RC: Exhaust Gas Temperature (EGT) Sensor

WARNING: Manual regeneration of the diesel particulate filter causes the exhaust gas to get very hot quickly. Initiate a manual regeneration only when the vehicle is on the ground with the area around the tailpipe free of people, obstructions, foreign material or other items. Failure to follow these instructions may result in serious personal injury.

Note: *Regeneration may occur during normal operation. During regeneration, diagnostic procedures may display biased values. If a regeneration occurs during diagnostic procedures, allow the process to complete before continuing diagnostics.*

This pinpoint test is intended to diagnose the following:

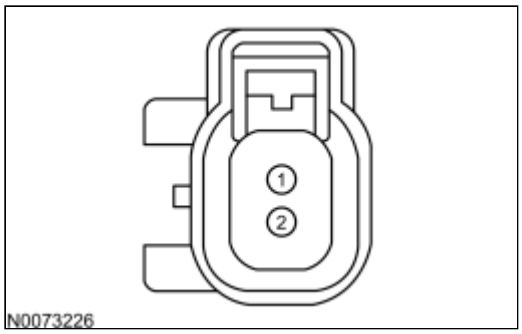
- EGT sensor (5J213)
- harness circuits: EGT11, EGT12, EGT13, EGT14, and SIGRTN
- PCM (12A650)

EGT Sensor Temperature And Resistance Specifications

Temperature		Temperature Sensor Value	EGT1x_VPID
°C	°F	Resistance (ohms)	(Volts)
1250	2282	975.81	2.432
1200	2192	951.86	2.401
1150	2102	927.32	2.369
1100	2012	902.2	2.335
1050	1922	876.49	2.299
1000	1832	850.2	2.261
950	1742	823.32	2.221
900	1652	795.86	2.179
850	1562	767.81	2.135
800	1472	739.18	2.089
750	1382	709.96	2.04
700	1292	680.16	1.989
650	1202	649.77	1.934
600	1112	618.8	1.877
550	1022	587.24	1.816
500	932	555.1	1.751
450	842	522.37	1.682
400	752	489.06	1.61
350	662	455.16	1.532
300	572	420.68	1.45
250	482	385.61	1.362
200	392	349.96	1.268
150	302	313.72	1.167

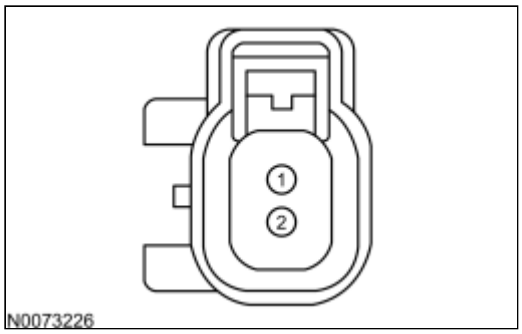
Temperature		Temperature Sensor Value	EGT1x_VPID
°C	°F	Resistance (ohms)	(Volts)
100	212	276.9	1.059
50	122	239.49	0.943
25	77	220.57	0.882
0	32	201.5	0.818
-40	-40	170.68	0.711

Exhaust Gas Temperature Bank 1, Sensor 1 (EGT11) Sensor Connector



Vehicle	Connector	Pin	Circuit
F-150, F-Series Super Duty	A	1 2	SIGRTN EGT11
All other vehicles	A	2 1	SIGRTN EGT11

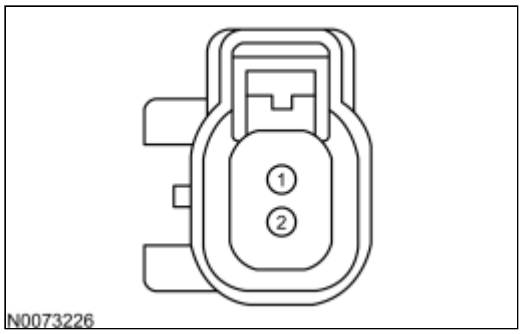
Exhaust Gas Temperature Bank 1, Sensor 2 (EGT12) Sensor Connector



Vehicle	Connector	Pin	Circuit
F-150, F-Series Super Duty	A	1 2	SIGRTN EGT12

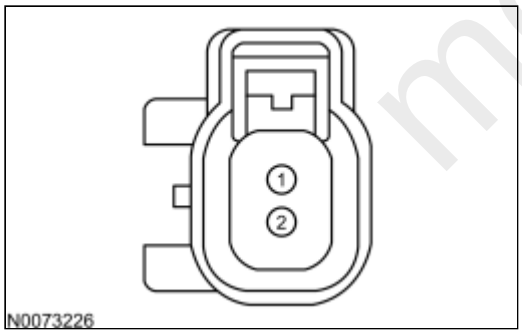
Vehicle	Connector	Pin	Circuit
All other vehicles	A	2 1	SIGRTN EGT12

