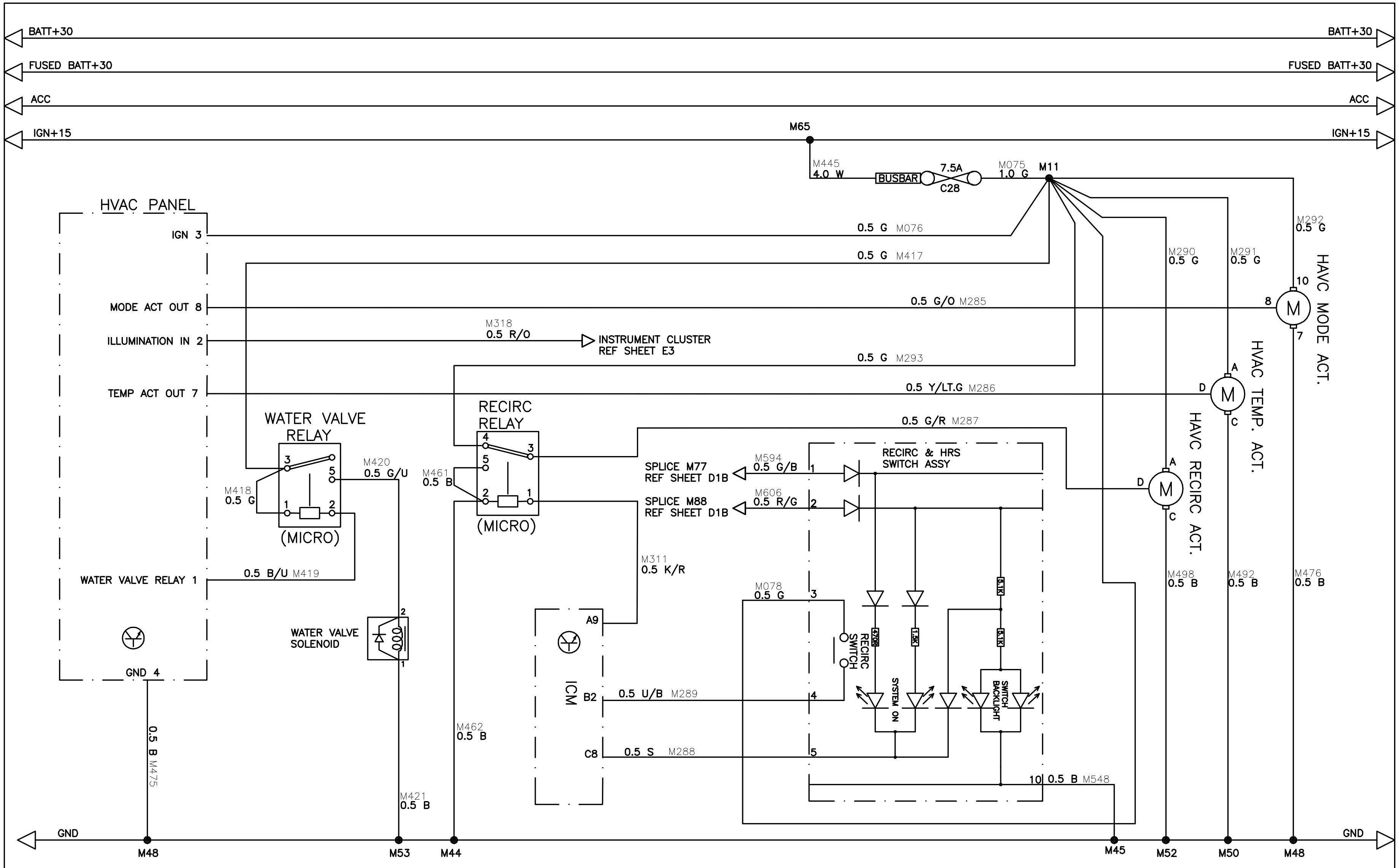


TITLE: CCT–HVAC PART 1		APPROVED		UPDATES	ISSUE	CONN NAME, MAIN/ENGINE, MALE CONN, 3, FEMALE CONN, CAVITY NUMBER
		CHECKED				
PROJECT: EAGLE	DRG. No:	DRAWN	N. CHOWLES			
SHEET:E4A	ISSUE LEVEL: PR	FIRST RELEASE DATE	18MY09			

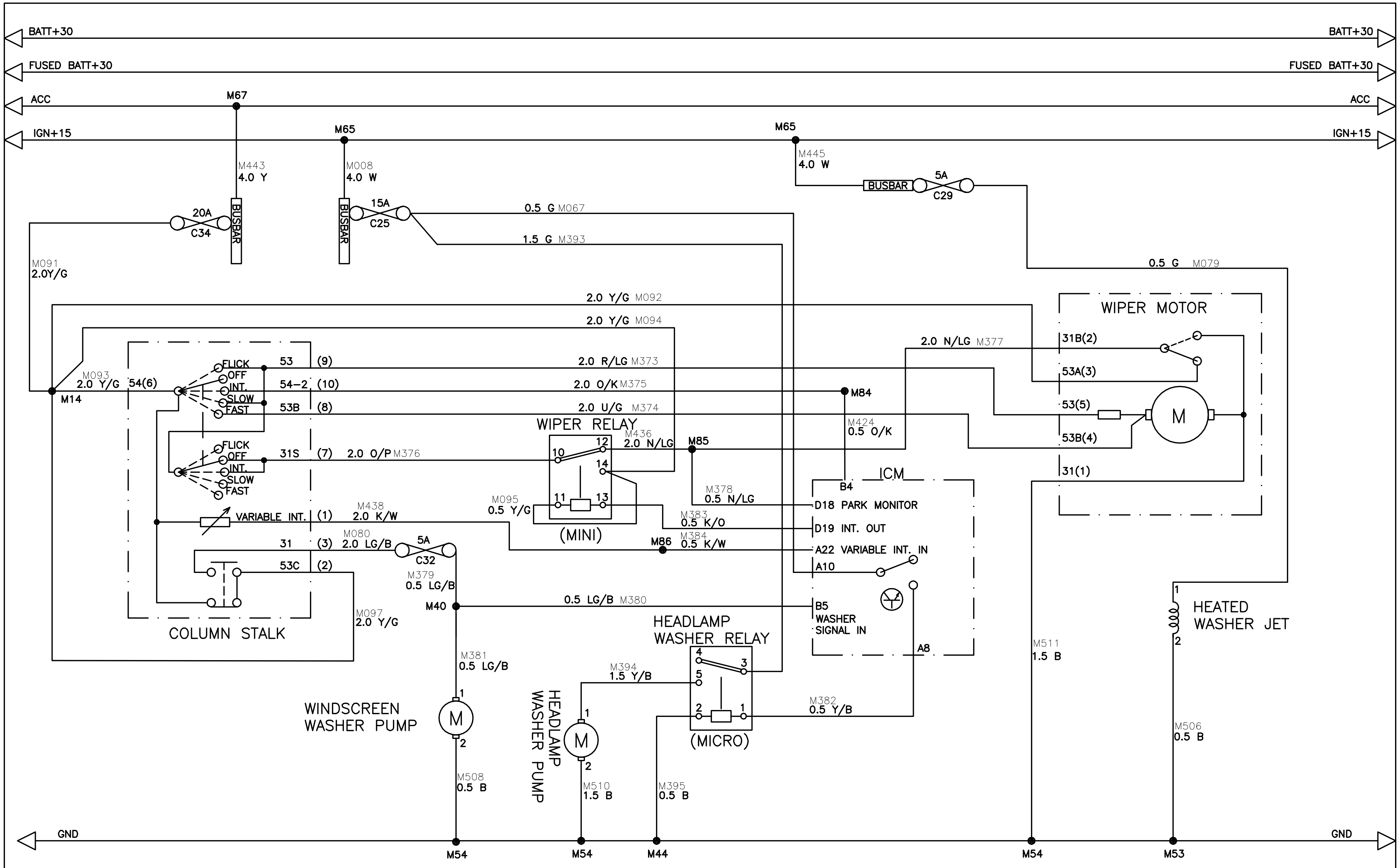


TITLE: CCT–HVAC PART 2		APPROVED		UPDATES	ISSUE
		CHECKED			
PROJECT: EAGLE	DRG. No:	DRAWN	N. CHOWLES		
SHEET:E4B	ISSUE LEVEL: PR	FIRST RELEASE DATE	18MY09		

CONN NAME
MAIN/ENGINE
MALE CONN
FEMALE CONN
3
CAVITY NUMBER

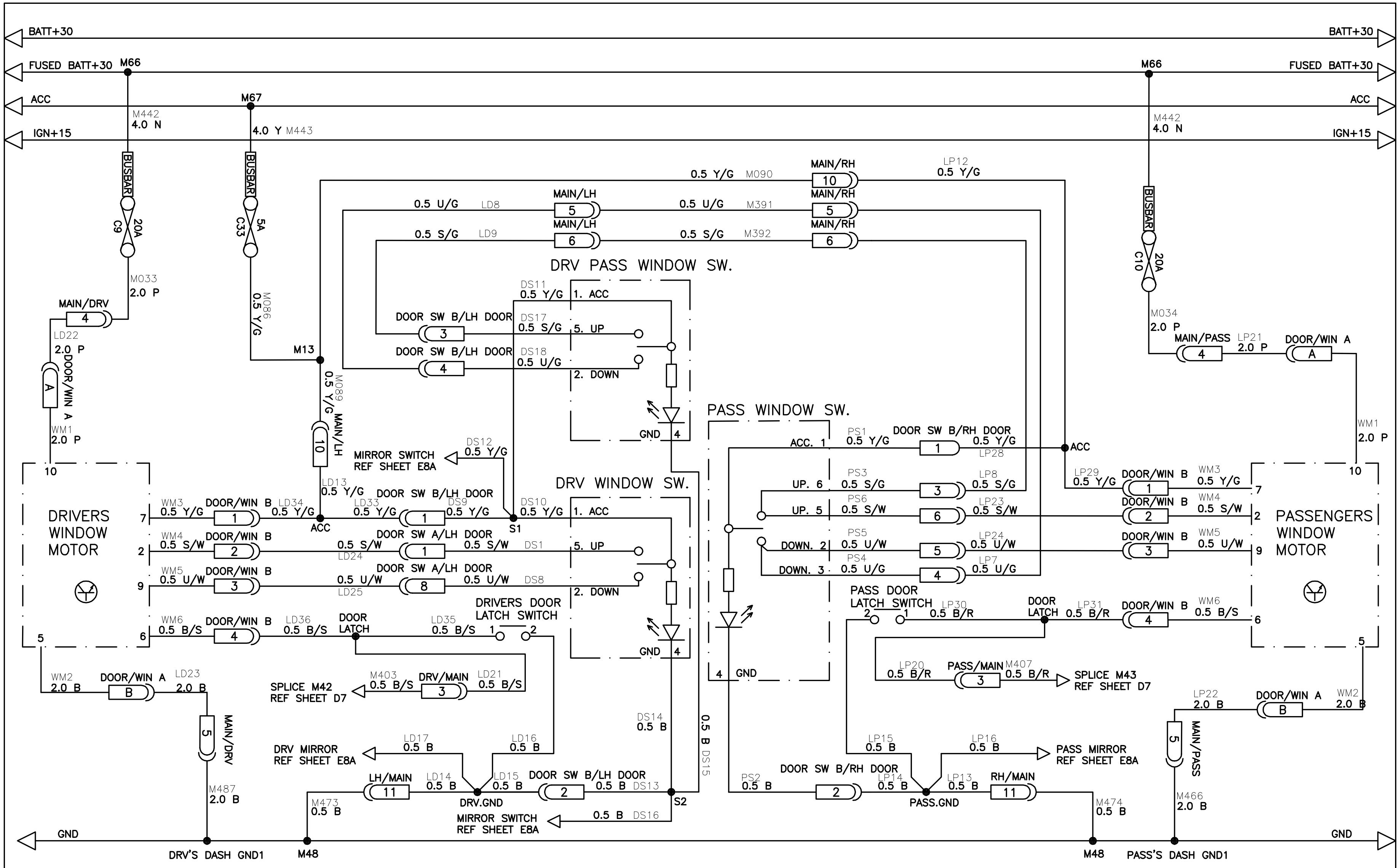


TITLE: CCT–HVAC PART 3		APPROVED		UPDATES	ISSUE	CONN NAME
		CHECKED		WATER VALVE ADDED		MAIN/ENGINE
PROJECT: EAGLE	DRG. No:	DRAWN	N. CHOWLES			MALE CONN 3 FEMALE CONN
SHEET:E4C	ISSUE LEVEL: PR	FIRST RELEASE DATE	28JL09			CAVITY NUMBER

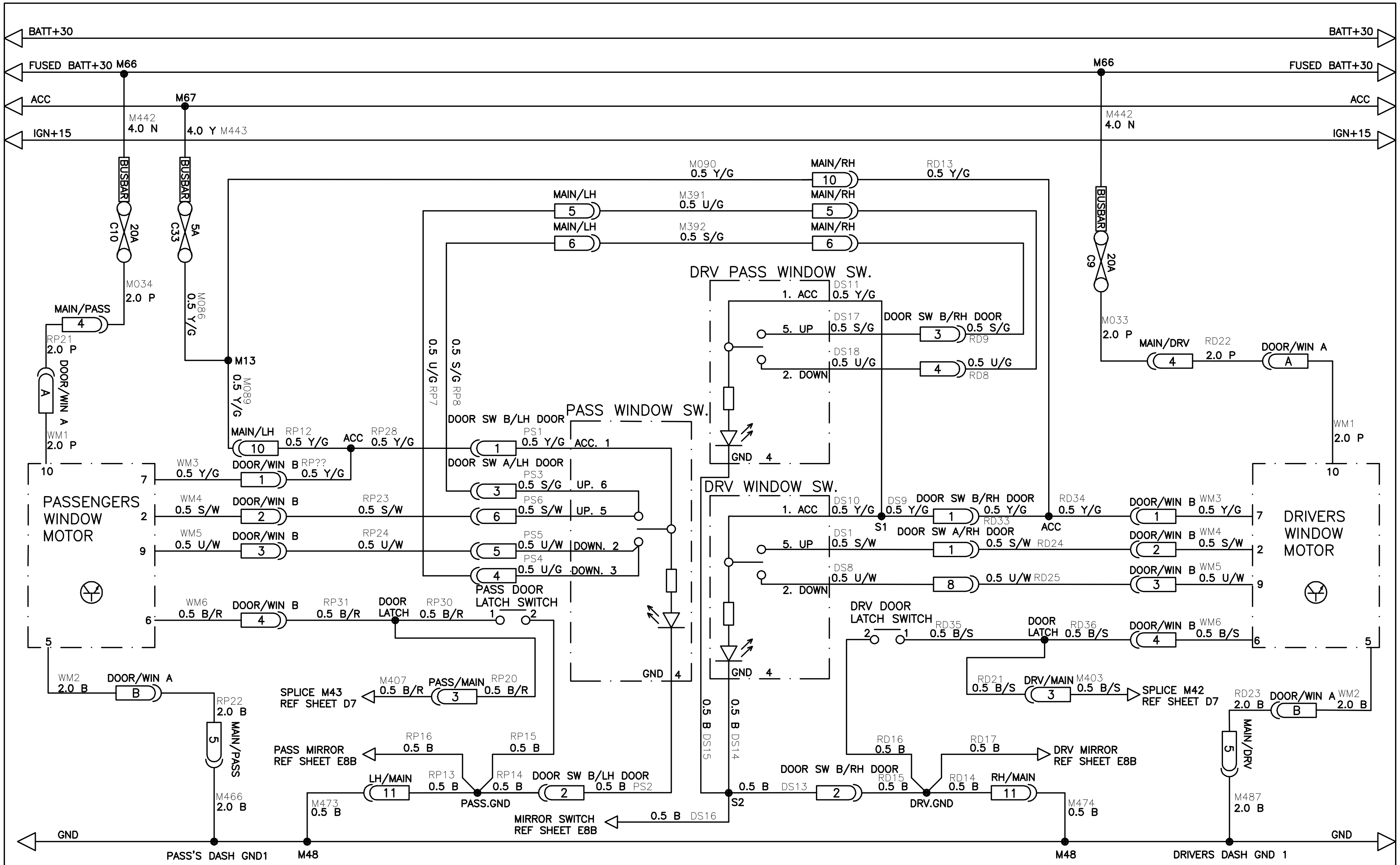


TITLE: CCT–WASH WIPE SYSTEM, POWER WASH & HEATED JETS		APPROVED		UPDATES	ISSUE
		CHECKED			
PROJECT: EAGLE	DRG. No:	DRAWN	N. CHOWLES		
SHEET:E5	ISSUE LEVEL: PR	FIRST RELEASE DATE	18MY09		

CONN NAME
MAIN/ENGINE
MALE CONN
3
FEMALE CONN
CAVITY NUMBER

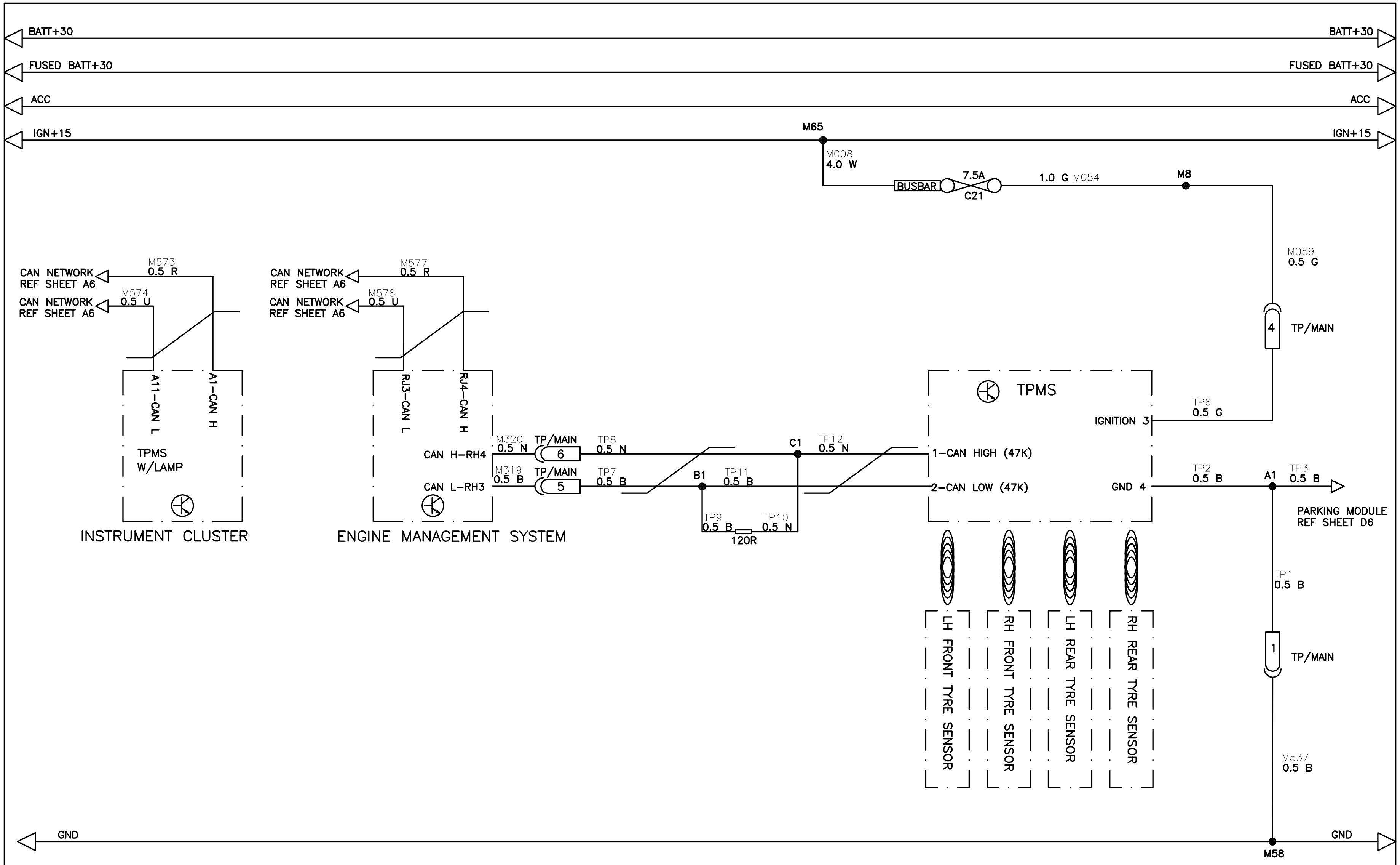


TITLE: CCT–WINDOW LIFT WITH ACTIVE GLASS (LH DRIVE)		APPROVED		UPDATES	ISSUE	CONN NAME / MAIN/ENGINE / MALE CONN / 3 / FEMALE CONN / CAVITY NUMBER
		CHECKED				
PROJECT: EAGLE	DRG. No:	DRAWN	N. CHOWLES			
SHEET:E6A	ISSUE LEVEL: PR	FIRST RELEASE DATE	18MY09			



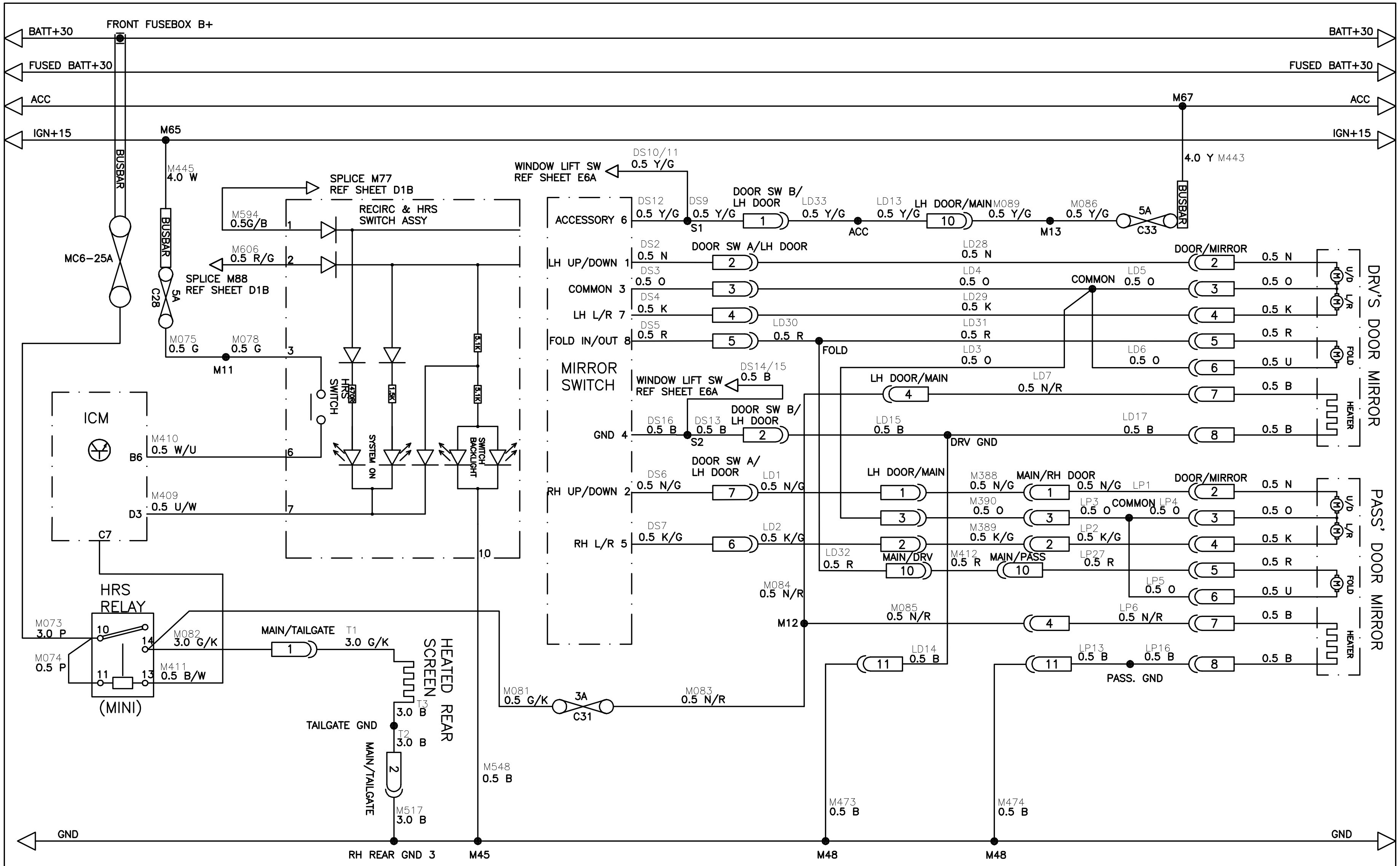
TITLE: CCT—WINDOW LIFT WITH ACTIVE GLASS (RH DRIVE)		APPROVED		UPDATES	ISSUE
		CHECKED			
PROJECT: EAGLE	DRG. No:	DRAWN	N. CHOWLES		
SHEET:E6B	ISSUE LEVEL: PR	FIRST RELEASE DATE	18MY09		

CONN NAME
MAIN/ENGINE
MALE CONN
FEMALE CONN
CAVITY NUMBER



TITLE: CCT-TYRE PRESSURE MONITORING		APPROVED		UPDATES	ISSUE
		CHECKED			
PROJECT: EAGLE	DRG. No:	DRAWN	N. CHOWLES		
SHEET:E7	ISSUE LEVEL: PR	FIRST RELEASE DATE	18MY09		

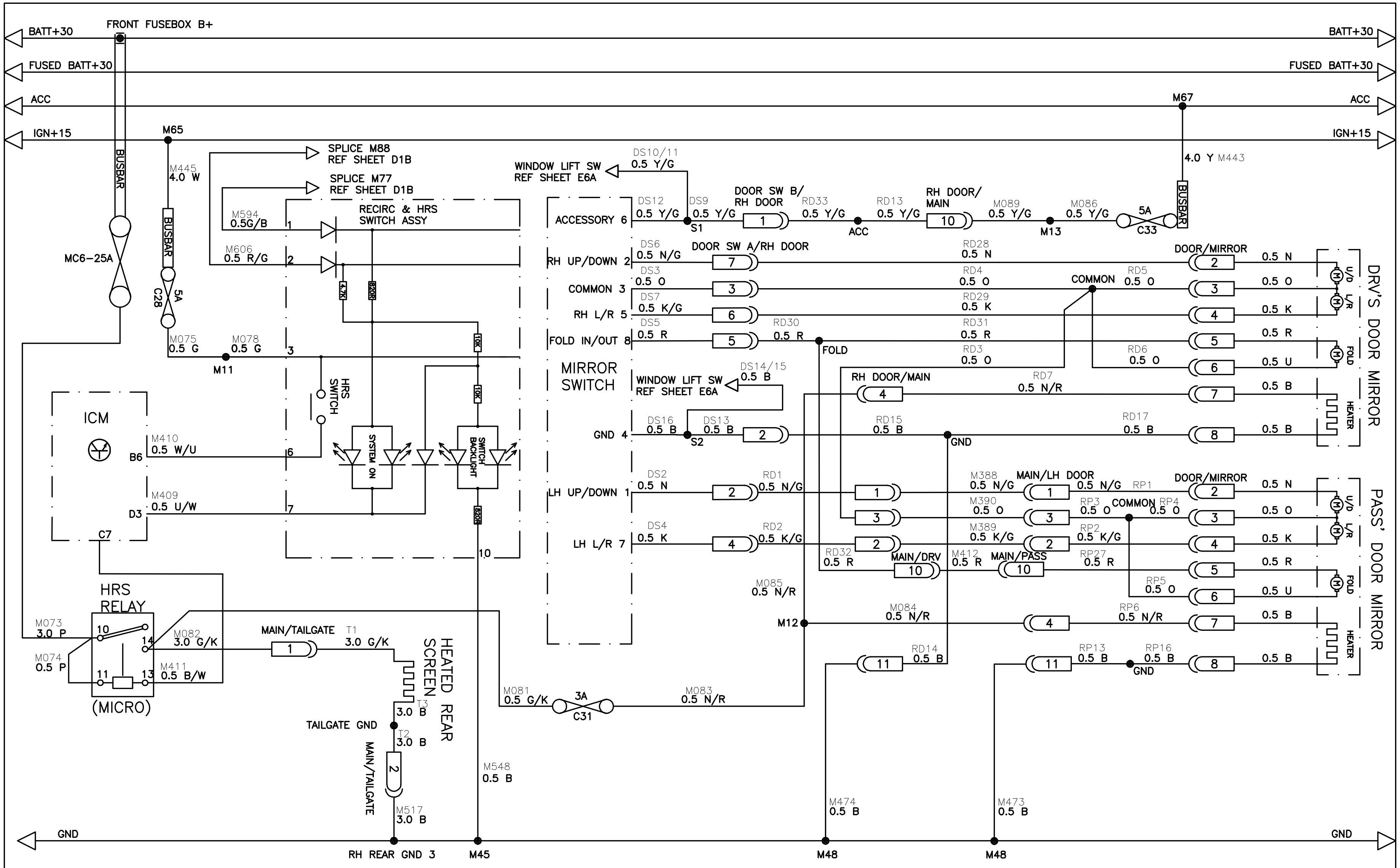
CONN NAME
MAIN/ENGINE
MALE CONN
3
FEMALE CONN
CAVITY NUMBER



TITLE: CCT−ELECTRIC MIRRORS & HEATED REAR SCREEN (LH DRIVE)		APPROVED		UPDATES
		CHECKED		
PROJECT: EAGLE	DRG. No:	DRAWN	N. CHOWLES	
SHEET:E8A	ISSUE LEVEL: PR	FIRST RELEASE DATE	18MY09	

ISSUE

CONN NAME
MAIN/ENGINE
MALE CONN
FEMALE CONN
CAVITY NUMBER



TITLE: CCT–ELECTRIC MIRRORS & HEATED REAR SCREEN (RH DRIVE)		APPROVED		UPDATES	ISSUE	CONN NAME / MAIN/ENGINE / MALE CONN / FEMALE CONN / CAVITY NUMBER
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PROJECT: EAGLE	DRG. No:	DRAWN	N. CHOWLES			
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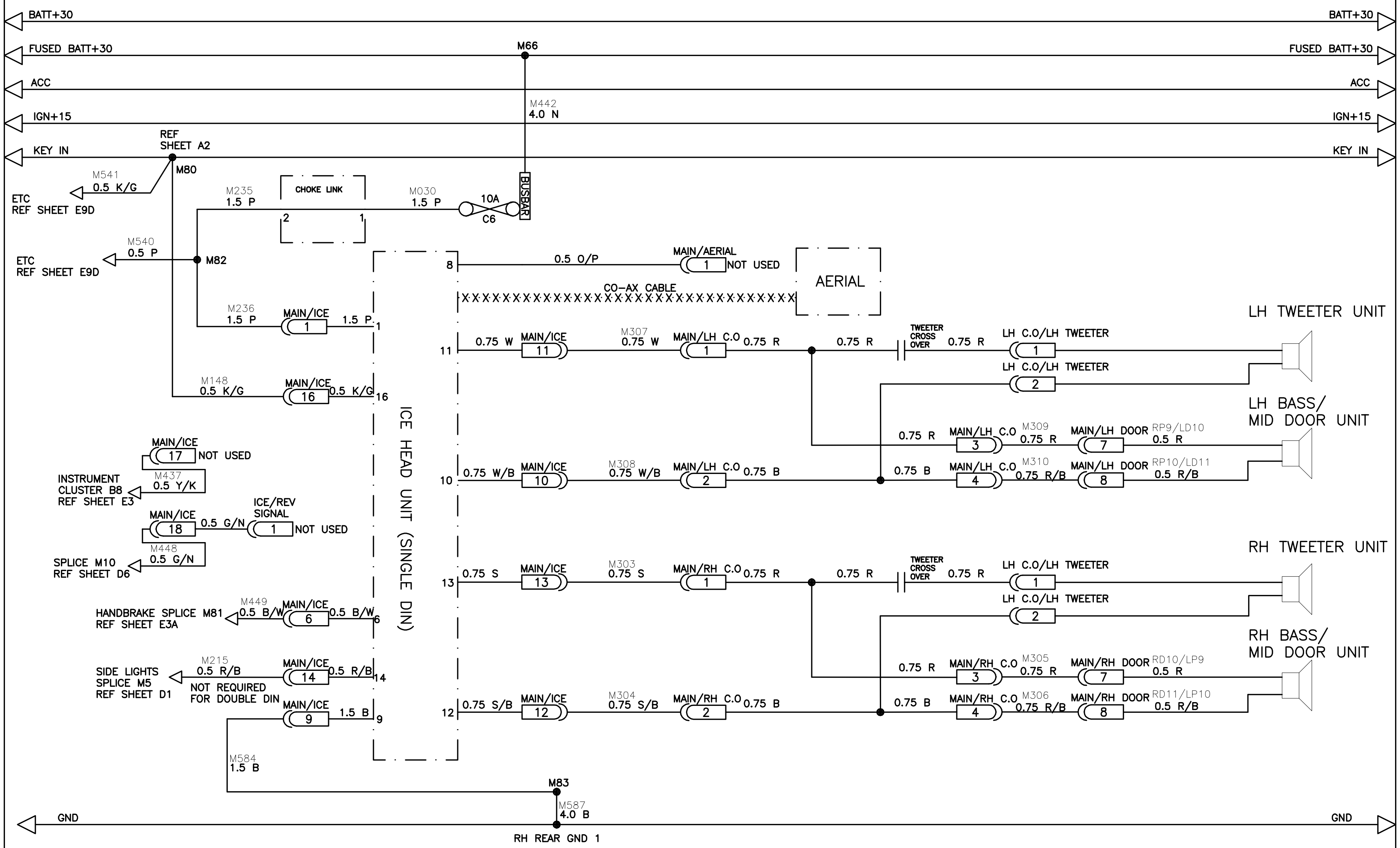

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PROJECT: EAGLE	DRG. No:	DRAWN	N. CHOWLES		
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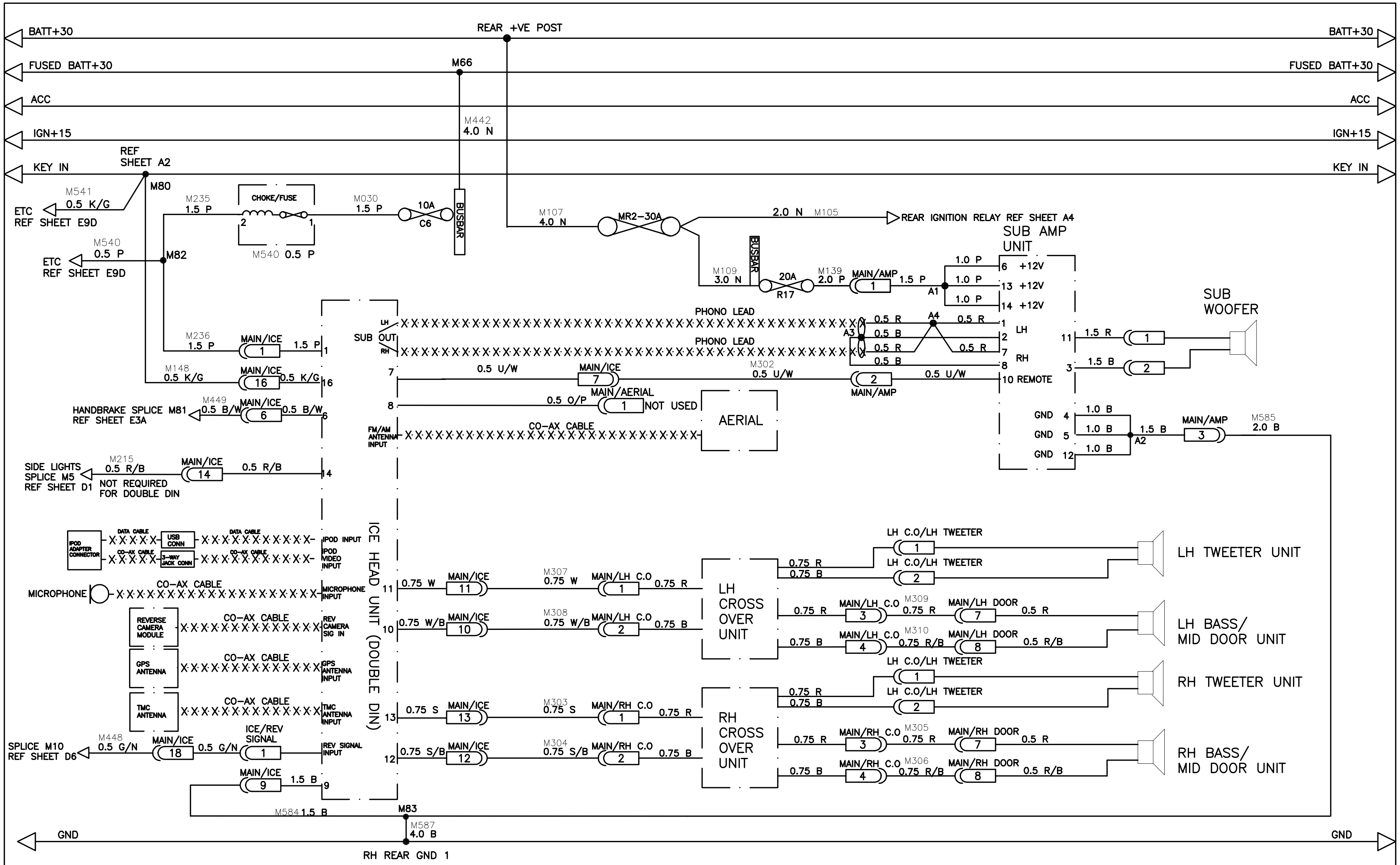
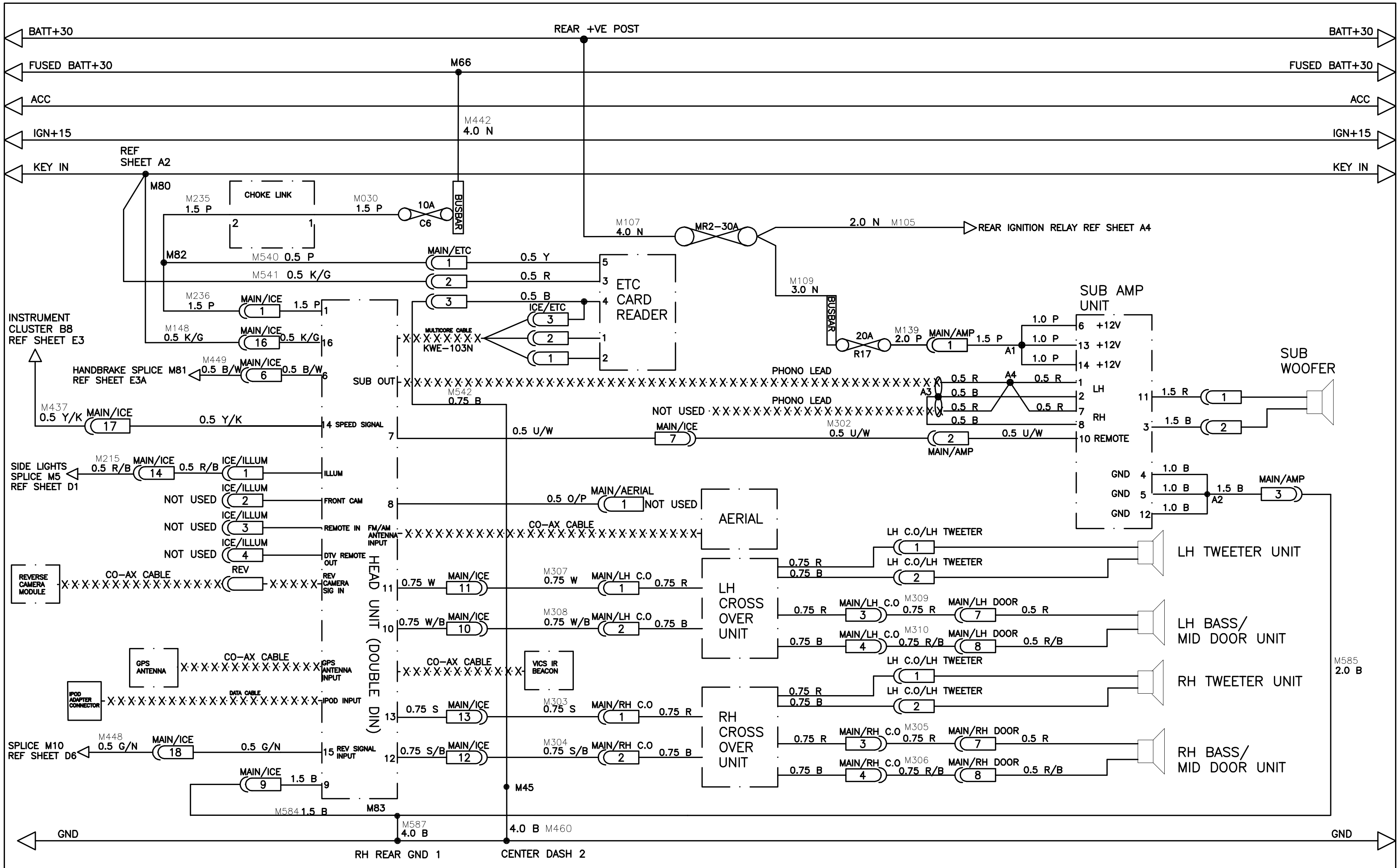
CONN NAME
MAIN/ENGINE
MALE CONN
FEMALE CONN
CAVITY NUMBER



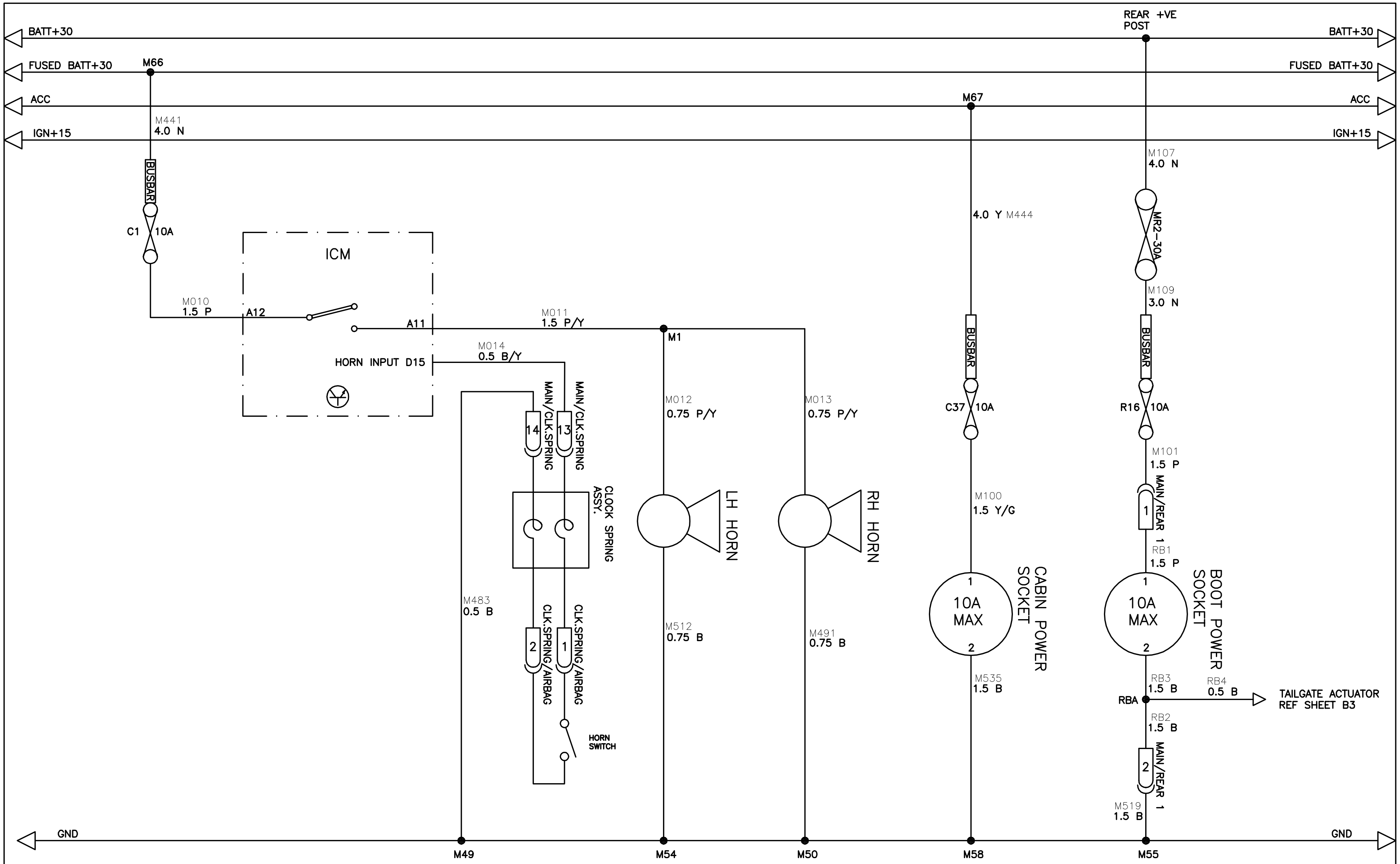
TITLE: CCT-ICE-TECH PACK		APPROVED		UPDATES	ISSUE
		CHECKED			
PROJECT: EAGLE	DRG. No:	DRAWN	N. CHOWLES		
SHEET:E9B	ISSUE LEVEL: PR	FIRST RELEASE DATE	18MY09		

CONN NAME
MAIN/ENGINE
MALE CONN
FEMALE CONN
CAVITY NUMBER



TITLE: CCT–ICE–JAPANESE		APPROVED		UPDATES	ISSUE
		CHECKED			
PROJECT: EAGLE	DRG. No:	DRAWN	N. CHOWLES		
SHEET:E9D	ISSUE LEVEL: PR	FIRST RELEASE DATE	29MY09		

CONN NAME
MAIN/ENGINE
MALE CONN
FEMALE CONN
CAVITY NUMBER



TITLE: CCT–HORNS & POWER SOCKET		APPROVED		UPDATES
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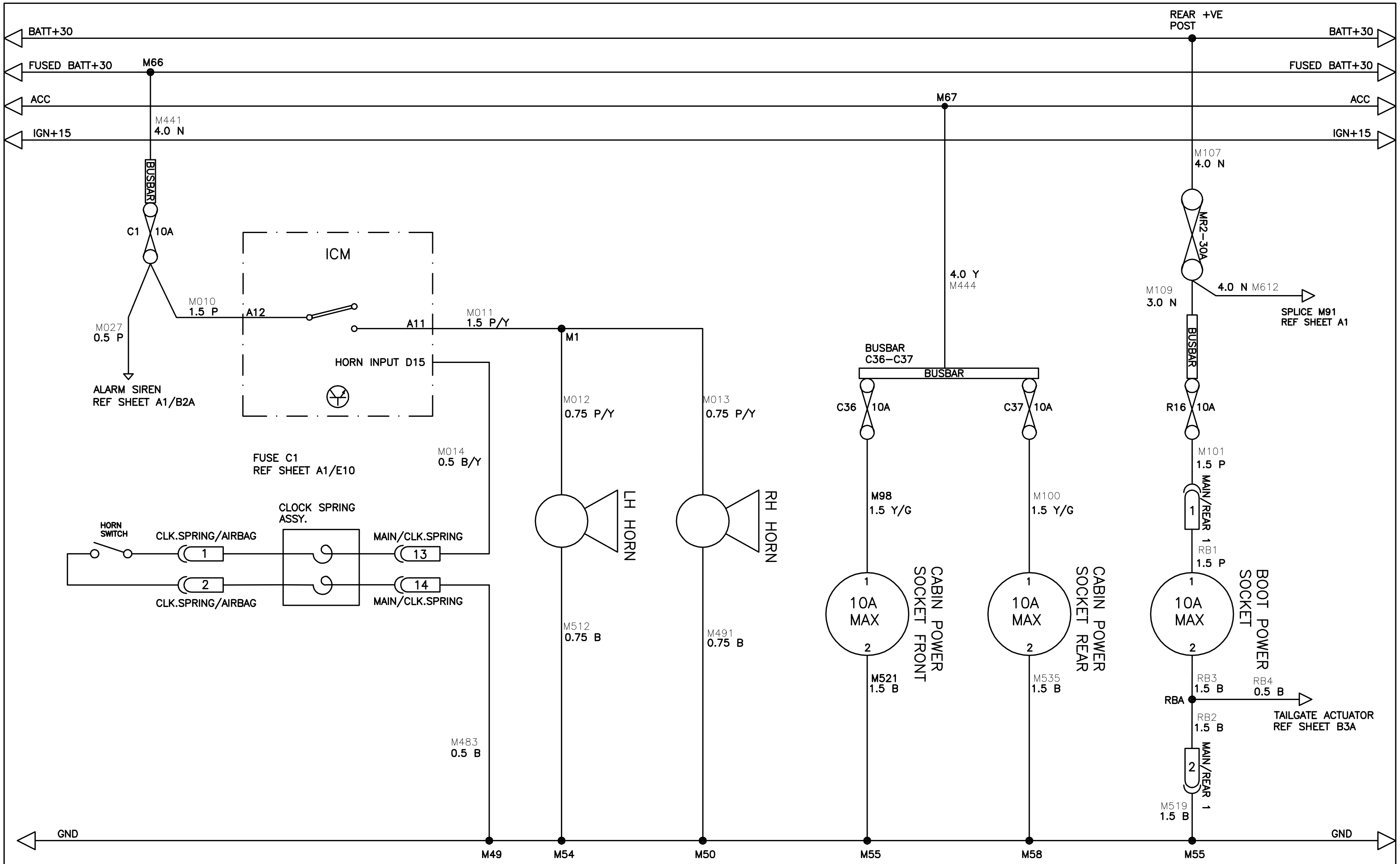
PROJECT: EAGLE	DRG. No:	DRAWN		
SHEET:E10	ISSUE LEVEL: PR	FIRST RELEASE DATE	29MY09	

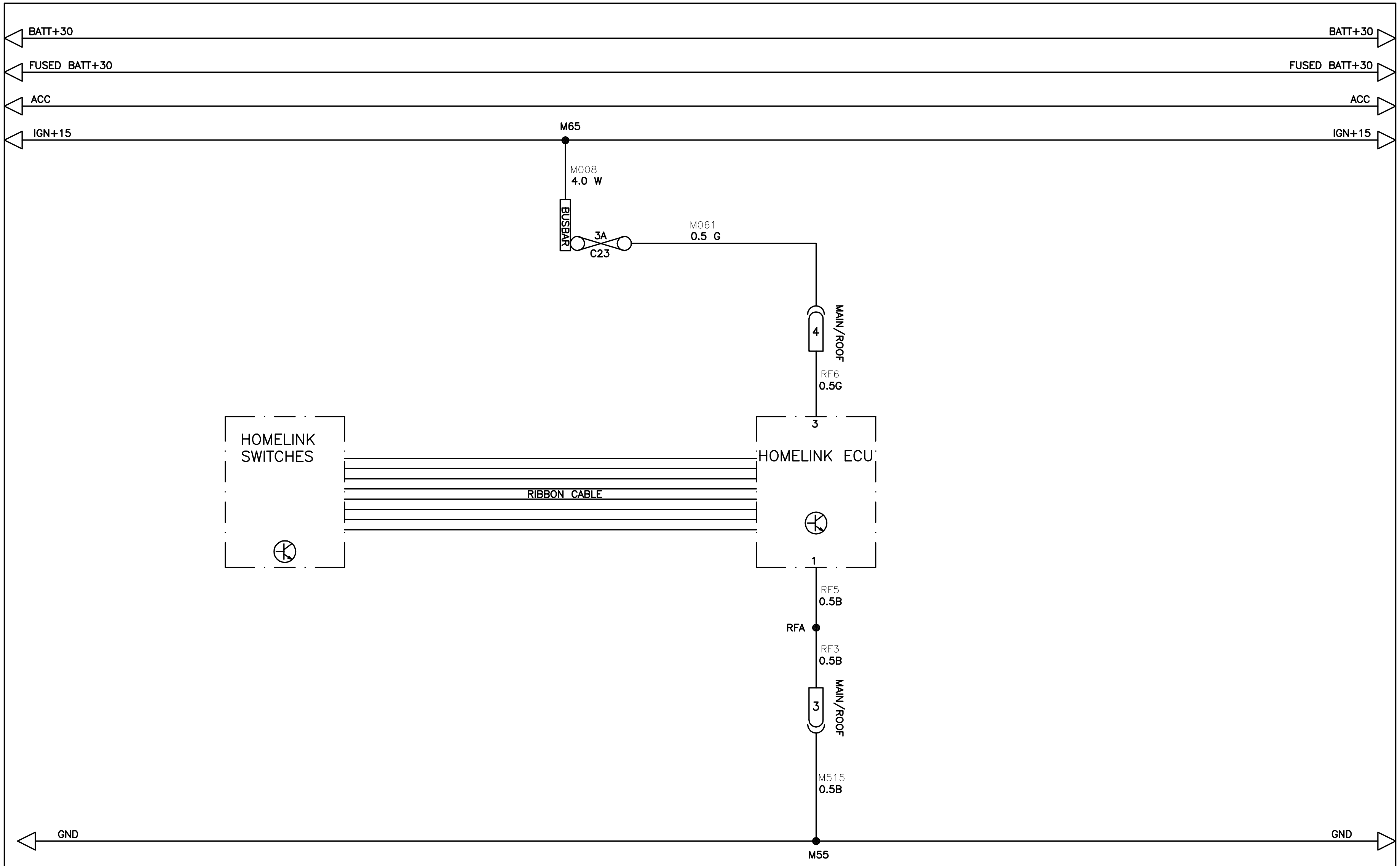
ISSUE

CONN NAME
MAIN/ENGINE
MALE CONN
3
FEMALE CONN
CAVITY NUMBER

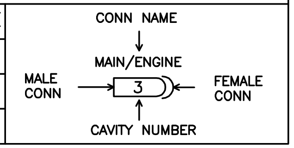


TITLE: HORNS & POWER SOCKETS		APPROVED		UPDATES	ISSUE
		CHECKED		ALL CARS BEFORE VIN SCCLMDTU4AHE11008	3
PROJECT: EVORA	DRG. No:	DRAWN		DEALER FITTED INLINE 3A FUSE TO	
SHEET:E10 UPDATE	ISSUE LEVEL: PR	FIRST RELEASE DATE	09DEC09	SIREN POSITIVE SUPPLY	

CONN NAME
MAIN/ENGINE
MALE CONN
3
FEMALE CONN
CAVITY NUMBER



TITLE:		APPROVED		UPDATES	ISSUE
CCT–HOMELINK		CHECKED			
PROJECT: EAGLE	DRG. No:	DRAWN	N. CHOWLES		
SHEET:E11	ISSUE LEVEL: PR	FIRST RELEASE DATE	18MY09		



Colour Code

B = Black
G = Green
K = Pink
LG = Light Green
N = Brown
O = Orange
P = Purple
R = Red
S = Grey
U = Blue
W = White
Y = Yellow

Abbreviations

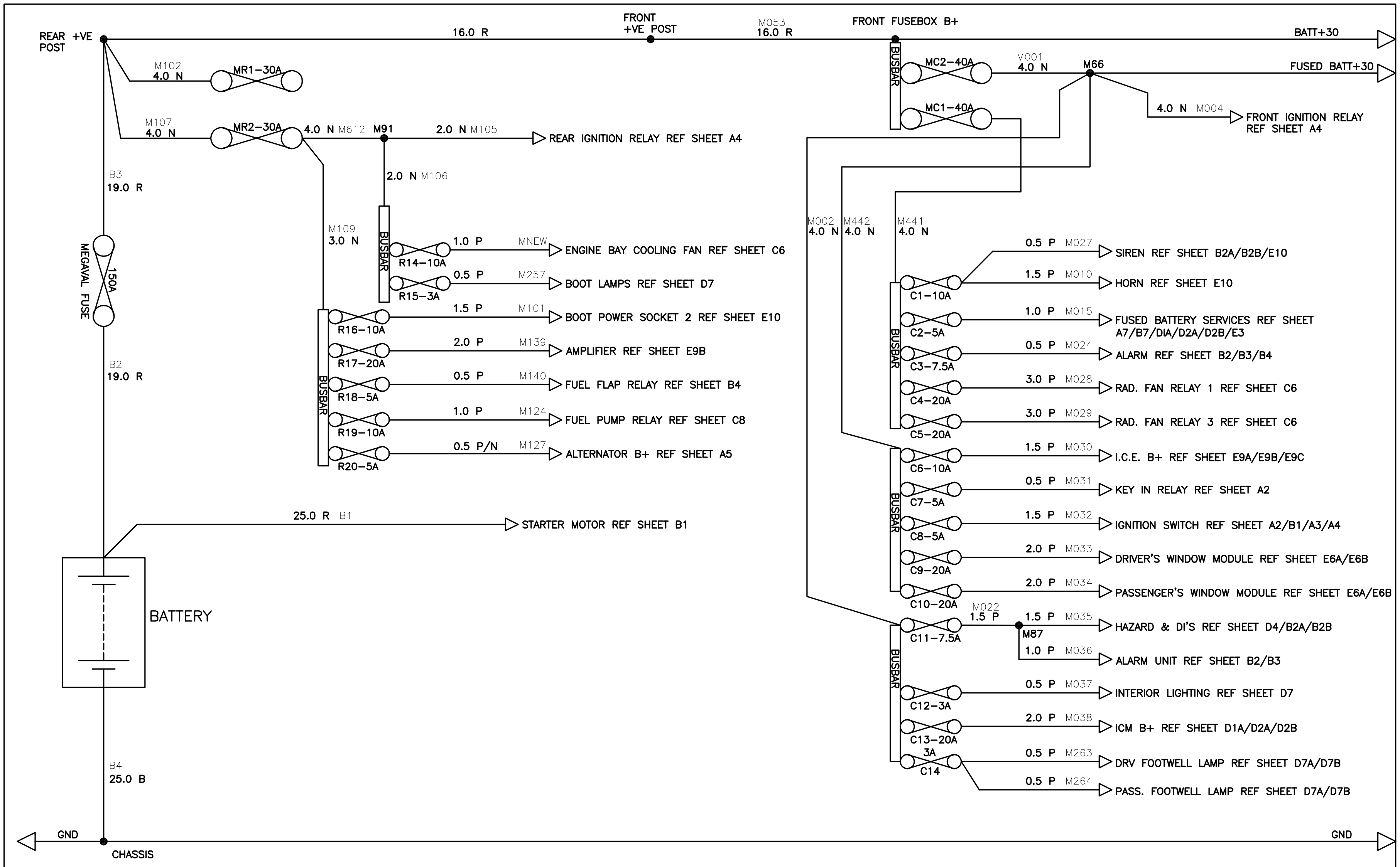
ABS Anti-lock Brake System
ACCM Air Conditioning Control Module
ACHC Air Conditioning Harness Connector
ACIS Acoustic Control Induction System
CDL Central Door Locking
CHMSL Centre High Mounted Stop Lamp
CVCV Canister Vent Close Valve
DDHC Driver's Door Harness Connector
DI Direction Indicator
ECU Electronic Control Unit
EHC Engine Harness Connector
FL Fog Lamp
FSM Front Side Marker
FTC Fuel Tank Connector
GND Ground
IP Instrument Pack
LF Left Front
LIHC Left Inner Harness Connector
LOHC Left Outer Harness Connector
LR Left Rear
MB Main Beam
NPL Number Plate Lamp
O2 Oxygen (sensor)
PDHC Passenger's Door Harness Connector
RF Right Front
RIHC Right Inner Harness Connector
RIL Rear Outer Lamp
RMC Rear Module Connector
ROHC Right Outer Harness Connector
ROL Rear Outer Lamp
RR Right Rear
RSM Rear Side Marker
SL Side Lamp
SPL Splice
SPMC Switch Pack Module Connector
SSWHC Starter Switch Harness Connector
TMAF Temperature & Mass Air Flow
VSV Vacuum Solenoid Valve
VVT Variable Valve Timing
VVTLi Variable Valve Timing & Lift - intelligent
WSS Wheel Speed Sensor
YMC Yazaki Module Connector

MR.16 - CIRCUIT DIAGRAMS - USA

NATURALLY ASPIRATED MANUAL TRANSMISSION

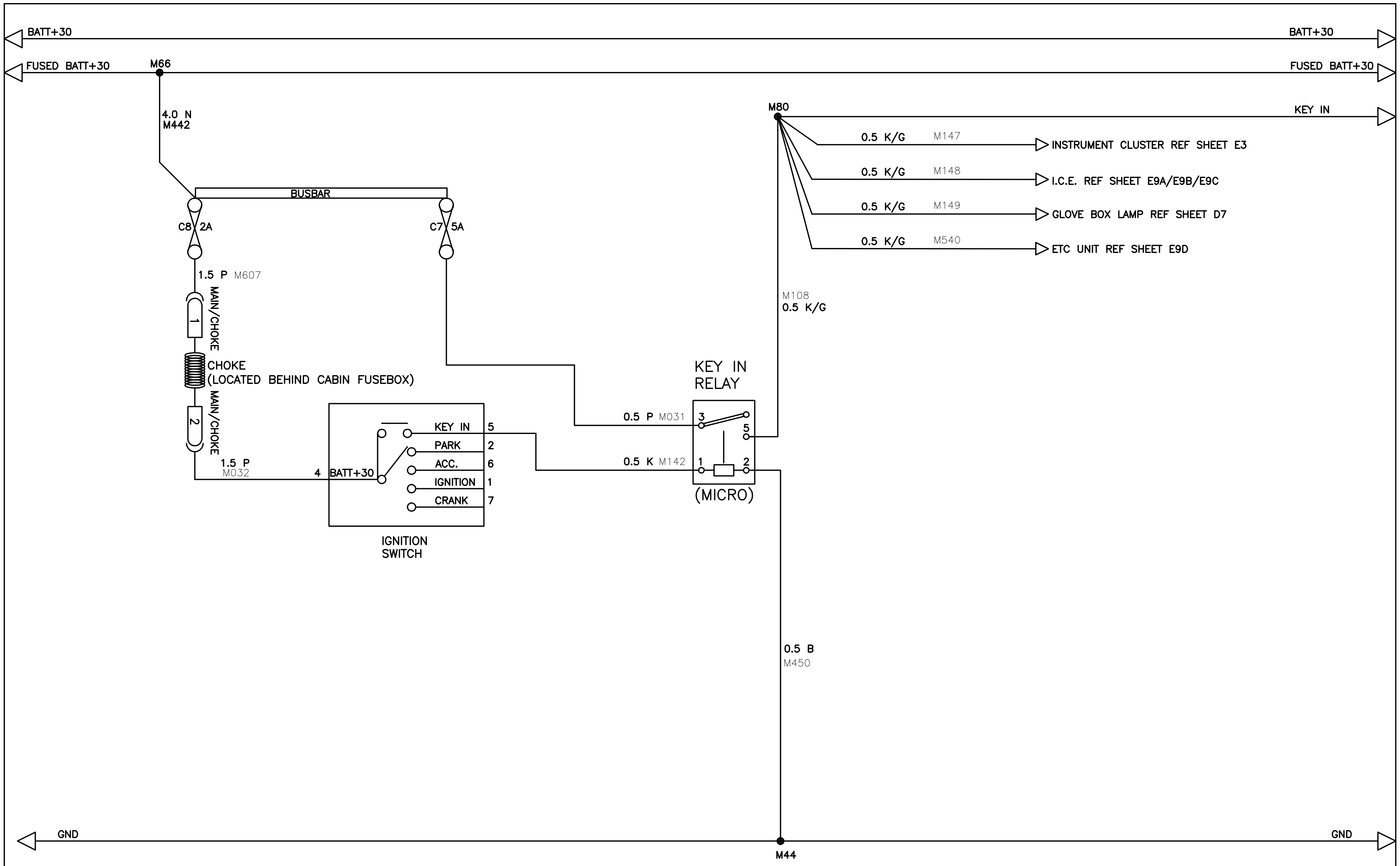
FROM START OF PRODUCTION UPTO VIN BH_11177

MR.16 - CIRCUIT DIAGRAMS (USA)

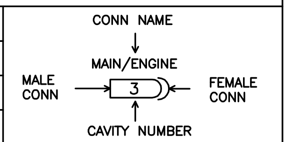


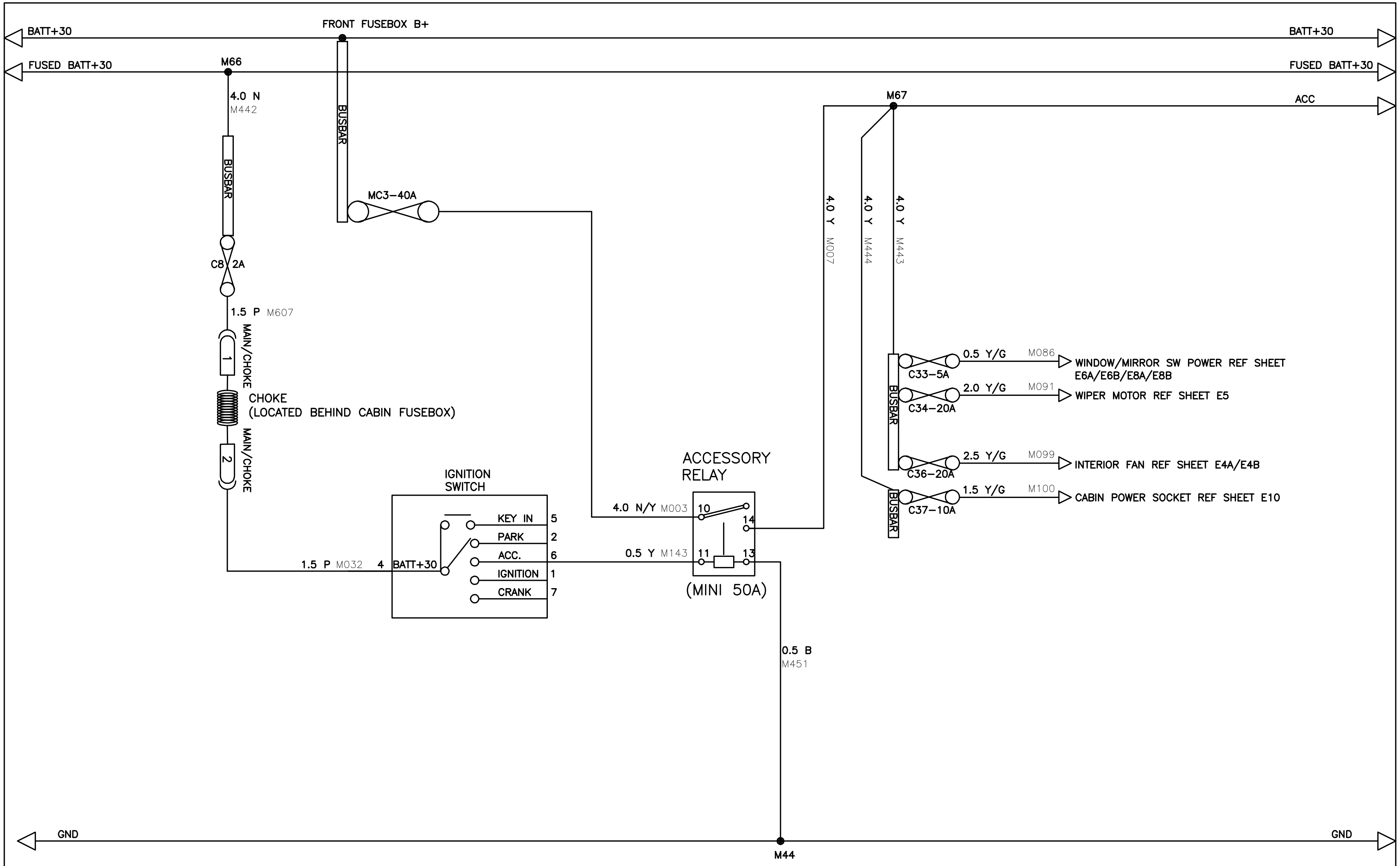
TITLE: CCT-BATTERY SUPPLY		APPROVED		UPDATES	ISSUE
		CHECKED		FEDERAL INTRODUCTION UPDATES	2
PROJECT: EAGLE	DRG. No:	DRAWN	N. CHOWLES		
SHEET:A1	ISSUE LEVEL: PR	FIRST RELEASE DATE	13JAN10		

CONN NAME
MAIN/ENGINE
MALE CONN
3
FEMALE CONN
CAVITY NUMBER



TITLE: CCT–KEY IN SUPPLY		APPROVED		UPDATES	ISSUE
		CHECKED			
PROJECT: EAGLE	DRG. No:	DRAWN	N. CHOWLES		
SHEET:A2	ISSUE LEVEL: PR	FIRST RELEASE DATE	10NO09		





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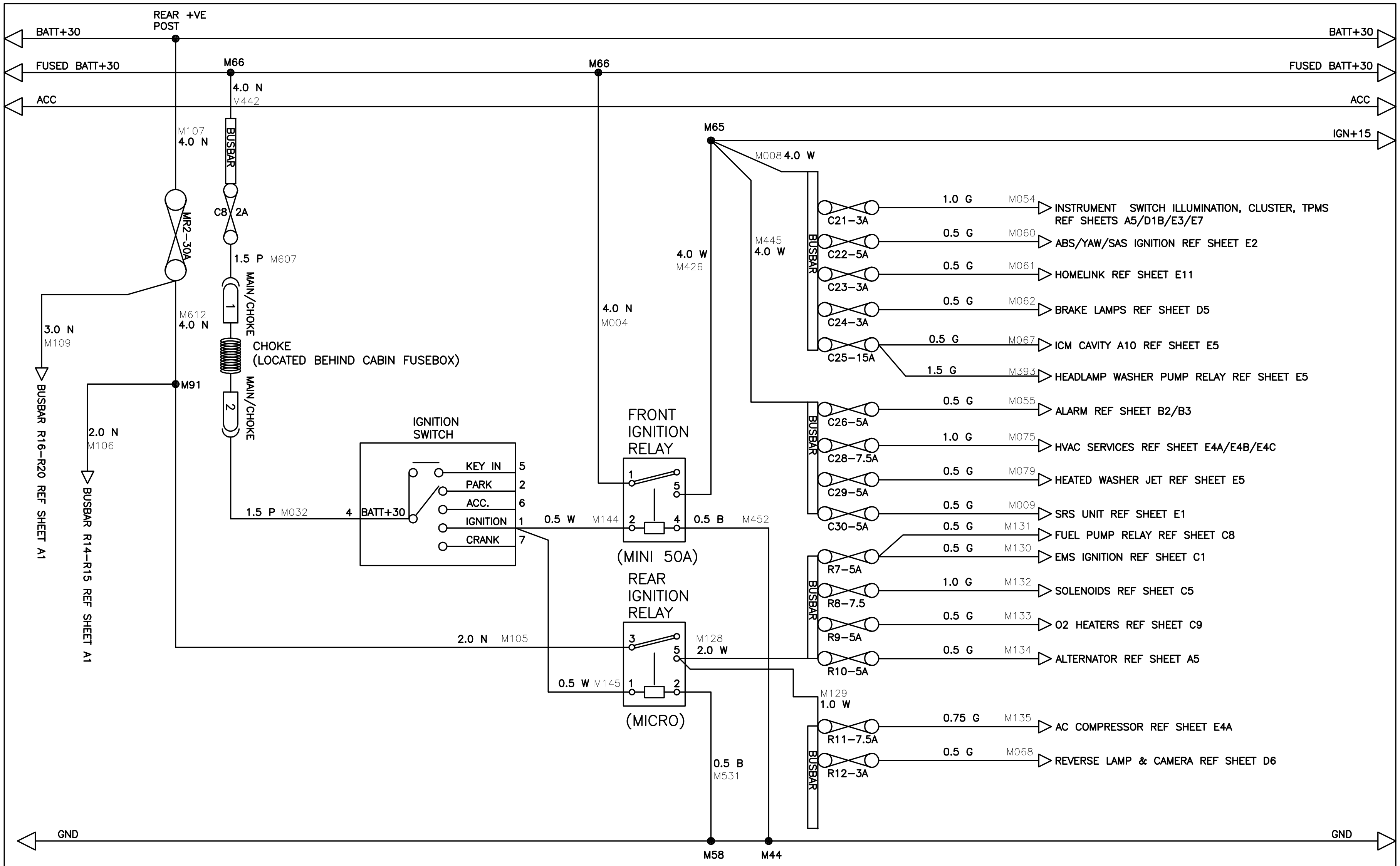
		CHECKED		
PROJECT: EAGLE	DRG. No:	DRAWN	N. CHOWLES	
SHEET:A3	ISSUE LEVEL: PR	FIRST RELEASE DATE	10NO09	

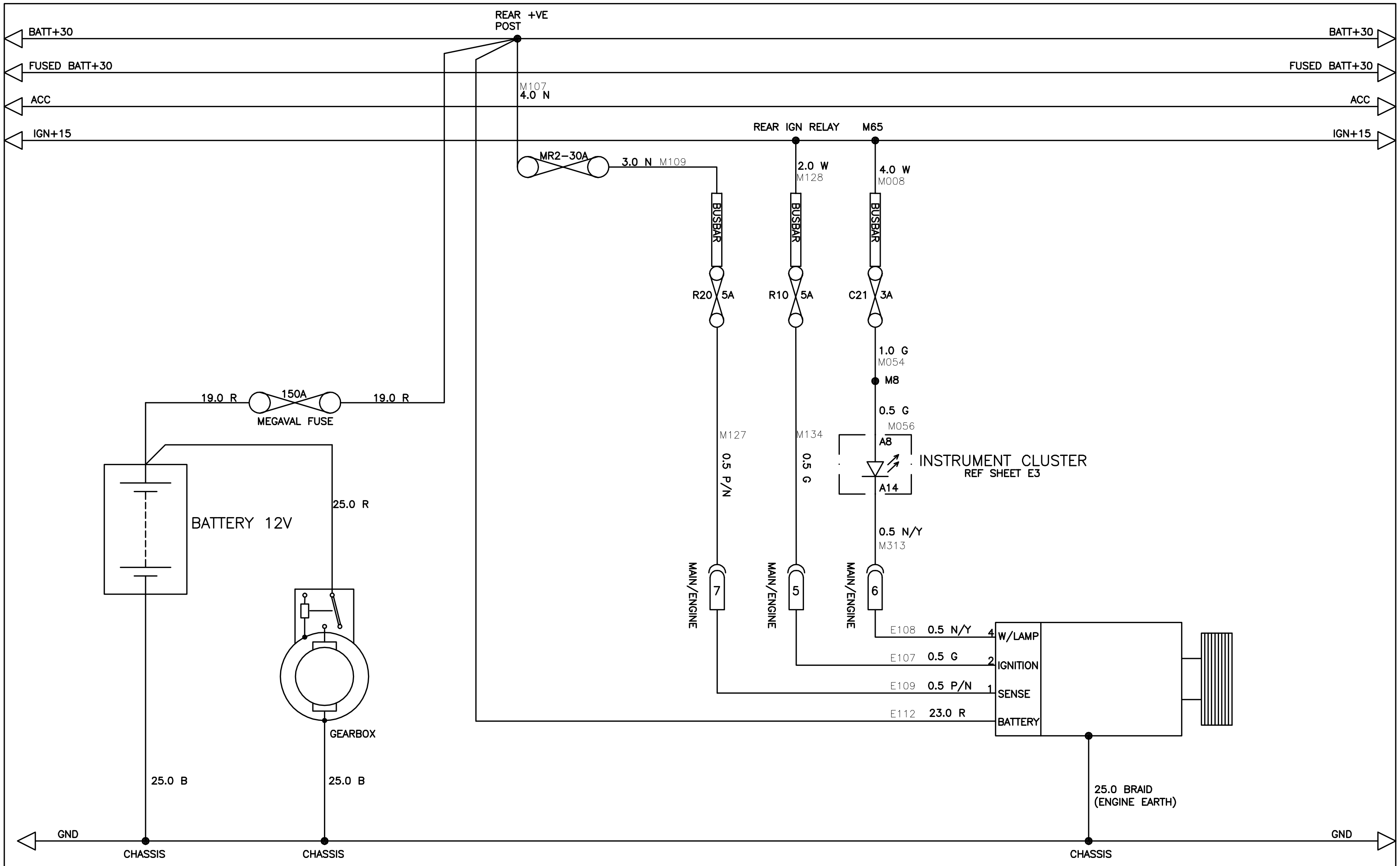
ISSUE

CONN NAME
MAIN/ENGINE
MALE CONN
3
FEMALE CONN
CAVITY NUMBER



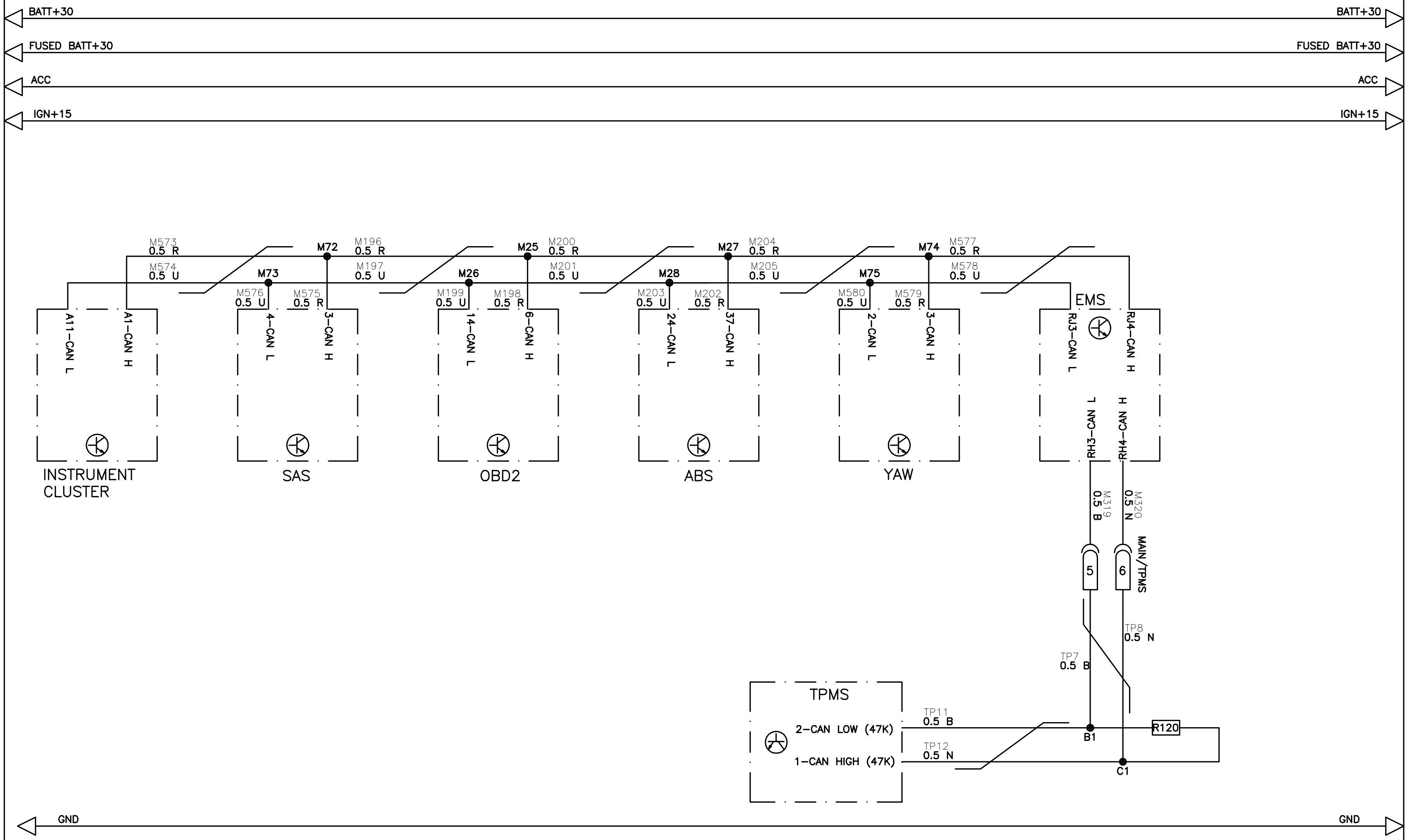
TITLE: CCT–IGNITION SUPPLY		APPROVED		UPDATES	ISSUE
		CHECKED			
PROJECT: EAGLE	DRG. No:	DRAWN	N. CHOWLES		
SHEET:A4	ISSUE LEVEL: PR	FIRST RELEASE DATE	10NO09		

CONN NAME
MAIN/ENGINE
MALE CONN
FEMALE CONN
CAVITY NUMBER



TITLE: CCT–CHARGING SYSTEM		APPROVED		UPDATES	ISSUE
		CHECKED			
PROJECT: EAGLE	DRG. No:	DRAWN	N. CHOWLES		
SHEET:A5	ISSUE LEVEL: PR	FIRST RELEASE DATE	10NO09		

CONN NAME
MAIN/ENGINE
MALE CONN
3
FEMALE CONN
CAVITY NUMBER



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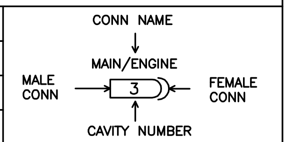
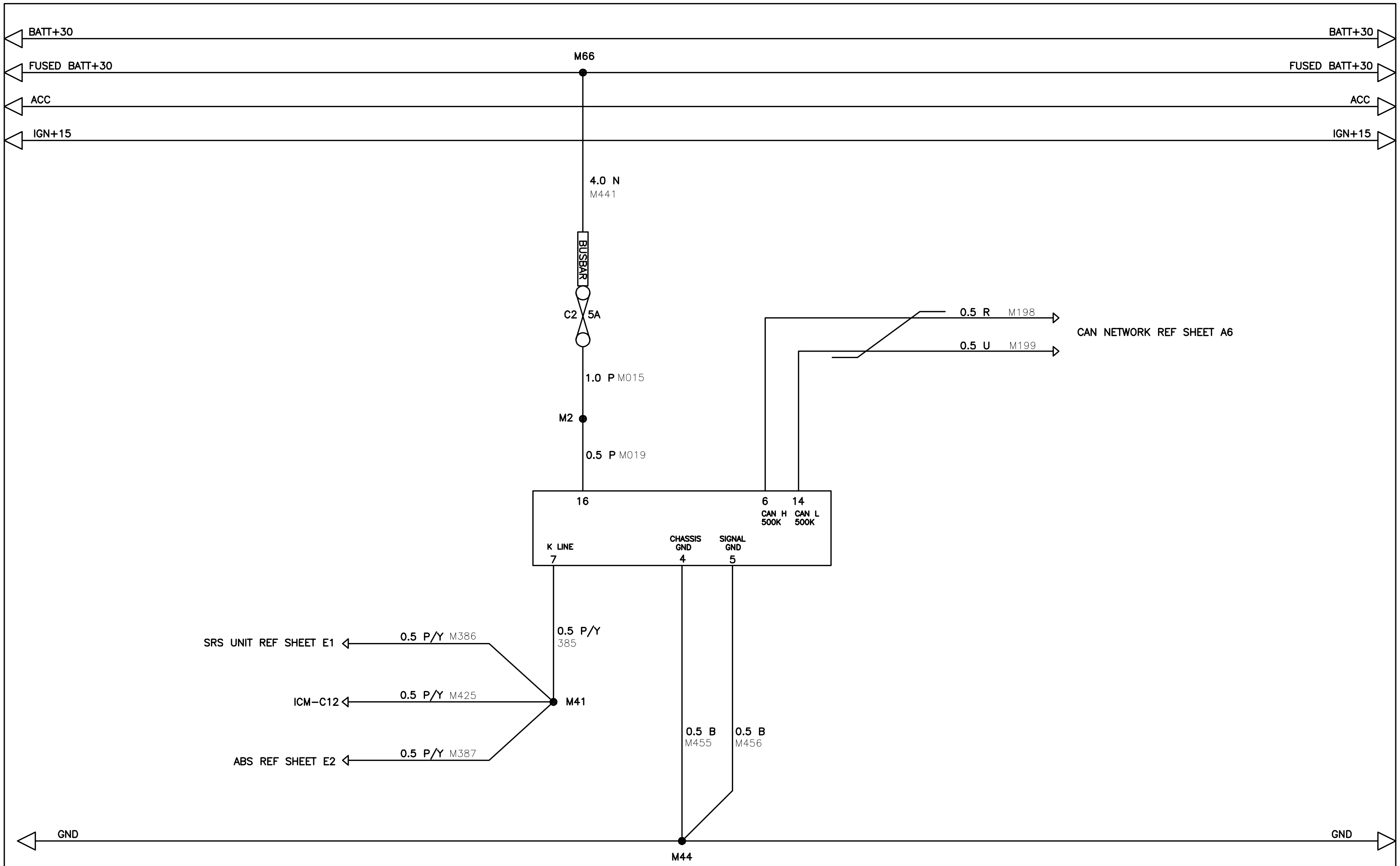
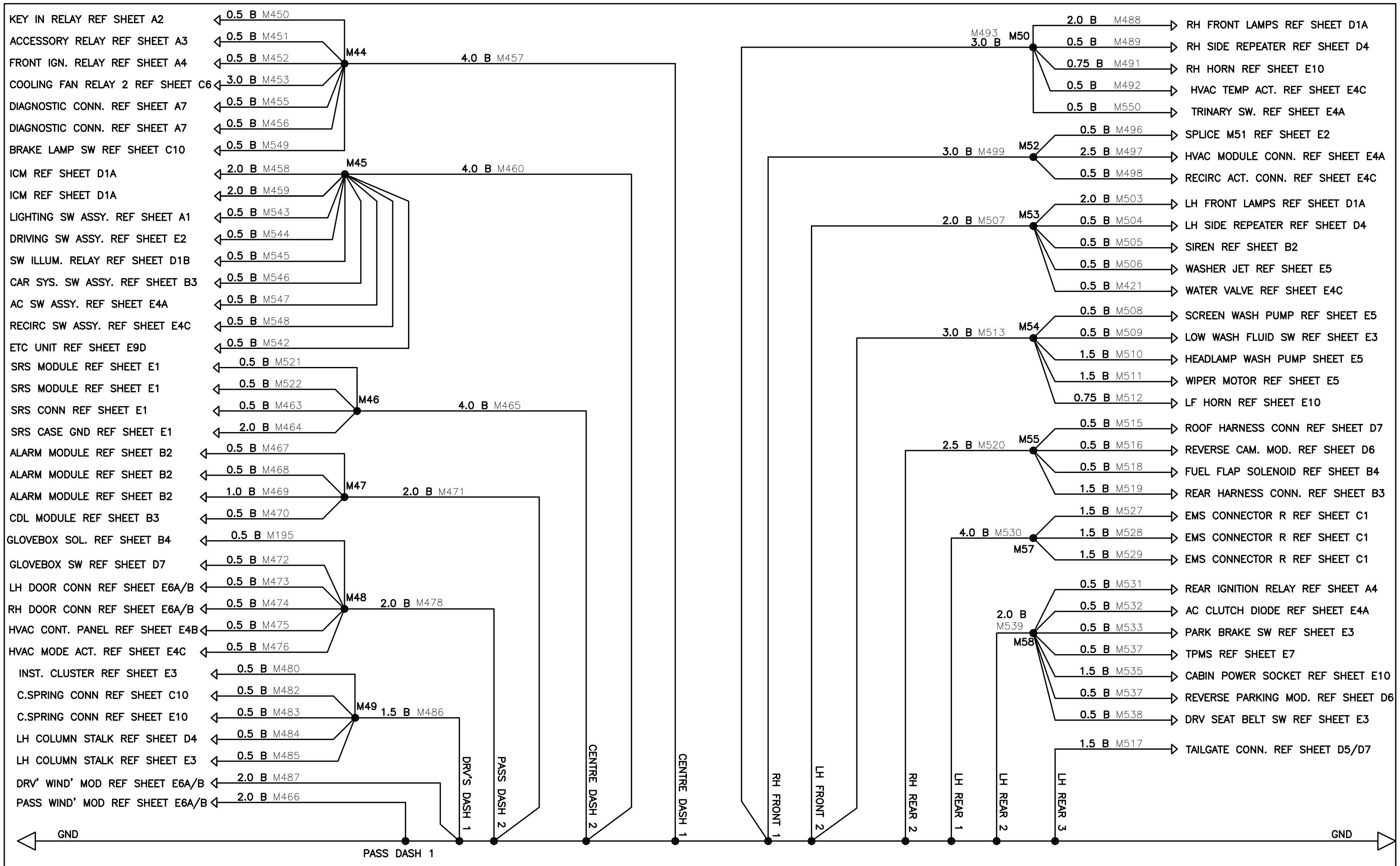
PROJECT: EAGLE	DRG. No:	DRAWN	N. CHOWLES		
SHEET:A6	ISSUE LEVEL: PR	FIRST RELEASE DATE	10NO09		



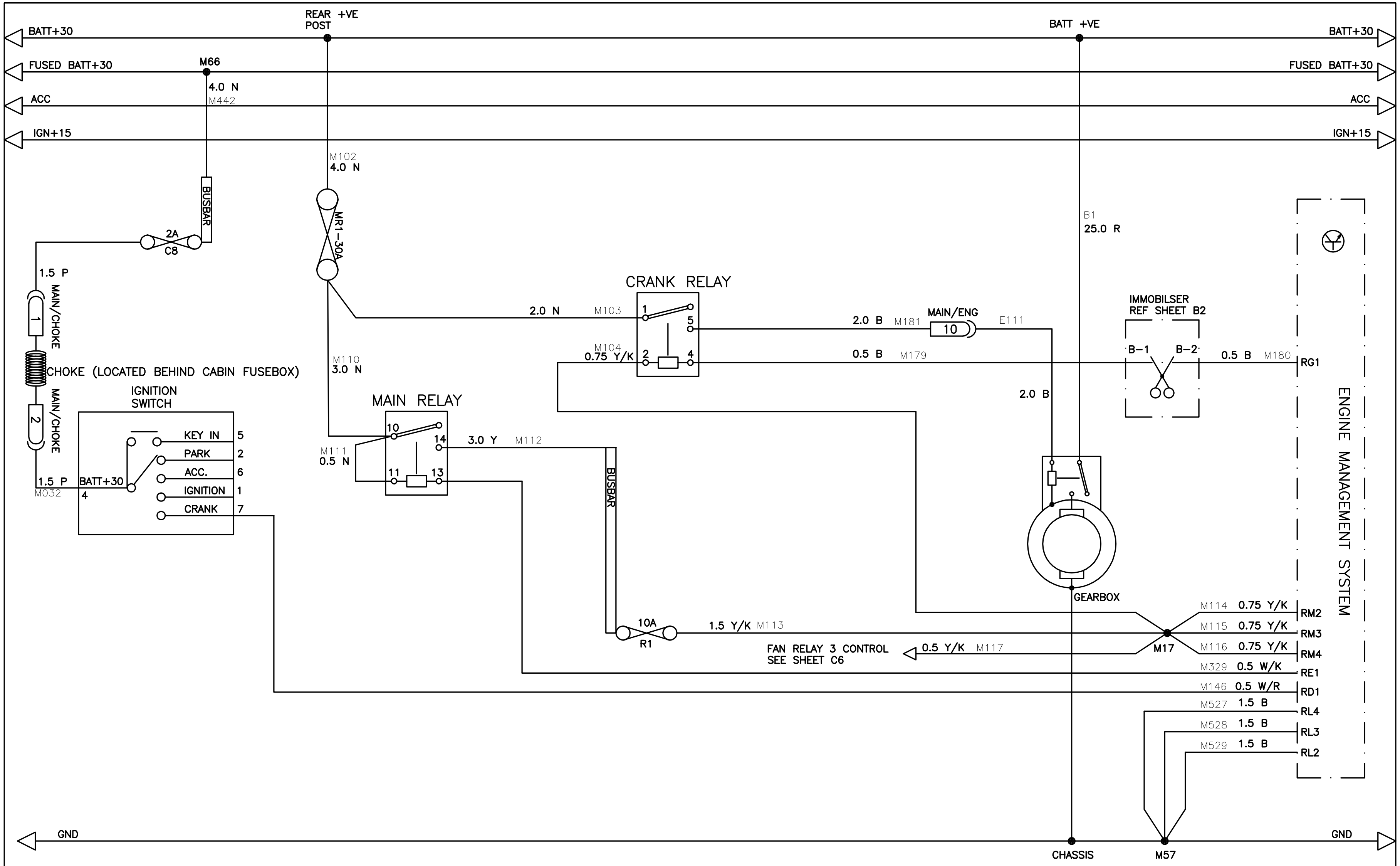


TITLE: CCT–DIAGNOSTIC CONNECTOR		APPROVED		UPDATES	ISSUE
		CHECKED			
PROJECT: EAGLE	DRG. No:	DRAWN	N. CHOWLES		
SHEET:A7	ISSUE LEVEL: PR	FIRST RELEASE DATE	10NO09		



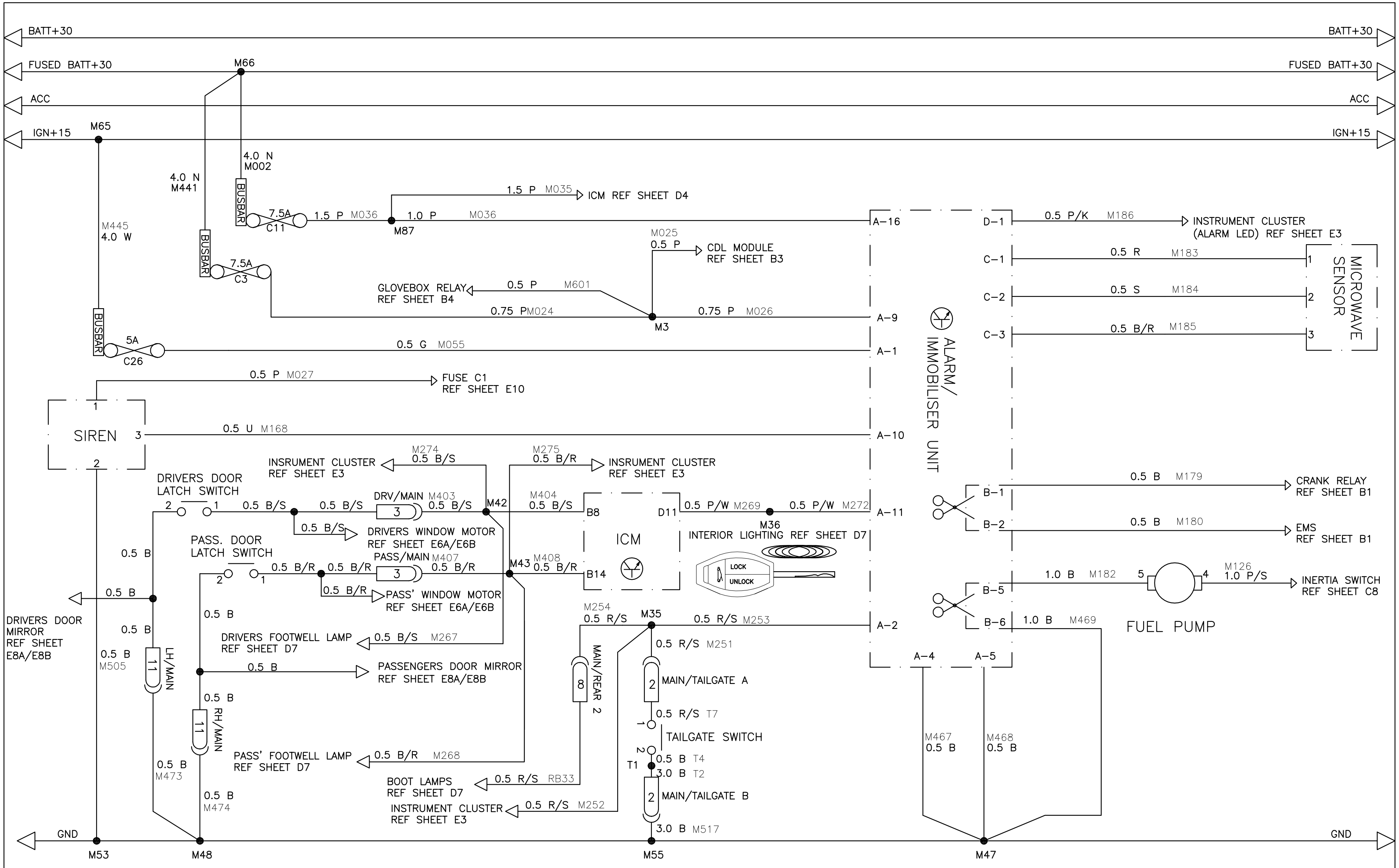
TITLE: GND STRUCTURE PART 1		APPROVED		UPDATES	ISSUE
		CHECKED			
PROJECT: EAGLE	DRG. No:	DRAWN	N. CHOWLES		
SHEET:A8	ISSUE LEVEL: PR	FIRST RELEASE DATE	10NO09		

CONN NAME
MAIN/ENGINE
MALE CONN
3
FEMALE CONN
CAVITY NUMBER

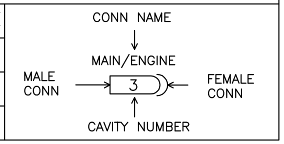


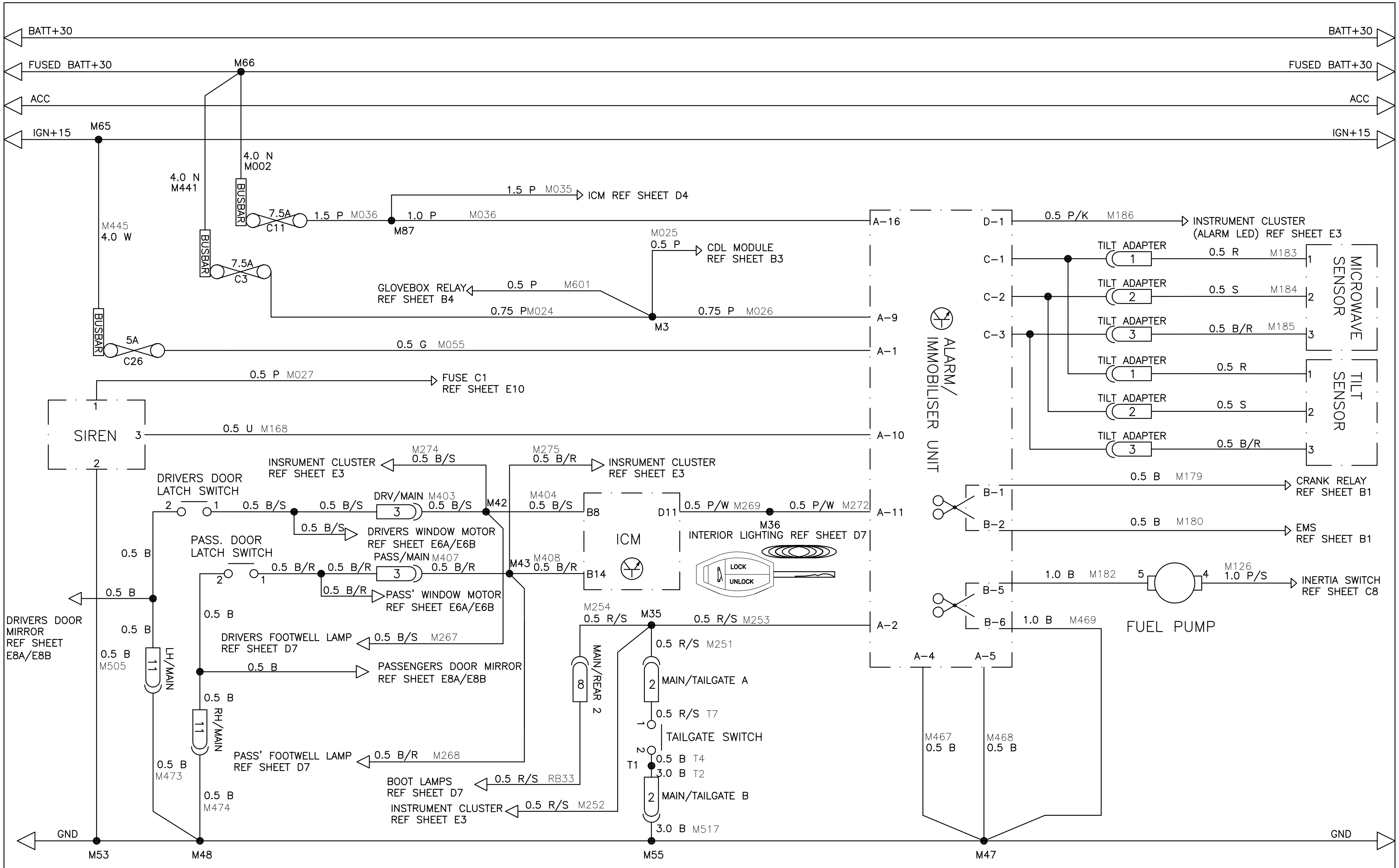
TITLE: CCT–CRANKING		APPROVED		UPDATES	ISSUE
		CHECKED			
PROJECT: EAGLE	DRG. No:	DRAWN	N. CHOWLES		
SHEET:B1	ISSUE LEVEL: PR	FIRST RELEASE DATE	10NO09		

CONN NAME
MAIN/ENGINE
MALE CONN
3
FEMALE CONN
CAVITY NUMBER



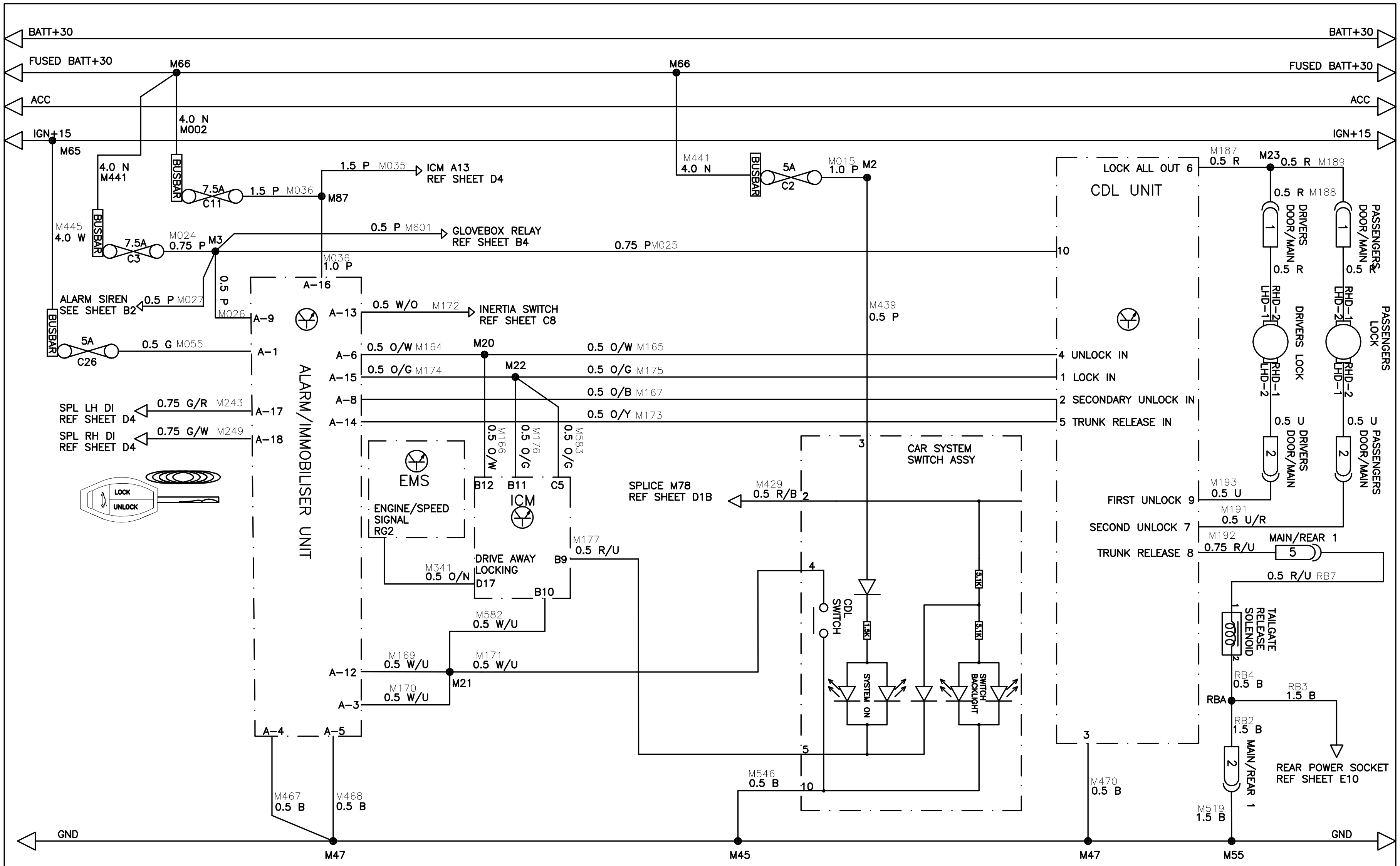
TITLE: CCT–ALARM & IMMOBILSER (NO TILT SENSOR)		APPROVED		UPDATES	ISSUE
		CHECKED		FEDERAL INTRODUCTION UPDATES	2
PROJECT: EAGLE	DRG. No:	DRAWN	N. CHOWLES		
SHEET:B2A	ISSUE LEVEL: PR	FIRST RELEASE DATE	13JAN10		





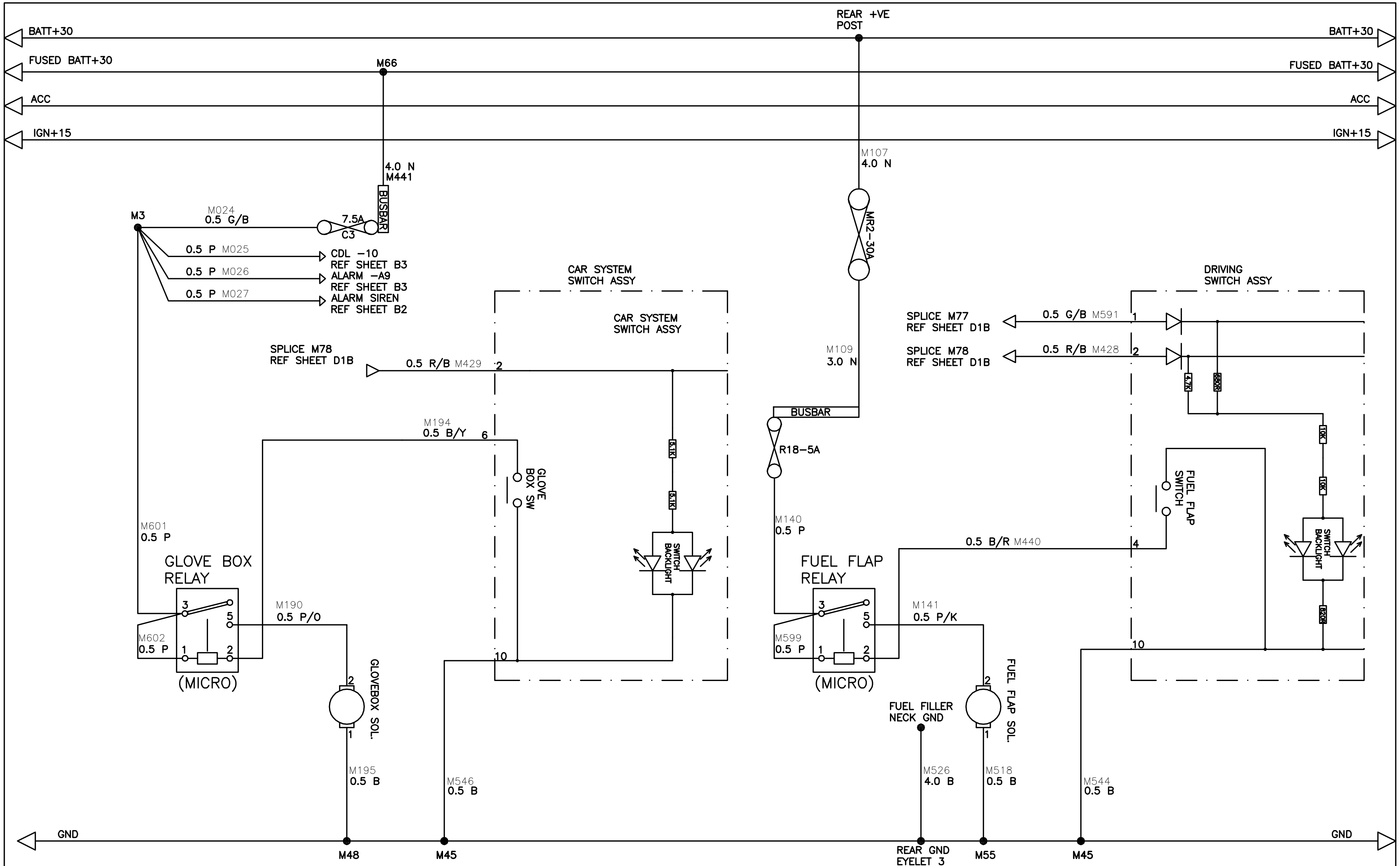
TITLE: CCT–ALARM & IMMOBILSER (WITH TILT SENSOR)		APPROVED		UPDATES	ISSUE
		CHECKED		FEDERAL INTRODUCTION UPDATES	2
PROJECT: EAGLE	DRG. No:	DRAWN	N. CHOWLES		
SHEET:B2B	ISSUE LEVEL: PR	FIRST RELEASE DATE	13JAN10		

CONN NAME
MAIN/ENGINE
MALE CONN
3
FEMALE CONN
CAVITY NUMBER



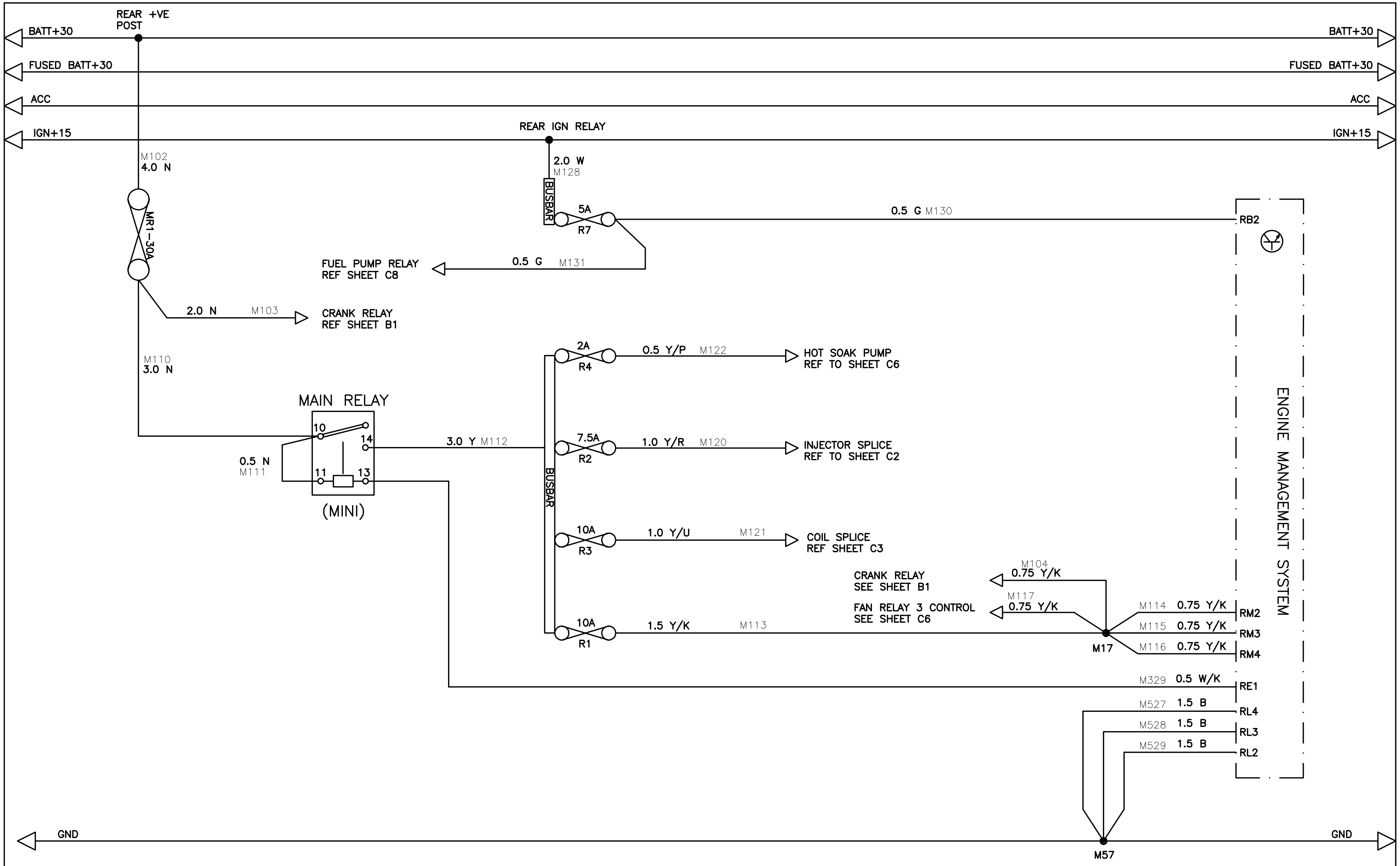
TITLE: CCT–CENTRAL LOCKING		APPROVED		UPDATES	ISSUE
		CHECKED			
PROJECT: EAGLE	DRG. No:	DRAWN	N. CHOWLES		
SHEET:B3	ISSUE LEVEL: PR	FIRST RELEASE DATE	10NO09		

CONN NAME
MAIN/ENGINE
MALE CONN
FEMALE CONN
CAVITY NUMBER



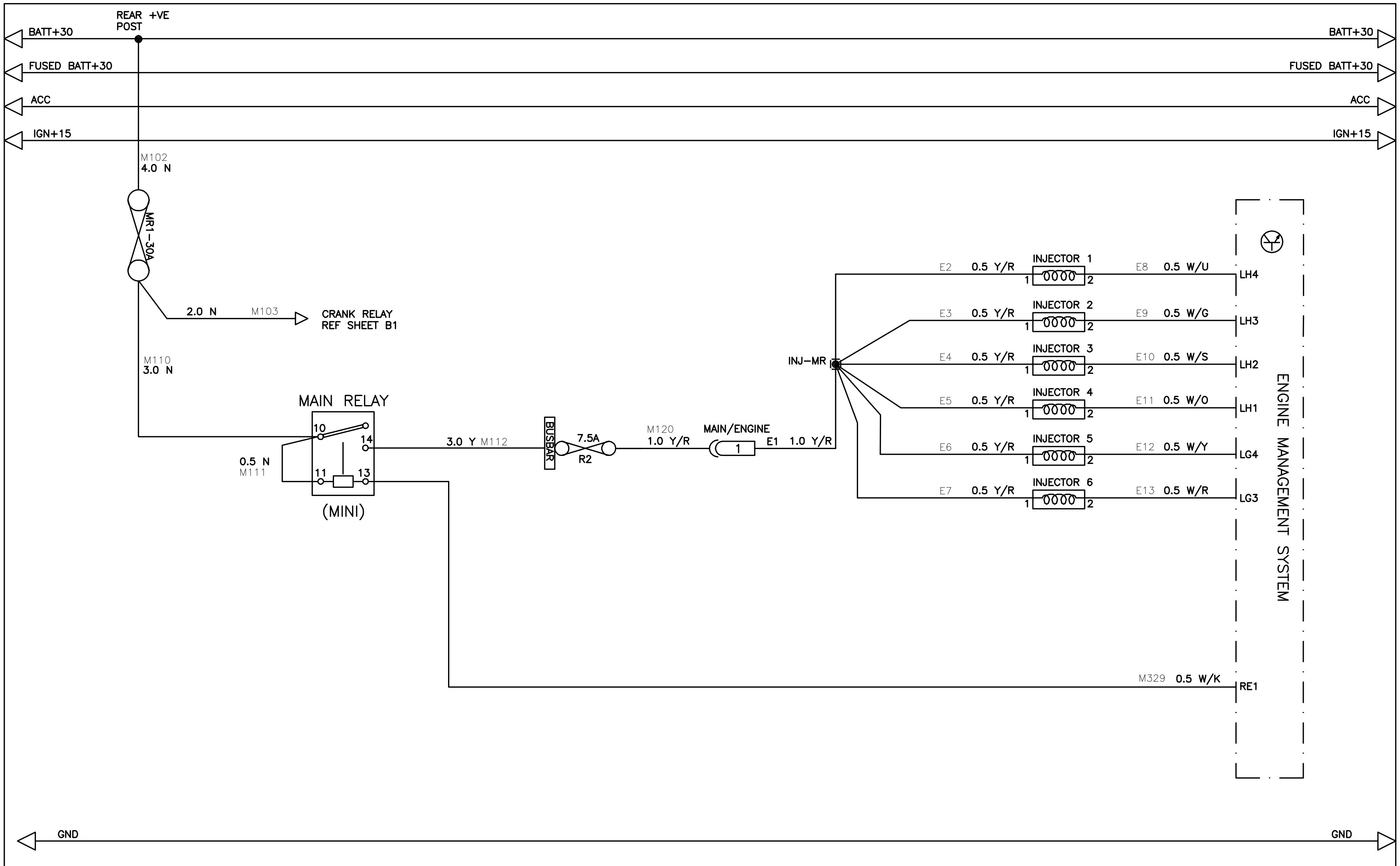
TITLE: CCT-FUEL FILLER FLAP & GLOVE BOX LOCK		APPROVED		UPDATES	ISSUE
		CHECKED			
PROJECT: EAGLE	DRG. No:	DRAWN	N. CHOWLES		
SHEET:B4	ISSUE LEVEL: PR	FIRST RELEASE DATE	10NO09		

