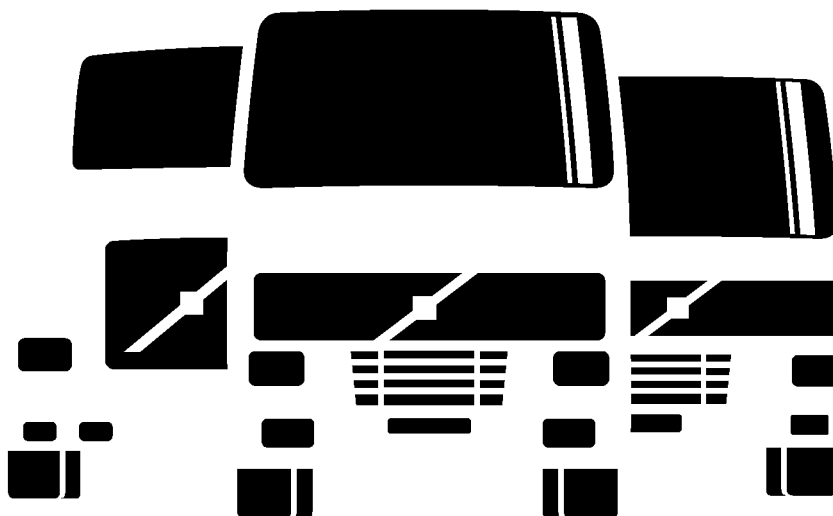


MID 128 Engine control unit, fault codes

MID 128 Engine control unit, fault codes



T0009739

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MID 128 Engine control unit, fault codes

Fault code	FMI	Function	FMI	Fault
PID26	3	Fan speed	3	Signal not available Short-circuit+, signal cable Short-circuit-, signal cable Open-circuit, signal cable Open-circuit, earth cable
	8		8	Interference in the signal cable.
PID45	3	Pre-heater relay	3	Short-circuit+
	4		4	Short-circuit-
	5		5	Open-circuit
PID84	9	Vehicle speed	9	Signal absent from VECU (MID144)
PID85	9	Cruise control status	9	Signal absent from CC
PID91	9	Pedal message	9	Signal absent from VECU (MID144)
PID94	1	Fuel pressure	1	Pressure critically low
	3		3	Short-circuit+ Signal cable Open-circuit Earth cable
	5		5	Open-circuit, 5V supply cable Short-circuit-, signal cable Open-circuit, signal cable
	7		7	Low pressure
PID97	3	Water in the fuel sensor	3	Short-circuit+, signal cable
	4		4	Short-circuit-, signal cable
PID98	1	Oil level	1	Below the range
	4		4	Short-circuit-, positive side
	5		5	Short-circuit+, positive side Open-circuit, positive side Open-circuit, negative side
PID100	1	Oil pressure	1	Below the range
	3		3	Short-circuit+, signal cable Open-circuit, earth cable
	5		5	Open-circuit, 5V supply cable Short-circuit-, signal cable Open-circuit, signal cable
PID 102	0	Charge pressure	0	Below the range
	2		2	Incorrect
	3		3	Short-circuit+, signal cable Open-circuit, earth cable
	5		5	Open-circuit, 5V supply cable Short-circuit-, signal cable Open-circuit, signal cable
PID105	2	Charge air temperature	2	Incorrect
	4		4	Short-circuit-, signal cable
	5		5	Short-circuit+, signal cable Open-circuit
	10		10	Stuck

Fault code	FMI	Function	FMI	Fault
PID107	0	Air filter indicator	0	Critically above the range
	3		3	Short-circuit+, signal cable
	4		4	Short-circuit-, signal cable
	5		5	Open-circuit
PID108	2	Ambient pressure	2	Within range
	3		3	Short-circuit+, signal cable
	4		4	Short-circuit-, signal cable
PID110	0	Coolant temperature	0	Critically above the range
	4		4	Short-circuit-, signal cable
	5		5	Short-circuit+, signal cable Open-circuit
PID111	1	Coolant level	1	Below the range Short-circuit-, signal cable
	3		3	Short-circuit+, signal cable
	5		5	Open-circuit
PID153	0	Crankcase pressure	0	Above range
	2		2	Within range
	3		3	Short-circuit+, signal cable Open-circuit, earth cable
	5		5	Open-circuit, 5V supply cable Short-circuit-, signal cable Open-circuit, signal cable
PID158	4	Battery voltage	4	TOO LOW
	3		3	TOO HIGH
PID171	9	Ambient air temperature	9	Signal absent from IC (MID140)
PID173	4	Exhaust temperature	4	Short-circuit-
	5		5	Short-circuit+ Open-circuit
PID175	0	Oil temperature	0	Above range
	4		4	Short-circuit-, signal cable
	5		5	Short-circuit+, signal cable Open-circuit
PID190	0	Engine rpm	0	Above range
PID224	2	Immobilizer	2	Incorrect data from IMMO (MID163)
	12		12	No response from IMMO (MID163)
PID228	11	Calibration factor (K)	11	Signal absent from VECU (MID144)
PID245	9	Total mileage	9	Signal absent from IC (MID140)
PID251	9	Time data failed	9	Exceeded time limit
PID252	9	Date data failed	9	Exceeded time limit
SID 1/2/3/4/5/6	3	Injector 1/2/3/4/5/6	3	Short-circuit+, low side
	5		5	Short-circuit+ Short-circuit- Open-circuit, high side Short-circuit-, low side