Exhaust Gas Temperature Bank 1, Sensor 3 (EGT13) Sensor Connector



Vehicle	Connector	Pin	Circuit
F-650 / F-750, Transit Connect	A	2 1	SIGRTN EGT13
All other vehicles	A	1 2	SIGRTN EGT13

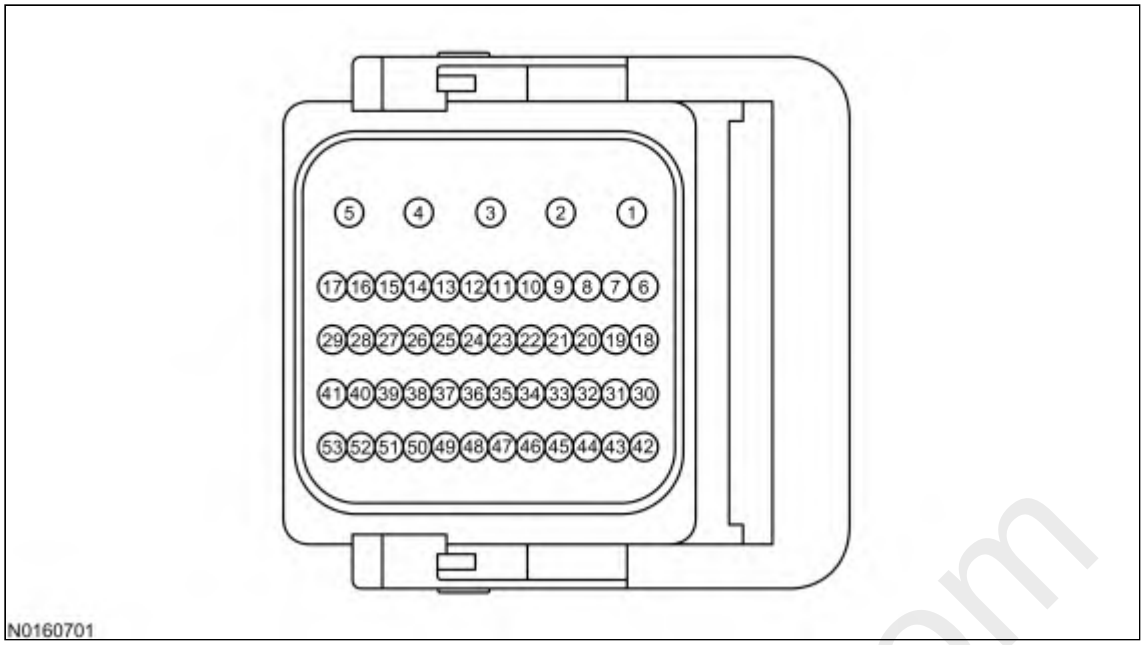
Exhaust Gas Temperature Bank 1, Sensor 4 (EGT14) Sensor Connector



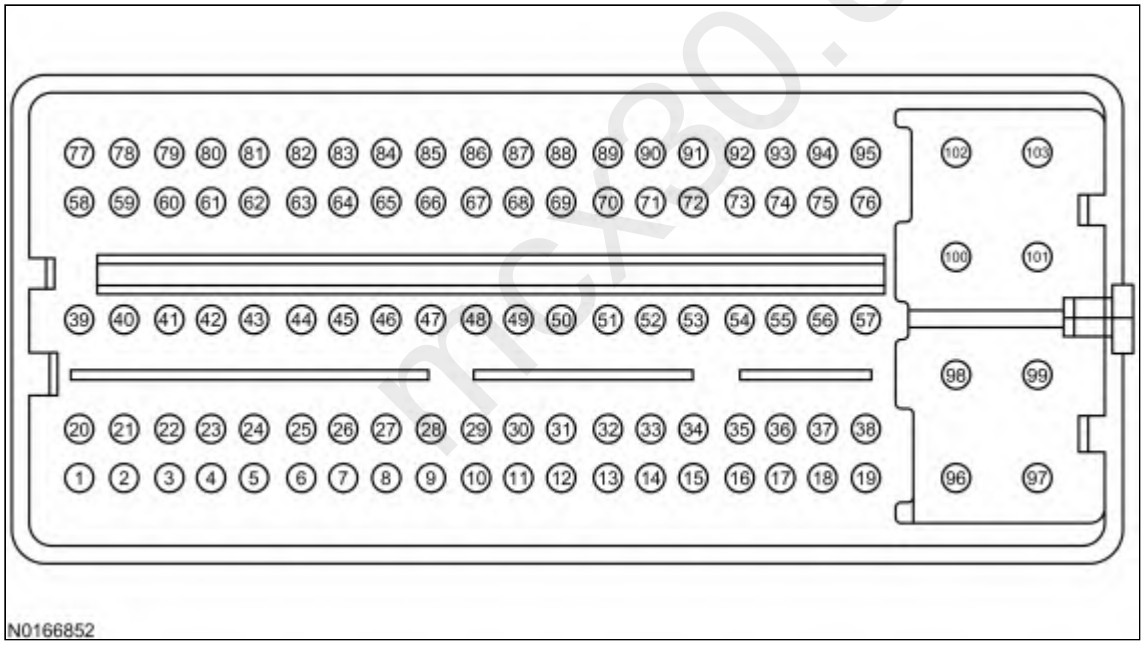
Vehicle	Connector	Pin	Circuit
F-650 / F-750	A	2 1	SIGRTN EGT14
All other vehicles	A	1 2	SIGRTN EGT14

