Fuller Heavy-Duty Transmissions TRTS0011 EN-US

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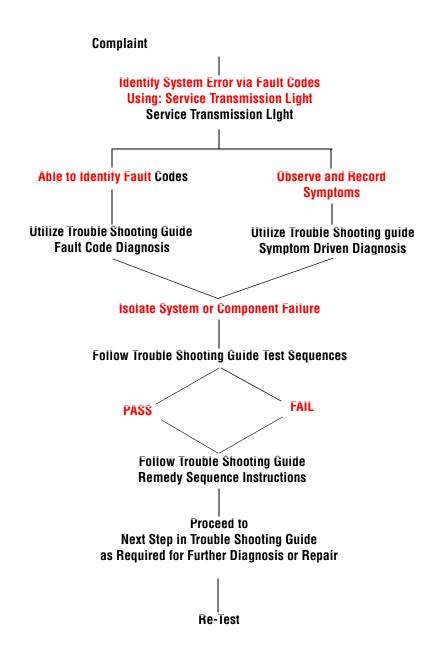
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▲ WARNING

- Before starting a vehicle always be seated in the driver's seat, move the shift lever to neutral, and set the parking brakes.
- If engine cranks in any other gear than neutral, service your vehicle neutral safety start circuit and start enable relay circuit immediately.
- Before working on a vehicle or leaving the cab with engine running, place the transmission in neutral, set the parking brakes,
 AND block the wheels.
- Do not release the parking brake or attempt to select a gear until the air pressure is at the correct level.
- For safety reasons, always engage the service brakes when moving the shift lever from neutral to one of the other gear positions.
- When parking the vehicle or leaving the cab, always place the shift lever in neutral and set the parking brakes.
- TOWING: To avoid damage to the transmission during towing, place the transmission in neutral and lift the drive wheels off the ground or disconnect the driveline.

Every effort has been made to ensure the accuracy of all information in this manual. However, Eaton Transmission Division makes no expressed or implied warranty or representation based on the enclosed information. Any errors or omissions may be reported to Training and Publications, Eaton Transmission Division, P.O. Box 4013, Kalamazoo, MI 49003

Complaint Isolation, Verification & Remedy Procedure



Introduction

For all questions concerning inspection, removal, replacement, or adjustment procedures, refer to Eaton or OEM Service and Parts Literature.

How To Use this Troubleshooting Guide

The purpose of this manual is to assist in the diagnosis and verification of your electronically managed heavy-duty transmission system. It should be used in conjunction with Eaton Driver Instructions, Illustrated Parts List, Installation Guide, and Service Manual -- as well as OEM service related material.

This guide provides three functions:

- 1. **Service Transmission Light Diagnostics:** designed to lead the service technician to the source of a problem through flashing error codes.
- 2. **Performance Evaluation:** designed to lead the service technician to the source of a problem through a performance evaluation.
- **3. Test and remedy Sequences:** detailed component testing designed to isolate and resolve system failures.

Service Transmission Light Diagnostics

The Service Transmission indicator light, which is also the torque converter open lamp, assists the mechanic in problem diagnosis via flashing signals equal to Fault Code numbers as listed in the Fault Codes Diagnosis section of this manual.

If a driver reports a degraded mode of operation, advise that the capabilities of the truck should be assessed and then taken to a service site. **The transmission temperature should be monitored during the trip to the service site.**Examples of potential problem conditions under which a vehicle with a Converter Enhanced Mechanical Transmission can be driven include:

- Transmission fails to lock torque converter, but vehicle can still proceed although speed and/or power is limited.
- Transmission is not able to select all ratios and limits the gears available.
- **1. Using the Service Transmission Light for Diagnostics:** To activate the retrieval of fault codes via the Service Transmission light perform the following steps:
- Active Codes: Place the Shift Lever in Neutral. Set the parking brakes. Begin
 with the key in the off position. Turn the key off and back on two (2) times within
 5 seconds (OFF/ON/OFF/ON). It is OK if the engine stops, or continues running,
 however do not re-energize the starter when retrieving Fault Codes as you may
 cause codes to clear.
- If there are no active fault codes, then retrieve the intermittent codes.
- Intermittent codes: Follow instructions for Active Codes, but turn key OFF and ON four (4) times.
- To clear fault codes: Follow instructions for Active Codes, but turn key OFF and ON six (6) times. Fault codes should be cleared each time the transmission is serviced.

Introduction

For all questions concerning inspection, removal, replacement, or adjustment procedures, refer to Eaton or OEM Service and Parts Literature.

- 1a. After activating the retrieval of codes, to read transmission errors via the Service Transmission light, observe the sequence of flashes exhibited by the light. The Service Transmission light will flash in coded sequences equal to Fault Codes identified in this manual. A long pause (5 seconds) follows each code before it is repeated, or the next codes sequence is given. Examples:
- Flash / Pause / Flash = Fault Code 11 System Controller
- Flash Flash / Pause / Flash Flash Flash = Fault Code 23 Engine Speed Sensor
- Flash / Pause / Flash Long Pause Flash Flash / Pause / Flash Flash Flash = Fault Codes 11
 & 23.
- **1b.** To identify fault codes and applicable tests signalled by the Service Transmission light refer to the Fault code Diagnosis section of this manual.

Symptom Diagnosis

- **1.** Refer to the Performance Evaluation test in this manual.
- 2. Locate and perform appropriate Test Sequence as indicated by the Performance Evaluation Test.

Before Beginning Diagnostic Procedures

It is possible to "clear" or "reset" the Converter Enhanced Mechanical Electronic Control Unit (ECU) for some transmission errors. If the transmission is not functioning properly try these steps before beginning diagnostic procedures:

- 1. Stop the vehicle.
- **2.** Place the shift lever in neutral.
- **3.** Set the parking brakes.
- **4.** Turn off the engine/ignition and wait for one minute.
- **5.** Restart the engine.
- **6.** Resume operation.

Test Sequence and Remedy Sequence

- **1.** Locate the correct Test Sequence.
- 2. Always perform pre-test procedures found at the top of each Test Sequence page before beginning test procedure.
- **3.** Follow test steps in sequence.
- **4.** Go to Remedy Sequence when required.
- **5.** Perform appropriate removal, replacement or adjustment procedures.

