

HU: Intake Air Systems

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HU1 CHECK FOR DIAGNOSTIC TROUBLE CODES (DTCS)

Are DTCS P0505, P0506, P0660, P0663, P2004, P2005, P2006, P2007, P2008, P2014, P2015, P2020, P2070, or P2071 present?

Yes	No
For DTCS P0505 or P0506, on vehicles with electronic throttle control (ETC), GO to HU40 . For DTCS P0505 or P0506, on vehicles without ETC, GO to HU2 . For DTCS P0660, P0663, P2070 or P2071, GO to HU31 . For DTCS P2004, P2005, P2006, P2007, P2008, P2014, P2015 or P2020, GO to HU15 .	For vehicles equipped with electronic throttle control (ETC) that have low idle concerns, difficulty starting, hesitation, loss of RPM, GO to HU40 . For lack/loss of power, GO to HU31 . For all other symptoms without DTCS, GO to HU2 .

HU2 PART THROTTLE SYMPTOM

Are any part throttle concerns present?

Yes	No
GO to HU7 .	GO to HU3 .

HU3 CHECK THE BASE IDLE SPEED

Note: The vehicle must be at operating temperature and at idle for a minimum of 1 minute.

- Ignition ON, engine running.
- Determine if the idle speed is incorrect. Refer to the [Section 6](#) Typical Reference Value Charts, if necessary.
- Access the PCM and monitor the RPM PID.
- If equipped, read the vehicle tachometer.

Is vehicle idle speed correct?

Yes	No
GO to HU5 .	GO to HU4 .

HU4 CHECK THE THROTTLE ARM CONTACTS

- Ignition OFF.
- Check that the throttle arm contacts the return stop.
- Ignition ON, engine running.

Is the idle speed high?

Yes	No
GO to HU9 .	GO to HU10 .

HU5 CHECK FOR BINDING OR STICKING IN THE THROTTLE SYSTEM

- Gently cycle the throttle from fully closed to fully open and back to fully closed. Check for sticking or binding during rotation.

Is a stick and bind condition present?

Yes	No
GO to HU6 .	GO to HU7 .

HU6 ISOLATE THE BINDING AND/OR STICKING CONCERN

NOTICE: Do not attempt to clean the throttle bore and plate area. Cleaning damages the throttle body assembly.

Note: The sticking or binding condition can either be within the cables or throttle body assembly.

- Disconnect the accelerator cable and speed control cable from the throttle body linkage.
- Rotate the throttle body linkage.

Does the throttle body rotate freely without a sticking, binding or grabbing condition?

Yes	No
REPAIR the cable(s) causing the concern. CLEAR the DTCs. REPEAT the self-test.	INSTALL a new throttle body assembly. REFER to the Workshop Manual Section 303-04, Fuel Charging and Controls. CLEAR the DTCs. REPEAT the self-test.

HU7 CHECK THE FUNCTIONALITY OF THE THROTTLE POSITION (TP) SENSOR

- Ignition ON, engine OFF.
- Access the PCM and monitor the TP PID.
- Gently cycle the throttle from fully closed to fully open and back to fully closed.

Does the TP PID display a smooth voltage reading?

Yes	No
GO to HU8 .	INSTALL a new TP sensor. REFER to the Workshop Manual Section 303-14, Electronic Engine Controls. CLEAR the DTCs. REPEAT the self-test.

HU8 CHECK THE INTAKE AIR SYSTEM FOR LEAKS, OBSTRUCTIONS AND DAMAGE

Note: The Focus air cleaner element is integral to the air cleaner assembly. Inspect the air restriction gauge (if equipped) for a restriction indication.

- Ignition OFF.
- Remove the air cleaner element. Check the air cleaner for blockage.
- Check for restrictions between the air inlet and the throttle body.

Are any restriction concerns present?

Yes	No
REMOVE the restriction. INSTALL a new air cleaner element. REFER to the Workshop Manual Section 303-12, Intake Air Distribution and Filtering. CLEAR the DTCs. REPEAT the self-test.	REINSTALL the air cleaner element. GO to HU9 .

HU9 CHECK THE POSITIVE CRANKCASE VENTILATION (PCV) SYSTEM

Note: A high idle may indicate an incorrect PCV valve size or a vacuum leak.

- Check that no cracks or leaks are present.
- Remove the PCV valve.
 - Verify a clean PCV valve.
 - Verify the proper PCV valve part number.

Are any PCV system concerns present?

