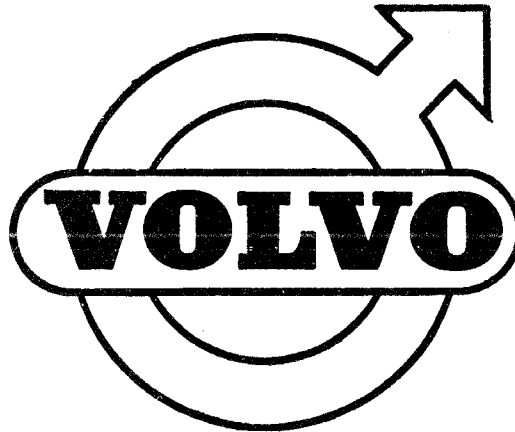




SERVICE HINTS

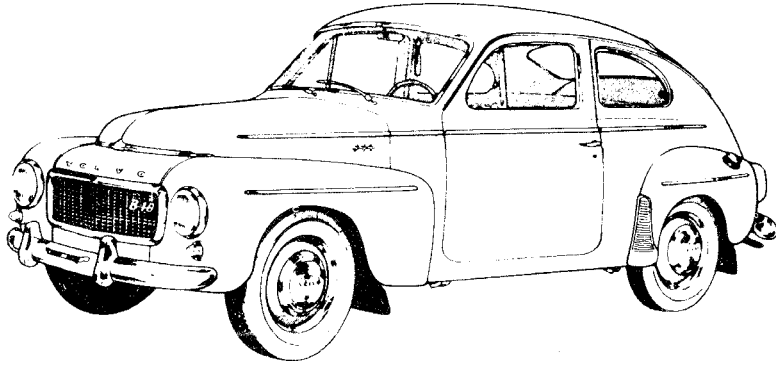
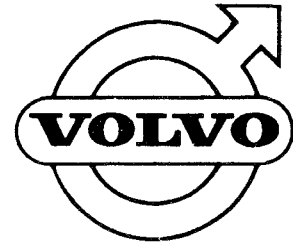


THIS "SERVICE HINT BOOKLET" IS ESPECIALLY MADE UP FOR THE VOLVO DEALERS SERVICE PERSONNEL AND IS THEREFORE NOT FOR SALE TO THE PUBLIC. THE PURPOSE OF THIS BOOKLET IS TO GIVE A QUICK ANSWER TO THE MOST COMMON SERVICE QUESTIONS.

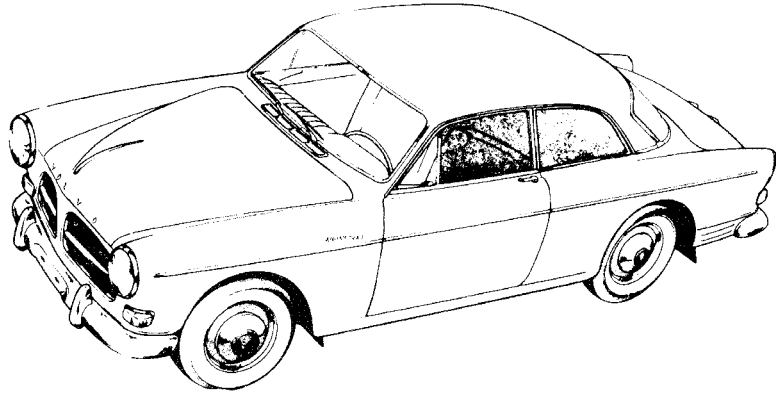
FOR FULL DETAILS AND SPECIFICATIONS, SEE VOLVO SERVICE MANUAL, WORKSHOP BULLETINS AND SERVICE BULLETINS.

February, 1965
VOLVO (CANADA) LTD.
TORONTO, ONTARIO.

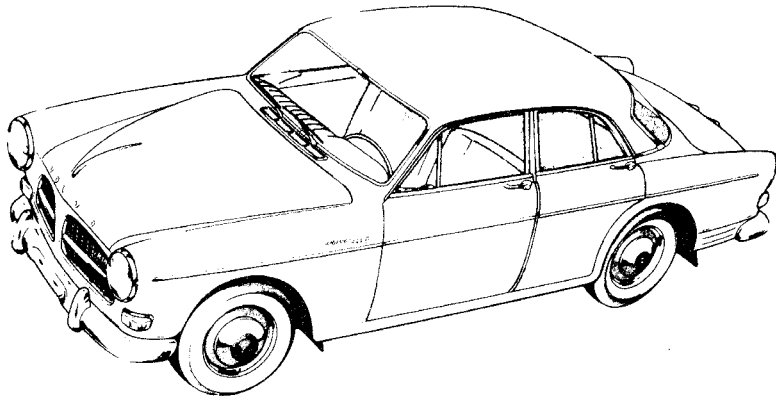
VEHICLE IDENTIFICATION



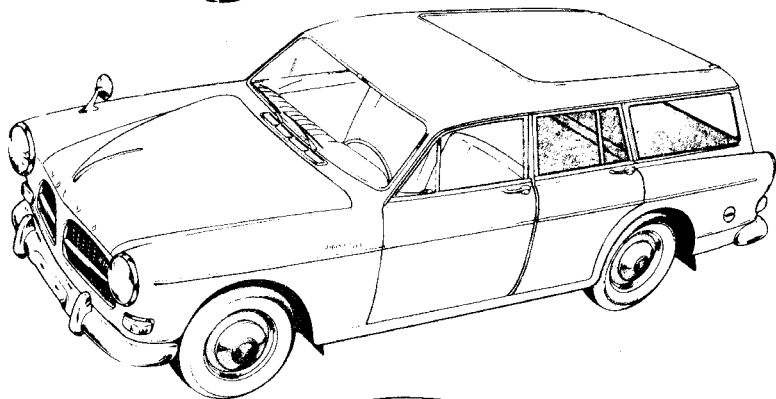
544 TWO-DOOR SEDAN
P1100
(Two-Piece wind-
shield = P444)



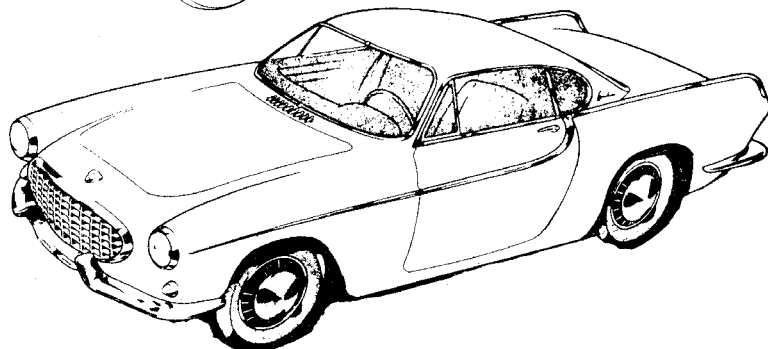
122S TWO-DOOR SEDAN
P1300



122S FOUR-DOOR SEDAN
P1200

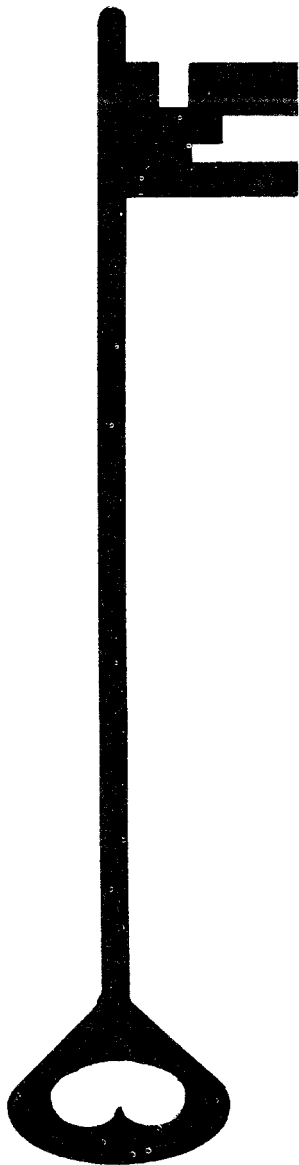


122S FOUR-DOOR
STATION WAGON
P2200

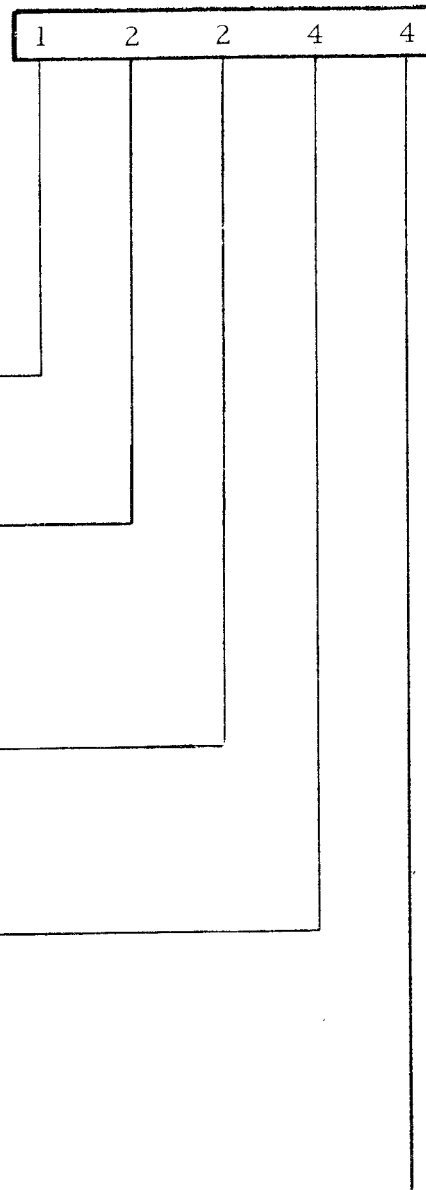


SPORTS COUPE
P1800

CODE KEY



Type Designations
Are Explained in the
Code Key Below



1st Figure — — — — —

1. Car
2. Station Wagon

2nd Figure — — — — —

1. 544 or 210 Station Wagon
2. 122S 4-door or 122S Station Wagon
3. 122S 2-door
8. P1800S

