

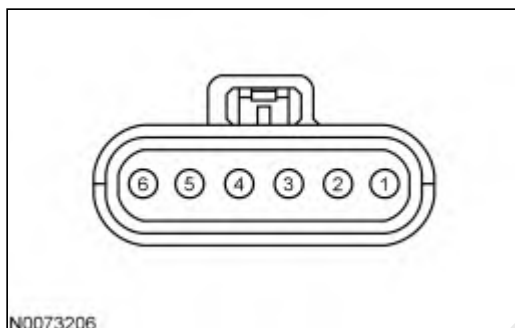
AH: Cooling Fan

⚠ WARNING: Do not operate the engine with the hood open until the fan blade has been examined for possible cracks and separation. A damaged fan can separate during operation. Failure to follow this instruction may result in serious personal injury.

Note: Regeneration may occur during normal operation. During regeneration, diagnostic procedures may display biased values. If a regeneration occurs during diagnostic procedures, allow the process to complete before continuing diagnostics.

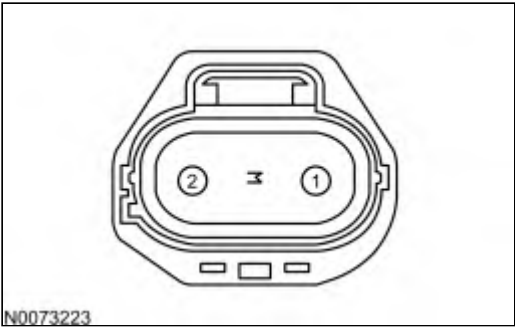
This pinpoint test is intended to diagnose the following:

- cooling fan (8600)
- cooling fan clutch (8A616)
- fan speed sensor (FSS) (8A616)
- fan control (FC1, FC2) relays
- harness circuits
- PCM (12A650)

Cooling Fan Connector

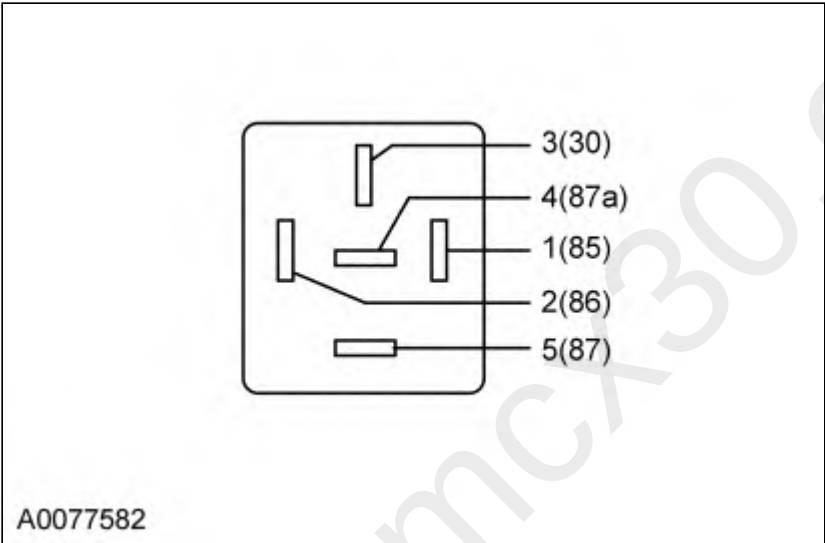
Vehicle	Connector	Pin	Circuit
F-Series Super Duty	A	6 1 4 5 3	FCV VPWR FSS SIGRTN VBPWR
All other vehicles	A	6 1 4 5 2	FCV VPWR FSS GND VBPWR

