TECHNICAL MANUAL No. 9-2320-218-20

HEADQUARTERS
DEPARTMENT OF THE ARMY
WASHINGTON, D. C., *23 September 1971*

ORGANIZATIONAL MAINTENANCE MANUAL

TRUCK, UTILITY: 1/4 TON, 4X4, M151, M151A1, M151A2;

TRUCK, UTILITY: 1/4 TON, 4X4, M151A1C, M825 WITH RECOILLESS RIFLE;

TRUCK, AMBULANCE, FRONT LINE: 1/4 TON, 4X4, M718, M718A1

*This manual supersedes TM 9-2320-218-20, 26 August 1968, including all changes.

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CHAPTER 1

INTRODUCTION

Section I. GENERAL

1-1. Scope

a. This technical manual contains instructions for organizational maintenance of the 1 / 4 Ton, 4x4, Utility Trucks, M151, M151A1 and M151A2; 1 / 4 Ton, 4x4, Utility Truck (with 106 MM Rocoilless Rifle) M151A1C, M825 and the Ambulance Truck M718 and M718A1. The M151A1C and M825 vehicles mounts a 106 MM recoilless rifle. The M718 and M718A1 vehicles are used as a front line ambulance. The M151A1C and M825 models are basically similar in design to the M151, M151A1 and M151A2 vehicles. Attaching parts are added to the M151A1C and M825 making them a mobile weaponry unit and to the M718 and M718A1 making them an ambulance unit. It also provides instructions for organizational maintenance for the M151, M151A1 and M151A2 when equipped with any of the following special purpose kits; Deep water fording, 100 ampere alternator, hot water heater (—25° F.), winterization kit (—65° F.), hardtop kit, machine gun mount kit, M16 / M14 rifle mount kit, door and side curtain kit. The M718 and M718A1 can be equipped with 100 ampere alternator, hot water heater (—25° F.) and deep water fording kits.

b. Chapter 3 contains material used in conjunction with major items, contains instructions for organizational maintenance on the vehicle special purpose kits.

c. Appendix A contains a list of current references, including supply manuals, technical manuals, forms, and other available publications for the above vehicles and their related special purpose kits.

d. Appendix B contains the maintenance allocation chart which lists the maintenance responsibilities allocated to each level of maintenance.

e. TM 9-2320-218-20P contains the repair parts and special tool lists for maintaining the material, and is the authority for requisitioning replacements.

f. This manual differs from TM 9-2320-218-20, August 1968 as follows:

(1) Revised information on organizational preventive maintenance services.

(2) Revised information on electrical troubleshooting and service and maintenance instructions on current vehicle production models.

1-2. Forms and Records

a. Authorized Forms. Maintenance forms and records that are required for use are explained in TM 38-750.

b. Field Report of Accidents.

(1) *Injury to personnel or damage to material.* The reports necessary to comply with the requirements of the Army safety program are prescribed in detail in AR 385-40. These reports are required whenever accidents involving injury to personnel or damage to materiel occur.

(2) *Ammunition.* Whenever an accident or malfunction involving the use of ammunition occurs, firing of the lot which malfunctions will be immediately discontinued. In addition to any applicable reports required in (1) above, details of the accident or malfunction will be reported as prescribed in AR 700-1300-8.

1-3. Reporting of Errors

Report or errors, omissions, and recommendations for improving this publication by the individual user is encouraged. Reports should be submitted on DA Form 2028 (Recommended Changes to Publications) and forwarded direct to Commanding General, U. S. Army Tank Automotive Command, ATTN: AMSTA-MAPT, Warren, Mich., 48090.

1-4. Equipment Serviceability Criteria

Equipment serviceability criteria for the vehicles are found in TM 9-2320-218-ESC.

1-5. Administrative Storage

Refer to TM 740-90-1 for administrative storage of equipment. Those requirements peculiar to M151 series vehicles are contained in Chapter 4 of this manual.

1-6. Destruction of Army Materiel to Prevent Enemy Use

a. The destruction of army materiel to prevent enemy use is a command decision, implemented only on the authority of the Division Commander or a higher commander.

b. Instructions for destruction of the vehicles covered in this manual are contained in chapter 4.

1-7. Description of Vehicles (figs. 1-1 through 1-3)

a. The ¼ Ton, 4x4 Utility Trucks, M151 Models (fig. 1-1), M151A1C and M825, 106 MM Recoilless Rifle (Fig. 1-2), and the M718 and M718A1 Front Line Ambulance Truck (fig. 1-3) are designed for use over all types of roads as well as crosscountry terrain, and in all weather conditions. While intended operations of the vehicles vary, as do some of their driving characteristics, maintenance support will be the same as for the M151 series trucks unless otherwise indicated. The vehicles have four driving wheels. Front wheel drive may be engaged as road conditions and terrain conditions require. The vehicles are powered by a four-cylinder, in-line, liquid-cooled, gasoline engine located forward of the passenger compartment under the hood. Vehicles have four-wheel hydraulic service brakes and a mechanical hand brake operates with a contracting band on the transmission-transfer brakedrum. All wheels are individually suspended on coil springs. The body is of unitized construction, and proper precautions should be exercised in raising the vehicle. Lifting eyes are provided at the wheels and pintle hooks are provided at the rear of vehicles.

b. The M151, M151A1 and M151A2, 1/4 Ton, 4x4, Utility Truck (fig. 1-1) is a general purpose personnel or cargo carrier. Including the driver, it provides space for four men with equipment. Its performance features are condensed, summarized, and tabulated in paragraph 1-8.

c. The M151A1C and M825 vehicles (fig. 1-2) are equipped with a 106 MM recoilless rifle on an M79 Rifle Mount. Provisions are provided for carrying six rounds of ammunition and weapon tools to create a mobile weapon system.

d. The M718 and M718A1, 4x4, 1/4 Ton, Front Line Ambulance Truck, (fig. 1-3) is designed to carry ambulatory and litter patients. The cargo area of the M718 and M718A1 is 18 inches longer than the M151, M151A1 and M151A2 vehicles and the top 5.3 inches higher to accomodate litters.

1-8. Tabulated Data

The tabulated data you will need to know is contained in table 1-1 for the proper operation of the M151 series vehicles.

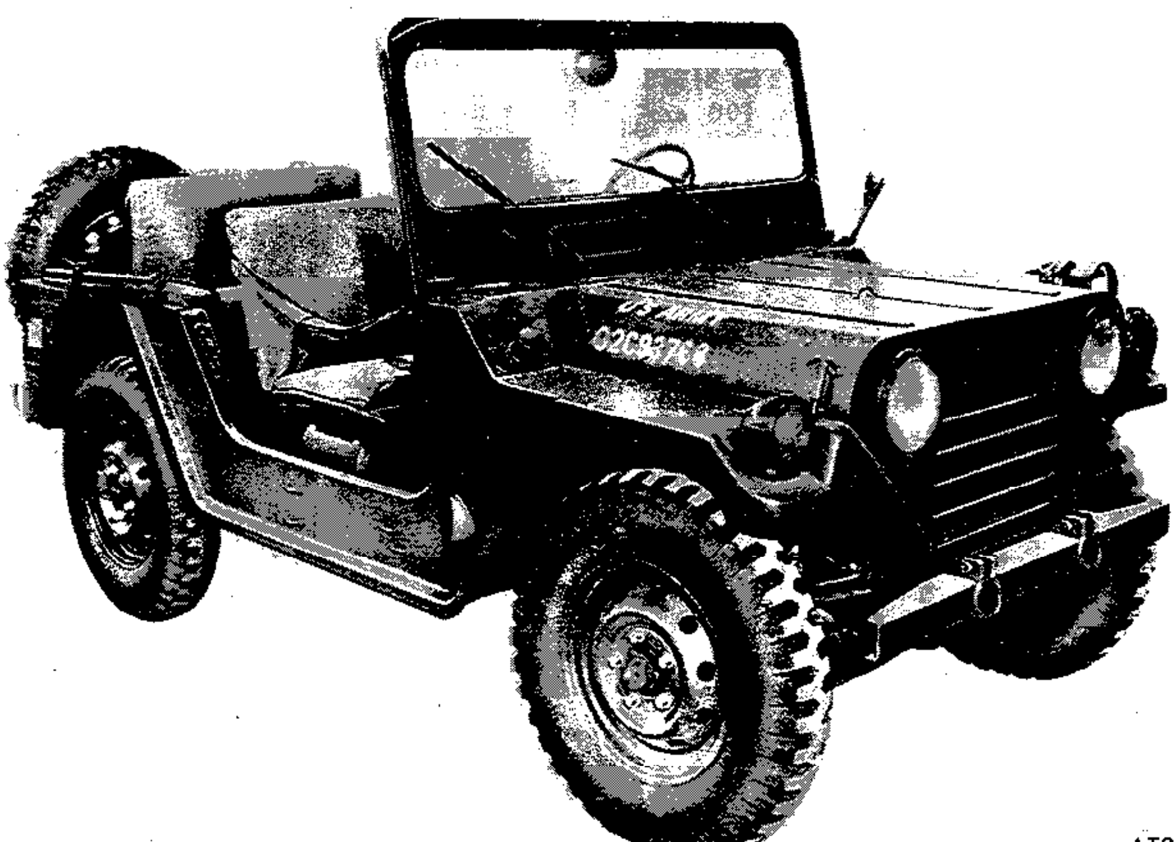

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Figure 1-1. Utility truck, 4X4, 1/4 ton, right front view with top removed.

Figure 1-2. Utility truck, 4X4, 1/4 ton, with 106 MM recoilless rifle: right rear view.

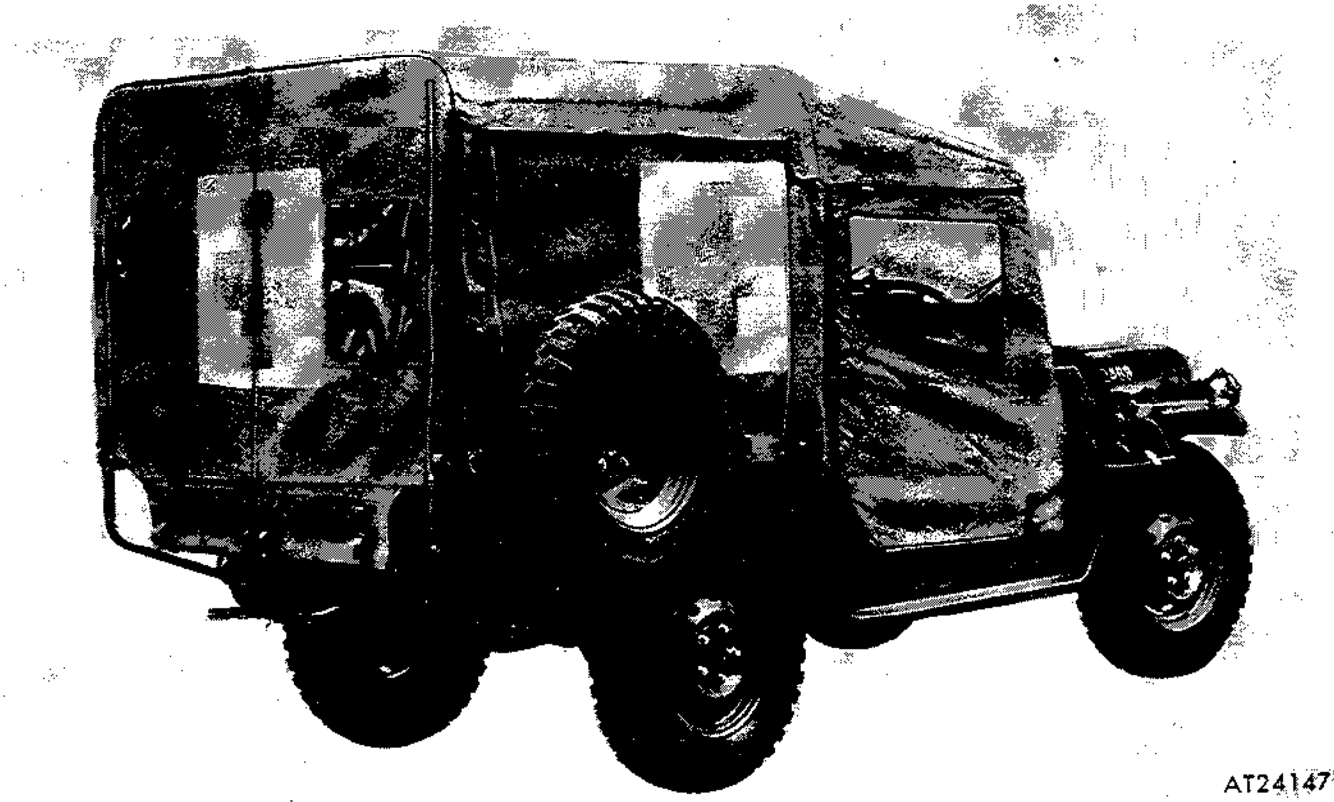


Figure 1-3. Frontline ambulance, 4X4, 1/4 ton, right rear view.

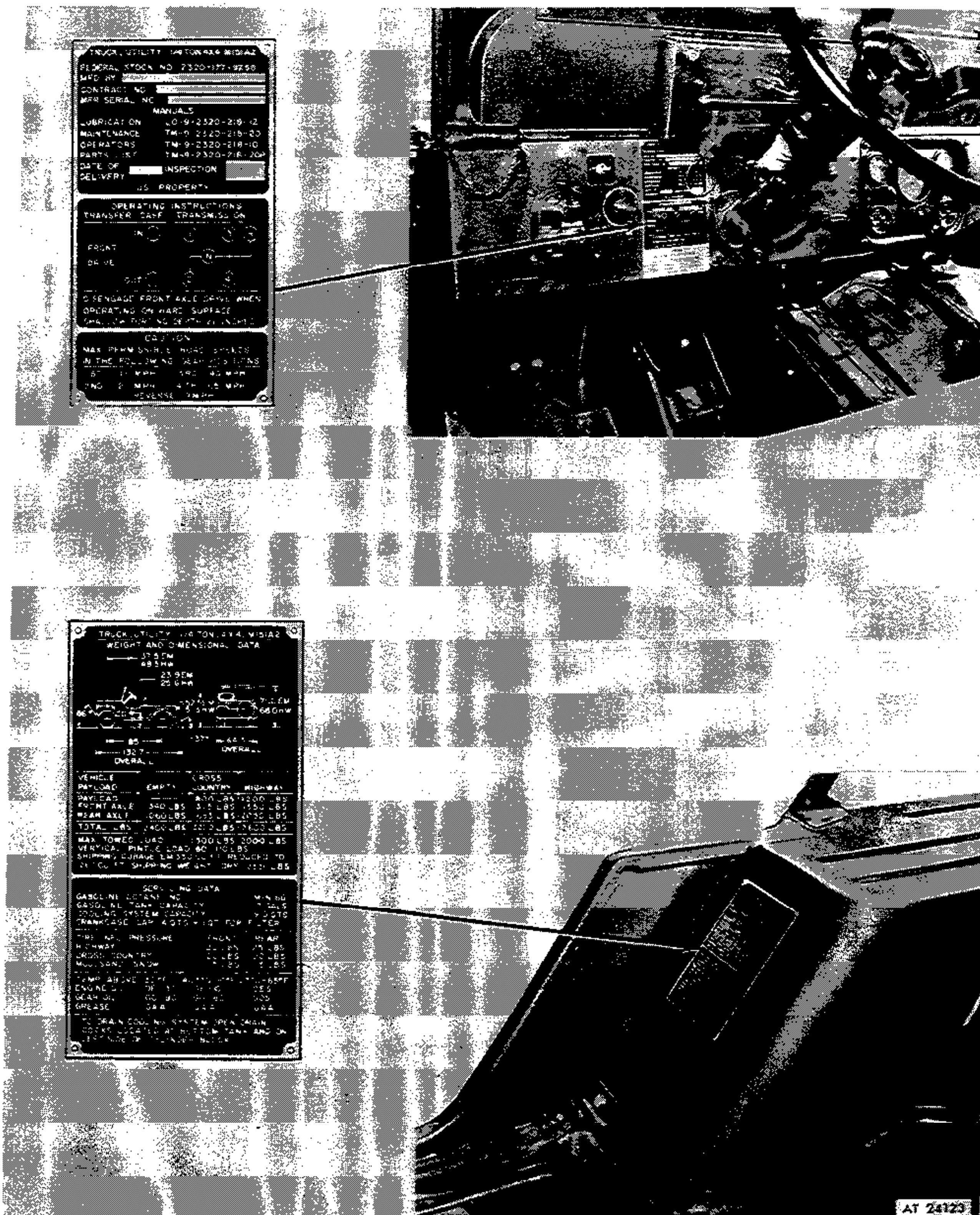


Figure 1-4. Location of name, caution and instruction plates on M151, M151A1, M151A2, M718 and M718A1 vehicles.

Figure 1-5. Location of name, caution and instruction plates on M151A1C and M825 vehicles.

Figure 1-6. Decal on driving speeds.

Table 1-1. Tabulated Data

DATA	M151	M151A1	M151A2	M151A1C	M825	M718	M718A1
(a) Max. Permissible Road Speeds:							
1st Gear	11 mph	11 mph	11 mph	11 mph	11 mph	11 mph	11 mph
2d Gear	21 mph	21 mph	21 mph	21 mph	21 mph	21 mph	21 mph
3d Gear	40 mph	40 mph	40 mph	40 mph	40 mph	40 mph	40 mph
4th Gear	65 mph	65 mph	65 mph	50 mph	50 mph	65 mph	65 mph
Reverse	9 mph	9 mph	9 mph	9 mph	9 mph	9 mph	9 mph
(b) Fuel:							
91 Min. Research Octane: (17 Gals)	*	*	*	*	*	*	*
(c) Fuel System:							
1. Fuel Filter: Impregnated in Tank	*	*		*		*	
2. Fuel Filter: in line and in tank (Saran)			*		*		*
3. Fuel Pump (Elec.) in Tank	*	*		*		*	
4. Fuel Pump (Mech.) Mounted to Engine			*		*		*
(d) Air Cleaner, Oil Bath:	*	*	*	*	*	*	*
Under Vehicle Hood	*	*	*	*	*	*	*
Capacity: 2.5 Pints	*	*	*	*	*	*	*
(e) Engine Oil:							
1. Capacity—4 Quarts	*	*	*	*	*	*	*
2. Filter—1 Quart	*	*	*	*	*	*	*
3. Oil, Engine (Above 32° F.)	OE30	OE30	OE30	OE30	OE30	OE30	OE30
4. Oil, Engine (+40° to —10°F.)	OE10	OE10	OE10	OE10	OE10	OE10	OE10
5. Oil Engine (0° to —65°F.)	OES	OES	OES	OES	OES	OES	OES
(f) Differential:							
1. Capacity—2 Pint	*	*	*	*	*	*	*
2. Oil, Gear (Above 32°F.)	GO90	GO90	GO90	GO90	GO90	GO90	GO90
3. Oil, Gear (+40° to —10°F.)	GO90	GO90	GO90	GO90	GO90	GO90	GO90
4. Oil, Gear (0° to —65°F.)	GOS	GOS	GOS	GOS	GOS	GOS	GOS
(g) Grease:							
Type: GAA	*	*	*	*	*	*	*
(h) Cooling System:							
1. Capacity—9.0 Quarts	*	*	*	*	*	*	*
2. Belts, Drive:							
Generator—25 amp.	2	2		2		2	
Generator—60 amp.	3	3	3	3	3	3	3
Generator—100 amp.	3	3	3	3	3	3	3
Type: "V" Wedge							
Width: Gen. 25 amp.	0.38in.	0.38in.		0.38in.		0.38in.	
Gen. 60-100 amp.	0.47in.	0.47in.	0.47in.	0.47in.	0.47in.	0.47in.	0.47in.
Length: Gen. 25 amp.	33.08in.	33.80in.		33.80in.		33.80in.	
Gen. 60-100 amp.	35.25in.	35.25in.	35.25in.	35.25in.	35.25in.	35.25in.	35.25in.
3. Fan:							
Type—4 Blade	*	*	*	*	*	*	*
Diameter: 15.0 inch	*	*	*	*	*	*	*

Table 1-1. Tabulated data—Continued

DATA	M151	M151A1	M151A2	M151A1C	M825	M718	M718A1
4. Radiator:							
Type-Plate, Fin, & Tube	*	*	*	*	*	*	*
Capacity—4.0 Quart	*	*	*	*	*	*	*
Radiator Cap-Pressure	*	*	*	*	*	*	*
Pressure—7.0 psi	*	*	*	*	*	*	*
Thermostat—Spring							
Cartridge	*	*	*	*	*	*	*
Location—Cyl. Head 180°	*	*	*	*	*	*	*
F & O							
Opening Temp. 202°F.	*	*	*	*	*	*	*
5. Pump, Water:							
Type: Centrifical	*	*	*	*	*	*	*
Location—Frt. of Cyl. Blk.	*	*	*	*	*	*	*
(i) Tires:							
1. Number—5	*	*	*	*	*	*	*
2. Type—Nylon Cord	*	*	*	*	*	*	*
3. Tread—Non-Directional	*	*	*	*	*	*	*
4. Size: 7.00 x 16	*	*	*	*	*	*	*
5. Plies: 4, (6 Ply Rating)	*	*	*	*	*	*	*
(j) Tire Inflation Pres.							
1. Front:							
Highway Use:	20 lbs.	20 lbs.	20. lbs.	25 lbs.	25 lbs.	20 lbs.	20 lbs.
Cross-Country Use	20 lbs.	20 lbs.	20 lbs.	25 lbs.	25 lbs.	20 lbs.	20 lbs.
Snow, Sand, Mud	15 lbs.	15 lbs.	15 lbs.	20 lbs.	20 lbs.	15 lbs.	15 lbs.
2. Rear Tires:							
Highway Use	25 lbs.	25 lbs.	25 lbs.	40 lbs.	40 lbs.	25 lbs.	25 lbs.
Cross-Country Use	20 lbs.	20 lbs.	20 lbs.	40 lbs.	40 lbs.	20 lbs.	20 lbs.
Snow, Sand, Mud	15 lbs.	15 lbs.	15 lbs.	35 lbs.	35 lbs.	20 lbs.	20 lbs.
(k) Electrical System:							
1. Batteries—2 HN	*	*	*	*	*	*	*
2. Voltage—12	*	*	*	*	*	*	*
3. Plates Per Cell —11	*	*	*	*	*	*	*
4. Negative Ground	*	*	*	*	*	*	*
5. Type—Water Proof	*	*	*	*	*	*	*
6. Number Used—2	*	*	*	*	*	*	*
7. Series—24 Volts	*	*	*	*	*	*	*
8. Amp. Hr. Cap. 45 at 20 Hr	*	*	*	*	*	*	*
9. Spark Plug:	14mm	14mm	14mm	14mm	14mm	14mm	14mm
10. Gap—0.29 — 0.32"	*	*	*	*	*	*	*
(l) Generator: 25 amp.							
1. Model: GHA4802UT	*	*		*		*	
2. Part No. 7524310	*	*		*		*	
3. FSN 2920-737-4750	*	*		*		*	
4. Rating:							
Volts—24	*	*		*		*	
Amperes—25	*	*		*		*	
5. Oper. Range—1750-8000 rpm	*	*		*		*	
6. Type: Shunt Field	*	*		*		*	
7. No. Brushes	2	2		2		2	
8. Rotation—Clockwise From Drive End	*	*		*		*	
9. Control of Max. Output Voltage Reg.	*	*		*		*	
(m) Generator: 25 amp.							
1. Model-GHA4804 JUT	*	*		*		*	
2. Part No. 10950808	*	*		*		*	
3. FSN 2920-903-9543	*	*		*		*	
4. Rating:							
Volts—24	*	*		*		*	
Amperes—25	*	*		*		*	
5. Oper. Range—1750-8000 rpm	*	*		*		*	
6. Type—Shunt Field	*	*		*		*	
7. No. Brushes—2	*	*		*		*	

Table 1-1. Tabulated data—Continued

DATA	M151	M151A1	M151A2	M151A1C	M825	M718	M718A1
8. Rotation—Clockwise from Drive End	*	*		*		*	
9. Control of Max. Output—Voltage Reg.	*	*		*		*	
(n) Generator—60 amp.							
1. Model—3002-AA		*	*	*	*	*	*
2. Part No. 10929868		*	*	*	*	*	*
3. FSN 2920-909-2483		*	*	*	*	*	*
4. Rating							
Volts—28		*	*	*	*	*	*
Amperes—60		*	*	*	*	*	*
5. Oper. Range—2000-8000 rpm		*	*	*	*	*	*
6. Type: Internal Rectifaction		*	*	*	*	*	*
7. No. Brushes—Internal Regulation		*	*	*	*	*	*
(o) Service Brakes:							
1. Type—Hydraulic	*	*	*	*	*	*	*
2. Brake Fluid—1 Pint Master Cylinder Located Cowl Left Side	*	*	*	*	*	*	*
(p) Parking Brake:							
Type—Mech. Drum & Band	*	*	*	*	*	*	*
(q) Payload: Including Personnel—							
1. Highway	1200 lbs.	1200 lbs.	1200 lbs.	1730 lbs.	1730 lbs.	900 lbs.	900 lbs.
2. Cross Country	800 lbs.	800 lbs.	800 lbs.	1730 lbs.	1730 lbs.	900 lbs.	900 lbs.
				Incl. 106 MM Rifle			
Rated Payload:							
3. Front Axle Wt. —Empty	1310 lbs.	1310 lbs.	1365 lbs.	1390 lbs.	1445 lbs.	1320 lbs.	1370 lbs.
—Loaded				1560 lbs.	1620 lbs.	1390 lbs.	1440 lbs.
—Cross Country	1495 lbs.	1495 lbs.	1530 lbs.				
—Highway	1530 lbs.	1530 lbs.	1565 lbs.				
4. Rear Axle Wt.							
Empty	1040 lbs.	1040 lbs.	1075 lbs.	1110 lbs.	1145 lbs.	1340 lbs.	1380 lbs.
Loaded				2670 lbs.	2700 lbs.	2170 lbs.	2210 lbs.
Cross Country	1655 lbs.	1655 lbs.	1710 lbs.				
Highway	2020 lbs.	2020 lbs.	2075 lbs.				
5. Gross Vehicle Wt.							
Highway	3550 lbs.	3550 lbs.	3640 lbs.	4230 lbs.	4230 lbs.	3560 lbs.	3650 lbs.
Shipping	2280 lbs.	2280 lbs.	2370 lbs.	2990 lbs. W / Rifle 2500 lbs. W / Equip. No Rifle	3080 lbs. W / Rifle 2590 lbs. W / Equip. No Rifle	2525 lbs.	2615 lbs.
(r) Engine:							
1. General Army Design 4 Cyl. Int. Combustion	*	*	*	*	*	*	*
Horse Power Rating 71 HP at 4000 rpm at 60°F. Air Temp—Torque	*	*	*	*	*	*	*
128 lb. ft. at 1800 rpm	*	*	*	*	*	*	*
Bore: 3.875 inch	*	*	*	*	*	*	*
Stroke: 3.00 inch	*	*	*	*	*	*	*
Displ: 141.5 cu. inch	*	*	*	*	*	*	*
Cylinders: 4	*	*	*	*	*	*	*
Firing Order 1-3-4-2	*	*	*	*	*	*	*
2. Valve Arrangement: Overhead	*	*	*	*	*	*	*
3. Valve Clearance:							
Intake: 0.015 inch	*	*	*	*	*	*	*
Exhaust: 0.015 inch	*	*	*	*	*	*	*
Comp. Ratio: 7.5-1	*	*	*	*	*	*	*
Comp. at Cranking: 135-145 psig (theoretical)	*	*	*	*	*	*	*

Table 1-1. Tabulated Data—Continued

DATA	M151	M151A1	M151A2	M151A1C	M825	M718	M718A1
4. Carburetor:							
Type: Single Barrel	*	*	*	*	*	*	*
Make: Zenith or Holley	*	*	*	*	*	*	*
Choke: Manual	*	*	*	*	*	*	*
5. D. C. Generator—Regulator							
Make—Prestolite	*	*		*		*	
Current Limit—28.3 at 70° F.	*	*		*		*	
6. Starter Motor							
Make: Prestolite	*	*	*	*	*	*	*
Optional: Delco—Remy	*	*	*	*	*	*	*
Type: Series Wound	*	*	*	*	*	*	*
Voltage: 24 DC	*	*	*	*	*	*	*
Drive-Follow-Through (Over Running Clutch)	*	*	*	*	*	*	*
Starting Motor Switch (On Toe Board Below Clutch Pedal)	*	*	*	*	*	*	*
7. Weight:							
Power Plant—528 lb	*	*	*	*	*	*	*
Engine with Flywheel and Accessories—328 lbs.	*	*	*	*	*	*	*
Engine with Flywheel and W/O Accessories—257 lbs.	*	*	*	*	*	*	*
Belts for Fan. 25 amp Generator and Water Pump—2 "V" Wedge. 0.38 Inch Wide X 33.0 Inch Long	*	*		*		*	
Belts for Fan 60 amp Alternator 3 "V" Wedge 0.47 In. Wide X 35.25 In. Long		*	*	*	*	*	*
Windshield Washer Reservoir Cap. 3 Qts.			*		*		*
(s) Dimensions:							
Length	132.7 in.	132.7 in.	132.7 in.	143.5 in.	143.5 in.	143.0 in.	143.0 in.
Width	64.0 in.	64.0 in.	64.3 in.	76.5 in.	76.5 in.	72.0 in.	71.6 in.
To Top Most Point	71.0 in.	71.0 in.	71.0 in.	77.2 in.	77.2 in.	76.3 in.	76.3 in.
Wheel Base	85.0 in.	85.0 in.	85.0 in.	85.0 in.	85.0 in.	85.0 in.	85.0 in.
(t) Personnel Complement:							
Crew, Operator and Patients	4	4	4	4	4	Refer to TM 9-2320-218-10	
(u) Cruising Range: (W/O Towed Load)	300 m	300 m	300 m	275 m	275 m	300 m	300 m
(v) Fording Depth W/Out Special Equipment:	21.0 in.	21.0 in.	21.0 in.	20.0 in.	20.0 in.	21.0 in.	21.0 in.
(w) Turning Radius:	17.9 ft.	18.5 ft.	18.5 ft.	18.5 ft.	18.5 ft.	18.5 ft.	18.5 ft.
(x) Vehicle Kits:							
Winterization (—65°F.)	*	*	*				
Hardtop	*	*	*				
Machine Gun Mount	*	*	*				
Door & Side Curtain	*	*	*				
M 16/14 Rifle Mount	*	*	*	*	*		
Deep Water Fording	*	*	*			*	*
100 amp Alternator	*	*	*	*	*	*	*
Heater, Hot Water (—25°F.)	*	*	*	*	*	*	*
Vehicle Lifting			*		*		*
Overload	*	*	*				
(y) Power Train:							
Clutch Type—Single Dry Disc.	*	*	*	*	*	*	*
Diameter—8.5 Inch	*	*	*	*	*	*	*
Transmission Type: Selective Synchromesh	*	*	*	*	*	*	*

Table 1-1. Tabulated Data—Continued

DATA	M151	M151A1	M151A2	M151A1C	M825	M718	M718A1
Speeds—4 Forward	*	*	*	*	*	*	*
1 Reverse	*	*	*	*	*	*	*
Synchronized Gears 2d. 3d							
and 4th	*	*	*	*	*	*	*
(Lubricant Cap.(5½ Pints)	*	*	*	*	*	*	*
Gear Ratio:							
First—5.712-1	*	*	*	*	*	*	*
Second—3.179-1	*	*	*	*	*	*	*
Third—1.674-1	*	*	*	*	*	*	*
Fourth—1.000-1	*	*	*	*	*	*	*
Reverse—7.497-1	*	*	*	*	*	*	*
(z) Transfer—Single Speed:	*	*	*	*	*	*	*
(aa) Steering Geometry:							
Wheel Toe-in—1 / 32—5 / 32 In.	*	*	*	*	*	*	*
Front Drive Turning Angle for							
Each Wheel:							
Maximum—right—22°	*	*	*	*	*	*	*
—Left—31°	*	*	*	*	*	*	*
Steering Gear Ratio: 16.4-1							
Type: Worm & Double Roller							
Steering Wheel Size: 17.25 in. dia.							
Type: Three Spoke							
(ac) Propeller Shaft:							
Type of Joint: Cardan	*	*	*	*	*	*	*
Front and Rear Drive							
(ad) Differential Type:							
Type: Drive Through	*	*	*	*	*	*	*
Gear and Type:							
Hypoid	*	*	*	*	*	*	*
4 Pinion	*	*	*	*	*	*	*
Drive Gear Ratio 4.86-1							
Lubrication Capacity—2 Pints	*	*	*	*	*	*	*
(ae) Suspension:							
Type: Independent. 4 Wheel	*	*	*	*	*	*	*
Springs: Coil	*	*	*	*	*	*	*
Front Shock Absorbers:							
Type: Hydraulic. Telescopic	*	*	*	*	*	*	*
Action: Two-Way. Direct							
(Jounce and Rebound Control)	*	*	*	*	*	*	*
Stops: Internal. Hydraulic—							
(Jounce and Rebound) or							
Mechanical (External Jounce							
and Internal Rebound)	*	*	*	*	*	*	*
Rear Shock Absorbers:							
Type: Hydraulic Telescopic	*	*	*	*	*	*	*
Action: Two-Way. Direct							
(Jounce and Rebound Control)							
Stops: Internal. Hydraulic							
(Rebound Only or Mechanical)							
(Internal Rebound Only)	*	*	*	*	*	*	*
(af) Ignition:							
Distributor Assy. (Prestolite)	*	*	*	*	*	*	*
Rotation (Rotor End Clockwise)	*	*	*	*	*	*	*
Type of Advance: (Centrifugal)	*	*	*	*	*	*	*
Breaker Point Opening:	*	*	*	*	*	*	*
0.017—0.022 Inch	*	*	*	*	*	*	*
Cam Angle—39°	*	*	*	*	*	*	*
Voltage—24	*	*	*	*	*	*	*
Timing—6° BTDC	*	*	*	*	*	*	*
Spark Plug Gap—0.029—							
0.032 Inch	*	*	*	*	*	*	*
Engine Firing Order—1-3-4-2	*	*	*	*	*	*	*
Ignition Coil Located in							
Distributor Housing	*	*	*	*	*	*	*

Table 1-1. Tabulated Data—Continued

DATA	M151	M151A1	M151A2	M151A1C	M825	M718	M718A1
(ag) (—65°F. Heater):							
Perfection Part No. 10920608	*	*	*			*	*
Stewart Warner Part No. 8720192	*	*	*			*	*
Fuel Pressure: 1—5 psi	*	*	*			*	*
Fuel Consumption:							
High Heat: 0.4 gph.	*	*	*			*	*
Low Heat: 0.27 gph.	*	*	*			*	*
(ah) (—25°F. Heater):							
Kysor Mfgr.	*	*	*			*	*
Heater Model No. 96906-51326-1	*	*	*			*	*
Requirements:							
Max. Volts: 28.0	*	*	*			*	*
Min. Volts: 18.0	*	*	*			*	*
Water Cap.: 1 Quart	*	*	*			*	*
(ai) Hard Top Kit:							
Material: Aluminum	*	*	*				
Thickness: 0.040—0.050 In.	*	*	*				
Shipping Cube: 88.24 Cu. Ft.							
(aj) Deep Water Fording Kit:							
Weight of Kit 71.5 Lbs	*	*	*	*	*	*	*
Fording Depth—Kit Installed: 60.0 Inch	*	*	*			*	*

CHAPTER 2

SERVICE AND MAINTENANCE INSTRUCTIONS

Section I. SERVICE UPON RECEIPT OF MATERIEL

2-1. General

Refer to TM 9-2320-218-10 for operating instructions, break-in operating cautions, and break-in speeds.

2-2. Equipment Log Book (Binder)

The Equipment Log Book will be with the item to which it pertains when the equipment is serviced, repaired, modified, or transferred. Instructions for preparation and application of equipment log books are contained in TM 38-750. Also, special reporting requirements on performed maintenance on the equipment are contained in TM 38-750.

2-3. General Preliminary Services

(Performed by Organizational Maintenance or Supplying Organization)

a. If any exterior surfaces are coated with rust-preventive compound, remove it with dry-cleaning solvent or mineral spirits paint thinner.

b. Read Processing Record for Shipment and Storage of Vehicles and Unboxed Engines tag (DD Form 1397) and follow all precautions checked thereon. This tag should be attached to the steering wheel, shifting levers, or ignition switch.

c. Crank engine at least two revolutions, before turning ignition on, to test for hydrostatic lock. (This precaution is taken because there might be an excess of preservative oil in the combustion chambers, or, possibly, coolant may have leaked into them).

NOTE

If the material has been driven to the using organization, most or all of the foregoing procedures should have been performed.

d. On processed material, when engine has been stored for over 30 days, service engine as outlined in TB ORD 392.

e. Follow the general procedures given in TM 9-2320-218-10.

NOTE

Seat belt anchors are provided on M151A2 models. It is the responsibility of local commanders to decide whether or not seat belts are to be installed to M151A2 or other M151 series vehicles when used for administrative purposes.

2-4. Specific Preliminary Services

a. Perform the "S" (6-month or 6000 mile) preventive-maintenance services. Refer to paragraph 2-16 for specific procedures.

b. Lubricate vehicle in accordance with lubrication order regardless of interval, excluding gearcases and engine. Check processing tag for gearcases and engine oil. If tag states that oil is suitable for operation and is of the proper viscosity for local climatic operation, check the level, but do not change the oil.

c. Schedule second "S" service on DD Form 314, Preventive-Maintenance Roster, and arrange for oil change at suggested normal intervals (Refer to LO 9-2320-218-12).

2-5. Correction of Deficiencies

a. Ordinary deficiencies disclosed during preliminary inspection and servicing, or during break-in period, will be corrected by the using organization or a higher category of maintenance.

b. Serious deficiencies, which appear to involve unsatisfactory design or material, will be reported in accordance with instructions in paragraph 1-3.

Section II. PARTS, TOOLS, AND EQUIPMENT

2-6. General

Tools, equipment, and repair parts are issued to organizational-maintenance personnel for maintaining the materiel. Tools and equipment should not be used for purposes other than prescribed and, when not in use, should be properly stowed in the chest and / or roll provided for them.

2-7. Repair Parts

Repair parts are supplied to organizational maintenance for replacement of those parts most likely to become worn, broken, or otherwise unserviceable, provided replacement of these parts is within their scope. Organizational repair parts supplied for the 1 / 4 ton utility truck, M151 series and M718 ambulance vehicles are listed in TM 9-2320-218-20P which is the authority for requisitioning replacements.

2-8. Common Tools and Equipment

Standard and commonly used tools and equipment having general application to this material are authorized for issue by tables of allowances and tables of organization and equipment.

2-9. Special Tools and Equipment
(fig. 2-1)

Certain tools and equipment specially designed for organizational maintenance, repair, and general use with the materiel are listed in table 2-1 for information only. This list is not to be used for requisitioning replacements. Special tools for organizational maintenance are listed in TM 9-2320-218-20P which is the authority for requisitioning replacements.

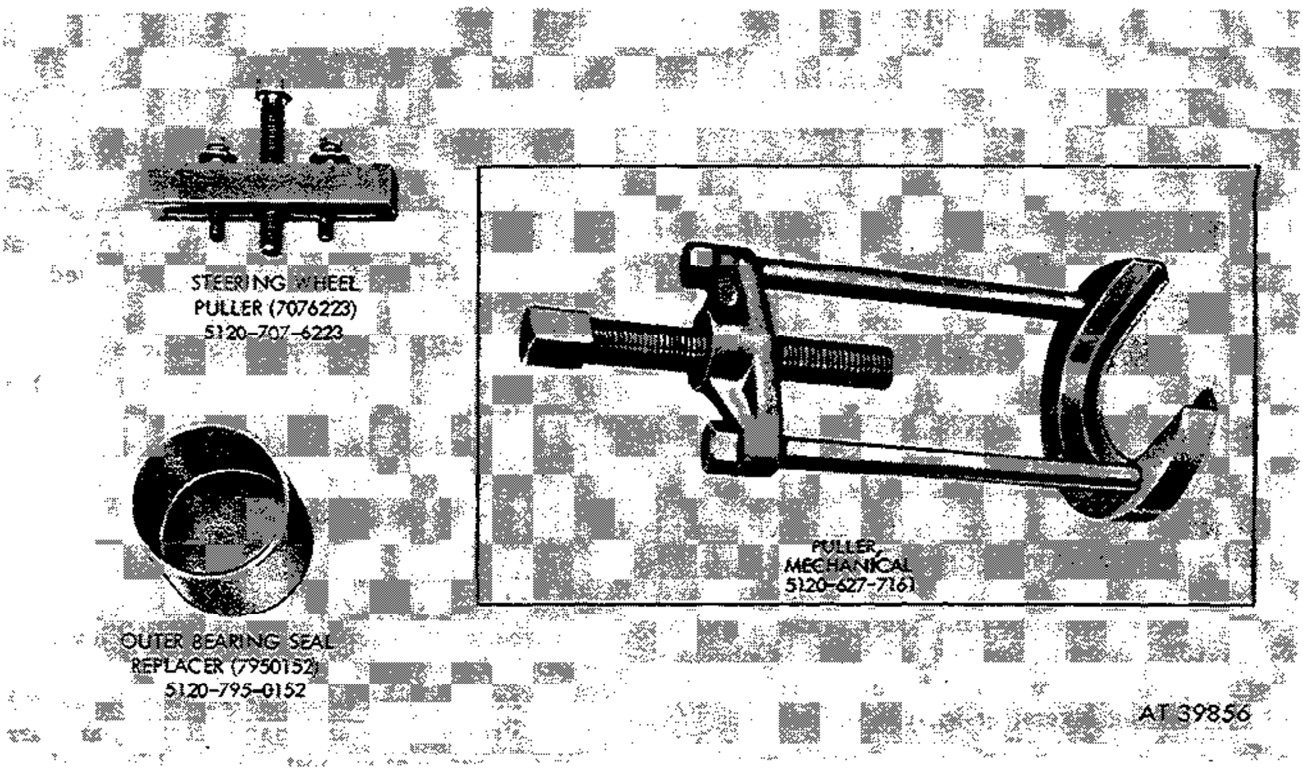


Figure 2-1. Special tools and equipment for organizational maintenance.

Table 2-1. Special Tools and Equipment for Organizational Maintenance

Item	Identifying No.	References Fig.	References Par.	Use
1 Puller	5120-707-6223 (7076223)	2-357	2-165	Removing steering wheel
2 Replacer	5120-795-0152 (7950152)	2-307 2-321	2-136 2-142	Installing differential side gear flange seal and retainer. Installing front and rear wheel-bearing seals.
3 Puller	5120-627-7161 (7345234)	2-319	2-141	Removing outer wheel bearing.

Section III. LUBRICATION

2-10. Lubrication Order

The lubrication order prescribes cleaning and lubricating procedures as to locations, intervals, and proper materials for these vehicles. Lubrication to be performed will be in accordance with the lubrication order. Whenever necessary, the operator, crew, or user will assist the organizational-maintenance personnel in lubrication of the materiel.

2-11. General Lubrication Instructions

a. General. Any special lubricating instructions required for specific mechanisms or parts are covered in the pertinent section.

b. Service Intervals. Service intervals specified on the lubrication order are for normal operation and where moderate temperature, humidity, and atmospheric conditions prevail.

c. Reports and Records.

(1) Report unsatisfactory performance of preserving materials in accordance with instructions in paragraph 1-3.

(2) Maintain a record of lubrication of the materiel on Form 2408-1, Equipment Lubrication Record.

2-12. Painting

Instructions for camouflage painting are contained in FM 5-20.

Section IV. PREVENTIVE-MAINTENANCE SERVICES

2-13. General

To insure that the vehicle is ready for operation at all times, it must be inspected systematically so that defects may be discovered and corrected before they result in serious damage or failure. The necessary preventive-maintenance checks and services to be performed are listed as described in table 2-2.

2-14. General Procedures

a. Automatically Applied. All of the general procedures given in the operator's manual will be followed. Organizational mechanics must be so thoroughly trained in these procedures that they apply them automatically at all times in the performance of their duties.

b. Driver or Crew Participation. The driver or crew usually accompanies the materiel and assists the organizational mechanic in the performance of his services.

c. Unwashed Materiel. The driver or crew should present the materiel for a scheduled preventive-maintenance service in a reasonably clean condition; that is, it should be dry and not caked with mud to such an extent as to seriously hamper inspection and services. However, washing of the materiel should be avoided immediately prior to an inspection, since certain types of defects such as loose parts and oil leaks may not be evident immediately after washing.

d. Services. Organizational maintenance services are defined by, and restricted to, the following general procedures unless approval has been given by the supporting maintenance organization.

(1) *Adjust.* Make all necessary adjustments in accordance with instructions contained in the pertinent section of this technical manual or technical bulletins.

(2) *Clean.* Clean the unit to remove old lubricant, dirt and other foreign material.

(3) *Special Lubrication.* This applies either to lubrication operations that do not appear on the lubrication order or to items that do appear but which should be performed in connection with the maintenance operations.

NOTE

In order to lubricate "U" joint grease fittings that are hard to get at, a special grease gun adapter must be used. This adapter is an authorized item in the lubrication kit FSN 4930-357-6301, and also available separately under FSN 4930-204-2550.

(4) *Service.* This usually consists of performing special operations, such as replenishing battery water, draining and refilling units with oil, and changing or cleaning the oil filter, air cleaner, or cartridges.

(5) *Tighten.* All tightening operations should be performed with sufficient wrench torque (force on the wrench handle) to tighten the unit according to good mechanical practice. Use a torque-indicating wrench where specified. Also do not overtighten, as this may strip threads or cause distortion. Tightening will always be understood to include the correct installation of lockwashers, locknuts, locking wire, or cotter pins to secure the tightened nut. Torque specifications for attaching parts are included with the paragraph containing the maintenance procedure.

(6) *Modification Work Order Application.* At least every 6 months, a checkup will be made to see that all applicable modification work orders published in DA Pam 310-7 have been accomplished. Also refer to DA Form 2408-5 (Equipment Modification Record). If a field maintenance modification has not been applied, promptly notify the supporting maintenance officer. No alteration or modification, which will affect moving parts, will be made by organizational personnel, except as authorized by official publications.

e. Special Conditions. When conditions make it difficult to perform the complete preventive-maintenance procedures at one time, they can be handled in sections. Plan to complete all operations within a week if possible. All available time at halts and during bivouac must be utilized to assure that maintenance operations are completed.

f. DA Form 2404, Equipment Inspection and Maintenance Worksheet. Perform the "S" preventive-maintenance service in the sequence shown in table 2-2, using DA Form 2404 as a worksheet.

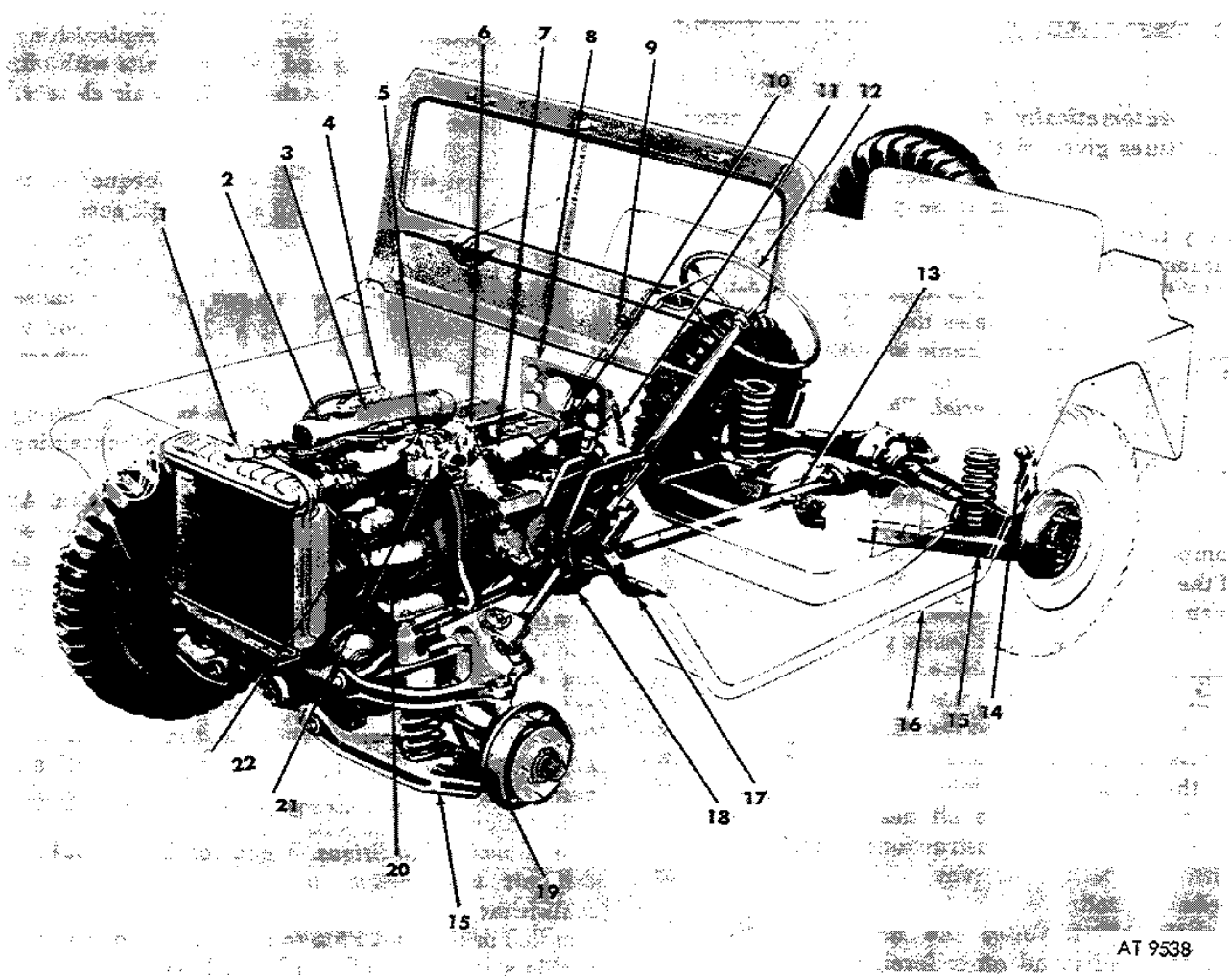
2-15. Semiannual "S" Preventive-Maintenance Services

a. Purpose. The "S" preventive-maintenance services insure the correct adjustment, securing, and assembly of all components of the materiel. Necessary replacements, cleaning, lubrication, and protection of parts and / or assemblies will be accomplished as required, to give reasonable assurance of trouble-free operation until the next "S" preventive-maintenance service is performed.

b. Intervals. The semiannual "S" preventive-maintenance services are performed by the organizational mechanics every six months or at every 6000 miles of vehicle operation, whichever occurs first.

2-16. Specific Procedures for Organizational Maintenance

Specific procedures for performing each item in the semiannual "S" preventive-maintenance services on materiel are outlined in table 2-3. Result of inspection and checking during preventive-maintenance services is authorization to take corrective action to remove the trouble found, by performing the service or repair at organizational-maintenance level. If repairs by a higher category of maintenance are required, a DA Form 2407, Maintenance Request, will be prepared and forwarded with the equipment to the supporting maintenance activity.



1 Cooling system
2 Oil filter (engine right side)
3 Engine performance
4 Ignition system
5 Fuel system
6 Choke and throttle linkage
7 Starter and switch
8 Instruments
9 Transmission
10 Batteries
11 Parking brake
12 Steering system
13 Propeller shafts and "U" joints
14 Shock absorbers
15 Suspension
16 Body w / frame and accessories
17 Clutch
18 Transfer
19 Service brake system
20 Generator and wiring
21 Air intake system
22 Fan and generator belts

Figure 2-2. Preventive-maintenance locator.

Table 2-2. Preventive-Maintenance Checks and Services

Organizational — Semiannual schedule

Sequence number	Item to be inspected	Procedures	Paragraph reference
1	Cooling System	Inspect radiator core, hoses, cap and gaskets. Check core for clogging or bent fins. Observe coolant level. If required, drain radiator and cylinder block, flush radiator and cylinder block, flush and refill cooling system and add rust inhibitor, unless antifreeze containing rust inhibitor, is used. In cold weather, test antifreeze. Add as required.	2-63
2	Air Intake System	Check air cleaner, air cleaner and air intake hose for secureness. Inspect hose for damage. Check air cleaner element for contamination and clean if necessary. Inspect for proper oil level.	2-43
3	Ignition System	If engine performance is satisfactory and shows no excessive loss of power, misfire, or exhaust smoke, only a visual inspection of the ignition system will be made. If loss of power, misfire, or excessive exhaust smoke is noted, isolate the difficulty by troubleshooting. **NOTE** Spark plugs, ignition, points, and capacitor must be replaced after 12,000 miles of service.	2-19
4	Exhaust System	Listen for loud or unusual noises and look for exhaust leaks. Tighten exhaust manifold mountings if required. Inspect muffler and exhaust pipe for damage.	2-40
5	Fan and Generator Belts	Inspect pulleys and fan for alinement. Check belts for proper tension. Notice if water pump is leaking.	2-66
6	Generator and Wiring	Check wiring for loose connections or worn insulation. Check security of generator mounting.	
7	Linkage and Lines	Inspect carburetor, choke, and throttle linkage and lines. Observe if choke and throttle valves open fully. Make an engine vacuum test and adjust carburetor mixture. Test fuel pump pressure. Examine fuel lines and connections for evidence of leaks. Examine ventilation lines for loose connections. Clean and inspect the ventilation control valve every 12,000 miles or annually which ever comes first.	2-29 2-44 2-49 2-50
8	Oil Filter	Check condition of oil. If oil change is necessary, change oil and replace oil filter.	2-34
9	Fuel System	Inspect engine compartment and under vehicle for leaks. Check lines and connections for damage. Replace in-line fuel filter every 12,000 miles or annually which ever comes first (M151A2, M825 and M718A1 only).	2-52
10	Batteries	Test batteries only after engine has been stopped for five minutes or more. Check specific gravity of each cell and record specific gravity. Check electrolyte level. Inspect cables and clamps for tightness and condition. After test, clean tops of batteries, coat terminals lightly with grease, and repaint carrier if necessary.	2-20 2-25
11	Starter and Switch	Notice if starter makes unusual noise. Notice if starting motor engages smoothly and turns engine with normal cranking speed.	

Table 2-2. Preventive-Maintenance Checks and Services

Organizational — Semiannual schedule

Sequence number	Item to be inspected	Procedures	Paragraph reference
12	Engine Performance	In starting and warming engine, observe if it starts easily and if action of throttle and choke control assemblies is satisfactory. Notice if idling speed is correct. Listen for any unusual noises at idle and higher speeds. When operating vehicle, notice if it has normal power and acceleration in each speed range. Listen for any unusual noises when engine is under load.	
13	Instruments	Check fuel gage, battery-generator indicator, speedometer, oil pressure gage, temperature gage and ignition switch for normal readings. Notice if ignition switch operates freely. Check other controls for normal operation.	
14	Safety Devices	Depress horn button to sound horn and determine if signal is normal (if tactical situation permits). Test windshield wipers for satisfactory operation. Examine rear view mirror and reflectors. Examine safety strap for secureness. Check fire extinguisher. NOTE M151A2, M825, and M718A1 vehicle have electrical windshield wipers with manually operated washers, two rear view mirrors and adhesive stick-on reflectors. Check these items for proper function.	
15	Service Brake System	Make several stops and check for unusual braking conditions. Check brake pedal for specified free travel. Remove one wheel and tire assembly and drum from each side of the vehicle and inspect brakedrum, brake lining, brakeshoe anchor, hold-down springs, retracting springs, brakeshoe adjusting screw, and wheel cylinder. If brake lining thickness from the outer surface to the rivet head is less than 3/64-inch, replace brakeshoe assemblies. If evidence of oil or grease is found on brakeshoe assemblies, replace shoe assemblies.	2-171 2-173
16	Parking Brake	Check to determine if parking brake control lever holds and if the lever requires more than three-quarters travel for full application. Stop vehicle on an incline and apply parking brake to see if it holds the vehicle. Inspect for correct adjustment of lining to drum.	2-167
17	Clutch	Determine if action of pedal return spring is satisfactory. Note if clutch disengages completely or if it has a tendency to drag. Note if clutch engages smoothly or if it chatters, grabs, or slips. With transmission in neutral, depress clutch and listen for unusual noise which may indicate a defective release bearing. Check clutch pedal free travel.	
18	Transmission	Note operation in all gears. Note ease of shifting. Listen for unusual noises and inspect for signs of malfunction or lubricant leakage.	2-41
19	Transfer	Note operation of transfer in all output combinations. Check ease of shift. Listen for unusual noises, and inspect for signs of malfunction or lubrication leakage.	
20	Steering System	Check for binding. Examine steering column and wheel. Inspect for damaged seals. Inspect to determine that steering stops are properly adjusted.	

Table 2-2. Preventive-Maintenance Checks and Services

Organizational — Semiannual schedule

Sequence number	Item to be inspected	Procedures	Paragraph reference
21	Body with Frame Accessories	Make general inspection of body including glass, panels, top, fenders, bows, paulins, curtains, brush guards, hinges, brackets, and fasteners. Inspect seat frames and upholstery. Examine condition of paint and check markings and name, caution, and identification plates for legibility.	2-198
22	Lights and Reflectors	During stops in the road test, check operation of lights and light switches. Check for damaged reflectors.	
23	Towing Pintle	Check operation of pintle hook. Check mounting bolt for tightness.	
24	Bumpers	Inspect front and rear bumpers for looseness or damage.	
25	Suspension	Make certain wheel driveshafts are installed correctly. Inspect seals for damage. If damaged, inspect wheel bearing grease for dirt. Inspect for worn rubber bushings. Check upper and lower ball joints for damage (front). Make certain suspension arms are not damaged. Inspect for damaged springs. Check shock absorbers and brackets for damage. Check for leaks. Inspect rubber insulators for excessive wear.	2-141 2-142 2-148
26	Propeller Shafts and "U" Joints	Inspect for loose bearings, damaged seals, damaged lubricant fittings and bent shafts. Inspect for looseness of bolts and tighten as required.	2-127 2-128
27	Final Road Check	Perform final road test. Pay special attention to items which have been repaired or adjusted.	

2-17. Scope

a. This section contains troubleshooting information and tests for locating and correcting some of the troubles which may develop in the vehicle. Each symptom of trouble or malfunction given for an individual unit or system is followed by a list of probable causes of the trouble and corrective actions necessary to remedy the malfunction.

b. This technical manual cannot cover all possible troubles and deficiencies that may occur under the many conditions of operation. If a specific malfunction, probable cause, and corrective action, therefore, is not covered herein proceed to isolate the system in which the trouble occurs and then locate the defective component. Use all the senses to observe and locate troubles. Do not neglect use of any test instruments such as an ohmmeter, voltmeter, ammeter, test lamp, hydrometer, and pressure and vacuum gages that are available. Standard automotive theories and principles of operation apply in troubleshooting this vehicle. Question the drive to obtain maximum number of observed malfunctions. The greater the number of malfunctions that can be evaluated, the easier will be the isolation of the defect.

c. The tests and remedies provided in this section and governed by the scope of the organizational level of maintenance.

2-18. Procedures

a. Table 2-3 lists possible malfunctions that may occur in the vehicle or in individual units or systems of the vehicle. Each malfunction is followed by a list of probable causes that must be considered in determining corrective action.

b. Where electrical malfunctions occur, only correction of minor and obvious causes, such as frayed cables or loose connections, are listed in table 2-3. All other electrical malfunctions are covered fully in the Electrical Troubleshooting charts, paragraphs 2-19 through 2-25.

Table 2-3. Troubleshooting

Malfunction	Probable Cause	Corrective Action
	ENGINE	
1. Engine fails to crank or cranks slowly.	*a.* Defective starter system.	*a.* Troubleshoot starting system.
	b. Mechanical seizure of parts.	*b.* Notify support maintenance.
	c. Incorrect oil viscosity (cold weather only).	*c.* Inspect engine oil. Drain and fill with correct grade as specified in lubrication order.
	d. Faulty batteries or cables.	*d.* Check for loosened cables of connectors at battery, battery to frame connection, starter switch, starter terminal stud or the engine to frame cable. Very often a poor connection in this high current circuit can be detected by feeling each connection for heat while the starter is energized.
2. Engine cracks but fails to start	*a.* Combustion chambers flooded with fuel.	*a.* If choke has been used excessively, fuel may flood the combustion chamber causing engine not to start. Push choke all the way in, open throttle and crank engine to clean out excessive fuel. If flooding continues, check fuel system. (items 15 through 18).
	b. Current not reaching spark plug.	*b.* Troubleshoot ignition system.
	c. Inoperative fuel system.	*c.* Test fuel pump pressure (para 2-49 or 2-50).
	d. Incorrect ignition timing.	*d.* Adjust ignition timing (para 2-71).
3. Engine starts but fails to keep running.	*a.* Engine idle speed set too low.	*a.* Adjust idle speed (para 2-44 and 2-45).
	b. Defective fuel pump.	*b.* Check fuel pump pressure (para 2-49 or 2-50).
	c. Choke not operating properly.	*c.* Check choke linkage and correct any binding condition or replace damaged linkage (para 2-47).
	d. Defective carburetor.	*d.* Replace carburetor (para 2-44 and 2-45).

Table 2-3. Troubleshooting—Continued

Malfunction	Probable Cause	Corrective Action
3. Engine starts but fails to keep running—Continued	*e.* Breaker points not properly adjusted.	*e.* Check braker point gap and tension of movable contact arm. Troubleshoot ignition system.
	f. Inoperative fuel pump safety switch (oil pressure safety switch) (on M151, M151A1, M151A1C and M718 vehicles only), or low oil level in crankcase.	*f.* Check engine oil level. Add oil if necessary. Troubleshoot fuel pump safety switch (oil pressure safety switch circuit.
	g. Defective spark plugs.	*g.* Check spark plugs (para 2-72).
4. Engine runs, but misses.	*a.* Improper breaker point adjust.	*a.* Troubleshoot ignition distributor.
	b. Defective ignition distributor.	*b.* Troubleshoot ignition distributor.
	c. Improper choke operation.	*c.* Check choke linkage and correct any binding condition, or replace damaged linkage (para 2-47).
	d. Low or erratic fuel pump pressure.	*d.* Check fuel pump pressure (para 2-49) fuel pump filter and fuel pump electrical system. If fuel pump pressure is not within specified limits, replace fuel pump (para 2-49). On M151A2, M825 and M718A1 vehicles, check mechanical fuel pump (para 2-50).
	e. Defective carburetor.	*e.* Replace carburetor (para 2-44 and 2-45).
5. Poor acceleration.	*a.* Incorrect ignition timing.	*a.* Troubleshoot ignition system. Refer to Electrical Troubleshooting table 4.
	b. Fouled or improperly adjusted spark plugs.	*b.* Inspect spark plugs (para 2-72).
	c. Defective or improperly adjusted breaker points.	*c.* Inspect breaker points (para 2-70).
	d. Ignition distributor not advancing properly.	*d.* Troubleshoot ignition system.
6. Lack of power.	*a.* Engine overheating.	*a.* Troubleshoot cooling system (items 12 through 14).
	b. Choke not fully open.	*b.* Push choke control rod all the way in. Adjust cable if necessary.
	c. Fuel system restricted.	*c.* Troubleshoot fuel system (items 15 through 18).
	d. Improper valve adjustment.	*d.* Check and adjust valve clearance. (para 2-33).
	e. Valves sticking.	*e.* Notify support maintenance.
7. Engine will not idle.	*a.* Carburetor out of adjustment.	*a.* Adjust carburetor (para 2-44 and 2-45).
	b. Air leaking into intake manifold.	*b.* Apply a small amount of oil at carburetor and intake manifold flanges. If oil is sucked into manifold air leak is present. Tighten flange nuts or replace gasket (para 2-39). Check, tighten and / or replace leaking vent lines and crankcase vent valve if required.
	c. Faulty ignition system.	*c.* Troubleshoot ignition system.
	d. Loose or corroded wiring.	*d.* Remove ignition system wiring and inspect wire terminals for corrosion. Remove corrosion and install. Tighten all connections.
8. Excessive oil consumption.	*a.* External leaks.	*a.* Inspect oil, oil filter and engine covers for leaks. If oil pan leaks, notify support maintenance.
	b. Crankcase overfilled.	*b.* Drain oil to correct oil level (LO 9-2320-218-12).
	c. Piston rings worn, stuck, or broken.	*c.* Test compression to verify cause (para 2-28). Notify support maintenance.

Table 2-3. Troubleshooting—Continued

Malfunction	Probable Cause	Corrective Action
8. Excessive oil consumption—Continued	*d.* Vacuum pump diaphragm failure (M151, M151A1, M151A1C and M718 vehicles only.	*d.* Replace vacuum pump (para 2-182). Vacuum pump is on M151, M151A1, M151A1C and M718 vehicles only.
	e. Crankcase vents not operating properly.	*e.* Check for inoperative crankcase metering valve. Clean or replace as required (para 2-122).
9. Spark knock or ping (a sharp metallic knock occurring on acceleration or when operating under heavy load).	*a.* Ignition timing too early for fuel used.	*a.* Check ignition timing, electrical troubleshooting procedure.
	b. Engine overheating.	*b.* Troubleshoot cooling system items (12 through 14).
	c. Improper spark plugs.	*c.* Install correct spark plugs.
10. Valve noise.	*a.* Valve clearance improperly adjusted.	*a.* Check valve clearance adjustment (para 2-33).
	b. Valve spring(s) broken.	*b.* Notify support maintenance.
	c. Valve stems or tappets worn.	*c.* Notify support maintenance.
11. Low or no oil pressure.	*d.* No oil at tappet. Oil low in crankcase.	*d.* Notify support maintenance. Check engine oil and grade. Refer to lubrication order. Crankcase should be properly filled with oil of correct grade. If correct level and grade of oil are found, low oil pressure may be caused by worn engine parts. Notify support maintenance.
	COOLING SYSTEM	
12. Engine overheats.	*a.* Cooling system has low coolant level.	*a.* Replenish coolant. Fill to a level slightly below the bottom of the radiator filler neck. Add antifreeze solution as required.
	b. Loose or worn drive belts.	*b.* Adjust belt tension or replace belts (para 2-66).
	c. Clogged cooling system.	*c.* Clean cooling system.
	d. Faulty thermostat.	*d.* Remove and test thermostat. Replace if faulty (para 2-64).
	e. Leaks in cooling system.	*e.* Inspect cooling system for leaks, paying particular attention to hose or radiator connections. Replace hose or leaking radiator (para 2-63).
	f. Incorrect ignition timing.	*f.* Check ignition timing, electrical troubleshooting procedure.
	g. Clogged muffler or exhaust outlet pipes.	*g.* Replace muffler, or exhaust outlet pipe (para 2-59 or 2-60).
	h. Air flow obstructed through radiator.	*h.* Remove obstructions to allow unrestricted flow of air.
	i. Excessive friction in powertrain.	*i.* Check brake systems and power train components for binding.
	j. Inoperative water pump.	*j.* Replace water pump (para 2-65).
13. Loss of coolant.	*a.* Hose leaks.	*a.* Tighten clamps or replace hose.
	b. Drain cock leak.	*b.* Tighten or replace.
	c. Cylinder head gasket leaks.	*c.* Replace cylinder head gasket (para 2-32).
	d. Radiator cap inoperative.	*d.* Replace cap.
	e. Water pump or radiator core leaks.	*e.* Replace water pump (para 2-65) or radiator (para 2-63).
	f. Cracked cylinder head or block.	*f.* Replace defective cylinder head (para 2-32). If block is cracked, notify support maintenance.
	g. Core hole plug leaks.	*g.* Notify direct support maintenance.
14. Engine fails to reach normal operating temperature.	*a.* Defective or incorrect thermostat installed in vehicle.	*a.* Inspect and test thermostat (para 2-64). Replace if defective or incorrect heat range (para 2-64).
	b. Temperature sending unit defective.	*b.* Troubleshoot temperature indicator and sending unit.
	c. Temperature indicator defective.	*c.* Same as above.

Table 2-3. Troubleshooting—Continued

Malfunction	Probable Cause	Corrective Action
	FUEL SYSTEM	
15. Fuel does not reach carburetor.	*a.* Fuel tank empty.	*a.* Fill tank with proper grade fuel.
	b. Oil pressure low. Fuel pump safety switch (oil pressure safety switch) is opening circuit to fuel pump (M151, M151A1, M151A1C and M718 vehicles only).	*b.* Troubleshoot electrical fuel pump system (M151, M151A1, M151A1C, and M718 vehicles only).
	c. Fuel line leak.	*c.* Tighten connector at leak; if line still leaks replace defective parts (para 2-54).
	d. Fuel filter clogged.	*d.* Replace fuel filter (para 2-51 or 2-52).
	e. Fuel pump pressure low.	*e.* Troubleshoot fuel pump.
	f. Fuel lines clogged.	*f.* Clean or replace fuel lines (para 2-54).
	g. Defective fuel pump safety switch (oil pressure safety switch) on M151, M151A1, M151A1C and M718 vehicles only.	*g.* Troubleshoot electrical fuel pump system (M151, M151A1, M151A1C and M718 vehicles only).
16. Fuel does not reach cylinders.	*a.* Choke does not close.	*a.* Remove air cleaner hose. Pull out choke control rod and note whether choke valve closes at carburetor. If not, connect or adjust linkage (para 2-47).
	b. Carburetor fuel passages clogged.	*b.* If fuel reaches carburetor and choke close properly, replace carburetor (paras 2-44 or 2-45).
17. Engine floods.	*a.* Carburetor choke control not fully open.	*a.* Remove air intake hose at carburetor. Push choke control all the way in. Look into carburetor to make certain choke control valve is fully open. If not fully open, adjust (para 2-47).
	b. Fuel pump pressure incorrect.	*b.* Check fuel pump pressure (para 2-49 or 2-50).
	c. Worn carburetor or float valve stuck.	*c.* If engine continues to flood after procedures a and b above have been performed, replace carburetor (para 2-44 and 2-45).
18. Excessive fuel consumption.	*a.* Leaks	*a.* Carefully inspect all fuel lines and fitting for leaks. Tighten or replace damaged lines or fittings (para 2-54).
	b. Carburetor choke control not fully open.	*b.* Refer to item 17*a*.
	c. Carburetor adjustment incorrect.	*c.* Adjust carburetor (para 2-44 and 2-45).
	d. Air cleaner restricted or dirty.	*d.* Service air cleaner (para 2-43).
	e. Spark plugs dirty or incorrectly adjusted.	*e.* Remove spark plugs (para 2-72). Clean and set plug gap at 0.028 to 0.032 in.
	f. Fuel pump pressure incorrect.	*f.* Check fuel pump pressure (para 2-49 or 2-50).
	g. Incorrect ignition timing.	*g.* Check ignition timing (par 2-71).
	h. Incorrect valve adjustment.	*h.* Perform manifold vacuum test (para 2-29). Adjust valve clearance.
	i. Brakes drag.	*i.* Adjust brakes (para 2-171).
	j. Cylinder compression poor or uneven.	*j.* Perform cylinder compression test (para 2-28). If compression is poor or uneven, notify support maintenance.
	k. Carburetor fuel float adjustment incorrect.	*k.* Replace carburetor (para 2-44 or 2-45).

Table 2-3. Troubleshooting—Continued

Malfunction	Probable Cause	Corrective Action
	EXHAUST SYSTEM	
19. Unusual noise.	*a.* Break or crack in exhaust muffler.	*a.* Inspect muffler for breaks or cracks. If muffler is unserviceable, replace (para 2-57).
	b. Loose connections or damaged gaskets.	*b.* Inspect exhaust system for broken brackets or leaking gaskets. Replace damaged parts as required (para 2-55).
20. Exhaust system restricted.	Muffler outlet pipe or pipes plugged.	Repair or replace pipe (para 2-58).
	CLUTCH	
21. Clutch chatter.	*a.* Grease on clutch driven disk, flywheel, or pressure plate.	*a.* Notify support maintenance.
	b. Binding of clutch release linkage.	*b.* Clean or free linkage.
	c. Disk facings loose on disk.	*c.* Notify support maintenance.
	d. Broken pressure plate.	*d.* Notify support maintenance.
	e. Loose engine mounts.	*e.* Tighten.
22. Clutch grabbing.	*a.* Grease on disk, flywheel or pressure plate.	*a.* Notify support maintenance.
	b. Clutch disk or pressure plate broken.	*b.* Notify support maintenance.
	c. Hub of disk not sliding freely on splined shaft.	*c.* Notify support maintenance.
	d. Release linkage binding.	*d.* Clean and free linkage.
23. Clutch slipping	*a.* Lack of pedal free play.	*a.* Adjust pedal free play (para 2-41).
	b. Release linkage binding.	*b.* Clean and free linkage.
	c. Pressure plate spring weak or broken.	*c.* Notify support maintenance.
	d. Disk facing worn.	*d.* Notify support maintenance.
	e. Pressure plate warped.	*e.* Notify support maintenance.
	f. Oil on disk facing.	*f.* Notify support maintenance.
24. Clutch dragging.	*a.* Excessive pedal free play.	*a.* Adjust pedal free play (para 2-41).
	b. Clutch disk bent or dished.	*b.* Notify support maintenance.
	c. Clutch disk facings loose or broken.	*c.* Notify support maintenance.
	d. Friction in crankshaft pilot bushings.	*d.* Notify support maintenance.
25. Gear Clash.		

NOTE

Gear clash caused by the clutch disk spinning, is frequently confused with clutch dragging. A clutch disk which releases perfectly will naturally spin under its own weight and momentum immediately after being released, if transmission gears are in neutral position. When shifting from neutral to first speed, or to reverse, wait for clutch to stop turning to avoid gear clash. If symptom is definitely gear clash, troubleshoot transmission and transfer.

Malfunction	Probable Cause	Corrective Action
	TRANSMISSION AND TRANSFER	
26. Hard gear shifting.	*a.* Too much clutch pedal free play.	*a.* Adjust pedal free play (para 2-41).
	b. Clutch disk or other clutch parts damaged.	*b.* Notify support maintenance.
27. Slips out of gear.	Transmission parts worn or damaged.	Replace transmission and transfer assembly (para 2-124). Coordinate with support maintenance.
28. Engagement of two speeds.	Transmission parts worn or damaged.	Replace transmission and transfer assembly (para 2-124). Coordinate with support maintenance.
29. Lubricant leakage.	*a.* Lubricant level too high in transmission.	*a.* Drain to proper level. Refer to LO 9-2320-218-12.
	b. Leak at bearing retainer capscrew.	*b.* Remove screw, dip in white lead or paint, and install.
	c. Drain plug loose or damaged.	*c.* Tighten or replace drain plug.
	d. Transmission input shaft seal leaking.	*d.* Notify support maintenance.

Table 2-3. Troubleshooting—Continued

Malfunction	Probable Cause	Corrective Action
29. Lubricant leakage—Continued	e. Transmission expansion plugs loose.	e. Notify support maintenance.
	f. Transmission cover gasket leaking.	f. Tighten cover mounting bolts.
30. Transmission noisy.	a. Loose mounting bolts.	a. Tighten loose bolts.
	b. Flywheel housing alinement incorrect.	b. Notify support maintenance.
	c. Insufficient lubricant.	c. Fill with proper lubricant.
	d. Worn or damaged parts.	d. Replace transmission and transfer assembly (para 2-124). Coordinate with support maintenance.
31. Transfer will not engage.	a. Incorrect lubricant.	a. Refer to LO 9-2320-218-12.
	b. Transfer worn or damaged.	b. Replace transmission and transfer assembly (para 2-124). Coordinate with support maintenance.
32. Transfer slips out of engagement.	Damaged or worn parts.	Replace transmission and transfer assembly (para 2-124). Coordinate with support maintenance.
33. Transfer noisy in operation.	a. Insufficient lubrication.	a. Check the transmission lubricant level. Refer to LO 9-2320-218-12.
	b. Incorrect lubricant.	b. Refer to LO 9-2320-218-12.
	c. Transfer parts worn or damaged.	c. Replace transmission and transfer assembly (para 2-124). Coordinate with support maintenance.
34. Transfer leaks lubricant.	a. Drain plug loose or damaged.	a. Tighten or replace drain plug.
	d. Damaged transfer input, output, or shifter shaft oil seal.	b. Notify support maintenance.
	c. Case cracked.	c. Notify support maintenance.
	d. Speedometer cable loose or damaged.	d. Tighten or replace (para 2-109).
35. Hard shifting out of front axle drive.	Torsional windup between front and rear propeller shafts.	Drive a short distance in a straight line, preferably on dirt or gravel.
36. Front axle will not disengage when lever is in disengaged position.	Indicates failure of transfer rear output shaft retaining ring.	Notify support maintenance.
37. Transmission will not shift out of 4th speed gear.	Indicates lockup of synchronizer sleeve in over shift altitude due to speed shifting.	Notify support maintenance.
38. Transmission will not shift out of 3d speed gear.	Indicates failure of 3d and 4th speed shifter shaft due to speed shifting.	Notify support maintenance.
	PROPELLER SHAFTS	
39. Backlash or noise in joint.	Damaged or worn bearings.	Repair universal joint (para 2-128).
40. Vibration in propeller shaft.	Worn or damaged universal joint or propeller shaft sprung.	Repair universal joint (para 2-128) and/or replace propeller shaft (para 2-127).
	DIFFERENTIAL AND DRIVE COMPONENTS	
41. Front axle assembly, unusual noise.	a. Insufficient lubricant.	a. Lubricate in accordance with LO 9-2320-218-12.
	b. Front wheel bearings incorrectly adjusted.	b. Adjust bearings (para 2-143).
	c. Front wheel bearings worn or incorrectly adjusted.	c. Adjust or replace bearings (para 2-143).
	d. Wheel drive shaft universal joint worn, loose, or damaged.	d. Replace or repair universal joint (para 2-133).
	e. Worn or damaged differential.	e. Replace differential (para 2-131).
42. Rear axle assembly, unusual noise.	Same as front axle, item 41 above.	Same as front axle, item 41 above.
43. Axle leaks lubricant.	a. Oil seal damaged.	a. Replace seal (para 2-136). Check breather valve (para 2-137).
	b. Differential housing or cover gasket leaking.	b. Replace differential (para 2-131). Coordinate with support maintenance.

Table 2-3. *Troubleshooting—Continued*

Malfunction	Probable Cause	Corrective Action
44. Excessive backlash (play).	*a.* Worn or defective differential.	*a.* Replace differential (para 2-13).
	b. Differential bearings out of adjustment.	*b.* Notify support maintenance.
	c. Loose universal joint flanges.	*c.* Tighten or replace flanges.
	SERVICE BRAKES	
45. One brake drags.	*a.* Distorted or improperly adjusted brakeshoes.	*a.* Inspect brakeshoe and adjust or replace as necessary (para 2-171 and 2-173).
	b. Faulty retracting spring.	*b.* Replace retracting spring (para 2-173).
	c. Brakedrum out-of-round.	*c.* Replace brakedrum (para 2-173).
	d. Faulty wheel cylinder.	*d.* Replace wheel cylinder (para 2-174).
	e. Improperly adjusted or damaged wheel bearing.	*e.* Adjust or replace wheel bearings (para 2-143).
	f. Brake line restricted.	*f.* Replace or clean affected brake line.
46. All brakes drag.	*a.* Pedal improperly adjusted.	*a.* Adjust brake pedal (para 2-171).
	b. Distorted or improperly adjusted brakeshoe.	*b.* See item 45 above.
	c. Brake line restricted.	*c.* See item 45 above.
	d. Faulty master cylinder.	*d.* Replace master cylinder (para 2-175).
	e. Master cylinder bypass porthole blocked.	*e.* Adjust eccentric or replace master cylinder (para 2-175).
47. Hard pedal.	*a.* Pedal linkage to master cylinder binding.	*a.* Free binding or repair or replace damaged portion of linkage.
	b. Glazed or worn brake linings.	*b.* Replace brakeshoe assemblies (para 2-173).
	c. Brake line restricted.	*c.* See item 45 above.
	d. Distorted or improperly adjusted brakeshoes.	*d.* See item 45 above.
48. Spongy pedal.	*a.* Insufficient hydraulic fluid.	*a.* Fill with proper fluid.
	b. Leaks in hydraulic system, hoses and tubes.	*b.* Inspect hydraulic system and replace faulty parts (para 2-176).
	c. Air in hydraulic system.	*c.* Bleed hydraulic system (para 2-172).
49. Vehicle pulls to one side when brakes are applied.	*a.* Improper tire pressure.	*a.* Refer to vehicle data plate or to table 1-1 for proper tire pressure.
	b. Distorted or improperly adjusted brakeshoes.	*b.* See item 45 above.
	c. Glazed or worn brake linings.	*c.* See item 47 above.
	d. Brakedrum out-of-round.	*d.* See item 45 above.
	e. Oil, grease or brake fluid on linings.	*e.* Inspect brake linings (para 2-173) and replace if necessary.
	f. Faulty retracting spring.	*f.* See item 45 above.
	g. Faulty wheel cylinder.	*g.* See item 45 above.
	h. Worn wheel bearings.	*h.* Adjust or replace wheel bearings (para 2-143).
	i. Improperly adjusted wheel bearings.	*i.* Adjust wheel bearings (para 2-143).
	j. Brake line restricted.	*j.* See item 45 above.
	k. Loose suspension arm.	*k.* Check suspension parts.
50. One wheel locks.	*a.* Distorted or improperly adjusted brakeshoe.	*a.* See item 45 above.
	b. Oil, grease or brake fluid on lining.	*b.* See item 49 above.
	c. Front wheel locks on turn.	*c.* Check turn stop adjustment. Notify support maintenance.
51. Brake chatter.	*a.* Brake drum out-of-round.	*a.* See item 45 above.
	b. Glazed or worn brake linings.	*b.* See item 47 above.
	c. Oil or grease on brake linings.	*c.* See item 49 above.
	d. Loose brake linings.	*d.* Inspect brake linings. Replace brakeshoe assemblies (para. 2-173).

Malfunction	Probable Cause	Corrective Action
52. Excessive pedal travel.	*a.* Brakes out of adjustment.	*a.* Adjust brakes (para 2-171).
	b. Insufficient hydraulic fluid.	*b.* See item 48 above.
	c. Leaks in hydraulic system.	*c.* See item 48 above.
	d. Glazed or worn brake linings.	*d.* See item 47 above.
53. Pedal gradually goes to floor.	*a.* Insufficient hydraulic fluid.	*a.* See item 48 above.
	b. Leaks in hydraulic system.	*b.* See item 48 above.
	c. Faulty master cylinder.	*c.* See item 46 above.
54. Brakes uneven.	*a.* Scored brakedrum.	*a.* Replace brakedrum (para 2-173).
	b. Incorrect adjustment.	*b.* Adjust brakes (para 2-171).
55. Brakes grab.	*a.* Distorted or improperly adjusted brakeshoe.	*a.* See item 45 above.
	b. Glazed or worn brake lining.	*b.* See item 47 above.
	c. Oil or grease on brake lining.	*c.* See item 49 above.
	d. Scored brakedrum.	*d.* See item 54 above.
	e. Dirt on drum or lining surface.	*e.* Inspect and clean brakedrum and shoe assemblies (para 2-173).
	f. Faulty wheel cylinder.	*f.* See item 45 above.
56. Brakes fail completely.	*a.* Insufficient hydraulic fluid.	*a.* See item 48 above.
	b. Leaks in hydraulic system.	*b.* See item 48 above.
	c. Air in hydraulic system.	*c.* See item 48 above.
	d. Faulty master cylinder.	*d.* See item 46 above.
	e. Linkage from pedal to master cylinder disconnected or broken.	*e.* Free binding or repair or replace damaged portion of linkage.
	f. Damage to hydraulic components.	*f.* Incorrect type of fluid. Drain, flush and replace with non-petroleum base fluid (LO 9-2320-218-12).
	PARKING BRAKE	
57. Parking brake does not hold.	*a.* Brake band improperly adjusted.	*a.* Adjust (para 2-167).
	b. Brake lining worn or damaged.	*b.* Replace band and lining (para 2-168) also inspect drum. Replace drum if necessary (para 2-169).
	c. Components coated with dirt or other contaminant.	*c.* Clean components if possible, replace parts as necessary.
	d. Brake linkage damaged.	*d.* Replace damaged linkage.
58. Parking brake drags and overheats.	*a.* Brake partially applied.	*a.* Release lever fully.
	b. Band improperly adjusted.	*b.* Adjust (para 2-167).
	c. Lining loose and damaged.	*c.* Replace band and lining (para 2-168).
	WHEELS AND TIRES	
59. Abnormal tire wear.	*a.* Continual use of four-wheel drive on hard surface roads and at speeds in excess of 25 mph.	*a.* Use four-wheel drive only when maximum traction is needed at speeds below 25 mph.
	b. Tire pressure low.	*b.* Correct tire pressure (refer to vehicle data plate or table 1-1).
	c. Improper toe-in.	*c.* If wear is in front tires, adjust toe-in (para 2-150). If wear is in rear tires check rear suspension arms for damage or notify support maintenance.
	d. Wheels, tires, or brakedrums out of balance.	*d.* Replace as necessary.
60. Wheel wobbles.	*a.* Bent wheel.	*a.* Replace wheel.
	b. Wheel bearings out of adjustment or damaged.	*b.* Adjust bearings (para 2-143) or replace (para 2-141 and 2-142). Notify support maintenance if wheel misalinement is suspected.
	STEERING	
61. Backlash in steering.	*a.* Pitman arm loose.	*a.* Tighten Pitman arm nut (para 2-161).
	b. Worn or damaged parts in steering gear.	*b.* Notify support maintenance.

Table 2-3. Troubleshooting—Continued

Malfunction	Probable Cause	Corrective Action
62. Erratic steering.	*a.* Incorrect front wheel alinement.	*a.* Adjust toe-in (para 2-150). If condition persists, notify support maintenance.
	b. Incorrect steering gear adjustment.	*b.* Notify support maintenance.
	c. Loose steering linkage.	*c.* Tighten all loose connections.
	d. Incorrect front wheel bearing adjustment.	*d.* Adjust wheel bearings (para 2-143).
63. Hard steering.	a. Incorrect tire pressure.	a. Inflate tires to proper pressure. (Refer to vehicle data plate or table 1-1).
	b. Tires not of uniform size or wheels not matched (steel or magnesium).	*b.* Install tires of uniform size or match front wheels.
	c. Lack of lubrication.	*c.* Lubricate in accordance with LO 9-2320-218-12.
	d. Incorrect steering gear adjustment.	*d.* Notify support maintenance.
	e. Incorrect front wheel alinement.	*e.* Adjust toe-in (para 2-150).
64. Shimmy.	*a.* Incorrect tire pressure.	*a.* Inflate tires to proper pressure. (Refer to vehicle data plate for table 1-1).
	b. Incorrect front wheel alinement.	*b.* Notify support maintenance.
	c. Incorrect steering gear adjustment.	*c.* Notify support maintenance.
	d. Tires not of uniform size or wheels not matched (steel or magnesium).	*d.* See item 63. If condition persists, notify support maintenance.
	e. Loose steering linkage.	*e.* Tighten steering linkage.
	f. Incorrect front wheel bearing adjustment.	*f.* Adjust wheel bearings (para 2-143).
	g. Weak front shock absorber.	*g.* Replace front shock absorber (para 2-144).
	h. Loose or worn spindle support.	*h.* Tighten.
	i. Loose suspension arm mounting bolts.	*i.* Tighten suspension arm mounting loose bolts.
	j. Loose crossmember mounting bolts.	*j.* Tighten crossmember mounting loose bolts.
	k. Bent wheel.	*k.* Replace wheel.
65. Pull to one side.	a. Incorrect tire pressure.	a. Inflate tires to proper pressure. (Refer to vehicle data plate or table 1-1).
	b. Incorrect front wheel alinement.	*b.* Adjust toe-in (para 2-150).
	c. Tires not of uniform size or wheels not of uniform weight (steel or magnesium).	*c.* See item 63; if condition persists, notify support maintenance.
	d. Unequal brake adjustment.	*d.* Adjust service brakes (para 2-171).
	e. Incorrect front wheel bearing adjustment.	*e.* Adjust wheel bearing (para 2-143).
	f. Bent spindle arm.	*f.* Replace spindle arm (para 2-164).
	g. Sagging or broken suspension front spring.	*g.* Replace suspension front spring (para 2-145).
66. Wander; body sway.	*a.* Incorrect tire pressure.	*a.* Inflate tires to proper pressure. Refer to vehicle data plate or table 1-1.
	b. Tires not of uniform size or wheels not of uniform weight (steel or magnesium).	*b.* Refer to item 63.
	c. Loose steering linkage.	*c.* Tighten steering linkage.
	d. Incorrect steering gear adjustment.	*d.* Notify support maintenance.
	e. Loose steering gear mounting bolts.	*e.* Tighten steering gear mounting loose bolts.
	f. Incorrect front wheel alinement.	*f.* Adjust toe-in (para 2-150).
	g. Bent spindle arm.	*g.* Replace spindle arm (para 2-164).

Malfunction	Probable Cause	Corrective Action
66. Wander: body sway—Continued	*h.* Sagging or broken suspension arm.	*h.* Replace suspension arm (para 2-146).
	i. Loose or worn spindle support.	*i.* Tighten support; if condition is not corrected, notify support maintenance.
	j. Loose suspension arm mounting bolts.	*j.* Tighten suspension arm mounting loose bolts.
	k. Loose crossmember mounting bolts.	*k.* Tighten crossmember mount loose bolts.
	l. Defective shock absorbers.	*l.* Replace shock absorbers (para 2-144 and 2-156).
67. Tires squeal on turns.	*a.* Incorrect tire pressure.	*a.* Inflate tires to proper pressure. (Refer to vehicle data plate or table 1-1).
	b. Incorrect front wheel alinement.	*b.* Adjust toe-in (para 2-150).
	c. Bent spindle arm.	*c.* Replace spindle arm (para 2-164).
	SPRING AND SHOCK ABSORBERS	
68. Spring breakage.	*a.* Extremely rough handling of vehicle over rough terrain.	*a.* Reduce vehicle speed over rough terrain when possible.
	b. Lack of shock absorber resistance.	*b.* Replace shock absorbers (para 2-144 and 2-156).
69. Poor recovery or slow action of shock absorbers.	*a.* Shock absorber bushing binding or damaged.	*a.* Replace bushings (para 2-144 and 2-156).
	b. No fluid in shock absorbers.	*b.* Replace shock absorbers (para 2-144 and 2-156).
	c. Loose mountings.	*c.* Check bushings. If serviceable,-tighten shock absorber mounting nuts.
70. Lack of spring control.	*a.* No fluid in shock absorbers.	*a.* Replace shock absorber (para 2-144 and 2-156).
	b. Shock absorbers inoperative.	*b.* Replace shock absorber (para 2-144 and 2-156).
	CRANKCASE VENTILATION SYSTEM	
71. Oil leak at tappet cover.	Restricted metering valve.	Clean metering valve (para 2-122).
72. Oil leak at rocker arm cover.	*a.* Restricted metering valve.	*a.* Clean metering valve (para 2-122).
	b. Loose cover hold-down nuts.	*b.* Tighten nuts to 18-24 in-lbs.
73. Erratic idling.	*a.* Defective metering valve.	*a.* Clean metering valve (para 2-122).
	b. Leak or hole in line or fitting.	*b.* Replace defective line or fitting.

Section VI. TROUBLESHOOTING THE ELECTRICAL SYSTEM

2-19. General

a. This section contains detailed troubleshooting information for locating and correcting malfunctions in the electrical system. Each of the functional systems are treated separately, by means of—

(1) A physical and functional description.

(2) A brief overall system check to determine if the complete system is operating properly.

(3) An illustration showing the location on the vehicle of the major components of the system.

(4) A simplified circuit diagram to clarify circuits, circuit components and disconnect points.

(5) Step-by-step tests to diagnose trouble, using authorized test equipment.

b. This section also includes a list of electrical circuit numbers with a brief description of each, and a complete vehicle circuit diagram (fig. 2-43 and 2-44).

NOTE

Electrical leads on the vehicle are marked with a circuit-numbered metal band attached to the junction or terminal end of each lead.

WARNING

Because of their higher power capabilities, 24-volt systems are more dangerous than 6- or 12-volt systems. Certain precautions must be observed before beginning any tests on the 24-volt system. Do not permit a "hot" wire to touch metal parts of the vehicle at any time. "Flash" testing by striking a hot wire against a vehicle ground will cause an arc that will completely destroy the connector on the lead. Accidental contact of metal tools between battery or starter cables and the frame of the vehicle causes a direct short circuit resulting in arcing and instant heating of the tool to red heat. This can cause painful burns on the hands and serious damage to tools, vehicle components and batteries. Moreover, the overloaded battery may explode, spraying hot acid and sharp fragments over the surrounding area. The correct procedure when removing electrical equipment, harnesses, battery cables or starter cables, is to disconnect the battery ground cable first. Protect the ground cable from accidental contact with the battery terminal. When the work has been completed, connect the battery ground cable last.

2-20. System Circuits

a. To successfully troubleshoot the electrical system, analyze the entire system as follows:

(1) Attempt to isolate the system (lighting, starting, etc.) in which the malfunction occurs.

(2) Isolate the circuit within the system that is not working.

(3) Isolate the individual component within the circuit that is causing the trouble.

b. Question the vehicle operator to obtain the maximum number of observed symptoms. The greater the number of symptoms of trouble that can be evaluated, the easier will be the isolation of the primary cause of defect. Since the operator of the vehicle, in most instances, can describe malfunctions only in terms of unsatisfactory vehicle performance, trained personnel should be capable of analyzing the operational symptoms to determine the primary cause of the malfunction.

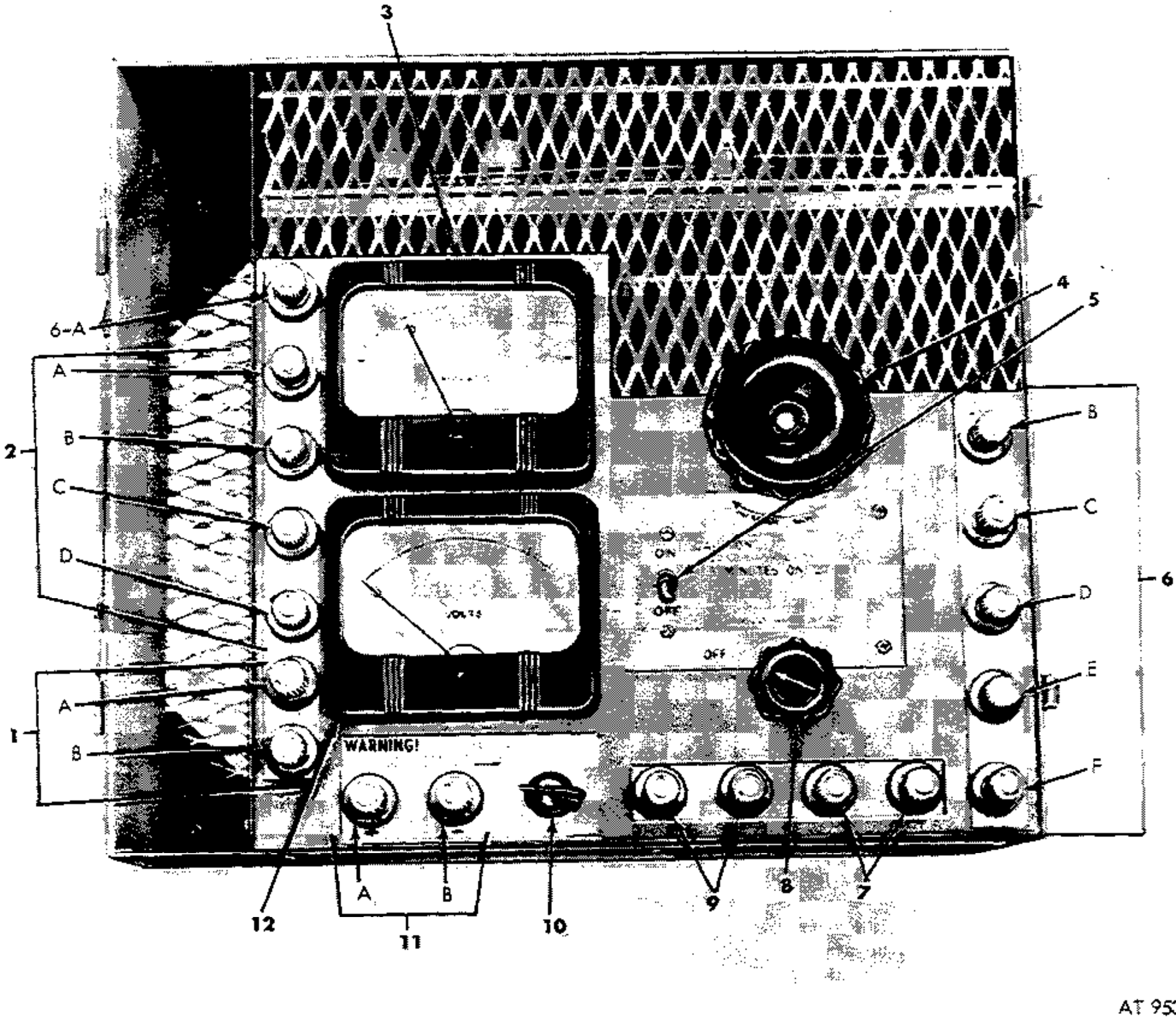
c. The functional system circuits covered in this manual are in the following sequence:

	Figure
1 Battery System Circuit	2-17
2 Starting System Circuit	2-18 and 2-19
3 Generating System Circuit	2-20 through 2-26
4 Ignition System Circuit	2-27 through 2-29
5 Lighting System Circuits	2-30 through 2-37
6 Directional Signal System Circuit	2-34 through 2-37
7 Instruments, Gages and Horn Systems Circuits	2-38 through 2-40
8 Fuel Supply System Circuit	2-41

2-21. Test Equipment

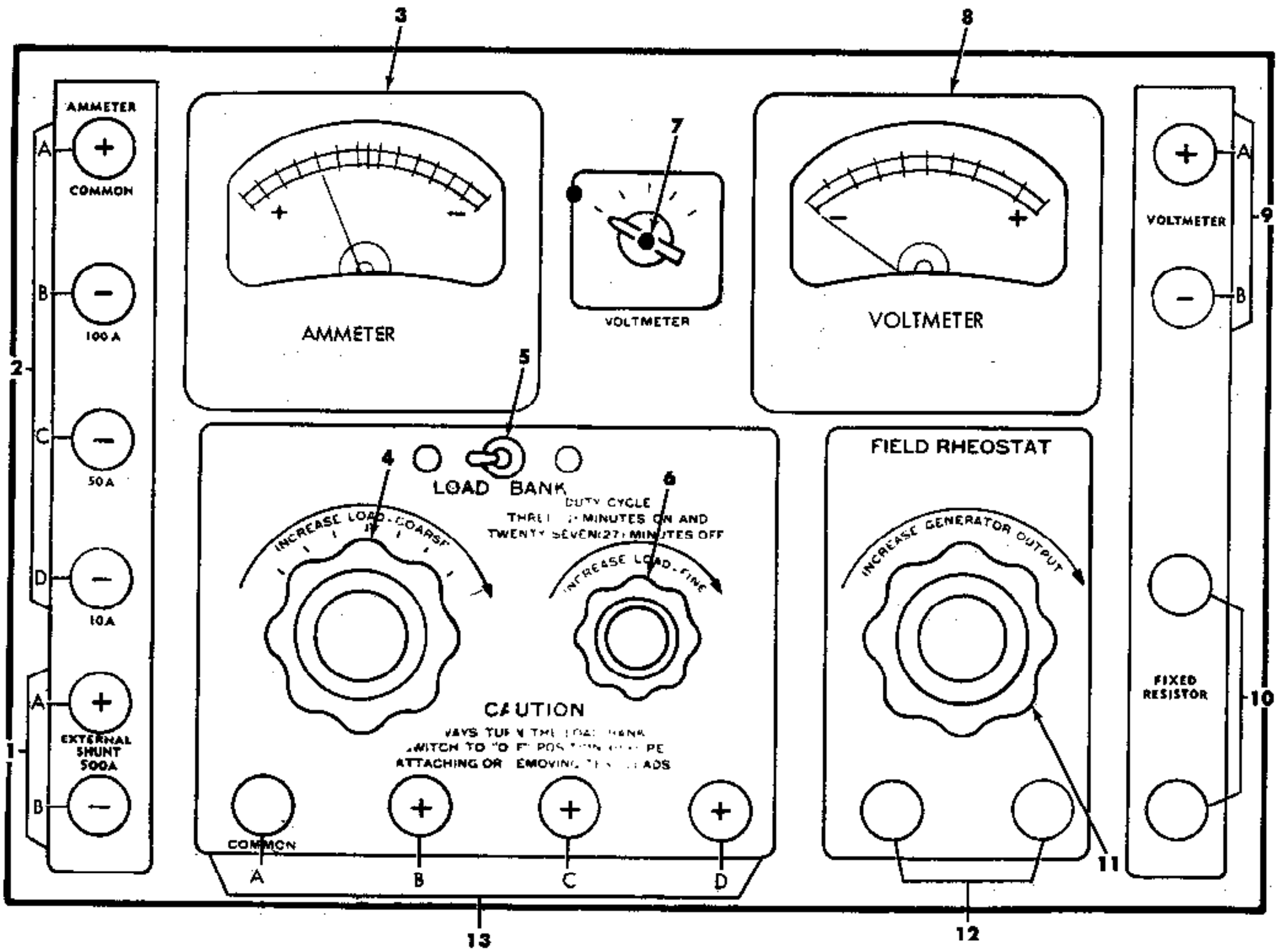
a. Description.

(1) *Low voltage circuit tester.* Figures 2-3 through 2-6 illustrate some of the types of Low Voltage Circuit Testers (LVCT) in general use. The LVCT consists of a voltmeter, an ammeter, a fixed resistance, load bank, and field rheostat unit. They are mounted in a metal case, which also provides stowage space for the meter leads and accessories (fig. 2-7) used for making all the necessary tests. Other test sets are similar, and all test described in this section can be performed equally well with these testers. Figure 2-9 shows a schematic diagram of two typical testers, to better understand how the tester components function with the circuit being tested.



1 External shunt binding posts
  A—Negative
  B—Positive
2 Ammeter binding posts
  A—Positive
  B—100 amp negative
  C—50 amp negative
  D—10 amp negative
3 Ammeter
4 Load bank control
5 Load bank switch
6 Load bank binding posts
  A—Common
  B—6 volts, 5-100 A
  C—12 volts, 50-100 A
  D—12 volts, 5-50 A-24 volts, 80-100 A
  E—24 volts, 10-80A
  F—24 volts, 5-10 A
7 1/4-ohm resistor binding posts
8 Field rheostat control
9 Field rheostat binding posts
10 Voltmeter range selector switch
11 Voltmeter binding posts
  A—Positive
  B—Negative
12 Voltmeter

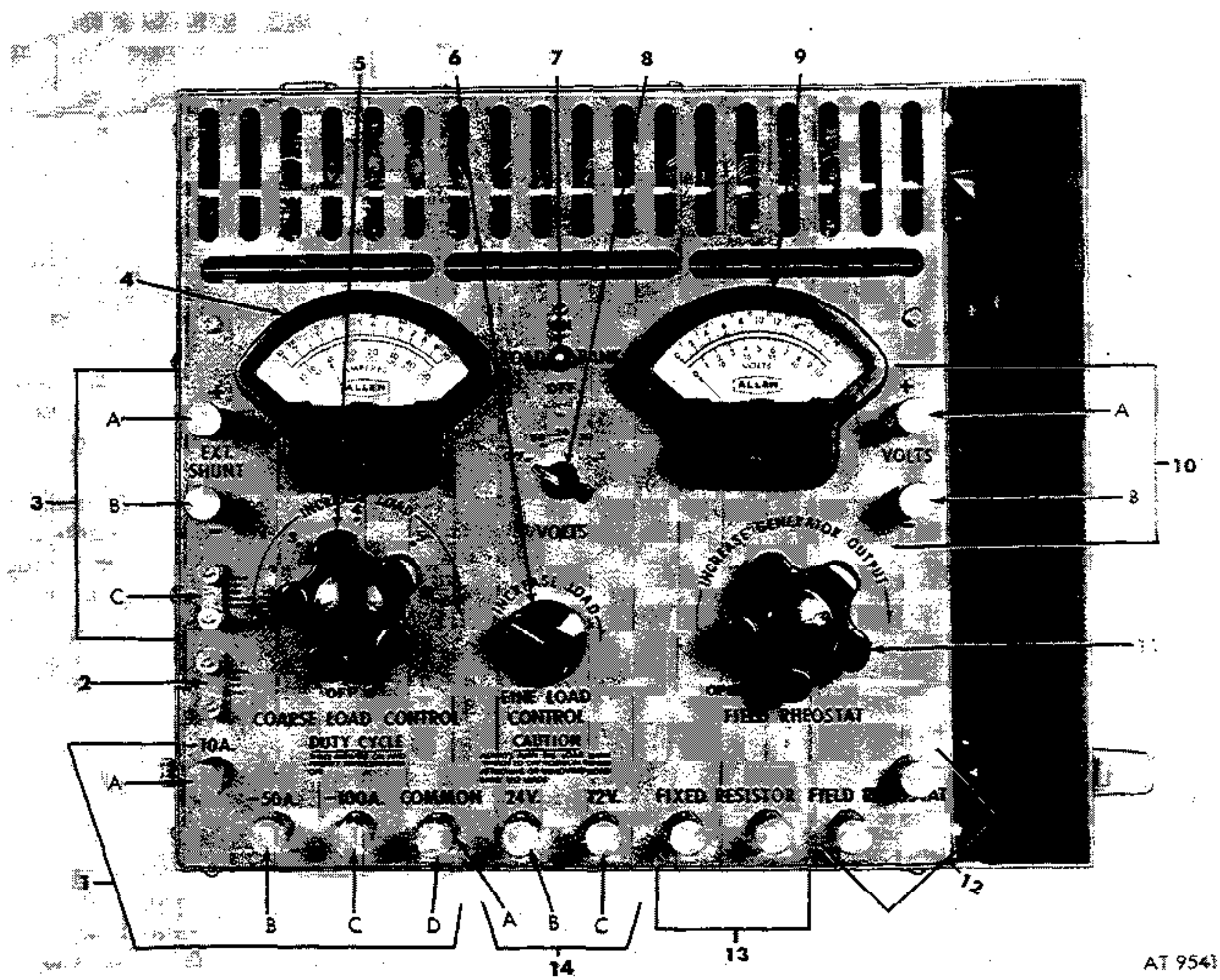
Figure 2-3. Low voltage circuit tester TV-100—FSN 4910-992-9136.



AT 9540

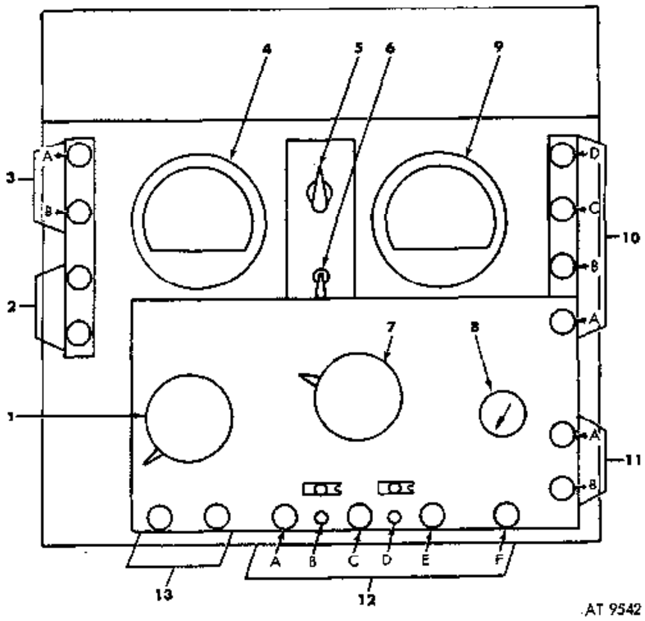
1 External shunt binding posts
   A—Negative
   B—Positive
2 Ammeter binding posts
   A—Positive
   B—100 amp negative
   C—50 amp negative
   D—10 amp negative
3 Ammeter
4 Load bank control, coarse
5 Load bank switch
6 Load bank control, fine
7 Voltmeter range selector switch
8 Voltmeter
9 Voltmeter bind posts
   A—Positive
   B—Negative
10 1 / 4-ohm resistor binding posts
11 Field rheostat control
12 Field rheostat binding posts
13 Load bank binding posts
   A—Common
   B—6 volts
   C—12 volts
   D—24 volts

Figure 2-4. Low voltage circuit tester EMC 1060—FSN 4910-092-9136.



1 Ammeter binding posts
   A—10 amp negative
   B—50 amp negative
   C—100 amp negative
   D—Positive
2 Load bank link, 12 volt
3 External shunt binding posts
   A—Positive
   B—Negative
   C—Disconnect link
4 Ammeter
5 Load bank control, coarse
6 Load bank control, fine
7 Load bank switch
8 Voltmeter range selector switch
9 Voltmeter
10 Voltmeter binding posts
   A—Positive
   B—Negative
11 Field rheostat control
12 Field rheostat binding posts
13 1/4-ohm resistor binding posts
14 Load bank binding posts
   A—Common
   B—24 volts
   C—12 volts

Figure 2-5. Low voltage circuit tester allen 30-92—FSN 4910-092-9136.



1 Field rheostat control
2 1 / 4-ohm resistor binding posts
3 Voltmeter binding posts
A—Positive
B—Negative
4 Voltmeter
5 Voltmeter range selector switch
6 Load bank switch
7 Load bank control, coarse
8 Load bank control, fine
9 Ammeter
10 Ammeter binding posts
A—Positive
B—100 amp negative
C—50 amp negative
D—10 amp negative
11 External shunt binding posts
A—Negative
B—Positive
12 Load bank binding posts
A—24 volts
B—12 volt link
C—12 volts
D—6 volt link
E—6 volts
F—Common
13 Field rheostat binding posts

Figure 2-6. Low voltage circuit tester RAM 62F151—FSN 4910-092-9136.

(2) *Adapter sets.* At present, there are several adapter sets in use. They are interchangeable, differing only in design. Adapter sets are used for making external connections to the waterproof electrical system on military vehicles. Figure 2-8 illustrates a typical adapter set.

(3) *Multimeter.* The multimeter (fig. 2-10) is a lightweight portable instrument for use in making voltage tests where load banks or ammeter ranges are not required. The multimeter is also useful in making resistance or continuity tests of components suspected of being open, intermittent, or short-circuited.

b. Low Voltage Circuit Tester Functions and Use.

NOTE

The key numbers noted in parentheses are in figure 2-3, except where otherwise noted.

(1) *Voltmeter.* The two voltmeter binding posts (11), marked positive (+) and negative (—) are used for making voltage tests of batteries, generators or wiring circuits. Four meter ranges (1, 10, 20 and 50 volts) are available, selected by the voltmeter range selector switch (10).

(2) *Ammeter.* Four ammeter binding posts (2) are provided for making current readings up to 100 amperes. One terminal (A) is a common positive (+) terminal; the others (B,C, D) provide a selection of three negative ranges of 10, 50, or 100 amperes. Two binding posts (1) are provided for the connection of an external shunt assembly to extend the ammeter range to 500 amperes for the measurement of heavy currents.

(3) *Fixed 1 / 4-Ohm Resistance Unit.* Two binding posts (7) provide a fixed 1 / 4-ohm resistance for use in charging circuit tests. Although the ammeter is used for these tests, the 1 / 4-ohm resistor has not internal connection to the ammeter.

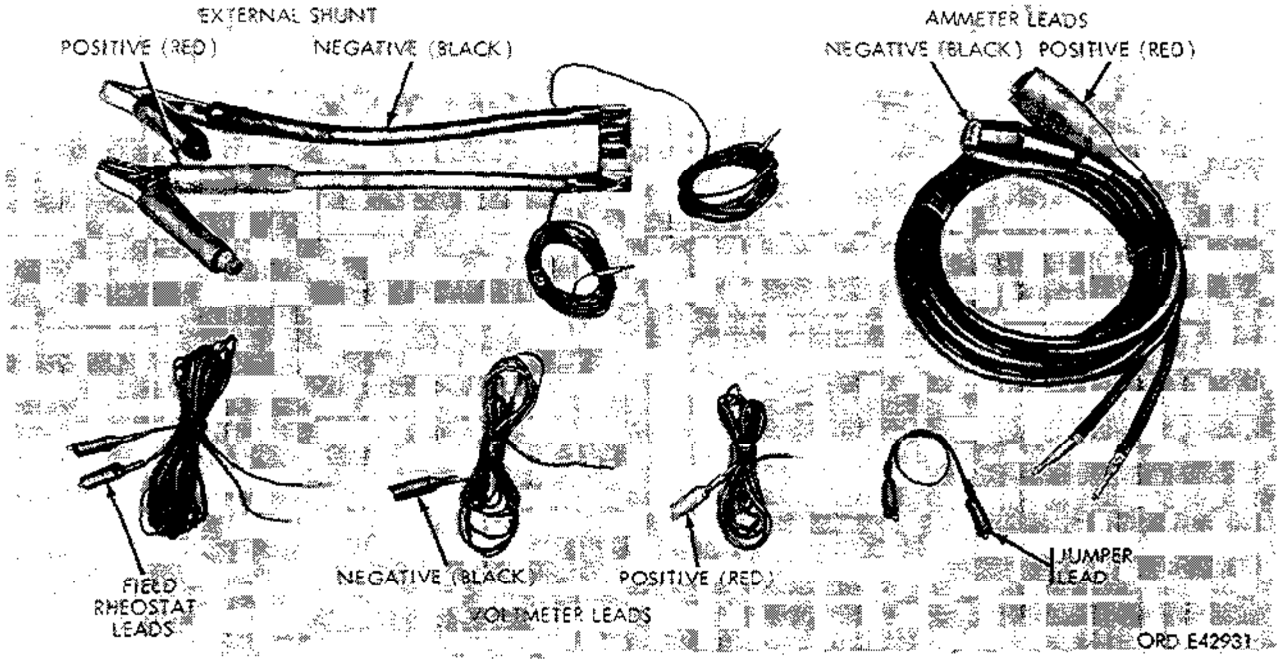


Figure 2-7. Test leads for use with low voltage circuit testers.

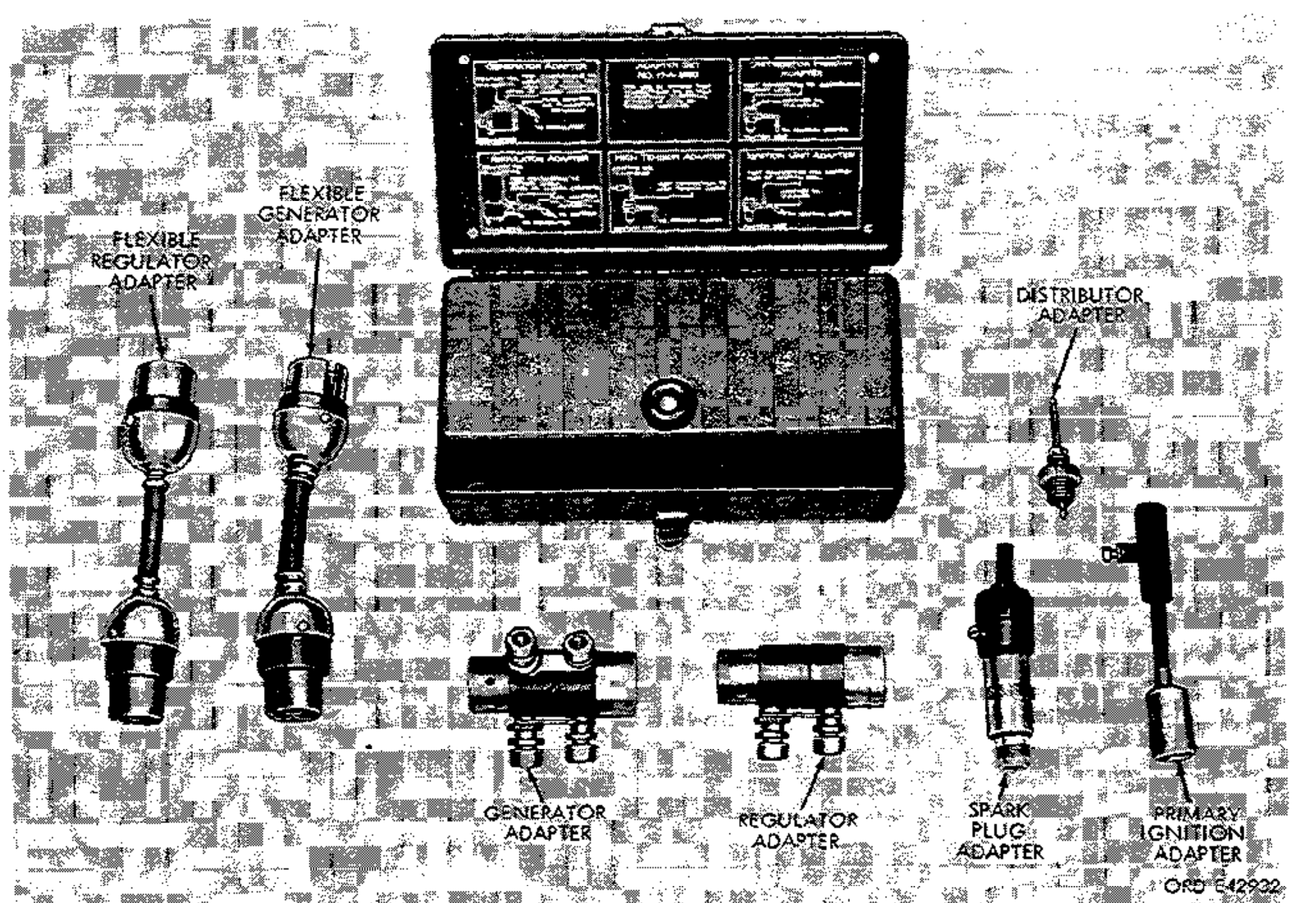


Figure 2-8. Engine electrical test adapter set No. 17-A-3150—FSN 4910-348-7600.

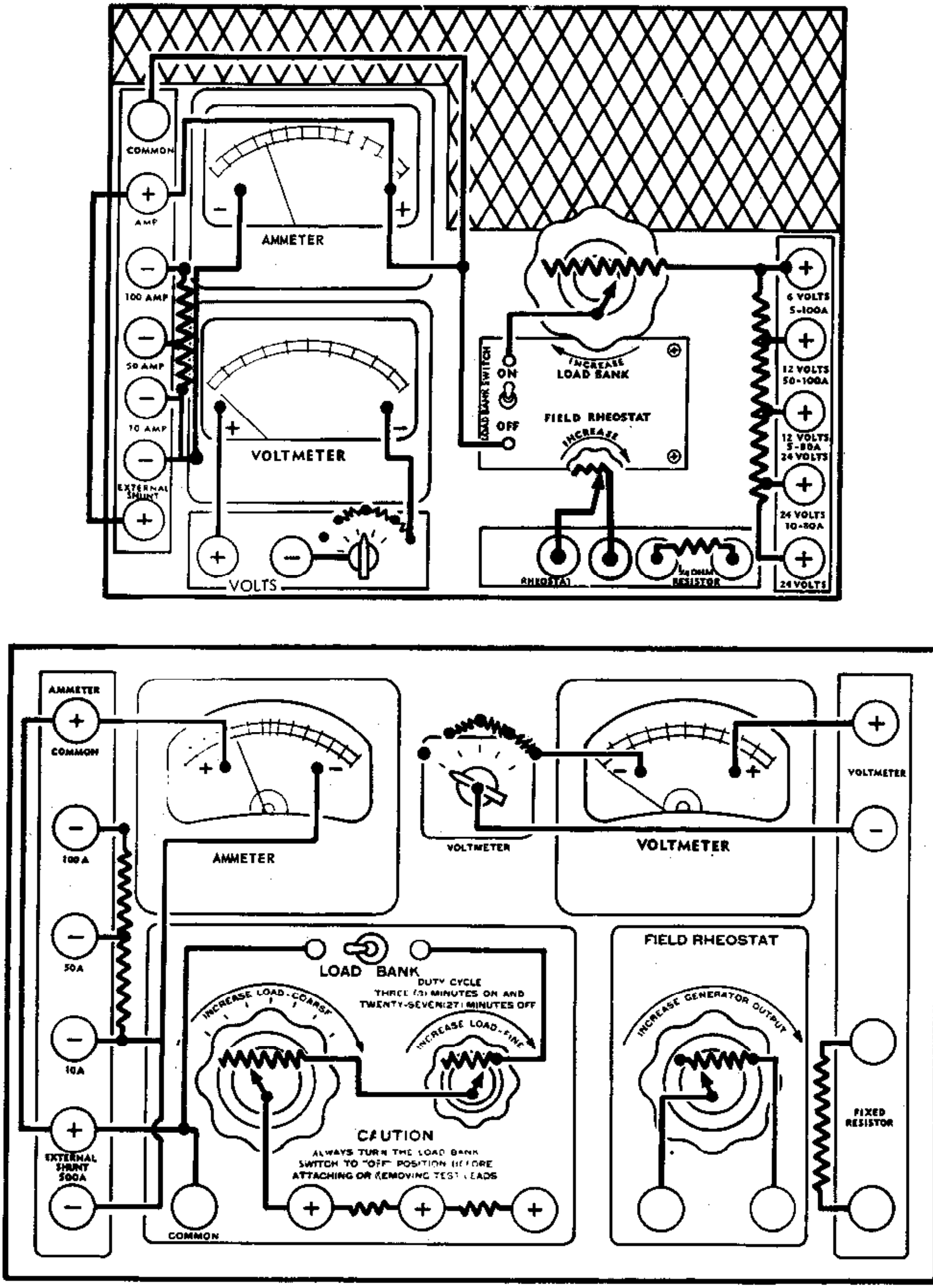


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Figure 2-9. Schematic layout of low voltage circuit testers (typical).

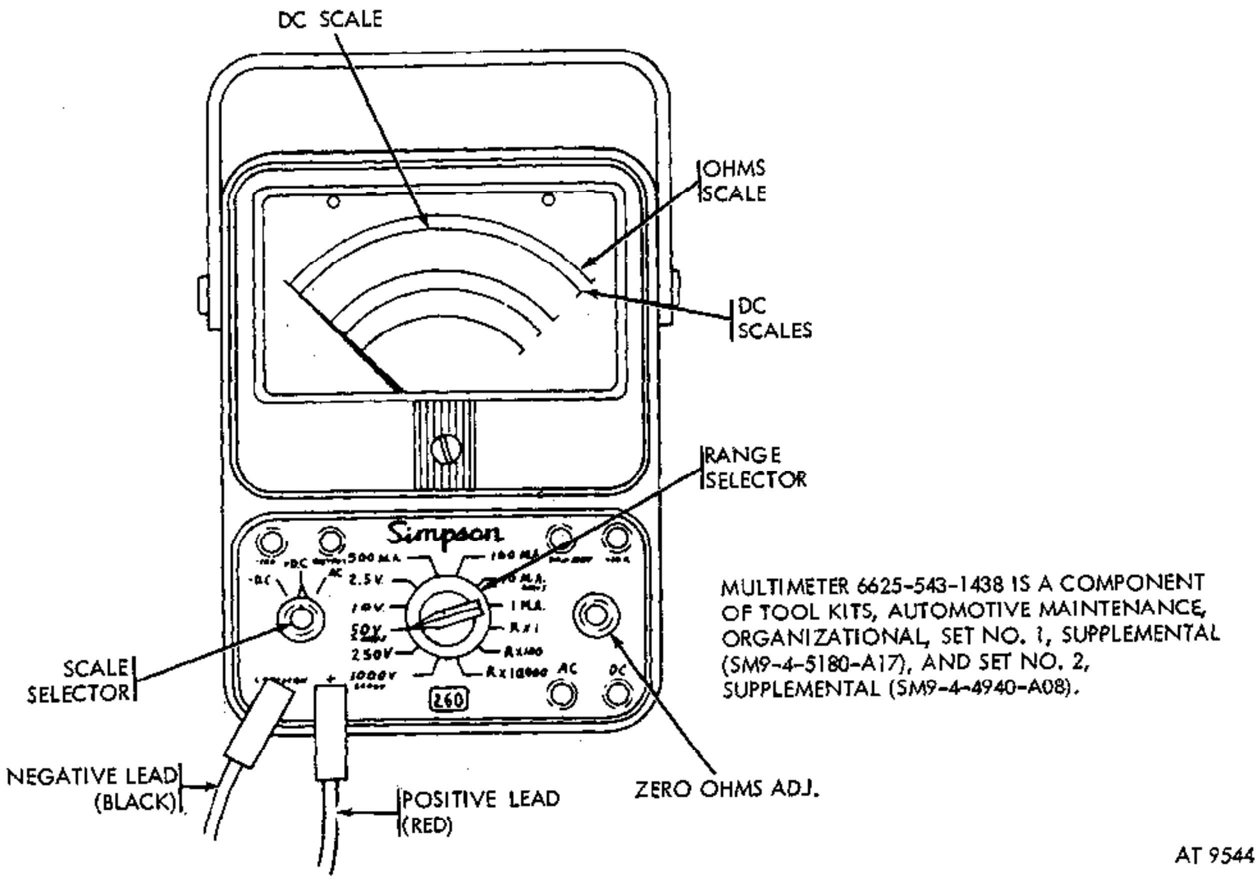


Figure 2-10. Multimeter—FSN 6625-543-1438.

(4) *Field rheostat unit.* Two binding posts (9) provide a changeable resistance for use in generator and charging circuit tests. There is no internal connection between the field rheostat unit and any other component of the tester.

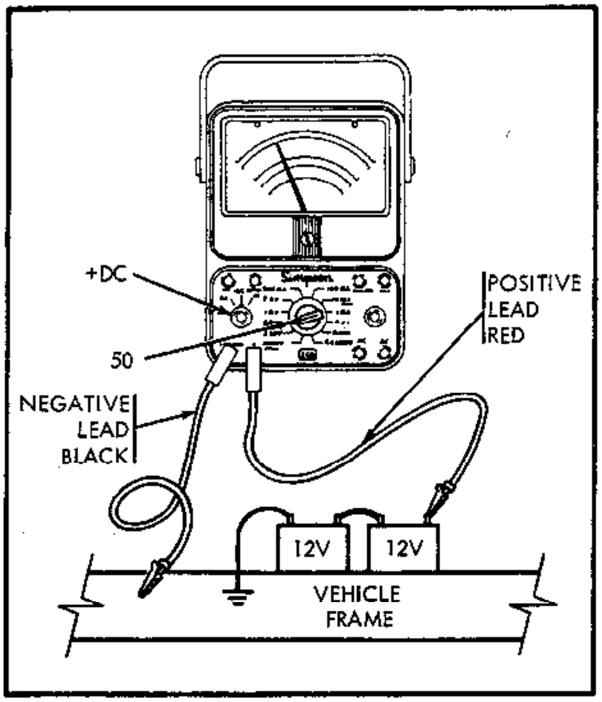
(5) *Load bank.* Six binding posts (6) provide the proper load resistances to set up generator charging rate tests for various battery and generator voltages. The common binding post (6A) is connected internally to the ammeter positive (+) binding post (2A) eliminating the need for a jumper lead when making load tests. The load resistance may be changed by the load bank control knob (4) or removed from the circuit by the load bank switch (5).

c. *Multimeter Functions and Use.*

(1) *Voltmeter.* The voltmeter (fig. 2-11) is similar to the voltmeter portion of the LVCT. Three meter ranges (2.5, 10 and 50 volts) are available for use in automotive testing. Two additional ranges (250 and 1000 volts) are useful in testing electronic equipment. Ranges are selected by the range selector switch.

(2) *Ohmmeter.* The ohmmeter (figs. 2-12 and 2-13) is used for making resistance and continuity tests. The ohmmeter is basically a voltmeter and internal battery connected in series, so that when the two test leads are connected together, the voltmeter reads the battery voltage. When a conductive circuit is connected between the test leads, the voltmeter will indicate how much voltage is being lost (voltage drop) in the circuit. In the case of a length of wire, there will be little or no voltage drop; for a small coil or a resistor, there may be considerable voltage drop. The amount of voltage drop is directly related to the resistance (in ohms) of the component being tested.

(3) *Other scales.* Since the multimeter is a general purpose instrument intended primarily for electronic testing, other scales and ranges are provided. These ranges are not normally used for automotive vehicle electrical troubleshooting, and are beyond the scope of this manual.



DC VOLTAGE TEST

(USED TO MEASURE BATTERY OR GENERATOR VOLTAGE)

1. SET SCALE SELECTOR ON +DC.
2. SET RANGE SELECTOR SWITCH ON 50V.
3. CONNECT NEGATIVE LEAD (BLACK) TO VEHICLE FRAME.
4. TOUCH POSITIVE LEAD (RED) TO TERMINAL POST OF BATTERY. NEEDLE SHOULD MOVE TOWARD CENTER OF SCALE TO INDICATE VOLTAGE.

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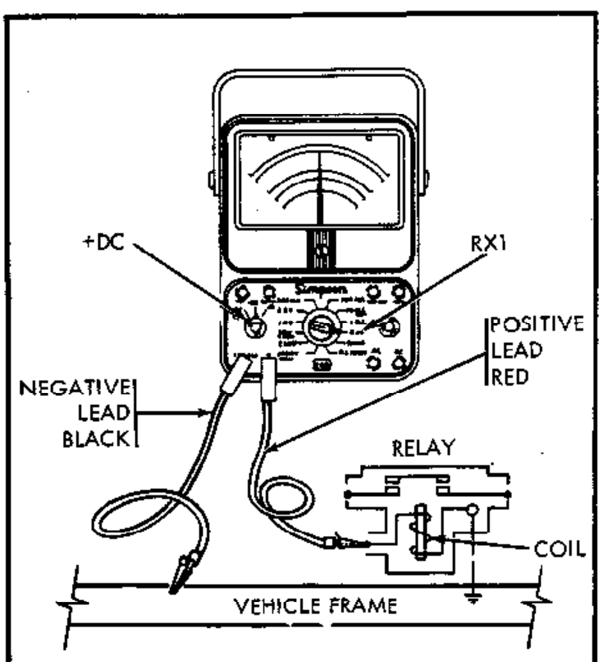
Figure 2-11. DC voltage test with multimeter.



RESISTANCE TEST

(USED TO MEASURE RESISTANCE OF COILS OR RESISTORS, AND TO LOCATE SHORT CIRCUITS)

1. SET SCALE SELECTOR SWITCH ON +DC.
2. SET RANGE SELECTOR SWITCH ON Rx1.
3. TOUCH METER LEADS TOGETHER AND TURN ZERO OHMS ADJUST UNTIL NEEDLE IS ON "O" OHMS.
4. MAKE SURE THERE IS NO BATTERY VOLTAGE CONNECTED TO CIRCUIT TO BE TESTED.
5. ATTACH NEGATIVE LEAD (BLACK) TO VEHICLE FRAME.
6. TOUCH POSITIVE LEAD (RED) TO TERMINAL OF COMPONENT BEING TESTED.
7. READ RESISTANCE ON METER SCALE.
8. IF METER NEEDLE DOES NOT MOVE, CIRCUIT IS OPEN.
9. IF METER NEEDLE MOVES COMPLETELY ACROSS SCALE TO "O" A SHORT CIRCUIT EXISTS, OR A HEAVY-DUTY COMPONENT WITH VERY LOW RESISTANCE.

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Figure 2-12. Resistance test with multimeter.

2-22. General Instructions for Use of Test Sets and Multimeter

CAUTION

Before proceeding with vehicle troubleshooting procedures, paragraphs 2-23 and 2-24 must be read and understood by all personnel using the test set. Incorrect connections to the test set could result in costly damage to test equipment or vehicle componets.

a. Be sure of the test to be made and the procedure to be used. Follow the step-by-step procedure given for each individual test.

b. Always select a meter range higher than the expected reading. Set the tester for this range before connecting it into the circuit.

c. Be sure to read the correct row of meter scale figures which correspond to the selected range. The range selector switch or the binding post marking always shows the right-hand figure of the row to be used. For example, if the range selector is set for 50 volts, read the row of meter scale figures that ends with 50 on the right-hand end.

d. When testing with an ammeter or ammeter shunt, always connect it in series with circuit to be tested. For maximum safety, the power should be turned off when connecting or disconnecting the ammeter or ammeter shunt.

e. When testing with a voltmeter, always connect it in parallel with (across) the terminals of the component to be tested. Where the terminals are easily accessible, the power need not be turned off to make voltage tests. Where there is a possibility of touching an adjacent terminal or the vehicle frame when attaching the positive test lead clip, the power should be off and the test lead clipped securely to the terminal to be tested before restoring power.

CAUTION

Never attempt to make resistance tests until all sources of power connected to the circuit or device to be tested are disconnected. The multimeter will be damaged if this procedure is not followed.

f. When testing with an ohmmeter, always connect it in parallel with (across) the terminals of the component to be tested. (If the component has only a single terminal, connect between the terminal and the frame of the component or vehicle). In addition, the component being tested must be electrically free from the circuit. Remove all connections to the component before making any resistance or continuity tests. (One terminal of most automotive electrical components is connected to the vehicle frame. However, the component may remain mounted in the vehicle provided all other circuit connections have been removed.)

g. Always handle the test sets carefully Although the test set is ruggedly built, the meter movements are delicate mechanisms and can be damaged easily by rough handling. Be sure to stow all test leads and adapters in their proper compartments after the tests have been completed.

CAUTION

In choosing a location for the low voltage circuit tester, at the vehicle or on the bench, be sure to place the tester in a position that will not restrict the air flow through the bottom and top openings. Do not exceed the duty cycle of 3 minutes "on" and 27 minutes "off".

2-23. Specific Instructions for Use of the Low Voltage Circuit Testers

NOTE

Complete detailed information on low voltage circuit testers is contained in TM 9-4910-402-12.

NOTE

The key numbers noted in parentheses are in figure 2-3, except where otherwise noted.

a. D. C. Voltage Tests.

(1) Determine exactly what is to be tested, where the test leads will be connected, and what voltage to expect.

(2) Voltage must be measured at the exact circuit point specified in Electrical Troubleshooting tests. Resistance of poor wiring, connections, and switch contacts can cause errors if voltages are measured at points elsewhere in the circuit or on other parts of the component.

(3) Connect the voltmeter test leads (fig. 2-7) to the voltmeter binding posts (11, fig. 2-3). Connect the black lead to the negative (—) post (B), and the red lead to the positive (+) post (A).

(4) Set the voltage range selector switch to a range higher than the expected voltage. Determine exactly which row of figures you will read.

CAUTION

(4) must be done before (5). A voltage range setting lower than the circuit voltage will damage the meter when (6) is performed.

(5) Connect the negative (black) lead first to the circuit to be tested. This will usually be the vehicle frame, or a similar ground point (fig. 2-14).

(6) Touch the positive (red) lead to the other circuit connection. If the meter needle moves to the left, reverse the test leads at the circuit—not at the tester binding posts.

(7) Read the voltage carefully, facing the meter squarely. Viewing the meter from an angle will result in inaccurate readings.

b. D. C. Current Tests.

(1) Determine exactly what is to be tested. Where the test leads will be connected, and what amperage to expect.

(2) Amperage may be measured at any convenient point in a single circuit, since the current is always the same throughout the circuit.

(3) Connect the ammeter red test lead (fig. 2-7) to the positive (+) binding post (2A, fig. 2-3). Tighten the binding post securely.

(4) Select a negative binding post (2B, C or D, fig. 2-3) marked with an amperage range higher than the expected amperage. Connect the ammeter black test lead (fig. 2-7) to this selected binding post and tighten the binding post securely. Determine exactly which row of figures on the ammeter you will read.

CAUTION

(4) must be done before (5). An amperage range lower than the circuit current will damage the meter when (6) is performed.

(5) Be sure that no power is being applied to the circuit to be tested. Separate the circuit at a convenient junction point to form two connection points. Connect the red wire to the connection point which is electrically closer to the battery positive (+) terminal. Connect the black wire to the other connection point (fig. 2-14).

(6) Apply power to the circuit momentarily, observing the ammeter. The needle should move to the right. If the needle moves to the left, interchange the red and black wires at the circuit test points—not at the tester binding posts.

(7) Read the ammeter carefully, facing the meter squarely. Viewing the meter from an angle will result in inaccurate readings.

(8) Remove the power from the circuit before disconnecting the test leads.

c. D. C. Current Tests with Ammeter Shunt.

(1) When amperage exceeding 100 amperes is expected, the external shunt assembly (fig. 2-7) should be used. The shunt assembly consists essentially of a power resistor which absorbs 98 percent of the circuit amperes and allows only 2 percent to be sent to the meter. Thus, if the circuit current was 200 amperes, 196 amperes would be absorbed by the shunt and 4 amperes would be indicated on the meter. The 500-ampere figures on the meter scale are used for this shunt. A 200-ampere current through the shunt will indicate a reading of 200 on the meter scale, although a current of only 4 amperes is actually flowing through the meter.

(2) Disconnect the power to the circuit to be tested. Connect the small diameter shunt leads to the shunt binding posts of the tester (1, fig. 2-3); the red lead to the positive (+) binding post (B) and the black lead to the negative (—) binding post (A).

(3) Connect the heavy shunt leads to the circuit to be tested (fig. 2-14). Make sure all connections are tight.

(4) Follow all instructions given in *b* (5), (6), (7) and (8) above.

d. Load Bank and Field Resistance Tests

(1) Three or more sections of the tester are used for these tests; the voltmeter, ammeter, and one or more of the resistances. Use extreme caution when connecting the test leads; severe damage can be caused to the tester and the components being tested if the test setup is incorrect. Follow the individual test setup illustration for the specific test being made. Figure 2-14 shows an example of a test of this type.

(2) Observe precautions in *a* and *b* above, for use of the voltmeter and ammeter.

(3) Both the LOAD BANK (4, fig. 2-3) and FIELD RHEOSTAT (8, fig. 2-3) knobs should be in the extreme counterclockwise position before connecting the load bank or field rheostat to the circuit being tested.

NOTE

The nameplates on the LOAD BANK and FIELD RHEOSTAT controls indicate clockwise rotation is required for an increase in current. However, to accomplish this effect, the actual resistance presented to the circuit is decreased with clockwise rotation of these controls. Refer to figure 2-9.

(4) Whenever resistances carry heavy currents, considerable heat is developed. To prevent heat damage to the resistors and other tester components, power should be applied to the resistors for not more than three minutes continuously. At least 27 minutes off time is required to allow the resistors to cool down sufficiently for another three-minute period of operation. Be sure there is sufficient ventilation provided for the tester. Before applying power to the circuit, have all connections in place and be ready to make the necessary adjustments and meter readings as rapidly as possible, consistent with accuracy and safety.

(5) Do not turn the LOAD BANK SWITCH (5, fig. 2-3) to OFF position while power is applied to the circuits. The switch contacts will arc and burn when subjected to heavy battery current.

2-24. Specific Instructions for Use of the Multimeter

a. D. C. Voltage Tests.

(1) Determine exactly what is to be tested, where the test leads will be connected, and what voltage to expect.

(2) Voltage must be measured at the exact circuit point specified in the Electrical

Troubleshooting tests. Resistance of poor wiring, connections, and switch contacts can cause errors if voltages are measured at points elsewhere in the circuit.

(3) Plug the voltmeter test leads (fig. 2-10) into the multimeter jacks. Plug the black lead into the jack marked "COMMON" and the red lead into the jack marked "+".

(4) Set the voltage range selector switch to a range higher than the expected voltage. Determine exactly which row of figures you will read.

CAUTION

(4) must be done before (5). A voltage range setting lower than the circuit voltage will damage the meter when (6) is performed.

(5) Connect the negative (black) lead first to the circuit to be tested. This will usually be the chassis frame, or a similar ground point (fig. 2-11).

(6) Touch the positive (red) lead to the other circuit connection. If the meter needle moves to the left, reverse the test leads at the circuit—not at the tester binding posts.

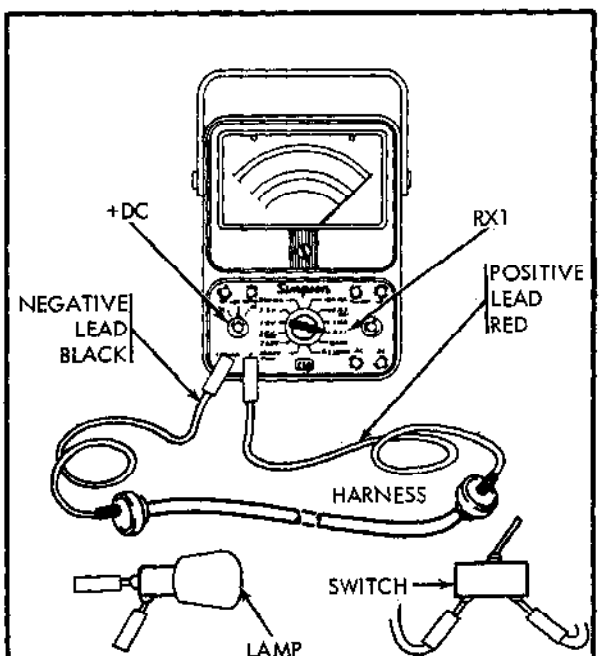
(7) Read the voltage carefully, facing the meter squarely. Viewing the meter from an angle will result in inaccurate readings.

b. Resistance Tests.

CAUTION

Never attempt to make resistance tests until all sources of power connected to the circuit or device to be tested are disconnected. The multimeter will be damaged if this procedure is not followed.

All electrical circuits possess some resistance. Some resistances, however, are so small and others so large that they cannot be read on the same scale. When a reading is obtained, it indicates the circuit had continuity (no break or openings). The following procedure must be followed to perform resistance or continuity tests:



CONTINUITY TEST

(USED TO TEST FOR CABLE BREAKS, LOOSE WIRES, BURNT OUT LAMPS OR OTHER ITEMS)

1. SET SCALE SELECTOR ON +DC.
2. SET RANGE SELECTOR SWITCH ON Rx1.
3. BE SURE THERE IS NO BATTERY VOLTAGE CONNECTED TO CIRCUIT TO BE TESTED.
4. ATTACH NEGATIVE LEAD (BLACK) TO ONE END OF CIRCUIT.
5. TOUCH POSITIVE LEAD (RED) TO OTHER END OF CIRCUIT. NEEDLE SHOULD MOVE TO RIGHT HAND END OF SCALE.
6. IF NEEDLE DOESN'T MOVE, CIRCUIT IS OPEN, OR LAMP IS BURNT OUT, OR COMPONENT OPEN.
7. IF NEEDLE FLICKERS, OR JUMPS BACK AND FORTH, LOOSE CONNECTIONS ARE INDICATED.

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Figure 2-13. Continuity test with multimeter.

(1) Place the SCALE SELECTOR switch (fig. 2-10) in the + D. C. position.

(2) Rotate the range selector switch to the required range to (1) R X 1 to measure resistance between 0 and 2,000 ohms and to test for continuity, (2) R X 100 to measure resistance between 0 and 200,000 ohms, and (3) R X 10,000 to measure resistance between 0 and 20 megohms (megohms = million ohms).

(3) Plug the black lead into the jack marked COMMON and the red lead into the jack marked "+". Touch the ends of the leads together and turn the ZERO OHMS knob until the pointer is at zero.

(4) Separate the ends of the test leads, and clip the leads across the portion of the circuit or component being tested (figs. 2-12 and 2-13). (Either of the leads may be clipped to the test points.)

(5) Read the ohms on the black area at the top of the scale.

NOTE

For range R X 1, read the figures directly, for range R X 100 multiply the reading indicated by 100 or add two zeros to the reading; for range R X 10,000 multiply the reading indicated by 10,000 or add four zeros to the reading.

Example: A 20,000-ohm resistance should be checked on the R X 100 range scale. The reading on the scale will be 200. Adding two zeros will give 20,000 ohms.

(6) An infinite reading is an open circuit reading. There will be no movement of the multimeter pointer on the R X 1 when an open circuit exists. This usually indicates a broken connection somehere. Infinite position on the ohmmeter range scale is marked with the symbol.

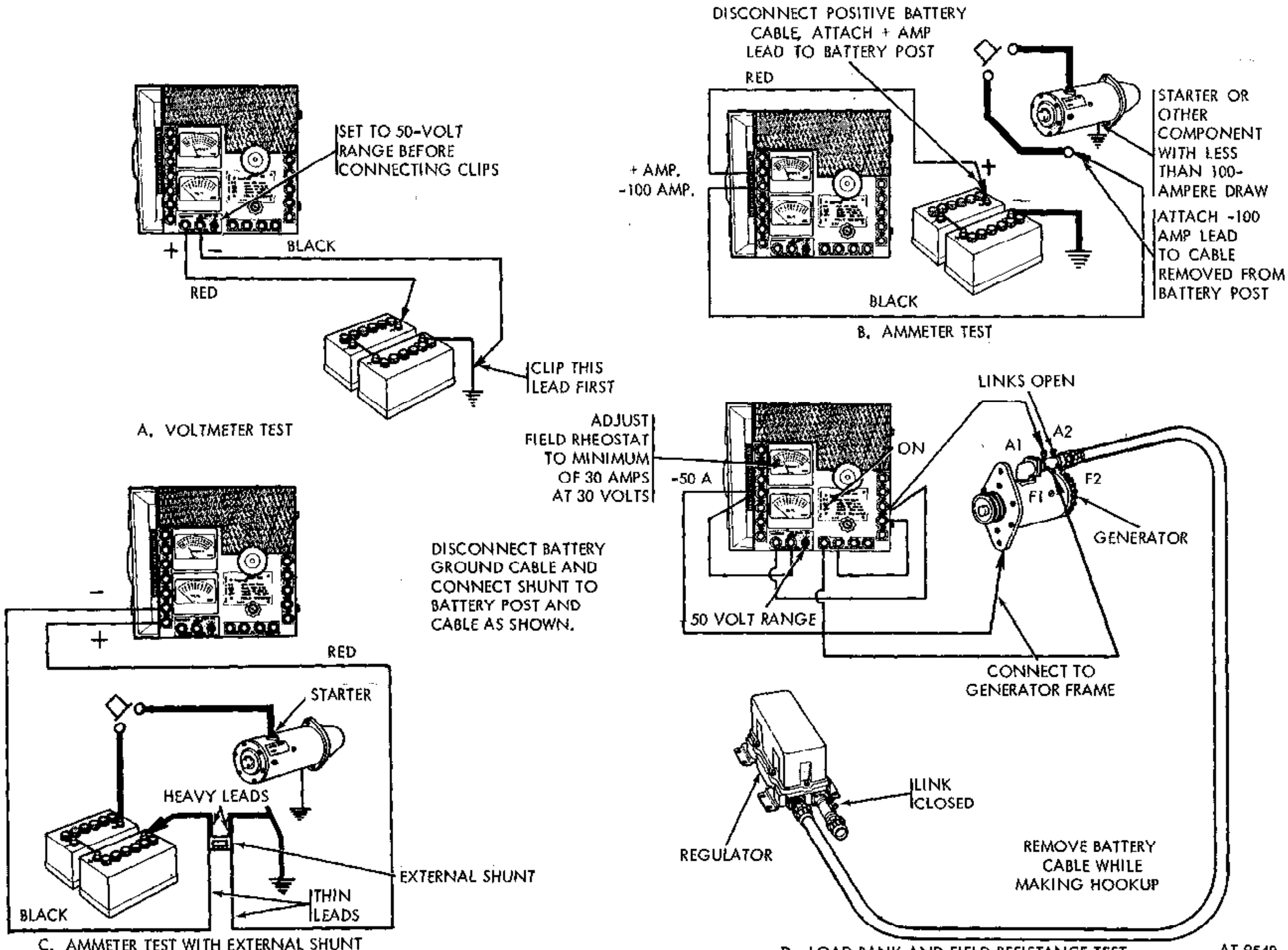


Figure 2-11. Typical arrangements of tests with low voltage circuit tester TV-100.

