

TECHNICAL MANUAL

**MAINTENANCE/OVERHAUL
INSTRUCTIONS**

AIRCRAFT TOWING TRACTOR, DED-TYPE: MB-2

<u>PART NO.</u>	<u>NSN</u>
1-905-000001	1740-01-1629946YW
1-905-000002	1740-01-1629947YW
1-905-000003	1740-01-1629946YW
1-905-000004	1740-01-1629947YW
1-905-000005	1740-01-1629946YW
1-905-000006	1740-01-1629946YW

GROVE MANUFACTURING COMPANY

F09603-83-C-2066

This publication is required for official use or for administrative or operational purposes only. Distribution is limited to U.S. Government Agencies. Other requests for this document must be referred to WR-ALC/MMEDT, Robins AFB, GA 31098.

PUBLISHED UNDER AUTHORITY OF THE SECRETARY OF THE AIR FORCE

19 JUNE 1984

LIST OF EFFECTIVE PAGES

NOTE: The portion of the text affected by the changes is indicated by a vertical line in the outer margins of the page. Changes to illustrations are indicated by miniature pointing hands. Changes to wiring diagrams are indicated by shaded areas.

Dates of issue for original and change pages are: Original 0 19 June 1984

TOTAL NUMBER OF PAGES IN THIS PUBLICATION IS 235
CONSISTING OF THE FOLLOWING:

Page No.	* Change No.	Page No.	* Change No.
i - viii	0		
1-1 - 1-10	0		
2-1 - 2-2	0		
3-1	0		
3-2 Blank	0		
4-1 - 4-36	0		
5-1 - 5-121	0		
5-122 Blank	0		
6-1	0		
6-2 Blank	0		
7-1 - 7-5	0		
7-6 Blank	0		
8-1 - 8-36	0		
9-1 - 9-2	0		
10-1 - 10-7	0		
10-8 Blank	0		
A-1	0		

* Zero in this column indicates an original page.

Reproduction for non-military use of the information or illustrations contained in this publication is not permitted. The policy for military use reproduction is established for the Army in AR 390-5, for the Navy and Marine Corps in OPNAVINST 5510.1B, and for the Air Force in Air Force Regulation 205-1.

ADDITIONAL COPIES OF THIS PUBLICATION MAY BE OBTAINED AS FOLLOWS:

USAF ACTIVITIES. — In accordance with Technical Order No. 00-5-2.

NAVY ACTIVITIES. — Use DD FORM 1348 and submit in accordance with the instructions contained in NAVSUP PUBLICATION 437 — Military Standard Requisitioning and Issue Procedures.

For information on other available material and details of distribution refer to NAVSUP PUBLICATION 2002, SECTION VIII and NAVAIR 00-500A.

TABLE OF CONTENTS

NOTE

The introduction (preceding Section I) explains the material covered in each section.

Section/Para.	Page	Section/Para.	Page
INTRODUCTION	vii	4-13. Hydraulic System Troubleshooting	4-21
I GENERAL INFORMATION	1-1	4-19. Scheduled Inspection	4-25
1-1. General Description	1-1	4-21. Scheduled Maintenance	4-29
1-4. Engine	1-1	4-29. Bleeding Fuel Lines	4-29
1-5. Drive Train	1-1	4-30. Adjusting Valves	4-30
1-6. Transmission	1-1	4-31. Adjusting Engine Idle	4-31
1-7. Axles	1-1	4-32. Coolant System	4-31
1-8. Fuel System	1-1	4-33. Checking Accumulator Charge	4-32
1-9. Cooling System	1-1	4-34. Lubrication Chart	4-33
1-10. Winterization Kit	1-1	V REMOVAL AND DIS-ASSEMBLY	5-1
1-11. Steering System	1-3	5-1. General	5-1
1-12. Brake System	1-3	5-3. Electrical	5-1
1-13. Cab	1-3	5-5. Batteries	5-21
1-14. Frame	1-3	5-7. Exterior Lights and Horn Installation	5-21
1-15. Electrical System	1-3	5-9. Front Driving Light	5-21
1-16. Table of Specifications	1-4	5-12. Spotlight	5-21
1-18. General	1-4	5-15. Rear Driving Light	5-26
1-19. Engine	1-4	5-18. Pintle Light (Front and Rear)	5-27
1-20. Drive Train	1-5	5-21. Beacon Light	5-28
1-21. Fuel System	1-6	5-24. Turnsignal Light (Front and Rear)	5-28
1-22. Cooling System	1-7	5-27. Cab Marker Light	5-30
1-23. Steering System	1-7	5-29. Clearance Light	5-30
1-24. Brake System	1-8	5-31. Turnsignal Switch	5-30
1-25. Cab	1-8	5-33. Hi-Tone Horn	5-32
1-26. Frame	1-9	5-35. Alternator	5-32
1-27. Electrical System	1-9	5-38. Starting Motor	5-35
II SPECIAL TOOLS AND TEST EQUIPMENT	2-1	5-41. Engine	5-37
III PREPARATION FOR USE	3-1	5-44. Air Cleaner	5-37
IV IN USE INSPECTION, MAINTENANCE AND LUBRICATION	4-1	5-47. Fuel Tank	5-44
4-1. Troubleshooting	4-1	5-49. Exhaust System	5-46
4-3. Starting Motor Troubleshooting	4-15	5-51. Radiator System	5-47
4-5. Alternator Troubleshooting	4-16	5-53. Radiator Shutter	5-47
4-7. Transmission Troubleshooting	4-17	5-56. Transmission	5-52

TABLE OF CONTENTS (CONT'D)

Section/Para.	Page	Section/Para.	Page
5-66. Transmission Shifter	5-66	6-5. Compressed Air	6-1
5-69. Drive Lines	5-66	6-7. Natural and Synthetic Rubber Parts	6-1
5-72. Front and Rear Axles	5-70		
5-75. Axle Brakes	5-75		
5-77. Axle Differential Carrier	5-76	VII INSPECTION, REPAIR, AND REPLACEMENT	7-1
5-80. Steer Cylinder	5-76	7-1. Inspection	7-1
5-83. Brake and Throttle Pedal	5-78	7-2. General	7-1
5-85. Brake Valve	5-80	7-4. Alternator	7-1
5-89. Accumulator	5-80	7-5. Starting Motor	7-3
5-91. Silicone Brake Actuating Cylinder	5-83	7-6. Drive Lines	7-4
5-94. Silicone Brake Master Cylinder	5-83	7-7. Axles	7-4
5-97. Wheel and Tire	5-83	7-8. Brake Valve	7-4
5-100. Steering Wheel and Column	5-88	7-9. Wheel and Tire	7-5
5-102. Steering Control Valve	5-88	7-10. Hydraulic Pump	7-5
5-105. Steering Selector Valve	5-92	7-11. Heater	7-5
5-108. Rear Steering Indi- cator	5-93	7-12. Pintle Hook	7-5
5-110. Hydraulic Pump Assembly	5-93	7-13. Repair and Replace- ment	7-5
5-113. Hydraulic Tank Installa- tion	5-96	VIII ASSEMBLY AND INSTALLA- TION	8-1
5-115. Hydraulic Lines	5-96	8-1. General	8-1
5-117. Hydraulic Oil Cooler	5-96	8-3. Acoustical Blankets	8-1
5-119. Cab	5-96	8-5. Fire Extinguisher Assem- bly	8-1
5-121. Wiper Motor	5-104	8-7. Pintle Hook	8-1
5-123. Cab Doors and Side Windows	5-105	8-10. Frame	8-1
5-125. Rear Window Assem- bly	5-105	8-12. Engine Hood	8-2
5-128. Park Brake Lever Installation	5-105	8-14. Seat and Pedestal	8-2
5-130. Heater	5-105	8-16. Heater	8-3
5-133. Seat and Pedestal	5-110	8-19. Park Brake Lever	8-3
5-135. Engine Hood	5-110	8-21. Rear Window Assem- bly	8-3
5-137. Frame	5-110	8-24. Cab Doors and Side Windows	8-3
5-139. Pintle Hook	5-115	8-26. Wiper Motor	8-4
5-142. Fire Extinguisher	5-116	8-28. Cab	8-4
5-145. Acoustical Blankets	5-116	8-30. Hydraulic Oil Cooler	8-4
VI CLEANING	6-1	8-32. Hydraulic Lines	8-4
6-1. General	6-1	8-34. Hydraulic Tank Installa- tion	8-5
6-3. Cleaning Solvent	6-1	8-36. Hydraulic Pump Assem- bly	8-5
		8-39. Rear Steering Indi- cator	8-7
		8-41. Steering Selector Valve	8-7
		8-44. Steering Control Valve	8-7

TABLE OF CONTENTS (CONT'D)

Section/Para.	Page	Section/Para.	Page
8-47. Steering Wheel and Column	8-10	8-99. Exhaust System	8-29
8-49. Tire and Wheel Assembly	8-10	8-101. Fuel Tank	8-29
8-52. Silicone Brake System Master Cylinder	8-11	8-103. Air Cleaner Installation	8-30
8-55. Silicone Brake Actuating Cylinder	8-11	8-106. Engine	8-30
8-58. Accumulator Assembly	8-12	8-109. Starting Motor	8-31
8-60. Charging Accumulator	8-12	8-112. Alternator	8-32
8-62. Brake Valve System	8-13	8-115. Hi-Tone Horn	8-33
8-65. Bleeding Brake System	8-14	8-117. Turnsignal Switch	8-34
8-66. Brake and Throttle Pedal	8-15	8-119. Clearance Light	8-34
8-68. Steering Cylinder	8-15	8-121. Cab Marker Light	8-34
8-71. Axle Differential Carrier Assembly	8-15	8-123. Turnsignal Light (Front and Rear)	8-34
8-74. Axle Brakes	8-17	8-125. Beacon Light	8-34
8-76. Front and Rear Axle Installation	8-19	8-127. Pintle Light (Front and Rear)	8-34
8-79. Drive Line	8-21	8-129. Rear Driving Light	8-34
8-81. Transmission Shifter Installation	8-22	8-131. Spotlight	8-35
8-84. Transmission	8-22	8-133. Front Driving Light	8-35
8-94. Radiator Shutter	8-28	8-135. Batteries	8-35
8-97. Radiator Installation	8-28		
		IX TESTING	9-1
		X DIFFERENCE DATA SHEETS	10-1
		A STANDARD TORQUE CHARTS	A-1

LIST OF ILLUSTRATIONS

Figure No.		Page	Figure No.		Page
1-1	MB-2 Towing Tractor	1-2	5-15	Pintle Light Assembly	
1-2	Steering Modes	1-3		(Front and Rear)	5-27
2-1	Charging Hose and		5-16	Beacon Light Assembly	5-28
	Gage Assembly	2-2	5-17	Front Turnsignal Assem-	
4-1	No-Load Test Circuit	4-16		bly	5-29
4-2	Alternator Test Points	4-17	5-18	Rear Turnsignal Assem-	
4-3	Transmission Check			bly	5-29
	Points	4-19	5-19	Cab Marker Light Assem-	
4-4	Hydraulic System Trouble-			bly	5-30
	shooting	4-20	5-20	Clearance Light Assem-	
4-5	Bleeding Low Pressure			bly	5-31
	Fuel Line	4-29	5-21	Turnsignal Switch Assem-	
4-6	Bleeding High Pressure			bly	5-31
	Fuel Lines	4-30	5-22	Hi-Tone Horn Assembly	5-32
4-7	Timing Pin	4-30	5-23	Alternator Installation	5-33
4-8	Valves Checked at		5-24	Alternator Assembly	5-34
	TDC	4-30	5-25	Starting Motor Installa-	
4-9	Setting Valve Clearances	4-31		tion	5-35
4-10	Valves Checked at 180°		5-26	Starting Motor Assembly	5-36
	to TDC	4-31	5-27	Engine/Transmission Installa-	
4-11	Idle Speed Adjustment	4-31		tion	5-38
4-12	Charging Hose and Gage		5-28	Air Cleaner Installation	5-43
	Assembly	4-32	5-29	Air Cleaner Assembly	5-44
4-13	Lubrication Chart	4-34	5-30	Fuel Tank Installation	5-45
5-1	Electrical System	5-2	5-31	Exhaust System Installa-	
5-2	Fuse and Relay Panel			tion	5-46
	Assembly	5-6	5-32	Radiator Installation	5-48
5-3	Fuse and Relay Harness		5-33	Radiator Shutter Assem-	
	Assembly	5-7		bly	5-49
5-4	Carrier Harness Assem-		5-34	Transmission Installation	5-53
	bly	5-9	5-35	Transmission Converter and	
5-5	Control Panel Instruments			Case Group	5-54
	and Lights Installation	5-13	5-36	Transmission Converter	
5-6	Control Panel Harness			Group	5-57
	Assembly	5-14	5-37	Turbine Retaining Ring	
5-7	Engine Harness Installa-			Removal	5-58
	tion	5-16	5-38	Oil Baffle Removal	5-58
5-8	Cold Weather Harness		5-39	Oil Baffle Puller Tool	5-58
	Assembly	5-19	5-40	Transmission Clutch and	
5-9	Electrical Schematic	5-20		Gear Group	5-59
5-10	Battery Installation	5-22	5-41	Front Bearing Snap Ring	
5-11	Exterior Lights Installa-			Removal	5-61
	tion	5-23	5-42	Reverse and 2nd Clutch	
5-12	Front Driving Light			Removal	5-61
	Assembly	5-24	5-43	Bearing Removal Pro-	
5-13	Spotlight Assembly	5-25		cedure	5-61
5-14	Rear Driving Light		5-44	Park Brake Assembly	5-62
	Assembly	5-26	5-45	Locating Ring Removal	5-63

LIST OF ILLUSTRATIONS (CONT'D)

Figure No.		Page	Figure No.		Page
5-46	Retaining Ring Removal	5-63	5-74	Hydraulic Oil Cooler Installation	5-102
5-47	Transmission Clutch Assembly	5-64	5-75	Cab Installation	5-103
5-48	Transmission Control Valve Assembly	5-65	5-76	Wiper Motor Installation	5-104
5-49	Rear Axle Disconnect Assembly	5-65	5-77	Cab Doors and Side Windows Assembly	5-106
5-50	Transmission Shifter Installation	5-67	5-78	Rear Window Assembly	5-107
5-51	Transmission Shifter Assembly	5-68	5-79	Park Brake Lever and Heater Installation	5-108
5-52	Drive Lines Assembly	5-69	5-80	Heater Assembly	5-109
5-53	Axle and Steer Cylinders Installation	5-71	5-81	Seat and Pedestal Installation	5-111
5-54	Axle Wheel End Parts Assembly	5-72	5-82	Engine Hood Installation	5-112
5-55	Axle Housing Assembly	5-74	5-83	Frame Installation (Class I)	5-113
5-56	Axle Brake Assembly	5-75	5-84	Frame Installation (Class II)	5-114
5-57	Axle Differential Carrier Assembly	5-77	5-85	Pintle Hook Assembly	5-115
5-58	Steer Cylinder Assembly	5-78	5-86	Fire Extinguisher Installation	5-116
5-59	Brake and Throttle Pedals Installation	5-79	5-87	Fire Extinguisher Assembly	5-117
5-60	Brake Valve Assembly	5-81	5-88	Engine Hood Acoustical Installation	5-118
5-61	Accumulator Assembly	5-82	5-89	Transmission Acoustical Installation	5-119
5-62	Silicone Brake System Installation	5-84	5-90	Cab Acoustical Installation	5-120
5-63	Silicone Brake Actuating Cylinder Assembly	5-85	7-1	Rotor Check	7-2
5-64	Silicone Brake Master Cylinder Assembly	5-86	7-2	Diode Trio Test	7-2
5-65	Wheel and Tire Assembly	5-87	7-3	Rectifier Bridge Check	7-2
5-66	Steering Valve and Column Installation	5-89	7-4	Stator Check	7-3
5-67	Steering Control Valve Assembly	5-90	7-5	Connections for Checking Solenoid	7-4
5-68	Steering Selector Valve Assembly	5-92	8-1	Drive, Gear Set, and Housing Alignment	8-9
5-69	Rear Steering Indicator Installation	5-93	8-2	Tightening Sequence — Steering Control Valve	8-10
5-70	Hydraulic Pump Installation	5-94	8-3	Charging Hose and Gage Assembly	8-13
5-71	Hydraulic Pump Assembly	5-95	8-4	Differential Carrier Backlash Pattern	8-18
5-72	Hydraulic Tank Installation	5-97	8-5	Forward Shaft Gear Retaining Ring Installation	8-24
5-73	Hydraulic Lines Installation	5-98	8-6	Output Shaft Assembly	8-24
			8-7	Piston Ring Sizing Tool	8-25
			8-8	Circuit for Checking Pinion Clearance	8-32
			8-9	Circuit for Alternator Bench Check	8-33

