# Computers and Control Systems: Pinpoint Tests
# Test HV: Cooling Fan Clutch
## PINPOINT TEST HV: COOLING FAN CLUTCH

| Cooling Fan Clutch | HV |
|---|---|

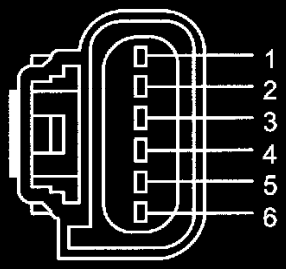
**⚠ WARNING: To avoid the possibility of personal injury or damage to the vehicle, do not operate the engine until the fan blade has been first examined for possible cracks and separation. Failure to follow these instructions may result in personal injury or death.**

Note: Before starting this pinpoint test, turn the clutch fan assembly by hand and check for mechanical binding around the fan shroud or surrounding components. If binding is present, correct the problem then continue with the pinpoint test. If no binding is present, start the engine and warm up to normal operating temperature then continue with the pinpoint test.

This pinpoint test is intended to diagnose the following:

- cooling fan clutch
- harness circuits: fan speed sensor (FSS), FSS PWRGND, FSS VPWR, fan control variable (FCV), and FCV VPWR
- powertrain control module (PCM) (12A650)

### Cooling Fan Clutch Connector

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| Pin | Circuit |
|---|---|
| 4 | FSS (Fan Speed Sensor) |
| 5 | PWRGND (Power Ground) |
| 2 | VBPWR (Vehicle Buffered Power) |
| 3 | VPWR (Vehicle Power) |
| 6 | FCV (Fan Control Variable) |

**Warning, Note And Cooling Fan Clutch Connector**

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## Powertrain Control Module (PCM) Connector

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

| Vehicle | Pin | Circuit |
|---|---|---|
| Expedition,<br>Navigator | B51, B52, B53<br>B45<br>B67, B68, B69, B70<br>B20<br>B48 | VPWR<br>FSS<br>PWRGND<br>VBPWR<br>FCV |
| F-150 | B51, B52, B53<br>E24<br>B67, B68, B69, B70<br>B20<br>B48 | VPWR<br>FSS<br>PWRGND<br>VBPWR<br>FCV |
| All other vehicles | B35, B36<br>E24<br>B47, B48, B49, B50<br>E20<br>E7 | VPWR<br>FSS<br>PWRGND<br>VBPWR<br>FCV |

| Test Step | | Results / Action to Take |
|---|---|---|
| HV1 | **CHECK FOR DIAGNOSTIC TROUBLE CODES (DTCS)** | |
| | • **Are DTCs P0480, P0483 or P0528 present?** | **Yes**<br>For KOEO and KOER DTC P0480, GO to **HV4**.<br>For KOEO and KOER DTCs P0483 or P0528, GO to **HV2**.<br>For continuous memory DTCs P0480 or P0528, GO to **HV10**.<br>**No**<br>GO to **HV2**. |
| HV2 | **CHECK THE COOLING FAN CLUTCH FOR MECHANICAL BINDING** | |
| | **Note:** The cooling fan clutch uses a viscous coupling. The viscous drag should be smooth during fan rotation. The amount of resistance is dependant upon the final cooling fan operational state before engine shutdown.<br>• Key in OFF position.<br>• Manually rotate the cooling fan.<br>• **Does the cooling fan clutch rotation feel rough or binding?** | **Yes**<br>INSTALL a new cooling fan clutch.<br>CLEAR the DTCs. REPEAT the self-test.<br>**No**<br>GO to **HV3**. |

