JAGUAR

XJ6 & VANDEN PLAS 3.6

TECHNICAL INTRODUCTION

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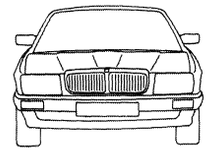
INTRODUCTION

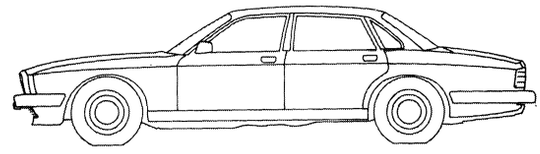
Throughout their six years of development, the new XJ6 and Vanden Plas models have been shaped and molded into exciting new automobiles. The development of the new Jaguar has been an evolutionary process which has successfully blended traditional Jaguar elegance with "state of the art" technology leaving no doubt that the new cars are pure Jaguar.

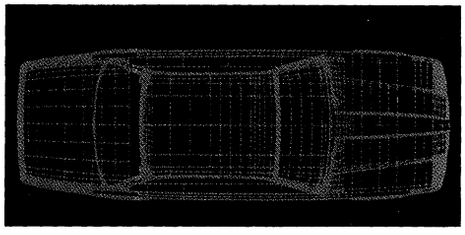
INTRODUCTION

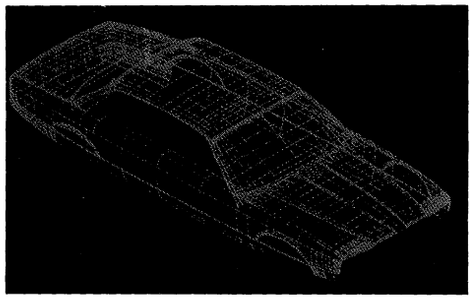
DISTINCTIVE STYLING

Created by designers who are intimate with the Jaguar styling heritage, aerodynamics were used to serve, not dictate the style of the new Jaguar. The elegant sweeping lines, which make a Jaguar totally distinctive, can be traced back through the lineage of past Jaguar models. The latest interpretation has produced a modern, prestigious and aerodynamically efficient shape. Although the size of the new car is comparable to the Series III, interior space and comfort have been increased.







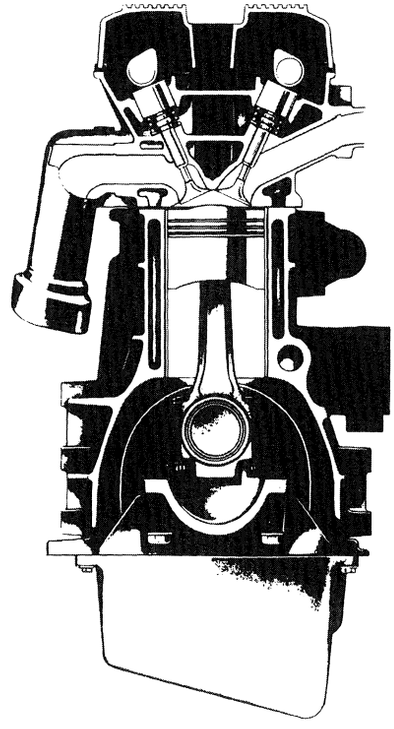


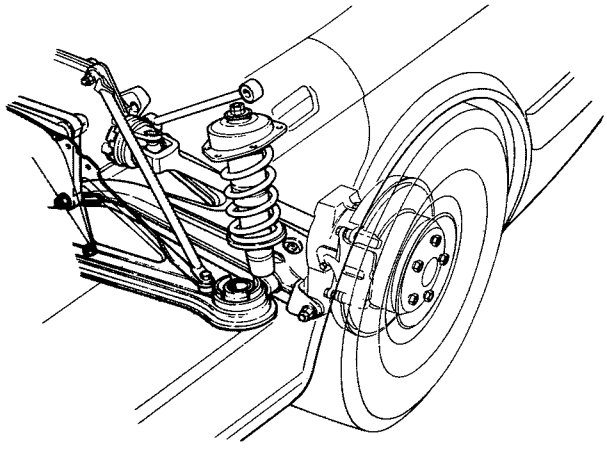
QUALITY AND RELIABILITY

5,500,000 miles of on-road testing in extremes of climate and road condition was only one part of the exhaustive testing program for the new Jaguars. Approximately 1700 new components were put through accelerated life tests on specially designed test rigs. Suppliers are building components to stringent quality standards which are being closely monitored. New testing and inspection procedures have been introduced to ensure the quality and reliability of the new cars. New facilities have been created and advanced manufacturing technology has been employed making the cars simpler to build while at the same time adding refinement and integrity, and more accurate assembly.

PERFORMANCE REFINEMENT EFFICIENCY

A new all aluminum alloy 6 cylinder, 24 valve engine designated as AJ-6 is fed and controlled by an advanced engine management system. The result is effortless power and whispering refinement. Driving through an efficient 4-speed automatic transmission with a "lock-up" torque converter, the new Jaguar achieves better fuel economy than ever before.



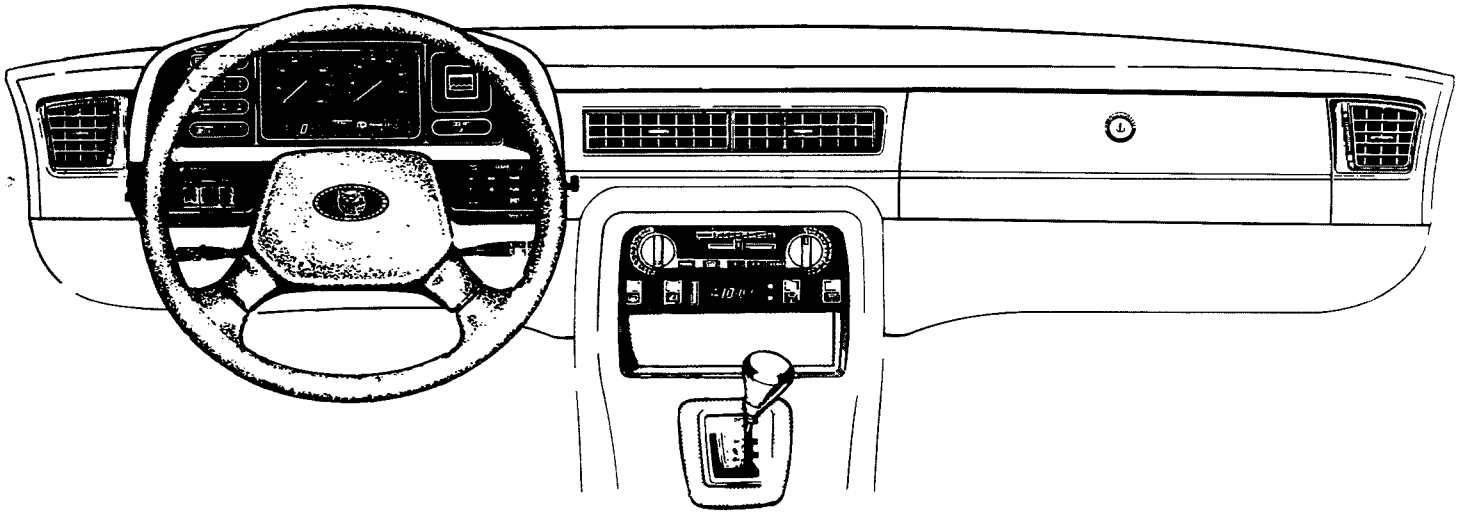


RIDE AND HANDLING

Living up to the standards of the Series III cars would be difficult enough; however, the new Jaguars surpass these standards in every respect. The new suspension system delivers outstanding road holding and a silky smooth ride. New engineering refinements have been introduced: hydraulic power boost for the braking system produces additional efficiency, anti-lock braking prevents the wheels from locking during braking helping to maintain vehicle stability and control. And, rear ride levelling ensures optimum performance under load.

ADVANCED TECHNOLOGY

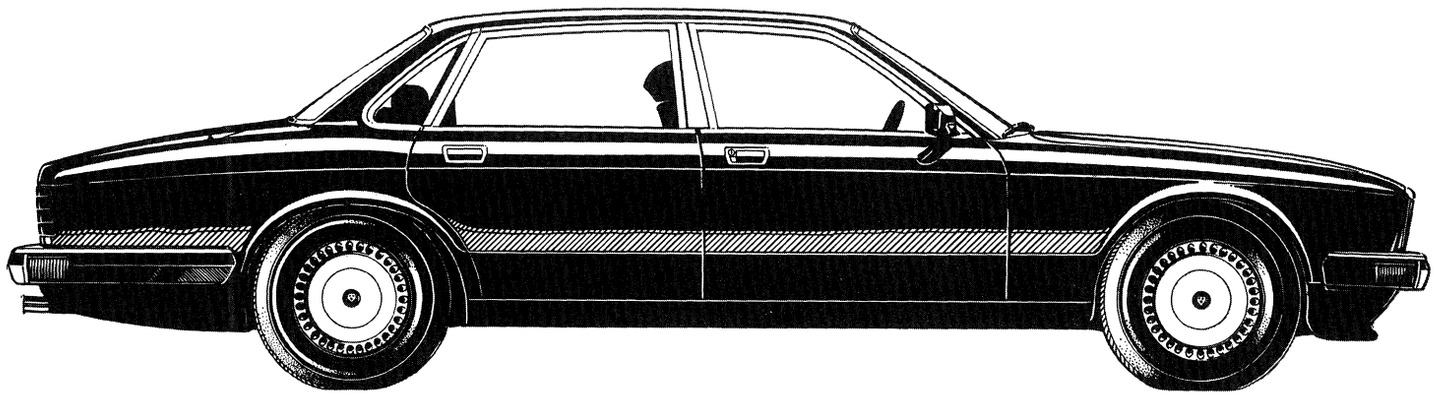
In every major vehicle function from Engine Management to the sophisticated instrumentation, Jaguar's use of microprocessor technology has achieved new standards in control and reliability. The new Jaguar is technically one of the most advanced cars of its time. This has been achieved through a completely new approach to electrical operation and design. One of the major products of this new approach is JDS (Jaguar Diagnostic System). Only the use of JDS will ensure total quality and accuracy when diagnosing the electrical system in the dealership.



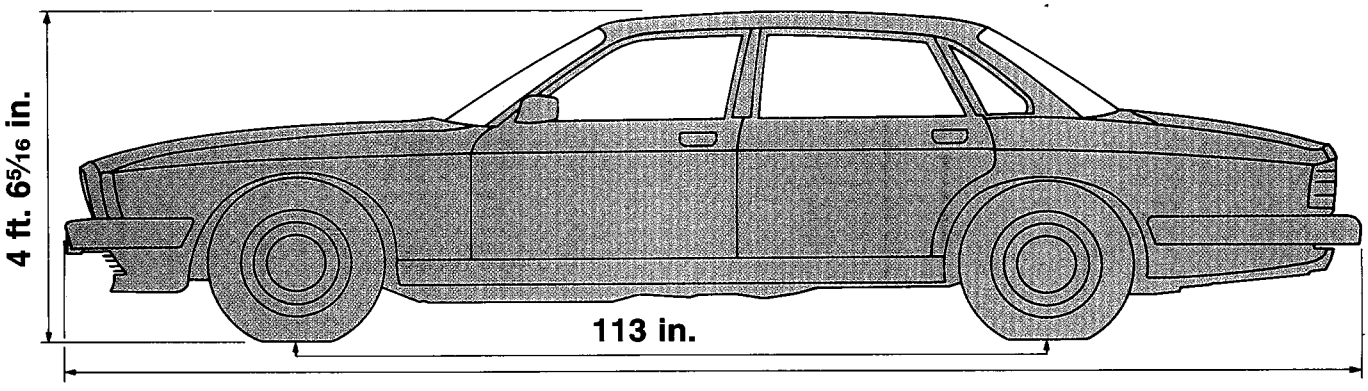
LUXURY

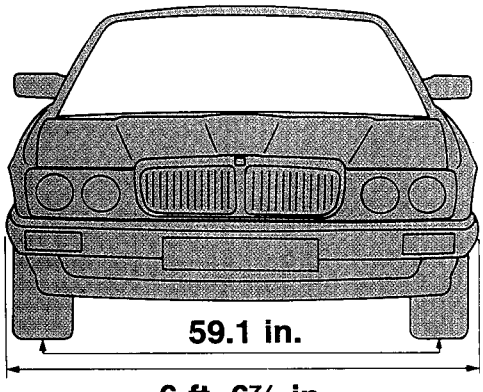
Hand-crafted wood and leather appointments are distinctively Jaguar. These have been blended with the most sophisticated luxuries and conveniences. The new Environmental Control System allows precise adjustment of air distribution, temperature, and humidity levels. Heated eight-way power seats and a specially designed multi-speaker in-car entertainment system are among the many refinements. Central locking, window and sunroof operation, and interior lighting are microprocessor controlled which allows several modes of operation. An extensive program of ergonomic development has integrated this equipment tastefully and discreetly into the beautifully designed interior.

The overriding priority in designing the new body was quality. Beyond this, six major objectives governed the body design of the new XJ6 and VDP:



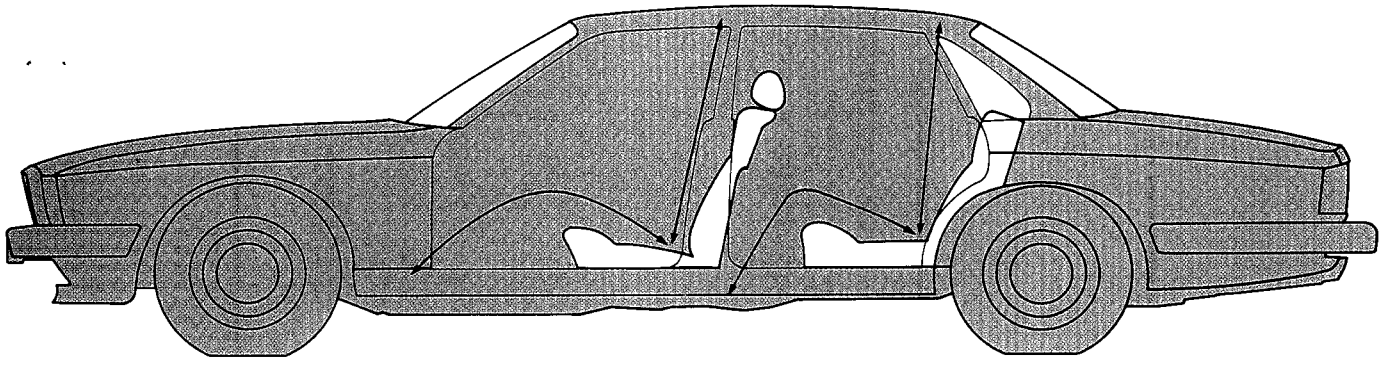
- *It was to be aerodynamically efficient, but the styling should remain unmistakably Jaguar.*
- *It would provide more interior space while maintaining exterior dimensions similar to the Series III.*
- *It would be lighter and easier to manufacture with improved panel fit and accuracy.*
- *Its structural integrity and quietness would continue to develop the Jaguar tradition.*
- *Its quality of paint finish would be outstanding.*
- *It would be better protected against corrosion than previous models.*





Shoulder Room 57+ in. front and rear

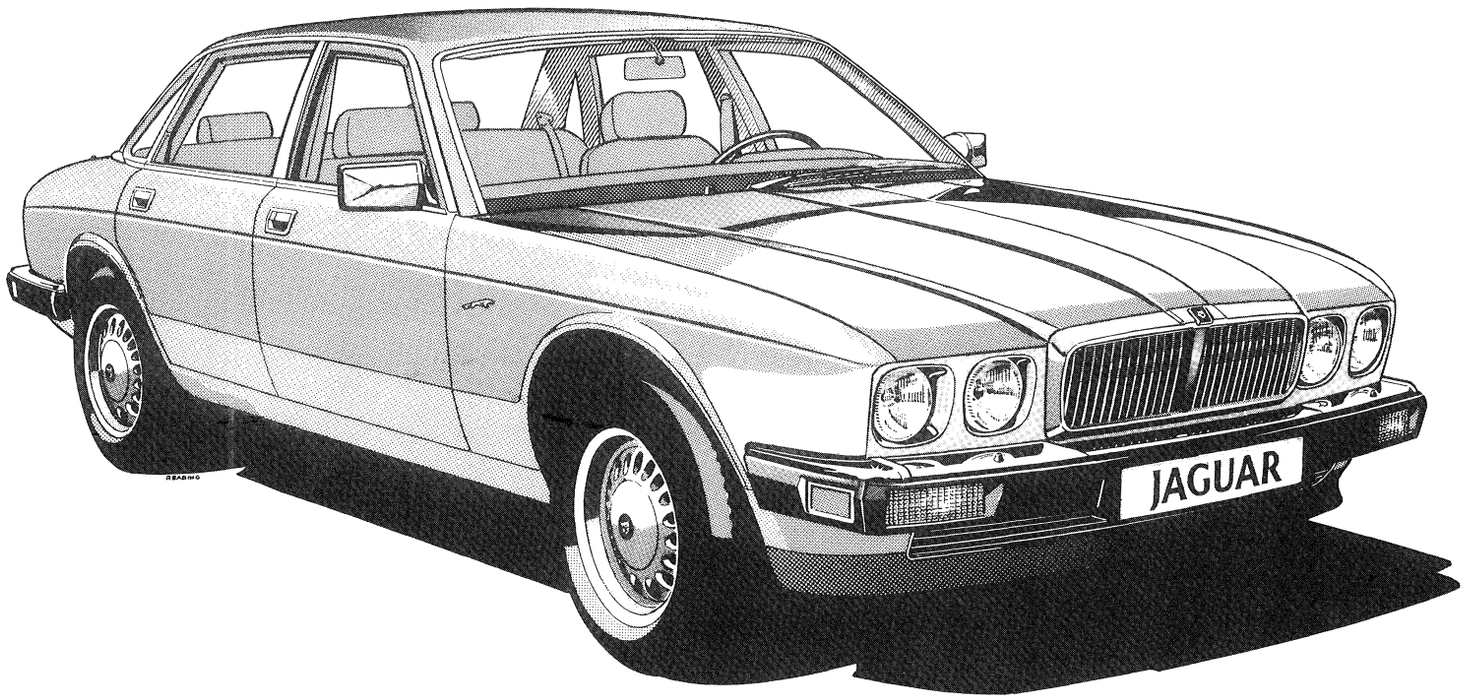
Trunk Space 15.1 cu.ft.



Vehicle Data:

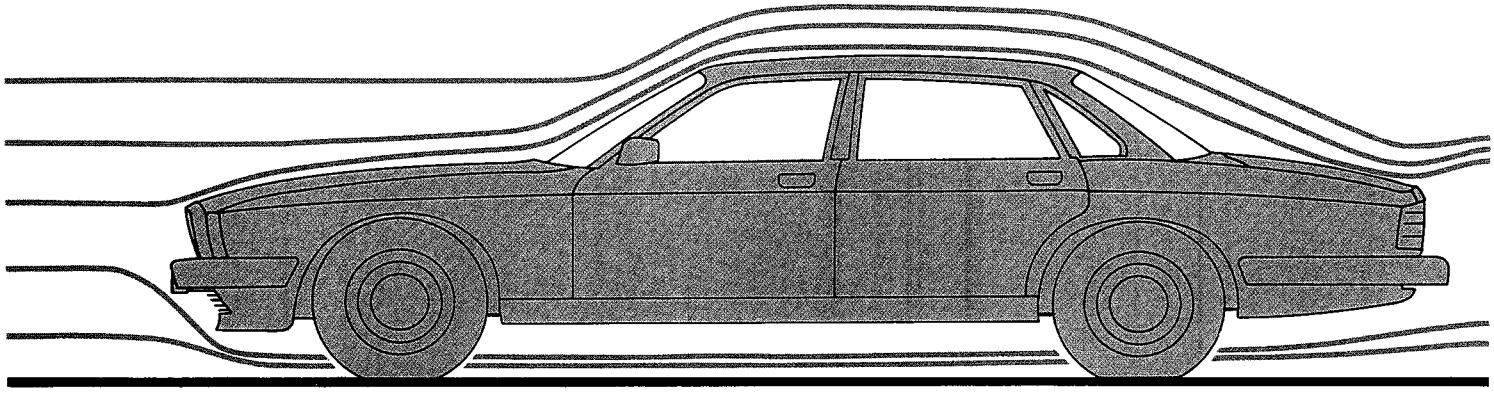
	XJ6	VDP
Curb Weight—	1734 kg 3824 lb	1771 kg 3904 lb
Gross Vehicle Weight—	2144 kg 4728 lb	2181 kg 4808 lb
Tires—	Pirelli P5 205/70 VR 15 Cinturato	
Fuel Tank Capacity—	24 gallons	

The designers' philosophy was that the style of the new car would not be dictated by aerodynamics. Instead they would strive for improved aerodynamic efficiency within the classic Jaguar lines. Another priority was to retain the Series III's stability at high speed.



Jaguar Identity

The subtle styling features which makeup the Jaguar identity are all there withing the clean, modern lines: the front grille, the flowing curve of the rear panels over the large wheels, the distinctive shape of the rear quarter windows, and the catlike quality of the car's low, confident stance—all these are unmistakable Jaguar hallmarks.



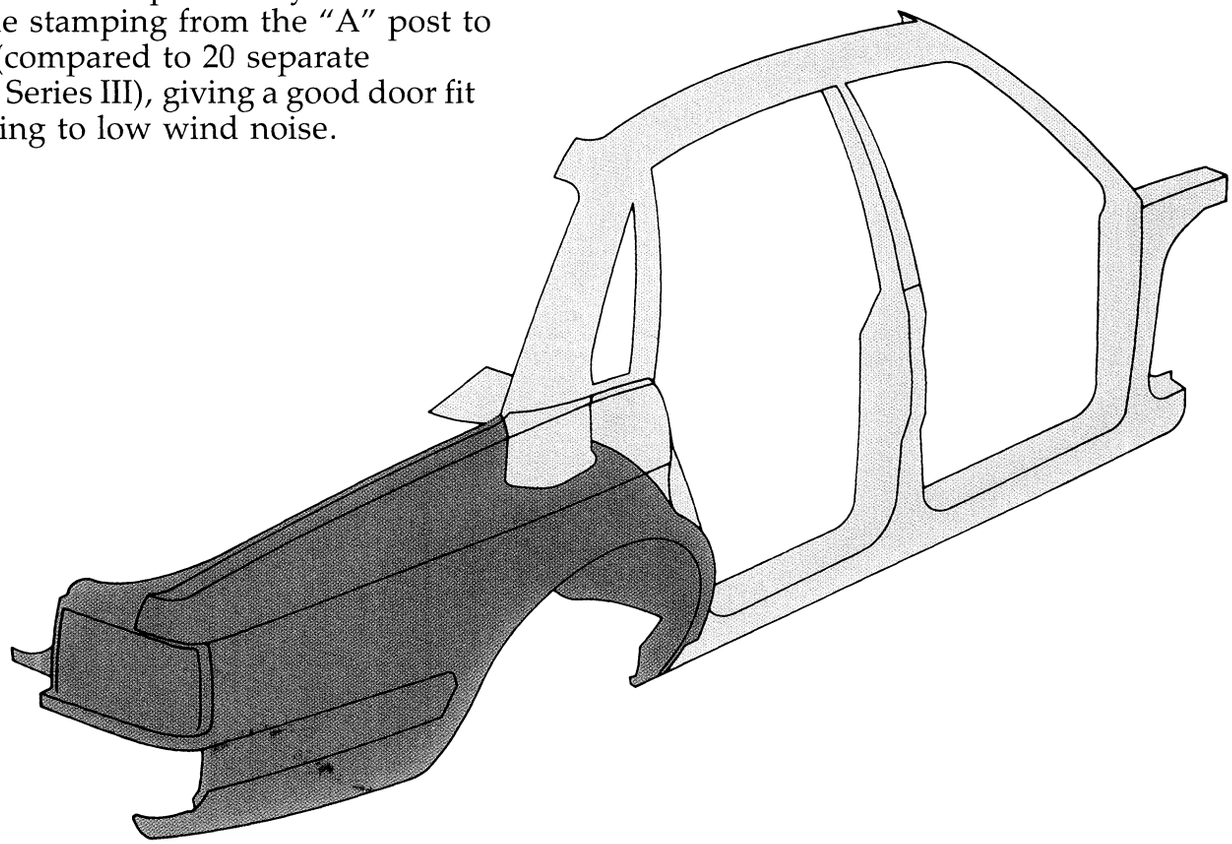
Aerodynamic Efficiency

Good aerodynamics are essential for low wind noise, improved fuel economy, and a high top speed. The front end is the most critical area with the angle of the grille and the styling of the headlights requiring careful study. Smoothing of the hood line, rounding the "A" posts, and mounting the mirrors in the window "cheater" panel also contributed to improved aerodynamic efficiency. The front spoiler helps reduce drag by improving air flow.

Stability

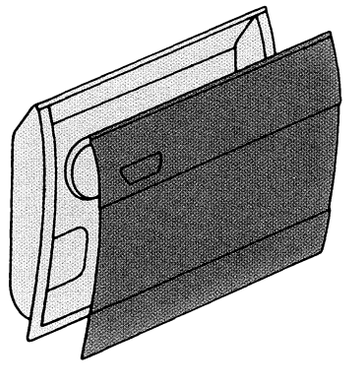
The stability of the new Jaguars is controlled both by aerodynamics and mechanical layout. The front to rear aerodynamic lift distribution is controlled by the precise trade-off between the depth and rake of the front spoiler, and the size and angle of the discreet lip on the rear of the trunk lid. The lateral center of pressure is precisely positioned by the slope of the rear window and the shape of the front end. The mechanical layout achieves a balanced front to rear weight distribution.

The body structure is designed for ease of manufacturing, accuracy, and consistency. 136 fewer panels than Series III are used in the new Jaguars—that's a reduction of 25%. A major development is the one-piece body side which is made in one stamping from the "A" post to the "E" post (compared to 20 separate stampings for Series III), giving a good door fit and contributing to low wind noise.



The simplified body structure has also brought important benefits to the overall quality of finish. The less complicated shapes of joints and seams eliminates the need for leading. This reduces the possibility of contamination and panel damage, and improves the fit of doors and seals.

A further benefit of the use of less panels is a very stiff structure. The new Jaguars have excellent torsional and beam rigidity—enhancing both safety and refinement.



Another example of structural simplification is the door, with just one stamping instead of three being used for the inner panel.

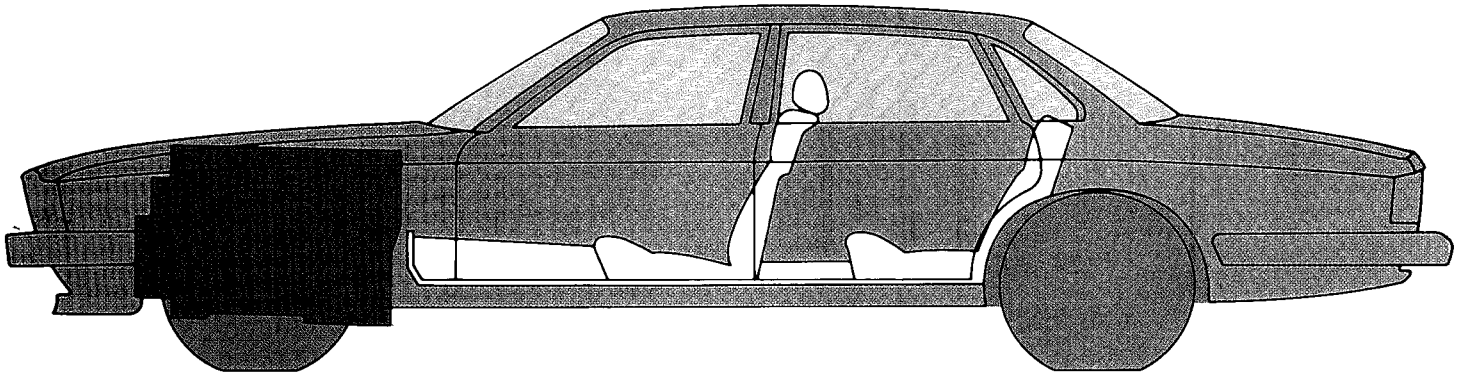
Weight reduction was essential for achieving good fuel economy. Skillful engineering has achieved significant weight reduction without any sacrifice in ride comfort or quietness.

Components

The aluminum alloy engine made the single most important contribution to weight savings. Wherever possible, components were made from lighter materials, or redesigned to use less material.

Glazing

All glass was reduced in thickness. The windshield and rear window are now 5mm thick.



Body

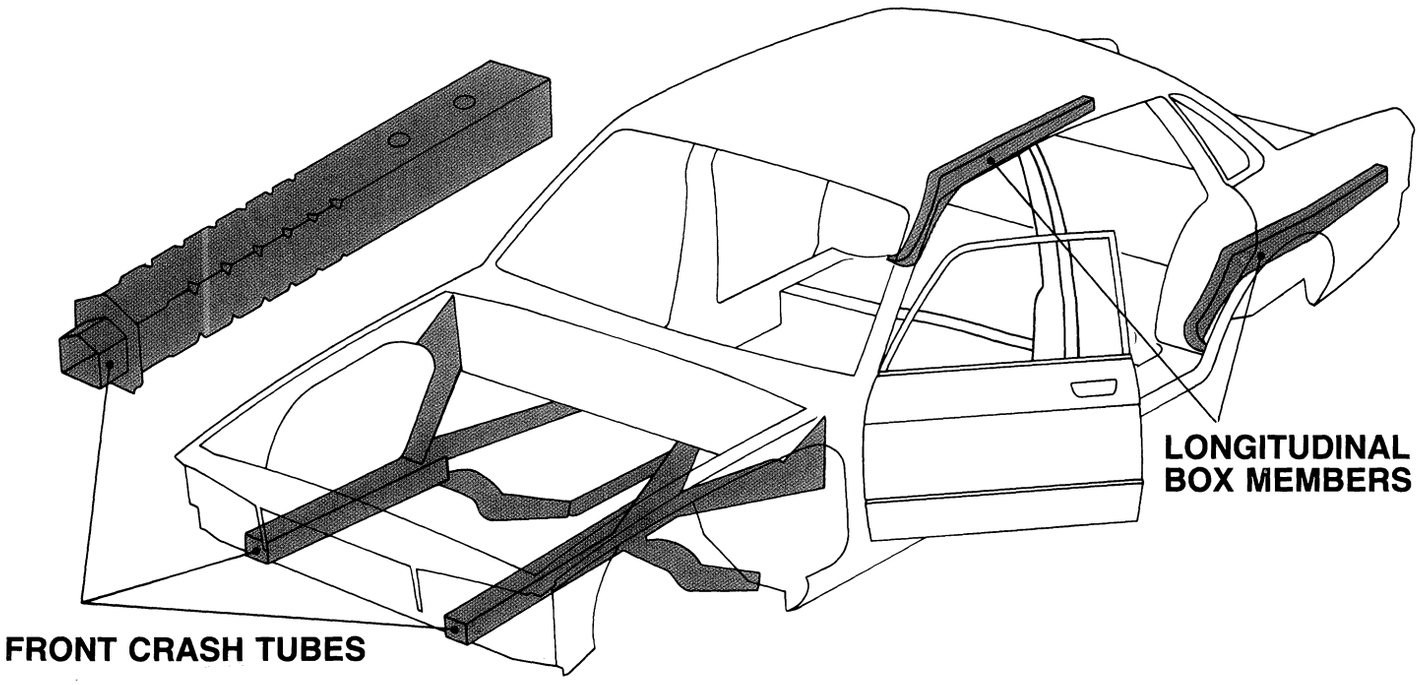
One of the many benefits of the reduced panel count was a reduction in weight. Far fewer stiffeners and panel overlaps are required.

Trim

Lighter materials are used with discretion—and never where they would affect quality, finish, and luxury appointments.

Side Protection

The large door sills are very stiff in section and interlock with the doors to form a substantial barrier against side impacts.

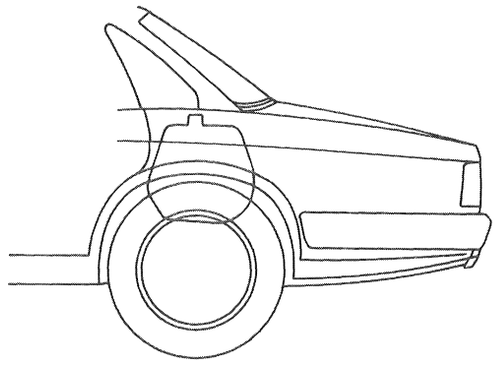


Front Protection

In order to keep the passenger compartment intact, the body structure must be able to progressively absorb impact forces. At the front end, 2 "crash tubes " running the length of the engine compartment, are designed with small notches. This allows them to crumple in a controlled manner dissipating impact energy. Impact force is then transmitted from the "crash tube" *around* the rigid passenger compartment—along the transmission tunnel, and into the door sills and "A" posts.

Rear Protection

Rear impacts are absorbed by the longitudinal box members which continue rearward from the door sills. The fuel tank, positioned above the rear axle, is also protected by these members.



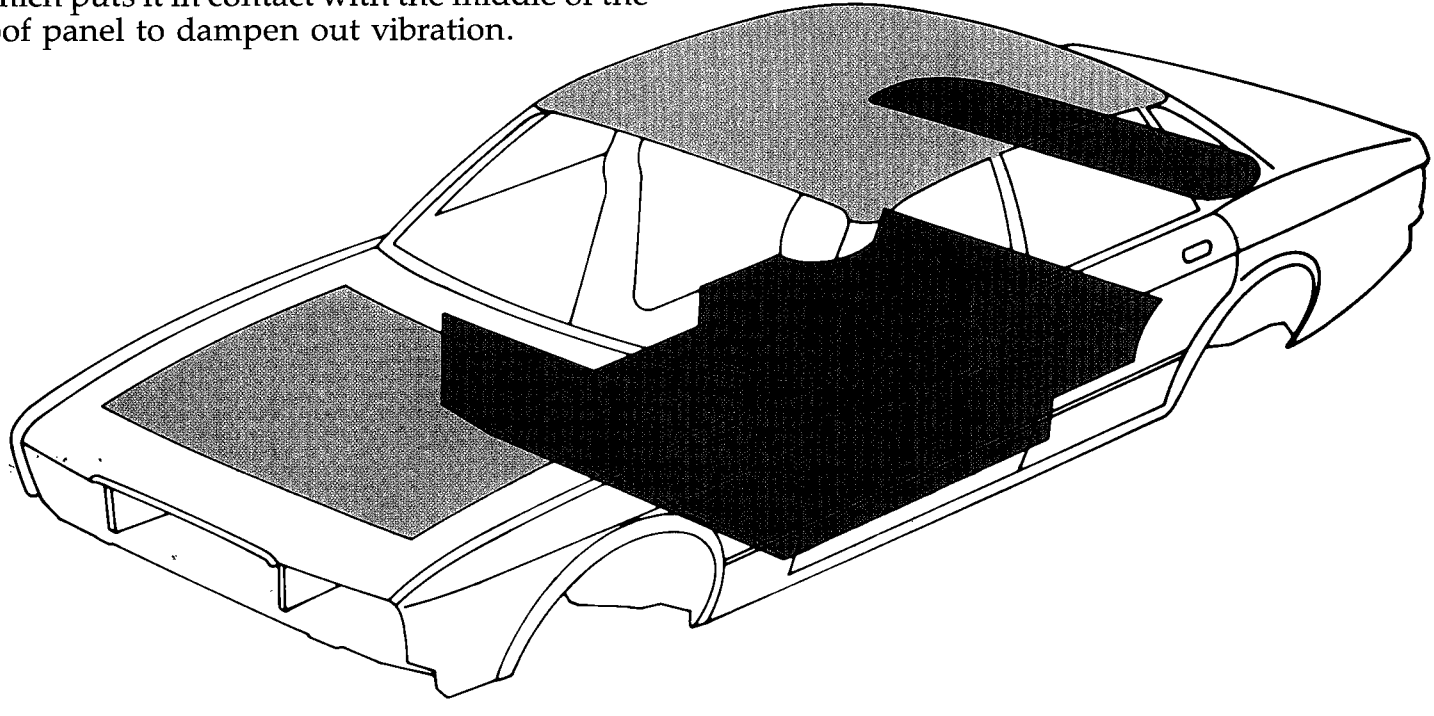
Refinement, a word synonymous with Jaguar, is designed into every part of the new car using Computer Aided Engineering together with the careful placement of sound insulation materials. Computer analysis allowed the design engineers to "tune out" annoying resonances by altering the mass of the component, or adding stiffening or dampening.

Sound Insulation

A lightweight insulating material is used throughout most of the car—on the bulkhead, the entire floor, and the rear seat panels. The material consists of a ½ inch thick foam layer attached to a top layer of barrier material made of synthetic rubber.

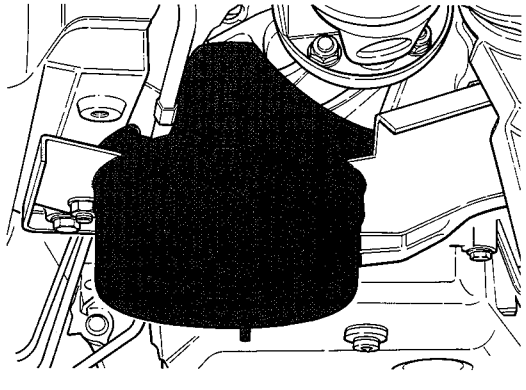
The molded headliner also provides sound insulation. Additionally, it has an "overbend" which puts it in contact with the middle of the roof panel to dampen out vibration.

The parcel shelf has a foam pad to reduce resonance. The hood is fitted with a sound insulating liner. Full interior carpeting and a completely trimmed trunk also contribute to quietness.



Engine Mounts

The front of the engine is mounted on the suspension subframe. This gives an extra layer of isolation. The engine is further isolated by a specially tuned rear engine mount. This consists of a steel mass located between the transmission and the body by two springs. The system has been designed to provide optimum engine isolation at mid-range engine speeds.

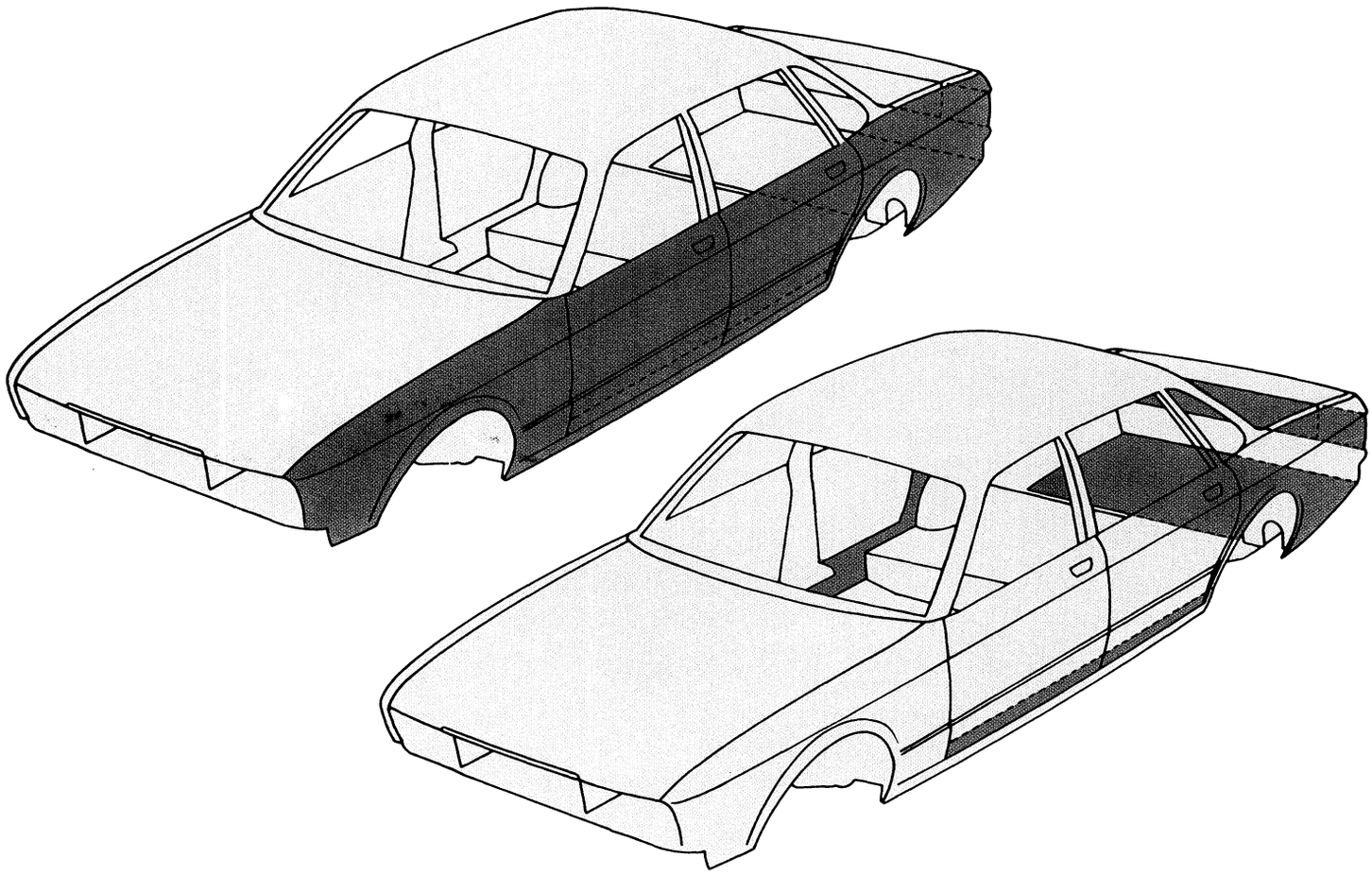


FINISH

The latest paint technology, combined with corrosion protection established through some of the roughest tests in the world, have made the new Jaguars both beautiful and highly durable. The deep luster of the paint colors is achieved through the Clear Over Base process. The color coats are electrostatically applied first, and then covered with two coats of clear—giving a very smooth and durable finish.