Powertrain Control Module-B (PCM-B) Connector

A



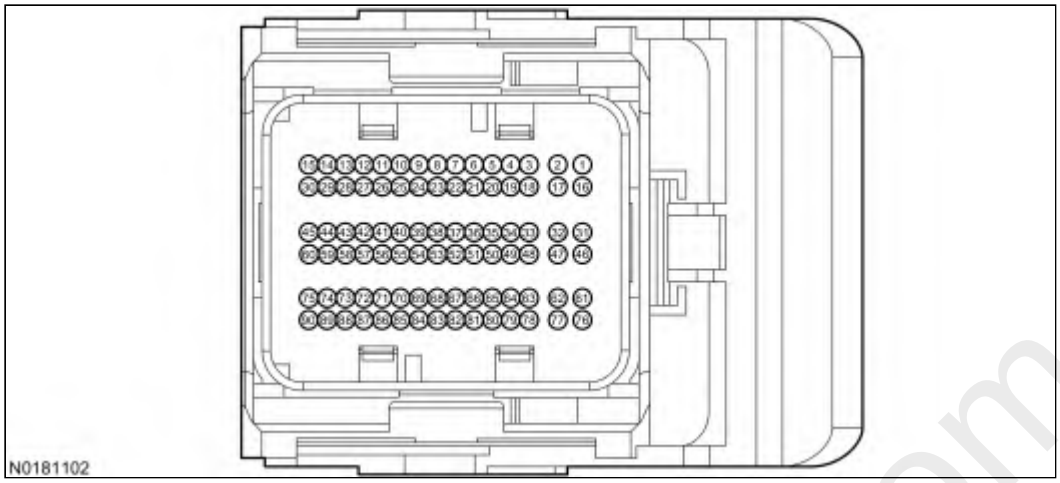
B



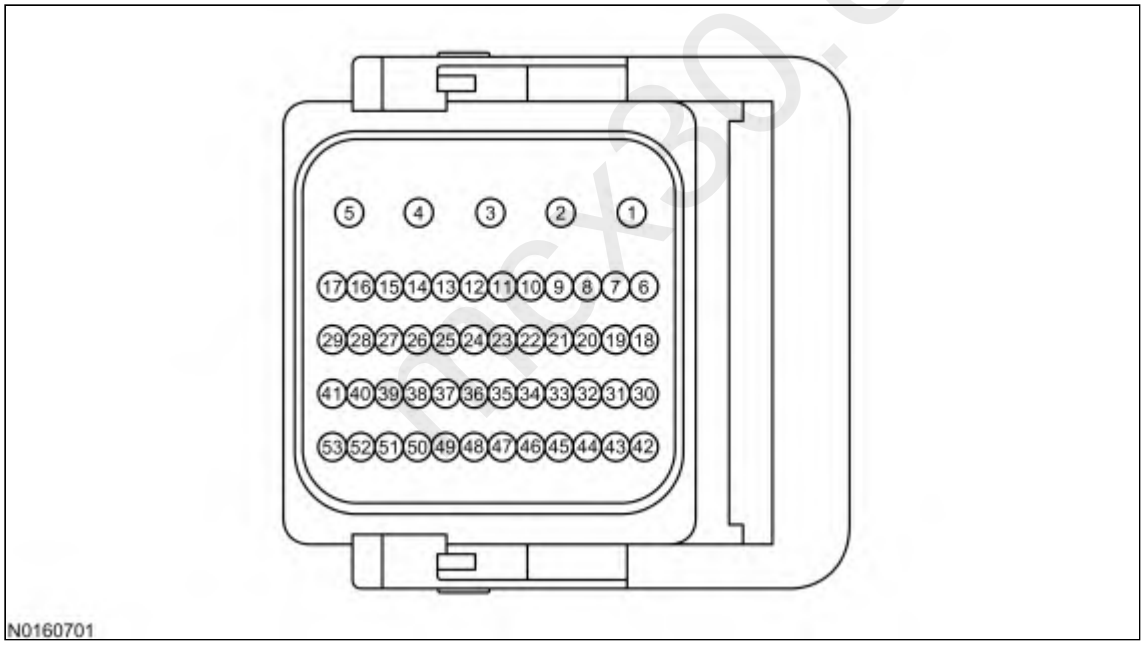
Vehicle	Connector	Pin	Circuit
Transit	A	8	EGT13
Transit Connect	B	36 55 91 59 75 72	SIGRTN EGT13 SIGRTN EGT12 SIGRTN EGT11