Cooling Fan Motor 1 Connector



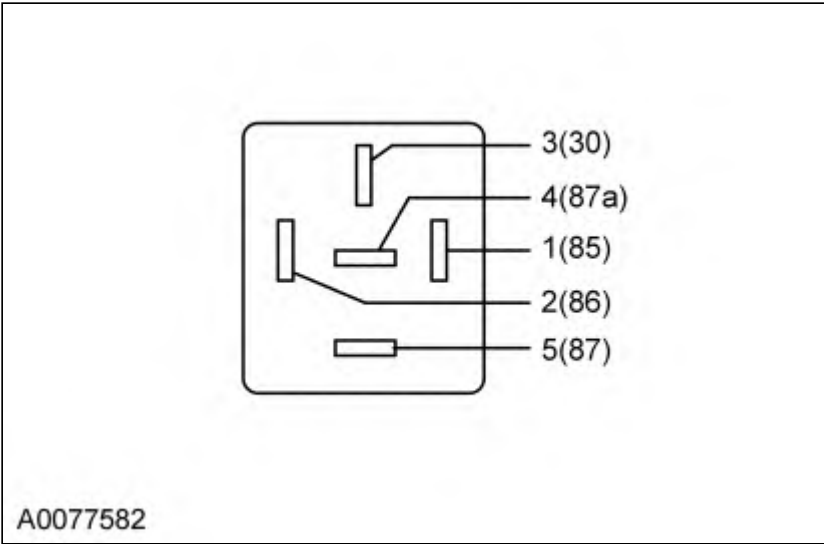
Pin	Circuit
1	GND (Ground)
2	FANPWR (Fan Power)

Fan Control 1 (FC1) Relay Connector



Pin	Circuit
5	FANPWR (Fan Power)
2	LFC (Low Fan Control)
3	B+ (Battery Positive Voltage)
1	VPWR (Vehicle Power)

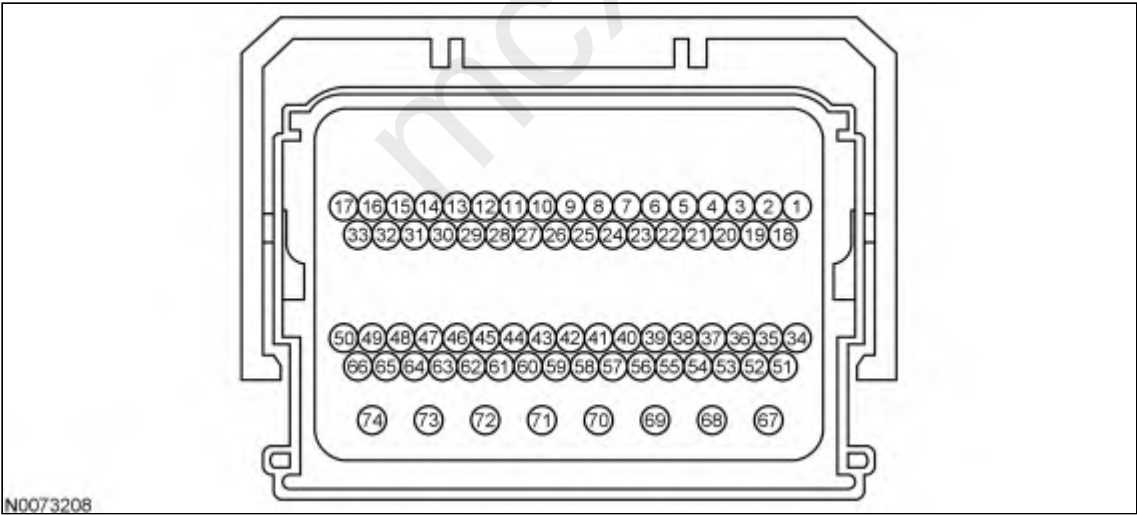
Fan Control 2 (FC2) Relay Connector



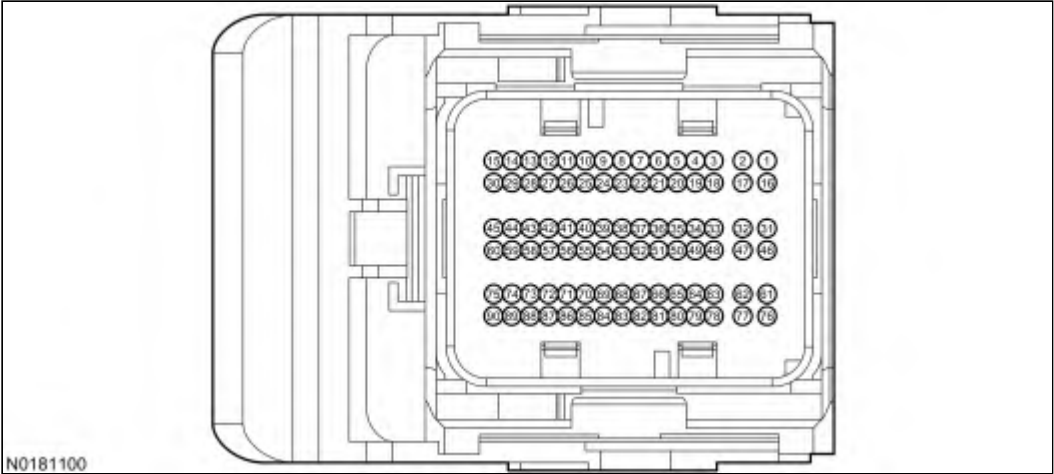
Pin	Circuit
5	FANPWR (Fan Power)
2	HFC (High Fan Control)
3	B+ (Battery Positive Voltage)
1	VPWR (Vehicle Power)

