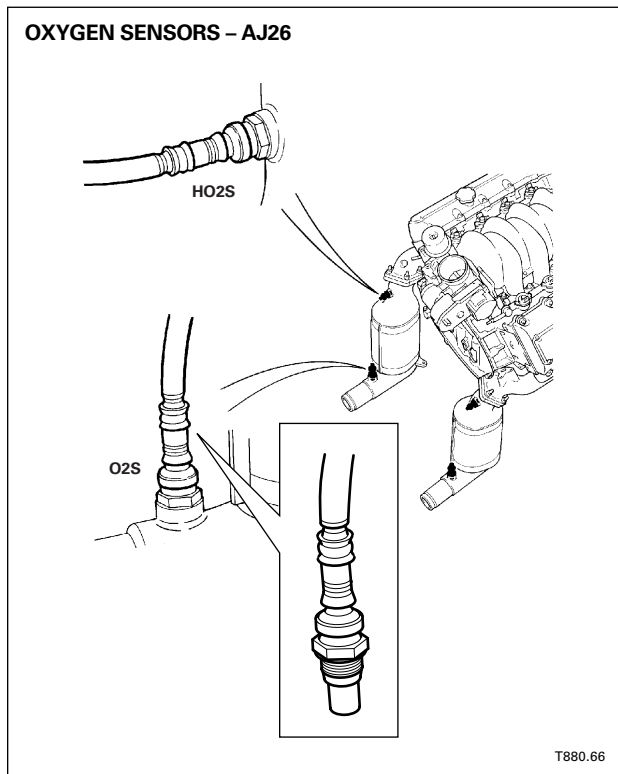
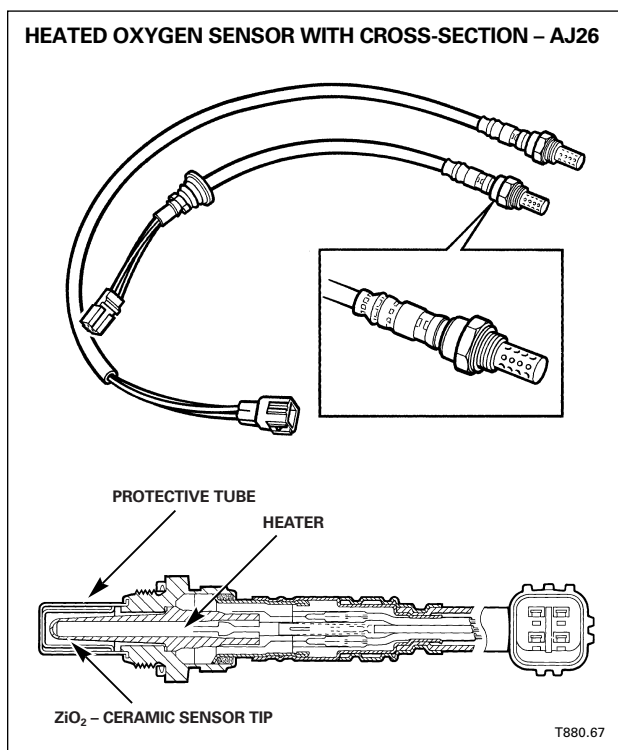