3rd Figure — — — — —

1. B18A Engine
2. B18D Engine
3. B18B Engine

4th Figure — — — — —

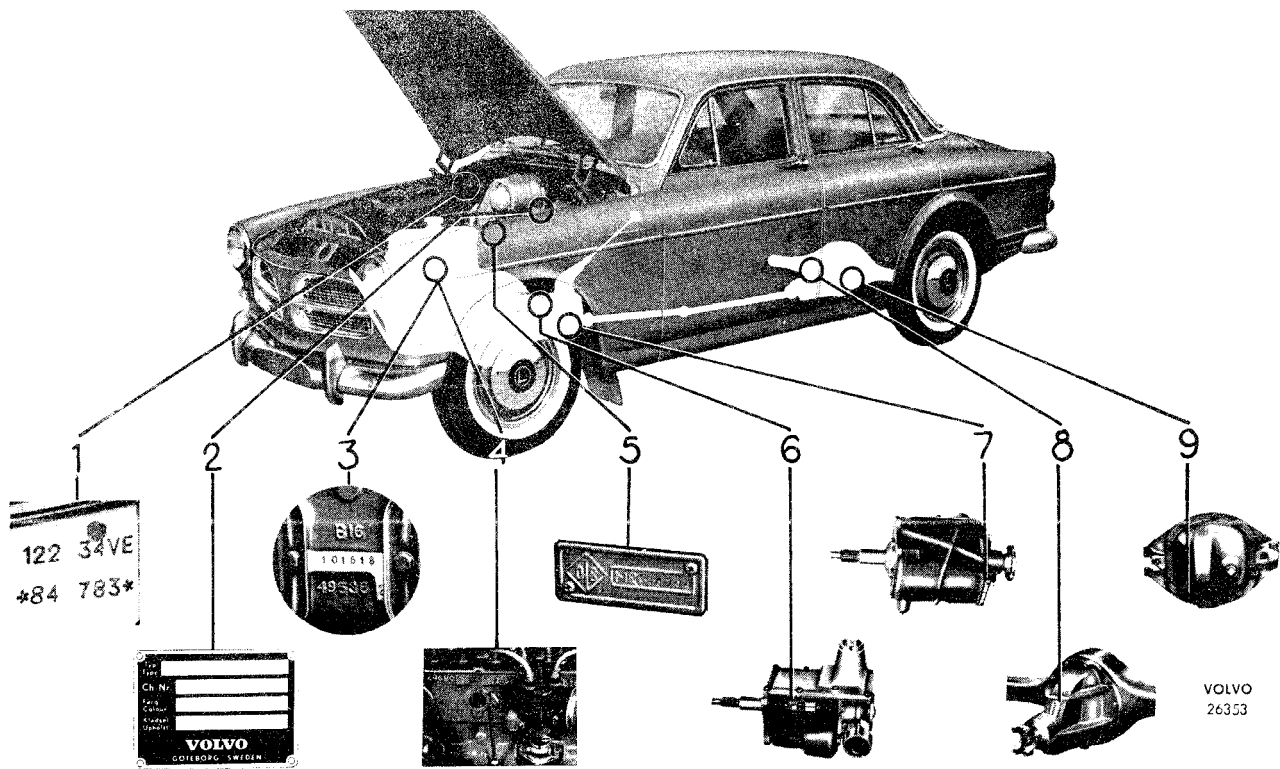
3. Special Model
4. USA Model
5. Norway Model
6. Denmark Model
9. Assembled Outside Sweden

5th Figure — — — — —

2. M30 Transmission
3. M31 Transmission (Overdrive)
4. M40 Transmission
5. M41 Transmission (Overdrive)
6. Automatic Transmission

The Code 12244 Means

1. Passenger Car
2. 122s 4-door
3. B18D Engine
4. USA Model
5. M40 Transmission



1. The chassis number on late production models is stamped in the bulkhead.
2. Type designation of vehicle, chassis number and code number for surface finish and upholstery.
3. Engine type designation (B 16), serial and part number (on right-hand side of early production engines).
4. Engine type designation (B 18), serial number and part number.
5. Body number.
6. Gearbox type designation, serial number and part number.
7. Gearbox type designation, serial number and part number.
8. ENV rear axle. Number of teeth and serial number stamped on forward part of housing.
9. Spicer rear axle. Number of teeth and ratio on plate attached to lower part of inspection cover.

<u>MODEL</u>	<u>PARTS CATALOG</u>	<u>ISSUED</u>
<u>P444</u> A two-door model. Easily recognized by its two-piece windshield.	<u>P44408 (B14A)</u> up to chassis no. 131917 <u>PV444 or P44408</u> from chassis no. 131918 to chassis no. 196004 (B16B)	July - 57 Mar. - 61
<u>P445</u> A station wagon. Easily recognized by its two-piece windshield.	<u>PV445, P210</u>	Jan. - 60
<u>P544</u> A two-door model which is a modification of the P444 model. The most significant change is the one-piece windshield.	<u>P544-P110-B16</u> from chassis no. 196005 to chassis no. 330099.	July - 60
<u>P1100</u> A continuation of the P544 series	<u>P110-210</u> from chassis no. 330100	
<u>P1200</u> A four-door model introduced in the U.S. in 1959.	<u>P1200</u> up to chassis no. 84299. <u>P120-130-220</u> from chassis no. 84300.	June - 59 June - 62
<u>P1300</u> A two - door model on the P1200 chassis - introduced in 1962.	<u>P120-130-220</u>	
<u>P1800</u> A sports car introduced in 1961	<u>P180</u>	
<u>P2100</u> Station wagon - a modification of the P445, recognized by its one-piece windshield.	<u>PV445, P210</u>	Jan. - 60
<u>P2200</u> A four door station wagon on the P1200 chassis - introduced in 1962.	<u>P120-130-220</u>	

	1	2	3	4	5	6	7	8	9	10	11	12	
Chassis Type	P44408 2 door 2 piece w/s	P44508 St. Wg. 2 piece w/s	P54401 2 door 1 piece w/s	P54402 2 door 1 piece w/s	P54408 2 door 1 piece w/s	P54409 2 door 1 piece w/s	P1100 (544 11244) 2 door 11294	P1300 (13244) 2 door 13296	P1200 (12244) 4 door 12296	P1800 Sports Coupe	P2100 (21244) St. Wg. 1 piece w/s	P2200 (22244) St. Wg. (122S)	22294
Canadian Prod.													
Equipment	B14A up to #131917 B16B from #131918	B14A up to #2912 B16B from #2913	B16A (single carb.)	B16A (single carb.)	B16B	B16B	B18D	B18D	B16B up to #84299 B18D from #84300	B18B 100 HP up to #6000 108 HP from #6001	B16B	B18D	
Engine													
Transmission	H5 3 speed up to #130562 H6 from #130563 M4 from 1958	H5 3 speed up to #2912 H6 - 3 speed from 2913	H6 3 speed or M30 3 speed	M4 4 speed or M30 3 speed	M4 4 speed up to #295499 M40-4 speed from #295500	H6 3 speed	M40 4 speed	M40 4 speed	M4 4 speed up to #54399 M40	M40S 4 speed or M41S with o/ drive	M40 4 speed	M40 4 speed	M40 4 speed
Rear Axle	Spicer M23 Ratio 4.56:1	Ratio 5.63:1 up to #4215 5.13:1 up to #7443- 5.56:1 from #7444	Spicer M27 Ratio 4.56:1	Spicer M27 Ratio 4.56:1	Spicer M23 up to #267124 M27 from #267125 all 4.56:1 ratio	Spicer M23 Ratio 4.56:1	Spicer M27 Ratio 4.1:1	Spicer M27 Ratio 4.1:1 Can. Prod. E.N.V. Ratio 4.1:1	Spicer M23 up to #61890 M27 4.56:1 from #61891 4.1:1 ratio from #84300 Can. Prod. E.N.V. 4.1:1	Spicer M27 Ratio 4.1:1 or 4.56:1 with o/ Drive	Ratio 4.56:1	Salis- bury Ratio 4.56:1	

Car Designation	P444 P445	P54401 P54402	P44408 from ch. #131918	P1800	P1100(544) from ch. #330100	
			P54408 up to ch. #329999		100 HP up to ch. #6000	P1200 from ch. #84300
			P1200 up to ch. #84299		108 HP from ch. #6001	P1300 P2200

SPECIFICATIONS

ENGINE	B14A	B16A	B16B	B18B	B18D
Output HP/RPM	70/5000	66/4500	85/5500	100/5500 S=108/5800	90/5000
Max. Torque Ft. Lbs./RPM	76/3000	85.4/2500	87/3500	108/4000 S=110/4000	105/3500
Displacement C.C./Cu. in.	1414/86	1580/96.4	1580/96.4	1780/109	1780/109
Compression Ratio	7.8:1	7.4:1	8.2:1	9.5:1 S=10:1	8.5:1
Lubrication oil For Service M.S. viscosity below 32°	10W-30 for year round	10W-30 for year round	10W-30 for year round	10W-30 for year round	10W-30 for year round
viscosity above 32°	SAE 10W	SAE 10W	SAE 10W	SAE 10W	SAE 10W
viscosity above 90°	SAE 20	SAE 20	SAE 20	SAE 20	SAE 20
Capacity with filter	4 qts.	3½ qts	3½ qts.	4 qts.	4 qts.
Capacity with- out filter	3½ qts.	3 qts.	3 qts.	3½ qts	3½ qts.
Cooling system capacity	9 qts.	9 qts.	9 qts.	9.5 qts.	9 qts.
Torque Spec. Cylinder Head	ft. lbs. 50-60	ft. lbs. 50-60	ft. lbs. 50-60	ft. lbs. 60-65	ft. lbs. 60-65
Main bearings	ft. lbs. 60-70	ft. lbs. 60-70	ft. lbs. 60-70	ft. lbs. 90-95	ft. lbs. 90-95
Con. Rod Bearings	ft. lbs. 30-35	ft. lbs. 30-35	ft. lbs. 30-35	ft. lbs. 40-45	ft. lbs. 40-45
Spark Plugs	ft. lbs. 25	ft. lbs. 25	ft. lbs. 25	ft. lbs. 30	ft. lbs. 30
Valve clearance intake	.020"-.022"	.016"-.018"	.020"-.022"	.020"-.022"	.016"-.018"
Exhaust	.020"-.022"	.018"-.020"	.020"-.022"	.020"-.022"	.016"-.018"
Spark Plugs	Bosch W175T3 Champion J6	Bosch W175T3 Champion J6	Bosch W175T3 Champion J6	Bosch *W225T1 Champion L5	Bosch *W175T1 Champion L7
Spark Plug Gap	.028"	.028"	.028"	.028"	.028"
Distributor Point Gap	.016"	.016"	.016"	.016"	.016"
Dwell Angle	47°-50°	47°-50°	47°-50°	60°-63°	60°-63°
Timing Setting	3°-5° Static	4°-6° Static	4°-6° Static or 24° at 1500 RPM Dist. vacuum line dis- connected	19° at 1500 RPM No vacuum line between carb. and dist.	24° 1500 RPM Dist. line disconnected

*Bosch plugs have proven to be best suited for the B18 engines

SPECIFICATIONS

(Cont'd)