Powertrain Control Module-B (PCM-B) Connector

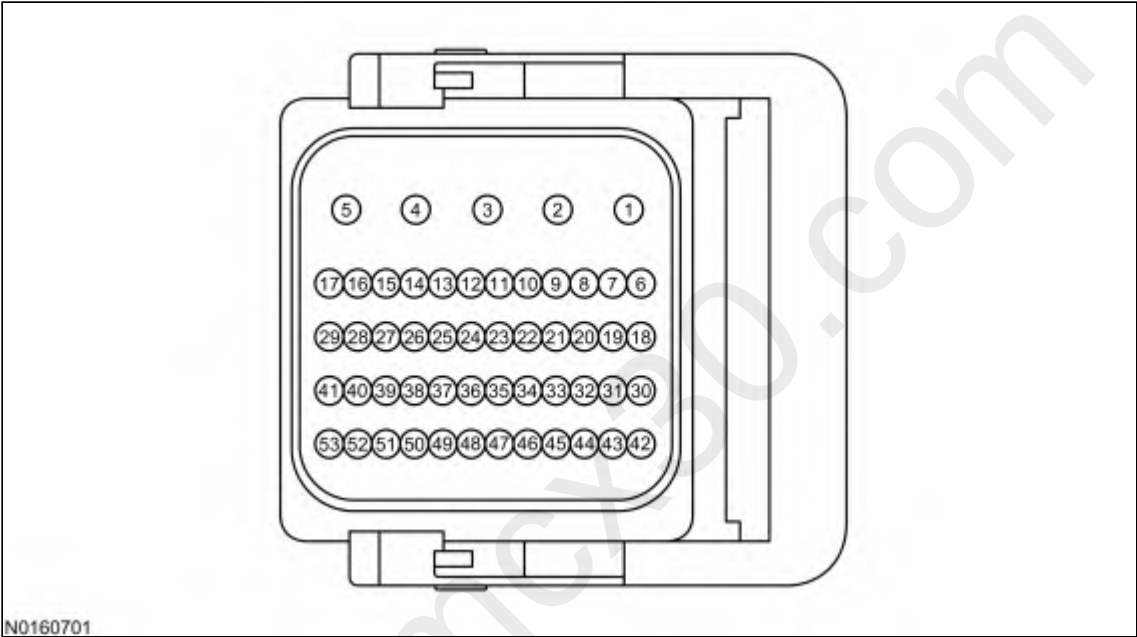
A



B



C



Vehicle	Connector	Pin	Circuit
F-650 / F-750	A	34 12	FCV FSS
F-Series Super Duty	B	70 80 37 1, 38	FCV SIGRTN FSS VBPWR
Transit	C	27 52	HFC LFC
All other vehicles	A	34 12 1	FCV FSS VBPWR

AH1 PRELIMINARY DIAGNOSIS

Are DTCs P0480, P0483, P0494, P0495, P0528, P0529, P0691, P0692, P0693, or P0694 present?

Yes	For Transit with DTCs P0691 or P0692, GO to AH3 . For Transit with DTCs P0693 or P0694, GO to AH8 . F-150, F-650 / F-750 and F-Series Super Duty with DTCs P0483, P0494, P0495, P0528 or P0529, GO to AH18 . For all others, GO to AH27 .
No	For F-150, F-650 / F-750 and F-Series Super Duty symptoms without DTCs, GO to AH18 . For Transit symptoms without DTCs, GO to AH2 . For all others, RETURN to Section 3, Symptom Charts for further direction.

