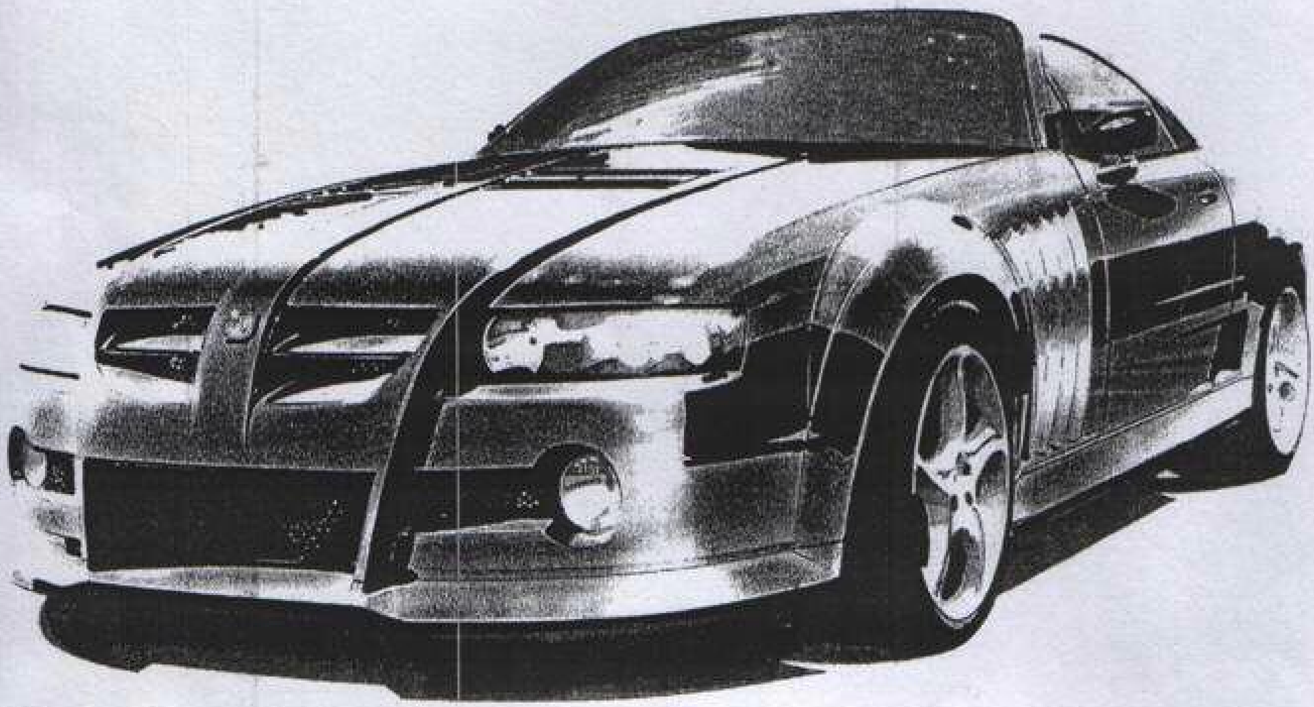

MG XPOWER SV
Introduction

MG SPORT & RACING LIMITED

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MG Sport and Racing

Interior

This is the place that everyone will want to be, inside the SV.

The SV's first class performance is complemented by its distinctive interior. In keeping with its sporting heritage both front seats, made by Sparco, are specified with full inertia four belt harnesses that are lockable for serious driving by the flick of a switch.

The trim is to your choice of six leather finishes. Competition seats and fascias can be specified in a combination of leather and Alcantara allowing your SV to be just the way you want it.

When you desire a change from the soundtrack provided by the V8 engine, a superb hi-fi system with the very best Infinity speakers is there for your pleasure.

The SV is a car to be enjoyed, and the best place to be is inside.

Power

One of the first questions you'll be asked is what's under the hood? Well how about 4.6 litres of quad cam all alloy V8?

The SV has 320 hp as standard, sufficient to propel the SV from 0-60 mph in 5.3 seconds and on to around 165 mph.

"It's a pretty special sound to my ears. It's distinctive V8, unmistakable exhaust note; superb."
Anthony Reid

Should you require more power then that can be arranged. How does 765 hp sound? The very same engine that powered the MG ZTT-T to 225 mph on the Bonneville Salt Lake is available for the SV.

More than that?

We'll see what we can do...

There ain't no substitute for cubic units and that's why the SV has a large capacity V8 under that carbon fibre bonnet. 4.6 litres means plenty of torque in all gears all the way through the rev range. Massive reserves of power make for the potential to proceed very rapidly. It's safety fast, very fast.

Handling

It's one thing having the power and the looks, but what matters most on the track or driving down the road is how the car feels, how it handles, how it goes round the bends.

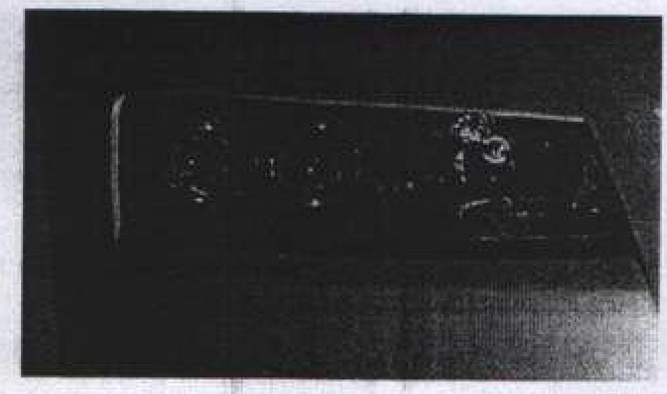
Fortunately, the SV has been developed by the very best in the business. MG has an exceptional reputation for creating superbly handling vehicles and the SV pushes their reputation yet further.

"It is the most fun to drive. With the front engine, rear wheel drive combination, you know when you are reaching the limit and the car does not suddenly surprise you." **Chief Engineer, Giordano Casarini**

Double wishbones mate with coil springs over shock absorbers, with everything finely tuned to perfection. In tyre tests during the SV's development at the Nurburgring Nordscheilfe, the development team were pleased to note that, unlike the SV's rivals, there was minimal wear to the Michelin Pilot Sports - a testament to the balance of the chassis, something vital for optimum drivability.

Construction

The MG XPOWER SV has been designed to be both light and very strong – true to the ethos of a real sports car. In a bold departure from the traditional materials of steel or aluminium panels, the body of the SV is created from composite carbon fibre, using a ground-breaking process new to the motor industry. The body panels have the same stiffness as steel but at only 25 per cent of the weight, make a massive contribution to the key requirements for a performance sports car.



Peter Stevens is world renowned in car design circles and was most notably stylist and aerodynamics specialist for the 240mph Mclaren F1, the world's fastest production car by some considerable margin for many years.

He has also worked on other supercars such as the Jaguar XJR 15 and was the Head of Design for a time at Lamborghini. Other credits include designing the highly acclaimed front-wheel-drive Lotus Elan of the early 1990s and winning the 2002 Autocar Designer of the Year award.

The SV features an immensely strong, box frame chassis allied to a uniquely constructed carbon fibre body shell that is instrumental in keeping the kerb weight to a competitive 1540kg and the centre of gravity as low as possible.

The steel chassis, coil springs, front and rear double wishbone suspension have been developed by Vaccari and Bosi in Modena in collaboration with the MG's own experienced chassis development team.

In a bold departure from normal practice, a composite carbon fibre body using a ground breaking process new to the motor industry, is used instead of more traditional steel or aluminium. With techniques developed by the UK based SP Group the body panels have the same stiffness as steel but at only 25 per cent of the weight, a key requirement for a performance sports car.

The SV's component parts are built wherever the best skills and talents lie. The chassis, for example, is constructed in the very epicentre of supercar construction, Modena.

Once an SV is completed each car undergoes a full road test around Warwickshire in order to check all the SV's systems in the real world. Then it's the time for one lucky owner to take delivery...

Impressions

The MG XPOWER SV was always going to make an impression. Those dramatic looks, allied to such a superb race-bred chassis mean that the car is one that people will be talking about for many years to come.

"It's so far out of the ordinary. It's a real head-turner. It's like nothing else that MG have ever done, It's a real drivers car, a real enthusiasts car and one that I think is going to be seriously sought after."
Warren Hughes

4.6 litre V8 all alloy quad cam power, carbon fibre bodywork and superlative handling all mean that anyone who samples the SV can't stop talking about it...

Protection

The SV majors on safety. If you want to take a race car into competition the governing body of international motorsport, the *Federation Internationale de l'Automobile*, has very strict and exacting requirements for the fitment of a rollcage. The SV has such a rollcage, as standard, for the road.

Another safety feature taken from the world of racing cars are the harnesses. Those in the SV combine the practicality of intertia belts for most of the time. In times of *more spirited driving*, merely press a button and the belts are locked in place and act just as a race harness. Clever, and very safe.

Prevention is better than cure, and the SV is honed to grip the road impeccably and obey your every driving command. When you can't power out of trouble the impressive Brembo braking system will stop you, very, very quickly.

Should one of the many who coverts the SV decide to relieve you of yours, then the tracking system will ensure it's soon recovered back to you.

Specifications

Acceleration (Est.)	0-60mph : 5.3 secs	0-100kmp : 5.4 secs
Top Speed	165mph	254kmh
Engine	4.6-litre V8	
Material	All aluminium alloy	
Valves	Double overhead cam, 4 valves per cylinder	
Compression ratio	10.0:1	
Power	320hp SAE @ 6000rpm (230kW @ 6000rpm)	
Torque	410Nm @ 4750rpm (302 lb.ft @ 4750rpm)	
Transmission	5-speed manual Tremec gearbox	
	Electronic traction control	
	1st:	3.37:1
	2nd:	1.99:1
	3rd:	1.33:1
	4th:	1.00:1
	5th:	0.73:1
	Final drive:	3.46:1
	Mph (kmh) per 1000rpm in 5th:	30.13 (48.51)
Exterior	Front aerodynamic splitter	
	Rear air diffuser	
	Black finish side air vents	
	Green tinted glass	
	Electrically heated and adjustable power-fold door mirrors	
	Roof-mounted aerial	
	Projector headlights	
	Front and rear fog lights	
Safety	Dual-action (inertia and fixed) 4-belt, 3-point safety harnesses	
	Remote control central door locking	
	Perimetric alarm system. Tracker with remote telemetry	
	Electric internal fuel filler release	
	Lockable wheel nuts	
Brakes	Brembo® discs and 4 pot calipers	
	Bosch 5.7 electronic ABS	
	324mm diameter ventilated and cross-drilled front discs	
	310mm diameter ventilated and cross-drilled rear discs	
Tyres	Michelin Pilot Sport	
	Front	225/40 ZR18
	Rear	265/40 ZR18
	Spare	Instant mobility system
Body	2 door, 2 seater coupe with unique carbon fibre construction	
Chassis	Steel box frame with integrated FIA-specification roll cage	
Unladen weight	1540kg (estimated)	
Instrumentation	Speedometer & tachometer	
	Fuel and coolant gauges	
	Analogue clock	
Climate control	Automatic temperature control	
	Rotary controls for temperature, distribution and fan over-rides	

Audio	Single CD player and tuner
	Four Infinity® speakers plus front tweeters
Interior	Sparco reclining leather and Alcantara seats
	Polished alloy centre console
	Carbon finish header, rails and door posts
	Leather steering wheel with height adjustment
	Leather & alloy finish gearknob
	Driver's clutch footrest
	Leather upper door waist rails
	Centre console storage bin with armrest
	Two cupholders
	Leather & bright stainless steel sill trims
	Leather handbrake, gearshift gaiter and console lid
	Colour-keyed cut pile carpet
	Colour-keyed carpeted rear luggage shelf and boot
	Lights-on and driver's door-open warning buzzers
	Courtesy delay lights in roof and rear compartment sides
	Door open/puddle lamps
	Electric front windows with driver's one-touch-down control
	Heated rear window with timed switch-off

Length	4480mm
Width	1900mm excluding mirrors
	2076mm including mirrors
Wheelbase	2670mm
Front track	1678mm
Rear track	1626mm
Height	1320mm
Cd	0.38
CdA	0.68

Suspension	Independent coil springs	
	Front	Double wishbones and 25mm anti-roll bar
	Rear	Double wishbones and 25mm anti-roll bar
Steering	Power-assisted rack & pinion	
	Turns lock-to-lock	3.0
	Overall ratio	17.2:1
	Turning circle	10.6m between kerbs
Wheels	Alloy OZ 2-piece, 5-spoke	
	Front	8J x 18 x 40
	Rear	10J x 18 x 41

Drivers Views

"From my perspective as a racing driver it's got an excellent chassis, very stiff and it handles extremely well."