CONN NAME
MAIN/ENGINE
MALE CONN
3
FEMALE CONN
CAVITY NUMBER



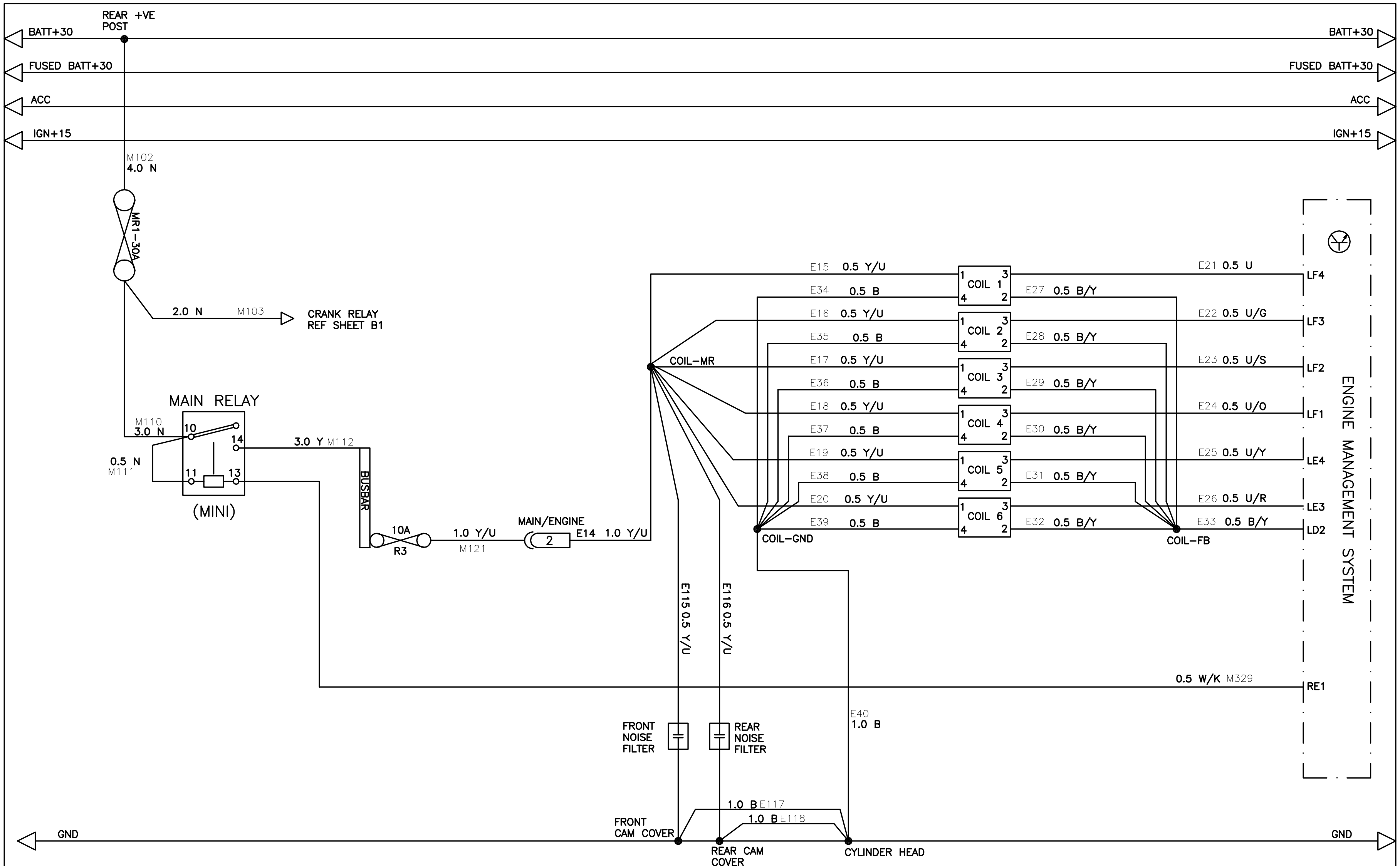
TITLE: CCT–EMS POWER & GND		APPROVED		UPDATES	ISSUE
		CHECKED			
PROJECT: EAGLE	DRG. No:	DRAWN	N. CHOWLES		
SHEET:C1	ISSUE LEVEL: PR	FIRST RELEASE DATE	10NO09		

CONN NAME
MAIN/ENGINE
MALE CONN
3
FEMALE CONN
CAVITY NUMBER



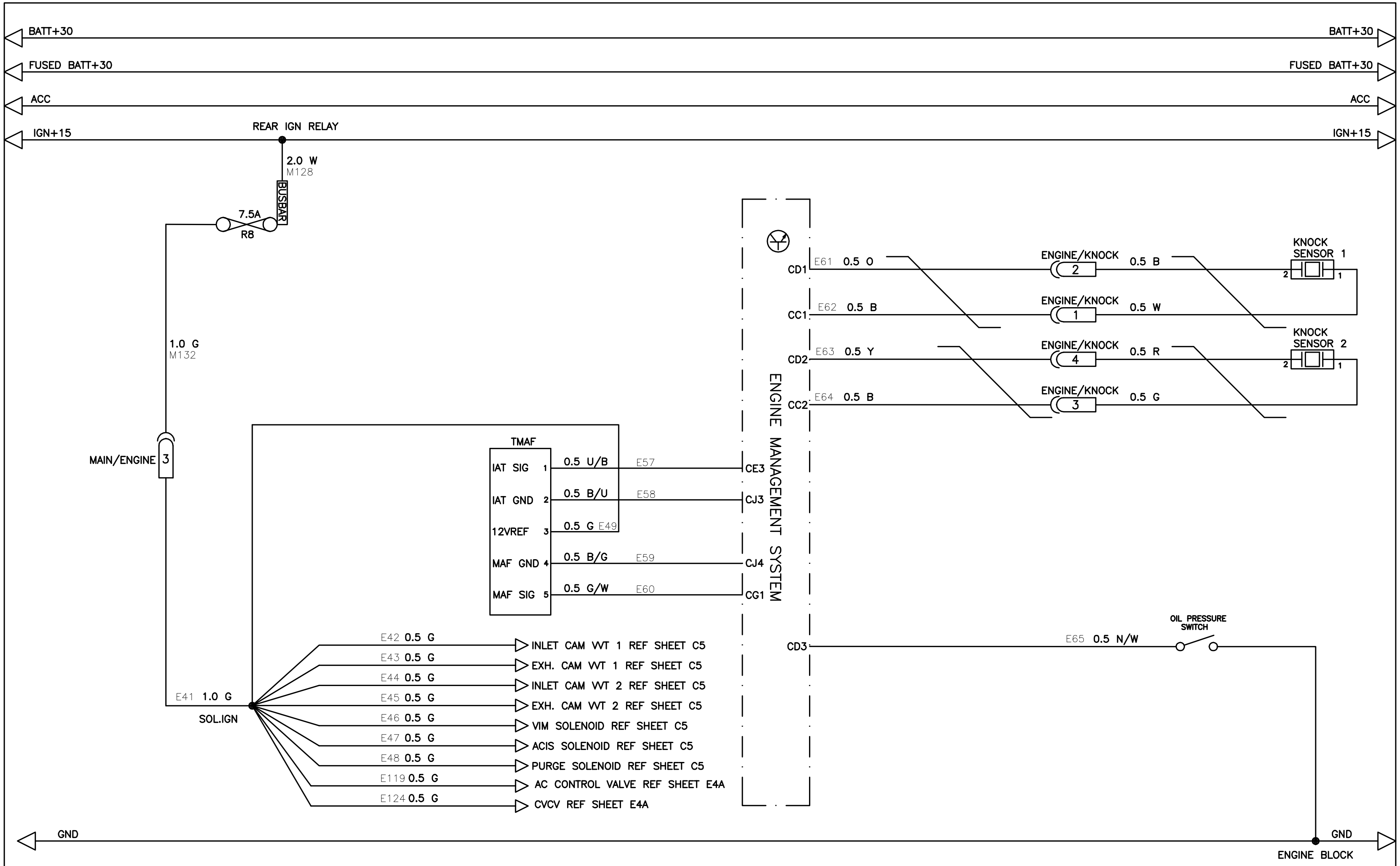
TITLE: CCT-EMS-FUEL INJECTION		APPROVED		UPDATES	ISSUE
		CHECKED			
PROJECT: EAGLE	DRG. No:	DRAWN	N. CHOWLES		
SHEET:C2	ISSUE LEVEL: PR	FIRST RELEASE DATE	10NO09		

CONN NAME
MAIN/ENGINE
MALE CONN
3
FEMALE CONN
CAVITY NUMBER



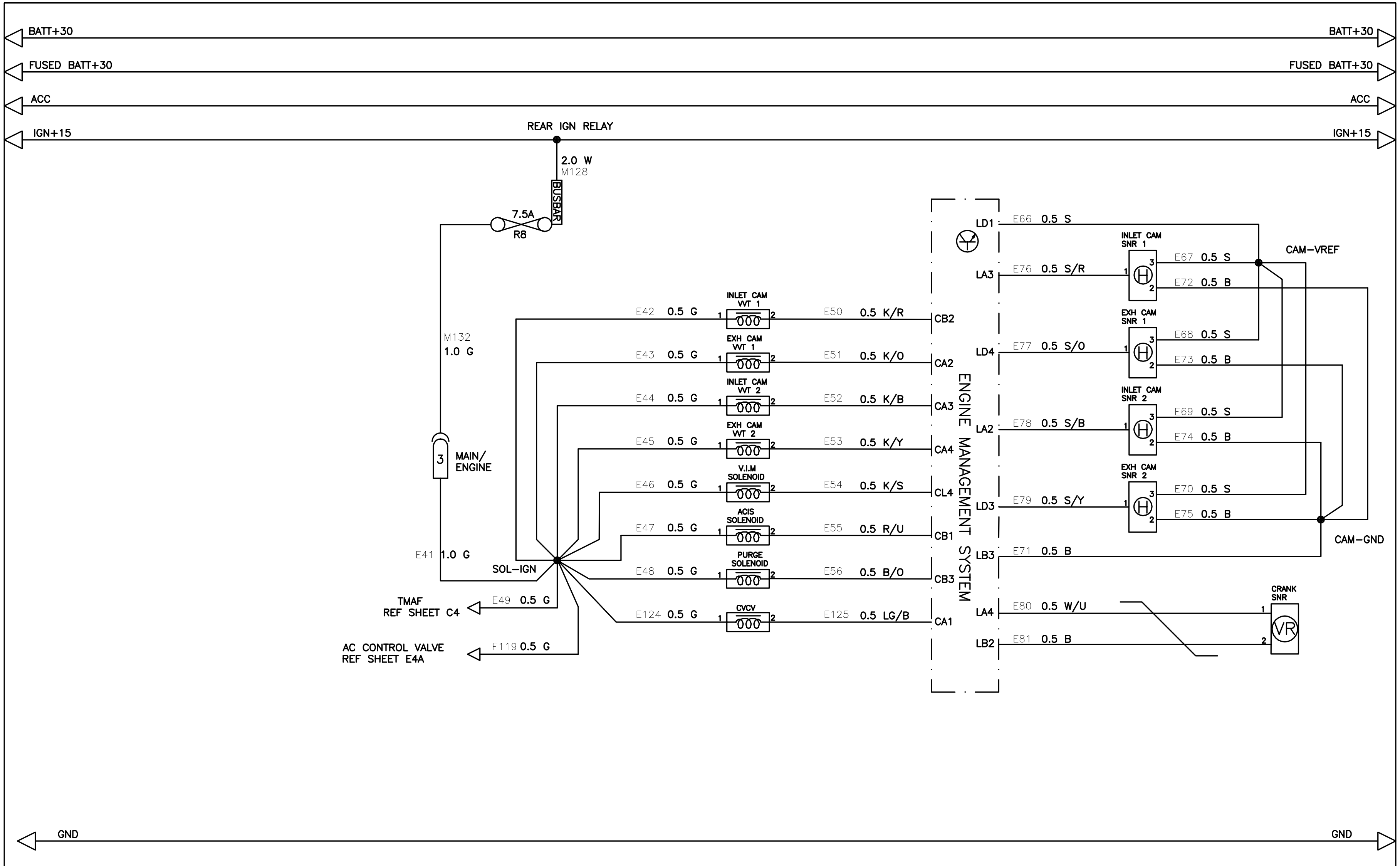
TITLE: CCT-EMS-IGNITION COILS		APPROVED		UPDATES	ISSUE
		CHECKED			
PROJECT: EAGLE	DRG. No:	DRAWN	N. CHOWLES		
SHEET:C3	ISSUE LEVEL: PR	FIRST RELEASE DATE	10NO09		

CONN NAME
MAIN/ENGINE
MALE CONN
3
FEMALE CONN
CAVITY NUMBER



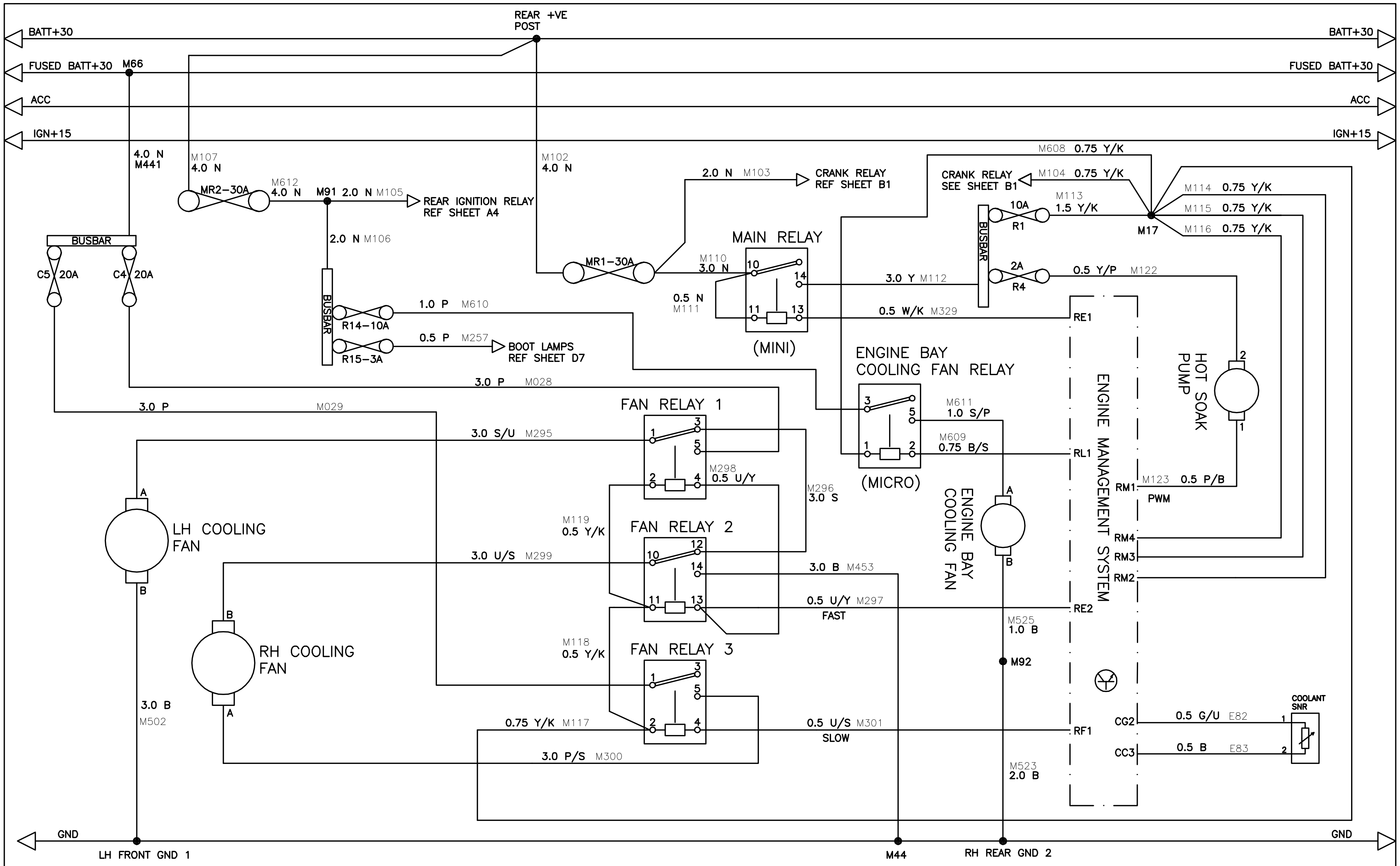
TITLE: CCT–EMS–TMAF, OIL PRESSURE SW & KNOCK SENSORS		APPROVED		UPDATES	ISSUE
		CHECKED			
PROJECT: EAGLE	DRG. No:	DRAWN	N. CHOWLES		
SHEET:C4	ISSUE LEVEL: PR	FIRST RELEASE DATE	10NO09		

CONN NAME
MAIN/ENGINE
MALE CONN 3 FEMALE CONN
CAVITY NUMBER



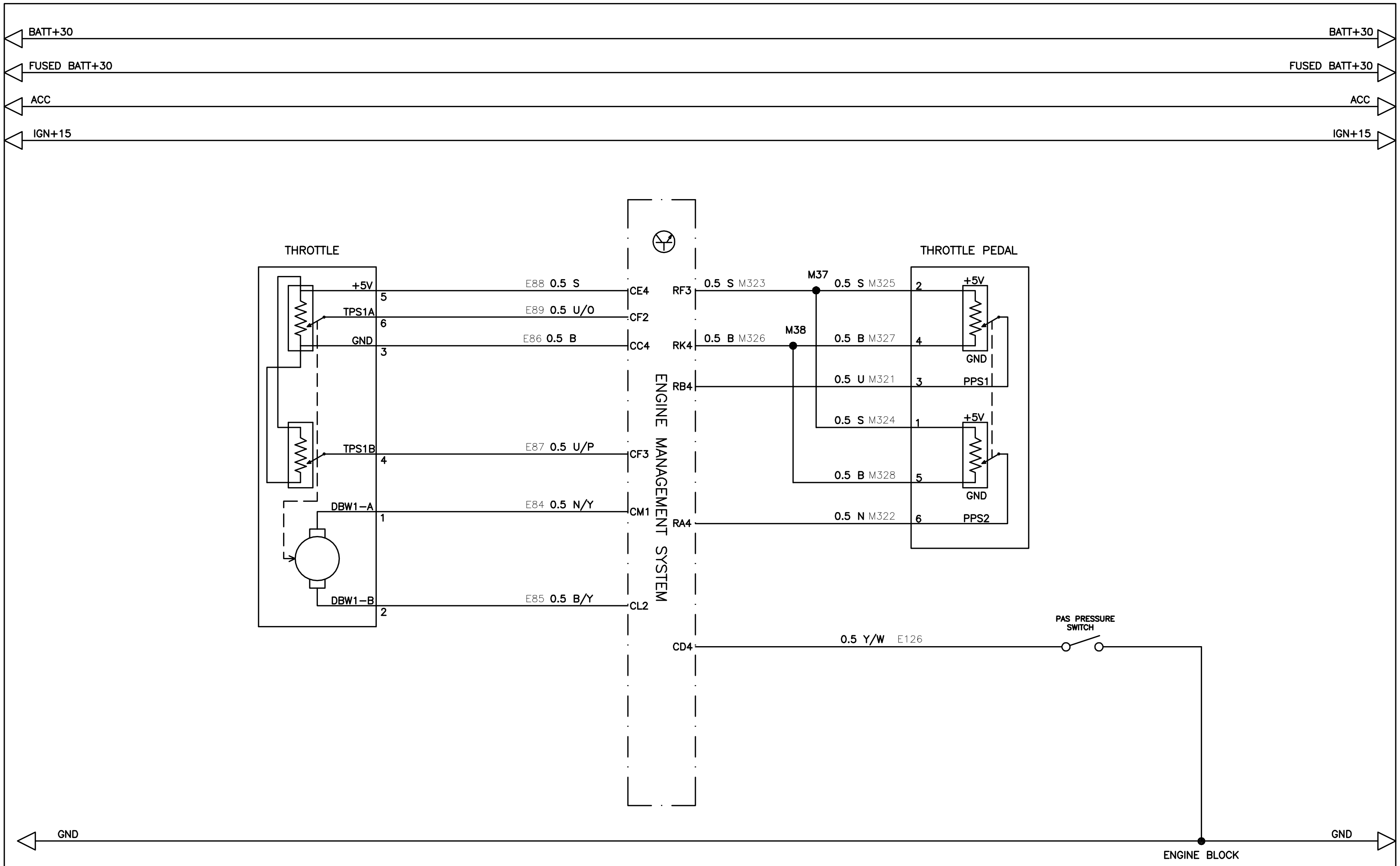
TITLE: CCT-EMS-CAM & CRANK SENSORS & VARIOUS SOLENOIDS		APPROVED		UPDATES	ISSUE
		CHECKED			
PROJECT: EAGLE	DRG. No:	DRAWN	N. CHOWLES		
SHEET:C5	ISSUE LEVEL: PR	FIRST RELEASE DATE	10NO09		

CONN NAME
MAIN/ENGINE
MALE CONN
3
FEMALE CONN
CAVITY NUMBER



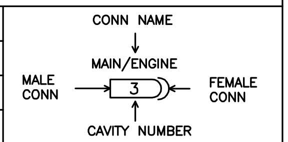
TITLE: CCT-EMS-COOLANT SENSING & FAN CONTROL		APPROVED		UPDATES / ISSUE
		CHECKED		
PROJECT: EAGLE	DRG. No:	DRAWN	N. CHOWLES	
SHEET:C6	ISSUE LEVEL: PR	FIRST RELEASE DATE	10NO09	

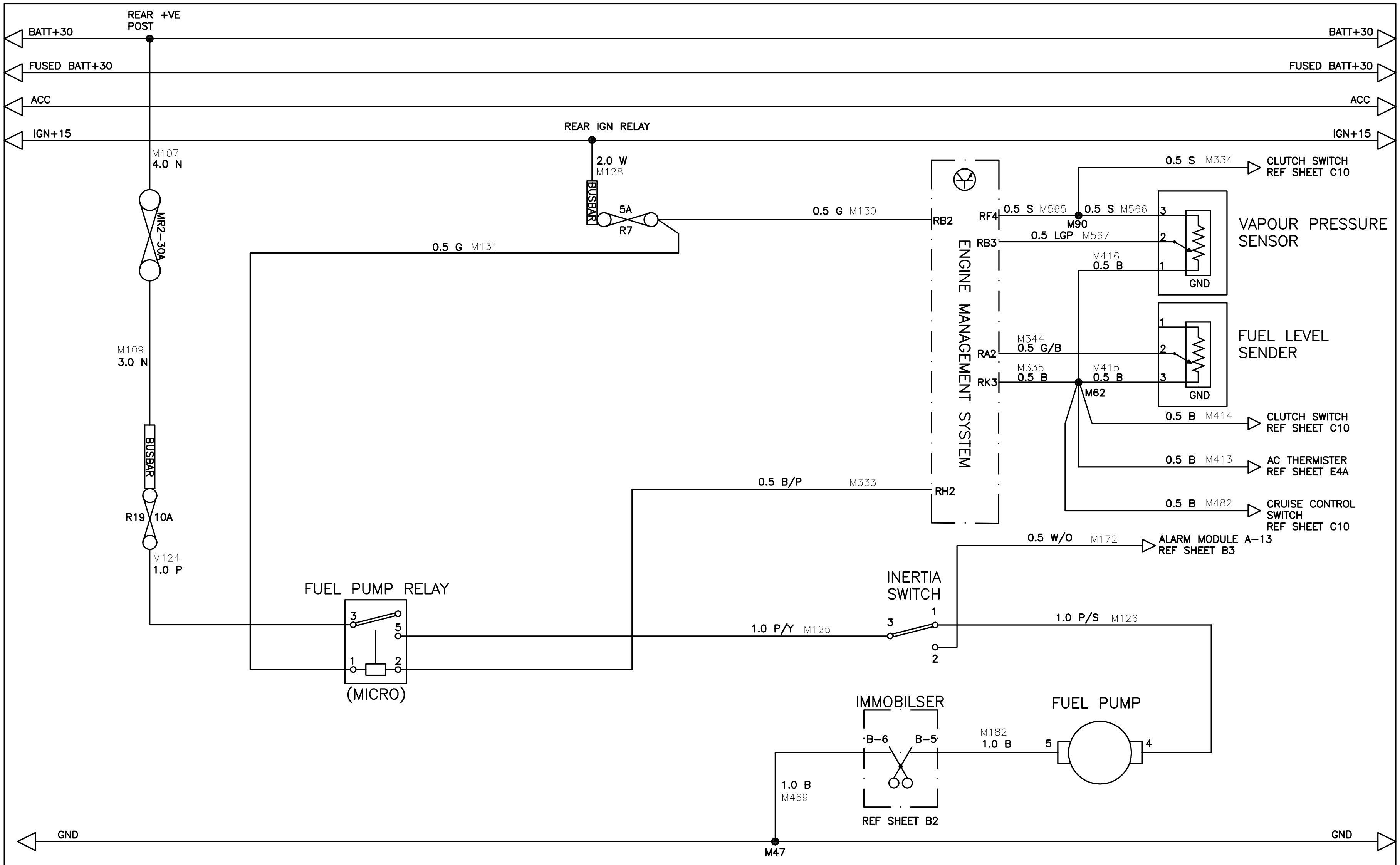
CONN NAME
MAIN/ENGINE
MALE CONN
3
FEMALE CONN
CAVITY NUMBER



TITLE: CCT–EMS–THROTTLE ACTUATION		APPROVED	
		CHECKED	
PROJECT: EAGLE	DRG. No:	DRAWN	N. CHOWLES
SHEET:C7	ISSUE LEVEL: PR	FIRST RELEASE DATE	10NO09

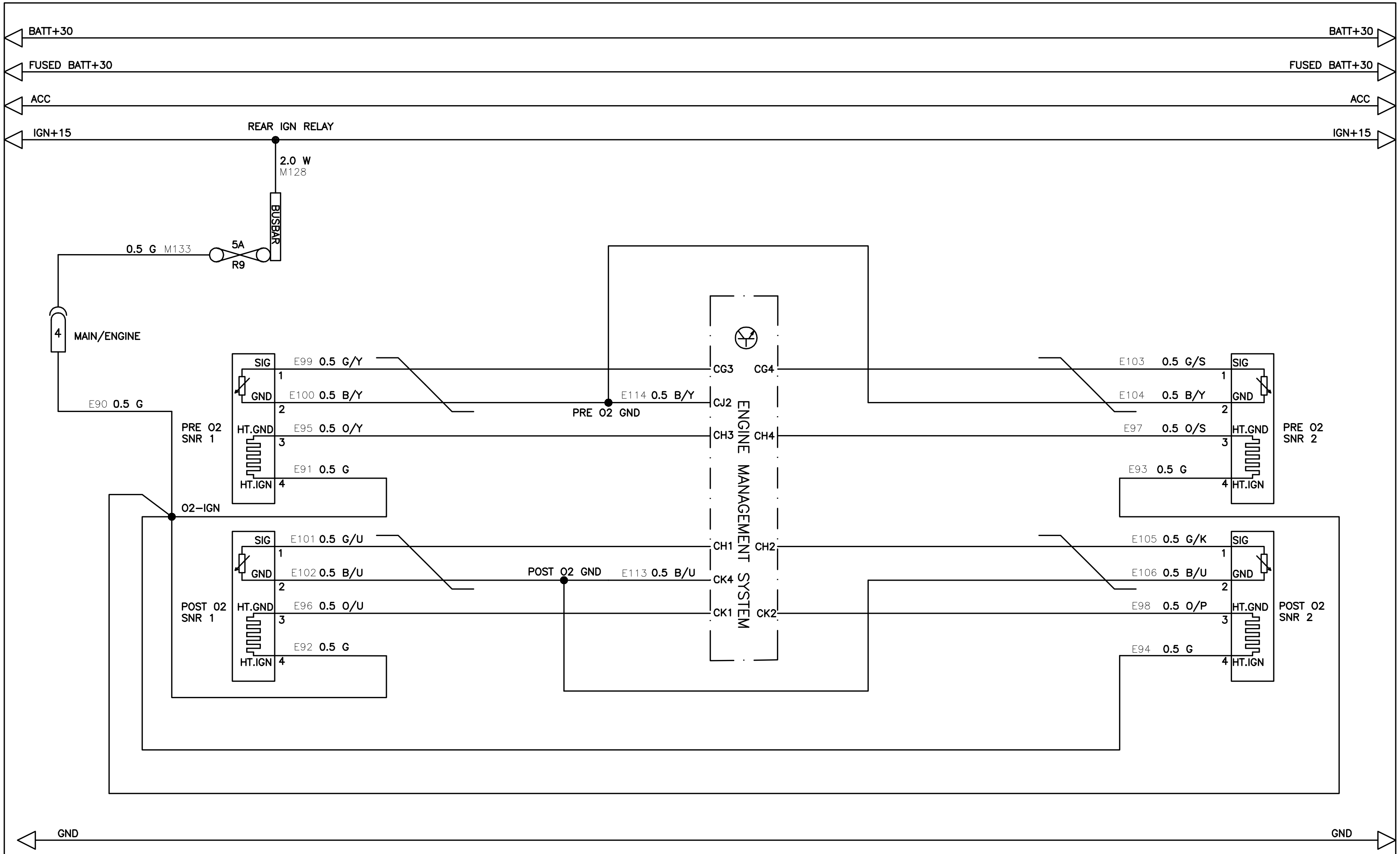
UPDATES	ISSUE





TITLE: CCT-EMS-FUEL PUMP & FUEL LEVEL		APPROVED		UPDATES	ISSUE
		CHECKED			
PROJECT: EAGLE	DRG. No:	DRAWN	N. CHOWLES		
SHEET:C8	ISSUE LEVEL: PR	FIRST RELEASE DATE	10NO09		

CONN NAME
MAIN/ENGINE
MALE CONN
3
FEMALE CONN
CAVITY NUMBER



TITLE: CCT–EMS–02 SENSORS		APPROVED		UPDATES	ISSUE
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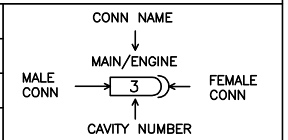

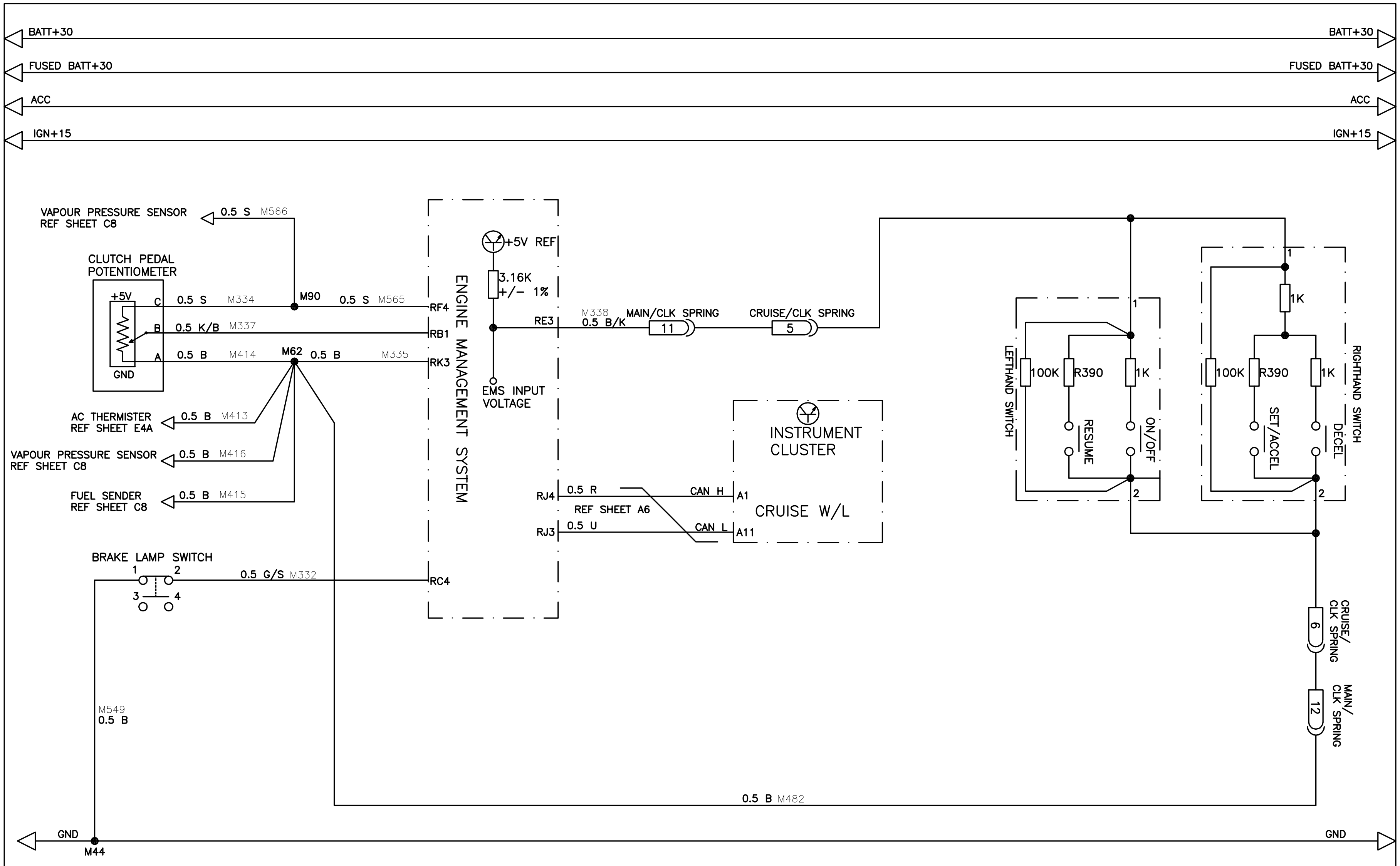

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PROJECT: EAGLE	DRG. No:	DRAWN	N. CHOWLES			MALE CONN 3 FEMALE CONN
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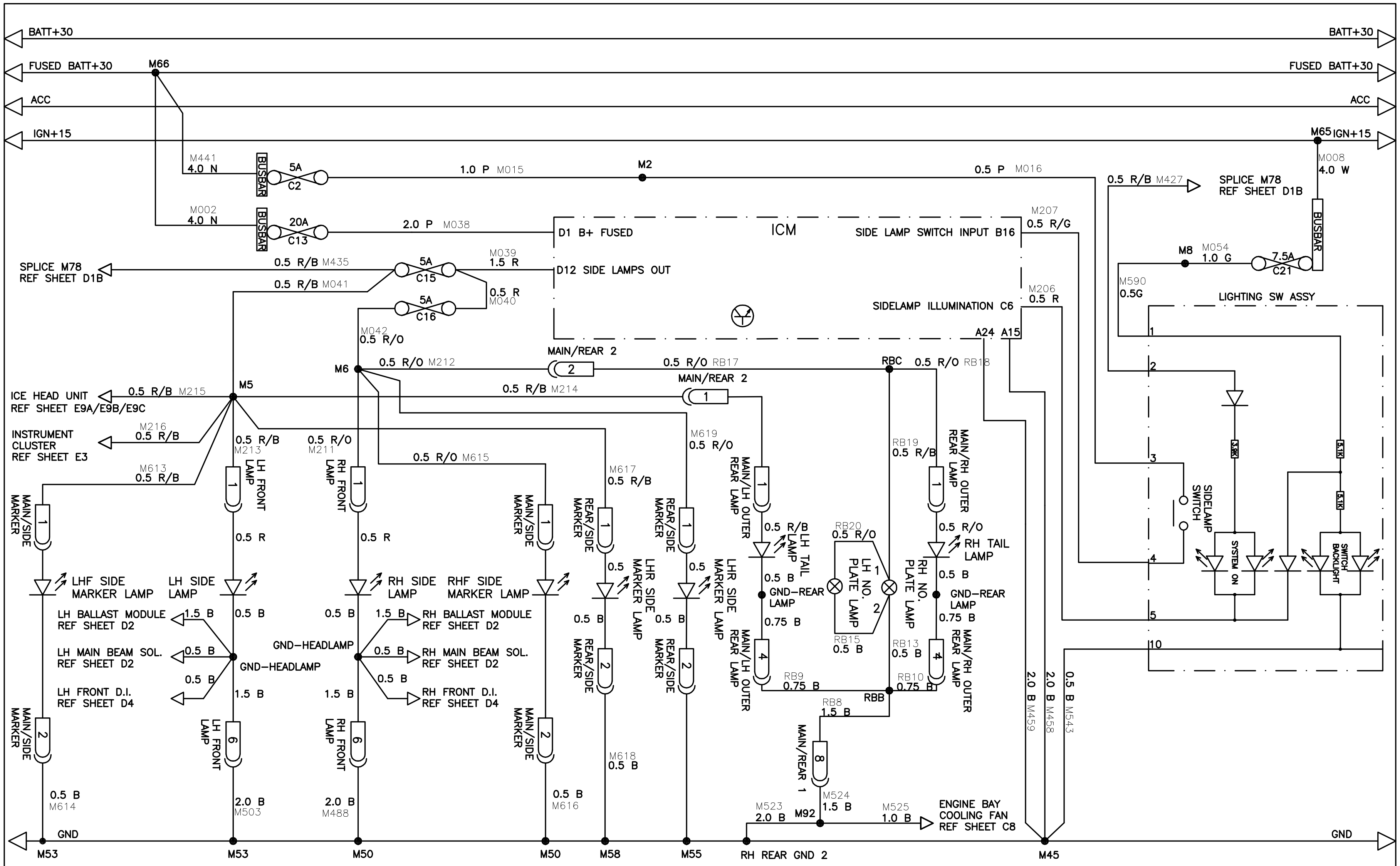

TITLE: CCT-SIDE LAMPS & SIDE MARKERS		APPROVED		UPDATES	ISSUE
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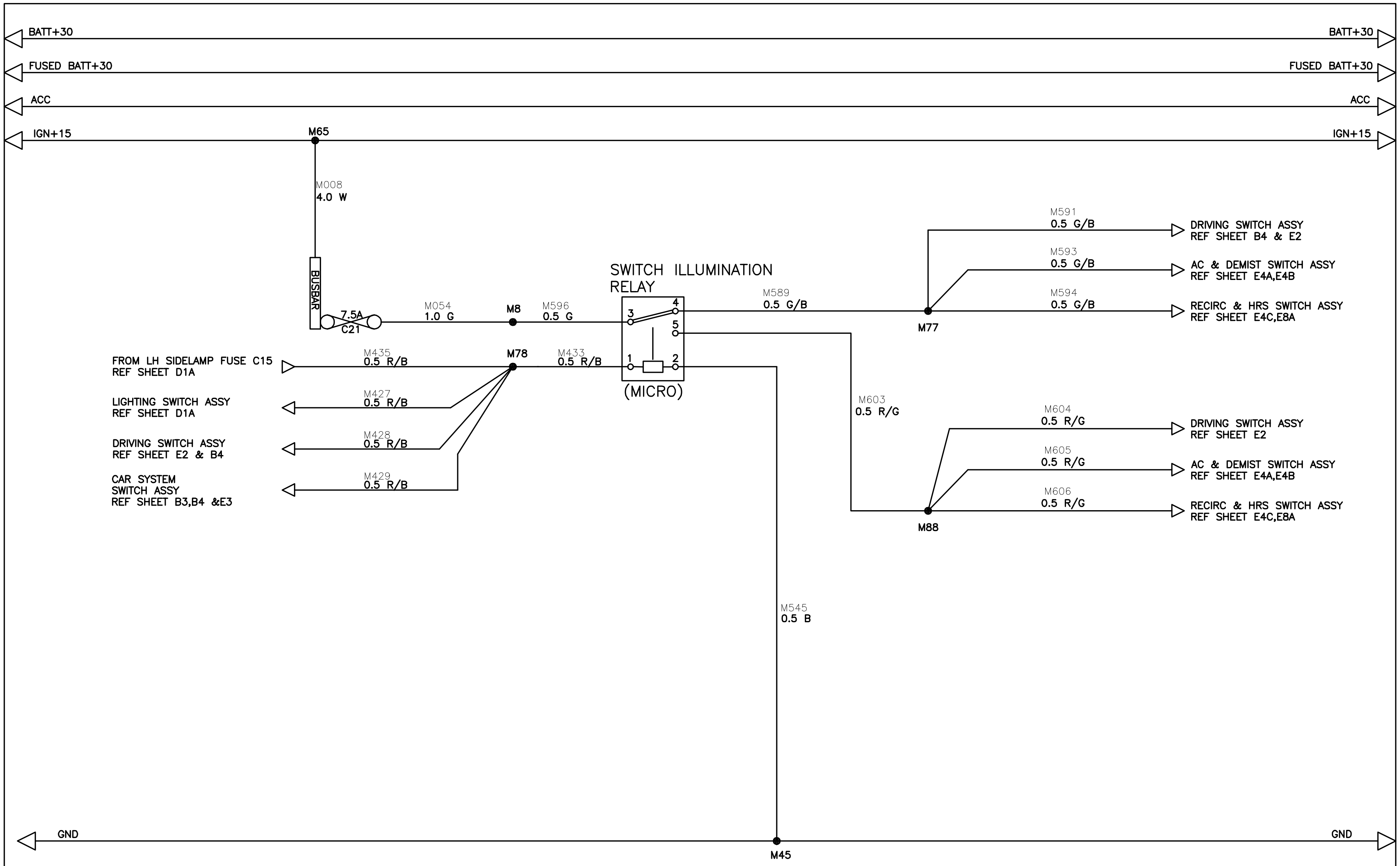

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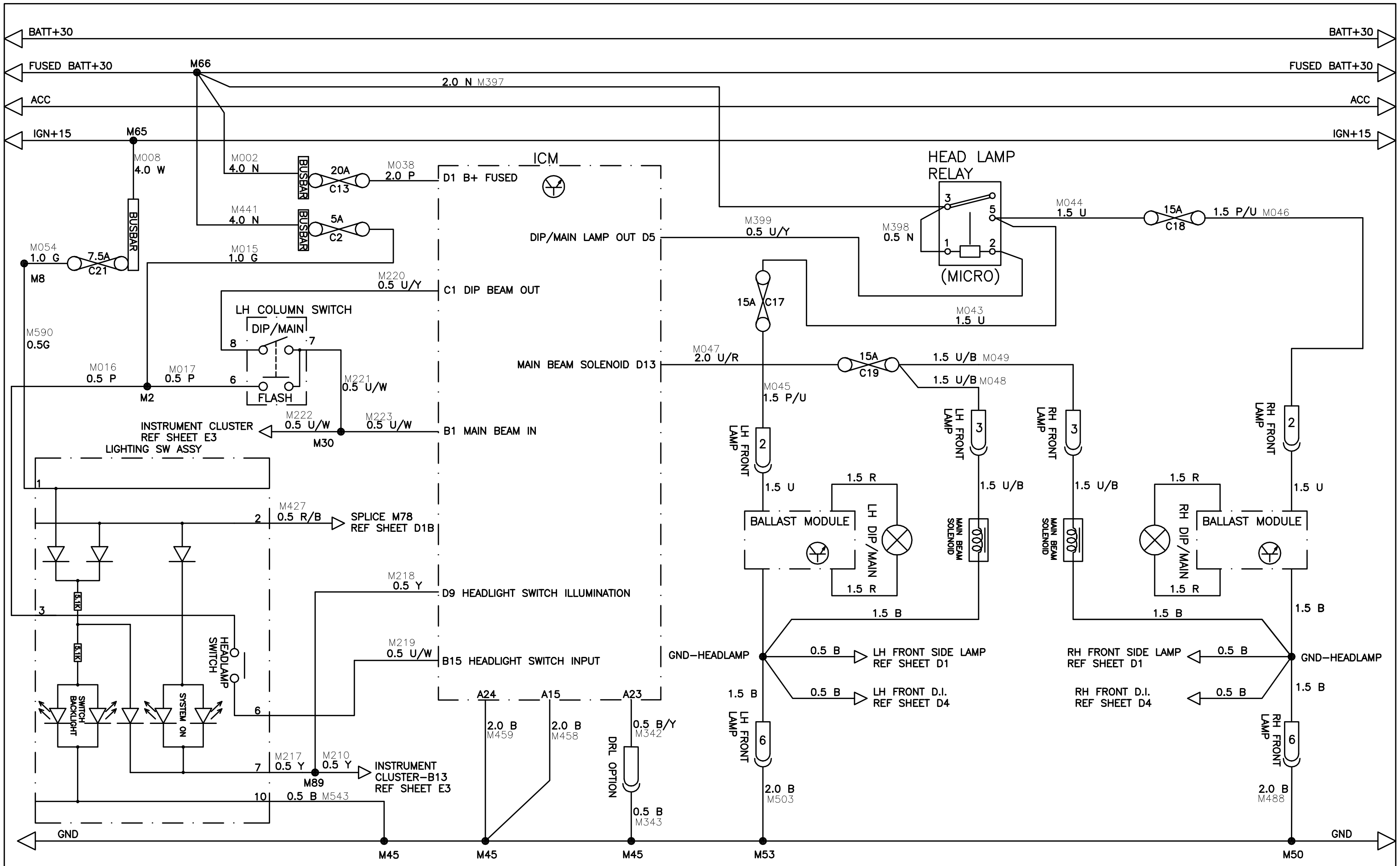
PROJECT: EAGLE	DRG. No:	DRAWN	N. CHOWLES	
SHEET:D1B	ISSUE LEVEL: PR	FIRST RELEASE DATE	10NO09	

ISSUE

CONN NAME
MAIN/ENGINE
MALE CONN
3
FEMALE CONN
CAVITY NUMBER



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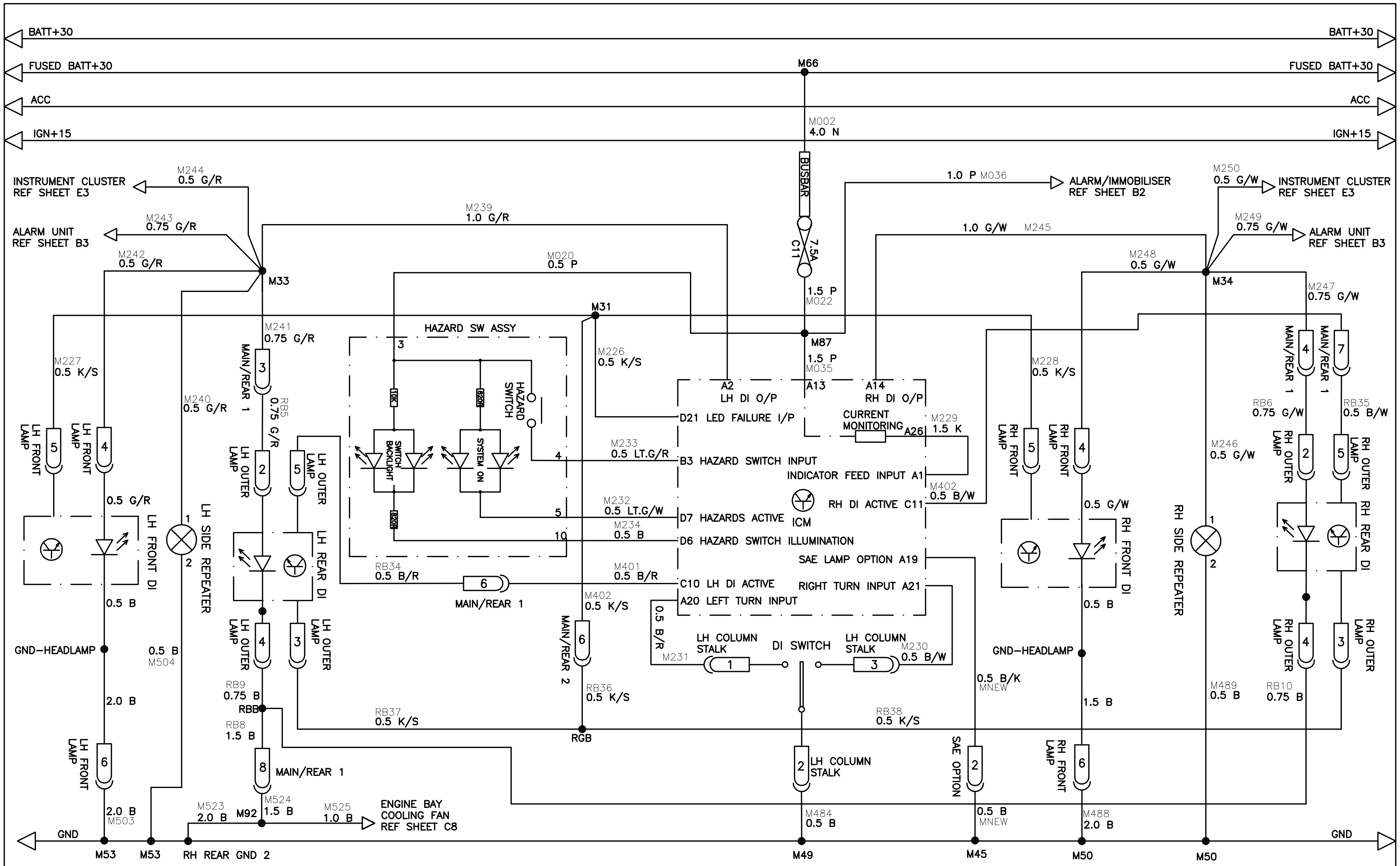

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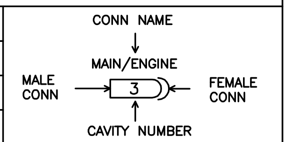

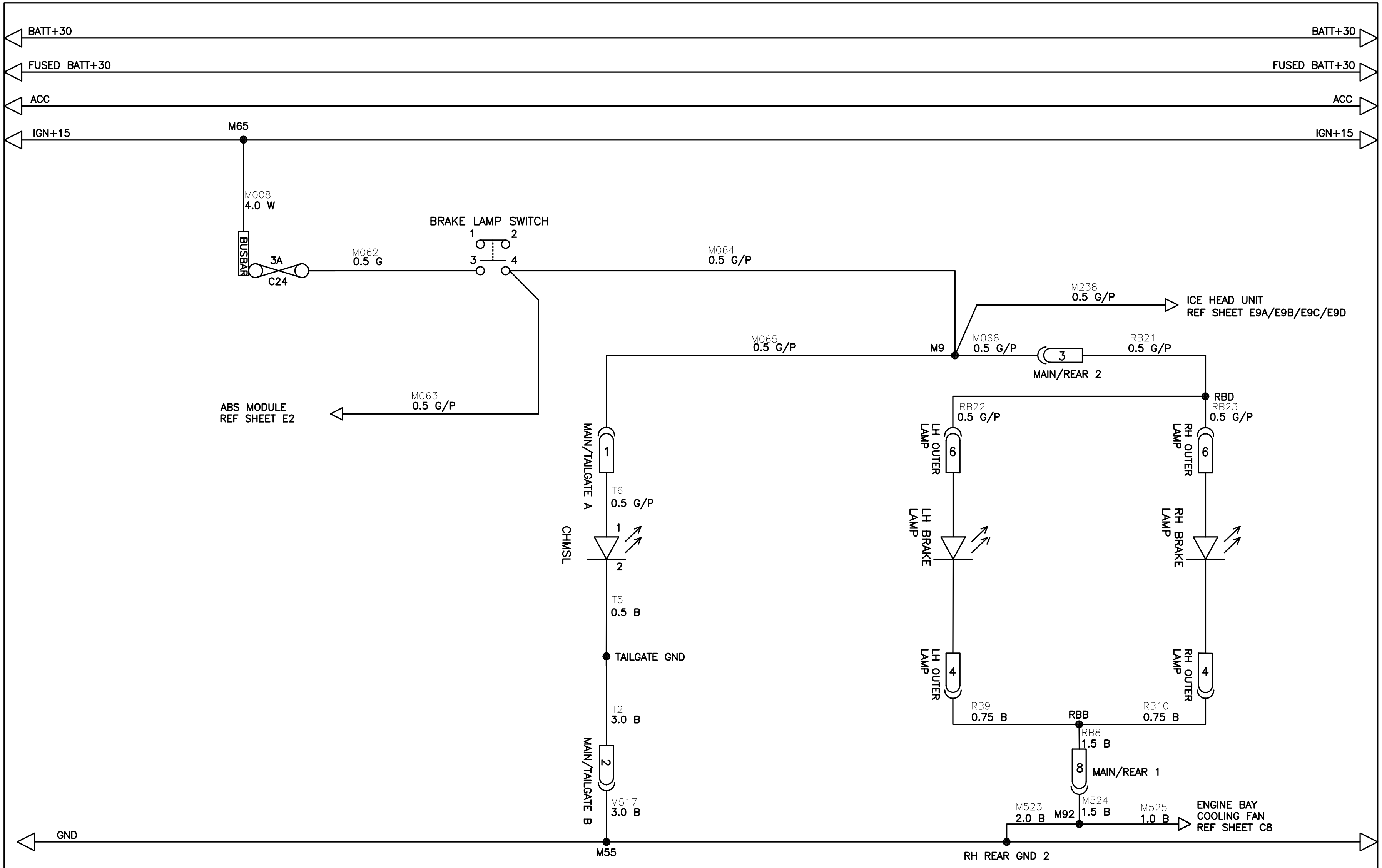

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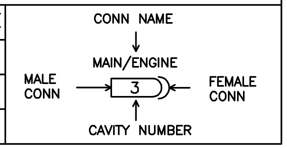

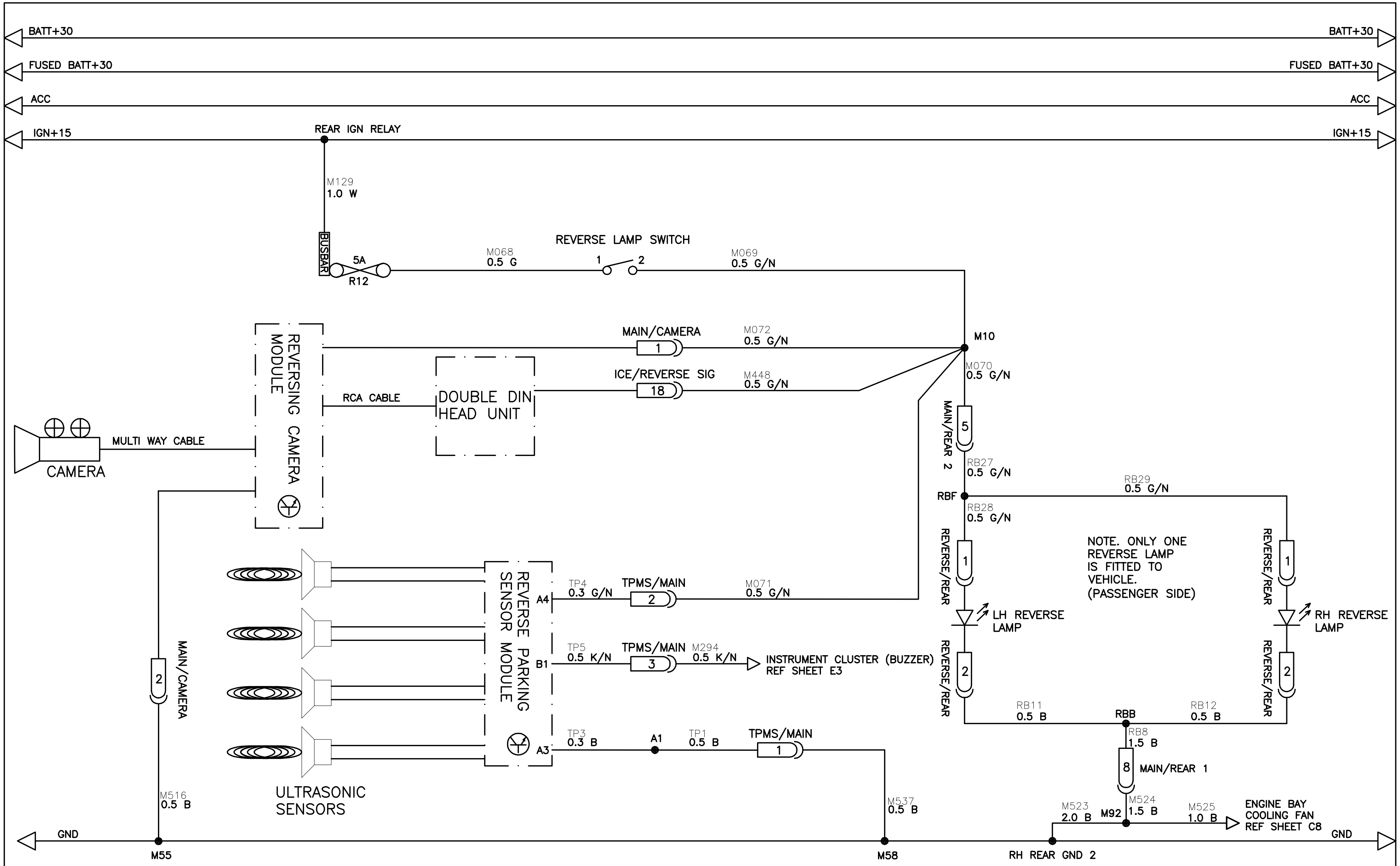

TITLE: CCT–REVERSE LAMPS & REVERSING CAMERA / SENSORS		APPROVED		UPDATES
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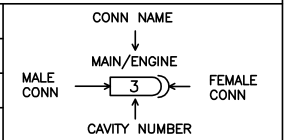
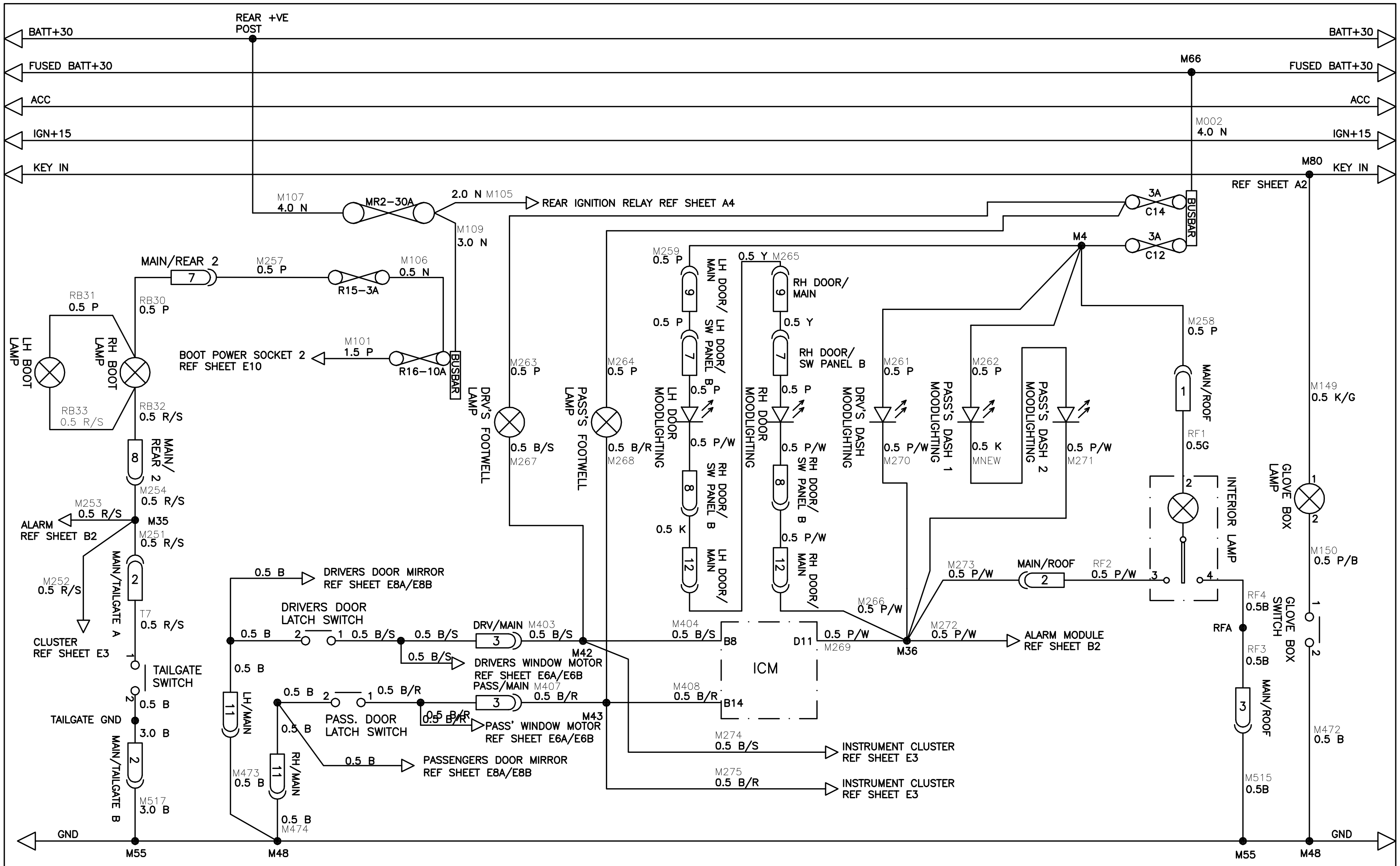
SHEET:D6	ISSUE LEVEL: PR	FIRST RELEASE DATE	10NO09	

ISSUE





TITLE: CCT-INTERIOR LIGHTING (LH DRIVE)		APPROVED	
		CHECKED	
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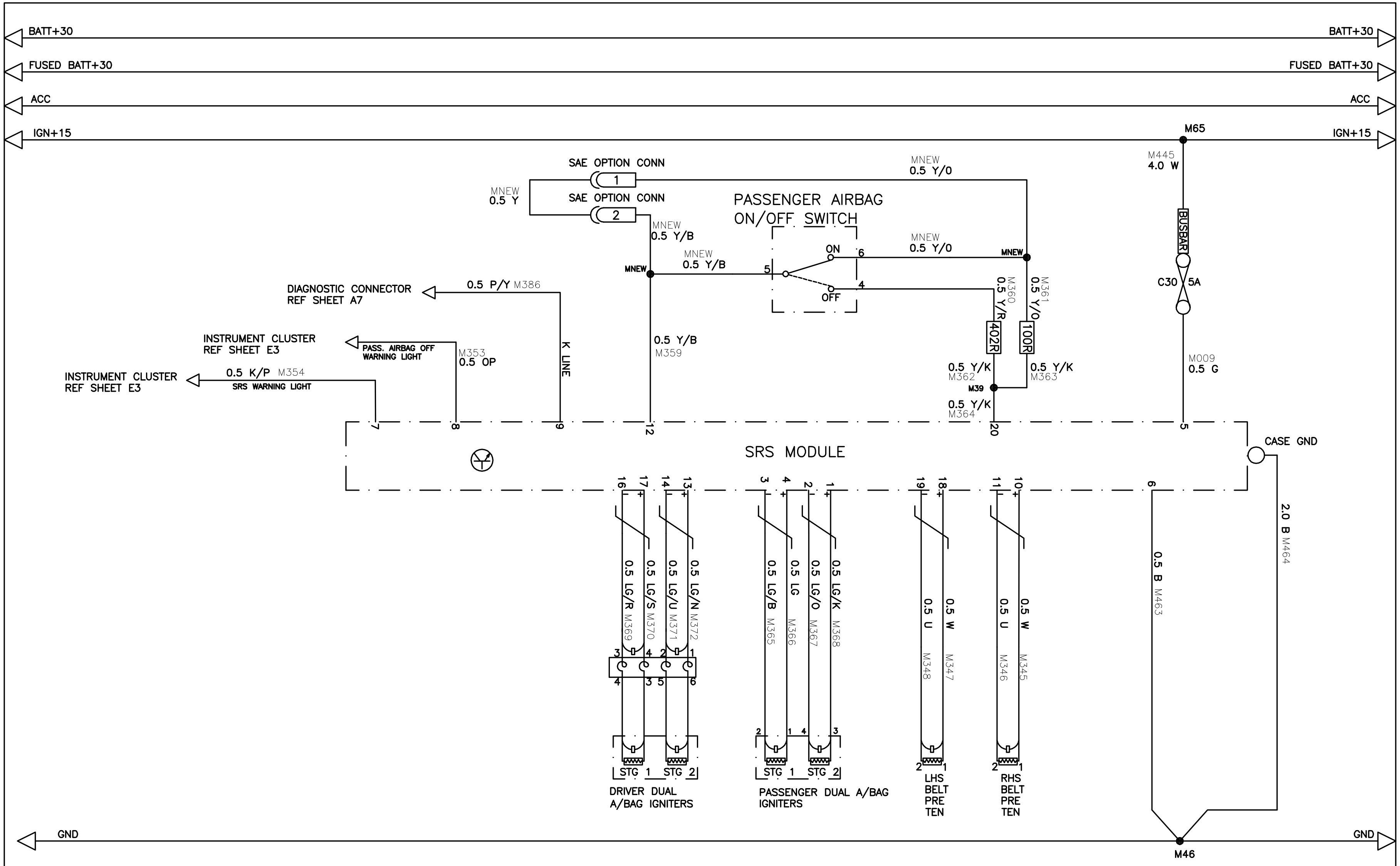
SHEET:D7A	ISSUE LEVEL: PR	FIRST RELEASE DATE	10NO09

UPDATES | ISSUE



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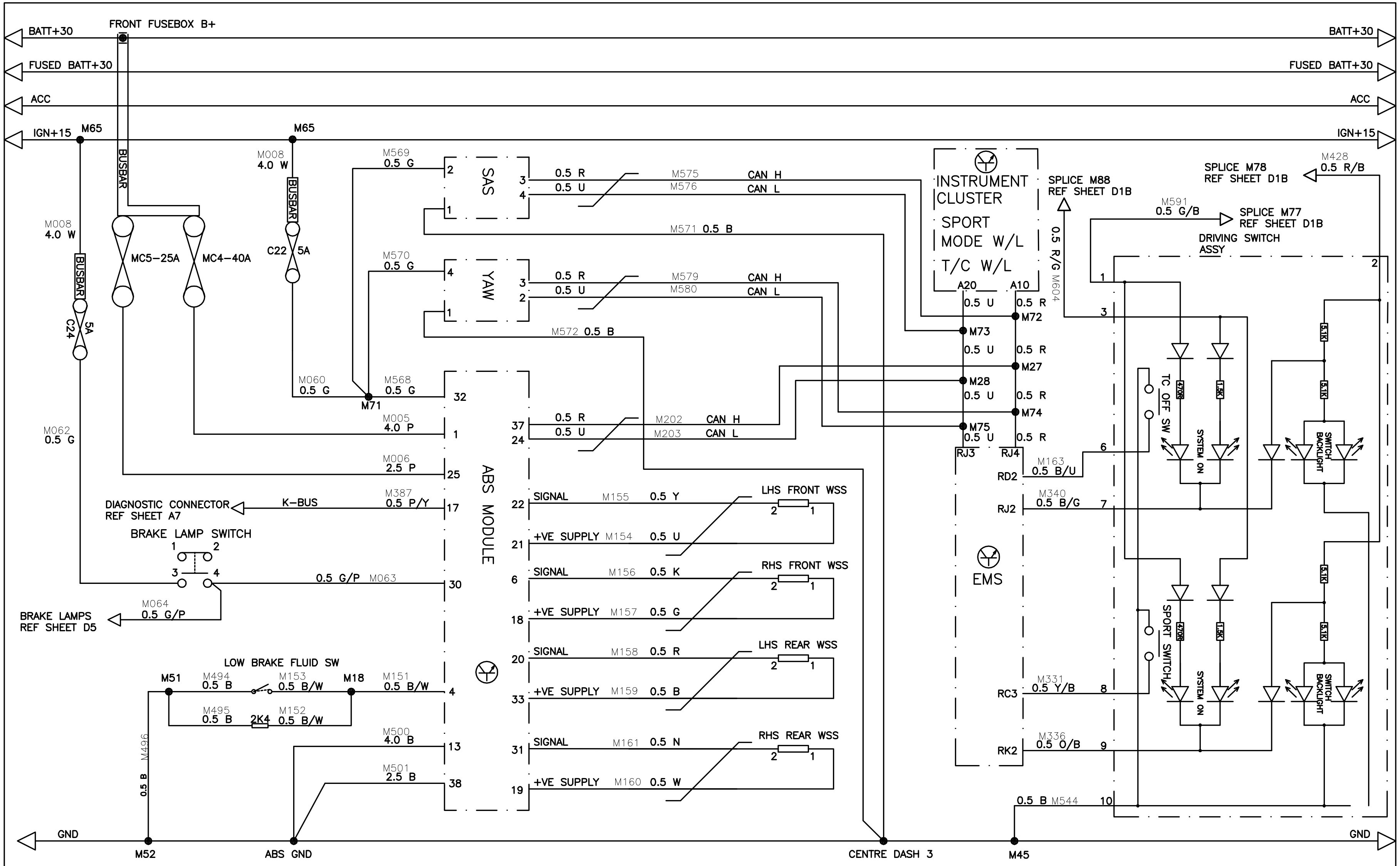
PROJECT: EAGLE	DRG. No:	DRAWN	N. CHOWLES		
SHEET:E1	ISSUE LEVEL: PR	FIRST RELEASE DATE	10NO09		

CONN NAME
MAIN/ENGINE
MALE CONN
FEMALE CONN
CAVITY NUMBER



TITLE: CCT–ABS SYSTEM, TRACTION CONTROL & SPORT MODE		APPROVED		UPDATES	ISSUE
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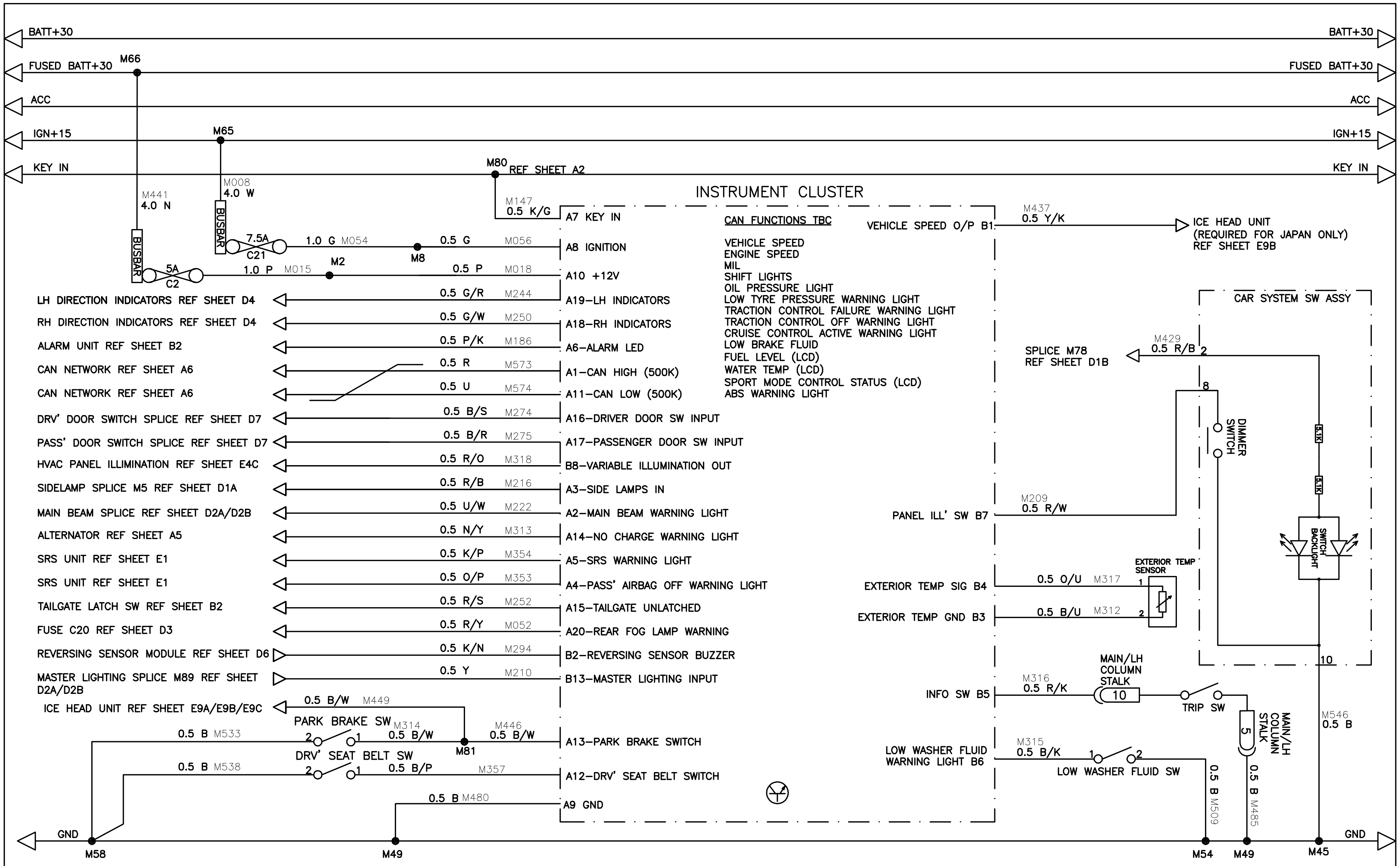
CONN NAME
MAIN/ENGINE
MALE CONN
FEMALE CONN
3
CAVITY NUMBER



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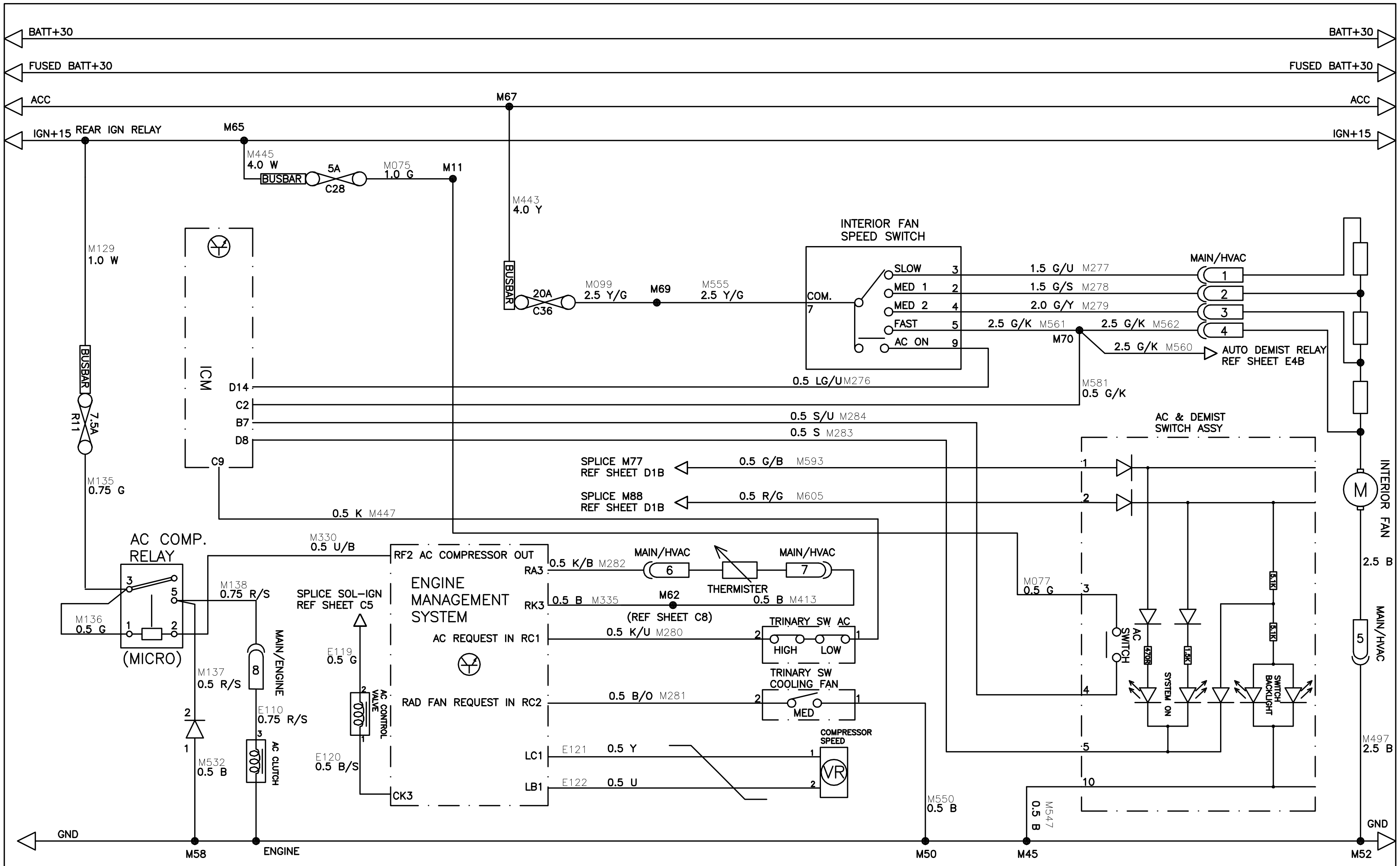
PROJECT: EAGLE	DRG. No:	DRAWN	N. CHOWLES		
SHEET:E3	ISSUE LEVEL: PR	FIRST RELEASE DATE	10NO09		

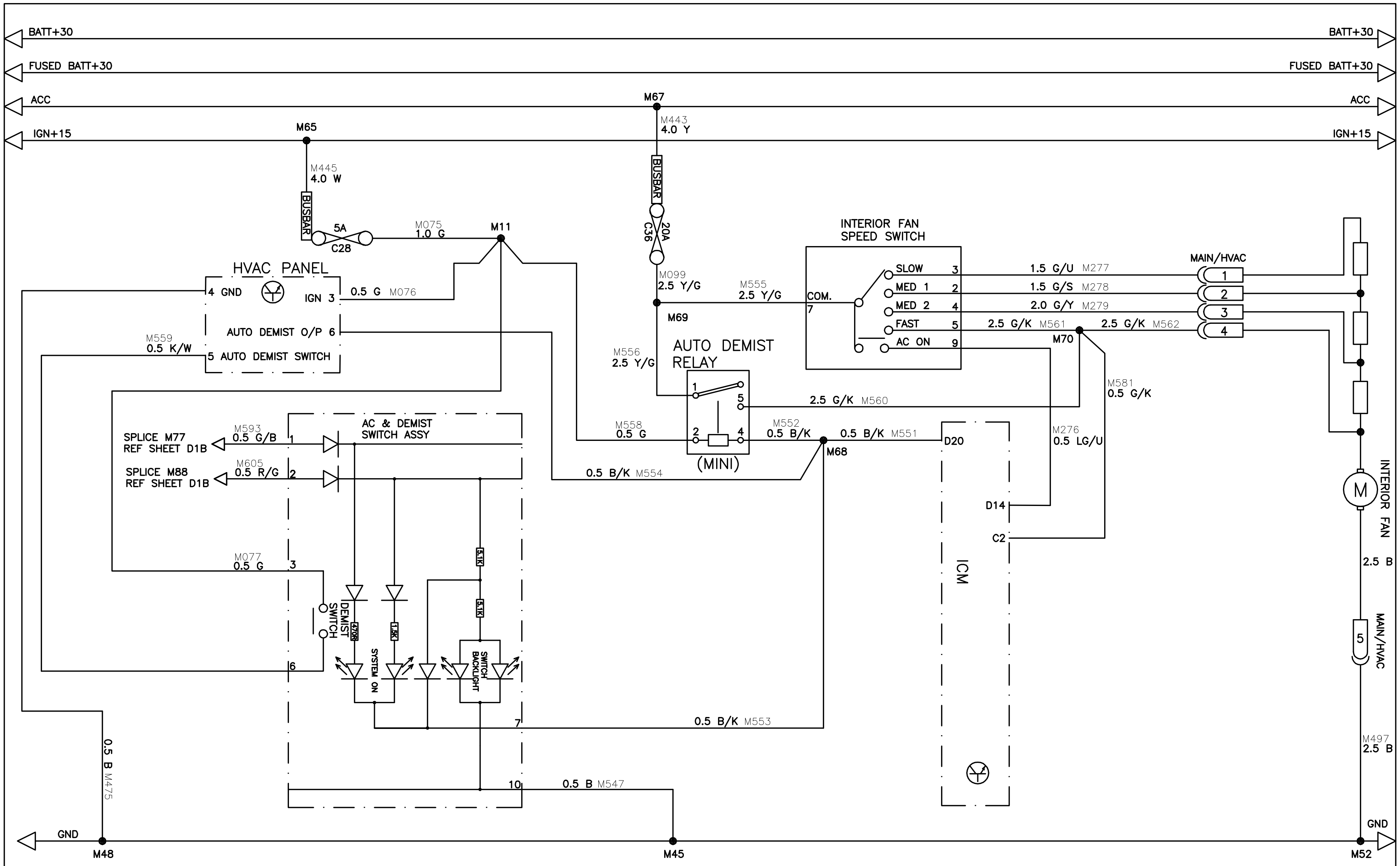
CONN NAME
MAIN/ENGINE
MALE CONN
FEMALE CONN
CAVITY NUMBER



TITLE: CCT–HVAC PART 1		APPROVED		UPDATES
		CHECKED		
PROJECT: EAGLE	DRG. No:	DRAWN	N. CHOWLES	
SHEET:E4A	ISSUE LEVEL: PR	FIRST RELEASE DATE	10NO09	

ISSUE

CONN NAME
MAIN/ENGINE
MALE CONN
3
FEMALE CONN
CAVITY NUMBER



TITLE: CCT–HVAC PART 2		APPROVED		UPDATES	ISSUE
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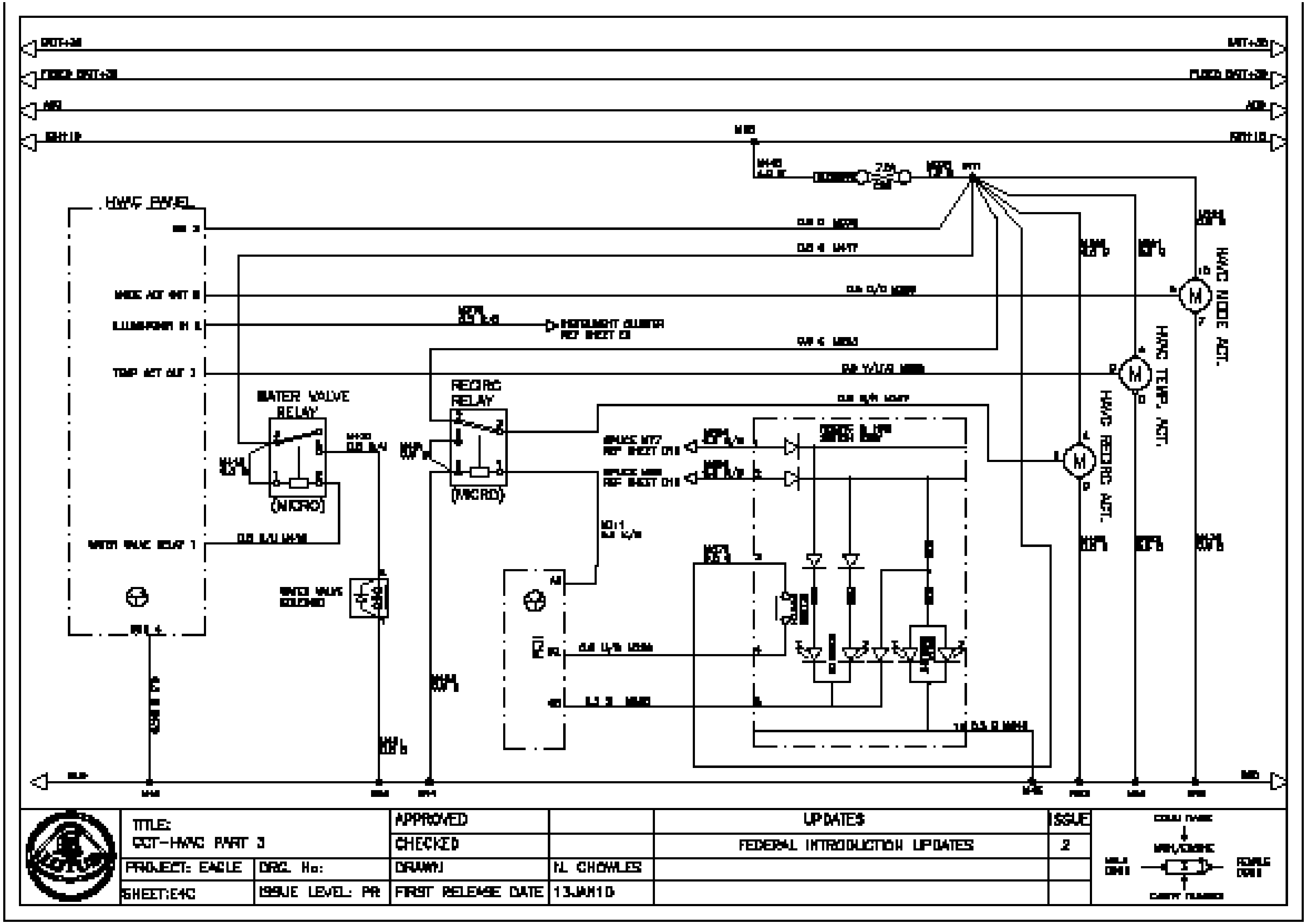
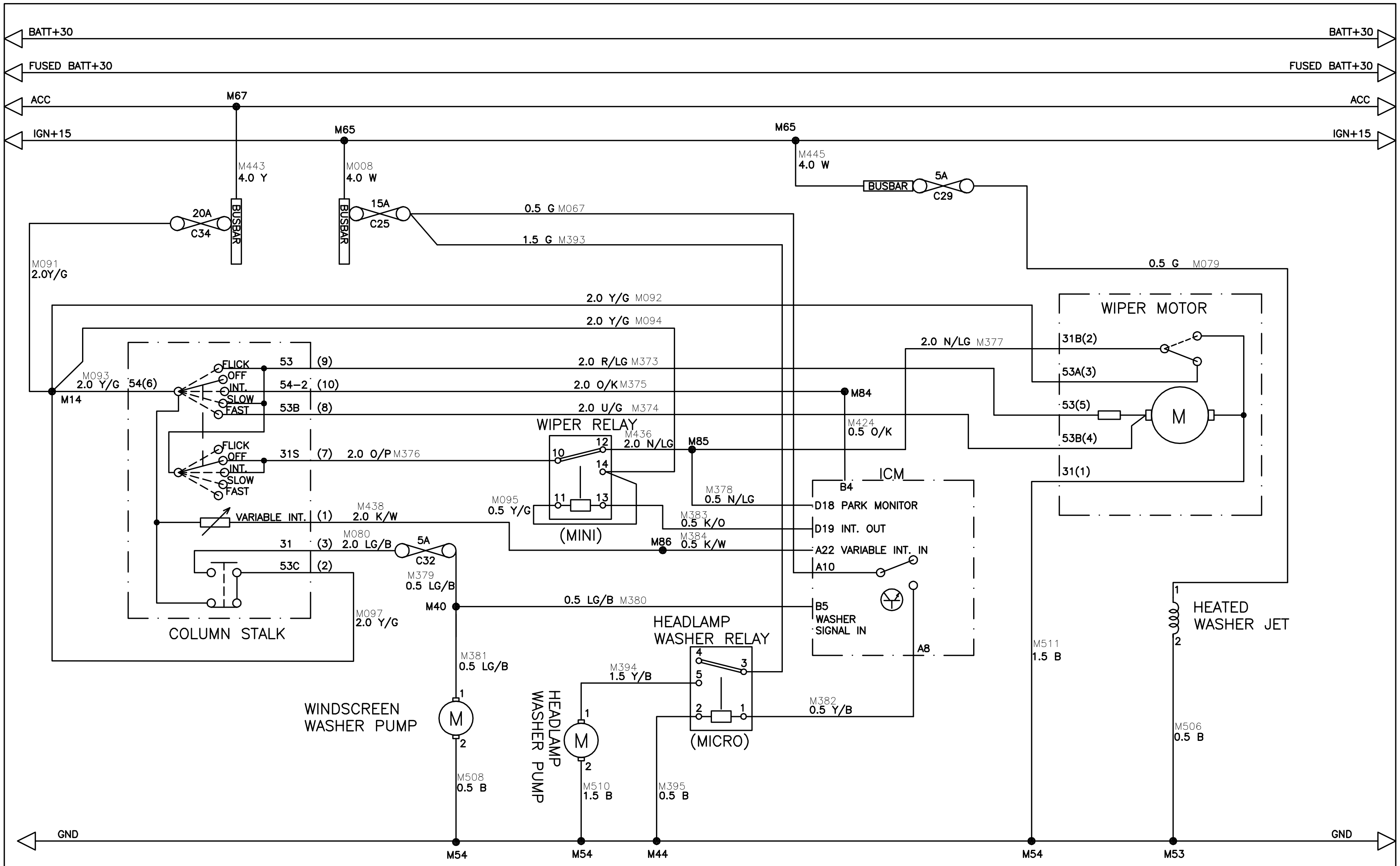
PROJECT: EAGLE	DRG. No:	DRAWN	N. CHOWLES		
SHEET:E4B	ISSUE LEVEL: PR	FIRST RELEASE DATE	10NO09		

CONN NAME
MAIN/ENGINE
MALE CONN
3
FEMALE CONN
CAVITY NUMBER


HVAC PANEL
WATER VALVE RELAY
(MICRO)
RECIRC RELAY
(MICRO)
HVAC MODE ACT.
HVAC TEMP. ACT.
HVAC RECIRC ACT.
INSTRUMENT CLUSTER REF SHEET C3
TITLE:
CCT-HVAC PART 3
PROJECT: EAGLE
DRG. No:
SHEET:E4C
ISSUE LEVEL: PR
APPROVED
CHECKED
DRAWN
N. CHOWLES
FIRST RELEASE DATE
13JAN10
UPDATES
FEDERAL INTRODUCTION UPDATES
ISSUE
2



TITLE: CCT–WASH WIPE SYSTEM, POWER WASH & HEATED JETS		APPROVED		UPDATES
		CHECKED		
PROJECT: EAGLE	DRG. No:	DRAWN	N. CHOWLES	
SHEET:E5	ISSUE LEVEL: PR	FIRST RELEASE DATE	10NO09	

ISSUE

CONN NAME
MAIN/ENGINE
MALE CONN
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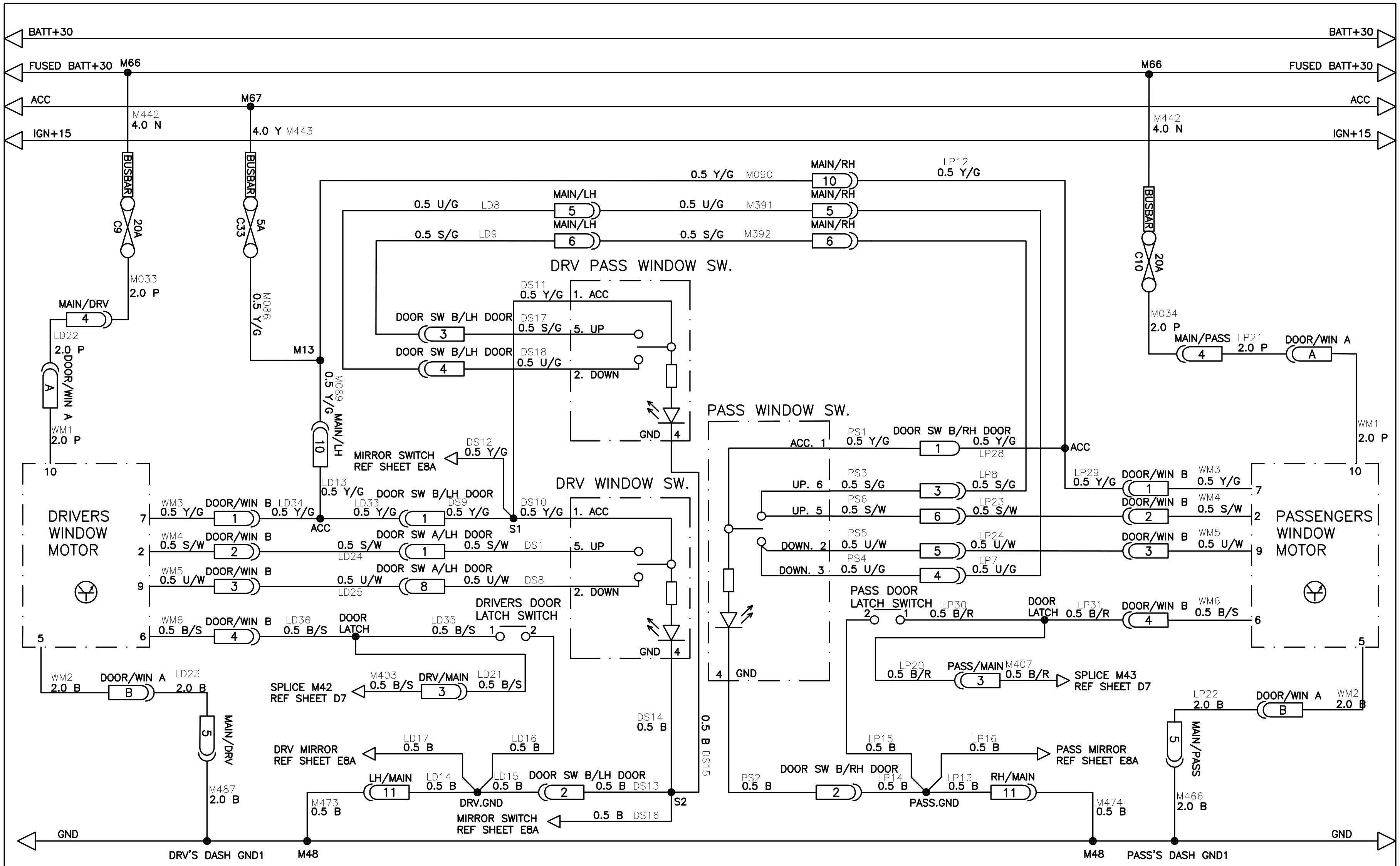
FEMALE CONN
CAVITY NUMBER



TITLE: CCT–WINDOW LIFT WITH ACTIVE GLASS (LH DRIVE)		APPROVED		UPDATES	ISSUE
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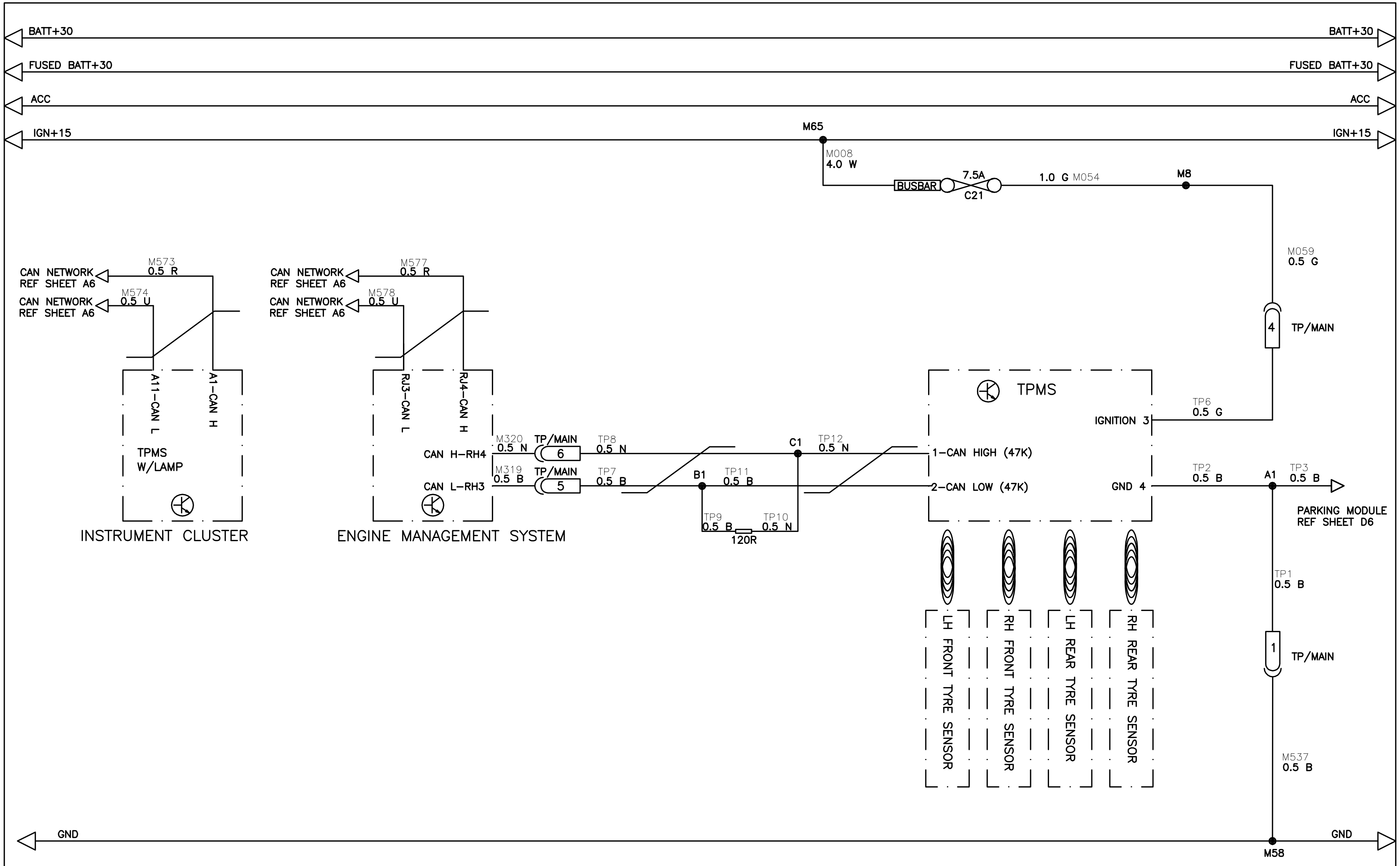
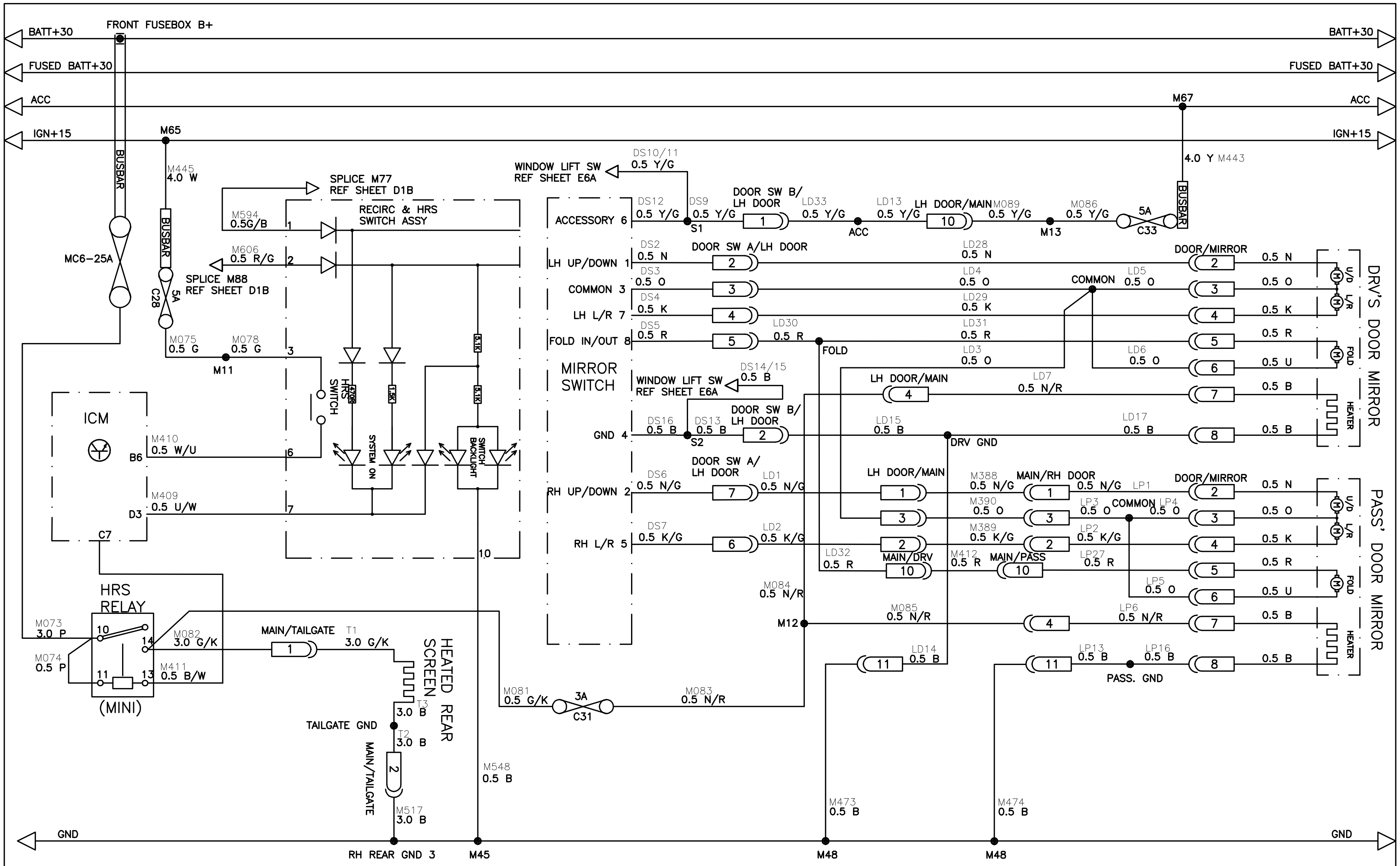


TITLE: CCT–TYRE PRESSURE MONITORING		APPROVED		UPDATES	ISSUE
		CHECKED			
PROJECT: EAGLE	DRG. No:	DRAWN	N. CHOWLES		
SHEET:E7	ISSUE LEVEL: PR	FIRST RELEASE DATE	10NO09		

CONN NAME
MAIN/ENGINE
MALE CONN
3
FEMALE CONN
CAVITY NUMBER



TITLE: CCT–ELECTRIC MIRRORS & HEATED REAR SCREEN (LH DRIVE)		APPROVED		UPDATES	ISSUE
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PROJECT: EAGLE	DRG. No:	DRAWN	N. CHOWLES		
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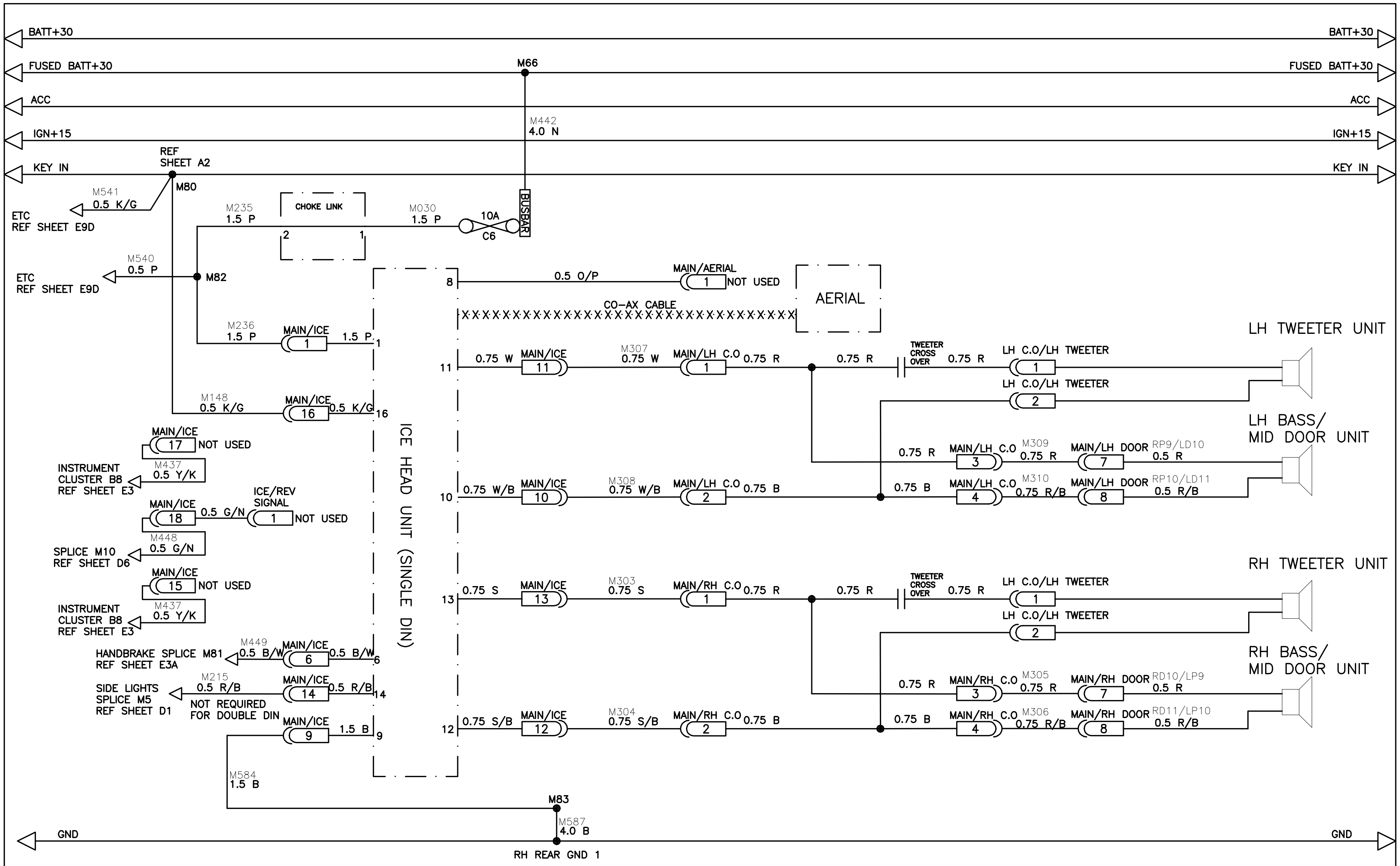
CONN NAME
MAIN/ENGINE
MALE CONN
FEMALE CONN
CAVITY NUMBER



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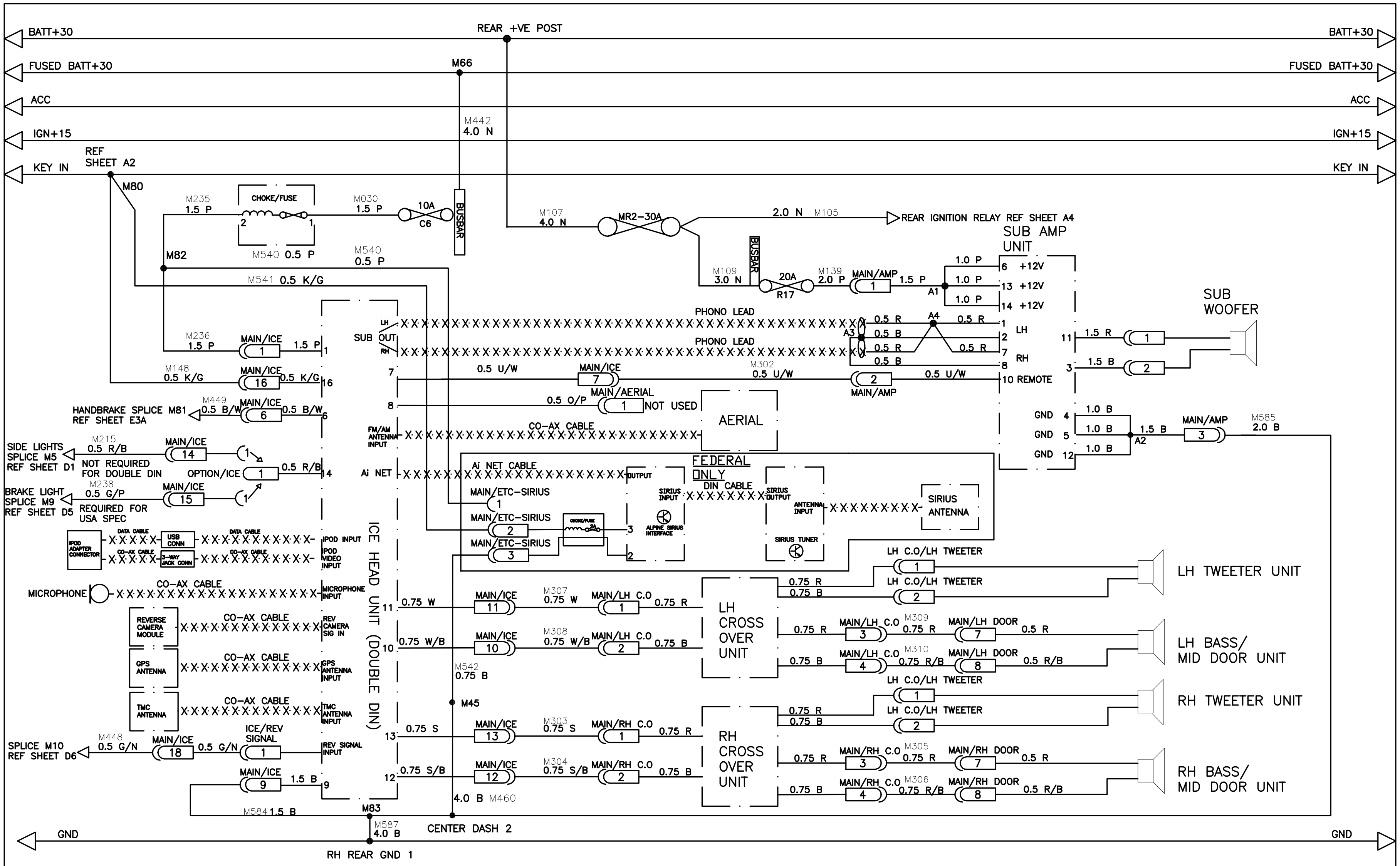
		CHECKED			
PROJECT: EAGLE	DRG. No:	DRAWN	N. CHOWLES		
SHEET:E9A	ISSUE LEVEL: PR	FIRST RELEASE DATE	10NO09		

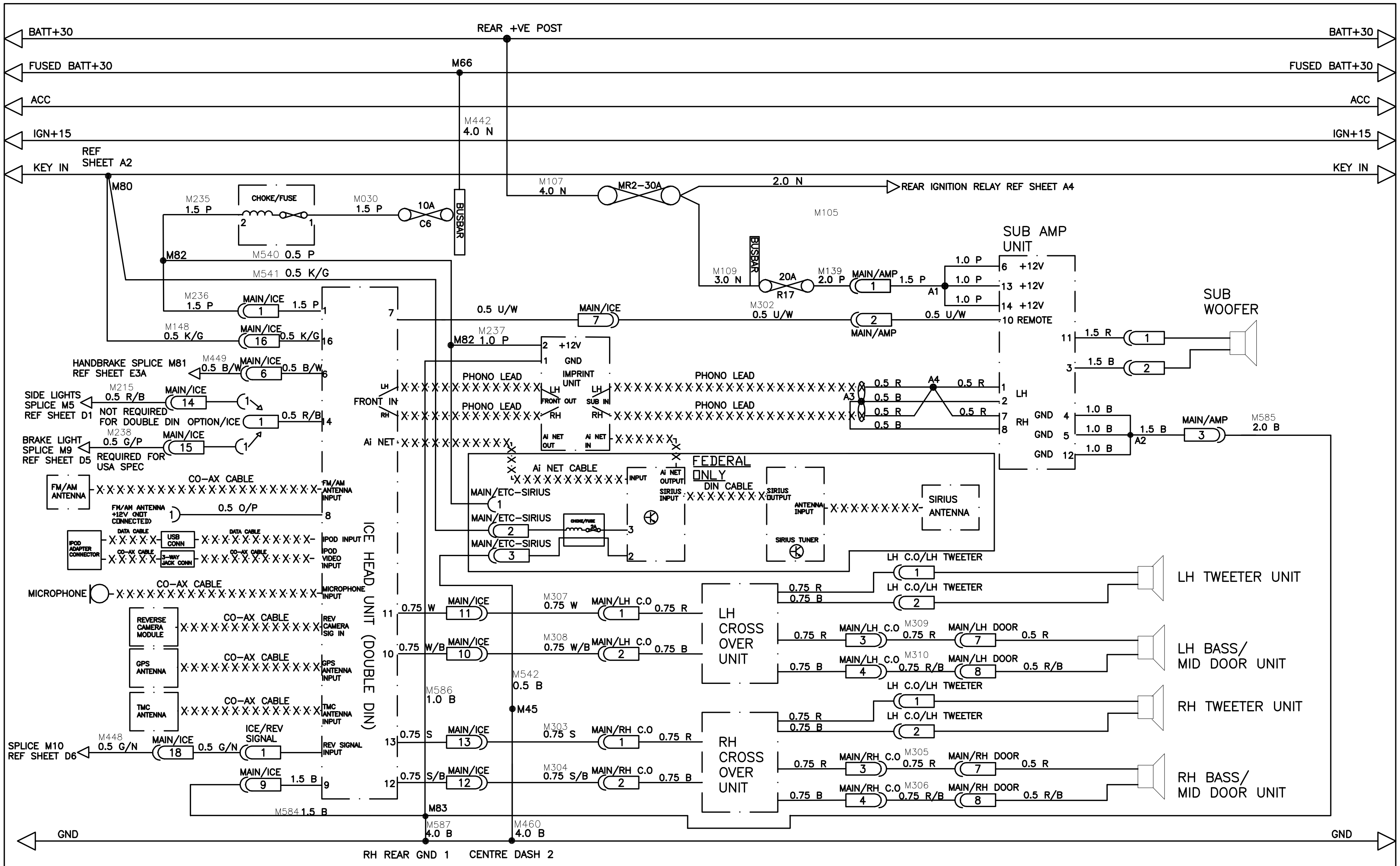
CONN NAME
MAIN/ENGINE
MALE CONN
3
FEMALE CONN
CAVITY NUMBER



TITLE: CCT-ICE-TECH PACK		APPROVED		UPDATES
		CHECKED		
PROJECT: EAGLE	DRG. No:	DRAWN	N. CHOWLES	
SHEET:E9B	ISSUE LEVEL: PR	FIRST RELEASE DATE	10NO09	

