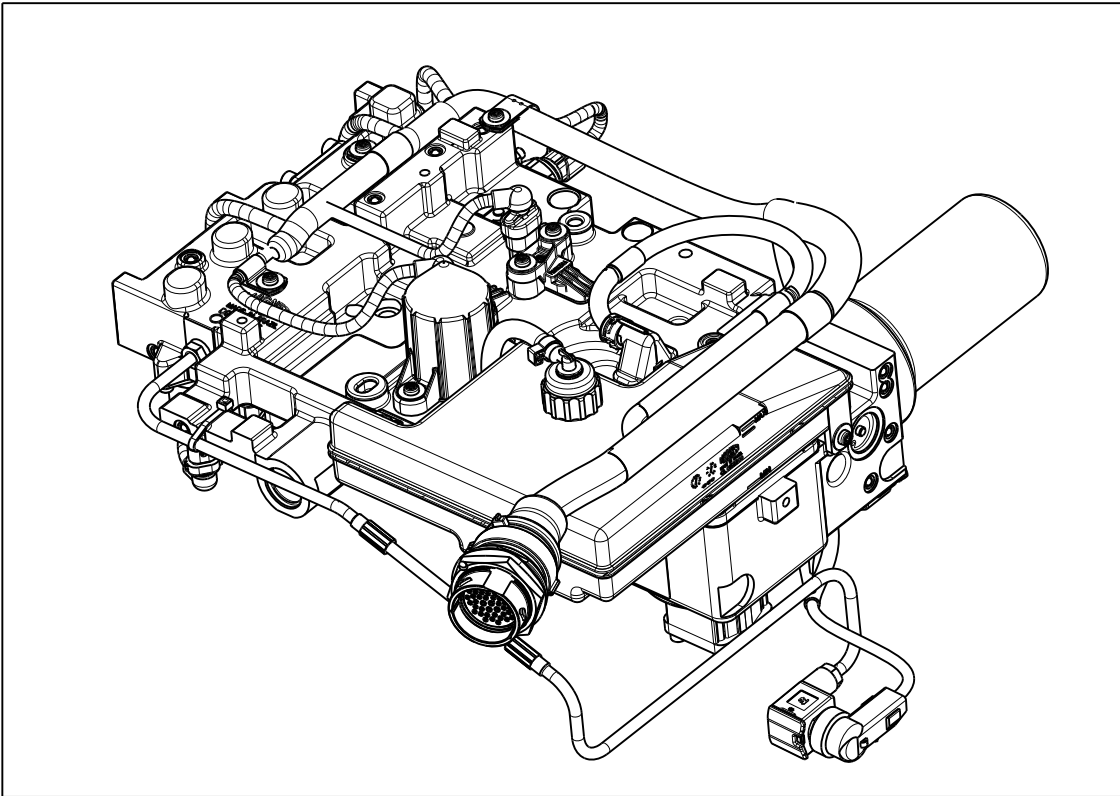


Troubleshooting Manual

Electro Hydraulic Control Unity

TRTS-2930 - EA06X06 EN

Revision 1
November 2022



Powering Business Worldwide

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Introduction - Use of This Manual

Overview

This Troubleshooting Guide provides troubleshooting instructions that are presented in codes when they occur.

How to consult the Manual

For query by code see "SPN.FMI INDEX" on page III.

For query by component see "TABLE OF CONTENTS" on page I.

Wiring inspection and procedure for troubleshooting

Recommendations

This topic represents a set of recommendations on how to troubleshoot potential vehicle wiring issues. These issues may be residing on the transmission harness, vehicle harness, power harness, or other accessory wiring, depending on the fault code or existing condition. When troubleshooting wiring, consider that wiring faults may be continuous, intermittent, or may not exist.

This procedure describes a visual inspection of wiring and connectors, and how to use a multimeter in open circuit inspection, short circuits in other wiring, and short circuit to GND.

Possible Causes

- Short of wiring to ground, short to power or open circuit.
- Terminals bent or broken apart or opened, oxidized or damaged.
- Missing or damaged connector protection.
- Wiring damaged, compressed or worn.

Visual Inspection

1. Make sure all connectors are clean and properly locked.
2. Inspect the wiring length between the connections and look for faulty wiring signals.
3. Before reading with the Meter, make sure there are no loose, rusted or damaged terminals other than bent or broken pins.

Note: If any damage is found on the transmission harness it is recommended that it be replaced. Check that the connector is damaged and replace it, if applicable. If damage to the vehicle wiring is found, refer to wiring replacement recommendations and vehicle connectors.

Care and Warnings

Warning: Failure to follow the indicated procedures creates a high risk or injury to service technicians.

Caution: failure to follow the indicated procedures can lead to damage or malfunction of the components.

Important: TO CARRY OUT THE SERVICES CORRECTLY AND SAFELY IT IS MANDATORY TO FOLLOW THE INDICATED PROCEDURES.

Important: Whenever the TCU is replaced or removed from its location for any reason, replace it in its position with all screws and connections properly.

Important: The TCU takes about 20 seconds to turn off after being switched off the key, so it's important to wait this time whenever you need to perform a key cycle (turn off and on the vehicle key).

Important: Whenever you need to replace a fuse system, the exchange must be performed with the key off (line 15 off).

Tool

Digital Multimeter

Resources:

- Voltage Measurement (Volts DC)
- Measurement of continuity

Acronyms

TCU - Transmission Control Unit – Name given to central (module), responsible for the electronic control of the transmission.

GND - Ground – Name given to battery negative (Mass). Ground in English means 'Earth'.

PWM - Pulse Width Modulation – Pulse Width Modulation, it is a Digital technique of varying the activation time of the signal at a given frequency. In this system Pulse Width Modulation is used as the signal generated by a digital circuit present in some sensors, and is interpreted by the TCU.

MMP - Main Microprocessor – Main Microprocessor, TCU device that performs the logic and calculation part for the correct operation of the automation system.

SMP - Safety Microprocessor – Security Microprocessor, device present in the TCU responsible for performing security tasks when necessary.

OEM - Original Equipment Manufacturer (Automaker/Vehicle brand)

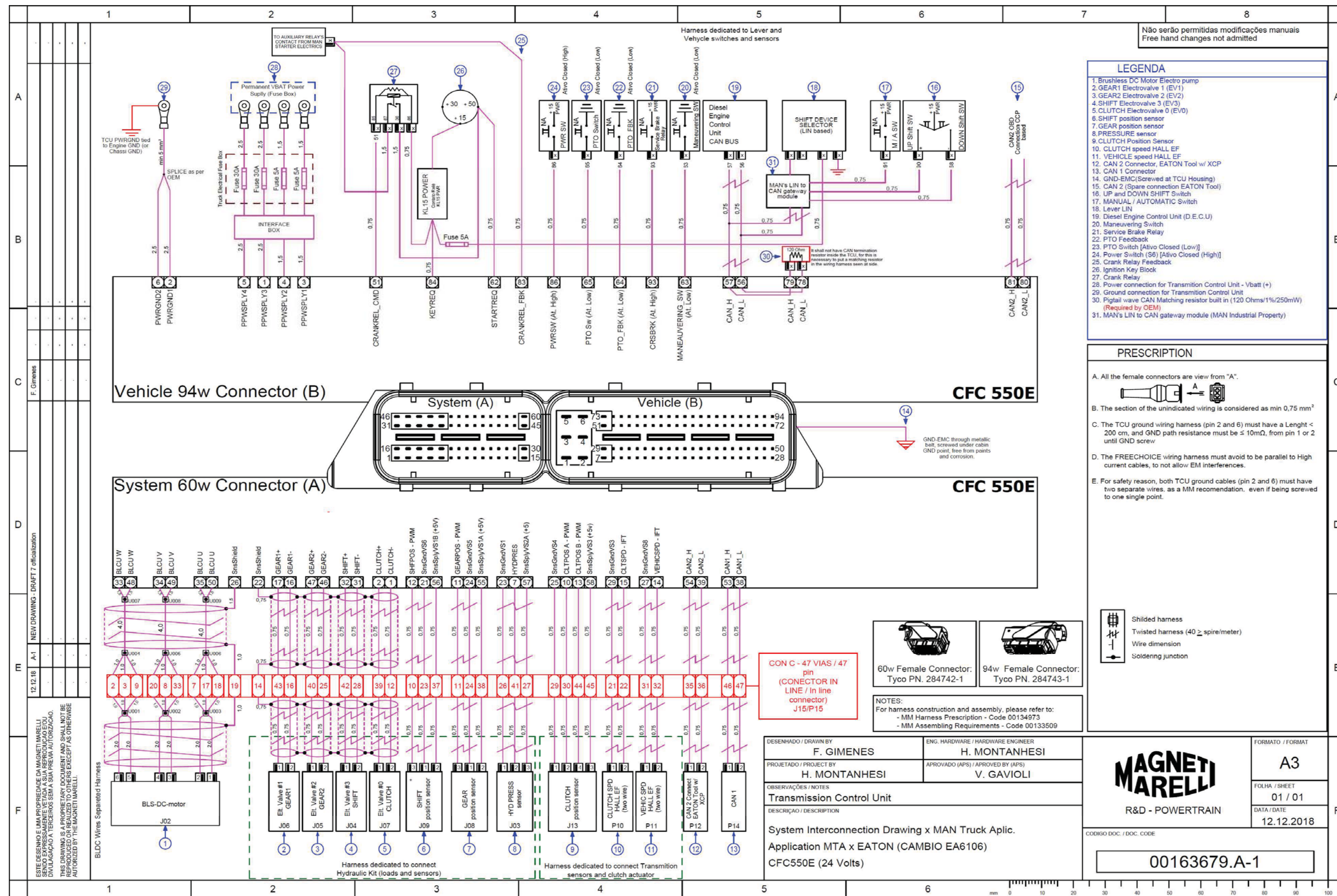
Terms

Kiss Point – Designation given when the clutch disc touches the engine flywheel. Moment that starts the engine torque transmission to the gear box.

Lever – Name given to the Gear Selector lever and steering mode.

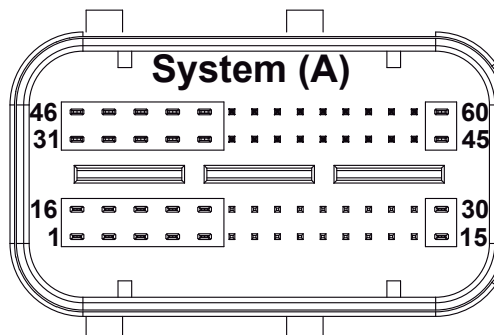
Kick Down - Denomination given the function that understands that the driver requires maximum power during the drive ability of the vehicle (accelerator pedal fully engaged)

ELECTRICAL SYSTEM



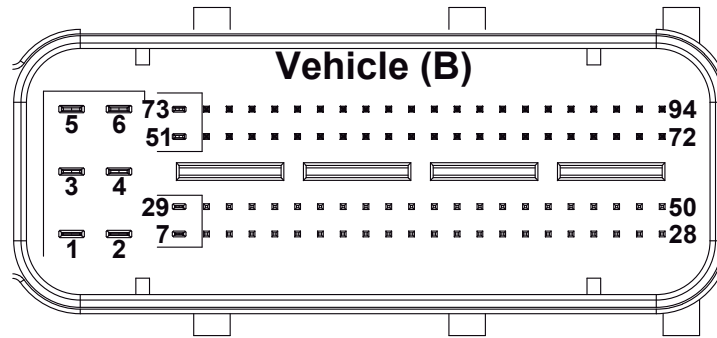
Connectors Pins Description

System Connector A - 60-way



Pin	Description	Pin	Description
1	CLUTCH- - Clutch Electrovalve Solenoid Grounding	31	SHIFT- Solenoid Electrovalve Selection
2	CLUTCH+ - Clutch Electrovalve Solenoid Control	32	SHIFT+ - Solenoid Valve Control Selection
3	Free	33	BLCU W
4	Free	34	BLCU V
5	Free	35	BLCU U
6	Free	36	Free
7	Analog Signal Hydraulic Pressure Sensor	37	Free
8	Free	38	CAN_L - CAN bus low signal
9	Free	39	CAN2_L - Secondary CAN bus CAN signal
10	CLTPOS A - Clutch Position Sensor A PWM Signal	40	Free
11	GEARPOS - PWM signal of the coupling position sensor	41	Free
12	SHFPOS - Selection position sensor PWM signal	42	Free
13	CLTPOS B - Clutch Position Sensor B Signal PWM	43	Free
14	TOSS - Transmission Output Rotation Sensor	44	Free
15	TISS - Clutch Rotation Sensor	45	Free
16	GEAR1 - Solenoid of the first Engaged Check Valve grounding	46	GEAR2 - Solenoid Grounding of the Second Engagement Electrovalve
17	GEAR+ - Solenoid control of the first coupling electrovalve	47	GEAR2+ - Solenoid control of the second coupling Electrovalve
18	Free	48	BLCU W
19	Free	49	BLCU V
20	Free	50	BLCU U
21	SnsGNDVS6 - GND (Ground), of the selection position sensor.	51	Free
22	SnsShield - Solenoid valve shielding	52	Free
23	SnsGNDVS1 - GND, Hydraulic pressure sensor	53	CAN_H - CAN bus High Signal
24	SnsGNDVS5 - GND, of the coupling position sensor.	54	CAN2_H - Secondary CAN Bus High CAN Signal
25	SnsGNDVS4 - GND, of the clutch position sensors	55	SnsSplyVS1A (+5V) - Coupling position sensor supply
26	SnsShield - Shielding of hydraulic pump coil controls	56	SnsSplyVS1B (+5V) - Selection position sensor supply
27	SnsGNDVS8 - GND (Ground), TOSS sensor	57	SnsSplyVS2A (+5V) - Hydraulic pressure sensor supply
28	Free	58	SnsSplyVS3(+5V) - Clutch Position Sensor Power
29	SnsGNDVS3 - GND (Ground), TISS sensor	59	Free
30	Free	60	Free

System Connector B - 94 way



Pin	Description	Pin	Description
1	PPWSPLY3 - Power to drive hydraulic pump motor and the Electrovalves	48	Free
2	PWRGND1 - GND (grounding), from TCU	49	Free
3	PPWSPLY1 - Main Microprocessor Power (MMP)	50	Free
4	PPWSPLY2 - Power Microprocessor Power Supply (SMP)	51	CRANKREL_CMD - Starter relay control
5	PPWSPLY4 - Power to drive hydraulic pump motor and the Electrovalves	52	Free
6	PWRGND2 - GND (grounding), from TCU	53	Free
7	Free	54	Free
8	Free	55	Free
9	Free	56	CAN_L - CAN Bus Signal Low
10	Free	57	CAN_H - CAN bus high signal CAN
11	Free	58	Free
12	Free	59	Free
13	Free	60	Free
14	Free	61	Free
15	Free	62	STARTREQ - Starter drive signal
16	Free	63	Free
17	Free	64	PTO_FBK - return signal from coupled PTO sensor
18	Free	65	PTO Sw (At. Low) - PTO Function Button
19	Free	66	Free
20	Free	67	Free
21	Free	68	Free
22	Free	69	Free
23	Free	70	Free
24	Free	71	Free
25	Free	72	Free
26	Free	73	Free
27	Free	74	Free
28	Free	75	Free
29	Free	76	Free
30	Free	77	Free
31	Free	78	CAN_L - CAN Bus Signal Low
32	Free	79	CAN_H - CAN bus high signal CAN
33	Free	80	CAN2_L - Secondary CAN Bus Signal Low
34	Free	81	CAN2_H - Secondary CAN bus high signal CAN
35	Free	82	Free
36	Free	83	CRANKREL_FBK - Starter Feedback Signal
37	Free	84	KEYREQ - Ignition switch signal
38	Free	85	Free
39	Free	86	Power mode switch signal
40	Free	87	Free
41	Free	88	Free
42	Free	89	Free
43	Free	90	Free
44	Free	91	Free
45	Free	92	Free
46	Free	93	CRSBRK - Service Brake Relay
47	Free	94	Free

Generic Test

If no SPN.FMI regarding the system is validated, but the system is malfunctioning, perform a general test according to the following steps.

A

Purpose: Check Batteries and Fuses

1. Make sure the vehicle's battery charge is at the proper level (between 18 and 32 Volts). If it is not, recharge the battery or replace it.
2. Also check that the system fuses are not broken and that they are connected correctly.
3. Make sure the load is appropriate by checking it again and, at the appropriate level, go to the next step.
 - If there is a fault, perform the indicated procedure and go to **Step V**.
 - If the problem is not identified or the error persists, go to the next step.

B

Purpose: Check connectors and harness

Check:

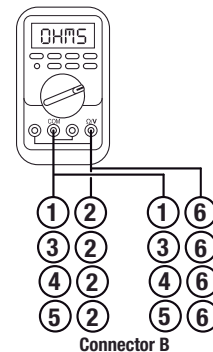
1. that there are no bent or broken pins.
2. that there are no open or loose terminals.
3. no terminal is oxidized or damaged, has no moisture or is suspected of being over current or short circuit.
4. check the harness for any broken or damaged wire.
 - If there is a fault, perform the indicated procedure and go to **Step V**.
 - If the problem is not identified or the error persists, go to the next step.

C

Purpose: Check power to the TCU connector



Caution: using a multimeter, check that the correct voltage (between 18 and 32 Volts) is present between:



1. pins 1 and 2 of connector B (positive and GND).
2. pins 3 and 2 of connector B (positive and GND).
3. pins 4 and 2 of connector B (positive and GND).
4. pins 5 and 2 of connector B (positive and GND).
5. pins 1 and 6 of connector B (positive and GND).
6. pins 3 and 6 of connector B (positive and GND).
7. pins 4 and 6 of connector B (positive and GND).
8. pins 5 and 6 of connector B (positive and GND).
 - If it is found that the correct voltage is not present, but the battery voltage checked in 'A' step is correct, investigate the connections to the battery are properly positioned without the presence of ill-contact.
 - If necessary, proceed with maintenance and go to **Step V**.
 - Otherwise go to the next step.

D**Purpose:** *Update the TCU*

1. With the help of the tool, update the TCU.
 - After performing the upgrade go to **Step V.**

V**Purpose:** *Final check*

1. Key off.
2. Reconnect all connectors and make sure all components are fully installed.
3. Switch on and engine off.
4. Clean all fault codes using the "Diagnosis device".
5. If you have performed the TCU update, redo the grid, accelerometer, and Kiss Point learning procedure using the Diagnosis device.
6. Run with the vehicle if possible to verify that the system is functioning properly.
7. Check with the device for the same or other fault codes.
 - If the fault is active during the test, go to **Step A.**
 - If another fault code appears, see "SPN.FMI INDEX" on page III.
 - If no faults appear and the vehicle works perfectly, THE TEST IS COMPLETE.

Note: If the test was performed with the TCU of another vehicle replace it with a new one and repeat this procedure (V).

Coupling Position Sensor

SPN.FMI: 59.02 - 59.03 - 59.04 - 59.08

Overview

The Coupling Position Sensor detects the longitudinal position of the engaging piston, and informs it by sending a PWM signal to the TCU. The sensor is connected to the TCU 60-way A connector via three cables (power, GND and signal).

The TCU continuously diagnoses the circuits and, upon detecting an inappropriate signal voltage level or a wrong PWM cycle, the corresponding fault code will be activated.

Detection

59.02 - Wrong PWM period: the signal received by the TCU is out of tolerance of the expected value.

59.03 - Fixed signal at HIGH level.

59.04 - Fixed signal at LOW level.

59.08 - PWM work cycle above the upper limit or below the lower limit.

Possible Causes

59.02

- System harness compromised.
- Sensor connector with bad contact
- Damaged sensor

59.03

- Loss of reference to GND
- Open circuit on sensor signal

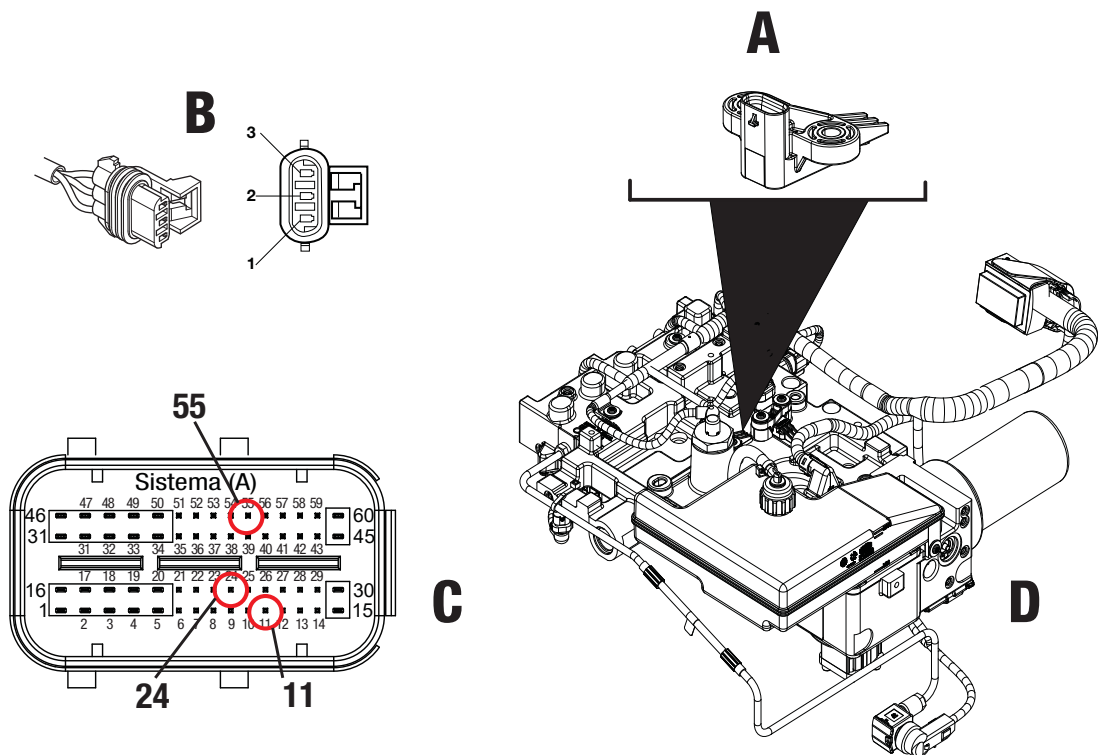
59.04

- Short circuit to GND
- Loss of sensor power supply

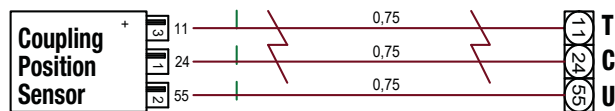
59.08

- Reference loss of magnetism (magnet loose or out of place)

Component Identification



- A.**Coupling Position Sensor
- B.**Coupling Position Sensor Connector
- C.**TCU 60- way A Connector
- D.**Hydraulic Kit

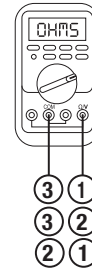


Procedure

A

Purpose: *Check fault codes present*

1. Use the diagnostic tool to check for fault codes.
 - If 59.02 or 59.03 or 59.04 go to **Step B.**
 - If 59.08 go to **Step E.**



B

Purpose: *Check connectors and harness*

Check:

1. that there are no bent or broken pins.
2. that there are no open or loose terminals.
3. that no terminal is oxidized or damaged, has no moisture or is suspected to have suffered an over current or short circuit.
4. check the harness for any broken or damaged wire.
 - If an irregularity is verified, change the harness and go to **Step V.**
 - Otherwise go to the next step.

- Perform this procedure on the sensor and the harness connector.
- If there is continuity, replace the harness.
- Otherwise go to the next step.

D

Purpose: *Check that there are no problems of continuity*



Caution: before checking make sure that the sensor and TCU connectors are disconnected.

C

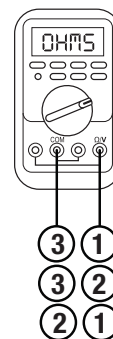
Purpose: *Check that there is no short circuit*



Caution: before checking make sure that the sensor and TCU connectors are disconnected.

With the aid of a multimeter, check that there is no continuity:

1. between pin 3 and pin 1 of the sensor connector
2. between pin 3 and pin 2 of the sensor connector
3. between pin 2 and pin 1 of the sensor connector



With the aid of a multimeter, check that there is no continuity:

1. between pin 3 of the sensor with pin 1
2. between pin 3 of the sensor with pin 2

-
3. between pin 3 and 2 of the sensor
 - If continuity problems are verified perform the harness change and go to **Step V.**
 - Otherwise go to the next step.

E

Purpose: *Replace the coupling shaft*

1. Replace the system coupling shaft according to the Service Manual due to a problem in the system.
 - After the replacement go to **Step V.**

F

Purpose: *Check whether the problem is in the sensor*

1. Replace the coupling position sensor with another of the same model.
 - After the replacement go to **Step V.**

G

Purpose: *Check if the problem is in the TCU*

1. If with previous checks and sensor replacement the fault is not found, perform a test with the TCU of another vehicle of the same model.
 - After the replacement go to **Step V.**

V

Purpose: *Final check*

1. Key off.
2. Reconnect all connectors and make sure all components are fully installed.
3. Switch on and engine off.
4. Clean all fault codes using the "Diagnosis device".
5. If you have performed the TCU update, redo the grid, accelerometer, and Kiss Point learning procedure using the Diagnosis device.
6. Run with the vehicle if possible to verify that the system is functioning properly.
7. Check with the device for the same or other fault codes.
 - If the fault is active during the test, go to **Step A.**
 - If another fault code appears, see "SPN.FMI INDEX" on page III.
 - If no faults appear and the vehicle works perfectly, THE TEST IS COMPLETE.

Note: If the test was performed with the TCU of another vehicle replace it with a new one and repeat this procedure (V).

Coupling and Selection Position Sensors Power Supply

SPN.FMI: 3509.03 - 3509.04

Overview

The Selection and Coupling Position Sensors respectively detect the position of the selection piston and the position of the coupling piston, and inform them by sending a signal to the TCU. The TCU uses the same supply circuit for both sensors.

The TCU continuously diagnoses the supply circuits of the Selection and Coupling Position Sensors and upon detecting an out-of-range supply voltage, the corresponding fault code is activated.

Detection

3509.03 - Supply voltage of the sensors above the upper limit.

3509.04 - Supply voltage of the sensors below the lower limit.

Possible Causes

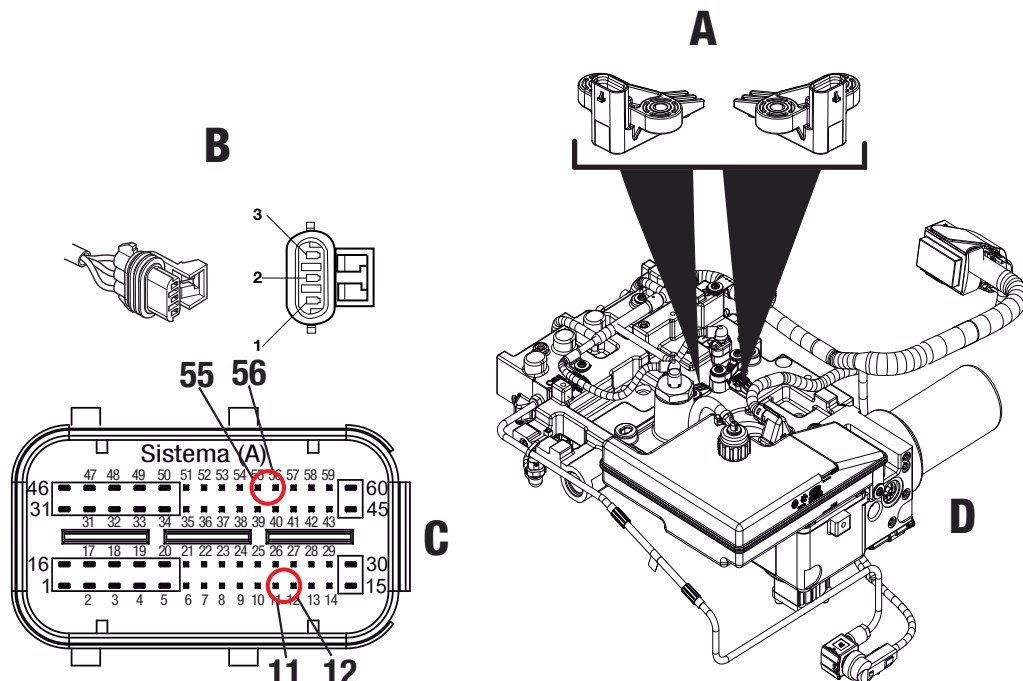
3509.03

- System harness compromised
- Sensor power connector with bad contact
- Short circuit to Power Supply
- Damaged sensor

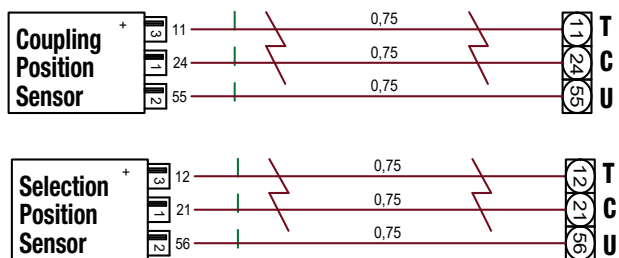
3509.04

- System connector compromised
- Sensor power connector with bad contact
- Short circuit to GND
- TCU problems

Component Identification



- A.** Coupling and Selection Position Sensors
- B.** Coupling and Selection Sensors Connectors
- C.** TCU 60- way A Connector
- D.** Hydraulic Kit



Procedure

A

Purpose: *Check connectors and harness*

Check:

1. Let there be no bent or broken pins.
2. That there are no open or loose terminals.
3. That no terminal is oxidized or damaged, or with traces of moisture or suspected to have suffered an over current or short circuit.
4. Check the harness for any cracked or damaged wire.
 - If an irregularity is verified carry out the change of the harness and go to **Step V.**
 - Otherwise go to the next step.

B

Purpose: *Check fault codes present*

1. Use the diagnostic tool to check for fault codes.
 - If 3509.03 go to **Step D.**
 - If 3509.04 go to **Step C.**

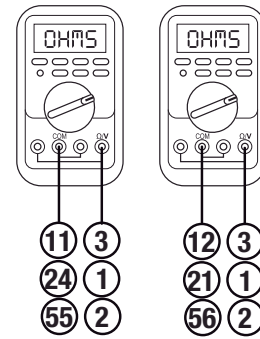
C

Purpose: *Check the continuity*



Caution: before checking make sure that the sensor and TCU connectors are disconnected.

With the aid of a multimeter, check that there is no continuity:



Coupling

Selection

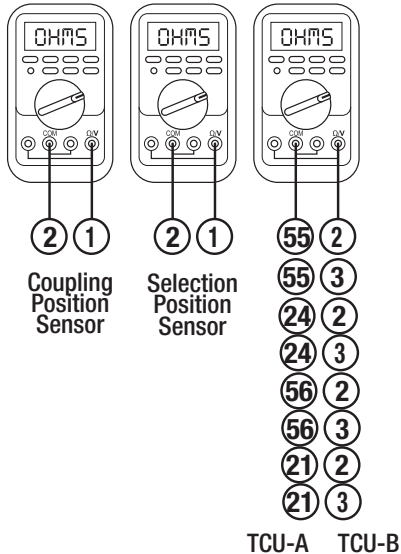
1. between terminal 11 of the TCU connector and terminal 3 of the Coupling Position Sensor connector.
2. between terminal 24 of the TCU connector and terminal 1 of the Coupling Position Sensor connector.
3. between terminal 11 of the TCU connector and terminal 3 of the Coupling Position Sensor connector.
4. between terminal 12 of the TCU connector and terminal 3 of the Selection Position Sensor connector.
5. between terminal 21 of the TCU connector and terminal 1 of the Selection Position Sensor connector.
6. between terminal 56 of the TCU connector and terminal 2 of the Selection Position Sensor connector.
 - If it is verified that there is no continuity in the above test, perform the harness change and go to **Step V.**
 - Otherwise go to the next step

D

Purpose: Check that there are no problems of continuity



Caution: before checking make sure that the sensor and TCU connectors are disconnected.