(7) A zero reading indicates a continuous circuit with resistance too low to be measured with the multimeter. Where two cable wires, or a circuit wire and a ground connection are being checked, this usually indicates a short circuit somewhere.

2-25. Troubleshooting Electrical System

a. *Preliminary Battery Check.* The vehicle battery condition should be checked prior to performing any electrical checks in the vehicle. The vehicle has two 12-volt batteries connected in series, furnishing 24 volts to the electrical system (fig. 2-15) which uses a negative (—) ground and a positive (+) power feed to the electrical components. To test the battery condition, turn the ignition switch to ON (without starting the engine). Observe the battery indicator (fig. 2-15). Start the engine, accelerate to about 1200 rpm, and again observe the battery indicator. If the indicator observations show that further tests are required, refer to the Electrical Troubleshooting tests, Battery System (fig. 2-17).

b. *Specific Gravity Check.* A specific gravity check should be made with a hydrometer as a routine check before making further tests. Observe the following precautions when making this check:

(1) Hold the hydrometer vertically, so the float does not touch the sides of the glass barrel. Be certain that the barrel is not so full of electrolyte that the float is stopped at the top. Read straight across the top of the liquid; disregard the curvature of the liquid at the edge of the glass and float.

(2) The electrolyte in a cell should be at the normal level when the reading is taken. If the level is below normal, the reading will be high. On the other hand, if the battery has been overfilled, the electrolyte will be weakened and the reading will be low.

(3) When water is added, it will tend to remain at the top of the cell and a hydrometer reading will be inaccurate. If it is necessary to add water to the battery before taking a reading, the battery should be charged for 1 or 2 hours to mix the electrolyte before the hydrometer is used. This may be done by connecting the battery to a charger or by operating the vehicle.

(4) Gravity readings may also be misleading if taken immediately after a battery has been discharged at a high rate, such as in prolonged cranking. Wait several hours before taking a specific gravity reading.

(5) When the temperature of the electrolyte is much greater or much less than 80°F., the specific gravity indication on the hydrometer will not be accurate. A temperature correction must be applied to the reading to obtain the correct specific gravity. Figure 2-16 shows the amount of temperature correction to be applied, and how to estimate the condition of the battery from the temperature-corrected specific gravity.

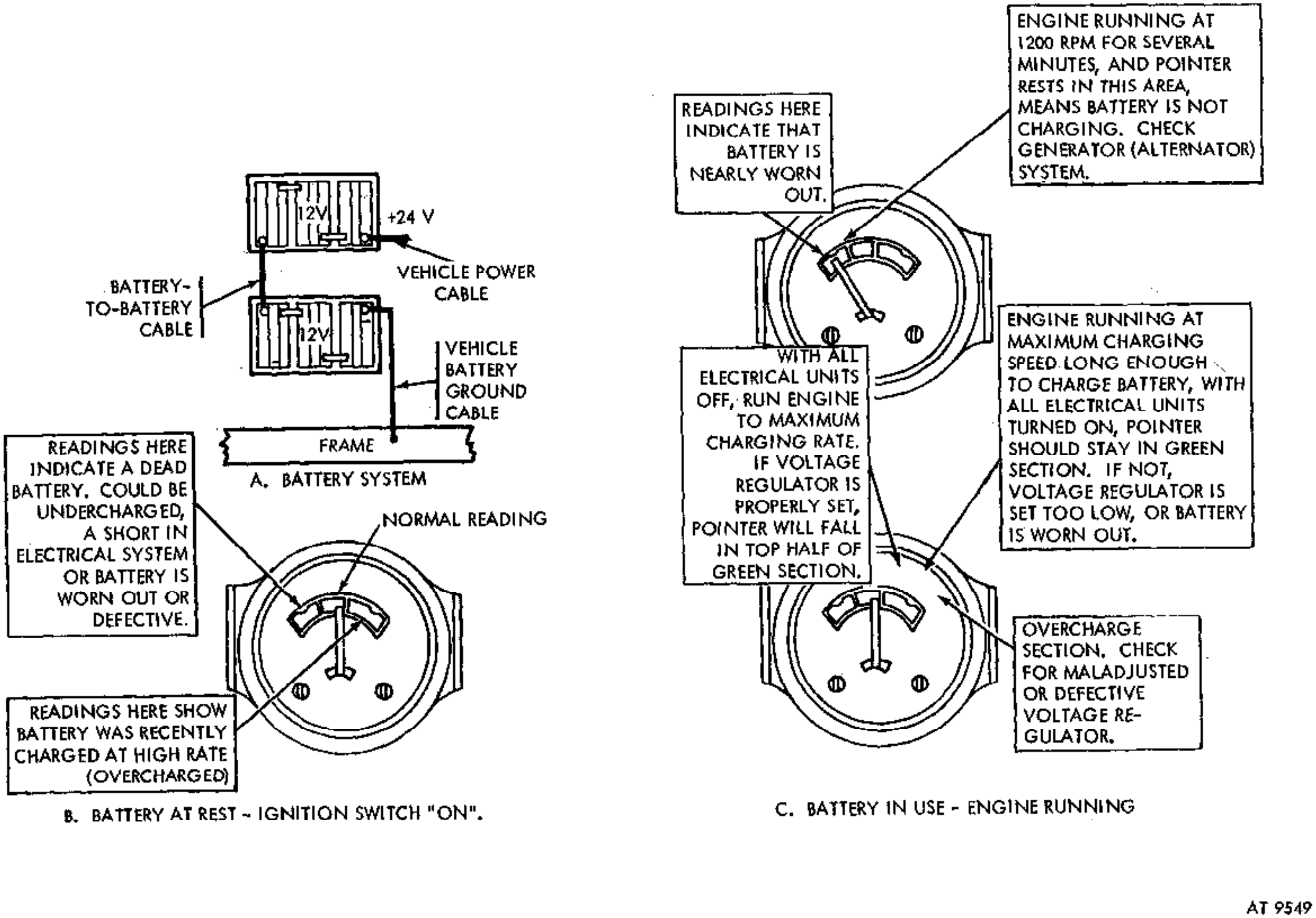


Figure 2-15. Interpretation of battery-generator indicator gage.

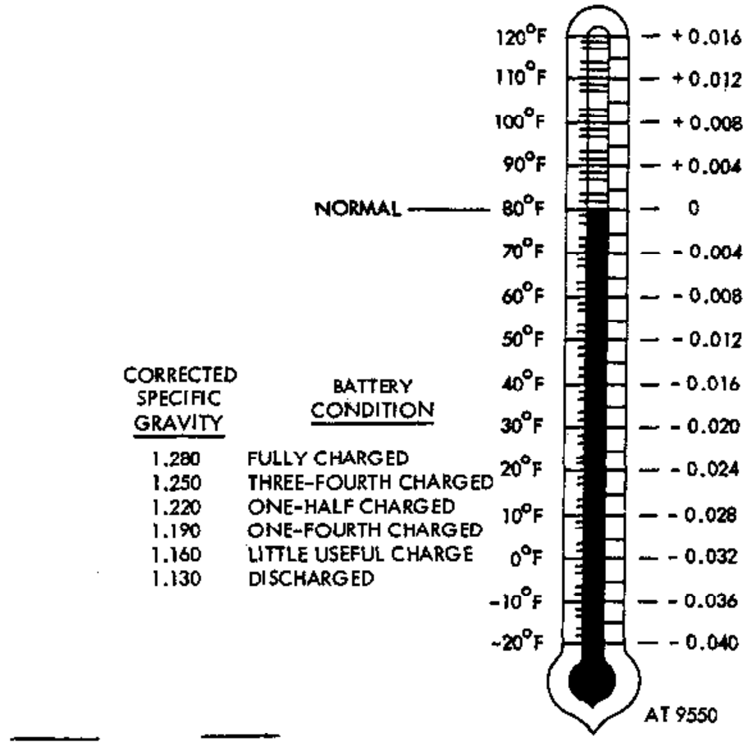


Figure 2-16. Hydrometer temperature correction chart.

Table 2-4. Electrical Troubleshooting

BATTERY SYSTEM CIRCUIT (fig. 2-17)

DESCRIPTION: Two 12-volt batteries are connected in series to provide 24 volts for the operation of all electrical equipment on the vehicle. The negative terminal of one battery is connected to the vehicle frame, and the positive terminal of the other battery is connected directly to the starter switch, for distribution to other electrical systems on the vehicle. The batteries and cables are waterproofed.

Malfunction	Circuit	Test
1. Vehicle will not crank. All electrical systems inoperative or weak.	7,68	Test 1. Make a visual inspection. Look for broken, cracked, or distorted battery cases. Check for loose terminals. Check for corrosion on the battery terminals, cables, battery hold-down and around battery posts. Check the cables for frayed or worn insulation. Check the electrolyte level in each cell. If the level is below the plates, the battery may be permanently damaged. Also look for dirt, oil or other contaminants floating in the electrolyte. Perform all required cleanup and make necessary repairs before proceeding with further tests. Test 2. Check each cell for specific gravity of battery electrolyte with hydrometer. (refer to para 2-25.) Batteries must test 1.225, or greater, temperature corrected, and each cell must test within 25 gravity points of the others. If variation is more than 25 points, charge batteries fully, and recheck specific gravity on all cells. If 25-point variation still exists, one or both batteries are defective.

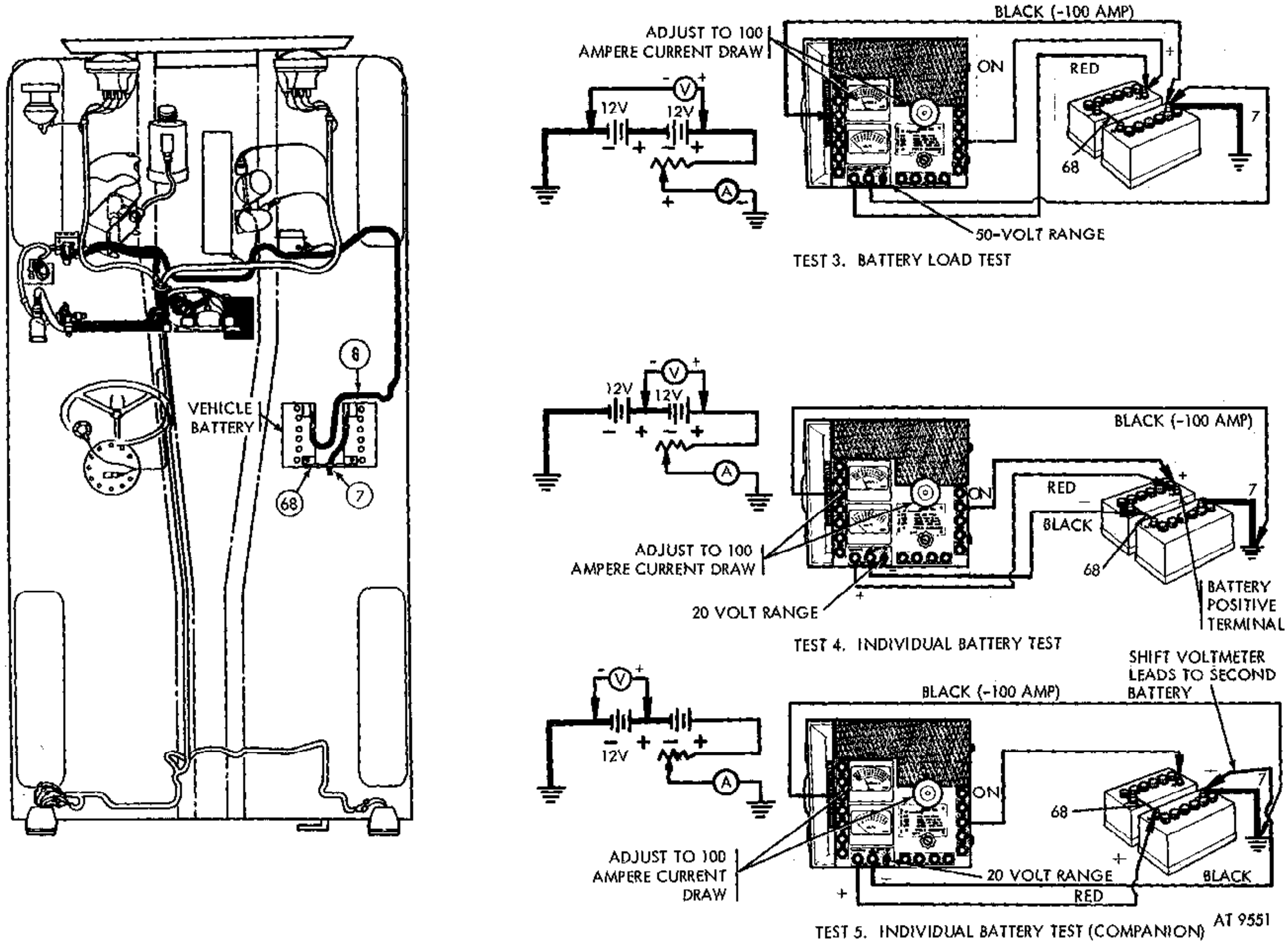


Figure 2-17. Battery system tests.

BATTERY SYSTEM CIRCUIT (fig. 2-17)

Malfunction	Circuit	Test
2. Slow cranking	7,68	Test 3. Test batteries under load to determine their ability to crank engine under starting conditions, and to determine maximum voltage drop with a 100-ampere load for 15 seconds. Turn load bank switch "OFF" with load bank control completely counterclockwise. Set voltmeter range selector switch to 50 volts. Connect circuit tester to batteries as shown in figure 2-17, test 3. Turn load bank switch "ON" and rotate load bank knob clockwise, watching ammeter scale until 100 amperes is indicated. Voltmeter should read not less than 18 volts during test, and 24 to 26 volts before and after test. If less, perform tests 4 and 5 to test individual batteries. **NOTE** Tests 4 and 5 use the same circuit tester setup as test 3, except that the voltmeter leads are moved to test the voltage of each individual battery.
	7,68	Test 4. Test individual batteries to determine maximum voltage drop with a 100-ampere load for 15 seconds, or if each has a maximum variation of ±2 volts of the other. Turn load bank switch "OFF" with load bank control completely counterclockwise. Set voltmeter range selector switch to 20 volts. Connect circuit tester to batteries as shown in figure 2-17, test 4. Turn load bank switch "ON" and rotate load bank knob clockwise, watching ammeter scale until 100 amperes is indicated. Voltmeter should indicate 9 volts or more. If less than 9 volts, battery is discharged or defective. Charge battery and retest.
	7,68	Test 5. Same as test 4, on the other battery. Voltage should not fall below 9 volts or be more than 0.2 volts higher or lower than the other battery.

STARTING SYSTEM CIRCUIT (fig. 2-18)

DESCRIPTION:	The starting system consists of the battery, starting motor assembly, starter switch and connecting cables. The starting motor is energized by depressing the starter switch. Current flows from the positive terminal of the battery, through the battery-to-switch cable, through the switch through the switch-to-starter cable, through the starter, to the vehicle frame, and through the frame to the negative terminal of the battery. Faulty connections contribute largely to starter system failures.

Malfunction	Circuit	Test
		NOTE Check condition of battery as shown by battery-generator indicator. Battery must be in good condition before making these tests. (See para 2-25.)
3. Starter fails to crank or cranks slowly.	6,7,68	Test 1. Make a visual inspection. Examine the starter terminal studs, battery terminals, and the engine ground strap to be certain that no loose or dirty electrical connections exist. While cranking with the starter, grasp all of the battery clamps and the battery-to-frame connection. A sensation of heat at any of these points indicates a poor connection. If the starter runs at a high rate of speed, but will not turn the engine, the overrun clutch is usually faulty. If this condition exists remove the starter and replace the clutch. If the starter does not crank at all or cranks slowly, perform the following tests:

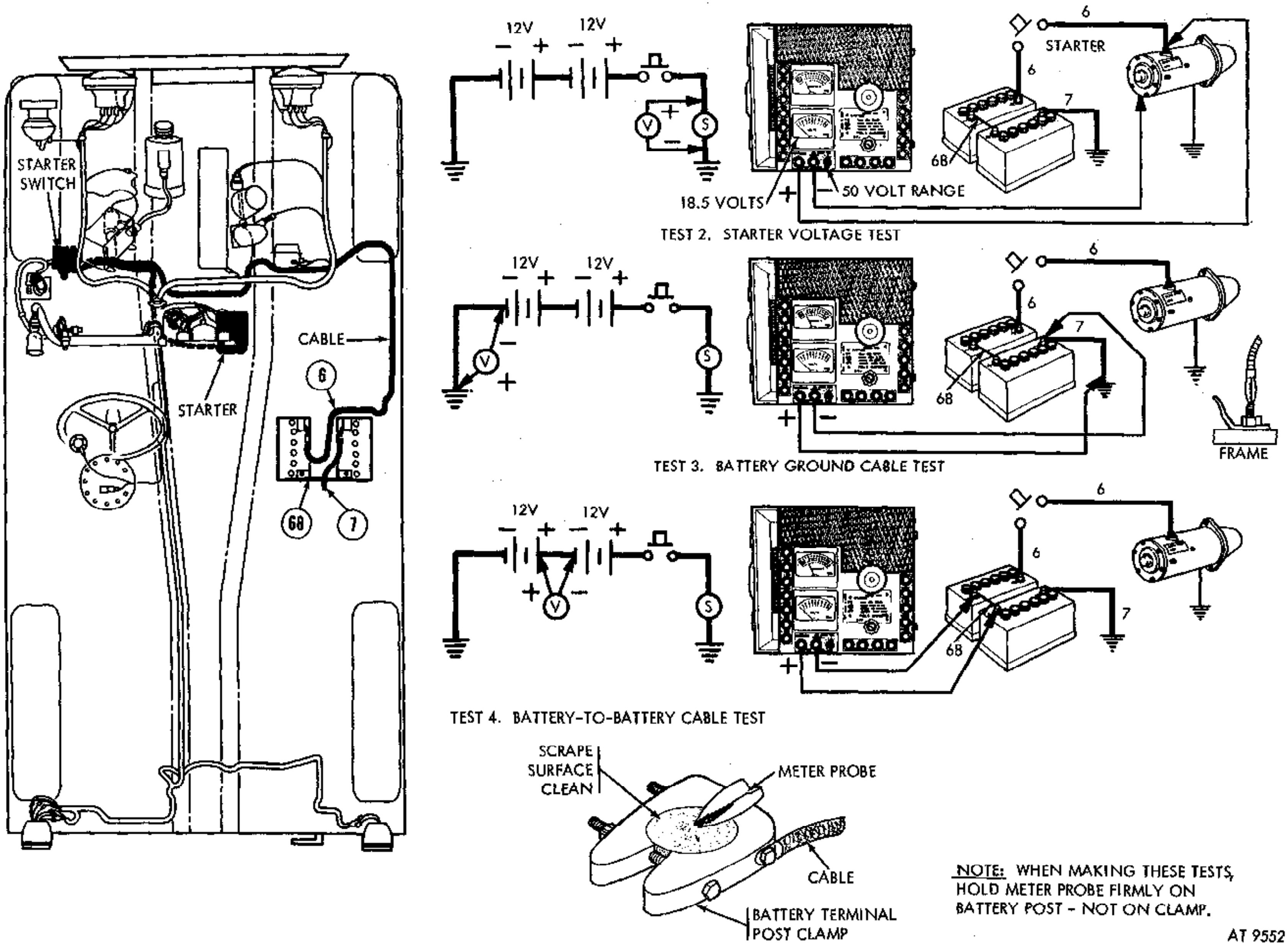


Figure 2-18. Starting system tests.

STARTING SYSTEM CIRCUIT (fig. 2-18)		
Malfunction	**Circuit**	**Test**
		NOTE All reference to ground for following tests pertains to vehicle frame.
3. Starter fails to crank or cranks slowly—Continued	6,7,68	Test 2. Perform the starter voltage test. Connect low voltage circuit tester (50-volt range) between starter terminal and starter frame as shown in figure 2-18, test 2. With the ignition switch off, depress starter switch. If reading is 18.5 volts or more, starting switch, cables and batteries are not the cause of slow cranking. Check for tight engine or defective starter. If reading is less than 18.5 volts, perform test 3.
NOTE Coat all battery terminal post clamps with light grease after tests have been completed.		Test 3. Perform the battery ground cable test. Connect low voltage circuit tester (50-volt range) between battery ground terminal and starter frame as shown in figure 2-18, test 3. With the ignition switch off, depress starter switch. If voltmeter shows no or low reading, switch the voltmeter range selector to a lower range until a reading is obtained or the 1-volt range is reached. If reading is more than 0.1 volt, remove battery ground cable and battery terminal post clamp. Clean battery terminal post and battery terminal post clamp with wire brush. Re-install battery cable and terminal post clamp and tighten all bolts securely to assure a good electrical connection. Perform test again. If the voltage reading is still more than 0.1 volt, install a new cable, and retest. If starter still cranks slowly, perform test 4.
	68	Test 4. Perform battery-to-battery cable test. Connect low voltage circuit tester (50-volt range) acorss battery-to-battery cable. Contact the actual battery posts, and not the terminal post clamp, with positive and negative test leads as shown in figure 2-18, test 4. With the ignition switch off, depress starter switch. If voltmeter shows no or low reading, switch the voltmeter range selector to a lower range until a reading is obtained or the 1-volt range is reached. If reading is 0.1 volts or less, cable is serviceable. If reading is 0.1 or more, remove the battery-to-battery cable. Clean the battery terminal posts and the terminal post clamps on the cable with a wire brush. Re-install the cable and tighten all bolts securely to assure a good electrical connection. Perform test again. If the voltage is still more than 0.1 volt, install a new cable, and retest. If the starter still cranks slowly, perform test 5.
		Test 5. Perform battery positive terminal test. Connect the low voltage circuit tester (50-volt range) between the battery positive post and its terminal post clamp as shown in figure 2-19, test 5. With the ignition switch off, depress the starter switch. If the voltmeter shows no or low reading, switch the voltmeter range selector to a lower range until a reading is obtained or the 1-volt range is reached. If the reading is more than 0.1 volt, remove the battery-to-starter switch terminal post clamp and clean the battery terminal post and the terminal post clamp with a wire brush. Re-install the cable and tighten all bolts securely to assure a good electrical connection. Perform test again. If the voltage is still more than 0.1 volt, install a new cable and retest. If the starter still cranks slowly, perform test 6.
	6,7,68	Test 6. Perform engine-to-frame ground strap test. Connect low voltage circuit tester (50-volt range) negative lead (black wire) to terminal post clamp of the negative (grounded) battery terminal. Connect the positive meter lead (red wire) to the starter frame, as shown in figure 2-19, test 6. With the ignition switch off, depress the starter switch. If the voltmeter shows no or low reading, switch the voltmeter to a lower range until a reading is obtained or the 1-volt range is reached. If the reading is more than 0.2 volts, check for loose bolts in the ground strap. If they are tight, and the reading is still more than 0.2 volts, install a new engine-to-frame ground strap, tightening bolts securely. Make sure frame surface area is clean to assure good electrical contact. Retest. If voltage is less than 0.2 volts and starter still cranks slowly, perform test 7.

STARTING SYSTEM CIRCUIT (fig. 2-19)

Malfunction	Circuit	Test
3. Starter fails to crank or cranks slowly—Continued **CAUTION** Test 7: Make this test carefully. Be sure that the screwdriver does not touch the frame of the vehicle during this test. Remove the screwdriver before releasing the starter switch.		Test 7. Perform starter switch test. Loosen starting switch screws and pull switch housing forward to expose terminals (para 2-75). Examine terminal nuts and cable terminals for good electrical connection. Clean and tighten as required. With ignition switch off, depress starter switch with one hand. With the other hand, place the blade of a heavy screwdriver between the starter switch terminals as shown in figure 2-19, test 7, and press hard. If the starter cranks faster under this condition, install a new starter switch (para 2-75). If starter still cranks slowly with a new switch, or if switch tests good, replace starter. After starter has been removed, turn engine flywheel by engaging screwdriver in ring gear with transmission in neutral. If engine will not turn, notify direct support maintenance. If engine is free, replace starter.

GENERATING SYSTEM CIRCUIT —25-AMPERE DC GENERATOR (fig. 2-20)

DESCRIPTION:	The 25-ampere dc generator electrical system consists of the following components: Battery-generator indicator, 25-ampere dc generator, generator regulator, charging circuit insulated cable, main wiring harness, battery ground cable and engine-to-frame ground strap. The circuit is energized by mechanical rotation of the generator. As the dc voltage builds up, the reverse current relay closes and supplies current to the battery through the current relay coil in the regulator. The voltage relay coil measures the voltage across the battery. When the voltage rises to more than 28 volts, the generator output is reduced by varying a resistance in the generator field coil circuit. When the engine slows down and the generator voltage fails substantially below the battery voltage, the reverse current relay disconnects the generator from the battery. The charging status of the generator is indicated by the battery-generator indicator (fig. 2-15).

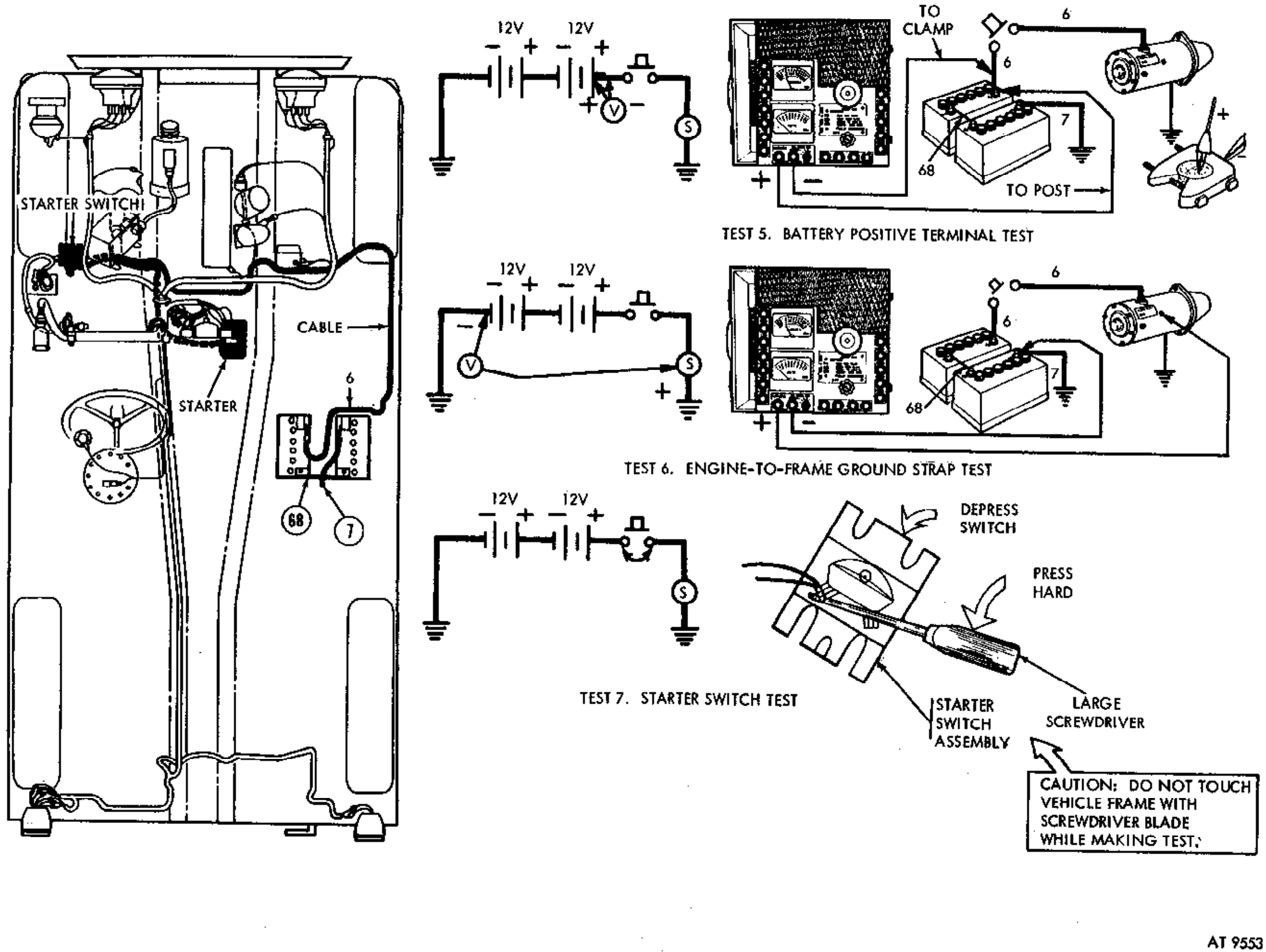


Figure 2-19. Starting system tests.

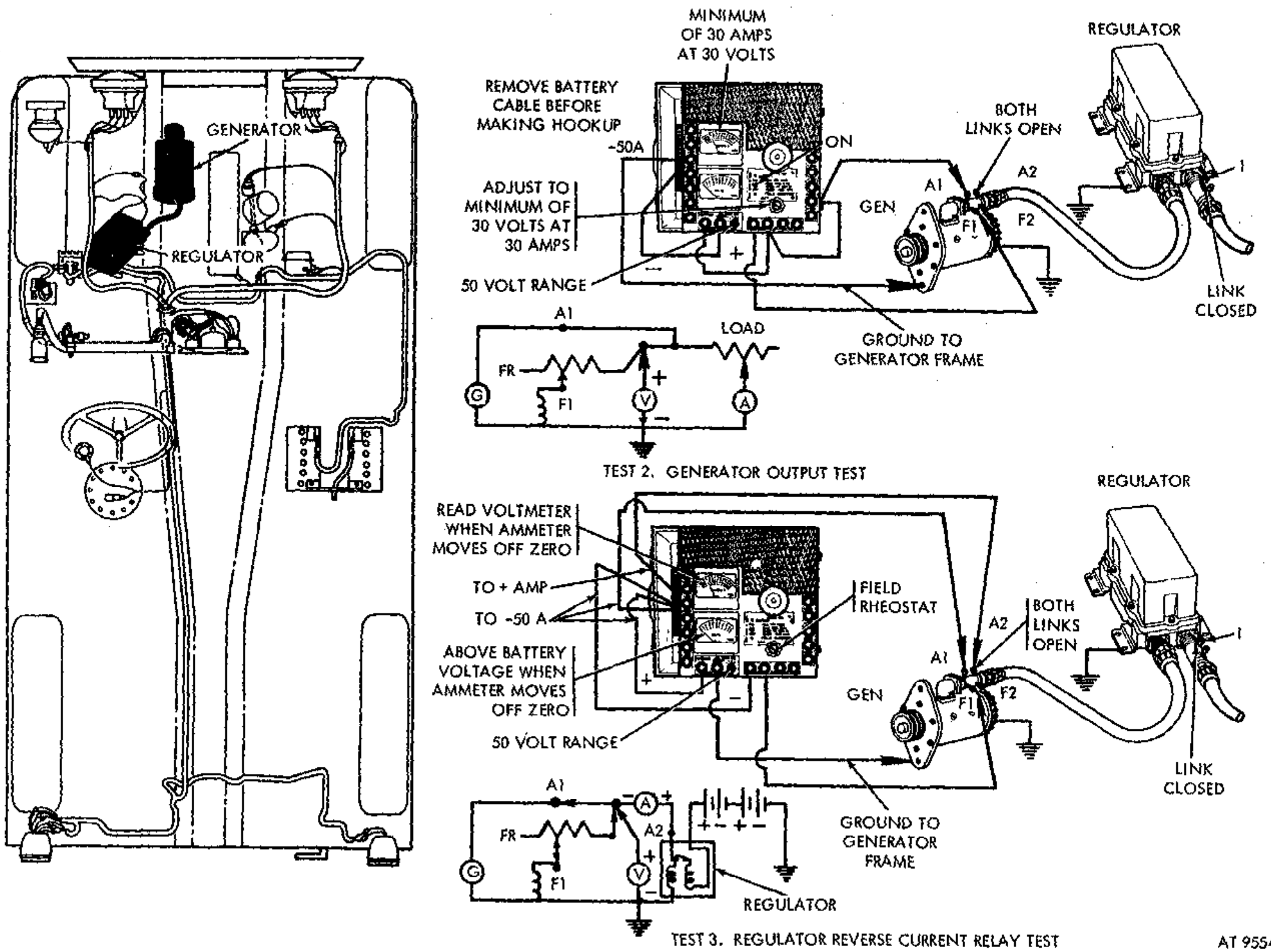
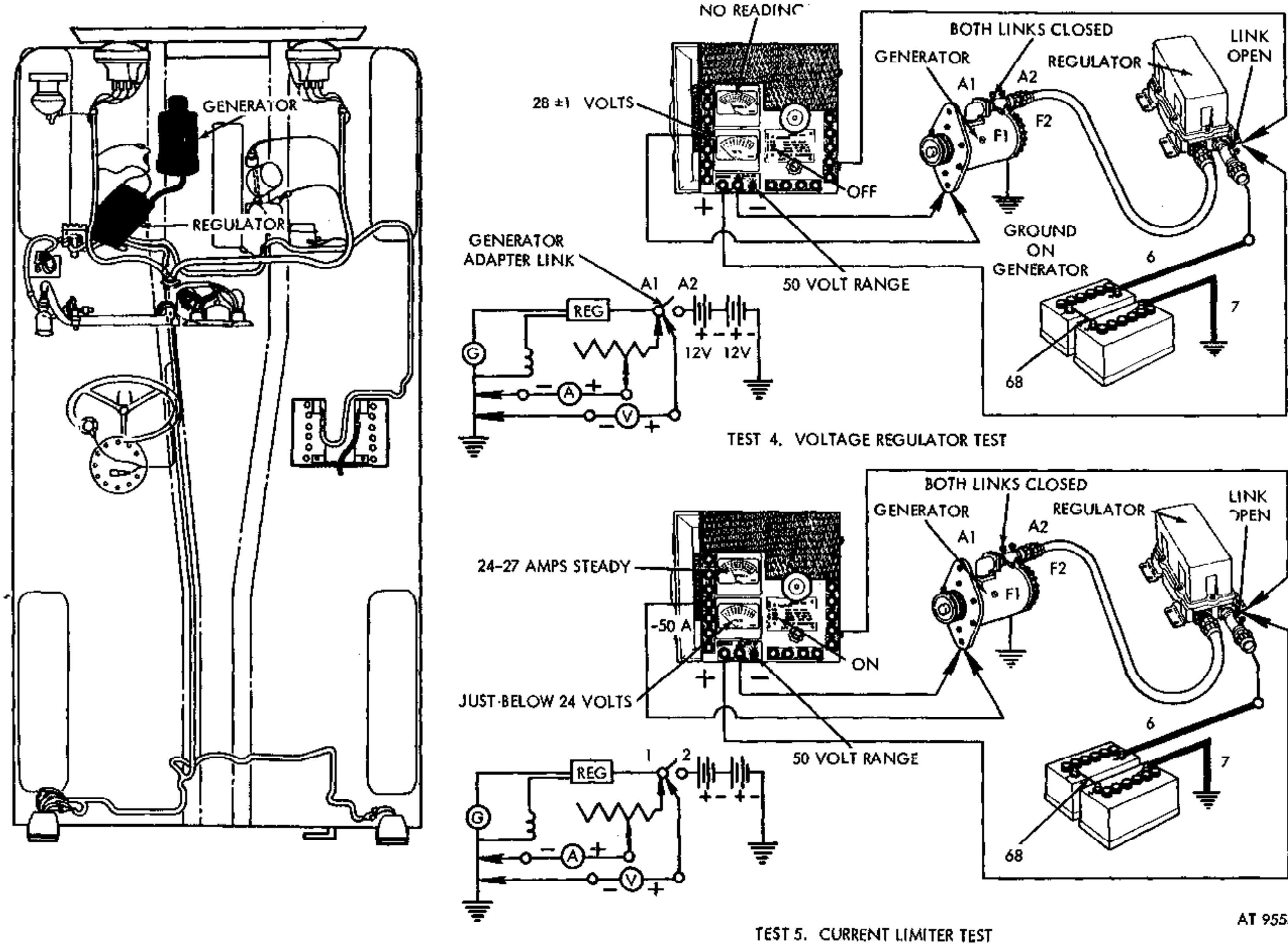


Figure 2-20. Generating system tests.

GENERATING SYSTEM CIRCUIT —25-AMPERE DC GENERATOR (fig. 2-20)

Malfunction	Circuit	Test
		CAUTION When performing the following tests, make sure none of the exposed parts or links of the adapters touch the engine or frame of the vehicle. **NOTE** Start and operate engine until temperature is normal. **CAUTION** Disconnect battery ground cable before connecting adapter to regulator. Reconnect battery ground cable after adapters are installed.
4. No charging action.	1,2	Test 1. Make a visual inspection. Check belt tension, bearings, loose terminals on generator or regulator, frayed or broken wires, corrosion, or any other visible signs of damage, deterioration or maladjustment. Make any required repairs before proceeding with further tests.
NOTE Failure of the generator system usually results in discharged or overcharged batteries. If the batteries become discharged without obvious cause, the generator system may be at fault. Quite often, failure of the generator system can be anticipated by observing the battery-generator indicator. Refer to paragraph 2-25a and figure 2-15 for correct interpretation.		Test 2. Perform generator load test. Install adapters (fig. 2-20) at generator and regulator, making certain connections are tight. Connect the battery ground cable. Polarize generator by connecting one end of a jumper to terminal 1 of the regulator adapter and briefly touching other end of jumper to field terminal F1 on generator adapter. Connect voltmeter, ammeter, adapter, field rheostat and load bank as shown in figure 2-20, test 2. Start engine and operate at high idle (1000-1200 rpm). Rotate field rheostat clockwise until voltmeter indicates 30 volts. Switch load switch "ON" and rotate load bank control clockwise until ammeter indicates 30 amperes. Both knobs must be adjusted, because as amperage increase, voltage falls off. Adjust load bank and field rheostat until a reading of at least 30 amperes at 30 volts is obtained. If reading is 30 amperes, generator is serviceable. If reading is less than 30 amperes, check for loose generator drive belt. If drive is slipping, tighten according to paragraph 2-66 and repeat test. If drive belt is not slipping, generator is faulty.
5. Incorrect charging rate.	1,2,4	Test 3. Perform generator regulator reverse current relay test. Connect voltmeter, ammeter, adapter and field rheostat as shown in figure 2-20, test 3. Make sure load switch in "OFF" and field rheostat knob is in maximum counterclockwise position. Start engine (fast idle, 1000-1200 rpm) and slowly rotate field rheostat clockwise until ammeter moves off zero. Voltmeter must indicate not less than 24 volts when ammeter moves. Rotate field rheostat counterclockwise until ammeter returns to zero and continues below zero. Continue this reduction of generator output until reverse current relay opens and ammeter returns to zero, indicating generator is disconnected from battery circuit. **CAUTION** If ammeter does not return to zero before it reaches left end of scale, replace unserviceable generator regulator. Repeat test with newly installed regulator. Ammeter must return to zero when generator is not charging. **NOTE** Voltage regulator and current limiter tests are usually made consecutively; therefore, the circuit tester connections are the same. During the voltage regulator test the load bank switch is "OFF" and only open voltage is tested; the load bank and ammeter are not in the circuit.
6. Low charging rate.	4,7	Test 4. Perform voltage regulator test. Connect voltmeter (50-volt range), ammeter (50-ampere range), load bank and adapters as shown in figure 2-21, test 4. Switch load bank switch to "OFF" and remove link from regulator adapter. Start engine and set at fast idle (1000-1200 rpm). The voltmeter should register the voltage regulator setting of 28 ±1 volts. If voltage is not in this range, the generator regulator is faulty.
7. High charging rate.	4,7	Test 5. Perform current limiter test. Connect voltmeter, ammeter, load bank and adapters as shown in figure 2-21, test 5 (same as test 4). Leave engine operating at fast idle. Set load bank control all the way counterclockwise, and switch load bank switch "ON". Rotate load bank knob clockwise until voltmeter reads 23-24 volts and read ammeter. The ammeter should read 24-27 amperes steady. If current is not in this range, the generator regulator is faulty. If regulator is good, perform test 6.



TEST 4. VOLTAGE REGULATOR TEST

TEST 5. CURRENT LIMITER TEST

Figure 2-21. Generating system tests.

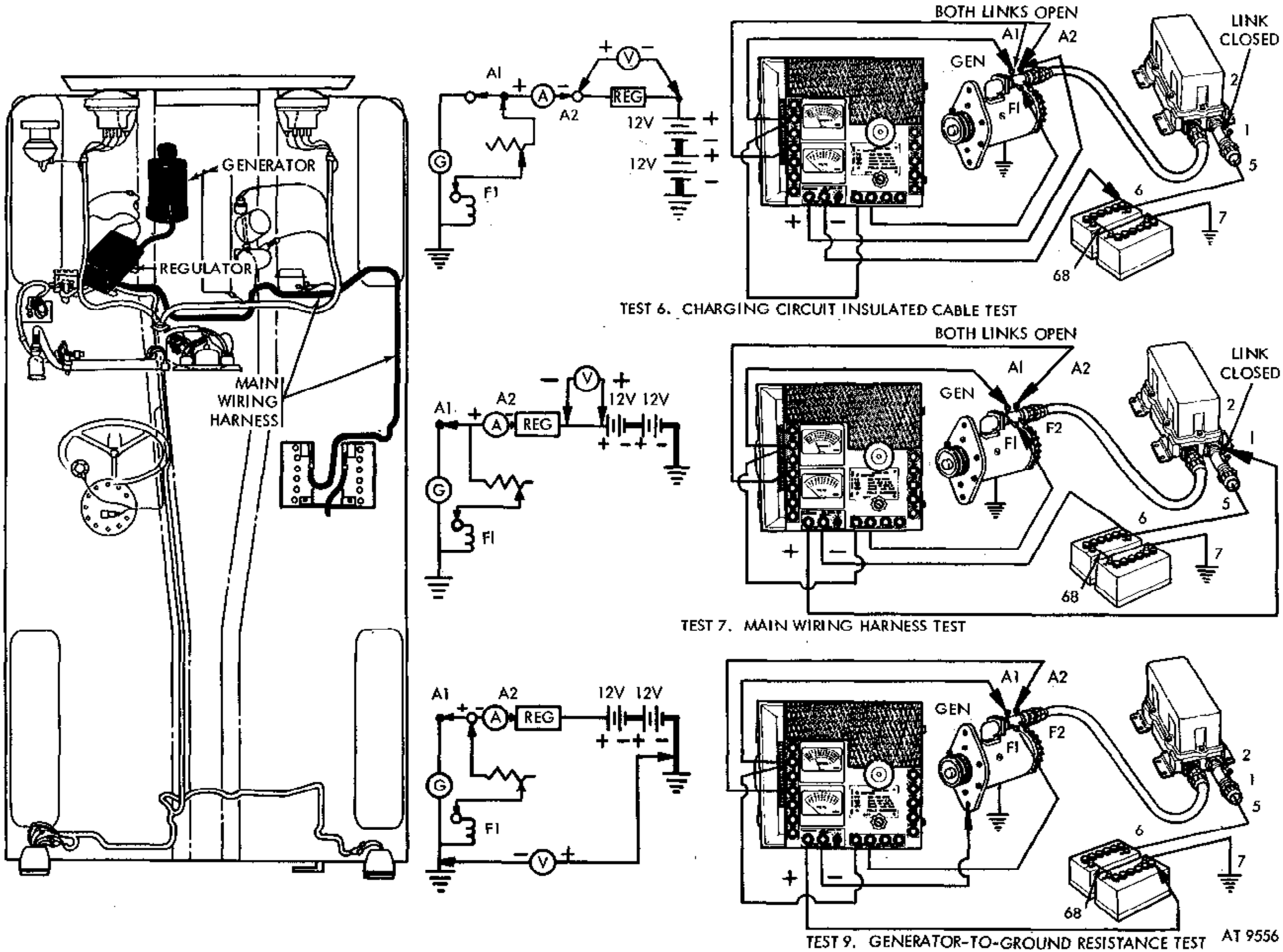


Figure 2-22. Generating system tests.

GENERATING SYSTEM CIRCUIT —25-AMPERE DC GENERATOR (fig. 2-20)

Malfunction	Circuit	Test
8. Incorrect charging rate (Low charge or high charge).	5,6,7,68	**CAUTION** Do not allow voltmeter to go below ww volts while making this test. Test 6. Perform charging circuit insulated cable resistance test. Connect voltmeter (50-ampere range), adapters and field rheostat as shown in fig. 2-22, test 6. Set field rheostat to "OFF" position. Start engine and set at fast idle (1000-1200 rpm). Slowly rotate field rheostat clockwise until ammeter indicates 20 amperes of charging current. Voltmeter should read zero on 50-volt range. Switch the voltmeter range selector to a lower range until a reading is obtained or the 1-volt range is reached. The voltage should read 0.3 volt or less. If voltage reading is excessive, perform the main wiring harness test (test 7, below).
	5,6,7,68	Test 7. Perform main wiring harness test. Connect voltmeter (50-volt range), ammeter (50-ampere range), adapter and field rheostat as shown in fig. 2-22, test 7. Set field rheostat to "OFF" position. Start engine and set at fast idle (1000-1200 rpm). Rotate field rheostat clockwise until ammeter indicates 20 amperes of charging current. Voltmeter should read zero on 50-volt range. Switch the voltmeter range selector to a lower range until a reading is obtained or the 1-volt range is reached. The voltage should read 0.1 volt. If voltage is over 0.1 volt, the fault is in the battery cable or wiring harness. Perform starter switch and cable test (figs. 2-18 and 2-19, tests 3, 4, 5). If starter switch and cable check out correctly, main wiring harness is faulty. If test 6, above, shows a high voltage drop, and this test (main wiring harness test) shows satisfactory performance, perform test 8.
	1,2,2A	Test 8. Perform generator-to-regulator assembly cable inspection. If test 6 indicates that the generator to positive battery terminal circuit has more than 0.3 volt drop, and test 7 indicates the main wiring harness has less than 0.1 volt drop, remove the generator-to-regulator cable assembly for inspection. Disassemble the connectors and inspect the soldered connections to the terminals. If these connections are frayed or broken, or if the cable is in generally poor condition, install a new cable.
	7, & generator grounding circuit	Test 9. Perform generator-to-ground resistance test. Connect voltmeter (50-volt range) directly between generator frame and battery ground terminal post. The positive voltmeter lead connects to the battery ground terminal post. Connect the ammeter (50-ampere range), adapters and field rheostat as shown in figure 2-22, test 9. Start engine and operate at high idle (1000-1200 rpm). Rotate field rheostat clockwise until ammeter registers 20 amperes of charging current. Voltmeter should read zero on 50-volt range. Switch the voltmeter range selector to a lower range until a reading is obtained or the 1-volt range is reached. The voltage should read 0.1 volt or less. If voltage is over 0.1 volt check generator regulator ground connections, battery ground connections, engine-to-frame cable, and generator mounting bolts and flanges for clean and tight connections. Also perform tests 3, 4 and 5 as described in Starting System, figures 2-18 and 2-19.

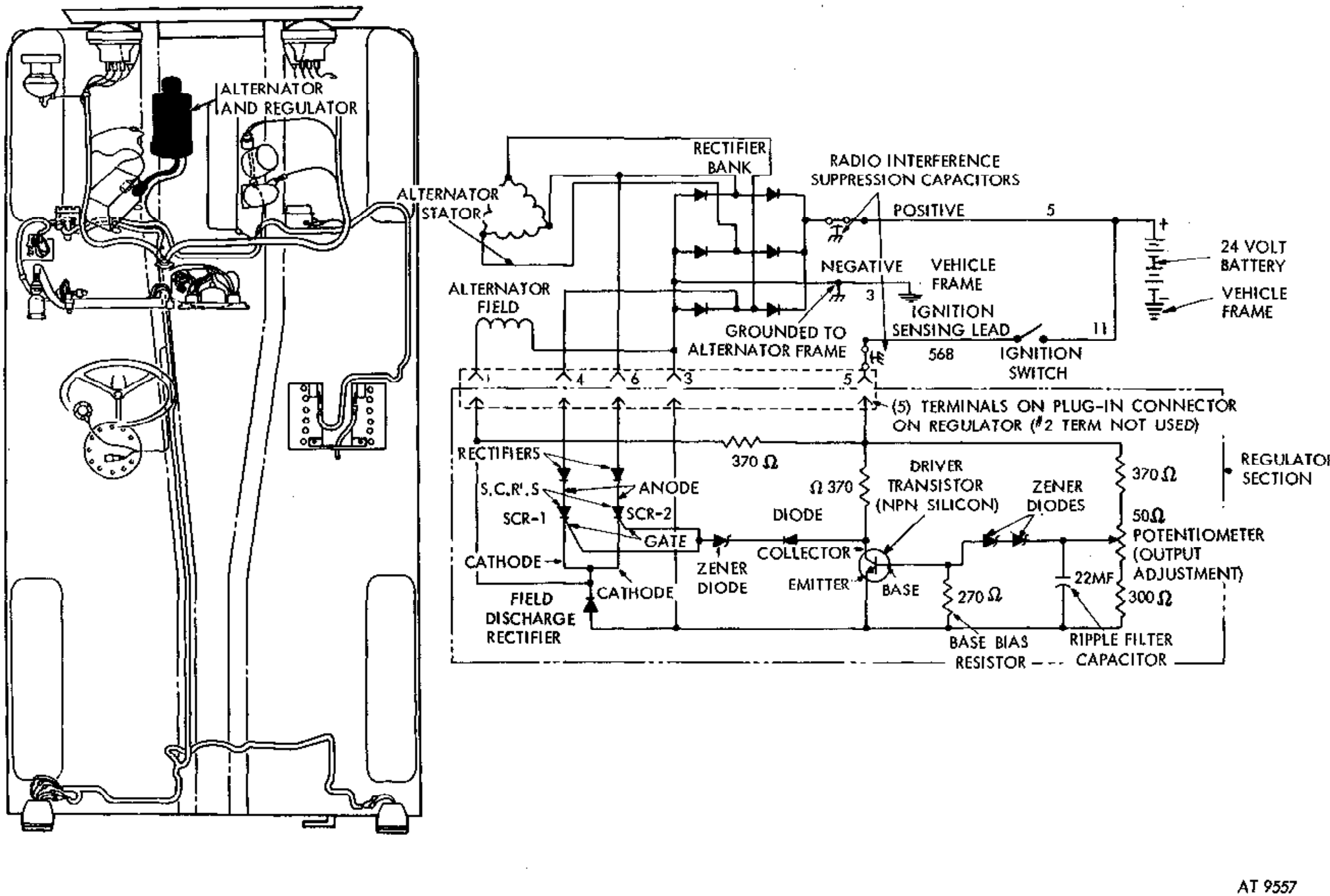


Figure 2-23. Alternator system wiring diagram.

	GENERATING SYSTEM CIRCUIT (Alternator) (fig. 2-23)
DESCRIPTION:	The alternator system consists of a 60-ampere, 24-volt, negative ground alternator and internal voltage regulator and rectifier assembly. The circuit is energized by mechanical rotation of the alternator, which generates alternating current (ac). The alternating current is changed to direct current (dc) by the rectifier bank, and the output voltage is maintained at 28±1 volts by the voltage regulator. This 28 volts is used to charge the vehicle battery and to assist the battery in carrying the electrical load of the vehicle. For further detailed information, refer to TM 9-2920-225-35 (Model 3002AA, group 4). **CAUTION** The alternator is relatively new and unfamiliar to military vehicles. It is very important that the following precautions are observed to prevent damage to the alternator and regulator. 1. NEVER reverse the battery connections. ALWAYS check the battery connecting cables with a voltmeter before any attachments are made to be sure that the negative cable will be connected to the alternator frame and the positive cable to the alternator positive terminal. Reversal will immediately burn out the rectifiers, which cannot stand the reverse polarity. 2. Booster batteries for cold weather starting must also be properly connected. Make sure that the negative cable of the booster battery connects to the negative terminal of the vehicle battery, and the positive cable to the positive terminal. If in doubt, use a voltmeter to check. NEVER make a trial connection by "flashing" the cable. 3. ALWAYS disconnect the battery cables before connecting a fast charger to the battery. 4. NEVER use a fast charger for starting the engine. Use another battery or a booster made for the express purpose of starting engines. 5. NEVER disconnect the voltage regulator sensing lead (ignition lead No. 568) while the engine is running. This is the only information the regulator has on the battery voltage. If the lead is removed, the alternator will burn itself out trying to reach 28 volts. 6. NEVER ground the alternator output terminal. The internal resistance is very low and an external short circuit will overload all the regulating and generating circuits, resulting in burn-out. 7. NEVER operate the alternator with the ignition sensing terminal energized unless a load is connect to the alternator output. 8. NEVER try to polarize an alternator. It is not necessary and could result in expensive damage. 9. NEVER disconnect batteries with engine running.

NOTE

Start and run engine at fast idle until normal temperature is reached.

Malfunction	Circuit	Test
9. Alternator not charging. **NOTE** Failure of the alternator usually results in discharged or overcharged batteries. If the batteries become discharged without obvious cause, the alternator may be at fault. Quite often, failure of the alternator may be anticipated by observing the battery-generator indicator. Refer to para 2-25a and figure 2-15 for correct interpretation.	3,5,568	Test 1. Make a visual inspection. Check belt tension (para 2-66), bearings, loose terminals on alternator, batteries and starter switch. Also look for frayed or broken wires, corrosion or any other visible signs of damage, deterioration, or maladjustment. Make any required repairs before proceeding with further tests. **NOTE** Test batteries for proper charge before further testing (para 2-25). Test 2. Perform alternator output test. Start the engine and run it at 1000 to 2000 rpm for 15 minutes. Connect a voltmeter (multimeter) from the alternator output terminal to the alternator ground terminal, as shown in figure 2-24 test 2A. The voltmeter should indicate 28±1 volts. If the voltage reading is less than 27 volts, stop the engine and note the voltage indicated. If the voltage reading remains the same as when the engine was running, disconnect the ignition sensing lead No. 568. Connect the voltmeter from the alternator ground terminal to the end of the lead No. 568 from the ignition switch, as shown in test 2B. Turn on the ignition switch (DO NOT START THE ENGINE). The voltmeter should indicate 24±1 volts. If the voltmeter indicates no or very low volts, repair or replace wire No. 568, and retest. If 24 volts is now indicated, reconnect the ignition sensing wire to the alternator ignition terminal.

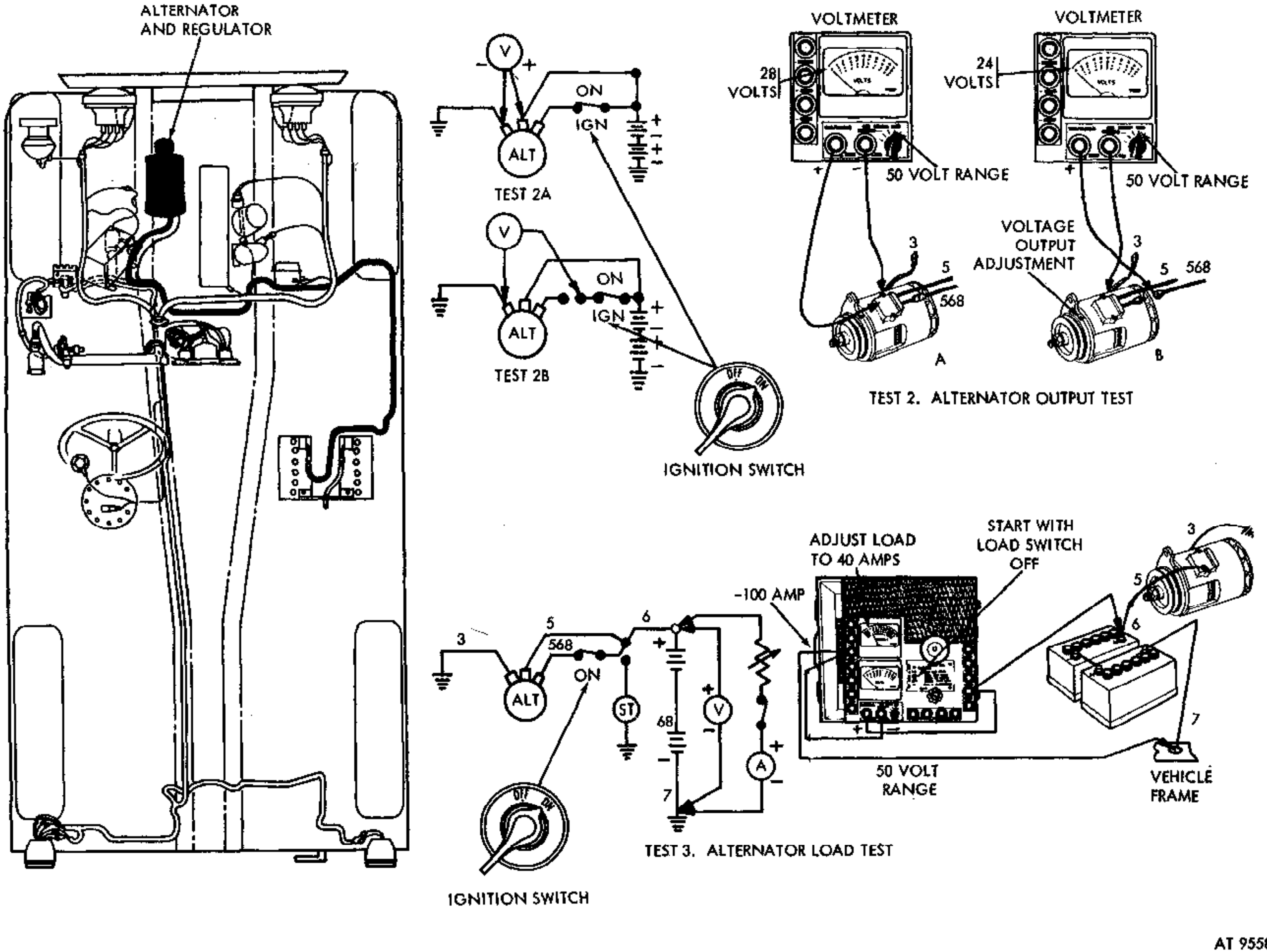


Figure 2-24. Alternator system tests.

GENERATOR SYSTEM CIRCUIT (Alternator) (fig. 2-23)

Malfunction	Circuit	Test
9. Alternator not charging—Continued		Repeat the alternator output test (above). If the alternator still has no output, replace the alternator with a known good one. If the alternator still has not output, replace the alternator with a known good one. If the alternator output is greater than 28.5 volts, or less than 27.5 volts, remove the plug from the front flange of the alternator. Adjust the output control until the voltmeter indicates exactly 28 volts. If the output voltage cannot be adjusted to this voltage, replace the alternator with a known good one.
	3,5,568	Test 3. Perform alternator load test. Connect the low voltage circuit tester as shown in figure 2-24, test 3. Be sure the voltmeter is on the 50-volt range, the ammeter on the 100-ampere range, and the load bank switch in "OFF" position. Set the coarse load control to "OFF" or minimum counterclockwise position. Start the engine and run at 1000-2000 rpm. Set the load bank switch to "ON" position and adjust the load control until the ammeter indicates 40 amperes.
		Note the voltmeter indication at this time. If the voltmeter indicates 27 volts or more, the alternator is operating satisfactorily. If the voltmeter indicates slightly less than 27 volts, remove the plug at the front of the alternator and adjust the output control to exactly 28 volts. If the voltmeter indicates less than 27 volts and cannot be raised to 28 volts, perform the cable tests.
	5,6	Test 4. Perform alternator-to-battery cable test. Connect the low voltage circuit tester as shown in figure 2-25, test 4. Start the engine and run at 1000 to 2000 rpm for 15 minutes. Turn the load bank switch "ON" and adjust load bank control until 40 amperes is indicated on the ammeter. Connect the voltmeter from the alternator output TERMINAL STUD to the positive battery POST. Adjust the voltmeter range switch until a reading is obtained or the 1-volt range is reached. If the meter reading exceeds 1.0 volt, turn off engine and examine all connections between the alternator and battery for loose connections, frayed wires and dirt. Clean and tighten all connections. Repeat the test. If the total voltage drop is still more than 1.0 volt, connect one voltmeter lead directly on the alternator terminal bolt, and successively touch each test point (alternator cable, starter switch, battery cable terminals). As each test point is touched, a small voltage drop of about 0.1 should be seen. If there is a sudden voltage jump at any connection touched, investigate the previous connection or cable. When a 1.0 volt or less drop has been obtained and the alternator output is still much less than 27 volts in test 3, perform the alternator ground cable test.
	3	Test 5. Perform alternator ground cable test. Set up equipment as in test 4, above. Connect the voltmeter from the negative battery terminal (scraped well) to the ground terminal on the alternator. (Be sure to touch the terminal, not the cable end.) Start the engine and run at 1000 to 2000 rpm for 15 minutes. Adjust the load bank (as in test 4, above) for 40 amperes. The voltmeter should read less than 0.1 volt. If more, investigate and clean the alternator ground cable. Repeat test 3, above.

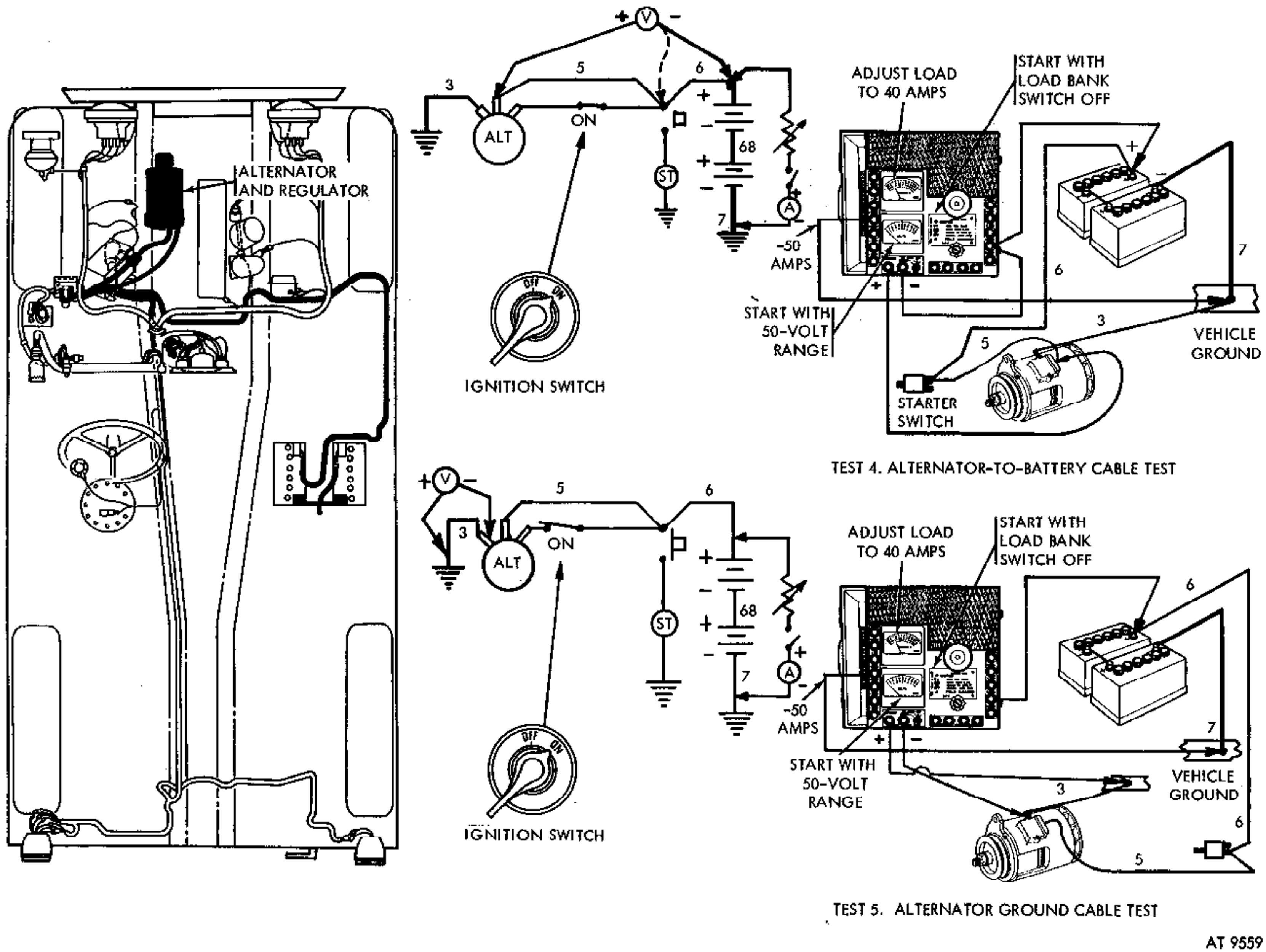
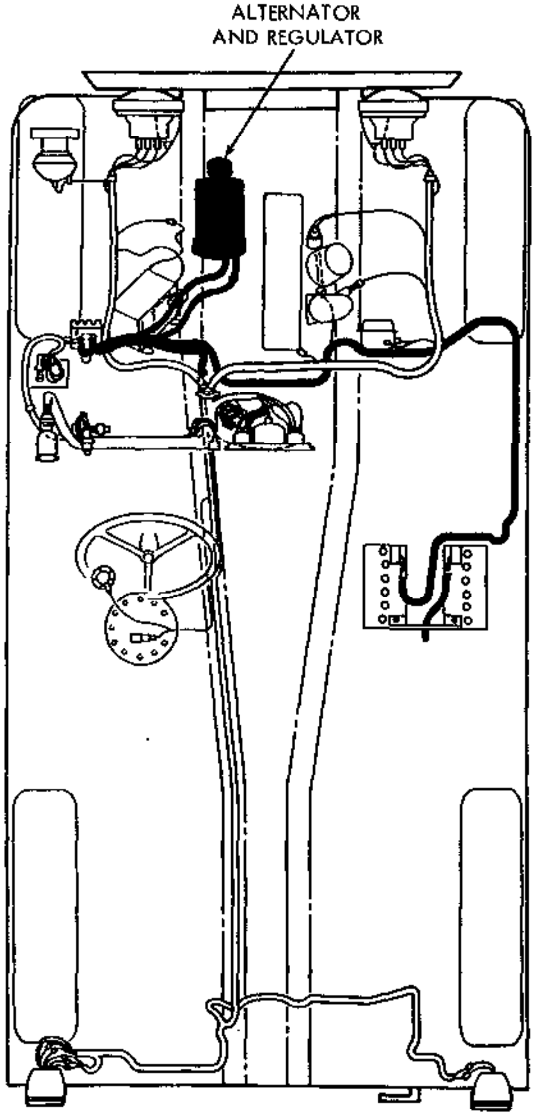
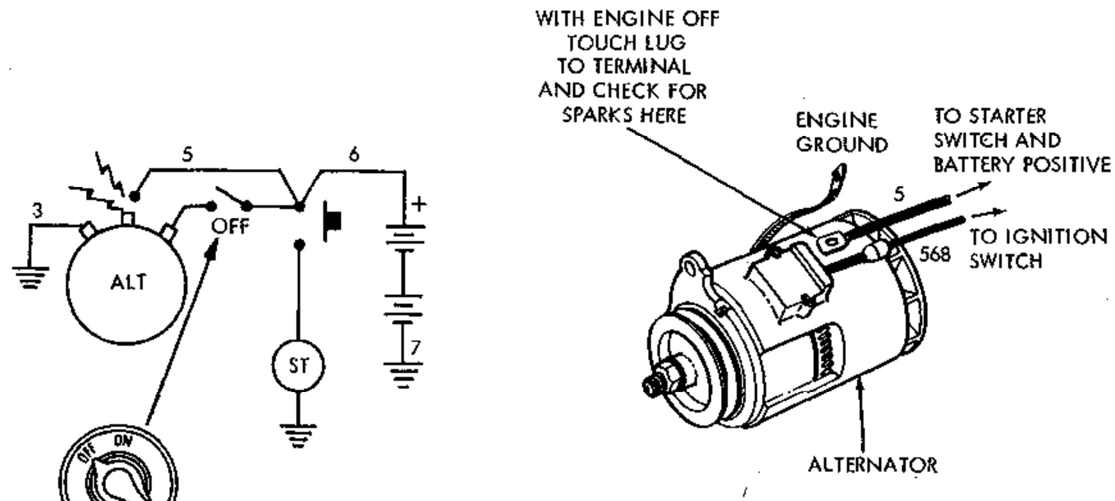


Figure 2-25. Alternator system tests.

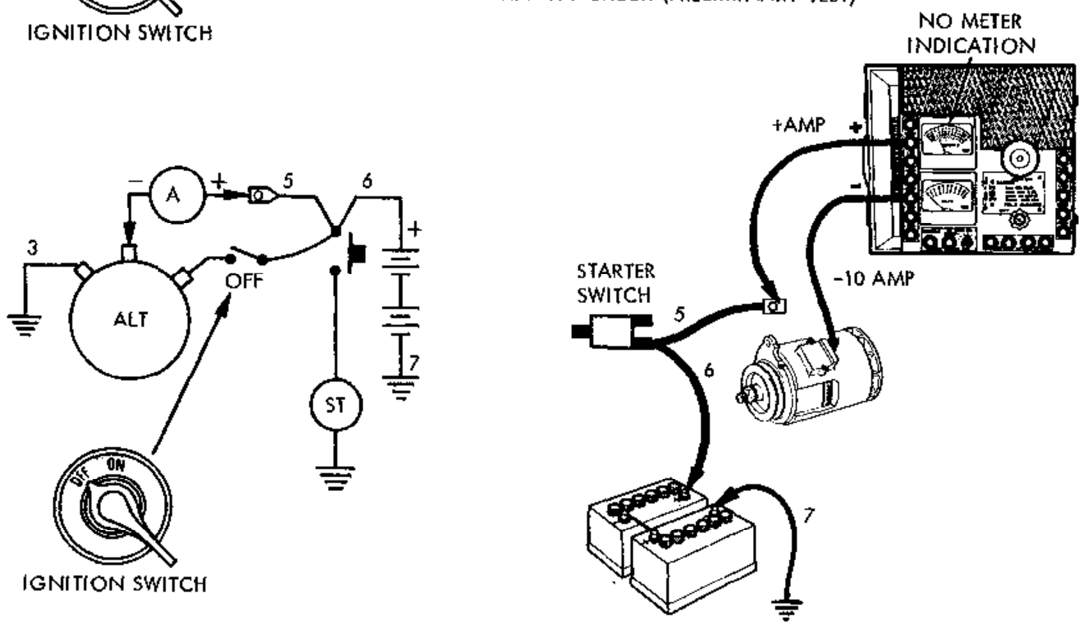
GENERATING SYSTEM CIRCUIT (Alternator) (fig. 2-23)

Malfunction	Circuit	Test
9. Alternator not charging—Continued	6,68,7	Test 6. Battery cable test. Refer to tests 3, 4, 5 and 6 of Starting Tests, figures 2-18 and 2-19. When all cables have been tested and repaired (as required) repeat test 3, above. If the alternator output still cannot be adjusted to 27.5 volts, replace the alternator with a known good one.
10. Alternator not charging, and battery discharges even if vehicle is not in use.	5	Test 7. Perform the rectifier integrity test. Be sure engine and ignition switch are "OFF". Remove the cable from the alternator output terminal as shown in figure 2-26, test 7 A. Touch the cable to the terminal in a darkened area. If there is any indication of sparking, one or more rectifiers or the radio suppression filter is defective. If no sparks appear, connect the ammeter in the line as shown in figure 2-26, test 7 B. Touch ammeter test lead to the output terminal of the alternator. There should be no indication on the meter except a small jump at the moment of connection. If there is any meter indication, the alternator has internal leakage and will discharge the battery in a day or two, depending on the severity of the leakage. If the meter has an indication, replace the alternator with a known good one. If the meter has no indication, reinstall the cable and tighten securely.





TEST 7A. RECTIFIER INTEGRITY CHECK (PRELIMINARY TEST)



TEST 7B. RECTIFIER INTEGRITY CHECK (METER TEST)

AT 9560

Figure 2-26. Alternator system tests.

	IGNITION SYSTEM CIRCUIT (fig. 2-27)
DESCRIPTION:	The ignition system produces and delivers high voltage surges to each spark plug in turn at correctly timed intervals relative to the respective piston position. When the distributor contact points are closed, current flows from the battery through the ignition coil low voltage circuit, then through the closed contact points and back to the battery through ground. This is known as the primary circuit. A ballast resistor is incorporated in series with the coil primary winding to reduce the primary current and prevent overheating of the coil, and to maintain a nearly constant current flow throughout the voltage range. Standard automotive ignition systems would not function properly without a condenser. The condenser prevents arcing at the distributor contact points when they begin to open, by providing a place for current to flow until the points are safely separated. When current flows through the primary circuit, a magnetic field is built up in the coil. As the circuit breaker cam rotates, it opens the contact points and breaks the primary circuit. The magnetic energy is transformed into a high voltage surge (approximately 25,000 volts) sufficient to establish a spark at the spark plug gap. In addition to closing and opening the contact points so that high voltage surges may be produced in the coil, the ignitor delivers these high voltage surges to the correct spark plug, at the correct instant. This is accomplished by the rotor, cap and high tension wiring and is known as the secondary circuit. A pair of metal tubes are connected to the ignitor assembly, one to the vacuum pump and the second to the carburetor air intake. These lines are necessary to keep the ignitor purged of corrosive gases generated by the electrical arcs.

CAUTION

If these purge lines are not in place, the ignitor assembly will deteriorate rapidly.

Malfunction	Circuit	Test
11. Engine will not start	12	Test 1. Perform secondary circuit voltage test. Remove each spark plug cable from its spark plug. Crank the engine with the starter (ignition switch on) while holding the spark plug cable end one-fourth inch from cylinder head as shown in figure 2-27, test 1. If a spark jumps the gap between the cable and head, the spark plug is defective, dirty, or has incorrect electrode gap adjustment. If, after cleaning, adjusting, or replacing spark plugs, the engine still does not start, check the fuel system (para 2-42) and distributor timing (para 2-71). If a spark does not jump the gap, proceed with test 2.
12. Engine will not start	12	Test 2. Perform primary circuit resistance test. Connect adapters, jumper wire and voltmeter as shown in figure 2-27, test 2. Select 50-volt range. Turn on ignition switch. If the voltmeter shows low or no reading, switch the voltmeter range selector to a lower range until a reading is obtained or the 1-volt range is reached. If voltmeter reads less than 0.2 volt, ignition switch and primary circuit connection are normal. A reading of more than 0.2 volt indicates a faulty ignition switch or primary circuit. Turn switch to "OFF" and to "ON" several times. If meter indicates a different voltage each time switch is turned on, check for loose or corroded connections.

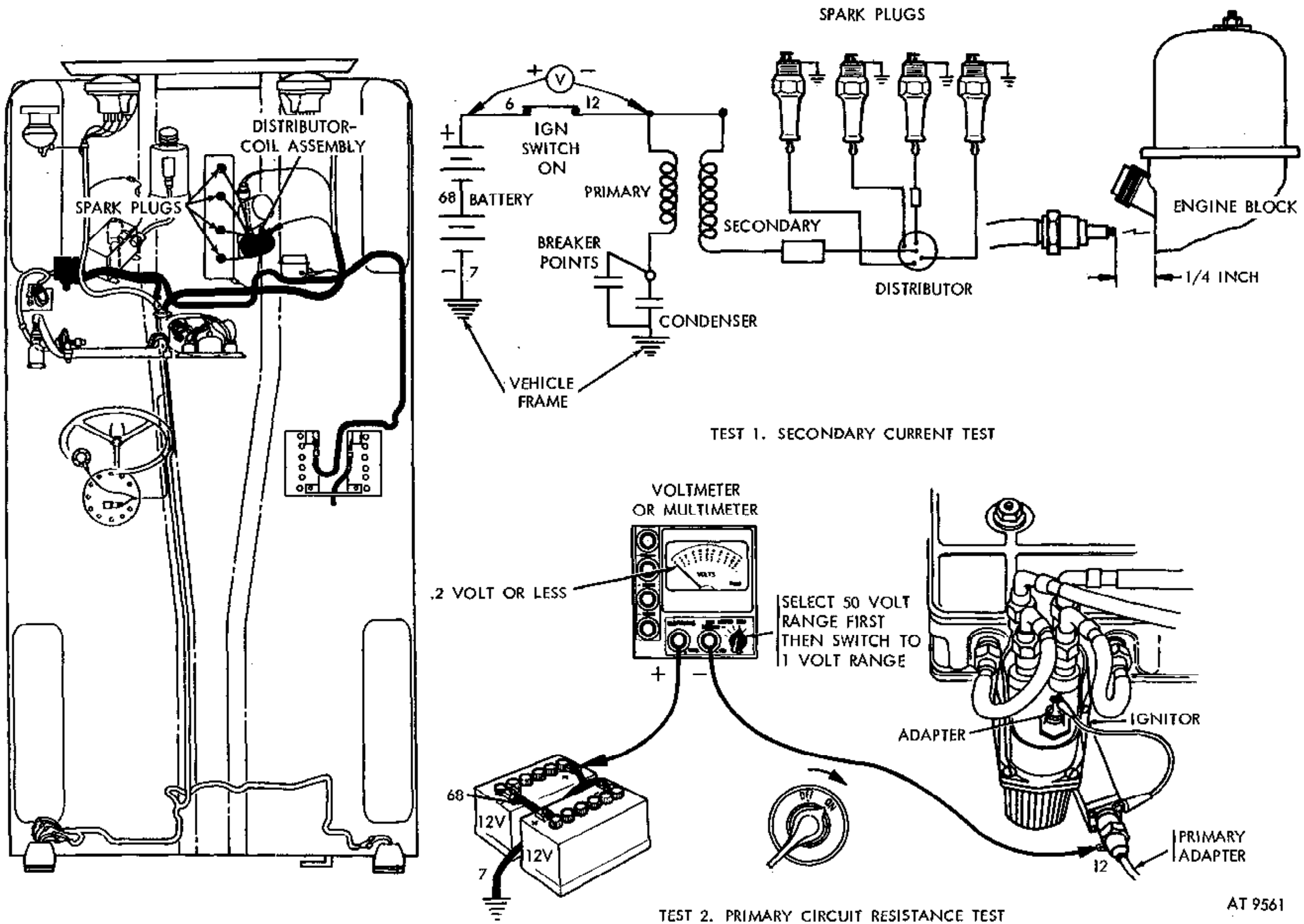


Figure 2-27. Ignition system tests.

Table 2-4. Electrical Troubleshooting—Continued

IGNITION SYSTEM CIRCUIT (fig. 2-27)

Malfunction	Circuit	Test
13. Engine starts hard or stalls easily	12	Test 3. Perform breaker point resistance test. Connect voltmeter and adapter as shown in Fig. 2-28, test 3. Select 50-volt range on voltmeter. Turn ignition switch to "ON" position. Actuate starter switch for short intervals until voltmeter reads zero, or very low value. Breaker points are now closed. Switch the voltmeter range selector to a lower range until a reading is obtained or the 1-volt range is reached. A reading of less than 0.2 volt indicates that breaker points, internal primary connections and distributor ground are normal. A reading of more than 0.2 volt indicates a poor distributor ground to engine or burned and pitted breaker points.
14. Engine misfire at high speed and under load, or is hard to start.	12	Test 4. Perform breaker point dwell test. Connect dwell meter and adapter as shown in figure 2-28, test 4. Set dwell meter selector switch to 4-cylinder position. Start and operate engine at 600 rpm. Observe dwell meter. A reading of 39-44° indicates normal breaker point gap setting. A reading of more than 44 degrees (small gap) may be a cause of hard starting. A reading of less than 39° (gap too large), may cause engine to misfire at high speeds or when pulling a heavy load. **NOTE** Ignition timing must be checked whenever breaker point gap is adjusted.
15. Engine runs unevenly	12	Test 5. Perform dwell variation test. First, perform breaker point test shown in figure 2-28, test 4. Slowly increase engine speed from 600 rpm to 1500 rpm and observe the highest and lowest dwell indication on dwell meter. A variation of less than 3° indicates distributor shaft and bushing are within specification. If a variation of more than 3 degrees is noted, check breaker point spring tension and possible binding of moveable point on its pivot prior to declaring distributor faulty.

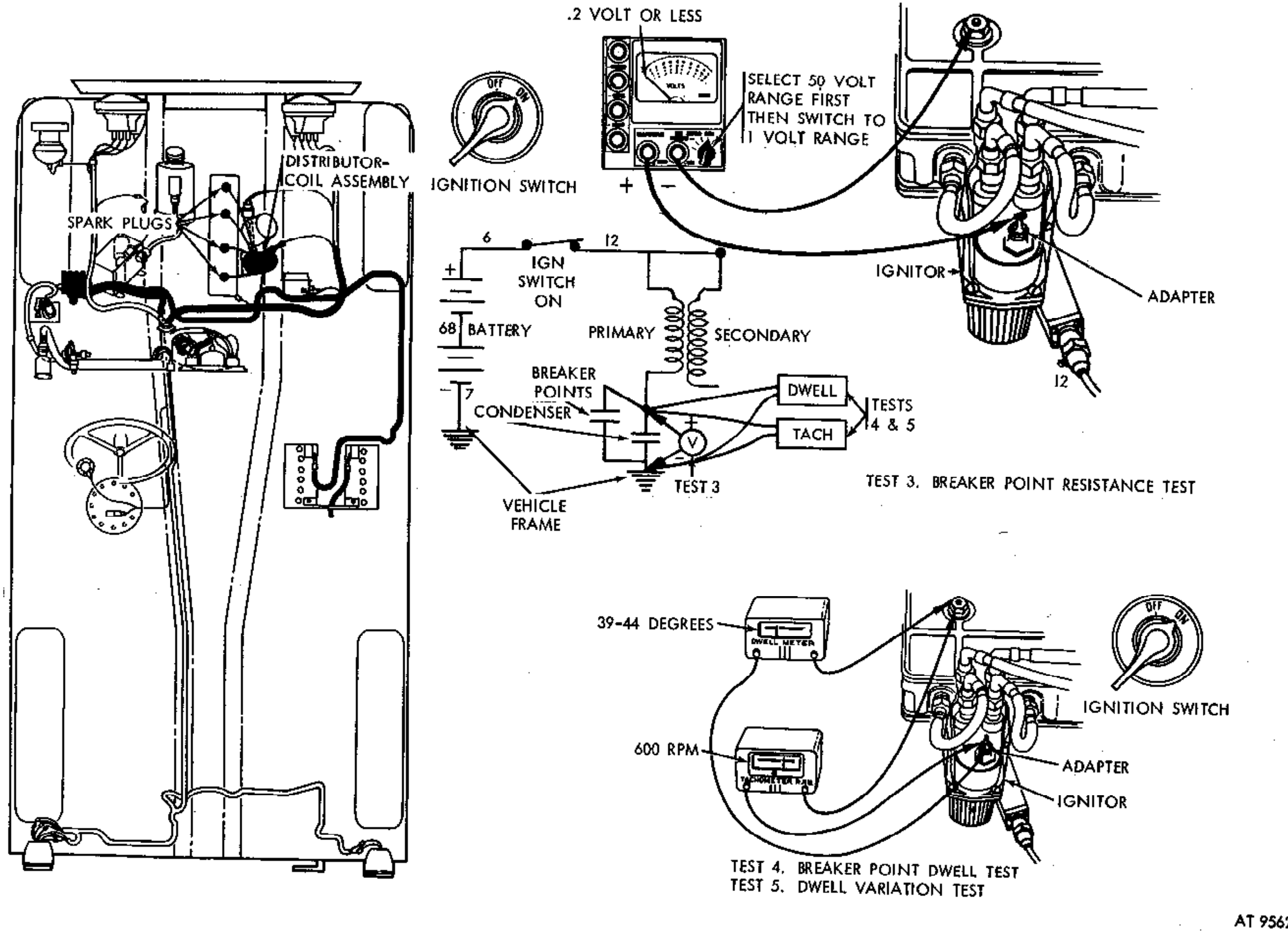


Figure 2-28. Ignition system tests.

IGNITION SYSTEM CIRCUIT (fig. 2-27)

Malfunction	Circuit	Test
16. Engine has spark knock on hard pull, overheating, hard starting, lack of power.	6,7,12,68	Test 6. Perform ignition timing test. Clean crankshaft timing notch and pointer (fig. 2-29). Connect techometer and adapter as shown in figure 2-28, test 4. Connect adapter and timing light as shown in fig. 2-29, tests 6 and 7. Start engine and set idle speed at or below 500 rpm. Timing notch alined with pointer indicates ignition timing is in correct adjustment. Timing notch above pointer or below pointer indicates incorrect adjustment.
17. Engine runs unevenly, misfires at high speed, spark knock on hard pull.	6,7,12,68	Test 7. Perform ignition timing advance test. Connect tachometer, adapter and timing light as shown for test 6, above. Start and operate engine at 500 rpm. Use timing light to observe timing notch and slowly increase engine speed to 1500 rpm. Hold engine speed at 1500 rpm and observe timing notch. If timing notch moves from pointer, distributor governor mechanism is operating normally. If timing notch does not move or jumps from pointer, distributor is faulty. If timing notch moves back and forth when engine speed is held constant, replace distributor and repeat test. If timing mark still moves back and forth, engine timing gears may be worn. Notify direct support maintenance unit.

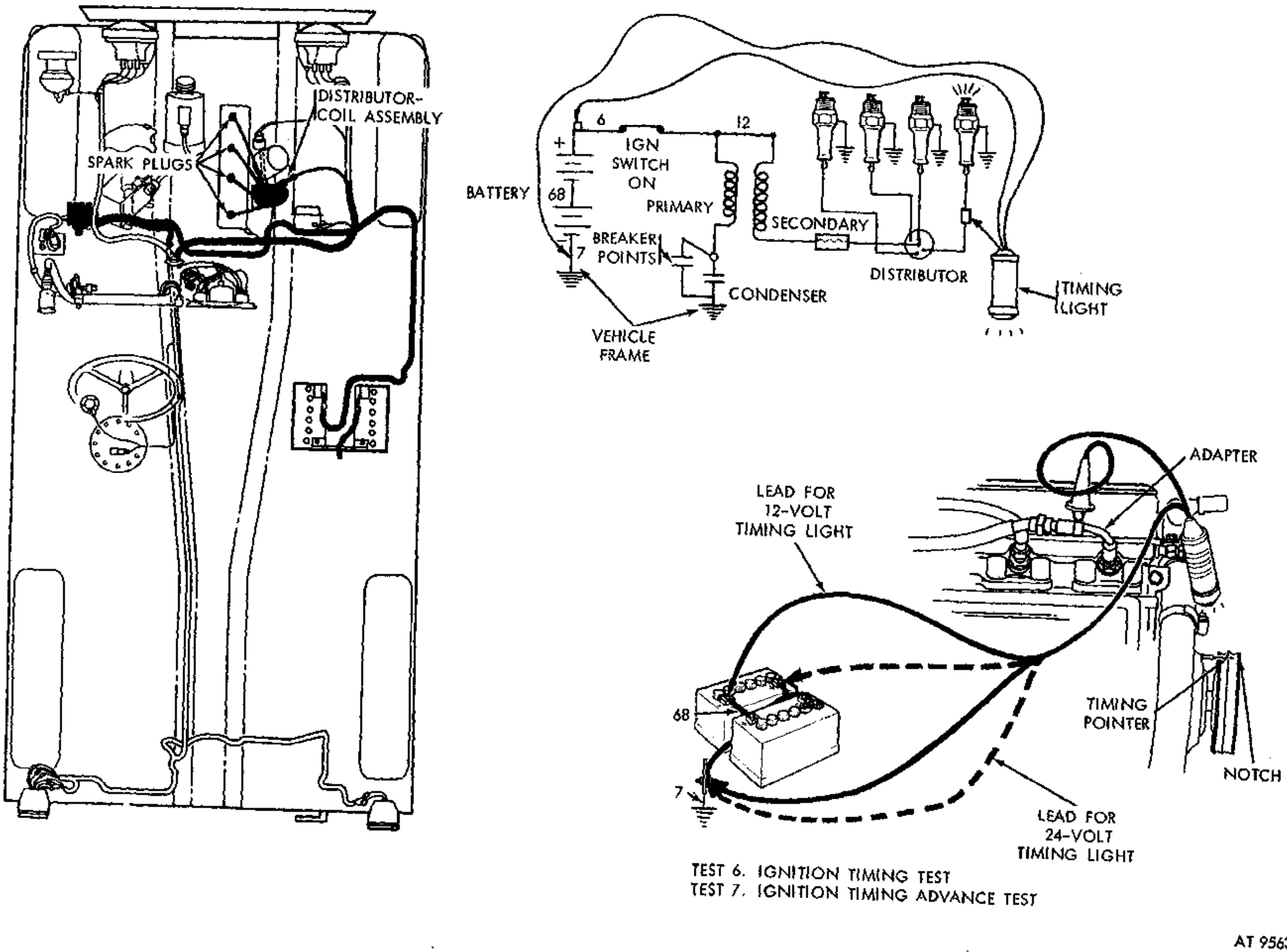


Figure 2-29. Ignition system tests.

	LIGHTING SYSTEM CIRCUIT (fig. 2-30)
DESCRIPTION:	Light circuits are controlled by the light switch on the instrument panel. Each light is connected to the light switch by connectors, wiring harnesses and cables; cables are identified by numbered tags near the end of each cable. A circuit breaker in the light switch protects the lighting system from overload. The lighting system is waterproofed. The light circuits are energized from the battery through circuits 6, 5 and 15. Individual or groups of lights are selected by the light switch, except the stoplamp, which is energized by a hydraulically-operated switch in the brake hydraulic system, and the directional signal system, which has an individual actuator / selector on the steering column. To test the operation of the lighting system, refer to TM 9-2320-218-10 for operating instructions for the light switch. **NOTE** On M151A2, M825, and M718A1 vehicles the stoplight is operated by an electro-mechanical switch which is attached to the brake pedal support, and is activated when force is applied to brake pedal.

Malfunction	Circuit	Test
		NOTE Before attempting to troubleshoot the lighting system, refer to the TM 9-2320-218-10 to become familiar with the lighting arrangement for each switch position and the nomenclature for each light.
18. Generally unsatisfactory lighting (flickering, dim, frequent burnouts, intermittent)	6,5,15, 17,18,91, 21,22,23, 24	Test 1. Perform a visual inspection. Inspect connections at the light switch and each individual light. Inspect all ground connections at light assemblies. If grounds are rusty or dirty, remove ground wire, scrape metal until clean, and reconnect, tightening securely. After tightening, coat the area with grease or other rust-reducing compound. If the complaint is short lamp life, or frequent burnout of lamps, check for high generating system voltage (refer to figs. 2-20 or 2-24), or loose lamp housings or components that would cause excessive vibration. Before discarding a lamp that has been removed, test it in another known good light socket or with an ohmmeter, to determine whether the lamp or socket is at fault.

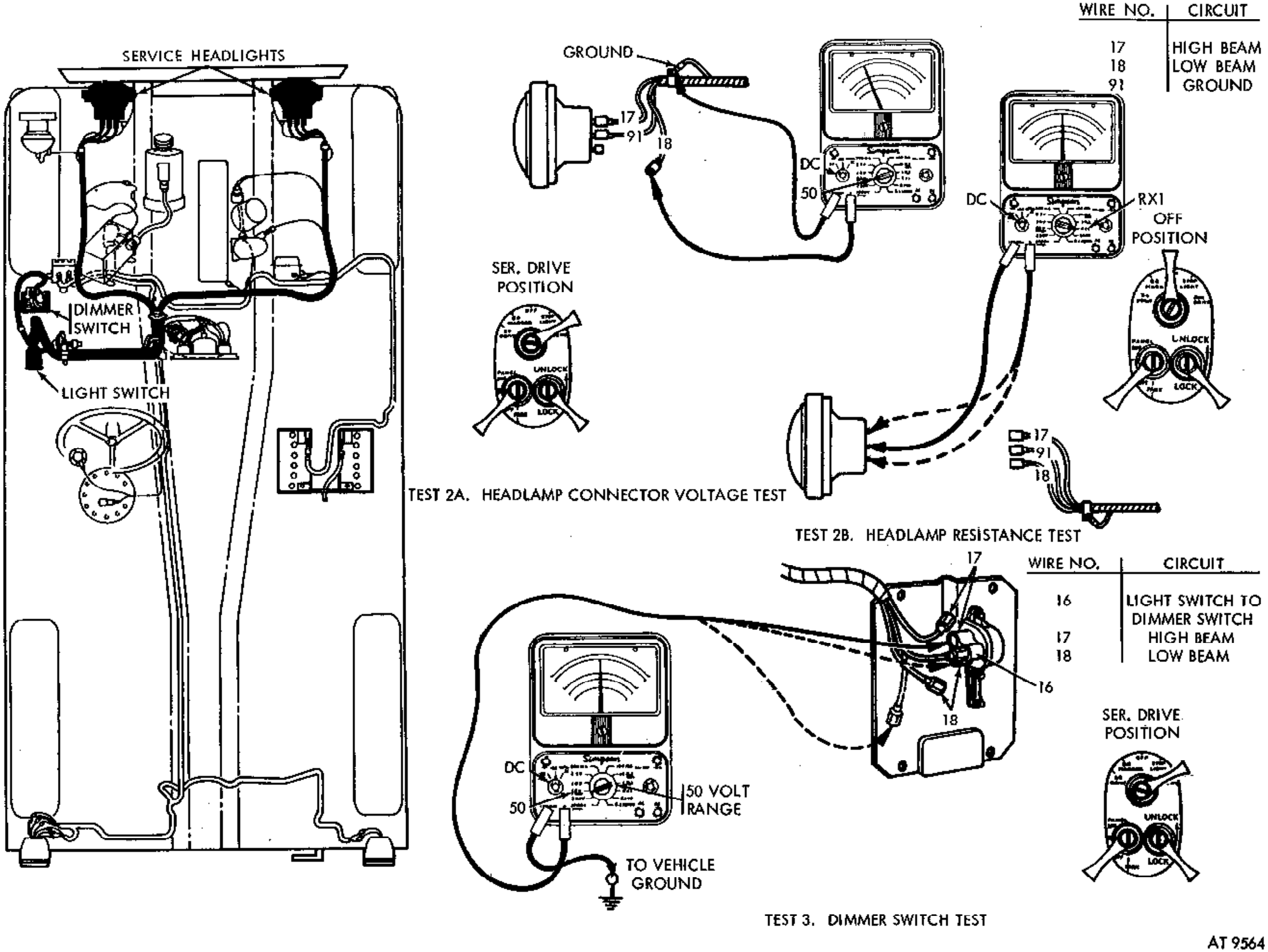
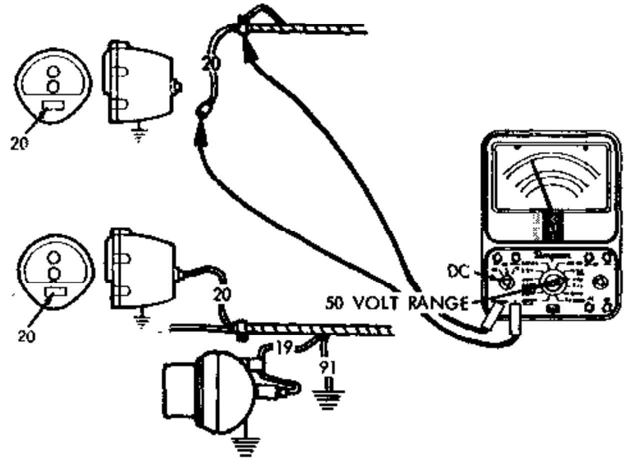


Figure 2-30. Lighting system tests.

LIGHTING SYSTEM CIRCUIT (fig. 2-30)

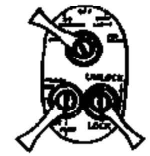
Malfunction	Circuit	Test
		NOTE The following voltage tests may be performed with either the multimeter, or the voltmeter section of the low voltage circuit tester.
9. Headlight (one side) inoperative.	17,18,91	Test 2. Perform service headlamp connector voltage test. Disconnect connector and connect voltmeter as shown in figure 2-30, test 2A. Turn lighting switch to "SER DRIVE" position. If no voltage is indicated, operate dimmer switch. If 24 volts is indicated, make a resistance test of the lamp unit. If not reading is indicated, in either position of the dimmer switch, and the other beam of the headlight operates, the wiring harness for headlamp to dimmer switch is unserviceable. Turn light switch to "OFF". Connect the multimeter between lamp terminals 91 and 18, as shown in figure 2-30, test 2B. If the multimeter needle moves past the center of the scale, connect the leads between terminals 91 and 17, and repeat. If the needle does not move with either test, replace the lamp with a known good one. If replacement lamp unit does not light, pin connector of headlamp body may be faulty.
20. Headlights (both sides) inoperative.	16,17,18	Test 3. Perform service headlamp voltage test (both sides). Check for voltage at connectors of both lamps as in test 2. If voltage is not present, disconnect No. 17 and No. 18 wires at dimmer switch. Connect voltmeter as shown in figure 2-30, test 3. Check for voltage at exposed terminal No. 17 of the dimmer switch. If voltage is not present, actuate switch. Repeat this step for exposed terminal No. 18 of the dimmer switch. If 24-volt reading is indicated at No. 17 and No. 18 switch terminals, but not at headlamp connectors, wiring harness from headlamps to dimmer switch is unserviceable. If voltage readings are not present at No. 17 and No. 18 dimmer switch terminals, remove No. 16 wire and connect the positive lead of the voltmeter to the No. 16 wire (not the dimmer switch terminal), to see if supply voltage is present. If voltage is indicated, replace dimmer switch; if no voltage is indicated, perform lighting switch connector voltage test (fig. 2-33, test 9) to determine if lighting harness from dimmer switch to lighting switch is unserviceable.
21. Blackout and marker lights inoperative.	19,20 91,491	Test 4. Perform front blackout lamp connector voltage test. Connect voltmeter as shown in fig. 2-31, test 4. Turn lighting switch to "BO DRIVE" position. If 24 to 28 volts in indicated, replace bulb; if new bulb does not light, check for corroded, dirty or defective socket and wire assembly. If no reading is indicated, perform lighting switch connector voltage test (fig. 2-33, test 9) to determine if wiring harness is unserviceable.
		NOTE See figure 2-31 for illustration of above test 4 procedures on M151A2, M825, and M718A1 vehicles.

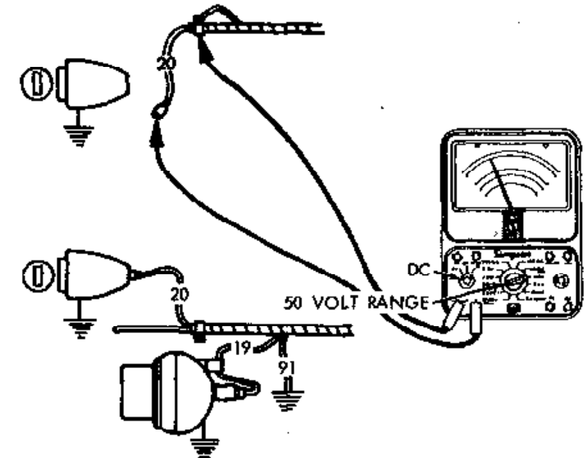


M151A2, M718A1 AND M825

WIRE NO.	CIRCUIT
19	B.O. DRIVE
20	B.O. MARKER
91	GROUND

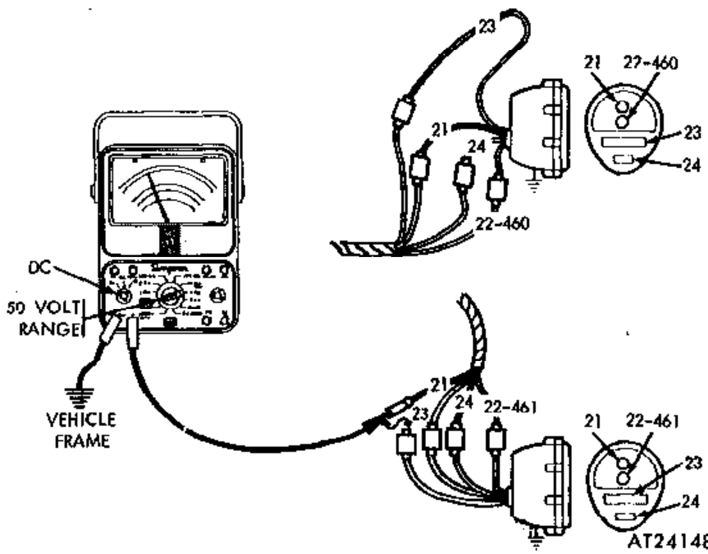
B.O. DRIVE POSITION





M151, M151A1, M151A1C AND M718

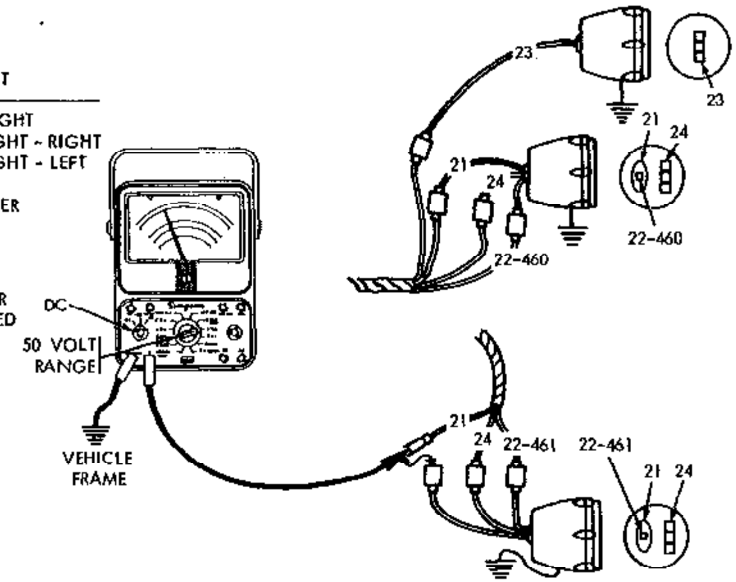
TEST 4. FRONT BLACKOUT LAMP CONNECTOR VOLTAGE TEST



M151A2, M718A1 AND M825

WIRE NO.	CIRCUIT
21	SERVICE REAR LIGHT
22-460	SERVICE STOPLIGHT - RIGHT
22-461	SERVICE STOPLIGHT - LEFT
23	B.O. STOPLIGHT
24	B.O. REAR MARKER

MUST BE IN POSITION FOR LAMPS BEING TESTED



M151, M151A1, M151A1C AND M718

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TEST 5. REAR LAMP CONNECTOR VOLTAGE TEST

Figure 2-31. Lighting system tests.

Table 2-4. Electrical Troubleshooting—Continued

LIGHTING SYSTEM CIRCUIT (fig. 2-30)

Malfunction	Circuit	Test
22. Rear lights inoperative.	21, 22, 23, 24	Test 5. Perform rear lamp connector voltage test. Connect the voltmeter as shown in figure 2-31, test 5. Turn lighting switch to position corresponding to position of faulty rear lamp; if stoplight, depress brake pedal. If 24 to 28 volts is indicated, replace bulb; if new bulb does not light, check for corroded, dirty or defective socket and wire assembly. If no voltage reading is indicated, perform lighting switch connector voltage test (fig. 2-33, test 9) to determine if wiring harness is unserviceable.
23. One or more trailer lights out (Trailer receptacle inoperative).	21, 22, 23, 24A, 24B, 90, 490	Test 6. Perform trailer connector voltage test. Turn lighting switch to position which should light inoperative trailer lamp. Connect voltmeter as shown in figure 2-32, test 6, to appropriate connector socket of inoperative circuit. If 24 to 28 volts is indicated at correct connector socket, check the No. 90 wire ground connection. If No. 90 wire is tightly grounded, trailer electrical system is faulty. If no reading is indicated at correct connector socket, perform chassis harness connector voltage test (test 7 below).
24. Rear lamps inoperative (test to determine if cause of failure is lighting switch or wiring harness).	21, 22, 23, 24, 28, 77 (M151, M151A1, & M718 vehs. only) 21, 22, 23, 24, (M151A2, M825, & M718A1 vehs.	Test 7. Perform chassis harness connector voltage test. Remove rear chassis harness connectors. Connect voltmeter as shown in figure 2-32, test 7, to appropriate connector socket for inoperative circuit. Turn light switch to position which should light faulty lamp; if stoplight is the inoperative circuit, depress brake pedal. If 24 to 28 volts is indicated check rear harness from rear chassis connector to inoperative lamp for broken or chafed wires. If no reading is indicated for blackout marker or service lamp connector terminals, perform lighting switch voltage test (fig. 2-33, test 9). If no reading for stoplight circuit terminals (brake pedal depressed with lighting switch in correct position), perform stoplight switch test (fig. 2-33, test 8).

WIRE NO.	CIRCUIT (TEST 7)
21	SERVICE REAR LIGHT
22-460	SERVICE STOPLIGHT (RH)
22-461	SERVICE STOPLIGHT (LH)
23	B.O. STOPLIGHT
24	B.O. MARKER LIGHTS
77	FUEL PUMP

PIN	WIRE NO.	CIRCUIT (TEST 6)
A	24A	REAR B.O. MARKER (LH)
B	22-461	SERVICE STOPLIGHT (LH)
C	24B	REAR B.O. MARKER (RH)
D	90	GROUND TO FRAME
E	21	SERVICE REAR LIGHT
F	23	B.O. STOPLIGHT
H	490	B.O. MARKER LIGHTS
J	22-460	SERVICE STOPLIGHT (RH)
K	NONE	NOT USED
L	90	GROUND TO FRAME
M	NONE	NOT USED
N	NONE	NOT USED

NOTE, REFER TO TRAILER MANUAL FOR TYPE AND LOCATION OF LIGHTS.

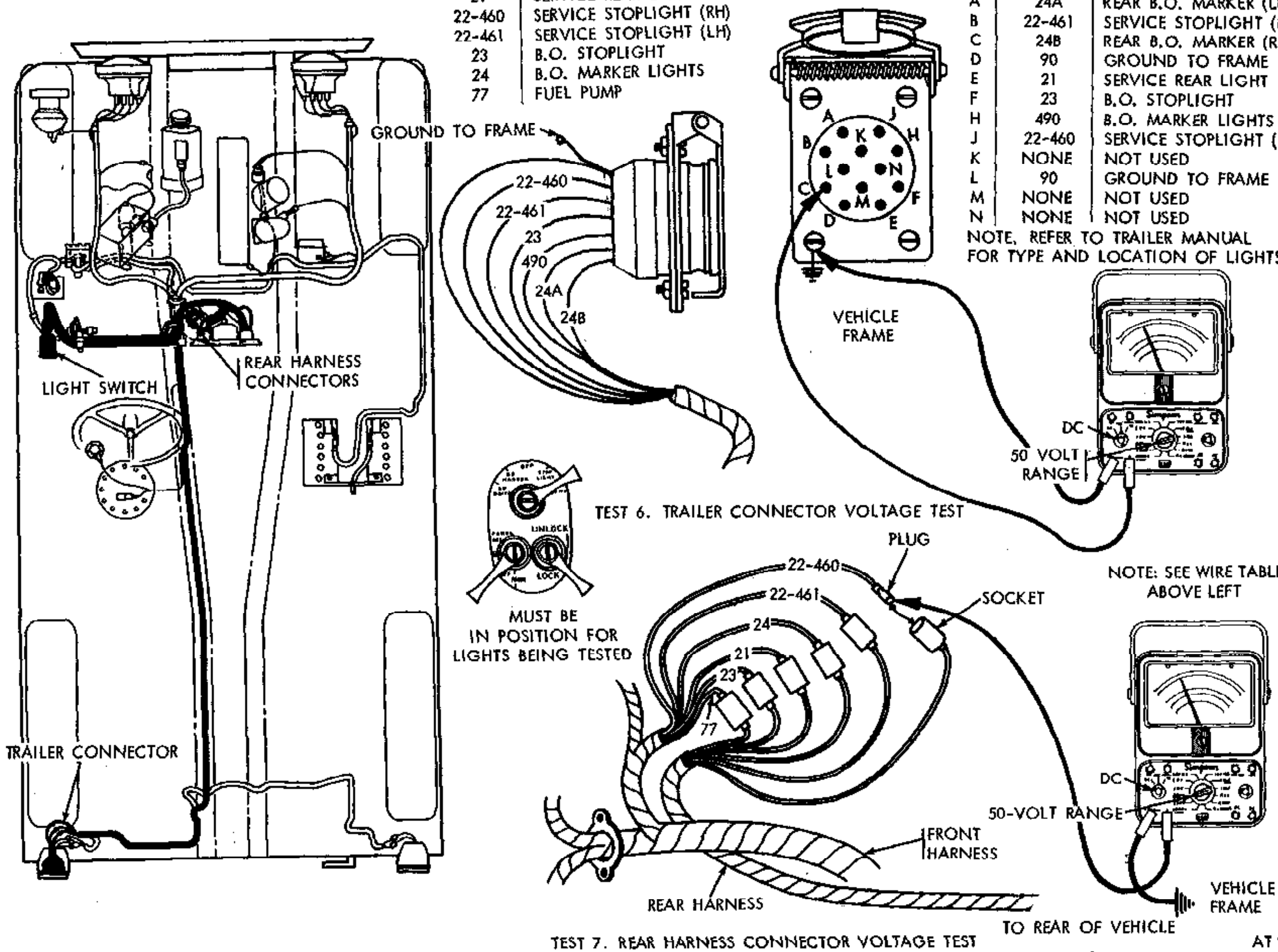
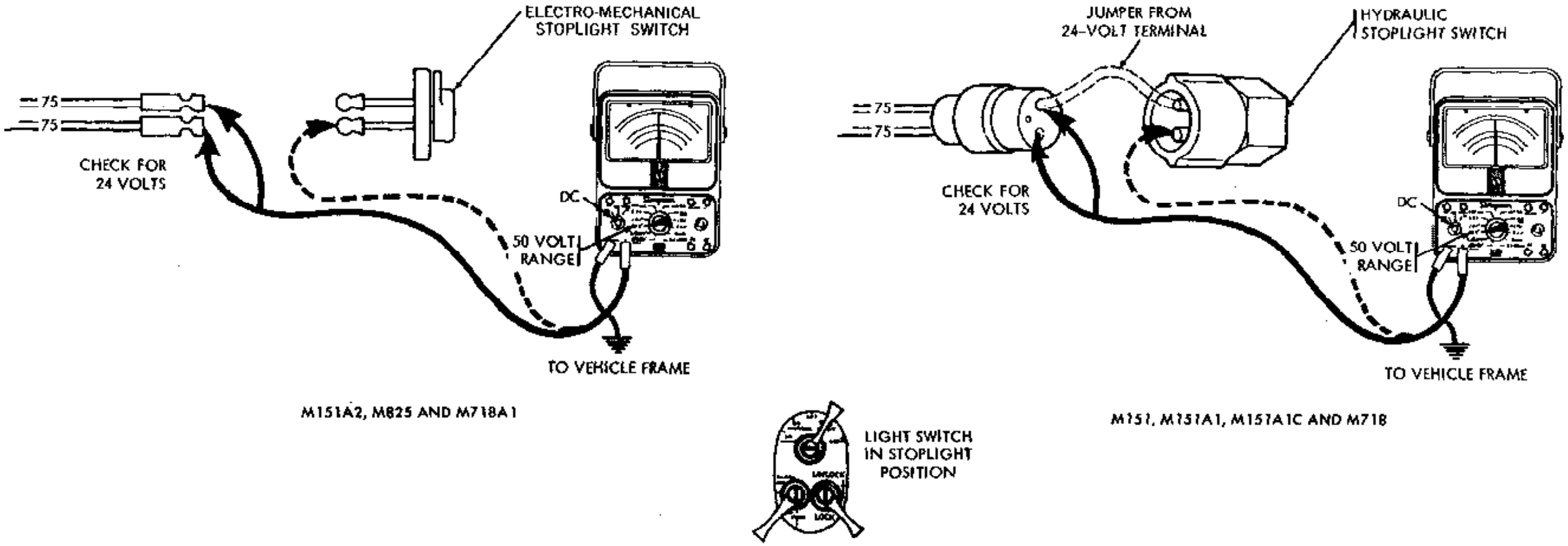


Figure 2-32. Lighting system tests.



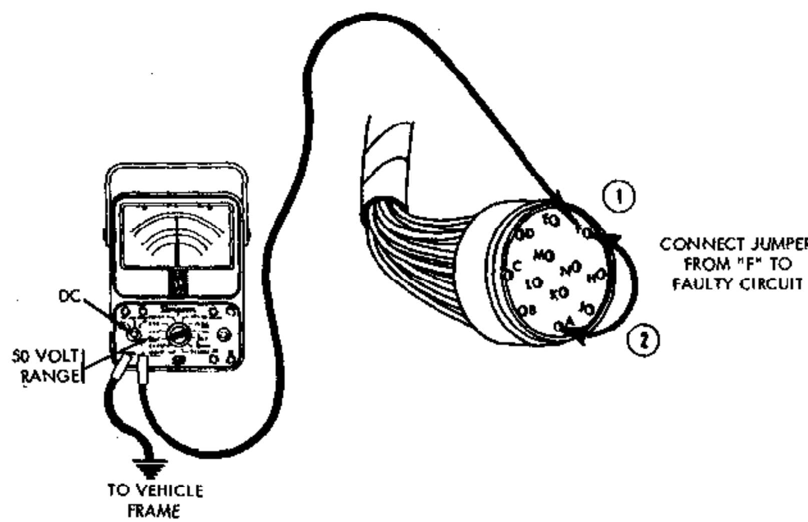
M151A2, M825 AND M718A1

M151, M151A1, M151A1C AND M718

TEST 8. STOPLIGHT SWITCH VOLTAGE TEST

SOCKET	WIRE NO.	CIRCUIT
A	75	STOPLIGHT SWITCH
B	40	PANEL LIGHTS
C	22	SERVICE STOPLIGHTS
D	19	B.O. DRIVING LIGHT
E	20	B.O. MARKER LIGHTS
F	15	BATTERY POS. 24 VOLTS
H	21	SERVICE REAR LIGHTS
J	467	DIRECTIONAL INDICATOR
K	75	STOPLIGHT SWITCH
L	491	PARKING LIGHT
M	16	SERVICE HEADLIGHTS
N	23	B.O. STOPLIGHT

M151A2, M825 AND M718A1



SOCKET	WIRE NO.	CIRCUIT
A	75	STOPLIGHT SWITCH
B	40	PANEL LIGHTS
C	22	SERVICE STOPLIGHTS
D	19	B.O. DRIVING LIGHT
E	20	B.O. MARKER LIGHTS
F	15	BATTERY POS. 24 VOLTS
H	21	SERVICE REAR LIGHTS
J	460-461	DIRECTIONAL INDICATOR
K	75	STOPLIGHT SWITCH
L	NONE	NOT USED
M	16	SERVICE HEADLIGHTS
N	23	B.O. STOPLIGHT

M151, M151A1, M151A1C AND M718

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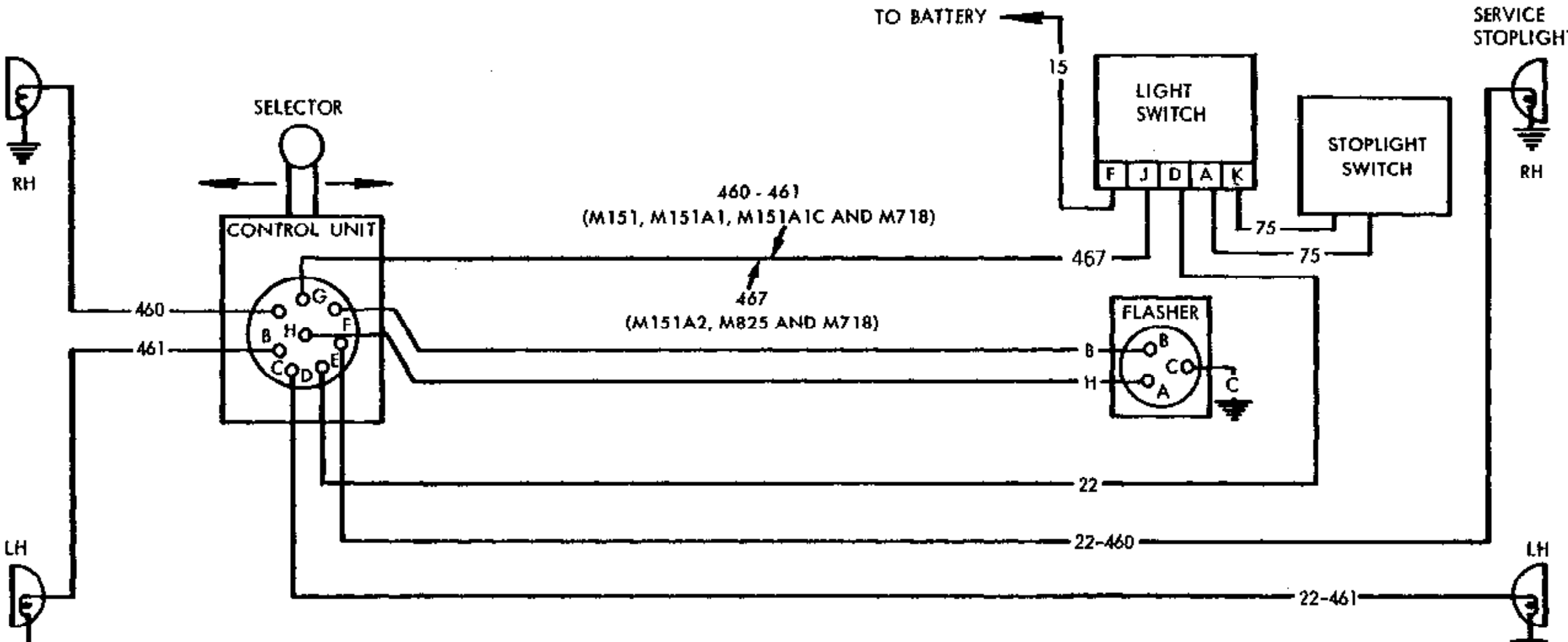
Figure 2-33. Lighting system tests.

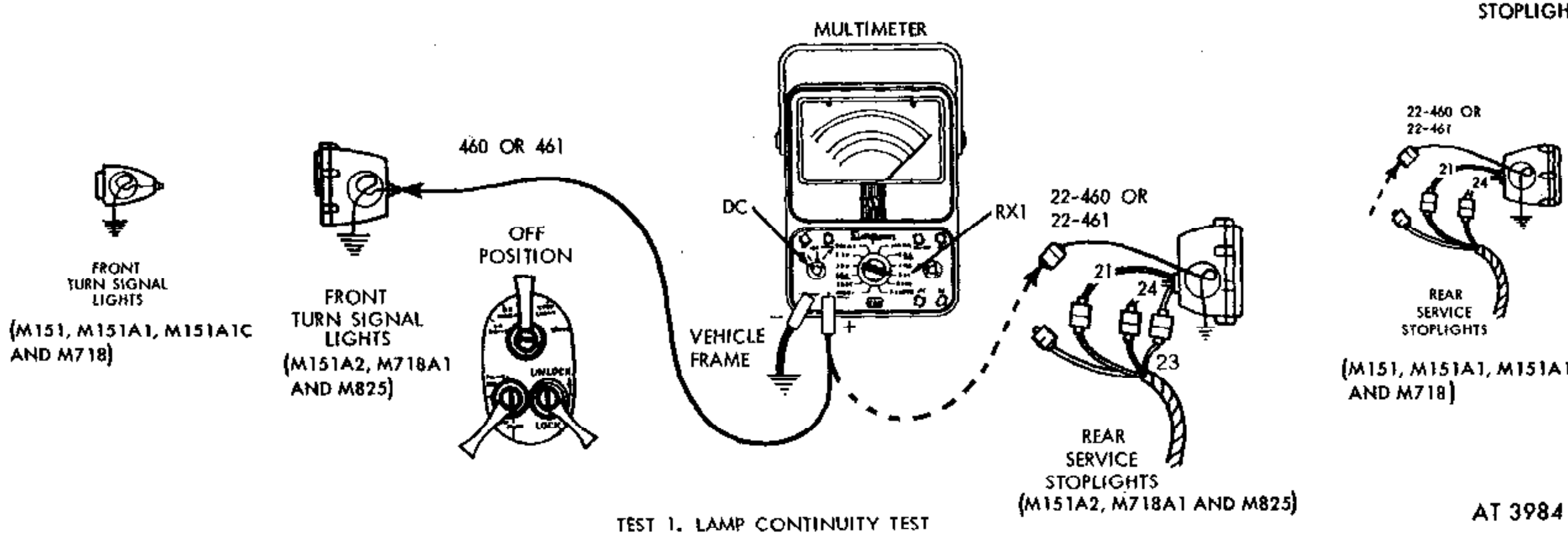
LIGHTING SYSTEM CIRCUIT (fig. 2-30)

Malfunction	Circuit	Test
		NOTE Electrical wire connection No. 77 shown in test 7 of figure 2-32 is for the electrical fuel pump. M151A2, M825, and M718A1 vehicles do not have this wire.
25. Stoplight inoperative (stoplight switch test).	75	Test 8. Perform stoplight switch voltage test. Move lighting switch to "STOPLIGHT" position. Disconnect connector from the stoplight switch located under the cowl panel on the bottom of the master cylinder assembly. Connect voltmeter as shown in figure 2-33, test 8. Check for voltage at one of the two No. 75 wires. If voltage is indicated, jumper that wire to one terminal of the stoplight switch. With brake pedal depressed, use positive voltmeter lead to check for voltage at exposed stoplight switch terminal. If 24 to 28 volts is indicated, stoplight switch is serviceable. If no reading is indicated at either of the two No. 75 wires, perform lighting switch connector voltage test (test 9) to determine if wiring harness is broken or if lighting switch is unserviceable. **NOTE** See figure 2-33 for an illustration of above test 8 procedures for the electro-mechanical stoplight switch on M151A2, M825, and M718A1 vehicles.
26. Lamps will not light (some lamps will not light).	15, 16, 19, 20, 21, 22 23, 40, 75, 460, 461	Test 9. Perform lighting switch connector voltage test. Remove lighting switch from dash panel and disconnect harness connector. Connect voltmeter between vehicle frame and socket (F) of lighting switch harness as shown in figure 2-33, test 9. If 24 to 28 volts is not indicated, check wiring harness circuits Nos. 5 and 16 from starter to lighting switch for broken wires or loose connections. If 24 to 28 volts is indicated on socket (F) of the connector, connect a jumper wire from (F) socket to socket of faulty circuit. If lamps light with jumper wire connected, replace lighting switch. If some lamps do not light with jumper wire connected, check wiring harness from lighting switch to inoperative light or rear harness connector for broken wire.

	DIRECTIONAL SIGNAL SYSTEM CIRCUIT (fig. 2-34)
DESCRIPTION:	Two types of directional signals are in use on these vehicles. Early production vehicles are equipped with a mechanical system, and later production vehicles use a solid state (transistorized) system. The mechanical system is considered obsolete and will not be covered in detail in this manual. The solid state system consists of a directional signal control assembly (mounted on the steering column), a flasher unit, connecting cables, and four lamps. The two front lamps are individual units. The rear lamps are combined with the service stoplights. The system is energized by setting the light switch to "STOPLIGHT" position, which supplies 24 volts via wire 460-461 to terminal "G" of the directional signal control unit. Moving the control unit lever to indicate a left turn connects terminal "G" to terminal "F" and supplies 24 volts to the flasher unit. At the same time, it connects the output of the flasher to the left front trun indicator light and the left rear stoplight, and activates the control unit indicator lamp. The hydraulic stoplight switch is also disconnected from the left rear stoplight to prevent it from overriding the flasher unit. The right rear stoplight remains connected to the hydraulic stoplight switch and operates normally when the brakes are applied. Moving the directional signal control lever to indicate a right turn causes the same action to occur on the right hand side of the vehicle. Moving the directional signal control lever to "FLARE" position connects all four lights (the two front turn indicators and the two stoplights) to the output of the flasher unit and disconnects hydraulic stoplight switch from both stoplights. An overall test of the system is to perform all functions of the directional signal control switch and observe the action of the lights as described above. Figure 2-34 shows a wiring diagram of the complete system circuit.



SOLID STATE DIRECTIONAL SIGNAL SYSTEM – WIRING DIAGRAM



TEST 1. LAMP CONTINUITY TEST

Figure 2-34. Directional signal system tests.

	DIRECTIONAL SIGNAL SYSTEM CIRCUIT (fig. 2-34)
DESCRIPTION Continued	(M151A2, M825, and M718A1): The solid state directional signal system on the above vehicles consists of a directional signal control assembly (mounted on vehicle's steering column), a flasher unit, the connecting cables, and the four signal lamps, two lamps at the front of the vehicle and two at the rear. Each front signal lamp is combined with a parking lamp and a blackout marker lamp to form one complete lighting unit. Each rear signal lamp is combined with a service taillight, a blackout marker lamp, and a blackout stoplight lamp into one complete lighting unit (fig. 2-34). In addition, the rear signal bulb functions as the service stoplight. The system is energized by setting the light switch to "STOPLIGHT" position which supplies 24 volts via No. 67 wire to terminal "G" of the directional control unit. Moving the control unit lever either up or down indicates either a right or left turn is being made, and activates the flasher unit and turn signal lamps at front and rear. At the same time, the stoplight switch on the side the turn is being made is disconnected so it will not override the flasher unit. But the stoplight switch on the opposite side of the vehicle is till connected, so this switch will activate the stoplight when the brake is applied and warn traffic in the rear that a vehicular stop is being made. Move the directional control unit lever into the "HAZARD WARNING" position connects all four directional lights (front and rear) to the output of the flasher unit and at the same time disconnects both the stoplight switches from both rear stoplight lamps. An overall test of the directional circuit system can be made by performing all the functions mentioned above with the control unit lever and observing what happens. **NOTE** If the vehicle is equipped with a mechanical flasher system, troubleshooting should be limited to a lamp check (test 1, below) and visual inspection for loose connections, poor ground, or frayed cables. If defects are found which cannot be corrected by minor repair, replace both mechanical units with the solid state flasher repair kit (see TM 9-2320-218-20P). Do not make a partial replacement; replace both mechanical flasher units with the complete solid state kit.

Malfunction	Circuit	Test
27. Individual lamps do not light with directional signal control lever in any position.	460, 461 22-460, 22-461	Test 1. Perform lamp continuity test. Set main light switch to "STOPLIGHT" Position. Try all positions of directional signal control lever, and observe which lights do not light in any position of the lever. Have assistant depress brake pedal and observe stoplights. If stoplights light, rear lamps are operational. If stoplights do not light, or if front turn indicators do not light in any position of the control lever, turn light switch to "OFF" and disconnect connector 460, 461, 22-460 or 22-461, as required (fig. 2-34). Set up multimeter for continuity test (fig. 2-13). Touch red lead to connector on light, as shown in figure 2-34, test 1. If the meter needle deflects to approximately 5 ohms, the lamp is normal and the trouble is elsewhere. If the meter does not deflect at all (infinity reading) replace lamp with a known good one, and retest. If meter still shows infinity or considerably more than 5 ohms, touch red test lead to the lamp housing, making sure to scrape through the paint to the bare metal. If the meter does not deflect completely to zero ohms, inspect the ground connection, removing the ground wire and scraping all metal surfaces bright, and reconnect. When light has been restored to 5 ohms, reconnect the connector and test the directional system again. If trouble still exists, perform wire harness tests.
	460, 461, 22-460, 22-461	Test 2. Perform wiring harness voltage test. Set up multimeter for dc voltage tests (see fig. 2-11). Disconnect connectors 460, 461, 22-460 or 22-461, as required (see diagram, fig. 2-34). Set main light switch to "STOPLIGHT" position, and directional signal control lever to "FLARE" position. Connect multimeter as shown in figure 2-35, test 2. Touch red test lead to center contact of cable connector on wiring harness. The voltmeter needle should defect past 24 volts at a rate of 1 to 2 per second. If meter does not deflect, or deflects much less than 24 volts, leave connector disconnected from light and perform wiring harness continuity test. **NOTE** Before starting test 2 procedures on M151A2, M825, and M718A1 vehicles, set directional control lever to "HAZARD WARNING" position. Connect multimeter as shown in figure 2-35, test 2. Disregard wiring for parking and blackout marker lamps (wires No. 20 and No. 491), and test only front directional signal wires No. 460 and / or No. 461 as indicated in figure 2-35. Proceed with test 2. Figures 2-36 and 2-37 also illustrate the new directional turn signal design on M151A2, M825, and M718A1 models.

Table 2-4. Electrical Troubleshooting—Continued

DIRECTIONAL SIGNAL SYSTEM CIRCUIT (fig. 2-34)

Malfunction	Circuit	Test
27. Individual lamps do not light with directional signal control lever in any position—Continued	460, 461 22-460 22-461	Test 3. Perform wiring harness continuity test. Set up multimeter for continuity test (fig. 2-13). Set main light switch to "OFF". Connect the black test lead to the vehicle frame near the control unit. Remove the cable connector from the control unit. Touch the red test lead to a socket in the cable connector to correspond with the defective circuit. The meter needle should not deflect (infinite reading). If there is any deflection, the wiring harness has a short circuit, or a high resistance leakage. Inspect the harness for frayed or pinched cables, and make repairs. If infinity is indicated on the meter, connect a jumper wire from the vehicle frame to the cable connector at the light, as shown in figure 2-35, test 3. Touch the red test lead to the appropriate socket terminal in the cable connector at the control unit. The meter needle should deflect fully, showing zero ohms. If less than full deflection, inspect the wiring harness for breaks, frayed wires, corroded connections, etc., and make necessary repairs. When all lamps and wiring harness have continuity restored, and system still does not operate, perform flasher and control unit tests.

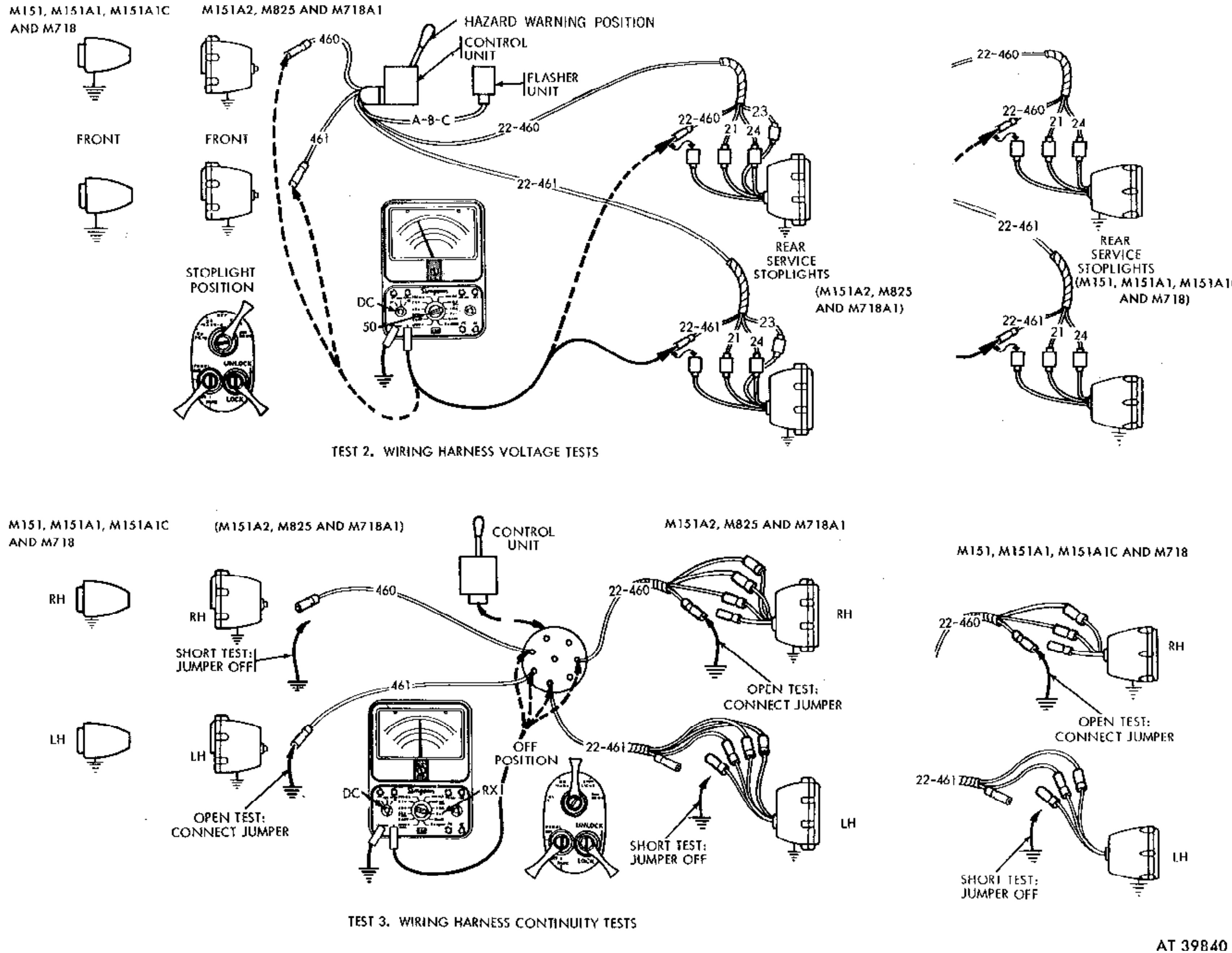
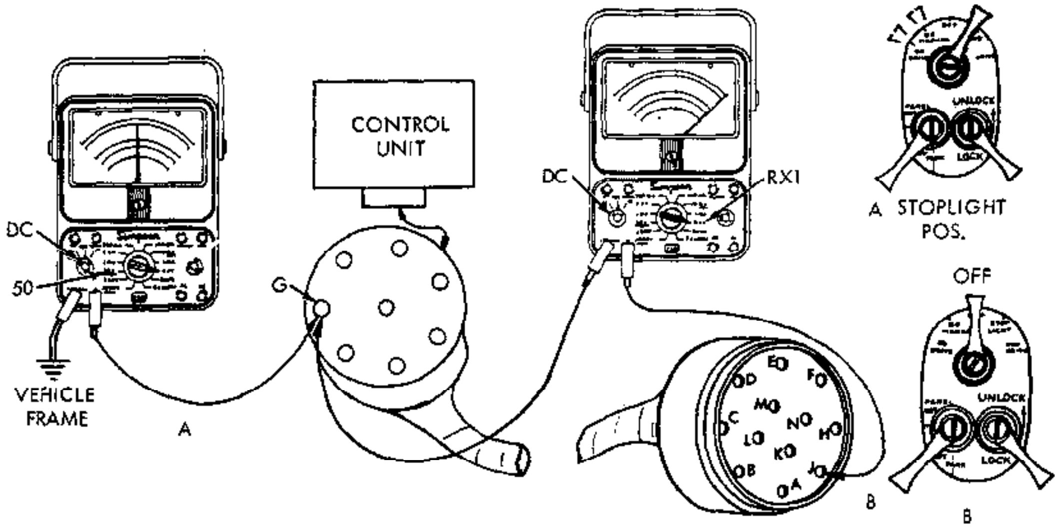


Figure 2-35. Directional signal system tests.

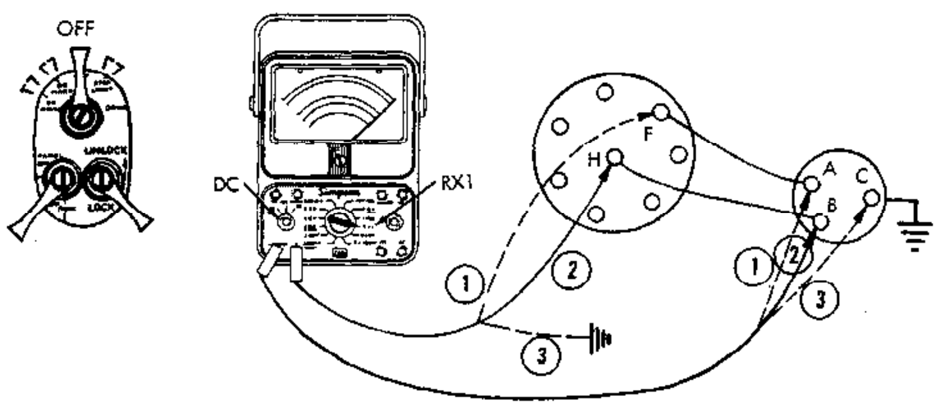
Table 2-4. Electrical Troubleshooting—Continued

DIRECTIONAL SIGNAL SYSTEM CIRCUIT (fig. 2-34)

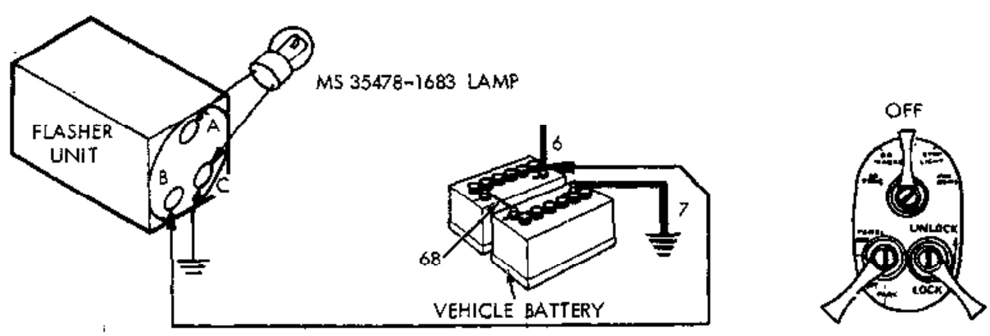
Malfunction	Circuit	Test
28. No lights operate with directional signal control lever in any position.	460, 461	Test 4. Perform directional signal control unit voltage feed test. Set up the multimeter for dc voltage test (fig. 2-11). Remove the cable connector from the directional signal control unit. Set the main light switch to "STOPLIGHT" position. Measure the voltage from the vehicle frame to terminal "G" of the cable connector on the wiring harness, as shown in figure 2-36, test 4. The meter needle should indicate 24 volts. If less or none, remove the cable connector from the light switch and perform a continuity test from contact "G" on the control unit end to contact "J" at the light switch end. If continuity is satisfactory, the light switch is defective. When 24 volts has been restored to contact "G" of the directional control unit cable connector, and the system still does not operate, perform the flasher cable continuity test.
	A, B, C	Test 5. Flasher unit cable continuity test. Set up the multimeter for continuity (fig. 2-13). Remove the cable connector from the flasher unit. Remove the cable connector from the control unit. Measure continuity between the cable wires as shown in figure 2-36, test 5. If any wire does not have continuity, inspect and make necessary repairs. If all three wires have continuity, perform the flasher operational test.



TEST 4. CONTROL UNIT VOLTAGE FEED TEST.



TEST 5. FLASHER UNIT CABLE CONTINUITY TEST.



TEST 6. FLASHER OPERATIONAL TEST

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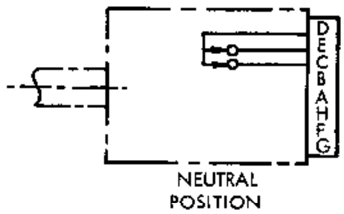
Figure 2-36. Directional signal system tests.

DIRECTIONAL SIGNAL SYSTEM CIRCUIT (figure 2-34)

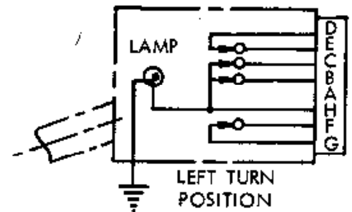
Malfunction	Circuit	Test
		NOTE It may be necessary to remove the flasher from the vehicle to make the following test.
29. Flashes erratically, no flash, or very slow flash.	A, B, C	Test 6. Perform the flasher operational test. Disconnect the cable connector from the flasher. Connect a source of positive 24 volts to terminal "B" of the flasher socket. (If the voltage is inadvertently reversed to the flasher, it will not operate. However, the flasher will not be harmed due to built-in reversal protection.) Connect one lamp type MS-35478-1683 between contact "A" and "C". Connect contact "C" to negative 24 volts, as shown in figure 2-36, test 6. The flasher should flash at a rate of 60 to 120 flashes per minute, at a regular rate without skipping. If it does not flash, or flashes irregularly, replace the entire flasher unit with a known good one. If the flasher tests satisfactory, perform control unit bench test.
30. System operates incorrectly in one or more positions of the directional signal control lever (all lights and wiring harness test satisfactory).	22, 22-460, 22-461, 460, 461, 75	**NOTE** It may be necessary to remove the directional signal control unit from the vehicle to perform the following test. Test 7. Perform the directional signal control unit continuity test. Set up the multimeter for continuity tests (fig. 2-13). Remove the cable connector from the control unit, and if necessary, remove the control unit from the vehicle. Set the control lever in all four operating positions and make tests as shown in figure 2-37, test 7. If any circuit does not test as shown in the tables, replace the control unit with a known good one.

SCHEMATIC DIAGRAM	FROM PIN:	TO PIN:	INDICATION



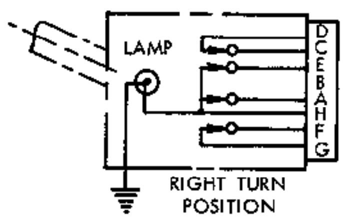
FROM PIN:	TO PIN:	INDICATION
H	A	OPEN
H	B	OPEN
H	C	OPEN
H	E	OPEN
D	C	SHORTED
D	E	SHORTED
F	G	OPEN

A. DIRECTIONAL SIGNAL CONTROL LEVER IN "NEUTRAL" POSITION



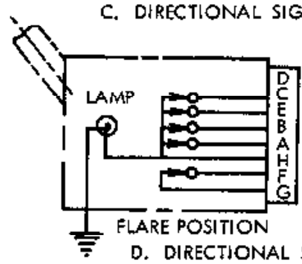
FROM PIN:	TO PIN:	INDICATION
H	B	SHORTED
H	C	SHORTED
H	A	OPEN
H	E	OPEN
F	G	SHORTED
D	E	SHORTED
D	C	OPEN

B. DIRECTIONAL SIGNAL CONTROL LEVER IN "LEFT TURN" POSITION



FROM PIN:	TO PIN:	INDICATION
F	G	SHORTED
H	A	SHORTED
H	E	SHORTED
H	B	OPEN
H	C	OPEN
D	C	SHORTED
D	E	OPEN

C. DIRECTIONAL SIGNAL CONTROL LEVER IN "RIGHT TURN" POSITION



FROM PIN:	TO PIN:	INDICATION
H	A	SHORTED
H	B	SHORTED
H	C	SHORTED
H	E	SHORTED
D	E	OPEN
D	C	OPEN
F	G	SHORTED

D. DIRECTIONAL SIGNAL CONTROL LEVER IN "FLARE: POSITION

TEST 7. DIRECTIONAL SIGNAL CONTROL UNIT CONTINUITY TESTS

AT 39839

Figure 2-37. Directional signal system tests.

	INSTRUMENTS, GAGES AND HORN SYSTEM CIRCUITS (fig. 2-38)
DESCRIPTION:	The battery-generator indicator, fuel level gage, temperature indicator, oil pressure indicator, headlight beam indicator and panel lights are mounted in the instrument panel. The fuel level sending unit is mounted in the top of the fuel tank and activates fuel level gage. The oil pressure sending unit and fuel pump safety switch (oil pressure safety switch) are located at the oil filter mounting base (M151A2, M825, and M718A1 vehicles have no fuel pump safety switch). The temperature sending unit is located on the rear of the engine block. The horn switch is located in the steering wheel hub and activates the horn, mounted on the engine compartment firewall. The instrument panel is energized by turning the ignition switch to "ON" position. This energizes circuit 27 from circuits 6, 5 and 11. Circuit 27 goes through a circuit breaker and then to the instrument panel, where it supplies 24 volts battery voltage for the various instrument and gage circuits. The temperature indicator system starts at the vehicle frame, through the temperature sending unit, via circuit 33 through the temperature indicator, to circuit 27. The oil pressure system starts at the vehicle frame, through the oil pressure sending unit, via circuit 36, through the oil pressure indicator, to circuit 27. The fuel level indicator system starts at the vehicle frame, through the fuel level sending unit, via circuit 28, through the fuel level indicator, to circuit 27. The battery-generator indicator is connected from the instrument panel ground via circuit 27B to circuit 27, thus putting it directly across the 24-volt battery supply to the instrument panel. The instrument panel lamps are connected from the instrument panel ground via circuit 40 to the main light switch. The high beam indicator lamp is connected from the instrument panel ground via circuit 17 to the high beam terminal of the dimmer switch. The horn is energized via circuit 5, 25 through a circuit breaker, through ~~the horn~~ assembly, through the horn button, to the vehicle frame.

