I. Mizouri

2.3 Liter Engine
With
CIS-E III
Engine Control System

Service Training

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Always check P-circulars and the microfiche system for information that may supersede any information included in this booklet.

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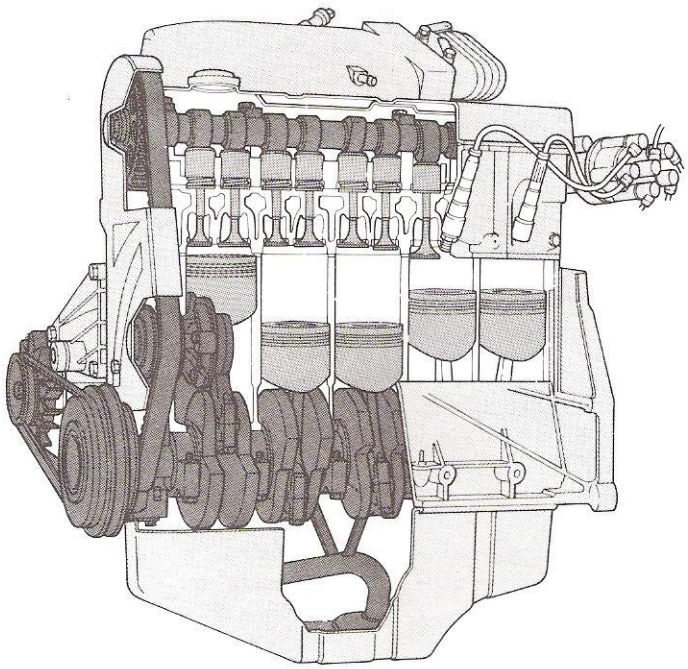
2.3 Liter Engine

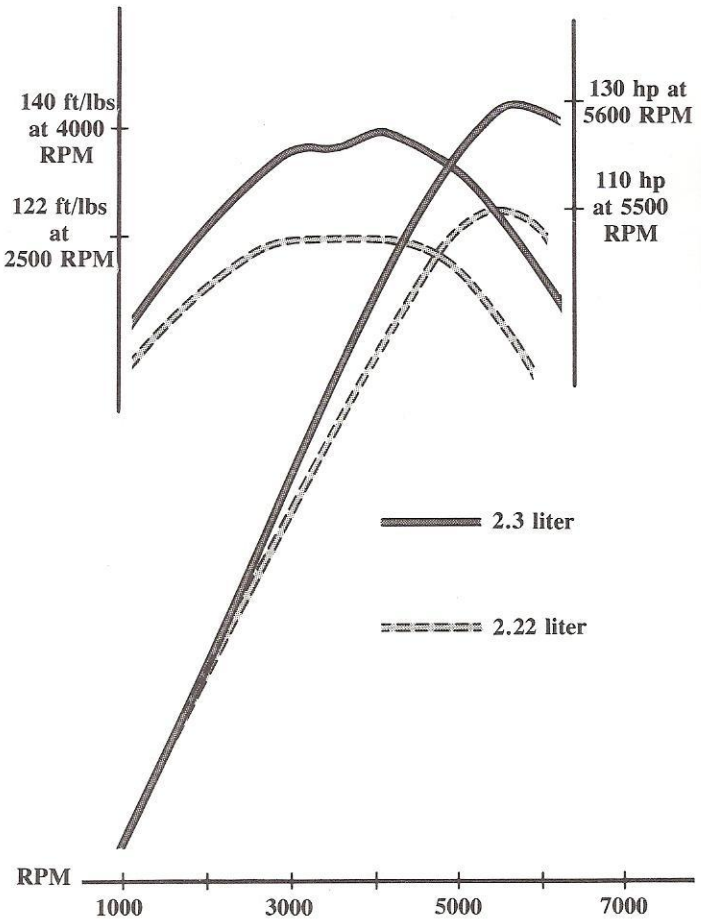
The Audi 5000S now comes equipped with a 2.3 liter 5 cylinder engine. This engine features many changes and modifications that result in increased horsepower and torque.

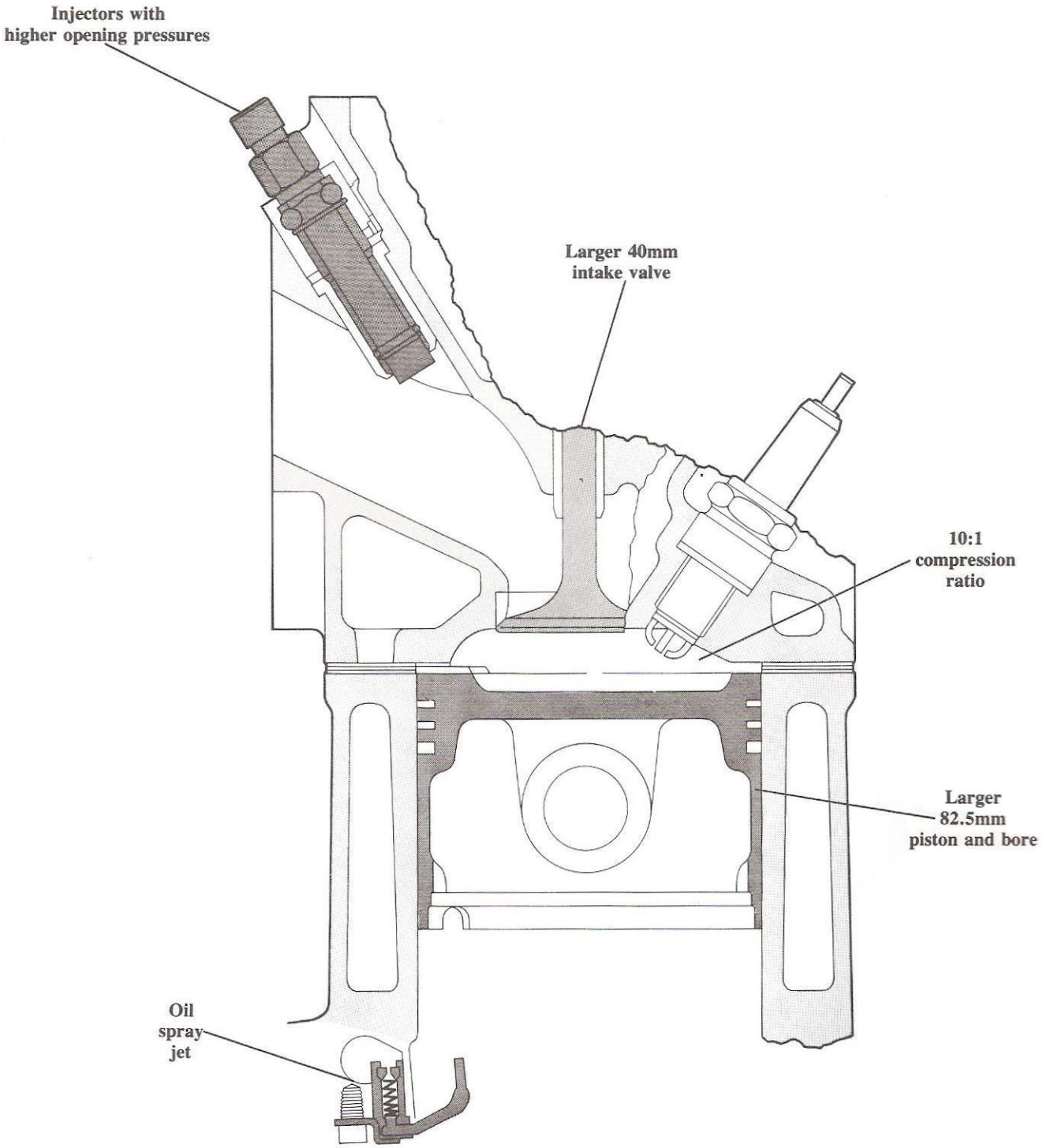
The engine displacement has been increased through a larger cylinder bore and a new CIS-E III engine management system is used.

Some of the engine's new features are:

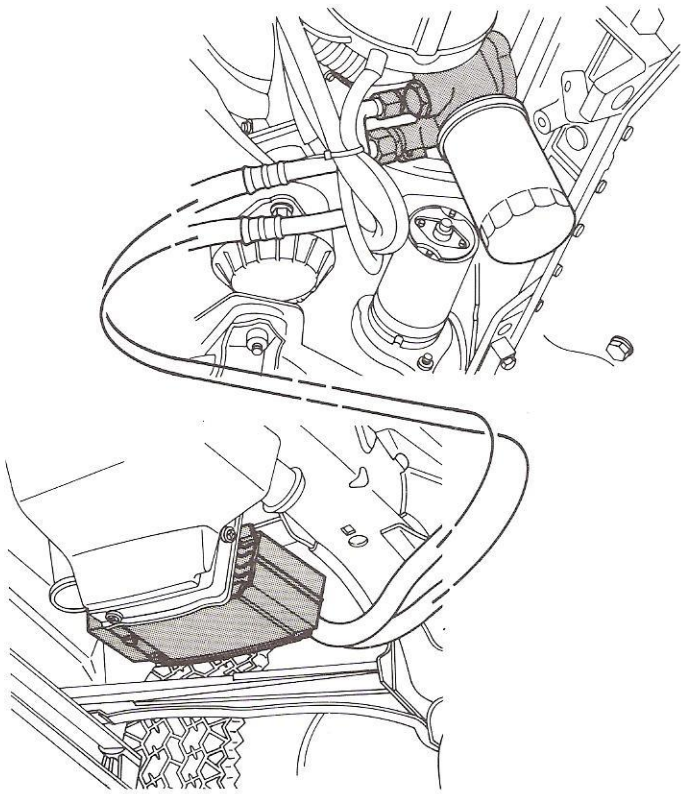
- Cylinder bore increased 1.5mm to 82.5mm
- Compression raised from 8.5:1 to 10:1
- Intake valves increased 2mm to 40mm
- Revised camshaft timing
- Oil spray jets for piston cooling
- Oil cooler with separate thermostat housing
- High pressure fuel system with new injectors, etc.






Injectors with
higher opening pressures
Larger 40mm
intake valve
10:1
compression
ratio
Larger
82.5mm
piston and bore
Oil
spray
jet

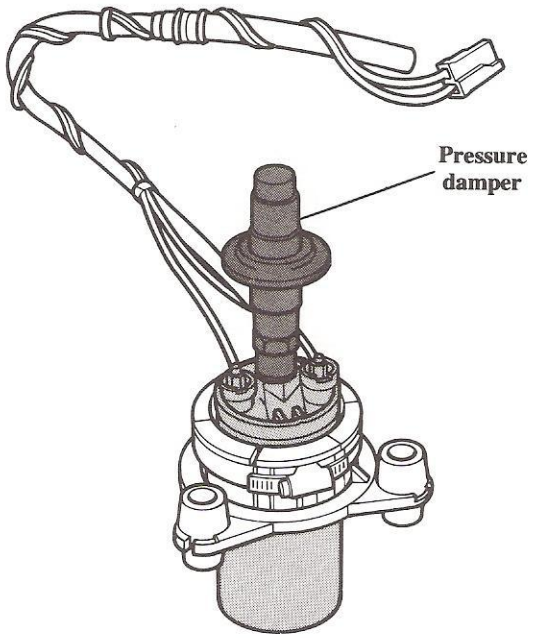
Oil Cooler



An oil cooler is located behind the right front apron. This is similar to the oil cooler used on turbocharged engines.

A thermostat assembly is attached to the right side of the engine block. As oil temperature rises the thermostat will open and allow the oil to flow through the cooler. The oil filter is also attached to this thermostat housing.

Fuel Pump



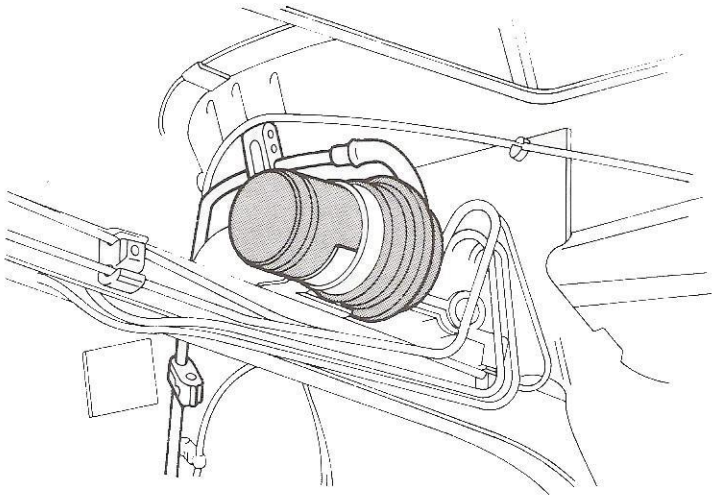
The delivery pressure of the fuel pump has been increased. This is the same pump that is used on turbocharged engines.

The pressure damper on the pump is also designed to operate at a higher pressure.

Fuel Pressure Accumulator

The fuel pressure accumulator from the turbocharged models is also used. This is a 20 cc accumulator. It is designed to maintain an increased residual pressure of 3.4 bar.

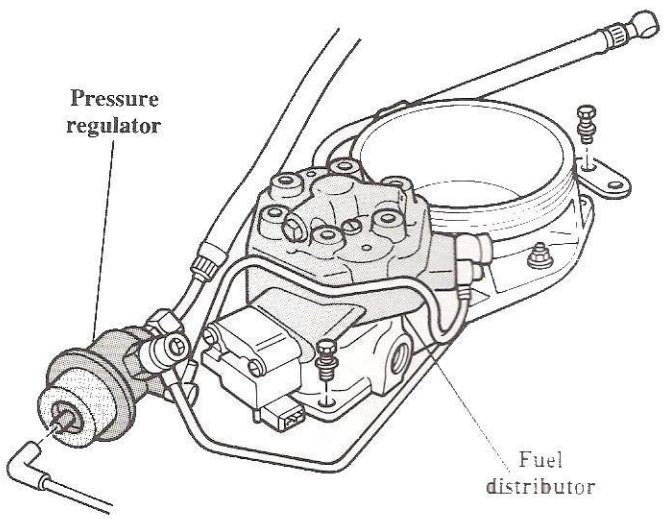
The fuel pressure accumulator is located above the rear axle on the right side.



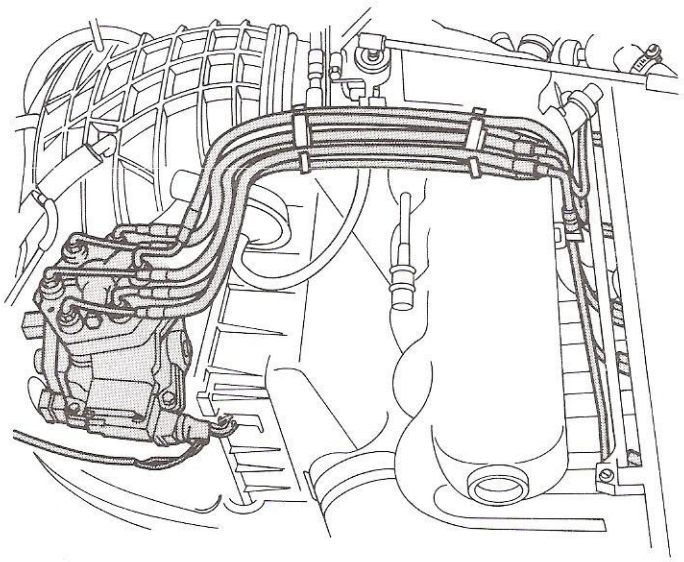
Pressure Regulator And Fuel Distributor

A new fuel pressure regulator is used to regulate the system pressure at a higher value. The system pressure is now maintained at 6.3 ± 0.2 bar.

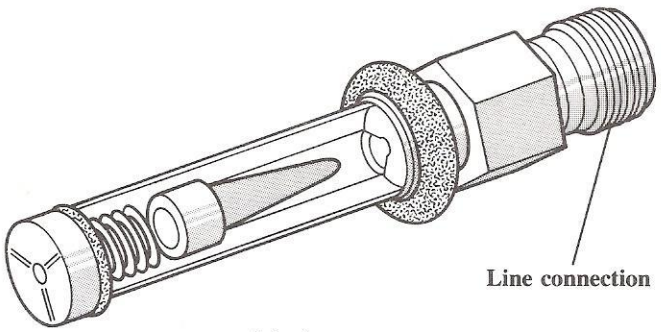
The fuel distributor is also modified. The top half of the unit is designed for use with high pressure injector lines. These new injector lines use flare type fittings instead of the previous banjo bolts with copper sealing washers.



Fuel Injectors And Injector Lines

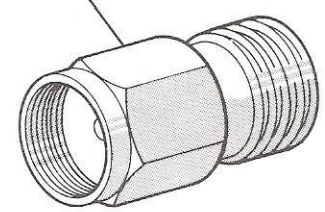


The fuel injector lines are also designed to operate at a higher pressure. The lines are a plastic and steel combination with a smaller inside diameter. These features, combined with the higher fuel system pressures, help to reduce the possibility of fuel percolation in the injector lines at high temperatures.



The opening pressure of the fuel injectors has been raised to allow a higher rest or residual pressure. The opening pressure is now 4.3 to 4.6 bar.

