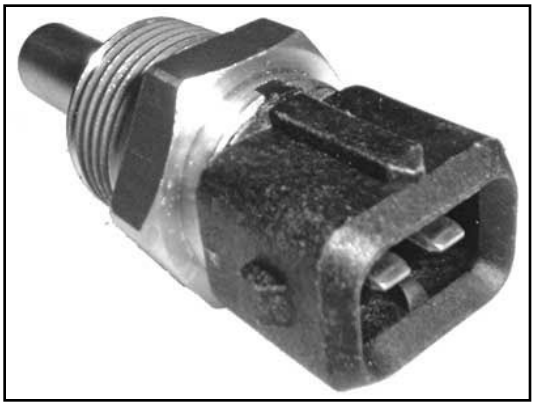
Rover SD1 Efi Coolant Temperature Sensor

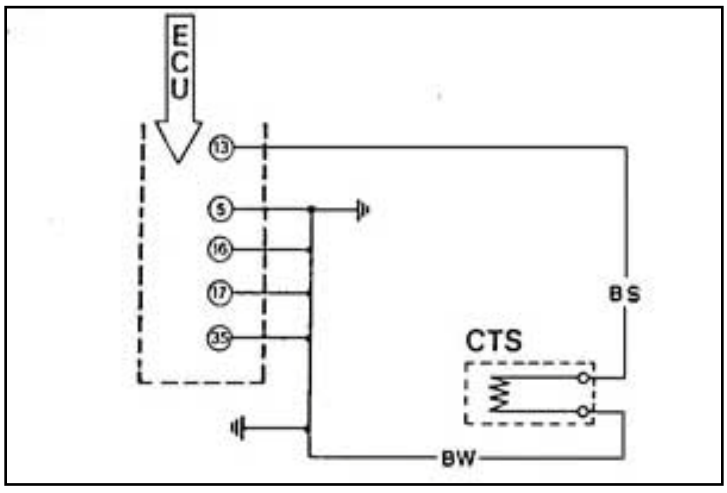
Location and Operation



The Rover SD1 Efi Coolant Temperature Sensor (CTS) is located in the coolant gallery at front left of the inlet manifold alongside but slightly behind the thermo-time switch. It informs the ECU of engine temperature changes so it can compute injector "open time" to provide correct fuel / air mixture for any temperature condition. e.g.: From cold, the CTS resistance falls continuously according to the profile below until the engine temperature stabilises. Thereafter minor changes are monitored accordingly.

Modes

The CTS is a key component of the Rover SD1 Efi System and, in truth, in conjunction with its wiring and connector, not very reliable. Recent anecdotal evidence indicates a fairly high fail rate which has a serious effect on the operation of the system. e.g.: The CTS and/or its wiring can go open circuit, falsely signalling the ECU that the engine remains cold, which in turn computes a rich air / fuel mixture resulting in significant over fuelling. At best, this produces very lumpy performance and at worst, floods the engine such that it will not start or run. Fortunately it is easy to test.



Circuit

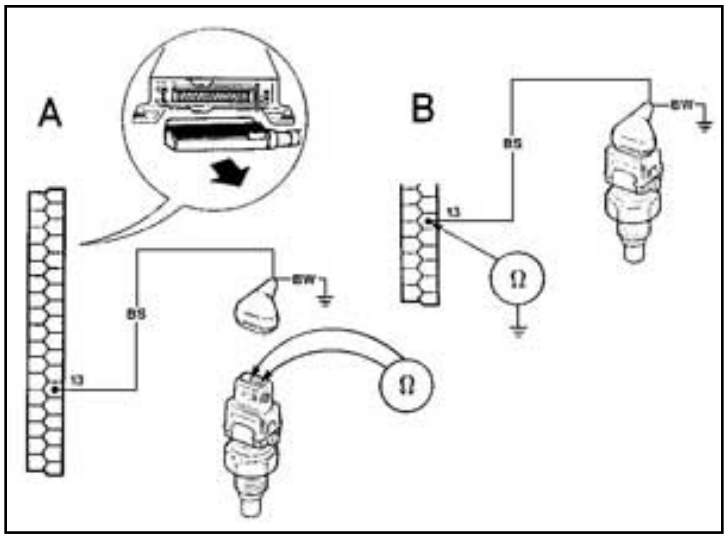
The CTS has a silicon element that changes its resistance to signal a change of temperature so the ECU can compute injector "open time"

It is connected to pin 13 and earth pins 5, 16, 17 and 35 of the ECU. The other (very important) earth on the black/white (BW) wire is a heavy duty ring tag on the Efi loom going to an earth stud on the engine block behind and below the LH rocker cover

Testing

Conditions as follows: Engine HOT, ECU multiplug disconnected as in A: Ignition OFF: Measure coolant temperature with thermal probe: Connect an ohmmeter as shown in B below and take a single reading. Compare it to the resistance/temperature profile below. Consider

connecting the ohmmeter for only short periods, not in fear of damage, but the meter battery may cause the sensor to heat up and give an incorrect reading. Allow the engine to cool and take further readings. If the measurements match the profile within (say) 10-15%, the CTS and its connections are OK.



TEMP	OHMS
-10°C	9100-9300
0°C	5700-5900
20°C	2400-2600
40°C	1100-1300
60°C	500-700
80°C	300-400
100°C	150-200

If the readings are clearly wrong, remove the sensor for a controlled test using a pan of water and thermometer.

Suspend the sensor in the water and bring to the boil. Compare resistance readings to the profile. Variations of (say) 10 -15% are not critical but if they are obviously way off or there is a clear intermittent or distorted result then consider the test failed. Obtain a replacement unit, check it as above to verify OK, fit it into the manifold and reconnect to the Efi circuit. Reconnect the ohmmeter as in B and repeat the measurement between the ECU pin 13 and earth. If this still incorrect there is a wiring problem so check the black/slate wire (BS) and black/white wire (BW) and their connections paying particular attention to the earth stud at the rear of the engine.

Temporary Get U Going Trick

Study of the chart shows at optimum coolant temperature of 90 deg C, the resistance of the CTS would be in the order of 200 ohms thus revealing a workable temporary solution to a faulty sensor.

When cold, start the engine with the sensor plug disconnected to get benefit from cold start enrichment. When the engine warms up and falters, insert a 200 ohm resistor into the sensor plug allowing normal driving to continue as long as the engine remains warm/hot. If difficult to restart when warm, a bootfull of the accelerator pedal will enrichen the mixture sufficiently to get moving again; and of course when the engine is cold, remove the temporary resistor from the sensor plug.

A practical trick highly dependent upon sufficient foresight to obtain a 200 ohm resistor. The really elegant solution is to keep a resistor taped to the sensor cable in anticipation!

Conclusions

The components in the Rover SD1 Efi System have varying degrees of reliability but generally they are quite robust. The lifetime of the CTS is thought to be between 100k and 200k miles, however, problems with this component often manifest themselves much sooner due to wiring or connector problems. The under-bonnet environment for an Efi Engine is very hostile due to extremely high temperatures generated by the latent heat of the engine which convects and conducts upwards into the aluminium manifold and plenum chamber. More so, when the car is parked up for short periods in very hot weather. The under-bonnet blanket installed for sound deadening reasons also acts as an efficient insulator trapping the excess heat for long periods. Such hostile temperature changes play havoc with the poorly specified Efi wiring loom and connectors which can become very brittle causing cracking and encouraging corrosion. Consequently, because of its importance to the correct fuelling of the engine when problems with the CTS are suspected, the first simple tests to perform would be to check the integrity of its connectors. Failing that, the recommended test procedure will identify any or all of the problems.

Ramon

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