LIST OF TABLES

Table		Page
2-1	Special Tools and Test Equipment	2-1
4-1	Troubleshooting	4-1
4-2	No-Load Test Results	4-16
4-3	Brake Valve Service Diagnosis	4-23
4-4	Scheduled Inspection	4-25
A-1	Standard Torque Chart	A-1

INTRODUCTION

1. INTRODUCTION.

a. This Maintenance/Overhaul Instructions manual illustrates and describes the procedures used to remove, disassemble, clean, repair, assemble, and install all components and assemblies, excluding the engine assembly, of the USAF Type MB-2 Aircraft Towing Tractor manufactured by Grove Manufacturing Company, Box 21, Shady Grove, Pennsylvania 17256.

b. United States Air Force technical orders related to the Maintenance/Overhaul Instructions are:

1. T.O. 36A10-3-5-81: Operation and Operator Maintenance Instructions.
2. T.O. 36A10-3-5-83-1: Engine Overhaul Instructions.
3. T.O. 36A10-3-5-84: Illustrated Parts Breakdown.

2. MODELS COVERED.

This Maintenance/Overhaul Instruction manual includes procedures for maintenance and overhaul of six models of the MB-2 Towing Tractor. The models and corresponding serial numbers are listed below.

PART NO.	SERIAL NUMBERS
1-905-000001 Class I, Standard	84L174 thru 84L181 84L200 thru 84L203 84L233 thru 84L264 84L344 thru 84L407
1-905-000002 Class II, Standard	84L173 84L182 thru 84L199 84L206 thru 84L231 84L267 thru 84L319 84L408 thru 84L436
1-905-000003 Class I, Winterized	84L172, 84L204, 84L205, 84L265, 84L266, 84L341, 84L342, and 84L343

PART NO.

SERIAL NUMBERS

1-905-000004 Class II, Winterized	84L232
1-905-000005 Class I, Snow Tires	84L320 thru 84L324
1-905-000006 Class I, Silicone Brake Fluid	84L325 thru 84L340

3. CONTENTS.

The Maintenance/Overhaul Instruction manual is divided into ten sections; General Information (Section I), Special Tools and Test Equipment (Section II), Preparation For Use (Section III), In Use Inspection, Maintenance, and Lubrication (Section IV), Removal and Disassembly (Section V), Cleaning (Section VI), Inspection, Repair, and Replacement (Section VII), Assembly and Installation (Section VIII), Testing (Section IX), and Difference Data Sheets (Section X).

4. GENERAL INFORMATION (SECTION I).

This section includes a concise, complete description of the towing tractor, purpose for which the towing tractor is to be used, general characteristics, and performance. This is followed by a brief description of component assemblies including the complete towing tractor presented to indicate relationship and function of component. A Table of Specifications is also included for quick reference.

5. SPECIAL TOOLS AND TEST EQUIPMENT (SECTION II).

This section lists and illustrates special tools and test equipment required for the disassembly, inspection, repair, assembly, and testing of the towing tractor and its components.

6. PREPARATION FOR USE (SECTION III).

This section describes the procedures required to

prepare the towing tractor for use in the field after shipping.

7. IN USE INSPECTION, MAINTENANCE, AND LUBRICATION (SECTION IV).

This section includes complete instructions for inspecting, servicing, lubricating, and adjusting assemblies by maintenance personnel.

8. REMOVAL AND DISASSEMBLY (SECTION V).

This section presents, by text and illustrations, all procedures preliminary to inspection, repair, and replacement of parts. These procedures consist of removal from towing tractor and dismantling into major assemblies, subassemblies, and component parts.

9. CLEANING (SECTION VI).

This section describes cleaning methods required. The type of cleaning is specified as well as requirements for ventilation or controlled environments. Precautions and special preservation procedures are detailed.

10. INSPECTION, REPAIR, AND REPLACEMENT (SECTION VII).

This section includes inspection instructions that

are peculiar to a certain part of the towing tractor for which maintenance personnel are likely to have little or no knowledge. Comprehensive instructions for necessary repair and replacement operations to restore the towing tractor to a completely satisfactory condition are also included.

11. ASSEMBLY AND INSTALLATION (SECTION VIII).

This section gives detailed step-by-step instructions for the assembly of component parts into major subassemblies to form a complete towing tractor. Assembly instructions include all pertinent criteria such as clearances, backlash dimensions, special torque values, peculiar safety wiring, end play, and similar data.

12. TESTING (SECTION IX).

This section contains essential instructions for aligning, adjusting, testing, and calibrating the tow tractor after assembly. Test pointing, test values, and acceptable tolerances are given for each test, as needed.

13. DIFFERENCE DATA SHEETS (SECTION X).

This section consists of Difference Data sheets for each of the six models of the MB-2 Towing Tractor.

SECTION I

GENERAL INFORMATION

1-1. GENERAL DESCRIPTION.

1-2. The MB-2 Aircraft Towing Tractor (figure 1-1) is a four-wheel drive, four-wheel steer vehicle designed for towing and parking large aircraft. The tractor is powered by a turbo-charged six-cylinder diesel engine. Power is transmitted to all four wheels by a six-speed transmission and torque converter, two drive shafts, and two drive axles with differential gearing.

1-3. The MB-2 Aircraft Towing Tractor is available in two weight classes. The Class I tractors weigh approximately 40,000 pounds and have a drawbar pull rating of 27,000 pounds. The Class II versions of the tractor are similar in appearance, standard equipment, and available options but carry extra counterweights which increase the vehicle's gross weight to approximately 53,000 pounds. The drawbar pull rating for the Class I & II tractors is 27,000 pounds at .75 MPH.

1-4. ENGINE. The engine is a Cummins six-cylinder, turbo-charged watercooled diesel with vertical in line cylinders. The turbo-charger, powered by exhaust gases, forces fresh air into each cylinder. Air is drawn into the turbo-charger through a single-stage air cleaner. The engine is cooled by circulating coolant drawn from the radiator by a water pump through jackets around the cylinder liners and through passages in the cylinder head. Lubrication is provided by a gear-type pump which draws oil from the sump through a filter cartridge to the turbo-charger, crankshaft, camshaft, pistons, bearings, and rocker levers. The fuel system consists of a gear-driven fuel lift pump, fuel/water separator, fuel filter, fuel injection pump, fuel injectors, low-pressure fuel supply line, and high-pressure fuel lines. The engine is protected by an emergency shutdown system which is triggered by low engine oil pressure or by high coolant temperature. Overhaul instructions for the Cummins engine are contained in T.O. 36A10-3-5-83-1.

1-5. DRIVE TRAIN. The drive train is made up of a six-speed transmission, two drive shafts, and two steerable driving axles.

1-6. TRANSMISSION. The transmission is a Clark Equipment six speed forward, six speed reverse, power shift unit. The torque converter is mounted to the engine flywheel housing. The transmission houses the first, second and reverse, and third clutch groups with a high/low range gear and shift lever. The rear axle disconnect assembly and parking brake assembly are mounted on the transmission housing. The speed range, direction, gear range, axle disconnect, and parking brake are controlled by individual levers located in the cab.

1-7. AXLES. The front and rear axles are similar Rockwell steerable axles equipped with hypoid gears and single reduction differentials. The axles have conventional hydraulic expanding-type brake shoes and wheel cylinders. The front axle is mounted to the frame on a pivoting fifth wheel. The rear axle is mounted rigidly to the frame.

1-8. FUEL SYSTEM. The fuel system consists of a fuel tank with fuel shutoff valve, throwaway fuel filter and water separator, fuel lift pump with hand primer lever, fuel injectors, and fuel lines. Fuel is drawn from the tank by a gear-driven fuel lift pump and forced through the water separator and fuel filter to the fuel injection pump. The fuel injection pump pressurizes the fuel and forces it through fuel lines to the six fuel injectors (one for each cylinder).

1-9. COOLING SYSTEM. The engine is cooled by a closed cooling system consisting of a radiator, water pump, and thermostat. The cooling fan is driven by a vibration dampened coupling attached to the crankshaft. The coolant is circulated through the system by a water pump and its temperature is regulated by the thermostat. The torque converter lubrication oil is circulated through cooling tubes located on the bottom of the radiator.

1-10. WINTERIZATION KIT. The winterization kit is an option which consists of a radiator shutter, oil pan heater and battery warmers. The radiator shutter assembly is designed to restrict air flow through the radiator core until the engine

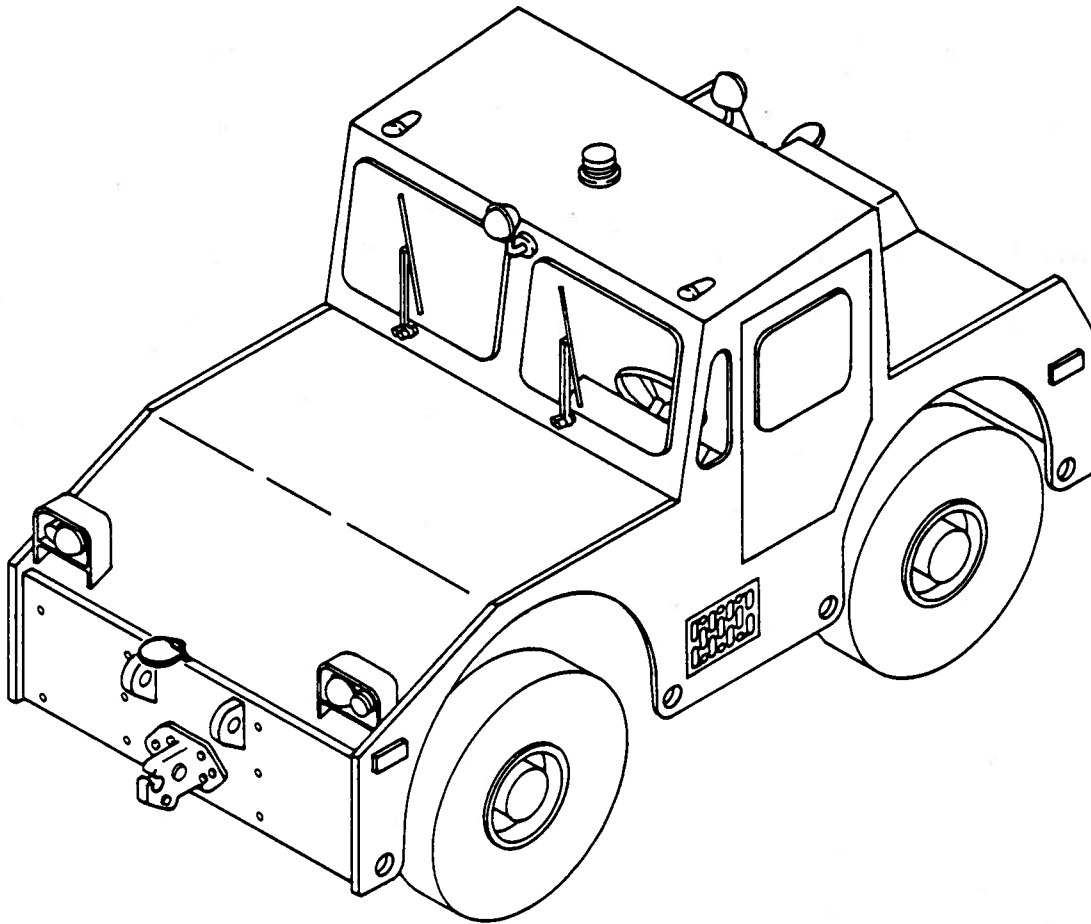


Figure 1-1. MB-2 Towing Tractor

coolant reaches its normal operating temperature. The oil pan heater helps to prevent engine oil thickening during cold weather. The battery warmers help to ensure that enough power is available for cold weather starting.

1-11. **STEERING SYSTEM.** The MB-2 Towing Tractor is equipped with a system capable of two or four-wheel steering and three steering modes (figure 1-2). Steering modes are determined by a lever in the tractor's cab. The system is linked to the tractor's brake system which provides hydraulic pressure from the hydraulic gear-type pump. The pump is mounted on the rear of the torque converter housing. All wheels are steered by turning the steering wheel which actuates a control valve. The steering control valve distributes the oil evenly to each of the four steering cylinders (in the "oblique crab" or "coordinated" modes) or to each of the two front steering cylinders (in the "front" mode).

1-12. **BRAKE SYSTEM.** The service brakes are hydraulic type with power supplied by the hydraulic pump mounted on the torque converter housing. Two expanding-type brake shoes at each wheel are actuated by the brake pedal in the cab, a full power brake valve, and wheel cylinders. Some units are equipped with a silicone brake system. The system consists of two master cylinders (one for each axle) and two

actuating cylinders. The actuating cylinders are controlled by the full power brake valve (which normally controls the wheel cylinders in the standard system). Each actuating cylinder controls a master cylinder which in turn controls the wheel cylinders located on its axle. The parking brake is a mechanical drum-type with internal expanding shoes. The parking brake is mounted on the transmission housing and locks the front drive shaft when the parking brake lever in the cab is set.

1-13. **CAB.** The cab is an all-weather unit with windows on all four sides. The cab can be accessed by doors with sliding side windows and door handle levers. The cab has an adjustable operator's seat and passenger seat. The cab is equipped with windshield wipers, a windshield defroster fan, and a heater. The heater is connected to the engine coolant system.

1-14. **FRAME.** The frame is an all steel, welded structure with removable front and rear ballast plates and engine hood. The frame has a pintle hook fore and aft for towing and/or pushing.

1-15. **ELECTRICAL SYSTEM.** The electrical system consists of an alternator, battery, voltage regulator, starting motor, lights, and accessories. The 12-volt electrical system circuits are protected from overload by fuses located in a panel under the instrument panel on the right side.

