

Setting Inductive Transmitter

1. The following illustrations describe the reassembly, resp. the setting of the Inductive transmitter N engine (9, Figure 359). The reassembly of the Inductive transmitter N turbine (14) and N central gear train (5) has to be carried out accordingly.

IMPORTANT

Pay attention to different setting dimensions. Setting dimension corresponds to distance between contact face inductive transmitter and tooth tip, see Figure 361.

2. Setting dimensions - Inductive transmitter N engine (9, Figure 359) and n turbine (14, Figure 359) = 0.03 - 0.08 mm (0.0012 - 0.0031 in).
3. Setting dimension - Inductive transmitter N central gear train (5, Figure 359) = 0.03 - 0.04 mm (0.0012 - 0.0016 in).

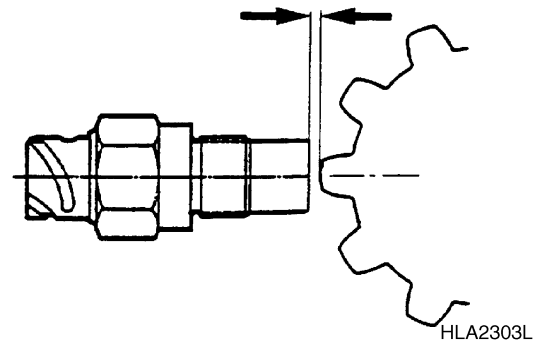


Figure 361

4. Turn counting disk radially until one tooth tip is situated centrally to inductive transmitter hole.
5. Insert measuring pin (S) until end face has got contact on tooth tip, resp. the retaining ring on screw - in face of housing.

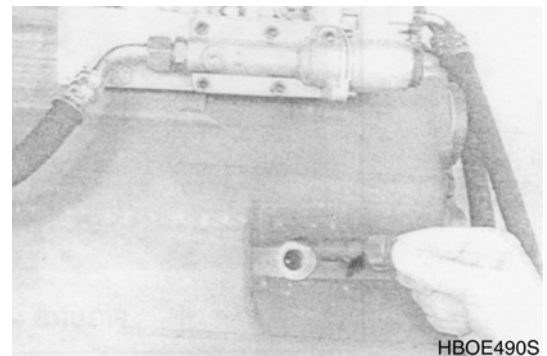


Figure 362

6. Remove measuring pin and measure Dimension I from end face/measuring pin to retaining ring.

NOTE: *Dimension I, e.g. 30.10 mm (1.1850 in).*

7. Measure Dimension II from contact face- inductive transmitter to contact face.

NOTE: *Dimension II, e.g. 30.00 mm (1.1811 in).*

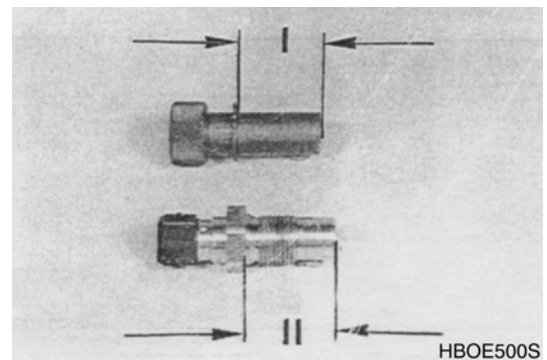


Figure 363

EXAMPLE L:

Dimension I	30.10 mm (1.1850 in)
Required Gap (0.03 - 0.08 mm (0.0012 - 0.0031 in)) e.g	- - 0.60 mm (0.0236 in)
Gives Installation Dimension	<u>= 29.50 mm (1.1614 in)</u>

EXAMPLE L:

Dimension II	30.00 mm (1.1811 in)
Installation Dimension	- 29.50 mm (1.1614 in)
Difference = Shim	<u>= 0.50 mm (0.0197 in)</u>

8. Assemble corresponding shim and wet thread (Figure 364) with Loctite #574.

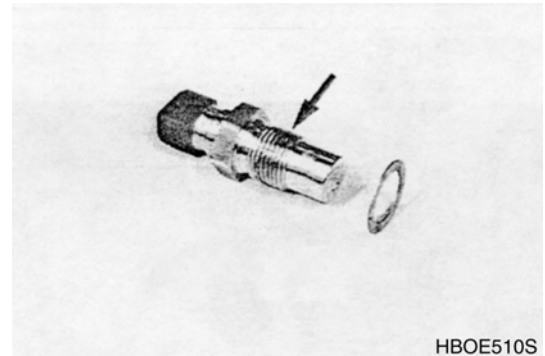


Figure 364

9. Install inductive transmitter N engine (9, Figure 365), N turbine (14) and N central gear train (5).

NOTE: Torque limit 3.06 kg•m (22 ft lb).

