

## Fault Code 73: Failed to Engage Gear

**J1587: MID 130    SID 58    FMI 7**  
**J1939: SA 3        SPN 781    FMI 7**

### Overview

The UltraShift *PLUS* transmission uses the X-Y Shifter to engage and disengage a gear based on the driver's selected mode of operation. Gear engagement is achieved by activating the X-Y Shifter Gear Motor, which controls the fore-and-aft movement of the Shift Finger. Pushing the Shift Finger against one of the Shift Bar Housing Shift Blocks guides the Shift Yoke to engage the Sliding Clutch into a gear. The position of the X-Y Shift Finger is monitored by the Transmission Electronic Control Unit (TECU) by way of the X-Y Gear Position and Rail Position Sensors.

Fault Code 73 is set when the X-Y Shift Finger attempts to engage a gear, but the X-Y Gear Position Sensor indicates that the transmission was unable to engage that gear. The TECU detected a system failure, but was unable to detect the specific root cause.

### Detection

This fault can only be detected when there are no failures of the TECU, X-Y Gear or Rail Motors, X-Y Position Sensors or Battery Supply voltage. This fault code is set when the system is unable to engage a gear.

### Conditions to Set Fault Code Active

FMI 7 – Mechanical System Not Responding: If the X-Y Gear Position Sensor does not meet the minimum gear engagement value after five consecutive attempts to engage the desired gear, this fault code sets Active.

### Fallback

FMI 7

- Transmission may not be able to complete a shift into gear.
- Transmission will attempt to move the Shift Finger to the destination gear.
- Engine may not crank.
- Gear display may flash current or destination gear.

### Conditions to Set Fault Code Inactive

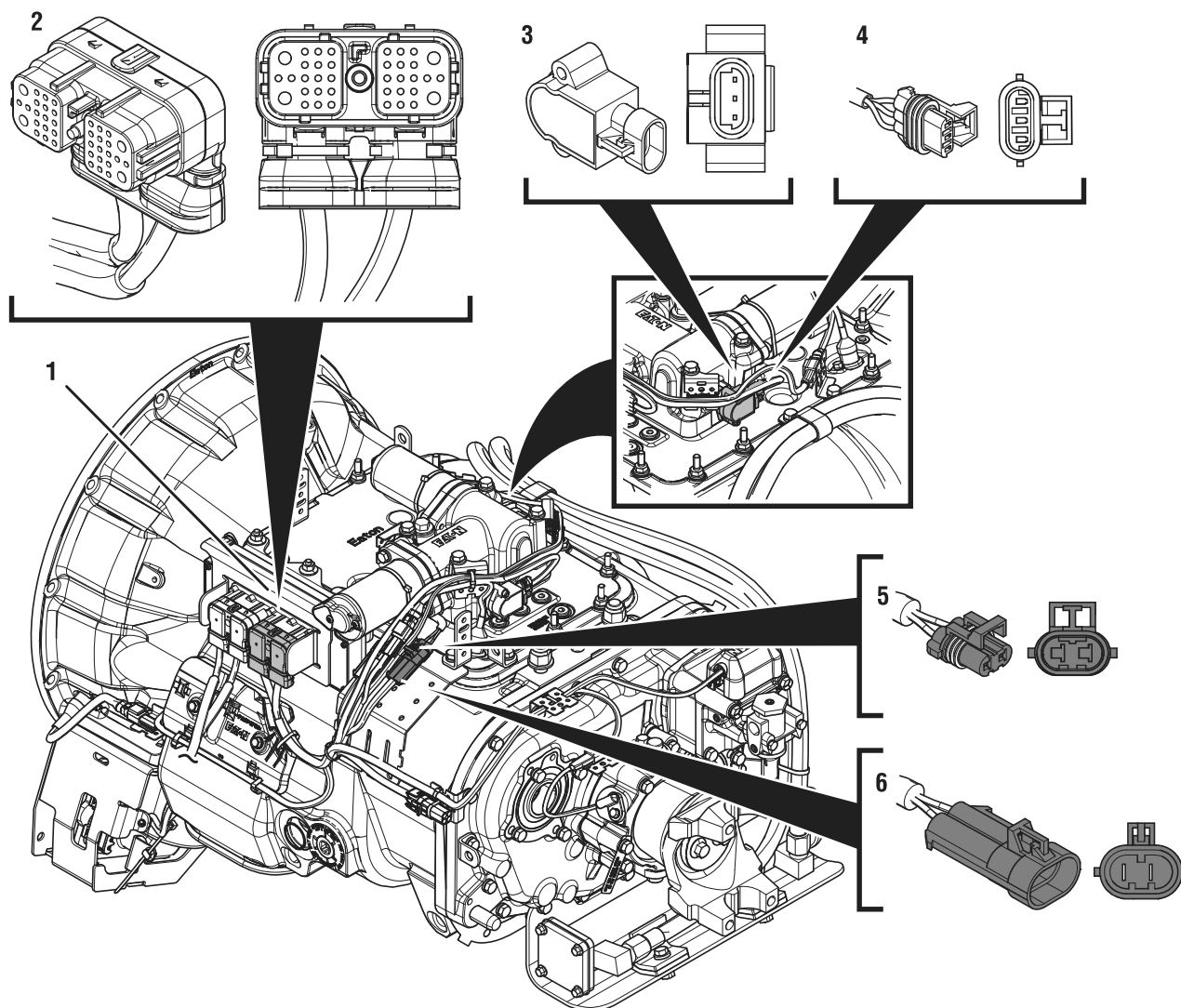
FMI 7: The system successfully engages the desired gear.