Fault

Code

Diagnosis

Fault Code	Test Procedure	Page	
13	Power Relay Coil Test	12	
15	Inertial Brake Solenoid Coil Test	15	
22	Bypass/Lockup Solenoid Coil Test	23	
23	Engine Speed Sensor Test	21	
33	System Voltage Test	13	
56	Input Shaft Speed Sensor Test	29	
57	Output Shaft Speed Sensor Test	31	

If no fault codes exist perform the Performance Evaluation Test. Locate and perform appropriate test sequence as indicated by the evaluation.

Symptom

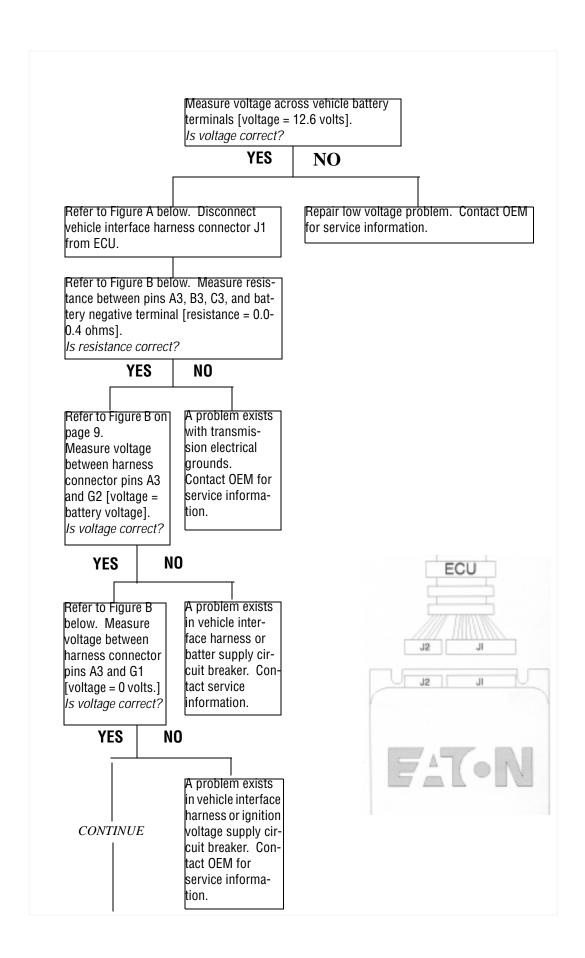
Driven

Diagnosis

Transmission

Electrical

Test



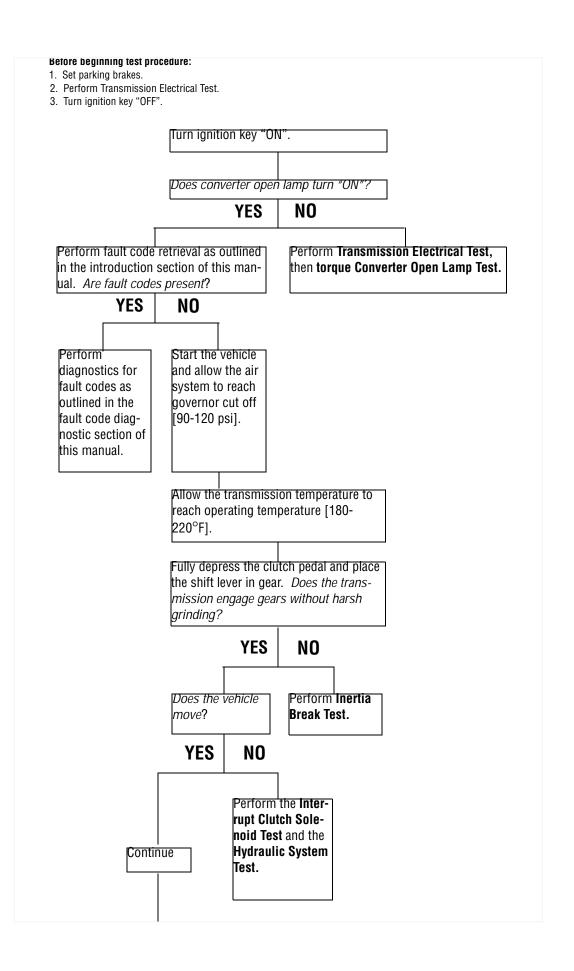
Continuation Turn the ignition key "ON". Refer to Figure B on page 12. Measure the voltage between the harness connector pins A3 and G1 [voltage = battery voltage]. Is voltage correct? YES NO Turn ignition key "OFF". A problem exists in vehicle interface harness or ignition voltage supply circuit breaker. Contact OEM for service information. Refer to Figure B below. Place jumper wire across vehicle interface harness connector pins F1 and A3. Refer to Figure B below. Measure voltage between harness connector pins B3 and E1 [voltage = battery voltage]. Is voltage correct? YES NO Refer to Figure A on page 8. A problem exists in transmis-Disconnect vehicle interface sion power relay or vehicle harness J2 connector from interface harness, contact ECU. OEM for service information. Refer to Figure C on page 12. Measure voltage between J1 connector pin B3 and J2 connector pin A3 [voltage = battery voltage]. Is voltage correct? YES NO Test complete Repair/replace vehicle interface harness according to OEM service information.

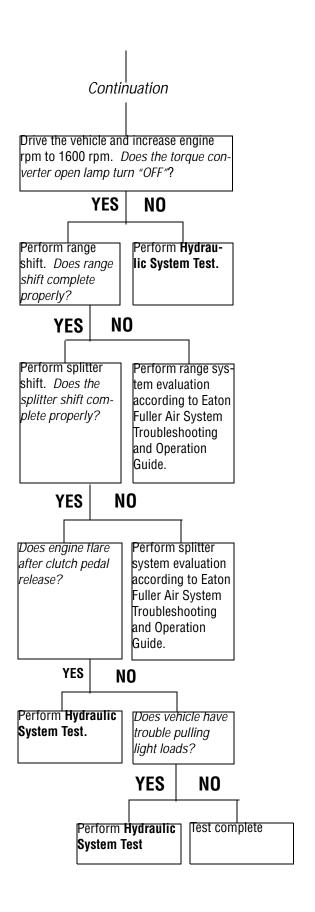
Transmission

Electrical

Test

Performance Evaluation Test





Power

Relay

Coil

Test

For all questions concerning inspection, removal, replacement, or adjustment procedures, refer to Eaton or OEM Service and Parts Literature.

rigure A: venicle interface Harness

ECU

FATO

Before beginning test procedure:

- 1. Set parking brakes.
- 2. Perform Transmission Electrical Test.
- 3. Turn ignition key "OFF".