CORROSION PROTECTION

During the production process, five major anti-corrosion steps provide long lasting protection:



Zinc-Coated Steel

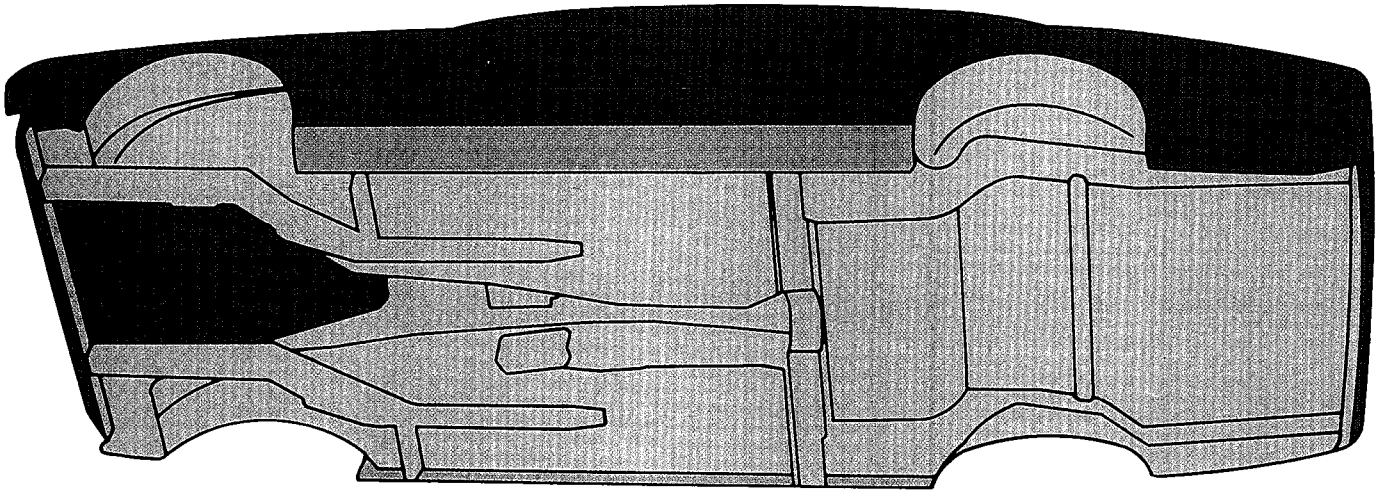
The extensive use of zinc-coated steel in areas where moisture can accumulate has substantially increased protection.

Seam Sealing

All seams and joints on door edges, hood and trunk lids, and the body have a flexible cosmetic bead sealant applied by robot. This provides a smooth, corrosion-resistant joint.

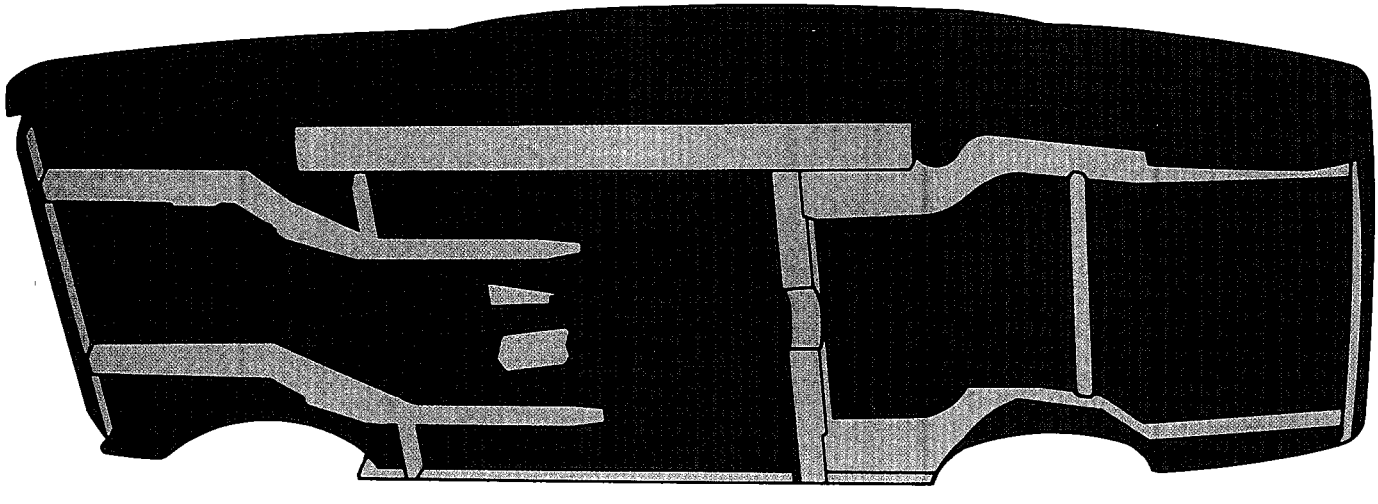
Cathodic Primer Application

A cathodic process in which the body is charged negatively and the primer paint bath charged positively results in a more even and thorough coverage than the anodic method (body charged positive, primer charged negative).



Underbody Sealing

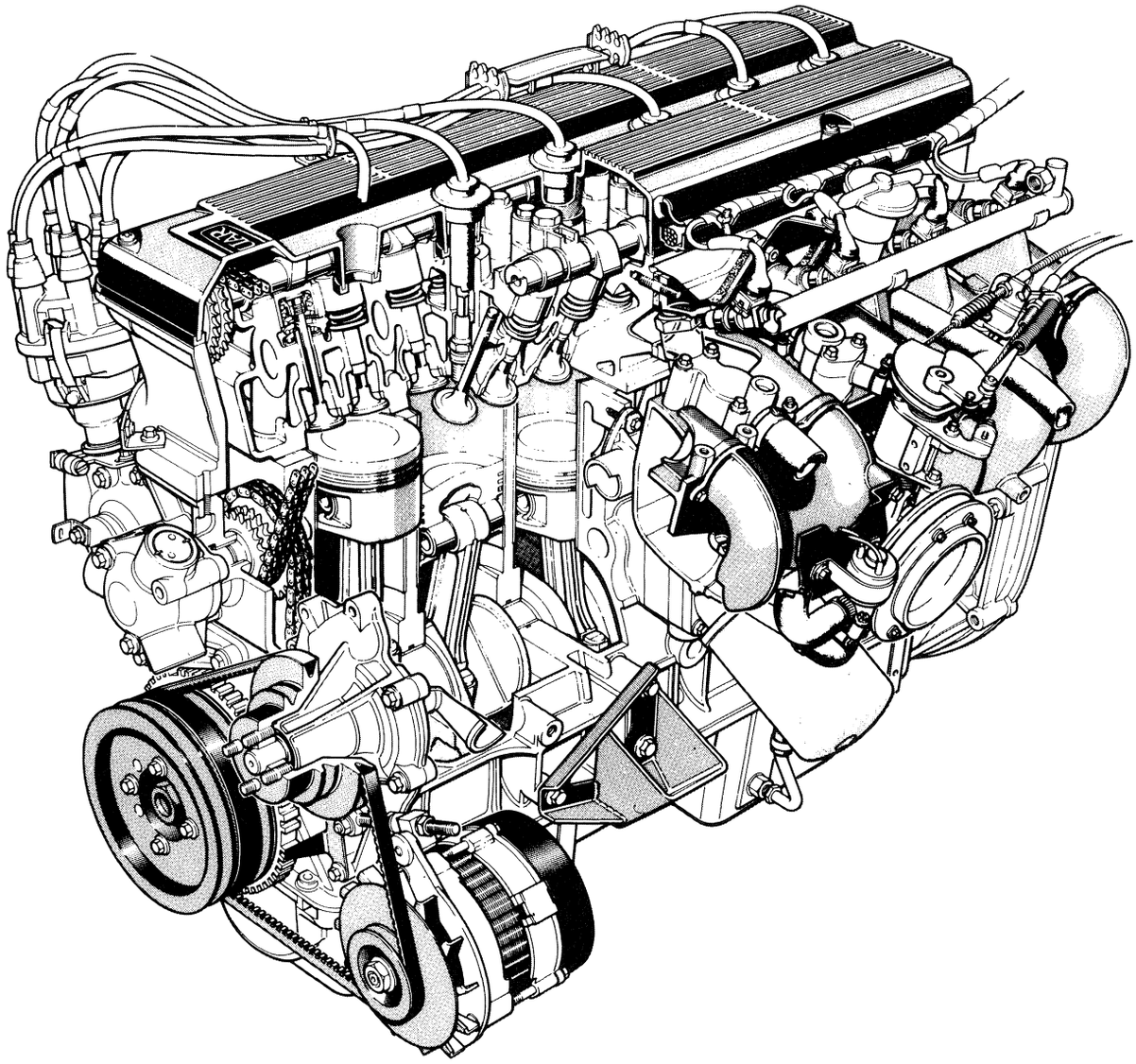
The complete underbody including the door sills is coated with a tough sealant. The sills are further coated with anti-chip paint.



Wax Injection

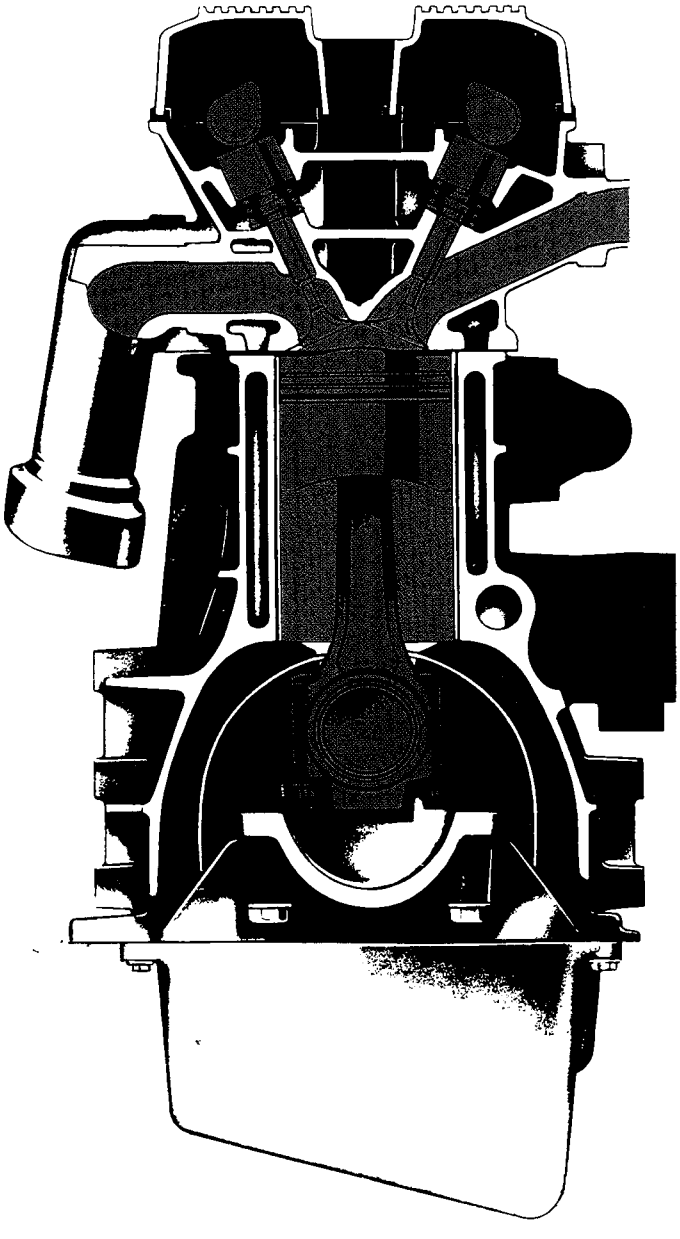
All box sections and closed areas are hot wax injected using special "wands" to give thorough coverage.

The all new 3.6 litre AJ-6 engine combines high performance with exceptional flexibility and refinement. The classic 6 cylinder layout includes double overhead camshafts and 4 valves per cylinder. Both the cylinder head and engine block are constructed of aluminum alloy making the AJ-6 very light in weight.



Engine Data AJ-6 3.6

Number of Cylinders	6 (number 1 at front)
Bore and Stroke	91mm x 92mm
Displacement	3590cc
Compression	8.2:1
Firing Order	1, 5, 3, 6, 2, 4
Ignition Timing	Fully Mapped Microprocessor System
Distributor Rotor Rotation	Clockwise (looking down)
Valve Clearances	Intake and Exhaust 0.012-0.014 in.
Compression Pressure	160-170 PSI
	10 PSI max. differential between cylinders
Fuel Injection	Fully Mapped Microprocessor System
Fuel Pressure	43 PSI ± 1 PSI (vacuum disconnected)



Engine Block

The engine block is manufactured in cast aluminum alloy with dry, cast iron cylinder liners. The skirted design of the engine block extends below the crankshaft center line, ensuring strength and rigidity.

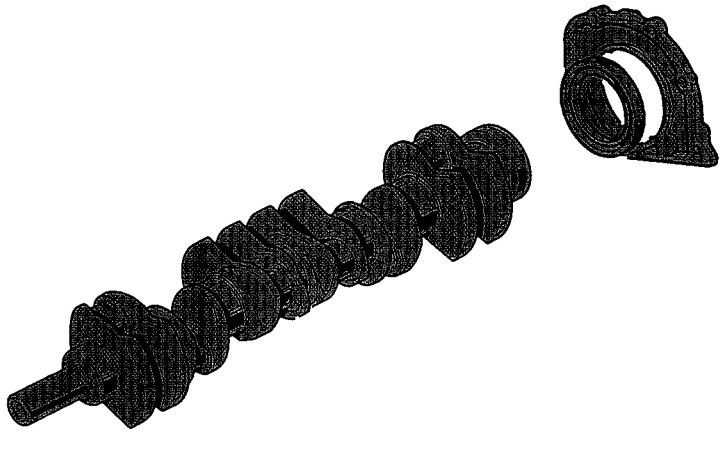
Connecting Rods and Pistons

The steel connecting rods are forged in an "H" section for strength. Aluminum alloy pistons are fitted with a spring assisted micro land oil control ring located below a barrel-faced chrome compression ring and a stepped taper-faced secondary ring.

Crankshaft

The cast iron crankshaft is nitro-carburise treated to produce a very high quality finish on the bearing surfaces and increase the life of the journals. Supported by seven rugged main bearings, the crankshaft resists flexing.

A new design lip-type seal provides a high degree of oil retention. It also allows easier serviceability as compared to previous type seals.

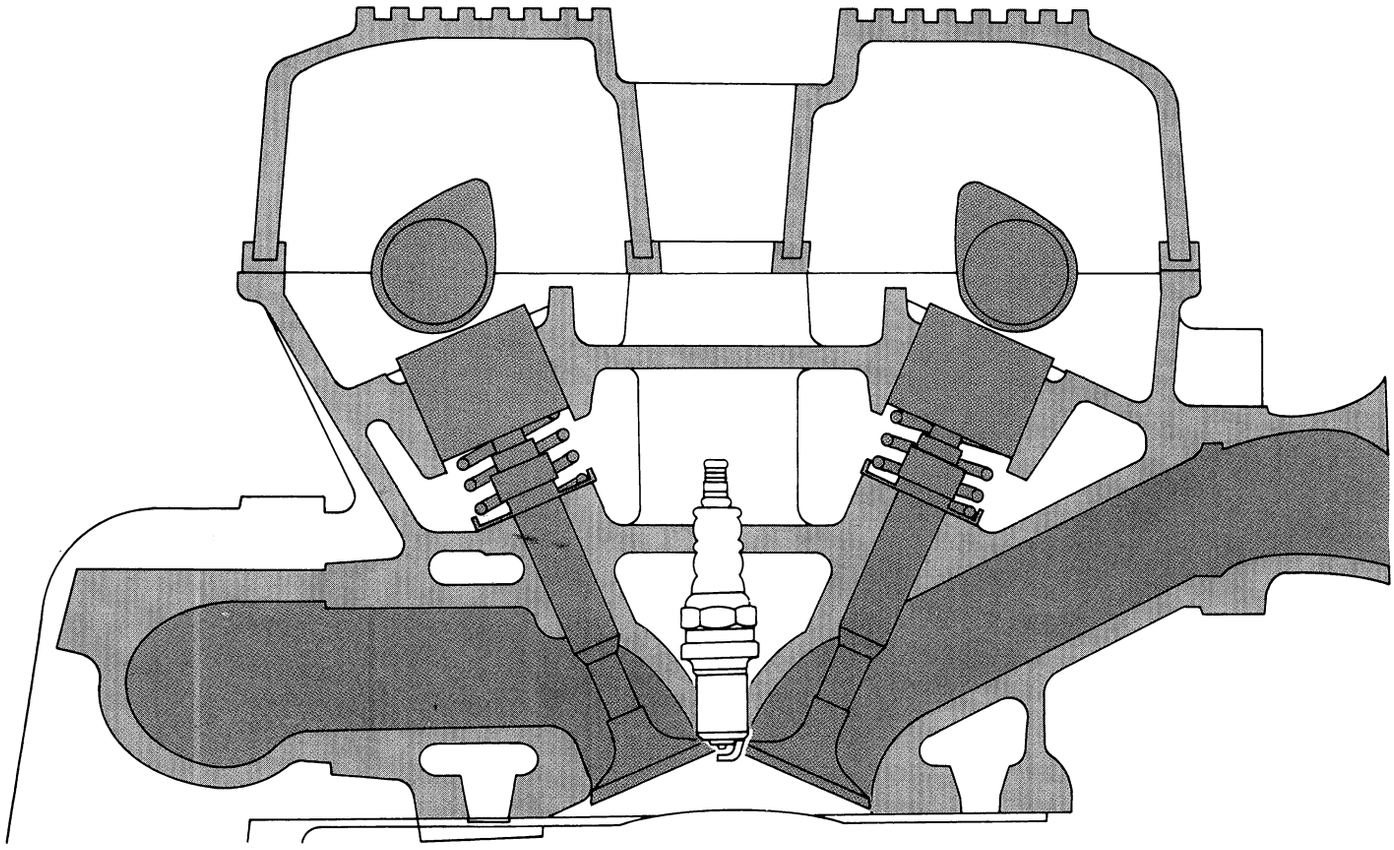


Four Valves Per Cylinder

Four valves per cylinder produces a greater combined area than two per cylinder. The smaller valves require less spring tension and have less stress on the operating gear. Power and efficiency are increased as the engine can "breathe" easier.

Two Camshafts

The two cast iron camshafts run directly in the cylinder head and are retained by machined aluminum caps. Each camshaft drives two valves per cylinder via bucket tappets with shim adjustment. Valve control is maintained by single valve springs.

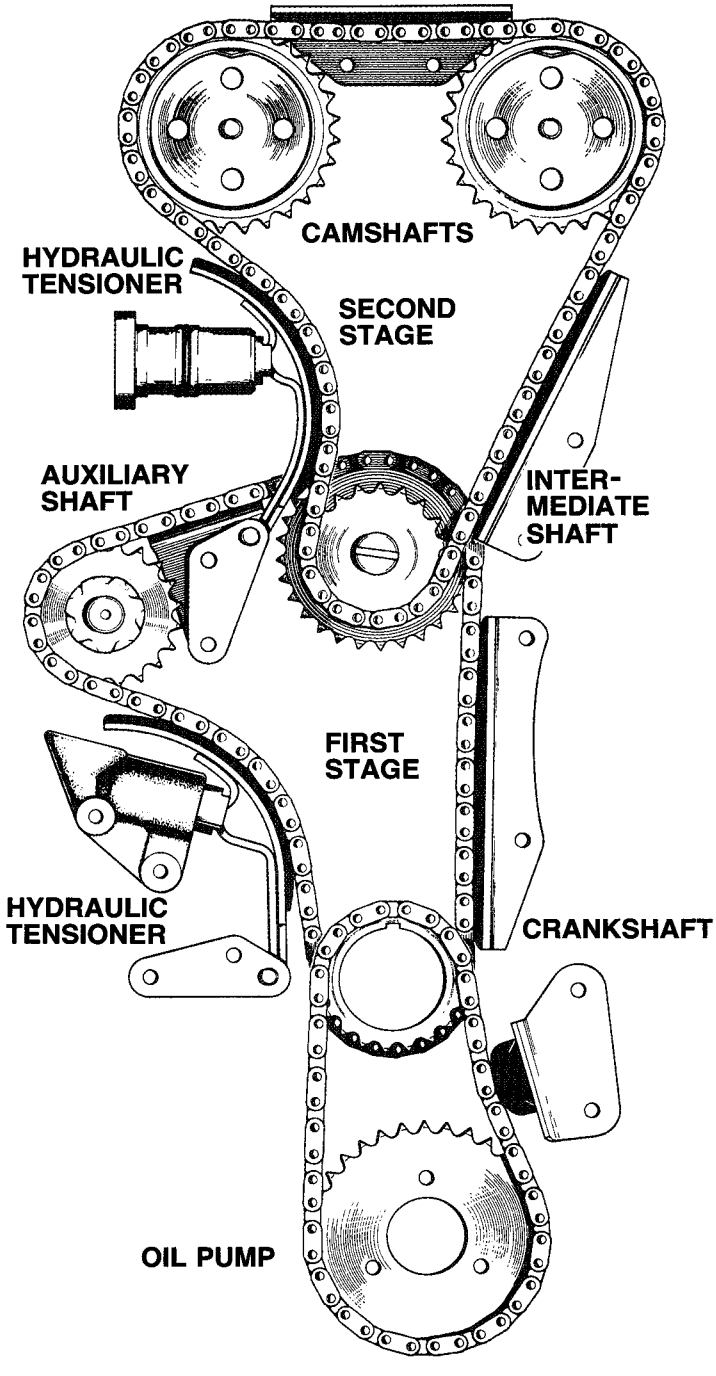


Pent-Roof Combustion Chambers

The pent-roof combustion chamber is both efficient and practical. The cross-flow design allows for a large valve opening area and free-flowing intake tracts. The centrally located spark plug gives a short flame travel within the combustion chamber for good burning. High power output and excellent performance result from the efficiency of the pent-roof design.

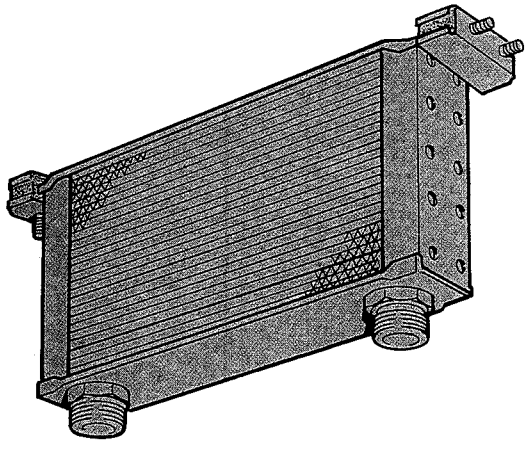
Camshaft and Accessory Drive

A two stage "duplex" (double row) chain drive from the crankshaft operates the camshafts and accessories. Each stage is controlled by a hydraulic tensioner operating through a pivoted rubber-faced blade. The first stage incorporates a three point drive via the crankshaft, intermediate shaft, and auxiliary shaft. The intermediate shaft provides the drive for the power hydraulic system pump. The auxiliary shaft provides the drive for the distributor through spiral reduction gears. It also provides drive for the power steering pump at the rear. The second stage three point drive operates between the intermediate shaft and the two camshafts. The coolant pump, alternator and air conditioning compressor are belt driven from the crankshaft pulley. The air injection pump is belt driven from the fan pulley.



Oil Cooler

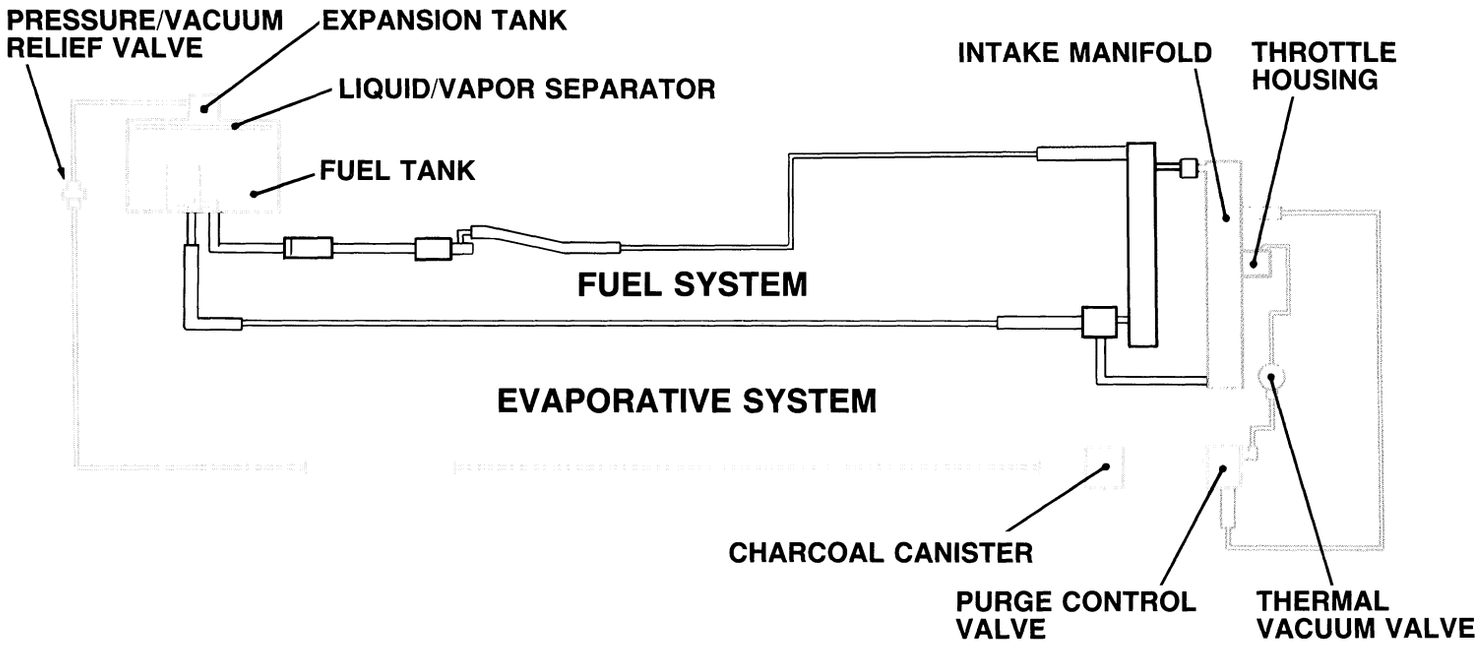
Oil is cooled before being filtered, via an external full flow oil cooler located under the radiator. A balance valve bypasses the oil cooler circuit when a differential pressure of 10 to 15 PSI occurs.



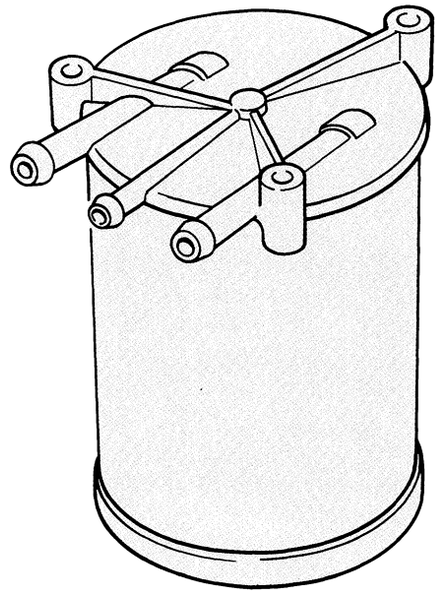
Oil Pump

A rotor type oil pump at the front of the crankcase is driven by a "simplex" (single row) chain from the crankshaft. The pump has a built-in pressure relief valve.

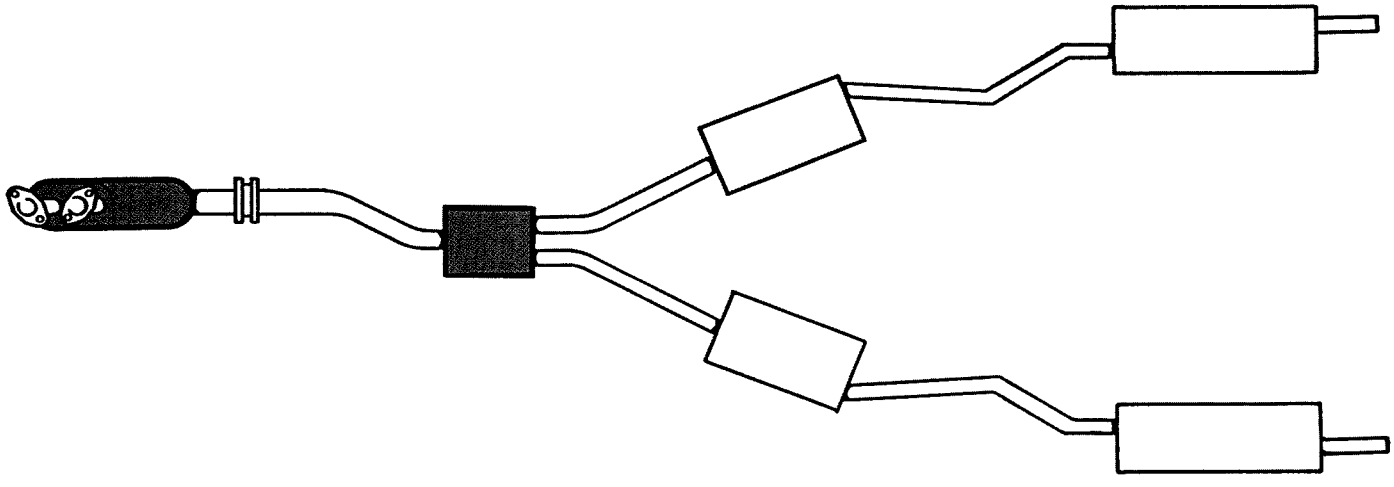
FUEL and EVAPORATIVE EMISSIONS CONTROL



The fuel tank incorporates an expansion tank which limits the fill level and allows for 10% fuel expansion. Tank venting is via a system of vapor pipes and a liquid/vapor separator to the charcoal canister located in the engine compartment. Vapor flow to the canister is controlled by a pressure/vacuum relief valve. Canister purging is controlled by a vacuum operated purge control valve with vacuum sourced at the throttle edge. Canister purging is inhibited until the engine coolant temperature exceeds 43°C (115°F). This is controlled by a thermal vacuum valve.

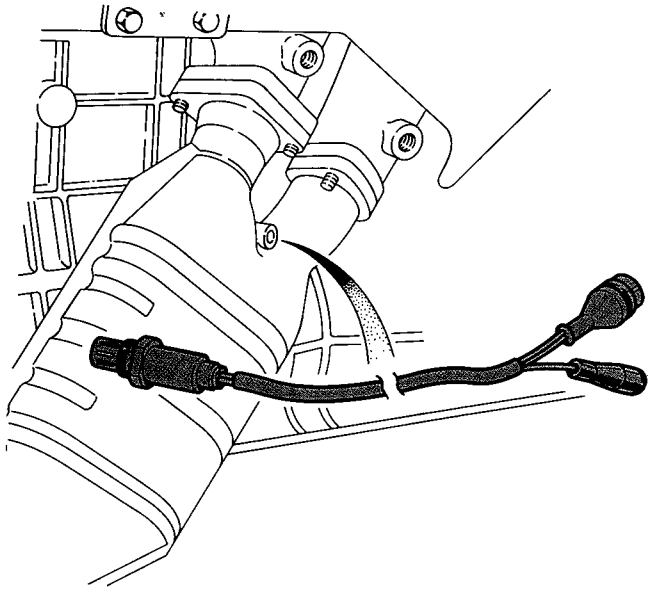


EXHAUST CATALYTIC CONTROL



Catalytic Converters

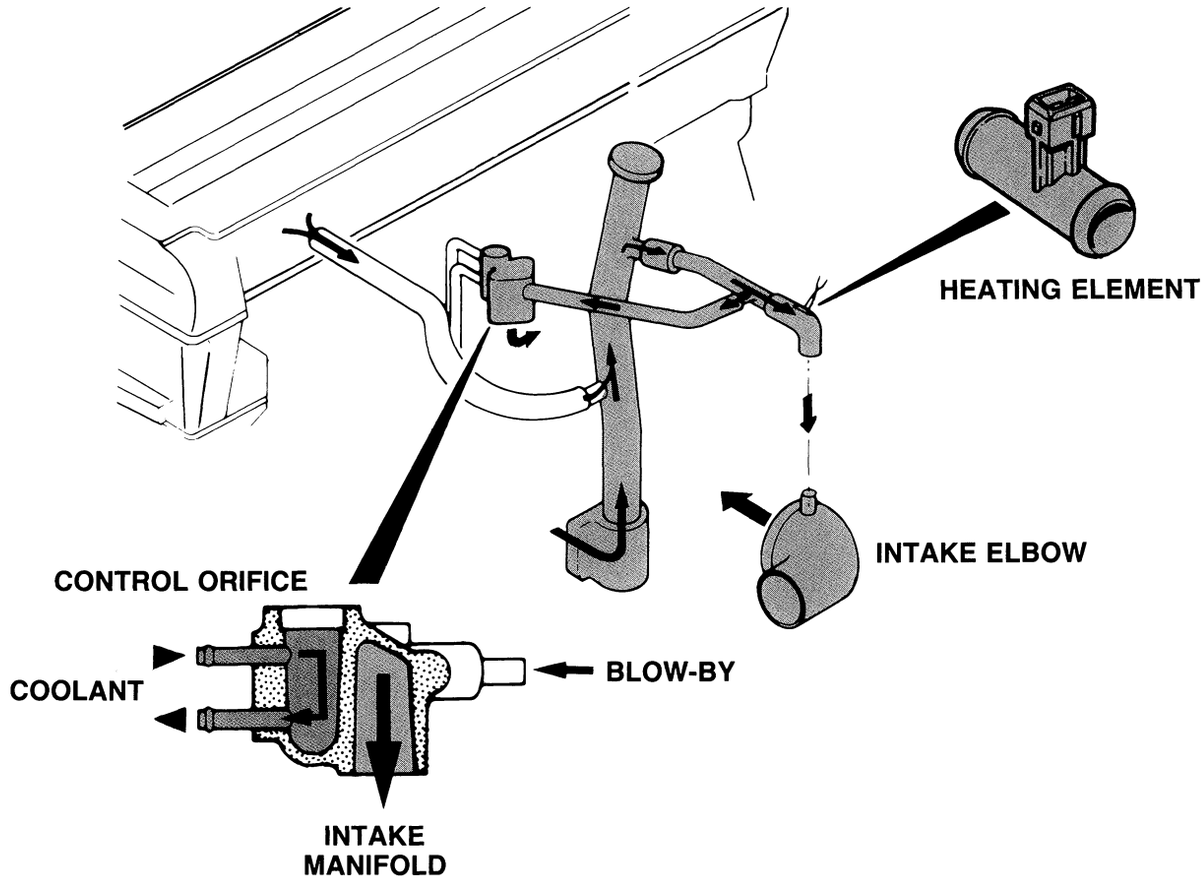
Two 3-way catalytic converters are mounted in the exhaust system—one in the down pipe close to the engine and the other under the car at the "Y" junction.



Oxygen Content

In order to achieve correct catalyst function, the exhaust oxygen content is monitored via a heated oxygen sensor located in the down pipe before the first catalytic converter. Oxygen content is adjusted by the Engine Management System.

CRANKCASE CONTROL



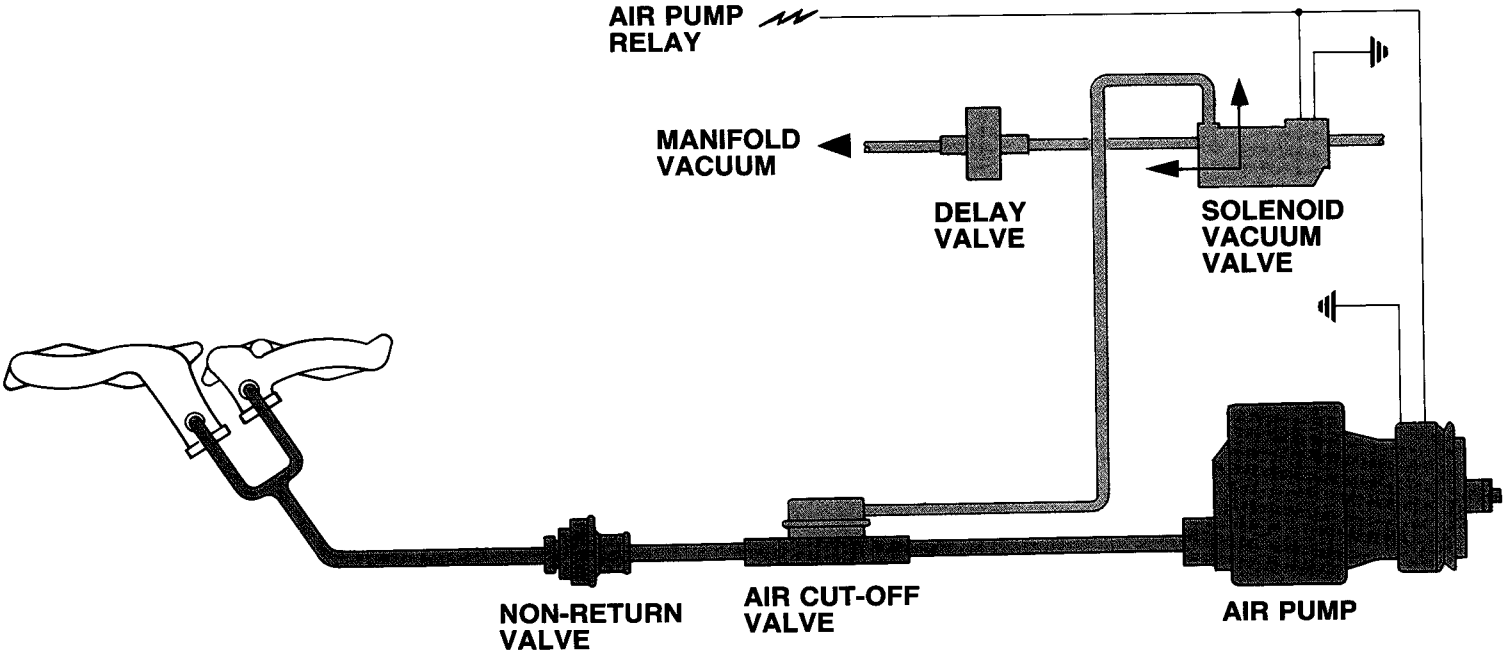
Crankcase Ventilation

Piston blow-by gasses are scavenged from the crankcase and the camshaft housing via the oil filler tube. These are collected and fed into the engine intake manifold at part throttle through the part throttle control orifice, and at full throttle through the air intake elbow.

Ice Prevention

To prevent possible icing-up during cold weather, the control orifice and the hose to the air intake are heated. The control orifice is continuously heated by engine coolant; the heater element is energized via a relay signal from the windshield washer jet temperature sensor.

AIR INJECTION



Air Injection

Secondary air is delivered to the exhaust manifolds during the initial engine warm-up period to aid oxidation. The rotary vane air pump is driven via an electromagnetic clutch by the accessory drive belt. The clutch is activated by the Engine Management System via a relay at coolant temperatures between 15 and 35°C (58-83°F) at engine speeds below 2500 RPM. A non-return valve prevents exhaust gas back flow to the air pump. A vacuum operated air cut-off valve prevents air being drawn into the exhaust when the pump is switched off. The operating vacuum to the air cut-off valve is controlled by a solenoid valve in a parallel circuit with the air pump clutch. A vacuum delay valve prevents vacuum loss to the solenoid valve during wide open throttle operation.

