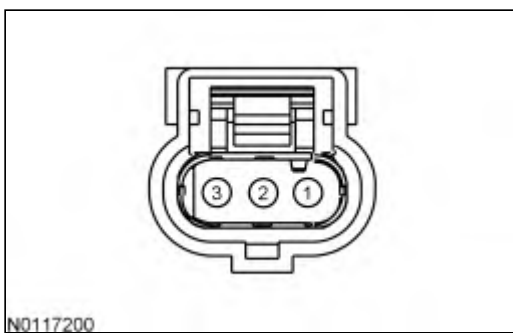
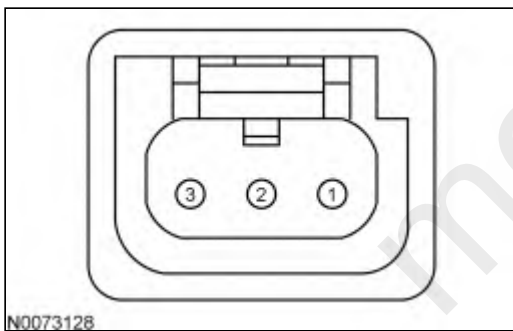
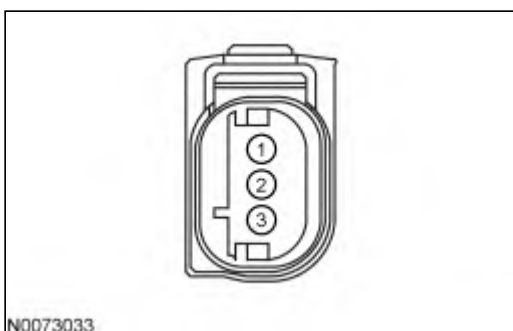
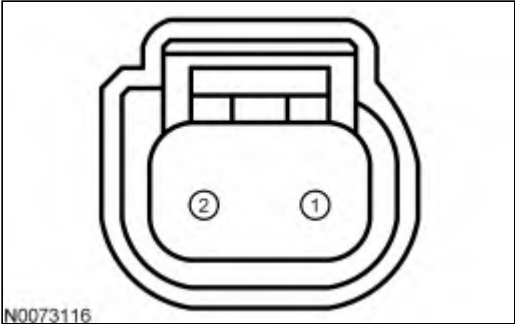


DR: Camshaft Position (CMP) Sensor

This pinpoint test is intended to diagnose the following:

- CMP sensor (6B288 or 12K073)
- harness circuits: CMP11, CMP12, CMP21, CMP22, SIGRTN, VBPWR or VREF
- PCM (12A650)

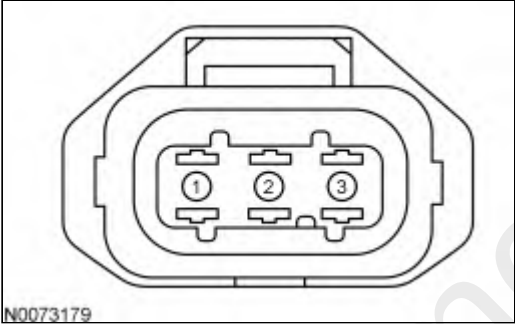
Camshaft Position Bank 1 Sensor 1 (CMP11) Sensor Connector**A****B****C****D**



