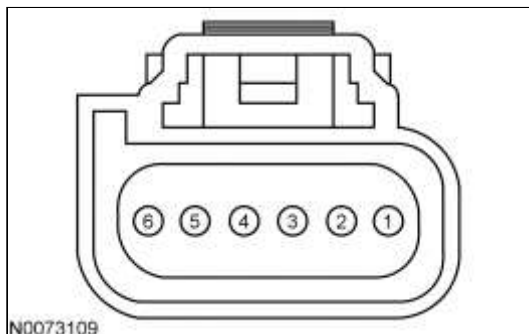


DC: Mass Airflow (MAF) Sensor

This pinpoint test is intended to diagnose the following:

- mass airflow (MAF) sensor (12B579)
- harness circuits: MAF, MAFRTN, vehicle power (VPWR), ground (GND), IAT and SIGRTN
- powertrain control module (PCM) (12A650)

Mass Airflow/Intake Air Temperature (MAF/IAT) Sensor Connector

Vehicle	Connector	Pin	Circuit
Expedition, F-150, F-650 / F-750, F-Series Super Duty, Focus, Mustang, Navigator	A	4 5 3	SIGRTN MAF VPWR
Fiesta	A	2, 4 3 6	SIGRTN MAF VPWR
Motorhome / Stripped Chassis / Step Van	A	4 5 3	GND MAF VPWR
All other vehicles	A	4 5 3 6	MAFRTN GND MAF VPWR

Powertrain Control Module (PCM) Connector

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

Vehicle	Connector	Pin	Circuit
E-Series 6.8L	170 PIN	E26 E25	MAFRTN MAF
Expedition, F-150 6.2L, F-150 5.0L, F-650 / F-750, F-Series Super Duty, Mustang 5.4L, Mustang 5.0L, Navigator	190-PIN	B2 B40	SIGRTN MAF
F-150 3.7L, Mustang 3.7L	190-PIN	B41 B40	SIGRTN MAF
Fiesta	128 PIN	E1 E37	SIGRTN MAF
Flex, MKS, MKT, Taurus	190-PIN	B42 B41	MAFRTN MAF
Focus	154 PIN	E36 E55	SIGRTN MAF
Fusion 3.5L, MKZ	140 PIN	B42 B41	MAFRTN MAF
Motorhome / Stripped Chassis / Step Van	190-PIN	B40	MAF
All other vehicles	190-PIN	B41 B40	MAFRTN MAF

DC1 VERIFY THE TYPE OF MAF SENSOR

Does the MAF/IAT sensor harness connector have 4 circuits?

Yes	GO to DC15 .
No	GO to DC2 .

DC2 CHECK FOR DIAGNOSTIC TROUBLE CODES (DTCs)

Are DTCs P0101, P0102, P0103, P0104, or P1100 present?

Yes	For DTCs P0101, P0102, P0103, P0104 or P1100, GO to DC3 . For all others, GO to Section 4, Diagnostic Trouble Code (DTC) Charts and Descriptions .
No	For symptoms without DTCs, GO to DC3 .

DC3 CHECK THE INTAKE AIR SYSTEM FOR LEAKS, OBSTRUCTIONS, AND DAMAGE

Note: Visually inspect the vehicle for aftermarket accessories and performance modifications (exhaust system, turbocharger, performance chip). Refer to Section 1 [Engine Control \(EC\) System](#), Modifications to OBD Vehicles.

- Ignition OFF.
- Check the intake air system (air cleaner, housing, ductwork) for obstructions or blockage.

- Check for broken or loose air outlet tube clamps, cracks or holes in the air outlet tube.
- Check for worn gaskets between the MAF/IAT sensor and the air cleaner assembly.
- Check that the MAF/IAT sensor connector is seated correctly.
- Check the throttle body bore for sludge.
- Check the crankcase ventilation system for leaks and restrictions.

Is a concern present?

Yes	REPAIR as necessary. Clear the PCM DTCs. REPEAT the self-test.
No	GO to <u>DC4</u> .

DC4 CHECK FOR VOLTAGE AT THE SENSOR

- MAF/IAT Sensor connector disconnected.
- Ignition ON, engine OFF.
- Measure the voltage between:

(+) MAF/IAT Sensor Connector, Harness Side	(-)
VPWR	Ground

Is the voltage greater than 10 V?

Yes	GO to <u>DC5</u> .
No	REPAIR the open circuit. Clear the PCM DTCs. REPEAT the self-test.

