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## 2019 Ford Fusion Service and Repair Manual

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PCM (powertrain control module) INJPWR_M (Injector Power Monitor) (V)	VOLTS	PID	12.28	14.43	12.86	12.91
PCM (powertrain control module) KNOCK_1 (Knock sensor 1) (Undefined / Not Used)	COUNT	KS11 Sensor	999.00	31.00	48.00	58.00
PCM (powertrain control module) KNOCK_2 (Knock sensor 2) (Undefined / Not Used)	COUNT	KS12 Sensor	999.00	35.00	54.00	49.00
PCM (powertrain control module) LOAD (Engine load) (%)	%	PID	0 (A)	50	63	98
PCM (powertrain control module) LOAD_ABSL (Absolute Load Value) (%)	%	PID	0 (A)	27	38	69
PCM (powertrain control module) LONGFT1 (Long term fuel trim 1) (%)	%	PID	0.00 (A)	-20 TO +20	-20 TO +20	-20 TO +20
PCM (powertrain control module) LONGFT2 (Long term fuel trim 2) (%)	%	PID	0.00 (A)	-20 TO +20	-20 TO +20	-20 TO +20
PCM (powertrain control module) MAP (Manifold absolute pressure sensor) (kPa)	kPa (PSI)	MAP Sensor	99.0 (14.36)	53.0 (7.69)	77.0 (11.17)	98.0 (208.4)

PCM (powertrain control module) O2S11_CUR (Exhaust Gas Oxygen Sensor Current Bank 1 Sensor 1) (mA)	mA/uA	HO2S11 Sensor	(A)	switching (C)	switching (C)	switching (C)
PCM (powertrain control module) O2S11_HTR (Commanded duty cycle for the (O2S11) heater output.) (%)	%	HO2S11 Sensor	23	33	42	35
PCM (powertrain control module) O2S11_IMPED ((O2S11) sensor impedance is expressed as a voltage.) (V)	VOLTS	HO2S11 Sensor	5.00	0.71	0.17	0.17
PCM (powertrain control module) O2S11_READY ((O2S11) is warm and ready to operate.)	TRUE/FALSE	HO2S11 Sensor	False	True	True	True
PCM (powertrain control module) O2S12 (Heated Exhaust Gas Oxygen Sensor (bank 1, sensor 2)) (V)	VOLTS	HO2S12 Sensor	(A)	switching (D)	switching (D)	switching (D)
PCM (powertrain control module) O2S21_CUR (Exhaust Gas Oxygen Sensor	mA/uA	HO2S21 Sensor	(A)	switching (C)	switching (C)	switching (C)

(Learned Relative Octane Adjustment) (Undefined / Not Used)						
PCM (powertrain control module) RO2FT1 (Rear O2 Fuel Trim - Bank 1) (%)	%	PID	0.00	-0.00	0.01	0.01
PCM (powertrain control module) RO2FT2 (Rear O2 Fuel Trim - Bank 2) (%)	%	PID	0.00	0.01	0.01	0.01
PCM (powertrain control module) RPM (Engine Revolutions Per Minute) (Rpm)	RPM	CKP Sensor	0	1,010	1,506	1,503
PCM (powertrain control module) RPM_DSD (Desired Idle Speed (RPM)) (Rpm)	RPM	PID	999	999	600	600
PCM (powertrain control module) SHRTFT1 (Short term fuel trim 1) (%)	%	PID	(A)	-10 TO +10	-10 TO +10	-10 TO +10
PCM (powertrain control module) SHRTFT2 (Short term fuel trim 2) (%)	%	PID	(A)	-10 TO +10	-10 TO +10	-10 TO +10
PCM (powertrain control module) SPARKADV (Spark Advance) (Deg)	DEG	PID	5.00	-3.50	34.50	4.50

PCM (powertrain control module) VCT_EXH_ACT2 (Actual Exhaust B Camshaft Position Bank 2) (Deg)	DEG	PID	0.00	0.00	40.13	20.56
PCM (powertrain control module) VCT_EXH_DC1 (Exhaust B Camshaft Position Duty Cycle Bank 1) (%)	%	VCT12 Solenoid	0	0	50	40
PCM (powertrain control module) VCT_EXH_DC2 (Exhaust B Camshaft Position Duty Cycle Bank 2) (%)	%	VCT22 Solenoid	0	0	48	40
PCM (powertrain control module) VCT_EXH_DIF1 (Exhaust B Camshaft Desired Minus Actual Bank 1) (Deg)	DEG	PID	0.00	-0.38	1.19	-0.63
PCM (powertrain control module) VCT_EXH_DIF2 (Exhaust B Camshaft Desired Minus Actual Bank 2) (Deg)	DEG	PID	0.00	0.00	1.00	-0.56
PCM (powertrain control module) VCT_INT_ACT1 (Actual Intake A Camshaft Position Bank 1) (Deg)	DEG	PID	0.00	0.00	-9.56	-43.69
PCM (powertrain control module) VCT_INT_ACT2 (Actual	DEG	PID	0.00	-0.31	-9.69	-44.00