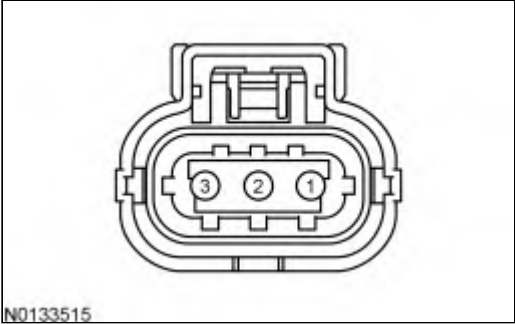
E



F



G



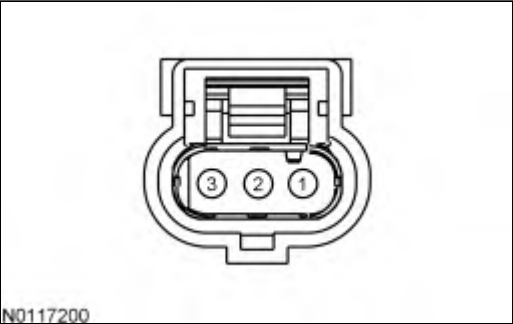
Vehicle	Connector	Pin	Circuit

Vehicle	Connector	Pin	Circuit
Continental 2.7L, Continental 3.0L, Continental 3.7L, Flex GTDI 3.5L, Ford GT, Fusion 2.7L, MKZ 3.0L	A	3 2 1	VBPWR SIGRTN CMP11
Continental 2.0L, EcoSport 2.0L, Fusion 2.0L, MKZ 2.0L, Mustang 2.3L, Transit Connect 2.0L	B	1 2 3	VREF SIGRTN CMP11
Corsair 2.0L, Corsair 2.3L, EcoSport 1.5L, Edge 2.0L, Escape/Kuga 1.5L, Escape/Kuga 2.0L, Explorer 2.3L, F-150 5.0L, F-Series Super Duty 6.2L, Mustang 5.0L, Nautilus 2.0L, Ranger 2.3L, Transit Connect 1.0L	A	1 2 3	VREF SIGRTN CMP11
E-Series	C	3 2 1	VBPWR SIGRTN CMP11
EcoSport 1.0L, Ranger 2.5L	A	1 3 2	VREF SIGRTN CMP11
F-650 / F-750, Flex TiVCT 3.5L	D	1 2	SIGRTN CMP11
Fusion 2.5L, Transit Connect 2.5L	E	1 3 2	VBPWR SIGRTN CMP11
Fusion 1.5L	F	3 1 2	VREF SIGRTN CMP11
KA	G	1 2 3	VREF SIGRTN CMP11

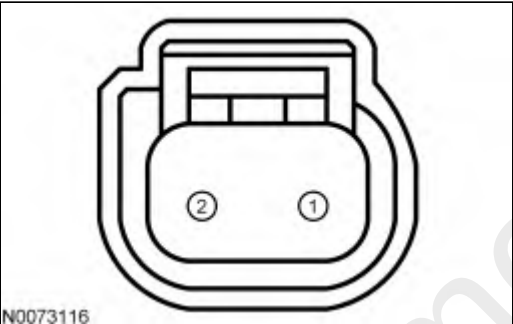
Vehicle	Connector	Pin	Circuit
All other vehicles	A	3 2 1	VREF SIGRTN CMP11

Camshaft Position Bank 1 Sensor 2 (CMP12) Sensor Connector

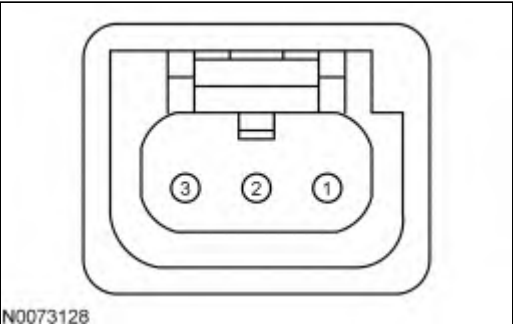
A



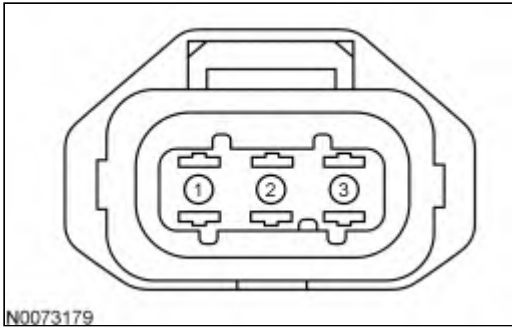
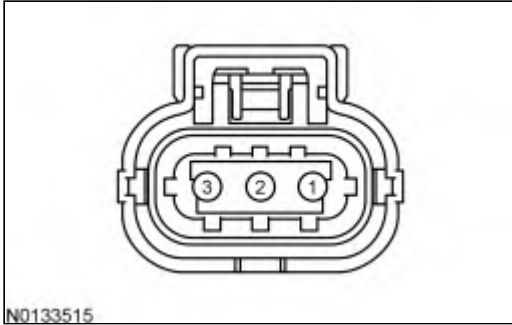
B



