

## Section 3 Electrical system

### Group 31 Battery

System voltage, with ignition off: ..... 12.5 - 12.7 V

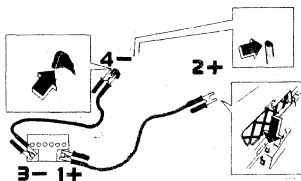
A newly charged battery may have a higher voltage.

#### Battery capacity

Cold start current* CCA SAE	Capacity	Reserve capacity** RC SAE	Recommended charge current
520 A	55 Ah	90	5.5 A
600 A	65 Ah	115	6 A
680 A	90 Ah	160	8 A

\* **Cold start current (CCA, SAE)** is the discharge current which a battery can provide for 30 seconds, at a temperature of  $-18^{\circ}\text{C}$  ( $0^{\circ}\text{F}$ ) without voltage dropping below 7.2 V.

\*\* **Reserve capacity (RC, SAE)** is the time taken at a temperature of  $+27^{\circ}\text{C}$  ( $81^{\circ}\text{F}$ ), and a discharge current of 25 A, to reduce the voltage of a fully charged battery to 10.5 V.



#### Jump start connection:

The jump start connection can be made on the integrated relay / fusebox in the engine compartment to which the battery positive lead is connected.

To stop the battery accidentally discharging through the cargo compartment electrical socket there is a control circuit in the rear electronic module.

If the current in the circuit exceeds 60 mA the following occurs.

- 1) a text message is displayed in the driver information module when the ignition key is turned from I to 0.
- 2) there is a short warning beep when the ignition key is removed from the ignition switch.

## Group 32 Generator / Charge regulator

Generators, electrical and mechanical data:

<b>Generator</b> Type:	BOSCH NCB1 14 V / 120 A
Petrol engine. Generator without a freewheel ..... Volvo P/N	94 42 841
Petrol engine. Generator with a freewheel ..... Volvo P/N	94 59 092
Diesel engine ..... Volvo P/N	94 59 093
Direction of rotation, petrol engine ..... Direction of rotation, diesel engine .....	Anticlockwise Clockwise
Current at 13.5 V ..... A Measured at a temperature of 25°C (77°F). Stabilized output voltage. Engine speed: 11.3 rps/680 rpm.	120
Current at 13.5 V ..... A Measured at a temperature of 25°C (77°F). Stabilized output voltage. Engine speed: 38.3 rps / 2,300 rpm.	70
Nominal output ..... W	1680
Maximum engine speed ..... rps (rpm)	113 (6800)
Carbon brushes, minimum length .....	5.0 mm (0.197")
<b>Tightening torques:</b>	
Mounting screw for rear cover, use B+ connection Nm/ft. lb.	35/26
Mounting screw for rear cover, do not use B+ connection ..... Nm/ft. lb.	12/9
Mounting screw for rear cover, locking screw ... Nm/ft. lb.	4/3
Mounting screw for governor, ground screws ... Nm/ft. lb.	2/1.5
Mounting screw for governor, phase connector . Nm/ft. lb.	1/0.7
Nut with left-hand thread for a fixed pulley ..... Nm/ft. lb.	65/48
Nut with left-hand thread for a freewheel pulley . Nm/ft. lb.	65/48
<b>Test values:</b>	
Resistance, rotor winding ..... Ω	2.6
Resistance, stator winding ..... Ω/phase	0.06
Measure with a low resistance voltmeter	

## Charge regulators, electrical and mechanical data:

<b>Charge regulator</b> Type:	BOSCH	
Volvo P/N	94 59 741 94 59 744	
Conditions: Battery charging ..... Air temperature ..... °C/°F Temperature, regulator at operating temperature °C/ °F Test values: Generator speed ..... rps (rpm) Engine speed ..... rps (rpm) Generator load ..... A Basic vehicle load Control voltage between B+ terminal and generator housing. This voltage reading should be carried out until 10 seconds after the engine has been started. Generator: 94 59 098, 94 42 841, 94 59 092, 94 59 093 ... V	In the car	On the test bench
	75% 25°/77° 60° - 80°/140° - 176°	100% 25°/77° 60° - 80°/140° - 176°
	100 (6000) 38.3 (2300) 25 - 45	25 - 45
	13.7 - 14.6	14.1 - 14.9

