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2019 Ford Police Responder Hybrid Service and Repair Manual

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Pinpoint Test Steps available in the on-line Workshop Manual.

PINPOINT TEST C : REFERENCE VOLTAGE (VREF)

Refer to Wiring Diagrams Cell 023for schematic and connector information.
Normal Operation and Fault Conditions Refer to the DTC (diagnostic trouble code) Fault Trigger Conditions. **DTC Fault Trigger Conditions**

DTC (diagnostic trouble code)	Description	Fault Trigger Condition
PCM (powertrain control module) P06A6:00	Sensor Reference Voltage 'A' Circuit Range/Performance: No Sub Type Information	Sets when the PCM (powertrain control module) detects the VREF circuit is not within a calibrated voltage range. All other Diagnostic Trouble Codes (DTCs) should be diagnosed first.
PCM (powertrain control module) P06A7:00	Sensor Reference Voltage 'B' Circuit Range/Performance: No Sub Type Information	Sets when the PCM (powertrain control module) detects the VREF circuit is not within a calibrated voltage range. All other Diagnostic Trouble Codes (DTCs) should be diagnosed first.
PCM (powertrain control module) P06A8:00	Sensor Reference Voltage 'C' Circuit Range/Performance: No Sub Type Information	Sets when the PCM (powertrain control module) detects the VREF circuit is not within a calibrated voltage range. All other Diagnostic Trouble Codes (DTCs) should be diagnosed first.

Possible Sources

- Sensor circuitry concern
- APP (accelerator pedal position) sensor (9F836)
- Air conditioning pressure sensor (19D594)
- Brake vacuum sensor
- Crankcase pressure sensor (6758)
- CKP (crankshaft position) sensor (6C315)
- CMP (camshaft position) sensor (6B288)
- Differential pressure feedback EGR (exhaust gas recirculation) sensor
- Electric EGR (exhaust gas recirculation) valve
- Electronic throttle body TP (throttle position) sensor (9E928)
- Exhaust pressure sensor
- Fuel pressure sensor (9F972)

		information on the engine RPM limiter, refer to Powertrain Control Software. If DTC (diagnostic trouble code) P1285 or P1299 is present, disregard DTC (diagnostic trouble code) P0219 at this time. Diagnose DTC (diagnostic trouble code) P1285 or P1299 first. If there are no other symptoms, return the vehicle to the customer with information about the DTC.
PCM (powertrain control module) P0297:00	Vehicle Overspeed Condition: No Sub Type Information	Sets when the PCM (powertrain control module) detects the vehicle is operated in a manner which caused the vehicle speed to exceed a calibration limit. The vehicle speed is continuously monitored and evaluated by the PCM (powertrain control module) . For additional information on the vehicle speed limiter, refer to Powertrain Control Software. If there are no other symptoms, return the vehicle to the customer with information about the DTC (diagnostic trouble code) .

Possible Sources

- Wiring, terminals, or connectors
- Mechanical concern
- Suspect sensor concern

Pinpoint Test Steps available in the on-line Workshop Manual.

PCM (powertrain control module)	P0014:00	B Camshaft Position Timing - Over-Advanced (Bank 1): No Sub Type Information	GO to Pinpoint Test HK
PCM (powertrain control module)	P0015:00	B Camshaft Position Timing - Over-Retarded (Bank 1): No Sub Type Information	GO to Pinpoint Test HK
PCM (powertrain control module)	P0016:00	Crankshaft Position - Camshaft Position Correlation (Bank 1 Sensor A): No Sub Type Information	GO to Pinpoint Test HK
PCM (powertrain control module)	P0017:00	Crankshaft Position - Camshaft Position Correlation (Bank 1 Sensor B): No Sub Type Information	GO to Pinpoint Test HK
PCM (powertrain control module)	P0018:00	Crankshaft Position - Camshaft Position Correlation (Bank 2 Sensor A): No Sub Type Information	GO to Pinpoint Test HK
PCM (powertrain control module)	P0019:00	Crankshaft Position - Camshaft Position Correlation (Bank 2 Sensor B): No Sub Type Information	GO to Pinpoint Test HK
PCM (powertrain control module)	P0020:00	A Camshaft Position Actuator A Control Circuit/Open Bank 2: No Sub Type Information	GO to Pinpoint Test HK
PCM (powertrain control module)	P0021:00	A Camshaft Position Timing - Over-Advanced (Bank 2): No Sub Type Information	GO to Pinpoint Test HK
PCM (powertrain control module)	P0022:00	A Camshaft Position Timing - Over-Retarded (Bank 2): No Sub Type Information	GO to Pinpoint Test HK
PCM (powertrain control module)	P0023:00	B Camshaft Position Actuator A Control Circuit/Open Bank 2: No Sub Type Information	GO to Pinpoint Test HK
PCM (powertrain control module)	P0024:00	B Camshaft Position Timing - Over-Advanced (Bank 2): No Sub Type Information	GO to Pinpoint Test HK