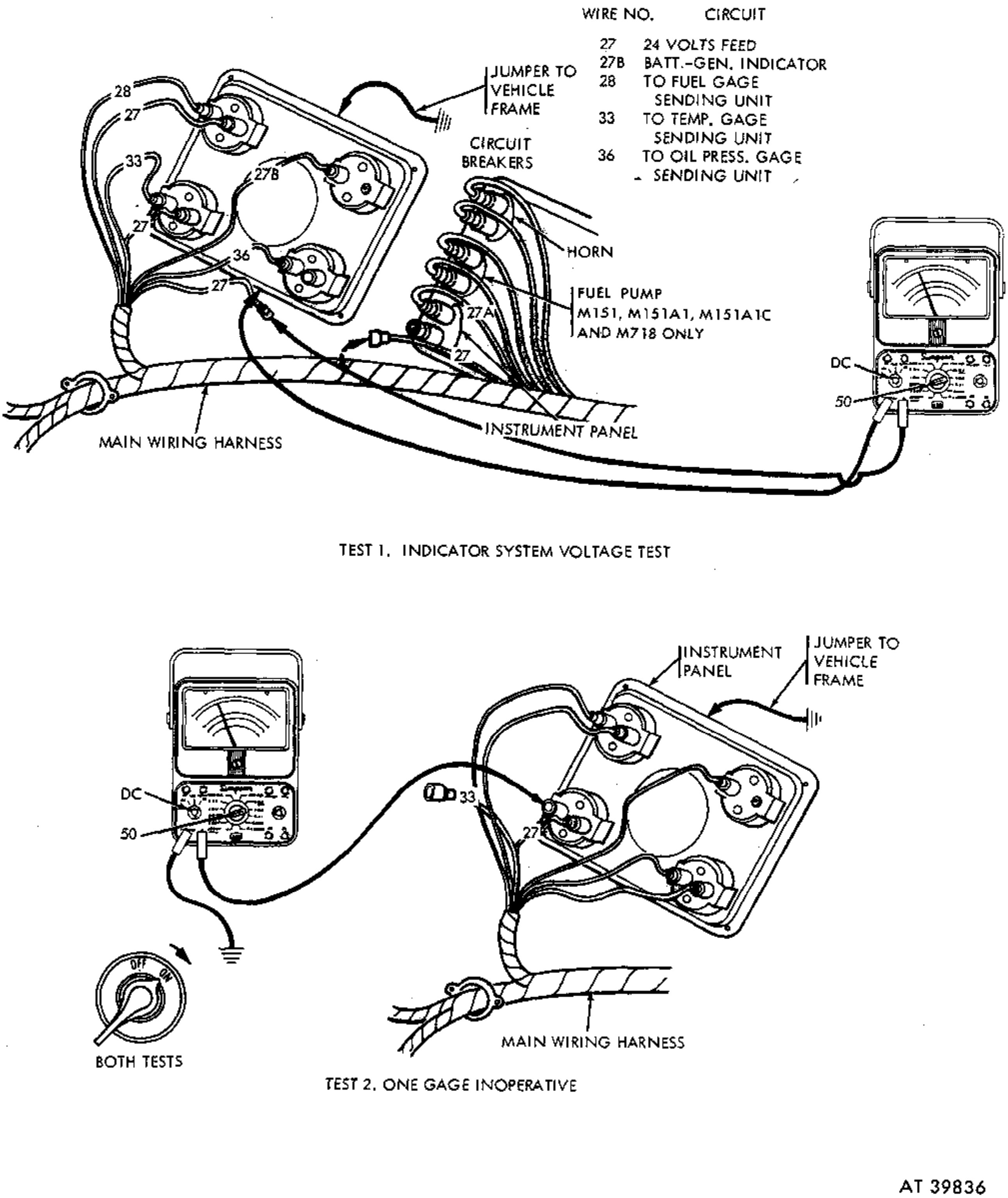
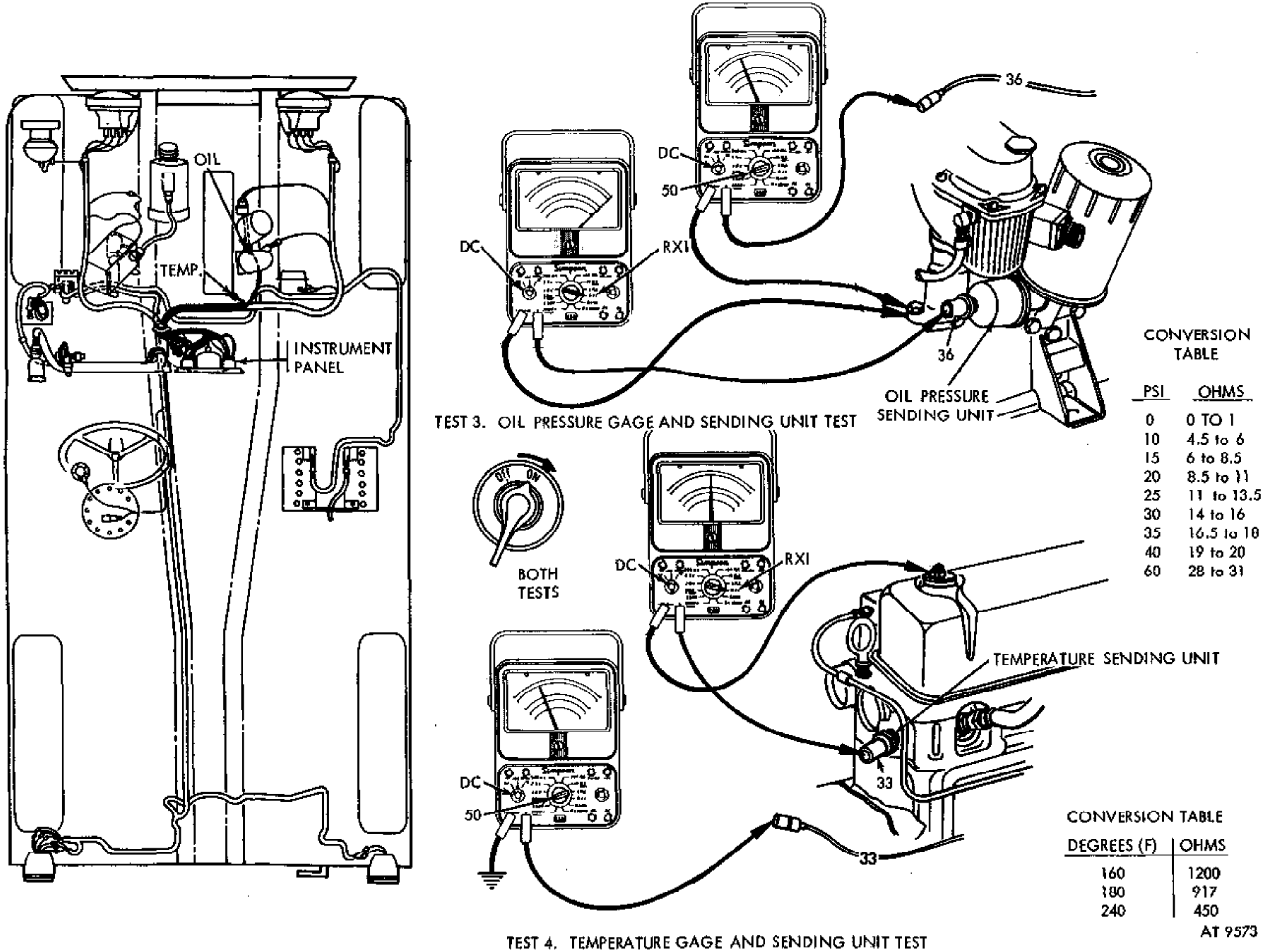


Figure 2-38. Instruments, gages and horn system tests.

INSTRUMENTS. GAGES AND HORN SYSTEM CIRCUITS (fig. 2-38)

Malfunction	Circuit	Test
		NOTE When instrument panel is removed from dash panel, connect a jumper wire from instrument panel to vehicle frame to provide a return circuit for the indicator lights and the gage actuators.
31. All gages inoperative.	27, 28, 33, 36	Test 1. Perform indicator system voltage test. Remove and ground instrument panel. Disconnect No. 27 wire at instrument. Turn ignition switch to "ON" position. Set up multimeter for voltage tests (fig. 2-11) and connect voltmeter as shown in figure 2-38, test 1. If 24 volts is not indicated, test No. 27 wire at instrument panel circuit breaker. If voltage is indicated, check for loose connection or faulty circuit breaker. If no reading is indicated at No. 27 wire to circuit breaker, remove No. 27 wire from ignition switch. Connect meter to exposed pin of ignition switch. If voltage is indicated, check wiring harness between ignition switch and circuit breaker for loose connection or open circuit. Repair or replace if required. If voltage is not indicated at exposed pin, remove No. 11 wire from ignition switch and place probe on wire. If voltage is present, replace ignition switch. If voltage is not present, check main wiring harness for open circuit or loose connection.
32. One gage inoperative.	27, 28, 33, 36	Test 2. Perform individual gage voltage test. remove wire and connector from inoperative gage. Set up multimeter for voltage tests (fig. 2-11) and connect voltmeter negative lead to vehicle frame. Connect voltmeter positive lead to terminal of gage, as shown in figure 2-38, test 2. Turn ignition to "ON" position and observe reading. If reading is 3 to 4 volts for fuel level gage and oil pressure gage circuit of 24 volts for temperature gage, perform sending unit resistance test. If no reading is indicated, check gage wire and connector for breaks or loose connections. If satisfactory, gage is faulty. **NOTE** Test 2 is useful for troubleshooting only a completely inoperative gage. For a complete test procedure, including accuracy tests, refer to TB 9-2300-228-20 and TB ORD 434.
33. Oil pressure gage inoperative (sending unit test).	36	Test 3. Perform oil-pressure sending-unit resistance test. Disconnect No. 36 wire from oil pressure sending unit. Set up multimeter for resistance tests (fig. 2-12) and connect it as shown in fig. 2-39, test 3. Start and operate engine at high idle speed. Ohmmeter reading should be less than 1 ohm before engine is started, and rise to about 6 to 10 ohms for normal oil pressures. Refer to conversion table in test 3, for a conversion of resistance values to pressures. If sending unit has more than 1 ohm resistance with engine "OFF" or considerably different resistances than shown in the table, sending unit is faulty. If resistance agrees with table, shut off engine and connect voltmeter to wire no. 36 as shown in figure 3-29, test 3. Turn on ignition switch. Voltage should read 0 to 2 volts. If less, or no voltage, check main wiring harness (wire No. 36) for open circuit or loose connection. If more, perform test 2, above, to check for faulty gage.



CONVERSION TABLE

PSI	OHMS
0	0 TO 1
10	4.5 to 6
15	6 to 8.5
20	8.5 to 11
25	11 to 13.5
30	14 to 16
35	16.5 to 18
40	19 to 20
60	28 to 31

CONVERSION TABLE

DEGREES (F)	OHMS
160	1200
180	917
240	450

Figure 2-39. Instruments, gages and horn system tests.

INSTRUMENTS, GAGES AND HORN SYSTEM CIRCUITS (fig. 2-38)

Malfunction	Circuit	Test
34. Temperature gage inoperative (sending unit test).	33	Test 4. Perform temperature sending unit resistance test. Remove radiator filler cap and insert a test thermometer into coolant. Start and operate engine until thermometer temperature is stable. Disconnect No. 33 wire from temperature sending unit. Set up multimeter for resistance tests (fig. 2-12) and connect it as shown in figure 2-39, test 4. Refer the ohmmeter reading to the conversion table in test r, and compare the temperature to the test thermometer reading. Stop the engine and observe the ohmmeter reading as the radiator cools. The resistance should increase as the engine cools off, to a maximum of approximately 3000 ohms, depending on adjacent air temperature. If hot resistance differs considerably, sending unit is faulty. If resistance agrees with table, connect voltmeter to No. 33 wire as shown in figure 2-39, test 4. Turn on ignition switch. Voltage should read 24 volts. If much less, or no voltage, check main wiring harness (wire no. 33) for open circuit or loose connections. **CAUTION** Be very careful when making electrical tests near the fuel tank. When components are removed, cover the tank opening with tape and make electrical tests as far from this area as possible.
35. Fuel level gage inoperative (sending unit test).	28	Test 5. Perform fuel level sending unit test. Remove sending unit from fuel tank. Set up multimeter for resistance test (fig. 2-12) and connect as shown in figure 2-40, test 5. Move sending unit float from bottom to top. An uneven increase in resistance or erratic meter needle movement indicates the fuel level sending unit is faulty. If the resistance increases smoothly from 0 to 30 ohms, the sending unit is serviceable. Set up multimeter for voltage readings (fig. 2-11) and connect to No. 28 wire as shown in figure 2-40, test 5. Turn on ignition switch. Voltage should read 0 to 2 volts. If less or no voltage, check main wiring harness for open circuit or loose connections. If voltage is considerably more than 2 volts, perform test 2, above, to check for faulty gage.
36. Battery-generator indicator inoperative.	27	Test 6. Perform battery-generator indicator voltage test. Set up multimeter for voltage tests (fig. 2-11). Test battery for normal voltage. Remove instrument panel and connect it to the vehicle frame with a jumper wire. Disconnect No. 27 B wire from indicator and connect voltmeter as shown in figure 2-40, test 6. Turn on ignition switch. If 24 volts is indicated, check other indicator terminal and metal case of indicator for proper grounding to instrument panel. If grounding is satisfactory, battery-generator indicator is faulty. If No. 27 B wire shows less than battery voltage, check wiring harness wire No. 27 B from indicator to junction with No. 27 wire for loose or corroded connections or broken wires.

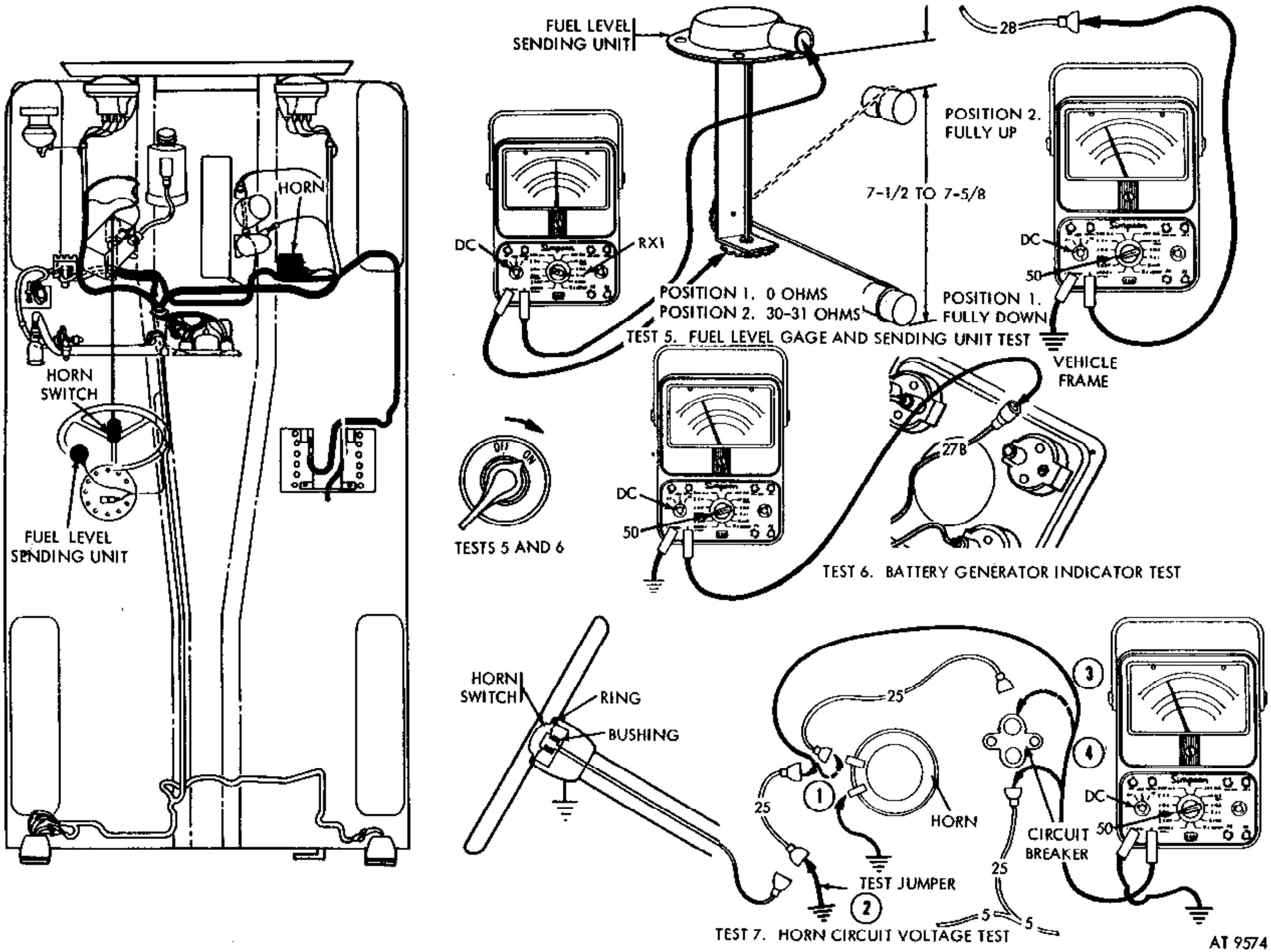


Figure 2-40. Instruments, gages and horn system tests.

INSTRUMENTS, GAGES AND HORN SYSTEM CIRCUITS (*fig. 2-38*)

Malfunction	Circuit	Test
37. Horn inoperative	25	Test 7. Perform horn circuit voltage test. Disconnect the two No. 25 wires from the horn. Set up the multimeter for voltage tests (fig. 2-11) and connect as shown in figure 2-40, test 7. Test both No. 25 wires for voltage. One wire should read zero volts, and the other should read 24 volts. If 24 volts is indicated on one No. 25 wire at horn, connect this wire to horn and jumper other horn terminal to vehicle frame. If horn does not operate, it is faulty. If horn operates, remove jumper and connect both wires to horn. Disconnect No. 25 wire at horn button wire leading from steering gear housing. Ground No. 25 wire that goes to wiring harness; if horn operates, check horn switch assembly in the steering wheel. In the initial test, if neither one of the No. 25 wires showed 24 volts, test the No. 25 terminal at the circuit breaker board mounted under the dash panel to the left of the steering column. If 24 volts appears here, inspect the No. 25 wire to the horn for breaks or loose connections. If no voltage appears at the circuit breaker terminal, test the other terminal of the circuit breaker. If 24 volts is indicated, the circuit breaker is faulty. If no voltage appears at this point, check the main wiring harness for broken wires or loose connections.

FUEL PUMP SYSTEM CIRCUIT (fig. 2-41)

DESCRIPTION:	The fuel pump system electrical components consist of a 24-volt, electric plunger-type fuel pump connected through a fuel pump safety switch actuated by engine oil pressure. When the engine has no low oil pressure, the safety switch connects the fuel pump in parallel with the starter. As the engine is started, the pump is energized as long as the starter switch is depressed. After the engine starts, and oil pressure builds up, the safety switch is connected to the ignition circuit and the pump will operate as long as the ignition switch is "ON". If oil pressure is reduced below the switch actuation level, the safety switch disconnects the fuel pump from the ignition circuit and the engine will stop when the residual fuel in the carburetor is consumed. Refer to figure 2-41 which shows a schematic diagram of the components.

Malfunction	Circuit	Test
		CAUTION Be very careful when making electrical tests near the fuel tank. When components are removed, cover the tank opening with tape and make electrical tests as far from this area as possible. **NOTE** The M151A2, M825, and M718A1 vehicles have a mechanical fuel pump which requires no electrical troubleshooting.
38. Fuel pump does not operate.	77	Test 1. Perform fuel pump voltage test. Disconnect wire No. 77 at the fuel pump. Set up the multimeter for voltage tests (fig. 2-11). Connect the voltmeter negative lead to the vehicle frame and the positive lead to the connector on wire No. 77, as shown in figure 2-41, test 1. With the ignition switch "OFF", depress the starter switch and crank the engine. The meter needle should indicate 24 volts. If not or low voltage is indicated, perform the fuel pump safety switch test.

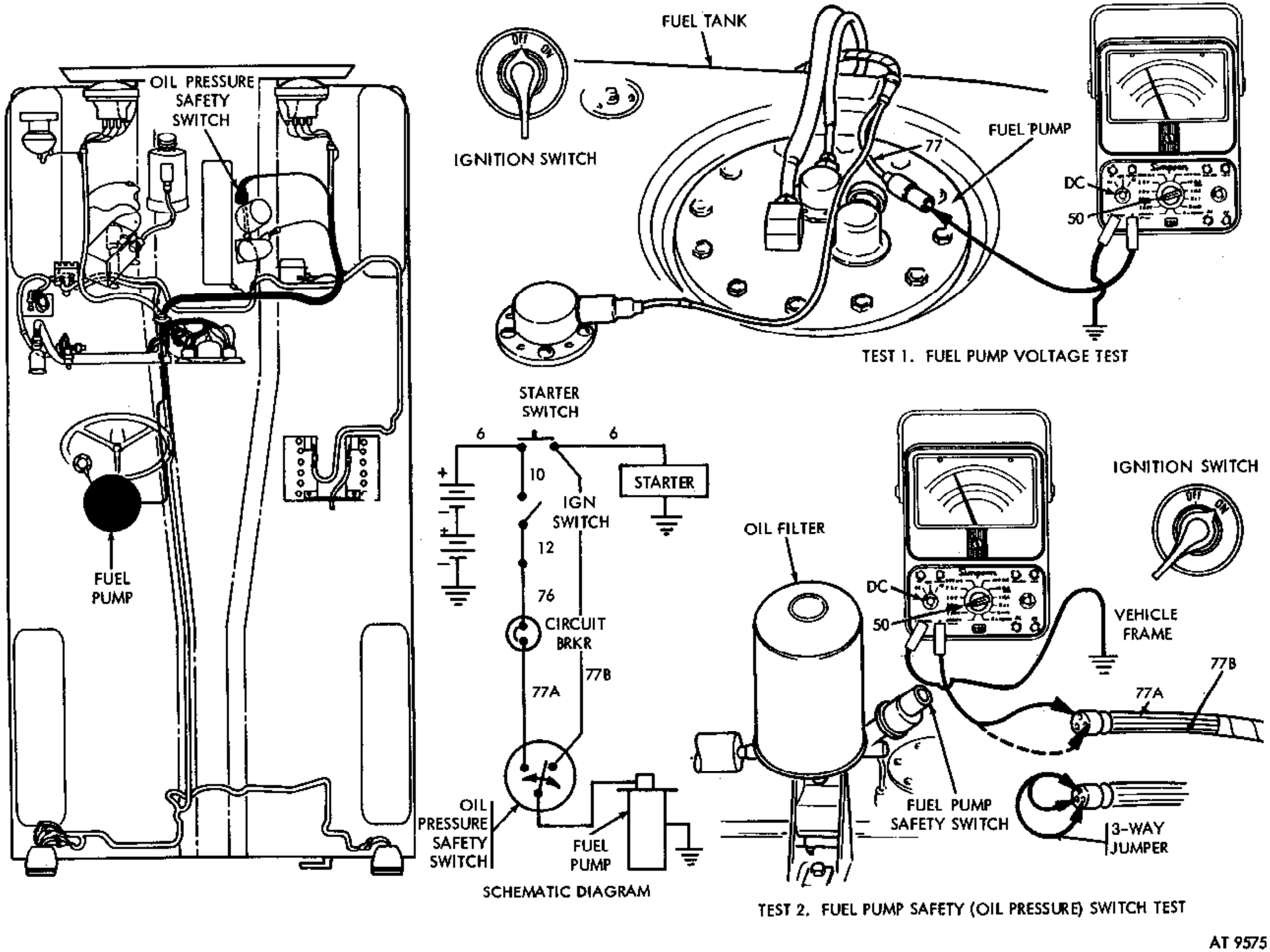


Figure 2-41. Fuel pum   m tests (M151, M151A1, M151A1C and M718 only).

FUEL PUMP SYSTEM CIRCUIT (fig. 2-41)

Malfunction	Circuit	Test
38. Fuel pump does not operate—Continued	77, 77A, 77B	Test 2. Perform the fuel pump safety switch voltage test. Set up the multimeter for voltage tests (fig. 2-11). Disconnect the connector at the safety switch. Connect the black voltmeter lead to the vehicle frame and the red one to terminal 77 A in the connector. Turn the ignition switch to "ON". The meter needle should indicate 24 volts. If it does not, test for voltage at the input (wire No. 76) and the output (wire No. 77A) of the circuit breaker. (This circuit breaker is located under the dash panel at the left side of the instrument panel; it is the center breaker of the group of three. If voltage is indicated at the input and not the output of the circuit breaker, the circuit breaker is defective. If no voltage is indicated at either position, check the connections at the ignition switch for breaks or loose connections. When voltage is restored to terminal 77A at the safety switch, and the fuel pump still does not operate, connect the red voltmeter lead to terminal 77B in the connector, and have an assistant depress the starter switch. If the meter does not indicate 24 volts, inspect wire 77B for breaks or loose connections and make repairs if necessary. If the meter indicates 24 volts at terminals 77B and 77A (with ignition switch "ON" and starter switch depressed) and the pump still does not operate, connect a jumper between all three terminals in the connector. If the fuel pump now operates, the safety switch is defective.

WINDSHIELD WIPER CIRCUIT, M151A2, M825, AND M718A1 (fig. 2-42)

DESCRIPTION: The two-speed windshield wiper system consists of the wiper assemblies connected by linkage to the electrical motor with an integrated control switch. The motor assembly, which includes an inherent circuit protector and gear box, is mounted directly in front of the steering column and directional signal controls. Wiper actuation and speed are controlled from the 3-position switch (OFF-LO-HI) mounted to the wiper motor and bracket assembly. When actuated, the two wiper blades operate in unison forming the same sweeping pattern across the windshield. When switch is returned to OFF position, the wiper assemblies automatically return to their down, nonoperating position.

Malfunction	Circuit	Test
39. Inoperative in either speed position.	71	Test 1. Perform a visual inspection. Inspect control switch; motor terminal connector and motor ground mounting.
	71	Test 2. Perform motor connector voltage test. Disconnect motor connector and connect mulitmeter as shown in figure 2-42, test 2. Turn ignition switch on. If 24 to 28 volts are indicated, check mechanical system for wiper and / or wiper bearing binding condition. If there is not mechanical friction, control switch and / or wiper motor is defective. Replace entire motor and bracket assembly. **NOTE** The motor incorporates an inherent circuit protector which may be tripped if motor is overheated. Perform the above test 2 with wiper motor at normal temperatures.
	71 5, 11, 27 71	Test 3. If 24 to 28 volts are not indicated, check ignition switch. Connect voltmeter as shown in figure 2-42, test 3 to circuit No. 27 on ignition switch. Connect a jumper wire from circuit No. 27 to circuit No. 11 (across switch). If 24 to 28 volts are indicated replace the ignition switch.
		Test 4. If 24 to 28 volts are still not registering, check out wiring harness circuits 5, 11, 27 and 71 from starter switch to instrument cluster for any broken or loose connections. Repair or replace harness as required.

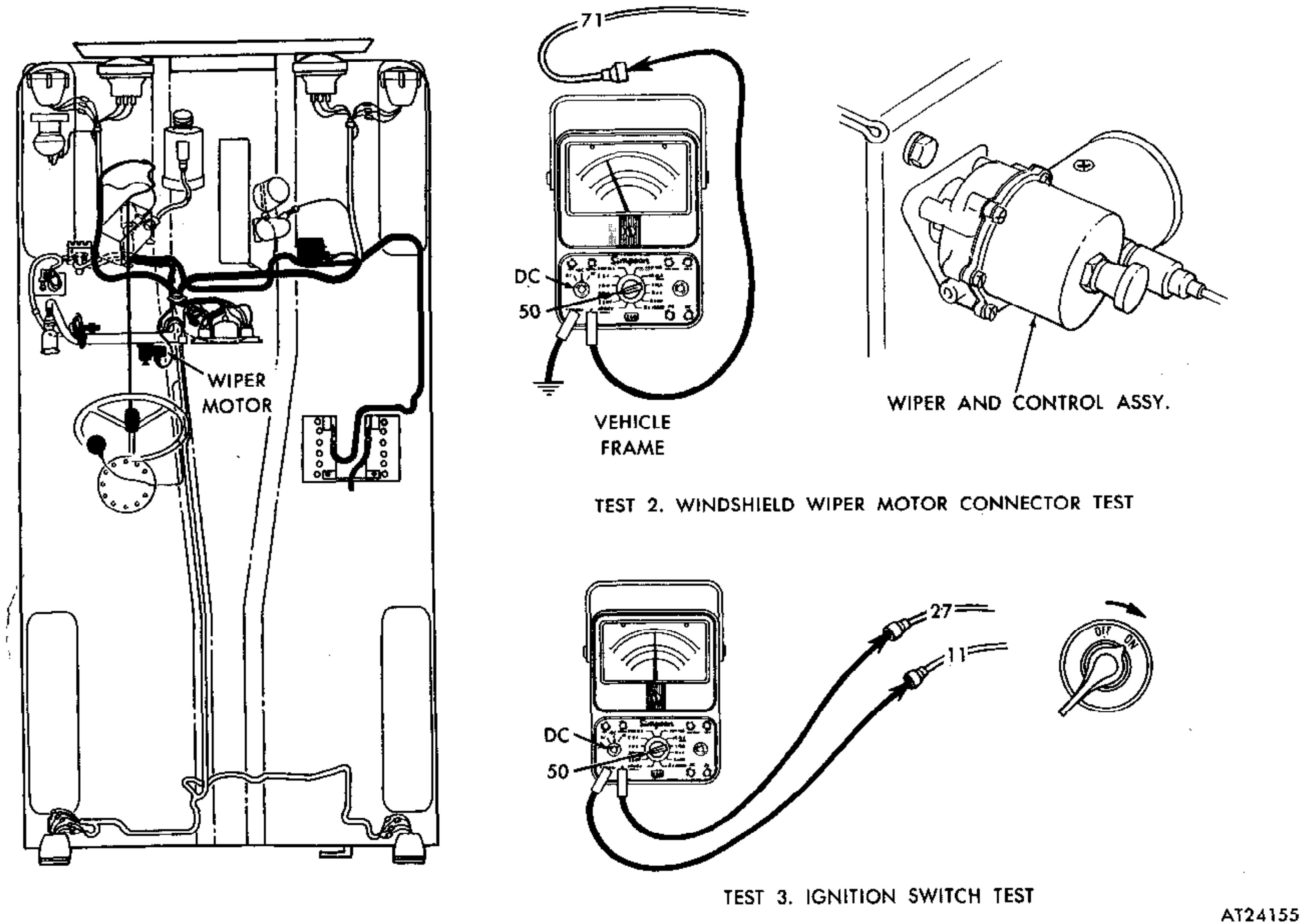


Figure 2-42. Windshield wiper system tests for M151A2, M825, and M718A1 Vehicles.

RADIO INTERFERENCE SUPPRESSION

GENERAL:	**NOTE** Figure 2-44 illustrates the wiring diagram and identifies the various electrical lines on M151A2, M825, and M718A1 Vehicles. Radio interference may arise from one or more sources on the vehicle. If not testing equipment is available for checking such sources, perform the checks described below progressively until interference has been eliminated, or notify support maintenance.

Malfunction	Probable Cause	Corrective Action
40. Radio interference.	*a.* Faulty spark plugs	*a.* Replace spark plugs (para 2-72).
	b. Faulty spark plug cables	*b.* Replace spark plug cables (para 2-72).
	c. Ground strap loose	*c.* Tighten ground strap.
	d. Faulty generator and/or generator regulator	*d.* Temporarily disengage fan and generator drive belts from generator pulley and start engine. If interference is eliminated when generator is not operating, replace generator (para 2-77) and/or generator regulator (para 2-78).
	e. Faulty ignition filter	*e.* Replace ignition capacitor (para 2-70).
	f. Faulty ignition distributor rotor or cap	*f.* Replace ignition distributor rotor or cap if contacts show evidence of burning.

ELECTRICAL CIRCUIT NUMBERS FOR FIGURE 2-43

Circuit No.	Description
1	Generator field circuit
2	Generator armature circuit
3	Generator armature circuit
5	Battery to regulator and splice through starter switch terminal
6	Battery to starter circuit
7	Battery to ground
10	Battery feed to instrument panel
11	Ignition switch feed
12	Ignition switch to ignition coil and splice
15	Main light switch feed
16	Light switch to dimmer switch
17	Dimmer switch to headlamp—high beam
18	Dimmer switch to headlamp—low beam
19	Lighting switch to blackout driving lamp
20	Lighting switch to blackout marker lamps
21	Lighting switch to service taillamp
22	Lighting switch to directional signal control unit
22-460	Directional signal control unit to right rear service stoplight
22-461	Directional signal control unit to left rear service stoplight
23	Lighting switch to blackout stoplight
24	Lighting switch to blackout taillamp
24A-24B	Blackout taillamp to trailer receptacle
25	Horn, horn switch, horn circuit breaker
27	Instrument feed
27B	Battery-generator indicator
28	Fuel gage to sending unit
33	Water temp gage to sending unit
36	Oil pressure gage to sending unit

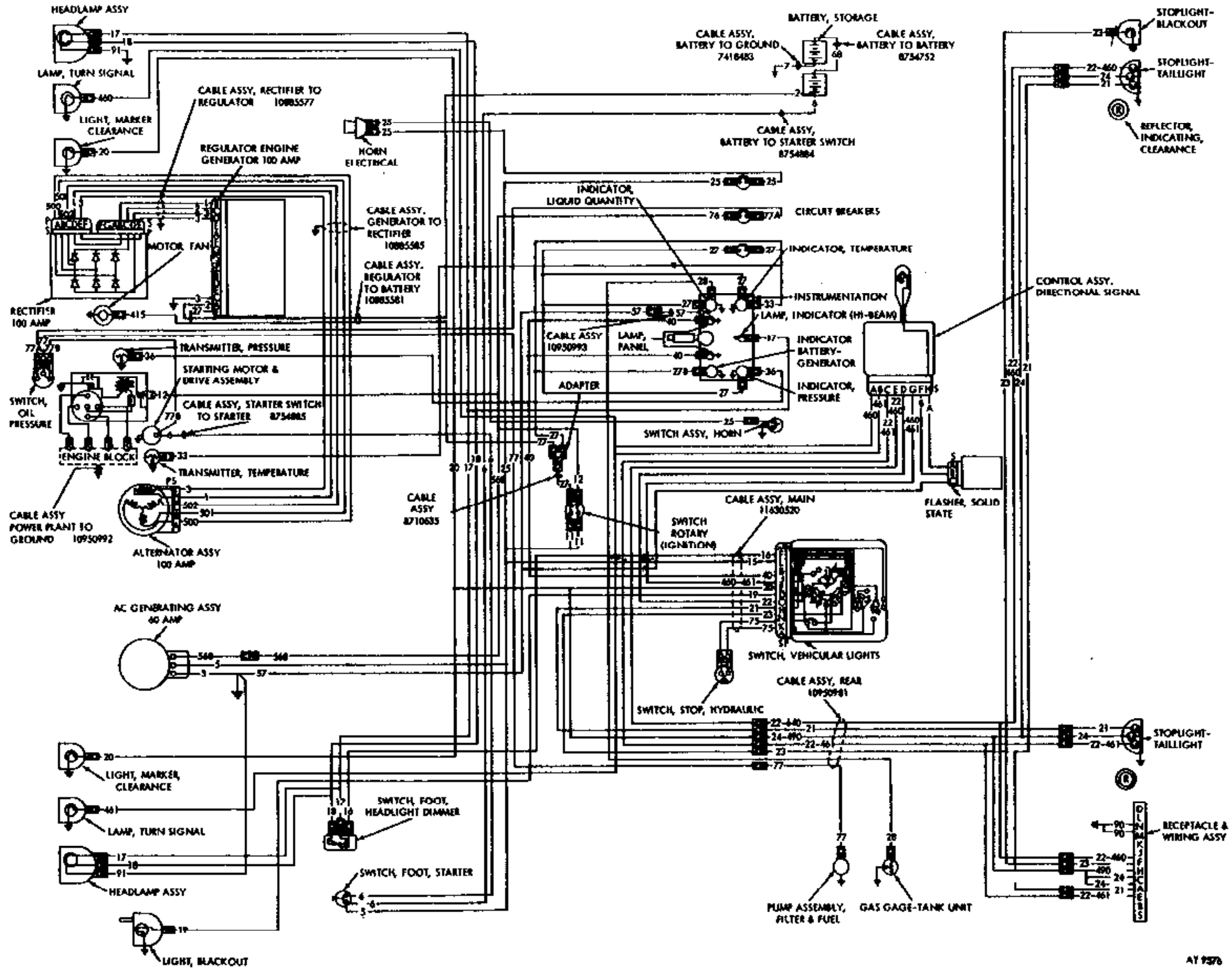


Figure 2-13. Vehicle wiring diagram and cable identification for M151, M151A1, M151A1C, and M718 vehicles.

ELECTRICAL CIRCUIT NUMBERS FOR FIGURE 2-43

Circuit No.	Description
40	Instrument lamp circuit
68	Battery interconnecting cables
75	Stoplight switch circuit
76	Fuel pump circuit feed
77	Fuel pump safety switch to fuel pump
77A	Circuit breaker to fuel pump safety switch
77B	Starter to fuel pump safety switch
90	Trailer receptacle to ground
91	Headlamp to ground
415	Rectifier ventilator fan, 100-ampere alternator
460	Turn signal light, right front
461	Turn signal light, left front
490	Clearance lamp blackout trailer feed
500	Alternator to rectifier, 100-ampere alternator
501	Alternator to rectifier, 100-ampere alternator
502	Alternator to rectifier, 100-ampere alternator
568	Ignition switch (via circuit 12) to 60-ampere alternator

Section VII. ENGINE DESCRIPTION AND MAINTENANCE (IN VEHICLE)

2-26. General

a. Description. The engine is four-cylinder, in-line, four-cycle, liquid-cooled, with overhead valves. Positive crankcase ventilation is provided through a closed system. All ignition system components are waterproof. Pressure lubrication, with a full-flow oil filter is provided by a gear-type oil pump. A built-in bypass in the top of the oil filter provides oil to the system in case the filter element becomes clogged.

b. Locational Terms. The fan end of the engine will be referred to as the "front", and the flywheel end as the "rear". The terms left and right respectively, refer to the engine as viewed from the rear. The crankshaft rotates in a counterclockwise direction when viewed from the rear of the engine. Cylinders are numbered from the front.

c. Engine Data. Refer to table 1-1 for complete engine data.

2-27. Operations Performed with Engine in Vehicle

Operations authorized to organizational maintenance personnel are to be performed with the engine installed in the vehicle. Refer to the maintenance allocation chart (app B) for the operations authorized to organizational maintenance. Refer to the manual index to locate appropriate paragraphs on engine components or accessories.

2-28. Cylinder Compression Test

a. Start engine and run for a minimum of 1/2 hour at 1200 rpm. Turn ignition switch off.

NOTE

Before making this test, valve stem to rocker arm clearance must be adjusted to 0.015 inch.

b. Remove spark plugs.

c. Pull the throttle control out to side open position. Make sure the choke control is pushed in all the way against the instrument panel.

d. Insert compression gage (fig. 2-45) into the spark plug holes, beginning with No. 1 cylinder, and crank engine with the starter. Record the highest compression reading from each cylinder on DA Form 2404.

e. Repeat test on each cylinder, cranking the engine the same number of times for each cylinder as was required to obtain the highest reading on the No. 1 cylinder.

f. Compare the compression pressures of the cylinders. The indicated compression pressures are considered normal if the lowest reading cylinder is within 25 psig of the highest with a minimum allowable pressure of 85 psig. A low compression reading on two adjacent cylinders indicates the possibility of a leak from one cylinder to the other at the cylinder head gasket. The leakage may be caused by improperly tightened cylinder head bolts or a faulty cylinder head gasket. Tighten the cylinder head bolts to a torque of 60-65 lb-ft in the sequence shown in figure 2-46. Adjust valve to rocker arm clearance and check cylinder compression again. If compression is still low on adjacent cylinders, there may be leakage because of a faulty cylinder head gasket. If leakage is present, install new cylinder head gasket.

g. If compression readings are uniformly low, the low compression may be due either to leakage at the valves or piston rings, or incorrect valve timing. Refer to support maintenance.

h. If compression pressures of cylinders vary more than 25 psig between the lowest or the highest, or are lower than 85 psig (after corrections indicated by the vacuum test have been made), notify support maintenance.

i. After completing compression test, adjust and install spark plugs.

j. Remove rocker arm cover.

NOTE

After cylinder head bolts are tightened, valve stem to rocker arm clearance must be adjusted 0.015 inch.

2-29. Manifold Vacuum Test

a. Remove the pipe plug installed in the top rear of the intake manifold. Insert adapter on end of vacuum gage hose (fig. 2-47). Be sure all connections are tight, as even a slight leak will result in a false reading.

b. Start engine and run at idling speed until minimum operating temperature (160° F.) is reached. Check carburetor adjustments (para. 2-44 or 2-45).

c. With the engine idling at 600 rpm, vacuum gage should show a steady reading of from 17 to 21 inches of mercury. As a further check, open and close the throttle quickly. If the engine is in good condition, vacuum should drop to 2 inches at wide open throttle and quickly return to approximately 25 inches at closed throttle. If this action is not obtained, worn piston rings, improper intake valve seating, or an abnormal restriction in the carburetor, air cleaner, or exhaust system is indicated.

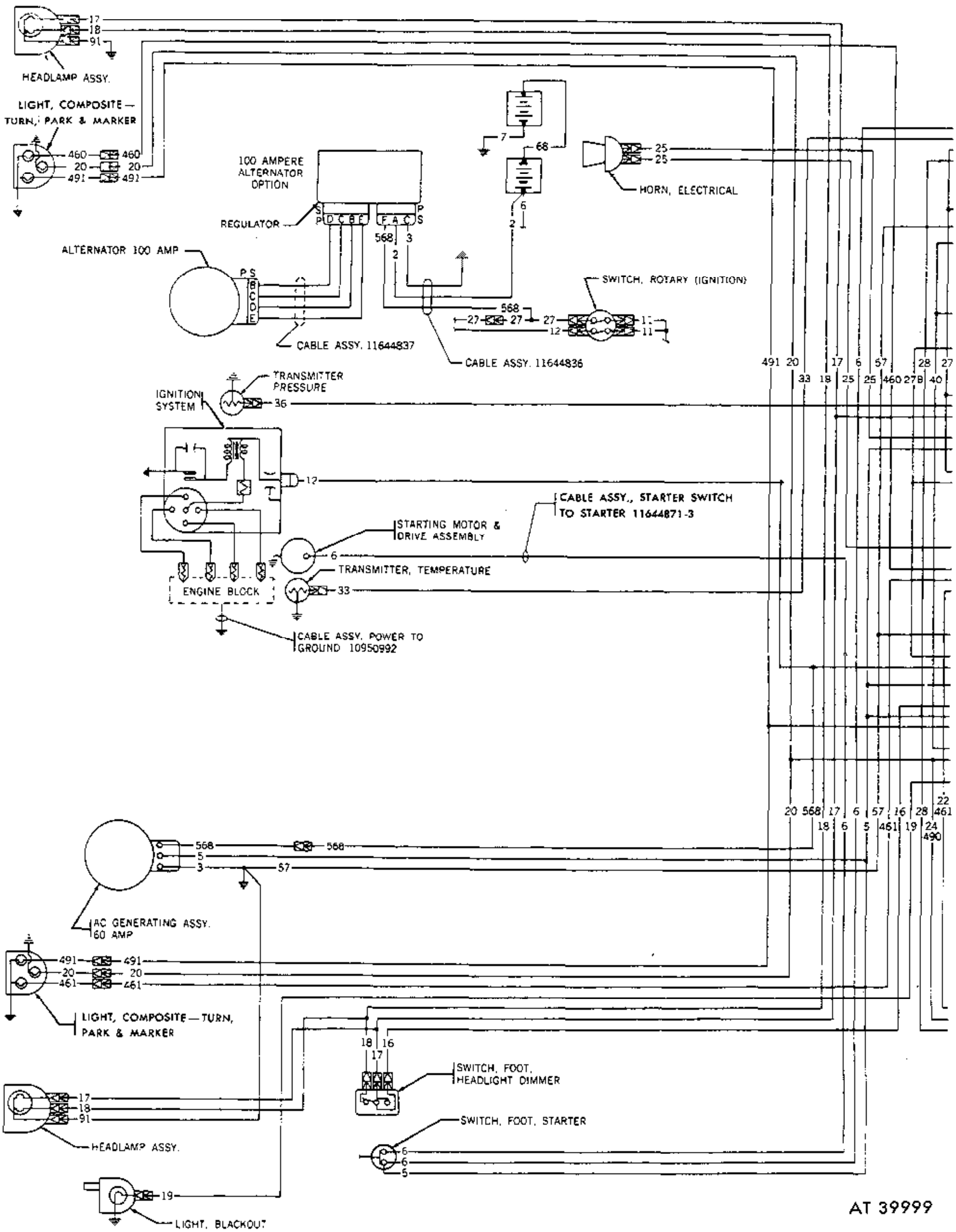


Figure 2-44. Vehicle wiring diagram and identification for M151A2, M825, and M718A1 vehicles (1 of 2).

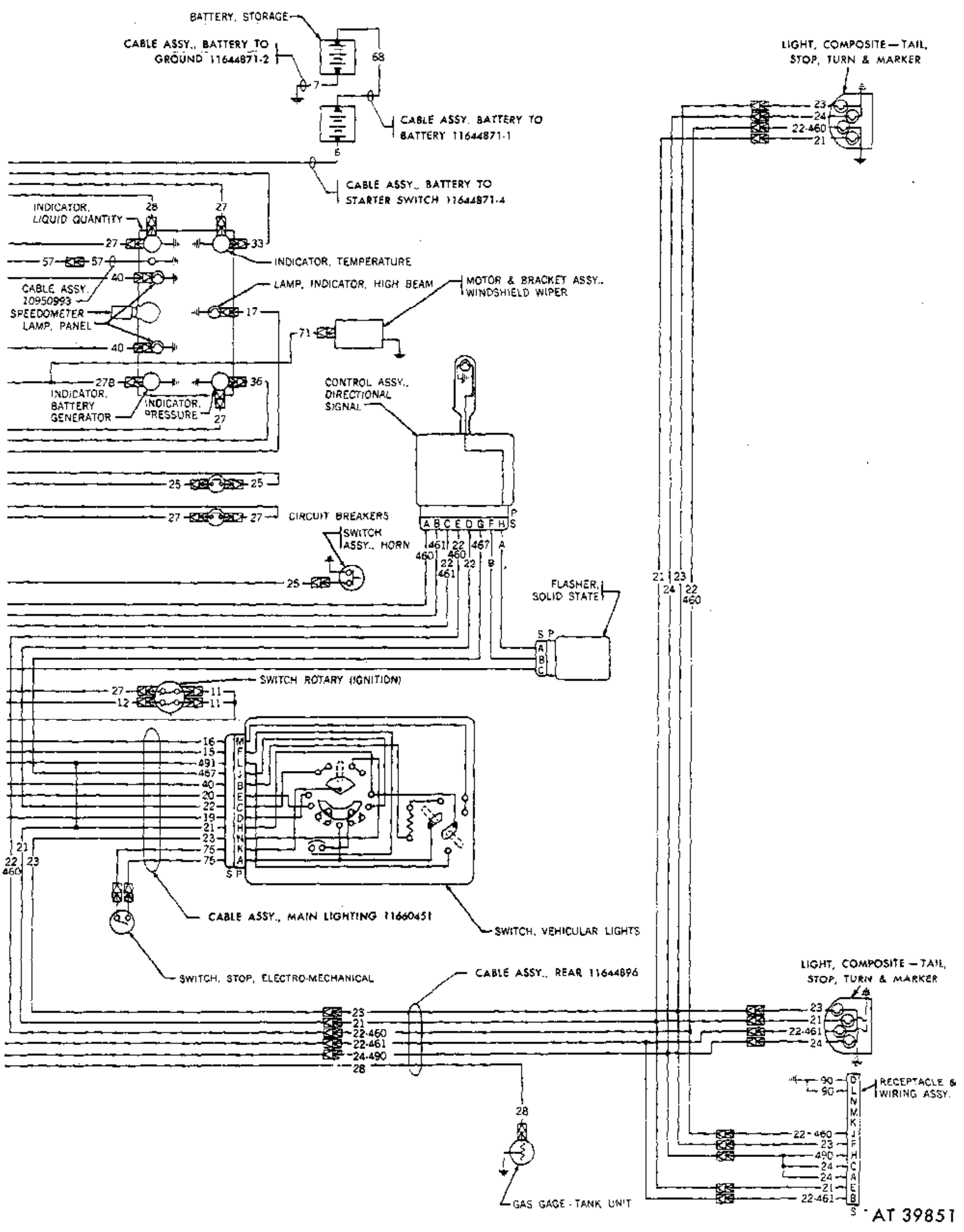


Figure 2-11. Vehicle wiring diagram and identification for M151A2, M825 and M718A1 vehicles (2 of 2).

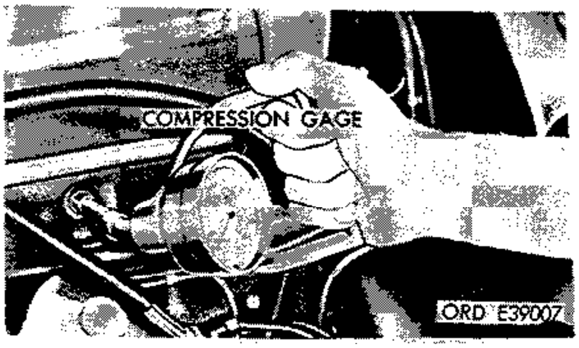


Figure 2-45. Compression test.

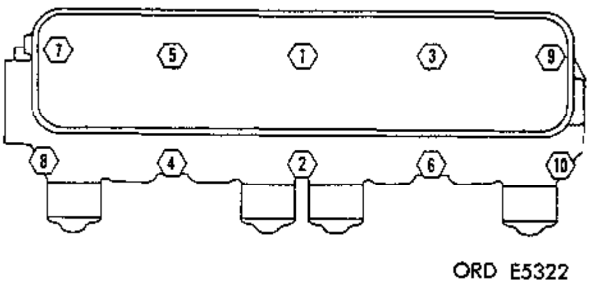


Figure 2-46. Cylinder head bolt tightening sequence.

d. Incorrect valve timing is indicated by a steady reading of approximately 10 inches of mercury.

e. Weak valve springs are indicated by a rapid fluctuation of the gage hand when the engine is accelerated. If a valve sticks at times only, the vacuum drops 4 or 5 inches momentarily when the valve sticks. Fluctuation of the gage hand between 14 and 19 inches indicates that the valve guides are worn.

f. A slow movement of the gage hand between 12 and 16 inches indicates poor carburetion.

g. Leakage at the carburetor gasket is indicated by a low steady reading. Leakage of compression between the cylinders is indicated by the gage hand drifting regularly between 5 and 19 inches. Worn or poorly fitted piston rings or scored pistons and cylinder walls are indicated by the gage hand remaining lower than normal, at approximately 15 inches.

NOTE

The above readings are for sea level operations. At higher elevations, the vacuum gage readings are lowered approximately 1 inch of mercury for each 1000 feet increase in altitude.

h. After performing the manifold vacuum test, install the 1/4-inch pipe plug into the intake manifold. Tighten the plug.

2-30. Radiator Assembly

a. Removal.

(1) Remove headlight connectors on all models, and marker light connectors on M151, M151A1, M151A1C, and M718 models (fig. 2-48).

(2) Remove six screw and lockwasher assemblies and six flat washers securing brush guard to fenders. Remove brush guard (fig. 2-49).

(3) Drain radiator coolant.

(4) Loosen radiator hose clamp and pull radiator inlet hose off engine outlet (fig. 2-50).

(5) Loosen radiator hose clamp and pull radiator outlet hose off engine inlet (fig. 2-51).

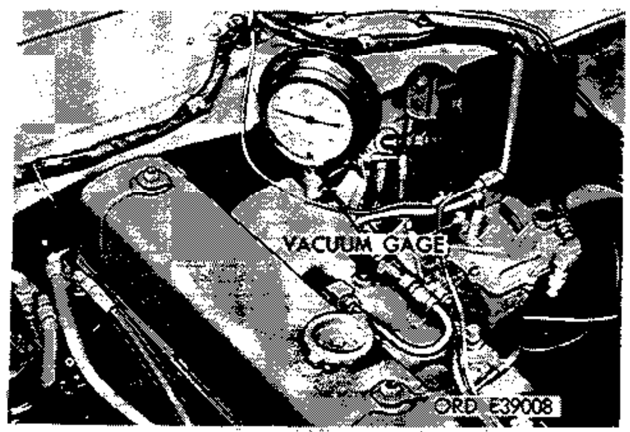


Figure 2-47. Manifold vacuum test.

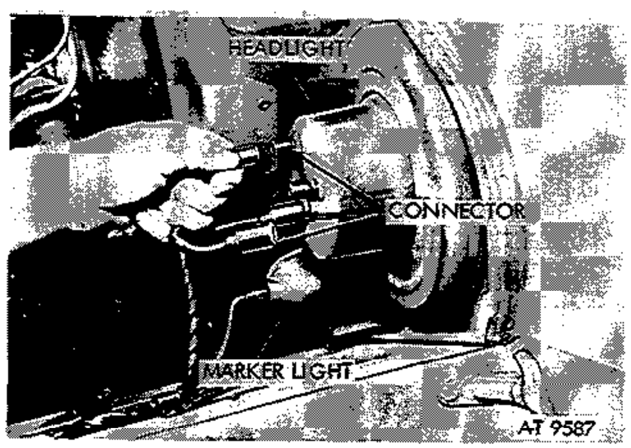


Figure 2-48. Headlight and marker light connectors.

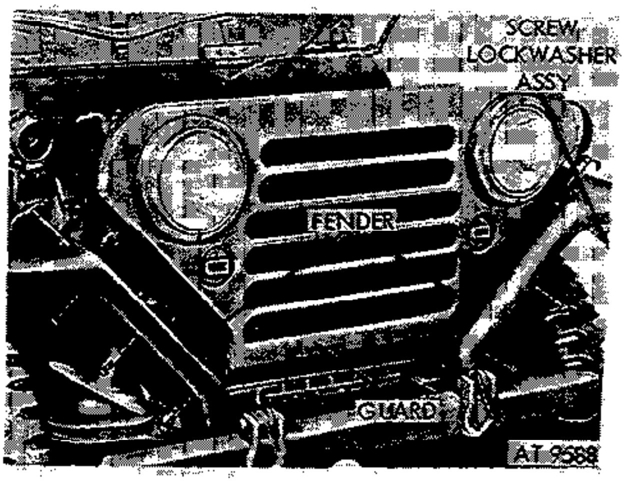


Figure 2-49. Remove brush guard.

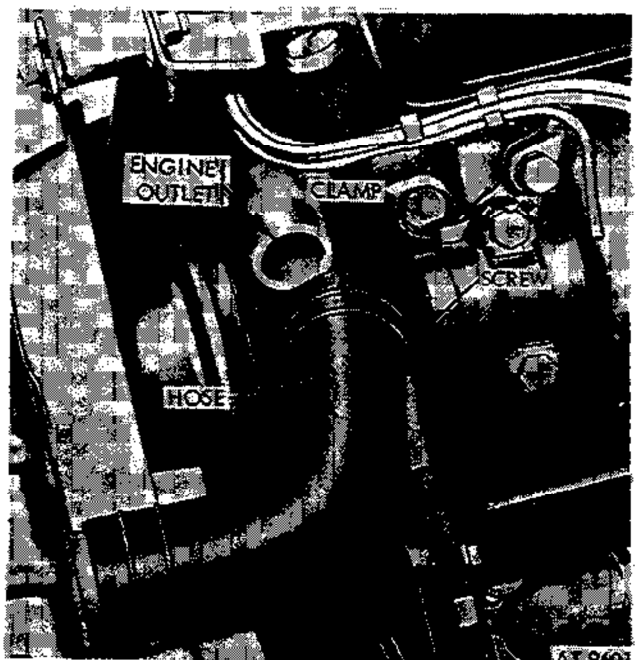


Figure 2-50. Radiator outlet hose.

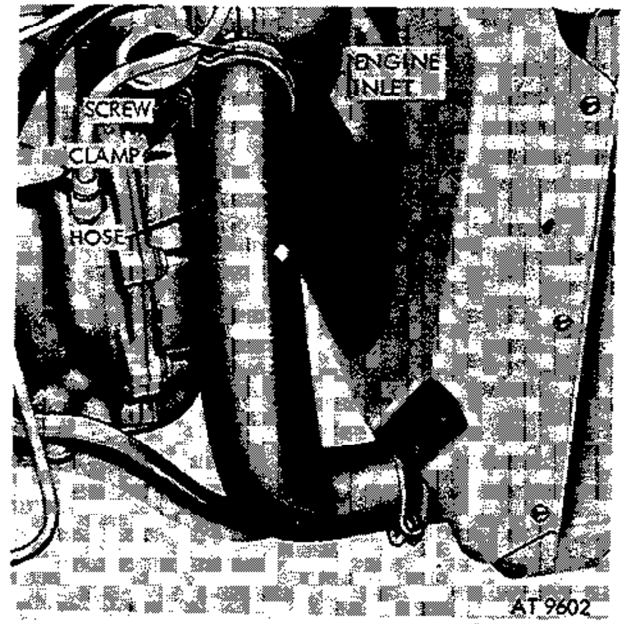


Figure 2-51. Radiator inlet hose.

(6) Remove two lower mounting nuts, washers and insulators (fig. 2-52).

(7) Loosen nut, lockwasher, and flat washer and slip radiator upper mount (rubber) from engine lifting eye bracket (fig. 2-53).

(8) Remove radiator.

b. Installation.

(1) Refer to figure 2-48 through figure 2-53. The following attaching parts are to be torqued to the values shown:

Radiator to support mounting nut (5 / 16-18)	5-8 lb-ft
Radiator upper bracket to insulator (5 / 16-24	7½-8½ lb-ft

(2) Replace radiator coolant.

2-31. Engine Mounting Cushions

a. Removal.

(1) Remove front seats (para 2-198).

(2) Remove transmission plate (para 2-199).

(3) Remove two rear support mounting bolts and washers (fig. 2-54).

(4) Remove left front support mounting bolt and washers (fig. 2-55).

(5) Remove right front support mounting bolt and washers (fig. 2-56).

(6) Using suitable jack or hoist, raise engine approximately one inch to gain clearance for removal of rubber cushions.

(7) Remove mounting cushions.

b. Installation. Complete operations (7) back to (1) and refer to appropriate illustrations as indicated in *a* above.

2-32. Cylinder Head

a. Removal.

(1) Drain cooling system.

(2) Remove carburetor (para 2-44 and 2-45).

(3) Remove intake manifold (para 2-39).

(4) Remove exhaust manifold (para 2-40).

(5) Remove thermostat (para 2-64).

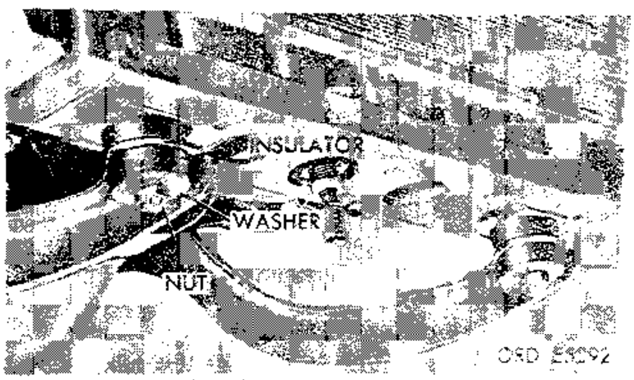


Figure 2-52. Mounting nuts, washers and insulators.

Figure 2-53. Radiator removal.

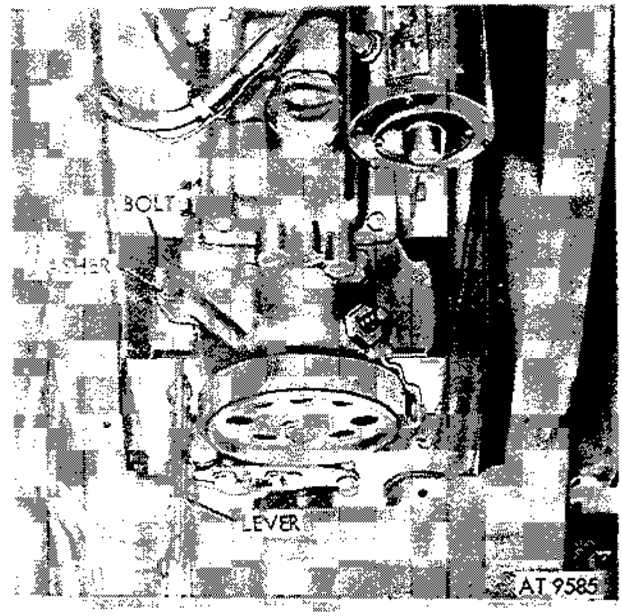


Figure 2-54. Rear support mounting bolts and washers.

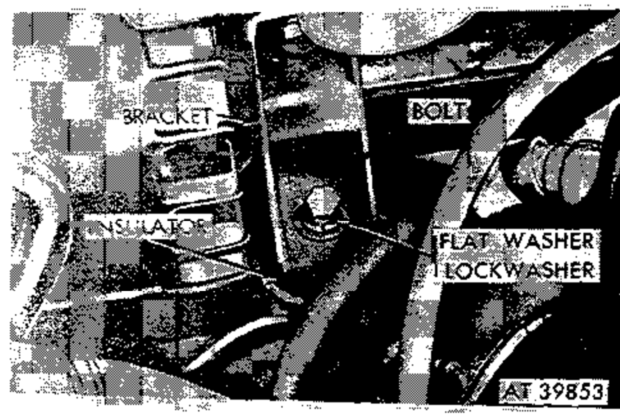


Figure 2-55. Left front bracket.

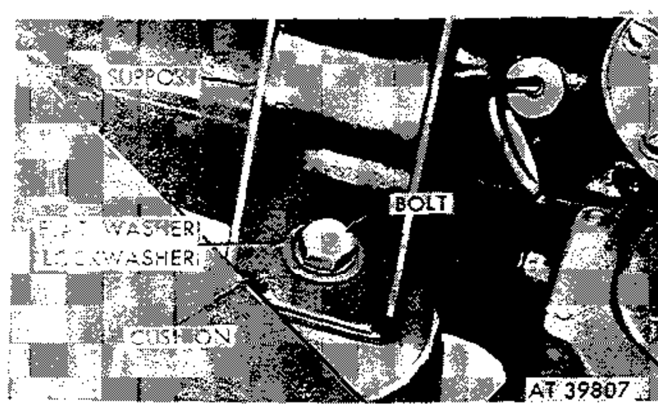


Figure 2-56. Right front bracket mounting bolt and washers.

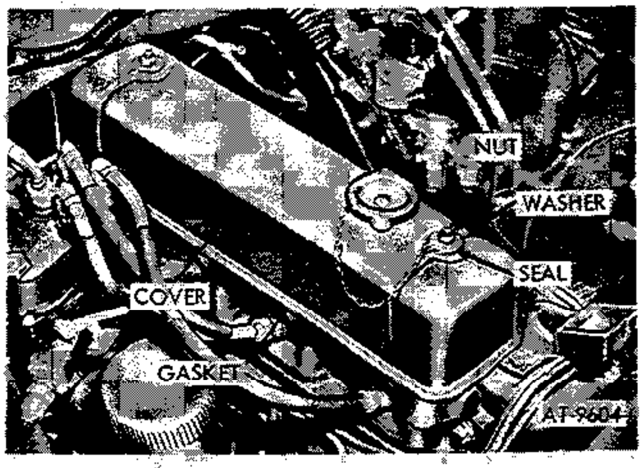


Figure 2-57. Remove rocker arm cover and gasket.

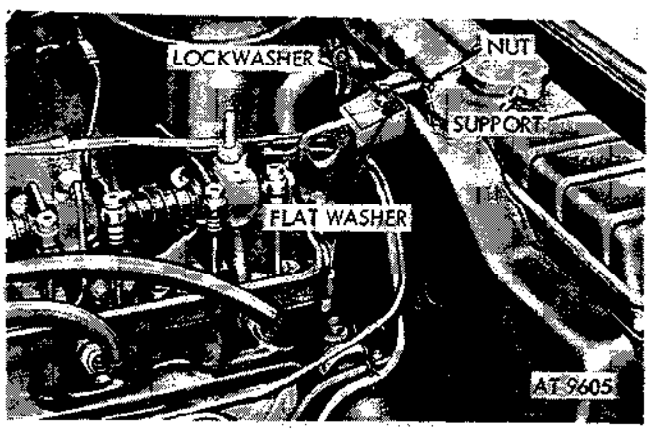


Figure 2-58. Remove radiator top support (rubber).

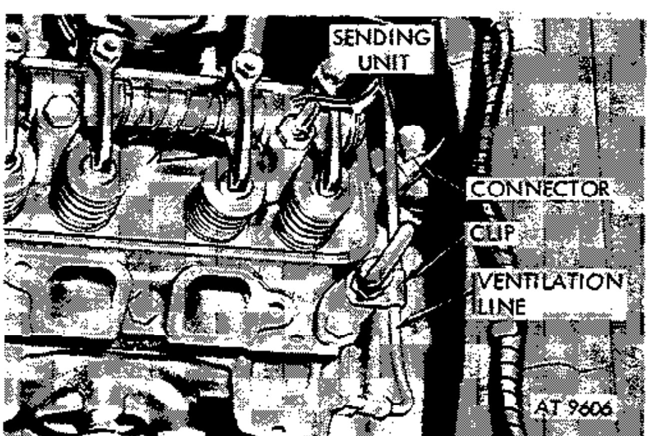


Figure 2-59. Remove connector and ventilation line.

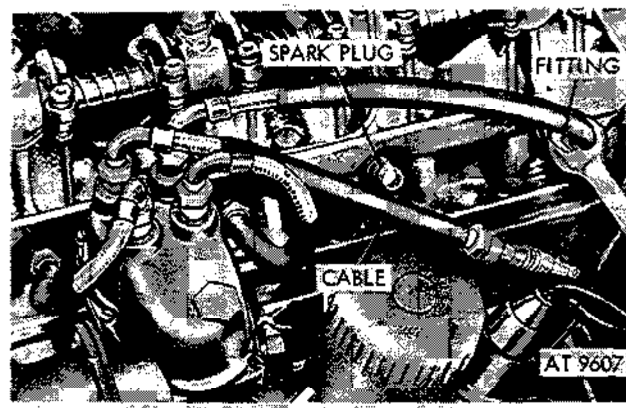


Figure 2-60. Remove spark plugs.

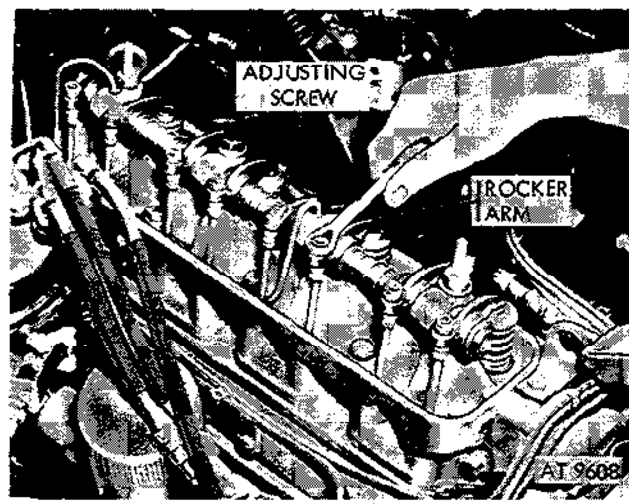


Figure 2-61. Back off adjusting screws.

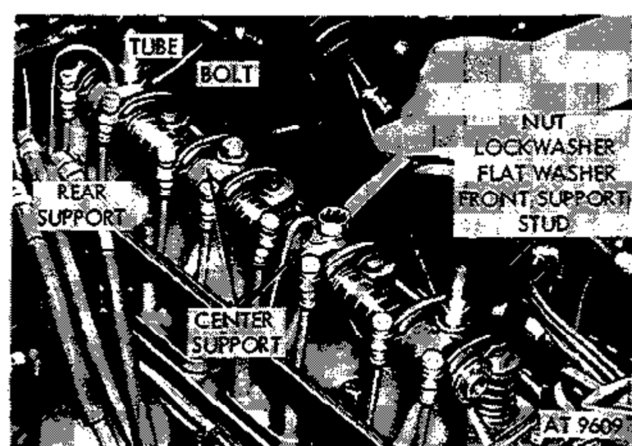


Figure 2-62. Remove bolts from center supports.

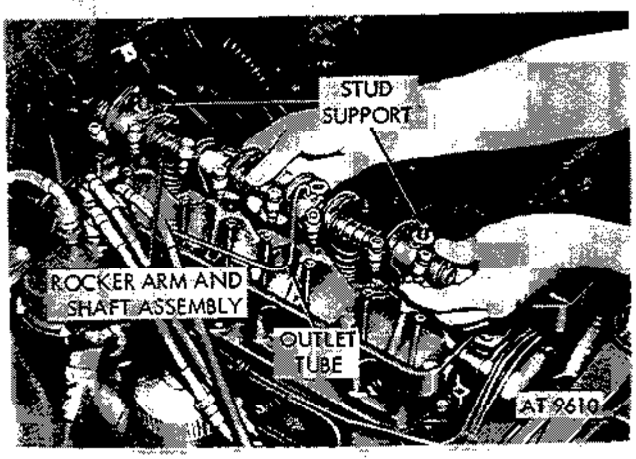


Figure 2-63. Rocker arm and shaft assembly removal.

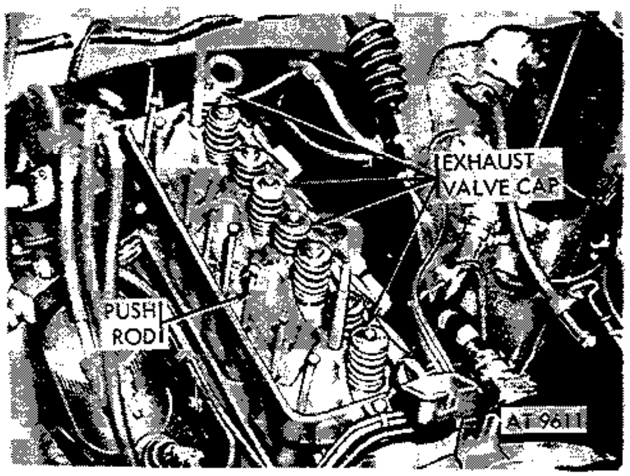


Figure 2-64. Remove push rods and valve caps.

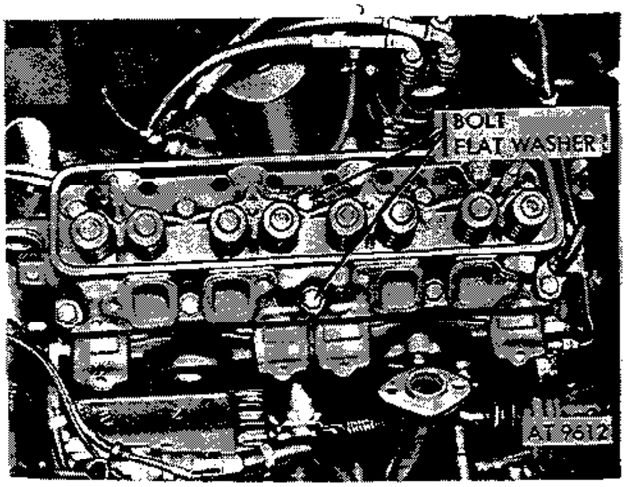


Figure 2-65. Remove head from block.

(6) Remove two rocker arm cover nuts, washers and seals (fig. 2-57).

(7) Remove rocker arm cover and gasket. Remove gasket from cover and discard gasket.

(8) Remove two nuts, lockwashers and flat washers. Remove radiator top support rubber (fig. 2-58).

(9) Remove connector from water temperature sending unit. Remove ventilation line from clip (fig. 2-59).

(10) Disconnect fitting securing spark plug cables to spark plugs. Remove spark plugs (fig. 2-60).

(11) Loosen eight valve-adjusting screws one turn to reduce load on rocker arms (fig. 2-61).

(12) Loosen two bolts securing the two rocker arm shaft center supports. Leave bolts in place (fig. 2-62).

(13) Remove nut, lockwasher and flat washer from rocker arm shaft front support stud (fig. 2-62).

(14) Remove nut, lockwasher, oil inlet tube bracket and oil inlet tube from rocker arm shaft rear support (fig. 2-62).

(15) Remove two bolts, two lockwashers, one flat washer and one oil outlet tube and bracket which were loosened in (12) above. Remove oil outlet tube from shaft assembly (fig. 2-63).

(16) Life rocker arm and shaft assembly from support studs (fig. 2-63).

(17) Remove eight valve push rods and four exhaust valve caps in sequence and mark for installation in original position (fig. 2-64).

(18) Remove ten bolts and flat washers securing cylinder head to cylinder block. Remove head from block (fig. 2-65).

NOTE

Do not pry between head and block. Damage to gasket surfaces will result.

b. Installation. To install the cylinder head reverse removal procedures and refer to figures 2-65 back through figure 2-57.

NOTE

Use new cylinder head gasket and new rocker arm cover gasket.

NOTE

Engine does not have to be up to normal operating temperature before tightening cylinder head bolts. Apply sealer (MIL-S-7916) (FSN 8030-543-4384) to gasket and bolts before installing.

Tighten cylinder head bolts in three stages (fig. 2-46); torque all bolts to 10 lb-ft; torque all bolts to 45-55 lb-ft; torque all bolts to 60-65 lb-ft. Fill cooling system. Adjust valve clearance (para. 2-33). Torque rocker arm cover nuts to 3-4 lb-ft.

2-33. Valve Tappet Adjusting Screw

a. General. The valve tappet adjusting screw has a self-locking interference-type thread. To remove the valve tappet adjusting screw, simply turn all the way out.

b. Adjustment. Minimum permissible adjusting screw torque is 5 ft-lb. (fig. 2-66).

(1) Operate engine for a minimum of 30

minutes at 1200 rpm to warm engine to normal operating temperature.

(2) Allow engine to idle and remove rocker arm cover.

(3) Insert feeler gage between valve stem and rocker arm pad and adjust to 0.015 inch.

(4) Examine rocker arm cover and gasket for damage; install new cover gasket if necessary. Torque nuts on rocker arm cover to 3-4 lb-ft.

2-34. Oil Filter

a. General. The oil filter is a disposable type which is removed and discarded as an assembly when the oil filter is due for replacement. Replacement is accomplished without special tools, since it is designed for hand loosening and tightening. The filter is full-flow type under full pump pressure and will show any leak immediately.

b. Replacement.

(1) Place container under oil filter. Turn counterclockwise to remove (fig. 2-67).

(2) Install new filter by turning clockwise and tighten securely. Operate engine and check for leaks.

NOTE

Lubricate filter gasket prior to installation of new filter.

2-35. Oil Filter Mounting Base on M151, M151A1, M718 and M151A1C

a. Removal. Refer to figure 2-68 and instruction below to remove oil filter mounting base.

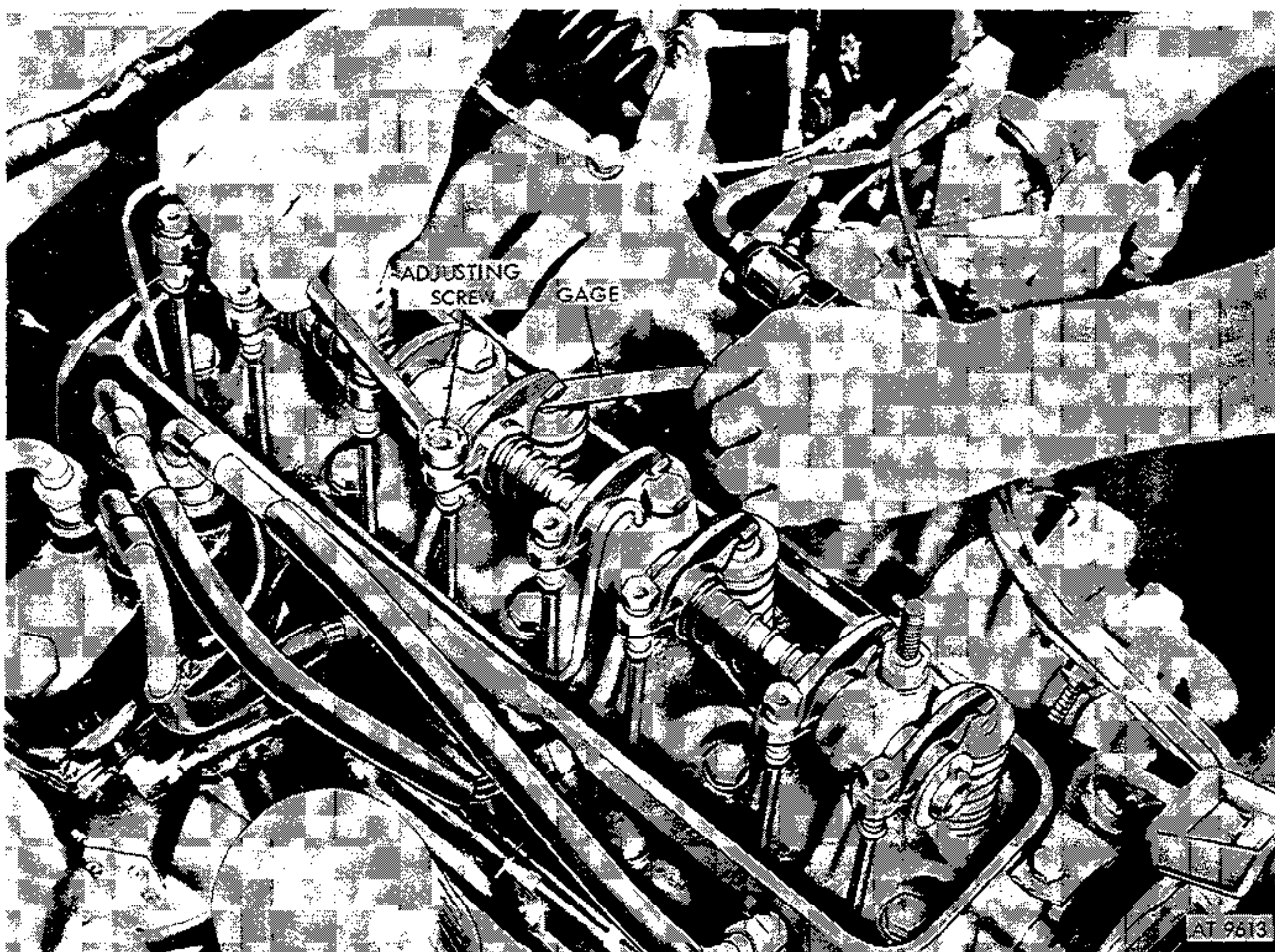


Figure 2-66. Adjusting valve clearance.

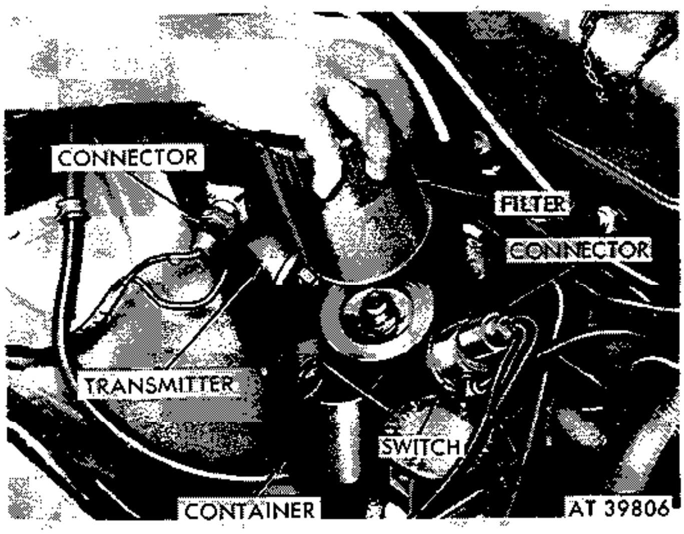


Figure 2-67. Remove oil filter and disconnect connector.

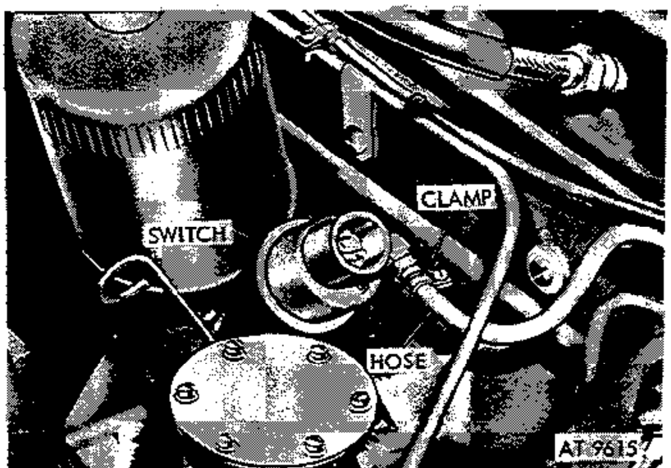


Figure 2-68. Remove fuel pump safety switch (M151, M151A1, M151A1C and M718).

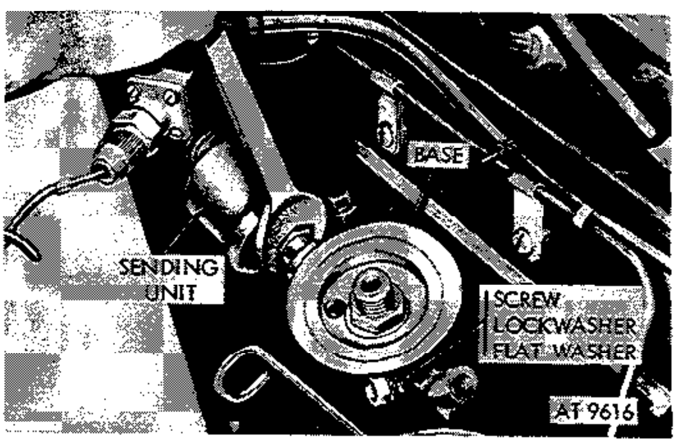


Figure 2-69. Remove sending unit and mounting base.

(1) Remove oil filter (para. 2-34).

(2) Grasp electrical connector at fuel pump safety switch (oil pressure safety switch) and pull, separating male and female connectors (fig. 2-67).

(3) Loosen clamp screw and pull vent hose off fuel pump safety switch (oil pressure safety switch) (fig. 2-68).

(4) Unscrew fuel pump safety switch (oil pressure safety switch) (fig. 2-68).

(5) Pull oil pressure sending unit electrical connector, separating male and female connectors.

(6) Unscrew oil pressure sending unit from oil filter mounting base (fig. 2-69).

(7) Remove two screw and lockwasher assemblies and flat washers (see fig. 2-69).

(8) Remove oil filter mounting base (fig. 2-69). Remove and discard gasket. Clean mounting base thoroughly. Blow out all oil passages with compressed air.

b. Installation. Reverse removal procedures in a above.

NOTE

Use new gasket when installing oil filter mounting base. Use care tightening oil pressure sending unit.

2-36. Oil Filter Mounting Base on M151A2, M825, and M718A1 Vehicles

a. Removal.

NOTE

Place container underneath filter to catch oil.

(1) Unscrew and remove oil filter (para. 2-34).

(2) Disconnect oil pressure sending unit connector.

(3) Unscrew and remove oil pressure sending unit from oil filter base (fig. 2-69).

(4) Remove two screws, lockwashers and flat washers securing base (fig. 2-69). Remove base and gasket. Discard gasket.

(5) Thoroughly clean mounting base making sure all oil passages are open by blowing out with compressed air.

b. Installation. Reverse removal procedures in *a* above. Use a new gasket when installing oil filter mounting base.

CAUTION

Exercise care when tightening oil pressure sending unit during replacement.

2-37. Fuel Pump Safety Switch (Oil Pressure Safety Switch)

NOTE

M151A2, M825, and M718A1 vehicles have a mechanical fuel pump and no fuel pump safety switch.

a. Description. The fuel pump safety switch (oil pressure safety switch; automatically stops the flow of fuel to the carburetor when the engine oil pressure falls below 3-1/2 to 7-1/2 psi. This action is accomplished by the switch cutting of current to the electric fuel pump. To start the engine when it would normally have no oil pressure, a second circuit is connected to the starting motor switch, bypassing the safety circuit only while the starter is being used. The second circuit also prevents fuel pump operation when only the ignition switch is turned on, preventing accidental flooding of the carburetor.

b. Removal. Complete operations (1) through (4) (para. 2-35) and refer to fig. 2-67 and fig. 2-68.

c. Installation. Operations (4) back through (1), fig. 2-68 and fig. 2-67, show operations for installing fuel pump safety switch (oil pressure safety switch).

d. Testing Fuel Pump Safety Switch (Oil Pressure Safety Switch). Refer to figure 2-70.

NOTE

This is an emergency procedure to be used when the engine stops with indications that the safety switch may be defective (fuel pump inoperative). Before testing switch, insure that there is sufficient oil in crankcase for operation. Do not operate vehicle without the use of the safety switch.

(1) Disconnect the male connector which contains leads No. 77, 77-A and 77-B from the safety switch. These wires control the safety cutoff feature.

(2) Connect No. 77 and 77-A leads together with a jumper wire. The electric fuel pump should now operate with ignition switch on.

(3) If fuel pump operates with leads connected together, start the engine and immediately check pressure indicated on oil pressure gage.

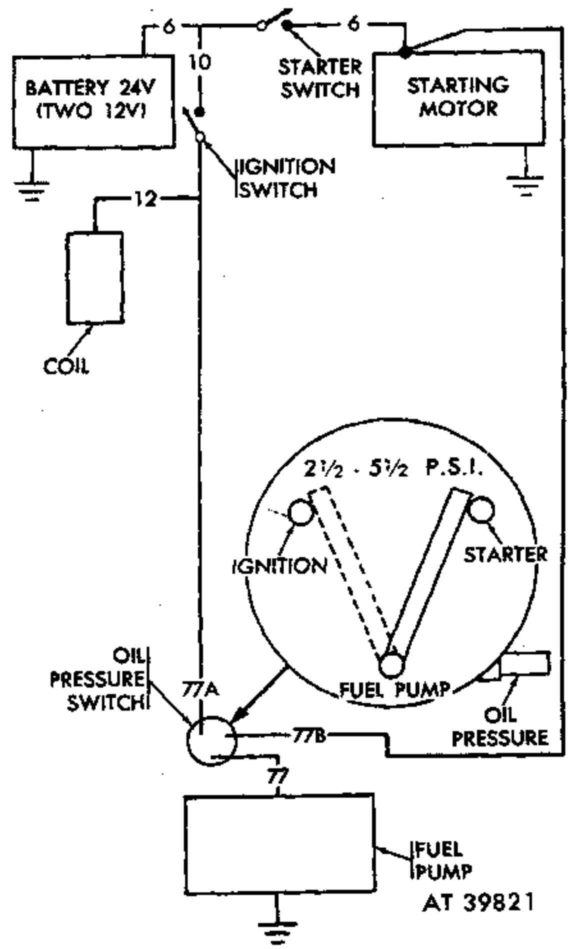


Figure 2-70. Fuel pressure safety switch circuit diagram.

(4) If no pressure is indicated, shut off engine and notify direct support maintenance. If pressure is indicated, replace safety switch.

2-38. Lines and Fittings

a. Inspection. Inspect all vacuum and fuel lines for leaks at fittings. Examine lines for cracks, bends, twists, or flattened areas.

b. Repair. Clean and dry all lines and fittings. Straighten slightly bent rigid lines. Remove broken or badly bent lines. Replace frayed, cracked or defective flexible lines.

2-39. Intake Manifold

a. Removal. Refer to fig. 2-71 through 2-74 for removing intake manifold.

(1) Remove air cleaner base and carburetor.

(2) Unscrew vent line fitting from intake manifold (see fig. 2-71).

(3) Disconnect all vent lines from crankcase ventilation metering valve and fitting (see fig. 2-72).

(2) Unscrew crankcase ventilating valve and fitting from intake manifold.

(5) Remove two bellcrank screws and lockwasher assemblies securing accelerator bellcrank bracket to intake manifold. Remove bellcrank (see fig. 2-73).

(6) Open tabs on dual tab washer and remove two screws and tab washer securing intake manifold to cylinder head.

(7) Remove six screws and four lockwashers securing intake manifold to cylinder head. Remove intake manifold and discard the two gaskets (see fig. 2-74).

b. Installation. Refer to figs. 2-74 to fig. 2-71 and reverse removal instructions to install intake manifold.

NOTE

Always use new gaskets at installation.

The following torque values apply for installation:

Four 1¼ inch long mounting screws	23-28 lb-ft
Two 1½ inch long mounting screws	10-12 lb-ft

After installation, apply a small amount of oil at the carburetor and intake manifold flanges while engine is running, to determine if a leak is present at the intake manifold gasket. If oil is drawn in, the manifold is leaking.

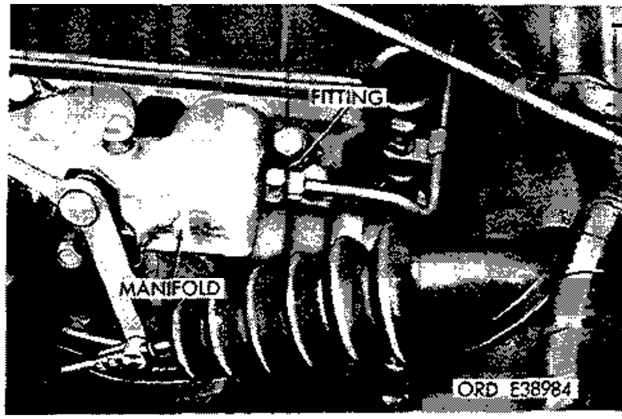


Figure 2-71. Unscrew vent line fitting from intake manifold

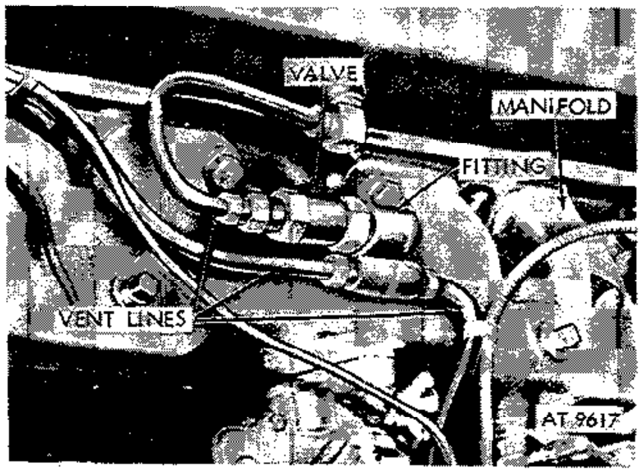


Figure 2-72. Disconnect vent lines from valve and fitting.

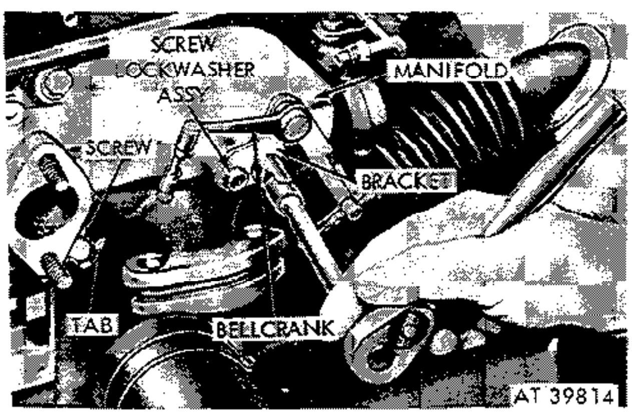


Figure 2-73. Remove bellcrank.

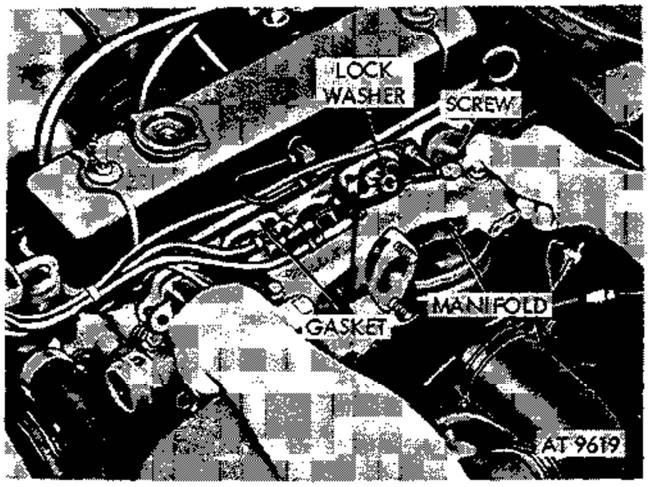


Figure 2-74. Remove intake manifold.

2-40. Exhaust Manifold

a. Removal.

(1) Remove intake manifold (para 2-39).

(2) Remove two brass nuts securing inlet pipe to exhaust manifold (fig. 2-75).

(3) Remove bolt and lockwasher securing exhaust manifold flange to block (fig. 2-75).

(4) Open locking tabs on four mounting bolts and remove bolts and two clamps (fig. 2-75).

(5) List off exhaust manifold and discard inlet pipe gasket (see fig. 2-76).

NOTE

No gasket is used between the cylinder head and the exhaust manifold. Coat port areas with sealant (FSN 8030-252-3391) prior to installation.

b. Installation. Perform operations (5) back through (1) and refer to figs. 2-76 and 2-75 for instructions to install exhaust manifold.

NOTE

Always use a new exhaust pipe gasket when installing exhaust manifold.

For installation, secure mounting bolts to a torque 12-16 lb-ft. Install intake manifold (para 2-39).

2-41. Clutch Linkage Adjustment

a. General. Clutch pedal free travel of 1⅛ to 1½ inches must be maintained. Free travel is the distance between the clutch pedal released position and the point when the clutch starts to disengage. If free travel is not maintained, slippage occurs between the clutch facings and causes the facings to become worn.

b. Adjustment.

(1) Remove clutch return spring located on left side of engine (fig. 2-77).

(2) Slip rod out of clutch release equalizer shaft lever and rotate the rod until the pedal free travel is obtained (fig. 2-77).

(3) Depress clutch pedal and check for pedal free travel of 1⅛ inches to 1½ inches (fig. 2-78).

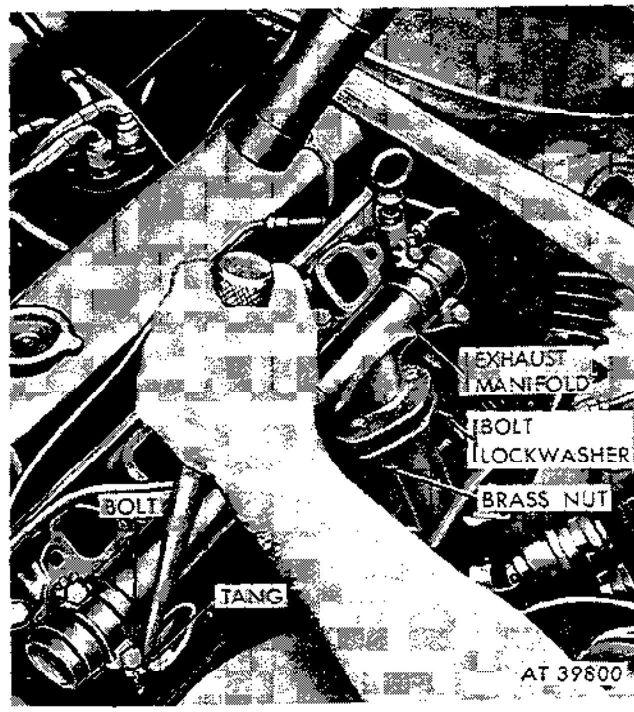


Figure 2-75. Remove bolts from exhaust manifold.

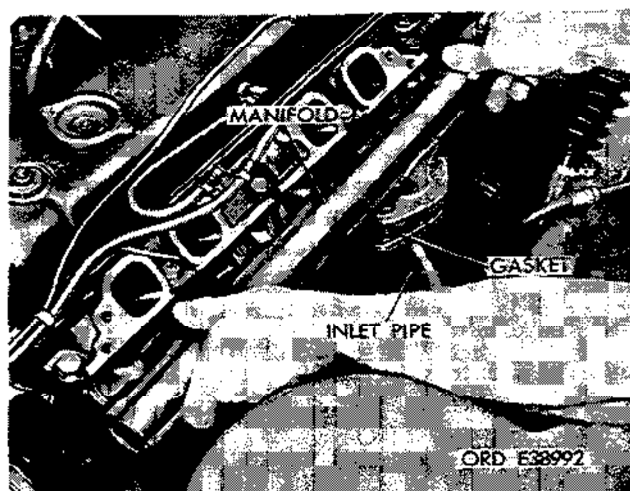


Figure 2-76. Remove exhaust manifold.

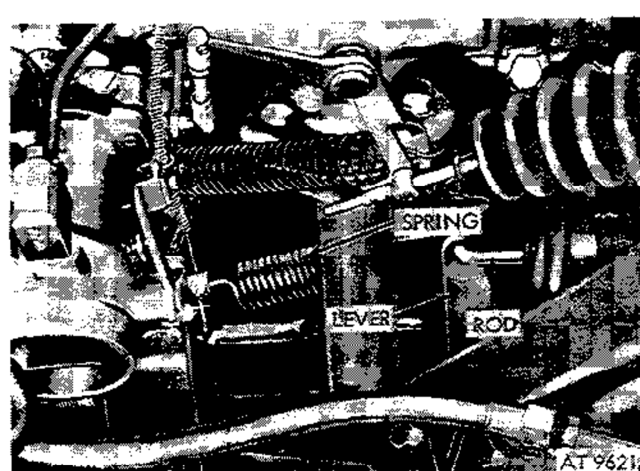


Figure 2-77. Clutch adjustment.

Figure 2-78. Clutch pedal free travel.

Section VIII. FUEL SYSTEM

2-42. Description and Data

a. General. The units comprising the fuel and air intake system include the carburetor, air cleaner, fuel pump, fuel filter, fuel tank, connecting fuel lines, and electric wiring for the fuel pump. Figure 2-79 is a view of the fuel and vent lines. Figure 2-80 is a schematic of the accelerator pedal, throttle, and choke control.

b. Carburetor. The carburetor is a side draft, single barrel type, mounted on the intake manifold on the left side of the engine as viewed from the driver's seat. Vehicles may come equipped with either a Holley or Zenith carburetor. The carburetor is mechanically controlled by the accelerator pedal, hand throttle and manual choke. For deepwater fording purposes, the Holley carburetor is extremely vented to the air cleaner. The Zenith carburetor is internally vented.

NOTE

M151A2, M825, and M718A1 vehicles have a mechanical fuel pump requiring no electrical wiring.

c. Air Cleaner. All M151 series vehicles are equipped with an oil bath type air cleaner that is mounted on brackets attached to left front fender panel inside the engine compartment. A flexible air hose connects the air cleaner unit to the carburetor. The carburetor float chamber is vented to the air cleaner (only on vehicles equipped with Holly carburetor). The M151, M151A1, M151A1C, and M718 vehicles have a fuel pump safety switch (oil pressure safety switch) which is also vented to the air cleaner unit. The air intake cap can be replaced by an air intake pipe extension for deep-water fording purposes.

d. Fuel Pump and Filter.

(1) On the M151, M151A1, M151A1C and M718 the fuel pump and filter assembly is located inside the fuel tank as a single unit, and is accessible from the top of the tank. The fuel pump is a 24-volt, electrically operated, plunger type. The pump contains a hollow steel plunger in a brass cylinder. Valves are attached to the lower end of the plunger and the cylinder. The valves operate in the same manner as a common lift pump. The plunger has no seal, but is freely fitted in the cylinder. The fuel itself provides a seal between the piston and the cylinder. This principle permits the pump to maintain a pressure of approximately 4 psi. The solenoid causes the plunger to compress the pumping spring. The spring design governs the pump static pressure. All fuel entering the pump passes through the filter element in which the pump is completely enclosed. The electrical connection is waterproof. The fuel pump is controlled by a double-throw safety switch, the mechanical linkage being actuated by oil pressure from the engine main oil gallery. One contact of the switch forms a series connection between the fuel pump and the starter switch. The other contact forms a series connection between the ignition switch and the fuel pump. When the starter switch is depressed, the first circuit is closed, and the fuel pump operates. Pump operation continues after releasing the starter switch since the safety switch opens the first circuit and closes the second circuit when the engine oil pressure reaches 2½ to 5½ psi. All parts of the electrical circuit are tamperproof and hermetically sealed in helium atmosphere. The pump is radio-interference suppressed. The filter element is replaceable, self-contained, and of a cylindrical type. It is made from helically wound ribbons of phenolic-resin-impregnated cellulose. Any impurities in the fuel are deposited on the entrance edges of the ribbons where they can be easily cleaned off without damage to the filter element.

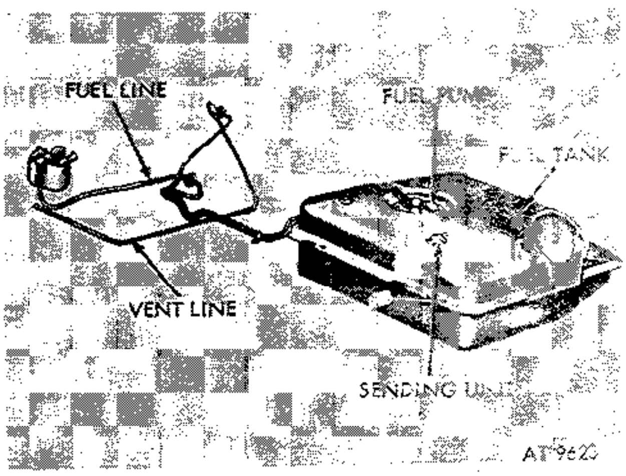


Figure 2-79. Fuel and vent lines on M151, M151A1, M151A1C, and M718.

(2) On M151A2 series vehicles the mechanical fuel pump (fig. 2-81) is mounted to the right side of the engine. This pump is a single action unit with a lever actuated diaphragm run off the camshaft lobe. Fuel leaving the pump maintains a constant pressure of from 4 to 6 psi. Fuel from the pump goes through the in-line filter (fig. 2-82) before being used by the carburetor.

e. Fuel Tank. The fuel tank is of terneplate steel, two-piece, seamwelded construction, and is located under the driver's seat on the left side of the vehicle. In operation, the tank is vented to the atmosphere through a vent line between the fuel pump cover (fuel filter cover on M151A2, M825 and M718A1 vehicles), and the air cleaner, and through the pressure filler cap. A drain plug is provided in the bottom center of the tank.

f. Fuel Lines.

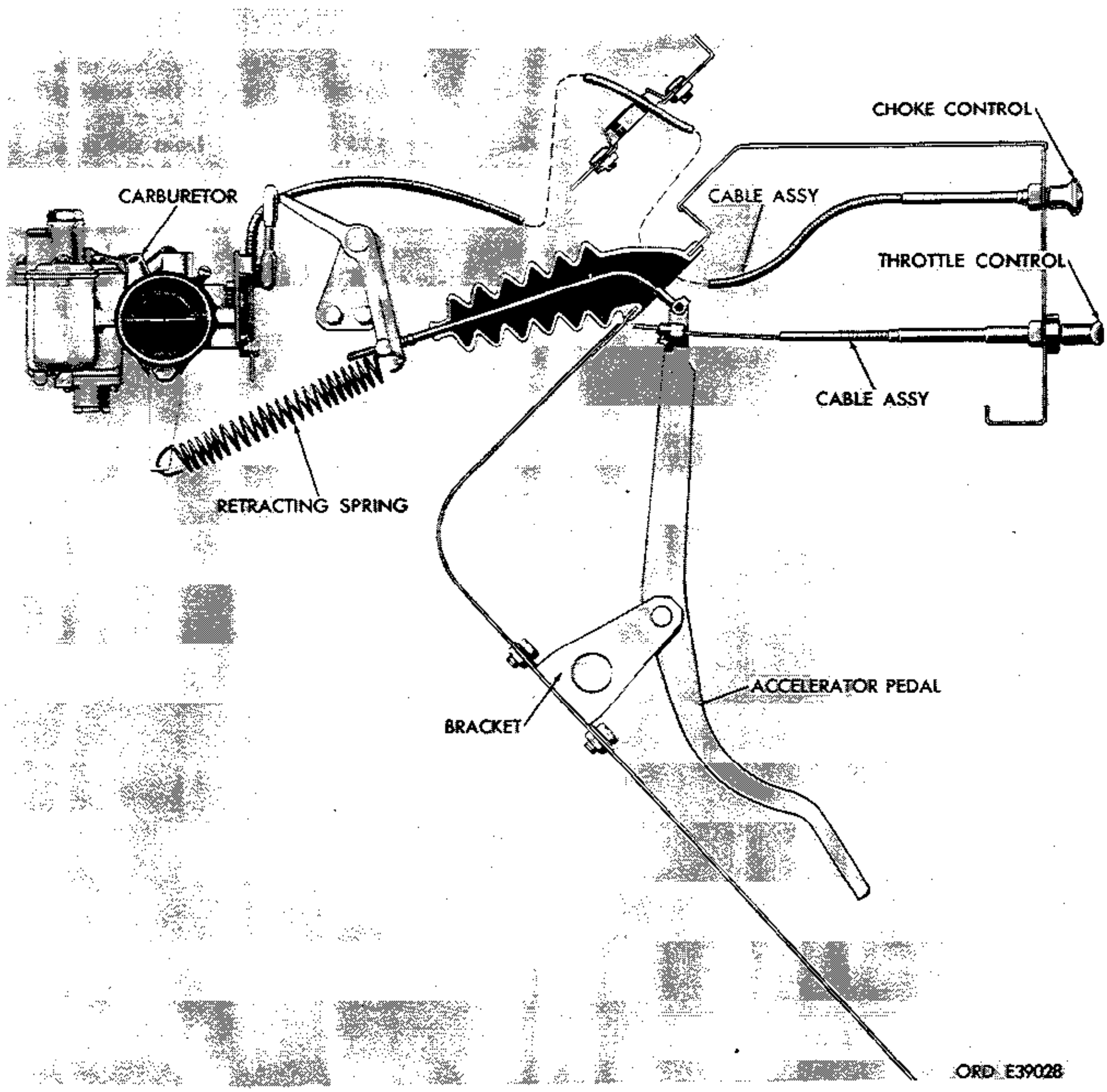


Figure 2-80. Accelerator pedal, throttle and choke control.

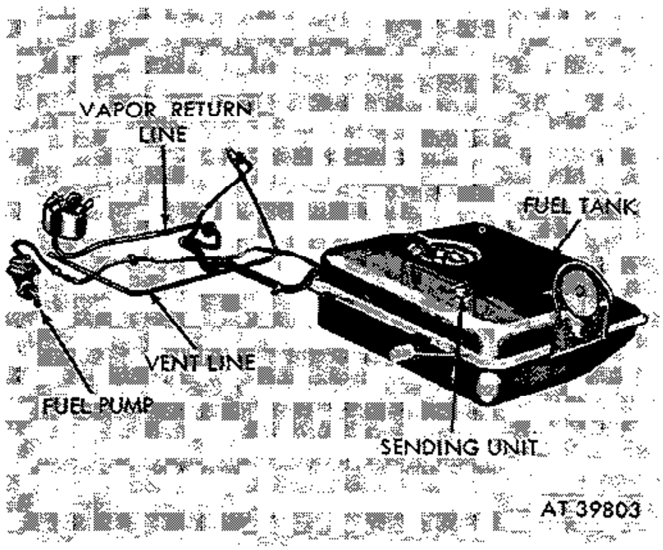


Figure 2-81. Fuel and vent lines on M151A2, M825, and M718A1 vehicles.

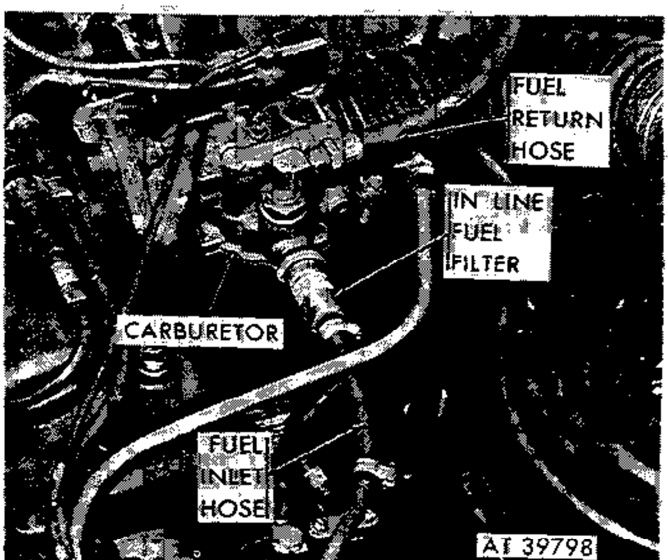


Figure 2-82. Zenith carburetor installed on M151A2, M825, and M718A1 vehicles.

(1) The fuel line on M151, M151A1, M151A1C, and M718 consists of formed metal tubing from the fuel pump to the engine compartment, a coupling, and a flexible hose to the carburetor.

(2) The fuel line on M151A2, M825 and M718A1 consists of formed metal tubing leading from the fuel tank to the mechanical fuel pump mounted to right side of engine block. From the fuel pump, the line goes to the carburetor. From the carburetor, a vapor return line goes to the fuel tank.

g. Data. Refer to table 1-1 for tabulated data.

2-43. Air Cleaner

a. Servicing Air Cleaner.

(1) Loosen clamp and remove air cleaner cover (fig. 2-83 or 2-84).

NOTE

Do not remove clamp from cover.

(2) Lift out air cleaner element (fig. 2-85).

NOTE

When removing cover be careful of rubber gasket; if loose apply adhesive to cover and install rubber gasket. Use adhesive (MIL-C-5092) (FSN 8040-221-3811).

(3) Lift out oil cup (fig. 2-86). Discard used oil. Clean oil cup, air cleaner element, and air cleaner body, using dry-cleaning solvent or miner spirits paint thinner.

(4) Place oil cup in body and fill to level mark with fresh engine oil (fig. 2-87). Refer to LO 9-2320-218-12). Install air cleaner element and secure air cleaner cover.

b. Removal.

(2) Loosen clamp screw and clamp at air intake hose. Remove hose from air cleaner (fig. 2-88).

(2) Loosen clamp on carburetor float chamber vent hose, (Holley Carburetor only). Pull hose from tube (fig. 2-89).

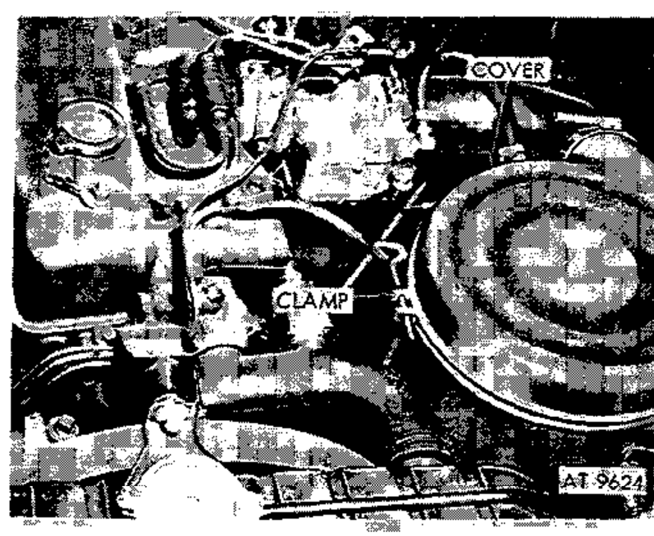


Figure 2-83. Remove air cleaner cover (Holley).

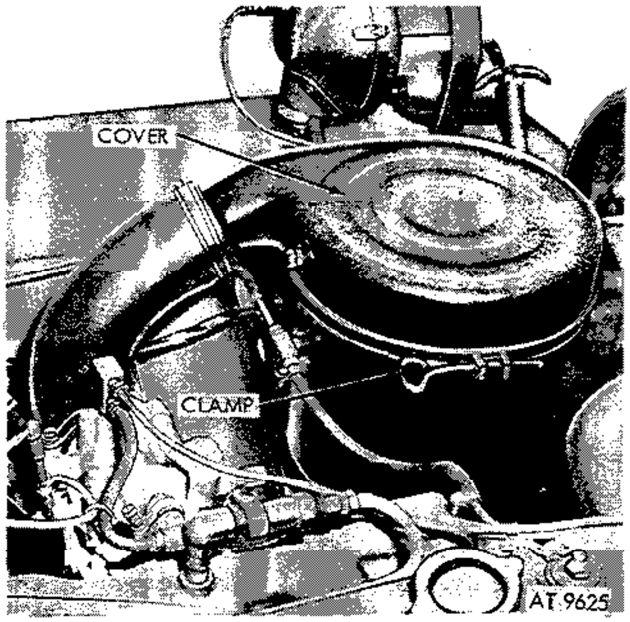


Figure 2-84. Remove air cleaner cover (Zenith).

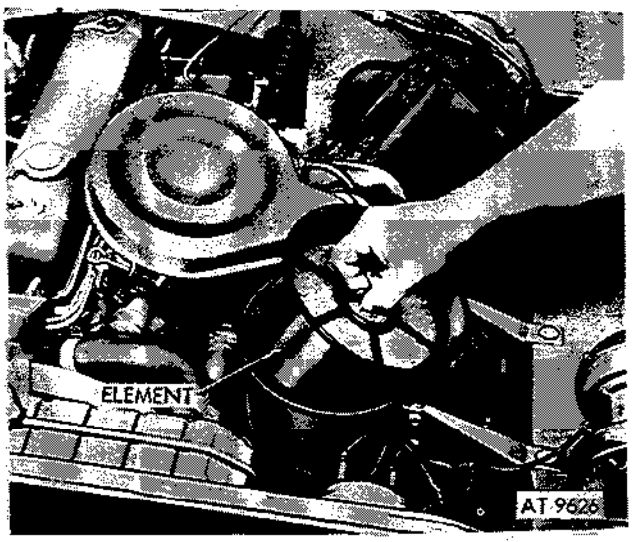


Figure 2-85. Remove air cleaner element.

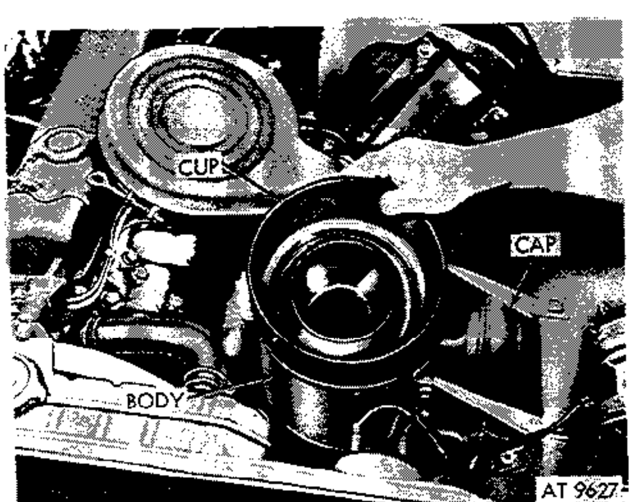


Figure 2-86. Lift out cup and discard oil.

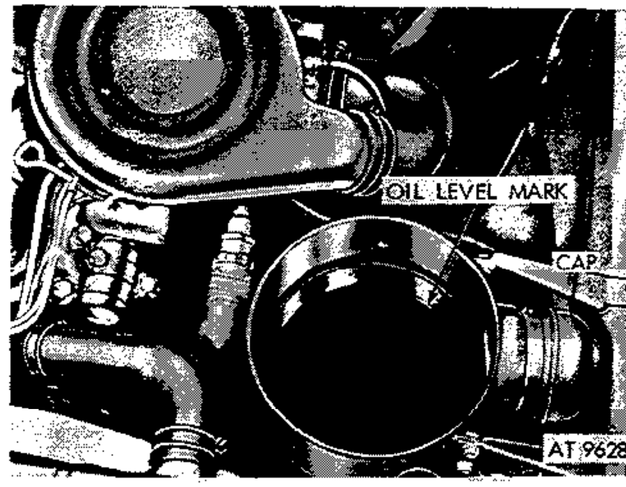


Figure 2-87. Fill to oil level mark.

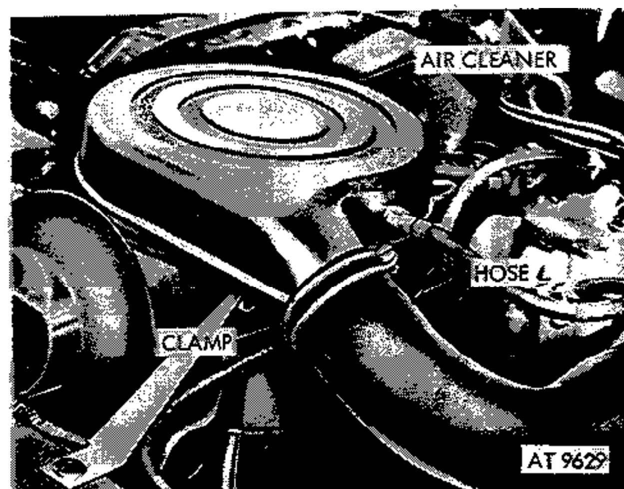


Figure 2-88. Remove hose from air cleaner.

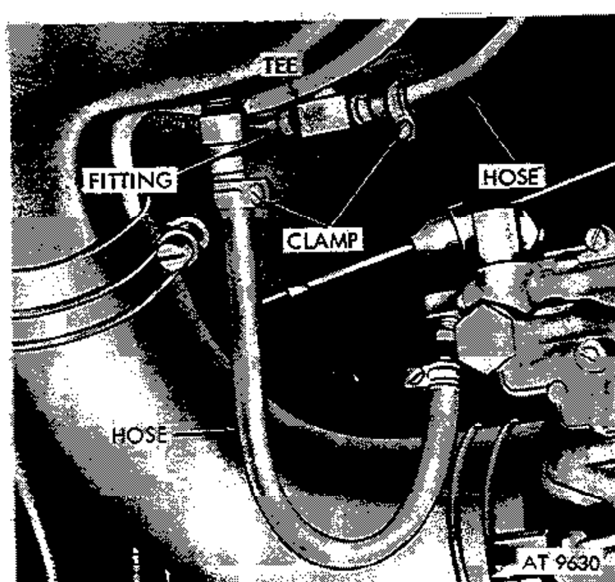


Figure 2-89. Remove vent hoses (Holley).

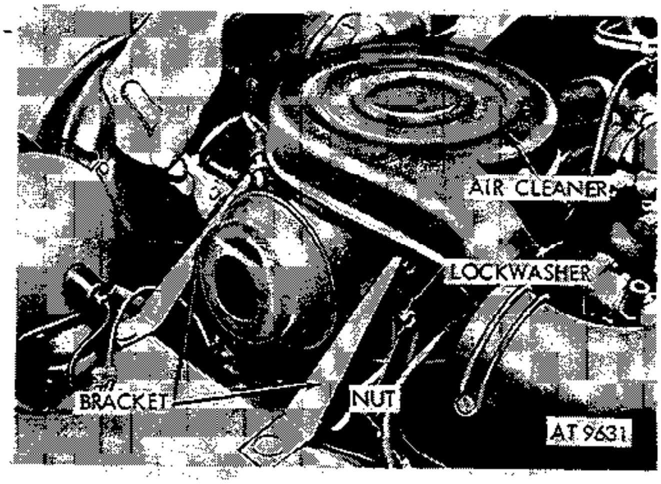


Figure 2-90. Remove air cleaner (Holley).

(3) Unscrew fuel tank vent hose fitting. Loosen clamp on fuel pump safety switch (oil pressure safety switch) vent hose. Pull hose from tee (fig. 2-89).

NOTE

Instruction in (3) above apply only to earlier M151 series models. M151A2 models do not have fuel pump safety switches.

(4) Remove four screws, washer assemblies and nuts securing air cleaner to brackets and remove air cleaner (fig. 2-90).

c. Installation. Perform removal operations (4) back through (1), and refer to figures 2-90 back through 2-88.

2-44. Holley Carburetor

a. Adjustments

(1) *General.* Adjustment of the carburetor is accomplished by means of the idle mixture adjusting screw (fig. 2-91) and the idle speed adjusting screw. Make all carburetor adjustments with engine running at normal operating temperatures.

(2) *Idle mixture.* Carefully turn the idle mixture adjusting screw in until it just touches the needle seat or the engine begins to lag; then turn OUT until the engine operates smoothly (approximately one full turn).

(3) *Idle speed.* The idle speed adjusting screw on the throttle lever (fig. 2-91) should be set to idle the engine speed at 550-600 rpm.

b. Removal.

(1) Disconnect ventilation tube fittings. Expand clamp on float chamber ventilation hose. Pull hose from fitting. Loosen intake air hose clamp. Pull hose from carburetor (fig. 2-92).

(2) Disconnect fuel return hose at carburetor (M151A2, M825, and M718A1 only) (fig. 2-82).

(3) Disconnect flexible fuel supply line at carburetor (M151, M151A1, M151A1C and M718 only) (fig. 2-93).

(4) Loosen clamp and disconnect fuel inlet hose from in-line fuel filter. Disconnect in-line fuel filter at carburetor (M151A2, M825 and M718A1 only) (fig. 2-82).

(5) Loosen two screws retaining choke control cable and housing and pull cable assembly through clamp (fig. 2-94).

(6) Disconnect throttle linkage at throttle valve arm ball joint socket (fig. 2-95).

(7) Remove retracting spring. Remove two carburetor mounting nuts, lockwashers and flat washers. Remove accelerator retracting spring bracket (fig. 2-96).

(8) Move carburetor and gasket away from intake manifold. Discard gasket (fig. 2-124).

c. Installation.

(1) Clean carburetor gasket surfaces on carburetor and intake manifold before installing gasket and carburetor.

(2) Clean hose connections before installing hoses.

(3) Perform removal operations (8) back through (1) to install carburetor.

NOTE

Use a new gasket when installing carburetor

(4) Bring engine up to normal operating temperature.

(5) Adjust carburetor.

2-45. Zenith Carburetor

a. Adjustments. Adjustment of the Zenith carburetor is accomplished by the same means as that of the Holley carburetor, in relationship to the idle mixture adjusting screw and the idle speed adjusting screw (fig. 2-91).

b. Removal of Zenith Carburetor. The Zenith carburetor can be removed by using the same procedure as given in operations (1) through (8) paragraph 2-44 for removal of Holley carburetor, except for deletion of float chamber vent hose.

c. Installation of Zenith Carburetor. Install the Zenith carburetor (fig. 2-82 or 2-98) using the same procedure as given for the Holley carburetor (para 2-44).

NOTE

Torque-tighten attaching screws 65-85 lb-in.

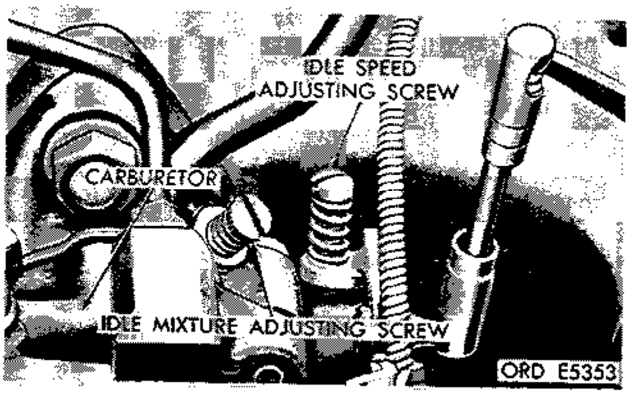


Figure 2-91. Carburetor adjustment (Holley or Zenith).

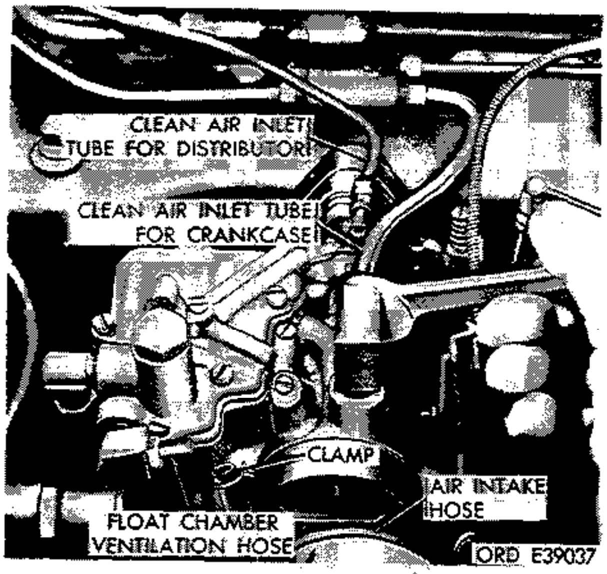


Figure 2-92. Disconnect fittings.

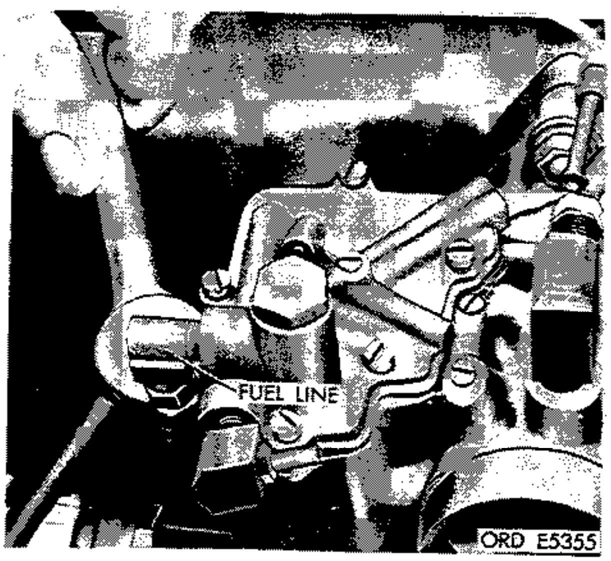


Figure 2-93. Disconnect fuel line at carburetor (M151, M151A1, M151A1C and M718).

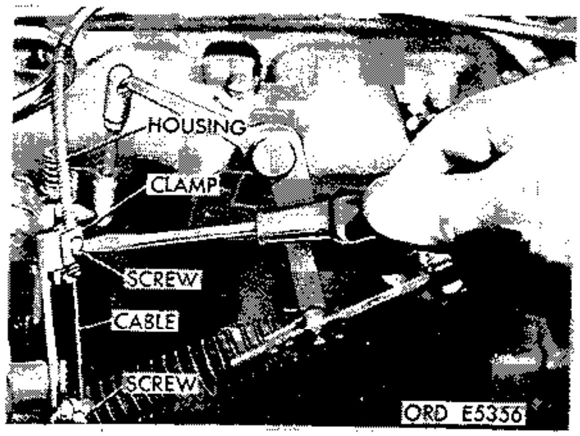


Figure 2-94. Disconnect choke cable.

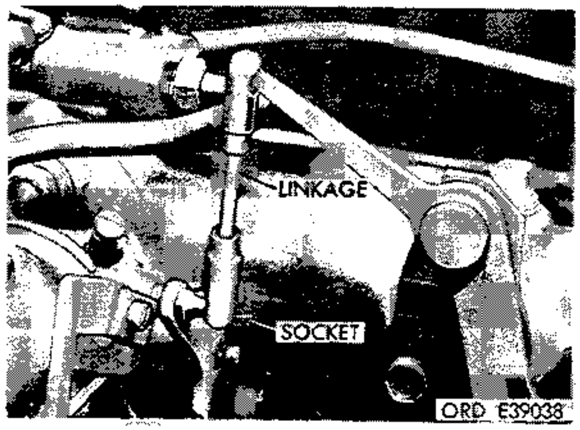


Figure 2-95. Disconnect linkage.

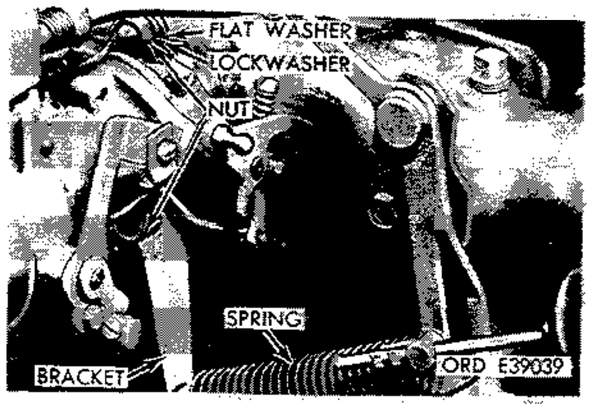


Figure 2-96. Remove spring and spring bracket.

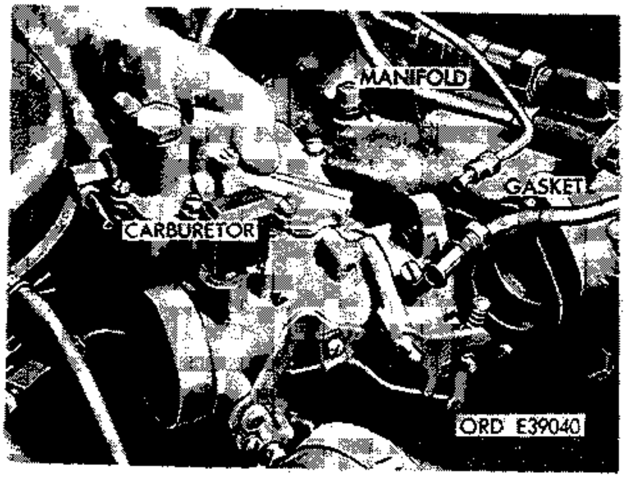


Figure 2-97. Remove carburetor and gasket from intake manifold.

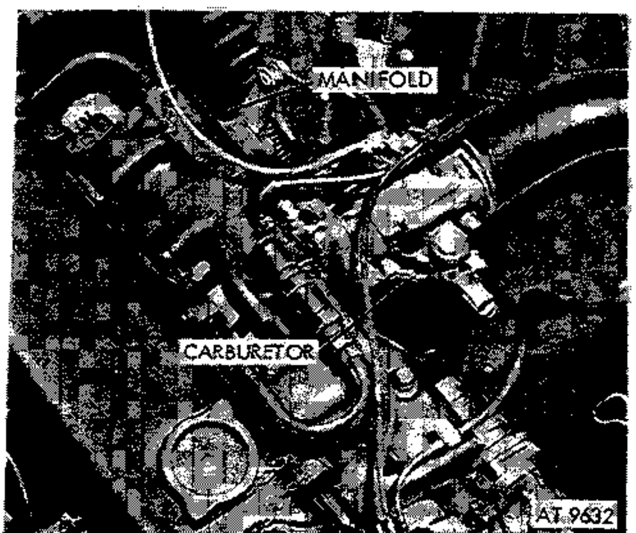


Figure 2-98. Zenith carburetor installed on M151, M151A1, M151A1C and M718 vehicles.

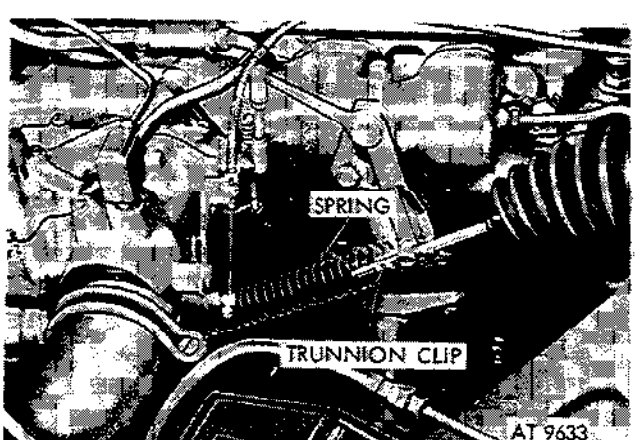


Figure 2-99. Remove spring and trunnion clip.

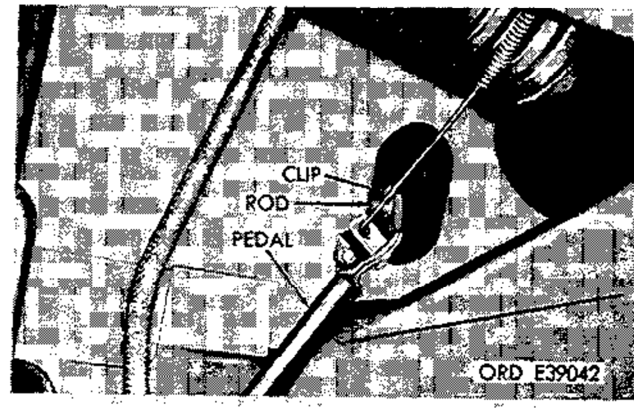


Figure 2-100. Remove rod to pedal clip.

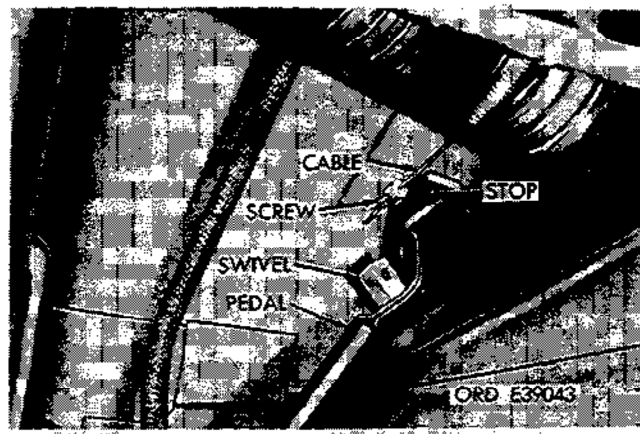


Figure 2-101. Disconnect swivel from accelerator pedal.

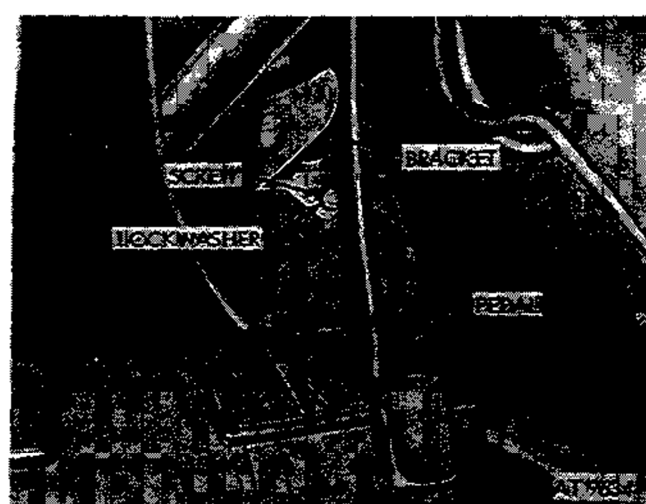


Figure 2-102. Remove accelerator pedal.

d. Idle Mixture and Speed. After the engine temperature stabilizes (15-20 min.) adjust the idle adjusting needle for smooth engine speed or highest intake manifold vacuum. Readjust the throttle stop screw for 500 rpm idle speed, and recheck the idle adjusting needle setting. If the engine speed increases, readjust the stop screw to obtain 500 rpm.

2-46. Accelerator Pedal

a. Removal.

(1) Remove accelerator pedal return spring and trunnion retaining clip (fig. 2-99).

(2) Remove accelerator road to pedal clip (fig. 2-100).

(3) Loosen throttle stop screw and remove stop from throttle cable. Disconnect throttle cable swivel from accelerator pedal (fig. 2-101).

(4) Remove two screws and lockwashers from accelerator pedal bracket. Remove accelerator pedal (fig. 2-102).

b. Installation. Install accelerator pedal by reversing removal operations (4) back through (1). Refer to figures 2-102 back through 2-99.

c. Adjustment. Adjust threaded trunnion on accelerator pedal rod (fig. 2-99) to obtain wide open throttle at carburetor with ¼ inch clearance under accelerator pedal pad. Obtain the adjustment as follows: With the accelerator or rod disconnected at the bellcrank, pull hand throttle out until accelerator pedal rests on floorboard. Block carburetor to full open position. Adjust threaded link to a slip fit in bellcrank. Turn link approximately one full turn to the right, and reassemble.

2-47. Choke Control Cable Assembly

a. Removal.

(1) Loosen clamp screw to loosen air intake hose clamp. Pull hose away from carburetor (fig. 2-103).

(2) Loosen choke control housing clamp screw. Loosen cable stop screw. Pull control cable and housing assembly from stop and clamp (fig. 2-94).

(3) Remove nut and lockwasher behind instrument panel from choke control cable and housing assembly (fig. 2-104).

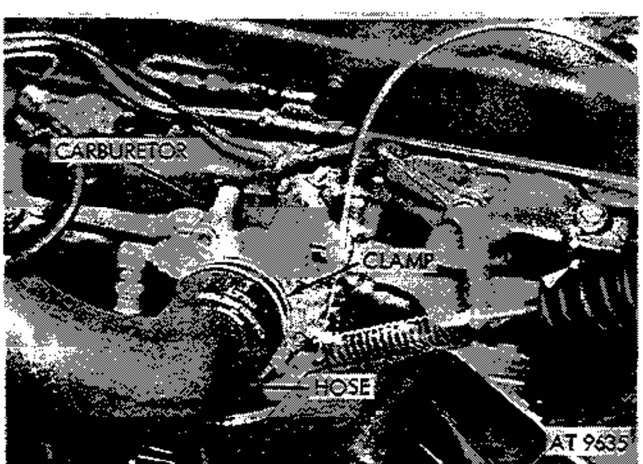


Figure 2-103. Disconnect carburetor hose.

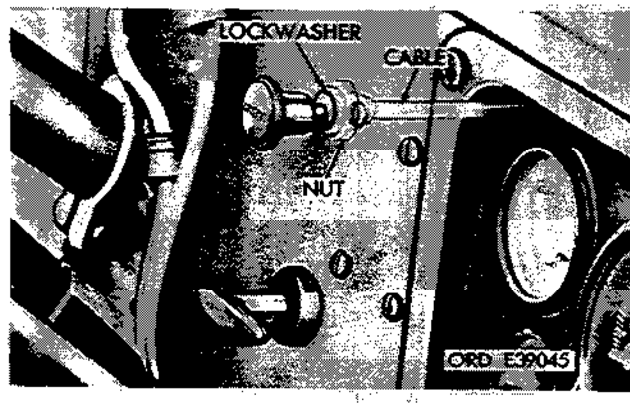


Figure 2-104. Remove choke control cable.

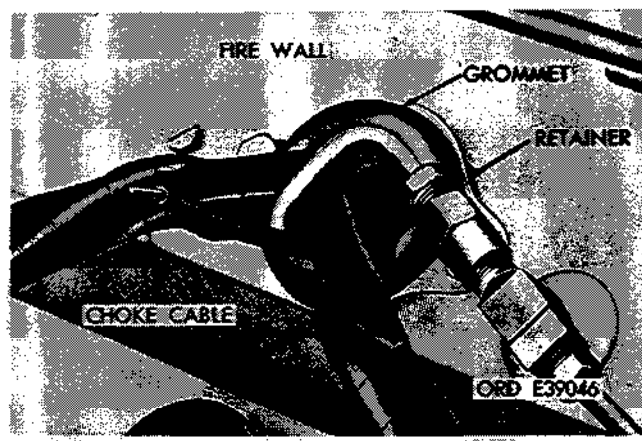


Figure 2-105. Remove choke control cable assembly through grommet.

(4) Remove cable and housing assembly through firewall grommet and through firewall. If necessary, remove retainer securing grommet to firewall (see fig. 2-105).

b. Installation. Install choke control cable assembly by reversing removal operations (4) back through (1). Refer to figures 2-105 back through 2-103.

NOTE

Before completing operation (2) perform adjustments *c(3) and c*(4) below.

c. Adjustment. Refer to figures 2-103 and 2-105 and proceed as follows:

(1) Remove air cleaner hose at carburetor to view the choke control plate when making adjustment.

(2) Loosen screw at the choke control cable stop at carburetor.

(3) Set choke control knob 1/16 inch out from instrument panel.

(4) Adjust choke control cable so the choke control plate in the carburetor is in fully open position.

(5) Secure cable and install air cleaner hose.

2-48. Throttle Control Assembly

a. Removal.

(1) Loosen setscrew on stop and remove throttle control cable from swivel (fig. 2-106).

(2) Remove nut and lockwasher behind instrument panel and remove throttle control assembly through instrument panel (fig. 2-134).

b. Installation. Install throttle control assembly by removal operations. Refer to figures 2-107 and 2-107.

NOTE

Before completing the installation operations be sure that accelerator adjustment is made and adjustments *c* (3) and *c* (4) below are performed.

c. Adjustment. Refer to figures 2-106 and 2-107 and proceed as follows:

(1) Loosen setscrew at cable stop.

(2) Set hand throttle control knob 1 / 16 inch out from dash panel.

(3) Adjust throttle control cable so throttle control plate at carburetc · is in fully closed position.

(4) Tighten setscrew.

2-49. Fuel Pump (In Tank, Electrical, M151, M151A1, M151A1C and M718) or Fuel Tank Cover (M151A2, M825 and M718A1)

a. Removal.

WARNING

Drain sufficient fuel from tank before removing fuel pump or fuel tank cover to prevent overflow. During removal operation, do not allow sparks or open flame near fuel tank.

CAUTION

Disconnect battery ground cable.

(1) Remove seats.

(2) Disconnect electrical connectors from fuel pump (M151, M151A1, M151A1C, and M718) and sending unit (fig. 2-108). Disconnect fuel and vent tubes. Remove ten screws and lockwashers securing fuel pump (M151, M151A1, M151A1C, and M718) or fuel tank cover (M151A2, M825, and M718A1) to fuel tank.

(3) Lift fuel pump or fuel tank cover out of tank. Removal and discard gasket (fig. 2-109).

b. Installation. Clean gasket surfaces on fuel pump (M151, M151A1, M151A1C, and M718) or fuel tank cover (M151A2, M825, and M718A1), and fuel tank before installing pump or cover and gasket.Install pump or cover by reversing removal operations (3) back to (1). Refer to figures 2-109 and 2-108.

c Testing Fuel Pump Pressure.

(1). Disconnect tube at carburetor.

(2) Using a pressure gage, hold tapered adapter to fuel tube.

(3) Start engine. Engine should normally operate due to sufficient fuel in carburetor. If engine does not start, continue operating starter until maximum reading on pressure gage is obtained. Correct pressure is from 4.9 to 5.4 psi. If pressure is incorrect, replace fuel pump.

(4) Recheck pressure and connect fuel tube.

2-50. Fuel Pump (M141A2, M825 and M718A1 Vehicles)

a. Removal.

(1) Loosen clamp and disconnect fuel inlet hose at mechanical fuel pump (fig. 2-110).

(2) Disconnect vent and fuel supply lines at fuel pump (fig. 2-111).

(3) Remove two screws and lockwashers securing fuel pump to engine block. Remove pump and gasket. Discard gasket.

b. Installation. Clean surfaces for pump gasket before installing fuel pump. Use new gasket and install pump by reversing procedures in a above.

c Testing Fuel Pump Pressure.

(1) Disconnect fuel line at filter (fig. 2-82).

(2) Use pressure gage. Hold tapered adapter to fuel line tube.

(3). Start engine. Engine should operate due to normal amount of fuel in carburetor. If engine does not start, continue cranking engine until a correct reading of from 5 to 6 psi is obtained. If pressure is incorrect, replace the pump assembly.

(4) Recheck pressure and connect fuel line to filter.

2-51. Filter Element and Pump Motor (M151, M151A1, M151A1C and M718)

a. Removal.

NOTE

During the disassembly operation, parts that are to be reused should be handled carefully to prevent damage.

(1) Remove fuel pump from gas tank (para. 2-49).

(2) Remove three screw and lockwasher assemblies securing filter retaining plate to underside of pump (fig. 2-112).

(3) Remove two filter gaskets, filter element, upper gasket spacer ring, and spring washer (fig. 2-113).

(4) Cut pump motor lead wire under the top cover plate (fig. 2-113).

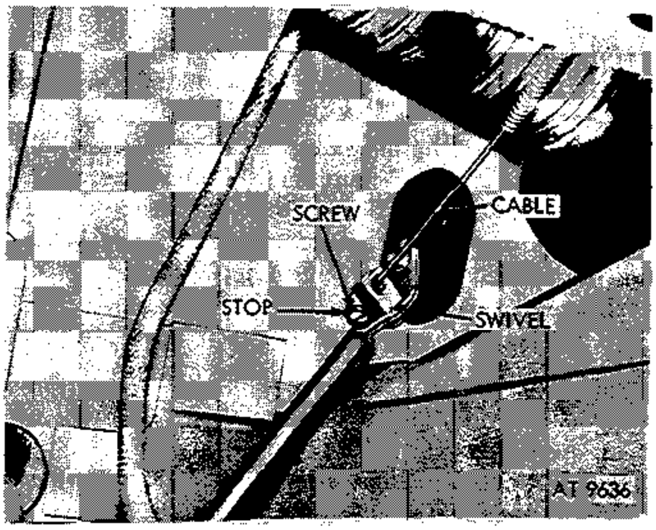


Figure 2-106. Remove throttle control cable from swivel.

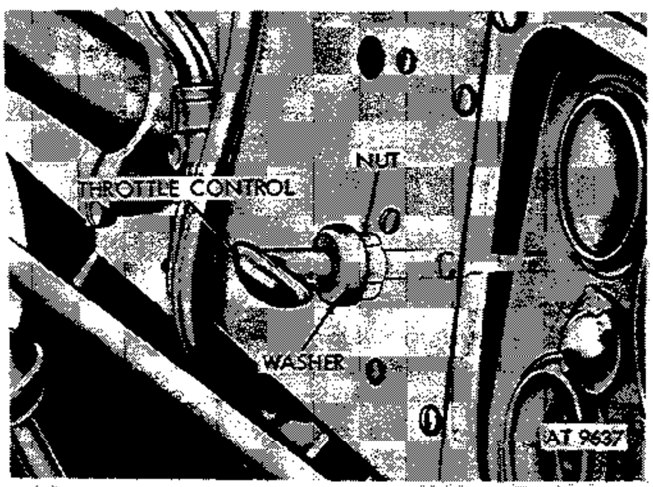


Figure 2-107. Remove throttle control assembly.

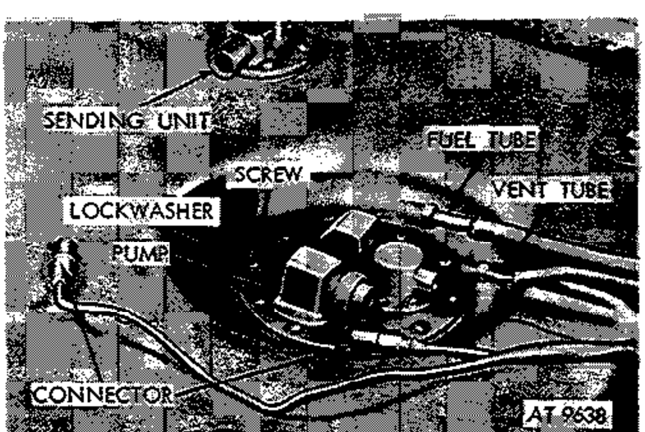


Figure 2-108. Disconnect tubes and connectors from fuel pump (M151, M151A1, M151A1C, and M718).

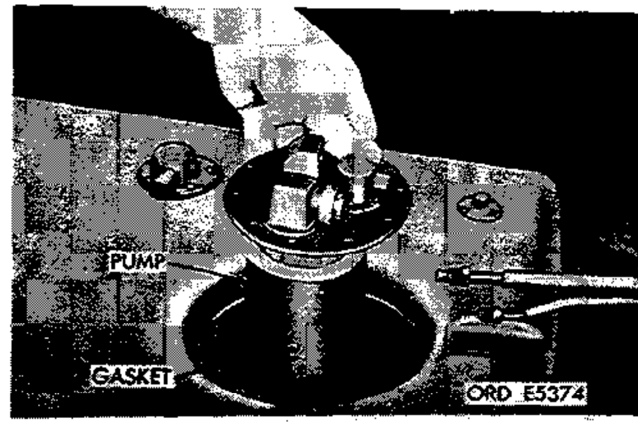


Figure 2-109. Remove pump and gasket (M151, M151A1, M151A1C, and M718).