	B14A	B16A	B16B	B18B	B18D
Carburetor		Zenit Car-			
Float Level	7/16"	buretor	7/16"	Fixed	Fixed
Needle & Seat					
Specification	T.1		T.1	T.1	T.1
Fuel Needle					
Normal	CZ		GT	ZH	ZH
Lean					KA
Generator out-put					
rated	160W	200W	200W	240W	240W
max.	240W	300W	300W	360W	360W
Volt	6	6	6	12	12
Regulator	RS/UA/160/6	RS/UA/200/6	RS/UA/200/6	LJ/GG240/12	LJ/GG240/12
Cut In	5.8-6.3V	5.8-6.3V	5.8-6.3V	12.1-12.8V	12.1-12.8V
Reverse Current	4-9A	4-9A	4-9A	2.0-7.5A	2.0-7.5A
Voltage Control					
Open Circuit	7.1-7.4V	7.0-7.5V	7.0-7.5V	13.9-14.9V	13.9-14.9V
Current Control	40A	50A	50A	30-45A	30-45A
Starter Test					
Values:					
	4.5V	4.5V	4.5V	10V	10V
Loaded	260-280A	260-280A	260-280A	200A	200A
Stalled	3.5V	3.5V	3.5V	8V	8V
	450-480A	450-480A	450-480A	400-450A	400-450A

FRONT WHEEL ALIGNMENT SPECIFICATION

MODEL	P444 P445 P544 P1100 P2100	P1200 P1300 P2200	P1800
Caster	-3/4° to + 1/4°	0° to +1°*	0° to + 1°
Camber	-1/4° to + 1/2°	0° to + 1/2°	0° to + 1/2°
King Pin Inclination	5°	8°	8°
Toe-In	1/16"	1/16"	1/16"
Toe-Out	22 [±] 1	21.5° to 23.5°	21.5° to 23.5°
Tire Pressure (cold tire)			
Front	20 lb/sq.in.	20 lb/sq.in.	26 lb/sq.in.
Rear	23 lb/sq.in.	23 lb/sq.in.	29 lb/sq.in.

COMPARISON OF INCH WITH OTHER STANDARD
WRENCH AND SOCKET SIZES

SAE	MM	W	BS	BA	SAE	MM	W	BS	BA
1/8*	3.17				.5906	15*			
5/32*	3.96				19/32*	15.07			
.1575	4*				.600	15.24	5/16*	3/8*	
3/16*	4.76				5/8*	15.87			
.1968	5*				.6299	16*			
7/32*	5.55				21/32*	16.66			
.2362	6*				.6693	17*			
.248	6.30			4 BA*	11/16*	17.46			
1/4*	6.35				.7087	18*			
.2756	7*				.710	18.034	3/8*	7/16*	
9/32*	7.14				23/32*	18.250			
.282	7.16			3 BA*	.7480	19*			
5/16*	7.9				3/4*	19.05			
.3150	8*			2 BA*	25/32*	19.84			
.324	8.23				.7874	20*			
.340	8.636	1/8*	3/16*		13/16*	20.63			
11/32*	8.72				8.20	20.828	7/16*	1/2*	
.3543	9*				.8268	21*			
.365	9.27			1 BA*	27/32*	21.42			
3/8*	9.53				.8661	22*			
.3937	10*				7/8*	22.22			
13/32*	10.31				.9055	23*			
.413	10.49			0 BA*	29/32*	23.01			
.4331	11*				.920	23.37	1/2*	9/16*	
7/16*	11.11				15/16*	23.81			
.445	11.30	3/16*	1/4*		.9449	24*			
15/32*	11.9				31/32*	24.60			
.4724	12*				.9842	25*			
1/2*	12.7				1*	25.4			
.5118	13*				1.023	26*			
.525	13.33	1/4*	5/16*		1 1/16*	26.98			
17/32*	13.49				1.0629	27*			
.5512	14*				1.100	27.94	5/8*	11/16*	
9/16*	14.28				1.023	28*			

*Standard Size

SAE - Society of Automotive Eng. Std.
MM - Metric Standard
W; BS; BA - British Standard

VOLVO PAINT FINISH

Volvo cars have a baked enamel finish, when touch-up or repaint use enamel paint only.

Cleaning of New Cars

REMOVING preservative wax use a solvent such as "old salt" made by Penetone Co., see bulletin Group #80, US 2. Apply the solvent with a spray gun.

DO NOT apply the solvent with a rag or agitate the solution on a dirty car because it will scratch the finish on the car.

DO NOT try to improve a poor clean-up job by polishing the car, because the polish on top of the protective wax will make the finish dull and hazy. REMEMBER on a thoroughly cleaned new car, polishing and/or waxing is not necessary nor recommended.

<u>COLOR CODE</u>	<u>COLOR CODE</u>	<u>PART NO.</u> <u>2.2 LB.</u>	<u>VEHICLE</u>
19, 49*, 50*	Black	79 982	P444, P544
20, 44*, 59*	Pearl-grey	79 984	P444, P445
21	Metallic Red	79 936	P444
22, 23*, 24*, 35*	Beige	279 043	P445
23	Royal Blue	279 041	P445
24	Grey	279 039	P445
31, 35*, 45*, 54*	Midnight Blue	79 980	P444, P544
33	Riveria Blue	279 045	P444
36	Red	279 094	P444
42	Ivory	279 256	P444, P544
43, 46, 51*	Red	279 266	P445
47	Dark Green	279 314	P444
48	Golden Beige	279 318	P444, P544
56, 59*, 68	Olive Green	279 684	P444
56-1, 68-1	Olive Green	277 074	P544, 1200
59	Red	279 428	P544, 1200, 1300, 2200, 1800
65, 43*, 44*, 45* 49*, 50*, 51*, 54*	Grey-Beige	279 262	" " " " "
67	Slate Blue	277 068	" " " " "
67-1	Slate Blue	277 158	" " " " "
72	Fawn	277 189	" " " " "
73	Mist Green	277 191	" " " " "
79	Pearl White	277 343	" " " " "
79-1	Pearl White	277 434	" " " " "
80	Graphite Grey	277 347	" " " " "
84	Desert Sand	277 447	" " " " "
85	Blue-Green	277 451	" " " " "
89	Light Blue	277 548	" " " " "
90	Dark Blue	277 552	" " " " "

*Codes used on cars with two-tone paint.

ENGINE TUNE-UP
ON
B16B, B18D & B18B ENGINE FITTED WITH SU CARBURETORS

1. Remove valve cover, spark plugs and air cleaners. Slacken screw on linkage between carburetors.
2. If special wrench, SVO 2264, is not available, remove rocker shaft torque all cylinder head bolts B16 50-60 ft. lbs. and B18 60-65 ft. lbs.

Be sure to follow the proper sequence (see manual.) Also torque the manifolds and carburetor flange nuts.
3. Adjust valves (see specification.)
4. Test compression - should be approximately equal for good tuning.
5. Check distributor point .016" gap. (47° - 50° cam angle B16) (60° - 63° B18)
Check advance mechanism.
6. B 16 only

Check timing (static) 4° - 6° B.T.D.C., engine stopped using lamp 6 volt.
7. Clean and adjust or replace spark plugs.
8. B18 Timing must always be checked and adjusted with the use of a stroboscope light and set at 1500 RPM. Vacuum line disconnected. (Static setting is not advisable because of gear clearance in the distributor drive.)
9. Remove and clean sediment bowl on fuel pump.
10. Check and tighten fan belt.
11. Remove carburetor suction chambers, clean the inside of chamber and the piston (with lacquer thinner.) Never use an emery cloth. The pistons should move free and easy in the suction chamber.
12. Check to see if the fuel needle (metering rod) is adjusted correctly and not bent. (Check for proper designation.)
13. Check fuel level in carburetors - quick check - with suction chamber off, hold jets in rich position (full down position.) Fuel should not flood over top of jets. If it does, check the needle and seat and the float. (B16 - if replacing the needle and seat, also replace the level arm and pin. Always use T1 needle and seat. Float level should be $7/16"$. NOTE: In later production a new float chamber attachment was introduced. Complaint of "surging" at high speed indicates that the float level could be too low.) (B18 - The float should be approximately horizontal when cover is turned upside down.)
14. Assemble the piston and suction chamber. Make sure that the spring is installed correctly (narrow end down) together with the thin brass washer.
15. Turn the jet adjusting nut all the way up to get the jet in top position. If the jet is properly aligned, the piston should hit the bottom with a definite sound when the piston is lifted and released. If not, the jet must be centralized.

NOTE: On B18, the jet adjustment nut and the spring must be removed when centralizing the jet. (See manual.)

16. Undo the jet adjusting nut 1-1/2 turns (9 flats.)
17. B18 - Adjust throttle linkage (See manual.)
18. Undo the idling set screws. Check that the end of the screw's surface is even. it can be smoothed with a file. Turn the screw so that they will touch the stop, then give another 1/2 turn on the adjusting screw.
19. Start the engine and let it warm up.
20. Check that the butterflies are open the same amount on both carburetors (synchronized) by turning each throttle adjusting screw to produce the same hissing sound at 600-700 rpm (or some vacuum reading on UNI-Syn gauge.)
21. Fill tube on the top of the piston (only tube on top of piston) with SAE 20 oil. NOTE: "Flat Spot" in acceleration is an indication that the oil is too low or has too light viscosity. Never use heavier oil than SAE 30. This oil should be checked at every lubrication. DO NOT use multi-viscosity oil.
22. Install damper plungers.
23. To check mixture - check each carburetor individually. Screw the adjusting nut slowly downward (richer) until engine starts to run rough then screw the adjusting nut slowly upward (leaner) counting the flats the nut is turned until the engine starts to run rough again then screw the nut approximately half the number of flats downward until smooth idling. To re-check the mixture on the front carburetor, lift piston on rear carburetor with the pin on the side of the carburetor housing. If the mixture is right, the engine should slow down (rough idling.) If the idling speed increases, the mixture is too rich and the jet adjusting nut on the front carburetor should be turned upward. Adjust only one flat on the nut each time. If the engine stalls, the mixture is too lean. Screw the adjusting nut downwards. Check the rear carburetor by reversing this process. HINT - B18 needs a richer mixture than the B16.
24. Recheck and adjust the carburetor (synchronizing) at 600-700 rpm. This may have risen on one or the other due to improving the mixture.
25. B16 - Tighten the screw on throttle linkage between the carburetors.
26. Recheck synchronization.
27. (B16 - Adjust the fast idling screw so it touches the cam, and then back off one turn.) (B18 - Loosen the wires on fast idling lever on carb, pull choke 1/2". Lift the fast idling lever so it just starts to move the jet. Tighten the lock for the wire. Adjust the fast idling screw so it just touches the cam.) IMPORTANT: - That both carburetors are adjusted equal.
28. Pull out the choke control to its full extent, check that both jets are in its lowest position. Check that the jet returns to normal position when the choke is pushed back.
29. Adjust the gas pedal so when fully depressed the butterflies in the carburetor should be fully opened except for small deviations - 1/32" - clearance between lever and stop on carburetor. NOTE: Wrong adjusted gas pedal linkage might cause broken linkage connections and an uncomfortable gas pedal.
30. Wash wire mesh air cleaners (old type) and soak the filter with oil, or replace with paper filter, "Microtype." Check that the ventilation holes on the air cleaner and suction chamber are lined up. The paper filters cannot be washed must be replaced.
31. Check generator output.

