DI: Direct Fuel Injection Fuel Injector

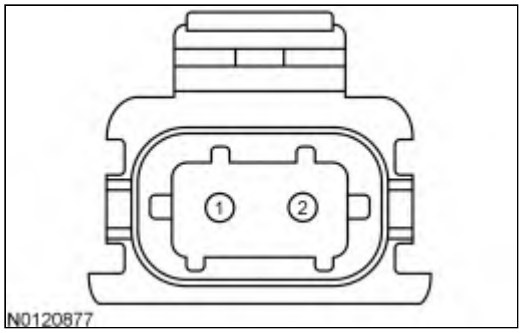
NOTICE: Do not apply battery voltage across the fuel injector circuits. Permanent damage to the fuel injector may result.

This pinpoint test is intended to diagnose the following:

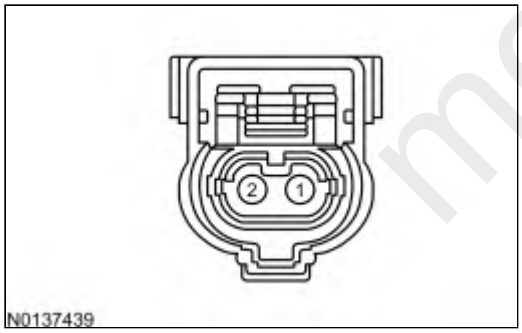
- fuel injectors (9F593)
- harness circuits: INJ and INJRTN
- PCM (12A650)

Direct Fuel Injection Fuel Injector Connector

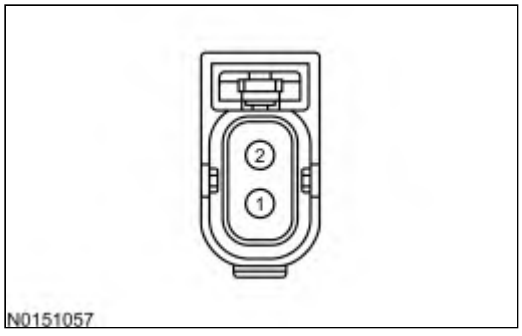
A



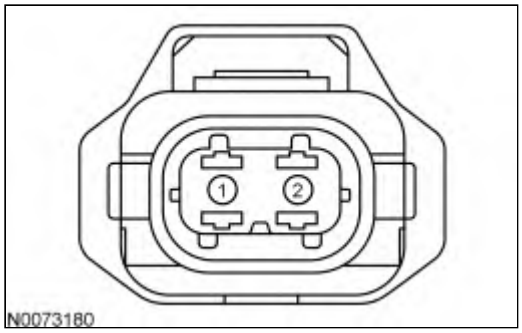
B



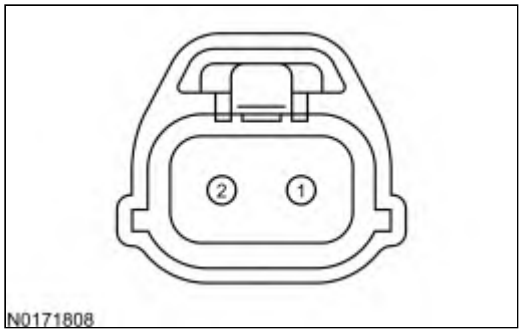
C



D



E



Vehicle	Connector	Pin	Circuit
Continental 2.0L, Fusion 2.0L, MKZ 2.0L	A	2 1	INJRTN INJ
Corsair, Escape/Kuga 2.0L, Expedition, Explorer 2.3L, Explorer 3.3L, F-150 3.3L, F-150 3.5L, Ford GT, Navigator, Transit TiVCT 3.5L	B	2 1	INJRTN INJ
EcoSport 1.0L, Escape/Kuga 1.5L, Fusion 1.5L, Transit Connect 1.0L	C	2 1	INJRTN INJ
Flex, Mustang 2.3L	D	2 1	INJRTN INJ
All other vehicles	E	2 1	INJRTN INJ