ISSUE

CONN NAME
MAIN/ENGINE
MALE CONN
3
FEMALE CONN
CAVITY NUMBER



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PROJECT: EAGLE	DRG. No:	DRAWN	N. CHOWLES	
SHEET:E9C	ISSUE LEVEL: PR	FIRST RELEASE DATE	10NO09	

ISSUE

CONN NAME
MAIN/ENGINE
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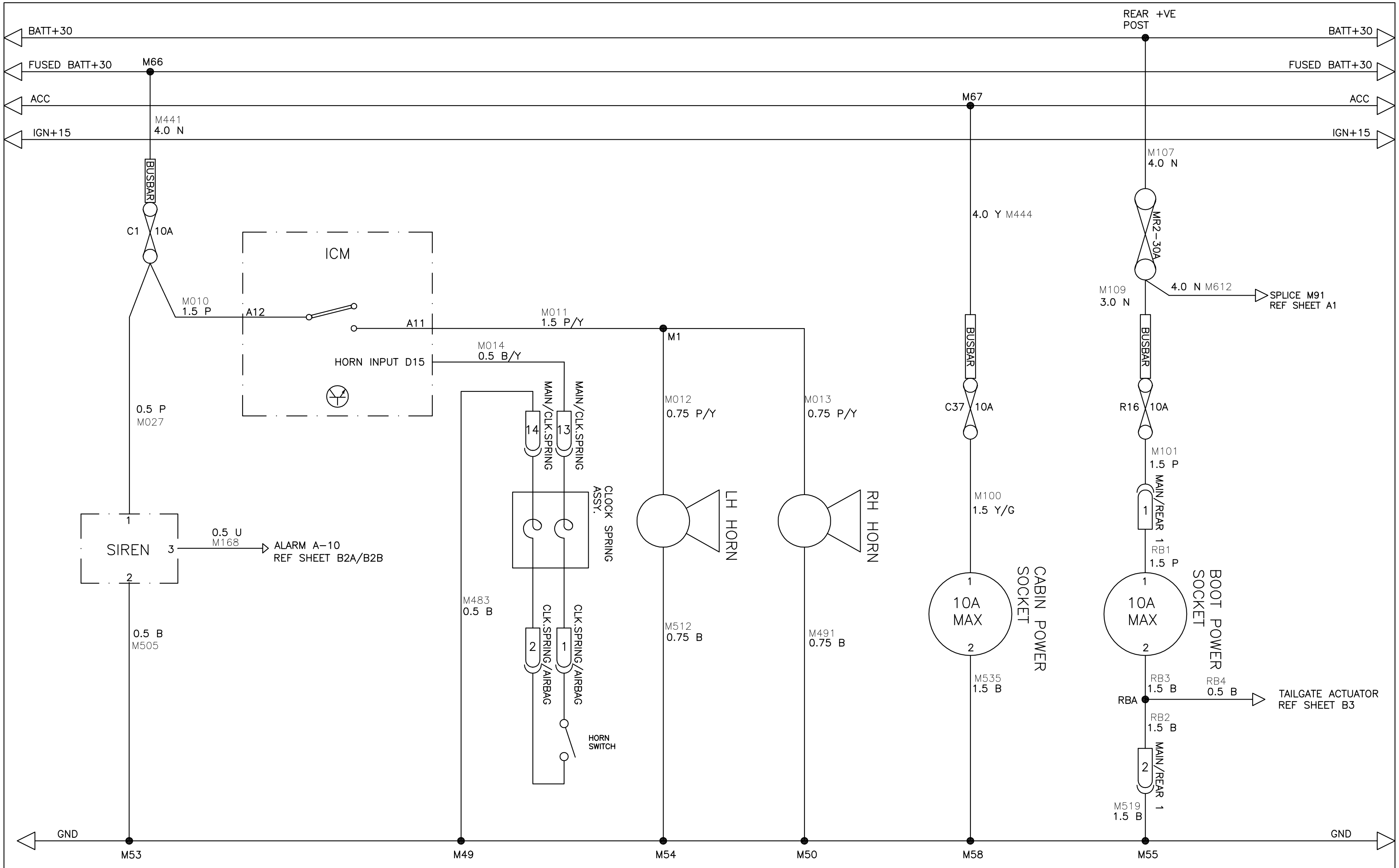
FEMALE CONN
CAVITY NUMBER



TITLE: CCT–HORNS & POWER SOCKET		APPROVED		UPDATES	ISSUE
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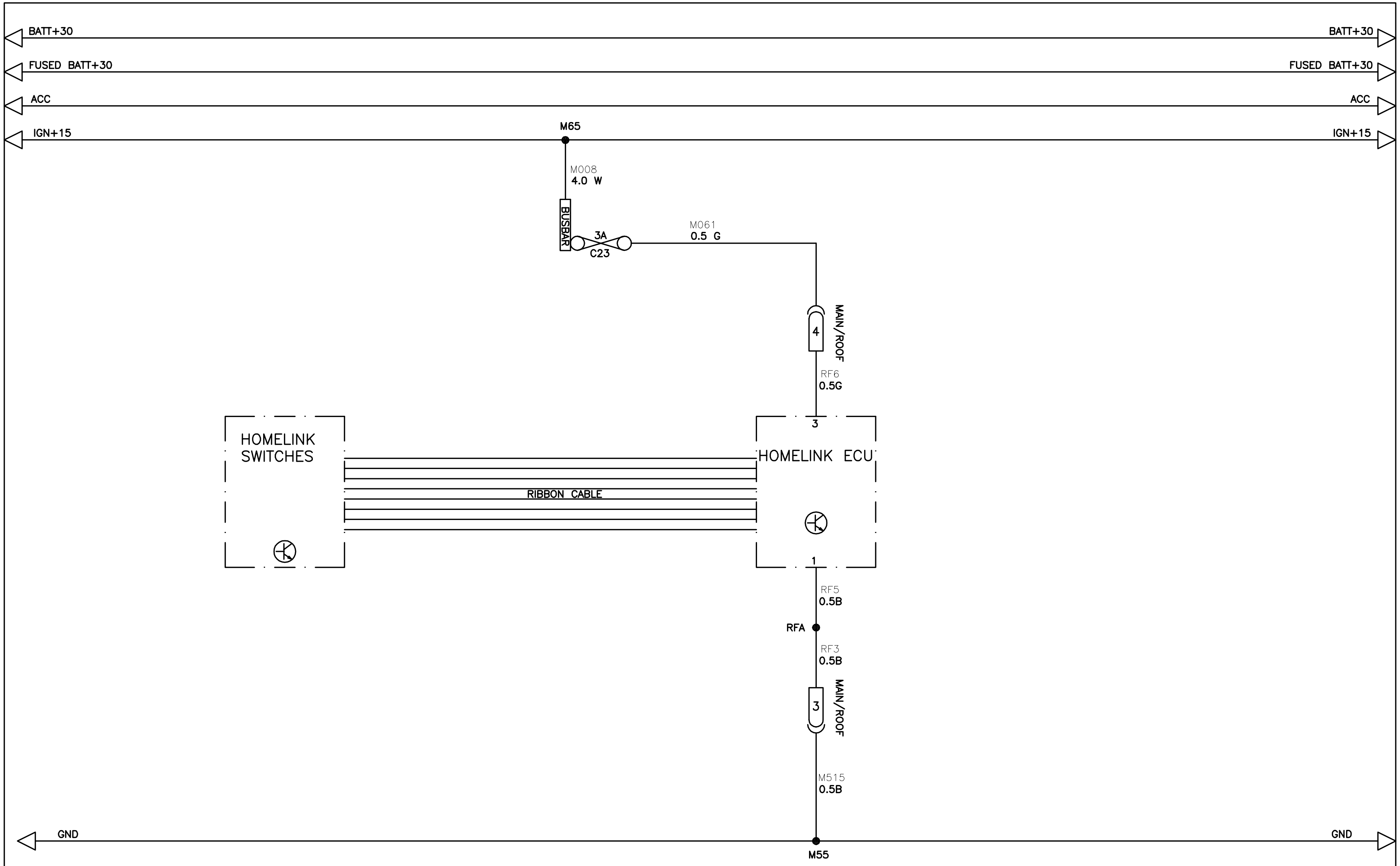
PROJECT: EAGLE	DRG. No:	DRAWN	N. CHOWLES		
SHEET:E10	ISSUE LEVEL: PR	FIRST RELEASE DATE	13JAN10		

CONN NAME
MAIN/ENGINE
MALE CONN
3
FEMALE CONN
CAVITY NUMBER



TITLE: CCT–HOMELINK		APPROVED		UPDATES / ISSUE
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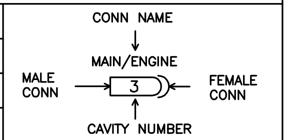
SHEET:E11	ISSUE LEVEL: PR	FIRST RELEASE DATE	10NO09	



Colour Code

B = Black
G = Green
K = Pink
LG = Light Green
N = Brown
O = Orange
P = Purple
R = Red
S = Grey
U = Blue
W = White
Y = Yellow

Abbreviations

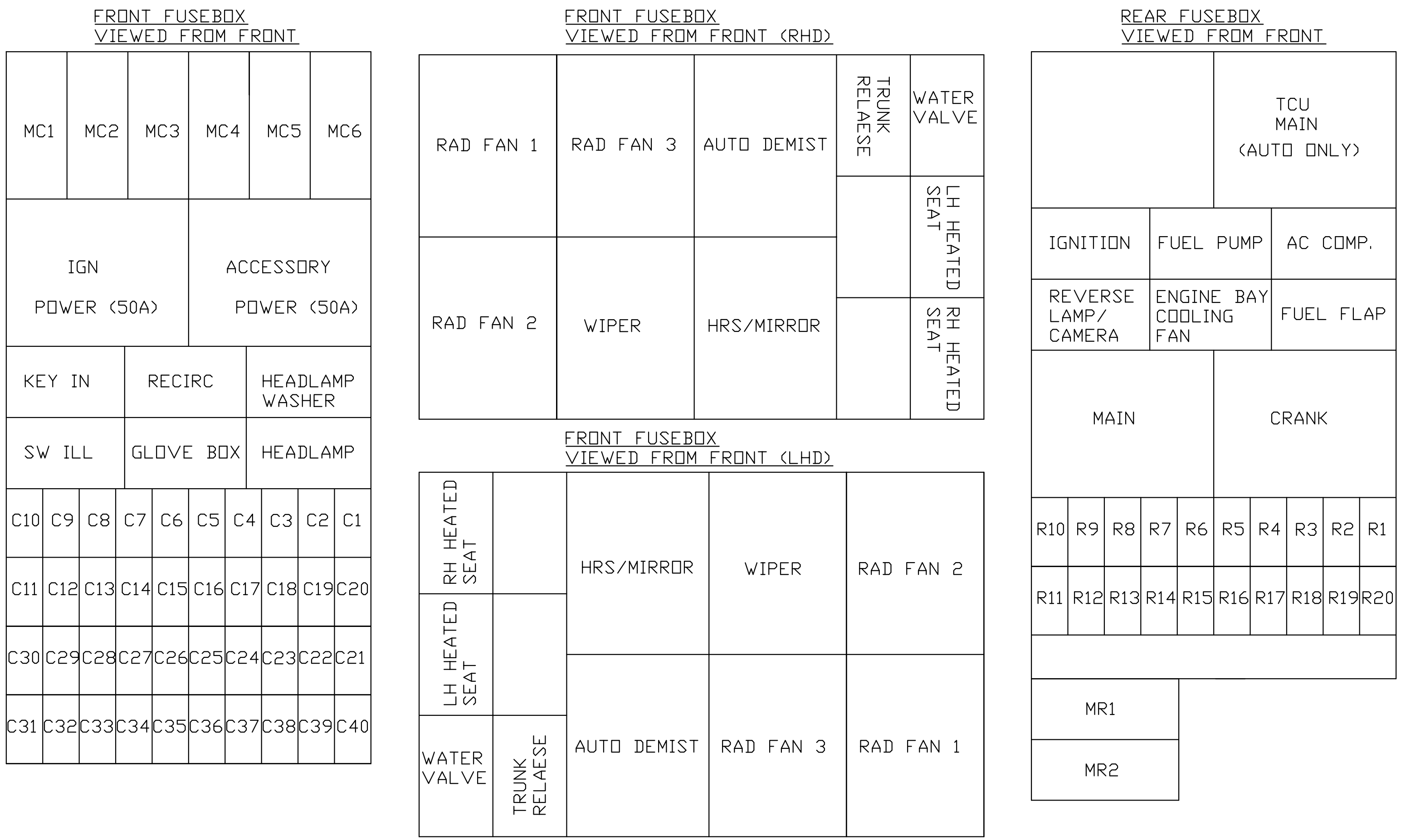
ABS Anti-lock Brake System
ACCM Air Conditioning Control Module
ACHC Air Conditioning Harness Connector
ACIS Acoustic Control Induction System
CDL Central Door Locking
CHMSL Centre High Mounted Stop Lamp
CVCV Canister Vent Close Valve
DDHC Driver's Door Harness Connector
DI Direction Indicator
ECU Electronic Control Unit
EHC Engine Harness Connector
FL Fog Lamp
FSM Front Side Marker
FTC Fuel Tank Connector
GND Ground
IP Instrument Pack
LF Left Front
LIHC Left Inner Harness Connector
LOHC Left Outer Harness Connector
LR Left Rear
MB Main Beam
NPL Number Plate Lamp
O2 Oxygen (sensor)
PDHC Passenger's Door Harness Connector
RF Right Front
RIHC Right Inner Harness Connector
RIL Rear Outer Lamp
RMC Rear Module Connector
ROHC Right Outer Harness Connector
ROL Rear Outer Lamp
RR Right Rear
RSM Rear Side Marker
SL Side Lamp
SPL Splice
SPMC Switch Pack Module Connector
SSWHC Starter Switch Harness Connector
TMAF Temperature & Mass Air Flow
VSV Vacuum Solenoid Valve
VVT Variable Valve Timing
VVTLi Variable Valve Timing & Lift - intelligent
WSS Wheel Speed Sensor
YMC Yazaki Module Connector

ELECTRICS

SECTION MR.16b CIRCUIT DIAGRAMS ALL MARKETS EVORA S - IPS AND ALL VINS AFTER BH_11178 & INTEVA DOOR LATCH SYSTEM AFTER '12MY VIN CH_10630

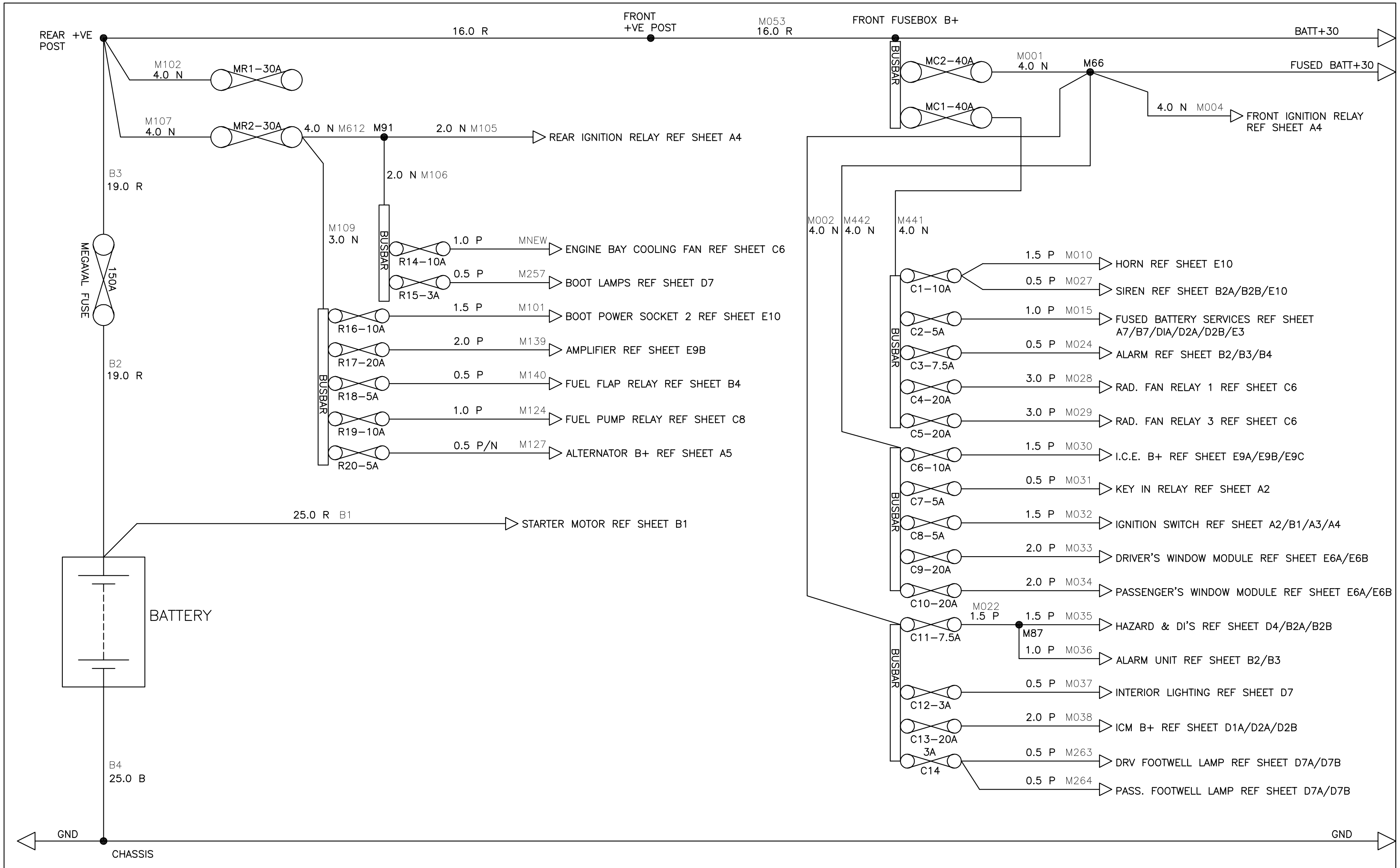
MR.16A- CIRCUIT DIAGRAMS

Continued.....



TITLE: FUSE & RELAY LAYOUT		APPROVED		UPDATES	ISSUE
		CHECKED		INTRODUCTION OF EVORA S & AUTOMATIC	3
PROJECT: EVORA	DRG. No:	DRAWN			
SHEET:A0	ISSUE LEVEL: PR	FIRST RELEASE DATE	13JAN10		

CONN NAME
MAIN/ENGINE
MALE CONN
3
FEMALE CONN
CAVITY NUMBER



TITLE: BATTERY SUPPLY		APPROVED		UPDATES	ISSUE
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PROJECT: EVORA	DRG. No:	DRAWN			
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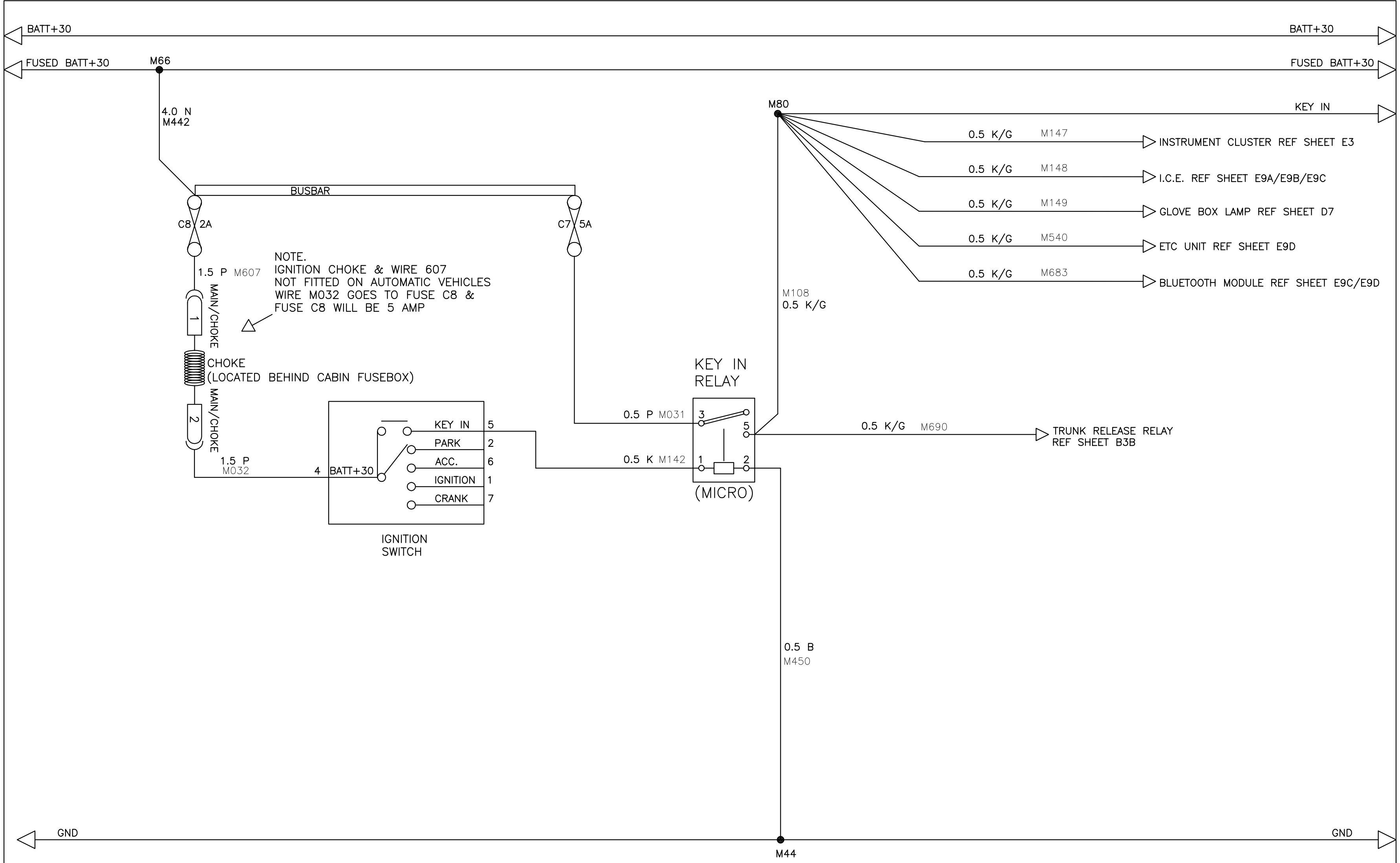

TITLE: KEY IN SUPPLY		APPROVED		UPDATES	ISSUE
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PROJECT: EVORA	DRG. No:	DRAWN			
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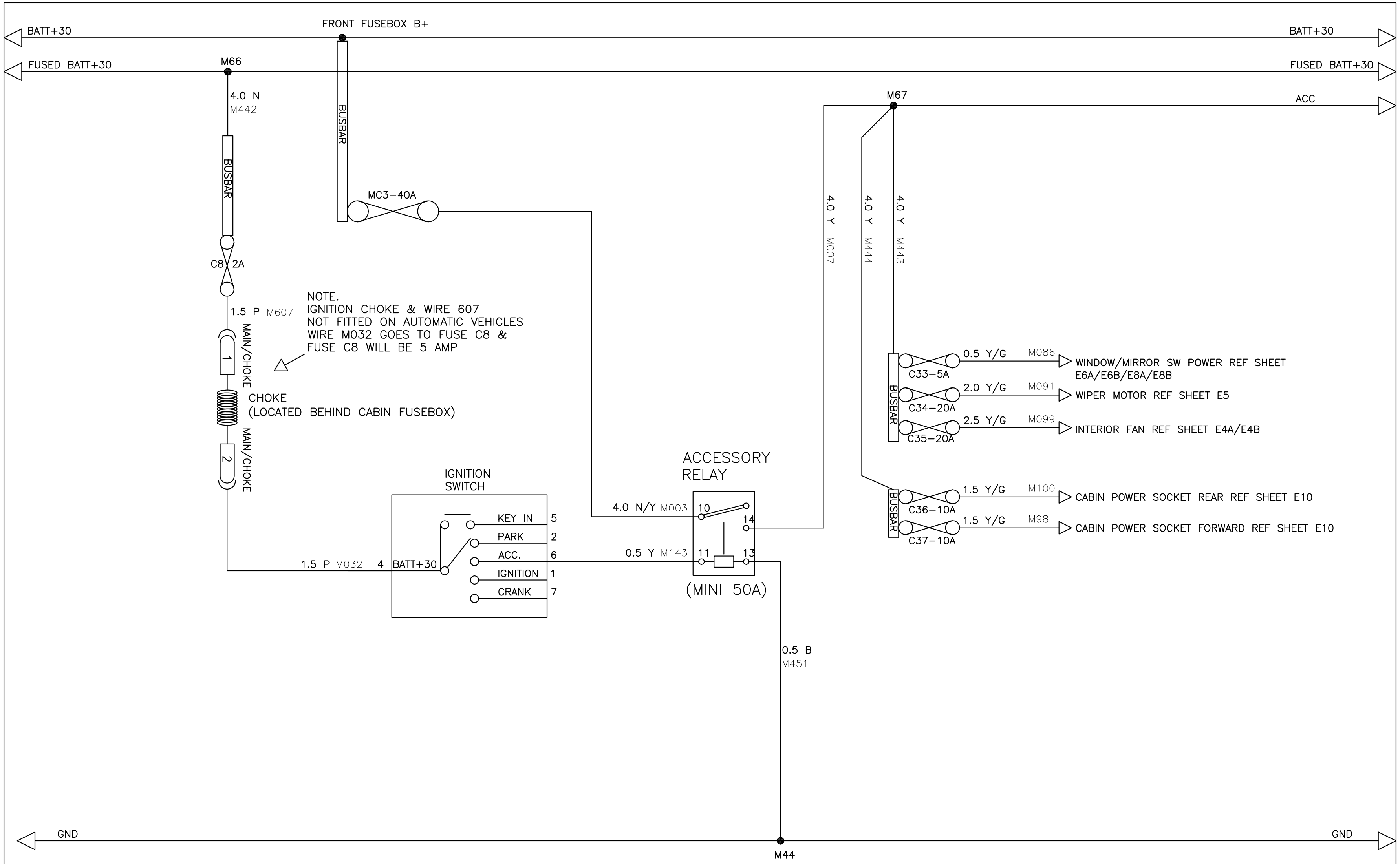
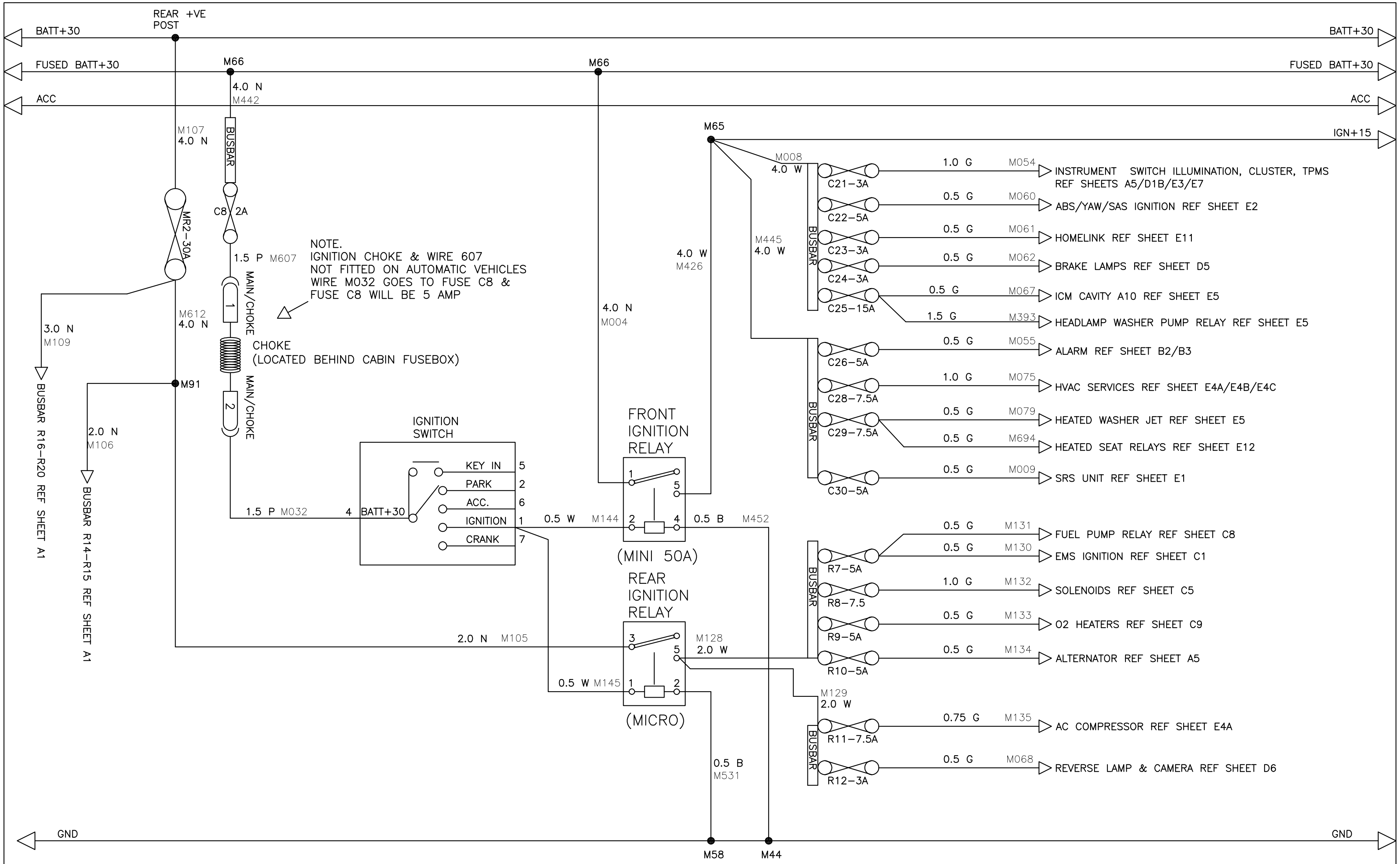
CONN NAME
MAIN/ENGINE
MALE CONN
3
FEMALE CONN
CAVITY NUMBER

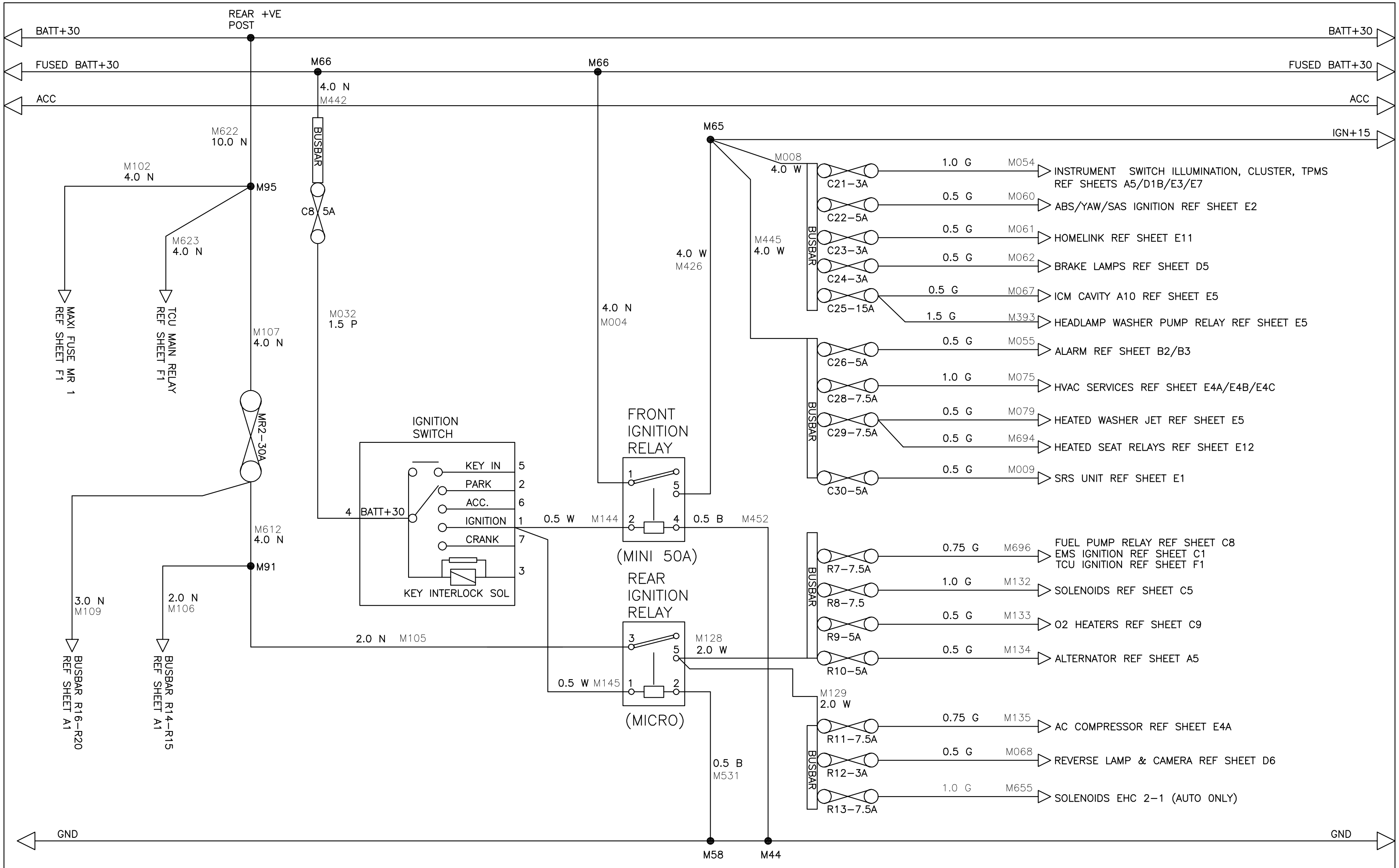


TITLE: ACCESSORY SUPPLY		APPROVED		UPDATES	ISSUE	CONN NAME / MAIN/ENGINE / MALE CONN / 3 / FEMALE CONN / CAVITY NUMBER
		CHECKED		INTRODUCTION OF EVORA S & AUTOMATIC	3	
PROJECT: EVORA	DRG. No:	DRAWN				
SHEET:A3	ISSUE LEVEL:PR	FIRST RELEASE DATE	13JAN10			



TITLE: IGNITION SUPPLY MANUAL VEHICLES		APPROVED		UPDATES	ISSUE
		CHECKED		INTRODUCTION OF EVORA S & AUTOMATIC	3
PROJECT: EVORA	DRG. No:	DRAWN			
SHEET:A4A	ISSUE LEVEL: PR	FIRST RELEASE DATE	02JUN10		

CONN NAME
MAIN/ENGINE
MALE CONN
3
FEMALE CONN
CAVITY NUMBER



TITLE: IGNITION SUPPLY AUTOMATIC VEHICLES		APPROVED		UPDATES	ISSUE
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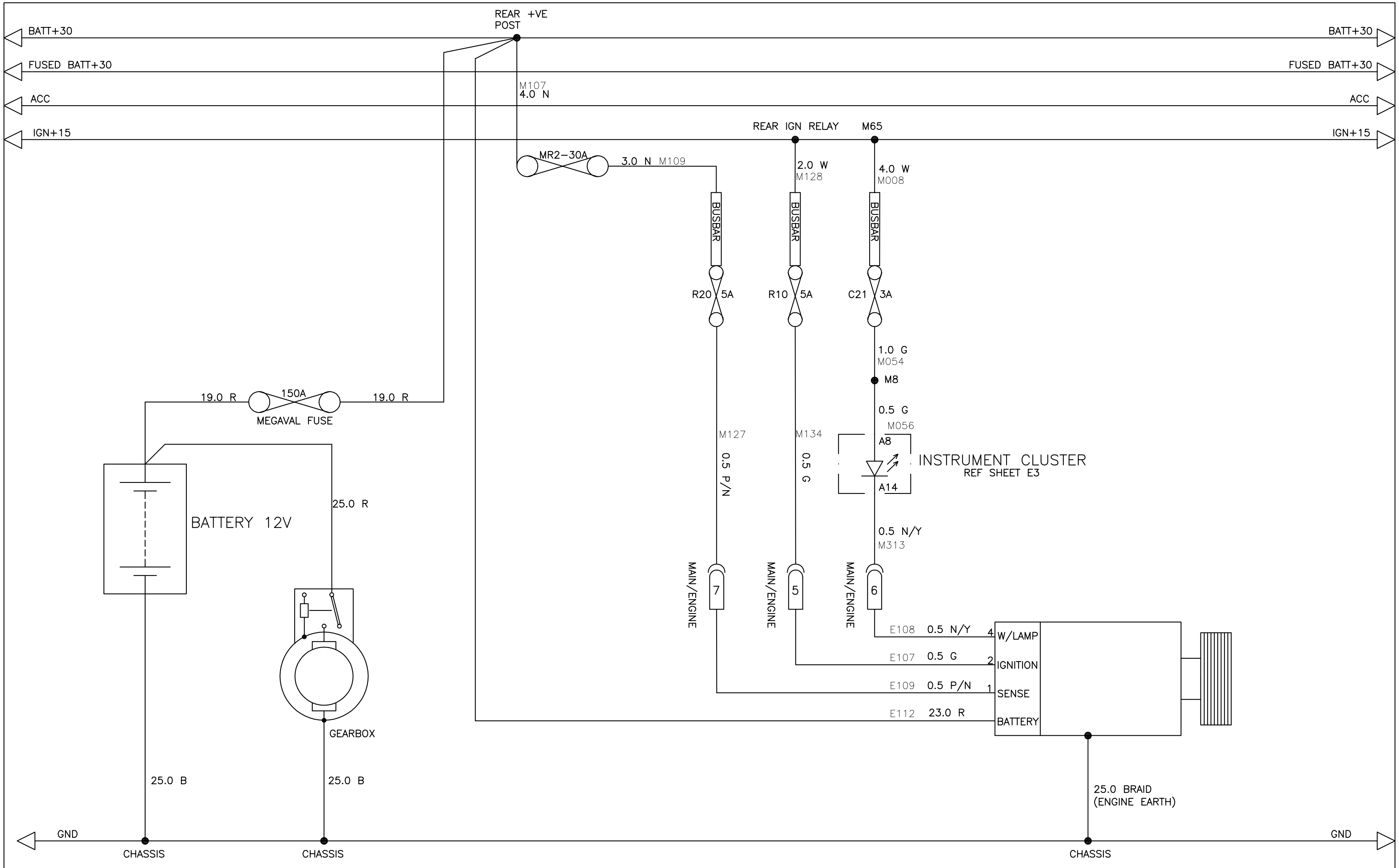
PROJECT: EVORA	DRG. No:	DRAWN			
SHEET:A4B	ISSUE LEVEL: PR	FIRST RELEASE DATE	02JUN10		



TITLE: CHARGING SYSTEM		APPROVED		UPDATES	ISSUE
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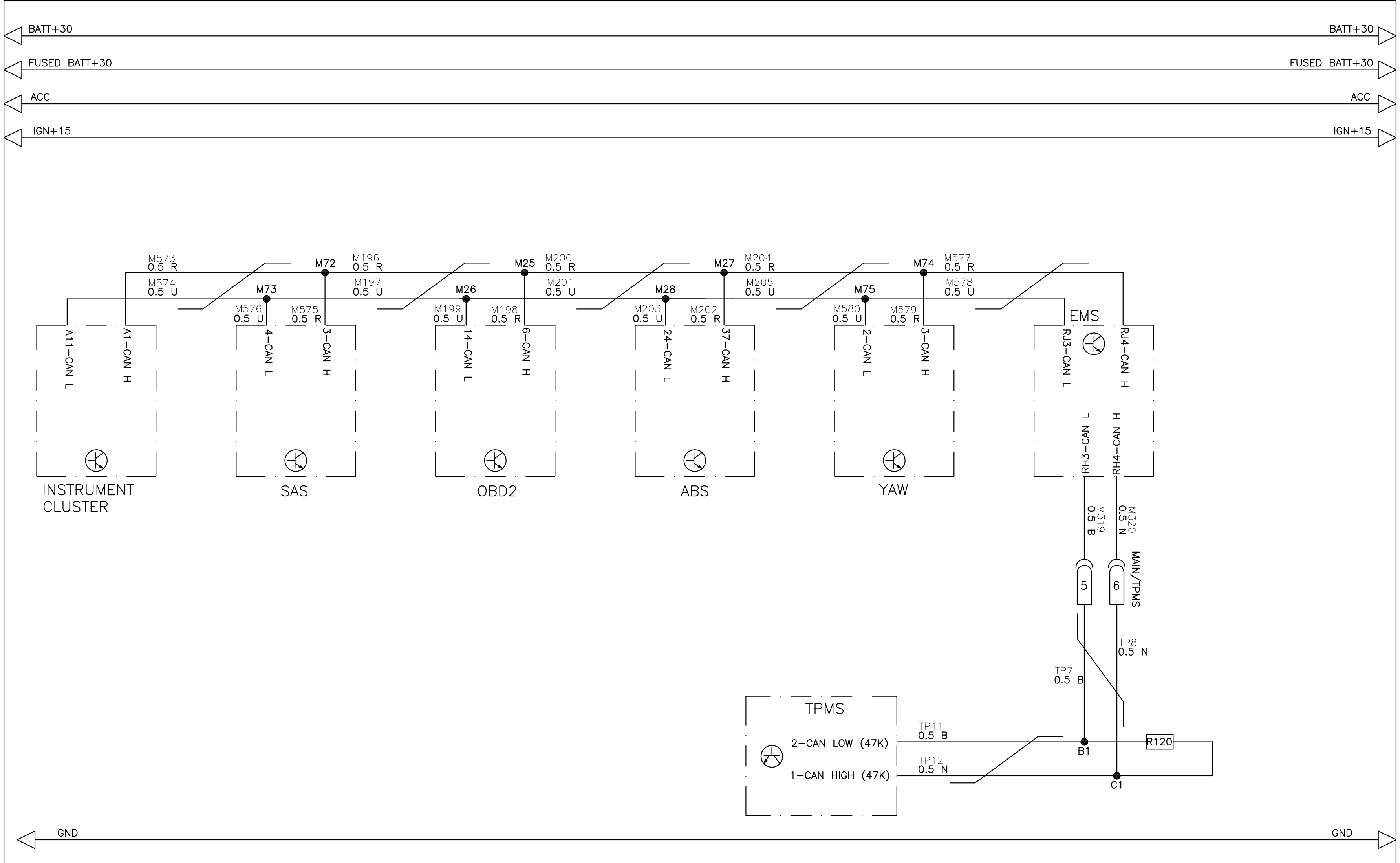
PROJECT: EVORA	DRG. No:	DRAWN			
SHEET:A5	ISSUE LEVEL: PR	FIRST RELEASE DATE	13JAN10		

CONN NAME
MAIN/ENGINE
MALE CONN
3
FEMALE CONN
CAVITY NUMBER



TITLE: CAN NETWORK MANUAL VEHICLES		APPROVED		UPDATES	ISSUE
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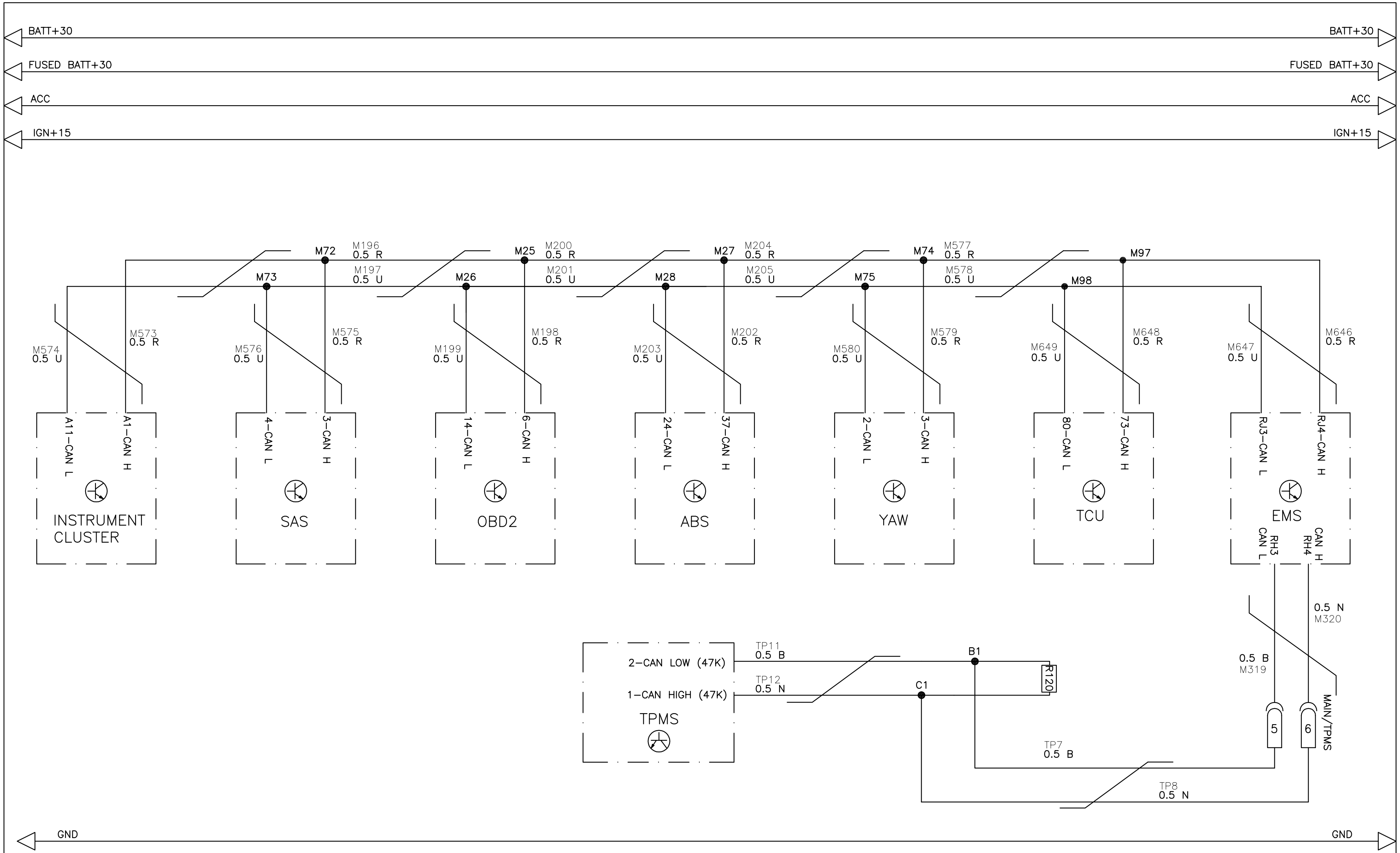
PROJECT: EVORA	DRG. No:	DRAWN			
SHEET:A6A	ISSUE LEVEL: PR	FIRST RELEASE DATE	13JAN10		



TITLE: CAN NETWORK AUTOMATIC VEHICLES		APPROVED		UPDATES	ISSUE
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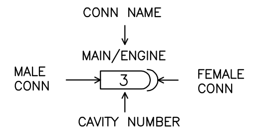
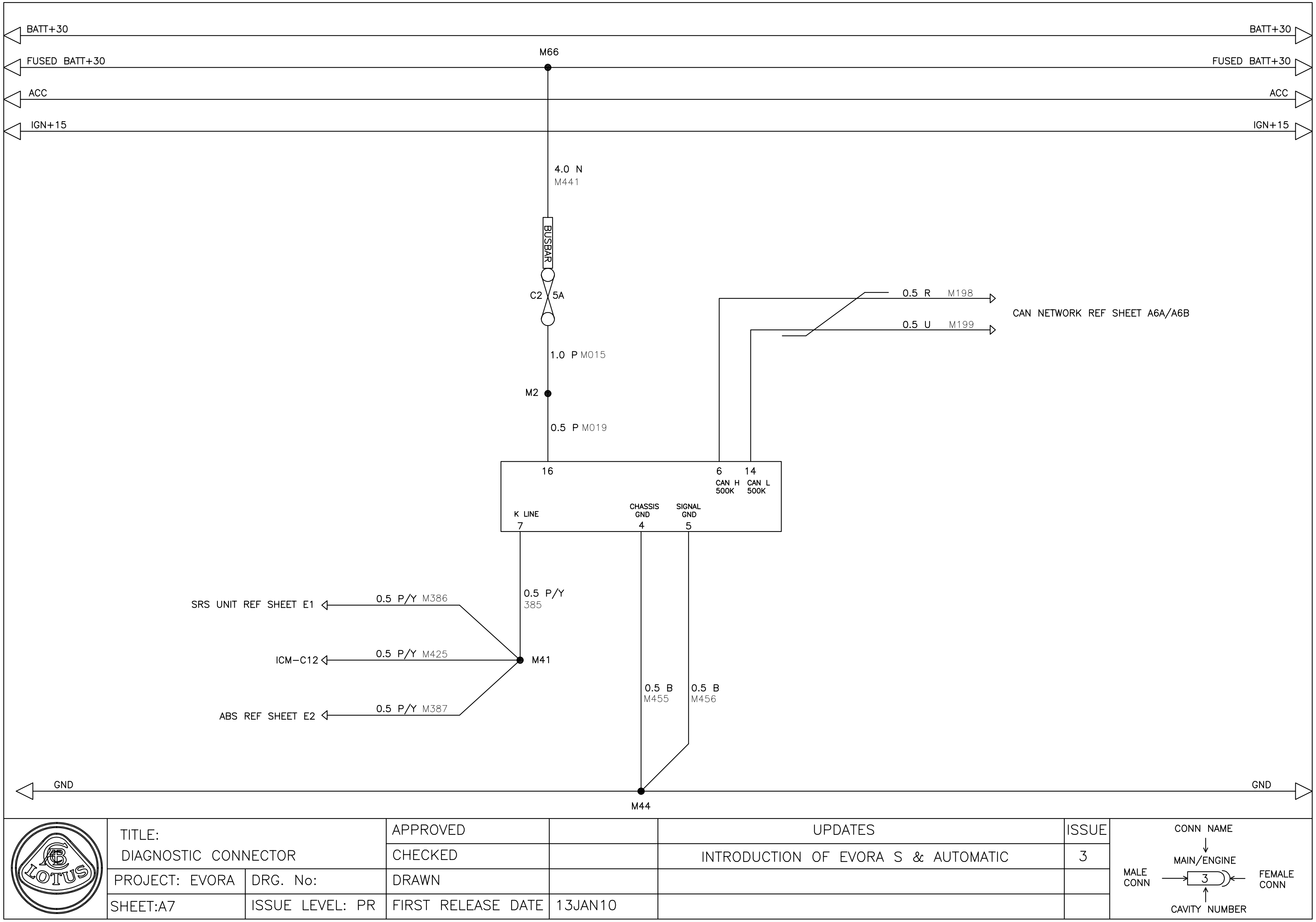
PROJECT: EVORA	DRG. No:	DRAWN			
SHEET:A6B	ISSUE LEVEL: PR	FIRST RELEASE DATE	19NOV09		

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0.5 R M198
0.5 U M199
CAN NETWORK REF SHEET A6A/A6B
16
6
14
CAN H 500K
CAN L 500K
K LINE
7
CHASSIS GND
4
SIGNAL GND
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385
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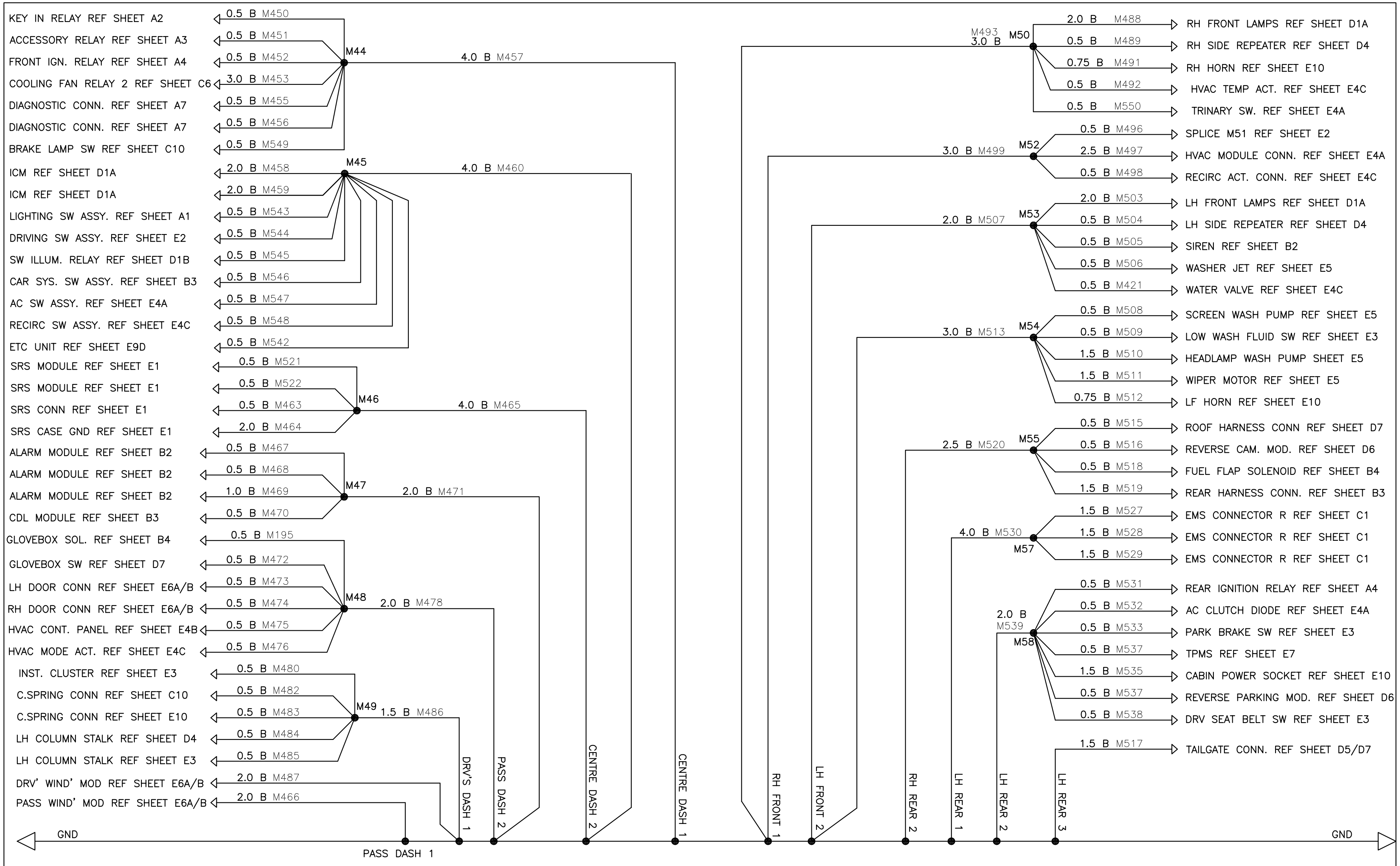
DIAGNOSTIC CONNECTOR
PROJECT: EVORA
DRG. No:
SHEET:A7
ISSUE LEVEL: PR
APPROVED
CHECKED
DRAWN
FIRST RELEASE DATE
13JAN10
UPDATES
INTRODUCTION OF EVORA S & AUTOMATIC
ISSUE
3
CONN NAME
MAIN/ENGINE
MALE CONN
3
FEMALE CONN
CAVITY NUMBER



TITLE: GND STRUCTURE PART 1		APPROVED		UPDATES	ISSUE
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PROJECT: EVORA	DRG. No:	DRAWN			
SHEET:A8	ISSUE LEVEL: PR	FIRST RELEASE DATE	13JAN10		

CONN NAME
MAIN/ENGINE
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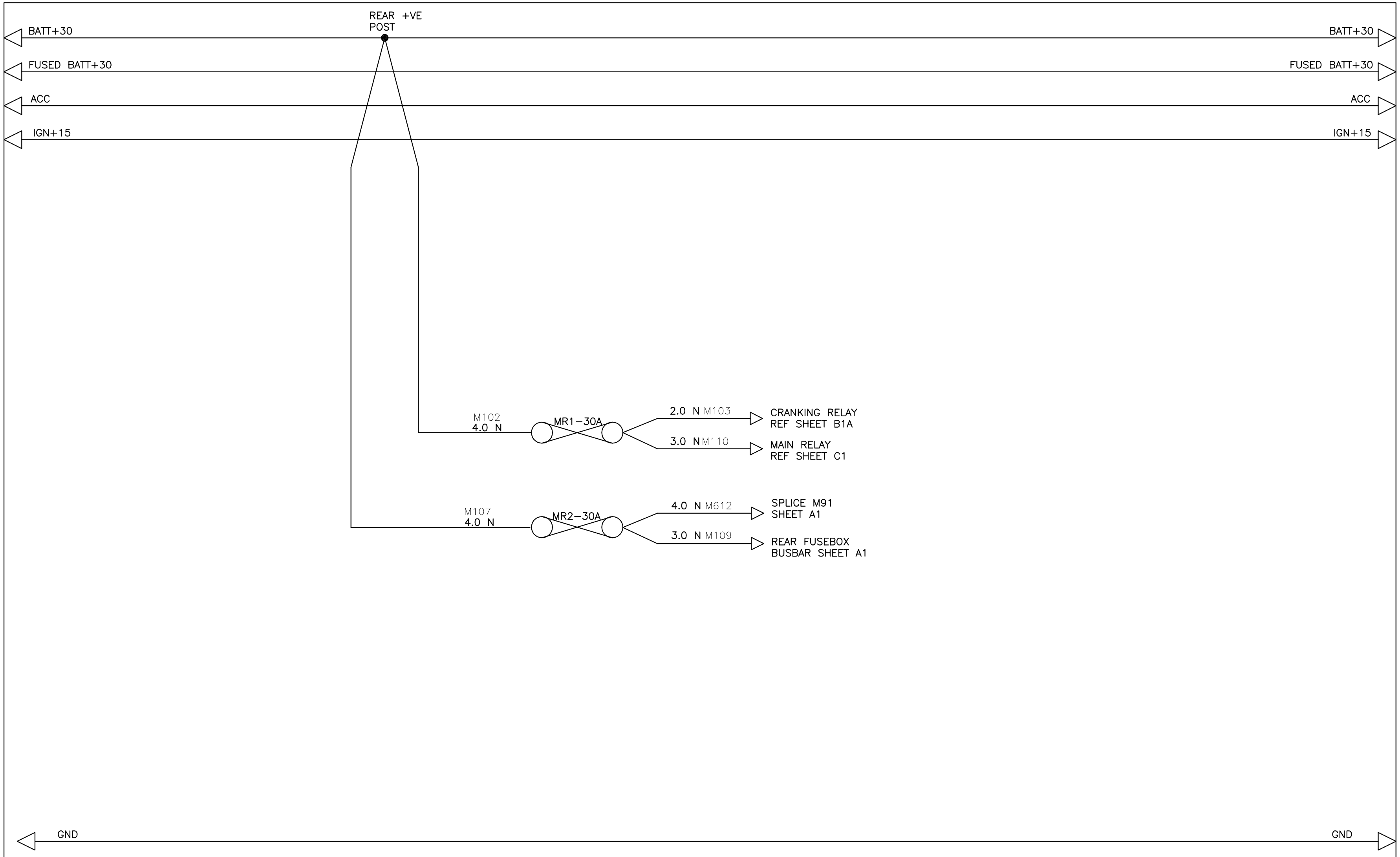
FEMALE CONN
CAVITY NUMBER



TITLE: REAR MAXI FUSE SUPPLIES MANUAL VEHICLES		APPROVED		UPDATES	ISSUE
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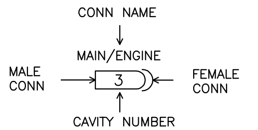
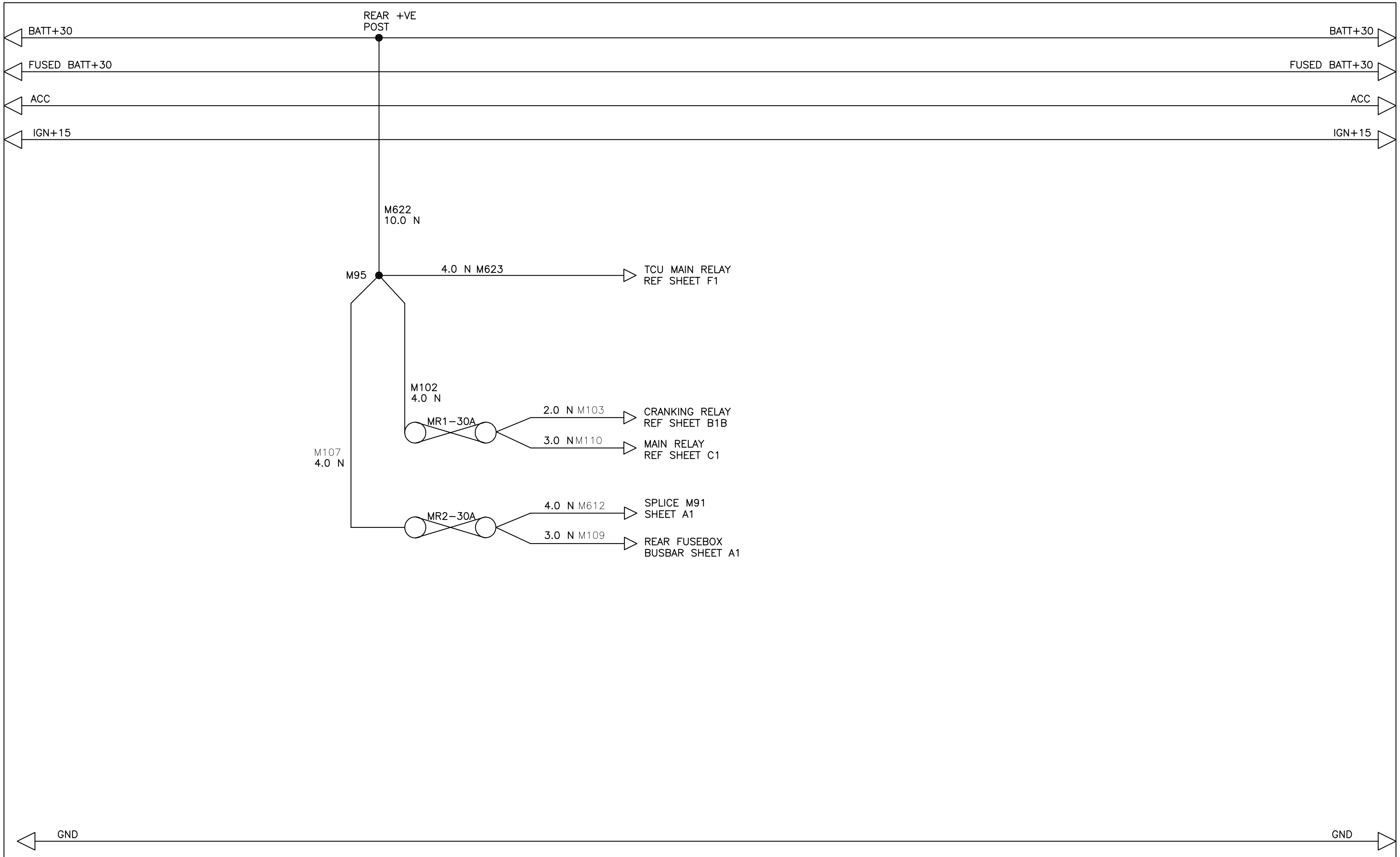
PROJECT: EVORA	DRG. No:	DRAWN			
SHEET:A9A	ISSUE LEVEL: PR	FIRST RELEASE DATE	02JUN10		





TITLE: REAR MAXI FUSE SUPPLIES AUTOMATIC VEHICLES		APPROVED		UPDATES	ISSUE
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PROJECT: EVORA	DRG. No:	DRAWN			
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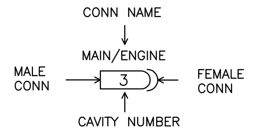
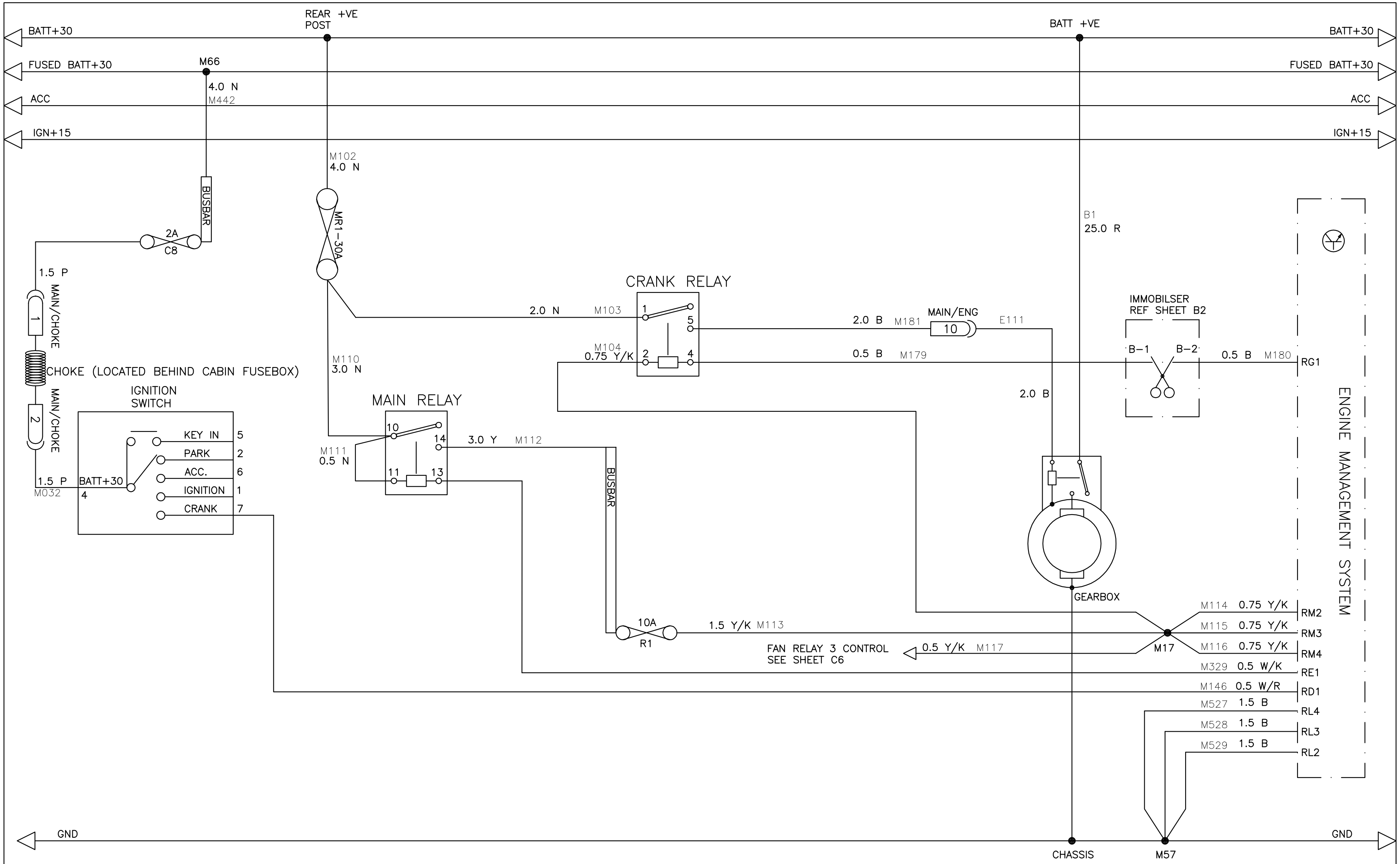
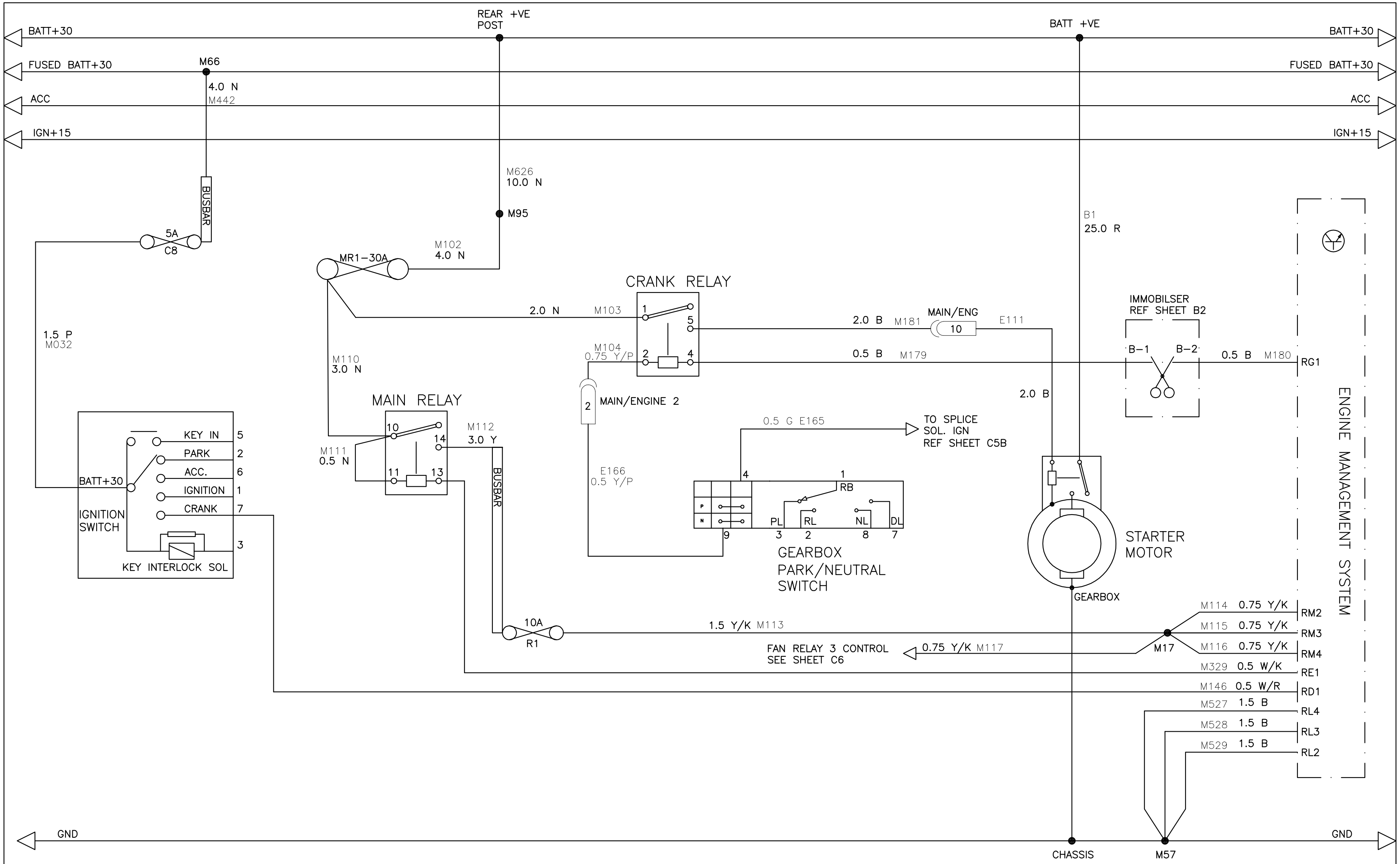




TITLE: CRANKING MANUAL VEHICLES	APPROVED		UPDATES	ISSUE
	CHECKED		INTRODUCTION OF EVORA S & AUTOMATIC	3
PROJECT: EVORA / DRG. No:	DRAWN			
SHEET:B1A / ISSUE LEVEL: PR	FIRST RELEASE DATE	13JAN10		

CONN NAME
MAIN/ENGINE
MALE CONN
3
FEMALE CONN
CAVITY NUMBER



TITLE: CRANKING AUTOMATIC VEHICLES		APPROVED		UPDATES	ISSUE	CONN NAME
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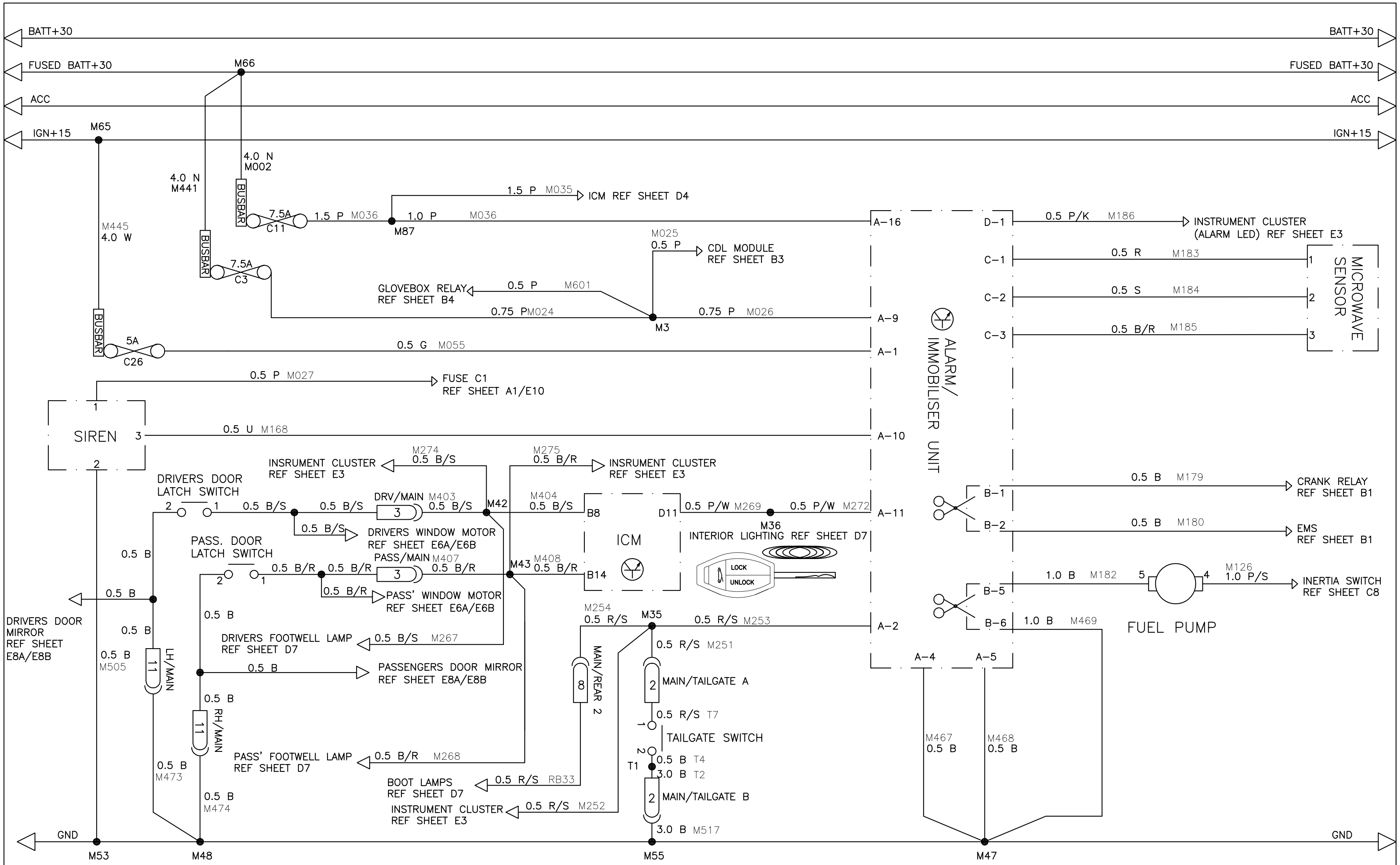
PROJECT: EVORA	DRG. No:	DRAWN				MALE CONN 3 FEMALE CONN
SHEET:B1B	ISSUE LEVEL: PR	FIRST RELEASE DATE	18NOV09			CAVITY NUMBER



TITLE: ALARM & IMMOBILSER NO TILT SENSOR		APPROVED		UPDATES	ISSUE
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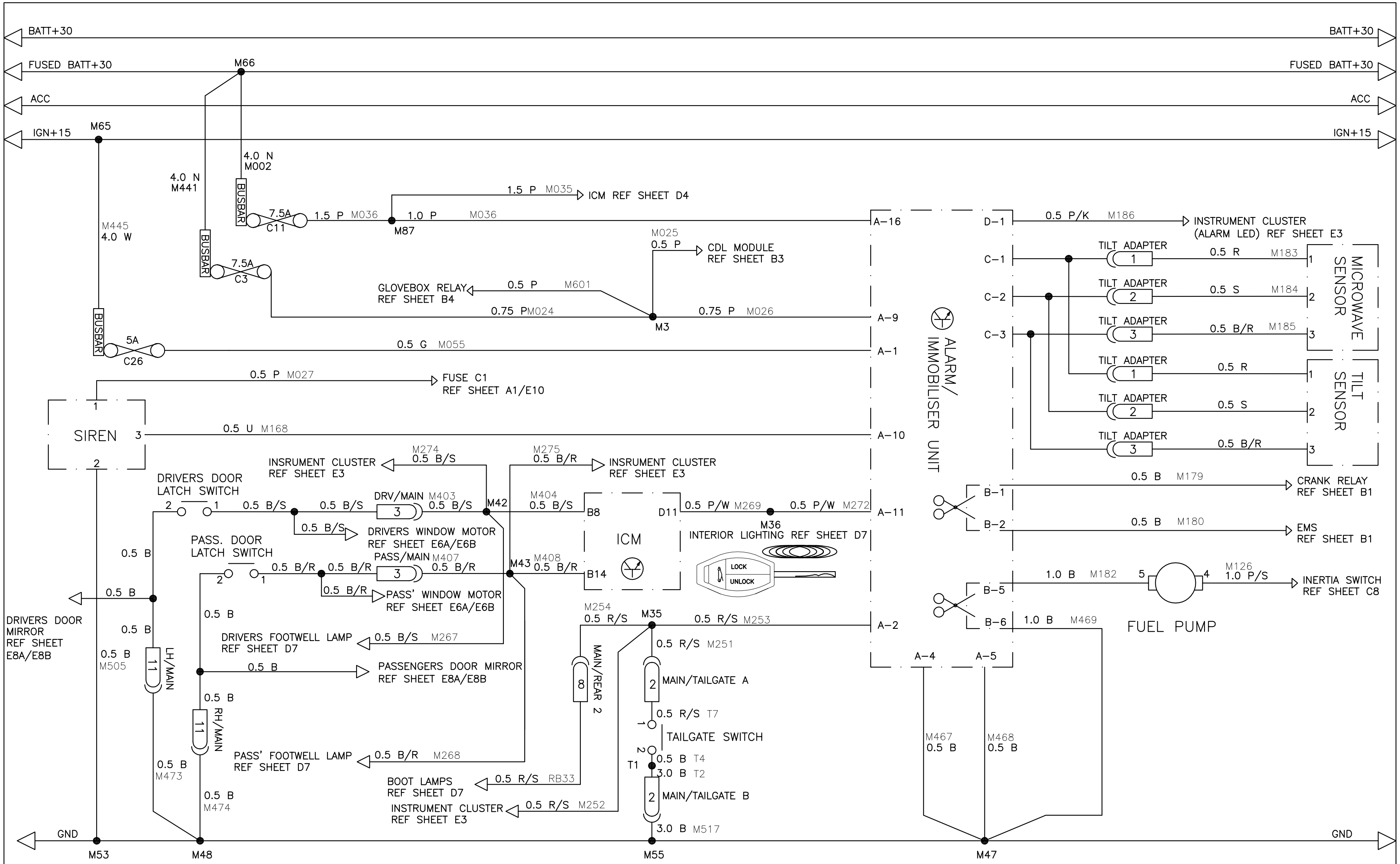
PROJECT: EVORA	DRG. No:	DRAWN			
SHEET:B2A	ISSUE LEVEL: PR	FIRST RELEASE DATE	13JAN10		

CONN NAME
MAIN/ENGINE
MALE CONN
FEMALE CONN
CAVITY NUMBER



TITLE: ALARM & IMMOBILSER WITH TILT SENSOR		APPROVED		UPDATES	ISSUE
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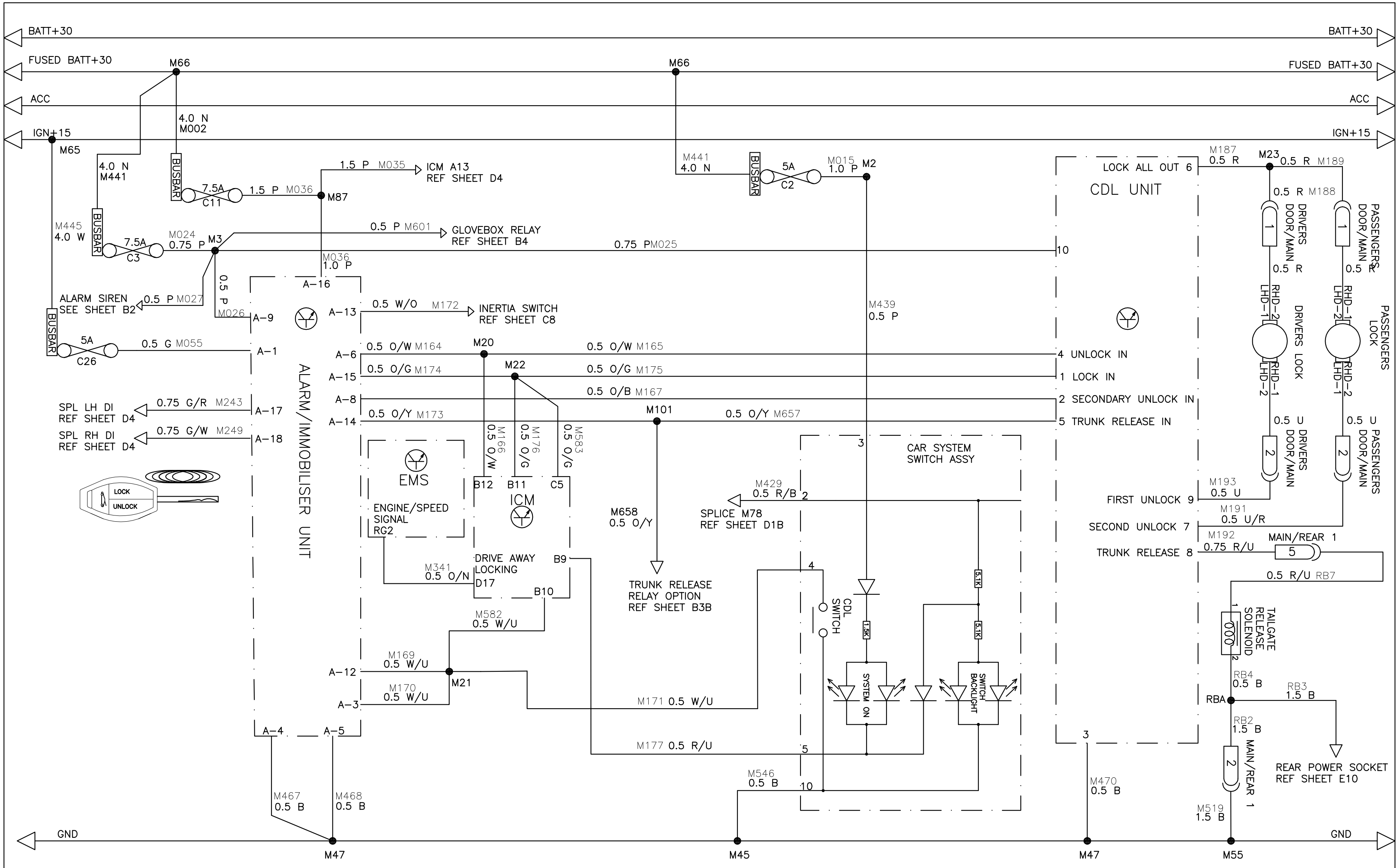
SHEET:B2B	ISSUE LEVEL: PR	FIRST RELEASE DATE	13JAN10		



TITLE: CENTRAL LOCKING		APPROVED		UPDATES	ISSUE	CONN NAME
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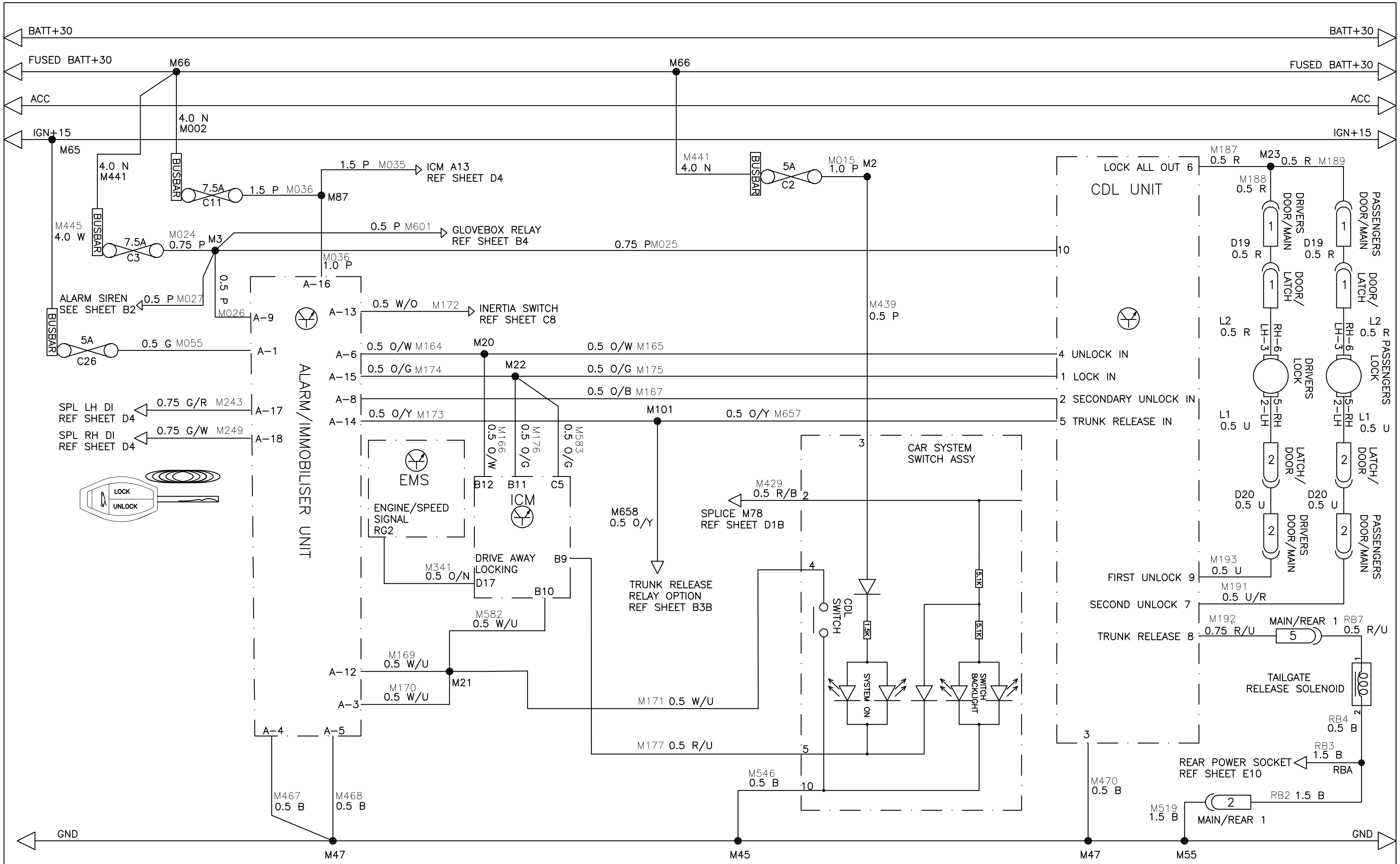
PROJECT: EVORA	DRG. No:	DRAWN				MALE CONN 3 FEMALE CONN
SHEET:B3A	ISSUE LEVEL: PR	FIRST RELEASE DATE	13JAN10			CAVITY NUMBER

UPDATED 21ST AUGUST 2012 - SEE B3A UPDATE ON NEXT PAGE FOR '12MY VIN CH_10630 ON WARDS FITTED WITH INTEVA DOOR LATCH SYSTEM

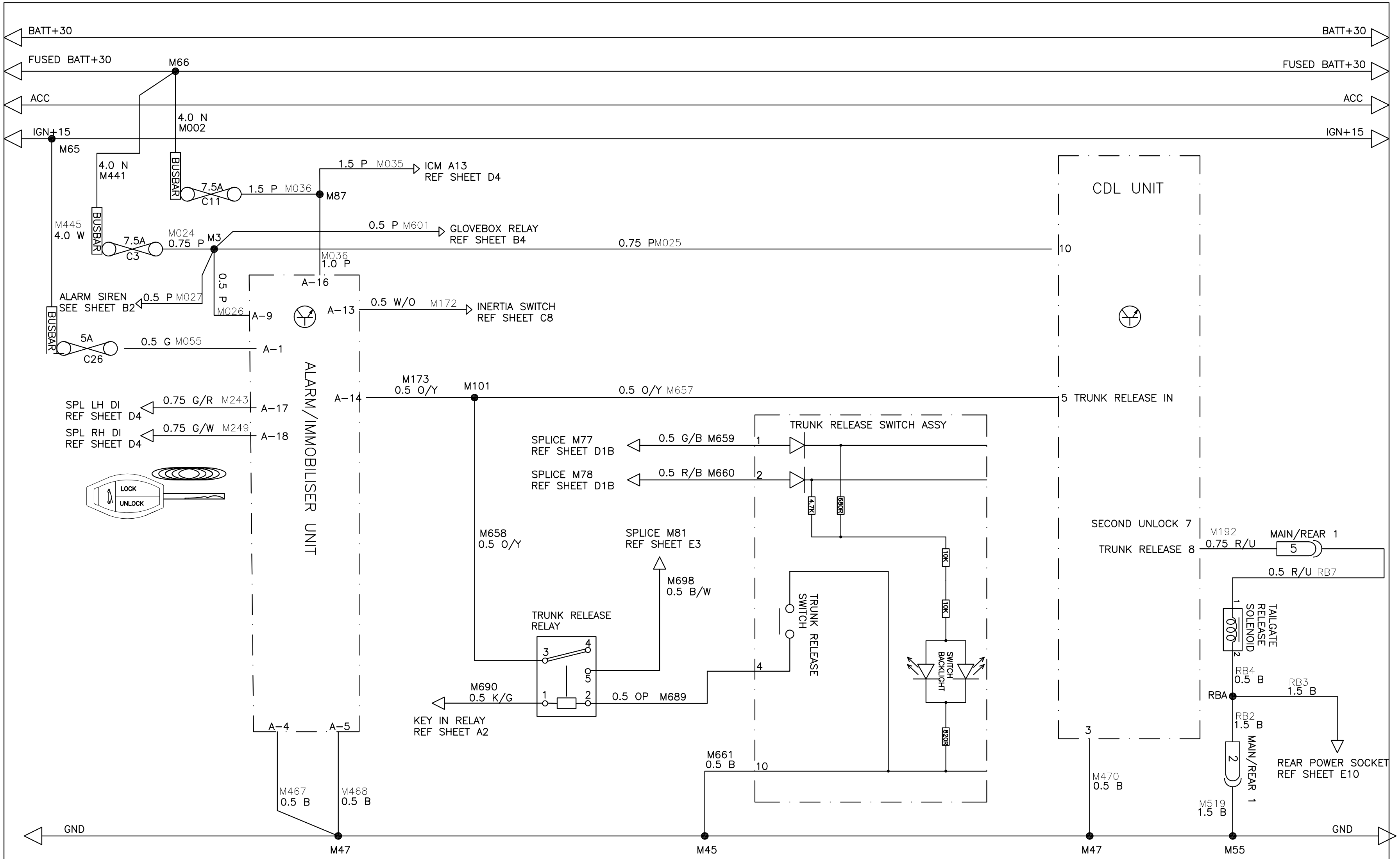


TITLE: CENTRAL LOCKING		APPROVED		UPDATES	ISSUE
		CHECKED		NEW DOOR & SWITCH PANEL HARNESSES	1
PROJECT: EVORA	DRG. No:	DRAWN		INTRODUCED MAY 2012	
SHEET:B3A UPDATE	ISSUE LEVEL: 1	FIRST RELEASE DATE	22MAY2012	(CDL ACTUATOR CIRCUITS)	

CONN NAME
MAIN/ENGINE
MALE CONN
FEMALE CONN
CAVITY NUMBER

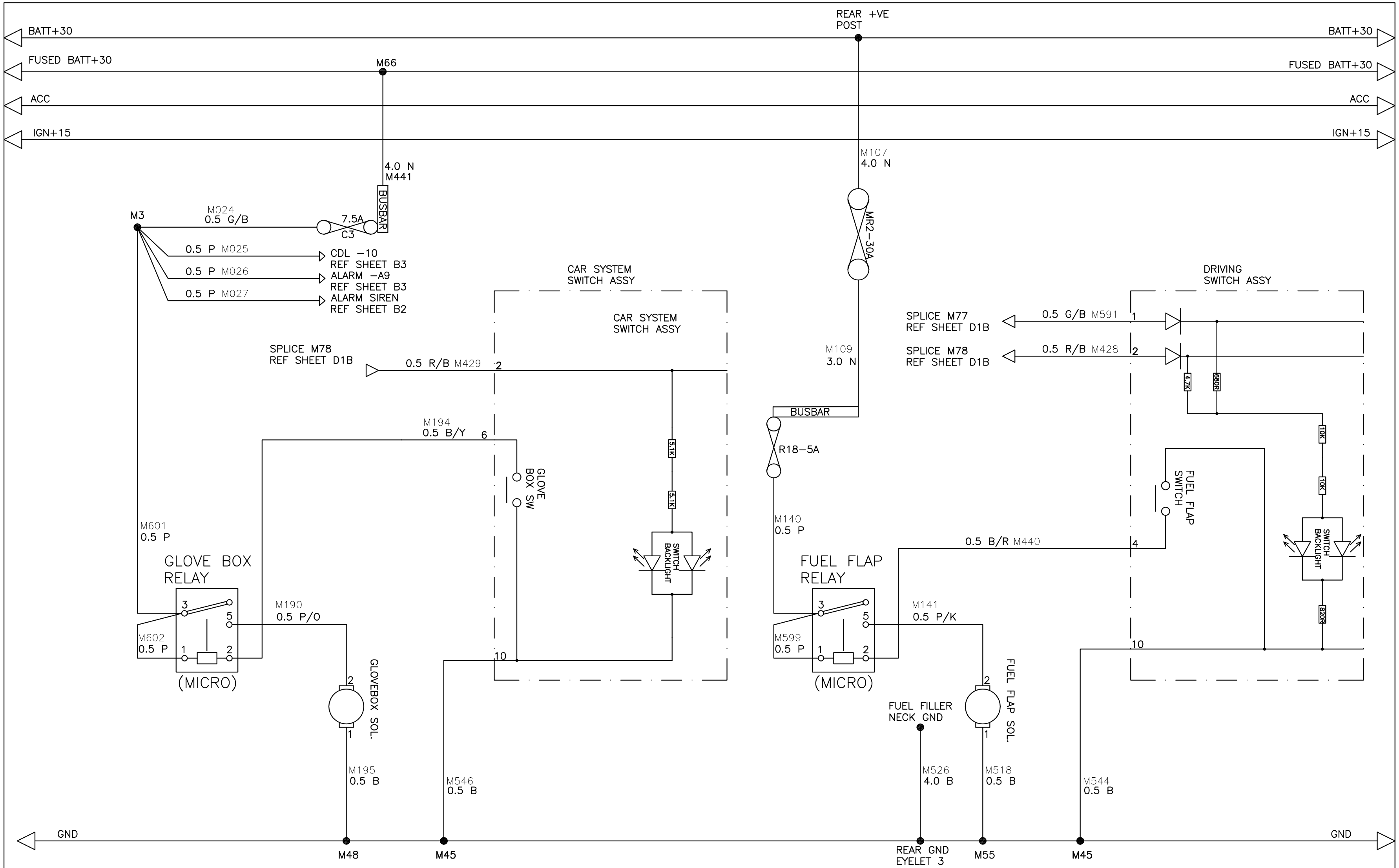
UPDATED 21ST AUGUST 2012

SEE B3A ON PREVIOUS PAGE FOR DOOR LATCH SYSTEM RIOR VIN '12MY CH_10630



TITLE: TRUNK RELEASE		APPROVED		UPDATES	ISSUE
		CHECKED		INTRODUCTION OF EVORA S & AUTOMATIC	3
PROJECT: EVORA	DRG. No:	DRAWN			
SHEET:B3B	ISSUE LEVEL: PR	FIRST RELEASE DATE	08DEC09		

CONN NAME
MAIN/ENGINE
MALE CONN
3
FEMALE CONN
CAVITY NUMBER



TITLE: FUEL FILLER FLAP & GLOVE BOX LOCK	APPROVED		UPDATES	ISSUE
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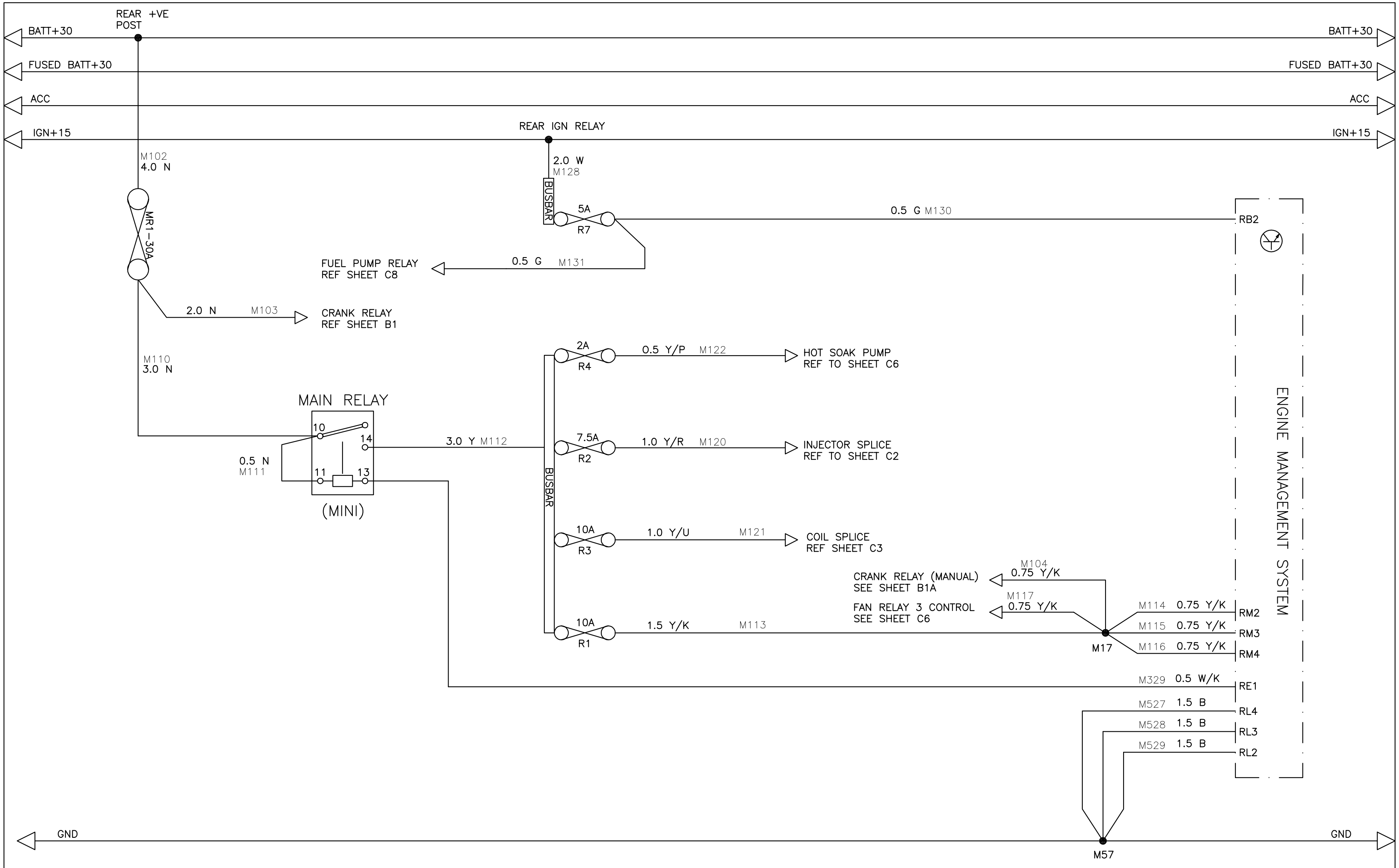
PROJECT: EVORA / DRG. No:	DRAWN			
SHEET:B4 / ISSUE LEVEL: PR	FIRST RELEASE DATE	13JAN10		

CONN NAME
MAIN/ENGINE
MALE CONN
FEMALE CONN
3
CAVITY NUMBER



TITLE: EMS POWER & GND		APPROVED		UPDATES	ISSUE
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PROJECT: EVORA	DRG. No:	DRAWN			
SHEET:C1	ISSUE LEVEL: PR	FIRST RELEASE DATE	13JAN10		

CONN NAME
MAIN/ENGINE
MALE CONN
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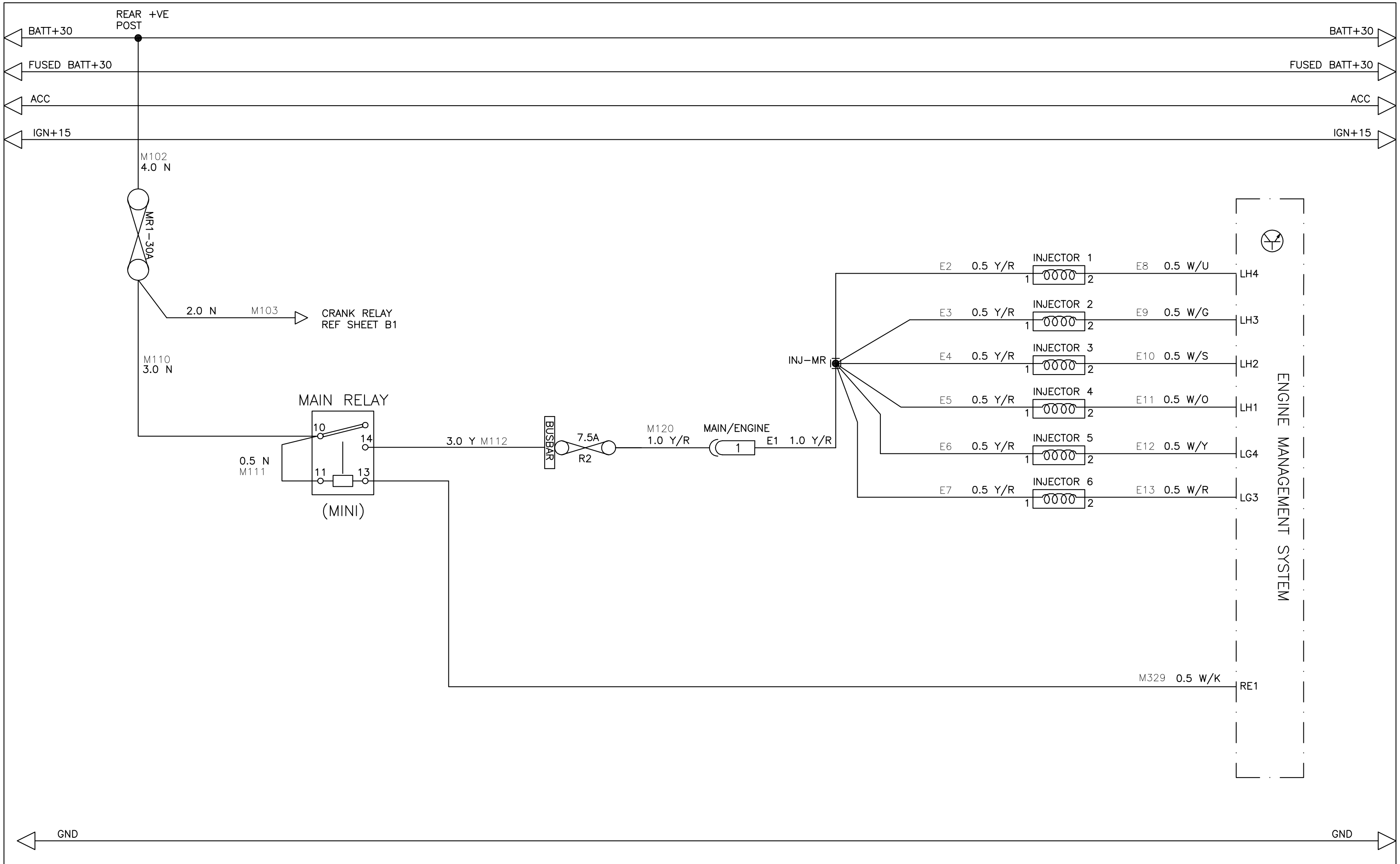
FEMALE CONN
CAVITY NUMBER



TITLE: EMS–FUEL INJECTION		APPROVED		UPDATES	ISSUE
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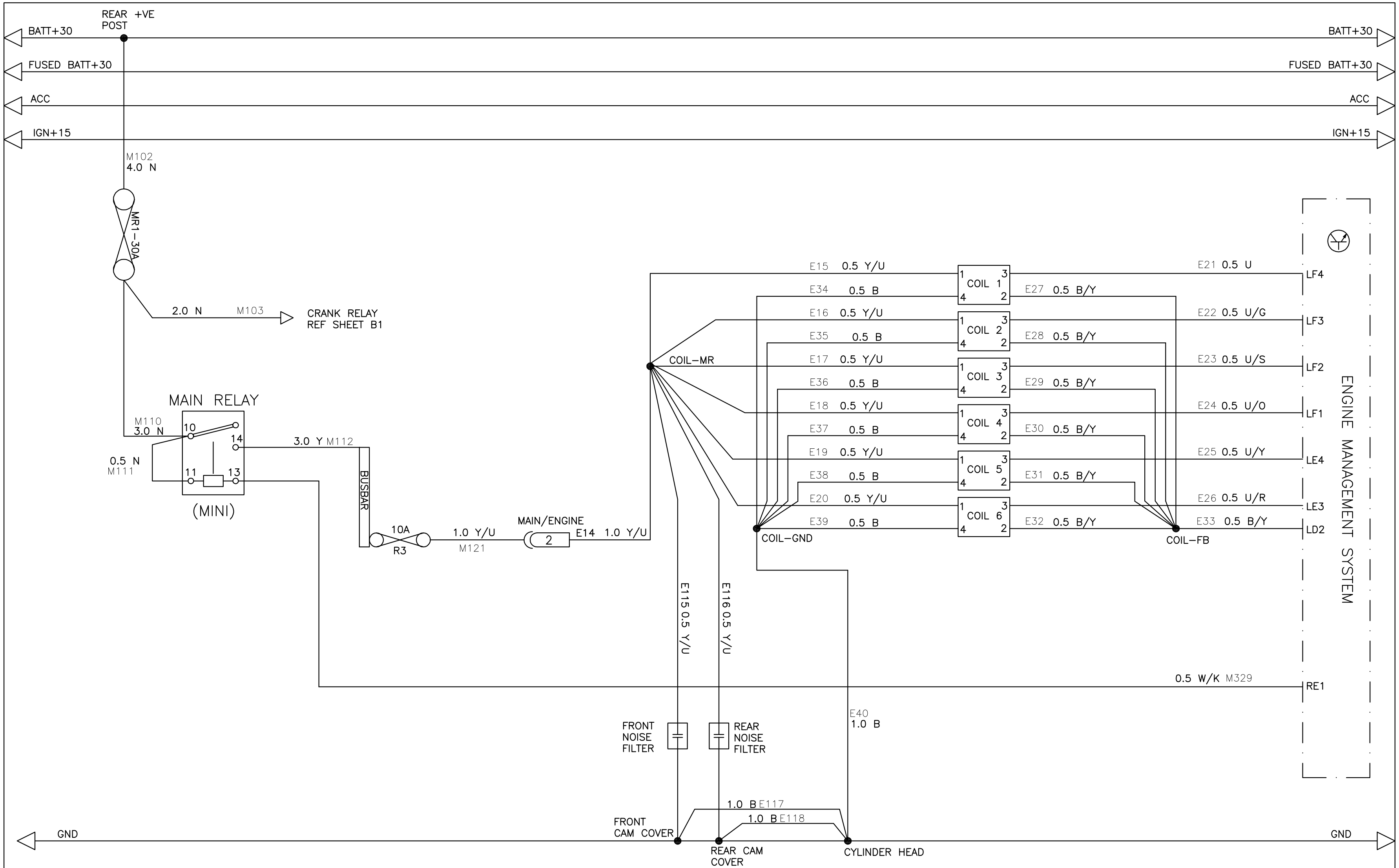
PROJECT: EVORA	DRG. No:	DRAWN			
SHEET:C2	ISSUE LEVEL: PR	FIRST RELEASE DATE	13JAN10		

CONN NAME
MAIN/ENGINE
MALE CONN
3
FEMALE CONN
CAVITY NUMBER



TITLE: EMS-IGNITION COILS		APPROVED		UPDATES	ISSUE
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PROJECT: EVORA	DRG. No:	DRAWN			
SHEET:C3	ISSUE LEVEL: PR	FIRST RELEASE DATE	13JAN10		

CONN NAME
MAIN/ENGINE
MALE CONN
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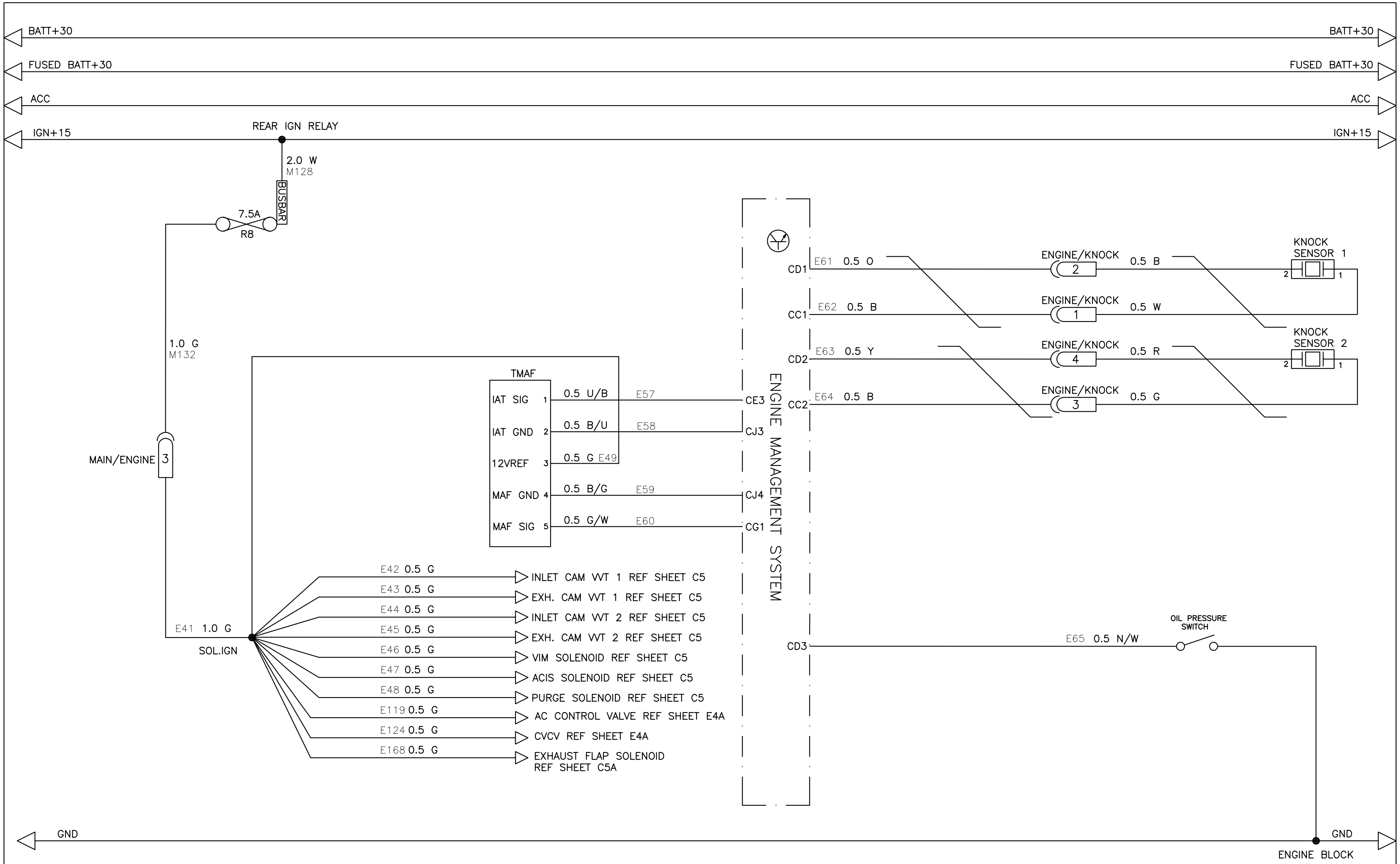
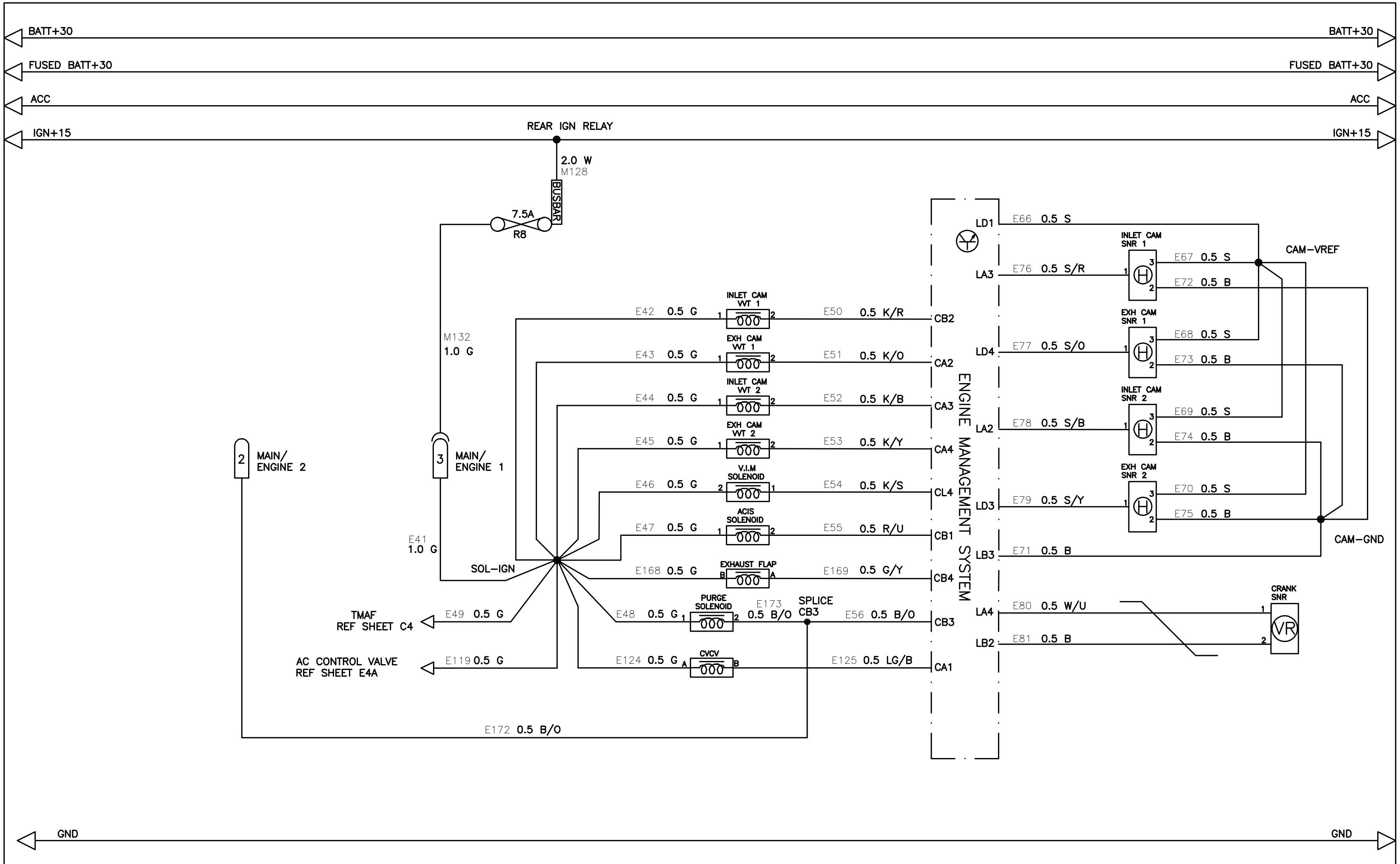
FEMALE CONN
CAVITY NUMBER



