DR: Camshaft Position (CMP) Sensor

DR: Introduction

DR1 CHECK FOR DIAGNOSTIC TROUBLE CODES (DTCS)

Are DTCs P0340, P0341, P0344, P0345, P0346, or P0349 present?

Yes	No
GO to DR2.	For all others, GO to Section 4, Diagnostic Trouble Code (DTC) Charts and Descriptions.

DR2 DTCS P0340, P0341, P0344, P0345, P0346 AND P0349: CHECK IF THE ENGINE STARTS

- Attempt to start the engine.

Does the engine start?

Yes	No
GO to DR3.	RETURN to Section 3, Symptom Charts for further direction.

DR3 CLEAR AND ATTEMPT TO RETRIEVE THE DTC

Note: If DTCs P0340, P0341, P0344, P0345, P0346, or P0349 are present, ignition, alternator noise, RFI and CKP concerns should be considered.

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.
- Retrieve the continuous memory DTCs.

Are DTCs P0340, P0341, P0344, P0345, P0346 or P0349 present?

Yes	No
GO to DR4.	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.

- PCM connector connected.

- CMP Sensor connector connected.
- 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 is still noisy.

Does the noise remain constant when the B+ connector is disconnected?

Yes	No
For Fusion 2.3L, Milan 2.3L, Focus, and Escape/Mariner, GO to DR17 . For all others, GO to DR5 .	REFER to the Workshop Manual Section 414-00, Charging System, to DIAGNOSE the generator is noisy symptom.

DR5 CHECK FOR DTCS

Are DTCs P0340, P0341, P0344, P0345, P0346 or P0349 present?

Yes	No
For DTCs P0340 or P0344, GO to DR6 . For DTCs P0341 or P0346, GO to DR30 . For DTCs P0345 or P0349, GO to DR11 .	Unable to duplicate or identify the concern at this time.

DR6 DTCS P0340 AND P0344: CHECK THE CMP SENSOR RESISTANCE

Note: For vehicles with 2-pin CMP sensors, measure the circuits listed in the table that apply to 2-pin sensors. For vehicles with 3-pin CMP sensors, measure the circuits listed in the table that apply to 3-pin sensors. Refer to connector end views at beginning of pinpoint test.

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

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

Vehicle	Minimum Resistance (ohms)	Maximum Resistance (ohms)
Edge, Flex, MKS, MKX, MKZ, Sable, Taurus, Taurus X	586	2,033
F-150 4.6L	1,978	5,590

F-150 5.4L	205	579
All others	250	1,000

Is the resistance within specification?

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

DR7 CHECK THE CMP CIRCUIT FOR A SHORT TO VOLTAGE IN THE HARNESS

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

(+) CMP Sensor Connector, Harness Side	(-) Vehicle Battery
CMP	Negative terminal

Is the voltage less than 1 V?

Yes	No
GO to DR8 .	REPAIR the short circuit. CLEAR the DTCs. REPEAT the self-test.

DR8 CHECK THE CMP AND SIGRTN OR VRSRTN CIRCUITS FOR AN OPEN IN THE HARNESS

Note: For vehicles with 2-pin CMP sensors, measure the circuits listed in the table that apply to 2-pin sensors. For vehicles with 3-pin CMP sensors, measure the circuits listed in the table that apply to 3-pin sensors. Refer to connector end views at beginning of pinpoint test.

- Ignition OFF.
- Measure the resistance between:

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

Are the resistances less than 5 ohms?

Yes	No
GO to DR9 .	REPAIR the open circuit. CLEAR the DTCs. REPEAT the self-test.

DR9 CHECK FOR A SHORT IN THE HARNESS BETWEEN THE PCM AND THE CMP SENSOR

Note: For vehicles with 2-pin CMP sensors, measure the circuits listed in the table that apply to 2-pin sensors. For vehicles with 3-pin CMP sensors, measure the circuits listed in the table that apply to 3-pin sensors. Refer to connector end views at beginning of pinpoint test.

- Measure the resistance between:

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

- Measure the resistance between:

(+) CMP Sensor Connector, Harness Side	(-) Vehicle Battery
CMP	Negative terminal
SIGRTN	Negative terminal
VRSRTN	Negative terminal

Are the resistances greater than 10K ohms?

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

DR10 CHECK THE CMP SENSOR OUTPUT

Note: For vehicles with 2-pin CMP sensors, measure the circuits listed in the table that apply to 2-pin sensors. For vehicles with 3-pin CMP sensors, measure the circuits listed in the table that apply to 3-pin sensors. Refer to connector end views at beginning of pinpoint test.