OVERVIEW

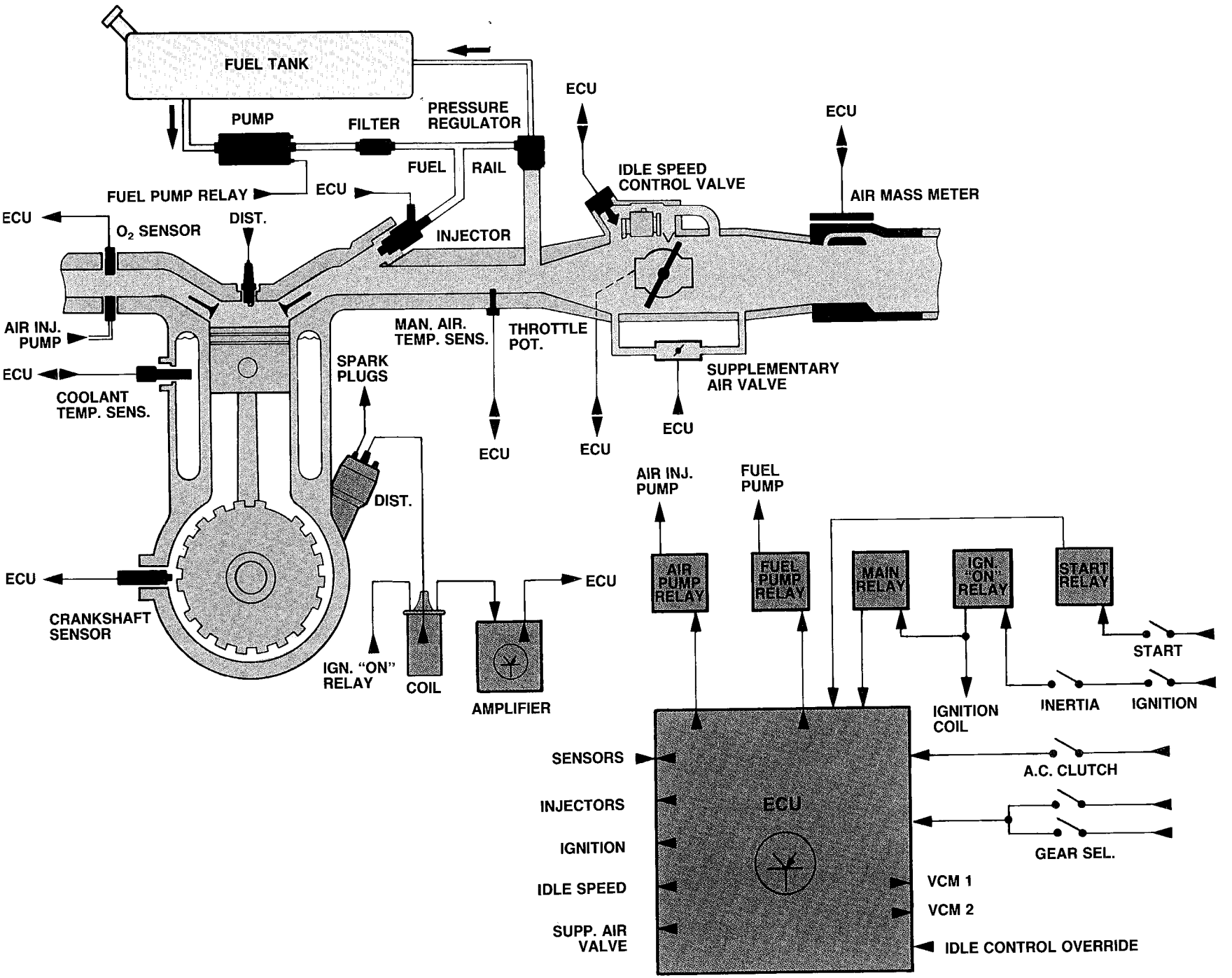
Main Functions

The engine management system maintains optimum performance over the entire engine operating range by precisely metering the fuel into each cylinder and adjusting the ignition timing. Both functions are performed by the ECU (Electronic Control Unit) which receives data from sensors located on and around the engine. The ECU evaluates optimum fuel metering and ignition timing parameters relative to engine load, speed, and condition.

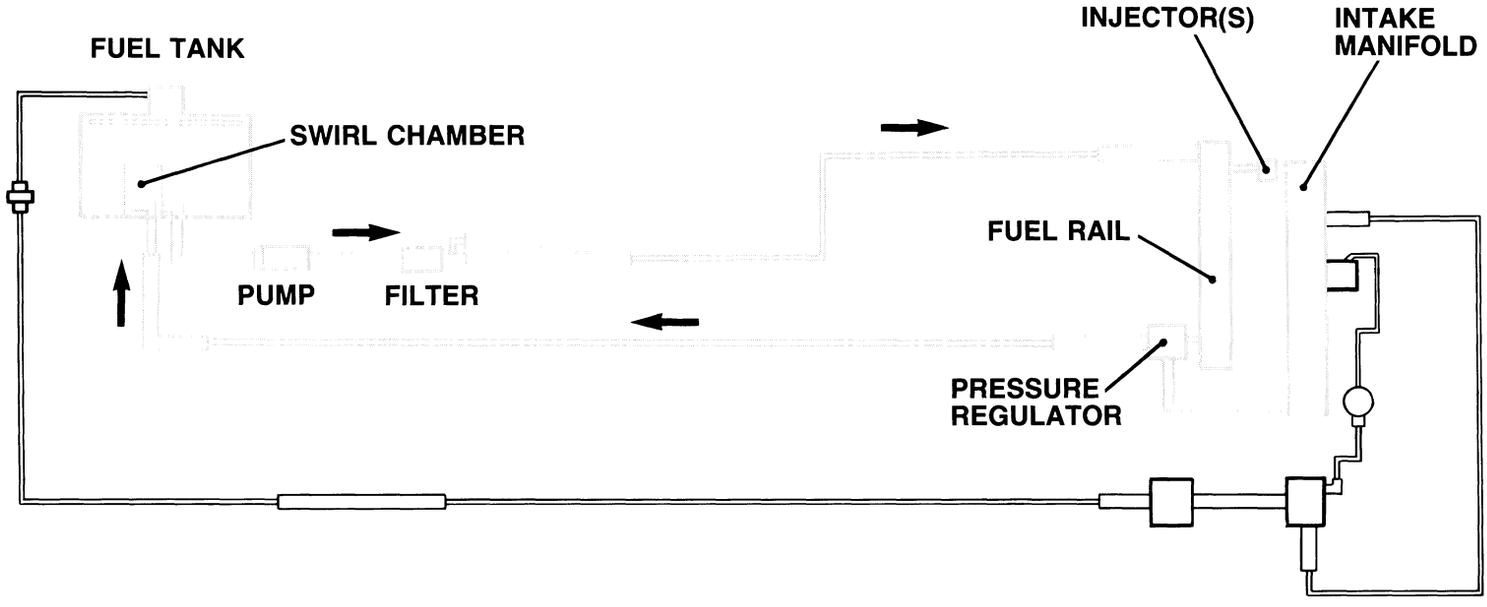
Additional Functions

Besides the two main functions, the engine management system also provides the following:

- *Fuel pump control.*
- *Cold start control.*
- *Idle speed control.*
- *Fuel cut-off during engine overrun.*
- *RPM limitation (engine overspeed control).*
- *Emissions control.*
- *Fuel monitoring (trip computer).*
- *Fault monitoring (Vehicle Condition Monitor).*
- *"Limp Home" capability.*


FUEL TANK
PUMP
FILTER
PRESSURE REGULATOR
FUEL RAIL
FUEL PUMP RELAY
ECU
IDLE SPEED CONTROL VALVE
AIR MASS METER
ECU
O2 SENSOR
DIST.
INJECTOR
AIR INJ. PUMP
MAN. AIR. TEMP. SENS.
THROTTLE POT.
SUPPLEMENTARY AIR VALVE
SPARK PLUGS
COOLANT TEMP. SENS.
DIST.
CRANKSHAFT SENSOR
IGN. "ON" RELAY
COIL
AMPLIFIER
AIR INJ. PUMP
FUEL PUMP
AIR PUMP RELAY
FUEL PUMP RELAY
MAIN RELAY
IGN. "ON" RELAY
START RELAY
START
INERTIA
IGNITION
IGNITION COIL
SENSORS
INJECTORS
IGNITION
IDLE SPEED
SUPP. AIR VALVE
ECU
A.C. CLUTCH
GEAR SEL.
VCM 1
VCM 2
IDLE CONTROL OVERRIDE

FUEL DELIVERY

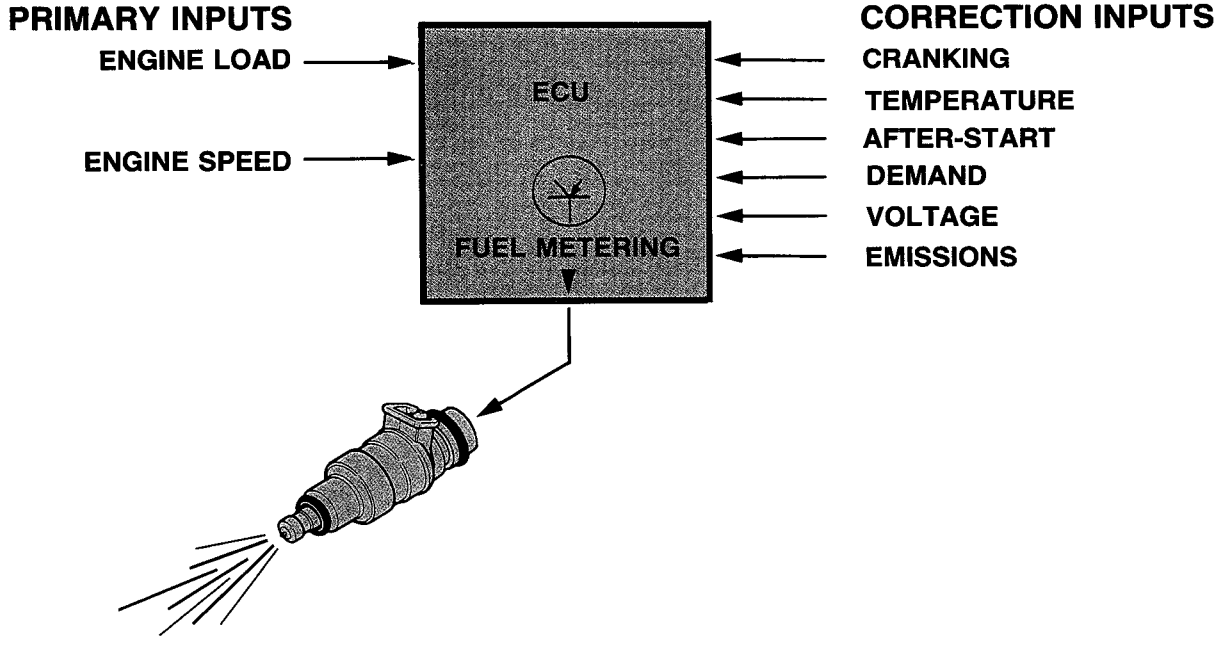


A recirculating fuel system is used in the new Jaguars. Fuel is drawn from the tank swirl chamber by the electric pump and delivered to the fuel rail through a renewable filter. The pressure regulator, mounted on the fuel rail, senses engine absolute manifold pressure and maintains a constant pressure across the injectors. Fuel pressure varies with manifold vacuum from 36 PSI @ idle to 44 PSI @ full throttle. This ensures that the quantity of fuel injected for a given injector "ON" time is constant, regardless of the intake manifold pressure. Unused fuel is returned to the tank swirl chamber. Here the returned fuel passes through a venturi then mixes with the tank fuel. This cools the returning fuel making a separate fuel cooler unnecessary.

The fuel pump is energized only when the ECU senses an engine CRANKING or an engine RUNNING signal.

FUEL METERING

The fuel injectors are operated by electrical impulses which trigger the injector solenoid valves. The duration (injector "ON" time) of each pulse (quantity of fuel injected) is determined primarily by the ECU from engine load and speed inputs received from the Air Mass Meter and the Crankshaft Sensor. The ECU uses this information to access mapped data stored in its memory to provide an injected pulse duration. 128 memory locations, containing injector pulse durations, are derived from 8 engine loads and 16 different engine speeds. Normally, pulses are applied to the injectors once per crankshaft revolution.



Cranking Enrichment—Provided every time the starter motor is activated. The injectors pulse frequency is increased from 1 to 3 per crankshaft revolution. When the engine speed reaches 600 RPM, cranking enrichment is cancelled.

Temperature Enrichment—Provided during starting and warm-up. The injector "ON" time is lengthened by the ECU in response to input from the coolant temperature sensor.

After-Start Enrichment—Provided regardless of engine temperature. The injector "ON" time is lengthened than gradually decreased to normal by the ECU at a programmed rate and time.

Demand Corrections—Provided for idle, acceleration, and full power demands. The injector "ON" time is lengthened by the ECU in response to input from the throttle potentiometer and other sensors. During rapid throttle opening, the injector pulse frequency is also increased.

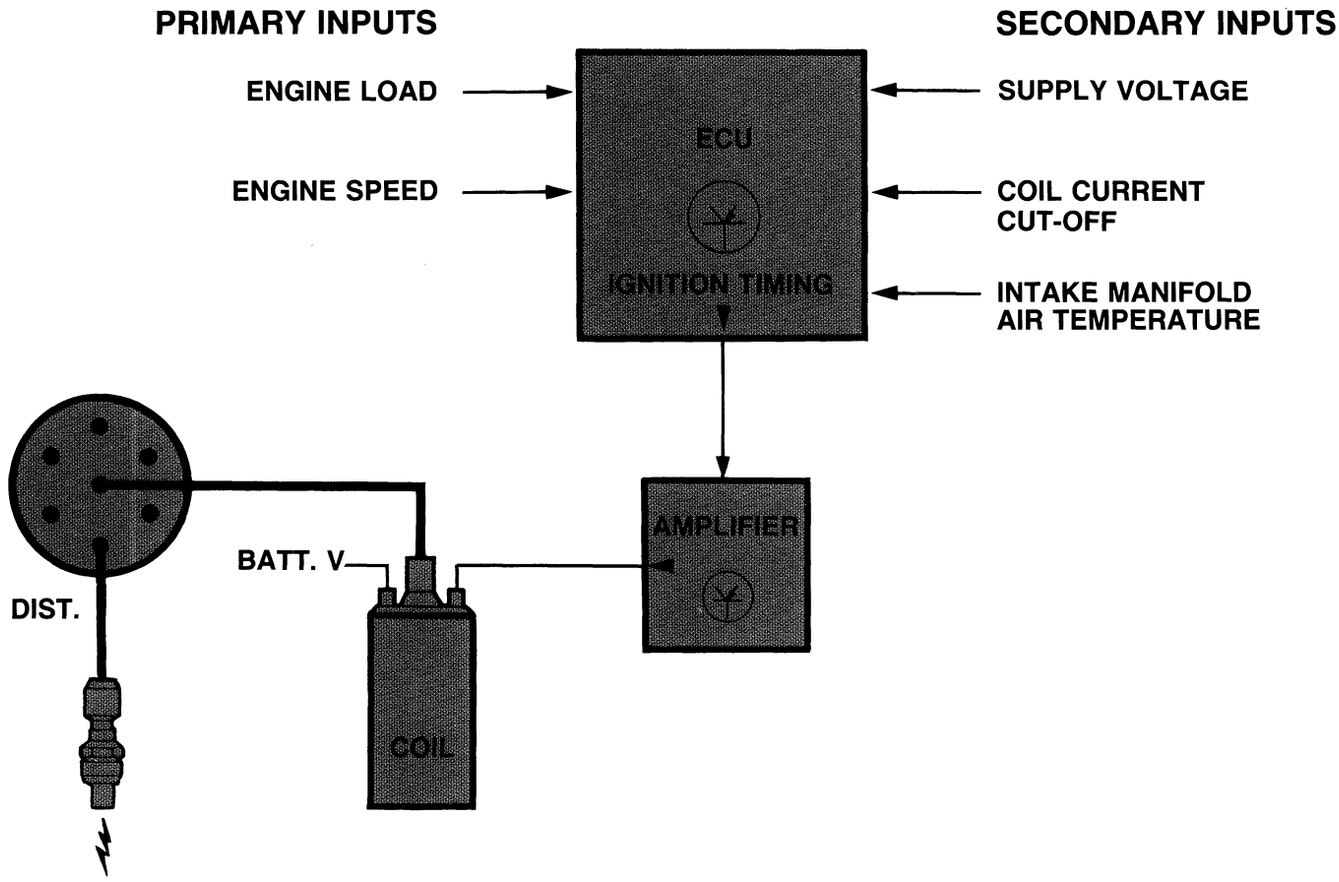
Voltage Corrections—The ECU constantly monitors the vehicle electrical system voltage and compensates for any voltage fluctuation by adjusting the injector "ON" time accordingly.

Emissions Corrections—"Closed-loop" exhaust emission control is provided by inputs from the heated oxygen sensor to the ECU. Air injection is activated by the ECU as described in Emissions Control. During air injection operation, input signals from the oxygen sensor are inhibited.

IGNITION

Ignition timing is provided by the ECU from engine load and speed inputs received from the Air Mass Meter and the Crankshaft Sensor. The ECU uses this information to access mapped data stored in its memory to provide an ignition pulse. As with Fuel Metering, 128 memory locations containing ignition timing information are derived from 8 engine loads and 16 different engine speeds. Depending on the monitored engine speed and supply voltage, the dwell angle is determined and the ignition energy is adapted to the immediate requirement. This prevents unnecessary ignition coil energy consumption.

Ignition pulses are provided by the ECU via a separate amplifier, to the ignition coil. The ignition coil generates high energy pulses which are supplied to the spark plugs via the distributor. The distributor has no primary circuit or advance mechanism. It only distributes the high voltage pulse to the spark plugs.

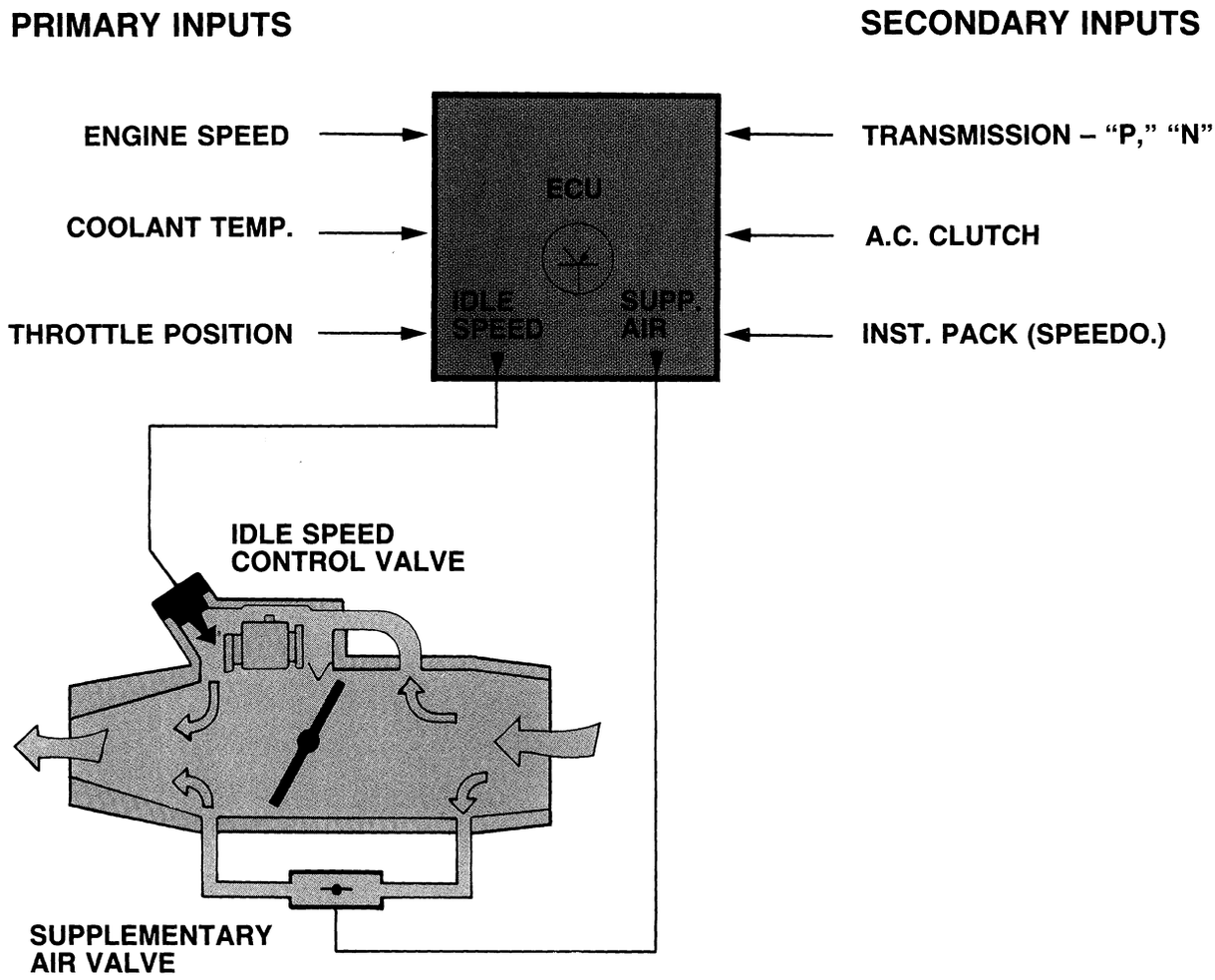


Coil Current Cut-off—Below a specific engine speed, the ECU cuts-off current flowing through the ignition coil. This prevents battery discharge and coil overheating if the ignition switch is left on with the engine not running.

Knock Control—Intake air temperature is input to the ECU from the Manifold Intake Air Temperature Sensor to provide knock control information. The ECU retards the spark *before* knock occurs.

IDLE SPEED

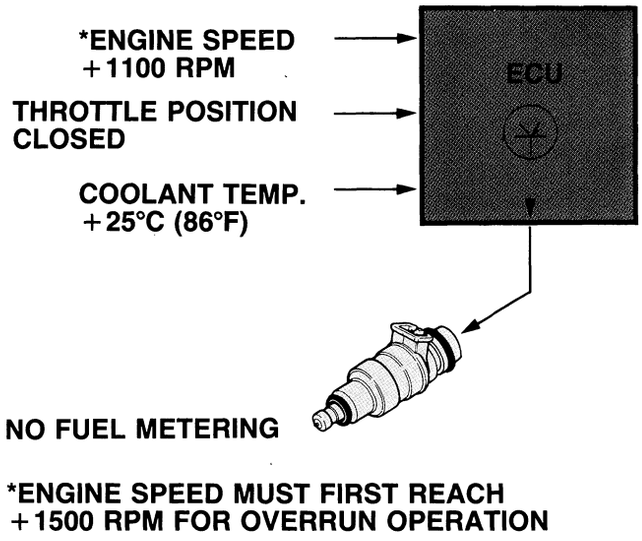
Idle speed is controlled by the idle speed control valve and, at very low temperatures the supplementary air valve, via signals from the ECU. Engine speed, coolant temperature, and throttle position are the primary inputs to the ECU for operation of the motorized idle speed control valve. Secondary inputs from the automatic transmission linear switches, the A.C. clutch circuit, and the speedometer allow compensation for transmission load, engine accessory load, and road speed. Idle speed control is cancelled by the ECU at road speeds above 3 MPH.



During starting and warm-up, the ECU activates the supplementary air valve at temperatures below –10°C (15°F) to provide additional idle air flow. The supplementary air valve operation is not affected by the secondary inputs to the ECU.

OVERRUN FUEL CUT-OFF

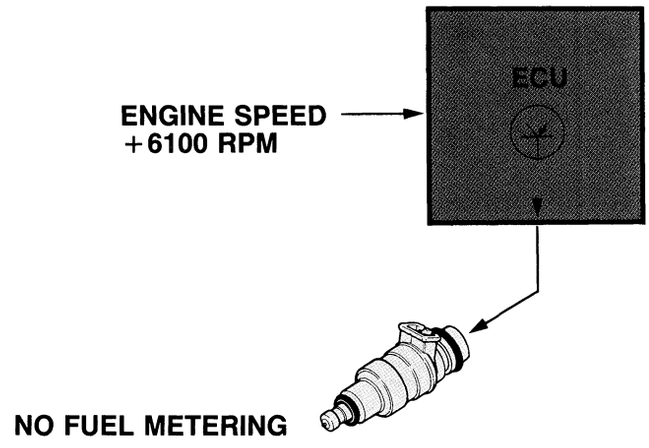
To improve fuel economy and aid in exhaust emissions control, fuel metering is cancelled during engine overrun conditions.



Engine overrun fuel cut-off is determined by the ECU from throttle position, engine speed, and coolant temperature inputs. With the throttle closed and the engine speed above 1100 RPM, the ECU cuts-off all fuel metering provided that the coolant temperature is above 25°C (86°F) and that 1500 RPM has been exceeded first. The engine speed must always reach 1500 RPM first for overrun fuel cut-off to occur. Ignition timing compensation is provided for when fuelling is reinstated as the throttle opens.

ENGINE OVER-SPEED CONTROL

To prevent engine damage caused by over-speeding, fuel metering is cancelled above 6100 RPM.



The ECU cuts-off all fuel metering when the crankshaft sensor inputs engine speed above 6100 RPM.

"LIMP HOME"

A "Limp Home" facility is provided in the memory of the ECU which will allow vehicle operation in the event of Engine Management System sensor failure. The ECU will substitute a nominal value for the missing input for all sensors *except* engine speed. *The crankshaft sensor must be operable at all times.*

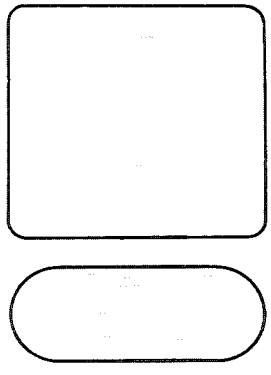
SAFETY

In the event of a vehicle impact, the inertia switch will switch off all ignition fed circuits by interrupting current flow to the ignition "on" relay.

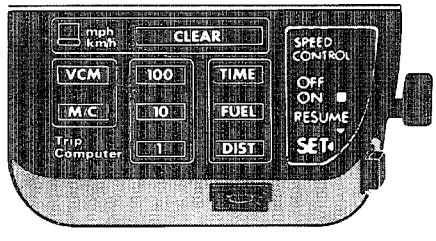
VCM OUTPUTS

The ECU supplies two output signals to the VCM (Vehicle Condition Monitor) located in the instrument panel. These are identified as VCM 1 and VCM 2 and are used for FUEL and FAULT MONITORING.

VCM 1 signal indicates an Engine Management System fault on the Vehicle Condition Monitor. This indicates a system fault, but does not identify the specific fault.

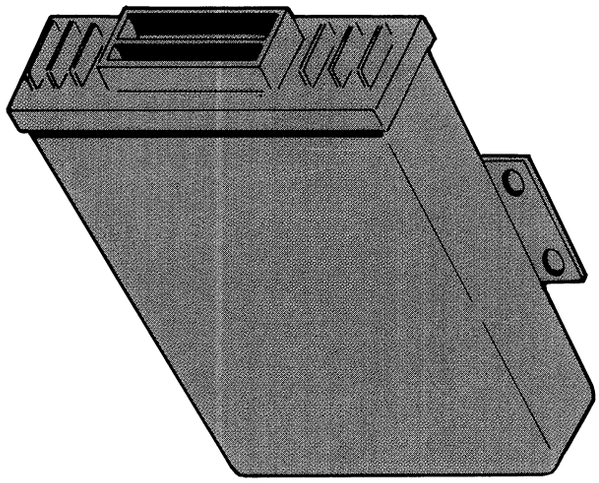


VCM 2 is a dual purpose signal. It provides precise fuelling information for the trip computer fuel calculations when the engine is running. It also identifies individual Engine Management System faults by code. Fault codes are displayed by turning the ignition switch to position II. Cranking the engine erases the stored code.



VCM Fault Code Identification:

1. Cranking signal failure.
2. Air mass meter failure (open circuit/short circuit to ground).
3. Coolant temperature sensor failure.
4. Feedback circuit failure.
5. Air mass meter failure (low throttle potentiometer Voltage with high air mass meter Voltage).
6. Air mass meter failure (high throttle potentiometer Voltage with low air mass meter Voltage).
7. Idle fuel potentiometer (in air mass meter) failure.
8. Intake manifold air temperature sensor failure (open circuit/short circuit to ground).

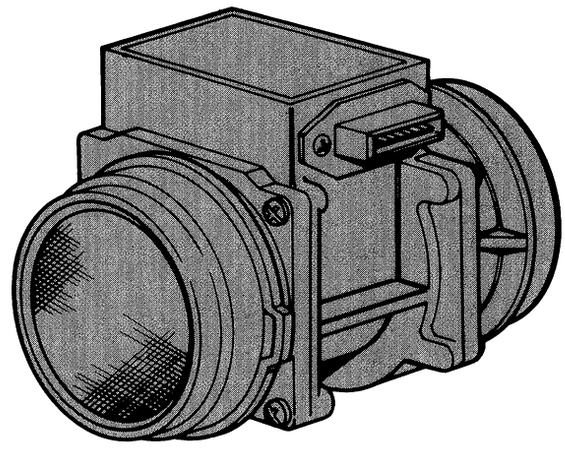


Electronic Control Unit

Location—Under the passenger side dash liner.
Description—The ECU contains a microprocessor and electronic components. The microprocessor performs all system control functions. Its memory is pre-programmed with system operating information.

Air Mass Meter

Location—Engine intake tract.
Description—The air mass meter contains two sourcing elements in a by-pass channel. The first element is maintained at intake air temperature; the second is heated by electrical current to establish a temperature differential. When intake air flows over the heated element, the element is cooled and requires additional current to maintain the temperature differential. The intake air volume is determined by measuring the electrical current required to maintain the temperature differential.



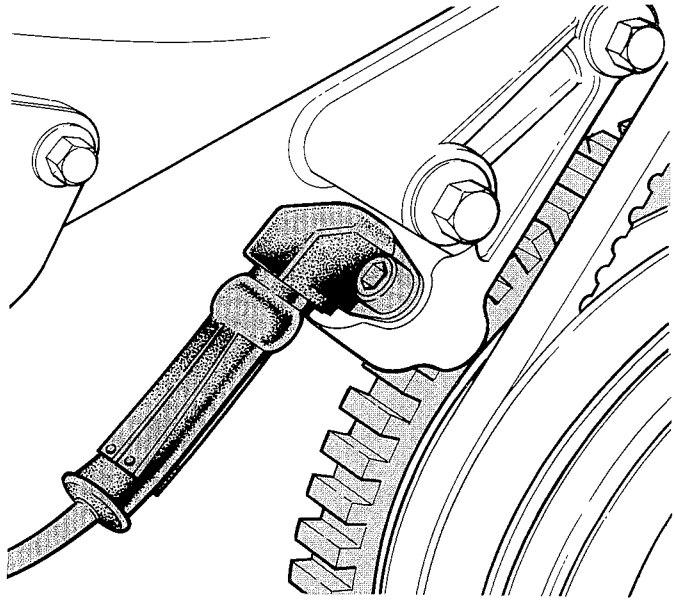
The by-pass method of measurement has a number of advantages:

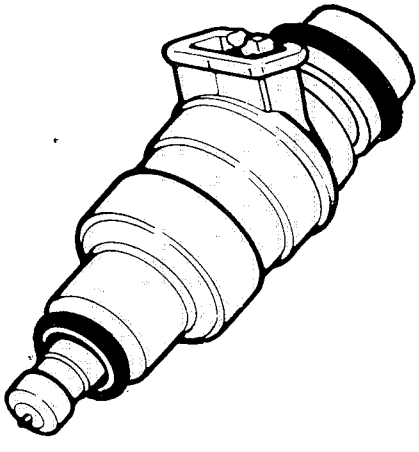
- *Delicate sensors are protected from shock loads.*
- *Measurement error due to severe flow pulsation is reduced.*
- *Dirt and backfire contamination of the sensors is minimal.*

An idle fuel adjustment is housed in the air mass meter but operates independently. This is used for initial idle fuel adjustment only and is sealed by a plug.

Crankshaft Sensor

Location—Front of crankshaft.
Description—The crankshaft sensor is made up of a toothed gear and a reluctance coil. The toothed gear has 57 segments with three spaces at 120° intervals. When the engine is running, the segments induce a signal in the reluctance coil at a frequency proportional to engine speed. This provides the ECU with engine speed input. The three spaces interrupt the induced signal and provide the ECU with crankshaft position references for ignition timing and injector triggering.



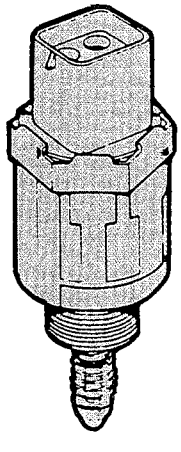


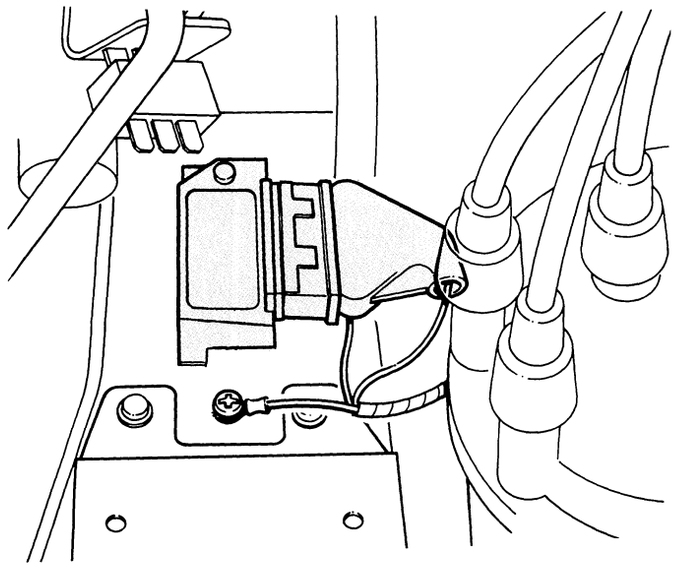
Fuel Injectors

Location—Intake manifold.
Description—Each fuel injector contains a solenoid operated needle valve which is held against its seat by spring pressure. When energized, the coil moves the needle away from its seat. Full valve lift is reached in a response time of approximately one millisecond.

Idle Speed Control Valve

Location—Above throttle housing.
Description—The idle speed control valve is a motorized valve which varies the intake air bypass around the throttle valve. The ECU maintains the correct idle speed by energizing the idle speed control valve to provide more or less throttle valve air bypass.



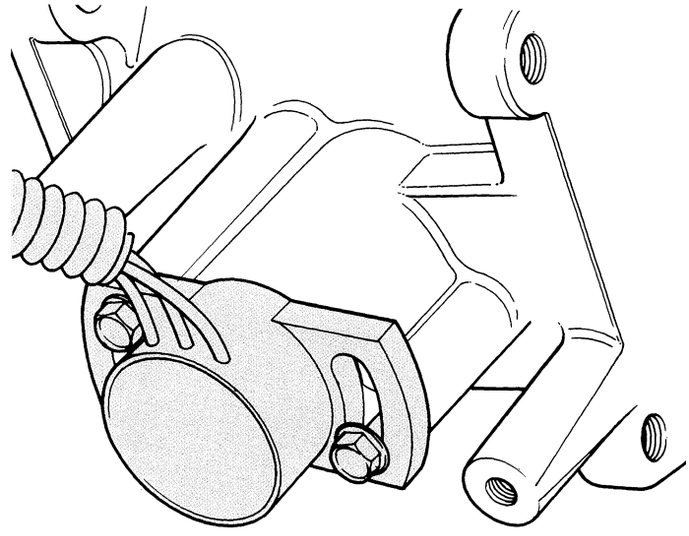


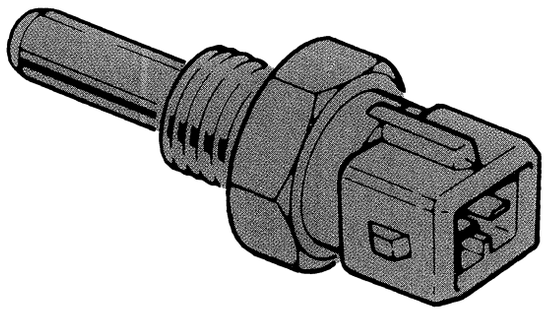
Ignition Amplifier

Location—Below ignition coil.
Description—The electronic ignition amplifier provides ignition primary switching via the ECU, to generate high energy ignition pulses.

Throttle Potentiometer

Location—Throttle housing.
Description—The throttle potentiometer is mechanically connected to the throttle valve shaft and provides a reference voltage to the ECU dependent on throttle position.



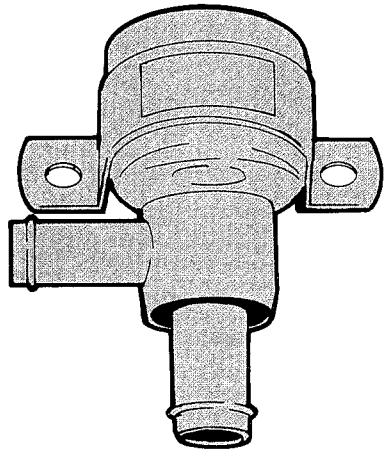


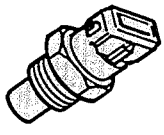
Coolant Temperature Sensor

Location—Top of thermostat housing.
Description—The coolant temperature sensor has a temperature sensitive resistor. As the coolant temperature increases, the electrical resistance decreases providing a coolant temperature parameter to the ECU.

Supplementary Air Valve

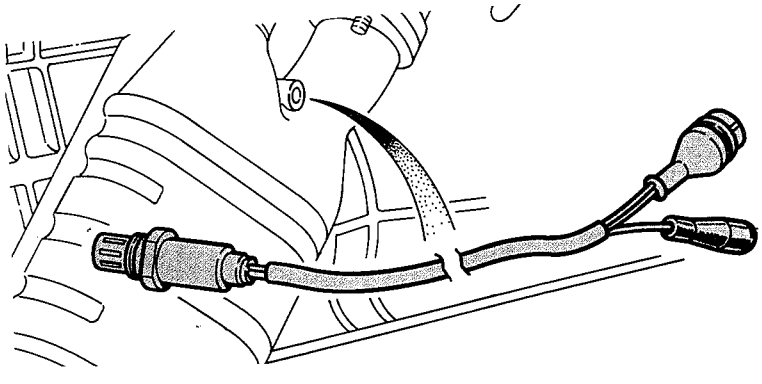
Location—Under throttle housing.
Description—The solenoid actuated supplementary air valve provides additional throttle valve bypass air during cold starting and warm-up at temperatures of –10°C (15°F) and below. The ECU activates the supplementary air valve.





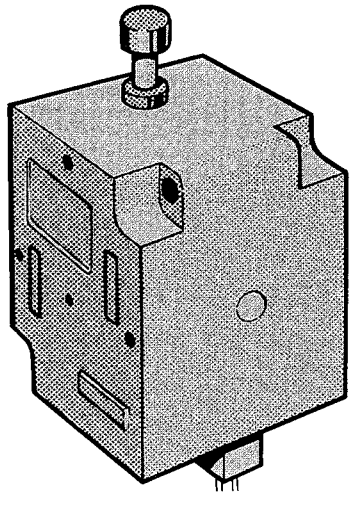
Intake Manifold Air Temperature Sensor

Location—Air Intake Elbow.
Description—The intake manifold air temperature sensor provides the ECU with a parameter for engine "knock" control.



Oxygen Sensor

Location—Exhaust down pipe.
Description—The heated oxygen sensor provides exhaust oxygen content information to the ECU for continuous fuel metering correction.



Inertia Switch

Location—Driver's side "A" post.
Description—The inertia switch turns off all ignition fed Engine Management circuits in the event of a vehicle impact.

Note: Additional inertia switch functions are shown on page 88.