TITLE: EMS–TMAF, OIL PRESSURE SWITCH & KNOCK SENSORS		APPROVED		UPDATES	ISSUE
		CHECKED		INTRODUCTION OF EVORA S & AUTOMATIC	3
PROJECT: EVORA	DRG. No:	DRAWN			
SHEET:C4	ISSUE LEVEL: PR	FIRST RELEASE DATE	13JAN10		



TITLE: EMS-CAM SENSORS & VARIOUS SOLENOIDS MANUAL VEHICLES		APPROVED		UPDATES	ISSUE
		CHECKED		EVORA S & AUTOMATIC UPDATE	3
PROJECT: EVORA	DRG. No:	DRAWN			
SHEET:C5A	ISSUE LEVEL: PR	FIRST RELEASE DATE	14DEC2010		

CONN NAME
MAIN/ENGINE
MALE CONN
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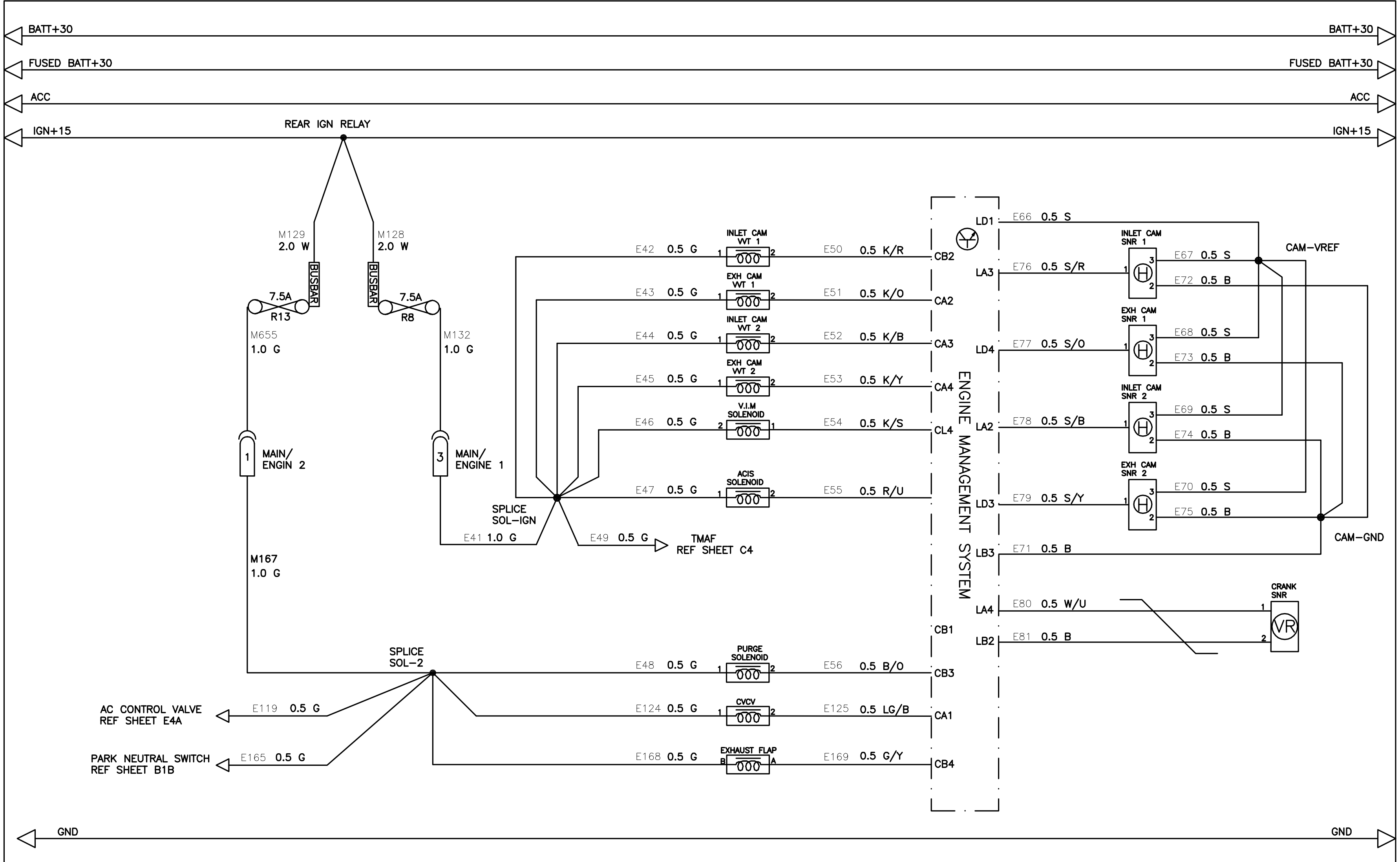
FEMALE CONN
CAVITY NUMBER



	TITLE: EMS–CAM SENSORS & VARIOUS SOLENOIDS AUTOMATIC VEHICLES		APPROVED		UPDATES	ISSUE
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	PROJECT: EVORA	DRG. No:	DRAWN			
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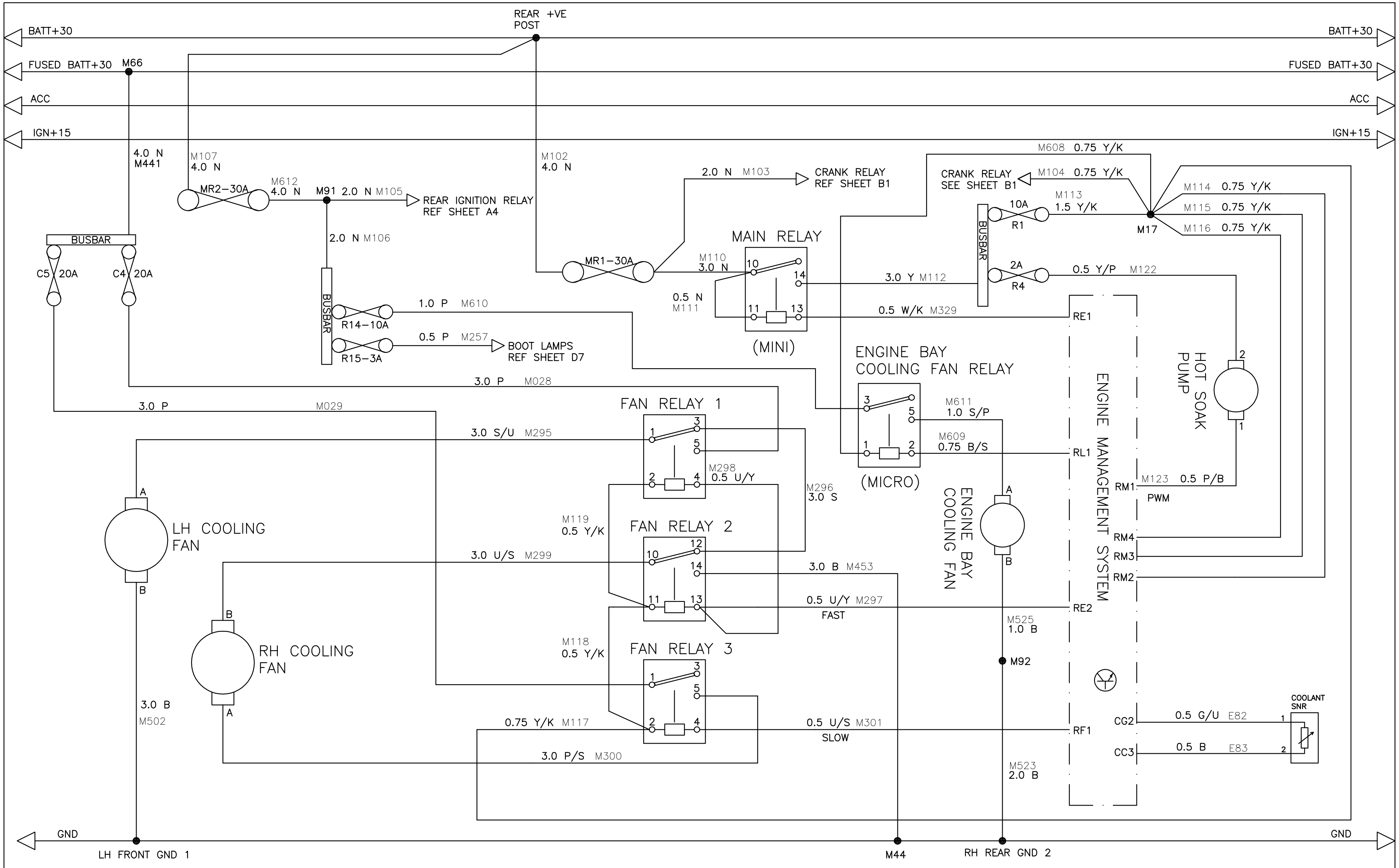
CONN NAME
MAIN/ENGINE
MALE CONN
3
FEMALE CONN
CAVITY NUMBER



TITLE: EMS−COOLANT SENSING & FAN CONTROL		APPROVED		UPDATES	ISSUE
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PROJECT: EVORA	DRG. No:	DRAWN			
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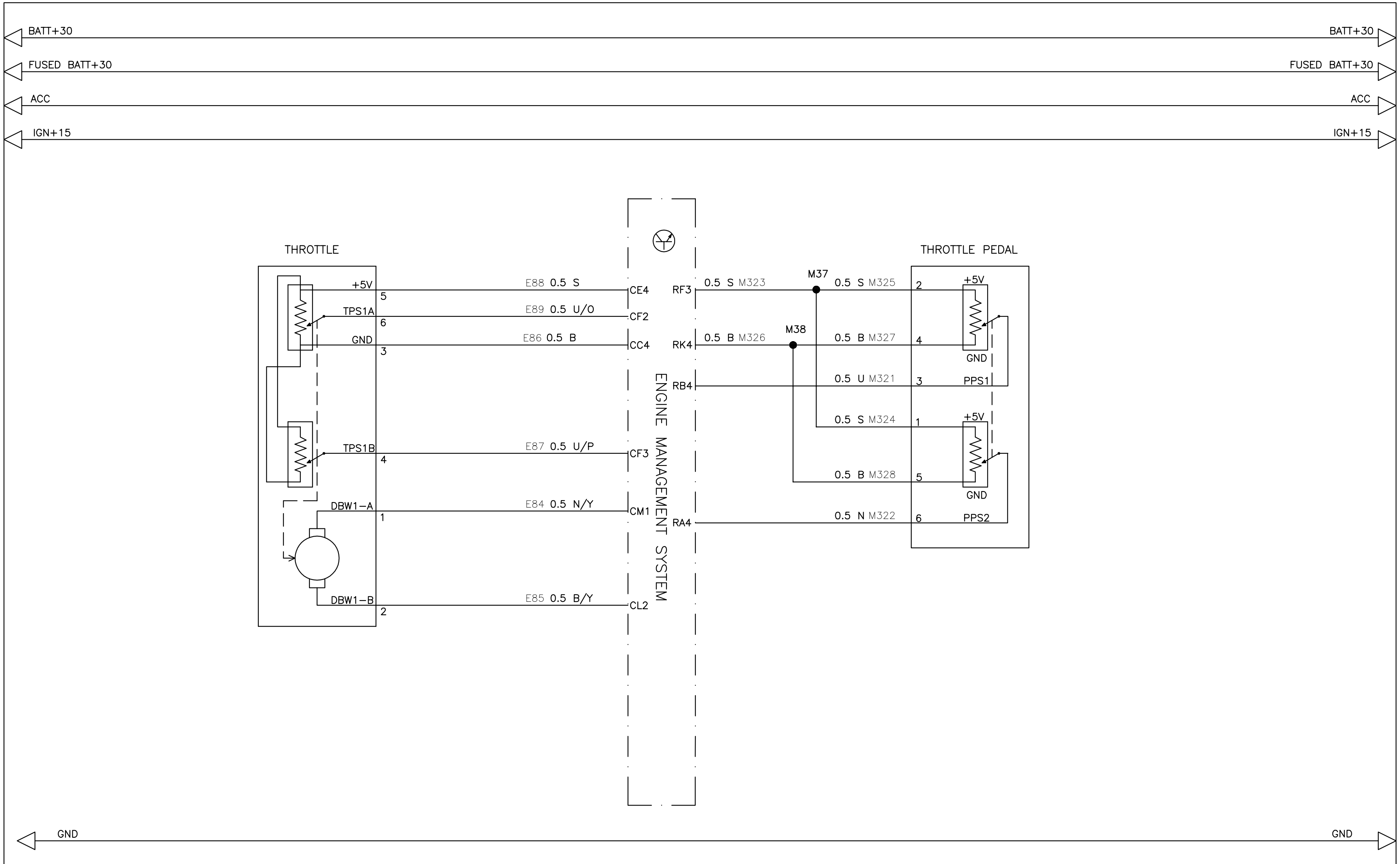

TITLE: EMS–THROTTLE ACTUATION		APPROVED		UPDATES	ISSUE
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PROJECT: EVORA	DRG. No:	DRAWN			
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MALE CONN
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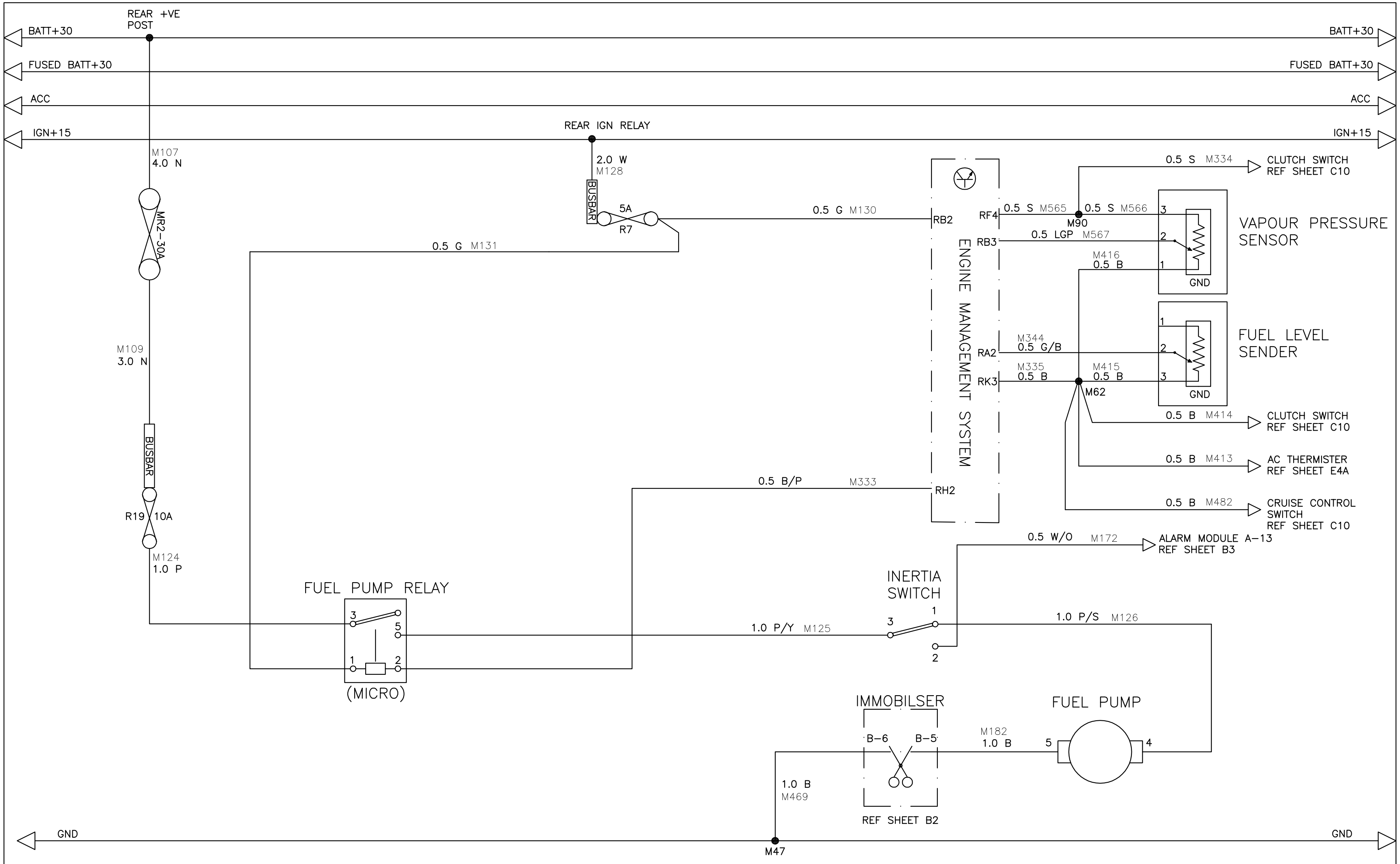
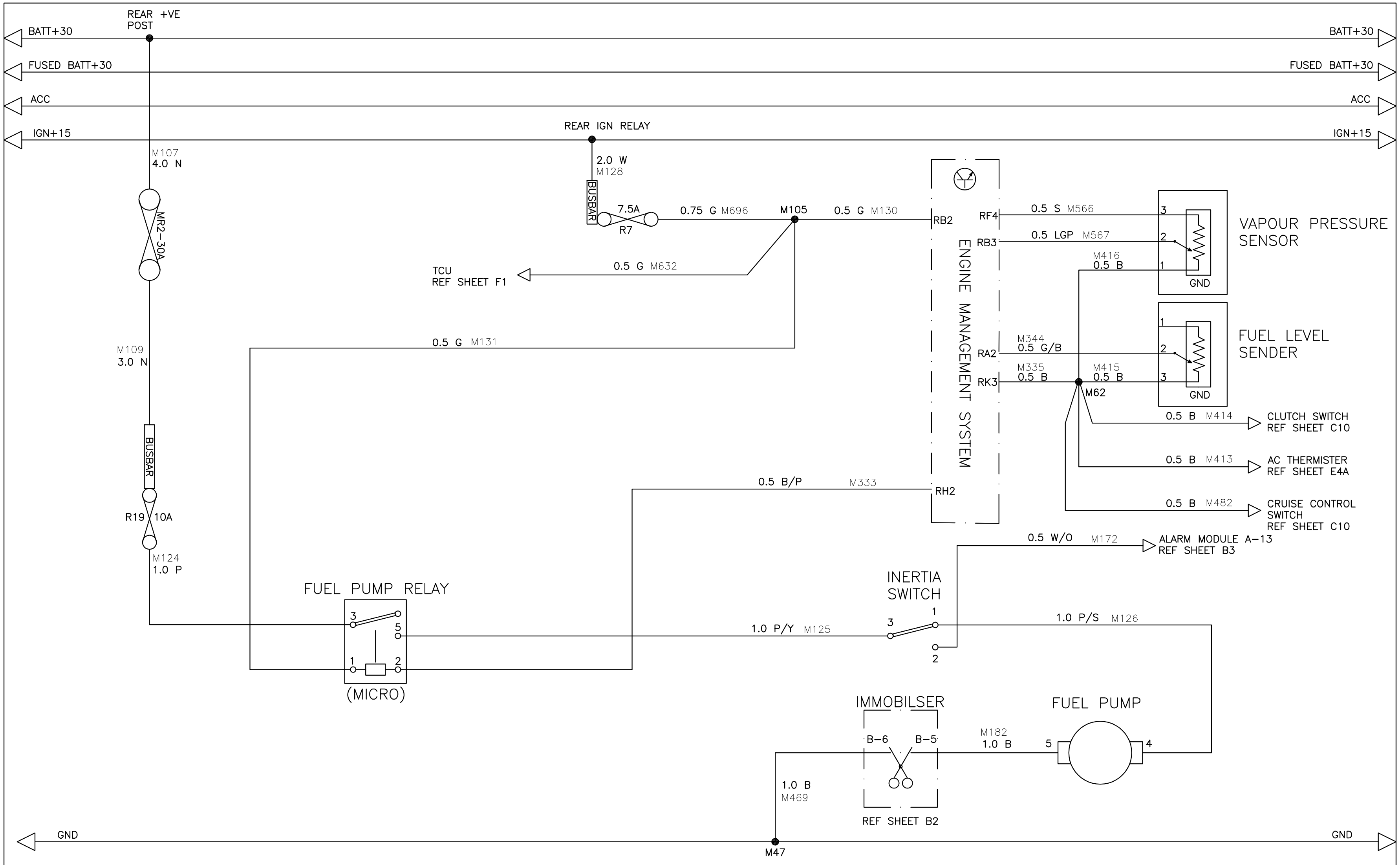
CAVITY NUMBER



TITLE: EMS-FUEL PUMP & FUEL LEVEL SENSOR MANUAL VEHICLES		APPROVED		UPDATES	ISSUE
		CHECKED		INTRODUCTION OF EVORA S & AUTOMATIC	3
PROJECT: EAGLE	DRG. No:	DRAWN			
SHEET:C8A	ISSUE LEVEL: PR	FIRST RELEASE DATE	13JAN10		

CONN NAME
MAIN/ENGINE
MALE CONN
3
FEMALE CONN
CAVITY NUMBER



TITLE: EMS-FUEL PUMP & FUEL LEVEL SENSOR AUTOMATIC VEHICLES		APPROVED		UPDATES	ISSUE
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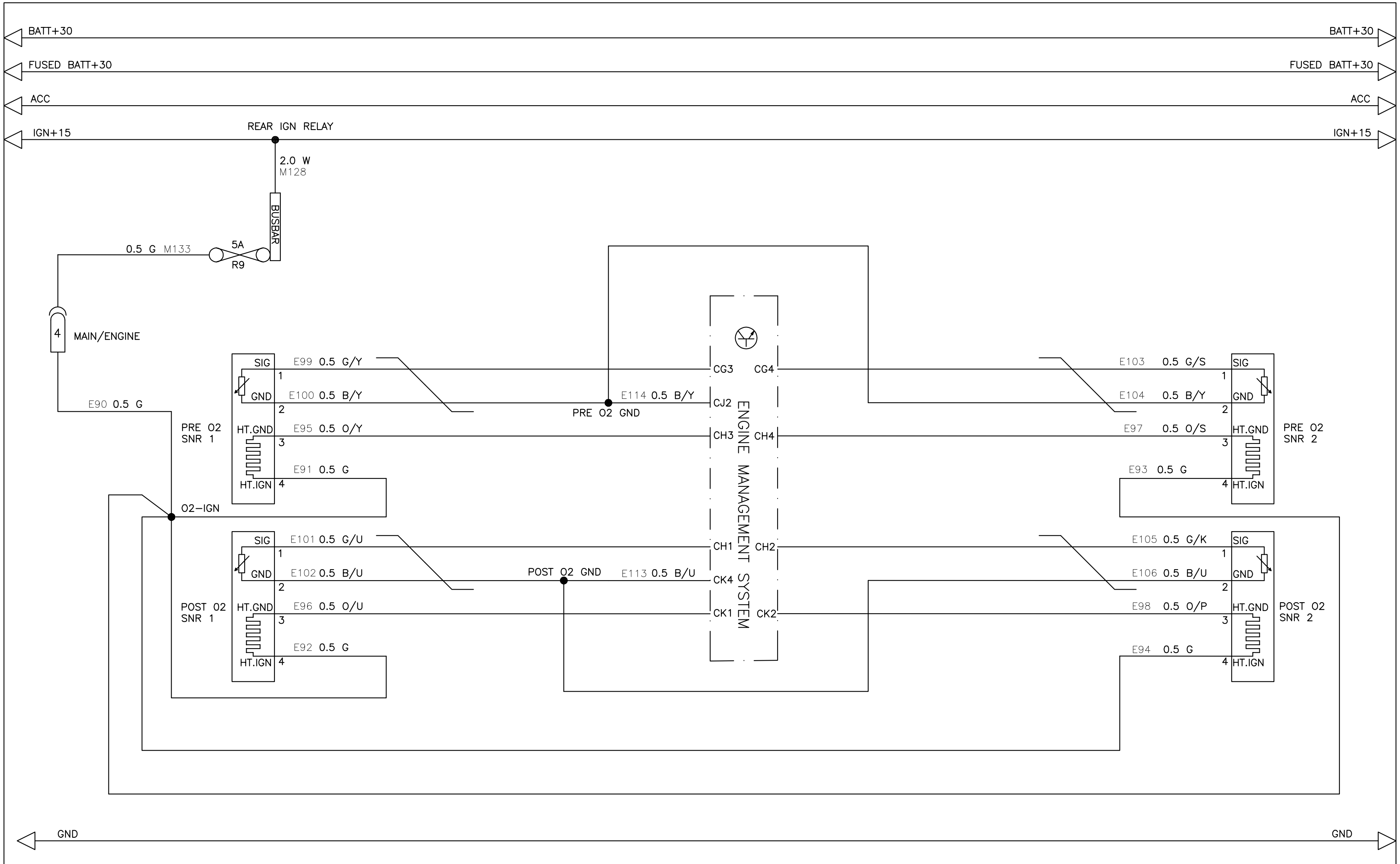
PROJECT: EVORA	DRG. No:	DRAWN			
SHEET:C8B	ISSUE LEVEL: PR	FIRST RELEASE DATE	13JAN10		



TITLE: EMS-O2 SENSORS		APPROVED		UPDATES	ISSUE
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PROJECT: EVORA	DRG. No:	DRAWN			
SHEET:C9	ISSUE LEVEL: PR	FIRST RELEASE DATE	13JAN10		

CONN NAME
MAIN/ENGINE
MALE CONN
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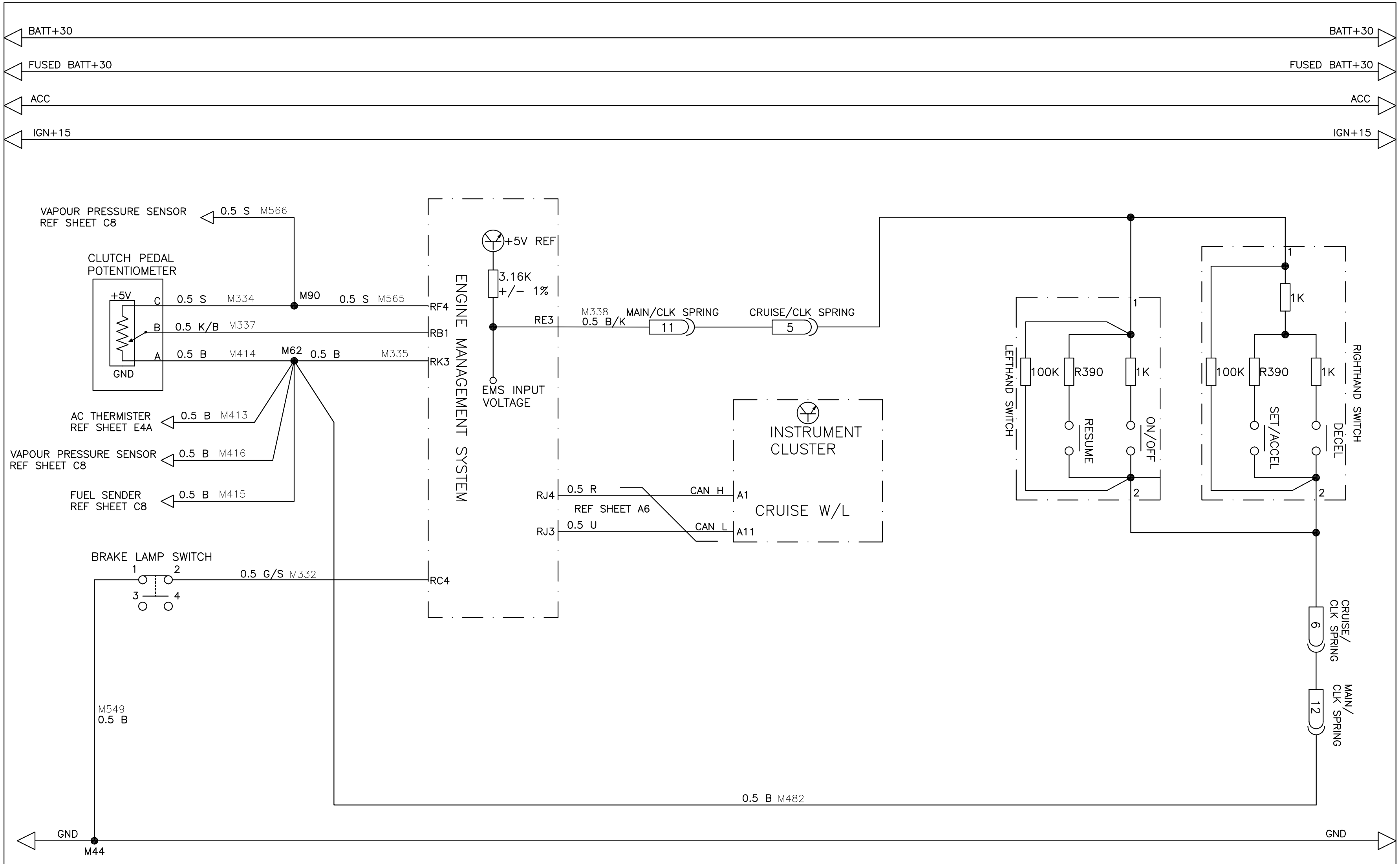
FEMALE CONN
CAVITY NUMBER



	TITLE: EMS-CRUISE CONTROL MANUAL VEHICLES		APPROVED		UPDATES	ISSUE
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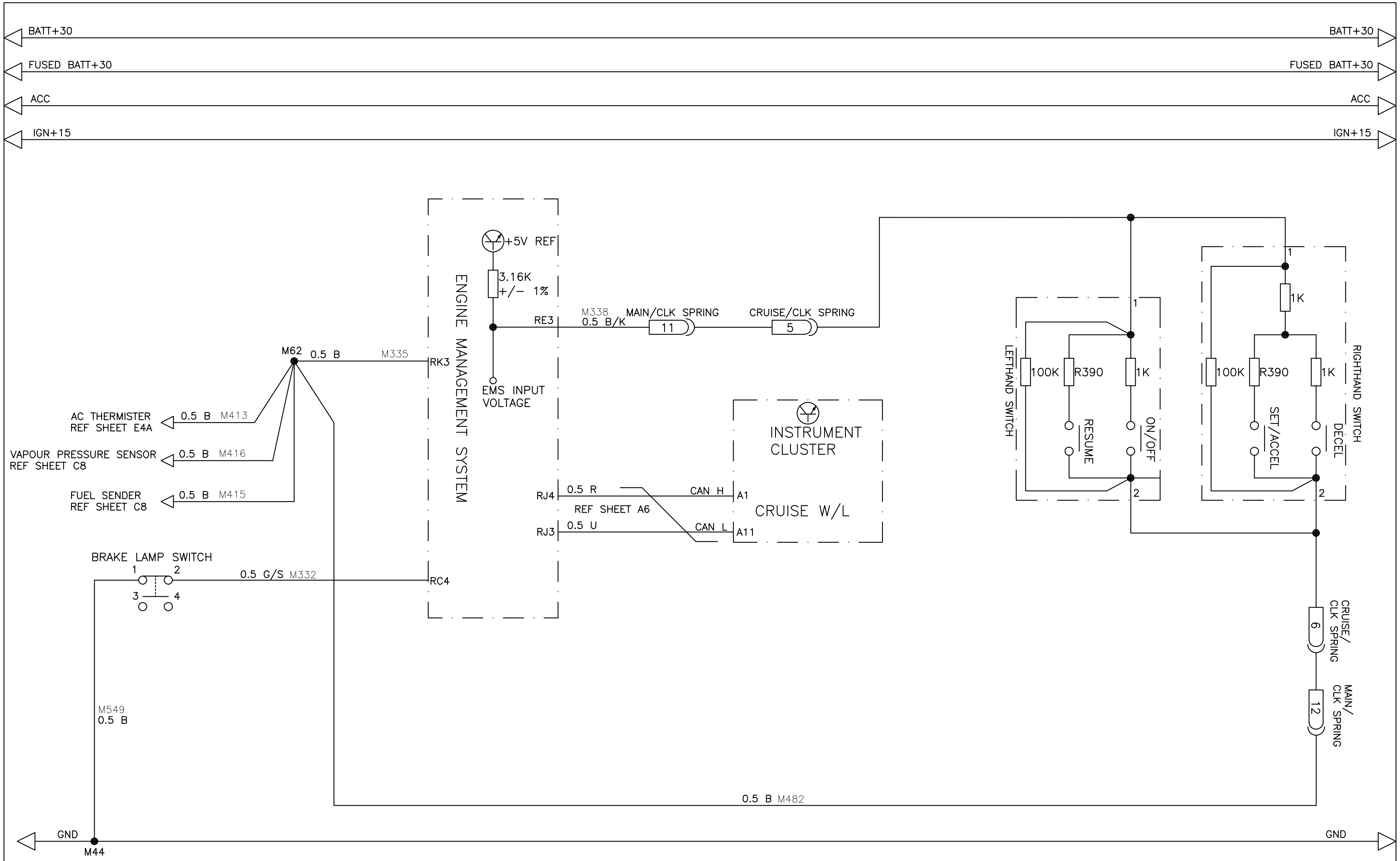

TITLE: EMS-CRUISE CONTROL AUTOMATIC VEHICLES		APPROVED		UPDATES	ISSUE
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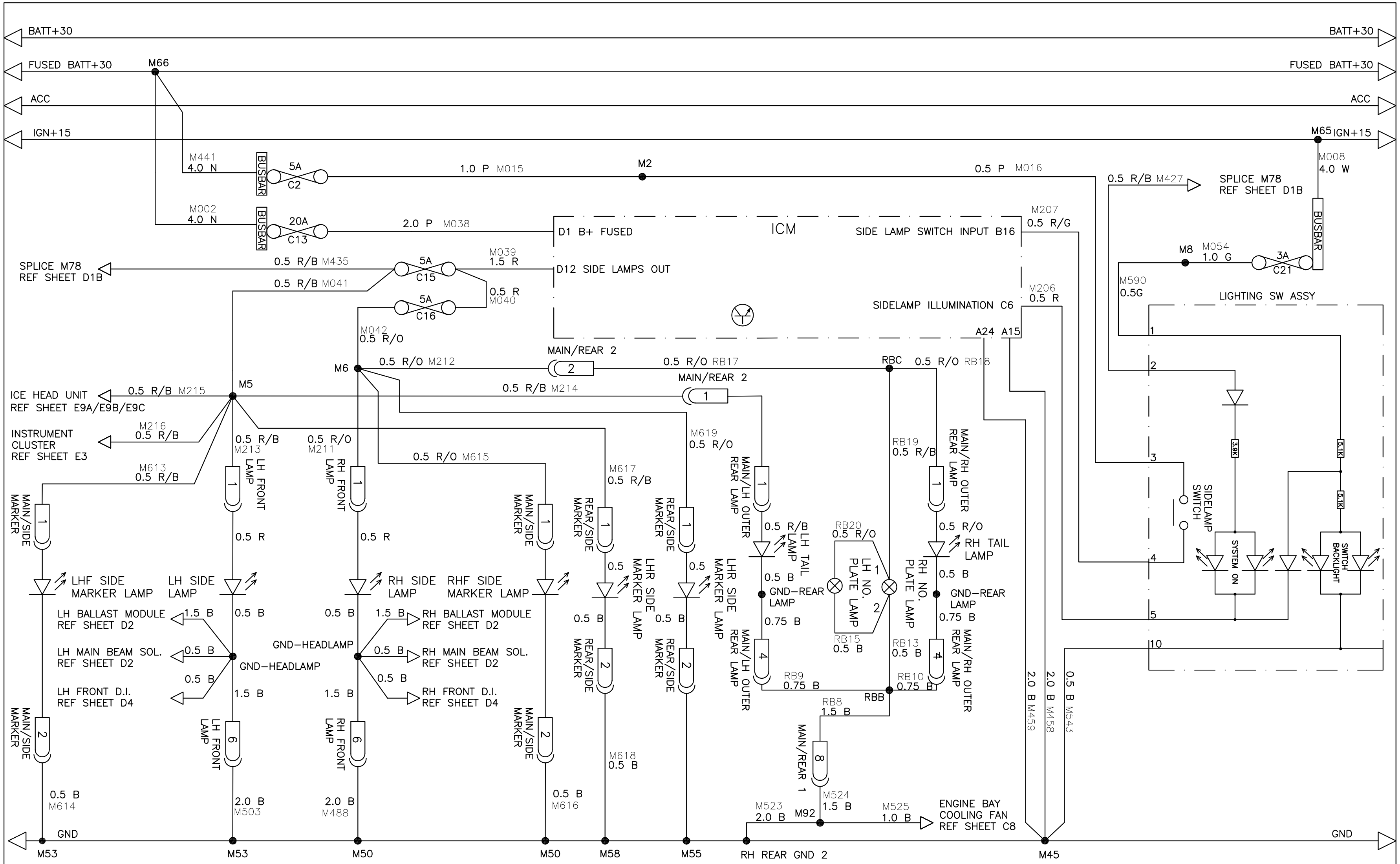
PROJECT: EVORA	DRG. No:	DRAWN			
SHEET:C10B	ISSUE LEVEL: PR	FIRST RELEASE DATE	13JAN10		

CONN NAME
MAIN/ENGINE
MALE CONN
3
FEMALE CONN
CAVITY NUMBER



TITLE: SIDE LAMPS & SIDE MARKERS		APPROVED		UPDATES	ISSUE
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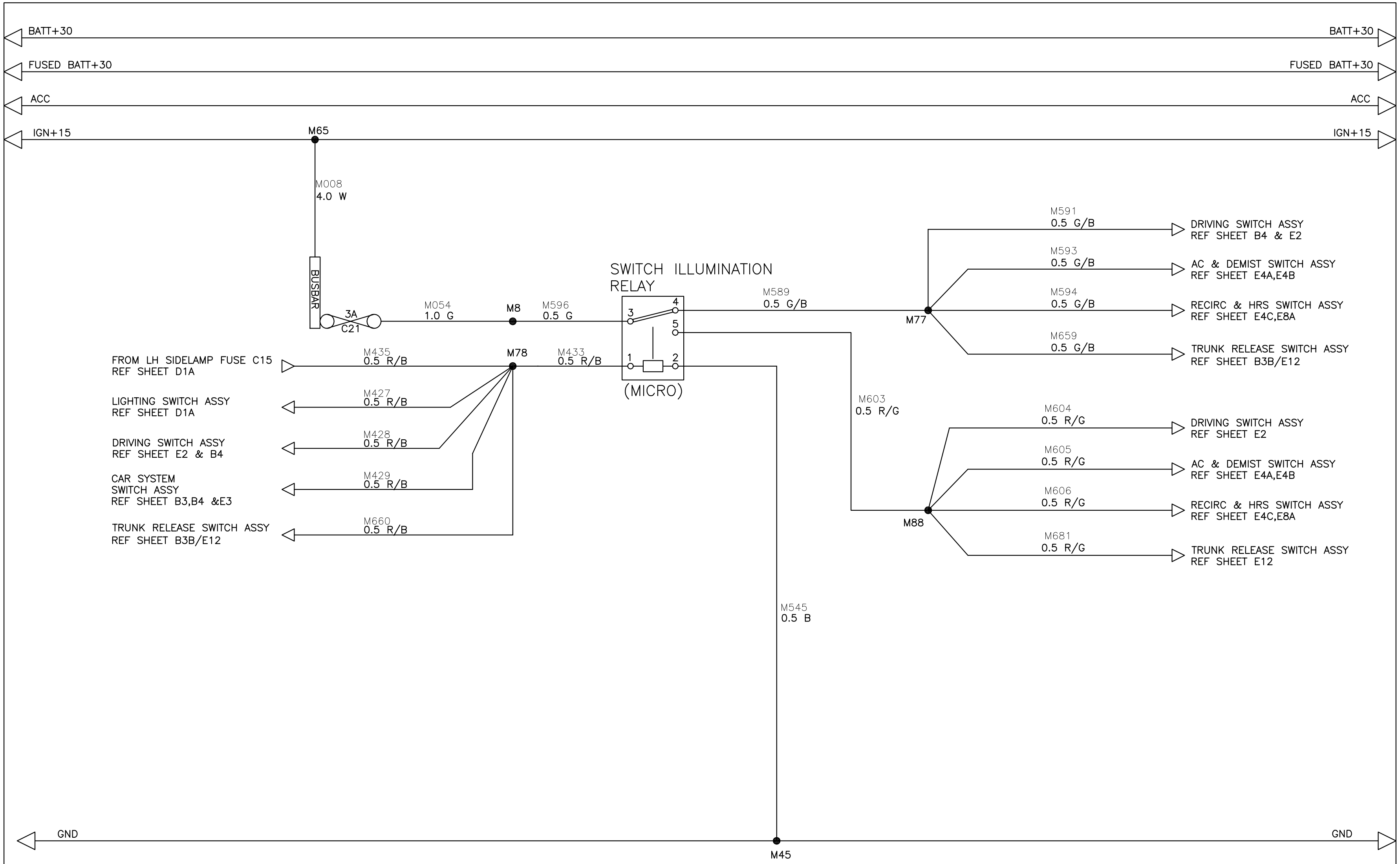
PROJECT: EVORA	DRG. No:	DRAWN			
SHEET:D1A	ISSUE LEVEL: PR	FIRST RELEASE DATE	13JAN10		

CONN NAME
MAIN/ENGINE
MALE CONN
FEMALE CONN
CAVITY NUMBER



TITLE: SWITCH ILLUMINATION		APPROVED		UPDATES	ISSUE	CONN NAME; MAIN/ENGINE; MALE CONN; FEMALE CONN; 3; CAVITY NUMBER
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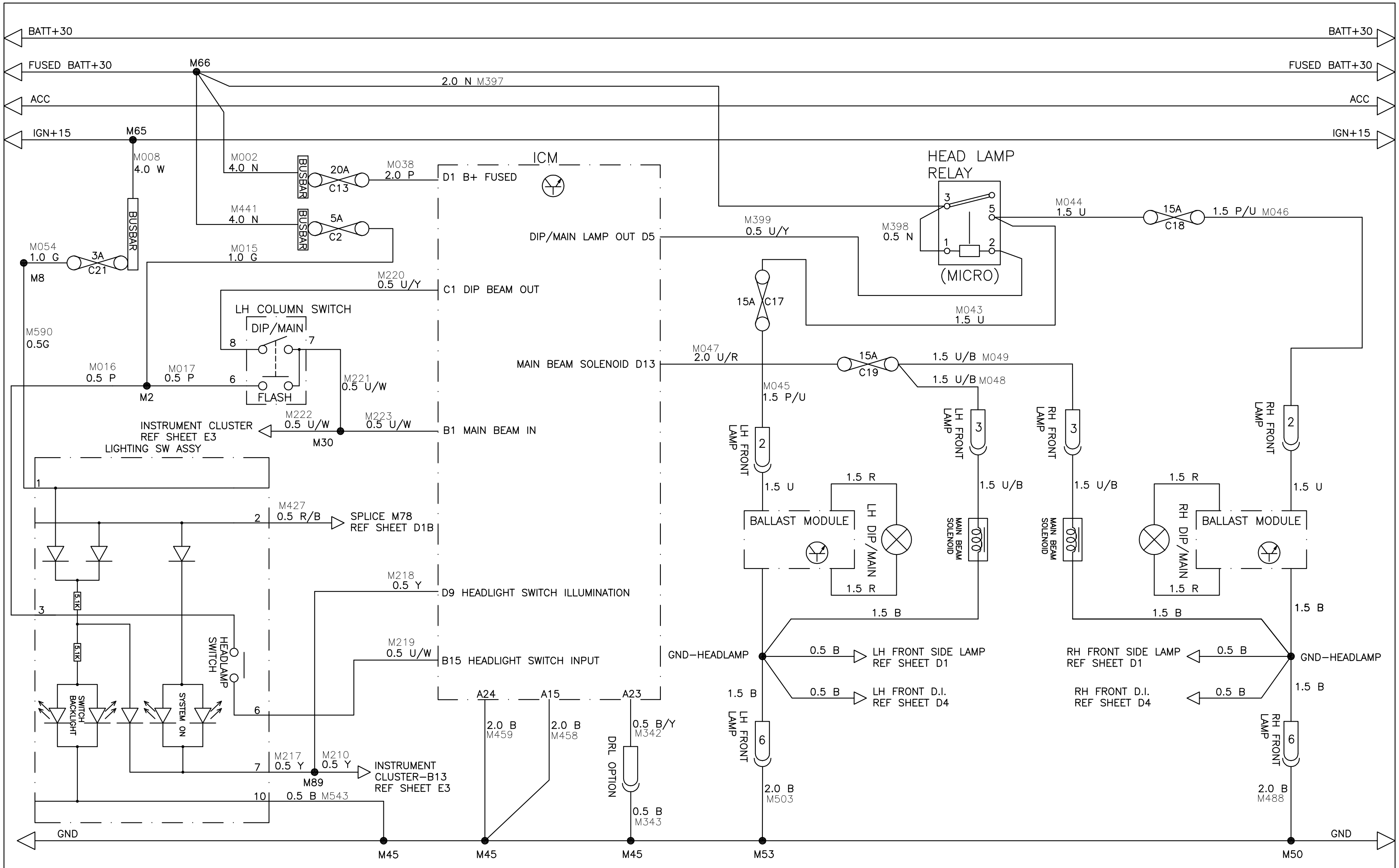
PROJECT: EVORA	DRG. No:	DRAWN				
SHEET:D1B	ISSUE LEVEL: PR	FIRST RELEASE DATE	13JAN10			



TITLE: HEADLAMPS (XENON)		APPROVED		UPDATES	ISSUE	CONN NAME
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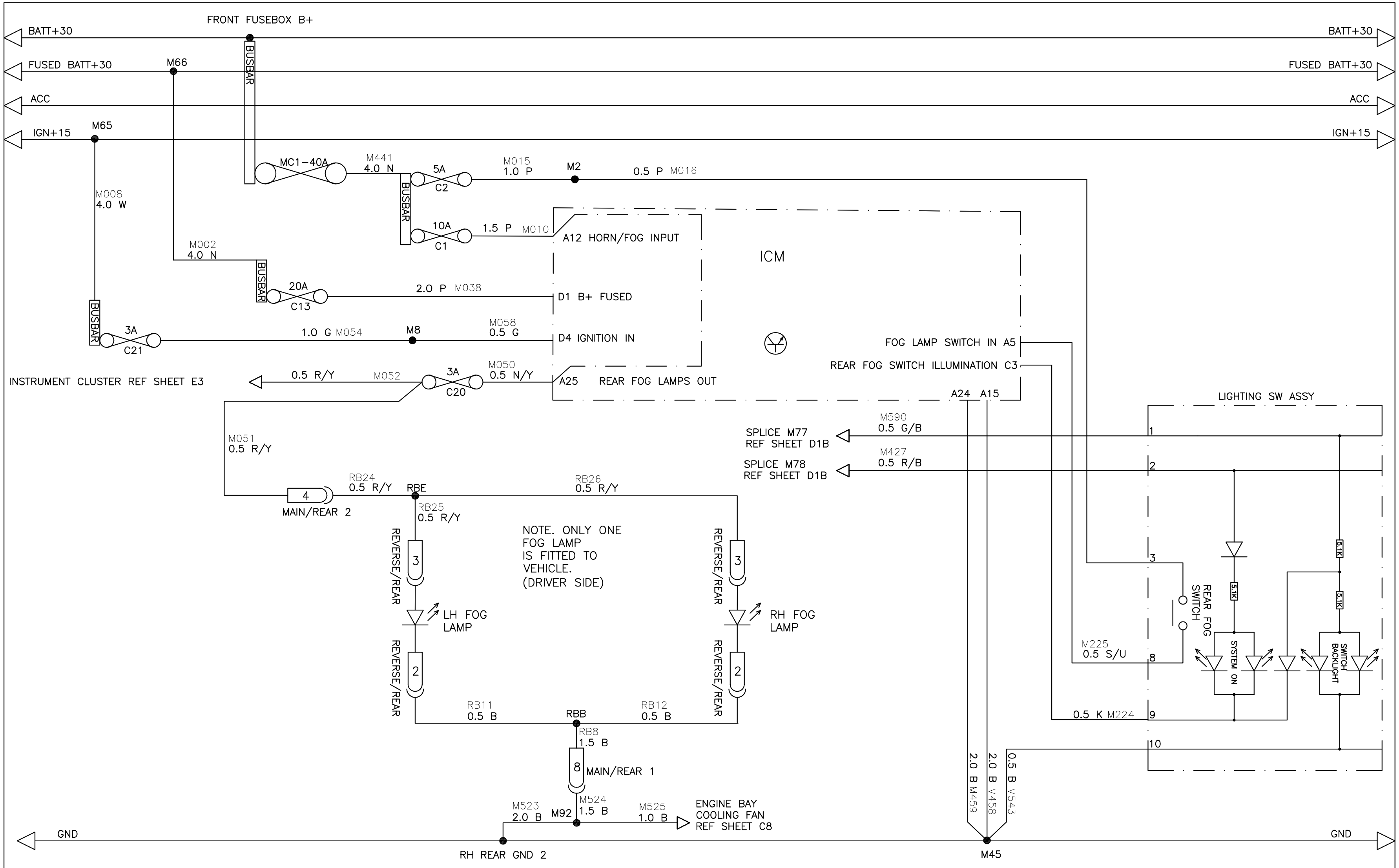
PROJECT: EVORA	DRG. No:	DRAWN				MALE CONN 3 FEMALE CONN
SHEET:D2A	ISSUE LEVEL: PR	FIRST RELEASE DATE	13JAN10			CAVITY NUMBER



TITLE: REAR FOG LAMPS (NON FEDERAL ONLY)		APPROVED		UPDATES	ISSUE	CONN NAME → MAIN/ENGINE; MALE CONN → 3 ← FEMALE CONN; CAVITY NUMBER
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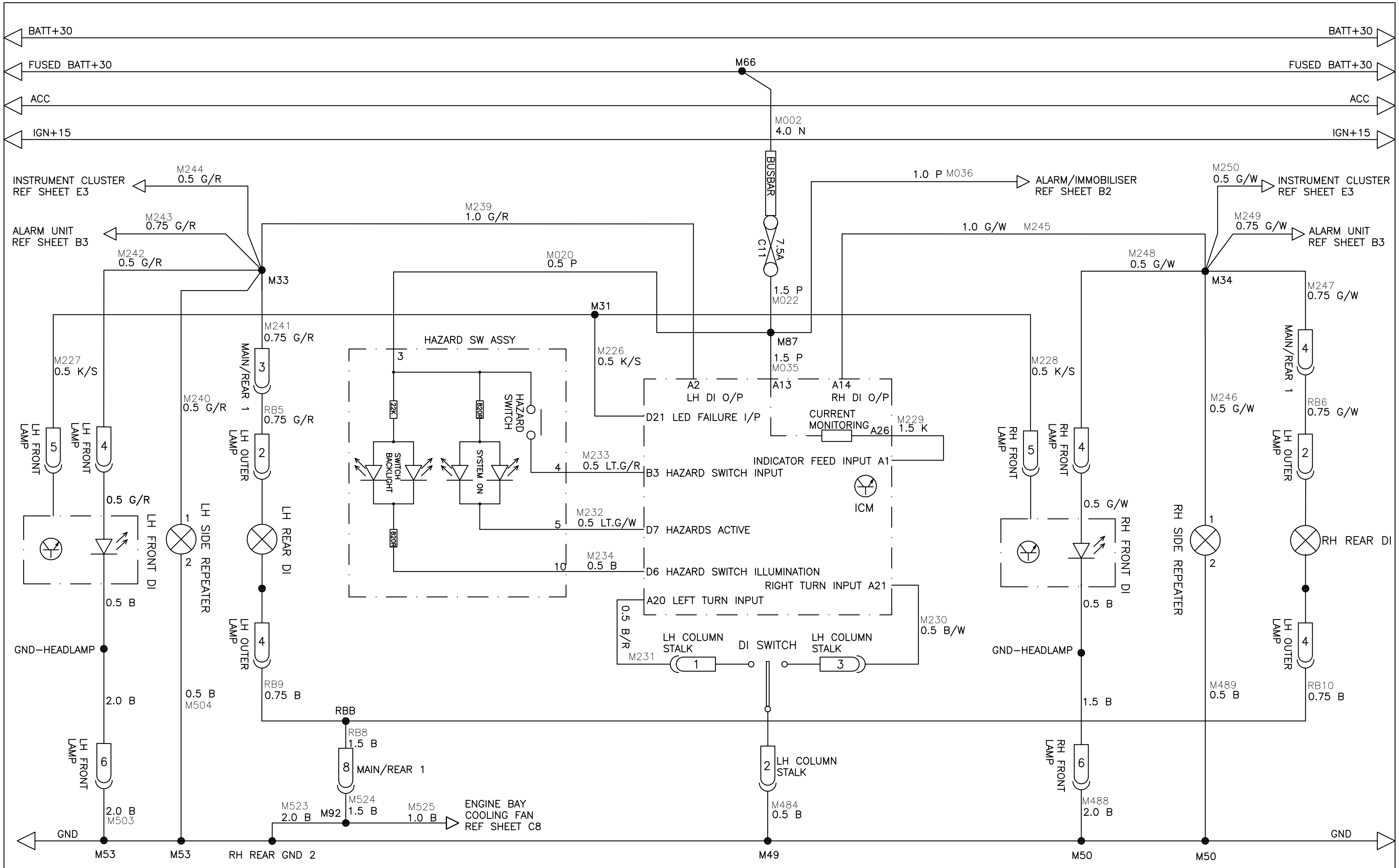
PROJECT: EVORA	DRG. No:	DRAWN				
SHEET:D3	ISSUE LEVEL: PR	FIRST RELEASE DATE	13JAN10			



TITLE: DIRECTION INDICATORS & HAZARDS (ECE)	APPROVED		UPDATES	ISSUE
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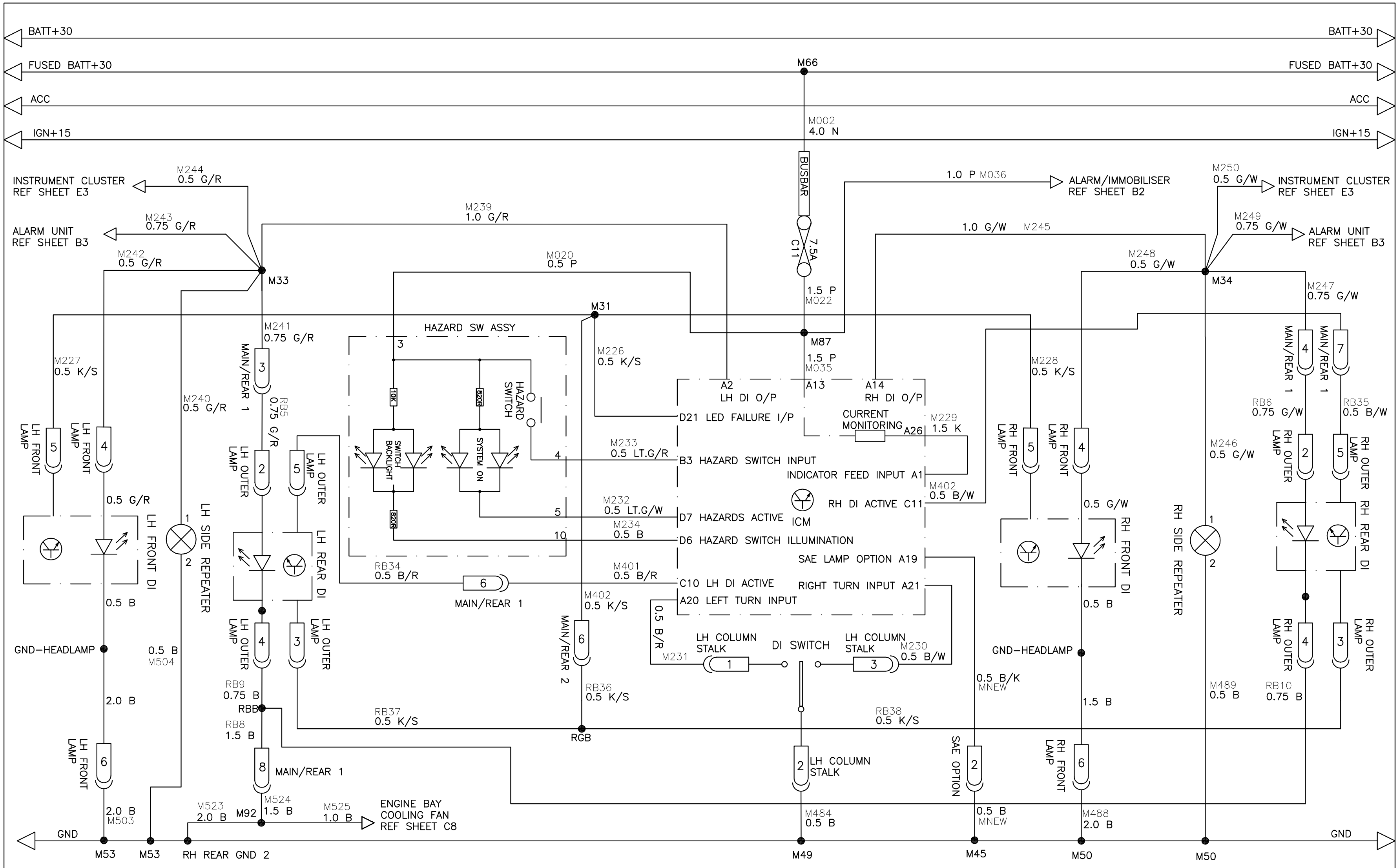
PROJECT: EVORA / DRG. No:	DRAWN			
SHEET:D4A / ISSUE LEVEL: PR	FIRST RELEASE DATE	13JAN10		

CONN NAME
MAIN/ENGINE
MALE CONN
3
FEMALE CONN
CAVITY NUMBER



TITLE: DIRECTION INDICATORS & HAZARDS (SAE)		APPROVED		UPDATES	ISSUE	CONN NAME: MAIN/ENGINE; MALE CONN; 3; FEMALE CONN; CAVITY NUMBER
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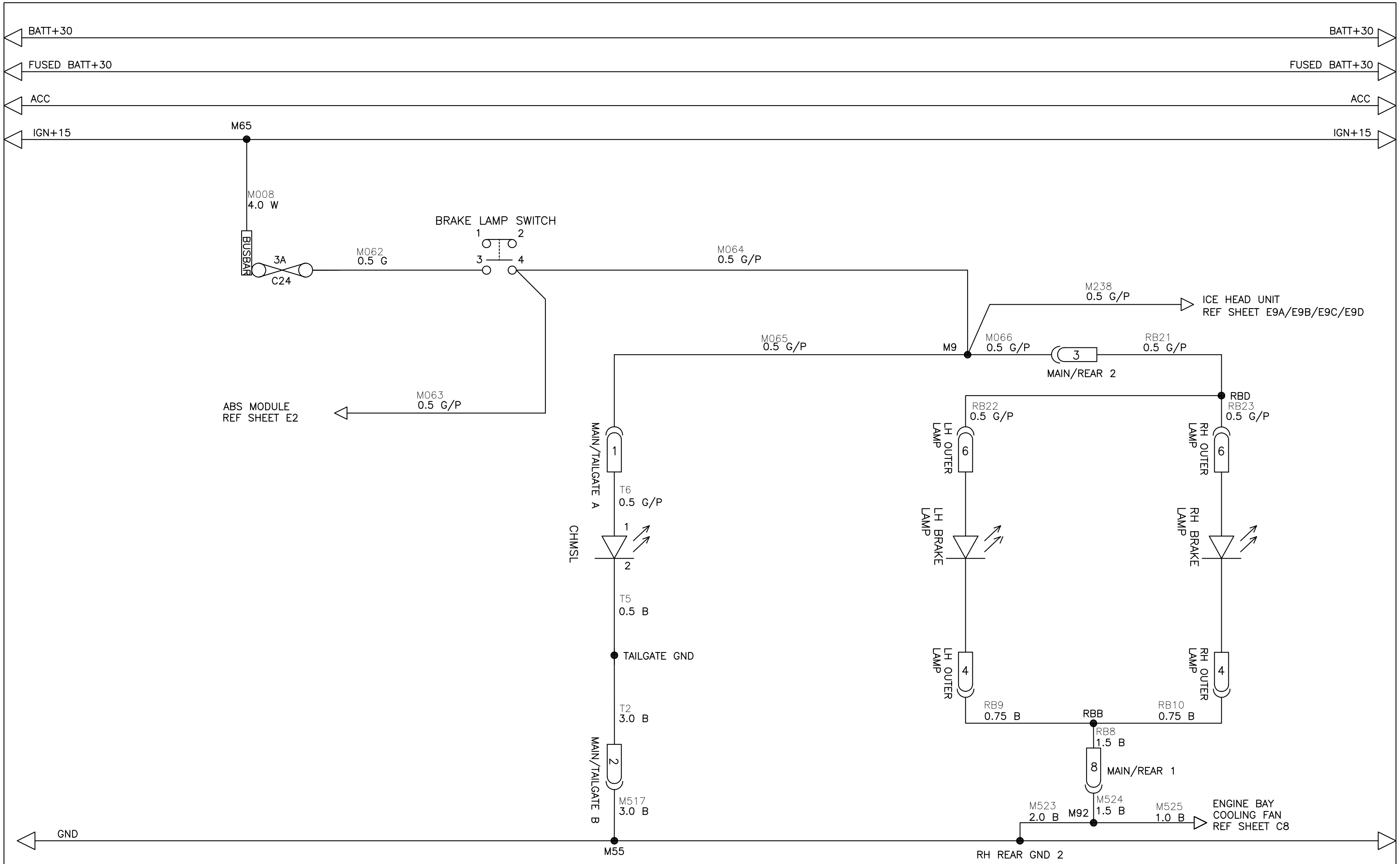
PROJECT: EVORA	DRG. No:	DRAWN				
SHEET:D4B	ISSUE LEVEL: PR	FIRST RELEASE DATE	13JAN10			



TITLE: BRAKE LAMPS		APPROVED		UPDATES	ISSUE	CONN NAME MAIN/ENGINE MALE CONN 3 FEMALE CONN CAVITY NUMBER
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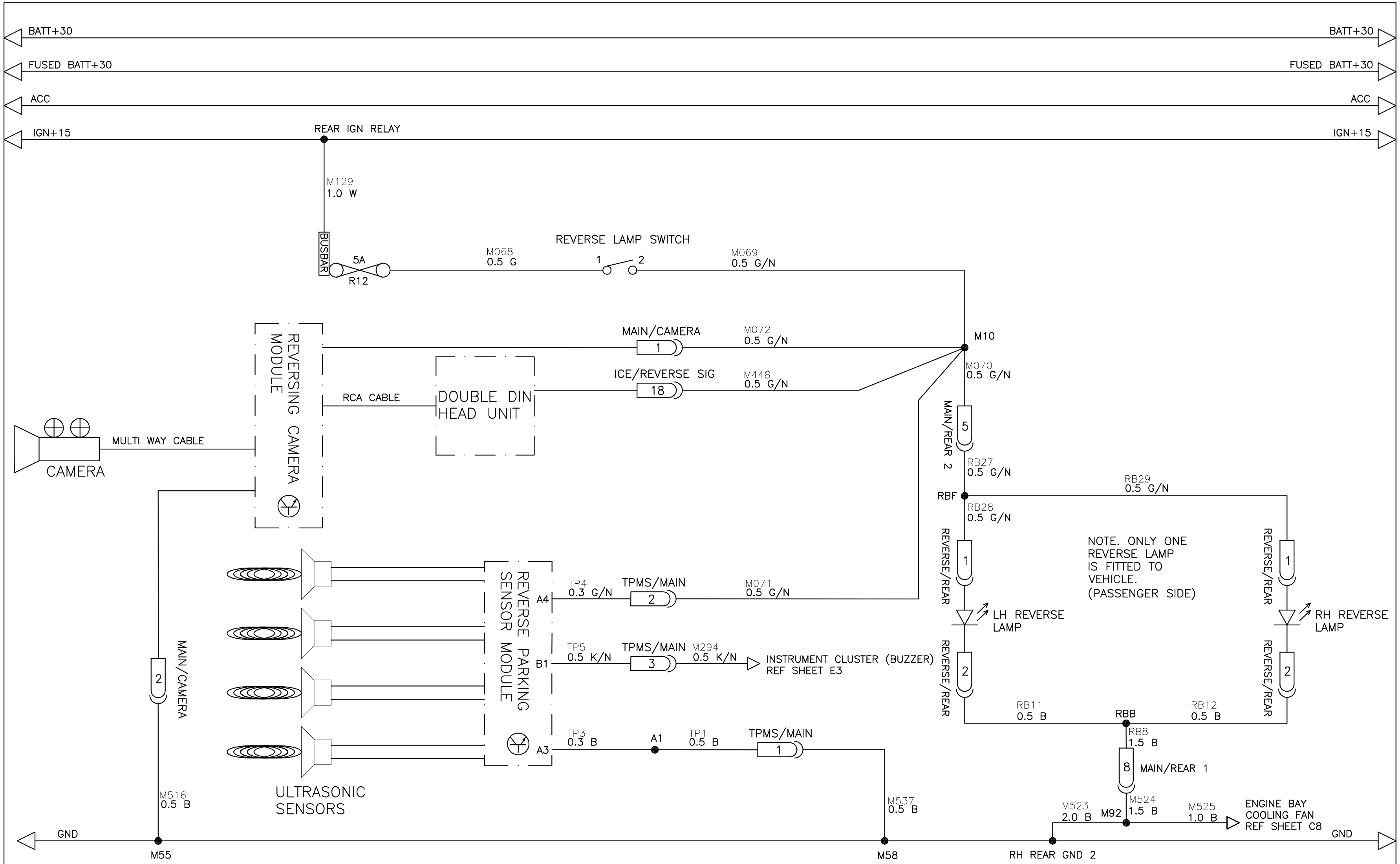
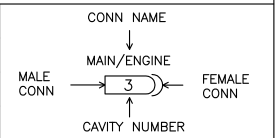
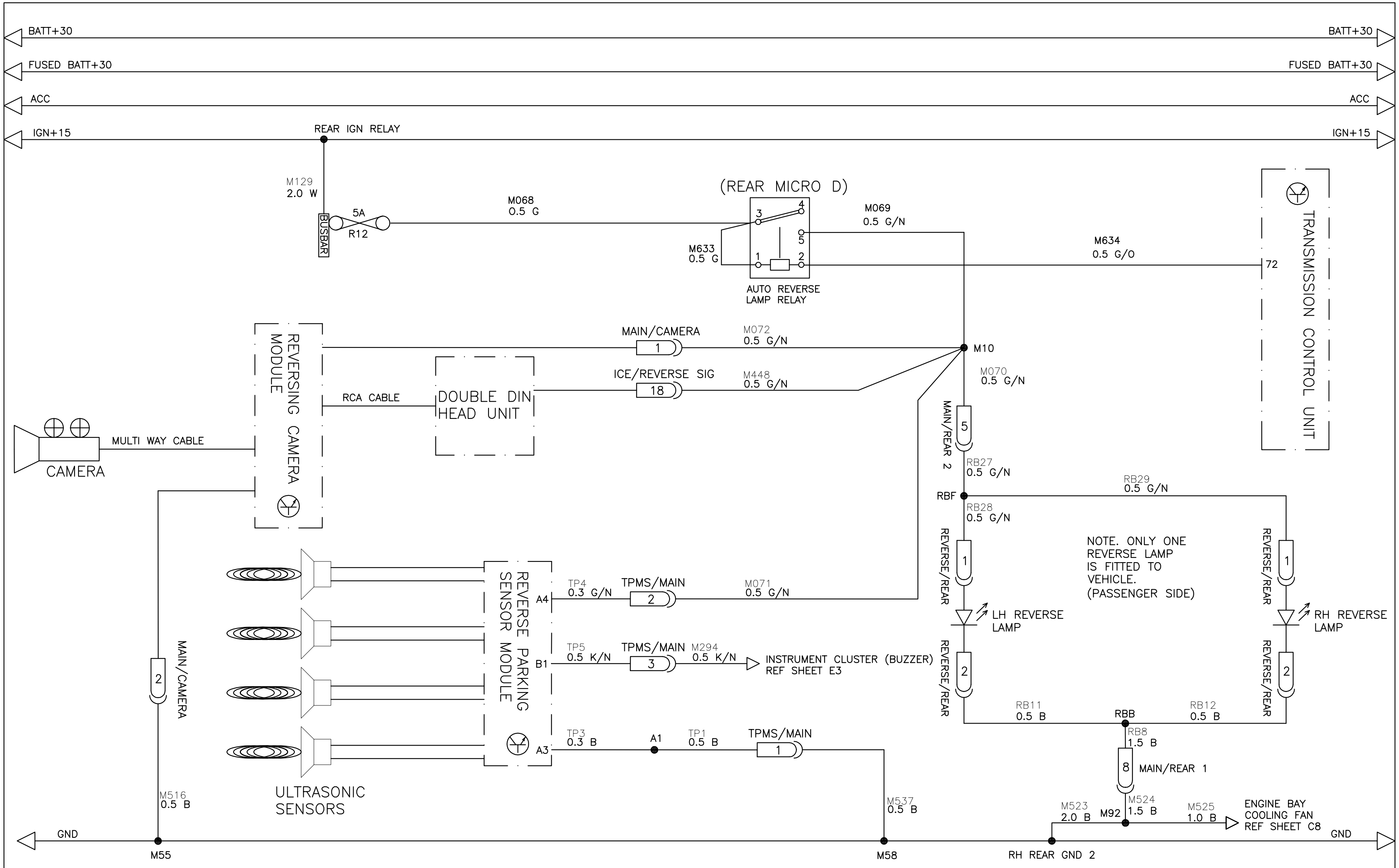
PROJECT: EVORA	DRG. No:	DRAWN				
SHEET:D5	ISSUE LEVEL: PR	FIRST RELEASE DATE	13JAN10			



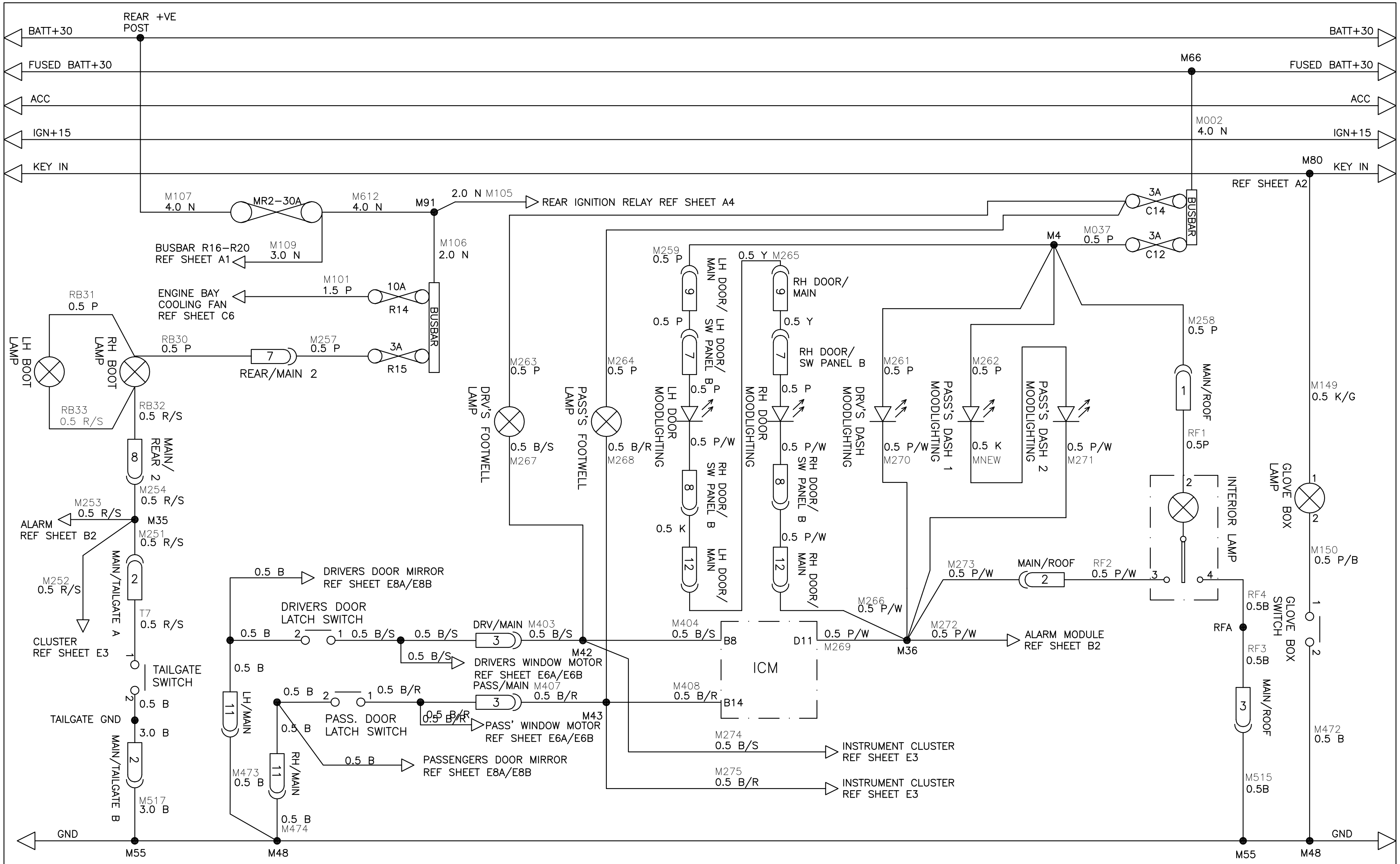
TITLE: REVERSE LAMPS / CAMERA & SENSORS MANUAL VEHICLES		APPROVED		UPDATES	ISSUE	
		CHECKED		INTRODUCTION OF EVORA S & AUTOMATIC	3	
PROJECT: EVORA	DRG. No:	DRAWN				
SHEET:D6A	ISSUE LEVEL: PR	FIRST RELEASE DATE	13JAN10			





TITLE: REVERSE LAMPS / CAMERA & SENSORS AUTOMATIC VEHICLES		APPROVED		UPDATES	ISSUE
		CHECKED		INTRODUCTION OF EVORA S & AUTOMATIC	3
PROJECT: EVORA	DRG. No:	DRAWN			
SHEET:D6B	ISSUE LEVEL: PR	FIRST RELEASE DATE	18NOV09		

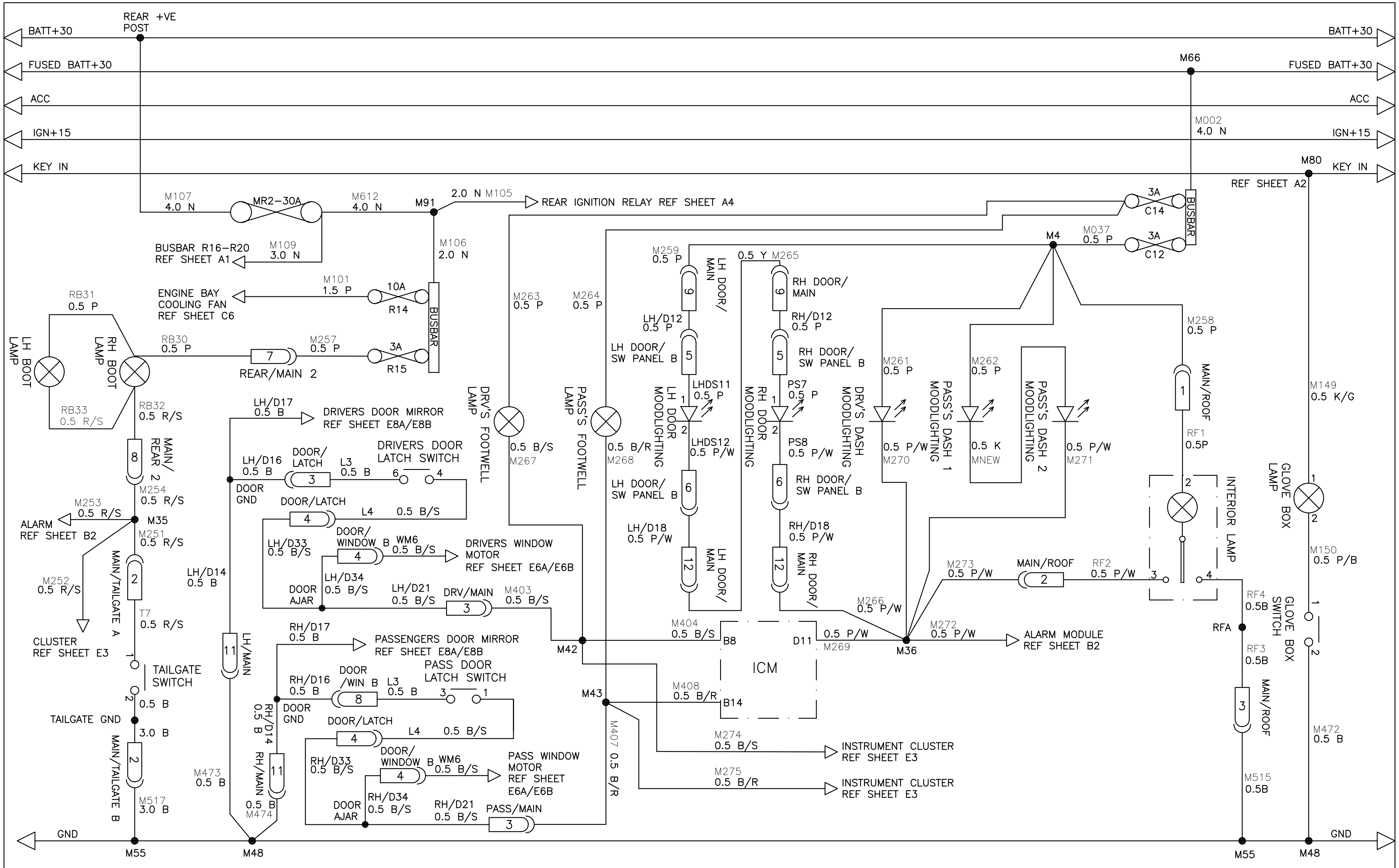
CONN NAME
MAIN/ENGINE
MALE CONN
3
FEMALE CONN
CAVITY NUMBER



TITLE: INTERIOR LIGHTING (LH DRIVE)		APPROVED		UPDATES	ISSUE
		CHECKED		INTRODUCTION OF EVORA S & AUTOMATIC	3
PROJECT: EVORA	DRG. No:	DRAWN			
SHEET:D7A	ISSUE LEVEL: PR	FIRST RELEASE DATE	13JAN10		

CONN NAME
MAIN/ENGINE
MALE CONN
3
FEMALE CONN
CAVITY NUMBER

UPDATED 21ST AUGUST 2012 - SEE D7A UPDATE ON NEXT PAGE FOR '12MY VIN CH_10630 ON WARDS FITTED WITH INTEVA DOOR LATCH SYSTEM

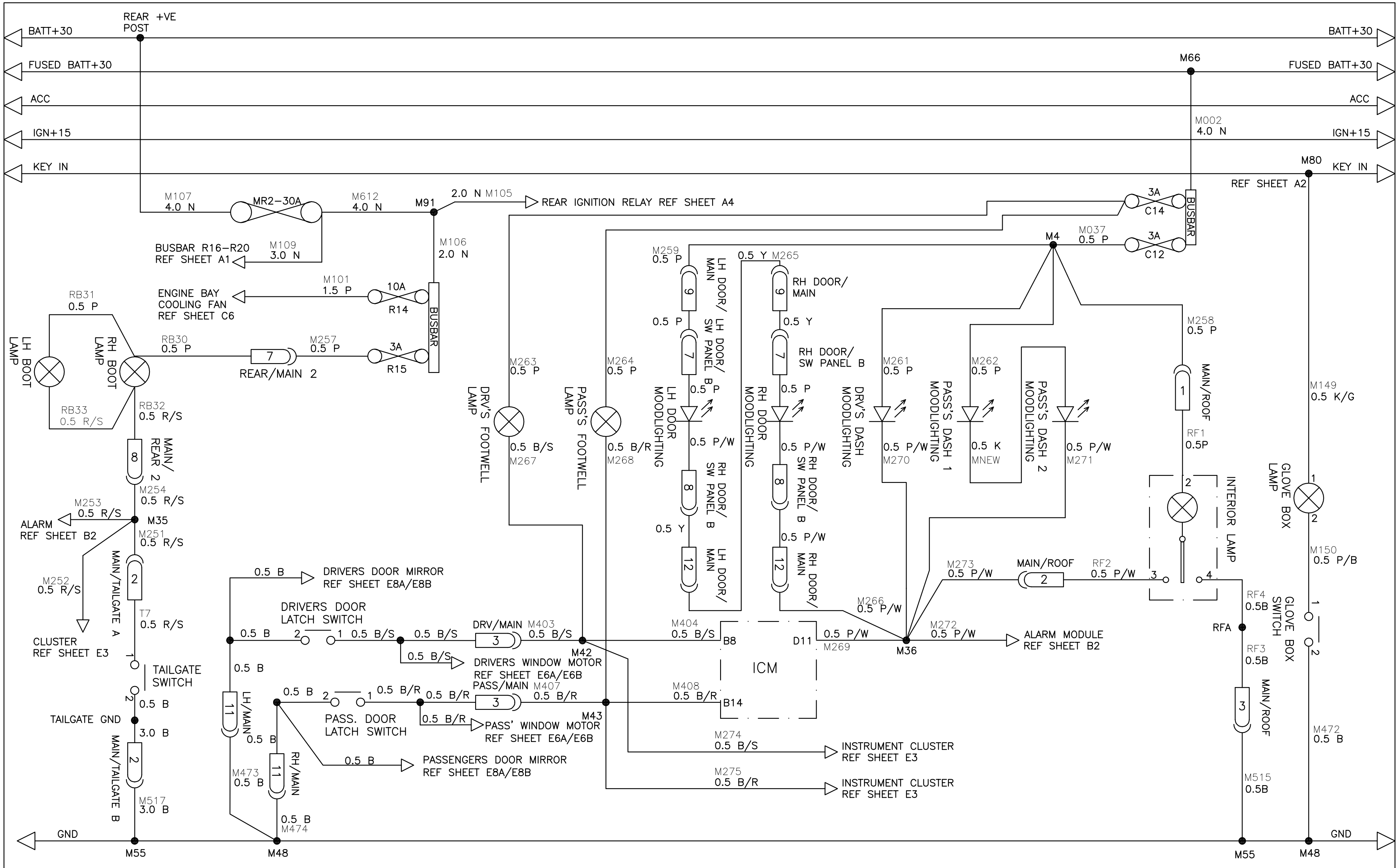


TITLE: INTERIOR LIGHTING (LH DRIVE)		APPROVED		UPDATES	ISSUE
		CHECKED		NEW DOOR & SWITCH PANEL HARNESSES	1
PROJECT: EVORA	DRG. No:	DRAWN		INTRODUCED MAY 2012	
SHEET:D7A UPDATE	ISSUE LEVEL: 1	FIRST RELEASE DATE	22MAY2012	(DOOR MOOD LIGHTING CIRCUITS)	

CONN NAME
MAIN/ENGINE
MALE CONN
3
FEMALE CONN
CAVITY NUMBER

UPDATED 21ST AUGUST 2012

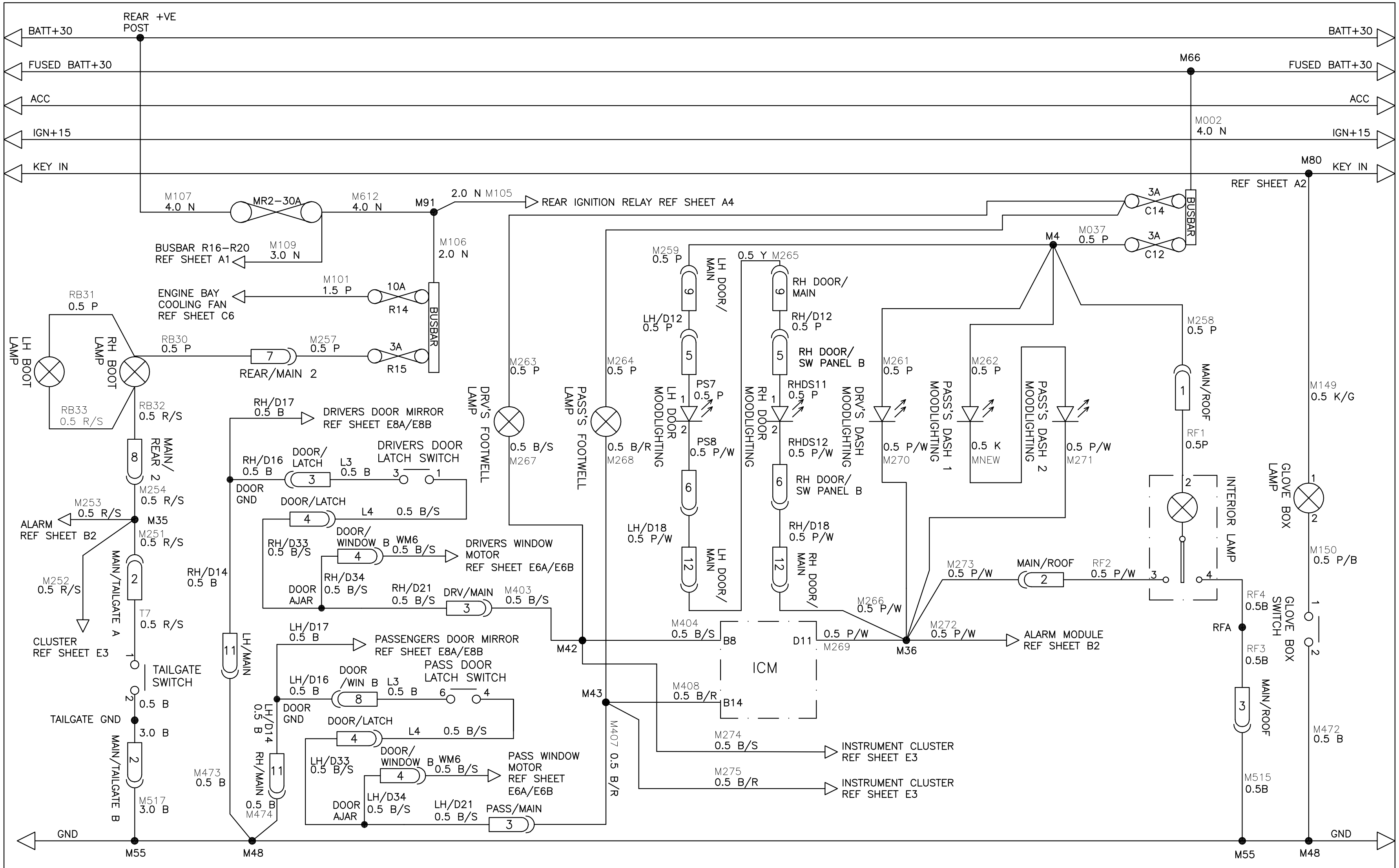
SEE D7A ON PREVIOUS PAGE FOR DOOR LATCH SYSTEM RIOR VIN '12MY CH_10630



TITLE: INTERIOR LIGHTING (RH DRIVE)		APPROVED		UPDATES	ISSUE
		CHECKED		INTRODUCTION OF EVORA S & AUTOMATIC	3
PROJECT: EVORA	DRG. No:	DRAWN			
SHEET:D7B	ISSUE LEVEL: PR	FIRST RELEASE DATE	13JAN10		

CONN NAME
MAIN/ENGINE
MALE CONN
FEMALE CONN
CAVITY NUMBER

UPDATED 21ST AUGUST 2012 - SEE D7B UPDATE ON NEXT PAGE FOR '12MY VIN CH_10630 ON WARDS FITTED WITH INTEVA DOOR LATCH SYSTEM

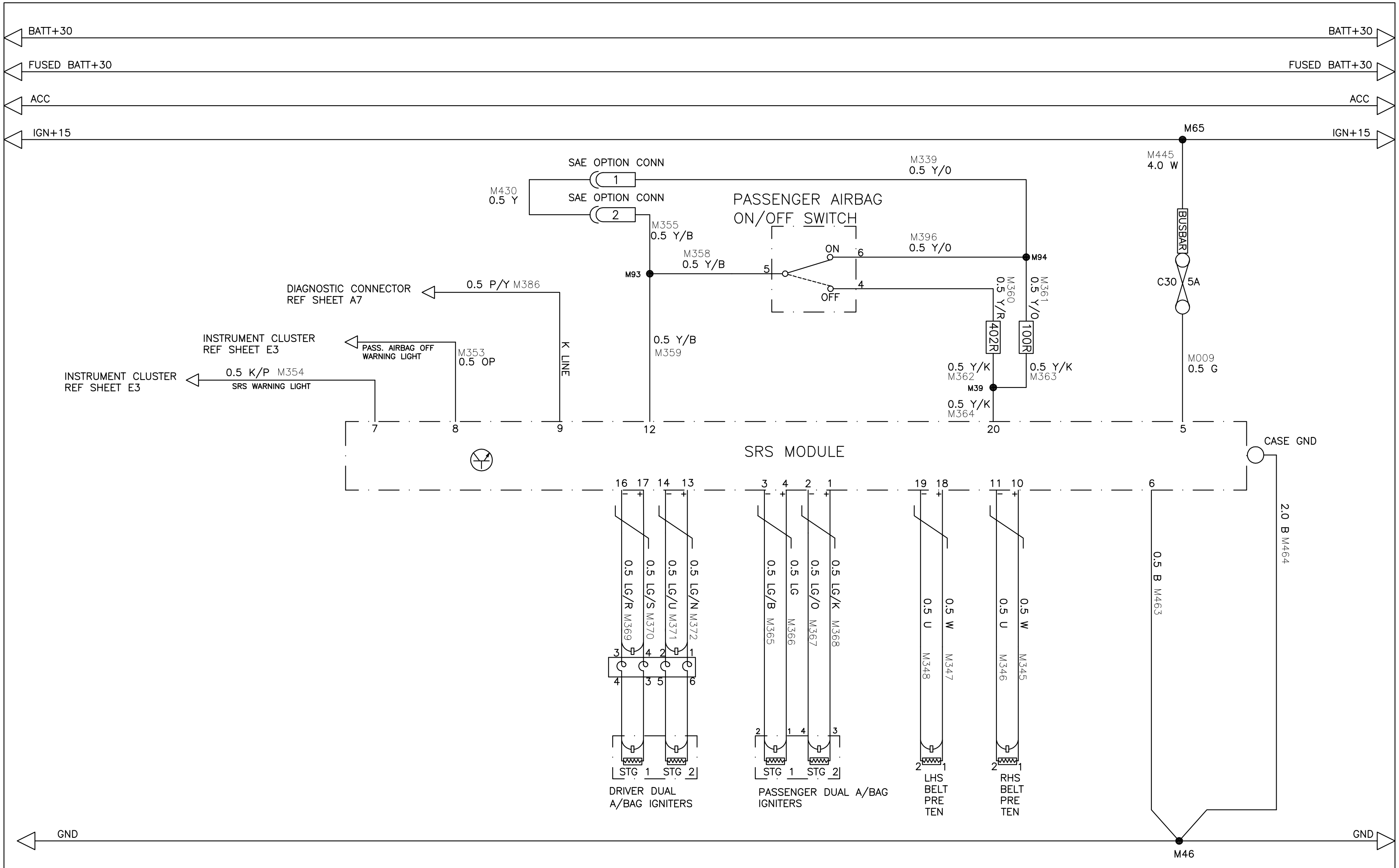


TITLE: INTERIOR LIGHTING (RH DRIVE)		APPROVED		UPDATES	ISSUE
		CHECKED		NEW DOOR & SWITCH PANEL HARNESSES	1
PROJECT: EVORA	DRG. No:	DRAWN		INTRODUCED MAY 2012	
SHEET:D7B UPDATE	ISSUE LEVEL: PR	FIRST RELEASE DATE	18JUL11	(DOOR MOOD LIGHTING CIRCUITS)	

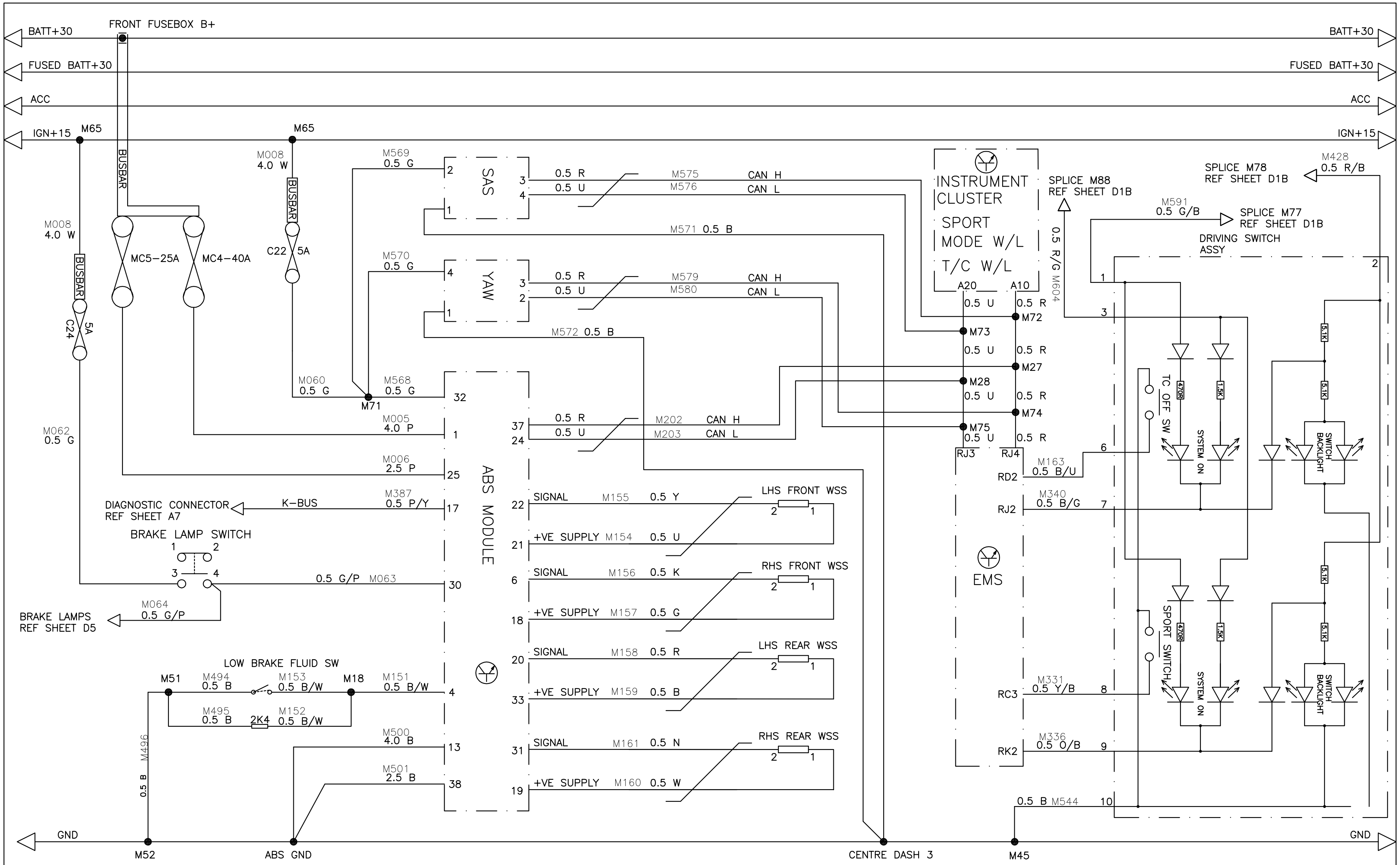
CONN NAME
MAIN/ENGINE
MALE CONN
FEMALE CONN
CAVITY NUMBER

UPDATED 21ST AUGUST 2012

SEE D7B ON PREVIOUS PAGE FOR DOOR LATCH SYSTEM RIOR VIN '12MY CH_10630

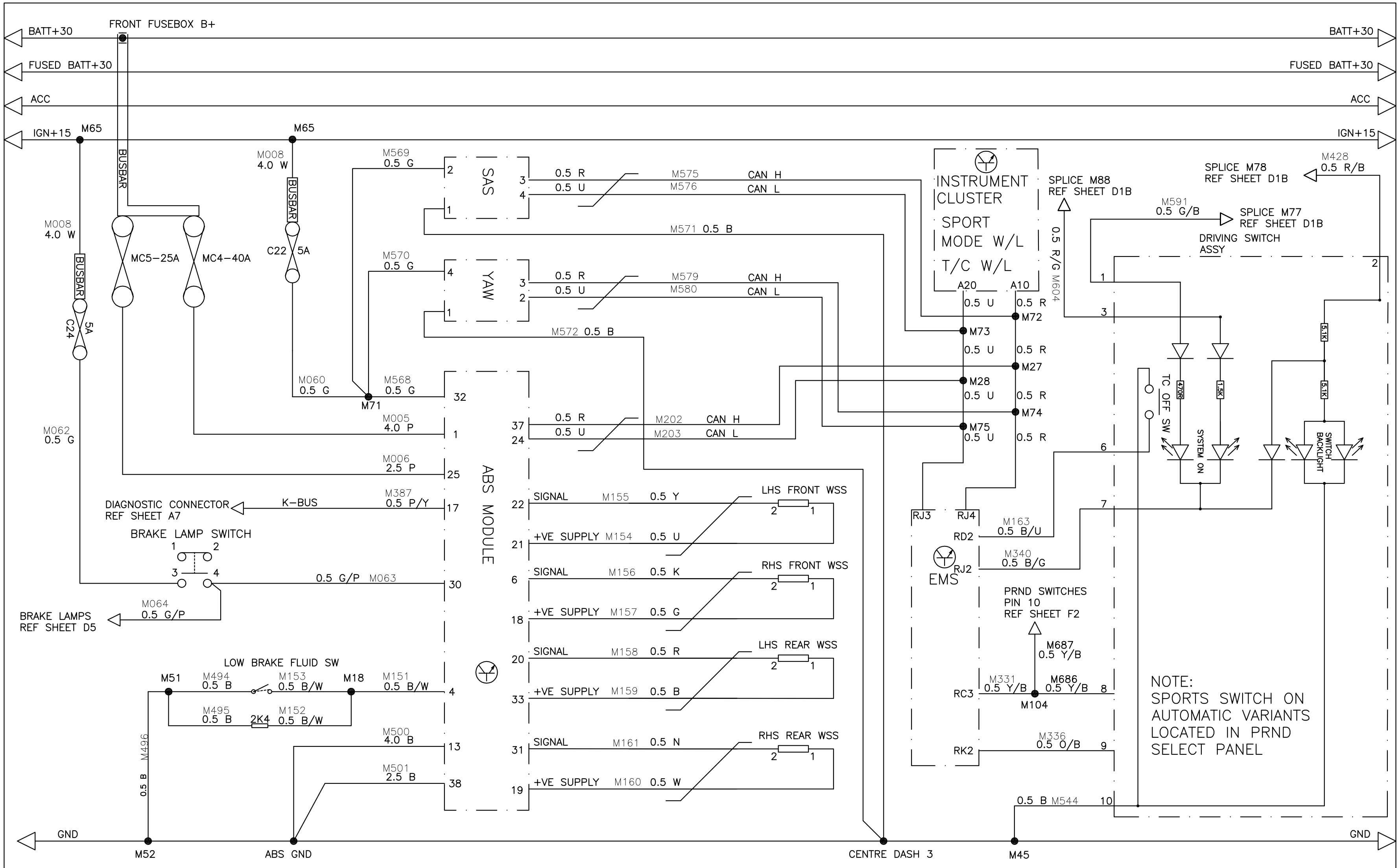


TITLE: SRS SYSTEM		APPROVED		UPDATES	ISSUE
		CHECKED		INTRODUCTION OF EVORA S & AUTOMATIC	3
PROJECT: EVORA	DRG. No:	DRAWN			
SHEET:E1	ISSUE LEVEL: PR	FIRST RELEASE DATE	13JAN10		

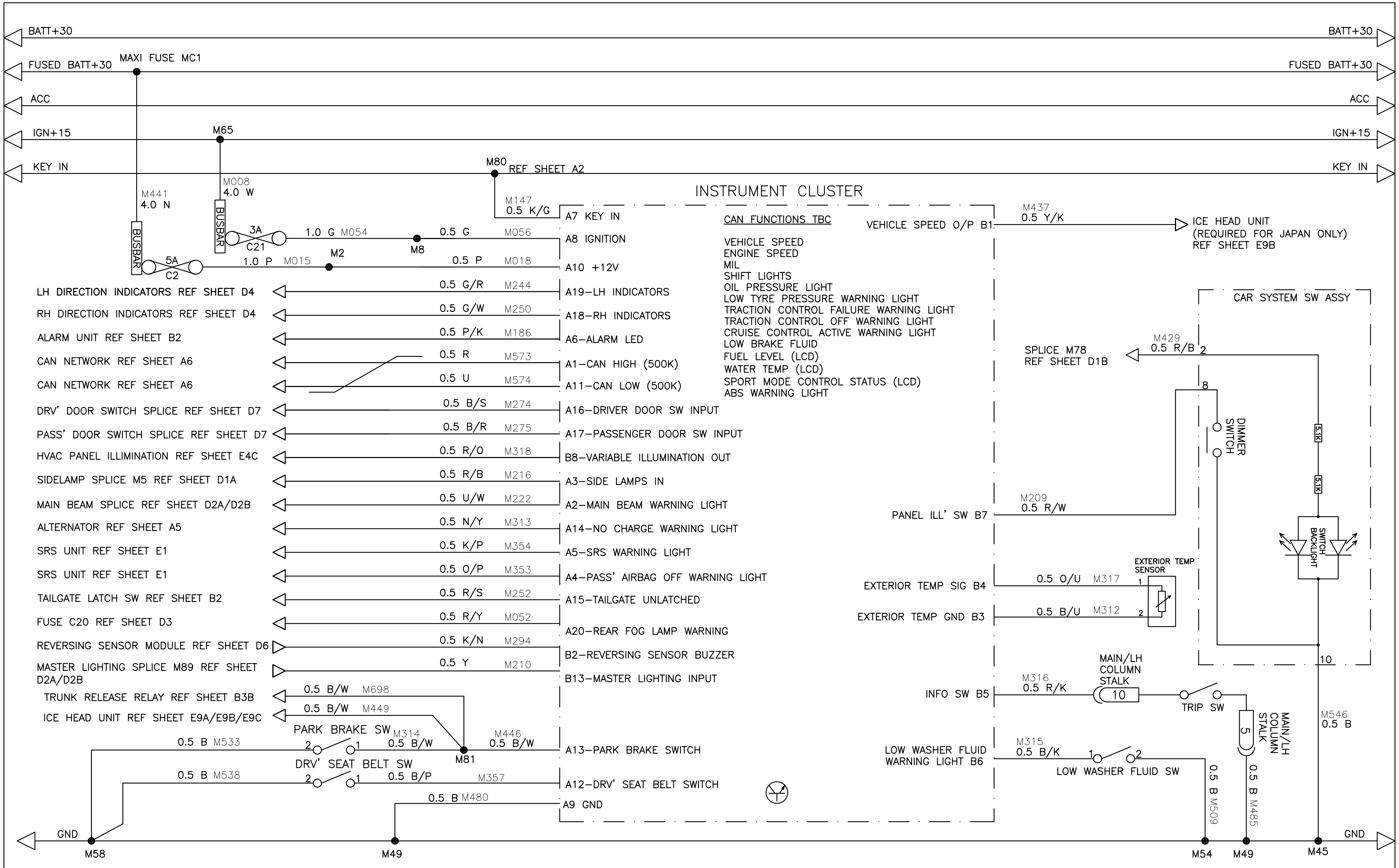


TITLE: ABS SYSTEM, TRACTION CONTROL & SPORT MODE MANUAL VEHICLES		APPROVED		UPDATES	ISSUE
		CHECKED		INTRODUCTION OF EVORA S & AUTOMATIC	3
PROJECT: EVORA	DRG. No:	DRAWN			
SHEET:E2A	ISSUE LEVEL: PR	FIRST RELEASE DATE	13JAN10		

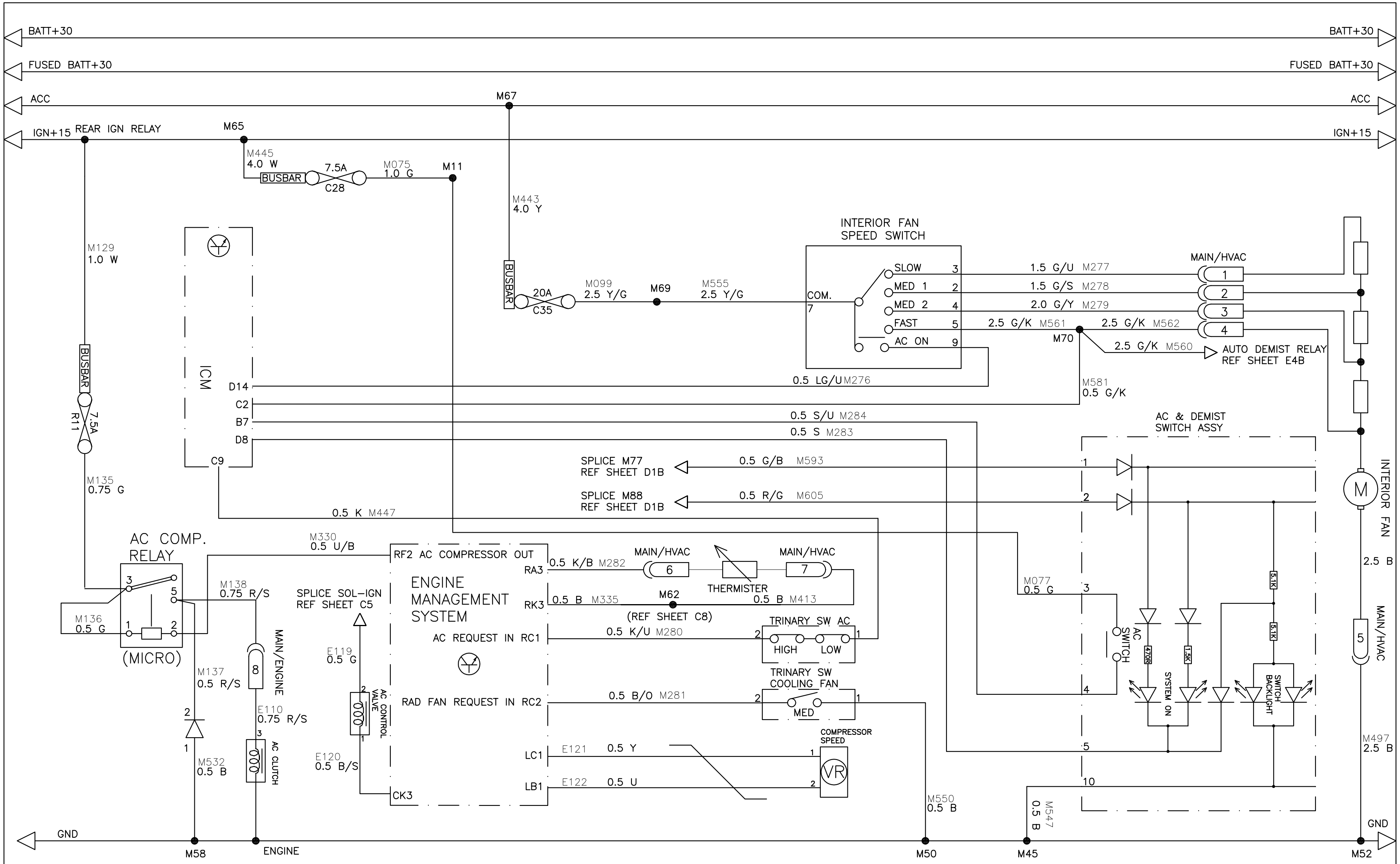
CONN NAME
MAIN/ENGINE
MALE CONN
3
FEMALE CONN
CAVITY NUMBER



TITLE: ABS SYSTEM, TRACTION CONTROL & SPORT MODE AUTOMATIC VEHICLES		APPROVED		UPDATES	ISSUE	CONN NAME
		CHECKED		INTRODUCTION OF EVORA S & AUTOMATIC	3	MAIN/ENGINE
PROJECT: EVORA	DRG. No:	DRAWN				MALE CONN 3 FEMALE CONN
SHEET:E2B	ISSUE LEVEL: PR	FIRST RELEASE DATE	11MAR10			CAVITY NUMBER

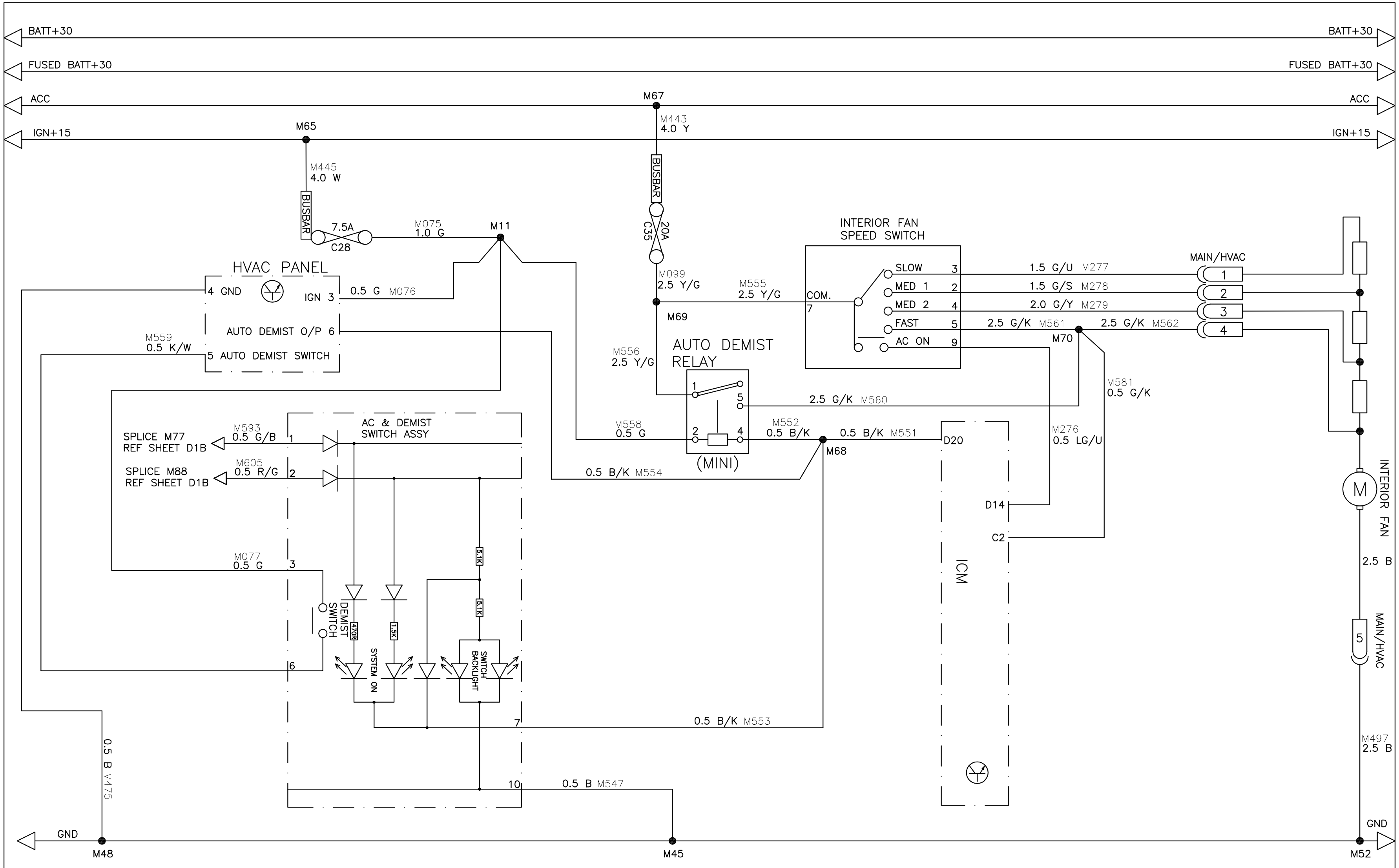


TITLE: INSTRUMENT CLUSTER		APPROVED		UPDATES	ISSUE
		CHECKED		INTRODUCTION OF EVORA S & AUTOMATIC	3
PROJECT: EVORA	DRG. No:	DRAWN			
SHEET:E3	ISSUE LEVEL: PR	FIRST RELEASE DATE	13JAN10		

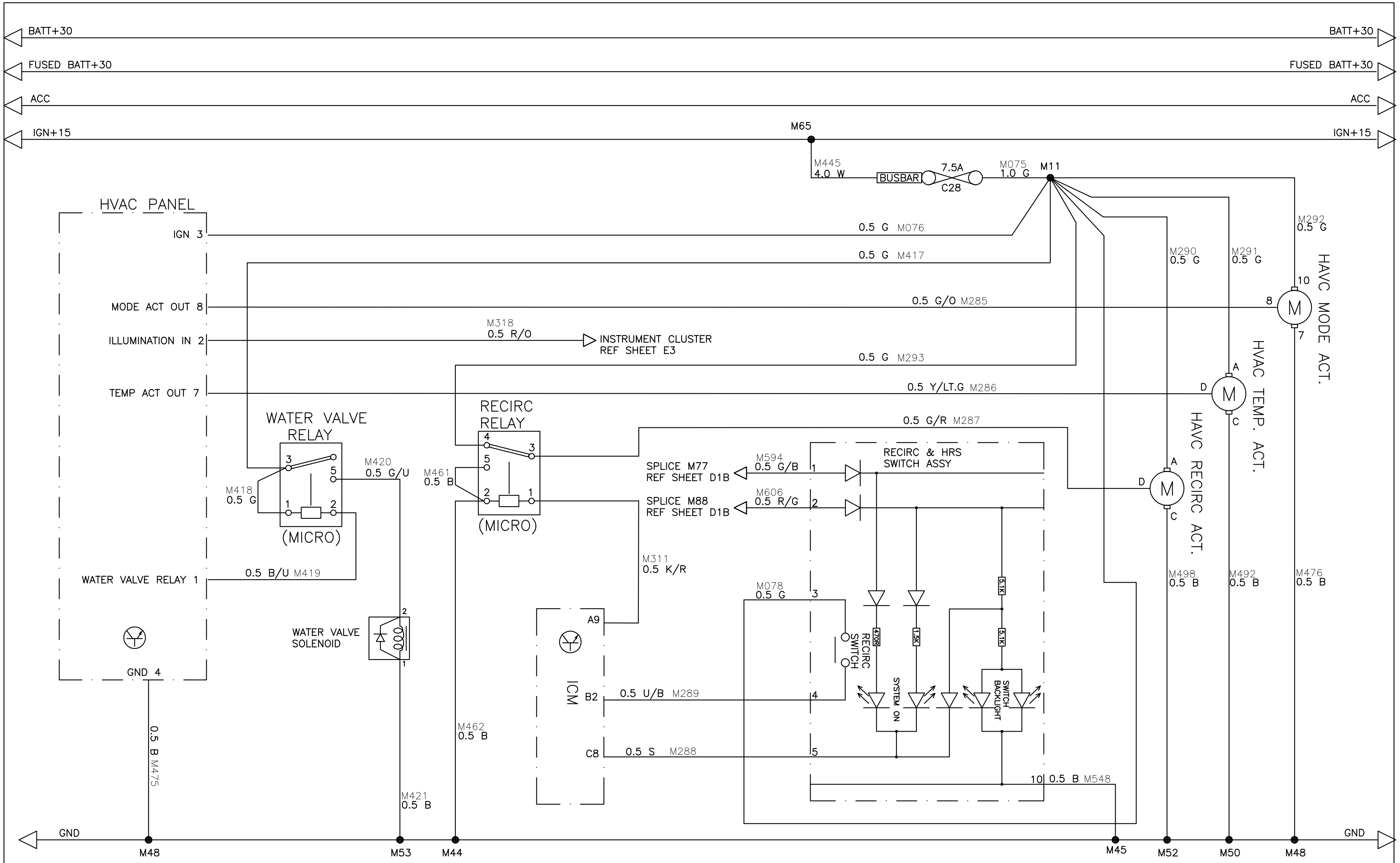


TITLE: HVAC PART 1	APPROVED		UPDATES	ISSUE
	CHECKED		INTRODUCTION OF EVORA S & AUTOMATIC	3
PROJECT: EVORA / DRG. No:	DRAWN			
SHEET:E4A / ISSUE LEVEL: PR	FIRST RELEASE DATE	13JAN10		