Fault code	FMI	Function	FMI	Fault
	7		7	Clock calibration
	12		12	Low holding current, injector
	14		14	Special instructions
SID18	3	Water in the fuel sensor	3	Short-circuit+
	4		4	Short-circuit-
	5		5	Open-circuit
SID21	2	CAM speed sensor	2	Phase error
	3		3	Signal absent from camshaft sensor (Short-circuit+, short-circuit-, open-circuit)
	8		8	Interference in the signal cable.
SID22	2	Crankcase speed sensor	2	Intermittent or weak signal
	3		3	Signal absent from crankcase sensor (Short-circuit+, short-circuit-, open-circuit)
	8		8	Interference in the signal cable.
SID32	3	Waste gate	3	Short-circuit+
	4		4	Short-circuit-
	5		5	Open-circuit
	7		7	Stuck closed
SID33	3	Engine cooling fan control	3	Short-circuit+
	4		4	Short-circuit-
	5		5	Open-circuit
SID39	0	Starter motor output	0	Starter motor overheat
	3		3	Short-circuit+
	5		5	Open-circuit
	7		7	Gearbox not in neutral
	10		10	Gear synchronisation
	14		14	Power take-off engaged
SID70	3	Pre-heating sensor 1	3	Short-circuit+
	4		4	Short-circuit-
	5		5	Open-circuit
SID78	3	Fuel evacuation pump	3	Short-circuit+
	4		4	Short-circuit-
	5		5	Open-circuit
SID211	3	5V supply 2	3	Above range
	4		4	Below the range
SID230	3	Buffered IVS	3	Short-circuit+
	5		5	Short-circuit- Open-circuit
SID231	2	CAN1 J1939 communica- tions link	2	Short-circuit+ Short-circuit- or open-circuit on one or other of the cables
SID232	3	5V supply 1	3	Above range
	4		4	Below the range

Fault code	FMI	Function	FMI	Fault
SID240	2	Program memory	2	Checksum fault
	7		7	Development SW
	11		11	Cell test position
SID253	2	Data memory	2	Checksum fault
	12		12	Checksum fault supplier
	14		14	Checksum fault on E2
SID254	3	RAM/Watchdog	3	RAM addressing failed.
	8		8	WD reset of CPU does not work.
	12		12	Write to RAM does not work
PPID55	4	Electronic control unit, temperature	4	Short-circuit-, signal cable
	5		5	Short-circuit+, signal cable Open-circuit
PPID109	3	Throttle disc EPG	3	Short-circuit+
	4		4	Short-circuit-
	5		5	Open-circuit
PPID122	1	VCB	1	Below the range
	3		3	Short-circuit+
	4		4	Short-circuit-
	5		5	Open-circuit
PPID123	3	ON/OFF EPG	3	Short-circuit+
	4		4	Short-circuit-
	5		5	Open-circuit
PPID124	3	EPG/ Wastegate PWM	3	Short-circuit+
	4		4	Short-circuit-
	5		5	Open-circuit
PPID270	2	NOx sensor Set by MID233 SCRT	2	Within range
	3		3	Short-circuit NOx signal
	5		5	Open-circuit, NOx signal
	9		9	Abnormal update
	12		12	Incorrect value
	13		13	Range control
	14		14	Signal absent from sensor due to Vbatt.
PPID273	1	AdBlue pressure Set by MID233 SCRT	1	Leakage
	2		2	Within range
	4		4	Short-circuit to earth
	5		5	Open-circuit
	7		7	Build up failed
	13		13	Electrical fault
	14		14	Heating failed