"When you get behind the wheel it just grabs you, the handling. It's got that very accurate direct steering, and the back wheels follow the front – that's what I love, as a racing driver I love a car where the back follows the front, and the car's tied together and it handles extremely well."

"As a racing driver it really appeals to me, as the car just handles so well. So many sports car purport to have very good road handling; they don't. They sell their cars on engine power alone. This car not only has a very powerful engine, but it has a fantastic heritage in terms of a real racing car feel; it's very well balanced with tight responsive steering which is accurate at the front. And the rear follows the front really well, which is what you want and says just one thing – this chassis is very, very taught, it's well built and it's great fun to drive."

"It's a fabulous handling car, much better than other cars in its class. I've tried other manufacturers' products and this is a far superior chassis, to the cars that it's competing against in its class."

Anthony Reid

"It is the most fun to drive. With the front engine, rear wheel drive combination, you know when you are reaching the limit and the car does not suddenly surprise you.

"Our engineers have ensured that there is a consistent steering response at all speeds, the driver's steering input is the same at 40 mph as it is at 140mph."

Giordano Casarini
Chief Development Engineer

Chassis Construction

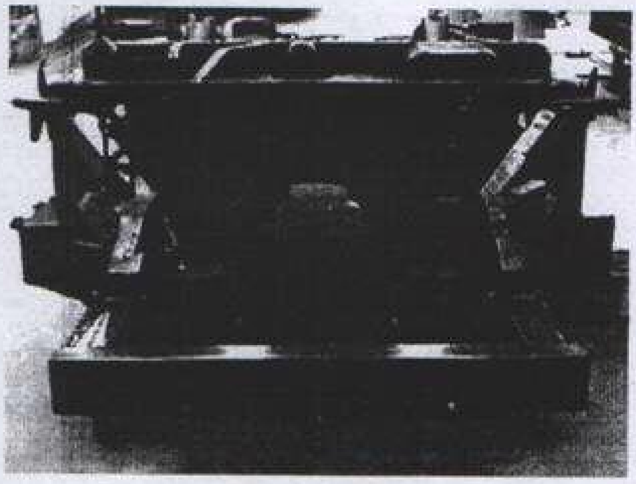
Strength and rigidity are at the core of the MG X Power SV interpretation of the front - engined rear wheel drive layout.

A galvanised box section steel chassis 'tub' originally the work of the former F1 designer Enrique Scalabroni provides the MG X Power SV with an incredible rigidity of around 10,000 Nm per degree of movement.

This outstanding rigidity allows a precise set up for the all round independent double wishbone suspension giving better and more predictable handling responses.

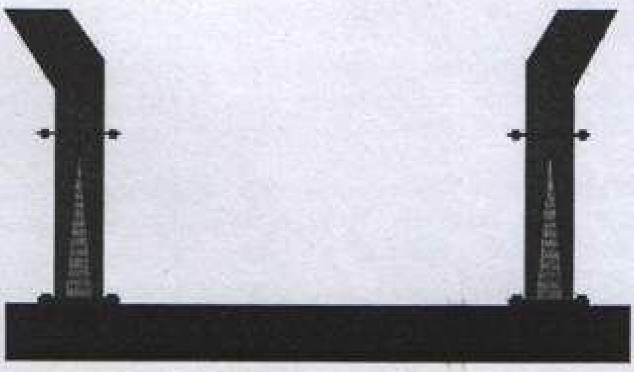
Vaccari and Bosi a company based Pievepelago, Italy manufacture the chassis assembly from galvanised steel for the majority of the assembly and special high resistance steel for the sill sections.

Chassis anti corrosion protection is created by electro coating the complete chassis in a bath of cataphoresis paint and sealing all the major welded joints. All the hollow box sections are treated internally with a wax oil substance applied at very high temperatures.



To avoid costly main chassis damage in the event of an accident, special crumple cone panels are fitted to the front and rear of the vehicle that feature a unique device that increases the resistance to deformation the more the panel is deformed.

A corrugated steel box section that incorporates a towing eye fixture joins the two crumple cone panels at the forward most point of the chassis and a standard box steel section joins the crumple cone panels at the rear most point of the chassis, this has the effect of load transferral in the event of a non full frontal impact.



Carbon Fibre

Vehicles using carbon fibre composite, although not usual are no longer a novelty.

Looking at vehicles that have used, or do use carbon fibre bodywork the MG Xpower SV joins a very exclusive list of high class manufacturers: Ferrari F50, Mclaren F1, Lamborghini Mercialago, Ferrari Enzo and Porsche Carrera GT.

All these cars use technology associated with Formula 1 racing cars, this is reflected within the price.

One reason for this can be attributed to the method of construction of the composite elements of the vehicle, no expense is spared to produce what is perceived to be a higher quality part.

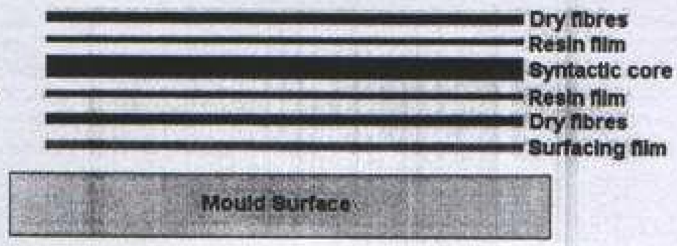
Typical aerospace materials and moulding techniques are used to produce the panels.

Low weight woven prepregs are laid up by hand in autoclaved carbon/epoxy moulds. Due to the low areal weight of the materials several plies are required to give a panel with the appropriate thickness and stiffness for a car body panel.

The MG XPOWER SV uses SPRINT CBS and SF 95 technologies supplied by SP Automotive based in the Isle of White.

SPRINT CBS (SP Resin Infusion Technology Car Body Sheet) consists of a syntactic core sandwiched by two skins of resin coated fabric. These fabrics can be carbon, glass or aramid with varying core thickness depending on the particular properties required.

One Layer of CBS



The material is designed to match the stiffness of a typical steel body panel with just 25% of the weight.

SF 95 is a film of filled epoxy resin sandwiched by lightweight scrims. The scrims provide paths for the air trapped during laminating to escape and give a porosity free surface finish.

SF 95 also provides a barrier to the differing thermal expansion rates of carbon fibre and epoxy, it is this difference in expansion rates that has historically shown up as print through.

SP supplies the kits of materials in 'pizza' style boxes, one for each part of the car.

This results in the moulder needing to place one layer of SF95 and then just one layer of CBS into the mould to make the body panel. This option provides MG Sport and Racing with a significant reduction in labour costs both in terms of time taken to produce the part and the skill of the laminators involved.

SP developed these kits by committing on site technical support for the first build of every part with DPS composites (MG Sport and Racing's manufacturing partner). The parts were then digitised and the files loaded onto SP's in house cutting machine.

This machine has a cutting bed with a conveyor table for picking of the cut shapes and assembly of the kits.

Body Construction

Some of the carbon-fibre panels are sourced at DPS Composites in England, a specialist company that is well versed in the production of race cars.

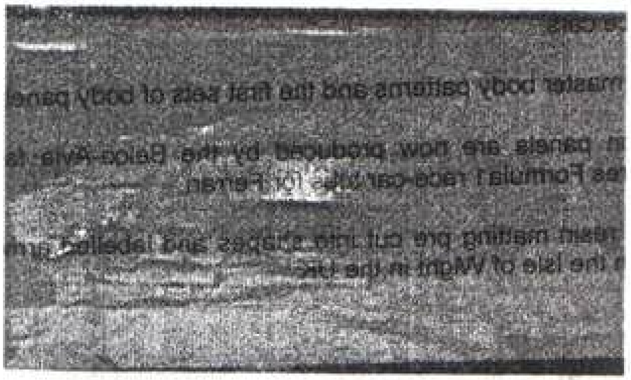
It was DPS that produced the master body patterns and the first sets of body panels for the SV.

70 per cent of the production panels are now produced by the Belco-Avia facility near Milano, Italy, a specialist that also manufactures Formula1 race-car tubs for Ferrari.

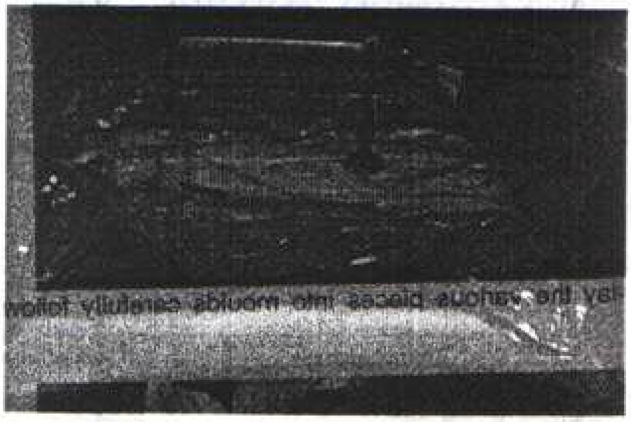
Kits of carbon-fibre 'pre-preg' resin matting pre cut into shapes and labelled arrive packaged into so-called pizza boxes by SP Systems on the Isle of Wight in the UK.

Belco-Avia's technicians hand-lay the various pieces into moulds carefully following directions and layout patterns supplied.

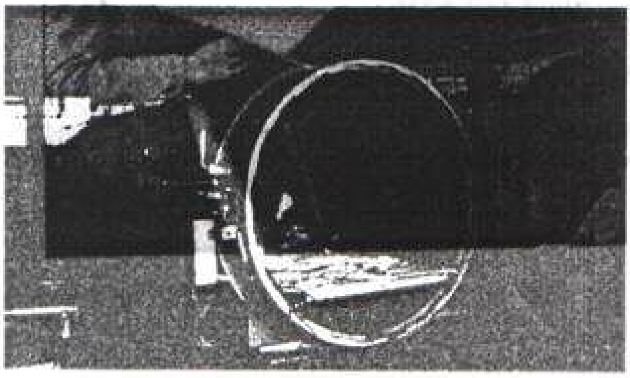
The moulds are then insulated and placed within sealed layers of plastic film.



Vacuum is applied to the now **sealed bag removing all traces of air**



The sealed bags are then placed **within giant cylindrical pressure containers ca**lled autoclaves that also function as ovens where they are **subject to high pressurisation and baking.**



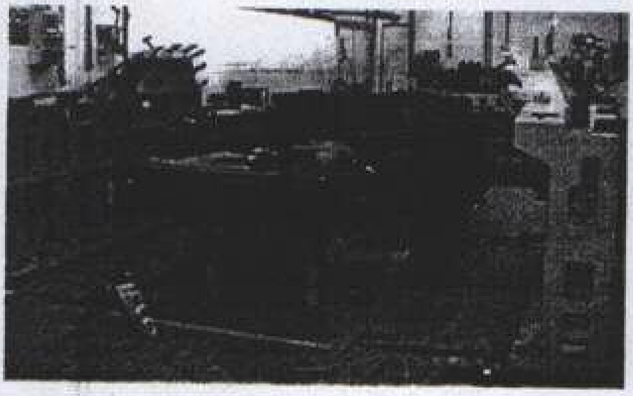
After a set period the bags are removed and the carbon fibre panels are extracted from their moulds to undergo a small finishing process.

The body panels are then shipped to OPAC in Torino, Italy.

Body Assembly

The treated chassis assembly has the differential, fuel tank and various fuel lines fitted at the facility in Modena, Italy. It is then transported to the OPAC facility in Torino, Italy.

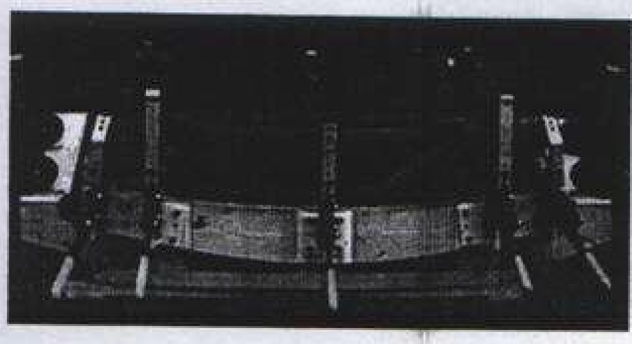
On arrival the chassis is located onto a jig where all the threaded locations are cleaned with a tap and lubricated with grease.



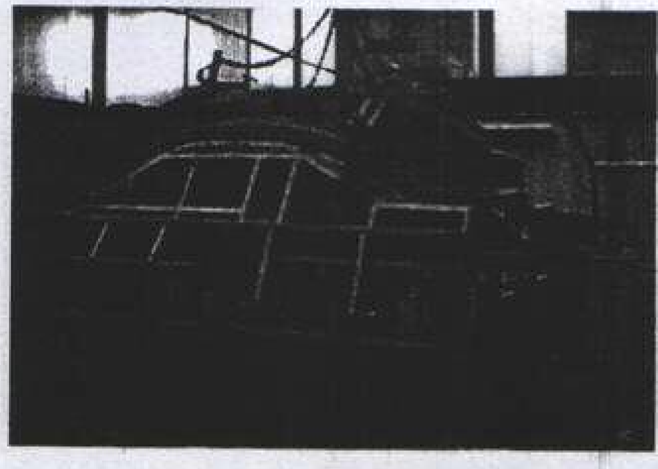
The components that make up the body panels supplied by Belco Avia are placed within specialist jigs that are designed to not only secure the panels for bonding but also check the panel profile.

