

1.9 KNOCK SENSOR (KS) SYSTEM

PURPOSE

Varying octane levels in today's petrol may cause detonation in some engines. Detonation is caused by an uncontrolled pressure in the combustion chamber. This uncontrolled pressure could produce a flame front opposite that of the normal flame front produced by the spark plug.

The "rattling" sound normally associated with detonation is the result of two or more opposing pressures (flame fronts) colliding within the combustion chamber. Though "light" detonation is sometimes considered normal, "heavy" detonation could result in engine damage. Light detonation occurs when the point of maximum pressure has been exceeded.

To control spark knock, a Knock Sensor (KS) System is used. This system is designed to retard spark timing up to 12 degrees to reduce spark knock in the engine. This allows the engine to use maximum spark advance to improve driveability and fuel economy.

OPERATION

The Knock Sensor is only used on the 182 kW V8 engine.

The KS system has two major components:

- KS Module (part of PROM)
- Knock Sensor

The knock sensor detects abnormal mechanical vibration (spark knocking) in the engine. There are several calibrations of knock sensors because each engine produces a different frequency of mechanical noise. The knock sensor is specifically chosen for this engine to best detect engine knock, over all the other noises in the engine. This engine has one knock sensor. The knock sensor is mounted in the engine block near the cylinders to better detect detonation.

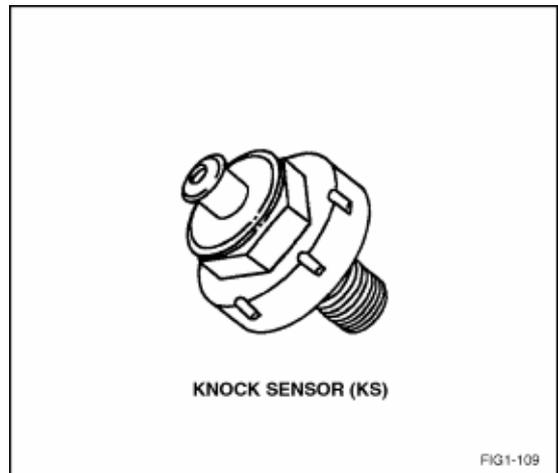


Figure 6C2-1-101 Knock Sensor

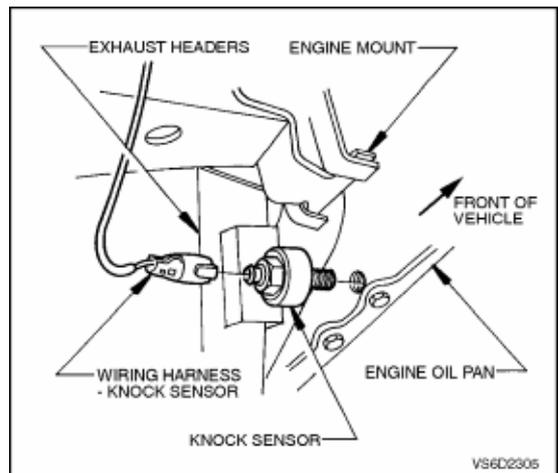


Figure 6C2-1-102 Knock Sensor Location

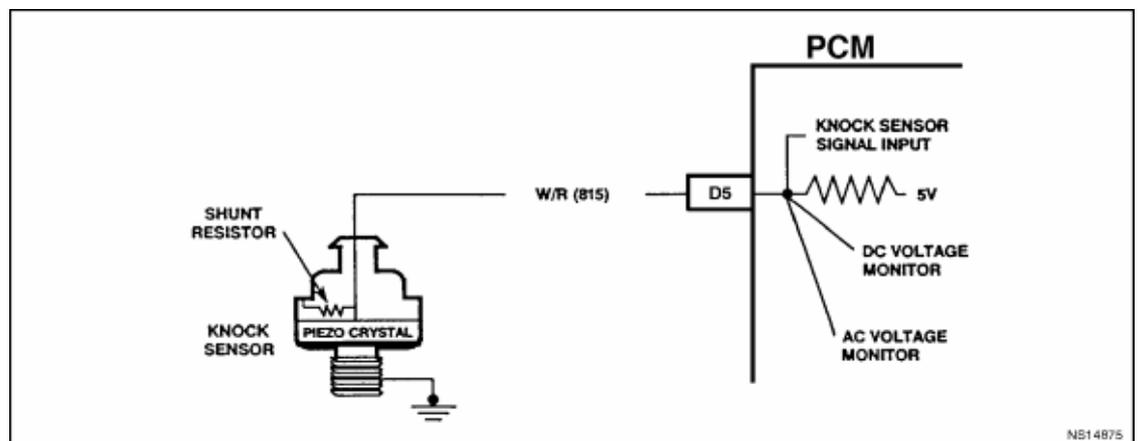
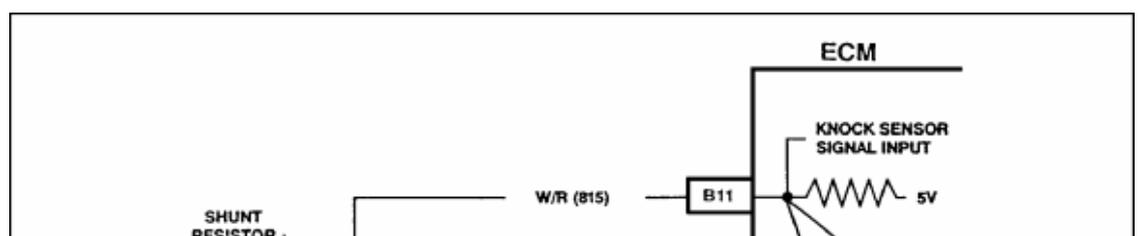