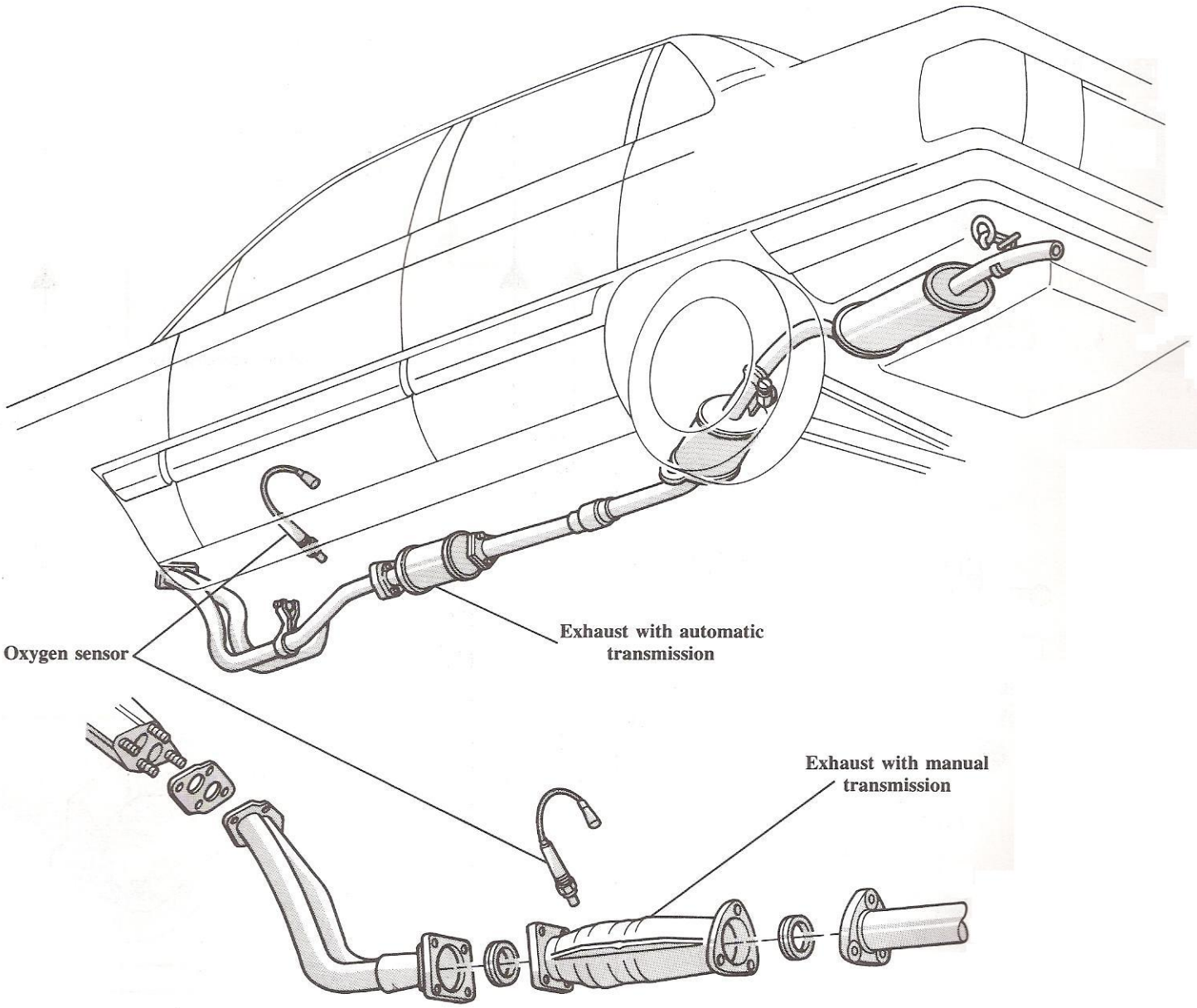
These injectors also have a finer thread for the line connection. When testing the injectors with the US 8034 pressure tester, a special adapter is needed to attach the injectors to the tester.



Exhaust System

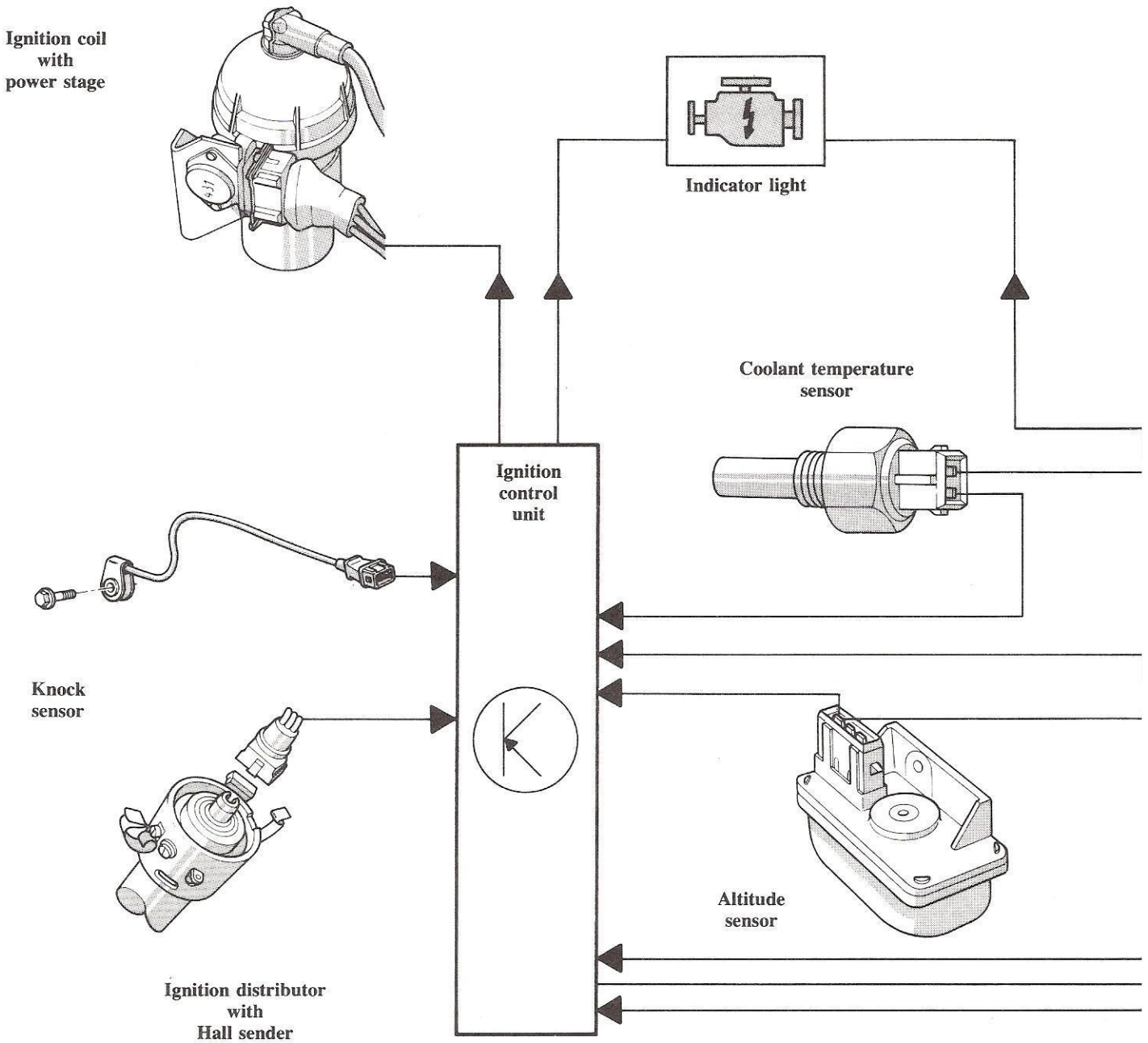
The exhaust has been modified to improve flow. A double take down pipe and larger exhaust manifold are used. The system's pipe diameter is increased from 50mm to 55mm.

Two different take down pipes and catalytic converters are used. On manual transmission vehicles, an oval converter is used which has the oxygen sensor installed at its inlet. On vehicles with automatic transmissions the converter is round and the sensor is located in the take down pipe.



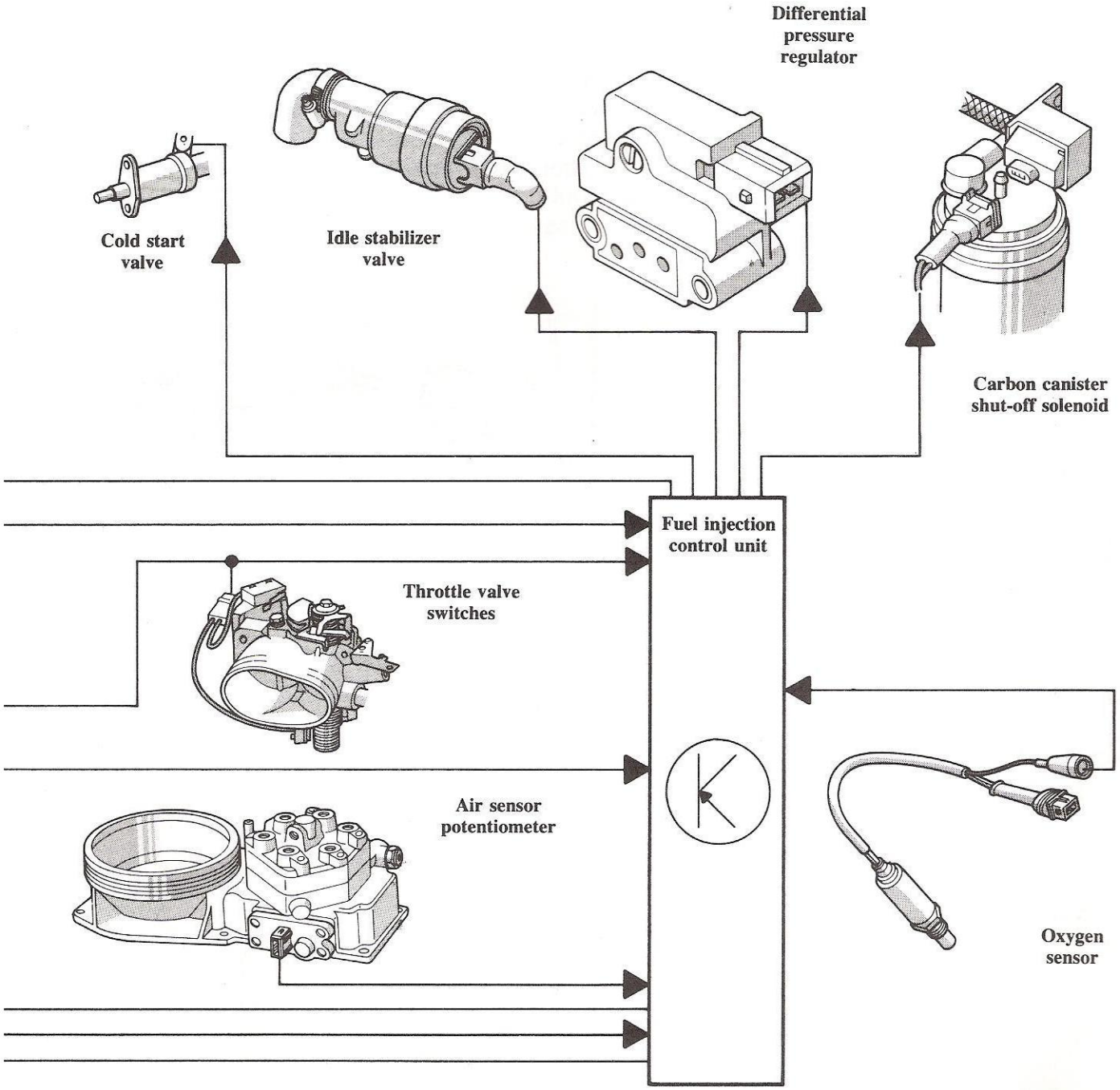
CIS-E III Engine Control

2.3 liter five cylinder engines will come equipped with CIS-E III engine control. This system is a development of CIS-E fuel injection and knock sensor ignition control. The system has two separate control units which receive inputs from various common sensors and shared signals.



CIS-E III Engine Control

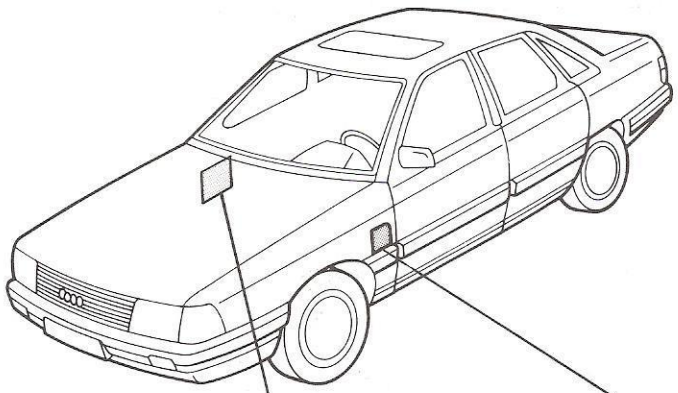
The CIS-E III engine control system features an expanded fault memory for self diagnosis and troubleshooting. With this system input and output signals are checked and any faults are stored in the system memories. These faults can later be displayed by a flashing four digit code sequence of the indicator light in the instrument cluster.

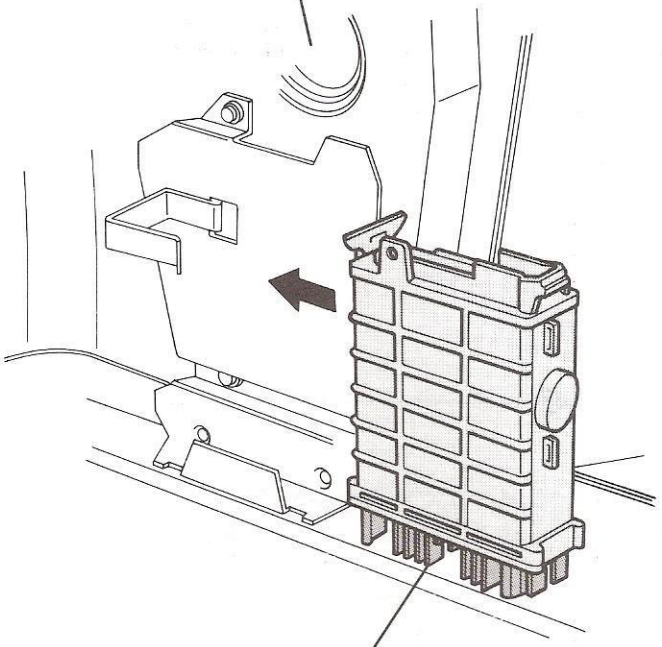


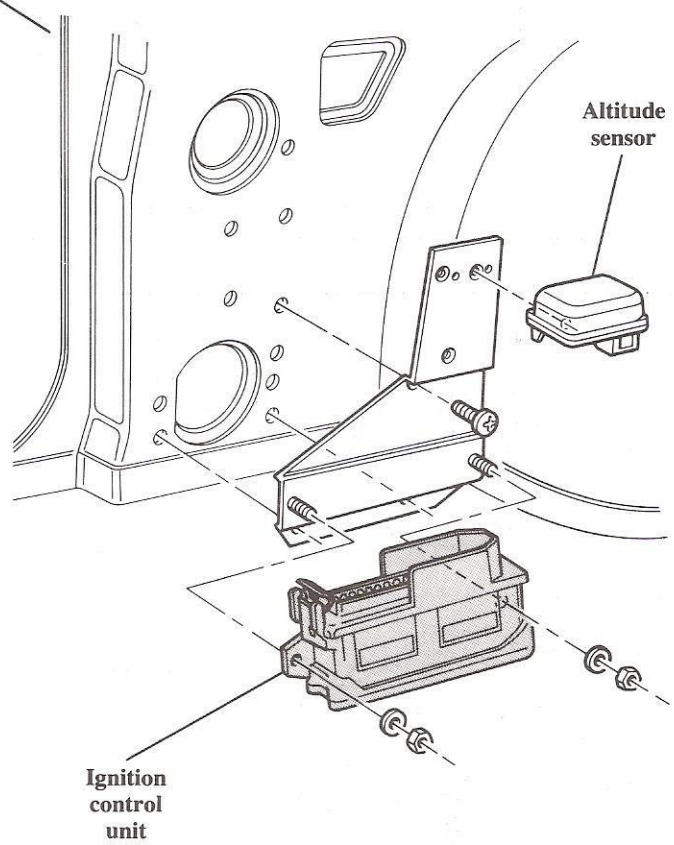
Control Units

The CIS-E III engine control system uses two separate control units. The control units are located behind the right and left kick panels. They are connected together electrically by the vehicle's wire harness.

Each control unit contains its own fault memory. During the self diagnosis display, any information stored in the ignition control unit will be displayed first. After that has been completed, the information from the fuel injection control unit will be displayed.