- Ignition OFF.
- Generator/regulator B+ connector connected.
- CMP Sensor connector disconnected.
- Ignition ON, engine running.
- Digital multimeter (DMM) on low voltage AC scale.
- Measure the voltage between:

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

- Run the engine at approximately 2,500 RPM.

Is the voltage greater than 0.25 V?

Yes	No
For Crown Victoria, E-Series, Explorer 4.0L, Explorer Sport Trac 4.0L, F-150 4.6L 2V,	

Focus, F-Super Duty 6.8L, Grand Marquis, Mountaineer 4.0L, Mustang 4.0L, Mustang 5.4L, Ranger, and Town Car, GO to DR32 . For all others, GO to DR31 .	INSTALL a new CMP sensor. REFER to the Workshop Manual Section 303-14, Electronic Engine Controls. CLEAR the DTCs. REPEAT the self-test.

DR11 DTCS P0345 AND P0349: CHECK THE CMP2 SENSOR RESISTANCE

Note: For vehicles with 2-pin CMP sensors, measure the circuits listed in the table that apply to 2-pin sensors. For vehicles with 3-pin CMP sensors, measure the circuits listed in the table that apply to 3-pin sensors. Refer to connector end views at beginning of pinpoint test.

- Ignition OFF.
- CMP2 Sensor connector disconnected.
- Measure the resistance between:

(+) CMP2 Sensor Connector, Component Side	(-) CMP2 Sensor Connector, Component Side
CMP2	SIGRTN
CMP2	VRSRTN
CMP2	VRSRTN2

Vehicle	Minimum Resistance (ohms)	Maximum Resistance (ohms)
Edge, Flex, MKS, MKX, MKZ, Sable, Taurus, Taurus X	586	2,033
F-150	205	579
All others	250	1,000

Is the resistance value(s) within specifications?

Yes	No
GO to DR12 .	INSTALL a new CMP2 sensor. REFER to the Workshop Manual Section 303-14, Electronic Engine Controls. CLEAR the DTCs. REPEAT the self-test.

DR12 CHECK THE CMP2 CIRCUIT FOR A SHORT TO VOLTAGE IN THE HARNESS

- PCM connector disconnected.

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

(+) CMP2 Sensor Connector, Harness Side	(-) Vehicle Battery
CMP2	Negative terminal

Is the voltage less than 1 V?

Yes	No
GO to DR13 .	REPAIR the short circuit. CLEAR the DTCs. REPEAT the self-test.

DR13 CHECK THE CMP2 AND SIGRTN, VRSRTN, OR VRSRTN2 CIRCUITS FOR AN OPEN IN THE HARNESS

Note: For vehicles with 2-pin CMP sensors, measure the circuits listed in the table that apply to 2-pin sensors. For vehicles with 3-pin CMP sensors, measure the circuits listed in the table that apply to 3-pin sensors. Refer to connector end views at beginning of pinpoint test.

- Ignition OFF.
- Measure the resistance between:

(+) PCM Connector, Harness Side	(-) CMP2 Sensor Connector, Harness Side
CMP2	CMP2
SIGRTN	SIGRTN
VRSRTN	VRSRTN
VRSRTN2	VRSRTN2

Are the resistances less than 5 ohms?

Yes	No
GO to DR14 .	REPAIR the open circuit. CLEAR the DTCs. REPEAT the self-test.

DR14 CHECK FOR A SHORT IN THE HARNESS BETWEEN THE PCM AND THE CMP2 SENSOR

Note: For vehicles with 2-pin CMP sensors, measure the circuits listed in the table that apply to 2-pin sensors. For vehicles with 3-pin CMP sensors, measure the circuits listed in the table that apply to 3-pin sensors. Refer to connector end views at beginning of pinpoint test.

- Measure the resistance between:

(+) CMP2 Sensor Connector, Harness Side	(-) CMP2 Sensor Connector, Harness Side
CMP2	SIGRTN
CMP2	VRSRTN
CMP2	VRSRTN2

- Measure the resistance between:

(+) CMP2 Sensor Connector, Harness Side	(-) Vehicle Battery

CMP2	Negative terminal
SIGRTN	Negative terminal
VRSRTN	Negative terminal
VRSRTN2	Negative terminal

Are the resistances greater than 10K ohms?

Yes	No
GO to DR15 .	REPAIR the short circuit. CLEAR the DTCs. REPEAT the self-test.