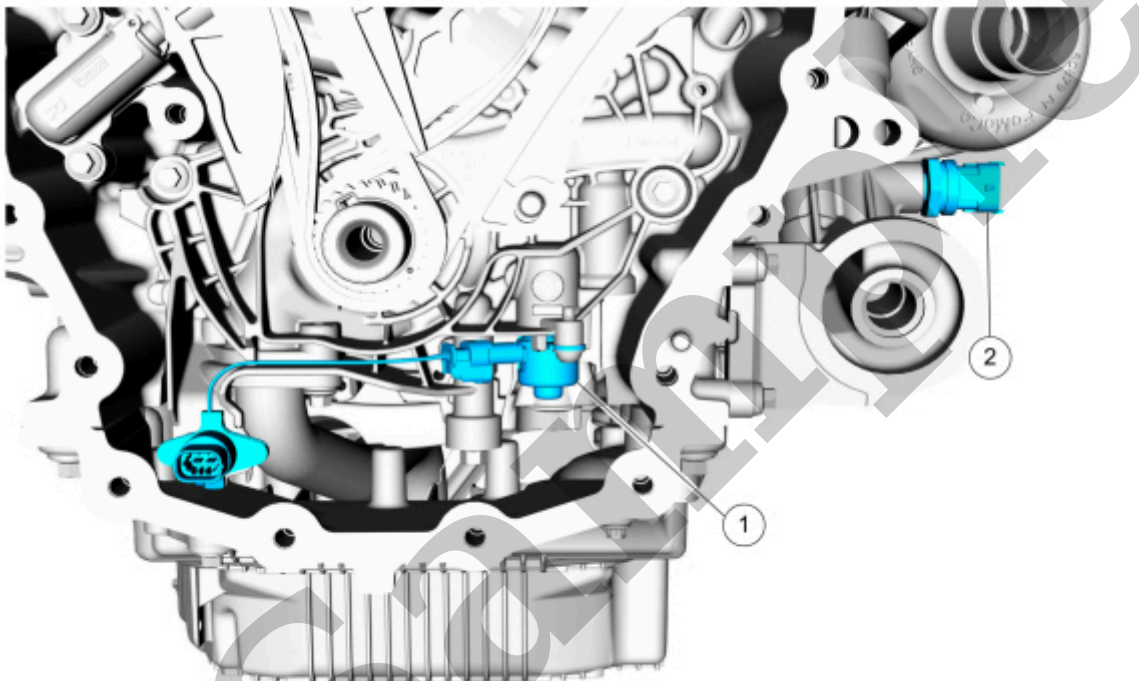
(Vehicle Speed) (Kph)

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Sample

3	IAT (intake air temperature) sensor
4	Left hand VCT (variable camshaft timing) oil control solenoids
5	Turbocharger Boost Pressure (TCBP) Charge Air Cooler (CAC) Temperature sensor
6	Right hand VCT (variable camshaft timing) oil control solenoids
7	PCM (powertrain control module)

