VOLVO
Volvo Trucks North America, Inc.
Greensboro, NC USA

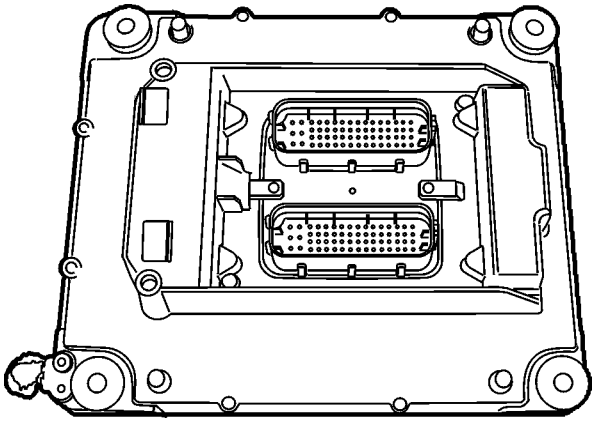
Service Bulletin Trucks

This Service Bulletin replaces SB 284–04, “Engine ECU, Fault Tracing, Checklist M” (9.2004), publication no. PV776–TSP20 016209.

Engine ECU
Fault Tracing
Checklist M
D12D

Engine ECU, Fault Tracing

Checklist M



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EECU (EMS2)

This information covers fault tracing the engine ECU of the Volvo D12D engine.

Contents

Note: Illustrations are used for reference only, and may differ slightly from the actual engine version. However, key components addressed in this information are represented as accurately as possible.

Engine ECU, Fault Tracing

See also:

- “Engine ECU, Fault Tracing” page 10 for warranty claim information

Vehicle	VIN	Mileage	Customer
Engine variant	Engine number	Control module, part number	Control unit, serial number
Software number	Data sets 1	Data sets 2	

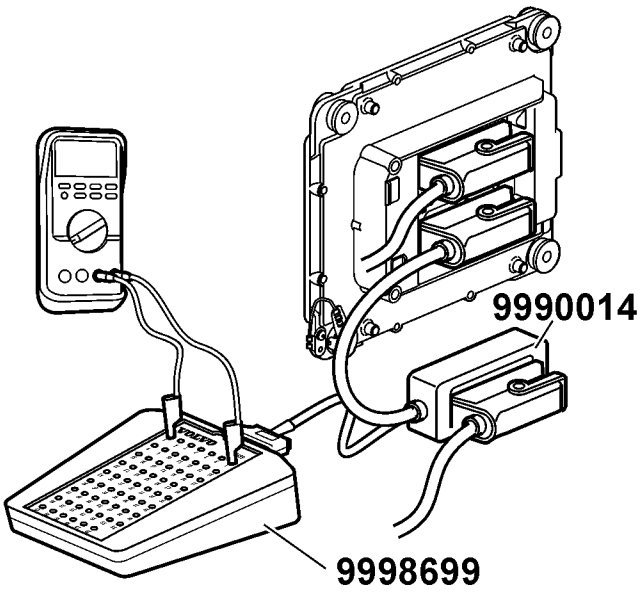
Step 1: Checking System Voltage

Conditions:

- Breakout box 9998699 and breakout cable 9990014 connected between EECU and wiring harness.
- EECU connected
- Ignition key in ON position
- Engine OFF
- Multimeter J-39200 measuring **Voltage DC**
- B+ = Battery voltage

(See also “EECU, Wiring Diagram” page 12.)

Checking EA voltage (lower connector)



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Before Checks

Verify that ground terminals EA57 (main) and EA11 (5V ground) are properly grounded (less than 10 Ω to ground).