Yes	No
INSTALL a new PCV valve. REPAIR as necessary. REFER to the Workshop Manual Section 303-08, Engine Emission Control. CLEAR the DTCs. REPEAT the self-test.	For high idle, GO to HU13 . For all others, CONNECT the PCV valve. GO to HU10 .

HU10 CHECK THE IDLE AIR CONTROL (IAC) VALVE RESPONSE

- Ignition ON, engine running.
- The vehicle must be at operating temperature and at idle for a minimum of 1 minute.
- IAC connector disconnected.

Does the RPM drop or the engine stall?

Yes	No
GO to HU12 .	GO to HU11 .

HU11 CHECK THE IAC VALVE RESPONSE

Is the idle speed high?

Yes	No
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GO to HU13 .	<p>INSTALL a new IAC.</p> <p>REFER to the Workshop Manual Section 303-14, Electronic Engine Controls.</p> <p>CLEAR the DTCs. REPEAT the self-test.</p>
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HU12 INSPECT THE THROTTLE BODY PLATE HOLE FOR PLUGGING

Note: Only some applications have a throttle plate hole. If not equipped go to [Section 3](#), Symptom Charts.

- Ignition OFF.
- Remove the resonator from the throttle body assembly.
- Inspect the throttle plate hole for any restrictions.

Are any restriction concerns present?

Yes	No
REPAIR as necessary. CLEAR the DTCs. REPEAT the self-test.	The concern is elsewhere. RETURN to Section 3, No Diagnostic Trouble Codes (DTCs) Present Symptom Chart Index , to DIAGNOSE performance while driving concerns.

HU13 CHECK FOR VACUUM LEAKS

- Listen for vacuum leaks.
- Inspect the entire intake air system from the mass air flow (MAF) sensor to the intake manifold for leaks such as:
 - cracked or punctured intake air tube.
 - loose connections on the intake air tube at the air cleaner housing or throttle body
 - IAC valve assembly or gasket
 - EGR valve gasket leak to intake manifold
 - intake manifold assembly or gasket
 - EGR valve diaphragm or control solenoid
 - vacuum supply connectors and hose

Are any leaks present?

Yes	No
REPAIR as necessary. CLEAR the DTCs. REPEAT the self-test.	GO to HU14 .

HU14 CHECK THE THROTTLE BODY FOR EXCESSIVE WEAR

- Ignition OFF.
- Remove the throttle body assembly. Refer to the Workshop Manual Section 303-04 Fuel Charging and Controls for removal and inspection.
- Check the following:
 - excessive wear or grooving in the throttle bore
 - misaligned or worn throttle plate
 - excessive gap between the throttle bore and plate

Are any concerns present?

Yes	No
INSTALL a new throttle body assembly. REFER to the Workshop Manual Section 303-04, Fuel Charging and Controls. CLEAR the DTCs. REPEAT the self-test.	The concern is elsewhere. RETURN to Section 3, No Diagnostic Trouble Codes (DTCs) Present Symptom Chart Index , to DIAGNOSE performance while driving concerns.

HU15 DTCS P2004, P2005, P2006, P2007, P2008, P2014, P2015 OR P2020: CHECK THE FUNCTIONALITY OF THE IMRC



WARNING: KEEP FINGERS CLEAR OF THE MECHANISM. FAILURE TO FOLLOW THESE INSTRUCTIONS MAY RESULT IN PERSONAL INJURY.

Note: On vacuum operated systems the engine must run for 20 seconds to restore vacuum between state commands.

- Ignition ON, engine running.
- Access the PCM and monitor the IMRC_F PID.
- Access the PCM and control the IMRC PID.
- Command the IMRC ON.

Does the IMRC state correctly change from OFF to ON while the IMRC is cycled and does the IMRC_F PID read NO?

Yes	No
GO to Pinpoint Test Z .	GO to HU16 .

HU16 VISUALLY CHECK THE FUNCTIONALITY OF THE IMRC



WARNING: KEEP FINGERS CLEAR OF THE MECHANISM. FAILURE TO FOLLOW THESE INSTRUCTIONS MAY RESULT IN PERSONAL INJURY.

Note: On vacuum operated systems the engine must run for 20 seconds to restore vacuum between state commands.

- Ignition ON, engine running.
- Physically monitor the IMRC actuator.
- Access the PCM and control the IMRC PID.
- Command the IMRC ON.

Does the IMRC cycle from fully closed and remain fully open while the output is commanded ON?

Yes	No
For Focus 2.0L, Fusion 2.3L, and Milan 2.3L, GO to HU25 . For Explorer 4.6L, Explorer SportTrac 4.6L,	GO to HU17 .