AH2 VERIFY A/C STATUS

- Verify the A/C system is OFF.
- Ignition ON, engine running.
- Access the PCM and monitor the AC_REQ (MODE) PID.

Is A/C being requested?

Yes	REFER to the Workshop Manual Section 412-00, Climate Control System, to diagnose the A/C system.
No	GO to AH3 .

AH3 CHECK THE VOLTAGE TO THE FC1 RELAY

- Ignition OFF.
- FC1 Relay connector disconnected.
- Ignition ON, engine OFF.
- Measure the voltage between:

(+) FC1 Relay Connector, Harness Side	(-)
VPWR - Pin 1	Ground
B+ - Pin 3	Ground

Are the voltages greater than 10.5 V?

Yes	GO to AH4 .
No	REPAIR the open circuit. Clear the PCM DTCs. REPEAT the self-test.

AH4 CHECK FC1 RELAY

- Carry out the Relay Component Test. Refer to Wiring Diagrams Cell 149.

Is a concern present?

Yes	INSTALL a new FC1 relay. Clear the PCM DTCs. REPEAT the self-test.
No	GO to AH5 .

AH5 CHECK THE LFC CIRCUIT FOR AN OPEN

- Ignition OFF.
- PCM-B connector disconnected.

- Measure the resistance between:

(+) FC1 Relay Connector, Harness Side	(-) PCM-B Connector, Harness Side
LFC - Pin 2	LFC

Is the resistance less than 5 ohms?

Yes	GO to AH6 .
No	REPAIR the open circuit. Clear the PCM DTCs. REPEAT the self-test.

AH6 CHECK THE LFC CIRCUIT FOR A SHORT TO GROUND

- Measure the resistance between:

(+) FC1 Relay Connector, Harness Side	(-)
LFC - Pin 2	Ground

Is the resistance greater than 10K ohms?

Yes	GO to AH7 .
No	REPAIR the short circuit. Clear the PCM DTCs. REPEAT the self-test.

AH7 CHECK THE LFC CIRCUIT FOR A SHORT TO VOLTAGE

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

(+) FC1 Relay Connector, Harness Side	(-)
LFC - Pin 2	Ground

Is any voltage present?

Yes	REPAIR the short circuit. Clear the PCM DTCs. REPEAT the self-test.
No	For all others, GO to AH8 .

AH8 CHECK THE VOLTAGE TO THE FC2 RELAY

- Ignition OFF.
- FC2 Relay connector disconnected.
- Ignition ON, engine OFF.
- Measure the voltage between:

(+) FC2 Relay Connector, Harness Side	(-)
VPWR - Pin 1	Ground
B+ - Pin 3	Ground

Are the voltages greater than 10.5 V?

Yes	GO to AH9 .
No	REPAIR the open circuit. Clear the PCM DTCs. REPEAT the self-test.

AH9 CHECK THE FC2 RELAY

- Carry out the Relay Component Test. Refer to Wiring Diagrams Cell 149.

Is a concern present?

Yes	INSTALL a new FC2 relay. Clear the PCM DTCs. REPEAT the self-test.
No	GO to AH10 .

AH10 CHECK THE HFC CIRCUIT FOR AN OPEN

- Ignition OFF.
- PCM-B connector disconnected.
- Measure the resistance between:

(+) FC2 Relay Connector, Harness Side	(-) PCM-B Connector, Harness Side
HFC - Pin 2	HFC

Is the resistance less than 5 ohms?

Yes	GO to AH11 .
No	REPAIR the open circuit. Clear the PCM DTCs. REPEAT the self-test.

AH11 CHECK THE HFC CIRCUIT FOR A SHORT TO GROUND

- Measure the resistance between:

(+) FC2 Relay Connector, Harness Side	(-)
HFC - Pin 2	Ground

Are the resistances greater than 10K ohms?

Yes	GO to AH12 .
No	REPAIR the short circuit. Clear the PCM DTCs. REPEAT the self-test.

AH12 CHECK THE HFC CIRCUIT FOR A SHORT TO VOLTAGE

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

(+) FC2 Relay Connector, Harness Side	(-)

(+) FC2 Relay Connector, Harness Side	(-)
HFC - Pin 2	Ground

Is any voltage present?