< — Less than
≈ — Approximately

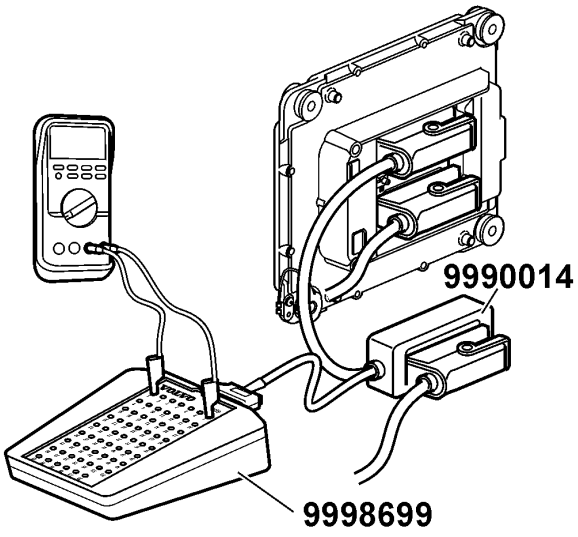
Note: > — Greater than

Terminal	Signal type	Measurement points	Nominal value	Measured value	"Notes" page 3
EA3	Fuel Pump	EA3 - EA57	≈ 7 - 9 V (inactive) ≈ 0 V (active)		
EA7	Supply to sensor (5V)	EA7 - EA11	4.80 - 5.15 V		
EA22	Intake manifold pressure sensor, signal	EA11 - EA22	1.1 ± 0.7 V (at sea level)		
EA30	EGR temperature sensor	EA30 - EB18	≈ 4.9 V @ 20 °C (68 °F)		3
EA31	Oil temperature sensor, signal	EA11 - EA31	≈ 3.0 V @ 20 °C (68 °F) ≈ 0.4 V @ 100 °C (212 °F)		
EA35	Fan Speed Sensor, viscous fan only (signal)	EA35 — EA39	0.005 — 5 V		4
EA47	Intake manifold air temperature sensor, signal	EA11 - EA47	≈ 2.6 V @ 20 °C (68 °F) ≈ 1.6 V @ 40 °C (104 °F)		

Notes

1 Normally "inactive" with ignition key in ON position.
2 Normally "open" with ignition key in ON position.
3 Measurement requires use of 2 breakout boxes 9998699 and adapters 9990014, connected to the EECU and both EA and EB connectors.
4 The value will change between 0.005 and 5 V six times during one revolution of the fan.
5 Make check with engine running for best accuracy.

Checking EB voltage (upper connector)



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Ground Checks

Verify that ground terminals EB10 (coolant level ground), EB58, EB59, EB61 (main), and EB18 (5V ground) are properly grounded (less than 10 Ω to ground).

Note: > — Greater than
< — Less than
≈ — Approximately

Terminal	Signal type	Measurement points	Nominal value	Measured value	"Notes" page 3
EB7	Preheater 1, heater diagnostics	EB7 - EB59	>65% B+ (active) 0 V (inactive)		1
EB11	Oil pressure sensor, signal	EB11 - EB18	≈ 0.5 V (engine not running)		
EB14	Preheater 2, heater diagnostics	EB14 - EB59	>65% B+ (active) 0 V (inactive)		1
EB15	Buffered idle validation switch	EB15 - EB59	0 - 4 V (inactive; pedal at rest) > 8 V (active, depressed accelerator pedal (AP))		
EB16	Fuel pressure sensor, signal	EB16 - EA11	0.5 V (engine not running)		3
EB17	Supply to sensor (5V)	EB17 - EB18	4.80 - 5.15 V		
EB19	EGR position 2	EB19 - EB18	≈ 0.2 - 0.8 V (valve closed)		
EB23	Coolant level sensor, signal	EB23 - EB10	≈ 80% B+ (open) - level normal 0 V (closed) - level low		2
EB24	EGR position 1	EB24 - EB18	≈ 0.2 - 0.8 V (valve closed)		
EB25	Preheater relay	EB25 - EB59	B+ (inactive) 0 V (active)		1
EB27	Coolant temperature sensor, signal	EB27 - EB18	≈ 3.0 V @ 20 °C (68 °F) ≈ 0.6 V @ 85 °C (185 °F)		
EB28	Crankcase pressure sensor	EB28 - EB18	2.9 ± 0.6 V (at sea level)		
EB30	VCB	EB30 - EB61	B+ (inactive) 0 V (active)		1
EB38	EPG signal	EB38 - EB59	≈ 8.5 - 10.5 V <1.0 V (active; 100%)		1