F-150 4.6L, Mountaineer 4.6L, and Mustang 4.6L, GO to HU17 .	
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HU17 VISUAL INSPECTION FOR DISCONNECTED IMRC LINKAGE

- Inspect the IMRC for any disconnected or damaged linkages.

Are any concerns present?

Yes	No
REPAIR as necessary. CLEAR the DTCs. REPEAT the self-test.	GO to HU18 .

HU18 CHECK THE IMRC FOR MECHANICAL OPERATION

NOTICE: Do not rotate electric actuator by hand. Perform all mechanical checks with linkages disconnected from the electronic actuator.

Note: The IMRC return spring is strong - approximately 0.34 to 0.45 Nm (3 to 4 in-lb).

- Disconnect the IMRC linkage or remove the actuator assembly from the manifold.
- Visually inspect the linkage for possible causes of binding or obstructions. Check the lever/linkage for movement. There may be some tension in one direction but there should be full travel.
- Rotate the IMRC plate lever to fully open and to fully closed, contacting both limits.
- Check for sticking or binding during rotation.

Is a mechanical concern present?

Yes	No
REPAIR as necessary or INSTALL a new IMRC. REFER to the Workshop Manual Section 303-01, Engine or Section 303-14, Electronic Engine Controls. CLEAR the DTCs. REPEAT the self-test.	CONNECT the IMRC linkage. GO to HU19 .

HU19 CHECK THE VPWR CIRCUIT FOR AN OPEN IN THE HARNESS

- Ignition OFF.
- IMRC Actuator connector disconnected.
- Ignition ON, engine OFF.
- Measure the voltage between:

(+) IMRC Actuator Connector, Harness Side	(-)
VPWR	Ground

Is the voltage greater than 10 V?

Yes	No

For Focus 2.0L, Fusion 2.3L, and Milan 2.3L, GO to HU21 . For all others, GO to HU20 .	REPAIR the open circuit. CLEAR the DTCs. REPEAT the self-test.
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HU20 CHECK THE GROUND CIRCUIT FOR AN OPEN IN THE HARNESS

- Measure the voltage between:

(+) IMRC Actuator Connector, Harness Side	(-) IMRC Actuator Connector, Harness Side
VPWR	PWRGND

Is the voltage greater than 10 V?

Yes	No
GO to HU21 .	REPAIR the open circuit. CLEAR the DTCs. REPEAT the self-test.

HU21 CHECK THE IMRC CIRCUIT FOR AN OPEN IN THE HARNESS

- Ignition OFF.
- PCM connector disconnected.
- Measure the resistance between:

(+) IMRC Actuator Connector, Harness Side	(-) PCM Connector, Harness Side
IMRC	IMRC

Is the resistance less than 5 ohms?

Yes	No
For Focus 2.0L, Fusion 2.3L, and Milan 2.3L, GO to HU22 . For all others, GO to HU24 .	REPAIR the open circuit. CLEAR the DTCs. REPEAT the self-test.

HU22 CHECK IMRC ACTUATOR COIL FOR AN OPEN

- Measure the resistance between:

(+) IMRC Actuator Connector, Component Side	(-) IMRC Actuator Connector, Component Side
IMRC	VPWR

Is the resistance less than 5 ohms?

Yes	No
	INSTALL a new IMRC actuator. REFER to the

GO to [HU23](#).

Workshop Manual Section 303-01, Engine or Section 303-14, Electronic Engine Controls.

CLEAR the DTCs. REPEAT the self-test.

HU23 CHECK VACUUM LINES TO IMRC ACTUATOR

- Inspect the IMRC actuator and vacuum lines for leaks, kinks, pinches, disconnects, blockage, misrouting or physical damage of any type.

Are any concerns present?

Yes	No
REPAIR as necessary or INSTALL a new IMRC actuator. REFER to the Workshop Manual Section 303-01, Engine or Section 303-14, Electronic Engine Controls. CLEAR the DTCs. REPEAT the self-test.	GO to HU42 .

HU24 CHECK FOR A SHORT BETWEEN CIRCUITS IN THE HARNESS

- Measure the resistance between:

(+) IMRC Actuator Connector, Harness Side	(-) IMRC Actuator Connector, Harness Side
IMRC	VPWR
IMRC	PWRGND

- For vehicles equipped with a monitor circuit:
- Measure the resistance between:

(+) IMRC Actuator Connector, Harness Side	(-) IMRC Actuator Connector, Harness Side
IMRC	IMRCM

Is the resistance greater than 10K ohms?