DESCRIPTION

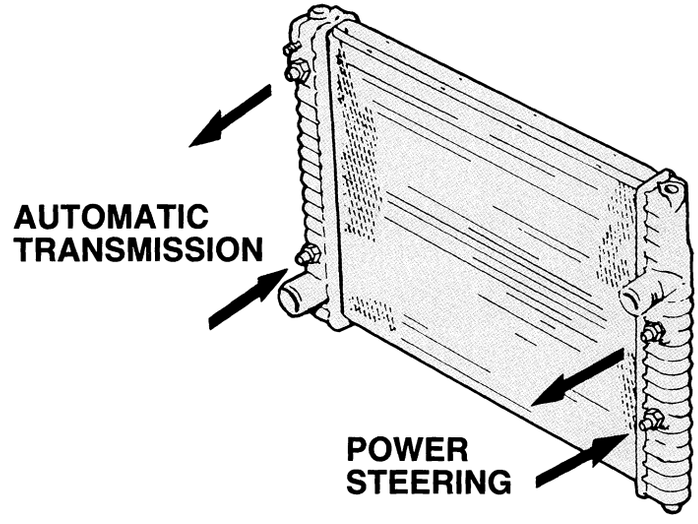
The cooling system consists of the following components:

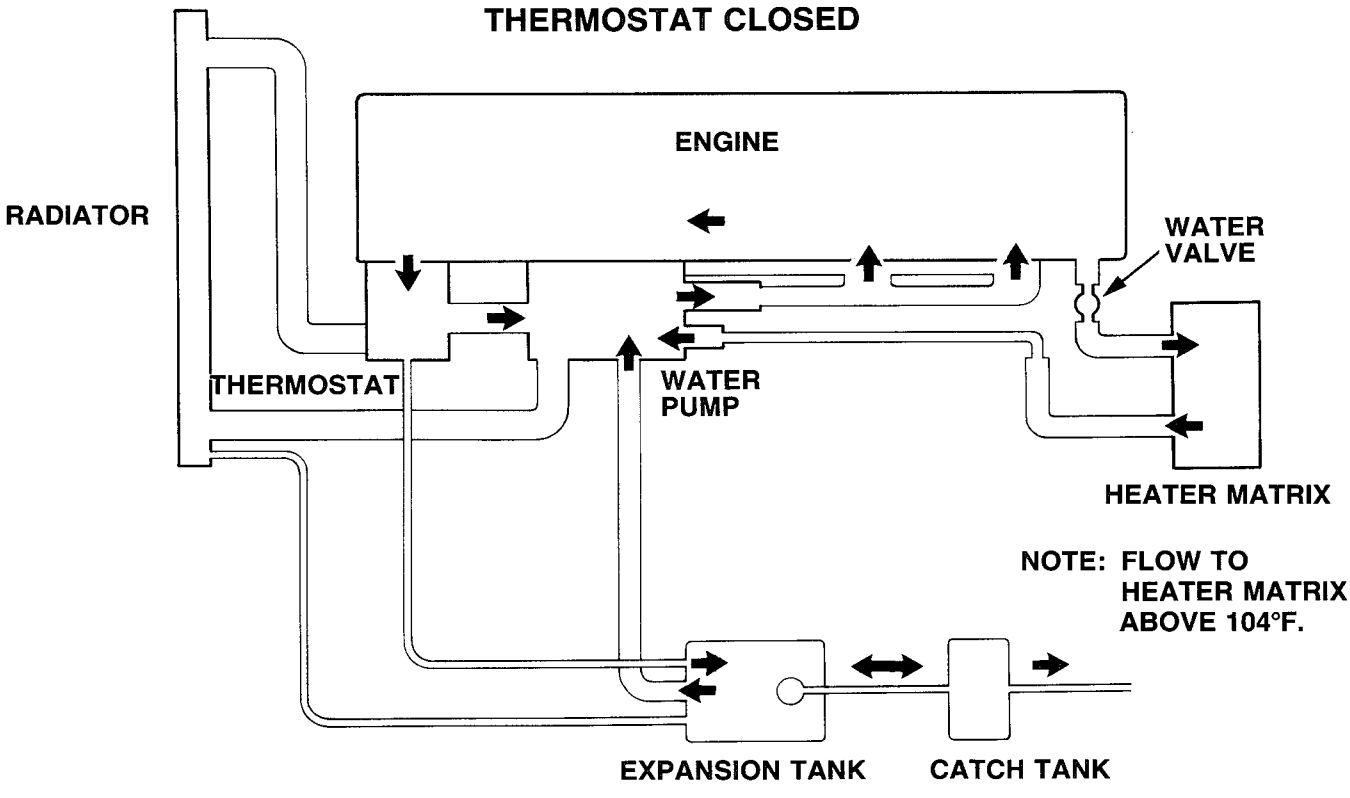
- *Cross-flow radiator*
- *Belt driven water pump*
- *Thermostat and housing*
- *Expansion tank*
- *Atmosphere tank*
- *Viscous coupled, belt driven fan*
- *Electric fan*

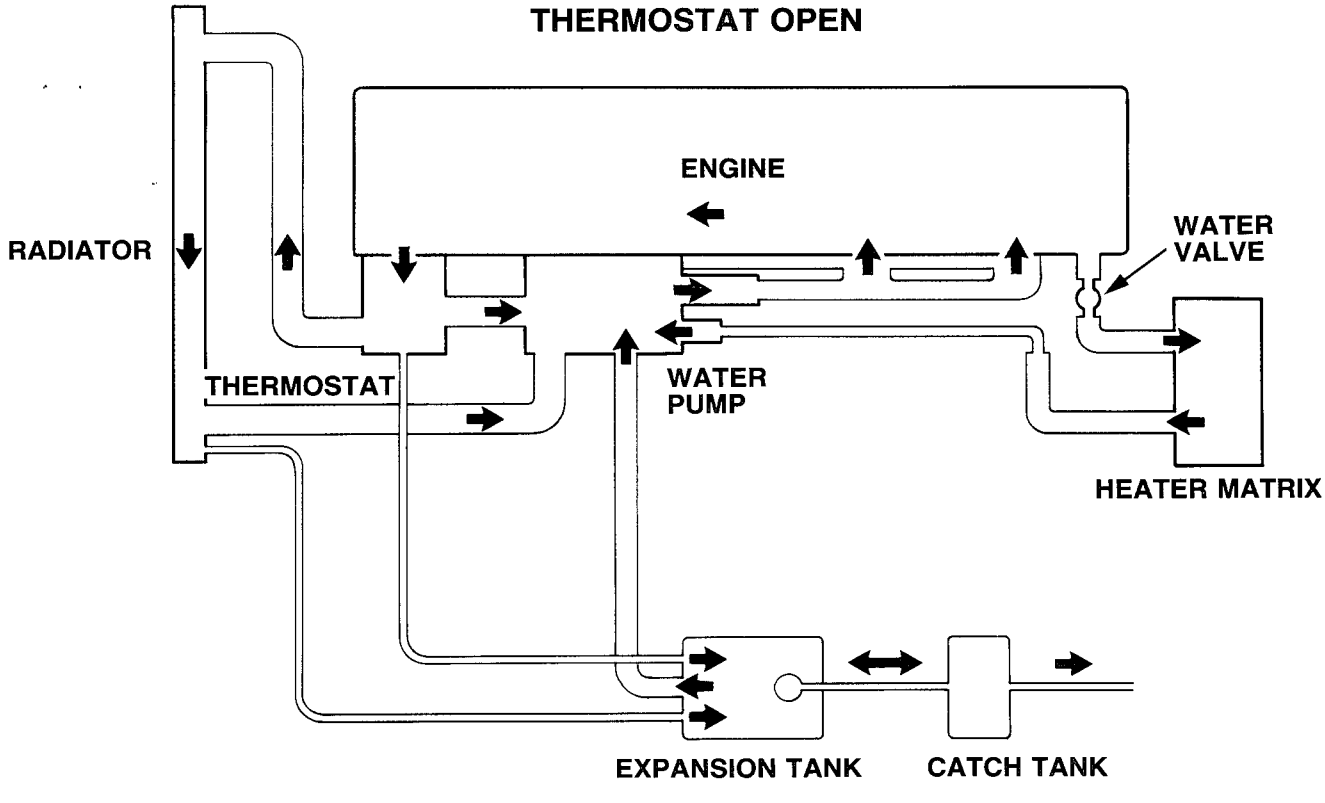
At coolant temperatures of 90°C (194°F) and above, the electric fan is activated thermostatically via a relay.

Oil Coolers

The radiator incorporates oil coolers for the automatic transmission and the power steering system. The automatic transmission cooler is in the left side; the power steering cooler is in the right side.

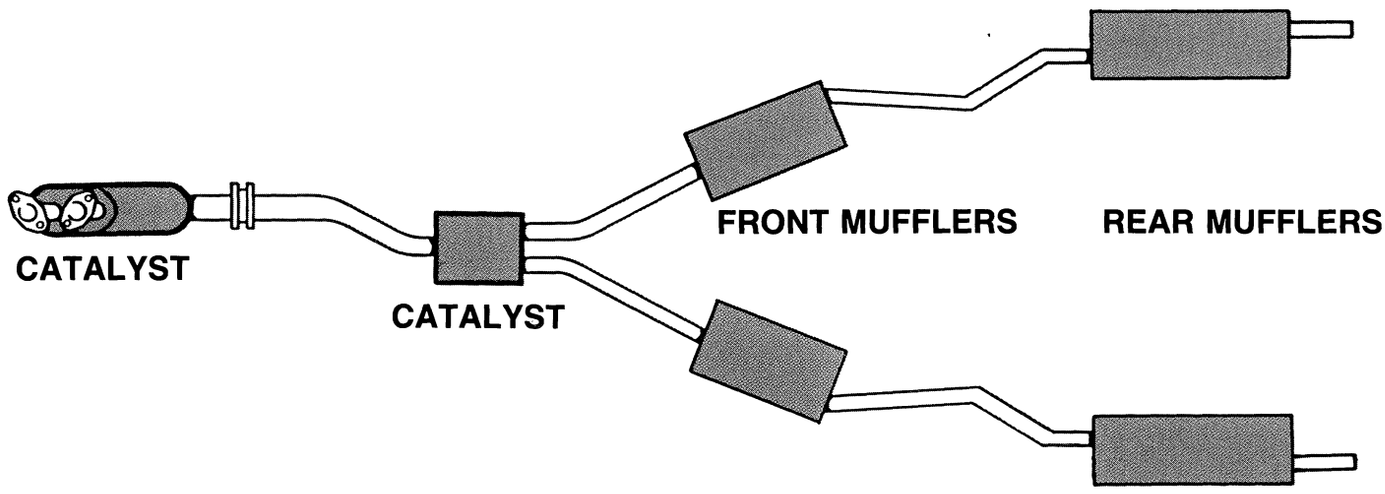



THERMOSTAT CLOSED
ENGINE
RADIATOR
WATER VALVE
THERMOSTAT
WATER PUMP
HEATER MATRIX
NOTE: FLOW TO HEATER MATRIX ABOVE 104°F.
EXPANSION TANK
CATCH TANK

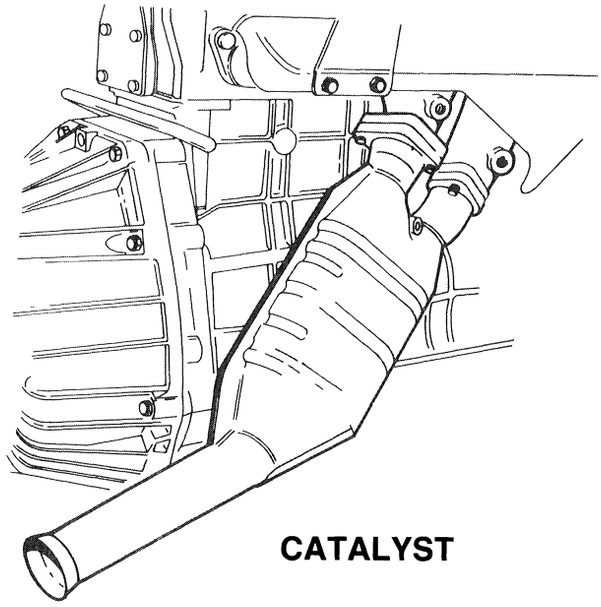

THERMOSTAT OPEN
ENGINE
RADIATOR
WATER VALVE
THERMOSTAT
WATER PUMP
HEATER MATRIX
EXPANSION TANK
CATCH TANK

DESCRIPTION

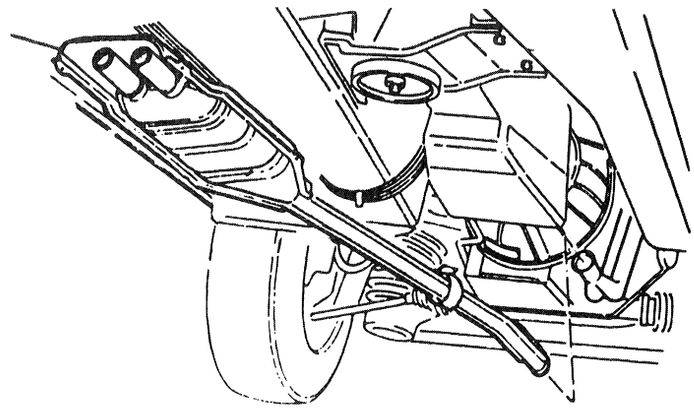
The exhaust system is laid out in the familiar "Y" pattern. The first catalyst is incorporated into the down pipe; the second catalyst is integral with the "Y" pipe.



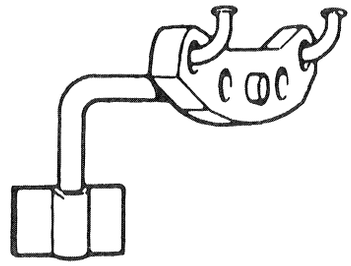
Service life has been greatly increased by using stainless steel throughout the exhaust system. Rubber mountings provide vibration and noise isolation as well as easy installation.



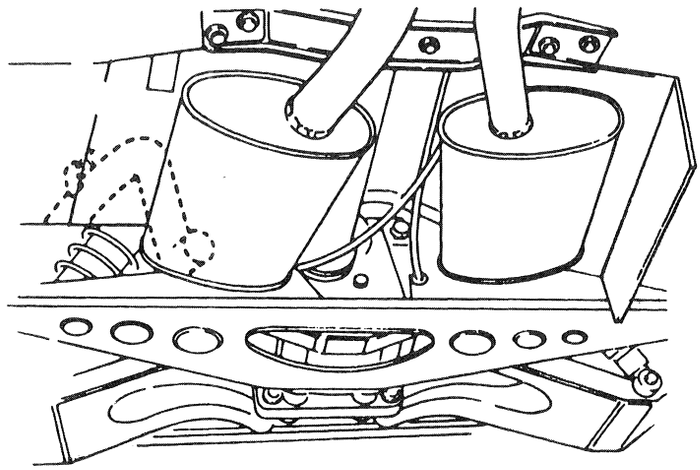
CATALYST



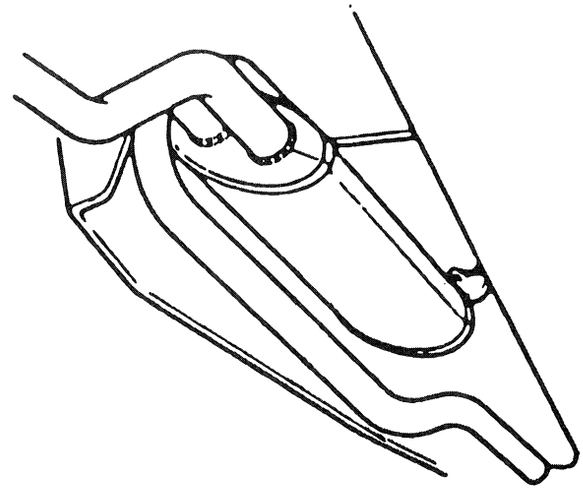
CATALYST



RUBBER MOUNTINGS



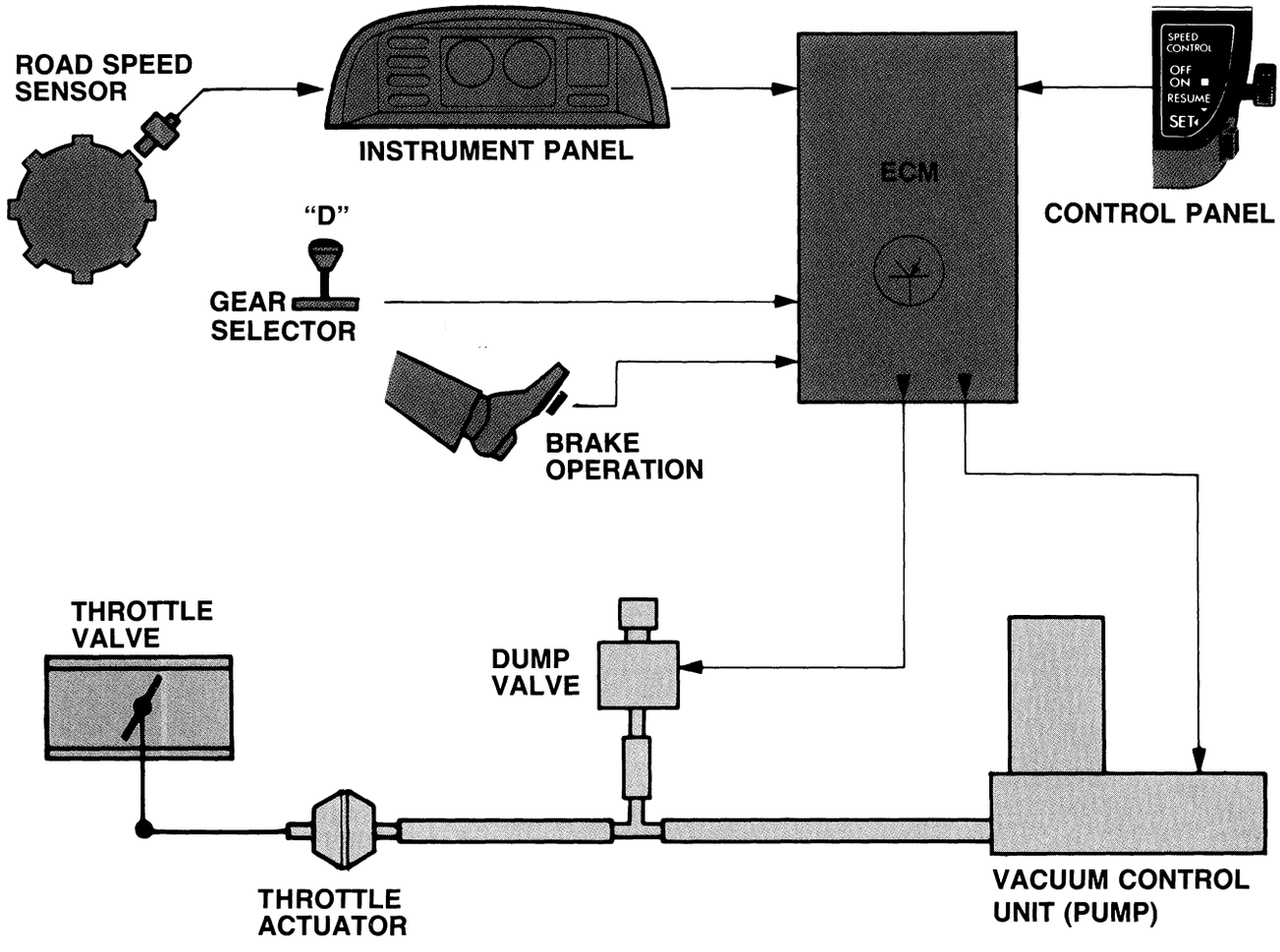
FRONT MUFFLERS



REAR MUFFLERS

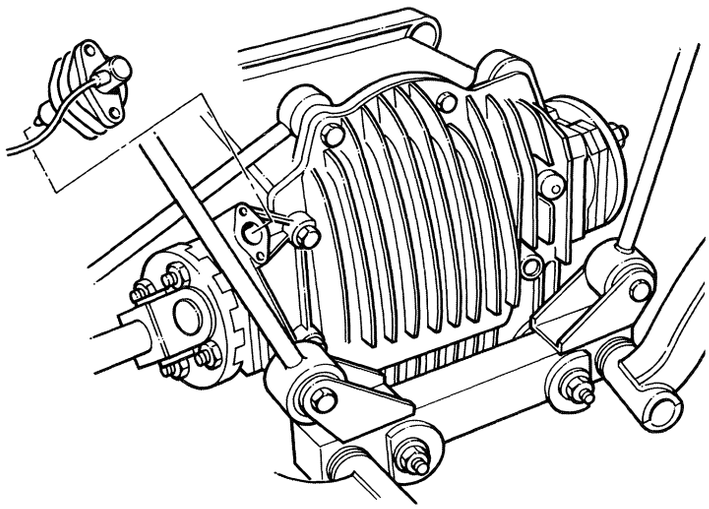
DESCRIPTION

The cruise control system maintains the vehicle at a selected speed by controlling the position of the throttle over a wide range of movement—from idle to full throttle. The system has its own vacuum source to operate the throttle and is not dependent on engine vacuum. This provides more consistant throttle movement under varying road condition. The ECM (Electronic Control Module) interprets sensor and control panel inputs to activate the Vacuum Control Unit and the Dump Valve.

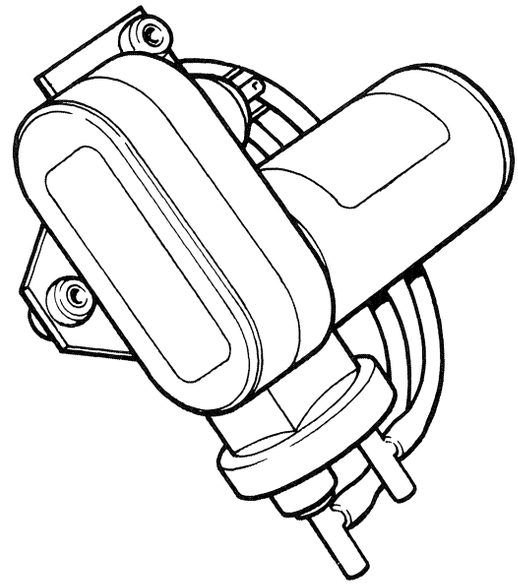


System operation is straight forward with the exception of "Coast-Down." To "Coast-Down" with cruise engaged, momentarily press RESUME and the car will decelerate; to return to the set speed, press RESUME again.

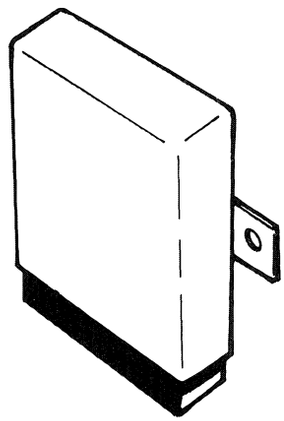
COMPONENTS



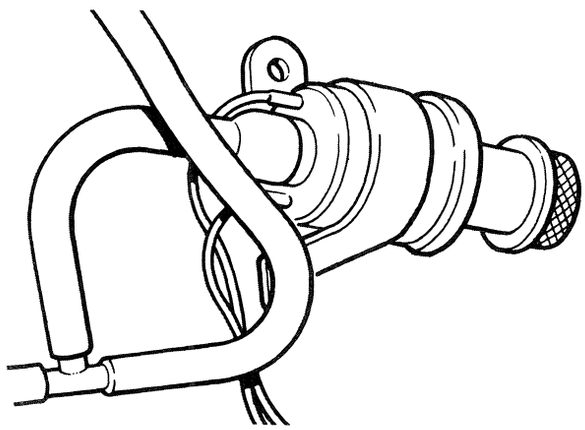
ROAD SPEED SENSOR



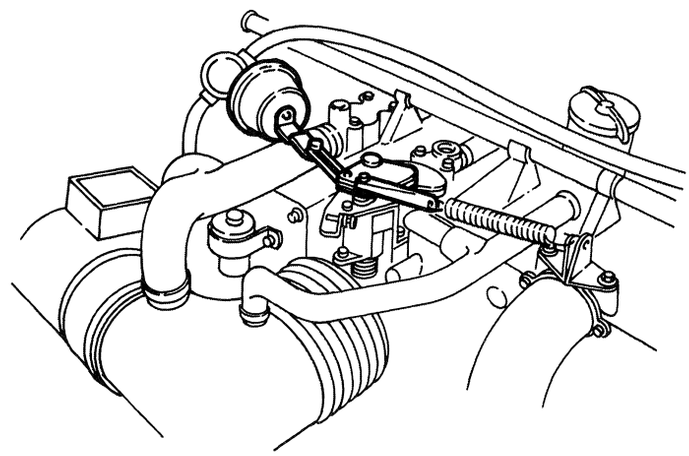
VACUUM CONTROL UNIT



ELECTRONIC CONTROL MODULE
(on component panel)

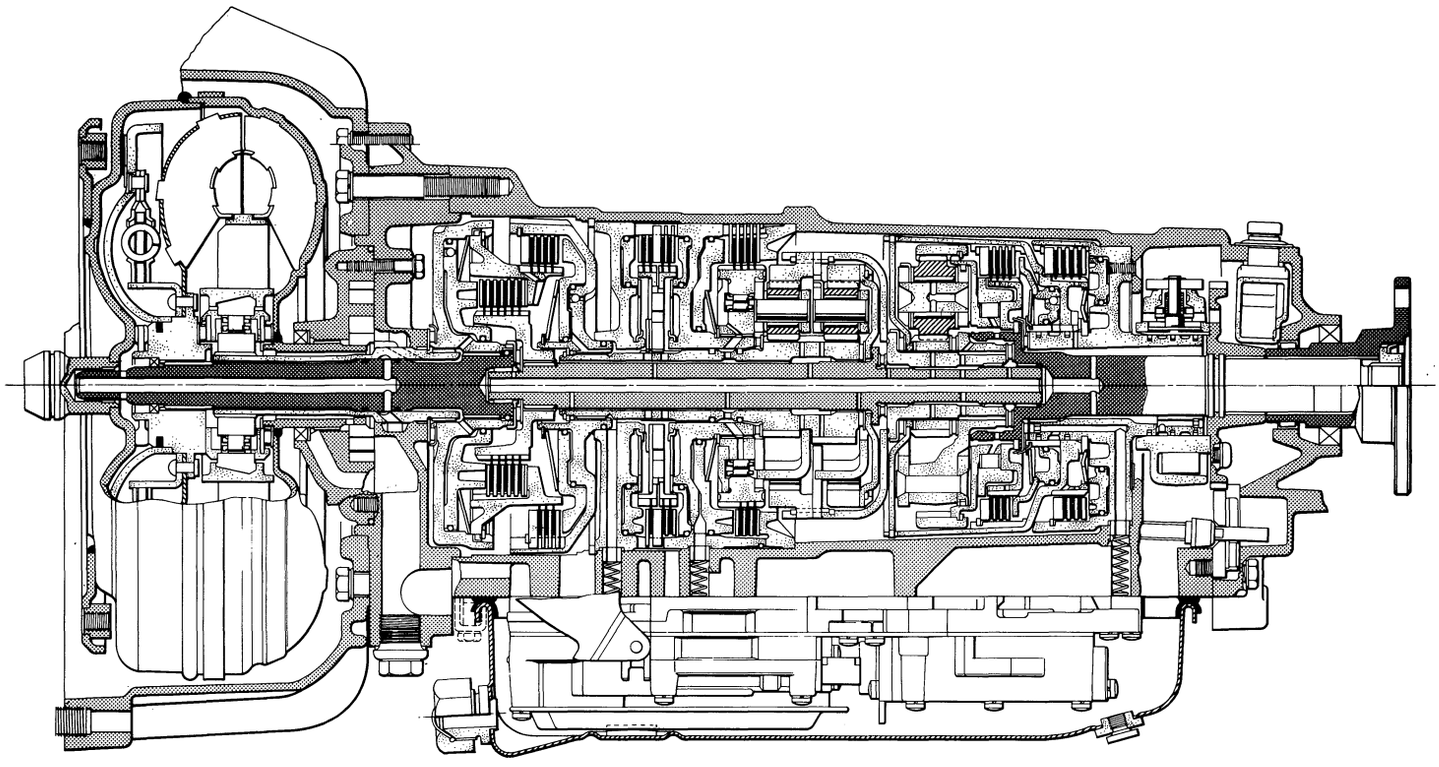


DUMP VALVE

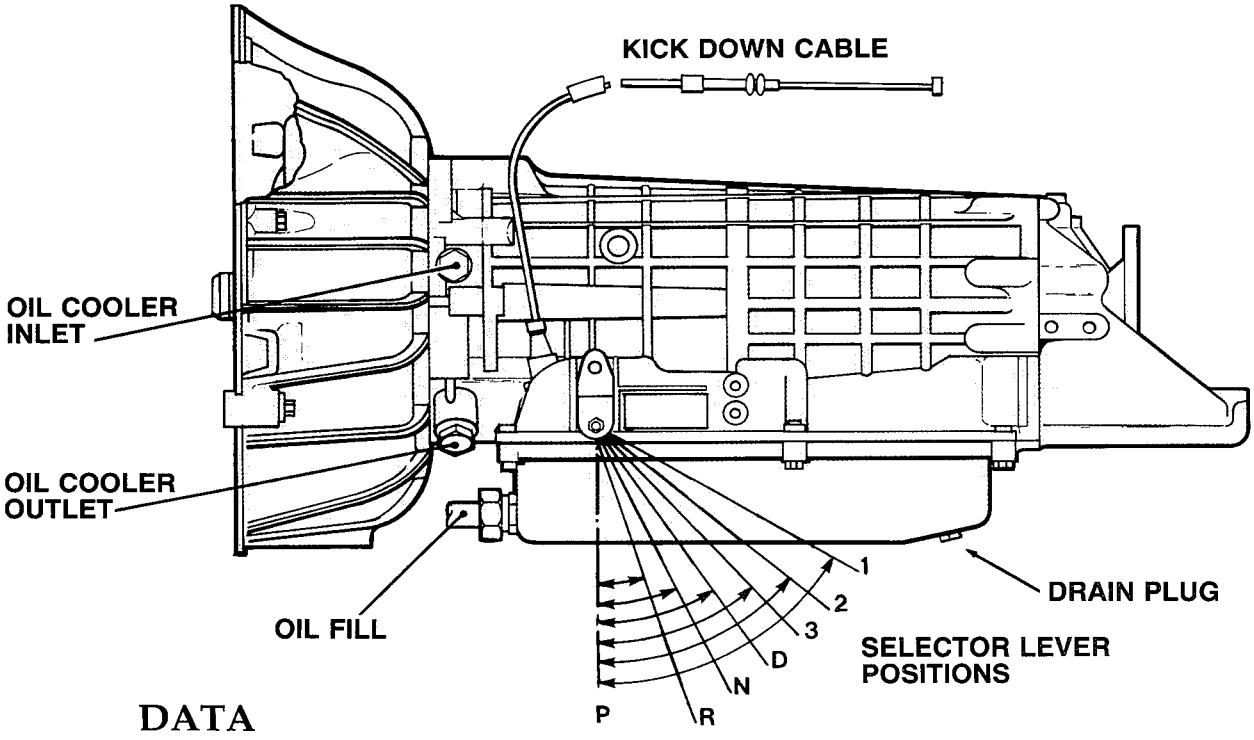


THROTTLE ACTUATOR

A lightweight and rugged 4 speed automatic transmission with a lock-up torque converter is used in the new Jaguars. This refined unit provides precise shifting and an overdrive gear for effortless cruising, and efficient operation.



Power loss through the torque converter at cruise speeds is eliminated with the lock-up feature. When locked-up, the torque converter forms a fixed mechanical connection between the engine and the transmission gearbox.



DATA

Gear Ratios:

1st	2.48:1
2nd	1.48:1
3rd	1.00:1
4th	0.73:1
Rev.	2.09:1

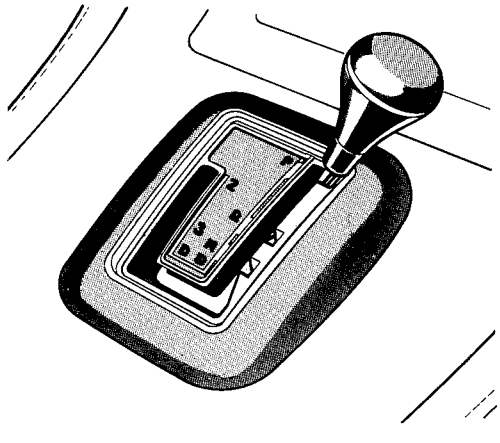
Converter lock-up occurs:
Transmission oil temp. above 20°C (68°F)
4th gear only
At approx. 55 MPH (normal highway speed)

Oil Cooler:
Integral with radiator–left side.

"J" Gate Selector

A unique "J" Gate selector has been designed to take full advantage of the potential of the new transmission, providing both manual and fully automatic control.

This gives the driver a clear choice between fully automatic modes on the right—P,R,N,D, and manually selected gears on the left—D,3,2.

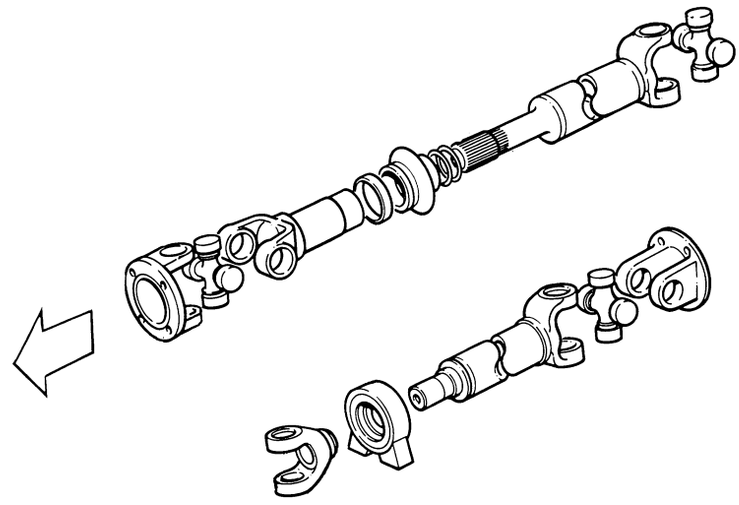


Inadvertent selection of R or P during manual control is eliminated by the "J" Gate design.

Note: The transmission valve body prevents forced down shifting at speeds which would overspeed the engine.

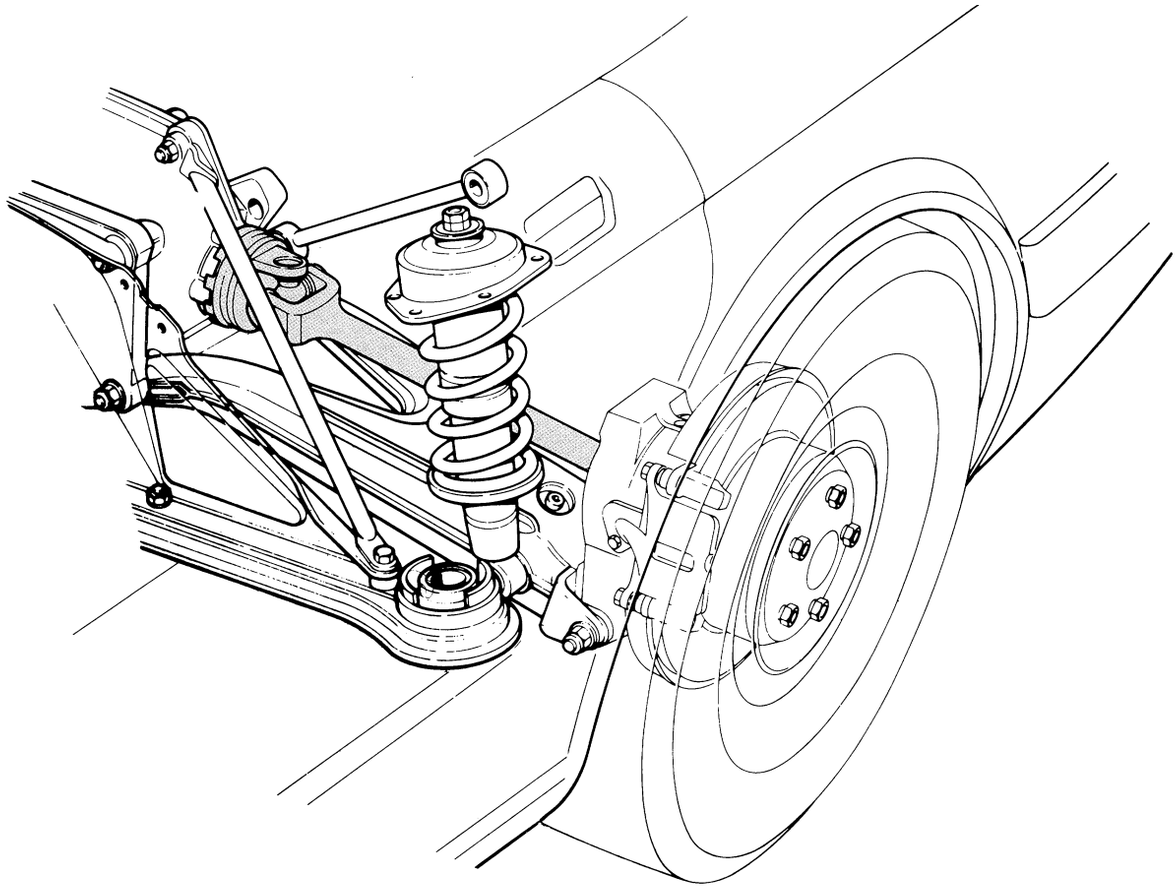
Propeller Shafts

The propeller shaft is laid out in the familiar 2 shafts with center bearing arrangement. Sliding splines are located at the forward end to allow engine and transmission movement.

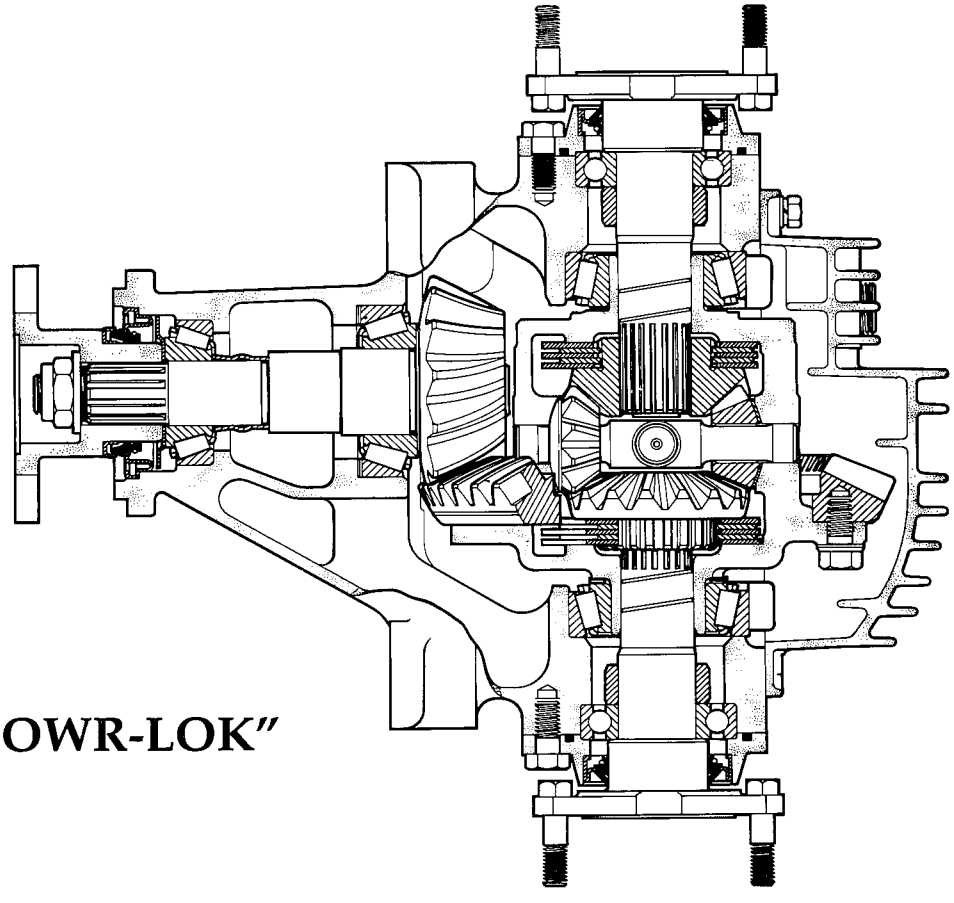


Drive Shafts

The 2 drive shafts will also be familiar. As in the past, they form the top link of the rear suspension system. Each shaft incorporates 2 universal joints which require periodic lubrication.



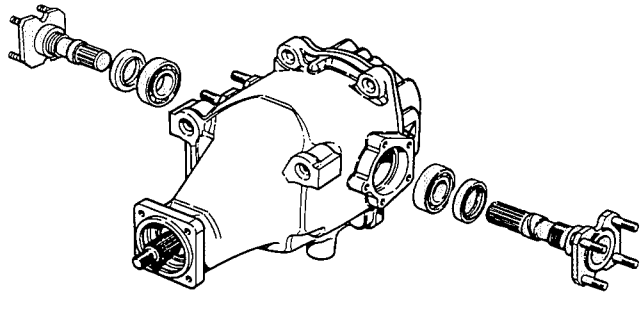
The final drive unit forms a part of the rear suspension system. Two versions of this unit are used—with and without limited slip differential. Limited slip is identified as "Powr-Lok" and a tag with the letters PL are attached to the unit under a rear cover bolt head.