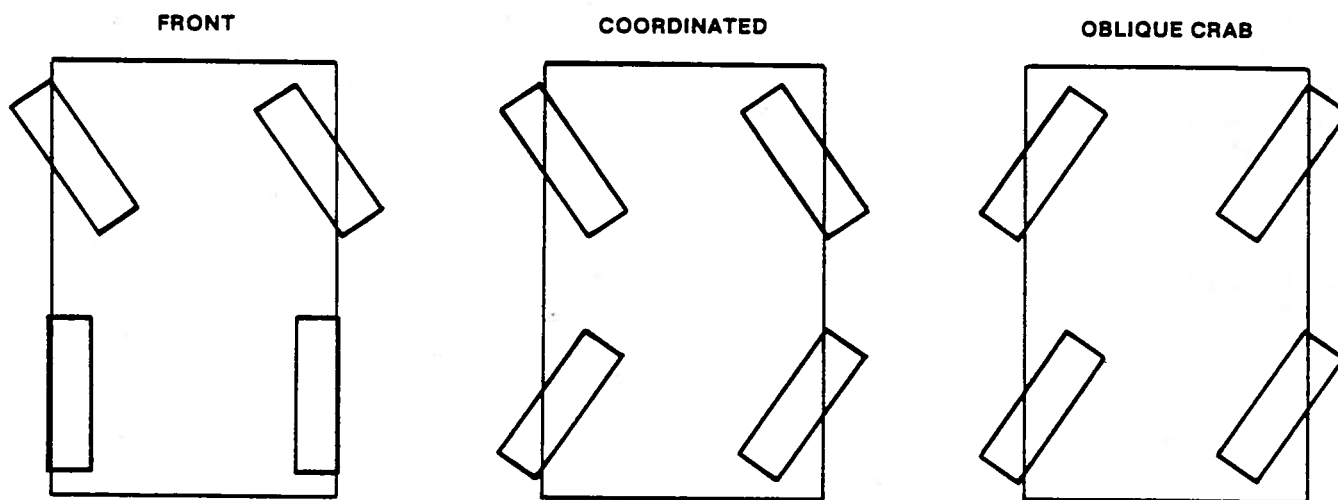


Figure 1-2. Steering Modes

1-16. TABLE OF SPECIFICATIONS.

1-17. The following is a list of leading particulars:

1-18. GENERAL.

Type	Aircraft Towing Tractor. Four-Wheel Drive, Four-Wheel Steer.
USAF Designation	MB-2
Manufacturer	Grove Manufacturing Company, Shady Grove, PA
Manufacturer's Part No.:	
Class I (Basic)	1-905-000001
Class II (Basic)	1-905-000002
Class I with Type "Winterization"	1-905-000003
Class II with Type "Winterization"	1-905-000004
Class I (Basic with Snow Tires)	1-905-000005
Class I (Basic with Silicone Brake Fluid)	1-905-000006
Gross Weight:	
Class I	40.000 Pounds (18,144 KG) Minimum
Class II	53.000 Pounds (24,041 KG) Minimum
Length:	
Class I	220.8 Inches (560.7 CM)
Class II	230.8 Inches (586.1 CM)
Width	
	100.9 Inches (256.4 CM)
Height	
	101 Inches (256.6 CM)
Ground Clearance	
	10 Inches Min. (25.4 CM)
Wheel Base	
	120 Inches (304.8 CM)
Track	
	84 Inches (213.4 CM)
Drawbar Pull:	
Class I	27,000 Pounds @ 0.75 MPH (12,247 KG @ 1.2 KPH)
Class II	27,000 Pounds @ 0.75 MPH (12,247 KG @ 1.2 KPH)
Hitch Height	
	24 Inches (60.9 CM)
Turning Circle:	
Coordinated Mode	390 Inches (990.6 CM)
Front Mode	685 Inches Approx (1739.9 CM)
Travel Speeds:	
Low Range	
First	1.6 MPH (2.6 KPH)
Second	3.5 MPH (5.6 KPH)
Third	7.8 MPH (12.5 KPH)
High Range	
First	4.0 MPH (6.4 KPH)
Second	8.5 MPH (13.6 KPH)
Third	16.8 MPH (26.9 KPH)

1-19. ENGINE.

Manufacturer	Cummins Engine Co.
Model	6BT5.9
Number of Cylinders	6

1-19. ENGINE. (Continued)

Firing Order	1-5-3-6-2-4
Displacement	359 CID (5.9 L)
Bore	4.02 Inches (102 MM)
Stroke	4.72 Inches (120 MM)
Rotation (Viewed from Front of Engine)	Clockwise
Compression Ratio	17.5:1
Idle Speed	600 RPM
Governed Speed	2400 RPM
Oil Filter:	
Manufacturer	Cummins Engine Co.
Part No	3903224
Lubrication Oil Capacity	15 Quarts (14.2 L)

1-20. DRIVE TRAIN.

a. Transmission.

Manufacturer	Clark Equipment Co.
Type	6 Speed, Power Shift
Model	12.6HR18641
Oil Filter:	
Manufacturer	Clark Equipment Co.
Part No	234099

b. Drive Shafts.

Manufacturer	Rockwell International
Model:	
Front	954-92-47-965
Rear	954-92-47-964

c. Axles.

Manufacturer	Rockwell International
Type	Planetary Steer
Model:	
Front	PSC-594-HD202
Rear	PSC-594-HD203

d. Tires.

Type I:	
Manufacturer	Armstrong Rubber Co.
Part No. (Tire)	311265
Part No. (Tube)	60152
Size	11.00 x 24
Rating	12 PR
Type II:	
Manufacturer	Armstrong Rubber Co.
Part No. (Tire)	314285
Part No. (Tube)	60152
Size	12.00 x 24
Rating	16 PR

1-20d. Tires. (Continued)

Snow Tires:

Manufacturer	B.F. Goodrich
Part No. (Tire)	923-494
Part No. (Tube)	60152
Size	11.00 x 24
Rating	12 PR

e. Wheels.

Type I: Manufacturer	Grove Manufacturing Co.
Part No	6-970-001194
Type II: Manufacturer	Grove Manufacturing Co.
Part No	6-970-001195

1-21. FUEL SYSTEM.

a. Fuel JP4, 5, 8 or #2 Diesel

b. Fuel Tank.

Manufacturer	Riverside Tank & Mfg. Co.
Part No	R1230
Capacity	30 Gallons (113.6 L)

c. Fuel Lift Pump.

Manufacturer	Cummins Engine Co.
Type	Mechanical
Part No	3904374

d. Fuel Injection Pump.

Manufacturer	Robert Bosch
Part No	FR9172

e. Fuel Injectors.

Manufacturer	Cummins Engine Co.
Part No	3802008

f. Fuel Filter.

Manufacturer	Cummins Engine Co.
Part No	3903640

g. Fuel Water Separator.

Manufacturer	Cummins Engine Co.
Part No	3903410

h. Air Cleaner.

Manufacturer	Donaldson
------------------------	-----------

1-21h. Air Cleaner. (Continued)

Part No FHG09-0025
 Filter Element:
 Manufacturer Donaldson
 Part No P12-0022

1-22 COOLING SYSTEM.

a. Water Pump.

Manufacturer Cummins Engine Co.
 Part No 3903749

b. Thermostat.

Manufacturer Cummins Engine Co.
 Part No 3902465

c. Radiator.

Manufacturer General Thermodynamics, Inc.
 Part No 1129
 Capacity 20.2 Quarts (19.1 L)

d. Radiator Cap.

Manufacturer General Thermodynamics, Inc.
 Part No 74404
 Pressure Rating 15 PSI

1-23. STEERING SYSTEM.

a. Hydraulic Pump.

Manufacturer Tyrone Hydraulics
 Type Hydraulic, Gear-Type
 Part No PVP16-1500-X
 Displacement 10 GPM(37.9 LPM)

b. Steering Control Valve.

Manufacturer Char-Lynn
 Part No 211-1038
 Displacement 23.8 IN /REV (390 CC/REV)

c. Steering Selector Valve.

Manufacturer Teledyne Inc.
 Part No FSL-852-108-2

1-24. BRAKE SYSTEM.

a. Full Power Brake Valve.

Manufacturer Minnesota Automotive Inc.
Part No 06-460-950

b. Service Brakes.

Manufacturer Rockwell International
Type Drum and Expanding Shoe

c. Brake Shoes.

Manufacturer Rockwell International
Part No A-3222-U-1633

d. Wheel Cylinders.

Manufacturer Rockwell International
Part No A-3261-G-319

e. Silicone Brake Master Cylinder. (2 Required; 1 Per Axle)

Manufacturer Minnesota Automotive, Inc.
Towing Tractors with Serial Numbers 84L325 thru 84L340
Part No 20-100-155

1-25. CAB.

a. Seat and Seat Belt.

Manufacturer Grove Manufacturing Co.
Part No 6-905-000110

b. Wiper Motor.

Manufacturer Ambac Industries
Part No 19612-27-M012WC

Wiper Blade (Front):

Manufacturer Anderson Co.
Part No 18802

Wiper Blade (Rear):

Manufacturer American Bosch
Part No BD721011-15

c. Heater.

Manufacturer Hunter Manufacturing Co.
Part No 1-170978-01

1-26. FRAME.

a. Frame.

Type I:

Manufacturer Grove Manufacturing Co.
Part No 6-905-00025

Type II:

Manufacturer Grove Manufacturing Co.
Part No 6-905-00028

b. Pintle Hook.

Manufacturer Holland Hitch Co.
Part No CP-360-S01340
Capacity 52,000 Pounds (23,586 KG)

1-27. ELECTRICAL SYSTEM.

a. Battery.

Manufacturer Delco Battery
Part No 1980474
Voltage 12
Capacity 630 AMPS

b. Alternator.

Manufacturer Delco-Remy
Part No 1105422
Voltage 12
Rating 63 AMPS @ 6500 RPM

c. Starting Motor.

Manufacturer Delco-Remy
Part No 1998456

d. Starting Relay.

Manufacturer Delco-Remy
Part No 1114532

e. Headlights.

Manufacturer K-D Lamp Co.
Part No 866-6-3-016
Lamp Part No 4467

f. Front Turn Signal.

Manufacturer Arrow Safety Device Co.
Part No 128-RA12
Lamp Part No 1156

1-27. ELECTRICAL SYSTEM. (Continued)

g. Spotlight.

Manufacturer	Unity Manufacturing Co.
Part No	.15052
Lamp Part No	4435

h. Beacon Light.

Manufacturer	Warn Industries
Part No	212351
Lamp Part No	210257

i. Marker Light.

Manufacturer	K-D Lamp Co.
Part No	.510-5101
Lamp Part No	.67

j. Fog and Driving Light.

Manufacturer	K-D Lamp Co.
Part No	.816-6-3-152
Lamp Part No	4412

k. Pintle Light (Front/Rear).

Manufacturer	K-D Lamp Co.
Part No	.863-2301
Lamp Part No	4411

l. Rear Turnsignal.

Manufacturer	Arrow Safety Device Co.
Part No	127-99017
Lamp Part No	1157

m. Clearance Lights.

Manufacturer	Grote Manufacturing Co.
Part No. (Red)	.46302
Part No. (Amber)	.46303
Lamp Part No	1893

SECTION II

SPECIAL TOOLS AND TEST EQUIPMENT

2-1. GENERAL.

2-2. Table 2-1 is a list of the special tools and test equipment required to perform the maintenance procedures contained herein.

Table 2-1. Special Tools and Test Equipment

Tool/Equipment Number	Figure No.	Nomenclature	Use and Application
8590T1 (FSCM-39428)	--	Voltmeter, Ammeter, Ohmmeter	Refer to para. 4-4.
1404T7 (FSCM-39428)	--	Indicator, RPM	Refer to para. 4-4.
02-740-011 (FSCM-39428)	--	Pressure Gage (0-3000 PSI)	Refer to para. 4-9.
4230K57 (FSCM-39428)	--	Flow Meter (2-30 GPM)	Refer to para. 4-15.
GG2527F (FSCM-62456)	2-1	Accumulator Charging Hose and Gage Assembly	Refer to para. 4-33.
7247K1 (FSCM-39428)	--	Ohmmeter	Refer to para. 7-4.
7256K11 (FSCM-39428)	--	Test Lamp	Refer to para. 7-5.
600057 (FSCM-96151)	--	Spring Installation Tool	Refer to para. 8-45.
1420T9 (FSCM-39428)	--	Pump, Hydraulic	Refer to para. 8-63.
20TC (FSCM-06365)	--	Bar, Trammel	Refer to para. 8-78.
5773A14 (FSCM-39428)	--	Pliers, Snap-ring Contracting-type	Refer to para. 8-91.

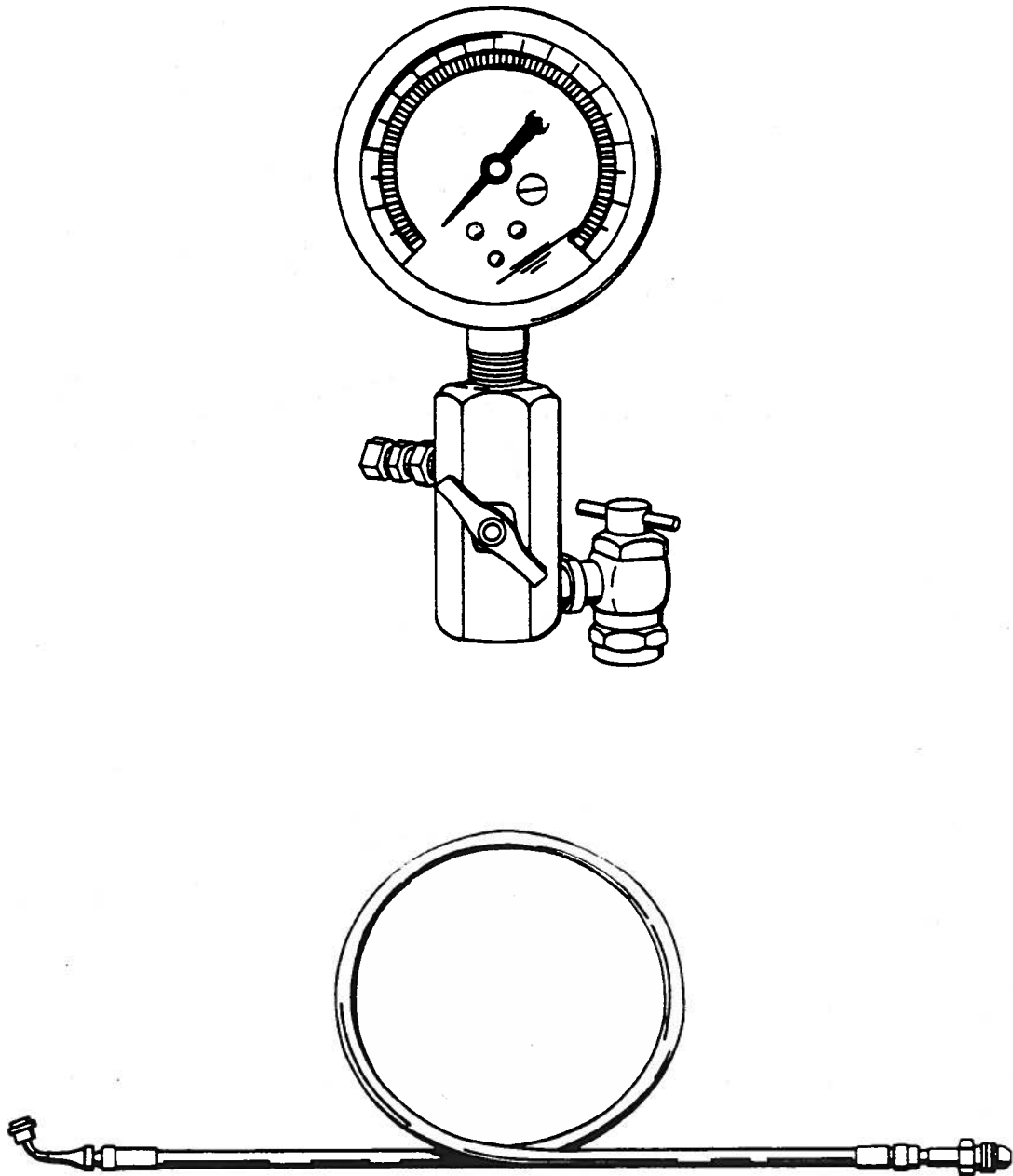


Figure 2-1. Charging Hose and Gage Assembly

SECTION III

PREPARATION FOR USE

3-1. GENERAL.

