



Volvo Chassis - Volvo Engine US04 D16D (ONLY) MID186 Actively Pressurized Cooling System (APCS) Codes And Diagnostic Information



> Internal Content

For more information on the Volvo Engine US04 D16D (ONLY) MID186 APCS Code and Diagnostic information click [here](#).



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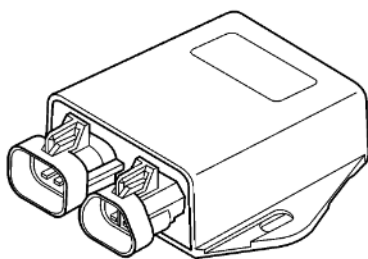
to help improve the content of this article

This Service Bulletin replaces Service Bulletin 262-38, "MID 186 (APCS) Fault Codes" (10.2005), publication number PV776-20035930.

Date	Group	No.	Page
7.2006	262	38	1(32)

MID 186 (APCS) Fault Codes
D16D

MID 186 (APCS) Fault Codes



W2005093

This information covers MID 186 fault codes for the Actively Pressurized Coolant System (APCS) on the Volvo D16D engine.

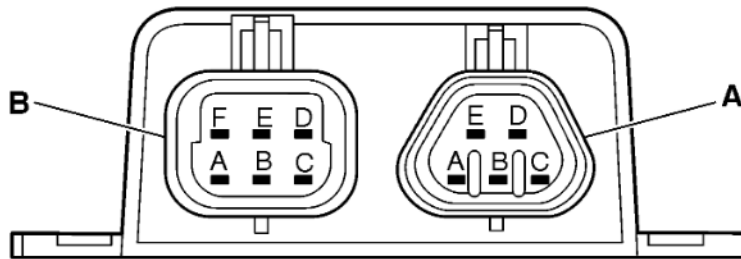
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Note: Information is subject to change without notice.
Illustrations are used for reference only and may differ slightly from the actual vehicle being serviced. However, key components addressed in this information are represented as accurately as possible.

Actively Pressurized Coolant System (APCS)