# Cooling Fan Clutch — HV

| Test Step | Results / Action to Take |
|---|---|
| **HV3 CHECK THE COOLING FAN CLUTCH OPERATION** | |
| • Key ON, engine running.<br>• Set the heater controls to OFF.<br>• Access the PCM and monitor the FANSS PID.<br>• **Does the FANSS PID indicate any RPM?** | **Yes**<br>GO to **HV4.**<br>**No**<br>GO to **HV11.** |
| **HV4 KOEO AND KOER DTC P0480: CHECK THE COOLING FAN CLUTCH ACTUATOR VALVE SOLENOID RESISTANCE** | |
| **Note:** If necessary, install terminal adapters on the component side pins to carry out the resistance measurement.<br>• Key in OFF position.<br>• Cooling Fan Clutch connector disconnected.<br>• Measure the resistance between:<br>( + ) Cooling Fan Clutch Connector, Component Side: FCV - Pin 6<br>( - ) Cooling Fan Clutch Connector, Component Side: VPWR - Pin 3<br>• **Is the resistance between 6 - 12 ohms?** | **Yes**<br>GO to **HV5.**<br>**No**<br>INSTALL a new cooling fan clutch.<br>CLEAR the DTCs. REPEAT the self-test. |
| **HV5 CHECK THE COOLING FAN CLUTCH ACTUATOR VALVE SOLENOID RESISTANCE** | |
| • Measure the resistance between:<br>( + ) Cooling Fan Clutch Connector, Component Side: FCV - Pin 6<br>( - ): Ground<br>• **Is the resistance greater than 10K ohms?** | **Yes**<br>GO to **HV6.**<br>**No**<br>INSTALL a new cooling fan clutch.<br>CLEAR the DTCs. REPEAT the self-test. |
| **HV6 CHECK THE VPWR VOLTAGE TO THE COOLING FAN CLUTCH ACTUATOR VALVE SOLENOID** | |
| • Key ON, engine OFF.<br>• Measure the voltage between:<br>( + ) Cooling Fan Clutch Connector, Harness Side: VPWR - Pin 3<br>( - ): Ground<br>• **Is the voltage greater than 10 V?** | **Yes**<br>GO to **HV7.**<br>**No**<br>REPAIR the open circuit. CLEAR the DTCs. REPEAT the self-test. |

# Cooling Fan Clutch — HV

| Test Step | | Results / Action to Take |
|---|---|---|
| HV7 | **CHECK THE FCV CIRCUIT FOR AN OPEN IN THE HARNESS** | |
| | • Key in OFF position.<br>• PCM connector disconnected.<br>• Measure the resistance between:<br>**( + ) Cooling Fan Clutch Connector, Harness Side:** FCV - Pin 6<br>**( - ) PCM Connector, Harness Side:** FCV<br>• **Is the resistance less than 5 ohms?** | **Yes**<br>GO to **HV8.**<br>**No**<br>REPAIR the open circuit. CLEAR the DTCs. REPEAT the self-test. |
| HV8 | **CHECK THE FCV CIRCUIT FOR A SHORT TO GROUND IN THE HARNESS** | |
| | • Measure the resistance between:<br>**( + ) Cooling Fan Clutch Connector, Harness Side:** FCV - Pin 6<br>**( - ):** Ground<br>• **Is the resistance greater than 10K ohms?** | **Yes**<br>GO to **HV9.**<br>**No**<br>REPAIR the short circuit. CLEAR the DTCs. REPEAT the self-test. |
| HV9 | **CHECK THE FCV CIRCUIT FOR A SHORT TO VOLTAGE IN THE HARNESS** | |
| | • Key ON, engine OFF.<br>• Measure the voltage between:<br>**( + ) Cooling Fan Clutch Connector, Harness Side:** FCV - Pin 6<br>**( - ):** Ground<br>• **Is any voltage present?** | **Yes**<br>REPAIR the short circuit. CLEAR the DTCs. REPEAT the self-test.<br>**No**<br>GO to **HV19.** |
| HV10 | **CONTINUOUS MEMORY DTCS P0480 OR P0528: INTERMITTENT CHECK** | |
| | **Note:** Keep the coil arm of the cooling fan clutch secure while checking the wiring harness. If the coil arm rotates, faulty readings may occur.<br>• Key ON, engine OFF.<br>• Access the PCM and monitor the FANSS and FANVAR_F PIDs.<br>• While observing the PID wiggle, shake, and bend small sections of the wiring harness while working from the cooling fan clutch to the PCM.<br>• Check the cooling fan clutch and the PCM connectors for damage and corrosion.<br>• **Is a concern present?** | **Yes**<br>ISOLATE the concern and REPAIR as necessary.<br>**No**<br>DISREGARD the current diagnostic trouble code (DTC) at this time. DIAGNOSE the next DTC. GO to DTC Index, Diagnostic Trouble Code (DTC) Charts and Descriptions. |