10. Now, install screw plugs (Figure 365).

NOTE: Equip screw plugs with new O-ring.

NOTE: Torque limit (M26x1.5) 8.16 kg•m (59 ft lb).

NOTE: Torque limit (M18 x 1.5) 5.10 kg•m (37 ft lb).

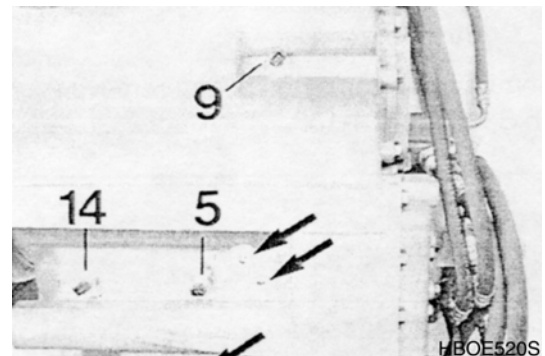


Figure 365

Speed Sensor (Hall Sensor) N Output and Speedometer

1. Illustration on right shows speed sensor 13.

Reference Number	Description
1	Speed Sensor
2	Plate
3	O-ring

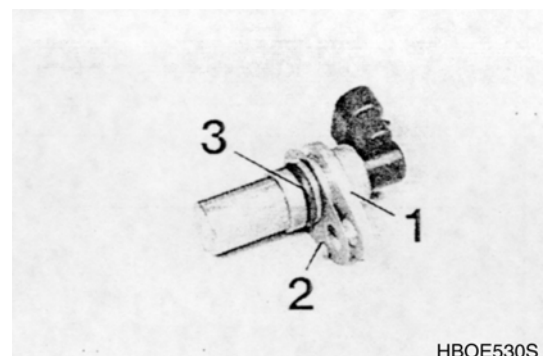


Figure 366

- Grease O-ring and fasten speed sensor (Figure 367) using socket head screw.

NOTE: Torque limit (M8/8.8) 2.35 kg•m (17 ft lb).

IMPORTANT

Before putting transmission into service, carry out oil filling according to Operation and Maintenance Manual.

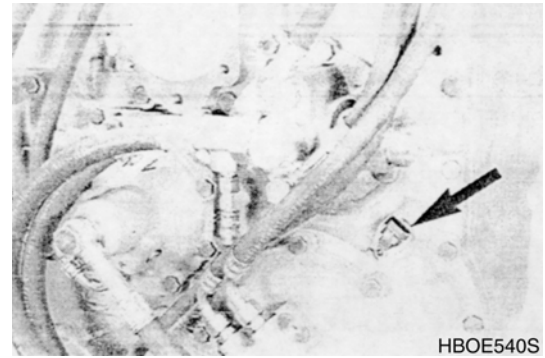


Figure 367

- Setting dimension - speed sensor = 1.0 - 1.5 mm (0.0394 - 0.0591 in).

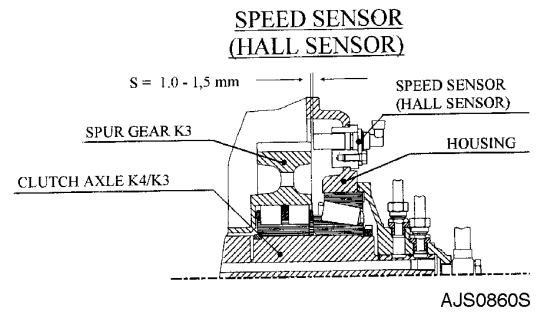


Figure 368

Transmission Error Codes (ZF)

Edition 1

Table of Contents

Transmission Error Codes (ZF)

Safety Precautions	5
Applicable Models	5
Introduction	6
Abbreviations	6
Display	7
Description of Fault Codes	7
Display During Operation	8
Display During AEB-Mode	10
Definition of Operating Modes	12
Normal	12
Substitute Clutch Control	12
Limp-home	12
Transmission shut Down	12
TCU Shut Down	13
Table of Fault Codes	14
Table of Fault Codes - ERGO-Control	50
Measurement of Resistance at Actuator/sensors and Cable	53
Actuator	53
Cable	53

SAFETY PRECAUTIONS



CAUTION!