Signal Indication



W2005252

APCS, Signal Indication

Connection between the Control Unit and the Breakout Harness



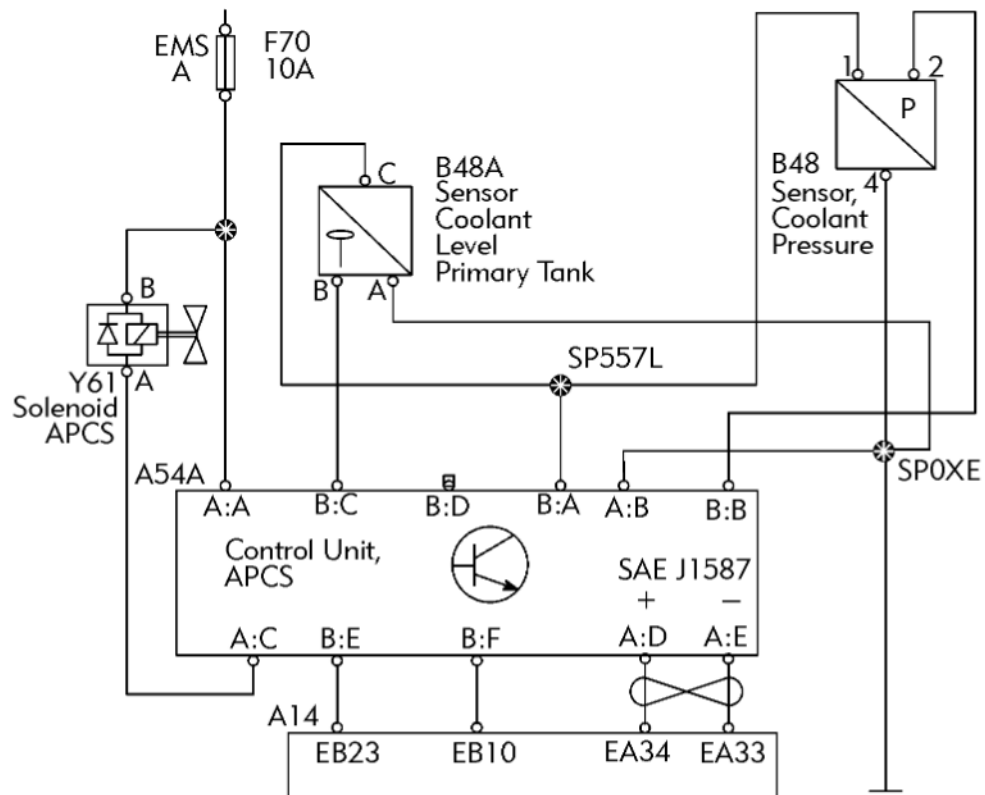
CAUTION

Connect only one connector at a time when checking signal values with special tool 88890023. If more than one connector is connected at a time damage to the electrical system or control unit is possible.

Terminal	Signal Type	Measurement Points	Nominal Value	Other
AA	Power Supply	AA - AB	$V \approx B+$	
AB	Ground	AB - Chassis	$R \approx 0 \Omega$	
AC	APCS Solenoid Control Output	AC - AA	Inactive - $V \approx B+$ Active - $V \approx 0V$	
AD	J1587 Data (+)	AD - AB	$V \approx 0 - 5V$	
AE	J1587 Data (-)	AE - AB	$V \approx 0 - 5V$	
BA	Sensor Supply Voltage	BA - Ground	$V \approx 5V$	
BB	Coolant Pressure, Input Signal	BB - Ground	$V \approx 0.5 - 5V$	
BC	Coolant Level, Input Signal	BC - Ground	$V \approx 0.5 - 5V$	
BD	Not used			
BE	Low Coolant, Output Normally Open	BE - BF	$V \approx 80\% B+$ (Level OK) $V \approx 0V$ (Level Low)	Open Closed
BF	Low Coolant, Output Common	BF - Ground	$R \approx 0 \Omega$	

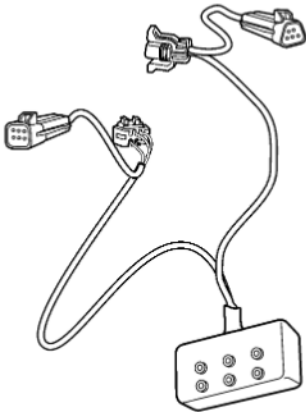
Note: Connector A = White 5 Pin
Connector B = Black 6 Pin