### Possible Causes

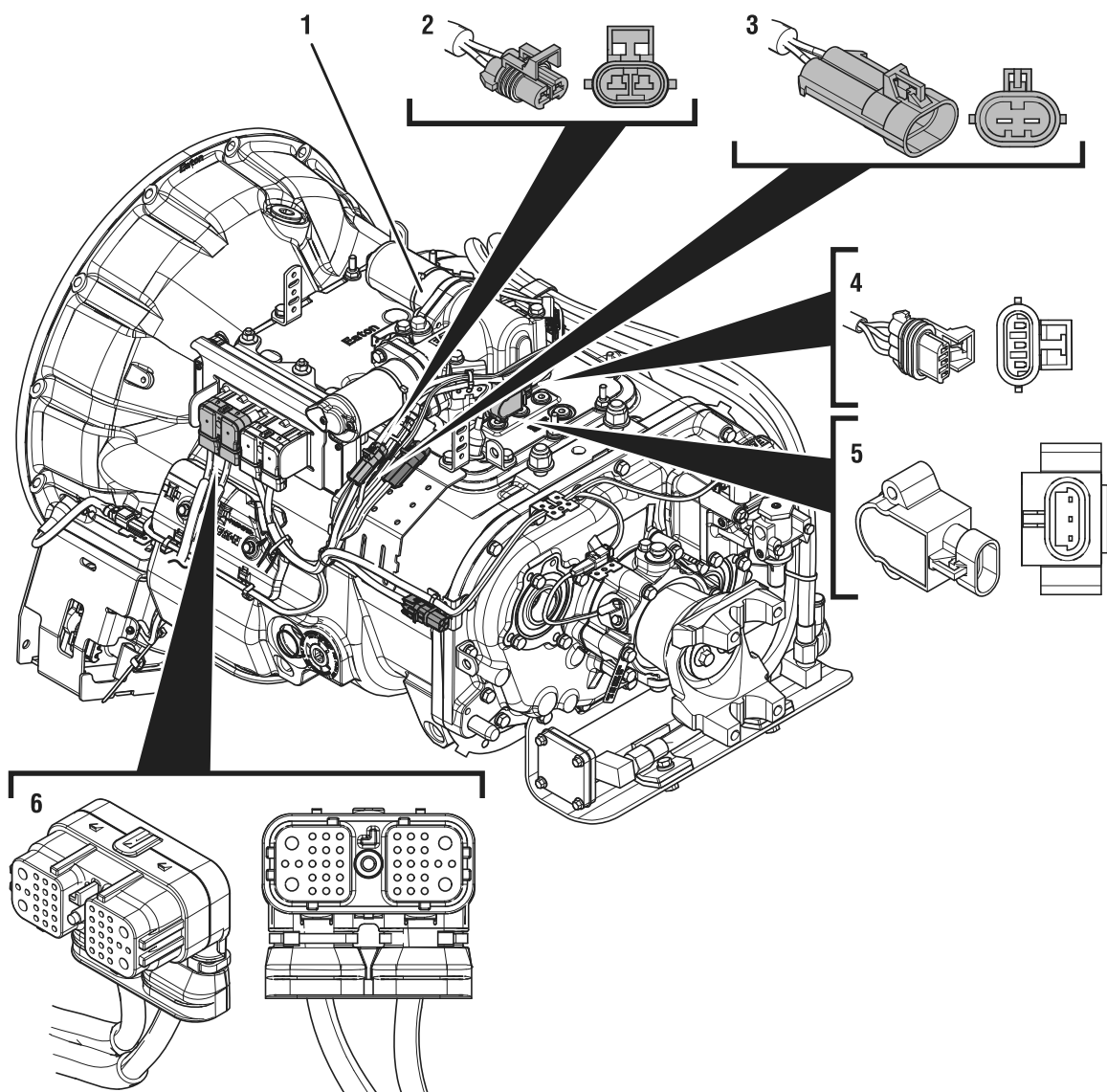
FMI 7

- TECU
  - Software issue
- Vehicle Power Supply
  - Poor power or ground supply to TECU
  - Bent, spread, corroded or loose terminals
- Vehicle Batteries
  - Internal failure
- Transmission Harness
  - Damaged wiring between the TECU and X-Y Shifter
  - Bent, spread, corroded or loose terminals
- X-Y Shifter
  - Worn or damaged X-Y Shifter ball screw, center shaft bushing, or other internal components
  - Contaminated X-Y Shifter ball screw due to coolant leak or oil contamination
  - Bent, spread, corroded or loose terminals
- Mechanical Transmission
  - Worn or damaged Shift Bar Housing
  - Worn Sliding Clutch slot width
  - Worn or damaged Shift Yokes
  - Worn or damaged internal transmission components

## Component Identification



1. Transmission Electronic Control Unit (TECU)
2. 38-Way Transmission Harness Connector
3. Gear Position Sensor
4. 3-Way Gear Position Sensor Connector
5. 2-Way Gear Motor Connector (blue)
6. 2-Way Gear Motor Connector Body (blue)



1. X-Y Shifter
2. 2-Way Rail Motor Connector (black)
3. 2-Way Rail Motor Connector Body (black)
4. 3-Way Rail Position Sensor Connector
5. Rail Position Sensor
6. 38-Way Vehicle Harness Connector

## Fault Code 73 Troubleshooting

### A

**Purpose:** Check for Active or Inactive fault codes.

1. Set parking brake and chock wheels.