DC5 CHECK FOR AN OPEN

Note: Only measure the circuits that apply to the vehicle being diagnosed.

- Ignition OFF.
- MAF/IAT Sensor connector disconnected.
- PCM connector disconnected.
- For Fiesta,
- Measure the resistance between:

(+) MAF/IAT Sensor Connector, Harness Side	(-) PCM Connector, Harness Side
MAF	MAF
SIGRTN	SIGRTN

- For all others,
- Measure the resistance between:

(+) MAF/IAT Sensor Connector, Harness Side	(-)
GND	Ground

- Measure the resistance between:

(+) MAF/IAT Sensor Connector, Harness Side	(-) PCM Connector, Harness Side
MAF	MAF
MAFRTN	MAFRTN

Are the resistances less than 5 ohms?

Yes	GO to DC6 .
No	REPAIR the open circuit. Clear the PCM DTCs. REPEAT the self-test.

DC6 CHECK FOR A SHORT TO GROUND

- Measure the resistance between:

(+) MAF/IAT Sensor Connector, Harness Side	(-)
MAF	Ground

Are the resistances greater than 10K ohms?

Yes	GO to DC7 .
No	REPAIR the short circuit. Clear the PCM DTCs. REPEAT the self-test.

DC7 CHECK FOR A SHORT TO VOLTAGE

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

(+) MAF/IAT Sensor Connector, Harness Side	(-)
MAF	Ground

Is any voltage present?

Yes	REPAIR the short circuit. Clear the PCM DTCs. REPEAT the self-test.
No	GO to DC8 .

DC8 INTERMITTENT CHECK

- Ignition OFF.
- PCM connector connected.
- MAF/IAT Sensor connector connected.
- Ignition ON, engine running.
- Run the engine up to 1,500 RPM for 5 seconds, then bring it back to idle. Run the engine up to 1,500 RPM for 5 seconds, then bring it back to idle.
- If the idle is not stable, refer to Section 3, [No Diagnostic Trouble Codes \(DTCs\) Present Symptom Chart Index](#).
- Access the PCM and monitor the MAF (VOLT) PID.
- Lightly tap on the MAF/IAT sensor and wiggle the harness connector to simulate road shock.

Does the MAF PID go below 0.3 volt or above 4.7 volts?

Yes	CLEAN the MAF/IAT sensor using CRC Mass Air Flow Sensor Cleaner 05110 or equivalent. RESET the keep alive memory (KAM). REFER to Section 2, Resetting The Keep Alive Memory (KAM). REPEAT the self-test. If the concern is still present, INSTALL a new MAF/IAT sensor. REFER to the Workshop Manual Section 303-14, Electronic Engine Controls. RESET the keep alive memory (KAM). REFER to Section 2, Resetting The Keep Alive Memory (KAM). REPEAT the self-test.
No	GO to DC9 .

DC9 CHECK THE INTAKE AIR SYSTEM FOR LEAKS

NOTICE: Pressure above 241 kPa (35 psi) can cause damage to system components. Regulate the shop air to 137.9 kPa (20 psi) before connecting to the system.

- Ignition OFF.
- Connect the Rotunda Smoke Machine, Fuel Evaporative Emission System Tester 218-00001 (522) or equivalent to the intake air system.
- Fill the intake air system with smoke.
- Pressurize the intake air system with 137.9 kPa (20 psi) regulated shop air.
- Check the intake air system for leaks.

Are any leaks or restrictions present?

Yes	REPAIR the leaks or restrictions. Clear the PCM DTCs. REPEAT the self-test.
No	GO to DC10 .

DC10 CHECK THE MAF PID

- Access the PCM and monitor the RPM (RPM) PID.
- Access the PCM and monitor the MAF (VOLT) PID.
- Run the engine up to 1,500 RPM for 5 seconds, then bring it back to idle. Run the engine up to 1,500 RPM for 5 seconds, then bring it back to idle.

Is the voltage less than 0.3 V?

Yes	CLEAN the MAF/IAT sensor using CRC Mass Air Flow Sensor Cleaner 05110 or equivalent. RESET the keep alive memory (KAM). REFER to Section 2, Resetting The Keep Alive Memory (KAM). REPEAT the self-test. If the concern is still present, INSTALL a new MAF/IAT sensor. REFER to the Workshop Manual Section 303-14, Electronic Engine Controls. RESET the keep alive memory (KAM). REFER to Section 2, Resetting The Keep Alive Memory (KAM). REPEAT the self-test.
No	GO to DC11 .