Using a multimeter, check for continuity.

1. between terminals 2 and 1 of the Coupling Position Sensor connector
2. between terminals 2 and 1 of the Selection Position Sensor connector
3. between terminal 55 of connector A and terminal 2 of connector B of the TCU
4. between terminal 55 of connector A and terminal 3 of connector B of the TCU
5. between terminal 24 of connector A and terminal 2 of connector B of the TCU
6. between terminal 24 of connector A and terminal 3 of connector B of the TCU
7. between terminal 56 of connector A and terminal 3 of connector B of the TCU
8. between terminal 56 of connector A and terminal 2 of connector B of the TCU
9. between terminal 21 of connector A and terminal 2 of connector B of the TCU

10. between terminal 21 of connector A and terminal 3 of connector B of the TCU

- If it is verified that there is no continuity in the above test, perform the whip change and go to **Step V.**
- Otherwise go to the next step.

E

Purpose: Check if the problem is in the TCU

1. If with the previous checks the defect is not found, perform a test with the TCU of another vehicle of the same model.
 - After the replacement go to **Step V.**

V

Purpose: *Final check*

1. Key off.
2. Reconnect all connectors and make sure all components are fully installed.
3. Switch on and engine off.
4. Clean all fault codes using the "Diagnosis device".
5. If you have performed the TCU update, redo the grid, accelerometer, and Kiss Point learning procedure using the Diagnosis device.
6. Run with the vehicle if possible to verify that the system is functioning properly.
7. Check with the device for the same or other fault codes.
 - If the fault is active during the test, go to **Step A.**
 - If another fault code appears, see "SPN.FMI INDEX" on page III.
 - If no faults appear and the vehicle works perfectly, THE TEST IS COMPLETE.

Note: If the test was performed with the TCU of another vehicle replace it with a new one and repeat this procedure (V).

Selection Position Sensor

SPN.FMI: 60.02 - 60.03 - 60.04 - 60.08

Overview

The selection position sensor detects the position of the selection piston and informs it by sending a signal to the TCU. The sensor is connected to the TCU 60-way A connector via three cables (power, GND and signal).

The TCU continuously diagnoses the circuits and, upon detecting an inadequate signal voltage level, or a wrong PWM cycle, the corresponding fault code will be activated.

Detection

60.02 - Wrong PWM period: the signal received by the TCU is out of tolerance of the expected value.

60.03 - Fixed signal at HIGH level.

60.04 - Fixed signal at LOW level.

60.08 - PWM work cycle above the upper limit or below the lower limit.

Possible Causes

60.02

- System harness compromised
- Sensor connector with bad contact
- Damaged sensor

60.03

- Loss of reference to GND
- Open circuit on sensor signal

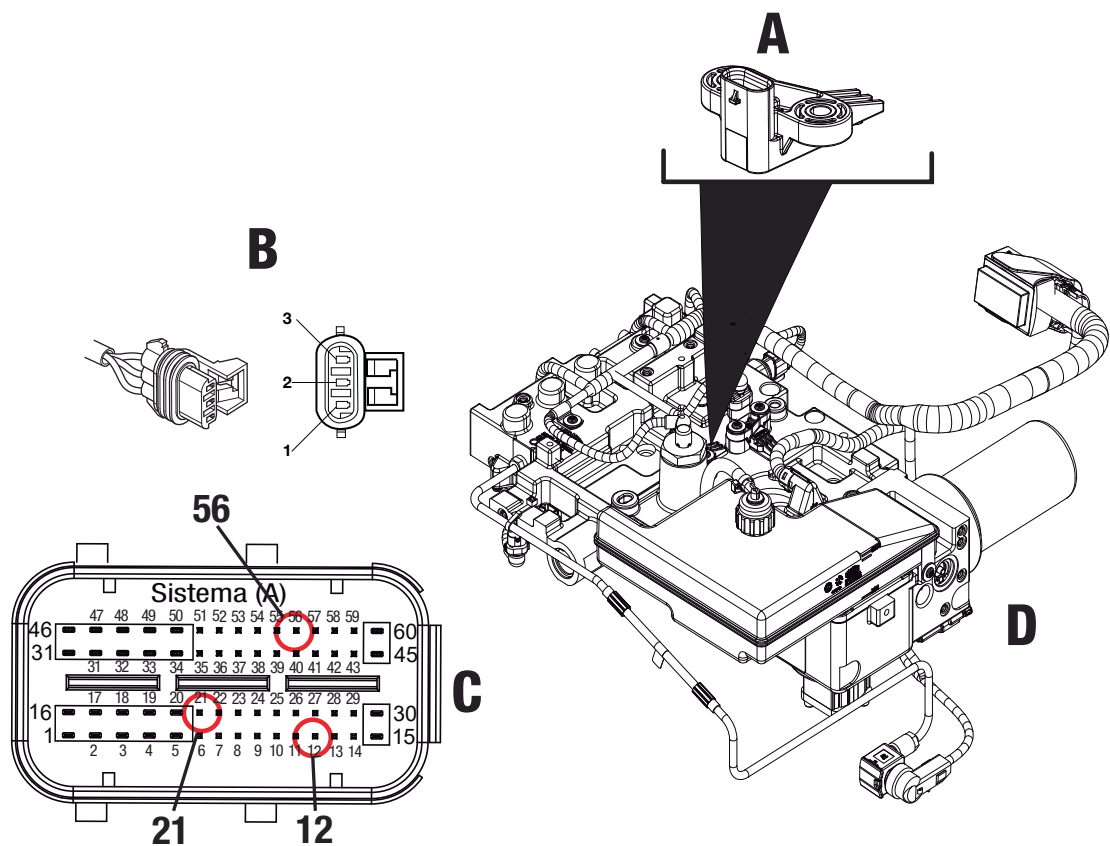
60.04

- Short circuit to GND
- Loss of supply to sensor

60.08

- Reference loss of magnetism (magnet loose or out of place)

Component Identification



- A.** Selection position sensor
- B.** Selection position sensor connector
- C.** TCU 60-way A connector
- D.** Hydraulic Kit



Procedure

A

Purpose: *Check fault codes present*

1. Use the diagnostic tool to check for fault codes.
 - If 60.02 or 60.03 or 60.04 go to **Step B.**
 - If 60.08 go to **Step E.**

B

Purpose: *Check connector and harness*

Check:

1. that there are no bent or broken pins.
2. that there are no open or loose terminals.
3. that no terminal is oxidized or damaged, has no moisture or is suspected to have suffered an over current or short circuit.
4. check the harness for any broken or damaged wire.
 - If an irregularity is verified, perform the harness change and go to **Step V.**
 - Otherwise go to the next step.

C

Purpose: *Check that there is no short circuit*

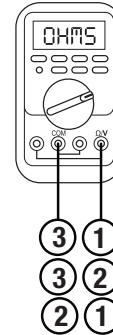


Caution: before checking make sure that the sensor and TCU connectors are disconnected.

With the aid of a multimeter, check that there is no continuity:

1. between pin 3 and pin 1 of the sensor connector
2. between pin 3 and pin 2 of the sensor connector

3. between pin 2 and pin 1 of the sensor connector



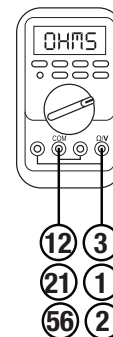
- Perform this procedure on the harness connector.
- If there is continuity, replace the harness.
- Otherwise go to the next step.

D

Purpose: *Check that there are no problems of continuity*



Caution: before checking make sure that the sensor and TCU connectors are disconnected.



1. between the terminal 12 of the TCU and the terminal 3 of the sensor
2. between the terminal 21 of the TCU and the terminal 1 of the sensor

-
3. between the terminal 56 of the TCU and the terminal 2 of the sensor
- If continuity problems are verified perform the harness change and go to **Step V.**
 - Otherwise go to the next step.
-

E

Purpose: *Replace the coupling shaft*

1. Replace the system coupling shaft according to the Service Manual due to a problem in the system.
 - After the replacement go to **Step V.**
-

F

Purpose: *Check whether the problem is in the sensor*

1. Replace the coupling position sensor with another of the same model.
 - After the replacement go to **Step V.**
-

G

Purpose: *Check if the problem is in the TCU*

1. If with previous checks and sensor replacement the fault is not found, perform a test with the TCU of another vehicle of the same model.
 - After the replacement go to **Step V.**
-

V

Purpose: *Final check*

1. Key off.
2. Reconnect all connectors and make sure all components are fully installed.
3. Switch on and engine off.
4. Clean all fault codes using the "Diagnosis device".
5. If you have performed the TCU update, redo the grid, accelerometer, and Kiss Point learning procedure using the Diagnosis device.
6. Run with the vehicle if possible to verify that the system is functioning properly.
7. Check with the device for the same or other fault codes.
 - If the fault is active during the test, go to **Step A.**
 - If another fault code appears, see "SPN.FMI INDEX" on page III.
 - If no faults appear and the vehicle works perfectly, THE TEST IS COMPLETE.

Note: If the test was performed with the TCU of another vehicle replace it with a new one and repeat this procedure (V).

Clutch Position Sensor - A Signal /B Signal

SPN.FMI: 33.02 - 33.03 - 33.04 - 33.08

Overview

The clutch position sensor detects the position of the clutch, and informs it by sending PWM signals to the TCU. The sensor is connected to the TCU's 60-way A connector via four cables (power, GND and two position signals: A and B).

The TCU continuously diagnoses the circuits and, upon detecting an inappropriate signal voltage level or a wrong PWM cycle, the corresponding fault code will be activated.

Detection

33.02 - Wrong PWM period in signal A or signal B: the signal received by the TCU is out of tolerance of the expected value.

33.03 - A or B signal set to HIGH.

33.04 - A or B signal set to LOW.

33.08 - PWM duty cycle in signal A or signal B above the upper limit or below the lower limit.

Possible Causes

33.02

- System harness compromised
- Sensor connector with bad contact

33.03

- Open circuit in power supply, signal A or B GND of the sensor
- Short circuit in signal supply A or B

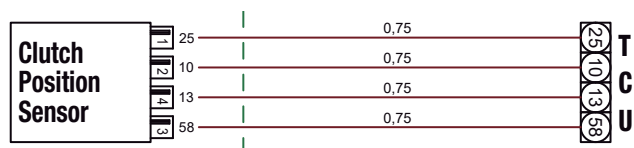
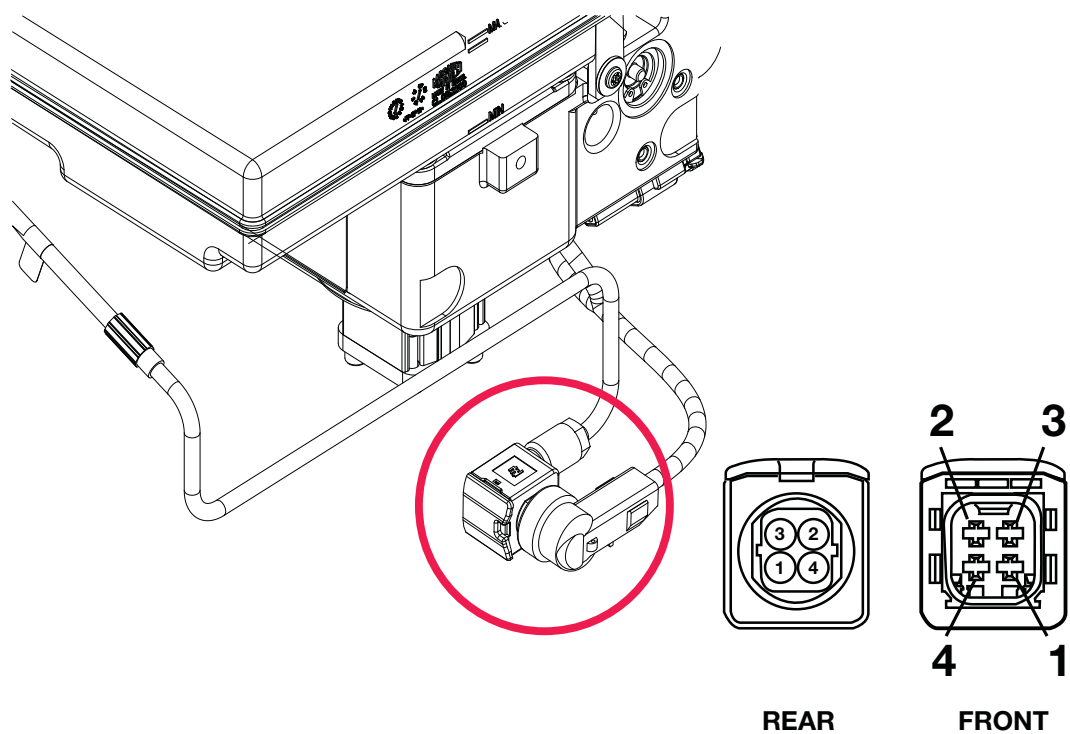
33.04

- Short circuit to the GND in the power supply or signal A or B
- Short circuit between signal A and signal B

33.08

- Loss of magnetism
- Damaged sensor
- Emergency clutch release

Component Identification



Procedure

A

Purpose: *Check fault codes present*

1. Use the diagnostic tool to check the fault codes.
 - If 33.08 go to **Step F.**
 - IF 33.02 or 33.03 or 33.04 go to **Step C.**
-

B

Purpose: *Check actuation of the clutch actuator*

1. Check actuation of the clutch actuator by activating the electrovalve via the service tool.
 2. When performing the clutch actuation test, fault code 33.08 may appear which must be ignored.
 - If actuation assembly actuates, go to **Step V.**
 - Otherwise go to the next step.
-

C

Purpose: *Check connectors and harness*

Check:

1. Let there be no bent or broken pins.
2. That there are no open or loose terminals.
3. That no terminal is oxidized or damaged, has no moisture or is suspected of over current or short circuit.

4. Check the harness for any cracked or damaged wire.

- If an irregularity is verified, change the harness and go to **Step V.**
 - Otherwise go to the next step.
-

D

Purpose: *Check that there is no short circuit*

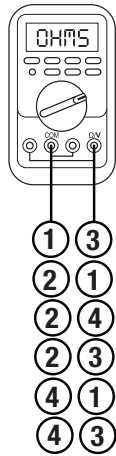


Caution: before checking make sure that the sensor and TCU connectors are disconnected.

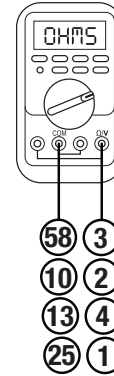
With the aid of a multimeter, check that there is no continuity:

1. between pin 1 and pin 3 of the sensor connector
2. between pin 2 and pin 1 of the sensor connector
3. between pin 2 and pin 4 of the sensor connector
4. between pin 2 and pin 3 of the sensor connector

5. between pin 4 and pin 1 of the sensor connector
6. between pin 4 and pin 3 of the sensor connector



- If continuity is found, replace the harness and go to **Step V.**
- Otherwise go to the next step.



- If continuity problems are verified perform the harness change and go to **Step V.**
- Otherwise go to the next step.

E

Purpose: *Check that there are no problems of continuity*



Caution: before checking make sure that the sensor and TCU connectors are disconnected.

Using a multimeter, perform a continuity test.

1. between terminal 58 of the TCU connector and terminal 3 of the sensor connector.
2. between terminal 10 of the TCU connector and terminal 2 of the sensor connector.
3. between terminal 13 of the TCU connector and terminal 4 of the sensor connector.
4. between terminal 25 of the TCU connector and terminal 1 of the sensor connector.

F

Purpose: *Replace the clutch actuator plunger*

1. Replace the clutch actuator plunger in accordance with the service manual, due to a problem with the clutch actuator.
 - After the replacement go to **Step V.**

G

Purpose: *Check whether the problem is in the sensor*

1. If possible, replace the clutch position sensor with another of the same model.
 - After the replacement go to **Step V**.
-

H

Purpose: *Verify that the problem is not in the TCU*

1. If with previous checks and sensor replacement the fault is not found, perform a test with the TCU of another vehicle of the same model.
 - After the replacement go to **Step V**.
-

V

Purpose: *Final check*

1. Key off.
2. Reconnect all connectors and make sure all components are fully installed.
3. Switch on and engine off.
4. Clean all fault codes using the "Diagnosis device".
5. If you have performed the TCU update, redo the grid, accelerometer, and Kiss Point learning procedure using the Diagnosis device.
6. Run with the vehicle if possible to verify that the system is functioning properly.
7. Check with the device for the same or other fault codes.
 - If the fault is active during the test, go to **Step A**.
 - If another fault code appears, see "SPN.FMI INDEX" on page III.
 - If no faults appear and the vehicle works perfectly, THE TEST IS COMPLETE.

Note: If the test was performed with the TCU of another vehicle replace it with a new one and repeat this procedure (V).

Clutch Position Sensor Power Supply

SPN.FMI: 3510.03 - 3510.04

Overview

The clutch position sensor detects the position of the clutch, and informs it by sending PWM signals to the TCU.

The TCU continuously diagnoses the circuits and, if it detects a power failure, the fault will be activated.

Detection

3510.03 - Supply voltage above the upper limit.

3510.04 - Supply voltage below the lower limit.

Possible Causes

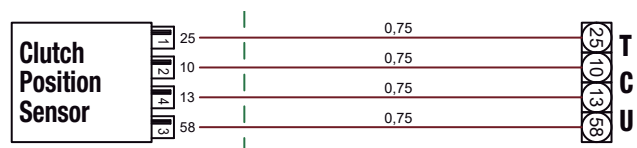
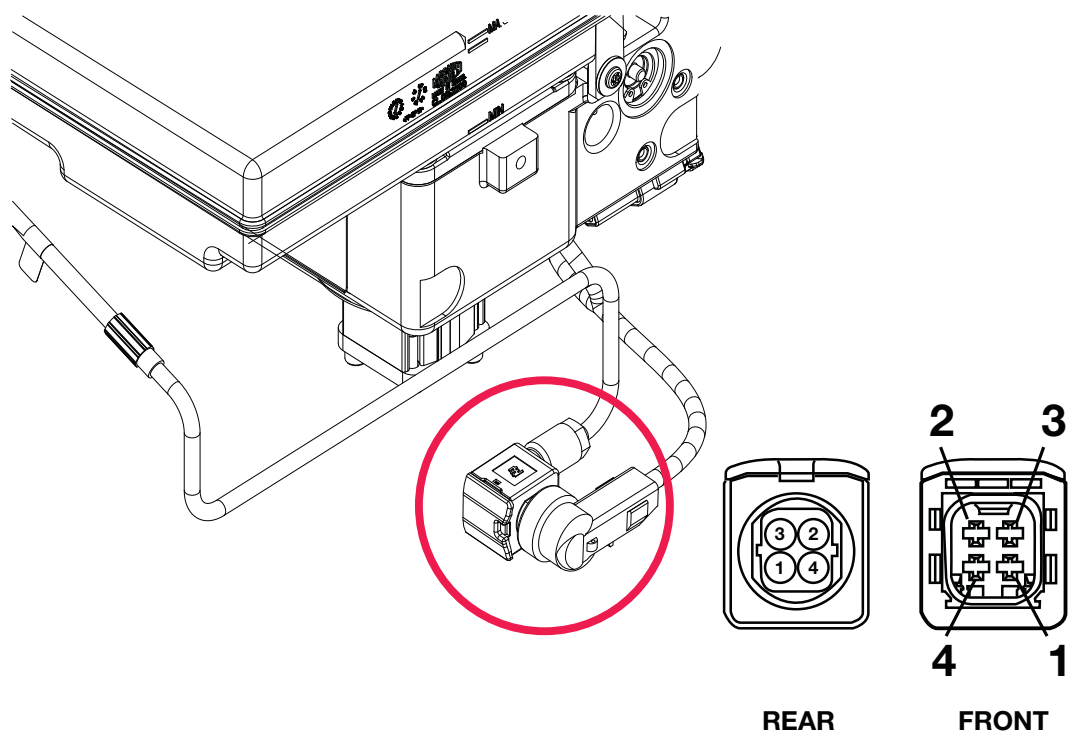
3510.03

- System harness compromised
- Sensor power connector with bad contact
- Short circuit to power supply.
- TCU problems.

3510.04

- System harness compromised
- Sensor power connector with bad contact
- Short circuit to GND
- TCU problem.

Component Identification



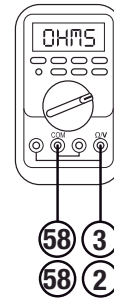
Procedure

A

Purpose: *Check connectors and harness*

Check:

1. Let there be no bent or broken pins.
2. That there are no open or loose terminals.
3. That no terminal is oxidized or damaged, has no moisture or is suspected of over current or short circuit.
4. Check the harness for any cracked or damaged wire.
 - If an irregularity is verified, change the harness and go to **Step V.**
 - Otherwise go to the next step.



1. between terminal 58 of connector A of the TCU and terminal 3 of connector B of the TCU.
2. between terminal 58 of connector A of the TCU and terminal 2 of connector B of the TCU.
 - If continuity is verified in the above test, perform maintenance on the damaged component and go to **Step V.**
 - Otherwise go to the next step.

B

Purpose: *Check fault codes present*

1. Use the diagnostic tool to check the fault codes.
 - If 3510.03 go to **Step C.**
 - If 3510.04 go to **Step D.**

D

Purpose: *Verify that the problem is not in the TCU*

1. If with previous checks and sensor replacement the fault is not found, perform a test with the TCU of another vehicle of the same model.
 - After the replacement go to **Step V.**

C

Purpose: *Check that there is no short circuit*



Caution: before checking make sure that the sensor and TCU connectors are disconnected.

With the aid of a multimeter, check that there is no continuity:

V

Purpose: *Final check*

1. Key off.
2. Reconnect all connectors and make sure all components are fully installed.
3. Switch on and engine off.
4. Clean all fault codes using the "Diagnosis device".
5. If you have performed the TCU update, redo the grid, accelerometer, and Kiss Point learning procedure using the Diagnosis device.
6. Run with the vehicle if possible to verify that the system is functioning properly.
7. Check with the device for the same or other fault codes.
 - If the fault is active during the test, go to **Step A.**
 - If another fault code appears, see "SPN.FMI INDEX" on page III.
 - If no faults appear and the vehicle works perfectly, THE TEST IS COMPLETE.

Note: If the test was performed with the TCU of another vehicle replace it with a new one and repeat this procedure (V).

Hydraulic Pressure Sensor

SPN.FMI: 785.02 - 785.03 - 785.04 - 785.10

Overview

The hydraulic pressure sensor detects the oil pressure present in the system, stored in the pressure accumulator and generated by the hydraulic pump. This pressure operates the electrovalves that position the coupling and selection piston and the coupling of the clutch. The sensor is connected to the TCU 60-way A connector via three wires (power, GND and signal).

The TCU makes a continuous diagnosis in the circuits and in case it detects an inadequate signal voltage level the fault will be activated.

Detection

785.02 - Wrong sensor signal value: The fault is detected when the TCU encounters an error in the signal value.

785.03 - Sign above the upper limit.

785.04 - Signal below the lower limit.

785.10 - Peak sensor signal value: failure is detected if the TCU detects electrical peaks in the sensor signal circuit.

Possible Causes

785.02

- Hydraulic pressure sensor damaged.

785.03

- Short circuit between the sensor signal and the supply voltage of the sensor.

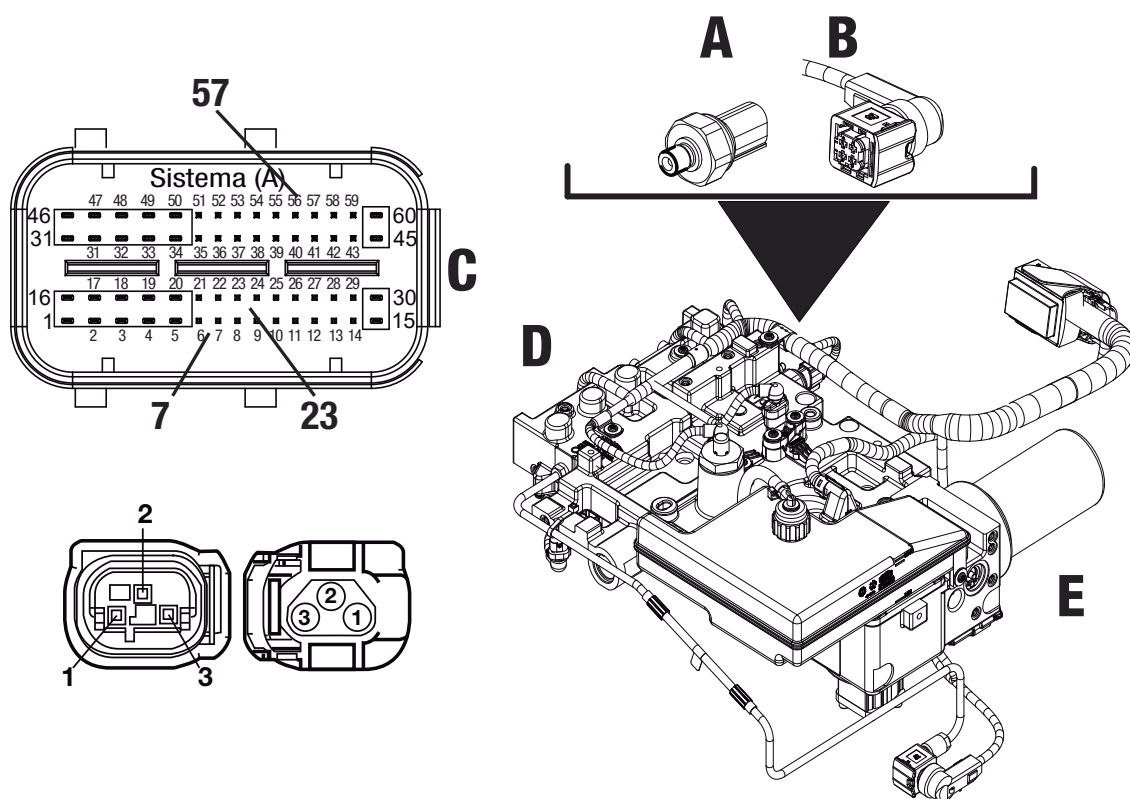
785.04

- Open circuit on sensor signal.
- Short circuit between sensor signal and GND.

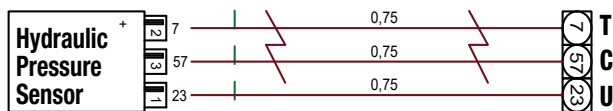
785.10

- Connector and / or sensor whip problems.

Component Identification



- A.**Hydraulic pressure sensor
- B.**Pressure sensor connector
- C.**TCU 60-way A connector
- D.**Hydraulic Kit
- E.**Pressure accumulator



Procedure

A

Purpose: Check fault codes present

1. Use the diagnostic tool to check the fault codes.
 - If 785.03 or 785.04 go to **Step D.**
 - If 785.02 or 785.10 go to **Step E.**

4. Check the harness for any cracked or damaged wire.
 - If an irregularity is verified, change the harness and go to **Step V.**
 - Otherwise go to the next step.

B

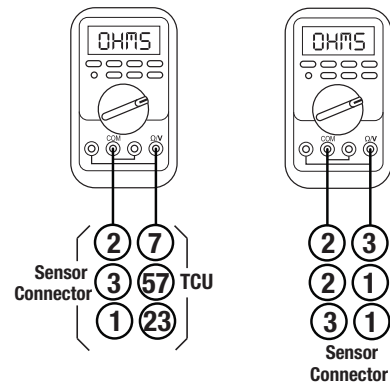
Purpose: Check actuation of the clutch actuator

1. Check actuation of the clutch actuator by activating the electrovalve via the service tool.
2. When performing the clutch actuation test, fault code 33.08 may appear which must be ignored.
 - If actuation assembly actuates, go to **Step V.**
 - Otherwise go to the next step.



Caution: before checking make sure that the sensor and TCU connectors are disconnected.

Using a multimeter, check:



C

Purpose: Check connectors and harness



Caution: before checking make sure that the sensor and TCU connectors are disconnected.

Check:

1. Let there be no bent or broken pins.
2. That there are no open or loose terminals.
3. That no terminal is oxidized or damaged, has no moisture or is suspected of over current or short circuit.

1. that there is continuity between terminal 2 of the sensor connector and 7 of the TCU connector.
2. that there is continuity between terminal 3 of the sensor connector and 57 of the TCU connector.
3. that there is continuity between terminal 1 of the sensor connector and 23 of the TCU connector.
4. that there is no continuity between terminals 2 and 3 on the connector and also on the sensor.
5. that there is no continuity between terminals 2 and 1 on the connector and also on the sensor.

-
6. that there is no continuity between terminals 3 and 1 on the connector and also on the sensor.
- If there are any problems with the sensor, go to the next step.
 - If the problem is on the connector, replace the harness and go to **Step V.**
 - If no problem is identified go to the next step.

E

Purpose: *Hydraulic pressure sensor replacement*

1. If the fault code is 785.02, or if the previous procedures indicated a defect in the sensor or did not indicate a defect, proceed with the replacement of the hydraulic pressure sensor due to a probable internal fault in the sensor.
 - After the replacement is made, go to **Step V.**
 - If the sensor has already been replaced, go to the next step.

F

Purpose: *Check if the problem is in the TCU*

1. If with the previous checks the defect is not found, perform a test with the TCU of another vehicle of the same model.
 - After the replacement go to **Step V.**
-

V

Purpose: *Final check*

1. Key off.
2. Reconnect all connectors and make sure all components are fully installed.
3. Switch on and engine off.
4. Clean all fault codes using the "Diagnosis device".
5. If you have performed the TCU update, redo the grid, accelerometer, and Kiss Point learning procedure using the Diagnosis device.
6. Run with the vehicle if possible to verify that the system is functioning properly.
7. Check with the device for the same or other fault codes.
 - If the fault is active during the test, go to **Step A.**
 - If another fault code appears, see "SPN.FMI INDEX" on page III.
 - If no faults appear and the vehicle works perfectly, THE TEST IS COMPLETE.

Note: If the test was performed with the TCU of another vehicle replace it with a new one and repeat this procedure (V).

Hydraulic Pressure Sensor Power Supply

SPN.FMI: 3511.03 - 3511.04

Overview

The hydraulic pressure sensor detects the oil pressure present in the system, stored in the pressure accumulator and generated by the hydraulic pump. This pressure operates the electrovalves that position the coupling and selection piston and the coupling of the clutch. The sensor is connected to the TCU 60-way A connector via three wires (power, GND and signal).

The TCU makes a continuous diagnosis in the circuits and in case it detects an incorrect power supply to the pressure sensor the fault will be activated.

Detection

3511.03 - Hydraulic pressure sensor short supply circuit with battery.

3511.04 - Hydraulic pressure sensor supply circuit short to GND.