Refer to Figure A below. Disconnect vehicle interface harness J1 connector from the transmission ECU.

Refer to Figure B below. Measure resistance between J1 connector pins F1 and G2 [resistance = 40-90 ohms]. Measure voltage between G2 and vehicle ground, F1 and vehicle electrical ground [should = battery voltage].

NO

YES

Replace transmission ECU. Locate power relay assembly and disconnect vehicle interface harness from relay assembly. Refer to Figure C below. Measure resistance between pins 85 and 86 of each power relay [resistance = 40-90 ohms]. Is resistance correct? YES NO Replace vehicle Replace power interface harness relay assembly according to OEM according to service informa-OEM service information. tion. Figure B: Connector J1 Test complete A3 B3 C3 D3 E3 F3 G3 H3 J3 K3 A2 B2 C2 D2 E2 F2 G2 H2 J2 K2

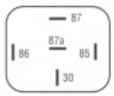
G1 H1 J1

K1

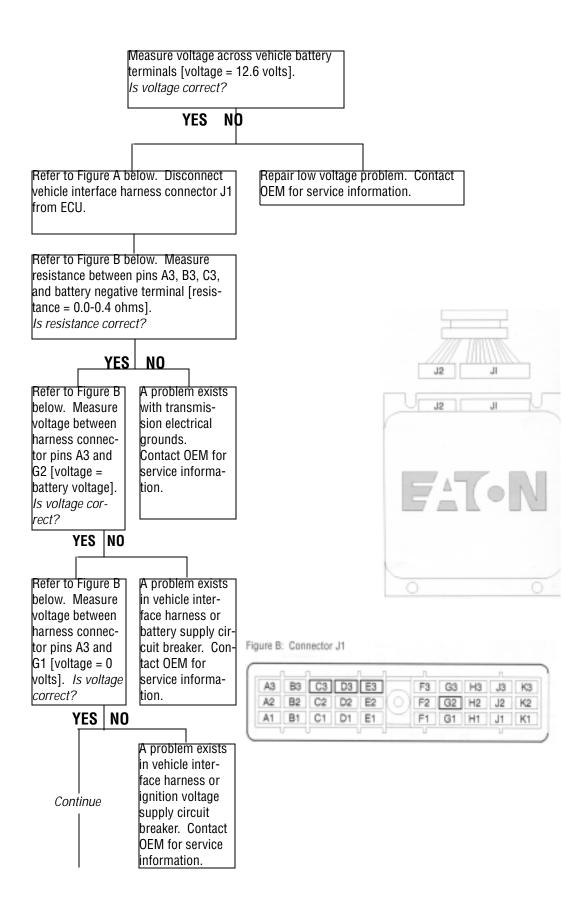
Figure C: Relay Connector

E1

B1 C1 D1



- 1. Set parking brakes.
- 2. Perform Transmission Electrical Test.
- 3. Turn ignition key "OFF".



System

Voltage

Test

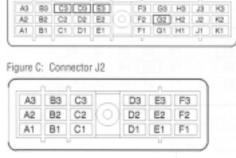
System

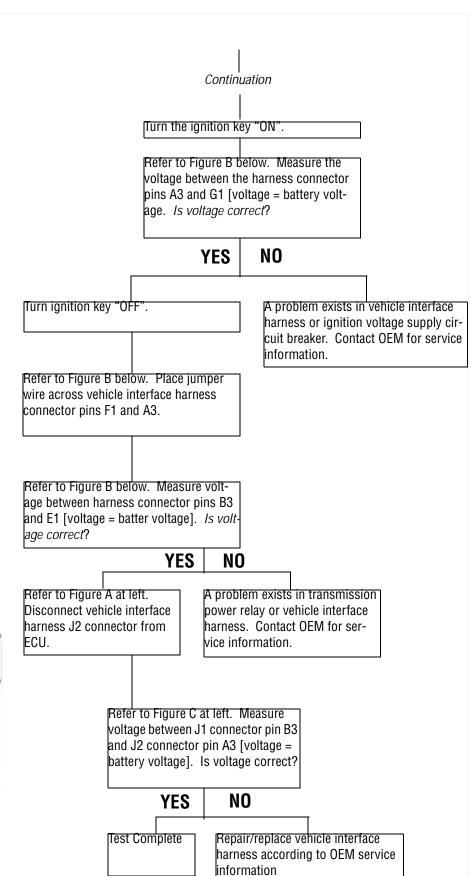
Voltage

Test



Figure B: Connector J1





- 1. Set parking brakes.
- 2. Perform Transmission Electrical Test.
- 3. Turn ignition key "OFF".

Inertia Brake Solenoid Coil Test

For all questions concerning inspection, removal, replacement, or adjustment procedures, refer to Eaton or OEM Service and Parts Literature.

Refer to Figure A below. Disconnect inertia brake solenoid from the transmission electrical harness.

Measure resistance between inertia brake solenoid connector pins [resistance = 11-18 ohms]. Measure resistance between inertia brake solenoid and vehicle electrical ground [resistance = infinity]. Is resistance correct?

Connect inertia brake solenoid to transmission harness.

Replace inertia brake solenoid.

Disconnect transmission harness

Refer to Figure B below. Measure resistance between transmission harness pins G and H [resistance = 11-18 ohms]. Measure resistance between transmission harness pin H and vehicle electrical ground [resistance = infinity]. Is resistance correct?

from vehicle interface harness.