Panel sections are placed within the jigs and structural adhesives are applied relative to template diagrams.

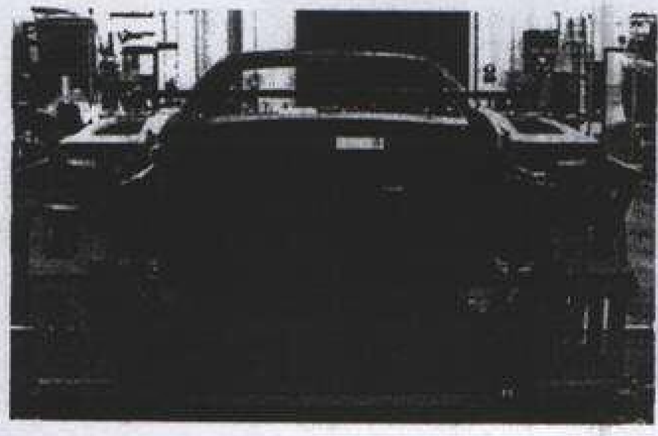
The sections are then mated together and clamped in position by the jigs.



Steel strengthening structures such as a roll cage for the roof and side intrusion frames for the doors are fitted to the relevant panels before the bonding process is carried out.



The pre formed body panels are then assembled to the chassis following a build process.



The complete chassis and body assembly is then transported to the Modena facility for vehicle assembly.

Vehicle Assembly

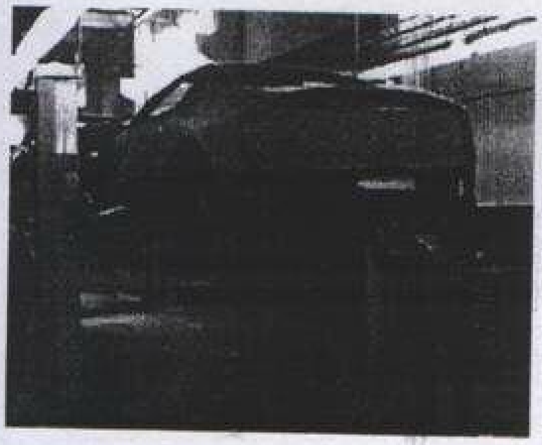
On arrival back at the Modena facility the vehicle is a complete shell less the mechanicals.

Station 1

The front clam panel is removed for access and the following components fitted:

Sound insulation
Front to rear brake pipes
Various control modules
Pedal box and steering column
Power brakes and master cylinder assembly
Heating and ventilation unit
Handbrake mechanism and cables

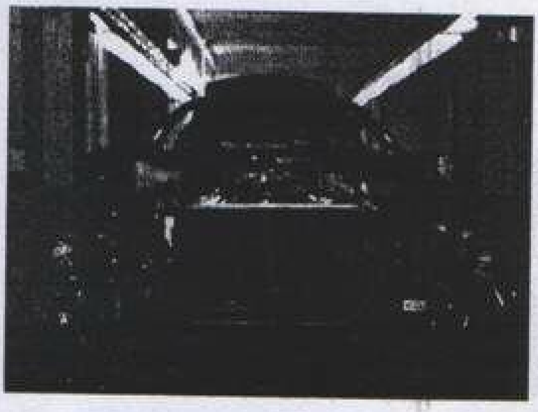
Station 2



Fitment of:

Suspension and braking components
Steering gear
Propshaft
Electrical harnesses
Engine and gearbox assembly

Station 3



Fitment of:

Exhaust system
Wheels

Charging of:

Cooling system
Air conditioning
Braking system
Steering system

Station 4

Refitting of clam panel and final check for export to the United Kingdom.

Finishing and Trim

The bare vehicles are delivered to a specialist restoration/finishing company named XK Engineering operating from premises at Shilton near Coventry. XK Engineering is a reputable company and leaders in its field of restoration and refinishing. This successful company undertakes projects such as Range Rover Autobiography and restoring Jaguar `E' types.

It is here that a highly skilled workforce prepares the SV in its part assembled condition for painting of the carbon fibre body panels, glazing and trimming of the car ready for final assembly.

The paintwork is completed to a very high quality finish.

On completion of the paint process the vehicle is glazed and then covered in protective film to ensure no superficial damage to the painted surface occurs during final assembly.

Special paint processes are carried out here to ensure a high level of finish on the carbon fibre body panels, such processes are not currently available at Longbridge due to the fact that the facility is only set up for the mass production for painting vehicles.

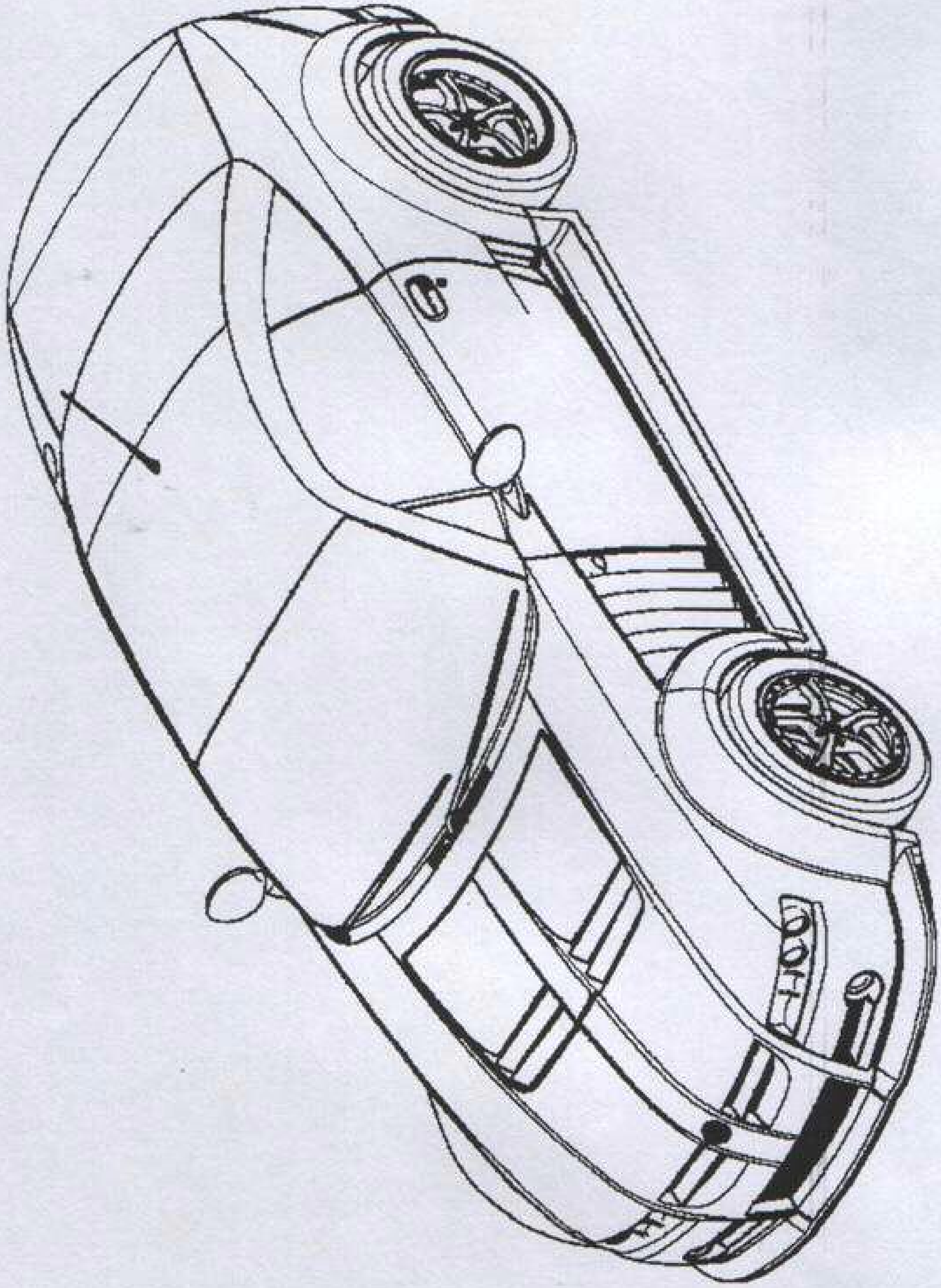
The cars are delivered to XK Engineering with rolling chassis, engine, transmission, rear axle, steering and suspension already fitted. The main body complete with roll over bars is attached to the chassis however the rest of the hinged panels and wheel arch liners are removed and packed in boxes ready for final assembly.

The skilled workforce here is more than used to working on prototypes, Rally cars and sports cars. Any fabrication required is completed to a high quality at any stage of the build. This could not be achieved on a mass production line.

Upon completion the vehicles are delivered to the MG Sport and Racing headquarters where they undergo very stringent examination and testing before release to the dealer network.

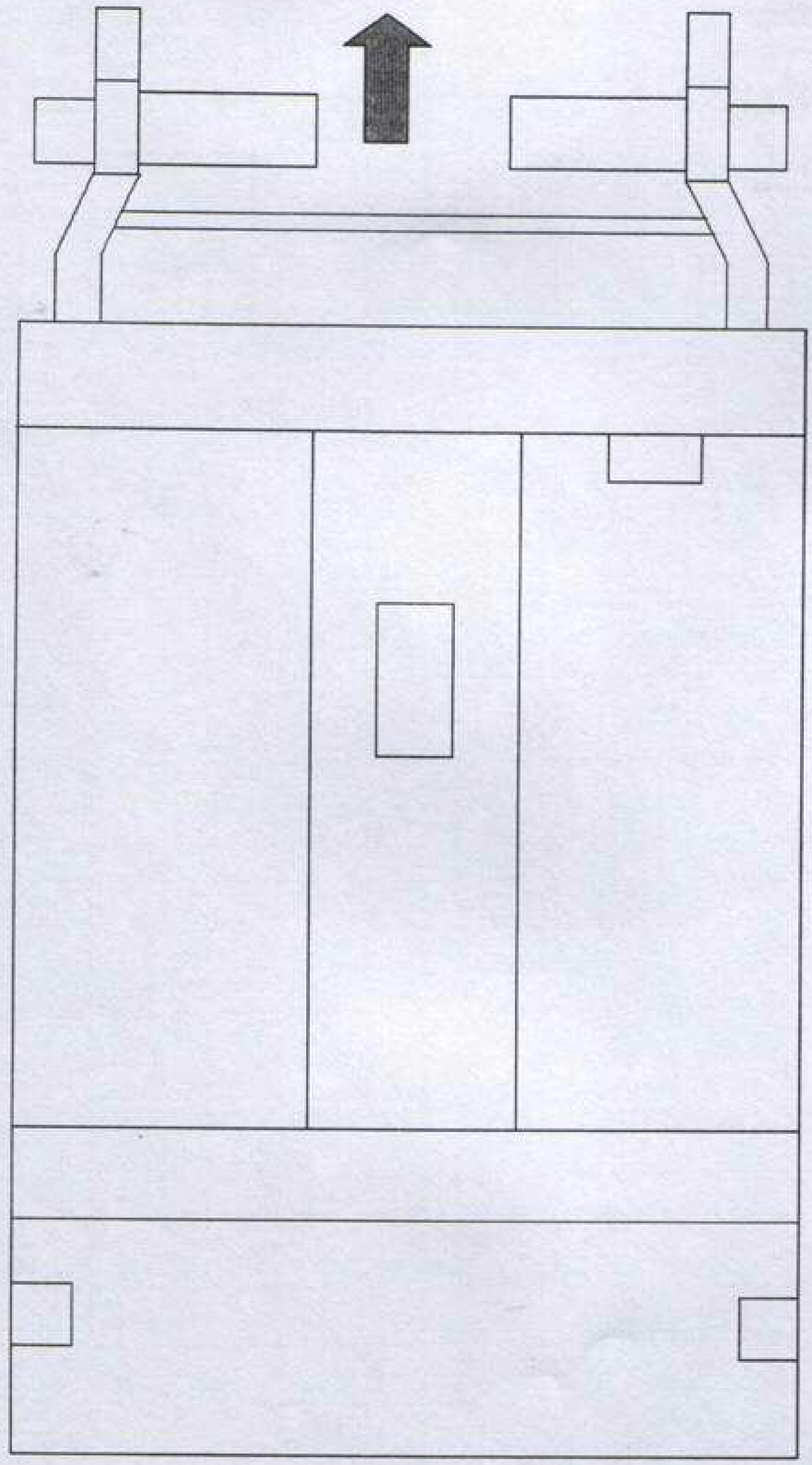
Full production of the MG X Power SV is soon to be moved into the MG Sport and Racing headquarters at Longbridge.