ENGINE

The crankshaft is surface hardened, therefore, only Volvo original bearings must be used. **NOTE:** The Volvo part number is stamped into the bearing shell. If proper bearing clearance, there is no need for replacement of bearings.

Torque - Always use a torque wrench for bearing bolts as well as cylinder head bolts. See specification in manual.

Cylinder bore and piston - The size of standard cylinder bores are classified by a letter code stamped on the top block surface, adjacent to the bore. Pistons must correspond to this code. When installing piston rings, always follow instructions supplied with the set. Honing is not necessary when replacing rings if the bore has no "scuff" marks. When honing use a fine grit hone lubricate with #10 oil. Clean bore with #10 oil never use kerosene or gasoline.

Wrist pin - Piston wrist pin is slide fitted, thumb pressure only, in piston as well as in con rod.

Con Rod B14 - B16 - The connecting rods are classified by weight with a letter code stamped on the rod. Therefore, only con rods with the same letter or same weight can be used in the same engine.

Timing Gear - At any undertermined engine noise, always check the timing gear. The gears should be replaced as a set, (both gears). Torque the camshaft nut to 108 ft. lbs.

Crankshaft Seals - Seals out of center of the crankshaft will cause oil leaks. Therefore, align the seals carefully and use the proper tools.

Water Hose - B16 - Since the water hose between the water pump and the cylinder head supplies all the cooling water to the engine, it is important to check this hose, expecially on complaints of overheating. (High reading on temperature gauge would indicate that pieces of the rubber hose are blocking the water distribution tube in cylinder head*.

Oil Consumption - on new engines is quite normal and is because of a fine finish of cylinder bores and piston rings (for longer engine life), which prolongs the brake-in period, oil consumption should be negligible, after 6,000 miles. In many instances oil consumption ceases by using lighter oil such as SAE 10W-30 all year round. The engine oil must meet M.S. service requirement. Severe engine failures have occured because of improper oil filters. Always use genuine Volvo filters recognized by the Volvo logo.

Thermostat - B18 - is equipped with a by-pass valve part #75975. If this valve is improperly mounted or missing it will cause overheating.

*See Bulletin, Group 26, No. US 1

CLUTCH

Since the crankshaft flywheel and clutch pressure plate are balanced as a unit, it is important to observe the balance mark to avoid vibrations. NOTE: Always use original clutch disc supplied by Volvo. If vibration noise at 40-50 mph, check if the proper clutch disc is installed. In many instances hard gear shift is caused by improperly adjusted clutch, therefore the free play should be checked on the clutch slave cylinder push rod and should measure 1/8".

TRANSMISSION

For hard gear shift check clutch adjustment. Always check for the right parts for the right transmission. The identification tag gives the part no. of the unit. M41 - with overdrive always use SAE 30 engine oil.

BRAKES

On cars with disc brakes, use only brake fluid fulfilling the requirement of SAE 70 R3. Fluid which only fulfills the requirement of 70 R1 or HD quality should not be used.

The brake pads will give better wear if the outside and inside pads are switched at the 18,000 mile inspection.

On duo-servo brakes, the secondary (rear) lining has a thicker portion which should be to the top. This is on the front wheels only.

Operating Characteristics of the Volvo 120-130
Equipped with Automatic Transmission.

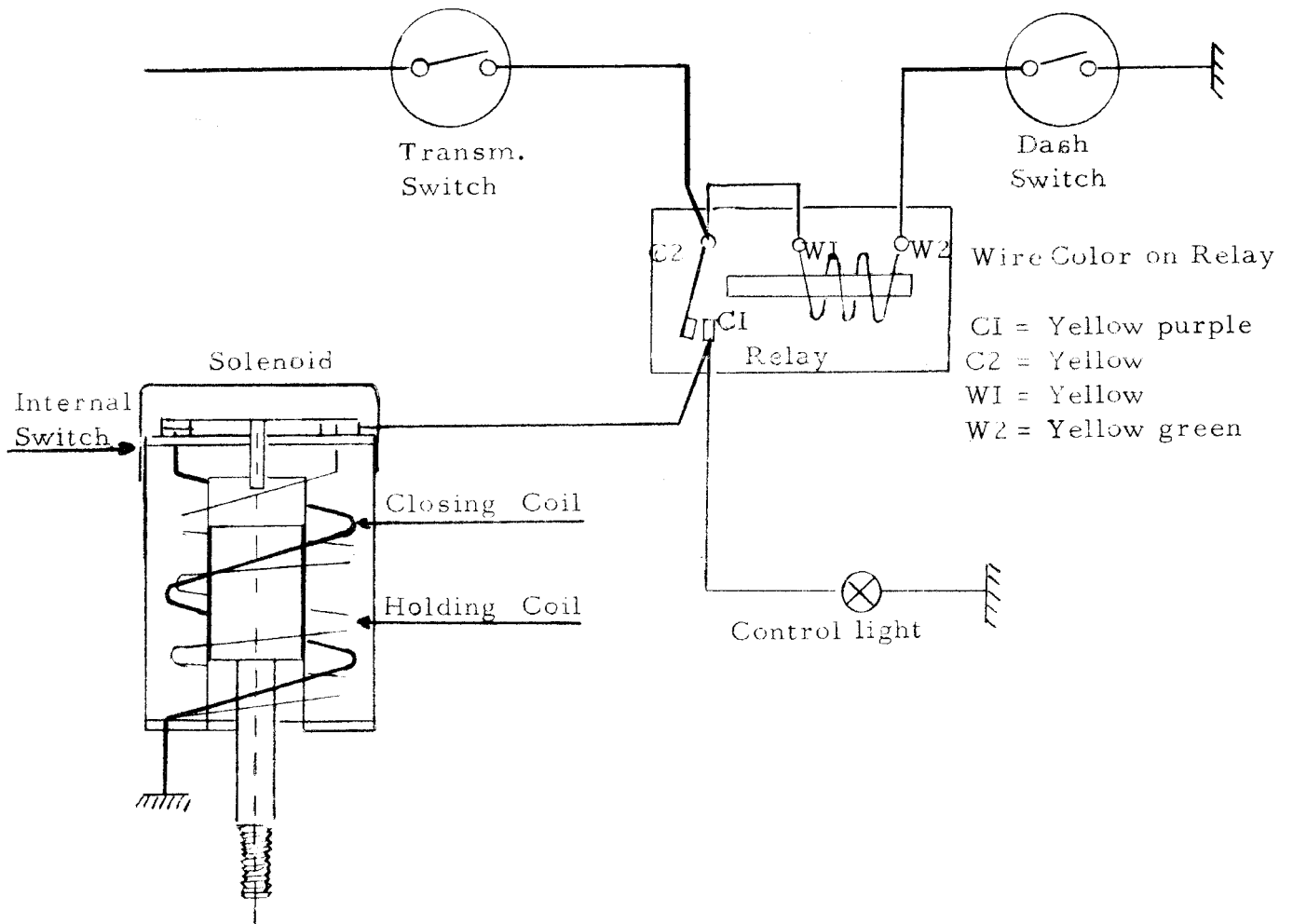
1. The automatic transmission used in Volvo cars is the Borg Warner model 35. This is basically a hydraulically controlled transmission giving three forward speeds and reverse, being driven by a torque converter that gives a variable reduction up to a maximum of 2 to 1, depending on engine speed. The approximate shift speeds at various throttle opening are as follows:

	<u>1-2</u>	<u>2-3</u>	<u>3-2</u>	<u>3-1</u>
Zero throttle	4-7	6-10	---	3
Full throttle	26-29	41-47	12-20	3
Full throttle (kickdown pos.)	39-43	60.65	55-60	30-35

The transmission automatically shifts down from 3rd to 2nd and 1st in accordance with decreasing vehicle speed.

2. The gear selector has five positions. P(Park) R (Reverse) N(Neutral) D(Drive) L(Low)
Do not select D,L, or R when the engine is revving high.
Do not select P or R while the car is moving.
Do not select L at speeds above 55 mph.
3. Under all normal driving conditions the car should be operated in "D" range. The car will then start in 1st gear and shift up to 2nd and 3rd gear in accordance with road speed and throttle position.
4. No advantage is gained by starting off in "L" (Low) range, because the available ratios are the same as those of the "D" range. If "L" is selected for starting off, or at a speed below 5 mph. the car will start off in 1st gear, and remain locked in this gear, and also provide maximum engine braking.
When "L" is selected at speeds above 5 mph. an immediate downshift to 2nd gear occurs. The transmission will remain locked in 2nd gear, and provide engine braking, until the shift lever is moved back to the "D" position. The transmission will also downshift to 1st gear when the vehicle speed drops below approximately 5 mph. To avoid over-revving the engine, "L" range should not be engaged at a higher speed than 55 mph.
5. Emergency engine starts may be made by push starting. The car should be allowed to attain a speed of approximately 25 mph. with the selector lever in "N". Switch on the ignition, and select "D" range. The engine can then be started through the rear wheels.
6. The transmission requires no periodic fluid changes. If it becomes necessary to add fluid to the transmission only Automatic transmission fluid may be used, and the can should bear the A.P.I. classification of A.Q., A.T.F. The fluid level must only be checked when the car is at normal operating temperature. This is because the fluid expands considerably when hot, and an erroneous low level is indicated when cold.

OVERDRIVE CHECKS P1800



All Checks With Dead Engine

With the ignition switch on, shift lever in fourth gear, a "click" should be heard from the solenoid when the dash switch is "flickered" off and on.

Terminal C 2 and W1 should be live when the ignition switch is on and only when the shift lever is in fourth gear.

Terminal C 1 should be live when Terminal W2 is grounded.

Other checks

1. Solenoid adj.
2. Oil level and oil viscosity SAE 30 engine oil.
3. That the control valve is activated by the solenoid.
4. Oil pressure at operating temperature 1000 - 1500 rpm 470- 570 psi.
5. Clean oil pump screen, relief valve, pump valve and control valve.
Check for any burrs or unevenness on the ball seat on the control valve rod.
6. Oil pump stroke - early model 126" - late model 166".
7. Hot weather SAE 40 oil can be used to improve oil pressure.
8. Before removing the overdrive from the car make a very careful diagnosis of the fault. **WARNING:** Do not remove oil pump if not absolutely necessary because it can easily damage the bore for the pump.