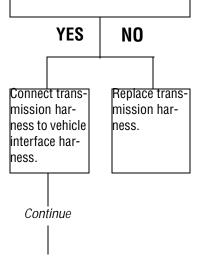
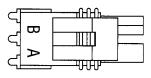


Figure A: Inertia Brake Solenoid Connector



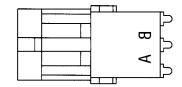
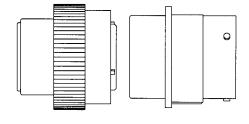
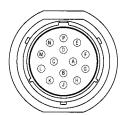


Figure B: Transmission Harness Connector

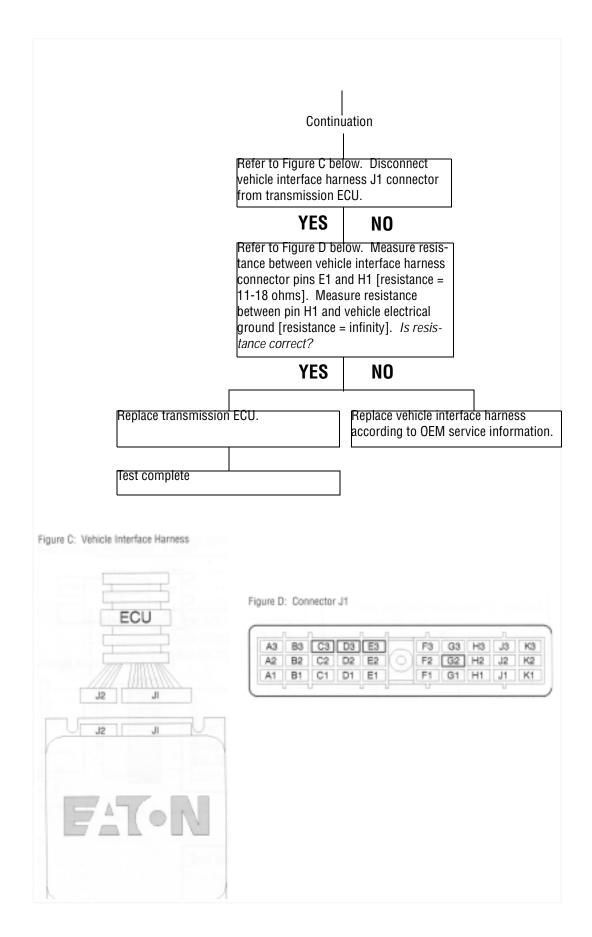




Inertia Brake Solenoid Test

For all questions concerning inspection, removal, replacement, or adjustment procedures, refer to Eaton or OEM Service and Parts Literature.

Coil



- 1. Set parking brakes.
- 2. Perform Transmission Electrical Test.
- 3. Turn ignition key "OFF".

Refer to Figure A below. Install 0-100 psi air gauge in inertia brake air line. Gauge should be installed in "T" fashion.

Start vehicle and allow air pressure to reach governor cut off [90-125 psi].

With the vehicle at idle fully depress clutch pedal and monitor air pressure gauge.

Does the inertia brake air pressure cycle on and off?

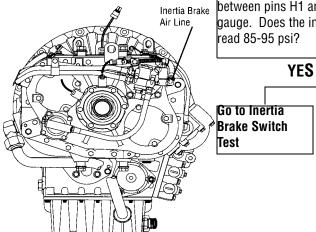
YES NO

Replace inertia brake according to service manual.

Refer to Figure B below. Disconnect vehicle interface harness connector J1 from transmission ECU.

Refer to Figure C below. Place jumper wire between pins G2 and E1.

Figure A



Refer to Figure C below. Place jumper wire between pins H1 and A3. Monitor pressure gauge. Does the inertia brake air pressure read 85-95 psi?

Remove air gauge from inertia brake air line.

NO

Go to Inertia Brake Air Supply Test

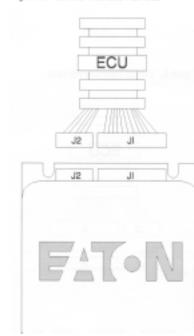
Figure C: Connector J1

					_	n_				
A0	D0	Ca	Da	E3	_	Fa	GG	Ha	J3	PC
A2	82	C2	D5	E2	(\circ)	F2	[32]	H2	JIZ	Kg
A1	D1	C1	D1	E1		E1	G1	H1	.11	901

Inertia Brake

Tes

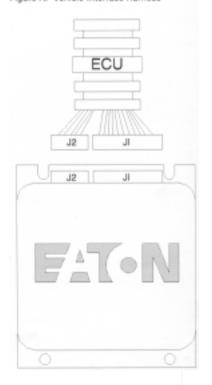
Figure B: Vehicle Interface Harness



Inertia Brake Switch Test

For all questions concerning inspection, removal, replacement, or adjustment procedures, refer to Eaton or OEM Service and Parts Literature.

Figure A: Vehicle Interface Harness



Before beginning test procedure:

- 1. Set parking brakes.
- 2. Perform Transmission Electrical Test.
- 3. Turn ignition key "OFF".

Refer to Figure A below. Disconnect vehicle interface harness connector J2 from the transmission ECU. Refer to Figure B below. Measure the resistance between pin F3 and vehicle electrical ground [resistance = infinity]. Is resistance correct? YES NO Fully depress the clutch pedal. Repair inertia brake switch according to OEM service information. Refer to Figure A below. Measure the resistance between pin F3 and vehicle electrical ground [resistance = 0-5 ohms]. Is resistance correct? YES NO Replce transmis-Repair inertia sion ECU accordbrake switch circuit according to ing to transmission ser-OEM service vice manual. information. Figure B: Connector J2 АЗ B3 Ca D3 E3 F3



- 1. Set parking brakes.
- 2. Perform Transmission Electrical Test.
- 3. Turn ignition key "OFF".

Refer to Figure A below. Install 0-100 psi air gauge in inertia brake solenoid air regulator port.

Start the vehicle and allow air system to reach governor cut-off [90-120 psi]. Monitor air pressure gauge. *Does air pressure equal 73-83 psi*?