Fault code	FMI	Function	FMI	Fault
PPID274	1	AdBlue tank temperature Set by MID233 SCRT	1	Temperature too low
	4		4	Short-circuit to earth
	5		5	Open-circuit
PPID275	0	AdBlue filter temperature Set by MID233 SCRT	0	Temperature too high
	1		1	Temperature too low, electrical heating not possible
	2		2	Outside operating range
	4		4	Short-circuit to earth
	5		5	Open-circuit
PPID278	1	AdBlue level Set by MID233 SCRT	1	Level low, coolant capacity limited
	3		3	Short-circuit high
	5		5	Open-circuit Short-circuit low
	13		13	Sensor voltage supply outside range
	14		14	Level low, stop dosing
PPID385	3	AdBlue ECU voltage Set by MID233 SCRT	3	TOO HIGH
	4		4	TOO LOW
	12		12	Internal supply fault
	14		14	Internal supply critical fault
PPID386	2	Exhaust temperature sensor upstream of SCR cat. Set by MID233 SCRT	2	Incorrect Stuck
	4		4	Short-circuit to earth
	5		5	Open-circuit
PPID435	0	Effective torque	0	Above range
	1		1	Below the range
PSID75	3	AdBlue tank heating valve Set by MID233 SCRT	3	Short-circuit to battery
	4		4	Short-circuit to earth
	5		5	Open-circuit
PSID77	3	AdBlue ECU EEPROM Set by MID233 SCRT	3	ECU internal supply high
	4		4	ECU internal supply low
	12		12	Checksum, communication or write
PSID82	3	AdBlue internal filter heater Set by MID233 SCRT	3	Short-circuit to battery
	4		4	Short-circuit to earth
	5		5	Open-circuit
PSID84	3	AdBlue hose heater 2 Set by MID233 SCRT	3	Short-circuit to battery
	4		4	Short-circuit to earth

Fault code	FMI	Function	FMI	Fault
	5		5	Open-circuit
PSID85	3	AdBlue ECU main relay Set by MID233 SCRT	3	Short-circuit to battery
	4		4	Short-circuit to earth
	5		5	Open-circuit
	6		6	Shut-off too late
PSID87	0	AdBlue pump motor speed Set by MID233 SCRT	0	Above speed
	1		1	Below speed
	10		10	No signal from pump
PSID89	3	AdBlue dosage valve Set by MID233 SCRT	3	Short-circuit to battery
	4		4	Short-circuit to earth
	5		5	Open-circuit
	7		7	Valve or hose blocked
	10		10	Valve stuck
	14		14	Frozen too many times
PSID90	1	SCR system capacity Set by MID233 SCRT	1	Dosage fault
	11		11	Underlying cause not known
	14		14	Major functional fault
PSID91	0	AdBlue consumption Set by MID233 SCRT	0	Level change in tank too great
	1		1	Level change in tank too small
PSID98	0	Charge pressure system	0	TOO HIGH
	1		1	TOO LOW
PSID101	3	Control valve for AdBlue cooling Set by MID233 SCRT	3	Short-circuit to battery
	4		4	Short-circuit to earth
	5		5	Open-circuit
	7		7	Mechanical problem
PSID102	3	AdBlue hose heater 3 Set by MID233 SCRT	3	Short-circuit to battery
	4		4	Short-circuit to earth
	5		5	Open-circuit
PSID103	3	AdBlue hose heater 1 Set by MID233 SCRT	3	Short-circuit to battery
	4		4	Short-circuit to earth
	5		5	Open-circuit
PSID104	3	AdBlue hose heater 4 Set by MID233 SCRT	3	Short-circuit to battery
	4		4	Short-circuit to earth
	5		5	Open-circuit

Fault code	FMI	Function	FMI	Fault
PSID105	3	AdBlue directional valve Set by MID233 SCRT	3	Short-circuit to battery
	4		4	Short-circuit to earth
	5		5	Open-circuit
	7		7	Mechanical problem
PSID107	3	AdBlue external filter heater Set by MID233 SCRT	3	Short-circuit to battery
	4		4	Short-circuit to earth
	5		5	Open-circuit
PSID161	12	VIN check 1	12	Defective device
PSID162	2	VIN check 2	2	Unreliable data
PSID201	9	CAN1 J1939 communication pause	9	No contact with VECU (MID144)
PSID229	9	CAN parameters from UDS Set by MID233 SCRT	9	Pause
	11		11	Underlying cause not known
PSID232	2	CAN2 J1939 communica- tions link	2	Short circuit Short-circuit- or open-circuit on one or other of the cables.

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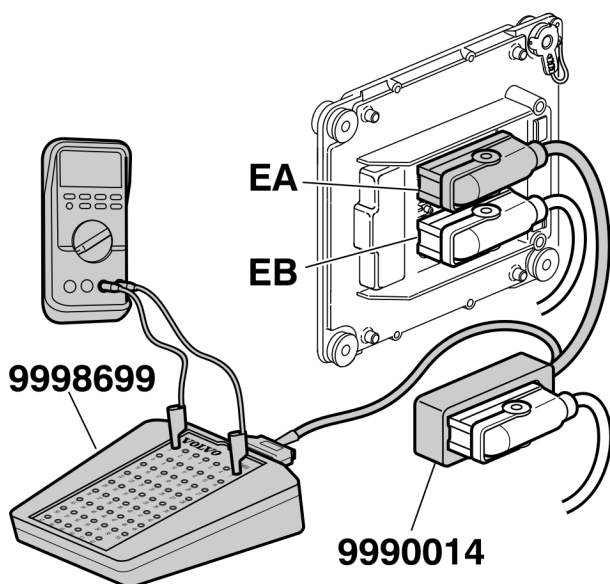
Engine control unit, check

Step 1: Checking the system.