## FUEL INJECTION

### Exhaust Gas Oxygen Content Monitoring: Oxygen Sensors – AJ26



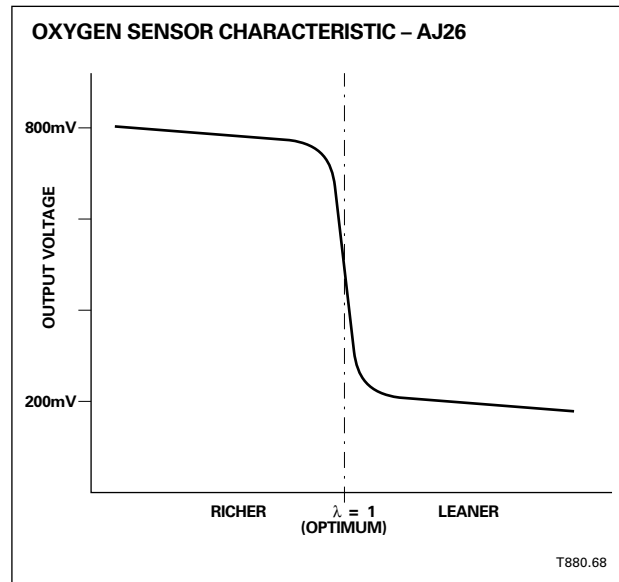
- The AJ26 EMS uses four zirconium dioxide type oxygen sensors.
- A heated oxygen sensor (HO2S) is located upstream of each catalytic converter; an unheated oxygen sensor (O2S) is located downstream of each catalytic converter.
- The two upstream sensors are used by the ECM for closed loop fuel metering correction. The downstream sensors for used for OBD catalyst monitoring.
- The oxygen sensors produce voltage by conducting oxygen ions at temperatures above 300 °C (572 °F).
- The tip portion of the sensor's ceramic element is in contact with the exhaust gas.
- The remaining portion of the ceramic element is in contact with ambient air via a filter through the sensor body.
- In order to reduce the time and resulting emission needed to bring the upstream sensors up to working temperature, an internal electric heater is used. The heaters are controlled by the ECM.
- At engine speeds above approximately 3000 rpm, the ECM switches off the heaters.
- The construction of the upstream and downstream sensor harnesses and connectors are different so that they can be easily identified and not be interchanged.
- The HO2S have a four-way connector; the O2S have a two-way connector.



#### NOTES

## Oxygen Sensor Characteristic

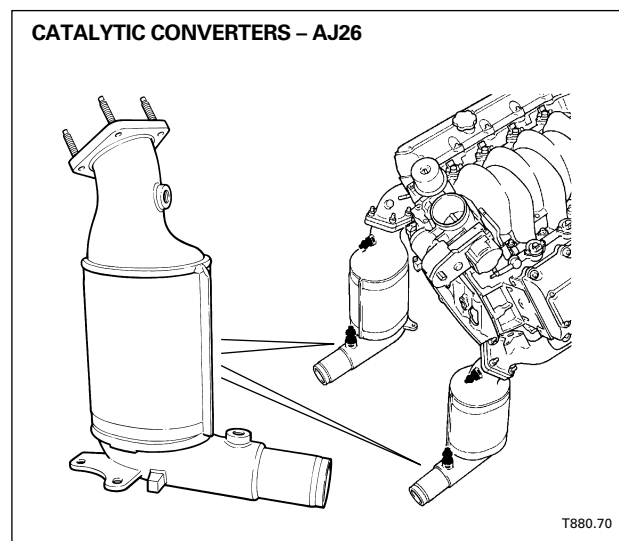
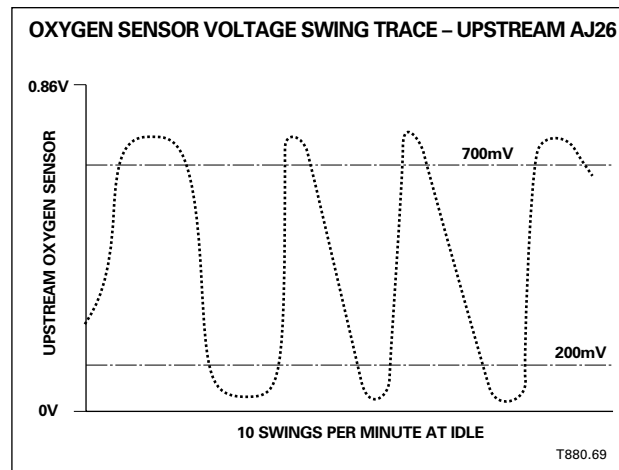
- The sensor voltage varies between approximately 800 millivolts and 200 millivolts, depending on the oxygen level in the exhaust gas.
- When the air : fuel ratio is richer than optimum, there is low oxygen in the exhaust gas and the voltage output is high.
- When the air : fuel ratio is leaner than optimum, oxygen in the exhaust is high and the output voltage is low.
- Only a very small change in air : fuel ratio is required to swing the oxygen sensor voltage from one extreme to the other, thus enabling precise fuel metering control.