Follow all safety recommendations and safe shop practices outlined in the front of this manual or those contained within this section.

Always use tools and equipment that are in good working order.

Use lifting and hoisting equipment capable of safely handling load.

Remember, that ultimately safety is your own personal responsibility.

APPLICABLE MODELS

The contents of this section apply to the following models and serial number ranges.

MODEL	SERIAL NUMBER RANGE
DL400	5001 and Up

INTRODUCTION

The "WG" series of ZF Transmissions use an electronic control system called "ZF-ERGO power."

The Ergo System (for short) allows the transmission to function either in a manual powershift mode, or in a fully automatic mode.

An LCD display (Figure 1) is in the cab. This display gives the machine operator a continuous status of the operating condition of the system. It displays normal operational codes, and fault codes.

ABBREVIATIONS

Throughout this section the following abbreviations are used to indicate various conditions.

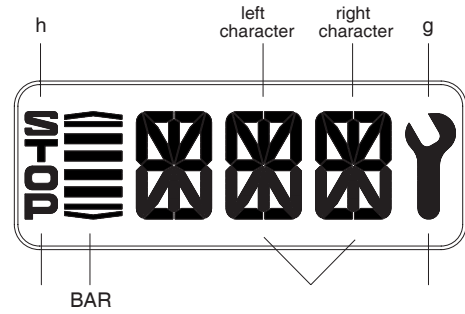
Abbreviations	
O.C.	Open Circuit
S.C.	Short Circuit
Op-Mode	OPERation Mode
TCU	Transmission Control Unit
EEC	Electronic Engine Controller
PTO	Power Take-off

DISPLAY

If a fault is detected, the display shows a spanner symbol (g) for a fault. The display shows the fault code, if the gear selector is in neutral position.

If more than one fault is detected, each fault code is shown for about 1 second.

Reference Letter	Description
a, f	Automatic Range (Upshifting and Downshifting)
b, c, d, e	Preselected Gear
g	EST-37 has detected an error and is flashing.
h	This character will not be used at the EST-37.



FG004442

Figure 1

Description of Fault Codes

The first number of the error code is the category that it is grouped into. They are as follows for the first number.









First Number	Meaning of Number
1 Hex	Digital Input Signal
2 Hex	Analog Input Signal
3 Hex	Speed Signal
4 Hex	CAN Signal Error
5 Hex	CAN Signal Error
6 Hex	CAN Signal Error
7 Hex	Analog Current Output Signal
8 Hex	Analog Current Output Signal
9 Hex	Digital Output Signal
A Hex	Digital Output Signal
B Hex	Transmission Fault, Clutch Error
C Hex	Logical Fault
D Hex	Power Supply
E Hex	High Speed Signal
F Hex	General Fault

DISPLAY DURING OPERATION

Symbol	Meaning	Remarks
1F, 1R 2F, 2R 3F, 3R 4F 5F 6F LF, LR	Actual gear and direction. Left digit shows actual gear. Right digit shows actual direction. Limp home gear.	-----
F or R, no gear	Clutch Cut Off.	-----
F or R flashing	Direction F or R selected while turbine speed is too high. CAUTION: Gear will engage if turbine speed drops.	-----
NN	Not neutral, waiting for neutral after power up or a severe fault.	Go engage a gear, first move shift selector to neutral position and again to F or R position.
**	Oil temperature too low, no gear available.	Warm up engine / transmission.
*N	Oil temperature low, only one gear available.	Warm up engine / transmission.
1 bar (special symbol)	Manual mode 1. gear.	-----
2 bars	Manual mode 2. gear.	-----
3 bars	Manual mode 3. gear.	-----
4 bars	Manual mode 4. gear.	-----
4 bars and 2 arrows	Automatic mode.	-----
Bars flashing	6 WG: converter lockup clutch open. 4 WG: Downshift mode active.	Difference of engine and turbine speed above a certain limit and lockup clutch not activated.
Spanner	At least one fault active.	Select neutral to get fault code displayed.
Fault code	See fault code list (See page -14).	-----
WS	Warning sump temperature.	Changes between actual gear/direction while driving, in neutral only displayed if no fault is detected (spanner).
WR	Warning retarder temperature.	Changes between actual gear/direction while driving, in neutral only displayed if no fault is detected (spanner).
WT	Warning torque converter temperature.	Changes between actual gear/direction while driving, in neutral only displayed if no fault is detected (spanner)
WE	Warning high engine speed.	Changes between actual gear/direction while driving, in neutral only displayed if no fault is detected (spanner).