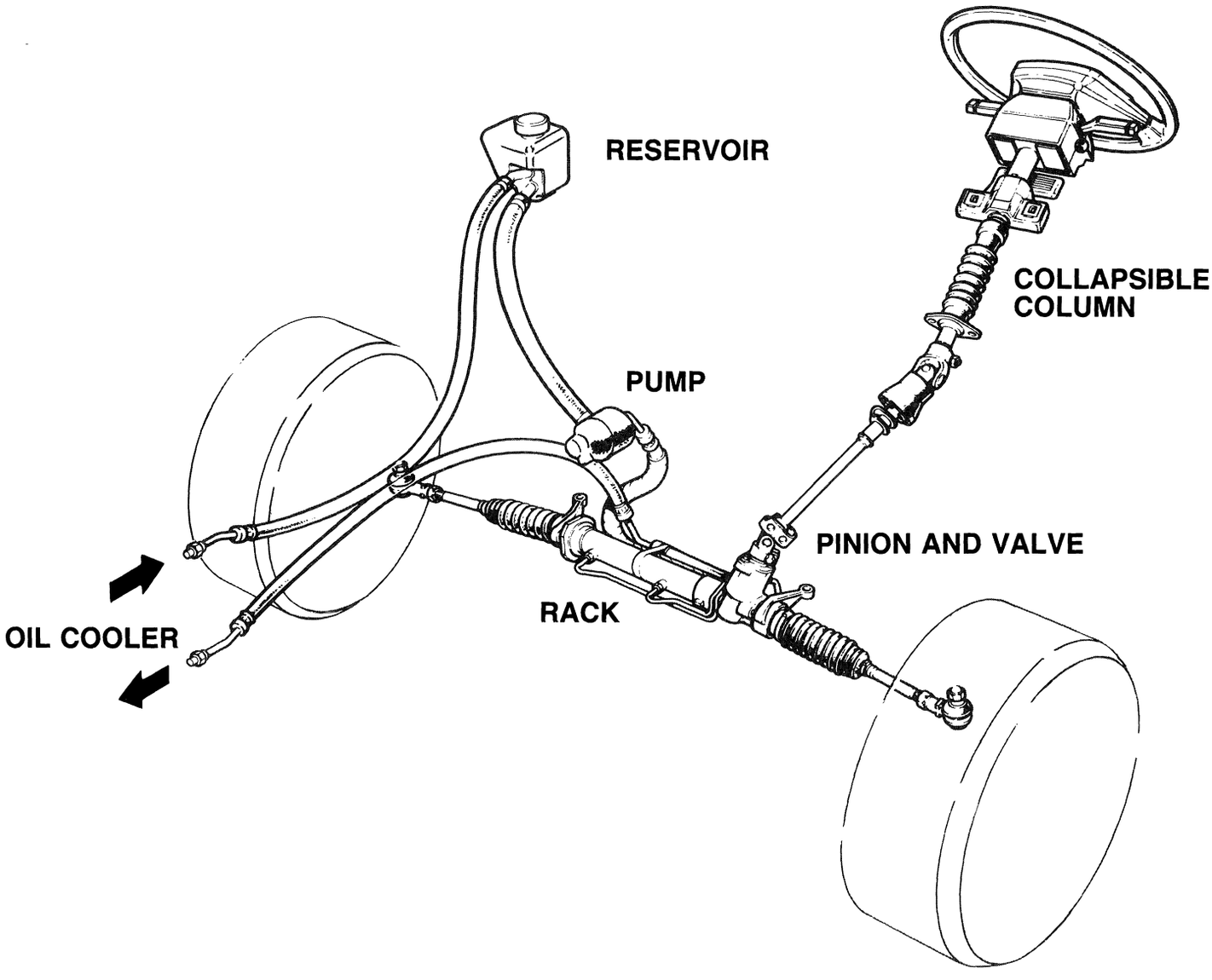
"POWR-LOK"

Output Shafts

The output shafts of these new units are supported by single ball bearings with shimmed preload adjustment. Triple lip seals are used.

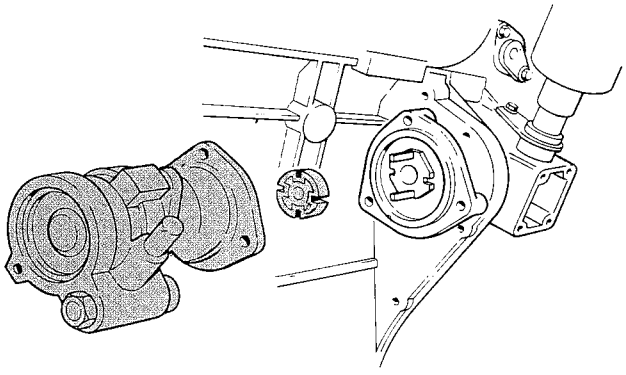


The power assisted rack and pinion steering system requires 2.8 turns, lock-to-lock, to turn the car through a circle of 39 ft.-4 in. The system has been refined to give positive feedback to the driver, and provided increased reliability.

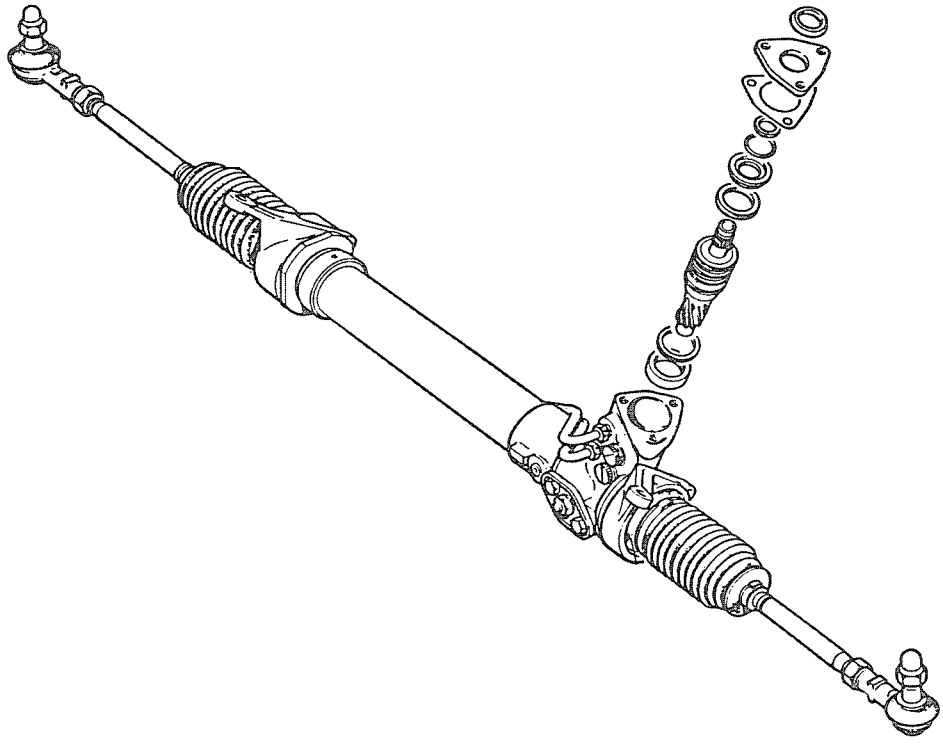


Power steering fluid is cooled via the radiator right side integral cooler.

The upper steering column is collapsible to provide driver protection in the event of a collision.

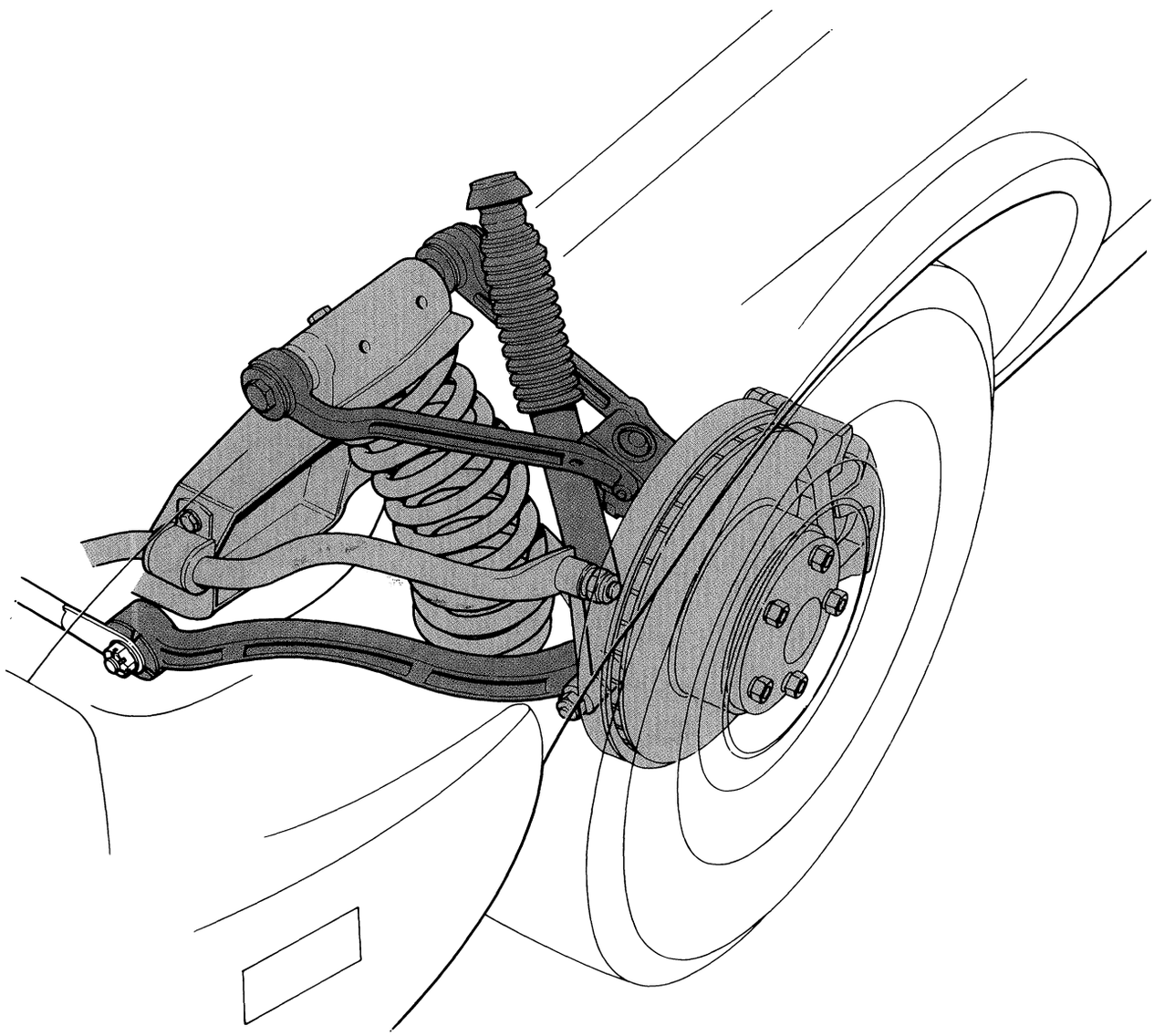


Pump
The pump is driven by the engine from the accessory drive, and mounts directly to the accessory drive pad. A coupling disc is used to connect the pump to the drive.



Rack and Valve
The control valve is assembled with the pinion gear. Note however, that the control valve housing is integral with the rack housing.

The layout of the front suspension follows the familiar Jaguar pattern. Having proved that this system delivers outstanding road holding, ride, and noise isolation, the double "A" arm layout with sub-frame mounting was retained for the new cars.

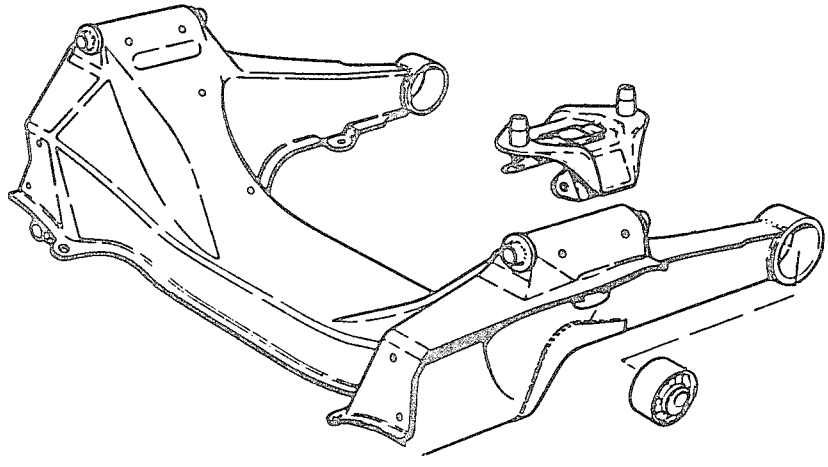


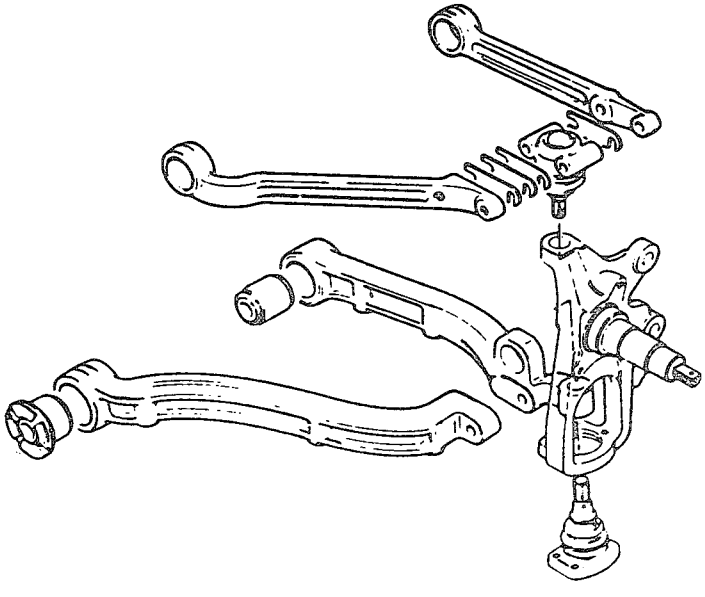
Although similar in appearance to the Series III, many detail changes have been made to improve the efficiency of the system.

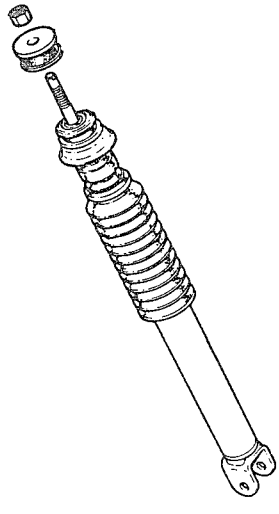
The new suspension has no carry over components.

Subframe

The most noticeable change is to the subframe. The pitch control arms face rearward and anchor into a stiffer part of the body. The front mounting bushings are "Vee" shaped and incorporate a safety strap. To provide increased rigidity, corrosion prevention, and noise insulation, the subframe is foam filled. Additionally, the subframe construction has been simplified.







"A" Arms

Both "A" arms are two piece forged assemblies.

Hub Carrier and Ball Joints

The hub carrier is retained by upper and lower ball joints. The ball joints are non-adjustable and are sealed, eliminating the need for lubrication.

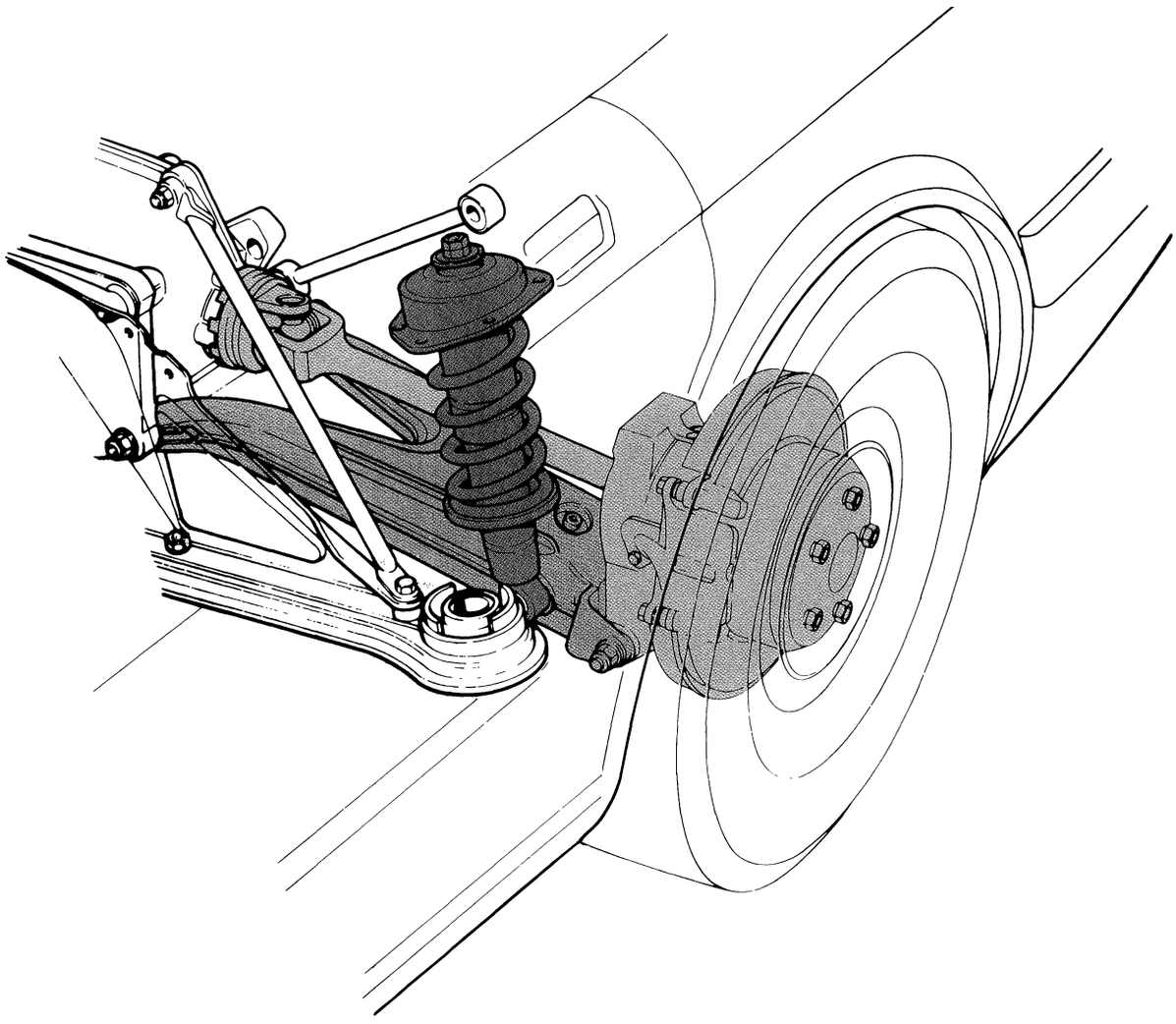
Shock Absorbers

The shock absorbers incorporate rebound stops for the suspension.

Alignment

All subframe fulcrums and mounting points are machined after assembly to ensure accuracy; therefore, steering rack positioning and front suspension camber adjustment provisions have been eliminated. Although shims are fitted in production, caster is not adjustable.

The design of the new rear suspension makes a substantial departure from the previous system. Both anti-lift and anti-squat compensation have been designed into the new system eliminating camber thrust changes and bump steer effects.

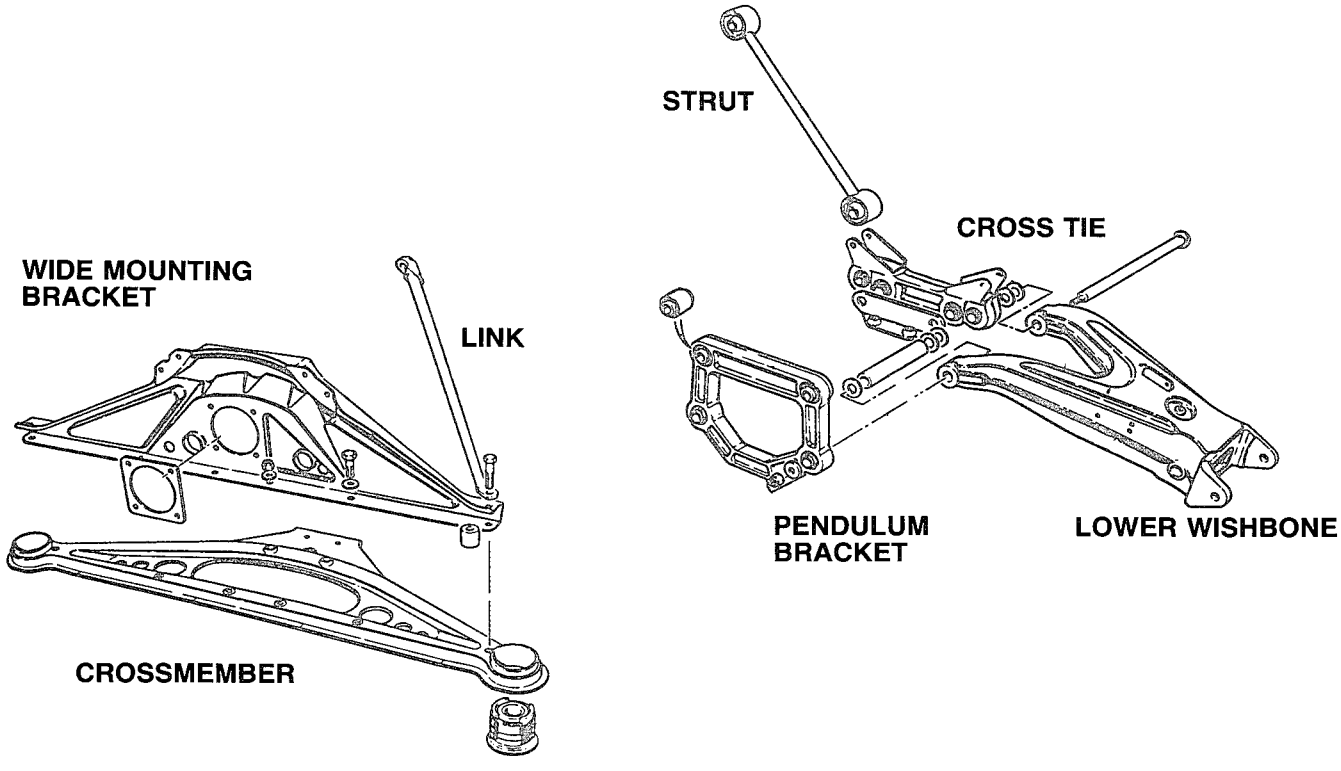


Isolation is provided by the use of a subframe; however, this is made up of many elements. The single coil shock assemblies attach to the body.

The basic two link system is retained with the drive shaft acting as the upper control arm. The rugged construction of the lower wishbone and the method of attachment eliminates the need for a radius arm.

Subframe

The subframe is made up of the cross member and a wide mounting bracket. Additional support and attachment to the body is provided by struts and links.



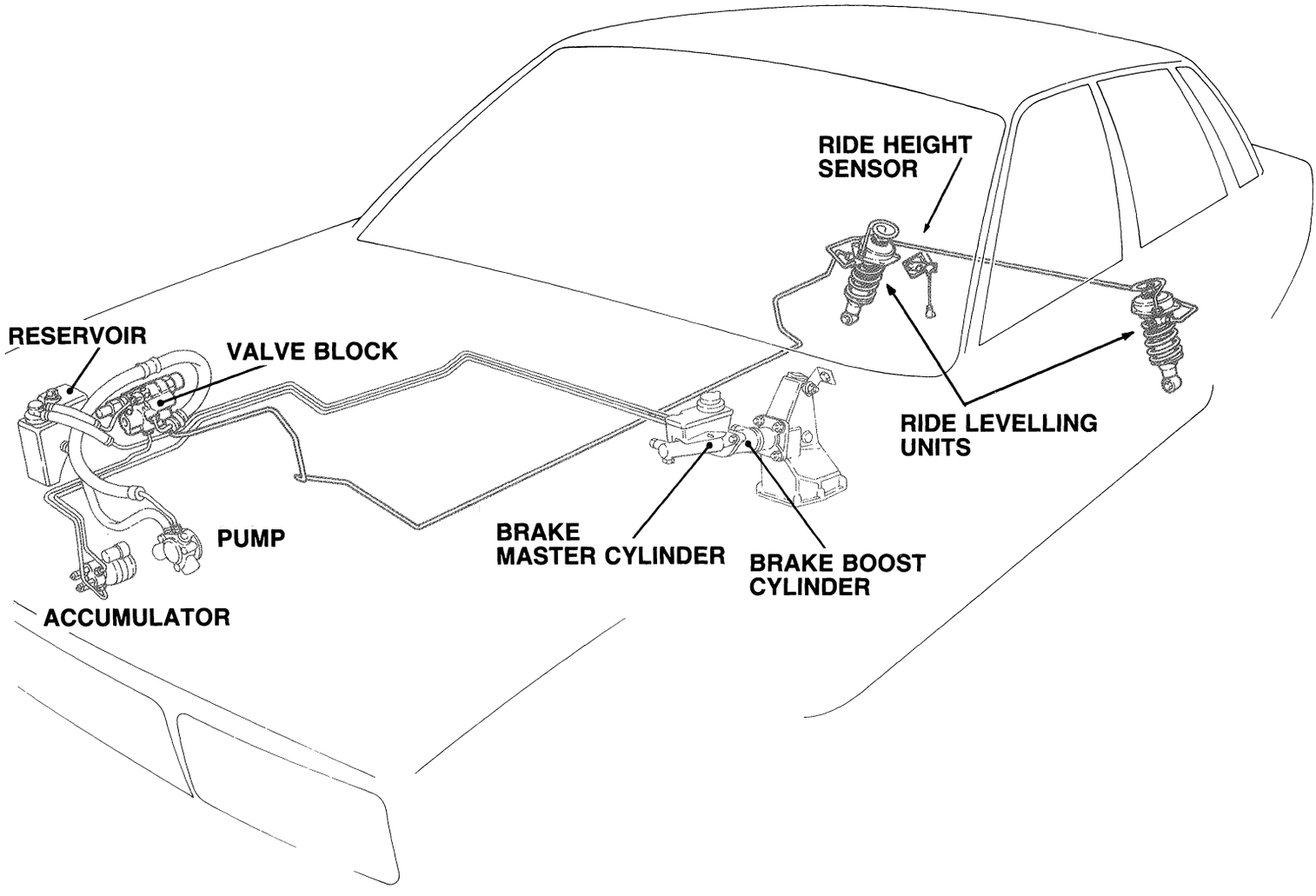
Isolation

Improved isolation over that offered by Series III was a major goal in designing the new rear suspension. This required considerable fore and aft compliance (movement); however, cornering stiffness had to remain tight to provide accurate handling. The use of a pendulum bracket at the front of the final drive unit and a cross tie at the rear provided the desired results. This compliant system attaches to the axle through bushings and uses the axle mass to dampen road noise. When the rear wheels pass over an irregular surface, the pendulum system allows approximately one inch of horizontal travel.

The coil shock units attach to the body in such a way as to provide down thrust at the differential pinion flange during acceleration. This reduces axle assembly "wind-up" which permits softer vertical mounting.

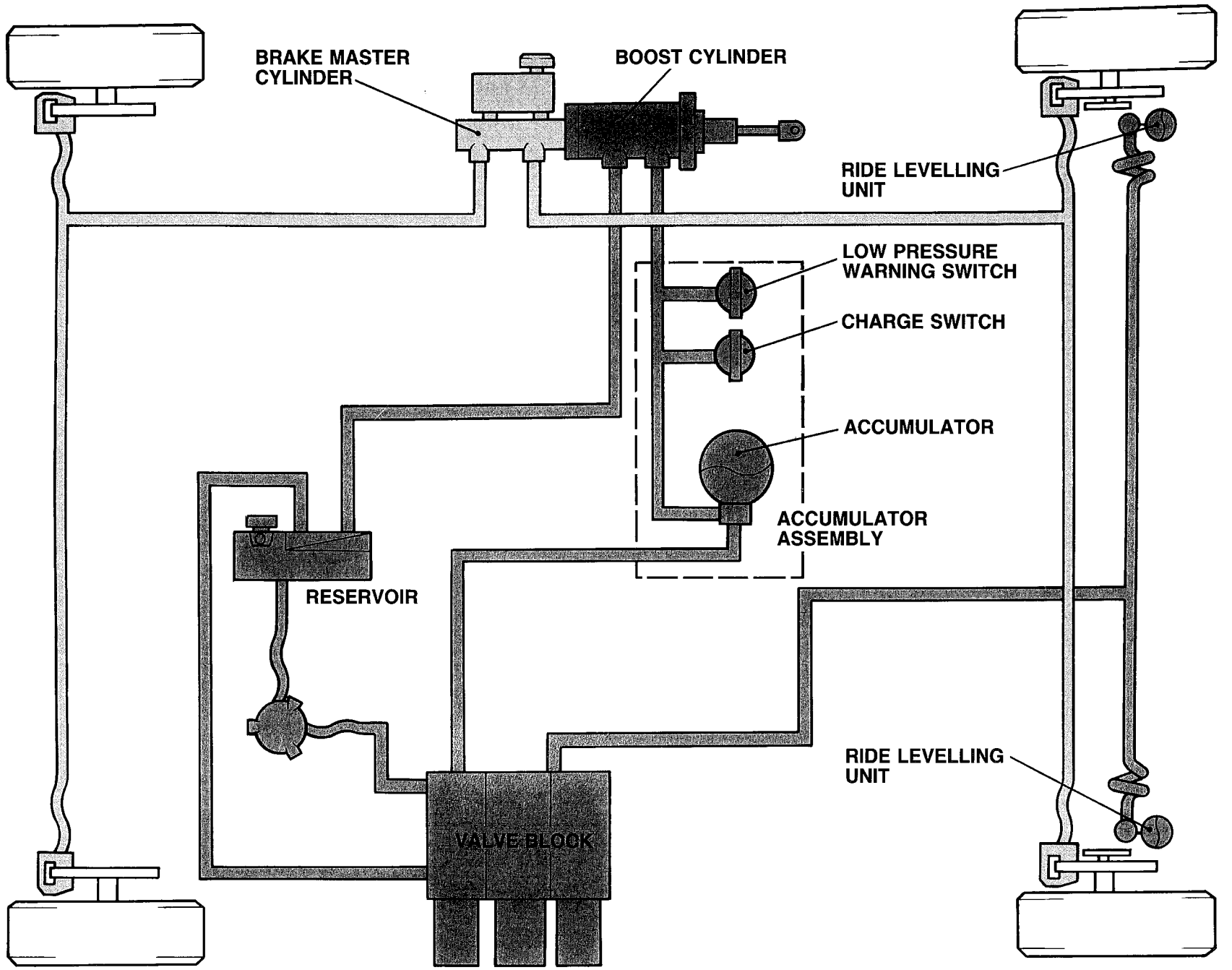
The result of this design is a considerable improvement in road isolation, axle noise isolation, ride, and handling.

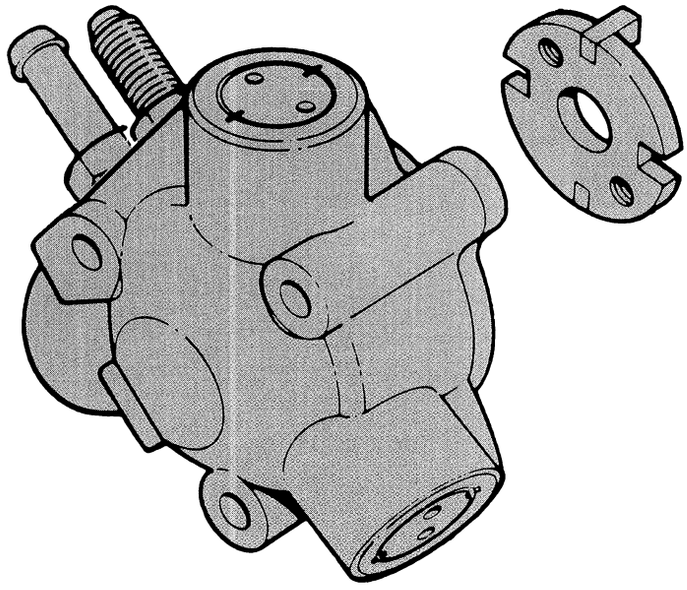
The new Jaguars have a central hydraulic power system to provide brake system boost and rear suspension ride levelling. CAUTION: THIS SYSTEM USES ONLY HYDRAULIC SYSTEM MINERAL OIL.



The basic system is comprised of a reservoir, pump, and valve block. The valve block directs oil to the brake boost system, the rear ride levelling system, or back to the reservoir.

The brake boost portion of the system incorporates an accumulator. Charging of this accumulator takes priority over other system functions and provides a reserve capacity of pressurized oil. This reserve will provide up to eight fully assisted brake pedal applications. The Jaguar Power Hydraulic System provides a 450% increase in potential boost energy over conventional vacuum systems and does so independent of engine speed, load, and temperature.


BRAKE MASTER CYLINDER
BOOST CYLINDER
RIDE LEVELLING UNIT
LOW PRESSURE WARNING SWITCH
CHARGE SWITCH
ACCUMULATOR
ACCUMULATOR ASSEMBLY
RESERVOIR
VALVE BLOCK
RIDE LEVELLING UNIT

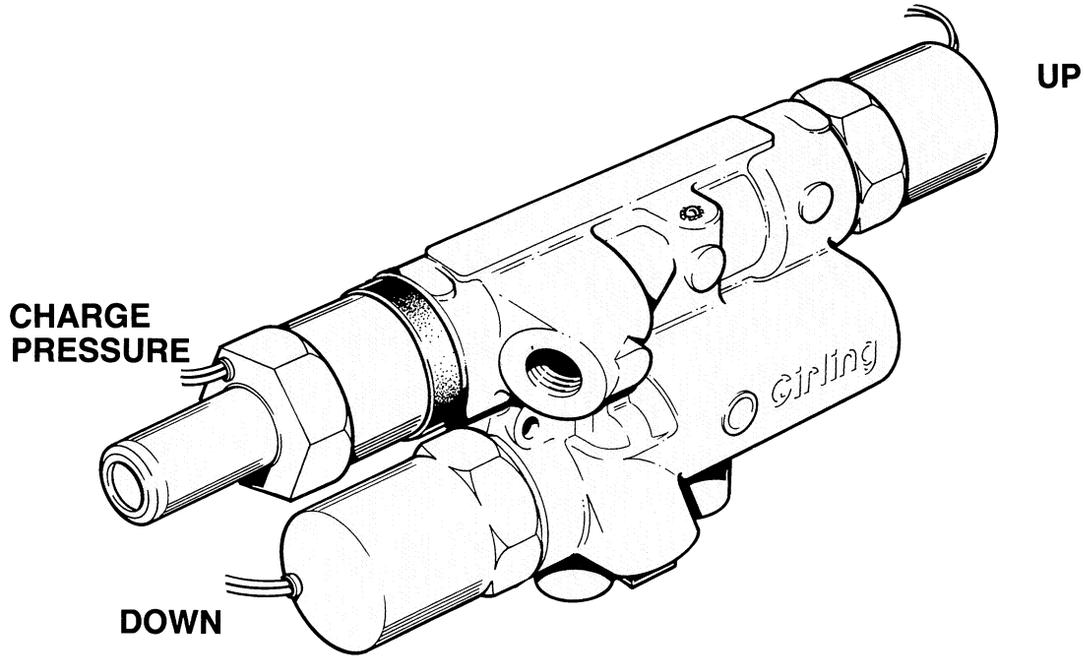


Pump

The three cylinder radial hydraulic pump is driven directly by the engine off the intermediate shaft drive pad. A coupling is used to connect the pump drive.

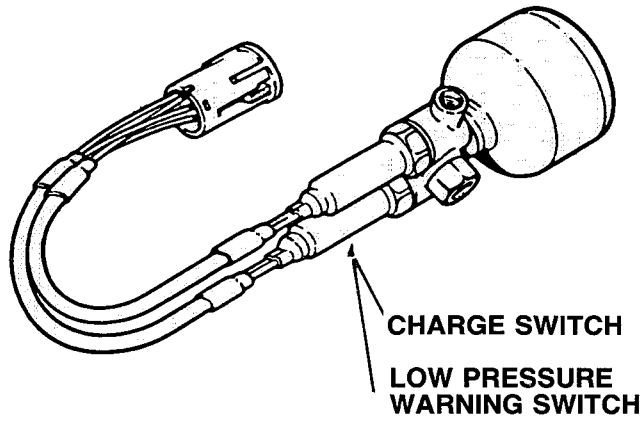
Valve Block

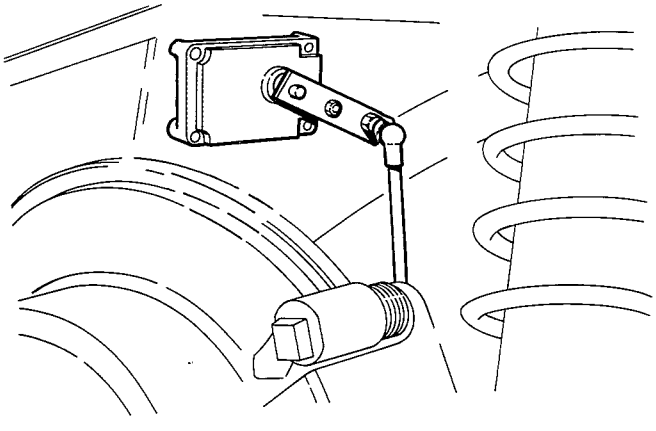
The valve block contains three solenoid operated spool valves. Two solenoids direct oil to and from the rear ride levelling units. The other provides charged pressure for the brake boost accumulator. An internal pressure relief valve is also incorporated.



Accumulator

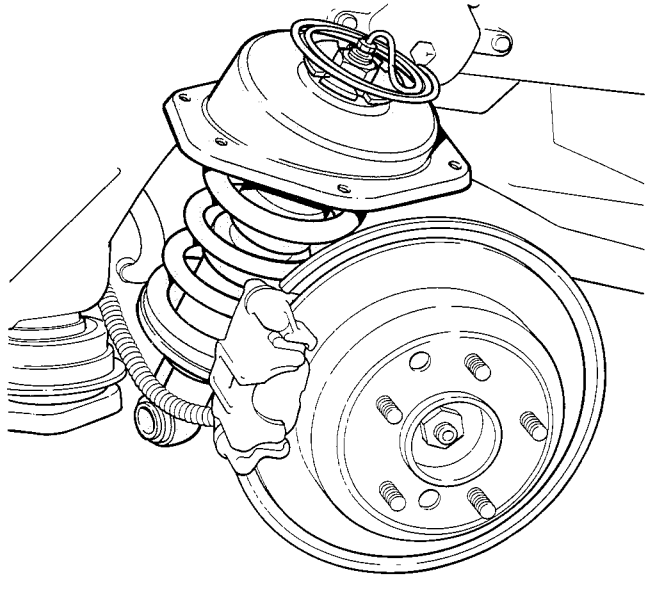
The accumulator has a nitrogen charged chamber separated from the hydraulic oil by a bladder. Incorporated into the accumulator are two switches: the charge switch activates the valve block charge solenoid; the low pressure warning switch sends a signal to the instrument pack for display on the VCM (Vehicle Condition Monitor).





Ride Height Sensor

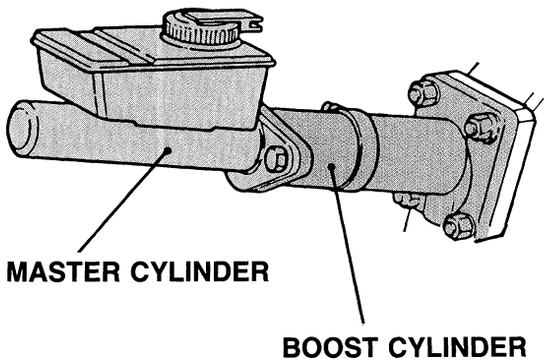
The ride height sensor incorpates a LED (Light Emitting Diode) height sensing mechanism and an electronic control module. The UP and DOWN solenoid valves are activated by the ECM. A nominal 20 second delay in UP and DOWN signals from the ECM prevents system reaction to transient loads such as cornering.

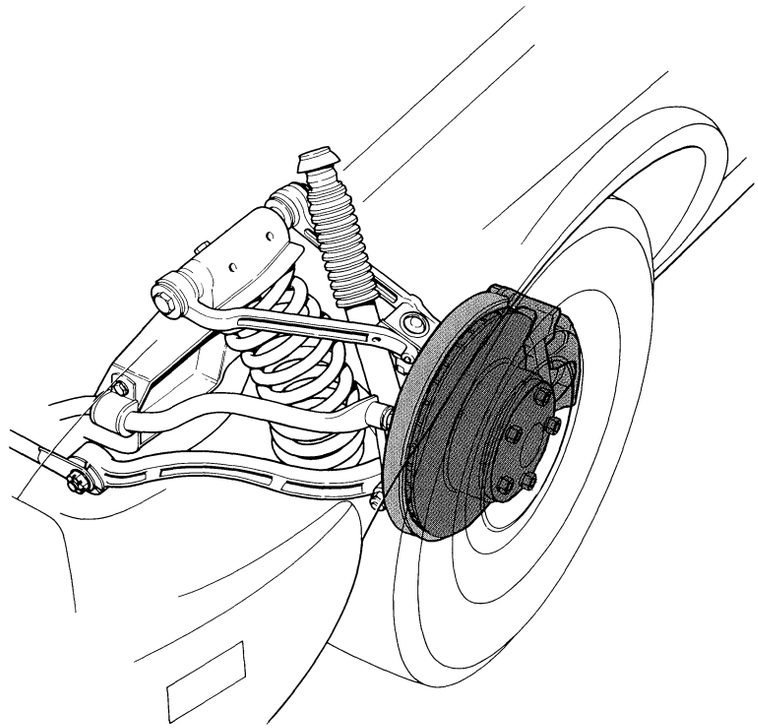


Ride Levelling Units

Ride levelling provision is provided in the rear coil shock units.