DC11 CHECK THE MAF CIRCUIT VOLTAGE CYCLING INTEGRITY

- Ignition ON, engine OFF.
- Access the PCM and monitor the MAF (VOLT) PID.
- Connect a 5 amp fused jumper wire between the following:

Point A MAF/IAT Sensor Connector, Harness Side	Point B MAF/IAT Sensor Connector, Harness Side
MAF	VPWR

- For Fiesta,
- Connect a 5 amp fused jumper wire between the following:

Point A MAF/IAT Sensor Connector, Harness Side	Point B
SIGRTN	Ground

- For all others,
- Connect a 5 amp fused jumper wire between the following:

Point A MAF/IAT Sensor Connector, Harness Side	Point B
MAFRTN	Ground

- Record the PID reading while both jumpers are installed.
- Remove the VPWR jumper while observing the MAF V PID.

Does the MAF PID change from greater than 4.50 volts to less than 0.20 volt when the VPWR jumper is removed?

Yes	CLEAN the MAF/IAT sensor using CRC Mass Air Flow Sensor Cleaner 05110 or equivalent. RESET the keep alive memory (KAM). REFER to Section 2, Resetting The Keep Alive Memory (KAM) . REPEAT the self-test. If the concern is still present, INSTALL a new MAF/IAT sensor. REFER to the Workshop Manual Section 303-14, Electronic Engine Controls. RESET the keep alive memory (KAM). REFER to Section 2, Resetting The Keep Alive Memory (KAM) . REPEAT the self-test.
No	GO to DC12 .

DC12 CHECK THE FUNCTIONALITY OF THE MAF SENSOR

Note: A MAF PID value of less than 0.35 volt may indicate an incorrectly installed air cleaner or a leak in the air inlet system.

- Ignition ON, engine running.
- Allow the engine to stabilize at the correct operating temperature.
- Access the PCM and monitor the MAF (VOLT) PID.

Is the MAF PID at idle and NEUTRAL between 0.35 volt and 1.3 volts?

Yes	GO to DC14 .
No	GO to DC13 .

DC13 CHECK TO ISOLATE THE MAF SENSOR FROM A LEAN DRIVEABILITY OCCURRENCE

Note: Due to increasingly stringent emission/OBD requirements, a fuel system DTC on some vehicles can be generated without a noticeable driveability concern with or without the MAF sensor disconnected.

- Ignition OFF.
- MAF/IAT Sensor connector disconnected.
- Ignition ON, engine running.
- Drive the vehicle on the road.

Is the lean driveability symptom (lack of power, spark knock/detonation, buck/jerk or hesitation/surge on

acceleration) gone?

Yes	CLEAN the MAF/IAT sensor using CRC Mass Air Flow Sensor Cleaner 05110 or equivalent. RESET the keep alive memory (KAM). REFER to Section 2, Resetting The Keep Alive Memory (KAM) . REPEAT the self-test. If the concern is still present, INSTALL a new MAF/IAT sensor. REFER to the Workshop Manual Section 303-14, Electronic Engine Controls. RESET the keep alive memory (KAM). REFER to Section 2, Resetting The Keep Alive Memory (KAM) . REPEAT the self-test.
No	GO to DC14 .

DC14 VERIFY THE DTC

Are any of the following DTCs present:

P0171, P0172, P0174, P0175, P2195, P2196, P2197, or P2198?

Yes	GO to Section 4, Diagnostic Trouble Code (DTC) Charts and Descriptions .
No	GO to DC23 .

DC15 PRELIMINARY DIAGNOSIS

Are DTCs P0102, P0103 or P0104 present?

Yes	For DTCs P0102, P0103 or P0104, GO to DC16 . For all others, GO to Section 4, Diagnostic Trouble Code (DTC) Charts and Descriptions .
No	For symptoms without DTCs, GO to DC16 .

DC16 CHECK THE INTAKE AIR SYSTEM FOR LEAKS, OBSTRUCTIONS, AND DAMAGE

- Ignition OFF.
- Check the intake air system (air cleaner, housing, ductwork) for obstructions or blockage.
- Check for broken or loose air outlet tube clamps, cracks or holes in the air outlet tube.
- Check for worn gaskets between the MAF/IAT sensor and the air cleaner assembly.
- Check that the MAF/IAT sensor connector is seated correctly.
- Check the throttle body bore for sludge.
- Check the crankcase ventilation system for leaks and restrictions.

Is a concern present?