Terminal	Signal type	Measurement points	Nominal value	Measured value	"Notes" page 3
EB49	Fan control (On/Off)	EB49 - EB59	B+ (inactive; fan engaged/locked) 0 V (active; fan disengaged/free)		5
	E-Viscous		B+ (fan requested, output not grounded) ≈ 0 V (no fan speed requested, output grounded)		5
EB57	Supply voltage, EECU	EB57 - EB59	B+		
EB60	Supply voltage, EECU	EB60 - EB61	B+		

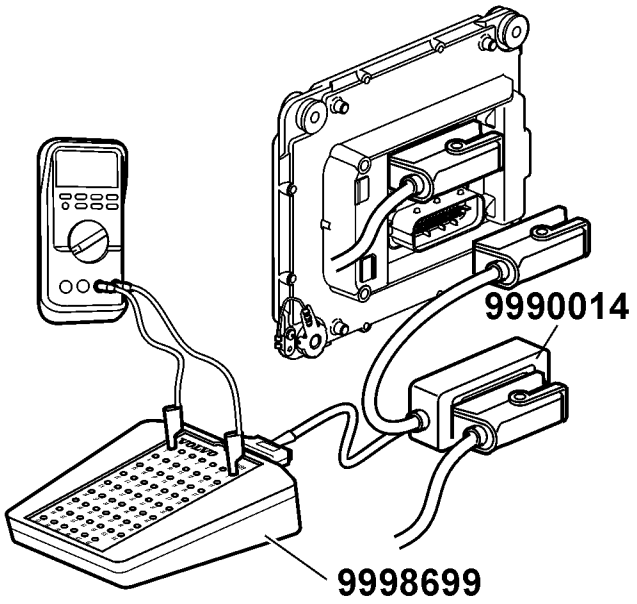
Step 2: Function Test (Wiring Harness and Circuit)

Conditions:

- Breakout box 9998699 and adapter 9990014 connected to the harness side.
- EECU disconnected
- Ignition key in OFF position
- Multimeter J-39200 measuring **resistance**.

(See also "EECU, Wiring Diagram" page 12.)

Checking EA resistance



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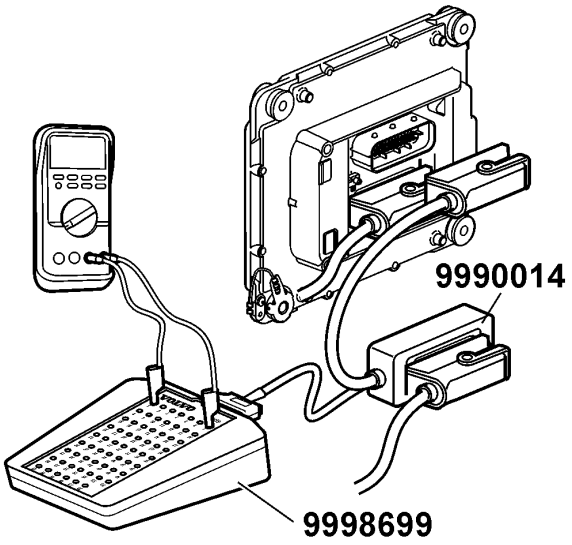
Note: > — Greater than
< — Less than
≈ — Approximately

Terminal	Signal type	Measurement points	Nominal value	Measured value	"Notes" page 8
EA3	Fuel pump	EA3 - EA57	> 10 Ω		
EA12	Unit injector cylinder 2 (NCV)	EA12 - EA62	0.9 - 5.2 Ω @ 20 °C (68 °F) 1.5 - 5.8 Ω @ 103 °C (218 °F)		2
EA16	Unit injector cylinder 2 (SV)	EA16 - EA59	1.1 - 5.8 Ω @ 20 °C (68 °F) 1.9 - 6.2 Ω @ 103 °C (218 °F)		3
EA20	Unit injector cylinder 1 (NCV)	EA20 - EA62	0.9 - 5.2 Ω @ 20 °C (68 °F) 1.5 - 5.8 Ω @ 103 °C (218 °F)		2
EA24	Unit injector cylinder 1 (SV)	EA24 - EA59	1.1 - 5.8 Ω @ 20 °C (68 °F) 1.9 - 6.2 Ω @ 103 °C (218 °F)		3
EA28	Unit injector cylinder 3 (NCV)	EA28 - EA62	0.9 - 5.2 Ω @ 20 °C (68 °F) 1.5 - 5.8 Ω @ 103 °C (218 °F)		2
EA30	EGR temperature sensor	EA30 - EB18	37 +2.8/-2.0 kΩ		5