3-2. The MB-2 Towing Tractor is shipped completely serviced except for diesel fuel. The following is a guideline for initial inspection of the towing tractor after shipment.

- a. Inspect all exterior lights and glass for damage.
- b. Inspect tires for damage and proper inflation.
- c. Unpack and stow fire extinguishers (2).
- d. Remove restraining straps on cab doors.
- e. Inspect cab interior for damaged or missing parts.
- f. Fill fuel tank with diesel fuel.
- g. Refer to operation and operator maintenance instructions to perform preoperational check.
- h. Refer to operation and operator maintenance instructions to start and operate towing tractor.



SECTION IV

IN USE INSPECTION, MAINTENANCE, AND LUBRICATION

4-1. TROUBLESHOOTING.

4-2. Table 4-1 outlines the common equipment failures, probable causes, and maintenance remedial actions for the MB-2 Towing Tractor.

Table 4-1. Troubleshooting

TROUBLE	PROBABLE CAUSE	CHECKOUT PROCEDURE AND REMEDIAL ACTION
a. Engine will not crank.	<ol style="list-style-type: none"> 1. Transmission direction lever not at N. 2. Battery disconnect switch in the OFF position. 3. Battery terminals loose or corroded. 4. Batteries discharged. 5. Starting motor inoperative. 6. Ignition switch inoperative. 7. Engine locked or seized. 	<ol style="list-style-type: none"> 1. Place transmission direction control lever at N. 2. Push battery disconnect switch to ON. 3. Clean and tighten battery terminals. 4. Charge batteries. 5. Test and repair starting motor. Refer to para. 4-3. 6. Replace ignition switch. Refer to figure 5-5. 7. Refer to engine overhaul instructions T.O. 36A10-3-5-83-1.
b. Engine cranks but will not start.	<ol style="list-style-type: none"> 1. Incorrect starting procedure. 2. Cold weather, ether injector needed. 3. Batteries are weak. 4. Fuel tank empty. 5. Restricted air intake system. <p style="text-align: center;">(Continued)</p>	<ol style="list-style-type: none"> 1. Refer to operator's manual T.O. 36A10-3-5-81. 2. Refer to operator's manual T.O. 36A10-3-5-81. 3. Charge batteries. 4. Check fuel gage and fill fuel tank if required. 5. Replace air cleaner element. Inspect all intake tubes and clamps. Refer to para. 5-44.

Table 4-1. Troubleshooting (Cont'd)

TROUBLE	PROBABLE CAUSE	CHECKOUT PROCEDURE AND REMEDIAL ACTION
b. Engine cranks but will not start. (Cont'd)	6. Fuel filter or separator clogged. 7. Fuel system, air intake system, or internal engine problem.	6. Replace fuel filter and fuel water separator. Refer to engine overhaul instructions T.O. 36A10-3-5-83-1. 7. Refer to engine overhaul instructions T.O. 36A10-3-5-83-1.
c. Engine hard to start.	1. Incorrect starting procedure. 2. Batteries are weak. 3. Cold weather, ether injector needed. 4. Incorrect fuel. 5. Restricted air intake system. 6. Fuel filter or separator clogged. 7. Fuel system, air intake system, or internal engine problem.	1. Refer to operator's manual T.O. 36A10-3-5-81. 2. Charge batteries. 3. Refer to operator's manual T.O. 36A10-3-5-81. 4. Drain and flush fuel system. Refer to engine overhaul instructions T.O. 36A10-3-5-83-1. Fill tank with proper grade of fuel. 5. Replace air cleaner element. Inspect all intake tubes and and clamps. Refer to para. 5-44. 6. Replace fuel filter and fuel water separator. Refer to engine overhaul instructions T.O. 36A10-3-5-83-1. 7. Refer to engine overhaul instructions T.O. 36A10-3-5-83-1.
d. Engine starts but will not keep running.	1. Idle speed too low. 2. Out of fuel. 3. Fuel filter or separator clogged. (Continued)	1. Adjust idle speed. Refer to para 4-31. 2. Check fuel gage and fill fuel tank as required. Bleed fuel system. Refer to para. 4-29. 3. Replace fuel filter and fuel water separator. Refer to engine overhaul instructions T.O. 36A10-3-5-83-1.

Table 4-1. Troubleshooting (Cont'd)

TROUBLE	PROBABLE CAUSE	CHECKOUT PROCEDURE AND REMEDIAL ACTION
d. Engine starts but will not keep running. (Cont'd)	4. Broken or loose fuel lines. 5. Fuel system, air intake system, or internal engine problem. 6. Broken or loose electrical connections. Inoperative ignition switch.	4. Repair fuel lines. Refer to engine overhaul instructions T.O. 36A10-3-5-83-1. 5. Refer to engine overhaul instructions T.O. 36A10-3-5-83-1. 6. Refer to para. 5-3 for repair of electrical system or replacement of ignition switch.
e. Engine surges at idle.	1. Idle speed too low. 2. Air in fuel system. 3. Low fuel level in tank 4. Fuel filter or water separator clogged. 5. Restricted fuel lines or inoperative fuel injection pump.	1. Adjust idle speed. Refer to para. 4-31. 2. Check all fuel fittings and tubes. Tighten where required. Bleed fuel system. Refer to para 4-29. 3. Check fuel gage and fill fuel tank as required. 4. Replace fuel filter and fuel water separator. Refer to engine overhaul instructions T.O. 36A10-3-5-83-1. 5. Refer to engine overhaul instructions T.O. 36A10-3-5-83-1.
f. Rough idle of warm engine or misfiring.	1. Idle speed too low. 2. Contaminated fuel. 3. Air in fuel system. (Continued)	1. Adjust idle speed. Refer to para. 4-31. 2. Drain and flush fuel system. Refer to engine overhaul instructions T.O. 36A10-3-5-83-1. Fill tank with proper grade of fuel. 3. Check all fuel fittings and tubes. Tighten where required. Bleed fuel system. Refer to para. 4-29.

Table 4-1. Troubleshooting (Cont'd)

TROUBLE	PROBABLE CAUSE	CHECKOUT PROCEDURE AND REMEDIAL ACTION
f. Rough idle of warm engine or misfiring. (Cont'd)	4. Restricted fuel lines or inoperative fuel injection pump and nozzles. 5. Broken engine mounts. location of engine and	4. Refer to engine overhaul instructions T.O. 36A10-3-5-83-1. 5. Refer to figure 5-27 for transmission mounts.
g. Engine runs hot.	1. Low coolant level. 2. Loose or worn water pump drive belt. 3. Radiator fins plugged. 4. Collapsed radiator hose(s). 5. Failed radiator cap. 6. Inoperative thermostat. 7. Optional shutter assembly inoperative (winterized units only). 8. Malfunctioning water temperature gage or sending unit. 9. Inoperative water pump. 10. Fuel injection pump not timed. 11. Vehicle overloaded.	1. Check all hoses and fittings. Add coolant as needed. 2. Inspect belt and replace as required. Refer to engine overhaul manual T.O. 36A10-3-5-83-1. 3. Blow out fins with low pressure air. 4. Replace hose(s) as needed. 5. Replae radiator cap. 6. Refer to engine overhaul instructions T.O. 36A10-3-5-83-1. 7. Repair shutter assembly. Refer to para. 5-53. 8. Refer to para. 5-3 for replacement of temperature gage or sending unit. 9. Refer to engine overhaul instructions T.O. 36A10-3-5-83-1. 10. Refer to engine overhaul instructions 36A10-3-5-83-1. 11. Reduce load or shift transmission to lower gear.
h. Low oil pressure.	1. Oil level low. (Continued)	1. Add oil to 'H' mark on dipstick.

Table 4-1. Troubleshooting (Cont'd)

TROUBLE	PROBABLE CAUSE	CHECKOUT PROCEDURE AND REMEDIAL ACTION
h. Low oil pressure. (Cont'd)	2. Inoperative oil pressure gage or sending unit. 3. Diluted oil, or improper grade for weather conditions 4. Oil filter clogged. 5. Relief valve stuck open. 6. Inoperative oil pump.	2. Refer to para. 5-3 for replacement of oil pressure gage or sending unit. 3. Obtain oil sample for oil analysis. Drain and replace oil proper grade. 4. Replace oil filter. 5. Refer to engine overhaul instructions T.O. 36A10-3-5-83-1. 6. Refer to engine overhaul instructions T.O. 36A10-3-5-83-1.
i. Loss of power.	1. Vehicle overloaded. 2. Throttle linkage not adjusted. 3. Improper grade of fuel. 4. Air cleaner clogged. 5. Air in fuel system. 6. Restricted fuel lines, fuel filter, or water separator.	1. Reduce load or shift transmission to lower gear. 2. Adjust throttle linkage. Refer to engine overhaul instructions T.O. 36A10-3-5-83-1. 3. Drain and flush fuel system. Fill fuel tank with proper grade fuel. 4. Replace air cleaner element. Inspect all air tubes and clamps. Refer to para. 5-44. 5. Bleed fuel system. Refer to para. 4-29. 6. Change fuel filter and fuel water separator. Refer to engine overhaul instructions T.O. 36A10-3-5-83-1 to remove and clean fuel lines.
	7. High oil level. 8. Restricted fuel drain manifold. 9. Air/exhaust leak at turbocharger. (Continued)	7. Check for proper oil level on dipstick. 8. Remove and clean restriction with low-pressure air. Replace fuel drain manifold. Refer to engine overhaul instructions T.O. 36A10-3-5-83-1. 9. Inspect hoses, tubes, and clamps. Refer to para. 5-44 and 5-49 for replacement of air/exhaust system components.

Table 4-1. Troubleshooting (Cont'd)

TROUBLE	PROBABLE CAUSE	CHECKOUT PROCEDURE AND REMEDIAL ACTION
i. Loss of power. (Cont'd)	10. Fuel system, air intake system, or internal engine problem.	10. Refer to engine overhaul instructions T.O. 36A10-3-5-83-1.
j. Excessive smoke under load.	1. Lugging engine. 2. Air in fuel system. 3. Air cleaner plugged. 4. Fuel injection pump not properly timed. 5. Air leak at turbocharger. 6. Inoperative turbocharger or fuel injection nozzles. 7. Engine running too cold.	1. Shift transmission to lower gear. 2. Bleed fuel system. Refer to para. 4-29. 3. Replace air cleaner element. Refer to para. 5-44. 4. Refer to engine overhaul instructions T.O. 36A10-3-5-83-1. 5. Inspect hoses, tubes, and clamps. Refer to para. 5-49 and engine overhaul instructions T.O. 36A10-3-5-83-1. 6. Refer to engine overhaul instructions T.O. 36A10-3-5-83-1. 7. Refer to engine overhaul instructions T.O. 36A10-3-5-83-1 for replacement of thermostat or thermostat or refer to para. 5-53 for repair of shutter assembly (winterized units only).
k. Fuel knock.	1. Engine overloaded. 2. Improper grade of fuel. 3. Air in fuel system. 4. Incorrect fuel injection pump timing. 5. Inoperative fuel injection nozzles.	1. Shift transmission to lower gear 2. Drain fuel tank. Fill fuel tank with proper grade fuel. 3. Bleed fuel system. Refer to para. 4-29. 4. Refer to engine overhaul instructions T.O. 36A10-3-5-83-1. 5. Repair/replace fuel injection nozzles. Refer to engine overhaul instructions T.O. 36A10-3-5-83-1.
l. Accelerator pedal sticks.	1. Lack of lubrication. (Continued)	1. Lubricate pedal and linkage.

Table 4-1. Troubleshooting (Cont'd)

TROUBLE	PROBABLE CAUSE	CHECKOUT PROCEDURE AND REMEDIAL ACTION
l. Accelerator pedal sticks. (Cont'd)	2. Linkage/throttle cable damaged. 3. Pedal inoperative.	2. Refer to para. 5-83 and replace defective components. 3. Refer to para. 5-83 and replace accelerator pedal.
m. Low output from alternator.	1. Loose or worn drive belt. 2. Loose ground connection. 3. Inoperative alternator or voltage regulator.	1. Inspect belt and replace as required. 2. Clean connector and tighten. 3. Troubleshoot alternator. Refer to para. 4-5.
n. Batteries will not hold charge.	1. Corroded or loose battery cable. 2. Infrequent usage.	1. Remove and clean battery cables and terminals. Clean battery posts. Install battery cables. 2. Charge or replace batteries.
o. Defective lights.	1. Bulb burned out. 2. Wires short circuited. 3. Defective light switch. 4. Defective fuse.	1. Replace bulb(s) as need. Refer to applicable maintenance procedure in section 5. 2. Inspect wires and harnesses for worn insulation. Refer to para. 5-3. 3. Refer to figure 5-5 for replacement of light switch. 4. Refer to figure 5-2 for replacement of fuse.
p. Transmission oil overheats.	1. Low transmission oil. 2. High transmission oil. 3. Improper oil. 4. Restricted oil cooler or oil cooler lines. (Continued)	1. Remove dipstick and fill to full line. 2. Drain transmission oil to FULL line on dipstick. 3. Drain oil. Fill with proper grade. Refer Lubrication Chart figure 4-13. 4. Calculate oil cooler pressure drop. Refer to para. 4-11.

Table 4-1. Troubleshooting (Cont'd)

TROUBLE	PROBABLE CAUSE	CHECKOUT PROCEDURE AND REMEDIAL ACTION
p. Transmission oil overheats. (Cont'd)	5. Vehicle overloaded. 6. Defective charge pump or other internal transmission problem.	5. Reduce load. 6. Troubleshoot transmission. Refer to para. 4-7.
q. Transmission oil loss at filler tube.	1. Loose dipstick. 2. High transmission oil level.	1. Tighten dipstick. 2. Drain transmission oil to FULL level on dipstick.
r. No movement in selected range, direction, or speed.	1. Parking brake set. 2. Transmission shift linkage requires adjustment or lubrication. 3. Defective shift control valve. 4. Internal transmission problem.	1. Release parking brake. 2. Inspect shift control, control cables, and associated linkage. Lubricate linkage and tighten loose connections. Repair transmission shifter. Refer to para. 5-66. 3. Repair transmission control valve. Refer to para. 5-64. 4. Troubleshoot transmission. Refer to para. 4-7.
s. Tires wearing unevenly.	1. Wheel lug nuts loose. 2. Tires over or under inflated. 3. Wheels out of alignment.	1. Tighten all lug nuts (360 lbs-ft). 2. Check and adjust air pressure as needed. (85 PSI for Class I, 105 PSI for Class II) 3. Adjust wheel alignment. Refer to para. 8-78.
t. Noisy axle or differential carrier.	1. Lubricant level low. 2. Drive line bearings worn. 3. Internal axle problems.	1. Check lubricant and add as required. Refer to lubrication chart figure 4-13. 2. Refer to para. 5-69. 3. Repair axles. Refer to para. 5-72.