MID 186 (APCS) Schematic



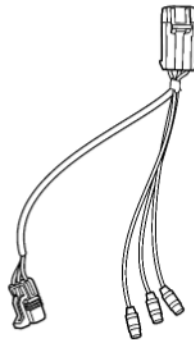
W2005043

Special tools



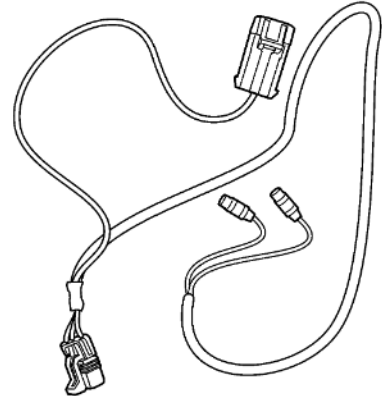
88890023

APCS Breakout Harness



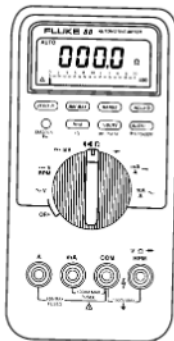
J42589

Coolant Level Sensor



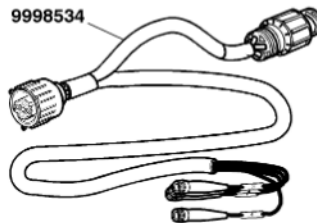
J43147

Solenoid Adapter Harness



J39200

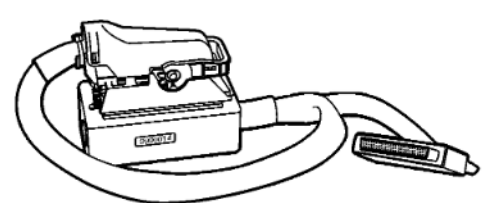
Multimeter



9998534

9998534

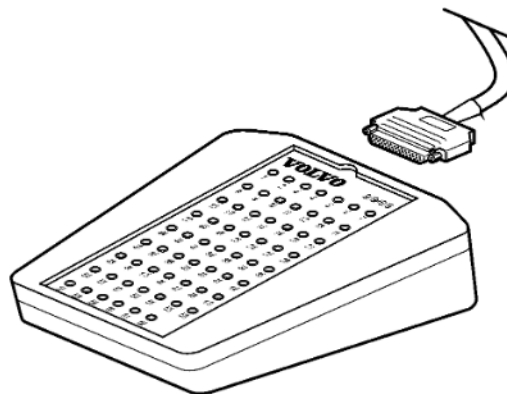
Pressure Sensor Adapter Harness



W0002091

9990014

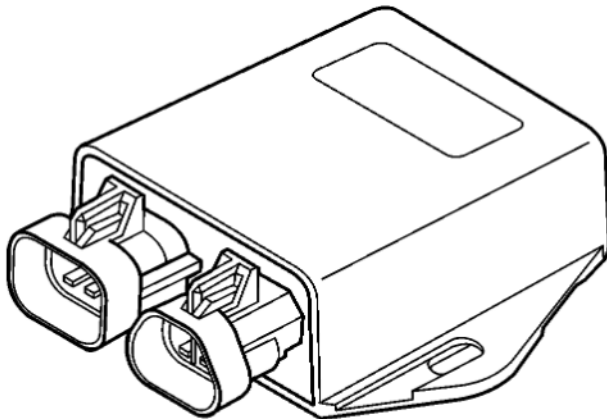
62-pin Cable Adapter



9998699

Measurement box 62-unit

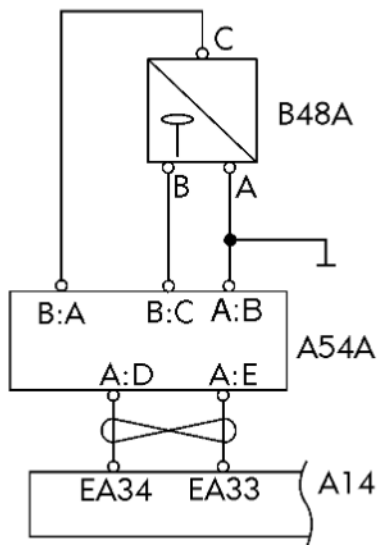
Actively Pressurized Coolant System (APCS)



W2005093

The purpose of the Actively Pressurized Cooling System (APCS) is to monitor critical parameters such as coolant level, pressure and temperature and to control the pressurization solenoid of the cooling system expansion tank. The APCS Control Unit can also pressurize the system to a specified level upon receiving a command from the Volvo service tool (VCADS Pro). It also has the ability to detect system malfunctions and alert the vehicle operator by means of messages communicated on the serial data network (SAE J1587).

MID 186 PSID 1 Coolant Level Sensor



W2005097

General Information

The coolant level is monitored via a level sensor located in the expansion tank. Three levels are monitored by the system, normal, low and critically low. The fault will become active for either of the following reasons:

- Voltage on terminal B:C is more than 5v or less than 0.5v
- Open circuit on either B:A or B:C

Component: Control Unit APCS (A54A), Coolant level sensor (B48A), Engine Control Unit (A14)

Normal signal - $V \approx 0.75$ to $1.75v$

Low signal - $V \approx 2.0$ to $3.0v$

Critically low signal - $V \approx 3.25$ to $4.25v$

PSID 1 FMI 3

Short Circuit to Higher Voltage

Condition for the fault:

- Voltage at pin B:C is more than 5 volts.

Possible reason:

- Short circuit to B+, signal wire.
- Short circuit to 5 volt, signal wire.
- Open circuit, ground wire.
- Fault in coolant level sensor.
- Fault in APCS ECU.

Reaction from APCS ECU:

- Fault code set.
- Yellow lamp requested.

Noticeable external symptom:

- Yellow lamp lights up.

PSID 1 FMI 4

Short circuit to ground

Condition for the fault:

- Voltage at pin B:C is less than 0.5 volts.

Possible reason:

- Short circuit to ground, signal wire.
- Fault in coolant level sensor.
- Fault in APCS ECU.