Yes	REPAIR the short circuit. Clear the PCM DTCs. REPEAT the self-test.
No	For all others, GO to AH13 .

AH13 CHECK THE FANPWR CIRCUIT FOR AN OPEN

- Ignition OFF.
- Cooling Fan Motor 1 connector disconnected.
- Measure the resistance between:

(+) FC2 Relay Connector, Harness Side	(-) Cooling Fan Motor 1 Connector, Harness Side
FANPWR - Pin 5	FANPWR - Pin 2

- Measure the resistance between:

(+) FC1 Relay Connector, Harness Side	(-) Cooling Fan Motor 1 Connector, Harness Side
FANPWR - Pin 5	FANPWR - Pin 2

Are the resistances less than 5 ohms?

Yes	GO to AH14 .
No	REPAIR the open circuit. Clear the PCM DTCs. REPEAT the self-test.

AH14 CHECK THE FANPWR CIRCUIT FOR A SHORT TO VOLTAGE

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

(+) Cooling Fan Motor 1 Connector, Harness Side	(-)
FANPWR - Pin 2	Ground

Is any voltage present?

Yes	REPAIR the short circuit. Clear the PCM DTCs. REPEAT the self-test.
No	GO to AH15 .

AH15 CHECK GROUND CIRCUITS

- Ignition OFF.
- Measure the resistance between:

(+) Cooling Fan Motor 1 Connector, Harness Side	(-)
GND - Pin 1	Ground

Is the resistance less than 5 ohms?

Yes	GO to AH16 .
No	REPAIR the open circuit. Clear the PCM DTCs. REPEAT the self-test.

AH16 COMMAND THE FANS ON AND CHECK FOR VOLTAGE TO THE COOLING FAN MOTORS

- Ignition OFF.
- PCM-B connector connected.
- FC1 Relay connector connected.
- FC2 Relay connector connected.
- Ignition ON, engine OFF.
- Access the PCM and control the FAN1 (MODE) PID.
- Command the PID ON.
- Measure the voltage between:

(+) Cooling Fan Motor 1 Connector, Harness Side	(-)
FANPWR - Pin 2	Ground

- Record the voltage.
- Command the PID OFF.
- Access the PCM and control the FAN2 (MODE) PID.
- Command the PID ON.
- Measure the voltage between:

(+) Cooling Fan Motor 1 Connector, Harness Side	(-)
FANPWR - Pin 2	Ground

- Record the voltage.

Are the voltages greater than 10.5 V?

Yes	GO to AH17 .
No	GO to Pinpoint Test ZZ .

AH17 CHECK FOR CORRECT FAN OPERATION

- Ignition OFF.
- Cooling Fan Motor 1 connector connected.
- Ignition ON, engine OFF.
- Access the PCM and control the FAN1 (MODE) PID.
- Command the PID ON.
- Check for fan operation.
- Command the PID OFF.
- Access the PCM and control the FAN2 (MODE) PID.
- Command the PID ON.
- Check for fan operation.

Does the fan operate when commanded ON?

Yes	The system is operating correctly at this time. The concern may have been caused by a loose or corroded connector.
No	INSTALL a new Cooling Fan motor. REFER to the Workshop Manual Section 303-03, Engine Cooling, Cooling Fan. Clear the PCM DTCs. REPEAT the self-test.

AH18 CHECK THE FAN SPEED SENSOR FOR VOLTAGE

- Ignition OFF.
- Cooling Fan connector disconnected.
- Ignition ON, engine OFF.
- For F-150,
- Measure the voltage between:

(+) Cooling Fan Connector, Harness Side	(-) Cooling Fan Connector, Harness Side
VBPWR	GND

- For all others,
- Measure the voltage between:

(+) Cooling Fan Connector, Harness Side	(-) Cooling Fan Connector, Harness Side
VBPWR	SIGRTN

Is the voltage greater than 10.5 V?

Yes	GO to AH23 .
No	GO to AH19 .

AH19 CHECK THE VBPWR CIRCUIT FOR VOLTAGE

- Measure the voltage between:

(+) Cooling Fan Connector, Harness Side	(-)
VBPWR	Ground

Is the voltage greater than 10.5 V?

Yes	GO to AH22 .
No	GO to AH20 .

