



Installation Instructions

18SP548—Install Exhaust Back Pressure Sensor Kit on Series 50 or Series 60 Diesel Coach Engine

Introduction

This exhaust back pressure sensor kit is intended for use on a Detroit Diesel Series 50® or Series 60® DDEC IV, diesel-fueled coach engine manufactured prior to October 2002. Used in conjunction with aftertreatment systems, the kit provides diagnostic capability and engine protection in the event of excessive exhaust back pressure. This back pressure kit is *required* for Emitless® particulate filter installations. It may be used as an *option* with catalytic converter installations.

This kit is intended for installation on Detroit Diesel DDEC IV Series 50 Diesel and Series 60 Diesel Coach Engines. As of 08/06/01 it is released for engine models 6047GK28, 6047TK28, 6047MK28, 6047MK2E, and 6067MK28. Contact an authorized

Detroit Diesel distributor to inquire if it is available for any other engine models.

The exhaust back pressure sensor is bracket mounted, and ported to the exhaust pipe upstream of the particulate filter or catalytic converter. For reference, the exhaust temperature sensor is installed directly into the outlet side of the Emitless particulate filter or catalytic converter. *An exhaust temperature sensor is required for all particulate filter and catalytic converter installations.* The wiring harness in these exhaust back pressure kits include both exhaust back pressure and exhaust temperature sensor connectors.

Three service kits with different length sensor harnesses are available. This kit includes the items listed in Table 1 in the A, B, or C column, depending on kit part number.

Part Number	Quantity			Description
	A	B	C	
23529470	1			Kit, Exhaust Back Pressure Sensor with 589 cm/232 in. L. Harness. <i>Includes all items in column A.</i>
23529471		1		Kit, Exhaust Back Pressure Sensor with 432 cm/170 in. L. Harness. <i>Includes all items in column B.</i>
23529472			1	Kit, Exhaust Back Pressure Sensor with 254 cm/100 in. L. – Harness. <i>Includes all items in column C.</i>
23528951	1			– Harness, Exhaust Temperature/Pressure, 589 cm/232 in. L.
23528952		1		– Harness, Exhaust Temperature/Pressure, 432 cm/170 in. L.
23528953			1	– Harness, Exhaust Temperature/Pressure, 254 cm/100 in. L.
23528948	1	1	1	– Sensor, Exhaust Back Pressure
23529151	1	1	1	– Hose, Stainless Steel Braided – 91 cm/36 in. L.
23529152	1	1	1	– Bracket, Sensor Mounting
23529150	1	1	1	– Fitting, Bulkhead Compression with Female 3/8 in. NPTF Pipe Thread
23528903	1	1	1	– Fitting, Compression – with Weld End

* Kits do not include the exhaust temperature sensor. Kits are assembled this way to accommodate customers retrofitting engines having sensor P/N 23521882 (with 182 cm/72 in. cable) previously installed. If an exhaust temperature sensor was not previously installed, obtain one from an *authorized* Detroit Diesel distributor.

Table 1. Service Kit Components

Part Number	Quantity			Description
	A	B	C	
11505299	2	2	2	– Bolt, M10 X 1.5 X 30 (Flange Head)
11506101	2	2	2	– Nut, M10 X 1.5 (Flange Head)
18SP548	1	1	1	– Installation Instructions

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Table 1. Service Kit Components, cont'd.

Preparations for Kit Installation

Installation of this kit requires removal of the exhaust temperature sensor harness and determining if wire 510 (cavity D1 on the vehicle interface 30-pin connector) is being used.

	CAUTION:
To avoid injury from hot surfaces, allow the engine to cool before removing any component. Wear protective gloves.	

	CAUTION:
To avoid injury from accidental engine start-up while servicing the engine, disconnect/disable the starting system.	

1. With the engine at ambient temperature (cool to the touch) and the starting system disconnected/disabled, check to see if an exhaust temperature sensor harness is installed. If installed, remove the existing harness from the engine, keeping the following points in mind (see Figure 1):

- A. Unplug the Exhaust Temperature Harness from the Exhaust Temperature Sensor.
- B. Unplug the Exhaust Temperature Harness from the Turbo Boost Sensor or Oil Pressure Sensor, depending on application.
- C. Unplug the Exhaust Temperature Harness from the Turbo Boost Sensor connector on the engine sensor harness (ESH).