Component Location



Component	Location	Description

Earth Point Location



Earth Point Location	Functionality

Engine

Specifications

- 8 cylinders 90° V
- 4.6 litres
- 4 valves per cylinder double overhead camshaft
- Non safe engine design
- Hydraulic tappet adjustment
- Normally aspirated
- 10:1 compression ratio
- 90.2 mm bore
- 90.0 mm stroke
- Aluminium cylinder block
- Aluminium cylinder heads
- Chain driven
- Firing order 13726548
- Sequential multiport fuel injection

Engine Number

The engine number is located on a sticker glued to the lower edge of a machined surface situated on the LH side of the engine block towards the rear of the unit adjacent to the oil sump face and gearbox bell housing face, as well as plastic stickers located on both camshaft covers.

Cylinder Block

The cylinder block is a gravity cast aluminium design with pressed in cast iron liners that have a wall thickness of 2.3 mm, a step is cast into the block at the bottom of the bore to seat the liner.

The cylinder liners are not serviceable.

The block features a deep skirt that provides extra metal at the bottom of the engine block, this extends from the centre of the crankshaft down to the engine sump face.

This design provides increased stiffness and structural integrity as well as improved NVH (noise, vibration and harshness) characteristics.

The use of extra long cylinder head retaining bolts means that when the cylinder head is torqued in to position the bolts fasten down deep inside the engine block to minimise cylinder bore distortion.

The crankshaft main bearing cap bolts are cross-bolted featuring 4 vertical bolts, 2 horizontal bolts and 'jack' screws, this system is used to distribute loads more evenly than the conventional system.

The extra vertical bolts maintain crankshaft straightness relative to the stresses placed upon the aluminium cylinder block.

Because of the flexible properties of aluminium it is essential to closely follow the main bearing and cap de-torque and torque sequences.

Failure to do so will cause the crankshaft to bind and possibly damage the engine. Binding can occur very quickly even when only a single bolt is improperly torqued or torqued out of sequence.

Crankshaft

The crankshaft is an internally balanced nodular iron casting.

Unique main and connecting rod bearings are used that feature a profile to allow for bearing 'crush' and fit in the aluminium block.

Crankshaft journals 2 and 4 are crossed drilled allowing a constant supply of oil under pressure to the connecting rod bearings. This is necessary as only the upper main bearing shells are grooved.

Connecting Rods and Pistons

The connecting rods used in the V8 engine are forged in one piece and are not sawn in half across the big end to provide mating surfaces.

A special manufacturing process mechanically separates, or cracks the forged connecting rods in half across the crankshaft end of the rod. This process occurs across a built-in fault line in a special anvil fixture.

When the rods bolts are torqued to specification during engine assembly, the grain of the metal structure mates more perfectly than a machined surface and the connecting rod bearing cannot move out of place once it is clamped to the proper torque.

This method results in rods that are strong and light, with only minute variations in weight and dimensions from one rod to another.

Note:
Connecting rod caps cannot be interchanged between connecting rod caps.

Pistons are manufactured from an aluminium alloy containing a 16% silicon alloy, have a very short skirt and are a select fit to the particular cylinder during manufacture.

The connecting rod pin has a slight interference fit into the connecting rod when at ambient temperature but begin to float at around 125° F. the connecting rod pins are retained in the piston with spring clips.

Cylinder Heads

Aluminium alloy is used in the construction of the cylinder heads that feature twin camshafts and 4 valves per cylinder.

The 4 valve design yields nearly 40% more total inlet valve area and 35% more exhaust valve area.

This allows improved air flow through the engine especially at high engine speed, full throttle conditions when full air flow is provided to the engine.

An important benefit of a four valve design is that each individual valve can be lighter so that valve spring pressure can be reduced, this allows a much higher engine speed before valve bounce occurs.

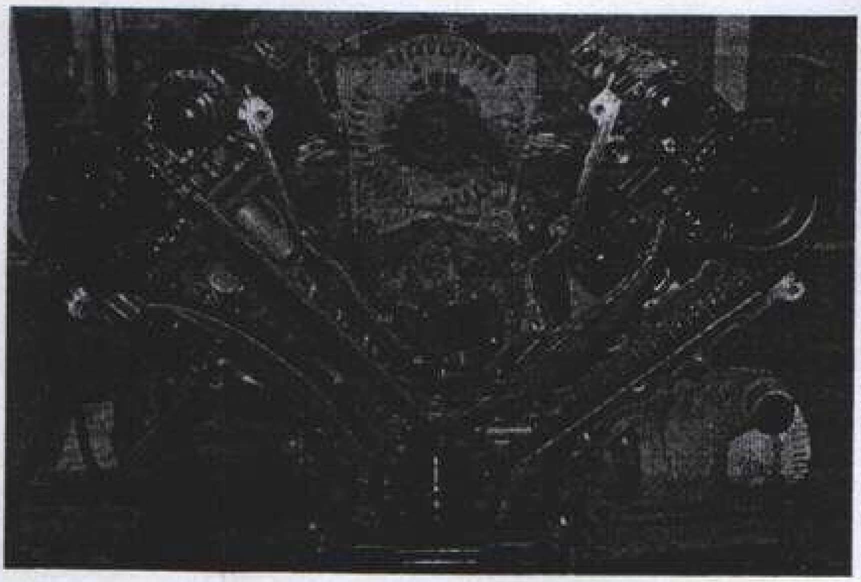
Cylinder head design means that the camshaft does not sit directly above the valves, therefore valve operation is via roller type followers supported by the valve stem at one end reacting against hydraulic tappets set in dedicated bores in the cylinder head at the opposite end.

The roller followers differ very slightly from inlet to exhaust and should therefore never be interchanged.

Camshafts are held in place in the cylinder head by a set of 8 camshaft cap assemblies – 4 per cylinder head, 2 per camshaft, these act as the top half of the camshaft bearing assembly and along with the cylinder head are line bored and therefore feature no separate camshaft bearing materials making this area of the cylinder head non serviceable.

The camshaft bearing cap assemblies also provide the restriction for oil feed to the camshafts by means of a machined groove between two oil ways, one a direct feed from the main oil gallery and the other the feed to the camshafts.

Separate timing chains drive the each of the camshafts, each of the 4 timing chains has its own dedicated hydraulic tensioner assembly.



There are two styles of timing chain tensioner used on the engine.

The primary tensioners are used on the primary chains that are used to drive the exhaust camshafts, these feature a sprung loaded hydraulically assisted piston that reacts upon a chain tensioner pad and a small ratchet device preventing the piston from separating from the housing.

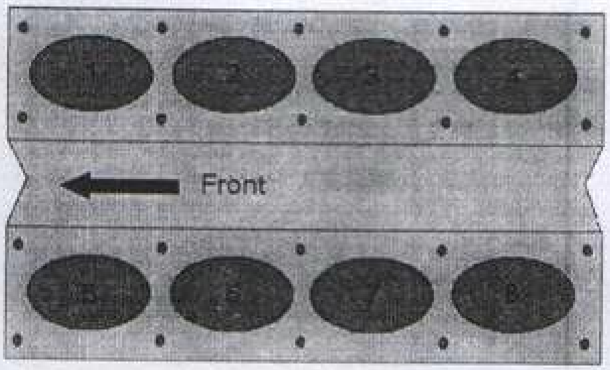
The secondary tensioners are used on the secondary chains that that run the inlet camshafts from the exhaust camshaft drive. These also feature a sprung loaded hydraulically assisted piston and ratchet device.

Because oil pressure is maintained, even when the engine is off it is necessary to compress the primary tensioner when performing service on the camshaft drive system. To do this it is necessary to release the ratchet device and compress the tensioner locking it in a compressed condition with a locking pin.

Primary Tensioner

Secondary Tensioner

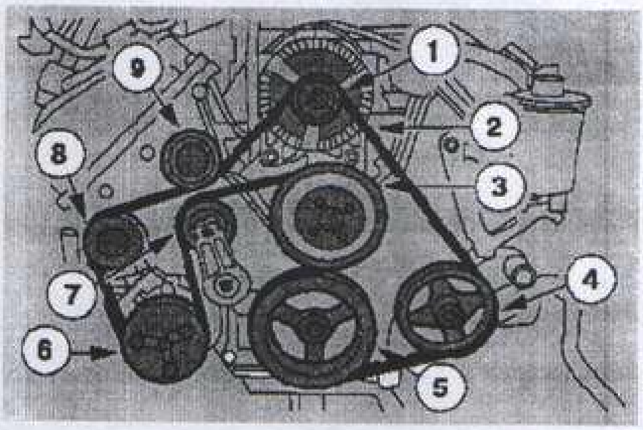
Cylinder Layout



Ancillary Drive Belt

The multi V ancillary drive belt is automatically tensioned and supplies drive to the following:

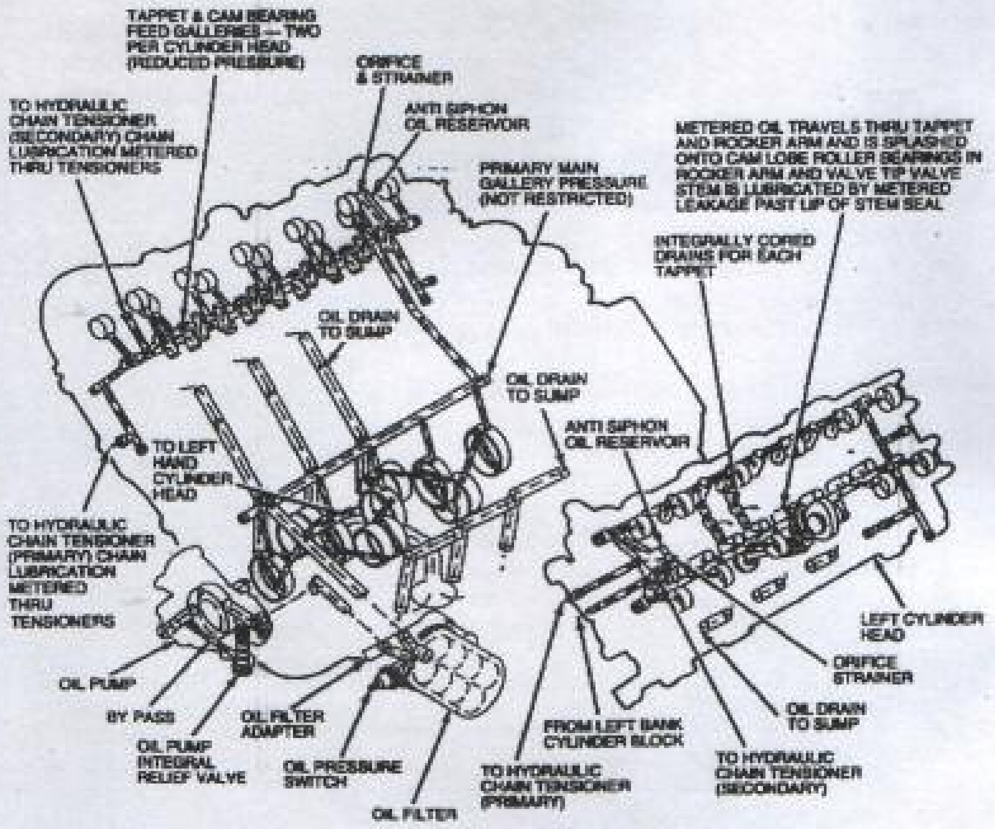
- Air conditioning compressor
- Alternator
- Power assisted steering pump
- Water pump



1. Alternator
2. Auxiliary drive belt
3. Water pump
4. Power assisted steering belt
5. Crankshaft pulley
6. Air conditioning compressor
7. Automatic tensioner
8. Jockey pulley
9. Jockey pulley

Lubrication

The lubrication system used is of a full flow design. This means that 100% of the engine oil supplied passes through the oil filter before flowing to other components within the system.



Lubrication is provided by a front mounted, integrated G-rotor oil pump and oil pressure relief valve driven directly by the crankshaft.

The engine lubrication system operates as follows:

- Oil is drawn into the oil pump through the oil pump screen cover and pick up pipe in the sump.
- Oil is pumped through the oil bypass filter on the left front side of the cylinder block.
- Oil enters the main oil gallery where it is distributed to the crankshaft main journals and to both cylinder heads.
- From the main journals, the oil is routed through cross-drilled passages in the crankshaft to lubricate the connecting rod bearings. Controlled leakage through the crankshaft main bearings and connecting rod bearings is exited radially to cool and lubricate the cylinder walls as well as the entire connecting rod, piston and piston rings assembly.
- The left cylinder head is supplied with oil from a drilling into the supply passage feeding the main gallery at the front of the cylinder block.
- The right cylinder head is supplied with oil from a drilling into the rear of the main gallery.