AH20 CHECK THE VBPWR CIRCUIT FOR AN OPEN

- Ignition OFF.
- PCM-B connector disconnected.

- Measure the resistance between:

(+) Cooling Fan Connector, Harness Side	(-) PCM-B Connector, Harness Side
VBPWR	VBPWR

Is the resistance less than 5 ohms?

Yes	GO to AH21 .
No	REPAIR the open circuit. Clear the PCM DTCs. REPEAT the self-test.

AH21 CHECK THE VBPWR CIRCUIT FOR A SHORT TO GROUND

- Measure the resistance between:

(+) Cooling Fan Connector, Harness Side	(-)
VBPWR	Ground

Is the resistance greater than 10K ohms?

Yes	For DTC P0494 or cooling fan always on, GO to AH33 . For DTC P0495 or cooling fan does not run, GO to AH34 . For all others, GO to Pinpoint Test ZZ .
No	REPAIR the short circuit. Clear the PCM DTCs. REPEAT the self-test.

AH22 CHECK THE GND AND SIGRTN CIRCUITS FOR AN OPEN

- Ignition OFF.
- For F-150,
- Measure the resistance between:

(+) Cooling Fan Connector, Harness Side	(-)
GND	Ground

- For all others,
- Measure the resistance between:

(+) Cooling Fan Connector, Harness Side	(-)
SIGRTN	Ground

Is the resistance less than 5 ohms?

Yes	For DTC P0494 or cooling fan always on, GO to AH33 . For DTC P0495 or cooling fan does not run, GO to AH34 . For all others, GO to Pinpoint Test ZZ .

No	REPAIR the open circuit. Clear the PCM DTCs. REPEAT the self-test.
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AH23 CHECK THE FAN SPEED SENSOR SIGNAL AND SIGRTN CIRCUITS FOR AN OPEN

- Ignition OFF.
- PCM-B connector disconnected.
- For F-150,
- Measure the resistance between:

(+) Cooling Fan Connector, Harness Side	(-) PCM-B Connector, Harness Side
FSS	FSS

- For all others,
- Measure the resistance between:

(+) Cooling Fan Connector, Harness Side	(-) PCM-B Connector, Harness Side
FSS	FSS
SIGRTN	SIGRTN

Are the resistances less than 5 ohms?

Yes	GO to AH24 .
No	REPAIR the open circuit. Clear the PCM DTCs. REPEAT the self-test.

AH24 CHECK THE SIGNAL AND SIGRTN CIRCUITS FOR A SHORT TO GROUND

- For F-150,
- Measure the resistance between:

(+) Cooling Fan Connector, Harness Side	(-)
FSS	Ground

- For all others,
- Measure the resistance between:

(+) Cooling Fan Connector, Harness Side	(-)
FSS	Ground
SIGRTN	Ground

Are the resistances greater than 10 ohms?

Yes	GO to AH25 .
No	REPAIR the short circuit. Clear the PCM DTCs. REPEAT the self-test.

AH25 CHECK THE SIGNAL AND SIGRTNCIRCUITS FOR A SHORT TO VOLTAGE

- Ignition ON, engine OFF.
- For F-150,
- Measure the voltage between:

(+) Cooling Fan Connector, Harness Side	(-)
FSS	Ground

- For all others,
- Measure the voltage between:

(+) Cooling Fan Connector, Harness Side	(-)
FSS	Ground
SIGRTN	Ground

Is any voltage present?

Yes	REPAIR the short circuit. Clear the PCM DTCs. REPEAT the self-test.
No	GO to AH26 .

AH26 CHECK THE SIGNAL CIRCUIT FOR VOLTAGE

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

(+) Cooling Fan Connector, Harness Side	(-)
FSS	Ground

Is the voltage greater than 10.5 V?

Yes	For DTC P0494 or cooling fan always on, GO to AH33 . For DTC P0495 or cooling fan does not run. GO to AH34 . For all others, GO to Pinpoint Test RD .
No	GO to AH35 .

AH27 CHECK THE VPWR CIRCUIT FOR VOLTAGE

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

(+) Cooling Fan Connector, Harness Side	(-)
VPWR	Ground

Is the voltage greater than 10.5 V?