PCM (powertrain control module)	P052C:00	Cold Start Intake A Camshaft Position Timing Over-Advanced (Bank 2): No Sub Type Information	GO to Pinpoint Test HK
PCM (powertrain control module)	P052D:00	Cold Start Intake A Camshaft Position Timing Over-Retarded (Bank 2): No Sub Type Information	GO to Pinpoint Test HK
PCM (powertrain control module)	P054A:00	Cold Start Exhaust B Camshaft Position Timing Over-Advanced (Bank 1): No Sub Type Information	GO to Pinpoint Test HK
PCM (powertrain control module)	P054B:00	Cold Start Exhaust B Camshaft Position Timing Over-Retarded (Bank 1): No Sub Type Information	GO to Pinpoint Test HK
PCM (powertrain control module)	P054C:00	Cold Start Exhaust B Camshaft Position Timing Over-Advanced (Bank 2): No Sub Type Information	GO to Pinpoint Test HK
PCM (powertrain control module)	P054D:00	Cold Start Exhaust B Camshaft Position Timing Over-Retarded (Bank 2): No Sub Type Information	GO to Pinpoint Test HK

Global Customer Symptom Code (GCSC) Chart

Diagnostics in this manual assume a certain skill level and knowledge of Ford-specific diagnostic practices.

REFER to: Diagnostic Methods

(100-00 General Information, Description and Operation).

Global Customer Symptom Code Chart

Customer Symptom	Action
Start/Run/Move > Running > Failed Emissions Testing > Catalyst	GO to Pinpoint Test DR
Driving Performance > Runs Rough > Acceleration > Always	GO to Pinpoint Test HK
Driving Performance > Runs Rough > Cruise/ Steady Speed > Always	GO to Pinpoint Test HK

Driving Performance > Engine Surge > Deceleration > Always	GO to Pinpoint Test HK

Pinpoint Tests

PINPOINT TEST DR : CAMSHAFT POSITION (CMP) SENSOR

Normal Operation and Fault Conditions

Refer to the DTC (diagnostic trouble code) Fault Trigger Conditions.

DTC Fault Trigger Conditions

DTC (diagnostic trouble code)	Description	Fault Trigger Condition
PCM (powertrain control module) P0340:00	Camshaft Position Sensor 'A' Circuit (Bank 1 or single sensor): No Sub Type Information	Sets when the PCM (powertrain control module) detects the CMP (camshaft position) bank 1, sensor 1, circuit signal cannot be detected. Harness routing, harness alterations, incorrect shielding, or electrical interference from other systems may have an intermittent impact on the CMP (camshaft position) signal. Diagnose any base engine concerns related to the engine oil pressure or engine timing. Refer to the appropriate 303-00 section, Engine System, Oil Pressure Test, to check the engine oil pressure. Refer to the appropriate 303-01 section, Engine, to check the engine timing and VCT (variable camshaft timing) phasers.
PCM (powertrain control module) P0344:00	Camshaft Position Sensor 'A' Circuit Intermittent (Bank 1 or single sensor): No Sub Type Information	Sets when the PCM (powertrain control module) detects the CMP (camshaft position) bank 1, sensor 1, circuit signal is intermittent. Harness routing, harness alterations, incorrect shielding, or electrical interference from other systems may have an intermittent impact on the CMP (camshaft position) signal. Diagnose any base engine concerns related to the engine oil pressure or engine timing. Refer to the appropriate 303-00 section, Engine System, Oil Pressure Test, to check the engine oil pressure. Refer to the appropriate 303-01 section, Engine, to check the engine timing and VCT (variable camshaft timing) phasers.
PCM (powertrain control	Camshaft Position Sensor 'A' Circuit (Bank 2): No Sub Type Information	Sets when the PCM (powertrain control module) detects the CMP (camshaft position) bank 2, sensor 1, circuit signal cannot be detected. Harness routing, harness alterations, incorrect shielding, or electrical interference from other systems may have an