REAR AXLE

Volvo automobiles are equipped with three types of Spicer rear axles - Model 23, Model 27 and Salisbury.

Model 23 axle is fitted on cars Model P444 and P544 up to chassis #267124 and on Model 122S (1200) up to chassis #61890. This rear axle can be recognized by the number 23 cast into the housing and the oil drain plug that is fitted in the bottom of the housing.

Model 27 axle is fitted on cars Model P544 (P1100) from chassis #267125 and on Model 122S (1200) from chassis #61891, and on the Model P1800. This rear axle can be recognized by the number 27 cast into the housing. This rear axle has no oil drain plug. Salisbury is fitted on P210 and P220 station wagon.

Assembly Instructions

1. Place the differential carrier with the ring gear and roller bearings (without shims) in the differential housing. Measure the end clearance with feeler gauges or with a dial indicator. NOTE: Make sure that the gauges go down to the bottom of the bearing seats. EXAMPLE:
Obtained clearance .060" plus preload .008" = .068"
2. The pinion has a nominal measurement equal the distance from the end of the pinion to the center line of the ring gear. To adjust this nominal measurement, a special tool with a dial indicator must be used. The nominal measurement for the axles is the following:

Rear Axle Model 23 and Salisbury - 2.250"
Rear Axle Model 27 - 2.094"

If the pinion is marked 0, the guage and calibrator should be on the same level. However, there are variations from the nominal measurements because of manufacturing tolerances. This is marked on the ground surface of the pinion. If it is marked +, the nominal measurement must be increased. If the marking is -, the nominal measurement must be decreased. The figure on the pinion shows the deviation in thousandths of an inch.

EXAMPLE: If the pinion is marked +3, that means that the pinion must be adjusted away from the ring gear to increase the nominal measurement with .003". Adjustment is carried out by installing or removing shims between the housing and rear pinion bearing. EXAMPLE: The pinion is marked +2, which means that the pinion should be adjusted on
Model 23 and Salisbury axle $2.250" + .002" = 2.252"$
Model 27 axle $2.094" + .002" = 2.096"$

NOTE: When checking the pinion setting, torque the companion flange nut 200 ft. lbs. (150 ft. lbs. Salisbury), then pinion must have proper preload 10-20 in. lbs. rotation torque on the pinion bearings. This can be adjusted by installing or removing shims between the pinion shaft and front bearings. HINT: The pinion will move approximately .0015" to .002" away from the ring gear when preload is applied.

3. When the pinion is installed according to Point 2, place the differential carrier (without shims behind the bearings) in the housing, move the ring gear against the pinion and measure the clearance between the differential bearing and housing on the ring gear side.
EXAMPLE: Obtained clearance .040" - approx. backlash .005" = .035"

4. An example of how to figure the adjustment of differential carrier with proper backlash:

- a. clearance noted in point 1 $.060'' + \text{preload } .008'' = .068''$
- b. clearance noted in point 3 $.040'' - \text{backlash } .005'' = .035''$
- c. point a $.068'' - .035''$ in point b $= .033''$

which means that the shims with thickness of $.035''$ should be installed between the carrier and the bearing on the ring side and shims with thickness of $.033''$ should be installed on the opposite side.

- 5. Check backlash pinion/ring gears with dial indicator $.004''$ to $.008''$ (If no other specification is engraved on the ring gear.) Salisbury has in general the backlash engraved on the ring/gear.
- 6. Check run out on ring gears with dial indicator. It should not exceed $.003''$.
- 7. Check tooth contact with marking paint. HINT: The tooth contact pattern on the ring gears drive side moves in the same direction as the pinion is moved. Alternation of $.001'' - .002''$ on the pinion location usually is sufficient to rectify an improper gear pattern.
- 8. Adjust end play on rear axle shaft right side only (clearance $.003''$ to $.008''$.)

SPECIFICATIONS

	<u>MODEL 23 & SALISBURY</u>	<u>MODEL 27</u>
Pinion nominal measurement	2.250"	2.094"
Adjusting jig for pinion	SVO 2283 SVO 2393	SVO 2393
Pinion preload	10-20 in. lbs.	10-20 in. lbs.
Preload on differential bearing	.008"	.008"
Backlash pinion/ring gear	.004" - .008"	.004" - .006"
Tightening torques:		
Companion flange nut	200-220 ft. lbs.	200-220 ft. lbs.
Bearing caps	70-80 ft. lbs.	40-50 ft. lbs.
Ring gear bolts	40-50 ft. lbs.	40-50 ft. lbs.

Procedure for the overhaul and adjustment of the E.N.V.
Rear Axle. - Canadian Production, Models P120 - 130

The overhaul procedure for the E.N.V. axle is somewhat different than for the Spicer type used on Swedish built cars, the main difference being that the differential may be removed from the axle housing as a complete unit. Pinion depth and preload is adjusted by selective shim. The differential carrier bearings are adjusted by nuts that are threaded into the bearing caps and differential housing. Many of the standard Spicer tools and pullers may be utilized in the overhaul of the E.N.V. axle, with the addition of SVO2409, SVO2410 and SVO4059. An important difference is that no pinion setting gauge is used on this unit. In the event the ring gear and pinion are to be replaced, the following procedure should be followed:

1. Mark the differential bearing caps before disassembly so that they may be installed in the same relative position.
2. Remove the pinion, and carefully note the number of adjusting shims beneath the inner pinion bearing cup.
3. To reassemble, install the inner pinion bearing cup with the same amount of adjusting shims as originally installed. Install the pinion, without the seal, and with tool SVO2409 installed in place of the companion flange, adjust the pinion bearing preload to a torque of 7 to 10 inch pounds. This is adjusted by the installation or removal of shims behind the outer pinion bearing cone.
4. Install the ring gear, and differential carrier bearings on to the differential carrier. Install the bearing cups and place assembly in gear housing. Install the bearing caps loosely and start the adjusting nuts in the threads, being careful not to cross the threads. Tighten down the cap bolts evenly, and then back them off half a turn.
5. Tighten the nut on the gear side of the pinion until the ring gear is in firm contact with the pinion. (Use tool SVO4059.) Then back off this adjusting nut three notches. Next tighten the opposite adjusting nut and watch carefully until the bearing cup just starts to turn with the nut. Carefully back off the nut until the bearing cup stops turning, and then re-tighten the nut two notches. This is a simple method that ensures correct bearing preload.
6. Tighten bearing caps and check gear backlash, which should be from .004" to .008". If adjustment is needed, loosen the cap screws half a turn and adjust the ring gear and carrier assembly, towards or away from the pinion as required. Be sure to move both adjusting nuts the same amount, i.e; one or two notches and in the same direction, so as to maintain the preload setting. Tighten bearing cap bolts to 40-45 ft. lbs. before checking backlash.

7. Check that ring gear runout does not exceed .003"
8. When backlash is correct, paint the ring gear teeth with red lead, and check the gear tooth contact. The contact pattern should be almost rectangular in shape, and on the driving side of the gear should be in the centre of the tooth, and slightly closer to the toe end, (inner end). On the reverse side of the tooth the contact pattern will be similar, but slightly more towards the top of the tooth. In the event that the contact pattern is unsatisfactory, it will be necessary to relocate the pinion by adding or removing shims from under the inner bearing cup and readjusting and checking the assembly. Install differential bearing adjuster locks.
9. Coat outer edge of pinion seal with sealer, and install into housing. Install companion flange and torque retaining nut to 150 ft. lbs.
10. Install assembly into axle housing, and adjust axle end play to .003" to .008". Adjustment should be made from the left side only. Install the thick spacer (.060") on the right hand side.

SPECIFICATIONS

Pinion preload	7 - 10 inch lbs.
Carrier bearing preload	2 notches on adj. nut
Ring gear & pinion backlash	.004" - .008"
Axle shaft end play	.003" - .008"
Tightening torque	
Companion flange nut	150 ft. lbs.
Bearing cap bolts	40 - 45 ft. lbs.
Ring gear bolts	36 - 40 ft. lbs.

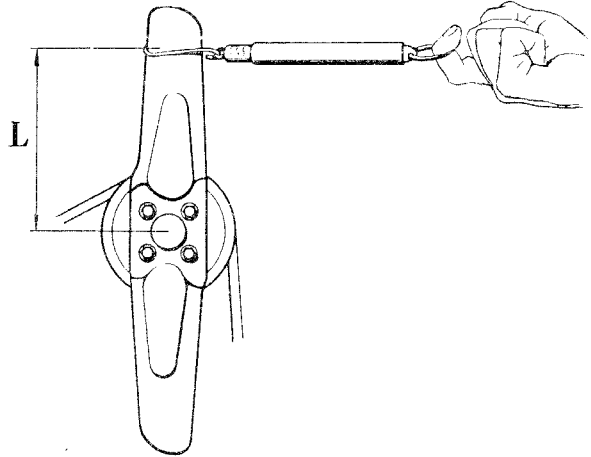
Electrical Equipments

Should the generator not charge, or there be any reason to suspect that it does not generate current in sufficient quantities, or should it produce excessive current or voltage, make sure that the fault lies in the generator itself and not because of:

- a) slipping fan belt
- b) high circuit resistance because of poor connections in wiring, terminals, and connections in fuse box (charging indicator light will in some instances pick-up high resistance or faulty fuse.)