Reaction from APCS ECU:

- Fault code set.
- Yellow lamp requested.

Noticeable external symptom:

- Yellow lamp lights up.

PSID 1 FMI 5

Open circuit

Condition for the fault:

- Open circuit on the coolant level circuit.

Possible reason:

- Open circuit, signal wire.
- Open circuit, 5 volt supply wire.
- Fault in coolant level sensor.
- Fault in APCS ECU.

Reaction from APCS ECU:

- Fault code set.
- Yellow lamp requested.

Noticeable external symptom:

- Yellow lamp lights up.

2600-21-03-01 MID 186 PSID 1 Coolant Level Sensor, Check

Special tools: 88890023, J-39200

Other special equipment: J-42589

Suitable tests in VCADS Pro

- Fault codes
- Actively Pressurized Cooling System Function Test

Measurement at Control Unit

Conditions:

- Breakout harness 88890023 connected between the control unit "B" connector and the electrical harness.
- Voltage measurement with multimeter J-39200.
- Key switch in drive position.

Measurement Points	Nominal Value	Comments
B:C - Ground	V $\approx$ 0.5 - 5v	
B:A - Ground	V $\approx$ 5v	

Measurement at Component

Conditions:

- Breakout harness J-42589 connected between the coolant level sensor and the electrical harness.
- Voltage measurement with multimeter J-39200.
- Key switch in drive position.

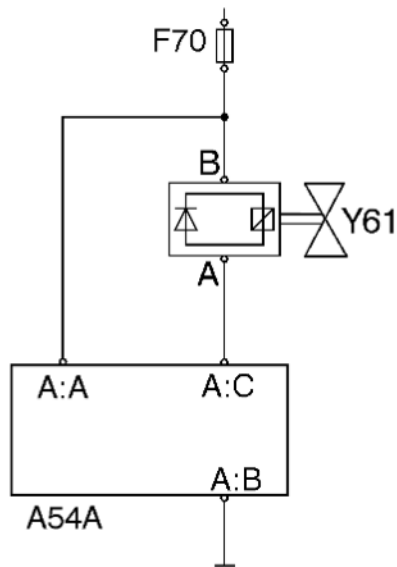
Measurement Points	Nominal Value	Comments
B - A	V $\approx$ 0.5 - 5v	
C - A	V $\approx$ 5v	

Conditions:

- Breakout harness J-42589 connected between the coolant level sensor and the electrical harness.
- Resistance measurement with multimeter J-39200.
- Key switch in off position.

A - Ground	R $\approx$ 0 Ω	
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MID 186 PSID 3 APCS Solenoid Valve



W2005089

General Information

The APCS control unit interprets coolant pressure and coolant temperature to command the normally closed solenoid to pressurize the cooling system. The solenoid, when grounded from the APCS control unit, will energize and then pressurize the cooling system.

The fault will become active for either of the following reasons:

- Terminal A:C connected to battery voltage when not active
- Terminal A:C connected to ground when not active
- The air solenoid's coil is open

Component: Control Unit APCS (A54A), APCS air solenoid (Y61)

PSID 3 FMI 3

Short circuit to higher voltage

Condition for the fault:

- Voltage at pin A:C is shorted to B+ (output activated).

Possible reason:

- Short circuit to B+, control wire between APCS ECU and solenoid.
- Short-circuited air solenoid.
- Fault in APCS ECU.

PSID 3 FMI 4

Short circuit to ground:

Condition for the fault:

- Short circuit to ground
- Short circuit to ground on A:C (control wire output)

Possible reason:

- Short circuit to ground, control wire between APCS ECU and solenoid.
- Short circuit to ground, air solenoid.
- Fault in APCS ECU.

Reaction from APCS ECU:

- Fault code set.
- APCS will not function while faults are active, but coolant level function will still work.

Noticeable external symptom:

- Too much pressure in cooling system, relief valve leaking air.

PSID 3 FMI 5

Open circuit

Condition for the fault:

- Open circuit in the air solenoid circuit.

Possible reason:

- Open circuit, control wire between APCS ECU and solenoid.
- Open circuit in the air solenoid.
- Fault in APCS ECU.

Reaction from APCS ECU:

- Fault code set.

