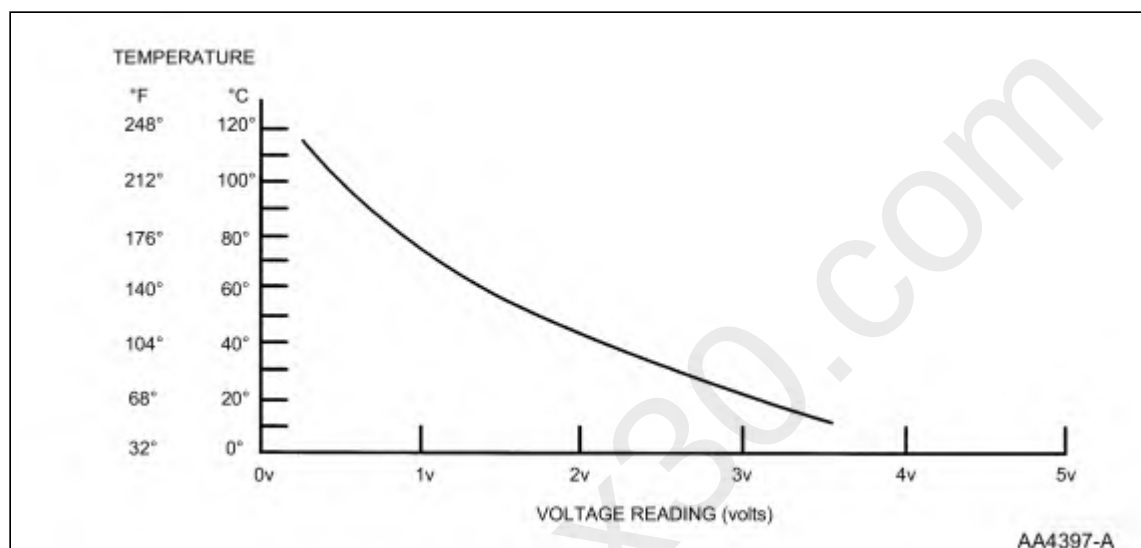


DN: Pressure And Temperature Sensors

This pinpoint test is intended to diagnose the following:

- intake air temperature 2 (IAT2) sensor (12A697)
- manifold absolute pressure (MAP)/charge air cooler temperature (CACT) sensor (9F479)
- manifold absolute pressure (MAP)/intake air temperature 2 (IAT2) sensor (9F479)
- turbocharger boost pressure (TCBP)/charge air cooler temperature (CACT) sensor (9F479)
- harness circuits: IAT2, CACT, SIGRTN and VREF
- PCM (12A650)

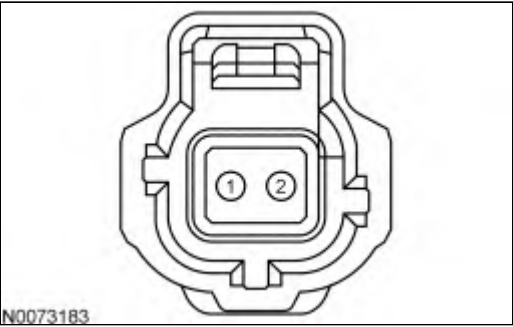
Voltage values calculated for VREF equals 5 volts. These values can vary by 15% due to sensor and VREF variations.

**TEMPERATURE SENSOR VOLTAGE AND RESISTANCE SPECIFICATIONS**

Temperature		Temperature Sensor Values
°C	°F	Resistance (K ohms)
120	248	1.18
110	230	1.55
100	212	2.07
90	194	2.80
80	176	3.84
70	158	5.37
60	140	7.70
50	122	10.97
40	104	16.15
30	86	24.27
20	68	37.30
10	50	58.75
0	32	95.85

