

## AUTOMATIC TRANSMISSION – ZF 5HP24

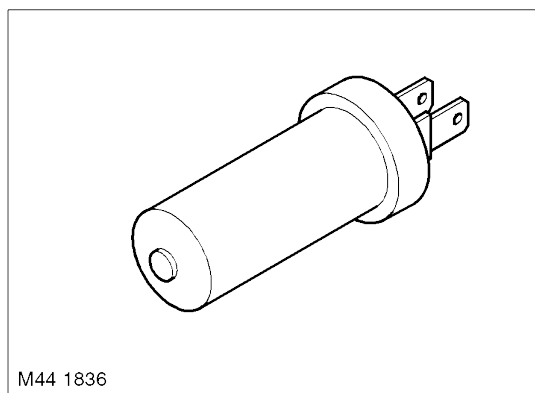
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### Sensors

The 5HP24 transmission contains two speed sensors and a temperature sensor. The sensors are located inside the transmission housing, with the speed sensors being the only serviceable items.

The sensors play an important part in the operation of the transmission and provide signal information to the EAT ECU. This information is used by the ECU to control shift timing and fluid temperature to provide the optimum operating condition for the transmission.

### *Speed Sensors*



Two speed sensors are used in the 5HP24 transmission to monitor turbine speed and output shaft speed.

The turbine speed sensor is monitored by the EAT ECU to calculate the slip of the torque converter clutch and internal clutch slip. This allows the EAT ECU to accurately control the slip timing during shifts and adjust clutch application or release pressure for overlap shift control.

The output shaft speed is monitored by the EAT ECU and compared to engine speed signals received on the CAN from the ECM. Using the comparison of the two signals the EAT ECU calculates the transmission slip ratio for plausibility and maintain adaptive pressure control.

The turbine speed sensor is located in the main casing and secured with a screw. The sensor monitors turbine speed from a toothed target wheel which on the outer diameter of clutch 'B' housing.

The output shaft speed sensor is located at the rear of the main casing and secured with a screw. The sensor monitors the output shaft speed from a toothed target wheel which is an integral part of the park lock gear.

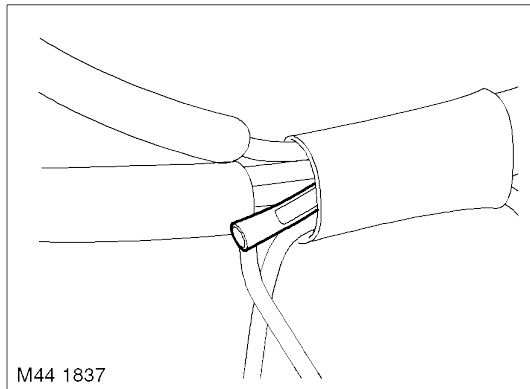
Both sensors are of the inductive type and are connected to the EAT ECU with two wires. The EAT ECU supplies a positive DC supply and a signal return wire to monitors the sensor signals. Both wires are covered by a screen which is connected to ground by the EAT ECU.

The sensor receives the DC supply from the EAT ECU. As the teeth of the target wheel pass the sensor tip, a change in the magnetic field of the sensor occurs and generates an AC pulse in the sensor field winding. The pulse is passed on the negative (ground) wire to the EAT ECU which calculates the rotational speed. The AC pulse generated is proportional to the rotational speed of the target wheel. The EAT ECU measures the peak to peak outputs of the AC waveform to calculate the rotational speed being measured.

The resistance of the coil winding in each sensor is between 285 and 365 $\Omega$  at 20°C (68°F). Failure of either speed sensor will cause the EAT ECU to store a related fault code.



## Transmission Temperature Sensor



The temperature sensor is located inside the wiring harness in the fluid pan and is connected to the EAT ECU with two wires. The sensor is a Positive Temperature Co-efficient (PTC) sensor which has a semi-conductor material which increases its resistance as the temperature increases.

The sensor receives a predetermined current from the EAT ECU on one of the wires and is connected to earth via the ECU on the second wire. The EAT ECU measures the returned voltage and using this information calculates the fluid temperature.

In the case of low fluid temperatures, the EAT ECU prohibits torque converter lock-up to promote faster fluid warm up. In the case of high fluid temperatures, the EAT ECU increases the converter lock-up control and modifies the shift programme to reduce fluid temperature.

If the temperature sensor fails, the EAT ECU uses a programmed default temperature value. The default value is derived from the engine coolant temperature sensor and received on the CAN from the ECM. A fault code is stored in the ECM which can be retrieved using TestBook.

The temperature sensor has a semi-conductor material with resistance to temperature values as shown in the following table.

**Temperature Sensor Resistance Values**

Temperature	Resistance
0°C (32°F)	820 $\Omega$
20°C (68°F)	962 $\Omega$
40°C (104°F)	1118 $\Omega$
60°C (140°F)	1289 $\Omega$