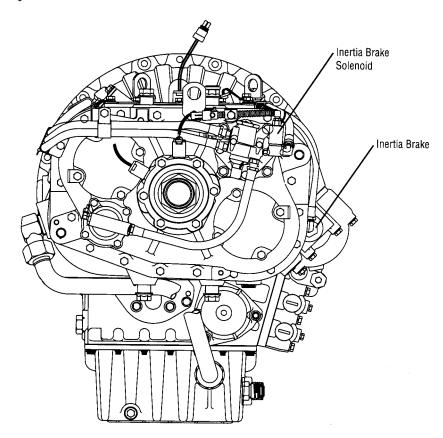
YES

NO

Replace inertia brake solenoid according to transmission service manual.

Replace air filter regulator according to transmission service manual.

Figure A



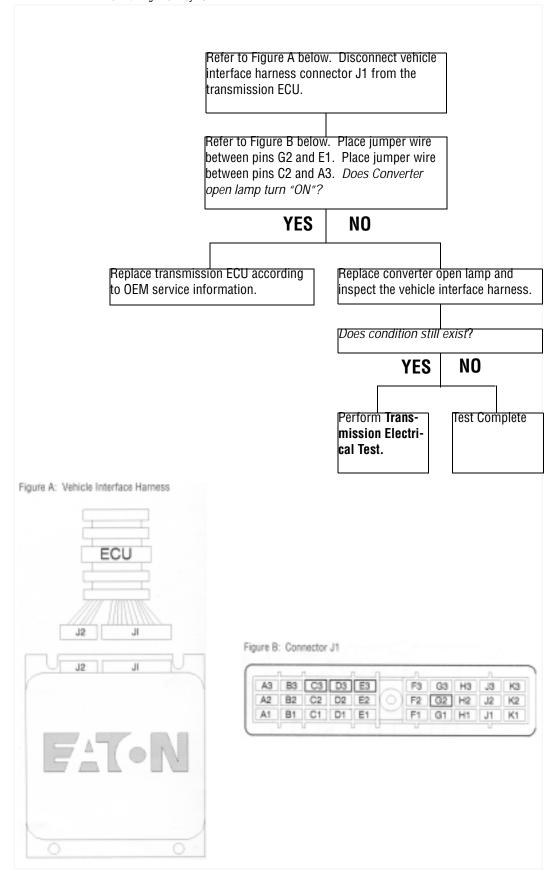
Inertia Brake Air Supply Test

Transmission Converter Open Lamp Test

For all questions concerning inspection, removal, replacement, or adjustment procedures, refer to Eaton or OEM Service and Parts Literature.

Before beginning test procedure:

- 1. Set parking brakes.
- 2. Perform Transmission Electrical Test.
- 3. Turn ignition key "OFF".



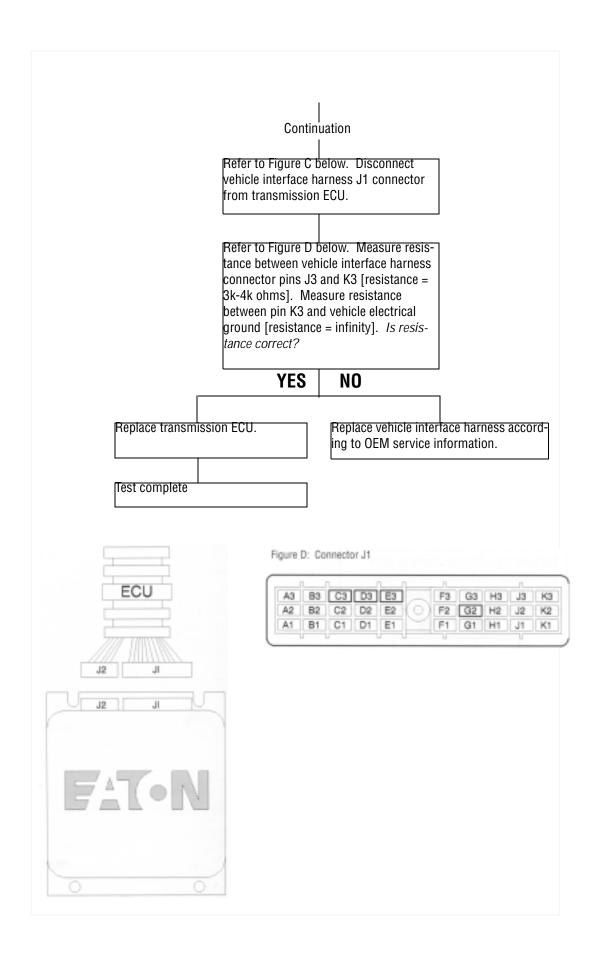
- 1. Set parking brakes.
- 2. Perform Transmission Electrical Test.
- 3. Turn ignition key "OFF".

Refer to Figure A below. Disconnect engine Test speed sensor from transmission electrical harness. Measure resistance between engine speed sensor connector pins [resistance = 3k-4k For all questions ohms]. Measure resistance between concerning engine speed sensor pin A and vehicle elecinspection, trical ground [resistance = infinity]. Is removal, resistance correct? replacement, or adjustment procedures, YES NO refer to Eaton or **OEM Service and** Parts Literature. Connect engine speed sensor to Replace engine speed sensor. transmission harness. Refer to Figure B below. Disconnect transmission harness from the vehicle interface harness. Measure resistance between transmission harness pins N and P [resis-Figure A: Engine Speed Sensor Connector tance = 3k-4k ohms]. Measure resistance between transmission harness pin P and vehicle electrical œ \Box ground [resistance = infinity]. Is ⋖ resistance correct? Figure B: Transmission Harness Connector YES NO 0 0 Connect trans-Replace transmission harmission harness to vehicle ness. interface harness. Continue

Engine

Speed Sensor

Engine Speed Sensor Test



- 1. Set parking brakes.
- 2. Perform Transmission Electrical Test.
- 3. Turn ignition key "OFF".

Refer to Figure A below. Disconnect torque converter harness from transmission electrical harness.

Measure resistance between torque converter harness pins A and B [resistance = 2.5-4 ohms]. Measure resistance between torque converter harness pin A and vehicle electrical ground [resistance = infinity]. Is resistance correct?