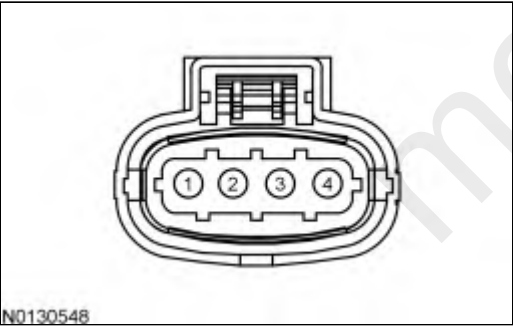
Temperature		Temperature Sensor Values
°C	°F	Resistance (K ohms)
-10	14	160.31

Intake Air Temperature 2 (IAT2) Sensor Connector



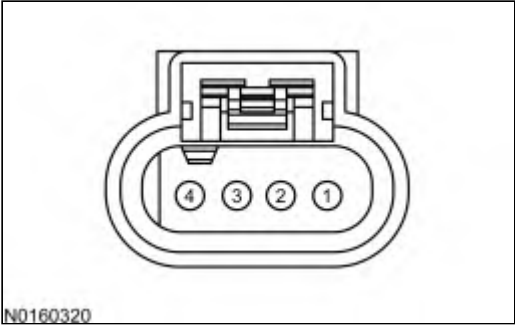
Pin	Circuit
2	SIGRTN (Signal Return)
1	IAT2 (Intake Air Temperature 2)

Manifold Absolute Pressure/Charge Air Cooler Temperature (MAP/CACT) Sensor Connector

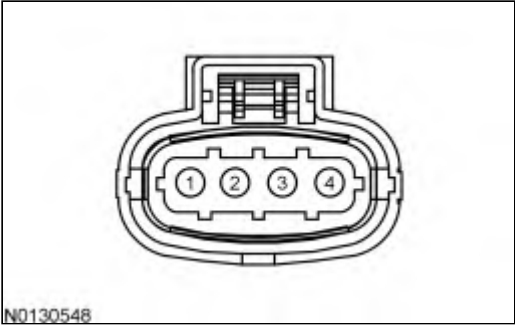


Pin	Circuit
1	SIGRTN (Signal Return)
2	CACT (Charge Air Cooler Temperature)

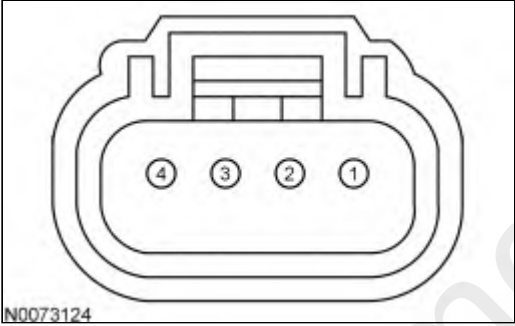
Manifold Absolute Pressure/Intake Air Temperature 2 (MAP/IAT2) Sensor Connector



B



C

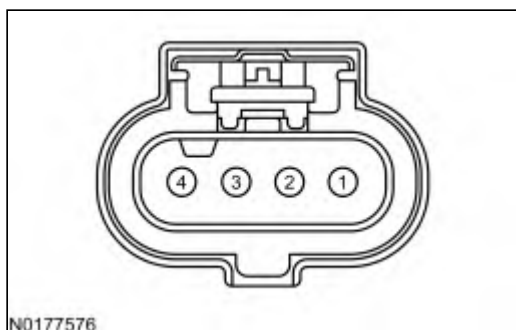


Vehicle	Connector	Pin	Circuit
Aviator, Explorer 3.0L	A	4 1	SIGRTN IAT2
Continental 2.0L, EcoSport, Mustang 2.3L	B	1 2	SIGRTN IAT2
Corsair, Escape/Kuga, Explorer 2.3L, Ranger	A	4 3	SIGRTN IAT2
Edge 2.7L, Nautilus 2.7L, Transit	C	4 1	SIGRTN IAT2