Terminal	Signal type	Measurement points	Nominal value	Measured value	"Notes" page 8
EA31	Oil temperature sensor, signal	EA31 - EA11	1.9 kΩ @ 20 °C (68 °F) 100 Ω @ 100 °C (212 °F)		
EA32	Unit injector cylinder 3 (SV)	EA32 - EA59	1.1 - 5.8 Ω @ 20 °C (68 °F) 1.9 - 6.2 Ω @ 103 °C (218 °F)		3
EA36	Unit injector cylinder 6 (NCV)	EA36 - EA61	0.9 - 5.2 Ω @ 20 °C (68 °F) 1.5 - 5.8 Ω @ 103 °C (218 °F)		2
EA37	Speed sensor flywheel, (+)	EA37 - EA38	775 - 945 Ω		
EA45	Camshaft sensor (+)	EA45 - EA46	775 - 945 Ω		
EA40	Unit injector cylinder 6 (SV)	EA40 - EA60	1.1 - 5.8 Ω @ 20 °C (68 °F) 1.9 - 6.2 Ω @ 103 °C (218 °F)		3
EA44	Unit injector cylinder 5 (NCV)	EA44 - EA61	0.9 - 5.2 Ω @ 20 °C (68 °F) 1.5 - 5.8 Ω @ 103 °C (218 °F)		2
EA47	Intake manifold air temperature sensor, signal	EA47 - EA11	6.2 kΩ @ 20 °C (68 °F) 2.5 kΩ @ 40 °C (104 °F)		
EA48	Unit injector cylinder 5 (SV)	EA48 - EA60	1.1 - 5.8 Ω @ 20 °C (68 °F) 1.9 - 6.2 Ω @ 103 °C (218 °F)		3
EA52	Unit injector cylinder 4 (NCV)	EA52 - EA61	0.9 - 5.2 Ω @ 20 °C (68 °F) 1.5 - 5.8 Ω @ 103 °C (218 °F)		2
EA56	Unit injector cylinder 4 (SV)	EA56 - EA60	1.1 - 5.8 Ω @ 20 °C (68 °F) 1.9 - 6.2 Ω @ 103 °C (218 °F)		3

Checking EB resistance



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Note: > — Greater than
< — Less than
≈ — Approximately

Terminal	Signal type	Measurement points	Nominal value	Measured value	"Notes" page 8
EB3	Oil level sensor	EB3 - EB4	11.7 - 12.9 Ω @ 22 °C (72 °F)		
EB5	EGR valve 2 (+)	EB5 - EB1	1 - 10 Ω		
EB7	Preheater 1, heater diagnostics	EB7 - EB59	< 5.0 Ω (closed) ∞ (open)		1
EB13	EGR valve 1 (+)	EB13 - EB9	1 - 10 Ω		
EB14	Preheater 2, heater diagnostics	EB14 - EB59	< 5.0 Ω (closed) ∞ (open)		1
EB19	EGR position 2	EB19 - EB18	≈ 0.9 kΩ		4
EB23	Coolant level sensor, signal	EB23 - EB10	< 5.0 Ω (closed) - level low > 100 kΩ (open) - level normal		
EB24	EGR position 1	EB24 - EB18	≈ 0.9 kΩ		4
EB27	Coolant temperature sensor, signal	EB27 - EB18	1.9 kΩ @ 20 °C (68 °F) 160 Ω @ 85 °C (185 °F)		
EB49	Fan control (ON/OFF)	EB49 - EB57	15 - 100 Ω		
	Fan control (E-Viscous)	EB49 - EB57	< 50Ω		

Notes

1 Normally, a "closed" measurement reveals a good circuit, fuse, and preheater element.
2 NCV = Needle Control Valve
3 SV = Spill Valve
4 Valve closed.
5 Measurement requires use of 2 breakout boxes 9998699 and adapters 9990014, connected to the EECU and both EA and EB connectors.