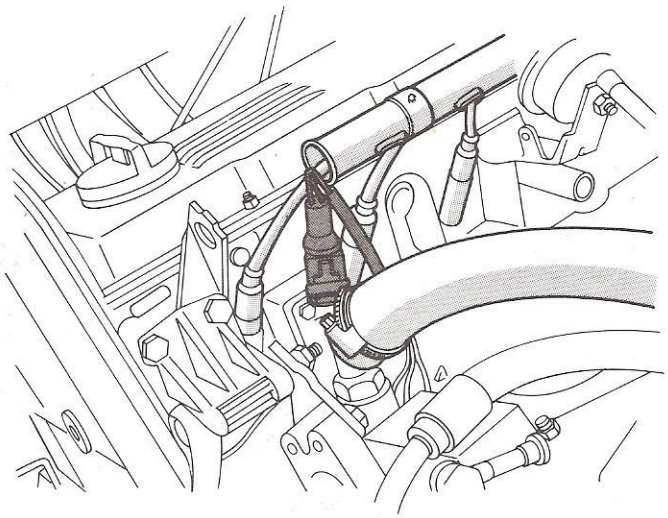


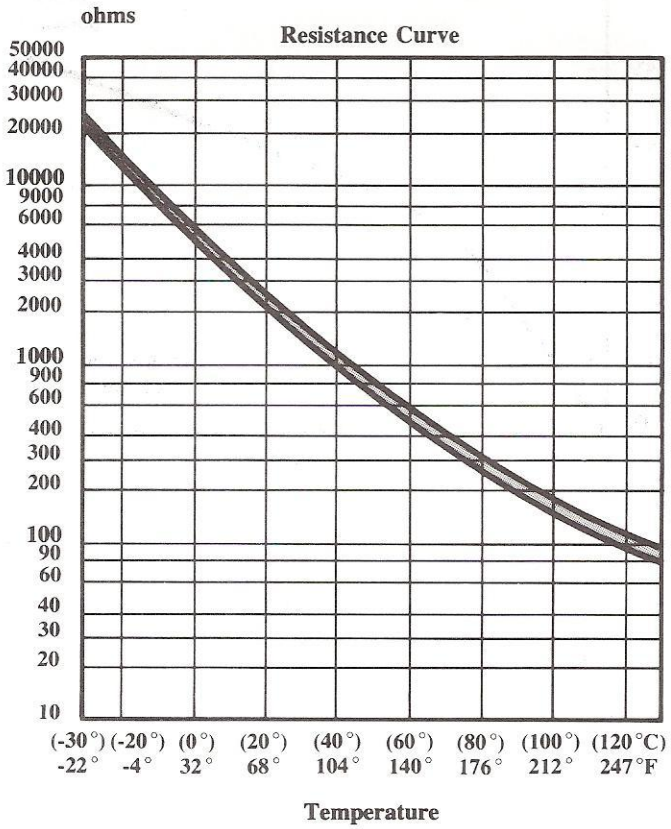
Coolant Temperature Sensor

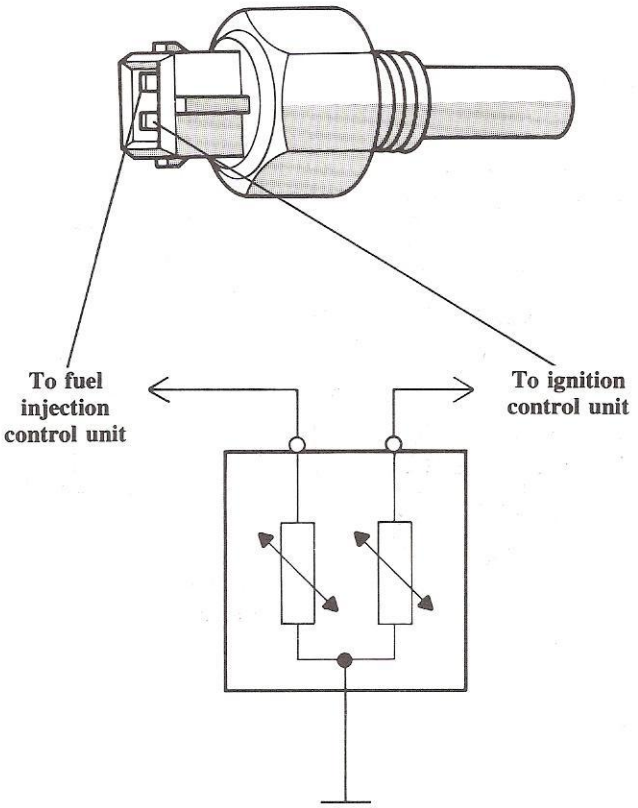
The coolant temperature sensor consists of two NTC resistors within one housing. One resistor provides information on engine coolant temperature to the ignition control unit. The second resistor provides the same information to the fuel injection control unit.

The signals from these sensors are used to provide corrections to the fuel mixture and ignition timing based on engine temperature.

Both resistors in the temperature sensor have the same resistance values. The sensor is located in the cylinder head coolant outlet flange.



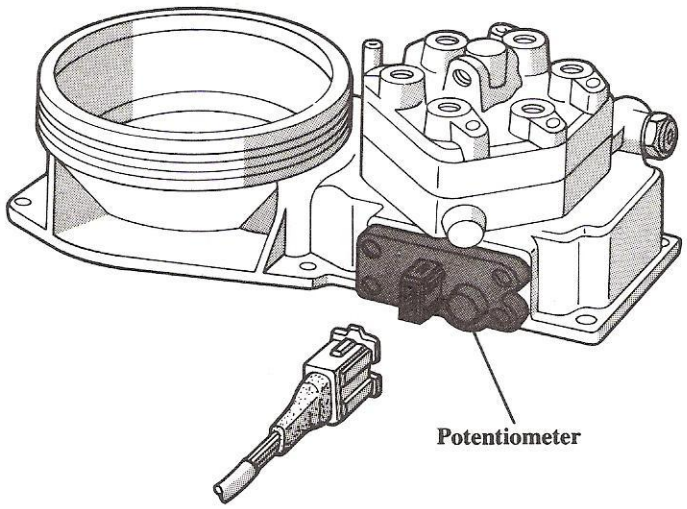


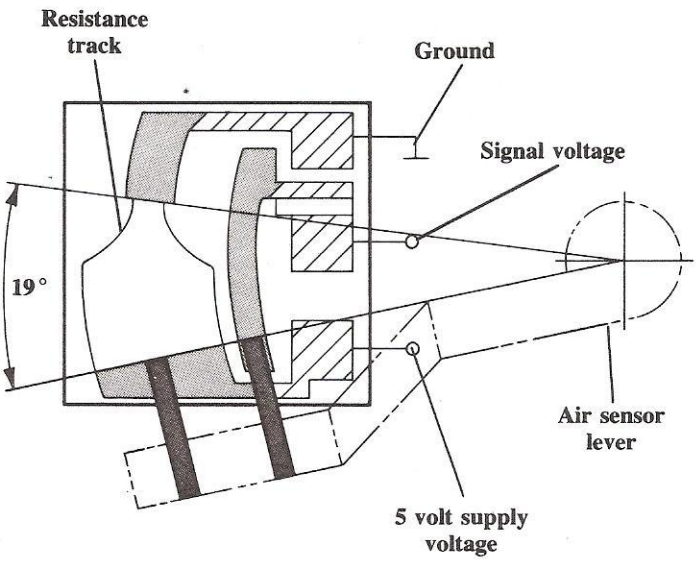


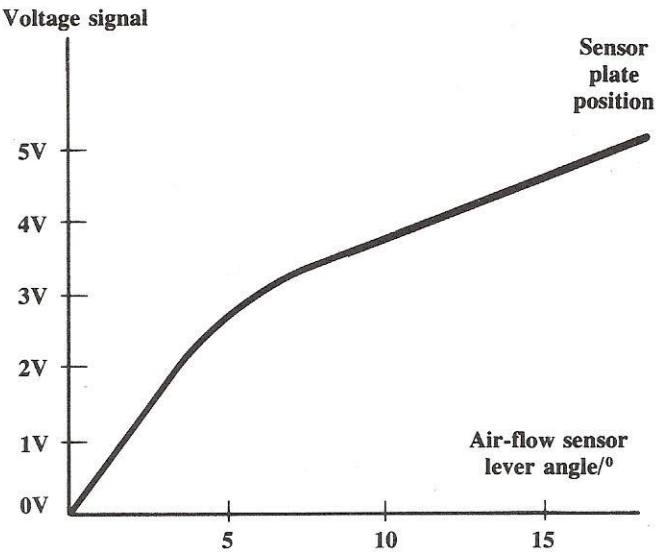
Air Sensor Potentiometer

The air sensor potentiometer is connected to the air sensor lever. It generates a voltage signal based on the position of the air sensor plate. This signal is used by the fuel injection control unit to determine cold acceleration enrichment.

The ignition control unit also uses this voltage signal to determine ignition timing. By measuring the position of the air sensor plate, the ignition control unit can determine engine load. This value, together with engine speed, is used to determine ignition timing.





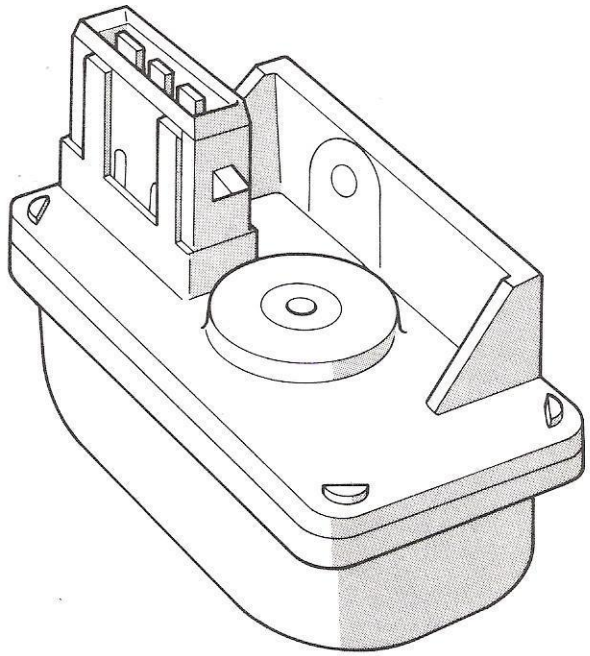


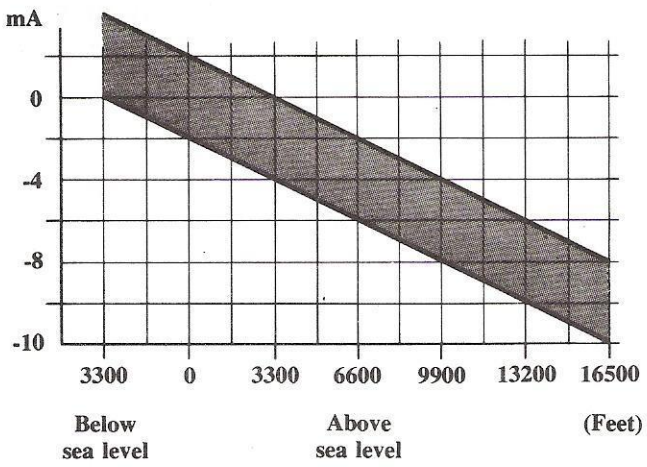
Altitude Sensor

The altitude sensor sends a voltage signal based on altitude or barometric pressure (air pressure). A barometric or aneroid element inside the sensor will react to changes in air pressure and move an electrical contact across a resistance track.

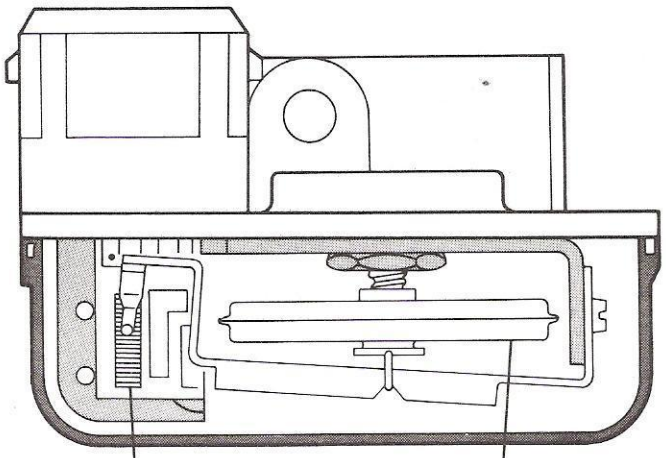
This voltage signal is used by the fuel injection control unit to correct the fuel mixture in relation to altitude or air pressure changes. The ignition control unit also uses this signal to correct the ignition timing during certain engine load ranges at higher altitudes.

The altitude sensor is attached to the mounting bracket for the ignition control unit behind the left kick panel.





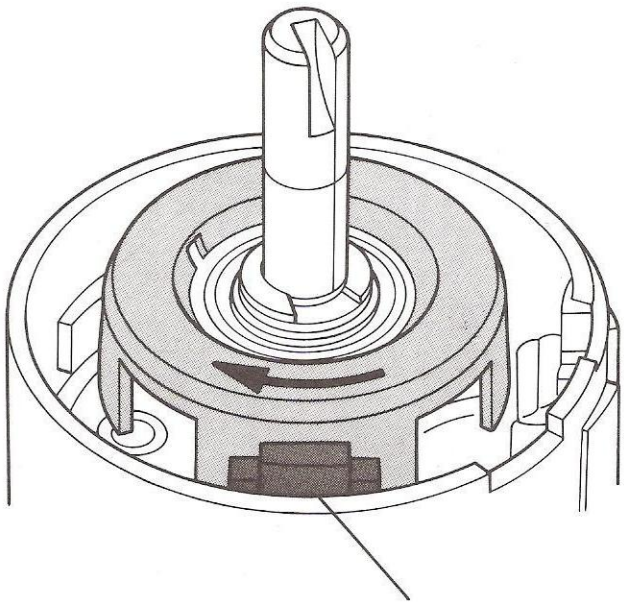
Differential pressure regulator current (with oxygen sensor disconnected)



Resistance track

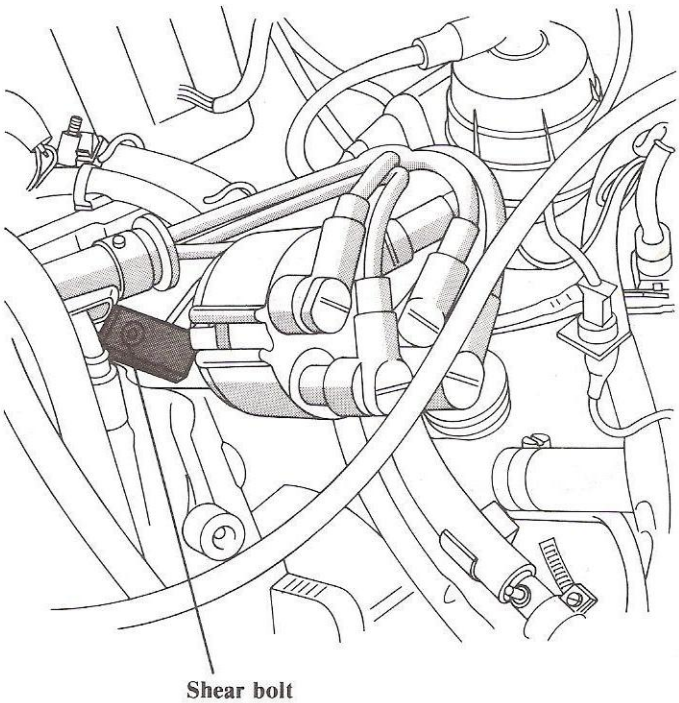
Barometric element

Ignition Distributor



The ignition distributor is a fixed unit with no centrifugal or vacuum advance. It contains a Hall sender which is operated by a trigger wheel. The trigger wheel has five apertures, one for each cylinder.

The Hall sender sends a voltage signal to the ignition control unit at approximately 60° BTDC for each cylinder. From these signals, the control unit determines engine speed and crankshaft position.



The ignition distributor also has an anti-tampering cover installed. The cover is attached to a boss on the cylinder head next to the distributor and covers the distributor clamping nut. This is to prevent tampering with the ignition timing.

If for any reason the distributor needs to be removed or adjusted, the cover can be removed by removing the cover's shear bolt. The distributor clamping nut will then be accessible.

Throttle Switches

An idle switch and a full throttle switch are installed on the throttle valve assembly. These switches provide information on throttle position to both the fuel injection control unit and the ignition control unit. When either switch is closed it sends a voltage signal.

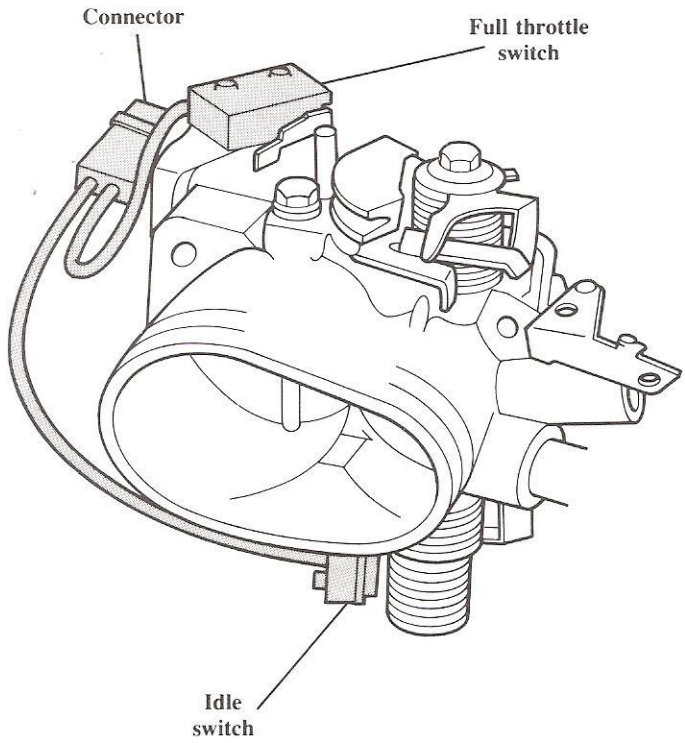
The idle switch is closed when the throttle plates are closed and opens after the throttle has been opened about 1°. The idle switch signal is used for:

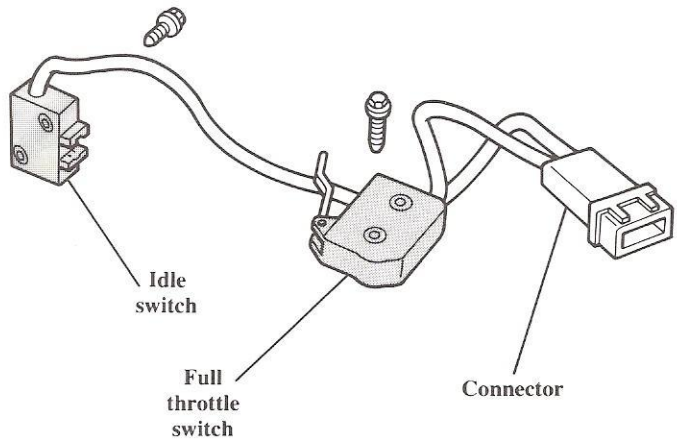
- Operation of idle stabilizer valve
- Operation of deceleration fuel shut-off
- Activation of special ignition timing map for deceleration

The full throttle switch closes about 10° before full throttle. This signal is used for:

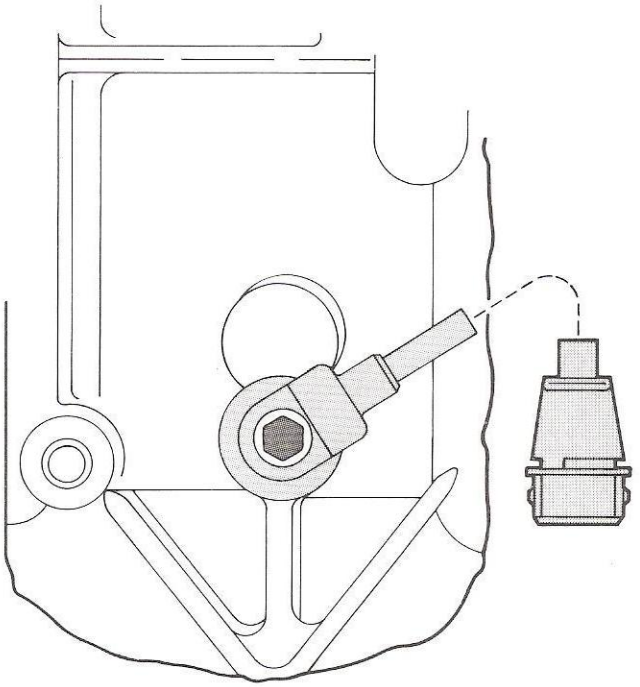
- Full throttle enrichment
- Activation of special ignition timing map for full engine load

The ignition and fuel injection control units also use the throttle switch signals to check the operation of the air sensor potentiometer.