DR15 CHECK FOR A SHORT BETWEEN THE CMP AND THE CMP2 CIRCUITS

- CMP Sensor connector disconnected.
- CMP2 Sensor connector disconnected.
- Measure the resistance between:

(+) PCM Connector, Harness Side	(-) PCM Connector, Harness Side
CMP	CMP2

Is the resistance greater than 10K ohms?

Yes	No
GO to DR16 .	REPAIR the short circuit. CLEAR the DTCs. REPEAT the self-test.

DR16 CHECK THE CMP2 SENSOR OUTPUT

Note: For vehicles with 2-pin CMP sensors, measure the circuits listed in the table that apply to 2-pin sensors. For vehicles with 3-pin CMP sensors, measure the circuits listed in the table that apply to 3-pin sensors. Refer to connector end views at beginning of pinpoint test.

- Ignition OFF.
- Generator/regulator B+ connector connected.
- CMP2 Sensor connector disconnected.
- Ignition ON, engine running.
- DMM on low voltage AC scale.
- Measure the voltage between:

(+) CMP2 Sensor Connector, Component Side	(-) CMP2 Sensor Connector, Component Side
CMP2	SIGRTN
CMP2	VRSRTN
CMP2	VRSRTN2

- Run the engine at approximately 2,500 RPM.

Is the voltage greater than 0.25 V?

Yes	No
	INSTALL a new CMP2 sensor. REFER to the Workshop Manual Section 303-14, Electronic

GO to DR31 .	Engine Controls. CLEAR the DTCs. REPEAT the self-test.

DR17 CHECK FOR DTCS

Are DTCs P0340, P0341, P0344, P0345, P0346 or P0349 present?

Yes	No
For DTCs P0340 or P0344, GO to DR18 . For DTCs P0341 or P0346, GO to DR30 . For DTCs P0345 or P0349, GO to DR24 .	Unable to duplicate or identify the concern at this time.

DR18 DTCS P0340 AND P0344: CHECK THE VOLTAGE TO THE CMP SENSOR

Note: For vehicles with 2-pin CMP sensors, measure the circuits listed in the table that apply to 2-pin sensors. For vehicles with 3-pin CMP sensors, measure the circuits listed in the table that apply to 3-pin sensors. Refer to connector end views at beginning of pinpoint test.

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

(+) CMP Sensor Connector, Harness Side	(-) Vehicle Battery
VPWR	Negative terminal
VBPWR	Negative terminal

Is the voltage greater than 10 V?

Yes	No
GO to DR19 .	REPAIR the open circuit. CLEAR the DTCs. REPEAT the self-test.

DR19 CHECK THE PWRGND OR SIGRTN CIRCUIT FOR AN OPEN CIRCUIT IN THE HARNESS

- Ignition OFF.
- Measure the voltage between:

(+) Vehicle Battery	(-) CMP Sensor Connector, Harness Side
Positive terminal	PWRGND
Positive terminal	SIGRTN

Is the voltage greater than 10 V?

Yes	No
GO to DR20 .	REPAIR the open circuit. CLEAR the DTCs. REPEAT the self-test.

DR20 CHECK THE CMP CIRCUIT FOR A SHORT TO VOLTAGE IN THE HARNESS

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

(+) CMP Sensor Connector, Harness Side	(-) Vehicle Battery
CMP	Negative terminal

Is the voltage less than 1 V?

Yes	No
GO to DR21 .	REPAIR the short circuit. CLEAR the DTCs. REPEAT the self-test.

DR21 CHECK FOR AN OPEN CIRCUIT BETWEEN THE PCM AND CMP SENSOR

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

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

Is the resistance less than 5 ohms?

Yes	No
GO to DR22 .	REPAIR the open circuit. CLEAR the DTCs. REPEAT the self-test.

DR22 CHECK THE CMP CIRCUIT FOR A SHORT TO PWRGND OR SIGRTN IN THE HARNESS

Note: The measurement may be taken at the PCM or CMP connector, whichever is easier to access.

- Measure the resistance between:

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

Is the resistance greater than 10K ohms?

Yes	No
GO to DR23 .	REPAIR the short circuit. CLEAR the DTCs. REPEAT the self-test.

DR23 CHECK THE CMP SENSOR FOR CORRECT OPERATION

Note: For vehicles with 2-pin CMP sensors, measure the circuits listed in the table that apply to 2-pin sensors. For vehicles with 3-pin CMP sensors, measure the circuits listed in the table that apply to 3-pin sensors. Refer to connector end views at beginning of pinpoint test.