- Main gallery pressure is reduced as it enters the cylinder head galleries through fixed serviceable orifices located between the No 1 camshaft support on the left hand cylinder head and No 6 camshaft support for the right hand cylinder head. It is this reduced pressure in the cylinder head galleries that feeds the camshaft journals, the hydraulic valve adjusters and the primary and secondary timing chain tensioners.

- The fixed orifice system layout prevents oil drain back ensuring a quiet engine on start up.

- The camshaft lobe and roller followers are lubricated by splash created through valve train operation.

Oil Pump

The lubrication system of the engine is designed to provide optimum oil flow to critical components of the engine through its entire operating range. The heart of the system is a positive displacement internal gear oil pump using top seal rotors. Generically this design is known as a g-rotor pump, which operates as follows.

- The oil pump is mounted on the front face of the cylinder block.

- The inner rotor is piloted on the crankshaft post and is driven through flats on the crankshaft.

- System pressure is limited by an integral, internally-vented relief valve which directs the bypassed oil back to the inlet side of the oil pump.

- Oil pump displacement has been selected to provide adequate volume to ensure correct oil pressure both at hot idle and maximum speed.

- The relief valve calibration protects the system from excessive pressure during high viscosity conditions.

- The relief valve is designed to provide adequate connecting rod bearing lubrication under high-temperature and high-speed conditions.

Oil Pressure Switch

The oil pressure switch is located in an alloy housing located on the LH side of the engine supporting the oil filter. It detects when a safe operating pressure has been reached during engine starting and initiates the illumination of a warning light in the instrument pack if the oil pressure drops below a given value.

Crankcase Ventilation

A positive crankcase ventilation system is used to vent blow-by gas from the crankcase to the air intake system.

Crankcase gas is drawn through a gauze oil separator located integrally to the camshaft covers and passes via hoses into either the inlet plenum chamber (OS cover) or the inlet track pipe work (NS cover).

The PCV valve is installed into the rocker cover using a quarter-turn cam-lock design to prevent accidental disconnection. High retention force moulded plastic lines are used from the PCV valve to the intake manifold.

The diameter of the lines and the intake manifold entry fitting are increased so that inadvertent disconnection of the lines after a vehicle is serviced will cause either an immediate engine stall or will not allow the engine to be restarted.

Cooling System

General

The cooling system employed is the by-pass type, allowing coolant to circulate around the engine and the heater circuit while the thermostat is closed.

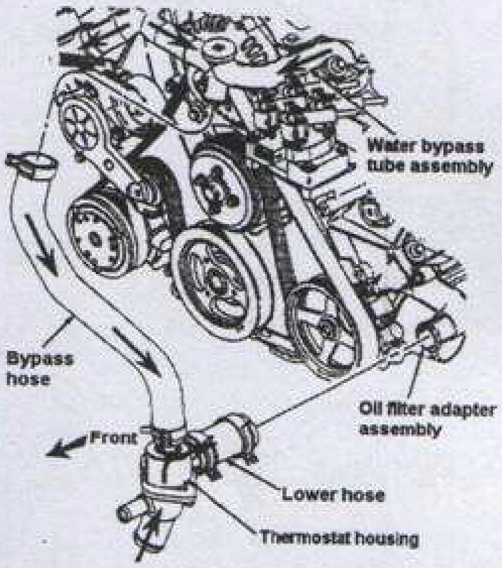
The system used on the 4 valve V8 engine is also known as an inlet side cooling system.

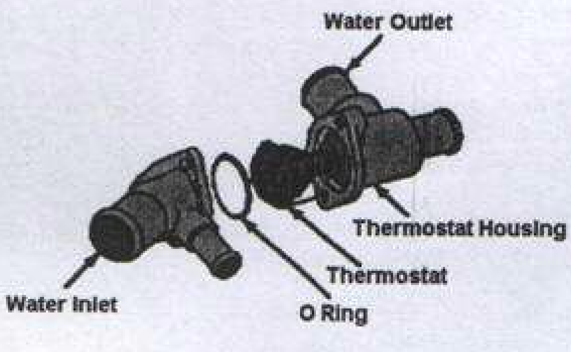
This means that the engine mounted water pump circulates coolant up from the bottom of the engine with the thermostat controlling the inlet flow rather than the outlet flow (as found on most engines).

The cooling system has been designed in this manner to maintain a consistent inlet coolant temperature in order to prevent the engine block and cylinder heads from being exposed to a hot/cold thermal cycling condition.

The thermostat mixes engine coolant with coolant from the radiator outlet resulting in a mix of coolant giving a very gradual increase in coolant temperature instead of a sudden introduction of cold coolant when the thermostat opens (as found on conventional systems).

Tight control of temperature is essential with an aluminium engine because drastic changes in temperature can have a detrimental effect on aluminium's thermal characteristics as well as improving the performance of the sealing media and surfaces because they warm up uniformly and stay at normal operating temperature inhibiting leaks within the cooling and lubrication systems.



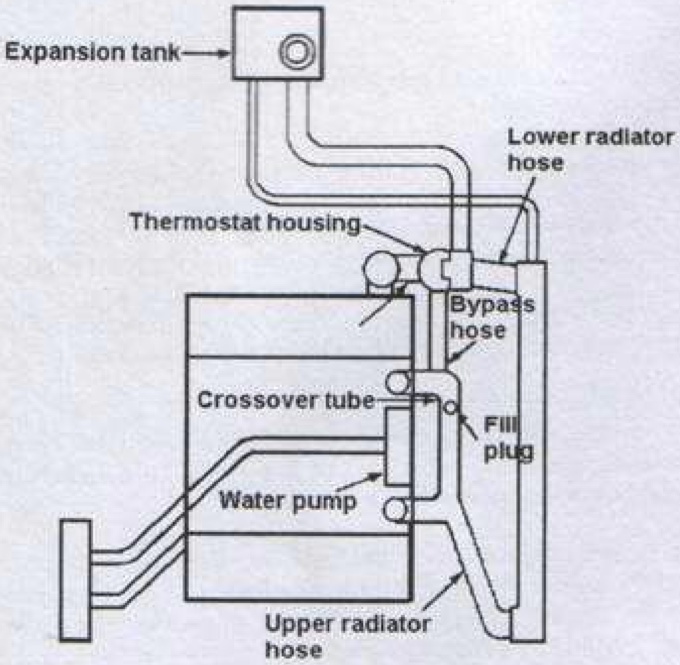


Note:
It is possible to install the thermostat housing backwards (upside down) because the inlet and outlet hoses are the same size, incorrect orientation/fitment will result in severe engine damage as coolant flow will be blocked.

The coolant is circulated by a G-rotor type pump mounted on the front of the engine, driven by the alternator belt.

The radiator is a cross flow type with an aluminium matrix and moulded plastic end tanks. The radiator end tanks have features that carry the fan assembly and air conditioning condenser.

Operation



When cold the thermostat is closed and coolant is prevented from circulating through the radiator. Coolant is however able to circulate through the by-pass and heater circuits.

As the coolant temperature increases, the thermostat gradually opens, this allows cool water from the radiator to blend with the hot water exiting the engine block via the bypass tube assembly and bypass hose.

Due to thermostat design when the thermostat is fully open a valve on the thermostat assembly closes off the supply from the bypass hose and allows full coolant flow from the radiator via the bottom hose and oil filter adapter to enter the engine.

The difference in temperature of the coolant causes the thermostat to begin to close blending the cooler coolant with hot coolant from the bypass hose.

The thermostat starts to open at 87°C to 93°C and is fully open at 104°C (219°F)

Any excess coolant, created by heat expansion, is returned to the expansion tank through a bleed hose from the top of the radiator.

The expansion tank has an outlet hose which is connected into the coolant circuit through the thermostat housing.

This outlet hose supplies coolant to the system when the engine is cool, replacing coolant displaced to the expansion tank due to heat expansion and allows any air bubbles to separate from the coolant.

Coolant flows through the radiator from the top right hand tank to the bottom left hand tank and is cooled by air passing through the matrix.

The Powertrain Control Module (PCM) monitors the temperature of the cooling system via a coolant temperature sensor located in the aluminium bridging section joining both cylinder heads.

Cooling is assisted by a single fan mounted in a cowling attached directly to the radiator with operation being controlled by the PCM.

Cooling System Maintenance

The coolant drain and refill procedures are critical to correct engine operation.

Because of the thermal characteristics of aluminium prompt removal of excessive heat and a constant temperature throughout the engine is essential. Failure to follow the procedures, especially for coolant fill can result in air bubbles forming in the system preventing correct engine cooling.

Coolant Drain

Warning:
To avoid personal injury, do not unscrew the coolant pressure relief cap while the engine is operating or hot.

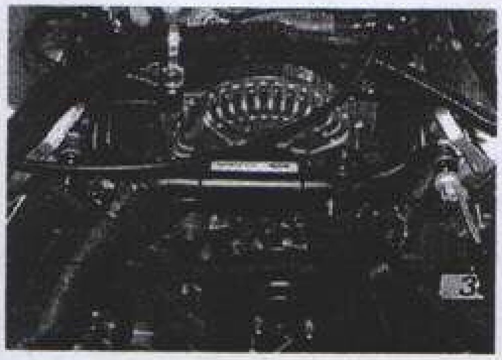
The cooling system is under pressure; steam and hot liquid can release forcefully when the cap is loosened slightly.

1. Place a clean drain tray beneath the radiator on the RH side of the vehicle.
2. Remove the cooling system pressure cap.
3. Ensure the heater controls are in the hot position.
4. Open the drain cock on the radiator side tank and completely drain the radiator.
5. Close the radiator drain cock.
6. Position the drain tray under the oil filter adapter on the LH side of the engine and remove the coolant inlet connection on the adapter.

This process completely drains the engine.

Coolant Refill

1. Remove the pressure cap from the coolant expansion tank and the fill plug from the engine water bypass tube.



2. Carefully pour a prepared 50/50 specified coolant mix into the fill neck of the bypass tube until coolant enters the expansion tank bottle.

Caution:
Do not fill the cooling system through the expansion tank on initial fill as coolant will not enter the engine resulting in severe engine damage if started.

3. Ensure the bypass tube is full to the level top of the plug aperture and install the plug.
4. Top up the expansion tank to the maximum mark and fit pressure cap.
5. Ensure the heater controls are set to hot.
6. Start engine and allow to idle, sensing the temperature of the heater vent air.
7. Allow engine to idle until the temperature gauge reads normal and the lower radiator hose feels hot to the touch.
8. Switch off the engine and allow to cool.
9. Visually check for any signs of leakage.
10. Check coolant level in reservoir and top up accordingly.

Engine Management System

Multiplexing

The increased number of modules on the vehicle dictates a more efficient method of communication. Multiplexing is the process of communicating several messages over the same signal path. This process allows multiple modules to communicate with each other through the signal path (BUS+/BUS-).

Modules communicate with the powertrain control module using Standard Corporate Protocol (SCP) that determines the priority in which the signals are sent. Multiplexing reduces the weight of the vehicle by reducing electrical wiring.

Standard Corporate Protocol

The Standard Corporate Protocol (SCP) is a communication language used for exchanging bi-directional messages (signals) between stand-alone modules and devices. Two or more signals can be sent over one circuit.

Included in these messages is diagnostic data that is output over the BUS+ and BUS - lines to the Data Link Connector (DLC).

Flash Electrically Erasable Programmable Read Only Memory

The Flash Electrically Erasable Programmable Read Only Memory (EEPROM) is an Integrated Circuit (IC) within the Powertrain Control Module (PCM). This IC contains the software code required by the PCM to control the powertrain. One feature of the EEPROM is that it can be electrically erased and then reprogrammed without removing the PCM from the vehicle.

If a software change is required to the PCM, the module no longer needs to be replaced, but can be reprogrammed at the dealership through the DLC.

Idle Air Trim

Idle Air Trim is designed to adjust the Idle Air Control (IAC) calibration to correct for wear and aging of components. When engine conditions meet the learning requirement, the strategy monitors the engine and determines the values required for ideal idle calibration.

The Idle Air Trim values are stored in a table for reference.

This table is used by the PCM as a correction factor when controlling idle speed. The table is stored in Keep Alive Random Access Memory (RAM) and retains the learned values even after the engine is shut off.

A Diagnostic Trouble Code (DTC) is output if the Idle Air Trim has reached its learning limits.

Whenever an IAC component is replaced or cleaned or a service affecting idle is performed, it is recommended that Keep Alive RAM be cleared. This is necessary so the idle strategy does not use the previously learned Idle Air Trim values.

