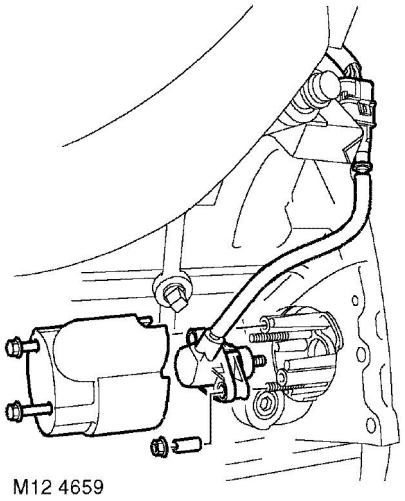
*Crankshaft position sensor*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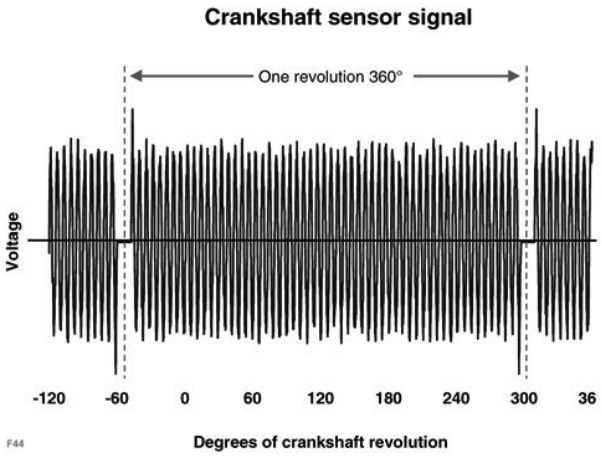
The crankshaft position sensor is located in the engine block, just below number 7 cylinder (see figure 51). It protrudes through the cylinder block and is positioned adjacent to the face of the flywheel or flex plate. The VHQVRUUHDFWVWRDµGULOOHGUHOXFWRU¶LQFRUSRUDWHGLQWRWKH flex plate to ascertain engine speed and position information. The sensor is located on a spacer and is secured in position by a single bolt. The spacer is 18 mm (0.709 in) thick on vehicles used with automatic transmission. The thickness of the spacer determines how far the sensor protrudes through the cylinder block and, therefore, sets the position of the sensor in relation to the flywheel or flex plate. The sensor and the spacer are covered by a protective heat shield. The sensor has three wires attached to it; one signal wire, one ground wire connected to the ECM and one ground wire connected to vehicle ground. This last wire acts as a shield to earth any stray electromagnetic radiation produced from the crankshaft signal.

The crankshaft sensor is an inductive type sensor which produces a sinusoidal output voltage signal. The following illustration shows a typical crankshaft signal over a 480° crankshaft revolution. This voltage is induced by the proximity of the moving toothed reluctor, which excites the magnetic flux around the tip of the sensor when each tooth passes. This output voltage will increase in magnitude and frequency as the engine rpm rises and the speed at which the reluctor passes the sensor increases. The signal voltage will peak at approximately 6.5 volts if connected to the ECM (further increases in engine speed will not result in greater magnitude). The ECM neither specifically monitors nor reacts to the output voltage (unless it is very small or very large) but does measure the time intervals between each pulse (i.e. signal frequency). The signal is determined by the number of teeth passing the sensor, and the speed at which they pass. The teeth are spaced at 6° intervals, with two teeth missing at 60° BTDC to give the ECM a hardware point of reference, so there is a total of 58 teeth.




The ECM outputs an engine speed signal to the automatic gearbox, the SLABS ECU, the instrument pack and the ACE ECU. The signal to the automatic gearbox TCM and the SLABS ECU are supplied via the CAN link, while the signals to the ACE ECU and the instrument pack are carried via a frequency dependent digital signal.

The signal produced by the crankshaft position sensor is critical to engine running. There is no backup strategy for this sensor and failure of the signal will result in the engine stalling and/or failing to start. If the sensor fails when the engine is running, then the engine will stall, a fault code will be stored and details captured, of the battery voltage, coolant temperature and air temperature at the time of the failure. If the signal fails when the engine is cranking, then the engine will not start and no fault will be stored, as the ECM will not detect that an attempt had been made to start the engine. In both cases the tachometer will also cease to function immediately and the MIL lamp will not extinguish.

During the power-down procedure, which occurs when the ignition LV VZ LWKHG RII ¶ WKH ( &0 stores details of the position of the crankshaft. This enables the ECM to operate the injectors appropriately to aid quick engine start, which serves to reduce emissions when the engine is cold.