Table 4-1. Troubleshooting (Cont'd)

TROUBLE	PROBABLE CAUSE	CHECKOUT PROCEDURE AND REMEDIAL ACTION
u. Brakes spongy.	1. Air in hydraulic system.	1. Bleed brake lines. Refer to para. 8-65. Bleed master cylinders if equipped.
v. Brakes grab.	1. Wet brake linings. 2. Oil or grease on brake linings.	1. Allow linings to dry then move vehicle against brake pressure to dry linings completely. 2. Replace brake shoes. Refer to para 5-75.
w. Brakes failed.	1. Hydraulic oil level too low. 2. Silicone brake fluid low in master cylinders (84L325 - 84L340) 3. Broken or loose hydraulic line. 4. Worn brake linings. 5. Inoperative wheel cylinders. 6. Defective system relief valve. 7. Inoperative hydraulic pump. 8. Inoperative brake valve.	1. Inspect all hoses and fittings for loose fittings and broken hoses. Refer to figure 5-73 for replacement of defective parts. Fill hydraulic tank to full level on dipstick. Refer to lubrication chart figure 4-13. 2. Fill master cylinders (2). Refer to lubrication chart figure 4-13. 3. Repair, replace, or tighten brake lines and fittings. Refer to para. 8-32. Bleed brake lines. Refer to para. 8-65. 4. Replace brake linings. Refer to para. 5-75. Bleed brake lines. Refer to para. 8-65. 5. Repair or replace wheel cylinders (2 per wheel). Refer to para. 5-75. 6. Check relief valve pressure. Refer to para. 4-15. 7. Troubleshoot hydraulic pump. Refer to para. 4-15. 8. Troubleshoot brake valve. Refer to para. 4-17.
x. Brakes slow to apply.	1. No gas in accumulator. (Continued)	1. Charge accumulator. Refer to para. 4-33.

Table 4-1. Troubleshooting (Cont'd)

TROUBLE	PROBABLE CAUSE	CHECKOUT PROCEDURE AND REMEDIAL ACTION
x. Brakes slow to apply. (Cont'd)	2. Brake linings not adjusted or worn brake linings. 3. Defective wheel cylinders. 4. Hydraulic lines or fittings leaking.	2. Adjust or replace brake linings. Refer to para. 5-75. 3. Repair or replace wheel cylinders (2 per wheel). Refer to para. 5-75. Bleed brake lines. Refer to para. 8-65. 4. Tighten lines and/or fittings. Replace hydraulic lines, fittings and/or O-rings as needed.
y. Brakes will not release completely.	1. Brake shoes not adjusted. 2. Defective wheel cylinders. 3. Defective brake valve.	1. Adjust brake shoes. Refer to para. 5-75. 2. Repair or replace wheel cylinders. Refer to para. 5-75. 3. Troubleshoot brake valve. Refer to para. 4-17.
z. Insufficient brakes.	1. Low oil level in hydraulic tank. 2. Brake shoes not adjusted. 3. Oil or grease on brake linings. 4. Brake lines damaged or leaking. 5. No gas charge in accumulator. 6. Worn brake linings. 7. Defective brake valve.	1. Add oil to full level on dipstick. 2. Adjust brake shoes. Refer to para. 5-75. 3. Replace brake linings. Refer to para. 5-75. 4. Tighten or replace brake lines as needed. 5. Charge accumulator. Refer to para. 4-33. 6. Replace brake shoes and linings. Refer to para. 5-75. 7. Troubleshoot brake valve. Refer to para. 4-17.
aa. Accumulator charging time too long. (10 seconds maximum)	1. Low oil level in hydraulic tank. (Continued)	1. Add oil to full level on dipstick.

Table 4-1. Troubleshooting (Cont'd)

TROUBLE	PROBABLE CAUSE	CHECKOUT PROCEDURE AND REMEDIAL ACTION
aa. Accumulator charging time too long. (10 seconds maximum) (Cont'd)	<ol style="list-style-type: none"> 2. Hydraulic system relief valve setting too low. 3. Inoperative hydraulic pump. 4. Defective brake valve. 	<ol style="list-style-type: none"> 2. Set relief valve at 2500 PSI. 3. Troubleshoot hydraulic pump. Refer to para. 4-15. 4. Troubleshoot brake valve. Refer to para. 4-17.
bb. Accumulator charging cycle repeats frequently when brakes are not used.	<ol style="list-style-type: none"> 1. Leaking accumulator line or fittings. 2. Accumulator gas charge too low. 3. Accumulator gas charge too high. 4. Defective brake valve. 5. Accumulator line plugged. 	<ol style="list-style-type: none"> 1. Check line and fittings. Replace and tighten as needed. 2. Charge accumulator. Refer to para. 4-33. 3. Check accumulator gas charge. Refer to para. 4-33. 4. Troubleshoot brake valve. Refer to para. 4-17. 5. Replace line.
cc. Accumulator starts to charge but fails to reach high limit. (LO BRAKE PRESS light stays lit.)	<ol style="list-style-type: none"> 1. Low hydraulic oil level. 2. Main system relief valve setting too low. 3. Defective hydraulic pump. 4. Defective brake valve. 	<ol style="list-style-type: none"> 1. Fill hydraulic tank to full level on dipstick. 2. Check relief valve setting. Refer to para. 4-15. 3. Troubleshoot hydraulic pump. Refer to para. 4-15. 4. Troubleshoot brake valve. Refer to para. 4-17.

Table 4-1. Troubleshooting (Cont'd)

TROUBLE	PROBABLE CAUSE	CHECKOUT PROCEDURE AND REMEDIAL ACTION
dd. Accumulator charges frequently while brakes are being held.	<ol style="list-style-type: none"> 1. Damaged or leaking brake lines and/or fittings. 2. Accumulator gas charge is too low. 3. Defective brake valve. 	<ol style="list-style-type: none"> 1. Check brake lines. Tighten or replace lines and fittings. 2. Charge accumulator. Refer to para. 4-33. 3. Troubleshoot brake valve. Refer to para. 4-17.
ee. No steering or inadequate steering when accumulator is charging. Steering is satisfactory when accumulator is not charging.	<ol style="list-style-type: none"> 1. Main system relief valve valve setting too low. 2. Defective hydraulic pump. 3. Defective brake valve. 	<ol style="list-style-type: none"> 1. Check relief valve setting. Refer to Refer to para. 4-15. 2. Troubleshoot hydraulic pump. Refer to para. 4-15. 3. Troubleshoot brake valve. Refer to para. 4-17.
ff. Accumulator fails to start charging.	<ol style="list-style-type: none"> 1. Low hydraulic oil level. 2. Main system relief valve setting too low. 3. Defective hydraulic pump. 4. Defective brake valve. 	<ol style="list-style-type: none"> 1. Fill hydraulic tank to full line on dipstick. 2. Check relief valve setting. Refer to para. 4-15. 3. Troubleshoot hydraulic pump. Refer to para. 4-15. 4. Troubleshoot brake valve. Refer to para. 4-17.
gg. Very rapid cycling of charging valve section.	<ol style="list-style-type: none"> 1. Accumulator gas charge is too low. <p style="text-align: center;">(Continued)</p>	<ol style="list-style-type: none"> 1. Charge accumulator. Refer to para. 4-33.

Table 4-1. Troubleshooting (Cont'd)

TROUBLE	PROBABLE CAUSE	CHECKOUT PROCEDURE AND REMEDIAL ACTION
gg. Very rapid cycling of charging valve section. (Cont'd)	2. Accumulator gas charge is too high. 3. Defective brake valve.	2. Check accumulator gas charge. Refer to para. 4-33. 3. Troubleshoot brake valve. Refer to para. 4-17.
hh. Interference with steering at full throttle but not at idle.	1. Defective brake valve.	1. Troubleshoot brake valve. Refer to para. 4-17.
ii. Interference with or no steering at idle but steering satisfactory with engine at full throttle. (Accumulator charging or not charging.)	1. Main system relief valve valve setting too low. 2. Defective hydraulic pump. 3. Defective steering system component(s).	1. Check relief valve setting. Refer to para. 4-15. 2. Troubleshoot hydraulic pump. Refer to para. 4-15. 3. Troubleshoot steering system. Refer to para. 4-18.
jj. Noisy hydraulic pump.	1. Hydraulic oil level too low. 2. Internal pump damage.	1. Inspect all hoses and fittings for loose fittings and broken hoses. Refer to para. 5-115 for replacement of defective parts. Fill hydraulic tank. Refer to lubrication chart figure 4-13. 2. Troubleshoot hydraulic pump. Refer to para. 4-15.
kk. Loose, hard, or jerky steering.	1. Low tire pressure. 2. Hydraulic oil level too low. (Continued)	1. Inflate tire(s) to proper pressure. (85 psi for Class I, 105 psi for Class II). Inspect all hoses and fittings for loose fittings and broken hoses. Refer to para. 5-115 for replacement of defective parts. Fill hydraulic tank. Refer to lubrication chart figure 4-13.

Table 4-1. Troubleshooting (Cont'd)

TROUBLE	PROBABLE CAUSE	CHECKOUT PROCEDURE AND REMEDIAL ACTION
kk. Loose, hard, or jerky steering. (Cont'd)	3. Broken or loose hydraulic lines. 4. Inoperative steering control valve or steering cylinder. 5. Defective brake valve.	3. Repair, replace, or tighten hydraulic lines and fittings. Refer to para. 5-115. 4. Troubleshoot steering system. Refer to para. 4-18. 5. Troubleshoot brake valve. Refer to para. 4-17.
ll. Wander-Vehicle will not stay in a straight line.	1. Air in the system due to low level of oil, cavitating pump, leaky fitting, pinched hose, etc. 2. Worn steering linkage. 3. Bending of linkage or cylinder rod. 4. Loose cylinder piston. 5. Inoperative steering control valve or selector valve.	1. Check hydraulic oil level. Fill as needed. Repair hydraulic lines. Refer to para. 5-115. 2. Repair or replace. Refer to para. 5-72. 3. Repair steering cylinder. Refer to para. 5-80. 4. Repair steering cylinder. Refer to para. 5-80. 5. Troubleshoot steering system. Refer to para. 4-18.
mm. Free Wheeling-Steering wheel turns freely with no feeling of pressure and no action on steered wheels.	1. Steering column upper shaft is loose or damaged. 2. Lower splines of column may be disengaged or broken. 3. No flow to steering valve can be caused by: <ul style="list-style-type: none"> a. Hydraulic oil level too low. <p style="text-align: center;">(Continued)</p>	1. Tighten steering wheel nut. Refer to para. 5-100. 2. Repair steering column. Refer to para. 5-100. <ul style="list-style-type: none"> a. Add hydraulic oil and check for leaks.

Table 4-1. Troubleshooting (Cont'd)

TROUBLE	PROBABLE CAUSE	CHECKOUT PROCEDURE AND REMEDIAL ACTION
mm. Free Wheeling. (Cont'd)	b. Ruptured hose. c. Internal steering control valve damage.	b. Replace hose. Refer to para. 5-115. c. Troubleshoot steering system. Refer to para. 4-18.
nn. Steering unit locks up.	1. Large particles in steering control valve. 2. Insufficient hydraulic power. 3. Severe wear and/or broken pin.	1. Repair steering control valve. Refer to para. 5-102. 2. Inspect hydraulic lines. Troubleshoot hydraulic system. Refer to para. 4-14. 3. Repair steering control valve. Refer to para. 5-102.
oo. Steering wheel oscillates or turns by turns by itself.	1. Parts assembled wrong. Steering control valve improperly timed. 2. Lines connected to wrong ports.	1. Repair steering control valve. Refer to para. 5-102. 2. Reconnect lines correctly. Refer to para. 5-115.
pp. Steered wheels turn in wrong direction when operator activates steering wheel.	1. Lines connected to wrong cylinder ports.	1. Reconnect lines correctly. Refer to para. 5-115.

4-3. STARTING MOTOR.

4-4. Perform no-load test on starting motor as follows:

- a. Remove starting motor. Refer to para. 5-39.
- b. Connect voltmeter from motor terminal to motor frame. Use RPM indicator to measure armature speed.
- c. Connect motor and armature in series with fully charged 12 volt battery and switch in open position from switch battery terminal to solenoid switch terminal. Refer to figure 4-1. Use carbon pile to reduce battery voltage.
- d. Close switch and compare r.p.m. current and voltage reading with following specifications and record results:
 1. Min Amps - (75)
 2. Max Amps - (175)
 3. Min RPM - (6900)
 4. Max RPM - (14,900)
- e. Open switch and disconnect test circuit.
- f. Interpret test results per table 4-2.

Table 4-2. No-Load Test Results

RESULT	PROBABLE CAUSE
1. Rated current draw and not load speed indicates normal condition of starting motor.	
2. Low free speed and high current draw indicates:	<ul style="list-style-type: none"> a. Too much friction. Tight, dirty, or worn bearings, bent armature shaft or loose pole shoe allowing armature to drag. b. Shorted armature. c. Grounded armature or fields.
3. Failure to operate with high current draw indicated:	<ul style="list-style-type: none"> a. Direct ground in terminal or fields. b. Frozen bearings.
4. Failure to operate with no current draw indicates:	<ul style="list-style-type: none"> a. Open field circuit. b. Open armature coils. c. Broken brush springs, worn brushes, high insulation between commutator bars or poor contact between commutator and brushes.
5. High free speed and high current draw:	<ul style="list-style-type: none"> a. Shorted fields. Replace field coil assembly.

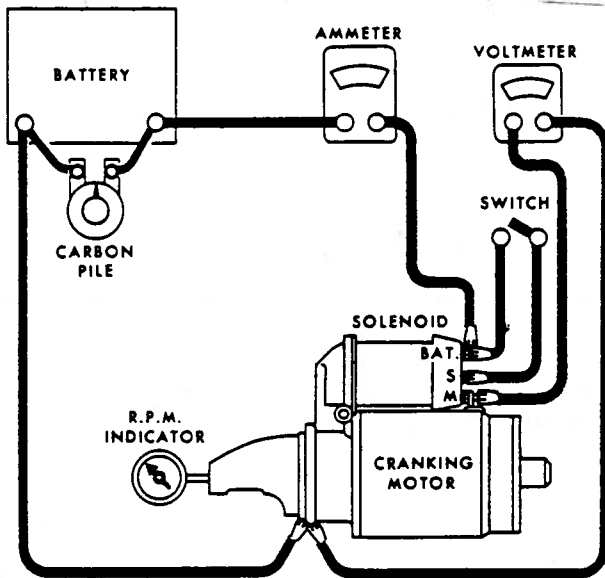


Figure 4-1. No-Load Test Circuit

NOTE

If motor performance resembles conditions described in table, disassemble only as far as necessary to repair or replace defective component.