Noticeable external symptom:

- Expansion tank/cooling system will not be pressurized, but coolant level function not affected.

PSID 3 FMI 7

Mechanical fault

Condition for the fault:

- Mechanical failure of solenoid.
- Expansion tank does not reached expected pressure within 5 seconds.

Possible reason:

- Open airline, airline not connected.
- Mechanical fault in solenoid.
- Leak in airline or expansion tank

Reaction from APCS ECU:

- Fault code logged.

Noticeable external symptom:

- APCS does not function while fault is active.

2600-21-03-02 MID 186 PSID 3 APCS Solenoid Valve, Check

Special tools: 88890023, J-39200
Other special equipment: J-43147

Suitable tests in VCADS Pro

- Fault codes
- Actively Pressurized Cooling System Function Test

Measurement at Control Unit

Conditions:

- Breakout harness 88890023 connected between the control unit "B" connector and the electrical harness.
- Voltage measurement with multimeter J-39200.
- Key switch in drive position.

Measurement Points	Nominal Value	Comments
B:C - Ground	$V \approx 0.5 - 5v$	
B:A - Ground	$V \approx 5v$	

Measurement at Component

Conditions 1:

- Breakout harness 88890023 connected between the control unit "A" connector and the electrical harness
- Voltage measurement with multimeter J-39200
- Key switch in drive position

Measurement Points	Nominal Value	Comments
A:C - A:A	$V \approx B+$	Inactive
A:C - A:A	$V \approx 0v$	Active
A:C - Ground	$V \approx 0v$	

Conditions 2:

- Breakout harness 88890023 connected between the control unit "A" connector and the electrical harness
- Voltage measurement with multimeter J-39200
- Key switch in drive position

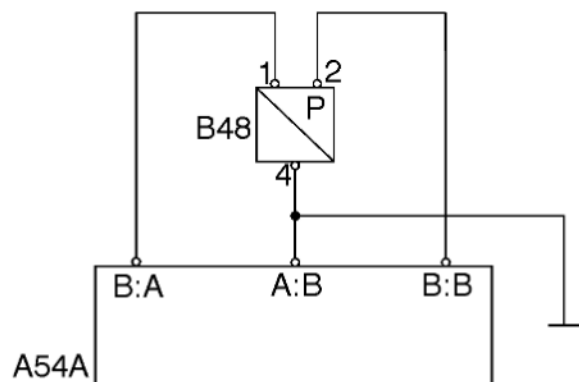
Measurement Points	Nominal Value	Comments
A:C - Ground	$R \approx \infty \Omega$	

Measurement at Component:

- Breakout harness J-43147 connected between the APCS Air Solenoid and the electrical harness
- Voltage measurement with multimeter J-39200
- Key switch in drive position

Measurement Points	Nominal Value	Comments
A - B	V ≈ B+	Inactive
A - B	V ≈ 0V	Active

MID 186 PSID 4 APCS Pressure Sensor



W2005098

General Information

The APCS Pressure sensor measures absolute pressure in the expansion tank. The fault will become active for either of the following reasons:

- Voltage on terminal B:B is more than 5v or less than 0.5V
- Open circuit on either B:A or B:B

Component: Control Unit APCS (A54A), APCS Pressure Sensor (B48)

PSID 4 FMI 3

Short circuit to higher voltage

Condition for the fault:

- Voltage at pin B:B is more than 5 volts.

Possible reason:

- Short circuit to B+, signal wire.
- Short circuit to 5 volt, signal wire.
- Open circuit, ground wire.
- Fault in pressure sensor.
- Fault in APCS ECU.

Reaction from APCS ECU:

- Fault code set.

Noticeable external symptom:

- Expansion tank not pressurized.

PSID 4 FMI 4

Short circuit to ground

Condition for the fault:

- Voltage at pin B:B is less than 0.5 volts.

Possible reason:

- Short circuit to ground, signal wire.
- Fault in pressure sensor.
- Fault in APCS ECU.

Reaction from APCS ECU:

- Fault code set.

Noticeable external symptom:

- Expansion tank not pressurized when fault is active.

PSID 4 FMI 5

Open circuit

Short circuit to ground

Condition for the fault:

- Open circuit on the coolant pressure sensor circuit.

