

ENGINE COOLING - V8 N/A 5.0L PETROL/V8 S/C 5.0L PETROL

DIAGNOSIS AND TESTING

PRINCIPLES OF OPERATION

For a detailed description of the Engine Cooling system, refer to the relevant Description and Operation section in the workshop manual. REFER to: Engine Cooling (303-03C, Description and Operation).

INSPECTION AND VERIFICATION



WARNING:

DO NOT remove the coolant expansion tank cap when the engine is hot. Failure to follow this instruction may result in personal injury.



CAUTION:

Diagnosis by substitution from a donor vehicle is **NOT** acceptable. Substitution of control modules does not guarantee confirmation of a fault, and may also cause additional faults in the vehicle being tested and/or the donor vehicle.



NOTES:

- If a control module or a component is suspect and the vehicle remains under manufacturer warranty, refer to the Warranty Policy and Procedures manual, or determine if any prior approval programme is in operation, prior to the installation of a new module/component.
- When performing voltage or resistance tests, always use a digital multimeter accurate to three decimal places, and with an up-to-date calibration certificate. When testing resistance always take the resistance of the digital multimeter leads into account.
- Check and rectify basic faults before beginning diagnostic routines involving pinpoint tests.

1. Verify the customer concern

1. Visually inspect for obvious signs of damage and system integrity

MECHANICAL	ELECTRICAL
<ul style="list-style-type: none"> ▪ Coolant leaks ▪ Coolant hoses ▪ Coolant expansion tank ▪ Coolant expansion tank cap ▪ Radiator ▪ Heater core ▪ Accessory drive belt ▪ Cooling fan 	<ul style="list-style-type: none"> ▪ Fuses ▪ Wiring harnesses and connectors ▪ Powertrain control module ▪ Engine coolant temperature sensor ▪ Radiator outlet temperature sensor ▪ Cooling fan



1. If an obvious cause for an observed or reported concern is found, correct the cause (if possible) before proceeding to the next step

1. If the cause is not visually evident, verify the symptom and refer to the Symptom Chart, alternatively check for Diagnostic Trouble Codes (DTCs) and refer to the DTC Index

1. Check DDW for open campaigns. Refer to the corresponding bulletins and SSMs which may be valid for the specific customer complaint and carry out the recommendations as required

SYMPTOM CHART



SYMPTOM	POSSIBLE CAUSES	ACTION
Coolant loss	<ul style="list-style-type: none"> ▪ Coolant leak <ul style="list-style-type: none"> ▪ Coolant hose damaged ▪ Coolant hose clamp loose /damaged ▪ Radiator leaking/damaged ▪ Coolant pump seal failed ▪ Heater core leaking /damaged ▪ Seal/gasket leaking ▪ Engine casting leaking ▪ Engine core plugs leaking 	<ul style="list-style-type: none"> ▪ Check for coolant leaks. Perform a cooling system pressure test. Rectify as necessary
Overheating	<ul style="list-style-type: none"> ▪ Coolant level low ▪ Coolant contaminated ▪ Coolant leak ▪ Thermostat stuck closed ▪ Radiator airflow obstructed ▪ Cooling fan inoperative 	<ul style="list-style-type: none"> ▪ Check the coolant level. Rectify as necessary ▪ Check the condition of the coolant. Rectify as necessary ▪ Check for coolant leaks. Perform a cooling system pressure test. Rectify as necessary ▪ Check the operation of the thermostat. Rectify as necessary ▪ Check the radiator for obstructions. Rectify as necessary ▪ Check the operation of the cooling fan. GO to Pinpoint Test A.

Engine not reaching normal temperature	<ul style="list-style-type: none"> Thermostat stuck open 	<ul style="list-style-type: none"> Check the operation of the thermostat. Rectify as necessary
Cooling fan operating at maximum speed - Engine not running	<div style="border: 1px solid black; background-color: #e0f2f1; padding: 5px; margin-bottom: 10px;">  NOTE: Circuit reference - PWM - </div> <ul style="list-style-type: none"> Cooling fan control module PWM signal circuit short circuit to ground, short circuit to power, open circuit, high resistance 	<ul style="list-style-type: none"> Refer to the electrical circuit diagrams and check the cooling fan control module PWM signal circuit for short circuit to ground, short circuit to power, open circuit, high resistance. Repair the wiring harness as necessary
Cooling fan is stationary - Engine running	<div style="border: 1px solid black; background-color: #e0f2f1; padding: 5px; margin-bottom: 10px;">  NOTE: Circuit reference - IGN - </div> <ul style="list-style-type: none"> Cooling fan control module ignition signal circuit short circuit to ground, short circuit to power, open circuit, high resistance 	<ul style="list-style-type: none"> Refer to the electrical circuit diagrams and check the cooling fan control module ignition signal circuit for short circuit to ground, short circuit to power, open circuit, high resistance. Repair the wiring harness as necessary