C



D

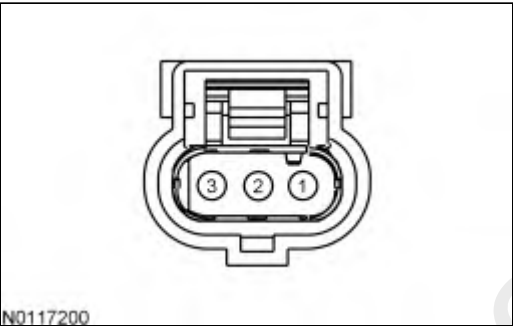
**E**

Vehicle	Connector	Pin	Circuit
Continental 2.7L, Continental 3.0L, Ford GT, Fusion 2.7L, MKZ 3.0L	A	3 2 1	VBPWR SIGRTN CMP12
Continental 3.7L, Flex	B	1 2	SIGRTN CMP12
Continental 2.0L, EcoSport 2.0L, Fusion 2.0L, MKZ 2.0L, Mustang 2.3L, Transit Connect 2.0L	C	1 2 3	VREF SIGRTN CMP12
Corsair, EcoSport 1.5L, Edge 2.0L, Escape/Kuga, Explorer 2.3L, F-150 5.0L, Mustang 5.0L, Nautilus 2.0L, Ranger, Transit Connect 1.0L	A	1 2 3	VREF SIGRTN CMP12

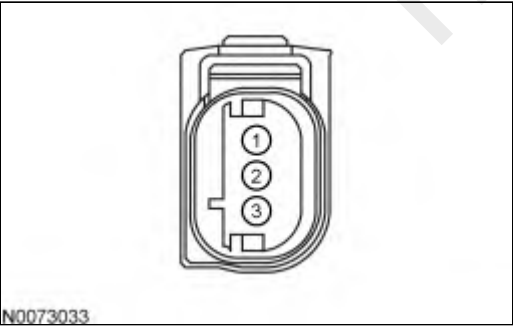
Vehicle	Connector	Pin	Circuit
EcoSport 1.0L	A	1 3 2	VREF SIGRTN CMP12
Fusion 1.5L	D	3 1 2	VREF SIGRTN CMP12
KA	E	1 2 3	VREF SIGRTN CMP12
All other vehicles	A	3 2 1	VREF SIGRTN CMP12