YES NO

Connect torque converter harness to transmission harness.

Replace torque converter harness.

Refer to Figure B below. Disconnect transmission harness from the vehicle interface harness.

Measure resistance between transmission harness pins A and B [resistance = 2.5-4 ohms]. Measure resistance between transmission harness pin B and vehicle electrical ground [resistance = infinity]. Is resistance correct?

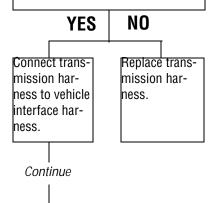


Figure A: Torque Converter Harness Connector

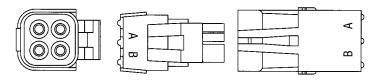
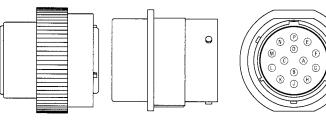


Figure B: Transmission Harness Connector



Bypass/

Lockup

Coil

Test

Solenoid

For all questions

concerning

inspection,

replacement,

or adjustment

OEM Service and Parts Literature.

procedures, refer to Eaton or

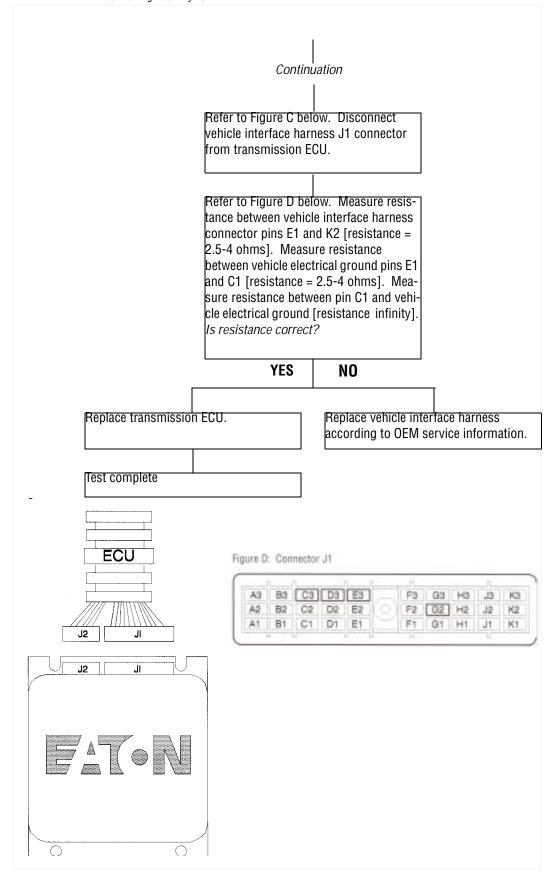
removal,

Bypass/ Lockup Solenoid Coil Test

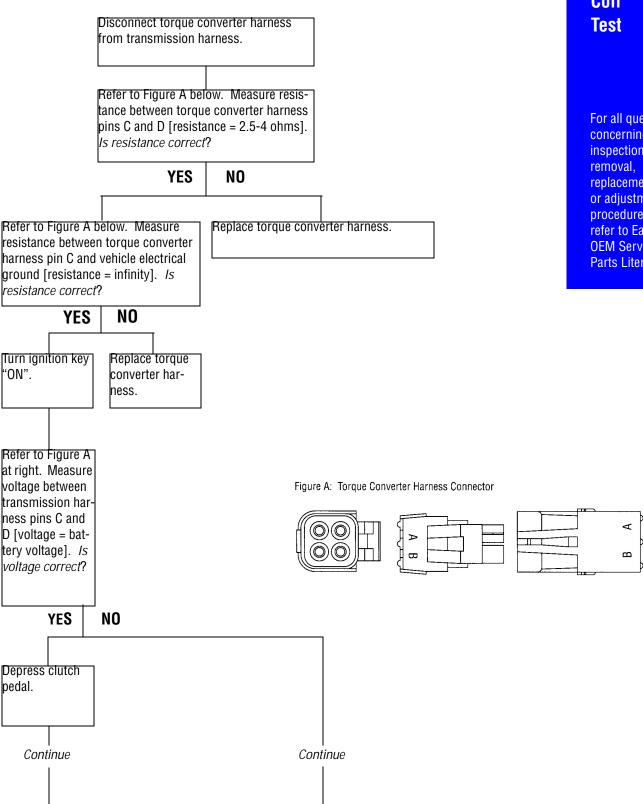
For all questions concerning inspection, removal, replacement, or adjustment procedures, refer to Eaton or OEM Service and Parts Literature.

Before beginning test procedure:

- 1. Set parking brakes.
- 2. Perform Transmission Electrical Test.
- 3. Turn ignition key "OFF".



- 1. Set parking brakes.
- 2. Perform Transmission Electrical Test.
- 3. Turn ignition key "OFF".

