

Fault Code 51 - Rail Position Sensor

J1587: MID 130 SID 60 FMI 2, 3, 4, 10
J1939: SA 3 SPN 60 FMI 2, 3, 4, 10

Overview

This fault code indicates an electrical failure of the Rail Select Sensor or mechanical failure on the Electric Shifter.

The transmission controller supplies sensor power to the Electric Shifter position sensors and uses the reported sensor position to determine gear finger location. There are 4 fault conditions defined by the reported FMI via ServiceRanger software.

This fault will not be set if a System Battery Voltage Low fault (Fault Code 33) is active.

Detection

Starting at key-on and throughout operation, the transmission controller constantly monitors the position of the sensor. If a failure condition is detected, the fault code is set.

Conditions to Set Fault Code Active

- FMI 2 - The transmission controller detects the rail sensor voltage is outside the 10-90% range for 1 second or longer.
- FMI 3 - The transmission controller detects the rail sensor supply voltage is 5% above the expected supply voltage for 1 second or longer.
- FMI 4 - The transmission controller detects the rail sensor supply voltage is 5% below the expected supply voltage for 1 second or longer.
- FMI 10 - The transmission controller detects the rail sensor signal moving more than +/- 0.093" (2%) when the rail motor is turned off in gear.

Fallback

Fallback mode During Power-Up

- The transmission will power-up and may not be able to confirm neutral, no start gears can be selected.
- Unit may not crank. An equal sign will appear in the display.

Fallback Mode During Operation

- The transmission remains in its current gear. An F may appear in the gear display.
- The service light will blink.
- Until the fault is cleared, driver may have to shut off engine in gear.
- Will not upshift, downshift nor shift into neutral.

Conditions to Set Fault Code Inactive

- FMI 2 - The fault becomes Inactive when the transmission controller detects the rail sensor output voltage is within 10% - 90% for 1 second or longer.
- FMI 3, 4 - The fault becomes Inactive when the transmission controller detects the rail sensor supply is within +/- 5% of the expected voltage.
- FMI 10 - The rail position is within +/- 0.093" (2%) of when the shift state went idle.

Possible Causes

This fault code can be caused by any of the following:

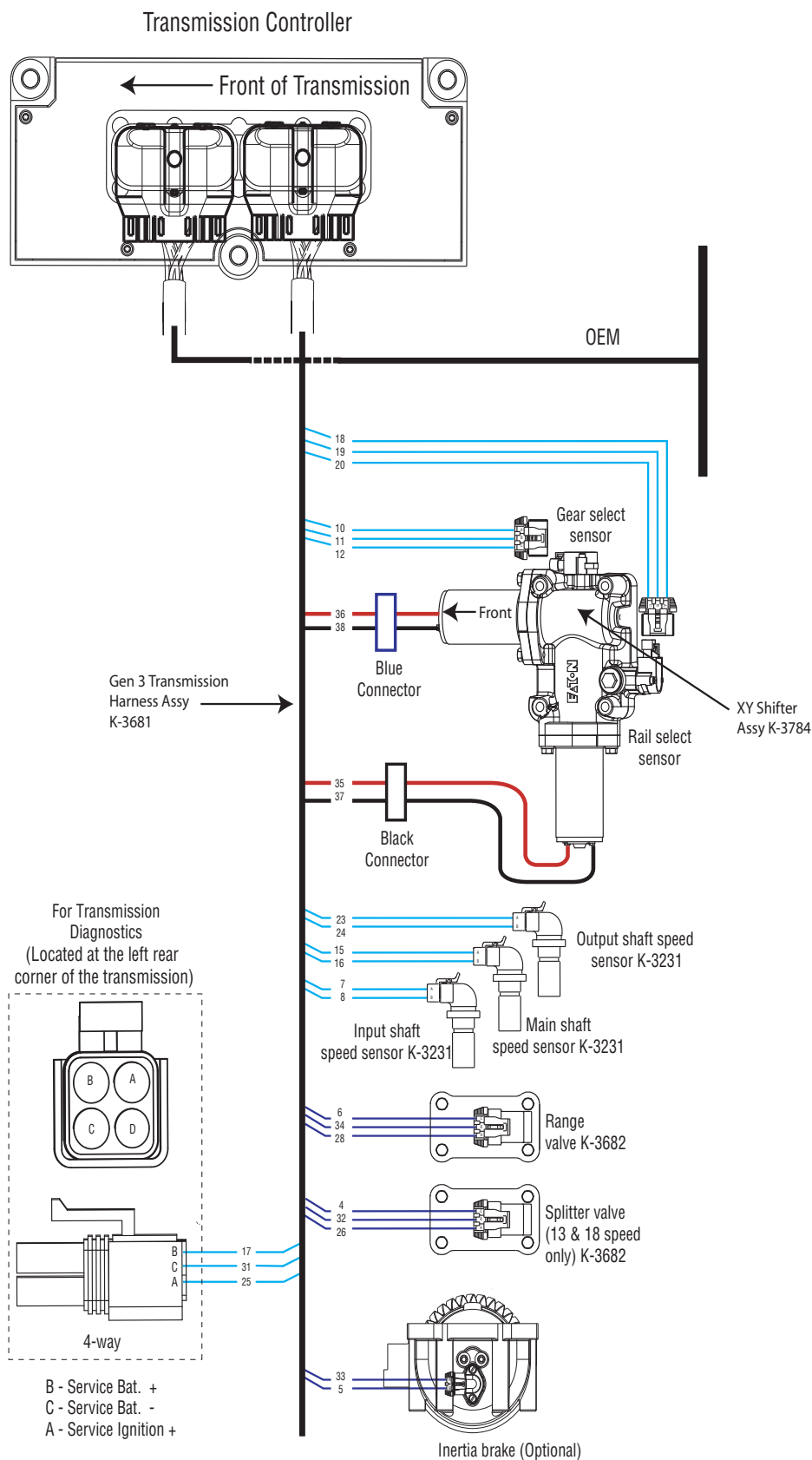
FMI 2, 4, 10:

- Transmission Harness - Connections and wires between the transmission controller and the rail sensor may be loose or damaged, terminals and wires may be bent, burnt or wires may be grounded, open or shorted.
- Electric Shifter - The rail sensor may have been damaged or malfunctioned.

