

Roadranger



EAT•N

Eaton® Hybrid Transmissions

Troubleshooting Guide

Visit the Roadranger web site at www.roadranger.com

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EH-8E406A-CDR

EH-8E406A-UPG

EH-8E406A-UP

EH-8E406A-CD

EH-8E406A-T

EH-6E607B-CD

EH-6E607B-P

Warnings & Cautions

Warnings and Cautions

Throughout this service manual there are paragraphs that are marked with a title of DANGER, WARNING, or CAUTION. These special paragraphs contain specific safety information and must be read, understood, and heeded before continuing the procedure or performing the step(s).



DANGER INDICATES YOU WILL BE SEVERLY INJURED OR KILLED IF DO NOT FOLLOW THE INDICATED PROCEDURE.

WARNING

WARNING INDICATES AN IMMEDIATE HAZARD, WHICH COULD RESULT IN SEVERE PERSONAL INJURY IF YOU DO NOT FOLLOW THE INDICATED PROCEDURE.

CAUTION

CAUTION INDICATES VEHICLE OR PROPERTY DAMAGE COULD OCCUR IF YOU DO NOT FOLLOW THE INDICATED PROCEDURE.

Note: NOTE INDICATES ADDITIONAL DETAIL THAT WILL AID IN THE DIAGNOSIS OR REPAIR OF A COMPONENT/SYSTEM.

WARNING

Follow the specified procedures in the indicated order to avoid personal injury:

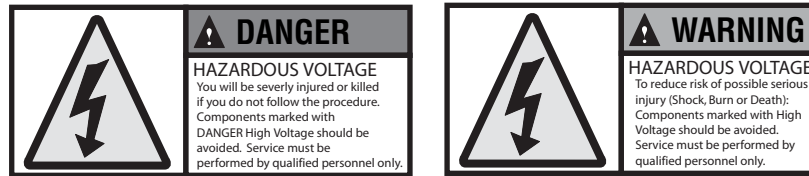
1. IF THE HIGH-VOLTAGE CONES ARE AROUND THE VEHICLE AND THE LOCKOUT IS INSTALLED ON THE PEC, THE ONLY PERSON THAT SHOULD BE ALLOWED TO START THE VEHICLE IS THE PERSON WHO SIGNED THE LOCKOUT TAG.
2. Before working on a vehicle or leaving the cab while the engine is running you should place the shift lever in "N" set the parking brake, and block the wheels.
3. For safety reasons, always engage the service brakes prior to selecting gear positions from "N."
4. Before starting a vehicle always be seated in the driver's seat, select "N" on the shift control, and set the parking brakes.
5. When parking the vehicle or leaving the cab you should place the shift lever in "N" and set the parking brake.
6. In vehicles with ePTO, the engine and/or Motor/Generator can start in ePTO mode. Never perform any maintenance or work on vehicle, while in this mode.
7. 12-volt Battery (+) and (-) must be disconnected prior to any welding on any Hybrid equipped vehicle.

⚠ CAUTION

Do not release the parking brake or attempt to select a gear until the air pressure is at the correct level.

⚠ CAUTION

To avoid damage to the transmission during towing place the shift lever in "N" and lift the drive wheels off the ground or disconnect the driveline.

High-Voltage Warnings & Cautions

- Use CO2 or Dry Chemical Fire Extinguishers.
- The high-voltage wiring is covered in orange insulation or convoluted tubing and marked with warning labels at the connectors.
- All Eaton® Hybrid Diesel/Electric vehicles will be marked 'Hybrid' on the outside of the vehicle, along with the shift label on the dash.
- Refer to OEM for specific location of chassis mounted hybrid components.
- Do NOT cut into the orange high-voltage cables.
- Do NOT cut into or open the PEC.
- Do NOT cut into or open the DC/DC converter.
- Do NOT cut into or open the Inverter.

A buffer zone must be set up and high-voltage insulated rubber gloves (class "O" with leather protectors) are required prior to working on high-voltage. Failure to follow these instructions may result in **severe personal injury or death**.

The rubber-insulated gloves that must be worn while working on the high-voltage system are class "O" with leather protectors. The rubber gloves should be tested before **EVERY** use following the rubber insulation gloves testing procedure found in the "Tool Specification" section. Failure to follow these instructions may result in **severe personal injury or death**.

Before inspecting or working on any high-voltage cables or components the "High-Voltage Service Shutdown Procedure" should be followed. Failure to follow these instructions may result in **severe personal injury or death**.

The Lockout and Tag-out devices should only be removed by the technician that placed the Lockout and Tag-out devices on the vehicle. Failure to follow these instructions may result in **severe personal injury or death**.