Step 3: Function Test (EECU)

J1939 (Data Link) and J1587/1708 (Information Link) Checks

Conditions: *(See also "EECU, Wiring Diagram" page 12.)*

- EECU connected.
- Measurement at diagnostic connector

Note: For more information on Data Link fault tracing, refer to IMPACT or ID DVD: Info type "Diagnostics" group 3711

Notes

1 Ignition key in ON position; use MIN/MAX function on multimeter J39200 (voltage on Information Link varies depending on number of control units and traffic on Information Link).

2 Ignition key in OFF position; use resistance measurement on multimeter J39200.

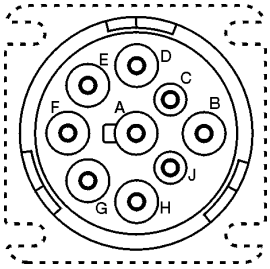
Terminal	Signal type	Measurement points	Nominal value	Measured value	"Notes" page 9
G	SAE J1587/1708	G - F	0 - 5 V		1
C	SAE J1939	C - D	50 - 70 Ω		2

Function Check

Conditions:

- Breakout box 9998699 and adapter 9990014 connected to harness connector EA only.
- Ignition key in OFF position
- Multimeter J39200 measuring **resistance**
- EA connector disconnected from EECU.

(See "EECU, Wiring Diagram" page 12.)



Terminal	Signal type	Measurement points	Nominal value	Measured value	Notes
EA33	SAE J1587-/1708 (CAN_Hi)	EA33 - G	0 Ω		
EA34	SAE J1587-/1708+ (CAN_Low)	EA34 - F	0 Ω		

J1939 Data Link Resistance Check

Conditions:

- Breakout box 9998699 and adapter 9990014 connected to harness connector EB only.
- Ignition key in OFF position.
- Multimeter J39200 measuring **resistance**.
- EB connector disconnected from EECU.

(See also "EECU, Wiring Diagram" page 12.)

Terminal	Signal type	Measurement points	Nominal value	Measured value	Notes
EB51 - EB55	SAE J1939 CAN HI/1939 CAN LOW	EB51 - EB55	120 Ω		
EB51	SAE J1939	EB51 - C	0 Ω		
EB55	SAE J1939	EB55 - D	0 Ω		

Notes:		
Completed by:	Dealer:	Date:

Engine ECU, Fault Tracing

You must read and understand the precautions and guidelines in Service Information, group 20, "General Safety Practices, Engine" before performing this procedure. If you are not properly trained and certified in this procedure, ask your supervisor for training before you perform it.

If the measurements on the wiring harnesses indicate faults, it is highly probable that the engine ECU is fault free.

DANGER

Never switch engine ECUs between vehicles for fault tracing or repairs **without re-programming**. Incorrect individual settings in the engine ECU can lead to loss of control of the vehicle, which can cause personal injury or death.

Note: ECU programming is not permitted without prior authorization from Volvo Trucks North America, Inc. For reprogramming information, refer to the VCADS Pro User Manual.

Warranty Claims

The checklist must be completed (with all measured values noted) to eliminate possible faults in the engine ECU before it can be replaced under warranty.