CONN NAME
MAIN/ENGINE
MALE CONN
3
FEMALE CONN
CAVITY NUMBER

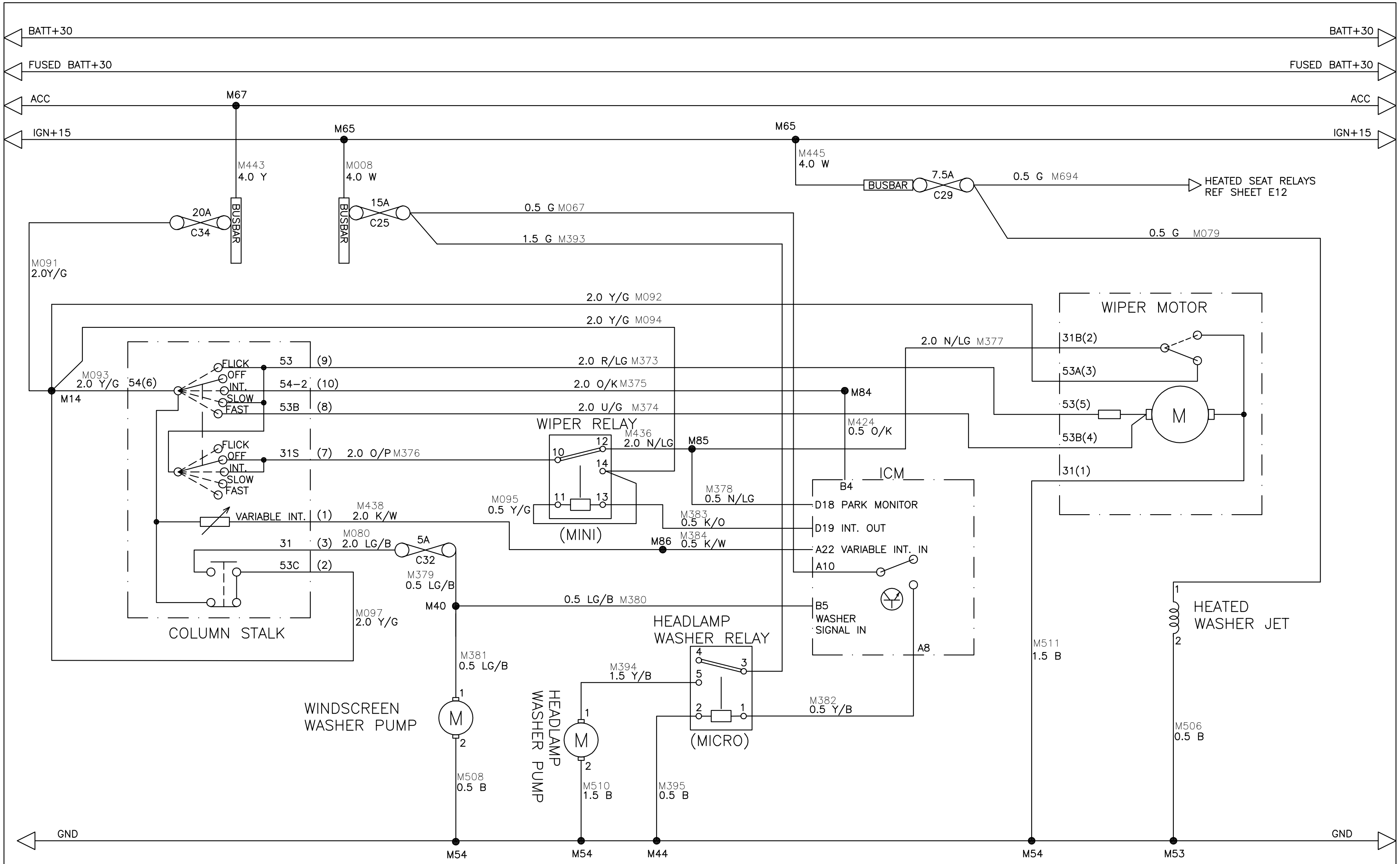


TITLE: HVAC PART 2		APPROVED		UPDATES	ISSUE	CONN NAME
		CHECKED		INTRODUCTION OF EVORA S & AUTOMATIC	3	MAIN/ENGINE
PROJECT: EVORA	DRG. No:	DRAWN				MALE CONN 3 FEMALE CONN
SHEET:E4B	ISSUE LEVEL: PR	FIRST RELEASE DATE	13JAN10			CAVITY NUMBER

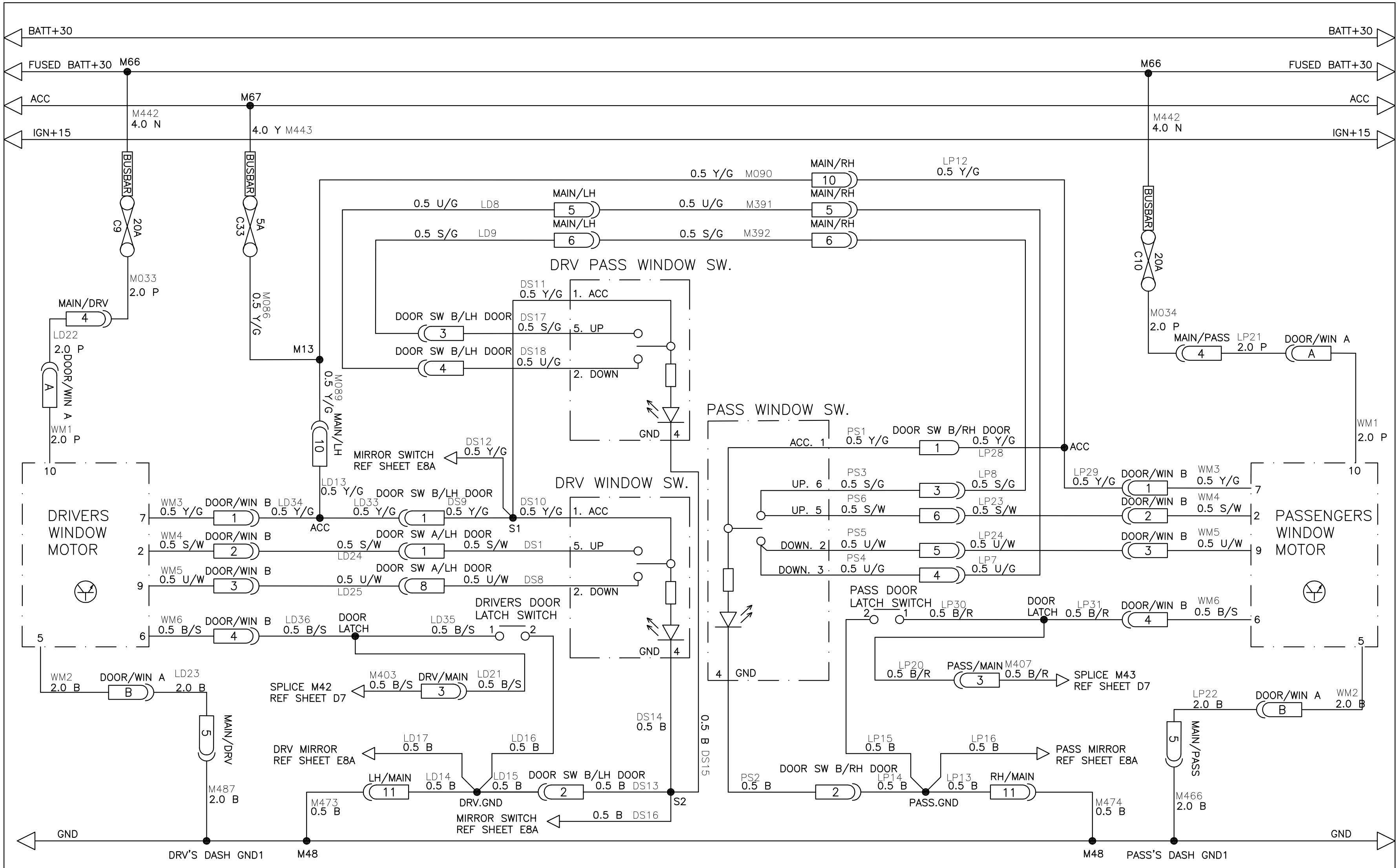


TITLE: HVAC PART 3		APPROVED		UPDATES	ISSUE
		CHECKED		INTRODUCTION OF EVORA S & AUTOMATIC	3
PROJECT: EVORA	DRG. No:	DRAWN			
SHEET:E4C	ISSUE LEVEL: PR	FIRST RELEASE DATE	13JAN10		

CONN NAME
MAIN/ENGINE
MALE CONN
3
FEMALE CONN
CAVITY NUMBER



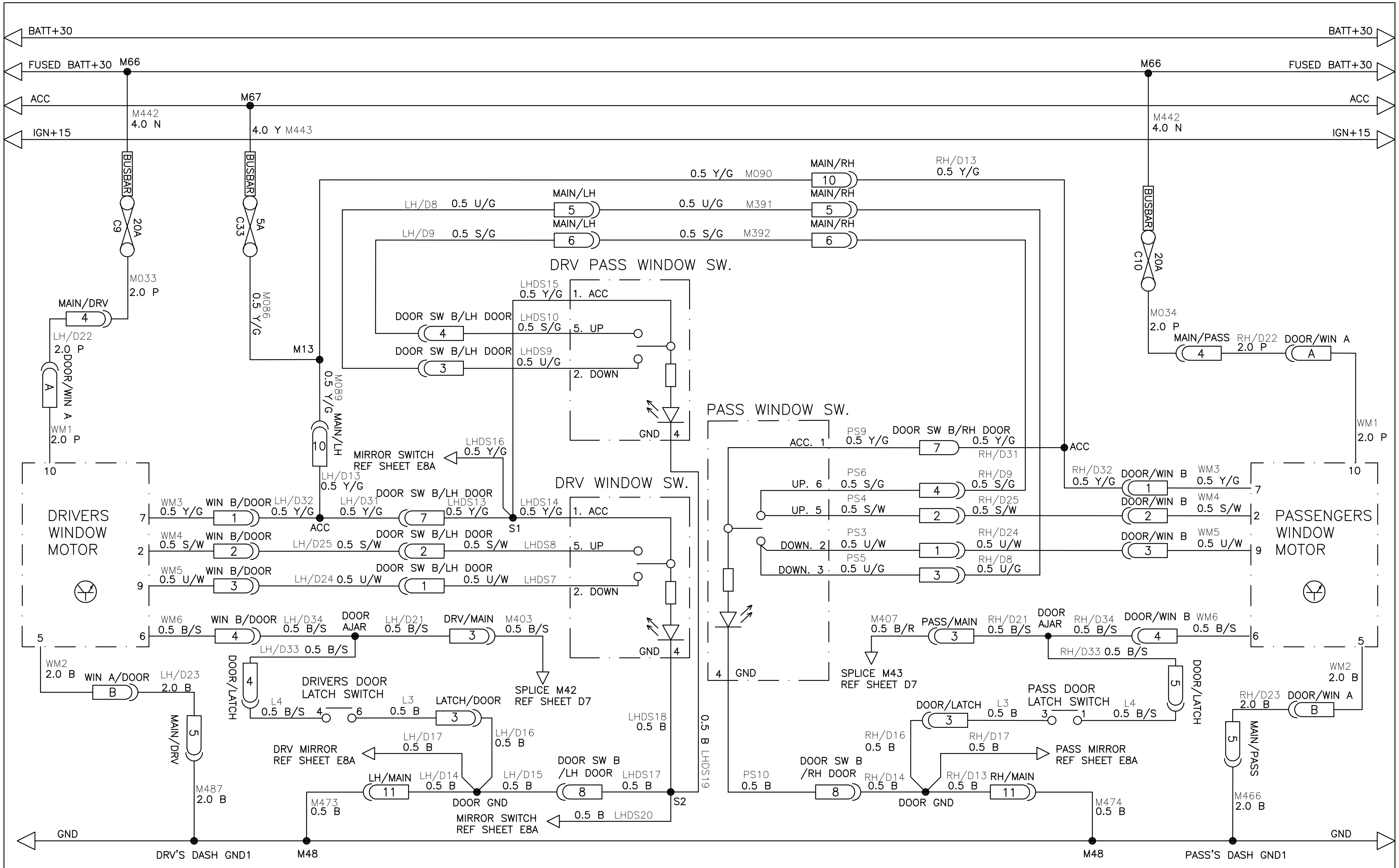
TITLE: WASH WIPE SYSTEM, POWER WASH & HEATED JETS		APPROVED		UPDATES	ISSUE
		CHECKED		INTRODUCTION OF EVORA S & AUTOMATIC	3
PROJECT: EVORA	DRG. No:	DRAWN			
SHEET:E5	ISSUE LEVEL: PR	FIRST RELEASE DATE	13JAN10		



TITLE: WINDOW LIFT WITH ACTIVE GLASS (LH DRIVE)		APPROVED		UPDATES	ISSUE
		CHECKED		INTRODUCTION OF EVORA S & AUTOMATIC	3
PROJECT: EVORA	DRG. No:	DRAWN			
SHEET:E6A	ISSUE LEVEL: PR	FIRST RELEASE DATE	13JAN10		

CONN NAME
MAIN/ENGINE
MALE CONN
3
FEMALE CONN
CAVITY NUMBER

UPDATED 21ST AUGUST 2012 - SEE E6A UPDATE ON NEXT PAGE FOR '12MY VIN CH_10630 ON WARDS FITTED WITH INTEVA DOOR LATCH SYSTEM

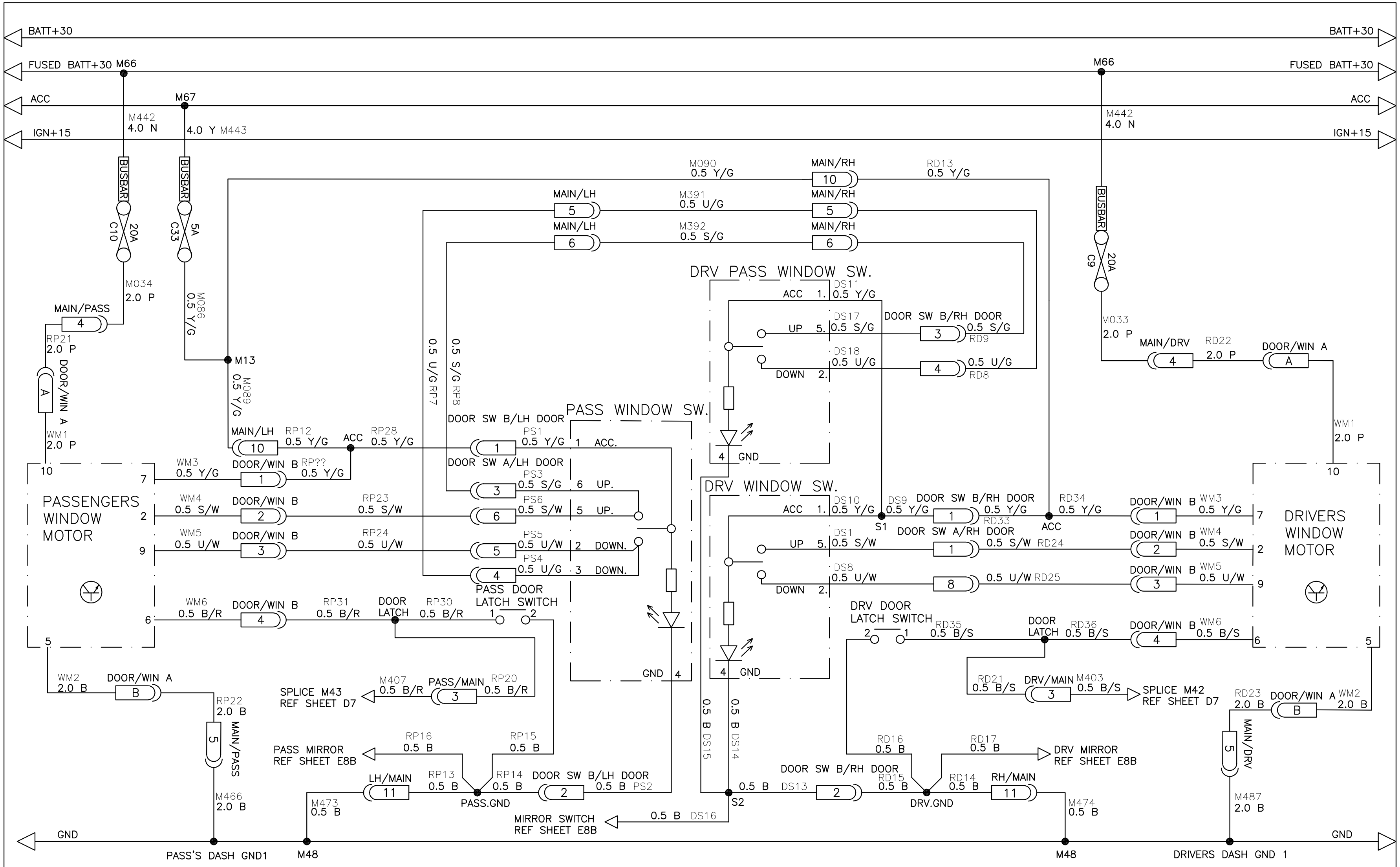


TITLE: WINDOW LIFT WITH ACTIVE GLASS (LH DRIVE)		APPROVED		UPDATES	ISSUE
		CHECKED		NEW DOOR & SWITCH PANEL HARNESSES	1
PROJECT: EVORA	DRG. No:	DRAWN		INTRODUCED MAY 2012	
SHEET:E6A UDATE	ISSUE LEVEL: 1	FIRST RELEASE DATE	22MAY2012		

CONN NAME MAIN/ENGINE; MALE CONN; FEMALE CONN; CAVITY NUMBER

UPDATED 21ST AUGUST 2012

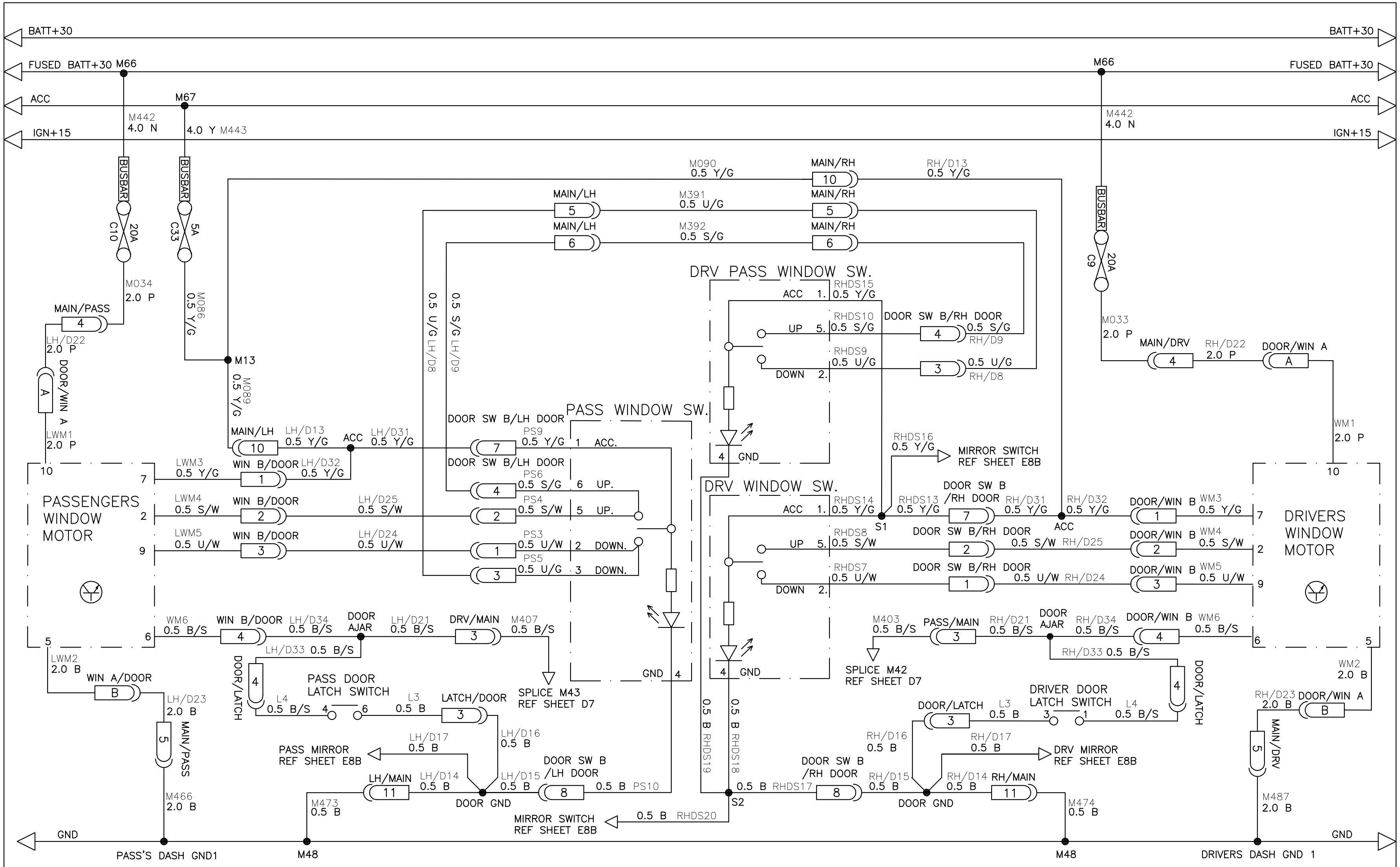
SEE E6A ON PREVIOUS PAGE FOR DOOR LATCH SYSTEM RIOR VIN '12MY CH_10630



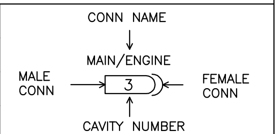
TITLE: WINDOW LIFT WITH ACTIVE GLASS (RH DRIVE)	APPROVED		UPDATES	ISSUE
	CHECKED		INTRODUCTION OF EVORA S & AUTOMATIC	3
PROJECT: EVORA / DRG. No:	DRAWN			
SHEET:E6B / ISSUE LEVEL: PR	FIRST RELEASE DATE	13JAN10		

CONN NAME
MAIN/ENGINE
MALE CONN
3
FEMALE CONN
CAVITY NUMBER

UPDATED 21ST AUGUST 2012 - SEE E6B UPDATE ON NEXT PAGE FOR '12MY VIN CH_10630 ON WARDS FITTED WITH INTEVA DOOR LATCH SYSTEM

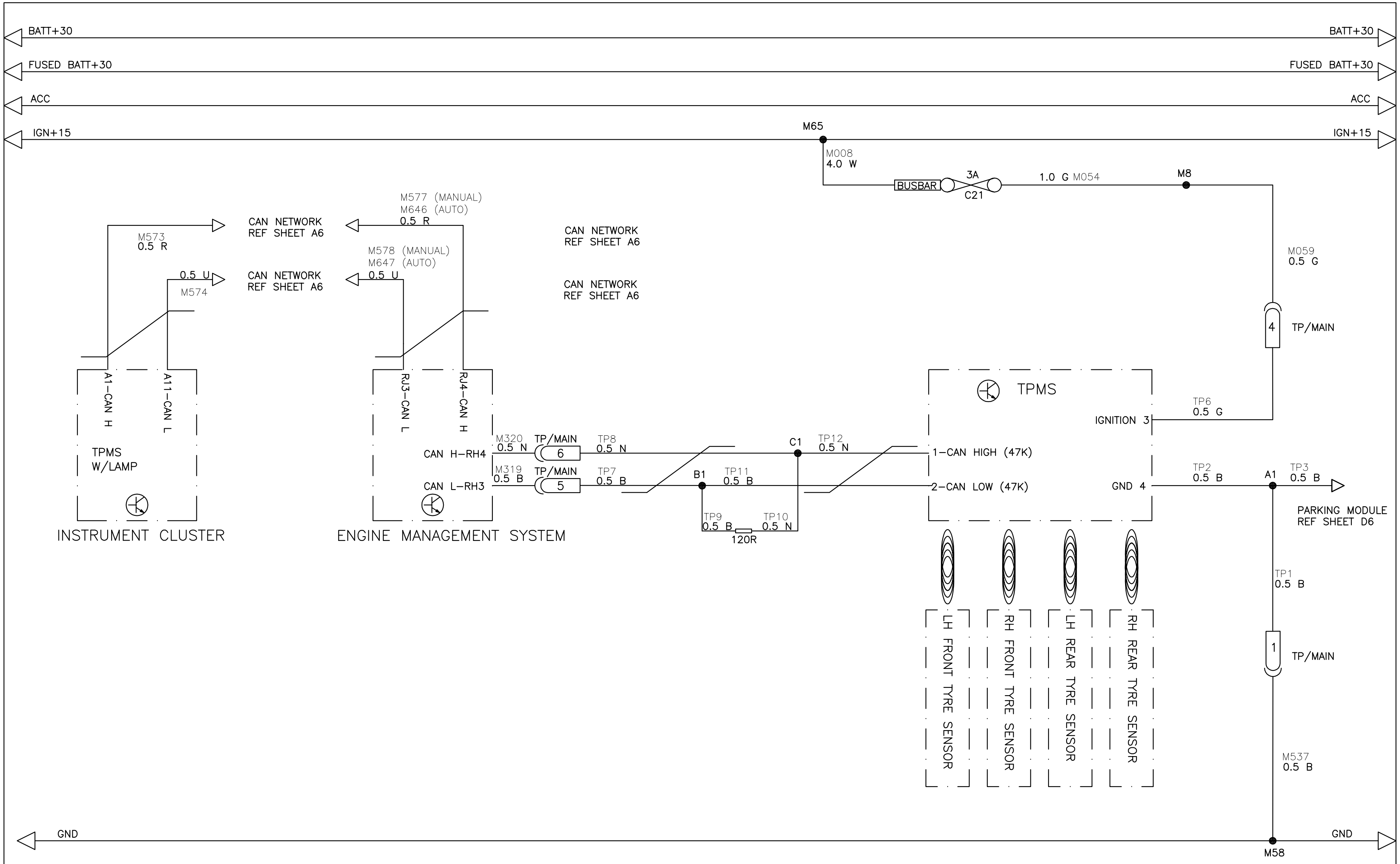


TITLE: WINDOW LIFT WITH ACTIVE GLASS (RH DRIVE)		APPROVED		UPDATES	ISSUE
		CHECKED		NEW DOOR & SWITCH PANEL HARNESSES	1
PROJECT: EVORA	DRG. No:	DRAWN		INTRODUCED MAY 2012	
SHEET:E6B UPDATE	ISSUE LEVEL: 1	FIRST RELEASE DATE	22MAY2012		

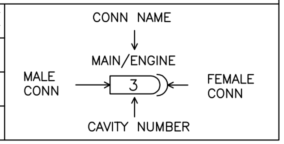


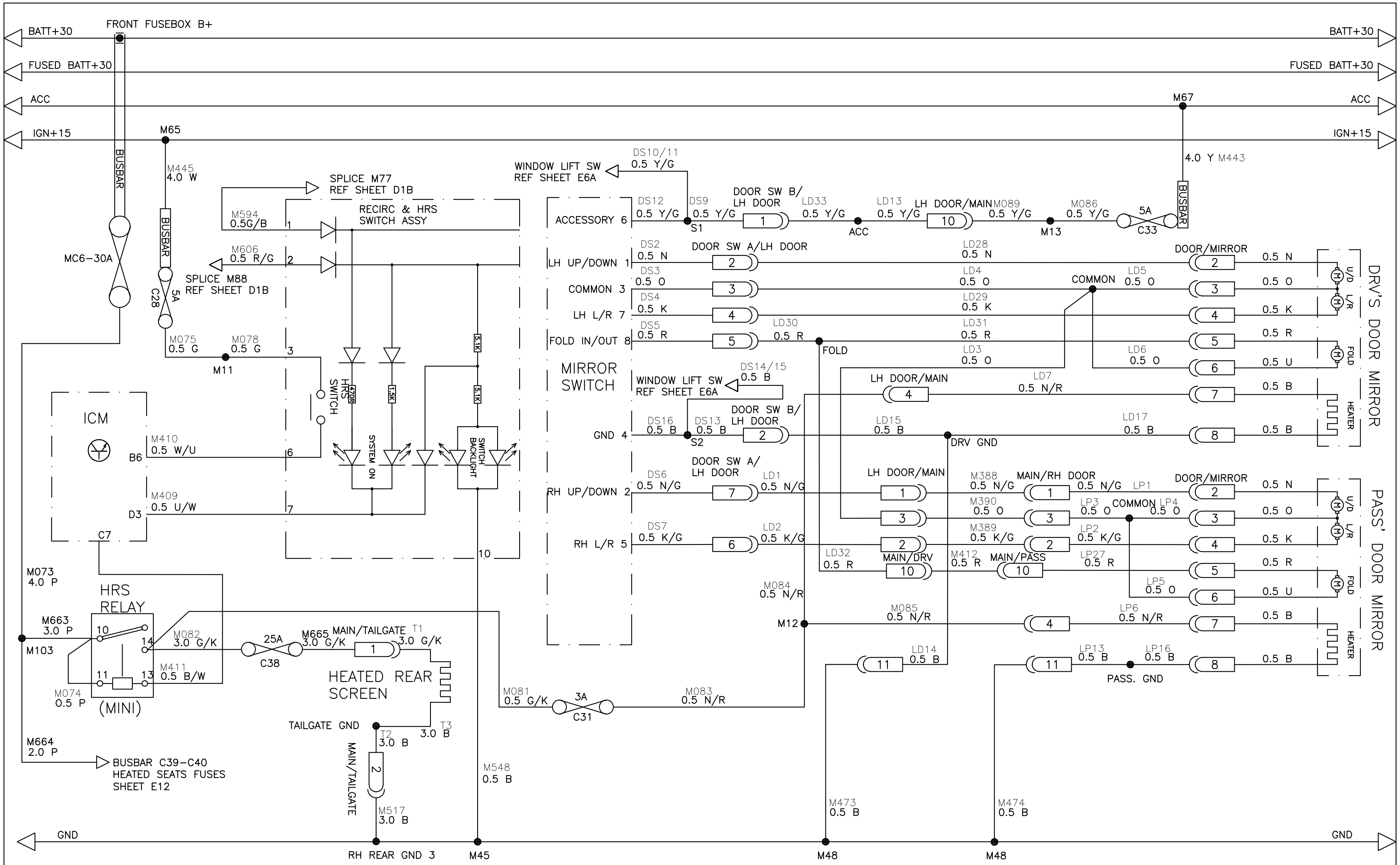
UPDATED 21ST AUGUST 2012

SEE E6B ON PREVIOUS PAGE FOR DOOR LATCH SYSTEM RIOR VIN '12MY CH_10630



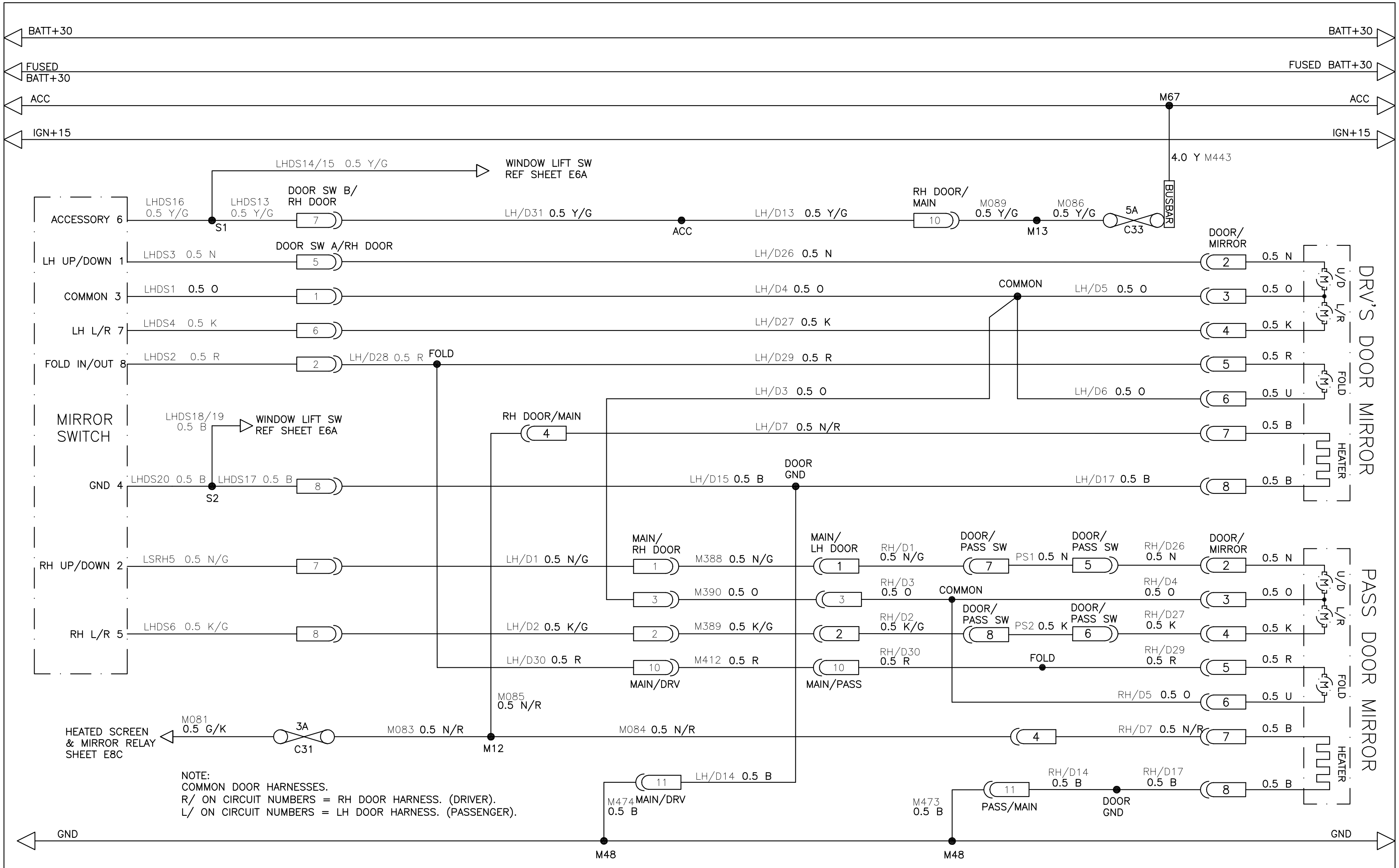
TITLE: TYRE PRESSURE MONITORING		APPROVED		UPDATES	ISSUE
		CHECKED		INTRODUCTION OF EVORA S & AUTOMATIC	3
PROJECT: EVORA	DRG. No:	DRAWN			
SHEET:E7	ISSUE LEVEL: PR	FIRST RELEASE DATE	13JAN10		





TITLE: ELECTRIC MIRRORS & HEATED REAR SCREEN (LH DRIVE)		APPROVED		UPDATES	ISSUE
		CHECKED		INTRODUCTION OF EVORA S & AUTOMATIC	3
PROJECT: EVORA	DRG. No:	DRAWN			
SHEET:E8A	ISSUE LEVEL: PR	FIRST RELEASE DATE	13JAN10		

UPDATED 21ST AUGUST 2012 - SEE E8A UPDATE ON NEXT PAGE FOR '12MY VIN CH_10630 ON WARDS FITTED WITH INTEVA DOOR LATCH SYSTEM

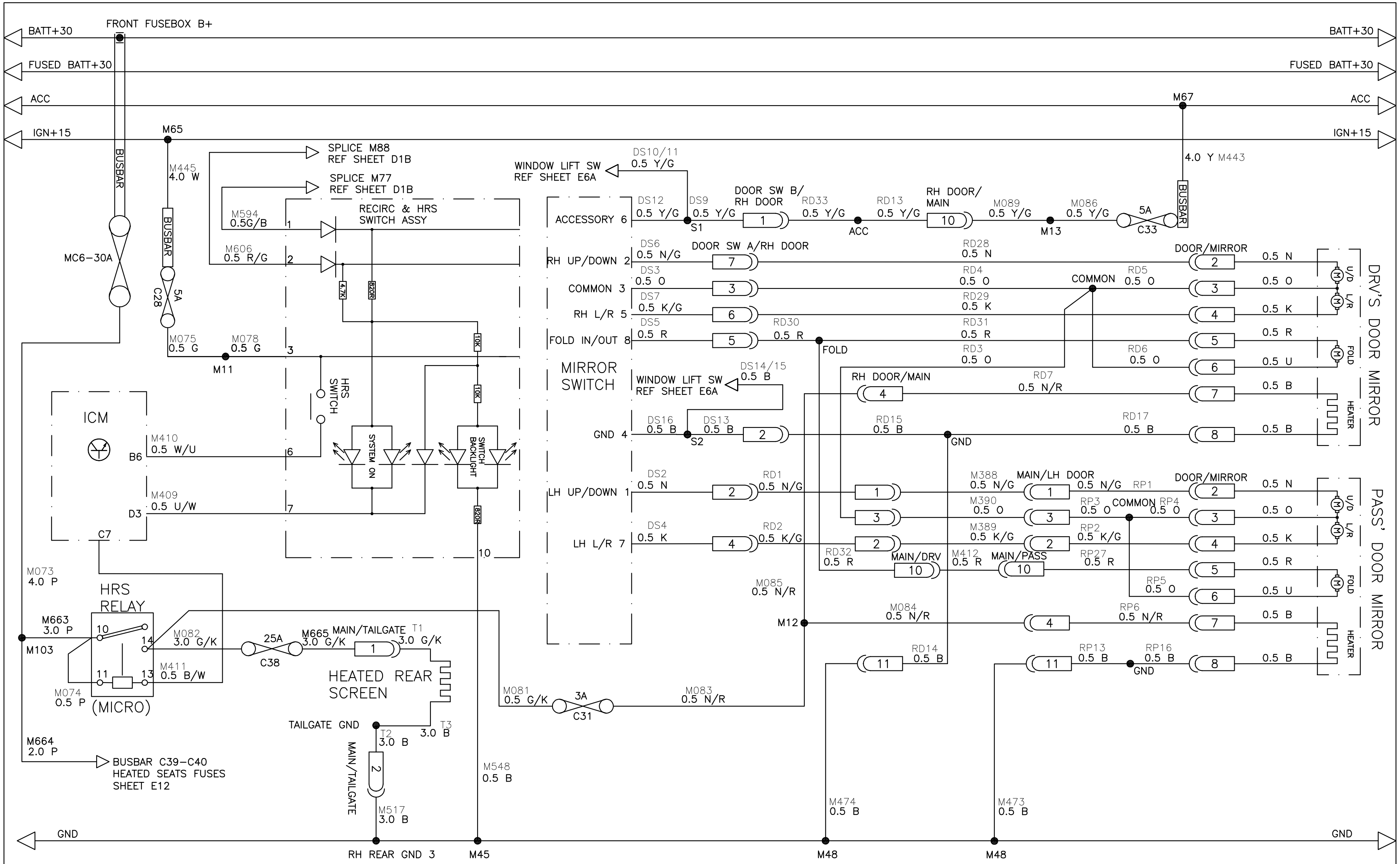


TITLE: ELECTRIC MIRRORS (LH DRIVE)		APPROVED		UPDATES	ISSUE
		CHECKED		NEW DOOR & SWITCH PANEL HARNESSES	1
PROJECT: EVORA	DRG. No:	DRAWN		INTRODUCED MAY 2012	
SHEET:E8A UPDATE	ISSUE LEVEL: 1	FIRST RELEASE DATE	22MAY2012		

CONN NAME
MAIN/ENGINE
MALE CONN
FEMALE CONN
CAVITY NUMBER

UPDATED 21ST AUGUST 2012

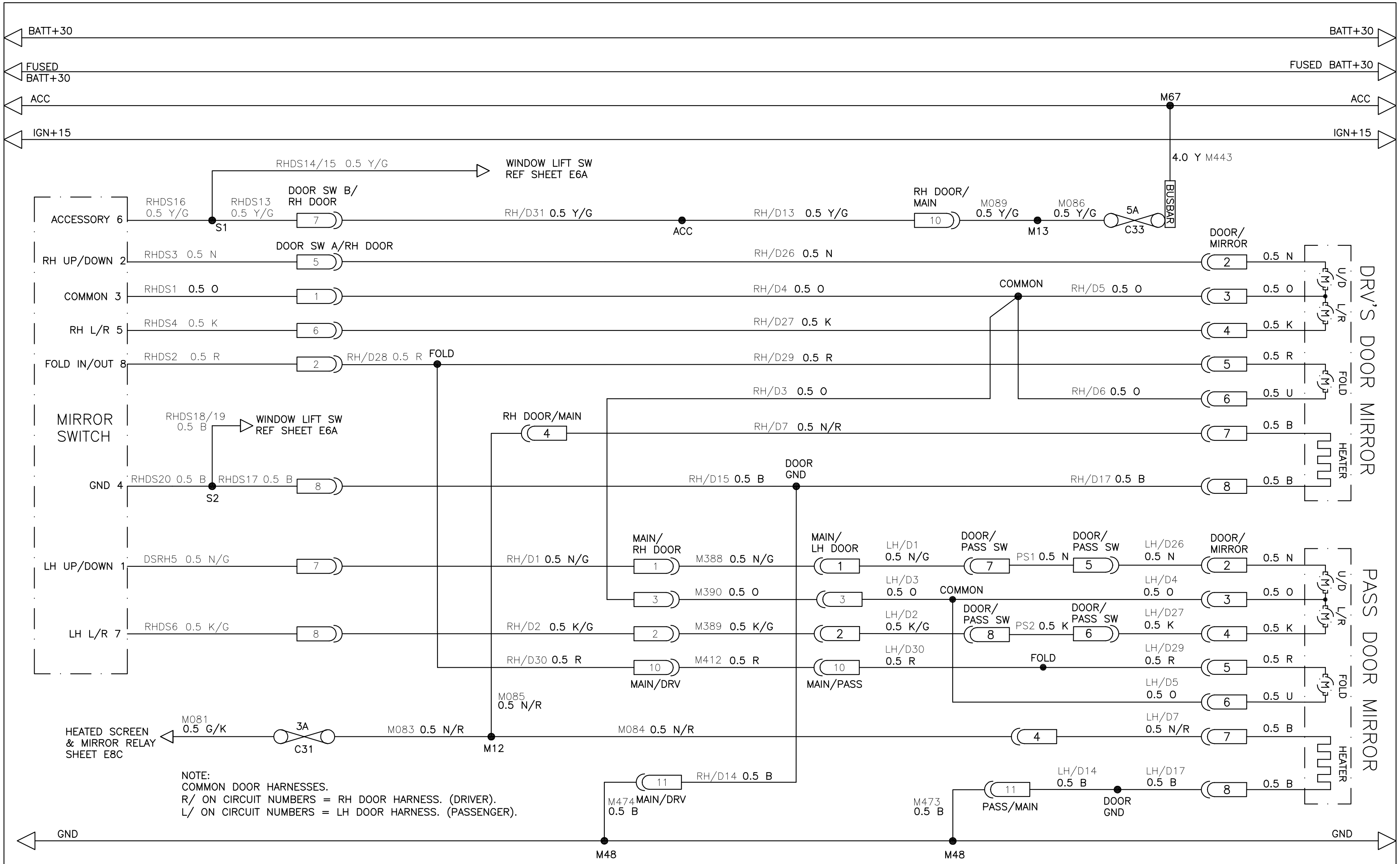
SEE E8A ON PREVIOUS PAGE FOR DOOR LATCH SYSTEM RIOR VIN '12MY CH_10630



TITLE: ELECTRIC MIRRORS & HEATED REAR SCREEN (RH DRIVE)		APPROVED		UPDATES	ISSUE
		CHECKED		INTRODUCTION OF EVORA S & AUTOMATIC	3
PROJECT: EVORA	DRG. No:	DRAWN			
SHEET:E8B	ISSUE LEVEL: PR	FIRST RELEASE DATE	10NOV09		

CONN NAME
MAIN/ENGINE
MALE CONN
3
FEMALE CONN
CAVITY NUMBER

UPDATED 21ST AUGUST 2012 - SEE E8B UPDATE ON NEXT PAGE FOR '12MY VIN CH_10630 ON WARDS FITTED WITH INTEVA DOOR LATCH SYSTEM

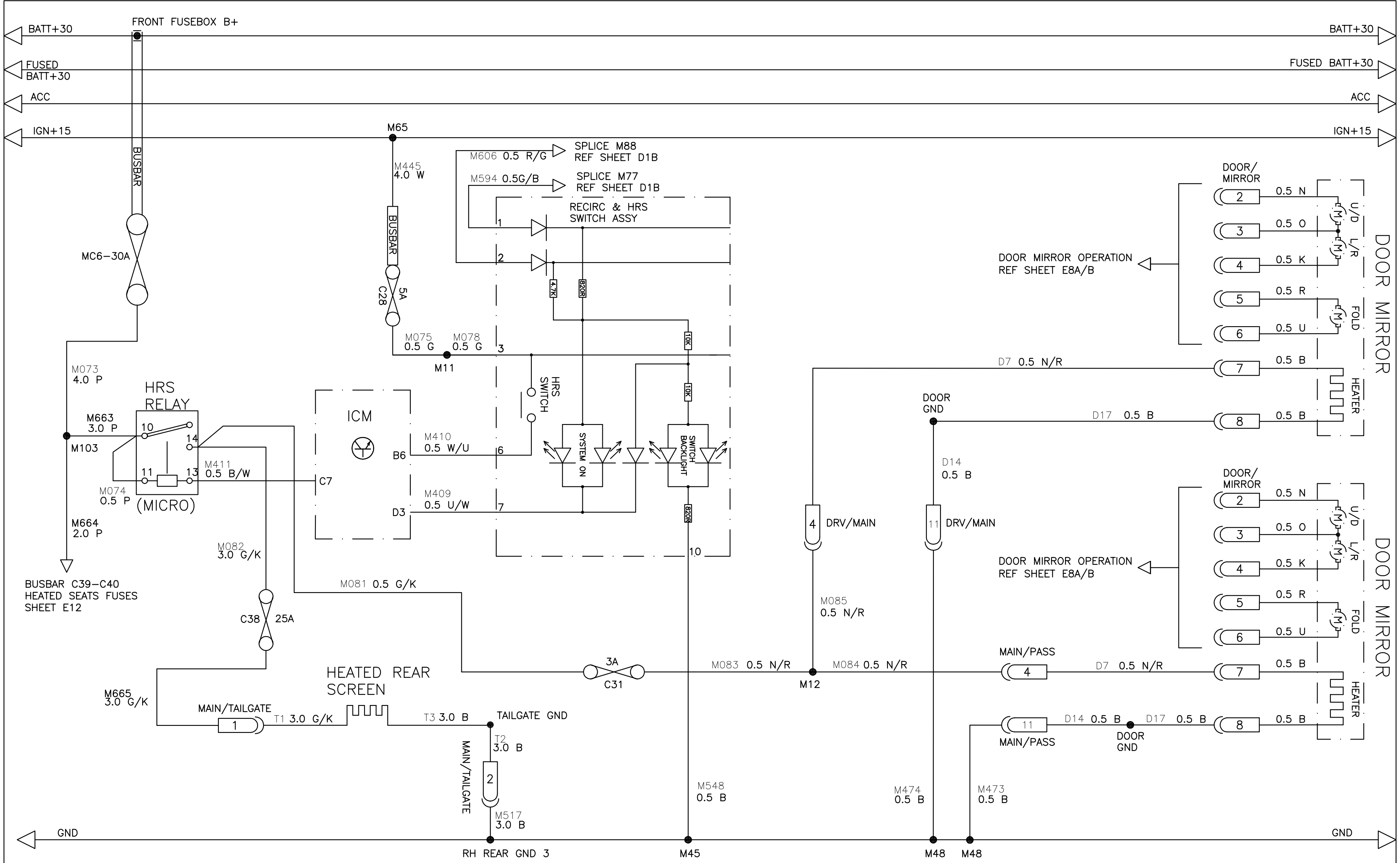


TITLE: ELECTRIC MIRRORS (RH DRIVE)		APPROVED		UPDATES	ISSUE
		CHECKED		NEW DOOR & SWITCH PANEL HARNESSES	1
PROJECT: EVORA	DRG. No:	DRAWN		INTRODUCED MAY 2012	
SHEET:E8B UPDATE	ISSUE LEVEL: 1	FIRST RELEASE DATE	22MAY2012		

CONN NAME
MAIN/ENGINE
MALE CONN
3
FEMALE CONN
CAVITY NUMBER

UPDATED 21ST AUGUST 2012

SEE E8B ON PREVIOUS PAGE FOR DOOR LATCH SYSTEM RIOR VIN '12MY CH_10630

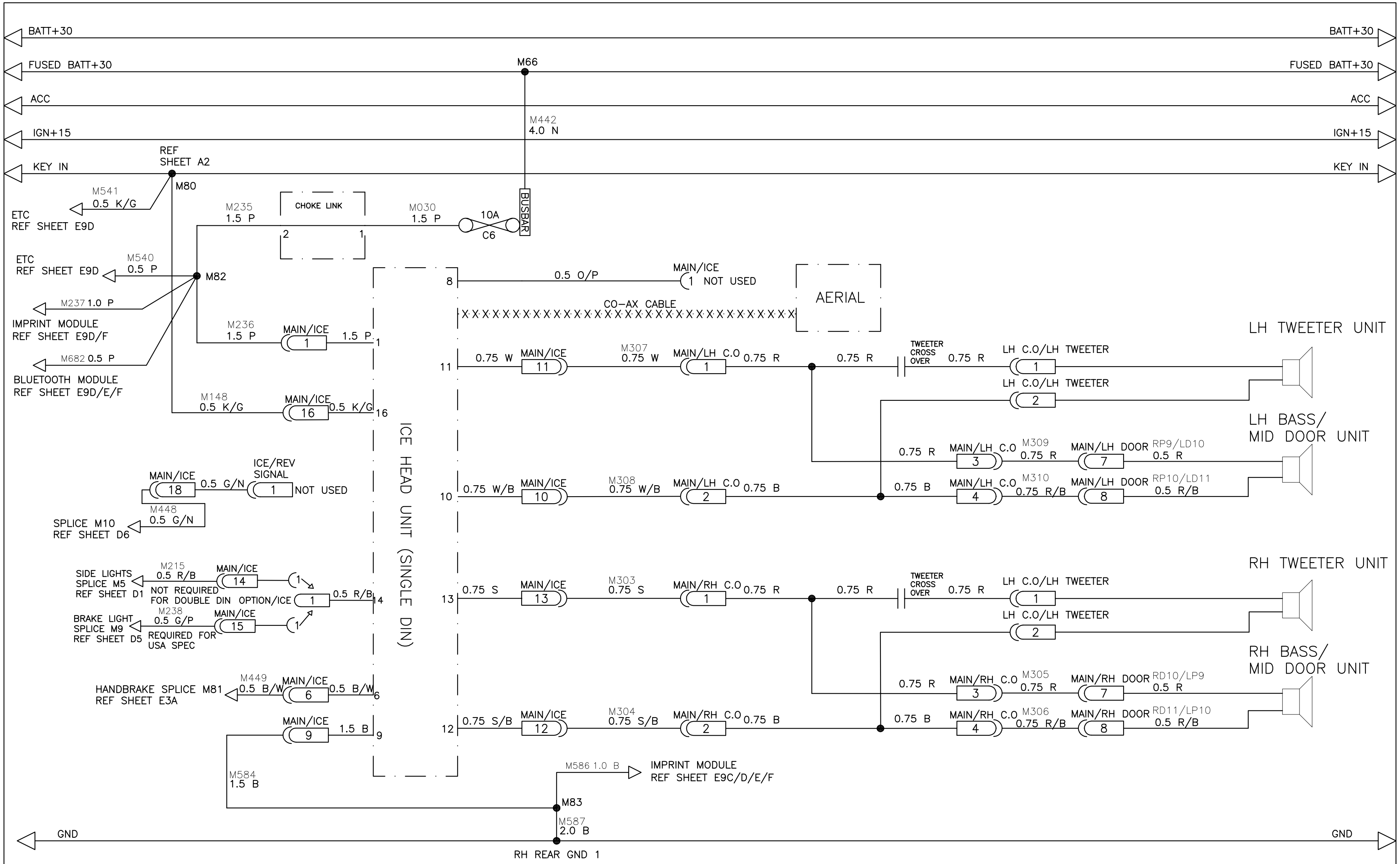


TITLE: HEATED REAR SCREEN & HEATED MIRRORS		APPROVED		UPDATES	ISSUE
		CHECKED		NEW DOOR & SWITCH PANEL HARNESSES	1
PROJECT: EVORA	DRG. No:	DRAWN		INTRODUCED MAY 2012	
SHEET:E8C	ISSUE LEVEL: 1	FIRST RELEASE DATE	22MAY2012	NEW SHEET COVERS HEATED MIRROR HEATERS & HRS	

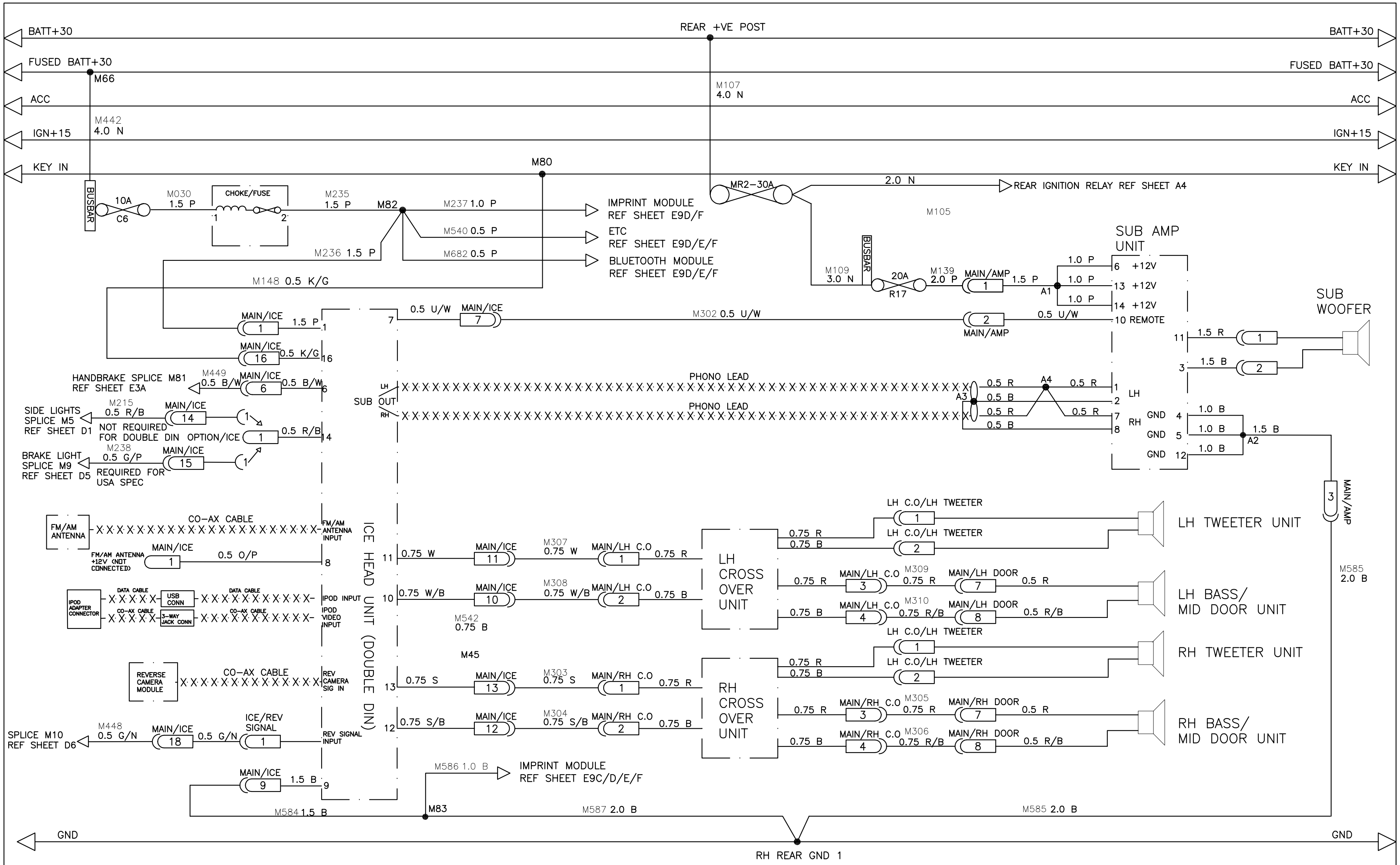
CONN NAME
MAIN/ENGINE
MALE CONN
FEMALE CONN
CAVITY NUMBER

UPDATED 21ST AUGUST 2012

SEE E8B & A ON PREVIOUS PAGES FOR DOOR LATCH SYSTEM RIOR VIN '12MY CH_10630

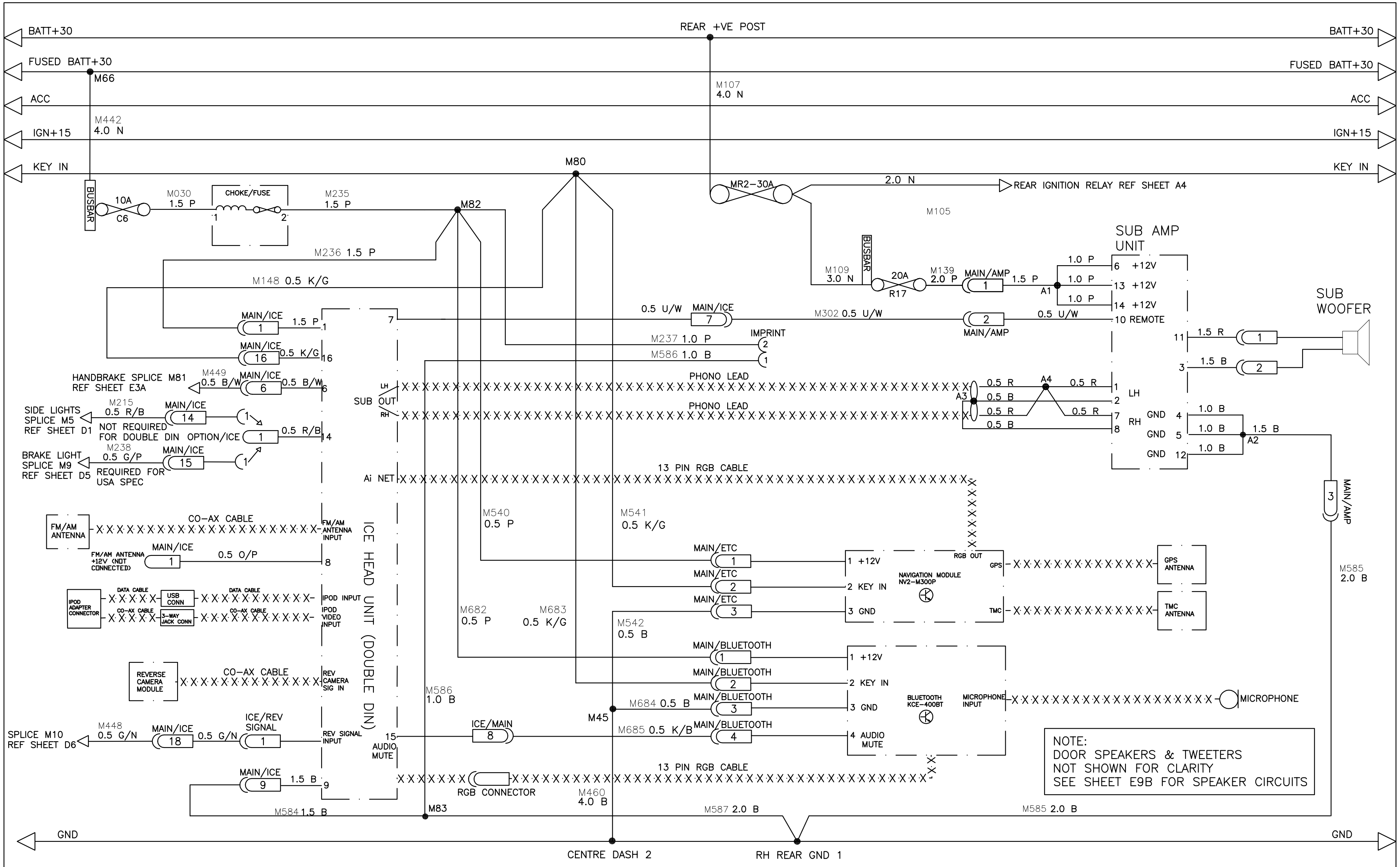


TITLE: ICE–BASE MODEL ALL MARKETS		APPROVED		UPDATES	ISSUE
		CHECKED		INTRODUCTION OF EVORA S & AUTOMATIC	3
PROJECT: EVORA	DRG. No:	DRAWN			
SHEET:E9A	ISSUE LEVEL: PR	FIRST RELEASE DATE	11MAR10		



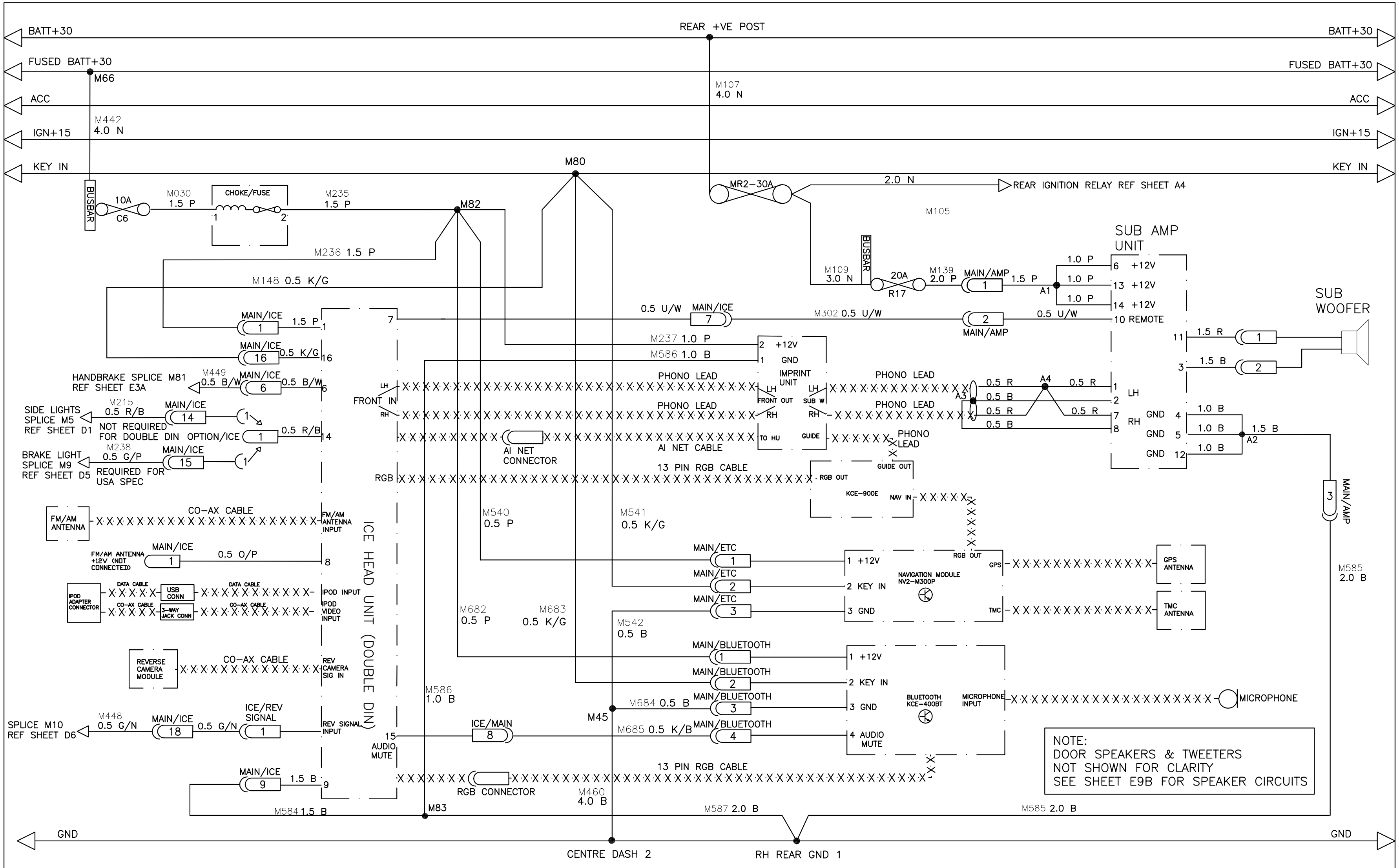
TITLE: ICE–SPEAKERS TECH PACK		APPROVED		UPDATES	ISSUE
		CHECKED		INTRODUCTION OF EVORA S & AUTOMATIC	3
PROJECT: EVORA	DRG. No:	DRAWN			
SHEET:E9B	ISSUE LEVEL: PR	FIRST RELEASE DATE	11MAR10		

CONN NAME
MAIN/ENGINE
MALE CONN
FEMALE CONN
CAVITY NUMBER



TITLE: ICE-TECH PACK WITHOUT IMPRINT EURO/ROW		APPROVED		UPDATES	ISSUE
		CHECKED		INTRODUCTION OF EVORA S & AUTOMATIC	3
PROJECT: EVORA	DRG. No:	DRAWN			
SHEET:E9C	ISSUE LEVEL: PR	FIRST RELEASE DATE	11MAR10		

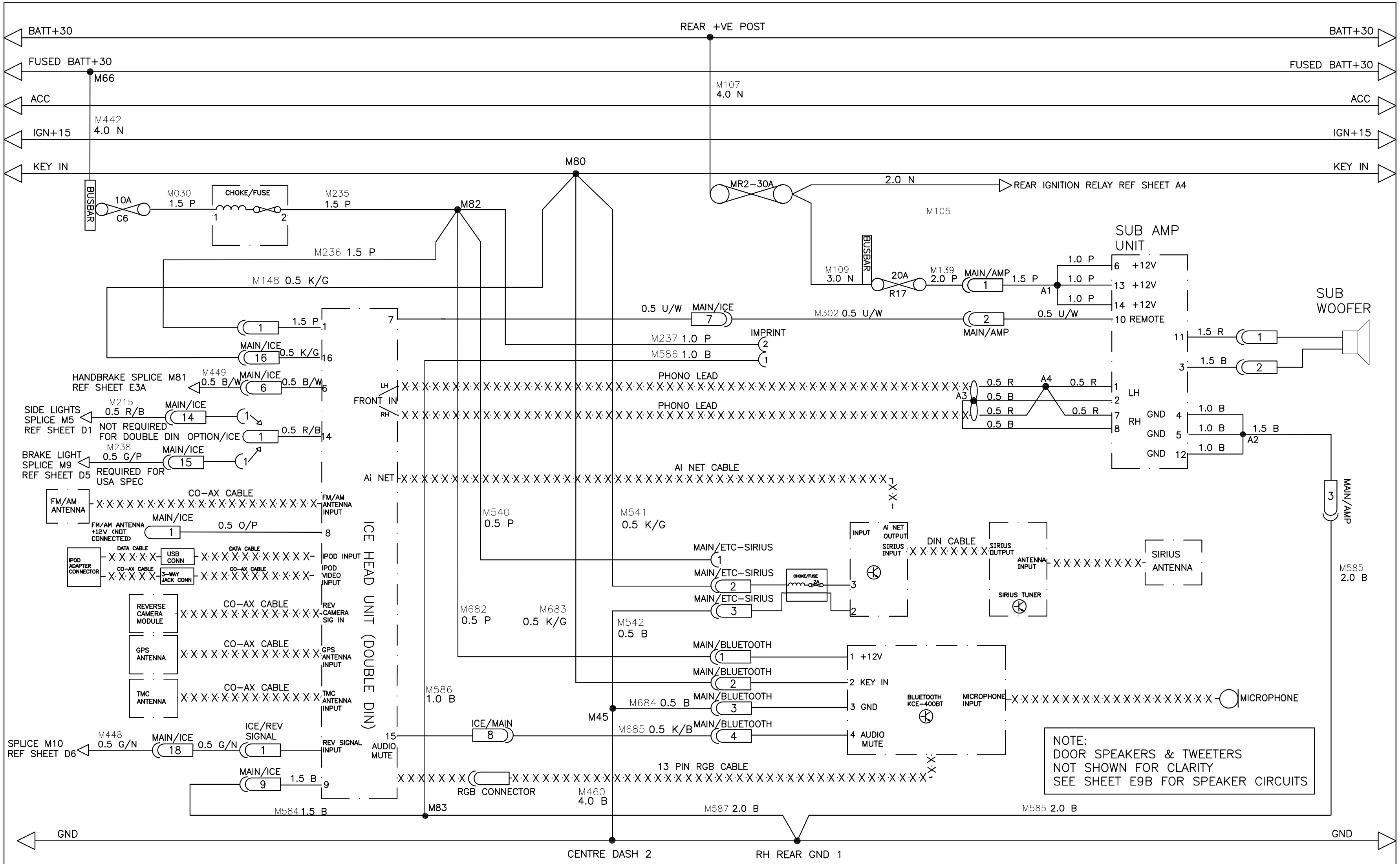
CONN NAME
MAIN/ENGINE
MALE CONN
3
FEMALE CONN
CAVITY NUMBER



NOTE:
DOOR SPEAKERS & TWEETERS
NOT SHOWN FOR CLARITY
SEE SHEET E9B FOR SPEAKER CIRCUITS

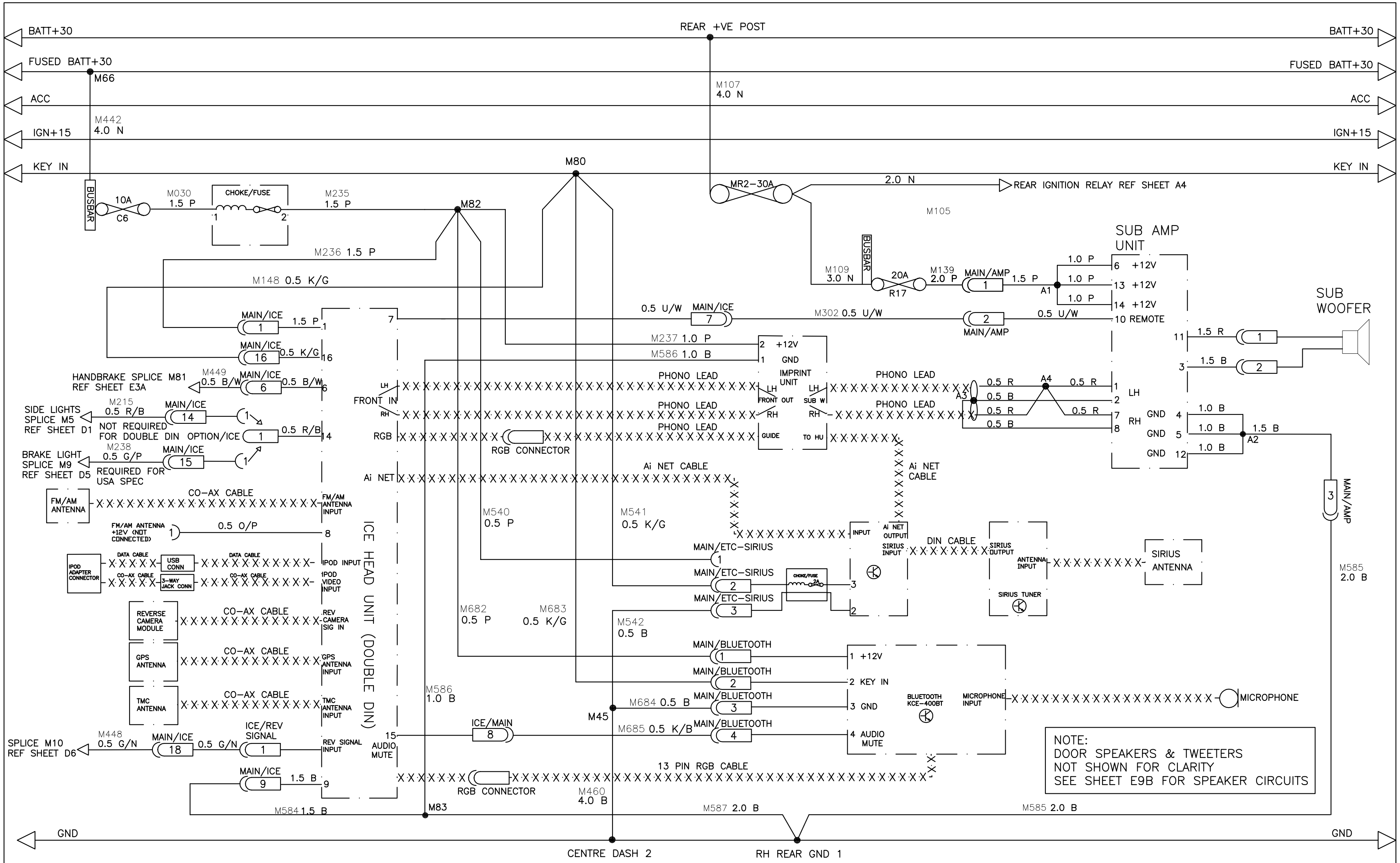
TITLE: ICE-TECH PACK WITH IMPRINT EURO/ROW		APPROVED	UPDATES	ISSUE
		CHECKED	INTRODUCTION OF EVORA S & AUTOMATIC	3
PROJECT: EVORA	DRG. No:	DRAWN		
SHEET:E9D	ISSUE LEVEL: PR	FIRST RELEASE DATE 11MAR10		

CONN NAME
MAIN/ENGINE
MALE CONN
FEMALE CONN
CAVITY NUMBER



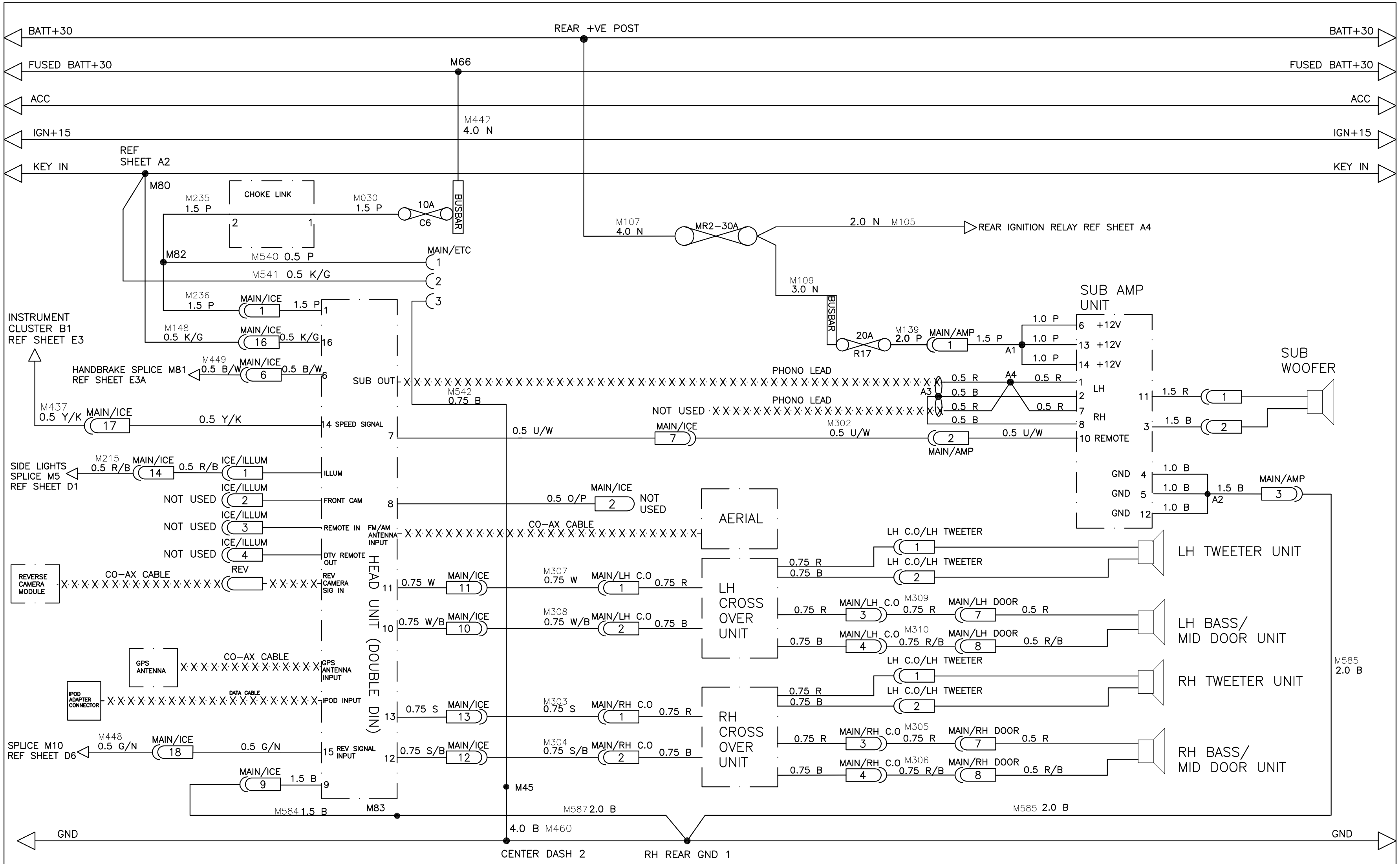
TITLE: ICE-TECH PACK USA WITHOUT IMPRINT	APPROVED		UPDATES	ISSUE
	CHECKED		INTRODUCTION OF EVORA S & AUTOMATIC	3
PROJECT: EVORA / DRG. No:	DRAWN			
SHEET:E9E / ISSUE LEVEL: PR	FIRST RELEASE DATE	11MAR10		

CONN NAME
MAIN/ENGINE
MALE CONN 3 FEMALE CONN
CAVITY NUMBER



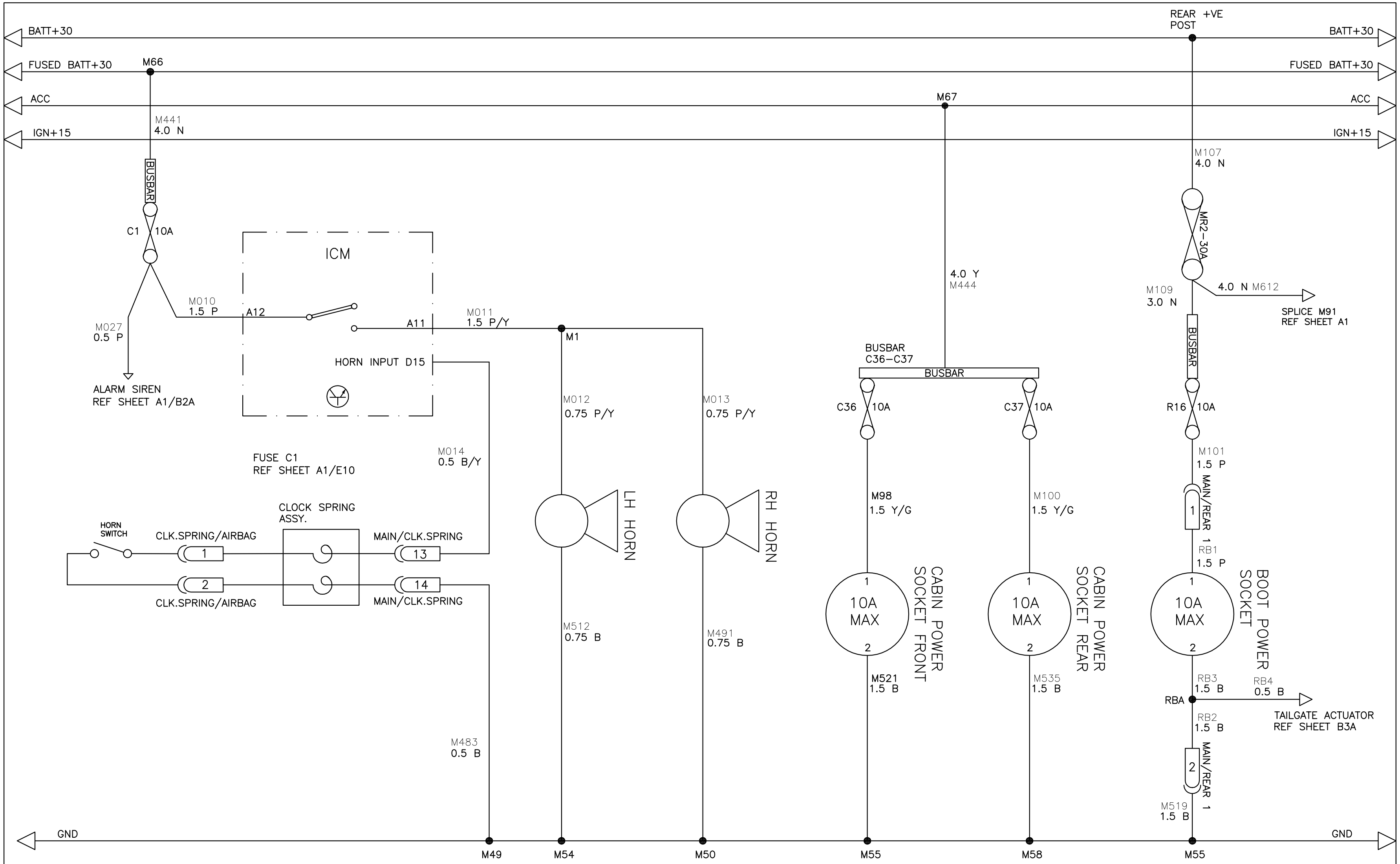
TITLE: ICE–TECH PACK USA WITH IMPRINT		APPROVED		UPDATES	ISSUE
		CHECKED		INTRODUCTION OF EVORA S & AUTOMATIC	3
PROJECT: EVORA	DRG. No:	DRAWN			
SHEET:E9F	ISSUE LEVEL: PR	FIRST RELEASE DATE	11MAR10		

CONN NAME: MAIN/ENGINE; MALE CONN; FEMALE CONN; CAVITY NUMBER



TITLE: ICE-TECH PACK JAPANESE		APPROVED		UPDATES	ISSUE
		CHECKED		INTRODUCTION OF EVORA S & AUTOMATIC	3
PROJECT: EVORA	DRG. No:	DRAWN			
SHEET:E9G	ISSUE LEVEL: PR	FIRST RELEASE DATE	13JAN10		

CONN NAME
MAIN/ENGINE
MALE CONN
FEMALE CONN
CAVITY NUMBER



TITLE: HORNS & POWER SOCKETS		APPROVED		UPDATES	ISSUE
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PROJECT: EVORA	DRG. No:	DRAWN			
SHEET:E10	ISSUE LEVEL: PR	FIRST RELEASE DATE	09DEC09		

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3
FEMALE CONN
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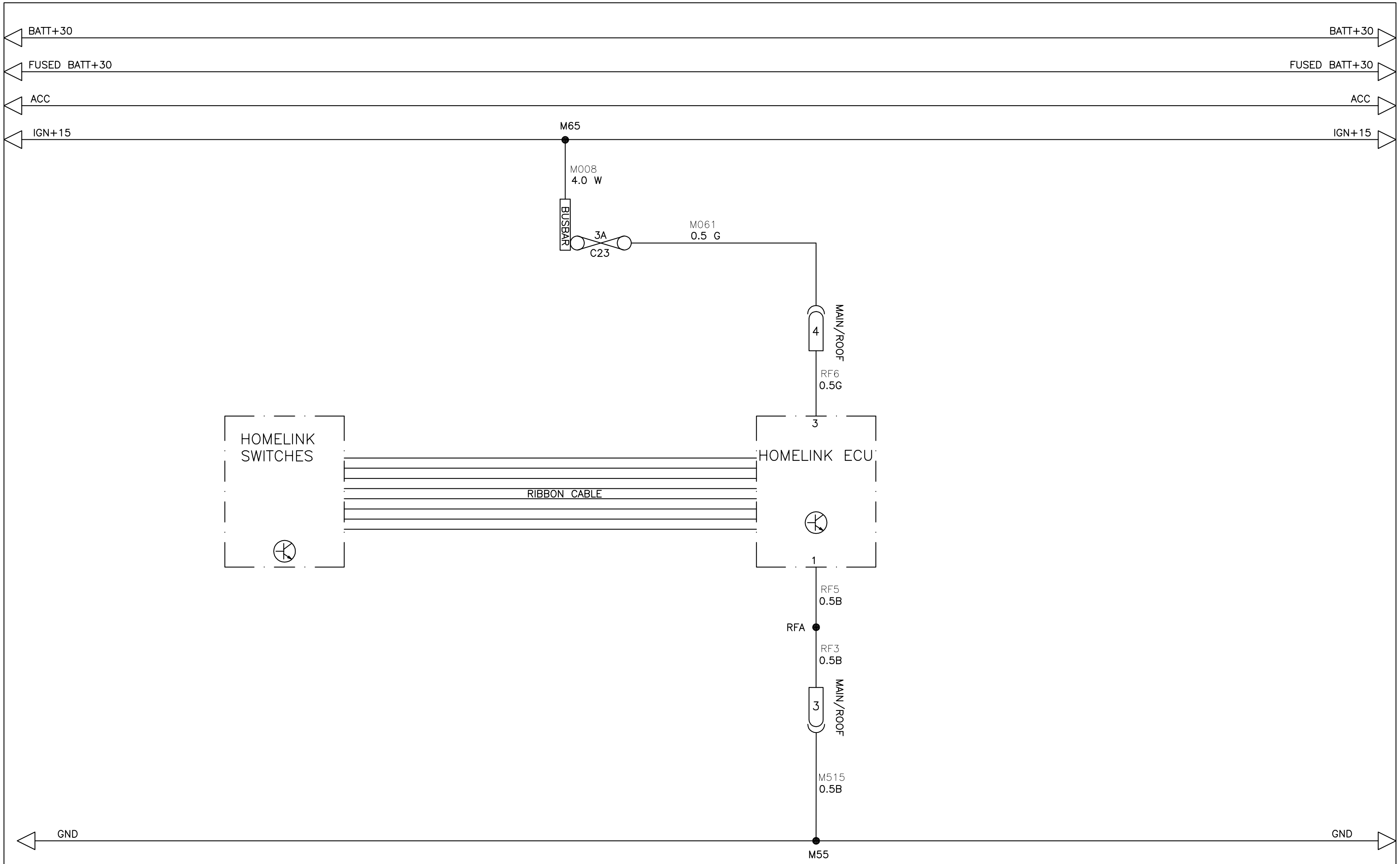

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PROJECT: EVORA	DRG. No:	DRAWN			
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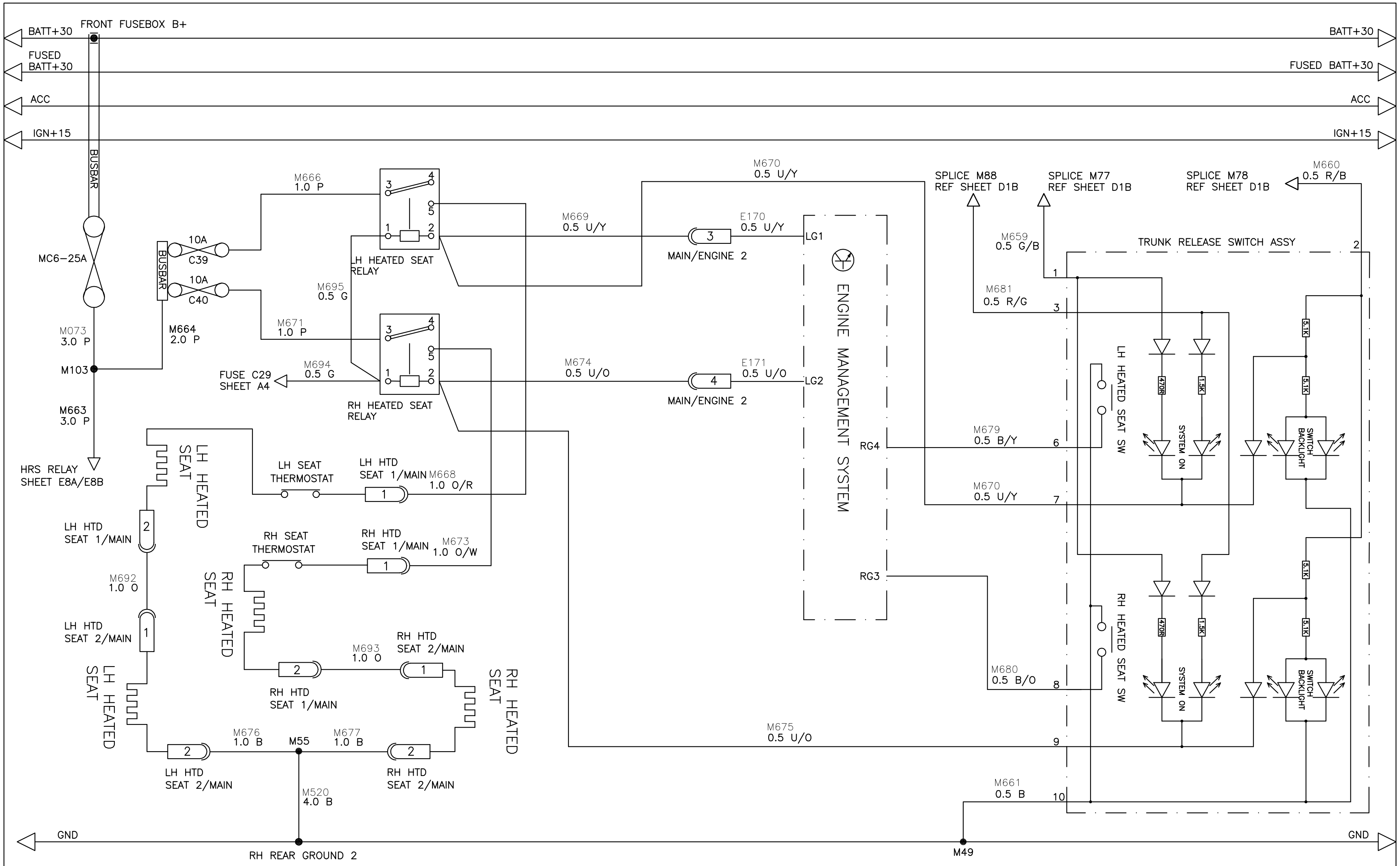

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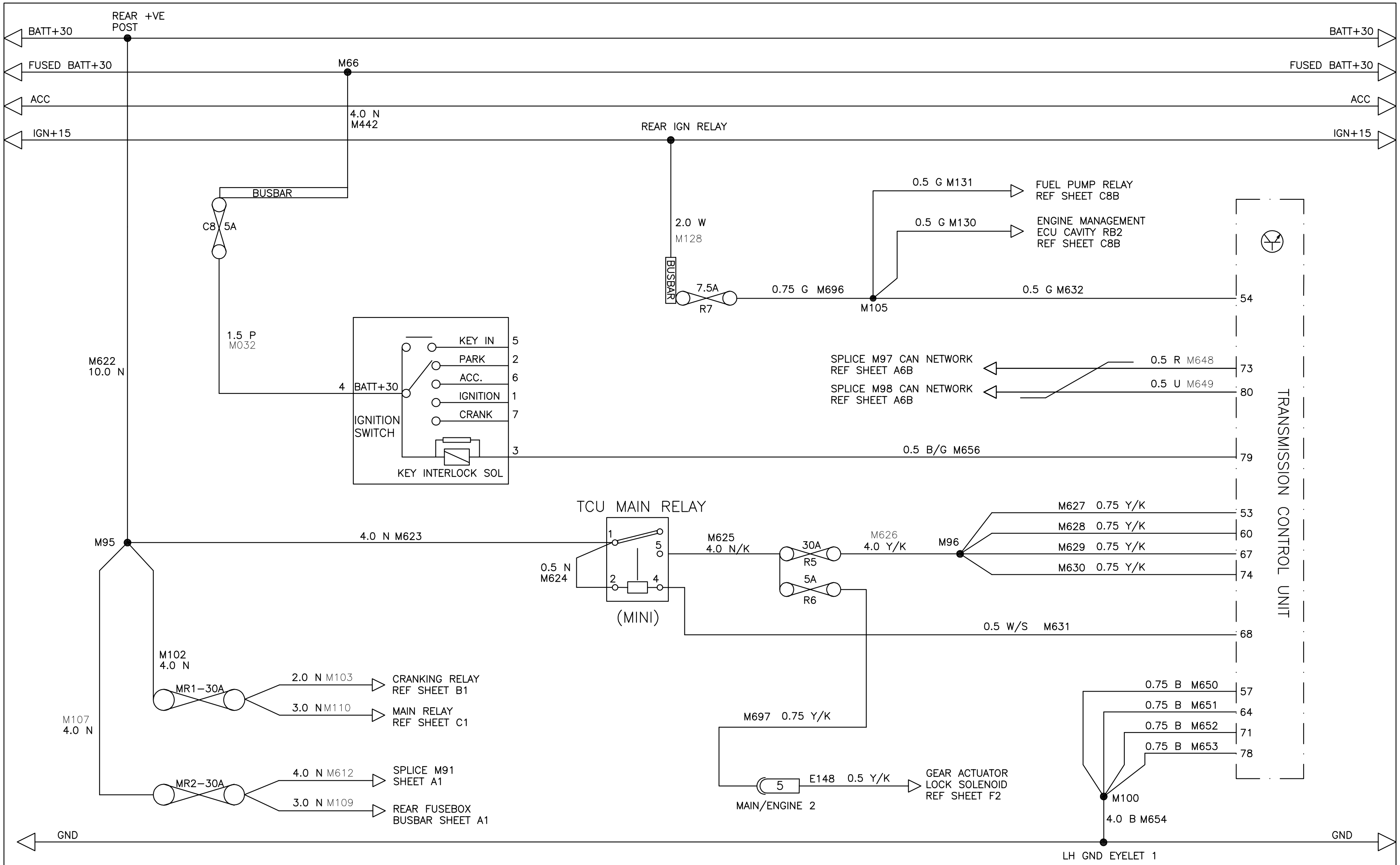

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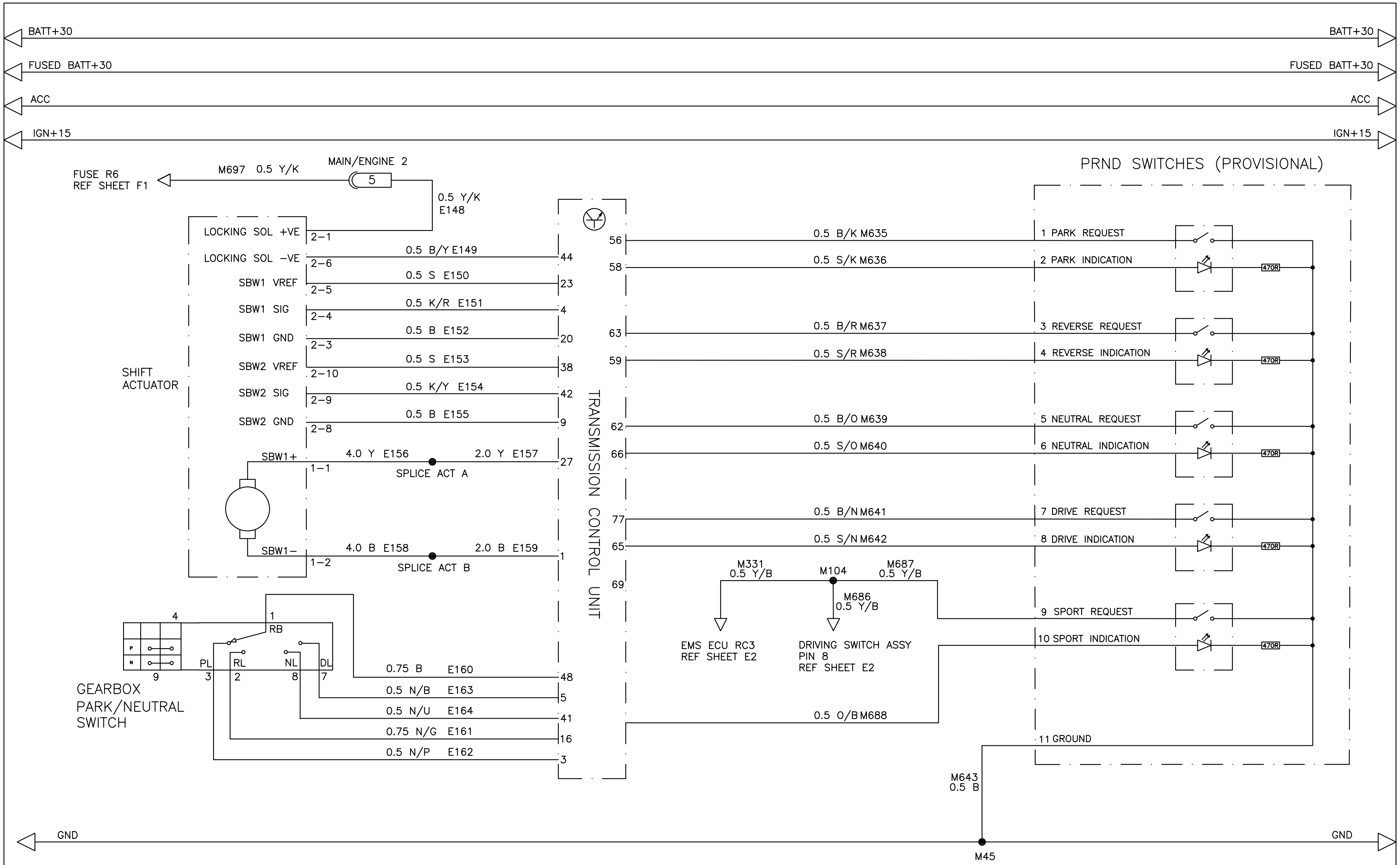

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PROJECT: EVORA	DRG. No:	DRAWN			
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CONN NAME
MAIN/ENGINE
MALE CONN
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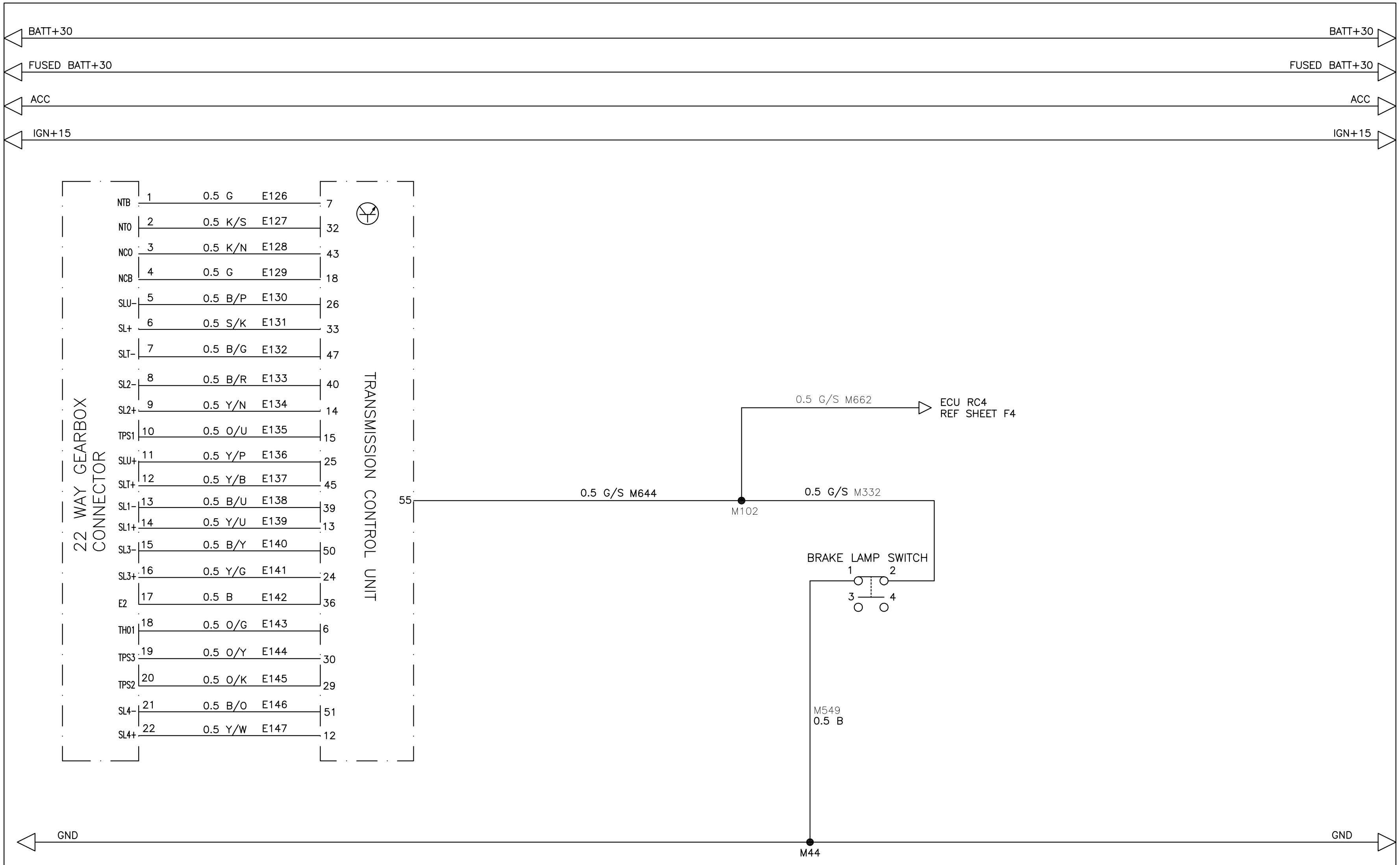
FEMALE CONN
CAVITY NUMBER



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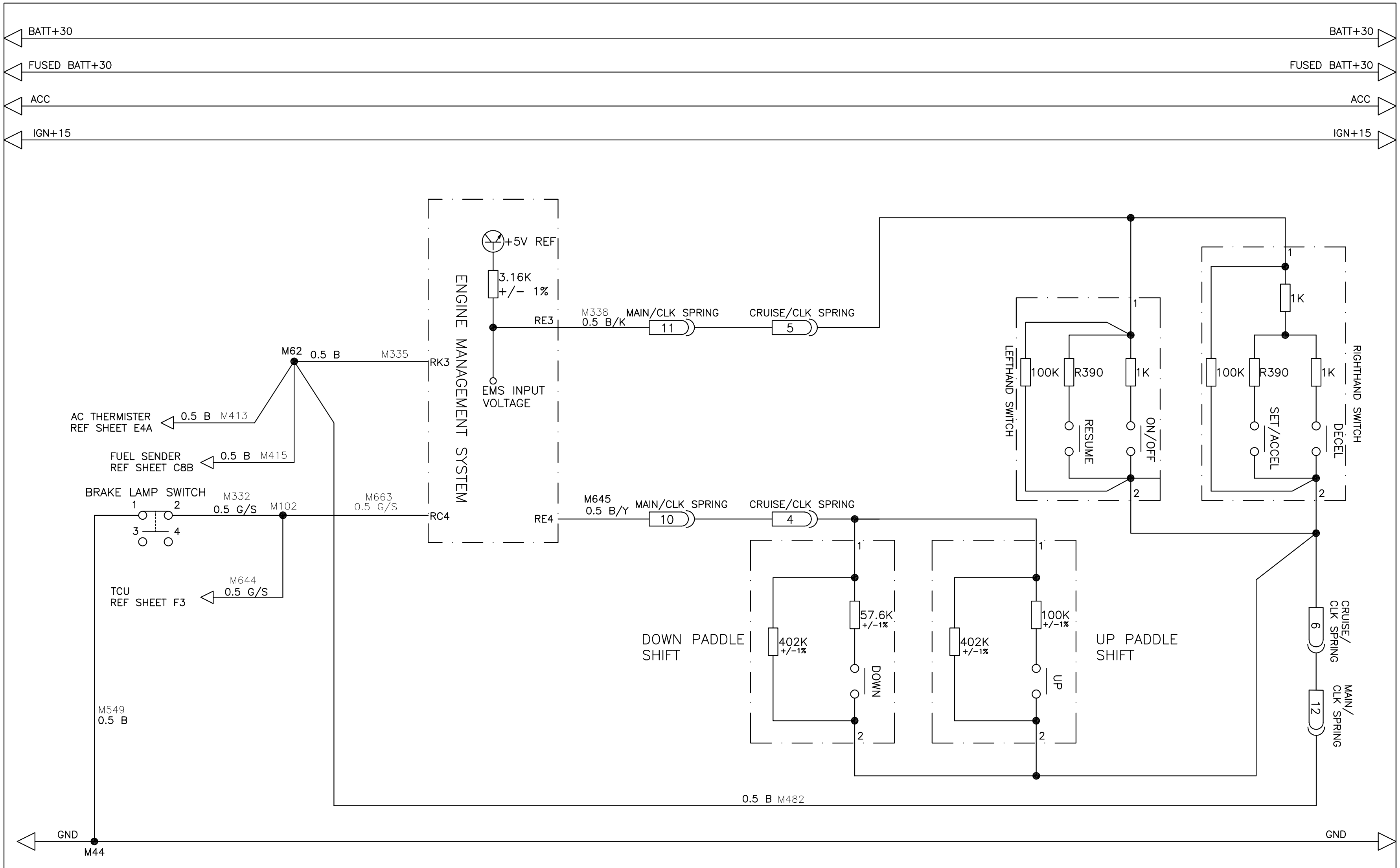

TITLE: AUTOMATIC EMS-CRUISE CONTROL & PADDLE SHIFTS		APPROVED		UPDATES	ISSUE	CONN NAME
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PROJECT: EVORA	DRG. No:	DRAWN				MALE CONN 3 FEMALE CONN
SHEET:F4	ISSUE LEVEL: PR	FIRST RELEASE DATE	19NOV09			CAVITY NUMBER

Colour Code

B = Black
G = Green
K = Pink
LG = Light Green
N = Brown
O = Orange
P = Purple
R = Red
S = Grey
U = Blue
W = White
Y = Yellow

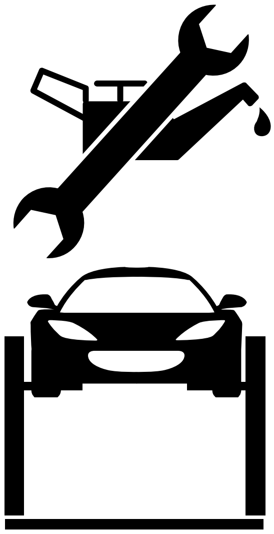
Abbreviations

ABS Anti-lock Brake System
ACCM Air Conditioning Control Module
ACHC Air Conditioning Harness Connector
ACIS Acoustic Control Induction System
CDL Central Door Locking
CHMSL Centre High Mounted Stop Lamp
CVCV Canister Vent Close Valve
DDHC Driver's Door Harness Connector
DI Direction Indicator
ECU Electronic Control Unit
EHC Engine Harness Connector
FL Fog Lamp
FSM Front Side Marker
FTC Fuel Tank Connector
GND Ground
IP Instrument Pack
IPS Intelligent Precision Shift (Automatic Variants)
LF Left Front
LIHC Left Inner Harness Connector
LOHC Left Outer Harness Connector
LR Left Rear
MB Main Beam
NPL Number Plate Lamp
O2 Oxygen (sensor)
PDHC Passenger's Door Harness Connector
RF Right Front
RIHC Right Inner Harness Connector
RIL Rear Outer Lamp
RMC Rear Module Connector
ROHC Right Outer Harness Connector
ROL Rear Outer Lamp
RR Right Rear
RSM Rear Side Marker
SL Side Lamp
SPL Splice
SPMC Switch Pack Module Connector
SSWHC Starter Switch Harness Connector
TCU Transmission Control Unit (Automatic Variants)
TMAF Temperature & Mass Air Flow
VSV Vacuum Solenoid Valve
VVT Variable Valve Timing
VVTLi Variable Valve Timing & Lift - intelligent
WSS Wheel Speed Sensor
YMC Yazaki Module Connector

EVORA 2009 - 2015 MODEL YEAR VEHICLES

MAINTENANCE & LUBRICATION

SECTION OK



Page

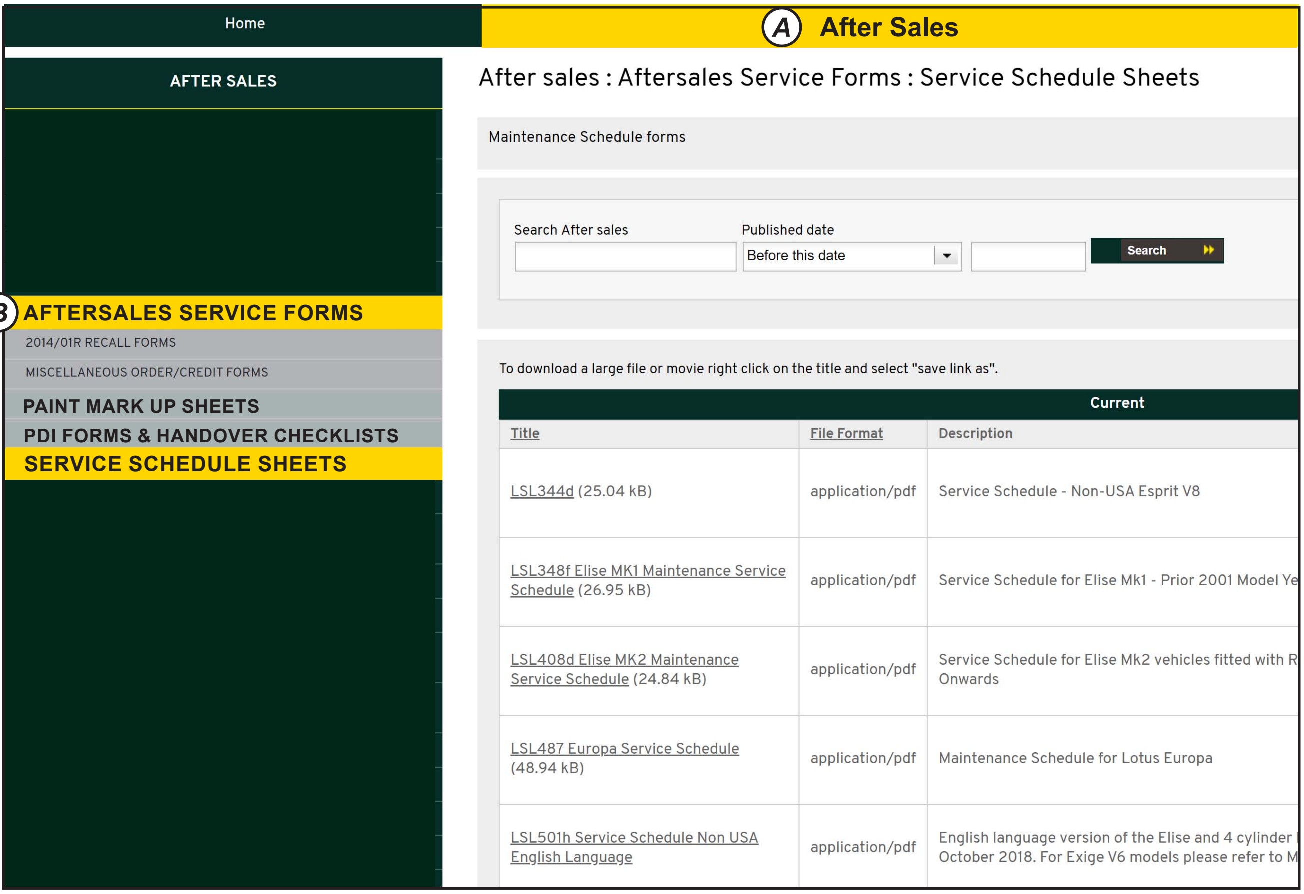
'Severe Service' Conditions
If a vehicle is regularly subjected to any of the 'severe service' conditions described below then it is recommended that the oil and filter be changed twice as frequently as is listed in the Maintenance Schedule.

- Driving in dusty areas (e.g. on unmetalled roads); Change the oil and filter as soon as possible after driving in a dust storm.
- Stop/start driving with frequent short trips where the engine rarely warms up thoroughly (especially in cold weather/climates); and/or frequent or prolonged idling.
- Track use, with repeated high rpm, wide throttle openings and high oil temperatures. In these circumstances, individual judgement must be made regarding appropriate servicing. Note that use of the car off road or in a competitive manner, including timed runs or laps, will invalidate warranty and require appropriate levels of expert car preparation and servicing.

Recommended Fluids & Lubricants
Please see service notes section TDU for information on fluid capacities, standards and approved products.