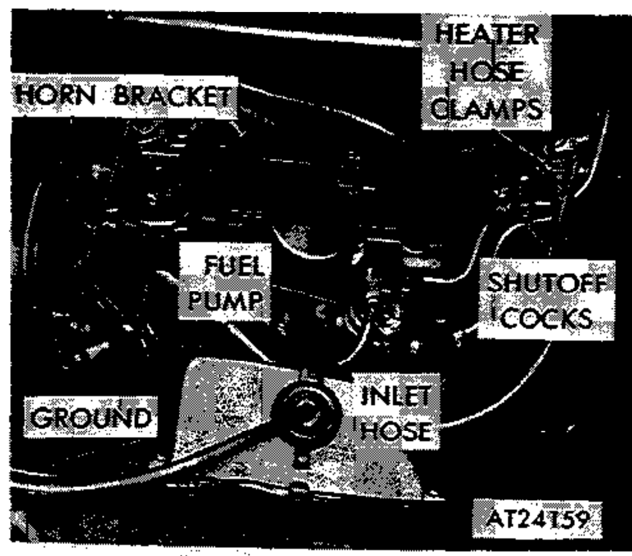


Figure 2-110. Disconnecting or connecting ground cable at horn, fuel pump line and heater hoses on M151A2, M825 and M718A1 vehicles.

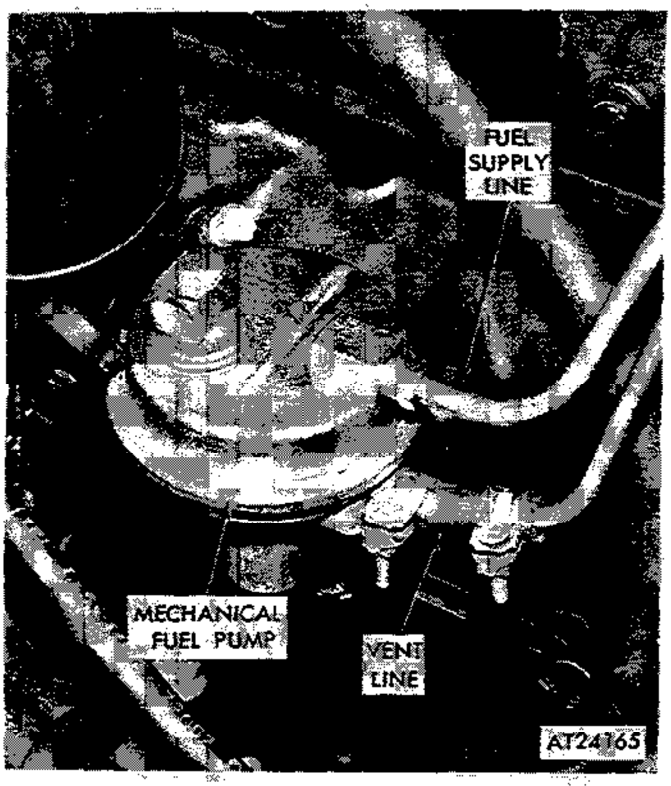


Figure 2-111. Removing or installing mechanical fuel pump (M151A2, M825, and M718A1 vehicles).

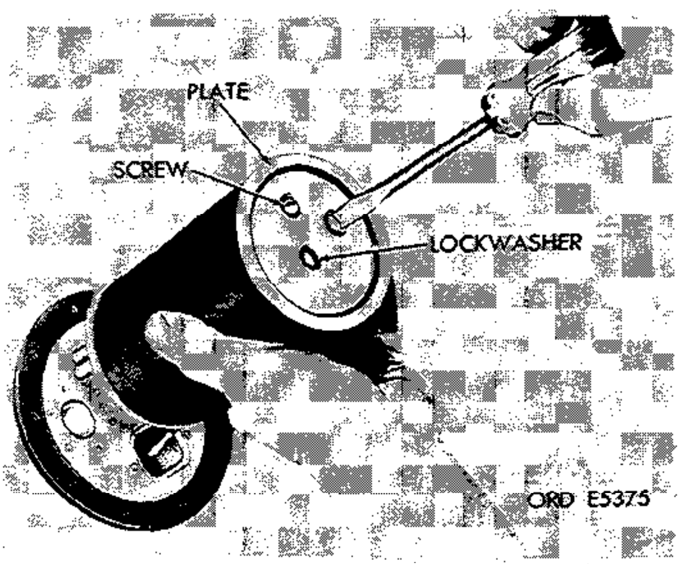


Figure 2-112. Remove filter retaining plate.

(5) Remove compression nut, top jam nut, and lockwasher securing pump motor to mounting plate (fig. 2-113).

(6) Remove lower jam nut from pump motor (fig. 2-113).

(7) Remove flared nut and fuel line tube from the fuel fitting in the top cover plate. (fig. 2-113)

(8) Remove electrical terminal nut using special wrench provided with Kit (5703309). Remove terminal and lead wire from the terminal housing (fig. 2-113).

(9) Remove rubber grommet from pump motor mounting plate (fig. 2-113).

b. Installation.

NOTE

Use new parts supplied in fuel pump kit (5703309)

(1) Install the fuel line tube and flared nut to the fuel fitting in the top cover plate. Tighten the nut (fig. 2-113).

(2) Thread lower jam nut to the pump motor to a dimension of approximately 5 / 32 of an inch measured from the bottom of the nut to the top of the shoulder on the cover boss (fig. 2-113).

(3) Hold top cover plate upside down. Place compression nut, sleeve, top jam nut, and lockwasher on the fuel line tube (fig. 2-113)

(4) Insert pump motor lead wire and cover boss through mounting plate. Check the 7.635-7.575 inch dimension from bottom of top cover plate to the bottom of pump motor. Adjust lower jam nut, if necessary, to conform to this dimension. Tighten the upper jam and compression nut (fig. 2-113).

(5) Insert rubber grommet over pump motor lead wire and press into position in mounting plate (fig. 2-113).

(6) Assemble in their proper order, to the terminal housing, the insulating washer, steel washer, pump motor lead wire, terminal shell, shell cup, and terminal nut. Tighten terminal nut using special wrench provided with Kit (5703309) (fig. 2-113).

CAUTION

Care should be taken during this operation to insure that the terminal shell is seated against terminal housing to allow the insulating washer to isolate the terminal, otherwise an electrical short will result.

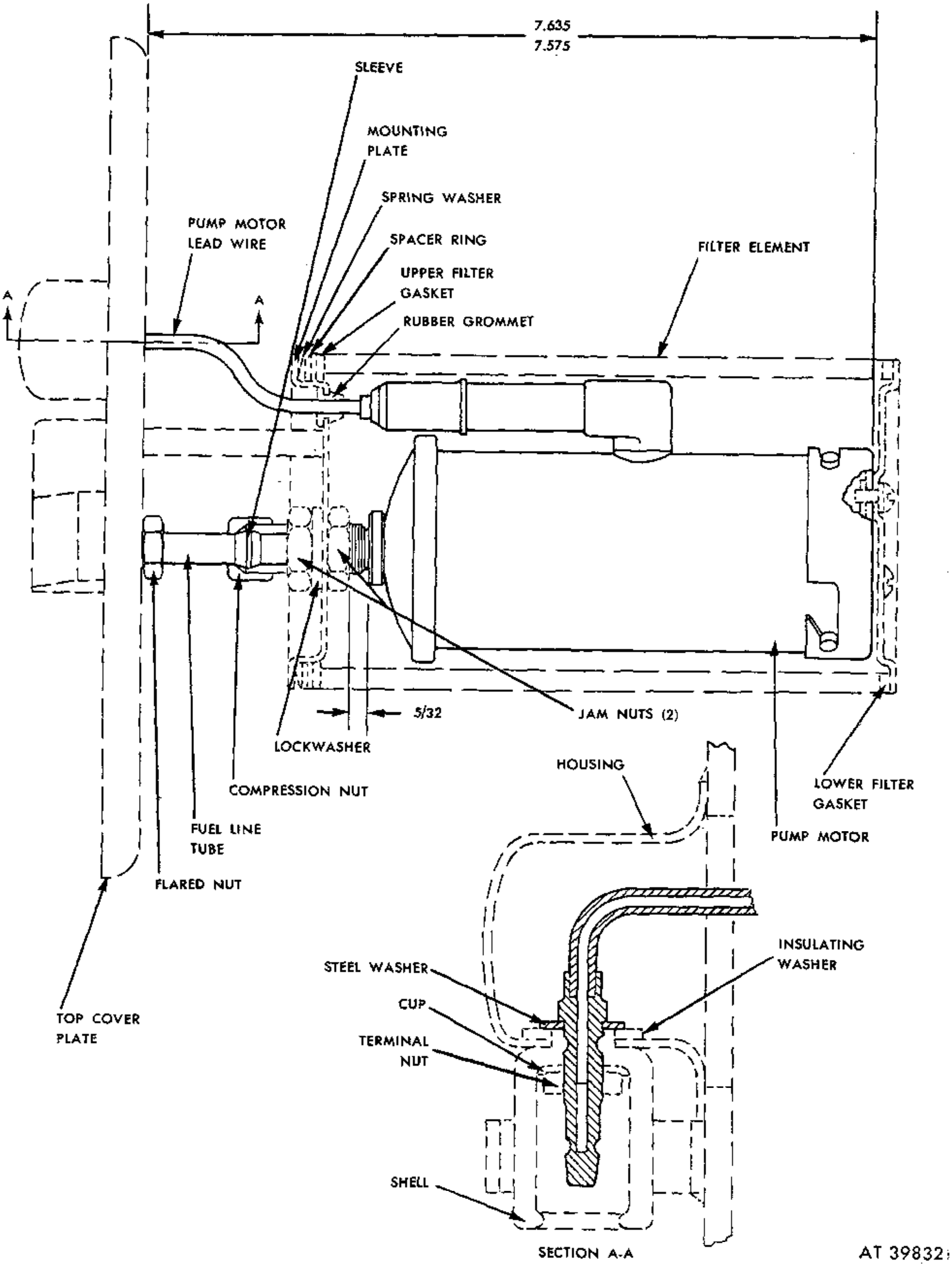


Figure 2-113. Remove fuel element.

(7) Make the necessary connections and check the flared nut and compression nut for leaks while pumping fluid. If leakage exists, tighten nuts further. If leakage still exists, pump assembly cannot be used.

(8) Assemble in their proper order, the spring washer, spacer ring, upper filter gasket, filter element, lower filter gasket, filter retaining plate, and three screw and lockwasher assemblies (fig. 2-112 and 2-113).

(9) Install fuel pump in gas tank (para 2-49).

2-52. Replacing Fuel Filters on M151A2, M825 and M718A1 Vehicles

a. Removal (In-Line Fuel Filter).

(1) Remove hose clamp at fuel inlet hose. See figure 2-82 and remove hose from filter.

(2) Unscrew filter from carburetor and remove (fig. 2-82).

b. Installation (In-Line Fuel Filter). Install new fuel filter in reverse of above procedure.

c. Removal (In-Tank Fuel Filter).

(1) Remove fuel tank cover (para 2-49).

(2) Remove and discard fuel filter from end of fuel supply tube (fig. 2-114).

d. Installation (In-Tank Fuel Filter). Install new fuel filter in reverse of above procedure.

2-53. Fuel Tank

a. Removal.

(1) Disconnect battery ground cable (fig. 2-182).

(2) Remove driver's seat (para 2-198).

NOTE

Place a suitable container directly under fuel tank drain plug.

(3) Drain tank by removing plug (fig. 2-115).

WARNING

Do not allow any sparks or open flame near fuel tank.

(4) Disconnect electrical connectors at fuel level sending unit and fuel pump on M151, M151A1, M151A1C and M718 (fig. 2-108). Disconnect fuel lines and vent line at tank connecting points.

(5) Remove four fuel tank mounting screws and lockwashers (fig. 2-116).

(6) Carefully lift tank away from vehicle (fig. 2-117).

NOTE

Use care not to damage or distort attaching fuel and vent lines during removal procedures.

b. Installation.

(1) Position fuel tank in vehicle and secure with four screws and lockwashers (figs. 2-116 and 2-117).

(2) Connect fuel line and vent line. Connect electrical connector at fuel level sending unit and fuel pump on M151, M151A1, M151A1C and M718 (fig. 2-108).

(3) Replace driver's seat.

(4) Replace drain plug.

(5) Connect battery ground cable (fig. 2-182).

2-54. Fuel and Fuel Ventilation Tubes, Hoses and Connectors

a. General. Figure 2-108, 2-118, and 2-119 show the fuel and fuel ventilation tubes, hoses, and connections in the engine and passenger compartments.

NOTE

Figure 2-119 shows fuel vent line on M151A2, M825, and M718A1 vehicles.

b. Removal. All fuel and fuel ventilation tube connections are made with flared end male-and-female-type fittings. To remove a tube, hose or fitting, used suitable tools and disconnect and remove.

c. Installation. When installing fuel and fuel ventilation tubes, start all threads by hand, being careful not to cross thread the connection. Tighten all connections securely, but do not overtighten. Inspect for leads. Make certain that electrical connectors are completely engaged.

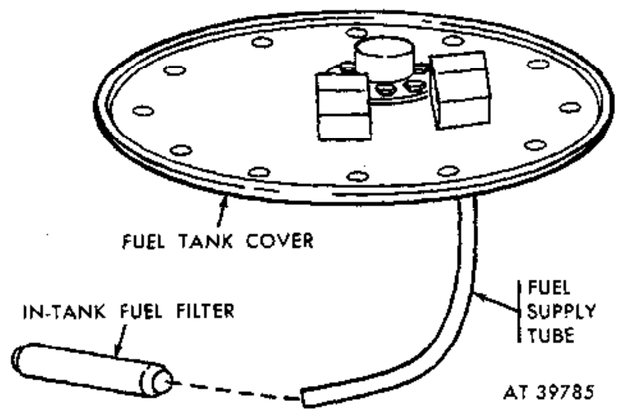


Figure 2-114. In-Tank fuel filter on M151A2, M825 and M718A1 vehicles.

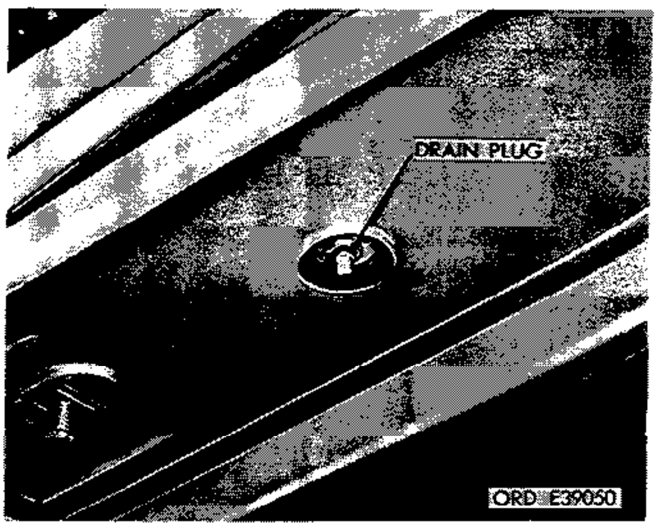


Figure 2-115. Drain fuel tank.

Figure 2-116. Remove screws and lockwashers from tank.

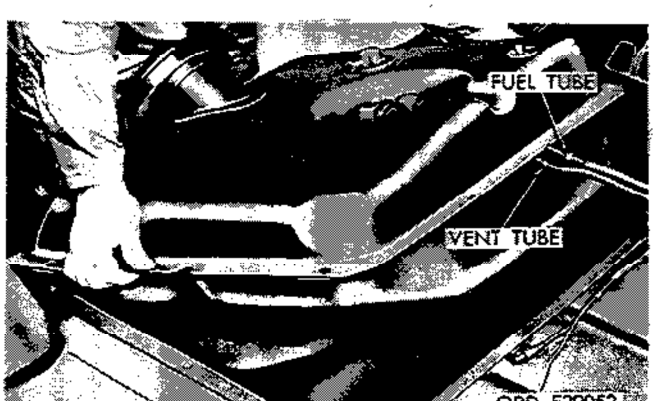


Figure 2-117. Remove fuel tank.

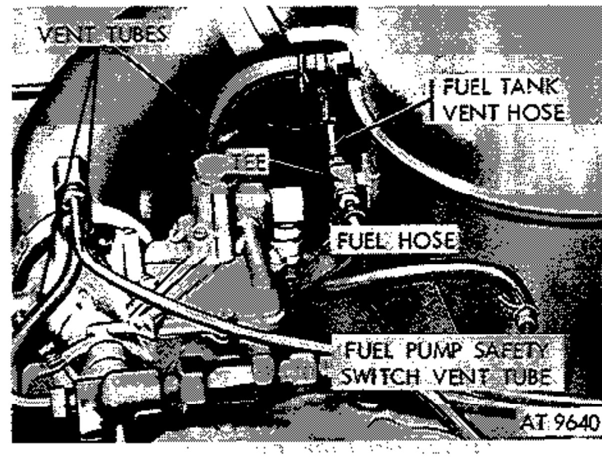


Figure 2-118. Fuel and ventilation hoses on M151, M151A1, M151A1C, and M718 vehicles.

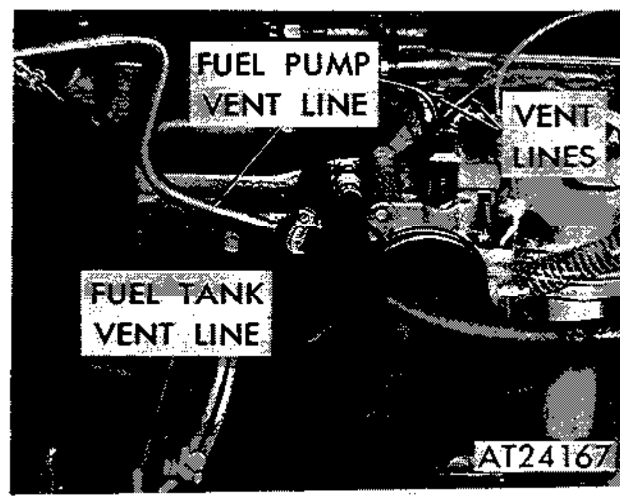


Figure 2-119. Fuel vent lines on M151A2, M825, and M718A1 vehicles.

2-55. Description

The exhaust system consists of a muffler inlet pipe, muffler, front outlet pipe, rear outlet pipe and a tailpipe extension, together with necessary clamps, gaskets, bolts, nuts and lockwashers. Figure 2-120 shows the exhaust system.

2-56. Muffler Inlet Pipe

a. Removal.

(2) Remove two brass nuts and lockwashers securing muffler inlet pipe to exhaust manifold and discard gasket (fig. 2-121).

(2) Raise vehicle and remove four bolts from rear universal joint of front propeller shaft (fig. 2-122).

(3) Remove two bolts, washers, and locknuts from clamp securing muffler inlet pipe to muffler inlet. Remove clamp and discard gasket (fig. 2-123).

b. Installation. Install muffler inlet pipe by reversing removal operations. Refer to figures 2-123 back to 2-121. Torque the following parts to the values shown:

Muffler inlet pipe to exhaust manifold nuts (3/8-24)	15-20 lb-ft
Muffler inlet pipe clamp locknut (5 / 16-18)	8-12 lb-ft
Universal joint bolt (5 / 16-24)	15-20 lb-ft

NOTE

Use new gaskets for installation.

2-57. Muffler

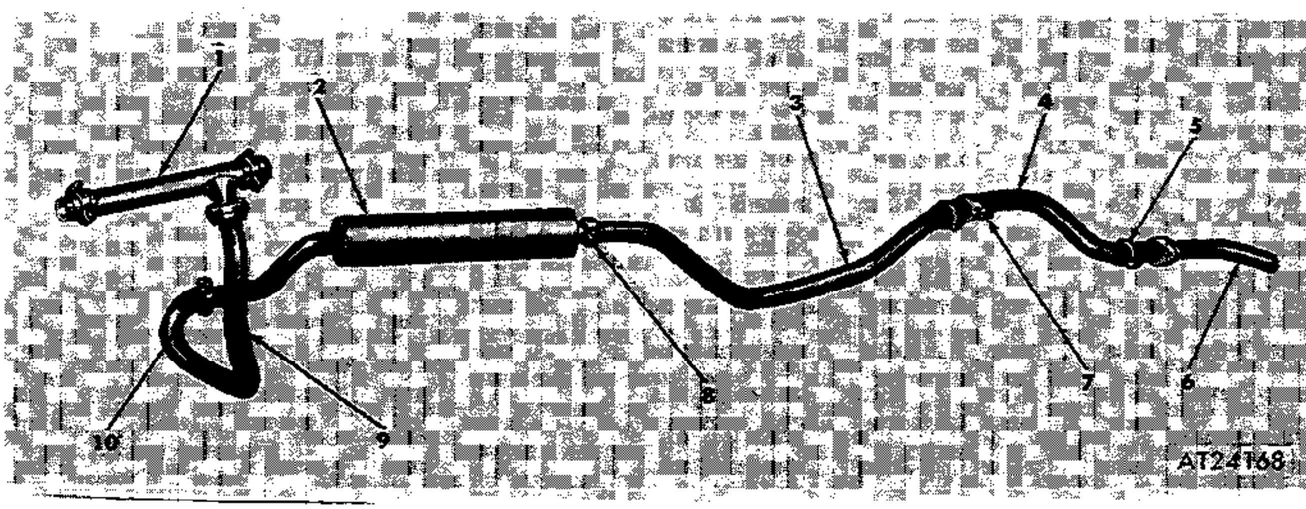
a. Removal.

(1) Lift vehicle and remove four bolts from front end of rear propeller shaft (fig. 2-124).

(2) Remove locknuts, washers and bolts from clamp securing muffler inlet pipe to muffler. Remove clamp and discard gasket (fig. 2-125).

(3) Remove locknuts, washers and bolts from clamp securing front outlet pipe to muffler. Remove clamp and discard gasket (fig. 2-126).

(4) Remove locknut and bolt from muffler retainer clamp and remove muffler (fig. 2-127).



1 Exhaust manifold
2 Muffler
3 Front outlet pipe
4 Rear outlet pipe
5 Rear pipe hanger
6 Tailpipe extension
7 Front to rear outlet pipe clamp
8 Muffler to outlet pipe clamp
9 Muffler inlet pipe
10 Inlet pipe to muffler clamp

Figure 2-120. Exhaust system.

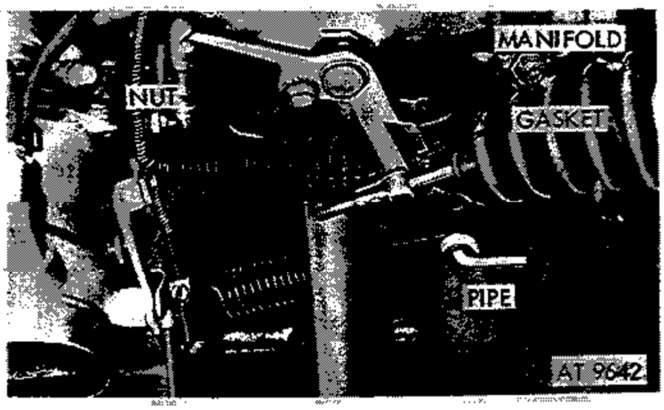


Figure 2-121. Remove muffler inlet pipe.

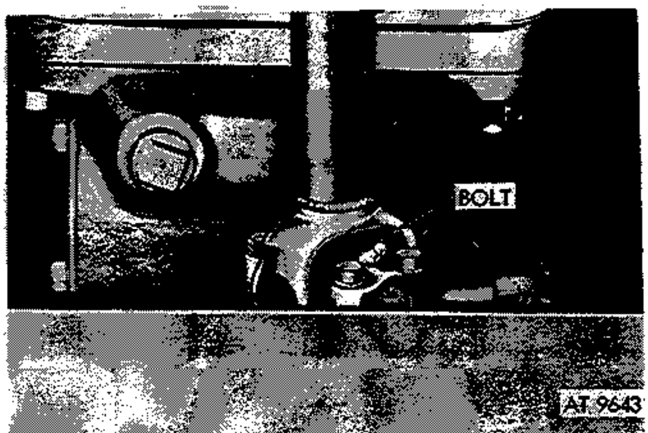


Figure 2-122. Disconnect rear joint of propeller shaft.

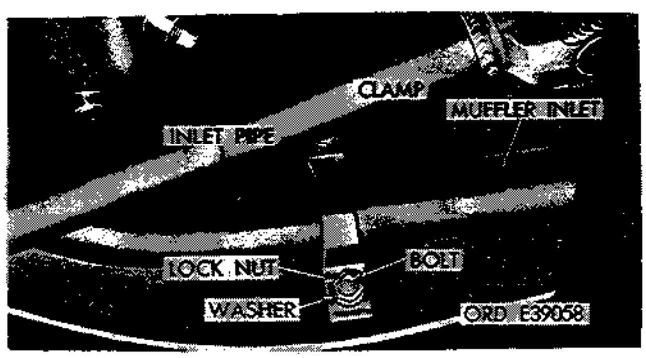


Figure 2-123. Remove muffler inlet pipe clamp.

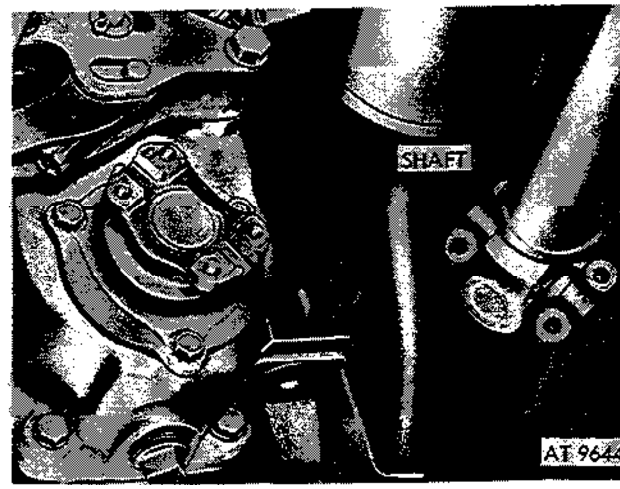


Figure 2-124. Disconnect front end of rear propeller shaft.

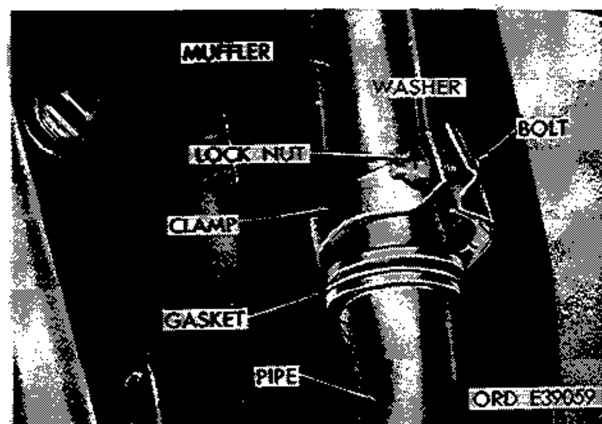


Figure 2-125. Remove clamp from muffler inlet pipe.

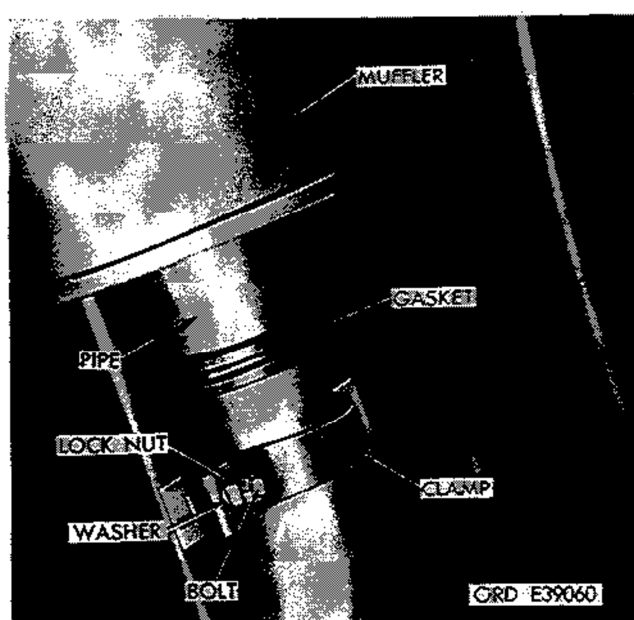


Figure 2-126. Remove clamp from muffler outlet pipe.

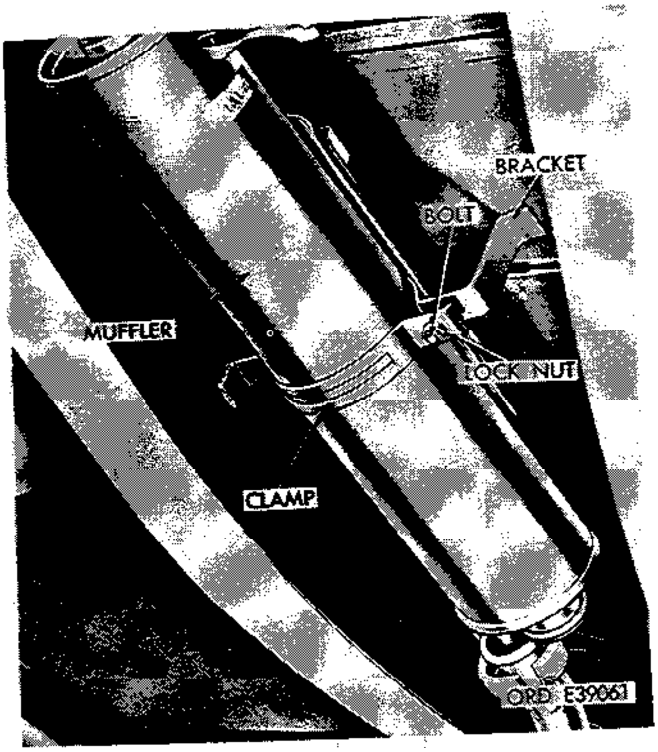
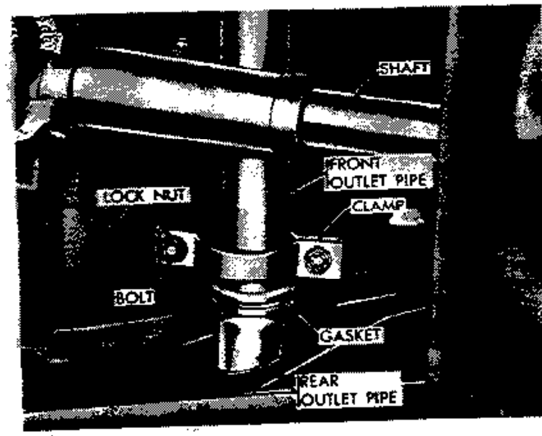


Figure 2-127. Remove muffler.



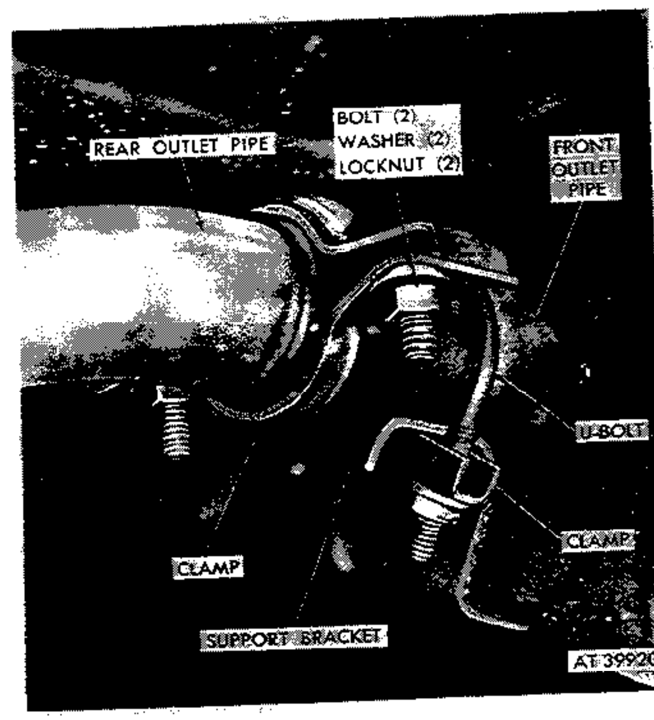


Figure 2-128. Remove front outlet pipe from rear outlet pipe.

b. Installation. Install muffler by reversing removal operations. Refer to figures 2-127 back to 2-124. Torque the following parts to the values shown:

Muffler retainer clamp locknut (5 / 16-18)	8-12 lb-ft
Muffler inlet pipe clamp locknut (5 / 16-18)	8-12 lb-ft
Muffler front outlet pipe clamp locknut (5 / 16-18)	8-12 lb-ft
Universal joint bolt (5 / 16-24)	15-20 lb-ft

NOTE

Use new gaskets at installation.

2-58. Front Outlet Pipe

a. Removal.

(1) Loosen muffler retaining bracket nut and bolt. Loosen bracket (fig. 2-127).

(2) Remove locknuts, washers and bolts from clamp securing front outlet pipe to rear of muffler. Remove clamp and discard gasket (fig. 2-126).

(3) Remove U-bolt and clamp securing front outlet pipe to support bracket (M151A2, M825 and M718A1 only) (fig. 2-128).

(4) Remove two locknuts, washers and bolts from clamp securing front outlet pipe to rear outlet pipe (fig. 2-128). Remove clamp and discard gasket. Work pipe down and out, rotating as necessary to clear drive shaft.

b. Installation. Install front outlet pipe by reversing removal operations. Refer to figures 2-128 back through 2-126. Torque the following parts to the values shown:

Muffler front outlet pipe clamp locknut (5 / 16-18)	8-12 lb-ft
Muffler rear outlet pipe clamp locknut (5 / 16-18)	8-12 lb-ft

NOTE

Use new gaskets at installation.

2-59. Rear Outlet Pipe

a. Removal.

(1) Remove two locknuts, washers, and bolts from clamp securing rear outlet pipe to front outlet pipe. Separate clamp and remove it from pipe (fig. 2-128).

(2) Loosen two locknuts from bolts securing clamps to rear outlet pipe and support bracket (M151, M151A1, M151A1C and M718 only) (fig. 2-129).

(3) Remove two locknuts, washers, and bolts from clamp retaining rear outlet pipe to frame. Remove rear outlet pipe and tailpipe extension from vehicle. Discard front outlet pipe to rear outlet pipe gasket (M151, M151A1, M151A1C and M718 only (fig. 2-130).

(4) Remove U-bolt and clamp retaining rear outlet pipe to frame. Remove rear outlet pipe and tailpipe extension from vehicles. Discard front outlet pipe to rear outlet pipe gasket (M151A2, M825 and M718A1 only) (fig. 2-130).

(5) Remove tailpipe extension from rear outlet pipe (para 2-60).

b. Installation. Install rear outlet pipe by reversing removal operations. Refer to figures 2-130 back through 2-128. Torque the following parts to the values shown:

Muffler front and rear outlet pipe clamp locknut 5 / 16-18)	8-12 lb-ft
Rear outlet pipe support bracket locknut (5 / 16-18)	8-12 lb-ft

NOTE

Use new gaskets for installation.

2-60. Tailpipe Extension

a. Removal.

(1) Remove two bolts and locknuts securing tailpipe extension to rear outlet pipe (fig. 2-131).

(2) Remove tailpipe extension and gasket. Discard gasket.

b. Installation. Install tailpipe extension by reversing removal operations. Refer to figure 2-131. Torque value for nuts is 12-15 lb-ft.

NOTE

Use new gasket at installation.

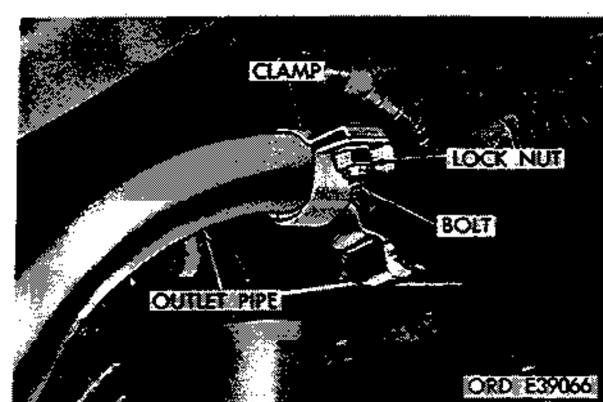
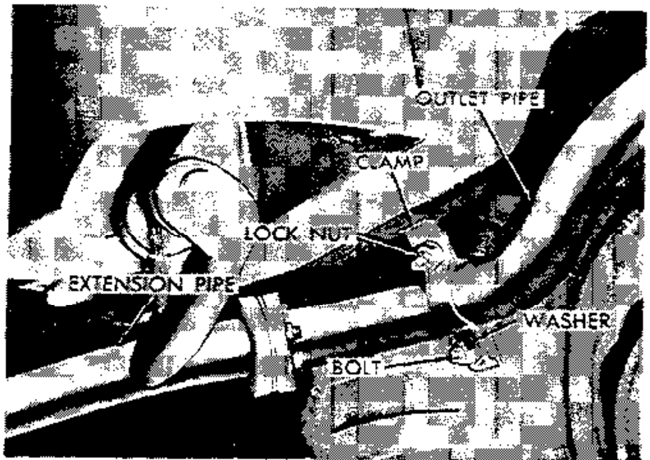


Figure 2-129. Disconnect rear outlet pipe and bracket (M151, M151A1, M151A1C and M718).



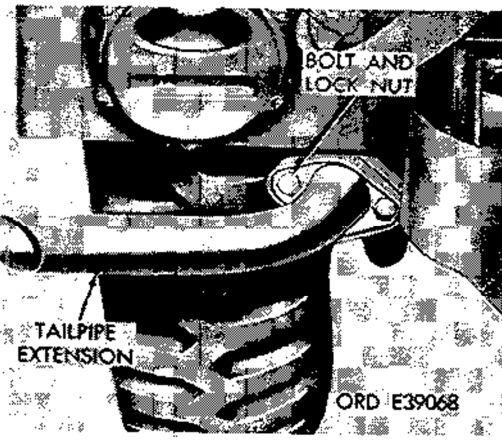


Figure 2-131. Remove tailpipe extension.

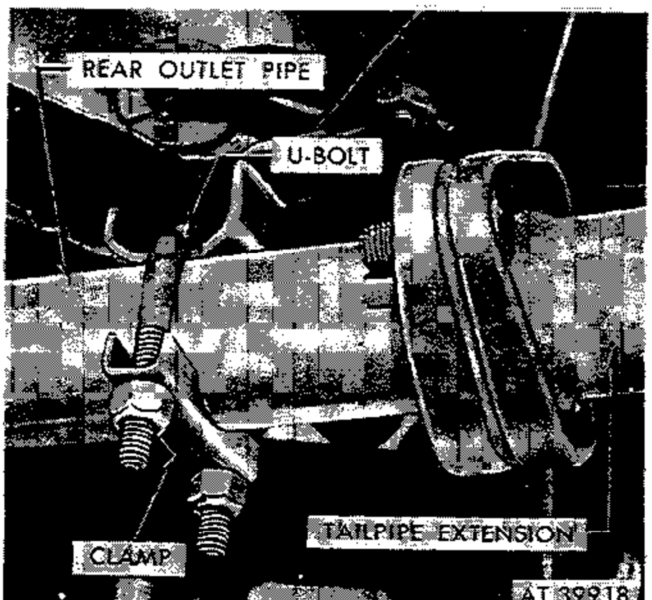


Figure 2-130. Remove rear outlet pipe and tailpipe extension from vehicle.

Section X. COOLING SYSTEM

2-61. General

a. Description.

(1) *Cooling system.* The cooling system is a forced circulation, pressurized type and consists of the water pump, fan, shroud, drive belts, thermostat, hoses, radiator, and a pressurizing radiator filler cap. The coolant is drawn from the lower tank of the radiator by the water pump and is circulated through the cylinder block and cylinder head. After circulating throughout the cylinder block and cylinder head, the coolant is forced through an outlet connection past the thermostat, if it is open, into the upper tank of the radiator. As the coolant drops to the lower tank of the radiator, it is cooled by air drawn through the radiator by the fan and the motion of the vehicle. When, because of insufficient operating temperature, the thermostat is closed, constant circulation of the coolant is provided by a drilled passage connecting the cylinder head with the intake side of the pump.

(2) *Water pump.* The water pump is a centrifugal-type unit mounted on the front of the cylinder block, and driven by two or three V -belts depending on the generator used. The pump shaft and double row ball bearing are integral. The bearing is packed with special high-melting point

grease at the time of manufacture and requires no further lubrication. The shaft and bearing unit assembly is retained in the housing by a snapring. The seal assembly is pressed into the pump housing. On side of the thrust washer of the seal assembly bears against the machined surface of the impeller and the other side is cemented to a rubber bellows which is in turn cemented to the seal retainer. A coil spring, an integral part of the seal, maintains a constant pressure against the thrust washer and the machined surface of the impeller, assuring a positive seal. A drain hole is provided in the bottom of the housing to prevent water seepage past the seal from entering the ball bearing. The pump pulley hub is pressed on the pump shaft.

(3) *Fan.* The fan is a four-blade type with blades spaced irregularly to dampen noise. The fan is bolted to the water pump hub which is pressed on the pump shaft. The bolts used to fasten the fan blades also retain the water pump fan pulley, which is driven from the crankshaft pulley by V-belts.

(4) *Radiator.* The radiator is of vertical tube-and-plate fin construction, utilizing a pressure filler cap which maintains a pressure of approximately seven pounds per square inch. By operating under this pressure, the boiling point of the coolant is raised approximately 19 degrees. An overflow tube is provided on the radiator to allow the escape of coolant and / or pressure when the pressure rises above the limit of the pressure cap. The radiator cap assembly also contains a vacuum relief valve which allows air into the radiator if a vacuum is created. Drain cocks are located at the left rear side of the cylinder block and at the bottom center of the radiator to provide for complete drainage of the coolant. The radiator is mounted to support brackets using rubber insulators. The brackets are bolted to both sides of the engine block. A rubber insulator support is provided at the center of the top of the radiator to control fore and aft motion of the radiator.

(5) *Radiator shroud.* The radiator shroud is attached to the radiator and is designed to prevent recirculation of the air.

(6) *Thermostat.* The thermostat is a spring and cartridge-type, located in the cylinder head and retained by the water outlet connection. The thermostat restricts the flow of coolant to the radiator until a predetermined temperature is reached, thus maintaining an efficient operating temperature.

b. Data. Refer to table 1-1 for tabulated data.

2-62. Radiator Hoses

a. Removal.

(1) Open drain cock and drain radiator (fig. 2-134). Loosen clamps and pull hose from inlet of radiator and from outlet of cylinder head (fig. 2-132).

(2) Loosen clamps and pull hose from water pump inlet and from radiator outlet (fig. 2-133).

b. Installation. Clean hose connections before installing hoses. Install hoses by reversing removal operations. Refer to figure 2-133 and 2-132.

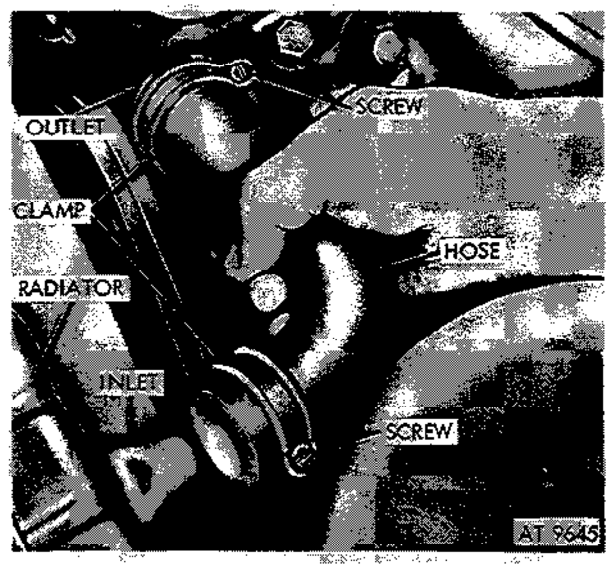


Figure 2-132. Remove upper radiator hose.

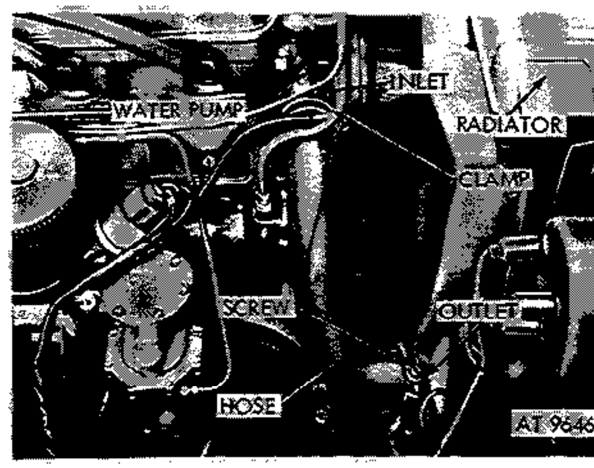


Figure 2-133. Remove lower radiator hose.

Torque clamps to 18-22 lb-in. Fill cooling system as specified in LO 9-2320-218-12.

NOTE

Check for coolant leaks

2-63. Radiator

a. Removal.

(1) Open drain cock and drain radiator (fig. 2-134).

(2) Loosen screw in radiator hose clamp and pull inlet hose from radiator (fig. 2-132).

(3) Loosen nuts and remove radiator insulator assembly from radiator support and engine lifting eye (fig. 2-135).

(4) Loosen radiator hose clamp and pull outlet hose from radiator (fig. 2-133).

(5) Remove two lower mounting locknuts, flat washers, and insulators (fig. 2-134).

(6) Remove six screw and lockwasher assemblies from fan shroud and remove radiator (fig. 2-136).

b. Installation. Install radiator by reversing removal operations. Refer to figures 2-136 back to 2-132. Torque the following attaching parts to the values shown:

Radiator to support mounting nut (5 / 16-18)	5-8 lb-ft.
Radiator upper bracket to insulator and insulator to engine lifting eye	7.5-8.5 lb-ft.
Radiator upper insulator bracket to head bolt (5 / 16-18)	7-11 lb-ft.

Fill cooling system as specified in TM 9-2320-218-10.

2-64. Thermostat

a. Removal.

(1) Open drain cock and drain radiator (fig. 2-134).

(2) Remove radiator upper hose (fig. 2-132).

(3) Remove two screws and lockwashers retaining coolant outlet to cylinder head (fig. 2-137).

(4) Remove coolant outlet and gasket. Discard gasket (fig. 2-138).

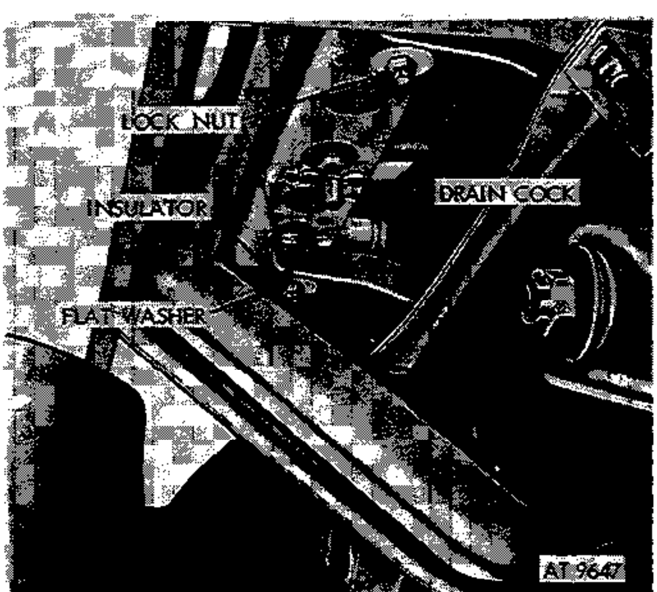


Figure 2-134. Radiator mounts and drain cock.

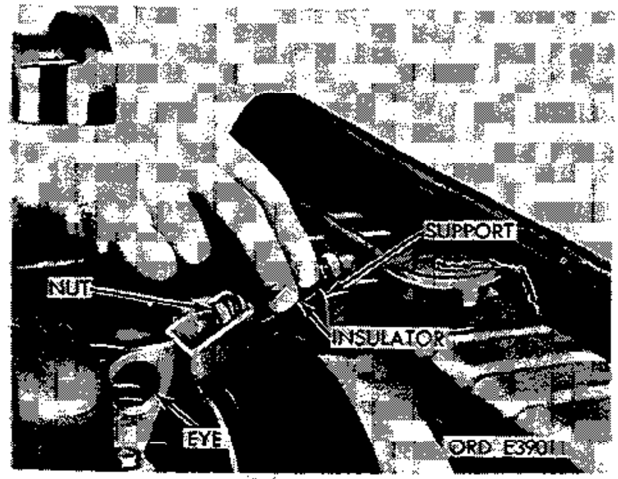


Figure 2-135. Radiator support and insulator.

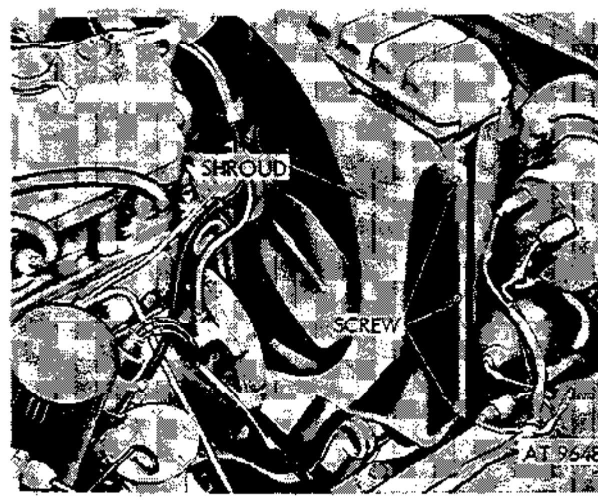


Figure 2-136. Remove radiator.

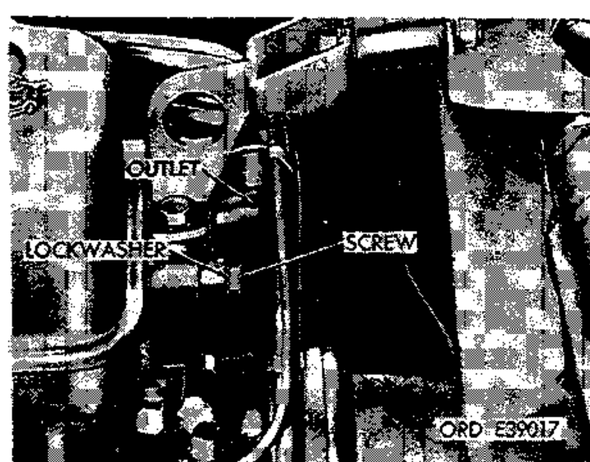


Figure 2-137. Remove coolant outlet.

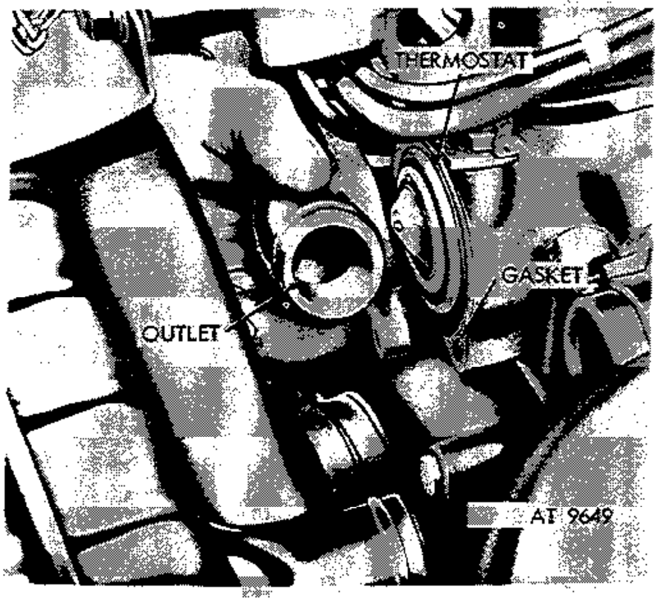


Figure 2-138. Remove thermostat.

(5) Remove thermostat from cylinder head (fig. 2-138).

b. Test. Open thermostat valve and place 0.003-inch thickness gage between valve and frame. Release valve. Gage should be held by valve spring pressure on valve. If thermostat cannot be suspended by thermostat, hold on gage, discard as defective. If it holds onto the gage, place in water which has been heated to 175°F. If gage is released, discard thermostat. If gage is not released, continue to heat water. Thermostat will be considered usable if it released between 177°F and 182°F. If it holds onto gage above 182°.F. discard thermostat.

c. Installation. Clean outlet gasket surfaces on cylinder head and outlet before installing gasket and outlet. Clean hose connections before installing upper hose. Install thermostat on vehicle by reversing removal operations. Torque outlet mounting screws to 10-15 lb-ft.

NOTE

Always use new gasket. Fill cooling system as specified in TM 9-2320-218-10. Check for coolant leaks.

2-65. Water Pump, Fan, Fan Pulley, and Drive Belts

a. Removal. Procedures (1) through (6) below show operations to remove water pump with radiator and shroud removed (para 2-63).

NOTE

To remove fan, fan pulley, or drive belts, follow the steps described and shown below to the point required for such removal. For removal of drive belts only, it is not necessary to remove radiator.

(1) Loosen generator mounting bolts on bottom of generator and loosen adjusting bolt, move generator toward engine (fig. 2-139).

(2) Remove drive belts (2 for 25 amp system, 3 for 60 amp system) (fig. 2-140).

(3) Remove four screws and lockwashers securing fan and fan pulley to water pump shaft flange. Remove fan (fig. 2-140).

(4) Remove fan pulley (fig. 2-141).

(5) Remove three bolts securing water pump to cylinder block (fig. 2-142).

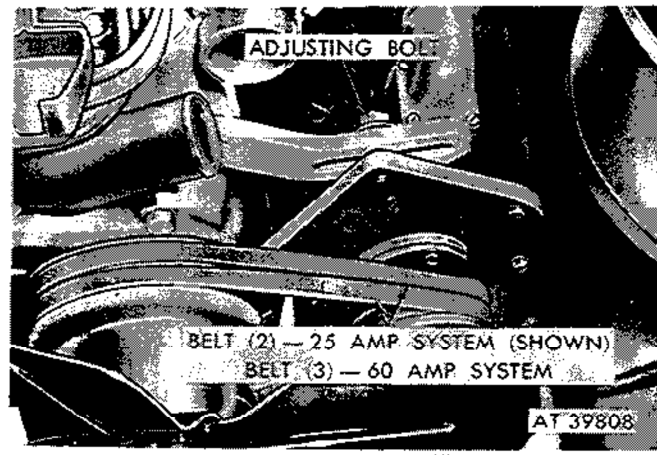


Figure 2-139. Reposition generator prior to removal of drive belts.

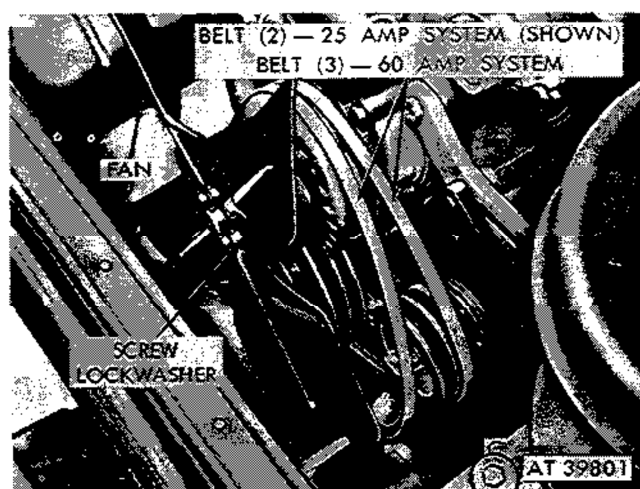


Figure 2-140. Remove drive belts and fan.

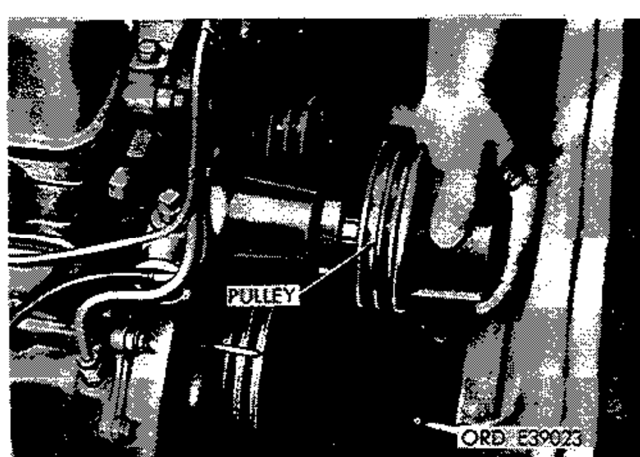


Figure 2-141. Remove fan pulley.

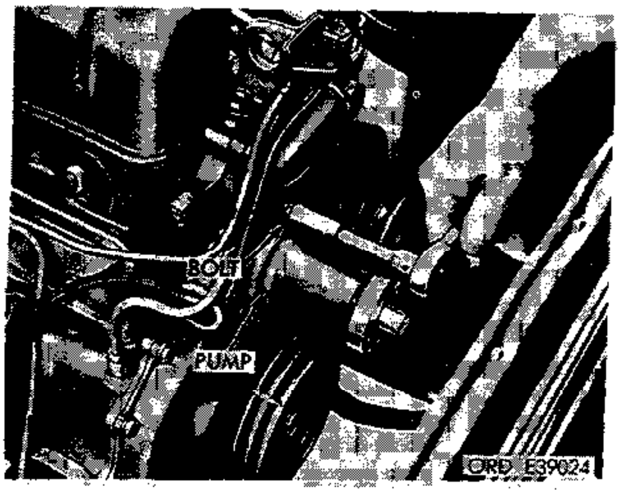


Figure 2-142. Remove water pump.

(6) Remove water pump and gasket. Discard gasket.

b. Installation. Clean water pump gasket surfaces on cylinder head and water pump before installation water pump and gasket. Install water pump by reversing removal procedures in *a* above. Refer to paragraph 2-66. For installation, use new gasket. The following attaching parts should be torqued to the values shown:

Generator adjusting arm bolt (⅜-16)	30-35 lb-ft.
Water pump to block bolt (5 / 16-18)	10-15 lb-ft.

2-66. Adjusting Drive Belt Tension

Perform the following three steps to adjust belt tension. Figure 2-143 illustrates the method of measuring belt tension.

a. Place a straight edge on the belt at the water pump pulley and generator pulley. Move generator until the belt has a measured 1 / 8-inch deflection for a new belt, ¼ inch deflection for a used belt, at midpoint between the pulleys when pushing firmly down on the belt.

b. Check the other belts. If any belts differ in tension or if they are of improper length, replace with a matched set.

c. Tighten generator mounting bolts (47-56 lb-ft.). Tighten generator adjusting bolt and adjusting arm to cylinder block bolt. Recheck belt deflection.

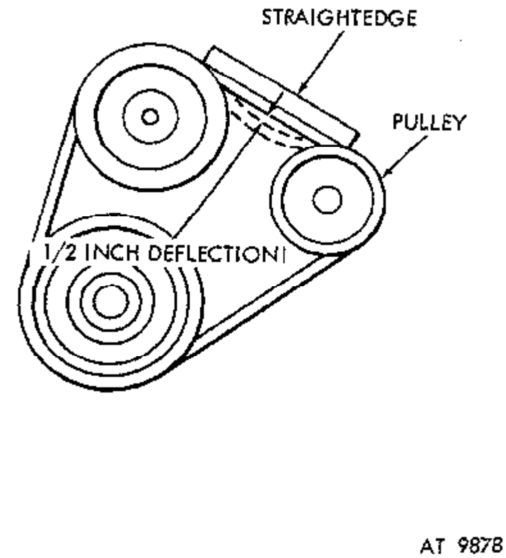


Figure 2-143. Measuring drive belt tension.

Section XI. IGNITION SYSTEM

2-67. Description and Data

a. Description. The ignition system consists of distributor, coil, ballast resistor, spark plugs, and spark plug cables. The distributor assembly consists of the distributor, ignition coil, and ballast resistor in a single housing mounted on the right side of the engine block and is driven through the oil pump by the camshaft. The primary, or low-voltage circuit, consists of the batteries, ignition switch, breaker points, primary capacitor, breaker point capacitor, ballast resistor, and the primary windings of the ignition coil. The secondary, or high voltage circuit, consists of the secondary windings of the coil, distributor rotor, distributor cover, cap assembly, spark plugs and spark plug cable assemblies. The ignition system is waterproof and includes devices for suppressing radio interference. Figure 2-144 is a view of the ignition system.

NOTE

In later model vehicles, new model coils, breaker points, and resistors are supplied. When replacing any of these items, the new replacement parts should be used.

b. Data.

Refer to table 1-1 for tabulated data.

2-68. Organizational Maintenance

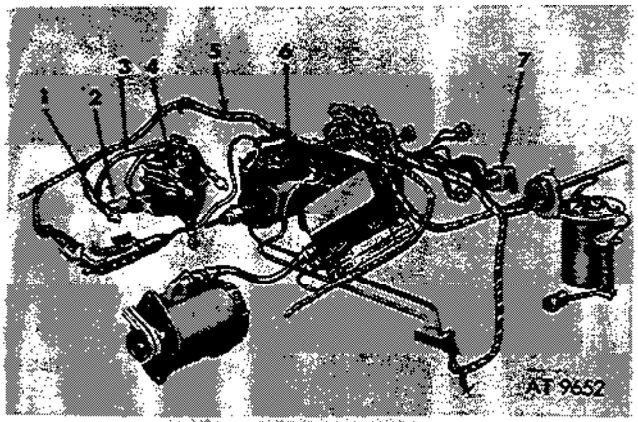
Periodic inspection and lubrication of the ignition system are the responsibility of the using organization. See LO 9-2320-218-12 for detailed instructions.

2-69. Distributor Replacement

a. Removal.

(1) Mark cover to identify spark plug cables for installation. Disconnect (fig. 2-145).

(2) Disconnect primary cable connector at receptacle (fig. 2-146).



1 Spark plug
2 Housing for radio suppression capacitor
3 Spark plug cable
4 Ignition distributor
5 Ignition wiring
6 Battery
7 Ignition switch

Figure 2-144. Ignition system.

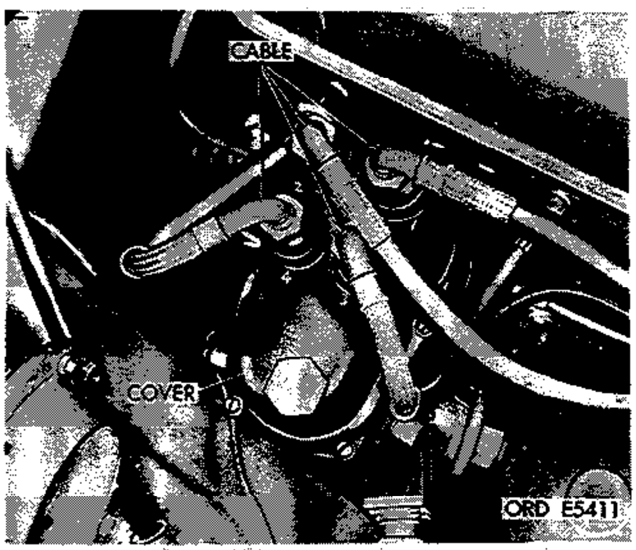


Figure 2-145. Disconnect cables.

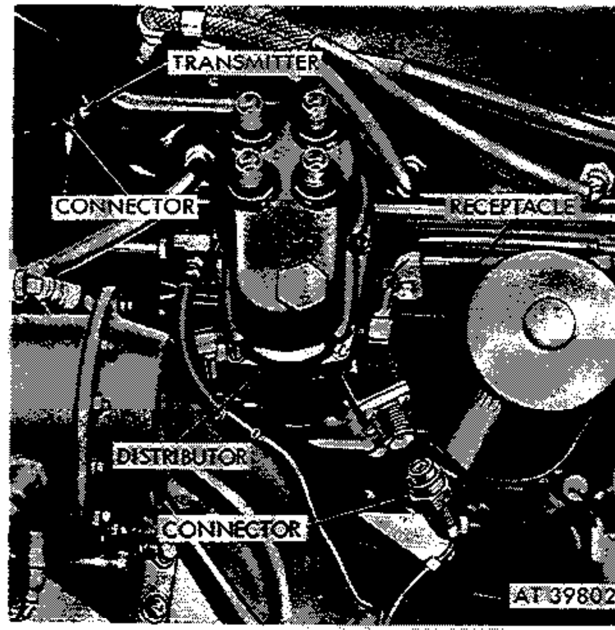


Figure 2-146. Disconnect primary cable connector.

(3) Remove clamp and remove vent hoses. Remove distributor mounting screw, flat washer and lockwasher located at slotted hole in adapter (fig. 2-147).

(4) Lift distributor out of adapter (fig. 2-148).

NOTE

When assembling, make sure distributor shaft bottoms in drive slot in distributor intermediate shaft before tightening mounting screw.

b. Installation. Install distributor on the vehicle by reversing removal operations. Refer to figures 2-148 back to 2-145. After installing distributor, perform ignition adjustment operations as described in paragraph 2-71.

2-70. Distributor Repair

a. Disassembly.

(1) Before removing cables, mark cover to

identify spark plug cables for installation. Remove four spark plug cables from cap and cover assembly (fig. 2-145).

(2) Remove six screws and remove cap and cover assembly (fig. 2-149).

(3) Remove three screws and lockwashers which attach cap to cover. Remove cap from cover. Remove four seals from cap terminals (fig. 2-150). Check for cracks and carbon tracks. Check inserts in cap for excessive burning.

(4) Lift rotor off cam and check rotor for cracks, loose contact strip, and excessive burning. Remove two terminal wire nuts and lockwashers from coil terminals. Remove two coil mounting screws and lock from distributor base (fig. 2-151).

(5) Remove four screws and lockwashers and remove filter capacitor assembly with attached resistor lead. Cut lead to remove capacitor and discard. Retain capactior mounting hardware and packings (fig. 2-152).

(6) Remove and discard old coil and coil leads (fig. 2-153).

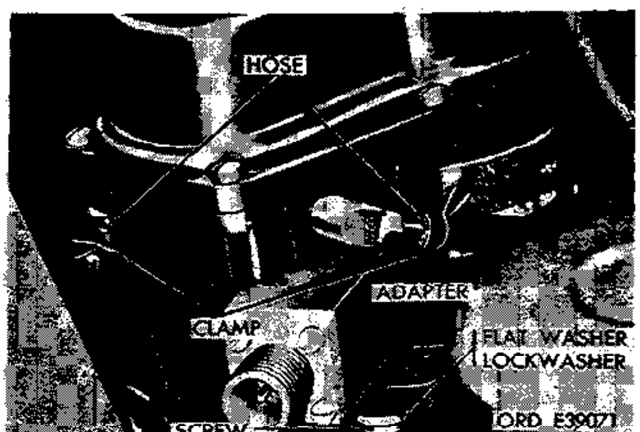


Figure 2-147. Pull vent hoses and remove mounting screw.

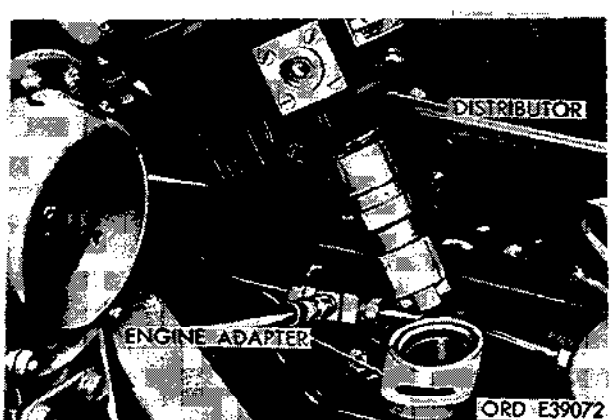


Figure 2-148. Lift distributor out of adapter.

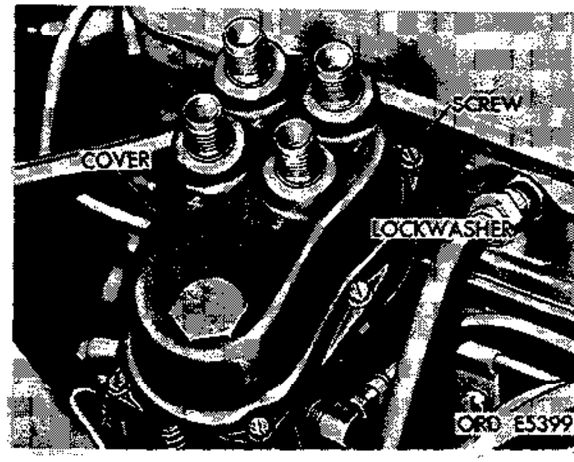


Figure 2-149. Remove distributor cover assembly.

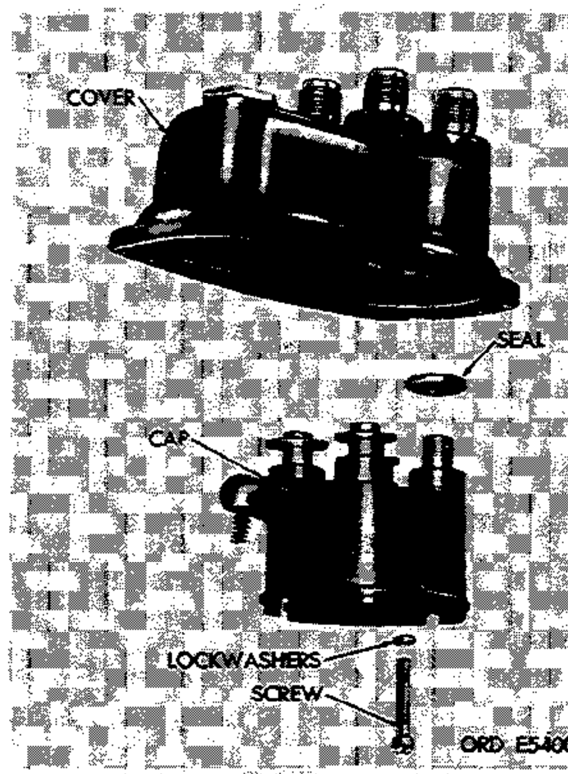


Figure 2-150. Remove cap from cover.

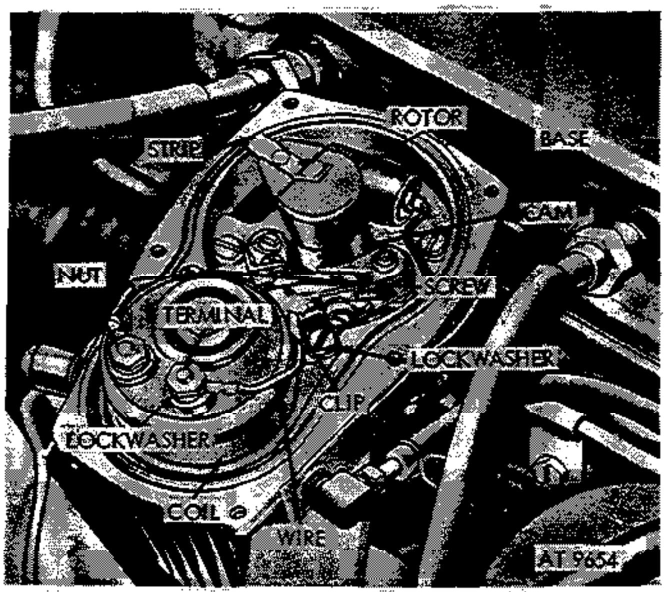


Figure 2-151. Remove rotor.

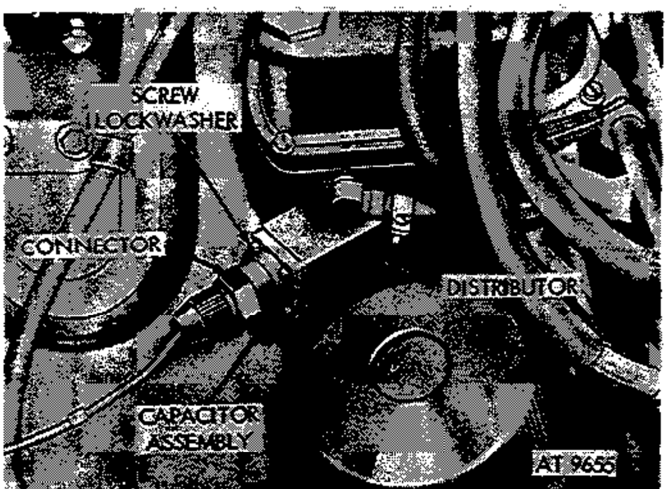


Figure 2-152. Removing or replacing capacitor assembly.

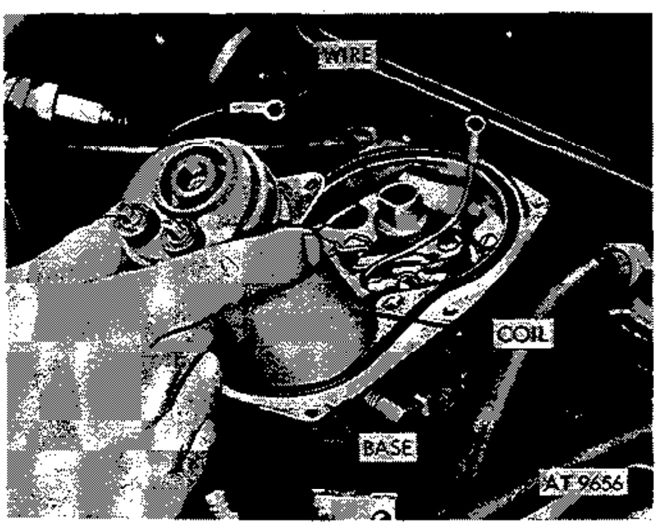


Figure 2-153. Removing or installing coil.

(7) Remove two breaker plate retaining screws, lockwashers and clips and remove breaker plate assembly (fig. 2-154).

(8) Remove terminal screw, flat washer and lockwasher and remove coil cable and capacitor cable (fig. 2-155).

(9) Remove screw and lockwasher and remove breaker point assembly (fig. 2-155).

(10) Remove screw and lockwasher and remove capacitor (fig. 2-155).

b. Assembly.

(1) Insert new filter capacitor assembly from outside of distributor base through filter capacitor opening. Existing packing should be placed on capacitor prior to insertion. Use existing hardware to retain capacitor (fig. 2-152).

(2) Install capacitor on breaker plate and secure with screw and lockwasher (fig. 2-155).

(3) Install breaker point assembly on breaker plate and secure with screw and lockwasher (fig. 2-155).

(4) Install capacitor cable and coil cable on terminal block and secure with screw, lockwasher and flat washer (fig. 2-155).

(5) Install breaker plate assembly to distributor base and secure with two screws, lockwashers and clips (fig. 2-154).

NOTE

Clips must be installed with the bent end of the clip in the up position.

(6) Install new coil assembly into distributor base and secure with lock tab and two screws. Route the filter capacitor wire and coil wire through the clamping ears and into the opening provided in the lock tab. Torque retaining screws to 40-50 lbs. inch. Position head of screw within the torque range so that one of the lock tabs can be bent up parallel again one the hex. head flats (fig. 2-156).

(7) Attach the filter capacitor wire to the positive post of the coil and the capacitor wire to the negative post and secure with two lockwashers and two nuts. Torque nuts to 15-20 lbs. inc. (fig. 2-153).

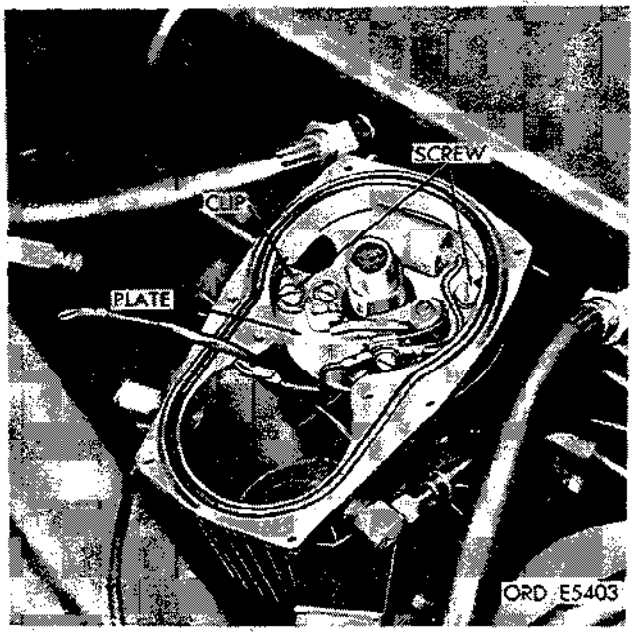


Figure 2-154. Removing or installing breaker plate.

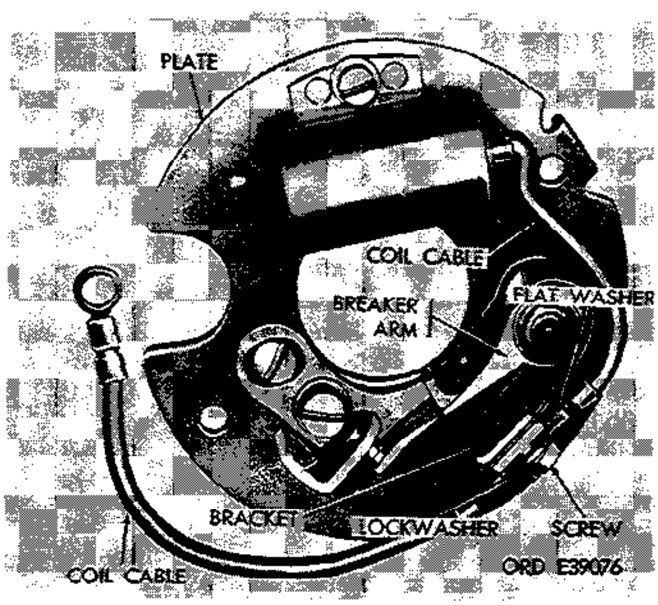


Figure 2-155. Removing or installing coil cable and breaker arm.

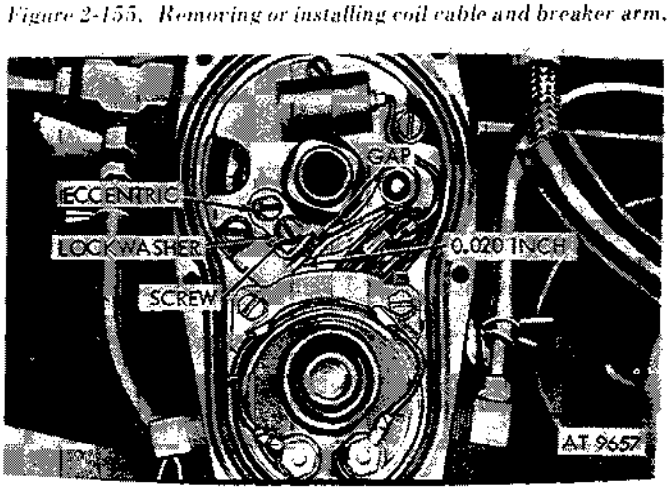


Figure 2-156. Adjust point gap.

2-71. Ignition Adjustment

a. General. Ignition timing is accomplished by four separate and consecutive procedures; breaker point gap adjustment, spring tension adjustment, timing by distributor positioning and precise timing by using an adapter, timing light and tachometer.

b. Breaker Point Gap Adjustment.

(1) Crank the engine until the rubbing block on movable breaker point rests on the peak of a cam lobe (fig. 2-156).

(2) Loosen stationary breaker point mounting screw and lockwasher (fig. 2-156).

(3) Adjust point gap with adjuster screw (fig. 2-156) until gap is 0.017 to 0.022 inch. Tighten contact mounting screw and lockwasher 5-20 lb. in.

NOTE

If this procedure is not followed, the screw may loosen after several thousand miles, causing erratic engine operation.

c. Adjusting Spring Tension.

(1) Attach spring gage to end of movable contact and pull on gage at right angles to movable contact (fig. 2-157).

(2) Adjust spring tension (fig. 2-158) by positioning spring slot until desired tension is obtained and tighten terminal screw. Points should start to open with a pull of 17 to 20 ounces.

d. Approximate Timing by Distributor Positioning. Set distributor to approximate timing as shown below:

(1) Mark the position of the No. 1 spark plug cable on distributor base (fig. 2-159) refer to figure 2-145 for No. 1 spark plug cable location. Adjust breaker point assembly (step b-1 through 3 above) but do not install cap and cover assembly.

(2) Rotate crankshaft until rotor is positioned toward No. 1 spark plug cable mark and pointer on timing gear cover and notch on crankshaft pulley are aligned. Slowly rotate distributor counterclockwise until breaker points just start to open.

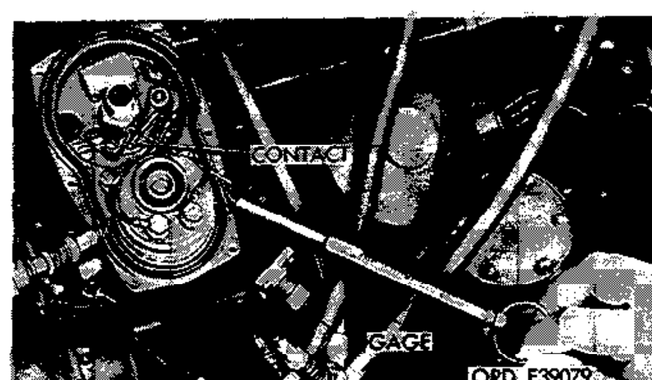


Figure 2-157. Attach spring gage.

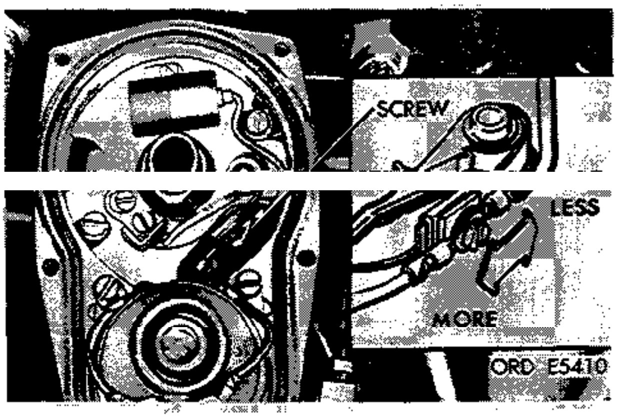


Figure 2-158. Adjust spring tension.

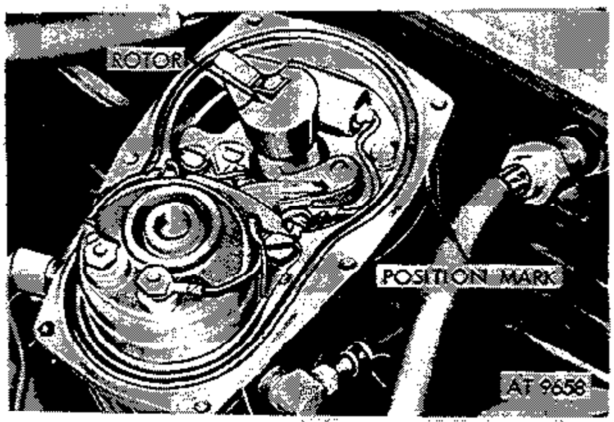


Figure 2-159. Mark position of No. 1 spark plug cable.

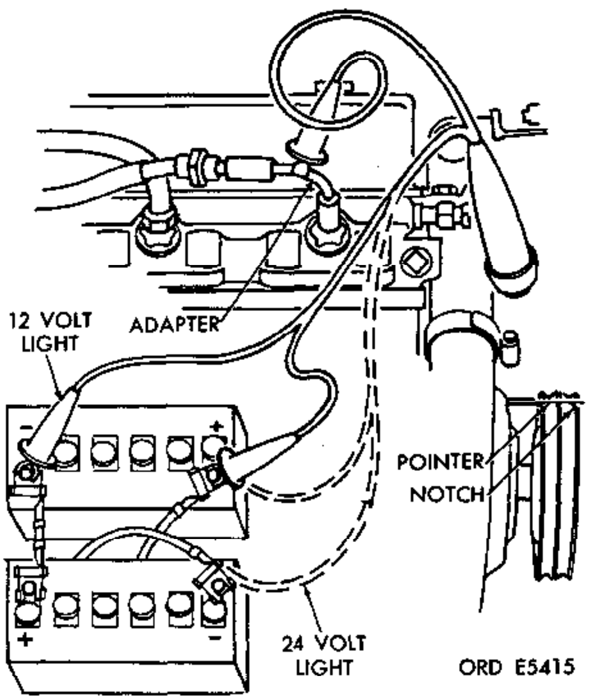


Figure 2-160. Schematic showing hook-up for ignition timing using timing light and adapter.

(3) Tighten distributor to adapter mounting screw to a snug fit (fig. 2-147).

(4) Install cap and cover assembly. This procedure alone is not adequate for good engine performance. Perform precise timing procedure, below.

e. Precise Timing. Refer to figure 2-160 for an

timing. Operations below show procedures required for ignition timing, when distributor shaft has not been removed from engine during previous maintenance.

(1) Remove No. 1 spark plug cable (fig. 2-161) from spark plug, place timing light adapter on spark plug, and attach spark plug cable to timing light adapter.

(2) Connect timing light leads to timing light adapter, ground, and battery (fig. 2-161).

(3) Attach tachometer to primary connector and ground (fig. 2-162). Adjust engine idle to 450 to 500 rpm.

(4) With engine idling, direct timing light at timing pointer on timing gear cover (fig. 2-163).

(5) Slowly rotate distributor until timing pointer and crankshaft pulley notch are alined. When timing marks are alined, firing will take place at 6° before top dead center of piston travel. When this alinement is accomplished, tighten distributor to distributor adapter mounting screw.

(6) After tightening mounting screw, recheck timing to determine that tightening has not disturbed alinement. Increase engine speed while directing timing light to notch and pointer. Notch should move away from pointer if distributor centrifugal advance is functioning. Disconnect all timing devices and install spark plug cable.

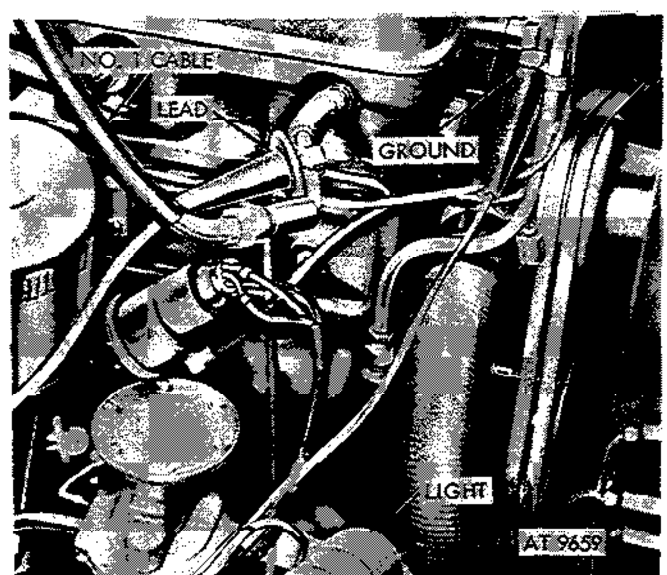


Figure 2-161. Connect timing light.

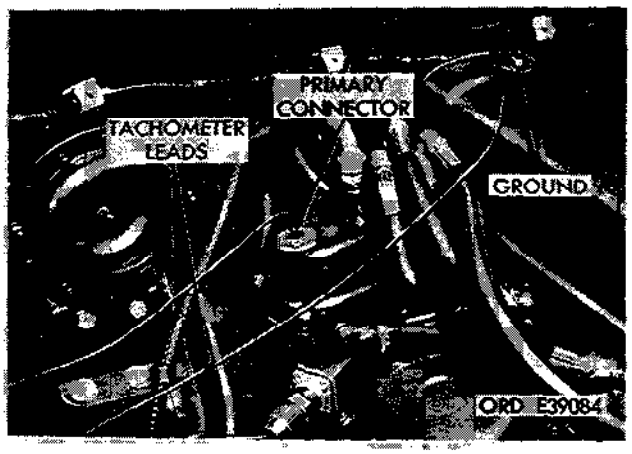


Figure 2-162. Attach tachometer.

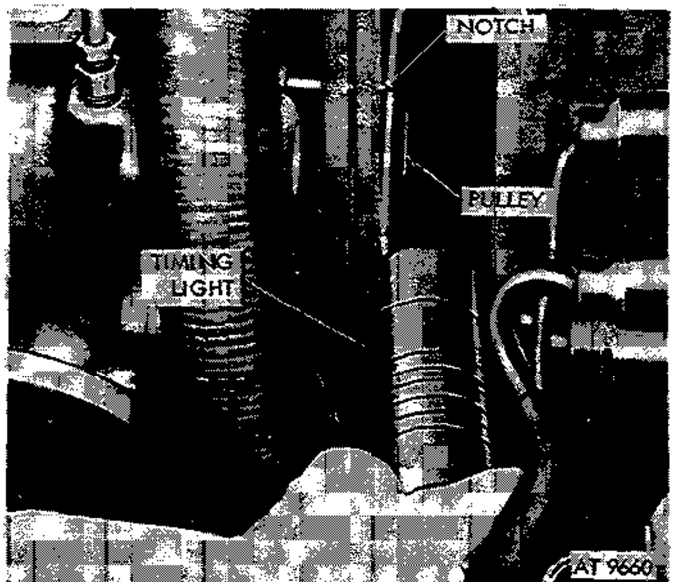


Figure 2-163. Checking timing using timing light.

2-72. Spark Plugs and Spark Plug Cables

a. Removal.

(1) Disconnect terminal nuts securing spark plug cable to spark plugs (fig. 2-164).

(2) Remove all dirt from cylinder head recess around spark plugs.

(3) Use a deep socket wrench and remove spark plugs (fig. 2-165). Discard spark plug gaskets.

(4) Clean spark plugs (fig. 2-165) on a spark plug cleaner and tester. Adjust gap to 0.027 to 0.030 in.

(5) Disconnect terminal nuts between spark plug cables and distributor. Remove cables.

b. Installation. Install spark plugs and spark plug cables by reversing removal operations. Refer to figures 2-164 and 2-165. Use new spark plug gaskets for installation. Torque spark plugs to 18-20 lb. ft.

NOTE

The lead and cable assembly must follow a smooth natural path without being twisted or stressed during or after assembly. Tighten cable nuts finger tight and then an additional 1 / 2 turn with a 3 / 4 inch open end wrench.

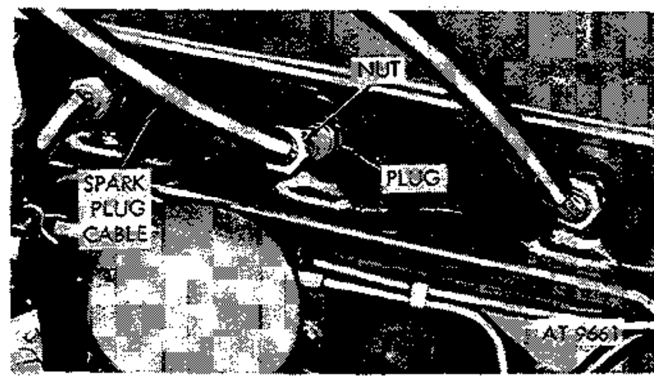


Figure 2-164. Remove spark plugs.

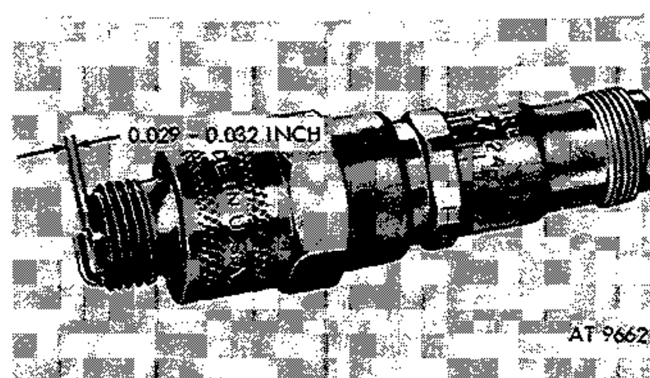


Figure 2-165. Adjust spark plug gap.

Section XII. STARTING SYSTEM

2-73. Description and Data

a. Description. The starting system consists of starting motor assembly, starter switch and connecting electrical cables. Figure 2-166 is a view of the starting system. The starting motor is a 24-volt, series wound, two-pole, four-brush, waterproof unit. It is mounted on the right rear face of the flywheel housing. The starting motor assembly is equipped with an overrunning clutch to prevent damage to the starting motor at engagement with the flywheel or when engine speed is greater than that of the starting motor.

b. *Data*. Refer to table 1-1 ~~for~~ tabulated data.

2-74. Starting Motor

a. *Removal*.

(1) Remove front seats (para 2-198).

(2) Remove battery cover (TM 9-2320-218-10).

(3) Remove battery ground cable (fig. 2-182).

(4) Remove transmission cover plate (para 2-199).

(5) Remove starter cable (fig. 2-238).

(6) Remove two nuts, washers and clip securing starting motor to flywheel housing. Remove starting motor and gasket. Discard gasket (fig. 2-167).

b. *Installation*. Clean starter mounting gasket surfaces on starter and flywheel housing before installing gasket and starter. Install starting motor on vehicle by reversing removal operations. Refer to figures 2-167, 2-166.

NOTE

Use new gasket at installation.

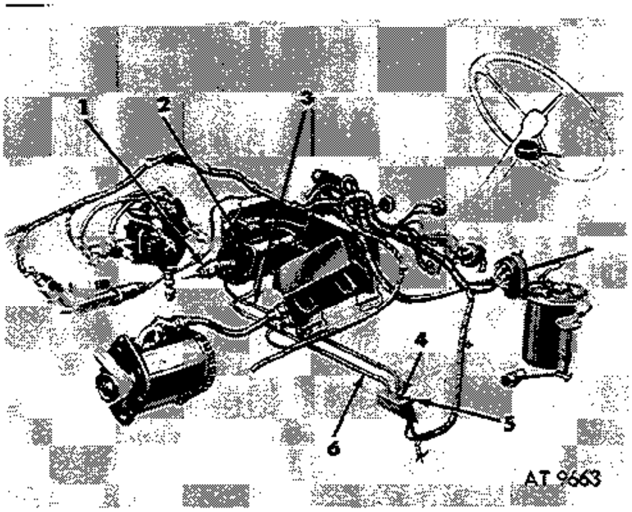
2-75. Starting Switch

a. *Removal*.

(1) Disconnect battery ground cable (fig. 2-182).

(2) Remove four screws, flat washers and lockwashers securing starting switch bracket to floor (fig. 2-168).

(3) Pull starting switch bracket away from floor and remove two nuts and lockwashers securing cables to cable terminals (fig. 2-169).



1 Bendix drive (overrunning clutch)
2 Starting motor
3 Battery to starter switch cable
4 Starter switch
5 Starter switch button
6 Starter switch to starting motor cable

Figure 2-166. Starting system.

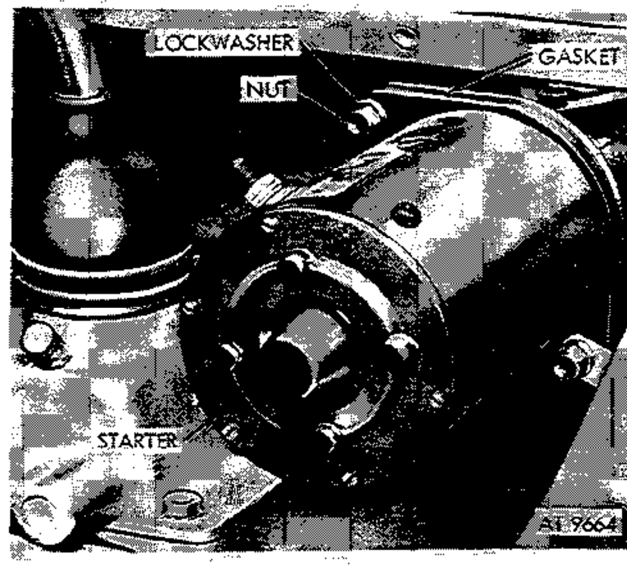


Figure 2-167. Remove starting motor.

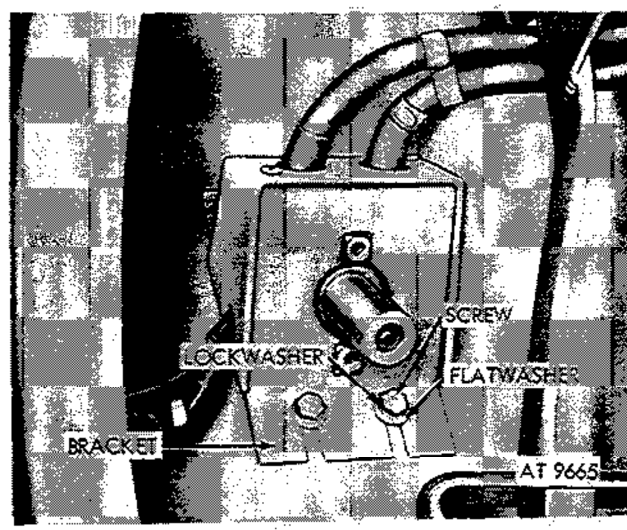


Figure 2-168. Remove starting switch bracket.

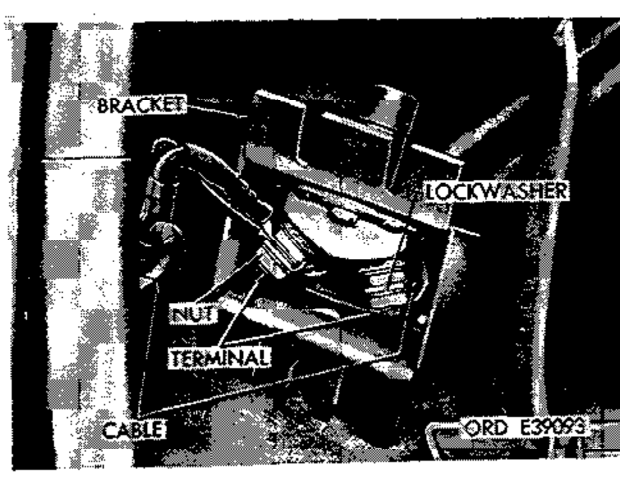


Figure 2-169. Remove starting switch cables from terminals.

(4) Remove two screws and lockwashers mounting starting switch to bracket and remove switch (fig. 2-170).

b. *Installation.* Install starting switch by reversing removal operations. Refer to figures 2-170 back through 2-168.

Section XIII. GENERATING SYSTEM

2-76. Description and Data

a. *Description.* The 25-ampere generating system consists of generator, generator regulator, and connecting cables. Figure 2-171 is a view of the 25-ampere generating system. The generator illustrated is a two-brush, 25-ampere, 24-volt, waterproof unit, mounted on the left side of the engine. It is driven by two crankshaft driven V-belts. The generator regulator consists of three units: the voltage limiter which controls generator output voltage to prevent overcharging the batteries; the current limiter which prevents overloading the generator; and the cutout which prevents discharging of the batteries when generator output falls below the level required to charge the batteries. Other model vehicles may have the 60-ampere, 24-volt negative ground alternator system with built-in voltage regulators. Unlike the conventional direct current shunt generator, the alternator differs in that the armature is called a stator and does not rotate. The rotor is the field. Internally mounted rectifiers in the 60-amp alternator convert the alternating current to direct current. The internally mounted regulator also controls the output of the alternator. In special applications the vehicle may include a 100-ampere or 180-ampere alternator, with external regulator, and rectifier. Refer to special purpose kits (ch. 3).

b. *Data.* Refer to table 1-1 for tabulated data.

2-77. Generator Assembly (25-Ampere)

a. *Removal.* Procedures (1) through (6) below give operations for removing generator assembly and for removing pulley from generator.

(1) Remove air cleaner (para. 2-44). Loosen generator and remove drive belts (para. 2-64).

(2) Using spanner wrench, disconnect generator-to-generator regulator cable at generator receptable (fig. 2-172).

(3) Loosen adjusting arm to cylinder block bolt. Remove adjusting arm bolt, lockwasher and flat washer from adjusting arm and generator. Remove two mounting bolt nuts, lockwashers and flat washers from generator and mounting bracket. Remove mounting bolts and flat washers from generator and bracket (fig. 2-173).

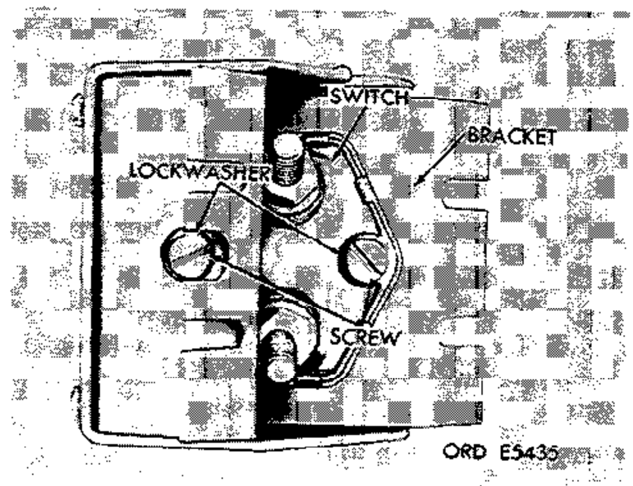
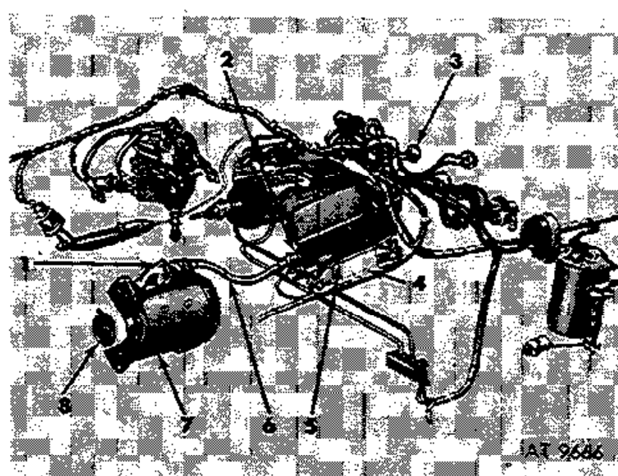


Figure 2-170. Remove starting switch from bracket.



1 Generator electrical receptacle
2 Generator regulator electrical receptacle
3 Battery-generator indicator
4 Generator regulator mounting bracket
5 Generator regulator
6 Generator-to-generator regulator cable
7 Generator
8 Generator drive pulley

Figure 2-171. Generating system.

(4) Remove cotter pin, washer and nut. Discard cotter pin (fig. 2-174).

(5) Remove pulley from generator shaft, using suitable puller.

(6) Remove Woodruff key from slot in generator shaft.

b. Installation. Reverse removal procedures for installing generator. Use new cotter pins at installation. When installing pulley on replacement generator, be sure spacer, Woodruff key, pulley and washer are properly seated. The following attaching parts are to be torqued to the values shown:

Adjusting arm to cylinder bolt (⅜-16)	30-35 lb-ft.
7 / 16-14	47-56 lb-ft.
Generator mounting bolt	58-60 lb-ft.
Generator to mounting bracket nut	60-70 lb-ft.

NOTE

The pulley nut on generators (Autolite) using cotter pin should be torqued to 35 lb-ft, and on generators (Delco Remy) not using cotter pin torque to 60 lb-ft. Refer to paragraph 2-66 for drive belt adjustment. Make sure generator bracket mounting bolts are torqued properly, loose bolts may cause damage to cylinder block.

2-78. Generator Regulator

a. Removal

CAUTION

Disconnect battery ground cable.

(1) Remove air cleaner hose (fig. 2-88).

(2) Using spanner wrench, disconnect main wiring harness connector at regular and pull plug out of receptacle (fig. 2-175).

(3) Using spanner wrench, disconnect generator-to-regulator cable connector at regulator and pull plug out of receptacle (fig. 2-176).

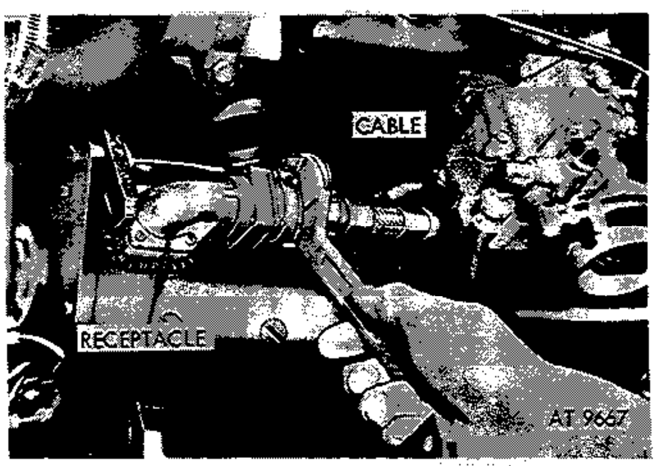


Figure 2-172. Disconnect regulator cable at generator receptacle.

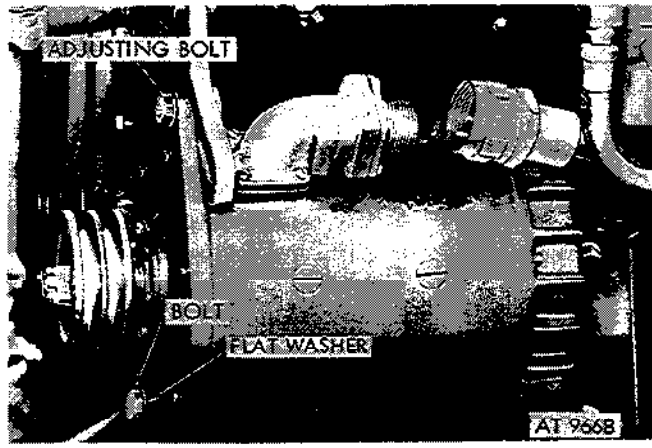


Figure 2-173. Remove adjusting bolt from adjusting arm and generator.

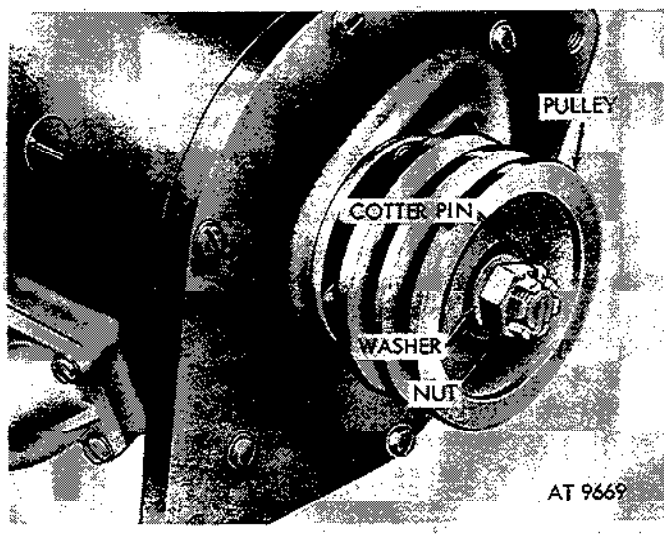


Figure 2-174. Remove pulley from generator shaft.

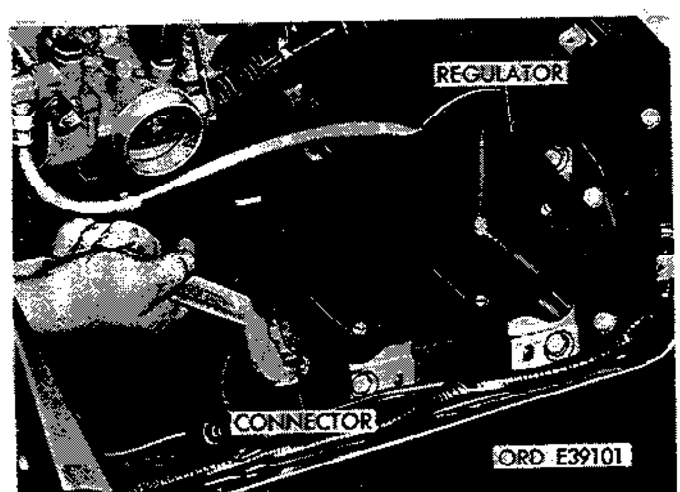


Figure 2-175. Disconnect wiring harness connector.

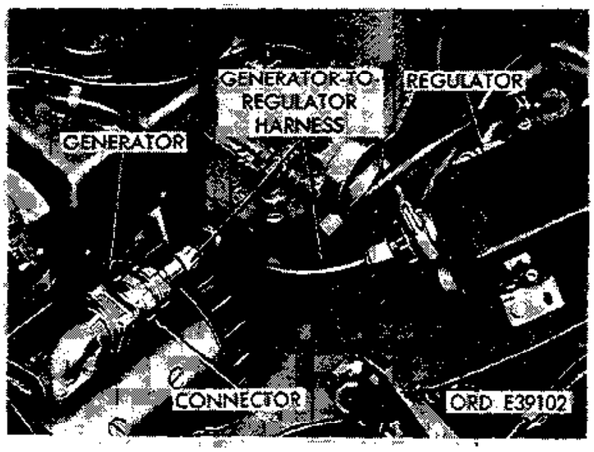


Figure 2-176. Disconnect generator-to-regulator cable connector.

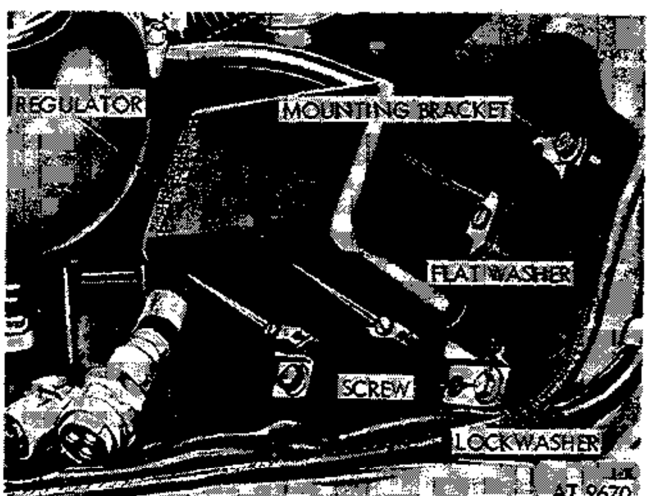


Figure 2-177. Remove generator regulator with mounting brackets attached.

(4) Remove four mounting screws, lockwashers and flat washers and remove generator regulator with mounting brackets attached (fig. 2-177).

b. Installation. Install generator regulator by reversing removal operation figure 2-177 back to 2-175.

NOTE

Torque attaching screws 9-12 lb-ft.

2-79. Generator-to-Regulator Harness

a. Removal.

(1) Using spanner wrench, loosen and remove main wiring harness connector at regulator receptacle (fig. 2-175) to provide access to generator-to-regulator harness connector.

(2) Using spanner wrench, disconnect generator-regulator harness connectors at regulator receptacle (fig. 2-176) and at generator receptacle. Remove harness.

b. Installation. Install generator-to-regulator harness, using the following procedure:

(1) Install harness-to-regulator connector at the regulator receptacle. Tighten connector with spanner wrench.

(2) Install generator-to-regulator harness connector at regulator receptacle. Tighten connector with spanner wrench.

(3) Install generator-to-regulator harness connector to generator receptacle. Tighten connector with spanner wrench.

2-80. Generator-to-Regulator Harness Repair

a. Disassembly.

(1) Use suitable tool and pull three insert plugs out of grommet (fig. 2-178) and unscrew grommet retaining nut.

(2) Slide nut and grommet away from receptacle. Unscrew spanner coupling nut and slide nut away from receptacle. Use suitable tool and push contact out of receptacle assembly (fig. 2-179).

b. Assembly. Reverse removal operations for assembling generator-to-regulator harness receptacle.

2-81. Generator (Alternator) Assembly (60-Ampere

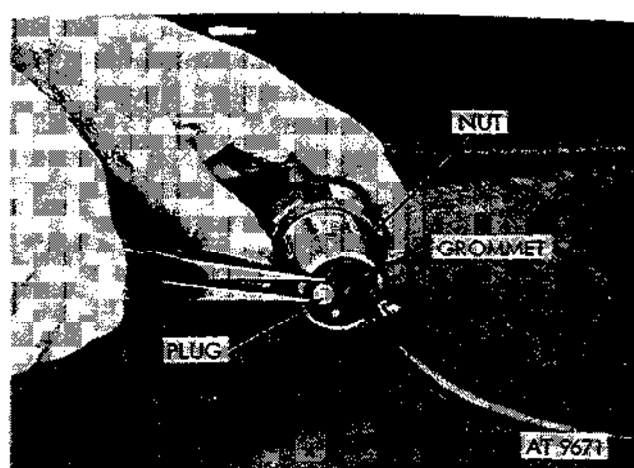


Figure 2-178. Remove plugs from grommet and unscrew retaining nut.

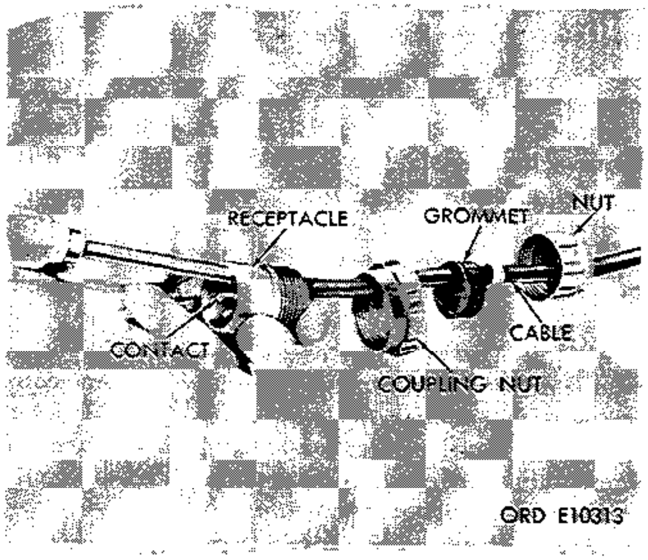


Figure 2-179. Unscrew coupling nut and push contact out of receptacle.

a. General. Later model vehicles are equipped with the Leece-Neville, model 3002A, 60-ampere, three-phase ac alternator (10929868). These units provide more than twice the power of the 25-ampere dc generator, and use rectifiers to convert the alternating current output to direct current for the 28-volt dc vehicle electrical system. Six internal solid state rectifiers, mounted on a cooling fin assembly for heat dissipation, are used for this purpose. Also internal to the alternator is the current and voltage regulator. The alternator is self-cooled and driven by three drive belts. It operates in the speed range of 2,000 rpm to 8,000 rpm. Proper operation of the unit is indicated by the battery-generator indicator located on the dash panel.

b. Maintenance and Adjustment. Conventional general maintenance procedures for rotating machinery is specified. Periodic inspections of the V-belts are specified. Worn belts are to be replaced as necessary and the correct degree of belt tension must be maintained at all times for proper operation. For alternator adjustment remove plug and adjust slotted screw to obtain 28 volts. (Refer to electrical troubleshooting table 2-4).

NOTE

Counterclockwise to increase voltage.
Apply sealer (FSN 8030-849-0071) to plug prior to installing.

c. Removal. Follow the general provisions for removal of the 25-ampere generator given in paragraph 2-77 *a*.

d. Cleaning, Inspection, and Repair. Refer to support maintenance for cleaning, inspection, and repair.

e. Installation. Follow the general provisions for installation of the 25-ampere generator given in paragraph 2-77 *b*.

Section XIV. BATTERIES AND LIGHTING SYSTEM

2-82. Description and Data

a. General. The batteries and lighting system are waterproofed. A circuit breaker in the light switch protects the lighting system from overload. All light circuits are controlled by the light switch on the instrument panel. Figures 2-180 and 2-181 are views of the lighting system. Cables are identified by numbered tags near the end of each cable.

b. Batteries. The 24-volt primary circuit is supplied by two 12-volt lead and acid-type storage batteries, connected in series. The batteries and connections are designed for under water operation.

c. Service Headlights. The sealed beam-type service headlights are mounted in the brush guard. High or low beam is selected by a foot-operated dimmer switch.

d. Blackout Driving Light. A single blackout driving light is mounted on the left front fender. This driving light supplies a diffused, low-intensity light beam, for use when the tactical situation prohibits use of the service headlights.

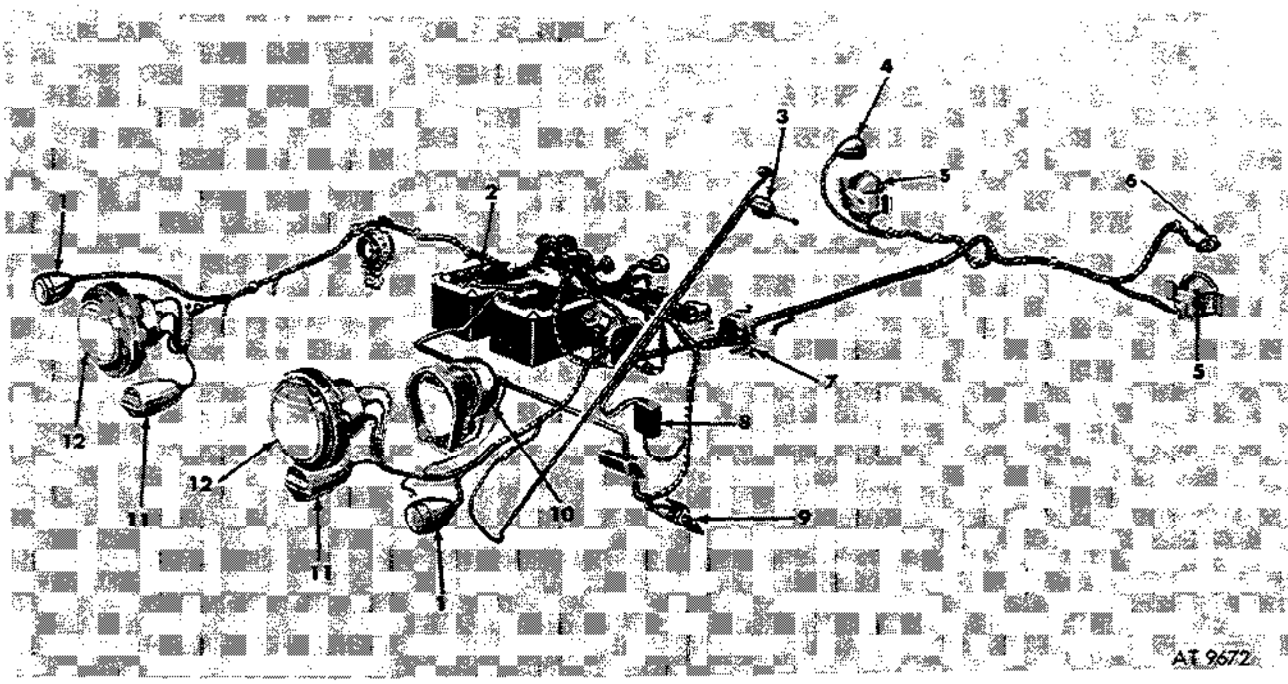
e. Blackout Marker Lihgts (M151, M151A1, M151A1C, and M718 Vehicles). Two light assemblies, one mounted below each service headlight, serve the purpose of blackout marker lights.

f. Front Parking, Signal, and Blackout Marker Lights (M151A2, M825, and M718A1 Vehicles). The above lamp bulbs are housed in one composite lighting assembly. A composite light assembly (fig. 2-181) (with the amber lens) is mounted to each front fender. The upper half of this light assembly houses the parking and directional turn signal bulbs. The lower housing contains the blackout marker light.

g. Blackout Stoplight (M151, M151A1, M151A1C and M718 Vehicles). The blackout stoplight is mounted on the right rear corner of the vehicle body, above the service taillight.

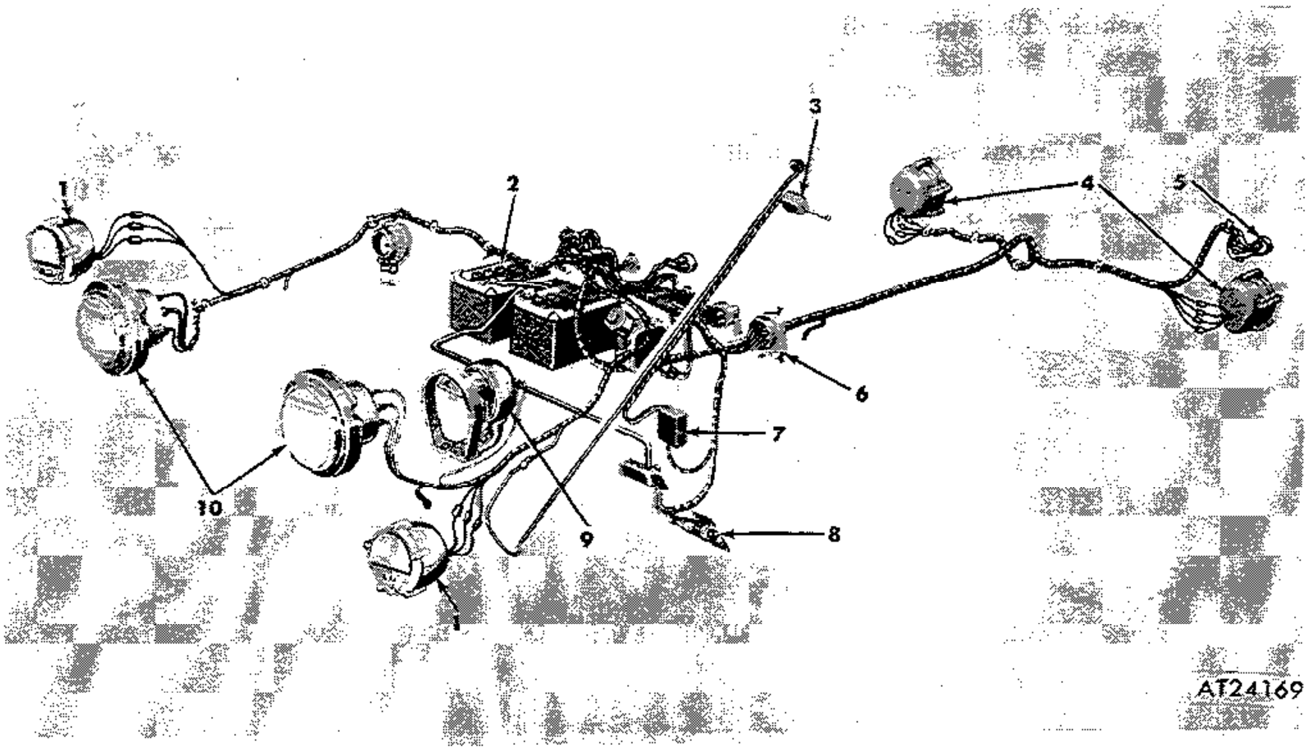
h. Blackout Taillight, Blackout Stoplight, Service Taillight and Service Stoplights (M151A2, M825, and M718A1 Vehicles). The above lamps are all contained within one composite lighting unit. One composite unit is mounted at each rear corner of the vehicle. The upper half of the unit houses the service taillight and service stoplight bulbs. They also serve as the left and right rear turn signal lights. The lower portion of the composite unit contains the blackout marker and stoplight bulbs.

i. Blackout Taillight, Service Taillight, and Service Stoplight (M151, M151A1, M151A1C, and M718 Vehicles). The blackout taillight, service taillight and service stoplight assemblies are mounted in the lower rear corners of the vehicle body. The upper half of the assembly houses two lamp units, a service taillight, a service stoplight and performs the left and right turn signal function. The lower half houses a single lamp unit, a blackout taillight.



1 Directional turn signal light (2)
2 Batteries (2)
3 Directional control assembly
4 Blackout stoplight
5 Blackout taillight, service taillight and service stoplight (2)
6 Trailer receptacle
7 Light switch
8 Distribution box or solid state flasher
9 Dimmer switch
10 Blackout drive light
11 Blackout marker light (2)
12 Service headlight (2)

Figure 2-180. Batteries and lighting system for M151, M151A1, M151A1C, and M718.



1 Front composite light (turn signal-parking-blackout marker lights) (2)
2 Batteries (2)
3 Directional turn signal control unit
4 Rear composite light (turn signal-stoplight, taillight, blackout marker, blackout stoplight) (2)
5 Receptacle
6 Light switch
7 Solid state flasher
8 Dimmer switch
9 Blackout drive light
10 Headlights (2)

Figure 2-181. Batteries and lighting system for M15A2, M825, and M718A1 vehicles.

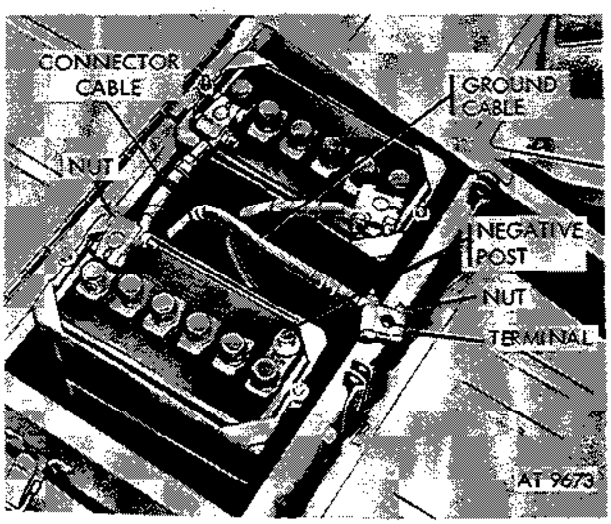


Figure 2-182. Remove terminal from negative post of right battery.

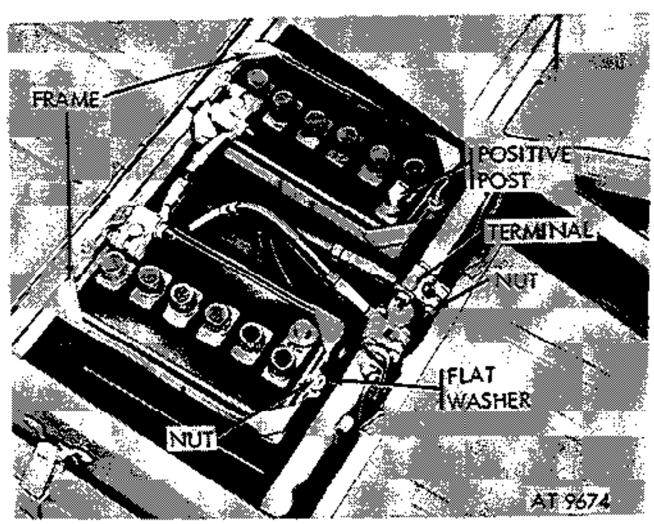


Figure 2-183. Remove terminal from positive post of left battery.

j. Trailer Coupling Electrical Receptacle. A twelve-terminal receptacle is mounted on the left rear corner of the body of the vehicle. This receptacle provides a means of connecting the electrical units of a towed trailer to the vehicle electrical system. When connected, trailer lights are controlled by the towing vehicle light switch.

k. Directional Turn Signal Lights. Directional turn signal lights are mounted on the left and right front fenders to provide turn signal directions and are controlled by means of a control handle mounted on the steering column.

l. Directional Control Assembly. A directional control assembly with control handle to activate the directional turn signal lights is mounted on the left side of the steering column. In its extreme upper position, the control handle actuates a flasher that switches all directional lights on and off to serve as a hazard or emergency warning.

m. Distribution Box. Flashing of the signal lights is accomplished by a flasher mechanism located in the distribution box (fig. 2-218) mounted on the firewall beneath the front panel. On later model vehicles this function is performed by a solid state flashing device (fig. 2-219).

n. Data. Refer to table 1-1 for complete data.

2-83. Batteries

a. General. For service instructions on adding water, cleaning, performing specific gravity test, and charging batteries, refer to TM 9-6140-200-15.

b. Removal.

(1) Remove passenger seat (para 2-198) and battery compartment cover (refer to TM 9-2320-218-10).

(2) Loosen battery ground cable terminal bolt nut and remove ground cable terminal from negative post of right battery (fig. 2-182).

(3) Loosen battery cable terminal bolt and nut and remove cable terminal from positive post of left battery (fig. 2-183).

NOTE

Do not pry on terminals. Use lifter FSN 5120-243-1039.

(4) Loosen battery connector cable terminal bolt nuts and remove battery connector cable from positive post of right battery and negative post of left battery (fig. 2-182).

(5) Remove four battery holddown nuts and flat washer. Remove two holddown frames (fig. 2-183).

(6) Lift batteries from compartment.

CAUTION

Do not use a lifting strap that connects to battery posts.

c. Installation. Install batteries by reversing removal operations.

CAUTION

Prior to assembly of battery cables, make sure all switches are "OFF".

After installation, check battery polarity. Turn ignition switch on. If battery-generator indicator registers no reading, battery or batteries are reversed; correct installation as necessary. If indicator registers, batteries are correctly installed.

NOTE

Be sure batteries are clamped down firmly to avoid damage from bouncing.

2-84. Battery to Starting Switch Cable (Positive)

a. Removal.

(1) Remove passenger seat (para 2-198), battery cover (TM 9-2320-218-10), and battery ground cable (fig. 2-182).

(2) Loosen terminal nut and remove positive cable from left battery and remove terminal from cable end (fig. 2-183).

(3) Remove nut, lockwasher and screw, and rubber covered clamp at inside of body side panel sill (fig. 2-184).

(4) Remove snap clips securing cable to inside of body panel sill (fig. 2-185).

(5) Remove nut and lockwasher from screw securing clamp to firewall. Remove rubber covered clamp from screw on firewall inside passenger compartment. Remove clamp from cable (fig. 2-185 and 2-186).

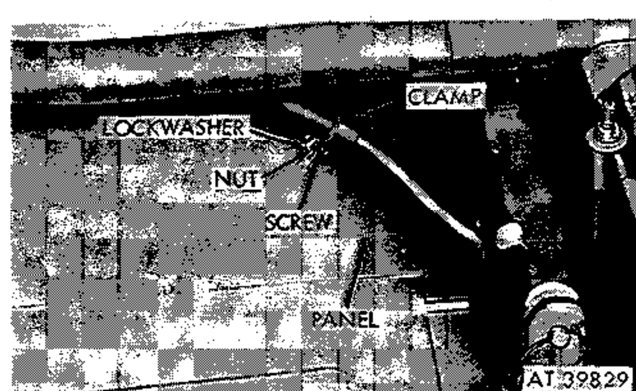


Figure 2-184. Remove clamp at body side panel sill.

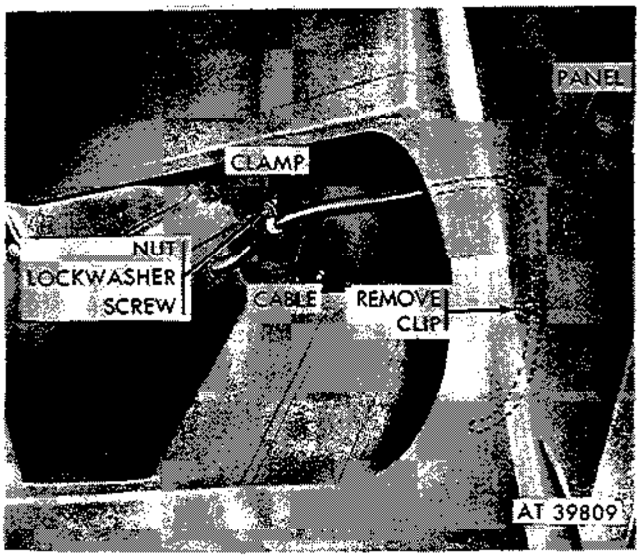


Figure 2-185. Remove snap clips at body panel sill and clamp on firewall (M151 only).

(6) Remove two screws and lockwashers securing clamps and cable to firewall inside passenger compartment above tunnel cover. Remove clamps from cable (M151A1, M151A2, M151A1C, M825, M718 and M718A1) (fig. 2-186).

(7) Remove two screws and lockwashers securing clamps and cable to right and left side of firewall tunnel. Remove clamps from cable (M151 only) (fig. 2-187).

(8) Remove nut, lockwasher and screw securing clamp and cables to firewall above clutch pedal. Remove rubber covered clamp from cables (fig. 2-188).

(9) Remove starting switch bracket and remove cable from terminal (fig. 2-169).

(10) Thread cable out of grommet at battery compartment (fig. 2-189).

(11) Thread cable out of grommet at both sides of transmission tunnel (M151 only).

b. Installation. Install battery to starting switch cable by reversing removal operations.

2-85. Service Headlights

a. Adjustment. Refer to figure 2-190.

(1) Position vehicle on a level floor with no load in vehicle. Headlights should be 25 feet from a smooth vertical surface. Inflate tires to proper pressure. Refer to vehicle data plate or table 1-1.

(2) Measure centerline of headlights from floor; draw a horizontal line at that height on the flat surface. Draw a second line parallel to and 3" below first line.

(3) Draw a vertical line intersecting the first two lines at the projected centerline of the vehicle.

(4) Measure distance between two headlight centers, then divide distance equally on both sides of centerline. Draw a vertical line at these points, intersecting the first two lines.

(5) Turn headlights on and select high beam. Cover one light while adjusting the other.

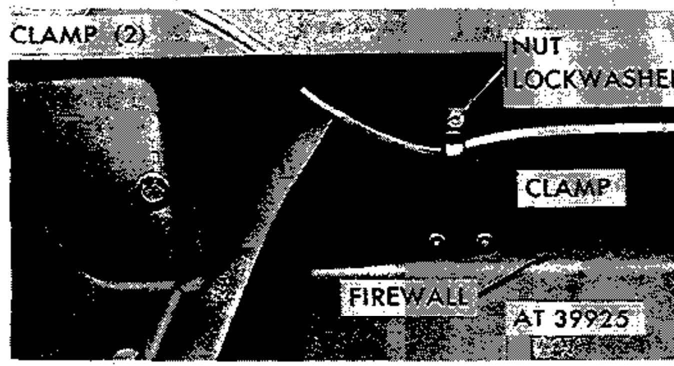


Figure 2-186. Remove clamps from firewall (M151A1, M151A2, M151A1C, M825, M718, M718A1).

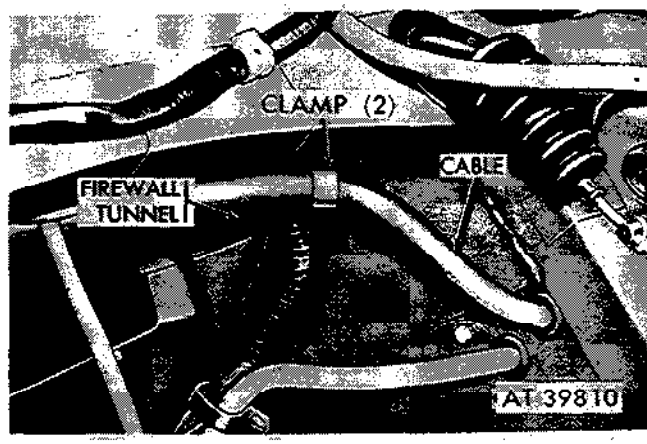


Figure 2-187. Remove clamps from firewall tunnel (M151 only).

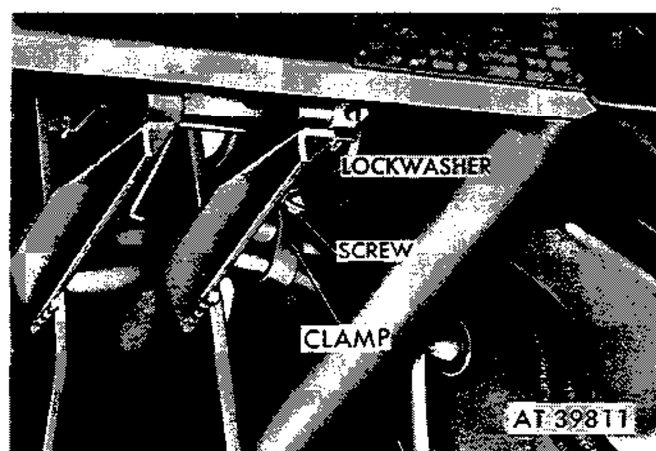


Figure 2-188. Remove clamp from firewall above clutch pedal.

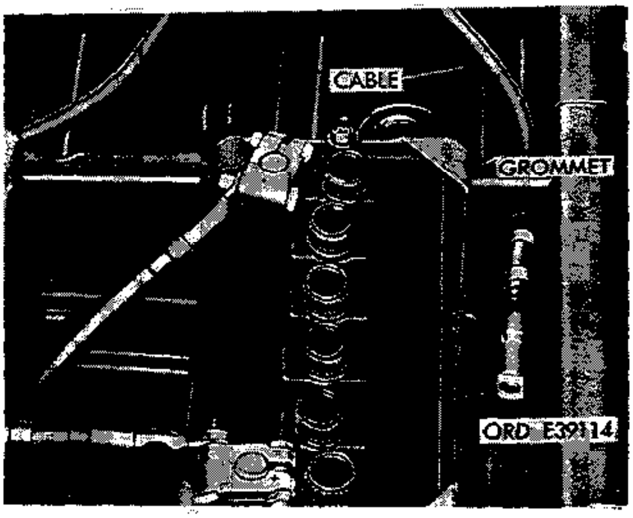


Figure 2-189. Thread cable out of grommet.

(6) Turn adjusting screws in or out until beam is adjusted to a pattern as near as possible to that shown in figure 2-190. Adjust other headlight in same manner.

b. Replacement of Sealed Beam Lamp.

(1) Remove three screws and lockwashers. Remove lamp retainer (fig. 2-191).

(2) Pull lamp out of recess. Pull electrical connectors from housing. Remove lamp unit (fig. 2-192).

NOTE

Connectors are molded to sealed beam unit. Do not remove.

c. Removal of Headlight Assembly.

(1) Disconnect electrical connectors (fig. 2-193).

(2) Remove three nuts and lockwashers securing headlight assembly to brush guard. Remove headlight assembly (fig. 2-193).

(3) Disassemble headlight assembly as shown in figure 2-194.

d. Installation of Headlight Assembly. Install headlight assembly by reversing removal operations.

NOTE

Whenever a new headlight assembly is installed in the vehicle it is necessary that headlights be adjusted (fig. 2-190).

2-86. Blackout Driving Light

a. Removal of Sealed Beam Lamp Unit.

(1) Remove three screws securing door assembly (fig. 2-195).

(2) Pull door and lamp assembly from light housing and separate cable connectors (fig. 2-196).

(3) Remove three lamp retaining springs and remove sealed beam lamp (fig. 2-197).

b. Installation of Sealed Beam Lamp Unit. Install sealed beam lamp unit by reversing removal operations.

c. Removal of Blackout Driving Light Assembly.

(1) Grasp cable at connectors and pull, separating male and female connectors (fig. 2-198).

(2) Remove nut and lockwasher securing blackout driving light assembly to bracket (fig. 2-199).

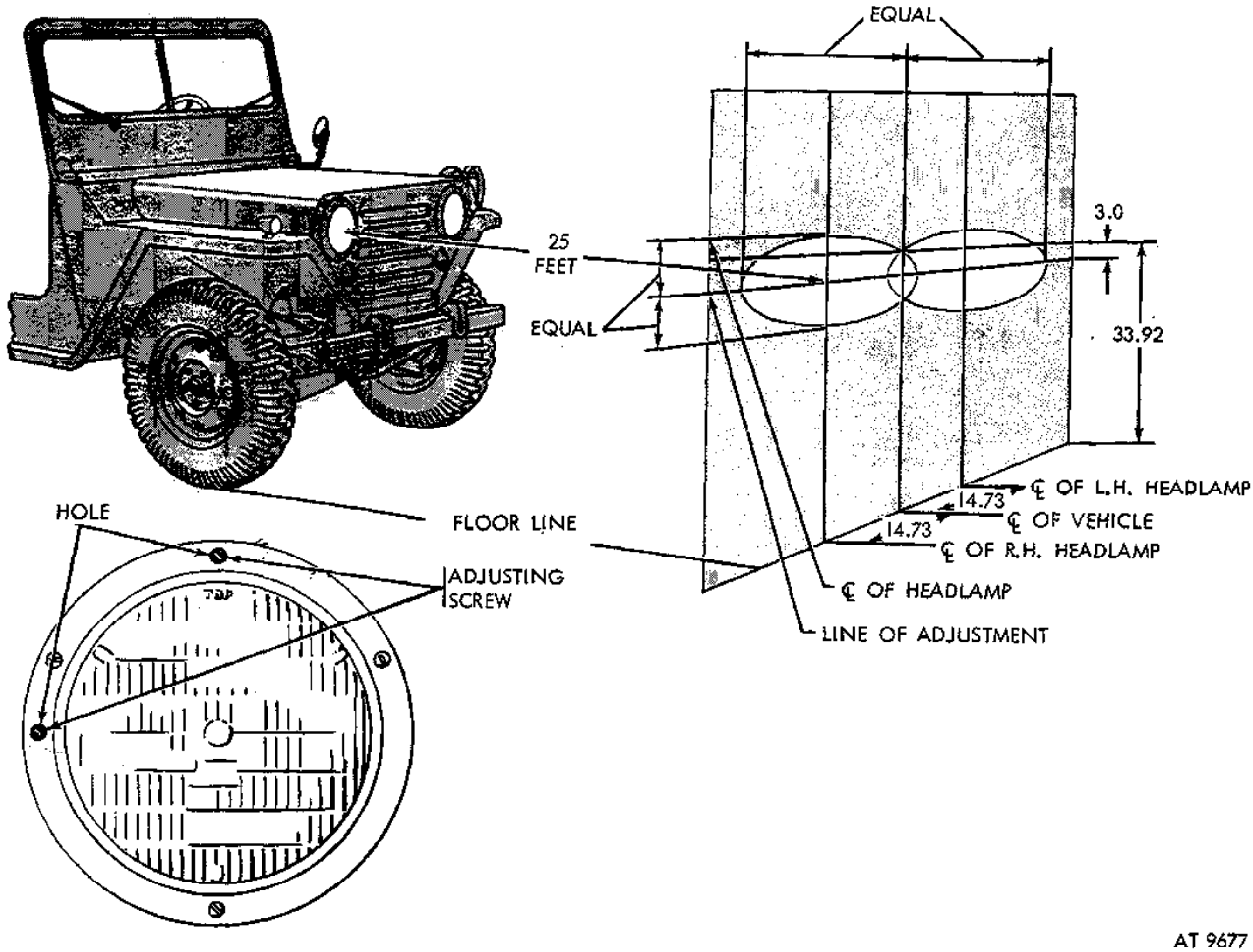


Figure 2-190. Headlight adjustment.

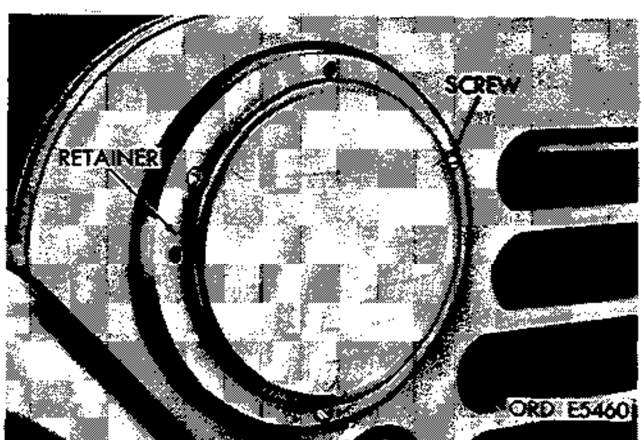


Figure 2-191. Remove lamp retainer.

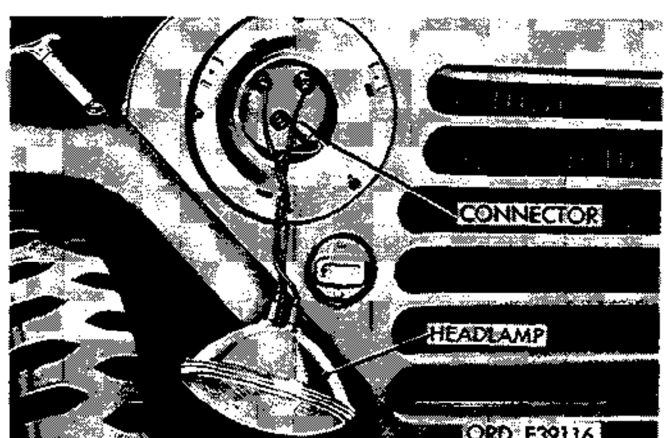


Figure 2-192. Remove headlamp unit.

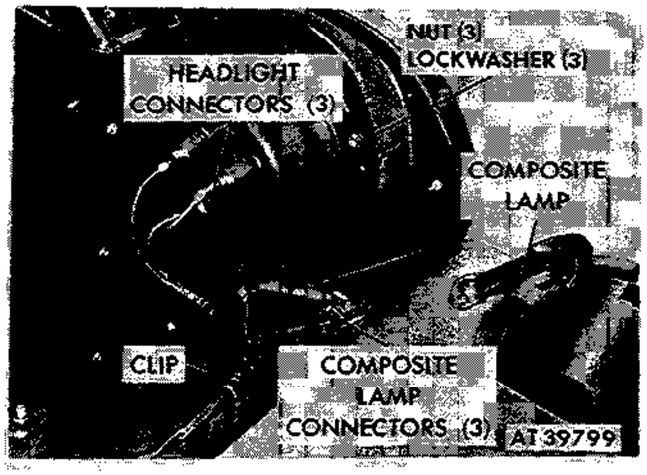


Figure 2-193. Remove headlight from brush guard.

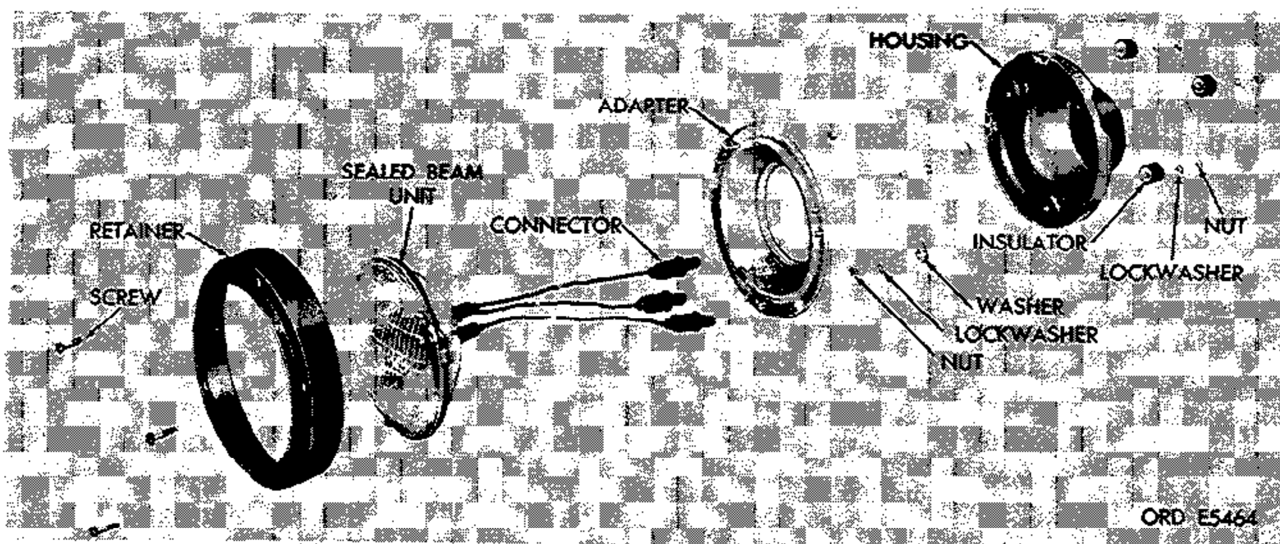


Figure 2-194. Headlight assembly—exploded view.

d. Installation of Blackout Driving Light Assembly. Reverse removal operations in c above.