PCM (powertrain control module) P0390:00	Camshaft Position Sensor 'B' Circuit (Bank 2): No Sub Type Information	Sets when the PCM (powertrain control module) detects the CMP (camshaft position) bank 2, sensor 2 circuit signal can not be detected. Harness routing, harness alterations, incorrect shielding, or electrical interference from other systems may have an intermittent impact on the CMP (camshaft position) sensor signal. Diagnose any base engine concerns related to the engine oil pressure or engine timing. Refer to the appropriate 303-00 section, Engine System, Oil Pressure Test, to check the engine oil pressure. Refer to the appropriate 303-01 section, Engine, to check the engine timing and VCT (variable camshaft timing) phasers
PCM (powertrain control module) P0394:00	Camshaft Position Sensor 'B' Circuit Intermittent (Bank 2): No Sub Type Information	Sets when the PCM (powertrain control module) detects the CMP (camshaft position) bank 2, sensor 2 circuit signal is intermittent. Harness routing, harness alterations, incorrect shielding, or electrical interference from other systems may have an intermittent impact on the CMP (camshaft position) sensor signal. Diagnose any base engine concerns related to the engine oil pressure or engine timing. Refer to the appropriate 303-00 section, Engine System, Oil Pressure Test, to check the engine oil pressure. Refer to the appropriate 303-01 section, Engine, to check the engine timing and VCT (variable camshaft timing) phasers

Possible Sources

- Radio frequency interference or electromagnetic interference
- CMP (camshaft position) circuitry concern
- Oil flow restriction
- Camshaft phaser and sprocket
- Camshaft timing
- Camshaft position sensor alignment
- CMP (camshaft position) sensor (6B288 or 12K073)
- PCM (powertrain control module) (12A650)

Pinpoint Test Steps available in the on-line Workshop Manual.

PINPOINT TEST HK : VARIABLE CAMSHAFT TIMING (VCT)

Normal Operation and Fault Conditions

The PCM (powertrain control module) monitors and evaluates the response of the actual position on a target position change. The setpoint and camshaft position are saved at the beginning of a setpoint change.

PCM (powertrain control module) P0012:00	'A' Camshaft Position Timing - Over-Retarded (Bank 1): No Sub Type Information	Sets when PCM (powertrain control module) detects the camshaft timing exceeds a maximum calibrated value or remains in a retarded position, indicating the VCT (variable camshaft timing) position is over-retarded. This DTC (diagnostic trouble code) may be accompanied by other Diagnostic Trouble Codes (DTCs). Diagnose all CMP (camshaft position) sensor Diagnostic Trouble Codes (DTCs) first. If no CMP (camshaft position) sensor related Diagnostic Trouble Codes (DTCs) are present, continue to follow diagnosis for this DTC (diagnostic trouble code) . This DTC (diagnostic trouble code) is a functional check of the VCT (variable camshaft timing) unit. Diagnose any base engine concerns related to the engine oil pressure or engine timing. Refer to the appropriate 303-00 section, Engine System, Oil Pressure Test, to check the engine oil pressure. Refer to the appropriate 303-01 section, Engine, to check the engine timing and VCT phasers.
PCM (powertrain control module) P0013:00	'B' Camshaft Position Actuator 'A' Control Circuit/Open Bank 1: No Sub Type Information	Sets when PCM (powertrain control module) detects a low or high voltage on the VCT (variable camshaft timing) bank 1, solenoid 2 circuit or if the voltage exceeds a calibrated limit for a calibrated amount of time.
PCM (powertrain control module) P0014:00	'B' Camshaft Position Timing - Over-Advanced (Bank 1): No Sub Type Information	Sets when PCM (powertrain control module) detects the camshaft timing exceeds a maximum calibrated value or remains in an advanced position, indicating the VCT (variable camshaft timing) position is over-advanced. This DTC (diagnostic trouble code) may be accompanied by other Diagnostic Trouble Codes (DTCs). Diagnose all CMP (camshaft position) sensor Diagnostic Trouble Codes (DTCs) first. If no CMP (camshaft position) sensor related Diagnostic Trouble Codes (DTCs) are present, continue to follow diagnosis for this DTC (diagnostic trouble code) . This DTC (diagnostic trouble code) is a functional check of the VCT (variable camshaft timing) unit. Diagnose any base engine concerns related to the engine oil pressure or engine timing. Refer to the appropriate 303-00 section, Engine System, Oil Pressure Test, to check the engine oil pressure. Refer to the appropriate 303-01 section, Engine, to check the engine timing and VCT phasers.
PCM (powertrain	'B' Camshaft Position Timing -	Sets when PCM (powertrain control module) detects the camshaft timing exceeds a maximum calibrated value or remains in a retarded