High-voltage rubber insulated gloves (class "O" with leather protectors) must be worn when working on any high-voltage cables. The "High-Voltage Service Shutdown Procedure" must be followed prior to removing any high-voltage cables. Failure to follow these instructions may result in **severe personal injury or death**.

High-voltage cables and wiring are orange and contain a warning label at the connectors. High-voltage components are marked with a label. High-voltage rubber insulated gloves (class "O" with leather protectors) must be used when working on any of these components. Failure to follow these instructions may result in **severe personal injury or death**.

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Insulated Rubber Glove Test and High-

Voltage Work Area

Insulated Rubber Glove Test

WARNING

The rubber-insulated gloves that must be worn while working on the high-voltage system are class "O" with leather protectors. The rubber gloves should be tested before EVERY use following the rubber insulation gloves testing procedure found in the "Diagnostic Tools" section. Failure to follow these instructions may result in severe personal injury or death.

- The insulated rubber gloves that must be worn while working on the high-voltage system are class "O" rated. They must be inspected before each use and must always be worn in conjunction with the leather outer glove. Any hole in the insulated rubber glove is a potential entry point for high-voltage.
- Roll the glove up from the open end until the lower portion of the glove begins to balloon from the resulting air pressure. If the glove leaks any air it must not be used.
- The gloves should not be used if they exhibit any signs of wear and tear.
- The leather gloves must always be worn over the rubber insulating gloves in order to protect them.
- The rubber insulating gloves must be class "O" and meet all of the American Safety Testing Materials Standards.

High-Voltage Work Area Requirements

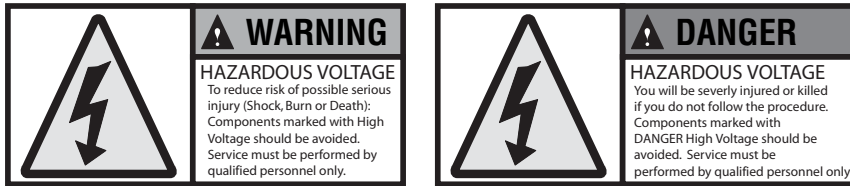
WARNING

A buffer zone must be set up and high-voltage insulated rubber gloves (class "O" with leather protectors) are required prior to working on any high-voltage. Failure to follow these instructions may result in severe personal injury or death.

The buffer zone is required only when working on the high-voltage DC or AC systems and is called out both in the "High-Voltage Service Shutdown Procedure" and the individual repair procedures.

- Position the vehicle in the service bay.
- Position four orange cones around the corners of the vehicle to mark off a 1m (3 ft.) perimeter around the vehicle.
- Do not allow any unauthorized personnel into the buffer zone during repairs involving high-voltage. Only personnel trained for service on the high-voltage system are to be permitted in the buffer zone.

High-Voltage Service Shutdown And Power-Up Procedure



A buffer zone must be set up and high-voltage insulated rubber gloves (class "O" with leather protectors) are required prior to working on high-voltage. Failure to follow these instructions may result in **severe personal injury or death**.

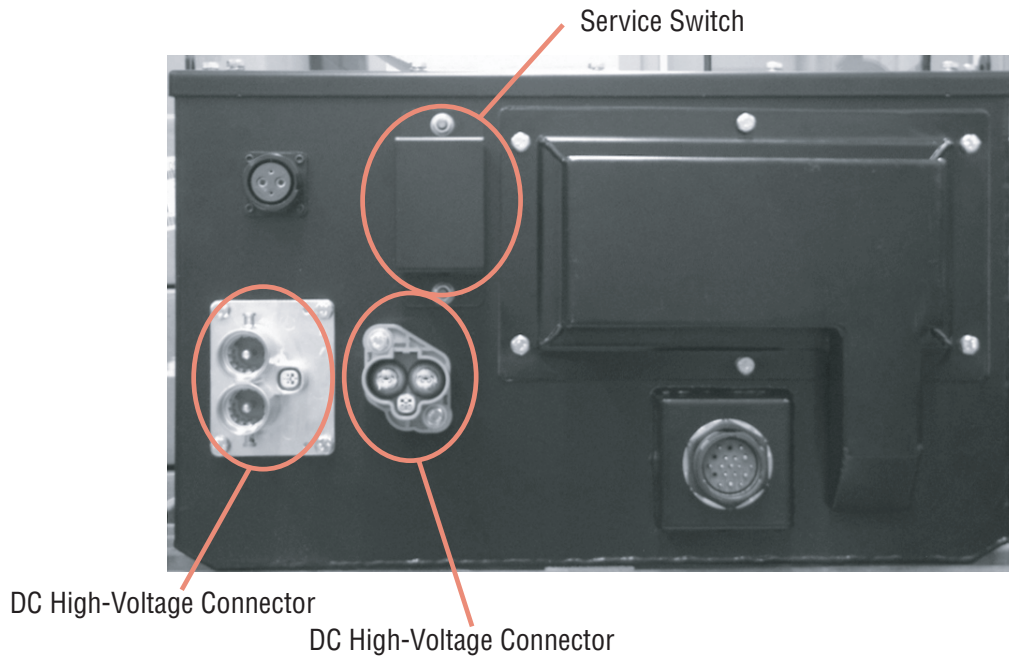
The rubber-insulated gloves that must be worn while working on the high-voltage system are class "O" with leather protectors. The rubber gloves should be tested before **EVERY** use following the rubber insulation gloves testing procedure found in the "Tool Specification" section. Failure to follow these instructions may result in **severe personal injury or death**.