Possible reason:

- Open circuit, signal wire.
- Open circuit, 5 volt supply wire.
- Fault in pressure sensor.
- Fault in APCS ECU.
- Supply and delivery port airlines switched on solenoid.

Reaction from EECU:

- Fault code set.

Noticeable external symptom:

- Expansion tank not pressurized.

2600-21-03-03

MID 186 PSID 4 APCS Pressure Sensor, Check

Special tools: 88890023, J-39200

Other special equipment: 9998534

Suitable tests in VCADS Pro

- Fault codes
- Actively Pressurized Cooling System Function Test

Measurement at Control Unit

Conditions:



CAUTION

Connect only one connector at a time when checking signal values with special tool 88890023. If more than one connector is connected at a time damage to the electrical system or control unit is possible.

- Breakout harness 88890023 connected between the control unit "B" connector and the electrical harness.
- Voltage measurement with multimeter J-39200.
- Key switch in drive position.

Measurement Points	Nominal Value	Comments
B:A - Ground	V $\approx$ 5v	5V Supply Voltage
B:B - Ground	V $\approx$ 0.5 - 4.5v	Signal Voltage

Measurement at Component

Conditions 1:

- Breakout harness 9998534 connected between the pressure sensor and the electrical harness
- Voltage measurement with multimeter J-39200
- Key switch in drive position

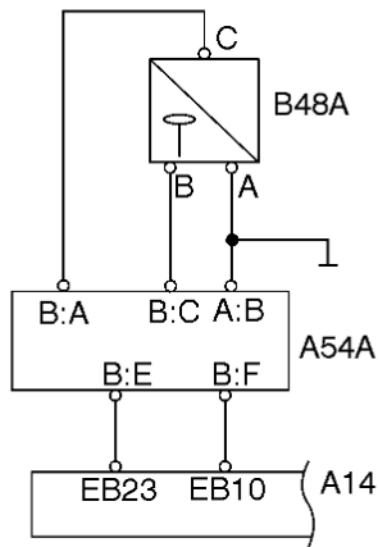
Measurement Points	Nominal Value	Comments
1 - 4	V $\approx$ 5V	5V Supply Voltage
2 - 4	V $\approx$ 0.5 - 4.5v	Signal Voltage

Conditions 2:

- Breakout harness 9998534 connected between the pressure sensor and the electrical harness
- Voltage measurement with multimeter J-39200
- Key switch in drive position

Measurement Points	Nominal Value	Comments
4 - ground	R $\approx$ 0 Ω	

MID 186 PSID 5 Coolant Level Output



W2005090

General Information

If the coolant level becomes either low or critically low, a switch inside the APCS control unit closes and the output to the engine ECU becomes active. The engine protection feature will become enabled and controlled by the engine until the coolant level returns to a normal level.

The fault will become active for either of the following reasons:

- Battery voltage on terminal B:F when the circuit is not active
- Open circuit on terminal B:F to EB:10

Component: Control Unit APCS (A54A), Engine ECU (A14)

PSID 5 FMI 3

Condition for fault code:

- Terminal B:F shorted high

Possible reason:

- Pins switched in the engine/chassis harness.

Reaction from APCS ECU:

- Fault code set.
- Yellow lamp requested.

Noticeable external symptom:

- Engine will not be notified when coolant is critically low.
- Expansion tank will not be pressurized while fault is active.

PSID 5 FMI 5

Noticeable external symptom:

- Engine will not be notified when coolant is critically low.
- Expansion tank will not be pressurized while fault is active.

Condition for fault code:

- B:F open circuit

Possible reason:

- Engine/Chassis harness connection missing.

Reaction from APCS ECU:

- Fault code set.
- Yellow lamp requested.

Noticeable external symptom:

- Engine will not be notified when coolant is critically low.
- Expansion tank will not be pressurized while fault is active.
- Yellow lamp on.

2600-21-03-04 MID 186 PSID 5 Coolant Level Output, Check

Special tools: 88890023, J-39200

Suitable tests in VCADS Pro

- Fault codes
- Actively Pressurized Cooling System Function Test

Measurement at Control Unit

Conditions 1:



CAUTION

Connect only one connector at a time when checking signal values with special tool 88890023. If more than one connector is connected at a time damage to the electrical system or control unit is possible.