Yes	REPAIR as necessary. Clear the PCM DTCs. REPEAT the self-test.
No	GO to DC17 .

DC17 CHECK THE VPWR TO THE MAF/IAT SENSOR

- MAF/IAT Sensor connector disconnected.
- Ignition ON, engine OFF.
- Measure the voltage between:

(+) MAF/IAT Sensor Connector, Harness Side	(-)
VPWR	Ground

Is the voltage greater than 10.5 V?

Yes	GO to DC18 .
No	REPAIR the open circuit. Clear the PCM DTCs. REPEAT the self-test.

DC18 CHECK FOR AN OPEN CIRCUIT

- Ignition OFF.
- MAF/IAT Sensor connector disconnected.
- PCM connector disconnected.
- Measure the resistance between:

(+) MAF/IAT Sensor Connector, Harness Side	(-) PCM Connector, Harness Side
MAF	MAF

- For Motorhome / Stripped Chassis / Step Van,
- Measure the resistance between:

(+) MAF/IAT Sensor Connector, Harness Side	(-)
GND	Ground

- For all others,
- Measure the resistance between:

(+) MAF/IAT Sensor Connector, Harness Side	(-) PCM Connector, Harness Side
SIGRTN	SIGRTN

Are the resistances less than 5 ohms?

Yes	GO to DC19 .
No	REPAIR the open circuit. Clear the PCM DTCs. REPEAT the self-test.

DC19 CHECK THE MAF SIGNAL CIRCUIT FOR A SHORT

- Measure the resistance between:

(+) MAF/IAT Sensor Connector, Harness Side	(-)
MAF	Ground

Is the resistance greater than 10K ohms?

Yes	GO to DC20 .
No	REPAIR the short circuit. Clear the PCM DTCs. REPEAT the self-test.

DC20 CHECK FOR A SHORT TO VOLTAGE

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

(+) MAF/IAT Sensor Connector, Harness Side	(-)
MAF	Ground

Is any voltage present?

Yes	REPAIR the short circuit. Clear the PCM DTCs. REPEAT the self-test.
No	GO to DC21 .

DC21 CHECK FOR AN INTERMITTENT CONCERN

- Ignition OFF.
- PCM connector connected.
- MAF/IAT Sensor connector connected.
- Ignition ON, engine running.
- Run the engine up to 1,500 RPM for 5 seconds, then bring it back to idle. Run the engine up to 1,500 RPM for 5 seconds, then bring it back to idle.
- If the idle is not stable, refer to Section 3, [No Diagnostic Trouble Codes \(DTCs\) Present Symptom Chart Index](#).
- Access the PCM and monitor the MAF_HZ (FREQ) PID.
- Lightly tap on the MAF sensor and wiggle the harness connector to simulate road shock.

Does the MAF PID reading change?

Yes	CLEAN the MAF/IAT sensor using CRC Mass Air Flow Sensor Cleaner 05110 or equivalent. RESET the keep alive memory (KAM). REFER to Section 2, Resetting The Keep Alive Memory (KAM) . REPEAT the self-test. If the concern is still present, INSTALL a new MAF/IAT sensor. REFER to the Workshop Manual Section 303-14, Electronic Engine Controls. RESET the keep alive memory (KAM). REFER to Section 2, Resetting The Keep Alive Memory (KAM) . REPEAT the self-test. If the concern or DTC is still present, GO to DC23 .
No	GO to DC22 .

DC22 CHECK THE MAF/IAT HARNESS FOR INTERMITTENT CONCERNS

- Access the PCM and monitor the MAF_HZ (FREQ) PID.
- While observing the PID, wiggle, shake, and bend small sections of the wiring harness working from the sensor to the PCM.

Does the MAF PID reading change?

Yes	REPAIR the harness as necessary. Clear the PCM DTCs. REPEAT the self-test.
No	CLEAN the MAF/IAT sensor using CRC Mass Air Flow Sensor Cleaner 05110 or equivalent. RESET the keep alive memory (KAM). REFER to Section 2, Resetting The Keep Alive Memory (KAM) . REPEAT the self-test.

If the concern is still present, INSTALL a new MAF/IAT sensor. REFER to the Workshop Manual Section 303-14, Electronic Engine Controls.

RESET the keep alive memory (KAM). REFER to Section 2, Resetting The Keep Alive Memory (KAM).

REPEAT the self-test.

If the concern or DTC is still present,

GO to DC23.

DC23 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, <u>Flash Electrically Erasable Programmable Read Only Memory (EEPROM)</u> , 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.