2. Record the transmission fault codes, FMIs, occurrences, and timestamps from the Service Activity Report created during the Diagnostic Procedure.

**Note:** If Fault Code 73 is Inactive and there are other Active fault codes, troubleshoot all Active fault codes first.

- If Fault Codes 33, 34, 51, 52, 61, 63 or 64 are Active or Inactive, troubleshoot per Fault Code Isolation Procedure.
- If Fault Code 73 is Active or Inactive, go to **Step B**.

### B

**Purpose:** Verify TECU Software Version.

1. Key on with engine off.
2. Connect ServiceRanger.
3. Go to "Programming".
4. Under "Software Information", record TECU software in table.
  - If TECU software is less than 5570059, update TECU software to 5570059 or greater. Go to **Step V**.
  - If TECU software is 5570059 or greater, go to **Step C**.

### C

**Purpose:** Use Product Diagnostic (PD) Mode to locate intermittent failures.

1. Set parking brake and chock wheels.
2. Place transmission in PD Mode. See more about *Product Diagnostic (PD) Mode* on page 7.

**Note:** Fault Code 73 does not set Active during PD Mode. Other fault codes may set Active during PD Mode that could indicate an issue with the wiring.

**Note:** Transmission does not enter PD Mode when Active fault codes exist.



3. Wiggle wiring and connections of the Transmission Harness from the X-Y Shifter to the TECU.
4. Wiggle wiring and connections of the Vehicle Power Supply Harness from the batteries to the TECU.
5. Exit PD Mode by powering down.