Service Schedule & Inspection Sheets
The current range of service schedule & inspection sheets available for the Evora 400 range are:

Description	***Part Number***	***Applicable Models***
Service Schedule	LSL537	All Evora 2009 - 2015 Model Year Vehicles
Pre-Delivery Inspection	LSL345	All Models
Hand-Over Checklist	LSL486	All Models
Paint Mark-Up Checklist	LSL544	All Evora Models

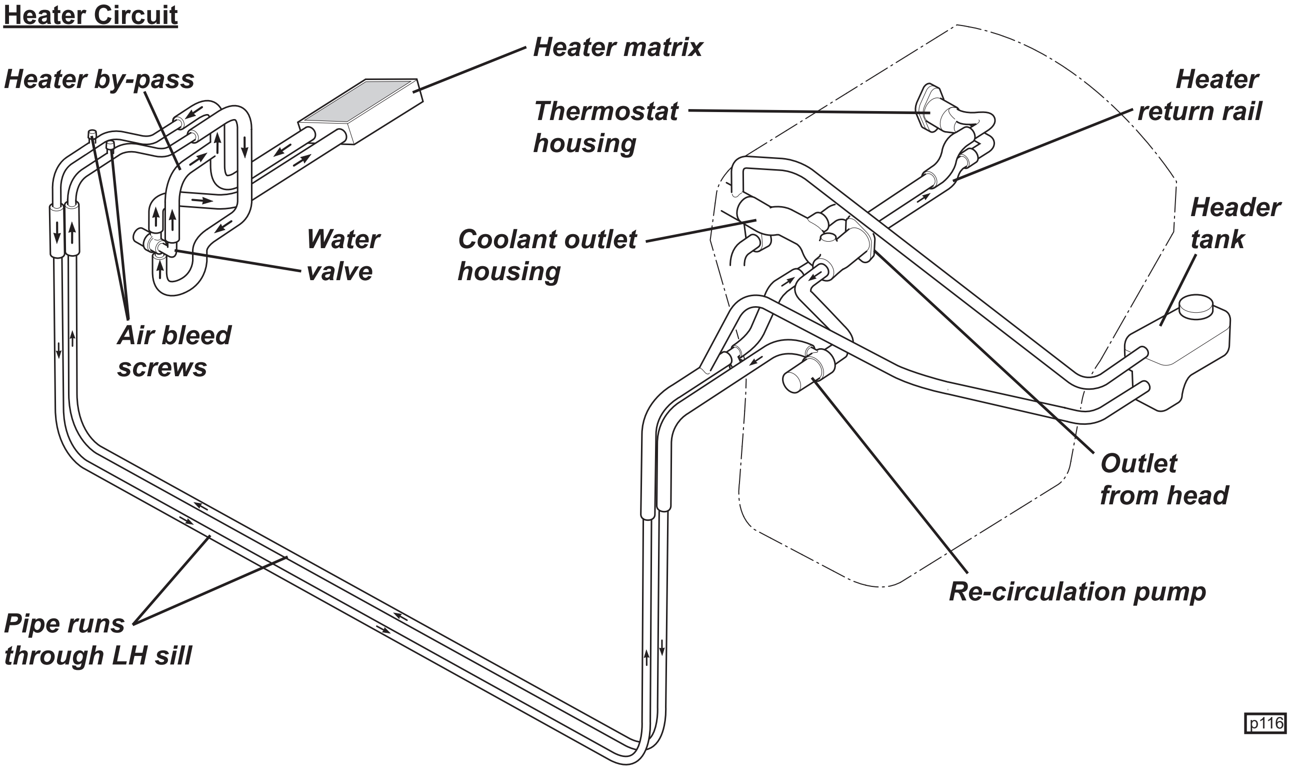


All service forms are available to download from the Lotus Dealer Portal at: http://dealers.lotuscars.com.
Select the 'After Sales' tab (A), at the top of the hompage then select 'Aftersales Service Forms' (B) and select the sub-category as required.

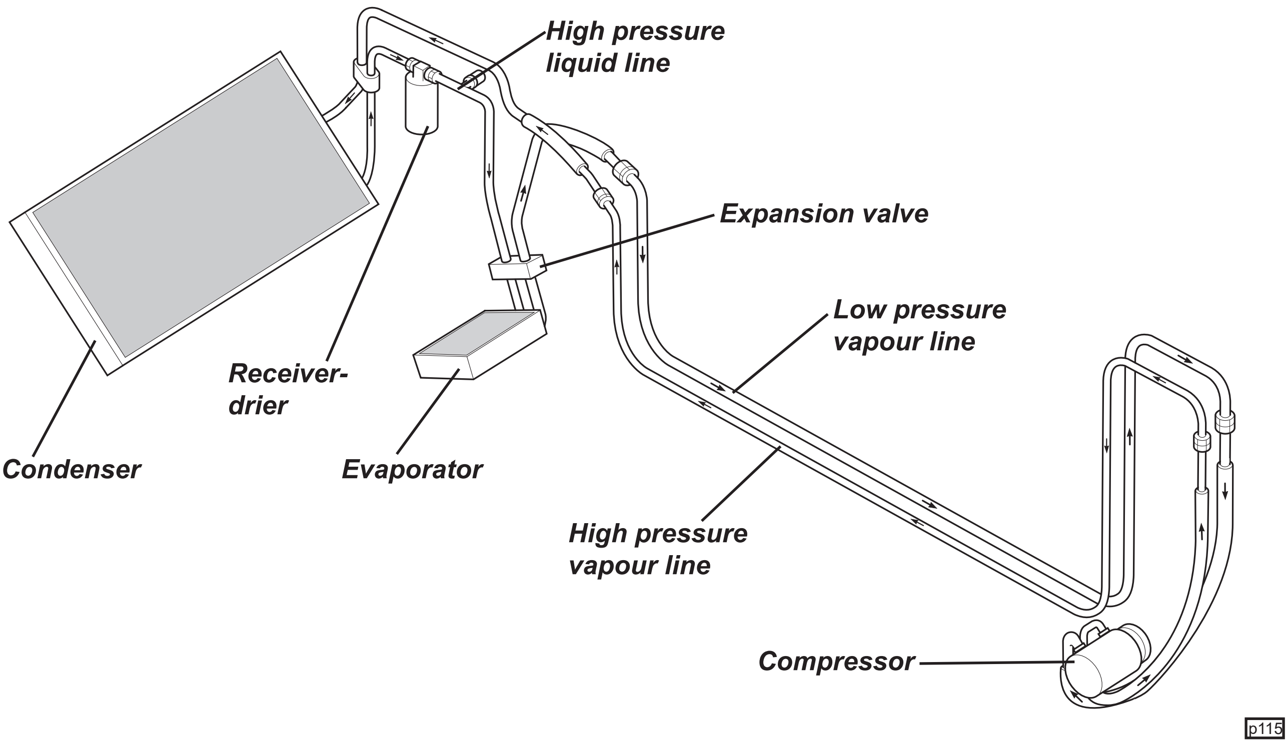
AIR CONDITIONING, HEATING & VENTILATION

SECTION PN

Heater Circuit



Refrigerant Circuit



PN.1 - GENERAL DESCRIPTION

The heating, ventilation and air conditioning (HVAC) main unit comprises a plastic casing secured to the front face of the main chassis tub, housing the fan blower, a.c. evaporator and heater matrix, with a fresh air inlet adaptor on its top face, a re-circulation intake port on the rear face, and an outlet to the air distribution chamber on the top rear of the unit.

Heater Circuit
The heating system uses engine coolant to provide a heat source transferred to the interior airstream via a heat exchanger matrix mounted within the HVAC unit. Hot coolant is directed from an offtake on the engine outlet housing at the rear of the cylinder head, via a re-circulation pump (see below), into pipework running through the LH sill, and connecting to the heater matrix via a diverter valve.

The outlet from the matrix connects to return pipwork routed alongside the supply line to the LH end of the heater return rail. This rail runs down the 'V' of the cylinder block, alongside the by-pass pipe, and connects to the engine side of the thermostat housing at the front of the engine. When a fully cold temperature selection is made, the diverter valve is energised to direct water flow from the supply line directly into the return line, thus by-passing the heater matrix and reducing air temperature within the HVAC unit.

In conditions of 'heat soak', after stopping a hot engine, the electric re-circulation pump mounted in the heater supply line at the LH side of the engine bay, is energised under engine ECU control, to pump coolant around the heater circuit and limit the potential for localised boiling within the cylinder head.

Air Conditioning - Basic Principles
The air conditioning unit uses a variable displacement compressor system with a thermostatic expansion valve to provide refrigerated air to the vehicle interior. The system comprises:
- a closed circuit containing refrigerant R134a;
- a variable displacement compressor mounted on the front side of the engine, driven by multi-vee belt from the front end of the crankshaft via an electromagnetic clutch;
- a condenser fixed to the front of the engine cooling radiator, between the front subframe longerons and tilted forwards at 45°;
- an evaporator unit (cooler) contained within the HVAC housing ahead of the cabin footwell bulkhead;
- a thermostatic expansion valve fitted at the inlet connection to the evaporator;
- a refrigerant receiver-drier unit mounted on the outside of the front subframe RH longeron, ahead of the RH front wheel.

Closed Circuit
The closed refrigerant circuit should not be opened unless absolutely necessary, and only then using appropriate refrigerant recovery equipment. Never allow the refrigerant to vent to atmosphere. Refer to sub-section PN.5. Failure to observe these precautions may result in personal injury.

The discharge hose from the engine driven compressor connects to a rigid aluminium pipe at the RH side of the engine bay, with the junction supported on an vibration isolator plate. The high pressure discharge pipe is routed through the RH body sill via foam support blocks clamped to the outside of the chassis main siderail.

At the rear of the RHF wheelarch, the pipe rises to another junction plate secured to the outside of the subframe longeron, where it connects to the condenser supply pipe/hose assembly which runs over the wheelarch area to the RH side of the condenser, to which it connects on the topside.

The condenser outlet union is sited alongside the inlet union, and supplies a rigid aluminium pipe running to the receiver-drier unit mounted ahead of the right hand front wheelarch. From here, another pipe, incorporating the trinary switch, connects to the expansion valve mounted on the evaporator inlet pipe at the RH side of the HVAC unit. Refrigerant leaving the evaporator passes through the expansion valve into a pipe/hose assembly which connects to a sill pipe and then continues to run in parallel to the supply line back to the compressor.

Compressor
The variable displacement compressor is mounted on the front side of the engine, and is driven by the multi-rib auxiliary belt. The compressor operates to discharge refrigerant vapour at high pressure and temperature into the condenser and is lubricated by a quantity of special refrigerant oil, most of which is retained in the compressor, with the remainder being circulated with the refrigerant.

The compressor contains a ring of cylinders with axes parallel to the compressor drive shaft, and whose pistons are driven up and down the bores by a rotating 'swash plate', the angle of which, in relation to the drive shaft, is variable. With a small swash plate angle, a short piston stroke is produced for a low refrigerant flow; a high swash plate angle results in greater piston stroke for a higher flow of refrigerant. The angle of the swashplate is determined by the pressure differential between that on top of the pistons, and that within the housing, applying a force to the underside of the pistons, in conjunction with a coil spring around the drive shaft.

This differential is controlled by a solenoid valve under ECU control, using pulse width modulation. When the valve is open, the output from the cylinders is bled off to the compressor housing to result in no pressure differential. The angle of the swashplate is then determined by the coil spring which pushes the plate to a near neutral position to provide minimal flow. As the valve is progressively closed, the pressure differential increases, with the pressure on top of the pistons pushing the swashplate to a greater angle, and producing an increased refrigerant flow.

The engine ECU is programmed to minimise refrigerant flow until an a.c. request is made, thus allowing the compressor to be run at all times in the interests of system lubrication, and the reduction of inactivity damage.

To safeguard the drive system in the event of compressor seizure, an electromagnetic clutch in the pulley hub is used to disengage the drive as signalled by a sensor in the compressor nose. The clutch will also be disengaged by the ECU if a loss of refrigerant is detected by the trinary switch (see below).

Hot refrigerant vapour from the compressor is fed via flexible hoses and alloy pipwork routed through the body RH sill, to the front mounted condenser.

Condenser
The aluminium condenser is a 'parallel flow' heat exchanger, configured with side mounted collector tanks interconnected by 40 oval shaped, horizontal tubes, all provided with generous finning. The unit is fixed to the front of the engine cooling radiator, sited between the longerons of the front subframe, and angled forwards at 45°. The hot vapour received from the compressor, is admitted into the top section of the RH condenser tank, and flows through 32 tubes to the LH tank before returning to the lower section of the RH tank via the bottom 8 tubes.

In so doing, heat is released to the surrounding air via the condenser finning, with airflow boosted by two electric fans mounted on top of the engine radiator, and ram air flow caused by vehicle movement.
A union at the bottom of the RH tank directs the condensed, liquid refrigerant into pipework connecting with the receiver-drier.

Receiver-Drier
The receiver-drier unit is fitted into the refrigerant line between the condenser and evaporator expansion valve, and houses a screen sack filled with desiccant to absorb traces of moisture and other contaminants from the refrigerant. The unit is mounted on the outside of the subframe RH longeron, ahead of the RHF wheel.

Trinary Switch
A trinary switch fitted into the pipe between the receiver-drier and expansion valve supplies a pressure signal to the engine ECU, which then allows system operation only within a pressure range of 2 to 32 bar in order to prevent system damage from too high a pressure, or from compressor oil starvation damage caused by too low a pressure. This data is also used by the ECU to engage the two condenser fans at half speed at pressures over 17.5 bar (see also sub-section KJ.5).

Expansion Valve
The expansion valve block is fitted into the high and low pressure pipes at the evaporator connection, and provides a variable restriction to the flow of high pressure liquid into the evaporator, such that the consequent pressure drop causes a change of state to a low pressure, low temperature atomised liquid.

By sensing the temperature and pressure of refrigerant leaving the evaporator, the expansion valve acts to modulate the flow of refrigerant into the unit to optimise the cooling performance.

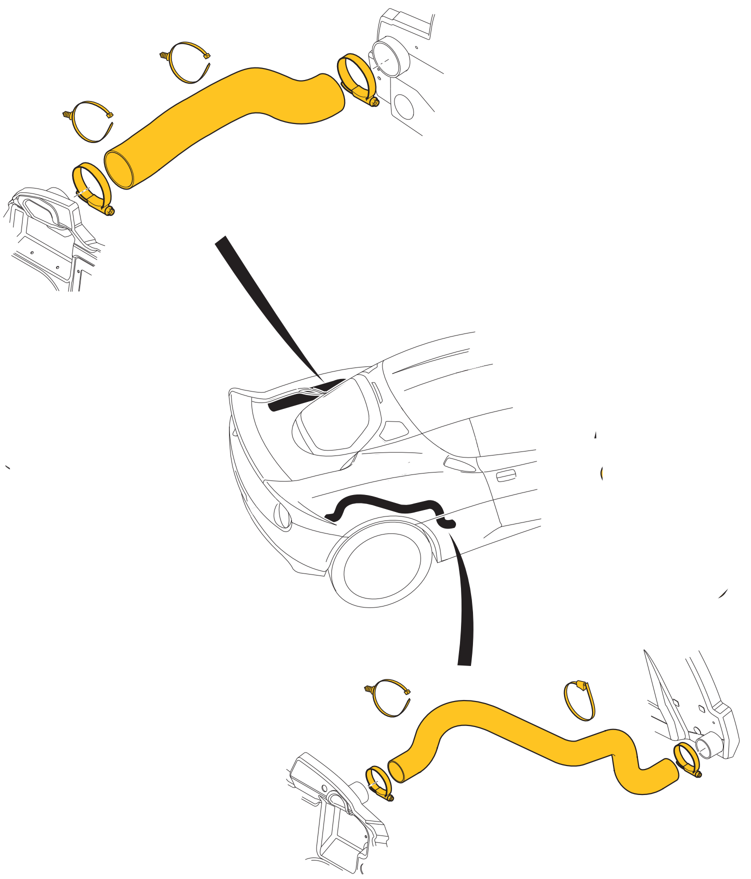
Evaporator
The evaporator is a 'serpentine' type heat exchanger mounted within the HVAC unit. The low pressure liquid refrigerant flowing into the evaporator via the expansion valve, begins to boil (evaporate) and in so doing, draws the necessary heat for this process from the airstream passing across the evaporator finning. This airstream is consequently cooled, and is directed through the various outlet vents to the passenger compartment.

When the a.c. switch is pressed by the driver, and other parameters allow it (i.e. ignition on, blower fan speed selected, a.c. system pressurised, ambient temperature above 3°C), the a.c. circuit is activated and refrigerant flow established. A thermostat, using a thermistor positioned against the outlet side of the evaporator finning, monitors the temperature of the refrigerated air and signals the ECU to regulate refrigerant flow in order to provide an output air temperature just above that at which ice may form on the evaporator.

The inlet and outlet pipes connect to the evaporator via the expansion valve block, into which they are sealed using 'O' rings and a clamp plate. The inlet is supplied from the receiver-drier, and the outlet feeds into pipework routed through the body right hand side sill, to the compressor.

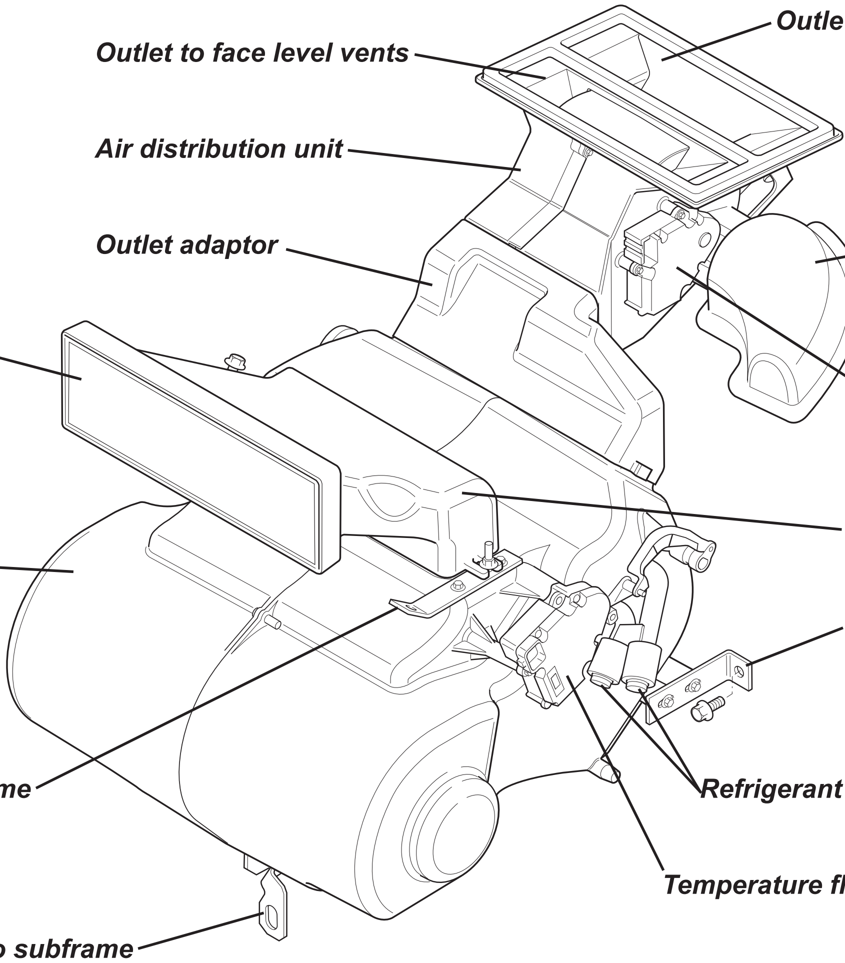
Ventilation
Air in the cabin is exhausted via an outlet vent at the left hand side of the rear bulkhead, and another at the bottom right hand corner of the bulkhead.

Ducting from each of these vents connects to the rear luggage compartment, from which air escapes to atmosphere through two one-way flap valves fitted in the rear transom and concealed by the rear bumper.



PN.2 - HEATER/A.C. AIRFLOW OVERVIEW

The HVAC unit comprises left and right hand plastic mouldings sandwiched together and containing; a pair of blower fans supplied from two intake sources; an a.c. evaporator; a heater matrix; and two electrically controlled flaps - one for the fresh air intake and one for the heater matrix.



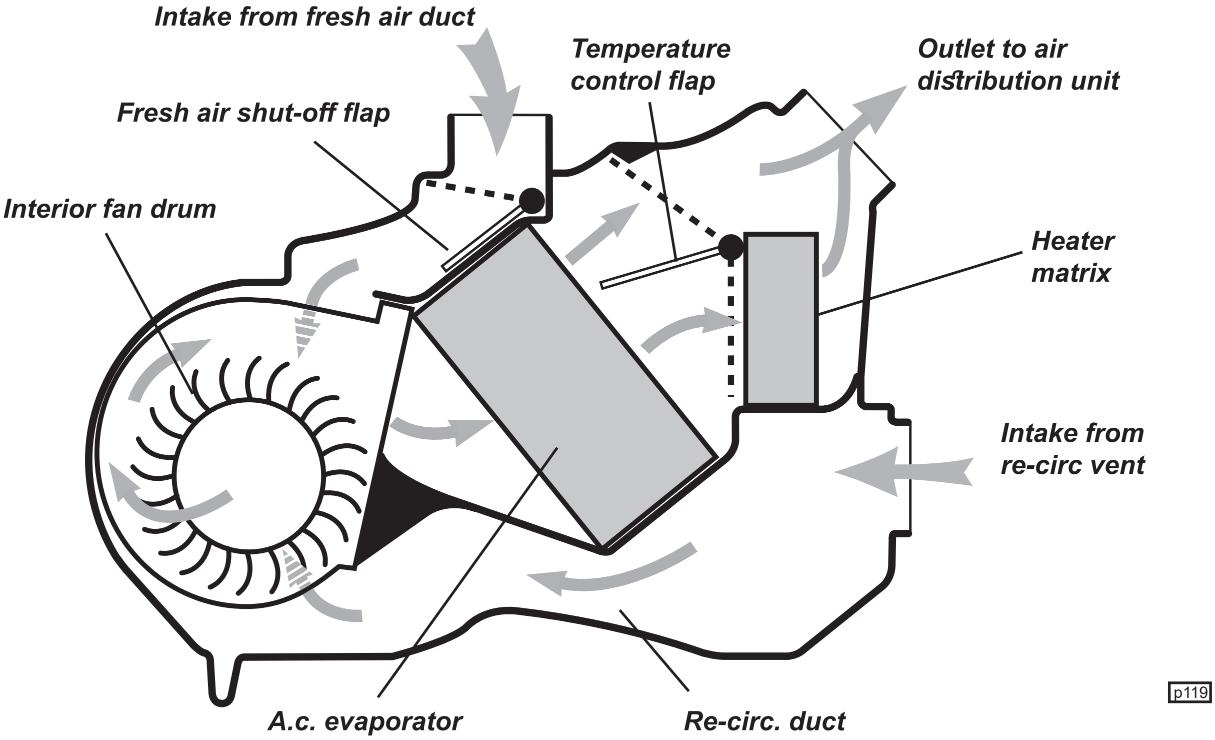
Ambient air collected from the top of the intake duct, ahead of the engine radiator, is fed via an insulated fibre-form duct to a pollen filter mounted at the intake to the HVAC unit, within which the airflow is divided towards the inner and outer sides of the two blower fans. Air enters the fan drums axially and is centrifuged outwards to be directed into the evaporator chamber.

A second intake duct collects air from the cabin interior via a central aperture in the footwell toeboard, from which the air flows through a duct formed in the lower section of the HVAC unit and into the fan chamber in a similar manner to the ambient flow. Electrical resistors used in the fan speed circuitry are cooled by the incoming air-flow stream. The fresh air intake may be closed off at the driver's request by an electrically operated flap at the top of the unit, which closes or fully opens the ambient air intake. The re-circulation intake is open at all times.

All air exiting the fan chamber is directed through the evaporator, whether or not a.c. is selected, and is then divided between routes flowing either past, or through the heater matrix by an electrically operated air blender flap, the position of which is determined by the temperature selector knob. Blended air then leaves the top rear of the HVAC unit and enters the Air Distribution Unit (ADU) which passes beneath the base of the windscreen and is secured to the top of the footwells.

A part cylindrical rotary mask on a horizontal axis, controls the airflow exiting the ADU into a top mounted port for the windscreen vents, an adjacent port for the face level vents, and, via a port in each end plate of the mask, to outlets supplying a duct in the top of the passenger footwell, and through the inboard side of the pedal box. The rotation of the mask is driven by a stepper motor (common with the air intake and air blender actuators) mounted on the left hand side of the ADU.

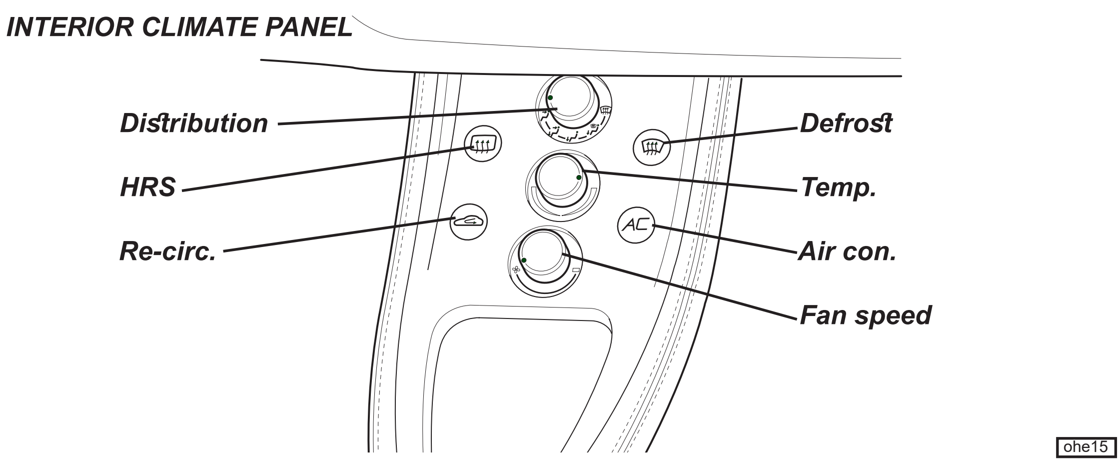
HVAC Airflow



Interior Climate Controls

The interior climate control panel is located on the centre console and consists of three rotary control knobs, for air distribution, temperature and fan speed, and four button switches, for air conditioning, demist, air re-circulation and heated rear screen. When the sidelamps are switched on, the rotary control graphics are backlit white and red/blue by an electro-luminescent panel, with red lit pips in the knobs to indicate their position.

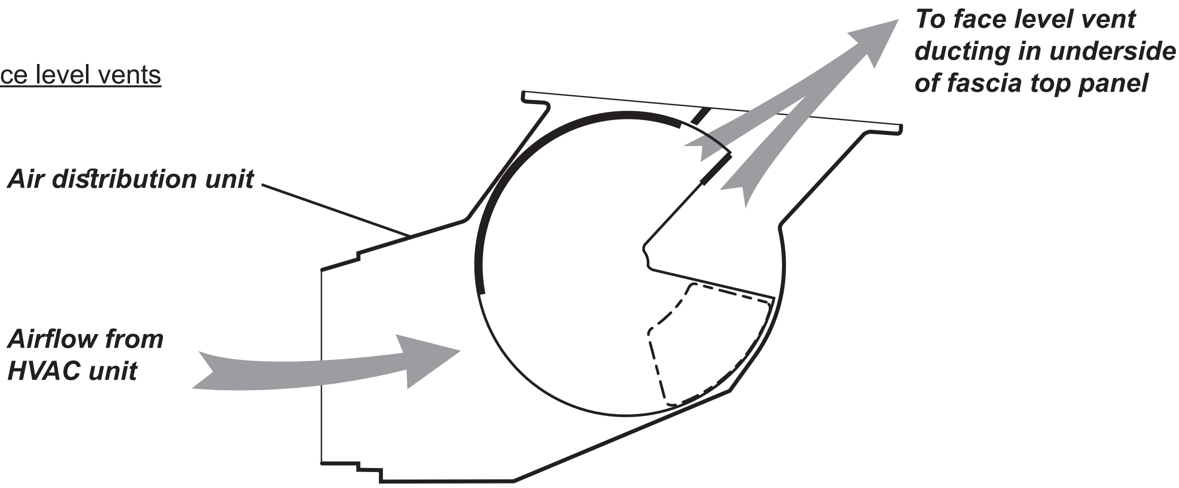
The button switches are backlit red with ignition or sidelamps switched on, and will light up brightly (HRS and demist in amber) when activated. Press the switch a second time to switch off. Climate control functionality requires the ignition to be on, and for refrigeration and heat production, the engine needs to be running.



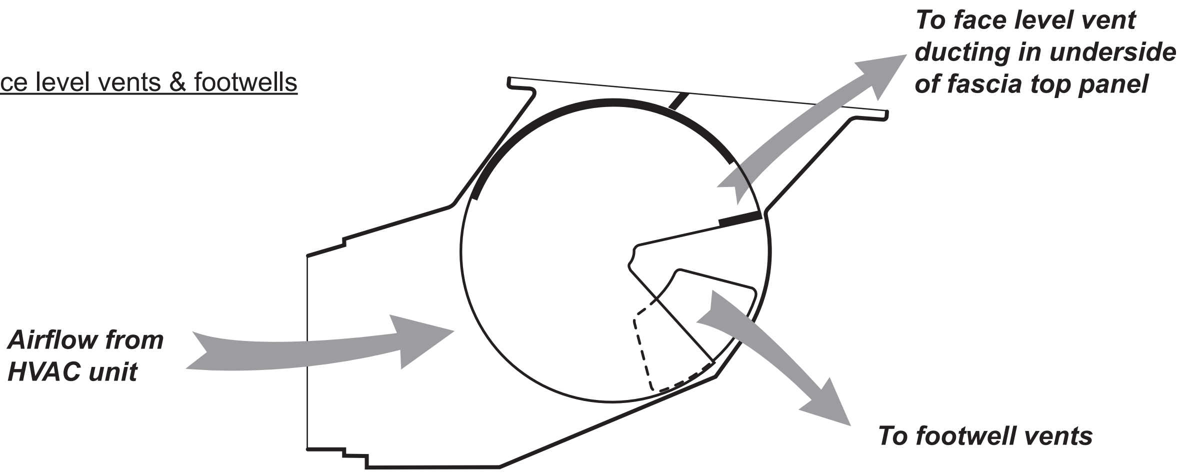
Distribution Control

This rotary control is positioned at the top of the HVAC panel and allows a choice of air distribution from the various outlet vents. There are 5 designated positions with corresponding symbols, although there is a progressive transition from each airflow mode to the next, allowing a preferred balance to be attained.

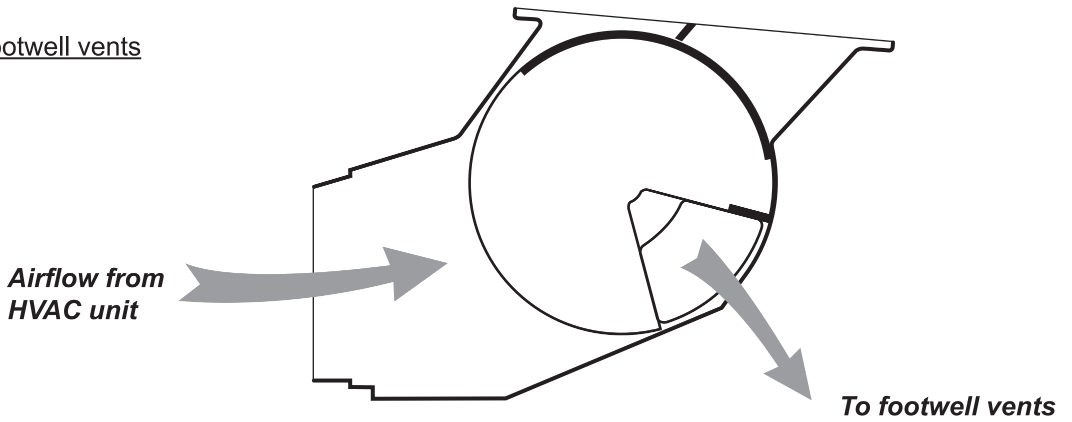
Face level vents



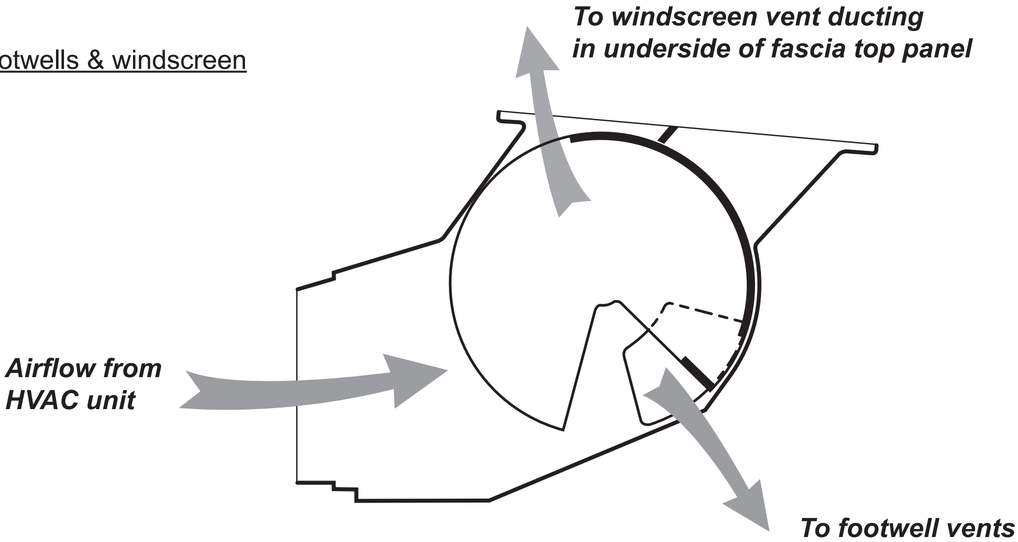
Face level vents & footwells



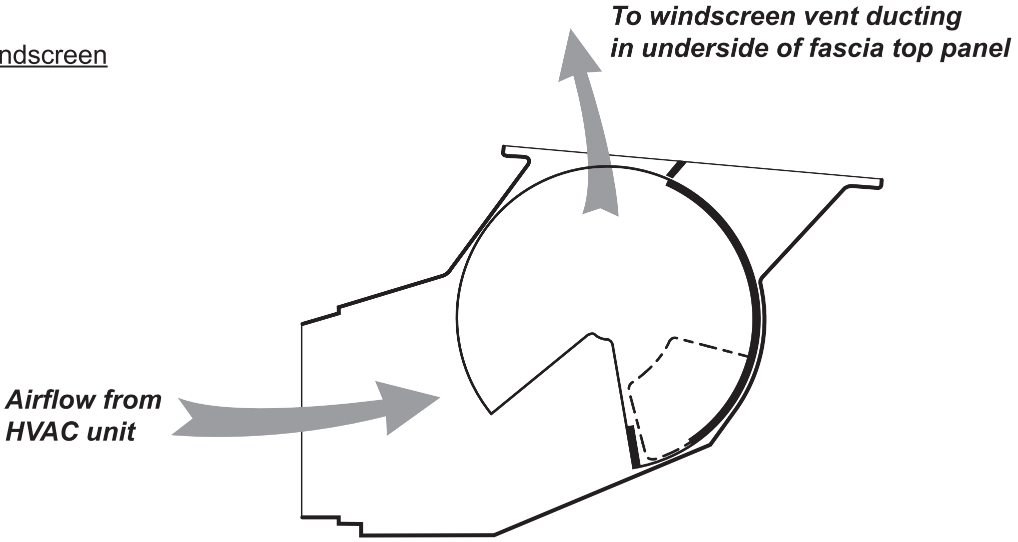
Footwell vents



Footwells & windscreen



Windscreen



Temperature Control
The rotary temperature control actuates the air blender flap, which dictates the proportion of the airflow which is directed through the heater matrix. With the control knob fully clockwise at the coldest position, the heater matrix is fully shut off. As the control is turned counterclockwise, the flap is moved to allow some airflow through the heater matrix, until at the fully hot position, all airflow is directed through the matrix for maximum heating. At the fully cold setting, an electrical contact is made which energises the HVAC water valve which then diverts water flow to by-pass the heater matrix and thus reduce air temperature within the HVAC housing.

Interior Fan
The lowermost of the rotary controls, allows the selection of 4 speeds for the interior fan, and functions with the key at the accessory or ignition positions. Turned fully clockwise, the fan is switched off. Turning the knob counterclockwise through 4 detent positions provides increasing fan speed and airflow delivery. Note that the air conditioning will not function until a fan speed is manually selected.

Re-circulation Switch
This switch functions with the key at the accessory or ignition positions, and will maintain its status throughout ignition cycles.

The re-circulation port in the footwell toe-board is open at all times, such that the greater proportion of air drawn into the fan chamber, via a duct incorporated into the bottom of the HVAC housing, is always from the cabin interior. The fresh air intake on the top of the unit is controlled by a stepper motor and flap valve and is normally open to provide approximately 30% fresh airflow. To close the intake and prevent fumes being drawn into the cabin, or to provide the quickest response to temperature change requests, the fresh air intake may be closed off by pressing the re-circ. switch, to result in 100% re-circulation. This option should, however, be used sparingly to avoid stuffiness in the cockpit.

Air Conditioning Switch
The engine must be running for the a.c. to operate. This switch signals the engine ECU with an air conditioning request, and will maintain its status throughout ignition cycles. The ECU determines whether the running conditions allow for compressor activation. Conditions which will inhibit a.c. include:
- near full throttle demand;
- excessive coolant temperature;
- any fault codes set;
- low refrigerant pressure.

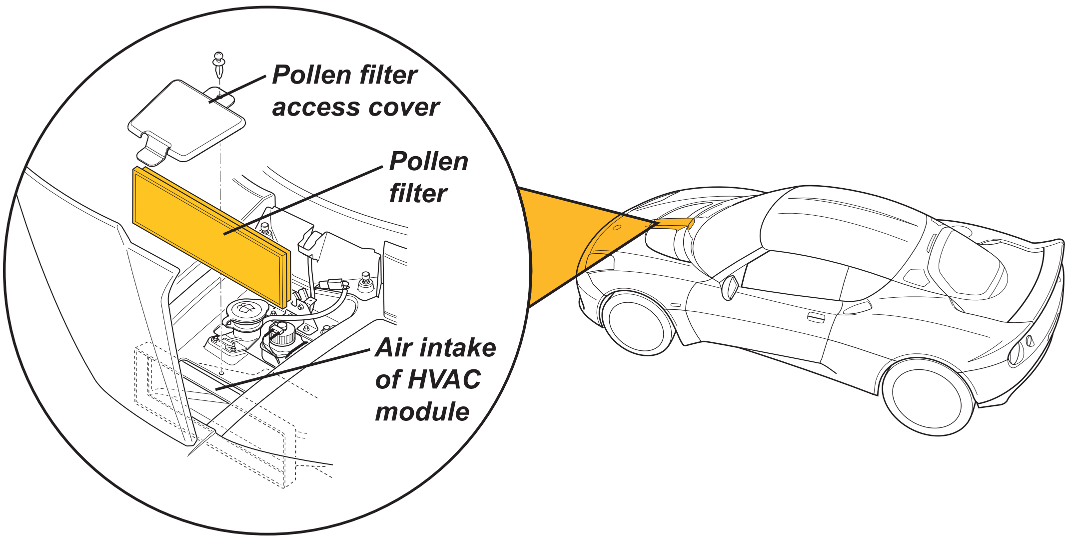
When appropriate, the ECU will activate the a.c. by applying a duty cycle to the compressor solenoid valve, thus generating a swash plate angle and initiating refrigerant flow.

Demist Switch
In order to allow a single touch selection of demist/defrost settings, a dedicated switch is provided. The switch is operative only with ignition on, and will default off at the next ignition cycle. When activated:
- The interior fan will operate at full speed;
- All airflow will be directed to the windscreen;
- Air conditioning will be switched on (may be overridden by manual de-selection).

Note that an appropriate temperature setting must be selected manually.

Heated Rear Screen
Due to the heavy current demand, this switch will operate only when the engine is running. Under this condition, the HRS and door mirror heating elements will be activated for a period of 10 minutes before automatically switching off. The switch and heating cycle will default off next time the ignition is turned on.

Pollen Filter

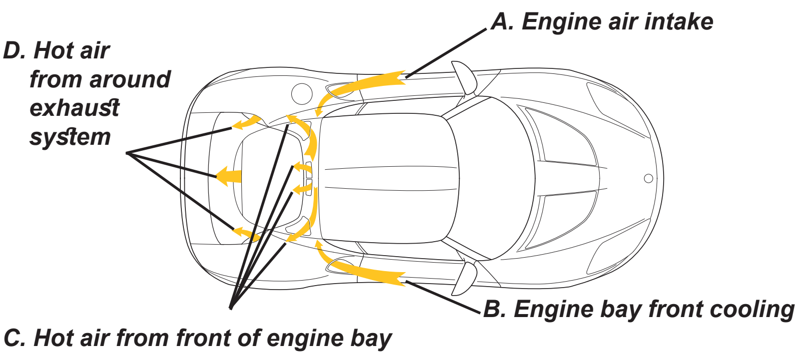


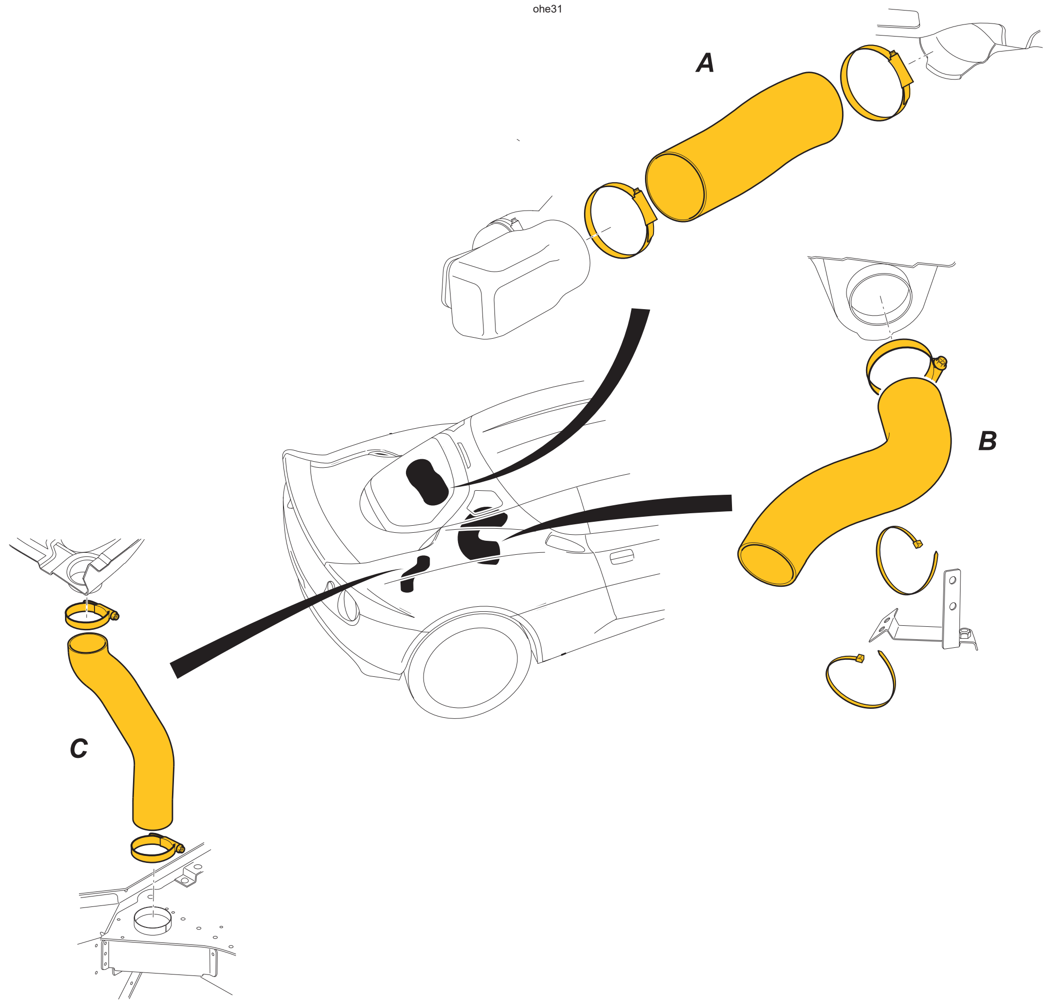
The folded paper pollen filter element, fitted into the front of the HVAC module inlet duct, is accessible from the access panel via an aperture provided in the top of the air intake duct assembly. This should be renewed at intervals specified in the Maintenance Schedule

Remove the cover plate to gain access to the filter. It may be necessary to carefully manipulate the filter to withdraw it from the air intake duct assembly.

Engine Bay Ventilation
Various intake and outlet vents are provided in the rear body to allow ventilation and cooling of the engine bay.

A Intake vent ahead of the left hand rear wheelarch to provide ambient air for the engine air intake,
B Intake vent ahead of the right hand rear wheelarch to provide ambient air and for engine bay cooling.
C Outlet grilles around the top of the tailgate panel exhaust hot air from around the catalytic converter at the front of the engine bay.
D An outlet grille at the base of the tailgate glass, and to either side, exhaust hot air from around the catalytic converter at the rear of the engine bay.





PN.3 - COOLING FANS & RE-CIRCULATION PUMP

The two cooling fans are fitted on the top side of the radiator/condenser package, and the coolant re-circulation pump is mounted at the LH side of the engine bay, beneath the air cleaner. Both the fans and pump are controlled by the engine management ECU using data provided by the engine coolant temperature sensor and the a.c. trinary switch mounted in the refrigerant line between receiver-drier and evaporator.

Cooling Fans

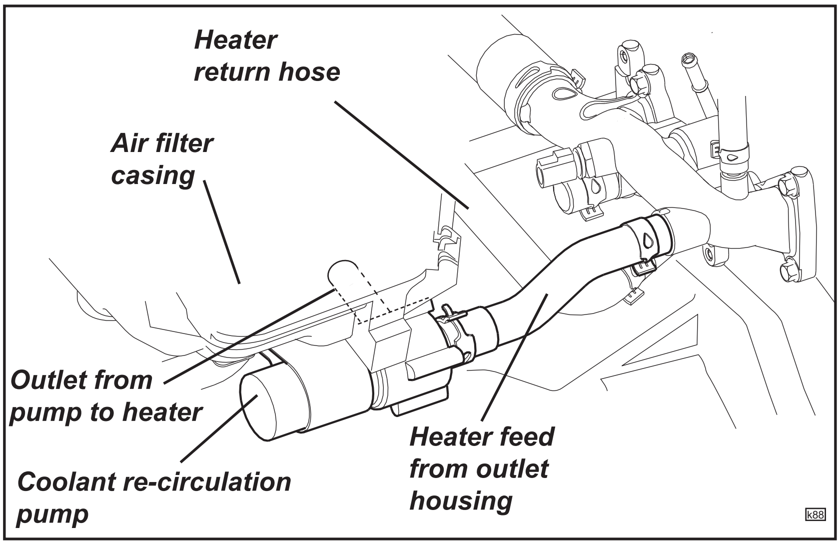
The cooling fans are switched as a pair, and will operate at half speed (connected in series) when coolant temperature reaches 98°C on rise (94°C with a.c. on), and switch off at 96°C on fall (92°C with a.c. on). If coolant temperature rises to 105°C (96°C with a.c. on), the fans will switch to full speed (connected in parallel), reverting to half speed on fall at 98°C (94°C with a.c. on).

Note that the temperatures displayed on the instrument panel may differ from the programmed values described above due to instrument damping lag.

The fans are also activated by signals received from the trinary switch; the fans will run at low speed for pressures between 13 - 18 bar, and at high speed for pressures over 18 bar.

Certain types of ECU detected engine fault will also cause the fans to be activated as an engine protection measure. If the ECU receives a coolant temperature sensor signal voltage outside of the acceptable range, a default setting equating to 60°C will be substituted, and the cooling fans will run at half speed.

Re-circulation Pump



A coolant re-circulation electric pump is mounted beneath the air cleaner, and is plumbed into the heater supply line. When energised, the pump circulates coolant through the heater system, drawing coolant from the back of the cylinder head, and pumping it through the heater matrix and back to the engine.

Heat Soak

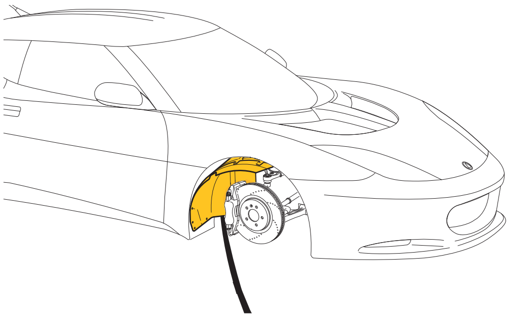
After ignition switch off, the ECU remains live for a minimum period of 1 minute for coolant temperatures below 75°C (at time of switch off), extending progressively to a maximum period of 10 minutes for temperatures over 90°C. If, during this period, the coolant temperature exceeds 110°C, the re-circ. pump will be activated and will run for a maximum period of 6 minutes, or until the coolant temperature falls to 50°C.

If, during the ECU live period the coolant temperature rises to 120°C, the cooling fans will run at slow speed in addition to the re-circ. pump, for a maximum period of 2 minutes, or until the temperature falls to 70°C.

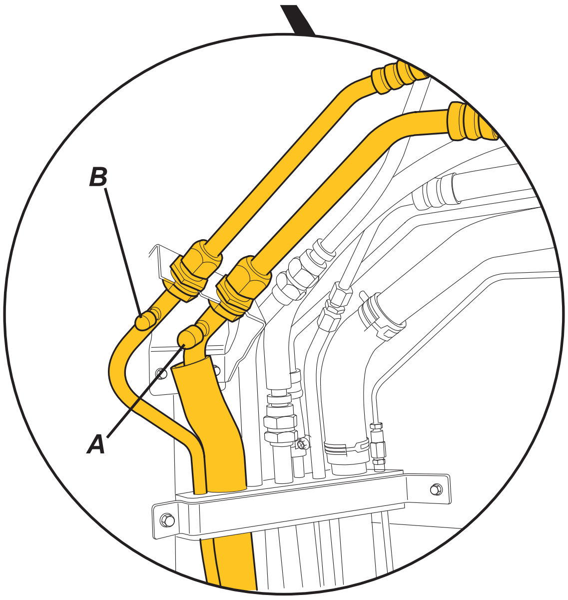
PN.4 - REFRIGERANT HANDLING & SERVICE PORT CONNECTIONS

The system is charged with HFC R134a refrigerant, (refer to service notes vehicle data section TDU for capacity), the following precautions MUST ALWAYS BE OBSERVED.

1. On no account should refrigerant ever be discharged to atmosphere - use a refrigerant recovery/recycling station in accordance with the manufacturer's instructions.



Pull wheelarch liner away from 'A' panel (road wheel not illustrated for clarity)



2. Service valve connectors are provided in the compressor suction and discharge pipes bodyside pipes at the right hand front wheelarch, behind the wheelarch liner panel;

   A. The low pressure vapour line port is fitted in the pipe between the evaporator and compressor.

   B. The high pressure liquid line port is fitted in the pipe between the compressor and condenser.

   Note: It is possible to recover and recharge the refrigerant system by turning the steering onto a full right hand lock and then carefully pull the rearmost outer edge of the right hand front wheelarch liner away from the wheelarch 'A' panel area to expose the service valve connectors.

3. Heavy concentrations of refrigerant vapour can produce toxic gas if exposed to a naked flame. The gas can also attack metal.

4. Refrigerant drums must never be left open - always ensure the caps are securely fitted.

5. Never transport drums of refrigerant in the passenger compartment of a car.

6. Never expose refrigerant drums to high temperature.

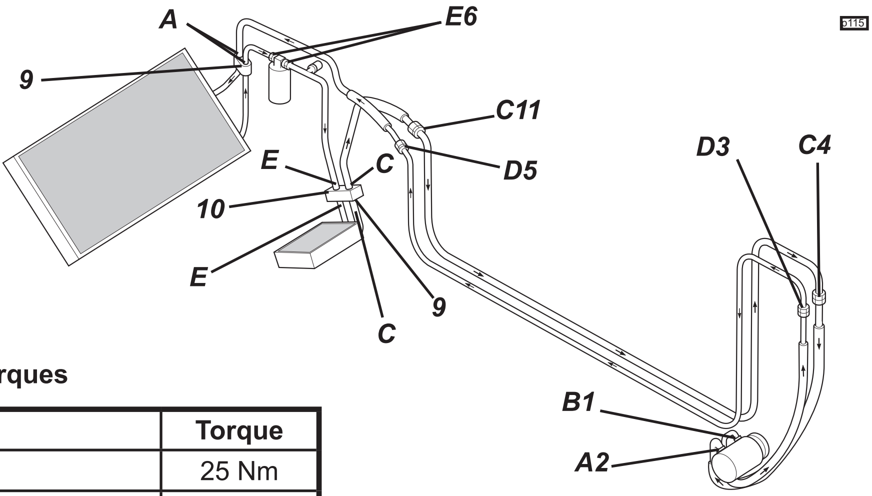
7. Never weld or use a steam cleaner in close proximity to any part of the air conditioning system.

8. Never expose the eyes to vaporised or liquid refrigerant - ALWAYS wear safety goggles and gloves when handling refrigerant.

PN.5 - REFRIGERANT PIPEWORK PRECAUTIONS

The following precautions must be observed when carrying out any work on the refrigerant pipework: Before disconnecting any refrigerant pipework, the refrigerant must first be recovered using suitable equipment

1. All replacement components and flexible end connections are sealed when new, and should only be opened IMMEDIATELY PRIOR TO FITTING, AND AT ROOM TEMPERATURE, to prevent condensation of any moisture which may enter when the sealing is removed.
2. Pipes, flexible end connections and components, must be capped immediately they are opened to prevent the ingress of moisture and/or dirt.
3. The receiver-drier should be the LAST component to be connected, to ensure optimum dehydration and maximum moisture protection of the system.
4. All joints should be coated with refrigeration oil before making any connections, to aid sealing.
5. Great care must be taken to prevent damage to the pipe fittings and connections, since due to the high pressures involved, a leak can be caused by the slightest imperfection. Always use two spanners of the correct size when releasing or tightening any pipe joint so that the fixed part of the union may be prevented from twisting and damaging the component. This is especially important with the aluminium condenser.
6. All pipes and hoses must be free from any kinking. The efficiency of the system can be impaired by a single kink, or restriction. Flexible hoses should not be bent to a radius which is less than ten times the diameter of the hose.



Refrigerant Pipework Fixing Torques

Key	Description	Torque
1	Compressor to engine	25 Nm
2	A.C. hoses to compressor	9 Nm
3	Sill pipe to comp. hose, high pressure	25-30 Nm
4	Sill pipe to comp. hose, low pressure	35-40 Nm
5	Sill pipe to condenser pipe	25-30 Nm
6	Receiver-drier connections	25-30 Nm
7	Evaporator pipe to receiver-drier	20-25 Nm
8	Trinary switch to pipe	10-13 Nm
9	Clamp plate, pipes to cond & exp valve	9 Nm
10	Clamp plate, expansion valve to evap	6 Nm
11	Evaporator to sill pipe	35-40 Nm

Use refrigeration oil only, smear on “O” rings and threads prior to assembly.

Gloves should be worn when handling refrigeration oil - see data sheet.

Refrigerant Pipework 'O' Rings

Key	Description	Diameter
A	Suction line to compressor/Condenser connections	17 mm
B	High pressure line to compressor	13 mm
C	Suction pipe to sill pipe and expansion valve	19 mm
D	High pressure line to sill pipe	12 mm
E	Receiver-drier connections and expansion valve inlet	9 mm

PN.6 - REFRIGERANT OIL

The internal working parts of the compressor are lubricated by refrigerant oil. This is a special type of oil which can mix with the refrigerant, such that a proportion of the oil circulates with the refrigerant, around the whole system. The refrigerant oil also absorbs moisture and holds debris in the system until it can be collected by the reciever-drier

Under normal operating conditions, the oil never needs changing or replenishing, and if the correct procedure for system depressurisation and re-charging is followed, minimal oil will be lost from the system during these operations.

If, however, the system suffers a major leak or sudden de-pressurisation, most of the oil held in suspension will be lost as the refrigerant escapes, necessitating the addition of a specified quantity of oil to the compressor on re-assembly (see section PN.7).

If a refrigeration component is to be replaced, the removed item will contain a certain amount of oil, and a corresponding amount of new oil must be added to the system on re-assembly:

Condenser;	30 cm^3
Evaporator;	30 cm^3
Any major pipe or hose;	10 cm^3
Receiver-drier;	30 cm^3

Approved Oils
Use only Denso ND-OIL 8 low viscosity (ISO46) PAG oil or equivalent (Sanden SP10; Four Seasons 59007).

Refrigerant oil absorbs water and should not be exposed to the atmosphere for any longer than is strictly necessary to perform the operation. Never return decanted oil back into the storage container.

PN.7 - COMPRESSOR

Important: To avoid premature compressor failure please read the 'Compressor Running-In Procedure' shown on page 20 before starting the engine for the first time after compressor fitment or renewal of any other air conditioning component if the system has been open to atmosphere for any length of time.

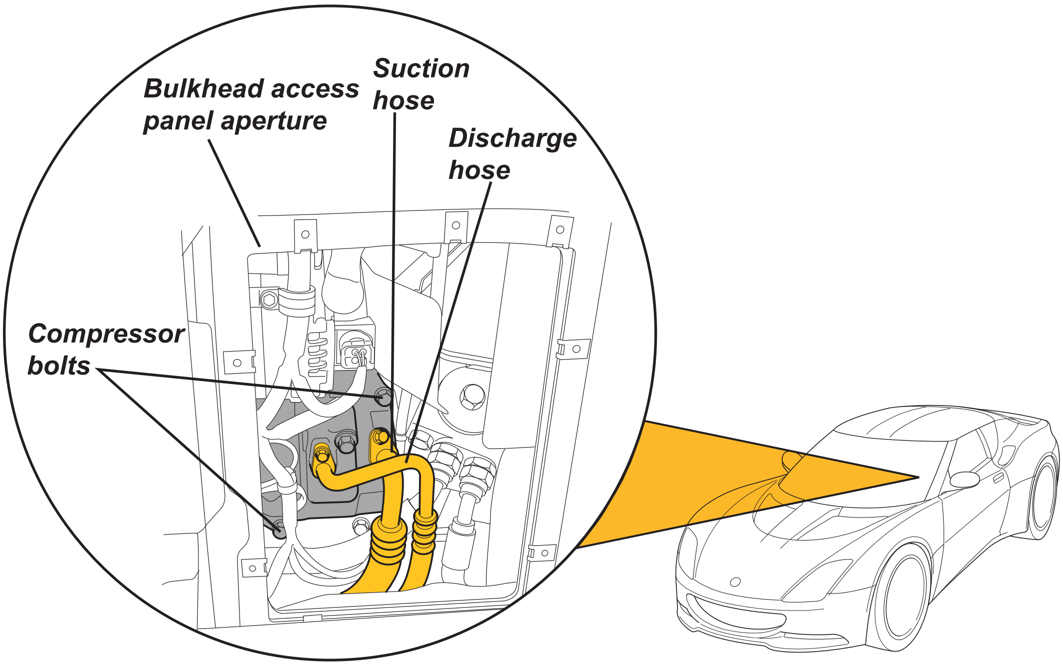
The a.c. compressor is mounted at the left hand front of the crankcase, and is driven from the crankshaft, together with the alternator, PAS pump and water pump, by a multi-rib, serpentine, synthetic belt. A maintenance free belt tensioner takes the form of an idler pulley mounted on a sprung eccentric hub, which mechanism applies pressure to the smooth, back side of the belt between the crankshaft and water pump, and provides a generous belt wrap around the crankshaft pulley.

The belt itself should be inspected for condition at each service interval, and if it exhibits any evidence of physical damage, cracking, fraying, perishing, abrasion, contamination or any other deterioration, it should be replaced. In the case of oil or coolant contamination, the cause must be identified and rectified, and each of the pulleys must be thoroughly degreased before the new belt is fitted.

Compressor Removal

1. Remove the RHF wheelarch liner and recover the refrigerant using equipment connected to the service ports at the rear of the wheelarch; refer to service notes section BV.17 and sub-section PN.4 for further information.

2. Remove the RHR wheel and wheelarch liner and relieve the tension on the auxiliary drive belt refer to service notes sections BV.17 and EJ.4 for further information.

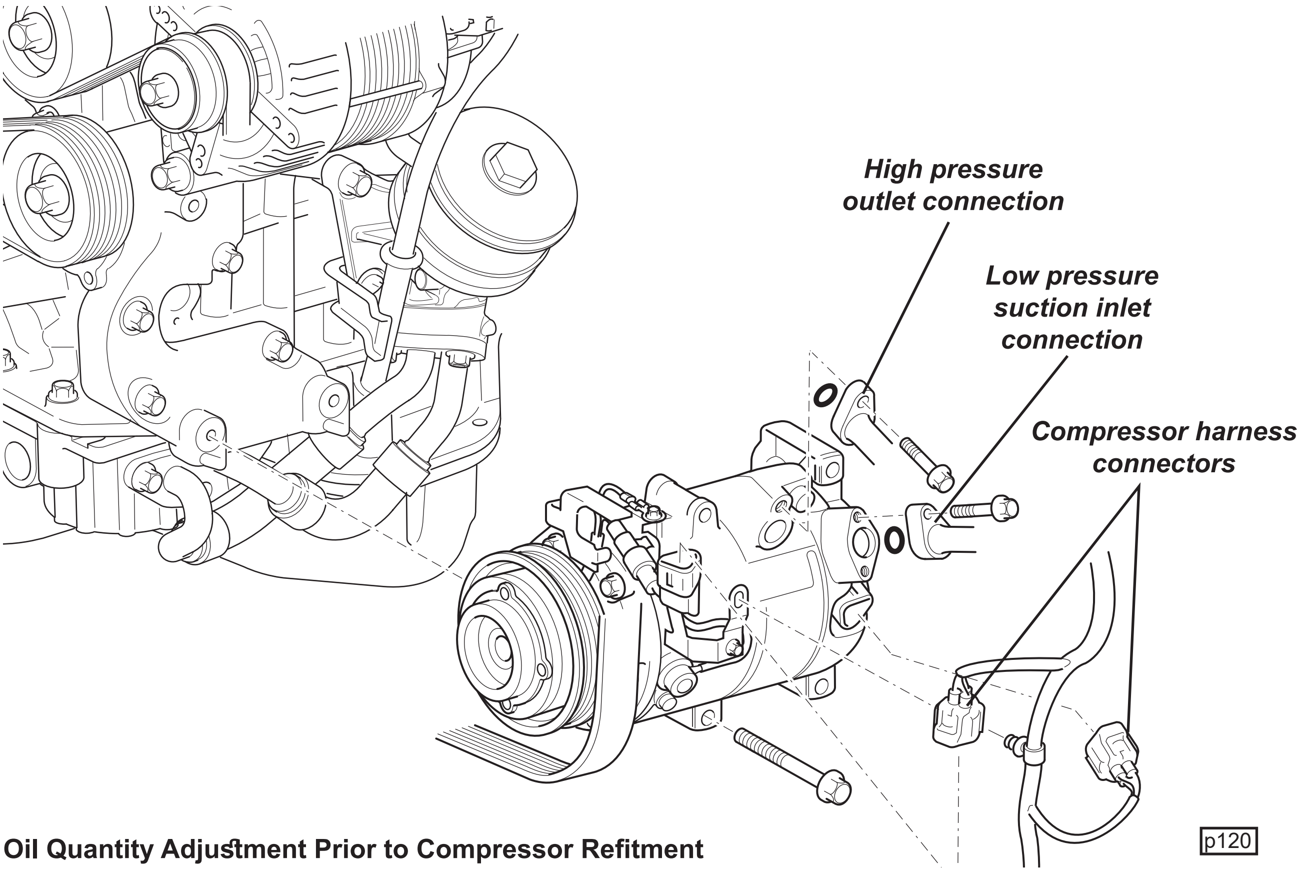


3. Remove the rear seat or cabin rear bulkhead trim; refer to service notes section VE.13 for further information. Release the 9 fixings retaining the bulkhead access panel and remove.

4. Release the clamp plates securing each of the pipes to the compressor and immediately cap the pipes and compressor ports to prevent ingress of dirt and moisture. Secure the two pipe/hoses aside.

5. Disconnect the two compressor electrical harness plugs.

6. Remove the four bolts securing the compressor to the engine, disengage the drive belt and withdraw the unit through the bulkhead aperture. Retain the compressor for oil quantity measurement if a new unit is to be fitted.



Oil Quantity Adjustment Prior to Compressor Refitment

Refitting Existing Compressor

i) If the existing compressor is to be refitted after normal refrigerant recovery has been performed, a quantity of oil equivalent to that recovered must be added to that already held in the compressor.

ii) If the system has suffered a rapid discharge, caused for example by accident damage, most of the refrigerant oil will have been lost. Drain the remaining oil from the compressor by removing the drain plug and rotating the clutch plate. Add 150 cm^3 of new refrigerant oil (see above) to the compressor before refitment. ***Also see 'Note' at the bottom of this page.***

Fitting New Compressor

New compressors are sealed and pressurised with nitrogen gas. The sealing caps should be removed only immediately prior to compressor fitment, at which time the gas pressure should be heard to escape as a cap is slowly released. New compressors are supplied with an oil fill of 150 cm^3.

i) If normal refrigerant recovery has been performed, the new compressor oil should be drained off, and the required oil quantity in the new compressor calculated and added:

- Drain and measure the oil quantity in the ***OLD*** compressor by removing the drain plug and rotating the clutch plate. Quantity = X cm^3

- Oil quantity to be added to new compressor = X + 10 cm^3

ii) If the system has suffered a rapid discharge, caused for example by accident damage or because the compressor has suffered internal damage/oil starvation, most of the refrigerant oil will have been lost. In this case, fit the new compressor as supplied with its 150 cm^3 oil charge. ***Also see 'Note' below.***

Note: If the compressor refitment or renewal is required under these circumstances, then the receiver drier should also be renewed; refer to sub-section PN.9 for further information.

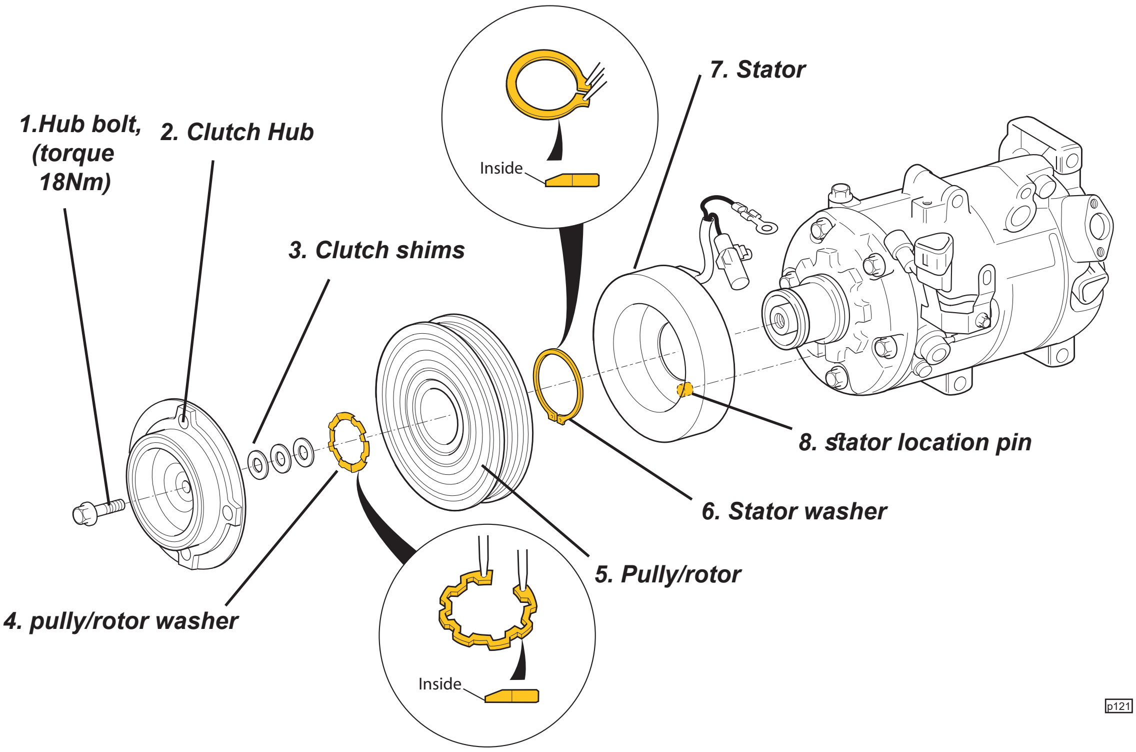
Clutch Assembly
The assembly comprises of a magnetic clutch stator, clutch rotor/pulley and clutch hub. The clutch stator is located into positon onto the front of the compressor by a locating pin and is retained in place by a circlip.

The rotor consist of a non serviceable pulley wheel and internal bearing assembly. the pulley wheel is internally recessed allowing it to fit over the stator. The rotors internal bearing allows the pulley wheel to spin on the compressor shaft casing and is retained in place by a circlip.

The clutch hub consists of a solid mount with an internally splined shaft allowing it to slide onto the compressor shaft splines and is solidly fixed to the compressor shaft by a bolt. A flexible plate is fixed to the rear face of the mount. When the hub assembly is in position the hub plate is in situ next to the outer face of the pulley.

A maximum of 3 shims are fitted between the hub mounts splined shaft and the end of the compressor shaft. This is so that a clearance is created between the contact face of the hub plate and pulley wheel.

When the engine is running, the pulley is in constant rotation via the auxiliary drive belt, but as there is a clearance between the rotor and the hub, the compressor will not turn until the the stator is energised (by turning on the air conditioning). When the stator is energised the clutch assembly becomes magnetised, drawing the flexible plate of the hub against the pulley, transmitting the drive from the auxiliary belt to the compressor shaft.



Clutch Assembly Removal
1. Remove compressor assembly (see sub-section PN.7).
2. Place compressor assembly in a vice.
3. Remove the hub bolt, withdraw the hub and collect the clutch washers (minimum of 3).
4. Remove pulley/rotor circlip and withdraw pulley.
5. Disconnect stator electrical connector.
6. Remove stator circlip and withdraw stator assembly.

Clutch Assembly Refitment

Refit in reverse order to removal except:

1. Ensure locating pin on stator is aligned with the notch on the compressor housing (item 8).

2. Fit new circlip to stator ensuring chamfered side is facing up (item 6).

3. Fit new circlip to pulley/rotor ensuring chamfered side is facing up (item 4).

4. Fit the clutch washers to the inside extension of the hub mount (item 3). Use same amount of washers as recovered during disassembly or a maximum of 3 and tighten hub bolt to 18Nm.

5. Check clutch clearance (if there is no clearance then add additional clutch washers).

Inspecting clutch clearance

1. Set a dial test indicator (DTI) to the face of the magnetic clutch hub.

2. Using a suitable 12 volt battery/power source and flyleads, connect the flyleads to the batteries positive and negative terminals. Connect the positive flylead to the clutch stator positive connector (B) and the negative flylead to the stator ground wire (C).

3. Using the power source, turn the magnetic clutch on and off and measure the clearance. (When the power source is connected the clutch should be heard to operate and the hub and rotor should lock together).

4. The distance the hub has moved can be measured on the DTI and equated as a clearance value between the hub and pulley. This should measure between 0.26 to 0.60mm.

5. If the measured clearance is not within this range then adjust it by adding or subtracting clutch washers as necessary.

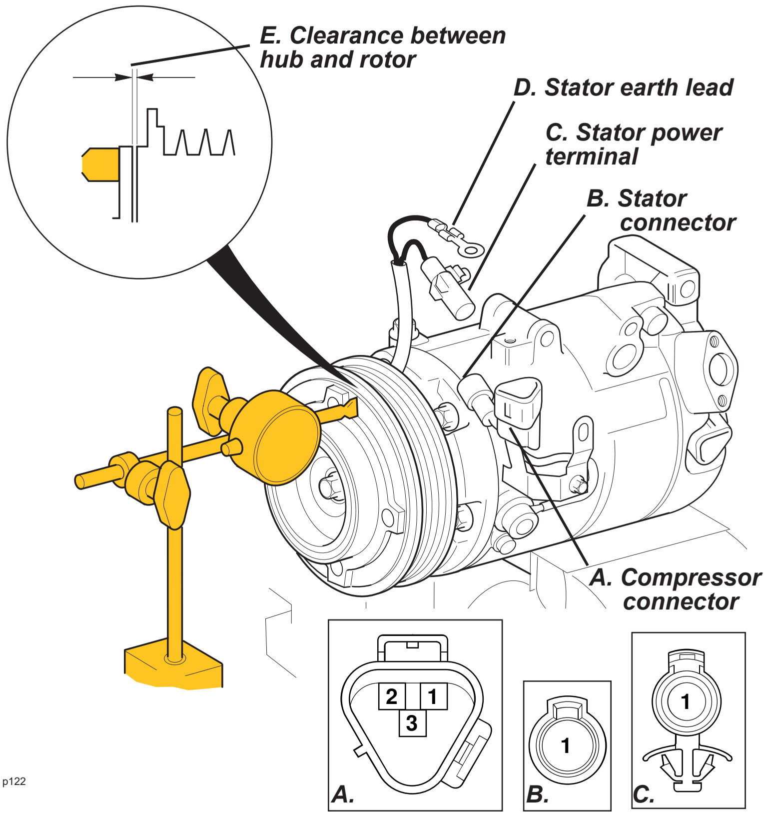
If the clutch fails to operate when a suitable power source is used then check the resistance of the compressor and clutch unit at the following terminals

Tester Connection	Condition	Specified Condition
A-3 - B-1	Always	Below 1 Ω
A-3 - Body ground	Always	10 kΩ or higher

If the resistance is not as specified, replace compressor and clutch

Tester Connection	Condition	Specified Condition
C-1 - Body ground	Always	3.4 to 3.8 Ω

If the resistance is not as specified, replace clutch



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Compressor Fitment
Important: To avoid premature compressor failure please read the ‘Compressor Running-In Procedure’ shown below before starting the engine for the first time after compressor fitment or renewal of any other air conditioning component if the system has been open to atmosphere for any length of time.

1. Fit the compressor to the engine and secure with the four M8 bolts; Tighten to 25 Nm (18 lbf.ft).

2. Using new 'O' rings lubricated with mineral refrigerant oil, fit the two refrigerant pipes to the compressor and tighten each clamp plate screw to 8 Nm.

3. Connect the compressor electrical harness plugs.

4. Fit the auxiliary belt around the pulleys ensuring correct engagement of the ribs. Apply a counterclockwise torque to the auxiliary belt tensioner and remove the locking pin.

5. Recharge the system with R134a refrigerant.

Note: If the compressor renewal is required because of internal damage or oil starvation, then the receiver drier should also be renewed; refer to sub-section PN.9 for further information.

Compressor Running-In Procedure
IMPORTANT: It is crucial to carry out the procedure described below to ‘run-in’ either a new or refitted compressor to ensure the refrigerant oil does not exit the compressor sump and flow directly into the air conditioning hoses/pipe-work before ***first*** circulating around the compressor ensuring the compressors internal components are fully lubricated.

Overtime insufficient compressor lubrication can result in reduced air conditioning effectiveness, generation of diagnostic trouble codes, failure of the compressor assembly and, in extreme circumstances, seizure of internal compressor components resulting catastrophic compressor damage.

Preparation:
Before starting the engine for the first time ensure that the system is correctly recharged with R134a and that the correct amount of refrigerant oil has been added, refer to sub-sections PN.6 and ‘Oil Quantity Adjustment Prior to Compressor Refitment’ section on previous pages for further information.

1. Start the engine but DO NOT allow the engine speed to rise above idle.

2. Turn on the air conditioning system, (set temperature setting to maximum cold).

3. Ensure the engine speed does not rise above idle for a minimum of TWO minutes.

4. Monitor air conditioning performance and carry out any leak detection/system checks as per normal before refitting any ancillary components back onto the vehicle.

Carrying out this procedure allows the oil to fully circulate around the refrigerant circuit and compressor system before the compressor is put under any loading.

PN.8 - CONDENSER

The a.c. condenser, engine cooling radiator and cooling fans (in front to back order), are secured together as a package and mounted between the front subframe longerons leaning forwards at an angle of 45°. The package is flexibly mounted via grommets and spigots off the engine radiator, with the condenser rigidly fixed to the front of the radiator by 4 setscrews. The inlet pipe to the top section of the divided RH tank and the outlet pipe from the lower section of the right hand tank extend to a joint plate accessible from above.

Removal of the condenser from below is possible without disturbing the engine radiator, and is facilitated by removal of the front clamshell, but is also possible with this panel *in situ*, provided the front bumper is removed.

To Remove Condenser

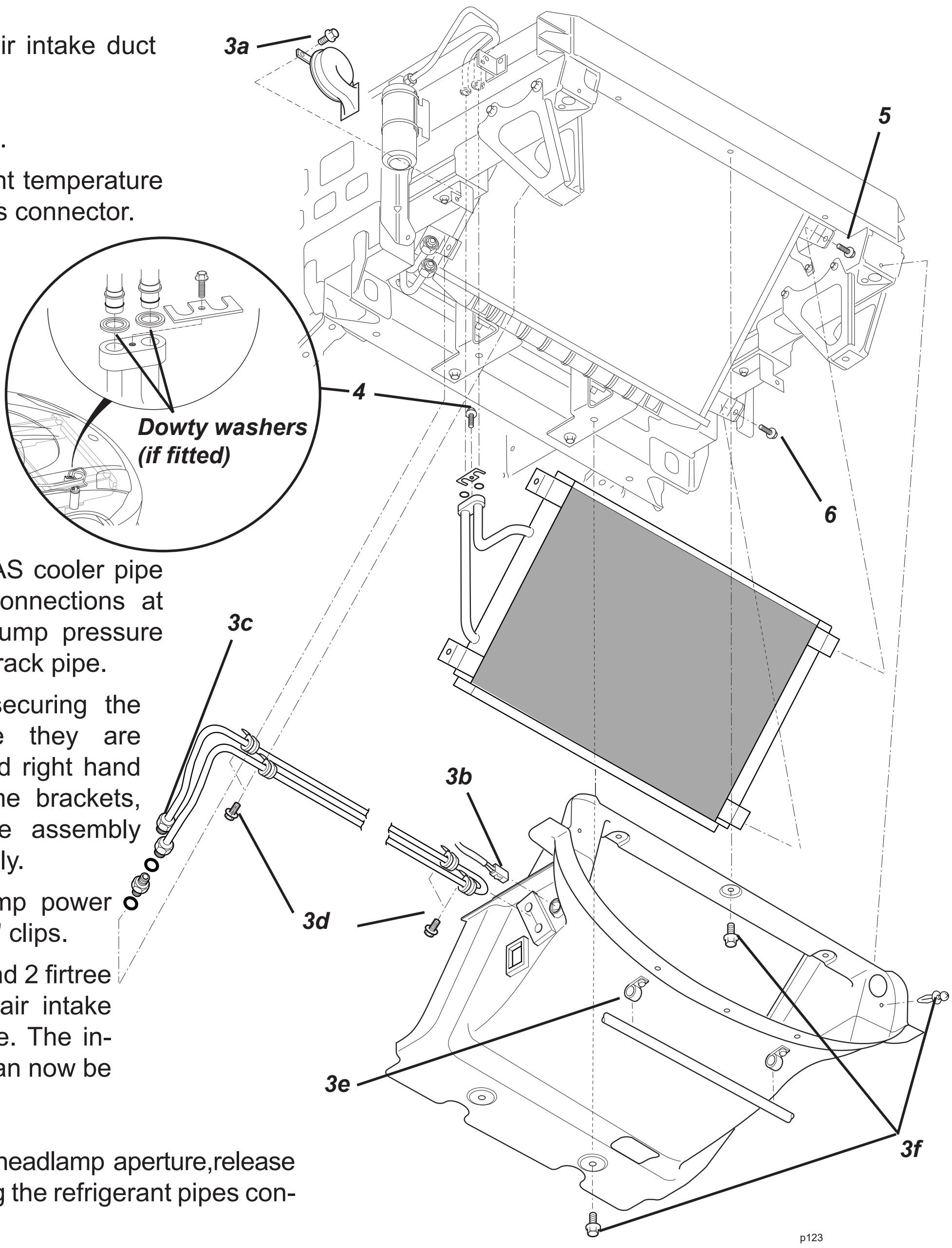
1. Remove the right hand front wheelarch liner and recover the refrigerant using equipment connected to the service ports at the rear of the wheelarch.

2. Remove the front undertray and bumper assembly; see service notes sections A - introduction and BV.17 for further information.

3. Remove the radiator air intake duct assembly by:

   A. Removing both horns.

   B. Unclipping the ambient temperature sensor from its harnes connector.



   C. If fitted, unbolt the PAS cooler pipe assembly from its connections at the cooler pipe to pump pressure pipe & cooler pipe to rack pipe.

   D. Remove the bolts securing the cooler pipes where they are clipped to the left and right hand undertray to subframe brackets, withdraw cooler pipe assembly from the duct assembly.

   E. Release the headlamp power wash hose from its 'P' clips.

   F. Remove the 5 bolts and 2 firtree fixings securing the air intake duct to the sub frame. The intake duct assembly can now be removed.

4. From the right hand side headlamp aperture,release the clamp plate securing the refrigerant pipes connection.

Note: Early cars from start of production may have dowty washers fitted between the condenser joint block and clamp plate for additional sealing. If replacing with a new condensor it should not be necessary to refit the dowty washers. See Technical Service Bulletin TSB2009/05 for additional information.

5. From each headlamp aperture, release the screw securing the top of the condenser to the radiator bracket.

6. At each side, release the single screw securing the bottom of the condenser to the radiator bracket, and withdraw the condenser.

7. Refit in reverse order to removal.
   - If a new condenser is fitted, add 30 cm^3 of approved refrigerant oil to the system.
   - Use new 'O' rings on the pipe connections, and lubricate with refrigerant oil.
   - Recharge the system with R134a, refer to service notes vehicle data section TDU for capacity.

Important: To avoid premature compressor failure please read the ‘Compressor Running-In Procedure’ shown on page 20 before starting the engine for the first time after compressor fitment or renewal of any other air conditioning component if the system has been open to atmosphere for any length of time.

PN.9 - RECEIVER-DRIER & TRINARY SWITCH

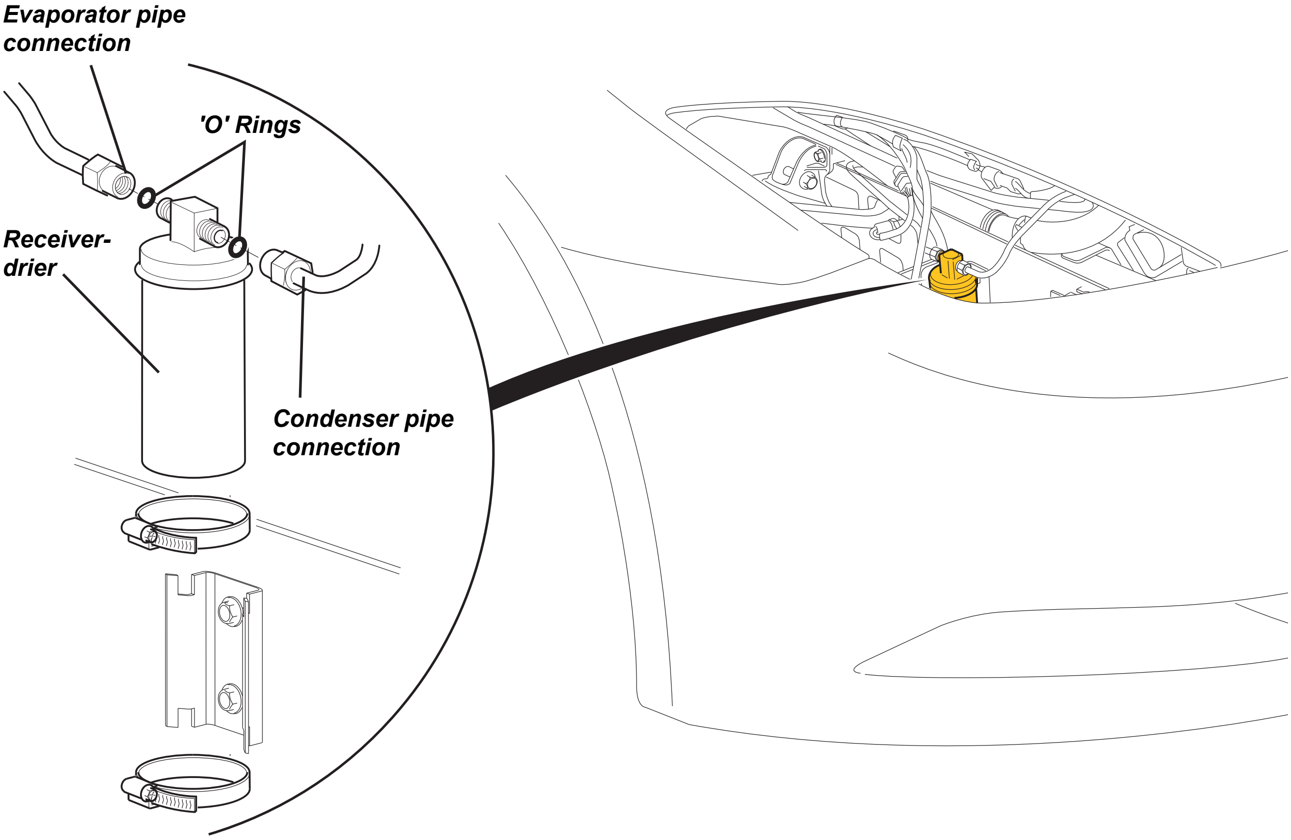
If the system has been open to atmosphere for any length of time, e.g. following accident damage or a burst hose or damaged component, the receiver-drier unit must be renewed, and should be the last component to be fitted, and uncapped only immediately prior to connection and recharging.

The receiver-drier is clamped to a mounting bracket fixed to the outside face of the front subframe RH longeron, ahead of the front wheel, and is accessible from beneath with the front undertray removed (if front oil cooler is not fitted) or with RH headlamp removed (if oil cooler fitted). Refer to service notes sections KJ.7, MR.11 and introduction section for further information.

If the receiver-drier is to be replaced, the refrigerant must first be recovered using suitable equipment connected to the service ports at the rear of the RHF wheelarch.

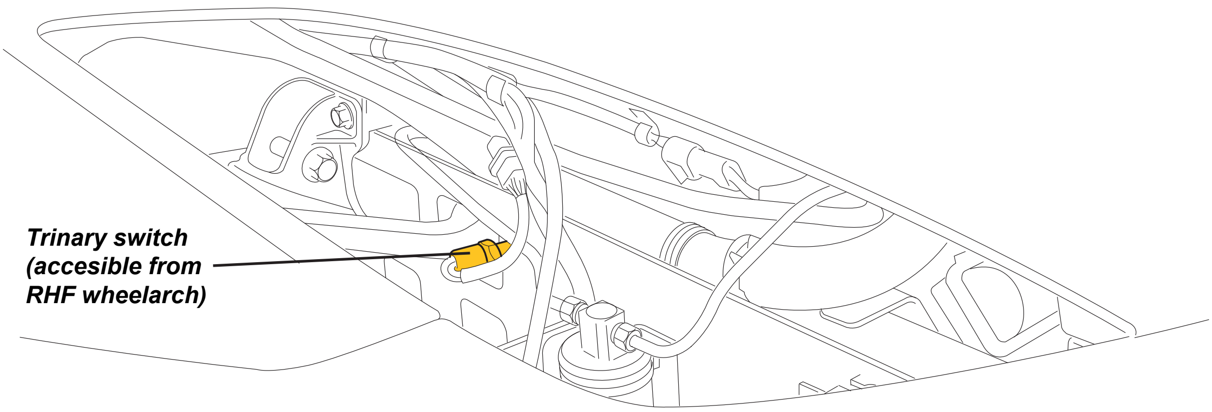
- Cap all pipes and ports immediately after disconnection to prevent the ingress of dirt and moisture.
- When reconnecting the pipes, use new 'O' rings coated in an approved refrigerant oil, and tighten to 25 - 30 Nm.
- If a new receiver-drier is fitted, add 30 cm^3 of approved refrigerant oil to the system.
- Recharge the system with R134a, refer to service notes vehicle data section TDU for capacity.

Important: To avoid premature compressor failure please read the ‘Compressor Running-In Procedure’ shown on page 20 before starting the engine for the first time after compressor fitment or renewal of any other air conditioning component if the system has been open to atmosphere for any length of time.



Trinary Switch

A trinary switch fitted into the pipe between the receiver-drier and expansion valve supplies a pressure signal to the engine ECU, which then allows system operation only within a pressure range of 2 to 32 bar in order to prevent system damage from too high a pressure, or from compressor oil starvation damage caused by too low a pressure. This data is also used by the ECU to engage the two condenser fans at half speed at pressures over 17.5 bar (see also service notes section KJ.5).



The trinary switch is accessible from RHF wheelarch area with the liner removed Refer to service notes section BV.17 for further information.

The trinary switch mounting port on the receiver-drier and expansion valve pipe is fitted with an integral schrader type valve, unwinding the switch from the pipe closes the valve limiting the amount of refrigerant loss.

Unless switch removal is required due to leaking refrigerant it should not be necessary to recover and recharge the system to remove and refit it.

Removal:

1. Unwind the trinary switch from the port at the receiver-drier to expansion valve pipe, if necessary support the pipe whilst unwinding to prevent placing excessive force on the pipe which may result in the pipe ends no longer seating properly on the receiver-drier or expansion valve resulting in refrigerant loss.

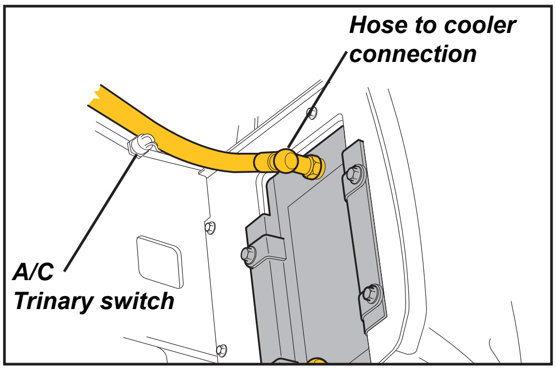
2. Cap the pipe port and trinary switch immediately after disconnection to prevent the ingress of dirt and moisture.

Refitment:

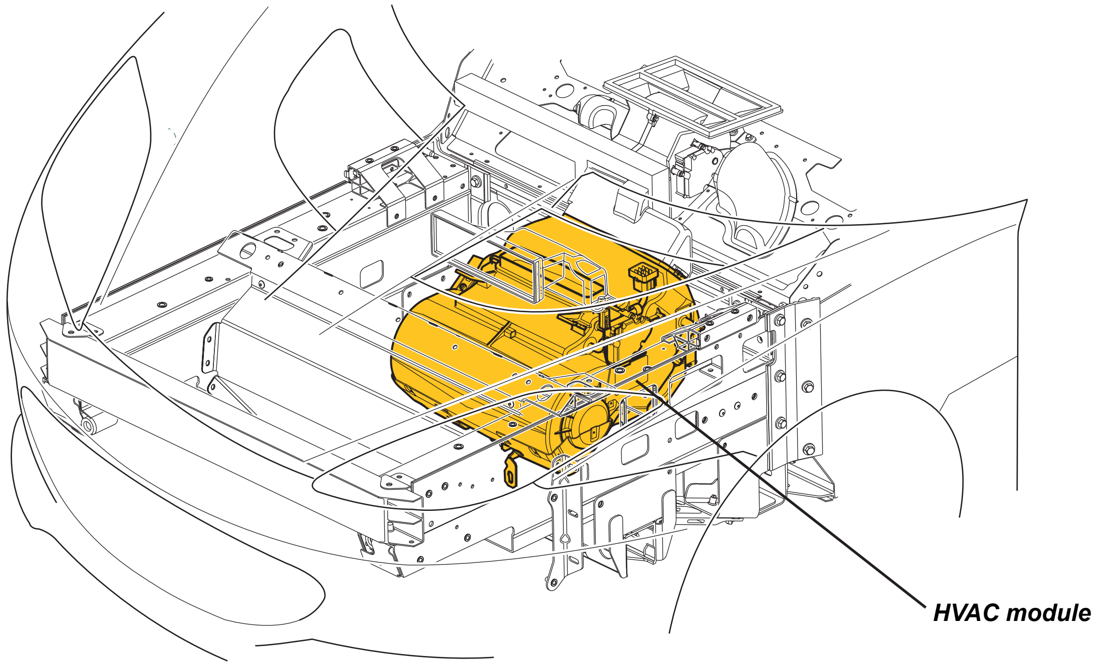
- Ensure the seal within the trinary switch is in good condition before fitting back onto the receiver-drier and expansion valve pipe.

- When reconnecting the switch tighten to 13Nm.

Note, If the vehicle is fitted with a front mounted oil cooler ensure the cooler hose is routed in front (forward) of the air conditioning trinary switch.



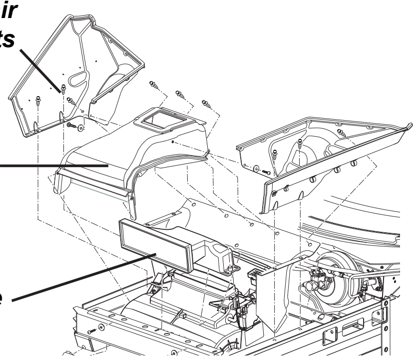
PN.10 - HEATER/VENTILATION/AIR CONDITIONING (HVAC) UNIT

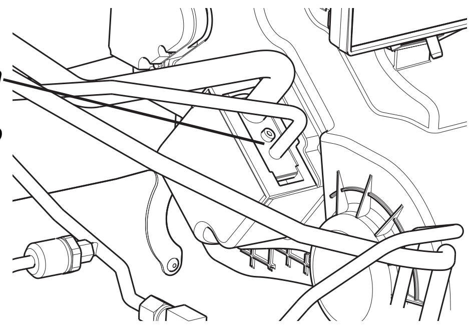


The complete HVAC module is mounted between the chassis front bulkhead and subframe cross-member/intermediate panel, with the steering rack beneath, and the radiator air outlet duct ahead.

Removal:

1. Remove the front undertray; refer to service notes introduction section for further information.
2. Remove front clamshell; refer to service notes section BV.4 for further information.
3. Remove radiator air outlet ducts
4. Remove the HVAC air inlet duct.
5. Recover the refrigerant, refer to sub-section PN.4 for further information.
6. Remove the wiper motor mechanism from the windscreen surround; refer to service notes section MR.9 for further information.
7. Remove pollen filter intake moulding.
8. Unplug the fan harness connector block, and disconnect the heater flap and air inlet flap actuators.
9. Release the M6 x 16 cap hd screw securing the a.c. pipe clamp plate to the expansion valve and withdraw the HVAC pipes.





10. Release the outlet pipe 'P' clip and secure the pipe aside, with both pipe and expansion valve port capped.
11. Remove the pipe between receiver-drier and expansion valve, and cap all pipe ends and ports.

12. Remove the upper fixings securing the subframe cross-member/intermediate panel to the subframe so that it can be pulled forward to allow withdrawal of the HVAC module (it is not possible to fully remove the panel without disconnecting and removing the PAS (Power Assisted Steering) pipes.

Remove:

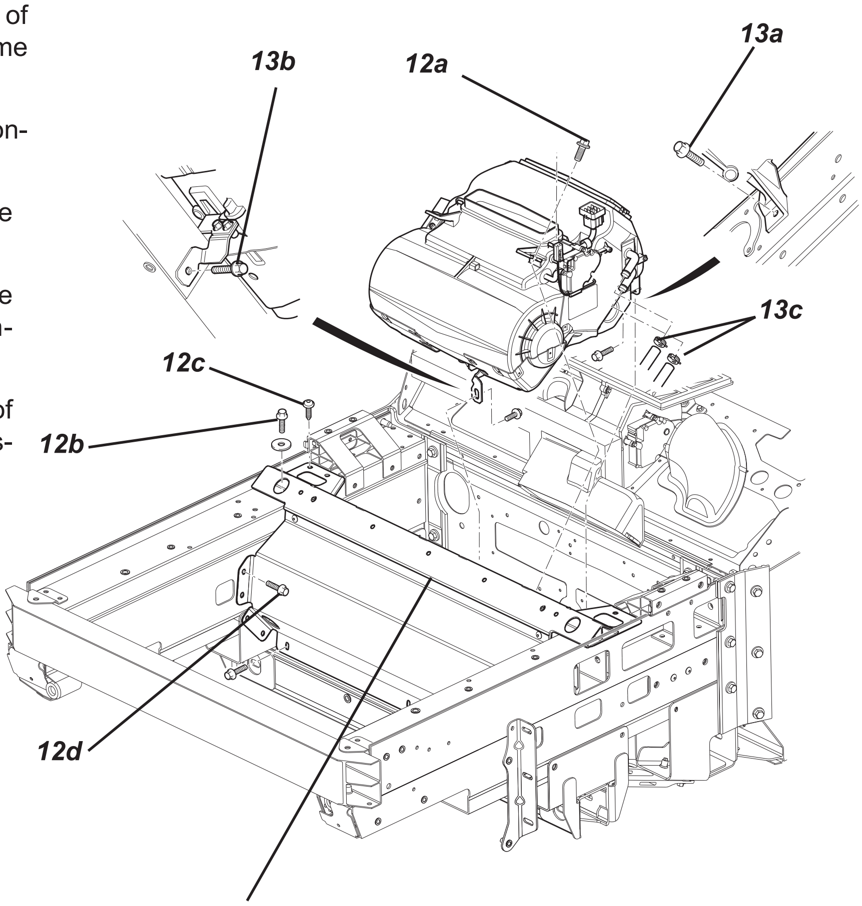
a. M8 x 20 screws and washers (2) torque 8Nm securing the top of the HVAC unit to the subframe crossmember;

b. 2 bolts each side to top of longerons;

c. 2 Torx head screws each side to top of longerons;

d. 4 bolts each side securing the crossmember wall to the inboard side of the longeron;

e. 3 bolts securing lower edge of wall to subframe lower crossmember.



14 Pull crossmember/wall assembly forward to withdraw HVAC unit

13. From beneath, release:

a. The M8 x 16 bolt (1) torque 9Nm securing the HVAC unit to the chassis bulkhead,

b. The M8 x 16 bolt (1) torque 9Nm joining the lower housing bracket to the lower crossmember bracket.

c. Disconnect the hoses from the heater matrix and collect escaping coolant by draining into a suitable container.

14. Carefully pull the crossmember/wall assembly forward and withdraw the HVAC unit.

Refitment:

Refit the HVAC unit in reverse order to removal:

- If a new evaporator is fitted, add 30 cm³ of approved refrigerant oil to the system.

- Use new 'O' rings on the pipe connections, and lubricate with refrigerant oil.

- Recharge the system with R134a, refer to service notes vehicle data section TDU for capacity.

- Refill the cooling system, refer to service notes vehicle data section KJ.3 for further information.

Important: To avoid premature compressor failure please read the ‘Compressor Running-In Procedure’ shown on page 20 before starting the engine for the first time after compressor fitment or renewal of any other air conditioning component if the system has been open to atmosphere for any length of time.

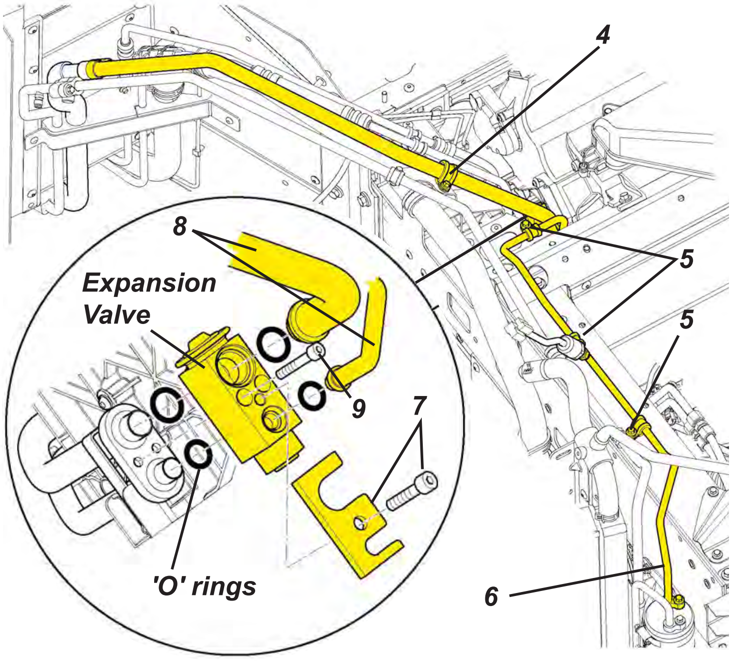
Expansion valve
The expansion valve is fitted onto the evaporator inlet and outlet pipes,

Removal:
1. Remove front clamshell; refer to service notes section BV.4 for further information.

2. Recover the refrigerant using equipment connected to the service ports at the rear of the right hand front wheelarch, refer to sub-section PN.4 & service notes section BV.17 for further information.

3. Remove the right hand radiator air outlet duct.

4. Release the M6 x 20 screw securing the outlet (low pressure vapour) pipe from the expansion valve 'P' clip to the subframe mounting bracket.



5. Release the M6 x 16 & M6 x 20 screws securing the inlet (high pressure liquid) pipe to the expansion valve 'P' clips to the subframe.

6. To limit ancillary items fouling the HVAC module during withdrawal from the vehicle, remove the pipe between receiver-drier and expansion valve and cap all pipe ends and ports, refer to sub-section PN.9 for further information.

7. Release the M6 x 16 cap hd screw securing the air conditioning pipe clamp plate to the expansion valve and remove the clamp (Torque (9 Nm).

8. Withdraw both pipes from the expansion valve and cap all pipe ends and ports immediately to prevent the ingress of dirt and moisture, (ensure to retrieve the 'O' ring seals).

9. Release the two M5 screws from the counter-bored holes in the top of the valve, securing the valve to the evaporator pipes and withdraw the valve from the pipes (torque 9 Nm). Collect the 'O' rings from the evaporator inlet/outlet pipes and then immediately cap the pipes and ports to prevent the ingress of dirt and moisture.

Refitment:
Refit in the reverse order to removal:
- Use new 'O' rings on all the pipe connections and lubricate with suitable refrigerant oil* and recharge the system with suitable refrigerant gas*, refer to service notes vehicle data section TDU for capacity.

*Refer to sub-sections PN.4 & PN.6 for further information.

Important: To avoid premature compressor failure please read the ‘Compressor Running-In Procedure’ shown on page 20 before starting the engine for the first time after compressor fitment or renewal of any other air conditioning component if the system has been open to atmosphere for any length of time.

PN.11 - AIR DISTRIBUTION UNIT (ADU)

The airflow distribution unit is mounted on top of the chassis scuttle, sandwiched between the underside of the fascia top/demist duct and the chassis. The unit comprises several plastic mouldings bonded and rivetted together to contain the rotary distribution drum which controls the airflow to the windscreen, face level vents, and footwells. The stepper motor for the drum is mounted on the left hand side of the unit.

To Remove the Air Distribution Unit

1. Remove the main fascia panel (see sub-section VE.8).

2. Remove the passenger footwell duct between the side of the ADU and the scuttle aperture by prising it away from the double sided tape retaining it in position.

3. Remove the driver footwell duct between the side of the ADU and the scuttle aperture by removing the blind pop rivets retaining it in position.

   Note: There are foam gaskets fitted around the ADU duct outlets, if the ADU unit is being renewed then these should be removed and fitted to the new unit unless the gaskets are being renewed.

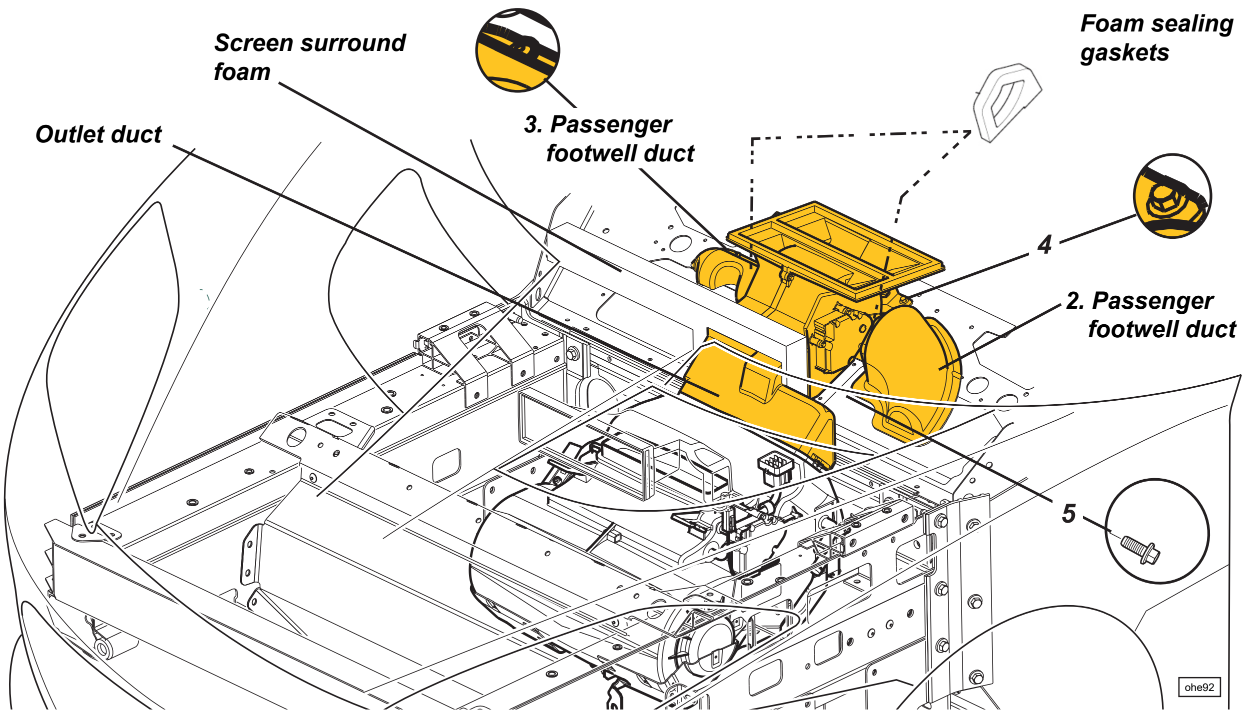
4. Remove the M6 x 16 Hex flange screws (2), torque to 4Nm on refitment, securing the ADU integral rear bracket to the scuttle.

5. From within the footwell, release the M6 x 12 flange screw (1), torqued to 8Nm on refitment within the scuttle top central reinforcement channel.

6. Withdraw the ADU from the screen surround foam and HVAC module outlet duct and disconnect the drum actuator harness plug.

Refitment:
Is the reversal of removal.

Apply a glazing wipe and adhesion promoter over the contact surfaces of the passenger footwell duct and scuttle panel before applying double sided tape to the underside of the duct.



PN.12 - REFRIGERANT PIPES

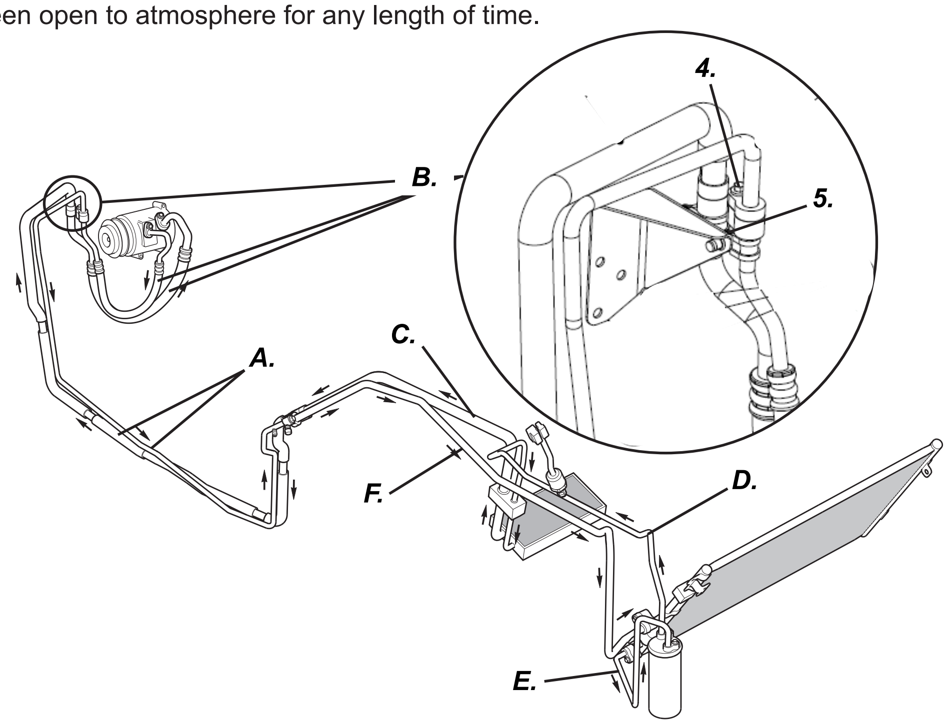
The main feed and return (high pressure liquid and low pressure suction) lines between the compressor, condenser and expansion valve, take the form of aluminium pipes clamped along the outside of the chassis RH siderail, such that removal of the body side panel is required for access to the pipes. Replacement of the pipes is unlikely to be necessary other than as a result of accident damage, in which case the body sill will be replaced in accordance with Service Notes section BU.9.

Removal notes: Prior to the removal of any air conditioning pipe or hose shown in this section, the refrigerant must be recovered using suitable equipment connected to the service ports at the rear of the wheelarch; refer to sub-sections PN.4 and PN.6 for further information.

Refitment notes: Use new 'O' rings lubricated with refrigerant oil when reassembling any pipes or hoses refer to sub-section PN.6 for further information.

- Recharge the system with suitable refrigerant, see sub-sections PN.4 & PN.6 for further information.

- To avoid premature compressor failure please read the 'Compressor Running-In Procedure' shown on page 20 before starting the engine for the first time after the renewal of any air conditioning component if the system has been open to atmosphere for any length of time.



A. Main feed and return (high pressure liquid and low pressure suction) body pipes: These are positioned between the compressor, condenser and expansion valve and take the form of aluminium pipes clamped along the outside of the chassis RH siderail, such that removal of the body side panel is required for access to the pipes. Replacement of the pipes is unlikely to be necessary other than as a result of accident damage, in which case the body sill will be replaced.

B. Feed and return compressor (high pressure liquid and low pressure suction) hoses: These are positioned between the compressor and main feed and return body pipes.

Removal:

1. Remove the right hand rear wheelarch liner and rear undertray, refer to service notes sections BV.17 & A for further information.

2. Remove the rear seat or cabin rear bulkhead trim; refer to service notes section VE.13 for further information, then release the 9 fixings retaining the bulkhead access panel and remove.

3. Release the screws securing each of the air conditioning hose flanged ends to the compressor, immediately cap the pipes and compressor ports to prevent ingress of dirt and moisture and secure the two hoses aside. Also refer to sub-section PR.7 for further information.

4. From within the right hand rear wheelarch area release the M6 x 20 screws securing the air conditioning hose flanged ends to the bodyside pipes (torque 8 Nm), immediately cap the hoses and bodyside pipe ports to prevent ingress of dirt and moisture.

5. Using a small suitable socket and ratchet, release the M6 x 16 screws securing the hose retaining ‘P’ clips to the HVAC line mounting bracket (torque 8 Nm).

6. Withdraw the hoses downwards from the underside of the engine compartment.

Refitment:
Is the reverse of removal.

C. Low pressure suction return pipe: Positioned between the expansion valve and low pressure return body pipe, replacement requires the removal of the front clamshell assembly, refer to service notes section BV.4 and sub-section PR.10 for further information.

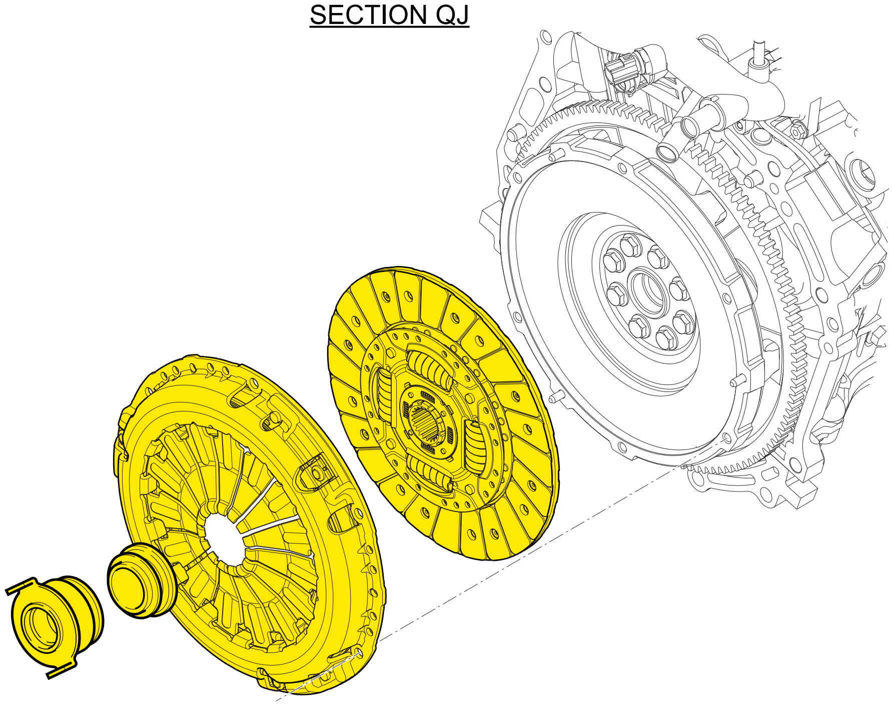
D. High pressure liquid pipe to expansion valve: Positioned between the receiver-drier outlet and expansion valve inlet port, replacement requires the removal of the front clamshell assembly, refer to service notes section BV.4 and sub-section PN.9 for further information.

E. High pressure liquid pipe to receiver-drier: Positioned between the condensor outlet and receiver-drier inlet port, replacement requires the removal of the right hand front headlamp assembly and front undertray, refer to service notes section A and sub-section PN.9 for further information.

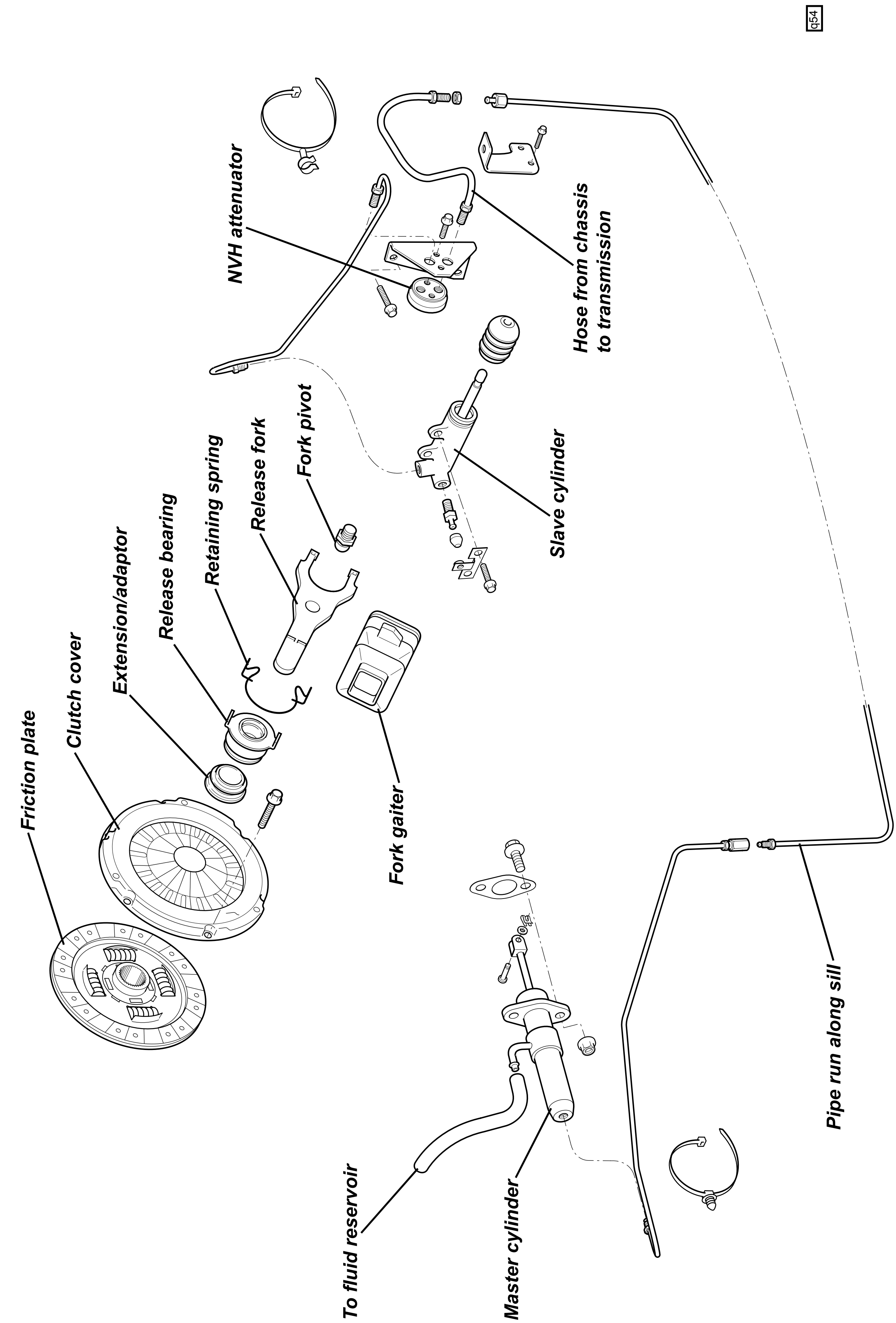
F. High pressure vapour pipe to condensor: Positioned between the high pressure feed body pipe and condensor inlet port, replacement requires the removal of the front clamshell assembly, refer to service notes section BV.4 and sub-section PN.10 for further information.