Yes	GO to AH28 .
No	REPAIR the open circuit. Clear the PCM DTCs. REPEAT the self-test.

AH28 CHECK THE FCV CIRCUIT FOR AN OPEN CIRCUIT

- Ignition OFF.
- PCM-B connector disconnected.
- Measure the resistance between:

(+) Cooling Fan Connector, Harness Side	(-) PCM-B Connector, Harness Side
FCV	FCV

Is the resistance less than 5 ohms?

Yes	GO to AH29 .
No	REPAIR the open circuit. Clear the PCM DTCs. REPEAT the self-test.

AH29 CHECK THE FCV CIRCUIT FOR A SHORT TO GROUND

- Measure the resistance between:

(+) Cooling Fan Connector, Harness Side	(-)
FCV	Ground

Is the resistance greater than 10K ohms?

Yes	GO to AH30 .
No	REPAIR the short circuit. Clear the PCM DTCs. REPEAT the self-test.

AH30 CHECK THE FCV CIRCUIT FOR A SHORT TO VOLTAGE

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

(+) Cooling Fan Connector, Harness Side	(-)
FCV	Ground

Is any voltage present?

Yes	REPAIR the short circuit. Clear the PCM DTCs. REPEAT the self-test.
No	GO to AH31 .

AH31 CHECK THE COOLING FAN RESISTANCE

- Ignition OFF.
- Cooling Fan connector disconnected.
- Measure the resistance between:

(+) Cooling Fan Connector, Component Side	(-) Cooling Fan Connector, Component Side
VPWR	FCV

Is the resistance between 9 - 14 ohms?

Yes	GO to AH32 .
No	INSTALL a new Cooling Fan. REFER to the Workshop Manual Section 303-03, Engine Cooling, Cooling Fan. Clear the PCM DTCs. REPEAT the self-test.

AH32 CHECK THE FCV CIRCUIT FOR AN INTERNAL SHORT TO GROUND

- Measure the resistance between:

(+) Cooling Fan Connector, Component Side	(-)
FCV	Ground

Is the resistance greater than 10K ohms?

Yes	GO to Pinpoint Test ZZ .
No	INSTALL a new Cooling Fan. REFER to the Workshop Manual Section 303-03, Engine Cooling, Cooling Fan. Clear the PCM DTCs. REPEAT the self-test.

AH33 CHECK THE COOLING FAN OPERATION

- Ignition ON, engine running.
- Access the PCM and monitor the FANSS (RPM) and RPM (RPM) PIDs.
- Engine at normal operating temperature.
- Access the PCM and control the RPM_DSD (RPM) PID.
- Increase and maintain the engine speed to 2,500 RPM.
- Access the PCM and control the FANDC (PER) PID.
- Command the cooling fan duty cycle to 0%.
- Allow the fan speed to stabilize below 600 RPM.

Does the fan speed stabilize less than 600 RPMs before two minutes?

Yes	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.
No	INSTALL a new Cooling Fan Clutch. REFER to the Workshop Manual Section 303-03, Engine Cooling, Cooling Fan. Clear the PCM DTCs. REPEAT the self-test.

AH34 CHECK COOLING FAN OPERATION

- Ignition ON, engine running.
- Access the PCM and monitor the FANSS (RPM) and RPM (RPM) PIDs.
- Engine at normal operating temperature.
- Access the PCM and control the RPM_DSD (RPM) PID.
- Increase and maintain the engine speed to 2,500 RPM.
- Access the PCM and control the FANDC (PER) PID.
- Command the cooling fan duty cycle to 70%.
- Allow the fan speed to stabilize above 2,800 RPM.

Is the fan speed greater than 2,800 RPMs and less than 3,600 RPMs within 30 seconds?

Yes	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.
No	INSTALL a new Cooling Fan Clutch. REFER to the Workshop Manual Section 303-03, Engine Cooling, Cooling Fan. Clear the PCM DTCs. REPEAT the self-test.

AH35 CHECK FOR CORRECT PCM OPERATION

- Disconnect all 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.
- Verify the concern is still present.

Is the concern still present?

Yes	INSTALL a new PCM. REFER to Section 2, Flash Electrically Erasable Programmable Read Only Memory (EEPROM).
No	The system is operating correctly at this time. The concern may have been caused by a loose or corroded connector.