**NOTICE:** Allow 2–3 minutes for the TECU to perform a complete power-down sequence before proceeding.

- If any fault sets Active while wiggling the Transmission Harness, replace **Transmission Harness**. Go to **Step V**.
- If any fault sets Active while wiggling the Power Supply Harness, refer to OEM guidelines for repair or replacement of Power Supply wiring. Go to **Step V**.
- If no fault codes set Active, go to **Step D**.

D

**Purpose:** Inspect the batteries, in-line fuse and power and ground supplies to the TECU.

1. Key off.  
**NOTICE:** Allow 2–3 minutes for the TECU to perform a complete power-down sequence before proceeding.
2. Inspect Starter, battery terminals and transmission 30-amp In-line Fuse Holder Connections for corrosion, loose terminals and bent or spread pins.
3. Inspect Battery Positive (+) and Negative (-) wires from the batteries to the TECU including all connections. Ensure a clean ground connection on the chassis. Verify no damage or corrosion to connectors.
  - If damage is found, repair or replace Power Supply Harness per OEM guidelines. Go to **Step V**.
  - If no damage is found, go to **Step E**.

E

**Purpose:** Perform a Load Test on each vehicle battery.

1. Key off.
2. Set parking brake and chock wheels.
3. Load test each vehicle battery per OEM specifications. Record reading(s).
  - If any battery(s) does not pass the Load Test, refer to OEM guidelines for repair or replacement of battery(s). Go to **Step V**.
  - If all batteries pass the Load Test, go to **Step F**.

Battery	Voltage Drop	Load Test Status (Pass/Fail)
1		
2		
3		
4		
5		

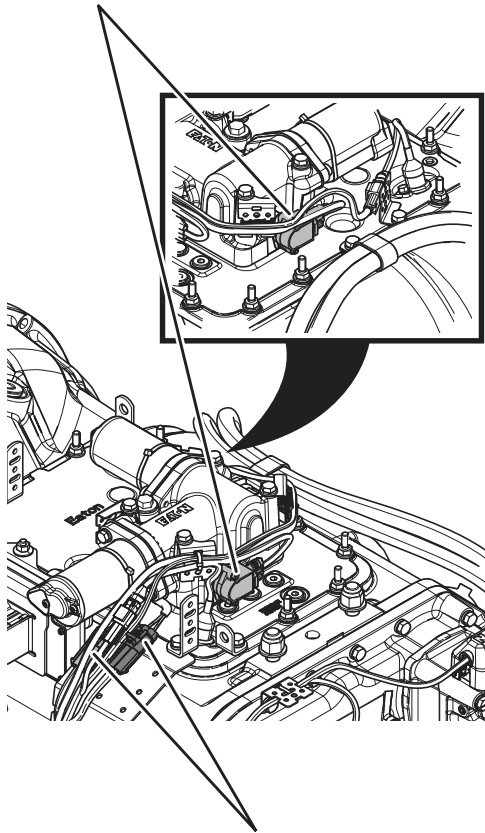
**F**

**Purpose:** Inspect X-Y Shifter and Transmission Harness for physical damage.

1. Key off.

**NOTICE:** Allow 2–3 minutes for the TECU to perform a complete power-down sequence before proceeding.

2. Inspect the physical condition of X-Y Shifter and all connections.
3. Inspect Transmission Harness for any pinched, chafed, corroded or shorted wiring.
4. Disconnect both 2-Way X-Y Gear and Rail Position Sensor Connectors.

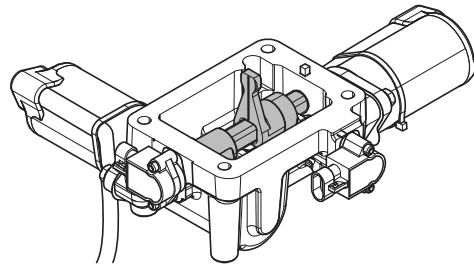


5. Disconnect both 2-Way X-Y Motor Connectors to the Transmission Harness.
6. Inspect connectors for corrosion, loose terminals, bent or spread pin or damage to the connector bodies.
  - If damage to the X-Y Shifter or X-Y Shifter wiring is found, replace **X-Y Shifter**. Go to **Step V**.
  - If damage to the Transmission Harness is found, replace **Transmission Harness**. Go to **Step V**.
  - If no damage is found, go to **Step G**.