Knock Sensor

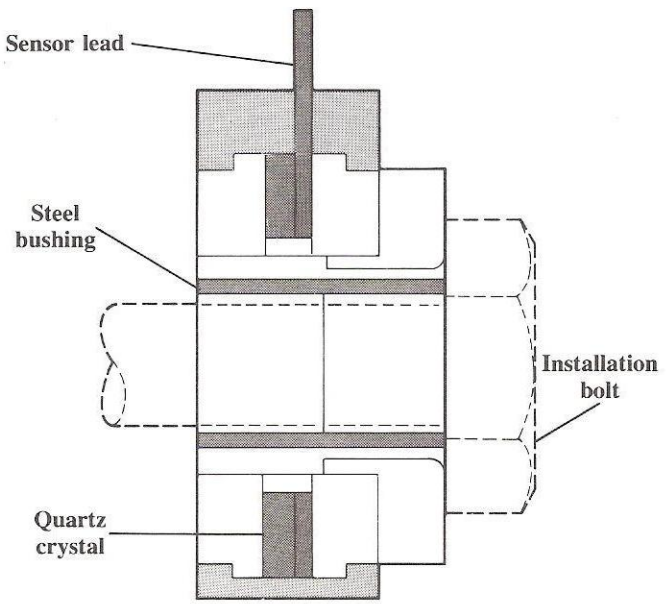


The knock sensor is attached to the left side of the cylinder block next to cylinder #3. It is a piezoelectric crystal encased in a metal and plastic housing.

Vibrations in the engine will cause the quartz crystal in the knock sensor to generate a small voltage. By monitoring this voltage the ignition control unit can determine when ignition knock or detonation occurs. The ignition control unit will then retard the ignition timing to prevent the ignition knock.

The construction of the knock sensor is slightly different than previous versions. A steel bushing is located inside the sensor housing. This is to prevent the quartz crystal inside the sensor from being crushed or damaged by overtightening the installation bolt.

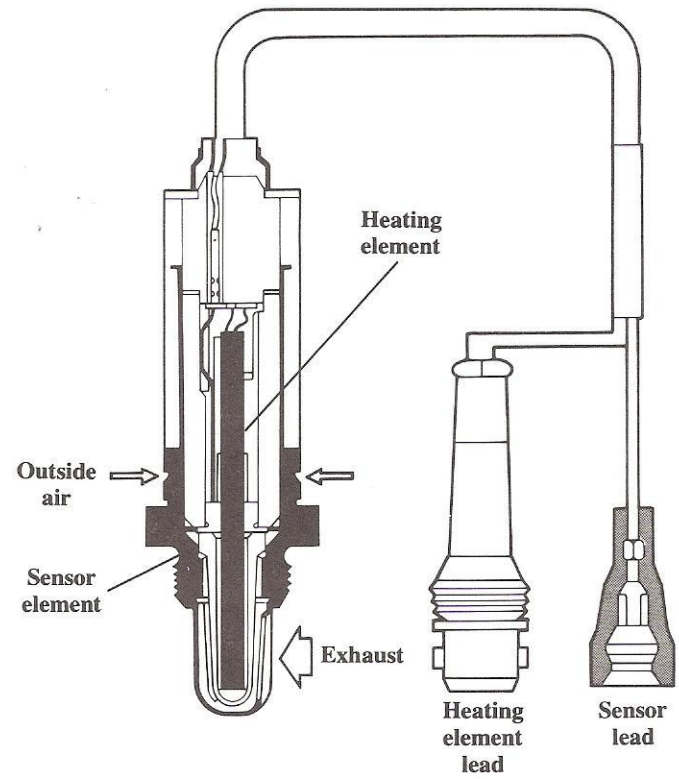
The installation torque for this new sensor is increased to 15-25 Nm (11-18 ft./lbs.). No washers should be used on the installation bolt.



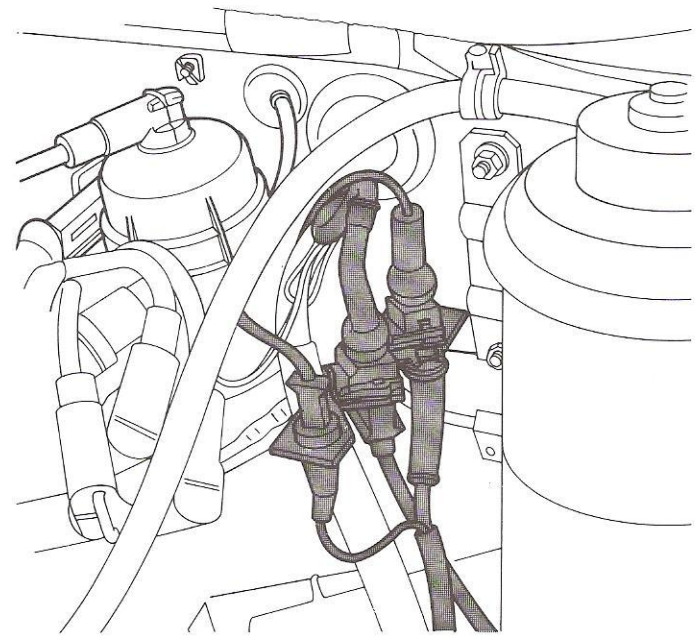
Oxygen Sensor

The oxygen sensor is located in the exhaust just before the catalytic converter. The sensor has a heated element to provide more uniform sensor output signals. The fuel injection control unit uses this signal to monitor the exhaust gas oxygen content. From this signal, the air/fuel mixture can be determined.

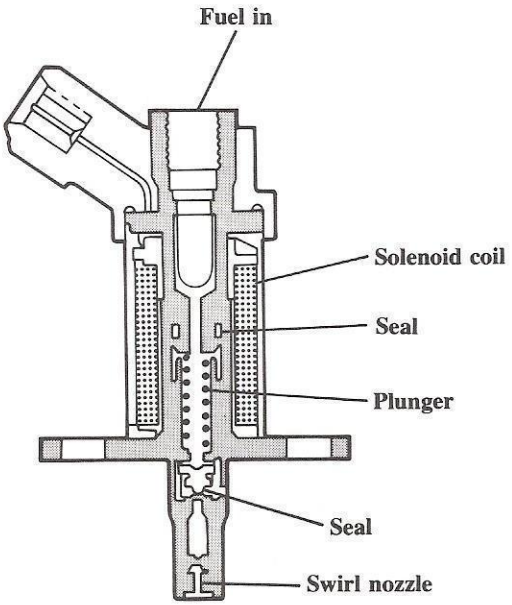
The sensor replacement interval is 60,000 miles. An OXS mileage counter is not used.



The connections for the oxygen sensor, oxygen sensor heating element and knock sensor are attached to a bracket located next to the ignition coil.

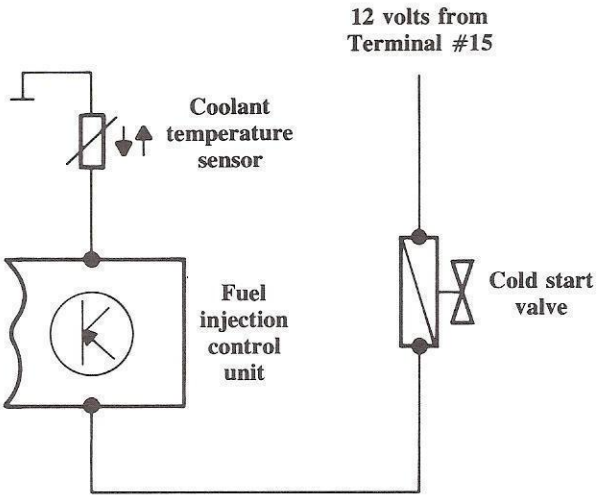


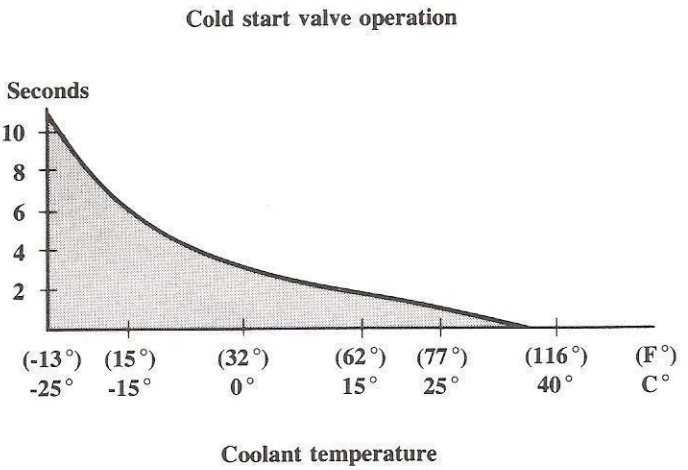
Cold Start Valve



The cold start valve is located on the back of the intake manifold. It injects additional fuel during cold starts.

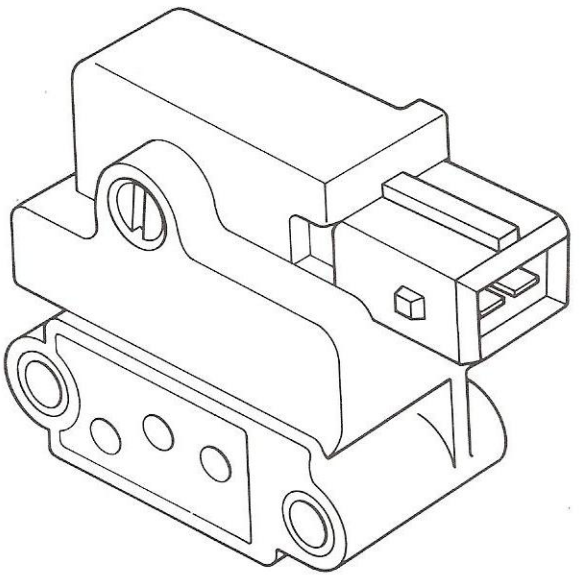
The cold start valve is operated by the fuel injection control unit. A thermo/time switch is not used. To prevent excess fuel from being injected, the operating duration of the cold start valve is determined by engine coolant temperature.



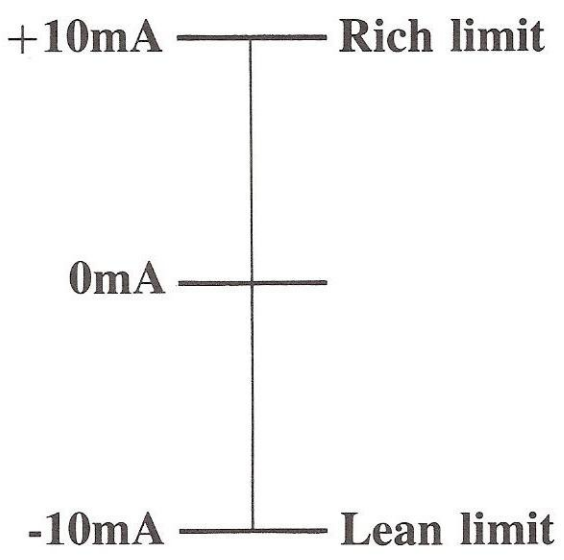


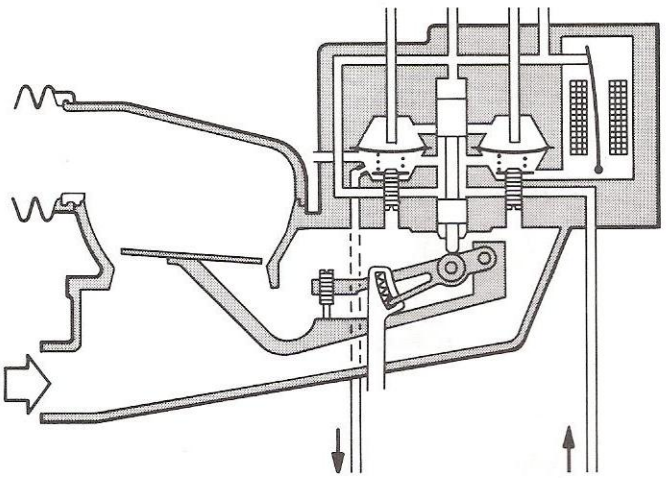
Differential Pressure Regulator

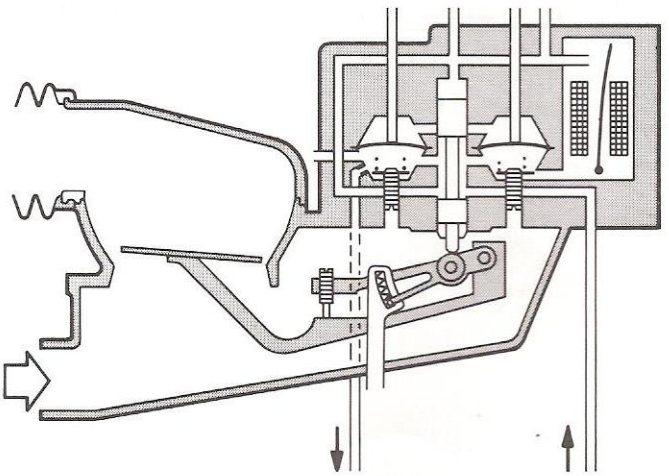
The differential pressure regulator is attached to the side of the fuel distributor. It helps to determine the fuel mixture by regulating the fuel flow in the lower chamber of the fuel distributor. This will regulate the fuel flow to the injectors.



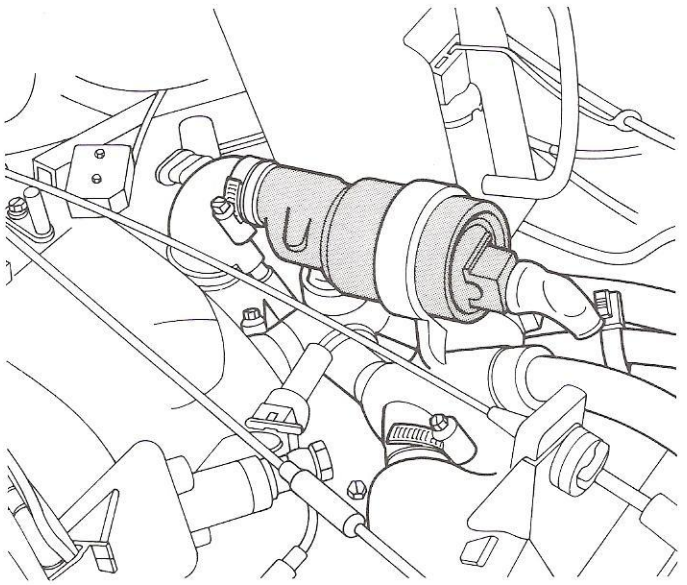
The regulator and its operation is the same as used on CIS-E fuel injection. The operating range during closed loop or oxygen sensor regulation has, however, been changed. The operating range is now +10mA to -10mA. The nominal CO adjusting point is now 0mA. This helps to insure better engine operation if an electrical failure should occur by providing a fuel mixture which is in the range of the nominal setting.







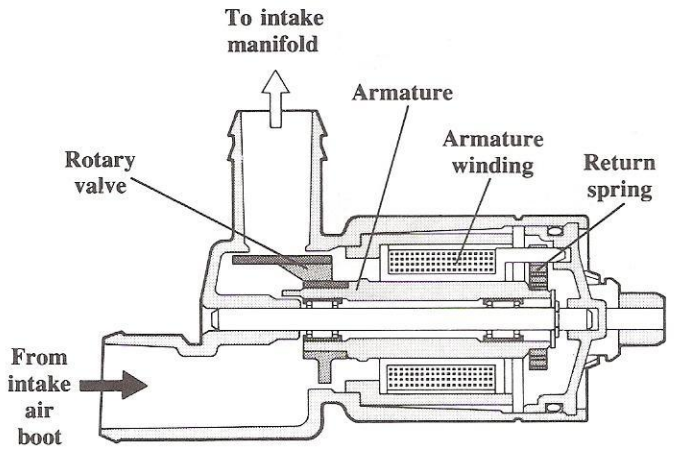
Idle Stabilization Valve

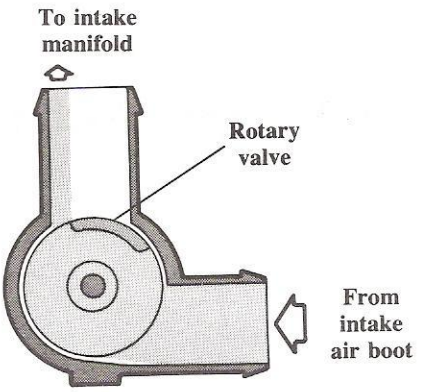


A small electrically operated valve is used to control the idle speed. The valve consists of a small single winding electric motor. A rotary valve and a return spring are attached to the motor's armature. This is a different design from previous versions.