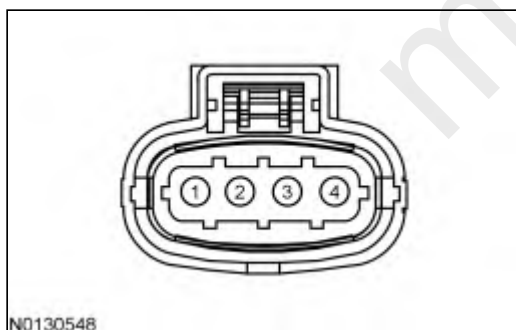
Vehicle	Connector	Pin	Circuit
Edge 2.0L, F-150 3.5L, MKZ, Nautilus 2.0L	B	4 3	SIGRTN IAT2
F-150 2.7L, Flex	C	4 3	SIGRTN IAT2
Mustang 5.2L	A	3 1	SIGRTN IAT2
All other vehicles	B	4 1	SIGRTN IAT2

Turbocharger Boost Pressure/Charge Air Cooler Temperature (TCBP/CACT) Sensor Connector

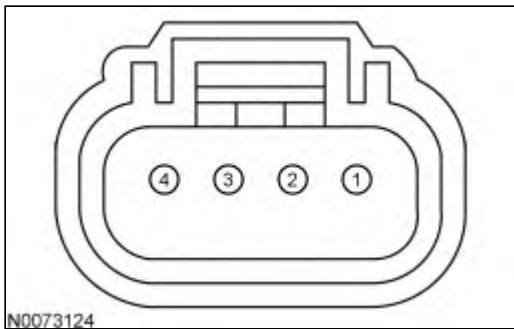
A



B



C



Vehicle	Connector	Pin	Circuit
Aviator, Explorer	A	4 3	SIGRTN CACT
Fusion 2.0L, MKZ 2.0L	B	1 2	SIGRTN CACT
All other vehicles	C	4 3	SIGRTN CACT

Powertrain Control Module (PCM) Connector

For PCM connector views or reference values, refer to Section 6, Reference Values.

Vehicle	Connector	Pin	Circuit
Aviator, Explorer 3.0L	306 PIN	B26 E13 E50 E10	SIGRTN SIGRTN IAT2 CACT
Continental 2.0L	198 PIN	E20 E34	SIGRTN IAT2
Continental 2.7L, Continental 3.0L, Fusion 2.7L	198 PIN	B18 B32 E20 E33	SIGRTN CACT SIGRTN IAT2
EcoSport 1.0L Automatic Transmission	198 PIN	E20 B75	SIGRTN IAT2
EcoSport 1.0L Manual Transmission	198 PIN	E19 B32	SIGRTN IAT2
Edge 2.7L	306 PIN	B26 B83 E13 E50	SIGRTN CACT SIGRTN IAT2

Vehicle	Connector	Pin	Circuit
Expedition, Navigator	198 PIN	B30 B35 E10 E52	SIGRTN CACT SIGRTN IAT2
F-150 2.7L, F-150 3.5L	306 PIN	E121 E10 E13 E52 E13	SIGRTN CACT SIGRTN IAT2 SIGRTN
F-150 3.5L High Output	198 PIN	B30 B35 E10 E17 E10	SIGRTN CACT SIGRTN IAT2 SIGRTN
Flex, MKZ 3.0L	198 PIN	B18 B32 E20 E34	SIGRTN CACT SIGRTN IAT2
Ford GT	198 PIN	E20 B53 E20 E34	SIGRTN CACT SIGRTN IAT2
Fusion 1.5L	198 PIN	E20 B32 E20 E34	SIGRTN CACT SIGRTN IAT2
Fusion 2.0L, MKZ 2.0L	198 PIN	B19 B32	SIGRTN CACT
Mustang 5.2L	306 PIN	E28 E94	SIGRTN IAT2
Nautilus 2.0L	198 PIN	E20 E25	SIGRTN IAT2
Nautilus 2.7L	306 PIN	B18 B83 E20 E50	SIGRTN CACT SIGRTN IAT2
Transit	306 PIN	B26 B10 E13 E50	SIGRTN CACT SIGRTN IAT2
Transit Connect 1.0L	198 PIN	E41 E53	SIGRTN IAT2
All other vehicles	198 PIN	E41 E52	SIGRTN IAT2

DN1 CHECK FOR DTCS

Note: This pinpoint test is designed to diagnose multiple components in the same test steps, only measure the circuits that apply to the vehicle and the component being diagnosed.