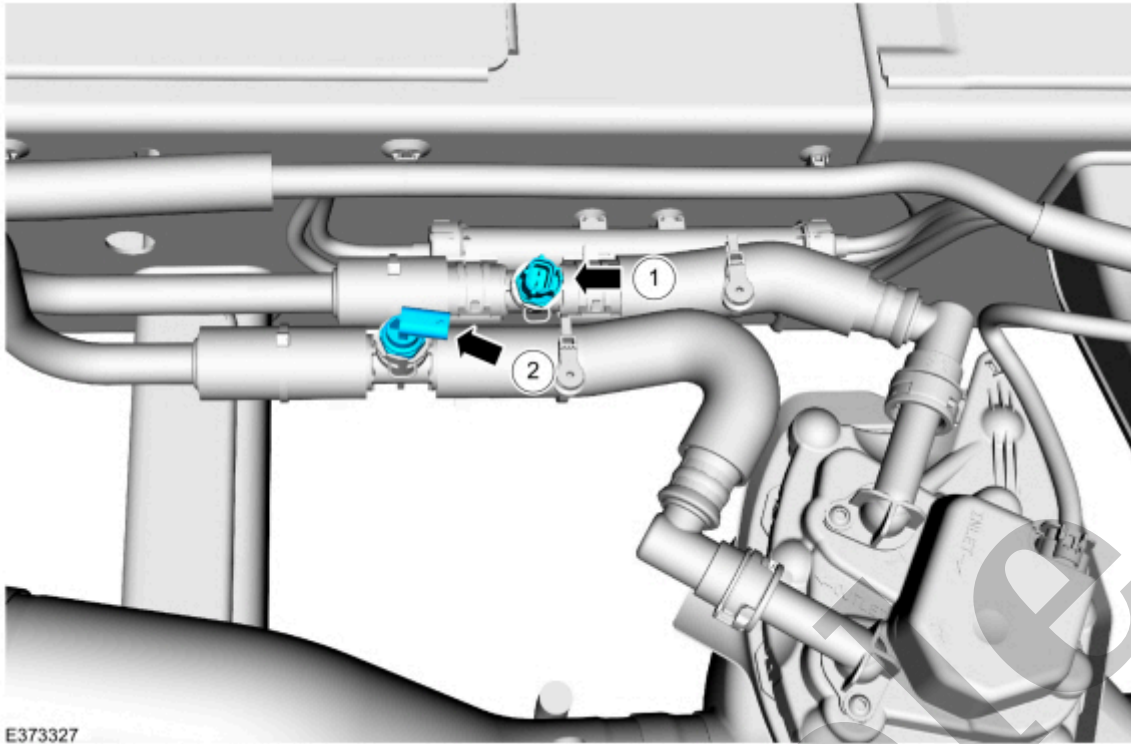
### Electronic Engine Controls- Front



E243271

Item	Description
1	Oil Pressure Control Solenoid
2	EOP (engine oil pressure) sensor

### Electronic Engine Controls - Rear



E373327

Item	Description
1	Engine Coolant Temperature (ECT3) Sensor
2	Engine Coolant Temperature (ECT4) Sensor

### Turbocharger Bypass Valve



## Electronic Engine Controls - Overview

<b>303-14C Electronic Engine Controls - 3.5L EcoBoost (BM)</b>	<b>2022 F-150</b>
<b>Description and Operation</b>	<b>Procedure revision date: 08/18/2016</b>

### Electronic Engine Controls - Overview

#### Overview

The EEC system provides optimum control of the engine through the enhanced capability of the powertrain control module (PCM). The EEC system also has an on board diagnostic (OBD) monitoring system with features and functions to meet federal regulations on exhaust emissions. The EEC system has two major divisions: hardware and software. The hardware includes the PCM, sensors, switches, actuators, solenoids, and interconnecting terminals. The software in the PCM provides the strategy control for outputs (engine hardware) based on the values of the inputs to the PCM. The PCM receives information from a variety of sensor and switch inputs. Based on the strategy and calibration stored within the PCM, the PCM generates the appropriate output. The system is designed to minimize emissions and optimize fuel economy and driveability. The software strategy controls the basic operation of the engine, provides the OBD strategy, controls the malfunction indicator lamp (MIL), communicates to the scan tool over the data link connector (DLC), allows for flash electrically erasable programmable read only memory (EEPROM) provides idle air and fuel trim, and controls failure mode effects management (FMEM).

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- The maximum engine off time is exceeded
- The engine operating temperature is less than 60°C (140°F)
- The gear selector is in the PARK, REVERSE, NEUTRAL or SECOND GEAR position
- Initial vehicle speed of greater than 4 km/h (2.5 MPH) and less than 2 seconds has elapsed
- The vehicle is on a steep road grade
- Elevation is above 12,000 feet (3,657 meters) approximately
- The CPP (clutch pedal position) sensor indicates the clutch pedal is not fully released

Any of the following conditions may result in an automatic restart of the engine:

- The blower fan speed is increased or the climate control temperature is changed
- An electrical accessory is turned ON or plugged in
- Incorrect brake vacuum
- The auto start stop switch is pressed to disable the system while the engine is stopped

### **Automatic Engine Idle Shutdown**

Vehicles equipped with automatic engine idle shutdown have an instrument panel cluster message and an audible alert that notifies the driver 30 seconds prior to engine shutdown. When the shutdown occurs, the PCM (powertrain control module) broadcasts a shutdown message and vehicle power is disabled. For additional information on the automatic engine idle shutdown, refer to the Owners Literature.

Shutdown occurs under the following conditions:

- The vehicle is stationary
- The gear selector is in the PARK or NEUTRAL position or the clutch pedal is released
- The accelerator pedal is released
- The brake pedal is released
- Scan tool is not connected

### **Comprehensive Component Monitor (CCM)**

The CCM checks for concerns in any powertrain electronic component or circuit that provides input or output signals to the PCM (powertrain control module) that can affect emissions and is not monitored by another OBD (on-board diagnostic) monitor. Inputs and outputs are, at a minimum, monitored for circuit continuity or