**G**

**Purpose:** Inspect condition of X-Y Shifter internal components.

1. Key off.
2. Remove the X-Y Shifter.
3. Inspect condition of the X-Y Shift Finger and Cross Shaft for damage or wear.



4. Inspect the X-Y Shifter ball screw for signs of coolant contamination.

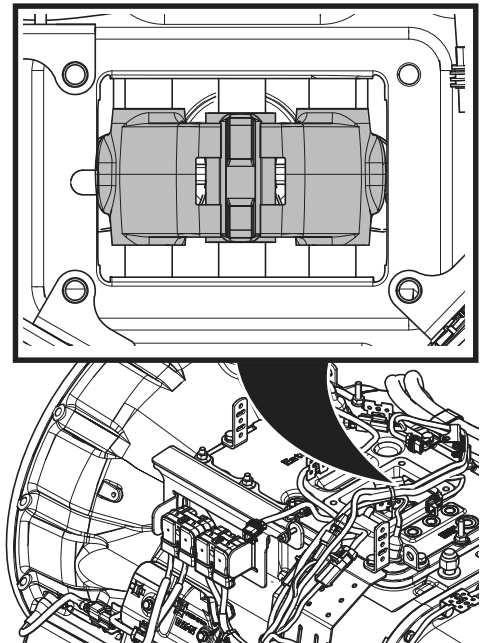
For the latest Service Bulletin updates, visit [Roadranger.com](http://Roadranger.com).

- If coolant contamination is found, repair the vehicle coolant system leak and follow Service Bulletin TMIB0124 for complete repair procedure. X-Y Shifter must be replaced upon completion of service bulletin. Go to **Step V**.
- If damage to the X-Y Shifter is found, replace **X-Y Shifter**. Go to **Step V**.
- If no damage is found, go to **Step H**.

**H**

**Purpose:** Inspect Condition of Shift Bar Housing.

1. Key off.
2. Inspect condition of the Shift Bar Housing Shift Blocks. Look for uneven gaps between the Shift Blocks or excessive wear to the block faces.
3. Verify Shift Blocks are tight to the rails and there are no other mechanical issues with the Shift Bar Housing.



4. Verify transmission shifts fully in and out of each gear.
5. Test the Shift Interlock to verify that the transmission will not engage two gears at once. See the Shift Interlock Inspection Procedure on page 539.
  - If damage to the Shift Bar Housing is found, repair **Shift Bar Housing**. Go to **Step V**.
  - If no damage is found, go to **Step I**.

**I****Purpose:** Inspect condition of the internal transmission components.

1. Key off.
2. Drain and save the transmission oil. Inspect oil for significant metal fragments.
3. Remove 8-bolt PTO cover.
4. Inspect main case gears for damage or excessive movement.
5. Inspect Shift Yokes and Sliding Clutches for damage or excessive wear.
  - If damage is found or there are significant metal fragments in the oil, replace damaged, worn or failed transmission components. Go to **Step V**.
  - If no damage is found within the transmission main case, replace **X-Y Shifter** and **Transmission Harness**. Go to **Step V**.

**Note:** If unsure whether damage or wear is significant, take pictures of the transmission gearing. Ensure these pictures are clear and the components are easily visible. Email these pictures to [auto.rtw@eaton.com](mailto:auto.rtw@eaton.com) and contact Eaton at (800) 826-4357.

**V****Purpose:** Verify repair.

1. Key off.
2. Reconnect all connectors and verify that all components are properly installed, including X-Y Shifter.
3. Reinstall 8-bolt PTO cover.
4. Refill transmission with lubricant.
5. Key on with engine off.
6. Clear fault codes using ServiceRanger.
7. Drive vehicle and attempt to reset the code or duplicate the previous complaint.
8. Check for fault codes using ServiceRanger.
  - If no fault codes set Active and vehicle operates properly, test complete.
  - If a fault code other than 73 sets Active, troubleshoot per *Fault Code Isolation Procedure Index* on page 15.
  - If Fault Code 73 sets Active, contact Eaton at (800) 826-4357 for further diagnostics.