Powertrain Control Module (PCM) Connector

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

Vehicle	Connector	Pin	Circuit
Continental 2.0L, EcoSport 2.0L, Fusion 2.0L, MKZ 2.0L	198 PIN	E92 E85 E93 E82 E88 E83 E87 E84	INJ4RTN INJ4 INJ3RTN INJ3 INJ2RTN INJ2 INJ1RTN INJ1
Continental 2.7L, Continental 3.0L, Flex, Ford GT, Fusion 2.7L, MKZ 3.0L	198 PIN	E94 E95 E92 E85 E88 E83 E93 E82 E89 E90 E87 E84	INJ6RTN INJ6 INJ5RTN INJ5 INJ4RTN INJ4 INJ3RTN INJ3 INJ2RTN INJ2 INJ1RTN INJ1
Corsair, Escape/Kuga 2.0L	198 PIN	E89 E94 E88 E93 E87 E82 E78 E83	INJ4RTN INJ4 INJ3RTN INJ3 INJ2RTN INJ2 INJ1RTN INJ1
EcoSport 1.0L Automatic Transmission	198 PIN	E93 E82 E89 E90 E87 E84	INJ3RTN INJ3 INJ2RTN INJ2 INJ1RTN INJ1
EcoSport 1.0L Manual Transmission	198 PIN	E76 E93 E82 E92 E84 E91	INJ3RTN INJ3 INJ2RTN INJ2 INJ1RTN INJ1

Vehicle	Connector	Pin	Circuit
Edge 2.0L, Explorer 2.3L, Mustang 2.3L, Nautilus 2.0L, Ranger, Transit Connect 2.0L	198 PIN	E89 E94 E88 E93 E77 E82 E78 E83	INJ4RTN INJ4 INJ3RTN INJ3 INJ2RTN INJ2 INJ1RTN INJ1
Escape/Kuga 1.5L, Transit Connect 1.0L	198 PIN	E89 E88 E77 E82 E78 E83	INJ3RTN INJ3 INJ2RTN INJ2 INJ1RTN INJ1
Expedition, F-150 3.5L High Output, Navigator	198 PIN	E93 E88 E81 E82 E83 E84 E92 E87 E94 E89 E91 E86	INJ6RTN INJ6 INJ5RTN INJ5 INJ4RTN INJ4 INJ3RTN INJ3 INJ2RTN INJ2 INJ1RTN INJ1
F-150 5.0L	306 PIN	E103 E124 E22 E1 E64 E43 E3 E24 E65 E44 E45 E66 E20 E41 E23 E2	INJ8RTN INJ8 INJ7RTN INJ7 INJ6RTN INJ6 INJ5RTN INJ5 INJ4RTN INJ4 INJ3RTN INJ3 INJ2RTN INJ2 INJ1RTN INJ1

Vehicle	Connector	Pin	Circuit
Fusion 1.5L	198 PIN	E92	INJ4RTN
		E85	INJ4
		E88	INJ3RTN
		E83	INJ3
		E93	INJ2RTN
		E82	INJ2
		E87	INJ1RTN
		E84	INJ1
Mustang 5.0L	306 PIN	E20	INJ8RTN
		E41	INJ8
		E65	INJ7RTN
		E44	INJ7
		E64	INJ6RTN
		E43	INJ6
		E45	INJ5RTN
		E66	INJ5
		E22	INJ4RTN
		E1	INJ4
		E3	INJ3RTN
		E24	INJ3
		E103	INJ2RTN
		E124	INJ2
		E23	INJ1RTN
		E2	INJ1
Transit GTDI 3.5L	306 PIN	E94	INJ6RTN
		E95	INJ6
		E64	INJ5RTN
		E43	INJ5
		E22	INJ4RTN
		E1	INJ4
		E65	INJ3RTN
		E44	INJ3
		E45	INJ2RTN
		E66	INJ2
		E23	INJ1RTN
		E2	INJ1

Vehicle	Connector	Pin	Circuit
All other vehicles	306 PIN	E20	INJ6RTN
		E41	INJ6
		E64	INJ5RTN
		E43	INJ5
		E22	INJ4RTN
		E1	INJ4
		E65	INJ3RTN
		E44	INJ3
		E45	INJ2RTN
		E66	INJ2
		E23	INJ1RTN
		E2	INJ1

DI1 CHECK FOR DTCS
Are DTCs P0201, P0202, P0203, P0204, P0205, P0206, P0207, P0208, P02EE, P02EF, P02F0, P02F1, P02F2, P02F3, P02F4 or P02F5 present?

Yes	GO to DI2.
No	For no start, runs rough at idle or misses, GO to DI2. For all others, RETURN to Section 3, Symptom Charts for further direction.