The motor is operated by a cycled DC voltage (duty cycle) which will cause the armature to work against the return spring. The strength of the motor's current (duty cycle) will determine the position of the armature and the size of the rotary valve opening.

If the valve should fail for any reason, the return spring will force the armature against a stop. This will establish a fixed rotary valve opening and cause a warm idle speed of about 900 RPM for emergency operation.





Idle Stabilization Valve

The idle stabilization valve is operated by the fuel injection control unit. The system will control the engine idle speed at the following levels:

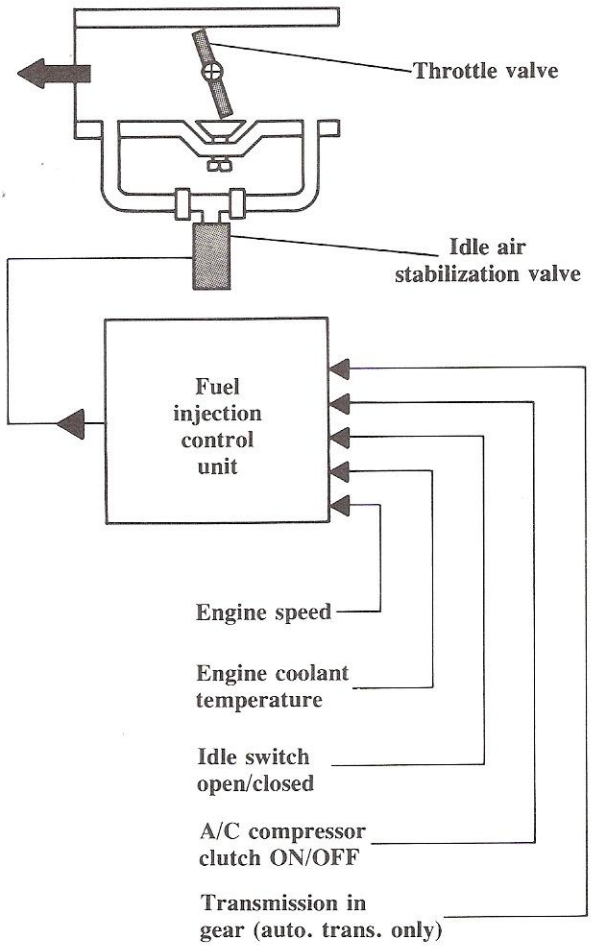
Cold Engine Approximately 1000 RPM, this speed will vary depending on the engine temperature. Idle speed will decrease from this value until it reaches the warm engine value.

Warm Engine 720 ± 70 RPM

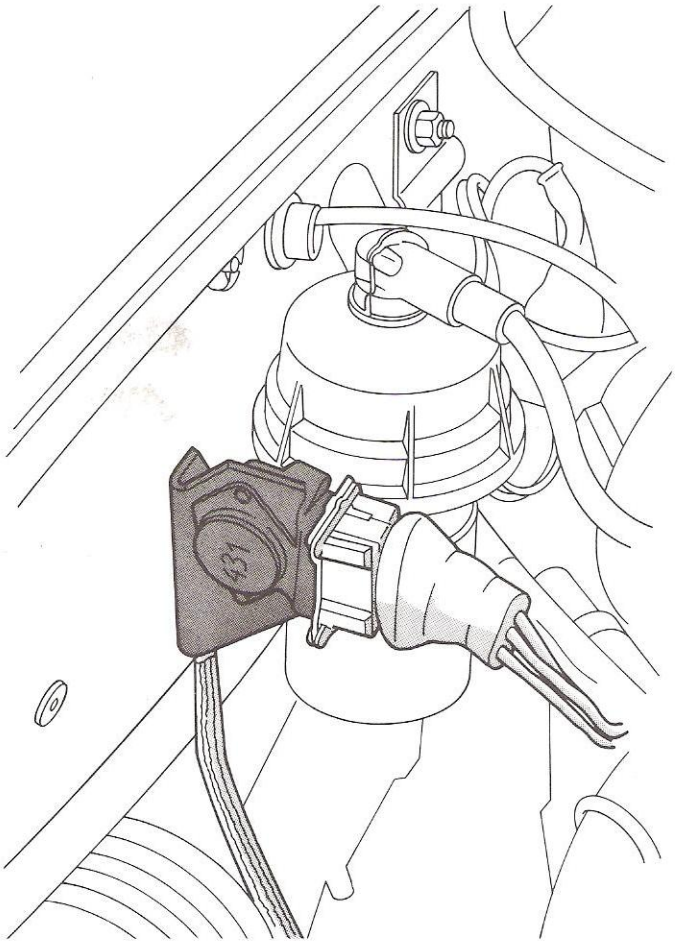
A/C Switched On 720 ± 70 RPM

With this system, no idle speed adjustments are possible or necessary. Because of this, there is no test lead to measure the idle stabilization valve's duty cycle.

To insure proper system operation, make sure the idle air bypass screw is turned in fully on its seat in the throttle housing.

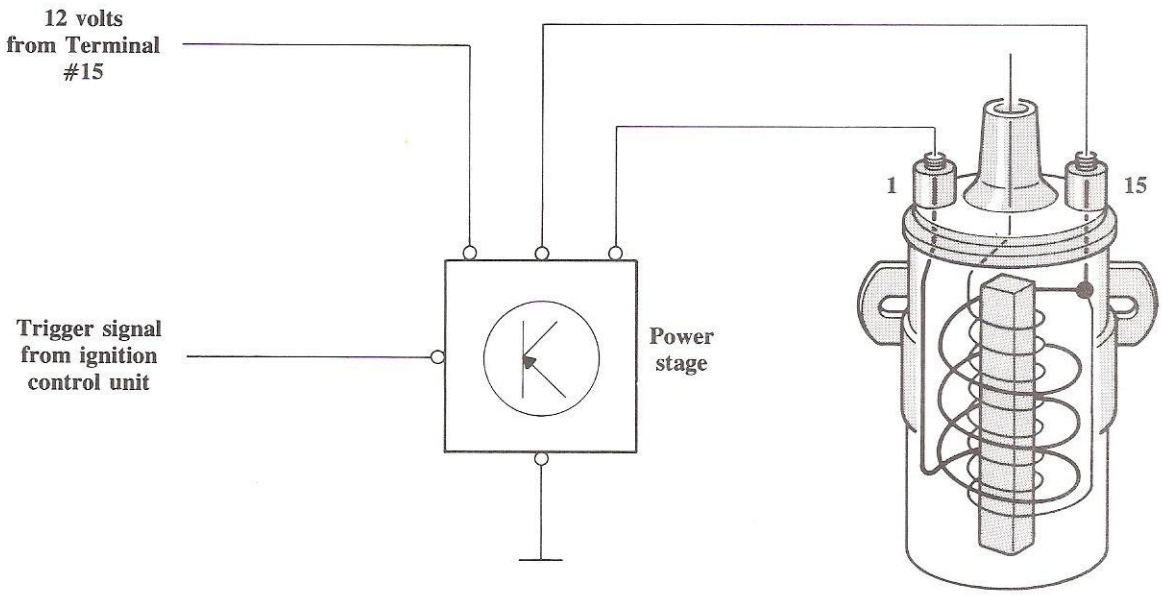


Ignition Coil



A Darlington type of power stage is mounted next to the ignition coil. This power stage is used to switch the primary current in the ignition coil on and off in place of the Hall control unit.

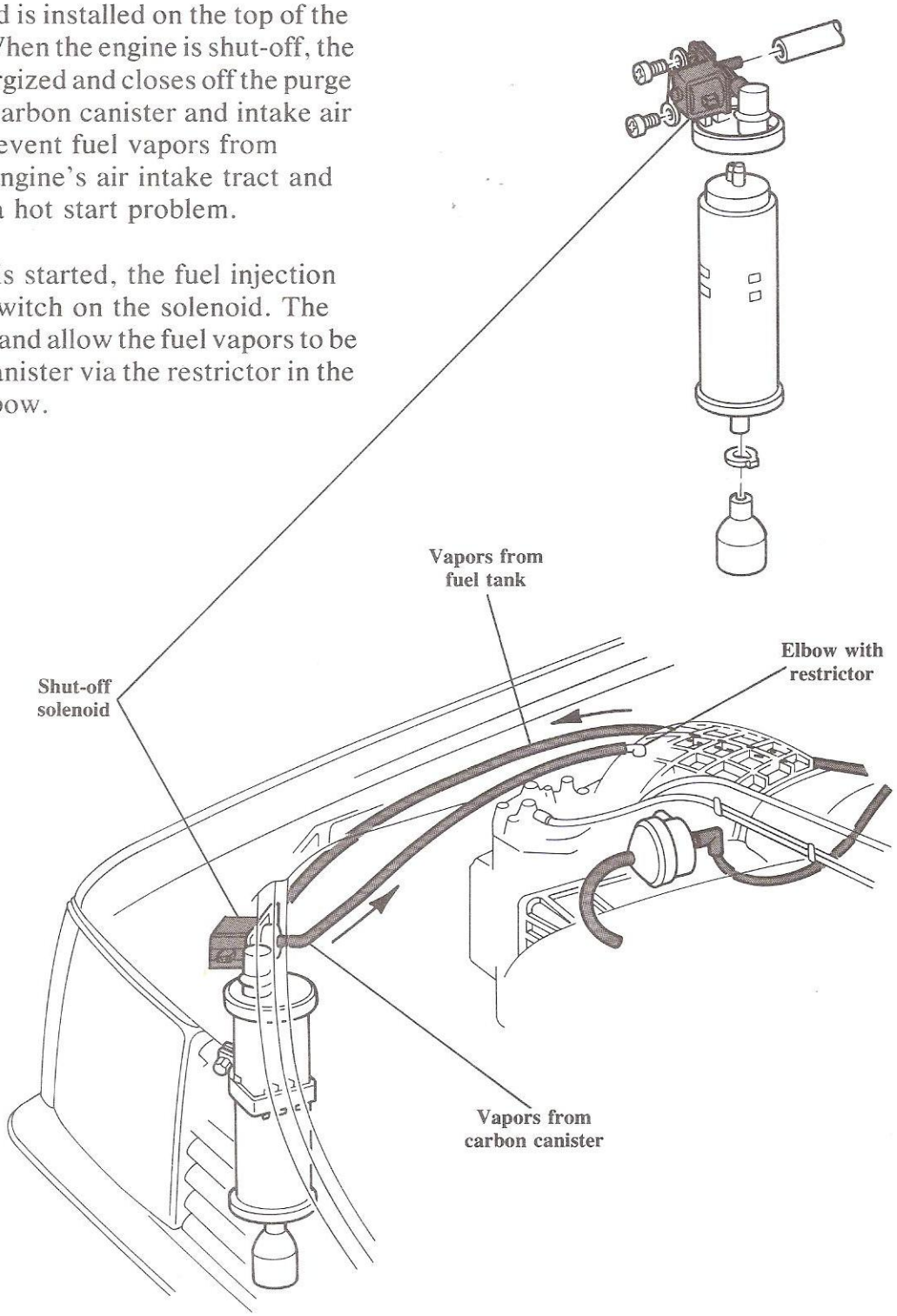
The ignition control unit sends a voltage signal to the power stage to operate it. The power stage will then switch the ignition coil primary current to control the spark discharge from the ignition coil. In this manner the power stage operates like a solid state pair of ignition points.



Carbon Canister Shut-Off Solenoid

A shut-off solenoid is installed on the top of the carbon canister. When the engine is shut-off, the solenoid is de-energized and closes off the purge line between the carbon canister and intake air boot. This will prevent fuel vapors from collecting in the engine's air intake tract and possibly causing a hot start problem.

When the engine is started, the fuel injection control unit will switch on the solenoid. The solenoid will open and allow the fuel vapors to be purged from the canister via the restrictor in the intake air boot elbow.



Ignition Timing

Ignition timing is determined according to values which are programmed in the ignition control unit.

The ignition timing is basically determined according to:

Engine speed — From the Hall sender

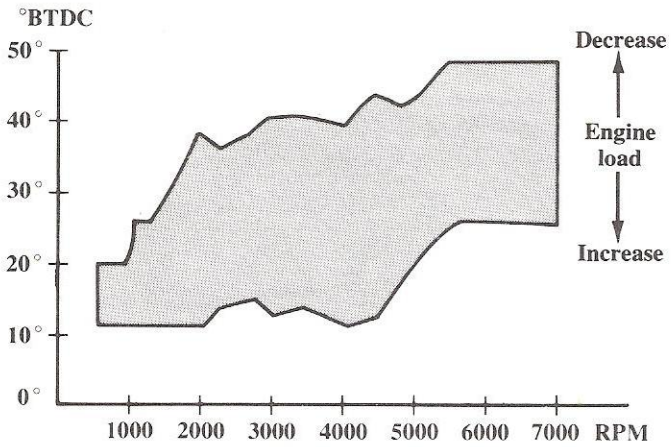
Engine load — From the air sensor potentiometer

The ignition timing will be advanced as engine speed increases. The amount of advance will be reduced, however, as engine load increases.

Two separate ignition maps are programmed into the control unit's memory. One map is designed for operation with regular fuel and the other with premium fuel.

The engine will develop the same horsepower when operated with either ignition map. However, when the premium fuel ignition map together with premium fuel is used, the engine will develop greater torque at a lower engine speed.

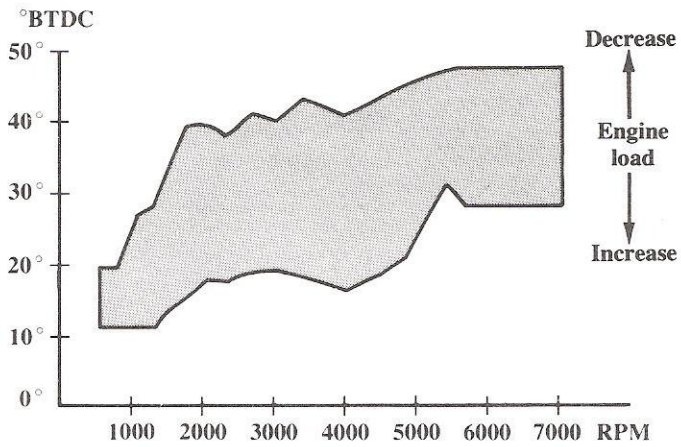
Regular Fuel Ignition Map



Engine Output With Regular Fuel

- 130 hp at 5600 RPM
- 138 ft./lbs. at 4500 RPM

Premium Fuel Ignition Map



Engine Output With Premium Fuel

- 130 hp at 5600 RPM
- 140 ft. /lbs. at 4000 RPM

Ignition Map Selection

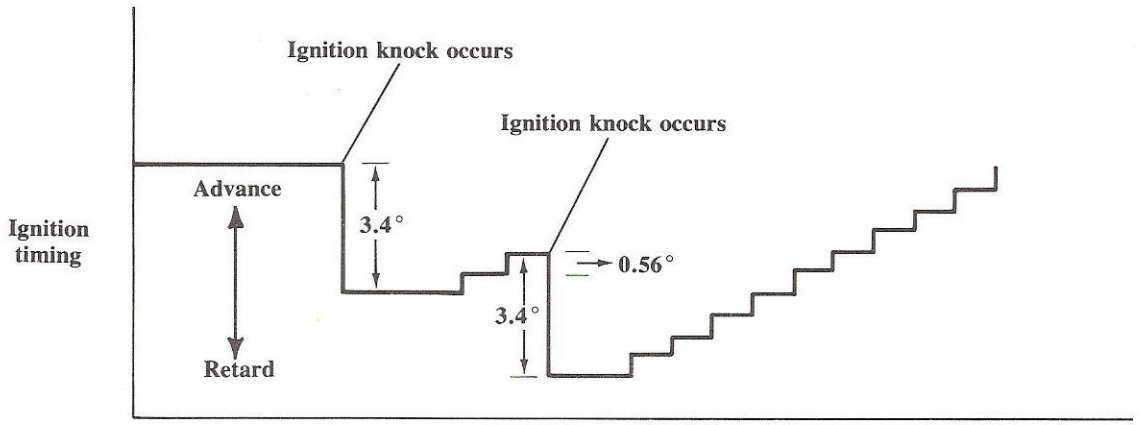
The ignition control unit switches automatically to the premium fuel ignition map whenever the engine coolant temperature is above 149°F (65°C). This map has ignition timing values that are slightly more advanced in some areas of operation than the ignition map for regular fuel. If ignition knock (detonation) occurs repeatedly, the ignition control unit will then switch to the ignition map for regular fuel.

The ignition control unit will automatically switch back to the premium fuel map after a fixed amount of time or whenever the engine is restarted.

Ignition Knock Regulation

If a cylinder develops ignition knock, the ignition control unit will sense this through the knock sensor mounted on the engine block. The control unit will then retard the ignition timing 3.4° for that cylinder. If the knocking stops, the ignition timing will be advanced in steps of 0.54° back to the pre-programmed value.

If the knocking continues or reoccurs, the ignition timing can be retarded up to 12° for each cylinder.



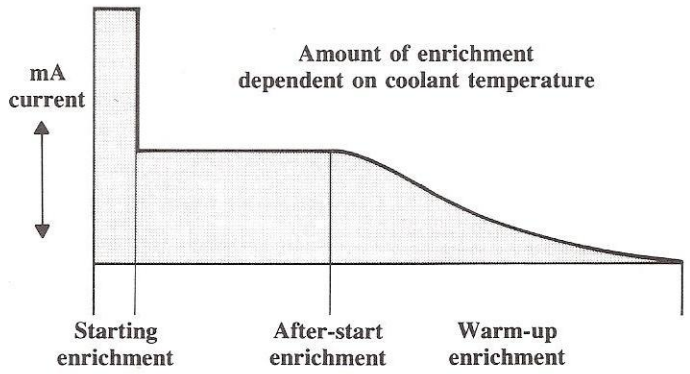
Starting Enrichment

When the starter is operated, the current to the differential pressure regulator is increased to enrich the fuel mixture and help start the engine. This enrichment will occur whenever the engine is started. The amount of enrichment is determined by the engine coolant temperature and cranking speed. Under some conditions the current can go as high as 140mA.