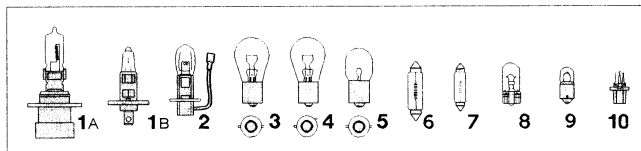
## Group 33 Starter motor

P/N and test data:

<b>Starter motor</b>	Bosch 12 V	
Type / Test data		
1.4 kW .....	Volvo P/N	91 62 617
1.4 + kW .....	Volvo P/N	91 62 618
2.0 kW .....	Volvo P/N	94 59 468
Control solenoid:		
Minimum voltage .....	V	7.4

Starter motor, type	Bosch 12 V / 1.4 kW	Bosch 12 V / 2.0 kW
Volvo P/N .....	91 62 617 91 62 618	94 59 468
Direction of rotation .....	Clockwise	Clockwise
Test value, starter motor unloaded:		
12.0 V and maximum 70 A, minimum rpm (rps)	2900 (48.3)	
12.0 V and maximum 85 A, minimum rpm (rps)		4900 (81.6)
Test value, starter motor locked:		
4.0 V and 0 rpm .....	A 650-750	
4.0 V and 0 rpm .....	A	700 - 1000
Control solenoid:		
Minimum voltage .....	V 7.4	8.0

Group 35 Lighting



Bulbs (Market dependent)

Location:	Output W	Socket type	Illustration number
Headlamp, high beam .....	60	HB3	1A
Headlamp, low beam .....	55	H7	1B
Fog lamps .....	55	H1	2
Parking lamps, front .....	21/5	BAY 15 d	4
Tail lamps: Upper .....	5	BA 15 s	5
Tail lamps: Lower .....	21/4	BAY 15 d	4
Turn signal lamps:			
Front .....	21/5	BAY 15 d	4
Rear .....	21	BAU 15 s	3
Side .....	5	W 2.1 x 9.5 d	8
Brake lamp, standard .....	21	BA 15 s	3
High-mounted brake lamp .....	4	Special	-
Rear fog lamps .....	21/4	BAY 15 d	4
Reversing lamps .....	21	BA 15 s	3
License plate lighting .....	5	W 2.1 x 9.5 d	8
Courtesy lighting .....	5	SV 8.5	6
Roof lighting .....	10	SV 8.5 / 6cp	6
Reading lamps, rear .....	5	W 2.1 x 9.5 d	6
Glove compartment lighting .....	2	BA 9 s	9
Vanity mirror lighting .....	1.2	SV 5.5	7
Instrument lighting .....	1.2/2/3	W 2 x 4.6 d	10
Lighting, controls .....	0.9	Special	10
Hazard warning signal flashers .....	0.9	Special	10

## Group 37 Fuses

<b>11A</b>		
Main fuses in the engine compartment, integrated relay / fusebox		
Fuse number:	Function	A
1	Glow plug relay	60
2	Fuses 11C/32-38, parking lamp relay	60
3	Fuses 11B/17-18, 11C/3-6, 11C/16-19 Overload relay X+, Overload relay 15 +	60
4	Fuses 11B/10, 12-13, 16, 11C/20-28	60
5	-	
6	-	
7	Fuses 11B/1-2, Engine cooling fan control module	60
8	Fuses 11B/20-21	60

<b>11B</b>		
Fuses in the engine compartment, integrated relay / fusebox		
Fuse number:	Function	A
1	Control module, additional heater	25
2	Accessories, auxiliary lamps	-
3	-	-
4	Heated oxygen sensors	20
5	Canister purge (CP) valve, reset valve for camshaft, EVAP canister shut-off valve	15
6	Engine control module, fuel injection pump, mass air flow sensor, injectors	15
7	Electronic throttle body control module	10
8	Air conditioning relay, accelerator pedal position sensor	10
9	Horn	15
10	Washer pump, rear windscreen	10
11	Glow plug relay, coolant heater plug relays, air conditioning relay, ignition discharge module with ignition coils, EGR controller, turbocharger control valve, engine pad solenoid valve, air preheating PTC resistor	20
12	Brake lamp switch	5
13	Windscreen wipers	25
14	ABS control module	30