Before inspecting or working on any high-voltage cables or components the "High-Voltage Service Shutdown Procedure" should be followed. Failure to follow these instructions may result in **severe personal injury or death**.

The Lockout and Tag-out devices should only be removed by the technician that placed the Lockout and Tag-out devices on the vehicle. Failure to follow these instructions may result in **severe personal injury or death**.

High-voltage rubber insulated gloves (class "O" with leather protectors) must be worn when working on any high-voltage cables. The "High-Voltage Service Shutdown Procedure" must be followed prior to removing any high-voltage cables. Failure to follow these instructions may result in **severe personal injury or death**.

High-voltage cables and wiring are orange and contain a warning label at the connectors. High-voltage components are marked with a label. High-voltage rubber insulated gloves (class "O" with leather protectors) must be used when working on any of these components. Failure to follow these instructions may result in **severe personal injury or death**.



High-Voltage Service Shutdown Procedures

1. Follow “High-voltage Work Area” procedure.
2. Locate the red PEC service switch on the front of the PEC and push to the Off position.
3. Remove the service switch cover and install the lockout bracket (J-48506).
4. Fasten tag to the lockout bracket.
5. Ensure the PEC service switch cannot move from the Off position.
6. Allow the system to set for a minimum of five (5) minutes to discharge high-voltage.
7. Connect ServiceRanger and view the Data Monitor PID 116 called “High-Voltage Battery Potential”
8. The voltage should be 30 volts or less. If the voltage is above 30 volts, do not work on the vehicle and contact Eaton® at 1-800-826-HELP (4357).
9. Turn ignition key off and proceed to repair or troubleshooting step.

Note: The voltage will drop to zero when the key is turned off.

High-Voltage Service Power-Up Procedure

1. Install all high-voltage connectors back into their locked positions.
2. Remove the lockout bracket and tag **ONLY IF YOU ARE THE PERSON WHO IS WORKING ON THE VEHICLE.**
3. Reinstall the protection bracket over the service switch.
4. Pull the service switch out and let vehicle set for two (2) minutes.
5. Start vehicle when appropriate.

Diagnostic Tools/ Service Publications

Eaton Tools

- Visit www.Roadranger.com

Tool	Description
ServiceRanger version 3	ServiceRanger PC based Diagnostic Tool

SPX/OTC Tools

- Contact SPX / OTC at (800) 328-6657

Tool	Description
J-49818	Eaton Hybrid Tool Safety Kit - Basic PPE (Items listed below can be ordered separately)
J-48603	High-Voltage Gloves w/leather protectors (1000 volt)
J-48605	Hybrid Safety Cones (set of 4)
J-48506	Lock-out Switch Plate
J-48906	Lock-out Tags (per 25)

Tool	Description
J-49819	Eaton Hybrid Tool Safety Kit - Basic Plus PPE (Items listed below can be ordered separately)
J-48603	High-Voltage Gloves w/leather protectors (1000 volt)
J-48605	Hybrid Safety Cones (set of 4)
J-48506	Lock-out Switch Plate
J-48906	Lock-out Tags (per 25)
J-48907	Orange Magnetic Sign
J-48608	Hybrid Non-Conductive Safety Pole
J-48908	Glove Bag