NOTE

Figure 2-200 illustrates mounting of blackout driving light and composite lighting assembly on M151A2, M825, and M718A1 vehicles.

2-87. Blackout Marker Light (M151, M151A1, M151A1C, and M718 Vehicles)

a. Replacement of Blackout Marker Lamp.

(1) Remove two screws and remove door assembly (fig. 2-201).

(2) Grasp lamp, turn counterclockwise and remove. Install new lamp. Install door assembly and screws (fig. 2-202).

b. Removal of Blackout Marker Light Assembly.

(1) Grasp cable at connectors and pull, separating male and female connectors (fig. 2-203).

(2) Remove nut and lockwasher securing blackout marker light assembly to bracket (fig. 2-203).

c. Installation of Blackout Marker Light Assembly. Reverse removal operations above.

2-88. Front Parking, Directional Signal, and Blackout Marker Composite Lights (M151A2, M825, and M718A1 Vehicles)

a. Replacement of Lamps.

(1) Loosen five screws securing door to light housing (fig. 2-204).

(2) Remove door (fig. 2-205) and preformed packing from housing. Press bulb in and turn counterclockwise.

(3) Install another bulb. Properly position performed packing and door to housing and secure door by tightening five screws.

b. Removal of Composite Light Assembly.

(1) Disconnect three connectors at the front composite light assembly (fig. 2-193).

(2) Reach to underside of front fender and

remove two screws and washers securing light assembly and wire guard to vehicle.

(3) Remove the composite light assembly from vehicle.

c. *Installation of Composite Light Assembly.* Reverse removal procedures above.

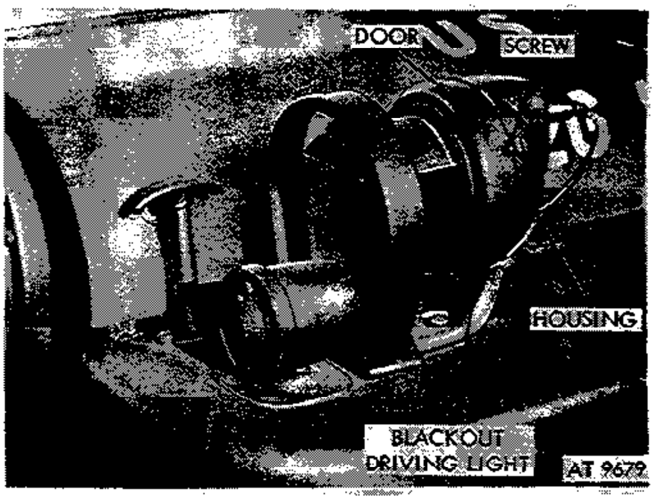


Figure 2-195. Remove blackout light door assembly.

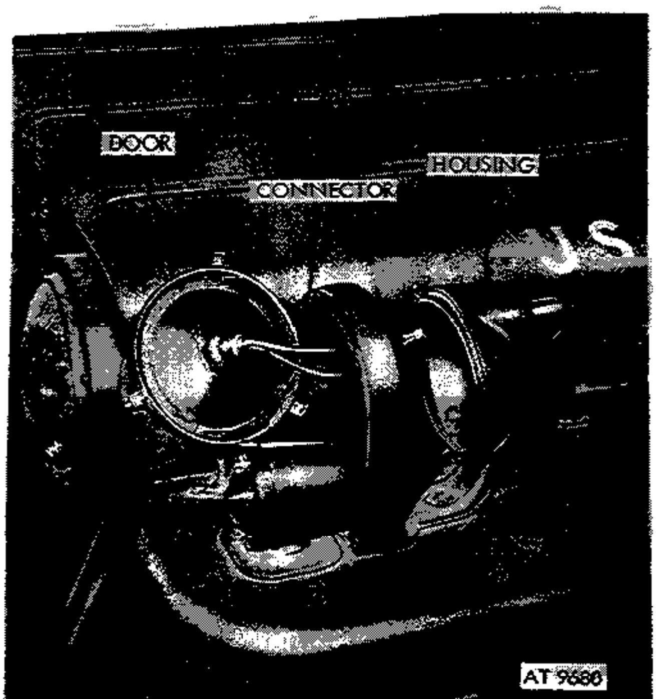


Figure 2-196. Pull door from housing and separate connectors.

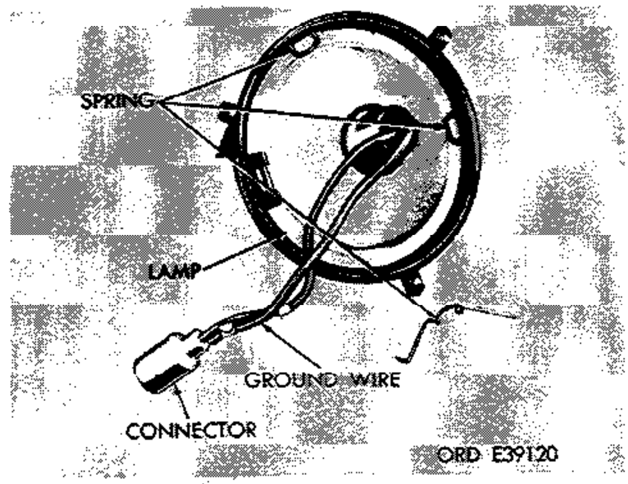


Figure 2-197. Remove sealed beam light.

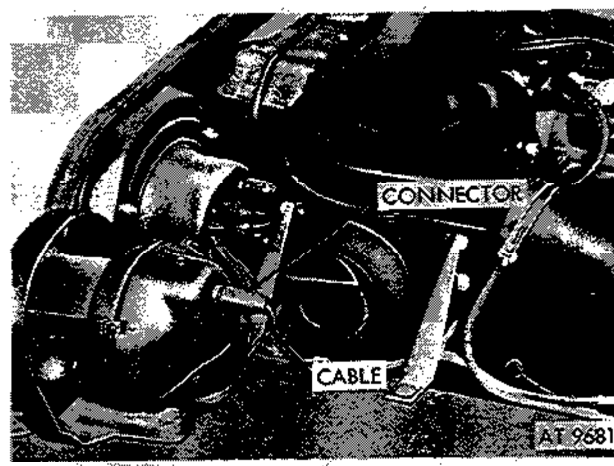


Figure 2-198. Separate connectors.

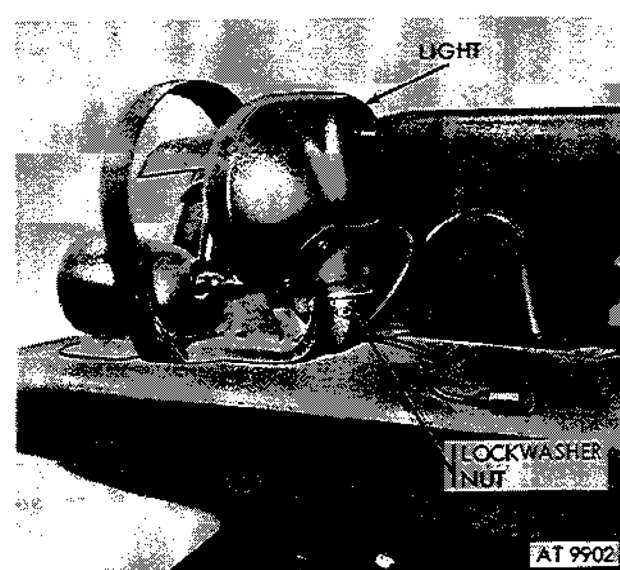


Figure 2-199. Remove driving light assembly.

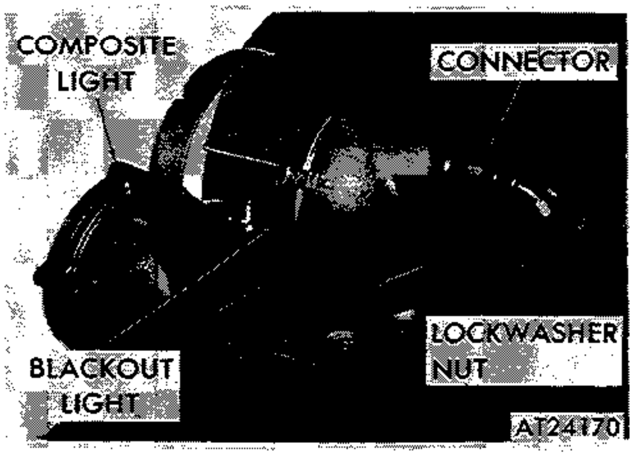


Figure 2-200. Removing or installing blackout headlamp on M151A2, M825, and M718A1 vehicles.

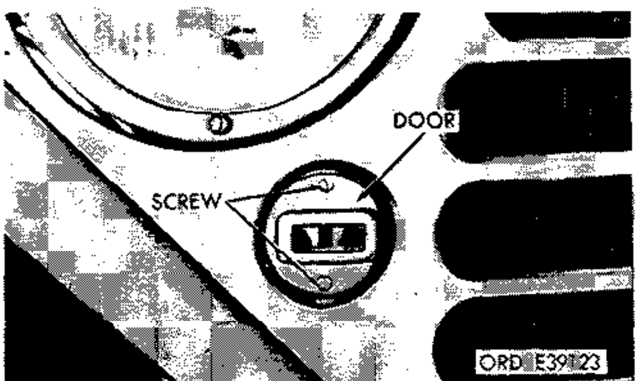


Figure 2-201. Remove blackout marker door assembly. (M151, M151A1, M151A1C and M718 vehicles

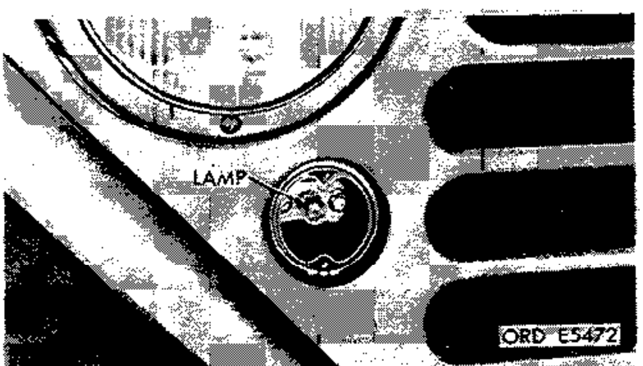


Figure 2-202. Remove blackout marker lamps. (M151, M151A1, M151A1C, and M718 vehicles).

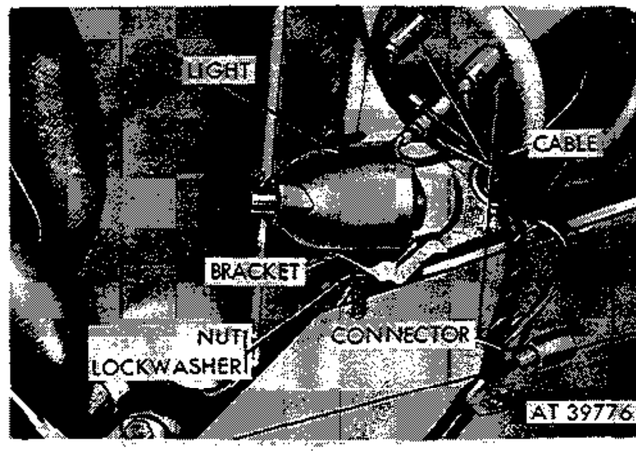


Figure 2-203. Remove blackout marker light assembly (M151, M151A1, M151A1C, and M718 Vehicles).

2-89. Tail and stoplight Assemblies Blackout Service (M151, M151A1, M151A1C, and M718)

a. Replacement of Lamps.

(1) Remove six screws securing door to light housing. Remove door (fig. 2-206).

(2) Press lamp in and turn counterclockwise and remove lamp (see fig. 2-207). Install new lamp. Install door and screws.

b. Taillight Assembly Removal.

(1) Disconnect three cable connectors. Remove two screws and lockwashers securing the taillight assembly (fig. 2-208).

(2) Remove taillight from opening in body (fig. 2-209).

c. Taillight Assembly Installation. Reverse removal operations above.

d. Replacement of Lamp.

(1) Remove the two screws securing the blackout signal lamp door assembly (fig. 2-206) to the blackout door gasket.

(2) Remove the door assembly and gasket.

(3) Press in on the blackout lamp and turn counterclockwise to remove from socket. Install new lamp. Install gasket, door assembly and two screws.

e. Blackout Stoplight Removal.

(1) Disconnect cable connectors. Remove screw and lockwashers securing the blackout stoplight from the right rear corner of the vehicle body.

(2) Remove the blackout stoplight.

f. Blackout Stoplight Installation. Reverse removal operations above.

2-90. Blackout Taillight, Blackout Stoplight, Service Taillight and Service Stoplights (M151A2, M825, and M718A1 Vehicles)

a. Replacement of Lamps.

(1) Loosen six screws securing door to light housing (fig. 2-210).

(2) Remove door (fig. 2-211) and preformed packing. Press bulb in and turn counter-clockwise to remove.

(3) Install new bulb. Position preformed packing and door assembly in place to light housing. Secure door by tightening six screws.

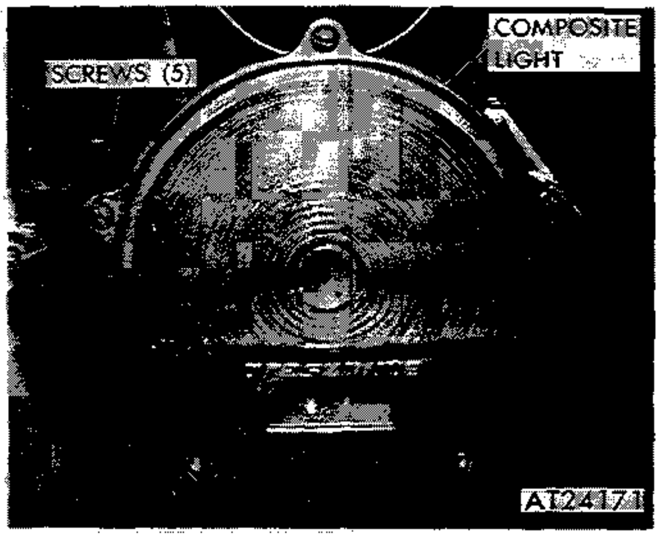


Figure 2-204. Removing or installing door to front light housing on M151A2, M825, and M718A1 vehicles.

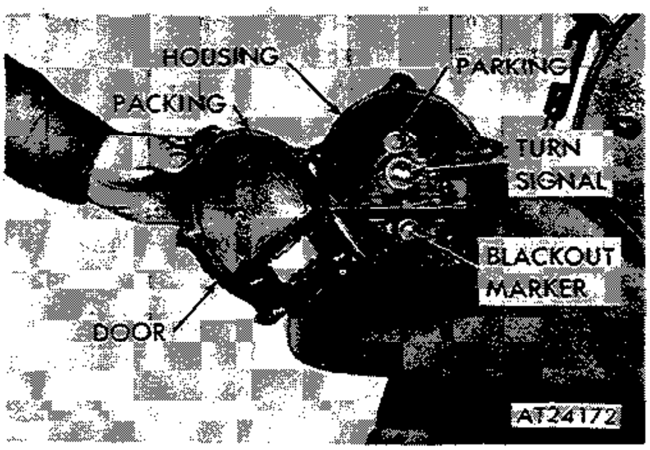


Figure 2-205. Removing or installing front lamp bulbs (M151A2, M825, and M718A1 vehicles).

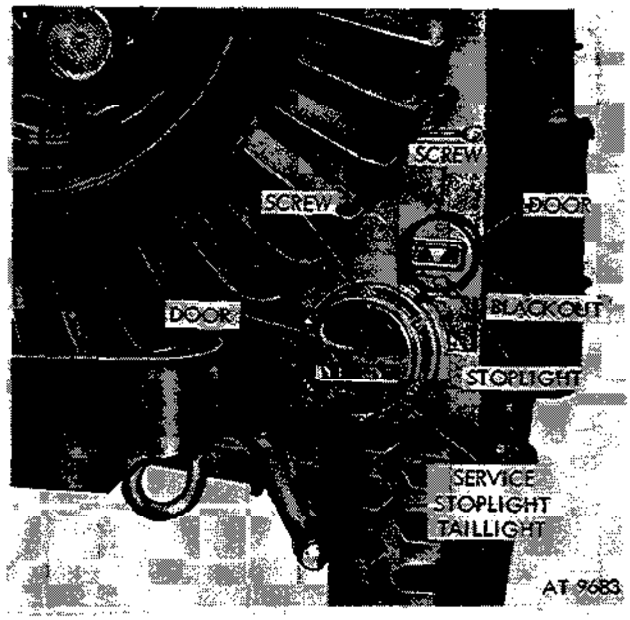


Figure 2-206. Remove door from light housing (M151, M151A1, M151A1C, and M718).

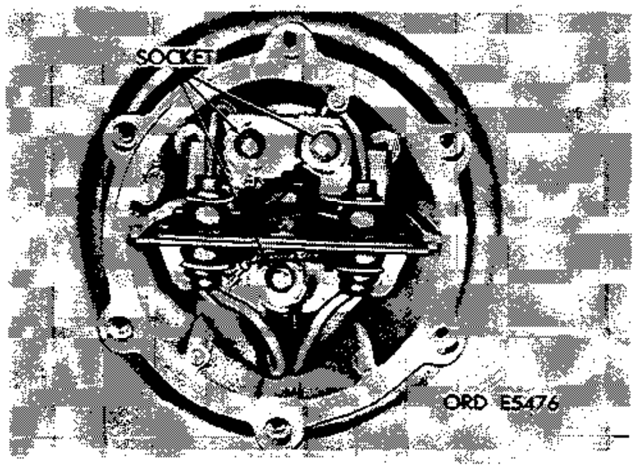


Figure 2-207. Remove lamp. (M151, M151A1, M151A1C and M718).

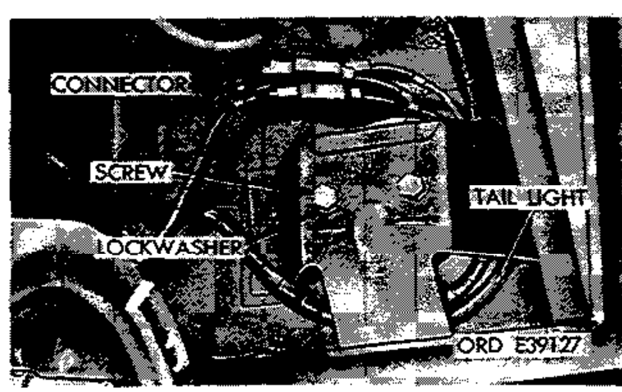


Figure 2-208. Disconnect cable connectors (M151, M151A1, M151A1C and M718).

Figure 2-209. Remove taillight from opening in body (M151, M151A1, M151A1C and M718).

b. *Removal of Composite Light Unit.*

(1) Remove three screws and lockwashers securing light assembly cover plate to vehicle body (fig. 2-212).

(2) Remove two screws and lockwashers securing rear composite light. Separate electrical connectors (fig. 2-213) and remove composite light unit from vehicle.

c. *Installation of Composite Light Unit.* Reverse removal procedures above.

2-91. Directional Signal Lights (M151, M151A1, M151A1C and M718)

NOTE

The directional signal lamps on M151A2, M825, and M718A1 vehicles are integrated into the composite light assemblies. Refer to paragraph 2-88.

a. *Replacement of Lamp.* Refer to figures 2-214 and 2-215.

(1) Remove two screws and washers from the turn signal lens.

(2) Remove the lens and gasket from the turn signal body.

(3) Press lamp in and turn counterclockwise to remove from socket.

Install new lamp. Install gasket, lens, screws and washers securing lens to turn signal body.

b. *Directional Signal Light Removal.*

(1) Disconnect cable connectors. Remove one turn signal lamp mounting screw and two washers securing the directional turn signal light assembly to the vehicle fender (fig. 2-216).

(2) Remove directional signal light.

c. *Directional Signal Light Installation.* Reverse removal operations above.

2-92. Directional Turn Signal Control Assembly

a. *Removal.*

(1) Disconnect cable to flasher assembly (fig. 2-217).

(2) Remove clips securing cable to steering column.

(3) Remove screw and nut from clamp on steering column and remove control assembly.

Figure 2-210. Removing or installing door to rear light housing (M151A2, M825, and M718A1 vehicles).

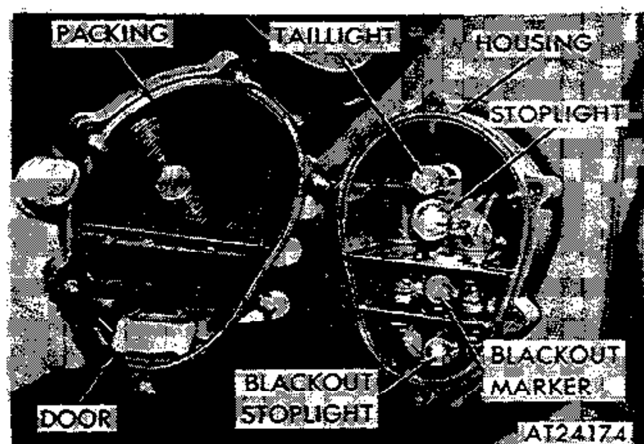


Figure 2-211. Removing or installing rear lamp bulbs (M151A2, M825, and M718A1 vehicles).

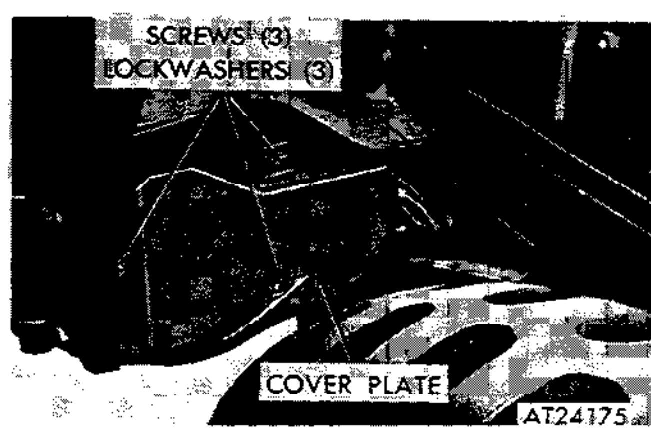


Figure 2-212. Removing or installing rear cover plate (M151A2, M825, and M718A1 vehicles).

Figure 2-213. Removing or installing rear composite light unit (M151A2, M825, and M718A1 vehicles).

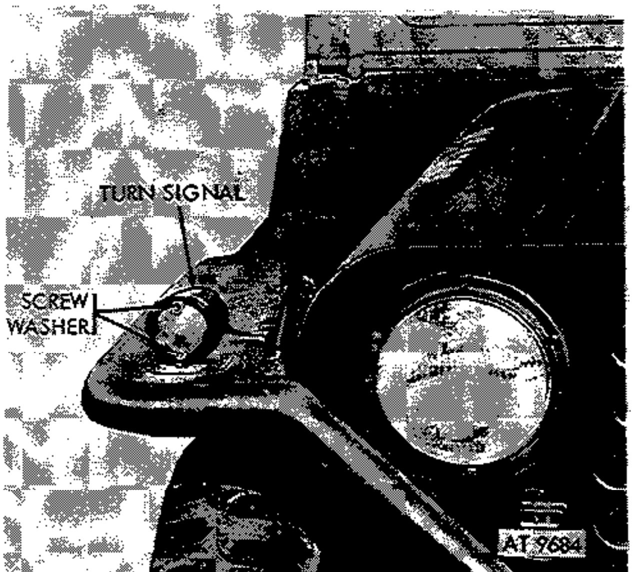


Figure 2-214. Remove directional turn signal lens (M151, M151A1, M151A1C, and M718 Vehicles).

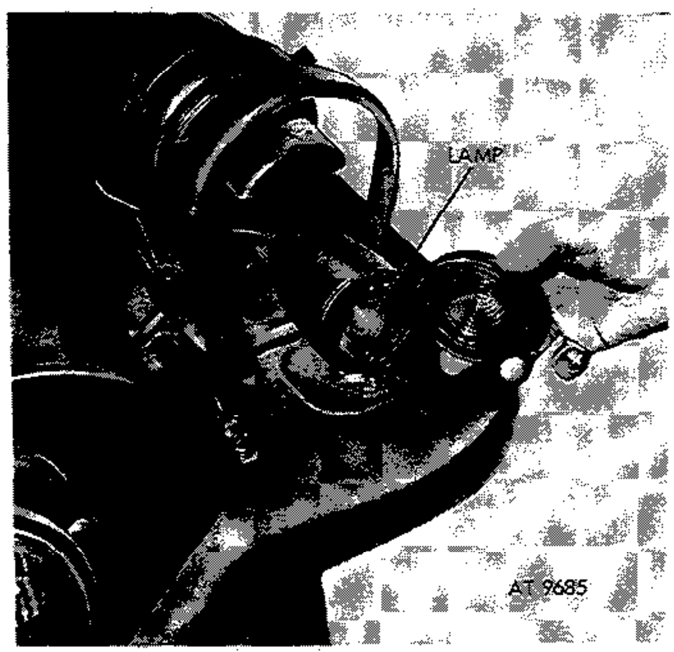


Figure 2-215. Replace directional signal lamp (M151, M151A1, M151A1C, and M718 vehicles).

NOTE

On vehicles equipped with a solid state flasher, the control assembly is removed in the same manner except the cable is disconnected at the control assembly.

b. Installation. Install directional control assembly by reversing removal operations.

NOTE

If control assembly is replaced, install only late model directional control. Refer to paragraph 2-94.

c. Replacement of Lamp. Remove lens signal light from control handle and remove lamp. Replace lamp and install lens signal light on control handle (fig. 2-217).

2-93. Distribution Box or Solid State Flasher

a. Removal of Distribution Box (fig. 2-218).

(1) Remove directional control harness and main wiring harness from distribution box.

(2) Remove two screws and washers securing distribution box to firewall. Remove distribution box.

b. Installation. If distribution box is to be replaced, install late model solid state flasher assembly. Refer to paragraph 2-94.

c. Removal of Solid State Flasher Assembly (fig. 2-219).

(1) Remove cable assembly from flasher assembly.

(2) Remove two screws and washers securing solid state flasher assembly to firewall. Remove flasher assembly.

d. Installation of Solid State Flasher Assembly. Reverse removal operations above.

2-94. Solid State Turn Signal Kit

a. Removal of Old Parts.

(1) Remove control assembly by completing removal operations in paragraph 2-92. Retain steering column clips.

(2) Remove distribution box by completing removal operations in paragraph 2-93.

(3) Remove old terminals from front wiring harness.

Figure 2-216. Remove directional turn signal light (M151, M151A1, M151A1C and M718A1 vehicles).

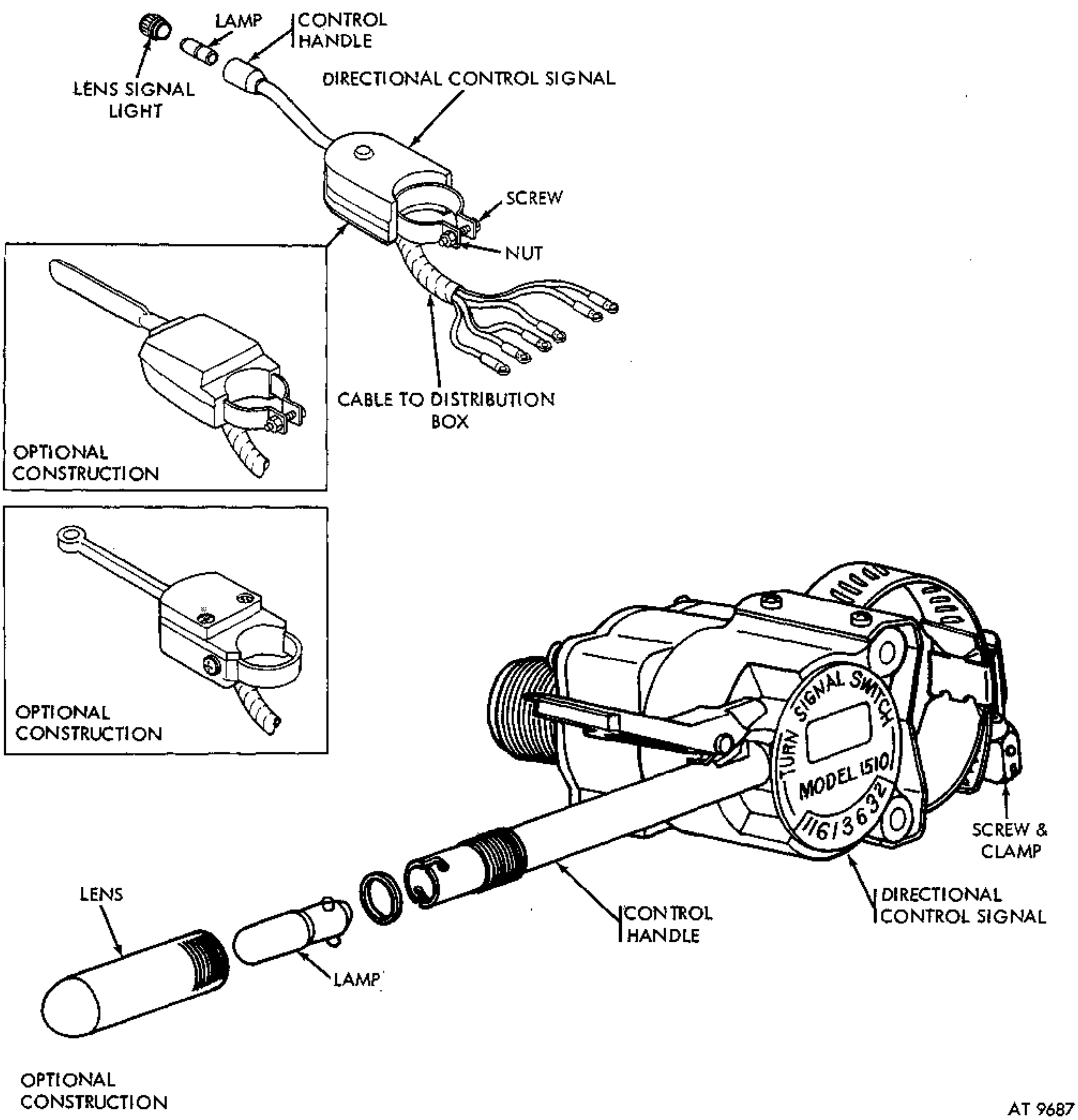


Figure 2-247. Directional turn signal control assembly.

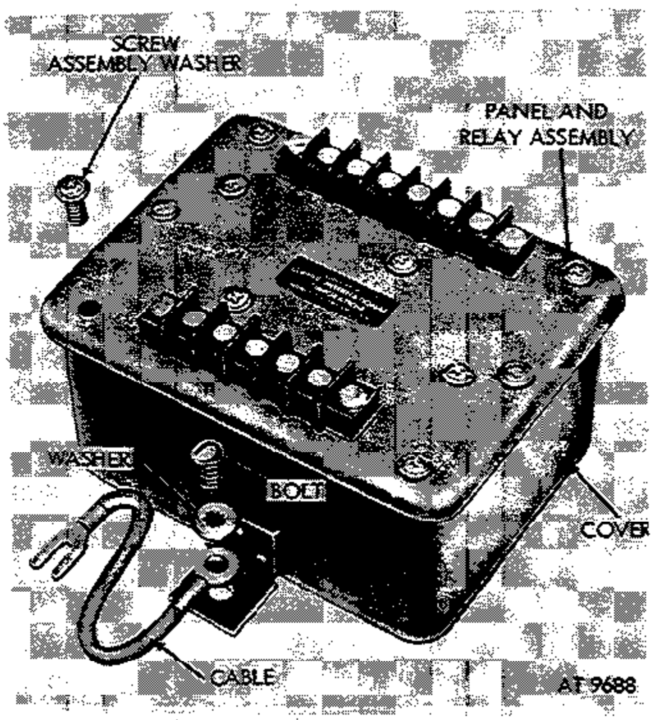


Figure 2-218. Distribution box.

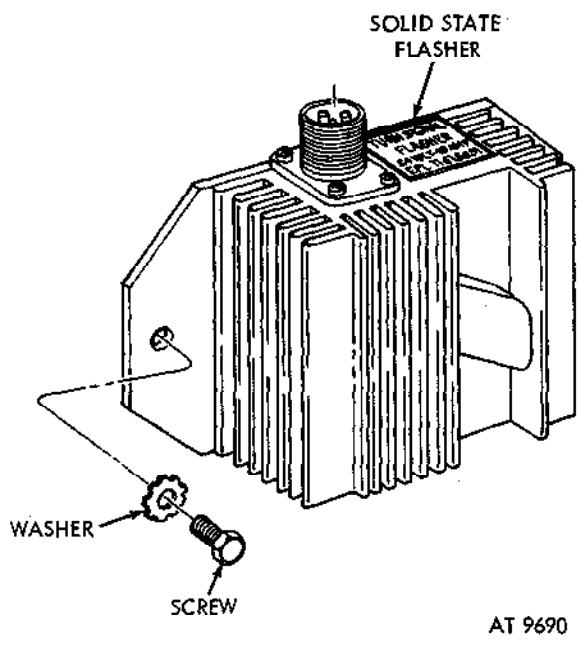


Figure 2-219. Remove solid state flasher.

b. *Installation.*

(1) Install six connectors to front wiring harness leads.

(2) Mount solid state flasher assembly using two screw and lockwasher assemblies in the location from which the distribution box was removed.

(3) Mount directional control switch assembly to steering column.

(4) Connect new cable to directional control assembly.

(5) Route cable along steering column and secure to column using clips removed in *a* (1) above.

(6) Connect cable to solid state flasher assembly.

(7) Connect cable ground to flasher assembly mounting screw nearest the connector, placing an internal-external tooth washer between ground terminal and mounting bracket.

(8) Connect control assembly cable leads to front wiring harness leads, matching wire numbers.

2-95. Trailer Electrical Connector Receptacle

a. *Removal.* Refer to figures 2-220 and 2-221.

(1) Pull connectors from receptacle.

(2) Remove screws, nuts, and lockwashers securing trailer electrical connector receptacle.

(3) Remove trailer electrical connector receptacle.

b. *Installation.* Reverse removal operations above.

NOTE

Both cables with No. 90 tag (fig. 2-222) are ground cables. Install under the lockwasher of the upper left and lower left receptable attaching screws. Be sure the terminal lead and body panel metal are clean to obtain a good ground.

2-96. Repair of Electrical Cables

All repairs to electrical cables will be made in accordance with TB ORD 650. Terminals of braided cables will not be repaired. Figures 2-223 and 2-224 show operations for exposing the male terminals. Damaged terminals will be removed and new terminals soldered or crimped in place. To expose female terminals of cables, simply pull the rubber waterproof cap toward center of the cable away from the terminal.

Figure 2-220. Pull connectors from receptacle.

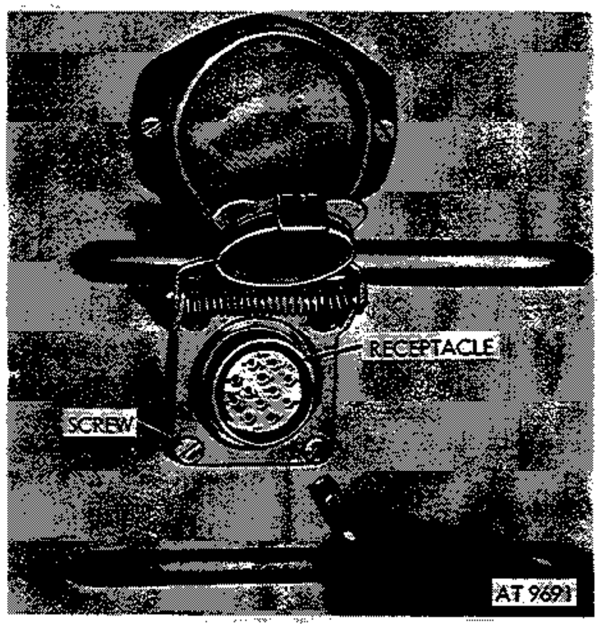


Figure 2-221. Remove trailer electrical receptacle.

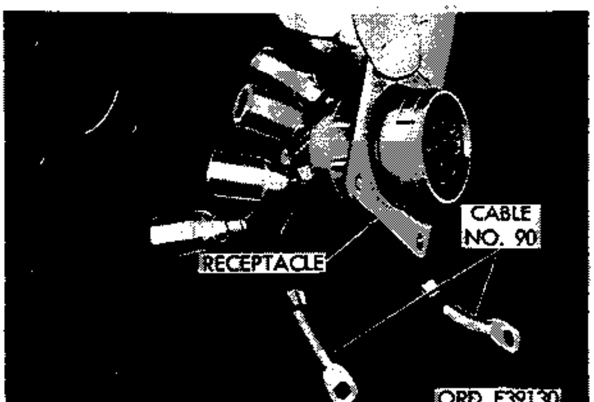


Figure 2-222. Receptacle ground cables.

(1) Use suitable tool and pull terminal out of rubber cap (fig. 2-223).

(2) Pull C-type retainer washer off cable (fig. 2-224).

(3) Slide rubber cap off cable, exposing terminal for repair (fig. 2-224).

2-97. Electrical Cables

a. General. Each electrical cable (except the spark plug cables) is identified by a numbered metal tag at each end of the cable. All cables in a single circuit are identified by the same number; however, when cables are connected through more than one connector, they may connect to a different numbered terminal at each connector. Refer to paragraphs 2-19 through 2-25 when replacing cables.

b. Circuit Identification. Paragraphs 2-19 through 2-25 list each circuit number in the electrical system and briefly trace each circuit. A point-to-point check for circuit continuity can be made, using a battery-operated test light, and a voltmeter equippped with long cables and suitable probes.

2-98. Chassis Wiring Front Harness

a. Description. The electrical wiring of the vehicle is housed in two major harness assemblies. The front assembly carries current to all electrical units located in and forward of the dash panel. The rear assembly carries current to the fuel pump and fuel gage sending unit, and all electrical units located in the rear of the vehicle. The two harnesses are connected behind the dash panel. Harness assemblies are waterproofed and each cable except the spark plug cable is identified by a numbered metal tag at each end. All cables is a single circuit are identified by the same number. Each harness assembly can be removed for repair or replacement without removing the other. It is important to determine whether the harness assembly will be repaired or discarded before removal from the vehicle. If the harness assembly will be repaired, some connectors must be disassembled before the connections can be cut from the cables eliminating this disassembly procedure.

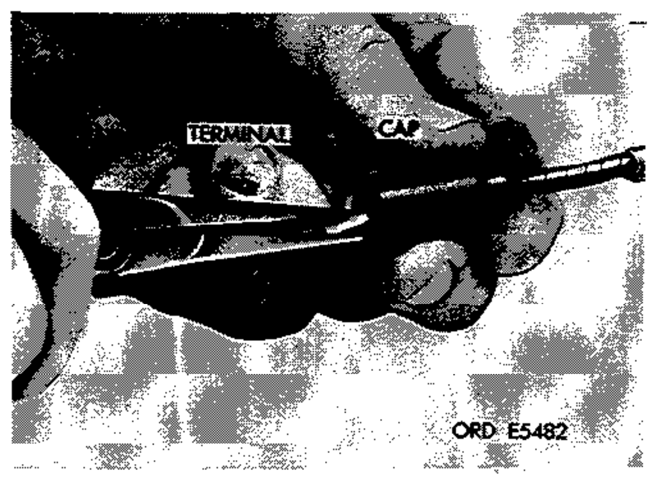


Figure 2-223. Pull terminal out of rubber cap.

NOTE

The M151A2 vehicle (this includes M151A2, M825, or M718A1 models) has not electrical fuel pump mounted in the fuel tank. Instead, a mechanical fuel pump is mounted at front right side of engine.

b. Removal of Front Wiring Harness (M151, M151A1, M151A1C and M718 Vehicles). Figure 2-225 shows the front harness assembly and its position in the vehicle.

(1) Remove front seats (para 2-198), battery compartment cover (TM 9-2320-218-10) and transmission tunnel cover (para 2-199)

(2) Loosen nut and lift battery ground cable off battery terminal (fig. 2-182).

WARNING

Be sure cable does not come in contact with battery terminal at any time.

(3) Pull connectors from right and left headlights and blackout marker light. Remove screw, nut and lockwasher securing ground cables and cable assembly clips (fig. 2-203).

CAUTION

Do not remove connectors by pulling on cables. This could cause damage to insulators and connectors.

(4) Remove connectors from blackout driving light and directional turn signals (fig. 2-195).

(5) Remove screw, nut, and lockwasher securing each ground cable clip to fender. Remove clips from ground cable (fig. 2-226).

(6) Use spanner wrench and unscrew cable No. 5 at generator regulator (fig. 2-227).

(7) Separate connector in horn switch cable (fig. 2-228).

(8) Remove cable assembly out of three clips on left side of engine compartment (fig. 2-229).

(9) Unscrew cable connector securing cable to ignition distributor (fig. 2-146).

(10) Remove connector (fig. 2-146).

(11) Remove connector from fuel pump safety switch (oil pressure safety switch) (fig. 2-67).

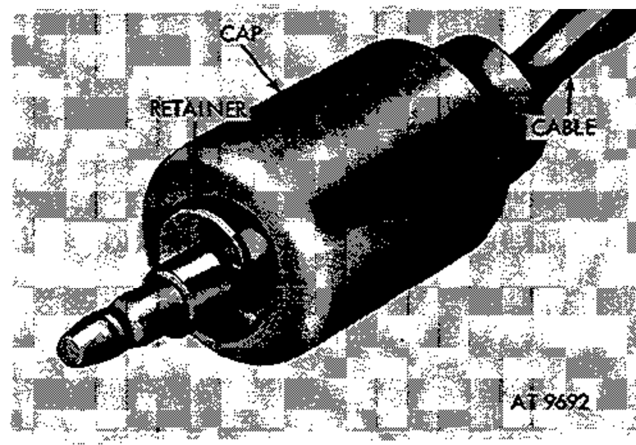


Figure 2-224. Remove retainer and cap from cable.

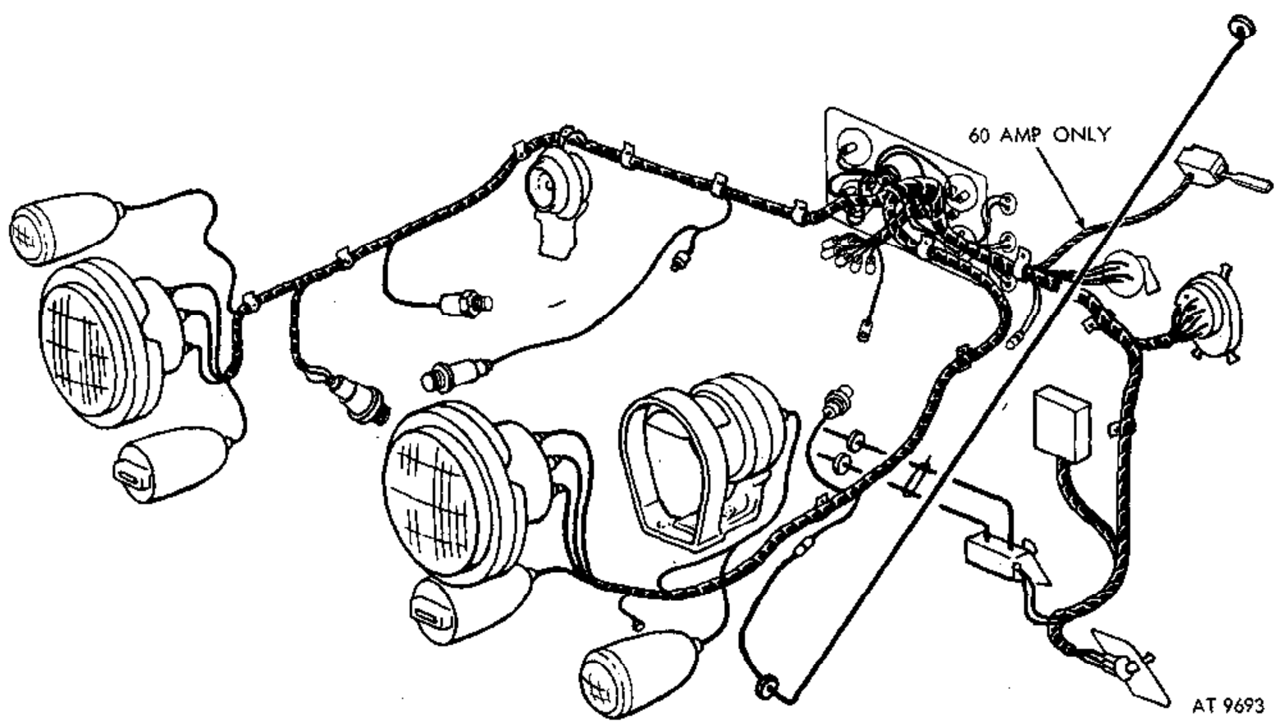


Figure 2-225. Front wiring harness assembly (M151, M151A1, M151A1C, and M718 vehicles).

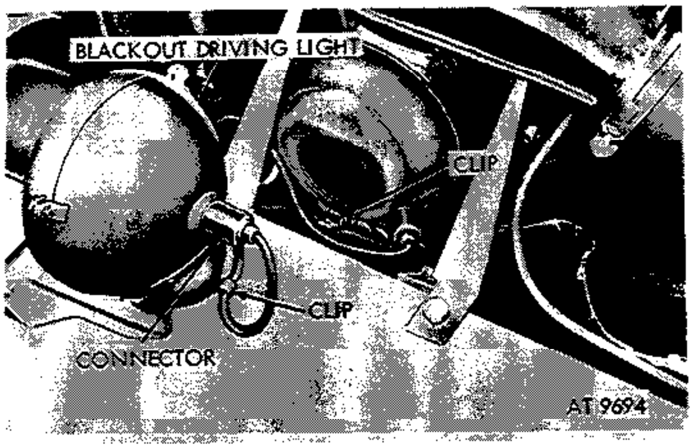


Figure 2-226. Remove clips from ground cables.

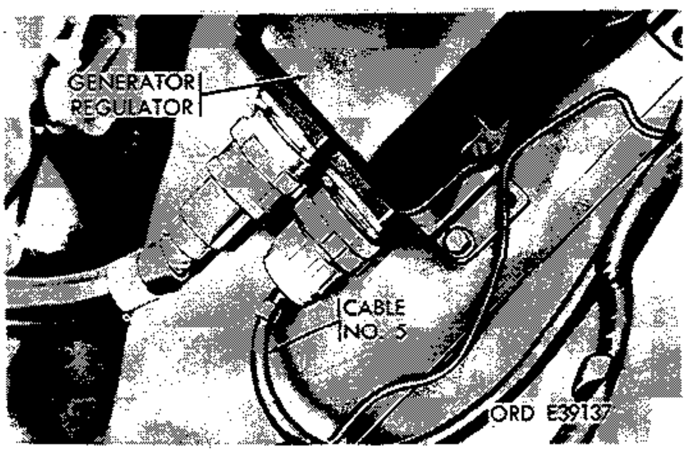


Figure 2-227. Unscrew cable No. 5 at generator regulator.

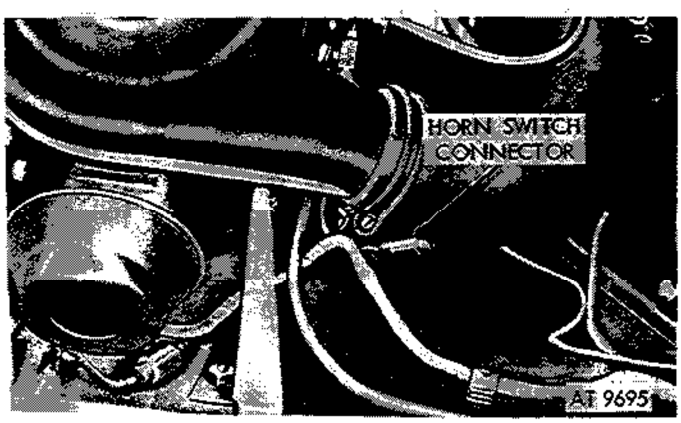


Figure 2-228. Separate connector in horn switch cable.

(12) Remove connectors from oil pressure transmitter unit (fig. 2-67).

(13) Remove connector from horn (fig. 2-285).

(14) Remove connector from temperature transmitter unit (fig. 2-146).

(15) Remove harness assembly from five clips on right side of engine compartment (fig. 2-230).

(16) Loosen two screws securing choke control cable and cable housing. Remove housing to vent tube clip. Remove housing and cable from carburetor (fig. 2-231).

(17) Remove vent tube nut from fitting. Pull vent tube through grommet (fig. 2-232).

NOTE

A rubber tubing is connected to vent tube on opposite side of grommet.

(18) Remove two grommet retainer mounting screws and lockwashers and remove grommet retainer. Pull grommet free of firewall and pull it off choke cable housing. Push choke cable housing through firewall (fig. 2-232).

(19) Remove four screws and lockwashers securing instrument cluster to dash panel and pull instrument cluster away from panel (fig. 2-233).

(20) Unscrew nut securing speedometer cable housing to speedometer (fig. 2-234).

(21) Pull connectors from instruments and gages, and remove instrument cluster (fig. 2-235).

NOTE

Numbers shown indicate circuit numbers.

(22) Separate the connectors between front harness assembly and rear harness assembly (fig. 2-236) (cable Nos. 27, 28, 24, 23, 22 and 21).

(23) Separate cable connectors from three circuit breakers (fig. 2-237).

(24) Remove transmission tunnel cover and remove nut and lockwasher securing starter cable and fuel pump safety switch (oil pressure safety switch) cable to starter. Remove cables from starter terminal (fig. 2-238).

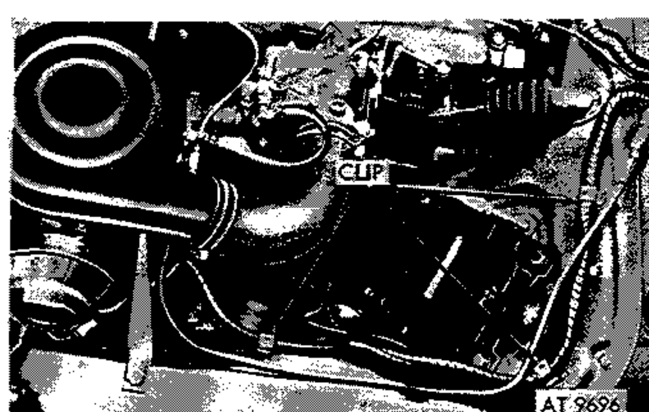


Figure 2-229. Remove cable assembly on left side of engine compartment.

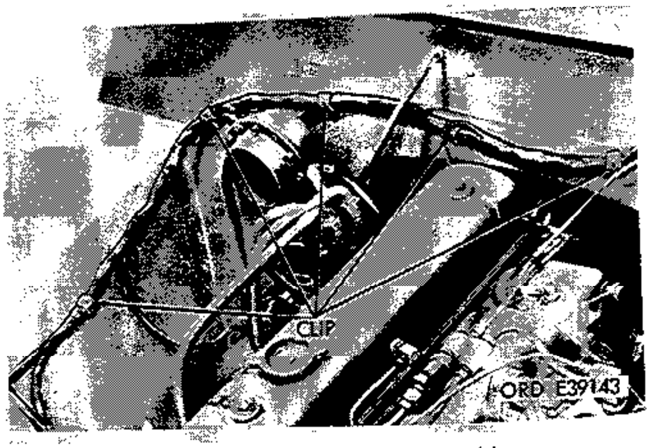


Figure 2-230. Remove harness assembly.

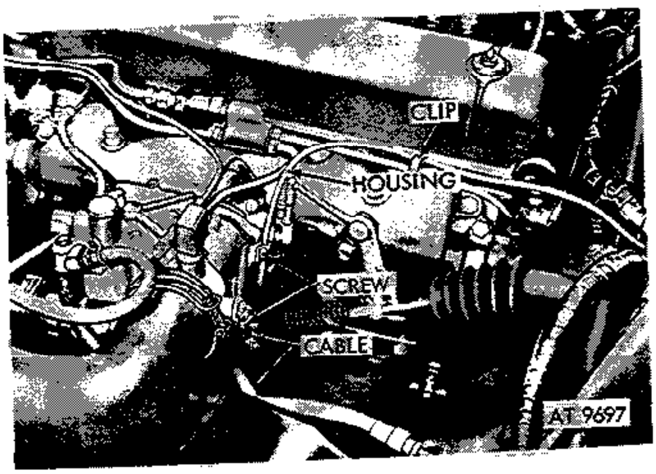


Figure 2-231. Remove housing and cable from carburetor.

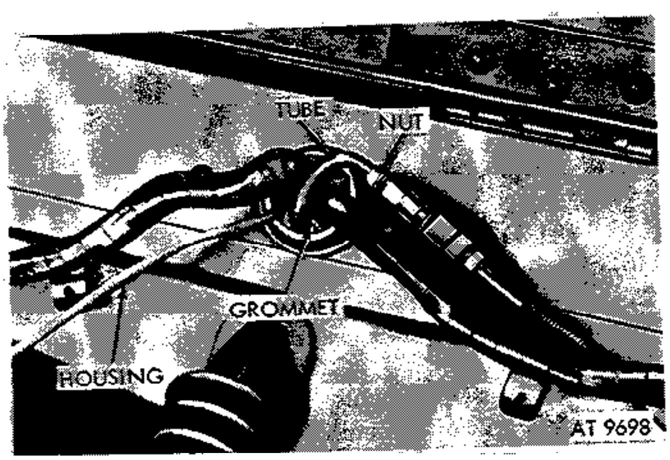


Figure 2-232. Remove tube and grommet.

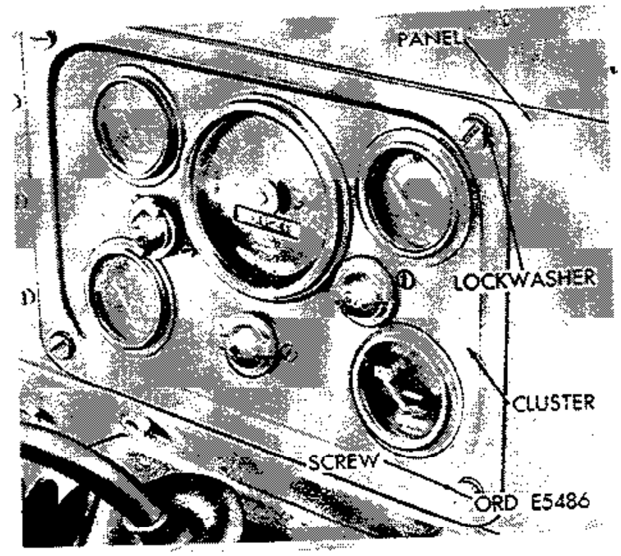


Figure 2-233. Instrument cluster removal.

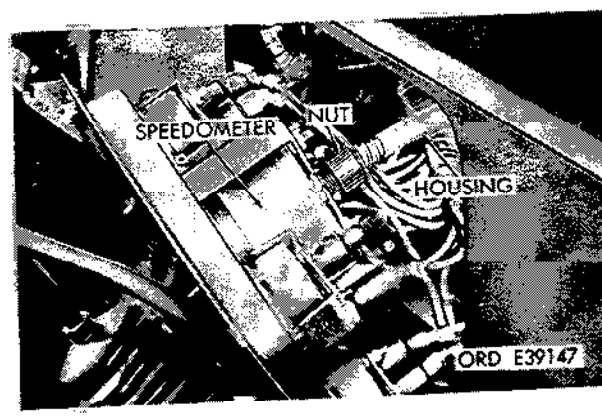


Figure 2-234. Disconnect speedometer cable.

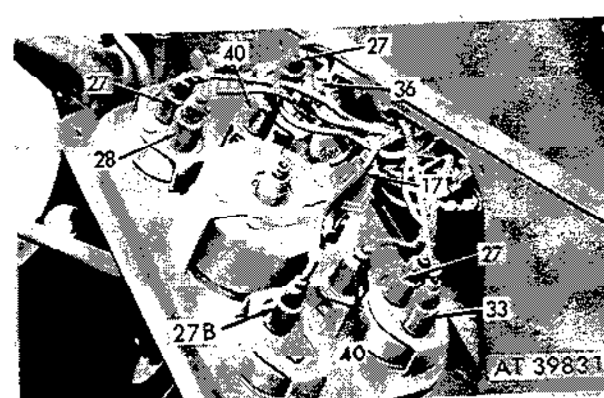


Figure 2-235. Pull connectors and remove cluster.

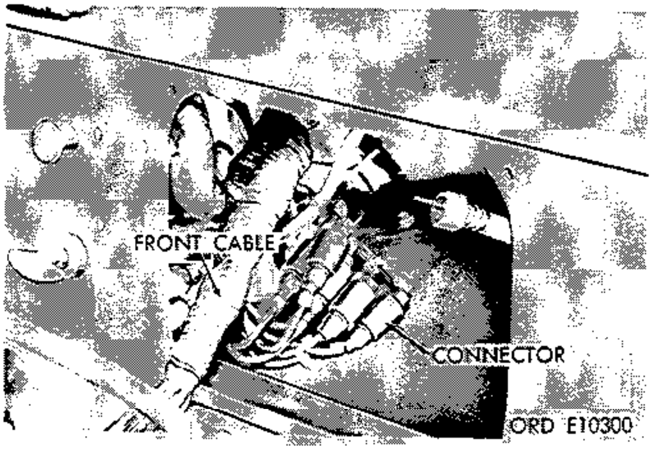


Figure 2-236. Separate front harness assembly and rear harness assembly.

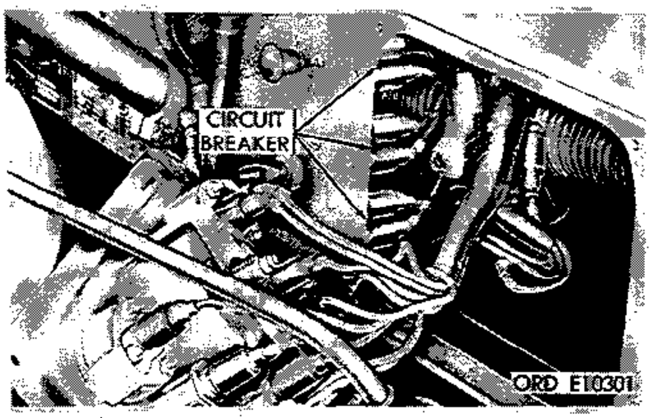


Figure 2-237. Separate cable connectors from circuit breakers.

(25) Unscrew cable connector behind light switch. Pull connectors from ignition switch (see fig. 2-239).

(26) Pull connectors from stoplight switch. Stoplight switch is located in bottom of master cylinder (see fig. 2-240).

(27) Remove four screws and lockwashers securing dimmer switch to floor panel (see fig. 2-241).

(28) Pull dimmer switch away from floor. Pull connectors from dimmer switch (see fig. 2-242).

(29) Loosen two screws in back of starter switch and remove two front screws switch to floor panel (see fig. 2-243).

(30) Pull starter switch away from floor. Remove two nuts and lockwashers securing electrical connectors (see fig. 2-244).

(31) Remove connectors at end of harness assembly.

(32) Push front harness assembly through hole in firewall (see fig. 2-245).

(33) Push front harness assembly out from inside of vehicle (see fig. 2-246).

c. Installation of Front Wiring Harness (M151, M151A1, M151A1C, and M718), procedures in *b* above.

NOTE

The M151A2 vehicle (this includes M151A2, M825, or M718A1 models) has not electrical fuel pump mounted in the fuel tank. Instead, a mechanical fuel pump is mounted at front right side of engine.

d. Removal of Front Wiring Harness of M151A2, M825, and M718A1 Vehicles. Figure 2-181 shows the front harness assembly and its position in the vehicle.

(1) Remove front seats (para 2-198), battery compartment cover (TM 9-2320-218-10) and transmission tunnel cover (para 2-199).

(2) Loosen nut and lift battery ground cable off battery terminal (fig. 2-182).

WARNING

Make sure cable does not contact battery ground terminal at any time while front harness is being removed.

(3) Disconnect 12 electrical connectors at two front headlights and two composite light assemblies (fig. 2-193).

(4) Remove screw and two lockwashers from retaining clip securing ground at right front fender (fig. 2-193).

(5) Pull connector at blackout driving light, and remove screws from retaining clips securing cables to left front fender. Separate clips from cables (fig. 2-226.)

(6) Remove screw and two lockwashers securing ground cable terminal to firewall. Place lockwashers and screw back into position since they also secure brake and clutch pedal assembly to driver's side of firewall.

(7) Separate electrical wiring from 60 ampere generator.

(8) Disconnect horn switch connector (fig. 2-228).

(9) Remove wiring harness assembly from strap at air cleaner bracket and three clips (fig. 2-229).

(10) Unscrew cable coupling from distributor and ignition coil assembly (fig. 2-247). Separate coupling from cable.

(11) Disconnect connectors at oil pressure transmitter (fig. 2-67) and temperature transmitter units (fig. 2-146).

(12) Disconnect the two connectors at horn assembly (fig. 2-247).

(13) Remove windshield washer hose from the one corner clip so right side of wiring harness can be removed from all five clips (fig. 2-247) in engine compartment.

(14) Loosen two screws and remove clip that secures choke cable assembly to carburetor and vent line (fig. 2-231).

(15) Remove two screws and lockwashers securing grommet retainer. Remove retainer (fig. 2-248).

(16) Pull rubber grommet away from firewall, and push choke cable and its housing through firewall.

(17) Remove four screws and lockwashers securing instrument cluster assembly to dash panel (fig. 2-233).

(18) Pull instrument cluster assembly away from dash panel, and disconnect speedometer cable nut and its housing from speedometer gage (fig. 2-234).

(19) Disconnect all connectors to various other gages on instrument cluster. Remove instrument cluster (fig. 2-235).

(20) Disconnect front and rear wiring harness connectors apart (fig. 2-236).

(21 Reach inside just to left of cluster opening and disconnect four connectors for the two circuit breakers (fig. 2-249).

(22) Disconnect connector coupling at light switch and four connectors at the ignition switch (fig. 2-239).

(23) Separate two connectors for stoplight switch (connectors are located near top of clutch pedal).

(24) Separate connector at windshield wiper motor (fig. 2-250).

(25) Remove coupling connectors at the directional control unit on the steering column (fig. 2-250).

(26) Disconnect the connector at the flasher unit located up against driver's side of firewall.

e. *Installation of Front Wiring Harness (M151A2, M825, and M718A1).* Install front wiring harness by reversing removal procedures in *d* above.

2-99. Rear Chassis Wiring Harness

a. *Removal of Rear Wiring Harness Assembly.* Figure 2-251 shows the rear harness assembly and its position in the vehicle. It is not necessary to remove the front harness assembly if only the rear harness assembly is defective. Refer to procedures (1) through (13) below for operations necessary to remove the rear harness assembly.

NOTE

Figure 2-252 illustrates the rear harness assembly and its position in M151A2, M825, and M718A1 series vehicles.

(1) Remove front seats (para 2-198), battery compartment cover (TM 9-2320-218-10) and transmission tunnel cover (para 2-199).

(2) Loosen nut and lift battery ground cable off terminal (fig. 2-182).

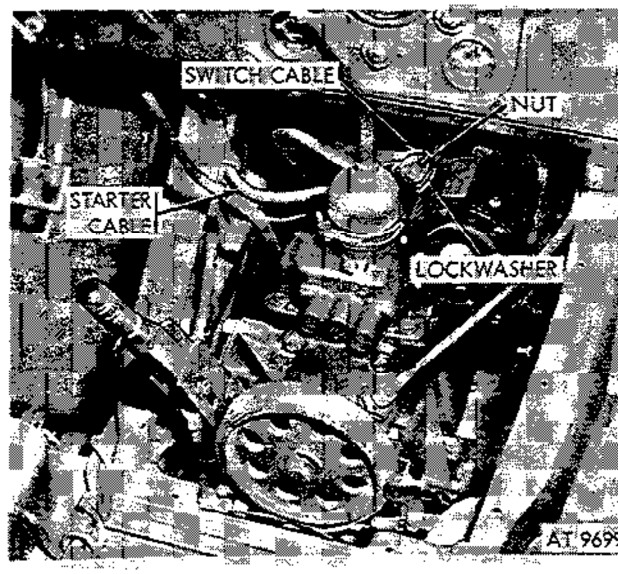


Figure 2-238. Remove transmission tunnel cover and remove cables from starter.

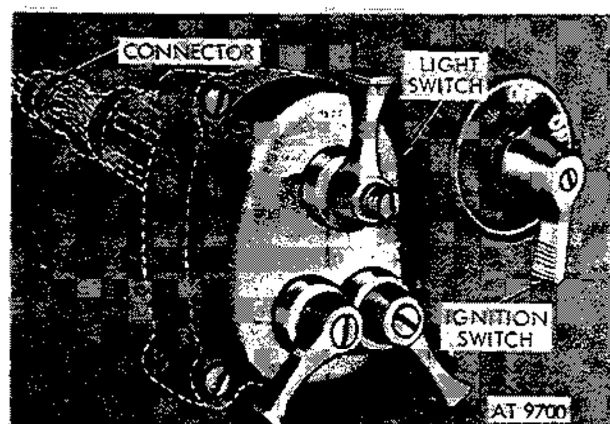


Figure 2-239. Unscrew connector behind light switch and pull connectors from ignition switch.

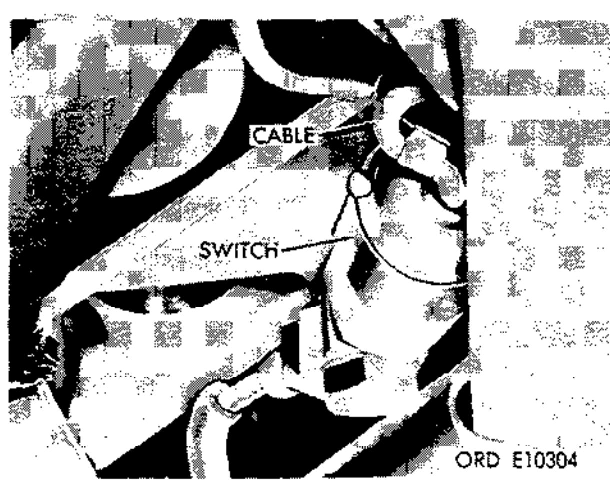


Figure 2-240. Pull connectors from stoplight switch.

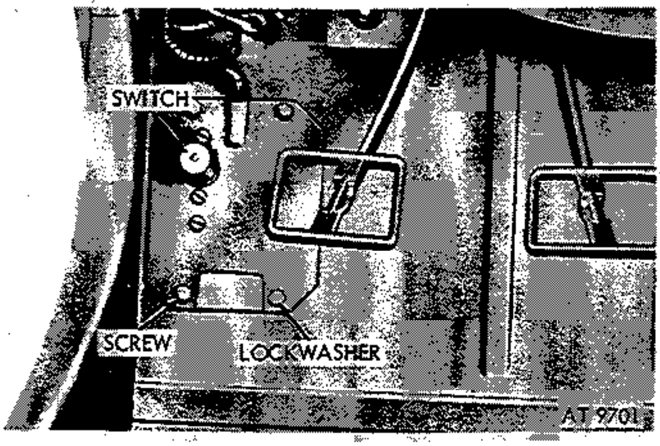


Figure 2-241. Remove dimmer switch from floor panel.

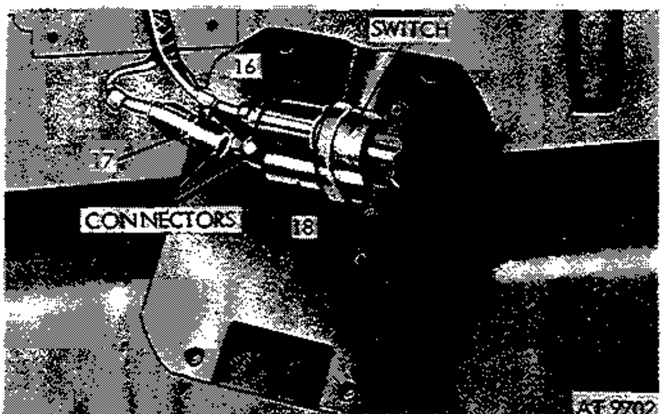


Figure 2-242. Pull connectors from switch.

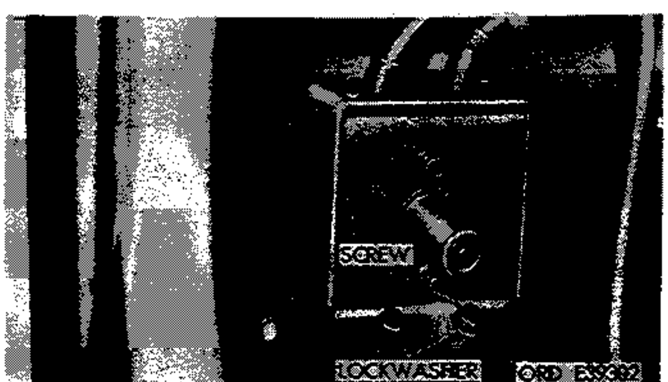


Figure 2-243. Disconnect starter switch from floor panel.

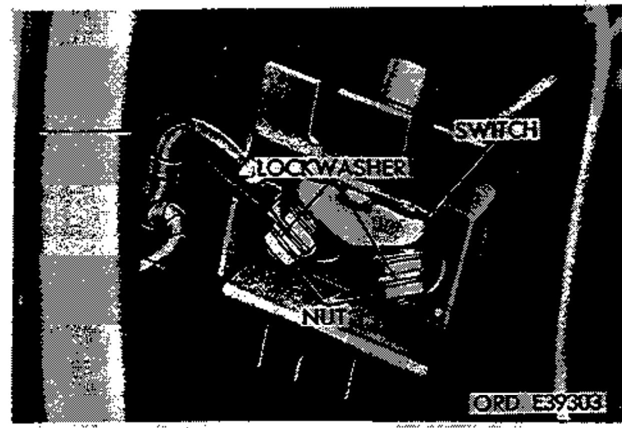


Figure 2-244. Remove electrical connectors from starter switch.

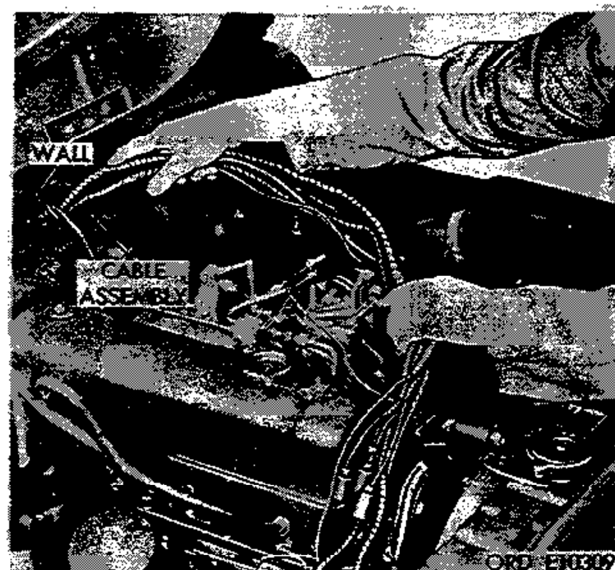


Figure 2-245. Push front harness assembly through hole in firewall.

Figure 2-246. Remove front harness from vehicle.

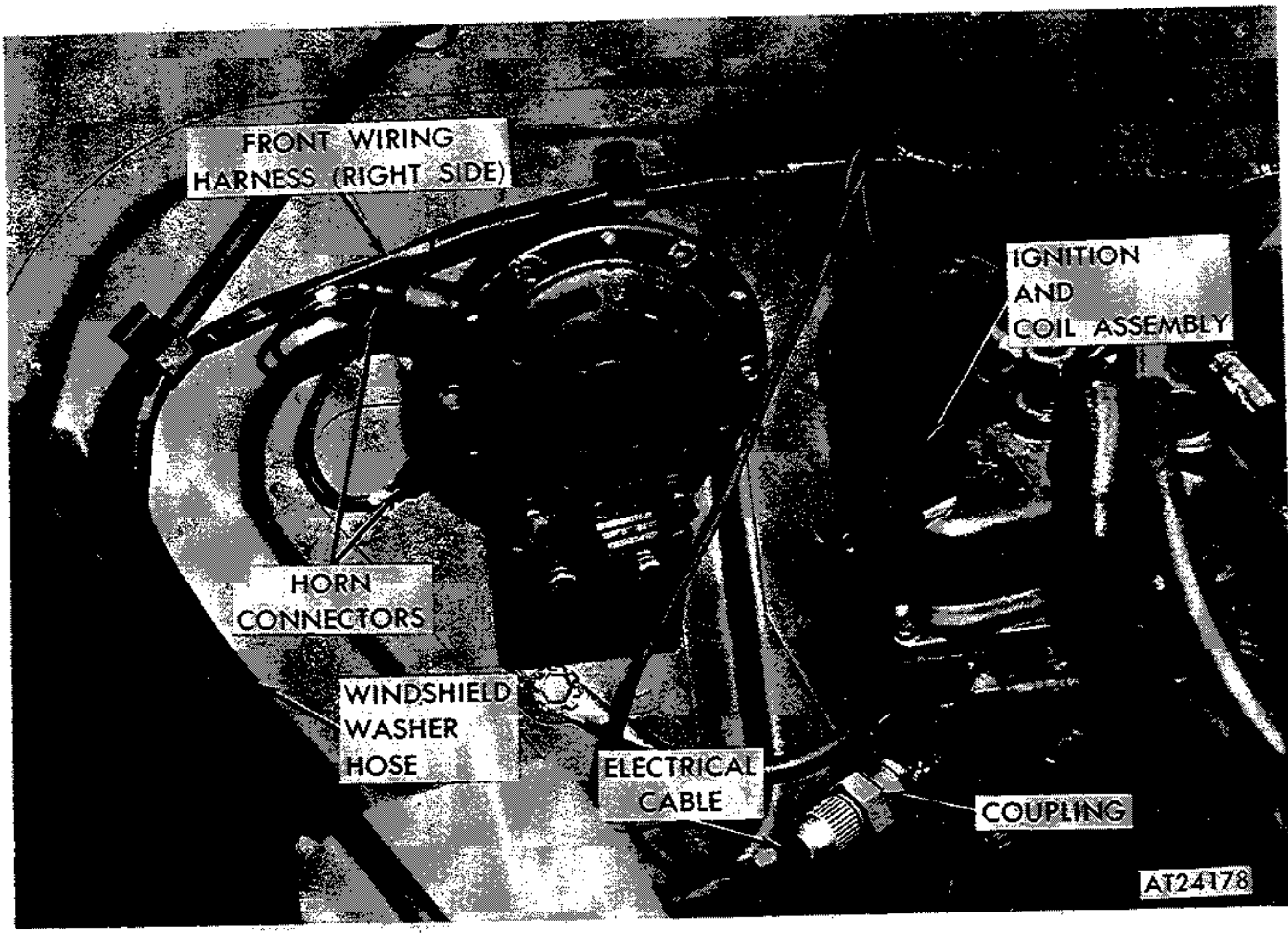


Figure 2-247. Removing or installing right side of front harness assembly on M151A2, M825, and M718A1 vehicles.

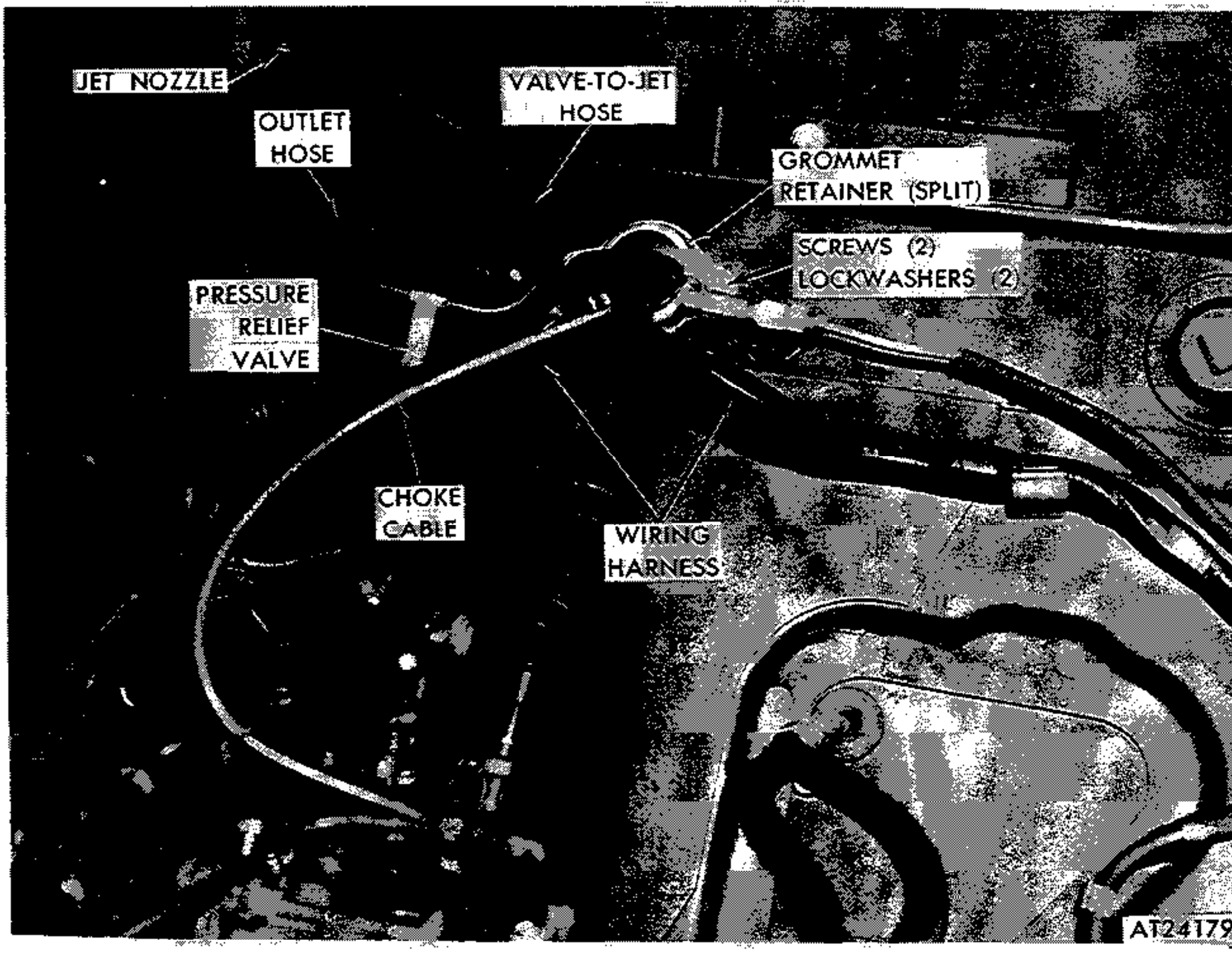


Figure 2-248. Removing or installing grommet and its retainer to firewall on M151A2, M825, and M718A1 vehicles.

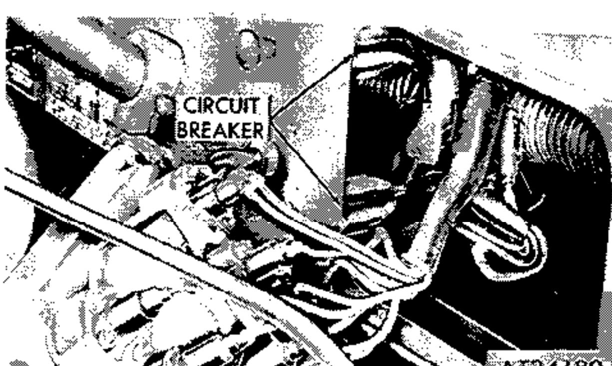


Figure 2-249. Disconnecting or connecting circuit breaker connectors on M151A2, M825, and M718A1 vehicles.

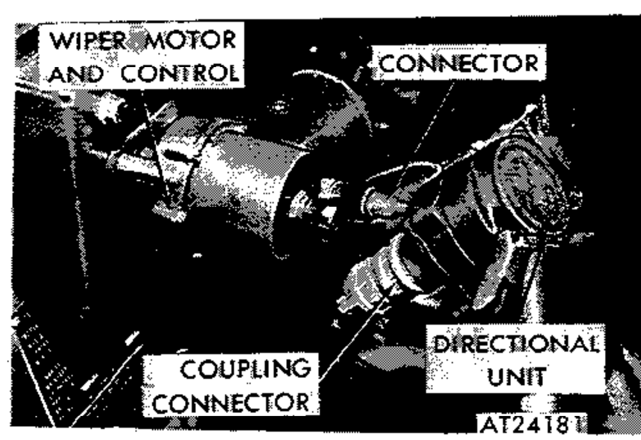


Figure 2-250. Disconnecting or connecting electrical connector at windshield wiper motor.

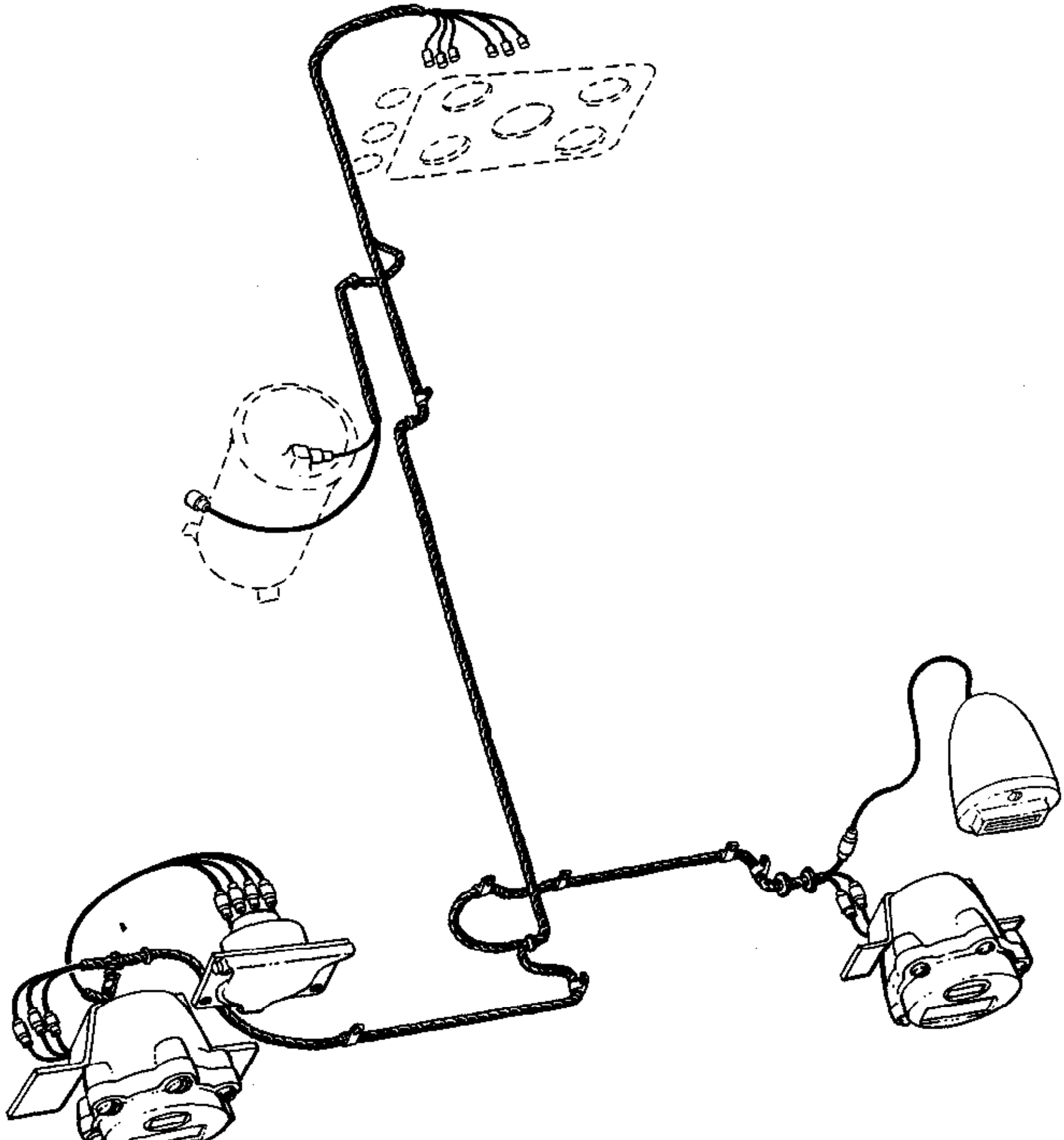


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Figure 2-251. Rear wiring harness assembly (M151, M151A1, M151A1C, and M718 vehicles).

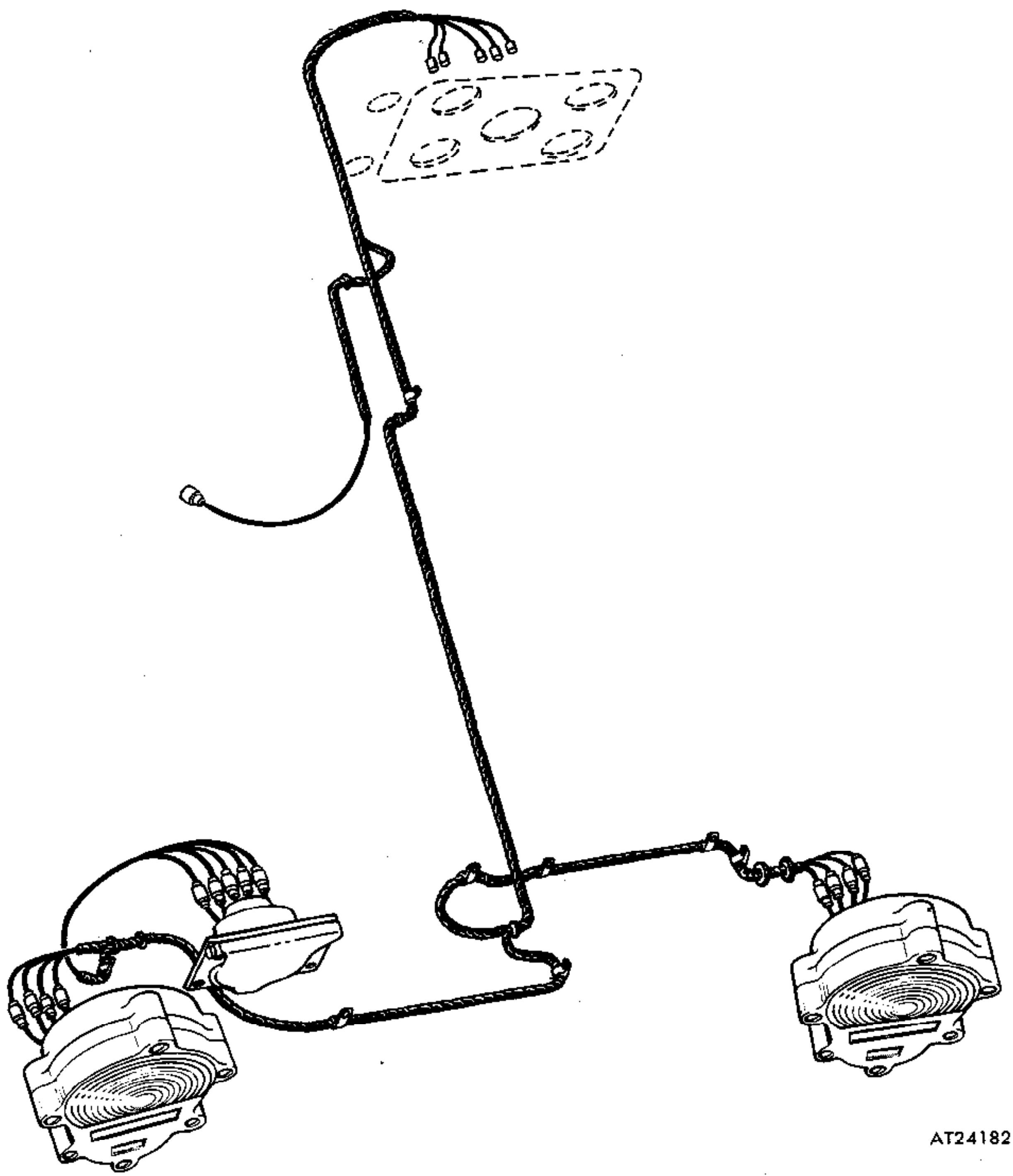


Figure 2-252. Rear wiring harness assembly for M151A2, M825, and M718A1 vehicles.

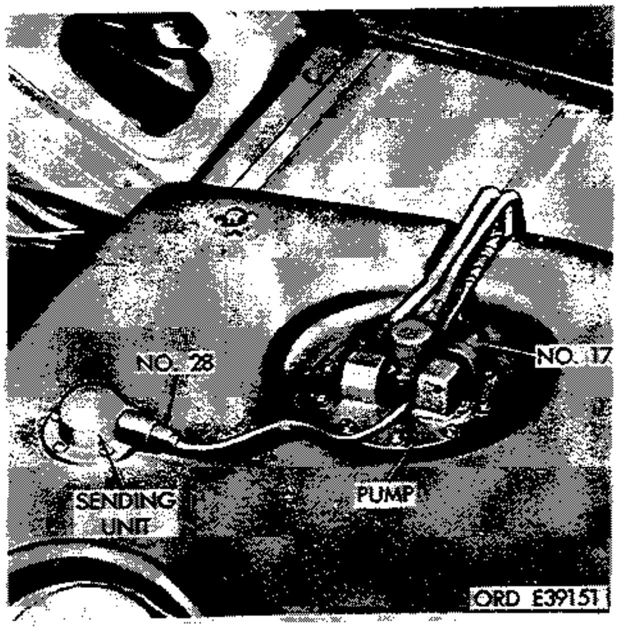


Figure 2-253. Remove sending unit connectors.

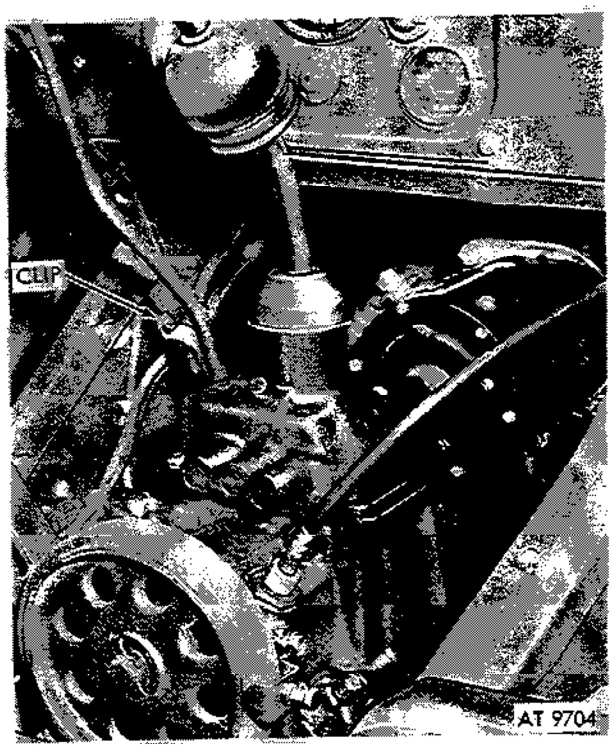


Figure 2-254. Remove cable clip.

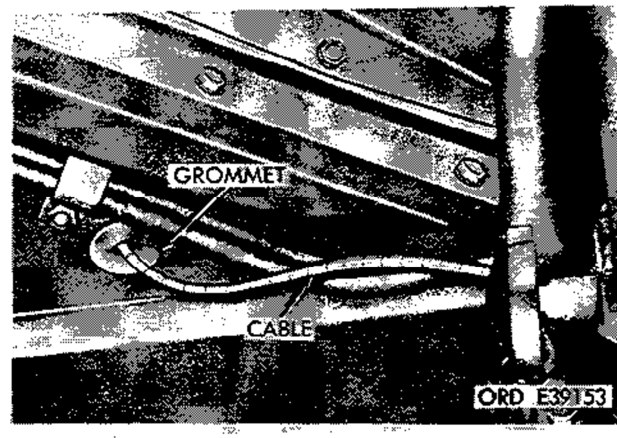


Figure 2-255. Remove cables from body left inner rail.

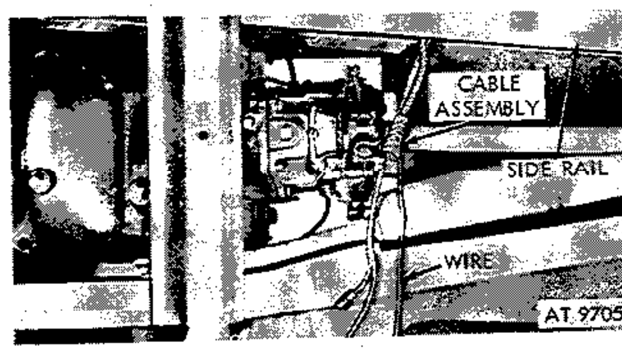


Figure 2-256. Pull new cable assembly through body side rail.

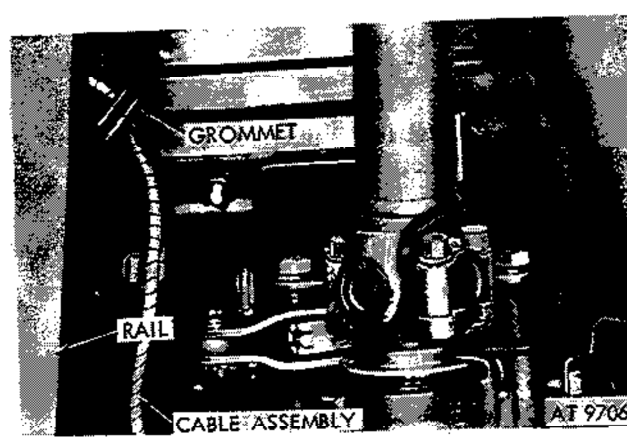


Figure 2-257. Push cable assembly into left side rail.

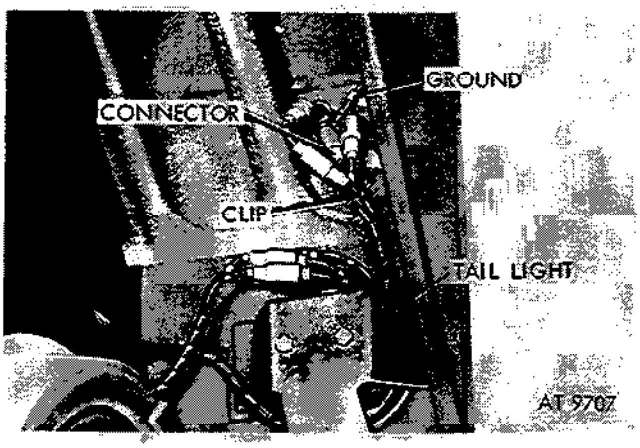


Figure 2-258. Disconnect connectors and ground wires.

WARNING

Be sure cable does not come in contact with battery terminal at any time.

(3) Refer to figures 2-234 through 2-236 and remove instrument cluster. Grasp cables and pull, separating male and female connectors between front and rear harness assemblies (cables Nos. 27, 28, 24, 23, 22 and 21).

NOTE

On M151A2 vehicles (M151A2, M825, and M718A1) rear harness cables connecting with front wiring harness are number 24, 21, 22-461, 22-460 and 23.

(4) Pull connectors at fuel pump and fuel gage sending unit (fig. 2-253).

NOTE

M151A2, M825, and M718A1 vehicles have a mechanical fuel pump mounted to engine right side, hence these models require no electrical connection for the fuel pump.

(5) Remove screw, nut and lockwasher securing cable clip and cable to left inner body rail. Remove clip from cable (fig. 2-254).

(6) On M151, M151A1, M151A1C, and M718 vehicles, remove grommet from body left inner rail and push fuel pump and fuel gage sending unit cables through hole. On M151A2, M825, and M718A vehicles, remove grommet and push fuel gage sending unit cable through hole (fig. 2-255).

(7) Attach a piece of wire seven feet long to end of harness assembly. Attach other end of wire to chassis part to prevent accidentally pulling loose end of wire into frame rail. This wire will be used to pull the new cable assembly through the length of the body side rail (fig. 2-256).

(8) Remove grommet and push cable assembly into left frame side rail (fig. 2-257).

(9) Disconnect connectors at trailer electrical receptacle. Loosen and remove two nuts and lockwasher attaching ground wires. Remove ground wires. Remove wire from clip (fig. 2-258).

(10) Disconnect connectors at left taillight (fig. 2-258) (M151, M151A1, M151A1C, and M718 vehicles). Remove three screws and lockwashers securing cover plate (fig. 2-212), and disconnect four connectors to rear composite light assembly (fig. 2-213) (M151A2, M825, and M718A1 vehicles).

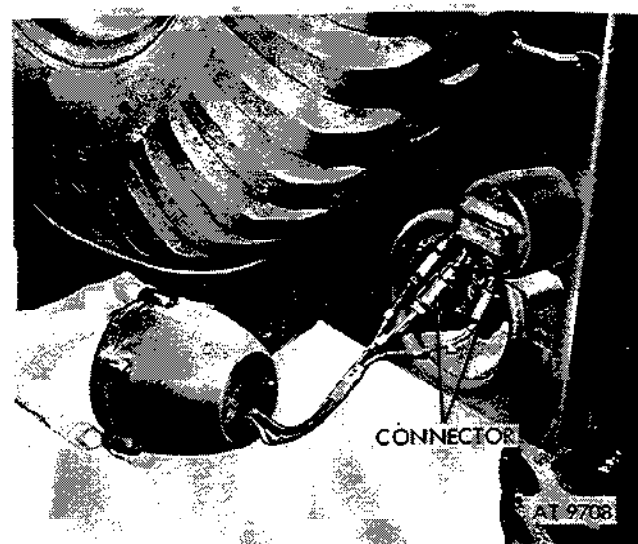


Figure 2-259. Disconnect connectors at right taillight.

Figure 2-260. Disconnect connector at blackout stoplight.

(11) Remove cable from clip and disconnect the connectors at right taillight (fig. 2-259) (M151, M151A1, M151A1C and M718 vehicles). Remove cable from clip. Remove cover plate as described in (10) above, and disconnect four connectors at rear left composite light assembly (M151A2, M825, and M718A1 vehicles).

(12) Remove cable from clip and disconnect connectors at blackout stoplight (fig. 2-260) (M151, M151A1, M151A1C, and M718 vehicles).

(13) Remove grommets from body left and right inner side rails and push cables through holes (fig. 2-261).

NOTE

When forward end of cable is pulled free of boxed inner side rail, unhook wire from cable as attached in (7) above. Leave wire in position is side rail to facilitate installation of new rear cable assembly.

(14) Remove cable from clips and pull cable assembly from frame inner side rail (fig. 2-262).

b. Installation. Install rear wiring harness by reversing removal procedure.

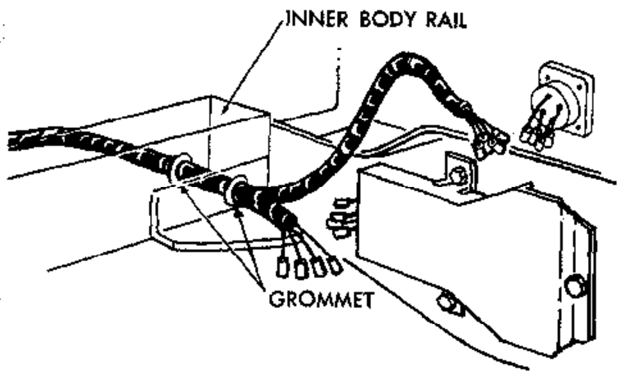


Figure 2-261. Remove grommets and push cables through holes.

Figure 2-262. Remove and pull cable from inner side rails.

Section XV. INSTRUMENT PANEL, GAGES, SWITCHES SENDING UNIT AND HORN

2-100. General

a. Instrument Cluster. The speedometer (with odometer), battery-generator indicator, fuel level gage, temperature indicator, oil pressure indicator, headlight high beam indicator, and two instrument panel lights are mounted in the instrument panel. The panel, together with mounted instruments and lights, is referred to as the instrument cluster.

b. Switches. The vehicle contains the following switches, for which information or data is provided in this section or as indicated:

(1) Lighting switch (para 2-111).

(2) Foot headlight dimmer switch (para 2-112).

(3) Stoplight switch (para 2-113).

(4) Fuel pump safety switch (oil pressure safety switch) (para 2-37).

(5) Starting switch (para 2-74).

(6) Ignition switch (para 2-110).

(7) Horn switch (para 2-117).

(8) Directional signal switch (para 2-118).

c. Sending Unit. The fuel level sending unit is mounted in the top of the fuel tank and transmits the fuel level in the tank to the fuel gage in the instrument panel.

d. Horn. The horn is of the vibrator type, electrically operated through the horn switch, and is waterproofed. The horn is mounted on the right side of the firewall in the engine compartment and is connected to the horn button (switch) by one cable. It is protected by the horn circuit breaker, which is mounted behind the instrument panel to the left of the instrument cluster.

e. Directional Turn Signal. The directional signal is located on the left side of the steering column. This directional signal is composed of lamp, control handle, and flasher unit.

f. Circuit Breakers (M151, M151A1, M151A1C, and M718 vehicles). Four circuit breakers protect circuits in the electrical system. Three are mounted behind the instrument panel and to the left of the instrument cluster. The top circuit breaker protects the temperature indicator, fuel gage, and the oil pressure gage. The middle circuit breaker protects the fuel pump circuit, and the bottom circuit breaker protects the horn circuit. The fourth circuit breaker, protecting the light circuit, is an integral part of the light switch.

g. Circuit Breakers on M151A2, M825, and M718A1 Vehicles. Two circuit breakers, both mounted inside the dash just left of instrument cluster (fig. 2-249), protect various electrical circuits. The top one protects the temperature indicator, fuel gage and oil pressure gage. The bottom one protects the horn circuit. A third breaker, integrated into the light switch assembly, protects the vehicle's lighting circuitry.

h. Cable Numbers. Standard circuit or cable numbers are used throughout the electrical system, where possible. The cable numbers are stamped on small metal tags attached near both ends of each cable. Refer to figure 2-43 for correct identification of cables.

2-101. Instrument Cluster

CAUTION

If gages are to be tested with instrument cluster pulled away from dash panel, instrument cluster must be grounded to dash panel, otherwise polarity of gages will be reversed.

a. Removal. Remove instrument cluster by completing removal operations given in paragraphs 2-98 *b* (19) through 2-98 *b* (21) and shown in figure 2-233 through 2-235.

b. Installation. Install instrument cluster by reversing removal operations given in paragraphs 2-98 *b* (21 back through 2-98 *b* (19).

2-102. Fuel Gage

a. Removal.

(1) Remove instrument cluster (para 2-101). Separate connectors at fuel gage (fig. 2-263).

(2) Remove two nuts and lockwashers securing fuel gage and remove retaining bracket and fuel gage (fig. 2-263).

CAUTION

Place hand in front of gage to prevent gage from falling out when nuts and washers are removed.

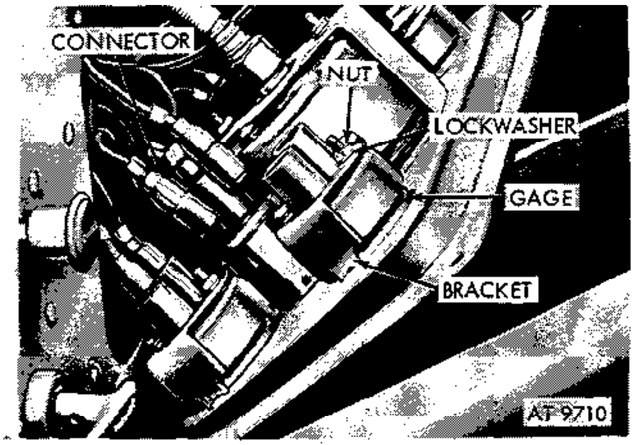


Figure 2-263. Remove fuel gage from retaining bracket.

b. Installation. Install fuel gage by reversing removal operations.

2-103. Temperature Indicator Gage

a. Removal.

(1) Remove instrument cluster (para 2-103). Separate connectors at temperature indicator (fig. 2-264).

(2) Remove two nuts and lockwashers securing temperature indicator gage and remove retaining bracket and temperature gage (fig. 2-264).

CAUTION

Place hand in front of gage to prevent gage from falling out when nuts and washers are removed.

b. Installation. Install temperature indicator gage by reversing removal operations.

2-104. Battery-Generator Indicator

a. Removal.

(1) Remove instrument cluster (para 2-101). Separate connector at generator indicator (fig. 2-265).

(2) Remove two nuts and lockwashers and bracket securing battery-generator indicator (fig. 2-265).

CAUTION

Place hand in front of gage to prevent gage from falling out when nuts and washers are removed.

b. Installation. Install battery-generator indicator by reversing removal operations.

2-105. Oil Pressure Gage

a. Removal.

(1) Remove instrument cluster (para 2-101). Separate connectors at oil pressure gage (fig. 2-266).

(2) Remove two nuts, lockwashers and bracket securing oil pressure gage (fig. 2-266).

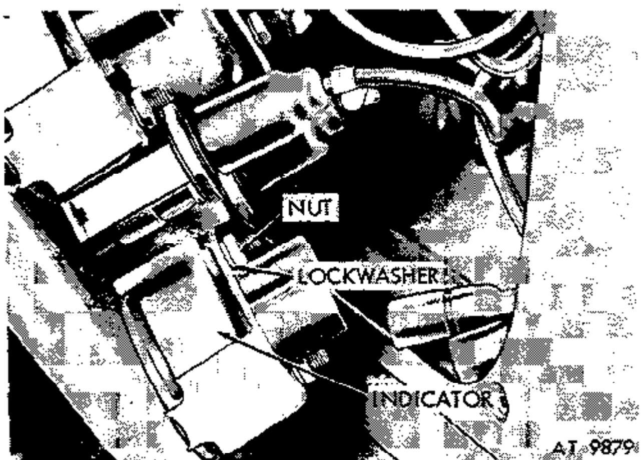


Figure 2-264. Remove temperature indicator and retaining bracket.

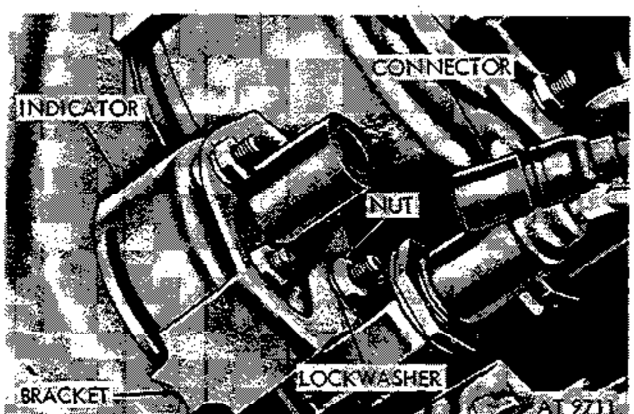


Figure 2-265. Remove battery-generator indicator from bracket.

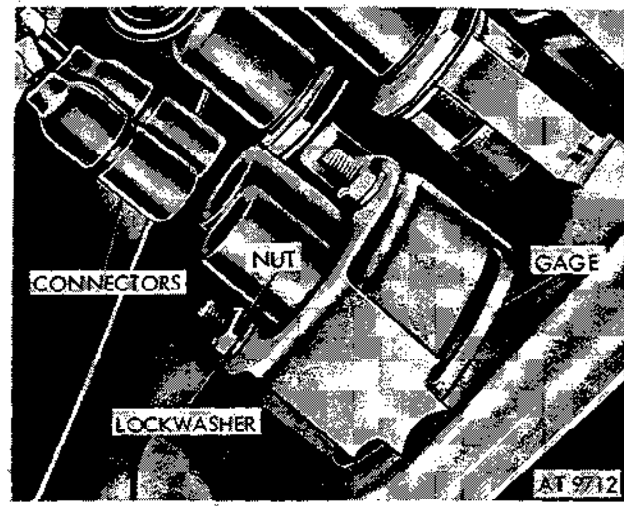


Figure 2-266. Remove oil pressure gage.

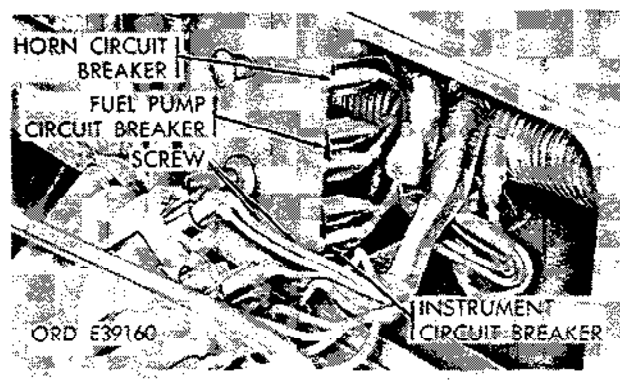


Figure 2-267. Remove circuit breaker.

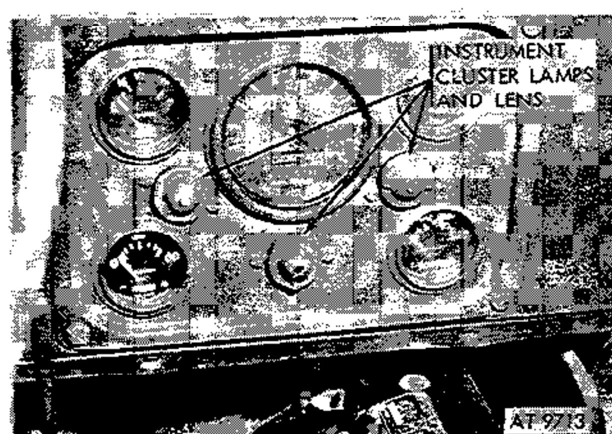


Figure 2-268. Location of instrument cluster lamps and lens.

CAUTION

Place hand in front of gage to prevent gage from falling out when nuts and washers are removed.

b. Installation. Install oil pressure gage by reversing operations.

2-106. Circuit Breakers

a. Removal.

NOTE

The three circuit breakers are removed and installed in the same manner.

(1) Remove instrument cluster (para 2-101) and remove speedometer cable housing from speedometer (para 2-108). Move cluster to left to provide access to circuit breakers.

(2) Separate the connectors at circuit breaker. Remove two screws, nuts, and lockwashers from each circuit breaker. Remove circuit breaker (fig. 2-267).

b. Installation. Install circuit breakers by reversing removal operations.

2-107. Instrument Cluster Lamps and Lens

a. Removal. The location of instrument cluster lamps and lens is shown in figure 2-268. Remove lamps and lenses as shown in figure 2-269.

b. Installation. Install instrument cluster lamps and lens as shown in figures 2-269 and 2-268.

2-108. Speedometer Assembly

a. Removal.

(1) Remove instrument cluster (para 2-101) and disconnect cable from housing assembly by loosening nut securing cable housing to speedometer housing. Pull cable from speedometer.

(2) Remove two nuts, lockwashers, and bracket securing speedometer to instrument cluster and remove speedometer (fig. 2-270).

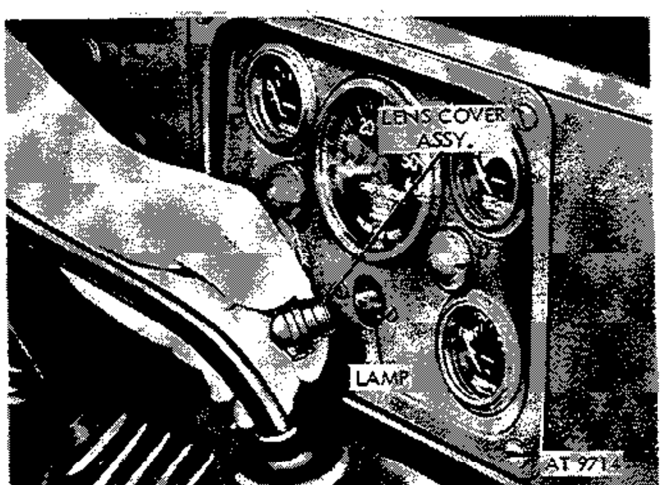


Figure 2-269. Unscrew lens. Push lamp in and turn to left to remove.

CAUTION

Place hand in front of speedometer to prevent gage from falling out when nuts and washers are removed.

b. Installation. Install speedometer by reversing removal operations.

2-109. Speedometer Cable, Housing, and Bushing

a. Removal.

(1) Remove instrument cluster (para 2-101) and disconnect speedometer cable from speedometer by loosening nut securing housing to speedometer.

(2) Pull cable from housing (fig. 2-271).

(3) Remove transmission cover plate (para 2-199). Loosen nut securing cable housing and remove housing from transfer case (fig. 2-272).

NOTE

On earlier model vehicles a 90° drive adapter fitting is used.

(4) Remove remaining portion of broken cable. Housing must be removed if damaged. Unscrew hex nut and remove driven gear bushing from transfer case (fig. 2-273).

b. Installation. Install speedometer cable, housing and bushing by reversing removal operations above.

NOTE

Do not bend or kink housing sharply. Coat inner cable with thin film of grease (GL). Tighten speedometer cable housing nut, finger tight, then tighten an additional one-half turn. On vehicles prior to serial No. 2C2600 tighten both speedometer housing hex-head nuts finger tight, then tighten an additional one-half turn.

2-110. Ignition Switch

a. Removal.

(1) Disconnect battery ground cable from negative terminal (fig. 2-182).

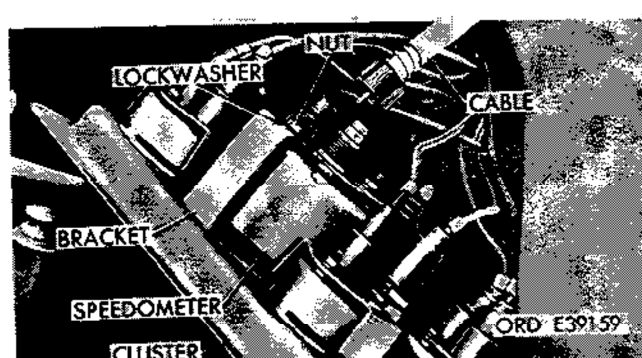


Figure 2-270. Remove speedometer.

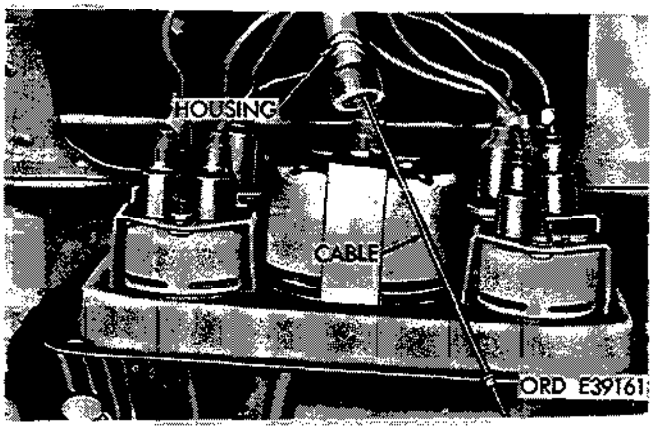


Figure 2-271. Pull speedometer cable from housing.

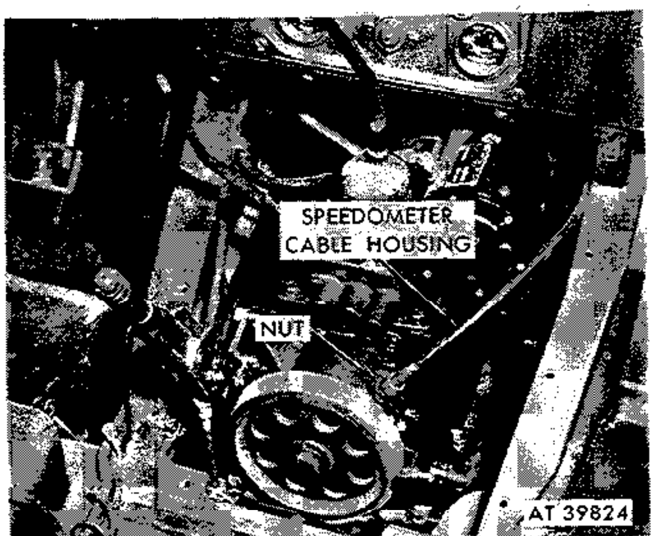


Figure 2-272. Remove speedometer cable housing from transfer case.

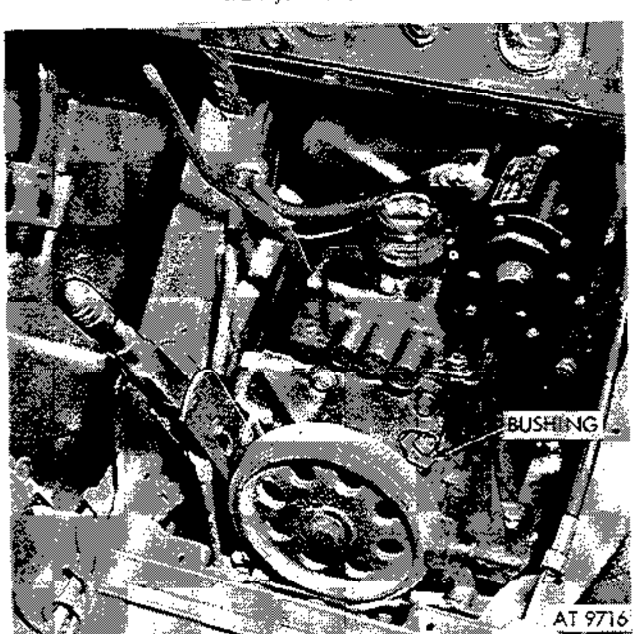


Figure 2-273. Remove driven gear bushing from transfer case.

(2) Remove screw from center of switch lever and remove switch lever (fig. 2-274).

(3) Remove nut and lockwasher securing the ignition switch and switch nameplate to the dash panel (fig. 2-275). Push switch through dash panel and lower below dash panel.

(4) Disconnect cable connectors. For installation, match serrated male and female connectors (fig. 2-276).

b. Installation. Install ignition switch by reversing removal operations.

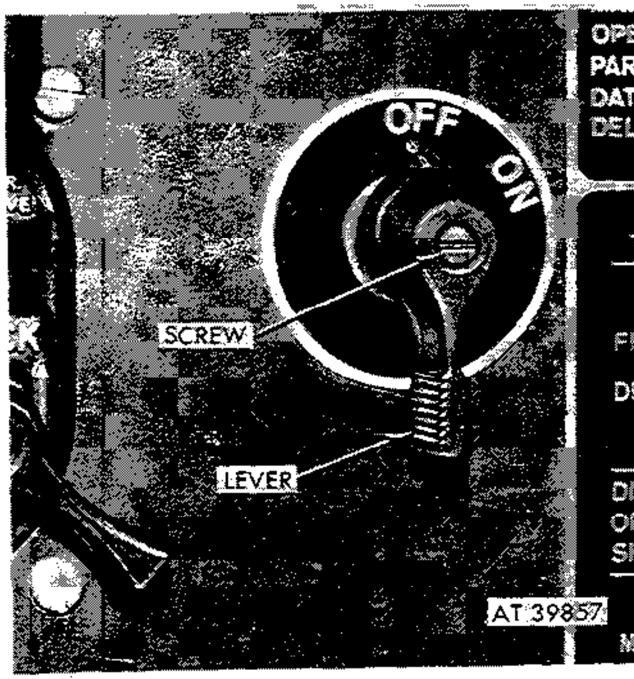


Figure 2-274. Remove switch lever.

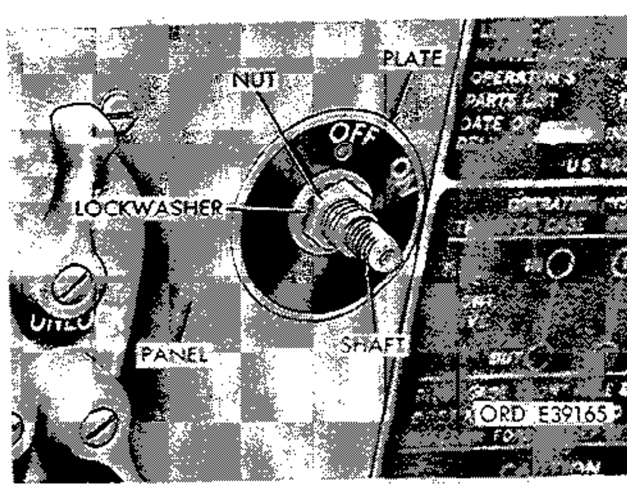


Figure 2-275. Remove ignition switch.

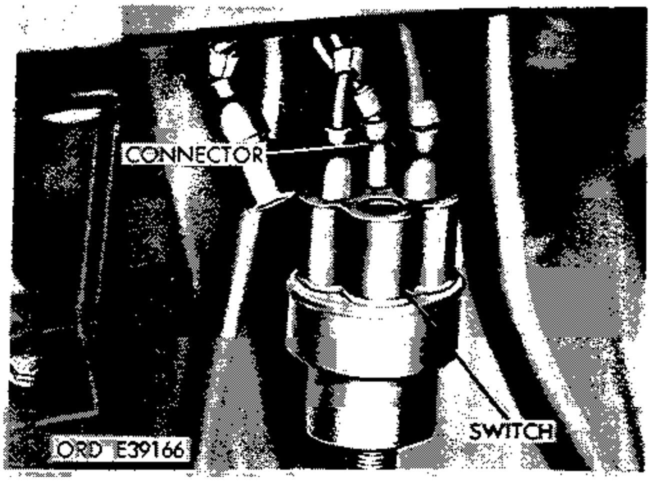


Figure 2-276. Disconnect ignition switch cable connectors from switch.

2-111. Light Switch

a. Removal.

(1) Remove retaining screw, lockwasher, and flat washer. Remove light switch top lever and flat washer (fig. 2-277).

(2) Remove four screws and lockwasher securing light switch to dash panel (fig. 2-277).

(3) Push light switch through dash panel and lower below dash panel (fig. 2-278).

(4) Unscrew cable plug nut and pull cable plug out of light switch (fig. 2-278).

b. Installation. Install lighting switch by reversing removal operations.

2-112. Headlight Dimmer Foot Switch

a. Removal.

(1) Remove four screws and lockwashers securing mounting plate to floor panel (fig. 2-279).

(2) Separate the connectors at switch (fig. 2-280).

(3) Remove three screws and lockwashers securing dimmer switch to mounting plate and remove switch (fig. 2-280).

b. Installation. Install headlight dimmer foot switch by reversing removal operations.

2-113. Stoplight Switch (M151, M151A1, M151A1C, and M718 Vehicles)

a. Removal.

(1) Disconnect cable connectors at stoplight switch (fig. 2-281) located behind the instrument panel on the bottom of the master cylinder assembly.

NOTE

Before removing stoplight switch, position a suitable container to drain master cylinder when switch is removed. When new stoplight switch is installed, fill master cylinder with new supply of brake fluid (LO 9-2320-218-12).

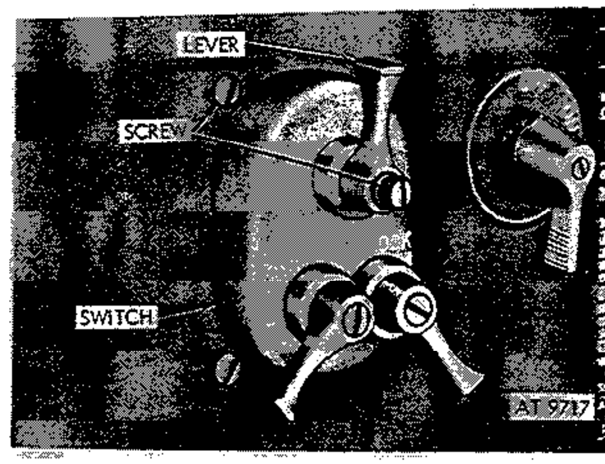


Figure 2-277. Remove lighting switch from dash panel.

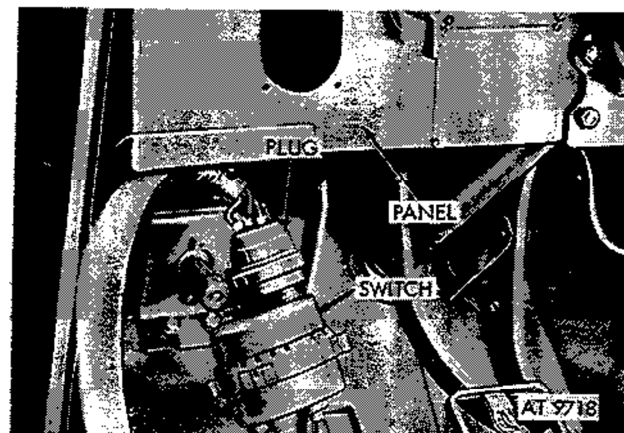


Figure 2-278. Remove light switch.

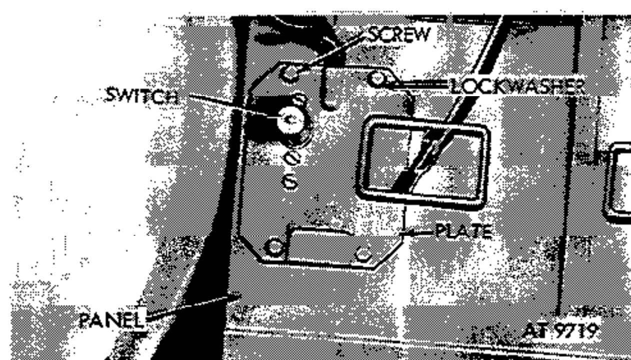


Figure 2-279. Remove mounting plate from floor panel.

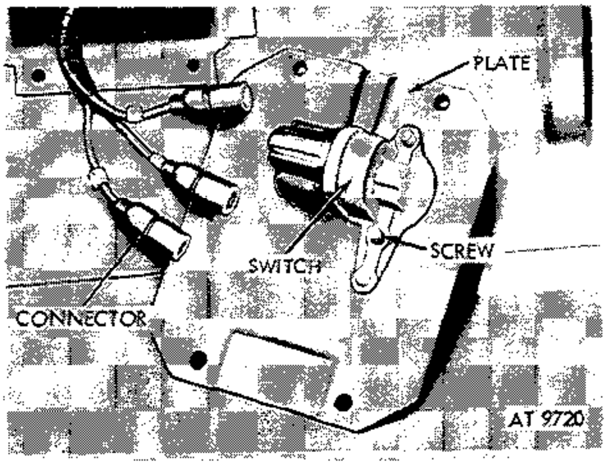


Figure 2-280. Remove dimmer foot switch.

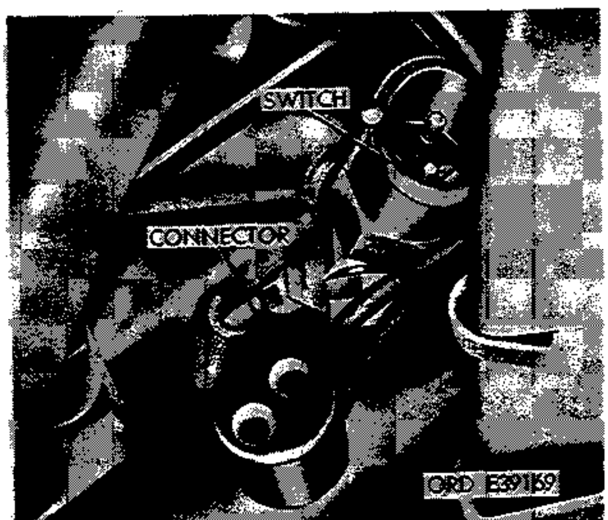


Figure 2-281. Disconnect cable connectors at stoplight switch.

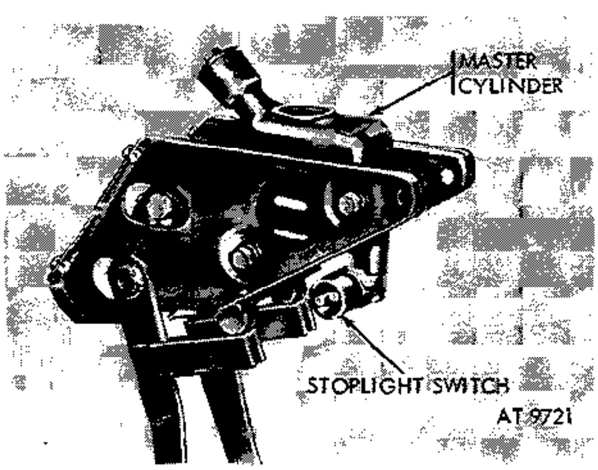


Figure 2-282. Remove stoplight switch.

(2) Unscrew stoplight switch from brake master cylinder (fig. 2-282).

b. Installation. Install stoplight switch by reversing removal operations.

2-114. Stoplight Switch (M151A2, M825 and M718A1) Vehicles

a. Removal.

(1) Disconnect electrical cable connectors at stoplight switch (fig. 2-283).

(2) Remove rod retaining nut and remove rod from switch assembly (fig. 2-283).

(3) Remove two screws, lockwashers and flat washers securing stoplight switch to support assembly and remove switch assembly (fig. 2-283).

b. Installation. Install stoplight switch assembly by reversing removal procedure.

c. Stoplight switch adjustment on M151A2, M825 and M718A1 vehicles.

NOTE

When ever stoplight switch has been removed, detached, or disturbed in any way, a brake pedal free travel adjustment should be made.

(1) Turn eccentric adjusting bolt (fig. 2-283) until brake pedal has approximately 1/4" free play.

(2) Check stoplight while brake pedal rests up against stop.

(3) If stoplight is on, turn rod nut (fig. 2-283) until stoplight goes off.

NOTE

Approximately 2½ to 3½ clockwise turns of the rod nut should be sufficient for proper stoplight adjustment.

2-115. Fuel Level Sending Unit

a. Removal.

(1) Remove front seats (para 2-198) and disconnect battery ground cable (fig. 2-182).

(2) Separate the connector at fuel level sending unit (fig. 2-284).

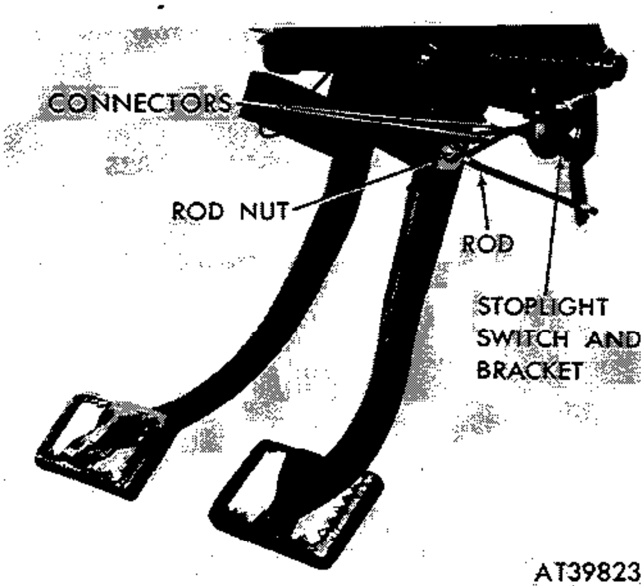


Figure 2-283. Adjusting electro-mechanical stoplight switch on M151A2, M825, and M718A1 vehicles.

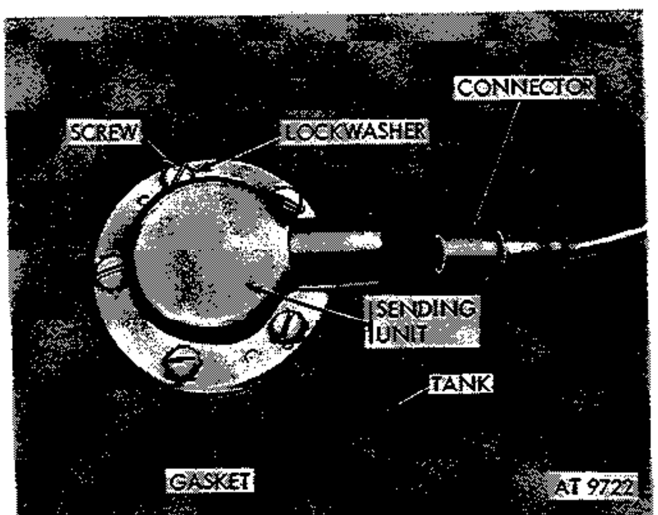


Figure 2-284. Remove fuel level sending unit.

(3) Remove five screws and lockwashers retaining the fuel level sending unit to fuel tank (fig. 2-284).

CAUTION

Do not allow sparks or open flame near fuel tank when removing or installing fuel level sending unit.

(4) Lift fuel level sending unit out of fuel tank and discard gasket (fig. 2-284).

b. Installation. Install fuel level sending unit by reversing removal operations.

NOTE

Clean fuel level sending unit gasket surfaces on unit and fuel tank before installing unit and gasket. For installation, use a new gasket. Check for leaks and operation.

2-116. Horn Assembly.

a. Adjustment. Refer to TM 9-8627 for instructions for adjusting the horn assembly.

b. Removal.

(1) Separate connectors at horn (fig. 2-285).

(2) Remove two nuts, nameplate and lockwashers securing horn assembly to horn mounting bracket (fig. 2-285).

c. Installation. Install horn assembly by reversing removal operations.

2-117. Horn Switch

a. Removal

(1) Separate the connector at horn cable located below generator regulator (fig. 2-286).

(2) Disassemble cable connector. Refer to figures 2-223 and 2-224.

(3) Use suitable tool and remove horn switch snapring. Pull horn switch and cable from steering column (fig. 2-287).

(4) Remove grommet from lower end of steering column.

b. Installation.

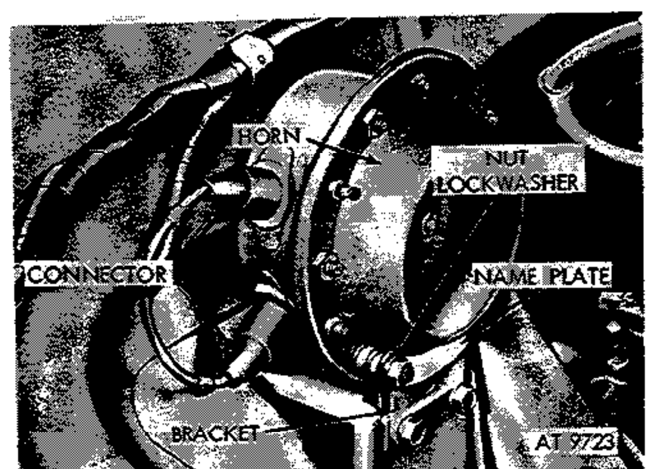


Figure 2-285. Remove horn assembly from bracket.

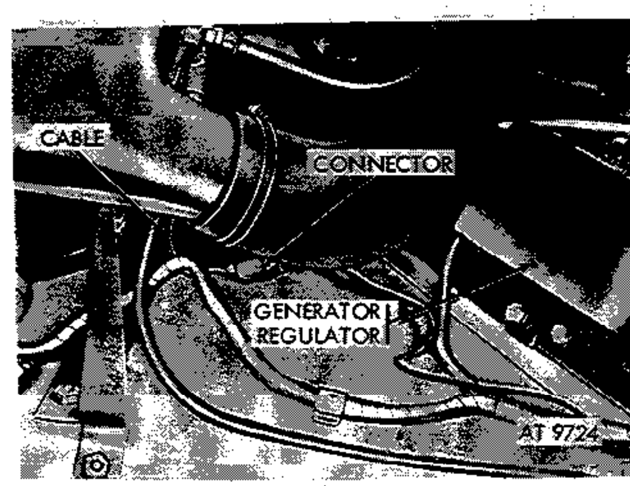


Figure 2-286. Separate horn switch connector at horn cable.

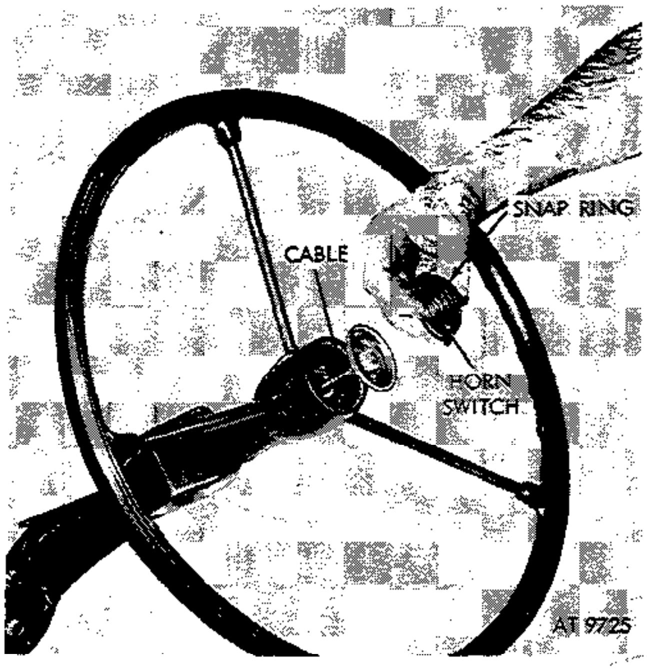


Figure 2-287. Remove horn switch and cable from steering column.

(1) Install horn switch by feeding cable through steering column and secure switch with snapring.

(2) Apply small amount of lubricant on end of grommet and slip over end of switch cable and reinstall in end of steering column.

(3) Assemble cable connector and connect to harness assembly.

2-118. Directional Signal Switch

a. Removal.

(1) Remove clamp screw securing the directional control switch assembly to the steering column (fig. 2-217).

(2) Disconnect the signal switch cable (fig. 2-218) at the distribution box located under the panel on the left side of the firewall.

NOTE

On vehicles equipped with solid state flasher, disconnect harness at signal switch and disregard (3) and (4) below.

(3) Identify the wires for correct installation.

(4) Remove clips securing cable to steering column. Remove the signal switch from the vehicle.

b. Installation. Install directional signal switch by reversing removal operations.

NOTE

If either distribution box or control assembly are to be replaced, install kit (FSN 2590-050-8821) which includes cable assembly, control assembly and solid state flasher.

Section XVI. VENTILATION SYSTEM

2-119. Description

Positive ventilation of the engine and distributor is provided by metal tubing, rubber hoses, ventilation control valve (metering valve), and tube fittings. The ventilation system uses vacuum from the intake manifold to remove fuel and water vapor from the engine. This vacuum is also used to ventilate the distributor. Figure 2-288 is a schematic of the ventilation system. Figure 2-289 shows the various lines and components of the ventilation system. Clean air from the carburetor air inlet is routed to the crankcase, push rod and tappet chamber and moves through passages to the cylinder head-rocker arm chamber. Air and fumes are drawn from the rocker arm chamber through the control valve into the intake manifold and in this way the manifold vacuum maintains a continuous circulation of air through the crankcase. Ventilation of the distributor is maintained through a separate ventilation system where clean air is taken at the carburetor air inlet to eliminate the possiblity of crankcase fumes entering the distributor. For deep water fording purposes the Holley carburetor is externally vented to the air cleaner. The Zenith carburetor is internally vented.

2-120. Maintenance

The ventilation system should be periodically inspected for loose connections and damaged tubing and hoses. Oil leakage at the tappet cover or rocker arm cover may be an indication that the ventilation control valve (metering valve) is restricted.

2-121. Repair

Repair of the ventilation system consists of cleaning or replacing the inoperative valve, tubing, hose or fitting.

2-122. Metering Valve (Ventilation Control Valve)

a. Removal.

(1) Disconnect rocker cover vent line from valve (fig. 2-72).

(2) Unscrew valve from fitting (fig. 2-72).

b. Clean and Inspect. If symptoms indicate the ventilation control valve is restricted, the valve should be cleaned, inspected or serviced as follows:

Soak valve assembly in solvent, shake to determine that plunger has been freed. A free acting plunger will emit an audible sound. Replace valve if procedure fails to free plunger.

c. Installation. Install ventilation control valve by reversing removal procedures in *a* above.

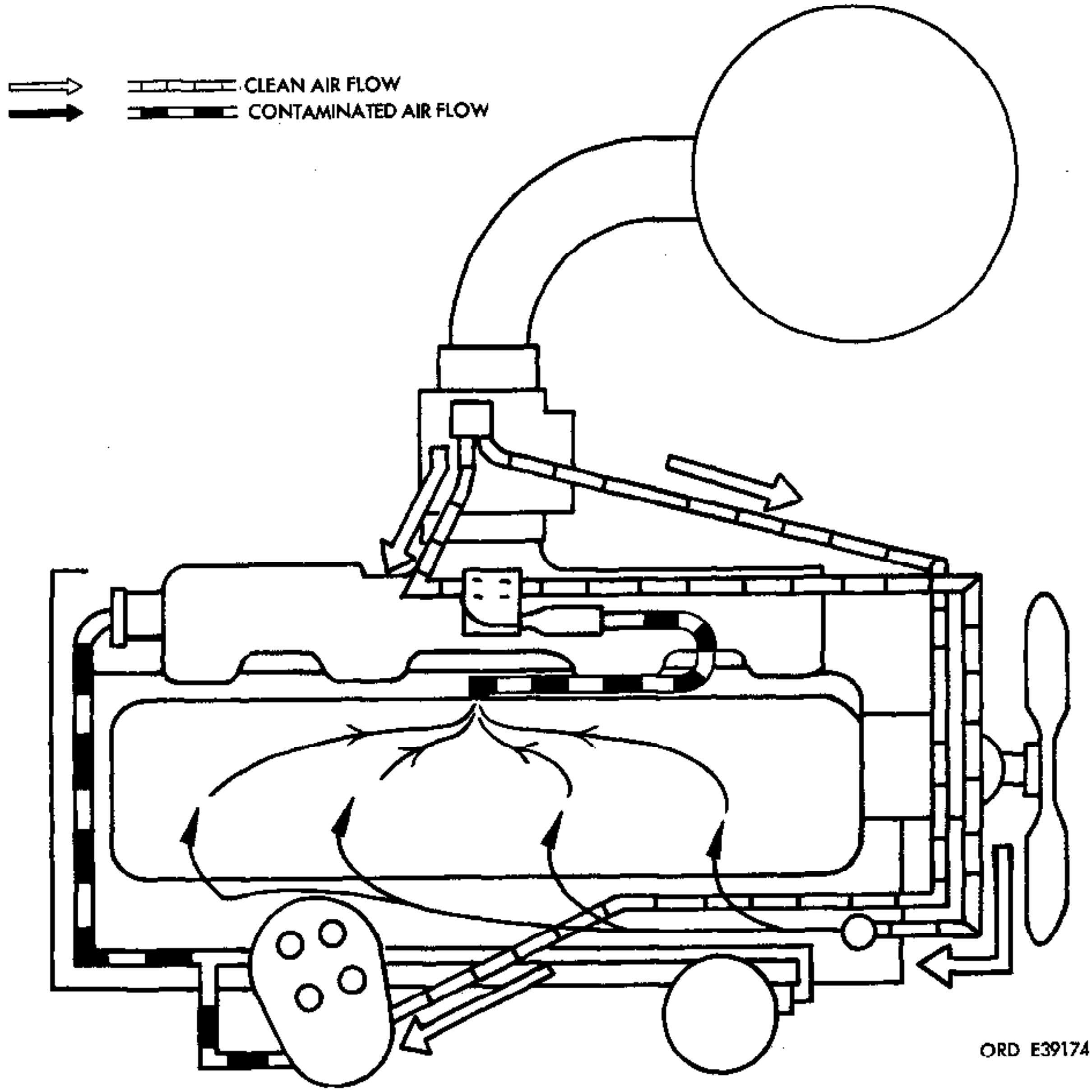


Figure 2-288. Crankcase ventilation system.

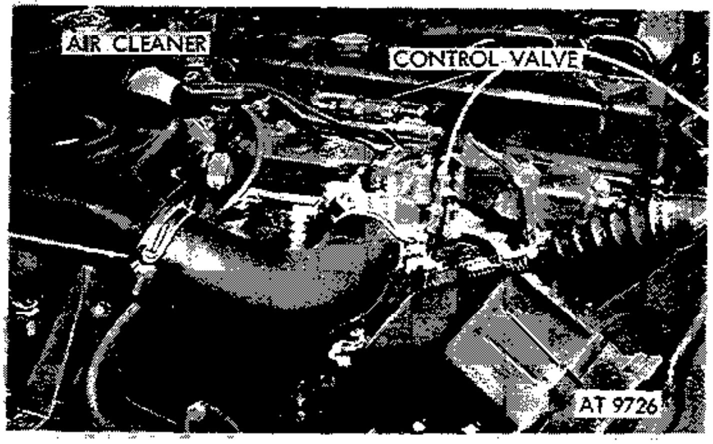


Figure 2-289. Ventilation system, lines and fittings.

Section XVII. TRANSMISSION AND TRANSFER

2-123. Description and Data

a. Description. The conventional four-speed, constant-mesh type transmission provides a synchro-silent action in second, third, and fourth speeds. All gears are helica' except first and reverse. The transmission case is made of cast iron. The gearshift housing assembly is attached to the top of the transmission. A standard commercial gearshift pattern is used plus the addition of the fourth forward speed. Gears within the transmission are shifted by the gearshift lever which extends from the gearshift housing into the driver's compartment. The gearshift lever and housing are sealed by a rubber boot to prevent water from entering the transmission. A pressure-type breather valve is located at the base of the gearshift housing. A filler plug is provided on the left side of the transmission case for filling both the transmission and transfer case. Separate drain plugs are located at the bottom of each case. The transfer case is a one-piece cast iron housing, doweled, and attached to the rear face of the transmission case. Transfer gears are directly on the vertical centerline of the vehicle. The transfer input gear, transfer intermediate gear, and transfer output gear are of the constant mesh helical type. The transmission case and transfer case are machined in matched sets. The speedometer drive gear and the parking brakedrum are mounted behind the transfer input gear and are secured to the transmission ouput shaft. The rear end of the transmission output shaft is supported by needle bearings mounted in the transfer case. A double lip-type oil seal prevents oil leakage past the hub of the parking brakedrum.

b. Data.
Refer to table 1-1 for tabulated data.

2-124. Transmission and Transfer

When it is necessary to replace a transmission and transfer assembly with a new or reconditioned assembly, refer to direct support maintenance.

2-125. Transmission and Transfer Breather Valve

a. Removal.

(1) Remove transmission cover plate (para 2-199).

(2) Unscrew breather valve and remove (fig. 2-290).

b. Installation. Install transmissionand transfer breather valve by reversing removal operations.

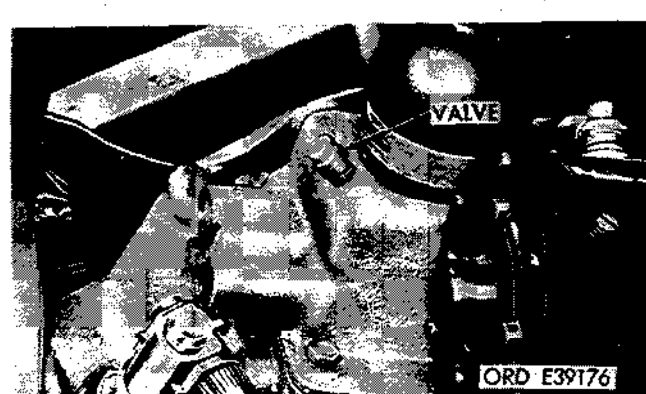


Figure 2-290. Unscrew and remove breather valve.