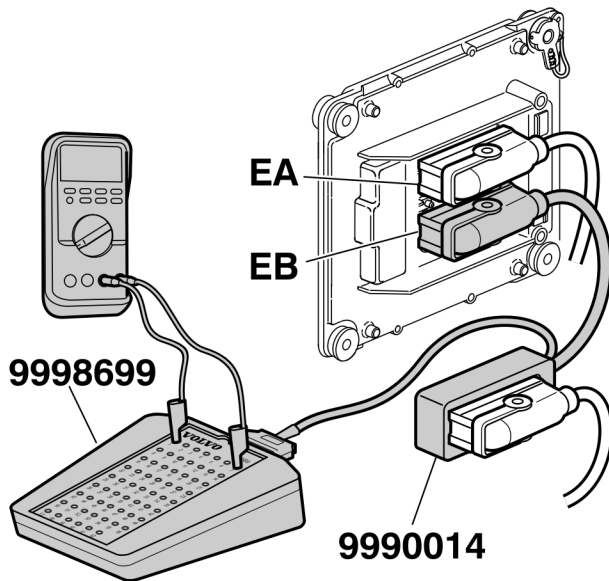
Conditions:

- Adapter 9990014 and breakout box 9998699 connected **between** the control unit and the cable harness.
- Control unit connected
- Ignition key in **drive position**
- Engine switched off
- Measurement position **voltage DC** with multimeter 9812519.
- U_{bat} = Battery voltage
- > = More than
- < = Less than
- $\approx$ = Approximately equal to

Note: If the values generally do not agree, check the common earth terminals EA11, EB17, EB18, EB58, EB59, EB61 and EA57.



Conne- ction	Signal type	Measurement points	Expected value	Note.
EA3	Fuel pump	EA3 - EA57	$\approx 0.8 * U_{bat}$ (inactive) ≈ 0 V (active)	
EA7	Supply to sensor (5 V)	EA7 - EA57	4.80 - 5.15 V	
EA21	EGR pressure	EA21 - EA11	0.5 V	
EA22	Charge pressure sensor, signal	EA22 - EA11	1.1±0.7 V	(at sea level)
EA30	EGR temperature sensor, signal	EA30 - EA11	≈ 4.9 V (+20°C)	
EA31	Oil temperature sensor, signal	EA31 - EA11	≈ 3.0 V (+20°C) ≈ 0.4 V (+100°C)	
EA35	Fan speed sensor	EA35 - EA39	0 – 5 V	Spin the fan by hand. The value should oscillate between 0 - 5 V.
EA47	Charge air temperature sensor, signal	EA47 - EA11	≈ 2.6 V (+20°C) ≈ 1.6 V (+40°C)	



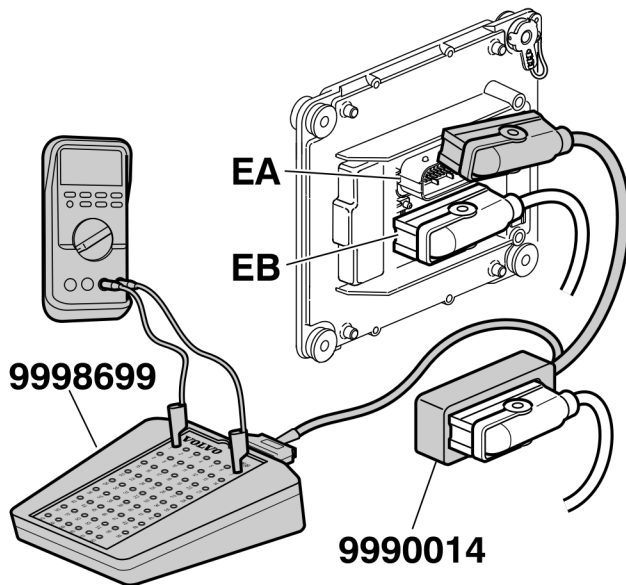
Con- nection	Signal type	Measurement points	Expected value	Note.
EB11	Oil pressure sensor, signal	EB11 - EB18	$\approx 0.5 \text{ V}$ (with engine shut-off)	
EB15	Buffered idle switch	EB15 - EB59	$< 4 \text{ V}$ (inactive) $> 8 \text{ V}$ (active, i.e. with depressed accelerator)	
EB16	Fuel pressure sensor, signal	EB16 - EB18	$\approx 0.5 \text{ V}$ (with engine shut-off)	
EB17	Supply to sensor (5 V)	EB17 - EB18	$\approx 5 \text{ V}$	
EB23	Coolant level sensor, signal	EB23 - EB10	$\approx 0.9 \cdot U_{\text{bat}}$ (open) $\approx 0 \text{ V}$ (closed)	Normally "open" with the starter key in drive position.
EB24	EGR position 1	EB24 - EB18	$\approx 0.2 - 0.8 \text{ V}$ (valve closed)	
EB25	Pre-heater relay	EB25 - EB59	U_{bat} (open) 0 V (closed)	
EB27	Coolant temperature sensor, signal	EB27 - EB18	$\approx 3.0 \text{ V}$ ($+20^{\circ}\text{C}$) $\approx 0.6 \text{ V}$ ($+85^{\circ}\text{C}$)	
EB28	Crankcase pressure sensor	EB28 - EB18	$2.9 \pm 0.6 \text{ V}$ (at sea level)	Engine stationary
EB30	VCB	EB30 - EB61	U_{bat} (inactive) 0 V (active)	Normally "inactive" with the ignition key in drive position.
EB38	EPG	EB38 - EB59	$\approx U_{\text{bat}}$ (inactive) $\approx 0 \text{ V}$ (active)	Normally "inactive" with the ignition key in drive position.
EB49	Fan control	EB49 - EB59	$\approx U_{\text{bat}}$ (inactive) $\approx 0 \text{ V}$ (active)	The fan is engaged when the fan coupling relay is inactive. The fan is off when the fan coupling relay is active.
EB50	Waste gate	EB50-EB59	$\approx U_{\text{bat}}$ (inactive) $\approx 0 \text{ V}$ (active)	Normally "inactive" with the ignition key in drive position.
EB51	SAE J1939 (CAN high)	EB51 - EB61	$2.5 - 4.0 \text{ V}$	
EB55	SAE J1939 (CAN low)	EB55 - EB61	$0 - 2.5 \text{ V}$	