4-5. ALTERNATOR TROUBLESHOOTING.

4-6. Troubleshoot the alternator (installed) as follows:

- a. Turn ignition switch to ON.
- b. Connect leads of voltmeter (0-24 volts) to:
 - 1. Alternator "BAT" terminal (figure 4-2).
 - 2. Alternator "1" terminal.
 - 3. Alternator "2" terminal.
- c. Zero reading indicates an open between the voltmeter connection and the battery. Troubleshoot electrical system per electrical schematic figure 5-9.
- d. With all accessories off (lights, heater, wipers, etc), start engine and operate at 1200. If voltage is 15.5 or more, remove alternator for repair. Refer to para. 5-35.
- e. If checks c and d are satisfactory, then check alternator as follows:

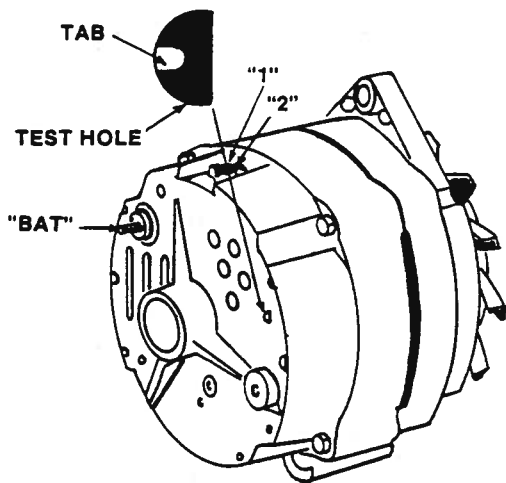


Figure 4-2. Alternator Test Points

1. Shutoff power at battery disconnect.
2. Connect ammeter (0-100 amps) in circuit at alternator "BAT" terminal.
3. Turn on power at battery disconnect switch.
4. Operate engine at idle speed (600 RPM).
5. If ampere output is not within 10 amperes of 63 amperes then ground field winding by inserting screwdriver into test hole (figure 4-2). Do not force screwdriver deeper than one inch.
6. Operate engine at idle speed (600 RPM).
7. If output is within 10 amperes of 63 amperes, disassemble alternator (para. 5-35) and check field winding and test voltage regulator (para. 7-4).
8. If output is not within 10 amperes of 63 amperes, disassemble alternator (para. 5-35) and check field winding, diode trio, rectifier bridge, and stator as covered in para. 7-4.

4-7. TRANSMISSION TROUBLESHOOTING.

4-8. Perform the following troubleshooting procedures when internal problems with the transmission are suspected:

4-9. TRANSMISSION CLUTCH PRESSURES. Check transmission clutch pressure as follows:

- a. Remove plug at check point A (figure 4-3) and install pressure gage (0-3000 psi).
- b. Start engine and idle until transmission oil temperature is between 180° and 200°F (82-93°C).

NOTE

Clutch pressure must be measured at idle. Never use service brakes while making clutch pressure checks.

- c. Move range selector to LO, direction selector to F, and speed selector to 3. Check and record clutch pressure.
- d. Move speed selector to 2. Check and record clutch pressure.
- e. Move speed selector to 1. Check and record clutch pressure.
- f. Move direction selector to R. Check and record clutch pressure.
- g. Shutdown engine, remove gage, and install plug at check point A.
- h. Compare clutch pressures as follows:
 1. Each clutch pressure should be from 180 to 220 psi.
 2. There should be no more than 5 psi variation between the readings.
- i. If clutch pressures are low in all gears, then probable causes include:

1. Leaking or plugged suction tube. Refer to para. 5-56 for removal of suction tube (51, figure 5-35).

2. Faulty clutch pressure regulating valve or charging pump. Replace charging pump (2, figure 5-35). Refer to para. 5-56.

- j. If clutch pressure is low in one or more gears but not all gears then probable causes include:

1. Leaking clutch sealing seals. Refer to para. 5-56.

2. Worn or broken sealing rings on clutch support or clutch shaft. Refer to para. 5-56.

3. Bleed ball in clutch drum stuck open. Refer to para. 5-56.

4. Faulty control cover. Refer to para. 5-56.

5. Leaking internal plumbing. Refer to para. 5-56.

4-10. CONVERTER OUTLET PRESSURE. Check converter outlet pressure as follows:

a. Remove plug at check point B (figure 4-3) and install pressure gage (0-3000 psi).

b. Start engine and idle until transmission oil temperature is between 180 and 200°F (82-93°C).

NOTE

Direction control lever must be at N (neutral).

c. Accelerate engine speed to 2000 RPM. Check and record converter outlet pressure. Pressure should be 25 psi minimum.

d. Shutdown engine, remove pressure gage, and install plug at check point B.

e. Low converter outlet pressure is caused by:

1. Low oil level. Check oil level and add to FULL mark on dipstick.

2. Sump screen is plugged. Remove and clean sump screen (19, figure 5-35). Reinstall.

3. Defective charging pump. Replace charging pump (2, figure 5-35). Refer to para. 5-56.

4-11. OIL COOLER PRESSURE DROP. Calculate the transmission oil cooler pressure drop as follows:

a. Install pressure gage (0-3000 psi) in "converter out" line (figure 4-3).

b. Install another pressure gage in "lube from cooler" line (figure 4-3).

c. Accelerate engine to 2000 RPM with transmission direction selector at N (neutral).

d. Check and record "converter out" pressure and "lube from cooler" pressure.

e. Subtract "lube from cooler" pressure from "converter out" pressure giving the "cooler drop" pressure.

f. If "cooler drop" pressure exceeds 27 psi then clean and flush oil cooler (part of radiator).

CAUTION

The oil cooler should be "back flushed" with clean transmission oil and compressed air until all foreign matter has been removed.

Do not use flushing compounds to flush transmission oil cooler.

g. Remove pressure gages and reinstall transmission cooler lines.

4-12. CONVERTER STALL SPEED CHECK. Check the converter stall speed as follows:

a. Check hydraulic oil level, engine oil level, and transmission oil level. Fill as needed.

b. Install pressure gage (0-3000 psi) in primary outlet line at hydraulic pump. See figure 4-4 (check point A).

NOTE

Ensure that steering selector lever is in FRONT mode.

c. Start engine and turn steering wheel to left until wheel stops. Chock all four tires.

d. Ensure that parking brake is set.

e. Place direction selector lever to F (forward), speed selector lever to 3, and range selector lever to HI.

f. Accelerate engine to approximately 1800 RPM until transmission oil temperature reaches 180°F.

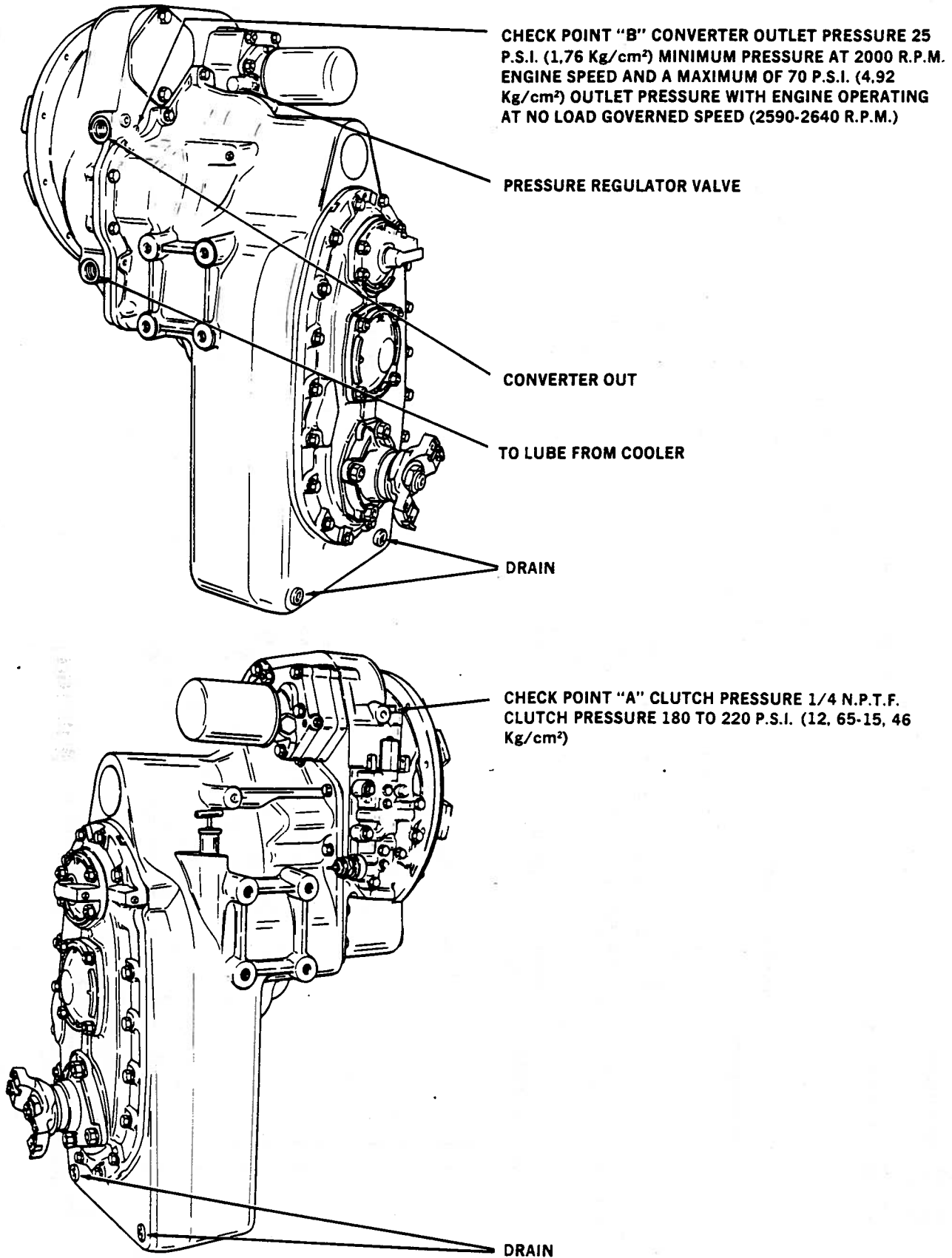


Figure 4-3. Transmission Check Points

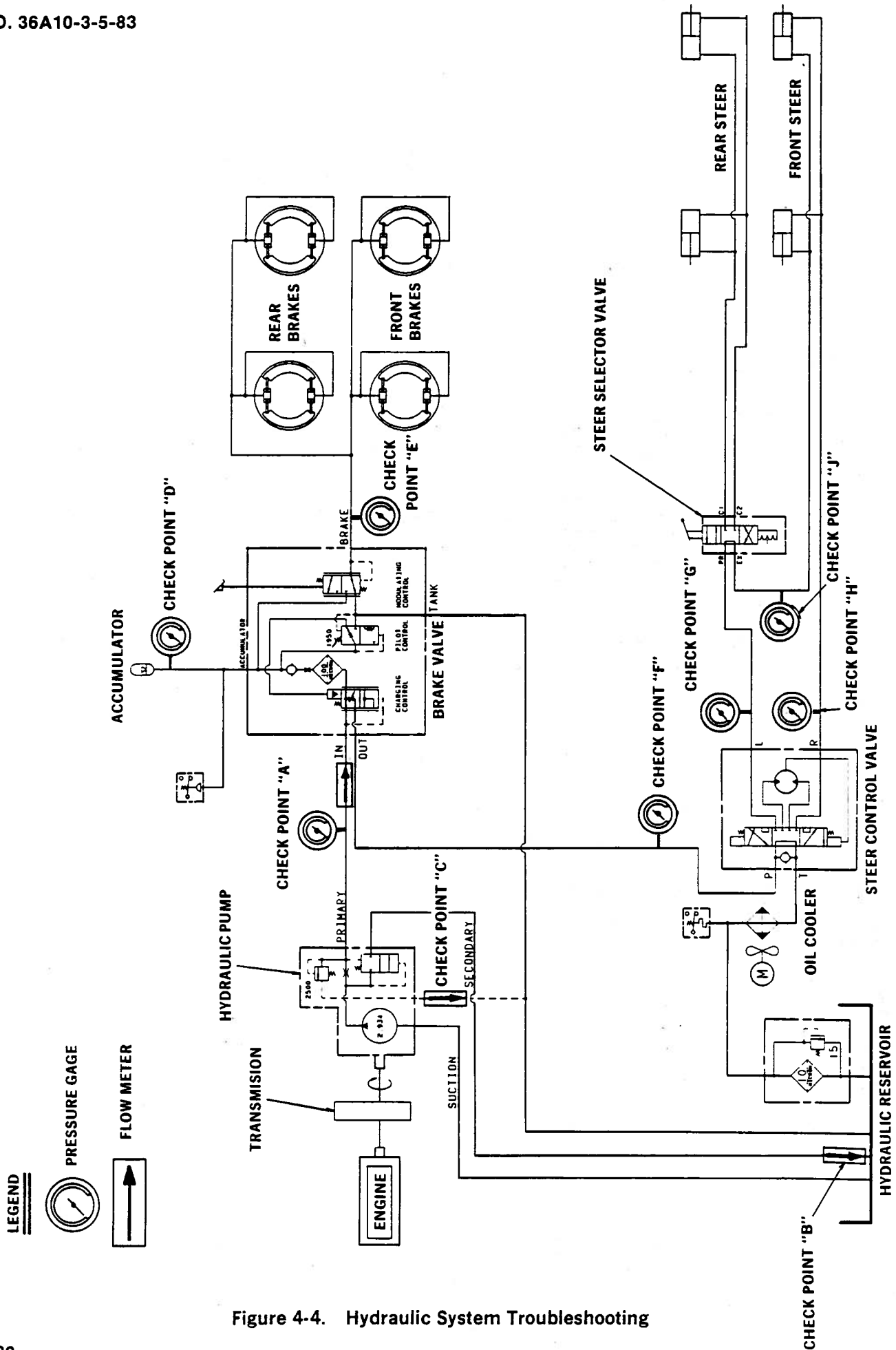


Figure 4-4. Hydraulic System Troubleshooting

CAUTION

Full throttle speeds for an excessive length of time will overheat the converter.

g. Accelerate to full throttle.

h. Read stall RPM on tachometer and relief pressure on gage. The converter stall should occur at 1945 RPM and relief pressure should be approximately 2640 psi.

i. Remove pressure gage and connect hydraulic line.

j. Low converter stall speed is caused by:

1. Plugged or dirty air cleaner. Remove and replace air cleaner. Refer to para. 5-44.

2. Accelerator linkage or other fuel system problem. Refer to engine overhaul manual T.O. 36A10-3-5-83-1.

3. Low compression. Refer to engine overhaul manual T.O. 36A10-3-5-83-1.

k. High converter stall speed is caused by internal transmission problems. Troubleshoot the transmission, para. 4-7.

4-13. HYDRAULIC SYSTEM.

4-14. Perform the following troubleshooting procedures when hydraulic system problems are indicated.