2-126. Description

The vehicle drive system has a front and rear propeller shaft. The shafts are of welded steel tubing, with forged steel yokes at each end. Cardan-type universal joints are retained in yokes by snap rings which are in contact with the outer bearing races of the universal joints. The universal joints consist of a cross-type trunnion, needle rollers, outer bearing races, seals, and a lubrication fitting. The needle bearings are retained on the journals of the trunnion by the outer bearing races which are grooved to also retain sleeve type seals. Lubrication passages are drilled in the trunnion to allow lubrication of the bearings from a central fitting. Either end of the propeller shafts can be attached to the differential yoke or transfer yoke.

2-127. Front and Rear Propeller Shafts

a. Removal.

(1) Remove four universal joint bolts from the differential end of the propeller shaft (fig. 2-291).

(2) Remove four universal joint bolts from the transmission end of the propeller shaft and remove shaft (fig. 2-292).

b. Installation. Install front and rear propeller shafts by reversing removal operations. Torque propeller shaft universal joint bolts to 15-20 lb-ft.

2-128. Universal Joints

a. Removal. Refer to paragraph 2-127 for removal of propeller shaft.

b. Disassembly.

(1) Slip two loose cross bearings and grease seals from cross.

(2) Remove two cross bearings snap rings from yoke (fig. 2-294).

(3) With an 11/16-inch socket as a driver and 1 1/8-inch socket as a receiver, use bench vise to press bearing races and cross from yoke (fig. 2-295).

c. Assembly.

Assemble universal joints by reversing removal operations.

NOTE

Races must be assembled one at a time with seals entering yoke first.

NOTE

Pre-lube all new universal joints before installing into the front and rear propeller shafts. Pre-lubing is accomplished by removing all four bearing races from the cross and lubricating through the grease fitting to completely fill the grease passages in each trunnion. Also place a small amount of grease in each bearing race before replacing on the journal cross.

d. Installation.

Refer to paragraph 2-127 for installation of propeller shaft.

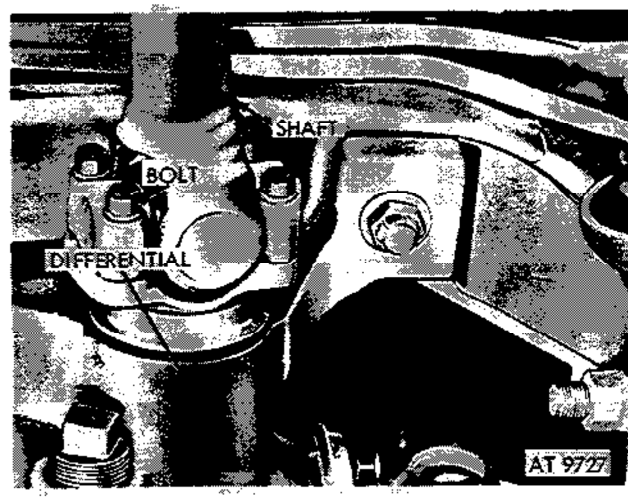


Figure 2-291. Remove universal joint bolts from differential end of propeller shaft.

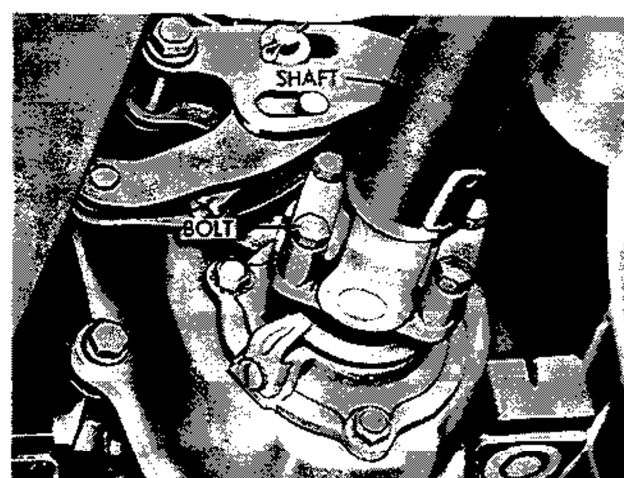


Figure 2-292. Remove universal joints bolts from transmission end of propeller shaft.

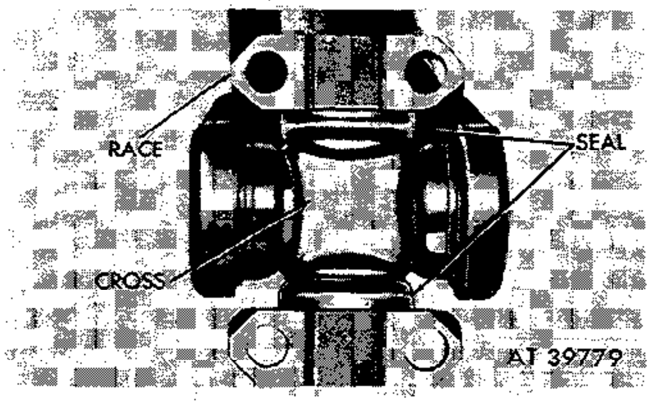


Figure 2-293. Remove cross bearings and grease seals.

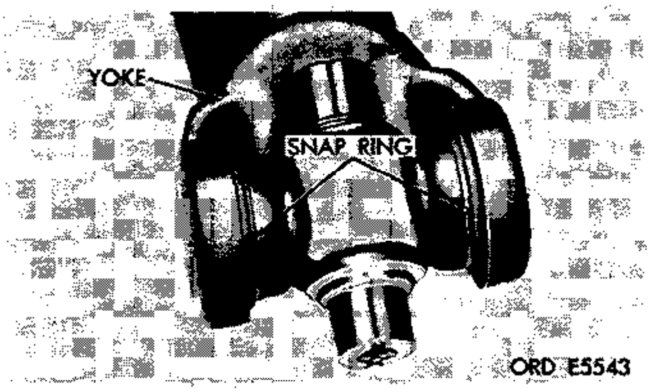


Figure 2-294. Remove snap rings from yoke.

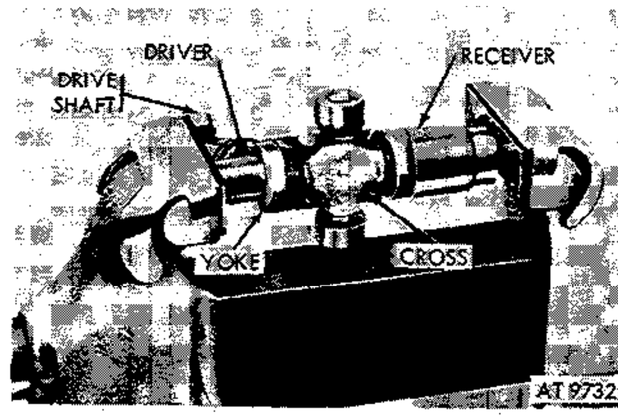


Figure 2-295. Press bearing race from yoke.

Section XIX. FRONT SUSPENSION AND DRIVE

2-129. Description and Data

a. Suspension Arms. Wheel spindle supports are attached to the suspension arms by ball joints located at the outer end of the arms. The inner ends of the arms are mounted on rubber bushings supported by a shaft bolted to the front crossmember assembly.

b. Coil Springs. Each coil spring is supported between a spring seat stamped in the lower arm and a spring seat welded in the front crossmember assembly.

c. Shock Absorbers. The shock absorbers are hydraulic and are located inside the coil springs. They are of the double action type with internal hydraulic stops and an external rubber jounce stop and an internal mechanical rebound shock (Monroe) which limit the travel of jounce and rebound.

d. Differential Assembly. The differential assembly is a drive-through, four-pinion type, and is interchangeable front and rear. The front differential assembly is mounted to the front crossmember by three bolts, flat washers, and locknuts. The carrier and cover are held together by ten bolts and lockwashers and are sealed with a gasket. Wheel drive shaft universal joint flanges are retained to the differential side gears by a bolt and lockwasher. All shaft openings in the carrier are sealed with double lip seals. The assembly is vented by a pressure-type valve. A filler plug is in the cover and a drain plug is in the carrier. Both plugs are magnetized.

e. Wheel Spindle and Spindle Support (Front). The front wheel spindle support is of the semi-floating design and is connected to the suspension arms by ball joints. The cups of the tapered wheel bearings supporting the spindle are pressed into the spindle support. Double lip seals at each end of the support retain lubricant and protect the wheel bearings from mud and water. The shaft section of the universal joint flange at the wheel is spined and the outer end is undercut and threaded. The wheel spindle hub is spined internally and fits over the shaft of the universal joint flange. A castle nut, washer, and cotter pin hold the spindle to the universal joint flange.

f. Wheel Drive Shafts and Universal Joints. Each wheel drive shaft consists of two assemblies: a splined shaft equipped with a universal joint, and a sliding yoke equipped with a universal joint. The shaft is attached to the wheel drive flange through the universal joint, by means of two "U" bolt nuts and lockwashers. The yoke is attached to the differential side gear flanges through the universal joint in the same way as the shaft. All universal joints are Cardan type. The drive shafts are inter-changeable side to side, and front with rear. The slip joint end of the shafts must be attached toward the differential.

g. Ball Joints. An upper and lower ball joint attaches each wheel spindle support to the suspension arm. The upper joint sustains less wear than the lower joint because the weight of the vehicle keeps the lower ball joints under constant load.

NOTE

M151A2, M825, and M718A1 vehicles have a "Lube-for-Life" design at the front ball joints. These ball joints do not require lubrication service and will be used as replacement parts on the older model vehicles when required.

h. Data. Refer to table 1-1 for tabulated data.

2-130. Front Suspension and Drive Assembly

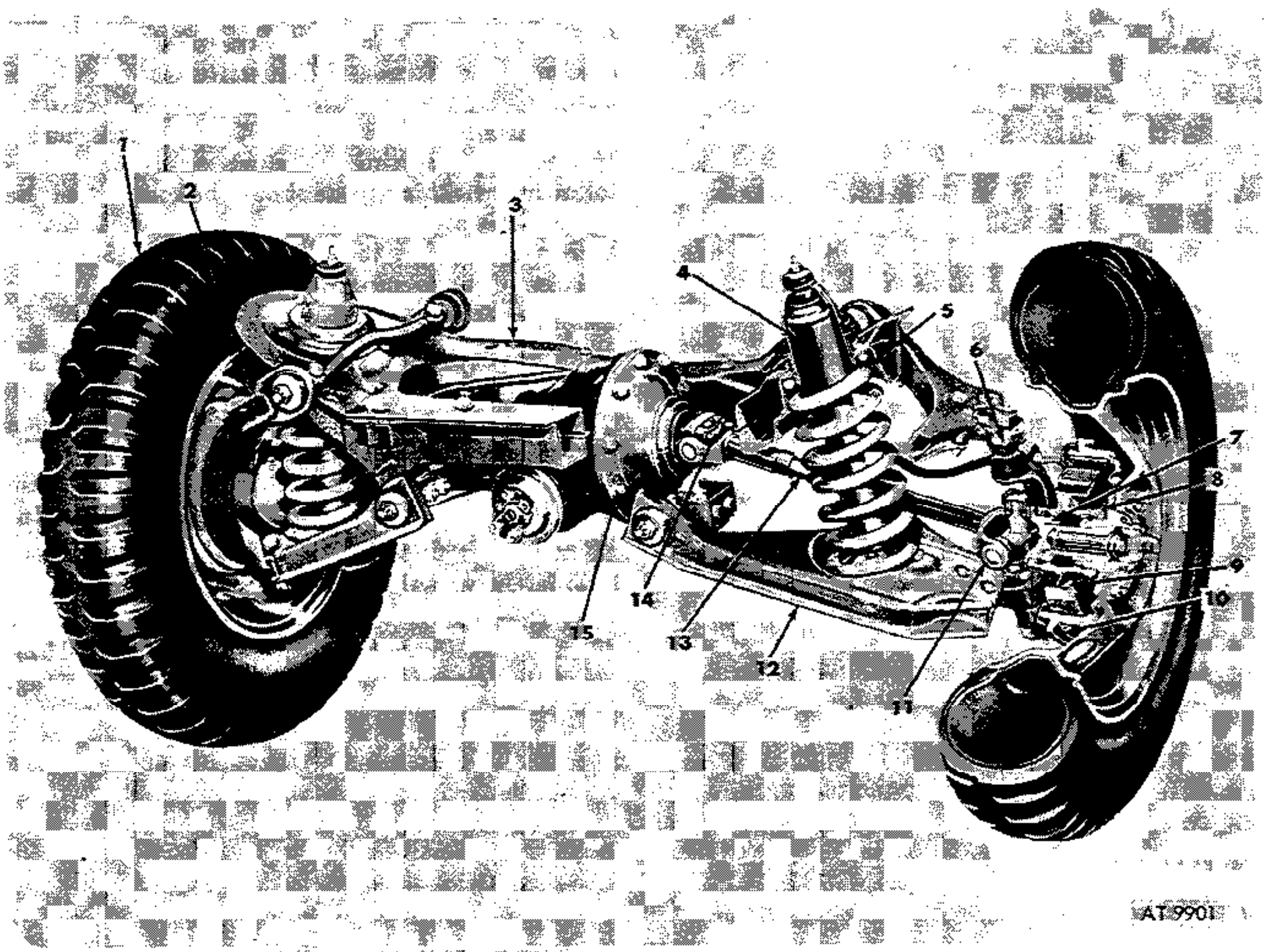
The front suspension and drive assembly consists of front crossmember, upper and lower suspension arms, coil springs, shock absorbers, ball joints, differential assembly, wheel drive shafts, Cardan-type universal joints, wheel support spindles, brakedrums, wheel brake mechanisms, and wheel retaining bolts. Figure 2-296 is a cutaway of the front suspension and drive. The front crossmember is fabricated from metal stampings to form a boxed section. All front suspension and drive assembly parts are assembled to this crossmember.

2-131. Differential Assembly (Front)

a. Removal.

(1) Refer to figure 2-297 and remove differential flange guard from bumper and differential.

(2) Remove four nuts and lockwashers and two "U" bolts securing sleeve yoke universal joint to differential (fig. 2-298).



1 Wheel and tire assembly
2 Upper suspension arm
3 Crossmember
4 Shock absorber
5 Coil spring
6 Ball Joint—upper
7 Wheel bearing—inner
8 Wheel bearing—outer
9 Brakeshoe and lining
10 Brakedrum
11 Universal joint (shaft to drive flange)
12 Lower suspension arm
13 Wheel drive shaft
14 Universal joint (yoke to differential)
15 Differential

Figure 2-296. Cutaway of the front suspension and drive.

Figure 2-297. Remove differential flange guard from differential.

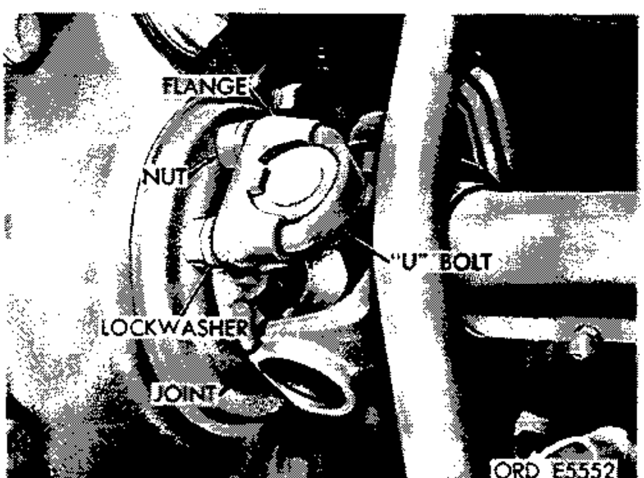


Figure 2-298. Remove drive shaft universal joint from differential drive flange.

(3) Remove four bolts securing front propeller shaft universal joint to differential drive flange (fig. 2-299).

(4) Remove three bolts, flat washers and locknuts securing differential assembly to front crossmember. Remove differential assembly (fig. 2-300).

b. Installation. Install differential assembly (front) by reversing removal operations. The following attaching parts should be torqued to the values shown:

Universal joint bolt (5 / 16-24)	15-20 lb-ft
Carrier to crossmember bolt (7 / 16-20)	30-40 lb-ft

2-132. Front Wheel Drive Shaft

a. Removal (fig. 2-301). Raise front of vehicle. Remove eight nuts and lockwashers from four "U" bolts. Slide drive shaft universal joint yoke toward wheel and remove shaft.

b. Installation (fig. 2-301, and reverse procedure). Slip joint end of shaft must be installed toward differential.

2-133. Universal Joint Removal

a. Removal.

(1) Remove wheel drive shaft (para 2-132).

(2) Remove lock rings from bearing races (fig. 2-302).

(3) With an 11 / 16-inch socket as a driver and 1 1 / 8 inch socket as a receiver, use bench vise to press bearing races and cross from yoke (fig. 2-295).

NOTE

Make certain that 11 / 16-inch socket is small enough in diameter to enter yoke bearing race bore without binding.

(4) Remove bearing races from cross (fig. 2-303).

(5) Remove cross from yoke.

b. Installation. Install universal joint by reversing removal operations.

NOTE

Races must be assembled one at a time with seals entering yoke first.

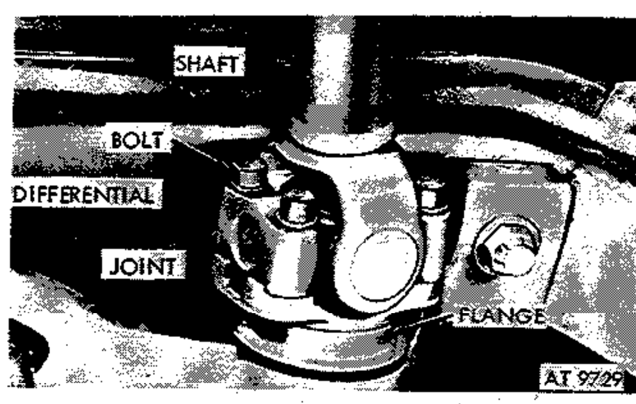


Figure 2-299. Remove front propeller shaft joint from front differential rear flange.

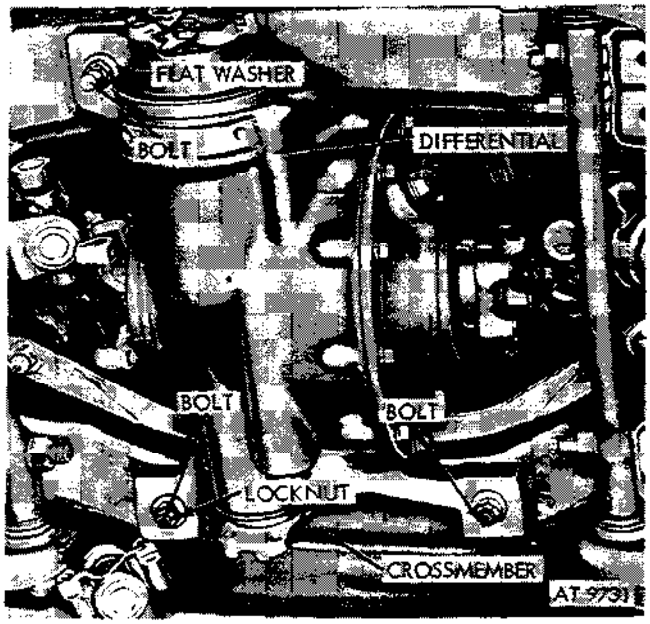


Figure 2-300. Remove differential assembly from crossmember.

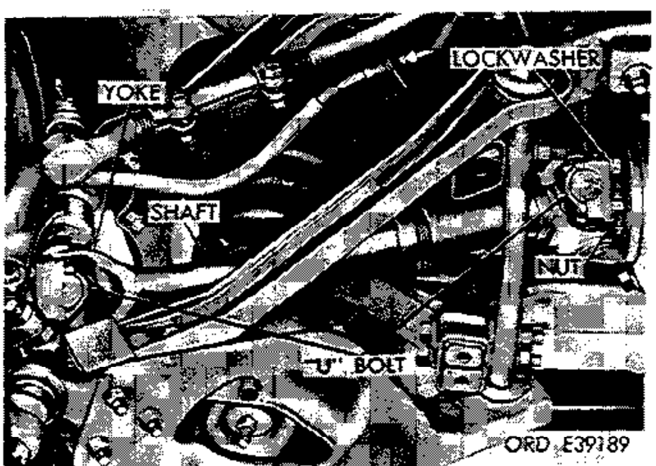


Figure 2-301. Remove front wheel drive shaft.

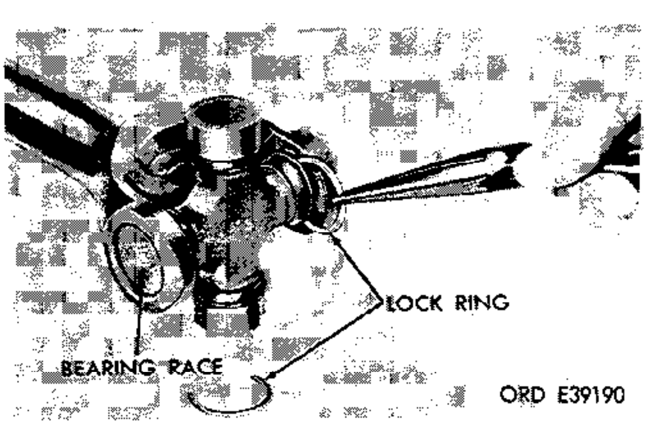


Figure 2-302. Remove ring from bearing race.

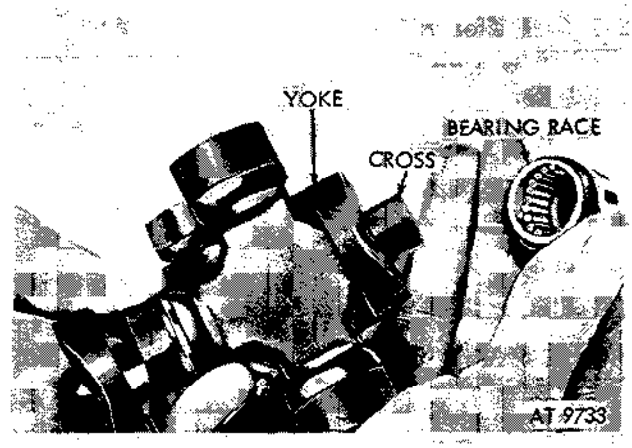


Figure 2-303. Removing bearing race from cross.

NOTE

Pre-lube all new universal joints before installing into the front wheel drive shafts. Pre-lubing is accomplished by removing all four bearing races from the cross and lubricating through the grease fitting to completely fill the grease passages in each trunnion. Also place a small amount of grease in each bearing race before replacing on the journal cross.

2-134. Differential Carrier Drive Pinion Flange

a. *Removal.*

(1) Remove front propeller shaft (para 2-127).

(2) Straighten tab ends at flange boss and remove tab lock. Remove nut and washer from pinion shaft (fig. 2-304).

(3) Remove flange from shaft (fig. 2-304).

b. *Installation.* Install differential carrier drive pinion flange by reversing removal operations.

2-135. Differential Carrier Side Gear Flange

a. *Removal*

(1) Remove four nuts and lockwashers and two "U" bolts securing wheel drive shaft universal joint to drive flange of differential (fig. 2-298).

(2) Secure loose universal joint bearings with tape to keep them from falling off cross. Slide wheel drive shaft universal joint yoke toward wheel to separate universal joint from flange. Remove flange mounting bolt and lockwasher from differential side gear (fig. 2-305).

(3) Pull flange over side gear (fig. 2-305).

b. *Installation.* Install differential carrier side gear flange by reversing removal operations. Torque the differential side gear to flange bolt 40-45 lb-ft.

2-136. Differential Carrier Side Gear Flange Seal and Retainer

a. Removal.

(1) Remove differential carrier side gear flange (para 2-135).

(2) Pry side gear flange seal and retainer from differential as shown in figure 2-306.

b. Installation. Lubricate side gear flange seal lips with grease (GAA) and coat seating surface with compound sealer (FSN 8030-656-1426). Install side gear flange seal and retainer in differential, using replacer (5120-795-0152) as shown in figure 2-307. Install side gear flange in differential as instructed in paragraph 2-135.

2-137. Differential Breather Valve

a. Replacement. The differential breather valve is located at the top of the differential (fig. 2-308). Clean outside of valve and around valve before removing it to avoid possibility of dirt entering lubricant. Turn in or out to install or remove valve.

b. Operation. Upon removal of breather valve, check for proper operation. Valve should allow air to pass out of carrier at approximately 1 / 2 pressure, but restrict passage of air into it. Leaking seals are good evidence that valve is defective or requires cleaning. If valve is inoperative, replace.

2-138. Wheel Spindle

a. Removal.

(1) Remove nut and lifting eye (fig. 2-309).

(2) Jack up front of vehicle. Remove five nuts and remove wheel and tire assembly (fig. 2-309).

(3) Remove brakedrum from spindle (fig. 2-310).

NOTE

Before removing brakedrum it may be necessary to retract shoe assemblies by backing off the brakeshoe adjusting screw.

(4) Remove cotter pin, flanged nut, washer and spindle from flange (fig. 2-311).

b. Installation. Install wheel spindle by reversing removal operation. During installation adjust wheel bearings (para 2-143) and adjust brakes (para 2-171). During installation torque wheel nuts to 80-110 lb-ft.

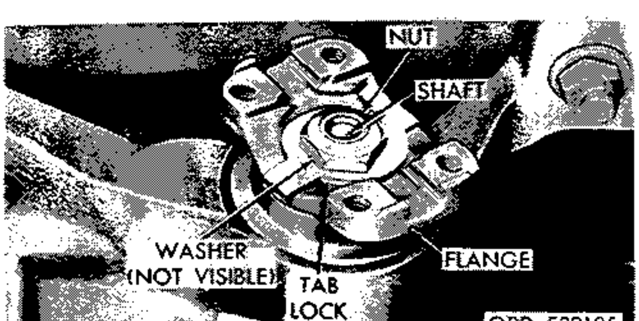


Figure 2-304. Remove flange from shaft.

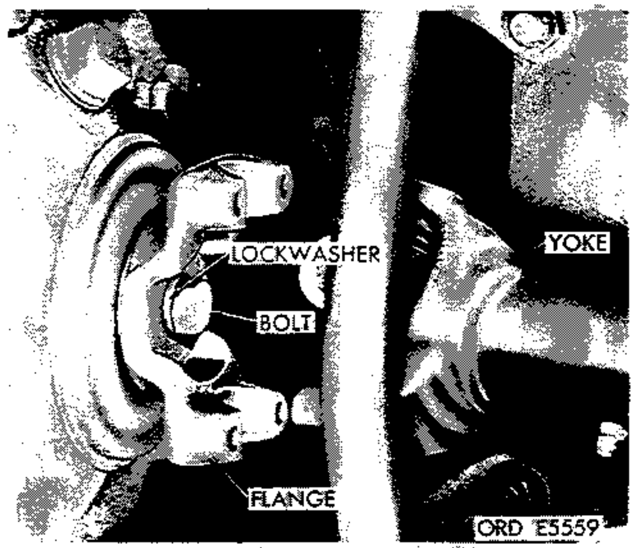


Figure 2-305. Remove differential side gear flange.

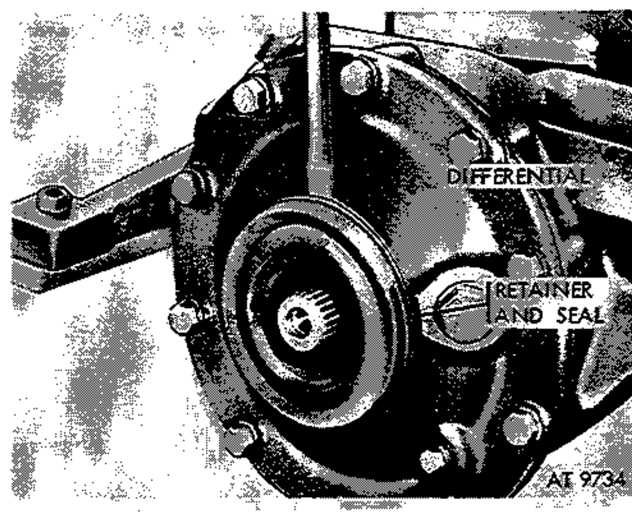


Figure 2-306. Pry retainer and seal from differential.

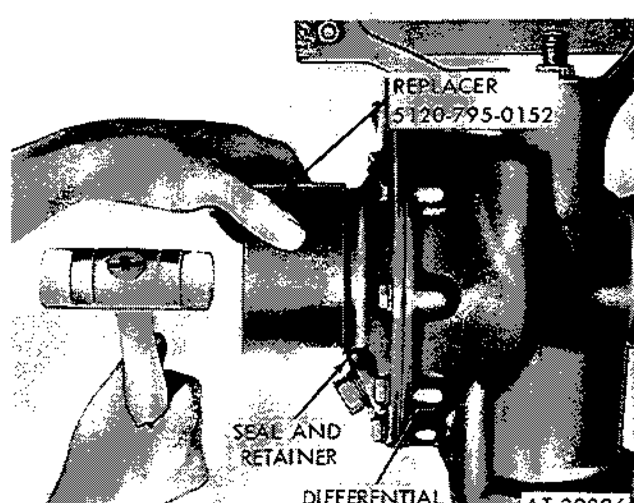


Figure 2-307. Install seal and retainer using replacer (FSN-5120-795-0152).

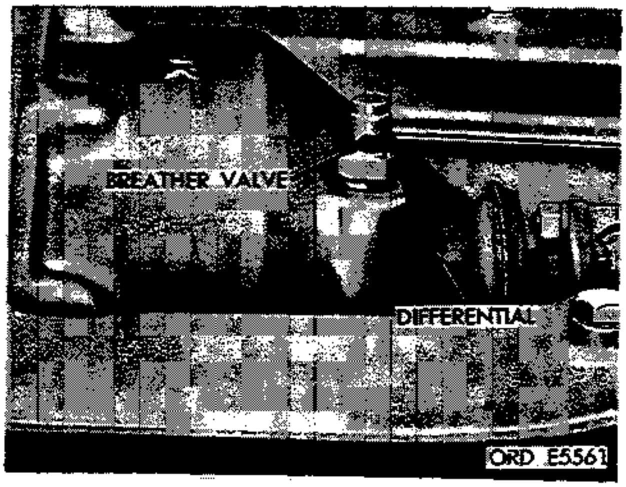


Figure 2-308. Differential breather valve.

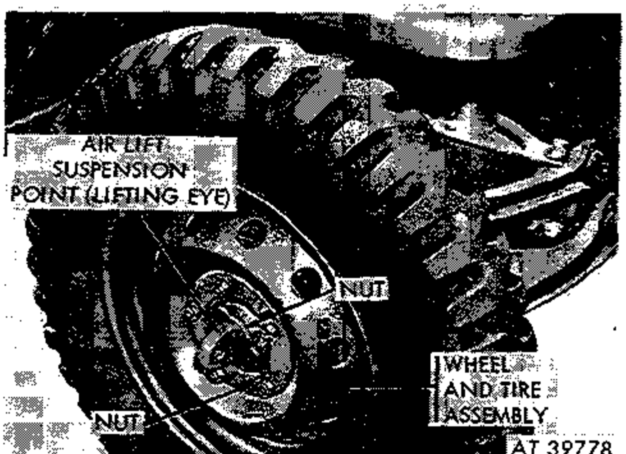


Figure 2-309. Remove nut and lifting eye, nuts, wheel and tire assembly.

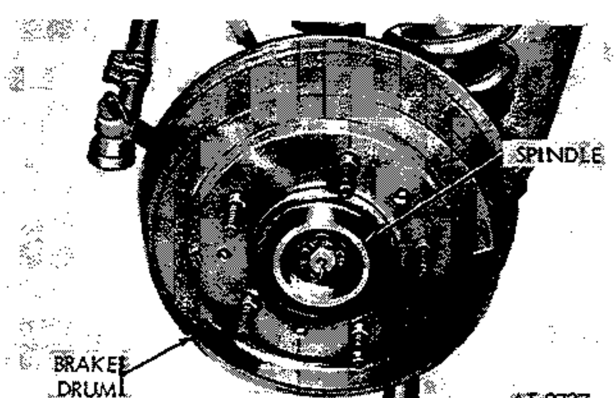


Figure 2-310. Remove brakedrum.

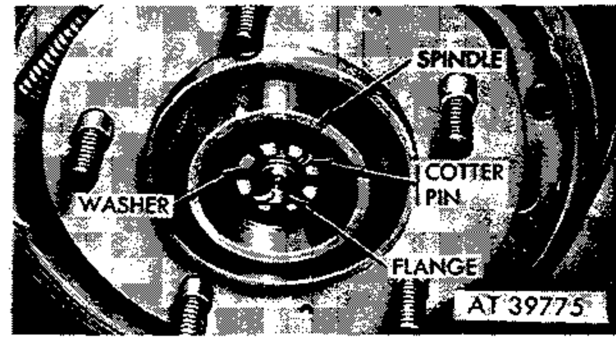


Figure 2-311. Remove spindle from flange.

2-139. Wheel Drive Flange

a. Removal.

(1) Remove wheel spindle (para 2-138).

(2) Remove four nuts and lockwashers and disconnect universal joint at drive flange (fig. 2-312).

(3) Position wheel drive shaft aside and pull wheel drive flange from support (fig. 2-313).

b. Installation. Install wheel drive flange by reversing removal operations. During installation torque "U" bolt nuts to 15-20 lb-ft.

2-140. Wheel Spindle Support

a. Removal.

(1) Raise vehicle and position support under lower control arm.

(2) Remove spindle (para 2-138), and disconnect tie rod end (para 2-164).

(3) Loosen nut and disconnect brake cylinder tube from brake backing plate (fig. 2-314).

(4) Remove three ball joint retaining nuts and bolts from upper control arm (fig. 2-315).

(5) Remove three ball joint retaining nuts and bolts from lower control arm (fig. 2-316).

(6) Remove support and backing plate. Remove four brake backing plate retaining bolts and lockwashers and remove backing plate from support (fig. 2-317).

b. Installation. Install wheel spindle support by reversing removal operations.

2-141. Wheel Outer Seal, Bearing and Cup

a. Removal.

(1) Remove spindle (para 2-138) and wheel drive flange (para 2-139).

(2) Pry outer seal and retainer from support. Using brass drift loosen bearing cup and remove from support (fig. 2-318).

(3) Remove outer bearing cone from spindle using puller 5120-627-7161 (fig. 2-319).

b. Installation. Pack lips of seal with grease (GAA), and coat sealing surface of support with sealing compound (FSN 8030-656-1426). Install wheel bearing outer seal, cup, and bearing as given in operations (1) through (5) below.

(1) Start bearing cup in support bore and seat in position with improvised driver (fig. 2-320).

(2) Coat entire inside of support bearing bore with one-sixteenth layer of grease (GAA). To prevent rust, coat inside of bore between the bearings with one-sixteenth inch layer of grease (GAA).

(3) Install seal on support using replacer special tool 5120-795-0152 (fig. 2-321).

(4) Pack bearing and cone with grease (GAA). Install outer bearing on spindle with improvised tool as shown in figure 2-322.

(5) Install drive flange (para 2-139) and spindle (para 2-138). Adjust wheel bearings (para 2-143).

2-142. Wheel Inner Seal, Bearing and Cup

a. Removal.

(1) Remove wheel spindle (para 2-138), drive flange (para 2-139 and support (para 2-140).

(2) Loosen inner bearing cup and seal using a block of wood or a brass drift (fig. 2-323).

(3) Remove seal (fig. 2-324), bearing and cone (fig. 2-325) and bearing cup (fig. 2-323) from support.

b. Installation. Install wheel inner seal, bearing and cup as given in operations (1) through (6) below.

(1) Position inner bearing cup in support (fig. 326).

(2) Seat cup in support using improvised driver (fig. 2-327).

(3) Pack bearing cone with grease (GAA) and position in bearing cup (fig. 2-325).

(4) Coat outside seating surface of seal with compound sealer MIL-S-45180 (FSN 8030-656-1426) and coat lips of seal with grease (GAA). Position seal in support (fig. 2-325).

(5) Seat seal in support using replacer 5120-795-0152 (fig. 2-321).

(6) Install support (para 2-140), drive flange (para 2-139), and spindle (para 2-138).

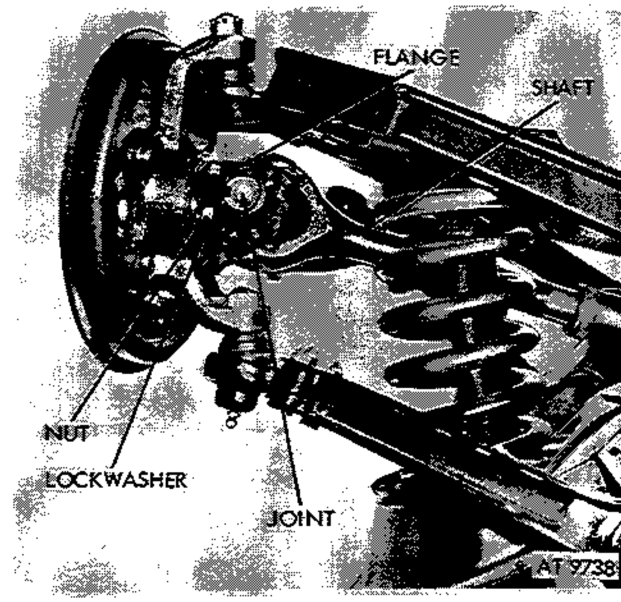


Figure 2-312. Disconnect universal joint at drive flange.

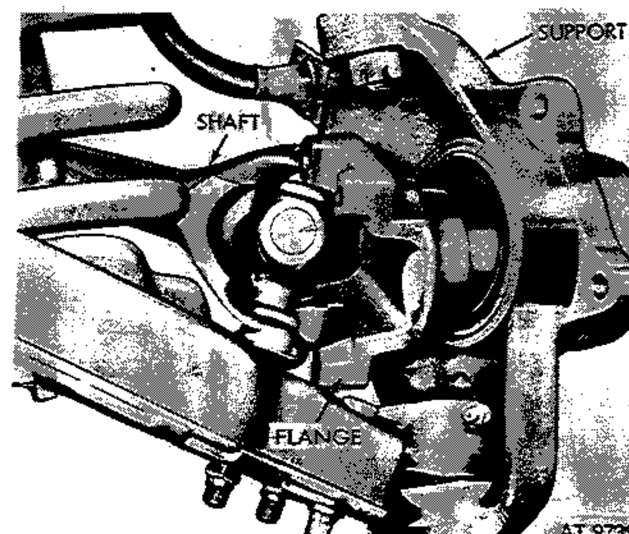


Figure 2-313. Position shaft to permit removal of wheel drive flange from support.

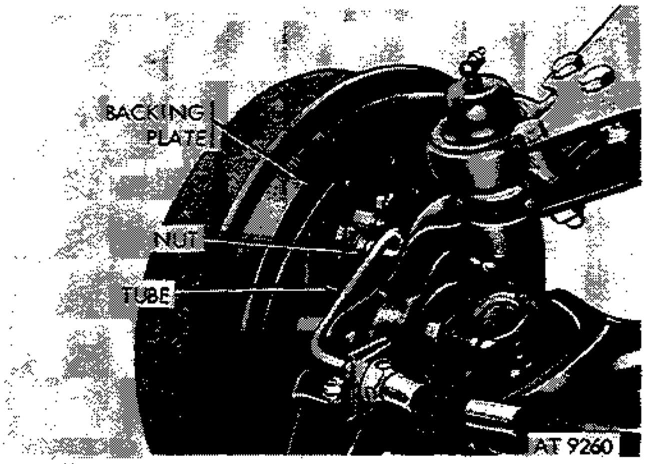


Figure 2-314. Disconnect brake cylinder tube from brake backing plate.

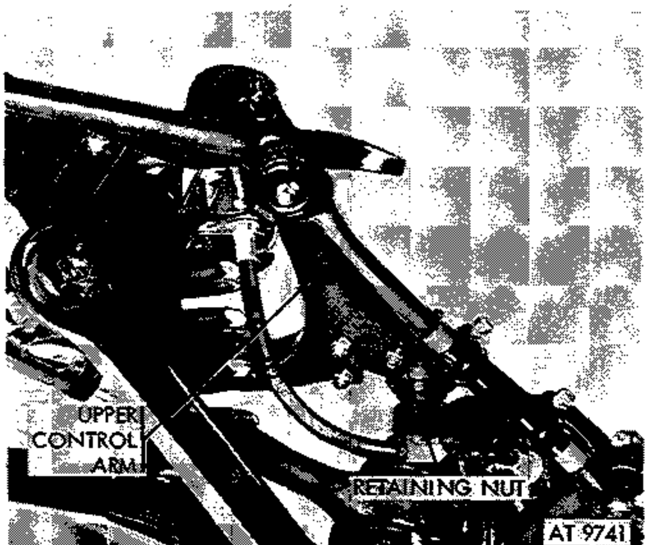


Figure 2-315. Remove retaining nuts and bolts from upper control arm.

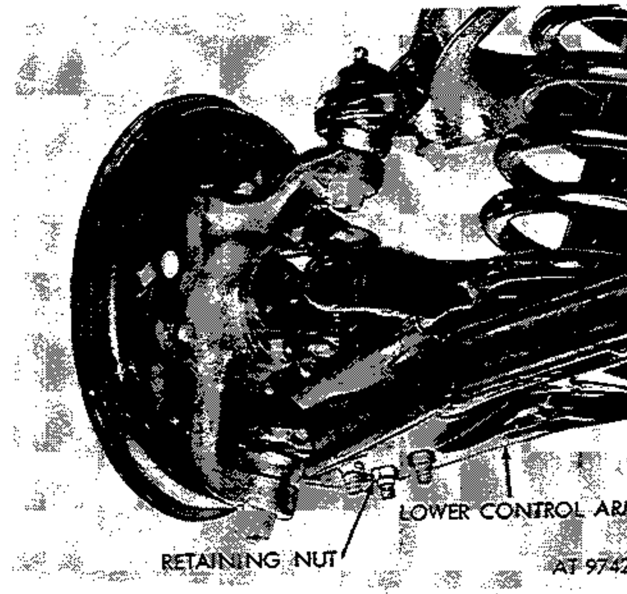


Figure 2-316. Remove retaining nuts and bolts from lower control arm.

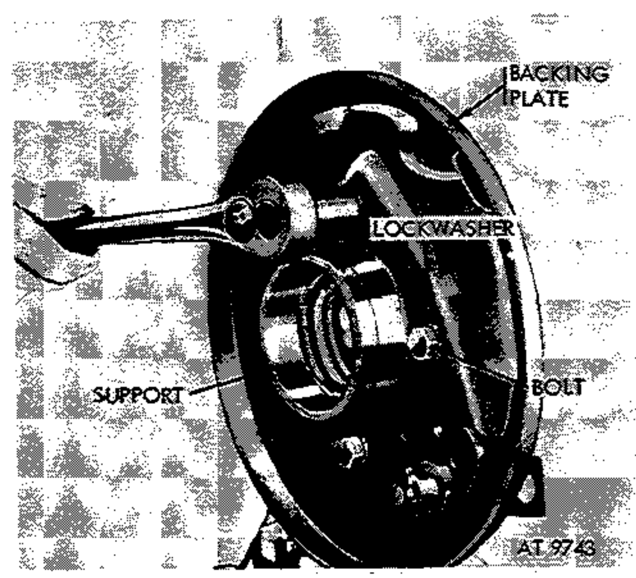


Figure 2-317. Remove backing plate from support.

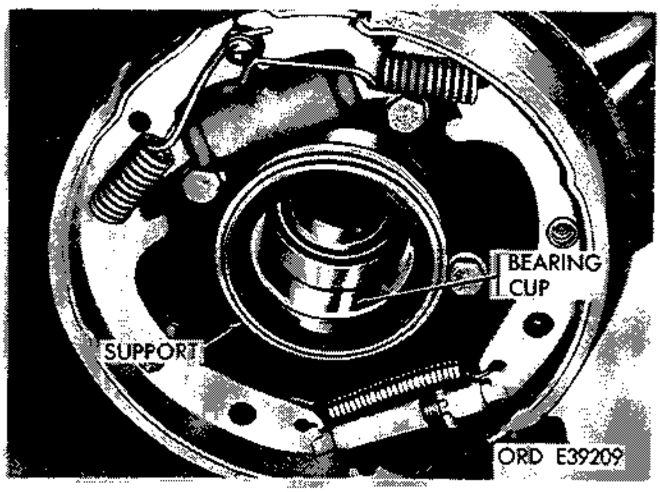


Figure 2-318. Remove bearing cup from support.

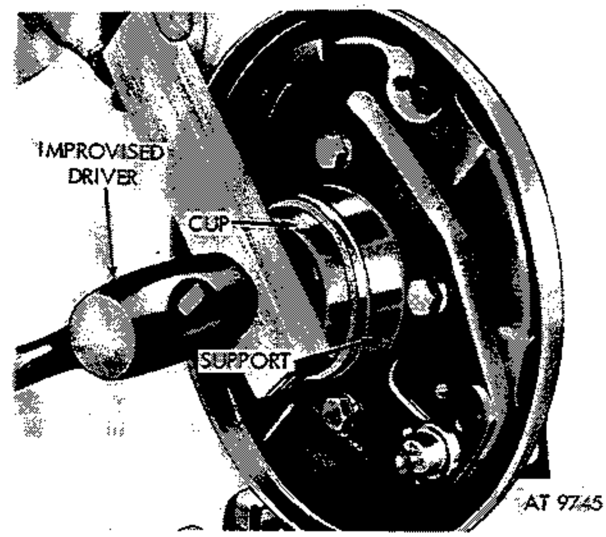


Figure 2-320. Bearing cup in position using improvised driver.

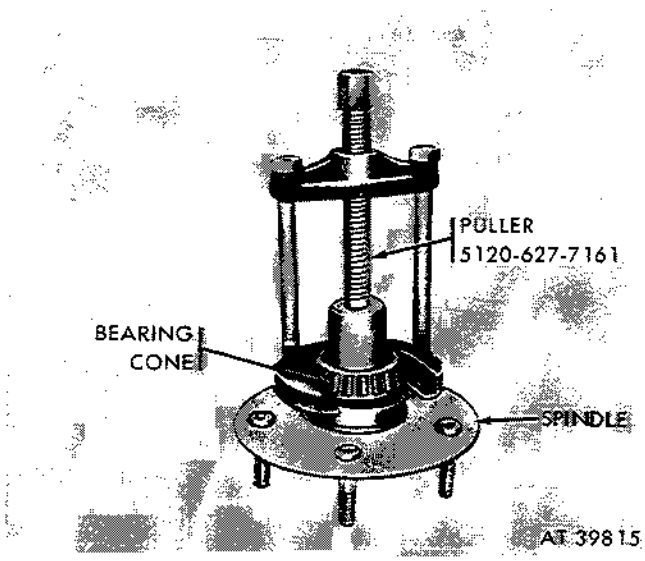


Figure 2-319. Remove couter bearing using puller 5120-627-7161.

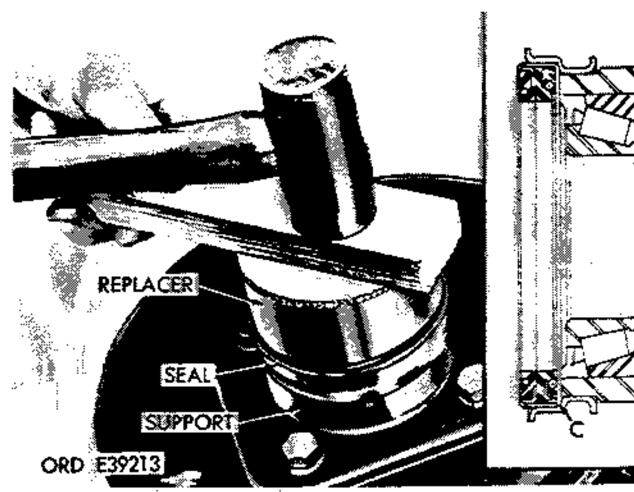


Figure 2-321. Install seal using replacer 5120-795-0152.

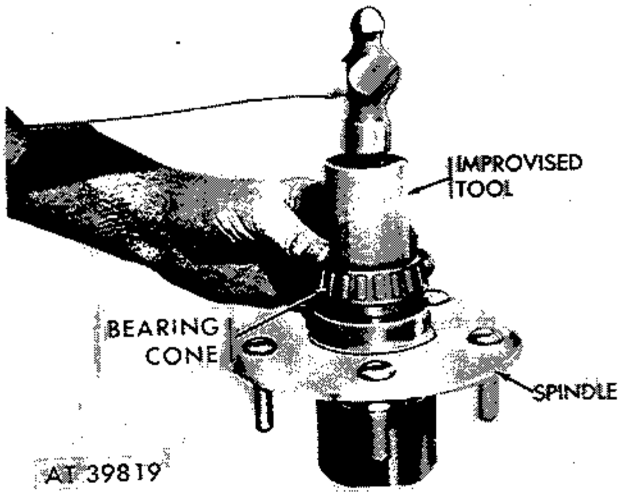


Figure 2-322. Install outer bearing on spindle.

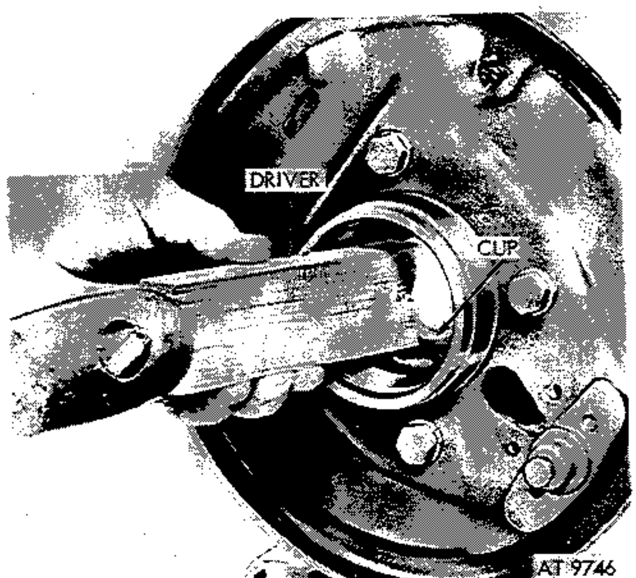


Figure 2-323. Loosen bearing cup and seal.

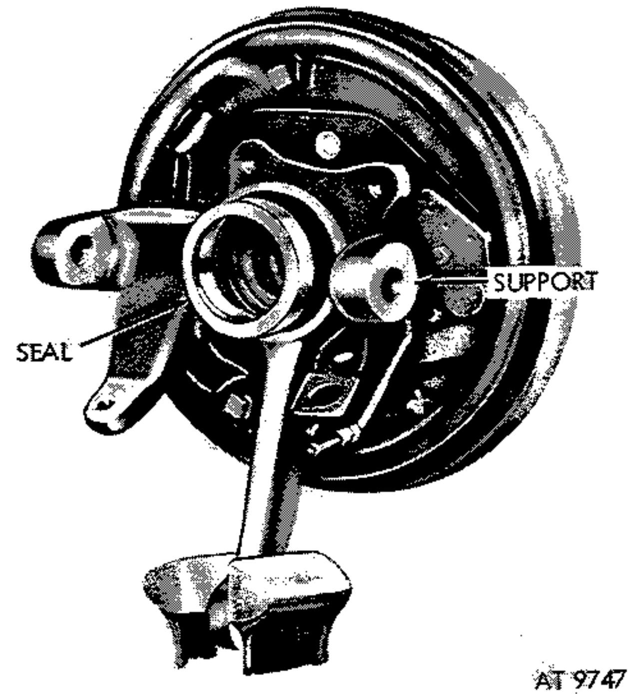


Figure 2-324. Remove seal from support.

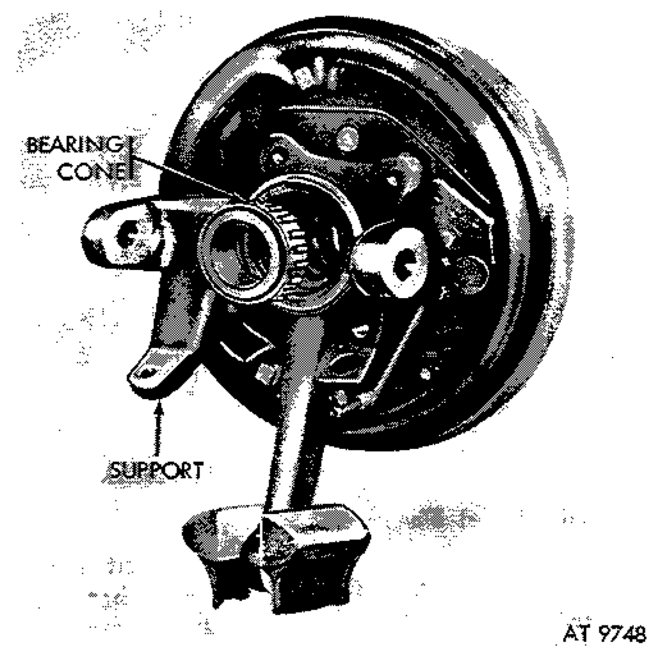


Figure 2-325. Remove bearing and cone from support.

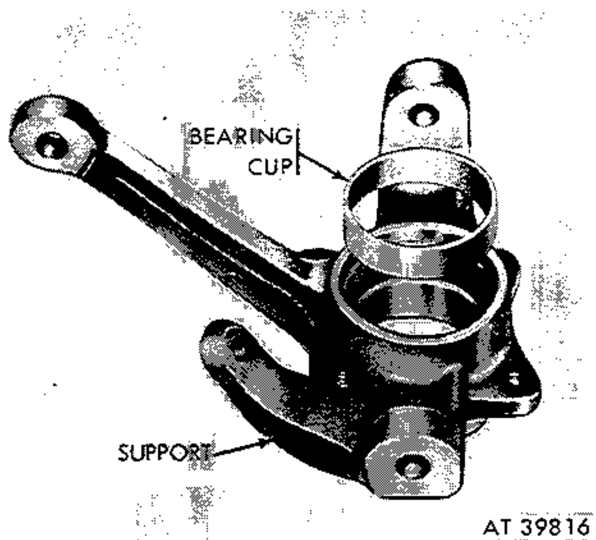


Figure 2-326. Remove inner bearing cup from support.

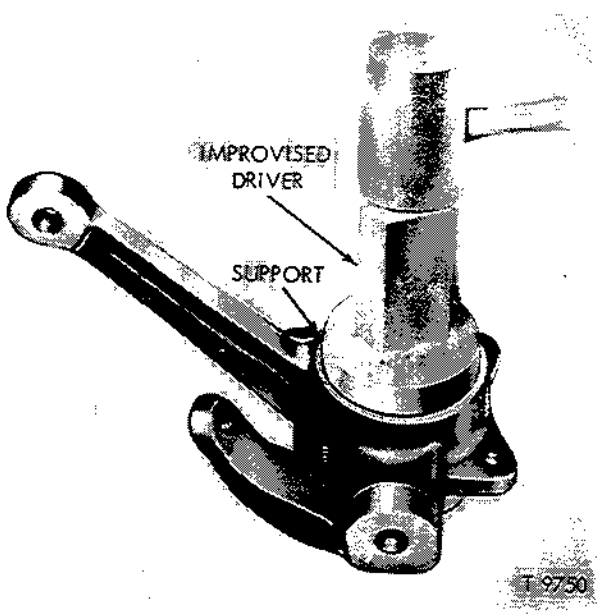


Figure 2-327. Seat bearing cup in support.

2-143. Wheel Bearing Adjustment

a. General. Wheel bearing adjustment should be performed each time adjustment has been disturbed or to compensate for bearing wear.

b. Adjustment Procedure.

(1) Remove wheel and tire assembly (fig. 2-309).

(2) Remove lifting eye and locknut (fig. 2-309).

(3) Remove cotter pin from wheel drive flange nut. Tighten drive flange nut to 30 lb-ft. torque.

(4) Rotate spindle three complete rotations.

(5) Recheck torque. If not at 30 lb-ft, tighten and repeat (4).

(6) Repeat (4) and (5) until torque can be maintained after rotating, then rotate spindle three complete rotations.

(7) Back nut off one complete rotation to relax the preload without rotating spindle. Tighten nut finger tight.

(8) Insert cotter pin and secure. The spindle has two through holes for the cotter pin. If the slots in the nut do not aline with either one of the holes, loosen the nut the least amount required to aline a slot with a hole and insert cotter pin.

(9) Install lighting eye and locknut.

(10) Install wheel and tire assembly.

2-144. Front Shock Absorbers

a. Removal.

(1) Raise vehicle and position support under lower suspension arm.

(2) Remove two bolts securing lower shock bracket to suspension arm (fig. 2-328).

(3) Turn mounting bracket 1/4 turn to remove from inside of suspension arm (fig. 2-329).

(4) Remove locknut securing top of shock absorber to crossmember (fig. 2-330).

(5) Lift off top washer and mounting bushing. Remove shock abosorber through opening in lower suspension arm (fig. 2-330).

(6) Remove shock absorber mounting locknut, washer, and bushing if shock absorber is to be replaced (fig. 2-328).

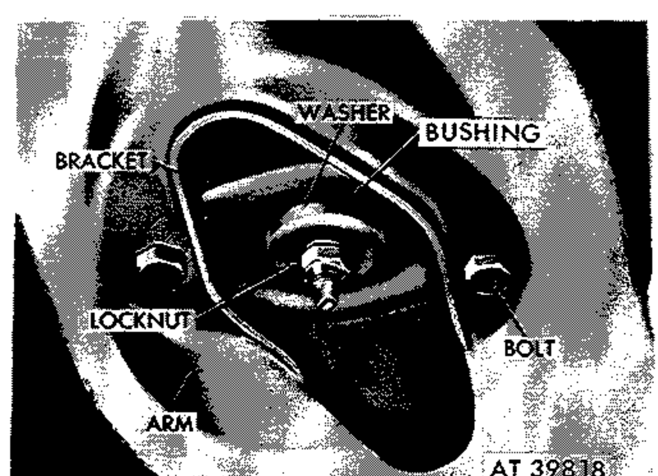


Figure 2-328. Disconnect front shock absorber lower mount.

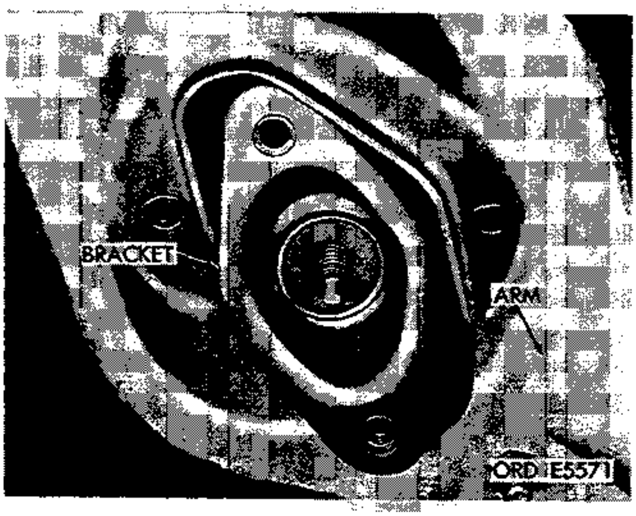


Figure 2-329. Rotate mounting bracket.

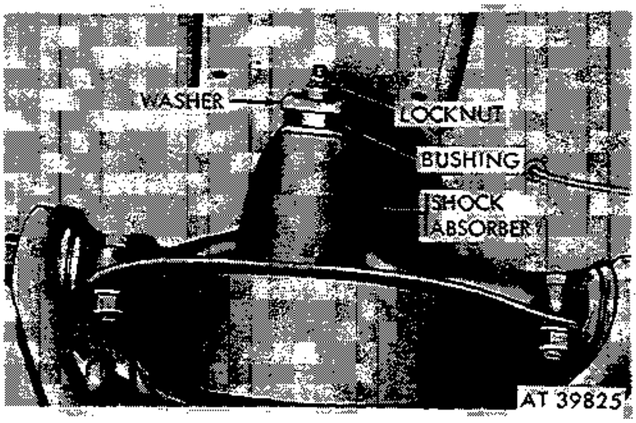


Figure 2-330. Remove shock absorber.

b. Installation. Install front shock absorbers by reversing removal operations. Torque the following attaching parts to the values shown:

Shock absorber lower mounting nut (7 / 16-20)	15-20 lb-ft.
Shock absorber upper mounting nut (7 / 16-20)	15-20 lb-ft.
Lower control arm to shock absorber bracket, mounting bolt (3 / 8-24)	40-45 lb-ft.

NOTE

At installation, inspect mounting bushings and washers. Replace damaged or unserviceable parts. The cup end of shock absorber must face downward when installed.

2-145. Front Springs

WARNING

Prior to removal of the three bolts and nuts, securing lower ball joint to suspension arm, the suspension arm must be supported to keep the spring tension from forcing the spring out of the arm and possibly causing injury to personnel.

a. Removal.

(1) Raise vehicle and position support under lower suspension arm.

(2) Disconnect lower end of shock absorber (para 2-144).

(3) Disconnect wheel drive shaft (para 2-132).

(4) Remove three bolts and nuts securing lower ball joint to suspension arm (fig. 2-316).

(5) Lower suspension down and remove coil spring.

b. Installation. Install either front spring by reversing removal operations.

2-146. Suspension Upper Arms

a. Removal.

(1) Raise vehicle and remove wheel assembly.

(2) Disconnect upper end of shock absorber (para 2-144).

NOTE

Support lower control arm to prevent damage to ball joints due to excessive arm travel.

(3) Remove two bolts, nuts, and lockwashers securing upper suspension arm to front crossmember (fig. 2-331).

(4) Remove three bolts, and locknuts securing upper ball joint to suspension arm and remove suspension arm (fig. 2-322).

b. Installation. Install suspension upper arms by reversing removal operations. After installation, refer to paragraph 2-150 for checking and adjusting toe-in. Torque the following attaching parts to the values shown:

Upper arm shaft to crossmember mounting bolt (1 / 2-20)	75-85 lb-ft.
Upper suspension arm to ball joint nut (3 / 8-24)	35-40 lb-ft.

2-147. Suspension Lower Arms

a. Removal.

(1) Raise vehicle, remove wheel assembly, and position support under lower suspension arm.

(2) Remove shock absorber (para 2-144).

(3) Remove three bolts and locknuts securing suspension arm to lower ball joint (fig. 2-333).

(4) Remove coil spring (para 2-145).

(5) Remove three bolts, nuts and flat washer securing suspension arm to crossmember (fig. 2-334).

b. Installation. Install suspension lower arms by reversing removal operations. Torque the following attaching parts to the values shown:

Lower arm to ball joint mounting nut (3 / 8-24)	35-40 lb-ft.

Lower arm shaft to crossmember mounting
bolt front (7 / 16-20) 40-55 lb-ft.
Lower arm shaft to crossmember mounting
bolt rear (1 / 2-20) 45-65 lb-ft.

2-148. Ball Joints

a. *General.* The lower ball joints carries the weight of the vehicle which keeps the ball firmly seated and the joint constantly loaded during operation. When the vehicle is raised in such a manner as to relieve the ball joint of the vehicle weight, the ball joint will be noticeably loose. This looseness will probably be due to normal operating clearance. Late model ball joints are of the lube-for-life type and may be easily distinguished from early model types which incorporated grease fittings and required regular lubrication intervals. These ball joints are interchangeable and when replacement is determined, the lube-for-life type should be installed.

b. *Inspection.* Inspect lower ball joint vertical travel as shown in figure 2-335.

(1) Check measurement of ball joint with vehicle resting on wheels.

(2) Raise vehicle to remove all vehicle weight from front suspension ball joints. Check measurement of ball joints.

(3) If dimension with load release is more than 1 / 8 inch (early model lube fitting type) greater than dimension under load, (1) above, replace lower ball joint.

NOTE

Late model lube-for-life type ball joints should not show any signs of excessive vertical or lateral free play or broken and cracked seal boot.

c. *Removal.*

(1) Remove coil spring (para 2-145).

(2) Remove three bolts and locknuts securing lower arm to lower ball joint (fig. 2-336).

(3) Remove cotter pin and nut securing lower ball joint and seal to wheel spindle support. Remove ball joint (fig. 2-337).

(4) Remove three nuts and bolts securing upper arm to upper ball joint (fig. 2-338).

(5) Remove cotter pins and nut securing upper ball joint and seal to wheel spindle support. Remove ball joint (fig. 2-339).

d. *Installation.* Install ball joints by reversing removal operations. Torque the following attaching parts to the values shown:

Lower arm ball joint mounting
nut (3 / 8-24) 35-40 lb-ft.
Ball joint stud nut (9 / 16-18) 50-60 lb-ft.

2-149. Ball Joint Seals

a. *Inspection.* Inspect ball joint seals for breaks, cracks, distortion or wear if seals indicate any damage, ball joints must be replaced.

b. *Removal.* Refer to paragraph 2-148 c.

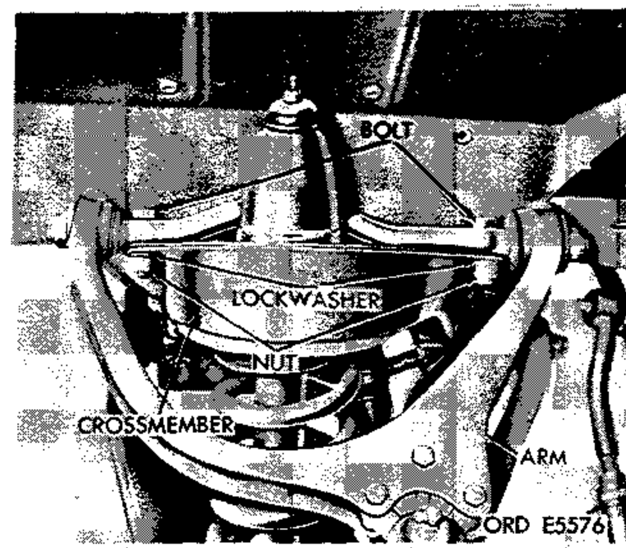


Figure 2-331. Disconnect upper suspension arm from front crossmember.

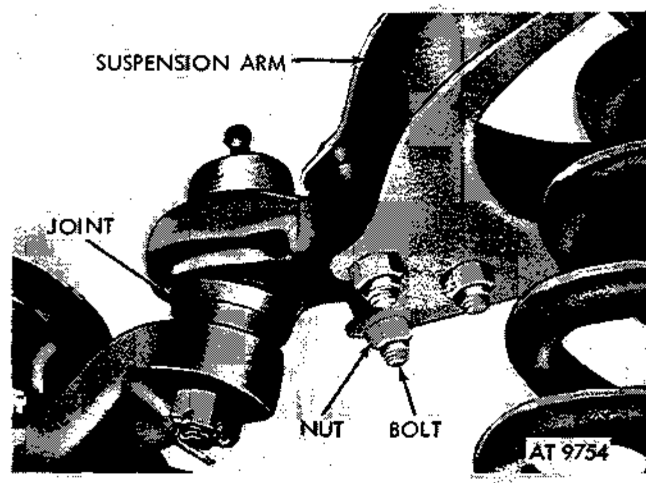


Figure 2-332. Remove suspension upper arm from ball joint

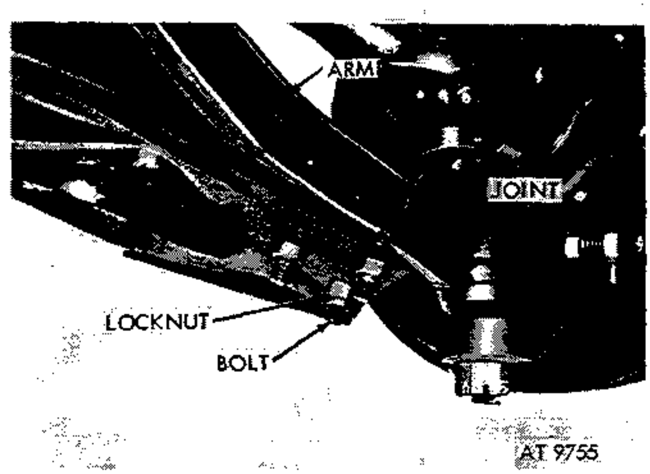


Figure 2-333. Remove suspension arm from lower ball joint.

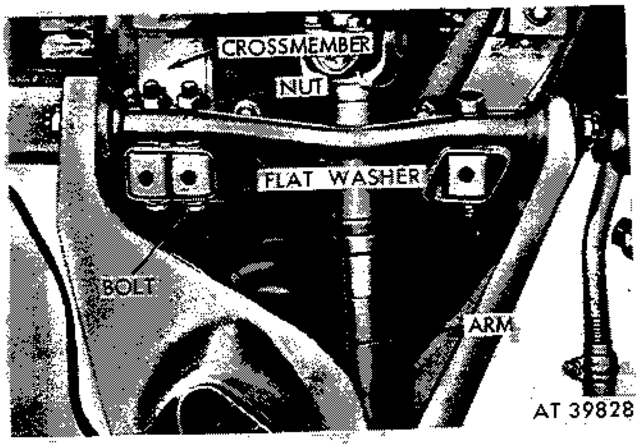


Figure 2-334. Remove suspension arm from crossmember.

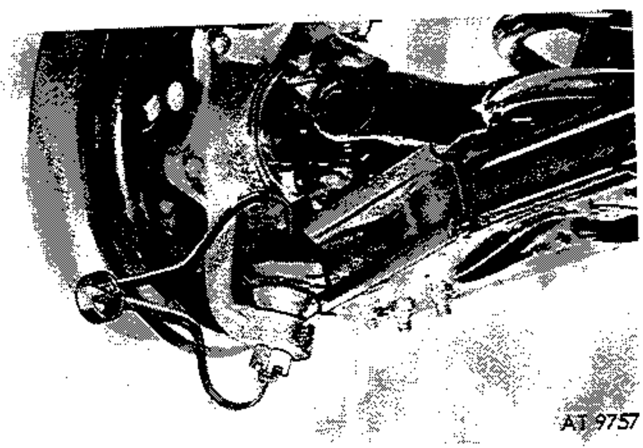


Figure 2-335. Lower ball joint inspection.

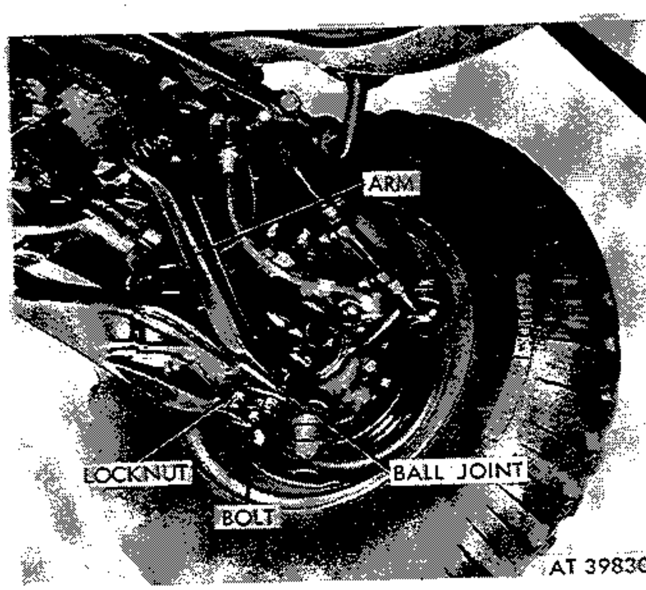


Figure 2-336. Remove lower arm from lower ball joint.

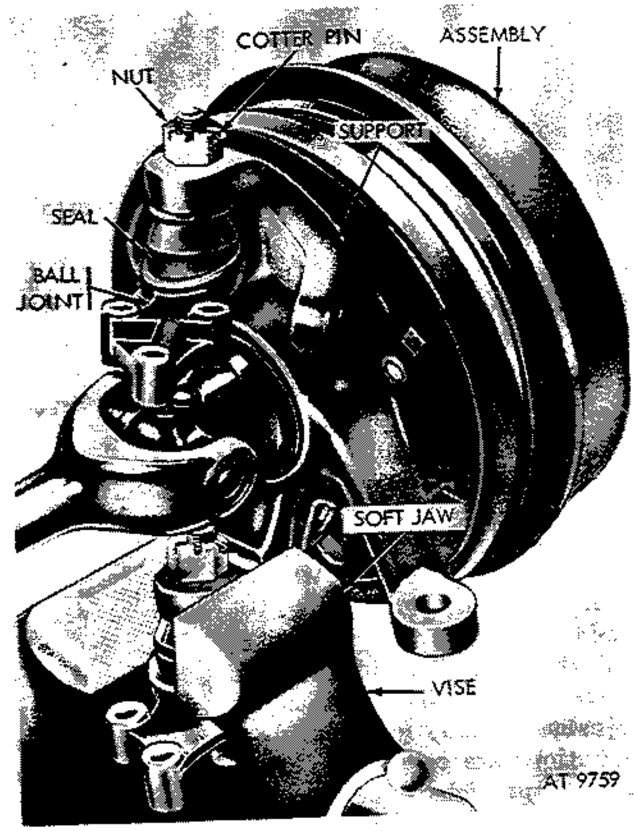


Figure 2-337. Remove lower ball joint from wheel spindle support.

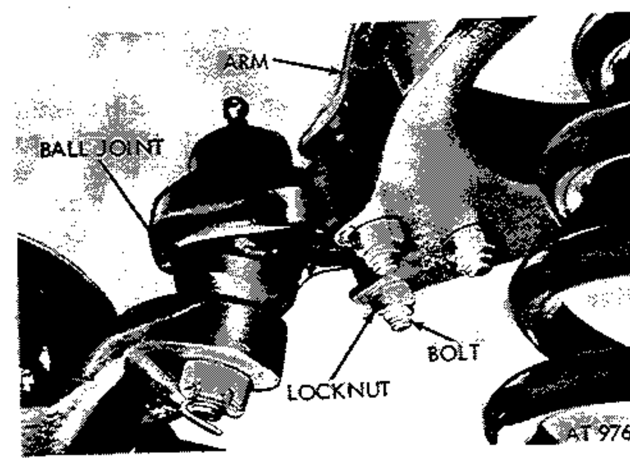


Figure 2-338. Remove upper arm from upper ball joint.

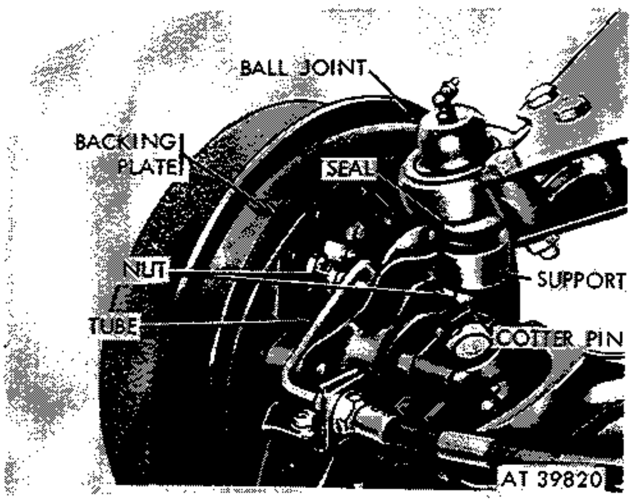


Figure 2-339. Remove upper ball joint from wheel spindle support.

c. *Installation.* Refer to paragraph 2-148 *d.*

2-150. Front Wheel Alinement

a. Front wheel alinement adjustments other than toe-in must be performed by direct support maintenance. The factors of alinement are inerrelated and if one adjustment is made, other adjustments may be affected. After all alinement operations are complete, check to determine that settings previously made are still within limits. Make all adjustments at curb weight. After installing new or reconditioned front end components check and adjust toe-in as outlined in *b* through *e* below, and as soon as possible thereafter report to support maintenance organization for complete front end wheel alinement.

b. *Rotate steering wheel to stop.* Reverse steering wheel approximately 1-5 / 6 turns until one spoke of steering wheel is at the bottom and in line with centerline of steering column. In this position, the Pitman arm and front wheels should point straight ahead.

NOTE

Vehicle must be on a level, smooth surface.

c. Loosen locknut on two clamps on both spindle arm tie-rod adjusting sleeves (fig. 2-340).

d. Place wheel alinement toe-in gage between front tires, ahead of the vertical centerline of the wheels (fig. 2-341). Position the gage so both chains just touch the floor. Move the gage scale to read zero.

e. Push vehicle forward until gage is behind the vertical centerline of the wheels (fig. 2-342) and the chains are just touching the floor. Read gage. Reading should be 1 / 32 to 5 / 32 inch. Remove gage and turn both adjusting sleeves equally and repeat toe-in check until correct adjustment is obtained. Torque clamps to 12-15 lb-ft. and report to support maintenance as soon as possible for complete front end wheel alinement.

Section XX. REAR DRIVE ASSEMBLY

2-151. General

The rear drive assembly consists of differential assembly, wheel drive shafts, and universal joints. This section describes those maintenance operations allocated to organizational maintenance on the rear drive assembly.

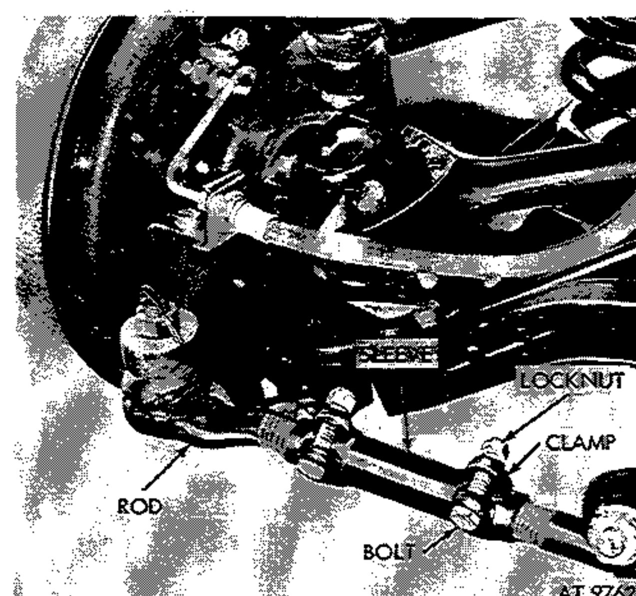


Figure 2-340. Loosen locknut on two clamps on both spindle arm tie-rod adjusting sleeves.

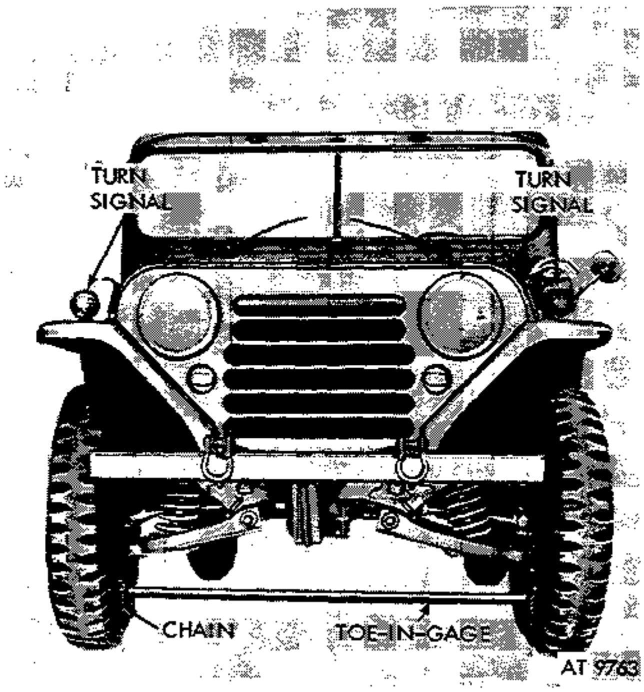


Figure 2-341. Toe-in adjustment with gage forward of vertical centerline of front wheels.

Figure 2-342. Toe-in adjustment with gage behind vertical centerline of front wheels.

2-152. Differential Assembly

The rear differential assembly is mounted to the three body brackets and secured with three bolts, flat washers, and locknuts. Differentials at the front and rear are interchangeable. For description of the differential assembly, refer to paragraph 2-129 *d*.

2-153. Differential Breather Valve

Refer to paragraph 2-137.

2-154. Wheel Drive Shafts and Universal Joints

Removal and installation of rear wheel drive shafts and universal joints are similar to removal and installation of front wheel drive shafts and universal joints (para 2-132 and 2-133 as applicable). At assembly, place slip joint end of shaft toward the differential.

2-155. General

a. The rear suspension is a swing-arm type of individual wheel suspension utilizing coil springs and hydraulic telescopic shock absorbers. The coil springs are mounted between a spring seat in the suspension arms and a formed seat in the integral frame and body. The shock absorbers control jounce and rebound. They are located rearward of the coil springs.

b. The many wide usages to which the M151 series vehicles have been applied have resulted in some installations which exceed the load limits for which the vehicle was originally designed. Mounting of heavy weapons systems and other special equipment has in some cases resulted in concentration of loads at the rear suspension system.

c. In the M151A1, M151A1C and M718 vehicles the rear suspension has been redesigned to accommodate these loading conditions mentioned above. Arms and brackets of the suspension are fabricated from high strength alloy steel making it a much stronger suspension. Two mounting bolts have been added to each rear wheel spindle support, and an extra rubber bump stop has been added to the rear side of each suspension arm. In the M151A1C truck an overload spring compensates for the heavier fixed loads.

NOTE

These arms are not interchangeable individually with the rear suspension arms of the M151 truck; however, the complete rear suspension assembly can be interchanged with the earlier model vehicles.

d. On the M151A2, M825, and M718A1 vehicles, single trailing arms individually suspend each rear wheel. The arms are steel alloy stampings that have been welded into an assembly. The double action shock absorbers are secured to both the suspension arm and vehicle underside. On top of each rear suspension arm is a rubber pump stop assembly that makes contact with underside of frame during full jounce conditions. These suspension arms are not interchangeable with those on earlier M151 models.

NOTE

Rear shock absorbers and coil springs are not interchangeable with those at the front on any model vehicle.

2-156. Rear Shock Absorbers

a. Removal.

(1) Raise vehicle and support rear suspension.

(2) Remove bolts and locknuts securing shock absorber to suspension arm and body (M151A2, M825, and M718A1) (fig. 2-343).

(3) Remove locknuts, plug, bushings, washers, and bolts, securing shock absorber to frame and suspension arm (151, M151A1, M151A1C and M718) (fig. 2-344).

b. Installation. Install rear shock absorber by reversing removal operations. Torque attaching parts to the values shown:

Shock absorber lower and upper mounting nuts on M151, M151A1, M151A1C and M718 Vehicles:

Lower nut (7 / 16-24)	40-50 lb-ft.
Upper nut (1 / 2-20)	50-60 lb-ft.

Shock absorbers lower and upper mounting nuts on M151A2, M825, and M718A1 Vehicles:

Lower nut (3 / 4-16)	110-150 lb-ft.
Upper nut (3 / 4-16)	110-150 lb-ft.

2-157. Rear Springs

a. Removal.

(1) Raise vehicle and support rear suspension.

(2) Remove nut and lifting eye (fig. 2-309).

(3) Remove five nuts and remove wheel and tire assembly (fig. 2-309).

(4) Remove bolt and locknut securing shock absorber to suspension arm (fig. 2-343).

(5) Remove four nuts, lockwashers, and two U-bolts securing wheel drive shaft to differential flange (fig. 2-298).

(6) Lower suspension and remove spring.

b. Installation. Install rear spring by reversing removal operations. Torque universal joint to drive shaft flange nut 10-15 lb-ft.

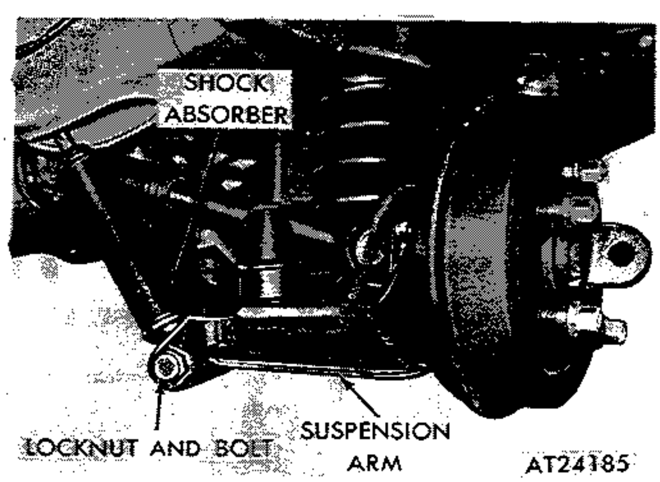


Figure 2-343. Removing or installing shock absorber to suspension arm.

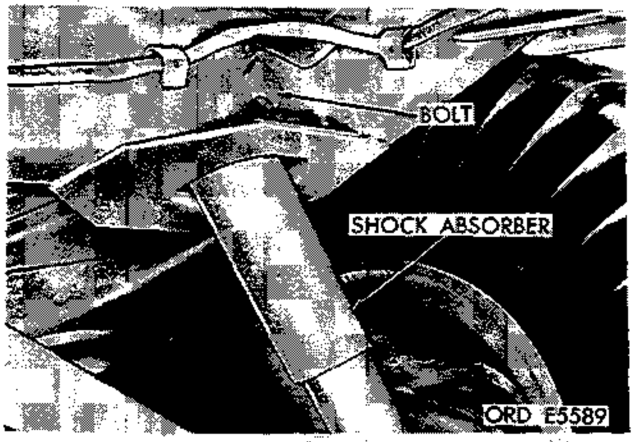


Figure 2-344. Remove rear shock absorber from frame.

2-158. Rear Suspension Arm Assembly

a. Removal.

(1) Raise vehicle and support rear suspension.

(2) Remove nut and lifting eye (fig. 2-309).

(3) Remove five nuts and remove wheel and tire assembly (fig. 2-309).

(4) Remove brake drum.

NOTE

Early models are equipped with two screws securing brake drum to wheel spindle. Later models are not equipped with screws.

(5) Remove cotter pin, nut and washer securing wheel spindle on drive flange and remove spindle (fig. 2-311).

(6) Unscrew brake hose fitting on suspension arm and remove from clip (fig. 2-345).

(7) Remove brake line fitting from wheel cylinder at inner side of brake backing plate (fig. 2-346) and remove brake line from suspension arm.

(8) Remove six bolts and lockwashers securing the brake assembly and spindle support to the suspension arm (fig. 2-347).

NOTE

Early model vehicles had only four bolts and lockwashers securing the brake assembly.

(9) Move wheel drive shaft with universal joint and wheel drive flange to one side.

(10) Remove locknut and bolt securing shock absorber to suspension arm (fig. 2-343).

(11) Lower suspension arm until spring can be removed.

(12) Loosen suspension arm bracket to body bolts (fig. 2-348).

(13) Remove two cotter pins, slotted nuts and pivot bolts securing suspension arm to brackets and remove suspension arm assembly (fig. 2-348).

b. Installation. To install rear suspension arm assembly, reverse removal procedures. Suspension arm be positioned by loosely installing shock absorber before tightening pivot bolt nuts and other attaching hardware to specifications listed below.

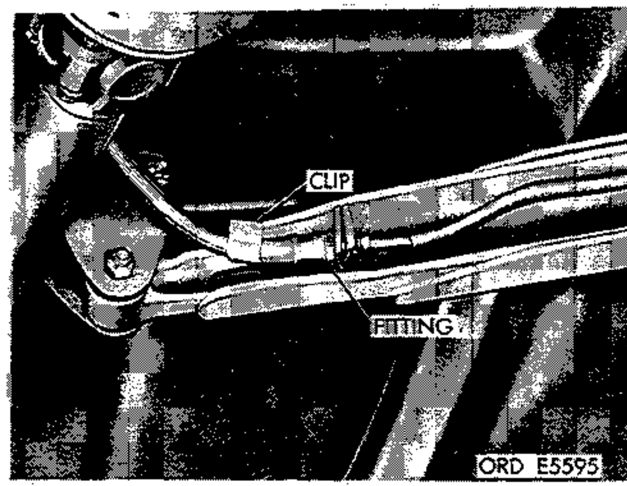


Figure 2-345. Remove fitting from clip.

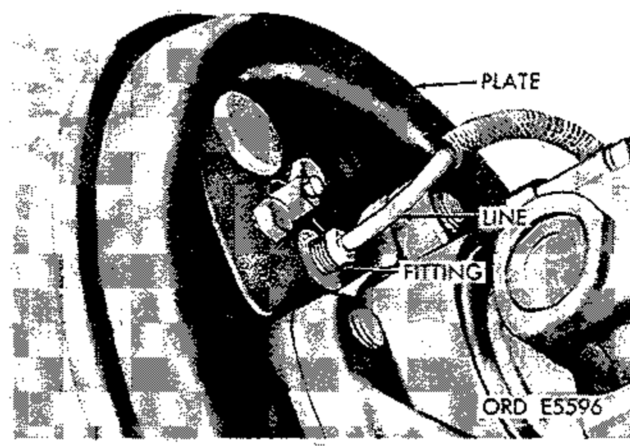


Figure 2-346. Remove fitting from wheel cylinder.

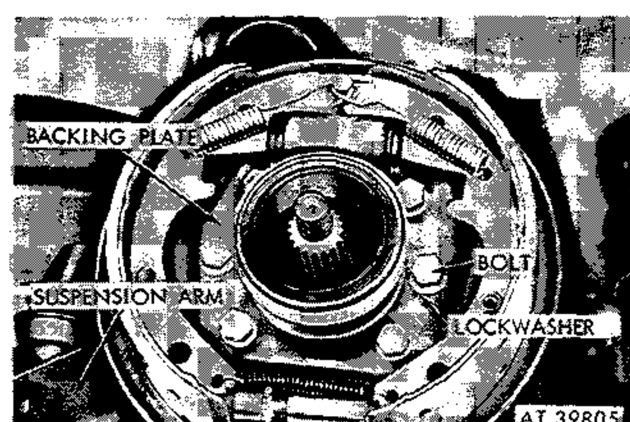


Figure 2-347. Remove brake assembly and spindle support.

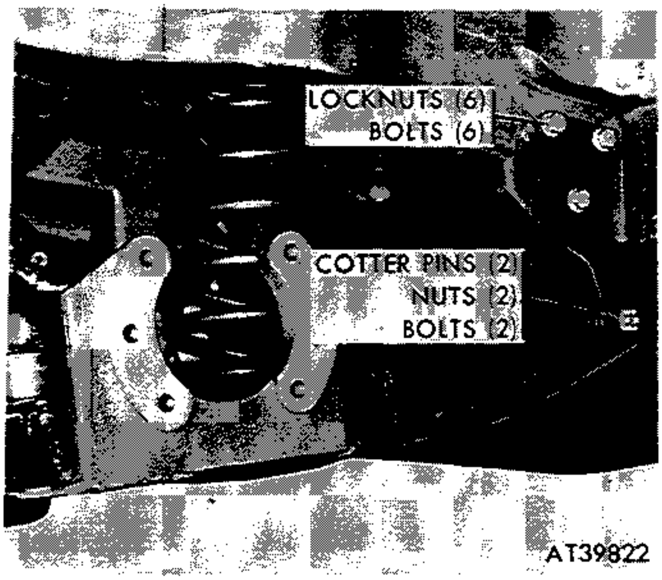


Figure 2-348. Removing or installing rear suspension arm assembly.

Remove lower shock bolt and install spring. After installation of rear springs, tighten the lower shock absorber bushing hardware while vehicle arm is sharing its portion of the vehicle's weight to the specifications listed below:

Front and rear arm bracket mounting bolts (M151, M151A1, M151A1C and M718 vehicles) (3 / 8-24)	35-40 lb-ft.
Arm bracket mounting bolts (M151A2, M825, and M718A1 vehicles) (7 / 16-20)	40-55 lb-ft.
Arm support bushing bolt (all models) (7 / 16-20)	65-70 lb-ft.
Arm to spindle support bolt (M151A2, M825, and M718) (7 / 16-20)	30-40 lb-ft.
Shock absorber lower mounting nut (M151, M151A1, M151A1C and M718 vehicles (7 / 16-24)	40-50 lb-ft.
Bumper, rubber	18-28 lb-ft.

NOTE

Perform wheel bearing adjustment as described in paragraph 2-143. Bleed brake system as described in paragraph 2-172.

2-159. Suspension Arm Bushings

a. General. Rear suspension arms must be removed from vehicle to replace the suspension arm bushings.

b. Removal. Refer to paragraph 2-158 and remove suspension arm from vehicle.

(1) Position suspension arm securely in bench vice.

(2) Remove bushing from suspension arm.

CAUTION

When removing bushing exercise care not to damage the bushing bore.

c. Installation.

(1) Apply a thin film of GAA grease to outer case of bushing and start bushing into bore of suspension arm.

(2) Use suitable socket and machinist's hammer and seat bushing in suspension arm bore to dimensions shown on figure 2-349.

NOTE

When replacing bushings, always replace both bushings in suspension arm assembly.

Section XXII. STEERING SYSTEM

2-160. Description and Data

a. Steering Gear. The steering gear assembly is of the worm and double roller type and is mounted on the body frame left side rail. The steering column is supported by a bracket attached to the instrument panel. The steering gear worm is pressed onto the steering shaft and is supported at each end by opposed tapered roller bearings. A double-tooth roller is attached to the sector shaft by a steel trunnion. The sector is mounted in anti-friction bushings which are pressed into the housing. The sector shaft cover is attached to the steering gear housing. An adjusting screw is mounted in the cover, and controls both sector shaft end play and worm-and-sector adjustment. Double lip seals are provided at top, bottom, and sector shaft sides of the steering gear housing. The Pitman arm and steering wheel have fluted serrations, with one serration being double width. The doublewidth serrations match those on shaft and steering shaft to insure correct installation.

b. Steering Linkage. The steering linkage is of the parallelogram type and consists of all parts necessary to transmit steering effort from the steering sector shaft to front wheels. The linkage includes Pitman arm, Pitman-to-idler arm rod assembly, steering arm tie-rod assemblies, steering idler arm, and bracket, and steering spindle arms. The tie-rod ends are equipped with nonadjustable, spring-loaded, ball sockets which compensate for wear of the ball studs. Grease fittings are located in each tie-rod end and idler arm bushing on the M151, M151A1, M151A1C and M718 vehicles. The M151A2, M825, and M718A1 vehicles are equipped with lube-for-life ball sockets and cannot be lubricated.

c. Data. Refer to table 1-1 for description and data.

2-161. Pitman Arm

a. Removal.

(1) Remove cotter pin and nut securing idler arm rod to Pitman arm (fig. 2-350).

(2) Remove nut and lockwasher securing Pitman arm to sector shaft (fig. 2-350).

(3) Use suitable puller and remove Pitman arm from sector shaft and from idler arm rod (fig. 2-351).

b. Installation. Refer to removal operations (3) back to (1). Before installing Pitman arm, rotate steering wheel to maximum turn. Reverse rotation approximately 15/6 turns until one spoke of steering wheel is at the bottom and is in line with centerline of steering column. Point wheels in straight ahead position. Point Pitman arm straight ahead, aline fluted serrations on arm and sector shaft and install Pitman arm. Tighten steering Pitman arm to sector shaft nut to 100-110 lb-ft. torque. Tighten nut on ball socket stud to 35-45 lb-ft. and install new cotter pin.

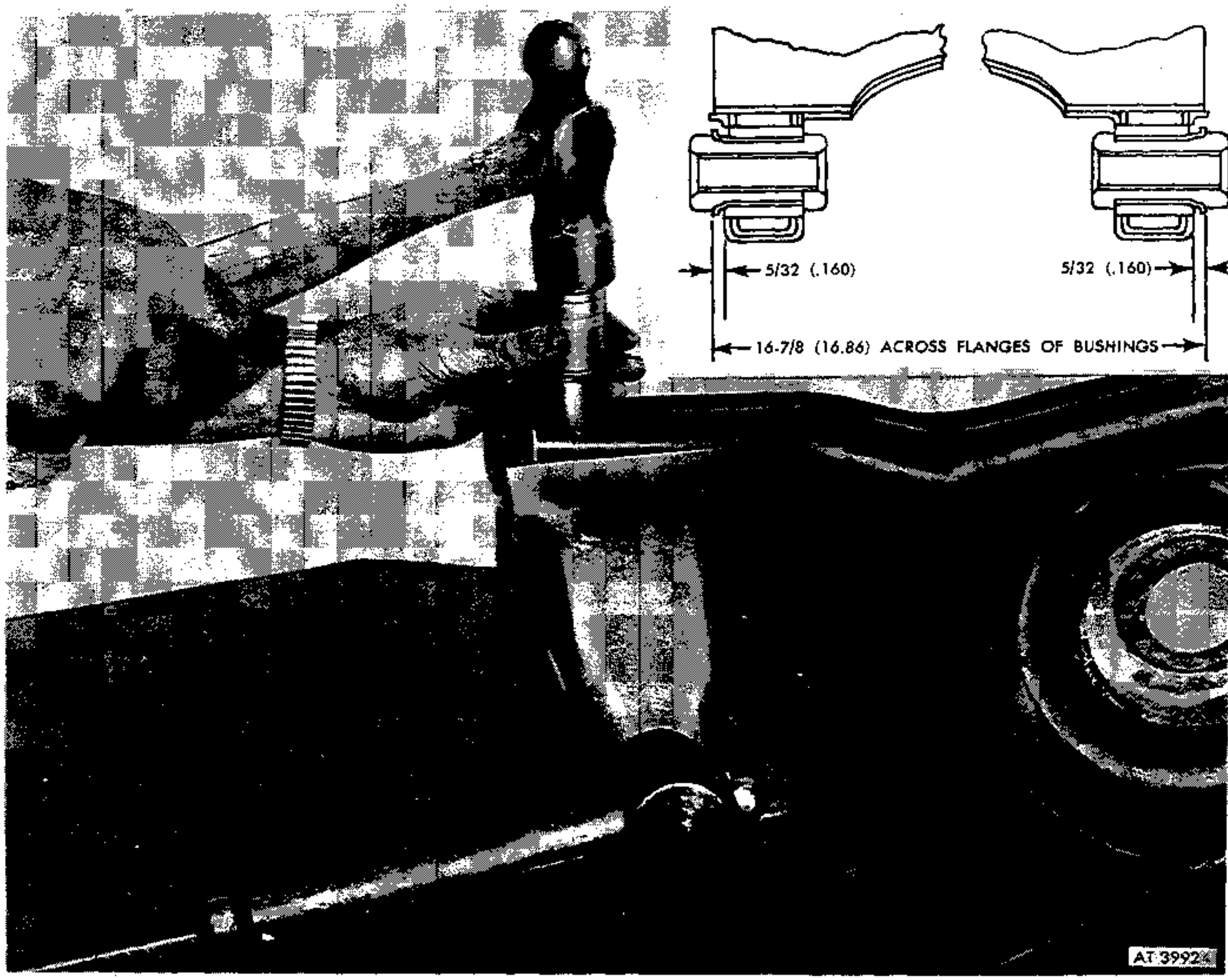


Figure 2-349. Removing or installing suspension arm bushings.

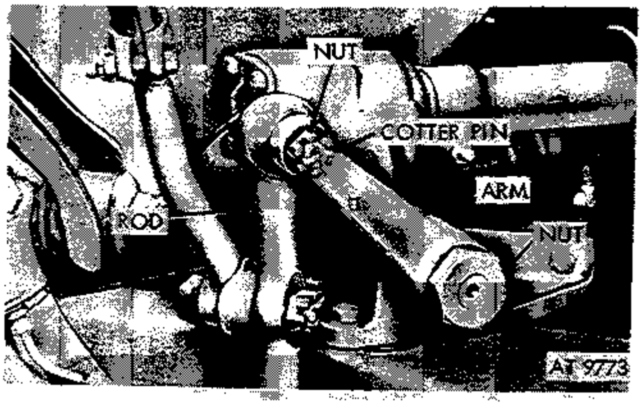


Figure 2-350. Disconnect Pitman arm from idler arm rod and sector shaft.

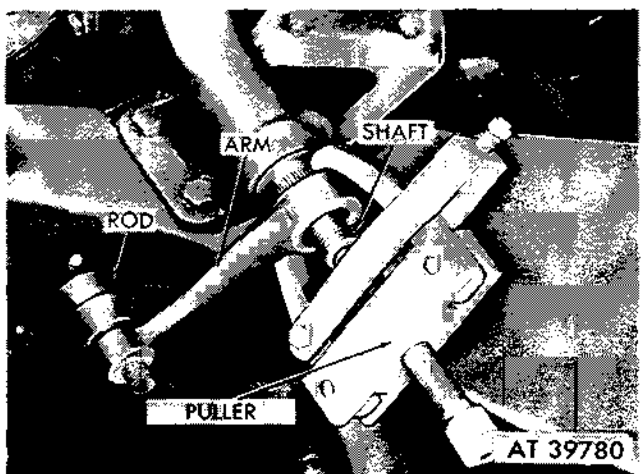


Figure 2-351. Remove Pitman arm using puller.

2-162. Idler Arm Rod

a. *Removal.*

(1) Remove cotter pin and nut securing idler arm rod to Pitman arm (fig. 2-350). Remove idler arm rod ball stud from Pitman arm with suitable puller.

(2) Remove cotter pin and nut securing left tie rod to idler arm rod (fig. 2-352). Remove tie-rod ball stud from idler arm rod.

(3) Remove cotter pin and nut securing right tie rod to idler arm rod (fig. 2-353). Remove tie-rod ball stud from idler arm rod.

(4) Remove three nuts and bolts securing idler arm bracket to frame (fig. 2-353).

(5) Unscrew (clockwise) idler arm bracket from idler arm. Unscrew (clockwise) idler arm from idler arm rod (M151, M151A1, M151A1C and M718 only) (para 2-163).

(6) Remove idler arm rod (M151, M151A1, M151A1C and M718) or link and idler assembly (M151A2, M825, and M718A1).

WARNING

Do not use hammer on tie-rod ends.

b. *Installation.* Install idler arm rod (M151, M151A1, M151A1C and M718) or link and idler assembly (M151A2, M825, and M718A1) by reversing removal operations. Before installation, inspect all seals.

NOTE

If replacement of seals is necessary replace with new lube-for-life linkage assembly.

Torque ball stud nuts to 35-45 lb-ft. After completing installation, adjust toe-in (para 2-150).

2-163. Idler arm bracket, idler arm, and idler arm bushings (M151, M151A1, M151A1C, and M718)

a. *Removal.*

(1) Remove three bolts and nuts securing idler arm bracket to frame (see fig. 2-353).

(2) Turn idler arm bracket and bushing clockwise (facing idler arm) to remove from idler arm (see fig. 2-354).

(3) Turn idler arm clockwise to remove from the idler arm rod assembly (see fig. 2-354). Remove and inspect seals. Remove lubrication fittings.

(4) Idler arm bushings at both ends of idler arm have R. H. outside threads. Remove and inspect bushings.

NOTE

To assemble idler arm in rod assembly, install bushing assembly, then turn idler arm in until all threads are completely engaged. Back, off one and one-half turns and place in correct position. Follow same procedure to assemble bracket to idler arm.

NOTE

If replacement of seals or bushings is necessary replace with new lube-for-life linkage assembly.

b. *Installation.* Install idler arm bracket, idler arm, and idler arm bushing by reversing removal operations.

NOTE

Lubrication fittings must be removed to torque idler arm to bracket and idler arm to idler arm rod. At installation, torque attaching parts to the values shown:

Idler arm bracket to frame nut (all models) (3 / 8-24) 25-35 lb-ft.

Idler arm bushing to idler arm rod (M151, M151A1, M151A1C and M718) (special) 100-110 lb-ft.

Idler arm bushing to idler arm bracket (M151, M151A1, M151A1C and (M718) (special) 100-110 bl-ft.

2-164. Tie Rod End Assemblies

a. General. Each tie rod with end assemblies has a right hand thread end and a left hand thread end. The ends are threaded into an adjusting sleeve onto which are fitted two clamps which serve to lock any adjustment made. The procedure for removal of all rod end assemblies are the same.

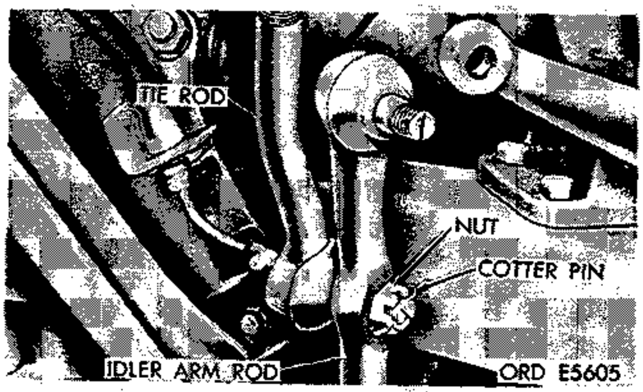


Figure 2-352. Remove left tie rod from idler arm rod.

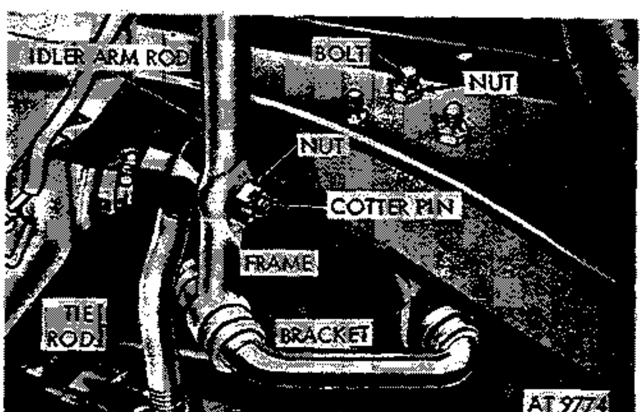


Figure 2-353. Remove right tie rod from idler arm rod.

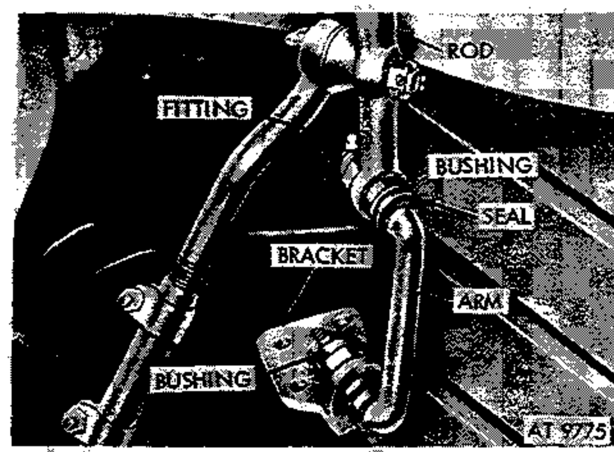


Figure 2-354. Remove idler arm bracket and idler arm (M151, M151A1, M151A1C and M718).

b. Removal.

(1) Remove cotter pin and nut securing tie rod end stud to steering spindle arm (fig. 2-355).

(2) Separate tie rod end form steering arm using suitable puller.

c. Installation. Install tie rod assembly by reversing removal operations. Torque the following attaching parts to the value shown: Steering spindle arm to tie rod assembly (½-20) 35-45 lb-ft.

NOTE

Before installation, inspect all seals and if replacement is necessary replace with new lube-for-life linkage assembly. Adjust toe-in (para 2-150).

2-165. Steering Wheel

a. Removal.

(1) Remove horn switch assembly (para 2-117).

(2) Remove steering wheel shaft nut (fig. 2-356).

(3) Use puller (FSN 5120-707-6223) and remove steering wheel (fig. 2-357).

b. Installation. Install steering wheel by reversing removal operations. Torque the steering wheel shaft nut to 25-35 lb-ft. and stake securely in place.

Section XXIII. BRAKE SYSTEM

2-166. Description and Data

a. Parking Brake. The parking brake is a transmission drum type with an external contracting band. The brake is actuated through linage from a lever mounted on the left side of the transfer case extending into the driver's compartment. The brake has 300 degrees of effective lining contact, in either forward or reverse braking. The lining is molded material riveted to a steel band. Two adjusting nuts and screws are provided for band alinement. A nut with integral detent is provided for brake adjustment. The brake drum is cast iron with an integral hub and is mounted on the rear end of the transmission output shaft. The parking brake, when applied, prevents the transmission output shaft from turning. On later model vehicles, and Orscheln-style parking brake lever provides a rotary-adjust feature in the handle to control the degree of tension on the brake band.

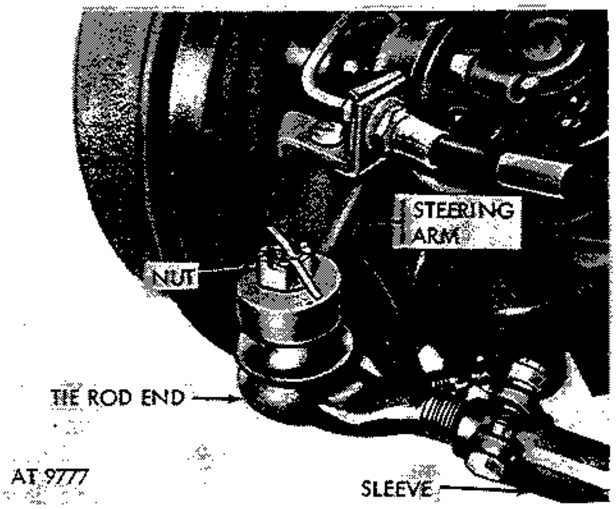


Figure 2-355. Remove tie-rod end.

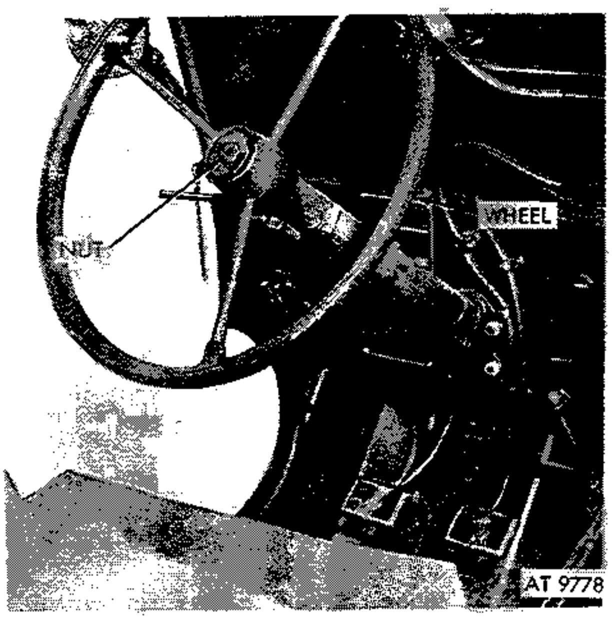


Figure 2-356. Remove steering wheel shaft nut.

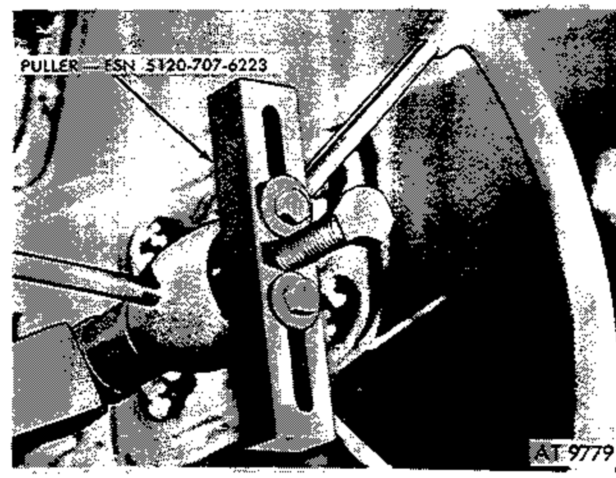


Figure 2-357. Remove steering wheel.

b. Service Brakes. The sevice brakes are of the hydraulic type with full braking action at all four wheels. They are fully energized in forward and reverse. Brakeshoes are full floating and self-centering. A reservoir and cylinder-type master cylinder is mounted in the vehicle at the cowl. The brake pedal is a suspended type and is mechanically connected to the master cylinder. Each brake has one double piston wheel cylinder located near the top of the backing plate. The upper ends of the two brakeshoes are held against the pistons by a retracting spring attached from the brakeshoe webs to the anchor pin. The lower ends of the shoes are connected and held against and adjustable link by a helical tension spring. The adjustable link is an adjusting screw threaded into a pivot nut. The outer ends of the adjusting screw and pivot nut are slotted to engage the web of the brakeshoes. The spring is connected from one shoe web to the other and crosses over the notched head of the adjusting screw. This spring bears against one of the notches in the head and acts as a detent for the adjusting screw. An opening with cover is provided in the backing plate for brake adjustment. Molded brake linings are riveted to the shoes. The brake mechanism is protected from dirt and mud by the channeled form of the outer edge of the backing plate into which the brake drum recesses when assembled. The wheel cylinder ends are sealed with rubber boots to keep out dust and moisture.

c. Data. Refer to table 1-1 for description and data.

2-167. Parking Brake Adjustment

a. Remove transmission tunnel cover.

b. Move parking brake lever forward to fully released position (fig. 2-358).

c. Loosen jam nuts on band-alining screws and adjusting nut alternately, using feeler gage until a clearance of 0.010 inch is obtained between brake lining and drum. Tighten jam nut (fig. 2-358). Place vehicle on incline and test parking brake. Install cover plate.

d. On later model vehicles parking brake adjustment can be made by following the procedure below:

(1) Park the vehicle on an incline, preferably a 40 percent slope (with highway load).

(2) Turn adjusting knob on top of lever counterclockwise to remove adjustment.

(3) Put handle in vertical engaged position and turn adjusting knob clockwise as tight as possible with one hand.

(4) Release handle to horizontal position and turn adjusting knob two full turns clockwise.

CAUTION

Do not turn adjusting knob to eliminate noise caused by vibration of parking brake linkage.

2-168. Parking Brake Band

a. Removal.

(1) Remove transmission cover plate.

(2) Unhook and remove parking brake retracting spring (fig. 358)

NOTE

Later model vehicles do not come equipped with retracting springs.

(3) Remove two screw and lockwasher assemblies securing band-alining screw support assembly to transfer (fig. 2-359).

(4) Remove band-adjusting nut (fig. 2-358).

(5) Remove cotter pin and washer and two bolts and lockwashers securing band to anchor support plates and lever plates (fig. 2-360).

(6) Withdraw band and lining from parking brake drum (fig. 2-360).

b. Installation. Install parking brake band by reversing removal operations. Torque the following attaching parts to the values shown:

Parking brake band alining-screw support to transfer bolt. (3 / 16-18) 8-10 lb-ft.

Parking brake anchor bracket to transfer case bolt (7 / 16-14) 40-44 lb-ft.

After installation, adjust parking brake (para 2-167).

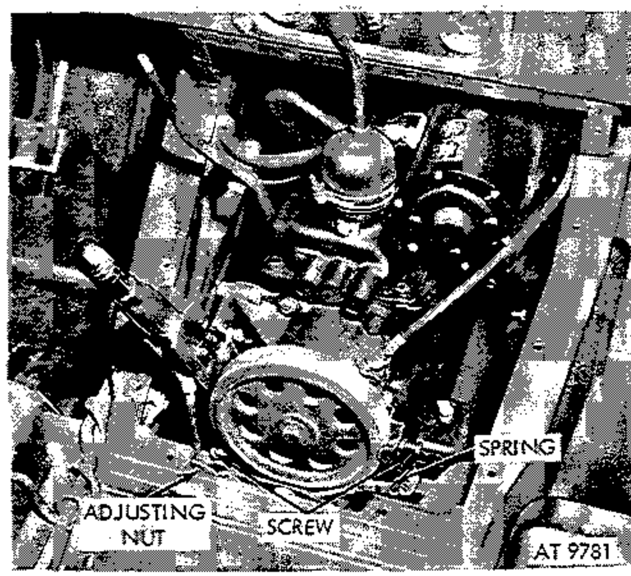


Figure 2-358. Parking brake adjustment.

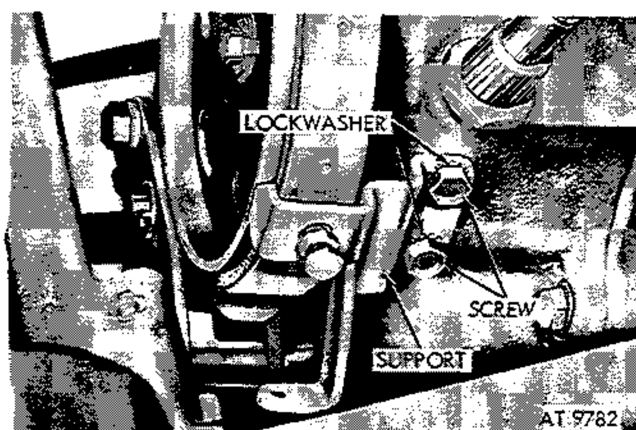


Figure 2-359. Remove Band-alining screw support assembly from transfer.

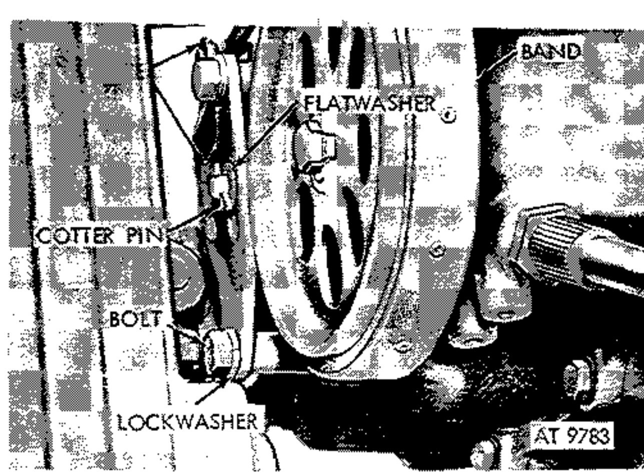


Figure 2-360. Remove band and lining from parking brakedrum.

2-169. Parking Brakedrum.

a. Removal.

(1) Remove parking brake band (para 2-168).

(2) Remove tab washer, bolt and flat washer securing parking brakedrum to transmission output shaft (fig. 2-361).

b. Installation. Install parking brakedrum by reversing removal operations. When installing new drum, use new lining. After installation adjust brake (para 2-167). Torque the following attaching parts to the values shown:

Parking brakedrum to transmission output shaft bolt 7 / 16-20	60-65 lb-ft.
Parking brake handle bracket to transmission case bolt (3 / 8-16)	12-15 lb-ft.

2-170. Parking Brake Linkage.

a. Removal. To remove a damaged part, disconnect at points indicated in appropriate figure and remove.

(1) Disconnect handle assembly (fig. 2-362).

(2) Disconnect band-alining screw support assembly (fig. 2-363).

(3) Remove linkage connector rod or link (fig. 2-364).

(4) Remove anchor support assembly (fig. 2-365).

2-171. Service Brake

a. General. Perform the following operations as required;

(1) Maintain fluid level in master cylinder at bottom of threads.

(2) Keep vent hole in master cylinder filler plug open.

(3) Make sure all brake line connections are securely tightened and leakproof.

(4) Replace scored brakedrums.

(5) Replace worn or oil saturated brakeshoe and lining assemblies (para 2-173).

(6) Adjust service brakes (*b* below) when pedal pad travel is within two inches of floor pan when brake pedal is in applied position.

b. Brake Pedal Free Travel Adjustment. Brake pedal free travel of ¼ inch must be maintained. To check brake pedal free travel, depress brake pedal by hand until resistance is encountered. The resistance indicates engagement of the push rod in the master cylinder. Brake pedal free travel is measured from this point to the position of the brake pedal at rest. To adjust, loosen locknut on eccentric adjusting bolt (fig. 2-366). Turn eccentric bolt until brake pedal free travel is ¼ inch. Torque eccentric bolt locknut to 10-15 lb-ft. and again check distance of free travel.

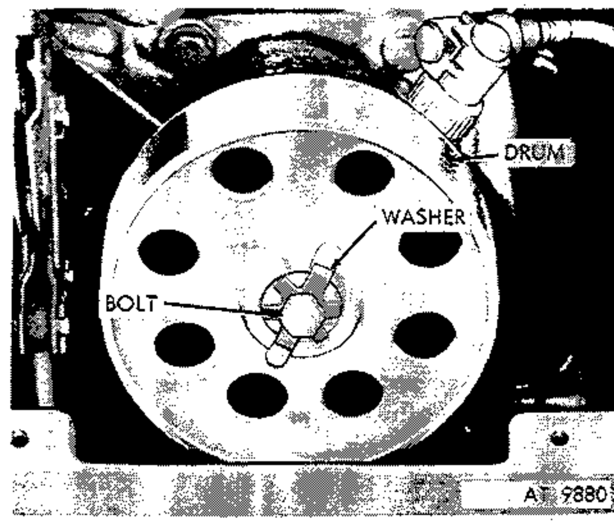


Figure 2-361. Remove parking brakedrum.

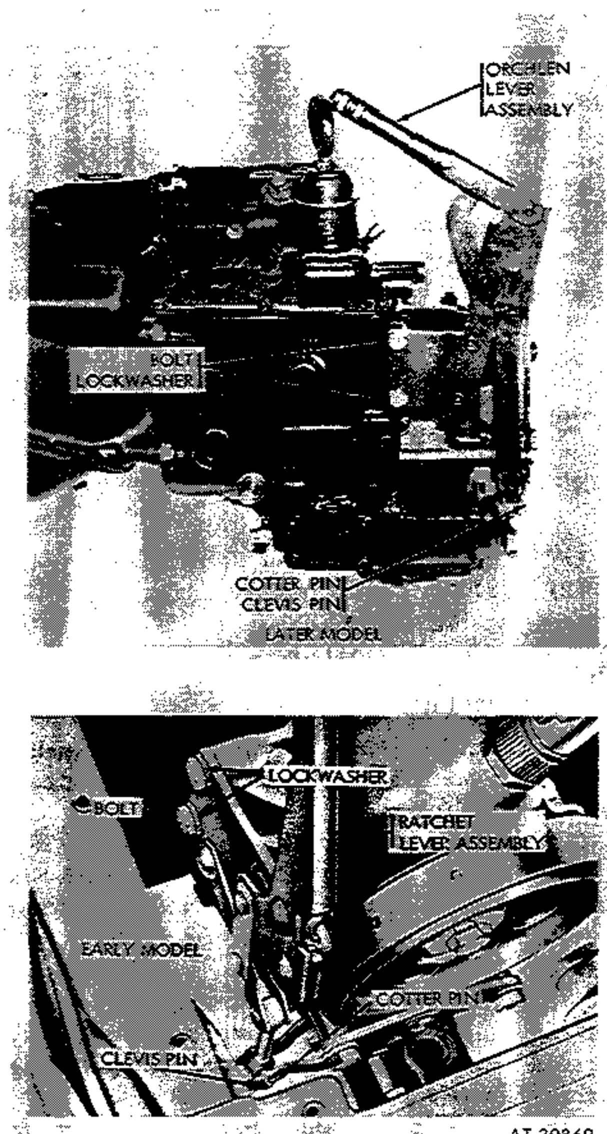


Figure 2-362. Lever assembly—disconnect points.

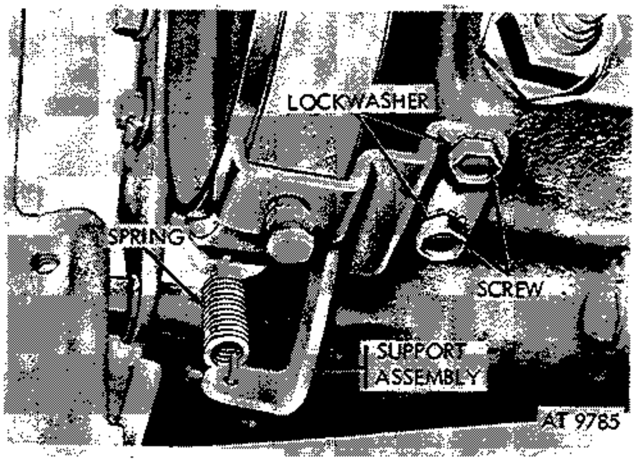


Figure 2-363. Band-alining screw support assembly.

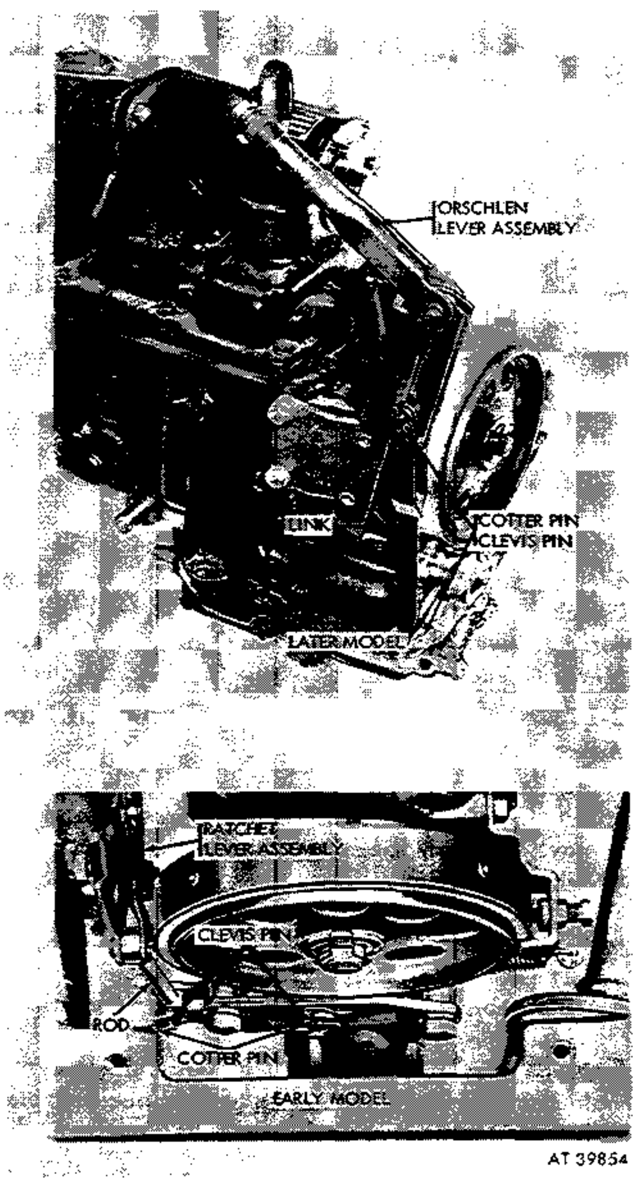


Figure 2-364. Linkage connector rod or link—disconnect points.

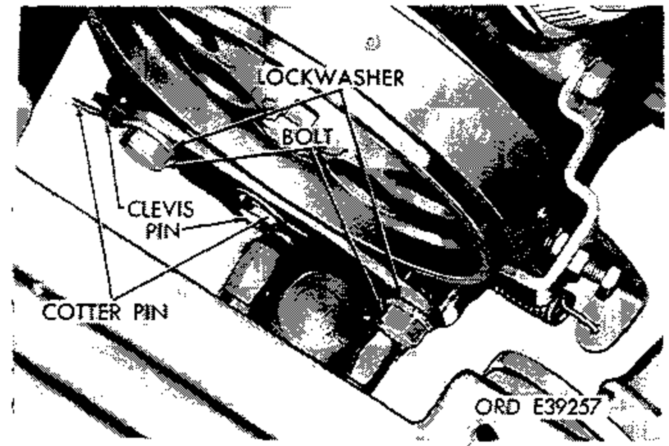


Figure 2-365. Anchor support assembly—disconnect points.

c. Brakeshoe Adjustment.

(1) Jack up wheel until tire clears ground.

(2) Pry cover from adjusting hole in backing plate (fig. 2-367).

NOTE

Remove only the cover toward front of vehicle for access to brake adjustment star wheel. The second hole in the backing plates makes possible backing plate interchangeability, right to left.

(3) Insert suitable adjusting tool through opening and engage star wheel of adjusting screw assembly. Rotate adjusting screw until wheel cannot be rotated with one hand. Back adjusting screw off 11 clicks. Install adjusting hole cover.

(4) Repeat brake adjustment on remaining wheels. Check fluid level in master cylinder, and add if required. Road test vehicle to determine that braking is equal at all wheels.

2-172. Bleeding Brake System

Bleed brake system by following operations (1) through (4) below. Bleed complete brake system. Bleeding should be started at the brake farthest away from the master cylinder.

(1) Check hydraulic fluid level in master cylinder and fill with proper fluid until fluid reaches bottom of thread level (fig. 2-368).

(2) Clean bleeder screw. Attach a bleeder hose to the screw and submerge lower end of hose in hydraulic fluid in a transparent bottle (fig. 2-369).

WARNING

Discard contaminated brake fluid.

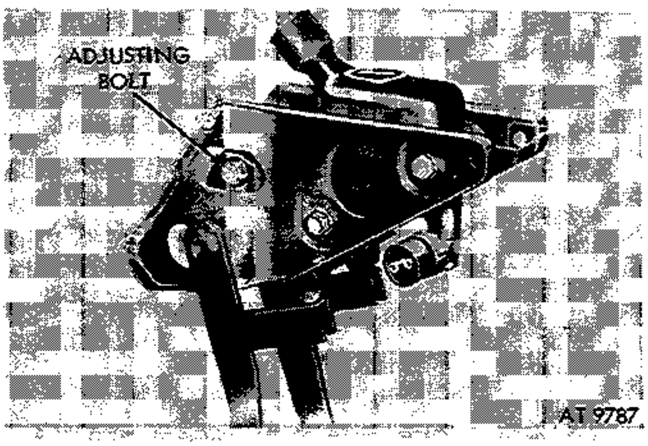


Figure 2-366. Position of eccentric adjusting bolt.

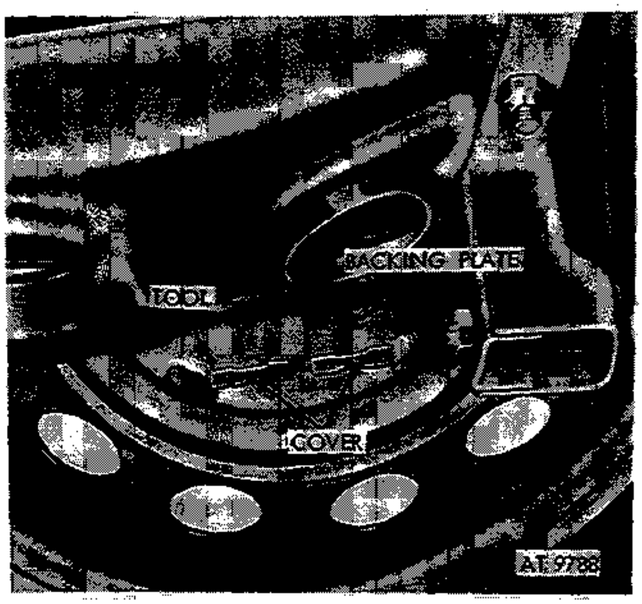


Figure 2-367. Backing plate adjusting hole cover.

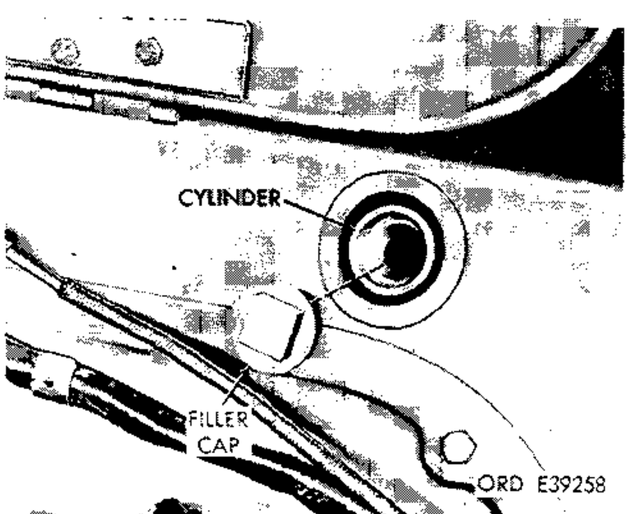


Figure 2-368. Check hydraulic fuel level in master cylinder.

Figure 2-369. Attach bleeder hose.

(3) Unscrew bleeder screw one-half turn. Depress brake pedal by hand with slow even pressure and allow pedal to slowly return to released position. Continue to pump pedal slowly until no air bubbles appear from end of tube.

NOTE

Two men are necessary to do this operation. Do not allow fluid in master cylinder to reach a level low enough to pump air into the system.

(4) Depress pedal and retain it in the depressed position while tightening bleeder screw. Check fluid level in master cylinder and fill to correct level with proper hydraulic fluid after bleeding each wheel. Refer to lubrication chart.

2-173. Service Brakedrum and Shoe and Lining Assembly

a. *Removal.*

(1) Jack up wheel until tire clears ground and remove five nuts securing wheel and tire assembly to wheel spindle.

(2) Remove brakedrum (fig. 2-310).

NOTE

It may be necessary to retract shoe assemblies by backing off the brake adjusting screw.

(3) Insert suitable tool in conical brakeshoe holddown spring. Push spring toward backing plate and force to one side until free of holddown anchor (fig. 2-370).

(4) Unhook and remove shoe retracting springs from anchor pin and brakeshoes (fig. 2-370).

(5) Remove both brakeshoes with adjusting screw assembly and adjusting spring intact from backing plate (fig. 2-371). Lift off entire assembly.

(6) Remove brakeshoe adjusting screw assembly and spring from brake shoes (fig. 2-371).

b. Installation. Install service brakedrum and shoe and lining assembly by reversing removal operations. Adjust brakes (para 2-171) after installation.

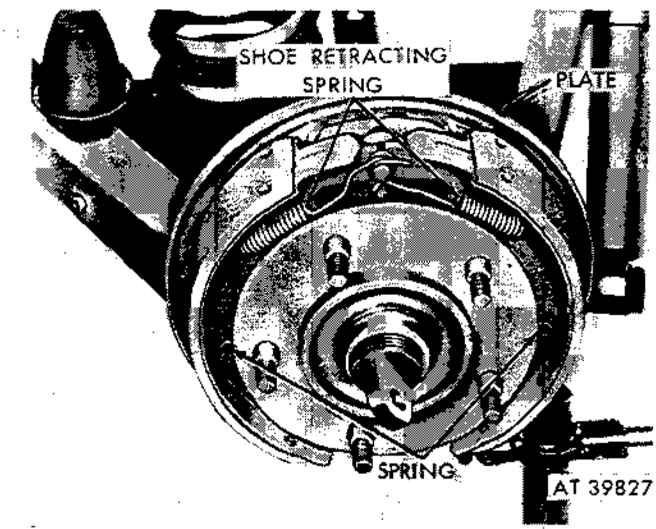


Figure 2-370. Remove brakeshoe holddown and retracting springs.

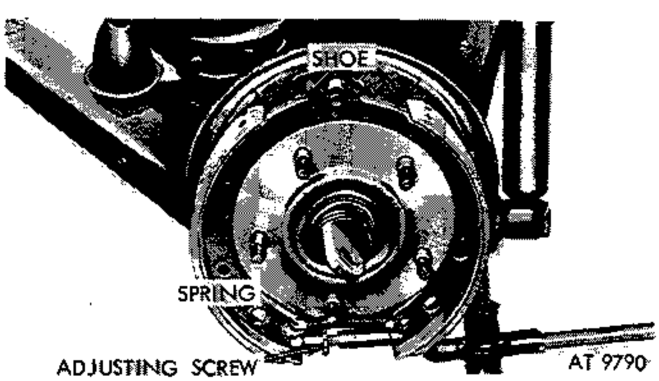


Figure 2-371. Remove brakeshoes.

2-174. Wheel Cylinder Assembly

a. Removal.

(1) Jack up wheel until tire clears ground and remove five nuts securing the wheel and tire clears ground and remove five nuts securing the wheel and tire assembly to the spindle.

(2) Remove brakedrum (fig. 2-310).

NOTE

It may be necessary to retract shoe assemblies by backing off the brake adjusting screw.

(3) Disconnect hydraulic brake line fitting from wheel cylinder. Remove bleeder valve (fig. 2-372).

(4) Remove brakeshoe assemblies (para 2-173).

(5) Remove two screw and lockwasher assemblies securing wheel cylinder assembly to backing plate (fig. 2-372).

b. Installation. Install wheel cylinder assembly by reversing removal operations. Torque the wheel cylinder to backing plate mounting bolts to 8-10 lb-ft.

2-175. Master Cylinder

a. Removal.

(1) Separate the connector at stoplight switch, located under dash panel (fig. 2-373).

(2) Disconnect brake line fitting from master cylinder (fig. 2-373).

(3) Remove nut and flat washer and lockwasher securing clutch lever to clutch lever pedal shaft (fig. 2-374).

(4) Remove two bolts and lockwashers securing master cylinder bracket to bracket on firewall under dash panel (fig. 2-375).

(5) Remove four bolts and lockwashers securing master cylinder, bracket and pedal assembly to firewall and remove assembly (fig. 2-376).

(6) Remove adjusting eccentric bolts, nut, flat washer and two bushings from brake pedal and push rod. Remove two bolts and lock washers securing master cylinder to bracket (fig. 2-377).

b. Installation. Refer to paragraph 2-.71 .or brake pedal free travel adjustment. Install master cylinder by reversing removal operations.
After installation, fill master cylinder. Torque the following attaching parts to the values shown:

Master cylinder bracket mounting bolt (3/8-24)	17-18.5 lb-ft.
Master cylinder bracket to body mounting bolt (5/16-24)	8-10 lb-ft.
Master cylinder to brake pedal connecting screw (3/8-24)	24-26 lb-ft.
Master cylinder outlet fitting (1/2-20)	20-25 lb-ft.

2-176. Brake Lines, Fittings and Hoses

a. Removal. Refer to figure 2-378.

(1) Unscrew connector fitting from hydraulic line at hose clip bracket.

(2) Slip clip off hose fitting.

(3) Pull hose out of bracket. Disconnect opposite end of line to be removed from tee or backing plate.

b. Installation. Install brake lines, fittings, and hoses by reversing removal operations.

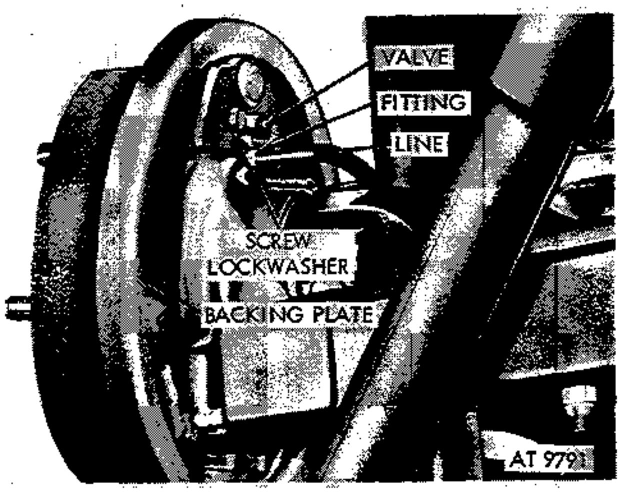


Figure 2-372. Remove wheel cylinder.

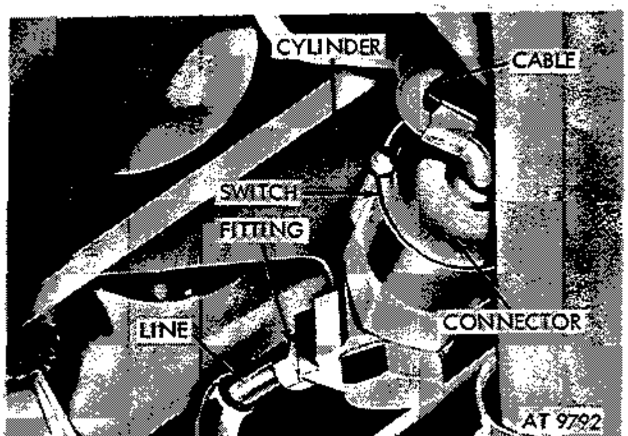


Figure 2-373. Separate connector at stoplight switch and disconnect fitting.

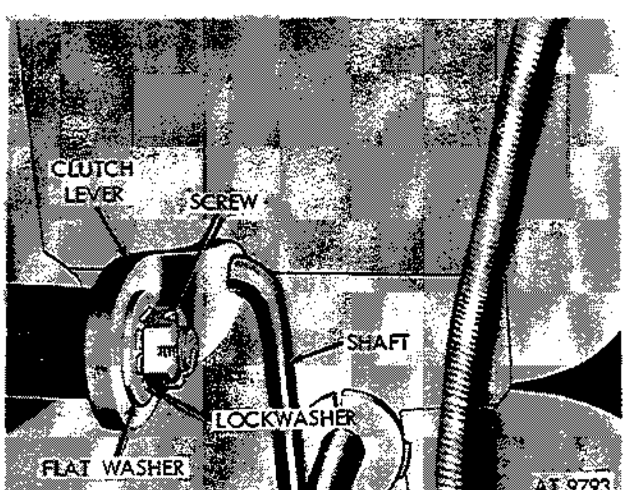


Figure 2-374. Remove clutch lever from clutch lever shaft.

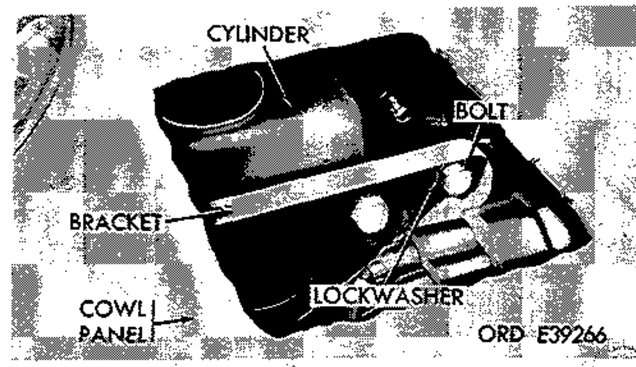


Figure 2-375. Disconnect master cylinder bracket from firewall.

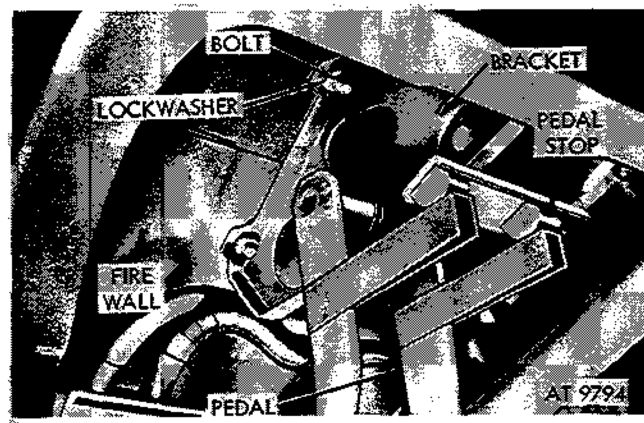


Figure 2-376. Disconnect pedal assembly from firewall.

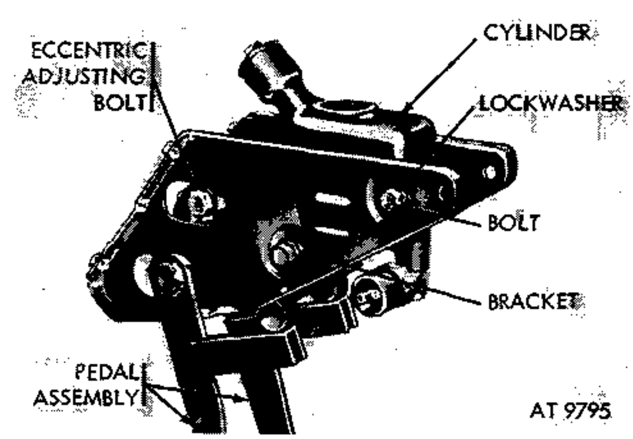


Figure 2-377. Remove master cylinder from pedal assembly.

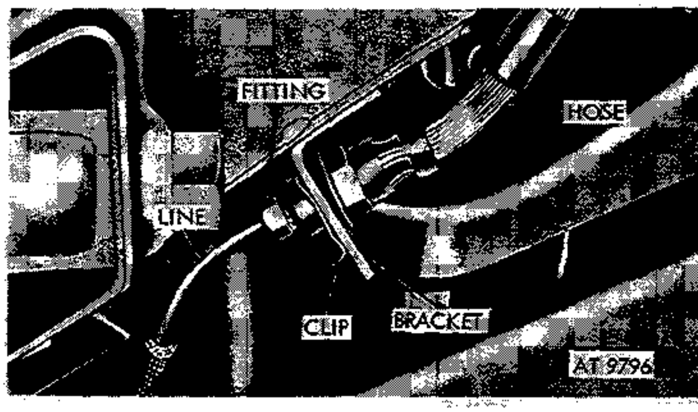


Figure 2-378. Brake lines, fittings and hose removal.

Section XXIV. WHEELS AND TIRES

2-177. Description and Data

a. *Description.* Late model vehicles are equipped with four steel wheels of a safety-rim drop-center type, and one spare. Each wheel is secured to the wheel spindle flange by five nuts. All wheel retaining nuts have right hand threads and therefore are interchangeable from left to right sides on the vehicles. Tires are low pressure type, cross-country nondirectional tread design, size 7.00 x 16, 4-ply with a 6-ply rating.

NOTE

Earlier model vehicles came equipped with case magnesium wheels containing oval holes instead of the later round holes. It is not recommended that mixed magnesium-steel wheels be installed.

b. *Data.* Refer to table 1-1 for description and data.

2-178. Maintenance

a. *Wheels.* Inspect all wheels at regular intervals for bent or cracked and worn or elongated mounting stud holes. Pay particular attention to edges of rims and mounting stud holes. Inspect mounting studs and nuts for worn or stripped threads. Replace any defective wheel or wheel nut immediately.

b. *Tires.* Inspect all tires and check pressures daily.

(1) Replace any tire with noticable cut on tread or side wall. Return tire to support maintenance unit for repair. If wear is uneven check toe-in adjustment (para 2-150). If incorrect toe-in is not the cause, report to support maintenance personnel.

(2) Check pressures when tires are cold. Dismount any tire showing unusual pressure loss and examine tire and tube for cause. Replace tube or tire as necessary.

(3) Inflate tires to pressure designated on vehicle data plate. Unequal pressures will affect steering and braking adversely. Underinflated tires are easily damaged. Install all valve caps to help prevent air loss.

c. *Tire Rotation.* To maintain equal wear, rotate tires in accordance with tire rotation plan shown in figure 2-379 at intervals of approximately 2000 miles.

d. *Tire or Tube Replacement.* Make certain that replacement tire is of same design, size, and tread as tires on vehicle. Tires of different design or tread sometimes have different rolling diameters, causing excessive scuffing in use. Refer to TM 9-2610-200-20 for care and maintenance of tires and tubes. Refer to TM 9-2320-218-10 for removal and installation of spare wheel and tire assembly.