		camshaft timing) unit. Diagnose any base engine concerns related to the engine oil pressure or engine timing. Refer to the appropriate 303-00 section, Engine System, Oil Pressure Test, to check the engine oil pressure. Refer to the appropriate 303-01 section, Engine, to check the engine timing and VCT phasers.
PCM (powertrain control module) P0018:00	Crankshaft Position - Camshaft Position Correlation - Bank 2 Sensor A: No Sub Type Information	Sets when PCM (powertrain control module) detects a misalignment between the camshaft and crankshaft. This indicates the misalignment is 1 tooth or greater. This DTC (diagnostic trouble code) can also set due to VCT (variable camshaft timing) system concerns (oil contamination or VCT (variable camshaft timing) solenoid stuck). This DTC (diagnostic trouble code) may be accompanied by other Diagnostic Trouble Codes (DTCs). Diagnose all CMP (camshaft position) sensor Diagnostic Trouble Codes (DTCs) first. If no CMP (camshaft position) sensor related Diagnostic Trouble Codes (DTCs) are present, continue to follow diagnosis for this DTC (diagnostic trouble code) . This DTC (diagnostic trouble code) is a functional check of the VCT (variable camshaft timing) unit. Diagnose any base engine concerns related to the engine oil pressure or engine timing. Refer to the appropriate 303-00 section, Engine System, Oil Pressure Test, to check the engine oil pressure. Refer to the appropriate 303-01 section, Engine, to check the engine timing and VCT phasers.
PCM (powertrain control module) P0019:00	Crankshaft Position - Camshaft Position Correlation - Bank 2 Sensor B: No Sub Type Information	Sets when PCM (powertrain control module) detects a misalignment between the camshaft and crankshaft. This indicates the misalignment is 1 tooth or greater. This DTC (diagnostic trouble code) can also set due to VCT (variable camshaft timing) system concerns (oil contamination or VCT (variable camshaft timing) solenoid stuck). This DTC (diagnostic trouble code) may be accompanied by other Diagnostic Trouble Codes (DTCs). Diagnose all CMP (camshaft position) sensor Diagnostic Trouble Codes (DTCs) first. If no CMP (camshaft position) sensor related Diagnostic Trouble Codes (DTCs) are present, continue to follow diagnosis for this DTC (diagnostic trouble code) . This DTC (diagnostic trouble code) is a functional check of the VCT (variable camshaft timing) unit. Diagnose any base engine concerns related to the engine oil pressure or engine timing. Refer to the appropriate 303-00 section, Engine System, Oil Pressure Test, to check the engine oil pressure. Refer to the appropriate 303-01 section, Engine, to check the engine timing and VCT phasers.

control module) P0023:00	'A' Control Circuit/Open Bank 2: No Sub Type Information	low or high voltage from the VCT (variable camshaft timing) bank 2 solenoid 2 circuit.
PCM (powertrain control module) P0024:00	'B' Camshaft Position Timing - Over-Advanced (Bank 2): No Sub Type Information	Sets when PCM (powertrain control module) detects the camshaft timing exceeds a maximum calibrated value or remains in an advanced position, indicating the VCT (variable camshaft timing) position is over-advanced. This DTC (diagnostic trouble code) may be accompanied by other Diagnostic Trouble Codes (DTCs). Diagnose all CMP (camshaft position) sensor Diagnostic Trouble Codes (DTCs) first. If no CMP (camshaft position) sensor related Diagnostic Trouble Codes (DTCs) are present, continue to follow diagnosis for this DTC (diagnostic trouble code) . This DTC (diagnostic trouble code) is a functional check of the VCT (variable camshaft timing) unit. Diagnose any base engine concerns related to the engine oil pressure or engine timing. Refer to the appropriate 303-00 section, Engine System, Oil Pressure Test, to check the engine oil pressure. Refer to the appropriate 303-01 section, Engine, to check the engine timing and VCT phasers.
PCM (powertrain control module) P0025:00	'B' Camshaft Position Timing - Over-Retarded (Bank 2): No Sub Type Information	Sets when PCM (powertrain control module) detects the camshaft timing exceeds a maximum calibrated value or remains in a retarded position, indicating the VCT (variable camshaft timing) position is over-retarded. This DTC (diagnostic trouble code) may be accompanied by other Diagnostic Trouble Codes (DTCs). Diagnose all CMP (camshaft position) sensor Diagnostic Trouble Codes (DTCs) first. If no CMP (camshaft position) sensor related Diagnostic Trouble Codes (DTCs) are present, continue to follow diagnosis for this DTC (diagnostic trouble code) . This DTC (diagnostic trouble code) is a functional check of the VCT (variable camshaft timing) unit. Diagnose any base engine concerns related to the engine oil pressure or engine timing. Refer to the appropriate 303-00 section, Engine System, Oil Pressure Test, to check the engine oil pressure. Refer to the appropriate 303-01 section, Engine, to check the engine timing and VCT phasers.