DI2 CHECK THE FUEL INJECTOR PID
- Ignition ON, engine OFF.
- Access the PCM and monitor the INJ_F (MODE) PID.

Does the INJ_F PID indicate a concern?

Yes	GO to DI4.
No	GO to DI3.

DI3 CARRY OUT THE POWER BALANCE TEST

Note: *The scan tool test referenced in this step may not be available on all vehicles. Proceed to the next step if the scan tool test is not available.*

- Verify the low pressure fuel system is operating correctly. GO to Pinpoint Test HC and follow the pinpoint test direction.
- Carry out the Power Balance Test. Refer to the instruction manual provided by the scan tool manufacturer.

Are the results satisfactory?

Yes	The system is operating correctly at this time. RETURN to Section 3, Symptom Charts for further direction.
No	GO to DI4.

DI4 CARRY OUT A THOROUGH WIGGLE TEST ON THE FUEL INJECTOR HARNESS
- Ignition ON, engine running.
- Engine at normal operating temperature.
- Access the PCM and monitor the INJ_F (MODE) PID.
- Wiggle, shake, and bend small sections of the wiring harness while working from the suspected fuel injector to the PCM.

Does the INJ_F PID indicate a concern?

Yes	REPAIR as necessary. Clear the PCM DTCs. REPEAT the self-test.
No	GO to DI5.

DI5 CHECK THE INJ AND INJRTN CIRCUITS FOR AN OPEN

- Ignition OFF.
- Direct Fuel Injection Fuel Injector connector disconnected.
- PCM connector disconnected.
- Measure the resistance between:

(+) PCM Connector, Harness Side	(-) Direct Fuel Injection Fuel Injector Connector, Harness Side
Suspect INJ	INJ
Suspect INJRTN	INJRTN

Are the resistances less than 5 ohms?

Yes	GO to DI6.
No	REPAIR the open circuit. Clear the PCM DTCs. REPEAT the self-test.

DI6 CHECK THE INJ AND INJRTN CIRCUITS FOR A SHORT TO GROUND

- Ignition OFF.
- Measure the resistance between:

(+) Direct Fuel Injection Fuel Injector Connector, Harness Side	(-)
INJ	Ground
INJRTN	Ground

Are the resistances greater than 10K ohms?

Yes	GO to DI7.
No	REPAIR the short circuit. Clear the PCM DTCs. REPEAT the self-test.

DI7 CHECK THE INJ AND INJRTN CIRCUITS FOR A SHORT TO VOLTAGE

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

(+) Direct Fuel Injection Fuel Injector Connector, Harness Side	(-)
INJ	Ground
INJRTN	Ground

Is any voltage present?

Yes	REPAIR the short circuit. Clear the PCM DTCs. REPEAT the self-test.
No	GO to DI8.

DI8 CHECK FOR A SHORT BETWEEN THE INJ AND INJRTN CIRCUITS

- Ignition OFF.
- Measure the resistance between:

(+) Direct Fuel Injection Fuel Injector Connector, Harness Side	(-) Direct Fuel Injection Fuel Injector Connector, Harness Side
INJ	INJRTN

Is the resistance greater than 10K ohms?

Yes	GO to DI9.
No	REPAIR the short circuit. Clear the PCM DTCs. REPEAT the self-test.

DI9 CHECK THE RESISTANCE OF THE FUEL INJECTOR

- Measure the resistance between:

(+) Direct Fuel Injection Fuel Injector Connector, Component Side	(-) Direct Fuel Injection Fuel Injector Connector, Component Side
INJ	INJRTN

Is the resistance between 1 - 3 ohms?

Yes	For Power Balance Test results indicating a fuel injector concern, INSTALL a new fuel injector as necessary. REFER to the Workshop Manual Section 303-04, Fuel Charging and Controls. RESET the keep alive memory (KAM). REFER to Section 2, Resetting The Keep Alive Memory (KAM). Clear the PCM DTCs. REPEAT the self-test. For all others, GO to DI10.
No	INSTALL a new Fuel Injector. REFER to the Workshop Manual Section 303-04, Fuel Charging and Controls. RESET the keep alive memory (KAM). REFER to Section 2, Resetting The Keep Alive Memory (KAM). REPEAT the self-test.

DI10 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.