To clear Keep Alive RAM, refer to PCM Reset. It is important to note that erasing DTCs with a diagnostic tool does not reset the Idle Air Trim table.

Once Keep Alive RAM has been reset, the engine must idle for 15 minutes (actual time varies between strategies) to learn new idle air trim values. Idle quality will improve as the strategy adapts.

Fuel Trim

The fuel control system uses the fuel trim table to compensate for normal variability of the fuel system components caused by wear or aging. During closed loop vehicle operation, if the fuel system appears "biased" lean or rich, the fuel trim table will shift the fuel delivery calculations to remove the bias. The fuel system monitor has two means of adapting Short Term Fuel Trim (FT) and Long Term Fuel Trim (FT). Short Term FT is referred to as LAMBSE and Long Term FT references the fuel trim table.

Short Term Fuel Trim (Short Term FT) (displayed as SHRTFT1 and SHRTFT2 on the diagnostic tool) is a parameter that indicates short-term fuel adjustments. Short Term FT is commonly referred to as LAMBSE. LAMBSE is calculated by the PCM from HO2S inputs and helps maintain a 14.7:1 air/fuel ratio during closed loop operation.

This range is displayed in percentage (%). A negative percentage means that the HO2S is indicating RICH and the PCM is attempting to lean the mixture. Ideally, Short Term FT may remain near 0% but can adjust between -25% to +35%.

Long Term Fuel Trim (Long Term FT) (displayed as LONGFT1 and LONGFT2 on the diagnostic tool) is the other parameter that indicates long-term fuel adjustments. Long Term FT is also referred to as Fuel Trim. Long Term FT is calculated by the PCM using information from the Short Term FT to maintain a 14.7:1 air/fuel ratio during closed loop operation.

The Fuel Trim strategy is expressed in percentages. The range of authority for Long Term FT is from -35% to +35%. The ideal value is near 0% but variations of ±20% are acceptable. Information gathered at different speed load points are stored in fuel trim cells in the fuel trim tables, which can be used in the fuel calculation.

Short Term FT and Long Term FT work together. If the HO2S indicates the engine is running rich, the PCM will correct the rich condition by moving Short Term FT in the negative range (less fuel to correct for a rich combustion).

If after a certain amount of time Short Term FT is still compensating for a rich condition, the PCM "learns" this and moves Long Term FT into the negative range to compensate and allows Short Term FT to return to a value near 0%.

As the fuel control and air metering components age and vary from nominal values, the fuel trim learns corrections while in closed loop fuel control. The corrections are stored in a table that is a function of engine speed and load.

The tables reside in Keep Alive Random Access Memory (RAM) and are used to correct fuel delivery during open and closed loop. As changing conditions continue the individual cells are allowed to update for that speed load point. If, during the adaptive process, both Short Term FT and Long Term FT reach their high or low limit and can no longer compensate, the MIL is illuminated and a DTC is stored.

Whenever a fuel injector or fuel pressure regulator is replaced, Keep Alive RAM should be cleared. This is necessary so the PCM does not use the previously learned fuel trim values.

Resetting Keep Alive RAM will return PCM memory to its default setting. Adaptive learning contents such as idle and fuel trim are included. A PCM Reset (described above) is also part of a KAM Reset.

After Keep Alive RAM has been reset, the vehicle may exhibit certain driveability concerns. It will be necessary to drive the vehicle to allow the PCM to relearn values for optimum driveability and performance.

PCM reset is carried out by the diagnostic tool.

If an error message is received or the diagnostic tool does not support this function, disconnecting the battery ground cable for a minimum of 5 minutes may be used as an alternative procedure.

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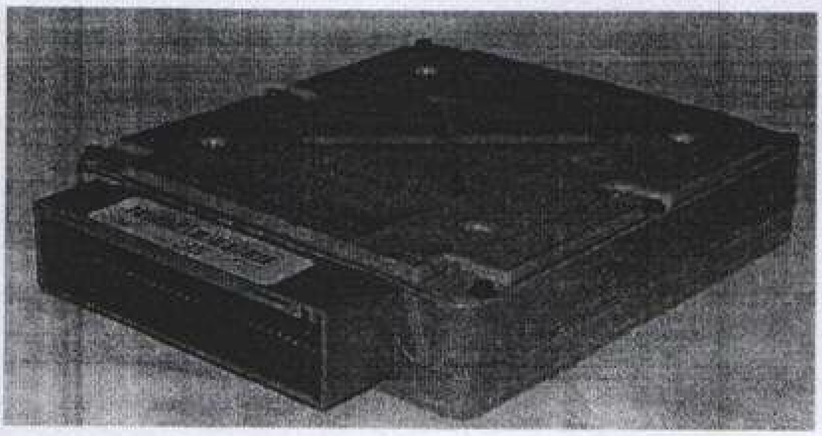
Powertrain Control Module (PCM)



The engine management system used on the MG X Power SV is the Electronic Engine Control V (EEC V) system most commonly associated with Ford Motor Company.

Electronic engine management systems are subject to continuous development due to the introduction of tighter exhaust emissions (ECD3), increased environmental awareness and sensitivity of customers to driving comfort and convenience. Couple this with the demand for increased power output, smooth silent running and low fuel consumption it becomes very clear that motor manufacturers not only have to make modifications to the basic engines, but also constantly strive to introduce better and more refined engine tunes to produce the best possible driving characteristics (performance, fuel consumption and exhaust emissions).

PCM Inputs

Air Conditioning Cycling Switch (ACCS)

The A/C Cycling Switch (ACCS) circuit to the PCM provides a voltage signal that indicates when the A/C is requested. When the A/C demand switch is turned on, and both the A/C cycling switch and the high pressure contacts of the A/C high pressure switch are closed, voltage is supplied to the ACCS circuit at the PCM. When the A/C cycling switch opens, the PCM will turn off the A/C clutch If the ACCS signal is not received by the PCM, the PCM circuit will not allow the A/C to operate.

Air Conditioning Pressure Sensor

The air conditioning pressure (A/C pressure) sensor is located in the high pressure (discharge) side of the air conditioning A/C system. The A/C pressure sensor provides a voltage signal to the powertrain control module (PCM) that is proportional to the A/C pressure. The PCM uses this information for A/C clutch control, fan control and idle speed control.

Air Conditioning High Pressure Switch

The A/C high pressure switch is used for additional A/C system pressure control. The A/C high pressure switch is either dual function for two-speed electric fan applications or single function for all others.

For refrigerant containment control, the normally closed high pressure contacts open at a predetermined A/C pressure. This will result in the A/C turning off, preventing the A/C pressure from rising to a level that would open the A/C high pressure relief valve.

For fan control, the normally open medium pressure contacts close at a predetermined A/C pressure. This grounds the ACPSW circuit input to the PCM. The PCM will then turn on the high speed fan to help reduce the pressure.

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Engine Coolant Temperature

The engine coolant temperature (ECT) sensor is a thermistor device in which resistance changes with temperature.

The electrical resistance of a thermistor decreases as the temperature increases, and increases as the temperature decreases.

The varying resistance affects the voltage drop across the sensor terminals and provides electrical signals to the PCM corresponding to temperature.

Thermistor-type sensors are considered passive sensors. A passive sensor is connected to a voltage divider network so that varying the resistance of the passive sensor causes a variation in total current flow.

Voltage that is dropped across a fixed resistor in a series with the sensor resistor determines the voltage signal at the PCM. This voltage signal is equal to the reference voltage minus the voltage drop across the fixed resistor.

The ECT measures the temperature of the engine coolant. The sensor is threaded into an engine coolant passage. The ECT sensor is similar in construction to the IAT sensor.

Fuel Level Input

The fuel level input (FLI) is a hard wire signal input to the PCM from the fuel pump (FP) module.

Fuel Pump Monitor

The fuel pump driver module (FPDM) communicates diagnostic information to the powertrain control module (PCM) through the Fuel Pump Monitor (FPM) circuit. This information is sent by the FPDM as a duty cycle signal.

Fuel Tank Pressure Sensor

For information on the fuel tank pressure (FTP) sensor, refer to the description of the fuel supply system.

Fuel Rail Pressure Sensor

The fuel rail pressure (FRP) sensor is a diaphragm strain gauge device in which resistance changes with pressure.

The electrical resistance of a strain gauge increases as pressure increases, and decreases as pressure decreases.

The varying resistance affects the voltage drop across the sensor terminals and provides electrical signals to the PCM corresponding to pressure.

Strain gauge type sensors are considered passive sensors. A passive sensor is connected to a voltage divider network so that varying the resistance of the passive sensor causes a variation in total current flow.

Voltage that is dropped across a fixed resistor in series with the sensor resistor determines the voltage signal at the PCM. This voltage signal is equal to the reference voltage minus the voltage drop across the fixed resistor.

The fuel rail pressure (FRP) sensor senses the pressure difference between the fuel rail and the intake manifold.

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Knock Sensor

The knock sensor (KS) is a tuned accelerometer on the engine which converts engine vibration to an electrical signal. The PCM uses this signal to determine the presence of engine knock and to retard spark timing.

Mass Air Flow Sensor

The mass air flow (MAF) sensor uses a hot wire sensing element to measure the amount of air entering the engine.

Air passing over the hot wire causes it to cool. This hot wire is maintained at 200°C (392°F) above ambient temperature as measured by a constant cold wire.

If the hot wire electronic sensing element must be replaced, then the entire assembly must be replaced.

Replacing only the element may change the air flow calibration.

The current required to maintain the temperature of the hot wire is proportional to the air mass flow.

The MAF sensor then outputs an analogue voltage signal to the PCM proportional to the intake air mass.

The PCM calculates the required fuel injector pulse width in order to provide the desired air/fuel ratio.

This input is also used in determining transmission electronic pressure control (EPC), shift and torque converter clutch scheduling.

The MAF sensor is located between the air cleaner and the throttle body or inside the air cleaner assembly.

Output Shaft Speed Sensor

The Output Shaft Speed Sensor (OSS) provides the Powertrain Control Module (PCM) with information about the rotational speed of an output shaft.

The PCM uses the information to control and diagnose powertrain behaviour. In some applications, the sensor is also used as the source of vehicle speed. The sensor may be physically located in different places on the vehicle, depending upon the specific application.

The design of each speed sensor is unique and depends on which powertrain control feature uses the information generated.

Throttle Position Sensor

The throttle position (TP) sensor is a rotary potentiometer sensor that provides a signal to the PCM that is linearly proportional to the throttle plate/shaft position.

The sensor housing has a three-blade electrical connector that may be gold plated. The gold plating increases corrosion resistance on terminals and increases connector durability. The TP sensor is mounted on the throttle body.

As the TP sensor is rotated by the throttle spindle shaft, four operating conditions are determined by the PCM from the TP. Those conditions are closed throttle (includes idle or deceleration), part throttle (includes cruise or moderate acceleration), wide open throttle (includes maximum acceleration or de-choke on crank), and throttle angle rate.

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The PCM monitors engine rpm and increases or decreases the IAC duty cycle in order to achieve the desired rpm.

Note:
The IAC Valve Assembly is not adjustable and cannot be cleaned.

The IAC valve (part of throttle body assembly) has an internal diode on some applications. If the internal diode is measured in crossed terminal position with a digital multi-meter, there will be an incorrect or negative reading.

It is important that the mating component and harness connectors correctly oriented. Diagnostic procedures emphasize this importance.

The PCM uses the IAC valve assembly to control:

- No touch start
- Cold engine fast idle for rapid warm-up
- Idle (corrects for engine load)
- Stumble or stalling on deceleration (provides a dashpot function)
- Over-temperature idle boost

Wide Open Throttle A/C Cut-Off

The wide open throttle A/C cut off relay (may be referred to as the A/C clutch relay) is normally open. There is no direct electrical connection between the A/C switch or EATC Module and the A/C clutch. The PCM will receive a signal indicating that A/C is requested (for some applications, this message is sent through the BUS + and BUS - circuits). When A/C is requested, the PCM will check other A/C related inputs that are available (such as ACP (SW), ACCS). If these inputs indicate A/C operation is OK, and the engine conditions are OK (such as coolant temperature, engine rpm, throttle position), the PCM will ground the WAC output, closing the relay contacts and sending voltage to the A/C clutch.

Vapour Management Valve

For information on the vapour management valve (EVAP canister purge valve), refer to the description of the fuel supply system.