D. At the Vehicle Interface Harness (VIH) to ECM connector, leave wire 749 in place at the 30 pin connector. Cut this wire from the old Exhaust Temperature harness, leaving about 2 feet of wire connected to the 30 pin connector. This wire can be spliced into when installing the new exhaust temperature and pressure harness later.

E. Remove the Exhaust Temperature Harness from the engine compartment. Secure any portions of existing harnessing that were loosened during this process.

2. Check to see if wire 510 (cavity D1 on the vehicle interface 30-pin connector) is being used for fast idle or rear throttle PTO:

A. *If wire 510 is not used*, proceed to section below, "Locating and Installing the Weld Fitting on the Exhaust Tubing."

B. *If wire 510 is used by fast idle or rear throttle PTO*, a dual throttle configuration using wire 417 must be used to free up this wire cavity in the ECM. Refer to "Dual Throttle" in the *DDEC IV Application and Installation Manual, TSA742*.

Locate the Weld Fitting (P/N 23528903) on the Exhaust Tubing

To locate the fitting on the exhaust tubing, observe the following guidelines:

- 1. Install the fitting on a straight section of exhaust pipe, if possible.
- 2. Locate fitting within 91 cm (36 in.) of the turbocharger exhaust outlet.
- 3. Do not locate the fitting on a section of bellows.

4. Locate the fitting so that the 91 cm (36 in.) long stainless steel hose can be conveniently run to the exhaust back pressure sensor mounting location. To determine where the exhaust back pressure sensor should be mounted, refer to section below, "Guidelines for Installing Exhaust Back Pressure Sensor."
5. If a location does not fit the criteria above, weld the fitting to the *side* of an exhaust tubing elbow. Do not weld the fitting on the inner radius or outer radius of the elbow.

NOTE:

If guideline 5 is used, the fitting location must still satisfy guidelines in Steps 2 through 4 above.

Installation of Weld Fitting on Exhaust Tubing

Install the weld fitting as follows:

 <p>CAUTION:</p>
<p>To avoid injury from arc welding, gas welding, or cutting, wear required safety equipment such as an arc welder's face plate or gas welder's goggles, protective apron, long sleeve shirt, head protection, and safety shoes. Always perform welding or cutting operations in a well-ventilated area. The gas in oxygen/acetylene cylinders used in gas welding and cutting is under high pressure. If a cylinder should fall due to careless handling, the gage end could strike an obstruction and fracture, resulting in a gas leak leading to fire or an explosion. If a cylinder should fall resulting in the gage breaking off, the sudden release of cylinder pressure will turn the cylinder into a dangerous projectile. Observe the following precautions when using oxygen/acetylene gas cylinders:</p> <ul style="list-style-type: none"> • Always wear required safety shoes. • Do not handle tanks in a careless manner or with greasy gloves or slippery hands. • Use a chain, bracket, or other restraining device at all times to prevent gas cylinders from falling. • Do not place gas cylinders on their sides, but stand them upright when in use. • Do not drop, drag, roll, or strike a cylinder forcefully. • Always close valves completely when finished welding or cutting.

1. The fitting material is stainless steel 316; use the appropriate rod to weld it in the selected location on the exhaust tubing. See Figure 2.
2. Visually inspect the weld for pinhole leak paths. If present, weld more material into that location.
3. After welding, insert a 6.35 mm (1/4 in.) diameter drill in the through hole of the fitting and drill out the exhaust tubing.
4. Remove any metal shavings from the exhaust tubing.

Guidelines for Installing Exhaust Back Pressure Sensor P/N 23528948

Use the following guidelines when selecting the area to mount the exhaust back pressure sensor:

1. Vibration at this location is not to exceed 4 G rms.
2. The temperature at this location is not to exceed 125° C. (257° F.).
3. The sensor must be located *higher* than the weld fitting on the exhaust tubing.
4. To ensure the sensor will drain fluid properly, the sensor must be installed as vertical as possible with the connector side on the top and the threaded portion on the bottom.
5. Run the braided hose with a continuous downward slope to prevent fluid from collecting in the hose.

NOTE:

The sensor may be adjusted a maximum of 45 degrees from the vertical orientation, if required.