EB57	Power supply, control unit	EB57 - EB59	U _{bat}	
EB60	Power supply, control unit	EB60 - EB61	U _{bat}	

Step 2: Function check (Cable harness and circuit)

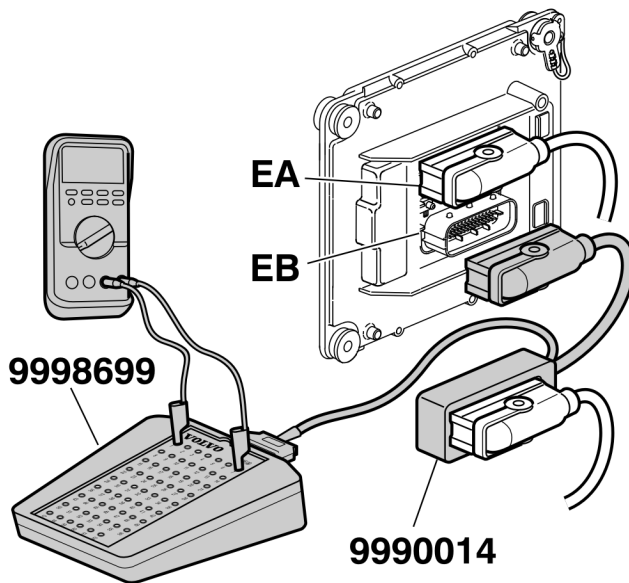
Conditions:

- Adapter 9990014 and breakout box 9998699 connected **to** the cable harness.
- Control unit disconnected
- Ignition key in **stop position**
- Measurement position **resistance** with multimeter 9812519.



Conne- ction	Signal type	Measurement points	Expected value	Note.
EA3	Fuel pump	EA3 - EA57	> 10 Ω	
EA12	Unit injector cylinder 2 (injector)	EA12 - EA62	0.9 - 5.2 Ω (20 $^{\circ}$ C) 1.5 - 5.8 Ω (100 $^{\circ}$ C)	
EA16	Unit injector cylinder 2 (return valve)	EA16 - EA59	1.1 - 5.8 Ω (20 $^{\circ}$ C) 1.9- 6.2 Ω (100 $^{\circ}$ C)	
EA20	Unit injector cylinder 1 (needle control valve)	EA20 - EA62	0.9 - 5.2 Ω (20 $^{\circ}$ C) 1.5 - 5.8 Ω (100 $^{\circ}$ C)	
EA24	Unit injector cylinder 1 (spill valve)	EA24 - EA59	1.1 - 5.8 Ω (20 $^{\circ}$ C) 1.9- 6.2 Ω (100 $^{\circ}$ C)	
EA28	Unit injector cylinder 3 (injector)	EA28 - EA62	0.9 - 5.2 Ω (20 $^{\circ}$ C) 1.5 - 5.8 Ω (100 $^{\circ}$ C)	
EA30	EGR temperature sensor	EA30 - EA11	30 – 45k Ω	
EA31	Oil temperature sensor, signal	EA31 - EA11	$\approx$ 1.9 k Ω (+20 $^{\circ}$ C) $\approx$ 100 Ω (+100 $^{\circ}$ C)	
EA32	Unit injector cylinder 3 (return valve)	EA32 - EA59	1.1 - 5.8 Ω (20 $^{\circ}$ C) 1.9- 6.2 Ω (100 $^{\circ}$ C)	
EA36	Unit injector cylinder 6 (injector)	EA36 - EA61	0.9 - 5.2 Ω (20 $^{\circ}$ C) 1.5 - 5.8 Ω (100 $^{\circ}$ C)	
EA37	Tachometer sensor, flywheel, +	EA37 - EA38	775 - 945 Ω	
EA40	Unit injector cylinder 6 (return valve)	EA40 - EA60	1.1 - 5.8 Ω (20 $^{\circ}$ C) 1.9- 6.2 Ω (100 $^{\circ}$ C)	
EA41	Tachometer turbo	EA41 - EA42	0.8 - 1 k Ω	