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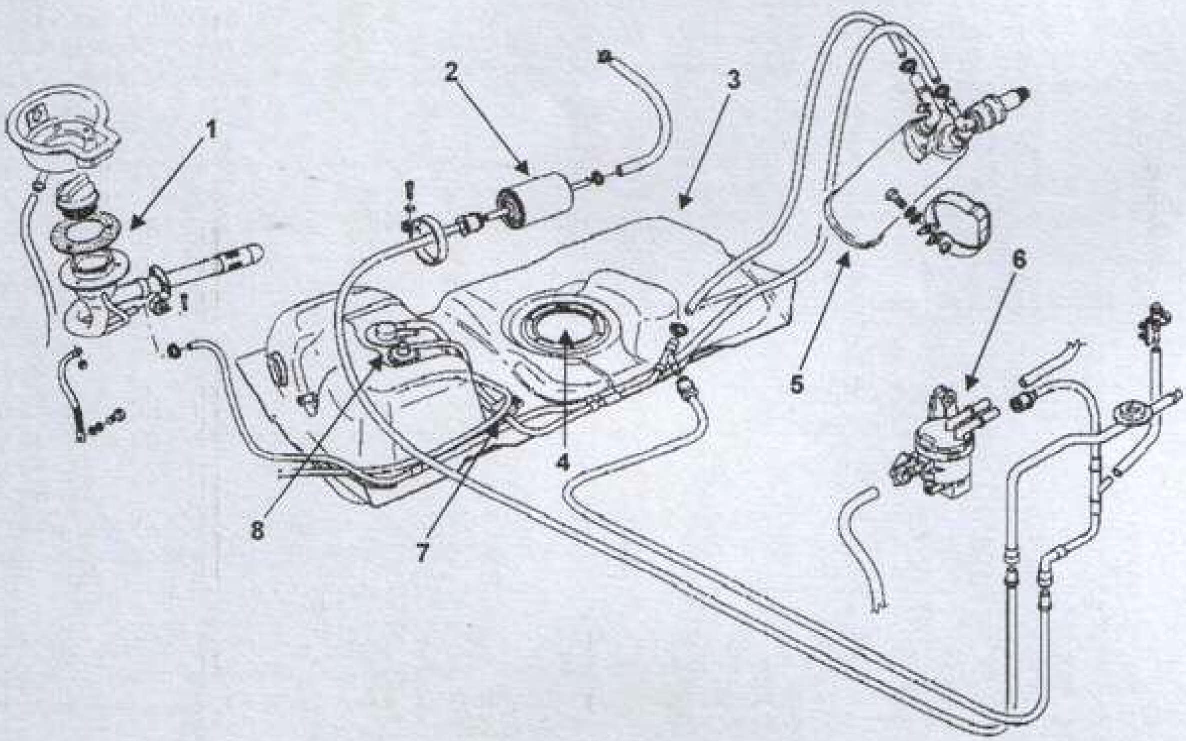
Fuel Supply System

MG X Power SV features a returnless fuel system that consists of:

- A fuel tank
- A fuel tank filler pipe that contains a restrictor plate to permit only unleaded fuel to be pumped into the fuel tank.
- A fuel filter providing filtration to protect the fuel injectors.
- A single fuel line accommodating the returnless fuel system.
- A fuel injection supply manifold that contains a differential pressure sensor and a fuel temperature sensor.
- A fuel pump and sender assembly which provides pressurised fuel to the engine and contains:
- A top flange with a bottom-mounted fuel module and integrated fuel level sensor.
- An inlet filter.
- A check valve that maintains system pressure after the pump is shut off.
- A pressure relief valve for overpressure protection in the event of restricted flow.



1. Filler neck & inlet filter
2. In line fuel filter
3. Fuel tank
4. Fuel pump & level sender
5. Carbon canister & canister vent solenoid
6. Evaporative emission canister & purge valve
7. Fuel tank pressure sensor
8. Fuel vapour vent valve & control valve

Overview

The fuel system supplies the Sequential Multiport Fuel Injection (SFI) fuel injectors with clean fuel at controlled pressure. The Powertrain Control Module (PCM) controls the fuel pump and monitors the fuel pump circuit.

The PCM also controls the duration of the on/off cycle providing correct timing of the fuel injectors. If the injectors have been replaced, it is necessary to clear learned values contained in the Keep Alive Random Access Memory (RAM) in the PCM.

This can be done by disconnecting the battery or the PCM for five minutes.

Electronic Returnless Fuel System

The fuel system consists of a fuel tank with reservoir, fuel pump, fuel rail pressure sensor, fuel filter, fuel supply line, engine fuel temperature sensor, fuel rail, fuel injectors, and schrader/pressure test point. Operation of the system is as follows:

- The fuel delivery system is enabled during crank or running mode once the PCM receives a crankshaft position (CKP) sensor signal.
- The fuel pump logic is defined in the fuel system control strategy and is executed by the PCM.
- The PCM commands a duty cycle to the fuel pump driver module (FPDM).
- The fuel pump driver module modulates the voltage to the fuel pump (FP) to achieve the proper fuel pressure. Voltage for the fuel pump is supplied by the power relay or FPDM power supply relay. (For additional information on FPDM operation, refer to PCM Outputs—Fuel Pump and PCM Inputs—FPM.)
- The fuel rail pressure (FRP) sensor provides the PCM with the current fuel rail pressure. The PCM uses this information to vary the duty cycle output to the FPDM to compensate for varying loads.
- The fuel injector is a solenoid-operated valve that meters the fuel flow to each combustion cylinder. The fuel injector is opened and closed a constant number of times per crankshaft revolution. The amount of fuel is controlled by the length of time the fuel injector is held open. The injector is normally closed and is operated by 12 volt VPWR from the power relay. The ground signal is controlled by the PCM.
- A pressure test point valve (schrader valve) is located on the fuel rail. This is used to measure fuel injector supply pressure for diagnostic procedures and repairs.
- There are three filtering or screening devices in the fuel delivery system. The intake sock is a fine, nylon mesh screen mounted on the intake side of the fuel pump. There is a fuel filter screen located at the fuel rail side of the fuel injector. The fuel filter assembly is located between the fuel pump and the pressure test point/schrader valve.
- The fuel pump (FP) module is a device that contains the fuel pump and the fuel sender assembly. The fuel pump is located inside the reservoir and supplies fuel through the fuel pump module manifold to the engine.
- The inertia fuel shut-off (IFS) switch is used to de-energize the fuel delivery secondary circuit in the event of a collision.

The IFS switch is a safety device that should only be reset after a thorough inspection of the vehicle (following a collision). It consists of a steel ball held in place by a magnet. When a sharp impact occurs, the ball breaks loose from the magnet, rolls up a conical ramp and strikes a target plate which opens the electrical contacts of the switch and shuts off the electric fuel pump. Once the switch is open, it must be manually reset before restarting the vehicle.

Fuel Pump and Reservoir

The fuel pump module is mounted inside the fuel tank in a reservoir. The pump has a discharge check valve that maintains system pressure after the ignition key has been turned off to minimize starting concerns. The reservoir prevents fuel flow interruptions during extreme vehicle manoeuvres with low tank fill levels.

Evaporative Loss System

The evaporative emission system:

- Is equipped with an on-board refuelling vapour recovery (ORVR) system.
- Prevents hydrocarbon emissions from reaching the atmosphere.
- Stores fuel vapours in the evaporative emission (EVAP) canister that are generated during vehicle operation or hot soak, or vehicle refuelling, until the engine can consume them.
- Routes the stored fuel vapours to the engine during engine operation.
- Is controlled by the Powertrain Control Module (PCM) that uses various sensor inputs to calculate the desired amount of purge flow. The PCM regulates the purge flow, induced by the application of intake manifold vacuum, by varying the duty cycle applied to the EVAP canister purge valve.
- Has an evaporative emission test port for test purposes.

The fuel vapours are routed:

- From the fuel tank through the fuel vapour control valve and fuel vapour vent valve.
- To the evaporative canister through a vapour line.
- To the engine when the evaporative canister purge valve is opened by the PCM.

The fuel tank pressure (FTP) sensor:

- Monitors the pressure levels in the fuel tank.
- Communicates the pressure reading to the PCM during the OBDII leak test.
- Is located in-line above the fuel tank and is serviced as part of the fuel vapour control valve tube assembly.

The evaporative emission canister:

- Is located in the left rear quarter panel.
- Contains activated carbon.
- Stores fuel vapour.

The fuel tank filler cap:

- Relieves system pressure above 14 kpa (56.21 inches H2O).
- Relieves system vacuum below 3.8 kpa (15.26 inches H2O).

The canister vent solenoid:

- Is normally open.
- Seals the evaporative system for the inspection and maintenance test and OBD II leak and pressure tests.
- Is mounted to the evaporative emission canister.
- Is repaired as a separate item.

The evaporative emission (EVAP) canister purge valve:

- Is normally closed.
- Regulates purging of the evaporative canister.
- Is controlled by the PCM.
- Is located in the right front inner wing.

The fuel vapour control valve tube assembly:

- Consists of the fuel vapour control valve, fuel vapour vent valve and an in-line fuel tank pressure sensor.
- Prevents suspended liquid fuel from being drawn into the evaporative emission canister along with the fuel vapours.
- Returns the liquid to the fuel tank.
- Includes a fresh air transfer tube routing fresh air between the canister vent solenoid hose and the fuel tank filler pipe assembly.
- Requires two grommets to seal the fuel vapour control valve and fuel vapour vent valve to the fuel tank.

The evaporative emission (EVAP) system monitor:

- Is a self-test strategy within the PCM, which tests the integrity of the evaporative system.
- Monitors the EVAP system for leaks.
- Monitors electronic EVAP components for irrationally high or low voltages.
- Monitors for correct EVAP system operation.
- Uses negative and positive leak test methods to test and activate the evaporative system.

The evaporative emission (EVAP) test port:

- Is used to connect the Evaporative Emission System Leak Tester to the evaporative system.
- Is located on the EVAP canister purge outlet tube near the evaporative canister purge valve.

The EVAP Running Loss System Leak Test:

- Utilises intake manifold vacuum to test the evaporative system and involves several stages.

EVAP System Operation Overview

The Evaporative Emission (EVAP) system prevents fuel vapour build-up in the sealed fuel tank.

Fuel vapours trapped in the sealed tank are vented through the vapour valve assembly on top of the tank.

The vapours leave the valve assembly through a single vapour line and continue to the EVAP canister (located in the engine compartment, in the rear of vehicle near luggage compartment area or along the frame rail) for storage until the vapours are purged to the engine for burning.

Evaporative Emission (EVAP) System

The EVAP system uses inputs from the engine coolant temperature (ECT) sensor, the intake air temperature (IAT) sensor, the mass air flow (MAF) sensor, the vehicle speed sensor (VSS) and the fuel tank pressure (FTP) sensor to provide information about engine operating conditions to the PCM.

The fuel level input (FLI) and FTP sensor signals to the PCM are used by the PCM to determine activation of the EVAP Monitor based on presence of vapour generation or fuel sloshing.

The PCM calculates a variable duty cycle based on the desired amount of purge vapour flow to the intake manifold for a given engine condition. The PCM can then output the duty cycle to the solenoid on the EVAP canister purge valve.

The PCM uses the EVAP system inputs to evacuate the system using the EVAP canister purge valve, seals the EVAP system from atmosphere using the CV solenoid, and uses the FTP sensor to observe total vacuum lost for a period of time.

The canister vent (CV) solenoid seals the EVAP system to atmosphere during the EVAP leak check Monitor.

The PCM outputs a variable duty cycle signal (between 0% and 100%) to the solenoid on the EVAP canister purge valve.

The fuel tank pressure (FTP) sensor monitors the fuel tank pressure during engine operation and continuously transmits an input signal to the PCM. During the EVAP monitor testing, the FTP sensor monitors the fuel tank pressure or vacuum bleed-up.

The fuel tank mounted fuel vapour vent valve assembly, fuel tank mounted fuel vapour control valve (or remote fuel vapour control valve) are used in the EVAP system to control the flow of fuel vapour entering the engine. All of these valves also prevent fuel tank overfilling during refuelling operation and prevent liquid fuel from entering the EVAP canister and the EVAP canister purge valve under any vehicle altitude, handling or rollover condition.

Hardware

EVAP Canister Purge Valve

The EVAP canister purge valve is the part of the EVAP system that is controlled by the PCM. This valve controls the flow of vapours (purging) from the EVAP canister to the intake manifold during various engine operating modes. The EVAP canister purge valve is normally closed valve.

Fuel Tank Pressure Sensor

The fuel tank pressure (FTP) sensor or inline fuel tank pressure (FTP) sensor is used to measure the fuel tank pressure during the EVAP monitor test on vehicles equipped with the Running Loss-type system. Also, it is used to control excessive fuel tank pressure by forcing the system to purge.

Canister Vent Solenoid

During the EVAP System test monitor, the canister vent (CV) solenoid seals the EVAP canister from atmospheric pressure. This allows the EVAP canister purge valve to obtain the target vacuum in the fuel tank during the monitor run.

Fuel Filler Cap

The fuel filler cap is used to prevent fuel spill and close the evaporative emission/fuel system to atmosphere.