Camshaft Position Bank 2 Sensor 1 (CMP21) Sensor Connector

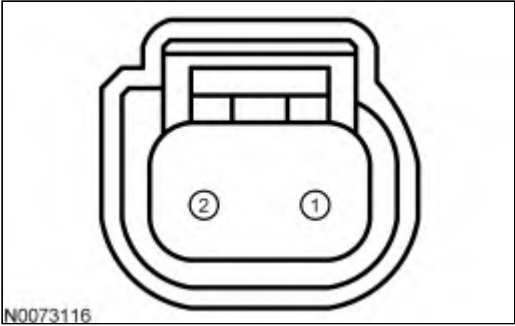
A



B



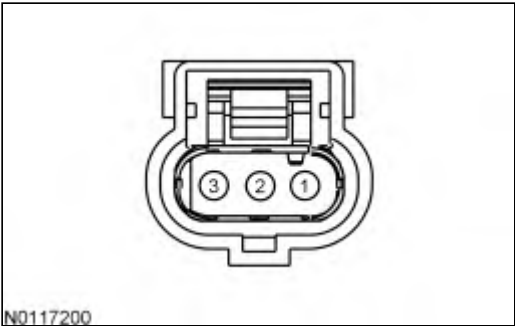
C

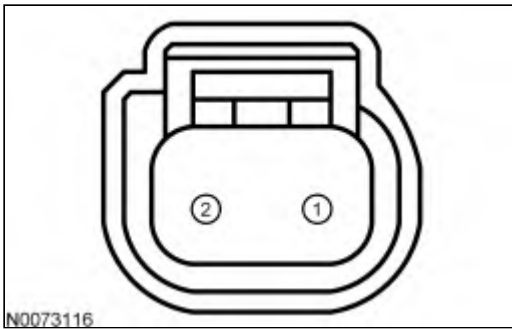


Vehicle	Connector	Pin	Circuit
Continental, Flex GTDI 3.5L, Ford GT, Fusion, MKZ	A	3 2 1	VBPWR SIGRTN CMP21
E-Series	B	3 2 1	VBPWR SIGRTN CMP21
F-150 5.0L, F-Series Super Duty	A	1 2 3	VREF SIGRTN CMP21
Flex TiVCT 3.5L	C	1 2	SIGRTN CMP21
Mustang 5.0L	B	1 2 3	VREF SIGRTN CMP21
All other vehicles	A	3 2 1	VREF SIGRTN CMP21

Camshaft Position Bank 2 Sensor 2 (CMP22) Sensor Connector

A



B

Vehicle	Connector	Pin	Circuit
Continental 3.0L, Continental 2.7L, Ford GT, Fusion, MKZ	A	3 2 1	VBPWR SIGRTN CMP22
Continental 3.7L, Flex	B	1 2	SIGRTN CMP22
F-150 5.0L, Mustang 5.0L	A	1 2 3	VREF SIGRTN CMP22
All other vehicles	A	3 2 1	VREF SIGRTN CMP22

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 1.0L Automatic Transmission, EcoSport 2.0L, Fusion 1.5L, Fusion 2.0L, MKZ 2.0L	198 PIN	E6 E54 E28 E53	VREF CMP12 CMP11 SIGRTN
Continental 2.7L, Continental 3.0L	198 PIN	E22 E54 E28 E53	VBPWR CMP12 CMP11 SIGRTN

Vehicle	Connector	Pin	Circuit
Continental 3.7L, Flex TiVCT 3.5L, Mustang TiVCT 5.2L	198 PIN	E17 E41 E42 E55 E56 E40, E49, E54	VBPWR CMP22 CMP21 CMP12 CMP11 SIGRTN
Corsair 2.0L, Corsair 2.3L, Edge 2.0L, Escape/Kuga 1.5L, Escape/Kuga 2.0L, Mustang 2.3L, Nautilus 2.0L, Ranger 2.3L, Transit Connect 1.0L, Transit Connect 2.0L	198 PIN	E19 E28 E27 E14	VREF CMP12 CMP11 SIGRTN
Corsair 2.5L, Escape/Kuga 2.5L	198 PIN	E17 E45 E44	VREF CMP11 SIGRTN
E-Series	198 PIN	E17 E42 E56 E49	VBPWR CMP21 CMP11 SIGRTN
EcoSport 1.0L Manual Transmission	198 PIN	E7 E37 E36 E20	VREF CMP12 CMP11 SIGRTN
EcoSport 1.5L Automatic Transmission, KA 1.5L Automatic Transmission	198 PIN	E28 E30 E45 E29	VREF CMP12 CMP11 SIGRTN
EcoSport 1.5L Manual Transmission, KA 1.2L, KA 1.5L Manual Transmission	112 PIN	E11 E33 E34 E38	VREF CMP12 CMP11 SIGRTN
Expedition, F-150 3.5L High Output, Navigator	198 PIN	E3 E69 E26 E54 E40 E29	VREF CMP22 CMP21 CMP12 CMP11 SIGRTN
Explorer 2.3L	198 PIN	E19, E30 E28 E27 E14	VREF CMP12 CMP11 SIGRTN