- Breakout harness 88890023 connected between the control unit "B" connector and the electrical harness.
- Voltage measurement with multimeter J-39200.
- Key switch in drive position.

Measurement Points	Nominal Value	Comments
B:E - B:F	V $\approx$ 80% B+	APCS Switch Open
B:E - B:F	V $\approx$ 0V	APCS Switch Closed
B:E - Ground	V $\approx$ 80% B+	
B:F - Ground	V $\approx$ 0V	

Conditions 2:



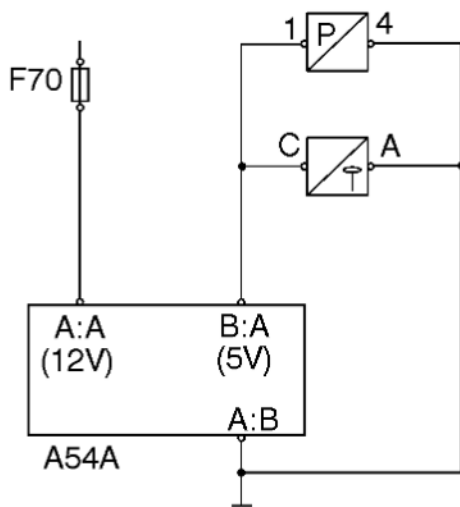
CAUTION

Connect only one connector at a time when checking signal values with special tool 88890023. If more than one connector is connected at a time damage to the electrical system or control unit is possible.

- Breakout harness 88890023 connected between the control unit "B" connector and the electrical harness.
- Breakout harness 9990014 and breakout box 9998699
- Voltage measurement with multimeter J-39200.
- Key switch in drive position.

Measurement Points	Nominal Value	Comments
B:F - EB:10	$R \approx 0\Omega$	

MID 186 SID 232 APCS 5 Volt Supply



W2005088

General Information

The APCS control unit supplies 5 volts to the pressure sensor and the coolant level sensor.

The fault will become active for the following reason:

- Voltage at B:A becomes higher than 5V or lower than 3.5V

Component: Control Unit APCS (A54A)

SID 232 FMI 3

Abnormally high or short circuit to battery voltage

Condition for fault code:

- Voltage at B:A is more than 5 volts.

Possible reason:

- Short circuit to battery voltage on the 5 volt supply circuit.
- Fault in APCS Control unit.

Reaction from APCS ECU:

- Fault code set.

Noticeable external symptom:

- Expansion tank not pressurized and the coolant level function will not work correctly.

SID 232 FMI 4

Short circuit to ground

Condition for fault code:

- Voltage at B:A is less than 3.5 volts.

Possible reason:

- Short circuit to ground on the 5 volt supply circuit.
- Fault in APCS Control unit.

Reaction from APCS ECU:

- Fault code set.

Noticeable external symptom:

- Expansion tank not pressurized and the coolant level function will not work correctly.

2600-21-03-05 MID 186 SID 232 APCS 5 Volt Supply, Check

Special tools: 88890023, J-39200

Suitable tests in VCADS Pro

- Fault codes
- Actively Pressurized Cooling System Function Test

Measurement at Control Unit

Conditions 1:



CAUTION

Connect only one connector at a time when checking signal values with special tool 88890023. If more than one connector is connected at a time damage to the electrical system or control unit is possible.

- Breakout harness 88890023 connected between the control unit "B" connector and the electrical harness.
- Voltage measurement with multimeter J-39200.
- Key switch in drive position.

Measurement Points	Nominal Value	Comments
B:A - Ground	V $\approx$ 5V	5V Supply Voltage

Measurement at Component

Conditions 1:

- Breakout harness 9998534 connected between the pressure sensor and the electrical harness
- Voltage measurement with multimeter J-39200
- Key switch in drive position