# Cooling Fan Clutch — HV

| Test Step | Results / Action to Take |
|---|---|
| **HV11 KOEO AND KOER DTC P0528: CHECK THE VOLTAGE AND GROUND TO THE FSS SENSOR** | |
| • Cooling Fan Clutch connector disconnected.<br>• Key ON, engine OFF.<br>• Measure the voltage between:<br>( + ) Cooling Fan Clutch Connector, Harness Side: VBPWR - Pin 2<br>( - ) Cooling Fan Clutch Connector, Harness Side: PWRGND - Pin 5<br>• **Is the voltage greater than 10 V?** | **Yes**<br>GO to **HV15.**<br>**No**<br>GO to **HV12.** |
| **HV12 CHECK THE VOLTAGE TO THE FSS SENSOR** | |
| • Measure the voltage between:<br>( + ) Cooling Fan Clutch Connector, Harness Side: VBPWR - Pin 2<br>( - ): Ground<br>• **Is the voltage greater than 10 V?** | **Yes**<br>GO to **HV14.**<br>**No**<br>GO to **HV13.** |
| **HV13 CHECK THE VOLTAGE CIRCUIT TO THE FSS SENSOR FOR AN OPEN IN THE HARNESS** | |
| • Key in OFF position.<br>• PCM connector disconnected.<br>• Measure the resistance between:<br>( + ) Cooling Fan Clutch Connector, Harness Side: VBPWR - Pin 2<br>( - ) PCM Connector, Harness Side: VBPWR<br>• **Is the resistance less than 5 ohms?** | **Yes**<br>GO to **HV19.**<br>**No**<br>REPAIR the open circuit. CLEAR the DTCs. REPEAT the self-test. |
| **HV14 CHECK THE GROUND CIRCUIT TO THE FSS SENSOR FOR AN OPEN IN THE HARNESS** | |
| • Key in OFF position.<br>• PCM connector disconnected.<br>• Measure the resistance between:<br>( + ) Cooling Fan Clutch Connector, Harness Side: PWRGND - Pin 5<br>( - ) PCM Connector, Harness Side: PWRGND<br>• **Is the resistance less than 5 ohms?** | **Yes**<br>GO to **HV19.**<br>**No**<br>REPAIR the open circuit. CLEAR the DTCs. REPEAT the self-test. |

# Cooling Fan Clutch — HV

| Test Step | Results / Action to Take |
|---|---|
| **HV15 CHECK THE FSS CIRCUIT FOR AN OPEN IN THE HARNESS**<br>• Key in OFF position.<br>• PCM connector disconnected.<br>• Measure the resistance between:<br>( + ) Cooling Fan Clutch Connector, Harness Side: FSS - Pin 4<br>( - ) PCM Connector, Harness Side: FSS<br>• **Is the resistance less than 5 ohms?** | **Yes**<br>GO to **HV16**.<br>**No**<br>REPAIR the open circuit. CLEAR the DTCs. REPEAT the self-test. |
| **HV16 CHECK THE FSS CIRCUIT FOR A SHORT TO GROUND IN THE HARNESS**<br>• Measure the resistance between:<br>( + ) Cooling Fan Clutch Connector, Harness Side: FSS - Pin 4<br>( - ): Ground<br>• **Is the resistance greater than 10K ohms?** | **Yes**<br>GO to **HV17**.<br>**No**<br>REPAIR the short circuit. CLEAR the DTCs. REPEAT the self-test. |
| **HV17 CHECK THE FSS CIRCUIT FOR A SHORT TO VOLTAGE IN THE HARNESS**<br>• Key ON, engine OFF.<br>• Measure the voltage between:<br>( + ) Cooling Fan Clutch Connector, Harness Side: FSS - Pin 4<br>( - ): Ground<br>• **Is any voltage present?** | **Yes**<br>REPAIR the short circuit. CLEAR the DTCs. REPEAT the self-test.<br>**No**<br>GO to **HV18**. |
| **HV18 CHECK THE FUNCTIONALITY OF THE FSS CIRCUIT**<br>• Key in OFF position.<br>• PCM connector connected.<br>• Key ON, engine OFF.<br>• Measure the voltage between:<br>( + ) Cooling Fan Clutch Connector, Harness Side: FSS - Pin 4<br>( - ): Ground<br>• **Is the voltage greater than 10 V?** | **Yes**<br>INSTALL a new cooling fan clutch.<br>CLEAR the DTCs. REPEAT the self-test.<br>**No**<br>GO to **HV19**. |

# Cooling Fan Clutch

# HV

| Test Step | | Results / Action to Take |
|---|---|---|
| HV19 | **CHECK FOR CORRECT PCM OPERATION** | |
| | • Disconnect all the PCM connectors.<br>• Visually inspect for:<br>— pushed out pins<br>— corrosion<br>• Connect all the PCM connectors and make sure they seat correctly.<br>• Carry out the PCM self-test and verify the concern is still present.<br>• **Is the concern still present?** | **Yes**<br>INSTALL a new PCM. REFER to Diagnostic Methods, Flash Electrically Erasable Programmable Read Only Memory (EEPROM), Programming the VID Block for a Replacement PCM.<br>**No**<br>The system is operating correctly at this time. The concern may have been caused by a loose or corroded connector. |