Vehicle	Connector	Pin	Circuit
F-150 3.5L	306 PIN	E118 E77 E75 E54 E76 E47	VREF CMP22 CMP21 CMP12 CMP11 SIGRTN
F-650 / F-750	198 PIN	E55 E54	CMP11 SIGRTN
F-Series Super Duty 6.2L	306 PIN	E118 E17 E75 E76 E47, E91	VREF VBPWR CMP21 CMP11 SIGRTN
F-Series Super Duty 7.3L, Motorhome / Stripped Chassis / Step Van	306 PIN	E118 E76 E47	VREF CMP11 SIGRTN
Flex GTDI 3.5L	198 PIN	E22 E26 E28 E53	VBPWR CMP21 CMP11 SIGRTN
Ford GT, Fusion 2.7L, MKZ 3.0L	198 PIN	E22 E70 E26 E54 E28 E53	VBPWR CMP22 CMP21 CMP12 CMP11 SIGRTN
Fusion 2.5L, Transit Connect 2.5L	198 PIN	E17 E45 E35	VBPWR CMP11 SIGRTN
KA 1.0L	128 PIN	T28, T30 T11 T12 T21, T22	VREF CMP12 CMP11 SIGRTN
Mustang 5.0L	306 PIN	E118 E17 E77 E75 E54 E76 E47, E91	VREF VBPWR CMP22 CMP21 CMP12 CMP11 SIGRTN
Ranger 2.5L	128 PIN	T18 T21 T29	VREF CMP11 SIGRTN

Vehicle	Connector	Pin	Circuit
All other vehicles	306 PIN	E118 E77 E75 E54 E76 E47, E91	VREF CMP22 CMP21 CMP12 CMP11 SIGRTN

DR1 CHECK FOR DTCS

Are DTCs P0340, P0341, P0344, P0345, P0346, P0349, P0365, P0366, P0369, P0390, P0391, or P0394 present?

Yes	For vehicles with DTCs and a no crank or no start symptom, GO to DR5 . For all others, GO to DR2 .
No	For symptoms without DTCs, GO to DR2 . For all others, RETURN to Section 3, Symptom Charts for further direction.

DR2 INSPECT THE HARNESS

- Ignition OFF.
- Check the harness for routing, alterations, incorrect shielding, or electrical interference from other systems.
- Check the CMP connector for damage or corrosion.

Is a concern present?

Yes	REPAIR as necessary. Clear the PCM DTCs. REPEAT the self-test.
No	GO to DR3 .

DR3 CLEAR AND ATTEMPT TO RETRIEVE THE DTC

Note: Consider the ignition system, alternator noise, radio frequency interference and crankshaft position (CKP) sensor concerns if DTCs P0340, P0341, P0344, P0345, P0346, P0349, P0365, P0366, P0369, P0390, P0391, or P0394 are present.

Note: For vehicles with variable camshaft timing (VCT), concerns with the engine oil level, oil filter, oil contamination, or the VCT system may cause camshaft positioning errors.

- Ignition ON, engine OFF.
- Clear the PCM DTCs.
- Ignition ON, engine running.
- Increase engine speed to greater than 1,500 RPM for 10 seconds. Repeat this 3 times.
- Carry out the PCM self-test.

Are DTCs P0340, P0341, P0344, P0345, P0346, P0349, P0365, P0366, P0369, P0390, P0391 or P0394 present?

Yes	GO to DR4 .
No	For symptoms without DTCs, RETURN to Section 3, Symptom Charts for further direction. For all others, GO to Pinpoint Test Z .

DR4 CHECK THE GENERATOR FOR EXCESSIVE ELECTRICAL NOISE

Note: If the generator/regulator is electrically noisy, the noise decreases when the B+ connector is disconnected.

- Ignition ON, engine running.

- Monitor the generator for an audible electric noise.
- Ignition OFF.
- Generator/regulator B+ connector disconnected.
- Ignition ON, engine running.
- With the engine running, determine if the generator noise remains steady, decreases or increases in volume.