The brake hydraulic system is a front/rear split system with a tandem master cylinder and dual brake fluid reservoir. Anti-lock Braking has been incorporated into the system and is detailed starting on page 56.

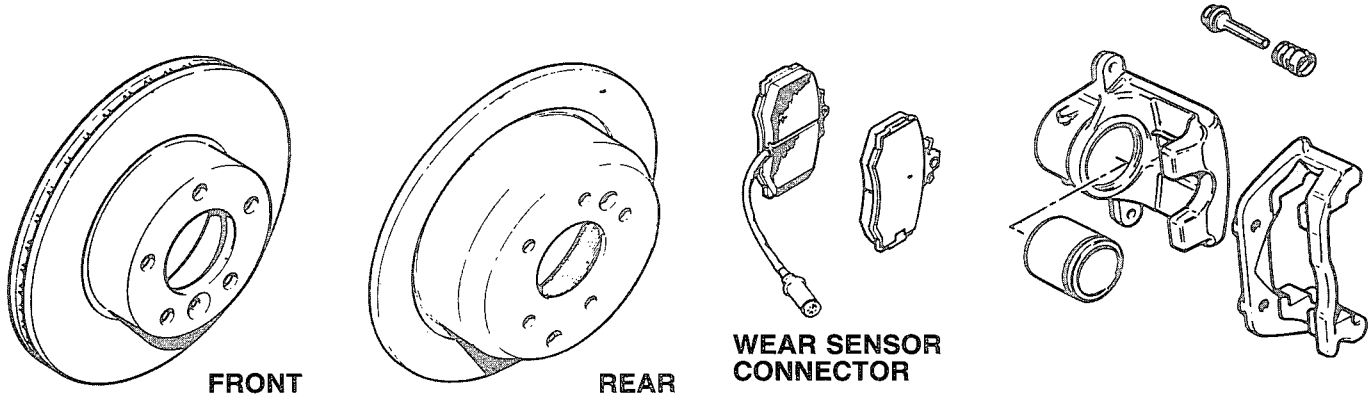




Brake Failure Warnings

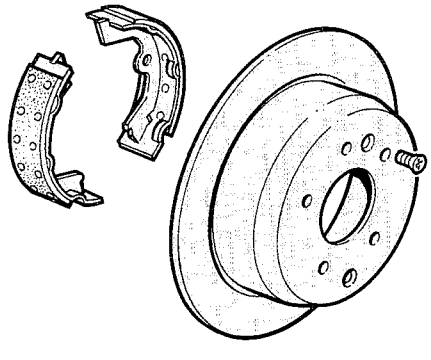
The instrumentation system provides the driver with several brake failure warnings on the VCM (Vehicle Condition Monitor):

- *BRAKE FAILURE (Hydraulic system failure)*
- *BRAKE FLUID*
- *BRAKE PAD LOW*
- *PARK BRAKE ON*
- *ABS*



Discs and Calipers

All four brakes are mounted outboard for ease of maintenance and brake cooling. The front brakes have ventilated discs; the rear, solid discs. Single piston, full floating calipers are used throughout. The inner pad in each caliper incorporates a wear indicator which signals the instrumentation system to provide a warning on the VCM.

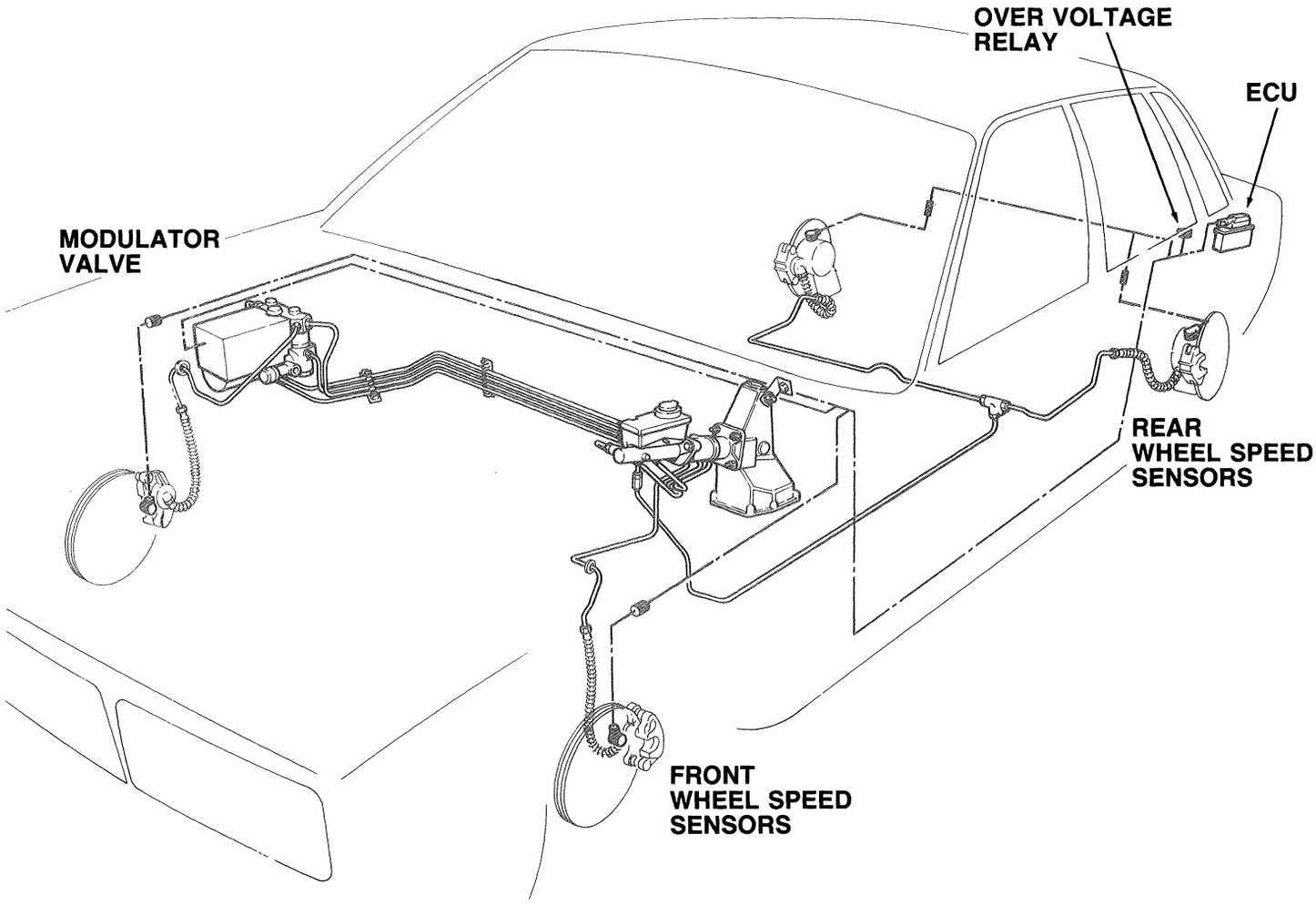


Parking Brake

The parking brakes are set by a hand lever near the center console through a cable system. Brake shoes are incorporated into "drums" in the rear discs and are applied by a sliding wedge mechanism. The self energizing shoes provide positive parking security.

OVERVIEW

The greatest benefit of Anti-lock Braking is that it helps the driver to maintain steering control when braking hard to take evasive action on a slippery road.

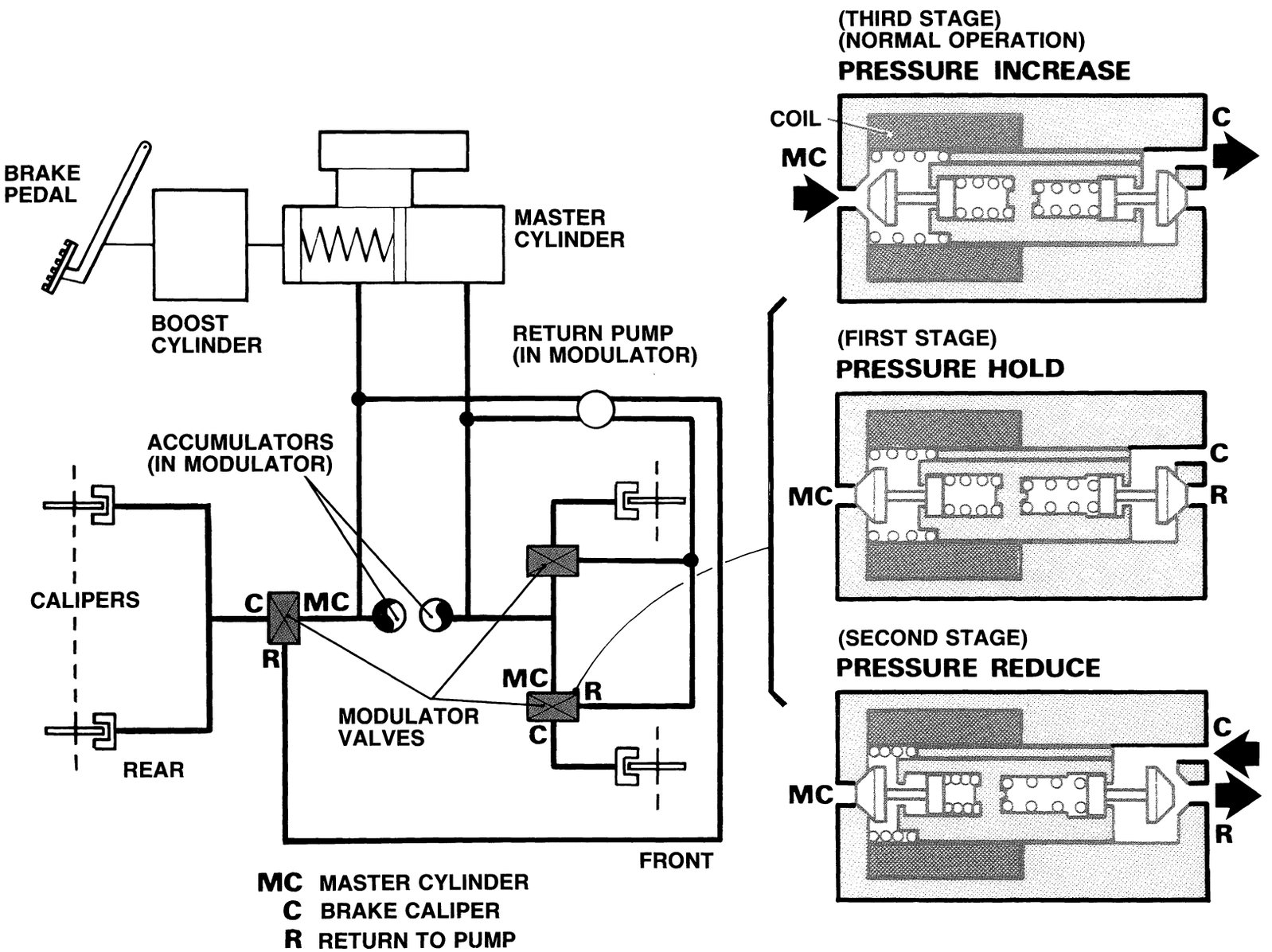


The Anti-lock Braking System eliminates wheel lock by modulating the hydraulic pressure applied to the individual brake calipers so that adhesion between the tires and the road is maintained.

The system consists of a modulator valve situated in the three hydraulic pressure lines from the master cylinder to the brake calipers—Left front wheel, Right front wheel, and Rear wheels. Each wheel is fitted with a wheel speed sensor. The ECU receives input from the four wheel speed sensors and controls the modulator action. An over voltage relay provides ECU electrical protection.

YAW CONTROL

If only one side of the car is on a slippery surface, there will be a considerable difference between the wheel speeds on either side of the car when the driver brakes. This can produce steering difficulty. The Jaguar Anti-lock Braking System has Yaw Control programmed into its ECU software which allows it to compensate for widely different side to side braking effort. It initially reduces the braking pressure on the "good" wheel as well as on the one about to lock. Yaw Control takes place only in the initial phase of operation allowing the driver time to sense the situation and apply progressive steering correction.


BRAKE PEDAL
BOOST CYLINDER
MASTER CYLINDER
RETURN PUMP (IN MODULATOR)
ACCUMULATORS (IN MODULATOR)
CALIPERS
REAR
C
MC
R
MODULATOR VALVES
FRONT
MC MASTER CYLINDER
C BRAKE CALIPER
R RETURN TO PUMP
(THIRD STAGE)
(NORMAL OPERATION)
PRESSURE INCREASE
COIL
(FIRST STAGE)
PRESSURE HOLD
(SECOND STAGE)
PRESSURE REDUCE

Four Wheel Sensing

Each wheel has a sensor which feeds wheel speed information to the ECU. The pulsations generated as the sensors turn provide the ECU with individual wheel speed information.

Brake Lock Sensing

By comparing the input from all four sensors, the ECU determines when wheel lock is imminent.

Anti-Lock Control

When wheel lock is imminent, the ECU responds in three stages:

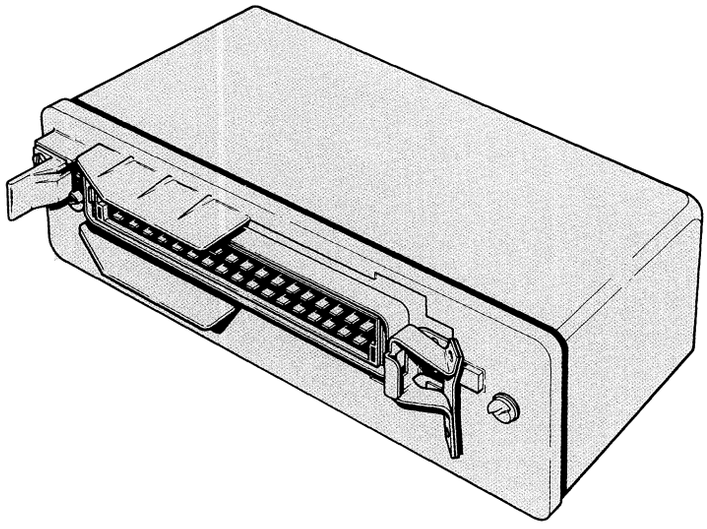
First—It closes off the supply port from the master cylinder which prevents additional brake pressure being applied to that wheel (wheels-rear).

Second—If the wheel is still decelerating, it opens the return port which allows the pressure to be reduced causing the wheel to re-accelerate. When the return port is opened by the ECU, the modulator return pump is activated to re-circulate the hydraulic fluid to the supply side accumulator.

Third—It reinstates brake pressure to decelerate the wheel (wheels-rear).

The ON-OFF three stage cycle occurs at between two and eight times per second, depending on braking conditions, until the wheel(s) again operate within the correct speed range.

COMPONENTS

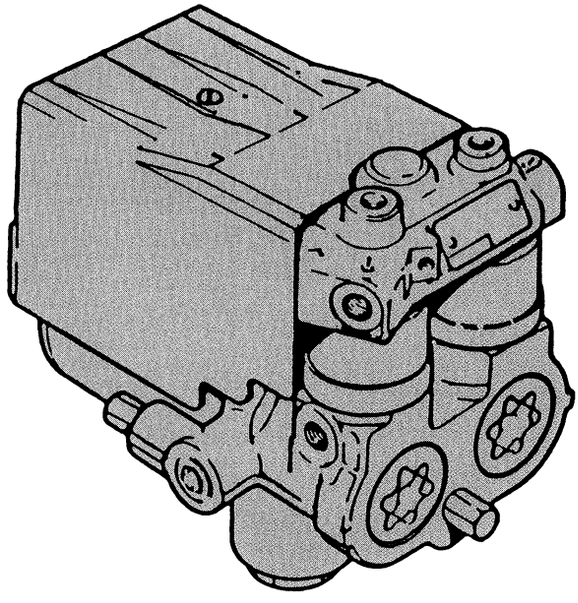


Electronic Control Unit

The ECU is a microprocessor which is programmed to provide anti-lock braking by comparing inputs received from the wheel speed sensors and providing activating signals to the modulator solenoid valves and return pump.

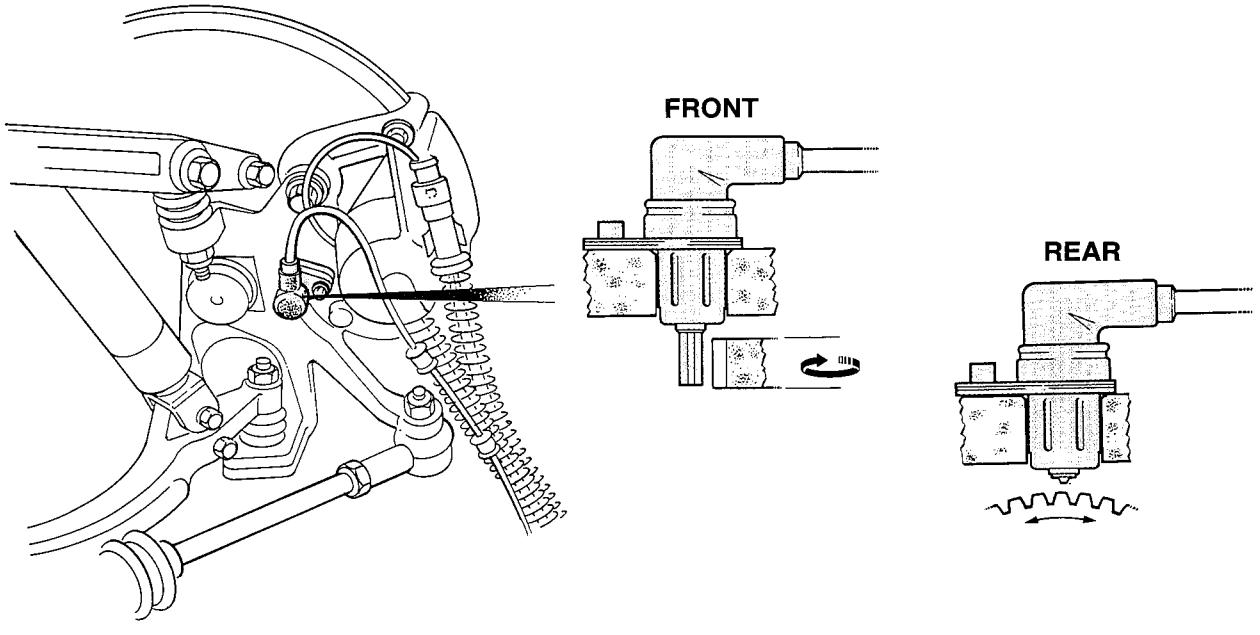
Modulator

The hydraulic modulator consists of: three solenoid operated valves, two accumulators – one in each supply line, and a return pump.



Wheel Speed Sensors

Each wheel speed sensor is made up of a magnetic sensor and a rotating, 48 tooth reluctor. When the reluctor turns it produces electrical pulsations which are fed to the ECU as individual wheel speed information.



SYSTEM SELF TESTS

The ECU automatically performs self tests and signals the instrumentation system to display a warning on the VCM (Vehicle Condition Monitor) if a fault is found.

The tests are performed in three phases:

Initial Tests—performed as the ignition is switched to II.

- *Simulated wheel speed signals are generated and circuits are checked for the correct response.*
- *Battery voltage checked to ensure greater than 10V.*
- *Wheel acceleration/deceleration levels checked within the microprocessor.*
- *Fail warning on VCM switched OFF if all okay.*

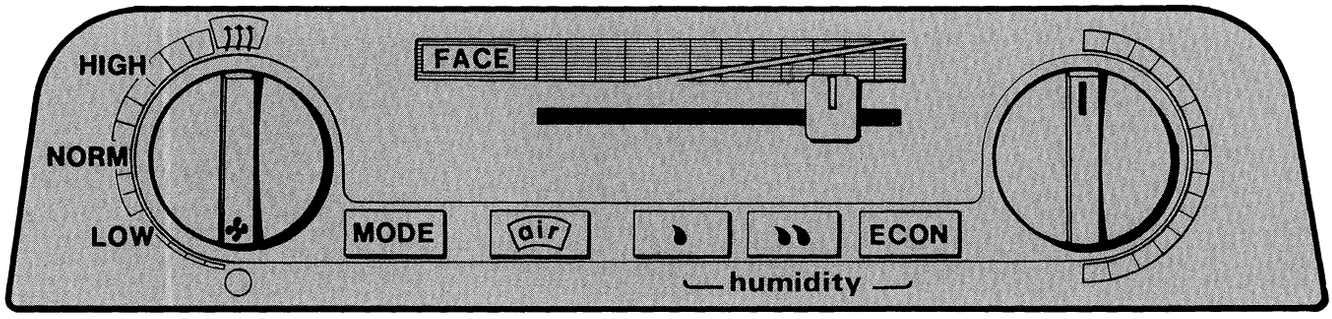
Low Speed Tests—performed when vehicle reaches speed of 3.6 MPH.

- *Modulator valves are actuated to ensure correct currents are flowing.*
- *The pump is activated and operation verified.*
- *Low speed tests occur the first time the road speed reaches 3.6 MPH, after the vehicle is started.*

Continuous Tests—performed while the vehicle is running.

- *Each wheel speed sensor output is monitored to ensure that it is within the expected range.*
- *The wiring harness is checked for open and short circuits.*

The climate control system is a completely new design. The sophisticated Mk IV system achieves its performance through simplicity and electronic control—there are no amplifiers, mechanical servos, or operating linkages in the climate control unit. The new system offers precise control of: TEMPERATURE, AIR FLOW, and HUMIDITY.

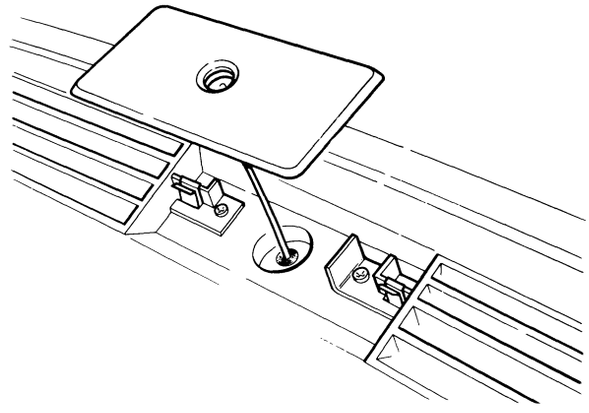


AUTOMATIC OR MANUAL Control

The Jaguar Mk IV system allows for fully automatic or manual control of *both the blower speed and temperature.*

Humidity Control

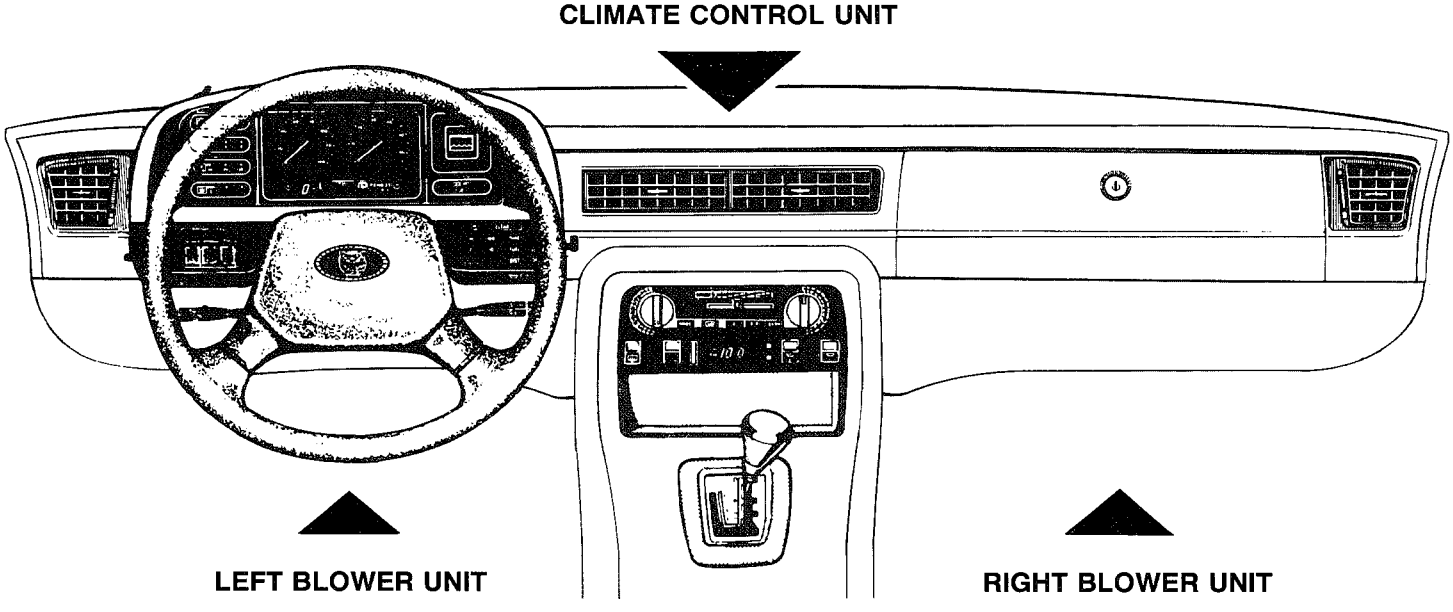
Humidity control is unique to the Jaguar Mk IV system. The humidity level is controlled by the "tear drop" switches and the "ECON" switch. the driver can select: maximum moisture removal (no switches selected), less moisture removal (1 teardrop), even less moisture removal (2 teardrops), and no moisture removal (ECON). Compressor operation is switched OFF when "ECON" is selected.

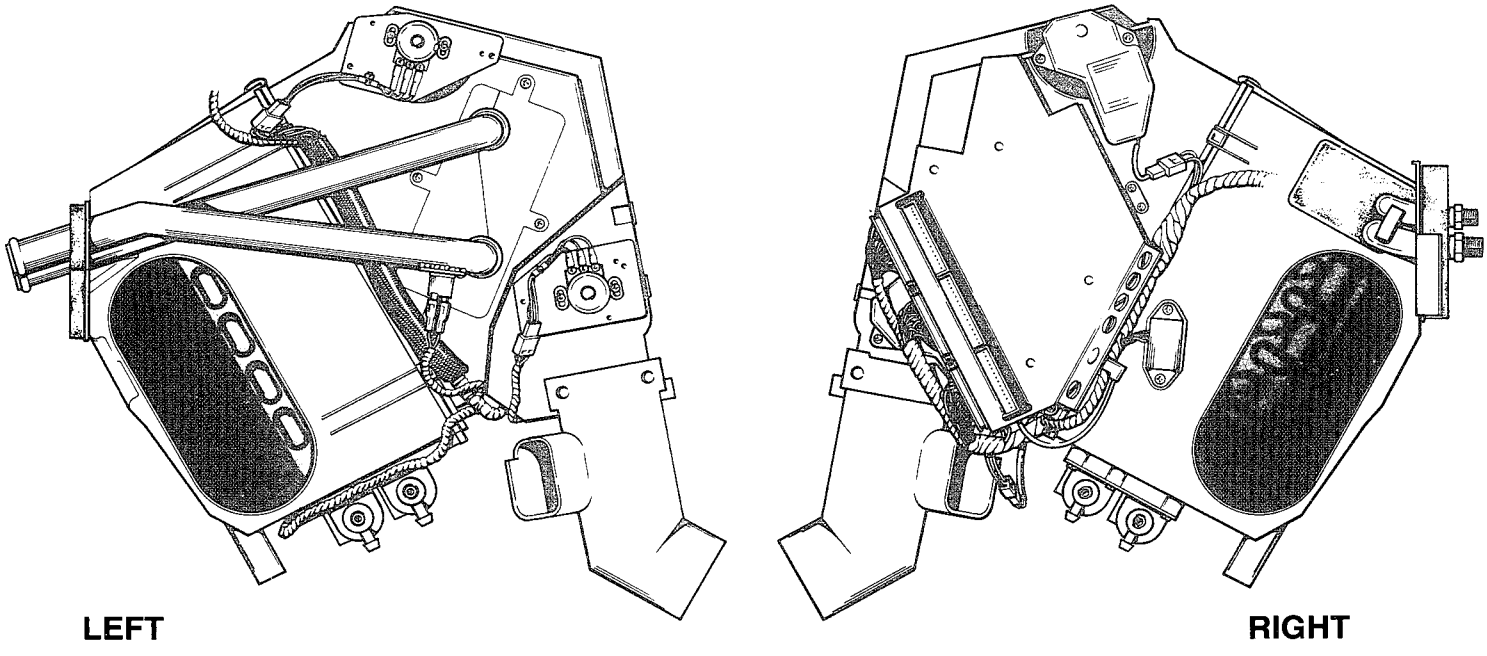


Solar Compensation

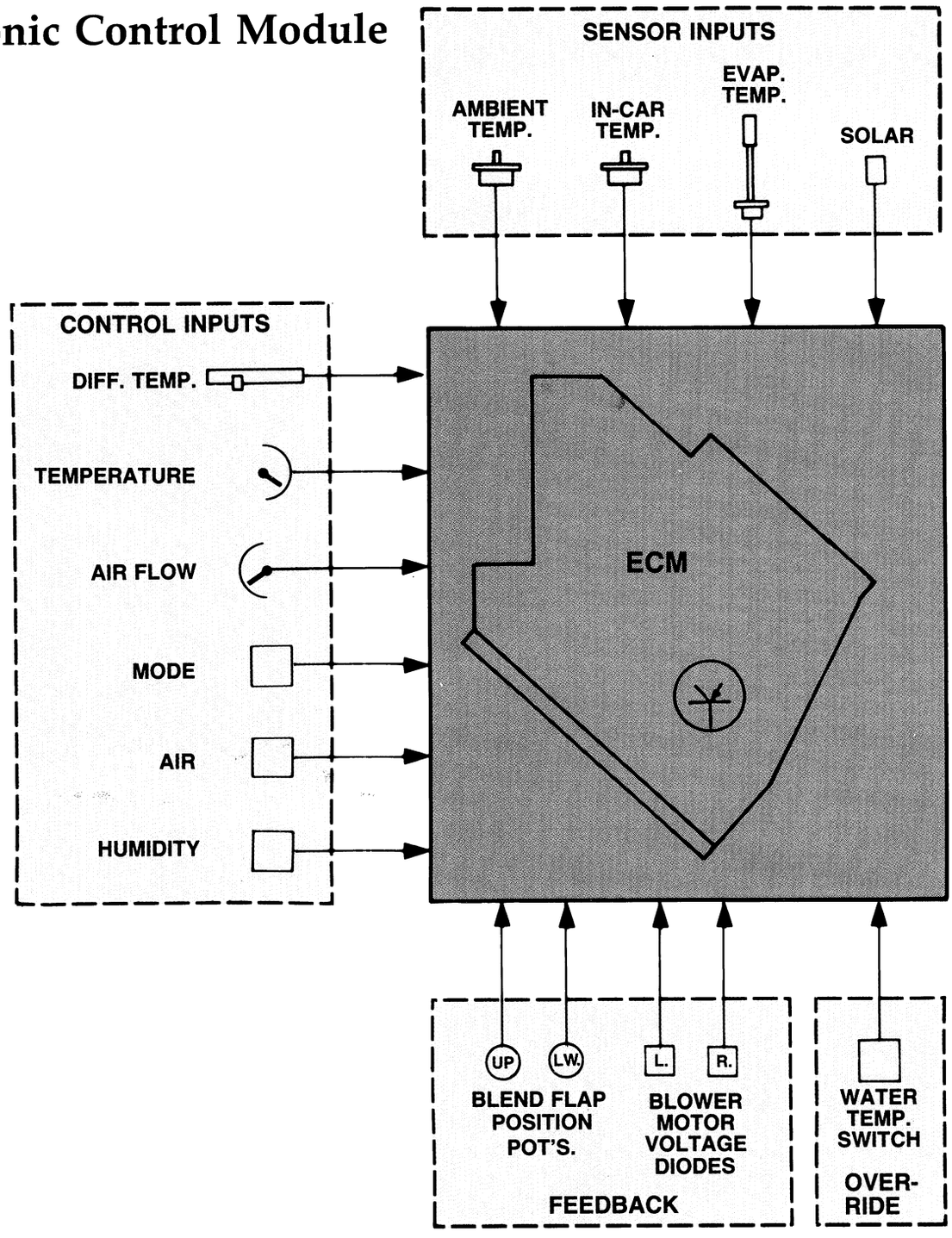
The Mk IV system compensates for heat from direct sunlight. A solar sensor located on the top of the dash, signals the climate control ECM (Electronic Control Module) to make immediate temperature adjustment for changing sunlight loads.

The system is laid out in the familiar way with the climate control unit behind the center console, and Left and Right blower motors and housings. Three vacuum actuated flaps control Re-circulation (blower housing flaps), Center Vent, and two stage Defroster Vent air flow.

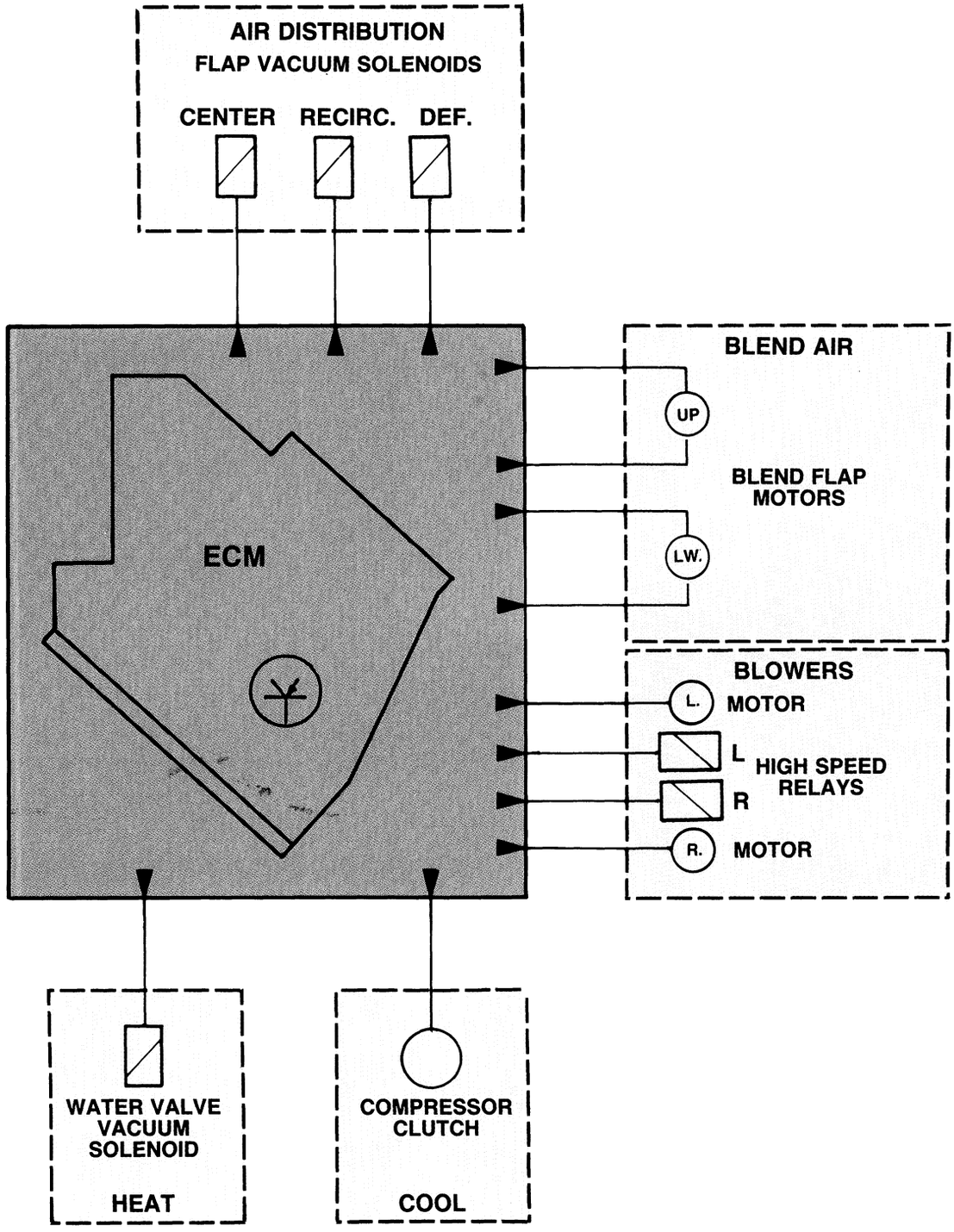




Electronic Control Module (ECM)

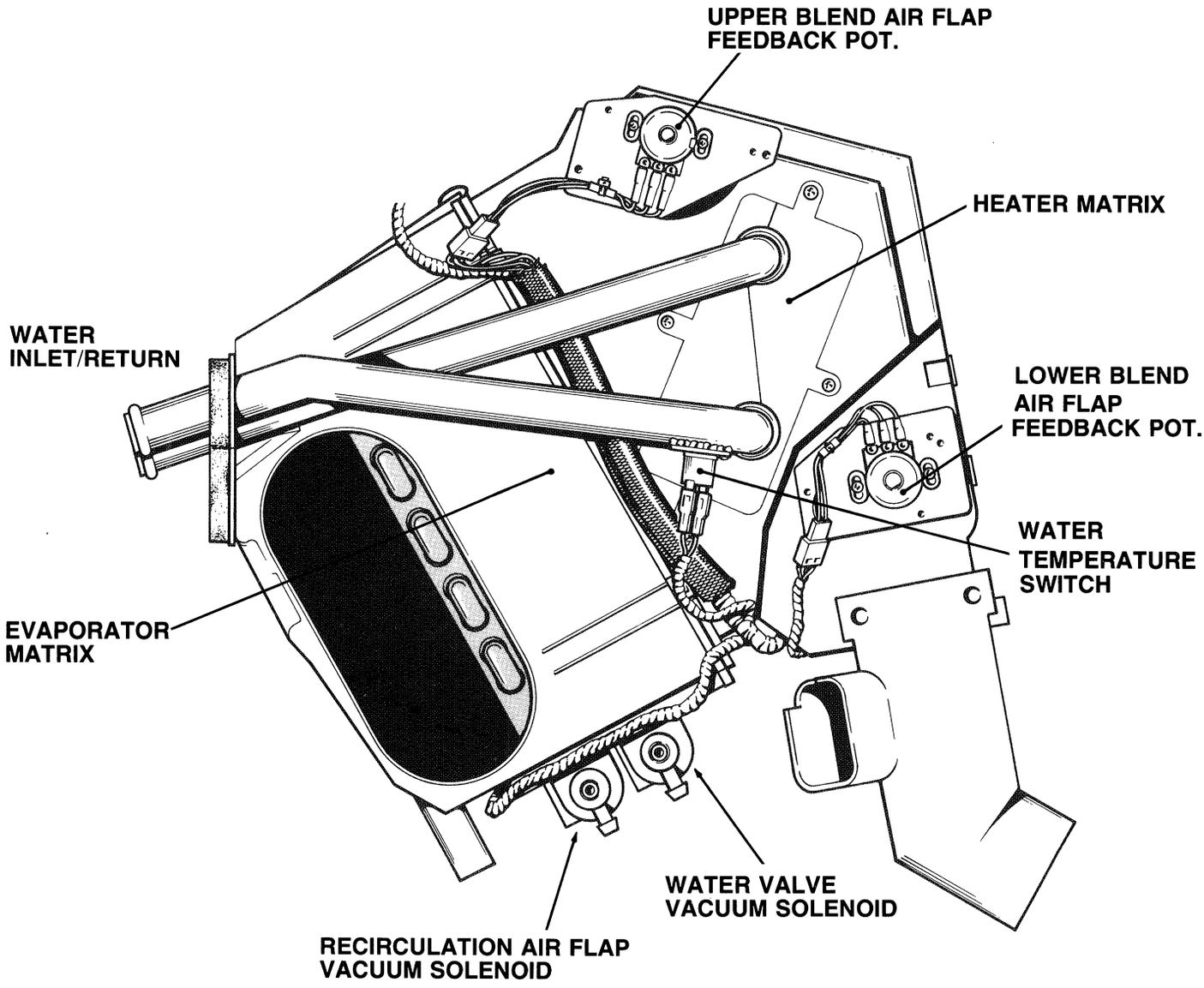


The Electronic Control Unit (ECM) receives input from the control panel, sensors, feedbacks, and an override switch. The ECU compares the control data with the sensor and feedback data.

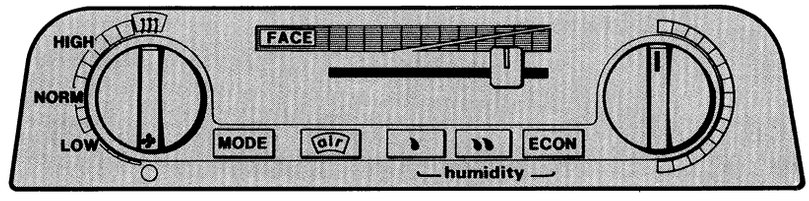


It then provides output voltages to operate flap servo solenoids, blend air flap motors, blowers, the compressor clutch, and the water valve solenoid to achieve the selected temperature, air flow, and humidity level. The blend air flap servo motors operate in both directions depending on voltage application from the ECU. The variable blower motor speeds are non-stepped and are electronically controlled via the power transistors in all speeds except high. In high, the high speed relays are energized. Each blower unit—left and right, has an individual blower speed control circuit.

