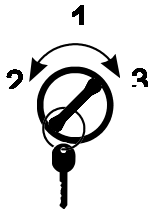


# General Procedures

## Retrieving Fault Codes

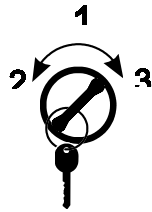
Retrieve transmission fault codes by enabling the transmission system's self-diagnostic mode.

**NOTE:** You can also use a diagnostic scan tool, such as the MPSI Pro Link Main, to retrieve transmission fault codes. Refer to the OEM's documentation for more information. You can also use a PC-based service tool, such as the Service Ranger, to retrieve fault codes.



1. 2 times
2. OFF
3. ON

To Retrieve Active Codes



1. 4 times
2. OFF
3. ON

To Retrieve Inactive Codes

1. Place the shift lever in neutral
2. Set the parking brakes.
3. Turn the ignition key on but do not start the engine. If the engine is already running, you may still retrieve codes, however, do not engage the starter if engine stalls.

### 4. To Retrieve Active Codes

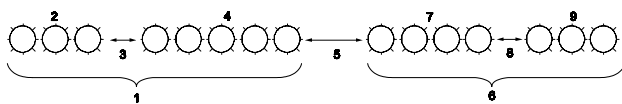
- a. Start with the key in the ON position.
- b. Turn the key OFF and ON two times within five seconds ending with the key in the ON position.

**NOTE:** After five seconds, the service lamp begins flashing two-digit fault codes. If no codes are active, the service light will flash code 25 (no codes).

### 5. To Retrieve Inactive Codes

- a. Start with the key in the ON position.
- b. Turn the key OFF and ON four times within five seconds ending with the key in the ON position.

**NOTE:** After five seconds, the service lamp begins flashing two-digit fault codes. If no codes are active, the service light will flash code 25 (no codes).



1. Code 35
2. 3 Flash
3. Short Pause (1/2 sec)
4. 5 Flashes
5. Long Pause (3-4 sec)

6. Code 43
7. 4 Flashes
8. Short Pause (1/2 sec)
9. 3 Flash

6. Observe the sequence of flashes on the indicator lamp and record the codes. A one to two second pause separates each stored code, and the sequence automatically repeats after all codes have been flashed.

## Clearing Fault Codes

The following procedure clears all inactive (intermittent) fault codes from the ECU's memory. (Active fault codes are automatically cleared when the fault has been corrected.)

**NOTE:** You can also use a PC-based service tool, such as the Service Ranger, to clear transmission fault codes.



1. 6 times
2. OFF
3. ON

1. Place the shift lever in neutral.
2. Set the parking brakes.
3. Turn the ignition key on but do not start the engine.
4. Start with the key in the on position. Turn the key off and on six times within five seconds ending with the key in the on position.

**NOTE:** If the codes have been successfully cleared, the service lamp will come on and stay on for five seconds.

5. Turn key off for 2 minutes to allow transmission to power down.

## Check for Proper Clutch Operation

When performing the test for proper clutch operation, the vehicle should be in same condition as when the problem occurred. For instance, if the problem only occurs when the vehicle is hot, drive the vehicle to warm it up before conducting the test.

When the operator depresses the clutch pedal and shifts from neutral to drive or reverse, the ECU waits for the transmission input shaft speed to decrease to less than 150 rpm before shifting the transmission into gear. If the clutch is not disengaging completely or the clutch brake is not functioning properly, the input shaft will not slow down and the transmission will not shift into gear.

### With Hand-held

1. Connect hand-held tool.
2. Make sure the transmission is in neutral.
3. Start engine.
4. Set hand-held to monitor input shaft speed.
5. With clutch pedal up (clutch engaged) compare input speed and engine speed (rpm). They should be the same.
6. If not:
  - A. Perform Input Shaft Speed Sensor (see page 122) test.
  - B. Confirm proper clutch adjustment, adjust as needed.
  - C. Check clutch for slippage, repair or replace as necessary.

# General Procedures

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## Check for Proper Clutch Operation (Continued)

7. Depress clutch pedal to activate clutch brake. Within 2 seconds, input shaft speed should be less than 25 rpm (0 rpm is desired).

If input shaft does not stop turning, this indicates that the clutch is not disengaging completely or the clutch brake is not functioning properly.

- A. Check for proper clutch adjustment, adjust as necessary.
- B. Inspect clutch brake for excessive friction material wear or internal damage. Replace as necessary.  
**NOTE:** The clutch brake may have to be removed to inspect properly.
- C. If clutch adjustment is correct and clutch brake appears satisfactory, the problem may be a defective clutch. The clutch may require repair or replacement. Refer to the clutch manufacturer's service information to verify a "dragging" clutch.