Does the generator noise remain steady when the B+ connector is disconnected?

Yes	GO to DR5 .
No	REFER to the Workshop Manual Section 414-00, Charging System, to DIAGNOSE the generator is noisy symptom.

DR5 CHECK THE VOLTAGE TO THE CMP SENSOR

Note: Diagnose the suspect CMP sensor indicated by the DTC. For 2 pin VR type CMP sensor DTCs, GO to [DR6](#).

- Ignition OFF.
- Generator/regulator B+ connector connected.
- CMP Sensor connector disconnected.
- Ignition ON, engine OFF.
- For the VBPWR CMP sensors,
- Measure the voltage between:

(+) CMP Sensor Connector, Harness Side	(-)
VBPWR	Ground

- For the VREF CMP sensors,
- Measure the voltage between:

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

Is the voltage greater than 10.5 V on the VBPWR circuit or is the voltage between 4.5 and 5.5 V on the VREF circuit?

Yes	GO to DR7 .
No	For Aviator, Continental 2.0L, Corsair, EcoSport, Edge, Escape/Kuga, Expedition, Explorer, F-150, F-Series Super Duty, Fusion 1.5L, Fusion 2.0L, KA, MKZ 2.0L,

Motorhome / Stripped Chassis / Step Van,
 Mustang,
 Nautilus,
 Navigator,
 Ranger,
 Transit 3.5L TiVCT,
 Transit Connect 1.0L, and
 Transit Connect 2.0L, GO to Pinpoint Test [C](#).
 For all others, REPAIR the open circuit.
 Clear the PCM DTCs. REPEAT the self-test.

DR6 CHECK THE CMP SENSOR RESISTANCE

Note: Diagnose the suspect CMP sensor indicated by the DTC.

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

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

Is the resistance between 250 to 2000 ohms?

Yes	GO to DR7 .
No	INSTALL a new CMP sensor. REFER to the Workshop Manual Section 303-14, Electronic Engine Controls. Clear the PCM DTCs. REPEAT the self-test.

DR7 CHECK THE CMP SENSOR CIRCUITS FOR AN OPEN

- PCM connector disconnected.
- Measure the resistance between:

(+) CMP Sensor Connector, Harness Side	(-) PCM Connector, Harness Side
CMP	CMP
SIGRTN	SIGRTN

Are the resistances less than 5 ohms?

Yes	GO to DR8 .
No	REPAIR the open circuit. Clear the PCM DTCs. REPEAT the self-test.

DR8 CHECK THE CMP CIRCUIT FOR A SHORT

- Measure the resistance between:

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

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

- Measure the resistance between:

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

Are the resistances greater than 10K ohms?

Yes	GO to DR9 .
No	REPAIR the short circuit. Clear the PCM DTCs. REPEAT the self-test.

DR9 CHECK THE CMP CIRCUIT FOR A SHORT TO VOLTAGE

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

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

Is any voltage present?

Yes	REPAIR the short circuit. Clear the PCM DTCs. REPEAT the self-test.
No	GO to DR10 .

DR10 CHECK THE CMP SENSOR OPERATION

- Ignition OFF.
- CMP Sensor connector connected.
- PCM connector connected.
- Ignition ON, engine running.
- Access the PCM and monitor the SYNC (MODE) PID.

Does the engine start and does the SYNC PID read YES?

Yes	GO to DR11 .
No	INSTALL a new CMP sensor. REFER to the Workshop Manual Section 303-14, Electronic Engine Controls. Clear the PCM DTCs. REPEAT the self-test.

DR11 CHECK FOR DTCS

- Carry out the PCM self-test.

Are any DTCs present?

Yes	INSTALL a new CMP sensor. REFER to the Workshop Manual Section 303-14, Electronic Engine Controls.
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	Clear the PCM DTCs. REPEAT the self-test.
No	The system is operating correctly at this time. The concern may have been caused by a loose or corroded connector. Clear the PCM DTCs. REPEAT the self-test.

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