Powertrain Control Module-T (PCM-T) Connector

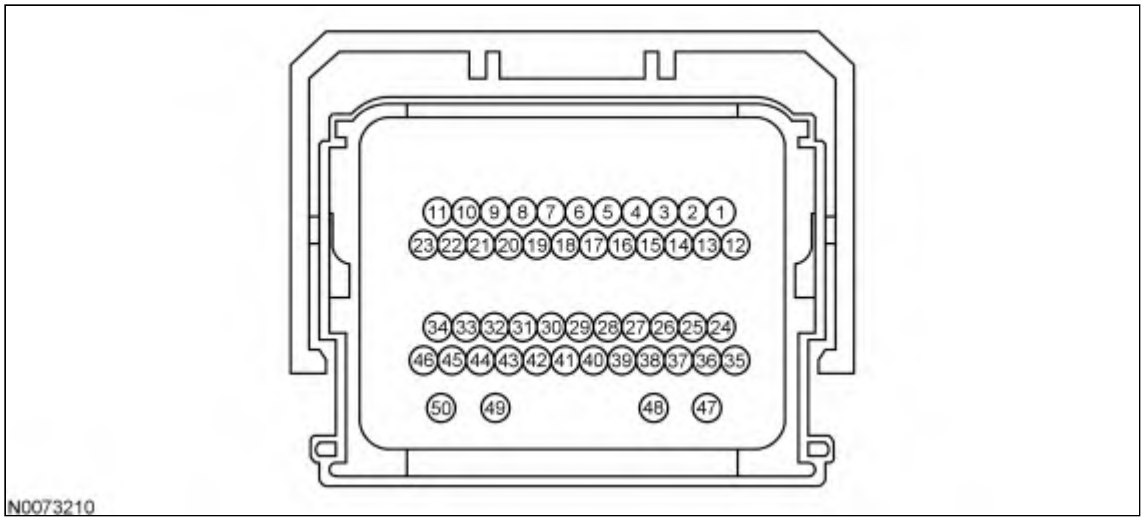
A



B



C



Vehicle	Connector	Pin	Circuit
F-Series Super Duty	A	56	SIGRTN
		41	EGT14
		28	SIGRTN
		13	EGT13
		27	SIGRTN
		12	EGT12
		26	SIGRTN
		11	EGT11
Transit	B	46	SIGRTN
		34	SIGRTN
		47	EGT12
		33	SIGRTN
		22	EGT11
All other vehicles	C	42	SIGRTN
		37	EGT14
		39	EGT13
		9	EGT12
		30	EGT11

RC1 PRELIMINARY DIAGNOSIS

Note: *The DTC P200E sets when the PCM identifies an over temperature concern using exhaust gas temperature bank 1, sensor 2 (EGT12) or exhaust gas temperature bank 1 sensor 3 (EGT13). Refer to Section 4, Diagnostic Trouble Code (DTC) Charts and Descriptions, for additional information.*

Note: *For additional information on the EGT sensors, refer to Section 1, Engine Control Components.*

Are DTCs P050E, P0544, P0545, P0546, P06EA, P06EB, P117B, P200C, P200E, P2031, P2032, P2033, P2080, P2084, P2085, P22FF, P242A, P242B, P242C, P242D, P242E, P246E, P246F, P2470, P2471, P2478, P2479, P247A, P247B, P249C, P249F, P24A0 or P24C2 present?

Yes	GO to RC2.
No	Unable to duplicate the condition. CHECK for a loose connection, and damaged or corroded terminals.

	WIGGLE the harness attempting to recreate the concern. REPAIR as necessary. RETURN to Section 3, Symptom Charts for further direction.