Climate Control Unit—Left Side

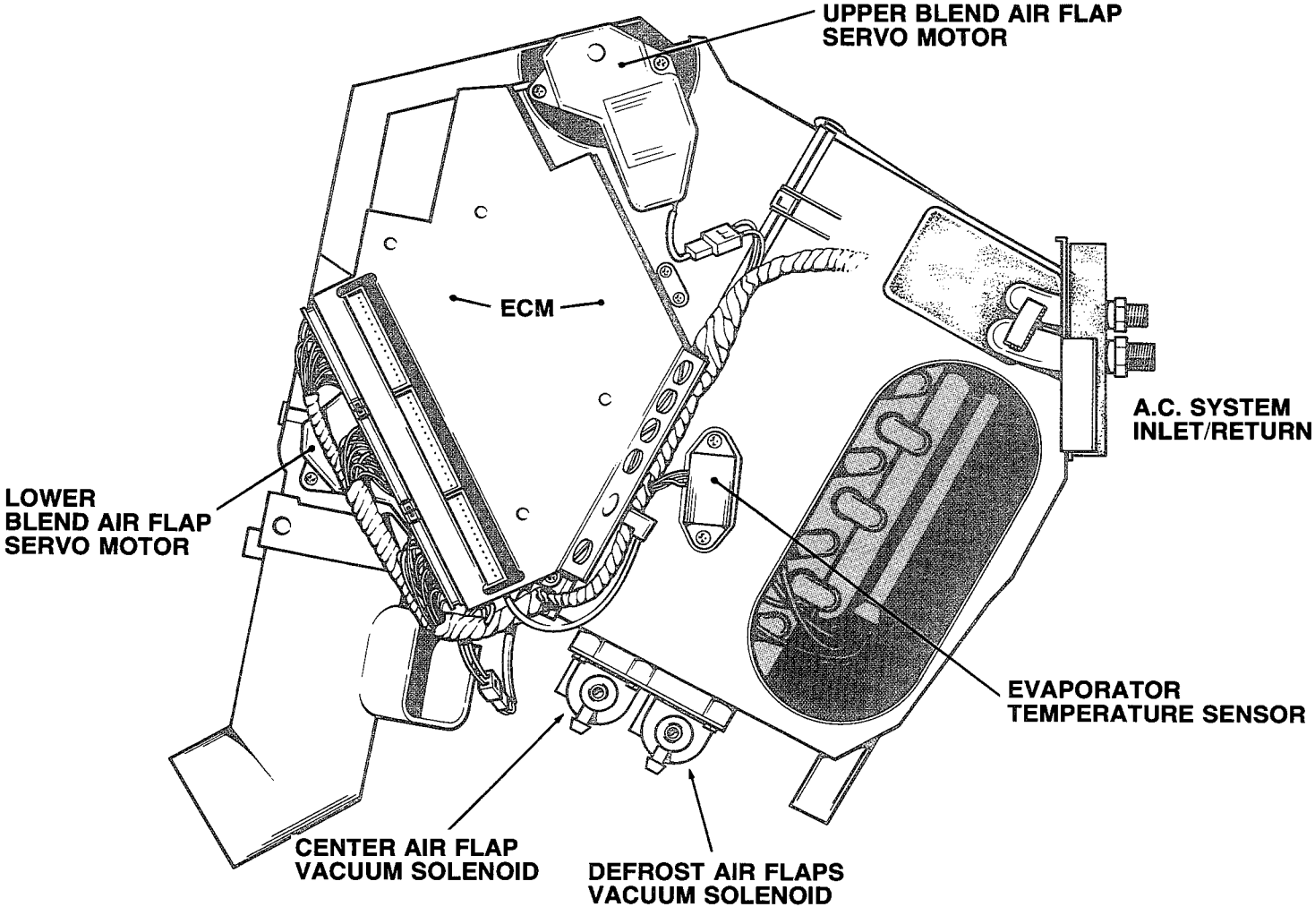


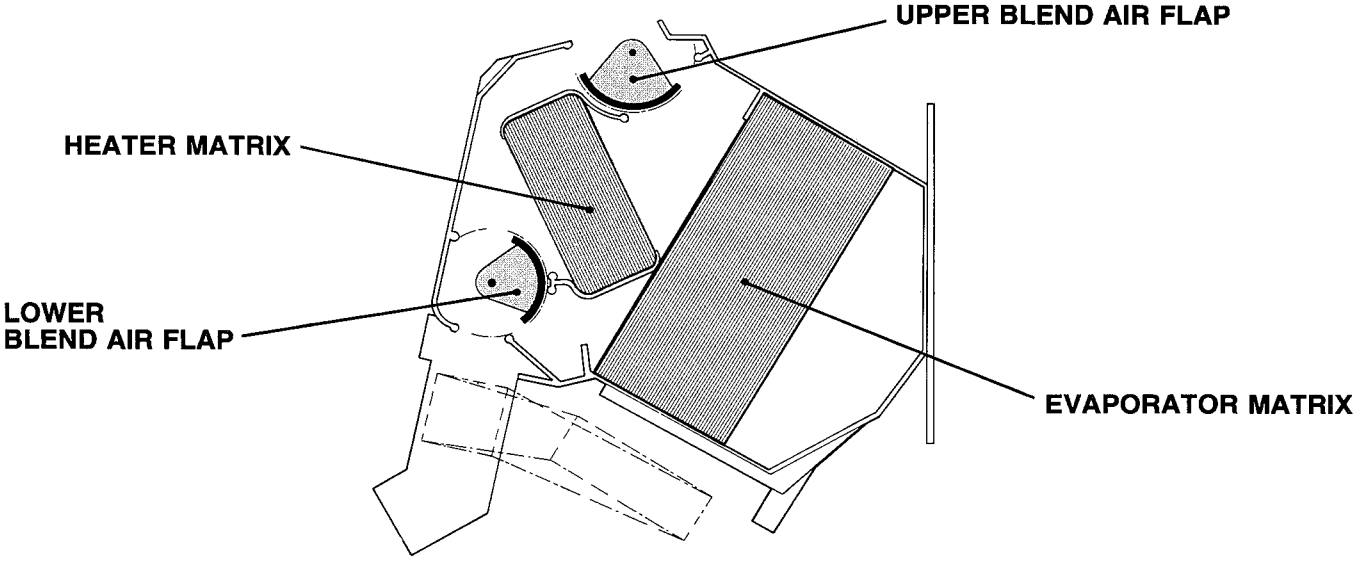
Control Panel



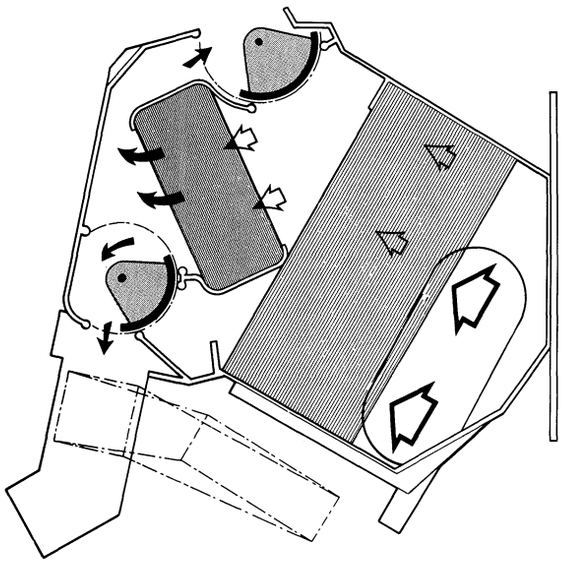
Separate unit with electrical connection to the climate control unit.

Climate Control Unit—Right Side

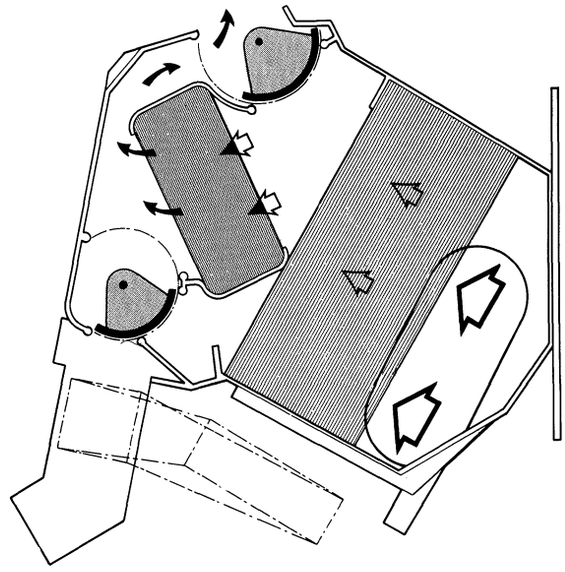




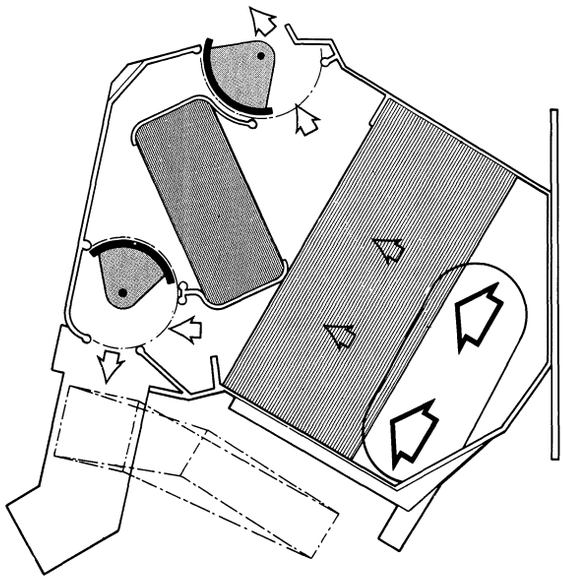
Blend Air Flap Positioning



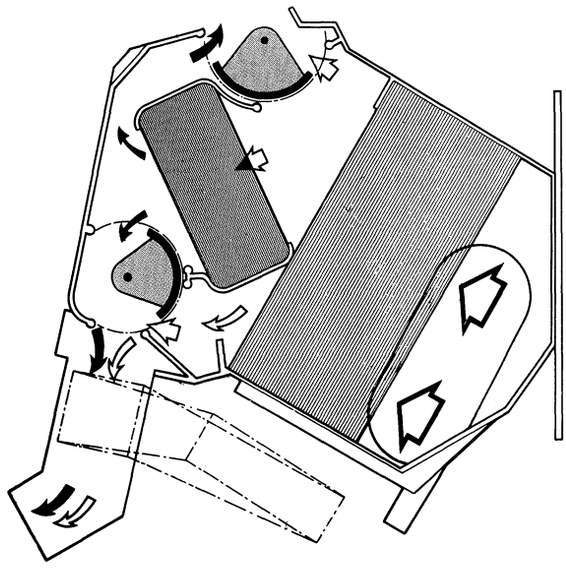
FULL HEAT



DEFROST

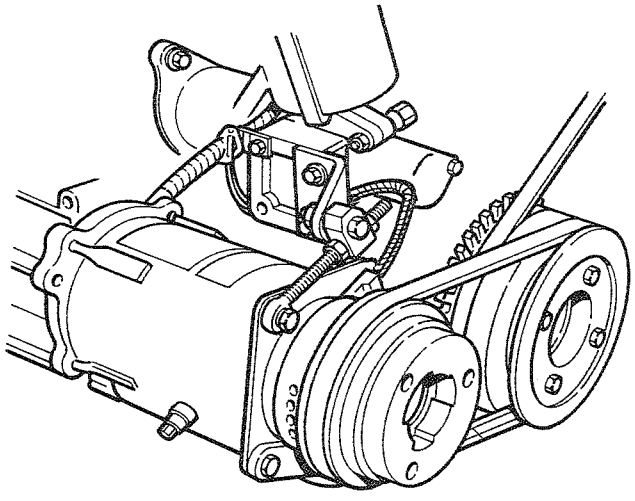


FULL COOL

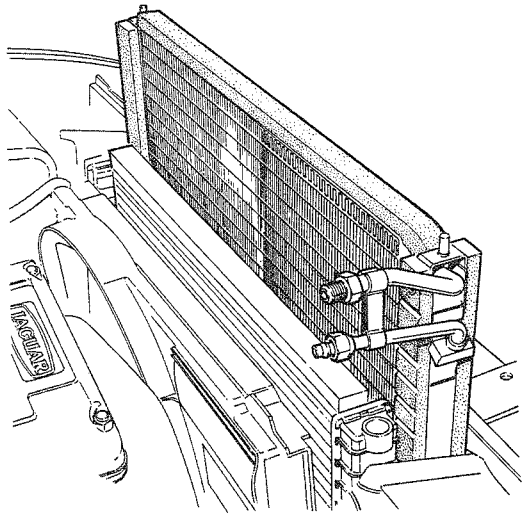


HEAT/COOL BLEND

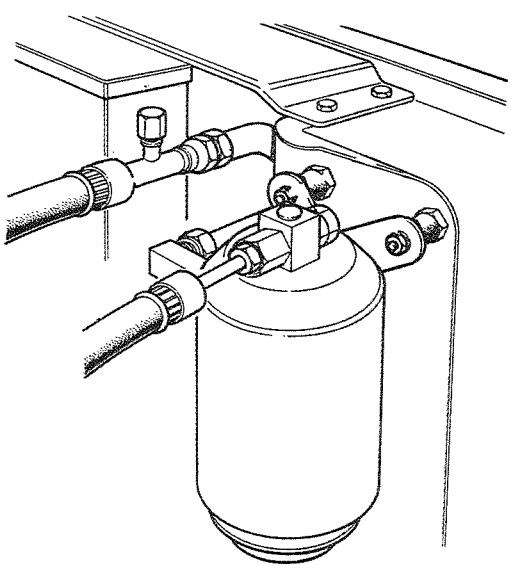
Air Conditioning Components



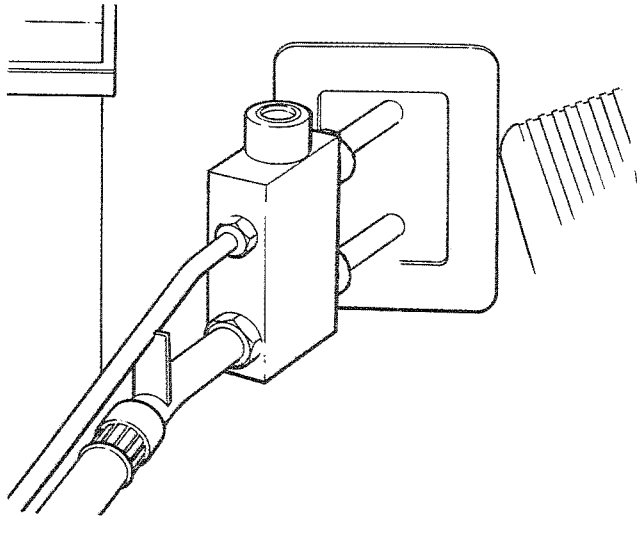
Compressor



Condenser

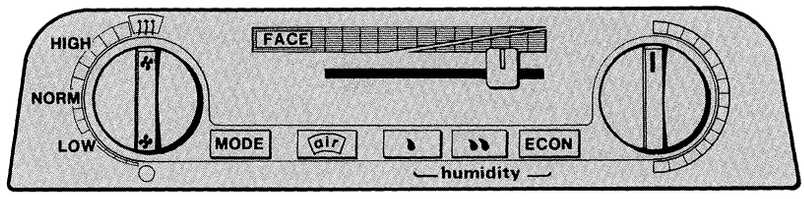


Receiver/Dryer

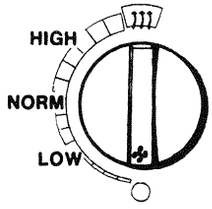


Expansion Valve

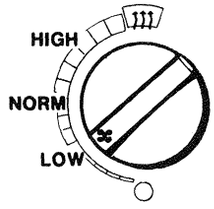
Controls



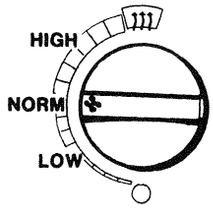
BLOWERS



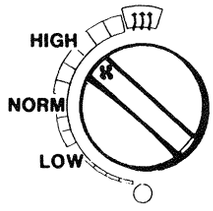
The system is not operational. Power is OFF but, a signal is sent to the ECM to ensure the re-circulation (blower intake) flaps are closed to prevent outside air from entering the car.



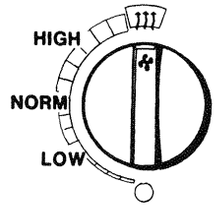
The ECM maintains blower speed within a range of low speeds depending on the vehicle temperature requirement.



The ECM controls the full range of blower speeds depending on the vehicle temperature requirement.

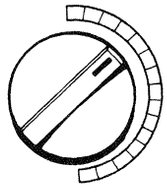


The ECM provides high blower speed only.



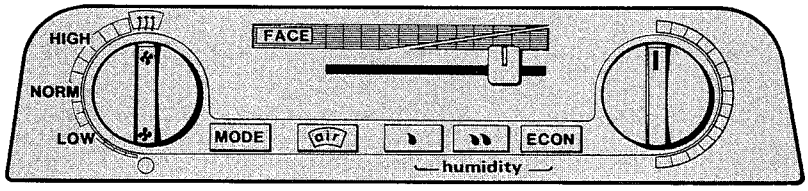
The ECM provides high blower speed only. Additionally the defrost vents are opened, the lower blend air flap is closed, and full heat is provided.

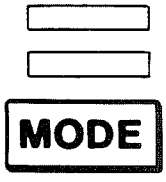
TEMPERATURE



In-car temperature requirements within a range of 63° to 83°F are provided, *with the MODE switch set to AUTOMATIC.*

Vent outlet temperature is set at the desired level, *with the MODE switch set to MANUAL.*





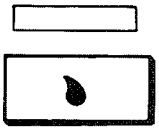
In AUTOMATIC, the system is under ECM control and provides the selected in-car temperature and humidity level.
In MANUAL, the temperature sensors are overriden and the selected temperature is provided at the vent outlets.

Air provides windshield demisting by opening the Defrost flaps; however, no change to air flow volume and temperature is made.

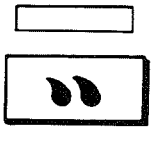
HUMIDITY

ALL OFF

The evaporator temperature is controlled between 32 to 32.5°F.

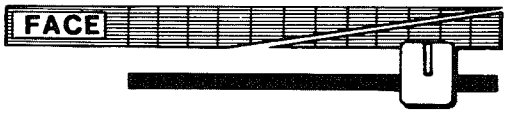


The evaporator temperature is controlled between 39 to 39.5°F.



The evaporator temperature is controlled between 44.8 to 45.2°F.

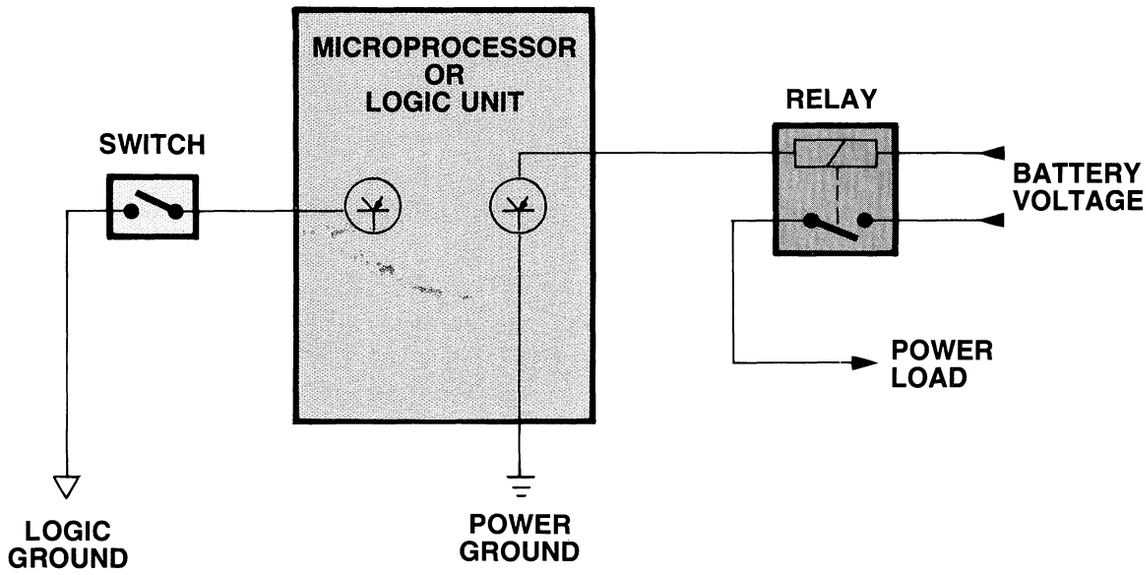
The compressor is switched off and the air conditioning system is inoperative. The system will operate as a heater, if required, in both AUTOMATIC and MANUAL modes.



Outlet air temperature of the two side facia vents can be controlled by the sliding bar. Full left decreases air outlet temperature; full right increases air outlet temperature.

The first priority in designing the new electrical system was RELIABILITY. Mechanical related components such as switches, relays, and connectors were known to be the weak points in conventional electrical systems, contributing to 60 percent of all electrical failures. To address these known shortcomings a fundamental change in electrical system design was called for.

Jaguar, starting with a "clean sheet of paper," has designed an electrical system which has been proven to deliver outstanding reliability and functional flexibility for this new generation of cars. This system employs new features which enhance reliability and allow a considerable reduction in wire size and harness bulk.



LOW VOLTAGE GROUND LINE SWITCHING

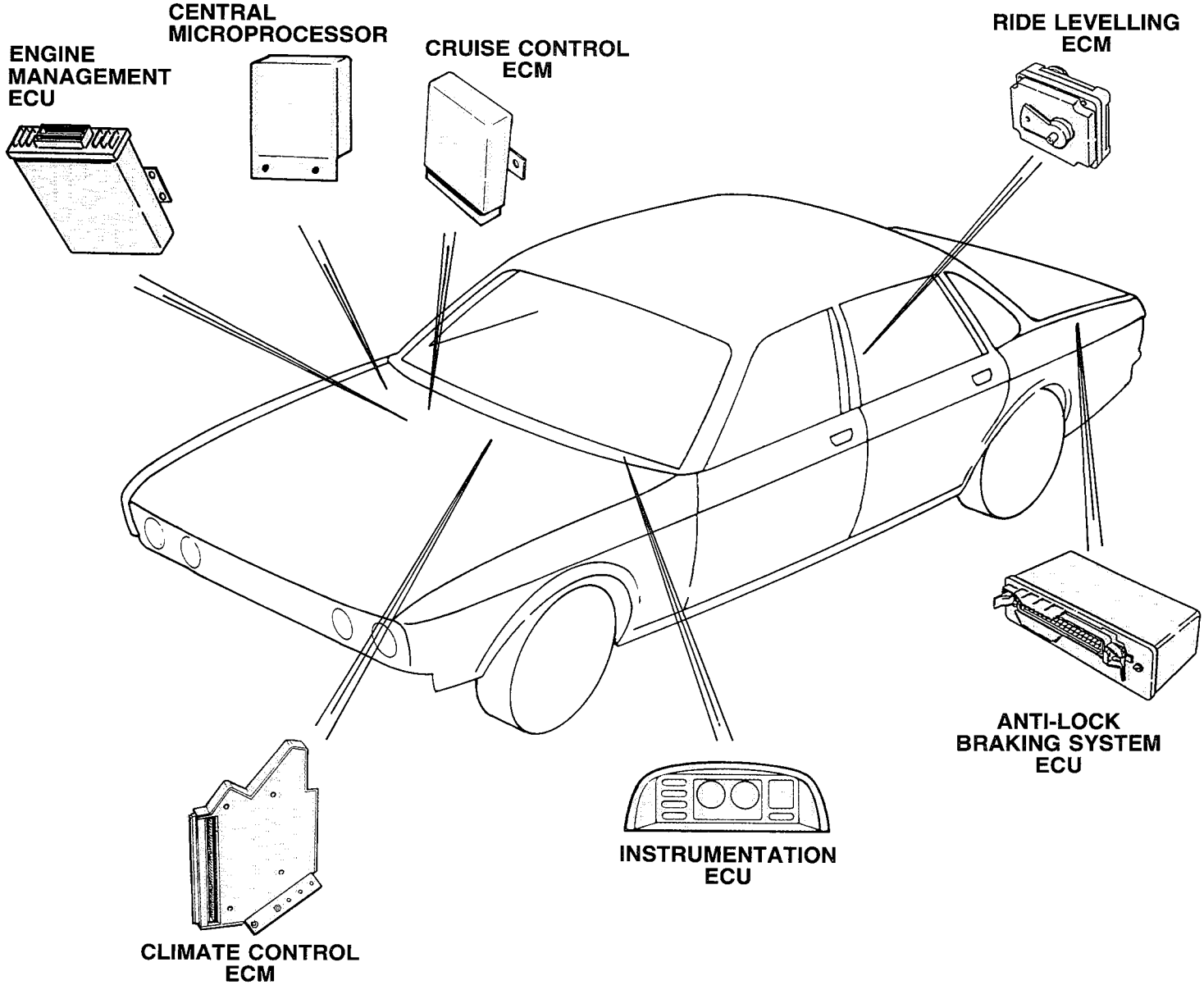
All switches now act as inputs to microprocessors or logic circuits and are therefore required to carry only very low current. The diagram shows the switch providing "ground" signal to a microprocessor; this is referred to as a LOGIC GROUND.

REMOTE POWER SWITCHING

The microprocessor, in turn, controls a relay coil ground circuit to activate the relay; this is referred to as a POWER GROUND. The remote relay activates the component by supplying voltage or ground connection.

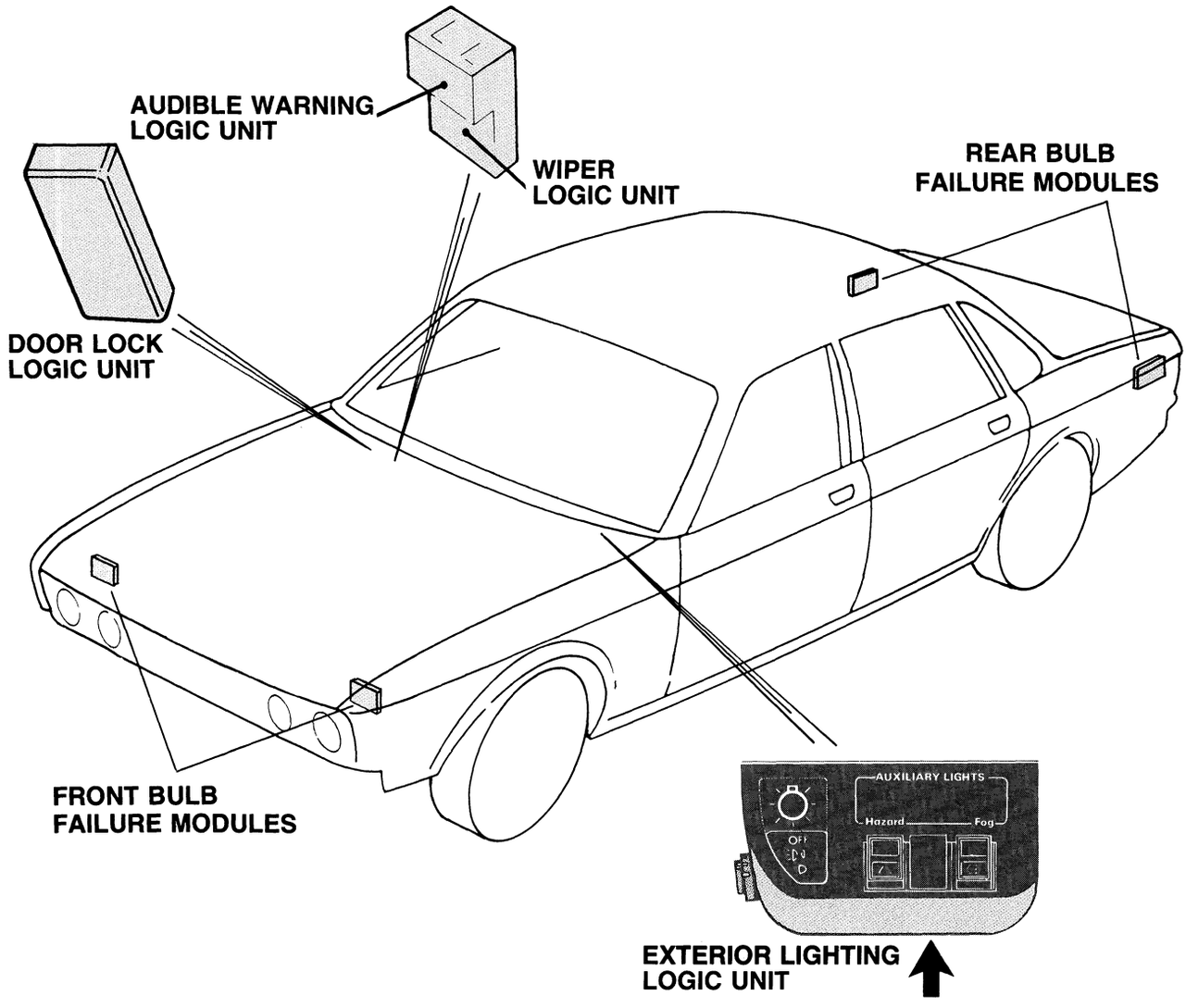
MICROPROCESSORS

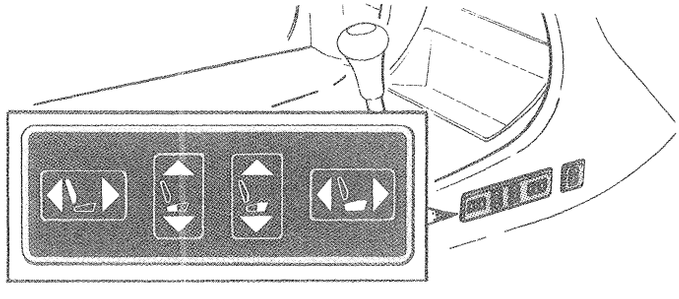
Seven microprocessors are used in the vehicle. These provide a level of control, performance, and relaibility far exceeding anything possible with conventional systems.



INDIVIDUAL LOGIC UNITS

Electronic logic units within individual circuits are used to provide various combination functions and provide feedback to the central microprocessor.





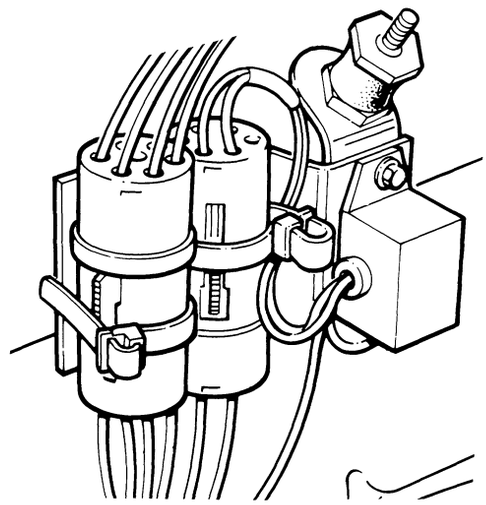
ELECTRONIC CIRCUITS INTEGRAL WITH SWITCHES

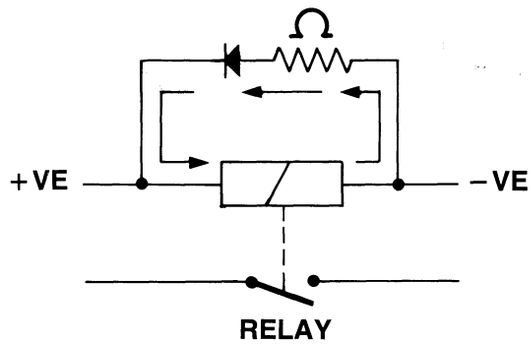
Electronic circuits are incorporated into many switches. This allows direct switching and, in some cases, microprocessor control of components.

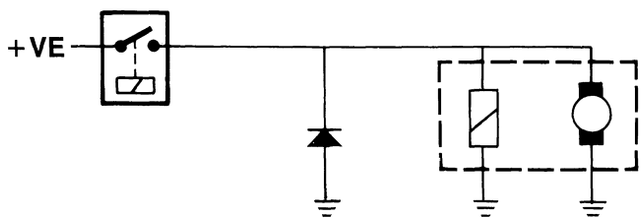
TRANSIENT PROTECTION

With the use of electronic components, it is necessary to limit the high voltage from the charging system to not more than 30 Volts to prevent component damage.

System Protection—If the battery is disconnected with the engine running or loose battery connections exist, the alternator may generate voltage as high as 80 Volts, causing extensive electronic component damage. To protect against high system transient voltages, an alternator dump module is installed. This module will limit system voltage by shunting (dumping) excess voltage to ground.







Component Protection—Relays and inductive power (coil type) consumers also have transient protection. Relay coils produce "high voltage spikes" when they are switched off and the coil magnetic field collapses. All relays have a diode and resistor placed in parallel with the coil. The 0.6 Volt voltage drop across the diode plus the drop across the resistor dissipates voltage as it "winds down," similar to a flywheel. Separate relays are wired as shown with the protection components in the connecting harness. Integral relays have the circuit incorporated into the circuit board.

Inductive power consumers such as the AC clutch, horns, and radiator fan, have a diode placed in the circuit which dissipates voltage when the component is switched off.

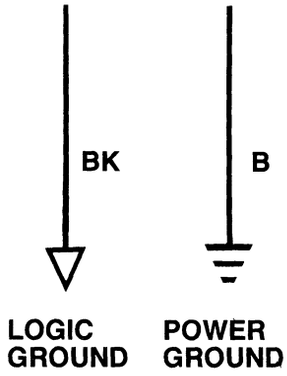
CAUTION: NEVER DISCONNECT THE BATTERY WITH THE ENGINE RUNNING. NEVER USE A TEST LIGHT TO TROUBLESHOOT AN ELECTRICAL FAULT.

WIRING HARNESS

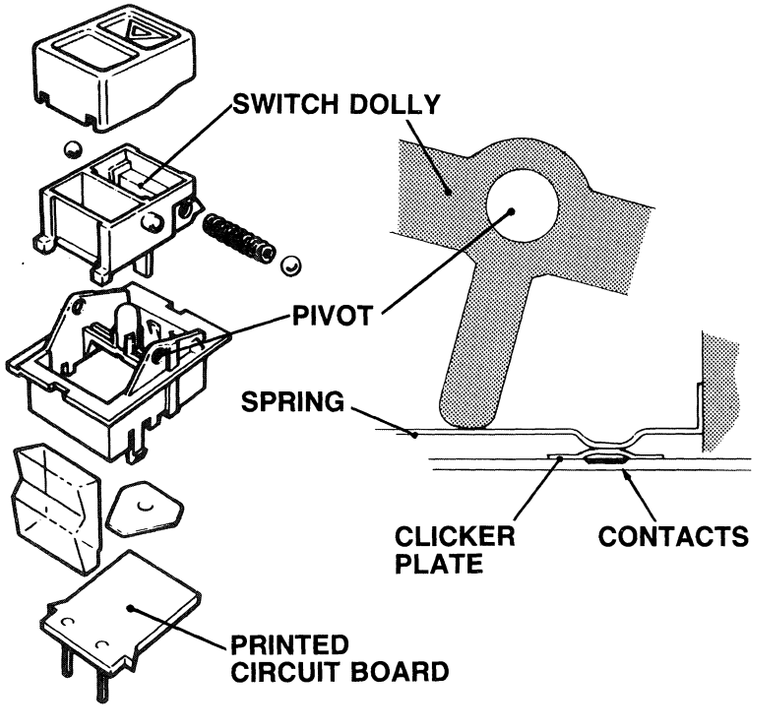
Wire Size—Low voltage ground line switching and remote power switching technology permitted the use of much lighter gauge wire in the logic circuits and much less heavy duty wire in the power circuits. This greatly reduced the bulk of the wiring harnesses.

Ground Circuits—Two separate ground circuits are used—one for logic grounds, one for power grounds. Logic grounds are completed back to a central point near the battery ground. Power grounds are completed to the vehicle chassis. This has resulted in a very "electrically clean" vehicle.

Wire Coding—The familiar Jaguar wire color coding system is retained. Logic grounds are coded BK (Black with Pink Tracer); Power grounds are coded B (Black). Different symbols are used for Logic and Power grounds.

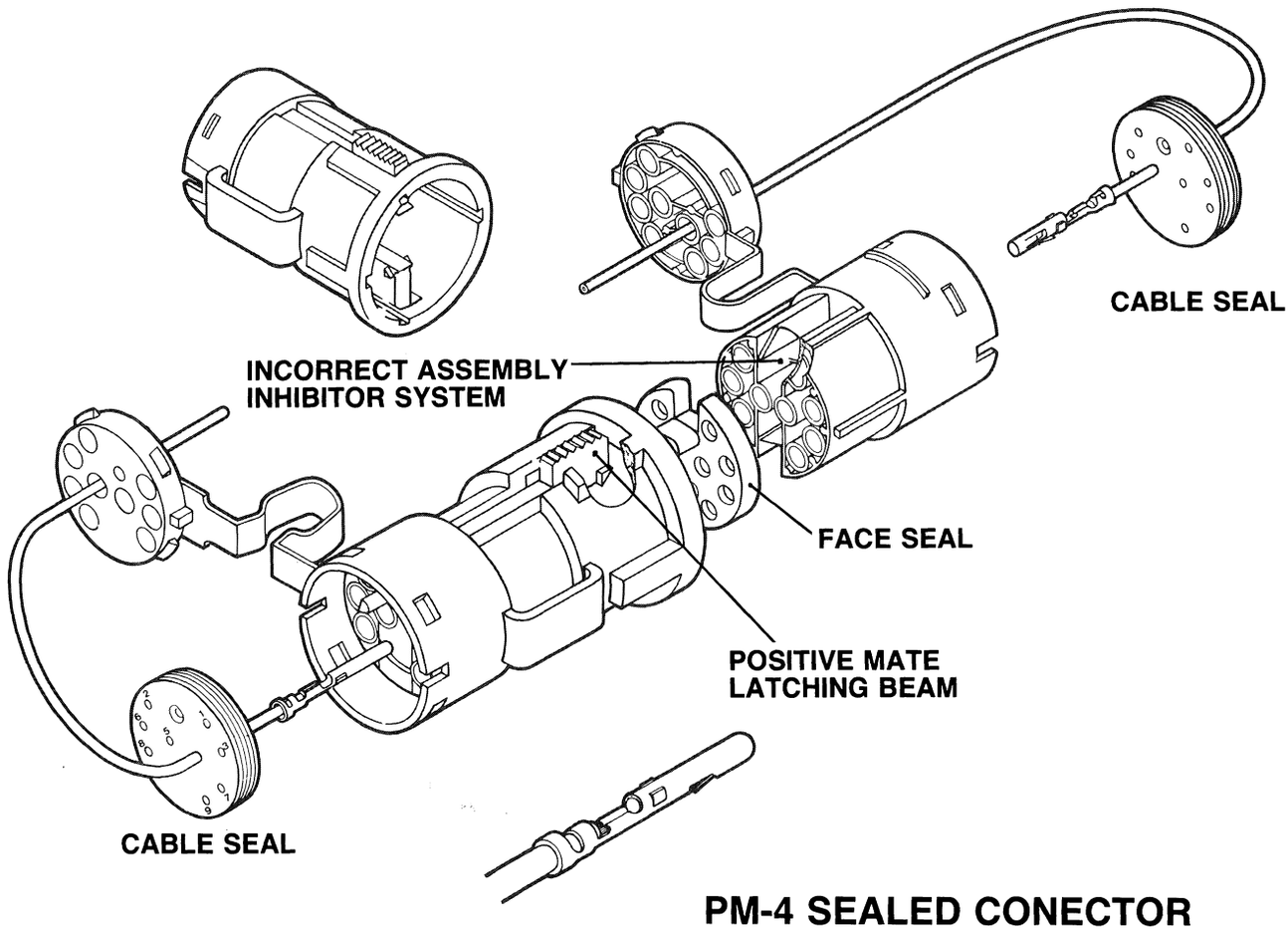


SWITCHES



Since the switches are acting as inputs to a microprocessor, they need only carry very low current. The switches are constructed with a domed metal foil above a contact on a printed circuit board. These "clicker plate" switches have contacts which are plated with noble metal, and the units are sealed from the environment. Both features prevent corrosion and resulting failure.