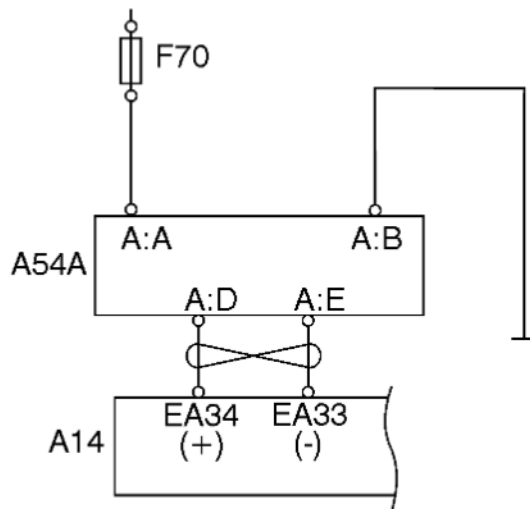
Measurement Points	Nominal Value	Comments
1 - 4	V $\approx$ 5V	5V Supply Voltage

Conditions 2:

- Breakout harness J-42589 connected between the coolant level sensor and the electrical harness
- Voltage measurement with multimeter J-39200
- Key switch in drive position

Measurement Points	Nominal Value	Comments
C - A	V $\approx$ 5V	5V Supply Voltage

MID 186 SID 250 J1708/J1587 Datalink



W2005091

General Information

The J1708/J1587 data link is an information link that allows for communication exchange between ECU's.

The fault will become active for the following reason:

- Coolant temperature data not received from the engine
- J1708/J1587 Data link interrupted (No messaging)

Component: Control Unit APCS (A54A), Engine ECU (A14).

SID 250 FMI 2

Condition for fault code:

- PID 110 data not received from engine for 5 seconds.

Possible reason:

- Fault in Information Link (SAE J1587/J1708).
- Fault from engine ECU.

Reaction from APCS ECU:

- Fault code set.

Noticeable external symptom:

- APCS does not work.
- Expansion tank not pressurized, but coolant level function will still operate correctly.

SID 250 FMI 9

Condition for fault code:

- All Datalink data ceased for a period of 10 seconds.

Possible reason:

- Fault in Information Link (SAE J1587/J1708).
- Fault from vehicle ECU.

Reaction from APCS ECU:

- Fault code set.

Noticeable external symptom:

- APCS does not work.
- Expansion tank not pressurized, but coolant level function will still operate correctly .

2600-21-03-06 MID 186 SID 250 J1708/J1587 Datalink, Check

Special tools: 88890023, J-39200

Suitable tests in VCADS Pro

- Fault codes
- Actively Pressurized Cooling System Function Test

Measurement at Control Unit

Conditions 1:

-



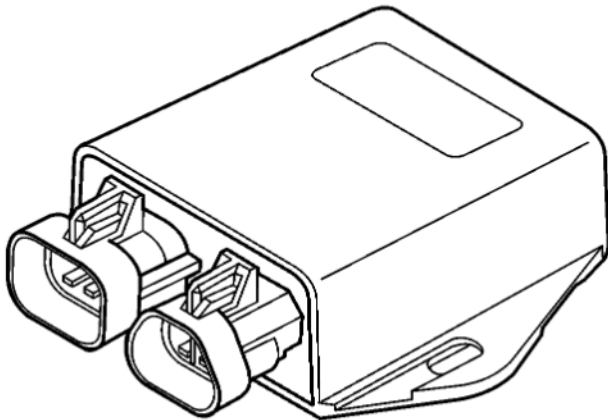
CAUTION

Connect only one connector at a time when checking signal values with special tool 88890023. If more than one connector is connected at a time damage to the electrical system or control unit is possible.

- Breakout harness 88890023 connected between the control unit "A" connector and the electrical harness.
- Voltage measurement with multimeter J-39200.
- Key switch in drive position.

Measurement Points	Nominal Value	Comments
A:D - A:B	V ≈ 0 - 5V	
A:E - A:B	V ≈ 0 - 5V	

MID 186 SID 254 APCS Control Unit



W2005093

General Information

The APCS performs regular self-tests in order to check internal functions.

The fault will become active for the following reason:

- The self-test fails
- Control unit internal fault

Component: Control Unit APCS (A54A)

SID 254 FMI 12

Condition for the fault:

- Incorrect self test in the APCS control unit.

Possible reason:

- Internal fault in the APCS control unit.

Reaction from APCS ECU:

- Fault code set.

Noticeable external symptom:

- Expansion tank not pressurized and coolant level function will not operate.