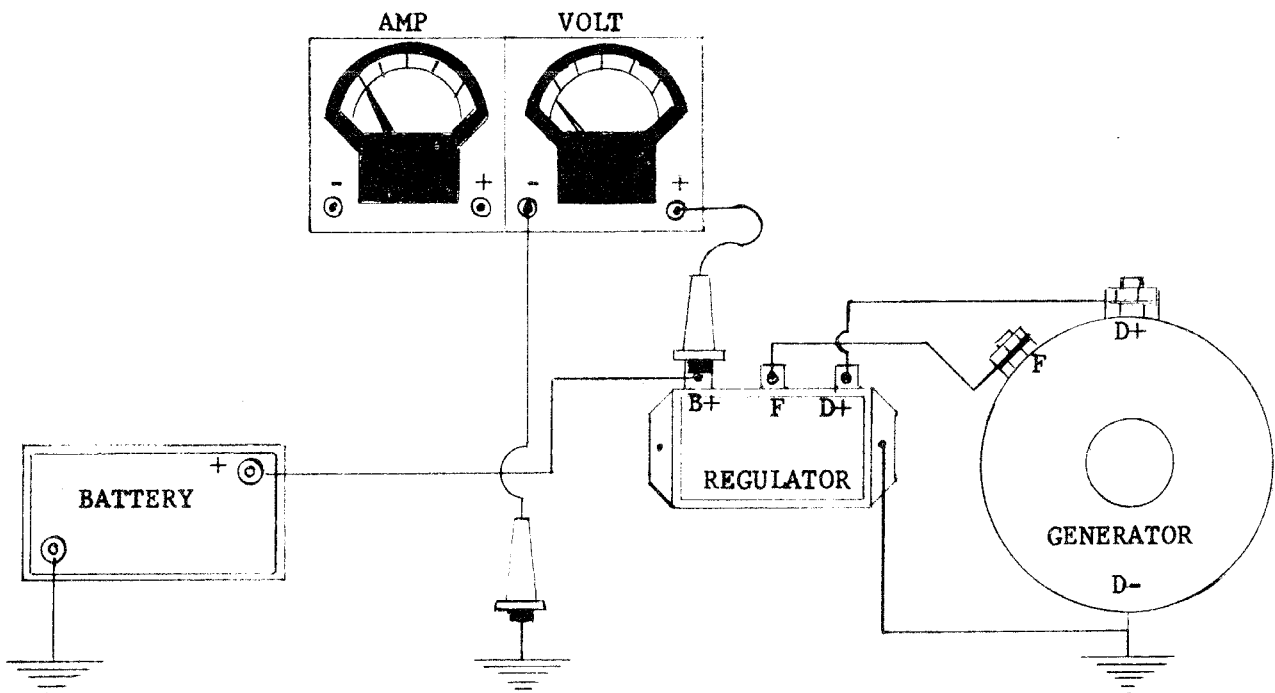
Fan Belt Tension Check

Turn the fan by hand in the direction of engine rotation. The belt friction should require approximately 15 lbs. to turn the fan.



Primary Electrical Check

- 1) First check that the connections from the battery to the voltage regulator connections marked B+ on the regulator is complete. By connecting a voltmeter between the regulator B+ terminal and the chassis (ground), the voltmeter should read the same as between the + and - terminal on the battery, if not there is faulty wiring between the regulator and battery.
- 2) Start the engine, increase the speed to approximately 2000 rpm, the voltmeter reading should be approximately 6.5-7.0 volts on the 6 volt system, and 13-14 volts on the 12 volt system. If not, see generator and regulator check.
- 3) With the engine remaining at the same speed, connect the voltmeter + lead to the + terminal on the battery. The voltage reading should not be more than 0.5 volts less than it was on the regulator B+ terminal.

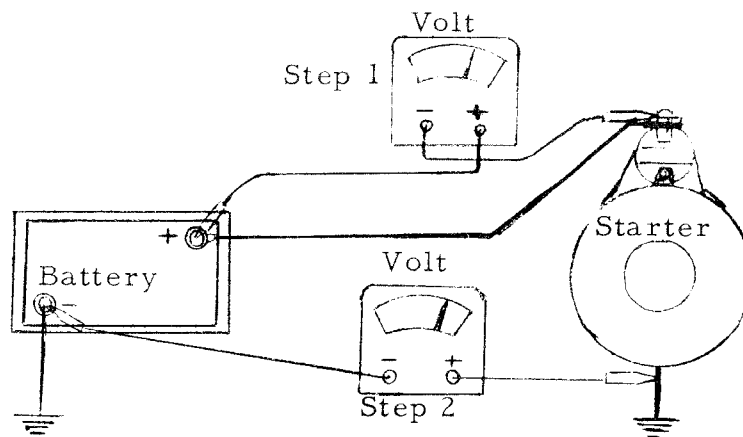


4) With the voltmeter + lead still connected to regulator B+ terminal, connect the - lead to engine frame, with a jumper lead ground the primary terminal on distributor, lock engine in high gear, turn on starter momentarily. The voltage should drop on the 12 volt system to approximately 8 volt, and on the 6 volt system to approximately 4 volt if the voltage drop is noticeably more, the battery is not fully charged, or there is a high resistance in the battery leads or terminals.

Resistance Check on Battery Leads

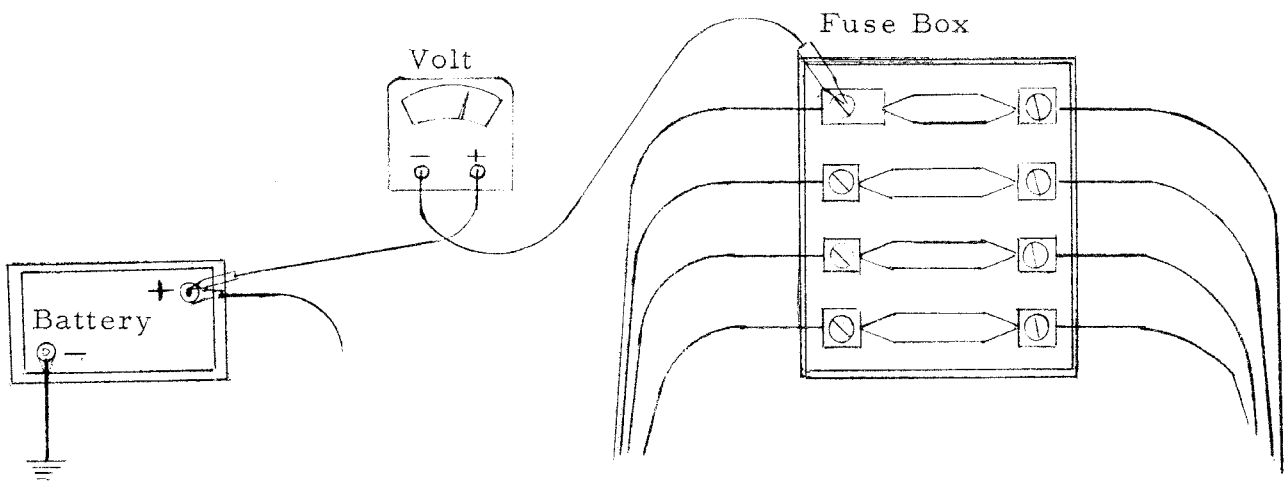
1) Connect voltmeters - lead to starter main terminal and + lead to the battery + post (not to the battery terminal). Crank the engine with the starter (distributor primary terminal grounded), the voltage reading should be less than 0.5 volt. If not, the battery + terminal has a poor connection to the battery post or faulty soldering of the terminal on the starter.

2) Connect voltmeter - lead to battery - post and + lead to starter frame, crank the engine with the starter, voltage reading less than 0.5 volt. If not, poor connection of the battery terminal to the battery post or poor connection of the ground lead to the chassis or faulty ground strap chassis to engine.



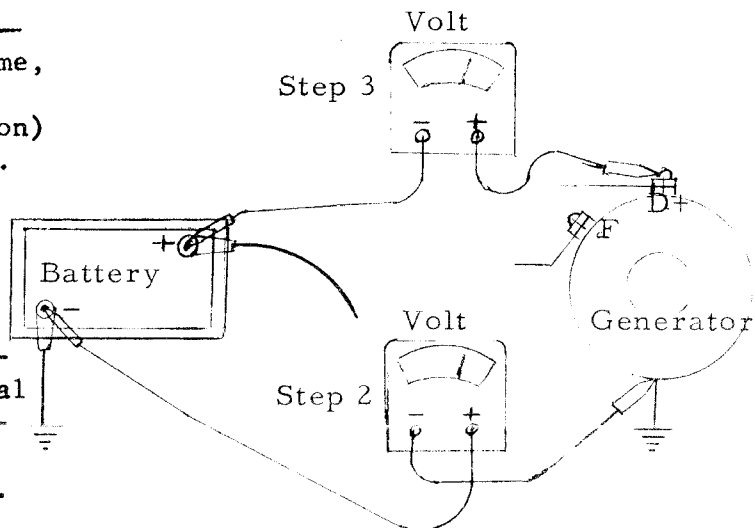
Circuit Resistance Check

1) With the engine stopped, turn on the headlight and heater motor, connect voltmeters + lead to battery + terminal, remove cover on fuse box and touch both sides of each fuse terminal with the voltmeter - lead, the reading should be less than 0.5 volt. If not, it is poor connections on fuse terminals. If all terminals indicate voltage drop, check for poor soldering on main circuit lead terminal on starter.



2) Connect voltmeter + lead to battery - terminal and the - lead to generator frame, start the engine, increase the speed to approximately 2000 rpm (headlight still on) the reading should be less than 0.5 volt. Continue the same test by connecting the voltmeter + lead to regulator frame.

3) Continue the test above by connecting the voltmeter + lead to generator D+ terminal and the - lead to battery + terminal continue the test by connecting the voltmeter + lead to regulator B+ terminal. The reading should be less than 0.5 volt.

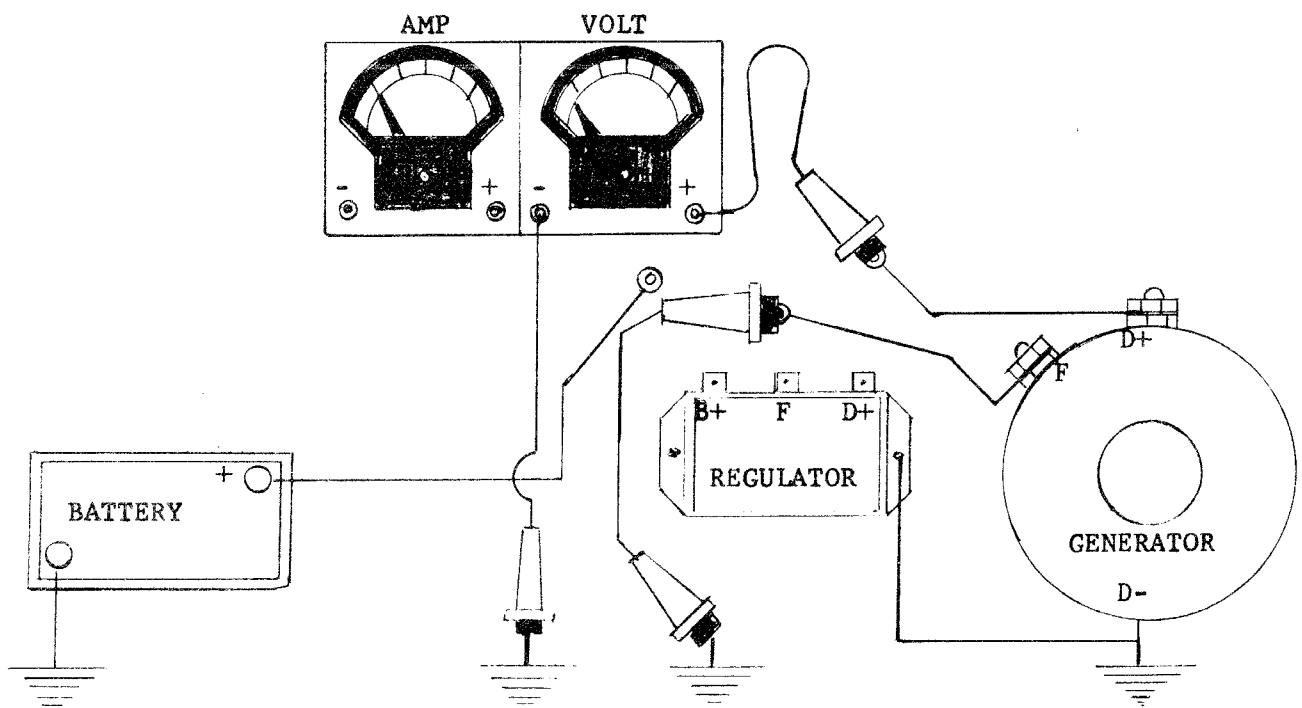


Generator Check

Unscrew all cables on the regulator. Connect the field cable to ground. (NOTE: To test the generator, the field cable must be disconnected from F terminal on the regulator.) Connect a voltmeter on the disconnected D+ cable. Start the engine, increase the idling speed watching the voltmeter reading at the same time. The voltage should increase as the engine speed increases. Return the engine speed to slow idling, disconnect the field cable from the ground connection. The voltmeter should then return to zero except small deviations. Should it not return, it is a "short" in the field circuit outside or inside the generator.