**11B**

## Fuses in the engine compartment, integrated relay / fusebox

Fuse number:	Function	A
15	-	-
16	Washer pump, windscreen, headlamp washer	15
17	Low beam	15
18	High beam	20
19	ABS/DSTC control module	30
20	Relay 2, coolant heater plug	30
21	Relay 1, coolant heater plug	30
22	Relay, starter motor	25
23	Main relay, engine management system	5
24	-	-

**11C**

## Fuses in the passenger compartment fusebox

Fuse number:	Function	A
1	Left low beam	10
2	Right low beam	10
3	Fog lamps, front	15
4	Power driver's seat	30
5	Power passenger seat	30
6	-	-
7	Central electronics module, supplementary restraint system control module Overload relay X supply	5
8	Heated seats	25
9	ABS, steering angle sensor control module	5
10	Left high beam	15
11	Right high beam	15
12	Headlamp wipers, Headlamp range adjustment	15
13	Cigarette lighter, 12 V socket, front and rear	20
14	Seat belt buckle switch, power passenger seat, central electronic module	5

<b>11C</b>		
Fuses in the passenger compartment fusebox		
Fuse number:	Function	A
15	Audio module, RTI display	5
16	Audio module	20
17	Amplifier	30
18	Carphone, RTI display	10
19	-	-
20	Transmission control module via the relay for the extended X-supply for automatic transmission.	10
21	Turn signal lamps	20
22	Electrical switch module, control stalks (steering wheel module)	5
23	Light switch module, data link connector, Climate control module	5
24	Extended X-supply via relay: Climate control module, driver information module, power driver's seat, additional heater control module, geartronic, shift lock	10
25	Ignition switch (30): Starter motor relay, engine control module, central electronics module, fuse 11/C7, supplementary restraint system control module, antenna ring, relay 15/X	10
26	Blower fan control module	30
27	Electronic door modules, front, left and right: central locking, power windows, door open warning lamps, heated door mirrors, power door mirrors, door mirror lighting	15
28	Roof lighting, upper electronic module, roof control module	10
29	Alarm siren	5
30	Parking lamp bulb (left front), parking lamp bulbs (left rear)	10
31	Parking lamp bulb (right front), parking lamp bulbs (right rear), license plate lighting	10
32	Fuse 11C/29, interior lighting, electronic power steering	10
33	Fuel pump	15
34	Sun roof	15
35	Electronic door module, front, left: central locking, power windows, heated door mirrors, power door mirrors, door mirror lighting	25
36	Electronic door module, front, right: central locking, power windows, heated door mirrors, power door mirrors, door mirror lighting	25



<b>11C</b> Fuses in the passenger compartment fusebox		
Fuse number:	Function	A
37	Rear power windows, child safety block	30
38	-	-

<b>11E</b> Main fuses, cargo compartment, by battery		
Fuse number:	Function	A
1	15I-supply rear	40
2	Fuses 11D/12-14	40
3	Heated rear window	40
4	-	-
5	Fuses 11D/6-10	40
6	-	-
7	Fuses 11D/1-5	40

<b>11D</b> Fuses, cargo compartment, in the integrated relay / fusebox		
Fuse number:	Function	A
1	Rear electronic module, cargo compartment lighting	10
2	Rear fog lamps	10
3	Brake lamps	15
4	Reversing lamps	10
5	Heated rear windscreen, control voltage, relay 15I	5
6	Tailgate opening, tailgate locking	10
7	Option: Fold-down head restraints, cargo compartment power socket	10/15
8	Central locking rear doors, fuel tank filler cover unlocking	15
9	Tow hitch for trailer, 30-supply	15
10	CD changer, RTI control module, pager	10
11	-	-
12	Tailgate wiper motor	15
13	Amplifier, bass speakers, cargo compartment	30

**11D**

Fuses, cargo compartment, in the integrated relay / fusebox

Fuse number:	Function	A
14	-	-
15	Tow hitch for trailer, 15-supply	20
16	Accessories: Electrical socket in the cargo compartment	15
17	-	-
18	-	-

**Relays**

Located in the engine compartment

Position	Function
FMA1	Relay 1 coolant heater plug 2/109
FMA2	Main relay, engine management system 2/32
FMA3	Glow plug relay 2/14
FMA4	Relay, starter motor 2/35
FMA5	Relay 2, coolant heater plug 2/74
FMI1	Relay, A/C 2/22
FMI2	Relay, horn 2/17
FMI3	Relay, washer pump, front 2/92
FMI4	Relay, washer pump, rear 2/93
FST1	Relay, intermittent windscreen wiper 2/91
FST2	-
FST3	Relay, windscreen wiper, low/high speed 2/90