- PCM connector connected.
- Connect a 5 amp fused jumper wire between the following:

Point A CMP Sensor Connector, Harness Side	Point B CMP Sensor Connector, Component Side
VPWR	VPWR
VBPWR	VBPWR
SIGRTN	SIGRTN
PWRGND	PWRGND

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

(+) CMP Sensor Connector, Component Side	(-) Vehicle Battery
CMP	Negative terminal

Does the voltage switch between LOW (less than 2 volts DC) and HIGH (greater than 8 volts DC)?

Yes	No
GO to DR32 .	INSTALL a new CMP sensor. REFER to the Workshop Manual Section 303-14, Electronic Engine Controls. CLEAR the DTCs. REPEAT the self-test.

DR24 DTCS P0345 AND P0349: CHECK THE VOLTAGE TO THE CMP2 SENSOR

- CMP2 Sensor connector disconnected.
- Ignition ON, engine OFF.
- Measure the voltage between:

(+) CMP2 Sensor Connector, Harness Side	(-) Vehicle Battery
VBPWR	Negative terminal

Is the voltage greater than 10 V?

Yes	No
GO to DR25 .	REPAIR the open circuit. CLEAR the DTCs. REPEAT the self-test.

DR25 CHECK THE SIGRTN CIRCUIT FOR AN OPEN CIRCUIT IN THE HARNESS

- Ignition OFF.
- Measure the voltage between:

(+) Vehicle Battery	(-) CMP2 Sensor Connector, Harness Side
Positive terminal	SIGRTN

Is the voltage greater than 10 V?

Yes	No
GO to DR26 .	REPAIR the open circuit. CLEAR the DTCs. REPEAT the self-test.

DR26 CHECK THE CMP2 CIRCUIT FOR A SHORT TO VOLTAGE IN THE HARNESS

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

(+) CMP2 Sensor Connector, Harness Side	(-) Vehicle Battery
CMP2	Negative terminal

Is the voltage less than 1 V?

Yes	No
GO to DR27 .	REPAIR the short circuit. CLEAR the DTCs. REPEAT the self-test.

DR27 CHECK FOR AN OPEN CMP2 CIRCUIT IN THE HARNESS

- Ignition OFF.
- CMP2 Sensor connector disconnected.
- Measure the resistance between:

(+) CMP2 Sensor Connector, Harness Side	(-) PCM Connector, Harness Side
CMP2	CMP2

Is the resistance less than 5 ohms?

Yes	No
GO to DR28 .	REPAIR the open circuit. CLEAR the DTCs. REPEAT the self-test.

DR28 CHECK THE CMP2 SIGNAL CIRCUIT FOR A SHORT TO GROUND AND SIGRTN

- Measure the resistance between:

(+) CMP2 Sensor Connector, Harness Side	(-)
CMP2	Ground

- Measure the resistance between:

(+) CMP2 Sensor Connector, Harness Side	(-) CMP2 Sensor Connector, Harness Side
CMP2	SIGRTN

Are the resistances greater than 10K ohms?

Yes	No

GO to DR29 .	REPAIR the short circuit. CLEAR the DTCs. REPEAT the self-test.

DR29 CHECK THE CMP2 SENSOR FOR CORRECT OPERATION

- PCM connector connected.
- Connect a 5 amp fused jumper wire between the following:

Point A CMP2 Sensor Connector, Harness Side	Point B CMP2 Sensor Connector, Component Side
VBPWR	VBPWR
SIGRTN	SIGRTN

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

(+) CMP2 Sensor Connector, Component Side	(-) Vehicle Battery
CMP2	Negative terminal

Does the voltage switch between LOW (less than 2 volts DC) and HIGH (greater than 8 volts DC)?

Yes	No
GO to DR31 .	INSTALL a new CMP2 sensor. REFER to the Workshop Manual Section 303-14, Electronic Engine Controls. CLEAR the DTCs. REPEAT the self-test.

DR30 DTCS P0341 AND P0346: 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	No
REPAIR as necessary. CLEAR the DTCs. REPEAT the self-test.	GO to DR31 .

DR31 CHECK THE VARIABLE CAMSHAFT TIMING (VCT) SYSTEM

Note: Only diagnose the bank indicated by the DTC.

- Check the VCT system for correct operation.

Is a concern present?

Yes	No

REPAIR as necessary. CLEAR the DTCs. REPEAT the self-test.	GO to DR32 .

DR32 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.