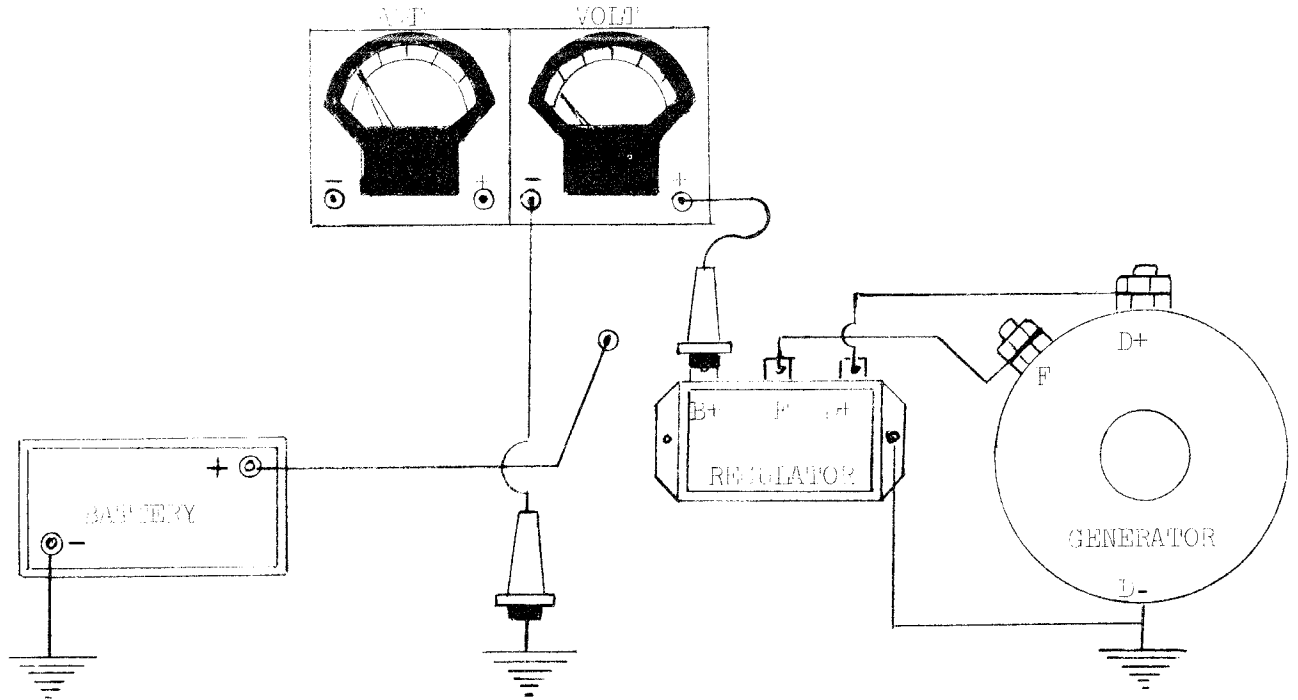
The generator current output is checked by connecting an amperemeter over a variable resistor to ground paralalled with the voltmeter. The current reading should be at least what is maximum specified for the generator at the specified voltage. If not, check for loose or slipping fan belt, poor connettions inside or outside the generator, poor ground connection.

There is no need to check the regulator if the generator cannot supply the specified current.



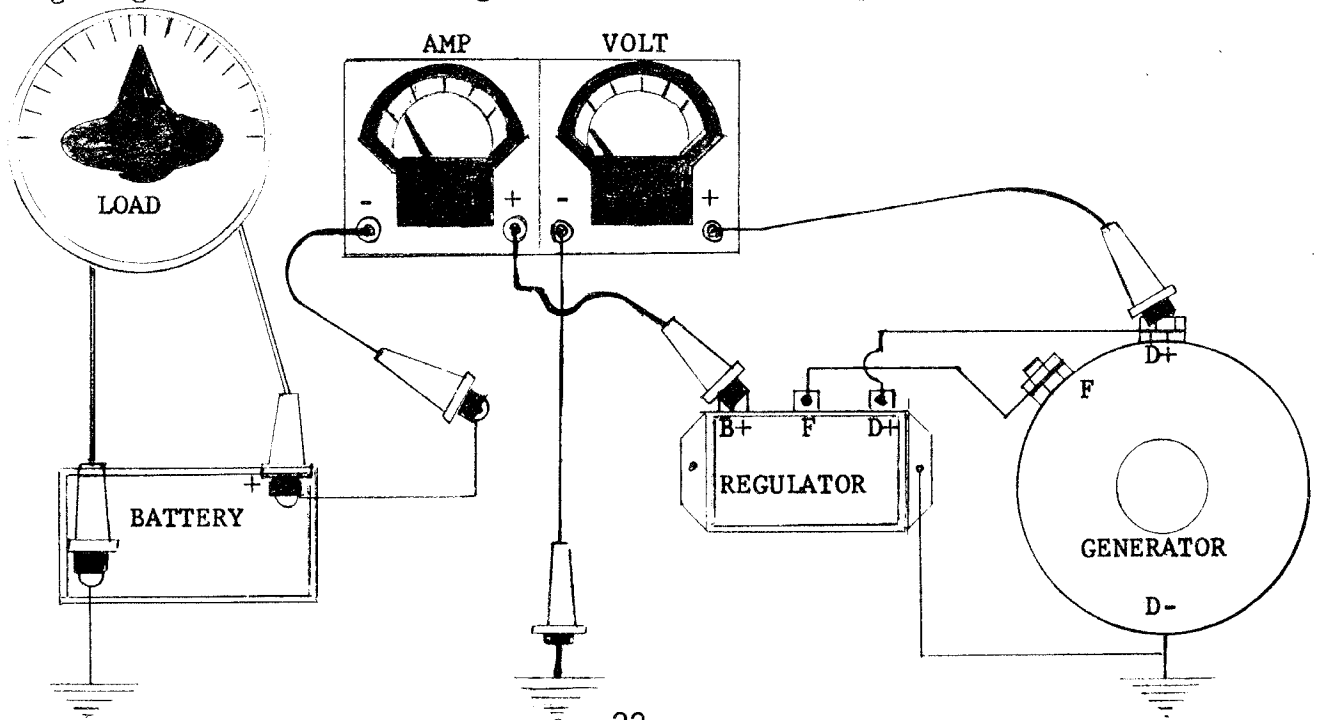
Regulator Voltage Check

If no fault can be found on the generator or the cables from the generator to the regulator, connect the field cable on regulator F terminal and D+ cable on D+ terminal. Connect the cable on B+ terminal. Start the engine, increase the idling speed to approximately 2000 rpm, turn on the headlights and let the regulator and generator "warm up" for about 10 minutes. Return the engine to slow idling. Disconnect cable on B+ terminal. Connect a voltmeter to the B+ terminal and ground. Increase engine speed slowly, watching the voltmeter reading. When the reading stops increasing, it indicates the regulated voltage.



Regulator Current Check

The same procedure can be applied when checking the current with the ammeter over a variable resistor. Since the adjustment of the regulator is very rarely needed, the regulator should only be opened and adjusted by a person having sufficient knowledge and experience in this type of work; otherwise damage might be done to the regulator as well as the generator