CLUTCH

SECTION QJ



Clutch System General Layout



QJ.1 - GENERAL DESCRIPTION

The Lotus Evora uses a CMS C500 cast iron flywheel bolted to the rear end of the engine crankshaft, secured with 8 bolts. Sandwiched between the flywheel and crankshaft is a steel plate carrying the starter ring gear, and also secured to the periphery of the flywheel with 6 screws.

The driving surfaces of the clutch assembly comprise the rear face of the flywheel, and a corresponding surface on a pressure plate carried by the spring diaphragm clutch cover which is bolted to the periphery of the flywheel. The driven element, constitutes a single, dry, double sided friction plate, splined to the gearbox input shaft, and sandwiched between the flywheel and pressure plate. The diaphragm spring between the clutch cover and pressure plate serves to clamp the friction plate between the pressure plate and flywheel and provide the drive connection between engine and gearbox. The gearbox input shaft, on which the friction plate is free to slide axially, is 'overhung' from the gearbox, with no spigot bearing in the rear end of the crankshaft.

The hydraulic clutch release mechanism uses a master cylinder fixed to the pedal box and operated by the clutch pedal, and a slave cylinder bolted to the left hand side of the clutch housing operating a release fork pivoted on a ball pin inside the housing to apply an axial thrust to the release bearing. The release bearing surrounds the gearbox input shaft and transmits the thrust via a ball bearing race and separate distance piece to the ends of the diaphragm spring fingers. This action releases the clamping action of the spring outer rim, serving to disengage the drive.

No routine adjustment of the clutch or release mechanism is required. The clutch slave cylinder is self adjusting, with the 'rest' position of the piston dependent on the thickness, or degree of wear, of the friction plate. As wear of the friction plate takes place, and its thickness is reduced, the slave cylinder piston is pushed progressively further back on the return stroke with a corresponding rise in the reservoir fluid level.

QJ.2 - CLUTCH PEDAL

The clutch pedal is fabricated from steel plate, and features synthetic 'top hat' bushes for maintenance free articulation on the steel pivot shaft, and a serrated alloy footpad. A hollow steel pivot shaft serving the brake and clutch pedals is bolted to a steel mounting plate, itself bolted to the inside of the pedal box.

The clutch pedal is equipped with an overcentre assist coil spring linkage, in order to reduce the pedal effort required to maintain full disengagement. Clutch pedal travel is monitored by a potentiometer module. The potentiometer comprises of a pronged arm which rotates around the main body of the potentiometer assembly which is fixed in place to the pedal box.

The potentiometer position on the pedal box is set by an integral locating pin and is retained in position with an M4 bolt tightened to 4Nm. The potentiometer arm is held in its relative position to the potentiometer by by a locating pin on the clutch pedal. Movement of clutch pedal rotates the arm relative to the position of the potentiometer.

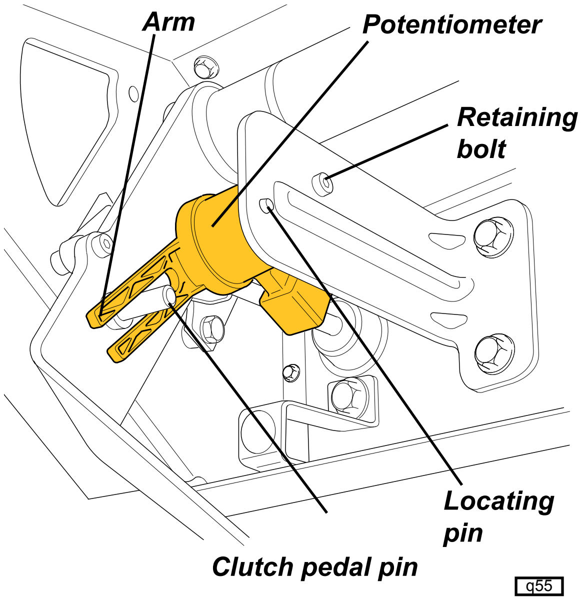
Data on clutch pedal position is used by the engine management system for:

- Cruise Control operation
- Gearchange fuel cut off (To assist rapid smooth gearchanges
- Start inhibit function on Canadian market vehicles.

Please see Service Notes Section EMR for Diagnostic Trouble Codes (DTC) associated with the clutch potentiometer.

Please Note: If Cruise Control is disabled without driver intervention but the service light has not been illuminated check that the potentiometer is secure to the pedal box bracket.

If the assembly is secure, then as the next course of diagnostic evaluation, renew the potentiometer as a condition exists where excessive flexing of the potentiometer arm may inadvertantly disable the cruise control.



The master cylinder pushrod is captive in the end of the master cylinder, and uses an integral clevis to connect to the pedal and control the pedal up position as the master cylinder 'tops' out. A downstop buffer is provided on the pedal box flange.

QJ.3 - HYDRAULIC RELEASE SYSTEM

Master Cylinder
The clutch master cylinder is mounted on the pedal box, and is accessible with the front clamshell removed. The cylinder is not equipped with its own fluid reservoir, but instead is linked via hose to the adjacent brake fluid reservoir.

From the start of production naturally aspirated vehicles were fitted with metal cylinders with a threaded outlet port. The clutch fluid outlet pipe is then screwed into cylinder using a pipe union nut.

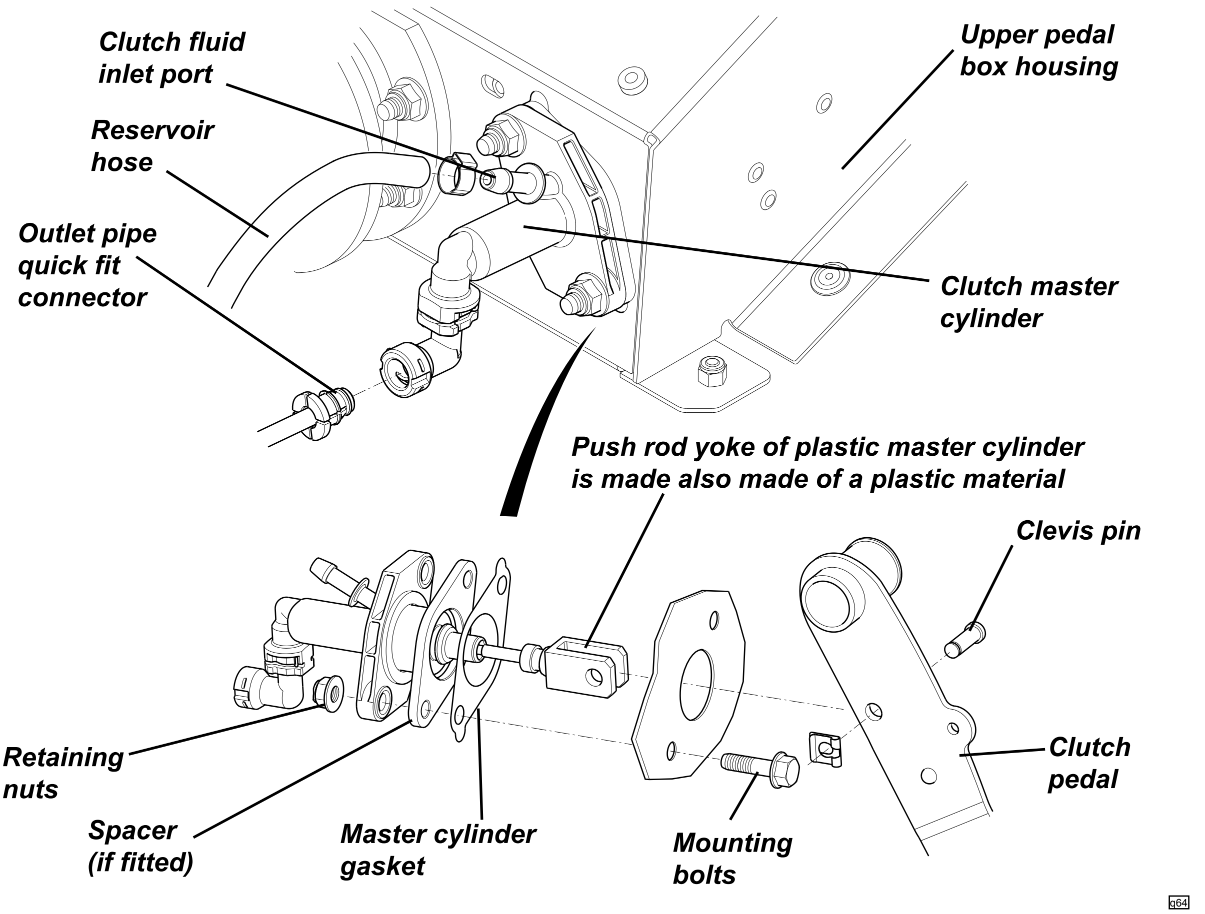
From the start of production all manual Evora S variants have been fitted with a plastic master cylinder incorporating a 'quick fit' outlet pipe connection. Fitment of the plastic master cylinder also involved modifications to the pedal box to configure the plastic cylinders mounting points.

The plastic master cylinder was then fitted to naturally aspirated manual vehicles as a running change from '11MY VIN BHD11343 (LHD), '11MY VIN BHC11524 (RHD) and '11MY VIN BHA11528 (FEDERAL).

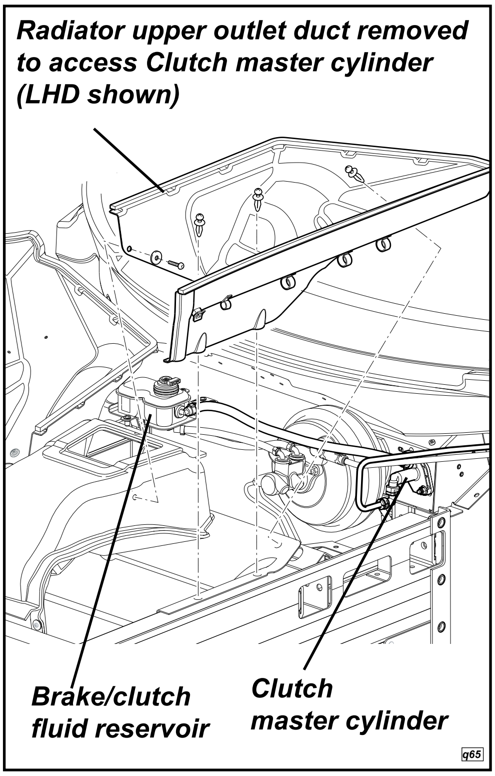
Note: due to factors such as the pedal box mounting configuration and outlet pipe connections, metal and plastic cylinders are not interchangeable.

There is no provision for any servicing of the master cylinder, and if found to be faulty, the unit should be replaced.

CLUTCH MASTER CYLINDER
(Plastic type shown - early metal version similar)



To replace the master cylinder



To remove:

1. Remove the front clamshell (see sub-section BV.6). and remove the RH or LH radiator upper outlet duct as required to gain access to the clutch master cylinder.

2. Clean the master cylinder and surrounding area with methylated spirit. **Do not use petrol or paraffin.**

3. Take all necessary precautions to guard against contamination of painted surfaces with brake fluid.

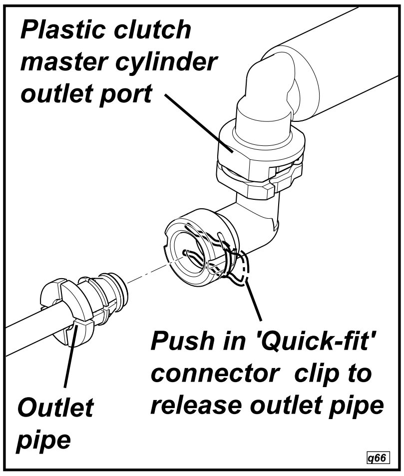
4. Disconnect and immediately plug and cap the hose connection to the fluid reservoir, refer to illustration on previous page.

NOTE: A revised specification reservoir hose was fitted as a production running change from December 2014 (refer to Technical Service Bulletin TSB 2015/02 for further information). The hose diameter was also increased requiring larger spring clips to be fitted. Also refer to Service Notes sections JL.8 for information on hose length.

5. Release the output pipe connection.

   Metal master cylinders: Release the pipe union nut.

   Plastic master cylinders fitted with 'quick-fit' connectors: Gently push the output pipe into the master cylinder and push in the sprung loaded retaining clip on the end of the hose connection to release the pipe from the cylinder, see right hand illustration.



6. From inside the footwell, remove the clevis pin connecting the pushrod to the clutch pedal, refer to illustration on previous page.

7. Remove the M8 bolts (2) and M8 flanged nuts (2) securing the cylinder to the pedal box and withdraw the cylinder from the pedal box and ensure to collect any spacers if fitted as well as the cylinder to pedal box gasket, refer to illustration on previous page.

To refit:
Is the reverse of the removal procedure.

- Refit the pedal box fixings and torque to 28 Nm.

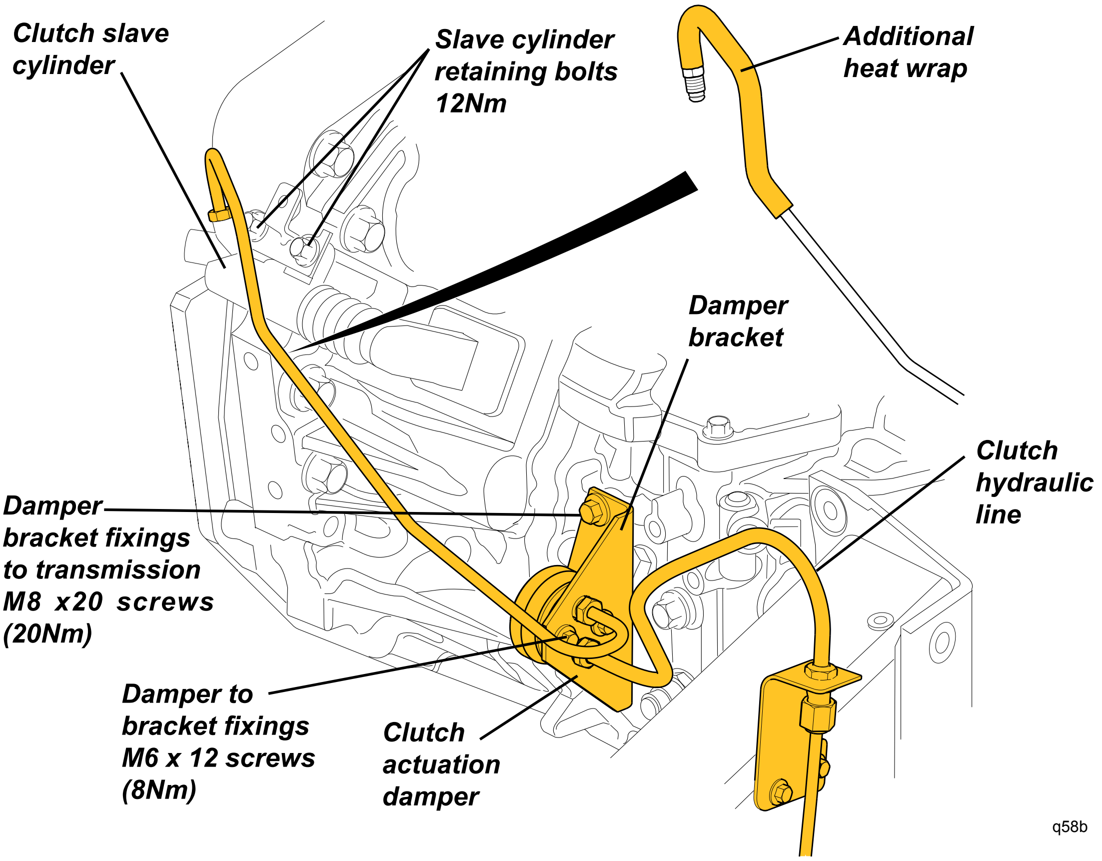
- Renew the Oetiker clip securing the reservoir hose to master cylinder then refit the hose onto the master cylinder inlet port **THE HOSE SHOULD BE PUSHED ONTO THE PORT DRY - DO NOT USE ANY CHEMICALS OR LUBRICANTS TO AID FITMENT AS THIS COULD CAUSE FLUID CONTAMINATION WHICH MAY RESULT IN AN INAFFECTIVE CLUTCH PEDAL.**

- Refit the clutch outlet pipe.

  Note:
  For metal master cylinders tighten the outlet pipe connection to 20 - 24 Nm.
  For plastic cylinders push the pipes quick fit connector back into outlet port.

- Bleed the hydraulic system of air, using the bleed nipple provided on the slave cylinder.

Slave Cylinder



The slave cylinder is secured to the left hand side of the clutch housing by two M8 fixings into tapped holes. The cylinder is protected from radiated heat from the front catalytic converter by an aluminium heat shield, part of which may be bent back to allow improved access to the slave cylinder bleed nipple.

WARNING
Do not attempt to bleed the clutch hydraulic system when the catalytic converter is hot - spilled hydraulic fluid could initiate a fire. Wait until the engine and converter is cool to the touch.

To replace the slave cylinder

To remove:
- Remove the rear undertray (see sub-section a - introduction for details).
- From underneath the vehicle, disconnect the clutch pipe union and immediately seal the open end of the pipe and the cylinder port.
- Release the two fixing bolts and withdraw the cylinder.
- Take all necessary precautions to guard against contamination of painted surfaces with brake fluid.

To refit/replace:
- Is the reversal of removal.
- Refit the the two M8 bolts securing the slave cylinder to the bell housing, torque to 12 Nm.
- Re-connect the clutch pipe union to the cylinder, torque to 15 Nm.
- Bleed the system of air, tightening the bleed nipple to 5 Nm.
- Finally, ensure that the heat shield is returned to its original shape in order adequately to protect the slave cylinder and hydraulic line.

Hydraulic Pipe
A 2-part rigid steel pipe is used to convey the hydraulic fluid from the master cylinder to the left hand front corner of the engine bay. The pipe is routed down the LH 'A' post to run along the outside of the chassis LH

main siderail, within the composite sill member, and is supported, together with other pipes and hoses in foam blocks. Another pipe is used to connect the rear end of the chassis pipe to an NVH clutch damper mounted on the transmission. A short rigid pipe then connects the damper to the slave cylinder.

The clutch damper was introduced as a running change and contains a flexible diaphragm to damp out pressure pulsations in the line caused by frequencies generated by crankshaft that are isolated from rest of chassis via engine mounts etc, but when the clutch pedal depressed the frequency travels through the clutch cover, release bearing, slave cylinder and through the fluid line up to the clutch pedal.

These pulsations give the symptoms of a 'roaring' noise and vibration which can be felt through the clutch pedal when it is depressed at high revs, typically 5000 rpm.

'12 MY vehicles from VIN CH_10179 have been fitted with additional protective heat wrapping positioned around the clutch slave cylinder pipe to provide insulation from potential excessive engine bay temperatures. The brake fluid contained within the clutch pipe may exceed its maximum working temperature especially if the vehicle is subjected to either extreme ambient temperatures and/or regular continuous high speed driving.

Vehicles subjected to these conditions have experienced difficultly in engaging or changing gear combined with other symptoms such as very little or no resistance required to depress the clutch pedal or the clutch pedal has failing to return to its original position when released,

Also see Technical Service Bulletin TSB 2011/29 for further details.

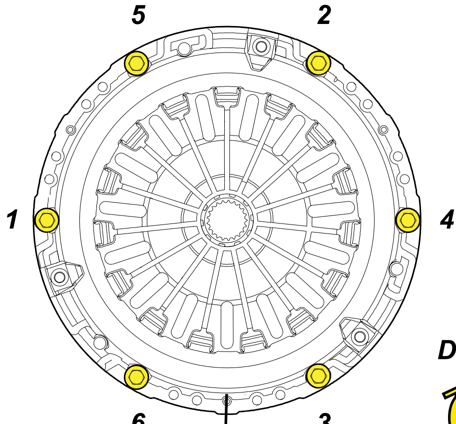
Clutch Bleeding Procedure

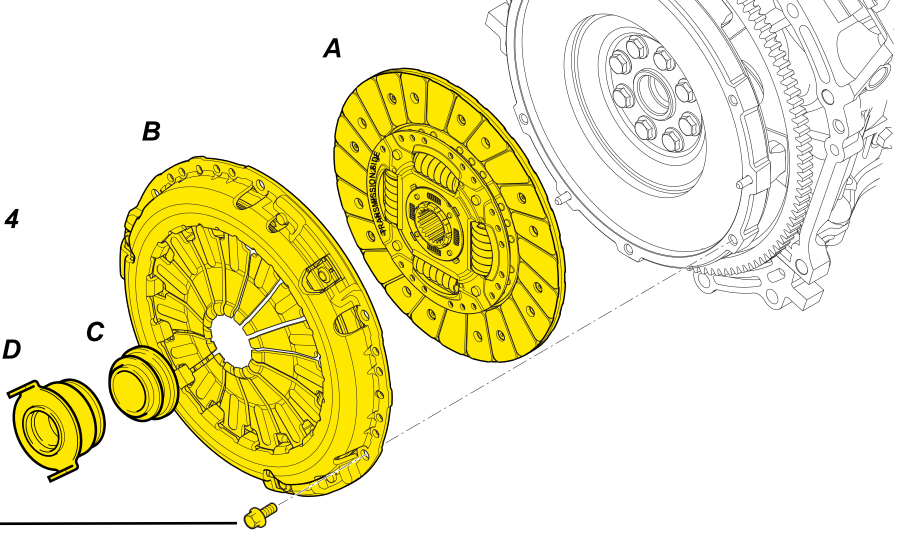
WARNING
Do not attempt to bleed the clutch hydraulic system when the catalytic converter is hot - spilled hydraulic fluid could initiate a fire. Wait until the engine and converter is cool to the touch.

- If the clutch fluid is to be renewed, or an hydraulic component replaced, the system should be bled of air using the following procedure:
- Remove the rear undertray - see service notes section an - introduction for details.
- Using only a fresh supply of DOT 4 non-mineral type brake fluid, top up the brake/clutch reservoir as necessary - also see service notes section JL.3 for further information.
- If the reservoir needs topping up, first clean around the cap to reduce the possibility of contamination before unscrewing the cap; it is not necessary to disconnect the level sensor cables. Take suitable precautions to guard against damage to paintwork caused by brake fluid dripping from the level sensor.
- From underneath the engine bay, fit a suitable bleed tube and container to the slave cylinders bleed nipple then open the nipple.
- Using conventional manual techniques, or low air pressure applied to the reservoir, bleed the system from slave cylinder bleed nipple in turn until no air bubbles can be seen.
- Test the operation of the clutch pedal, if the pedal operation is spongy repeat the process until an acceptable pedal action is obtained.
- Top up the fluid level in the reservoir (but do not overfill) then replace the filler cap securely.
- Refit the undertray

QJ.4 - CLUTCH ASSEMBLY

The clutch assembly comprises:
A. Friction plate (centre plate).
B. Clutch cover assembly (pressure plate/ diaphragm spring/cover).
C. Bearing adaptor.
D. Release bearing.





Clutch cover bolt loosening sequence

For access to the clutch assembly, the complete power unit must first be removed from the vehicle and the transmission and engine assembly separated (see service notes sections EJ.5 & FL.5. for further information.

Clutch Removal:
1. Unless the cover is to be renewed, first match mark the cover in relation to the flywheel prior to removal.

2. Progressively loosen the M8 x 16 bolts (6) in the sequence as shown, to release the clamp load without distorting the clutch cover.

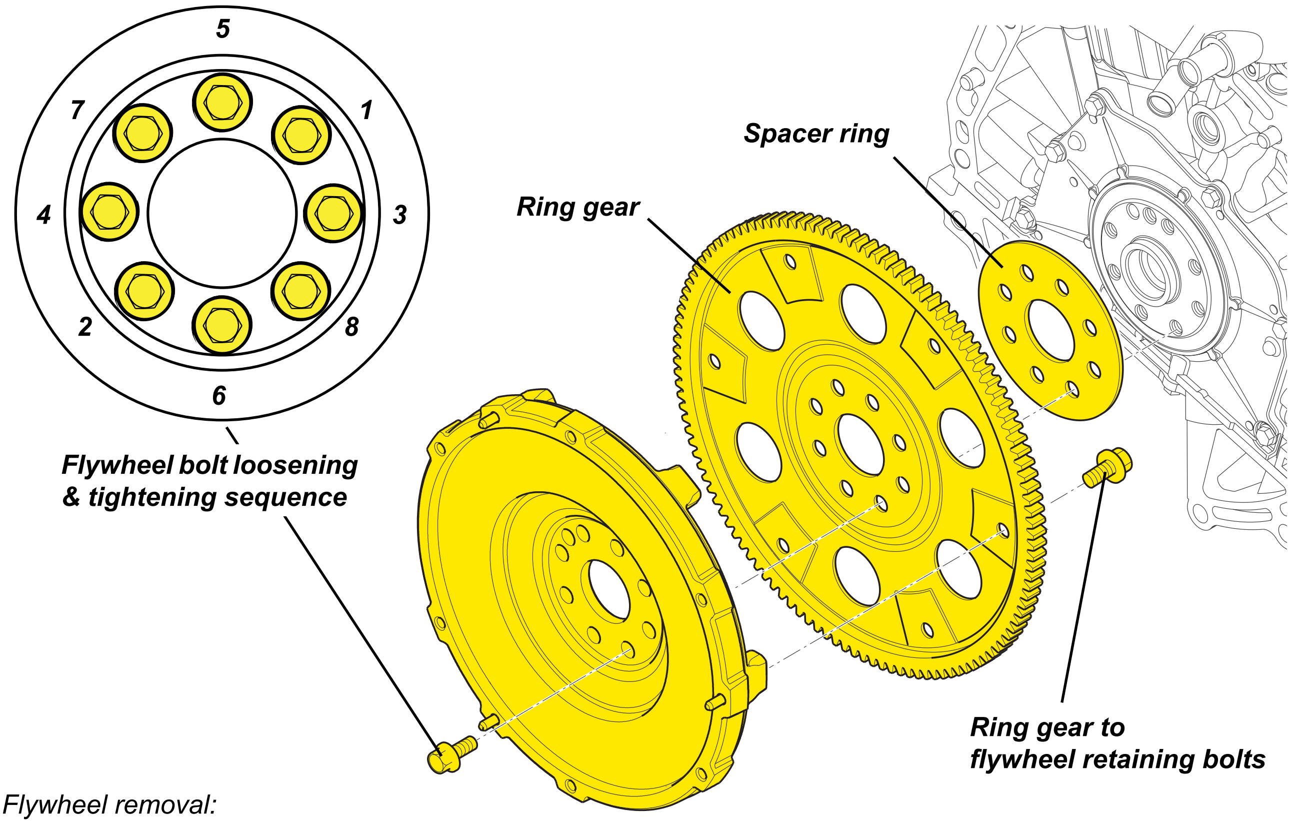
3. Remove the bolts and withdraw the cover from the flywheel dowels and prepare to capture the friction plate which will also be released.

Inspection:
Clutch cover: Check the surface of the pressure plate for excessive scoring or discolouration through overheating. Check the fingers of the diaphragm spring for excessive wear at the release bearing contact surface and for even height. If the cover is accidentally dropped, the setting or balance of the assembly could be disturbed; replacement of the cover is recommended.

Friction plate: Check the cush drive springs for breakage or cracking of the hub. Examine the condition of the friction material for signs of oil contamination, scorching, or any other damage. Measure the depth of material on both sides of the plate from the friction surface to the head of the rivets. The minimum service depth = 0.3 mm. If any of these inspections are failed, or if there was an issue with clutch judder, the friction plate should be renewed.

Release bearing & fork: Be aware of the extension/adaptor which may or may not be retained in the release bearing. Unclip the release bearing from the fork, and check the bearing for discernible play, noise or rough feeling and renew if there is any doubt. Check the arm for undue wear on any of the contact surfaces and for cracks. Check the condition of the release fork pivot ball.

Flywheel: Check the friction surface of the flywheel for excessive scoring or discolouration through overheating. Using a dial test indicator, measure the axial run-out at the centre of the flywheel friction surface. The maximum runout is 0.15 mm. If necessary, renew the flywheel.



Flywheel removal:

1.Using a suitable flywheel holding tool, lock the flywheel ring gear against the engine casing.

2.Progressively loosen the eight bolts securing the flywheel to the crankshaft in the sequence as shown

3.Remove the bolts and withdraw the flywheel and prepare to capture the spacer ring fitted between the ring gear plate and the crankshaft flange.

Ring gear removal:

1.Progressively loosen and remove the 6 bolts securing the ring gear to the flywheel.

2.Separate the ring gear from the flywheel.

Ring gear refitment:

- Ensure scrupulous cleanliness of the ring gear to flywheel contact surfaces before locating the ring gear against the flywheel. Ensure that the ring gear plate swages face towards the flywheel.

- Fit the ring gear to the rear side of the flywheel.

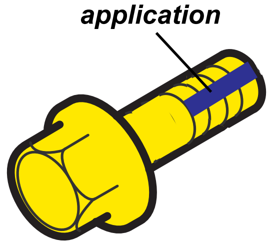
- Use a suitable alignment tool to ensure the ring gear and flywheel are aligned/concentric before tightening the 6 securing bolts to 30 Nm.

Flywheel/ring gear refitment:

- Ensure scrupulous cleanliness of the ring gear to crankshaft contact surfaces before locating the flywheel/ ring gear assembly onto the crankshaft flange.

- Fit the assembly to the crankshaft, ensuring the spacer ring is fitted between the ring gear plate and crankshaft, with the dimple on the spacer locating in the crankshaft flange dowel hole.

- Apply a single bead of Permabond A130 along the length of the threads of each of the 8 the flywheel retaining bolts.

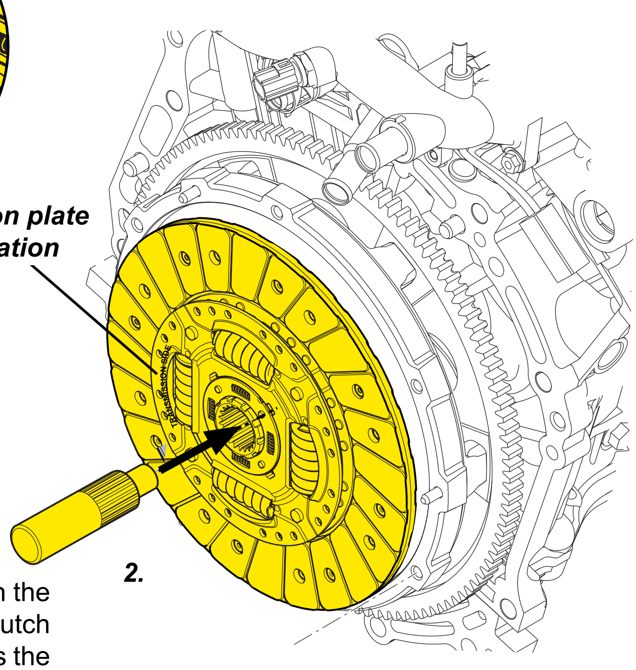


Important: The drillings for the flywheel retaining bolt threads pass completely through the crankshaft flywheel mounting flange. It is possible that under running conditions, oil within the engine may travel between the flywheel retaining bolt and flywheel mounting flange threads. Therefore Permabond A130 should be utilised as both a thread lock and sealant to prevent the potential of oil leaking from the engine and onto the flywheel and clutch assembly.

- Refit the bolts and progressively tighten the bolts in a diagonal sequence, locking the ring gear before finally torque tightening to 75 Nm.

Clutch Refitment:

Preparation: On re-assembly, using a suitable automotive clutch and brake cleaner, thoroughly degrease the friction surfaces of the flywheel and pressure plate.

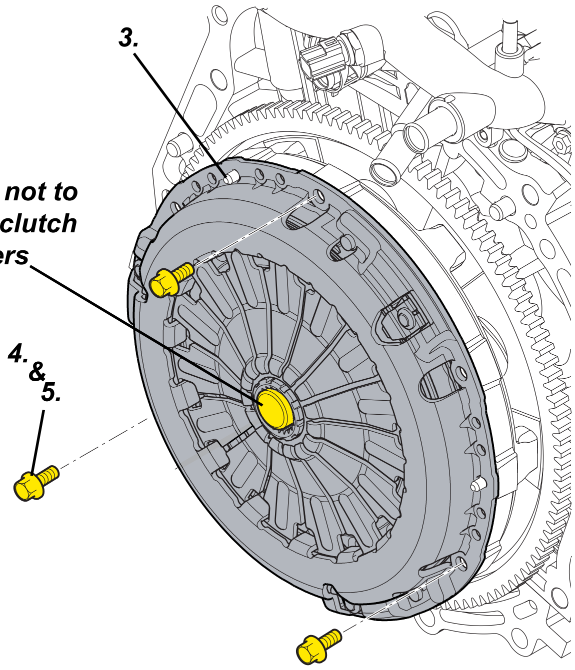


1.Place the friction plate the correct way against the flywheel (identified by the 'TRANSMISSION SIDE' text on the plate).

2.Use a suitable* alignment tool to position the friction plate centrally to the flywheel.

*The alignment tool used must not protrude further than the clutch cover spring fingers. This will ensure that the clutch cover compression tool, (see step 6) will fully compress the clutch cover against the flywheel.

Using an alignment tool which is too long potentially risks the pressure pad of the compression tool contacting the end of the alignment tool before the clutch cover has made full contact with the flywheel.



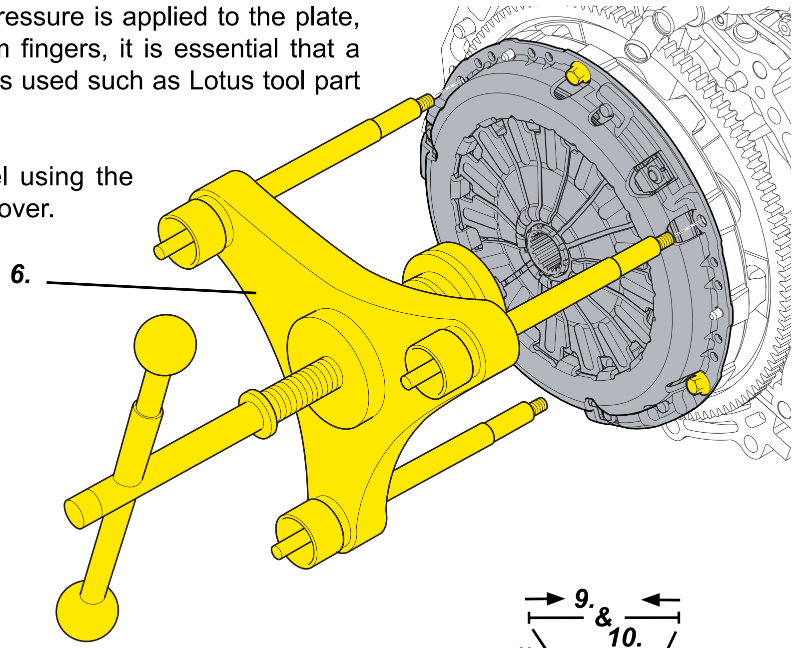
3.Fit the clutch cover, positioning it to align the 3 locating dowels on the flywheel with the corresponding holes on the cover.

4.Apply Permabond A130 thread locking compound to three of the clutch cover retaining bolts.

5.Fit the 3 bolts (by hand only sufficiently to hold the centre plate in position when the alignment tool is removed) to every other retaining hole in the cover to the flywheel, this will retain the cover at 3 equal points.

To ensure that the most uniform spring pressure is applied to the plate, with minimum distortion of the diaphragm fingers, it is essential that a proprietary clutch cover compressor tool is used such as Lotus tool part number T000T1524F.

6.Fit the compressor tool to the flywheel using the remaining 3 fixing points for the clutch cover.

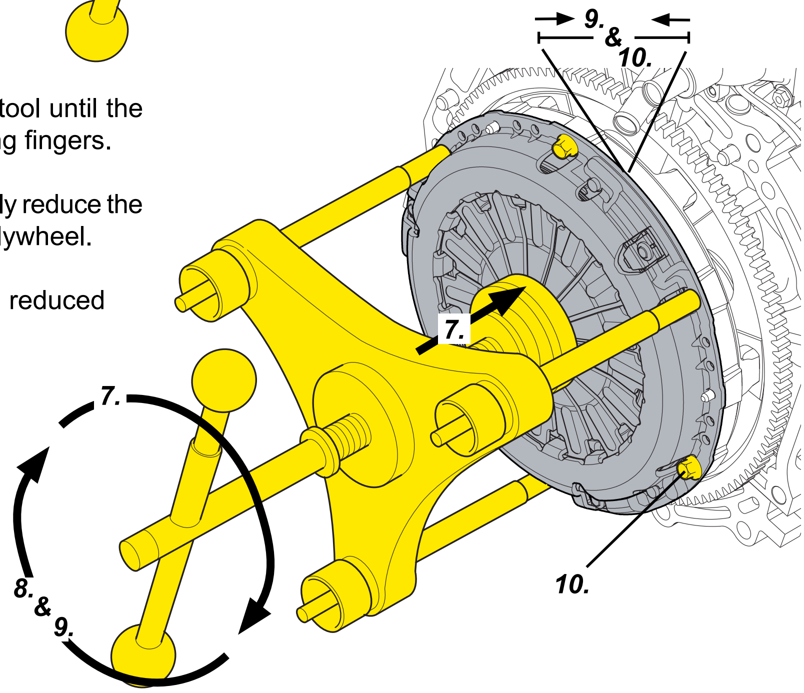


7.Wind in the spindle of the compressor tool until the spindle pressure pad contacts the spring fingers.

8.Tighten the spindle further to progressively reduce the gap between the clutch cover and the flywheel.

9. Continue compression until this gap is reduced to zero.

10.Apply a further 2 complete turns (equivalent to 3mm axial travel) to preload the diaphragm spring before evenly tightening the three clutch cover retaining screws to a final torque of 20 Nm.

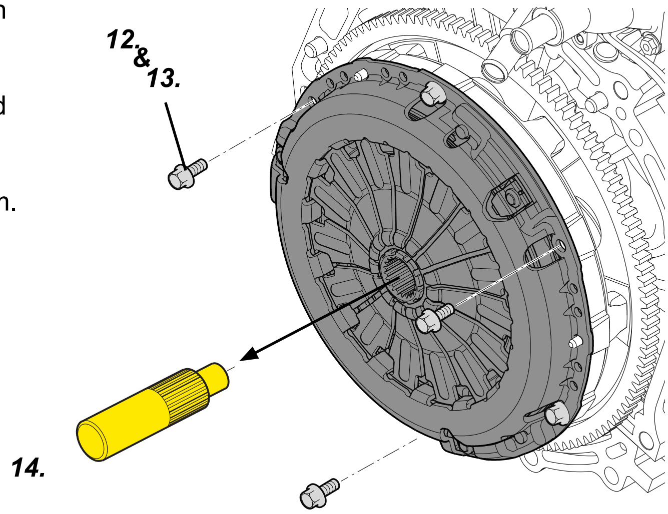


11.Unwind the spindle of the compressor tool and then remove the tool from the flywheel.

12.Apply Permabond A130 thread locking compound to the remaining three clutch cover bolts.

13.Fit the bolts and progressively tightening to 20 Nm.

14.Remove the clutch alignment tool



Release bearing and adaptor:

15. Ensure that the release bearing is correctly fitted to the release fork by ensuring that the notch in the rear of the bearing is inset of the release fork.

16. Prior to fitment of the clutch fork and release bearing, apply a small amount of Renolit LX EP 2 grease to the forks support peg recess.

17. Apply a small amount of Renolit LX EP 2 grease to the gearbox input shaft collar.

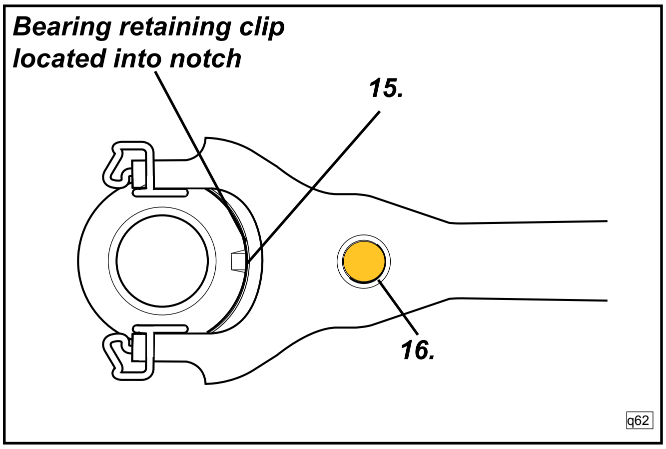
18. From inside the gearbox bell housing, engage the release bearing around the input shaft collar whilst feeding the opposite end of the fork through the release fork gaiter.

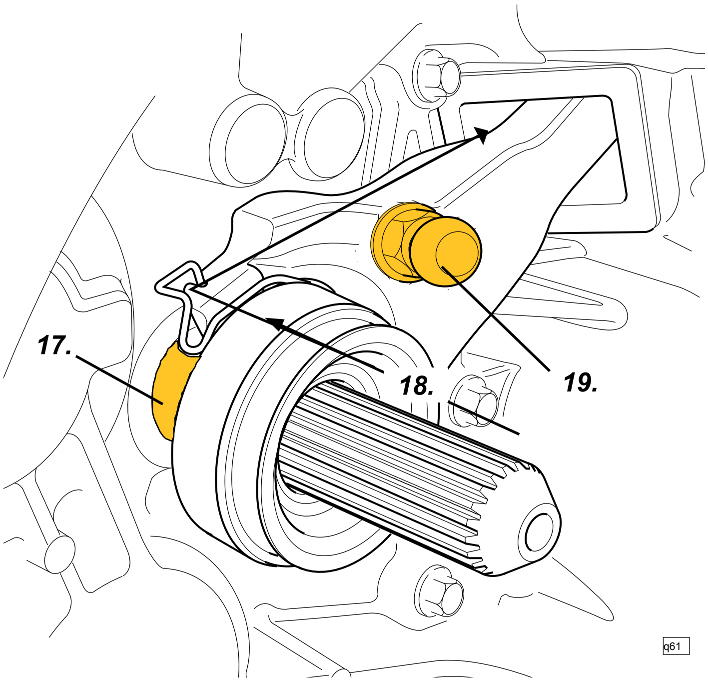
19. Align the clutch fork recess against the support peg, then push the fork firmly to fully engage the fork on the support peg.

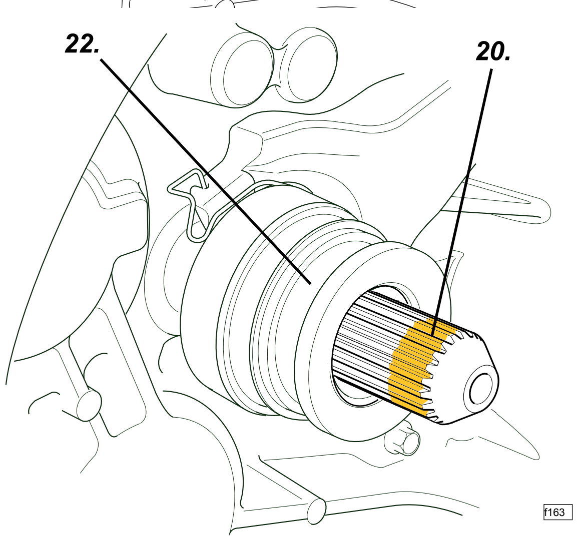
20. Apply a small amount of suitable automotive multipurpose high temperature grease (such as Castrol multipurpose high temperature grease formerly named LMX) over the forward most 10 mm of the splined area of the gearbox input shaft.

21. Remove any excess grease that has built up on the chamfer on the input shaft which could contaminate the clutch assembly causing a source of potential clutch judder.

22. Ensure the bearing adaptor is located positively against the clutch release bearing.





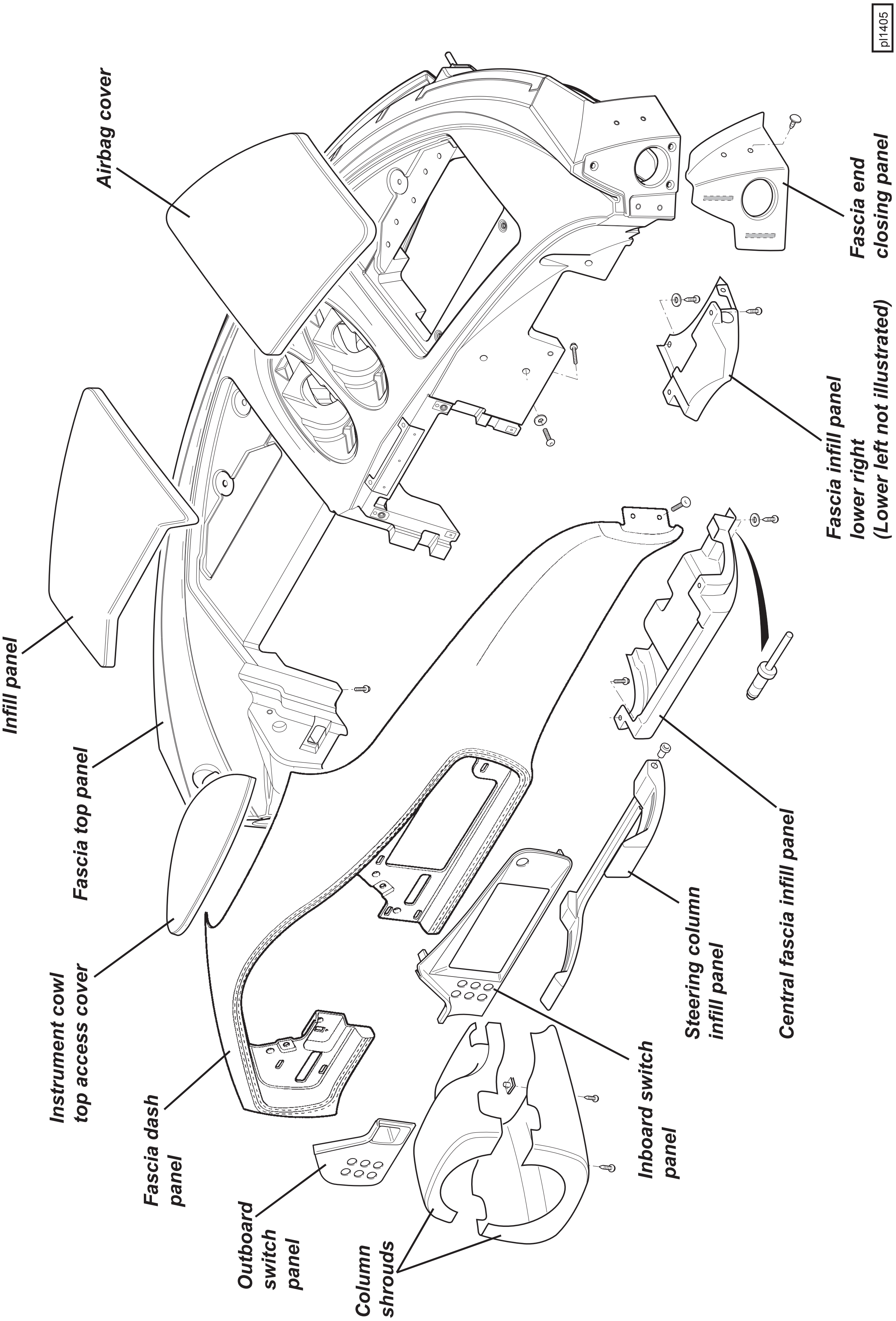


Transmission refitment:
Fit the transmission assembly to the engine, refer to service note section FL.5 for further information.

INTERIOR TRIM

SECTION VE

FASCIA STRUCTURE



VE.1 - GENERAL DESCRIPTION

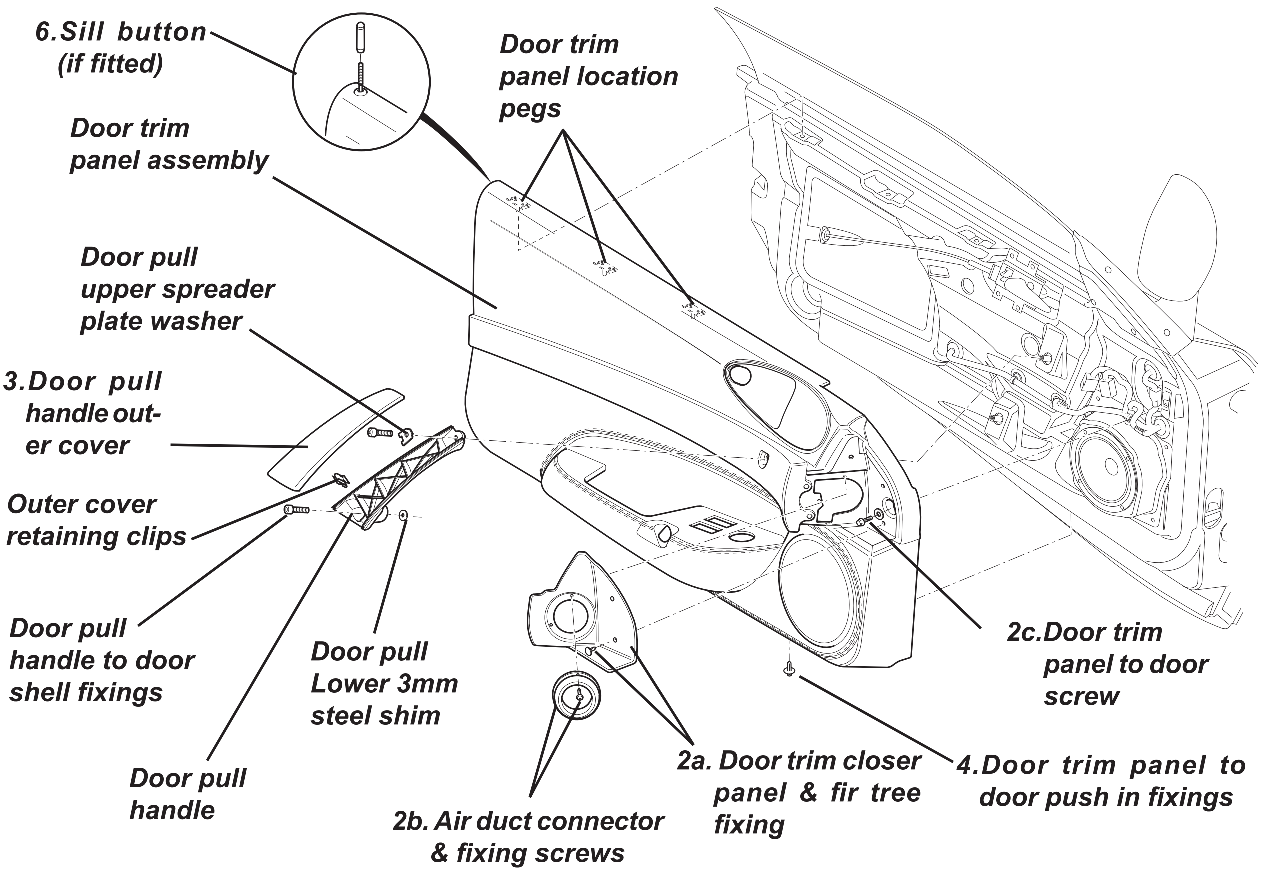
Interior trim panels on the Evora are manufactured by one of three processes;

1. *Structural Reaction Injection Moulding (SRIM);* using a polyurethane resin and glass reinforcement.
   Panels include:
   - Door trim panels;
   - Lower 'A' post trim panels;
   - Door sill trim panels;
   - Rear quarter trim panels;
   - Rear bulkhead trim panel;
   - Centre console;
   - Fascia panel lower centre;
   - Fascia panel lower left hand and right hand;
   - Fascia dash panel.

2. *Polyurethane Foam;*
   Panels include:
   - Fascia top panel;
   - Passenger airbag cover;
   - Driver's side fascia infill panel;
   - Glovebox lid;
   - Steering column cover.

3. *Reaction Transfer Compression (RTC) moulding;* using a polypropylene glass reinforced moulding to which is bonded a Nylon polypropylene fabric with a foam backing (visible surface) and a polypropylene foam lining (reverse side).
   Panels include:
   - Roof liner;
   - 'B' post upper trim panels;
   - 'A' pillar trim panels.

VE.2 - DOOR TRIM PANEL



The door trim panel is secured to the door shell by the door pull handle fixings, five screws along the bottom shutface, a single screw at the top front corner, and three location pegs along the top edge. Note that the door speaker grille is fixed to the door panel, but the speaker itself is mounted to the door shell.

Removal:

1. Prise out the window and mirror switches and unplug the harness connector.

2. Remove the door front top corner closing panel:
   a Prise out the two fir tree fasteners.
   b Remove the two screws in the flange of the air duct connector.
   c Remove the single fixing screw securing the panel to the door shell.

3. Prise out the outer cover from the door pull handle (4 'S' type spring clips), and remove the M8 x 30 (2) button headed screws (torque 12Nm) securing the handle and trim panel to the door.

4. Remove the five push-in fixings in the underside of the door securing the panel.

5. Pull out the bottom of the door panel and lift the top edge location pegs from their slots in the door shell.

6. Unwind the door sill button (if fitted) and remove from the latch rod.

7. The trim panel assembly can now be withdrawn from the door shell.

8. From behind the trim panel assembly, remove the starlock fastener and linkage clip off of the interior door handle release cable; refer to service notes section BV.12 for further information.

9. Loosen the interior cable retaining nuts at the handle bracket just enough to remove the cable from the bracket.

10. Disconnect the door harness from the window/mirror switchgear and mood lighting strip.

The door trim panel may now be fully removed from the vehicle.

Refitment:
Is the reverse of removal except:

The interior release cable free-play setting procedure as shown in service notes section BV.12 must be carried out to ensure the correct activation of the door latch module is achieved.

Door pull upper spreader plate washer

VE.3 - DOOR TRIM PANEL COMPONENTS

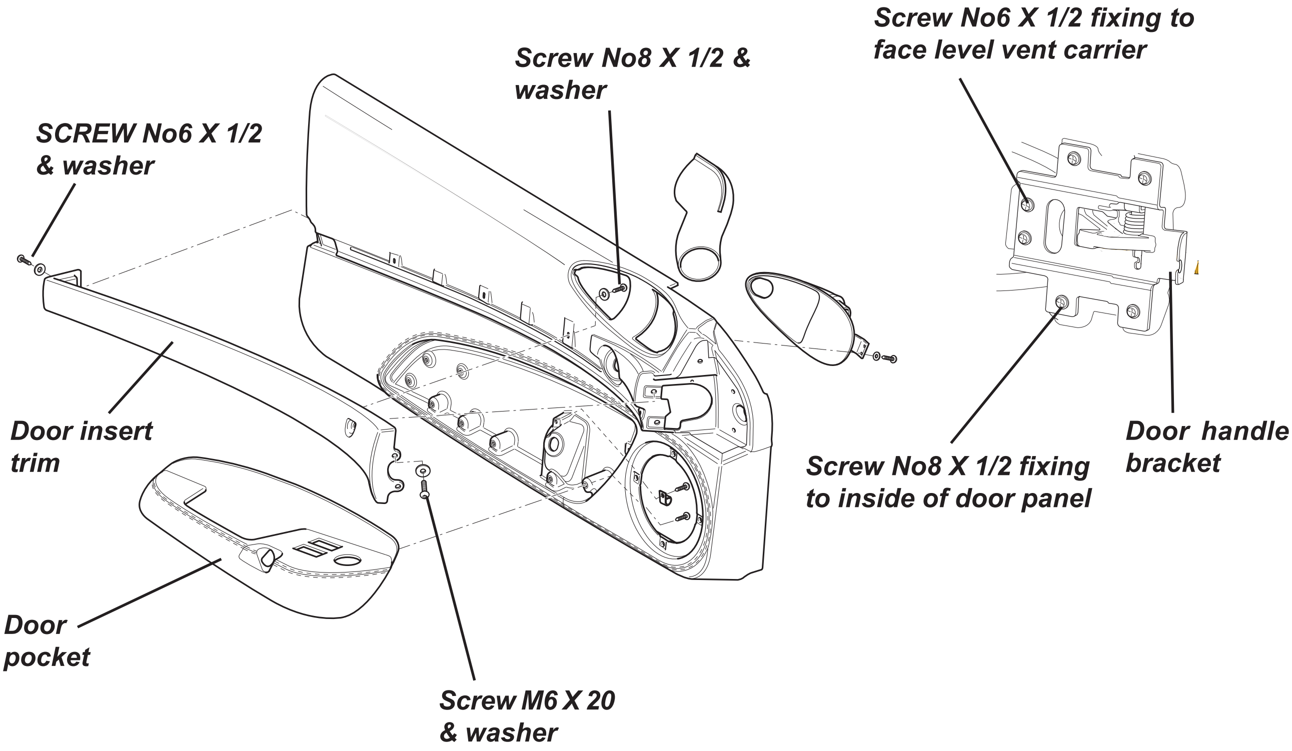
Face level vent/release handle escutcheon
The face level vent itself may be pulled out of the escutcheon with the door panel *in situ*.

To remove the escutcheon, the door panel must be removed. Then from behind the panel, remove the blanking sticker on the air duct moulding to access the two screws securing the front of the escutcheon, and release another pair of screws in the door release handle bracket.

Door release handle bracket
To remove the door release handle/bracket assembly, remove the door trim panel and from behind the panel, release the NO8 x 1/2 pozi flange screws (4) securing the bracket to the inside of the panel and the NO6 x 1/2 pozi flange screws securing the bracket to the face level vent carrier.

Door insert trim feature strip & mood lighting
The feature strip is secured by two fixings in the front shut face, two in the rear shut face and three screws along its length, all accessed from behind the panel. The mood lighting strip is secured to the door trim panel with double sided tape.

Door pocket
The door pocket comprises inner and outer parts both secured to the door trim panel from behind by 10 screws.

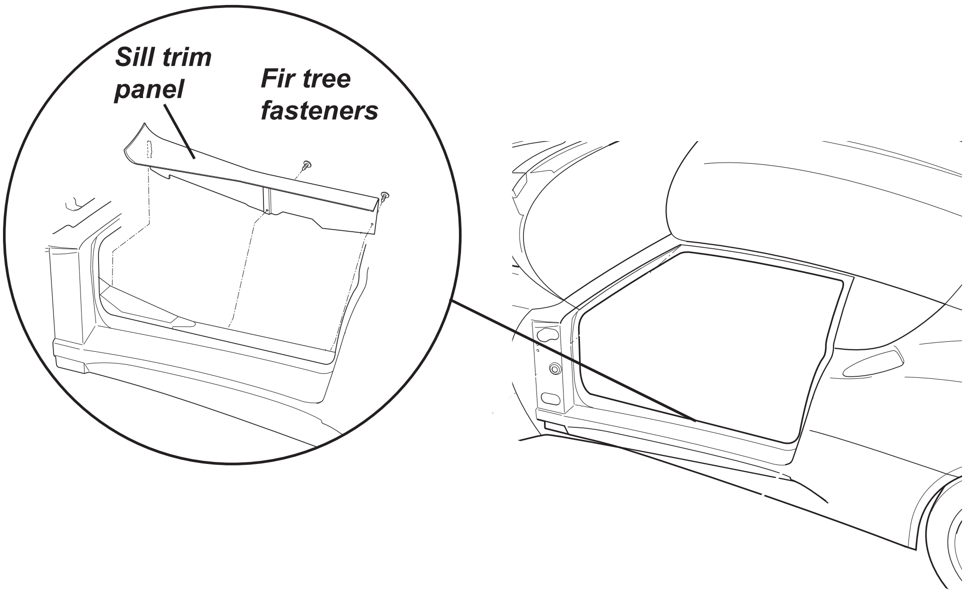


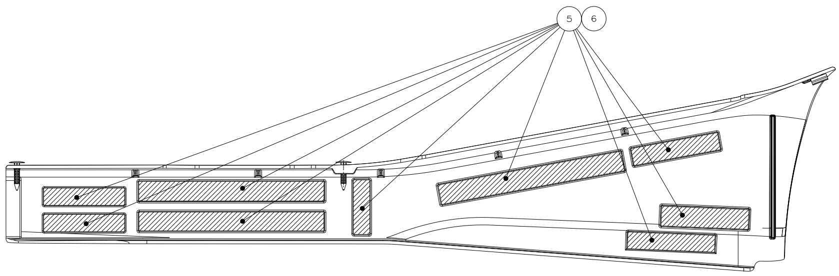
VE.4 - DOOR SILL TRIM PANEL

The door sill panel comprises of a base Structural Reaction Injection Moulding (SRIM) polyurethane resin and glass reinforcement base panel which is covered in either cloth or leather material dependant upon the vehicle trim specification.

The door sill trim panel positioning to the chassis side rail is set by two 'fir tree' fasteners located at the inner lower edge, the underside of the panel is further secured to the top of the chassis rail by self adhesive 'grip-lok' hook and loop strips.

If necessary, remove the harness protection cover from the rear of the sill by prising out the 'fir tree' buttons on the lower edge, and pulling the panel from its double sided tape.



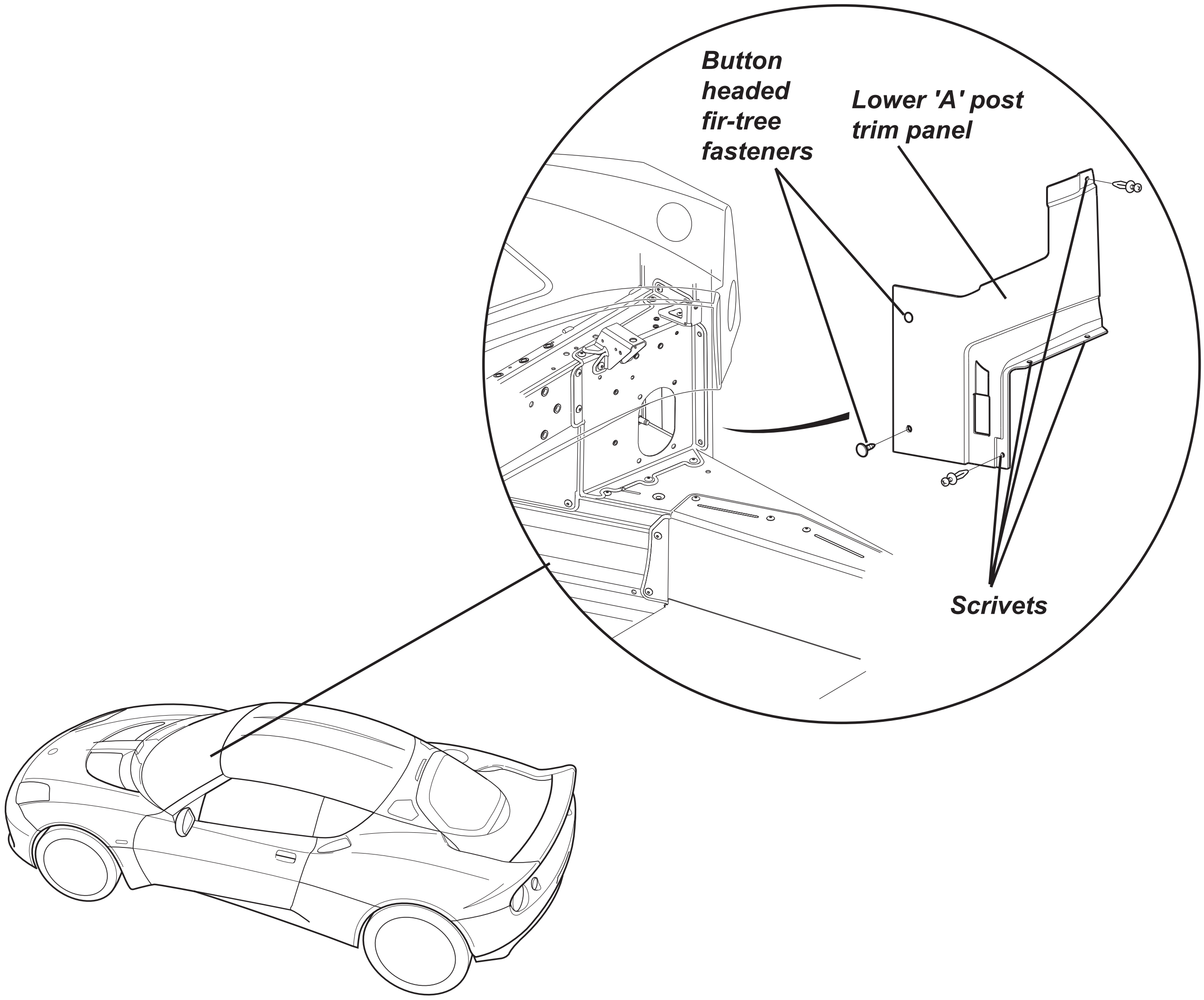


VE.5 - LOWER 'A' POST TRIM PANEL

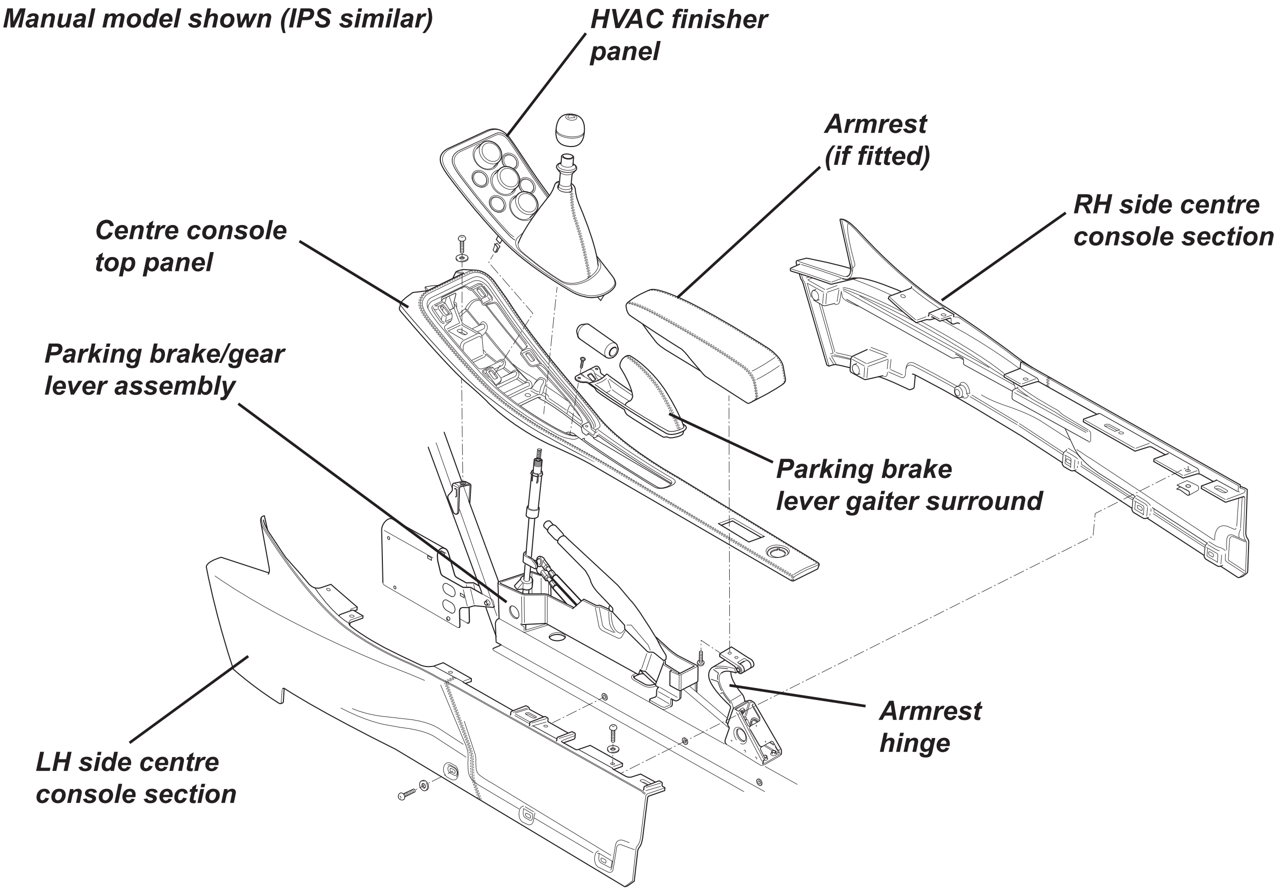
1. Remove the door sill trim panel (see VE.4).

2. Release the three scrivets securing the bottom edge to the chassis side rail, the single scrivet at the outboard top corner to the scuttle beam and two button headed fir-tree fasteners securing the forward edge to the chassis.

3. Pull the panel from the 'grip-lok' strips on the footwell side wall.



VE.6 - CENTRE CONSOLE



The centre console, which is constructed from separate right and left hand sides, and a top panel, extends from the base of the fascia to the rear seats/stowage compartment, and surrounds the gear and parking brake levers. To remove the console:

1. Remove the parking brake lever sleeve after loosening the retaining grub screw.

2. Remove the gear lever knob (manual models); refer to service notes section FL.2 for further information.

3. Release the armrest from its hinge by removing the two fixings beneath its rear end.

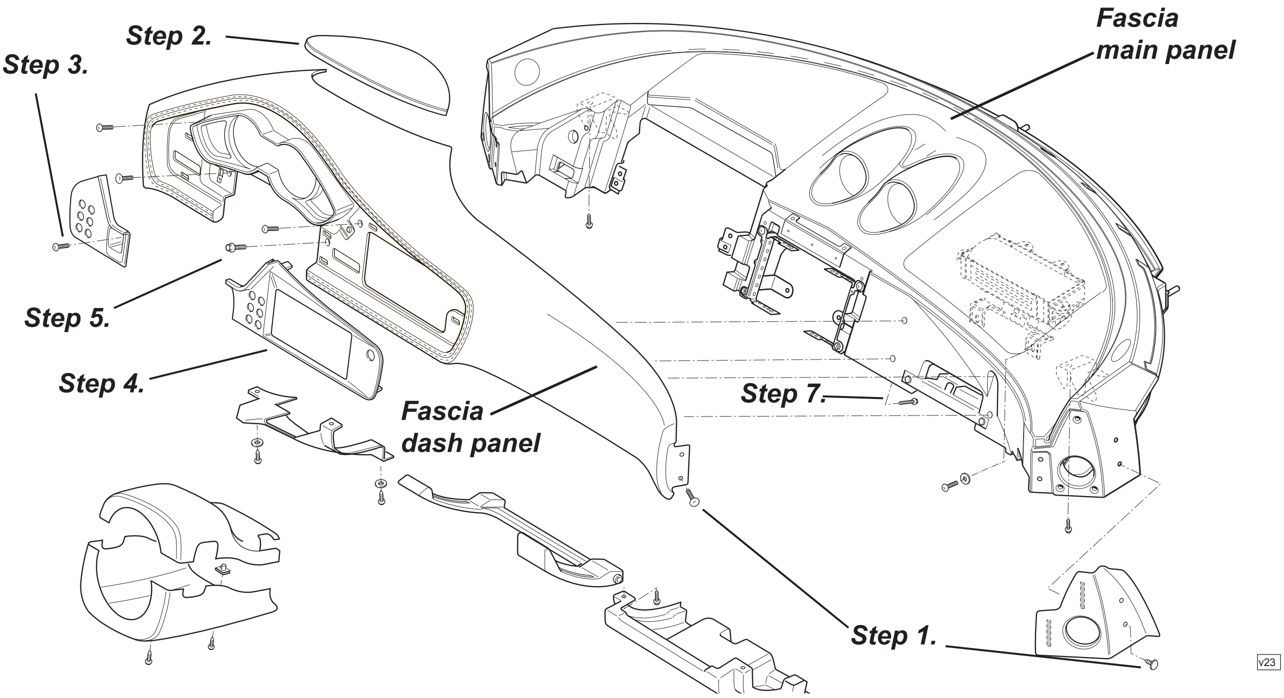
4. Remove the HVAC panel from the console by careful prising to release the 5 Tower-clip fasteners. Unplug the harness connectors, and lift the panel until the gaiter top clip can be released, and the panel fully withdrawn.

5. Release the two screws at the back of the gear lever aperture securing the park brake lever surround, unhook the rear end and withdraw the panel and gaiter over the lever.

6. Remove 3 screws within the front aperture securing the console top panel, and pull the rear part of the panel upwards to withdraw the two tower clips.

7. Remove the 4 screws securing the top surfaces of the console sides together. Remove the 3 screws securing each of the side's lower rear flanges to the floor channel. Pull away the front end of each side panel to release the two spring steel clips.

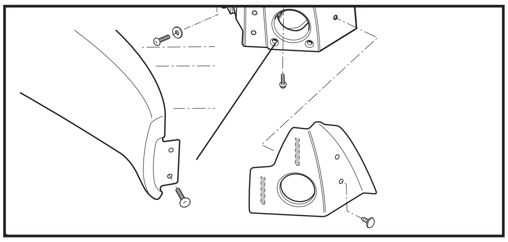
VE.7 - FASCIA DASH PANEL



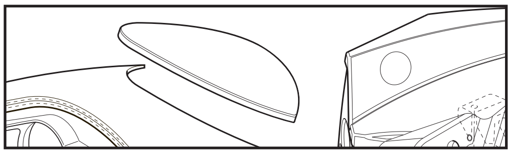
The fascia dash panel reaches across the full width of the fascia and includes the instrument cowl/surround. The panel also mounts the instrument pack, switch panels and mood lighting strip. As it is necessary to disconnect electrical multiplugs to remove the fascia, ensure the glove box is placed in the open position before disconnecting the vehicle battery.

To remove console:

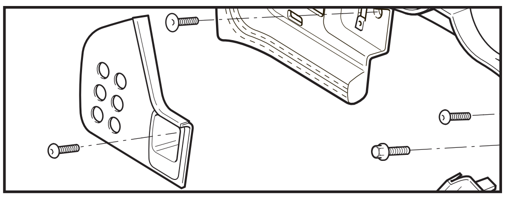
1. Remove the closing panel from each end of the fascia by prising out the two fir tree fasteners, and pulling the panel from its Griplock strips. At each end, release the two screws securing the dash panel to the fascia.



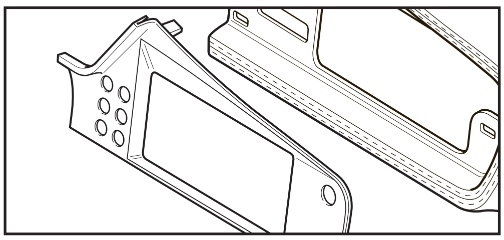
2. Remove the instrument cowl top access panel by lifting the forward end free from its Griplock strips, and unhook the rearward end. Unplug the harness connectors from the instrument panel.



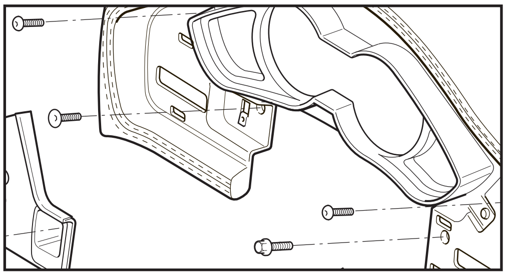
3. From within the coin pocket outboard of the steering column, remove the blanking sticker and release the switch panel fixing screw. Carefully prise the outboard switch panel out with its two Tower clips. Unplug the switch harness connector.



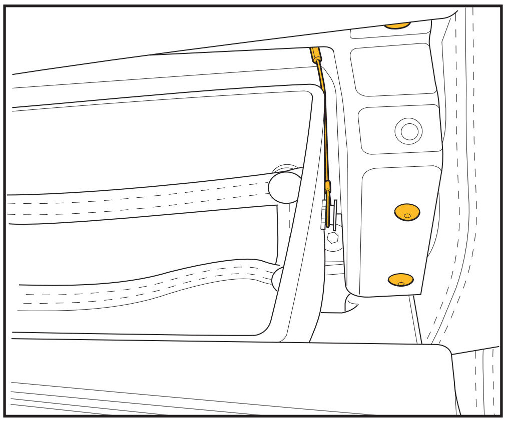
4. ***Carefully*** prise out the inboard switch panel with its four Tower clips and unplug the switch harness connectors. (Tower clips may break if switch panel is forcibly removed).



5. Release the four screws round the underside of the instrument panel (not the screws securing the instrument panel itself), fixing the dash panel to the fascia.

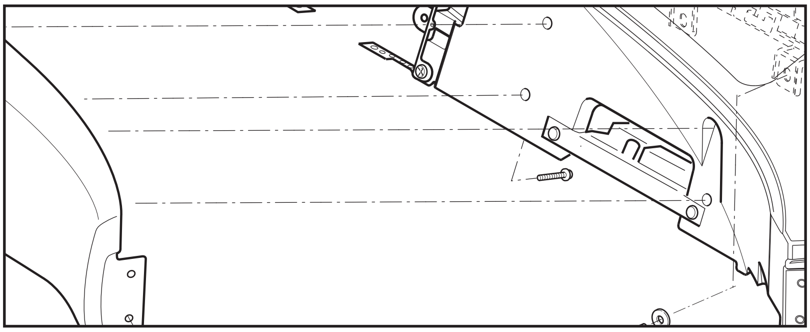


6. Open the glovebox, detach the glove box damper cord which will allow the glove box to tilt past its normal resting point. This will allow additional access to remove the 2 screws and 4 firetree fasteners securing the inner glovebox liner to facia top panel. Once all the fixings are removed, withdraw the glovebox inner liner and unplug the harness connectors for the glovebox light and switch. (Withdraw I-pod cable if fitted).



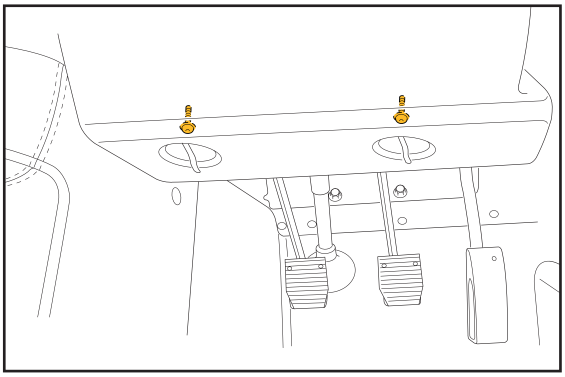
7. The 4 screws located behind the fascia top panel/glove box wall can be removed.

8. Withdraw the dash panel, and unplug the harness 3 connectors to the mood lighting strip and glovebox light.



VE.8 - FEDERAL FASCIA LOWER PANELS

The fascia lower panels comprise left, right and centre panels, plus the passenger's glovebox and driver's column infill panel, all of these linking the underside of the main fascia to the chassis scuttle beam. These panels should be removed before removal of the main fascia panel.



1. Steering column infill panel: Remove the 2 screws securing the column infill panel to scuttle beam. They are accessed through slits in the underside of the panel. Carefully pull the upper edge of the panel away from the column area which will release it from it's griplock fasteners.

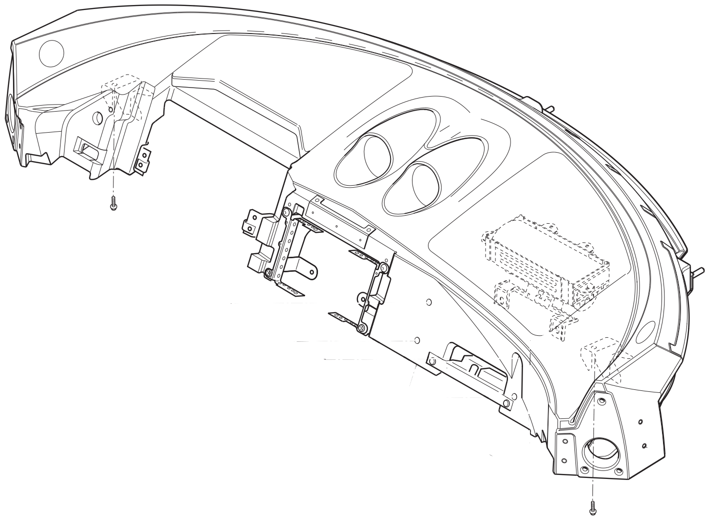
2. Drivers side infill panel: Remove steering column infill panel as described in step one, then remove the 3 screws securing panel to the scuttle beam and underside of dash panel fascia

3. Passenger's side infill panel: remove the glovebox as described in VE.7, then remove the 3 screws securing the panel to the scuttle beam and underside of the dash panel fascia.

4. Central fascia lower panel: First remove the centre console (see section VE.6). Remove the two screws securing the centre fascia lower panel to the scuttle beam, and the two screws to the underside of the main fascia panel.

VE.9 - MAIN FASCIA PANEL

The main fascia panel extends from the base of the windscreen to the scuttle beam, carries the dash panel and passenger airbag, and incorporates ducting to the demist vents.



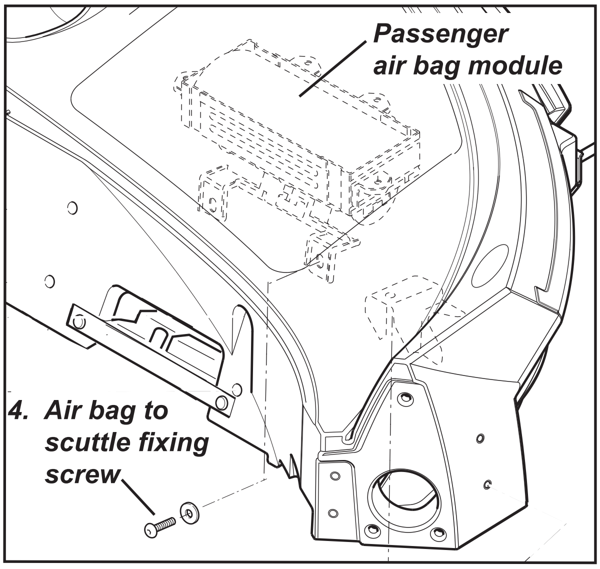
Removal:

1. Remove the fascia dash panel, refer to sub-section VE.6 for further information.

2. Remove the fascia lower panels, refer to sub-section VE.7 for further information.

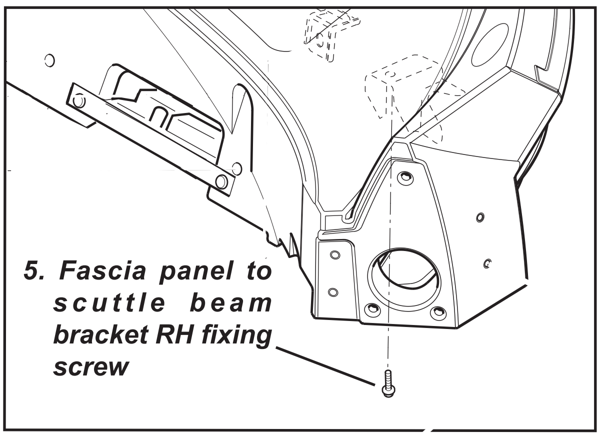
3. Disconnect the airbag harness yellow connector from the main vehicle harness; refer to service notes section WF.11 for further information.

4. Remove the M8 or M10 x 20 screws (2) torque 35Nm securing the passenger air bag brackets lower mounting points to the chassis scuttle beam.



5. At each end, remove the M6 X 16 screw and washer torque 6Nm securing the fascia to the support bracket on the scuttle beam.

6. Draw the main fascia panel rearwards to disengage the three front edge spigot pins from their location holes in the windscreen frame.

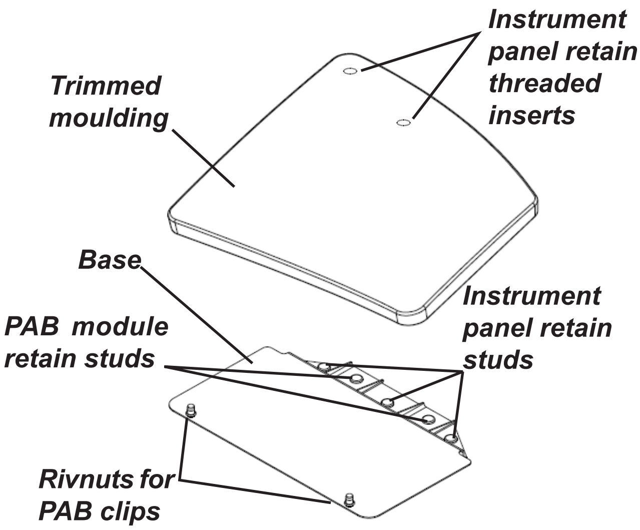


PAB (Passenger Air Bag) Cover

The PAB trimmed cover comprises of formed sheet steel base, incorporating integral studs to firmly secure it to the forward/front edge of the passenger side of the main fascia panel and PAB module bracket. Two M5 rivnuts are fitted to the rear edge to accommodate the PAB sacrificial plastic clips which retain it to the rear edge of the panel.

A shaped polyurethane foam moulding, trimmed in leather is bonded to the upper surface of the steel base. The rear of the moulding overhangs the steel base and is fitted with 2 - 6mm threaded inserts to accommodate fixings which also secure it to the forward edge of the main fascia panel.

Upon airbag deployment the PAB covers steel base is designed to hinge at its front end, breaking the PAB clips so creating an opening between the cover and fascia panel, directing the inflating bag into the area of optimum effectiveness.



Access to the fixings securing the PAB cover to the fascia panel is limited, to prevent potentially damaging any under-dash modules or main harness wiring removal should only be attempted with the main fascia panel removed from the vehicle.

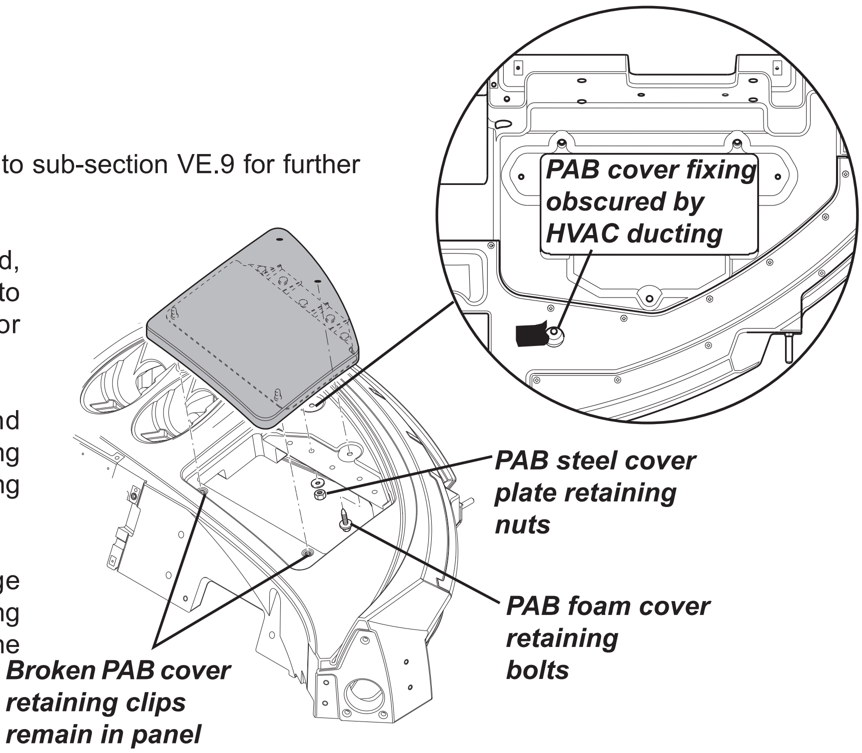
Removal:

11. Remove main fascia panel refer to sub-section VE.9 for further information.

12. With the instrument panel inverted, remove the PAB module, refer to service notes section WF.11 for further information.

13. Release the M6 nyloc nuts and washers (3) torque 10Nm securing the PAB covers steel plate retaining studs to the fascia panel.

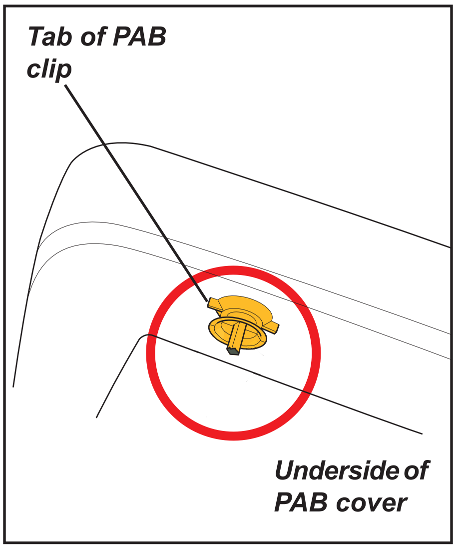
14. Release the M6 x 12 (2) flange headed bolts torque 6Nm securing the PAB covers foam cover to the fascia panel.



Note the furthermost bolt is obscured by the HVAC ducting, remove the adhesive tape covering the access aperture to gain access to the head of the fixing.

15. With all threaded fixings removed, carefully pull the rear edge of the PAB cover away from the fascia panel in a slow progressive movement to break its 2 retaining clips (if not already broken).

6. Turning the tab of the broken portion of the PAB clips remove them from the 6mm threaded inserts in the PAB cover plate, also remove the other portion from the location holes in the main facia panel.



Refitment:
Is the reverse of removal except that new PAB clips will be required.

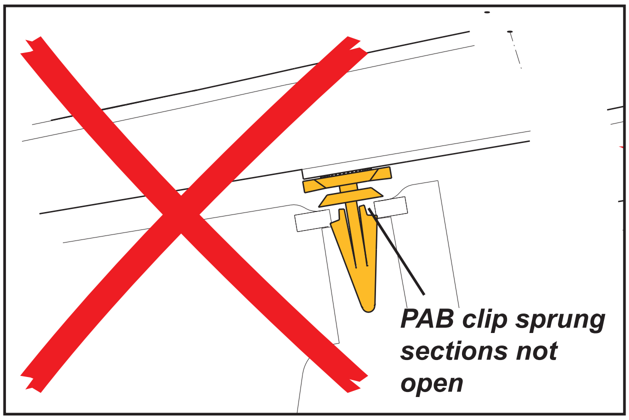
Using the tab section of the new PAB clip, carefully wind the threaded portion of new clip into the 6mm threaded inserts of the PAB cover assembly ensuring pressure is applied to the main clip section.

Turn the clip until the surface of the main clip section lightly touches the inner surface of the cover & slight resistance is felt.

Turn the clip a further 180º- 270º degrees clockwise to fully secure into position.

Repeat procedure for the other clip.

Care point: only tighten the clip by turning it at its tabs, turning the top of the clip may cause it to fail.

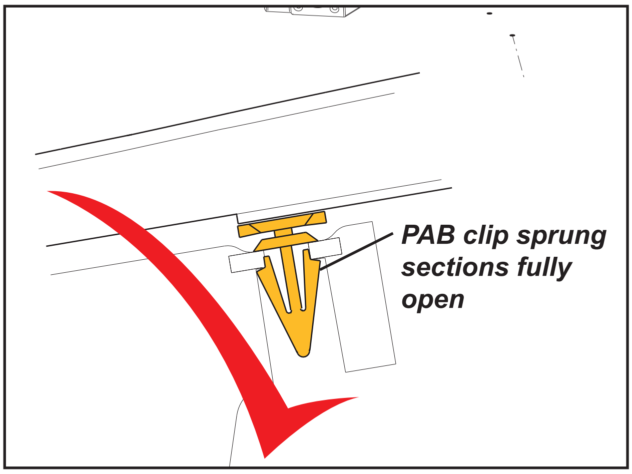


Position the PAB cover into the facia panel, turn over the fascia and loosely fit the washers and nyloc nuts to the middle and both outside PAB cover retaining studs (other remaining inner studs are used to secure PAB module bracket).

Care point: to ensure the cover is correctly seated within the fascia panel the top sprung sections of PAB clips must open out fully when fitted into the panel location holes; refer to RH illustrations.

Loosely fit the flange headed bolts securing the PAB covers foam to the fascia panel.

Care point: PAB covers on early vehicles may have been fitted with longer bolts than the current production M6 x 12 flange headed bolts now fitted, To ensure the cover sits correctly on the fascia panel check the dimensions of the cover bolts and renew with the current M6 x 12 bolt part number as shown in the Lotus Evora Service Parts List.

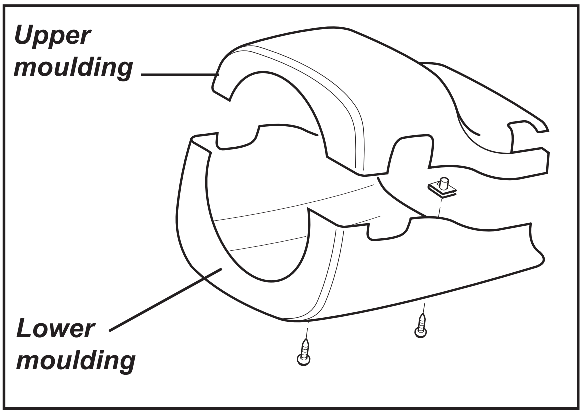


Turn over the fascia and ensure the PAB cover is correctly aligned within its fascia aperture, adjust as necessary then torque all fixings (values shown on previous page).

Refit all other components previously removed.

VE.10 - STEERING COLUMN SHROUD

The steering column shroud consists of upper and lower mouldings. The upper section is clipped to the lower, and should be prised off before releasing the tree screws securing the lower section to the steering column.

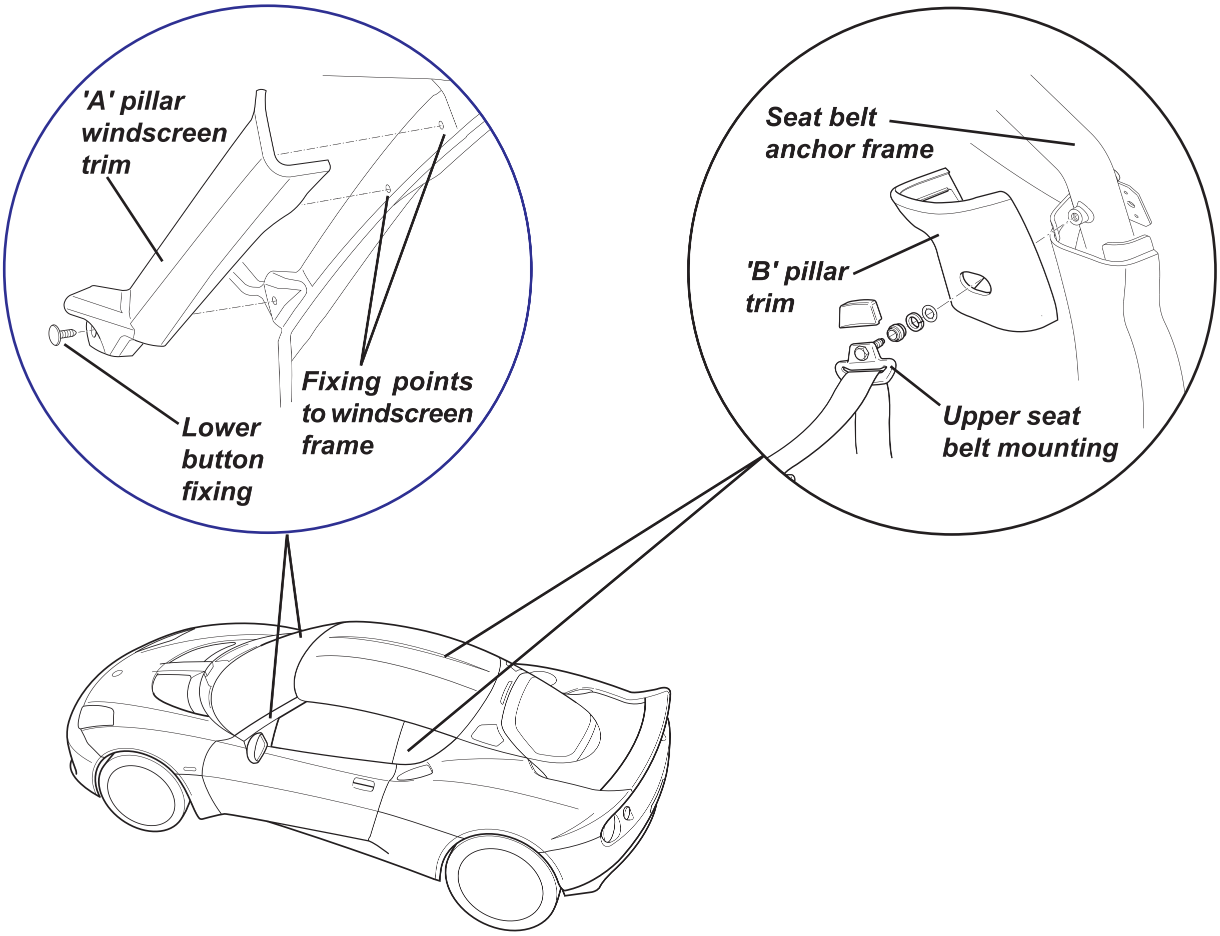


VE.11 - WINDSCREEN 'A' PILLAR TRIM PANELS & 'B' PILLAR TRIMS

'A' Pillar Trim
The windscreen 'A' pillar trim panels are retained by a single 'fir tree' button at their lower ends (which is obscured by the main fascia panel), and by 2 captive 'fir tree' type fixings along their length which retain them to the LH/RH inner windscreen frame.

Note: The correct removal and refitment procedure of the ‘A’ pillar trim(s) requires the removal of the main fascia panel to gain access to the lower fir tree button fixing(s).

'B' Pillar Trim
To remove the ‘B’ pillar trim release the upper seat belt mounting bolt from the seat belt anchor frame boss; refer to service notes section WF.12 for further information.

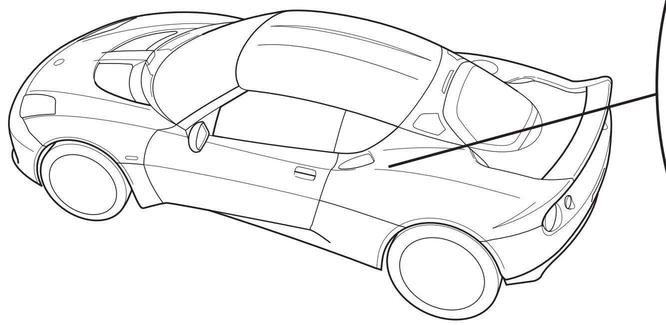


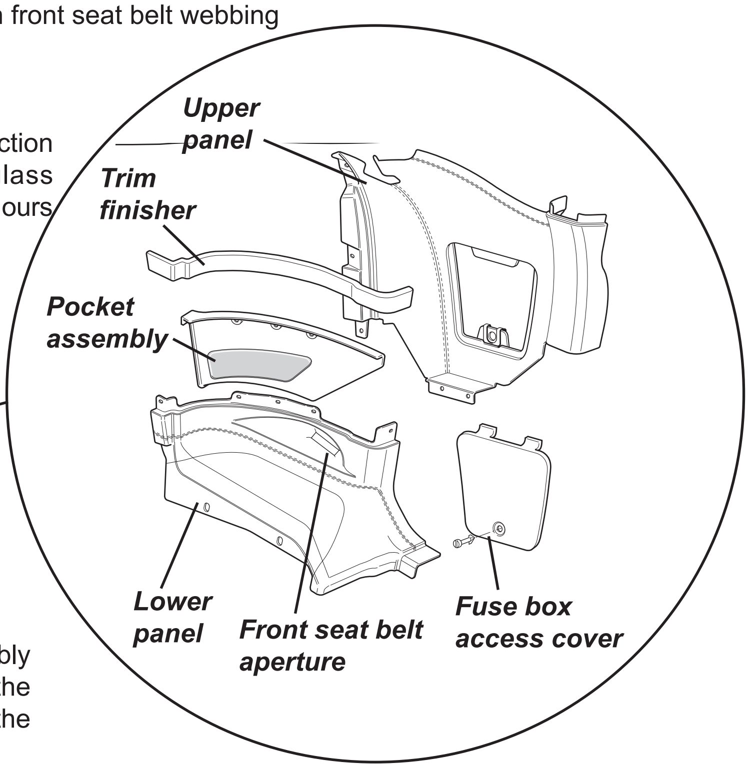
V.12 - REAR QUARTER PANELS

The rear quarter panel assemblies comprises of 4 major components:

1. Upper panel - LH panel fitted with cover to gain access to rear fuse box and ECM, RH panel fitted with grille for subwoofer speaker (if fitted)
2. Lower panel - With machined aperture to feed through front seat belt webbing
3. Trim finisher
4. Pocket assembly

These panels are produced from Structural Reaction Injection Moulding (SRIM) using a polyurethane resin and glass reinforcement which are then finished in various grades/colours of leather coverings to match the rest of the interior trim.





The finished panels are assembled into a single assembly using self tapping screw fixings which are fitted from the rear side of the panels so that no fixings are visible once the assembly is fitted into the cabin.

LH Quarter Panel Removal (RH Similar):

1. Remove the rear seat cushion or shelf, rear seat backrest or bulkhead insulation; refer to sub-section VE.13 for further information.

2. Remove the rear window surround; refer to sub-section VE.14 for further information.

3. Remove the door sill trim and harness cover to gain access to the seat belt anchor rail; refer to sub-section VE.4 for further information.

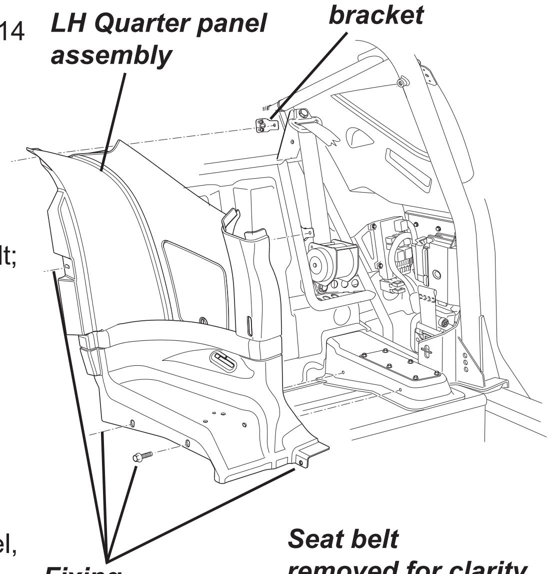
4. Release the seat belt anchor rail from the sill and slide off the belt; refer to service notes section WF.12 for further information.

5. Release the seat belt upper anchorage bolt from the 'B' post and remove the LH 'B' pillar trim; refer to service notes section WF.12 and sub-section VE.4 for further information.

6. Pull off the rear section of the door weatherstrip.

7. Release the two fixing screws from the base of the lower panel, and the two at the upper rear edge.

8. The panel can now be pulled away from the LH bodyside and fuel tank bay floor using a gentle pulling action, releasing the



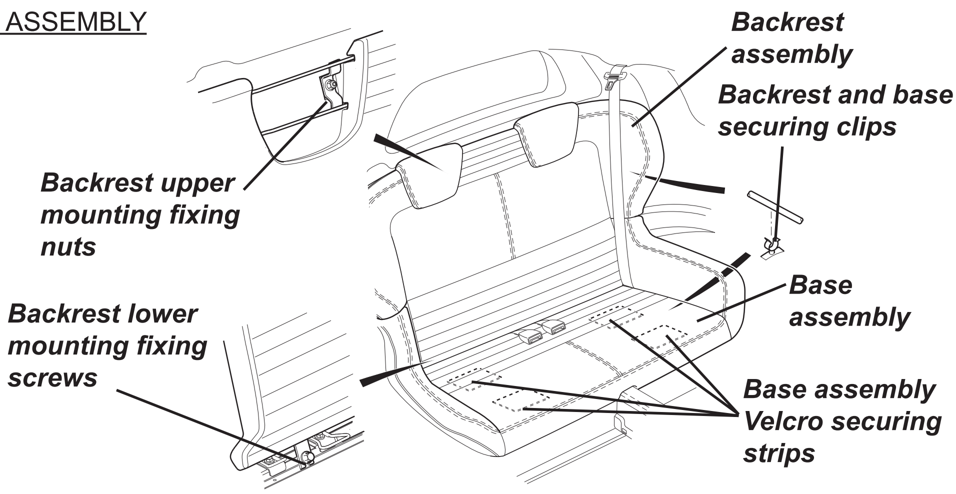
integral rear side mounted spring clips from the retaining brackets located around the LH side window aperture.

9. Feed the open end of the seat belt through the machined aperture located in the lower section of the quarter panel assembly. The quarter panel can now be withdrawn from the vehicle.

Refitment:
Is the reverse of removal.

Make sure the seat belt webbing is refitted correctly behind the quarter panel (i.e., not kinked, twisted or trapped between the panel, seat belt anchor frame or any other ancillary components) so ensuring the belt is free to withdraw and return into the reel assembly during its operational use.

VE.13 - REAR SEAT ASSEMBLY



Backrest

The rear seat backrest is secured in 4 places, 2 upper mounting points are located on the rear bulkhead panel and 2 lower points being located on the rear seat belt lower/Isofix mounting support plate positioned above the fuel tank bay panel.

Note: on later models additional security is provided by the use of open ended clips* which push fit into the LH/RH quarter panels, the LH/RH sections of the outer seat back frame fit into these clips offering additional security to the seat back squab area.

Upper fixing points: Studs attached to the rear bulkhead panel pass through mounting plates integral to the upper seat back frame which are then secured by M5 flanged nyloc nuts. These fixing points are located behind the LH/RH headrest top inserts. Slide the inserts upwards releasing them from their seat back frame mounting points to gain access to the nuts.

Lower fixing points: M5 x 16 flange headed screws pass through open ended slotted brackets integral to the base of the seat back frame. The screws secure the base of the seat back to threaded inserts in the rear seat belt lower/Isofix mounting support plate. Push down on the rearmost of the seat base, or totally remove it to gain access to the fixing screws.

Seat Base

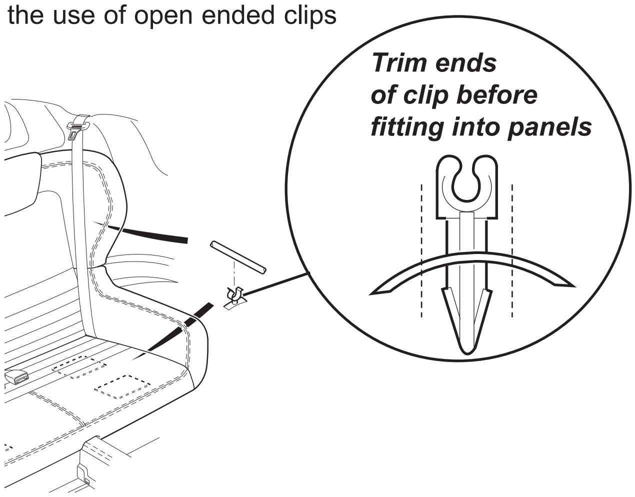
Individual Velcro 'hook' pad sections are bonded to the 4 NHV pads located on the fuel tank bay panel, corresponding to Velcro 'loop' sections which are bonded to the underside of the seat base foams. When the seat base is fitted into position on the fuel tank bay panel the Velcro sections join together to provide a large and secure mounting area.

Note: on later models additional security is provided by the use of open ended clips which push fit into the LH/RH quarter panels.

The LH/RH sections of the outer seat base frame fit into these clips offering additional security to the seat base squab area.

The clips used for this purpose are modified on the production line before fitment by cutting of a small section of off each end of the moulded mounting tang.

In the event that it is necessary renew the clips then the LH/RH tangs should be trimmed before fitment as per the RH illustration.



Backrest removal:

1. Remove both backrest top insert pads by pushing upwards to release their spring clips from the backrest frame.

2. Release both M5 flanged nyloc nuts securing the upper seat backrest frame to the rear bulkhead studs.

3. Push down on the rearmost of the seat base to access the M5 x 16 screws securing the lower seat frame to the rear seat belt mounting panel and release (but do not fully remove) the screws.

4. Place your hand around the outer section of the LH/RH outer squab sections to determine if retaining clips have been fitted to secure the seat back frame to the quarter panels, if so very gently pull the frame towards you to release the frame from the clips.

5. Pull the rear seat belt webbing away from the backrest and slightly raise so that the lower mounting points can slide free of the partially release screws then withdraw the assembly from the bulkhead panel.

Refitment:
Is the reverse procedure of removal.

Make sure the seat belt webbing is refitted correctly around and over the backrest (i.e., not kinked, twisted or trapped between the backrest and bulkhead panel) so ensuring the belt is free to withdraw and return into the reel assembly during its operational use.

Note: No torque tightening figures are given for the upper and lower M5 nuts and screw fixings, to prevent causing damage to the backrest fixing threads only tighten until moderate resistance is felt.

Seat Base Removal:

1. Place your hand around the outer section of the LH/RH outer squab sections to determine if retaining clips have been fitted to secure the seat base frame to the lower section of the quarter panels, if fitted gently pull the frame upwards to release the frame from the clips.

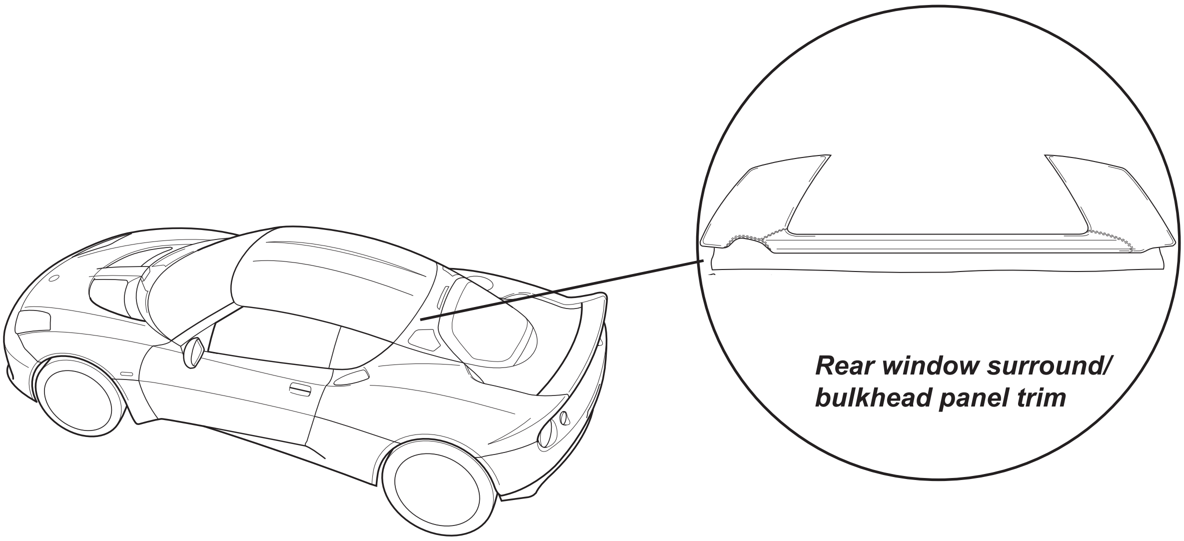
2. Release the rear seat base cushion from the fuel tank bay panel by pulling it free from its 4 Velcro fastening sections.

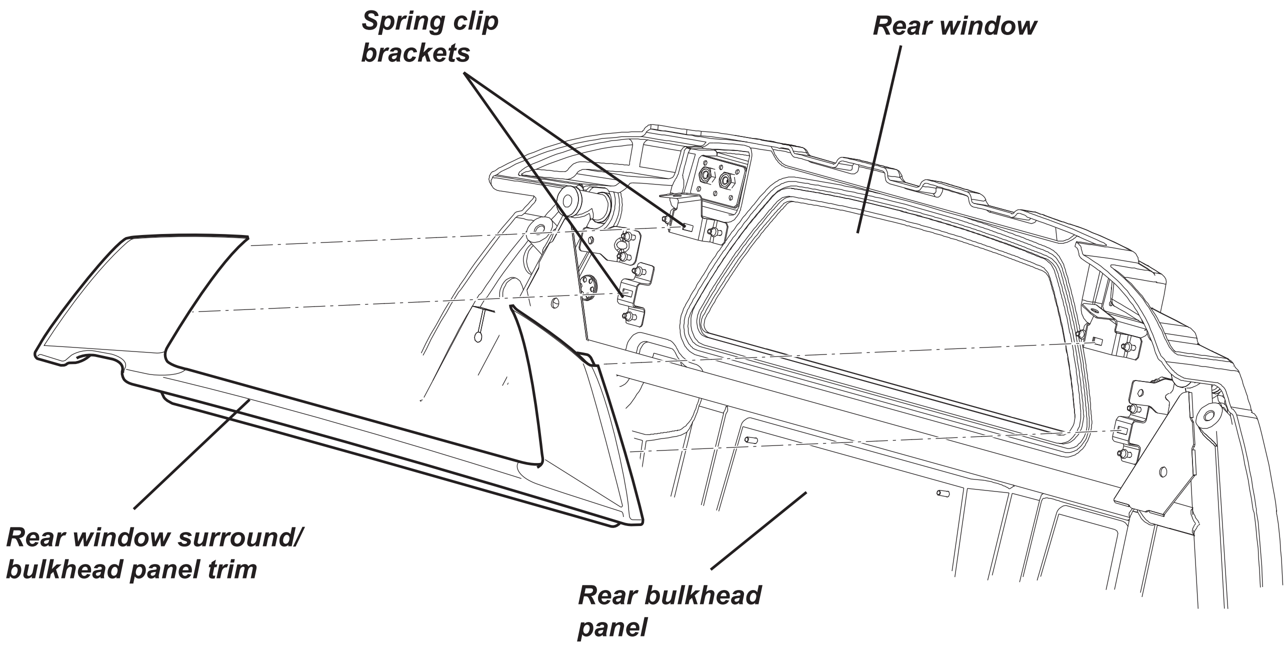
3. The seat base may now be withdrawn from the cabin.

Refitment:
Is the reverse procedure of removal.

Ensure sure the seat belt buckles are refitted correctly between the backrest and seat base assembly (i.e., not kinked, twisted or trapped between the backrest, seat base or bulkhead panel).

VE.14 - REAR WINDOW SURROUND/BULKHEAD PANEL TRIM





The panel is produced from Structural Reaction Injection Moulding (SRIM) using a polyurethane resin and glass reinforcement which are then finished in various grades/colours of leather coverings to complete the assembly to match the rest of the interior trim.

It is secured by four integrally mounted spring clips which push fit into corresponding brackets bonded around the rear screen aperture of the bulkhead panel

Bulkhead Panel Removal:
Gently pull the panel forwards to release the panels spring clips from their bulkhead mounting brackets.