FMI 3:

- Transmission Controller - The transmission controller may have been damaged or malfunctioned.

Component Identification



Fault Code 51 - Rail Position Sensor

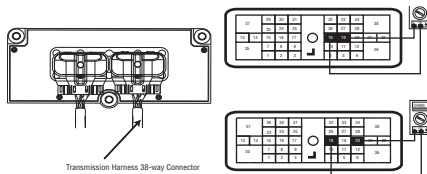
A

Purpose: Measure resistance of the Rail Position Sensors through the Transmission Harness.

1. If the fault code is Inactive put unit in PDM mode and perform the wire wiggle test. Check the overall harness connections to sensor. If a tone is heard and/or a fault code appears in the gear display, the Fault Code Isolation Procedure Index.
2. Key off.
3. Disconnect negative battery cable.
4. Disconnect the Transmission Harness 38-way connector.
5. Measure resistance between Pin 18 and Pin 19 and between Pin 18 and Pin 20 on the Transmission Harness 38-way connector.

Note: An Auto Ranging Digital Volt/Ohm Meter must be used.

6. Measure resistance of the Rail Position Sensors through the Transmission Harness.

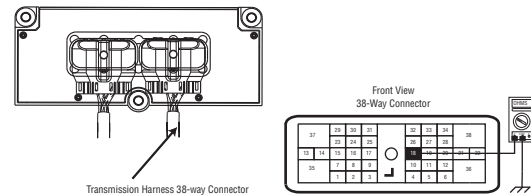


- If resistance between Pin 18 and Pin 19 is 100 to 200 ohms and between Pin 18 and Pin 20 resistance is 5K to 7K ohm, go to **Step B.**
- If any of the above conditions are not met, go to **Step C.**

B

Purpose: Test the Rail Position Sensor Plus line for shorts to ground through the Transmission Harness.

1. Measure resistance between Transmission Harness 38-way connector Pin 18 to ground.



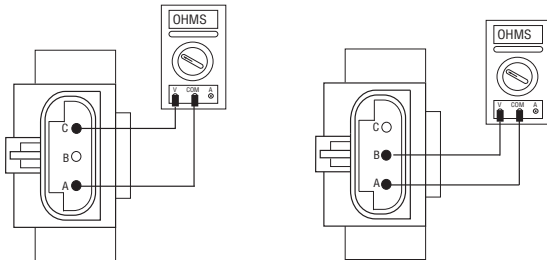
- If resistance is OL, Reconnect 38-way connector, (if fault code is Active) replace the:
 - **Medium-Duty Transmission Electronic Control Unit (TECU)**
 - **Heavy-Duty Transmission Electronic Control Unit (TECU)**
- If FMI 2, 3, 4, or 10 is present with an Inactive code, replace the **Electric Shifter** and the:
 - **Medium-Duty Transmission Harness**
 - **Heavy-Duty Transmission Harness**
- If resistance is less than 10K ohm, go to **Step C.**

C

Purpose: Measure resistance of the Rail Position Sensor.

1. Disconnect Transmission Harness from Rail Select Sensor.
2. Measure resistance between Pin A and Pin C and between Pin A and Pin B on the Rail Select Sensor.

Note: An Auto Ranging Digital Volt/Ohm Meter must be used.

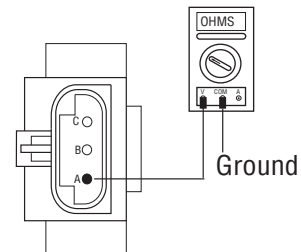


- If resistance between Pin A and Pin C is 5K to 7K and between Pin A and Pin B is 100 to 200 ohms, go to **Step D**.
- If any of the above conditions are not met, replace the **Electric Shifter**. Go to **Step V**.

D

Purpose: Test the Rail Position Sensor Plus line for shorts to ground.

1. Measure resistance between Rail Select Sensor Pin A and ground.



- If resistance is OL, replace the:
 - **Medium-Duty Transmission Harness**
 - **Heavy-Duty Transmission Harness**

Go to **Step V**.

- If resistance is less than 10K ohm, replace the **Electric Shifter**. Go to **Step V**.

V**Purpose:** Verify repair.

1. Key off.
 2. Reconnect all connectors.
 3. Key on.
 4. Clear codes, see “Fault Code Retrieval/Clearing” on page 5.
 5. Drive the vehicle and attempt to reset the code.
 6. Check for fault codes, see “Fault Code Retrieval/Clearing” on page 5.
 - If no fault codes, test complete.
 - If Fault Code 51 appears go to **Step A.** to find error in testing.
 - If code other than 51 appears, See “Fault Code Isolation Procedure Index” on page 8.
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