Installation of Exhaust Back Pressure Sensor P/N 23528948

Install the exhaust back pressure sensor as follows:

1. Orient the bulkhead fitting mounting bracket as indicated above and mount in the selected location using the two (2) flange-head bolts and nuts. See Figure 2.

NOTE:

If the bracket cannot be properly mounted in the selected location, fabricate a bracket to which the bulkhead fitting can be attached and install it so that the mounting criteria above will be satisfied.

2. Install the exhaust back pressure sensor into the bulkhead fitting and torque sensor to 23 - 28 N•m (17 - 21 lb-ft).
3. Insert the bulkhead fitting into the bracket, thread on the retaining nut and torque to 145 - 159 N•m (107 - 117 lb-ft).

Guidelines for Routing Steel-Braided Hose P/N 23529151

Use the following guidelines for routing the steel braided hose P/N 23529151 between the bulkhead fitting and the fitting welded to the exhaust tubing:

1. Ensure the hose does not rub against any other piping, tubing, or wiring.
2. Ensure the hose does not contact any moving parts.
3. Loosely support the hose in one or two locations along its full length using P-clips or nylon ties.
4. Do not secure the hose directly to the engine.
5. Ensure there is a *continuous downward slope from the sensor to the exhaust fitting*. This will prevent fluid from collecting in the hose and causing an incorrect pressure sensor reading.

Installation of Steel-Braided Hose P/N 23529151

Install the steel-braided hose as follows:

1. Completely insert the steel-braided hose end into the compression fitting on the bulkhead fitting. See Figure 2.
2. Finger-tighten the compression-fitting nut.
3. Using a fitting wrench, rotate the nut an additional 1-1/4 turns to properly tighten.

NOTE:

The 1-1/4 turns indicated above are for a new hose and new compression fittings only. Should the hose require *removal and reinstallation*, finger-tighten the nut and then rotate the nut a 1/4 turn only. This will ensure proper seal and lengthen the life of the compression fittings.

*An OPS may be found on a DDEC III to DDEC IV upgrade.

Routing and Installation of Exhaust Temperature/Pressure Harness (ETPH)

NOTE:

On DDEC® IV engines, the ETPH taps into the engine sensor harness connection at the turbo boost sensor. This provides access to sensor power and ground. On DDEC III engines, this connection is made at the oil pressure sensor, due to connector differences. See Figure 3 and see Figure 4.

Install the ETPH as follows (see Figure 3):

1. Unplug the engine sensor harness (3) from the TBS (turbo boost sensor) or OPS (oil pressure sensor).*
2. Plug the engine sensor harness (3) into the receptacle on the ETPH (2).
3. Install the plug (1) from the ETPH into the TBS or OPS.*
4. Route the ETPH along the engine sensor harness toward the back of the engine and secure to this harness with tie straps. All connectors *must* be secure to ensure the receptacle (2) does not bounce around.
5. Remove the vehicle interface harness connector (4) from the ECM (electronic control module).
6. Insert wire 749 (yellow) from the ETPH into cavity D3 of the 30-pin connector on the vehicle interface harness (4). Crimp the terminal on the lead and pull to seat.

NOTE:

If the engine already has an exhaust temperature sensor, there will be a wire in cavity D3. Disconnect this wire from the existing exhaust temperature harness and splice to wire 749 (yellow) on the ETPH.

7. Insert wire 138 (white) from the ETPH into cavity D1 of the vehicle interface harness 30-pin connector (4). Crimp the terminal on the lead and pull to seat. *Relabel this wire as wire 510.*
8. Install the vehicle interface harness 30-pin connector (4) into the ECM.
9. Route the harness branch for the exhaust back pressure sensor along existing wire looms in the vehicle where possible. Secure this branch no more than 15 cm (6 in.) from the exhaust back pressure sensor.

NOTE:

The exhaust back pressure sensor requires an external boot for protection against moisture intrusion. This boot is part of the ETPH. See Figure 5.

- 10. As shown in Figure 5, remove the conduit end ring from the exhaust pressure branch of the ETPH. Pull some of the wire out of the conduit, then pull the boot back clear of the connector plug. Install the plug (5) into the sensor, making sure that the secondary (red) connector lock is engaged.
- 11. Pull the boot down so that it covers the sensor and is snug on the stainless hex. See Figure 5. Put the wire back into the conduit and install the conduit end ring.
- 12. Route the harness branch for the exhaust temperature sensor along existing wire looms in the vehicle where possible. Install the plug (6) into the mating connector (7) from the exhaust temperature sensor. Tie wrap this interconnection to a secure location to minimize movement.