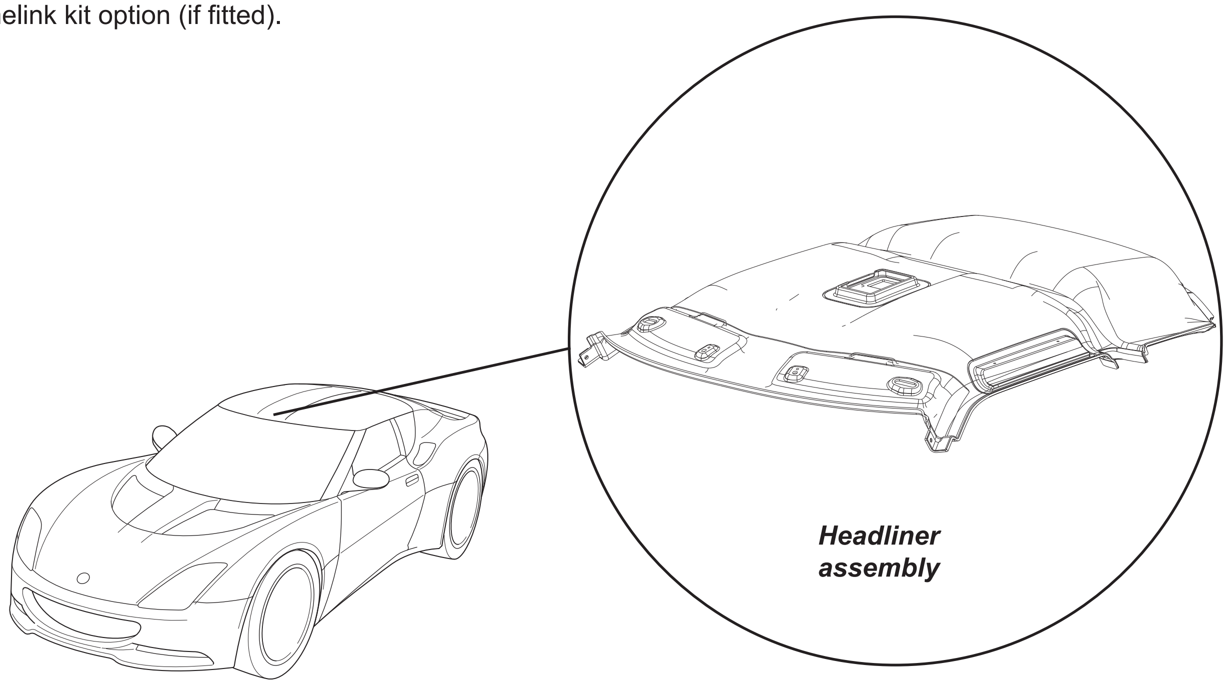
Refitment:
Is the reverse procedure of removal.

VE.15 - HEADLINER

The single piece Headliner is produced from a Reaction Transfer Compression (RTC) moulding; using a polypropylene glass reinforced moulding to which is bonded a Nylon polypropylene fabric with a foam backing on the visible surface and a polypropylene foam lining on the reverse side.

The inherent stiffness created by the materials and manufacturing processes used to create the panel means that supplementary fixing clips are not required to fix the headliner to the underside of the roof panel but instead it is retained in position by the sun visor brackets, the 'B' post upper trims, and two screws at its rearmost edge.

An additional rectangular aperture is machined forward of the interior light aperture to accommodate the Homelink kit option (if fitted).



Headliner Panel Removal:

1. Withdraw the interior lamp from the roof trim panel, ease one end of the lamp from lining aperture. Withdraw the lamp sufficiently to allow access to the harness connector, unplug and remove from the vehicle.

2. Carry out the same procedure if a Homelink switch is fitted.

3. Remove the rear window surround/bulkhead panel trim: refer to sub-section VE.14 for further information

4. Remove the two screws securing the rearmost edge of the headliner to the bulkhead panel.

5. Release the seat belt upper anchorage bolt from the LH/RH 'B' pillars, and remove both 'B' post upper trims: refer to sub-section VE.11 for further information.

6. Remove the LH/RH 'A' pillar trims; refer to sub-section VE.11 for further information.

7. Remove the three screws securing each of the sun visors and visor clips to the roof.

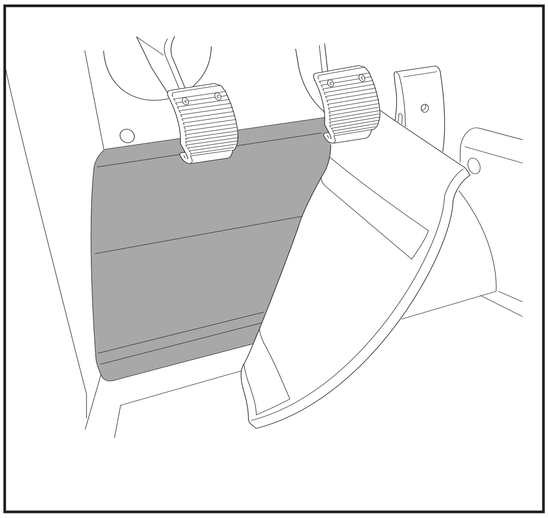
8. The headliner should now be free of the roof panel, but it may be necessary to tilt the front seats forward to allow a sufficient clear path to manoeuvre the headliner out of the vehicle cabin.

Refitment:
Is the reverse of removal but care should be taken to ensure that all wiring paths running along the underside of the roof panel are clear and will not become trapped when fitting the headliner back into position.

VE.16 - DRIVERS FOOTREST

The driver's footrest on early production vehicles (Except for Federal) consisted of an aluminium extrusion fixed to the outboard side of the drivers footwell area. This was replaced as a running change with a triangular foam assembly located behind the foot pedals, covered by the footwell carpet. This forms a rest spanning between the outermost footwell, front bulkhead and centre console. Re-profiling of the footwell area has also shortened the length of the drivers footmat.

Removal/Replacement:
From inside the footwell area, remove the drivers foot mat, pull back the front bulkhead carpet taking care not to pull the transfer tape off of the underside of the carpet, the foot rest is now accessible.



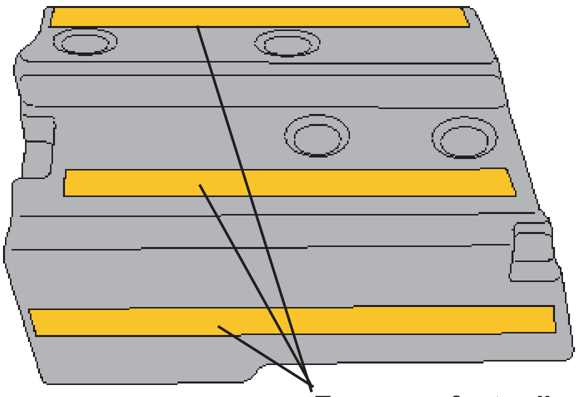
Although the footrests profile ensures it is held securely into the footwell, for additional security 3 strips of double sided transfer tape are also applied to the base and rear of the rest (2 between the footrest and bulkhead and 1 between the footrest and floorpan).

The footrest can now be carefully pulled away from the footwell. If the original footrest is to be refitted then ensure that the existing transfer tape is in a suitable condition to be re-used. If the tape is damaged then remove it and the clean tape contact area of the footrest.

- Before fitting the tape, clean the contact areas of both the footrest and the vehicle footwell with a suitable degreaser. (following manufacturers directions for suitable application methods and safety information).

- Apply a suitable adhesion promoter such as 3M-4297 or equivalent to the tape contact areas of the footrest and vehicle footwell (following manufacturers directions for suitable application methods and safety information). Apply 3 lengths of suitable ***thin*** double sided transfer tape* (Approx 500mm in total length) the footrest can now be fitted to the vehicle.

  *Transfer tape is an unsupported type tape (it does not have a backing and must be very thin so that it does not allow for any gaps between the footrest and bulkhead/floorpan when fitted in place.



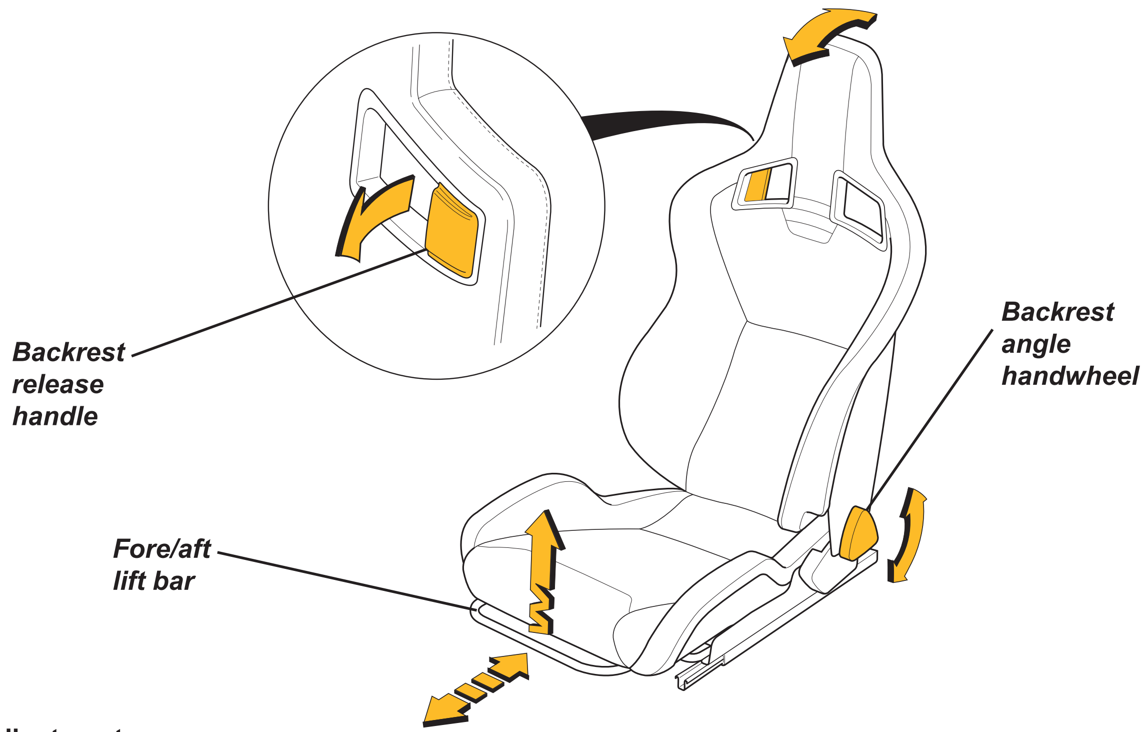
VE.17 - FRONT DRIVERS & PASSENGER SEATS

The Evora seats are non serviceable assemblies, and at the time of this publication seat shells, trims or cushions are not available for service replacement. Seats assemblies are available in both cloth and leather trim options to match material and colour options of the door panels and dashboard trims.

The assemblies consist of a trimmed seat base and hinged backrest, the seat base is fixed to a metal frame on which the seat belts buckle and seat runners are then bolted onto. The seat runners are then bolted to extruded mounting sections on the chassis floor pan.

From the introduction of '11MY VIN BH_11178 Front driver and passenger's seats are available with a heated option and thermostatically controlled to maintain a maximum temperature of 37 ± 3 °C.

Please note: vehicles may be fitted with heated seats regardless if this option is available for selection by the driver.



Seat adjustment
To adjust the fore/aft position of a front seat, raise the lift bar beneath the front of the seat, and slide to the position required. Ensure that the catch is fully engaged after adjustment by attempting to slide the seat with the lift bar released.

The backrest angle may be adjusted by turning the handwheel at either side of the backrest base. For access to the rear of the cabin, a backrest release handle is provided in the outboard shoulder harness slot. Pulling the lever will allow the backrest to fold forwards without losing the original setting, to which the seat may be returned after releasing the lever.

Seat and runner removal

Preparation
To prevent potential damage to the interior trims and seat during removal, fit protective covers to the side sill trims and seat assembly before removal.

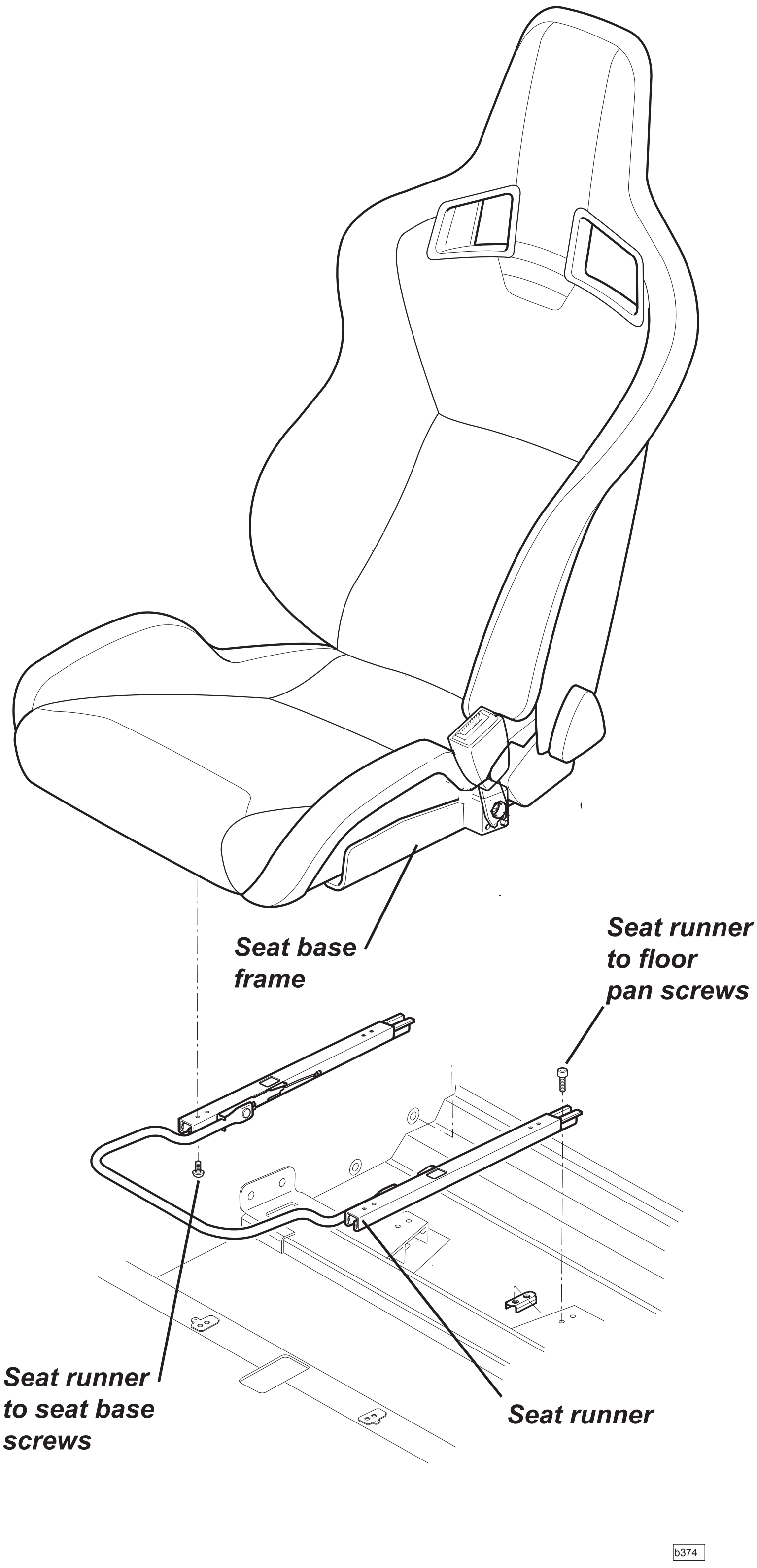
1. Using the seats release handle, move the seat forward.
2. Release the 2 M8 x 25 screws securing the rear of the LH and RH seat runners' to the chassis floor.
3. Move the seat rearwards.
4. Release the 2 M8 x 25 screws securing the front of the LH and RH seat runner's to the chassis floor.
5. Carefully raise the seat and disconnect any harness multi-plugs (such as drivers seat belt stalk harness or heated seat connections if fitted).
6. The seat and runner assembly can now be removed from the vehicle.
7. Release the 4 M8 x 20 screws securing the runner assembly to the seat frame.
8. The runner assembly can now be removed

Refitment is reverse procedure to removal.

Fit all 4 runner to seat frames screws in finger tight then tighten to 25Nm, and then check runners slide freely before refitting seat assembly back into the vehicle.

Fit all 4 runner to floor mount screws in finger tight, ensure seat will move freely on runners before tightening all 4 fixings to 33Nm.

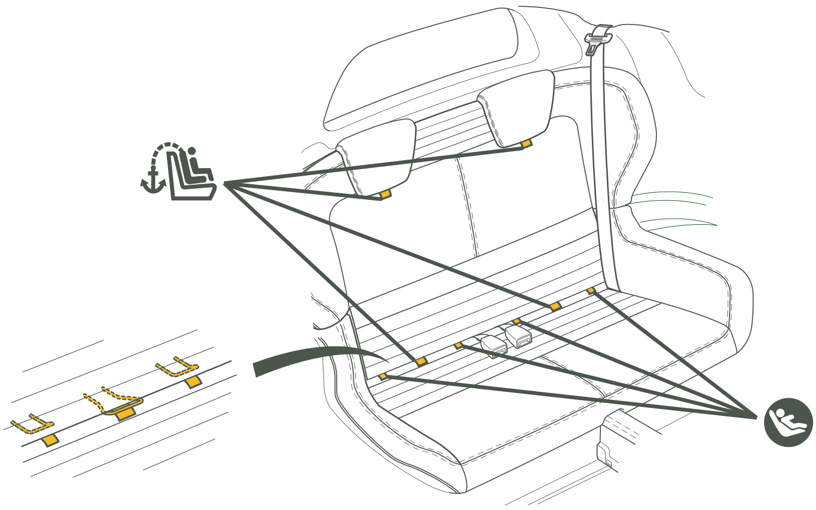
Note: for seat belt buckle removal see service notes section WF.12 for further information.



VE.18 - REAR SEAT ISOFIX BRACKETS AND TETHER MOUNTS (2+2 VERSIONS)

ISOFIX brackets

4 Isofix seat brackets are bolted into the rear floor chassis rail, 1 each to the inboard of the standard seat belt buckle and reel lower mount. ONE Isofix seat can be fitted to the passenger side of the rear seat.



The ISOFIX brackets are located between the base of the backrest and seat cushion and can be identified by the symbol located to the rear of the seat cushion.

The following child seats have been approved for use in the Evora, using the standard fitment lap and diagonal seat belts or ISOFIX fixing system:

Mass group	Seating Position		
	Maxi cosi Cabriofix E4 04443517	Recaro Young Sport E1 04301171	Maxi cosi Family IsoFix with Pearl E4 04443908
Group 0, 0+ (Rearward facing)	Yes *(1 & 2)	No	No
Group 1 (Forward facing)	No	Yes *(3 & 4)	Yes *(2)
Group 2 (Forward facing)	No	Yes *(3 & 4)	No
Group 3 (Forward facing)	No	Yes *(3 & 4)	No

Notes

1. Suitable for fitment to front passenger seat in fully rearward position with passenger airbag turned off.

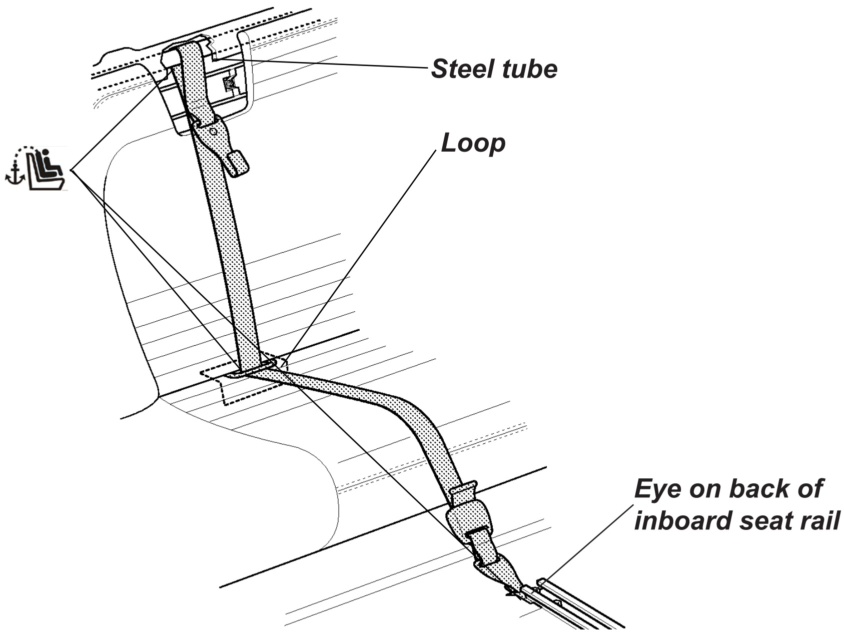
2. On 2+2 cars, suitable for fitment in passenger side rear seat, with front passenger seat moved fully forward.

3. Suitable for fitment to front passenger seat in fully rearward position.

4. On 2+2 cars, suitable for fitment in passenger side rear seat, with front passenger seat in mid-position.

Rear Seat Anchor Brackets (2+2 versions)

Mounting points are provided to allow the fitment of a child seat requiring a top tether to secure it to the passenger side rear seat. Tether mounts are located behind the rear headrests, the base of the seat backrest and inboard passenger seat rail. Tether mounting points located behind the seat can be indentified by the symbol.



Fit Top Tether

Remove the right hand rear headrest from the rear seat by pushing upwards to release the spring clips. If the child seat is to be installed in the left hand rear seat, the left hand headrest must also be removed, and the top of the backrest released by removing the single fixing in each headrest aperture.

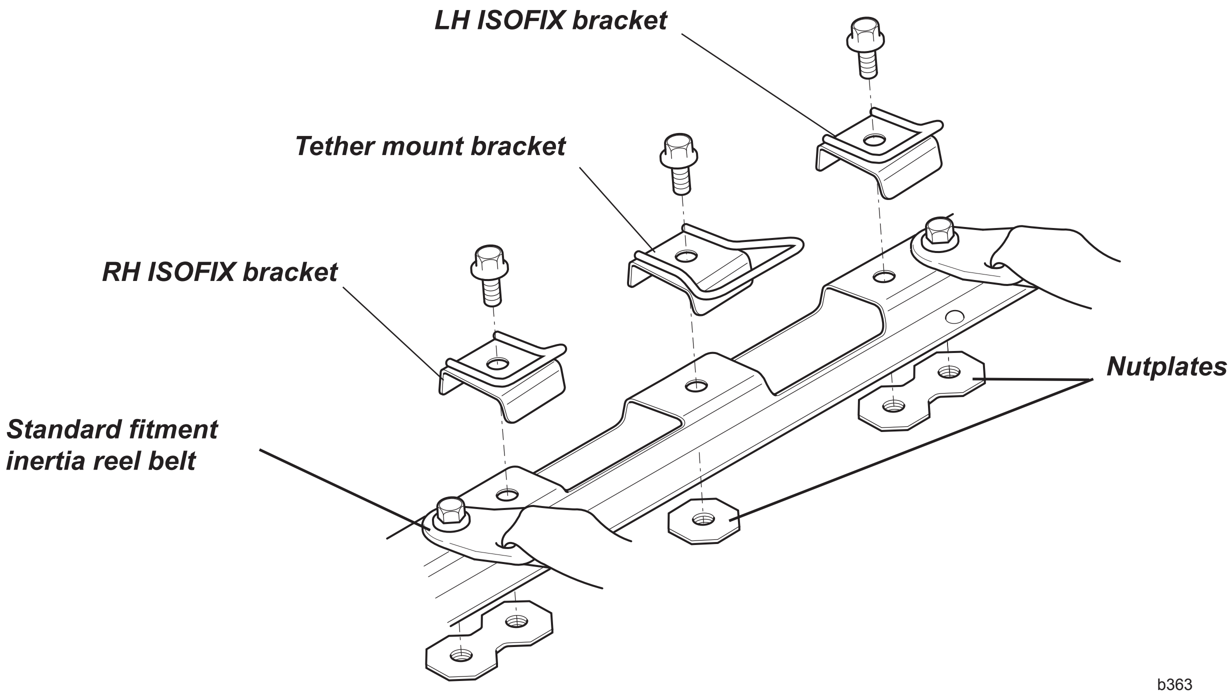
The 1 inch (25 mm) diameter steel tube running across the bulkhead is the top tether routing device as indicated by an adjacent symbol.

Feed the tether around the tube using the recess available at the right hand side, and if necessary, ease the backrest forwards to allow the tether to be slid across to the left hand side. Refit the backrest top fixings.

Then feed the tether through the loop at the base of the seat backrest. Note that this loop is also indicated by the symbol.

Finally, hook the tether into the eye at the rear end of the front passenger seat inboard mounting rail as shown in the illustration.

ISOFIX bracket and Tether mount removal



Remove the rear seat (see section VE.13).

Remove the rear fixing of the ISOFIX bracket or tether mount as required.

Note, if tether mount fixing is removed then ensure that its nutplate is retrieved from the chassis rail.

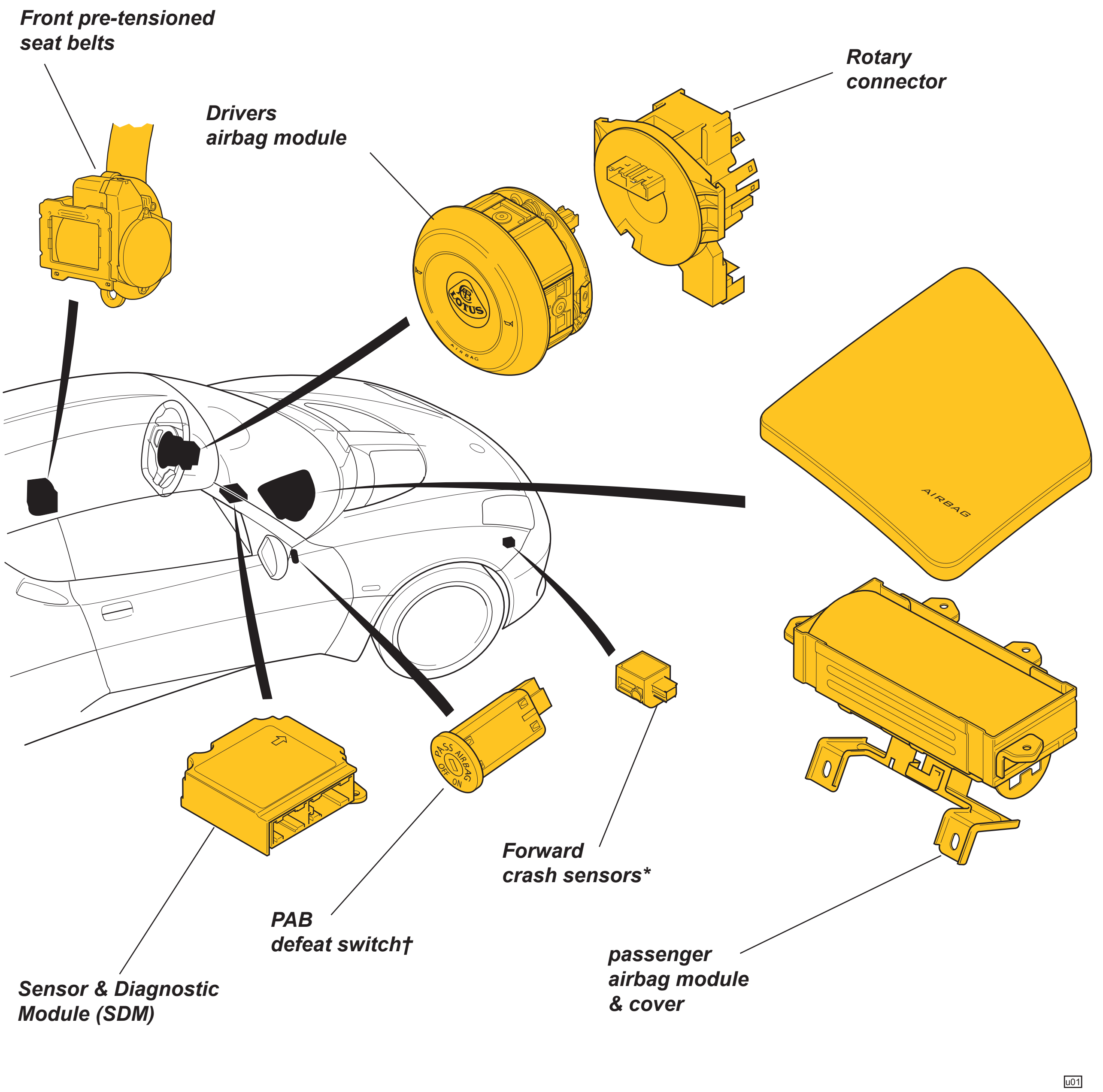
Refit is reverse of removal ensure any disturbed fixing is tightened to 33NM.

Please note:
ISOFIX brackets and tether mounts may not have been factory fitted on early cars, please refer to Technical Service Bulletin TSB 2009/17 for additional information.

AIRBAG SYSTEM

SECTION WF

Supplementary Restraint System (SRS) Main Components & Location (LHD shown)



* *Forward crash sensors only fitted to Non USA/GCC vehicles from the start of production and no longer fitted from '11MY VIN BH_11178.*

† *Passenger Airbag Defeat (PAB) is not fitted to USA vehicles.*

WF.1 - GENERAL DESCRIPTION

The Lotus Evora is equipped with dual stage airbags for both the driver and front seat passenger, in conjunction with pyrotechnic seat belt pre-tensioners for both front seat occupants. The airbag Supplementary Restraint System (SRS) is supplemental to the seat belts, and does not render the seat belts redundant. Seat belts have proven to be the single most effective safety device, and should be worn at all times by both driver and passenger, no matter how short the journey. Properly worn seat belts also ensure that the seat occupant is in the best position for full effectiveness of the airbag.

WARNING: Airbags inflate with great force, in a fraction of a second, and if a vehicle occupant is too close to the airbag (less than 250 mm) or incorrectly positioned, they could be killed or seriously injured.

The SRS is designed to operate when the vehicle is involved in a frontal, or near frontal collision, and the impact (rate of deceleration) as detected by any one of three vehicle mounted sensors, is sufficient to warrant airbag and seat belt tensioning protection to both front seat occupants.

The 55 litre airbag for the driver is housed in the centre of the steering wheel, with a 100 litre bag for the passenger housed within the fascia. Three 'G' sensors are mounted in the vehicle to detect the rate of deceleration in a collision, and if the signal from any one of these should exceed a threshold value, the first stage of airbag inflation will be initiated.

This will cause the airbags to inflate at a rate calculated to provide appropriate protection, whilst minimising the potential for airbag induced injury, especially where an occupant is not positioned optimally at the triggering moment. If a higher rate of deceleration is detected, indicating a more severe impact, the second stage inflator modules will be triggered to more rapidly inflate the airbags. In either case, both bags inflate in a fraction of a second to form a cushion for the driver's and passenger's upper bodies. The bags then deflate very rapidly to minimise any obstruction to the driver.

Note that in order to protect against the danger of an unprogrammed firing of the second stage after a first stage airbag deployment, with the potential to cause injury to the vehicle occupant or carer, any first stage firing is followed almost immediately by triggering of the second stage, too late to affect the speed of airbag inflation, but ensuring that the airbag is then 'dead' and in a stable condition.

Initiated at the same time as the airbags is a pyrotechnic device on each front seat belt reel assembly, which uses rapid gas generation and a train of balls in a track to apply a tightening force to the belt reel and remove any slack from the belt. The force sustained by the belt and its user during the event, is then controlled by a torsion bar within the belt reel to limit the deceleration force to which the occupant is subjected.

Note that the SRS will deploy only in moderate to severe frontal and near frontal collisions, and is not designed to be triggered in rollover, rear or low speed frontal collisions, or in some types of side impacts.

The system incorporates a self-diagnostic facility, which continuously monitors the SRS electrical circuits for faults, and if necessary, lights a tell tale lamp in the instrument cluster. Most components of the SRS will require replacement after an airbag deployment.

WF.1A - SRS MODULE CHANGE POINTS

Page 2 displays the key components of the Supplementary Restraint System (SRS) as fitted at the start of production from June 2009 approx. At the time of production forward mounted crash sensors were required to ensure that all impact scenarios were detected at the relevant angles as required by safety legislation

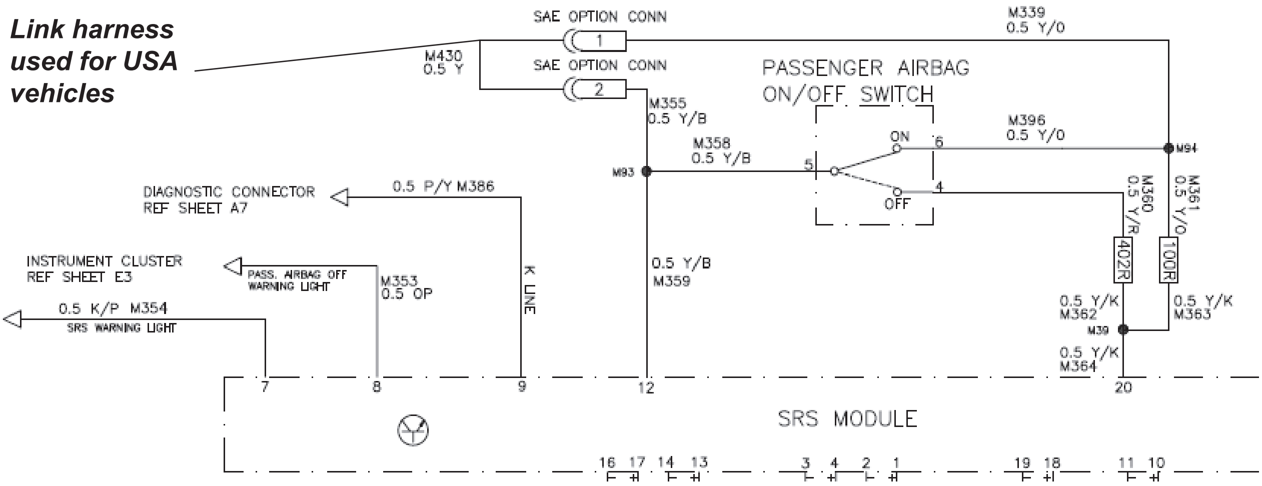
Although USA and GCC vehicles (introduced March 2010) utilised the same interior cabin components as shown on page 2, these vehicles did not require the forward mounted crash sensors as their functionality could now be incorporated within the Sensor & Diagnostic Module (SDM).

Airbag module inflation rates, bag profiles and front seat belt pre-tensioners were also altered for USA vehicles ensuring that they complied with Federal regulations regarding unrestrained (i.e., un-seat belted) vehicle occupants.

Although the location and functionality of the majority of the SRS components was the same, their operation upon initialisation would slightly differ, requiring different variations of modules and different part numbers for the same components for these two markets.

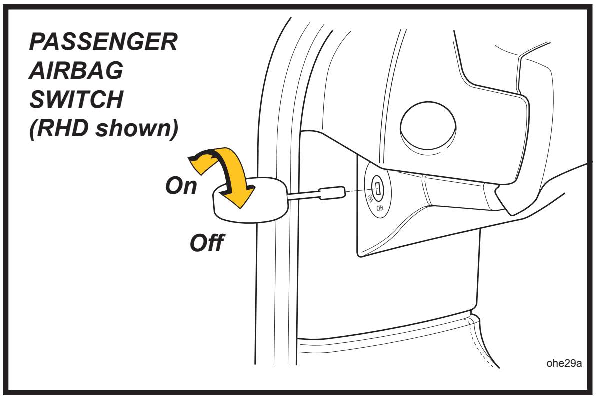
At the introduction of the Evora S in December 2010 '11MY VIN BH_11178, the SRS systems were harmonised for all markets and subsequently referred to as the 'Global System' now using the identical parts for both markets.

Extract from sheet E1 of CCT diagrams



Passenger Airbag Defeat (PAB) Switch (not fitted on USA cars)

If a rearward facing child seat is to be used in the front passenger seat of the Evora, it is essential to switch off the passenger airbag. If an accident should occur and trigger airbag inflation, the back of the seat could be subjected to a force sufficient to seriously injure or kill the child.



A PAB switch is located at the end of the passenger fascia, and is operated using the mechanical ignition key; insert the key and turn clockwise to the 'OFF' position, and withdraw the key. With the ignition switched on, a tell tale lamp in the instrument panel will light up red as a reminder that the passenger airbag has been disabled. To reinstate airbag operation, insert the key in the PAB switch and turn counterclockwise.

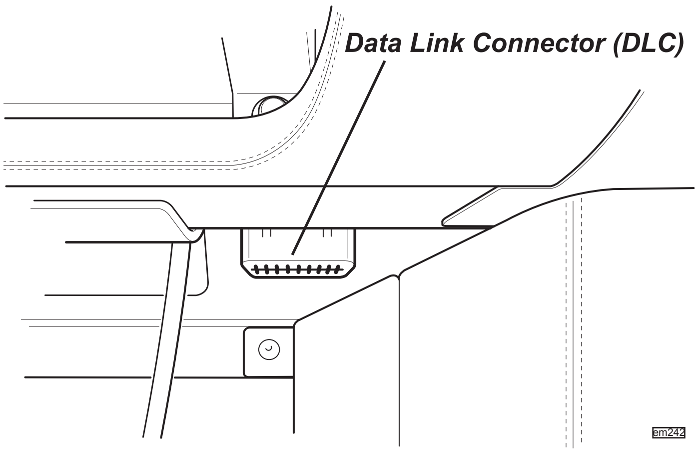
This option is not available for USA specification vehicles, and the main harness connectors used for the PAB switch are 'bridged' using a link harness.

WF.2 - AIRBAG TELL TALE 

The airbag safety system, including the pre-tensioning seat belts, has a self-diagnostic feature which lights the red tell tale and sounds an audible alert if a fault is detected. As a circuit check, the tell tale will light for about six seconds following ignition switch on, and then go out. If the lamp remains lit, or comes on at any other time, a fault in the airbag system is indicated, which should be rectified without delay.

WARNING: If the airbag tell tale is lit, the airbags may not inflate correctly in a crash, or may inflate without warning; or the pre-tensioning seat belts may not perform correctly. The SRS should be interrogated using the Lotus TechCentre and diagnosed and rectified without delay.

WF.3 - DATA LINK CONNECTOR (DLC)



In order to provide for communication with the SRS Sensing and Diagnostic Module (SDM), the Lotus TechCentre may be plugged into the special 16 terminal harness connector socket, known as a Data Link Connector, located beneath the driver's side fascia at the outboard side of the footwell. Communication with engine management and anti-lock brakes is also available via this connector.

WF.4 - TROUBLE CODES & BASIC DIAGNOSIS

All the time that the ignition is switched on, the SRS ECM (Electronic Control Module) also referred to as the SDM (Sensor & Diagnostic Module) is continuously monitoring the electrical resistance and voltage values of all the sensors and modules contained within its circuits and compares these values with pre-programmed tolerance bands to enable it to recognise 'faults' in the system and illuminate the airbag tell tale lamp(s) in the instrument cluster.

If a fault is detected, the ECM stores a DTC (Diagnostic Trouble Code) for that particular type of fault in its memory.

i). Current (Present) Codes - Faults that are currently being detected. Current codes are stored in the SDM Random Access Memory (RAM), which will be cleared if the vehicle battery is disconnected.

ii). History (Not present) Codes - All faults detected since the last time faults were cleared from the memory using the Lotus TechCentre. History codes are stored in the SDM Electronically Erasable Programmable Read Only Memory (EEPROM) and are not cleared if the battery is disconnected.

Diagnosing SRS Fault Codes Using Lotus TechCentre
It should be understood that any SRS DTC displayed on Lotus TechCentre (or any other diagnostic tool), **does not necessarily** mean that the specific module(s) associated with that fault code description are faulty and require replacement.

Example:

DTC	***Description***
9047	Drivers Airbag 2nd Stage

It should not be presumed that the fault is specifically the drivers airbag and now requires replacement, but rather any module or connection contained within that entire circuit including the driver’s airbag back to the SRS ECM (Electronic Control Module) is in question.

A DTC may also be generated because of:

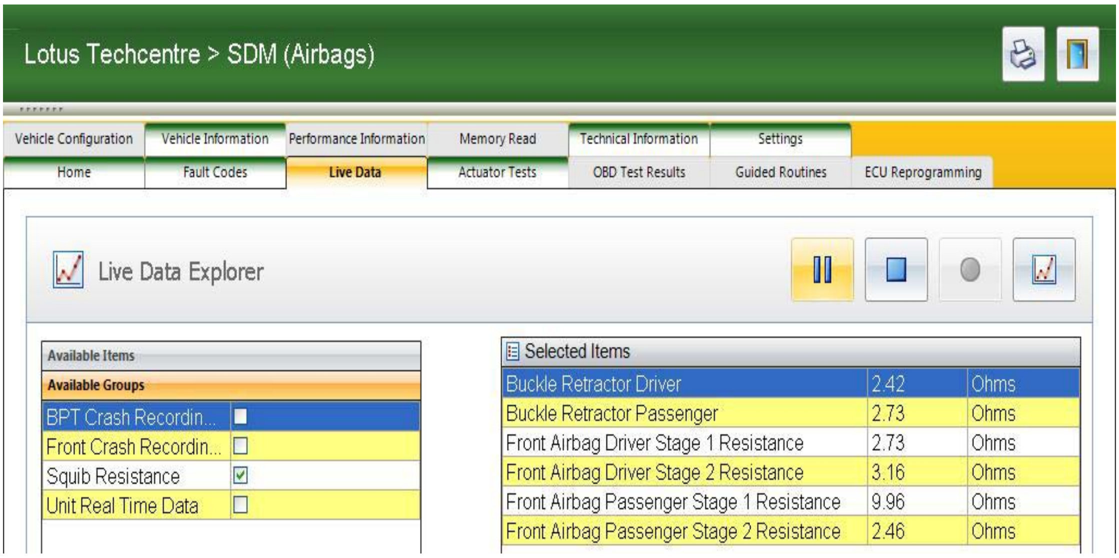
- An unplugged harness connector.
- A damaged wire within any of the wiring harnesses going to that sensor.
- A corroded or damaged pin/terminal within any of the harness multi-plug connector(s) within the circuit or even a faulty SRS ECM itself.

SRS ECM's, airbag modules and sensors are designed to be very robust and manufactured to very exacting standards and in the majority, SRS faults are normally caused by poor electrical connections.

Refer to any relevant circuit diagrams within the service notes to identify all associated voltage feeds, earth points, terminals, pin outs, modules and harness connections etc contained within the circuit(s) which may be a potential cause of failure.

If any fault code displayed within Lotus TechCentre indicates that there may be a potential SRS system fault within the driver’s airbag system, then the following course of action is recommended.

Diagnostic Route Recommended if Drivers Airbag Module DTC is Generated
Select the SDM (Sensor & Diagnostic Module) Live Data screen in Lotus TechCentre and if a high resistance reading * indicates a driver’s airbag circuit fault then the following diagnostic route is recommended in the first instance to determine the cause of the problem.



Note: A resistance reading of 9.96 Ω on TechCentre indicates an open circuit, with typical SRS module/circuit resistance values of 2.1 Ω - 3.2 Ω being acceptable.

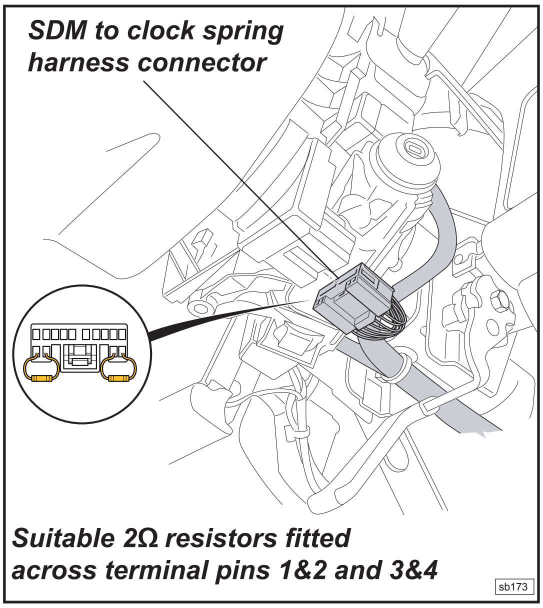
Note: This screen function on Lotus TechCentre is only operational for all USA vehicles from start of production and Non-USA from '11MY VIN BH_11177. But the procedure 1-7 listed below can still be carried out as a process of elimination for Non-USA models from start of production.

WARNING: Please refer to all safety notices and procedures listed in service notes section WF.9 whilst working on any area of the SRS system.

1. Remove the lower steering column shroud - see service notes section VE.10 and check the continuity between the main harness clock spring connector & the SRS SDM module connector. The SDM module is mounted in an alloy box bolted to the centre underside of the scuttle beam in front of the centre console - see service notes section WF.8.

2. Inspect the terminals at each connector and ensure that they have not been opened up thereby possibly causing an open circuit. The wire identification for the connectors is 369 LG/R, 370 LG/S, 371 LG/U & 372 LG/N - see service notes section MR.16b, Evora CCT diagrams sheet E1 for further information.

3. If the terminals do not appear to have opened then temporarily fit 2 suitable 2 ohm resistors across pins 1 & 2 (Driver stage 1) & pins 3 & 4 (Driver stage 2) of the main harness clock spring connector as shown in the right hand illustration. This will simulate the correct airbag resistances values.



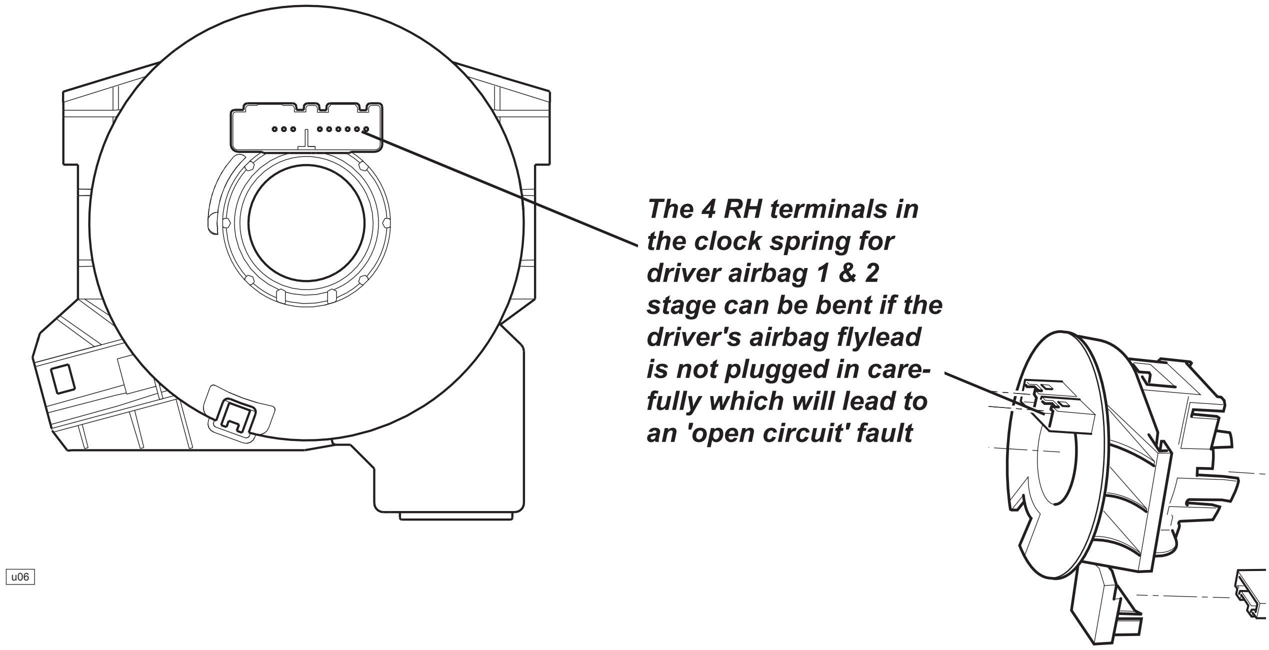
4. Clear the codes using Lotus TechCentre.

5. Exit the SRS system screens in Lotus TechCentre and go back to the main menu.

6. Turn the ignition on; if the airbag tell tale within the instrument pack extinguishes after 6 seconds and the DTC codes are cleared (once Lotus TechCentre is directed back into the SRS menu) then this indicates that the fault is after this connector (within the clock spring / airbag connections) & not within the main harness / SRS module side of the circuit.

7. In the event that the airbag tell tale fails to extinguish and the DTC codes are re-generated then further investigation of the integrity of the harness, connectors and its terminals of the clock spring to SRS ECM module is required.

Similar to the clock spring connecter this involves checking that the terminals within the connectors have not opened up and that the resistance readings of the harness are within the acceptable limits.



Note: The majority of drivers airbag DTC code generation have been eventually been diagnosed as the pins within the connector housing on the airbag side of the clock spring being forced & bent if the airbag connector has not been engaged carefully or due to an internal break within the clock spring assembly.

The clock spring to SDM harness will typically only fail if the main harness to clock spring connector has not been fully engaged into the clock spring housing or if damaged during steering column/rack renewal.

WF.5 - CAN BUS DIAGNOSTICS; LOTUS TECHCENTRE

Controller Area Network (CAN) is an electronic standard to allow high speed communication between modules and controllers, via a serial data bus. The bus is a circuit linking the modules to the controller, consisting of a pair of cables, twisted together to reduce electromagnetic interference, and carrying a square wave voltage signal corresponding to '0's and '1's, coded in such a way as to identify and prioritise the individual messages. On the Evora, CAN based systems include; engine management, anti-lock braking and related features, tyre pressure monitoring, instrument pack, SRS and onboard diagnostics.

A 'stand alone' lap top PC loaded with 'Lotus TechCentre' software allows the CAN based serial data to be read. A Vehicle Communication Device (T000T1472F) introduced for the Europa model is used to connect the vehicle to the laptop Lotus TechCentre. Engine programming, live data display and systems diagnosis are all carried out via the Lotus TechCentre.

The minimum specification of the laptop computer for installation of the Lotus TechCentre is as follows:

Processer 1.70 Ghz;
1 GB RAM;
40 GB HDD;
CDRW DVD ROM;
WIN XP PRO or VISTA;
USB interface;
Ethernet or Wireless LAN

Note that this laptop should be dedicated soley to the Lotus TechCentre, with no other software installed. This diagnostic software is designed primarily for use by trained Lotus technicians, and is available as a CD under part number T000T1510F (version 4) or later supercessions. A monthly (Lotus Dealers) or annual (non-Lotus dealers) licence and support fee will also be levied, providing access to Lotus TechCentre Technical Support phoneline on ***0870 9493 668***, and e-mail on ***lotus.support.uk@omitec.com***

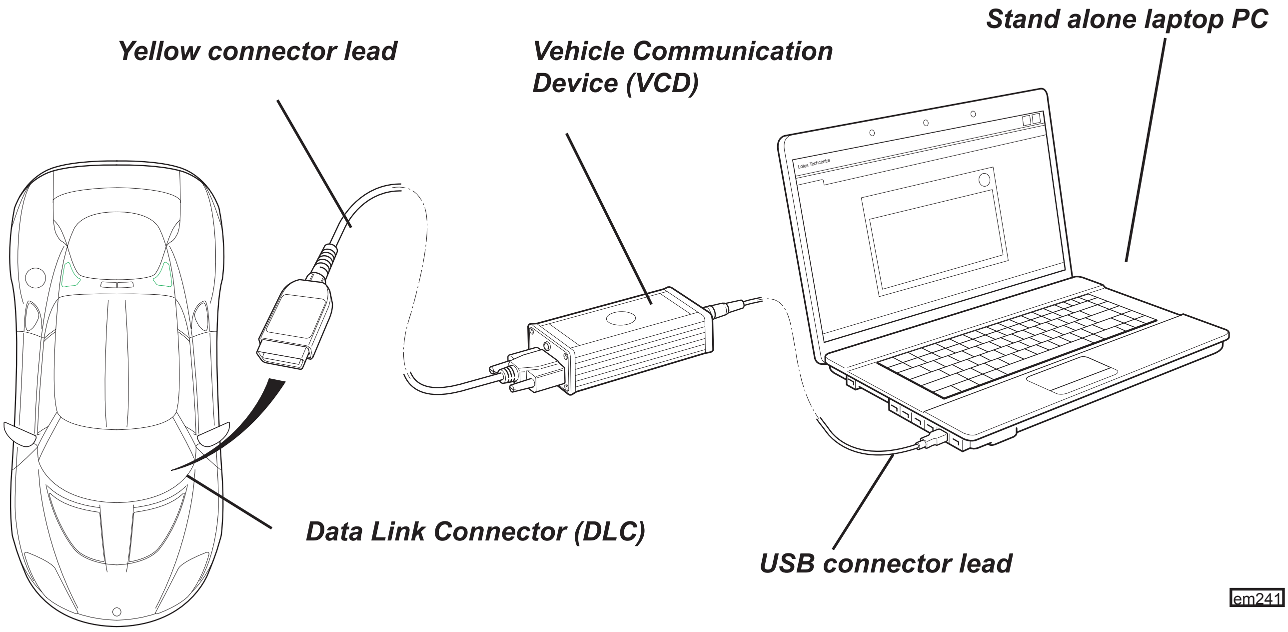
Also required is a unique 18 character licence/registration key without which TechCentre will not function. This key is non transferable to other PC's.

Scope of Lotus TechCentre

Model		Type of Electronic Control Unit Communication compatible					Engine ECU Reprogrammable
		EMS	ABS	SRS	TPMS	IP	08 MY on
Elise	2004 on	**Y**	**Y**	**Y**	**Y**	**N**	**Y**
Exige	2004 on	**Y**	**Y**	**Y**	**Y**	**N**	**Y**
Europa	2006 on	**N**	**Y**	**Y**	**N/A**	**N**	**N**
2-11	2007 on	**Y**	**Y**	**N/A**	**N/A**	**N**	**Y**
Evora	2009 on	**Y**	**Y**	**Y**	**Y**	**Y**	**Y**
Esprit	V8	**Y**	**Y**	**N**	**N**	**N**	**N**

Note that TechCentre has no connectivity to Rover powertrain Elise/Exige variants, and that only limited diagnostics are available for the V8 Esprit. No communication is available with the Europa powertrain. Diagnostics for these vehicles are accessible using the Lotus Scan 3 tool T000T1467F (U.K./EU).

TechCentre Connection
TechCentre connection to the car is made via the Vehicle Communication Device (VCD) and the Data Link Connector (DLC) located beneath the driver's side fascia at the outboard side of the footwell.



Power for the VCD is taken from the vehicle battery via the DLC and when powered a blue tell tale on the unit will light. Should updated firmware be available for the VCD (usually downloaded as part of an online update) TechCentre will automatically update the VCD and display a message to confirm.

The VCD, under part number T000T1472F is supplied in a black plastic carry case containing the following:

VCD
16 Pin Yellow connector lead (VCD to Vehicle)
USB lead (VCD to PC)
USB extension lead (VCD to PC) not illustrated

Use of TechCentre
For further information see the 'Lotus TechCentre User Guide' , which can be downloaded from the Lotus Dealer Portal at:

http://dealers>Aftersales>Miscellanous Technical Information>TechCentre Information.

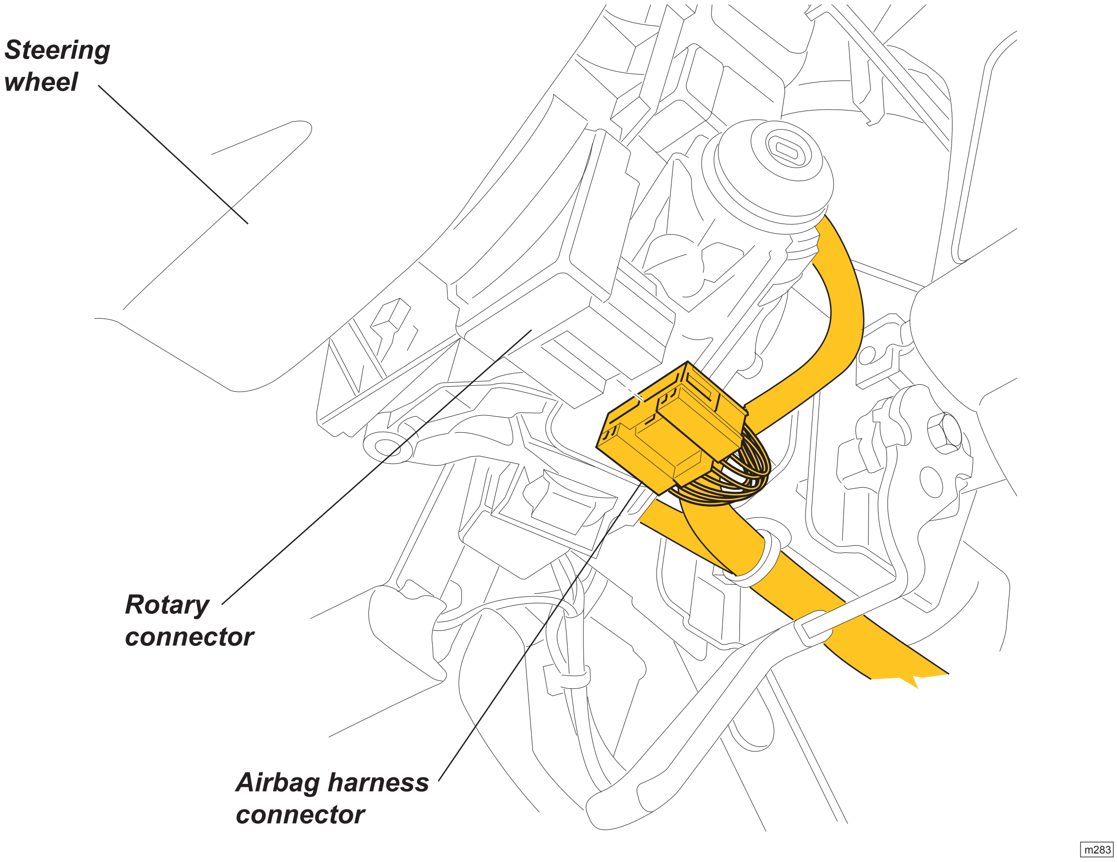
WF.6 - SAFETY PRECAUTIONS, SHIPPING, STORAGE & DISPOSAL

WARNING: The SDM can maintain sufficient voltage to cause an airbag deployment for up to 20 seconds after the battery has been disconnected. Before working on the airbag system, or in close proximity to an airbag, first take the following precautions to temporarily disable the airbag system:

1. Turn off the ignition
2. Before disconnecting the battery, use the Lotus TechCentre to read any stored trouble codes.

   Note: Do not disconnect the battery for at least 30 minutes after switching off the ignition to allow the engine management system and associated sensors to shut down in the correct sequence.

3. Disconnect the negative (earth) lead from the battery and tape back to ensure that no contact with the battery negative terminal can be made.
4. Wait for 30 seconds.
5. If working on or near the steering wheel, first unclip the top part of the column shroud, then remove the lower part after releasing the three retaining screws.
6. Locate and unplug the airbag harness from the rotary connector. Note that the connector socket is fitted with 'shorting bars' which automatically interconnect the high and low terminals of the airbag to prevent unschedules deployment caused by a voltage differential.



When service work has been completed, reconnect the harness plug secured with its locking feature, and reconnect the battery. Ensure the airbag tell tale lights for a few seconds with ignition and then goes out.

Storage
- Airbag modules and SDMs should not be stored at temperatures above 176°F (80°C).
- Airbag modules and SDMs should not be stored in damp conditions.
- Do not store airbag module or SDM boxes more than two high.
- Always store and handle airbag modules and SDMs in an upright position. Never store SDMs upside down.

Sensor & Diagnostic Module (SDM) & Forward Crash Sensors
The SDM and forward crash sensors (if fitted) are calibrated specifically to the Evora, and are mounted in a dedicated manner in specific positions. Never use SRS components from any other vehicle, or modify their mounting to the Evora.

WARNING:
- **Handle the SDM with great care. Never strike or jar the SDM as this could cause airbag deployment and result in personal injury or improper operation of the SRS.**
- **All module and mounting bracket bolts must be correctly installed and tightened to assure proper security and operation.**
- **Never power up the SRS when the SDM is not properly mounted and secured, since the SDM is easily triggered when not attached, and could result in deployment causing personal injury.**
- **Do not use or attempt to repair a damaged SDM.**

Inflator Module
Live (Undeployed) Inflator Modules: Special care is necessary when handling and storing a live (undeployed) inflator module. In the unlikely event of accidental deployment, violent movement of the inflator module could result in personal injury.

WARNING:
- **When carrying a live inflator module, make sure the bag and trim cover are pointed away from you. In case of an accidental deployment, the bag will then deploy with minimal chance of injury.**
- **When placing a live inflator module on a bench or other surface, always face the bag and trim cover upwards, away from the surface. This is necessary so that a free space is provided to allow the air bag to expand in the unlikely event of accidental deployment. Otherwise, personal injury may result.**
- **Never carry the inflator module by the wires or connector on the underside of the module.**
- **Do not use or attempt to repair a damaged inflator module, and NEVER apply any electrical power to the module except as specified in the diagnostic procedures.**

Inflator Module Shipping Procedures for Live (Undeployed) Inflator Modules
The transportation of uninstalled inflator modules is regulated by the Hazardous Materials Regulations of the U.S. Dept, of Transportation (DOT) and most state governments. Special procedures are required for transportation. Lotus recommends that the dealers and repair shops check with the hazardous material section of their respective state police authority for applicable shipping requirements.

For all shipments on public roads, the DOT has classified the uninstalled inflator module as a flammable solid under a special exemption process. It should always be shipped and stored in the approved cardboard container in which it is purchased. The container should be marked with “Flammable Solid , n.o.s., UN1325, DOT-E8236” and labelled with the specified red and white flammable solid label. Each shipping location must have a copy of the exemption on file. A shipping paper (e.g., a customer receipt) must accompany each shipment and identify the module as “Flammable Solid, n.o.s., UN1325, DOT-E8236”. Transportation, storage and handling of the module should be in accordance with the exemption and the requirements for a DOT flammable solid. Do not expose the module to heat, open flame, impact, friction, or electrical charge.

Inflator Module Scrapping Procedures

WARNING: Failure to follow proper SRS inflator module disposal procedures can result in airbag deployment which may cause personal injury. Undeployed inflator modules must not be disposed of through normal refuse channels. The undeployed inflator module contains substances that can cause severe illness or personal injury if the sealed container is damaged during disposal. Disposal in any manner inconsistent with proper procedures may be a violation of federal, state and/or local laws.

Reference should be made to the local State authority for the correct disposal procedures for deployed inflator modules.

Vehicle Scrapping Procedures
Some vehicles equipped with SRS that have live (undeployed) inflator modules may have to be scrapped because they have completed their useful life, or have been severely damaged in a non-deployment type accident. The following procedure should be followed when scrapping a vehicle with an undeployed module.

1. Follow the safety procedure detailed in sub-section WF.6 to turn off the ignition, disconnect the battery and unplug the inflator module harness.
2. Follow the procedure detailed in sub-section WF.11 to gain access to the passenger airbag module.
3. At the driver's airbag harness alongside the steering column, cut the harness side of the SRS wiring approx. 75 to 150 mm from the yellow connector.
4. Splice 2 wires at least 6 metres long to the red/blue and the red/green coloured cables in this connector block.
5. Reconnect the yellow 4-way connector block now equipped with 2 x 6 m long cables.
6. Check that the inflator module is secured to the steering wheel.
7. Remove all loose objects from the front seat.
8. Ensure no one is in the vehicle.
9. Stretch wires away from car to their full length.
10. Apply 12 volts across the wires to deploy the air bag.
11. Do not touch the inflator module area for 20 minutes due to the heat generated during deployment.
12. Wear gloves and safety glasses to handle the deployed air bag. Wash your hands with mild soap and water afterwards.
13. Repeat steps 3 to 12 for the passenger airbag, splicing the 6 m cables into the two wires connecting the SDM to the airbag.

Deployed Inflator Modules

WARNING: Safety precautions must be observed when handling a deployed inflator module. After deployment, the air bag surface may contain a white packing powder used to ease deployment. Always wear gloves and safety glasses when handling a deployed inflator module, and wash your hands with a mild soap and water afterwards.

Inspections Required After an Accident
All SRS system components, including harnesses and brackets, must be inspected after an accident. If any are damaged or bent, they must be replaced even if a deployment did not occur. If the SRS was deployed, the following components MUST be renewed even if there is no visible damage to the parts:
- Driver airbag module;
- Passenger airbag module;
- Sensor & Diagnostic Module (SDM);
- Driver and passenger pyrotechnic seat belt assemblies;
- Rotary connector;
- Passenger airbag mounting brackets (if passenger airbag was deployed);
- Main fascia panel (if passenger airbag was deployed);

Inspect the steering column for damage or telescoping (see Section HG) and column mounting brackets for damage. Inspect the front subframe longerons, and the mounting of the two forward crash sensors (if fitted) for damage or distortion. Inspect the chassis scuttle beam in the area of the passenger airbag mounting brackets for damage or distortion. Inspect the SRS wiring harness and connectors for damage or any signs of overheating. Inspect both front seat shells, and all seat mounting brackets and runners. Check all seat belt mountings and brackets for damage or distortion.

Do not attempt to repair the steering column or chassis or any of the above mentioned components. Service only by replacement.

WARNING: Proper operation of the SRS system requires that any repairs to the vehicle structure return it to its original production configuration. Deployment, or any visible damage to the SRS components and/or their respective mounting brackets requires replacement, not repair.

WF.7 - THEORY OF OPERATION

The key components of the Supplementary Restraint System (SRS) are the following:
- Sensor & Diagnostic Module (SDM);
- Forward crash sensors; (if fitted)
- Driver airbag module;
- Passenger airbag module;
- Rotary connector;
- Seat belt pre-tensioners.

Sensor & Diagnostic Module (SDM);
The SDM is the main electronic control unit (ECU) of the SRS, and incorporates an accelerometer to detect rates of forward deceleration in conjuction with two forward crash sensors (if fitted). When data from these sensors meets collision recognition criteria over a certain threshold, the SDM triggers as a single set, the driver and front passenger airbags in either stage one or stage two mode, and both front seat belt pre-tensioners.

Additional functions are to maintain an electrical energy reserve in case of vehicle battery power interruption during the accident, operation of a dash mounted tell tale lamp, and an electronic diagnostic and event recording facility accessible via a workshop scanner tool.

The unit is mounted in an alloy box bolted to the centre underside of the chassis scuttle beam, accessible from the footwells.

The following functionality is provided by the SDM;

- Sensing of frontal impact crash events and vehicle specific discrimination between airbag non-deployment and stage one or stage two deployment-requiring events as well as activation of the front seat belt pre-tensioners.
- In case of a required deployment, timely switching of the activation current for the deployment loops.
- Detection of electrical system faults which may influence the readiness of the system to deploy, or increase the probability of an inadvertent deployment by:
  - continuous electrical monitoring of all deployment circuits (without any effect on the readiness of the system);
  - continuous monitoring of the supply voltage and the lamp circuitry (dependent on lamp driver activation status);
  - SDM self test;
  - activation of a tell tale lamp in case of a detected system fault.
- Fault storage and 'Crashrecording' within EEPROM ('crashrecording': recording of system parameters {e.g. fault status in deployment events}).
- Diagnostic communication using an ISO9141 protocol.

Frontal Impact Sensing and Deployment
The SDM and the two forward crash sensors (if fitted) contain accelerometers which provide a nearly linear proportional electrical representation of the acceleration experienced by the vehicle along the longitudinal axis. This signal is amplified and filtered to reduce unwanted electronic noise and to compensate for offset drifts. The filtered signal is then digitized to provide an input for evaluation by the crash algorithm. As soon as the crash algorithm detects that pre-defined thresholds have been exceeded, the SDM activates both airbags in either stage 1 or stage 2 mode, and both front seat belt pre-tensioners.

To enhance system reliability under normal driving conditions, an additional electromechanical 'safing' sensor is included within the SDM to ensure that the SRS is armed only when significant deceleration occurs. In order to protect against undesired deployments in case of severe EMI, humidity or accelerometer fault, the deceleration condition monitoring by the safing sensor occurs in addition to, and independent of, the crash algorithm.
Note that neither the seat belt pre-tensioners nor the airbags will be activated by the SDM as long as the diagnostic mode is active.

Fault Display

The following conditions lead to a fault display in the form of continuous illumination of the airbag tell tale:

- One or more trouble codes requiring tell tale lamp activation in the 'historic' and 'present' condition are stored in the SDM's EEPROM.
- One or more trouble codes requiring tell tale lamp activation in the 'present' condition only are stored in the SDM's EEPROM, the condition of which is, or has been, 'present' in the current operating cycle. For all faults requiring four consecutive incidents for a trouble code to be set, the 'present' condition and fault display will be activated already after two consecutive events if the related trouble code has already been stored in a previous operating cycle.
- Faults concerning the voltage supply (overvoltage/undervoltage) will lead to tell tale activation only until the regular voltage range has been reached again (turn-off delay max. 5s after return from undervoltage and max. 20s after return from overvoltage). There are no related trouble codes.
- The airbag tell tale will not be activated due to SRS warning lamp related faults.
- The tell tale will be activated immediately after entering the diagnostic mode, or on deployment of the SRS.

Excluding the exceptions stated above, it is not possible to switch off the tell tale other than by resetting the fault codes stored in the EEPROM. This is not possible after an airbag deployment - the SDM must be renewed.

The following delays apply for the detection and display of faults. The delays apply from the extinguishing of the tell tale, following the ignition switch on bulb check period:

1 to 5 secs	- for external deployment circuit faults and overvoltage supply.
12 to 20 secs	- for undervoltage supply.
up to 15 secs	- for SDM internal faults.

The tell tale will be activated without SDM intervention in the following situations:

- the minimum voltage of 8.0 V has not been exceeded after switching on the ignition.
- the energy reserve (in SDM) has run low, which may be caused by supply voltages below 7.8 V.
- the watchdog has interfered.

A trouble code readout using tell tale blink codes is not implemented.

Power Supply & Grounding

The nominal supply voltage of +12 volts is derived from terminal 5 when the ignition is switched on. The SDM internal ground (terminal 7) must be securely connected to the vehicle chassis ground. To provide redundant grounding, the SDM housing is internally connected to the ground connector pin.

Supply Voltage Range

The SDM is designed to operate within the following voltage ranges:
System fault detection, SDM self test: min. 8.0 V; max. 16.0 V
Below 10.0 V system readiness may be delayed by 3 s.
Below 9.0 V system readiness may be delayed by 10 s.
System fault detection and SDM self test are reduced as long as an undervoltage condition is detected, which could already apply for supply voltages below 10.5 V.
Activation of airbags: min. 8.0 V; max. 16.0 V.
Activation of seat belt pre-tensioners: min. 10.0 V; max. 16.0 V.

Energy Reserve

Energy reserve capacitors within the SDM are provided to allow SRS deployment if the vehicle battery power supply is interrupted during the time of vehicle impact. The capacitors provide full support of the acceleration sensing and airbag initiation capability for a minimum of 150 ms after a loss of external power supply, provided that before the loss, the SDM had been supplied with:
at least 10.0 V for at least 10 s; or
at least 9.0 V for at least 13 s; or
at least 8.0 V for at least 20 s.
The capacitors will be discharged down to a point where no initiation of airbags is possible within a max. of 20 s after removal of the power supply.

WF.8 - SRS/SENSOR & DIAGNOSTIC MODULE (SDM)

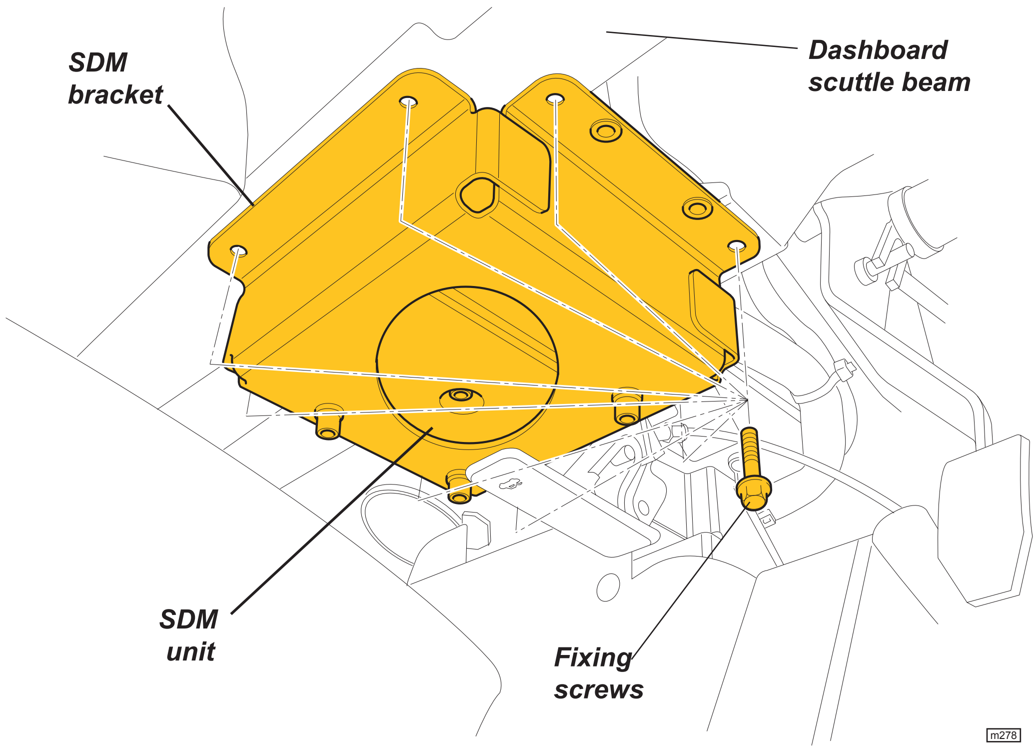
To Replace SRS/SDM Unit

WARNING: The SDM must be replaced after SRS deployment. Do not attempt to repair or reuse.

The SDM is mounted in an alloy box bolted to the centre underside of the scuttle beam in front of the centre console and is accessible from the driver and passenger footwell.

1. Follow the safety procedure detailed in sub-section WF.6 to turn off the ignition, disconnect the battery and unplug the rotary connector.

2. From the footwells, release the 8 setscrews securing the SDM mounting box to the scuttle. Release the three screws securing the SDM to the box and unplug the two harness connectors.

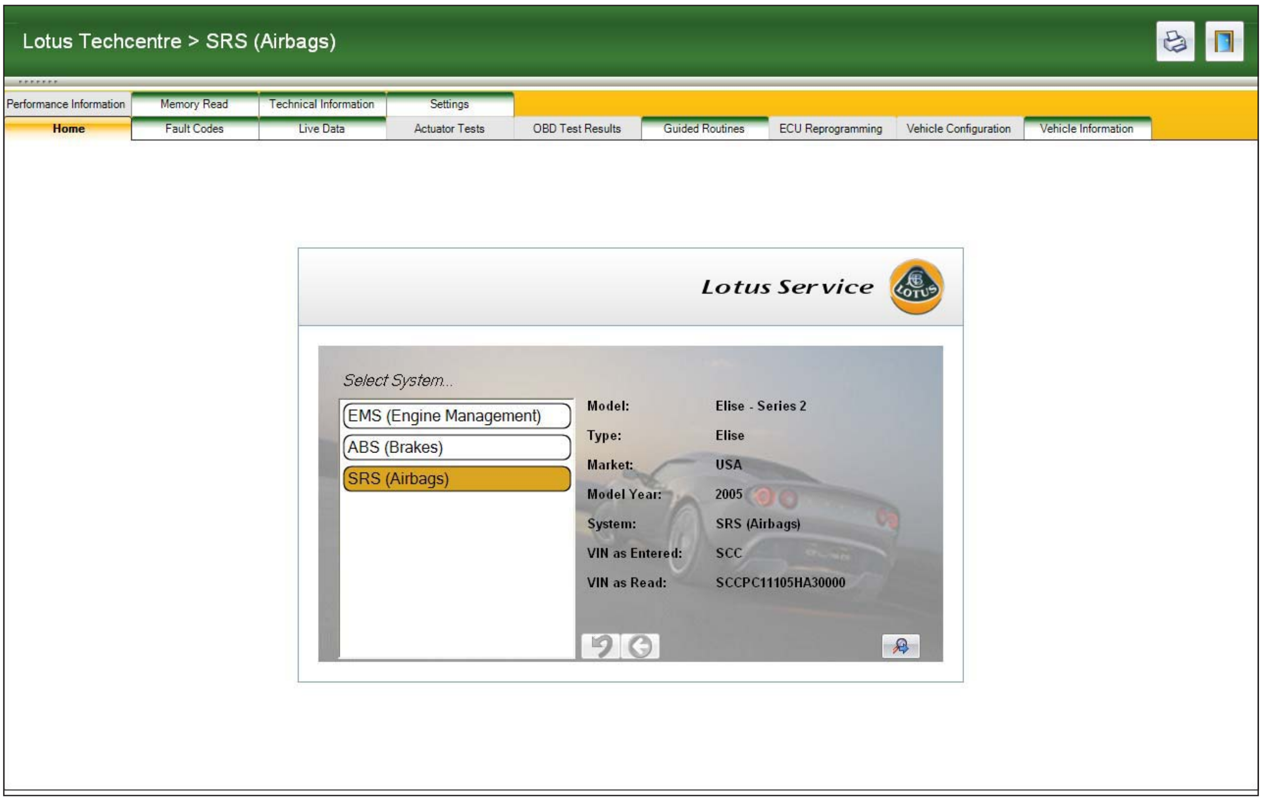


Refitment of the SDM is a reversal of the removal procedure, torque tightening the fixing screws for SDM and mounting box to 9 Nm.

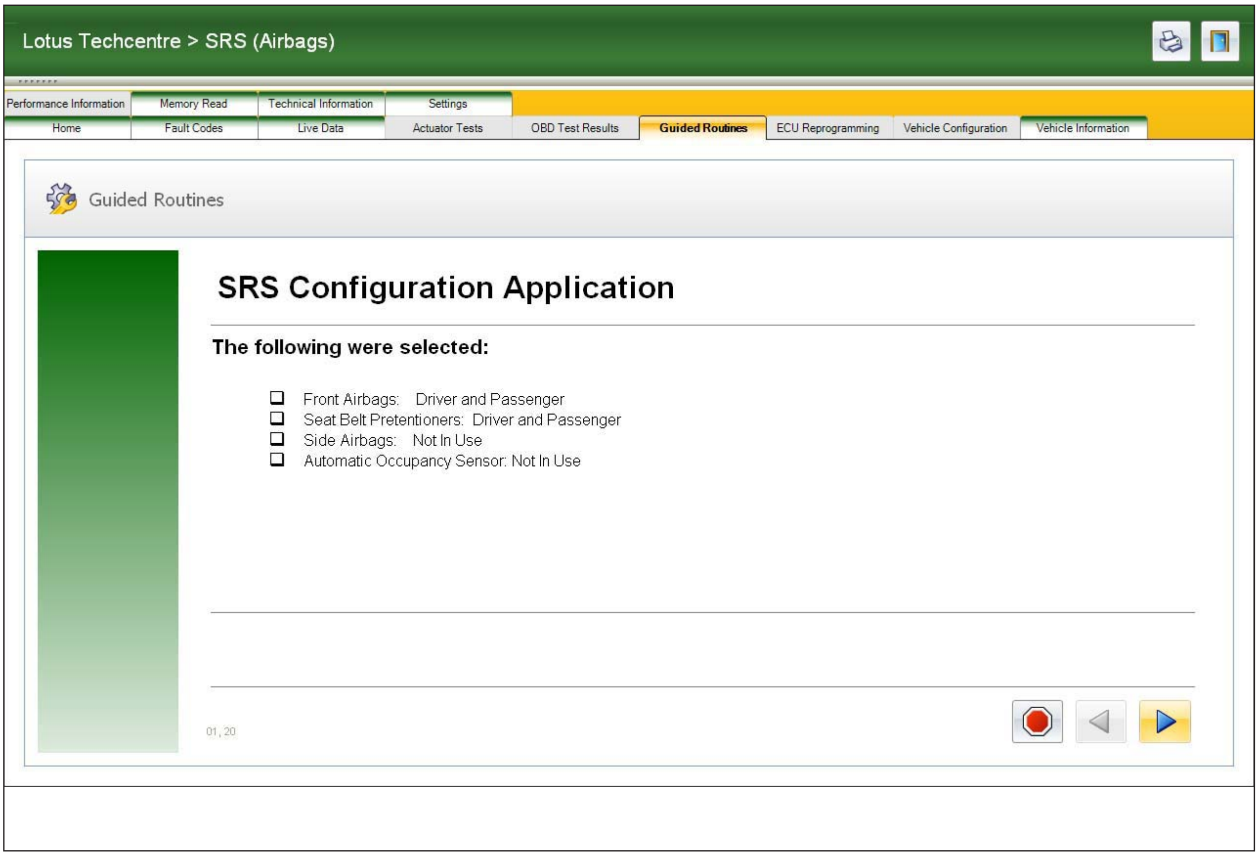
The SDM unit has additional functionality not required for the Evora. If the unit is removed or replaced then its configuration must be checked or reprogrammed as necesary using Lotus TechCentre.

From the home screen select:
- System - SRS (Airbags)
- Select 'Guided Routines' tab
- Select Configuration – Reprogram or ECU renewal option as applicable
- Follow the instruction prompts located at the RH bottom of the screen
- When configuring select:
- Front airbags = Driver and Passenger
- Automatic Occupancy Sensor fitted = Not in use
- Which Seat Belt Pretensioners are Fitted = Driver and Passenger
- Which Side Airbags are Fitted = Not in use

Examples of TechCentre screens for SRS configuration are shown on the following page/

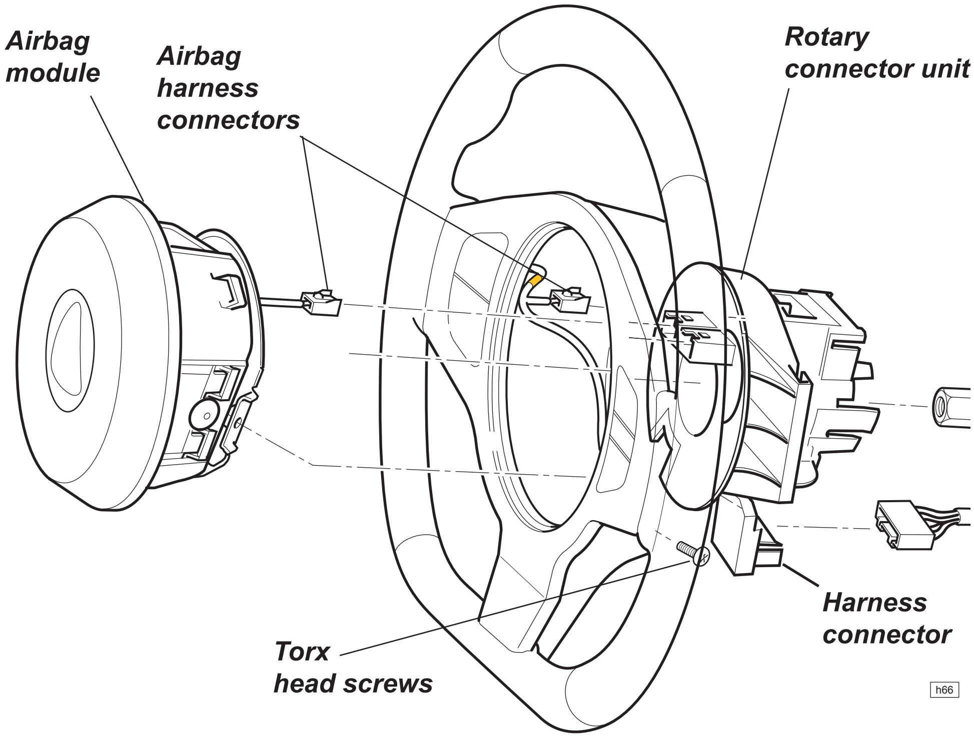


srs screenshot1



srs screenshot2

WF.9 - DRIVER AIRBAG MODULE



WARNING: Safety precautions must be observed when handling a deployed airbag. After deployment, the airbag surface may contain a white packing powder used to ease deployment. Always wear gloves and safety glasses when handling a deployed inflator module, and wash your hands with a mild soap and water afterwards.

The driver's airbag (or inflator module) is housed in the hub of the steering wheel, beneath a moulded trim cover designed to hinge open in the event of deployment. The module comprises:

- an inflatable fabric bag;
- an inflator (canister of gas generating material)
- an initiator (or 'squib')

The complete module also serves as a horn operating pad, such that pressing anywhere on the steering wheel centre trim will operate the horns. The module is spring mounted to a baseplate secured to the steering wheel hub, the baseplate carrying 4 earthed electrical contacts which correspond with 4 opposing contacts supplied with 12 volts and mounted on the module itself. Closing any of the contacts will ground the circuit and sound the horns.

When the vehicle suffers a forward deceleration of sufficient magnitude to close both the safing sensor and the integrated accelerometer within the SDM or one of the two forward crash sensors, current flows through the stage 1 or stage 2 deployment loop of both the driver and passenger airbag module initiators and ignites the gas generating material.

Each bag inflates in a fraction of a second, the driver's bag bursting open the steering wheel centre trim cover, and then deflates via vents in the bag, with the whole cycle taking less than one second. The airbag is designed for a single deployment, and must then be renewed.

In order to help prevent unwanted deployment of the driver's airbag when servicing the steering column or other SRS components, a shorting bar is incorporated into each of the two connector sockets on the rotary connector (one connector for each airbag stage). The shorting bar operates when the connector is unplugged, to short across the feed and return connections to the airbag. Thus, if a positive feed, or earth is inadvertently applied to the connector terminals, both sides of the inflator module will be subject to the same electrical potential, and no deployment will occur. The same feature is included in the airbag module connector sockets.

To replace driver's airbag

WARNING: The following procedures must be followed in the order listed to temporarily disable the airbag system whilst working in the immediate vicinity of an airbag. Failure to follow this procedure could cause unintended airbag deployment, resulting in personal injury and unnecessary airbag system repairs.

1. Follow the safety procedure detailed in sub-section WF.6 to turn off the ignition, disconnect the battery and unplug the harness connector from the back of the rotary contact unit.

2. On the reverse side of the steering wheel, release the two Torx head screws, accessible via holes in the plastic shroud around the steering wheel hub. Withdraw the airbag module and disconnect the two airbag harness connectors and the two horn leads.

WARNING: When carrying a live airbag module, make sure the bag and trim cover are pointed away from you. In case of an accidental deployment, the bag will then deploy with minimal chance of injury. When placing a live airbag module on a bench or other surface, always face the bag and trim cover upwards, away from the surface. This is necessary so that a free space is provided to allow the airbag to expand in the unlikely event of accidental deployment.

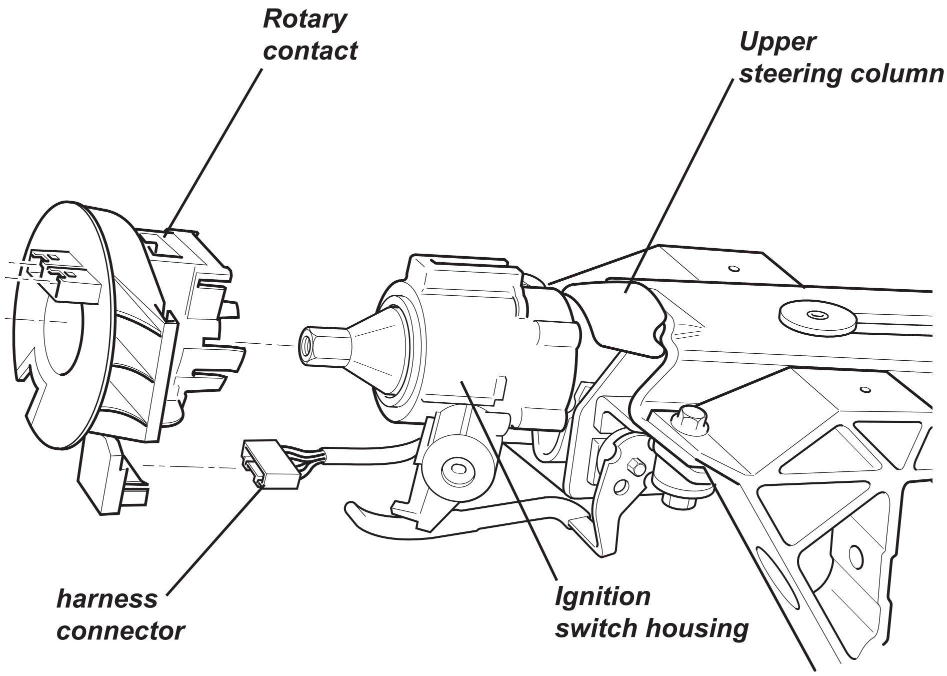
3. If a driver's airbag is deployed, refer to steering sub-section HI.5 to determine whether the steering column telescoping mechanism has been activated, and if necessary, renew the column assembly.

4. Mate the two harnesss connectors to the new airbag module sockets, matching the colour coding, and connect the two horn leads. Locate the module into the steering wheel and retain with the two Torx head retaining screws, tightening to 7 Nm.

5. When all service work is complete, connect the harness plugs to the rotary connector sockets and refit the column shrouds. Reconnect the battery, turn on the ignition and check that the airbag tell tale lights for a few seconds and then goes out.

Updated 7th July 2011

WF.10 - ROTARY CONNECTOR



WARNING: The rotary connector MUST be replaced after SRS deployment even if there is no visible damage.

The rotary connector is a device which fits between the steering wheel and column, and allows the steering wheel to turn whilst maintaining electrical continuity to the airbag module and horn buttons. The assembly consists of an annular housing fitted over the top end of the steering column, and containing a coil of wires providing feed and return circuits for the first and second stage airbag initiators, horn buttons and cruise controls.

The steering column side of the device is fitted with a connector block into which is plugged a branch of the main vehicle harness. The steering wheel side of the device has a divided connector block for the cruise control jump harness, and the airbag/horn jump harness.

The coil housing is constructed in two parts, with the outer part fixed to the outer (stationary) column, and the inner part keyed to the steering wheel. The two parts of the coil housing slide inside of each other in such a way as to allow the steering wheel to be rotated through its full travel, lock to lock, whilst maintaining an unbroken feed to each of the circuits in the steering wheel hub, via the continuous wires in the coils.

In order to help prevent unwanted deployment of the air bag when servicing the steering column or other SIR components, a shorting bar is incorporated into the rotary connector column side connector socket. This shorting bar operates when the connector is unplugged, to short across the feed and return connections to the inflator module. Thus, if a positive feed, or earth is inadvertently applied to the connector terminals, both sides of the inflator module will be subject to the same potential, and no deployment will occur.

When servicing the rotary connector, it is most important that the correct orientation of the connector is maintained on refitment, or the connector will run out of travel and be broken.

To replace the rotary connector

1. Remove the airbag module from the steering wheel (see sub-section WF.8).

2. Disconnect the cruise control harness plug.

3. Ensure the wheels are pointing straight ahead, match mark the wheel to the column, and remove the steering wheel retaining bolt. Note that the wheel is located on a steep angle hexagonal taper on the column.

CAUTION: If excessive force is applied to either the steering wheel or column, the break-out inserts securing the column to the fascia bracket may be disturbed, necessitating replacement of the complete column. If necessary, use an appropriate puller.

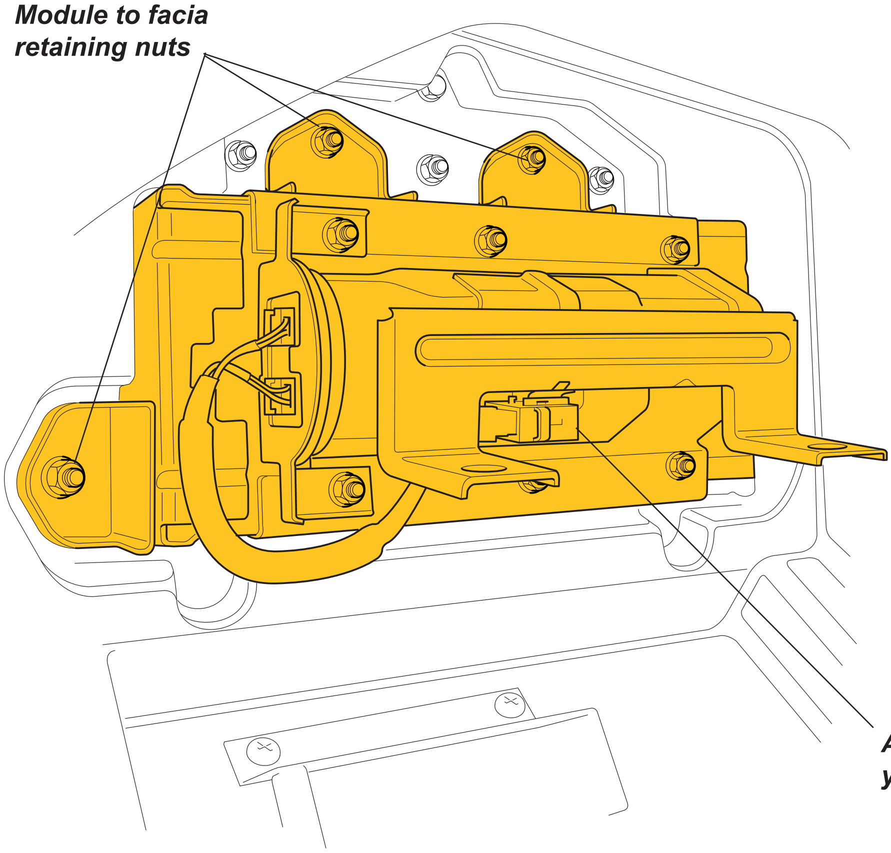
4. Unplug the harness from the two column lever switches and unclip each switch from the carrier.

5. Unplug the harness from the column side of the rotary connector, unclip the carrier from the outer column, and slide the the rotary connector from the steering column.

6. Refit in reverse order to removal, but before fitting the steering wheel, it is essential to centralise the rotary connector, or the unit will be broken when lock is applied. Turn the connector fully clockwise until it tightens, and then turn back just over two turns until the red marker appears in the square window. Note that this instruction is printed on the rotary connector. Ensure the road wheels are pointing straight ahead and fit the steering wheel with the match marks aligned. Tighten the steering wheel retaining bolt to 50 Nm. When fitting the jump harness for the cruise controls, ensure the cable is routed through the channel provided in the steering wheel carrier.

7. After re-assembly, check that the airbag tell tale lights for a few seconds with ignition, and then goes out.

WF.11 - PASSENGER AIRBAG MODULE



WARNING: Safety precautions must be observed when handling a deployed airbag. After deployment, the airbag surface may contain a white packing powder used to ease deployment. Always wear gloves and safety glasses when handling a deployed inflator module, and wash your hands with a mild soap and water afterwards.

The passenger's airbag (or inflator module) is mounted on the underside of the main fascia panel and also braced to the rear face of the chassis scuttle beam. An airbag 'door' in the top surface of the fascia, is designed to break open under the force of airbag deployment, and, hinging at its front end, direct the inflating bag into the area of optimum effectiveness.

The passenger's airbag (or inflator module) comprises:

- an inflatable fabric bag;
- an inflator (canister of gas generating material)
- an initiator (or 'squib')

When the vehicle suffers a forward deceleration which closes the safing sensor, and the signal from the SDM accelerometer or either of the two forward sensors indicates that the severity is sufficient to require airbag deployment, current flows through the stage 1 or stage 2 deployment loop of both the driver and passenger airbag module initiators and ignites the gas generating material.

Each bag inflates in a fraction of a second, the passenger's bag bursting open the fascia airbag door, and then deflates via vents in the bag, with the whole cycle taking less than one second. The airbag is designed for a single deployment, and must then be renewed.

To replace passenger airbag

WARNING: The following procedures must be followed in the order listed to temporarily disable the airbag system whilst working in the immediate vicinity of an airbag. Failure to follow this procedure could cause unintended airbag deployment, resulting in personal injury and unnecessary airbag system repairs.

i). Turn off the ignition.
ii). Before disconnecting the battery, use the Lotus TechCentre to read any stored trouble codes.
iii). Disconnect the negative (earth) lead from the battery and tape back to ensure that no contact with the battery negative terminal can be made.
iv). Wait for at least 30 seconds to allow the SDM capacitors to discharge.
v). Open the glovebox, release the tether and damper cords, and lower the glovebox fully see section VE.7.
vi). Remove the glovebox back panel; remove the two screws into the underside of the fascia panel, and prise out the four 'fir tree' fasteners. Disconnect the glovebox lamp.
vii). Access is now available to unplug the airbag harness yellow connector.

1. Replacement of the passenger airbag requires that the main fascia panel be removed - refer to sub-section VE.8.

2. Release the four fixings securing the airbag module to the underside of the fascia.

WARNING: When carrying a live airbag module, make sure the top surface of the module is pointed away from you. In case of an accidental deployment, the bag will then deploy with minimal chance of injury. When placing a live airbag module on a bench or other surface, always arrange for the deployment face to be uppermost. This is necessary so that a free space is provided to allow the airbag to expand in the unlikely event of accidental deployment.

3. If an airbag deployment has occurred, the chassis scuttle beam and main fascia panel must be carefully examined for damage or distortion and replaced if necessary. The airbag door will always need replacing.

WARNING: Proper operation of the SRS system requires that the vehicle structure remains in its original production configuration. Any damage to the SRS components and/or their respective mounting brackets, including the chassis, requires replacement, not repair.

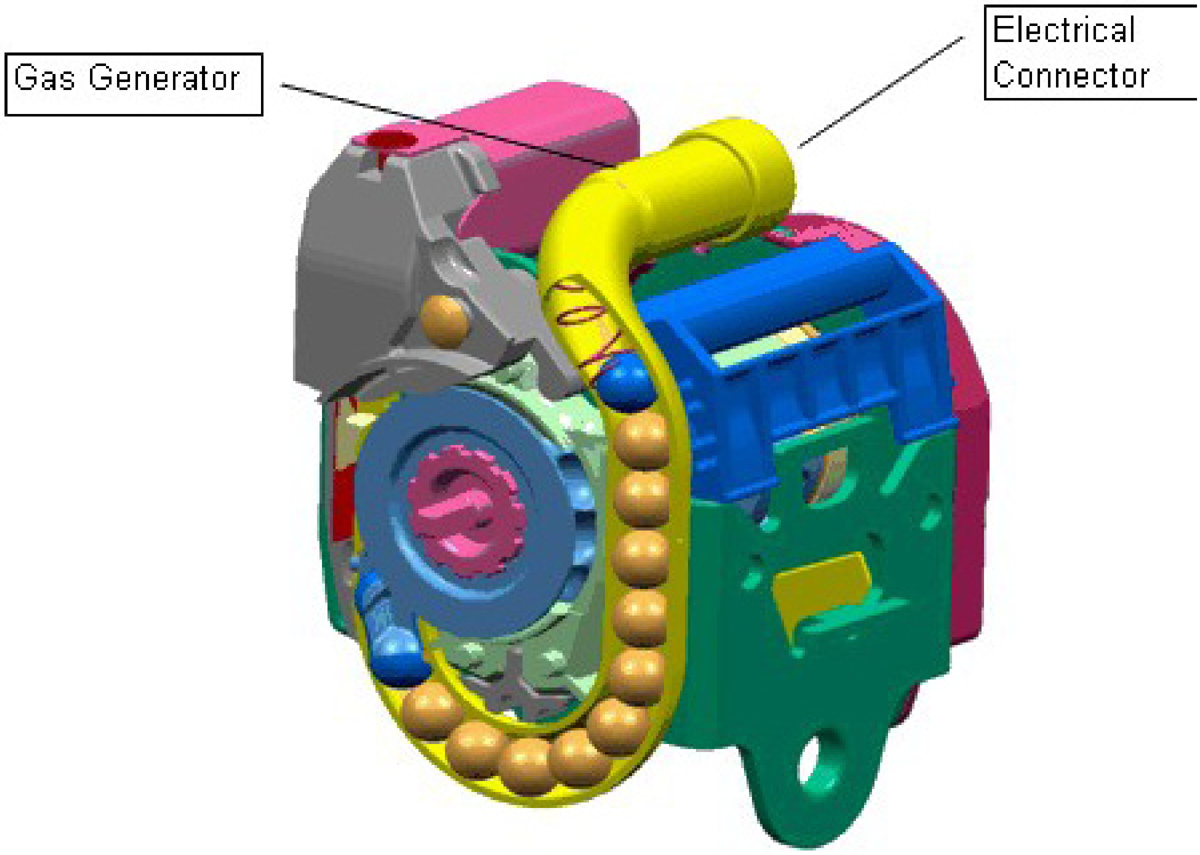
4. Fit the airbag module to the fascia panel and tighten the four M6 nuts to 10 Nm.

5. Fit a new airbag door to the fascia panel and tighten the two M6 nuts to 10 Nm. Ensure the 2 plastic barb clips are correctly engaged: refer to service notes section VE.9 for further information.

6. Refit the fascia panels; refer to service notes section VE for further information and plug in the passenger airbag harness connector.

7. When all service work is complete, check that the airbag tell tale lights for a few seconds with ignition, and then goes out.

WF.12 - SEAT BELT PRE-TENSIONERS



WARNING:
- **Failure to comply with the instructions, safety standards and operating procedures as described in this section, may cause vehicle damage and/or personal injury.**
- **Both driver and passenger front seat belt assemblies must be replaced after SRS deployment. Do not attempt to repair or reuse.**

Device Operation
Initiated at the same time as the airbags, is a pyrotechnic device on each front seat belt reel assembly to apply a tightening force to the belt reel and remove any slack from the belt. The force sustained by the belt and its user during the event, is then controlled by a torsion bar within the belt reel to limit the deceleration force to which the occupant is subjected.

When airbag/pre-tensioner triggering conditions apply, the SDM signals ignition of a gas generator on each front seat belt assembly, the pressure from which forces a train of balls around a tubular track to apply a retraction force to the belt reel.

The belt pre-tensioning mechanism is designed to operate only once, such that both front belt assemblies should be renewed after airbag/seat belt pre-tensioner deployment. Activation of the pyrotechnic mechanism is indicated by the belt reel being locked, and allowing neither extraction nor retraction of the belt.

To replace front seat belt assembly
Each front seat belt reel assembly is secured to the seat belt mounting frame/roof hoop by a single bolt, with an orientation tag on the belt reel engaging with a slot in the mounting plate.

WARNING: Before removing or refitting a pyrotechnic seat belt assembly, the ignition key should be withdrawn, and the battery leads disconnected from both positive and negative terminals, and isolated to ensure that accidental contact cannot occur.

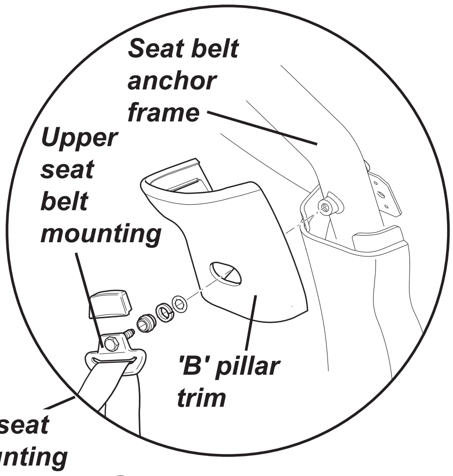
Note: Do not disconnect the ECU harness connectors for at least 30 minutes after switching off the ignition to allow the engine management system and associated sensors to shut down in the correct sequence.

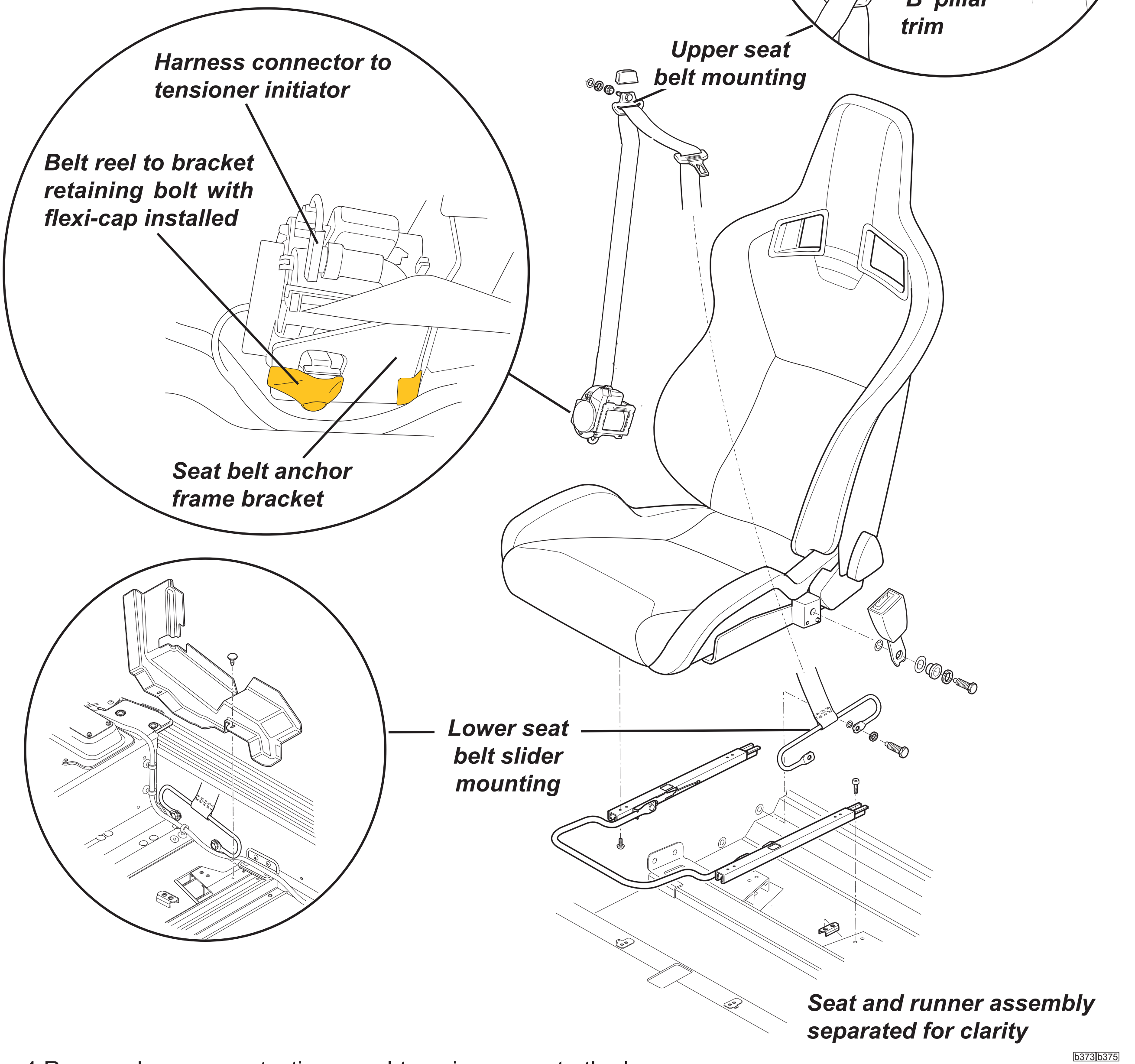
Removal:

1. Release the bolt retaining the upper seat belt mounting to the 'B' pillar area of the seat belt anchor frame.

2. Release the fixings securing the rear quarter trim panel; refer to service notes section VE.12 for further information .

3. Remove the sill trim panel; refer to service notes section VE.4 for further information.





4. Remove harness protection panel to gain access to the lower seat belt slider bar where it mounts to the chassis side sill panel. .

5.Release the slider bar bolts from the sill panel, the looped end of the seat belt webbing can be threaded out of the slider bar, allowing the belt to be threaded through the aperture in the rear quarter panel trim which can now be withdrawn away from the seat belt anchor frame to gain better access to the reel assembly.

6.From the seatbelt anchor frame bracket, unplug the vehicle harness from the belt tensioner initiator, pull the flexi-cap off from the threaded end of the belt reel assemblies retaining bolt and release the bolt.

The seat belt reel assembly can now be removed from the vehicle.

Please see important safety standards information with storage and disposal procedures.

Refitment:
Refit in reverse order to removal,

- Ensure all spacers and washers are refitted to either side of the upper and lower mounts in the correct order
- Tightening the belt reel, upper and lower mounting securing bolts to 33 Nm.
- Make sure the seat belt webbing is refitted correctly behind the quarter panel (i.e., not kinked, twisted or trapped between the panel, seat belt anchor frame or any other ancillary components) so ensuring the belt is free to withdraw and return into the reel assembly during its operational use.
- When all service work is complete, check that the airbag tell tale lights for a few seconds with ignition, and then goes out.

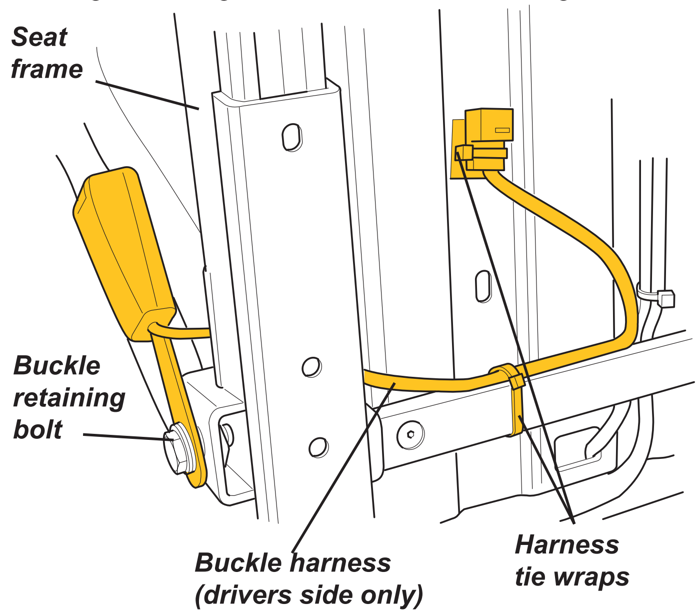
Seat Belt Buckle

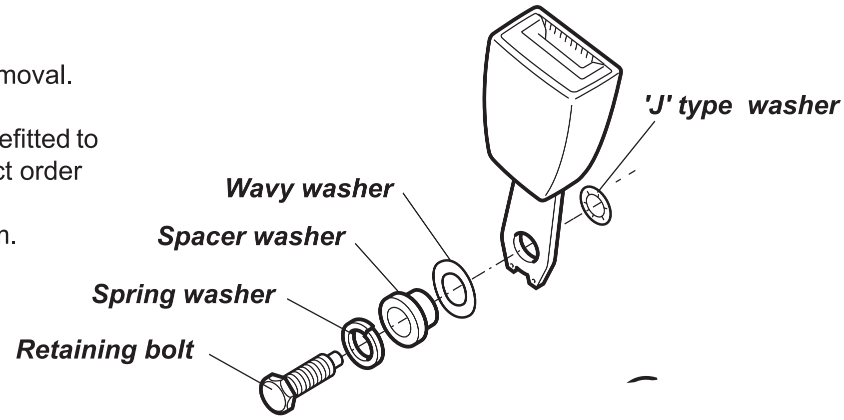
Removal:
1. Remove the seat and runner assembly from the vehicle (see section VE.17).
2. Cut and discard the tie wraps securing buckles wiring harness to the seat frame and seat base (drivers buckle only).
3. Release the bolt retaining the buckle to the seat frame and retain all spacers and washers.
4. The buckle can now be removed from the seat, taking care to feed the buckle harness from between the seat base and frame (drivers buckle only).

Refitment:
Refitment is reverse procedure to removal.

Ensure all spacers and washers are refitted to either side of the buckle in the correct order

Tighten buckle retaining bolt to 25Nm.





Safety Standard
The pre-tensioning function is energised via pyrotechnic materials, therefore manipulation, handling and storage MUST be performed to the specified procedures as described to avoid any occurrence of injury to the operator or damage to the pre-tensioning unit.

In normal conditions, the pre-tensioner assembly can only be activated through the action of the electric ignition control during impact. During the activation phase of the pyrotechnic charge, small gas quantities are developed. The main constituent of the gases is Nitrogen:

Note! This gas is not toxic.
The pre-tensioner assemblies must be protected against exposure;
- To temperatures over 90°C (195°F) at contact with surfaces
- 90°C during 106 hrs.
- From sparks and naked flames.

WARNING: If exposed to temperatures in excess of 140°C, self-ignition of the pyrotechnic charge of the gas generator may occur. Exposure to temperatures in excess of 165°C, self-ignition of the pyrotechnic charge will occur.

Also, if exposed to temperatures between 90°C (285°F) and 165°C (330°F), deterioration of the pyrotechnic charge ignition is possible. The consequences of this could be failure to activate at prescribed levels. The pre-tensioner must be protected against stresses, shocks and dropping. Pre-tensioners that have been subjected to such treatment must be discarded and returned to the supplier with accompanying paperwork describing the reasons for return.

Never store pre-tensioner assemblies with other flammable or combustible materials. Gas generators MUST be prevented from coming into contact with acid, water, grease and heavy metals: **Contact with these substances may cause toxic or dangerous gases, or explosive mixtures.**

Any residual fuel of the gas generator, not burned during ignition, is slightly flammable. The unit, therefore, must **never** be disassembled, damaged or the parts manipulated. Any advertising or demonstrations of the pre-tensioner assembly should only be carried out using inert pre-tensioners (without the pyrotechnic charge). The base of the pre-tensioner must be painted green, with visible and indelible wording, stating **'Inert Assembly'**. It must incorporate the KSS logo, signed with indelible ink by the person responsible for the supply of the product.

WARNING: Never disassemble the pre-tensioner or any of it's components!

Transportation of belt with pre-tensioner
Transport on road vehicles should be carried out with the assemblies stored in the luggage compartment. Never transport in the passenger compartment. Never transport the pre-tensioner manually or holding it by the webbing: this can result in damage to the assembly.

Storage of belt with pre-tensioner
Belts with pre-tensioning elements should be stored in containers or boxes that can be locked with a key, and ventilated. They MUST be stored in an area free from flames and heat sources. On completion of work, or during work break periods, pre-tensioner belts should be returned to the storage container and locked with a key.

Disposal of belts with pre-tensioner
Charged pre-tensioners to be scrapped and not fitted to a car must be activated. This should be carried out only by the belt manufacturers, or specialised workshops.

Vehicle disposal
Charged pre-tensioners fitted to a vehicle MUST be removed before the vehicle is dismantled for scrapping. If the pre-tensioner is not activated during an accident, the device must be considered as still to be in a 'charged' condition.

General safety instructions/dangers for health

- When handling activated pre-tensioners, use safety glasses and vinylic or nitrylic protection gloves.
- After handling a loaded pre-tensioner, wash hands with soap and water.
- There is no danger of exposure to propellants in the sealed system. The propellant mix is in a solid state, therefore no inhalation is possible, even if the gas generator cartridge is broken.
- Avoid skin contact and do not ingest the propellant.

First aid

Ingestion: Help the person vomit if conscious. Call a physician.
Skin contact: Wash immediately with soap and water. Call a physician.
Eyes: Wash the eyes immediately with running water for a minimum of 10 minutes. Call a physician.
Inhalation: Take the person immediately to fresh air. Call a physician.

General notice

Storage, transport, dismantling and/or recycling of the pre-tensioner shall be carried out according to the legal and local regulations, taking account also of directives for masonry, fire fighting, transport, environmental protection and the safety and health of all staff.

WARNING: The seat belt pre-tensioner devices fitted on the Lotus Evora are designed and calibrated specifically for this particular model. Pre-tensioners must not be adapted, re-used or installed on any other vehicle - they must only be fitted to the prescribed vehicle with specific homologation continuity.

Any attempt to re-use, adapt or install pre-tensioners on a different vehicle can cause severe or fatal injuries to the occupants during normal operation as well as the result of an accident.