CONNECTORS



PM-4 SEALED CONECTOR

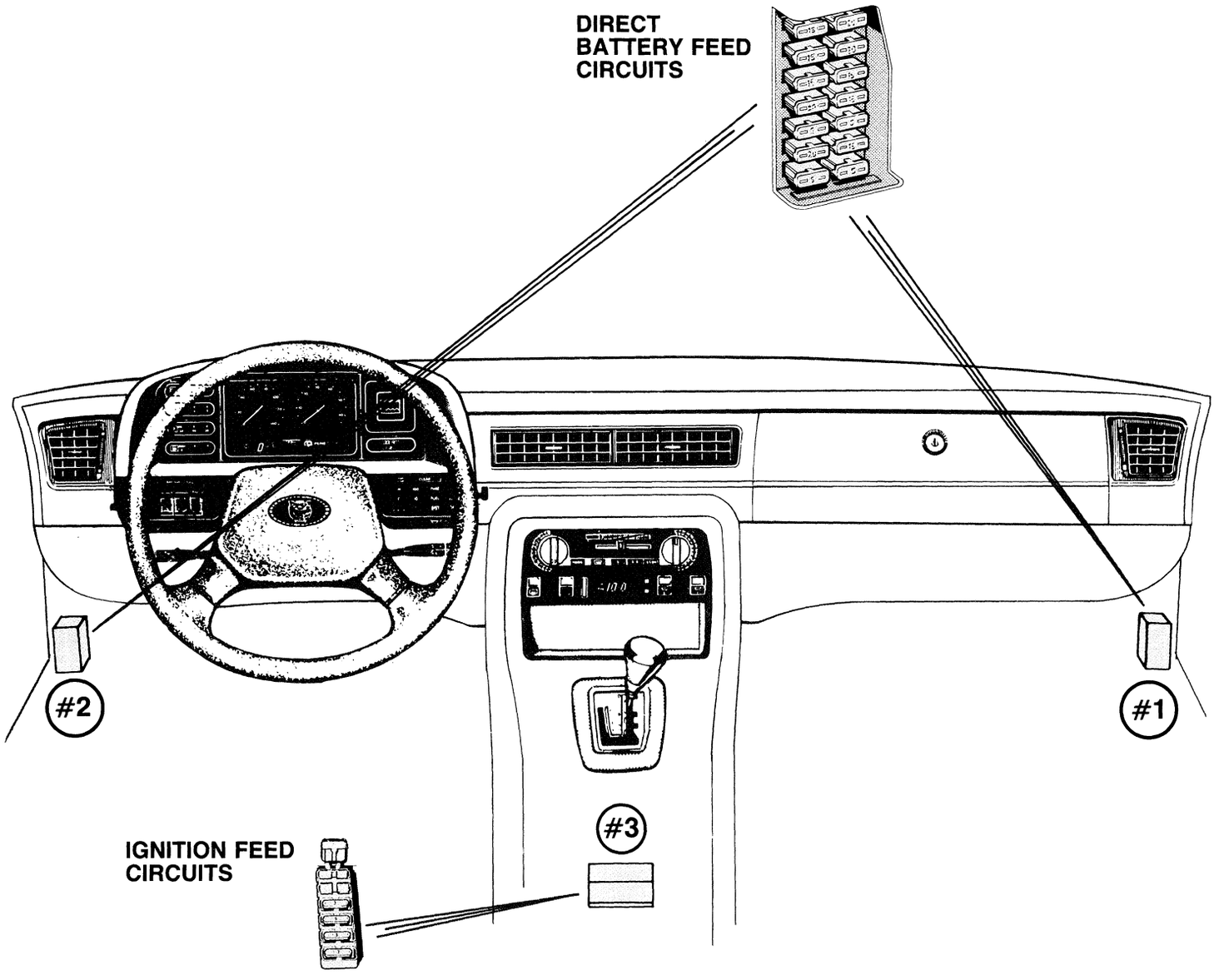
In pursuit of increased reliability, the wiring system uses entirely new connectors incorporating the latest technology. Two basic types are used—one for signal circuits and one for power circuits.

PM-HD (Positive Mate–High Density) rectangular connectors, used for signal circuits, have positive mate and anti-backout features, and either latch or reject when making. PM-HD connectors with between 2 and 36 way connections are used.

PM-4 (Positive Mate–4th Generation) round connectors, used for power circuits, have the same features as PM-HD with the additional capability of weather sealing. PM-4 connectors with between 2 and 9 way connections are used.

FUSES

Fuses are grouped into 3 units—on the right (#1) and left (#2) "A" post and (#3) under the center arm rest. Each box contains circuit identification.

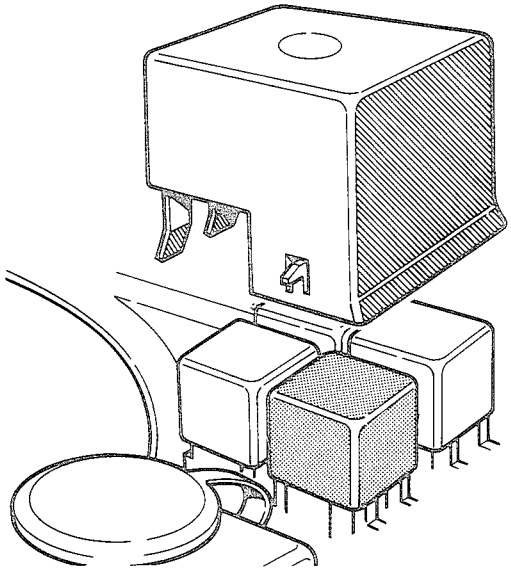


Ignition Switched Circuits—All ignition switched circuit protection fuses are incorporated into the center fuse box.

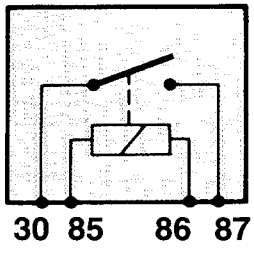
Direct Battery Feeds—Circuit protection fuses for direct battery feed circuits are incorporated into the left and right fuse boxes.

RELAYS

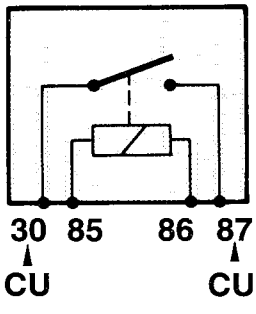
Most of the approximately 90 relays in the vehicle are incorporated into the circuit boards of individual components. Separate plug-in relays are all of the same family and have the same shape and size, except for the Anti-lock Braking over-voltage protection relay located in the trunk relay pack by the fuel filler.



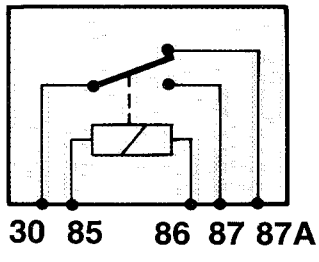
Three variations of the standard plug-in relay are used:



SINGLE CONTACT STANDARD DUTY—One output terminal (87).



SINGLE CONTACT HEAVY DUTY—One output terminal (87). Identified by copper coating on terminals 30 and 87.



CHANGE OVER CONTACT—Two output terminals (87 and 87A). Relay switch rests on contact 87A.

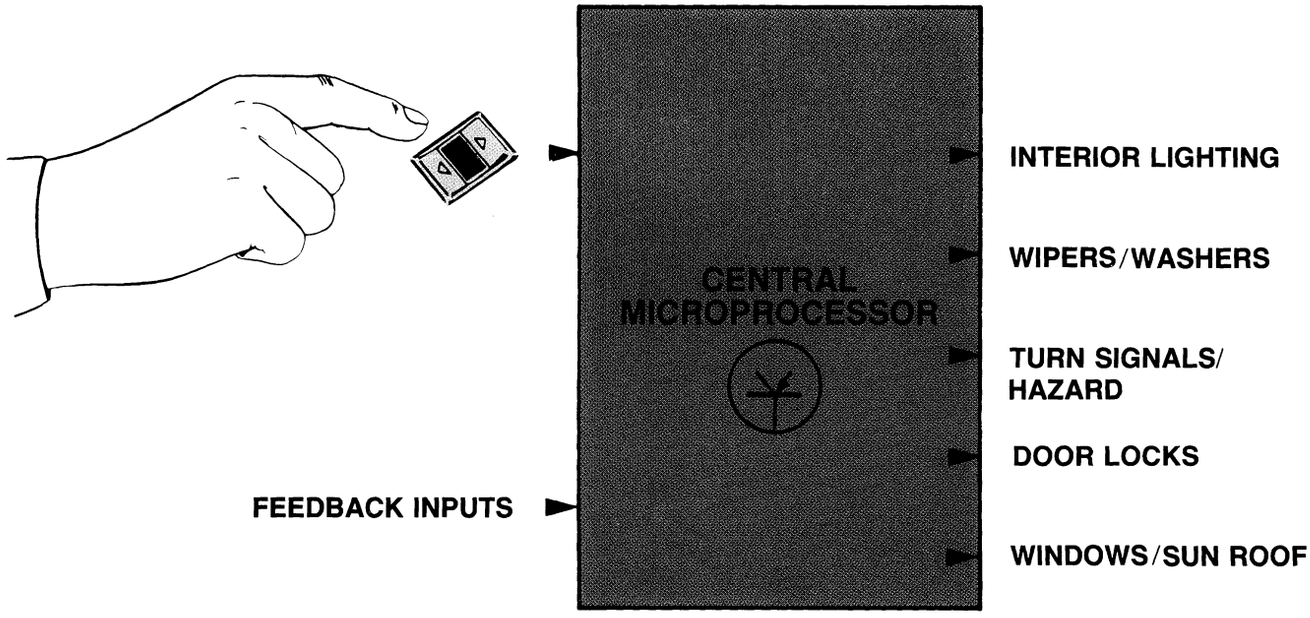
CENTRAL MICROPROCESSOR

The central microprocessor provides the following functions:

- **Switching for Driver Controlled Circuits**
- **Audible Warning Signal**
- **Timing Control**
- **Turn Signal Bulb Failure Interfacing**

Switching for Driver Controlled Circuits

The central microprocessor can activate the circuits from a logical decision based on many inputs. In all cases except the turn signals, the microprocessor switching is in addition to direct driver control.



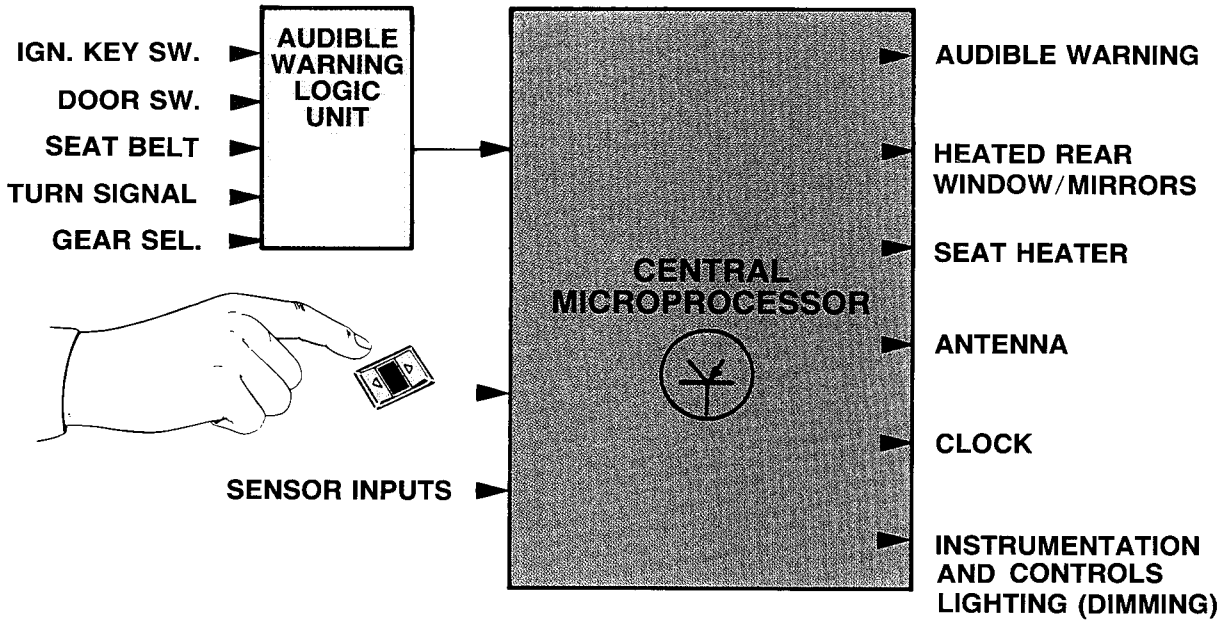
An example of this is interior lighting. The lights can be switched direct from the interior lighting switch or via the door and seat switch. When the driver's door is opened and the driver sits down, the interior lighting will stay on for 15 seconds after the door is closed. If the driver does not sit down, the interior lights will immediately turn off when the door is closed. Additionally, the interior lighting will turn off as soon as the ignition is switched ON.

Audible Warning Signal

The central microprocessor supplies the audible warning signal (near the ignition key) for: DOOR OPEN, SEAT BELT, TURN SIGNAL, and GEAR SELECTOR (ign. OFF—not in "P").

Timing Control

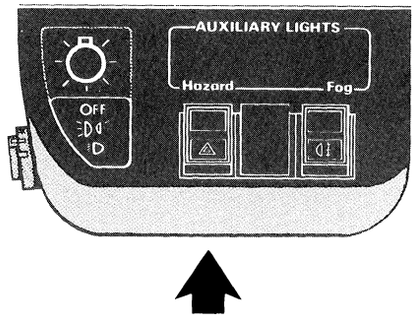
The central microprocessor provides timing control for safety, comfort, and convenience features.



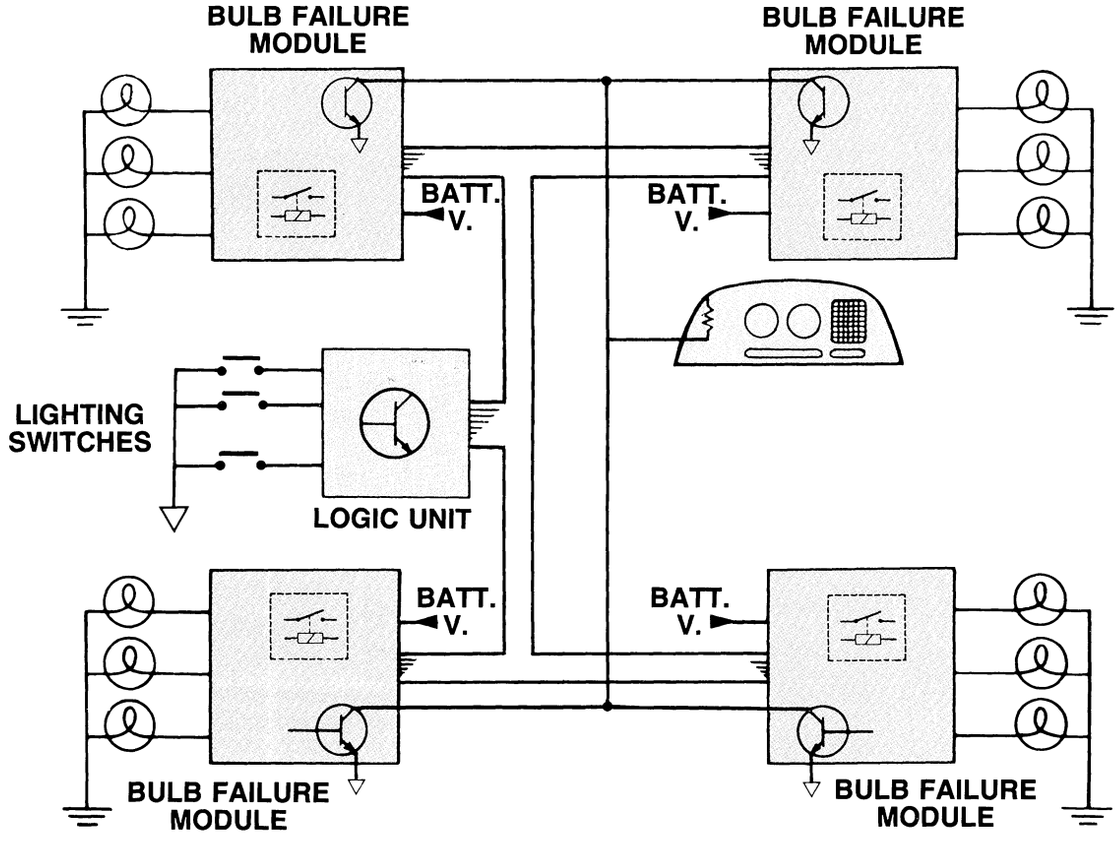
The state (position) of each input switch is measured each 16 thousandths of a second. A system, which energizes each switch with a 5 Volt pulse, senses if current flows. Since some of the functions operate before the ignition is turned ON, the central microprocessor is powered direct from the battery.

Exterior Lighting

The exterior lighting switches act as signals to the logic circuit board incorporated under the switches. The logic circuit controls the selection of certain combinations of lights.



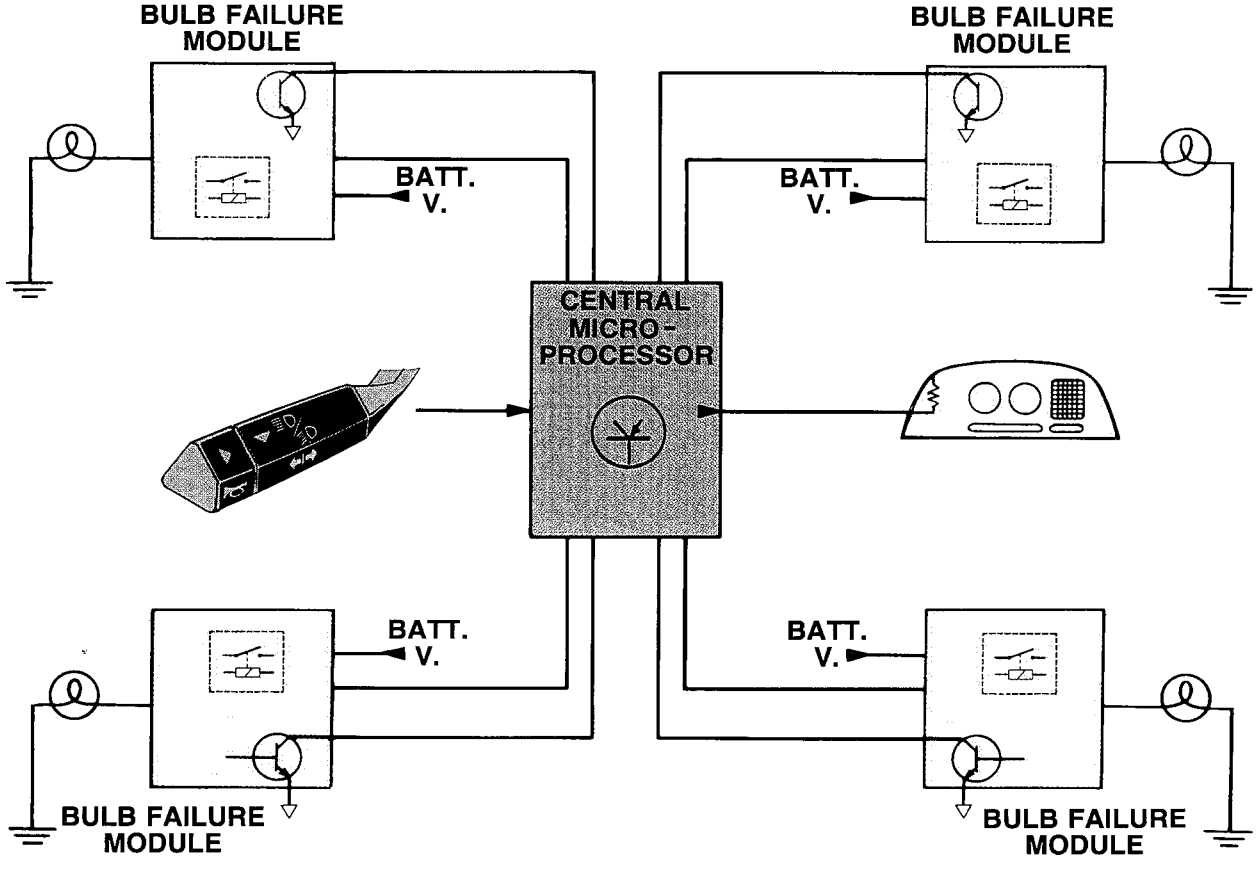
The output from the logic circuit energizes relays in the bulb failure modules located at the four corners of the vehicle. The relays, in turn, provide current to the lights. A separate relay is used for each light.



Bulb Failure Warning (except turn signals)—The four bulb failure modules also contain electronic circuits which can detect current flow to the bulbs. Failed bulbs will be identified regardless of whether they are switched on or off; however, the ignition must be switched ON for sensing. Outputs from the four modules are input to the instrumentation system for display on the VCM (Vehicle Condition Monitor).

Turn Signals

The turn signal stalk switch is an electronic control and does not stay locked when operated. It is momentarily operated and then returns to the central position. The low current switch signal inputs to the central microprocessor timer and the turn signals are activated through the relays in the modules. The microprocessor cancels the turn signal indicator by sensing the position of a steering column magnet with three reed switches.

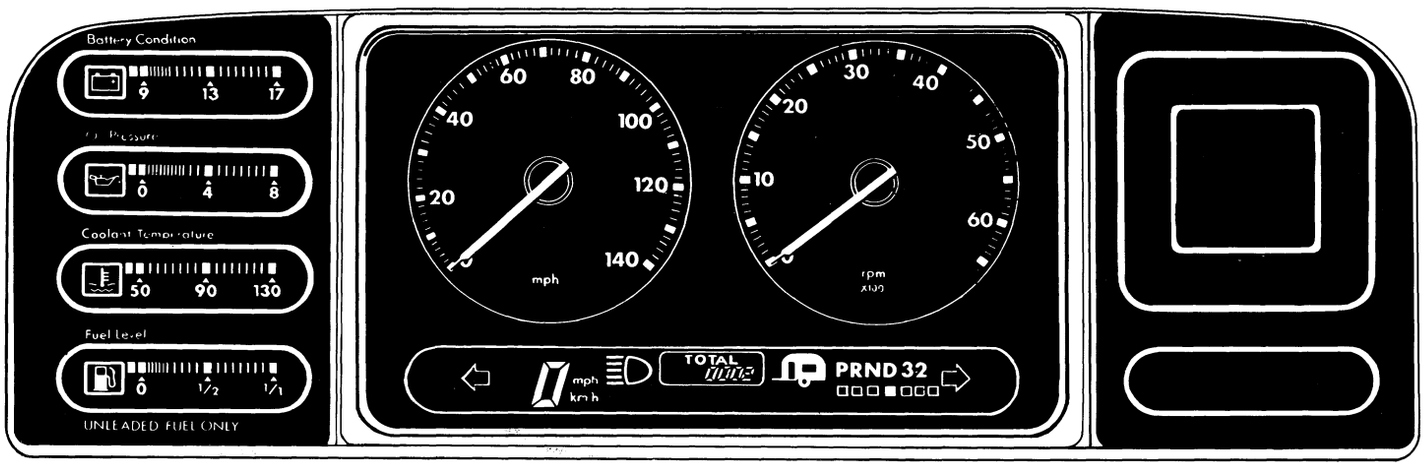


Turn Signal Bulb Failure Warning

Turn signal bulb condition sensing is fed back to the central microprocessor for interfacing with the indicator circuit before being displayed on the VCM (Vehicle Condition Monitor).

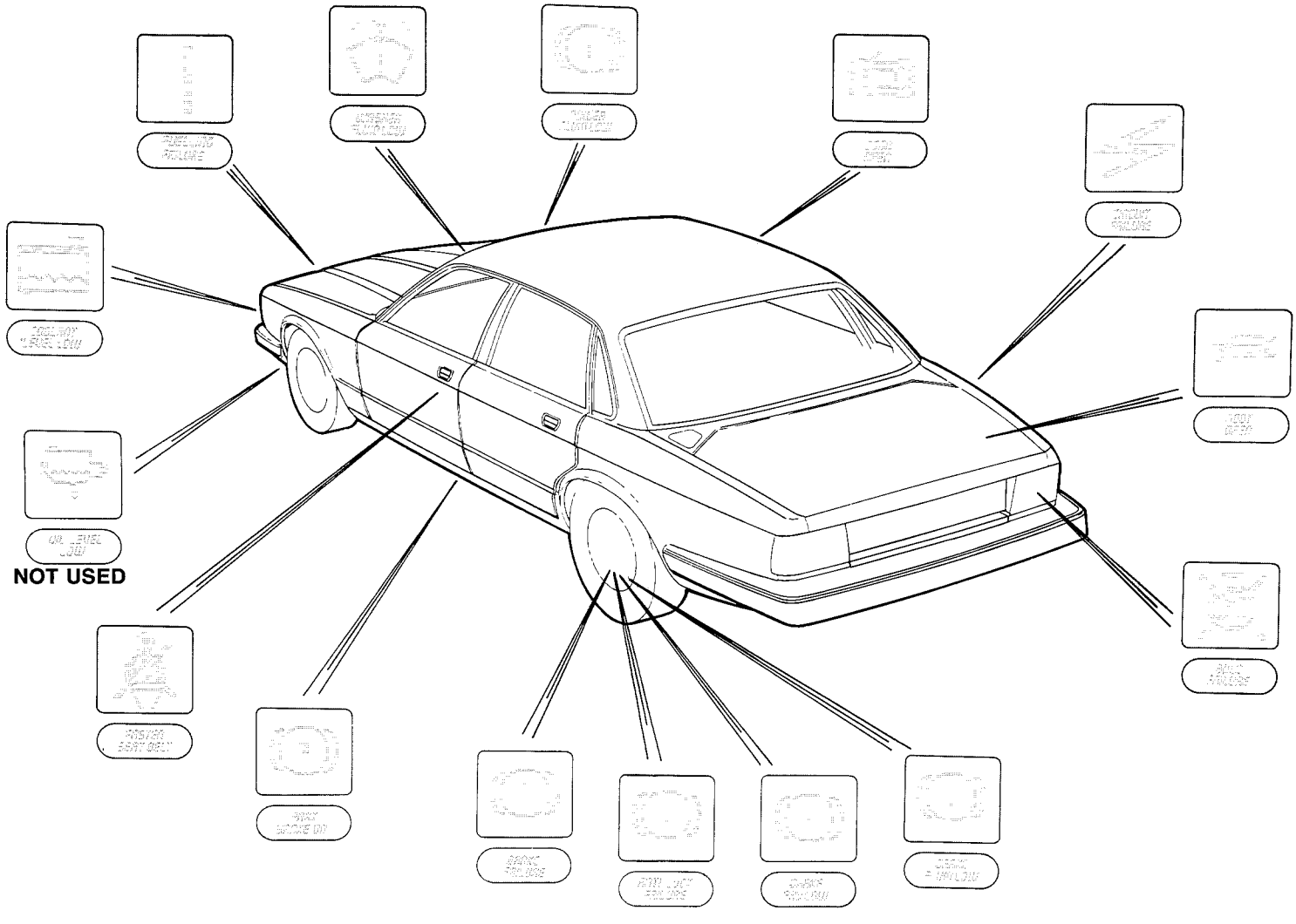
INSTRUMENT PACK

The instrumentation system is contained within the instrument pack and receives inputs from sensors and other circuits in the vehicle. The heart of the system is the INSTRUMENTATION MICROPROCESSOR in the pack.



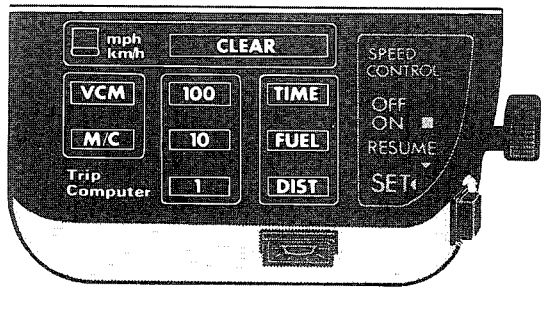
Engine gauges, battery voltage, and fuel level information is displayed on the left side. The center portion provides analog (dial) speedometer and tachometer and digital speedometer readout. The indicator panel incorporates a digital odometer. The right side contains the Vehicle Condition Monitor (VCM). This displays warning and information symbols. Below the VCM graphic display screen is a panel which displays alphanumeric (written) information corresponding to the graphic display.

VCM WARNING SYMBOLS



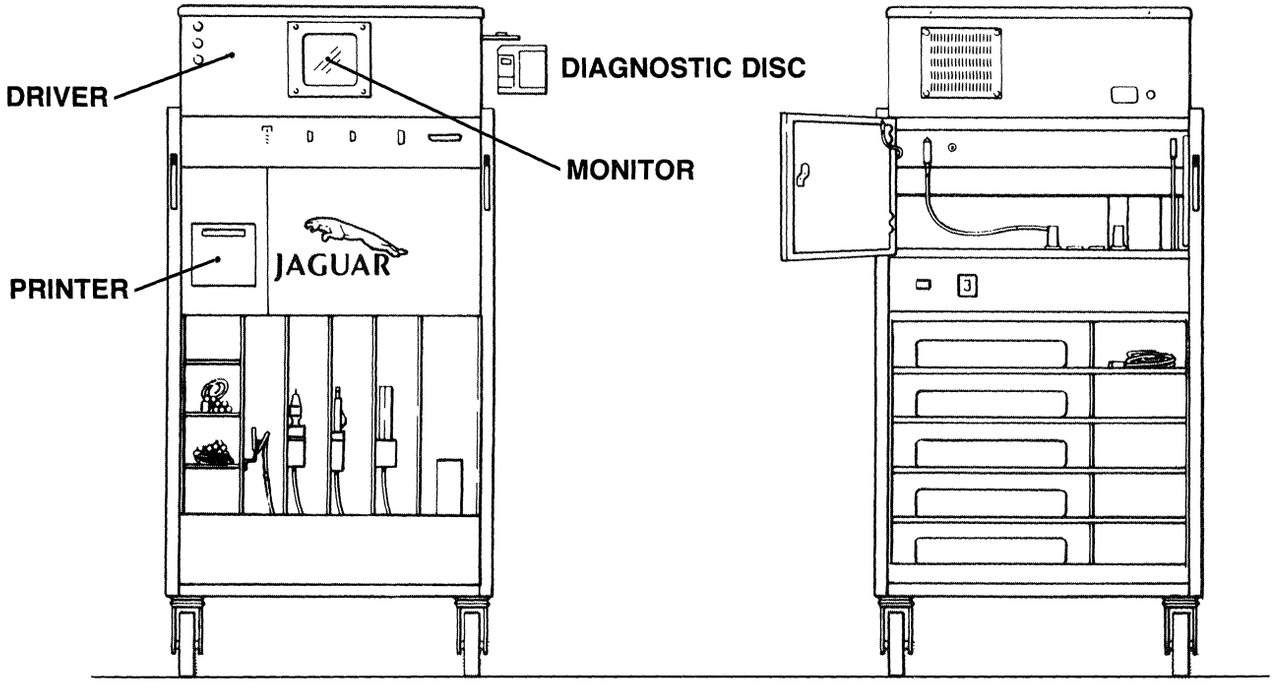
Trip Computer

The trip computer is part of the instrumentation system with a separate keyboard to the right of the steering wheel. Trip computer information is displayed on the VCM alphanumeric panel.



It is apparent from the description that the Jaguar electrical system requires a new approach in both understanding by the technician and fault diagnosis. The system integrates electric and electronic circuits. Attempting to understand and identify each individual circuit down to the last detail and component would take a very large effort. Consequently, using a traditional approach to fault diagnosis would be extremely difficult, time consuming, and in many cases, cause component damage in the process.

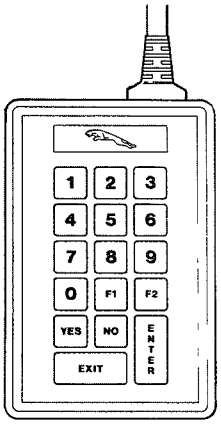
JAGUAR DIAGNOSTIC SYSTEM (JDS)



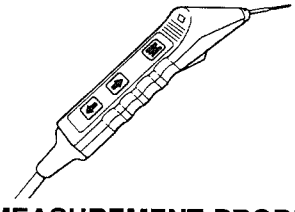
COMPUTERIZED FAULT DIAGNOSIS IS THE OBVIOUS SOLUTION TO PROVIDING FAST AND ACCURATE RESULTS.

Jaguar has developed JDS in conjunction with a leading worldwide supplier of computerized diagnostic systems. In use, JDS does not interfere with, or change electronic functions during the diagnostic process, and it tests circuits and components under vehicle operating conditions.

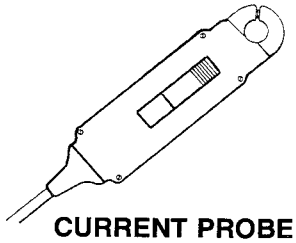
JDS is a complete diagnostic system which will direct you through logical paths to the fault, and then identify the failed component. TO HAVE ACCURATE RESULTS, IT IS EXTREMELY IMPORTANT THAT YOU FOLLOW JDS INSTRUCTION EXACTLY.



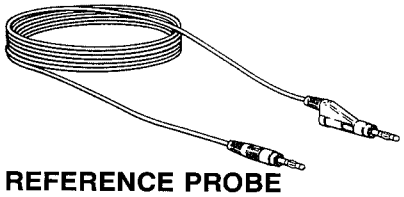
KEY PAD



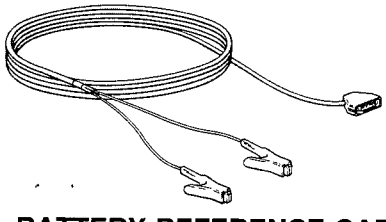
MEASUREMENT PROBE



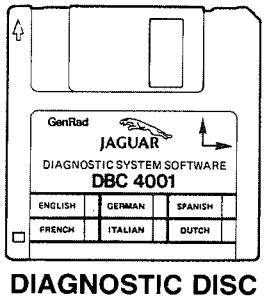
CURRENT PROBE



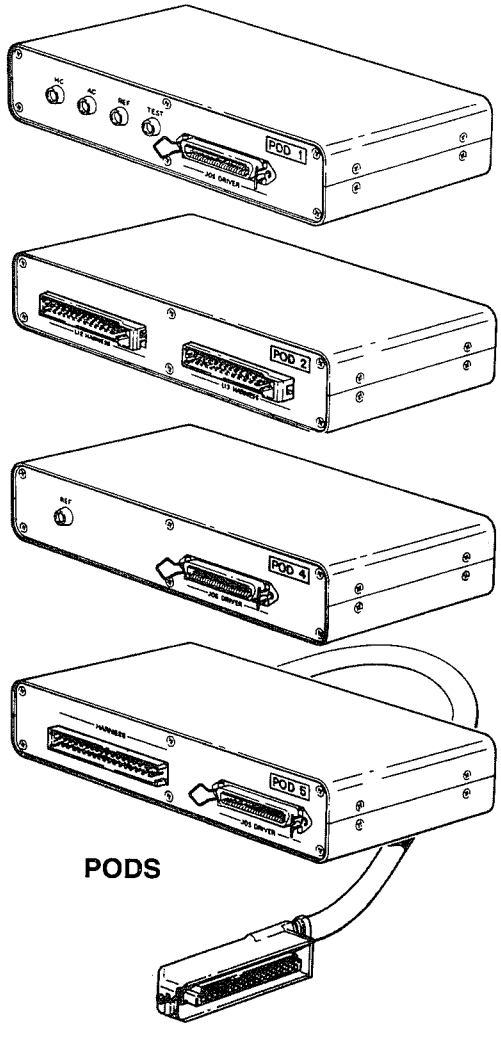
REFERENCE PROBE



BATTERY REFERENCE CABLE



DIAGNOSTIC DISC



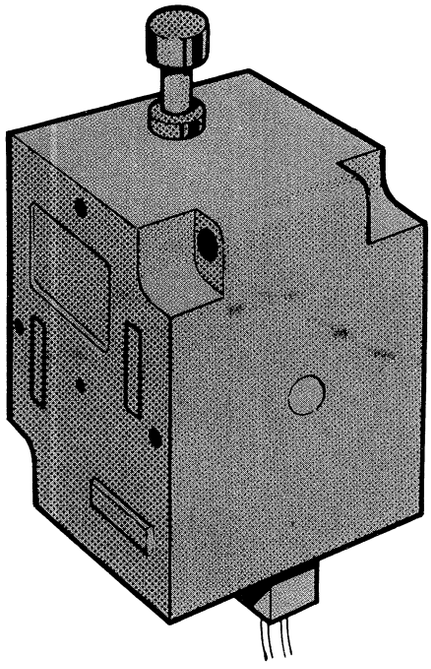
PODS

JDS consists of a microcomputer and disc drive linked to a display screen, printer, and keypad. A measurement probe, current probe, and battery reference cables connect to the computer. Four diagnostic pods with special computer programs for microprocessor controlled circuits "tee" into the vehicle circuits and connect to the computer. Accessories, such as the reference probe and connector adaptors, are provided for making specific measurement.

Software—The diagnostic computer control and information is in the form of a diskette. Revision and updates are easily accomplished simply by issuing a new diskette.

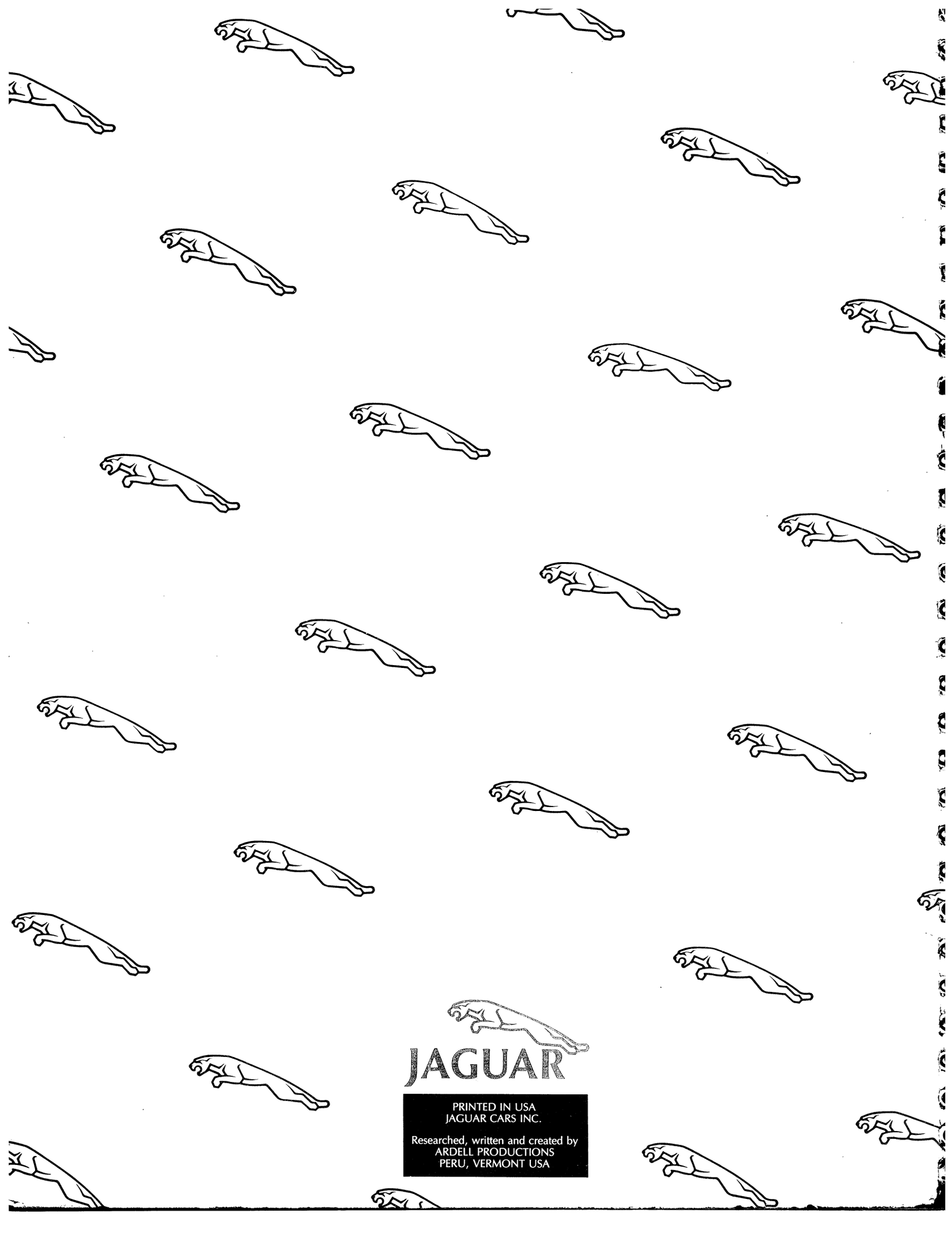
INERTIA SWITCH

In previous Jaguar vehicles, the inertia switch provided safety protection by switching off the ignition and fuel pump in the event of an impact. In the new Jaguars, the inertia switch does more:



- *It switches off all ignition fed circuits*
- *It locks the fuel filler cap*
- *It locks the trunk (only if the doors are locked)*
- *It unlocks the doors (only if they are locked)*

Note: The circuits are switched direct from the inertia switch.



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