PINPOINT TESTS

PINPOINT TEST A : COOLING FAN TESTS

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
A1: CHECK FOR COOLING FAN RELATED DTCS	
	<p>1 Using the manufacturer approved diagnostic system, check the powertrain control module for the following cooling fan related DTCS (with any third byte):</p> <ul style="list-style-type: none"> P0480 Fan 1 Control Circuit P0481 Fan 2 Control Circuit P0483 Fan Rationality Check
	<p>Are any cooling fan related DTCS set in the powertrain control module?</p> <p>Yes Refer to the powertrain control module DTC index and perform the relevant corrective action. GO to A9 .</p> <p>No GO to A2 .</p>
A2: CHECK FOR OTHER DTCS	
	<p>1 Using the manufacturer approved diagnostic system check the powertrain control module for DTCS</p>
	<p>Are any other DTCS set in the powertrain control module?</p> <p>Yes Refer to the powertrain control module DTC index and perform the relevant corrective action</p> <p>No GO to A3 .</p>
A3: COOLING FAN IS OPERATING PERMANENTLY	

	<p>1 Check the operation of the cooling fan</p>
	<p>Is the cooling fan operating permanently at maximum speed?</p> <p>Yes GO to A5 .</p> <p>No GO to A4 .</p>
A4: COOLING FAN IS NOT OPERATING	
	<p>1 Check the operation of the cooling fan</p>
	<p>Is the cooling fan inoperative?</p> <p>Yes GO to A6 .</p> <p>No No fault found. Verify customer concern of cooling fan operation</p>
A5: COOLING FAN IS OPERATING PERMANENTLY	
<p> WARNING:</p>	
<p>Moving parts can cause severe injury, keep clear of moving parts, never place your hands or any part of your body near to moving parts.</p>	
	<p>1 Using the manufacturer approved diagnostic system, check datalogger signal - Electric Fan PWM Control Commanded (0x03F9)</p>
	<p>Is the datalogger signal value between 5% and 16% whilst the cooling fan is operating?</p> <p>Yes GO to A8 .</p> <p>No GO to A6 .</p>
A6: COOLING FAN IS NOT OPERATING	
<p> CAUTION:</p>	
<p>Ensure hood is closed and there are not any loose objects in front of the vehicle.</p>	
	<p>1 Using the manufacturer approved diagnostic system, set datalogger signal - Electric Fan PWM Control Commanded (0x03F9) - to 30% (using output state control)</p>
	<p>Does the cooling fan operate?</p> <p>Yes GO to A7 .</p> <p>No GO to A8 .</p>
A7: ELECTRIC FAN PWM CONTROL	
	<p>1 Using the manufacturer approved diagnostic system, set datalogger signal - Electric Fan PWM Control Commanded (0x03F9) - to 90% (using output state control)</p>
	<p>Did the cooling fan speed increase?</p> <p>Yes No fault found. Verify customer concern of cooling fan operation. GO to A9 .</p> <p>No GO to A8 .</p>
A8: WIRING CHECK	
	<p>1 Refer to the electrical circuit diagrams and check the cooling fan motor control module circuits for short circuit to ground, short circuit to power, open circuit, high resistance</p>

Were any circuit faults present?

Yes

Repair the wiring harness as necessary. [GO to A9](#) .

No

[GO to A9](#) .

A9: COOLING FAN VALIDATION PROCEDURE

	1 Ensure that the hood is closed
	2 Start the engine
	3 Set the air conditioning to on, set the temperature to cold and the fan speed to fast
	4 Allow the engine to reach normal operating temperature (approximately 90°C)
	5 Using the manufacturer approved diagnostic system, check datalogger signals - Engine Coolant Temperature (0xF405) - and - Electric Fan PWM Control Commanded (0x03F9). As the engine coolant temperature reaches normal operating temperature, the fan speed should increase between the values of 9% and 90%
	Did the cooling fan speed increase speed as engine coolant temperature increased? Yes Return vehicle to customer No Contact Dealer Technical Support

DTC INDEX

For a list of Diagnostic Trouble Codes (DTCs) that could be logged on this vehicle, please refer to Section 100-00. REFER to: Diagnostic Trouble Code (DTC) Index - V8 S/C 5.0L Petrol, DTC: Engine Control Module (ECM) (100-00 General Information, Description and Operation).