4-15. HYDRAULIC PUMP. Use the following procedure to check the main system relief valve setting and hydraulic pump flow output.

a. Disconnect hydraulic line at check point A (figure 4-4) and install pressure gage (0-3000 psi) and flow meter (2-30 gpm).

b. Disconnect hydraulic lines at check points B and C and install flow meters (2-30 gpm).

c. Start engine and idle until operating temperature is reached.

d. Turn all wheels straight ahead. Move steering selector handle to FRONT.

e. With engine at idle, check pressure gages and flow meter against following specifications:

1. Check point A Pressure Gage - 50-100 psi
2. Check point A Flow Meter - 8-10 gpm
3. Check point B Flow Meter - "No Flow"
4. Check point C Flow Meter - "No Flow"

f. Accelerate engine to 1500 rpm. Check pressure gage and flow meters against following specifications:

1. Check point A Pressure Gage - 100-200 psi
2. Check point A Flow Meter - 10 gpm
3. Check point B Flow Meter - 20 gpm
4. Check point C Flow Meter - "No Flow"

g. Steer front wheels to left against wheel stop.

h. With engine at idle, check pressure gage and flow meters against following specifications:

1. Check point A Pressure Gage - 2500 psi
2. Check point A Flow Meter - "No Flow"
3. Check point B Flow Meter - "No Flow"
4. Check point C Flow Meter - 6-8 gpm

i. Accelerate engine to 1500 rpm. Check pressure gage and flow meters against following specifications:

1. Check point A Pressure Gage - 2650 psi
2. Check point A Flow Meter - "No Flow"
3. Check point B Flow Meter - 20 gpm
4. Check point C Flow Meter - 10 gpm

j. Set system main relief valve if necessary. Refer to para. 4-16.

k. If hydraulic pumps fails to output 8-10 gpm at check point A in step e, then hydraulic pump is defective. Prior to disassembly, clean spring guide and orifice as follows:

1. Remove plug (1, figure 5-71).
2. Remove spring (2) and spring guide and orifice (4).
3. Clean spring guide and orifice.
4. Install spring guide and orifice (4) with spring (2).
5. Install plug (1) with new O-ring (3).
6. Recheck hydraulic pump output (steps c thru i).

NOTE

If hydraulic pump fails retest after cleaning spring guide and orifice, then hydraulic pump must be disassembled. Refer to para. 5-109.

1. If all readings are good, remove pressure gage and flow meters.

4-16. SYSTEM MAIN RELIEF VALVE. Set the system main relief valve as follows:

- a. Remove nut (6, figure 5-71).
- b. Loosen locknut (8).
- c. Adjust valve setting by:
 1. Turning in set screw (9) to increase relief pressure.
 2. Backing out set screw (9) to decrease relief pressure.
- d. Tighten locknut (8) and install nut (6) with O-ring (7).
- e. Check hydraulic pump and system main relief valve pressure. Refer to para. 4-15.

4-17. BRAKE VALVE. Use the following procedure to troubleshoot the brake valve:

a. Depress and release brake pedal (approximately 15 cycles) to relieve hydraulic pressure at accumulator.

b. Check accumulator charge. Refer to para. 4-33.

c. Disconnect hydraulic line at check point D (figure 4-4) and install pressure gage (0-3000 psi).

d. Disconnect hydraulic lines at check points E and F and install pressure gages (0-3000 psi).

e. Start engine. Idle engine until operating temperature is reached.

f. Depress brake pedal and release several times. Record pressure reading at check point D when accumulator charge begins.

g. Record pressure reading at check point D when accumulator stops charging.

h. Compare readings at check point D with following specifications:

1. Accumulator starts charging 1900 ± 50 psi.
2. Accumulator stops charging 2300 ± 50 psi.

NOTE

If pressures in step h are not satisfactory, then charging section of brake valve is defective. Repair brake valve.

i. Depress brake pedal and check pressure gages at check points D and E. Pressure readings at check point E should be approximately 100 psi less than reading at check point D.

NOTE

If pressure readings in step i are not satisfactory then modulating control section of brake valve is defective. Repair brake valve.

j. Steer front wheels to left against wheel stop. Record pressure at check point F. Pressure should be 2500 psi.

NOTE

If pressure not satisfactory in step j, then charging valve is defective. Repair brake valve.

k. If all test results are satisfactory, then brake

valve is good. Remove all pressure gages and reconnect hydraulic lines.

l. If brake valve is defective, compare the troubleshooting problem with the probable brake valve defects shown in table 4-3.

Table 4-3. Brake Valve Service Diagnosis

PROBLEM	PROBABLE CAUSE
a. Brakes will not release.	1. Defective valve and ball (27, figure 5-60). 2. Piston (4), piston (12), and washer (11) are binding.
b. Insufficient brakes.	1. Broken spring (8). 2. Cut boot (1) allowing dirt to accumulate at piston (4).
c. No brakes.	1. Piston (12) or piston (4) stuck. 2. Broken spring (8).
d. Accumulator charging cycle repeats frequently when brakes are not being used.	1. Poppet (55) is leaking. 2. O-ring (57) is leaking. 3. Valve and ball (27) not seating. 4. Ball (38) leaking. 5. Seals (23 and 26) are leaking.
e. Accumulator charges frequently when brakes are being held.	1. Cup (17) is worn. 2. Piston (12) is damaged.
f. Accumulator starts to charge but does not reach high limit.	1. O-rings (41 and 42) are damaged. 2. O-ring (50) is damaged.
g. Accumulator charging time too long.	1. Broken spring (47). 2. Dirt in filter (59). 3. Poppet (55) is stuck partially closed.

(Continued)

Table 4-3. Brake Valve Service Diagnosis (Cont'd)

PROBLEM	PROBABLE CAUSE
h. Accumulator fails to start charging.	<ol style="list-style-type: none"> 1. Broken spring (30). 2. Broken spring (47). 3. O-ring (45) is defective. 4. Spool (49) is stuck. 5. Dirt in filter (59).
i. Very rapid cycling of charging valve.	<ol style="list-style-type: none"> 1. Spool (39) and insert (40) are worn.
j. Steering system interference.	<ol style="list-style-type: none"> 1. Charging valve adjustment not correct.

4-18. STEERING SYSTEM. Use the following procedures to troubleshoot the steering system:

NOTE

If steering problems occur in all three driving modes, the probable causes include the steering selector valve, the steering control valve, and/or the front steering cylinder(s).

If steering problems occur only in the COORD or OBLIQUE CRAB modes then the probable cause is the steering selector valve or the rear steering cylinder(s).

- a. Check hydraulic pump output and pressure. Refer to para. 4-15.
- b. Check brake valve. Refer to para. 4-17.
- c. Remove hydraulic lines at check points F, G, and H and install pressure gages (0-3000 psi).
- d. Start engine. Idle until operating temperature is reached.
- e. Ensure that steering selector valve is in FRONT mode.
- f. Steer front wheels to left. Check and record pressures at check points F, G, and H.

g. If pressures recorded at check points F, G, and H are approximately equal then:

1. Filter at hydraulic reservoir is dirty and filter bypass valve is clogged, or
2. Control spool in steering control valve is defective, or
3. Oil cooler is clogged.

h. If pressures recorded at check points F and G are approximately equal then steering control valve and front steering cylinders are good.

NOTE

If pressures at check points F and G are not equal, then remove and repair steering control valve.

- i. Steer wheels straight ahead. Shutdown engine:
- j. Remove pressure gages at check points F and G. Connect all hydraulic lines.
- k. Disconnect hydraulic line at check point J. Install pressure gage (0-3000 psi).
- l. Start engine and move steering selector valve to OBLIQUE CRAB. Steer wheels to right.

m. Check and record pressures at check points H and J. Pressure at check point H should be approximately 2 times the pressure recorded at check point J.

n. If pressures are not approximately 2:1 then:

1. Steer cylinder seals are worn.
2. Steering selector valve is defective.

o. Remove all gages and install hydraulic lines.

4-19. SCHEDULED INSPECTION.

4-20. Table 4-4 is a list of the scheduled inspection requirements for the MB-2 towing tractor. Although specific inspection periods are given, the actual operating environment will affect the time span between inspections.

Table 4-4. Scheduled Inspection

SCHEDULED INSPECTION	DAILY	WEEKLY	MONTHLY	QUARTERLY	SEMI	ANNUAL
ENGINE						
Check lube oil level	X					
Check torque on mounting bolts				X		
FUEL SYSTEM						
Inspect fuel tank for corrosion, leaks, and damage			X			
Inspect fuel lines for leaks, cracks, and damage			X			
Inspect cold starting aid for damage			X			
Inspect throttle linkage for damage and looseness			X			
Inspect air cleaner element				X		
Inspect fuel injectors for leaks				X		
Inspect air intake system for cracked hoses, loose clamps, etc				X		
Check engine idle speed					X	
EXHAUST SYSTEM						
Inspect hoses and clamps for damage and looseness			X			
Inspect muffler and resonator for damage				X		
Inspect turbocharger for damaged compressor turbine blades and oil leaks into crossover or exhaust pipe						X
(Continued)						

Table 4-4. Scheduled Inspection (Cont'd)

SCHEDULED INSPECTION	DAILY	WEEKLY	MONTHLY	QUARTERLY	SEMI	ANNUAL
COOLANT SYSTEM						
Check coolant level	X					
Inspect radiator hoses for breaks and deterioration	X					
Check coolant mixture					X	
Inspect water pump for leaks					X	
Inspect radiator shutter (if equipped) for cleanliness and damage					X	
ELECTRICAL SYSTEM						
Inspect control panel instruments and lights for damage and operation	X					
Inspect control panel switches for operation	X					
Inspect exterior lights for damage and operation	X					
Test horn and back-up alarm	X					
Inspect alternator drive belt for tension and damage		X				
Inspect alternator for damage, cleanliness, and overheating			X			
Inspect starting motor for loose connections, cleanliness, and damage			X			
Check battery charge indicator (2)			X			
Inspect terminals and cables for corrosion			X			
Inspect wiring harnesses for burned insulation, loose connectors, and worn insulation			X			
Test alternator for rated output					X	
Inspect starting motor brushes for wear					X	
Check sending units for proper operation and loose connections					X	
(Continued)						

Table 4-4. Scheduled Inspection (Cont'd)

SCHEDULED INSPECTION	DAILY	WEEKLY	MONTHLY	QUARTERLY	SEMI	ANNUAL
TRANSMISSION						
Check lube oil level. Check torque on mounting bolts	X			X		
DRIVE SHAFTS						
Inspect cross bearings for wear Check torque on mounting bolts			X	X		
AXLES						
Check housing for leaks Check lube oil level Inspect tie rod assembly for wear and damage Check wheel alignment Check torque on mounting bolts	X	X X		X X		
BRAKE SYSTEM						
Inspect lines and fittings for leaks and damage Inspect parking brake linkage for damage and looseness Check master cylinder for fluid level (units equipped for silicone brake fluid) Check accumulator charge Inspect parking brake linings for wear Inspect wheel cylinders (2 each wheel) for leaks and damage Inspect service brake linings for wear	X X	X	X	X X X		
TIRE/WHEEL						
Check tire pressure Inspect tires for cuts, nicks, and wear (Continued)	X X					

Table 4-4. Scheduled Inspection (Cont'd)

SCHEDULED INSPECTION	DAILY	WEEKLY	MONTHLY	QUARTERLY	SEMI	ANNUAL
Inspect wheel parts for damage and corrosion Check torque on lug nuts	X	X				
STEERING SYSTEM						
Inspect steering lines and fittings for damage and leaks	X					
Inspect steering control valve for leaks		X				
Inspect steering selector valve for leaks		X				
Inspect steering cylinders (2 each axle) for leaks, damage, and corrosion		X				
FRAME						
Inspect pintle hooks for damage	X					
Check fire extinguisher charge and damage	X					
Inspect all decals for damage	X					
Inspect frame for cracks and corrosion				X		
Check torque on end plate bolts						X
CAB						
Inspect glass for damage	X					
Inspect all decals and plates for damage	X					
Inspect windshield wiper blades (3)		X				
Inspect cab door latches for damage and corrosion			X			
HYDRAULIC SYSTEM						
Inspect all lines and fittings for leaks and damage	X					
Check hydraulic oil level	X					
Inspect hydraulic pump for leaks		X				
Check torque on hydraulic pump mounting bolts				X		

4-21. SCHEDULED MAINTENANCE.

4-22. The following paragraphs provide scheduled maintenance procedures for the MB-2 towing tractor. The schedule is a guide for preventive maintenance which should be adopted for vehicle usage and environmental conditions.

4-23. DAILY.

- a. Fill fuel tank.
- b. Drain fuel/water separator.
- c. Empty air cleaner vacuator cup.
- d. Tighten wheel lug nuts. (360 lbs-ft)
- e. Lubricate as required. See figure 4-13.

4-24. WEEKLY, 50 HOURS.

- a. Lubricate as required. See figure 4-13.

4-25. MONTHLY, 100 HOURS.

- a. Lubricate as required. See figure 4-13.
- b. Check accumulator charge. See para. 4-33.

4-26. QUARTERLY, 250 HOURS, OR 5000 MILES.

- a. Change engine lube oil and filter.
- b. Replace air cleaner element.
- c. Thoroughly clean towing tractor.
- d. Lubricate as required. See figure 4-13.

4-27. SEMI-ANNUALLY, 500 HOURS, OR 10,000 MILES.

- a. Change fuel filter and fuel/water strainer.
- b. Bleed fuel system. See para. 4-29.
- c. Lubricate as required. See figure 4-13.

4-28. ANNUALLY, 1000 HOURS, OR 20,000 MILES.

- a. Adjust valve clearances. See para. 4-30.
- b. Steam clean axles, engine, and transmission.
- c. Drain and flush coolant system. See para. 4-32.
- d. Change hydraulic system fluid and oil filter.
- e. Change transmission lube oil and filter.
- f. Lubricate as required. See figure 4-13.

4-29. **BLEEDING FUEL LINES.** Remove air from low and high pressure fuel lines as follows:

WARNING

Put out all smoking materials or open flames. Ensure that engine is cool before bleeding the fuel lines.

- a. Open bleed screw (figure 4-5).

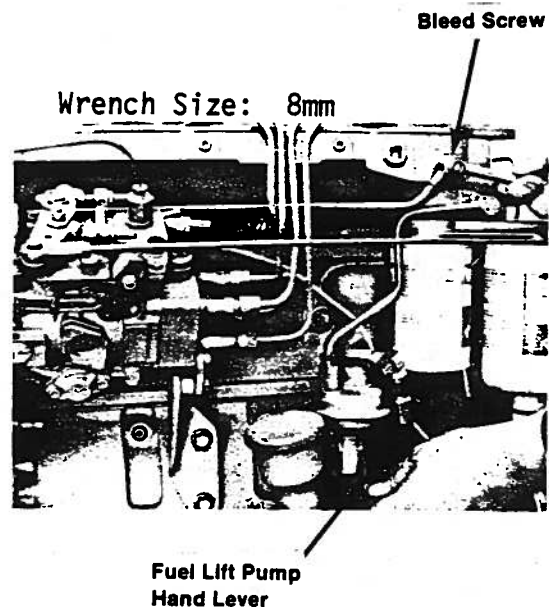


Figure 4-5. Bleeding Low Pressure Fuel Line

- b. Operate fuel lift pump by hand until fuel flowing from bleed screw is free of air bubbles.
- c. Close bleed screw.

WARNING

High pressure fuel can cause personal injury.

Do not bleed a hot engine as this could cause fuel to spill onto hot manifold creating a fire hazard.

- d. Loosen fitting at injector number one (figure 4-6).