Possible Causes

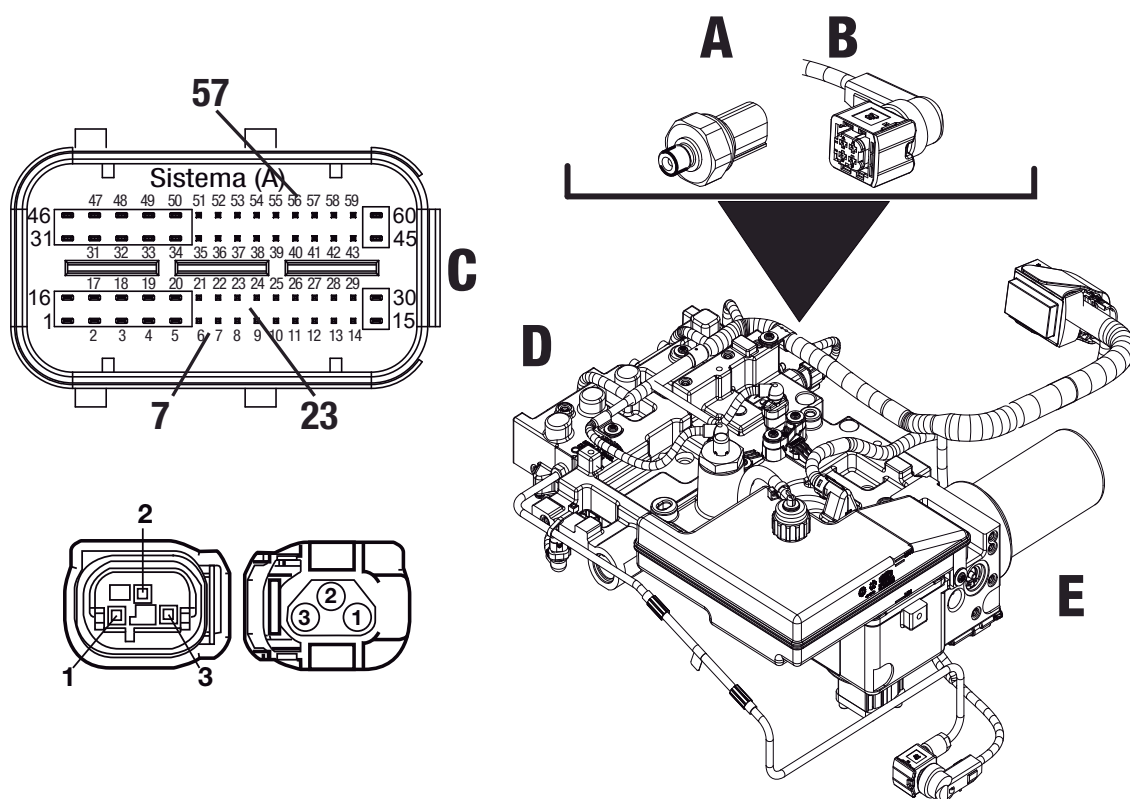
3511.03

- TCU or short circuit to the battery in the sensor power circuit.

3511.04

- TCU or short circuit to GND in the sensor supply circuit.

Component Identification



- A.**Hydraulic pressure sensor
- B.**Pressure sensor connector
- C.**TCU 60-way A connector
- D.**Hydraulic Kit
- E.**Pressure accumulator

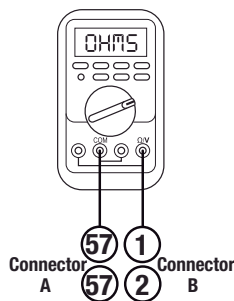


Procedure

A**Purpose:** *Check*

Caution: before checking make sure that the sensor and TCU connectors are disconnected.

1. if there is no continuity between pin 57 of connector A with pin 1 of connector B.
2. if there is no continuity between pin 57 of connector A with pin 2 of connector B.



- If there are continuity between these pins, proceed with the replacement of the harness and go to **Step V.**
- Otherwise go to the next step.

B**Purpose:** *Perform a TCU test*

1. If with the previous checks the fault is not found, perform a test with the TCU of another vehicle.
 - After the replacement go to **Step V.**

V**Purpose:** *Final check*

1. Key off.
2. Reconnect all connectors and make sure all components are fully installed.
3. Switch on and engine off.
4. Clean all fault codes using the "Diagnosis device".
5. If you have performed the TCU update, redo the grid, accelerometer, and Kiss Point learning procedure using the Diagnosis device.
6. Run with the vehicle if possible to verify that the system is functioning properly.
7. Check with the device for the same or other fault codes.
 - If the fault is active during the test, go to **Step A.**
 - If another fault code appears, see "SPN.FMI INDEX" on page III.
 - If no faults appear and the vehicle works perfectly, THE TEST IS COMPLETE.

Note: If the test was performed with the TCU of another vehicle replace it with a new one and repeat this procedure (V).

Clutch Rotation Sensor

SPN.FMI: 161.02 - 161.04 - 161.05 - 161.09 - 161.10

Overview

The clutch rotation speed is detected by means of a Hall effect sensor and a phonic wheel, and the information is sent to the TCU. The clutch rotation sensor is connected to the TCU via the 60-way A connector via two wires (GND and signal feedback).

The TCU continuously diagnoses the signal received from the Hall sensor and, upon detecting a failure to read the clutch rotation, the corresponding fault code will be activated.

Detection

161.02 - Incorrect signal: due to discrepancy between crankshaft rotation and clutch rotation.

161.04 - Sign below the lower limit.

161.05 - Signal above the upper limit.

161.09 - Missing signal: The fault is detected when the TCU reads the clutch rotation equal to zero, always with motor on and clutch engaged.

161.10 - Sensor signal with noises: the fault occurs when the TCU detects high peaks in the rotation signal.

Possible Causes

161.02

- Electrical fault on the harness or internal sensor defect.

161.04

- Short circuit to GND.

161.05

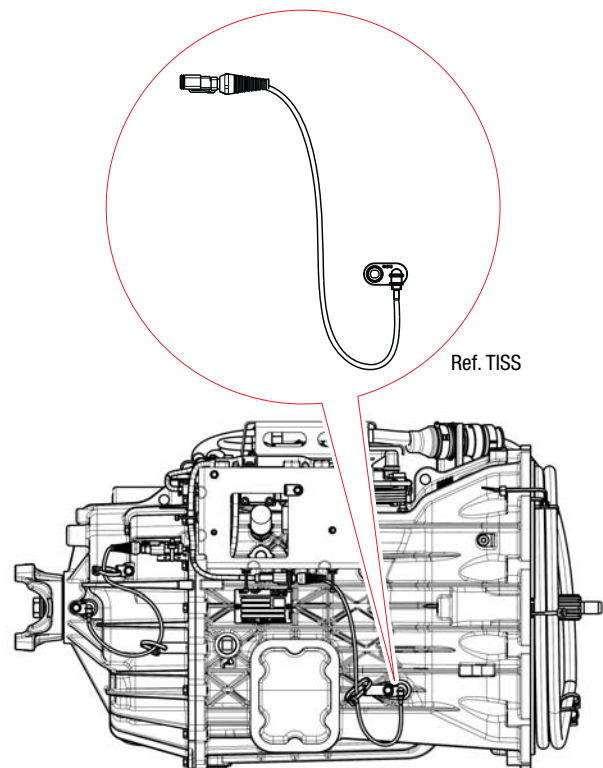
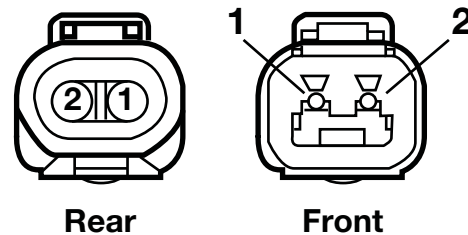
- Short circuit to power supply.
- Open circuit.

161.09

- Lagged sensor with respect to the teeth.
- Sensor sending incorrect rotation.
- Sensor not sending rotation.

161.10

- Sensor with bad contact or problems with the harness.



Procedure

A

Purpose: *Check connectors and harness*

1. Let there be no bent or broken pins.
2. That there are no open or loose terminals.
3. That no terminal is oxidized or damaged, or with traces of moisture or suspected to have suffered an over current or short circuit.
4. Check the harness for any cracked or damaged wire.
 - If there is a fault, replace the harness and go to **Step V.**
 - If the problem is not identified, proceed to the next step.

B

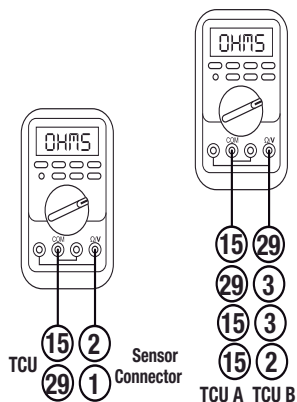
Purpose: *Check that there are no problems of continuity*



Caution: before checking make sure that the sensor and TCU connectors are disconnected.

With the aid of a multimeter check **that there is continuity:**

1. between pin 15 of TCU connector A and pin 2 of sensor connector.
2. between pin 29 of TCU connector A and pin 1 of sensor connector.



That **there is no continuity:**

1. between pins 15 and 29 of connector A of the TCU.
2. between pin 29 of connector A of the TCU and pin 3 of connector B of the TCU.
3. between pin 15 of connector A of the TCU and pin 3 of connector B of the TCU.
4. between pin 15 of connector A of the TCU and pin 2 of connector B of the TCU.
 - If there is a fault, replace the harness and go to **Step V.**
 - Otherwise go to the next step.

C

Purpose: *Check the clutch rotation sensor*

1. Verify that the clutch rotation sensor is correctly installed and is not dislodged or damaged.
 - If a problem is verified, proceed with the correction and go to **Step V.**
 - Otherwise go to the next step.

D

Purpose: *Check for possible contamination of the sensor*

1. Check for particulate matter.
 - If there are contaminants in the TOSS sensor reading area, clean it and go to **Step V.**
 - ***Do not use chemical product.**
 - Otherwise go to the next step.

E**Purpose: Check the sprocket**

1. Check that it is not damaged, has traces of filings or that the distance between the sensor and the sprocket is not excessive.
 - If a problem is verified, proceed with the correction and go to **Step V.**
 - Otherwise go to the next step.
-

F**Purpose: *Replacing the Clutch Rotation Sensor***

1. If there is no fault in the sensor installation or in the harness, replace the Clutch Rotation Sensor.
 - After the replacement go to **Step V.**
-

G**Purpose: *Check if the problem is in the TCU***

1. If with the previous checks the defect is not found, perform a test with the TCU of another vehicle of the same model.
 - After the replacement go to **Step V.**
-

V**Purpose: Final check**

1. Key off.
2. Reconnect all connectors and make sure all components are fully installed.
3. Switch on and engine off.
4. Clean all fault codes using the "Diagnosis device".
5. If you have performed the TCU update, redo the grid, accelerometer, and Kiss Point learning procedure using the Diagnosis device.
6. Run with the vehicle if possible to verify that the system is functioning properly.
7. Check with the device for the same or other fault codes.
 - If the fault is active during the test, go to **Step A.**
 - If another fault code appears, see "SPN.FMI INDEX" on page III.
 - If no faults appear and the vehicle works perfectly, THE TEST IS COMPLETE.

Note: If the test was performed with the TCU of another vehicle replace it with a new one and repeat this procedure (V).

Vehicle Speed Sensor

SPN.FMI: 191.05 - 191.18

Overview

The vehicle speed is detected by means of a Hall effect sensor and a phonic wheel, which sends the signal to the TCU defining the speed of the vehicle. The vehicle speed sensor is connected to the TCU via the 60-way A connector through two wires (GND and signal feedback).

The TCU continuously diagnoses the signal received from the Hall sensor and, upon detecting a failure to read the vehicle speed, the corresponding fault code will be activated.

Detection

191.05 - Signal below the lower limit.

191.18 - Sign above the upper limit.

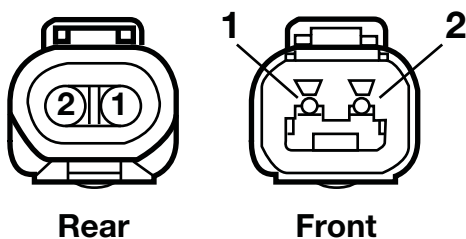
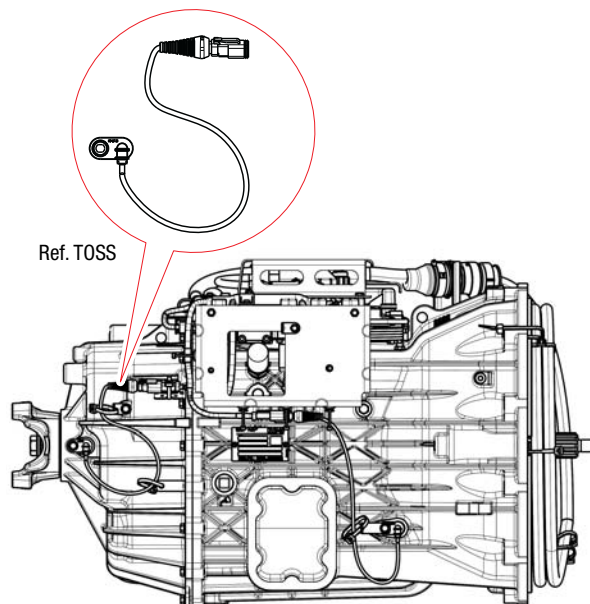
Possible Causes

191.05

- Short circuit to GND.

191.18

- Short circuit to power supply.
- Open circuit.



Procedure

A

Purpose: Check connectors and harness

1. Let there be no bent or broken pins.
2. That there are no open or loose terminals.
3. That no terminal is oxidized or damaged, or with traces of moisture or suspected to have suffered an over current or short circuit.
4. Check the harness for any cracked or damaged wire.
 - If there is a fault, replace the harness and go to **Step V**.
 - If the problem is not identified, proceed to the next step.

B

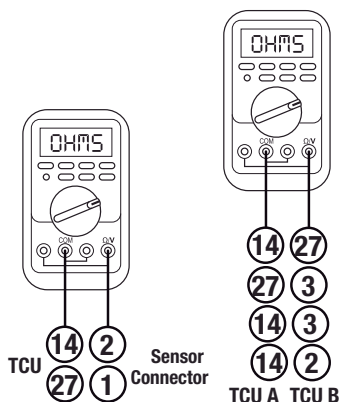
Purpose: Check that there are no problems of continuity



Caution: before checking make sure that the sensor and TCU connectors are disconnected.

That there is no continuity:

1. between pin 14 of connector A of the TCU and pin 2 of sensor connector.
2. between pin 27 of connector A of the TCU and pin 1 of sensor connector.



With the aid of a multimeter check that there is continuity:

1. between pins 14 and 27 of connector A of the TCU.
2. between pin 27 of connector A of the TCU and pin 3 of connector B of the TCU.
3. between pin 14 of connector A of the TCU and pin 3 of connector B of the TCU.
4. between pin 14 of connector A of the TCU and pin 2 of connector B of the TCU.
 - If there is a fault, replace the harness go to **Step V**.
 - Otherwise go to the next step.

C

Purpose: Check speed sensor installation

1. Check that the speed sensor of the vehicle is properly installed and not displaced.
 - If a problem is found, proceed with the correction and go to **Step V**.
 - Otherwise to the next step.

D

Purpose: Check for possible contamination of the sensor

1. Check for particulate matter.
 - If there are contaminants in the TOSS sensor reading area, clean it and go to **Step V**.
 - ***Do not use chemical product.**
 - Otherwise to the next step.

E**Purpose:** *Replacing the vehicle speed sensor*

1. If there is no defect in sensor installation or harness, replace the Vehicle Speed Sensor.
 - If a problem is found, proceed with the correction and go to **Step V**.
 - Otherwise go to the next step.
-

F**Purpose:** *Check if the problem is in the TCU*

1. If with the previous checks the defect is not found, perform a test with the TCU of another vehicle of the same model.
 - Then go to **Step V**.
-

V**Purpose:** *Final check*

1. Key off.
2. Reconnect all connectors and make sure all components are fully installed.
3. Switch on and engine off.
4. Clean all fault codes using the "Diagnosis device".
5. If you have performed the TCU update, redo the grid, accelerometer, and Kiss Point learning procedure using the Diagnosis device.
6. Run with the vehicle if possible to verify that the system is functioning properly.
7. Check with the device for the same or other fault codes.
 - If the fault is active during the test, go to **Step A**.
 - If another fault code appears, see "SPN.FMI INDEX" on page III.
 - If no faults appear and the vehicle works perfectly, THE TEST IS COMPLETE.

Note: If the test was performed with the TCU of another vehicle replace it with a new one and repeat this procedure (V).

Speed and Rotation Sensors Plausibility Monitoring

SPN.FMI: 191.02 - 810.02 - 3825.02

Overview

The vehicle speed and the Clutch Rotation are detected by means of Hall sensors and phonic wheel, which send the signal to the TCU defining the speed of the vehicle and the rotation of the clutch. The sensors are connected to the TCU via the 60-way A connector through two wires (GND and signal return).

The TCU continuously diagnoses the coherence of speed monitoring and, upon detecting a fault, the corresponding fault code will be activated.

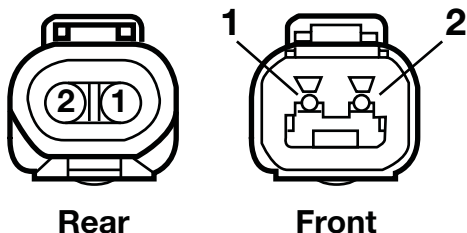
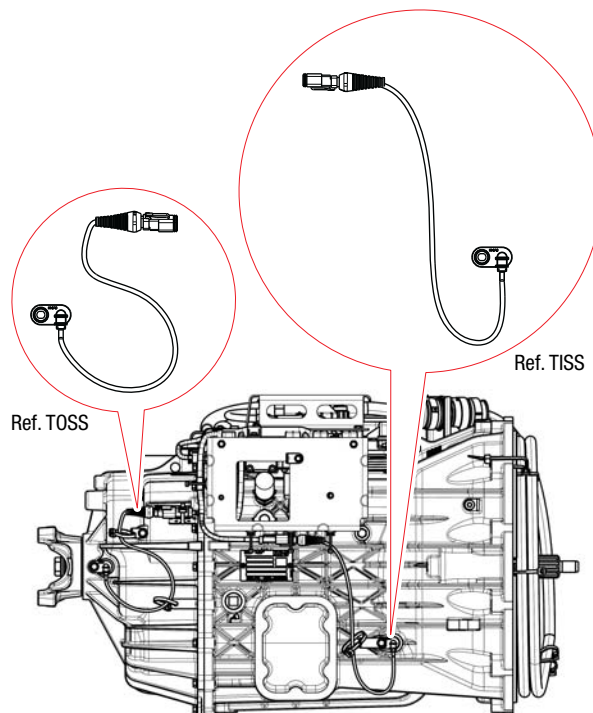
Detection

191.02 - 810.02 - 3825.02 - Signal monitoring of the clutch speed sensor and vehicle speed sensor.

Possible Causes

191.02 - 810.02 - 3825.02

- Failure of the clutch rotation sensor or the vehicle speed sensor, and problems with the plausibility between these signals and values of engine speed or rotation of the drive shaft.



Procedure

A

Purpose: Check other fault codes

1. With the vehicle diagnostics check for other fault codes, and if there are others, treat them first according to specific procedure.
 - If there is a fault, replace the harness and go to **Step V.**
 - Otherwise go to the next step.

B

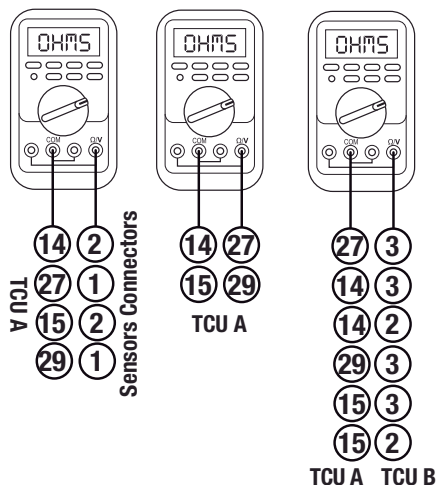
Purpose: Check for continuity between circuits



Caution: before checking make sure that the sensor and TCU connectors are disconnected.

With the aid of a multimeter check that **there is continuity**:

1. between pin 14 of connector A of the TCU and pin 2 of sensor connector.
2. between pin 27 of connector A of the TCU and pin 1 of sensor connector.
3. between pin 15 of connector A of the TCU and pin 2 of sensor connector.
4. between pin 29 of connector A of the TCU and pin 1 of sensor connector.



That **there is no continuity**:

1. between pins 14 and 27 of connector A of the TCU.
2. between pins 15 and 29 of connector A of the TCU.
3. between the pin 27 of the A connector of the TCU and the pin 3 of the connector B of the TCU.
4. between the pin 14 of the A connector of the TCU and the pin 3 of the connector B of the TCU.
5. between the pin 14 of the A connector of the TCU and the pin 2 of the connector B of the TCU.
6. between the pin 29 of the A connector of the TCU and the pin 3 of the connector B of the TCU.
7. between the pin 15 of the A connector of the TCU and the pin 3 of the connector B of the TCU.
8. between the pin 15 of the A connector of the TCU and the pin 2 of the connector B of the TCU.
 - If a malfunction occurs, replace the harness and go to **Step V.**
 - Otherwise go to the next step.

C

Purpose: Replace the TCU

1. If the above checks do not define the defect, replace the TCU (internal defect).

It is indicated to test the vehicle with a "Slave" TCU or with one used on a vehicle without any fault.

The test:

1. Replace the TCU in the vehicle "Without doing any reprogramming", if it returns to normal operation without failure, return the original TCU.
2. Clear all the fault codes using the "diagnostic tool" and repeat the test, if the faults appear again, and the vehicle presents the same faults, replace the TCU and go to **Step V.**

V

Purpose: *Final check*

1. Key off.
2. Reconnect all connectors and make sure all components are fully installed.
3. Switch on and engine off.
4. Clean all fault codes using the "Diagnosis device".
5. If you have performed the TCU update, redo the grid, accelerometer, and Kiss Point learning procedure using the Diagnosis device.
6. Run with the vehicle if possible to verify that the system is functioning properly.
7. Check with the device for the same or other fault codes.
 - If the fault is active during the test, go to **Step A.**
 - If another fault code appears, see "SPN.FMI INDEX" on page III.
 - If no faults appear and the vehicle works perfectly, THE TEST IS COMPLETE.

Note: If the test was performed with the TCU of another vehicle replace it with a new one and repeat this procedure (V).

Clutch Rotation and Vehicle Speed Sensors Power Supply

SPN.FMI: 191.03 - 191.04

Overview

The vehicle speed and the Clutch Rotation are detected by means of Hall sensors, which send the signal to the TCU, defining the speed of the vehicle and the rotation of the clutch.

The TCU continuously diagnoses the supply voltage of the sensors and, upon detecting a fault, the corresponding fault code will be activated.

Detection

191.03 - Supply voltage above the upper limit.

191.04 - Supply voltage below the lower limit.

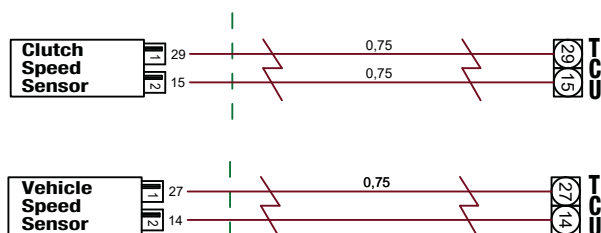
Possible Causes

191.03

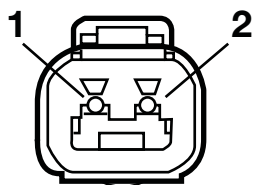
- System harness compromised.
- Sensor power connector with bad contact.
- Short circuit to power supply.
- TCU Problems.

191.04

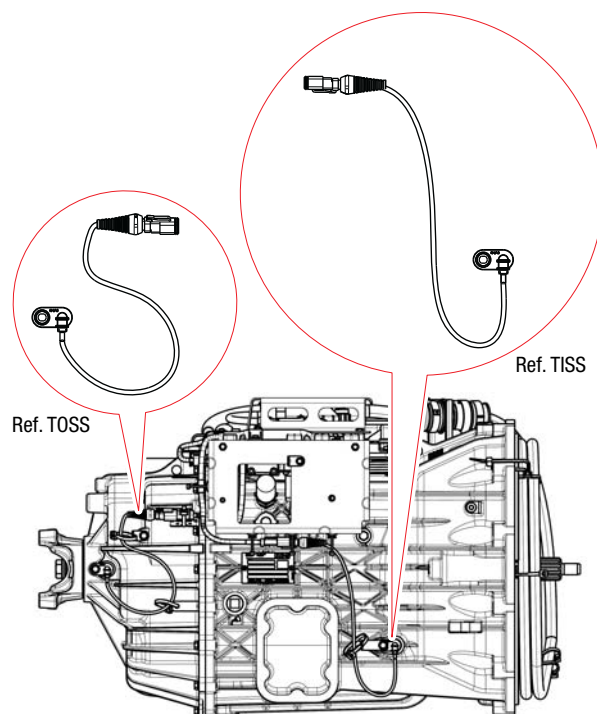
- System harness compromised
- Sensor power connector with bad contact.
- Short circuit to GND.
- TCU Problems.



Rear



Front



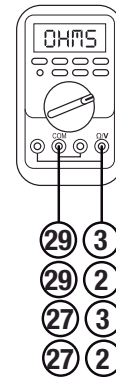
Procedure

A

Purpose: *Check connectors and harness*

Check:

1. that there are no bent or broken pins.
2. that there are no open or loose terminals.
3. that no terminal is oxidized or damaged, has no moisture or is suspected of being over current or short circuit.
4. check the harness for any broken or damaged wire.
 - If there is a fault, replace the harness and go to **Step V.**
 - Otherwise go to the next step.



1. between pin 29 of connector A of the TCU and pin 3 of connector B of the TCU.
2. between pin 29 of connector A of the TCU and pin 2 of connector B of the TCU.
3. between pin 27 of connector A of the TCU and pin 3 of connector B of the TCU.
4. between pin 29 of connector A of the TCU and pin 2 of connector B of the TCU.
 - If continuity is verified in the above test, perform maintenance on the damaged component and go to **Step V.**
 - Otherwise go to the next step.

B

Purpose: *Check pending fault codes*

1. Use the diagnostic tool to check for fault codes.
 - If 191.04 or 191.04 go to **Step C.**

C

Purpose: *Perform a continuity test*



Caution: before checking make sure that the sensor and TCU connectors are disconnected.

With the aid of a multimeter check that there is no continuity:

V

Purpose: *Final check*

1. Key off.
2. Reconnect all connectors and make sure all components are fully installed.
3. Switch on and engine off.
4. Clean all fault codes using the "Diagnosis device".
5. If you have performed the TCU update, redo the grid, accelerometer, and Kiss Point learning procedure using the Diagnosis device.
6. Run with the vehicle if possible to verify that the system is functioning properly.
7. Check with the device for the same or other fault codes.
 - If the fault is active during the test, go to **Step A.**
 - If another fault code appears, see "SPN.FMI INDEX" on page III.
 - If no faults appear and the vehicle works perfectly, THE TEST IS COMPLETE.

Note: If the test was performed with the TCU of another vehicle replace it with a new one and repeat this procedure (V).

Power Mode Switch

SPN.FMI: 1852.02

Overview

The TCU module monitors the Power Mode switch to detect its status and activates a SPN.FMI if it has an electrical defect or in the circuit that connecting it to the control unit.

Detection

1852.02 - Switch jammed.

Possible Causes

1852.02

- Sign locked as closed due to harness or switch itself.



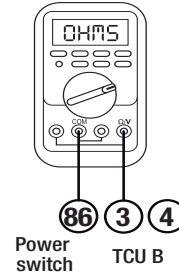
Procedure

A

Purpose: *Inspect the button*

1. Make sure that the button is working normally, is not jammed, or is operating irregularly.
 - If there are problems with the button replace it with a new one according to the procedures indicated by OEM and go to **Step V**.
 - Otherwise go to the next step.

1. If in the previous checks the problem is not identified, with the button at rest check that there is no continuity between pin 86 and battery positive (pins 4 and 3), connector B of the TCU.



- If there is continuity, replace the harness and go to **Step V**.

B

Purpose: *Check connectors and harness*

Check:

1. that there are no bent or broken pins.
2. that there are no open or loose terminals.
3. that no terminal is oxidized or damaged, has no moisture or is suspected of being over current or short circuit.
4. check the harness for any broken or damaged wire.
 - If there is a fault, replace the harness and go to **Step V**.
 - Otherwise go to the next step.

C

Purpose: *Check other circuits*



Caution: before checking make sure that the sensor and TCU connectors are disconnected.

V

Purpose: *Final check*

1. Key off.
2. Reconnect all connectors and make sure all components are fully installed.
3. Switch on and engine off.
4. Clean all fault codes using the "Diagnosis device".
5. If you have performed the TCU update, redo the grid, accelerometer, and Kiss Point learning procedure using the Diagnosis device.
6. Run with the vehicle if possible to verify that the system is functioning properly.
7. Check with the device for the same or other fault codes.
 - If the fault is active during the test, go to **Step A.**
 - If another fault code appears, see "SPN.FMI INDEX" on page III.
 - If no faults appear and the vehicle works perfectly, THE TEST IS COMPLETE.

Note: If the test was performed with the TCU of another vehicle replace it with a new one and repeat this procedure (V).

Engine Rotation

SPN.FMI: 190.02

Overview

The TCU monitors the communication in the CAN bus and evaluates the values of the different messages that travel through the bus. In case there is a missing or incorrect engine rotation message, the fault is activated.

Detection

190.02 - Invalid engine rotation signal.

Possible Causes

190.02

- The TCU receives an incorrect message or is absent.

Procedure

A

Purpose: *Check other modules*

1. With the help of the Diagnostics tool, check if there are no faults present in other modules that communicate with the TCU.
 - If fault occurs, perform maintenance according to the procedure in the specific manual for the module that has the fault.
 - If the problem is not identified or if the problem persists, go to the next step.
-

B

Purpose: *Check if the problem is not in the TCU*

1. If with the previous procedures the problem is not identified and solved, perform a test if possible, changing the TCU to another one of a vehicle of the same model and configuration.
 - Then go to **Step V**.
-

V

Purpose: *Final check*

1. Key off.
2. Reconnect all connectors and make sure all components are fully installed.
3. Switch on and engine off.
4. Clean all fault codes using the "Diagnosis device".
5. If you have performed the TCU update, redo the grid, accelerometer, and Kiss Point learning procedure using the Diagnosis device.
6. Run with the vehicle if possible to verify that the system is functioning properly.
7. Check with the device for the same or other fault codes.
 - If the fault is active during the test, go to **Step A**.
 - If another fault code appears, see "SPN.FMI INDEX" on page III.
 - If no faults appear and the vehicle works perfectly, THE TEST IS COMPLETE.

Note: If the test was performed with the TCU of another vehicle replace it with a new one and repeat this procedure (V).

Power Take-Off Drive Switch

SPN.FMI: 3452.02

Overview

The TCU module monitors the PTO Drive switch to detect its status and will activate an SPN.FMI if it has an electrical fault in it or in the circuit that connects it with the switch.

Detection

3452.02 - Stuck switch.

Possible Causes

3452.02

- Signal locked as closed due to harness or switch itself.



Procedure

A

Purpose: *Inspect button*

1. Make sure the button is operating normally, not jammed or malfunctioning.
 - If there are problems with the button, replace it with a new one according to procedures indicated by OEM and go to **Step V**.
 - Otherwise go to the next step.

B

Purpose: *Check connectors and harnesses*

Check on the button and TCU connector:

1. that there are no bent or broken pins.
2. no open or loose terminals.
3. that no terminal is rusty or damaged, damp or suspected of over current or short circuit.
4. Check the harness for any broken or damaged wires.
 - If there is any damage, replace the harness and go to **Step V**.
 - Otherwise go to the next step.

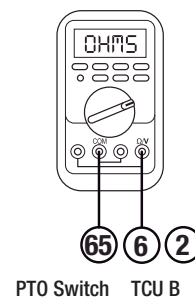
C

Purpose: *Check short circuits*



Caution: before checking make sure the sensor and TCU connectors are disconnected.

1. If the above checks is not identified the problem with the button at rest ensure that there is no continuity between the pin 65 and the battery negative (pins 6 and 2), B TCU connector.



- If there is continuity, replace the harness and go to **Step V**.

V

Purpose: *Final check*

1. Key off.
2. Reconnect all connectors and make sure all components are fully installed.
3. Switch on and engine off.
4. Clean all fault codes using the "Diagnosis device".
5. If you have performed the TCU update, redo the grid, accelerometer, and Kiss Point learning procedure using the Diagnosis device.
6. Run with the vehicle if possible to verify that the system is functioning properly.
7. Check with the device for the same or other fault codes.
 - If the fault is active during the test, go to **Step A.**
 - If another fault code appears, see "SPN.FMI INDEX" on page III.
 - If no faults appear and the vehicle works perfectly, THE TEST IS COMPLETE.