RC2 CHECK FOR LEAKS IN THE EXHAUST SYSTEM

- Ignition OFF.
- Visually inspect the exhaust system for the following:
  - exhaust leaks at flanges and gaskets
  - punctures or cracks in the catalyst
  - punctures or cracks in the diesel particulate filter
  - engine coolant or oil contamination

Is a concern present?

Yes	REPAIR as necessary. Clear the PCM DTCs. REPEAT the self-test.
No	GO to RC3.

RC3 CHECK THE EGT SIGNAL AND SIGRTN CIRCUITS FOR AN OPEN

Note: *Only diagnose the suspect EGT sensor indicated by the DTC.*

- For Transit Connect,
- EGT11 Sensor connector disconnected.
- EGT12 Sensor connector disconnected.
- EGT13 Sensor connector disconnected.
- PCM-B connector disconnected.
- Measure the resistance between:

(+) EGT11 Sensor Connector, Harness Side	(-) PCM-B Connector, Harness Side
EGT11	EGT11
SIGRTN	SIGRTN

- Measure the resistance between:

(+) EGT12 Sensor Connector, Harness Side	(-) PCM-B Connector, Harness Side
EGT12	EGT12
SIGRTN	SIGRTN

- Measure the resistance between:

(+) EGT13 Sensor Connector, Harness Side	(-) PCM-B Connector, Harness Side
EGT13	EGT13
SIGRTN	SIGRTN

- For Transit EGT11 and EGT12,
- EGT11 Sensor connector disconnected.
- EGT12 Sensor connector disconnected.
- PCM-T connector disconnected.

- Measure the resistance between:

(+) EGT11 Sensor Connector, Harness Side	(-) PCM-T Connector, Harness Side
EGT11	EGT11
SIGRTN	SIGRTN

- Measure the resistance between:

(+) EGT12 Sensor Connector, Harness Side	(-) PCM-T Connector, Harness Side
EGT12	EGT12
SIGRTN	SIGRTN

- For Transit EGT13,
- EGT13 Sensor connector disconnected.
- PCM-B connector disconnected.
- PCM-T connector disconnected.
- Measure the resistance between:

(+) EGT13 Sensor Connector, Harness Side	(-) PCM-T Connector, Harness Side
EGT13	EGT13

- Measure the resistance between:

(+) EGT13 Sensor Connector, Harness Side	(-) PCM-B Connector, Harness Side
SIGRTN	SIGRTN

- For F-Series Super Duty,
- EGT11 Sensor connector disconnected.
- EGT12 Sensor connector disconnected.
- EGT13 Sensor connector disconnected.
- EGT14 Sensor connector disconnected.
- PCM-T connector disconnected.
- Measure the resistance between:

(+) EGT11 Sensor Connector, Harness Side	(-) PCM-T Connector, Harness Side
EGT11	EGT11
SIGRTN	SIGRTN

- Measure the resistance between:

(+) EGT12 Sensor Connector, Harness Side	(-) PCM-T Connector, Harness Side
EGT12	EGT12
SIGRTN	SIGRTN

- Measure the resistance between:

(+) EGT13 Sensor Connector, Harness Side	(-) PCM-T Connector, Harness Side
EGT13	EGT13
SIGRTN	SIGRTN

- Measure the resistance between:

(+) EGT14 Sensor Connector, Harness Side	(-) PCM-T Connector, Harness Side
EGT14	EGT14
SIGRTN	SIGRTN

- For all others,
- EGT11 Sensor connector disconnected.
- EGT12 Sensor connector disconnected.
- EGT13 Sensor connector disconnected.
- EGT14 Sensor connector disconnected.
- PCM-T connector disconnected.
- Measure the resistance between:

(+) EGT11 Sensor Connector, Harness Side	(-) PCM-T Connector, Harness Side
EGT11	EGT11
SIGRTN	SIGRTN

- Measure the resistance between:

(+) EGT12 Sensor Connector, Harness Side	(-) PCM-T Connector, Harness Side
EGT12	EGT12
SIGRTN	SIGRTN

- Measure the resistance between:

(+) EGT13 Sensor Connector, Harness Side	(-) PCM-T Connector, Harness Side
EGT13	EGT13
SIGRTN	SIGRTN

- Measure the resistance between:

(+) EGT14 Sensor Connector, Harness Side	(-) PCM-T Connector, Harness Side
EGT14	EGT14

(+) EGT14 Sensor Connector, Harness Side	(-) PCM-T Connector, Harness Side
SIGRTN	SIGRTN

Are the resistances less than 5 ohms?

Yes	GO to RC4.
No	REPAIR the open circuit. Clear the PCM DTCs. REPEAT the self-test.