Yes	No
REFER to the Workshop Manual Section 303-01, Engine or Section 303-14, Electronic Engine Controls. CLEAR the DTCs. REPEAT the self-test. If the concern or DTC is still present, GO to HU42 .	REPAIR the short circuit. CLEAR the DTCs. REPEAT the self-test.

HU25 CHECK THE VREF CIRCUIT FOR AN OPEN

- Ignition OFF.
- IMRCM Sensor connector disconnected.
- Ignition ON, engine OFF.
- Measure the voltage between:

(+) IMRCM Sensor Connector, Harness Side	(-)
VREF	Ground

Is the voltage between 4.5 - 5.5 V?

Yes	No
GO to HU26 .	REPAIR the open circuit. CLEAR the DTCs. REPEAT the self-test.

HU26 CHECK THE SIGRTN CIRCUIT FOR AN OPEN

- Measure the voltage between:

(+) IMRCM Sensor Connector, Harness Side	(-) IMRCM Sensor Connector, Harness Side
VREF	SIGRTN

Is the voltage between 4.5 - 5.5 V?

Yes	No
GO to HU27 .	REPAIR the open circuit. CLEAR the DTCs. REPEAT the self-test.

HU27 CHECK THE IMRCM CIRCUIT FOR AN OPEN

- Ignition OFF.
- PCM connector disconnected.
- Measure the resistance between:

(+) IMRCM Sensor Connector, Harness Side	(-) PCM Connector, Harness Side
IMRCM	IMRCM

Is the resistance less than 5 ohms?

Yes	No
GO to HU28 .	REPAIR the open circuit. CLEAR the DTCs. REPEAT the self-test.

HU28 CHECK FOR A SHORT BETWEEN CIRCUITS IN THE HARNESS

- Measure the resistance between:

(+) IMRCM Sensor Connector, Harness Side	(-) IMRCM Sensor Connector, Harness Side
IMRCM	VREF
IMRCM	SIGRTN

Are the resistances greater than 10K ohms?

Yes	No
INSTALL a new IMRCM sensor. REFER to the	

<p>Workshop Manual Section 303-01, Engine or Section 303-14, Electronic Engine Controls.</p> <p>CLEAR the DTCs. REPEAT the self-test.</p> <p>If the concern or DTC is still present,</p> <p>GO to HU42.</p>	<p>REPAIR the short circuit. CLEAR the DTCs. REPEAT the self-test.</p>
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HU29 CHECK THE IMRCM CIRCUIT FOR AN OPEN

- Ignition OFF.
- PCM connector disconnected.
- Measure the resistance between:

(+) IMRC Actuator Connector, Harness Side	(-) PCM Connector, Harness Side
IMRCM	IMRCM

Is the resistance less than 5 ohms?

Yes	No
GO to HU30 .	REPAIR the open circuit. CLEAR the DTCs. REPEAT the self-test.

HU30 CHECK FOR A SHORT BETWEEN CIRCUITS IN THE HARNESS

- Measure the resistance between:

(+) IMRC Actuator Connector, Harness Side	(-) IMRC Actuator Connector, Harness Side
IMRCM	VPWR
IMRCM	PWRGND
IMRCM	IMRC

Are the resistances greater than 10K ohms?

Yes	No
<p>INSTALL a new IMRC actuator. REFER to the Workshop Manual Section 303-01, Engine or Section 303-14, Electronic Engine Controls.</p> <p>CLEAR the DTCs. REPEAT the self-test.</p> <p>If the concern or DTC is still present,</p> <p>GO to HU42.</p>	<p>REPAIR the short circuit. CLEAR the DTCs. REPEAT the self-test.</p>

HU31 DTCS P0660, P0663, P2070 OR P2071: VISUAL INSPECTION OF THE INTAKE MANIFOLD TUNING VALVE

- Inspect the component for signs of damage.
- Check the harness and connection.

Is a concern present?

Yes	No
REPAIR as necessary. CLEAR the DTCs. REPEAT the self-test.	GO to HU32 .

HU32 CHECK THE VPWR CIRCUIT FOR AN OPEN IN THE HARNESS

- IMTV Actuator connector disconnected.
- Ignition ON, engine OFF.
- Measure the voltage between:

(+) IMTV Actuator Connector, Harness Side	(-) Vehicle Battery
VPWR	Negative terminal

Is the voltage greater than 10.5 V?

Yes	No
GO to HU33 .	REPAIR the open circuit. CLEAR the DTCs. REPEAT the self-test.