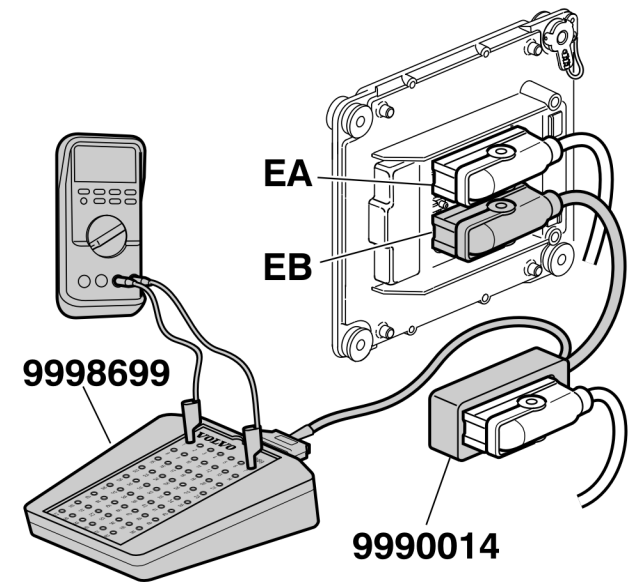
EA44	Unit injector cylinder 5 (injector)	EA44 - EA61	0.9 - 5.2 Ω (20 $^{\circ}$ C) 1.5 - 5.8 Ω (100 $^{\circ}$ C)	
EA45	Camshaft sensor, +	EA45 - EA46	775 - 945 Ω	
EA47	Charge air temperature sensor, signal	EA47 - EA11	$\approx$ 6.2 k Ω (+20 $^{\circ}$ C) $\approx$ 2.5 k Ω (+40 $^{\circ}$ C)	
EA48	Unit injector cylinder 5 (return valve)	EA48 - EA60	1.1 - 5.8 Ω (20 $^{\circ}$ C) 1.9- 6.2 Ω (100 $^{\circ}$ C)	
EA52	Unit injector cylinder 4 (injector)	EA52 - EA61	0.9 - 5.2 Ω (20 $^{\circ}$ C) 1.5 - 5.8 Ω (100 $^{\circ}$ C)	
EA56	Unit injector cylinder 4 (return valve)	EA56 - EA60	1.1 - 5.8 Ω (20 $^{\circ}$ C) 1.9- 6.2 Ω (100 $^{\circ}$ C)	



Conne- ction	Signal type	Measurement points	Expected value	Note.
EB3	Oil level sensor	EB3 - EB4	11.7 - 12.9 Ω ($\approx$ +22 $^{\circ}$ C)	
EB13	EGR valve 1, engine	EB13 - EB9	1 - 10 Ω	
EB23	Coolant level sensor, signal	EB23 - EB10	> 100 k Ω (open) normal level < 5.0 Ω (closed) low level	
EB27	Coolant temperature sensor, signal	EB27 - EB18	1.9 k Ω (20 $^{\circ}$ C) 160 Ω (185 $^{\circ}$ C)	
EB49	Fan control	EB49 - EB57	< 50 Ω	

Conditions:

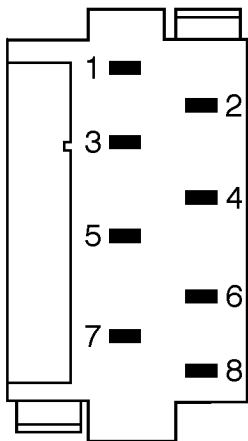
- Adapter 9990014 and breakout box 9998699 connected **between** the control unit and the cable harness.
- Control unit connected
- Ignition key in **stop position**
- Measurement position **resistance** with multimeter 9812519.