After-Start And Warm-Up Enrichment

After the engine has started, the control unit continues to enrich the fuel mixture. The amount of current and length of time it occurs is also determined by coolant temperature. It can last as long as 40 seconds.

When after-start enrichment is completed, the differential pressure regulator current will gradually decrease as the engine warms up. This warm-up enrichment is also determined by coolant temperature.

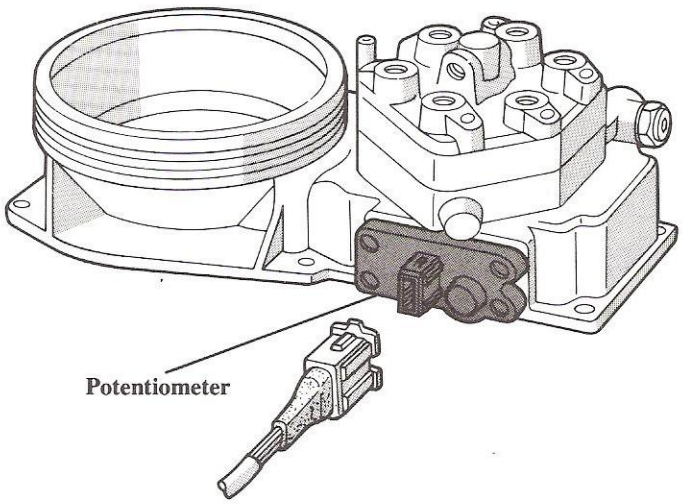


Acceleration Enrichment

The differential pressure regulator current will be briefly increased during acceleration when the engine is cold. The current can briefly rise up to 6mA and is only effective for a few seconds.

The amount of acceleration enrichment is determined by:

- Signal from air sensor potentiometer
- Signal from coolant temperature sensor
- Engine speed



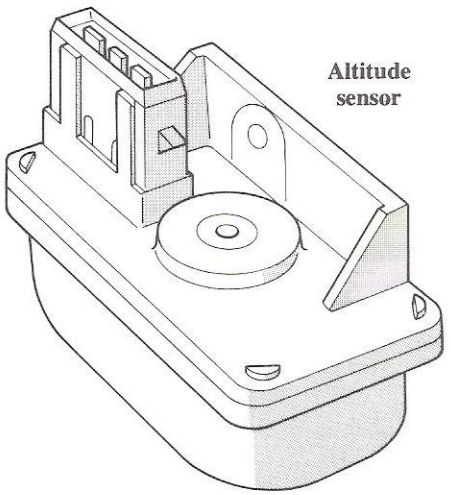
Full Throttle Enrichment

During full load operation, the fuel mixture will be enriched to provide maximum engine output. When the full throttle switch is closed, the fuel injection control unit will increase the differential pressure regulator current by about 3mA. This value will vary slightly according to engine speed. When operating in high altitude areas, this value will also be lower.

Altitude Correction

The fuel mixture will be corrected according to altitude and air pressure. This is based on the signal from the altitude sensor.

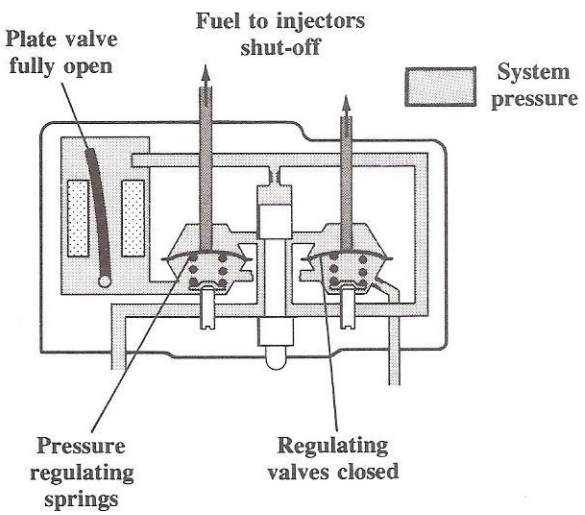
As altitude increases and air pressure decreases, the current to the differential pressure regulator will be reduced to slightly lean the fuel mixture. This is only effective during "open loop" conditions such as warm-up and full throttle enrichment. It has no effect during oxygen sensor regulation (closed loop).



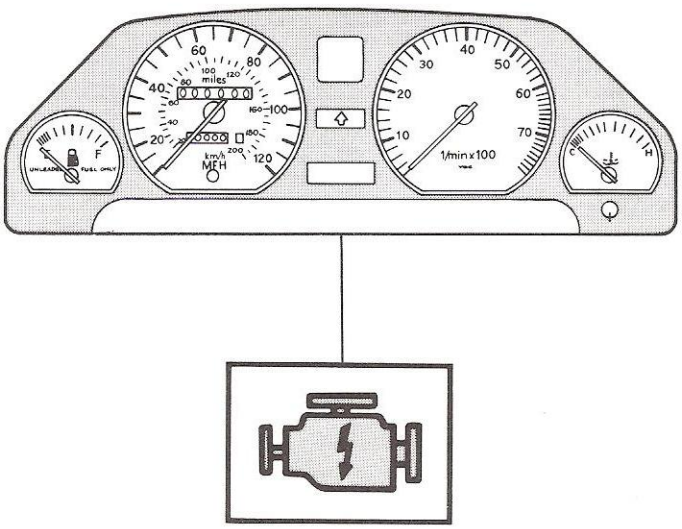
Deceleration Fuel Shut-Off And Engine Speed Limitation

During engine deceleration, fuel to the injectors is shut-off by increasing the negative current to the differential pressure regulator to about -50 to -60mA. This helps reduce fuel consumption and exhaust emissions. The engine speed at which this will occur is regulated by coolant temperature.

This will also occur at about 6600 RPM to limit the engine speed.



Fault Memory



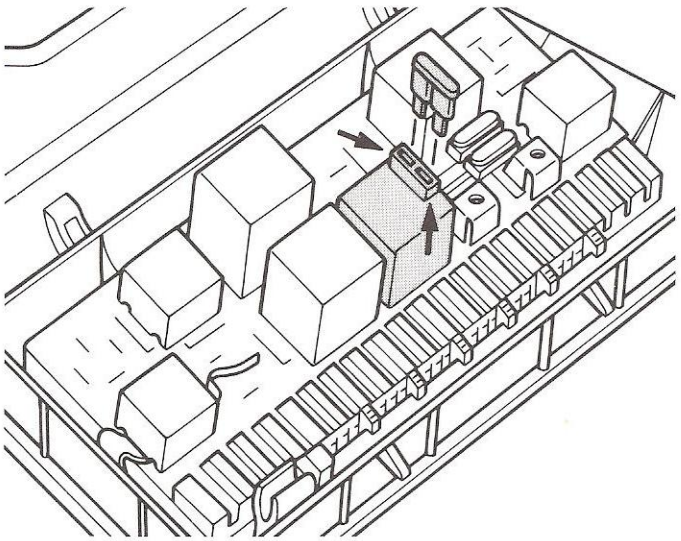
Both the ignition control unit and fuel injection control unit have a fault memory for self diagnosis. These fault memories constantly monitor the systems' sensors, wiring and input signals.

If a problem or fault develops, these memories will store this information and take corrective action.

Example:

The engine coolant temperature sensor develops an open circuit.

Both control units will now assume a calculating value of a fully warmed engine.



The fault information stored in the memories can be displayed by a flashing code of the engine control indicator light. This display is activated by inserting a spare fuse in the top of the fuel pump relay.

The indicator light will also come on while driving if:

— The ignition timing is being fully retarded because of ignition knock.

— A problem develops with the knock sensor.

Fault Memory

The fault display is activated by inserting a spare fuse into the top of the fuel pump relay for 4 seconds. This connects the diagnostic terminals to ground. When the fuse is removed, the indicator light will then flash in a certain sequence.

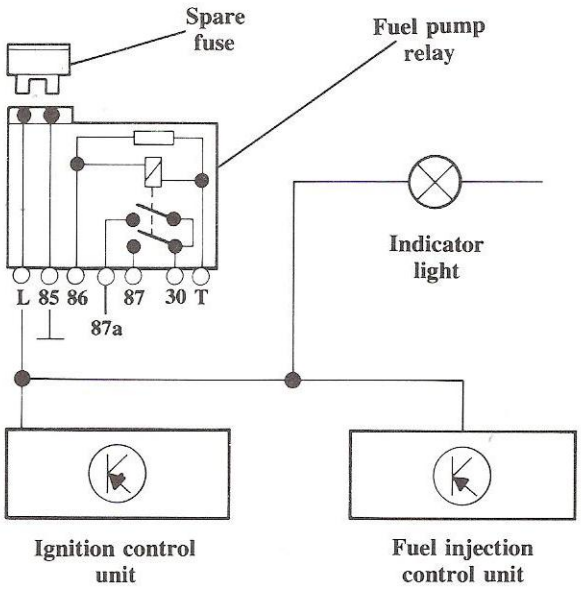
Any faults stored in the control unit's memory will be displayed in steps. To move to the next step, the fuse must be reinserted for another 4 seconds.

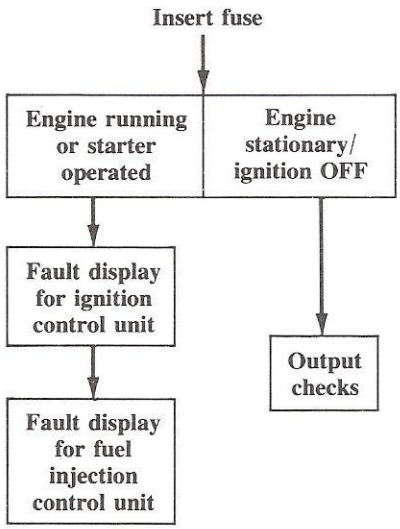
When making the input checks, the car must be driven 5 minutes to insure that all necessary information is stored in the memories. If the car has a no start condition, operate the starter for 6 seconds to store the necessary inputs.

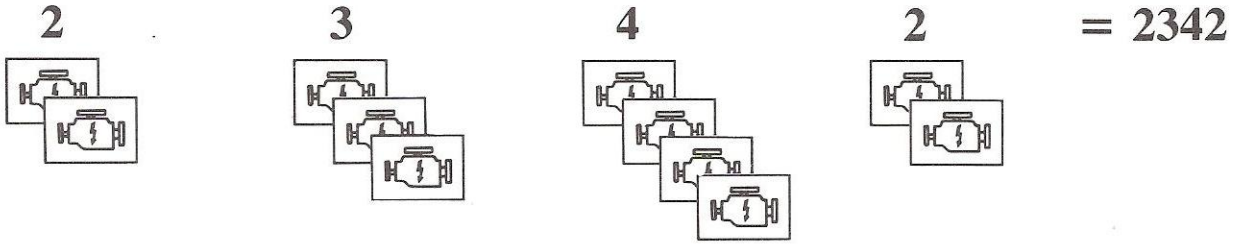
Do not switch the ignition off after driving the car or operating the starter. This will erase the fault memory.

This self diagnosis procedure can also be used to check the systems' outputs. If the fuse is inserted with the ignition switched off, the system switches to the output checks when the ignition is turned on. See page #32.

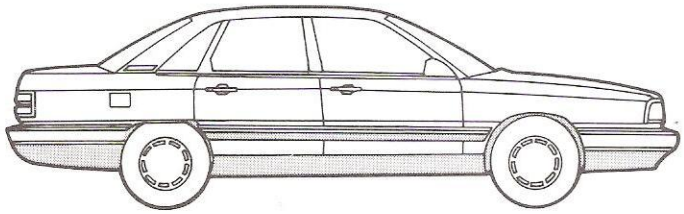
The four digit codes are displayed by the flashing of the indicator light. The code will continue to repeat until the display is switched to the next step.







To Use The Fault Memory
Drive The Car For At Least 5 Minutes



The car must be driven for 5 minutes because the control unit will not store some of the fault information until this amount of time has elapsed.

If the car has a no start condition, operate the starter for at least 6 seconds.

Do not turn ignition OFF. This will erase the fault memories.

Activate Ignition Fault Display By Inserting Fuse In Top Of Fuel Pump Relay

Insert fuse at least 4 seconds, then remove

After the fuse is removed, the indicator light in the instrument cluster will begin to flash a four digit code. It is now displaying information from the ignition control unit.

A fault code of 4444 means no faults have been recorded in that control unit.

Switch To Next Step Of Fault Display

Insert fuse at least 4 seconds, then remove

Once a display code has been recorded, switch to the next step. Record all fault codes.

The fault display for the ignition control unit is completed when the code 0000 is displayed.

Code 0000 is displayed by the indicator light coming on 2.5 seconds and going off 2.5 seconds repeatedly.

Switch To Fuel Injection Fault Display

Insert fuse at least 4 seconds, then remove

Once the ignition display is completed the memory from the fuel injection control unit will be displayed.

The engine idle speed may increase slightly when the fuel injection fault display is activated.

The display is completed when 0000 is shown.

Fault Codes

Code	Location of Fault	Problem
1111	Ignition control unit or fuel injection control unit	Defective memory circuits in control unit
2121	Idle switch	Switch stuck closed or problem in wiring to switch
2122	Engine speed signal or Hall sender	No engine speed signal from Terminal #17 of ignition control unit to Terminal #30 of fuel injection control unit
2123	Full throttle switch	Switch stuck closed or problem in wiring to switch
2141	Knock regulation	Engine or ignition knock is causing timing to be retarded the maximum amount
2142	Knock sensor	Defective sensor or sensor wiring
2223	Altitude sensor	No signal from sensor
2232	Air sensor potentiometer	No signal from potentiometer to fuel injection control unit or break in wire between fuel injection control unit Terminal #21 and ignition control unit Terminal #8
2233	Reference (supply) voltage for air sensor potentiometer and altitude sensor	No reference voltage from Terminal #21 of ignition control unit to Terminal #26 of fuel injection control unit
2312	Coolant temperature sensor	No signal from sensor
2341	Oxygen sensor control	Oxygen sensor control operating at rich or lean limit
2342	Oxygen sensor	No signal from sensor
4431	Idle stabilizer valve	Problem in wiring to idle stabilizer valve
4444	No faults stored in memory	
0000	End of diagnosis	

Output Checks

The control units can also generate certain output signals to check the operation of some components. By inserting the fuse in the top of the fuel pump relay with the ignition switched OFF, the system will switch to the output checks.

The system will now generate four separate output signals, each one in a separate step, when the ignition is turned ON. If the starter is operated or the engine has been run, the system will switch to the input checks.

The fuse must be inserted before the ignition is switched on.

To switch from one step to the next, the fuse must be reinserted into the top of the fuel pump relay.

The indicator light will flash a code to indicate which test step the system is in.

The output signals will only be generated when the full throttle switch is closed.

This procedure can be used to check the operation of the following components. If a problem is found, first check the component with an ohmmeter for an open or short circuit, then check the wiring.

Step	Code Displayed	Component Checked	Operating Cycle
#1	4341	Differential pressure regulator	10mA current flow to regulator when full throttle switch is closed
#2	4343	Carbon canister shut-off solenoid	Clicks ON and OFF when full throttle switch is closed
#3	4431	Idle stabilizer valve	Clicks when full throttle switch is closed
#4	4443	Cold start valve	Clicks ON and OFF for a maximum of 10 seconds when full throttle switch is closed

Differential Pressure Regulator Check

— Connect multimeter to differential pressure regulator with adapter 1315 A/1. Set meter to 200 mA DC scale.