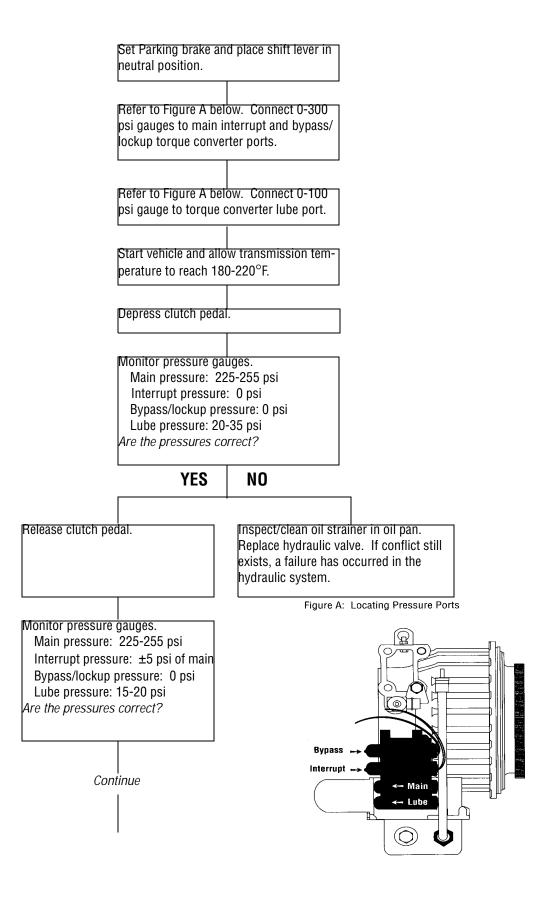


Interrupt Clutch Solenoid Coil

Interrupt Clutch Solenoid Coil Test

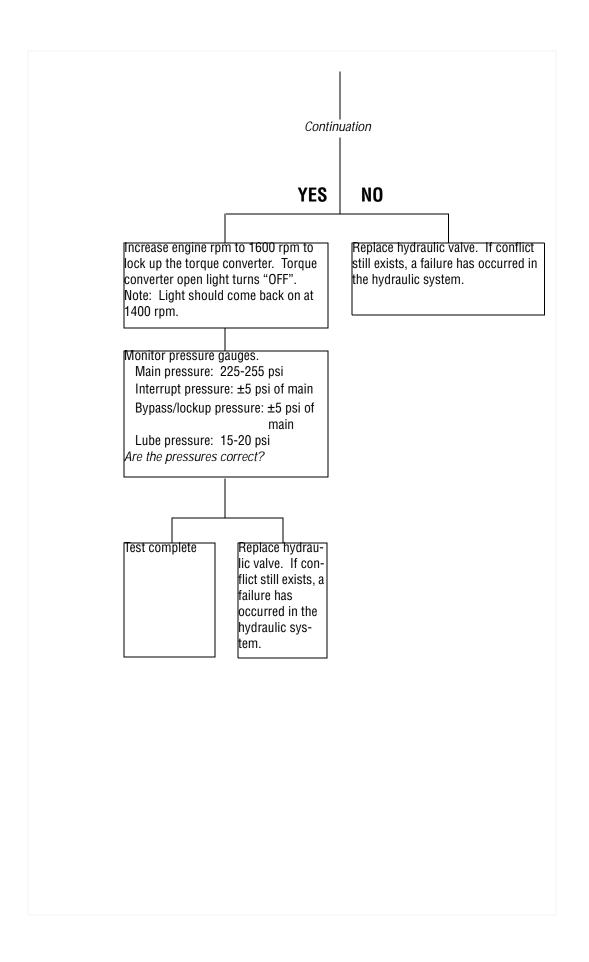
Continuation Continuation Refer to Figure A below. Measure volt-For all questions age between transmission harness pins concerning C and D [voltage = 0 volts]. Is voltage inspection, correct? removal, replacement, YES NO or adjustment procedures, refer to Eaton or Test Complete Release clutch **OEM Service and** pedal. Parts Literature. Figure A: Torque Converter Harness Connector Connect torque converter harness to transmission harness. Disconnect transmission harness from vehicle V interface harness. Ω Refer to Figure B below. Measure volt-Figure B: Transmission Harness Connector age between vehicle interface harness pins C and D [voltage = battery voltage]. Is voltage correct? 0 YES NO € (0) A Depress clutch pedal. Refer to Figure B at left. Measure voltage between vehicle interface harness pins C and D [voltage = 0 volts]. Is voltage correct? YES N₀ Replace trans-A problem exists in the vehicle interface mission harness harness, clutch switch or power connect relay. Contact OEM for service information.

- 1. Set parking brakes.
- 2. Perform Transmission Electrical Test.
- 3. Turn ignition key "OFF".



Hydraulic System Test

Hydraulic System Test

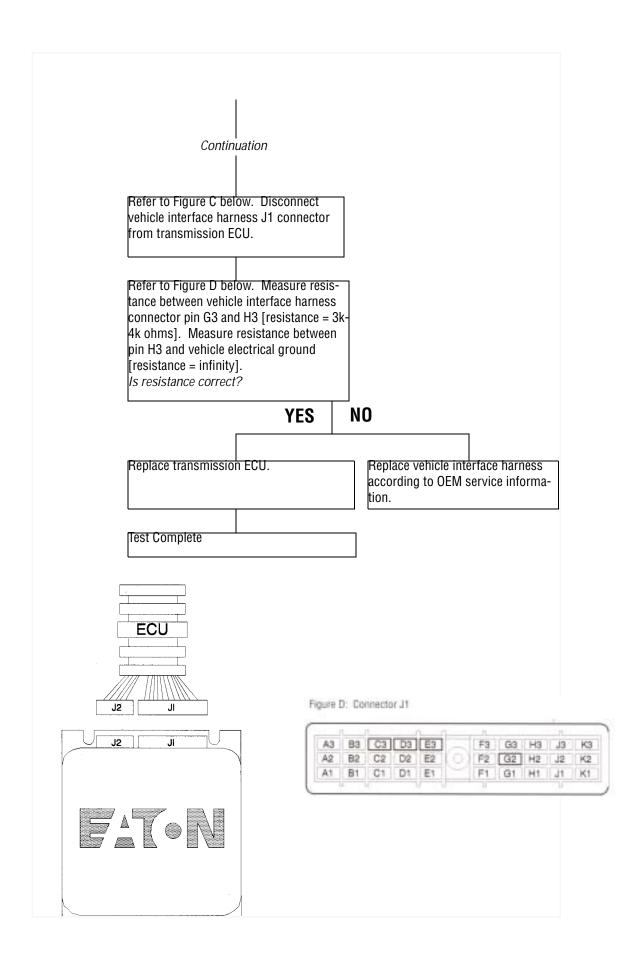


- 1. Set parking brakes.
- 2. Perform Transmission Electrical Test.
- 3. Turn ignition key "OFF".