NOTE:

The harness branches to the sensors should be tie wrapped to a secure location every 30 cm (12 in). Harness branches must not touch any hot surfaces or moving parts. If a branch is too long, shorten it by cutting to length and splicing.

NOTE:

If there is an exhaust temperature sensor boss on the upstream side of the filter, verify there is a cap on it and the cap is torqued to 22 ft-lb (30 N•m).

Update Software After Kit Installation

The mainframe system has to be updated for each engine serial number that has a back pressure sensor installed. The mainframe system can be updated by an authorized Detroit Diesel Distributor, Regional Office, or Technical Services. Refer to the list below to determine which 6N4C group should be used to activate the back pressure sensor. In addition, a DDEC IV software level of R31.0 (or higher) is needed for the back pressure sensor to operate. When reprogramming a DDEC IV unit to activate the back pressure sensor, the software will automatically be updated to R31.0 (or higher). Reprogramming fee is waived for the back pressure kit installation. This fee is waived under the conditions described in service information letter No.: 01 TS-40.

Series 50:

- 06N04C-0391: Jakes NO, Exh. Temp YES, EGR YES, Exh. Bck Press NO, Std PWM 2 Fan, PWM 4 VGT
- 06N04C-0365: Same as 0391 with Exh. Bck Pressure YES
- 06N04C-0342: Jakes NO, Exh. Temp YES, EGR YES, Exh. Bck Press NO, Std PWM 1 Fan, PWM 4 VGT
- 06N04C-0364: Same as 0342 with Exh. Bck Pressure YES
- 06N04C-0301, 0304, 0306, 0309, 0316, 0323, 0344: Jakes NO, EGR NO, Exh. Bck Press NO, Std PWM 4 Fan
- 06N04C-0363: Same as above groups with Exh. Bck Press YES and Exh. Temp. YES

Series 60:

- 06N04C-0347: Jakes NO, Exh. Temp. YES, Exh. Bck Press NO, Std PWM 2 Fan
- 06N04C-0366: Same as 0347 with Exh. Bck Pressure YES

If a DDEC III engine is being converted to DDEC IV, the 6N4D group will also have to be changed on the mainframe for each engine serial number. A preliminary list is contained below. Please contact an authorized Detroit Diesel Distributor, Regional Office, or Technical Services if you are upgrading to a DDEC IV and your 6N4D does not appear on the list below. The DDEC IV ECM part number for bus and coach applications is 23519308 and R23519308.

Series 50:

<u>Original 6N4D</u>	<u>Change to 6N4D</u>
6502	6683
6504	6684
6534	6685
6536	6686