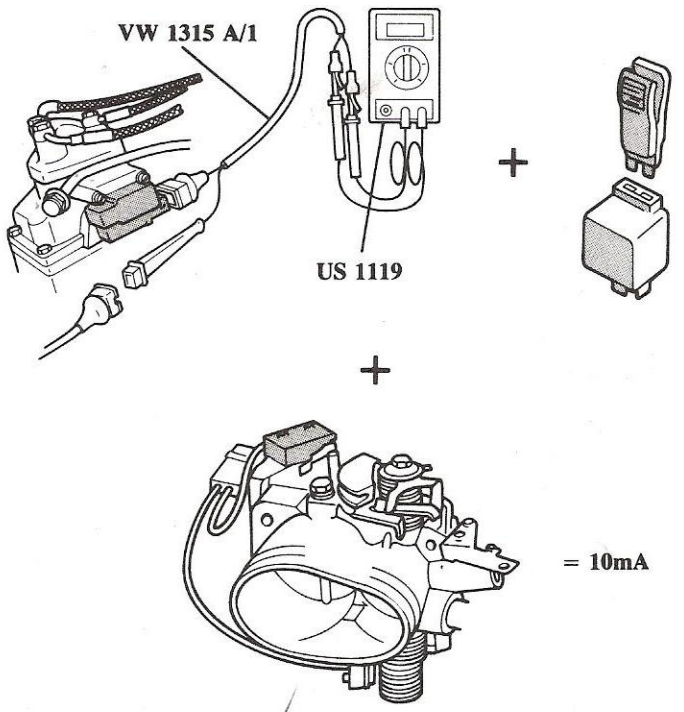
— Insert spare fuse in top of fuel pump relay

— Turn ignition on, remove fuse after 4 seconds

- Indicator light displays 4341

— Close full throttle switch

- Differential pressure regulator current switches to 10mA (is 100mA with full throttle switch open)



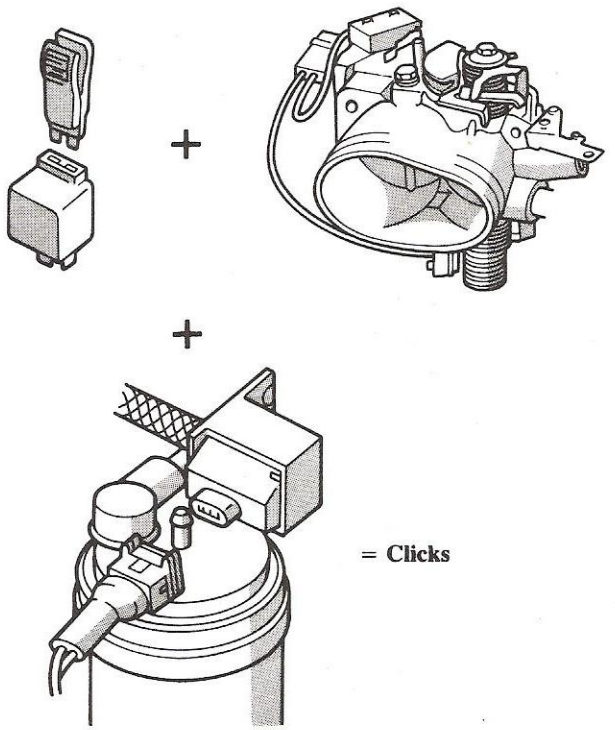
Carbon Canister Shut-Off Solenoid

— Re-insert spare fuse in top of fuel pump relay for 4 seconds, then remove

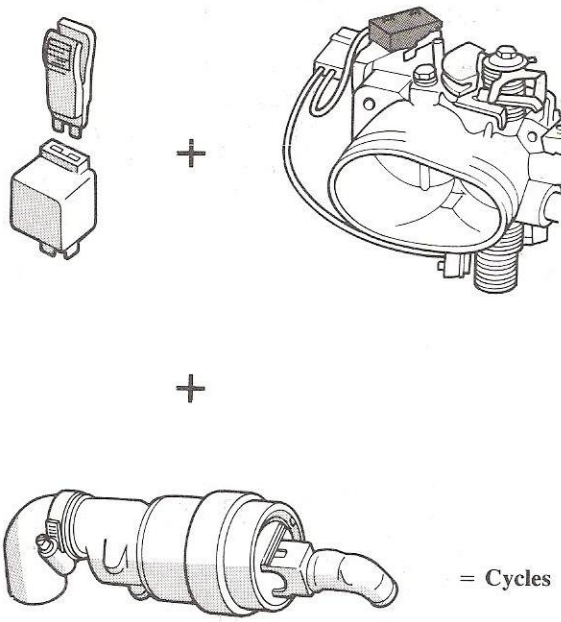
- Indicator light displays 4343

— Close full throttle switch

- Shut-off solenoid clicks ON and OFF when full throttle switch is closed



Idle Stabilizer Valve Check



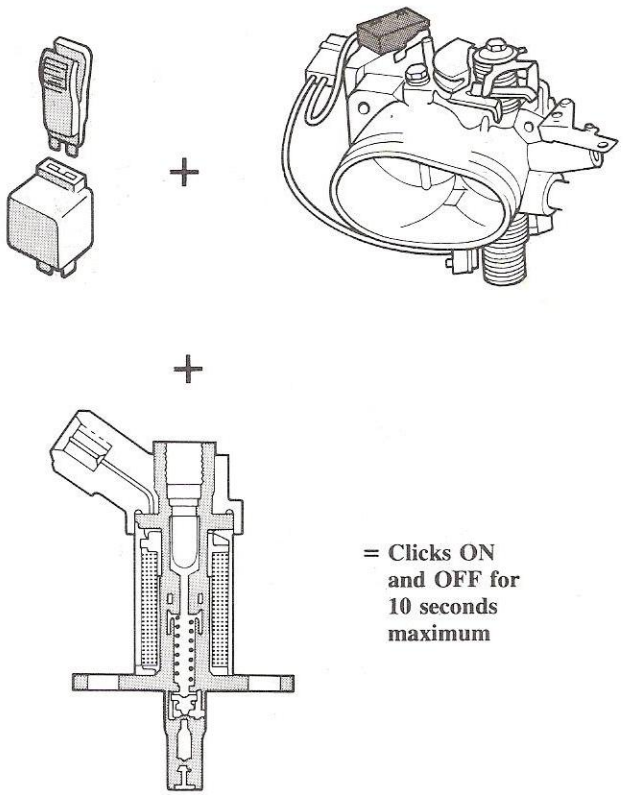
— Reinsert fuse in top of fuel pump relay for 4 seconds, then remove

- Indicator light displays 4431

— Close full throttle switch

- Idle stabilizer valve cycles when full throttle switch is closed

Cold Start Valve Check



— Reinsert fuse in top of fuel pump relay for 4 seconds, then remove

- Indicator light displays 4443

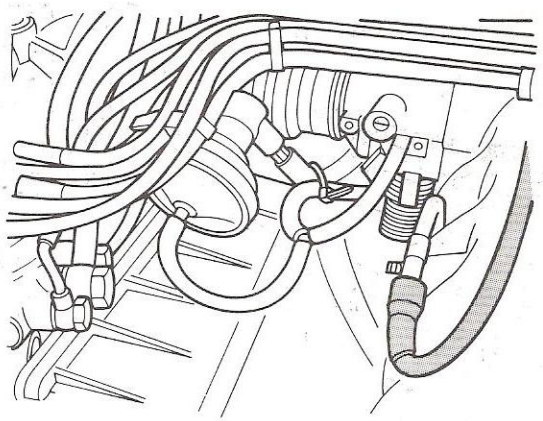
— Close full throttle switch

- Cold start valves click ON and OFF for **10 seconds maximum** when full throttle switch is closed

Checking/Adjusting Engine Settings

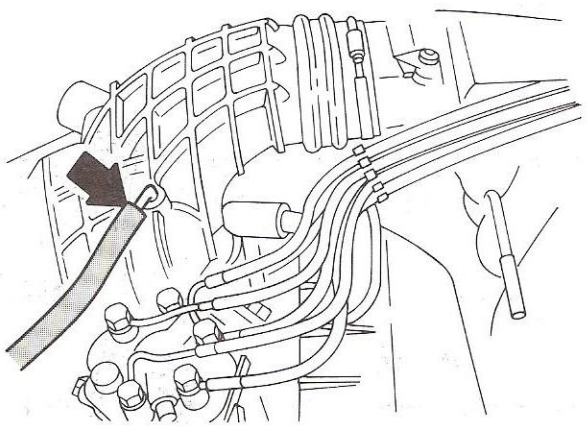
— Remove cap from exhaust probe

— Connect hose from exhaust gas analyzer to exhaust probe



— Remove carbon canister vent hose from elbow at intake air boot

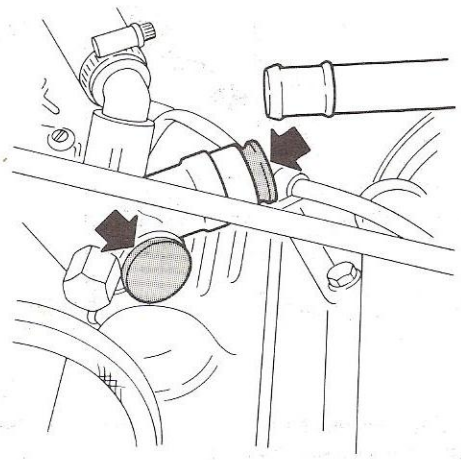
Note: Leave elbow unplugged to draw in fresh air through restrictor



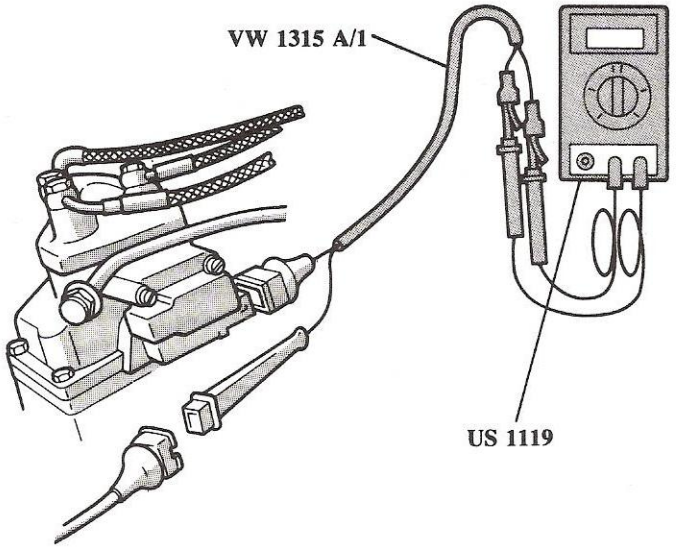
— Remove crankcase breather connections at valve cover

— Plug both openings at connector

Note: Crankcase vapors must vent to atmosphere during checking or adjusting procedure

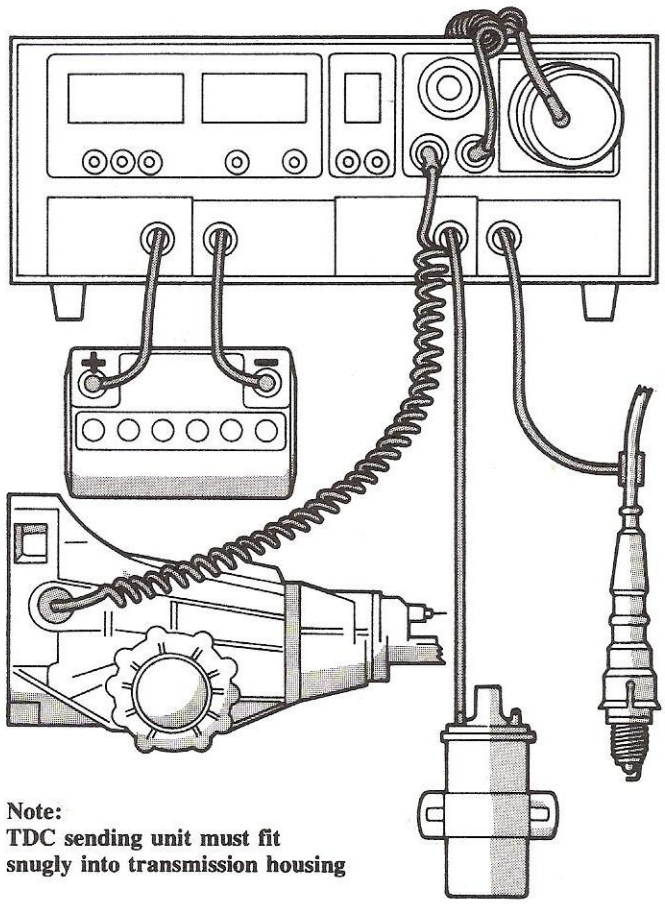


Checking/Adjusting Engine Settings (Cont'd.)



— Connect multimeter US 1119 or equivalent to differential pressure regulator with adapter VW 1315 A/1.

— Set scale to 200mA DC.



Note:
TDC sending unit must fit snugly into transmission housing

— Connect engine tester to check ignition timing and idle speed.

— Start engine and run to normal operating temperature.

Note: If the injector lines are loosened or replaced, the engine should be run at about 3000 RPM for several minutes to bleed injectors and lines.

Checking/Adjusting Engine Settings

— Insert fuse in top of fuel pump relay

Note: Indicator light must come on. This indicates that ignition timing is stabilized for testing purposes after 4 seconds

— Check ignition timing

- Should be 13° to 17° BTDC
- If not, adjust to 15° ± 1° BTDC

— Remove fuse from fuel pump relay and briefly raise engine speed above 2500 RPM to cancel fault display

— Check idle speed

- Should be 720 ± 70 RPM

Note: The idle speed is not adjustable. The idle air bypass screw should be turned in fully against its seat.

- If idle speed is out of this range, check for an engine problem such as vacuum leaks, etc.

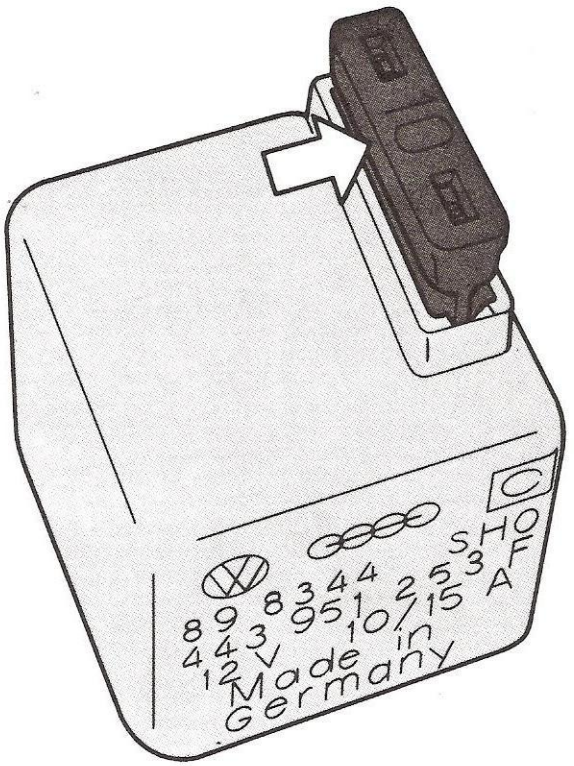
— Check differential pressure regulator current with oxygen sensor connected

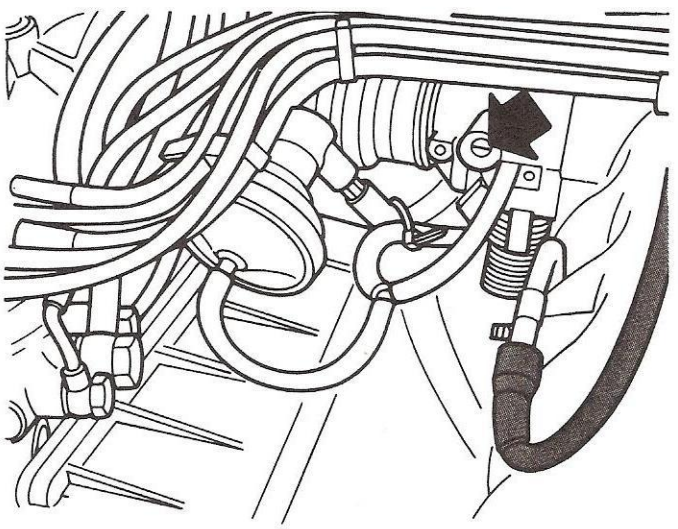
- Should be -4mA to +6mA and fluctuating
- If not, adjust to -1 to +1mA

— Check CO %

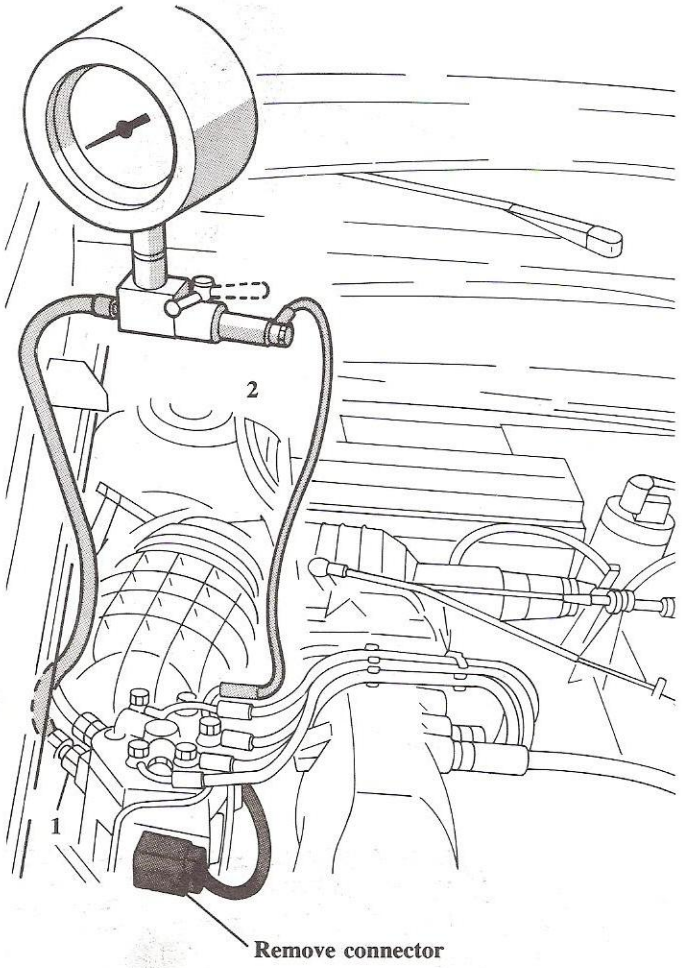
- Should be 0.3 % to 1.2 %

— Disconnect testers and reconnect hoses on engine.





System Pressure



— Remove fuel line (2) from cold start valve

— Remove test plug (1) from lower chamber on fuel distributor

— Connect VW 1318 pressure gauge between fuel line from cold start valve (2) and lower chamber of fuel distributor (1) as shown

Note: Use adapter 1318/5 on lower chamber connection if necessary. Always use new sealing washers.