Tool	Description
Misc. Service Tools	Items listed below are ordered separately
J-48624	Nexiq USB-Link Communication Adapter
J-43318-A*	Pin Adapter Kit - Interface Harness Diagnostics
J-48735*	Alignment Pins - Hybrid Motor/Gen to Transmission Main Case
J-49111*	Clutch Alignment Tool
J-46708*	Fluke Digital Multimeter
J-48505	Input Shaft Turning Socket
J-48507	Lifting Fixture - Power Electronics Carrier
J-48502	Jack Adapter Plate - Hybrid Drive Unit
5019	Transmission Jack - Low Lift
5078	Transmission Jack - High Lift
J-48577	Engine/Transmission Stand Adapter Plate - Hybrid Drive Unit
J-29109-A	Engine/Transmission Stand - 6000 lb. Rating

J-48893 - Hybrid PPE / Service Tool Kit (includes J-49819 kit and items from Miscellaneous Service Tools highlighted with *)

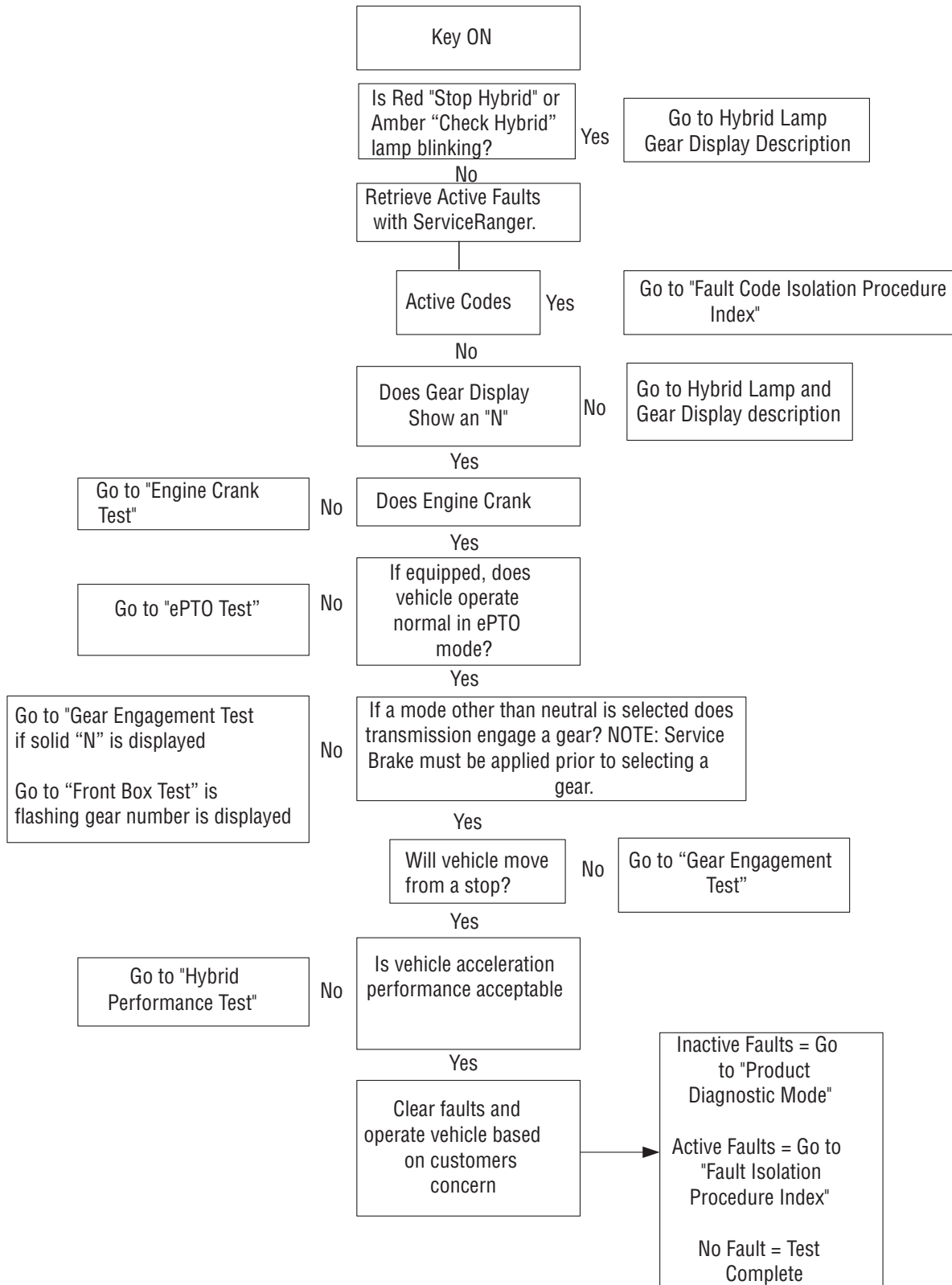
Service Publications

- Visit www.Roadranger.com

TRSM2000	Service Manual (covers external components on transmission and Hybrid components)
TRSM0110	Service Manual (covers internal transmission repairs only)
TRTS2000	Troubleshooting Guide
TRDR1000	Drivers Instructions
TRDR1110	First Responder Guide