Note: If the test was performed with the TCU of another vehicle replace it with a new one and repeat this procedure (V).

Power Take Off Drive Switch Feedback

SPN.FMI: 976.02

Overview

The TCU module monitors the PTO mechanical coupling switch signal to detect PTO status and activates an SPN.FMI if it has an electrical fault in it or in the circuit that connects it with the control panel.

Detection

976.02 - Open Circuit, GND Short Circuit to GND or Supply.

Possible Causes

976.02

- System harness compromised.
- Connector with bad contact.
- Signal interrupted.
- Short circuit to GND.
- Short circuit to supply.



Procedure

A

Purpose: *Check coupling drive device*

1. Make sure the coupling system is operating normally, not jammed or malfunctioning.
 - In case of problems replace it with a new one according to procedures indicated by OEM and go to **Step V.**
 - Otherwise go to the next step.

B

Purpose: *Check connectors and harnesses*

Check on the button and TCU connector:

1. that there are no bent or broken pins.
2. no open or loose terminals.
3. that no terminal is rusty or damaged, damp or suspected of over current or short circuit.
4. Check the harness for any broken or damaged wires.
 - If there is any damage, replace the harness and go to **Step V.**
 - Otherwise go to the next step.

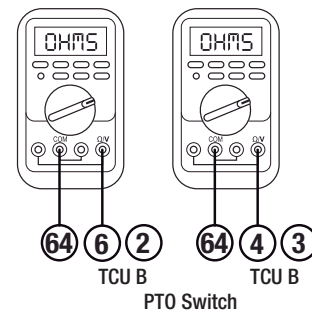
C

Purpose: *Check short circuits*



Caution: before checking make sure the sensor and TCU connectors are disconnected.

1. If the above checks is not identified the problem with the button at rest ensure that there is no continuity between the pin 64 and with the power (pins 4 and 3), B TCU connector.



- If there is continuity, replace the harness and go to **Step V.**

V

Purpose: *Final check*

1. Key off.
2. Reconnect all connectors and make sure all components are fully installed.
3. Switch on and engine off.
4. Clean all fault codes using the "Diagnosis device".
5. If you have performed the TCU update, redo the grid, accelerometer, and Kiss Point learning procedure using the Diagnosis device.
6. Run with the vehicle if possible to verify that the system is functioning properly.
7. Check with the device for the same or other fault codes.
 - If the fault is active during the test, go to **Step A.**
 - If another fault code appears, see "SPN.FMI INDEX" on page III.
 - If no faults appear and the vehicle works perfectly, THE TEST IS COMPLETE.

Note: If the test was performed with the TCU of another vehicle replace it with a new one and repeat this procedure (V).

Hill Holder Drive Switch

SNI.FMI: 577.02

Overview

The TCU monitors communication on the CAN bus and evaluates the values of the different messages that travel over the bus. If there is a missing or incorrect Hill Holder drive switch message, the fault is activated.

Detection

577.02 - Error Signal on Hill Holder Pushbutton Switch.

Possible Causes

976.02

- The TCU receives an incorrect or out of range message.

Procedure

A

Purpose: *Check other modules*

1. With the aid of the Diagnose tool check that there are no faults present in other modules that communicate with the TCU.
 - If a failure occurs, perform maintenance according to the procedure in the manual specific to the failed module.
 - If the problem is not identified or the problem persists, continue to the next step.
-

B

Purpose: *Verify that the problem is not in the TCU*

1. If with the previous procedures the problem is not identified and solved, perform a test if possible, replacing the TCU with another one of a vehicle of the same model and configuration.
 - Then go to **Step V**.
-

V

Purpose: *Final check*

1. Key off.
2. Reconnect all connectors and make sure all components are fully installed.
3. Switch on and engine off.
4. Clean all fault codes using the "Diagnosis device".
5. If you have performed the TCU update, redo the grid, accelerometer, and Kiss Point learning procedure using the Diagnosis device.
6. Run with the vehicle if possible to verify that the system is functioning properly.
7. Check with the device for the same or other fault codes.
 - If the fault is active during the test, go to **Step A**.
 - If another fault code appears, see "SPN.FMI INDEX" on page III.
 - If no faults appear and the vehicle works perfectly, THE TEST IS COMPLETE.

Note: If the test was performed with the TCU of another vehicle replace it with a new one and repeat this procedure (V).

Hill Holder Operation

SNI.FMI: 2912.02

Overview

The TCU monitors communication on the CAN bus and evaluates the values of the different messages that travel over the bus. If there is a missing or incorrect Hill Holder operation message, the fault is activated.

Detection

2912.02 - Error Signal on Hill Holder operation.

Possible Causes

2912.02

- The TCU receives an incorrect or out of range message.

Procedure

A

Purpose: *Check other modules*

1. With the aid of the Diagnose tool check that there are no faults present in other modules that communicate with the TCU.
 - If a failure occurs, perform maintenance according to the procedure in the manual specific to the failed module.
 - If the problem is not identified or the problem persists, continue to the next step.
-

B

Purpose: *Verify that the problem is not in the TCU*

1. If with the previous procedures the problem is not identified and solved, perform a test if possible, replacing the TCU with another one of a vehicle of the same model and configuration.
 - Then go to **Step V**.
-

V

Purpose: *Final check*

1. Key off.
2. Reconnect all connectors and make sure all components are fully installed.
3. Switch on and engine off.
4. Clean all fault codes using the "Diagnosis device".
5. If you have performed the TCU update, redo the grid, accelerometer, and Kiss Point learning procedure using the Diagnosis device.
6. Run with the vehicle if possible to verify that the system is functioning properly.
7. Check with the device for the same or other fault codes.
 - If the fault is active during the test, go to **Step A**.
 - If another fault code appears, see "SPN.FMI INDEX" on page III.
 - If no faults appear and the vehicle works perfectly, THE TEST IS COMPLETE.

Note: If the test was performed with the TCU of another vehicle replace it with a new one and repeat this procedure (V).

Cruise Control Indicator

SNI.FMI: 595.02

Overview

The TCU monitors communication on the CAN bus and evaluates the values of the different messages that travel over the bus. If there is a missing or incorrect Hill Holder operation message, the fault is activated.

Detection

595.02 - Error Signal on Cruise Control Indicator.

Possible Causes

595.02

- The TCU receives an incorrect or out of range message.

Procedure

A

Purpose: *Check other modules*

1. With the aid of the Diagnose tool check that there are no faults present in other modules that communicate with the TCU.
 - If a failure occurs, perform maintenance according to the procedure in the manual specific to the failed module.
 - If the problem is not identified or the problem persists, continue to the next step.
-

B

Purpose: *Verify that the problem is not in the TCU*

1. If with the previous procedures the problem is not identified and solved, perform a test if possible, replacing the TCU with another one of a vehicle of the same model and configuration.
 - Then go to **Step V**.
-

V

Purpose: *Final check*

1. Key off.
2. Reconnect all connectors and make sure all components are fully installed.
3. Switch on and engine off.
4. Clean all fault codes using the "Diagnosis device".
5. If you have performed the TCU update, redo the grid, accelerometer, and Kiss Point learning procedure using the Diagnosis device.
6. Run with the vehicle if possible to verify that the system is functioning properly.
7. Check with the device for the same or other fault codes.
 - If the fault is active during the test, go to **Step A**.
 - If another fault code appears, see "SPN.FMI INDEX" on page III.
 - If no faults appear and the vehicle works perfectly, THE TEST IS COMPLETE.

Note: If the test was performed with the TCU of another vehicle replace it with a new one and repeat this procedure (V).

Transmission Request Gear

SNI.FMI: 525.02 - 525.11 - 525.12 - 525.19

Overview

The TCU monitors communication on the CAN bus and evaluates the values of the different messages that travel over the bus. If there is a missing or incorrect Transmission Request Gear message, the fault is activated.

Detection

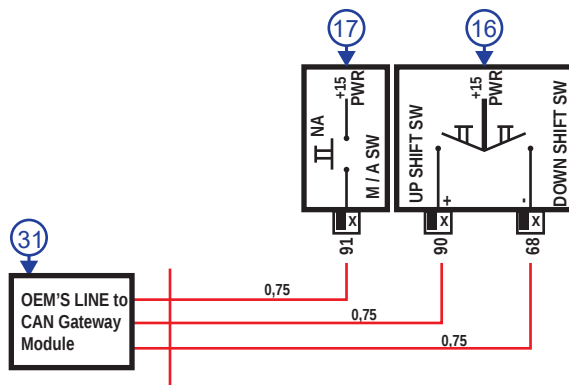
525.02, 525.11, 525.19 - Not valid Signal of "D-N-R" Drive Select Switch (Drive-Neutral-Reverse).

525.12 - Not valid sign key +/- (Up / Down).

Possible Causes

525.02 - 525.11 - 525.12 - 525.19

- Bad +/- Sign Up / Down



Procedure

A

Purpose: *Check other modules*

1. With the aid of the Diagnose tool check that there are no faults present in other modules that communicate with the TCU.
 - If a failure occurs, perform maintenance according to the procedure in the manual specific to the failed module.
 - If the problem is not identified or the problem persists, continue to the next step.
-

B

Purpose: *Check for Possible Failures on "D-N-R" Coupler Select Switch*

1. Check if there is any mechanical problem with the selection switch.
 - If it fails, replace as directed in the OEM Maintenance Manual, and then go to **Step V.**
 - If there are no problems with the key go to **Step D.**
-

C

Purpose: *Check for +/- Switch Faults*

1. Check if there is any mechanical problem with the +/- switch
 - If it fails, replace as directed in the OEM Maintenance Manual, and then go to **Step V.**
 - If there are no problems with the key go to **Step D.**
-

D

Purpose: *Verify that the problem is not in the TCU*

1. If with the previous procedures the problem is not identified and solved, perform a test if possible, replacing the TCU with another one of a vehicle of the same model and configuration.
 - Then go to **Step V.**
-

V

Purpose: *Final check*

1. Key off.
2. Reconnect all connectors and make sure all components are fully installed.
3. Switch on and engine off.
4. Clean all fault codes using the "Diagnosis device".
5. If you have performed the TCU update, redo the grid, accelerometer, and Kiss Point learning procedure using the Diagnosis device.
6. Run with the vehicle if possible to verify that the system is functioning properly.
7. Check with the device for the same or other fault codes.
 - If the fault is active during the test, go to **Step A.**
 - If another fault code appears, see "SPN.FMI INDEX" on page III.
 - If no faults appear and the vehicle works perfectly, THE TEST IS COMPLETE.

Note: If the test was performed with the TCU of another vehicle replace it with a new one and repeat this procedure (V).

Gas Pedal Position

SPN.FMI: 91.02

Overview

The TCU monitors the communication in the CAN bus and evaluates the values of the different messages that travel through the bus. In case there is a missing or incorrect gas pedal position message, fault is activated.

Detection

91.02 - Invalid accelerator pedal position signal.

Possible Causes

91.02

- The TCU receives an incorrect or an absent message.

Procedure

A

Purpose: *Check other modules*

1. With the help of the Diagnostics tool, check if there are no faults present in other modules that communicate with the TCU.
 - If fault occurs, perform maintenance according to the procedure in the specific manual for the module that has the fault.
 - If the problem is not identified or if the problem persists, go to the next step.
-

B

Purpose: *Check if the problem is not in the TCU*

1. If with the previous procedures the problem is not identified and solved, perform a test if possible, changing the TCU to another one of a vehicle of the same model and configuration.
 - Then go to **Step V**.
-

V

Purpose: *Final check*

1. Key off.
2. Reconnect all connectors and make sure all components are fully installed.
3. Switch on and engine off.
4. Clean all fault codes using the "Diagnosis device".
5. If you have performed the TCU update, redo the grid, accelerometer, and Kiss Point learning procedure using the Diagnosis device.
6. Run with the vehicle if possible to verify that the system is functioning properly.
7. Check with the device for the same or other fault codes.
 - If the fault is active during the test, go to **Step A**.
 - If another fault code appears, see "SPN.FMI INDEX" on page III.
 - If no faults appear and the vehicle works perfectly, THE TEST IS COMPLETE.

Note: If the test was performed with the TCU of another vehicle replace it with a new one and repeat this procedure (V).

Current Engine Torque

SPN.FMI: 513.02

Overview

The TCU monitors the communication in the CAN bus and evaluates the values of the different messages that travel through the bus. In case there is a missing or incorrect engine current torque message, the fault is activated.

Detection

513.02 - Invalid engine current torque signal.

Possible Causes

513.02

- The TCU receives an incorrect or an absent message.

Procedure

A

Purpose: *Check other modules*

1. With the help of the Diagnostics tool, check if there are no faults present in other modules that communicate with the TCU.
 - If fault occurs, perform maintenance according to the procedure in the specific manual for the module that has the fault.
 - If the problem is not identified or if the problem persists, go to the next step.
-

B

Purpose: *Check if the problem is not in the TCU*

1. If with the previous procedures the problem is not identified and solved, perform a test if possible, changing the TCU to another one of a vehicle of the same model and configuration.
 - Then go to **Step V**.
-

V

Purpose: *Final check*

1. Key off.
2. Reconnect all connectors and make sure all components are fully installed.
3. Switch on and engine off.
4. Clean all fault codes using the "Diagnosis device".
5. If you have performed the TCU update, redo the grid, accelerometer, and Kiss Point learning procedure using the Diagnosis device.
6. Run with the vehicle if possible to verify that the system is functioning properly.
7. Check with the device for the same or other fault codes.
 - If the fault is active during the test, go to **Step A**.
 - If another fault code appears, see "SPN.FMI INDEX" on page III.
 - If no faults appear and the vehicle works perfectly, THE TEST IS COMPLETE.

Note: If the test was performed with the TCU of another vehicle replace it with a new one and repeat this procedure (V).

Engine Torque (Requested)

SPN.FMI: 512.02

Overview

The TCU monitors the communication in the CAN bus and evaluates the values of the different messages that travel through the bus. In case there is a missing or incorrect (requested) motor torque message, the fault is activated.

Detection

512.02 - Engine torque signal (requested) invalid.

Possible Causes

512.02

- The TCU receives an incorrect message or value outside the valid range.

Procedure

A

Purpose: *Check other modules*

1. With the help of the Diagnostics tool, check if there are no faults present in other modules that communicate with the TCU.
 - If fault occurs, perform maintenance according to the procedure in the specific manual for the module that has the fault.
 - If the problem is not identified or if the problem persists, go to the next step.
-

B

Purpose: *Check if the problem is not in the TCU*

1. If with the previous procedures the problem is not identified and solved, perform a test if possible, changing the TCU to another one of a vehicle of the same model and configuration.
 - Then go to **Step V**.
-

V

Purpose: *Final check*

1. Key off.
2. Reconnect all connectors and make sure all components are fully installed.
3. Switch on and engine off.
4. Clean all fault codes using the "Diagnosis device".
5. If you have performed the TCU update, redo the grid, accelerometer, and Kiss Point learning procedure using the Diagnosis device.
6. Run with the vehicle if possible to verify that the system is functioning properly.
7. Check with the device for the same or other fault codes.
 - If the fault is active during the test, go to **Step A**.
 - If another fault code appears, see "SPN.FMI INDEX" on page III.
 - If no faults appear and the vehicle works perfectly, THE TEST IS COMPLETE.

Note: If the test was performed with the TCU of another vehicle replace it with a new one and repeat this procedure (V).

Coolant Temperature

SPN.FMI: 110.02

Overview

The TCU monitors the communication in the CAN bus and evaluates the values of the different messages that travel through the bus. In case there is a message of the coolant temperature missing or incorrect, the fault is activated.

Detection

110.02 - Invalid coolant temperature signal.

Possible Causes

110.02

- The TCU receives an incorrect message or value outside the valid range.

Procedure

A

Purpose: *Check other modules*

1. With the help of the Diagnostics tool, check if there are no faults present in other modules that communicate with the TCU.
 - If fault occurs, perform maintenance according to the procedure in the specific manual for the module that has the fault.
 - If the problem is not identified or if the problem persists, go to the next step.
-

B

Purpose: *Check if the problem is not in the TCU*

1. If with the previous procedures the problem is not identified and solved, perform a test if possible, changing the TCU to another one of a vehicle of the same model and configuration.
 - Then go to **Step V.**
-

V

Purpose: *Final check*

1. Key off.
2. Reconnect all connectors and make sure all components are fully installed.
3. Switch on and engine off.
4. Clean all fault codes using the "Diagnosis device".
5. If you have performed the TCU update, redo the grid, accelerometer, and Kiss Point learning procedure using the Diagnosis device.
6. Run with the vehicle if possible to verify that the system is functioning properly.
7. Check with the device for the same or other fault codes.
 - If the fault is active during the test, go to **Step A.**
 - If another fault code appears, see "SPN.FMI INDEX" on page III.
 - If no faults appear and the vehicle works perfectly, THE TEST IS COMPLETE.

Note: If the test was performed with the TCU of another vehicle replace it with a new one and repeat this procedure (V).

Rear Axle Wheels Speed

SNI.FMI: 905.02 - 905.07

Overview

The TCU monitors communication on the CAN bus and evaluates the values of the different messages that travel over the bus. If there is a missing or incorrect rear axle speed message, the fault is activated.

Detection

905.02 -Rear axle speed signal not valid.

905.07 - Rear axle speed signal missing or inconsistent.

Possible Causes

905.02

- The TCU receives an incorrect or out of range message.

905.07

- Incoerência entre o sinal da velocidade do eixo traseiro e sinal da velocidade de transmissão.

Procedure

A

Purpose: *Check other modules*

1. With the aid of the Diagnose tool check that there are no faults present in other modules that communicate with the TCU.
 - If a failure occurs, perform maintenance according to the procedure in the manual specific to the failed module.
 - If the problem is not identified or the problem persists, continue to the next step.
-

B

Purpose: *Check other failures in the transmission system*

1. With the aid of the diagnostic tool check that there is no fault present in the transmission speed sensor by changing the sensor for another one.
 - Then go to **Step V.**
-

C

Purpose: *Verify that the problem is not in the TCU*

1. If with the previous procedures the problem is not identified and solved, perform a test if possible, replacing the TCU with another one of a vehicle of the same model and configuration.
 - Then go to **Step V.**
-

V

Purpose: *Final check*

1. Key off.
2. Reconnect all connectors and make sure all components are fully installed.
3. Switch on and engine off.
4. Clean all fault codes using the "Diagnosis device".
5. If you have performed the TCU update, redo the grid, accelerometer, and Kiss Point learning procedure using the Diagnosis device.
6. Run with the vehicle if possible to verify that the system is functioning properly.
7. Check with the device for the same or other fault codes.
 - If the fault is active during the test, go to **Step A.**
 - If another fault code appears, see "SPN.FMI INDEX" on page III.
 - If no faults appear and the vehicle works perfectly, THE TEST IS COMPLETE.

Note: If the test was performed with the TCU of another vehicle replace it with a new one and repeat this procedure (V).

Front Axle Wheels Speed

SNI.FMI: 904.02

Overview

The TCU monitors communication on the CAN bus and evaluates the values of the different messages that travel over the bus. If there is a missing or incorrect front axle speed message, the fault is activated.

Detection

904.02 - Front axle speed signal not valid.

Possible Causes

904.02

- The TCU receives an incorrect or out of range message.

Procedure

A

Purpose: *Check other modules*

1. With the aid of the Diagnose tool check that there are no faults present in other modules that communicate with the TCU.
 - If a failure occurs, perform maintenance according to the procedure in the manual specific to the failed module.
 - If the problem is not identified or the problem persists, continue to the next step.
-

B

Purpose: *Verify that the problem is not in the TCU*

1. If with the previous procedures the problem is not identified and solved, perform a test if possible, replacing the TCU with another one of a vehicle of the same model and configuration.
 - Then go to **Step V**.
-

V

Purpose: *Final check*

1. Key off.
2. Reconnect all connectors and make sure all components are fully installed.
3. Switch on and engine off.
4. Clean all fault codes using the "Diagnosis device".
5. If you have performed the TCU update, redo the grid, accelerometer, and Kiss Point learning procedure using the Diagnosis device.
6. Run with the vehicle if possible to verify that the system is functioning properly.
7. Check with the device for the same or other fault codes.
 - If the fault is active during the test, go to **Step A**.
 - If another fault code appears, see "SPN.FMI INDEX" on page III.
 - If no faults appear and the vehicle works perfectly, THE TEST IS COMPLETE.

Note: If the test was performed with the TCU of another vehicle replace it with a new one and repeat this procedure (V).

Brake Switch

SPN.FMI: 597.02

Overview

The TCU monitors the communication in the CAN bus and evaluates the values of the different messages that travel through the bus. In case there is a missing or incorrect brake switch message, fault is activated.

Detection

597.02 - Invalid brake switch signal.

Possible Causes

597.02

- The TCU receives an incorrect message or the value outside the valid range.

Procedure

A

Purpose: *Check other modules*

1. With the help of the Diagnostics tool, check if there are no faults present in other modules that communicate with the TCU.
 - If fault occurs, perform maintenance according to the procedure in the specific manual for the module that has the fault.
 - If the problem is not identified or if the problem persists, go to the next step.
-

B

Purpose: *Check if the problem is not in the TCU*

1. If with the previous procedures the problem is not identified and solved, perform a test if possible, changing the TCU to another one of a vehicle of the same model and configuration.
 - Then go to **Step V**.
-

V

Purpose: *Final check*

1. Key off.
2. Reconnect all connectors and make sure all components are fully installed.
3. Switch on and engine off.
4. Clean all fault codes using the "Diagnosis device".
5. If you have performed the TCU update, redo the grid, accelerometer, and Kiss Point learning procedure using the Diagnosis device.
6. Run with the vehicle if possible to verify that the system is functioning properly.
7. Check with the device for the same or other fault codes.
 - If the fault is active during the test, go to **Step A**.
 - If another fault code appears, see "SPN.FMI INDEX" on page III.
 - If no faults appear and the vehicle works perfectly, THE TEST IS COMPLETE.

Note: If the test was performed with the TCU of another vehicle replace it with a new one and repeat this procedure (V).

ASR Active Brake Control

SPN.FMI: 562.02

Overview

The TCU monitors the communication in the CAN bus and evaluates the values of the different messages that travel through the bus. In case there is missing or incorrect ASR active brake control message, fault is activated.

Detection

562.02 - Signal of active brake control ASR is invalid.

Possible Causes

562.02

- The TCU receives an incorrect message or the value outside the valid range.

Procedure

A

Purpose: *Check other modules*

1. With the help of the Diagnostics tool, check if there are no faults present in other modules that communicate with the TCU.
 - If fault occurs, perform maintenance according to the procedure in the specific manual for the module that has the fault.
 - If the problem is not identified or if the problem persists, go to the next step.
-

B

Purpose: *Check if the problem is not in the TCU*

1. If with the previous procedures the problem is not identified and solved, perform a test if possible, changing the TCU to another one of a vehicle of the same model and configuration.
 - Then go to **Step V**.
-

V

Purpose: *Final check*

1. Key off.
2. Reconnect all connectors and make sure all components are fully installed.
3. Switch on and engine off.
4. Clean all fault codes using the "Diagnosis device".
5. If you have performed the TCU update, redo the grid, accelerometer, and Kiss Point learning procedure using the Diagnosis device.
6. Run with the vehicle if possible to verify that the system is functioning properly.
7. Check with the device for the same or other fault codes.
 - If the fault is active during the test, go to **Step A**.
 - If another fault code appears, see "SPN.FMI INDEX" on page III.
 - If no faults appear and the vehicle works perfectly, THE TEST IS COMPLETE.

Note: If the test was performed with the TCU of another vehicle replace it with a new one and repeat this procedure (V).

ABS Active Anti Lock Brake System

SPN.FMI: 563.02

Overview

The TCU monitors the communication in the CAN bus and evaluates the values of the different messages that travel through the bus. In case there is message of active ABS anti-lock brake system missing or incorrect, fault is activated.

Detection

563.02 - Signal of anti-lock brake system ABS active invalid.

Possible Causes

563.02

- The TCU receives an incorrect message or the value outside the valid range.

Procedure

A

Purpose: *Check other modules*

1. With the help of the Diagnostics tool, check if there are no faults present in other modules that communicate with the TCU.
 - If fault occurs, perform maintenance according to the procedure in the specific manual for the module that has the fault.
 - If the problem is not identified or if the problem persists, go to the next step.
-

B

Purpose: *Check if the problem is not in the TCU*

1. If with the previous procedures the problem is not identified and solved, perform a test if possible, changing the TCU to another one of a vehicle of the same model and configuration.
 - Then go to **Step V**.
-

V

Purpose: *Final check*

1. Key off.
2. Reconnect all connectors and make sure all components are fully installed.
3. Switch on and engine off.
4. Clean all fault codes using the "Diagnosis device".
5. If you have performed the TCU update, redo the grid, accelerometer, and Kiss Point learning procedure using the Diagnosis device.
6. Run with the vehicle if possible to verify that the system is functioning properly.
7. Check with the device for the same or other fault codes.
 - If the fault is active during the test, go to **Step A**.
 - If another fault code appears, see "SPN.FMI INDEX" on page III.
 - If no faults appear and the vehicle works perfectly, THE TEST IS COMPLETE.

Note: If the test was performed with the TCU of another vehicle replace it with a new one and repeat this procedure (V).

Park Brake

SPN.FMI: 70.02

Overview

The TCU monitors the communication in the CAN bus and evaluates the values of the different messages that travel through the bus. In case there is missing or incorrect parking brake message, fault is activated.

Detection

70.02 - Invalid parking brake signal.

Possible Causes

70.02

- The TCU receives an incorrect message or the value outside the valid range.

Procedure

A

Purpose: *Check other modules*

1. With the help of the Diagnostics tool, check if there are no faults present in other modules that communicate with the TCU.
 - If fault occurs, perform maintenance according to the procedure in the specific manual for the module that has the fault.
 - If the problem is not identified or if the problem persists, go to the next step.
-

B

Purpose: *Check if the problem is not in the TCU*

1. If with the previous procedures the problem is not identified and solved, perform a test if possible, changing the TCU to another one of a vehicle of the same model and configuration.
 - Then go to **Step V**.
-

V

Purpose: *Final check*

1. Key off.
2. Reconnect all connectors and make sure all components are fully installed.
3. Switch on and engine off.
4. Clean all fault codes using the "Diagnosis device".
5. If you have performed the TCU update, redo the grid, accelerometer, and Kiss Point learning procedure using the Diagnosis device.
6. Run with the vehicle if possible to verify that the system is functioning properly.
7. Check with the device for the same or other fault codes.
 - If the fault is active during the test, go to **Step A**.
 - If another fault code appears, see "SPN.FMI INDEX" on page III.
 - If no faults appear and the vehicle works perfectly, THE TEST IS COMPLETE.

Note: If the test was performed with the TCU of another vehicle replace it with a new one and repeat this procedure (V).

Engine Torque Loss (Nominal Friction)

SNI.FMI: 514.02

Overview

The TCU monitors communication on the CAN bus and evaluates the values of the different messages that travel over the bus. If there is a missing or incorrect Engine Torque Loss message, the fault is activated.

Detection

514.02 - Engine torque loss signal not valid.

Possible Causes

514.02

- The TCU receives an incorrect or out of range message.

Procedure

A

Purpose: *Check other modules*

1. With the aid of the Diagnose tool check that there are no faults present in other modules that communicate with the TCU.
 - If a failure occurs, perform maintenance according to the procedure in the manual specific to the failed module.
 - If the problem is not identified or the problem persists, continue to the next step.
-

B

Purpose: *Verify that the problem is not in the TCU*

1. If with the previous procedures the problem is not identified and solved, perform a test if possible, replacing the TCU with another one of a vehicle of the same model and configuration.
 - Then go to **Step V**.
-

V

Purpose: *Final check*

1. Key off.
2. Reconnect all connectors and make sure all components are fully installed.
3. Switch on and engine off.
4. Clean all fault codes using the "Diagnosis device".
5. If you have performed the TCU update, redo the grid, accelerometer, and Kiss Point learning procedure using the Diagnosis device.
6. Run with the vehicle if possible to verify that the system is functioning properly.
7. Check with the device for the same or other fault codes.
 - If the fault is active during the test, go to **Step A**.
 - If another fault code appears, see "SPN.FMI INDEX" on page III.
 - If no faults appear and the vehicle works perfectly, THE TEST IS COMPLETE.

Note: If the test was performed with the TCU of another vehicle replace it with a new one and repeat this procedure (V).

Power Take-Off Drive Feedback

SNI.FMI: 3460.02

Overview

The TCU monitors communication on the CAN bus and evaluates the values of the different messages that travel over the bus. If there is a missing or incorrect PTO Drive Feedback message, the fault is activated.

Detection

3460.02 - PTO Drive Feedback signal not valid.

Possible Causes

3460.02

- The TCU receives an incorrect or out of range message.



Procedure

A

Purpose: *Check other modules*

1. With the aid of the Diagnose tool check that there are no faults present in other modules that communicate with the TCU.
 - If a failure occurs, perform maintenance according to the procedure in the manual specific to the failed module.
 - If the problem is not identified or the problem persists, continue to the next step.
-

B

Purpose: *Verify that the problem is not in the TCU*

1. If with the previous procedures the problem is not identified and solved, perform a test if possible, replacing the TCU with another one of a vehicle of the same model and configuration.
 - Then go to **Step V**.
-

V

Purpose: *Final check*

1. Key off.
2. Reconnect all connectors and make sure all components are fully installed.
3. Switch on and engine off.
4. Clean all fault codes using the "Diagnosis device".
5. If you have performed the TCU update, redo the grid, accelerometer, and Kiss Point learning procedure using the Diagnosis device.
6. Run with the vehicle if possible to verify that the system is functioning properly.
7. Check with the device for the same or other fault codes.
 - If the fault is active during the test, go to **Step A**.
 - If another fault code appears, see "SPN.FMI INDEX" on page III.
 - If no faults appear and the vehicle works perfectly, THE TEST IS COMPLETE.

Note: If the test was performed with the TCU of another vehicle replace it with a new one and repeat this procedure (V).

CAN Line

SPN.FMI: 639.11 - 639.19

Overview

The TCU monitors the lines on the CAN bus and each of the nodes present in the system to detect internal wiring problems to the modules, and the integrity of the messages on the CAN bus. In case there is a value outside the defined parameters or some fault line CAN it is activated.

Detection

639.11 - Loss of CAN bus.

639.19 - Internal verification of CAN communication.

Possible Causes

1/01/06

- CAN bus problems.

1/01/07

- Internal TCU failure.

Procedure

A

Purpose: *Check fault codes present*

1. Use the diagnostic tool to check for fault codes.
 - If 639.11 go to **Step B.**
 - If 639.19 go to **Step C.**

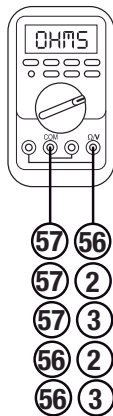
B

Purpose: *Check other circuits*



Caution: before checking make sure that the sensor and TCU connectors are disconnected.

Use a multimeter to check for continuity.



1. between pins 57 and 56 of connector B of the TCU.
2. between pins 57 and 2 of connector B of the TCU.
3. between pins 57 and 3 of connector B of the TCU.
4. between pins 56 and 2 of connector B of the TCU.

5. between pins 56 and 3 of connector B of the TCU.
 - If problem is identified, replace the harness and go to **Step V.**
 - Otherwise go to the next step.

C

Purpose: *Check if the problem is not in the TCU*

1. If with the previous procedures the problem is not identified and solved, perform a test if possible, changing the TCU to another one of a vehicle of the same model and configuration.
 - Then go to **Step V.**

V

Purpose: *Final check*

1. Key off.
2. Reconnect all connectors and make sure all components are fully installed.
3. Switch on and engine off.
4. Clean all fault codes using the "Diagnosis device".
5. If you have performed the TCU update, redo the grid, accelerometer, and Kiss Point learning procedure using the Diagnosis device.
6. Run with the vehicle if possible to verify that the system is functioning properly.
7. Check with the device for the same or other fault codes.
 - If the fault is active during the test, go to **Step A.**
 - If another fault code appears, see "SPN.FMI INDEX" on page III.
 - If no faults appear and the vehicle works perfectly, THE TEST IS COMPLETE.