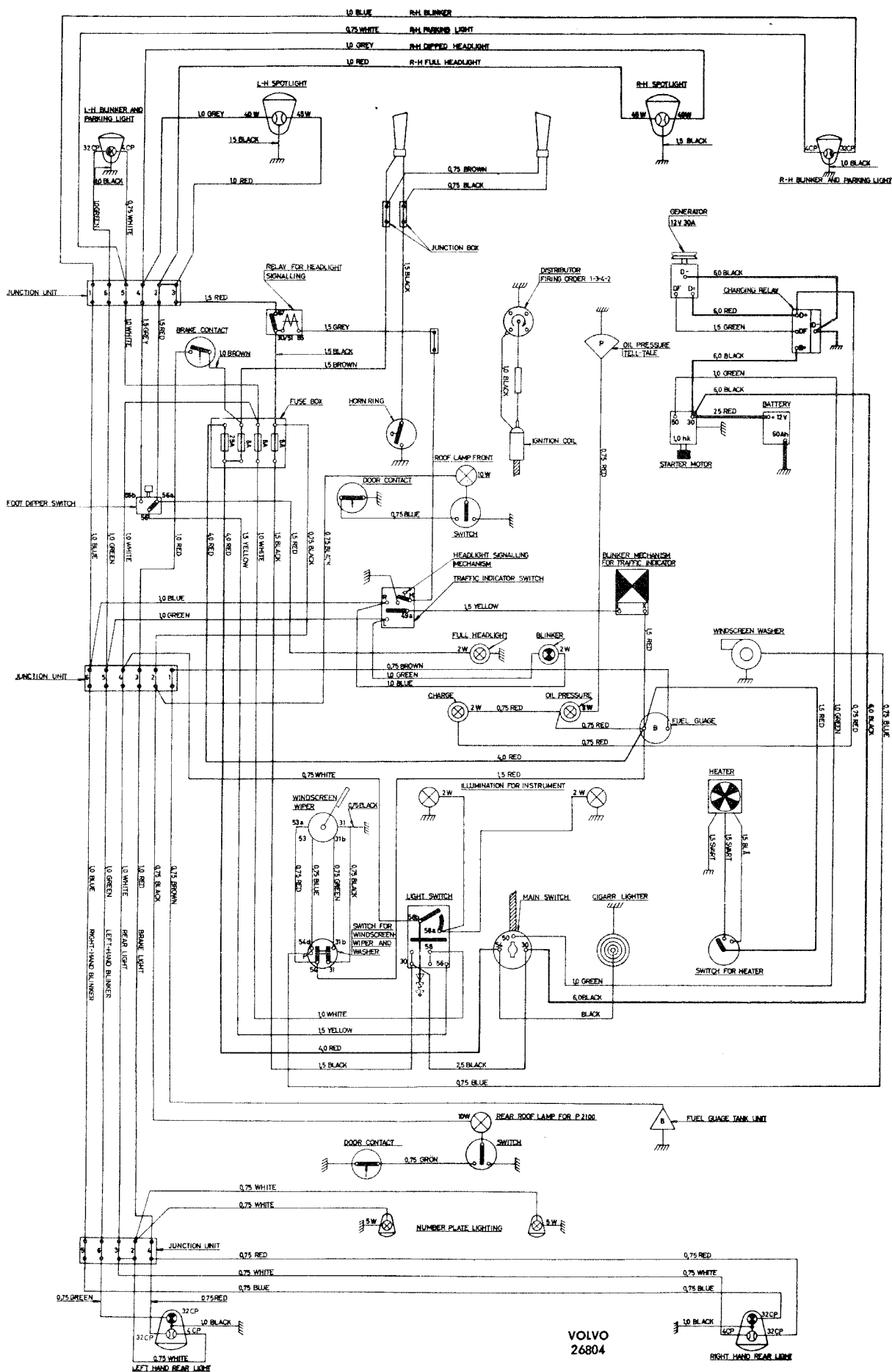


Illustration 1. Wiring diagram with effect from chassis number 330100

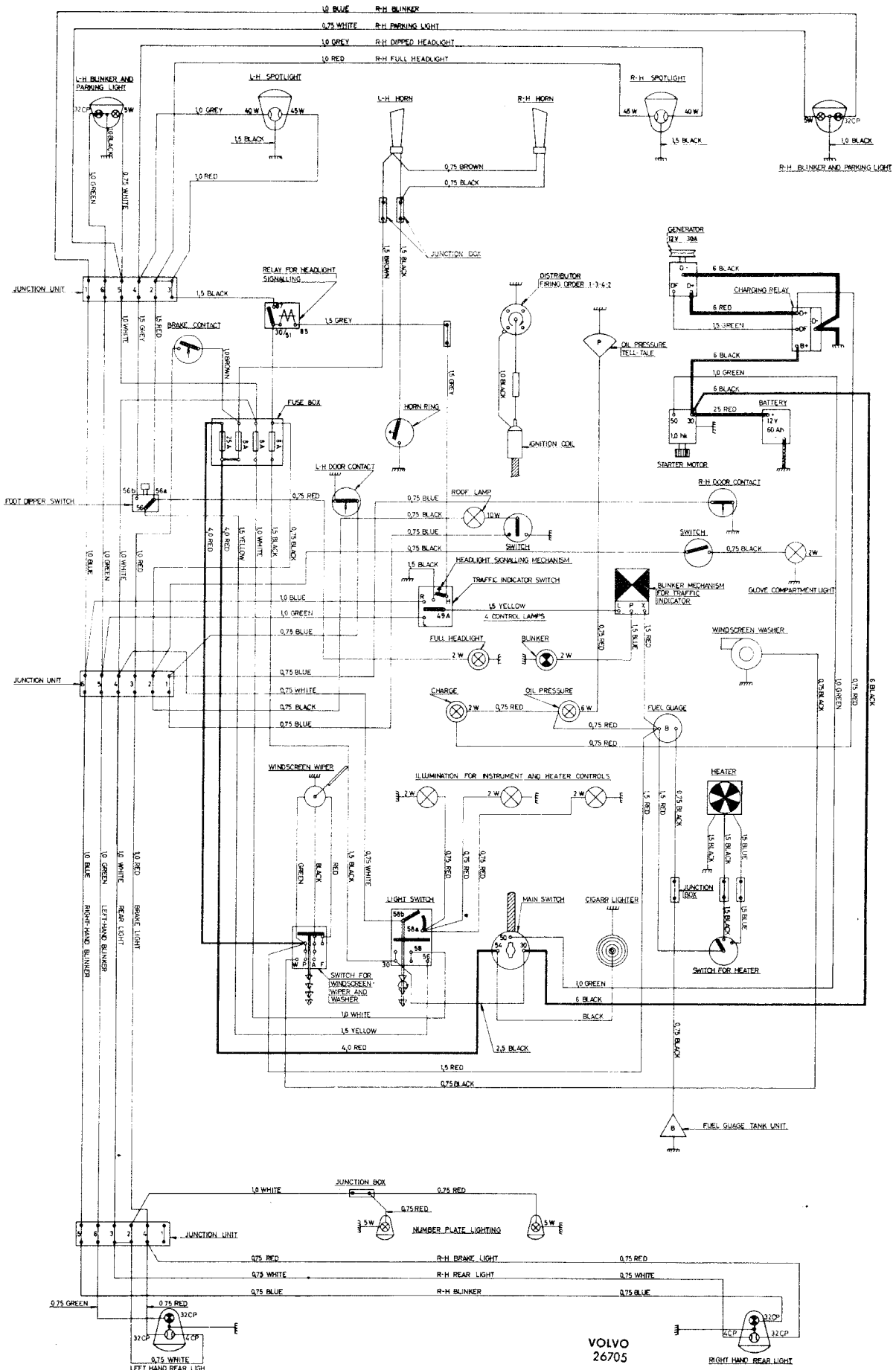
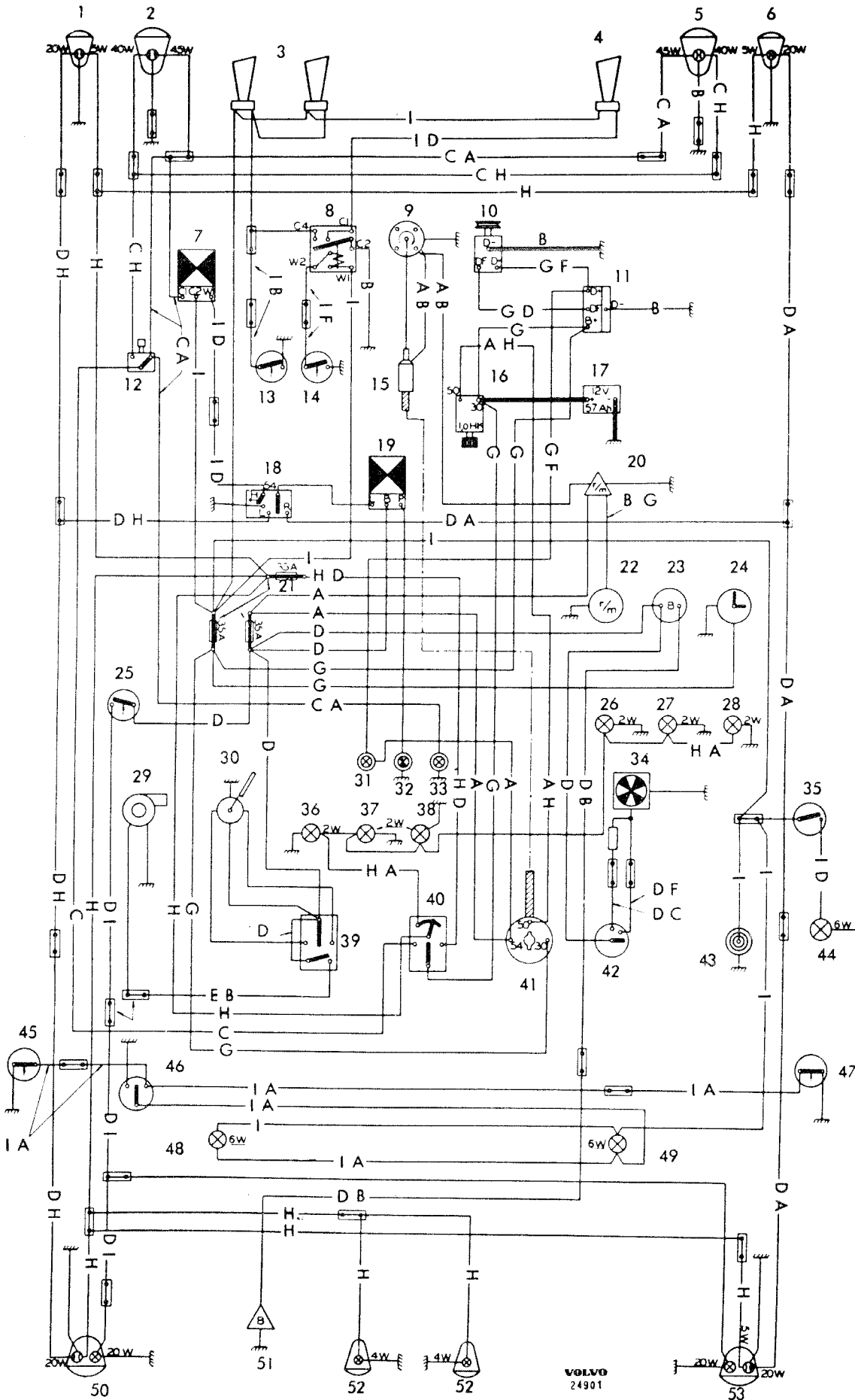


Illustration 1. Wiring diagram with effect from chassis number 84300.

P 1800



1. Flasher and parking light, left
2. Headlight, left
3. Horn
4. Loud tone horn
5. Headlight, right
6. Flasher and parking light, right
7. Relay for headlight flasher
8. Horn relay
9. Distributor
10. Generator
11. Charging control
12. Foot dimmer switch
13. Horn button
14. Lever for loud tone horn
15. Ignition coil
16. Starter motor
17. Battery
18. Directional indicator switch
19. Flasher impulse unit, directional indicators
20. Revolution counter sender
21. Fuses
22. Revolution counter
23. Fuel gauge
24. Clock
25. Brake contact
26. Instrument lighting
27. Instrument lighting
28. Instrument lighting
29. Windshield washer
30. Windshield wipers
31. Warning lamp, charging
32. Warning lamp, directional indicators
33. Warning lamp, full headlights
34. Heater
35. Switch, map-reading light
36. Instrument lighting
37. Instrument lighting
38. Instrument lighting
39. Controls for windshield wipers and windshield washers
40. Lighting controls
41. Ignition switch
42. Heater controls
43. Cigarette lighter
44. Map-reading light
45. Door contact
46. Switch for roof light
47. Door contact
48. Roof light
49. Roof light
50. Rear light, left
51. Fuel gauge sender
52. Number plate lighting
53. Rear light, right

- A = White
- B = Black
- C = Blue
- D = Green
- E = Light green
- F = Yellow
- G = Brown
- H = Red
- I = Purple

VOLVO
2490T