## Without Hand-held

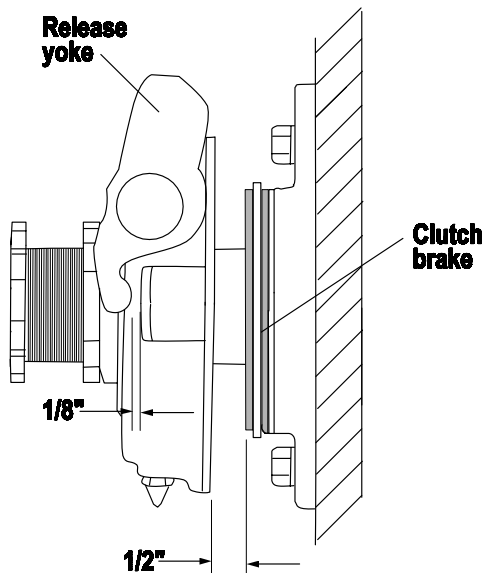
1. Make sure the transmission is in neutral.
2. Start engine.
3. Let up on the clutch pedal (clutch engaged).
4. Depress clutch pedal fully to activate clutch brake and hold for 2 seconds.
5. Place transmission in starting gear.
6. Gear display shows flashing gear not yet engaged or solid gear for engaged. If flashing gear is displayed, slowly release clutch pedal.
7. If flashing gear does not become solid or gear does not engage, check clutch brake for proper function and check clutch adjustment.
8. If gear does not engage and clutch is adjusted properly, troubleshoot for dragging clutch according to clutch manufacturer.

## Confirm Proper Clutch Adjustment

### Confirm release bearing travel gap

1. Use a 1/2" gauge to verify the release bearing travel gap. This gap (distance between the rear of the release bearing and the clutch brake) must be between 1/2" and 9/16".
2. If this dimension is incorrect, adjust the clutch per the clutch manufacture's instructions.

### Confirm the free-play gap \*



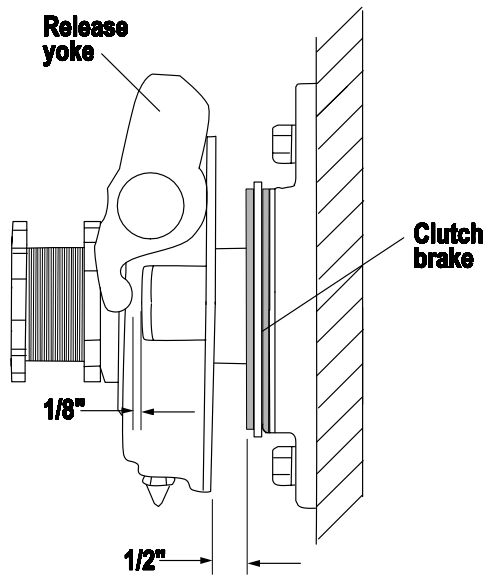
1. Use a 1/8" gauge to verify proper free-play gap. This gap should be 1/8".
2. If this dimension is incorrect, adjust the clutch per the clutch manufacturer's instructions.

For mechanical clutch release systems with free-play.

# General Procedures

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## Clutch Brake Contact



1. Insert a .010" feeler gauge between the release bearing and the clutch brake. Have an assistant fully depress the clutch pedal. The .010" feeler gauge should be squeezed between the release bearing rear and the clutch brake. Have the assistant slowly let up on the clutch pedal. The .010" feeler gauge should slide out when the clutch pedal is 1/2" to 1" above the cab floor or lower pedal stop.
2. If the .010" feeler gauge is not adequately squeezed to prevent removal or can be removed with the pedal less than 1/2" or greater than 1", check and adjust the clutch pedal height and travel per the chassis manufacturer's instructions. In addition, check the external clutch linkage for excessive wear or obstruction preventing complete travel.

## Driving Techniques

Fault Codes	Hand-Held Code			Description	Type of Code	Driving Technique
	PID	SID	FMI			
11		254	2, 12	System Controller	Component	Key on. If the fault is present, the system should automatically detect the problem and set the code. If the fault is not present at key on, operate the vehicle and attempt to duplicate the driving conditions that triggered the fault code. Possible triggers include heat and vibration.

Fault Codes	Hand-Held Code			Description	Type of Code	Driving Technique
	PID	SID	FMI			
12		233	12	Transmission Controller	Component	Key on. If the fault is present, the system should automatically detect the problem and set the code. If the fault is not present at key on, operate the vehicle and attempt to duplicate the driving conditions that triggered the fault code. Possible triggers include heat and vibration.

Fault Codes	Hand-Held Code			Description	Type of Code	Driving Technique
	PID	SID	FMI			
13		236	4,5	Power Connect Relay Coil	Component	Key on. If the fault is present, the system should automatically detect the problem and set the code. If the fault is not present at key on, operate the vehicle and attempt to duplicate the driving conditions that triggered the fault code. Possible triggers include heat and vibration.