Note: If the test was performed with the TCU of another vehicle replace it with a new one and repeat this procedure (V).

ABS Brake System

SNI.FMI: 2011.02

Overview

The TCU monitors the CAN bus and checks system CAN messages from the ABS control module or node. If there is a missing message ID or inconsistent message length, the system has this defect.

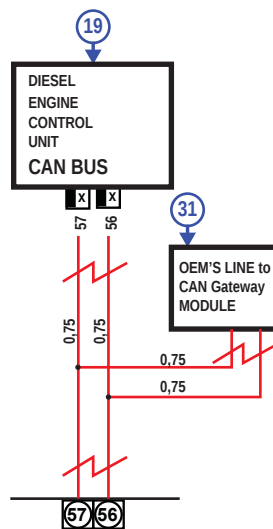
Detection

2011.02 - Missing message ID or inconsistent message length.

Possible Causes

2011.02

- Inactive module in the CAN network
- Message sending with wrong data length codes



Procedure

A

Purpose: *Check other modules*

1. With the aid of the Diagnose tool check that there are no faults present in other modules that communicate with the TCU.
 - If a failure occurs, perform maintenance according to the procedure in the manual specific to the failed module.
 - If the problem is not identified or the problem persists, continue to the next step.

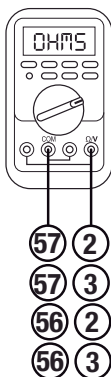
B

Purpose: *Check short circuits*



Caution: before checking make sure the sensor and TCU connectors are disconnected.

Using a multimeter check that there is no continuity.



1. between pins 57 and 2 of TCU connector B.
2. between pins 57 and 3 of TCU connector B.
3. between pins 56 and 2 of TCU connector B.

4. between pins 56 and 3 of TCU connector B.

- If the problem is identified, replace the harness and go to **Step V.**
- Otherwise go to the next step.

C

Purpose: *Verify that the problem is not in the TCU*

1. If with the previous procedures the problem is not identified and solved, perform a test if possible, replacing the TCU with another one of a vehicle of the same model and configuration.
 - If the problem persists go to **Step A.**
 - If the fault has been resolved, go to **Step V.**

V

Purpose: *Final check*

1. Key off.
2. Reconnect all connectors and make sure all components are fully installed.
3. Switch on and engine off.
4. Clean all fault codes using the "Diagnosis device".
5. If you have performed the TCU update, redo the grid, accelerometer, and Kiss Point learning procedure using the Diagnosis device.
6. Run with the vehicle if possible to verify that the system is functioning properly.
7. Check with the device for the same or other fault codes.
 - If the fault is active during the test, go to **Step A.**
 - If another fault code appears, see "SPN.FMI INDEX" on page III.
 - If no faults appear and the vehicle works perfectly, THE TEST IS COMPLETE.

Note: If the test was performed with the TCU of another vehicle replace it with a new one and repeat this procedure (V).

ECM Engine Control

SNI.FMI: 2000.02 - 2000.11

Overview

The TCU monitors the CAN bus and checks system CAN messages from the engine control module or node. If there is a missing message ID or inconsistent message length, the system has this defect.

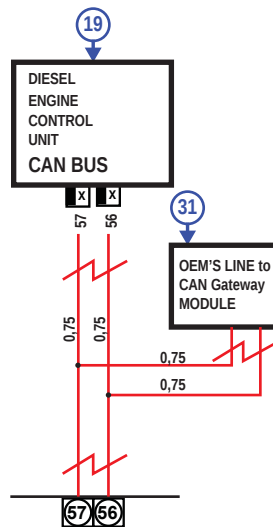
Detection

2000.02, 2000.11 - Missing message ID or shorter than expected.

Possible Causes

2000.02 - 2000.11

- Inactive module in the CAN network
- Message sending with wrong data length codes



Procedure

A

Purpose: *Check other modules*

1. With the aid of the Diagnose tool check that there are no faults present in other modules that communicate with the TCU.
 - If a failure occurs, perform maintenance according to the procedure in the manual specific to the failed module.
 - If the problem is not identified or the problem persists, continue to the next step.

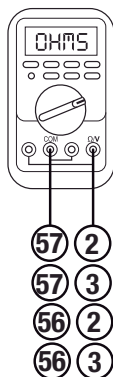
B

Purpose: *Check for short circuits*



Caution: before checking make sure that the sensor and TCU connectors are disconnected.

Use a multimeter to check for continuity.



1. between pins 57 and 2 of connector B of the TCU.
2. between pins 57 and 3 of connector B of the TCU.
3. between pins 56 and 2 of connector B of the TCU.

4. between pins 56 and 3 of connector B of the TCU.
 - If problem is identified, replace the harness and go to **Step V.**
 - Otherwise go to the next step.

C

Purpose: *Verify that the problem is not in the TCU*

1. If with the previous procedures the problem is not identified and solved, perform a test if possible, replacing the TCU with another one of a vehicle of the same model and configuration.
 - If the problem persists go to **Step A.**
 - If the fault has been resolved, go to **Step V.**

V

Purpose: *Final check*

1. Key off.
2. Reconnect all connectors and make sure all components are fully installed.
3. Switch on and engine off.
4. Clean all fault codes using the "Diagnosis device".
5. If you have performed the TCU update, redo the grid, accelerometer, and Kiss Point learning procedure using the Diagnosis device.
6. Run with the vehicle if possible to verify that the system is functioning properly.
7. Check with the device for the same or other fault codes.
 - If the fault is active during the test, go to **Step A.**
 - If another fault code appears, see "SPN.FMI INDEX" on page III.
 - If no faults appear and the vehicle works perfectly, THE TEST IS COMPLETE.

Note: If the test was performed with the TCU of another vehicle replace it with a new one and repeat this procedure (V).

Chassis Control System

SNI.FMI: 2033.02

Informações Gerais

The TCU monitors the CAN bus and checks system CAN messages from the Chassis Control System module or node. If there is a missing message ID or inconsistent message length, the system has this defect.

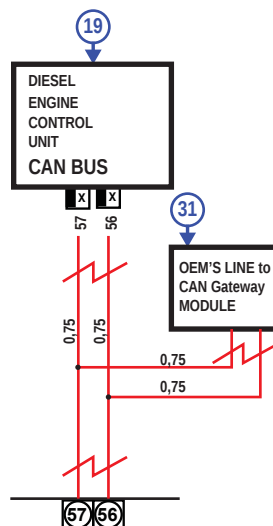
Códigos de Falhas

2033.02 - Missing message ID or shorter than expected.

Causas Possíveis

2033.02

- Inactive module in the CAN network
- Message sending with wrong data length codes



Procedure

A

Objetivo: *Check other modules*

1. With the aid of the Diagnose tool check that there are no faults present in other modules that communicate with the TCU.
 - If a failure occurs, perform maintenance according to the procedure in the manual specific to the failed module.
 - If the problem is not identified or the problem persists, continue to the next step.

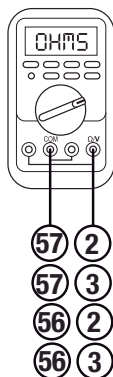
B

Objetivo: *Check short circuits*



Cuidado: before checking make sure that the sensor and TCU connectors are disconnected.

Use a multimeter to check for continuity.



1. between pins 57 and 2 of connector B of the TCU.
2. between pins 57 and 3 of connector B of the TCU.
3. between pins 56 and 2 of connector B of the TCU.

4. between pins 56 and 3 of connector B of the TCU.
 - If problem is identified, replace the harness and go to **Step V.**
 - Otherwise go to the next step.

C

Objetivo: *Verify that the problem is not in the TCU*

1. If with the previous procedures the problem is not identified and solved, perform a test if possible, replacing the TCU with another one of a vehicle of the same model and configuration.
 - If the problem persists go to **Step A.**
 - If the fault has been resolved, go to **Step V.**

V

Objetivo: *Final check*

1. Key off.
2. Reconnect all connectors and make sure all components are fully installed.
3. Switch on and engine off.
4. Clean all fault codes using the "Diagnosis device".
5. If you have performed the TCU update, redo the grid, accelerometer, and Kiss Point learning procedure using the Diagnosis device.
6. Run with the vehicle if possible to verify that the system is functioning properly.
7. Check with the device for the same or other fault codes.
 - If the fault is active during the test, go to **Step A.**
 - If another fault code appears, see "SPN.FMI INDEX" on page III.
 - If no faults appear and the vehicle works perfectly, THE TEST IS COMPLETE.

Nota: If the test was performed with the TCU of another vehicle replace it with a new one and repeat this procedure (V).

Coupling Selection Control System

SNI.FMI: 2005.02

Overview

The TCU monitors the CAN bus and checks system CAN messages from the Coupling Selection Control System module or node. If there is a missing message ID or inconsistent message length, the system has this defect.

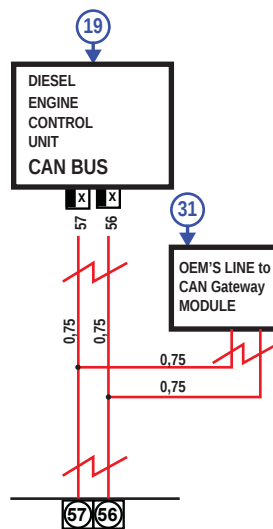
Detection

2005.02 - Missing message ID or shorter than expected.

Possible Causes

2005.02

- Inactive module in the CAN network
- Message sending with wrong data length codes



Procedure

A

Purpose: *Check other modules*

1. With the aid of the Diagnose tool check that there are no faults present in other modules that communicate with the TCU.
 - If a failure occurs, perform maintenance according to the procedure in the manual specific to the failed module.
 - If the problem is not identified or the problem persists, continue to the next step.

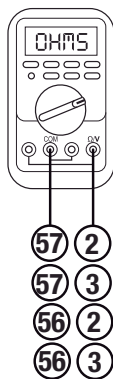
B

Purpose: *Check short circuits*



Caution: before checking make sure that the sensor and TCU connectors are disconnected.

Use a multimeter to check for continuity.



1. between pins 57 and 2 of connector B of the TCU.
2. between pins 57 and 3 of connector B of the TCU.
3. between pins 56 and 2 of connector B of the TCU.

4. between pins 56 and 3 of connector B of the TCU.
 - If problem is identified, replace the harness and go to **Step V.**
 - Otherwise go to the next step.

C

Purpose: *Verify that the problem is not in the TCU*

1. If with the previous procedures the problem is not identified and solved, perform a test if possible, replacing the TCU with another one of a vehicle of the same model and configuration.
 - If the problem persists return go to **Step A.**
 - If the fault has been resolved, go to **Step V.**

V

Purpose: *Final check*

1. Key off.
2. Reconnect all connectors and make sure all components are fully installed.
3. Switch on and engine off.
4. Clean all fault codes using the "Diagnosis device".
5. If you have performed the TCU update, redo the grid, accelerometer, and Kiss Point learning procedure using the Diagnosis device.
6. Run with the vehicle if possible to verify that the system is functioning properly.
7. Check with the device for the same or other fault codes.
 - If the fault is active during the test, go to **Step A.**
 - If another fault code appears, see "SPN.FMI INDEX" on page III.
 - If no faults appear and the vehicle works perfectly, THE TEST IS COMPLETE.

Note: If the test was performed with the TCU of another vehicle replace it with a new one and repeat this procedure (V).

Clutch Electrovalve EV0

SPN.FMI: 788.03 - 788.04 - 788.05 - 788.06 - 788.11

Overview

The TCU monitors the output circuits of the different actuators to check if there is any electrical problem in the system. In this case the monitored circuits correspond to the command of the EV0 clutch flow proportional electrovalve used to operate the hydraulic circuit, which in turn couples or disengages the clutch, and upon detecting something inappropriate the corresponding fault code will be activated.

Detection

788.03 - Short circuit fault to power supply on the high side or on the low side.

788.04 - Short circuit fault between low and high sides.

788.05 - Open circuit fault.

788.06 - Short circuit fault to the GND on the high side or on the low side.

788.11 - Generic error, failure not recognized.

Possible Causes

788.03

- Short circuit to power supply on the high side or on the low side.

788.04

- Short circuit between the low and high sides of the solenoid valve.

788.05

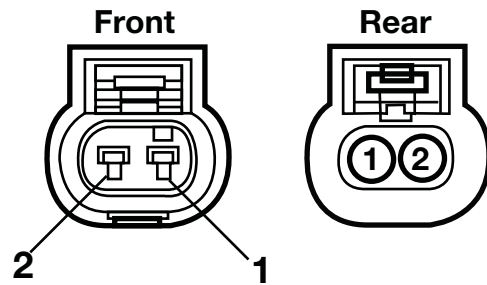
- Open circuit on the low side of the solenoid valve
- Open circuit on the high side of the solenoid valve

788.06

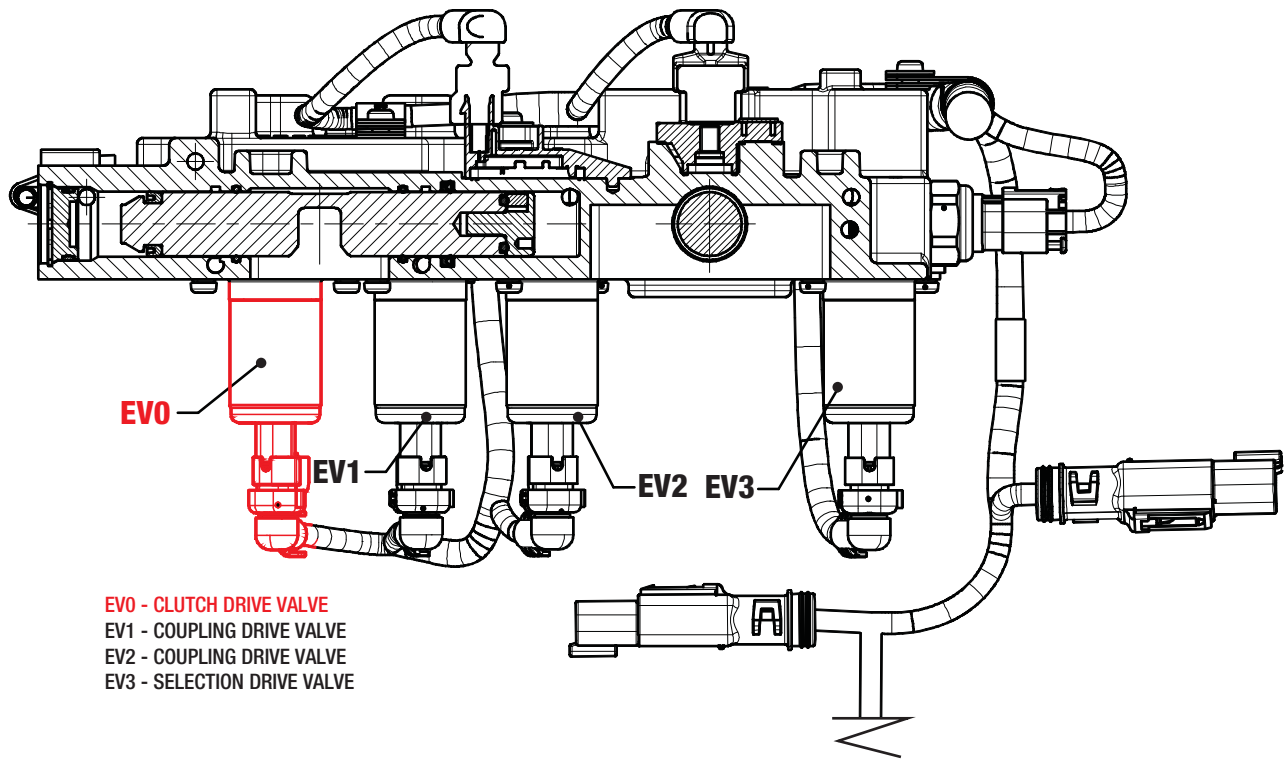
- Short circuit to GND on the high side or on the low side.

788.11

- The TCU module detects that the solenoid valve is not working properly, but the reason has not yet been determined.



Component Identification



Procedure

A

Purpose: *Check connectors and harness*

Check:

1. that there are no bent or broken pins.
2. that there are no open or loose terminals.
3. that no terminal is oxidized or damaged, has no moisture or is suspected of being over current or short circuit.
4. that there is no broken or damaged wire in the harness.
 - If an irregularity is verified carry out the change of the harness and go to **Step V.**
 - Otherwise go to the next step.

B

Purpose: *Check operation of Electrovalves*

Carry out activations, via service tool:

1. Activate the clutch actuator
2. Shift to any gear
 - If the actuating system works, go to **Step V.**
 - Otherwise go to the next step.

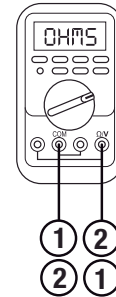
C

Purpose: *Check that there are no problems of continuity*



Caution: before checking make sure that the sensor and TCU connectors are disconnected.

With a multimeter check for continuity.



1. between pin 1 of the TCU connector and pin 2 of the solenoid valve connector.
2. between pin 2 of the TCU connector and pin 1 of the solenoid valve connector.
 - If continuity problems are verified, perform the harness change and go to **Step V.**
 - Otherwise go to the next step

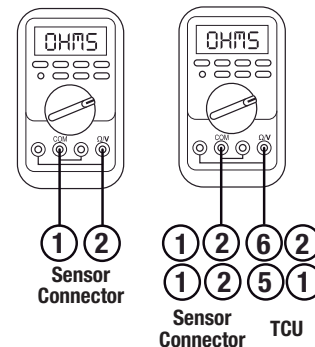
D

Purpose: *Check that there is not short circuits*



Caution: before checking make sure that the sensor and TCU connectors are disconnected.

With the aid of a multimeter check that there is no continuity



1. between pins 1 and 2 of the sensor connector.

2. between pins 1 or 2 of the sensor connector with pins 6 or 2 of the TCU (GND) connector.
3. between pins 1 or 2 of the sensor connector with pins 5 or 1 of the TCU connector (Vbat).
 - If it is verified that continuity exists in the above test, perform the harness change and go to **Step V.**
 - Otherwise go to the next step.

E

Purpose: *Check the electrovalve solenoid*

With the aid of a multimeter check that the solenoid

1. is not with the circuit open (infinite resistance between terminals 1 and 2).
2. not in short circuit (close to zero resistance between terminals 1 and 2).
3. not in short circuit to the positive of the battery (voltage around 24V between terminals 1 and 2 and GND).
4. is not in short circuit with GND (resistance close to zero between any of terminals 1 or 2 and GND).
 - If there is any problem, replace the solenoid valve and go to **Step V.**
 - Otherwise go to the next step.

F

Purpose: *Check if the problem is in the TCU*

1. If with the previous procedures the problem is not identified and solved, perform a test if possible, changing the TCU to another one of a vehicle of the same model and configuration.
 - After the replacement go to **Step V.**

V

Purpose: *Final check*

1. Key off.
2. Reconnect all connectors and make sure all components are fully installed.
3. Switch on and engine off.
4. Clean all fault codes using the "Diagnosis device".
5. If you have performed the TCU update, redo the grid, accelerometer, and Kiss Point learning procedure using the Diagnosis device.
6. Run with the vehicle if possible to verify that the system is functioning properly.
7. Check with the device for the same or other fault codes.
 - If the fault is active during the test, go to **Step A.**
 - If another fault code appears, see "SPN.FMI INDEX" on page III.
 - If no faults appear and the vehicle works perfectly, THE TEST IS COMPLETE.

Note: If the test was performed with the TCU of another vehicle replace it with a new one and repeat this procedure (V).

Coupling Electrovalve EV1

SPN.FMI: 773.03 - 773.04 - 773.05 - 773.06 - 773.11

Overview

The TCU monitors the output circuits of the different actuators to check if there is any electrical problem in the system. In this case the monitored circuits correspond to the command of the proportional coupling electrovalve EV1, used to operate the hydraulic circuit, which provides pressure for engaging the gears 1, 3 and 5 and when detecting an inappropriate signal voltage level the corresponding fault code will be activated.

Detection

773.03 - Short circuit fault to power supply on the high side or on the low side.

773.04 - Short circuit fault between low and high sides.

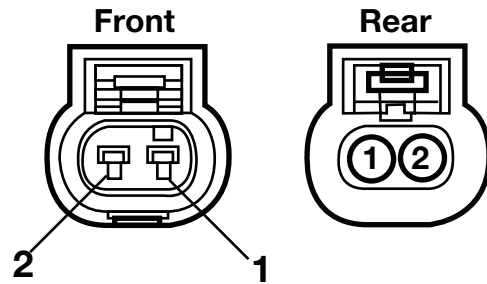
773.05 - Open circuit fault

773.06 - Short circuit fault to the GND on the high side or on the low side.

773.11 - Generic error, failure not recognized.

773.11

- The TCU module detects that the solenoid valve is not working properly, but the reason has not yet been determined.



Possible Causes

773.03

- Short circuit to power supply on the high side or on the low side.

773.04

- Short circuit between the low and high sides of the solenoid valve.

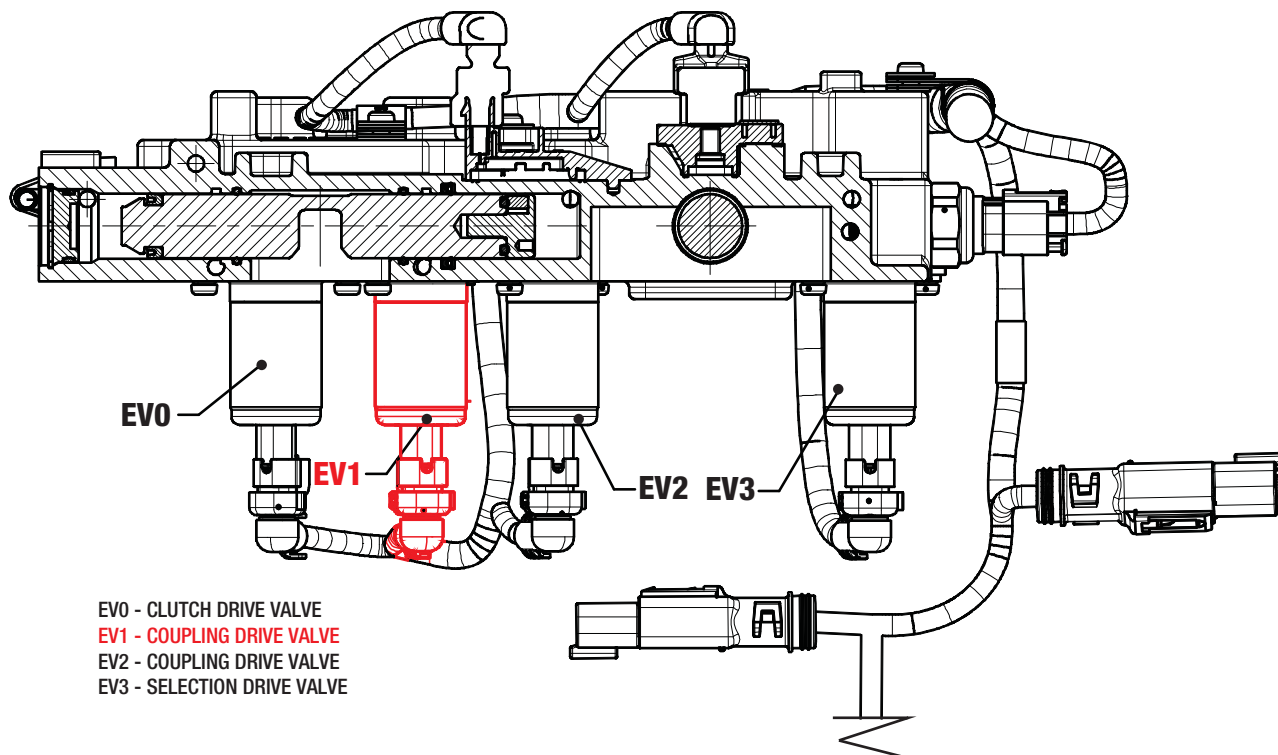
773.05

- Open circuit on the low side of the solenoid valve
- Open circuit on the high side of the solenoid valve

773.06

- Short circuit to GND on the high side or on the low side.

Component Identification



Procedure

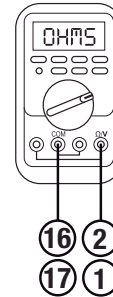
A

Purpose: Check connectors and harness

Check:

1. that there are no bent or broken pins.
2. that there are no open or loose terminals.
3. that no terminal is oxidized or damaged, has no moisture or is suspected of being over current or short circuit.
4. that there is no broken or damaged wire in the harness.
 - If an irregularity is verified carry out the change of the harness and go to **Step V.**
 - Otherwise go to the next step.

With a multimeter check for continuity.



1. between pin 16 of the TCU connector and pin 2 of the solenoid valve connector.
2. between pin 17 of the TCU connector and pin 1 of the solenoid valve connector.
 - If continuity problems are verified, perform the harness change and go to **Step V.**
 - Otherwise go to the next step

B

Purpose: Check operation of the Electrovalve

Carry out activations, via service tool:

1. Activate EV1 gear
2. Shift to any gear
 - If the actuating system works, go to **Step V.**
 - Otherwise go to the next step

D

Purpose: Check that there is not short circuits



Caution: before checking make sure that the sensor and TCU connectors are disconnected.

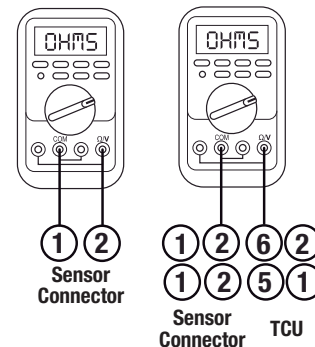
With the aid of a multimeter check that there is no continuity

C

Purpose: Check that there are no problems of continuity



Caution: before checking make sure that the sensor and TCU connectors are disconnected.



1. between pins 1 and 2 of the sensor connector.

2. between pins 1 or 2 of the sensor connector with pins 6 or 2 of the TCU (GND) connector.
3. between pins 1 or 2 of the sensor connector with pins 5 or 1 of the TCU connector (Vbat).
 - If it is verified that continuity exists in the above test, perform the harness change and go to **Step V.**
 - Otherwise go to the next step.

E

Purpose: *Check the electrovalve solenoid*

With the aid of a multimeter check that the solenoid

1. is not with the circuit open (infinite resistance between terminals 1 and 2).
2. not in short circuit (close to zero resistance between terminals 1 and 2).
3. not in short circuit to the positive of the battery (voltage around 24V between terminals 1 and 2 and GND).
4. is not in short circuit with GND (resistance close to zero between any of terminals 1 or 2 and GND).
 - If there is any problem, replace the solenoid valve and go to **Step V.**
 - Otherwise go to the next step.

F

Purpose: *Check if the problem is in the TCU*

1. If with the previous procedures the problem is not identified and solved, perform a test if possible, changing the TCU to another one of a vehicle of the same model and configuration.
 - After the replacement go to **Step V.**

V

Purpose: *Final check*

1. Key off.
2. Reconnect all connectors and make sure all components are fully installed.
3. Switch on and engine off.
4. Clean all fault codes using the "Diagnosis device".
5. If you have performed the TCU update, redo the grid, accelerometer, and Kiss Point learning procedure using the Diagnosis device.
6. Run with the vehicle if possible to verify that the system is functioning properly.
7. Check with the device for the same or other fault codes.
 - If the fault is active during the test, go to **Step A.**
 - If another fault code appears, see "SPN.FMI INDEX" on page III.
 - If no faults appear and the vehicle works perfectly, THE TEST IS COMPLETE.

Note: If the test was performed with the TCU of another vehicle replace it with a new one and repeat this procedure (V).

Coupling Electrovalve EV2

SPN.FMI: 784.03 - 784.04 - 784.05 - 784.06 - 784.11

Overview

The TCU monitors the output circuits of the different actuators to check if there is any electrical problem in the system. In this case, the monitored circuits correspond to the control of the proportional electrovalve of the coupling EV2, used to operate the hydraulic circuit, which provides pressure to engage the R, 2, 4 and 6 gears and to detect an inappropriate signal voltage level the code corresponding fault will be activated.

Detection

784.03 - Short circuit fault to power supply on the high side or on the low side.

784.04 - Short circuit fault between low and high sides.

784.05 - Open circuit fault

784.06 - Short circuit fault to the GND on the high side or on the low side.

784.11 - Generic error, failure not recognized.

Possible Causes

784.03

- Short circuit to power supply on the high side or on the low side.

784.04

- Short circuit between the low and high sides of the solenoid valve.

784.05

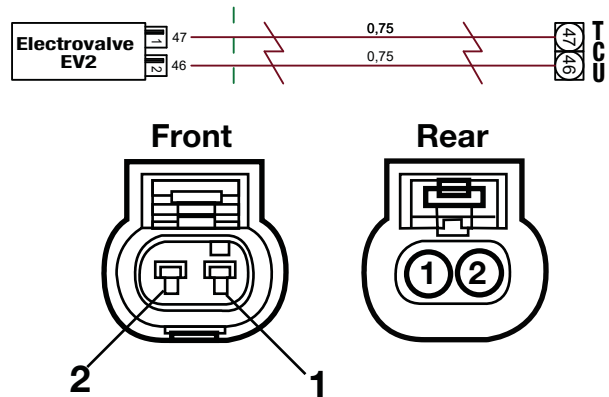
- Open circuit on the low side of the solenoid valve
- Open circuit on the high side of the solenoid valve

784.06

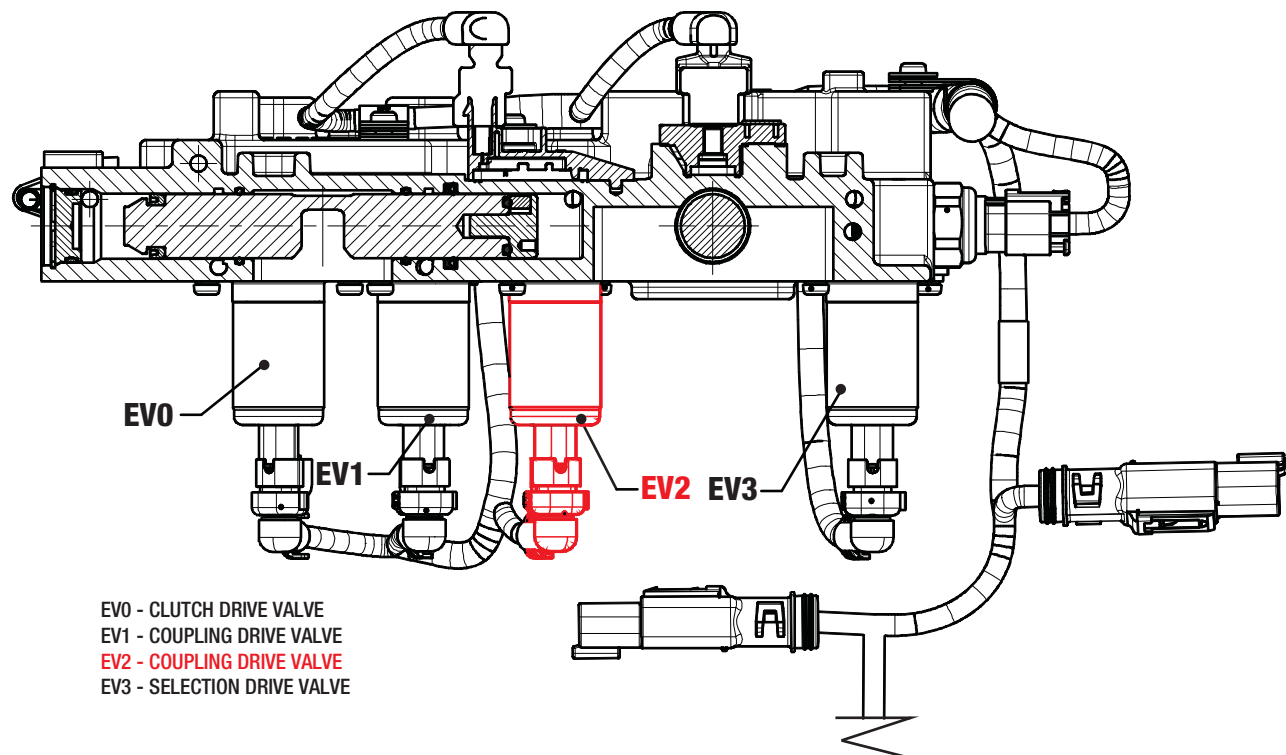
- Short circuit to GND on the high side or on the low side.