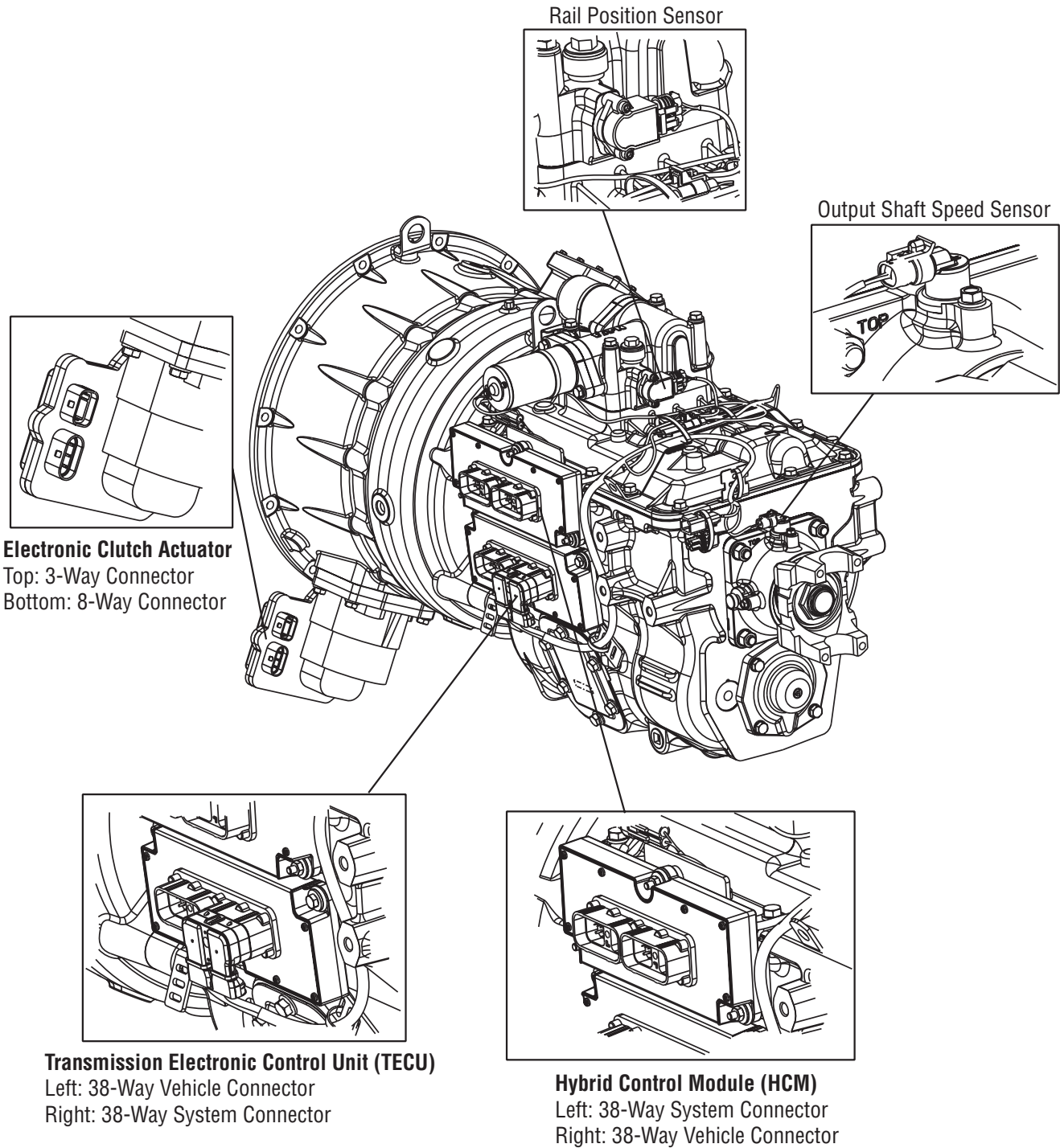
Hybrid Diagnostic Procedure