MG X Power SV is equipped with On-Board Refuelling Vapour Recovery (ORVR) Evaporative Emission (EVAP) system.

On-Board Refuelling Vapour Recovery (ORVR) Evaporative Emission (EVAP) System

The basic elements forming the ORVR system and operation are as follows when fuel is dispensed:

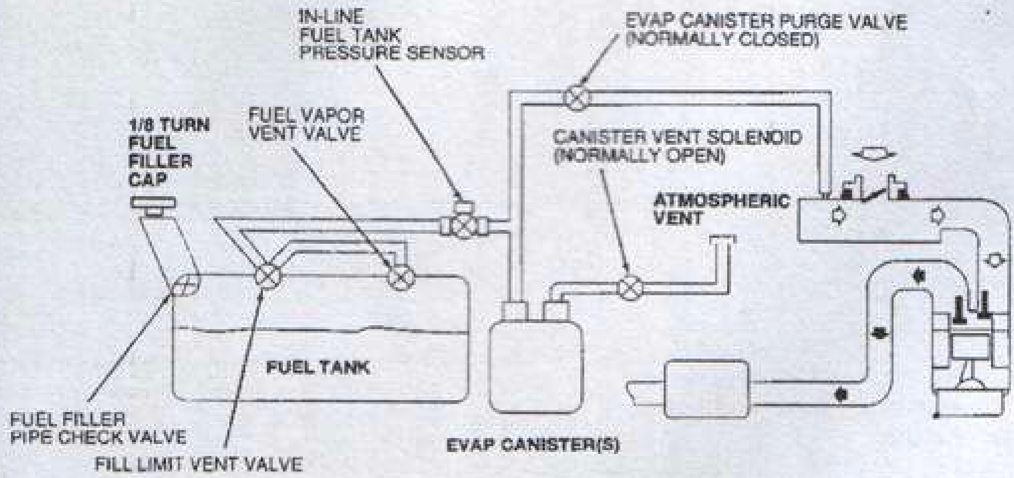
- The fuel filler pipe forms a seal to prevent vapours from escaping the fuel tank, while liquid is entering the fuel tank (liquid in the one inch diameter tube blocks vapours from rushing back up the fuel filler pipe).
- A fuel vapour control valve controls the flow of vapours out of the fuel tank (valve closes when liquid level reaches a height associated with the fuel tank usable capacity). This valve accomplishes the following:

  Limits the total amount of fuel that can be dispensed into the fuel tank.

  Prevents liquid gasoline from exiting the fuel tank when submerged (and also when tipped well beyond a horizontal plane as part of the vehicle roll-over protection in road accidents).

  Minimizes vapour flow resistance during anticipated refuelling conditions.
- Fuel vapour tubing connects the fuel vapour control valve to the EVAP canister. This routes the fuel tank vapours (displaced by the incoming liquid) to the EVAP canister.
- A check valve in the bottom of the fuel filler pipe prevents liquid from rushing back up the fuel filler pipe during the liquid flow variations associated with the filler nozzle shut-off.

Between refuelling events, the EVAP canister is purged with fresh air so that it may be used again to store vapours accumulated engine soaks or subsequent refuelling events. The vapours drawn off of the carbon in the EVAP canister are consumed in the engine.



Exhaust Gas Recirculation

Overview

The Exhaust Gas Recirculation (EGR) system controls the oxides of nitrogen (NOx) emissions. Small amounts of exhaust gases are recirculated back into the combustion chamber to mix with the air/fuel charge. The combustion chamber temperature is reduced, lowering NOx emissions.

Differential Pressure Feedback EGR System

The Differential Pressure Feedback EGR system consists of a differential pressure feedback EGR sensor, EGR vacuum regulator solenoid, EGR valve, orifice tube assembly, powertrain control module (PCM) and connecting wires and vacuum hoses. Operation of the system is as follows

The Differential Pressure Feedback EGR system receives signals from the engine coolant temperature (ECT) sensor, intake air temperature (IAT) sensor, throttle position (TP) sensor, mass air flow (MAF) sensor and crankshaft position (CKP) sensor to provide information on engine operating conditions to the PCM.

The engine must be warm, stable and running at a moderate load and rpm before the EGR system is activated. The PCM deactivates EGR during idle, extended wide open throttle or whenever a failure is detected in an EGR component or EGR required input.

The PCM calculates the desired amount of EGR flow for a given engine condition. It then determines the desired pressure drop across the metering orifice required to achieve that flow and outputs the corresponding signal to the EGR vacuum regulator solenoid.

The EGR vacuum regulator solenoid receives a variable duty cycle signal (0 to 100%). The higher the duty cycle the more vacuum the solenoid diverts to the EGR valve.

The increase in vacuum acting on the EGR valve diaphragm overcomes the valve spring and begins to lift the EGR valve pintle off its seat, causing exhaust gas to flow into the intake manifold.

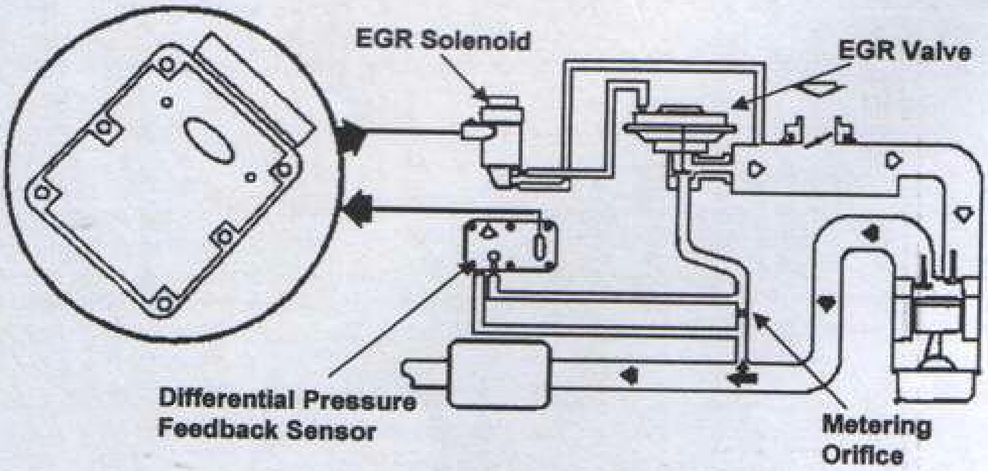
Exhaust gas flowing through the EGR valve must first pass through the EGR metering orifice. With one side of the orifice exposed to exhaust backpressure and the other to the intake manifold, a pressure drop is created across the orifice whenever there is EGR flow.

When the EGR valve closes, there is no longer flow across the metering orifice and pressure on both sides of the orifice is the same.

The PCM constantly targets a desired pressure drop across the metering orifice to achieve the desired EGR flow.

The differential pressure feedback EGR sensor measures the actual pressure drop across the metering orifice and relays a proportional voltage signal (0 to 5 volts) to the PCM.

The PCM uses this feedback signal to correct for any errors in achieving the desired EGR flow.



Hardware

Differential Pressure Feedback EGR Sensor

The differential pressure feedback EGR sensor is a ceramic, capacitive-type pressure transducer that monitors the differential pressure across a metering orifice located in the orifice tube assembly. The differential pressure feedback sensor receives this signal through two hoses referred to as the downstream pressure hose (REF SIGNAL) and upstream pressure hose (HI SIGNAL). The HI and REF hose connections are marked on the aluminium differential pressure feedback EGR sensor housing for identification (note that the HI signal uses a larger diameter hose). The differential pressure feedback EGR sensor outputs a voltage proportional to the pressure drop across the metering orifice and supplies it to the PCM as EGR flow rate feedback.

Tube Mounted Differential Pressure Feedback EGR Sensor

The tube mounted differential pressure feedback EGR sensor is identical in operation as the larger metal or plastic DPFE sensors and uses a 1.0 volt offset. The HI and REF hose connections are marked on the underside of the sensor.

EGR Vacuum Regulator Solenoid

The EGR vacuum regulator solenoid is an electromagnetic device which is used to regulate the vacuum supply to the EGR valve. The solenoid contains a coil which magnetically controls the position of a disc to regulate the vacuum. As the duty cycle to the coil increases, the vacuum signal passed through the solenoid to the EGR valve also increases. Vacuum not directed to the EGR valve is vented through the solenoid vent to atmosphere. Note that at 0% duty cycle (no electrical signal applied), the EGR vacuum regulator solenoid allows some vacuum to pass, but not enough to open the EGR valve.

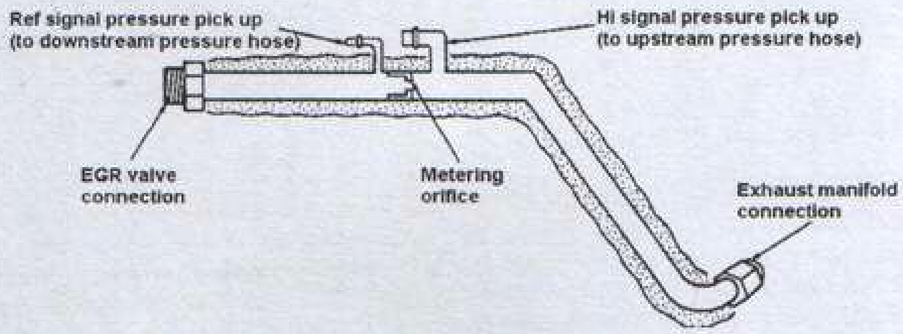
Exhaust Gas Recirculation Valve

The EGR valve in the Differential Pressure Feedback EGR system is a conventional, vacuum-actuated EGR valve. The valve increases or decreases the flow of exhaust gas recirculation. As vacuum applied to the EGR valve diaphragm overcomes the spring force, the valve begins to open. As the vacuum signal weakens, at 5.4 kPa (1.6 in-Hg) or less, the spring force closes the valve. The EGR valve is fully open at about 15 kPa (4.5 in-Hg).

Since EGR flow requirement varies greatly, providing service specifications on flow rate is impractical. The on-board diagnostic system monitors the EGR valve function and triggers a Diagnostic Trouble Code if the test criteria is not met. The EGR valve flow rate is not measured directly as part of the field diagnostic procedures.

Orifice Tube Assembly

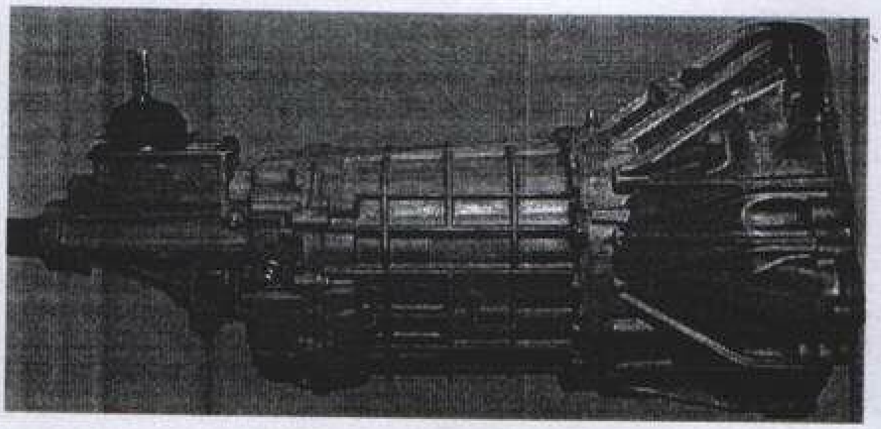
The orifice tube assembly is a section of tubing connecting the exhaust system to the intake manifold. The assembly provides the flow path for the EGR to the intake manifold and also contains the metering orifice and two pressure pick-up tubes. The internal metering orifice creates a measurable pressure drop across it as the EGR valve opens and closes. This pressure differential across the orifice is picked up by the differential pressure feedback EGR sensor that provides feedback to the PCM.



Transmission

Manual Transmission

The manual transmission featured on the MG X Power SV is the Tremec 3650.



Tremec is part of the Transmission Technology Corporation (TTC) that in turn is part of the Desarrollo Ecomonico Sociedad Civil (D.E.S.C) Group the biggest automotive component supplier in Mexico with facilities in Queretaro, Mexico and Knoxville Tennesse.

D.E.S.C acquired Tremec in 1994 and expanded further to acquire Borg Warner in 1997.

Features:

- Triple shaft selector system
- 5 speed constant mesh
- Fully synchronised forward and reverse gears
- All gears are helical cut
- Alloy casings

The manual transmission comprises of three shafts, input shaft, output shaft and the countershaft.

Transmission Number

The manual transmission information number is stamped on a tag located on a lower fixing securing the rear extension housing to the main transmission case.

TCET1789 AB	Transmission Assembly Number
AC141	Build Code
2R33 7003 AC	Identification Number
10474	Serial Number