HU33 CHECK THE IMTV CIRCUIT FOR AN OPEN IN THE HARNESS

- Ignition OFF.
- PCM connector disconnected.
- Measure the resistance between:

(+) IMTV Actuator Connector, Harness Side	(-) PCM Connector, Harness Side
IMTV	IMTV

Is the resistance less than 5 ohms?

Yes	No
GO to HU34 .	REPAIR the open circuit. CLEAR the DTCs. REPEAT the self-test.

HU34 CHECK THE IMTV CIRCUIT FOR A SHORT TO GROUND IN THE HARNESS

- Measure the resistance between:

(+) PCM Connector, Harness Side	(-)
IMTV	Ground

Is the resistance greater than 10K ohms?

Yes	No
GO to HU35 .	REPAIR the short circuit. CLEAR the DTCs. REPEAT the self-test.

HU35 CHECK THE IMTV CIRCUIT FOR A SHORT TO VPWR IN THE HARNESS

- Measure the voltage between:

(+) PCM Connector, Harness Side	(-)
IMTV	Ground

Is the voltage less than 1 V?

Yes	No
GO to HU36 .	REPAIR the short circuit. CLEAR the DTCs. REPEAT the self-test.

HU36 CHECK THE IMTV DRIVER CIRCUIT WITH THE PCM CONNECTED

- IMTV Actuator connector disconnected.
- PCM connector connected.
- Ignition ON, engine OFF.
- Connect a non-powered test lamp between:

Point A IMTV Actuator Connector, Harness Side	Point B IMTV Actuator Connector, Harness Side
VPWR	IMTV

Does the test lamp illuminate?

Yes	No
GO to HU42 .	GO to HU37 .

HU37 CHECK THE IMTV PCM DRIVER CIRCUIT WHEN COMMANDED ON

- Access the PCM and control the IMTV PID.
- Connect a non-powered test lamp between:

Point A IMTV Actuator Connector, Harness Side	Point B IMTV Actuator Connector, Harness Side
VPWR	IMTV

Does the test lamp illuminate?

Yes	No
GO to HU38 .	GO to HU42 .

HU38 CHECK THE IMTV FOR DAMAGE

- Ignition OFF.
- Remove the IMTV. Refer to the Workshop Manual Section 303-01, Engine or Section 303-14, Electronic Engine Controls.
- Visually inspect the shutter for damage.
- Manually rotate the shutter.

Is a concern present?

Yes	No
INSTALL a new IMTV actuator. REFER to the Workshop Manual Section 303-01, Engine or Section 303-14, Electronic Engine Controls as necessary. CLEAR the DTCs. REPEAT the self-test.	GO to HU39 .

HU39 CHECK THE IMTV FOR FUNCTIONALITY WHEN COMMANDED ON

- IMTV Actuator connector connected.
- Ignition ON, engine OFF.
- Access the PCM and control the IMTV PID.

Does the IMTV shutter rotate?

Yes	No
The concern is an intermittent. GO to Pinpoint Test Z .	INSTALL a new IMTV actuator. REFER to the Workshop Manual Section 303-01, Engine or Section 303-14, Electronic Engine Controls as necessary. CLEAR the DTCs. REPEAT the self-test.

HU40 PRELIMINARY DIAGNOSIS FOR DIAGNOSTIC TROUBLE CODES (DTCs) P0505 OR P0506

- Ignition ON, engine OFF.

Are any DTCs present other than P0505 or P0506?

Yes	No
DISREGARD the current diagnostic trouble code (DTC) at this time. DIAGNOSE the next DTC. GO to Section 4, Diagnostic Trouble Code (DTC) Charts and Descriptions .	GO to HU41 .

HU41 MONITOR THE INTAKE AIR SYSTEM RELATED PIDS

Note: Verify that the vehicle has reached the normal engine coolant operating temperature of 77°C (170° F). Allow the engine to idle an additional 5 minutes.

Note: The ETC_TRIM PID may not be available on all vehicles.

- Access the PCM and monitor the ECT PID.
- Access the PCM and monitor the ETC_TRIM PID.
- Access the PCM and monitor the IACTRIM and IACKAM2 PIDs.
- Mathematically add and record the value of the IACTRIM PID to the IACKAM2 PID value, for the total IAC value at idle.

Is the ETC_TRIM PID angle equal to 3.5 degrees or is the total IAC value greater than 0.5 lb/min?

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Yes	No
INSTALL a new throttle body assembly. REFER to the Workshop Manual Section 303-04, Fuel Charging and Controls to INSTALL a new throttle body. CLEAR the DTCs. REPEAT the self-test.	RETURN to Section 3 , Symptom Charts for further direction.

HU42 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 and verify the concern is still present.

Is the concern still present?

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