Connec- tion	Signal type	Measurement points	Expected value	Note.
EB51	SAE J1939	EB51 - EB55	60 Ω	When there is no terminal resistor 120 Ω (or when the contact EA is disconnected)

Step 3: Function check (engine control unit)

- Conditions:
- Control unit connected
 - Measurement via the data link connector
- DC no. = Connection in data link connector

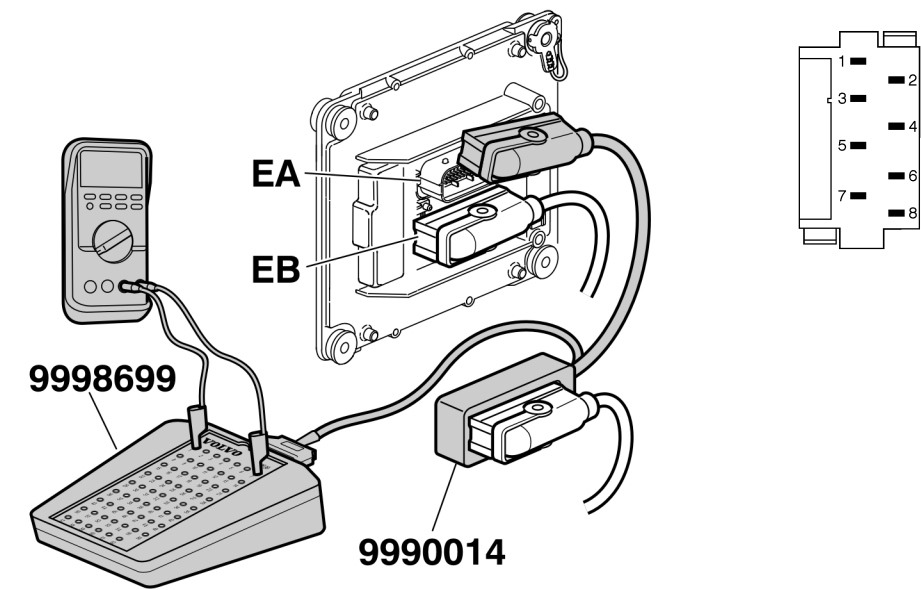


Conne- ction	Signal type	Measurement points	Expected value	Note.
DC3	SAE J1587/1708	DC3 - DC2	0 - 5 V	

Conditions:

- Adapter 9990014 and breakout box 9998699 connected to cable harness **EA**
- Control unit connector EA disconnected
- Ignition key in **stop position**
- Measurement position **resistance** with multimeter 9812519.

DC no. = Connection in data link connector

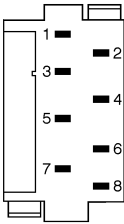
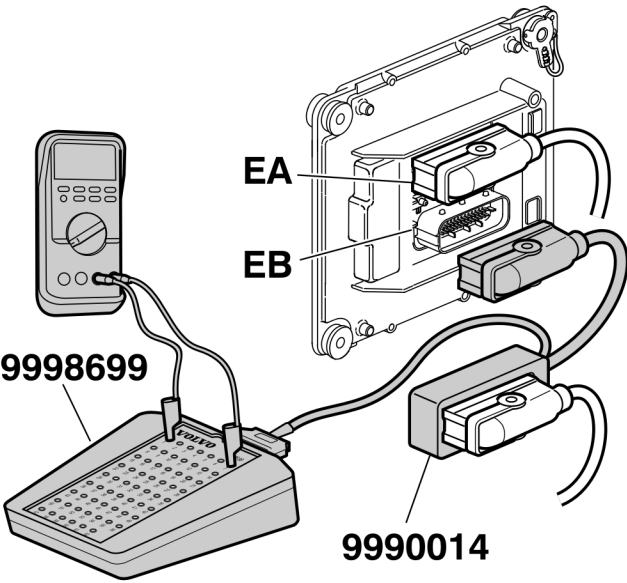


Connec- tion	Signal type	Measurement points	Expected value	Note.
EA33	SAE J1587-1708 (CAN high)	EA33 - DC3	0 - 5 Ω	
EA34	SAE J1587-1708 (CAN low)	EA33 - DC2	0 - 5 Ω	

Conditions:

- Adapter 9990014 and breakout box 9998699 connected to cable harness **EB**
- Control unit connector EB disconnected
- Ignition key in **stop position**
- Measurement position **resistance** with multimeter 9812519.

DC no. = Connection in data link connector



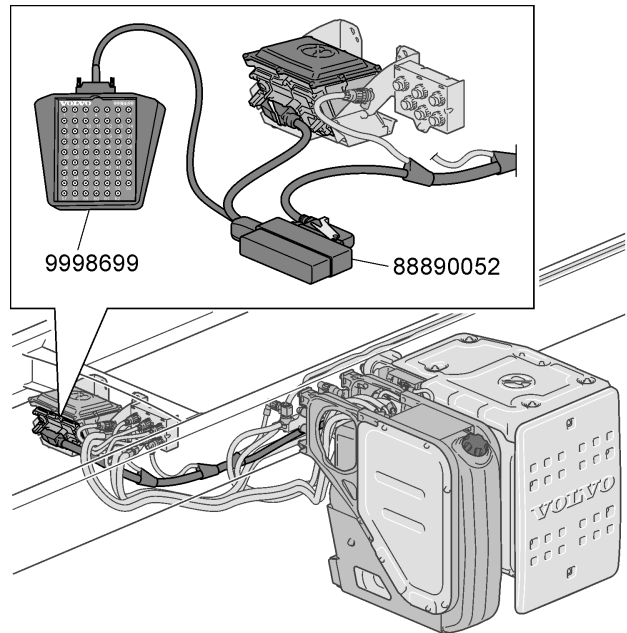
Connec- tion	Signal type	Measurement points	Expected value	Note.
EB51	SAE J1939 (CAN high)/1939 (CAN low)	EB51 - EB55	120 Ω	

SCRT, fault tracing

Step 1: Checking the system.