Refer to Figure A below. Disconnect Test input shaft speed sensor from the transmission electrical harness. Measure resistance between input shaft speed sensor connector pins [resistance = 3k-4k ohms]. Measure resistance between input shaft speed sensor pin A and vehicle electrical ground [resistance = infinity]. Is resistance correct? YES NO Connect input shaft speed sensor to Replace the input shaft speed sensor. transmission harness. Refer to Figure B below. Disconnect Figure A: Speed Sensor Connector transmission harness from vehicle interface harness. Measure resistance between transmission harness pins J and K [resistance = 3k-4k ohms]. Measure resistance between transmission harness pin K and vehicle electrical ground [resistance = infinity]. Is resistance correct? YES NO Connect transmission harness to Replace the transmission harness. transmission electrical harness. Continue Figure B: Transmission Harness Connector 0 ① A

Input
Shaft
Speed
Sensor
Test

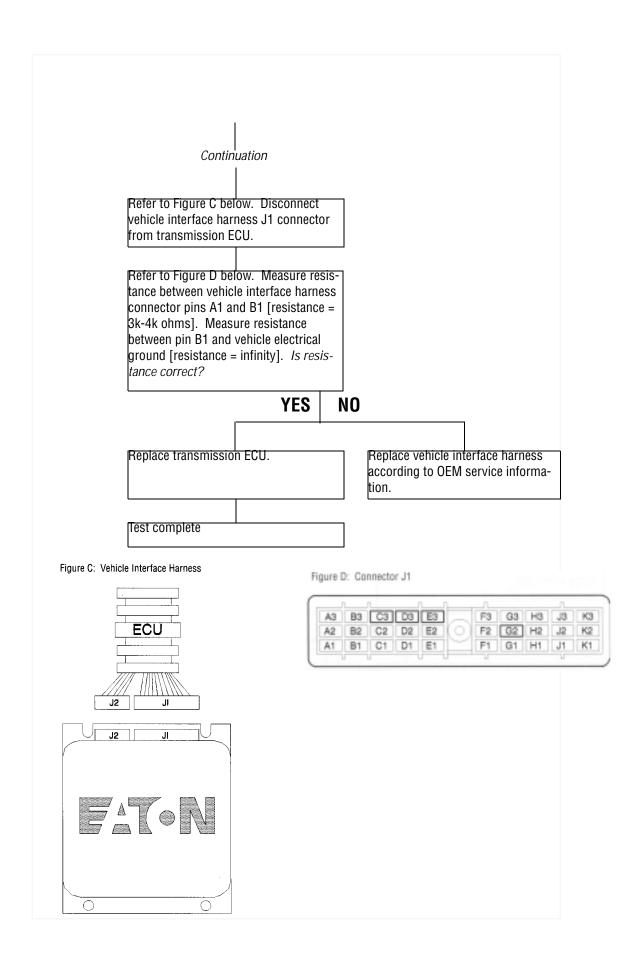
Input Shaft Sensor Test



- 1. Set parking brakes.
- 2. Perform Transmission Electrical Test.
- 3. Turn ignition key "OFF".

Refer to Figure A below. Disconnect output shaft speed sensor from the transmission electrical harness. Measure resistance between output shaft speed sensor connector pins [resistance = 3k-4k ohms]. Measure resistance between output shaft speed sensor pin A and vehicle electrical ground [resistance = infinity]. Is resistance correct? YES NO Connect output shaft speed sensor to Replace the output shaft speed sensor. transmission harness. Refer to Figure B below. Disconnect Figure A: Speed Sensor Connector transmission harness from vehicle interface harness. Measure resistance between transmission harness pins E and F [resistance = 3k-4k ohms]. Measure resistance between transmission harness pin F and vehicle electrical ground [resistance = infinity]. Is resistance correct? YES N₀ Connect transmission harness to Replace the transmission harness. transmission electrical harness. Continue Figure B: Transmission Harness Connector 0 Output Shaft Speed Sensor Test

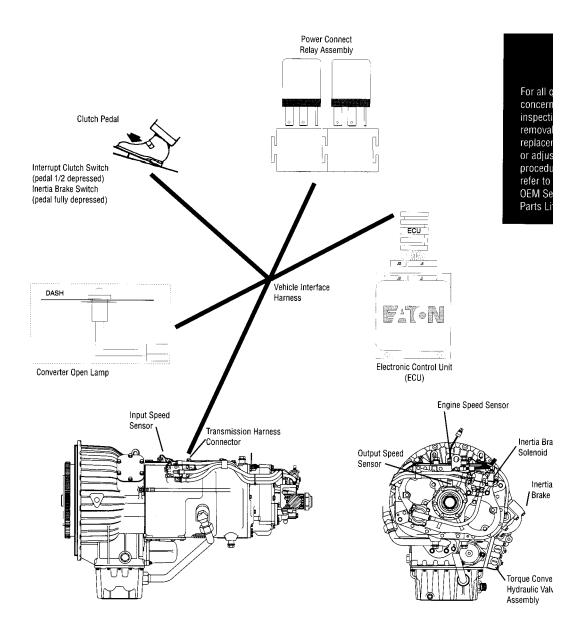
Output Shaft Sensor Test



Appendix I

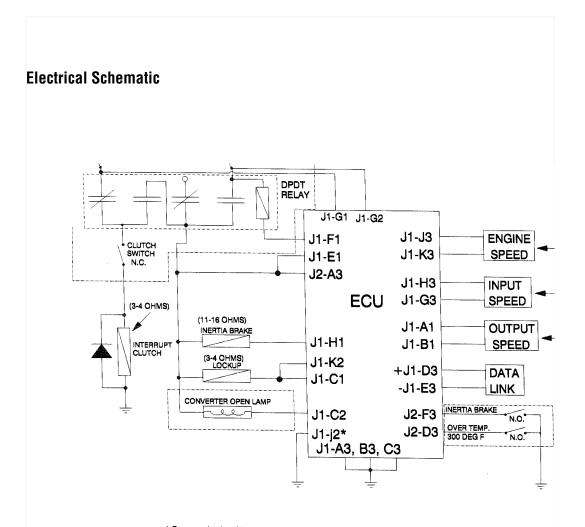
For all questions concerning inspection, removal, replacement, or adjustment procedures, refer to Eaton or OEM Service and Parts Literature.

System Overview



Appendix I

For all questions concerning inspection, removal, replacement, or adjustment procedures, refer to Eaton or OEM Service and Parts Literature.



*Ground pin J2 only for 11118. Leave open for a 9118.

Everything in dashed boxes supplied by OEM.

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