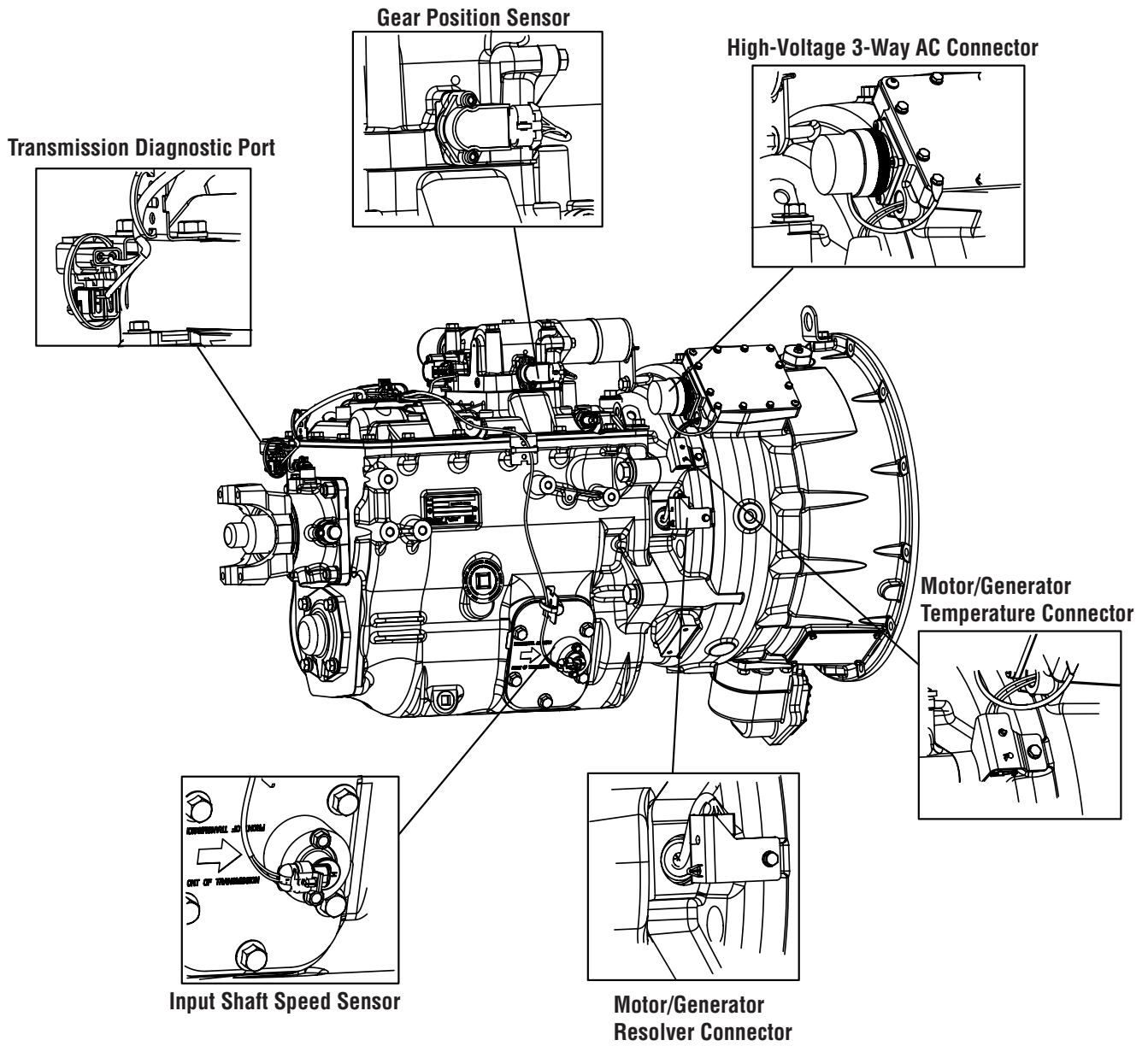
Hybrid Diagnostic Procedure



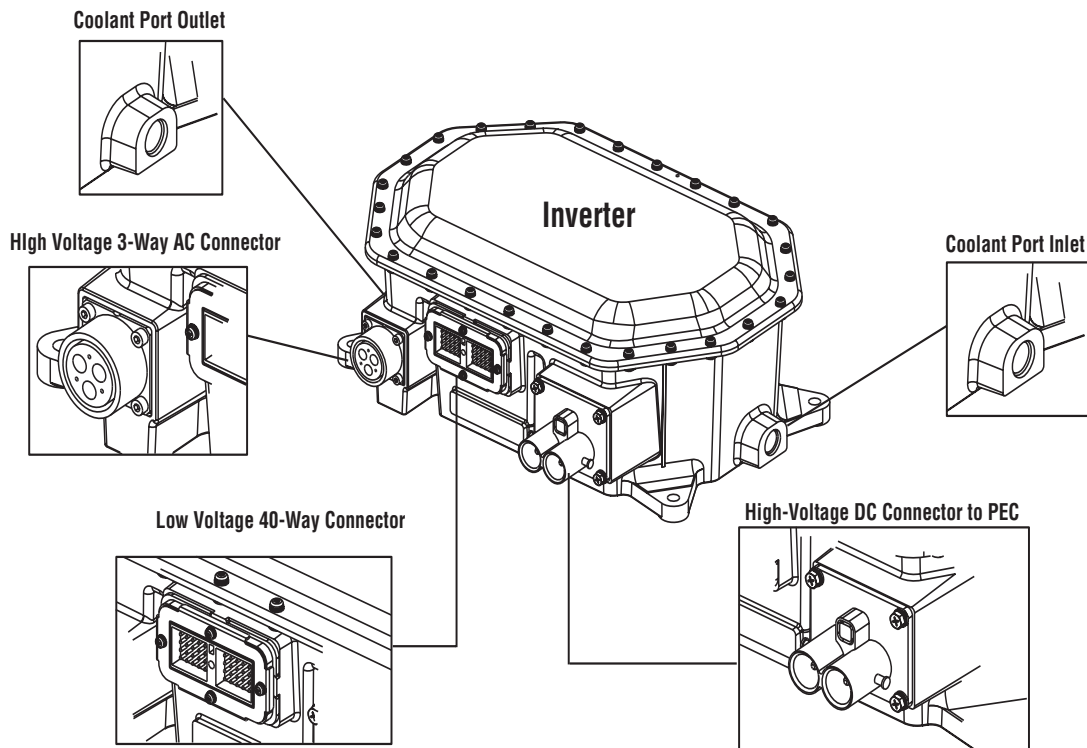