Symbol	Meaning	Remarks
PN	Direction F or R selected while parking brake engaged.	Transmission in neutral until parking brake is released. CAUTION: Vehicle starts to move after release of parking brake.
EE flashing	No communication with display.	Checked wiring from TCU to display.

DISPLAY DURING AEB-MODE

Symbol	Meaning	Remarks
PL	AEB - Starter is plugged at the diagnostic plug.	-----
ST	AEB - Starter button is pressed.	-----
K1... K4, KV, KR	Calibrating clutch K1... K4, KV or KR resp.	-----
 + Kx	Wait for start, initialization of clutch Kx, x: 1, 2, 3, 4, V, R	-----
 + Kx	Fast fill time determination of clutch Kx.	-----
 + Kx	Compensating pressure determination of clutch Kx.	-----
OK	Calibration for all clutches finished	Transmissions stays in neutral, you have to restart the TCU (ignition off/on) after removing AEB-starter
STOP	AEB canceled (activation stopped)	Transmissions stays in neutral, you have to restart the TCU (ignition off/on)
STOP and Kx	AEB stopped, clutch Kx cannot be calibrated.	Transmissions stays in neutral, you have to restart the TCU (ignition off/on)
 + Kx	Kx couldn't be calibrated, AEB finished	-----
 + E	Engine speed too low, ◦Ê raise engine	-----
 + E	Engine speed too high. ◦Ê lower engine speed.	-----
 + T	Transmission oil temperature too low. ◦Ê Heat up transmission	-----
 + T	Transmission oil temperature too high. ◦Ê Cool down transmission	-----
FT	Transmission temperature not in defined range during calibration	Transmissions stays in neutral, you have to restart the TCU (ignition off/on)
FB	Operating mode not NORMAL or transmission temperature sensor defective or storing of Calibrated values to EEPROM has failed.	Transmissions stays in neutral, you have to restart the TCU (ignition off/on)
FO	Output speed not zero	Transmissions stays in neutral, you have to restart the TCU (ignition off/on)
FN	Shift lever not in Neutral position	Transmissions stays in neutral, you have to restart the TCU (ignition off/on)
FP	Park brake not applied	Transmissions stays in neutral, you have to restart the TCU (ignition off/on)

Symbol	Meaning	Remarks
STOP	AEB - Starter was used incorrect or is defective. Wrong device or wrong cable used.	Transmissions stays in neutral, you have to restart the TCU (ignition off/on)

DEFINITION OF OPERATING MODES

Normal

There is no failure detected in transmission system or failure has no or slight effects on transmission control. TCU will work without or in special cases with little limitations. (See "Table of Fault Codes" on page -14.)

Substitute Clutch Control

TCU cannot change gears or direction under control of normal clutch modulation. TCU uses substitute strategy for clutch control. All modulations are only time controlled. (Comparable with EST 25.)

Limp-home

The detected failure in the system has strong limitations to transmission control. TCU can engage only one gear in each direction. In some cases only one direction will be possible.

TCU will shift the transmission into neutral at the first occurrence of the failure. First, the operator must shift the gear selector into neutral position.

If output speed is less than a threshold for neutral to gear and the operator shifts the gear selector into forward or reverse, the TCU will select the limp-home gear.

If output speed is less than a threshold for reversal speed and TCU has changed into the limp-home gear and the operator selects a shuttle shift, TCU will shift immediately into the limp-home gear of the selected direction.

If output speed is greater than the threshold, TCU will shift the transmission into neutral. The operator has to slow down the vehicle and must shift the gear selector into neutral position.

Transmission shut Down

TCU has detected a severe failure that disables control of the transmission.

TCU will shut off the solenoid valves for the clutches and also the common power supply (VPS1).

Transmission shifts to Neutral. The park brake will operate normally, also the other functions which use ADM 1 to ADM 8.

The operator has to slow down the vehicle. The transmission will stay in neutral.