Fault Codes	Hand-Held Code			Description	Type of Code	Driving Technique
	PID	SID	FMI			
14		18	12	Shift Lever	Component	Key on. If the fault is present, the system should automatically detect the problem and set the code. If the fault is not present at key on, operate the vehicle and attempt to duplicate the driving conditions that triggered the fault code. Possible triggers include heat, vibration and selecting different shift lever positions.

## Driving Techniques

Fault Codes	Hand-Held Code			Description	Type of Code	Driving Technique
	PID	SID	FMI			
15		57	2	Shift Lever Data Link	Component	Key on. If the fault is present, the system should automatically detect the problem and set the code. If the fault is not present at key on, operate the vehicle and attempt to duplicate the driving conditions that triggered the fault code. Possible triggers include heat and vibration.

Fault Codes	Hand-Held Code			Description	Type of Code	Driving Technique
	PID	SID	FMI			
16		248	2	Eaton Proprietary Link (EPL)	Component	Key on. If the fault is present, the system should automatically detect the problem and set the code. If the fault is not present at key on, operate the vehicle and attempt to duplicate the driving conditions that triggered the fault code. Possible triggers include heat and vibration.

Fault Codes	Hand-Held Code			Description	Type of Code	Driving Technique
	PID	SID	FMI			
17		237	4	Start Enable Relay Coil	Component	Key on. If the fault is present, the system should automatically detect the problem and set the code. If the fault is not present at key on, operate the vehicle and attempt to duplicate the driving conditions that triggered the fault code. Possible triggers include heat and vibration.

Fault Codes	Hand-Held Code			Description	Type of Code	Driving Technique
	PID	SID	FMI			
31	62		3,4,5	Engine Brake Relay Coil	Component	Key on. If the fault is present, the system should automatically detect the problem and set the code. If the fault is not present at key on, operate the vehicle and attempt to duplicate the driving conditions that triggered the fault code. Possible triggers include heat and vibration.

## Driving Techniques

Fault Codes	Hand-Held Code			Description	Type of Code	Driving Technique
	PID	SID	FMI			
33	168		4	Battery Voltage Supply	Component	Key on. If the fault is present, the system should automatically detect the problem and set the code. If the fault is not present at key on, operate the vehicle and attempt to duplicate the driving conditions that triggered the fault code. Possible triggers include heat and vibration.

Fault Codes	Hand-Held Code			Description	Type of Code	Driving Technique
	PID	SID	FMI			
35		231	2,7	Engine Control Failure	System	Key on. If the fault is present, the system should automatically detect the problem and set the code. If the fault is not present at key on, operate the vehicle and attempt to duplicate the driving conditions that triggered the fault code. Possible triggers include heat ,vibration and varying levels of throttle demand.

Fault Codes	Hand-Held Code			Description	Type of Code	Driving Technique
	PID	SID	FMI			
41		56	7	Rang Failed to Engage	System	Operate the vehicle and perform several range upshifts and downshifts.The failure is detected after 5 consecutive attempts to complete the same type of range shift. Several shifts (ten or more) may be necessary before the ECU confirms the failure.

Fault Codes	Hand-Held Code			Description	Type of Code	Driving Technique
	PID	SID	FMI			
42		61	7	Splitter Failed to Engage	System	Operate the vehicle and perform several range upshifts and downshifts.The failure is detected after 5 consecutive attempts to complete the same type of range shift. Several shifts (ten or more) may be necessary before the ECU confirms the failure.



## Driving Techniques

Fault Codes	Hand-Held Code			Description	Type of Code	Driving Technique
	PID	SID	FMI			
43		35 or 36	3,4,5	Range Solenoid Valve	Component	Key on. If the fault is present, the system should automatically detect the problem and set the code. If the fault is not present at key on, operate the vehicle and attempt to duplicate the driving conditions that triggered the fault code. Possible triggers include heat and vibration.

Fault Codes	Hand-Held Code			Description	Type of Code	Driving Technique
	PID	SID	FMI			
44	54		3,4,5	Inertia Brake Solenoid Coil	Component	Key on. If the fault is present, the system should automatically detect the problem and set the code. If the fault is not present at key on, operate the vehicle and attempt to duplicate the driving conditions that triggered the fault code. Possible triggers include heat and vibration.

Fault Codes	Hand-Held Code			Description	Type of Code	Driving Technique
	PID	SID	FMI			
46		37 or 38	4,5	Splitter Solenoid Valve	Component	Key on. If the fault is present, the system should automatically detect the problem and set the code. If the fault is not present at key on, operate the vehicle and attempt to duplicate the driving conditions that triggered the fault code. Possible triggers include heat and vibration.