<b>Relays</b>	
Located in the passenger compartment	
Position	Function
CMA1	-
CMA2	Overload relay, X-supply 2/30
CMA3	Overload relay, 15-supply 2/31
CMA4	-
CMI1	Relay, power window up, left rear 2/116
CMI2	Relay, power window down, left rear 2/118
CMI3	Relay, power window child safety block, rear doors 2/120
CMI4	Relay, high beam 2/63
CMI5	Relay, parking lamps 2/61
CMI6	-
CMI7	Relay, low beam 2/62
CMI8-10	-
CMI11	Relay, fog lamps, front 2/34
CMI12	Relay, fuel pump 2/23
CMI13-20	-
CMI21	Relay, extended X-supply, automatic transmission 2/101
CMI22	Relay, extended X-supply 2/29
CMI23	Relay, power window down, right rear 2/119
CMI24	Relay, power window up, right rear 2/117
CMI25	-
CSH1	Shunt, left turn signal lamp, central electronic module 20/32
CSH2	Shunt, right turn signal lamp, central electronic module 20/34
CSH3	-
CSH4	Shunt, low beam, central electronic module 20/27
CSH5-6	-
CST1	-

<b>Relays</b> Located in the cargo compartment	
Position	Function
RMA1	Relay, 15l-supply, rear 2/52
RMA2	-
RMA3	Relay, heated rear windscreen 2/82
RMA4	-
RMI1	Relay, central locking, left rear door 2/111
RMI2	Relay, central locking, left rear door 2/112
RMI3	Relay, central locking, deadlocked, rear doors 2/115
RMI4	Relay, reversing lamp 2/80
RMI5	Relay, brake lamp 2/79
RMI6	Relay, rear fog lamp 2/49
RMI7	Relay, fog lamp, trailer 2/83
RMI8-10	-
RMI11	Relay, pager 1 2/136
RMI12	Relay, pager 2 2/137
RMI3	Relay, tailgate wiper 2/72
RMI4	Option: Relay, fold-down head restraints, rear 2/75
RMI5	-
RMI6	Relay, tailgate wiper 2/16
RMI17-18	-
RMI19	Relay, tailgate, opening 2/87
RMI20	Relay, tailgate, locking 2/86
RMI21	Relay, fuel tank filler cover, unlocking 2/59
RMI22	Relay, fuel tank filler cover, locking 2/58
RMI23	Relay, central locking, right rear door 2/114
RMI24	Relay, central locking, right rear door 2/113
RMI25	-
RSH1	-
RSH2	Shunt, rear fog lamp 20/29
RSH3	Shunt, power socket in cargo compartment 5DR 20/39
RSH4	Shunt, parking lamps, group 1 20/28
RSH5	Shunt, parking lamps 2, 20/33

V70

Group 37 Fuses

<b>Relays</b> Located in the cargo compartment	
Position	Function
RSH6	Shunt, brake lamp 20/31
RST1	-

## Group 38 Instruments, sensors

<b>Fuel level sensor:</b>	Volume litres:	Volume US gallons:	Fuel tank unit, left-hand side: Measured across terminal pins 5 and 6. Resistance $\Omega$ !	Fuel tank unit, right-hand side: Measured across terminal pins 6 and 7. Resistance $\Omega$ !
Empty fuel tank . . . . .	0	0	374	393
Half tank . . . . .	40/35/36	9.2/6.5/10.6	136/136/133	129/133/115
Full fuel tank . . . . .	70/72/80	18.5/19.0/ 21.1	12	12

<b>Engine coolant temperature sensor:</b>						
Temperature: °C (°F)	0° (32°)	10° (50°)	20° (68°)	40° (104°)	80° (176°)	100° (212°)
Resistance . . . . . $\Omega$	5740	3700	2450	1150	318	184
Voltage . . . . . V	2.65	2.10	1.62	0.92	0.29	0.17

**Speedometer**

Speedometer, resistance sensor . . . . .	Cannot be measured. Carry out check using a VADIS station.
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