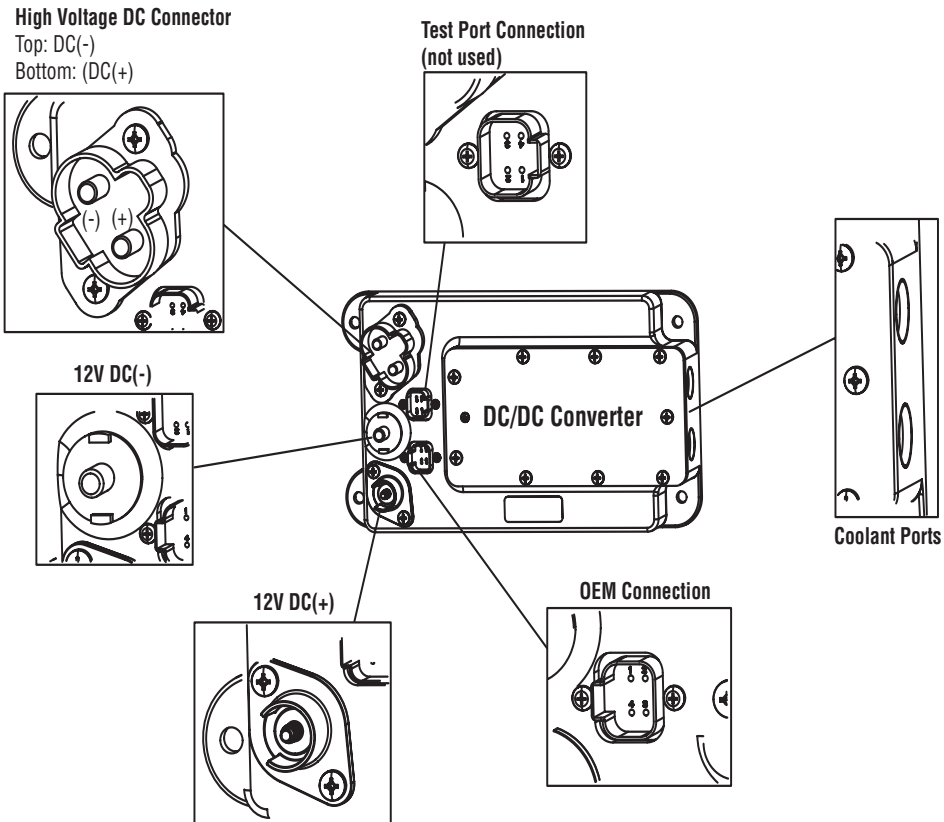
Hybrid Component & Connector Locations