Note: Diagnose circuit concerns before range or performance concerns.

Are DTCs P007B, P007C, P007D, P0096, P0097, P0098, or P00CE present?

Yes	GO to DN2 .
No	For symptoms without DTCs, GO to DN2 . For all others, RETURN to Section 3, Symptom Charts for further direction.

DN2 MONITOR THE PID

- Ignition ON, engine OFF.
- For the IAT2 or MAP/IAT2 sensor,
- Access the PCM and monitor the IAT2_V (VOLT) PID.
- For the MAP/CACT or TCBP/CACT sensor,
- Access the PCM and monitor the CAC_V (VOLT) PID.

Are the voltages between 0.5 - 4.95 V?

Yes	GO to DN6 .
No	GO to DN3 .

DN3 CHECK THE CIRCUITS FOR AN OPEN

- Ignition OFF.
- PCM connector disconnected.
- For the IAT2 sensor,
- IAT2 Sensor connector disconnected.
- Measure the resistance between:

(+) IAT2 Sensor Connector, Harness Side	(-) PCM Connector, Harness Side
IAT2 - Pin 1	IAT2
SIGRTN - Pin 2	SIGRTN

- For the MAP/CACT sensor,
- MAP/CACT Sensor connector disconnected.
- Measure the resistance between:

(+) MAP/CACT Sensor Connector, Harness Side	(-) PCM Connector, Harness Side
CACT - Pin 2	CACT
SIGRTN - Pin 1	SIGRTN

- For the MAP/IAT2 sensor,
- MAP/IAT2 Sensor connector disconnected.
- Measure the resistance between:

(+) MAP/IAT2 Sensor Connector, Harness Side	(-) PCM Connector, Harness Side
IAT2	IAT2
SIGRTN	SIGRTN

- For the TCBP/CACT sensor,
- TCBP/CACT Sensor connector disconnected.
- Measure the resistance between:

(+) TCBP/CACT Sensor Connector, Harness Side	(-) PCM Connector, Harness Side
CACT	CACT
SIGRTN	SIGRTN

Are the resistances less than 5 ohms?

Yes	GO to DN4 .
No	REPAIR the open circuit. Clear the PCM DTCs. REPEAT the self-test.

DN4 CHECK THE SIGNAL CIRCUIT FOR A SHORT TO GROUND

- For the IAT2 sensor,
- Measure the resistance between:

(+) IAT2 Sensor Connector, Harness Side	(-)
IAT2 - Pin 1	Ground

- For the MAP/CACT sensor,
- Measure the resistance between:

(+) MAP/CACT Sensor Connector, Harness Side	(-)
CACT	Ground

- For the MAP/IAT2 sensor,
- Measure the resistance between:

(+) MAP/IAT2 Sensor Connector, Harness Side	(-)
IAT2	Ground

- For the TCBP/CACT sensor,
- Measure the resistance between:

(+) TCBP/CACT Sensor Connector, Harness Side	(-)
CACT	Ground

Is the resistance greater than 10K ohms?

Yes	GO to DN5 .
No	REPAIR the short circuit. Clear the PCM DTCs. REPEAT the self-test.

DN5 CHECK FOR A SHORT TO VOLTAGE

- Ignition ON, engine OFF.
- For the IAT2 sensor,
- Measure the voltage between:

(+) IAT2 Sensor Connector, Harness Side	(-)
IAT2 - Pin 1	Ground

- For the MAP/CACT sensor,
- Measure the voltage between:

(+) MAP/CACT Sensor Connector, Harness Side	(-)
CACT	Ground

- For the MAP/IAT2 sensor,
- Measure the voltage between:

(+) MAP/IAT2 Sensor Connector, Harness Side	(-)
IAT2	Ground

- For the TCBP/CACT sensor,
- Measure the voltage between:

(+) TCBP/CACT Sensor Connector, Harness Side	(-)
CACT	Ground

Is any voltage present?