784.11

- The TCU module detects that the solenoid valve is not working properly, but the reason has not yet been determined.



Component Identification



Procedure

A

Purpose: Check connectors and harness

Check:

1. that there are no bent or broken pins.
2. that there are no open or loose terminals.
3. that no terminal is oxidized or damaged, has no moisture or is suspected of being over current or short circuit.
4. that there is no broken or damaged wire in the harness.
 - If an irregularity is verified carry out the change of the harness and go to **Step V**.
 - Otherwise go to the next step.

B

Purpose: Check operation of the Electrovalve

Carry out activations, via service tool:

Activate 250 psi
500 psi max

- If the actuating system works, go to **Step V**.
- Otherwise go to the next step

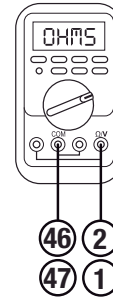
C

Purpose: Check that there are no problems of continuity



Caution: before checking make sure that the sensor and TCU connectors are disconnected.

With a multimeter check for continuity.



1. between pin 46 of the TCU connector and pin 2 of the solenoid valve connector.
2. between pin 47 of the TCU connector and pin 1 of the solenoid valve connector.
 - If continuity problems are verified, perform the harness change and go to **Step V**.
 - Otherwise go to the next step

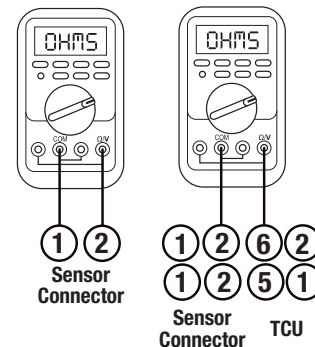
D

Purpose: Check that there is not short circuits



Caution: before checking make sure that the sensor and TCU connectors are disconnected.

With the aid of a multimeter check that there is no continuity



1. between pins 1 and 2 of the sensor connector.

2. between pins 1 or 2 of the sensor connector with pins 6 or 2 of the TCU (GND) connector.
3. between pins 1 or 2 of the sensor connector with pins 5 or 1 of the TCU connector (Vbat).
 - If it is verified that continuity exists in the above test, perform the harness change and go to **Step V.**
 - Otherwise go to the next step.

E

Purpose: *Check the electrovalve solenoid*

With the aid of a multimeter check that the solenoid

1. is not with the circuit open (infinite resistance between terminals 1 and 2).
2. not in short circuit (close to zero resistance between terminals 1 and 2).
3. not in short circuit to the positive of the battery (voltage around 24V between terminals 1 and 2 and GND).
4. is not in short circuit with GND (resistance close to zero between any of terminals 1 or 2 and GND).
 - If there is any problem, replace the solenoid valve and go to **Step V.**
 - Otherwise go to the next step.

F

Purpose: *Check if the problem is in the TCU*

1. If with the previous procedures the problem is not identified and solved, perform a test if possible, changing the TCU to another one of a vehicle of the same model and configuration.
 - After the replacement go to **Step V.**

V

Purpose: *Final check*

1. Key off.
2. Reconnect all connectors and make sure all components are fully installed.
3. Switch on and engine off.
4. Clean all fault codes using the "Diagnosis device".
5. If you have performed the TCU update, redo the grid, accelerometer, and Kiss Point learning procedure using the Diagnosis device.
6. Run with the vehicle if possible to verify that the system is functioning properly.
7. Check with the device for the same or other fault codes.
 - If the fault is active during the test, go to **Step A.**
 - If another fault code appears, see "SPN.FMI INDEX" on page III.
 - If no faults appear and the vehicle works perfectly, THE TEST IS COMPLETE.

Note: If the test was performed with the TCU of another vehicle replace it with a new one and repeat this procedure (V).

Selection Electrovalve EV3

SPN.FMI: 772.03 - 772.04 - 772.05 - 772.06 - 772.11

Overview

The TCU monitors the output circuits of the different actuators to check if there is any electrical problem in the system. In this case, the monitored circuits correspond to the control of the proportional electrovalve EV3, used to operate the hydraulic circuit, which provides pressure for engaging the Reverse, 1/2, 3/4 and 5/6 gears and detecting a level of the corresponding fault code will be activated.

Detection

772.03 - Short circuit fault to power supply on the high side or on the low side.

772.04 - Short circuit fault between low and high sides.

772.05 - Open circuit fault.

772.06 - Short circuit fault to the GND on the high side or on the low side.

772.11 - *Generic error, failure not recognized.*

Possible Causes

772.03

- Short circuit to power supply on the high side or on the low side.

772.04

- Short circuit between the low and high sides of the solenoid valve.

772.05

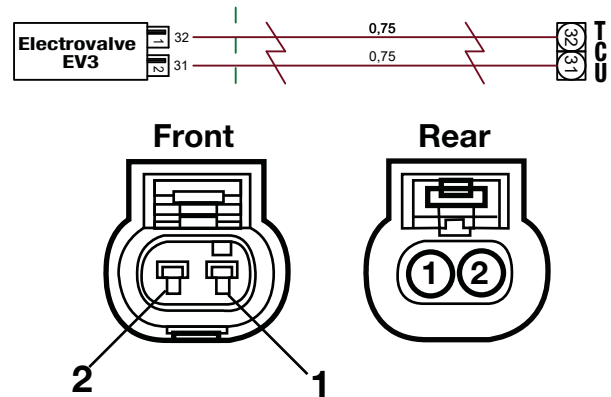
- Open circuit on the low side of the solenoid valve
- Open circuit on the high side of the solenoid valve

772.06

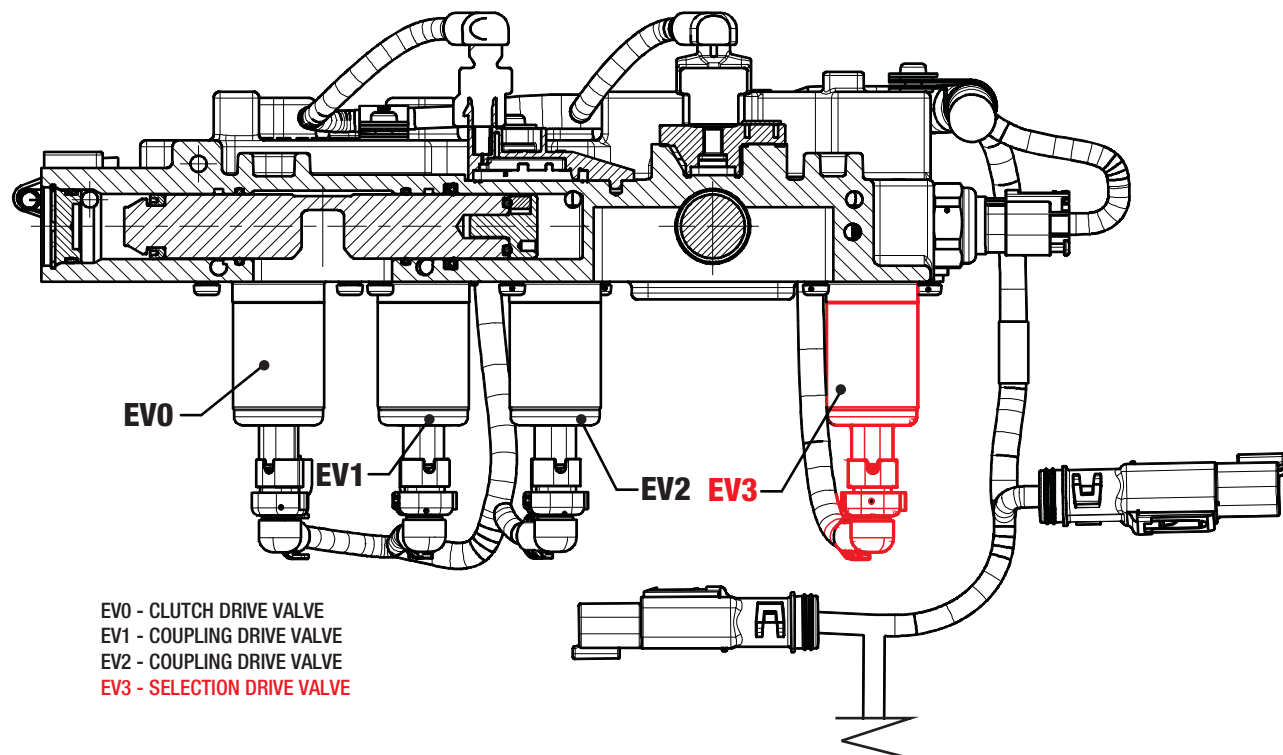
- Short circuit to GND on the high side or on the low side.

772.11

- The TCU module detects that the solenoid valve is not working properly, but the reason has not yet been determined.



Component Identification



Procedure

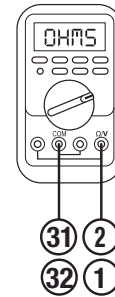
A

Purpose: Check connectors and harness

Check:

1. that there are no bent or broken pins.
2. that there are no open or loose terminals.
3. that no terminal is oxidized or damaged, has no moisture or is suspected of being over current or short circuit.
4. that there is no broken or damaged wire in the harness.
 - If an irregularity is verified carry out the change of the harness and go to **Step V.**
 - Otherwise go to the next step.

With a multimeter check for continuity.



1. between pin 31 of the TCU connector and pin 2 of the solenoid valve connector.
2. between pin 432 of the TCU connector and pin 1 of the solenoid valve connector.
 - If continuity problems are verified, perform the harness change and go to **Step V.**
 - Otherwise go to the next step

B

Purpose: Check operation of the Electrovalve

Carry out activations, via service tool:

1. Activate EV3 gear
2. Shift to any gear
 - If the actuating system works, go to **Step V.**
 - Otherwise go to the next step

D

Purpose: Check that there is not short circuits



Caution: before checking make sure that the sensor and TCU connectors are disconnected.

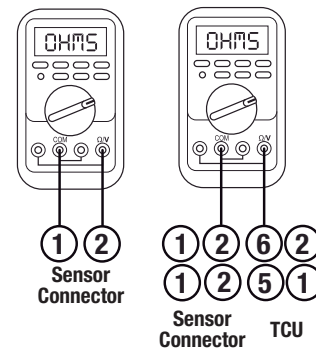
With the aid of a multimeter check that there is no continuity

C

Purpose: Check that there are no problems of continuity



Caution: before checking make sure that the sensor and TCU connectors are disconnected.



1. between pins 1 and 2 of the sensor connector.

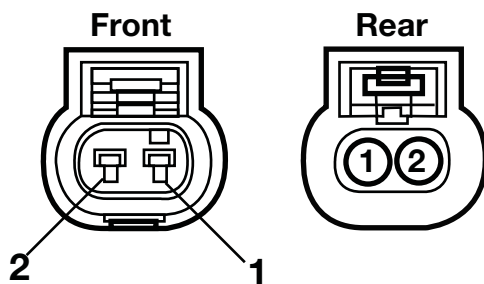
2. between pins 1 or 2 of the sensor connector with pins 6 or 2 of the TCU (GND) connector.
3. between pins 1 or 2 of the sensor connector with pins 5 or 1 of the TCU connector (Vbat).
 - If it is verified that continuity exists in the above test, perform the harness change and go to **Step V.**
 - Otherwise go to the next step.

E

Purpose: Check the electrovalve solenoid

With the aid of a multimeter check that the solenoid

1. is not with the circuit open (infinite resistance between terminals 1 and 2).
2. not in short circuit (close to zero resistance between terminals 1 and 2).
3. not in short circuit to the positive of the battery (voltage around 24V between terminals 1 and 2 and GND).
4. is not in short circuit with GND (resistance close to zero between any of terminals 1 or 2 and GND).



- If there is any problem, replace the solenoid valve and go to **Step V.**
- Otherwise go to the next step.

F

Purpose: Check if the problem is in the TCU

1. If with the previous procedures the problem is not identified and solved, perform a test if possible, changing the TCU to another one of a vehicle of the same model and configuration.
 - After the replacement go to **Step V.**

V

Purpose: Final check

1. Key off.
2. Reconnect all connectors and make sure all components are fully installed.
3. Switch on and engine off.
4. Clean all fault codes using the "Diagnosis device".
5. If you have performed the TCU update, redo the grid, accelerometer, and Kiss Point learning procedure using the Diagnosis device.
6. Run with the vehicle if possible to verify that the system is functioning properly.
7. Check with the device for the same or other fault codes.
 - If the fault is active during the test, go to **Step A.**
 - If another fault code appears, see "SPN.FMI INDEX" on page III.
 - If no faults appear and the vehicle works perfectly, THE TEST IS COMPLETE.

Note: If the test was performed with the TCU of another vehicle replace it with a new one and repeat this procedure (V).

Hydraulic Pump Motor

SPN.FMI: 701.05- 701.06 - 702.05 - 702.06 - 703.05 - 703.06- 1044.07

Overview

The TCU monitors the output circuits of each of the different actuators to check for any electrical problems in the system. In this case the monitored circuits correspond to the three phases of the brushless DC motor that acts on the system pressure pump.

The TCU performs continuous circuit diagnostics and, upon detecting an inadequate signal voltage level, the corresponding fault code will be activated.

Detection

701.05 - Open circuit on the U-phase.

701.06 - U-phase error on the high-side circuit or on low-side circuit or overload on U-phase signal.

702.05 - Open circuit on the V-phase.

702.06 - V-phase error on the high-side circuit or on low-side circuit or overload on V-phase signal.

703.05 - Open circuit on the W-phase.

703.06 - W-phase error on the high-side circuit or on low-side circuit or overload on W-phase signal.

1044.07 - Hydraulic pump locked.

Possible Causes

701.05

- Open circuit on the low or high side of the U-phase or motor U-phase or connector (motor side or TCU side)

701.06

- Electrical fault in the high side or low side circuit of U-phase or Overload in the U-phase signal caused by low resistance in phase or one of the circuits up to phase

702.05

- Open circuit on the low or high side of the V-phase or motor V-phase or connector (motor side or TCU side)

702.06

- Electrical fault in the high side or low side circuit of V-phase or Overload in the V-phase signal caused by low resistance in phase or one of the circuits up to phase

703.05

- Open circuit on the low or high side of the W-phase or motor W-phase or connector (motor side or TCU side)

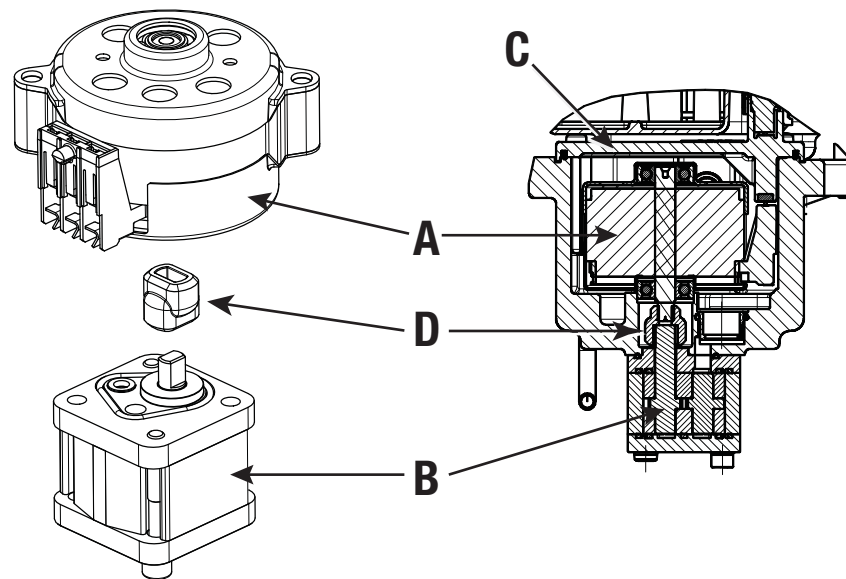
703.06

- Electrical fault in the high side or low side circuit of W-phase or Overload in the W-phase signal caused by low resistance in phase or one of the circuits up to phase

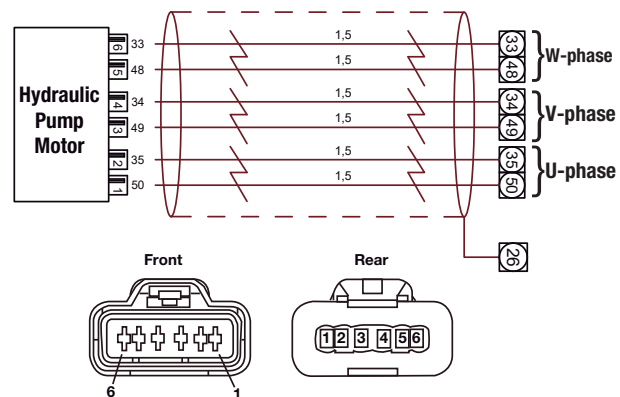
1044.07

- Mechanical blockage of the pump, caused by having the electric motor shaft locked, resulting in strong current increase in all phases.

Component Identification



- A.**Electric Motor
- B.**Hydraulic Pump
- C.**Oil Reservoir Cap
- D.**Plastic Coupling Bushing



Procedure

A

Purpose: *Check connectors and harness*

Check:

1. that there are no bent or broken pins.
2. that there are no open or loose terminals.
3. that no terminal is oxidized or damaged, has no moisture or is suspected of being over current or short circuit.
4. that there is no broken or damaged wire in the harness.
 - If an irregularity is verified carry out the change of the harness and go to **Step V.**
 - Otherwise go to the next step.

B

Purpose: *Check operation of the BLDC motor*

Carry out activations, via service tool:

1. Activate the BLDC motor
2. Shift to any gear
 - If the actuating system works, go to **Step V.**
 - Otherwise go to next step

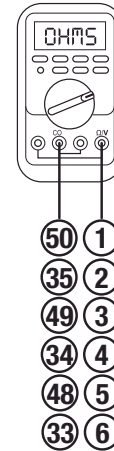
C

Purpose: *Check that there are no problems of continuity*



Caution: before checking make sure that the sensor and TCU connectors are disconnected.

With a multimeter check for continuity.



1. between pin 50 of the TCU connector and terminal 1 of the motor connector.
2. between pin 35 of the TCU connector and terminal 2 of the motor connector.
3. between pin 49 of the TCU connector and terminal 3 of the motor connector.
4. between pin 34 of the TCU connector and terminal 4 of the motor connector.
5. between pin 48 of the TCU connector and terminal 5 of the motor connector.
6. between pin 33 of the TCU connector and terminal 3 of the motor connector.
 - If continuity problems are verified, perform the harness change and go to **Step V.**
 - Otherwise go to next step

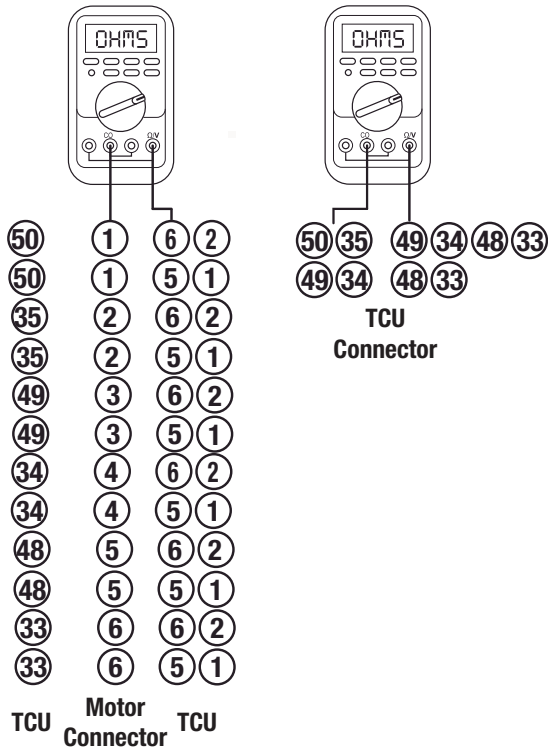
D

Purpose: *Check that there is not short circuits*



Caution: before checking make sure that the sensor and TCU connectors are disconnected.

With the aid of a multimeter check that there is no continuity



1. between terminal 50 of the TCU connector or terminal 1 of the motor connector (U-phase) and terminal 6 or 2 of the TCU connector.
2. between terminal 50 of the TCU connector or terminal 1 of the motor connector (U-phase) and terminal 5 or 1 of the TCU connector.
3. between terminal 35 of the TCU connector or terminal 2 of the motor connector (U-phase) and terminal 6 or 2 of the TCU connector.
4. between terminal 35 of the TCU connector or terminal 2 of the motor connector (U-phase) and terminal 5 or 1 of the TCU connector.
5. between terminal 49 of the TCU connector or terminal 3 of the motor connector (phase V) and terminal 6 or 2 of the TCU connector.
6. between terminal 49 of the TCU connector or terminal 3 of the motor connector (phase V) and terminal 5 or 1 of the TCU connector.
7. between terminal 34 of the TCU connector or terminal 4 of the motor connector (phase V) and terminal 6 or 2 of the TCU connector.
8. between terminal 34 of the TCU connector or terminal 4 of the motor connector (phase V) and terminal 5 or 1 of the TCU connector.

9. between terminal 48 of the TCU connector or terminal 5 of the motor connector (phase W) and terminal 6 or 2 of the TCU connector.
10. between terminal 48 of the TCU connector or terminal 5 of the motor connector (phase W) and terminal 5 or 1 of the TCU connector.
11. between terminal 33 of the TCU connector or terminal 6 of the motor connector (phase W) and terminal 6 or 2 of the TCU connector.
12. between terminal 33 of the TCU connector or terminal 6 of the motor connector (phase W) and terminal 5 or 1 of the TCU connector.
13. between the terminal 50 or 35 and the terminal 49, 34, 48 or 33 of the TCU connector.
14. between the terminal 49 or 34 and the terminal 48 or 33 of the TCU connector.
 - If continuity problems are verified, perform the harness change and go to **Step V**.
 - Otherwise go to next step

E

Purpose: Check that the motor coils are not totally or partially in short circuit

1. It does not have a low resistance between terminals 1 and 2 of the motor connector (U-phase totally or partially in short circuit).
2. It does not have a low resistance between terminals 3 and 4 of the motor connector V-phase totally or partially in short circuit).
3. Do not have a low resistance between terminals 5 and 6 of the motor connector (W-phase totally or partially in short circuit).
 - If there is any problem, replace the solenoid valve and go to **Step V**.
 - Otherwise go to next step.

F**Purpose:** *Check for mechanical problems*

1. Check that there are no mechanical blockages or friction in the rotation of the electric pump.
 - If any, replace the faulty element.
-

G**Purpose:** *Check if the problem is in the TCU*

1. If with the previous procedures the problem is not identified and solved, perform a test if possible, changing the TCU to another one of a vehicle of the same model and configuration.
 - After the replacement go to **Step V.**
-

V**Purpose:** *Final check*

1. Key off.
2. Reconnect all connectors and make sure all components are fully installed.
3. Switch on and engine off.
4. Clean all fault codes using the "Diagnosis device".
5. If you have performed the TCU update, redo the grid, accelerometer, and Kiss Point learning procedure using the Diagnosis device.
6. Run with the vehicle if possible to verify that the system is functioning properly.
7. Check with the device for the same or other fault codes.
 - If the fault is active during the test, go to **Step A.**
 - If another fault code appears, see "SPN.FMI INDEX" on page III.
 - If no faults appear and the vehicle works perfectly, THE TEST IS COMPLETE.

Note: If the test was performed with the TCU of another vehicle replace it with a new one and repeat this procedure (V).

Clutch

SPN.FMI: 33.07 - 33.10 - 33.11 - 522.00 - 522.07 - 740.07

Overview

The TCU monitors the variables and values of the system through the data received from the sensors, to detect mechanical or hydraulic failures of the components that form the exchange system. This defect occurs if there is a problem with the clutch.

Detection

33.07 - Clutch does not disengage prior to shifting.

33.10 - Coupling clutch during gear shift.

33.11 - Clutch control.

522.00 - Clutch overheating.

522.07 - Clutch slipping

740.07 - Clutch locked open.

Possible Causes

33.07

Damage to clutch / actuator / valve:

- Clutch Valve Locked
- Clutch Actuator Locked
- Clutch Diaphragm Locked

33.10

Damage to clutch / actuator / valve:

- Clutch valve jammed
- Clutch actuator jammed
- Oil leak in clutch actuator
- Clutch diaphragm stuck
- Clutch Position Sensor Magnet Off

33.11

Clutch engagement due to command failure (hydraulic or mechanical damage):

- Clutch Valve Locked
- Clutch Actuator Locked
- Oil leak in clutch actuator
- Clutch diaphragm stuck
- Clutch Position Sensor Magnet Off

522.00

- Slipping clutch over a long period

522.07

- Clutch or sensor problem

740.07

Clutch disengaged locked due to hydraulic or mechanical damage:

- Contamination of the clutch valve
- Inside clutch movement locked
- Clutch Actuator Locked
- Clutch sensor failure (signal locked within range)

Procedure

A**Purpose:** *Check other faults*

1. With the help of diagnostic equipment make sure that there are other SPN.FMI present in the system.
 - If there perform the diagnosis of these first.
 - Otherwise go to next step

B**Purpose:** *Check actuation of the clutch actuator*

Carry out activations, via service tool:

1. Activate the clutch actuator
2. Shift to any gear

*When performing the clutch activation test, fault code 33.08 may appear which must be ignored.

- If the actuating system works, go to **Step V.**
- Otherwise go to next step.

C**Purpose:** *Check the clutch position sensor*

1. Make sure that the sensor is not damaged and that it is properly installed, free and aligned.
 - If an irregularity is identified, proceed with the repositioning of the component correctly or with the replacement of the same and go to **Step V.**
 - Otherwise go to next step.

D**Purpose:** *Check the clutch electrovalve*

1. Check that the valve operates properly, frictionless, that it is not stuck, and there are no oil contaminations or foreign bodies in the clutch valve.
 - If an irregularity is identified, proceed with the replacement of the component and go to **Step V.**
 - Otherwise go to next step.

E**Purpose:** *Check the clutch actuator*

1. Verify that the actuator operates properly, frictionless, is not stuck, and there is no oil leakage or foreign matter in the clutch actuator.
 - If any irregularities are identified, proceed with the maintenance according to the Service Manual and go to **Step V.**
 - Otherwise go to next step.

F**Purpose:** *Inspect the clutch assembly*

Check:

1. that the clutch diaphragm operates correctly, without friction, and that none of the vanes are broken, damaged or deformed.
2. that the clutch disc has no damage to the friction surface, that it is not spinned or glazed.

-
3. that there are no rotating moving internal components in the clutch assembly that are stuck or frayed, or damaged, and that the clutch assembly rotates properly.
 - If any irregularities are identified, proceed with the maintenance according to the Service Manual and go to **Step V.**

V

Purpose: *Final check*

1. Key off.
2. Reconnect all connectors and make sure all components are fully installed.
3. Switch on and engine off.
4. Clean all fault codes using the "Diagnosis device".
5. If you have performed the TCU update, redo the grid, accelerometer, and Kiss Point learning procedure using the Diagnosis device.
6. Run with the vehicle if possible to verify that the system is functioning properly.
7. Check with the device for the same or other fault codes.
 - If the fault is active during the test, go to **Step A.**
 - If another fault code appears, see "SPN.FMI INDEX" on page III.
 - If no faults appear and the vehicle works perfectly, THE TEST IS COMPLETE.

Note: If the test was performed with the TCU of another vehicle replace it with a new one and repeat this procedure (V).

Gearbox

SPN.FMI: 525.07 - 560.00 - 560.07 - 560.11 - 560.13 - 574.07 - 574.10 - 574.11 - 574.14

Overview

The TCU monitors the variables and values of the system through the data received from the sensors, to detect mechanical or hydraulic failures of the components that form the gearbox system. This defect occurs if there is a problem with the exchange.

Detection

525.07 - Neutral Failure: When the gearbox has one or more gears engaged.

560.00 - Unintentional disengage

560.07 - Failure to disengage.

560.11 - Unintentional engage

560.13 - Pattern test failed.

574.07 - Selector blocked

574.10 - Excessive rotation of the clutch during gear engagement.

574.11 - Failure to engage

574.14 - Selection failure

Possible Causes

525.07

- Hydraulic or mechanical problem

560.00

- Gear retention fault
- Synchronized ring damaged

560.07

- Engage valve stuck
- engage actuator stuck
- Gear shaft or selector fork blocked
- Irregular clutch drag torque

560.11

- Selection Valve jammed by Contamination
- Reservoir pressure above or below nominal (breather clogged)
- Gearbox interior damaged
- Failure of the coupling sensor

560.13

- Hydraulic or mechanical problem

574.07

- Selection Valve jammed by Contamination
- Selection shaft moving parts locked
- Selection actuator stuck
- Selection sensor failure (unsteady signal)

574.10

- Fault in the actuator of selection by blocking
- Coupling valve blocked opened

574.11

- Engage actuator stuck
- Gear shaft or selector fork blocked
- Clutch drag torque
- Wear of the engage fork
- Synchronized ring damaged

574.14

- Selection Valve Blocked by Contamination
- Selection shaft moving parts locked
- Selection actuator stuck
- Selection sensor failure (unsteady signal)

Procedure

A

Purpose: *Check other faults*

1. With the help of diagnostic equipment make sure that there are other SPN.FMI present in the system.
 - If there perform the diagnosis of these first.
 - Otherwise go to next step
-

B

Purpose: *Check system operation*

1. Check for particulate matter in the TOSS sensor reading area, clean it.
*Do not use chemical product
Carry out activations, via service tool:
 2. Activate the clutch actuator
*When performing the clutch activation test, fault code 33.08 may appear which must be ignored.
 3. Shift to any gear
* In case of not completing the activation, check the #EVs
 4. Check for clearance in the bearing, remove the clutch actuator inspection cover, and with the vehicle in neutral accelerate, checking for vibration in the cylinder rod. If excessive vibration is found, check the bearing and if any irregularity is identified, replace it.
 - If the actuating system works as expected, go to **Step V.**
 - Otherwise go to next step.
-

C

Purpose: *Check sensors*

1. Check that the coupling sensor is not damaged and that it is correctly installed, free of gaps and aligned.
 2. Check that the selection sensor is not damaged and that it is correctly installed, free of gaps and aligned.
 - If an irregularity is identified, proceed with the repositioning of the component correctly or with the replacement of the same and go to **Step V.**
 - Otherwise go to next step.
-

D

Purpose: *Check electrovalves*

1. Check that the check valve operates properly, frictionless, that is not stuck, and does not leak.
 2. Check that the coupling valve operates properly, frictionless, that is not stuck, and does not leak.
 - If an irregularity is identified, proceed with the replacement of the component and go to **Step V.**
 - Otherwise go to next step.
-

E**Purpose:** *Check actuators*

1. Verify that the actuator engages properly, frictionless, that is not stuck.
2. Check that the selection actuator operates correctly, frictionless, and is not stuck.
 - If any irregularities are identified, proceed with the maintenance according to the Service Manual and go to **Step V.**
 - Otherwise go to next step.