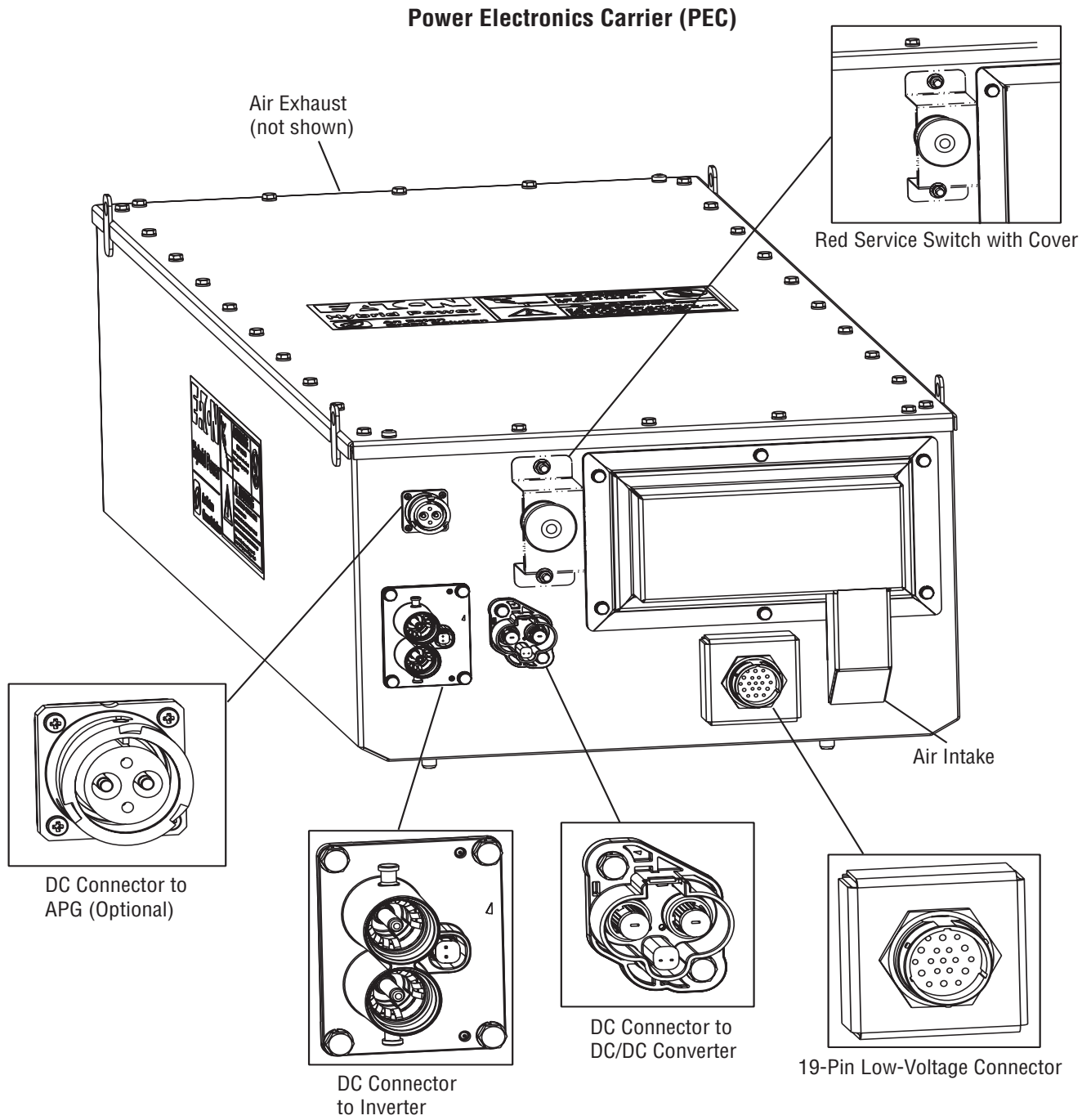
Transmission Wiring Connections





Component Wiring Connections





Fault Code Retrieval/Clearing

All Eaton® Hybrid systems require the use of ServiceRanger for all diagnostics. To view fault codes or clear them follow the procedures below.

View Active and Inactive Faults

1. Connect ServiceRanger to the 9-pin diagnostic connector.
2. Go to the Tools menu and select the "Communication" tab.
3. Select the appropriate communication device for J-1587 and J-1939.
4. Select "Connect" on the main page.
5. Select the "View Fault Codes" tab.

Note: Initial use requires all steps, however subsequent uses require only steps 4 and 5.

Clear Inactive Faults

1. Connect ServiceRanger to the 9-pin diagnostic connector.
2. Go to the Tools menu and select the "Communication" tab.
3. Select the appropriate communication device for J-1587 and J-1939.
4. Select "Connect" on the main page.
5. Select the "View Fault Codes" tab.
6. Select the "Clear Faults" button.

Note: Initial use requires all steps, however subsequent uses require only steps 4 and 5.

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