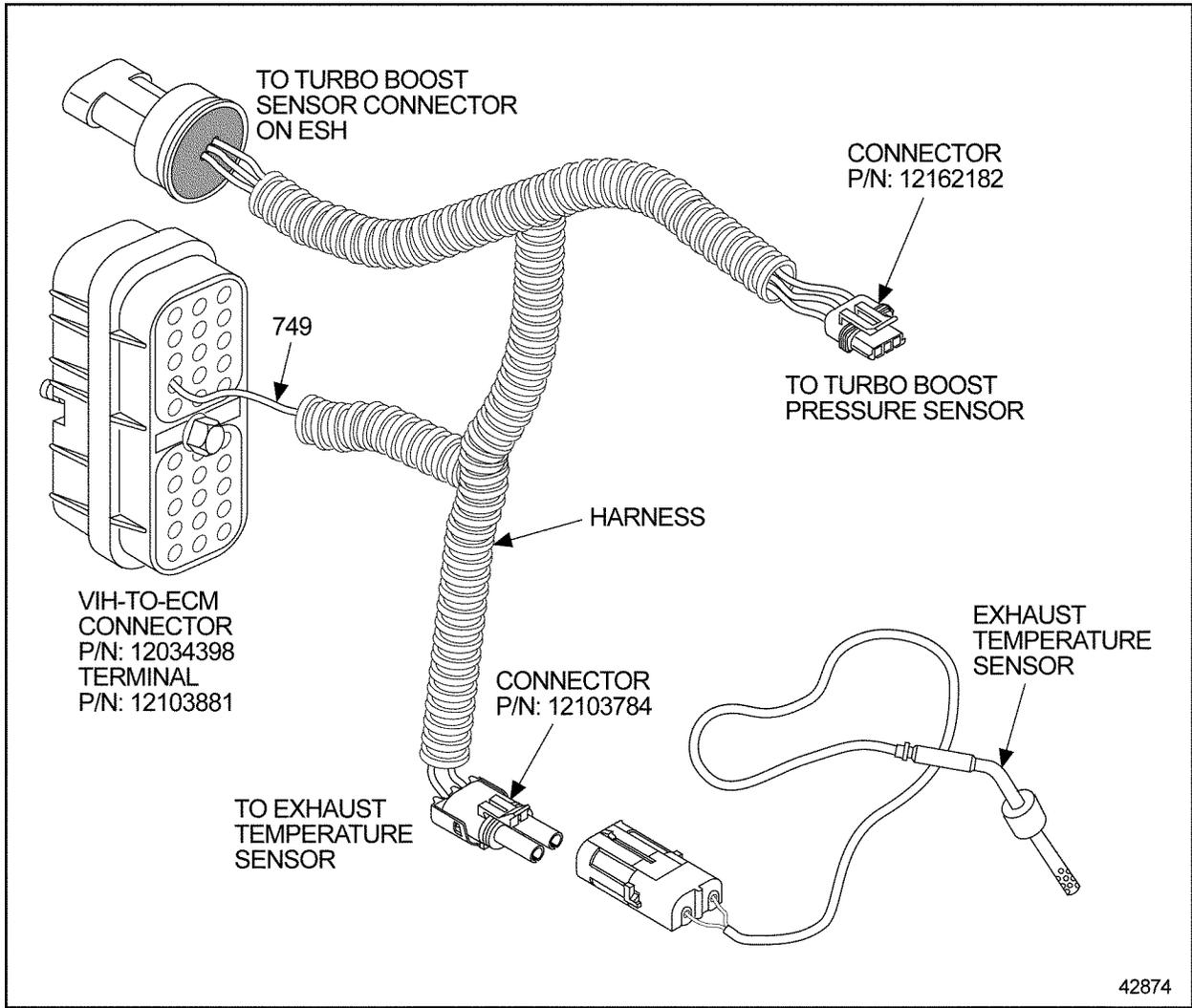


Figure 1. Exhaust Temperature Sensor Harness (to be removed)

Specifications subject to change without notice.