— Remove electrical connector from differential pressure regulator

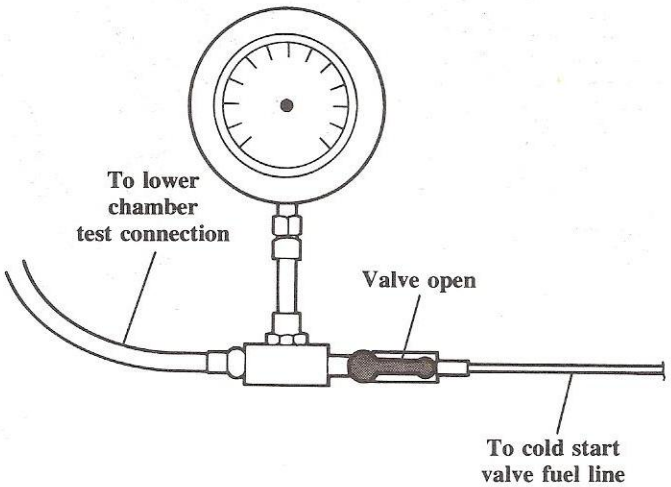
— Remove fuel pump relay and jump socket

— Open valve on VW 1318

— Energize fuel pump and read system pressure on gauge

- Pressure should be 6.1 to 6.5 bar

Note: System pressure is not adjustable



Differential Pressure
Part I

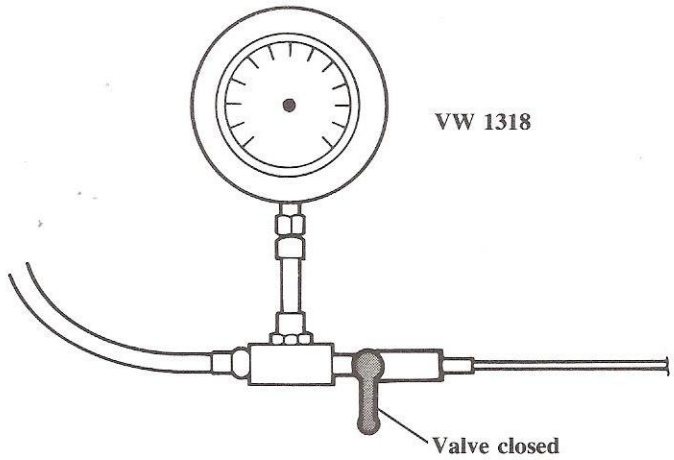
— Close valve on VW 1318 pressure gauge

Note: Wiring connector on differential pressure regulator remains disconnected

— Fuel pump switched ON

— Read differential pressure on gauge

- Should be 0.3 to 0.5 bar less than system pressure



Differential Pressure
Part II

— Valve on VW 1318 pressure gauge closed

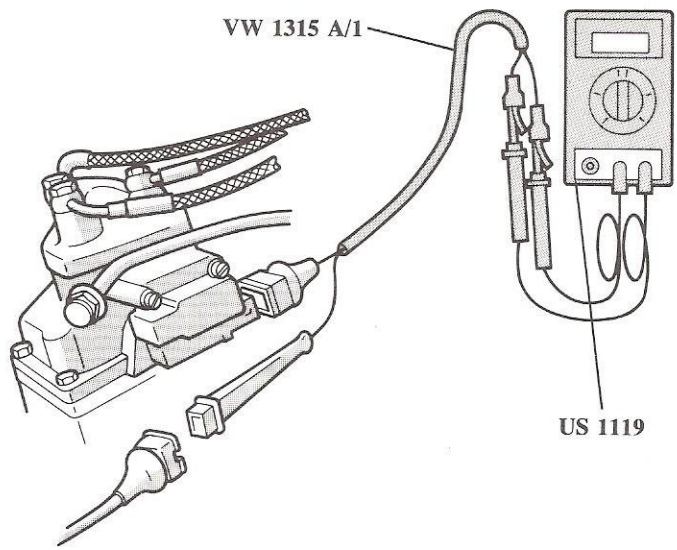
— Fuel pump switched ON

— Connect multimeter US 1119 or equivalent to differential pressure regulator with adapter 1315 A/1. Switch meter to 200mA DC scale.

— Turn ignition ON

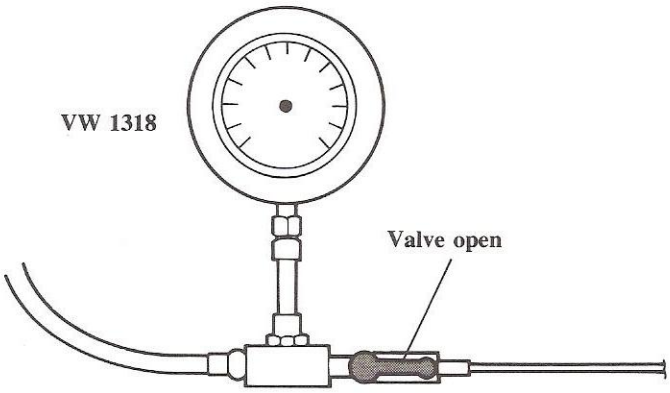
— Read regulator current and differential pressure

- Regulator should be 100mA
- Differential pressure should be 1.2 to 1.5 bar less than system pressure



Note: The circuitry in the fuel injection control unit will generate a fixed current of 100mA to the differential pressure regulator whenever the ignition is switched on and the engine stationary.

Residual Pressure



— Open valve of VW 1318 pressure gauge

— Energize fuel pump for at least 30 seconds

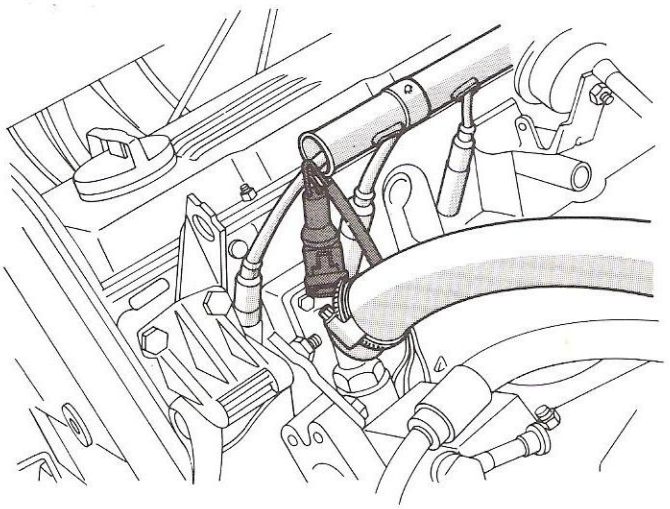
— Shut off fuel pump

— Read system pressure, minimum pressure should be:

- 3.5 bar after 10 minutes
- 3.4 bar after 20 minutes

Note: The residual pressure check does not include the cold start valve. To check, reattach fuel line, energize fuel pump, and check valve visually for leaks.

Cold Acceleration Enrichment



— Multimeter connected to differential pressure regulator with 1315 A/1 adapter and set to 200mA DC scale

Note: Engine must be less than 40°C (104°F). If necessary connect spare sensor to coolant sensor electrical connector. Connect spare sensor housing to ground with jumper cable.

— Disconnect oxygen sensor

— Start engine and let idle

— Measure regulator mA current

— Accelerate engine and measure regulator mA current

- Should increase approximately 6mA during acceleration

Deceleration Fuel Shut-Off

— Engine fully warmed

— Multimeter connected to differential pressure regulator with adapter 1315 A/1 and set to 200mA scale

— Accelerate engine above 3000 RPM

— Release throttle and check mA current

- Regulator current should decrease to approximately -50mA while throttle is closed until engine spead reaches approximately 1200 RPM

Oxygen Sensor Control

— Multimeter connected to differential pressure regulator with adapter 1315 A/1 and set to 200mA DC scale

— Disconnect oxygen sensor lead

— Start engine and let idle

— Read mA current

— Connect male terminal of oxygen sensor test lead to ground

— Read mA current

- Should increase 9 to 11mA after 15 seconds

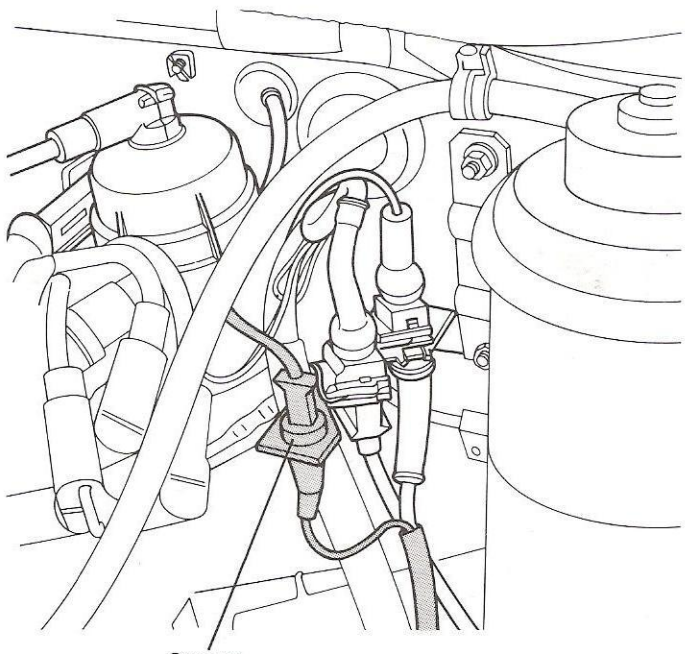
— Reconnect oxygen sensor

— Raise engine speed to approximately 3000 RPM for a few moments

— Let engine idle

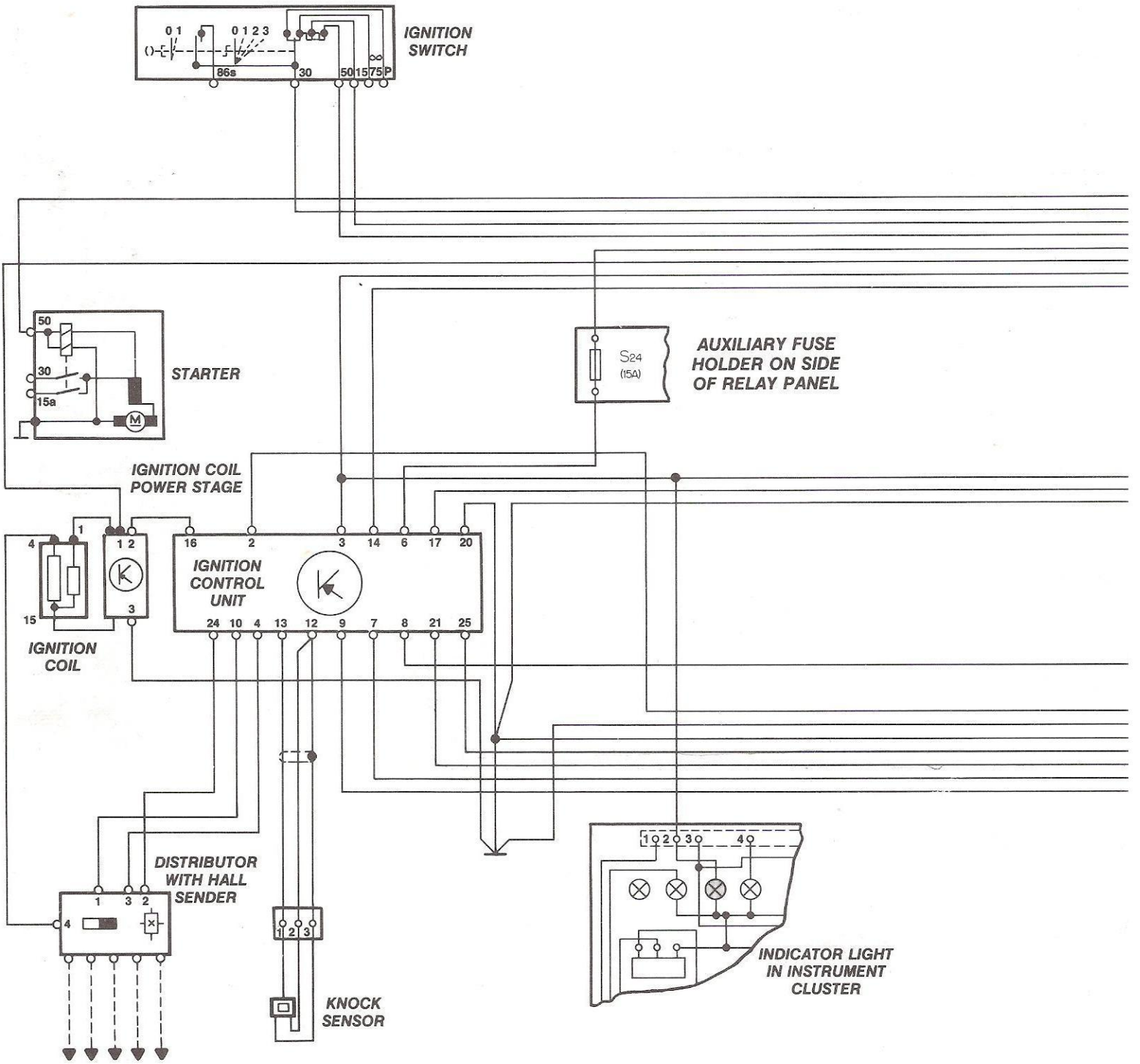
— Read mA current

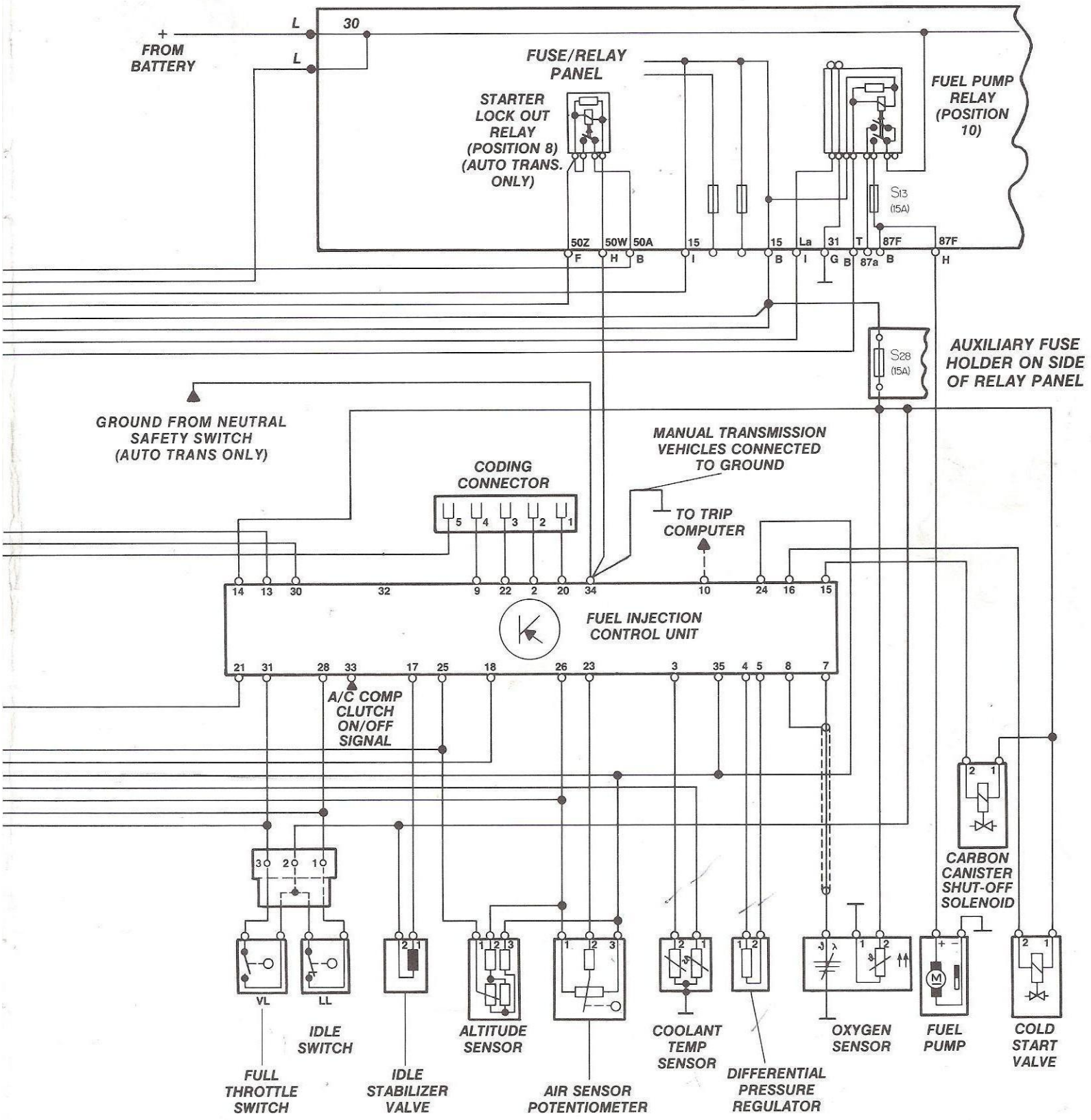
- Should fluctuate 1 to 3mA in the -10mA to + 10mA range



Oxygen sensor lead

Wiring Diagram




+
FROM BATTERY
L
L
30
FUSE/RELAY PANEL
STARTER LOCK OUT RELAY (POSITION 8) (AUTO TRANS. ONLY)
FUEL PUMP RELAY (POSITION 10)
S13 (15A)
50Z F
50W H
50A B
15 I
15 B
La I
31 G
T B
87a
87F B
87F H
S28 (15A)
AUXILIARY FUSE HOLDER ON SIDE OF RELAY PANEL
GROUND FROM NEUTRAL SAFETY SWITCH (AUTO TRANS ONLY)
MANUAL TRANSMISSION VEHICLES CONNECTED TO GROUND
CODING CONNECTOR
5 4 3 2 1
TO TRIP COMPUTER
14 13 30 32 9 22 2 20 34 10 24 16 15
FUEL INJECTION CONTROL UNIT
21 31 28 33 17 25 18 26 23 3 35 4 5 8 7
A/C COMP CLUTCH ON/OFF SIGNAL
CARBON CANISTER SHUT-OFF SOLENOID
VL
LL
IDLE SWITCH
FULL THROTTLE SWITCH
IDLE STABILIZER VALVE
ALTITUDE SENSOR
AIR SENSOR POTENTIOMETER
COOLANT TEMP SENSOR
DIFFERENTIAL PRESSURE REGULATOR
OXYGEN SENSOR
FUEL PUMP
COLD START VALVE

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