Fault Codes	Hand-Held Code			Description	Type of Code	Driving Technique
	PID	SID	FMI			
51	60		2	Rail Select Sensor	Component	Key on. If the fault is present, the system should automatically detect the problem and set the code. If the fault is not present at key on, operate the vehicle and attempt to duplicate the driving conditions that triggered the fault code. Possible triggers include heat and vibration.

## Driving Techniques

Fault Codes	Hand-Held Code			Description	Type of Code	Driving Technique
	PID	SID	FMI			
52	59		2	Gear Select Sensor	Component	Key on. If the fault is present, the system should automatically detect the problem and set the code. If the fault is not present at key on, operate the vehicle and attempt to duplicate the driving conditions that triggered the fault code. Possible triggers include heat and vibration.

Fault Codes	Hand-Held Code			Description	Type of Code	Driving Technique
	PID	SID	FMI			
53		34	2	Reverse Ball Switch	Component	Select a reverse gear (repeatedly).

Fault Codes	Hand-Held Code			Description	Type of Code	Driving Technique
	PID	SID	FMI			
56	161		2	Input Shaft Speed Sensor	Component	Select a forward gear and drive at a steady speed no slower than 10 mph. It may be necessary to operate the vehicle for a prolonged period of time if the cause of failure is related to heat and vibration.

Fault Codes	Hand-Held Code			Description	Type of Code	Driving Technique
	PID	SID	FMI			
57	160		2	Main Shaft Speed Sensor	Component	Select a forward gear and drive at a steady speed no slower than 10 mph. It may be necessary to operate the vehicle for a prolonged period of time if the cause of failure is related to heat and vibration.

Fault Codes	Hand-Held Code			Description	Type of Code	Driving Technique
	PID	SID	FMI			
58	191		2	Output Shaft Speed Sensor	Component	Select a forward gear and drive at a steady speed no slower than 10 mph. It may be necessary to operate the vehicle for a prolonged period of time if the cause of failure is related to heat and vibration.

# Driving Techniques

Fault Codes	Hand-Held Code			Description	Type of Code	Driving Technique
	PID	SID	FMI			
61		39	5,6	Rail Select Motor	Component	Key on. If the fault is present, the system should automatically detect the problem and set the code. If the fault is not present at key on, operate the vehicle and attempt to duplicate the driving conditions that triggered the fault code. Possible triggers include heat and vibration.

Fault Codes	Hand-Held Code			Description	Type of Code	Driving Technique
	PID	SID	FMI			
63		40	5,6	Gear Select Motor	Component	Key on. If the fault is present, the system should automatically detect the problem and set the code. If the fault is not present at key on, operate the vehicle and attempt to duplicate the driving conditions that triggered the fault code. Possible triggers include heat and vibration.

Fault Codes	Hand-Held Code			Description	Type of Code	Driving Technique
	PID	SID	FMI			
65		251	4	Low Motor Voltage	Component	Key on. If the fault is present, the system should automatically detect the problem and set the code. If the fault is not present at key on, operate the vehicle and attempt to duplicate the driving conditions that triggered the fault code. Possible triggers include heat and vibration.

Fault Codes	Hand-Held Code			Description	Type of Code	Driving Technique
	PID	SID	FMI			
71		60	7	Stuck Engaged	System	Engage LO gear and allow the vehicle to slowly move forward. While the vehicle is in motion, move the shift lever to Reverse LO and slowly bring the vehicle to a stop. The vehicle will shift into Reverse LO. Several shifts (ten or more) may be necessary before the ECU confirms the failure.

## Driving Techniques

Fault Codes	Hand-Held Code			Description	Type of Code	Driving Technique
	PID	SID	FMI			
72		59	7	Failed to Select Rail	System	Complete several shifts while the vehicle is in motion, including selections from neutral. Allow the transmission to complete several automatic shifts.

Fault Codes	Hand-Held Code			Description	Type of Code	Driving Technique
	PID	SID	FMI			
73		58	7	Failed to Engage Gear	System	Complete several shifts while the vehicle is in motion, including selections from neutral. Allow the transmission to complete several automatic shifts.

Fault Codes	Hand-Held Code			Description	Type of Code	Driving Technique
	PID	SID	FMI			
74		18	14	Failed to Sync Initial Engagement	System	With vehicle stopped, select a drive gear and fully depress the clutch pedal. Return transmission to neutral. Repeat several times.

Fault Codes	Hand-Held Code			Description	Type of Code	Driving Technique
	PID	SID	FMI			
83		18	14	Shift Lever Missing	Component	Key on. If the fault is present, the system should automatically detect the problem and set the code. If the fault is not present at key on, operate the vehicle and attempt to duplicate the driving conditions that triggered the fault code. Possible triggers include heat and vibration.