RC4 CHECK THE EGT SIGNAL CIRCUIT FOR A SHORT TO GROUND OR SIGRTN

Note: *Only diagnose the suspect EGT sensor indicated by the DTC.*

- Measure the resistance between:

(+) EGT11 Sensor Connector, Harness Side	(-)
EGT11	Ground

- Measure the resistance between:

(+) EGT11 Sensor Connector, Harness Side	(-) EGT11 Sensor Connector, Harness Side
EGT11	SIGRTN

- Measure the resistance between:

(+) EGT12 Sensor Connector, Harness Side	(-)
EGT12	Ground

- Measure the resistance between:

(+) EGT12 Sensor Connector, Harness Side	(-) EGT12 Sensor Connector, Harness Side
EGT12	SIGRTN

- Measure the resistance between:

(+) EGT13 Sensor Connector, Harness Side	(-)
EGT13	Ground

- Measure the resistance between:

(+) EGT13 Sensor Connector, Harness Side	(-) EGT13 Sensor Connector, Harness Side
EGT13	SIGRTN

- Measure the resistance between:

(+) EGT14 Sensor Connector, Harness Side	(-)
EGT14	Ground

- Measure the resistance between:

(+) EGT14 Sensor Connector, Harness Side	(-) EGT14 Sensor Connector, Harness Side
EGT14	SIGRTN

Are the resistances greater than 10K ohms?

Yes	GO to RC5.
No	REPAIR the short circuit. Clear the PCM DTCs. REPEAT the self-test.

RC5 CHECK THE EGT SIGNAL CIRCUIT FOR A SHORT TO VOLTAGE

NOTICE: Only diagnose the suspect EGT sensor indicated by the DTC.

- Ignition ON, engine OFF.
- Measure the voltage between:

(+) EGT11 Sensor Connector, Harness Side	(-)
EGT11	Ground
SIGRTN	Ground

- Measure the voltage between:

(+) EGT12 Sensor Connector, Harness Side	(-)
EGT12	Ground
SIGRTN	Ground

- Measure the voltage between:

(+) EGT13 Sensor Connector, Harness Side	(-)
EGT13	Ground
SIGRTN	Ground

- Measure the voltage between:

(+) EGT14 Sensor Connector, Harness Side	(-)

(+) EGT14 Sensor Connector, Harness Side	(-)
EGT14	Ground
SIGRTN	Ground

Is any voltage present?

Yes	REPAIR the short circuit. Clear the PCM DTCs. REPEAT the self-test.
No	For Transit or Transit Connect, GO to RC7. For DTCs P0544, P200C, P200E, P2031, P242A or P246E, GO to RC9. For DTCs P2478, P2479, P247A or P247B, GO to RC6. For all others, GO to RC8.

RC6 CHECK THE EGT SENSOR

Note: *Only diagnose the suspect EGT sensor indicated by the DTC.*

Note: *All PIDs may not be available on all vehicles.*

- Ignition OFF.
- EGT Sensor connector connected.
- PCM-B connector connected.
- PCM-T connector connected.
- Ignition ON, engine OFF.
- Access the PCM and monitor the EGT11 (TEMP), EGT12 (TEMP), EGT13 (TEMP) and EGT14 (TEMP) PIDs.

Do any of the PIDs display a reading higher than 1,100°C (2,012°F)?

Yes	INSTALL a new EGT sensor. REFER to the Workshop Manual Section 303-14, Electronic Engine Controls. Clear the PCM DTCs. REPEAT the self-test.
No	Unable to duplicate or identify the concern at this time. Clear the PCM DTCs. REPEAT the self-test.

RC7 CHECK THE EGT SENSOR AND CIRCUITS FOR AN INTERMITTENT SHORT OR OPEN

Note: *If any EGT sensor connector has been disconnected during testing, with the ignition ON and the engine OFF, connect the EGT sensor. Turn the ignition OFF for 30 seconds before attempting to start the vehicle. Do not crank or start the engine until the ignition has been turned OFF for a minimum of 30 seconds. Failure to do so may result in a 60 minute no crank, no start condition and a failure mode effects management (FMEM) condition. Carry out the EGT Engine Protection Reset on the scan tool. Refer to Section 2, Clear The Continuous Diagnostic Trouble Codes (DTCs) And Reset The Emission Monitors Information in The Powertrain Control Module (PCM).*

- Ignition ON, engine OFF.
- Access the PCM and monitor the EGT11_V (VOLT), EGT12_V (VOLT) and EGT13_V (VOLT) PIDs.
- For an IDS scan tool, use the auto capture function while carrying out a thorough wiggle test on the suspect EGT harness from the PCM connector to the EGT sensor connector. Set the voltage limits as follows:
  - for DTCs P0545, P2032 or P242C, set the lower limit voltage to 0.3V
  - for DTCs P0546, P2033 or P242D, set the upper limit voltage to 4.6V
- Tap lightly around the sensor to simulate road shock.
- For a generic scan tool, monitor the voltage of the suspect EGT PID while carrying out a thorough wiggle test on the suspect EGT harness from the PCM connector to the EGT sensor connector.
- Tap lightly around the sensor to simulate road shock.