Section XXV. BODY AND MISCELLANEOUS COMPONENTS

2-179. Description

a. *Body and Frame.* The body is of the unitized body and frame design. Body panels, reinforcement, braces, and underbody frame are welded to form an integral unit (fig. 2-380).

b. *Seats.* Two seats are provided in the front section of the body and a single two-passenger seat is provided in the rear section of the body. Seat frames are of a tubular steel, onto which are assembled formed wire-type springs. Seat cushion trim and seat back trim are made of foam rubber, vinyl, and burlap covered with a water-repellent canvas or impregnated nylon material. Seat trim can be removed or installed without use of any tools. A map compartment is incorporated into the seat back trim of both front seats. All seat assemblies are removable and the two front seats are adjustable fore and aft. The rear seat back can be folded forward onto the rear seat cushion. The rear seat mounting bars, extending from the seat ends, snap into clips on the body.

c. *Windshield and Windshield Wipers (M151, M151A1, M151A1C, and M718 Vehicles).* A hinged-type windshield is provided with two windshield wiper vacuum motors, wiper arms, and blades. The vacuum motors are driven by engine intake manifold vacuum and the vacuum pump mounted at right front of the engine (fig. 2-381) and controlled by the vacuum valve which is mounted on the dash panel directly to the right of the steering column. In case of vacuum motor failure, the wipers can be hand-operated. Defroster passages are incorporated into the windshield and cowl.

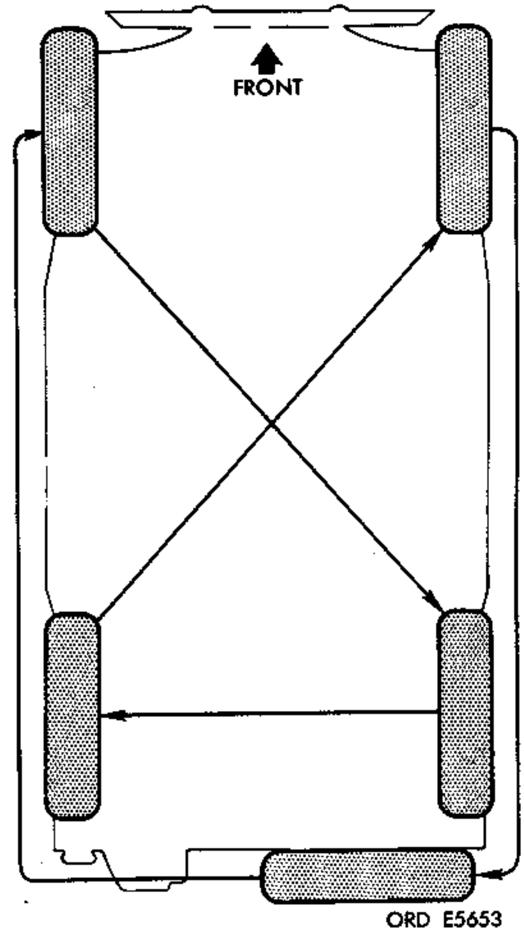


Figure 2-379. Tire rotation plan.

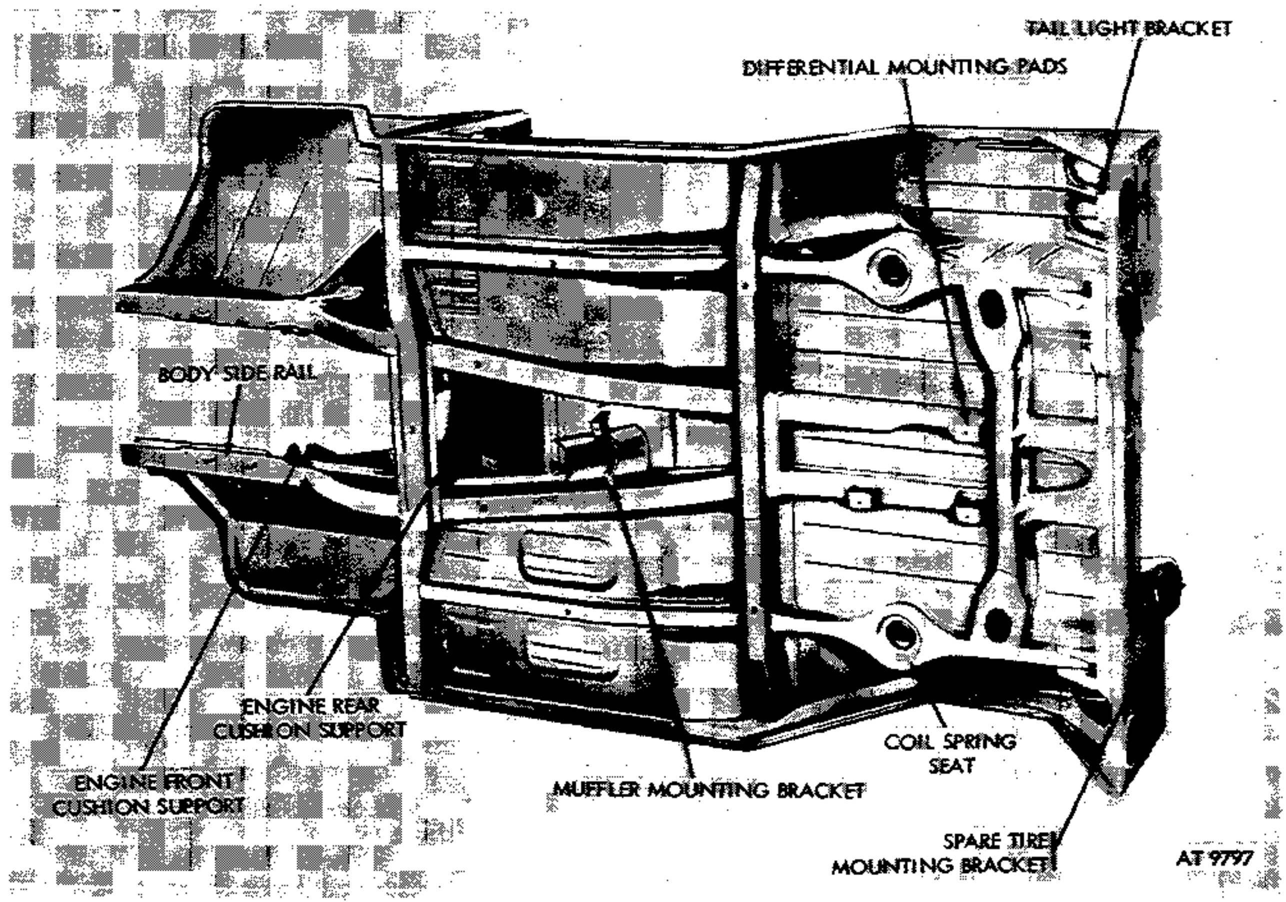


Figure 2-380. Unitized body and frame.

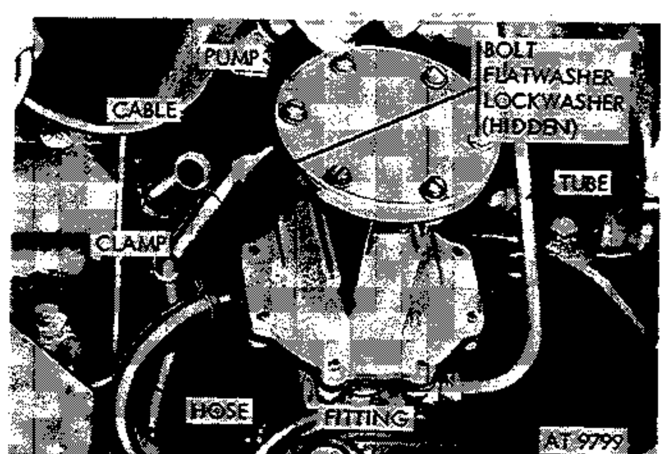


Figure 2-381. Remove vacuum pump (M151, M151A1, M151A1C, and M718 Vehicles).

d. Windshield, Windshield Wipers and Washer (M151A2, M825, and M718A1 vehicles). The hinged one-piece glass windshield assembly (fig. 2-382) can be folded forward horizontal to the hood. The electrical motor and switch assembly (fig. 2-250) for the windshield wipers in mounted to the lower part of the windshield assembly just in front of the driver's seat. The switch (control knob) has three positions, OFF, LO, and HI. Turning the knob to either the high or low position actuates the two-speed motor which controls the two wiper blades on the windshield. The wipers move in a wide sweeping pattern across the windshield. A manually operated handle attached to the dash underside (fig. 2-383) is used to actuate the windshield washer. The washer reservoir is mounted on the right fender under the hood area. Openings in the lower sill are provided for defrosting the windshield.

e. Front Bumper and Bumperettes. The front bumper is bolted to the body frame inner side rails and provides additional rigidity to the body front section.

f. Miscellaneous Accessories (M151, M151A1, M151A1C, and M718 Vehicles). The vehicle is equipped with a rear view mirror mounted on the left side cowl panel. Reflectors are provided at the rear panel and on earlier models, on the sides in back of the rear wheel housings. Drain openings are provided in the passenger compartment floor panel for drainage. Protection against weather is provided by means of a windshield, canvas top, rear curtain. The side curtains and doors are a special purpose kit. Metallic folding used to form doors.

Canvas top bows are of a tubular construction and are folded rearward for a storage. They are held to the body by retaining straps. Top bows are removable. The canvas top may be stored under the rear passenger seat. The battery compartment is located under the front passenger seat. The tool compartment is located directly behind the battery compartment. An additional tool box is located in the right rear of the M718 and M718A1 vehicles.

g. Miscellaneous Accessories (M151A2, M825, and M718A1 Vehicles). In addition to being equipped with an adjustable rear view mirror at the driver's side of the windshield, M151A2 series vehicles have an "inside" rear view mirror mounted at top center of the windshield assembly. This ball joint mirror is also adjustable. Stick-on reflectors are affixed on both sides at the rear of the vehicle and on the spare tire retainer. Refer to paragraph 2-179 for description of other miscellaneous accessories on M151A2 series vehicles.

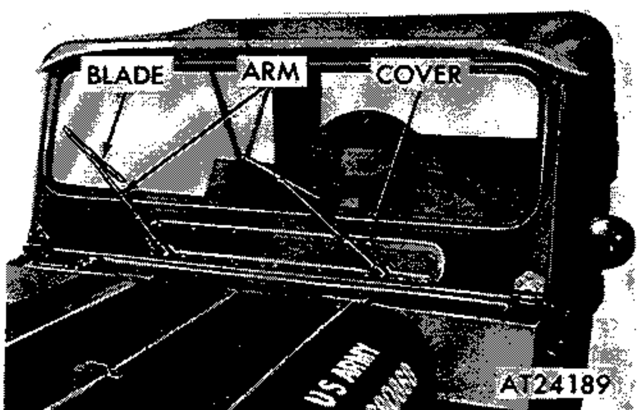


Figure 2-382. Windshield assembly on M151A2, M825, and M718A1 vehicles.

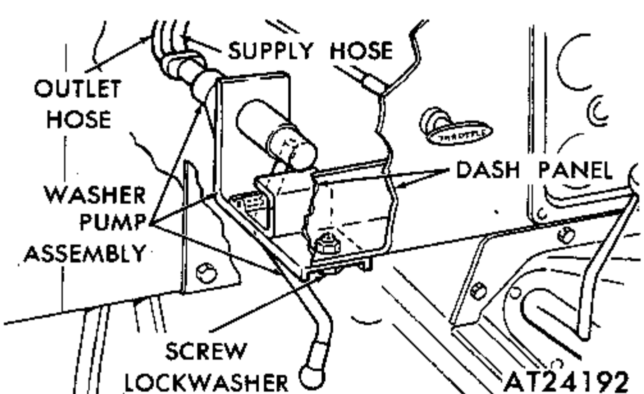


Figure 2-383. Removing or installing washer pump (M151A2, M825, and M718A1 vehicles).

2-180. Rear View Mirror (M151, M151A1, M151A1C, and M718 Vehicles).

a. General. The rear view mirror assembly includes a mirror with ball joint, an extension arm, mirror main arm bracket wind hinge, and mirror mounting bracket. The mirror assembly is attached to the vehicle body by two bolts which also attach the windshield hinge to the body cowl. The entire mirror assembly can be disconnected from the vehicle body by removing these two bolts (fig. 2-384).

b. Mirror Adjusting Points. The mirror has four adjusting points which are shown in figure 2-384.

(1) Ball joint mirror adjustment and ball joint friction adjusting screw.

(2) Mirror extension arm friction adjustment.

(3) Mirror universal friction adjustment.

(4) Mirror horizontal adjustment.

2-181. Rear View Mirrors (M151A2, M825, and M718A1 Vehicles).

a. General. M151A2, M825, and M718A1 vehicles have two rear view mirror assemblies. The left "outside" rear view mirror is essentially the same as one on earlier M151 models. The second "inside" rear view mirror and bracket assembly is secured by two screws and lock washers to top center of the windshield.

b. Mirror Adjusting Points. Refer to paragraph 2-180b for adjusting points to left "outside" rear view mirror.

c. Inside Rear View Mirror. The two screws securing the "inside" rear view mirror also secure the tie-down strap footman loop to the windshield.

2-182. Vacuum Pump (M151, M151A1, M151A1C, and M718 Vehicles Only)

a. Removal (fig. 2-381)

(1) Remove tube fitting outlet from vacuum pump.

Figure 2-384. Mirror adjustments (M151, M151A1, M151A1C, and M718 vehicles).

(2) Remove two bolts, flat washers and lock-washers securing vacuum pump and body ground cable to engine. Remove clamp securing rubber hose to pump inlet.

(3) Lift vacuum pump off engine. Remove and discard gasket.

b. Installation. Install vacuum pump by reversing removal operations (3) back through (1).

NOTE

Be sure to install new gasket.

2-183. Windshild Wiper Blade Replacment (M151, M151A1, M151A1C, and M718 Vehicles)

a. Removal. Lift wiper arm so blade clears windshield. Grasp inner end of blade and swing around one-half circle to unhook from slot in wiper arm (fig. 2-385).

b. Installation. Position new blade as shown in figure 2-385 with hook pointed inward. Hook into eye of wiper arm and swing through one-half circle and secure with hook pointed outward (fig. 2-386). Drop wiper onto windshield.

2-184. Windshield Wiper Blade Replacement on M151A2, M825, and M718A1 Vehicles

a. Removal. Lift wiper arm away from windshield so blade is completely off windshield (fig. 2-382). Grasp inner end of blade and remove nut and screw securing blade to windshield wiper arm. Remove wiper blade.

b. Installation. Position new blade into saddle of arm assembly and secure blade to arm with screw and nut. Do not bend saddle of arm too snugly into the blade. If arm is fitted too tightly in saddle, it will promote wiper arm chattering during operation.

2-185. Windshield Wiper Motor and Wiper Arms (M151, M151A1, M151A1C, and M718 Vehicles)

a. Removal.

(1) Remove rubber hoses at windshield wiper motor (fig. 2-387).

(2) Separate wiper arm from motor shaft by pulling apart with hand or suitable tool. Wiper arms should be parallel to manual operating levers on windshield wiper motor.

(3) Remove two screws and pull wiper motor from windshield (fig. 2-388).

b. Installation. Install windshield wiper motor by reversing removal operations.

2-186. Two-Speed Electrical Windshield Wiper Motor and Wiper Assembly (M151A2, M825, and M718A1 Vehicles)

a. Removal.

(1) Remove both wiper arm and blade assemblies (fig. 2-382).

(2) Remove 18 screws securing cover and gasket assembly (fig. 2-382).

(3) Remove two snap rings and spring washers retaining two pivot pins that secure connecting link (fig. 2-389).

(4) Drive two pivot pins out and remove bushing from each pin. Remove the connecting link (fig. 2-389).

(5) Remove two screws and lockwasher securing arm and pivot shaft assembly to its mounting bracket (fig. 2-389).

(6) Remove arm and pivot shaft assembly from vehicle.

(7) Remove the two screws and washers securing wiper motor and control switch assembly to inside of windshield panel.

(8) Remove two longer bolts and washers securing wiper motor and control switch assembly to operator's side of windshield panel. Remove windshield wiper motor and control switch assembly from vehicle (fig. 2-250).

b. Installation. To install windshield wiper motor and wiper assemblies to vehicle, reverse those removal procedures described in a above.

2-187. Windshield Wiper Control Valve (M151, M151A1, M151A1C, and M718 Vehicles Only)

a. Removal. Refer to figure 2-390.

(1) Pull rubber hoses from wiper control valve.

(2) Remove screws securing control valve.

(3) Remove control valve from dash panel.

b. Installation. Install windshield wiper control valve by reversing removal operations.

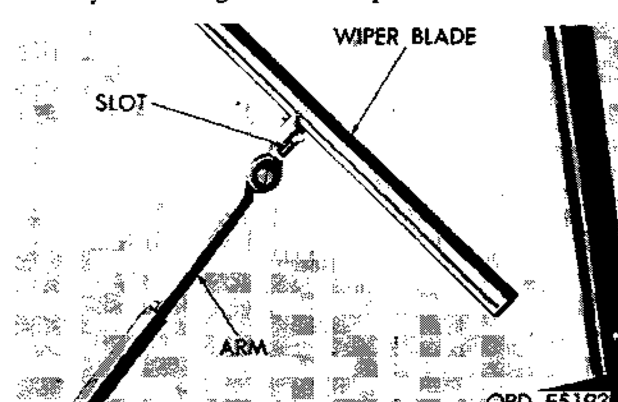


Figure 2-385. Unhook wiper blade from slot in wiper arm (M151, M151A1, M151A1C, and M718 vehicles).

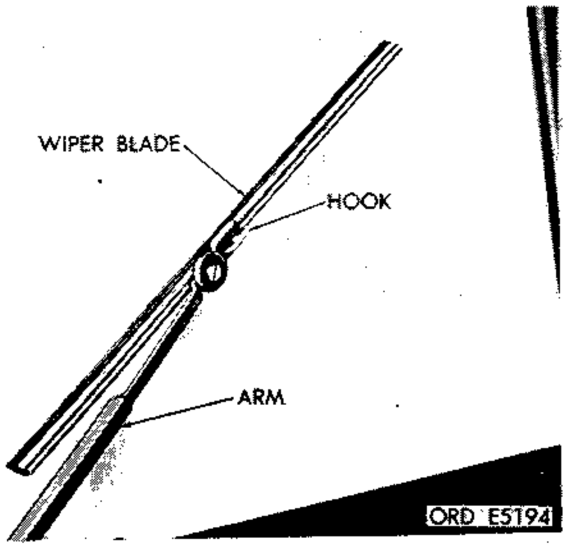


Figure 2-386. Position new blade with hook pointed outward (M151, M151A1, M151A1C, and M718 vehicles).

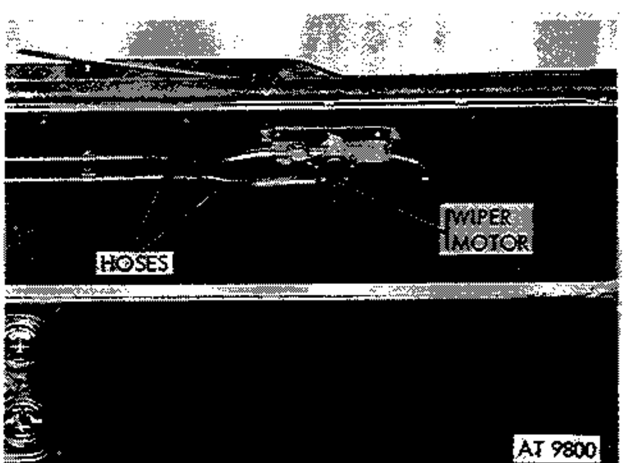


Figure 2-387. Remove rubber hoses at windshield wiper motor (M151, M151A1, M151A1C, and M718 vehicles).

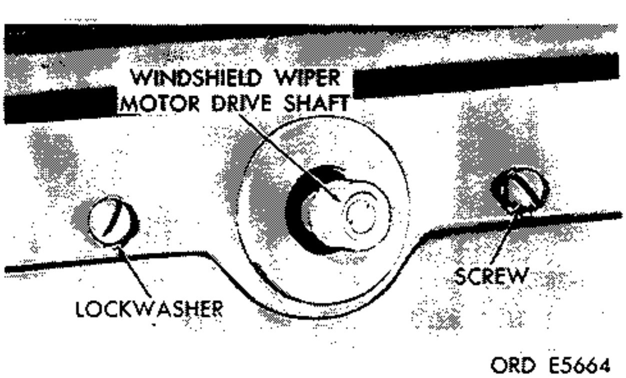


Figure 2-388. Remove windshield wiper motor (M151 M151A1, M151A1C, and M718 vehicles).

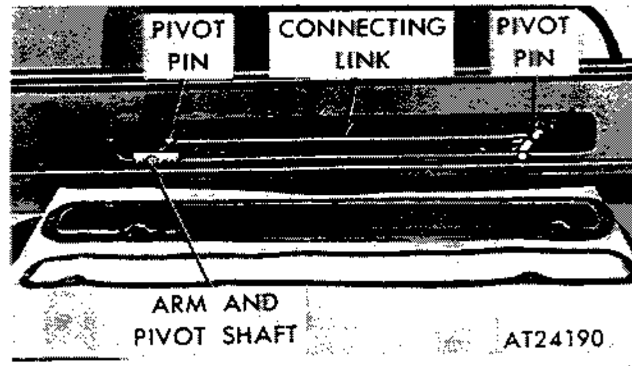


Figure 2-389. Removing or installing windshield wiper pivot shaft and connecting link (M151A2, M825, and M718A1 vehicles).

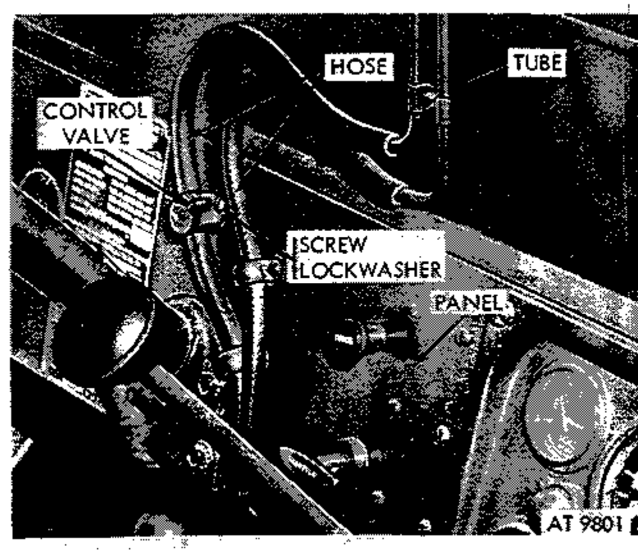


Figure 2-390. Remove windshield wiper control valve (M151, M151A1, M151A1C, and M718 vehicles).

NOTE

Exercise care in starting threads to prevent cross threading. Do not overtighten, and do not use a wrench to start threads. Replace entire hose assemblies and line or tube assemblies. Do not alter design of lines with assembled fittings by cutting, splicing or making temporary repairs.

2-188. Windshield Assembly

a. Removal.

(1) Remove canvas top (TM 9-2320-218-10).

(2) Disconnect vacuum hoses from vacuum tubes. Refer to figure 2-390 (M151, M151A1, M151A1C, and M718 vehicles only).

(3) Disconnect electrical connector and remove cable clamp at windshield wiper motor.

Refer to figure 2-250 (M151A2, M825, and M718A1 vehicles only).

(4) Remove pin and bolt from each side of windshield hinge (see fig. 2-391). Remove windshield assembly from vehicle (fig. 2-392).

b. Installation. Install windshield by reversing removal operations.

2-189. Windshield Washer Assembly (M151A2, M825, and M718A1 Vehicles).

a. Removal.

(1) Separate supply hose, cap, and strainer assembly from plastic reservoir tank.

(2) Remove three screws, three lockwashers and three flat washers securing reservoir to inside panel of right fender (fig. 2-393). Remove reservoir from vehicle.

(3) Pull supply hose out of retaining clip in engine compartment. Push its grommet out of mounting place in firewall, and pull hose through firewall from passenger side (fig. 2-247).

(4) Remove instrument cluster from dash panel as described in (17) and (18), paragraph 2-98 *b*. Reach through cluster dash opening and remove two clips from firewall.

(5) Pull supply hose out of clips and away from pump (fig. 2-383). Remove supply hose through instrument cluster opening.

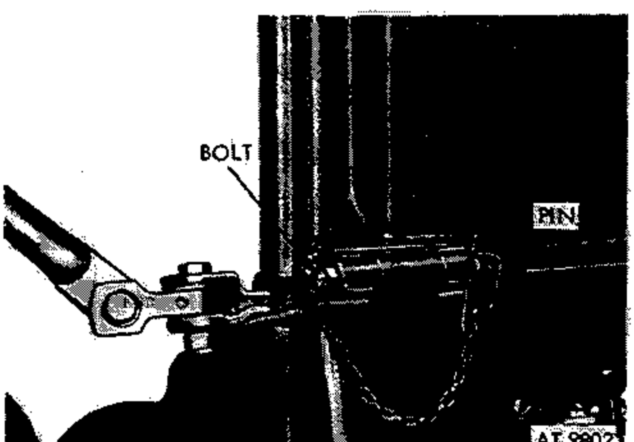


Figure 2-391. Remove pin and bolt from each side of windshield.

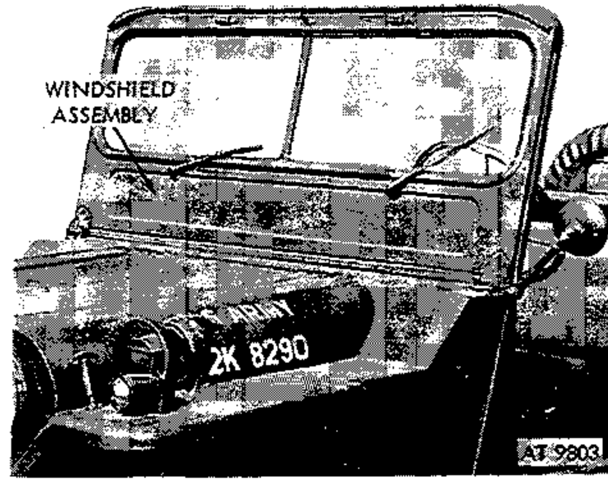


Figure 2-392. Remove windshield assembly.

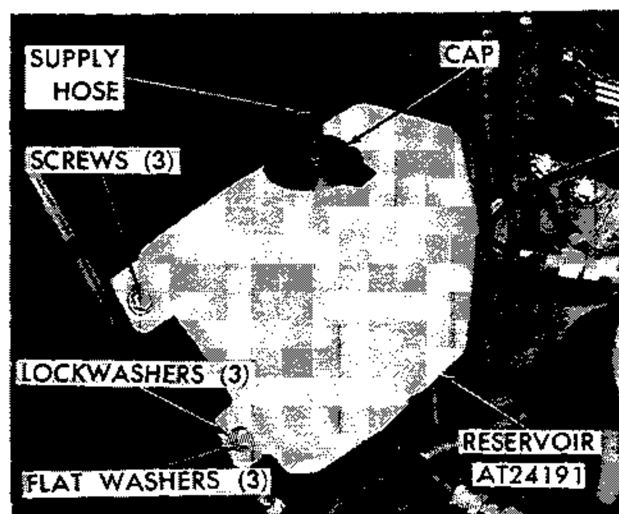


Figure 2-393. Removing or installing washer reservoir (M151A2, M825, and M718A1 vehicles).

(6) Detach washer outlet hose from washer pump (fig. 2-383). Pull outlet hose through firewall from engine compartment side.

(7) Pull outlet hose off pressure relief valve (fig. 2-248) and remove hose. If necessary, remove grommet for outlet hose from firewall.

(8) Disconnect inlet hose at jet nozzle (fig. 2-248). Separate inlet hose from the pressure relief valve.

(9) Unscrew and remove jet nozzle and its rubber washer from hood mounting place.

(10) Remove the screw and lockwasher securing washer pump and bracket assembly to underside of dash (fig. 2-383).

(11) Remove washer pump and bracket from vehicle.

b. Installation. To install washer pump assembly, washer lines, and reservoir to vehicle, reverse removal procedures in a above. Torque hardware to values indicated below:

Pump to dash panel bolts (5/8-20)	4-7 lb-ft.
Reservoir to fender bolts (5/8-20)	4-6 lb-ft.

2-190. Rear Reflex Reflector (M151, M151A1, M151A1C, and M718 Vehicles)

a. General. A total of four red reflex reflectors are attached to the earlier vehicle, two on the rear wheel housing assemblies, and two on the rear of the vehicle. Later models have two reflectors on the rear only.

b. Replacement. Each of the four reflectors is secured to the vehicle body with two screws and lockwashers (fig. 2-394).

NOTE

Side reflectors are not used on vehicles after serial No. 2K-3900.

2-191. Stick-On Reflectors (M151A2, M825, and M718A1 Vehicles)

a. General. M151A2, M825, and M718A1 vehicles use stick-on reflectors at rear and on the spare wheel (fig. 2-395).

b. Replacement.

(1) Make sure surface, where stick-on reflector is to be placed, is clean and smooth (fig. 2-396).

(2) Before placing reflector in position on vehicle, tear backing off stitch-on material.

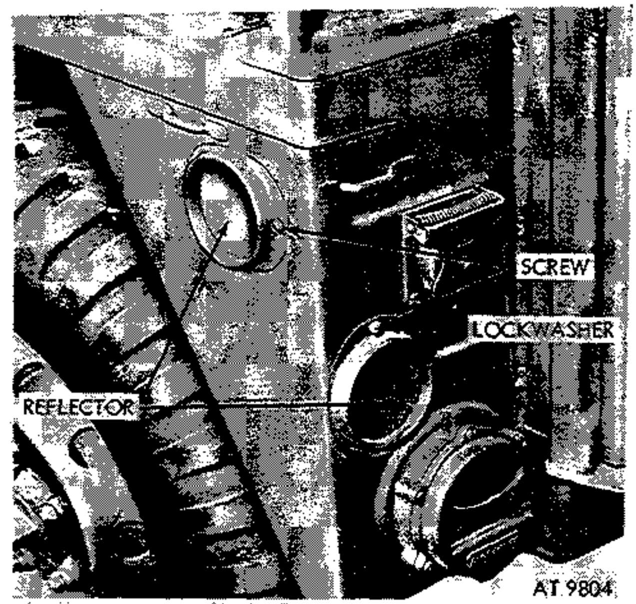


Figure 2-394. Remove reflex reflectors (M151, M151A1, M151A1C, and M718 vehicles).

Figure 2-395. Spare wheel reflector (M151A2, M825, and M718A1 vehicles).

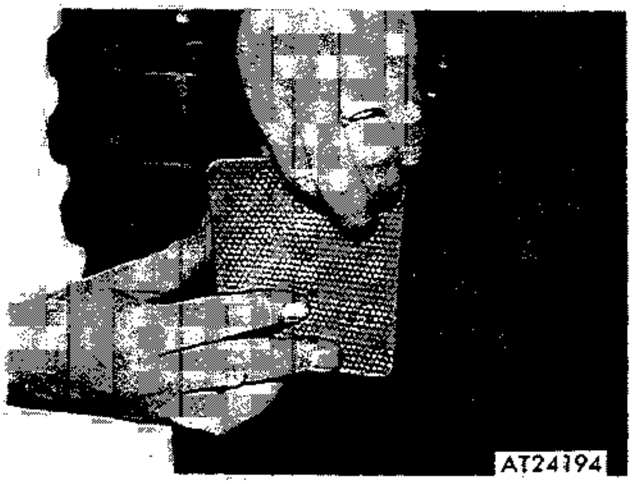


Figure 2-396. Removing or installing stick-on reflectors (M151A2, M825, and M718A1 vehicles).

(3) Smooth down stick-on reflector in place by rolling across it with hands so any air bubbles that might be forming underneath are worked out.

(4) Apply sealer (11614197) completely around edge of reflector (¼" off edge) as shown in figure 2-397.

(5) As illustrated in figure 2-395, the stick-on reflector for the spare wheel has a special configuration to match surface of the outside mounting plate.

2-192. Safety Handle Bar

a. General. On some vehicles a safety handle bar is provided inside the vehicle for the convenience of the front seat passenger. The safety handle bar assembly includes attaching parts consisting of two backing plates, two nuts, two screws and two washers.

b. Replacement. The safety handle bar is secured to the dash panel with two hexagon head capscrews, two nuts, two washers, and two backing plates (fig. 2-398).

2-193. Vehicular Data and Operating Instruction Plates

a. Location. Refer to figures 1-4 and 1-5.

b. Replacement. Plates are secured with cross recess head self tapping screws.

2-194. Brush Guard

a. Removal. Refer to paragraph 2-30.

b. Installation. Refer to paragraph 2-30.

2-195. Towing Pintle

a. Removal. Remove four hexagon head capscrews, nuts, and washers from pintle assembly (fig. 2-399) and remove towing pintle from rear of vehicle.

NOTE

M151A2 series vehicles have a safety chain bracket in combination with the towing pintle (fig. 2-400).

b. Installation. Refer to figure 2-399 for M151, M151A1, M151A1C, and M718 Vehicles, to figure 2-400 for installation on M151A2, M825, and M718A1 vehicles. Torque bolts (½-20) securing towing pintle assembly to 65-100 lb-ft.

2-196. Lifting Shackle and Bracket (M151, M151A1, M151A1C, and M718 Vehicles)

a. Removal.

(1) Remove pin retainer and pin securing lifting shackle to bracket. Lift off lifting shackle (fig. 2-401).

(2) Remove two nuts, bolts, and lockwashers securing lifting shackle bracket to bumper and remove bracket.

b. Installation. Install lifting shackle by reversing removal operations (2) back through (1). Torque the lifting shackle bracket to bumper nuts (7/16-20) to 30-50 lb-ft.

2-197. Rear Lifting Shackles and Bracket (M151A2, M825, and M718A1 Vehicles)

a. Removal.

(1) Remove cover plate and rear light assembly from vehicle. Refer to paragraph 2-90 *b.*

(2) Remove four nuts and bolts securing lifting shackle and bracket assembly to vehicle (fig. 2-397).

NOTE

If necessary, shackle can be separated from its bracket by removing cotter pin, locking nut and bolt.

b. Installation. Install lifting shackle and bracket assembly to vehicle by reversing removal procedures described in *a* above.

2-198. Seat Assemblies

a. Front Seat Cushions. To remove the back cushion from the front seat frame, grasp cushion at top and pull upward until free of frame (fig. 2-402) To remove seat bottom cushion, tip the seat forward and from the underside unfasten the strap fasteners and remove the cushion (fig. 2-403).

b. Rear Seat Cushion. To remove the rear seat cushion on the M151, M151A1, and M151A2, unfasten the seat strap fasteners and remove the cushion from the tube frame (fig. 2-404). To remove cushions on M151A1C and M825 remove two screws holding cushion to frame. The M718 and M718A1 is removed by unlocking the turn button fasteners.

c. Front Seat Frame. The front seat frames are identical and constructed of tube welded steel. Remove three retaining pins to remove frame from floor (figs. 2-405 and 2-406).

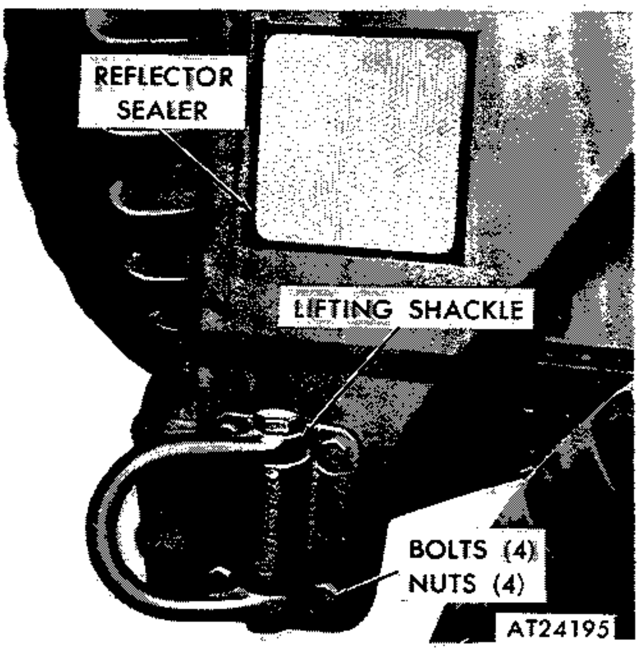


Figure 2-397. Removing or installing rear lifting shackle assemblies. (M825, M151A2, and M718A1 vehicles.)

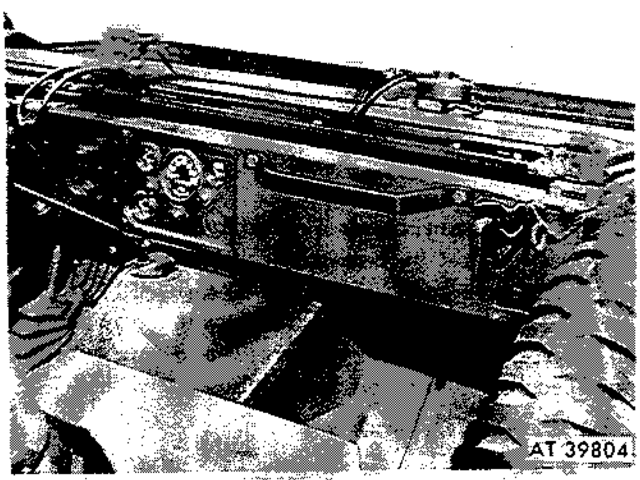


Figure 2-398. Remove safety bar.

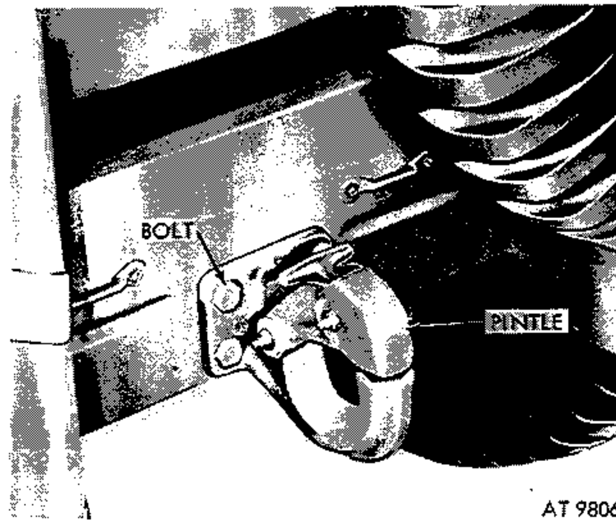


Figure 2-399. Remove towing pintle. (M151, M151A1, M151A1C, and M718 vehicles.)

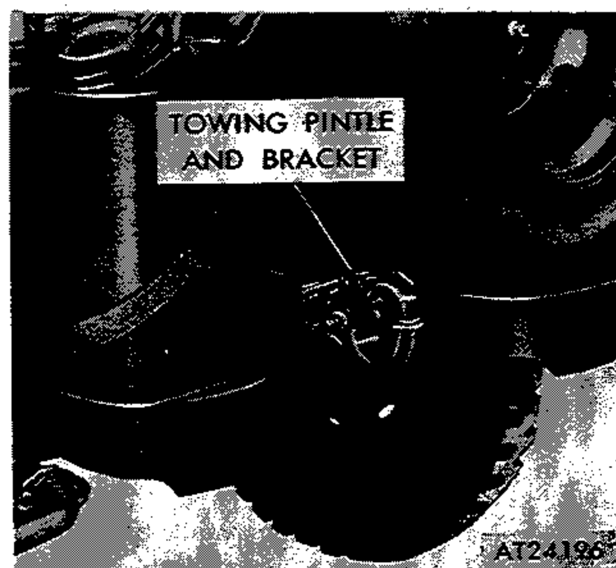


Figure 2-400. Towing pintle and bracket assembly on M151A2, M825 and M718A1 vehicles.

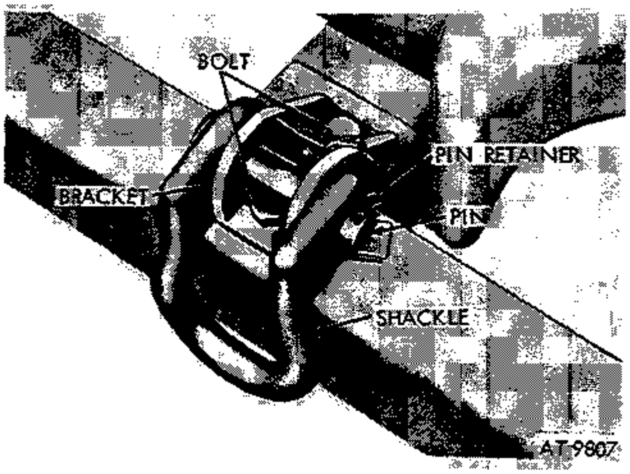


Figure 2-401. Removal of lifting shackle and bracket. (M151, M151A1, M151A1C, and M718 vehicles).

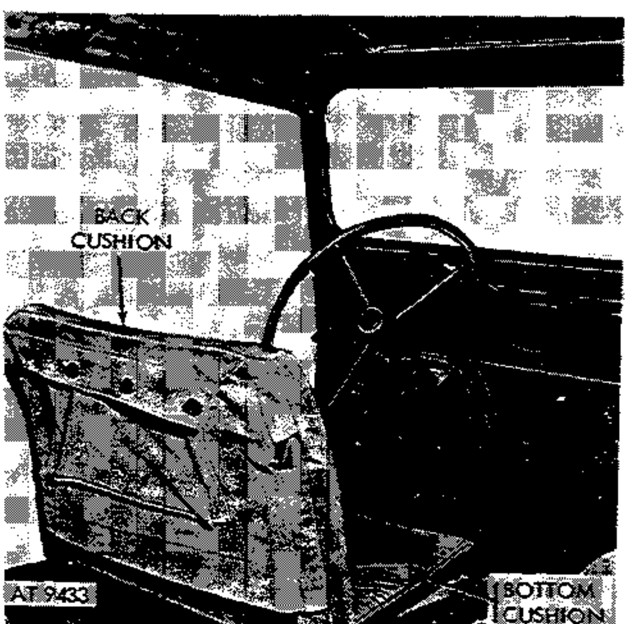


Figure 2-402. Front seat back.

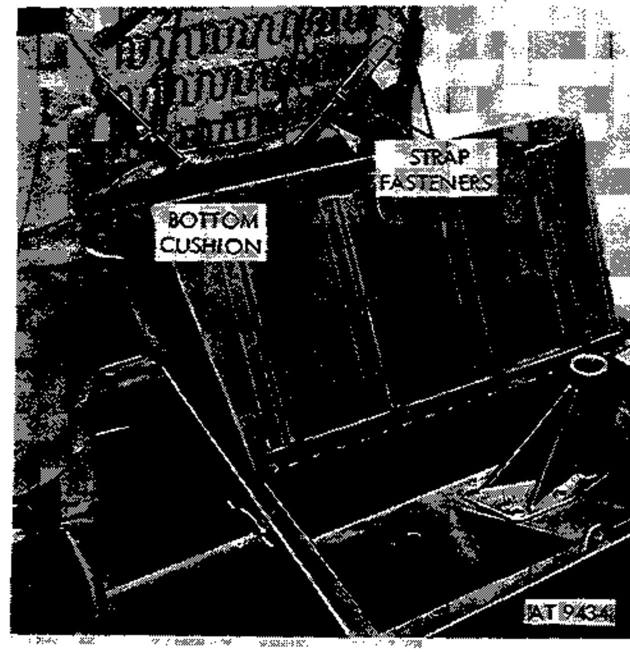


Figure 2-403. Front seat cushion straps and fasteners.

d. Rear Seat Frame.

(1) Removal-rear seat frame (M151, M151A1, and M151A2).

(a) Pull two locking pins from brackets on rear side panels (fig. 2-407).

(b) Pull seat back frame from retaining clips on rear panel (fig. 2-407).

(c) Lift frame from brackets.

(2) Installation-rear seat frame (M151, M151A1, and M151A2). Install rear seat frame by reversing removal operations above.

(3) Remove-rear seat assembly (M151A1C and M825). Remove four screws, flat washers and nuts securing seat frame to top of wheel house panel.

(4) Installation-rear seat assembly (M151A1C and M825). Install four screws, flat washers, and nuts securing seat frame to top of wheel house panel.

e. Inspection.

(1) *Cushions.* Inspect condition of seat cushion and back cushion assemblies; look for tears, open seams, and wear. Check operation of turn button fasteners on map stowage pockets. Check condition and security of the cushion holddown straps and fasteners. Check frame for cracks, breaks and bent condition.

(2) *Front seat frame assembly.* Inspect and check operation of adjusting mechanism; operation should be free and smooth through entire travel of adjustment. Check condition of seat pins and rear fastener and attaching chain, at rear bottom frame member. Check springs for breaks, distortion, and security in frame clips.

(3) *Rear Seat Frame Assembly.* Inspect frame for cracks, breaks, and bent condition. Check all welds. Check springs for breaks, distortion, and security in frame clips. Check condition of seat straps and strap fasteners.

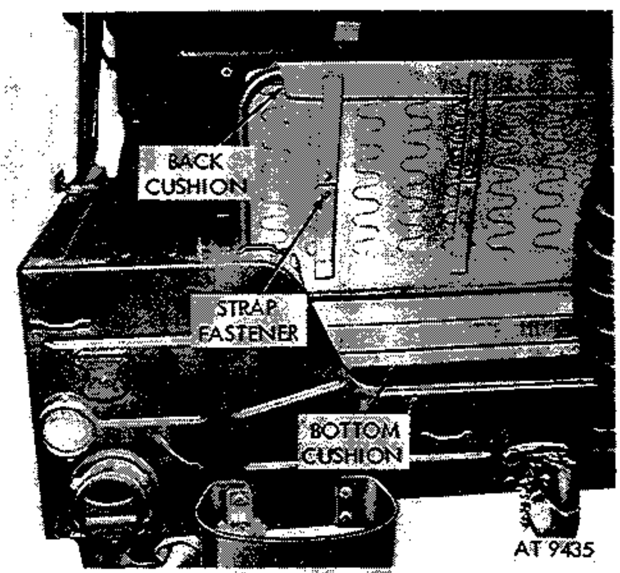


Figure 2-404. Rear seat (M151, M151A1, and M151A2).

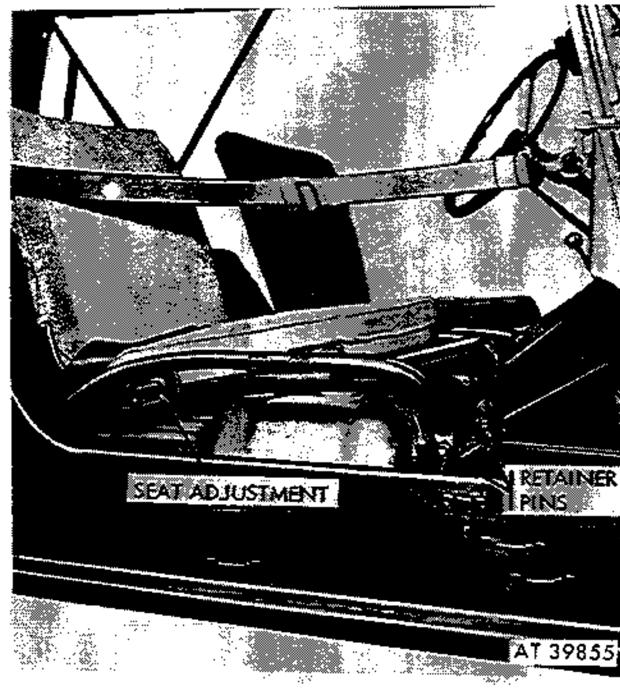


Figure 2-405. Front seat removal.

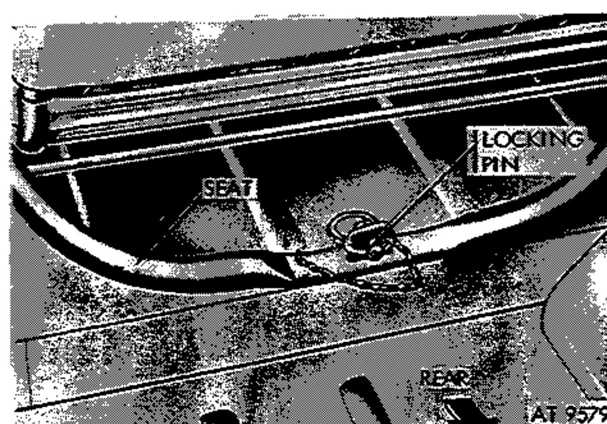


Figure 2-406. Front seat locking pin.

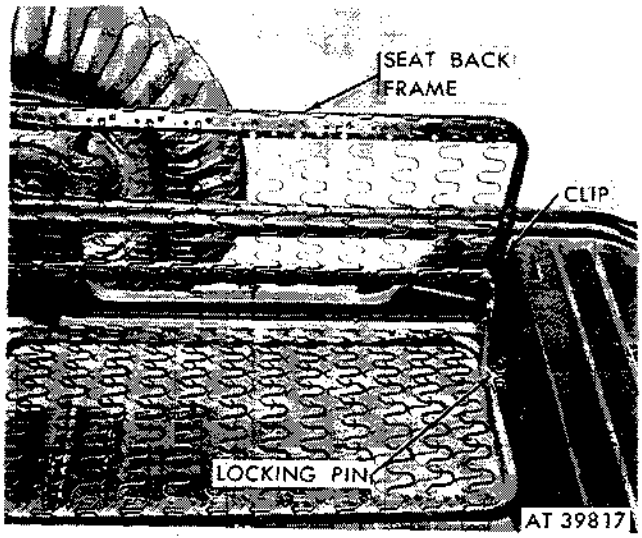


Figure 2-407. Rear seat frame assembly (M151, M151A1 and M151A2).

2-199. Transmission Cover Plate

a. Removal.

(1) Remove gear shift knobs (fig. 2-408).

(2) Remove six screws and lockwashers securing boot retainer to transmission cover plate and remove boots and boot retainer (fig. 2-408).

(3) Remove twelve screws and lockwashers securing transmission cover plate to floor panel (fig. 2-408).

(4) Remove transmission cover plate.

b. Installation. Install transmission cover plate by reversing removal operations above.

2-200. Vehicle Marking

Marking applied to the vehicle shall consist of service identification and the assigned registration number. Letters and numerals will be the blocktype Gothic style, two inches high, and will be placed from ⅜ to ½ inch apart. The marking will consist of two lines spaced two inches apart with the service identification U.S. ARMY on the top line and the assigned registration number centered on the second line. Figure 2-409, shows the location for ¼ ton, 4 x 4, utility truck, M151A1.

Section XXVI. RADIO INTERFERENCE SUPPRESSION

2-201. General.

Radio interference suppression is the elimination or minimizing of the electrical disturbances which interfere with radio reception, or disclose the location of the vehicle to sensitive electrical detectors. It is important that vehicles with, or without radios be properly suppressed to prevent interference with radio reception of neighboring vehicles.

2-202. Description

The ignition and generating systems have been designed to suppress radio interference. Ignition system interference suppression is effected by a primary capacitor in the distributor wiring harness receptacle, a resistor suppression in the spark plugs, and by shielded spark plug cables.

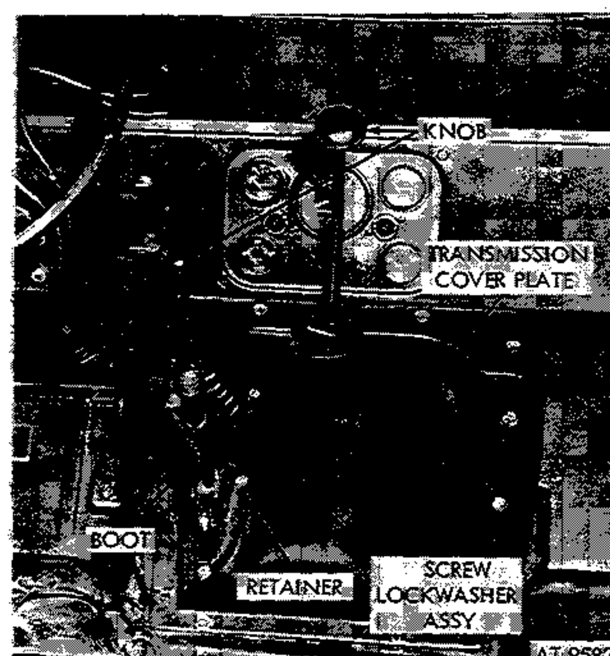


Figure 2-408. Transmission cover plate.

NOTE. ALL DIMENSIONS SHOWN ARE IN INCHES.

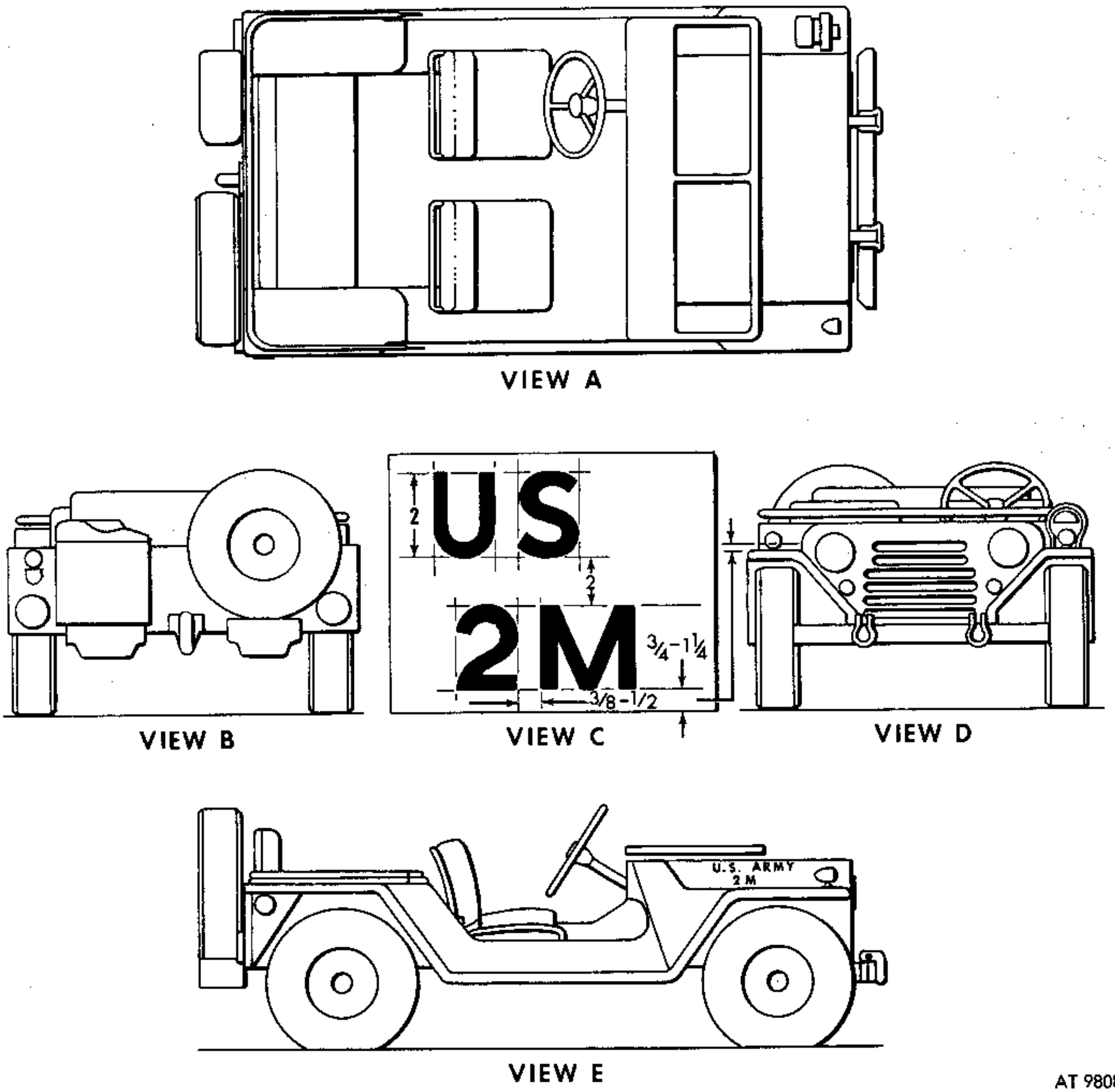


Figure 2-109. Vehicle marking.

Radio interference suppression in the generating system is effected by a choke, capacitor, filter and rectifier in the generator regulator assembly. The primary capacitor is housed in the distributor wiring harness receptacle (fig. 2-152) and is an integral part of the primary circuit. Spark plugs are shielded individually by metallic braid beneath the rubber insulation. The generator regulator assembly houses the capacitor, choke, filter and rectifier.

2-203. Maintenance

Radio interference may be corrected by replacing one or more of the following parts:

a. Replacement of primary capacitor.

b. Replacement of spark plugs (para 2-72).

c. Replacement of spark plug cables (para 2-72).

d. Replacement of generator regulator (para 2-78).

Section XXVII. M151A1C AND M825 VEHICLES AND 106MM RECOILLESS RIFLE

2-204. Description and Data

Description and data covering the 106mm recoilless rifle, M151A1C and M825, 4 x 4, ¼ ton, utility truck, refer to paragraph 1-7.

2-205. Removal and Installation

Refer to TM 9-1000-205-12 for removal and installation instructions on the 106mm recoilless rifle.

2-206. Warnings and Cautions

For safe firing limits of the 106mm recoilless rifle when it is installed to the M151A1C or M825 vehicle, refer to TM 9-2320-218-10. For operating, handling and maintenance precautions in the use of 106mm recoilless rifles refer to TM 9-1000-205-12. For warning and instruction plates, identification markings and location of major controls and components refer to figure 2-410.

2-207. Maintenance

Instructions for the maintenance of the 106mm recoilless rifle is provided in TM 9-1000-205-12.

Section XXVIII. M718 AND M718A1 VEHICLES

2-208. Description and Data

For description and data for the trucks, ambulance, frontline, ¼ ton, 4 x 4, M718 refer to figure 1-3.

2-209. Litter Installation Instructions

Refer to TM 9-2320-218-10.

2-210. Top, Side, Rear and Door Curtains

a. *Removal.*

(1) Remove door assemblies, right and left with vehicle door curtains (fig. 2-411).

(2) Remove safety belt from eyelet attached to rear bow (fig. 2-412).

(3) Remove side curtain right and left (fig. 2-411).

(4) Remove top and rear curtain (fig. 2-411).

b. Installation. Install top, side, rear and door curtains by reversing removal operations.

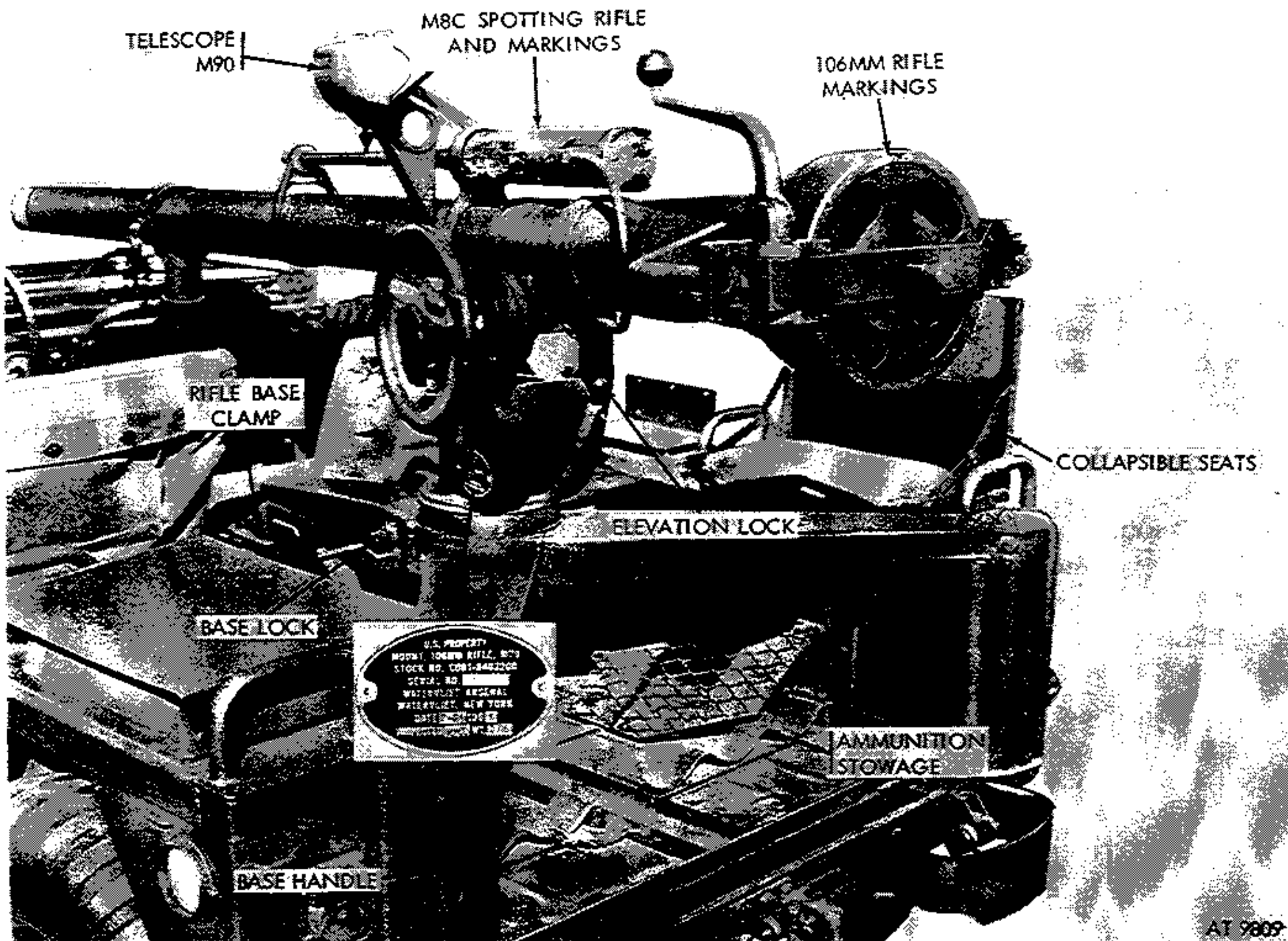


Figure 2-410. 106mm rifle installation.

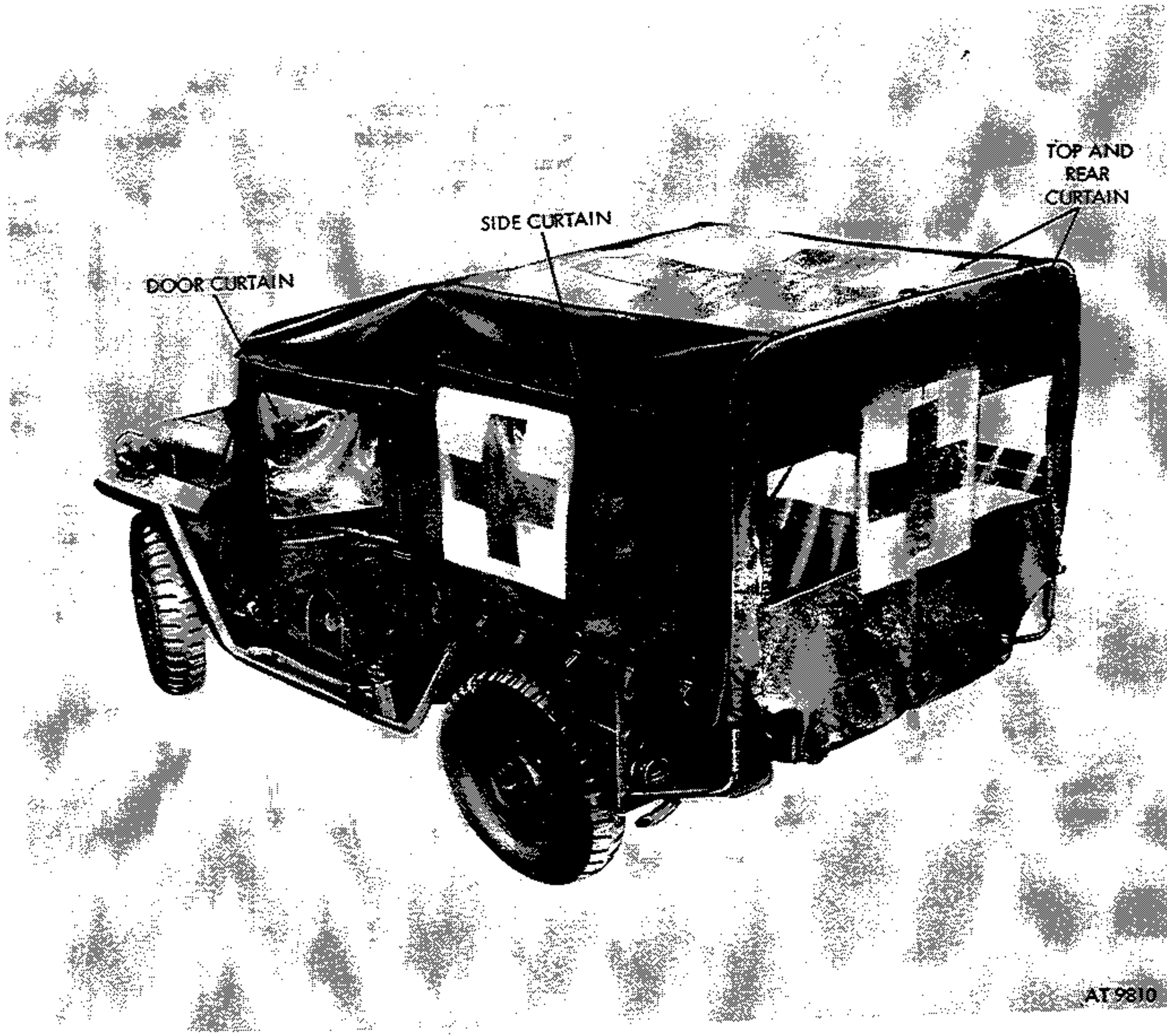


Figure 2-411. Top, side, rear and door curtains installed.

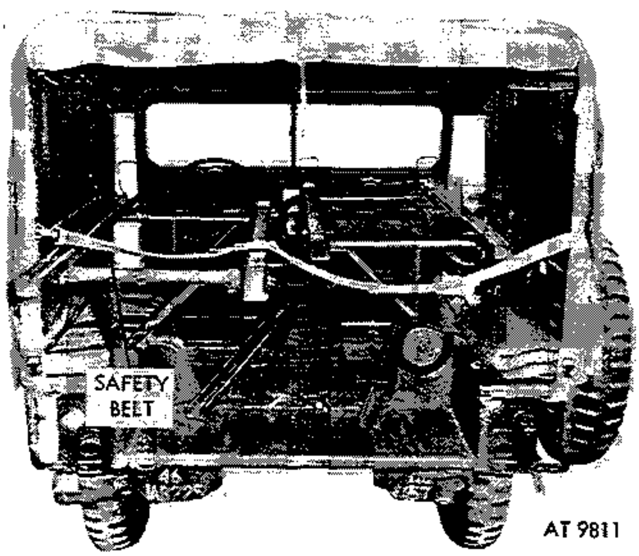


Figure 2-412. Remove safety belt.

2-211. Bows, Rods and Supports

Refer to figure 2-413.

a. *Removal.*

(1) Remove rear side cushion on left side of vehicle together with three safety belts.

(2) Remove four seat back support, two on each side mounted to the front and rear bows.

(3) Remove two side verticle rods from top rods and from rod retainers.

(4) Remove intermediate bow from right and left side supports, also three top front rods from existing brackets located on front bow and top of windshield.

(5) Remove three top rear rods and two heavier side supports from existing brackets located on rear and front bows.

(6) Remove front bow from right and left front bow side supports.

(7) Remove rear bow from right and left rear socket extension bracket.

b. *Installation.* Install bows, rods and supports by reversing removal operations (7) back through (1).

NOTE

Before installing side supports, protect canvas from damage by giving a small radius to edges of support.

CAUTION

Make sure that bolt heads are installed inboard.

2-212. Warnings and Cautions

The driving characteristics of M718 and M718A1 vehicles change substantially when the body extensions and additional loads are added to the vehicle. Refer to applicable warning and caution statements in the TM 9-2320-218-10 manual.

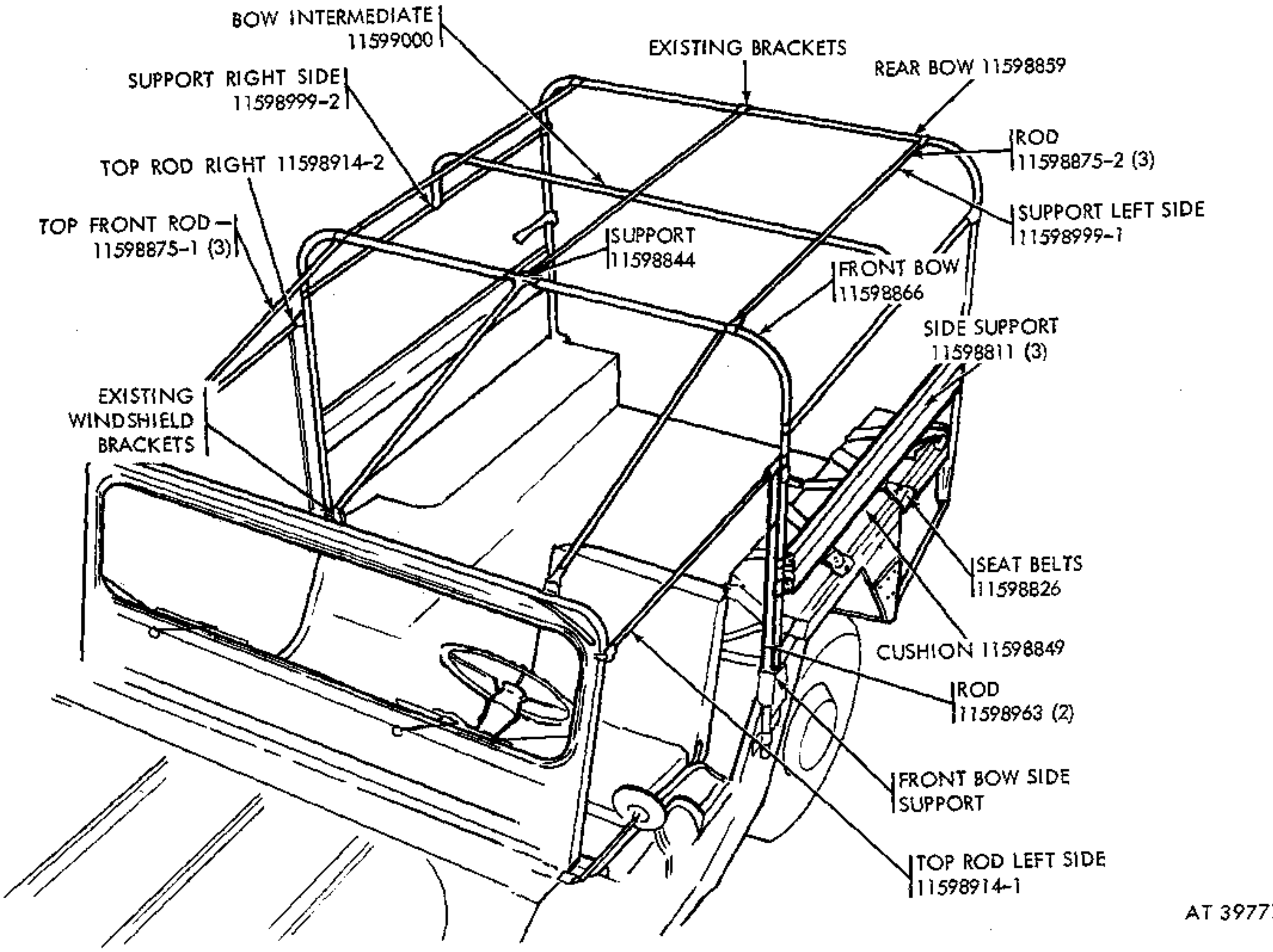


Figure 2-413. Roof bows and rods installed.

CHAPTER 3

MATERIEL USED IN CONJUNCTION WITH MAJOR ITEMS

Section I. GENERAL

3-1. Scope

a. This chapter contains instructions for organizational maintenance of the eight special pupose kits issued for installation on the ¼ Ton, 4 x 4 Utility Truck Models, M151, M151A1, and M151A2 as well as description of the major units of each kit and their function in relation to the components of the vehicle. Special pupose kits applicable to M151, M151A1 and M151A2 vehicles consist of Winterization kit (−65°F), Hardtop Kit, Door and Side Curtain Kit, M14 / 16 Rifle Mount Kit, Machinegun Mounting Kit, Deepwater Fording Kit, Hot Water Heater (−25°F) Kit, and 100-ampere Alternator Kit. Only the latter two kits are applicable to the M151A1C and M825 vehicles, and only the latter three kits are applicable to the M718 and M718A1 vehicles.

b. These kits are authorized for issue under criteria defined in SB 9-16 (winterization kits) and SB 9-155 (deepwater fording kit) and SB 11-131 (100-ampere generator kit). The M14 / 16 rifle mount kit is authorized to meet local requirements for stowage and use of the rifle.

3-2. Maintenance Allocation

The prescribed maintenance responsibilities will apply as shown in the vehicle maintenance allocation chart (app. B). Any need for cleaning, lubrication, replacement, or repair detected in the equipment beyond the scope of this publication is to be immediately reported to the designated authority.

3-3. Service Upon Receipt of Materiel

a. General.

(1) When a vehicle equipped with a new or reconditioned kit is received determine that the kit has been properly prepared for service and that all necessary parts are present. Inspect all assemblies, subassemblies, and parts for proper assembly and condition. If any exterior surfaces are coated with rust-preventive compound, remove with dry-cleaning solvent or mineral spirits paint thinner.

(2) Ordinary deficiencies disclosed during preliminary inspection servicing or during installation will be corrected by support maintenance personnel.

(3) Serious deficiencies detected in the equipment which occur under the circumstances indicated in TM 38-750 should be immediately reported in accordance with instructions in these regulations.

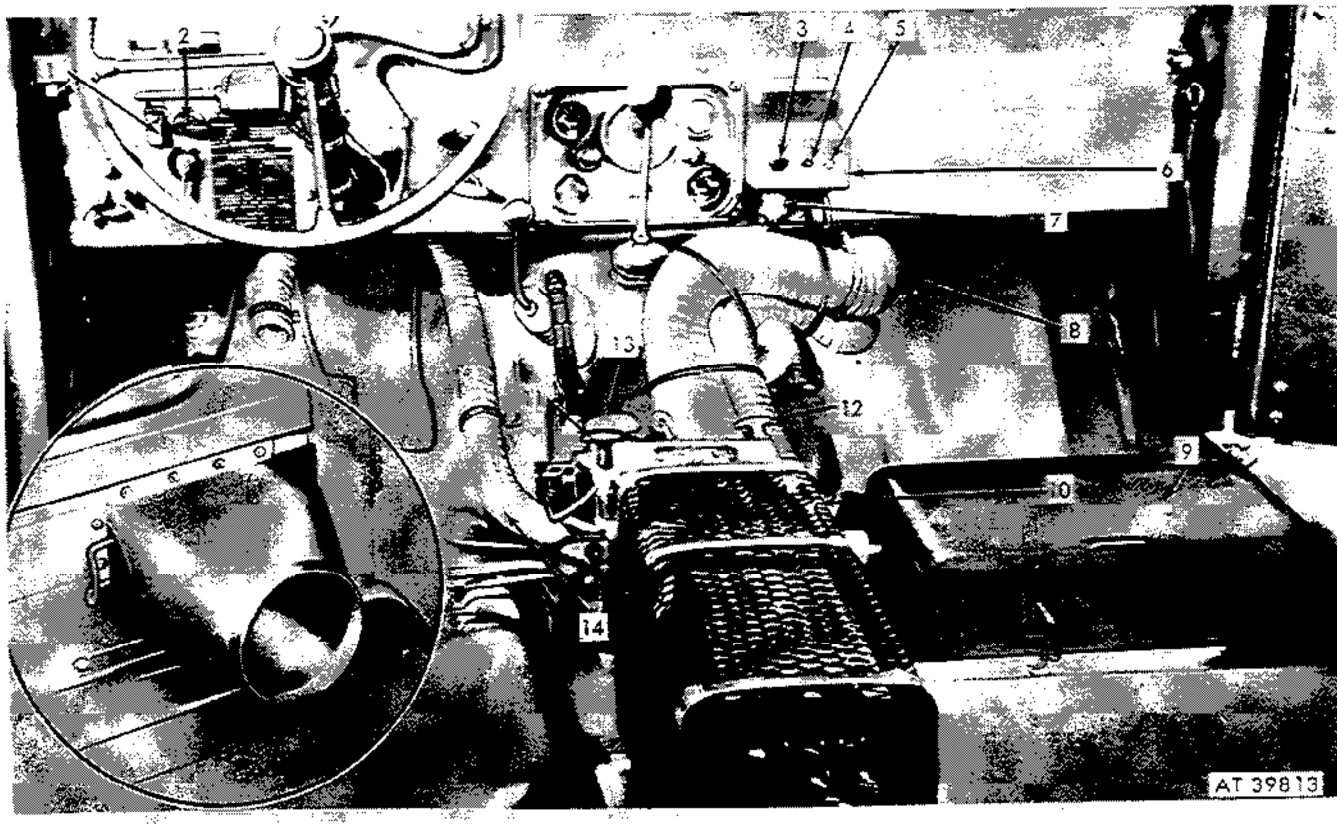
b. Specific Procedures. For specific procedures refer to the applicable section.

Section II. WINTERIZATION KIT (—65 °F.)

3-4. Description and Data

a. General. The vehicle winterization kit (−65°F) consists of a gasoline burning crew compartment heater of the fresh-air type equipped with a windshield defroster, battery compartment heater, manually controlled engine oil pan heater, and automatic controls for heating the vehicle when unattended. Also furnished in the kit is a standard slave receptacle installed on the right cowl, and a hood cover and an adjustable brush guard cover for regulating engine temperature under arctic conditions.

b. Gasoline Burning Heater. The gasoline burning heater supplied with this kit (fig. 3-1) receives its fuel from the vehicle fuel tank. An electric fuel pump is employed to supply pressurized fuel to the heater. Fresh air is supplied to the heater inlet through an air intake hood (fig. 3-2) located at the rear top of the hardtop roof, and a duct assembly (fig. 3-3). Heated air from the heater is diverted for crew compartment heating and ducted through hoses to provide windshield defrosting. Automatic temperature control of air flow is provided for heating of the batter box. Heater exhaust gas can be diverted to a shroud enclosing part of the engine oil pan to heat the engine lubricating oil. Two heat intensity outputs are available and are controlled by a three position control switch. An emergency switch is provided to permit rapid shut down of the heater to prevent drawing of contaminated air into the vehicle in the event of an atomic or gas attack.



1 Emergency switch
2 Defroster control cable
3 Indicator and test lamp
4 Circuit breaker reset button
5 Heater control switch
6 Control box
7 Connector plug
8 Diverter plug
9 Battery box
10 Heater guard
11 Exhaust diverter control handle
12 Diverter box damper control
13 Duct to crew compartment

Figure 3-1. Winterization kit (—65° F.) installation on M151, M151A1, M151A2 1/4 ton utility truck.

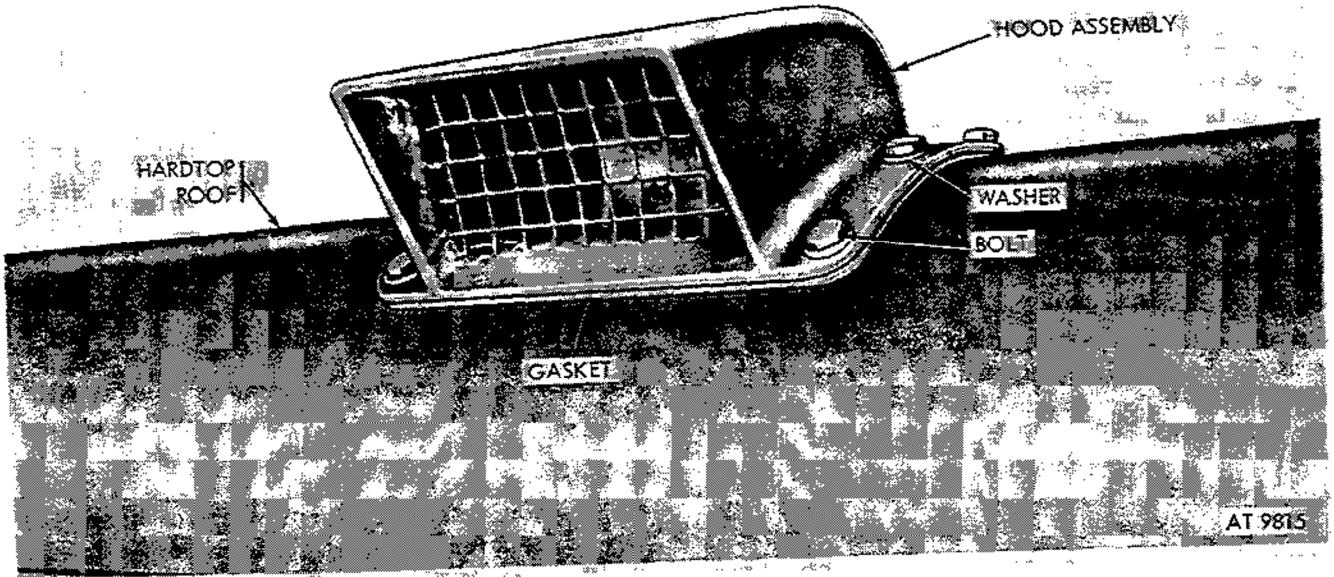


Figure 3-2. 1/4 ton utility truck, M151, M151A1, and M151A2 hardtop roof, hood assembly and gasket.

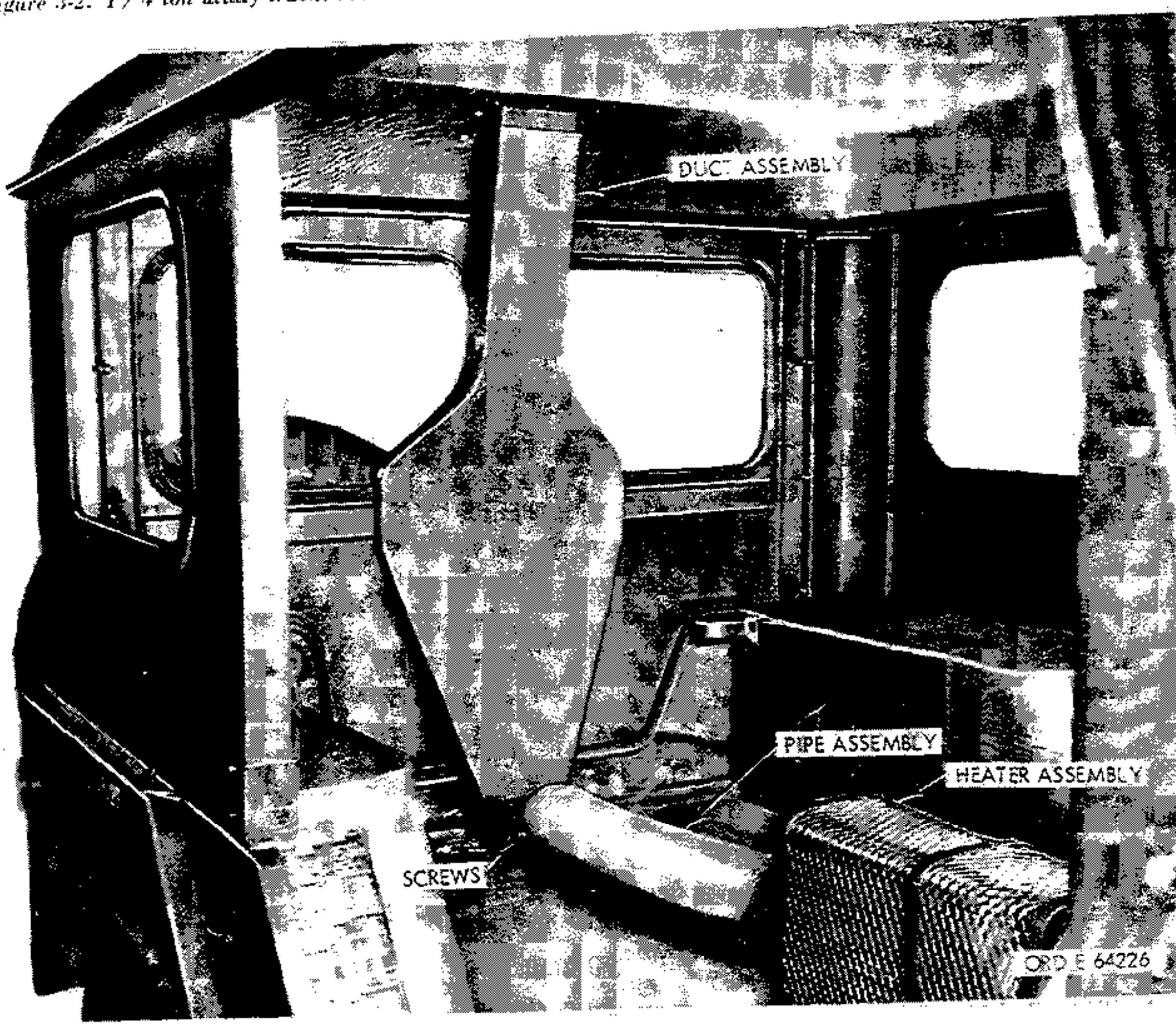


Figure 3-3. Air inlet duct and heater installation on M151 & M151A1, and M151A2, 1/4 ton utility truck.

c. Electrical Controls. In order to prevent damage to the heat exchanger unit, a time delay mechanism is built into the on-off switch circuit. With this system, the blower continues to run after the switch has been turned off and fuel has ceased to flow to the burner. A temperature sensitive switch shuts off current to the blower only when the heat exchanger has cooled to the point that warpage of the heat exchanger or other damage cannot occur. The control switch panel also contains an overload relay with a reset feature to prevent damage to the electrical wiring in case of electrical malfunction. A warning light is incorporated into the control switch panel. This light serves a double purpose. First it indicates that the burner is in operation since it is connected to a temperature sensitive switch. Second, the light continues to burn after the heater is shut off and goes out only when the burner is cool enough to re-ignite safely. A second switch is also furnished, covered by a safety panel, which shuts off the whole heater electrical system disregarding damage to components. This emergency switch is for use only in an atomic or chemical warfare attack to prevent the heater from circulating contaminated air inside the vehicle.

d. Slave Receptacle. An electrical slave receptacle located on the right cowl provides a means of starting the vehicle with a service cable connected to a cold-starting aid kit (slave kit).

e. Hood and Brush Covers. A hood cover and brush guard cover protect the engine from cold weather. The cover on the radiator brush guard controls the flow of cold air through the radiator and protects the engine from windblown snow.

f. Refer to table 1-1 for tabulated data.

3-5. Service Upon Receipt of Materiel

NOTE

Key numerals in parentheses refer to figure 3-1.

a. Snap the "emergency switch" (1) to "ON" position.

b. Press reset button (4) on control box.

c. Use "press to test" feature on indicator lamp (3). The lamp should light.

d. Snap control switch (5) to "ON-HI" position. The heater fuel pump should start immediately and the indicator light (3) should come on within two minutes after the control switch is snapped on.

e. The heater blower should transfer from low speed to high speed operation when the indicator light comes on.

f. Check operation of battery compartment damper actuator. With a temperature of approximately 100°F. in the battery compartment, the actuator should close the damper. When the temperature in the battery box drops to approximately 70°F. the actuator should open the damper permitting heated air to again flow to the batteries. Perform test by removing battery compartment and battery box covers after the damper door has closed. This will allow the thermostat to cool more rapidly causing the actuator to open the damper. If the damper opens when it should close, reverse the thermostat lead wire connections at the terminal strip of the actuator (fig. 3-9). Repeat test.

g. Pull exhaust diverter control handle (11) up. Check for heat at the engine oil pan shroud.

h. Push exhaust diverter control handle down. Check for exhaust gas from heater exhaust pipe and for exhaust smoke. Heavy smoking indicates a malfunction in heater.

i. Position diverter box damper control (12) handle toward the exhaust diverter control handle (11). This positions the damper for maximum air to the defroster diverter.

j. Position defroster diverter control handle to "ON". Check for hot air output from both defroster nozzles.

k. Snap control switch to "ON-LOW" position. Check for lower temperature air leaving the heater. Blower speed should remain constant for both the "ON-HI" and "ON-LO" positions of the control switch since switch controls heat output, not blower speed.

l. Snap control switch to "OFF" position. The indicator light and the blower must operate for several minutes until the heater has cooled.

m. Check operation of emergency switch.

(1) Remove the five-pin connector plug (7) from the control box (6).

(2) Press indicator light (3). Maintain finger pressure on light, and snap emergency switch (1) to "OFF" position. The indicator light should go out. Snap emergency switch to "ON" position. The indicator light should come on. Release indicator light.

(3) Install five-pin connector plug to control box.

n. Check mechanical operation of circuit breaker.

(1) Remove five-pin connector plug (7) from control box. (6).

(2) Press indicator light (3). Maintain finger pressure on light. Pull circuit breaker reset button (4) out to "open" position, using finger-nail pressure under lip of button. Indicator light should go out. Push reset button. Indicator light should come on. Release indicator light.

(3) Install five-pin connector plug to control box.

o. Replace any unit which fails to pass any test or shows signs of failure such as intermittent operation. Tighten hose clamps, electrical connectors, mounting and attaching screws, and controls, as necessary, and fill fuel tank to minimize condensation.

3-6. Preventive Maintenance Services

a. Daily. During cold-weather operation, the heater fuel filter must be removed and drained of water daily, using the special tool wrench 10950836 which is provided as part of the kit. This helps to prevent the lines from freezing. TM 9-2320-218-10 describes the daily preventive-maintenance service to be performed on the −65°F. winterization equipment by the driver each day the vehicle is in operation.

b. Weekly.

(1) Inspect heater electrical components. Repair or replace as necessary.

(2) Inspect for loose defroster nozzles. Tighten as necessary.

(3) Perform all preventive-maintenance services as directed in TM 9-8662.

c. Lubrication. Lubrication of equipment installed with the winterization kit consists of "oil can points" which require sparing use of OE or OES (oil, engine). Every 1000 miles or semiannually lubricate all pivot points of starter detent on older model vehicles, bail pivot and cap threads of slave receptacle, pivot points of diverter actuator and defroster levers, and the exhaust diverter control cable sleeve. The heater blower motor does not require additional lubrication.

d. Seasonal. Perform all seasonal preventive maintenance as directed in TM 9-8662.

3-7. Troubleshooting.

NOTE

For wiring diagram, refer to figure 3-4.

a. Heater Assembly. For troubleshooting instructions on the heater assembly, refer to TM 9-8662.

b. Battery Heat Damper Actuator Assembly. If the actuator fails to operate, perform the following test:

(1) Connect a jumper wire between the positive battery cable and the terminals of the actuator. Touch each terminal alternately while observing the damper. If the actuator operates normally, the thermostat or connecting wiring must be repaired or replaced.

(2) If the actuator fails to operate, check for improper grounding of the actuator, diverter, or adapter. To checks, connect a jumper wire between the battery negative cable clamp and a bare metal screw head on the actuator assembly. Alternately touch the terminals with the jumper wire as in (1) above.

(3) If the actuator operates normally with the grounding jumper in use, remove the paint under the lead of one attaching screw of the actuator, diverter and adapter. Tighten screws.

(4) If the actuator fails to operate with jumper, replace the diverter actuator assembly (para 3-14).

c. Slave Receptacle. For troubleshooting instructions on the slave receptacle refer to table 3-1.

3-8. Heater Assembly

a. Removal (Heater Assembly 8720193).

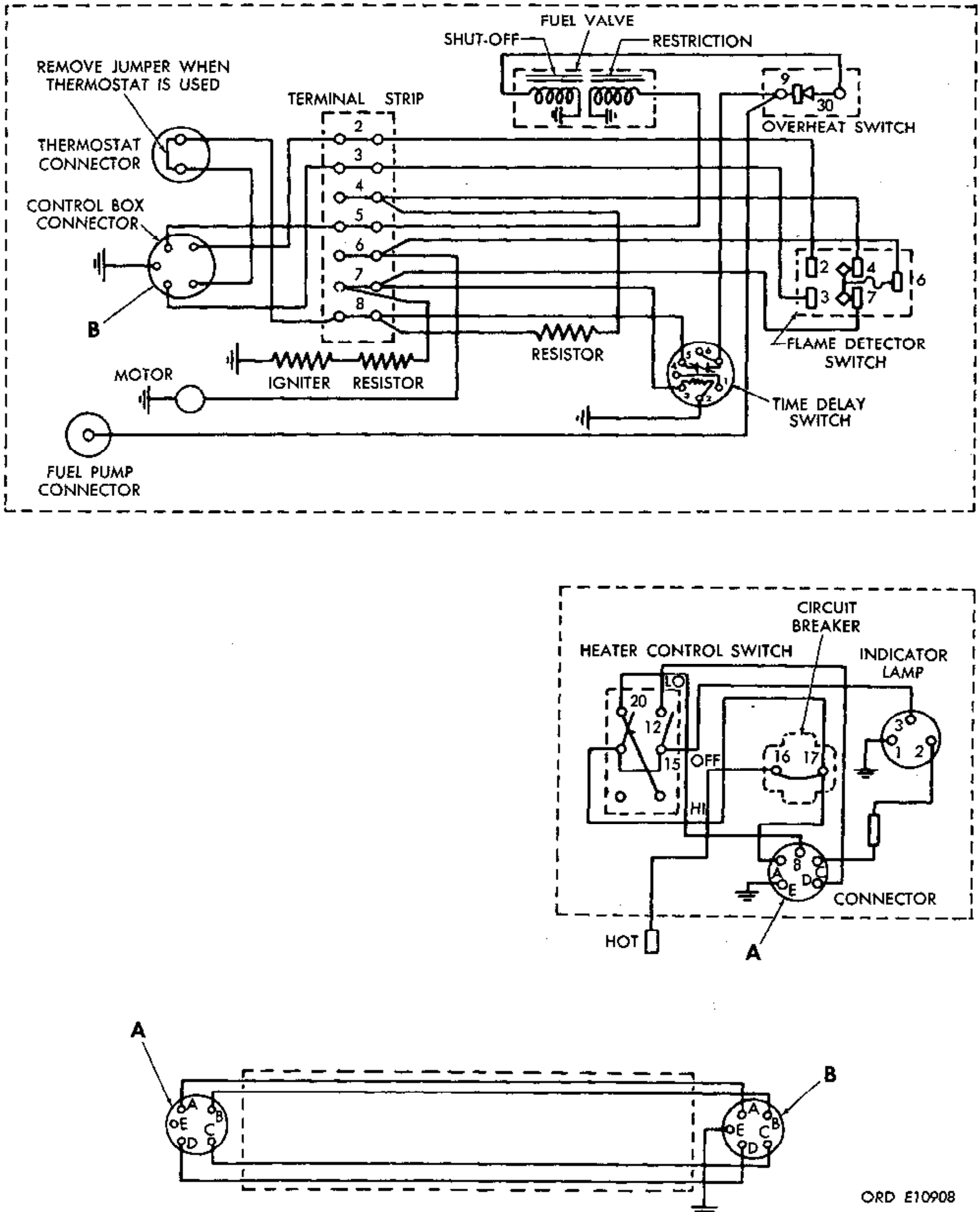


Figure 3-4. Wiring diagram (—65°F.) winterization kit.

(1) Remove four heater guard retaining screws. Remove guard (fig. 3-5).

(2) Loosen clamps retaining hoses to heater diverter and inlet adapter.

(3) Remove exhaust diverter control handle, locknut, and upper nut on sleeve. Slide cable downward and remove lower locknut from sleeve. Remove sleeve from lower bracket (fig. 3-6).

(4) Disconnect both cable connectors at panel near rear of heater (fig. 3-7).

(5) Disconnect fuel line.

(6) Disengage both heater mounting straps at screw-type clamps. Remove cover screw and lift off heater cover to allow rear strap to be removed. Install cover (fig. 3-8).

(7) At terminal board, mark one of the thermostat control leads (fig. 3-9), and the respective terminal for identification. Remove both leads from terminals (fig. 3-9).

(8) Loosen nuts from exhaust diverter studs located under heater to relieve gasket pressure on heater exhaust pipe.

(9) Lift heater from mounting pads.

(10) Place chalk mark on heater body, adapter and diverter-actuator to coordinate position of each at assembly (fig. 3-6).

(11) Remove four screws securing adapter and diverter-actuator assembly to heater body (fig. 3-6).

(12) Remove three nuts and screws securing adapter to diverter-actuator assembly and remove adapter (fig. 3-6).

(13) Remove blower inlet adapter by removing three screws (fig. 3-10). Install inlet louver to blower assembly using three screws.

b. Removal (Heater Assembly 10920608).

(1) Refer to operations (1) through (9) in a above.

(2) Remove three screws securing diverter-actuator assembly to heater body. Remove assembly.

(3) Remove three screws securing inlet adapter to heater body intake and remove adapter (fig. 3-10).

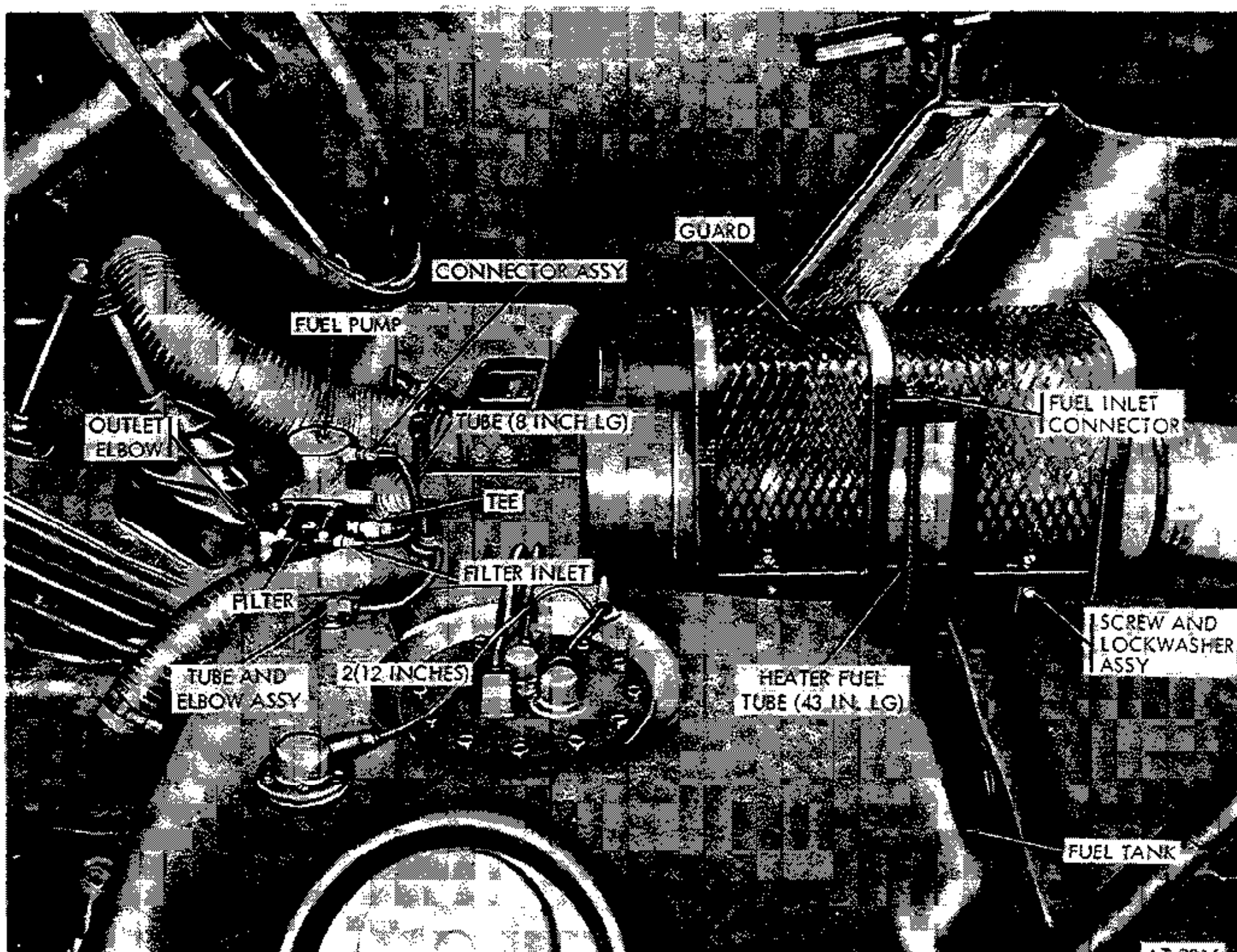


Figure 3-5. Fuel pump filter & fuel lines installation.

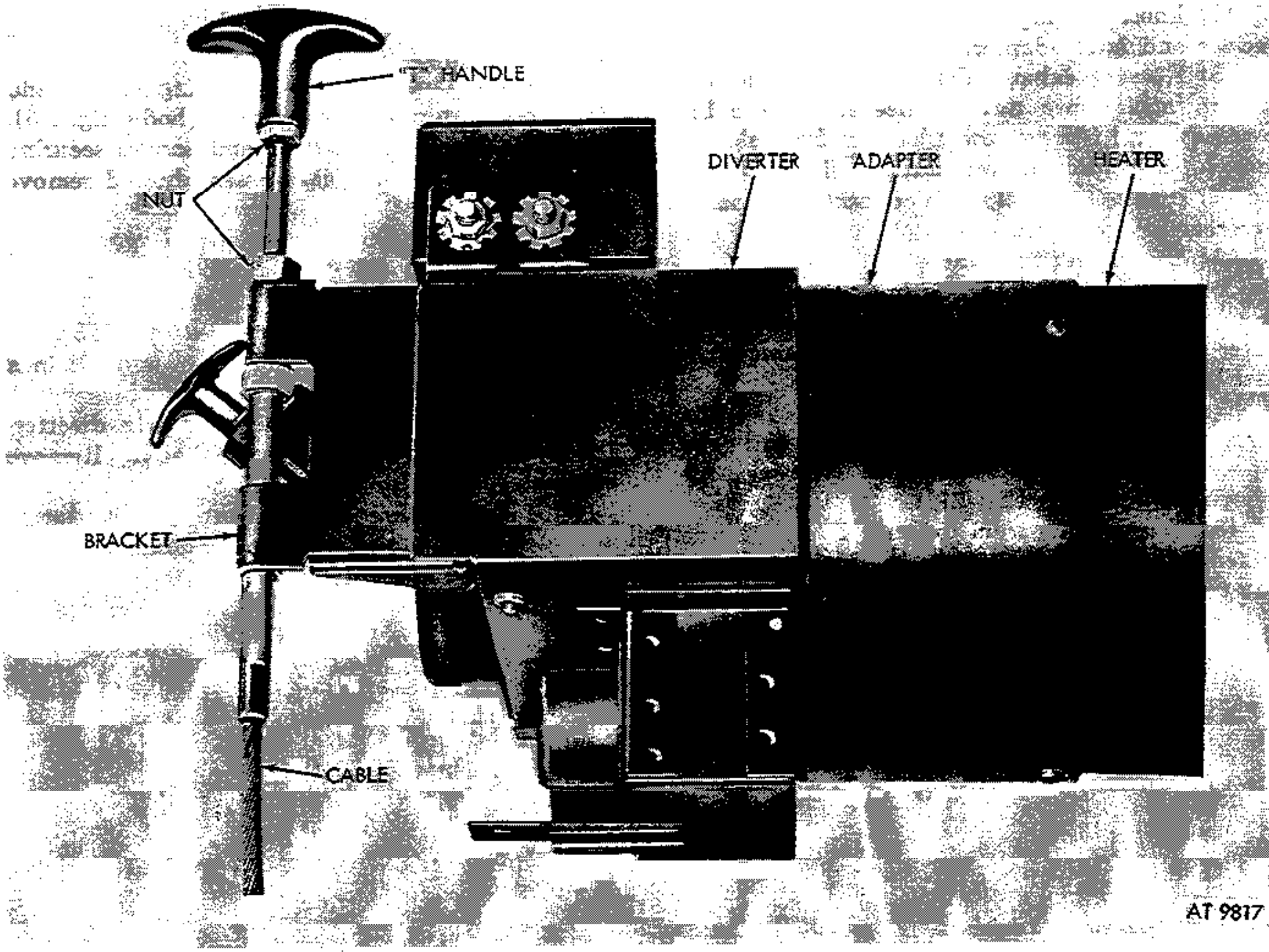


Figure 3-6. Exhuast diverter control handle removal.

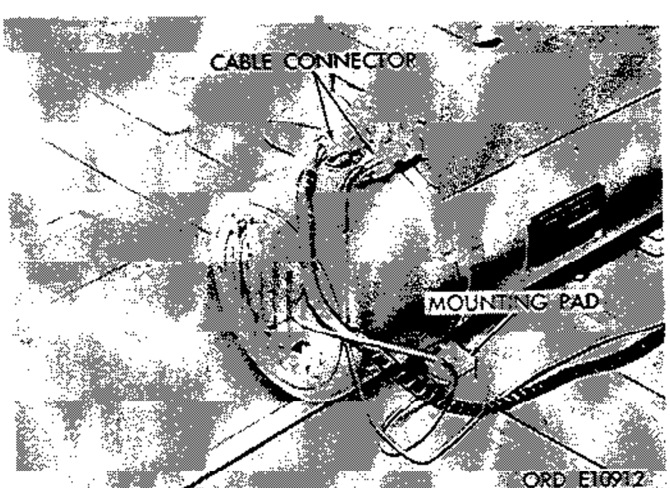


Figure 3-7. Heater wiring connections and mountings.

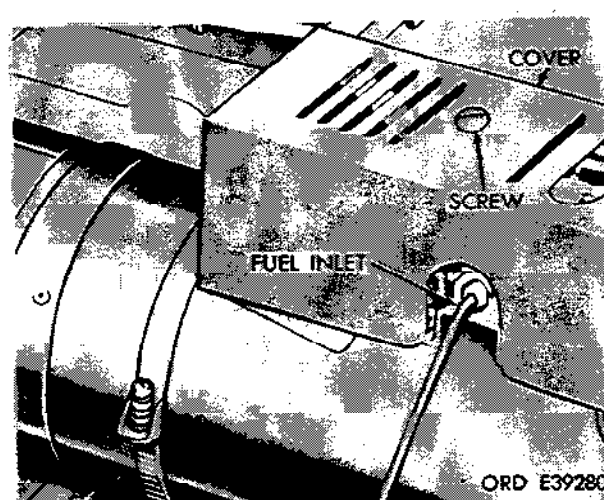


Figure 3-8. Fuel lines and mounting straps.

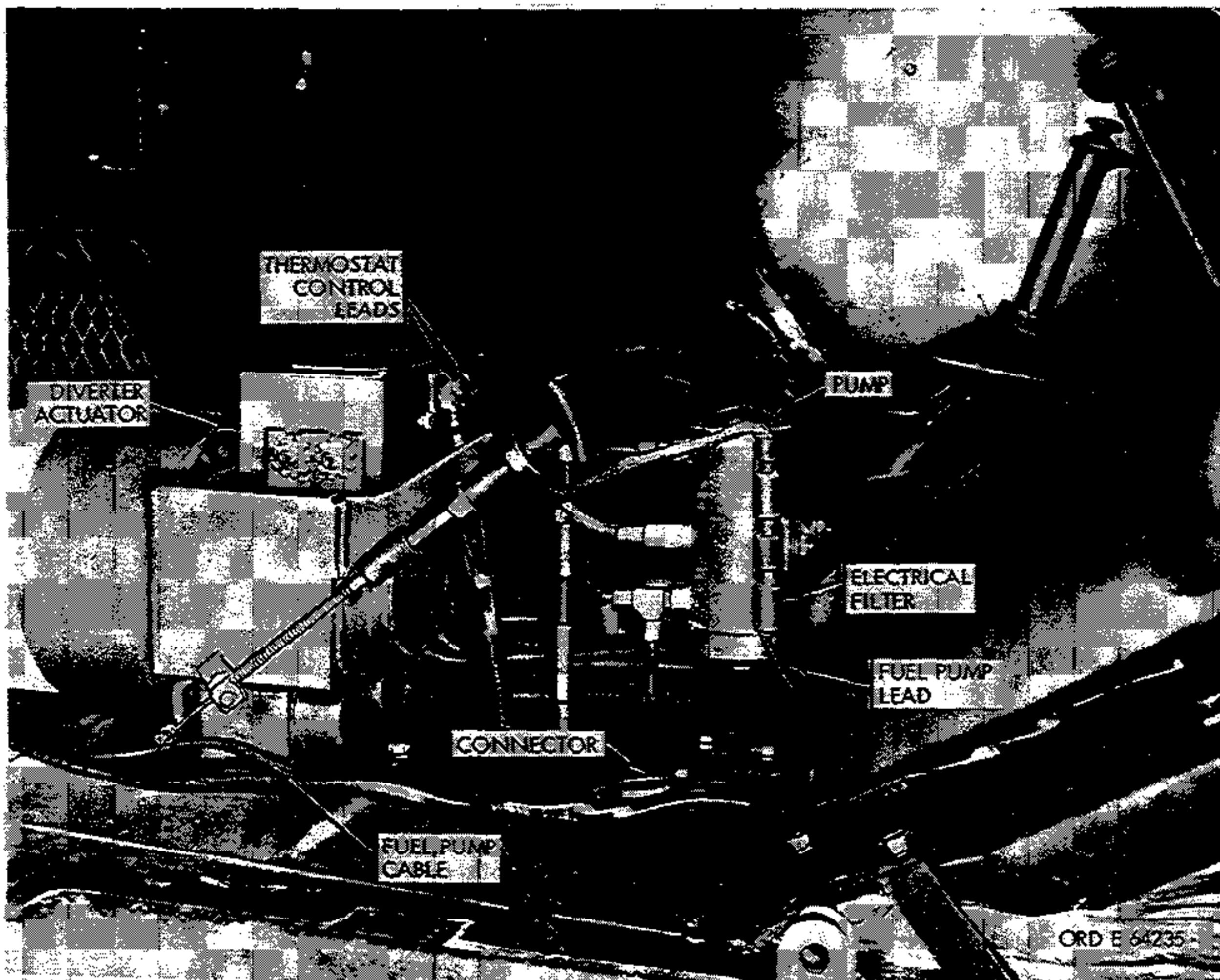


Figure 3-9. Fuel pump cable and connector.

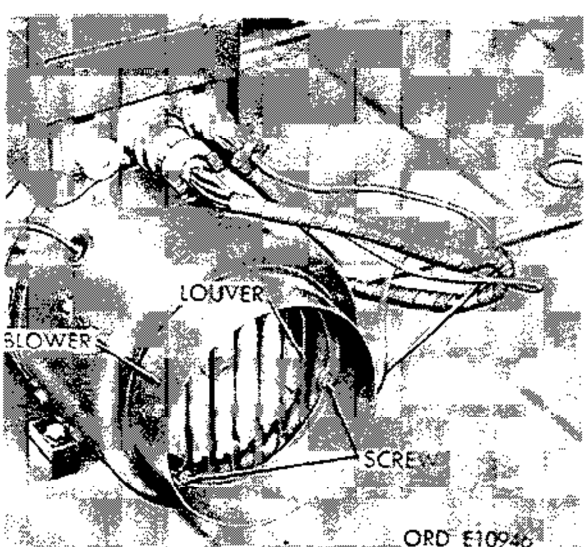


Figure 3-10. Adapter mounting screws.

c. Installation. Reverse procedures in *a* or *b* above as applicable for heater assembly being installed.

NOTE

Install ground cable under lockwasher at right front heater guard mounting screw.

3-9. Fuel Pump

a. Removal. Refer to figure 3-5.

(1) Disconnect upper fuel line from fuel pump.

(2) Disconnect both fuel lines from tee at bottom of fuel pump.

(3) Remove tee from fuel pump.

(4) Disconnect cable connector at fuel pump (fig. 3-9).

(5) Remove mounting nuts, washers, and screws. Remove pump.

b. Installation. Reverse procedure shown in (5) through (1), *a* above.

3-10. Fuel Filter

a. Removal. Refer to figure 3-5.

(1) Disconnect both fuel lines from fuel filter assembly.

(2) Remove two mounting screws.

(3) Remove elbow from fuel outlet.

b. Installation. Reverse procedure shown in (3) through (1) of a above.

3-11. Defroster Diverter Assembly

a. Removal. Refer to figure 3-11.

(1) Loosen three clamps retaining hoses to diverter assembly and remove hoses.

(2) Remove two mounting screws, washers, and nuts.

b. Installation. Refer to figure 3-11.

(1) Attach diverter assembly to lower lip of dash panel with two screws, washers, and nuts.

(2) Position clamp and connect hose from heater to inlet at bottom of diverter. Tighten clamp screws.

(3) Connect Hose from left defroster nozzle to left top of diverter. Tighten clamp screw. Connect hose from right defroster nozzle to right top outlet of diverter. Tighten clamp screw.

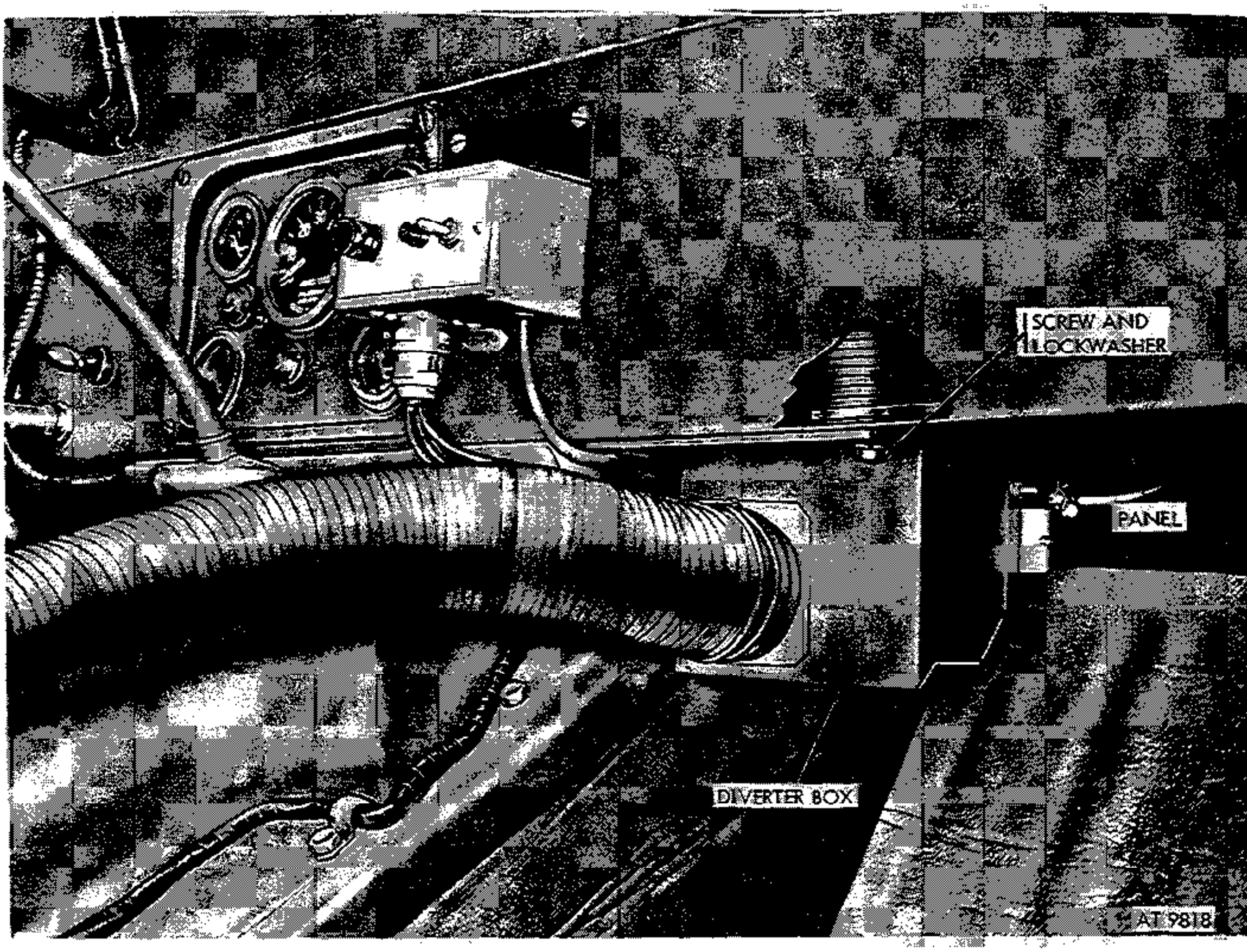


Figure 3-11. Defroster diverter installed.

3-12. Emergency Switch (fig. 3-12)

a. Removal.

(1) Disconnect both cable connectors from switch.

(2) Remove two screw and lockwasher assemblies retaining heater guard to instrument panel and switch. Remove guard and switch.

b. Installation.

(1) Position switch to forward side of instrument panel with the word "ON" upward.

(2) Position guard to instrument panel and over switch toggle. Secure with two screw and lockwasher assemblies.

(3) Connect cable from control box to the lower connection of switch.

(4) Connect cable from ignition switch to upper connection of switch.

3-13. Control Box Assembly

a. Removal. Refer to figure 3-13.

(1) Disconnect cable plug at underside of control box.

(2) Disconnect emergency switch cable under instrument panel.

(3) Remove two mounting screw and lock-washer assemblies retaining control box to mounting bracket.

b. Installation.

(1) Position control box to mounting bracket. Install two mounting screw and lockwasher assemblies.

(2) Connect emergency switch cable to switch.

(3) Connect heater cable and connector to control box.

c. Repair.

(1) Remove two screws securing control box cover (fig. 3-13). Remove cover.

(2) Disconnect two jumpers and one cable from rear of switch.

(3) Remove locknut (fig. 3-13) securing switch to cover.

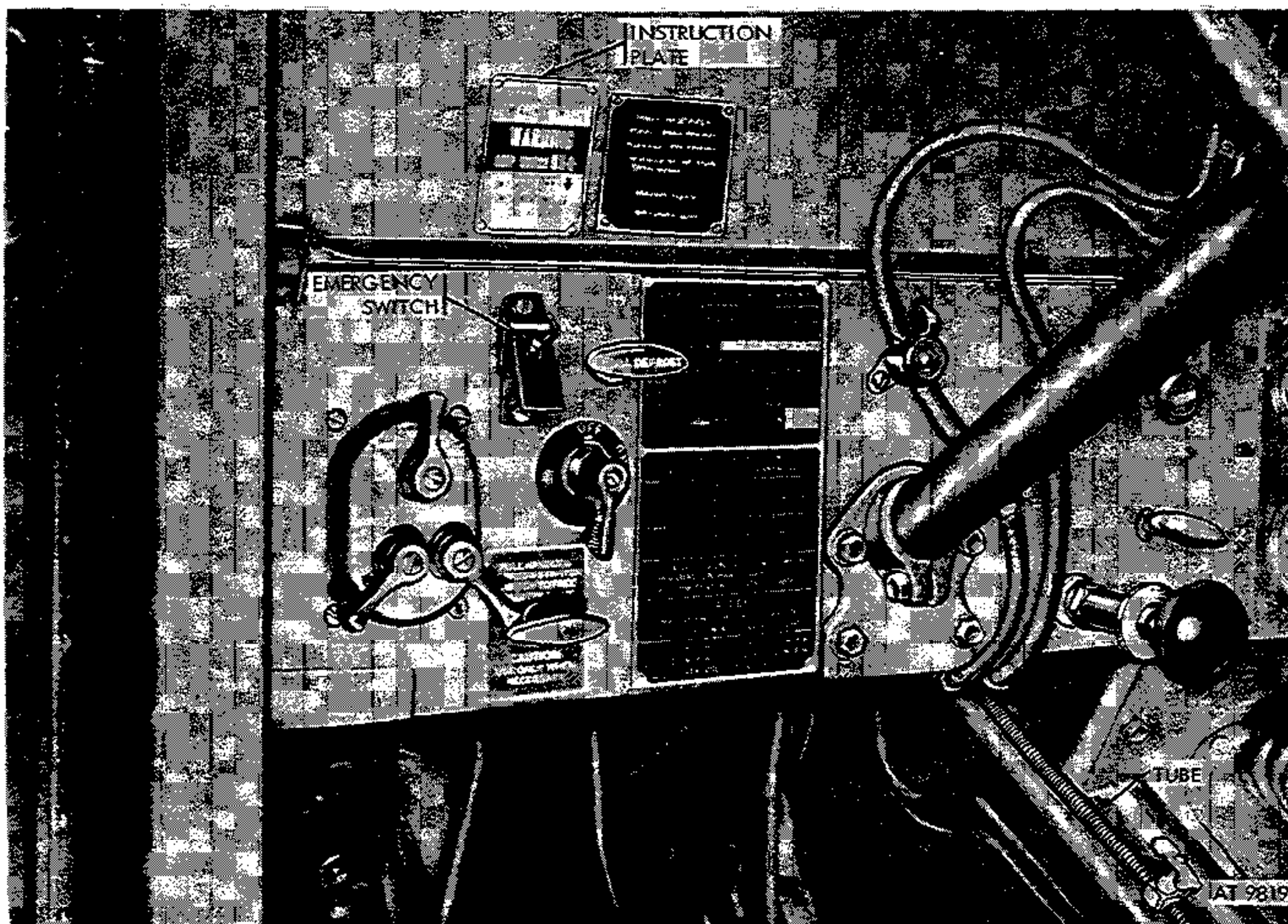


Figure 3-12. Emergency switch and instruction plate.

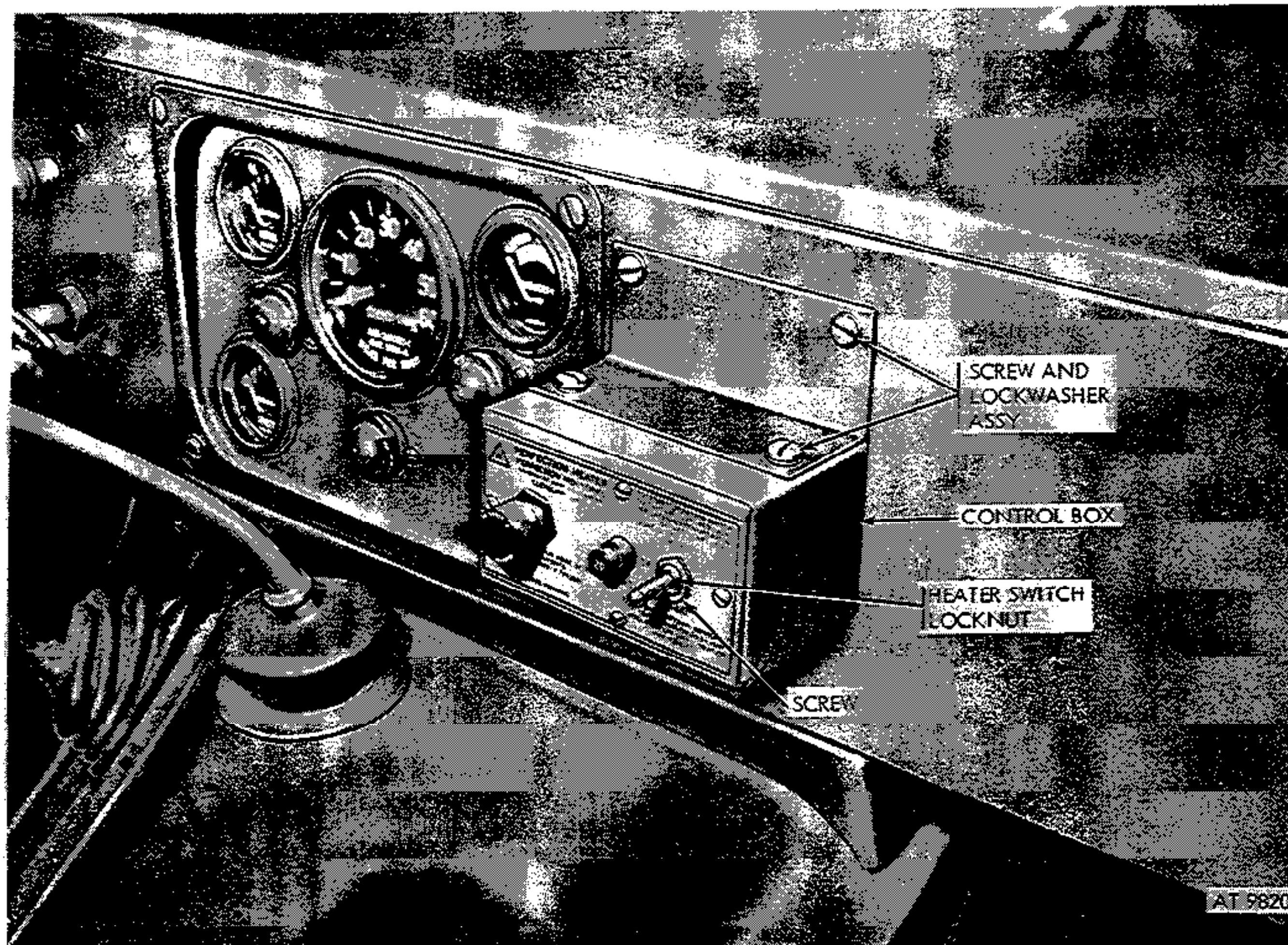


Figure 3-13. Control box assembly.

(4) Install new switch by reversing procedure above.

NOTE

Unscrew lens cover to replace lamp.

3-14. Diverter Actuator Assembly

a. Removal (Heater Assembly 870193) (fig. 3-9).

(1) Loosen both hose clamps and remove defroster hose and battery box hose from diverter assembly.

(2) Remove exhaust diverter control handle (fig. 3-6).

(3) Mark one battery box thermostat lead wire and its respective terminal. Disconnect both lead wires from actuator terminal strip.

(4) Remove four screws securing diverter adapter to heater body. Remove diverter and adapter.

(5) Remove three screws, washers, and nuts securing adapter to diverter.

b. Removal (Heater Assembly 10920608). Refer to figure 3-9.

(1) Perform (1) through (3) above.

(2) Remove three diverter to heater body attaching screws. Remove diverter-actuator assembly.

c. Installation. Reverse procedures in a and b above as applicable for heater being installed.

3-15. Slave Receptacle Assembly

a. Removal. Refer to figures 3-14, 3-15 and 3-16.

(1) Remove right front seat and battery compartment cover. Remove battery winterization cover. Disconnect and remove outer battery.

(2) Remove nut from left battery positive terminal and disconnect slave cable.

(3) Remove retaining screw, washer, nut and cable clamps from body right side panel.

(4) Remove cable retaining clips from right cowl channel.

(5) Remove four receptacle-to-cowl retaining screws, lockwashers, flat washers, and nuts. Ground cable is attached by lower left screw.

(6) Remove receptacle assembly from cowl.

b. Installation.

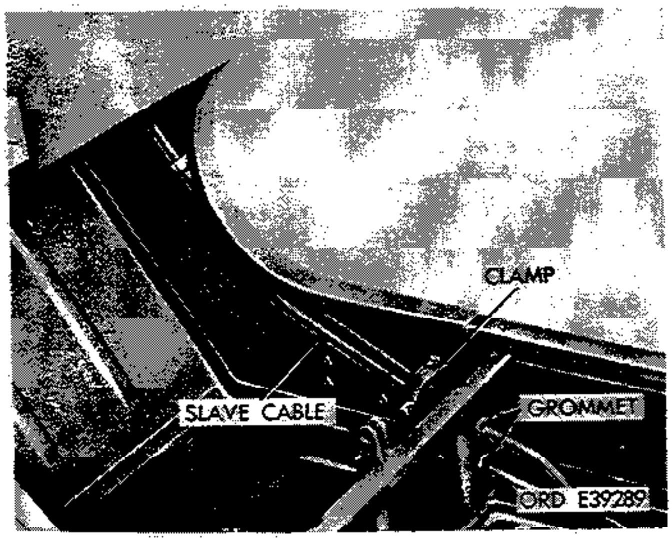


Figure 3-14. Slave cable installation body right side panel.

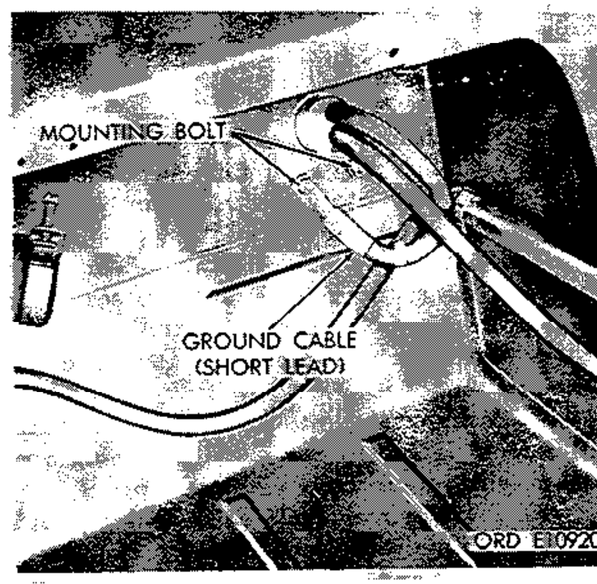


Figure 3-15. Slave cable installation-cowl channel.

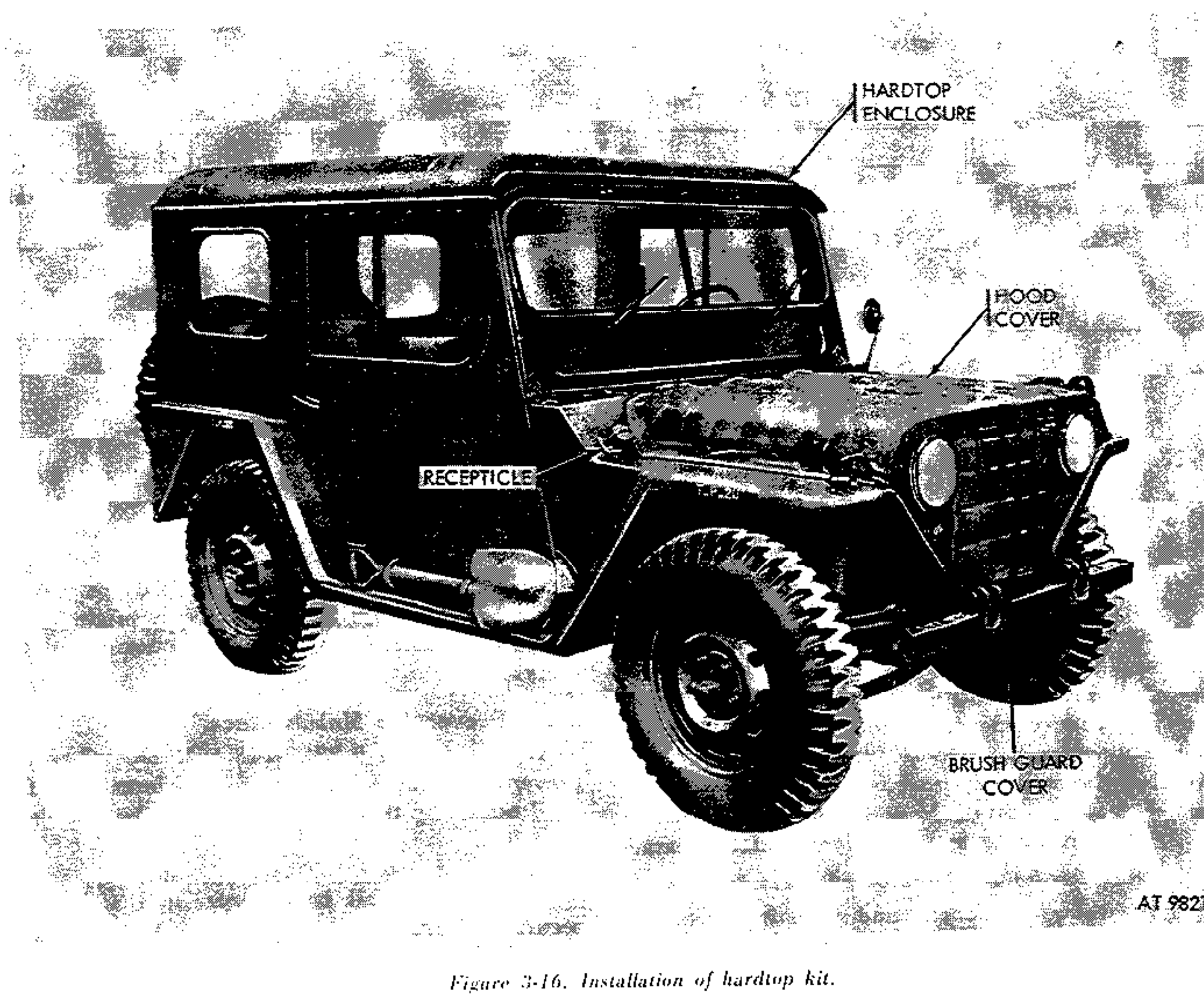


Figure 3-16. Installation of hardtop kit.

(1) Position receptacle to right cowl.

(2) Insert one screw through lower left mounting hole.

(3) Install three screws, flat washers, lockwashers, and nuts to remaining three holes.

(4) Position lockwasher and receptacle ground cable (short cable) over lower left mounting screw; install lockwasher and nut.

(5) Route receptacle long cable along battery cable and insert through grommet in seat riser.

(6) Position two cable retaining clips over battery and receptacle cables and attach clips to right cowl channel.

(7) Position cable retaining clamp over battery and receptacle cables and install retaining screw, washer, and nut in body right side panel.

(8) Position receptacle cable end to battery positive terminal and install nut.

(9) Install and connect cables to right battery. Install battery compartment cover and right front seat.

3-16. Electrical Cable Assemblies

a. *Removal.* Before starting removal of any electrical cable in the vehicle heater system, disconnect the connector to main wiring harness cable at the wiring harness. Remove any of the following cable assemblies by disconnecting connectors at both ends of the cable assembly heater to fuel pump, heater to control box, connector to ignition switch, and control box to emergency switch (fig. 3-6).

b. *Installation.* If cable was burned, troubleshoot the heater system before installing a new cable assembly. If cable was damaged by other causes, install cable by connecting at both ends of appropriate cable assembly (fig. 3-7). Connect heater system to vehicle electrical system at connector to main wiring harness.

3-17. Air Hose Replacement

Use defective air hose as a template and cut hose material to the required length. Install screw-driver type clamps to new hose, position hose to inlet and outlet, and tighten clamps securely.

Table 3-1. Troubleshooting—Slave Receptacle

Malfunction	*Probable cause*	*Corrective action*
No input when service cable is connected to receptacle	*a.* Improper polarity	*a.* Check instructions for use of cold starting kit (TM 9-207)
	b. Cable not properly grounded	*b.* Check receptacle ground cable for loose connection
	c. Receptacle cable not connected properly to battery terminal	*c.* Check cable at battery for proper electrical connections

Section III. HARDTOP KIT

3-18. Description and Data

a. *Description*

The hardtop kit is a metal and glass enclosure designed to protect vehicle and crew from weather extremes and provide comfort and vision for the crew. It is fabricated of aluminum panels and doors which are assembled and attached to the body with common fasteners bolts, nuts, and screws. Panels are of a convenient size so the whole unit may be shipped knocked-down without excessive cubage requirements. The doors are equipped with weather-resistant strip and is sealed to the basic vehicle body. Refer to figure 3-16.

b. *Data.* Refer to table 1-1 for tabulated data.

3-19. Service Upon Receipt of Materiel

a. Inspect all bolts, nuts, and attaching parts for security of attachment and tightness.

b. Inspect glass for broken or chipped panes. Check sliding windows for ease of operation and weather sealing properties. Inspect all sealing weatherstrips for air leaks. Inspect doors for ease of operation, latching and weather sealing.

c. Inspect insulating materials for security of attachment.

d. Inspect interior and exterior body panels for scratches, dents, or abrasions which might affect corrosion resistance or protective qualities of the body.

3-20. Preventive Maintenance

a. *Daily* (TM 9-2320-218-10). Describes the preventive-maintenance services performed on the hardtop kit by the driver each day the vehicle is operated.

b. *Semiannually.*

(1) Inspect all bolts, nuts, and screws for security of attachment and tightness.

(2) Examine aluminum hardtop body panels for signs of corrosion or fatigue at joints and attaching holes. Clean corrosion from body panels and paint with zinc chromate primer followed by

finish coat. If welding of aluminum is required, notify support maintenance.

(3) Inspect glass for broken or chipped panes which will interfere with vision, comfort, or safety. If glass replacement is necessary notify support maintenance.

(4) Inspect condition of door hinges, lockes, weatherstrip, etc., for serviceability and worn parts. Refer to support maintenance for repair or replacement of parts.

(5) Inspect weather sealing material for hardening and loss of sealing properties. Inspect for air leaks at attachment points. If sealing material requires replacement, coordinate with support maintenance.

(6) Inspect any insulating material for security of adhesion to body panels. If application of adhesive material is required, coordinate with support maintenance.

3-21. Troubleshooting

For troubleshooting refer to table 3-2.

3-22. Service Instructions

For major repairs to body or removal and installation of hardtop kit, refer vehicle to support maintenance.

Table 3-2. Troubleshooting—Hardtop Kit

Malfunction	*Probable cause*	*Corrective action*
1. Door not latching	Broken or sticking lock	Refer to support maintenance
2. Excessive rattles	*a.* Loose parts or joints	*a.* Tighten
	b. Worn or damaged glass channel	*b.* Refer to support maintenance.
3. Sticking door glass	Worn or damaged glass channel	Refer to support maintenance
4. Excessive air leaks	*a.* Loose parts or joints	*a.* Tighten
	b. Worn or damaged glass channel	*b.* Refer to support maintenance.
5. Water leaks	*a.* Loose parts or joints	*a.* Tighten
	b. Worn or damaged glass channels	*b.* Refer to support maintenance.
6. Cracked glass	Worn or damaged glass channels	Refer to support maintenance

Section IV. HOT WATER HEATER KIT (—25° F.)

3-23. Description and Data

a. General. The hot water kit (−25°F.) includes a crew compartment heater with defroster, a slave receptacle, and a brush guard cover. The kit is for use on vehicles operated in areas where the normal temperature during the coldest part of the year is above −25°F. Vehicles with a canvas passenger compartment enclosure may be equipped with this heater. Vehicles equipped with this kit may be used for deep water fording when the deep water fording kit is installed.

b. Hot Water Heater (fig. 3-17). As the hot water heater obtains heat from the engine coolant, the engine temperature must be in the normal range for maximum heater output. The heater is connected to the engine cooling system by suitable fittings and hoses and is mounted under the dash panel below the right cowl ventilator. Outside air is drawn into the heater through the heater core by a heavy-duty squirrel cage-type blower. A voltage dropping resistor is used to provide two blower speeds. The air heated by the core is distributed to the vehicle interior and windshield glass through hoses and ducts. When outside air operation is not desired, air from within the vehicle is drawn through openings in the adapter under the cowl ventilator and recirculated through the heater core. Shut-off fittings at the water pump and cylinder head are provided to control the circulation of coolant throught the heater system and to permit removal of the heater without loss of coolant. Controls include a driver heater tube control for directing all heat to the driver and an auxiliary heat door for the passenger.

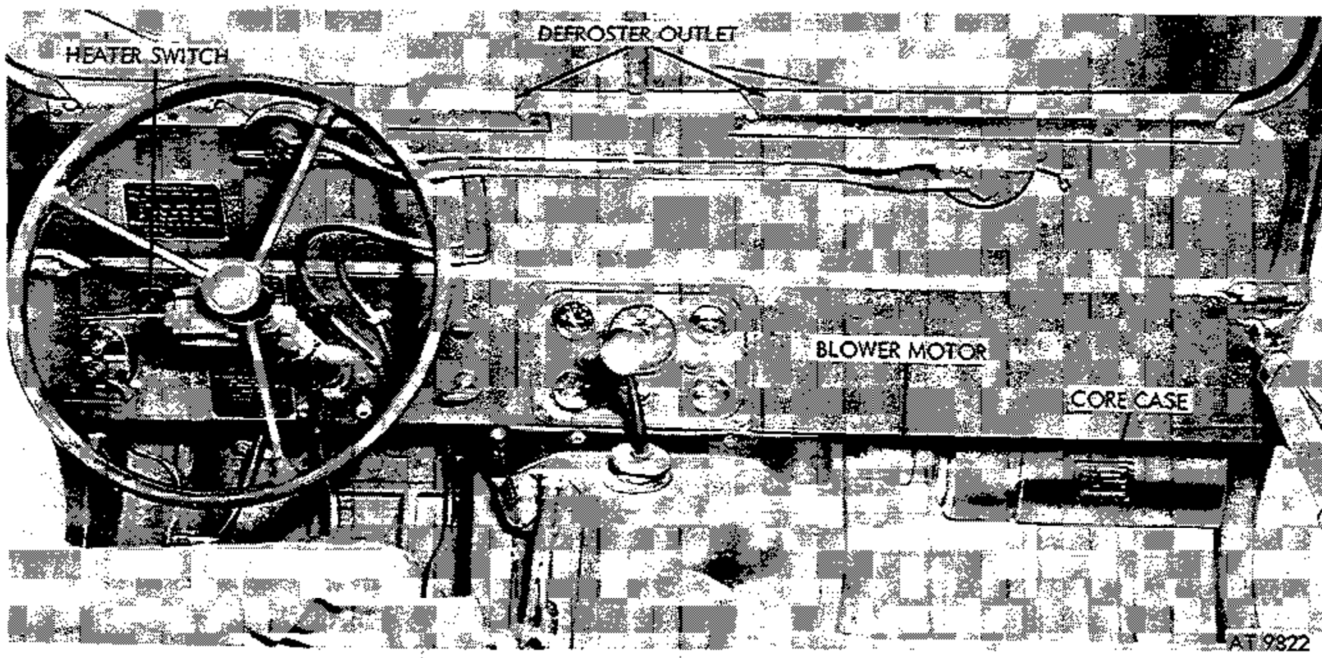


Figure 3-17. Hot water heater kit (—25°F.) installed.

c. Slave Receptacle. A slave electrical receptacle (fig. 3-15) located on the right cowl provides a means of starting the vehicle with a service cable connected to a cold-starting aid kit (slave kit).

d. Brush Guard Cover and Flap. A cover on the radiator brush guard controls the flow of cold air through the radiator and protects the engine from windblown snow. A flap in the cover can be opened to admit air for engine cooling.

e. Data. Refer to table 1-1 for tabulated data.

3-24. Service Upon Receipt of Material

a. Operate all controls. Refer to TM 9-2320-218-10 and figure 3-17.

b. Perform all daily and semiannual preventive maintenance. Refer to TM 9-2320-218-10 for daily preventive maintenance and paragraph 3-28 for preventive-maintenance instructions. Correct or report all deficiencies.

c. Lower windshield and inspect for damaged or misplaced windshield-to-body rubber seal. Inspect sealing surfaces and defroster air passages for obstruction, sand, or dirt.

3-25. Preventive Maintenance

a. Daily. TM 9-2320-218-10 describes the preventive-maintenance service performed on the −25°F. heater equipment by the driver each day the vehicle is operated. No other daily service is required.

b. Semiannually.

(1) Inspect heater electrical components. Repair and / or replace as necessary.

(2) Inspect brush guard cover and flap for deterioration and tears. Repair or replace as necessary.

(3) Inspect for loose defroster nozzles. Tighten as necessary.

c. Lubrication. Lubrication of the hot water kit consists of "oil can points" which require sparing use of lubricating oil (OES). Every 1000 miles or semiannually, lubricate bail pivot and cap threads of slave receptacle, pivot points of driver heat and defroster levers, and the auxiliary heat door hinge. The heater blower motor does not require lubrication.

3-26. Troubleshooting.

For troubleshooting the hot water heater (−25°F.) refer to table 3-3.

3-27. Diverter Box

a. Removal. Refer to figures 3-17 and 3-18.

(1) Remove three diverter box-to-heater retaining screws and lockwashers.

(2) Remove diverter box from heater.

(3) Remove right defroster hose elbow from nozzle flange and diverter.

(4) Disconnect duct from diverter.

b. Installation. Refer to figures 3-17 and 3-18.

(1) Connect hot air duct to diverter opening (driver side), and right defroster hose elbow to right side opening and nozzle flange.

(2) Position diverter box to heater outlet; insert three screws and lockwashers.

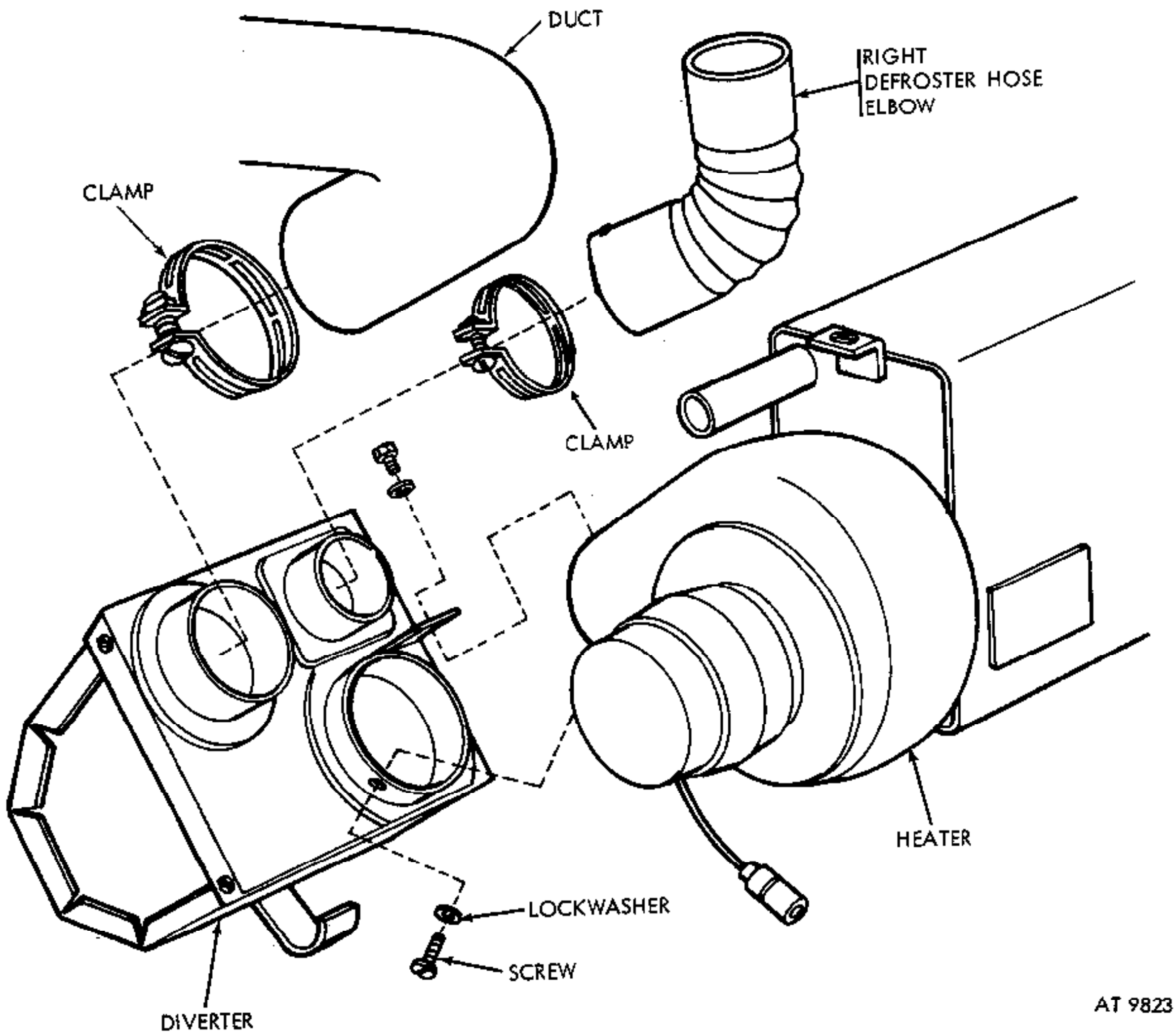


Figure 3-18. Defroster hose connections to diverter box.