Figure 6C2-1-103 PCM Knock Sensor Wiring



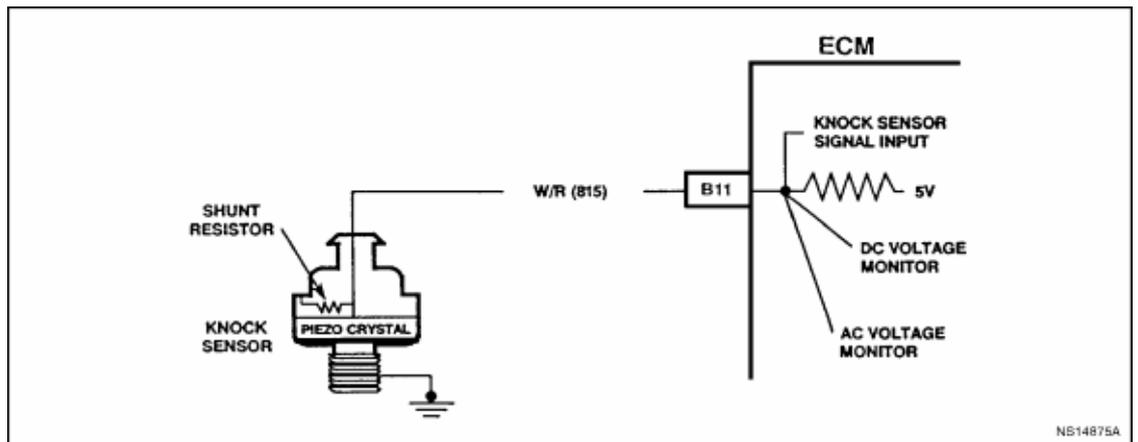


Figure 6C2-1-104 ECM Knock Sensor Wiring

The Knock sensor is used to detect engine detonation, and the ECM/PCM will retard the Electronic Spark Timing (EST) based upon the signals being received.

The ECM/PCM sends out a 5 volt signal to the knock sensor. The shunt resistor inside the Knock sensor is used to keep the voltage at approximately 2.5 volts. Under a no knock condition, the circuit should measure about 2.5 volts. The knock sensor produces an AC output voltage that rides on top of the 2.5 volts DC voltage and increases amplitude and signal frequency with the severity of the knock. This signal voltage is used as an input to the ECM/PCM. This AC signal voltage to the ECM/PCM is processed by an analogue signal to a Signal Noise Enhancement Filter (SNEF) module. This SNEF module is used to determine if the AC signal coming in is noise or actual detonation. This SNEF module is part of the PROM and cannot be replaced. The processed knock sensor signal is then supplied to the ECM/PCM. The ECM/PCM then adjusts the ignition control system to reduce the spark advance. How much the timing is retarded is based upon the amount of time knock is detected and is limited to a maximum value of 12 degrees. After the detonation stops, the timing will gradually return to its calibrated value of spark advance. The Knock Sensor system will only retard timing after the following conditions are met:

- Engine running longer than 5 seconds
- Engine speed above 1,000 RPM
- ECT greater than 44 degrees C

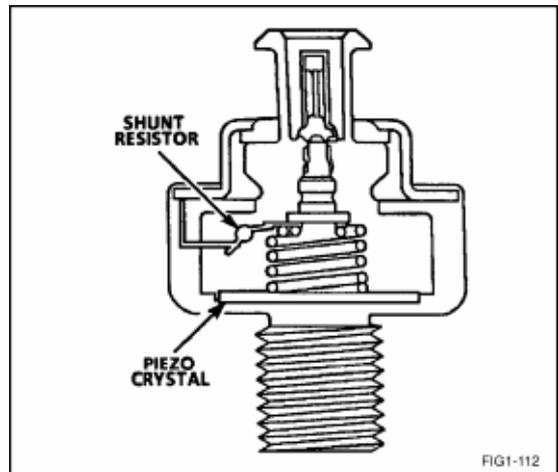


Figure 6C2-1-105 Knock Sensor Sectioned View

The Tech 1 "Scan" tool has two data display to check for diagnosing this knock sensor circuit. "KNOCK SIGNAL" is used to monitor the input signal from the knock sensor. This position will display "YES" when knock is being detected. "KNOCK RETARD" is the indication of how much the PCM is retarding the spark advance.

The Knock Sensor System has one DTC to detect a failure in its system. DTC 43 is designed to diagnose the knock sensor and wiring, so that problems encountered with this circuit should set the DTC 43. When DTC 43 is set the PCM will retard total spark advance by 6 degrees C.

DTC 43 will set if the Knock sensor signal circuit becomes open or shorted. If the Knock sensor signal becomes open or shorted to voltage, the voltage will go above 4.4 volts and set DTC 43. If the Knock sensor signal becomes shorted to earth, the voltage will be below 0.2 volts and set DTC 43.