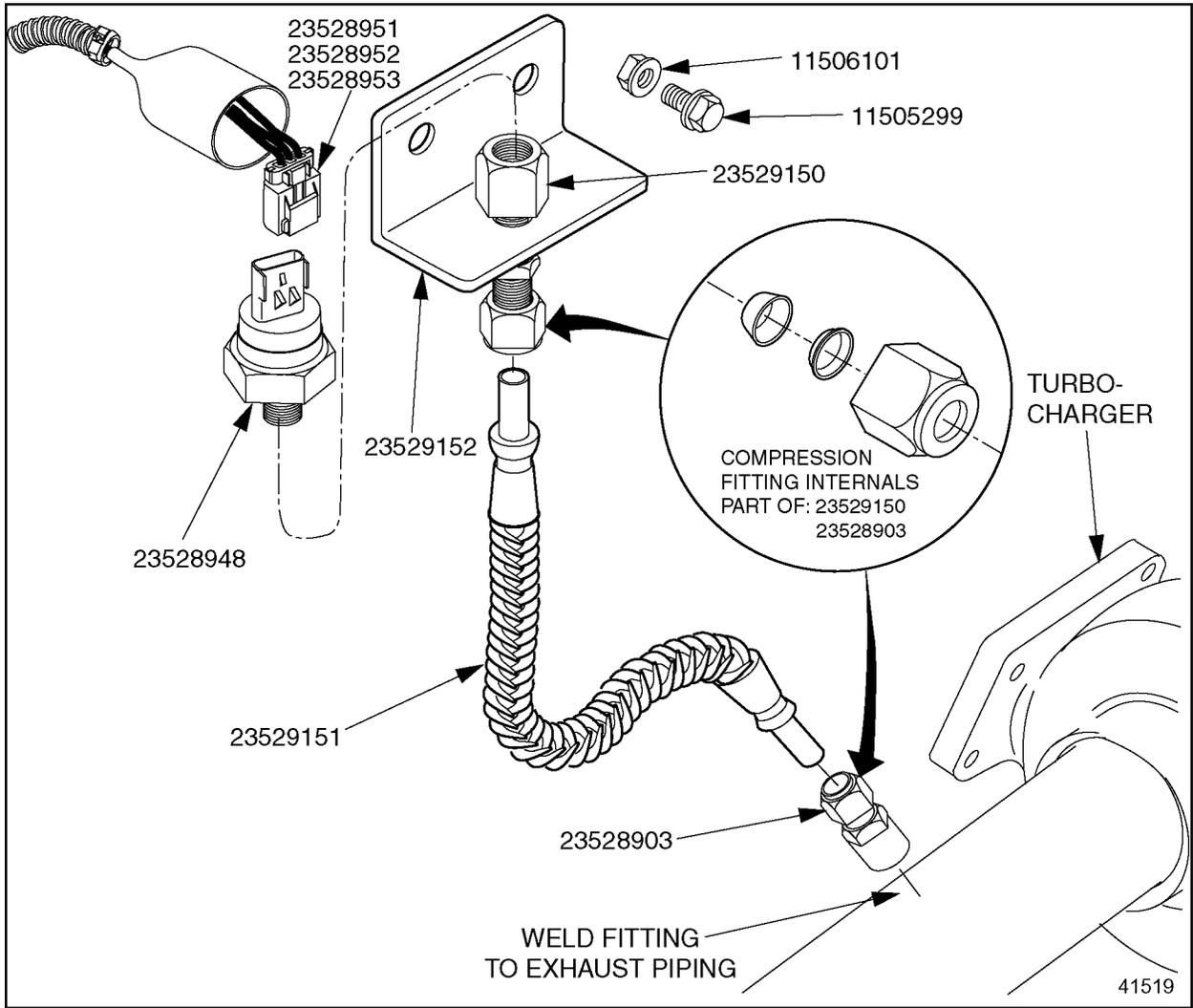


Figure 2. Installation of Exhaust Back Pressure Sensor Kit

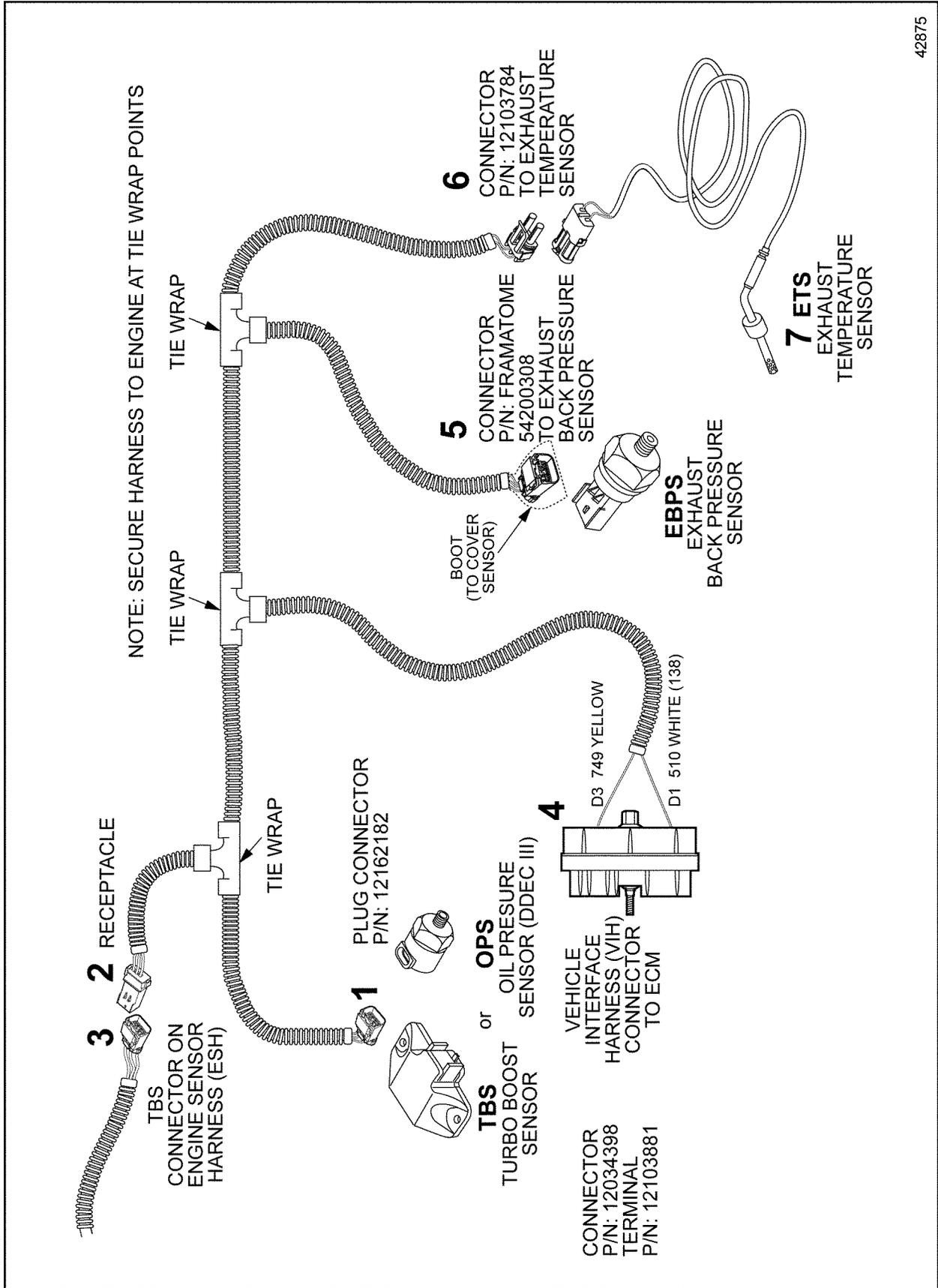


Figure 3. Exhaust Temperature/Pressure Harness (ETPH) Connections

Specifications subject to change without notice.