Table 3-3. Troubleshooting—25°F. Hot Water Heater

Malfunction	Probable causes	Corrective action
1. Cool or cold air at outlets after engine reached normal operating temperature.	*a.* One shut-off cock partially or fully closed.	*a.* Check if shut-off cocks are open (rotate counter clockwise to open)
	b. Soft or collapsed hot water hoses.	*b.* Replaces hoses (para 3-30)
	c. Air in heater	*c.* Bleed heater (para 3-28) Check for leaking cylinder head gasket if air recurs.
	d. Plugged heater core	*d.* Clean or replace heater core (para 3-28)
2. Cool or cold air outlets due to low temperature.	*a.* Defective engine thermostat.	*a.* Replace thermostat
	b. Extreme cold weather	*b.* Install brush guard cover.
3. No air flow at defroster	*a.* Hose disconnected at nozzle.	*a.* Connect hose nozzle (para 3-32)
	b. Hose disconnected at diverter.	*b.* Connect hose to diverter box (para 3-32)
	c. Collapsed hose	*c.* Repair or replace hose (para 3-32)
	d. Leaking windshield to body seal.	*d.* Notify support maintenance.
4. No air flow at driver heat outlet.	*a.* Hose disconnected at diverter box.	*a.* Connect hose to diverter box (para 3-32).
	b. Collapsed or cut hose	*b.* Replace hose (para 3-32)
5. Blower motor inoperative	*a.* Lead to heater switch disconnected.	*a.* Connect lead to heater switch (fig. 3-20)
	b. Heater electrical open circuit.	*b.* Check heater electrical circuit for improper or loose connections (para 3-35)
	c. Defective blower motor	*c.* Replace blower motor assembly (para 3-36)
	d. Defective switch or circuit breaker.	*d.* Replace as necessary (para 3-33)
6. Blower motor operates on "HI" only.	*a.* Loose lead to switch	*a.* Check resistor leads to switch (fig. 3-20)
	b. Defective resistor	*b.* Replace resistor (para 3-34)
	c. Defective switch	*c.* Replace switch (para 3-33)
7. No input when service cable is connected to receptacle.	*a.* Cable not properly grounded	*a.* Check receptacle ground cable for loose connection to toeboard (fig. 3-15)
	b. Improper polarity	*b.* Check instructions for use of cold starting kit.
	c. Receptacle cable not properly connected to battery terminal.	*c.* Check cable connection at battery for proper connection.

3-28. Heater Assembly

a. Removal.

(1) Close both shut-off cocks by turning clockwise (fig. 3-19).

(2) Remove four weldment screws and washers.

(3) Disconnect blower motor cable from circuit breaker cable (fig. 3-20).

(4) Disconnect two hoses from heater core.

(5) Remove two toeboard-to-bracket-retaining screws, flat washers, and weldment heater nuts.

(6) Remove four top cowl-to-core heater mounting retaining screws, washers, and lockwashers (fig. 3-21).

b. Installation.

(1) Position heater to intake duct under right side of dash panel.

(2) Install four screws, flat washers, and nuts to holes in top cowl and to intake duct.

(3) Install two screws, flat washers, and nuts to holes in toeboard and heater weldment bracket.

(4) Connect two heater hoses to heater core tubes. Tighten clamp screws.

(5) Connect blower motor cable to circuit breaker cable.

(6) Turn both shut-off cocks counter clockwise to open position. Check engine coolant level.

(7) Start engine and operate until normal engine operating temperature is reached.

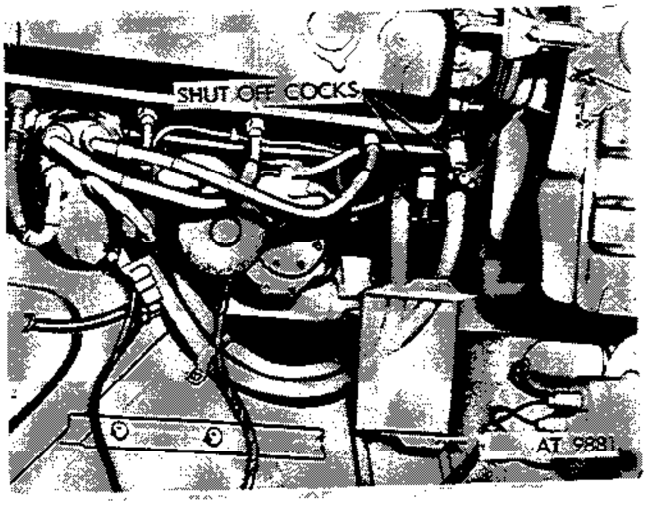


Figure 3-19. Heater shut-off cocks and heater hoses.

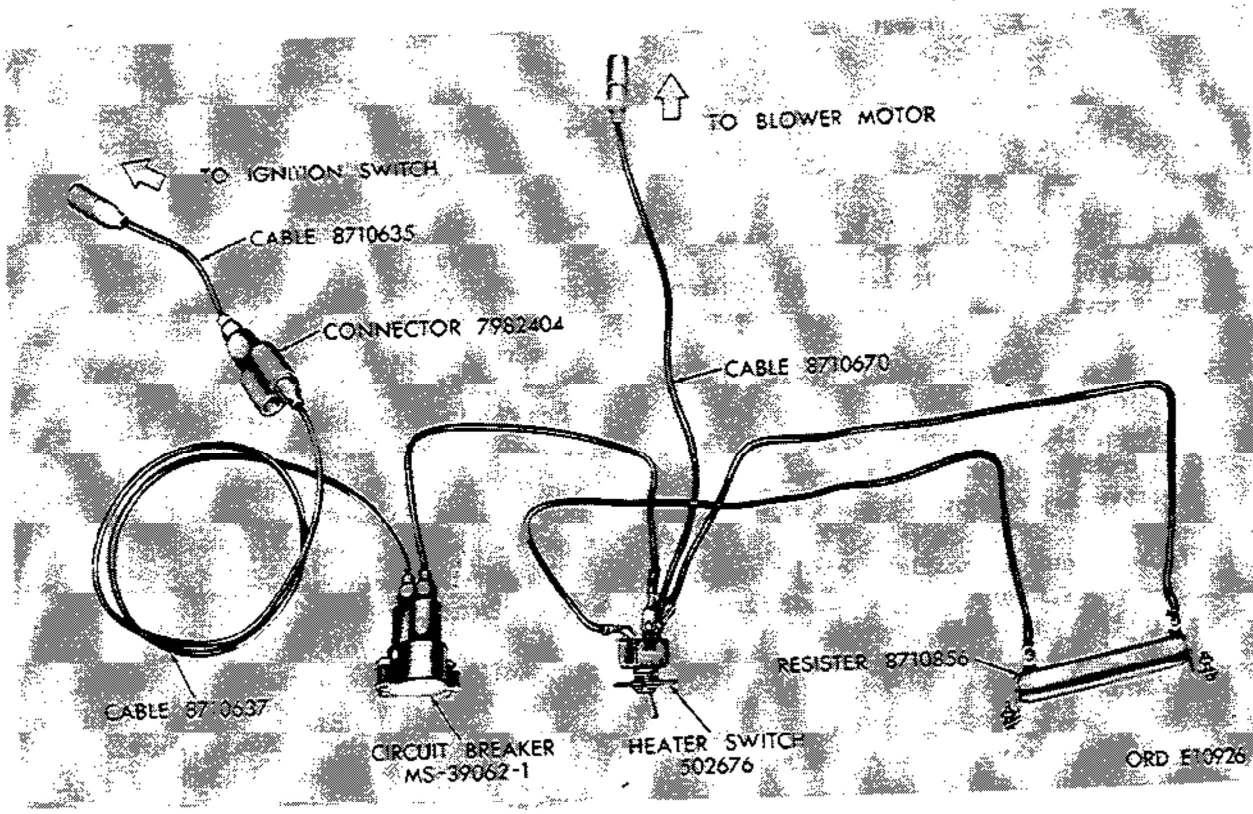


Figure 3-20. Wiring assembly—hot water heater.

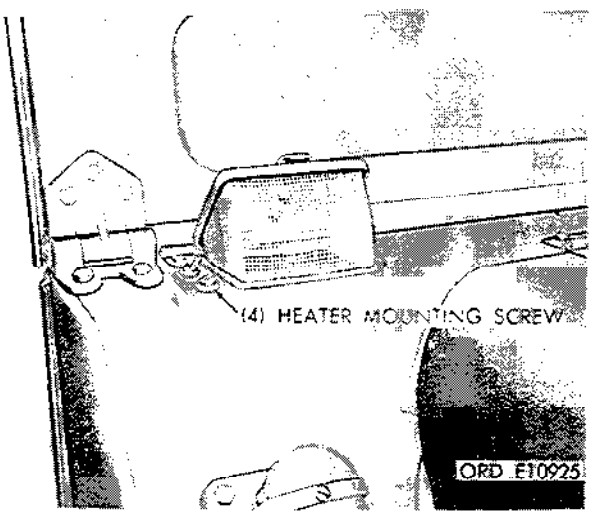


Figure 3-21. Heater mounting.

(8) Check engine coolant level.

3-29. Slave Receptacle Assembly

Refer to paragraph 3-16.

a. *Removal.*

(1) Remove heater (para 3-28).

(2) Remove right front seat and battery compartment cover. Disconnect and remove right battery.

(3) Remove nut from left battery positive terminal and disconnect cable.

(4) Remove retaining screw, washer, nut and cable clamp from right body side panel.

(5) Remove cable retaining clips from right cowl channel.

(6) Remove four receptacle to cowl retaining screws, lockwashers, flat washers, and nuts (ground cable is attached to lower left screw).

(7) Remove receptacle assembly from cowl.

b. *Installation.*

(1) Position receptacle to right cowl.

(2) Insert screw through lower left mounting hole.

(3) Install three screws, flat washers, lockwashers, and nuts to remaining three holes.

(4) Position lockwasher and receptacle ground cable (short cable) over lower left mounting screw; install lockwasher and nut.

(5) Route long receptacle cable along battery cable and insert through grommet in seat riser.

(6) Position two cable retaining clips over battery and receptacle cables and attach clips to right cowl channel.

(7) Position cable retaining clamp over battery and receptacle cables and install retaining screw washer and nut in right body side panel.

(8) Position receptacle cable end to left battery positive terminal and install nut.

(9) Install and connect cables to right battery. Install battery compartment cover and right front seat.

(10) Install heater (para 3-28).

3-30. Hot Water Hose

a. *Removal.* Refer to figure 3-19.

(1) Close both shut-off cocks by turning clockwise.

(2) Remove diverter box (para. 3-27).

(3) Remove hose retaining clamp screw, washer, and nut from right fender apron and remove clamp from hoses.

(4) Remove hose support clamp from heater hose at bend around firewall.

(5) Loosen hose clamp screw and remove hose from shut-off cock.

(6) Loosen clamp screw and remove hose from heater core tube. Remove hose clamp from hose.

(7) Pull hose from engine compartment through grommet in right tunnel panel.

b. *Installation.*

(1) Cut replacement hose to proper length (para. 3-26).

(2) Route hose from engine compartment through grommet in tunnel right panel.

(3) Place clamp on end of hose and attach to heater core tube. Tighten clamp screw.

(4) Route hose to shut off cock. Place clamp on hose and attach to shut off cock. Tighten clamp screw.

(5) Place retaining clamp over hoses and position to hole in fender apron. Secure clamp with screw, lockwasher, and nut.

(6) Install hose support clamp over heater hoses at bend around firewall.

(7) Turn shut-off cock counterclockwise to open position. Check engine coolant level.

(8) Start engine and operate until engine reaches normal operating temperature.

(9) Check coolant level and add coolant as required.

3-31. Shut-Off Cocks

a. *Removal.* Refer to figure 3-19.

(1) Drain coolant.

(2) Disconnect hot water hose at shut-off cock.

(3) Remove shut-off cock from adapter.

b. *Installation*

(1) Install shut-off cock to adapter.

(2) Connect hot water hose to shut-off cock.

(3) Fill radiator with coolant.

(4) Start engine and operate until engine reaches normal operating temperature.

3-32. Defroster and Diverter Heater Hose

a. Removal. Refer to figure 3-18.

(1) Remove four instrument cluster panel retaining screws and lockwashers.

(2) Disconnect speedometer and lay instrument cluster panel aside with gage wires connected.

(3) Loosen clamp screw and remove hose from nozzle or adapter.

(4) Remove hose from diverter box.

(5) Remove clamps from hose.

b. Installation.

NOTE

Route left defroster (long) hose on top of speedometer cable and choke and throttle control cables. Position left defroster hose to diverter which is near the heater switch and steering column. Diverter which gives heat to driver and heat to nozzle flange is positioned six inches from toeboard.

(1) Cut new hose (para. 3-26) to proper length.

(2) Place clamp on end of hose and attach to nozzle or adapter.

(3) Place clamp over diverter end of hose and connect hose to diverter box.

(4) Connect speedometer cable to speedometer. Connect defroster hose bracket to speedometer.

(5) Position instrument cluster panel to dash panel and install four retaining screws and lockwashers.

3-33. Heater Switch

a. Removal. Refer to figure 3-17.

(1) Remove nut, lockwasher, nameplate, and special washer from heater switch.

(2) Remove switch from dash panel.

(3) Remove cables connected to switch.

b. Installation.

(1) Connect eyelet of cable (from top terminal on circuit breaker) to center post on switch.

(2) Connect eyelet of cable (from blower motor) and lead from resistor to terminal on keyway side of switch.

(3) Connect remaining lead from resistor to remaining terminal on switch.

(4) Remove nut, lockwasher, and indexing washer from replacement switch.

(5) From behind dash panel, insert switch through hole in dash panel.

(6) Position nameplate to switch and install lockwasher and nut.

3-34. Resistor

a. Removal.

(1) Remove heater switch. Refer to paragraph 3-33.

(2) Remove two resistor retaining screws, lockwashers and nuts from left body side panel.

(3) Remove resistor from left body side panel.

(4) Disconnect two resistor leads from switch terminals.

b. Installation.

(1) Position resistor to holes in left body side panel.

(2) Install two screws, lockwashers, and nuts.

(3) Route resistor leads along lip of dash panel to heater switch location.

(4) Connect resistor lead and lead from blower motor to the terminal on keyway side of switch.

(5) Connect remaining lead from resistor to open terminal on switch.

(6) Install switch.

3-35. Circuit Breaker

a. Removal. Refer to figure 3-20.

(1) Remove two circuit breaker retaining screw, lockwashers, and nuts on left body side panel.

(2) Disconnect cables from circuit breakers.

b. Installation.

(1) Position circuit breaker behind left body side panel and install two screws, lockwashers, and nuts.

(2) Connect cable from ignition switch to lower terminal on circuit breaker.

(3) Connect cable from heater switch to top terminal on circuit breaker.

3-36. Blower Motor and Wheel Assembly

a. Removal. Refer to figures 3-20 and 3-22. Disconnect blower motor to circuit breaker leads. Remove four screws and lockwashers attaching the blower motor and wheel to flange.

b. Installation. Position blower motor and wheel assembly to blower motor flange and install four lockwashers and screws. Connect blower motor cable to circuit breaker cable.

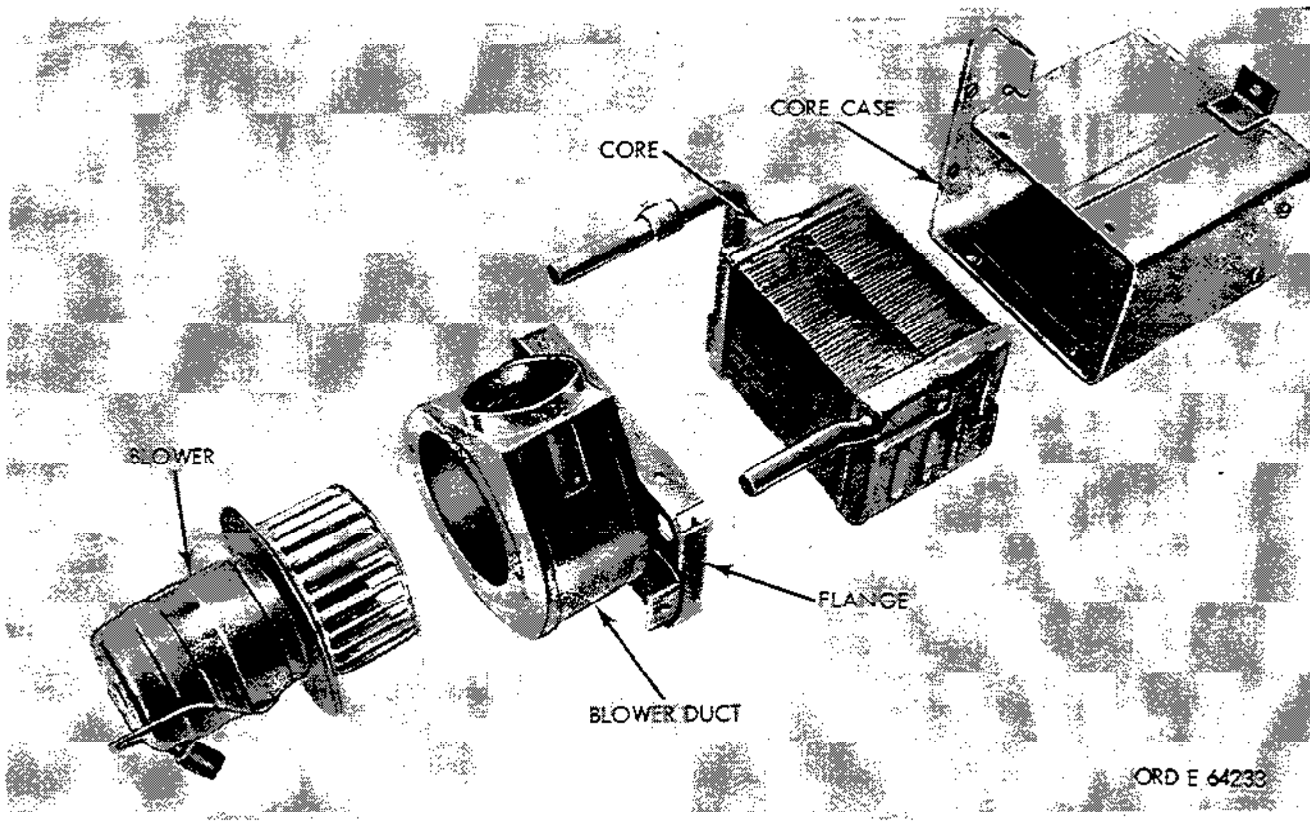


Figure 3-22. Heater assembly—major components—exploded view.

Section V. DEEPWATER FORDING KIT

3-37. Description and Data

a. Description

The deepwater fording kit (fig. 3-23) consists of a carburetor air intake tube extension which attaches to the air cleaner and is mounted at the body left side panel. An exhaust extension tube attaches to the exhaust flanged tailpipe and is secured with a support assembly at the body left rear panels. A fording valve control (fig. 3-24) mounted on the dash panel is connected to the fording valve by means of a flexible cable. A fording valve is mounted on the intake manifold which connects various vent lines to the intake manifold. A vent tube and fitting for venting the brake master cylinder is also included. Various brackets and standard bolts and nuts necessary to install the kit to the vehicle are also included. With this kit installed, the vehicle can ford hardbottom water crossings up to 5 feet in depth.

NOTE

Deepwater fording kit sealer MIL-S-12158 type 2, quantity one quart is provided with the kit for application to battery starter, and starter switch terminals to reduce the effects of corrosion.

b. Data. Refer to table 1-1 for tabulated data.

3-38. Service Upon Receipt Of Materiel

a. Inspect air intake tube for secure attachment to body and tight connection to air cleaner.

b. Inspect exhaust extension tailpipe for secure attachment to body and exhaust extension cover for operation. Inspect exhaust tailpipe extension for watertight connections.

c. Inspect installation of brake master cylinder vent for secure attachment.

d. Check tightness of vent connections located on firewall.

e. Operate engine and fording valve to verify operation.

f. Inspect fuel tank cap fording valve setting for ease of operation.

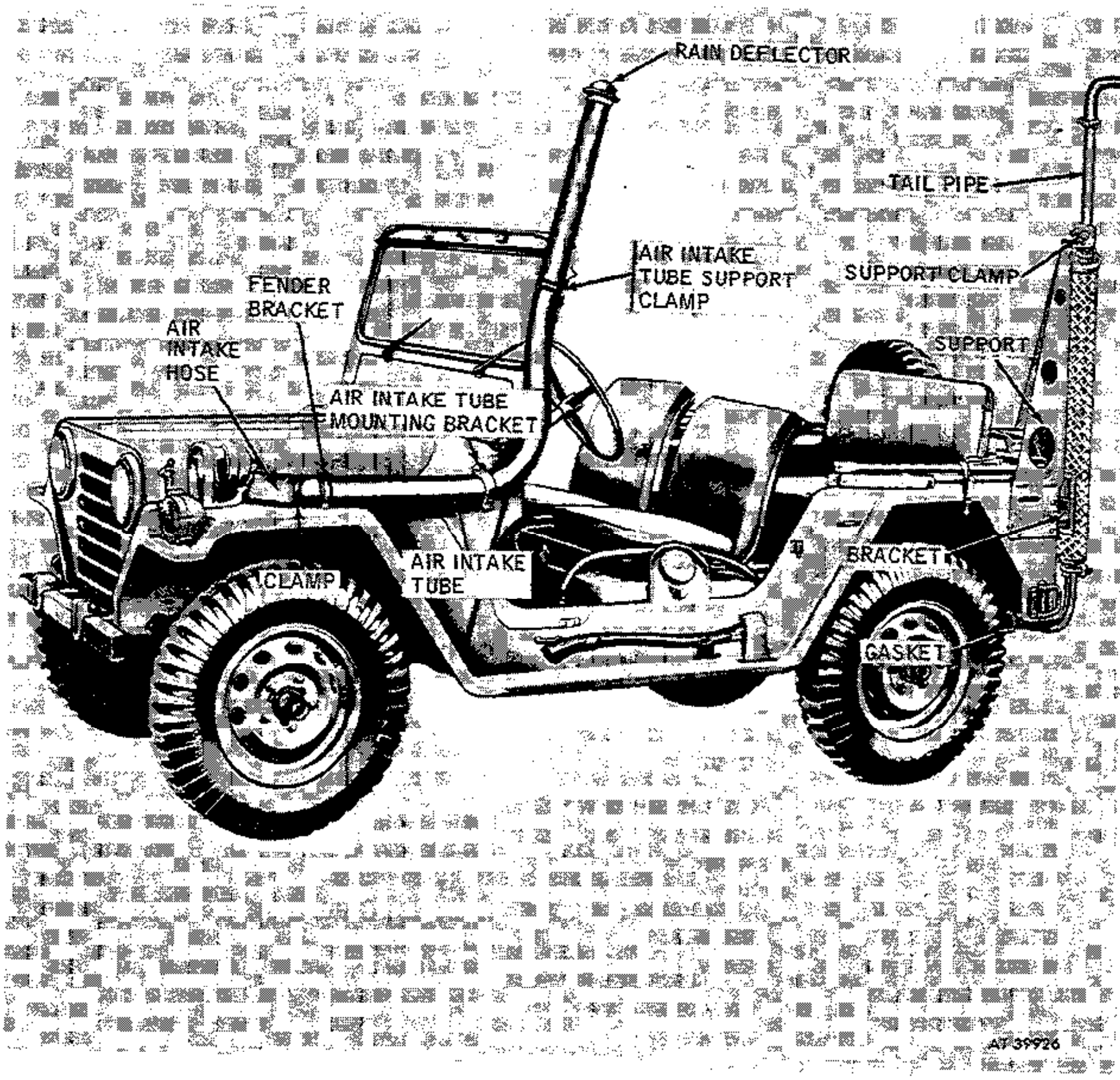


Figure 3-23. Deepwater fording kit installation.

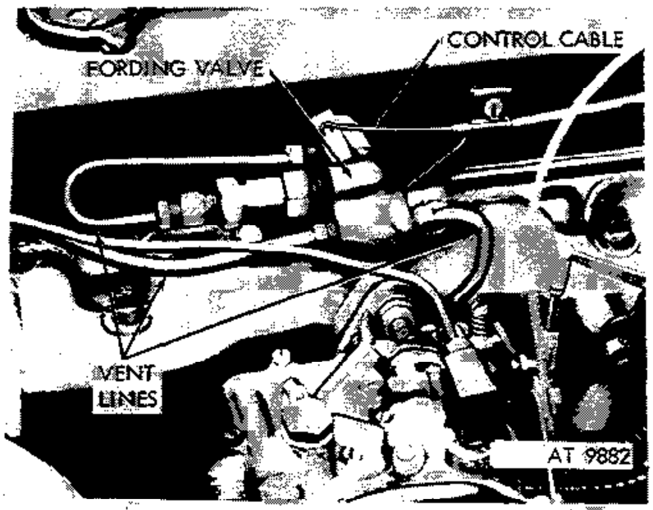


Figure 3-24. Fording valve and cable.

3-39. Preventive Maintenance

a. Daily. TM 9-2320-218-10 to describe the preventive-maintenance services to be performed on the deepwater fording equipment by the driver each day the vehicle is operated.

b. Semiannually.

(1) Inspect air intake tube for tight connection to air cleaner inlet.

(2) Inspect all exhaust extension tailpipe joints for tight connections. Tighten connections or replace gaskets as necessary.

(3) Tighten all intake tubes and tailpipe extension attaching brackets.

(4) Inspect all attaching brackets for bent, cracked, or broken parts. Replace as necessary.

(5) Tighten all vent line connections as necessary to prevent entrance of water.

(6) Verify operation of fording valve, controls, and linkage. Lubricate as necessary (TM 9-2320-218-10).

3-40. Troubleshooting

For troubleshooting the vehicle with fording kit installed, refer to table 3-4.

3-41. Fording Valve

a. Removal. Refer to figure 3-24.

(1) Disconnect control cable at valve operating lever by loosening retaining screw in support bracket and pulling the eyed end of the control cable off valve operating lever.

(2) Remove valve cover vent tube from ventilator valve.

(3) Unscrew ventilator valve from fording valve body.

(4) Remove carburetor vent line.

(5) Unscrew fording valve from intake manifold.

b. Installation. Reverse the order of (5) through (1) above.

NOTE

Be sure the fording valve control is pushed completely in and that the control cable is properly positioned in the bracket before tightening retaining screw.

3-42. Four Way Ventilation Fitting.

a. Removal. Disconnect brake master cylinder, fuel tank, and windshield wiper tube fittings from four-way fitting on face of firewall. Remove fitting.

b. Installation.

(1) Position fitting to fuel tank ventilation line at grommet in firewall and install line to fitting finger tight.

(2) Position and install remaining three ventilation lines to the four way fitting.

(3) Check position of fitting and tighten all connections securely.

3-43. Fording Valve Control

a. Removal.

(1) Remove control cable from control valve.

(2) Remove nut retaining control assembly to instrument panel and carefully pull control and cable from instrument panel and firewall along with instruction plate.

b. Installation.

(1) Position instruction plate to instrument panel and start eyed end of control cable through center hole.

(2) Place retaining nut and washer on cable and retain in position at instrument panel while pushing control and cable through instrument panel.

(3) Guide eyed end of cable through grommet in firewall.

(4) Grasp cable and pull until control is seated against instrument panel.

(5) Install control retaining nut and washer to instrument panel, being sure that instruction plate is properly seated against instrument panel.

(6) Connect eyed end of control cable to fording valve.

3-44. Intake Hose

a. Removal.

(1) Remove two clamps retaining the flexible intake tube to the air cleaner and extension intake tube.

(2) Compress flexible hose endwise and remove hose with clamps.

b. Installation.

(1) Position clamps at center of flexible hose.

(2) Compress flexible hose endwise and install hose on air cleaner and extension intake tube, making sure tube is curving freely and equally spaced on attaching ends.

3-45. Exhaust Extension Tailpipe Gasket

a. Removal.

(1) Remove two screws and locknuts retaining extension tailpipe to vehicle tailpipe.

(2) Spread pipe flanges apart and remove gasket.

b. Installation.

(1) Clean vehicle tailpipe and extension tailpipe mating flanges and position gasket between the flanges.

(2) Install two screws and two hug locknuts and tighten to 12-15 lb-ft.

(3) Inspect joint for watertight connection.

Table 3-4. Troubleshooting Vehicle With Deepwater Fording Kit

Malfunction	*Probable causes*	*Corrective action*
1. Excessive smoking from vehicle exhaust extension	*a.* Carburetor air inlet restricted.	*a.* Remove inlet pipe & clean.
	b. Improper fording valve operation	*b.* Disconnect vent inlet lines & verify valve operation (para 3-41).
2. Loss of power	*a.* Carburetor air inlet restricted	*a.* Remove inlet pipe & clean.
	b. Restricted exhaust extension	*b.* Remove exhuast extension pipe & clean.
	c. Improper fording valve operation	*c.* Disconnect vent inlet lines and verify valve operation (para 3-41).
	d. Fuel tank filler cap valve unsatisfactory.	*d.* Replace cap.
3. Stalling on land	*a.* Carburetor not adjusted correctly.	*a.* Adjust carburetor.
	b. Carburetor air inlet restricted	*b.* Remove air inlet pipe and clean
	c. Restricted exhaust extension	*c.* Remove exhaust pipe extension & clean.
	d. Improper fording valve operation.	*d.* Disconnect vent inlet lines & verify valve operation (para 3-41).
	e. Fuel tank filler cap valve improperly set.	*e.* Position valve correctly or replace cap.
4. Stalling in water	*a.* Leaks in air intake system	*a.* Examine & tighten all air intake connections
	b. Leaking exhaust system	*b.* Examine & tighten all exhaust connections
	c. Improper fording valve operation	*c.* Disconnect vent inlet lines & verify valve operation (para 3-41).
	d. Loose ventilating line connections.	*d.* Examine & tighten ventilating line connections.
	e. Fuel tank filler cap valve improperly set	*e.* Position valve correctly or replace cap.
5. Water in engine	*a.* Leaks in air intake system	*a.* Examine & tighten all air intake connections. Change oil and oil filter.
	b. Loose ventilating line connections	*b.* Examine all ventilating line connections and tighten as necessary. Change oil and oil filter.
	c. Improper fording valve operation	*c.* Disconnect vent inlet lines & verify valve operation (para 3-41). Change oil & oil filter.
6. Water in fuel	*a.* Fuel tank filler cap valve improperly set	*a.* Position valve correctly or replace cap. Drain water from fuel tank.
	b. Improper fording valve operation.	*b.* Disconnect vent inlet lines and verify valve operation (para 3-41). Drain water from fuel tank.
	c. Loose ventilating line connections.	*c.* Examine all ventilating line connections & tighten as necessary. Drain water from fuel tank.
	d. Leaks in air intake system	*d.* Examine & tighten leaking intake connections. Drain water from fuel tank.

Table 3-4. Troubleshooting Vehicle With Deepwater Fording Kit—Continued

Malfunction	Probable cause	Corrective action
7. Water in brake fluid	*a.* Loose ventilating line connections.	*a.* Examine all ventilating line connections as necessary. Drain all contaminated brake fluid from system. Flush system & replenish fluid. Bleed brake systems.
	b. Improper fording valve operation	*b.* Disconnect vent inlet lines & verify valve operation (para 3-41). Drain all contaminated brake fluid from system. Flush system and replenish fluid. Bleed brake system.
	c. Leaks in air intake system.	*c.* Examine & tighten leaking air intake connections. Drain all contaminated brake fluid from system. Flush system & replenish fluid. Bleed brake system.

Section VI. 100-AMPERE ALTERNATOR KIT

3-46. Description and Data

a. General. The 100-ampere charging system (fig. 3-25) is used when the electrical requirements of special equipment such as radio transmitters exceed the capabilities of the standard 25-ampere charging system. The system consists of two major components; and alternating current generator which is in the same location as the standard generator; and a regulator which is located in the engine compartment on the right fender. The basic difference between this system and the standard system is that the generator unit produces alternating current rather than direct current. Since alternating current cannot be used to charge storage batteries or supply current directly to the vehicle electrical system, an internal rectifier is incorporated in the generator to convert the alternating current to direct current. All components of the system are waterproofed or sealed so vehicles with this equipment may be used for fording.

b. Alternator. The 100 ampere alternator (fig. 3-25) is driven by four belts. Externally it is not sealed; however, the internal components are waterproof and cannot be damaged by submersion in water. The alternator will not function when submerged, but will start charging when removed from the water. The unit is cooled by a fan which is located at the rear of the generator housing.

c. Regulator. The solid state regulator (fig. 3-25) is a hermetically sealed unit and is not affected by water. It contains a load relay which connects the generating system to the vehicle batteries when the ignition switch is turned on. The load relay also connects the generator fields to the batteries for initial excitation. The regulator contains a carbon pile type voltage limiter which controls the generator field current and thus limits the system voltage. The voltage limiter is adjusted externally by a variable resistor located in the base of the regulator.

d. Data. Refer to table 1-1 for tabulated data.

3-47. Service Upon Receipt Of Materiel

Perform the preventive-maintenance services as specified in paragraph 3-48. Also, perform the voltage output test specified in paragraph 3-49 *b.*

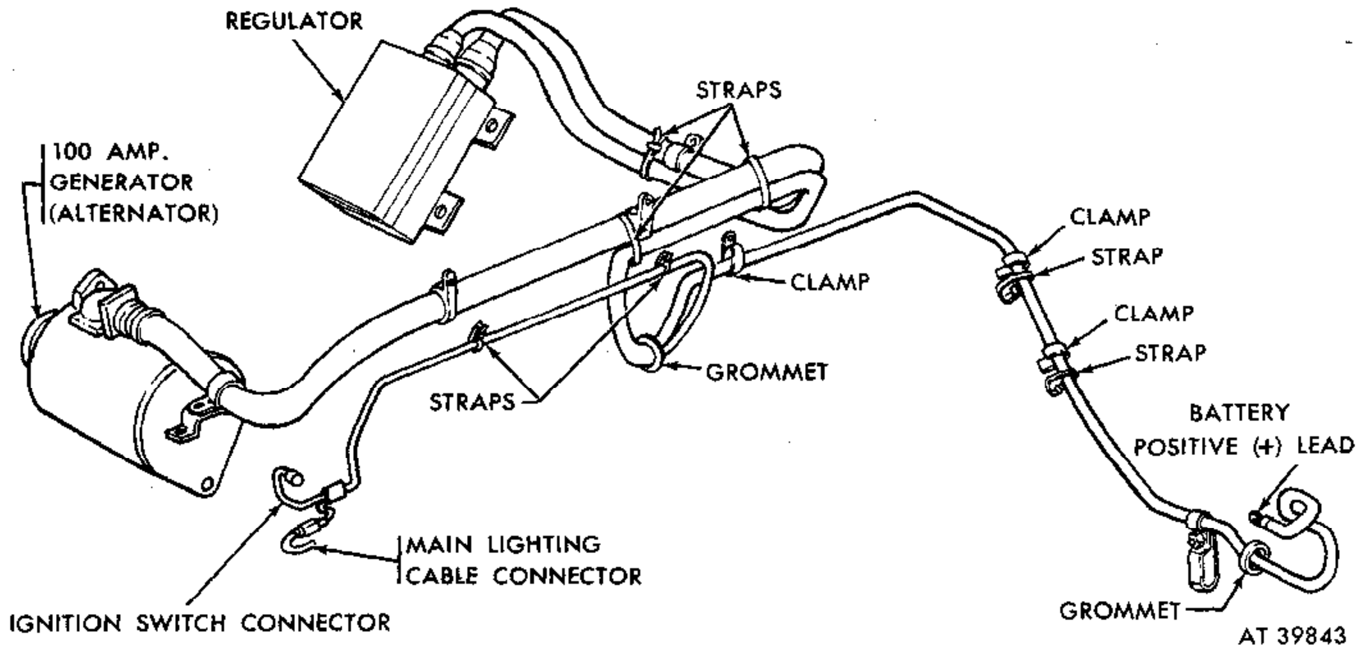


Figure 3-25. 100 Ampere generating system components.

3-48. Preventive Maintenance

a. Check fan and generator belt tension. All belts should have approximately ½ inch deflection (par. 3-51).

b. Check generator and regulator, mounting screw, bolts, and nuts for tightness.

c. Check to see that all cable connectors are tight. Check for breaks in conduits and harnesses.

d. Check battery cables for tightness and condition. Tighten, clean, or replace as required.

e. Turn ignition on; battery-generator indicator should move to the yellow band. Start engine. Allow engine to reach operating temperature and observe battery generator indicator. At approximately 1,500 rpm, indicator should stay in the green band. Turn ignition off if indicator is not in the red band, troubleshoot the entire generating system.

3-49. Troubleshooting

a. General. Refer to the following procedures and table 3-5.

b. Voltage Output Test.

(1) Connect a dc voltmeter, having a 50-volt range, across the positive terminal of one battery and negative terminal of the other battery.

NOTE

If vehicle is equipped with a slave receptacle, check voltage at the receptacle.

Turn ignition switch "ON". Battery-generator indicator should move to the yellow band, and the voltmeter should read between 23 to 25 volts. Depress starter switch with ignition switch "ON". Observe voltmeter. If voltmeter indicates less than 18 volts vehicle cranking starter, discontinue attempting to start vehicle and replace both batteries. Disconnect voltmeter.

(2) When engine has started, allow engine to reach operating temperature. Connect voltmeter across batteries (1) above, between 27.5 to 28 volts, and battery-generator indicator should be in the green band. Turn on lights and any load not exceeding 100 amperes. Voltage should be constant and remain 27.5 to 28 volts. If voltage drops below 27.5 volts, or exceeds 28 volts during the test, adjust the regulator voltage (*c* below).

NOTE

It is normal for the ac generator unit to whine or howl while charging (para. 3-51 *b* (8).

c. Regulator Voltage Adjustment (figs. 3-26 through 3-29). Remove plug from top or side of regulator. Using a screwdriver, turn the voltage adjusting rheostat in clockwise direction to increase voltage and in the counterclockwise direction to decrease voltage. Rheostat should not allow more than a 5-volt range in its adjustment and voltage is to remain stable. Apply sealing compound to threads of plug.

d. Visual Checks. Check security of all connectors and determine that the wiring is not damaged.

e. Battery to Regulator Harness Check. Disconnect the battery wiring from the regulator (connector no. 1, fig. 3-26) and check the sockets then remove harness as follows:

(1) Plus lead of voltmeter to socket A, negative lead to ground; voltmeter should indicate battery voltage.

(2) Plus lead of voltmeter to socket A, negative lead to socket B; voltmeter should indicate battery voltage.

(3) Plus lead of voltmeter to socket F, negative lead to socket C (ignition switch "ON"), voltmeter should indicate battery voltage. If battery voltage is indicated in each test, connect harness connector to regulator. If battery voltage is not indicated, inspected for damaged connectors, sockets, and wiring. Repair or replace harness as required.

f. Generator (Alternator) to Regulator Lead and Conduit Check. Disconnect the generator to regulator lead and conduit at the generator (connector 3, fig. 3-26) and perform the following checks at the disconnected connector of the lead and conduit.

(1) Place positive lead of voltmeter to socket D and negative lead to socket E with ignition switch on. Voltmeter should indicate battery voltage.

(2) Connect negative lead of voltmeter to ground, and with positive lead contact in, turn sockets A, B, and C with ignition switch on. No voltage should be indicated on the voltmeter. If voltage readings are specified in *d* and *e* above and visual checks do not locate the trouble, perform the generator tests which follow:

g. Generator (Alternator) Tests. Proceed as follows:

CAUTION

Perform the following checks with all electrical power on the vehicle off (ignition switch off) to prevent damage to the ohmmeter.

Disconnect the conduit connector from the generator if not already disconnected. Set ohmmeter to low ohm scale (R x 1) and make the following checks at the generator and generator receptacle.

(1) Check three-phase winding continuity. Connect ohmmeter leads to pins A and B, then to pins A and C, and finally to pins C and B. Ohmmeter should indicate no resistance (closed circuit).

(2) Check field resistance. Set ohmmeter selector to R x 1 scale. Connect ohmmeter leads to pins d and e of generator receptacle. Meter should read less than 4 ohms. To assure that brushes are contacting the field rings, and rings are clean throughout all points of contact, remove the fan and alternator belts from the alternator and rotate the rotor at least five times by hand. Ohmmeter reading should be constant and remain at approximately 4 ohms or less. Install belts and adjust (para 3-52).

(3) Check for ground. With ohmmeter set on the ohms scale (R x 100) check for pins A, B, and C to the alternator housing or case (ground). Ohmmeter should read infinite resistance (open circuit).

(4) Test alternator to regulator lead and conduit. Connect conduit connector at alternator receptacle and disconnect the same conduit at the regulator. Repeat the tests made on the alternator receptacle on the pins of the connector of the disconnected conduit (1) through (3) above. Results of tests should be the same; if not, conduit is defective. Repair or replace conduit as required (para 3-55) if the above tests do not locate the trouble continue to the next test.

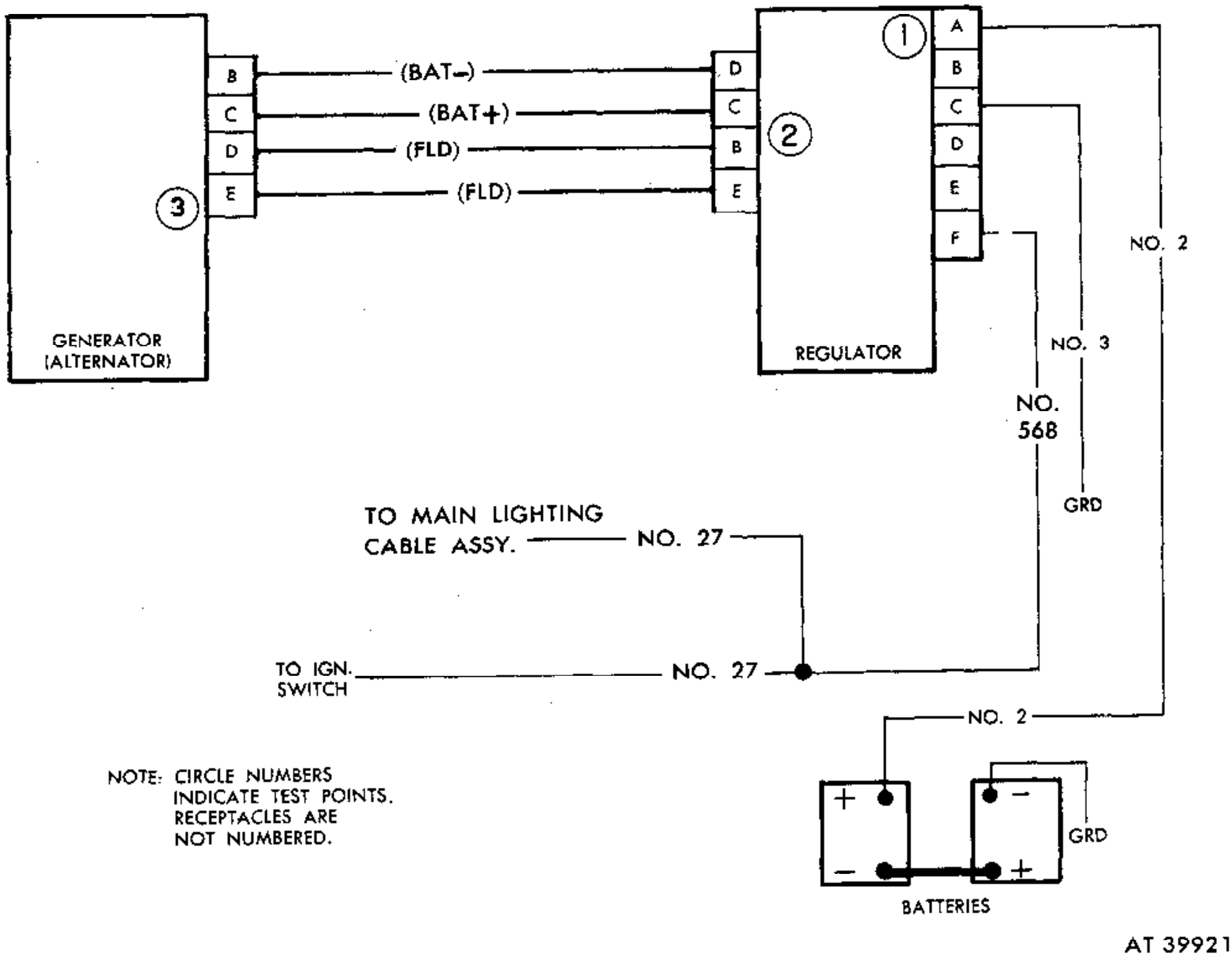
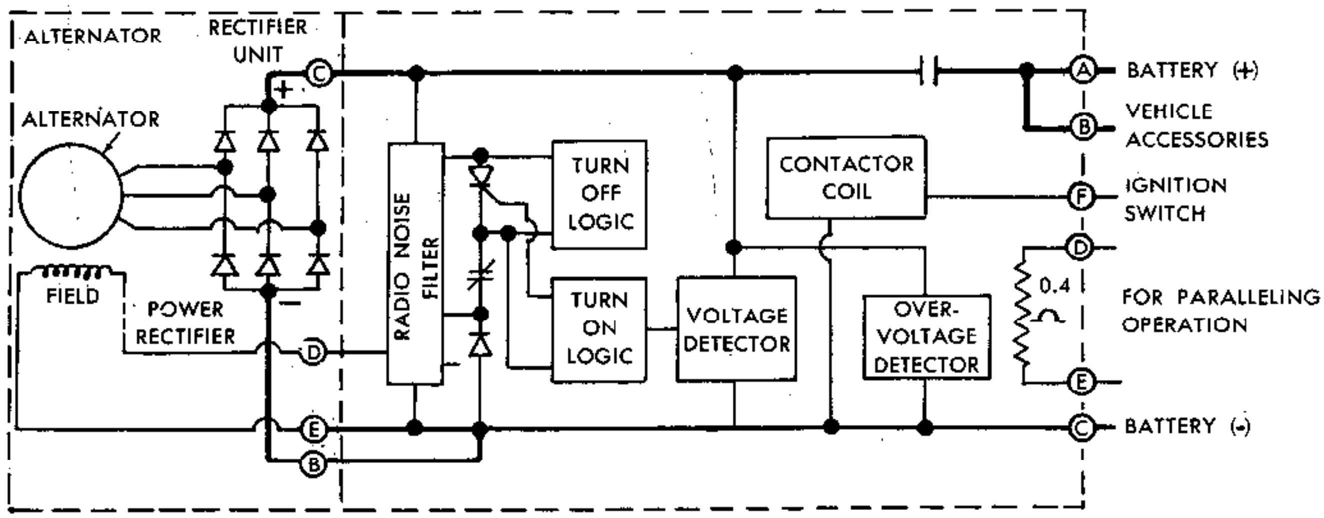


Figure 3-26. 100 Ampere generating system wiring connections.



RECTIFIED A.C. GENERATING SYSTEM
SCHEMATIC WIRING DIAGRAM

AT 39931

Figure 3-27. Schematic wiring diagram.

Table 3-5. Troubleshooting—100 Ampere

Generating System		
Malfunction	*Probable cause*	*Corrective action*
1. No output	*a.* Broken or loose belts.	*a.* Adjust or replace belts (para 3-52).
	b. Generator seized.	*b.* Replace generator (para 3-51).
	c. Broken wire.	*c.* Replace or repair as required (fig. 3-26).
	d. Disconnected wire.	*d.* Tighten all wires and connections (fig. 3-26).
	e. Defective regulator.	*e.* Replace regulator (para 3-50).
	f. One or both batteries dead.	*f.* Replace both batteries.
2. Low output; less than 27.5 volts.	*a.* Loose belts.	*a.* Adjust belts (para 3-52).
	b. Loose connection.	*b.* Tighten connectors.
	c. Regulator out of adjustment.	*c.* Adjust voltage rheostat (para 3-49*c*) or replace regulator (para 3-50).
	d. One phase shorted on generator.	*d.* Replace generator (para 3-50).
	e. One or both batteries dead.	*e.* Replace both batteries. **CAUTION** Reversing polarity of battery will damage generator.
3. High output: more than 28.5 volts.	*a.* One or both batteries low.	*a.* Replace both batteries.
	b. Regulator out of adjustment.	*b.* Adjust voltage rheostat (para 3-49*c*) or replace regulator (para 3-50).
	c. Wire shorted.	*c.* Check wiring (fig. 3-26).

Table 3-5. Troubleshooting—100 Ampere—Continued

Malfunction	Probable cause	Corrective action
4. Battery generator indicator stays in red or yellow band with engine at 1500 rpm.	a. Faulty indicator.	a. Connect voltmeter with 50 volt dc scale across vehicle battery. Check voltage, if between 27.5 and 28, replace indicator.
	b. Broken connection.	b. Check wiring (fig. 3-26).
	c. No output of generating system.	c. See items 1 and 2 above.
	d. One or both batteries dead.	d. Replace both batteries.
	e. Low voltage setting.	e. Adjust voltage rheostat (para 3-49c).
5. Belt squeal.	a. Glazed belts.	a. Install new belt set (para 3-52).
	b. One or more worn or broken belts.	b. Install new belt set (para 3-52).
	c. Generator seized.	c. Replace generator (para 3-51).
	d. Loose belts.	d. Adjust belt tension (para 3-52).
	e. Seized water pump.	e. Replace pump.
6. Battery uses too much water.	a. High voltage setting.	a. Adjust voltage rheostat (para 3-49c).
	b. Cracked battery case.	b. Replace battery.
7. Battery does not hold charge.	a. Voltage limiter incorrectly adjusted.	a. Adjust voltage rheostat (para 3-49c) or replace regulator (para 3-50).
	b. One or both batteries dead.	b. Replace both batteries.
	c. Failed charging system.	c. Perform tests and adjustments (para 3-49).
	d. Slipping belts.	d. Refer to item 5 above.

3-50. Regulator Assembly

a. Removal. Refer to figure 3-28.

(1) Disconnect vehicle ground cable terminal at battery.

(2) Disconnect the generator-to-regulator conduit and the wiring harness from the regulator.

(3) Remove four screws (10) and washers (4) securing regulator assembly (2) to fender mounting brackets (3) and remove regulator assembly.

(4) Remove four screws (8) and washers (9) securing two brackets (1) to regulator.

b. Installation.

(1) Secure regulator assembly to two brackets (1) with four screws (8) and four internal teeth lockwashers (9).

(2) Install regulator assembly on fender brackets (3) using four screws (10) and washers (4).

(3) Connect generator-to-regulator conduit and the wiring harness to regulator.

(4) Tighten connectors to receptacles using a spanner wrench.

(5) Connect negative terminal (ground) to the battery.

(6) Perform voltage output tests and regulator adjustment if required (para 3-52).

3-51. Generator Alternator Assembly

a. Removal. Refer to figure 3-29.

(1) Remove air cleaner and carburetor air intake hose.

(2) Disconnect alternator to regulator conduit at the generator receptacle using a spanner wrench.

(3) Loosen alternator to alternator support attaching bolts. Loosen adjusting arm capscrew at engine block. Remove alternator adjusting arm capscrew, washer and nut from alternator. Push alternator toward engine block and remove belts from alternator drive pulley.

(4) Remove alternator to support attaching bolts, washers and nuts and lift out alternator assembly.

(5) Remove washer and nut retaining alternator drive pulley to shaft.

(6) Remove pulley from shaft using a suitable puller. Remove Woodruff key from slot in shaft.

Key No.	*Item*	*Part No.*	*Quantity*
1	Bracket	11644840	2
2	Regulator	10947439	1
3	Bracket	11644835	2
4	Washer	MS45904-72	5
5	Screw	MS90725-31	6
6	Washer	MS27183-13	5
7	Washer	MS35338-45	5
8	Screw	MS35226-63	4
9	Washer	MS35335-32	4
10	Screw	MS90725-29	4

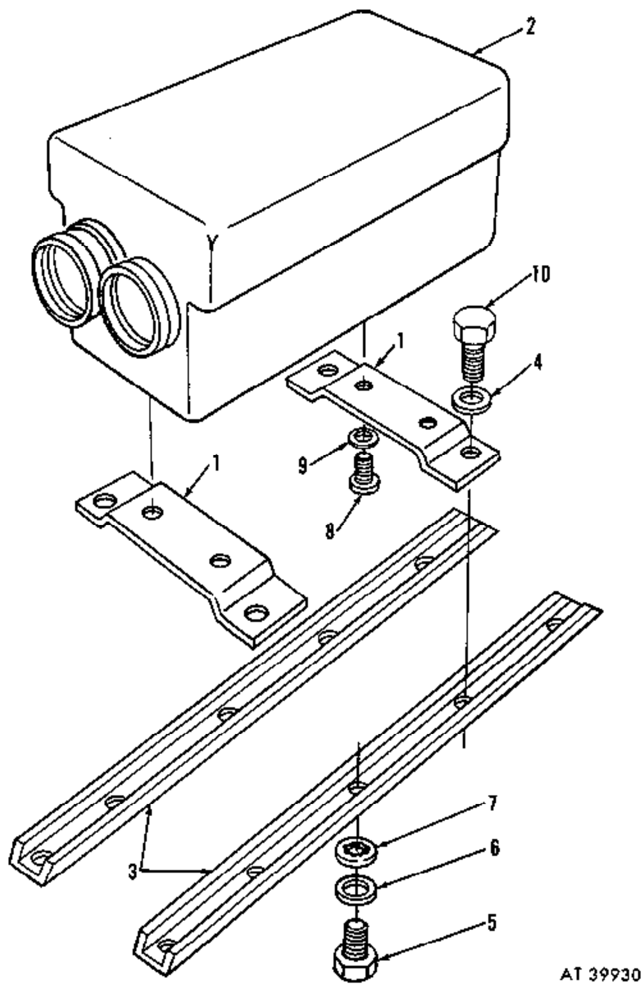


Figure 3-28. 100—ampere generator regulator and attaching hardware.

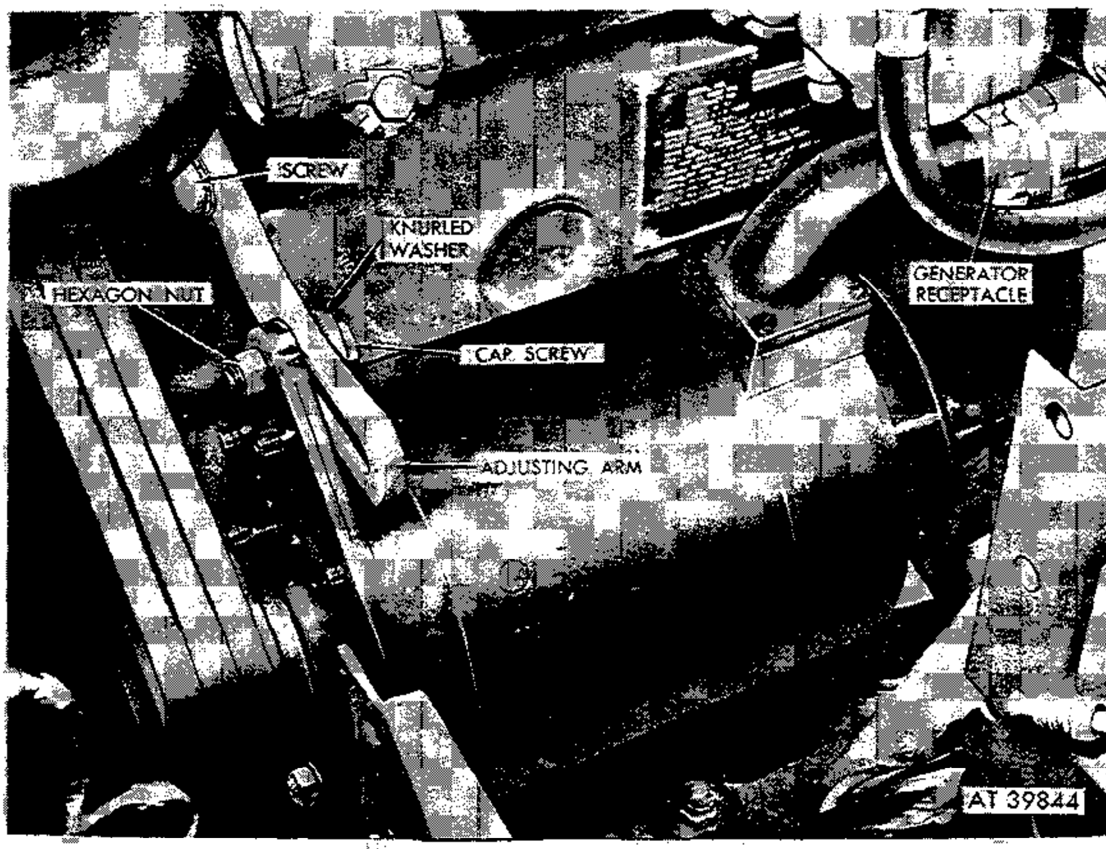


Figure 3-29. 100 Ampere generator—installed.

b. Installation.

(1) Assemble pulley, to alternator shaft wi one key, flat washer and nut. Tighten nut to 75-8 lb-ft torque.

(2) Position alternator on alternator support.

(3) Secure alternator to support using two bolts, four flat washers, and two safety nuts. Use one flat washer at each bolt head and another at each nut. Both bolts are to be installed with heads closest to the front of the vehicle. Tighten nuts snugly. Final tightening is to be performed after belt tension adjust (5) below.

NOTE

Torque alternator mounting bracket bolts 58-65 lb-ft. Loose bolts may cause damage to cylinder block.

(4) Attach adjusting arm to alternator capscrew, knurled washer and nut. Final tighten arm attaching screw and bolt at engine block after belt tension adjustment (5) below.

(5) Place fan and alternator belts in pulley grooves. Pull alternator outward and tighten adjusting arm at point where some play remains in belts. Check adjustment by placing a straight edge over belt at the water pump pulley to the alternator pulley. A result of a firm push on a belt, a deflection of ½ inch from the straightedge should be maintained on each belt. Adjust as required. If the four belts differ in tension, replace set. Tighten bolt securing alternator to support to 60-70 lb-ft. Tighten adjusting arm to engine block bolt to 47-56 lb-ft. Tighten adjusting arm to alternator screw to 35-40 lb-ft torque.

(6) As a preliminary test start engine without connecting the alternator to regulator conduit to the alternator. No noise should be produced by the alternator at any speed. If alternator is noisy during this test, remove alternator and inspect for cause of noise. If noise cannot be corrected without disassembly, obtain another alternator. If alternator is not noisy, stop engine and connect alternator to regulator conduit receptacle. Tighten cable connector securely using a spanner wrench.

(7) Install air cleaner and carburetor air intake hose.

(8) Perform voltage output tests and regulator adjustment if required (para 3-49 *b*).

NOTE

With an electrical load on the charging system it is normal for the alternator unit to whine. If at any time mechanical binding or interference is suspected because of excessive noise perform the test in (5) above.

3-52 Fan and Alternator Belt Set

a. Removal.

(1) Remove air cleaner and carburetor air intake hose.

(2) Loosen alternator to alternator support attaching bolts. Loosen adjusting arm capscrew at engine block. Loosen alternator adjusting arm capscrew. Push alternator toward engine block and remove fan and alternator belts from alternator drive pulley. Remove each belt from the water pump pulley and work each belt out of the crankshaft pulley.

NOTE

Belts are supplied in matched sets and should be replaced in sets.

b. Installation.

(1) Install each belt onto the crankshaft pulley and onto the water pump and generator pulleys. Adjust belt tension as prescribed in paragraph 3-51.

(2) Install air cleaner and carburetor air intake hose.

(3) Check operation of alternator as indicated by the battery-alternator indicator. If not satisfactory perform voltage output test and adjustment as required (para 3-49 *b*).

3-53 Water Pump Pulley

a. Removal.

(1) Remove brush guard, radiator, and radiator fan shroud.

(2) Release tension from fan and generator belts (para 3-51) and remove belts from water pump pulley.

(3) Remove four screw and washer assemblies securing fan and water pump pulley to water pump (fig. 3-30). Lift off fan and pulley from water pump.

b. Installation.

(1) Install water pump pulley and fan to water pump using four screw and washer assemblies. Tighten screws to 15-18 lb.-ft. torque.

(2) Install the three belts to the water pump pulley and alternator pulley and adjust belt tension (para 3-51).

(3) Install radiator, fan shroud, and brush guard.

(4) Fill cooling system (TM 9-2320-218-10).

(5) Check operation of alternator as indicated by the battery-charge indicator. If not satisfactory, perform voltage output test and adjustment as required (para 3-49b).

3-54 Alternator Pulley

a. Removal. Refer to paragraph 3-51 *a* (1) through (6).

b. Installation. Refer to paragraph 3-51 *b* (1) through (8).

3-55 Alternator to Regulator Cable

a. Removal. Refer to figure 3-31.

(1) Disconnect battery ground cable. Disconnect cable connectors from alternator and regulator.

(2) Remove strap securing wiring harness to alternator to regulator cable.

(3) Remove four screws, nuts, and lockwashers securing cable clamps to bracket on left dash support panel, rear of right front fender panel, and cowl panel.

NOTE

Remove instrument cluster for access to hold nuts from turning at rear of dash panel.

(4) Remove cable.

b. Installation. Refer to figure 3-31

(1) Install alternator to regulator cable by routing cable across cowl and under wiring harness. Keep cable under carburetor choke control and above accelerator pedal rubber boot.

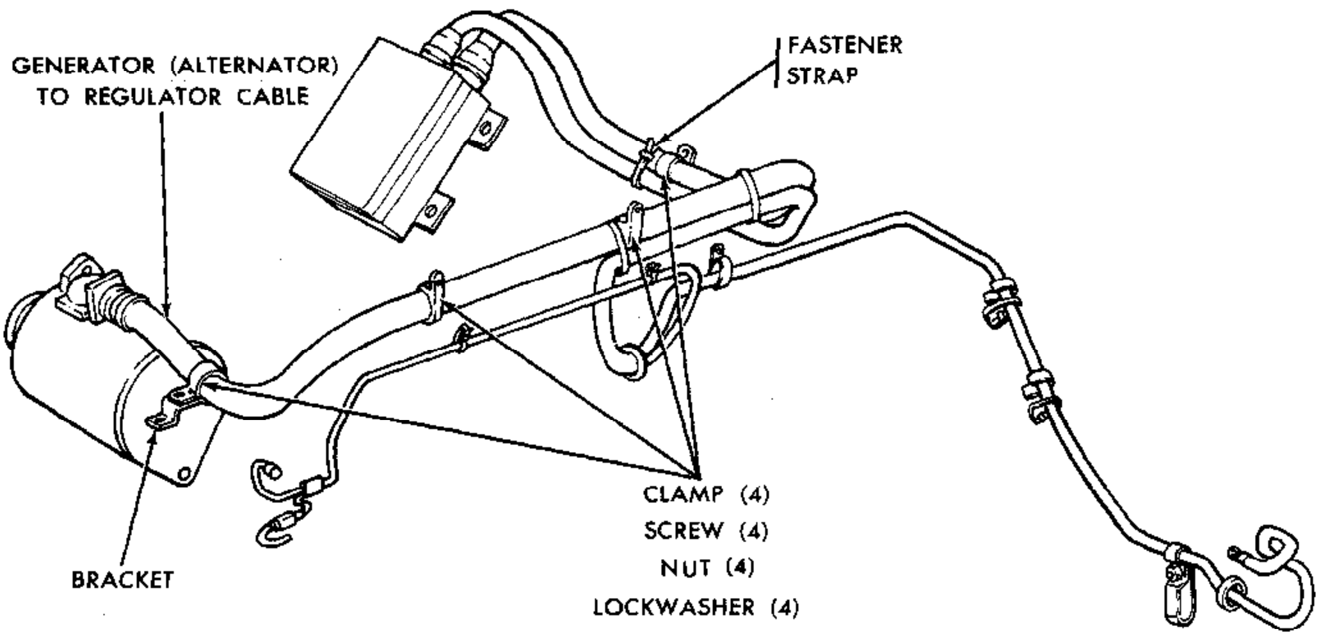


Figure 3-30. Water pump and alternator pulleys—installed.

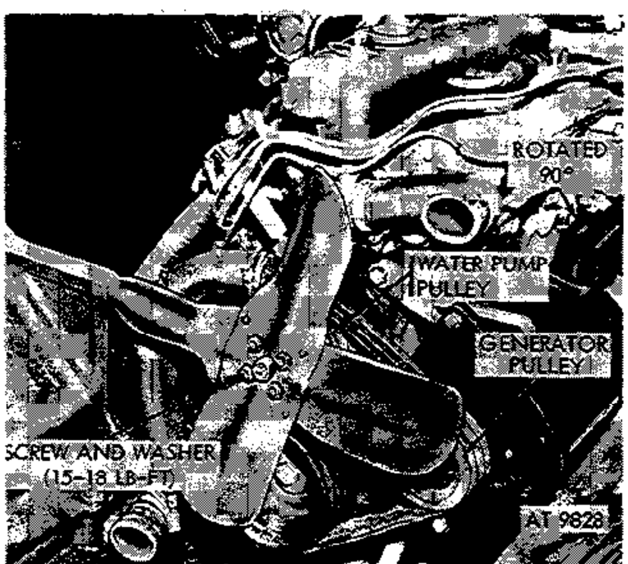


Figure 3-31. 100—ampere generator (alternator to regulator cable).

(2) Place four clamps over alternator to regulator cable. Secure clamps to bracket on left dash support panel, rear of right front fender panel, and cowl panel with four screws, nuts, and lockwashers. Tighten bolts to 4-8 lb. ft torque. Hold nuts at rear of dash panel through instrument cluster opening.

(3) Install strap securing wiring harness to alternator to regulator cable.

(4) Install instrument cluster.

(5) Tighten cable connectors securely using a suitable wrench.

(6) Connect battery ground cable.

3-56. Regulator to Battery Wiring Harness

a. Removal. Refer to figures 3-25 and 3-32.

(1) Remove right front seat and battery compartment cover.

(2) Remove negative battery cable from negative terminal of right battery.

(3) Disconnect the positive cable from the positive terminal of the left battery. Remove the lead connected to the battery positive cable terminal.

(4) Disconnect two connectors (No. 27) of regulator to battery wiring harness from vehicle main lighting cable and ignition switch.

(5) Remove two straps securing regulator to battery wiring harness to vehicle main lighting cable at front of crew compartment.

(6) Remove screw, nut, and lockwasher securing battery lead cable clamp to right side panel (approximately 3½ inches in front of the seat riser) and remove clamp from cable. Thread cable through seat riser and out of battery compartment.

(7) Remove two straps securing battery positive lead of wiring harness along side panel.

(8) At front and right side of transmission tunnel cover remove battery lead of wiring harness from cable clamp secured to toeboard.

(9) Moving to the engine compartment, remove wiring harness connector from regulator forward receptacle, using suitable wrench.

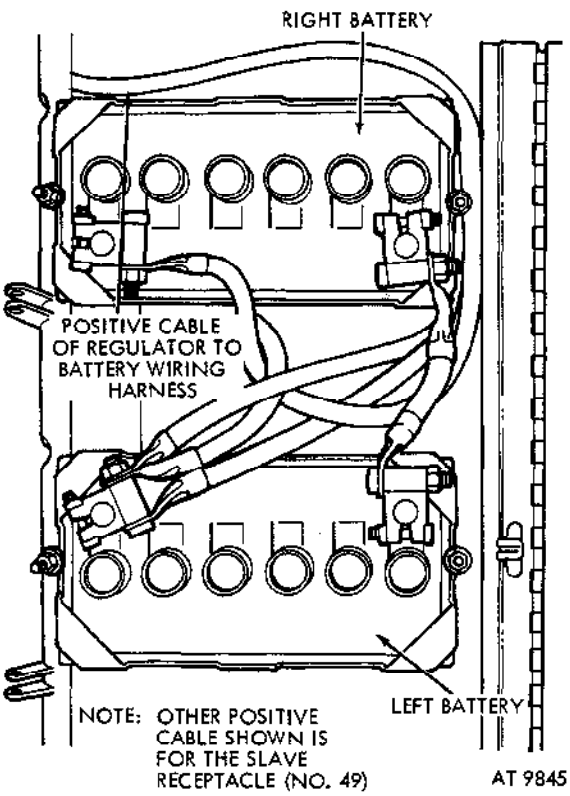


Figure 3-32. Battery compartment, 100-ampere generator and slave receptacle cables—installed.

(10) Remove strap securing wiring harness to alternator to regulator cable at right front fender panel.

(11) Remove one screw, and two washers securing clamp and wiring harness ground lead terminal to horn bracket.

(12) Remove two straps securing wiring harness to vehicle main lighting cable on cowl.

(13) Withdraw wiring harness from passenger compartment by pulling harness through grommet in right side of transmission tunnel.

(14) Remove wiring harness from engine compartment.

b. Installation. (fig. 3-25 and 32).

(1) Connect wiring harness connector to regulator forward receptacle, aline slot with guide to assure proper installation. Tighten connector securely using suitable wrench.

(2) Route wiring harness along right front fender panel and attach ground lead terminal and clamp to horn bracket using one screw and two washers.

NOTE

Install internal-external tooth washer between ground terminal and horn bracket, and external tooth washer between clamp and head of screw.

(3) Secure wiring harness to alternator to regulator cable, at right front fender, panel with strap.

(4) Secure wiring harness to vehicle main lighting cable, on cowl, with two straps.

(5) Route wiring harness through grommet in right transmission tunnel and into passenger compartment.

(6) Route harness leads (No. 27) along front of crew compartment to the ignition switch. Secure harness to vehicle main lighting cable using two straps.

(7) Connect the two lead connectors (No. 27) to vehicle main lighting cable and ignition switch.

(8) Route battery positive lead of wiring harness across toeboard, along side panel through grommet in seat riser. Secure positive lead to toeboard along with the starter to battery cable with cable clamp using existing hardware.

(9) Secure battery positive lead of wiring harness, along side panel, with two straps.

(10) Install cable clamp onto battery positive lead of wiring harness and secure to side panel (approximately 3½ inches in front of seat riser) using screw, nut, and lockwasher.

(11) Install the battery positive cable of the wiring harness to the terminal of the positive battery cable. Install battery positive cable to the positive terminal of the left battery.

(12) Strike the battery negative cable onto the negative terminal of the right battery. If there is sparking, check if the ignition switch or some accessory is on. If there is sparking after the ignition switch or accessory is turned off, troubleshoot the entire generating system (para 3-48 and 3-49). If there is no sparking, connect the battery negative cable to the negative terminal of the right battery (fig. 3-32).

(13) Perform voltage output tests and regulator adjustment if required (para 3-49 *b*).

(14) Install battery compartment cover and right front seat.

Section VII. 180-AMPERE BATTERY CHARGING SYSTEM

3-57. Description.

This installation kit adapts the vehicle to provide power for operation of the 2.2 KW Xenon Searchlight. The system consists of an alternator assembly (180-amp output), voltage and current regulator, rectifier assembly, and attaching hardware. Complete information covering description of all components included in the Xenon Light Installation are contained in TM 11-2300-351-15-3.

3-58. Maintenance

Maintenance instructions allocated to organizational maintenance for vehicles equipped with the 180 ampere battery charging system are contained in TM 9-2300-351-15-3. The referenced manual provides for testing, adjusting and troubleshooting the charging system as installed on the vehicle.

Section VIII. M16 / 14 RIFLE MOUNT KIT

3-59. General

a. The M16 / 14 rifle mount kit consists of a reinforcement plate, bracket mounting catch assembly, catch, and a floor mounting support assembly. With this kit installed, the vehicle provides a readily accessible location for storage of the M16 and M14 rifle. Refer to figures 3-33 and 3-34.

b. The M16 / 14 rifle mounting kit as used on vehicles equipped with the soft top is located on the left and right side as indicated in figure 3-33. Due to door channel installation on vehicles equipped with hardtop kit, the rifle kit is located as indicated by figure 3-34. Where location of mounting holes necessitates different instructions, these instructions will refer to illustrations indicating the different locations.

NOTE

Key numbers in parentheses refer to figure 3-35 unless otherwise noted.

Key	*Item*	*Part number*
1	Reinforcement plate	8712410
2	Screw (4)	96906-35-207-269
3	Lockwasher (4)	96906-35333-39
4	Spacer sleeve (4)	8168546
5	Nut (4) (use on right side only)	96906-35650-302
6	Bracket assembly	11630581
7	Screw	96906-35207-284
8	Lockwasher	96906-35335-33
9	Nut	96906-51968-2
10	Catch Assembly	10939520
11	Spacer	11630586
12	Screw	96906-90726-5
13	Support	11630594

3-60. Light Switch

Remove and retain the light switch and four lockwashers (para 2-113). Discard the four panhead mounting screws.

3-61. Dash Panel Reinforcement Plate (Left Side)

a. Drilling Operations.

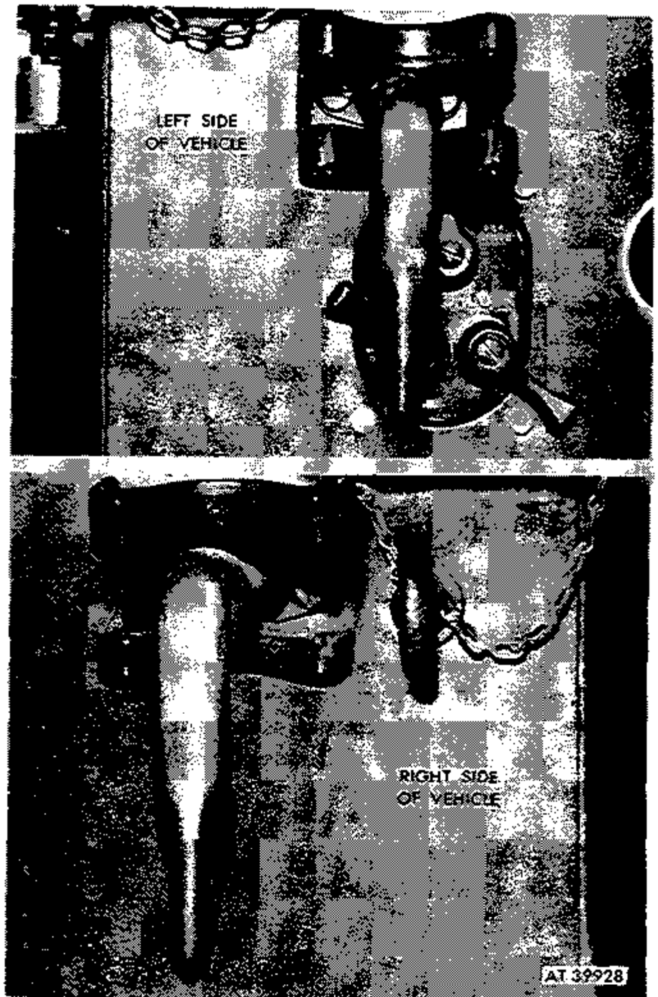


Figure 3-33. M16/M14 rifle mount kit—installed, left and right side (softtop vehicles).

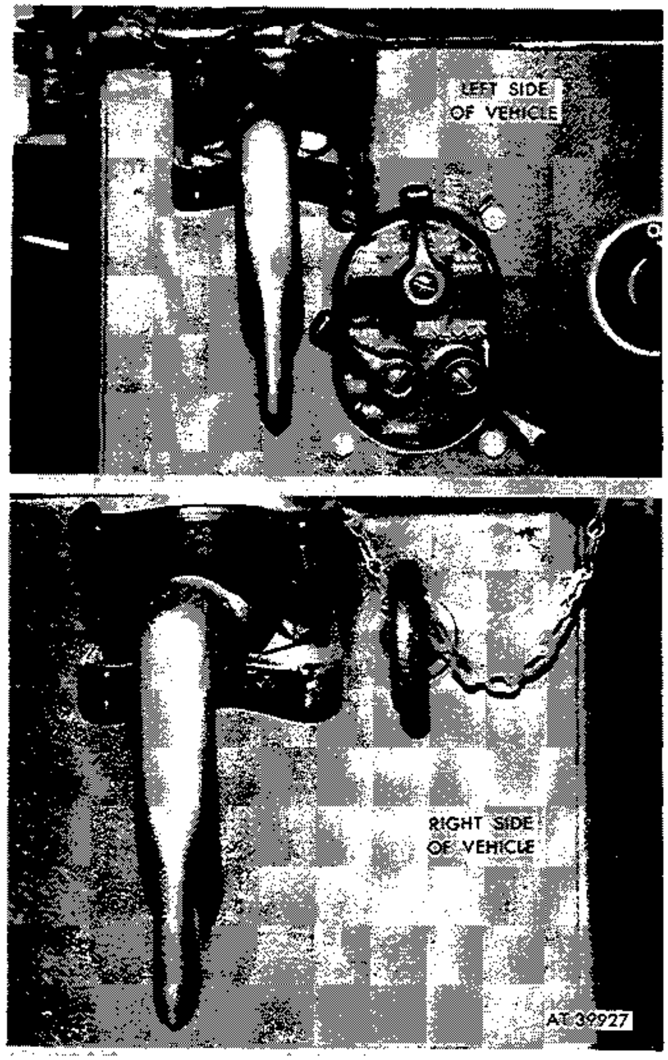


Figure 3-34. M16/M14 rifle mount kit—installed, left and right side (hardtop vehicle).

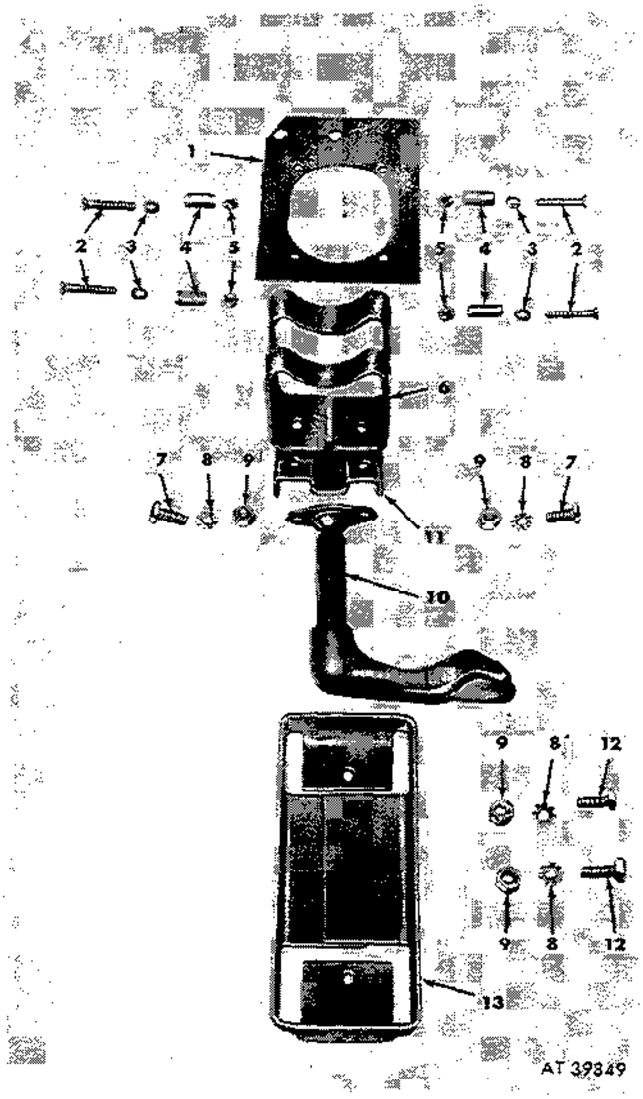


Figure 3-35. M16 14 rifle mounting kit components.

(1) Position dash panel reinforcement plate (1), on the front of the dash panel with four holes in reinforcement plate centered over the light switch mounting holes in the dash panel.

(2) Secure reinforcement plate in this position with a C-clamp as indicated in figure 3-36 for soft top vehicle or figure 3-37 for hardtop vehicle.

b. Soft Top Vehicles.

(1) Use the upper left hole "A" indicated in figure 3-36. Move the reinforcement plate to the left as shown by the dotted lines for the location of hole "B".

(2) Drill a 5 / 16 inch diameter hole in the dash panel. These two holes will be used for mounting the catch assembly bracket and catch assembly.

(3) Remove the C-clamp and reinforcement plate.

c. Hardtop Vehicle.

(1) Using the upper holes in the reinforcement plate as a guide, indicated in figure 3-37, drill two 5 / 16 inch diameter holes in the dash panel. These two holes will be used for mounting the catch assembly bracket and catch assembly.

(2) Remove the C-clamp and reinforcement plate.

d. Installation Procedure (Soft Top and Hardtop Vehicles).

(1) Install the dash panel reinforcement plate (1) and the light switch using four panhead screws (2) with lockwashers (3), and four sleeve spacers (4).

(2) Install the four lockwashers on the four panhead screws; place the reinforcement behind the dash panel with the beveled corner to the upper left.

(3) Insert the four screws through the dash panel and reinforcement; place a sleeve spacer on each screw and insert screws into the light switch and tighten securely.

NOTE

The sleeve spacers installed between the reinforcement and light switch will recess the light switch so that it will be accessible when the M14 rifle is installed.

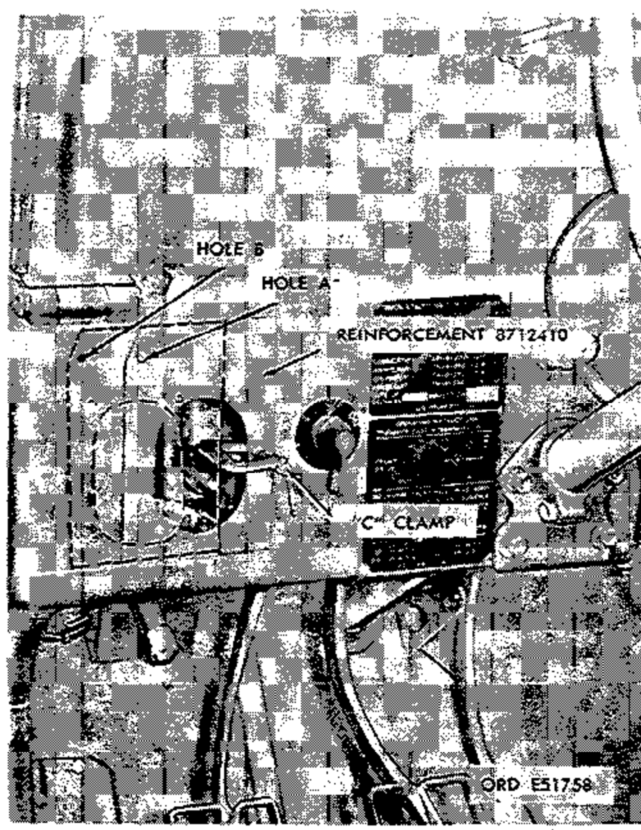


Figure 3-36. Reinforcement plate, left dash panel (softtop vehicle).

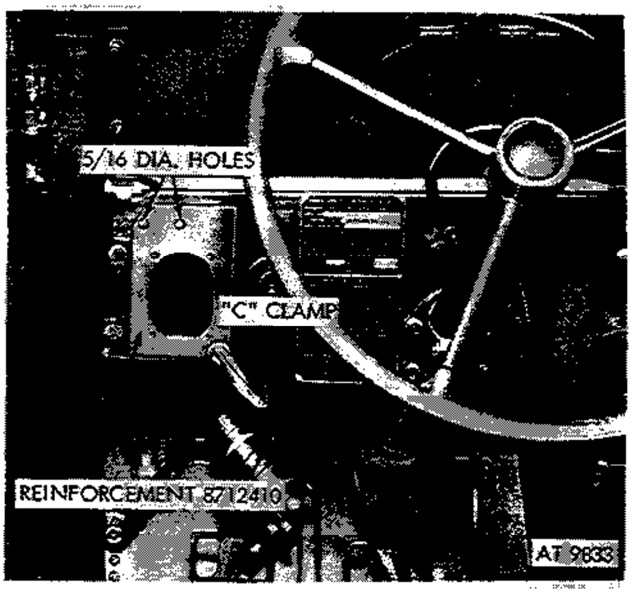


Figure 3-37. Reinforcement plate, left dash panel (hardtop vehicle).

(4) Replace the light switch upper lever and screw assembly.

(5) Install and secure the mounting bracket catch assembly (6), spacer (11), and catch assembly (10) to the dash panel with two panhead screws (7), lockwasher (8) and nuts (9).

NOTE

Install the mounting bracket catch assembly with the long offset side toward the top of the dash panel.

3-62. Rifle Mounting Floor Bracket (Left Side)

a. Locating and Drilling Procedures.

(1) Position rifle mounting bracket (13) on the vehicle floor as indicated in figure 3-38.

(2) Locate position for hole A by measuring on the vehicle floor from the driver's seat bulkhead panel and the vehicle side panel as indicated in figure 3-38.

(3) Mark center for hole A. Remove bracket and drill a 5 / 16 inch diameter hole through vehicle floor.

(4) Install and secure rifle mounting bracket to the vehicle floor with capscrew (12) lockwasher (8) and nut (9).

NOTE

The lockwasher and nut are installed from the underside of the vehicle.

(5) Tighten the nut efficiently to hold the mounting bracket in the position indicated in figure 3-38.

(6) Using the mounting bracket as a guide, drill a 5 / 16 inch diameter hole through the vehicle floor for hole B.

b. Installation.

(1) Install capscrew (12) in hole B of rifle mounting bracket and through vehicle floor.

(2) Install from the underside of the vehicle, lockwasher (8) and nut (9) on screw.

(3) Torque nuts to 6-7 lb-ft.

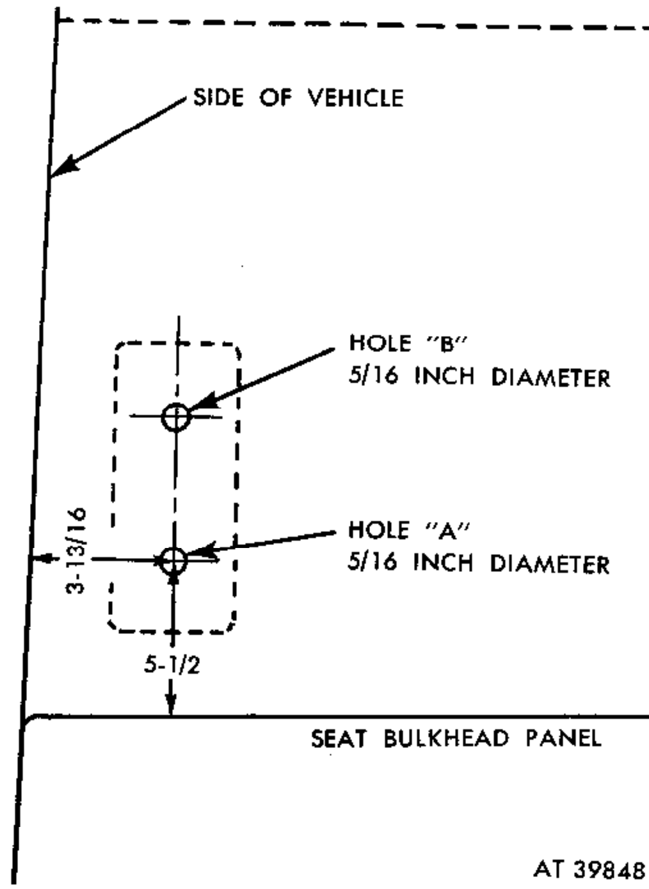


Figure 3-38. Mounting bracket hole locations (left side).

3-63. Dash Panel Reinforcement Plate (Right Side)

a. Drilling Operations.

(1) Position and secure reinforcement plate (1) on the right dash panel with a C-clamp as indicated in figure 3-39.

(2) Using the reinforcement as a template, drill four 7 / 32 inch and two 5 / 16 inch diameter holes through the dash panel, as indicated in figure 3-39.

(3) Remove C-clamp and reinforcement plate.

b. Installation.

(1) Install the reinforcement plate to the back of the dash panel with the beveled corner at the upper right corner of the panel using four panhead screws (2), lockwashers (3), sleeve spacers (4), and nuts (5).

(2) Insert the four screws through the dash panel and reinforcement, place a sleeve spacer, lockwasher, and nut on each screw. Tighten the four nuts securely.

(3) Install and secure the mounting bracket assembly (6), spacer (11), and catch assembly (10) to the dash panel with two panhead screws (7) lockwashers (8) and nuts (9).

NOTE

Install the mounting bracket catch assembly with long offset side toward the top of the dash panel.

3-64. Rifle Mounting Floor Bracket (Right Side)

a. Locating and Drilling Procedures.

(1) Position rifle mounting bracket (1) on the vehicle floor as indicated in figure 3-40.

(2) Locate position for hole A by measuring on the vehicle floor from the seat bulkhead panel and the vehicle side panel, as indicated in figure 3-40.

(3) Mark center for hole A in vehicle floor. Remove bracket and drill a 5 / 16 inch diameter hole through vehicle floor.

(4) Install and secure rifle mounting bracket to the vehicle floor with a capscrew (12), a lockwasher (8) and a nut (9).

NOTE

The lockwasher and nut are installed from underside of the vehicle.

(5) Tighten the nut sufficiently to hold the mounting bracket in position, as indicated in figure 3-40.

b. Installation.

(1) Install a capscrew (12), through the rifle bracket, and vehicle floor at hole B.

(2) Install lockwasher (8) and nut (9) from the underside of the vehicle.

(3) Torque nuts to 6-7 lb-ft.

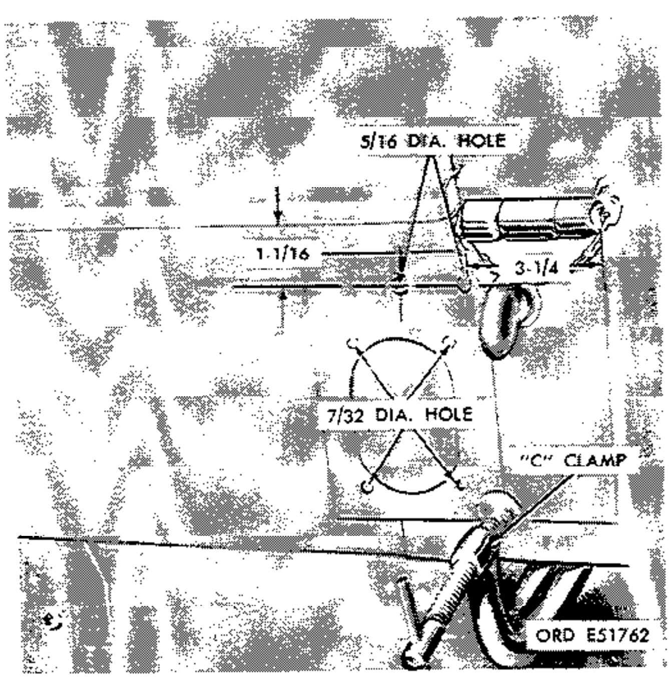


Figure 3-39. Reinforcement plate, right dash panel.

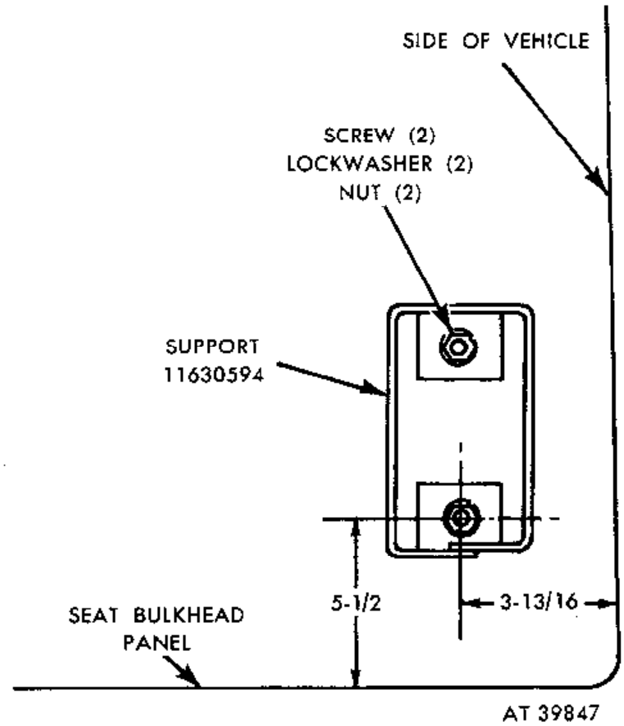


Figure 3-40. Mounting bracket—installed (right side).

Section IX. DOOR AND SIDE CURTAIN KIT

3-65. General

The M151, M151A1 and M151A2 models may be equipped with protective enclosures for cold weather driving consisting of canvas doors, and side curtains. The vehicle can be operated with all enclosure parts removed, with all parts installed, or with only some parts installed. Assembly and installation of all enclosure units can be done without tools. When not in position on the vehicle, all enclosure parts should be stowed under the rear seat.

3-66. Door and Side Curtain Kit

For removal, installation and stowage of door and side curtain kit refer to TM 9-2320-218-10.

Section X. M4 GUN MOUNT PEDESTAL

3-67. M4 Gun Mount Pedestal (Fig. 3-41)

a. *Description and Data* (TM 9-2320-218-10).

b. *Operating Instructions* (TM 9-1000-306-13).

c. *Daily Preventive Maintenance* (TM 9-1000-205-12).

d. *Lubrication* (TM 9-1000-205-12).

e. *Troubleshooting* (TM 9-1000-205-12).

3-68. Modification Procedure

a. *Removal of Parts.*

(1) Remove and discard canvas top assembly, door, side curtains, roof top bows, and rods.

(2) Remove and retain the two front seats. Remove and discard the rear seat.

b. *Locating and Drilling Holes for Pedestal Support and Brace Assemblies.*

(1) Locate six 1/8 inch pilot holes as indicated in figure 3-42.

(2) Drill six 7/16 inch holes through floor panel and reinforcement weldments as indicated by figure 3-42.

c. *Installation of Parts Removed.*

(1) Install and secure front seats.

(2) Install soft top assembly.

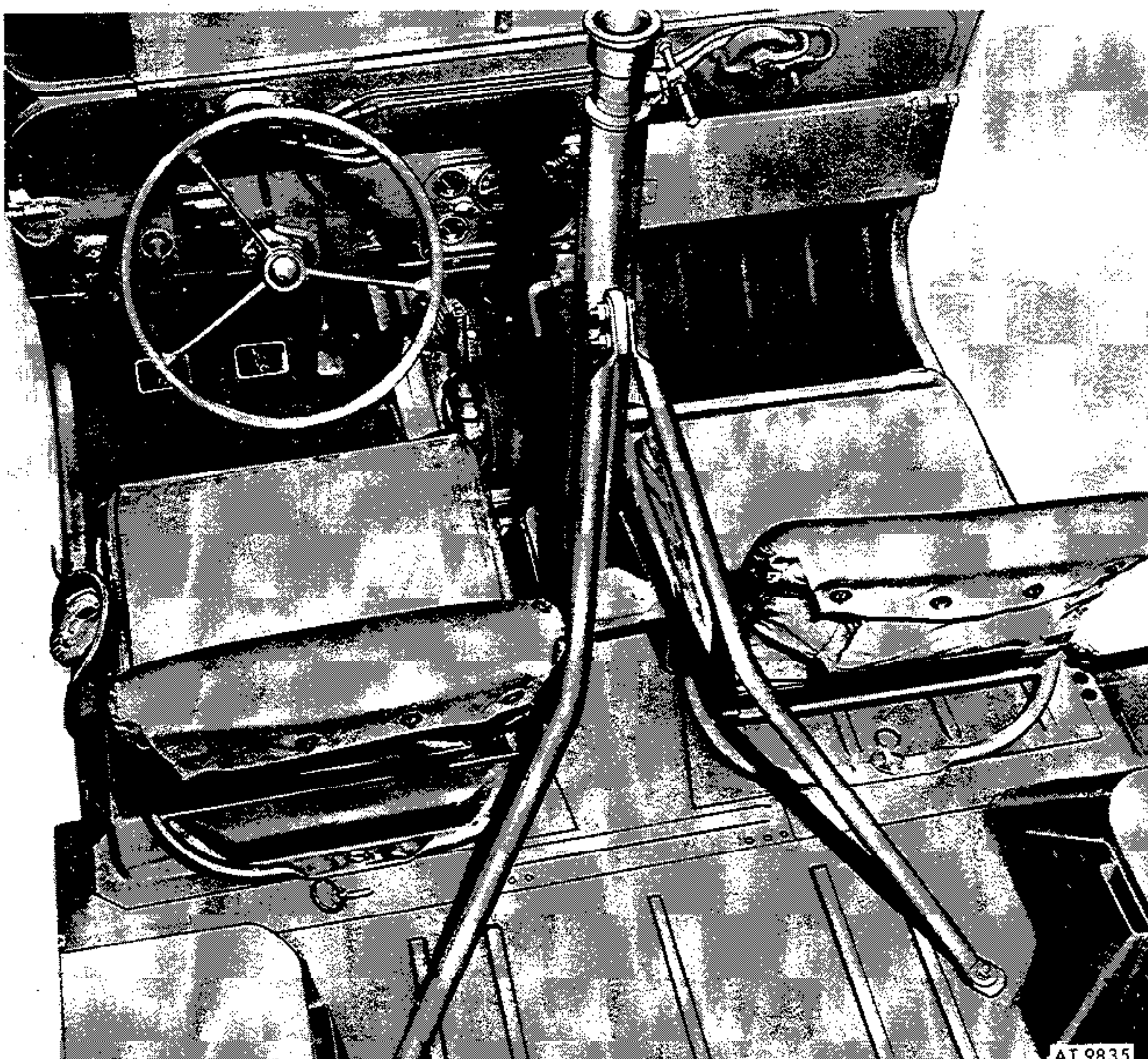


Figure 3-11. M4 gun mount pedestal—installed.

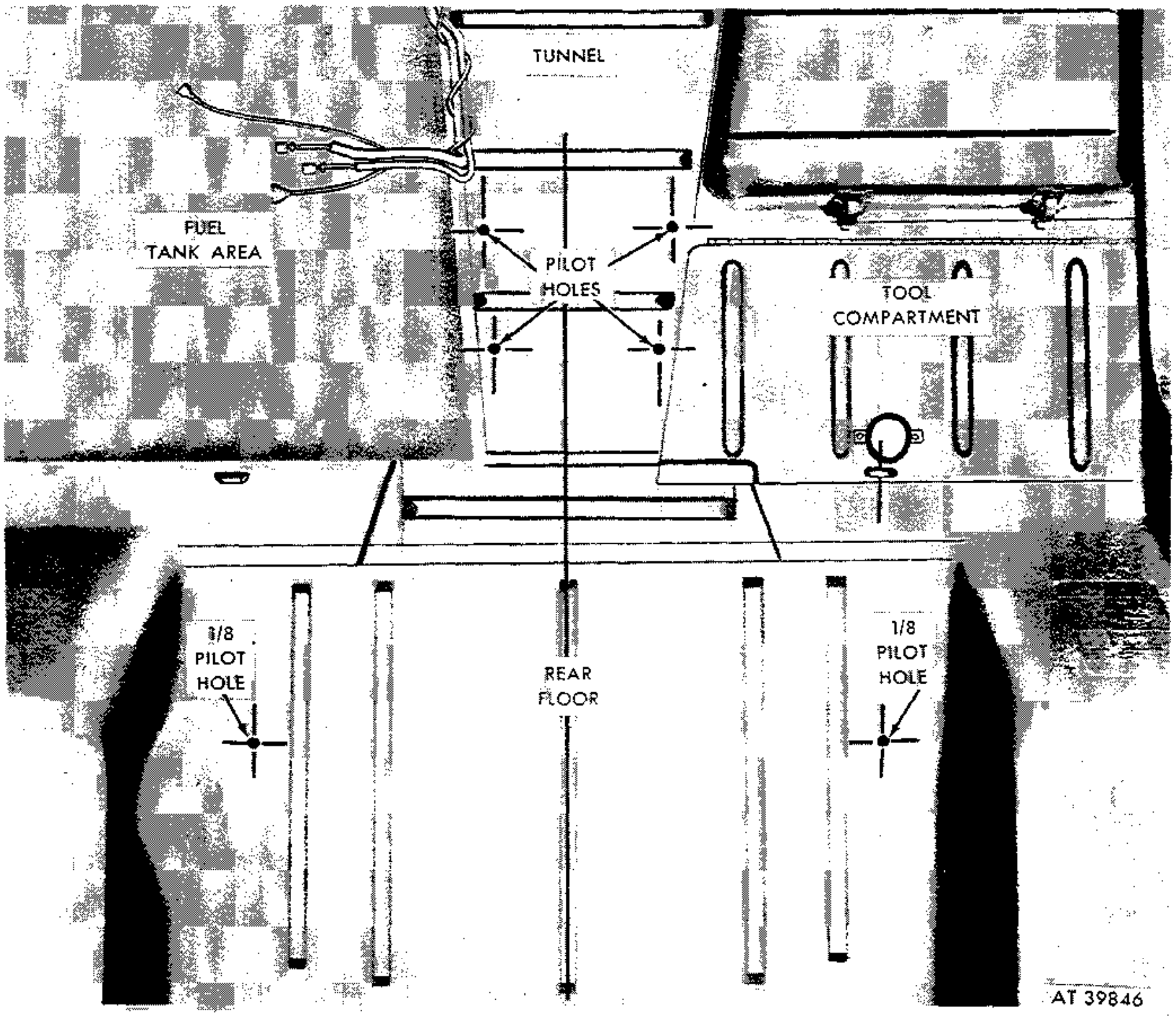


Figure 3-42. Details for locating holes in vehicle floor.

CHAPTER 4

ADMINISTRATIVE STORAGE

Section I. SHIPMENT AND STORAGE

4-1. General

Commanders are responsible for insuring that all vehicles issued or assigned to their command are maintained in a serviceable condition and properly cared for, and that personnel under their command comply with technical instructions. Lack of time, lack of trained personnel, or lack of proper tools may result in a unit being incapable of performing maintenance for which it is responsible. In such cases, unit commanders may, with the approval of major commanders, place vehicle that is beyond the maintenance capability of the unit in administrative storage or return it to supply agencies.

"When preparing M151, M151A1, M151A2, M151A1C, M825, M718 and M718A1 vehicles for administrative storage or shipment the unit commander will be responsible for processing the vehicle (including all its tools and equipment) in such a manner as to protect it from corrosion, deterioration, and physical damage."

4-2. Administrative Storage Instructions

a. Time Limitations. Administrative storage is restricted to a period of 90 days and must not be extended unless the vehicle is reprocessed in accordance with b below.

b. Storage Procedure. Disassembly will be limited to that necessary to clean and preserve exposed surfaces. Except as otherwise noted, and to the maximum extent consistent with safe storage, the vehicle will be placed in administrative storage in as nearly a completely assembled condition as practicable. Equipment will be installed and adjustments made so that the vehicle may be placed in service and operated with minimum of delay.

(1) The vehicle should be stored on level ground in the most favorable location available, preferably one which afford protection from exposure to the elements and from pilferage.

(2) Perform an "S" semiannual preventive-maintenance service on vehicles intended for administrative storage. This maintenance will consist of inspecting, cleaning, servicing, preserving, lubricating, adjusting, and replacement of minor repair parts if required.

(3) Remove storage batteries and place in covered storage, maintaining a charged condition.

(4) Provide access to the vehicle to permit inspection, servicing, and subsequent removal from storage.

(5) Mark the vehicle "Administrative Storage" (on windshield, tagged, or other convenient method). Vehicles so marked will not be operated while in this category.

c. Inspection in Administrative Storage.

(1) Visual inspection of vehicles in administrative storage must be conducted at least once each month and immediately following hard rain, heavy snowstorm, windstorm, or other severe weather conditions. Disassembly will be performed as necessary to ascertain fully the extent of any deterioration or damage found. A record of these inspections will be maintained for each vehicle in administrative storage, attached to the vehicle in such a manner as to protect the record from the elements.

(2) When rust or deterioration is found on any unpainted area, necessary reprocessing for administrative storage will be immediately accomplished. Damage caused to the vehicle by severe weather conditions will be promptly repaired. Deterioration or damage to on-equipment materiel (OEM) will be repaired as necessary. Painted surfaces showing evidence of deterioration will be thoroughly cleaned, dried and repainted, using paint of the same quality and color as the original paint.

4-3. Shipping Instructions

a. Preparation for Shipment. Preservation and other protective measures taken in the preparation of vehicles and accompanying tools and equipment for shipment must be sufficient to protect the materiel against deterioration and physical damage during shipment.

(1) *Cleaning.* Prior to application of preservatives, surfaces must be cleaned to insure removal of corrosion, soil, grease, fingerprints, perspiration, or other acid and alkali residues.

(a) Interior of vehicle. Remove all dirt and other foreign matter from all unpainted metal surfaces of the vehicle by scrubbing with cloths soaked in dry-cleaning solvent 6850-264-9037 or mineral spirits paint thinner 8010-246-6115. Do not apply solvent to electrical equipment or rubber parts of any nature; use trichloroethylene 6810-664-0388 to clean electrical parts and electrical contact points. Use warm water for cleaning rubber parts.

WARNING

Cleaning fluids are flammable and toxic. Keep them away from sparks and open flame. Use only in well-ventilated area and avoid prolonged inhalation of fumes or skin contact with fluids. Wear synthetic rubber gloves and protective clothing and goggles.

CAUTION

Do not use liquids under pressure for cleaning interior of vehicle.

(b) Exterior of Vehicle. Exterior surfaces of the vehicle will be cleaned in a manner which will insure removal of all foreign matter including excess cleaning material.

(2) *Drying.* Immediately after cleaning, parts must be thoroughly dried to remove cleaning solutions or residual moisture by ambient air or by wiping with clean, dry, lint-free cloths.

(3) *Lubrication.* After cleaning has been accomplished, all grease fittings must be wiped clean with solvent 6850-264-9037 and the vehicle lubricated in accordance with LO 9-2320-218-12. Excess grease must be removed after lubrication and before processing.

(4) *Preservation.* All critical unpainted metal surfaces must be protected during shipment. Use procedures and materials listed in *(a)* and *(b)* below. If the preservatives listed below are not available, oil or grease covered in LO 9-2320-218-12 may be used for this purpose, but it is effective for only a few days; therefore, equipment so protected must be closely watched for signs of corrosion. Selection of preservatives shall be such that their application, use or removal will not damage the surface to which they are applied.

(a) Battery leads. Each battery lead terminal, including the jumper lead ends, shall be cleaned, coated with type P-11 automotive and artillery grease 9150-190-0908, and wrapped with type I, class I pressure-sensitive adhesive tape 8135-266-5016. Jumper leads shall then be taped to the battery-to-ground lead to avoid loss.

(b) Miscellaneous preservation. All unpainted, machined metal surfaces on the inside of the vehicle shall be coated with type P-11 automotive and artillery grease 9150-190-0908. All unpainted, exposed, machined metal surfaces on the exterior of the vehicle, shall be coated with type P-4 corrosion-preventive compound 8030-231-2354.

(5) *Packaging.*

(a) Lenses. Cover all vehicle lamp lenses with grade A, class I, grease-proof barrier-material 8315-171-0934, and secure with type I, class I pressure-sensitive adhesive tape 8135-266-5016.

(b) Electrical openings. Cover all open electrical receptacles with type I, class I pressure-sensitive adhesive tape 8135-266-5016, or with plastic caps which will afford the same degree of protection.

(6) *Packing.*

(a) All spare parts, tools equipment, and other loose items will be packaged and packed to prevent mechanical damage.

(b) For shipment, battery ground terminal should be disconnected and taped.

(7) *Marking.* Provide any necessary identification and precautionary markings in accordance with instructions contained in MIL-STD-129.

b. Army Shipping Documents. Prepare all army shipping documents accompanying freight in accordance with TM 38-750.

4-4. Loading and Blocking of Vehicles on or in Railroad Cars

a. Loading.

WARNING

The height and width of vehicles when prepared for rail transportation must not exceed the limitations indicated by the loading table in AR 700-15. Whenever possible, local transportation officers must be consulted about the limitations of the particular railroad lines to be used for the movement in order to avoid delays, dangerous conditions, or damage to equipment.

(1) When vehicles are shipped by rail, every precaution must be taken to see that they are properly loaded and securely fastened and blocked to floor of flatcar.

(2) Load vehicles on flatcars so they will not form an unbalanced load.

(3) After each vehicle has been finally spotted on flatcar, apply parking brakes and wire or block lever.

(4) When suitable hoisting equipment is not applicable, and other methods of loading and pivoting materiel into balanced position on flatcar are necessary, refer to flatcar loading in TM 9-200.

NOTE

The spare tire for the utility truck is attached to the rear of the vehicle. If these vehicles are to be lifted rather than driven onto the flatcar, the attached spare tires may interfere with lifting devices, and they should be removed and secured with metal strapping at some other suitable location on the vehicle.

b. Blocking.

(1) *General.* All blocking instructions specified herein are minimum and are in accordance with

Pamphlet No. MD-7, Rules Governing the Loading of Defense Materiel on Open-Top Cars of Association of American Railroads. Additional blocking may be added, as required, at the discretion of the officer in charge. Doubleheaded nails may be used, except in the lower piece of two-piece cleats. All item reference letters in (2) through (5) below refer to details and locations shown in figures 4-1 through 4-6. The number of vehicles to be loaded will depend upon the length of flatcar.

(2) *Brake wheel clearance.* "A" load vehicles on flatcars with a minimum clearance of at least 4 inches below and 6 inches above, behind, and to each side of the brake wheel. Any increase in clearance must be consistent with proper location of load.

NOTE

Three methods of blocking are given herein; the method to be used will depend on dimensions of flatcars and availability of required blocking materials. These instructions are for vehicles single-loaded.

(3) *Method I.*

(a) Chock blocks "B" (6 x 9 x 12, six required per truck, constructed as shown in detail 1, fig. 4-6). Locate the 53-degree surface of blocks against the front and rear of each outside wheel, against the front of each inside wheel and against the rear of each inside rear wheel. Nail heel of each block to car floor with three fortypenny nails and toenail both sides of blocks to car floor with one fortypenny nail each.

NOTE

Alternate type B-1 and B-2 chock blocks may be constructed as shown in details 2 and 3, figure 4-6 and located against tires as shown in figure 4-2 and 4-3. Vehicles require chock blocks at the front and rear of all four wheels.

(b) Inside wheel blocks "C" (6 x 9 x 12 four required per truck, constructed as shown in detail 1, figure 4-6). Locate the 6 x 9 surface of block flush against the inside of each wheel, as shown in figure 4-1. Nail heel of each block to car floor with fortypenny nails and toenail each side of floor with one fortypenny nail.

NOTE

Alternate-type inside wheel blocks C-1 may be constructed as shown in detail 4, figure 4-6, and located against tires as shown in figure 4-3. When inside wheel blocks C-1 are used, cushioning material "D" (waterproof paper or burlap) will be placed between blocks C-1 and inside of tire. The materiel should extend 2 inches beyond block on car floor and 2 inches above block against side of tire.

(c) Vehicle strapping "E" (1-in. No. 14 BW gage, hot-rolled steel, length to suit, two required per truck). Locate strapping "E" over front bumper of vehicle and through rear pintle hook of vehicle, as shown in figure 4-1. Pass strapping "E" over front bumper of vehicle and through, and nail anchor plates to car floor with eight twentypenny nails. Substitute, if desired, four strands of No. 8 gage, black annealed wire, "E-1" twisted to form cables. Pass the cable over the bumper or through the pulling hook underneath and around random 2 x 4 x 18 cleat "F" with shim "F-1" (detail 6, fig. 4-6). Nail cleat lengthwise to car floor and twist-tighten cables to remove all slack.

(4) *Method II.*

(a) Wheel cleats "N" (4 in. wide, 6 in. high, 8 inches longer than width of truck, four required for every truck). Locate a cleat "N" across the front and rear of front and rear wheels as shown in figure 4-4, and toenail each to car floor with four thirtypenny nails.

(b) Wheel cleats "J" (2 x 4 in., 4 inches longer than distance between front and rear faces of cleats "N", four required per truck). Locate cleat "J" across top cleats "N" with sides of cleats "J" flush against inside of tires, as shown in figure 4-4. Nail end of each cleat "J" to cleats "N" with three twentypenny nails.

(c) Support cleats "P" (2 x 4 x 18 in., eight required per truck). Locate four cleats "P" 24 from ends of "N" with ends flush against cleats "N" as shown in figure 4-4. Nail cleat to car floor with four thirtypenny nails. Locate one cleat on top of each lower cleat and nail with four thirtypenny nails.

(5) *Method III.*

(a) Wheel cleats "H" (2 x 4 in., length to suit, eight required for every truck). Locate a cleat "H" across flatcar close to front and rear of front and rear wheels and nail to car floor with ten thirtypenny nails as shown in figure 4-5.

(b) Wheel side cleats "J" (2 x 4 in., length 4 inches longer than distance between front and rear faces of cleats "H", four required per vehicle). Locate a cleat "J" against inside or outside of wheels as shown in figure 4-5, and nail each end to cleats "H" with three twentypenny nails.

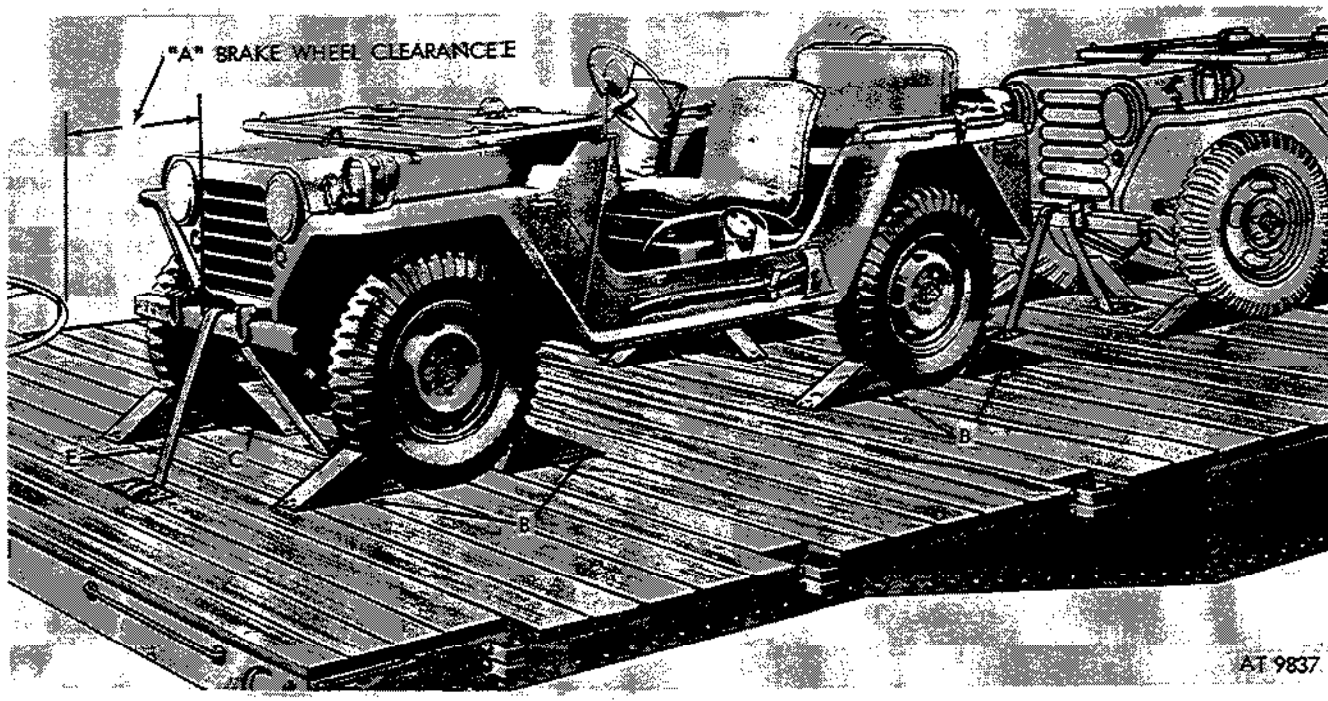


Figure 4-1. Methods of blocking the 1 / 4 ton, 4 x 4, M151, M151A1, and M151A2 on flatcars.

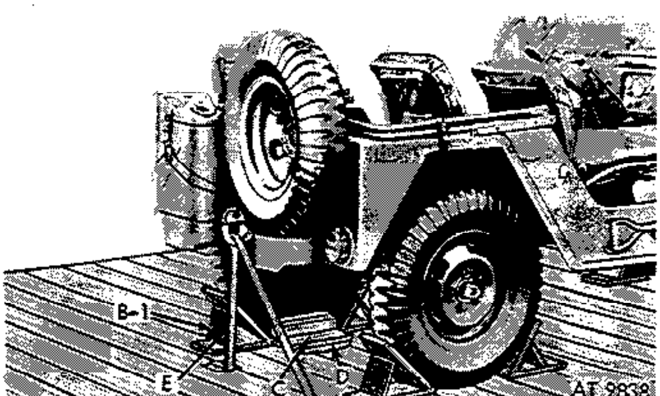


Figure 4-2. Methods of blocking (detail 1).

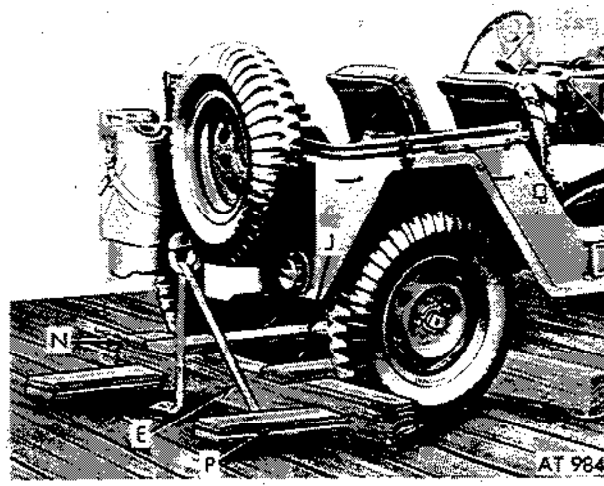


Figure 4-4. Methods of blocking (detail 3).

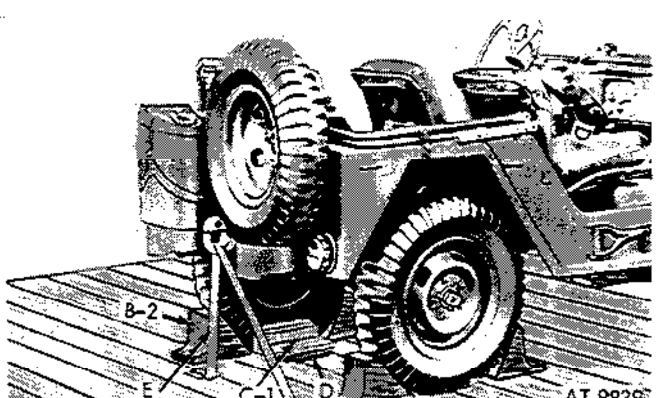


Figure 4-3. Methods of blocking (detail 2).

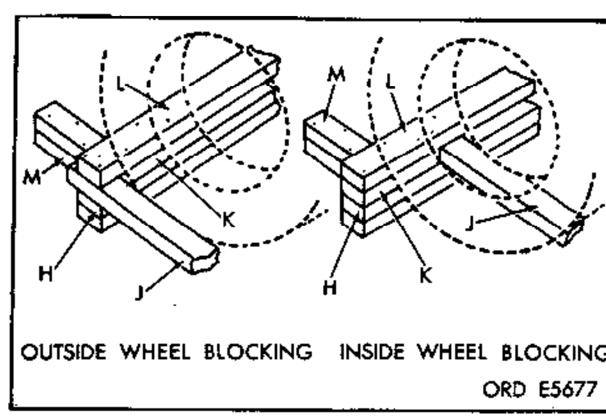


Figure 4-5. Methods of blocking (detail 4).

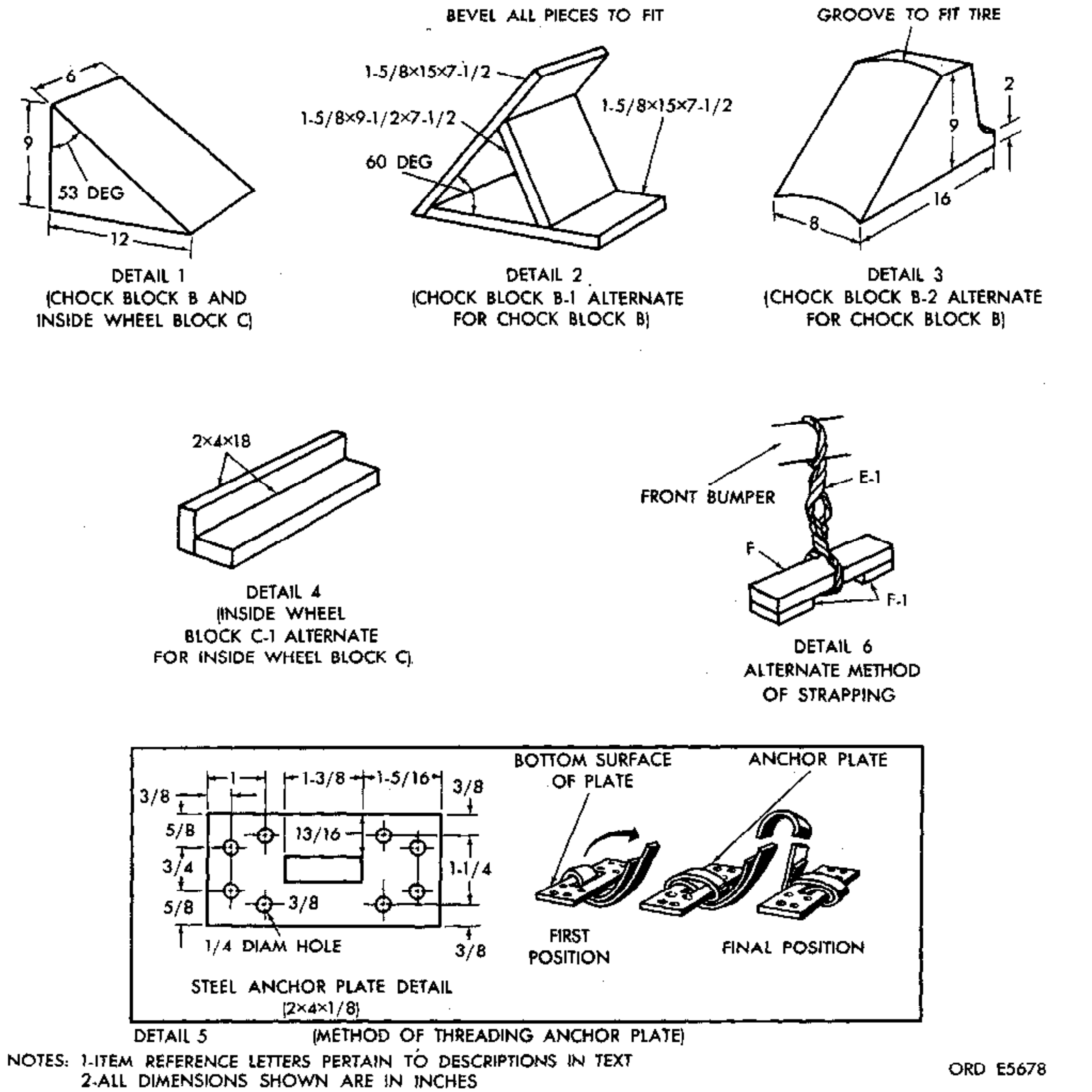


Figure 4-6. Materials for blocking the 1/4 ton, 4 x 4, M151, M151A1, and M151A2 on flatcars.

(c) Intermediate cleats "K" (2 x 4 in., eight required per vehicle). Locate a cleat "K" on top of cleats "H" with end flush against cleat "J" and nail to cleats "H" with two twentypenny nails as shown in figure 4-5. Cleats "J" will be on the outside of wheels and cleats "K" will be on the inside of cleats "J".

(d) Upper cleats "L" (2 x 4 in., length to equal cleats "H", four required per truck. Locate cleat "L" across cleats "J" and nail to cleats "J" and "K" with three twentypenny nails at each end as shown in figure 4-5.

(e) End cleats "M" (2 x 4 x 18 in., total of eight required). Locate a cleat "M" on car floor near each end of "H" with end flush against cleat "H" near each side of car, and secure with four thirtypenny nails. Locate one cleat "M" on top of each lower cleat and secure with four thirtypen nails as shown in figure 4-5.

Section II. DESTRUCTION OF MATERIEL TO PREVENT ENEMY USE

4-5. General

a. Destruction of the M151 series vehicles, when subject to capture or abandonment in the combat zone, will be undertaken by the using organization only when, in the judgment of the unit commander concerned, such action is necessary in accordance with orders of, or policy established by, the army commander.

b. The information which follows is for guidance only. Certain procedures outlined below require the use of explosives and incendiary grenades which normally may not be authorized items for the vehicle. The issue of these and related materiel, and the conditions under which destruction will be effected, are command decisions in each case, according to the tactical situation. Of the several means of destruction, those most generally applicable are—

Mechanical
Requires axe, or similar implement.

Burning
Requires gasoline, oil, incendiary grenades, or other flammables.

Demolition
Requires suitable explosives or ammunition. Refer to FM 5-25.

Gunfire
Includes artillery, machine guns, rifles using rifle grenades, and launchers using antitank rockets. Under some circumstances hand grenades may be used.

In general, destruction of essential parts, followed by burning, will usually be sufficient to render the vehicle useless. However, selection of the particular method of destruction requires imagination and resourcefulness in the utilization of the facilities at hand under the existing conditions. Time is usually critical.

c. If destruction to prevent enemy use is resorted to, the vehicle must be so badly damaged that it cannot be restored to a usable condition in the combat zone, either by repair or cannibalization. Adequate destruction requires that all parts essential to the operation of the vehicle, including essential spare parts, be destroyed or damaged beyond repair. However, when lack of time and personnel prevents destruction of all parts, priority is given to the destruction of those parts most difficult to replace. Equally important, the same essential parts must be destroyed on all like vehicles so the enemy cannot construct one complete unit from several damaged ones.

d. If destruction is directed, due consideration should be given to —

(1) Selection of a point of destruction that will cause greatest obstruction to enemy movement and also prevent hazard to friendly troops from fragments or ricocheting projectiles which may occur incidental to the destruction.

(2) Observation of appropriate safety precautions.

4-6. Destruction of M151 Series Vehicles

a. Method No. 1—by Burning.

(1) Using an axe, pick mattock, sledge, or other heavy implement, smash all vital elements such as distributor, carburetor, generator, ignition coil, fuel pump, spark plugs, air cleaner, lights, instruments, and controls. If time permits, and a sufficiently heavy implement is available, smash the engine cylinder block and head, crankcase, and transmission.

(2) Puncture fuel tank as near the bottom as possible, collecting gasoline for use as outlined in (5) below.

(3) Slash tires. If tires are inflated, exercise care to prevent injury should the tire blow out while being slashed. Whenever practicable, it is usually preferable to deflate tires before slashing.

(4) Explosive ammunition, if available nearby, should be removed from packing or other protective material. Place ammunition in and about the vehicle so that it will be fully exposed to the fire and in such locations that the greatest damage will result from its detonation. Remove any safety devices from ammunition.

(5) Pour gasoline and oil in and over the entire vehicle. Ignite by means of an incendiary grenade fires from a safe distance, a burst from a flame thrower, a combustible train of suitable length, or other appropriate means. Take cover immediately. If gasoline and oil are not available, use other flammables such as oily rags or waste, wood, or paper. Ignite by means of incendiary grenades or other suitable means.

CAUTION

Cover must be taken without delay since an early explosion of the explosive ammunition, if present, may be caused by the fire. Due consideration should be given to the highly flammable nature of gasoline and its vapor. Carelessness in its use may result in painful burns. Elasped time: about 6 minutes.

b. Method No. 2—by Demolition.

(1) Prepare two, 2-pound charges of EXPLOSIVE, TNT (two 1 pound blocks, or equivalent, per charge, together with the necessary detonating cord to make up each charge). Set the charges as follows:

(a) The first, on top of the clutch housing.

(b) The second, as low on the left side of the engine as possible.

(c) Connect the two charges for simultaneous detonation with detonating cord. Provide for dual priming to minimize the possibility of a misfire.

(d) For priming, either a nonelectric blasting cap crimped to at least 5 feet of safety fuse (safety fuse burns at the rate of 1 ft. in approximately 40 sec.; test before using) or an electric blasting cap and firing wire may be used. Safety fuse, which contains black powder, and nonelectric blasting caps must be protected from moisture at all times. The safety fuse may be ignited by a fuse lighter or a match; the electric blasting cap requires a blasting machine or equivalent source of electricity.

WARNING

Keep the blasting caps, detonating cord, and safety fuses separated from the charges until required for use.

NOTE

For the successful execution of methods of destruction involving the use of demolition materials, all personnel concerned must be thoroughly familiar with the pertinent provisions of FM 5-25. Training and careful planning are essential.

(2) Destroy the tires as outlined in above *a* (3).

(3) Detonate the charges. If primed with nonelectric blasting cap and safety fuse, ignite and take over. If primed with electrical blasting cap, take cover before firing the charges. The danger zone is approximately 200 yards.

Elapsed time: about 5 minutes.

c. Method No. 3 — by Gunfire.

(1) Destroy the tires as outlined in a (3) above.

(2) Destroy the vehicle by gunfire, using artillery, machine guns, rifles using rifle grenades, or launchers using antitank rockets. Fire on the vehicle aiming at the engine, axles, body and wheels. Although one well-placed, direct hit may destroy the vehicle, several hits are usually required for complete destruction unless an intense fire is started, in which case the vehicle may be considered destroyed.

WARNING

Firing artillery at ranges of 500 yards or less should be from cover. Firing rifle grenades or antitank rockets should be from cover. Elasped time: about 5 minutes.

d. Method No. 4—by Mechanical Means. Perform operations as indicated in *a* (2) and (3) above. Also puncture fuel tank in several places.

4-7. Destruction of Guns, Ammunition and Fire Control Equipment

For instructions in the destruction of guns, ammunition and fire control equipment aboard the M151A1C or M825 vehicle, refer to TM 9-1000-205-12.

APPENDIX A

REFERENCES

A-1. Publication Indexes and General References

Indexes should be consulted frequently for latest changes or revisions of references given in this appendix and for new publications relating to material covered in this tenchical manual.

a. Military Publication Indexes.

Index of Army Motion Pictures and Related Audio-Visual Aids	DA Pam 108-1
Index of Administrative Publications	DA Pam 310-1
Index of Blank Forms	DA Pam 310-2
Index of Technical Manuals, Supply Manuals, (type 7, 8 and 9), Technical Bulletins, Supply Bulletins, and Lubrication Orders	DA Pam 310-4
Index of Doctrinal, Training, and Organization Publications	DA Pam 310-3

b. General References.

Authorized Abbreviations and Brevity Codes	AR 310-50
Dictionary of United States Army Terms	AR 310-25
Military Symbols	FM 21-30
Military Training	FM 21-5
Techniques of Military Instruction	FM 21-6

A-2. Supply Manuals

The following Department of the Army Supply Manuals pertain to this materiel:

a. Demolition of Materiel to Prevent Enemy Use.

Explosives, Bulk, Propellants, and Explosive Devices	SM 9-5-1375
Land Mines and Components	SM 9-5-1345
Pyrotechnics, Military, All Types	SM 9-5-1370

b. Maintenance and Repair.

Tool Kit, Automotive Maintenance, Organizational: (2d echelon), Set No. 2, Common (5180-754-0650)	SM 9-4-4910-A86
Tool Kit, Automotive Maintenance, Organizational: (2d echelon), Set No. 2, Supplemental (4940-754-0743) (line item 453910)	SM 9-4-4940-95-CL-A08
Tool Kit, Organizational Maintenance: (2d echelon), No. 1, Common (5180-754-0654)	SM 9-4-4910-A88

A-3. Forms

The following forms pertain to this materiel. (Refer to DA Pamphlet 310-2 for index of blank forms and to TM 38-750 for explanation on use.)

DA Form 2400, Equipment Utilization Record
DA Form 2401, Organizational Control Record for Equipment
DA Form 2402, Exchange Tag
DA Form 2404, Equipment Inspection and Maintenance Worksheet
DA Form 2405, Maintenance Request Register
DA Form 2406, Materiel Readiness Report
DA Form 2407, Maintenance Request
DA Form 2407-1, Maintenance Request—Continuation Sheet
DA Form 2408, Equipment Log Assembly (Records)
DA Form 2408-1, Equipment Daily or Monthly Log
DA Form 2408-5, Equipment Modification Record
DA Form 2408-7, Equipment Transfer Record
DA Form 2408-8, Equipment Acceptance and Registration Record
DA Form 2408-10, Equipment Component Register
DA Form 2409, Equipment Maintenance Log (Consolidated)
DA Form 348, Driver Qualification Record
DA Form 285, Accident Report

DA Form 1089, Claim for Personal Property
DD Form 6, Report of Packaging and Handling Deficiencies
DD Form 314, Preventive Maintenance Schedule and Record
DD Form 518, Accident—Identification Card
Standard Form 46, U. S. Government Motor Vehicle Operator's Identification Card
Standard Form 91, Operator Report on Motor Vehicle Accidents

A-4. Other Publications

The following publications contain information pertinent to major item materiel and association equipment:

a. Vehicle.

Lubrication—Truck Utility ¼ ton, 4 x 4, M151 Series	LO 9-2320-218-12
Operation—Truck, Utility, ¼ ton, 4 x 4, M151 Series	TM 9-2320-218-10
Organizational Parts—Truck, Utility, ¼ ton, 4 x 4, M151 Series	TM 9-2320-218-20P
Equipment Serviceability Criteria—Truck, Utility ¼ ton, 4 x 4, M151 Series	TM 9-2320-218-ESC

b. Camouflage.

Camouflage, Basic Principles and Field Camouflage	FM 5-20
Camouflage of Vehicles	FM 5-20B

c. Decontamination.

Chemical, Biologic, and Radiological (CBR) Decontamination	TM 3-220
Defense Against CBR Attack	FM 21-40

d. General.

Accident Reporting and Records	AR 385-40
Basic Cold-Weather Manual	FM 31-70
Cooling Systems: Vehicles and Powered Ground Equipment	TM 9-2858
Manual for the Wheeled Vehicle Driver	TM 21-305
Driver Selection and Training (Wheeled Vehicles)	TM 21-300
Deep-Water Fording of Ordnance Materiel	TM 9-238
Fording Kits for Combat and Transport Vehicles	MIL-F-3201
Command Maintenance Management Inspections	AR 750-8
Motor Transportation, Operations	FM 25-10
Mountain Operations	FM 31-72
Northern Operations	FM 31-71
Operation and Maintenance of Army Materiel in Extreme Cold Weather (0° F. to —65° F.)	TM 9-207
Ordnance Direct Support Service	FM 9-3
Ordnance General and Depot Support Service	FM 9-4
Petroleum Handling Equipment & Operations	TM 10-1101
Preservation, Methods of	MIL-P-116
Principles of Automotive Vehicles	TM 9-8000
Prevention of Motor Vehicle Accidents	AR 385-55
Ordnance Maintenance Spark Plugs Used on Ordnance Materiel	TM 9-8638

e. Maintenance and Repair.

Care and Maintenance of Pneumatic Tires	TM 9-2610-200-20
Cambat Vehicles and Tactical Transport Vehicles: Procedure for Starting Engines with Slave Cable	TB ORD 537
Description, Use, Bonding Techniques, and Properties of Adhesives	TB ORD 1032
General Supply:	
Winterization Kits for Army Tank-Automotive Materiel	SB 9-16
Inspection, Care and Maintenance of Antifriction Bearings	TM 9-214
Tank-Automotive Gasoline Engines: Lubrication Before Use	TB ORD 392
Operation and Organizational, Field and Depot Maintenance: Storage Batteries, Lead-Acid Type	TM 9-6140-200-15
Ordnance Tracked and Wheeled Vehicle Hull and Chassis Wiring: Repair of Cracked or Peeled Plastic, Natural Rubber, or Synthetic Rubber-Covered Conduit Cables	TB ORD 650
Organization, Policies, and Responsibilities for Maintenance Operation	AR 750-5
Use of Antifreeze Solutions and Cleaning Compounds in Engine Cooling Systems	TB 750-651

j. Shipment and Limited Storage.

Color and Marking of Army Materiel	AR 746-5
Preservation, Packaging, and Packing of Military Supplies and Equipment	TM 38-230-1
Standards for Oversea Shipment and Domestic Issue of Combat, Tactical and Special Purpose Vehicles	TB 9-2300-281-35
Preservation, Packaging and Packing Materials, Supplies and Equipment Used by the Army	SB 38-100
The Army Maintenance Management System (Tamms)	TM 38-750

APPENDIX B

MAINTENANCE ALLOCATION CHART

B-1. Explanation

The Maintenance Allocation Chart designates overall responsibility for the maintenance function on end item or assembly. Repair of major assemblies is designated by authority of the Army Commander representative except for the specific subfunctions listed in the Maintenance Allocation Chart. Deviation from maintenance operations allocated in the Maintenance Allocation Chart are authorized only upon approval of the Army Commander representative.

B-2. Definitions

The following definitions explain the various terms used in the Maintenance Allocation Chart.

a. *Adjust.* To regulate periodically to prevent malfunction.

b. *Aline.* To adjust two or more components of an electrical or mechanical system so that their functions are properly synchronized.

c. *Calibrate.* To determine the corrections to be made in the readings of instruments or test equipment used in precise measurement. Consists of the comparison of two instruments one of which is a certified standard of known accuracy to detect and adjust any discrepancy in the accuracy of the instrument being compared with certified standard.

d. *Inspect.* To determine serviceability of an item by comparing its physical, mechanical and electrical characteristics with established standards.

e. *Install.* To set up for use in an operational environment such as Special Purpose Kits that do not come with the vehicle i.e., Deep Water Fording Kits, Heater Kits, Search Light, Radion, etc.

f. *Overhaul.* To restore an item to a completely serviceable condition as prescribed by Maintenance serviceability standards using the Inspect and Repair Only as Necessary (IROAN) technique.

g. *Rebuild.* To restore an item to a standard as nearly as possible to original or new condition in appearance, performance and life expectancy. This is accomplished through complete disassembly of the item, inspection of all parts or components, repair or replacement of worn or unserviceable elements (items) using original manufacturing tolerances and specifications and subsequent reassembly of the item.

h. *Repair.* To restore to a serviceable condition by replacing unserviceable parts or by any other action required utilizing tools, equipment and skills available, to include welding, grinding, riveting, straightening, adjusting, etc.

i. *Replace.* To substitute serviceable assemblies, subassemblies and parts for unserviceable components.

j. *Service.* Operations required periodically to clean, to preserve, to change, to drain, and to add fuel, lubricants, cooling agents and air.

k. *Test.* To verify serviceability and to detect electrical or mechanical failure by use of test equipment.

l. *Maintenance Function Code.* The functional group responsible for the maintenance level within which the repair part belongs is identified by code. The maintenance level code is —

Code	*Explanation*
C	Crew or operator maintenance
O	Organizational maintenance
F	Direct support maintenance
H	General support maintenance
D	Depot maintenance

MAINTENANCE ALLOCATION CHART

(1) Group No.	(2) Assembly group	(3) Maintenance functions A Inspect	B Test	C Service	D Adjust	E Align	F Calibrate	G Install	H Replace	I Repair	J Overhaul	K Rebuild	(4) Tools and equipment	(5) Remarks
	GROUP 01 ENGINE													
0100	Power plant	O	O	O					F	F	H	D		
	Engine	O	O	O					F	F	H	D		
0101	Block assembly, engine								F	H	H	D		
	Cylinder head, engine	O	O		O				O	F	F	D		
0106	Pump, oil	F	F						F	F	F	D		
	GROUP 02 CLUTCH													
0200	Clutch assembly		O		O				F			D		
	GROUP 03 FUEL													
0301	Carburetor	O	O	O	O				O	F	F			
0302	Pump, fuel, electrical	O	O	O					O	F				
	Pump, fuel, mechanical	O	O						O					
0306	Tank, fuel	O	F	C					O	F				
	Filter, fuel			O					O					
	GROUP 05 COOLING													
0501	Radiator, engine	O	O	C					O	F				
0504	Pump, water	O	F						O			D		
0505	Belts	O	O		O				O					
	GROUP 06 ELECTRICAL													
0601	Generator (25 amp)	O	O						O	F		D		
	Generator (60 amp)	O	O		O				O					
0603	Starter, engine	O	O						O	F		D		
0605	Distributor, ignition	O	O		O				O	O		D		
0609	Lamps and lamp units	O	O		O				O	O				
0611	Horn		C		O				O					
0612	Batteries	O	O	C					O					
	GROUP 07 TRANSMISSION													
0700	Transmission Transfer	O	C	O					F	H	H	D		
	GROUP 08 TRANSFER													
0801	Transfer, transmission	O	C	O					F	H	H	D		
	GROUP 09 PROPELLER SHAFTS													
0900	Shaft assembly	O		O					O	O				
	GROUP 10 FRONT AXLE													
1002	Carrier, differential	O		O					O	H		D		
	GROUP 11 REAR AXLE													
1102	Carrier, differential	O		O					O	H		D		
1104	Sleeve, shaft and cross wheel drive seals, flange and spindle	O		O					O	O			5120-795-0152	Replacer, seal side gear
	GROUP 12 BRAKES													
1201	Band assembly, parking brake	O	C		O				O			D		
1202	Brakeshoe and lining	O	C		O				O			D		
1204	Cylinder, master	O	O		C				O			D		
	Cylinder, wheel	O	O						O			D		
	GROUP 13 WHEELS, HUBS, DRUMS												5120-627-7161	Puller, mechanical wheel
1301	Suspension assy., front & rear	O	O			O			O	O		D	5210-254-2342	bearing caliper, outside, measuring ball joint end play
1313	Wheel and tire assy.	O	O	O					O	O				
	GROUP 14 STEERING													
1401	Steering gear assy.	O	O	O	F				F		H			
	Column assy.	O			O				O				5120-707-6223	Puller, mechanical steering wheel
	Linkage assy.	O	O		O				O					

(1) Group No.	(2) Assembly group	(3) Maintenance functions											(4) Tools and equipment	(5) Remarks
		A	B	C	D	E	F	G	H	I	J	K		
		Inspect	Test	Service	Adjust	Align	Calibrate	Install	Replace	Repair	Overhaul	Rebuild		
	GROUP 16 SPRINGS AND SHOCK ABSORBERS													
1604	Shock absorbers	O	O						O					
	GROUP 18 BODY, CAB, HOOD, HULL													
1802	Windshield assy.	C						C	O	F				
1806	Cushions, seat	C						C	O	F		D		
	GROUP 22 BODY ACCESSORIES													
2201	Canvas curtain	C						C	O	F				
2202	Windshield washer	C	C	C	O				O	O				
	Windshield wipers	C	C	O	O				O	O				
	GROUP 33 SPECIAL PURPOSE KITS													
3303	Winterization kit (—65°)		C	O				F	O	O				
	Heater assy. (—65°)		C	F	F			F	O	F				
	Pump, fuel (—65°)							F	O	F				
	Winterization kit (—25)		C	O				F	O	D				
	Heater assy (—25)		C					F	O	F				
3305	Deep water fording kit		C					F	O	O				
3307	Hardtop kit	C	C		O			F	O	F				
	100 amp generator kit		O		O			F	O					
	M14 / 16 Rifle mount kit	C	C					F	O					
	M4 Gun mount kit	C	C	O				F	O					
	Door and side curtain kit	C	C		O			C	O	F				
	GROUP 47 GAGES (NON-ELECTRICAL)													
4701	Speedometer		C						O	O				

APPENDIX C

DEPROCESSING OF VEHICLES

C-1. Deprocessing at Domestic Shipment Destination for Services

The deprocessing required before operation will appear opposite the processing accomplished. Use DD Form 1397, Processing and Deprocessing Record for Shipment, Storage and Issue of Vehicles and Spare Engines.

a. Removal of Sealing and Preserving Materials.

(1) Remove all sealing and protective materials that have been applied.

(2) Remove preservatives, as necessary, with approved cleaning solvents, and service as instructed in pertinent technical manuals.

(3) Unblock the clutch.

b. Installation of Components and Equipment Removed. Install all removed components and equipment in normal operating position.

c. Tires. Inflate to prescribed pressure.

d. Spare Fuel Container. Flush thoroughly with approved solvents and install on vehicle.

e. Drains, Inspection, Plates, and Valves. Close drains, remove screens, and install inspection plates and gaskets.

f. Lubrication.

(1) Refer to sample record to assure that oils applied are applicable for operation within the current local temperature range. Unsuitable oils will be drained and replaced with proper grade oils.

(2) Preservative oils in lubrication systems as indicated will be kept to operating level until first oil change.

(3) Refer to LO 9-2320-218-12, and lubricate (oil or grease) all points regardless of interval since last lubrication. Exception: Wheel bearings and those items indicated on form.

g. Batteries. Change, service, or install as necessary, clean posts, and connect.

h. Belts. (Fan, Generator, Etc.) Tighten to proper tension.

i. Engines.

(1) Gasoline engines not reprocessed within the period established in TB 9-300-2/1 as indicated in "Reprocessing Cycle" block on face of form, shall be serviced before use, as follows:

(a) Remove spark plug from each cylinder.

(b) Atomize spray 2 ounces of lubricating oil preservative special into each cylinder through the spark plug opening.

(c) After an interval of 15 minutes rotate engine with starter for 30 seconds.

(d) Reinstall spark plugs.

(e) See TB ORD 392.

(2) Refer to TM 9-2320-218-10. Caution must be used in starting the engine to insure that malfunctions such as hydrostatic lock do not occur.

C-2. Deprocessing at Overseas Shipment Destination for Service

a. In order that materiel will not be damaged due to corrosion during initial operation, thoroughly flush all surfaces that have been exposed to salt water with fresh water as soon as practicable. In addition, disassemble, clean, and lubricate essential operating mechanisms, in accordance with LO 9-2320-218-12, as soon as the tactical or logistical situation permits.

b. Perform any of the deprocessing prescribed in paragraph C-1 (*a* through *i*) that is applicable.

C-3. Deprocessing in Storage Prior to Operation

a. General. Perform any of the deprocessing prescribed in paragraph C-1 (*a* through *i*) that is applicable to the processed materiel.

b. Engines. If the engine is filled with preservative lubricating oil, the preservative oil will be retained until the using service places equipment on scheduled maintenance. Install new engine oil filters where applicable.

c. Gearcases. Transfer, transmission, differential, and other gearcases will be filled to operating level with prescribed seasonal grade lubricant if required.

d. Lubrication. Lubricate materiel in accordance with instructions contained in LO 9-2320-218-12.

ALPHABETICAL INDEX