Does the IDS trigger and capture a voltage fluctuation or does the suspect EGT voltage PID fluctuate?

Yes	REPAIR as necessary.

	Clear the PCM DTCs. REPEAT the self-test.
No	GO to RC9.

RC8 CHECK THE EGT SENSOR AND CIRCUITS FOR AN INTERMITTENT SHORT OR OPEN

Note: *If any EGT sensor connector has been disconnected during testing, with the ignition ON and the engine OFF, connect the EGT sensor. Turn the ignition OFF for 30 seconds before attempting to start the vehicle. Do not crank or start the engine until the ignition has been turned OFF for a minimum of 30 seconds. Failure to do so may result in a 60 minute no crank, no start condition and a failure mode effects management (FMEM) condition.*

Note: *Only diagnose the suspect EGT sensor indicated by the DTC.*

Note: *All PIDs may not be available on all vehicles.*

- Ignition OFF.
- EGT Sensor connector connected.
- PCM-B connector connected.
- PCM-T connector connected.
- Ignition ON, engine OFF.
- Access the PCM and monitor the EGT11 (TEMP), EGT12 (TEMP), EGT13 (TEMP) and EGT14 (TEMP) PIDs.
- Record the EGT11, EGT12, EGT13 and EGT14 PIDs values.
- Set the scan tool EGT11, EGT12, EGT13 and EGT14 PIDs limits as follows:
  - set the lower limit to 30°C (54°F) below the lowest reading sensor
  - set the upper limit to 20°C (36°F) above the highest reading sensor
- Carry out a thorough wiggles test on the suspect EGT harness from the PCM connector to the EGT sensor connector.
- Tap lightly around the sensor to simulate road shock.

Do the EGT11, EGT12, EGT13 and EGT14 PIDs values exceed the set limits range?

Yes	REPAIR as necessary. Clear the PCM DTCs. REPEAT the self-test.
No	GO to RC9.

RC9 COMPARE THE EGT AND AAT PID VALUES

Note: *If any EGT sensor connector has been disconnected during testing, with the ignition ON and the engine OFF, connect the EGT sensor. Turn the ignition OFF for 30 seconds before attempting to start the vehicle. Do not crank or start the engine until the ignition has been turned OFF for a minimum of 30 seconds. Failure to do so may result in a 60 minute no crank, no start condition and a failure mode effects management (FMEM) condition. For Transit, carry out the EGT Engine Protection Reset on the scan tool. Refer to Section 2, Clear The Continuous Diagnostic Trouble Codes (DTCs) And Reset The Emission Monitors Information in The Powertrain Control Module (PCM).*

Note: *All PIDs may not be available on all vehicles.*

- Ignition OFF.
- Allow the exhaust system temperature to stabilize to the ambient temperature for a minimum of 6 hours.
- EGT Sensor connector connected.
- PCM-B connector connected.
- PCM-T connector connected.
- Ignition ON, engine OFF.
- Access the PCM and monitor the EGT11 (TEMP), EGT12 (TEMP), EGT13 (TEMP), EGT14 (TEMP) and AAT (TEMP) PIDs.

Are all EGT PID readings within 20°C (36°F) of ambient temperature?

Yes	GO to RC10.
No	GO to RC11.

RC10 CHECK THE EGT SENSOR PERFORMANCE

Note: *An EGT sensor may exceed its operating range only while in regeneration mode, which may result in performance DTCs being set.*

- Clear the PCM DTCs.
- Drive the vehicle at steady state speed above 50 km/h (30 mph) for at least 20 minutes.
- Carry out the key on engine off (KOEO) self-test.

Are any EGT DTCs pending?

Yes	INSTALL a new EGT sensor for the DTC in question. REFER to the Workshop Manual Section 303-14, Electronic Engine Controls. Clear the PCM DTCs. REPEAT the self-test.
No	For Transit with DTC P24A0, GO to Pinpoint Test RL. For all others, unable to duplicate or identify the concern at this time. Clear the PCM DTCs. REPEAT the self-test.

RC11 CHECK THE EGT SENSOR FOR CORRECT RESISTANCE

Note: *Only diagnose the suspect EGT sensor indicated by the DTC.*

- Ignition OFF.
- EGT Sensor connector disconnected.
- Measure the resistance between:

(+) EGT Sensor Connector, Component Side	(-) EGT Sensor Connector, Component Side
EGT	SIGRTN

Is the resistance less than 775 ohms?