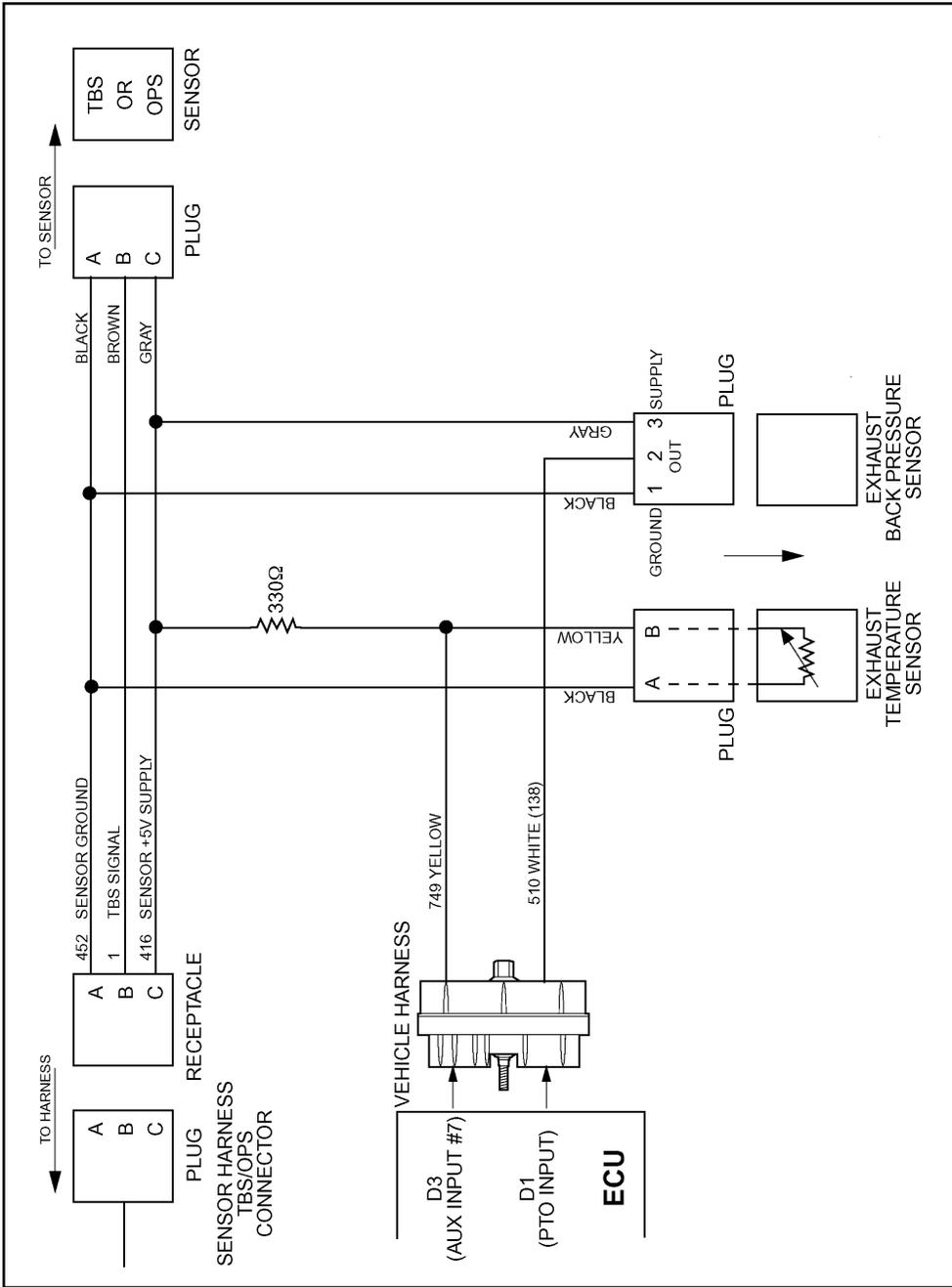


Figure 4. Exhaust Temperature and Pressure Sensor Wiring Schematic

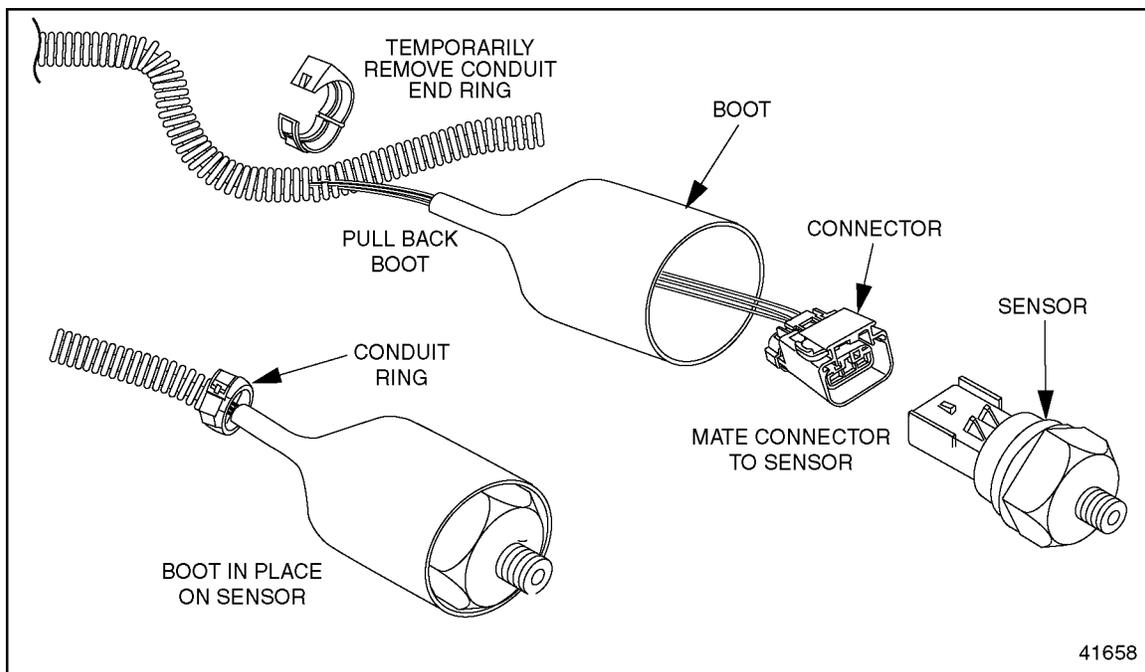


Figure 5. Exhaust Back Pressure Sensor with Sensor Boot

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