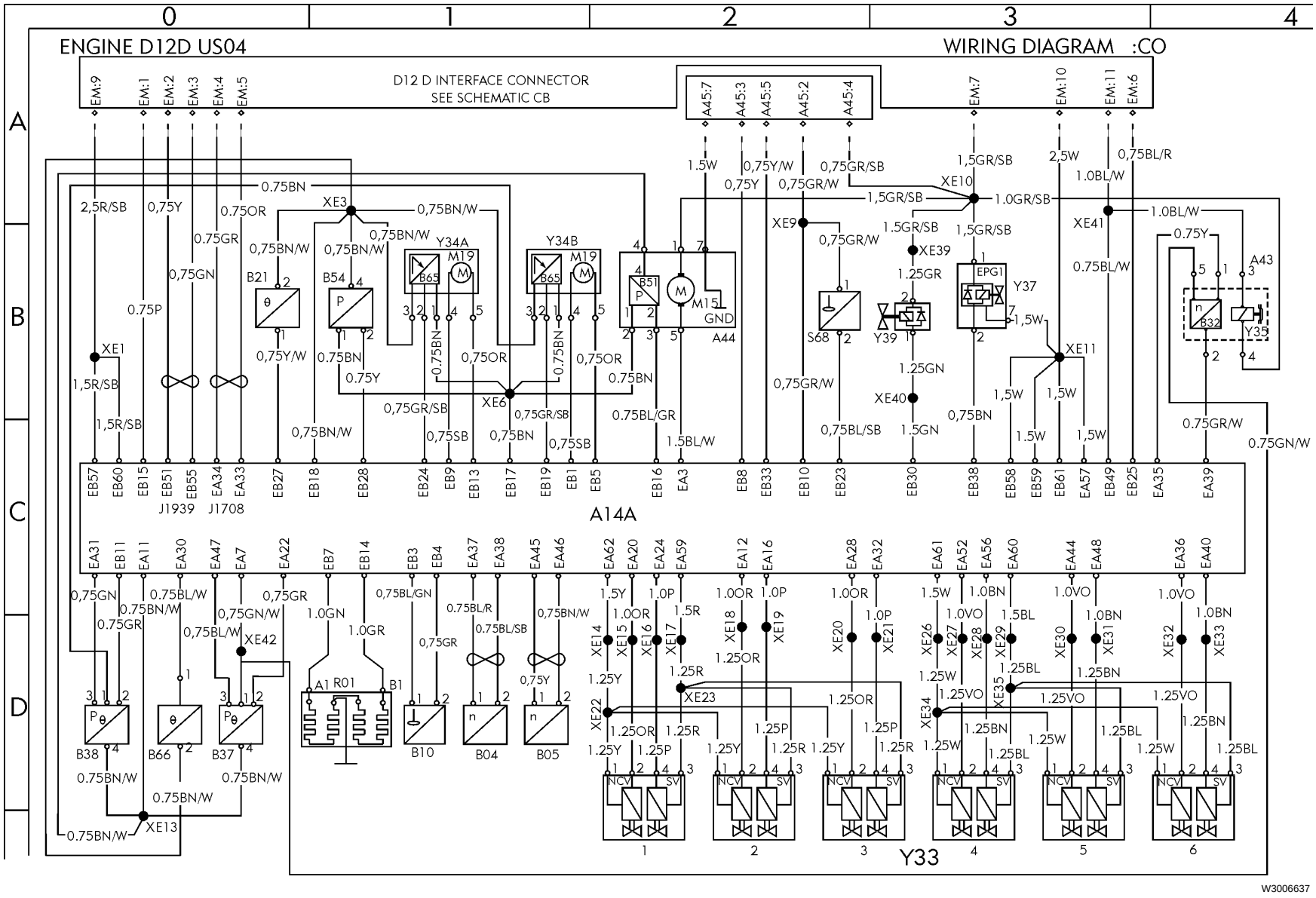
A copy of the completed checklist must be attached to the warranty claim.

Component Descriptions

(See “EECU, Wiring Diagram” page 12.)

Compo-nent	Description
A14	EECU (engine electronic control unit)
A17	VECU (vehicle electronic control unit)
A43	Engine group component. Contains B32 and Y35.
A44	Engine group component. Contains B51 and M15.
B04	Sensor, engine speed, crankshaft
B05	Sensor, engine position, camshaft
B10	Sensor, oil level
B21	Sensor, engine coolant temperature
B32	Sensor, fan speed
B37	Sensor, air intake pressure and charge air temperature
B38	Sensor, oil pressure and oil temperature
B51	Sensor, fuel pressure
B54	Sensor, pressure, crankcase
B66	Sensor, EGR temperature
M15	Engine, electric fuel pump
R01	Preheater element
S68	Sensor, coolant level
Y33	Solenoid valves, UI (unit injector)
Y34A	EGR valve 1 (contains B65 position sensor)
Y34B	EGR valve 2 (contains B65 position sensor)
Y35	Solenoid, fan (E-Viscous) (On/off fan after 10/03)
Y37	Solenoid valve (PWM valve), exhaust pressure governor (EPG)
Y39	Solenoid valve, Volvo compression brake
Y53A	Solenoid, On/Off fan (10/02 — 9/03)