## Catalytic Converters – AJ26

The AJ26 engine exhaust system uses a single catalytic converter for each engine bank. The placement of the catalysts in the down pipes, adjacent to the exhaust manifolds, ensures rapid “light off” and eliminates the need for secondary catalysts.

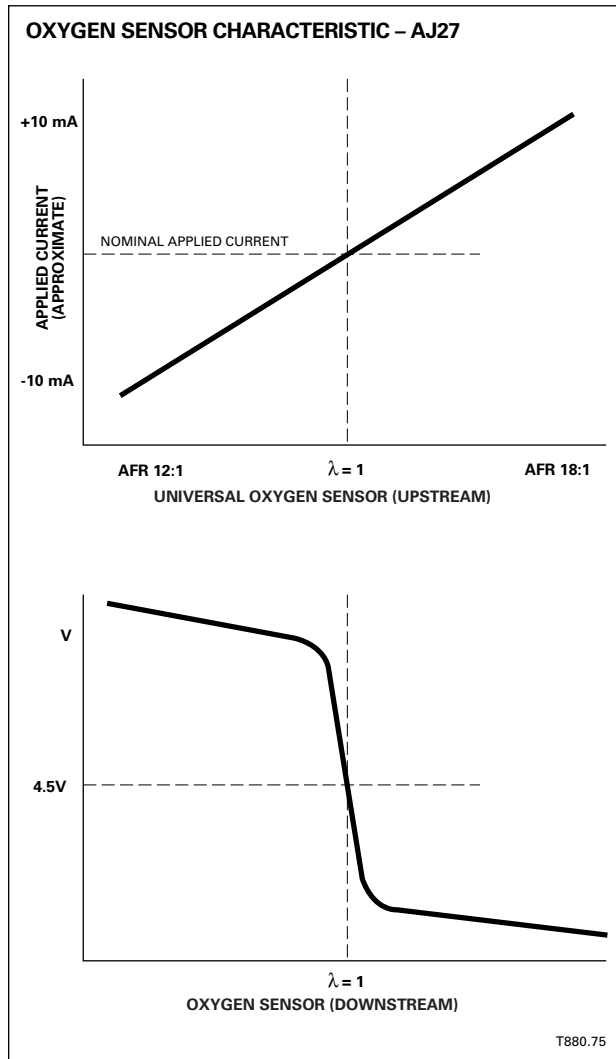
Deterioration of catalytic conversion efficiency will create unacceptable HC, CO and NO<sub>x</sub> exhaust emission. The efficiency of the catalytic converter system is monitored and any deterioration in efficiency is flagged as a fault by the ECM. Catalyst efficiency is monitored by sampling both the incoming and outgoing exhaust gas at the catalysts. Two oxygen sensors are positioned in each exhaust downpipe assembly – one HO<sub>2</sub>S upstream of the catalyst and one O<sub>2</sub>S downstream of the catalyst. By comparing the voltage swings of each set of sensors, the ECM can detect when catalyst efficiency drops off.



## NOTES

## FUEL INJECTION

### Oxygen Sensors – AJ27



#### “Universal” Oxygen Sensors

- In order to improve air : fuel ratio (AFR) control under varying engine conditions, a “universal” type heated oxygen sensor is fitted in the upstream position.
- The universal sensor has varying current response to changes in exhaust gas content.
- The AFR can be maintained more precisely within a range from approximately 12:1 to 18:1, not just stoichiometric.
- Voltage is maintained at approximately 450 mV by applying a current.
- The current required to maintain the constant voltage is directly proportional to the AFR.
- A higher current indicates a leaner condition; a lower current indicates a richer condition.
- The current varies with the temperature of the sensor and is therefore difficult to measure for technician diagnostic purposes.
- The downstream heated oxygen sensors, used for catalyst efficiency monitoring, remain unchanged. However, the location in the exhaust system has changed. Refer to the following page.

#### HO2S Heater Control

- The universal oxygen sensors require precise heater control to ensure accuracy and prevent sensor damage.
- After engine start, the ECM initially applies B+ voltage to the heaters to quickly warm the sensors, then reduces the voltage as necessary to maintain sensor temperature. The ECM varies the voltage by PWM control of the individual heater ground side circuits.

#### NOTES