F**Purpose:** *Inspect gearbox assembly*

Check:

1. that the shaft and the fork work properly, frictionlessly, and are not jammed or damaged.
2. that the fork has no wear, friction, damage and is not stuck.
3. that the selection axis operates correctly, without friction, and that it is not jammed or damaged.
4. that the synchronizer rings are not damaged.
5. that there is no internal damage to the gearbox.
 - If any irregularities are identified, proceed with the maintenance according to the Service Manual and go to **Step V.**

G**Purpose:** *Check the system pressure*

1. Check, with the aid of a pressure gauge, that the operating pressure is within tolerance.
 - If not checking that the tank breather is not damaged or clogged.
 - If any irregularities are identified, proceed with the maintenance according to the Service Manual and go to **Step V.**

V**Purpose:** *Final check*

1. Key off.
2. Reconnect all connectors and make sure all components are fully installed.
3. Switch on and engine off.
4. Clean all fault codes using the "Diagnosis device".
5. If you have performed the TCU update, redo the grid, accelerometer, and Kiss Point learning procedure using the Diagnosis device.
6. Run with the vehicle if possible to verify that the system is functioning properly.
7. Check with the device for the same or other fault codes.
 - If the fault is active during the test, go to **Step A.**
 - If another fault code appears, see "SPN.FMI INDEX" on page III.
 - If no faults appear and the vehicle works perfectly, THE TEST IS COMPLETE.

Note: If the test was performed with the TCU of another vehicle replace it with a new one and repeat this procedure (V).

Hydraulic Circuit

SPN.FMI: 785.14 - 1044.00 - 1044.16 - 1762.01 - 1762.10 - 1762.14

Overview

The TCU monitors the variables and values of the system through the data received from the sensors, to detect mechanical or hydraulic failures of the components that form the exchange system. This defect occurs if there is a problem with the hydraulic system operating the gear unit.

1762.14

- Hydraulic failure in the circuit (leakage from the high pressure side to reservoir)
- Solenoid Valve damaged or worn

Detection

785.14 - Bad use of the system.

1044.00 - Pump overheating

1044.16 - Running time of the pump reached.

1762.01 - Low pressure.

1762.10 - Discharged accumulator

1762.14 - Very large leakage

Possible Causes

785.14

- High number of manual gear shifting requests
- Or in automatic mode when the throttle is pressed and released continuously

1044.00

- Hydraulic failure in the circuit (leakage from the high pressure side to reservoir)
- Bad driver use

1044.16

- Low oil level
- Misuse of the system
- Damage to the pump

1762.01

- Very low oil level
- Check valve stuck open
- Breather valve stuck open
- Hydraulic failure in the circuit (leakage from the high pressure side to the reservoir)

1762.10

- Problems in the pressure accumulator

Procedure

A

Purpose: *Check the oil level*

1. Check that the oil level is within specification.
 - If necessary complete or drain the oil, and go to **Step V.**
 - Otherwise go to next step.

B

Purpose: *Check operation of the hydraulic system*

Carry out activations, via service tool:

1. Activate the BLDC motor
2. Shift to any gear
 - If the actuating system works, go to **Step V.**
 - Otherwise, check for the absence of active faults and go to the next step.
3. With the vehicle on and idling, check if the system performs the automatic activation of the BLDC pump in a period of time longer than 60 seconds.
 - If the system automatically pressurizes in a period longer than 60 seconds, go to **Step V.**
 - Otherwise, test electrovalves (check whether they are locked by activating EVs via service tool) and go to **Step D.**

C

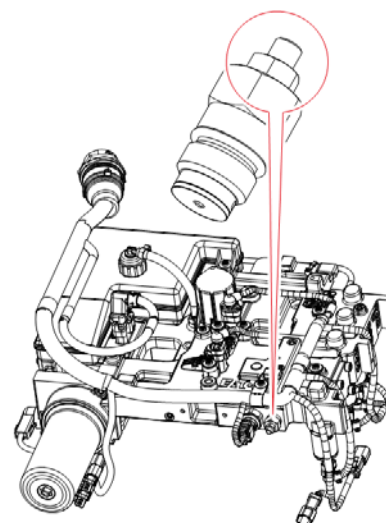
Purpose: *Check driver's use*

1. Check and ask if the driver is not using the system aggressively, operating with the lever in the manual mode when the system is in automatic mode, or if it makes constant changes in the pedal (fully depressed and released) for a long period .
 - If an irregularity is identified, walk a little with the truck in automatic mode and correctly (avoiding operations mentioned above). After walking with the truck go to **Step V.**
 - Otherwise go to next step.

D

Purpose: *Check valves*

1. Check that the electrovalves are not stuck, that they operate correctly, without friction, and that they are not damaged.
2. Check that the breather valve is stuck, operates properly, without friction, and is not damaged.
3. Check if the maximum pressure valve nut seal is broken. If the violation is confirmed, replace the maximum pressure valve.



-
4. Check that the valve solenoid is not damaged.
 - If an irregularity is identified, proceed with the replacement of the component and go to **Step V.**
 - Otherwise go to next step.

E

Purpose: *Check for leakages*

1. Check for leaks in the circuit or if the system accumulator is leaking or damaged.
2. Check if the pump is leaking, stuck, spinning or damaged.
3. Check with a pressure gauge for pressure leaks in the system and, if any, locate if there is a leak or sealing failure between the high pressure and low pressure side.
 - If any irregularities are identified, proceed with the maintenance according to the Service Manual and go to **Step V.**
 - Otherwise go to next step.

V

Purpose: *Final check*

1. Key off.
 2. Reconnect all connectors and make sure all components are fully installed.
 3. Switch on and engine off.
 4. Clean all fault codes using the "Diagnosis device".
 5. If you have performed the TCU update, redo the grid, accelerometer, and Kiss Point learning procedure using the Diagnosis device.
 6. Run with the vehicle if possible to verify that the system is functioning properly.
 7. Check with the device for the same or other fault codes.
 - If the fault is active during the test, go to **Step A.**
 - If another fault code appears, see "SPN.FMI INDEX" on page III.
 - If no faults appear and the vehicle works perfectly, THE TEST IS COMPLETE.
- Note:** If the test was performed with the TCU of another vehicle replace it with a new one and repeat this procedure (V).

Power Supply (2) 24 V

SPN.FMI: 627.04

Overview

The TCU monitors the supply voltage at terminal 4 of the 94-way vehicle side B connector, and if it is above the upper limit or below the lower limit with respect to the reference voltage (battery positive) the corresponding fault code is activated.

Detection

627.04 - Inadequate supply voltage

Possible Causes

627.04

- System harness compromised
- Bad contact in the power supply connector
- Fuse with bad contact or damage

Procedure

A

Purpose: *Check battery charge*

1. Make sure the vehicle's battery charge is at the proper level (between 18 and 32 Volts).
 - If it is not, recharge the battery or replace it, make sure the charge is appropriate and go to **Step V**.
 - If the charge is already at the appropriate level, go to the next step.

B

Purpose: *Check connectors, harness and fuses*

Check:

1. that there are no bent or broken pins.
2. that there are no open or loose terminals.
3. that no terminal is oxidized or damaged, has no moisture or is suspected of being over current or short circuit.
4. on the harness that there is no broken or damaged wire.
5. that there is no damaged fuse in system.
 - If an irregularity is verified, replace the harness or the fuse and go to **Step V**.
 - Otherwise go to next step.

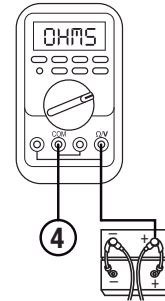
C

Purpose: *Check continuity problems*



Caution: before checking make sure that the sensor and TCU connectors are disconnected.

Use a multimeter to check for continuity.



1. between terminal 4 of the TCU connector and the battery positive.
 - If there is no continuity replace the harness and go to **Step V**.
 - Otherwise go to next step.

D

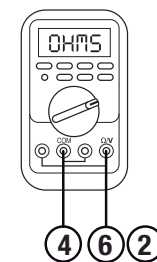
Purpose: *Check for short circuit problems*



Caution: before checking make sure that the sensor and TCU connectors are disconnected.

Using a multimeter, check that there is no continuity (short circuit).

1. between terminal 4 and terminal 6 or 2 of the TCU connector.



-
- If there is continuity replace the whip and go to **Step V.**
 - Otherwise go to next step.

E

Purpose: *Check if the problem is in the TCU*

1. If with the previous checks the defect is not found, perform a test with the TCU of another vehicle of the same model.
 - After the replacement go to the next step.
-

V

Purpose: *Final check*

1. Key off.
2. Reconnect all connectors and make sure all components are fully installed.
3. Switch on and engine off.
4. Clean all fault codes using the "Diagnosis device".
5. If you have performed the TCU update, redo the grid, accelerometer, and Kiss Point learning procedure using the Diagnosis device.
6. Run with the vehicle if possible to verify that the system is functioning properly.
7. Check with the device for the same or other fault codes.
 - If the fault is active during the test, go to **Step A.**
 - If another fault code appears, see "SPN.FMI INDEX" on page III.
 - If no faults appear and the vehicle works perfectly, THE TEST IS COMPLETE.

Note: If the test was performed with the TCU of another vehicle replace it with a new one and repeat this procedure (V).

Battery Voltages

SPN.FMI: 168.03 - 168.04 - 168.14

Overview

The TCU monitors the battery supply voltage, and if it is unsuitable the corresponding fault code is activated.

Detection

168.03 - Battery voltage above the upper limit.

168.04 - Battery voltage below the lower limit, making it impossible to change gears.

168.14 - Low battery voltage.

Possible Causes

168.03, 168.04, 168.14

- Battery discharged
- Alternator with malfunction
- Damaged accessory belt or pulley

Procedure

A

Purpose: *Check battery charge*

1. Make sure the vehicle's battery charge is at the proper level (between 18 and 32 Volts).
 - If it is not, recharge the battery or replace it, make sure the charge is appropriate and go to **Step V**.
 - If the charge is already at the appropriate level, go to the next step.
-

B

Purpose: *Check the charging system*

With the help of the correct tools, check:

1. the condition of the belt and pulley, and whether the alternator turns freely and without noise.
 2. which, with the engine on, charge is generated by the alternator.
 3. if the circuits from the alternator to the battery have continuity, they do not have high or short resistance to GND.
 - If the charging system is operating normally proceed to the next step.
-

C

Purpose: *Check if the problem is in the TCU*

1. If with the previous checks the defect is not found, perform a test with the TCU of another vehicle of the same model.
 - After the replacement go to the next step.
-

V

Purpose: *Final check*

1. Key off.
2. Reconnect all connectors and make sure all components are fully installed.
3. Switch on and engine off.
4. Clean all fault codes using the "Diagnosis device".
5. If you have performed the TCU update, redo the grid, accelerometer, and Kiss Point learning procedure using the Diagnosis device.
6. Run with the vehicle if possible to verify that the system is functioning properly.
7. Check with the device for the same or other fault codes.
 - If the fault is active during the test, go to **Step A**.
 - If another fault code appears, see "SPN.FMI INDEX" on page III.
 - If no faults appear and the vehicle works perfectly, THE TEST IS COMPLETE.

Note: If the test was performed with the TCU of another vehicle replace it with a new one and repeat this procedure (V).

Power Supply (3) 24 V

SPN.FMI: 1542.04

Overview

The TCU monitors the supply voltage at terminal 1 of the 94-way vehicle side B connector, and if it is above the upper limit or below the lower limit with respect to the reference voltage (battery positive) the corresponding fault code is activated.

Detection

1542.04 - Inadequate supply voltage or open circuit.

Possible Causes

1542.04

- System harness compromised
- Power supply connector with bad contact
- Fuse with bad contact or damaged

Procedure

A

Purpose: *Check battery charge*

1. Make sure the vehicle's battery charge is at the proper level (between 18 and 32 Volts).
 - If it is not, recharge the battery or replace it, make sure the charge is appropriate and go to **Step V**.
 - If the charge is already at the appropriate level, go to the next step.

B

Purpose: *Check connectors, harness and fuses*

Check:

1. that there are no bent or broken pins.
2. that there are no open or loose terminals.
3. that no terminal is oxidized or damaged, has no moisture or is suspected of being over current or short circuit.
4. on the harness that there is no broken or damaged wire.
5. that there is no damaged fuse in system.
 - If an irregularity is verified, replace the harness or the fuse and go to **Step V**.
 - Otherwise go to next step.

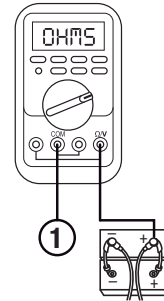
C

Purpose: *Check continuity problems*



Caution: before checking make sure that the sensor and TCU connectors are disconnected.

Use a multimeter to check for continuity.



1. between terminal 1 of the TCU connector and the battery positive.
 - If there is no continuity replace the harness and go to **Step V**.
 - Otherwise go to next step.

D

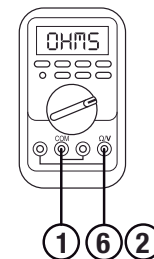
Purpose: *Check for short circuit problems*



Caution: before checking make sure that the sensor and TCU connectors are disconnected.

Using a multimeter, check that there is no continuity (short circuit).

1. between terminal 1 and terminal 6 or 2 of the TCU connector.



-
- If there is continuity replace the whip and go to **Step V.**
 - Otherwise go to next step.

E

Purpose: *Check if the problem is in the TCU*

1. If with the previous checks the defect is not found, perform a test with the TCU of another vehicle of the same model.
 - After the replacement go to the next step.
-

V

Purpose: *Final check*

1. Key off.
2. Reconnect all connectors and make sure all components are fully installed.
3. Switch on and engine off.
4. Clean all fault codes using the "Diagnosis device".
5. If you have performed the TCU update, redo the grid, accelerometer, and Kiss Point learning procedure using the Diagnosis device.
6. Run with the vehicle if possible to verify that the system is functioning properly.
7. Check with the device for the same or other fault codes.
 - If the fault is active during the test, go to **Step A.**
 - If another fault code appears, see "SPN.FMI INDEX" on page III.
 - If no faults appear and the vehicle works perfectly, THE TEST IS COMPLETE.

Note: If the test was performed with the TCU of another vehicle replace it with a new one and repeat this procedure (V).

Power Supply (4) 24 V

SPN.FMI: 1543.04

Overview

The TCU monitors the supply voltage at terminal 5 of the 94-way vehicle side B connector, and if it is above the upper limit or below the lower limit with respect to the reference voltage (battery positive) the corresponding fault code is activated.

Detection

1543.04 - Inadequate power supply voltage or open circuit

Possible Causes

1543.04

- System harness compromised
- Power supply connector with bad contact
- Fuse with bad contact or damaged

Procedure

A

Purpose: *Check battery charge*

1. Make sure the vehicle's battery charge is at the proper level (between 18 and 32 Volts).
 - If it is not, recharge the battery or replace it, make sure the charge is appropriate and go to **Step V**.
 - If the charge is already at the appropriate level, go to the next step.

B

Purpose: *Check connectors, harness and fuses*

Check:

1. that there are no bent or broken pins.
2. that there are no open or loose terminals.
3. that no terminal is oxidized or damaged, has no moisture or is suspected of being over current or short circuit.
4. on the harness that there is no broken or damaged wire.
5. that there is no damaged fuse in system.
 - If an irregularity is verified, replace the harness or the fuse and go to **Step V**.
 - Otherwise go to next step.

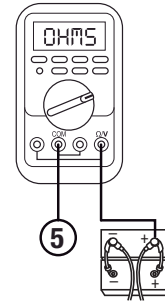
C

Purpose: *Check continuity problems*



Caution: before checking make sure that the sensor and TCU connectors are disconnected.

Use a multimeter to check for continuity.



1. between terminal 5 of the TCU connector and the battery positive.
 - If there is no continuity replace the harness and go to **Step V**.
 - Otherwise go to next step.

D

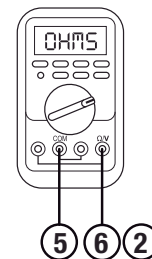
Purpose: *Check for short circuit problems*



Caution: before checking make sure that the sensor and TCU connectors are disconnected.

Using a multimeter, check that there is no continuity (short circuit).

1. between terminal 5 and terminal 6 or 2 of the TCU connector.



-
- If there is continuity replace the whip and go to **Step V.**
 - Otherwise go to next step.

E

Purpose: *Check if the problem is in the TCU*

1. If with the previous checks the defect is not found, perform a test with the TCU of another vehicle of the same model.
 - After the replacement go to the next step.
-

V

Purpose: *Final check*

1. Key off.
2. Reconnect all connectors and make sure all components are fully installed.
3. Switch on and engine off.
4. Clean all fault codes using the "Diagnosis device".
5. If you have performed the TCU update, redo the grid, accelerometer, and Kiss Point learning procedure using the Diagnosis device.
6. Run with the vehicle if possible to verify that the system is functioning properly.
7. Check with the device for the same or other fault codes.
 - If the fault is active during the test, go to **Step A.**
 - If another fault code appears, see "SPN.FMI INDEX" on page III.
 - If no faults appear and the vehicle works perfectly, THE TEST IS COMPLETE.

Note: If the test was performed with the TCU of another vehicle replace it with a new one and repeat this procedure (V).

Power Supply to GND (1)

SPN.FMI: 627.03

Overview

The TCU monitors the supply voltage at terminal 2 of the 94-way vehicle side B connector, and if it is above the upper limit or below the lower limit with respect to the reference voltage the corresponding fault code is activated.

Detection

627.03 - Open Circuit

Possible Causes

627.03

- Power supply connector with bad contact
- Fuse damaged

Procedure

A

Purpose: *Check battery charge*

1. Make sure the vehicle's battery charge is at the proper level (between 18 and 32 Volts).
 - If it is not, recharge the battery or replace it, make sure the charge is appropriate and go to **Step V**.
 - If the charge is already at the appropriate level, go to the next step.

B

Purpose: *Check connectors, harness and fuses*

Check:

1. that there are no bent or broken pins.
2. that there are no open or loose terminals.
3. that no terminal is oxidized or damaged, has no moisture or is suspected of being over current or short circuit.
4. on the harness that there is no broken or damaged wire.
5. that there is no damaged fuse in system.
 - If an irregularity is verified, replace the harness or the fuse and go to **Step V**.
 - Otherwise go to next step.

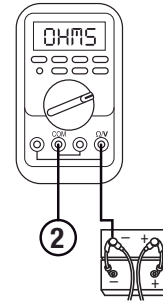
C

Purpose: *Check continuity problems*



Caution: before checking make sure that the sensor and TCU connectors are disconnected.

Use a multimeter to check for continuity.



1. between terminal 2 of the TCU connector and the battery positive.
 - If there is no continuity replace the harness and go to **Step V**.
 - Otherwise go to next step.

D

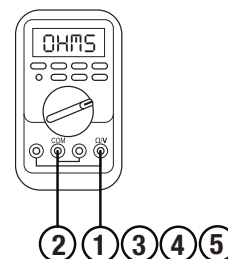
Purpose: *Check for short circuit problems*



Caution: before checking make sure that the sensor and TCU connectors are disconnected.

Using a multimeter, check that there is no continuity (short circuit).

1. between terminal 2 and terminal 1 or 3 or 4 or 5 of the TCU connector.



-
- If there is continuity replace the whip and go to **Step V.**
 - Otherwise go to next step.

E

Purpose: *Check if the problem is in the TCU*

1. If with the previous checks the defect is not found, perform a test with the TCU of another vehicle of the same model.
 - After the replacement go to the next step.
-

V

Purpose: *Final check*

1. Key off.
2. Reconnect all connectors and make sure all components are fully installed.
3. Switch on and engine off.
4. Clean all fault codes using the "Diagnosis device".
5. If you have performed the TCU update, redo the grid, accelerometer, and Kiss Point learning procedure using the Diagnosis device.
6. Run with the vehicle if possible to verify that the system is functioning properly.
7. Check with the device for the same or other fault codes.
 - If the fault is active during the test, go to **Step A.**
 - If another fault code appears, see "SPN.FMI INDEX" on page III.
 - If no faults appear and the vehicle works perfectly, THE TEST IS COMPLETE.

Note: If the test was performed with the TCU of another vehicle replace it with a new one and repeat this procedure (V).

Power Supply to GND (2)

SPN.FMI: 1542.03

Overview

The TCU monitors the supply voltage at terminal 6 of the 94-way vehicle side B connector, and if it is above the upper limit or below the lower limit with respect to the reference voltage the corresponding fault code is activated.

Detection

1542.03 - Open Circuit

Possible Causes

1542.03

- Power supply connector with bad contact
- System harness compromised

Procedure

A

Purpose: *Check battery charge*

1. Make sure the vehicle's battery charge is at the proper level (between 18 and 32 Volts).
 - If it is not, recharge the battery or replace it, make sure the charge is appropriate and go to **Step V**.
 - If the charge is already at the appropriate level, go to the next step.

B

Purpose: *Check connectors, harness and fuses*

Check:

1. that there are no bent or broken pins.
2. that there are no open or loose terminals.
3. that no terminal is oxidized or damaged, has no moisture or is suspected of being over current or short circuit.
4. on the harness that there is no broken or damaged wire.
5. that there is no damaged fuse in system.
 - If an irregularity is verified, replace the harness or the fuse and go to **Step V**.
 - Otherwise go to next step.

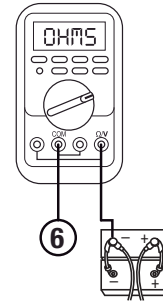
C

Purpose: *Check continuity problems*



Caution: before checking make sure that the sensor and TCU connectors are disconnected.

Use a multimeter to check for continuity.



1. between terminal 6 of the TCU connector and the battery positive.
 - If there is no continuity replace the harness and go to **Step V**.
 - Otherwise go to next step.

D

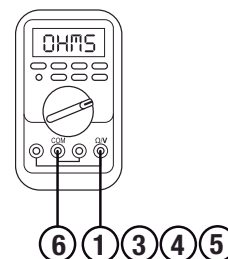
Purpose: *Check for short circuit problems*



Caution: before checking make sure that the sensor and TCU connectors are disconnected.

Using a multimeter, check that there is no continuity (short circuit).

1. between terminal 6 and terminal 1 or 3 or 4 or 5 of the TCU connector.



-
- If there is continuity replace the whip and go to **Step V.**
 - Otherwise go to next step.

E

Purpose: *Check if the problem is in the TCU*

1. If with the previous checks the defect is not found, perform a test with the TCU of another vehicle of the same model.
 - After the replacement go to the next step.
-

V

Purpose: *Final check*

1. Key off.
2. Reconnect all connectors and make sure all components are fully installed.
3. Switch on and engine off.
4. Clean all fault codes using the "Diagnosis device".
5. If you have performed the TCU update, redo the grid, accelerometer, and Kiss Point learning procedure using the Diagnosis device.
6. Run with the vehicle if possible to verify that the system is functioning properly.
7. Check with the device for the same or other fault codes.
 - If the fault is active during the test, go to **Step A.**
 - If another fault code appears, see "SPN.FMI INDEX" on page III.
 - If no faults appear and the vehicle works perfectly, THE TEST IS COMPLETE.

Note: If the test was performed with the TCU of another vehicle replace it with a new one and repeat this procedure (V).

ROM Memory

SPN.FMI: 628.12

Overview

The TCU monitors the verification data to see if the module's ROM is damaged or corrupted.

Detection

628.12 - Change of data.

Possible Causes

628.12

- Power supply failure during software update download
- Module damaged

Procedure

A

Purpose: *Check battery charge*

1. Make sure the vehicle's battery charge is at the proper level (between 18 and 32 Volts).
 - If it is not, recharge the battery or replace it, make sure the charge is appropriate and go to **Step V.**
 - If the charge is already at the appropriate level, go to the next step.
-

B

Purpose: *Update the TCU*

1. After making sure the battery is properly charged, try upgrading the module again with the help of the tool.
 - If you can upgrade, go to **Step V.**
 - Otherwise go to next step
-

C

Purpose: *Replace the TCU*

1. If it is not possible to complete the procedure and it is impossible to recover the module, proceed with its replacement due to an internal defect.

It is indicated to test the vehicle with a "Slave" TCU or with one used on a vehicle without any fault.

The test:

1. Replace the TCU in the vehicle "Without doing any reprogramming", if it returns to normal operation without failure, return the original TCU.
 2. Clear all the fault codes using the "diagnostic tool" and repeat the test, if the faults appear again, and the vehicle presents the same faults, replace the TCU and go to **Etapas V.**
-

V

Purpose: *Final check*

1. Key off.
2. Reconnect all connectors and make sure all components are fully installed.
3. Switch on and engine off.
4. Clean all fault codes using the "Diagnosis device".
5. If you have performed the TCU update, redo the grid, accelerometer, and Kiss Point learning procedure using the Diagnosis device.
6. Run with the vehicle if possible to verify that the system is functioning properly.
7. Check with the device for the same or other fault codes.
 - If the fault is active during the test, go to **Step A.**
 - If another fault code appears, see "SPN.FMI INDEX" on page III.
 - If no faults appear and the vehicle works perfectly, THE TEST IS COMPLETE.

Note: If the test was performed with the TCU of another vehicle replace it with a new one and repeat this procedure (V).

RAM Memory

SPN.FMI: 630.12

Overview

The TCU monitors the integrity of the module's RAM cell to see if it is damaged or corrupted.

Detection

630.12 - Change of data

Possible Causes

630.12

- Module internally damaged

Procedure

A

Purpose: *Check battery charge*

1. Make sure the vehicle's battery charge is at the proper level (between 18 and 32 Volts).
 - If it is not, recharge the battery or replace it, make sure the charge is appropriate and go to **Step V.**
 - If the charge is already at the appropriate level, go to the next step.
-

B

Purpose: *Erase the fault*

1. After making sure that the battery is properly charged, try to clear the defect with the aid of the diagnostic tool.
 - If you can erase, go to **Step V.**
 - Otherwise go to next step
-

C

Purpose: *Replace the TCU*

1. If it is not possible to complete the procedure and it is impossible to recover the module, proceed with its replacement due to an internal defect.

É indicado testar o veículo com uma TCU "Escrava" ou de um veículo sem falha.

Do teste:

1. Substitua a TCU no veículo "Sem fazer qualquer reprogramação", caso volte a operar normalmente sem falha, retorne a TCU original.
 2. Limpe todos os códigos de falhas utilizando o "aparelho de diagnose" e volte a testar, caso as falhas voltem aparece, e o veículo volte a apresentar as mesmas falhas, realize a substituição da TCU vá para **Etapa V.**
-

V

Purpose: *Final check*

1. Key off.
2. Reconnect all connectors and make sure all components are fully installed.
3. Switch on and engine off.
4. Clean all fault codes using the "Diagnosis device".
5. If you have performed the TCU update, redo the grid, accelerometer, and Kiss Point learning procedure using the Diagnosis device.
6. Run with the vehicle if possible to verify that the system is functioning properly.
7. Check with the device for the same or other fault codes.
 - If the fault is active during the test, go to **Step A.**
 - If another fault code appears, see "SPN.FMI INDEX" on page III.
 - If no faults appear and the vehicle works perfectly, THE TEST IS COMPLETE.

Note: If the test was performed with the TCU of another vehicle replace it with a new one and repeat this procedure (V).

EEPROM Memory

SPN.FMI: 2802.12

Overview

The TCU monitors the data to see if the module's EEPROM memory is corrupted or corrupted.

Detection

2802.12 - Grid data values changed or Changing of system auto-adjust values.

Possible Causes

2802.12

- Power supply failure during data storage
- Module internally damaged

Procedure

A

Purpose: *Check battery charge*

1. Make sure the vehicle's battery charge is at the proper level (between 18 and 32 Volts).
 - If it is not, recharge the battery or replace it, make sure the charge is appropriate and go to **Step V.**
 - If the charge is already at the appropriate level, go to the next step.
-

B

Purpose: *Update the TCU*

1. After making sure the battery is properly charged, try upgrading the module again with the help of the tool.
 - If you can upgrade, go to **Step V.**
 - Otherwise go to next step
-

C

Purpose: *Replace the TCU*

1. If it is not possible to complete the procedure and it is impossible to recover the module, proceed with its replacement due to an internal defect.

É indicado testar o veículo com uma TCU "Escrava" ou de um veículo sem falha.

Do teste:

1. Substitua a TCU no veículo "Sem fazer qualquer reprogramação", caso volte a operar normalmente sem falha, retorne a TCU original.
 2. Limpe todos os códigos de falhas utilizando o "aparelho de diagnose" e volte a testar, caso as falhas voltem aparece, e o veículo volte a apresentar as mesmas falhas, realize a substituição da TCU vá para **Etapa V.**
-

V

Purpose: *Final check*

1. Key off.
2. Reconnect all connectors and make sure all components are fully installed.
3. Switch on and engine off.
4. Clean all fault codes using the "Diagnosis device".
5. If you have performed the TCU update, redo the grid, accelerometer, and Kiss Point learning procedure using the Diagnosis device.
6. Run with the vehicle if possible to verify that the system is functioning properly.
7. Check with the device for the same or other fault codes.
 - If the fault is active during the test, go to **Step A.**
 - If another fault code appears, see "SPN.FMI INDEX" on page III.
 - If no faults appear and the vehicle works perfectly, THE TEST IS COMPLETE.

Note: If the test was performed with the TCU of another vehicle replace it with a new one and repeat this procedure (V).

Electrovalves Controller

SPN.FMI: 785.12

Overview

The TCU monitors the internal controller of the system's solenoid valves for damage or corruption.

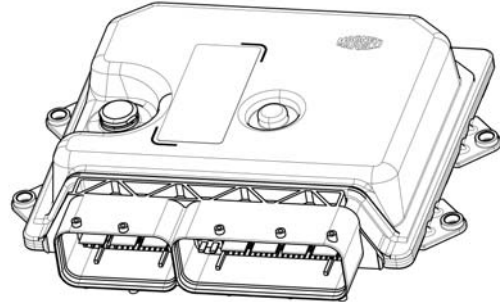
Detection

785.12 - Lost communication, Module defect, Voltage below the lower limit.

Possible Causes

785.12

- SPI communication failed
- Driver software update unsuccessful
- Low Voltage Controller Problems
- Problems in the external controller oscillator (internal fault)



Procedure

A

Purpose: *Check battery charge*

1. Make sure the vehicle's battery charge is at the proper level (between 18 and 32 Volts).
 - If it is not, recharge the battery or replace it, make sure the charge is appropriate and go to **Step V.**
 - If the charge is already at the appropriate level, go to the next step.
-

B

Purpose: *Update the TCU*

1. After making sure the battery is properly charged, try upgrading the module again with the help of the tool.
 - If you can upgrade, go to **Step V.**
 - Otherwise go to next step
-

C

Purpose: *Replace the TCU*

1. If it is not possible to complete the procedure and it is impossible to recover the module, proceed with its replacement due to an internal defect.

É indicado testar o veículo com uma TCU "Escrava" ou de um veículo sem falha.

Do teste:

1. Substitua a TCU no veículo "Sem fazer qualquer reprogramação", caso volte a operar normalmente sem falha, retorne a TCU original.
 2. Limpe todos os códigos de falhas utilizando o "aparelho de diagnose" e volte a testar, caso as falhas voltem aparece, e o veículo volte a apresentar as mesmas falhas, realize a substituição da TCU vá para **Etapa V.**
-

V

Purpose: *Final check*

1. Key off.
2. Reconnect all connectors and make sure all components are fully installed.
3. Switch on and engine off.
4. Clean all fault codes using the "Diagnosis device".
5. If you have performed the TCU update, redo the grid, accelerometer, and Kiss Point learning procedure using the Diagnosis device.
6. Run with the vehicle if possible to verify that the system is functioning properly.
7. Check with the device for the same or other fault codes.
 - If the fault is active during the test, go to **Step A.**
 - If another fault code appears, see "SPN.FMI INDEX" on page III.
 - If no faults appear and the vehicle works perfectly, THE TEST IS COMPLETE.

Note: If the test was performed with the TCU of another vehicle replace it with a new one and repeat this procedure (V).

Hydraulic Pump Motor Controller

SPN.FMI: 1044.12 - 1044.31

Overview

The TCU monitors the data to see if the Hydraulic Pump Motor Controller is damaged or corrupted.

Detection

1044.12 - 1044.31 - Internal problems related to the Hydraulic Pump motor controller.