Yes	GO to RC12.
No	INSTALL a new EGT sensor. REFER to the Workshop Manual Section 303-14, Electronic Engine Controls. Clear the PCM DTCs. REPEAT the self-test.

RC12 CHECK THE EGT SENSOR FOR THE CORRECT RESPONSE

Note: *Only diagnose the suspect EGT sensor indicated by the DTC. Allow the exhaust system temperature to stabilize.*

Note: *All PIDs may not be available on all vehicles.*

Note: *Identify the suspect EGT sensor by comparing the EGT sensor temperature PID to the ambient temperature after an 8 hour ignition OFF soak time. The EGT temperature differences should be within 40°C (72°F).*

Note: *For Transit, if any EGT sensor connector has been disconnected during testing, with the ignition ON and the engine OFF, connect the EGT sensor. Turn the ignition OFF for 30 seconds before attempting to start the vehicle. Do not crank or start the engine until the ignition has been turned OFF for a minimum of 30 seconds. Failure to do so may result in a 60 minute no crank, no start condition and a failure mode effects management (FMEM) condition. Carry out the EGT Engine Protection Reset on the scan tool. Refer to Section 2, Clear The Continuous Diagnostic Trouble Codes (DTCs) And Reset The Emission Monitors Information in The Powertrain Control Module (PCM).*

- EGT Sensor connector connected.
- Ignition ON, engine running.
- Access the PCM and monitor the EGT11 (TEMP), EGT12 (TEMP), EGT13 (TEMP) and EGT14 (TEMP) PIDs.
- Run the engine at 1,500 RPM for 10 minutes.
- At the end of the 10 minutes, record the EGT11 (TEMP), EGT12 (TEMP), EGT13 (TEMP) and EGT14 (TEMP) PID values.
- Ignition OFF.
- Allow the exhaust system temperature to stabilize for a minimum of 10 minutes. After the 10 minute cool down, record the EGT11 (TEMP), EGT12 (TEMP), EGT13 (TEMP) and EGT14 (TEMP) PID values.
- Compare the recorded PID values to each other in both readings.

Is each EGT sensor PID value within 40°C (72°F) of the next sensor in line of the exhaust flow?

Yes	For DTC P249C, GO to Pinpoint Test RD. For all others, GO to RC13.
No	INSTALL a new EGT sensor. REFER to the Workshop Manual Section 303-14, Electronic Engine Controls. Clear the PCM DTCs. REPEAT the self-test.

RC13 DETERMINE THE SUSPECT EGT SENSOR

Note: *Only diagnose the suspect EGT sensor indicated by the DTC.*

Note: *All PIDs may not be available on all vehicles.*

Note: *For Transit, if any EGT sensor connector has been disconnected during testing, with the ignition ON and the engine OFF, connect the EGT sensor. Turn the ignition OFF for 30 seconds before attempting to start the vehicle. Do not crank or start the engine until the ignition has been turned OFF for a minimum of 30 seconds. Failure to do so may result in a 60 minute no crank, no start condition and a failure mode effects management (FMEM) condition. Carry out the EGT Engine Protection Reset on the scan tool. Refer to Section 2, Clear The Continuous Diagnostic Trouble Codes (DTCs) And Reset The Emission Monitors Information in The Powertrain Control Module (PCM).*

- Ignition ON, engine OFF.
- Access the PCM and monitor the EGT11_V (VOLT), EGT12_V (VOLT), EGT13_V (VOLT) and EGT14_V (VOLT) PIDs.
- Disconnect the suspect EGT sensor harness connector.

Is the suspect EGT sensor PID value greater than 4.7 V when disconnected?

Yes	CHECK for a loose connection, and damaged or corroded terminals. WIGGLE the harness attempting to recreate the concern. REPAIR as necessary. If no concerns were found during the visual inspection, INSTALL a new EGT sensor. REFER to the Workshop Manual Section 303-14, Electronic Engine Controls. Clear the PCM DTCs. REPEAT the self-test.
No	GO to RC14.

RC14 CHECK FOR CORRECT PCM OPERATION

- Disconnect all the PCM connectors.
- Visually inspect for:
  - pushed out pins
  - corrosion
- Connect all the PCM connectors and make sure they seat correctly.
- Carry out the PCM self-test.
- Verify the concern is still present.

Is the concern still present?

Yes	INSTALL a new PCM. REFER to Section 2, Flash Electrically Erasable Programmable Read Only Memory (EEPROM).
No	The system is operating correctly at this time. The concern may have been caused by a loose or corroded connector.