Yes	REPAIR the short circuit. Clear the PCM DTCs. REPEAT the self-test.
No	GO to DN6 .

DN6 INTERMITTENT CHECK

- Ignition OFF.
- PCM connector connected.
- IAT2 Sensor connector connected.
- MAP/CACT Sensor connector connected.
- MAP/IAT2 Sensor connector connected.

- TCBP/CACT Sensor connector connected.
- Ignition ON, engine OFF.
- For the MAP/CACT or TCBP/CACT sensor,
- Access the PCM and monitor the CAC_V (VOLT) PID.
- For the IAT2 or MAP/IAT2 sensor,
- Access the PCM and monitor the IAT2_V (VOLT) PID.
- For the sensor in question wiggle the harness and connectors from the component to the PCM.

Is there a large change in the voltage reading?

Yes	REPAIR as necessary. If no concerns are present, INSTALL a new sensor in question. REFER to the Workshop Manual Section 303-14, Electronic Engine Controls. Clear the PCM DTCs. REPEAT the self-test.
No	GO to DN7 .

DN7 SIMULATE THE OPPOSITE SIGNAL TO THE PCM

- Ignition OFF.
- IAT2 Sensor connector disconnected.
- MAP/CACT Sensor connector disconnected.
- MAP/IAT2 Sensor connector disconnected.
- TCBP/CACT Sensor connector disconnected.
- Ignition ON, engine OFF.
- For the MAP/CACT or TCBP/CACT sensor,
- Access the PCM and monitor the CAC_V (VOLT) PID.
- For the IAT2 or MAP/IAT2 sensor,
- Access the PCM and monitor the IAT2_V (VOLT) PID.

Is the voltage greater than 4.2 V?

Yes	For DTCs P007B, P0096 or P00CE, GO to DN8 . For all others, UNABLE to duplicate or identify the concern at this time. GO to Pinpoint Test Z .
No	GO to DN10 .

DN8 TEMPERATURE SENSOR CORRELATION

- Ignition OFF.
- IAT2 Sensor connector connected.
- MAP/CACT Sensor connector connected.
- MAP/IAT2 Sensor connector connected.
- TCBP/CACT Sensor connector connected.
- Cold soak the vehicle at ambient temperature for at least 6 hours.
- Ignition ON, engine OFF.
- Access the PCM and monitor the CAC_T (TEMP), IAT (TEMP) and IAT2 (TEMP) PIDs.

Are the IAT, CACT and IAT2 temperature readings within 16.67°C (30°F) of each other?

Yes	GO to DN9 .
No	For the IAT sensor, GO to Pinpoint Test DA . For all others, CHECK the sensor in question for contamination or obstructions. REPAIR as necessary. If no concerns are present, INSTALL a new sensor in question. REFER to the Workshop Manual Section 303-14, Electronic Engine Controls. Clear the PCM DTCs. REPEAT the self-test.

DN9 TEMPERATURE SENSOR CORRELATION AT OPERATING TEMPERATURE

- Ignition ON, engine running.
- Allow the engine to idle at the normal operating temperature.
- Access the PCM and monitor the CAC_T (TEMP), IAT (TEMP) and IAT2 (TEMP) PIDs.
- Drive the vehicle at a steady speed of 88 km/h (55 mph) for a minimum of 6 minutes.

Does the IAT temperature exceed 65.5°C (150°F), or does the CACT temperature exceed 104.4°C (220°F), or does the IAT2 temperature exceed 115.6°C (240°F)?

Yes	CHECK the charge air cooler (CAC) for debris and obstructed air flow. REPAIR as necessary. If no concerns are present, INSTALL a new sensor in question. REFER to the Workshop Manual Section 303-14, Electronic Engine Controls. Clear the PCM DTCs. REPEAT the self-test.
No	GO to DN10 .

DN10 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) , Programming the VID Block for a Replacement PCM.
No	The system is operating correctly at this time. The concern may have been caused by a loose or corroded connector.