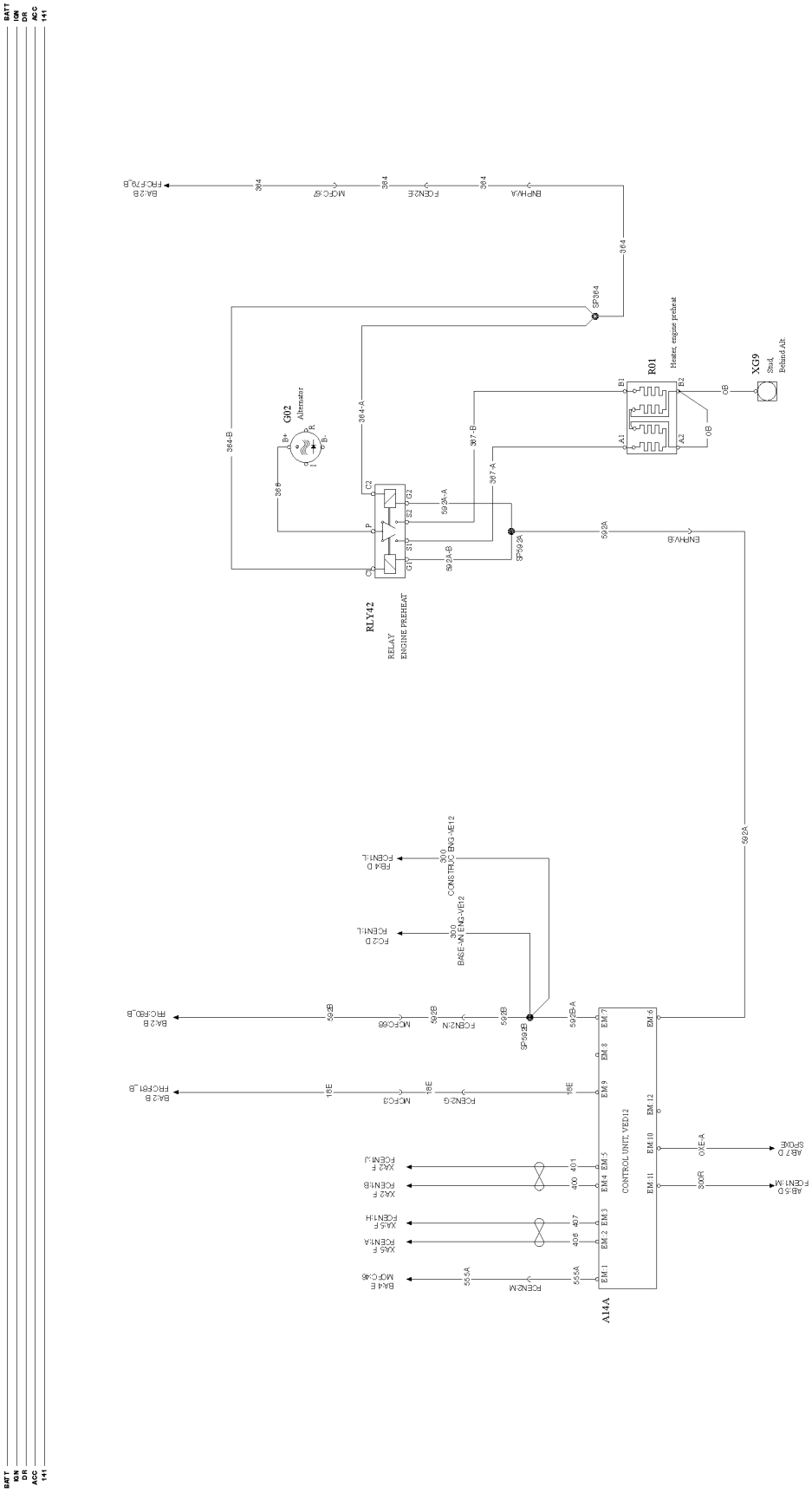
EECU, Wiring Diagram



NOTE: D12D Interface connection is Interface Connection Box A14A (see also “Preheat Schematic, CB” page 13).

Preheat Schematic, CB

10/02 — 9/03



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Preheat Schematic, CB

From 10/03