Conditions:

- Adapter 88890052 and breakout box 9998699 connected **between** the control unit and the cable harness.
- Control unit connected
- Ignition key in **drive position**
- Engine switched off
- Measurement position **voltage DC** with multimeter 9812519.
- U_{bat} = Battery voltage
- > = More than
- < = Less than
- $\approx$ = Approximately equal to

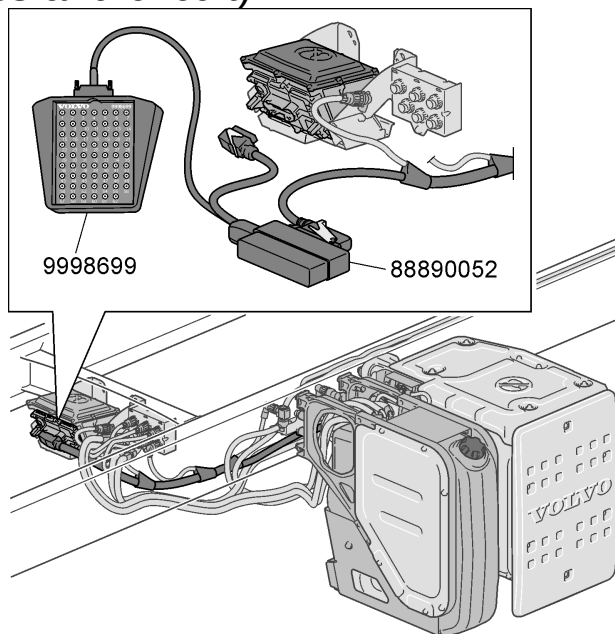


Connection	Signal type	Measurement points	Expected value
A6	Tank level sensor/temperature sensor supply	A6 - A17	4.75-5.25 V
A8	Catalytic converter temperature sensor, upstream, signal	A8 - A19	$\approx 0.9 \text{ V (25}^{\circ}\text{C)}$ $\approx 1.5 \text{ V (300}^{\circ}\text{C)}$
A10	Catalytic converter temperature sensor, downstream, signal	A10 - A11	$\approx 0.9 \text{ V (25}^{\circ}\text{C)}$ $\approx 1.5 \text{ V (300}^{\circ}\text{C)}$
A18	Tank level sensor, signal	A18 - A17	0.30-4.75 V
A12	Supply voltage from F10 (DR signal)	A:12 - A:22	U_{bat}
A33	Supply voltage from F94	A:33 - A:22	U_{bat}
A32	Supply voltage from F94	A:32 - A:22	U_{bat}
A31	SAE J1939-7 (CAN high)	A:31 - A:22	2.5-4.0 V
A30	SAE J1939-7 (CAN low)	A:30 - A:22	0-2.5 V

Step 2: Function check (Cable harness and circuit)

Conditions:

- Adapter 88890052 and breakout box 9998699 connected **to** the cable harness.
- Control unit disconnected
- Ignition key in **stop position**
- Measurement position **resistance** with multimeter 9812519.



Connection	Signal type	Measurement points	Expected value
A7	Tank temperature sensor, signal	A7 - A17	$\approx 15.0 \text{ k}\Omega$ (0°C) $\approx 4.7 \text{ k}\Omega$ (25°C)
A8	Exhaust temperature sensor, upstream, signal	A8 - A19	$\approx 220 \text{ }\Omega$ (25°C) $\approx 350 \text{ }\Omega$ (200°C)
A10	Exhaust temperature sensor, downstream, signal	A10 - A11	$\approx 220 \text{ }\Omega$ (25°C) $\approx 350 \text{ }\Omega$ (200°C)
A21	Earth	A21 - Earth	$\approx 0 \text{ }\Omega$
A22	Earth	A22 - Earth	$\approx 0 \text{ }\Omega$
A31	SAE J1939-7 (CAN high)	A31 - A30	$120 \text{ }\Omega$
A13	Tank heating valve	A13 - A35	$40 - 55 \text{ }\Omega$
A24	Dosing valve	A24 - A25	$1.5 - 5.0 \text{ }\Omega$
	Filter heater		Not possible to measure
A14	Hose heater 1	A14 - A34	$10 - 15 \text{ }\Omega$
A4	Hose heater 2	A4 - A34	$8 - 15 \text{ }\Omega$
A2	Hose heater 3	A2 - A35	$8 - 13 \text{ }\Omega$
A1	Hose heater 4	A1 - A35	$11 - 15 \text{ }\Omega$
A3	External filter heater	A3 - A35	$30 - 70 \text{ }\Omega$