Possible Causes

1044.12

- Over current identification in the electric motor drive
- Error in thermal shutdown of controller
- Cross-drive system failure
- Problems in the external controller oscillator (internal fault)
- Controller failure (power supply problems)
- Internal controller error

1044.31

- Thermal controller warning
- Diagnosis of coherence in voltage supply

Procedure

A

Purpose: *Check battery charge*

1. Make sure the vehicle's battery charge is at the proper level (between 18 and 32 Volts).
 - If it is not, recharge the battery or replace it, make sure the charge is appropriate and go to **Step V.**
 - If the charge is already at the appropriate level, go to the next step.
-

B

Purpose: *Erase the fault*

1. After making sure that the battery is properly charged, try to clear the defect with the aid of the diagnostic tool.
 - If you can erase, go to **Step V.**
 - Otherwise go to next step
-

C

Purpose: *Replace the TCU*

1. If it is not possible to complete the procedure and it is impossible to recover the module, proceed with its replacement due to an internal defect.

É indicado testar o veículo com uma TCU "Escrava" ou de um veículo sem falha.

Do teste:

1. Substitua a TCU no veículo "Sem fazer qualquer reprogramação", caso volte a operar normalmente sem falha, retorne a TCU original.
 2. Limpe todos os códigos de falhas utilizando o "aparelho de diagnose" e volte a testar, caso as falhas voltem aparece, e o veículo volte a apresentar as mesmas falhas, realize a substituição da TCU vá para **Etapa V.**
-

V

Purpose: *Final check*

1. Key off.
2. Reconnect all connectors and make sure all components are fully installed.
3. Switch on and engine off.
4. Clean all fault codes using the "Diagnosis device".
5. If you have performed the TCU update, redo the grid, accelerometer, and Kiss Point learning procedure using the Diagnosis device.
6. Run with the vehicle if possible to verify that the system is functioning properly.
7. Check with the device for the same or other fault codes.
 - If the fault is active during the test, go to **Step A.**
 - If another fault code appears, see "SPN.FMI INDEX" on page III.
 - If no faults appear and the vehicle works perfectly, THE TEST IS COMPLETE.

Note: If the test was performed with the TCU of another vehicle replace it with a new one and repeat this procedure (V).

Accelerometer

SPN.FMI: 3318.12

Overview

The TCU monitors the normal, lateral, and longitudinal acceleration data to verify that the accelerometer operation is correct.

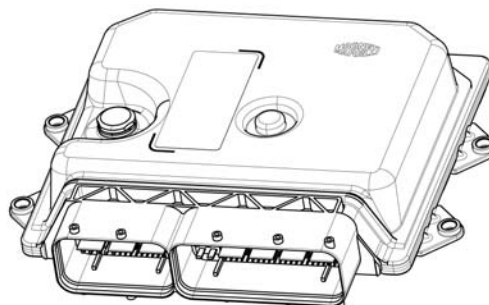
Detection

3318.12 - Accelerometer fail

Possible Causes

3318.12

- Internally Damaged Module (Accelerometer Damaged)



Procedure

A

Purpose: *Check battery charge*

1. Make sure the vehicle's battery charge is at the proper level (between 18 and 32 Volts).
 - If it is not, recharge the battery or replace it, make sure the charge is appropriate and go to **Step V.**
 - If the charge is already at the appropriate level, go to the next step.
-

B

Purpose: *Erase the fault*

1. After making sure that the battery is properly charged, try to clear the defect with the aid of the diagnostic tool.
 - If you can erase, go to **Step V.**
 - Otherwise go to next step
-

C

Purpose: *Replace the TCU*

1. If it is not possible to complete the procedure and it is impossible to recover the module, proceed with its replacement due to an internal defect.

É indicado testar o veículo com uma TCU "Escrava" ou de um veículo sem falha.

Do teste:

1. Substitua a TCU no veículo "Sem fazer qualquer reprogramação", caso volte a operar normalmente sem falha, retorne a TCU original.
 2. Limpe todos os códigos de falhas utilizando o "aparelho de diagnose" e volte a testar, caso as falhas voltem aparece, e o veículo volte a apresentar as mesmas falhas, realize a substituição da TCU vá para **Etapa V.**
-

V

Purpose: *Final check*

1. Key off.
2. Reconnect all connectors and make sure all components are fully installed.
3. Switch on and engine off.
4. Clean all fault codes using the "Diagnosis device".
5. If you have performed the TCU update, redo the grid, accelerometer, and Kiss Point learning procedure using the Diagnosis device.
6. Run with the vehicle if possible to verify that the system is functioning properly.
7. Check with the device for the same or other fault codes.
 - If the fault is active during the test, go to **Step A.**
 - If another fault code appears, see "SPN.FMI INDEX" on page III.
 - If no faults appear and the vehicle works perfectly, THE TEST IS COMPLETE.

Note: If the test was performed with the TCU of another vehicle replace it with a new one and repeat this procedure (V).

Protected Battery Voltage

SPN.FMI: 3512.12

Overview

The protected battery voltage system, is a branching filtered and internal to the Hardware of the supply voltage.

It serves as a voltage source for digital and analog system input circuits.

The TCU monitors the state of the voltage of this system in order to verify that it is operative, and in the event of a problem with the system, the fault is activated.

Detection

3512.12 - Lack of voltage or incorrect voltage in the system.

Possible Causes

3512.12

- Short circuit to GND or open circuit

Procedure

A

Purpose: *Check battery charge*

1. Make sure the vehicle's battery charge is at the proper level (between 18 and 32 Volts).
 - If it is not, recharge the battery or replace it, make sure the charge is appropriate and go to **Step V.**
 - If the charge is already at the appropriate level, go to the next step.
-

B

Purpose: *Erase the fault*

1. After making sure that the battery is properly charged, try to clear the defect with the aid of the diagnostic tool.
 - If you can erase, go to **Step V.**
 - Otherwise go to next step
-

C

Purpose: *Replace the TCU*

1. If it is not possible to complete the procedure and it is impossible to recover the module, proceed with its replacement due to an internal defect.

É indicado testar o veículo com uma TCU "Escrava" ou de um veículo sem falha.

Do teste:

1. Substitua a TCU no veículo "Sem fazer qualquer reprogramação", caso volte a operar normalmente sem falha, retorne a TCU original.
 2. Limpe todos os códigos de falhas utilizando o "aparelho de diagnose" e volte a testar, caso as falhas voltem aparece, e o veículo volte a apresentar as mesmas falhas, realize a substituição da TCU vá para **Etapa V.**
-

V

Purpose: *Final check*

1. Key off.
2. Reconnect all connectors and make sure all components are fully installed.
3. Switch on and engine off.
4. Clean all fault codes using the "Diagnosis device".
5. If you have performed the TCU update, redo the grid, accelerometer, and Kiss Point learning procedure using the Diagnosis device.
6. Run with the vehicle if possible to verify that the system is functioning properly.
7. Check with the device for the same or other fault codes.
 - If the fault is active during the test, go to **Step A.**
 - If another fault code appears, see "SPN.FMI INDEX" on page III.
 - If no faults appear and the vehicle works perfectly, THE TEST IS COMPLETE.

Note: If the test was performed with the TCU of another vehicle replace it with a new one and repeat this procedure (V).

TCU Switch Off Function

SPN.FMI: 1867.12

Overview

The TCU monitors the period from the time the ignition key is set to "OFF" until it switches off. If the TCU continues to operate in normal power mode after the time set for "Power Latch Off" (electrical systems off), the fault is displayed.

Detection

1867.12 - TCU shutdown.

Possible Causes

1867.12

- Internally damaged module

Procedure

A

Purpose: *Check other fault codes*

1. With the diagnostic tool check for other SPN.FMI, and if there are others, treat them first according to specific procedure.
 - If there is a fault, replace the harness and go to **Step V.** otherwise go to the next step.

B

Purpose: *Check battery charge*

1. Make sure the vehicle's battery charge is at the proper level (between 18 and 32 Volts).
 - If it is not, recharge the battery or replace it, make sure the charge is appropriate and go to **Step V.**
 - If the charge is already at the appropriate level, go to the next step.

C

Purpose: *Erase the fault*

1. After making sure that the battery is properly charged, try to clear the defect with the aid of the diagnostic tool.
 - If you can erase, go to **Step V.**
 - Otherwise go to next step

D

Purpose: *Replace the TCU*

1. If it is not possible to complete the procedure and it is impossible to recover the module, proceed with its replacement due to an internal defect.

É indicado testar o veículo com uma TCU "Escrava" ou de um veículo sem falha.

Do teste:

1. Substitua a TCU no veículo "Sem fazer qualquer reprogramação", caso volte a operar normalmente sem falha, retorne a TCU original.
2. Limpe todos os códigos de falhas utilizando o "aparelho de diagnose" e volte a testar, caso as falhas voltem aparece, e o veículo volte a apresentar as mesmas falhas, realize a substituição da TCU vá para **Etapa V.**

V

Purpose: *Final check*

1. Key off.
2. Reconnect all connectors and make sure all components are fully installed.
3. Switch on and engine off.
4. Clean all fault codes using the "Diagnosis device".
5. If you have performed the TCU update, redo the grid, accelerometer, and Kiss Point learning procedure using the Diagnosis device.
6. Run with the vehicle if possible to verify that the system is functioning properly.
7. Check with the device for the same or other fault codes.
 - If the fault is active during the test, go to **Step A.**
 - If another fault code appears, see "SPN.FMI INDEX" on page III.
 - If no faults appear and the vehicle works perfectly, THE TEST IS COMPLETE.

Note: If the test was performed with the TCU of another vehicle replace it with a new one and repeat this procedure (V).

Grid Self-Tuning Procedure

SPN.FMI: 60.13

Overview

The TCU monitors several system auto-tuning variables, and if there is any variable with the value out of specification, this defect is activated.

Detection

60.13 - Fail in the self-tuning system grid

Possible Causes

60.13

- Auto adjustment procedure not performed or not completed successfully

Procedure

A

Purpose: *Erase the fault*

1. After making sure that the battery is properly charged, try to clear the defect with the aid of the diagnostic tool.
 - If you can erase, go to **Step V.**
 - Otherwise go to next step
-

B

Purpose: *Check Hydraulic Kit*

1. Perform an inspection on the Hydraulic Kit according to the Service Manual. After performing the inspection if the kit is not working properly proceed as indicated in the manual.
 - If the kit is working properly or the procedure has already been performed, proceed to the next step.
-

C

Purpose: *Redo the auto adjustment*

1. With the aid of the diagnostic tool, repeat the grid learning procedure.
 - After the procedure go to the next step.
-

D

Purpose: *Replace the TCU*

1. If it is not possible to complete the procedure and it is impossible to recover the module, proceed with its replacement due to an internal defect.

É indicado testar o veículo com uma TCU "Escrava" ou de um veículo sem falha.

Do teste:

1. Substitua a TCU no veículo "Sem fazer qualquer reprogramação", caso volte a operar normalmente sem falha, retorne a TCU original.
 2. Limpe todos os códigos de falhas utilizando o "aparelho de diagnose" e volte a testar, caso as falhas voltem aparece, e o veículo volte a apresentar as mesmas falhas, realize a substituição da TCU vá para **Etapa V.**
-

V

Purpose: *Final check*

1. Key off.
2. Reconnect all connectors and make sure all components are fully installed.
3. Switch on and engine off.
4. Clean all fault codes using the "Diagnosis device".
5. If you have performed the TCU update, redo the grid, accelerometer, and Kiss Point learning procedure using the Diagnosis device.
6. Run with the vehicle if possible to verify that the system is functioning properly.
7. Check with the device for the same or other fault codes.
 - If the fault is active during the test, go to **Step A.**
 - If another fault code appears, see "SPN.FMI INDEX" on page III.
 - If no faults appear and the vehicle works perfectly, THE TEST IS COMPLETE.

Note: If the test was performed with the TCU of another vehicle replace it with a new one and repeat this procedure (V).

Kiss Point Auto-Learning Procedure

SPN.FMI: 33.13

Overview

The TCU monitors several variables present in the Kiss Point auto-learning function, and if there is any variable with the value out of specification, this defect is activated.

Detection

33.13 - Kiss Point's self-learning procedure failed.

Possible Causes

33.13

- Kiss Point self-learning procedure not performed or not completed successfully

Procedure

A

Purpose: *Erase the fault*

1. After making sure that the battery is properly charged, try to clear the defect with the aid of the diagnostic tool.
 - If you can erase, go to **Step V.**
 - Otherwise go to next step
-

B

Purpose: *Check the clutch assembly*

1. Perform an inspection on the clutch assembly according to the Service Manual. After performing the inspection if the assembly is not working correctly proceed as indicated in the manual.
 - If the assembly is working properly or the procedure has already been performed, proceed to the next step.
-

C

Purpose: *Redo the auto adjustment*

1. With the aid of the diagnostic device, redo the Kiss Point auto-learning procedure.
 - After the procedure go to next step
-

D

Purpose: *Replace the TCU*

1. If it is not possible to complete the procedure and it is impossible to recover the module, proceed with its replacement due to an internal defect.

É indicado testar o veículo com uma TCU "Escrava" ou de um veículo sem falha.

Do teste:

1. Substitua a TCU no veículo "Sem fazer qualquer reprogramação", caso volte a operar normalmente sem falha, retorne a TCU original.
 2. Limpe todos os códigos de falhas utilizando o "aparelho de diagnose" e volte a testar, caso as falhas voltem aparece, e o veículo volte a apresentar as mesmas falhas, realize a substituição da TCU vá para **Etapas V.**
-

V

Purpose: *Final check*

1. Key off.
2. Reconnect all connectors and make sure all components are fully installed.
3. Switch on and engine off.
4. Clean all fault codes using the "Diagnosis device".
5. If you have performed the TCU update, redo the grid, accelerometer, and Kiss Point learning procedure using the Diagnosis device.
6. Run with the vehicle if possible to verify that the system is functioning properly.
7. Check with the device for the same or other fault codes.
 - If the fault is active during the test, go to **Step A.**
 - If another fault code appears, see "SPN.FMI INDEX" on page III.
 - If no faults appear and the vehicle works perfectly, THE TEST IS COMPLETE.

Note: If the test was performed with the TCU of another vehicle replace it with a new one and repeat this procedure (V).

Kiss Point Auto Learning Procedure

SPN.FMI: 33.16 - 33.18

Overview

The module performs a self-learning procedure of the clutch position when the clutch is engaged. If it does not complete correctly, the fault is displayed.

Detection

33.16 - Coupling position of the clutch above the limit.

33.18 - Coupling position of the clutch below the limit.

Possible Causes

33.16, 33.18

- Clutch mechanical problem

Procedure

A

Purpose: *Erase the fault*

1. After making sure that the battery is properly charged, try to clear the defect with the aid of the diagnostic tool.
 - If you can erase, go to **Step V.**
 - Otherwise go to next step
-

B

Purpose: *Check the clutch assembly*

1. Perform an inspection on the clutch assembly according to the Service Manual. After performing the inspection if the assembly is not working correctly proceed as indicated in the manual.
 - If the assembly is working properly or the procedure has already been performed, proceed to the next step.
-

C

Purpose: *Redo the auto adjustment*

1. With the aid of the diagnostic device, repeat the procedure for learning the clutch coupling position.
 - After the procedure go to next step
-

D

Purpose: *Replace the TCU*

1. If it is not possible to complete the procedure and it is impossible to recover the module, proceed with its replacement due to an internal defect.

É indicado testar o veículo com uma TCU "Escrava" ou de um veículo sem falha.

Do teste:

1. Substitua a TCU no veículo "Sem fazer qualquer reprogramação", caso volte a operar normalmente sem falha, retorne a TCU original.
 2. Limpe todos os códigos de falhas utilizando o "aparelho de diagnose" e volte a testar, caso as falhas voltem aparece, e o veículo volte a apresentar as mesmas falhas, realize a substituição da TCU vá para **Etapas V.**
-

V

Purpose: *Final check*

1. Key off.
2. Reconnect all connectors and make sure all components are fully installed.
3. Switch on and engine off.
4. Clean all fault codes using the "Diagnosis device".
5. If you have performed the TCU update, redo the grid, accelerometer, and Kiss Point learning procedure using the Diagnosis device.
6. Run with the vehicle if possible to verify that the system is functioning properly.
7. Check with the device for the same or other fault codes.
 - If the fault is active during the test, go to **Step A.**
 - If another fault code appears, see "SPN.FMI INDEX" on page III.
 - If no faults appear and the vehicle works perfectly, THE TEST IS COMPLETE.

Note: If the test was performed with the TCU of another vehicle replace it with a new one and repeat this procedure (V).

Accelerometer Auto-Learning

SPN.FMI: 3318.13

Overview

The module performs an auto learn procedure of the Accelerometer. If it is not completed correctly, the fault is displayed.

Detection

3318.13 - Accelerometer auto learning not completed.

Possible Causes

3318.13

- Self-learning service procedure displaced
- Component internal failure

Procedure

A

Purpose: *Erase the fault*

1. After making sure that the battery is properly charged, try to clear the defect with the aid of the diagnostic tool.
 - If you can erase, go to **Step V.**
 - Otherwise go to next step
-

B

Purpose: *Check the clutch assembly*

1. Perform an inspection on the clutch assembly according to the Service Manual. After performing the inspection if the assembly is not working correctly proceed as indicated in the manual.
 - If the assembly is working properly or the procedure has already been performed, proceed to the next step.
-

C

Purpose: *Redo the auto adjustment*

1. With the aid of the diagnostic device, repeat the procedure for learning the accelerometer.
 - After the procedure go to next step
-

D

Purpose: *Replace the TCU*

1. If it is not possible to complete the procedure and it is impossible to recover the module, proceed with its replacement due to an internal defect.

É indicado testar o veículo com uma TCU "Escrava" ou de um veículo sem falha.

Do teste:

1. Substitua a TCU no veículo "Sem fazer qualquer reprogramação", caso volte a operar normalmente sem falha, retorne a TCU original.
 2. Limpe todos os códigos de falhas utilizando o "aparelho de diagnose" e volte a testar, caso as falhas voltem aparece, e o veículo volte a apresentar as mesmas falhas, realize a substituição da TCU vá para **Etapas V.**
-

V

Purpose: *Final check*

1. Key off.
2. Reconnect all connectors and make sure all components are fully installed.
3. Switch on and engine off.
4. Clean all fault codes using the "Diagnosis device".
5. If you have performed the TCU update, redo the grid, accelerometer, and Kiss Point learning procedure using the Diagnosis device.
6. Run with the vehicle if possible to verify that the system is functioning properly.
7. Check with the device for the same or other fault codes.
 - If the fault is active during the test, go to **Step A.**
 - If another fault code appears, see "SPN.FMI INDEX" on page III.
 - If no faults appear and the vehicle works perfectly, THE TEST IS COMPLETE.

Note: If the test was performed with the TCU of another vehicle replace it with a new one and repeat this procedure (V).

Safety - Level 2 Intervention

SPN.FMI: 611.02 - 611.11 - 611.12

Overview

The TCU monitors several self-diagnosis variables of the module itself, and if it has any out of specification, it activates this defect.

Detection

611.02 - Intervention of the prevention function of dangerous violations.

611.11 - Processing of incoming information failure.

611.12 - Integrity of the module compromised.

Possible Causes

611.02

- Change of direction not requested by driver or change of direction not performed after driver's request when vehicle is stopped, engine on and pedal pressed
- Clutch lock above position limit with vehicle stopped, engine turned on and pedal released
- Failure to disengage the Clutch when vehicle is stopping and the driver is stepping on the brake to stop the vehicle

611.11

- Problems with system inputs

611.12

- Hardware integrity failure (internal problem)

Procedure

A

Purpose: *Erase the fault*

1. After making sure that the battery is properly charged, try to clear the defect with the aid of the diagnostic tool.
 - If you can erase, go to **Step V**.
 - Otherwise go to next step
-

B

Purpose: *Replace the TCU*

1. If it is not possible to complete the procedure and it is impossible to recover the module, proceed with its replacement due to an internal defect.

É indicado testar o veículo com uma TCU "Escrava" ou de um veículo sem falha.

Do teste:

1. Substitua a TCU no veículo "Sem fazer qualquer reprogramação", caso volte a operar normalmente sem falha, retorne a TCU original.
 2. Limpe todos os códigos de falhas utilizando o "aparelho de diagnose" e volte a testar, caso as falhas voltem aparece, e o veículo volte a apresentar as mesmas falhas, realize a substituição da TCU vá para **Etapas V**.
-

V

Purpose: *Final check*

1. Key off.
2. Reconnect all connectors and make sure all components are fully installed.
3. Switch on and engine off.
4. Clean all fault codes using the "Diagnosis device".
5. If you have performed the TCU update, redo the grid, accelerometer, and Kiss Point learning procedure using the Diagnosis device.
6. Run with the vehicle if possible to verify that the system is functioning properly.
7. Check with the device for the same or other fault codes.
 - If the fault is active during the test, go to **Step A**.
 - If another fault code appears, see "SPN.FMI INDEX" on page III.
 - If no faults appear and the vehicle works perfectly, THE TEST IS COMPLETE.

Note: If the test was performed with the TCU of another vehicle replace it with a new one and repeat this procedure (V).

Safety - Level 3 Intervention (MMP Failure)

SPN.FMI: 612.12

Overview

The TCU monitors several self-diagnostic variables of the main Microprocessor (MMP), and if it has any out of specification, it activates this defect.

Detection

612.12- Main microprocessor integrity failure.

Possible Causes

612.12

- Module internally damaged.

Procedure

A

Purpose: *Erase the fault*

1. After making sure that the battery is properly charged, try to clear the defect with the aid of the diagnostic tool.
 - If you can erase, go to **Step V**.
 - Otherwise go to next step
-

B

Purpose: *Replace the TCU*

1. If it is not possible to complete the procedure and it is impossible to recover the module, proceed with its replacement due to an internal defect.

É indicado testar o veículo com uma TCU "Escrava" ou de um veículo sem falha.

Do teste:

1. Substitua a TCU no veículo "Sem fazer qualquer reprogramação", caso volte a operar normalmente sem falha, retorne a TCU original.
 2. Limpe todos os códigos de falhas utilizando o "aparelho de diagnose" e volte a testar, caso as falhas voltem aparece, e o veículo volte a apresentar as mesmas falhas, realize a substituição da TCU vá para **Etapas V**.
-

V

Purpose: *Final check*

1. Key off.
2. Reconnect all connectors and make sure all components are fully installed.
3. Switch on and engine off.
4. Clean all fault codes using the "Diagnosis device".
5. If you have performed the TCU update, redo the grid, accelerometer, and Kiss Point learning procedure using the Diagnosis device.
6. Run with the vehicle if possible to verify that the system is functioning properly.
7. Check with the device for the same or other fault codes.
 - If the fault is active during the test, go to **Step A**.
 - If another fault code appears, see "SPN.FMI INDEX" on page III.
 - If no faults appear and the vehicle works perfectly, THE TEST IS COMPLETE.

Note: If the test was performed with the TCU of another vehicle replace it with a new one and repeat this procedure (V).

Safety Microprocessor

SPN.FMI: 613.12

Overview

The TCU monitors several self-diagnostic variables of the Safety Microprocessor (SMP), and if it is out of specification, it activates this defect.

Detection

613.12 - Security microprocessor integrity failure.

Possible Causes

613.12

- Main microprocessor damaged or with power supply problem

Procedure

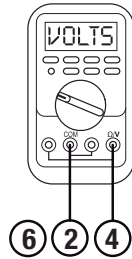
A

Purpose: Check voltage level on SMP power supply



Caution: before checking make sure that the sensor and TCU connectors are disconnected.

With the aid of a multimeter check:



1. that the voltage level on pin 4 of the TCU is correct. To do this, place the multimeter on the voltage scale and place the negative probe on pin 6 or 2, and the positive probe on pin 4 of connector B on the TCU, and check that the voltage level is between 18 and 32 Volts.
2. if it is not within range check the integrity of the harness, the connection to the battery and even replace it if necessary.
 - If the problem is solved, go to **Step V.**
 - Otherwise go to next step.

B

Purpose: Erase the fault

1. After making sure that the battery is properly charged, try to clear the defect with the aid of the diagnostic tool.
 - If you can erase, go to **Step V.**
 - Otherwise go to next step

C

Purpose: Replace the TCU

1. If it is not possible to complete the procedure and it is impossible to recover the module, proceed with its replacement due to an internal defect.

É indicado testar o veículo com uma TCU "Escrava" ou de um veículo sem falha.

Do teste:

1. Substitua a TCU no veículo "Sem fazer qualquer reprogramação", caso volte a operar normalmente sem falha, retorne a TCU original.
2. Limpe todos os códigos de falhas utilizando o "aparelho de diagnose" e volte a testar, caso as falhas voltem aparece, e o veículo volte a apresentar as mesmas falhas, realize a substituição da TCU vá para **Etapa V.**

V

Purpose: *Final check*

1. Key off.
2. Reconnect all connectors and make sure all components are fully installed.
3. Switch on and engine off.
4. Clean all fault codes using the "Diagnosis device".
5. If you have performed the TCU update, redo the grid, accelerometer, and Kiss Point learning procedure using the Diagnosis device.
6. Run with the vehicle if possible to verify that the system is functioning properly.
7. Check with the device for the same or other fault codes.
 - If the fault is active during the test, go to **Step A.**
 - If another fault code appears, see "SPN.FMI INDEX" on page III.
 - If no faults appear and the vehicle works perfectly, THE TEST IS COMPLETE.

Note: If the test was performed with the TCU of another vehicle replace it with a new one and repeat this procedure (V).

Safety Microprocessor Charge Test

SPN.FMI: 613.2

Overview

The TCU monitors the internal microprocessor security (SMP) status of the module to check for a integrity problem or if it is unable to operate properly.

Detection

613.2- SMP integrity failure or integrity failure of SMP inputs and outputs.

Possible Causes

613.2

- Failure to disable the coupling valve.
- Return or clutch control failure
- Failure to return or power command

Procedure

A

Purpose: *Check battery charge*

1. Make sure the vehicle's battery charge is at the proper level (between 18 and 32 Volts).
 - If it is not, recharge the battery or replace it, make sure the charge is appropriate and go to **Step V.**
 - If the charge is already at the appropriate level, go to the next step.
-

B

Purpose: *Erase the fault*

1. After making sure that the battery is properly charged, try to clear the defect with the aid of the diagnostic tool.
 - If you can erase, go to **Step V.**
 - Otherwise go to next step
-

C

Purpose: *Replace the TCU*

1. If it is not possible to complete the procedure and it is impossible to recover the module, proceed with its replacement due to an internal defect.

É indicado testar o veículo com uma TCU "Escrava" ou de um veículo sem falha.

Do teste:

1. Substitua a TCU no veículo "Sem fazer qualquer reprogramação", caso volte a operar normalmente sem falha, retorne a TCU original.
 2. Limpe todos os códigos de falhas utilizando o "aparelho de diagnose" e volte a testar, caso as falhas voltem aparece, e o veículo volte a apresentar as mesmas falhas, realize a substituição da TCU vá para **Etapa V.**
-

V

Purpose: *Final check*

1. Key off.
2. Reconnect all connectors and make sure all components are fully installed.
3. Switch on and engine off.
4. Clean all fault codes using the "Diagnosis device".
5. If you have performed the TCU update, redo the grid, accelerometer, and Kiss Point learning procedure using the Diagnosis device.
6. Run with the vehicle if possible to verify that the system is functioning properly.
7. Check with the device for the same or other fault codes.
 - If the fault is active during the test, go to **Step A.**
 - If another fault code appears, see "SPN.FMI INDEX" on page III.
 - If no faults appear and the vehicle works perfectly, THE TEST IS COMPLETE.

Note: If the test was performed with the TCU of another vehicle replace it with a new one and repeat this procedure (V).

Main Microprocessor Charge Test

SPN.FMI: 612.2

Overview

The TCU monitors the module's internal microprocessor (MMP) status to see if there is a integrity problem or if it can not operate properly.

Detection

612.2- Integrity failure at MMP inputs and / or outputs.

Possible Causes

612.2

- Disengagement of the coupling valve failure.
- Security mode activation signal failed
- Return or clutch control failure
- Failure to return or power command

Procedure

A

Purpose: *Check battery charge*

1. Make sure the vehicle's battery charge is at the proper level (between 18 and 32 Volts).
 - If it is not, recharge the battery or replace it, make sure the charge is appropriate and go to **Step V.**
 - If the charge is already at the appropriate level, go to the next step.
-

B

Purpose: *Erase the fault*

1. After making sure that the battery is properly charged, try to clear the defect with the aid of the diagnostic tool.
 - If you can erase, go to **Step V.**
 - Otherwise go to next step
-

C

Purpose: *Replace the TCU*

1. If it is not possible to complete the procedure and it is impossible to recover the module, proceed with its replacement due to an internal defect.

É indicado testar o veículo com uma TCU "Escrava" ou de um veículo sem falha.

Do teste:

1. Substitua a TCU no veículo "Sem fazer qualquer reprogramação", caso volte a operar normalmente sem falha, retorne a TCU original.
 2. Limpe todos os códigos de falhas utilizando o "aparelho de diagnose" e volte a testar, caso as falhas voltem aparece, e o veículo volte a apresentar as mesmas falhas, realize a substituição da TCU vá para **Etapa V.**
-

V

Purpose: *Final check*

1. Key off.
2. Reconnect all connectors and make sure all components are fully installed.
3. Switch on and engine off.
4. Clean all fault codes using the "Diagnosis device".
5. If you have performed the TCU update, redo the grid, accelerometer, and Kiss Point learning procedure using the Diagnosis device.
6. Run with the vehicle if possible to verify that the system is functioning properly.
7. Check with the device for the same or other fault codes.
 - If the fault is active during the test, go to **Step A.**
 - If another fault code appears, see "SPN.FMI INDEX" on page III.
 - If no faults appear and the vehicle works perfectly, THE TEST IS COMPLETE.

Note: If the test was performed with the TCU of another vehicle replace it with a new one and repeat this procedure (V).

SPN.FMI INDEX

SPN.FMI	Description	Page Number
33.02	Wrong PWM period in signal A or signal B	page 21
33.03	A or B signal set to HIGH	page 21
33.04	A or B signal set to LOW	page 21
33.07	Clutch does not disengage prior to shifting	page 128
33.08	PWM duty cycle in signal A or signal B above the upper limit or below the lower limit	page 21
33.10	Coupling clutch during gear shift	page 128
33.11	Clutch control	page 128
33.13	Kiss Point's self-learning procedure failed	page 181
33.16	Coupling position of the clutch above the limit	page 184
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59.03	Fixed signal at HIGH level	page 8
59.04	Fixed signal at LOW level	page 8
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60.02	Wrong PWM period	page 17
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110.02	Invalid coolant temperature signal	page 74
161.02	Incorrect signal: due to discrepancy between crankshaft rotation and clutch rotation	page 37
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168.04	Battery voltage below the lower limit, making it impossible to change gears	page 140
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191.02	Signal monitoring of the clutch speed sensor and vehicle speed sensor	page 43
191.03	Supply voltage above the upper limit	page 46
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525.07	Neutral Failure: When the gearbox has one or more gears engaged	page 131
525.11	Not valid Signal of “D-N-R” Drive Select Switch (Drive-Neutral-Reverse)	page 66
525.12	Not valid sign key +/- (Up / Down)	page 66
525.19	Not valid Signal of “D-N-R” Drive Select Switch (Drive-Neutral-Reverse)	page 66
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560.07	Failure to disengage	page 131
560.11	Unintentional engage	page 131
560.13	Pattern test failed	page 131
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563.02	Signal of anti-lock brake system ABS active invalid	page 84
574.07	Selector blocked	page 131
574.10	Excessive rotation of the clutch during gear engagement	page 131
574.11	Failure to engage	page 131
574.14	Selection failure	page 131
577.02	Error Signal on Hill Holder Pushbutton Switch	page 60
595.02	Error Signal on Cruise Control Indicator	page 64
597.02	Invalid brake switch signal	page 80
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703.06	W-phase error on the high-side circuit or on low-side circuit or overload on W-phase signal	page 123
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773.03	Short circuit fault to power supply on the high side or on the low side	page 111
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