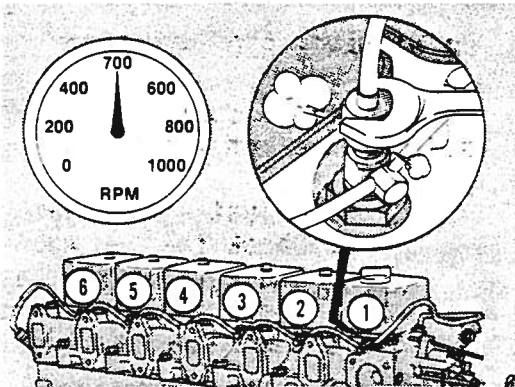
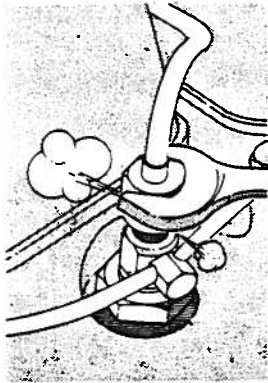


Figure 4-6. Bleeding High Pressure Fuel Lines

- e. Start engine and allow trapped air to bleed from line.
- f. Tighten fitting.
- g. Repeat steps d, e, and f for injectors two thru six.

4-30. ADJUSTING VALVES. Adjust the clearance of intake and exhaust valves as follows:

- a. Remove valve covers.
- b. Locate Top Dead Center (TDC) for cylinder number 1 by barring engine slowly while pressing

engine timing pin until pin engages hole in camshaft gear. Refer to figure 4-7.

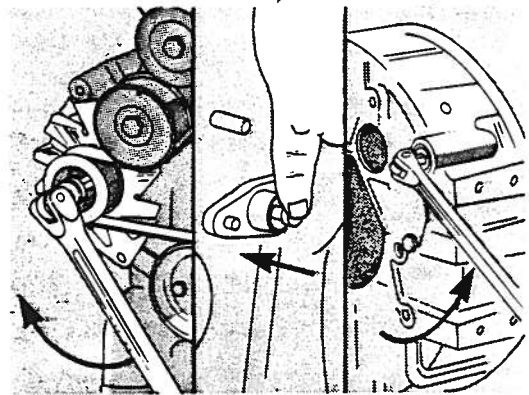


Figure 4-7. Timing Pin

- c. Disengage pin after locating TDC.

- d. Set valve clearances with engine cold. Intake valve clearance should be 0.010 inch (.254 mm). Exhaust valve clearance should be 0.020 inch (.508 mm).

NOTE

The clearance is correct when some resistance is "felt" when the feeler gage is slipped between the valve stem and the rocker lever.

- e. Check intake and exhaust valve clearance for cylinders indicated in figure 4-8. (I=Intake; E=Exhaust).

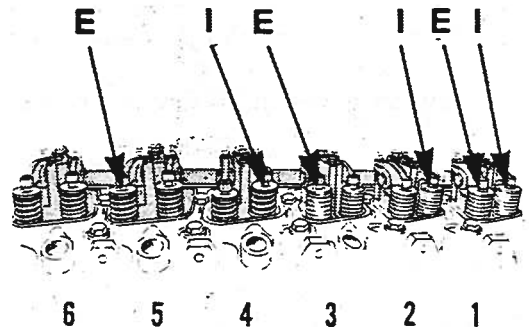


Figure 4-8. Valve Checked at TDC

- f. Adjust valve clearances by loosening locknut and adjusting setscrew. Tighten locknut to 18 lbs-ft. See figure 4-9.

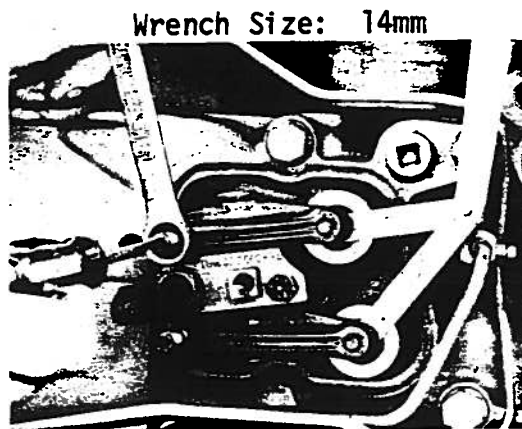


Figure 4-9. Setting Valve Clearances

CAUTION

Ensure that timing pin is disengaged.

g. Mark pulley and rotate crankshaft 360 degrees.

h. Set valve clearances indicated in figure 4-10.

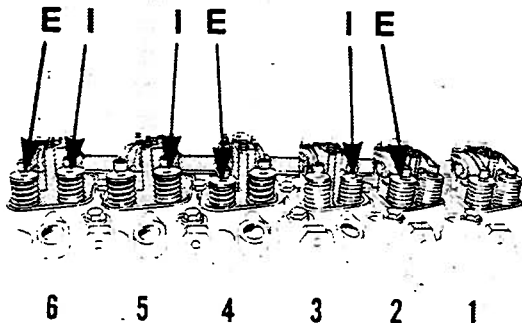


Figure 4-10. Valves Checked at 180° to TDC

i. Install valve covers and torque capscrews to 18 lbs-ft.

4-31. **ADJUSTING ENGINE IDLE.** Adjust the engine idle as follows:

- a. Start and warm up engine.
- b. Loosen locknut (figure 4-11).
- c. Turn adjusting screw until 600 RPM is indicated on tachometer.

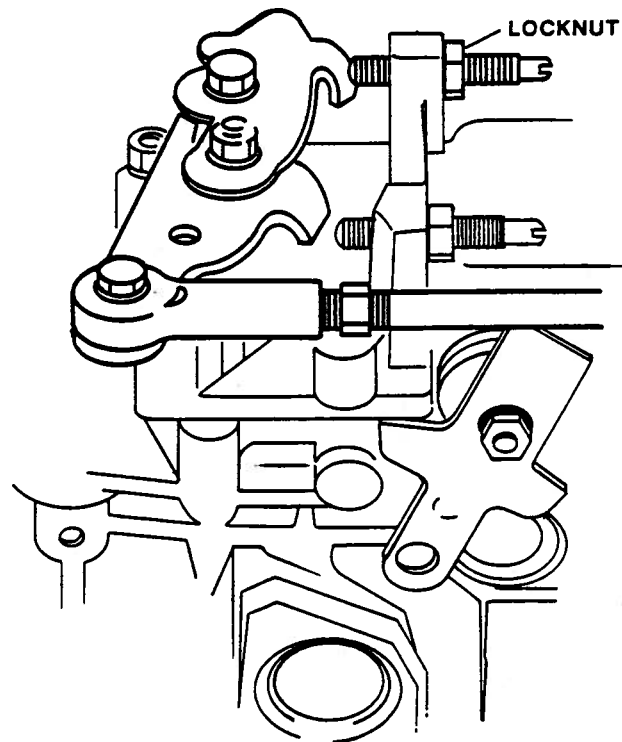


Figure 4-11. Idle Speed Adjustment

d. Tighten locknut.

4-32. **COOLANT SYSTEM.** Drain and flush radiator and coolant as follows:

a. Park towing tractor on level surface.

WARNING

Do not remove radiator cap until radiator is cool. Remove cap slowly to prevent personal injury.

b. Remove radiator cap slowly.

c. Open drain cock at bottom of radiator and drain coolant into container. Radiator capacity is 20.2 qts.

CAUTION

Do not mix anti-freeze or corrosion inhibitors with cleaning and flushing compounds.

d. Fill radiator with clean water and commercial grade cooling system solution. Refer to manufacturer's directions for specific cleaning procedures.

e. Fill radiator with clean water and drain repeatedly to ensure that all traces of cleaning solution have been removed.

f. Remove hose clamps and disconnect upper and lower radiator hoses.

g. Connect pressurized water hose to lower radiator hose connection.

h. Plug upper radiator hose connection.

CAUTION

Do not use more than 6 psi pressure to flush radiator.

i. Back flush radiator with clean water until only clean water flows out of filler neck.

WARNING

Wear safety goggles when using compressed air.

j. Use low-pressure air to clean and dry exterior of radiator.

k. Install upper and lower radiator hoses and secure with clamps.

l. Fill radiator with 50/50 mixture of anti-freeze and fresh water.

m. Install radiator cap.

n. Start engine and inspect radiator and hoses for leaks.

4-33. CHECKING ACCUMULATOR CHARGE.
Check the accumulator charge as follows:

a. Depress and release brake pedal (approximately 15 cycles) to exhaust hydraulic pressure on accumulator.

WARNING

The accumulator weighs 41 pounds.

b. Remove nuts and lockwashers securing accumulator to frame.

c. Remove capscrews securing guard to accumulator.

WARNING

Do not inhale nitrogen gas.

d. Loosen nut on gas valve (part of accumulator) one full turn.

e. Install gage assembly (figure 4-12) to gas valve.

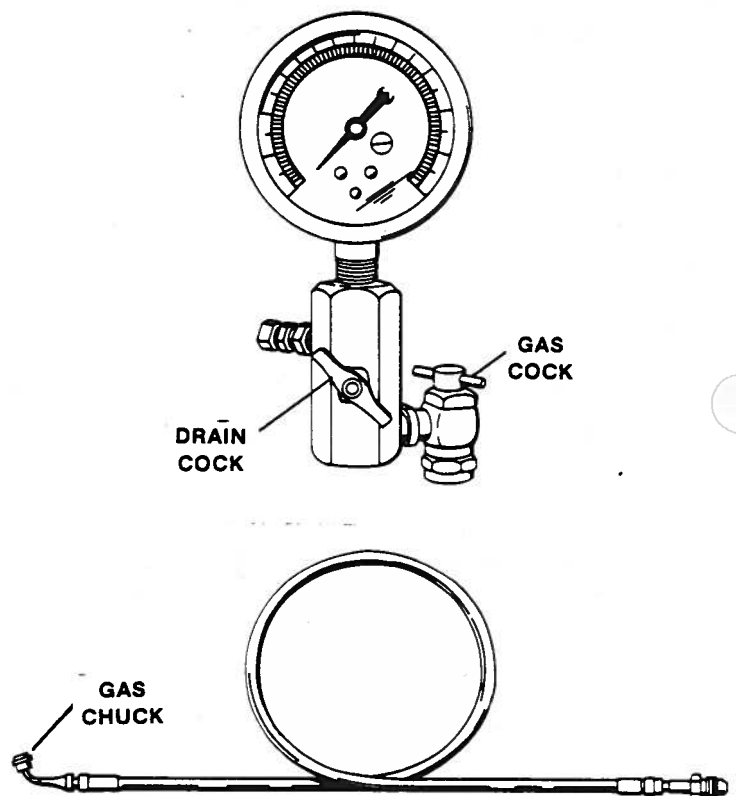


Figure 4-12. Charging Hose and Gage Assembly

f. Close drain cock on gage assembly.

g. Turn gas cock handle clockwise.

h. Pressure on gage should read 1200 psi.

i. If necessary, reduce pressure by slowly opening drain cock until gage reads 1200 psi. Close drain cock.

j. If necessary, increase pressure as follows:

(1) Install gas chuck end of charging hose to gage assembly.

(2) Install tail piece end to nitrogen cylinder.

(3) Open gas cock.

(4) Open nitrogen cylinder valve. When pressure reading on gage is 1200 psi, close cylinder valve.

(5) Close gas cock.

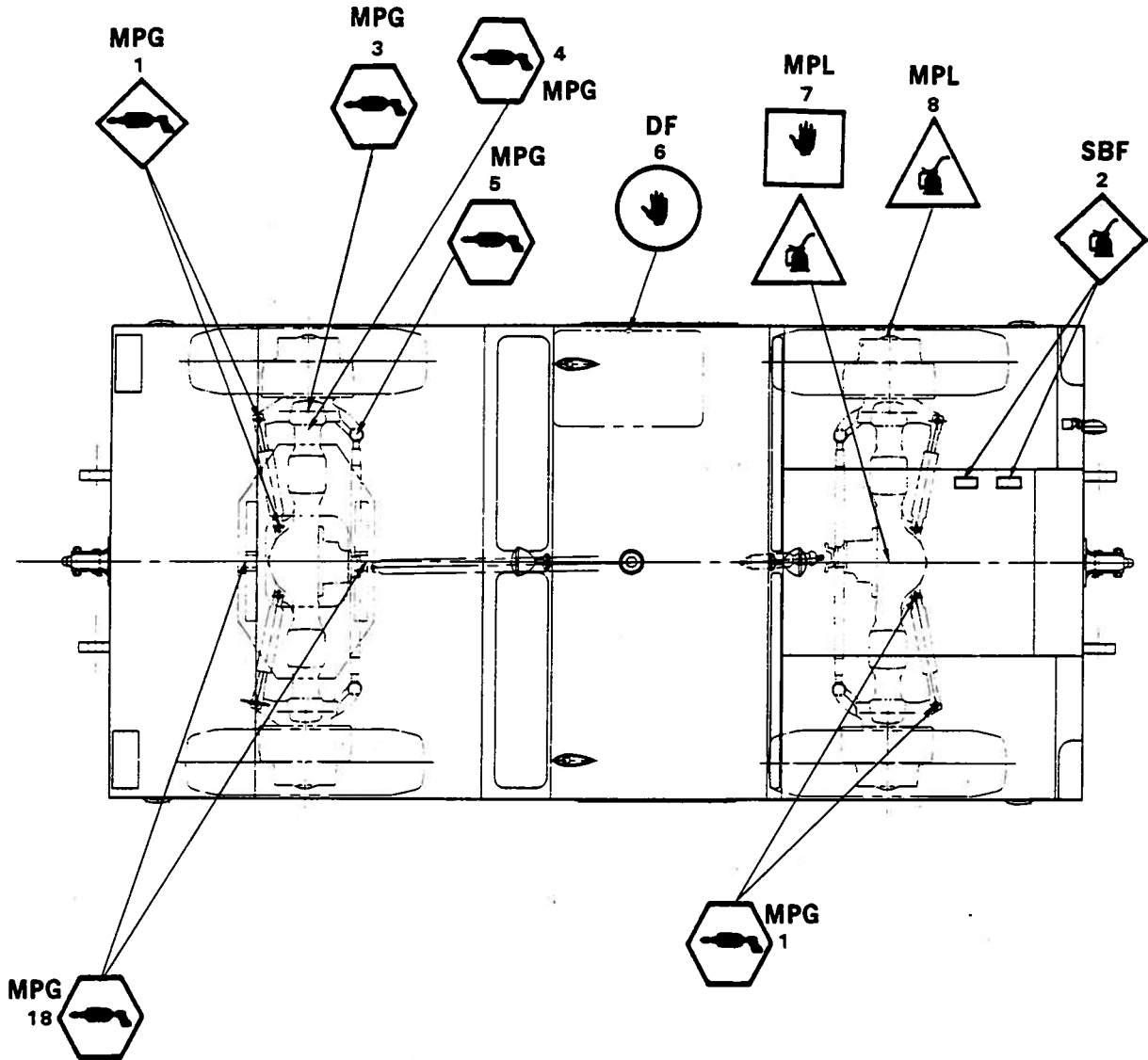
k. Remove charging hose and gage assembly. Tighten nut on gas valve.

l. Install guard and capscrews.

m. Install accumulator to frame with nuts and lockwashers.

4-34. LUBRICATION CHART.

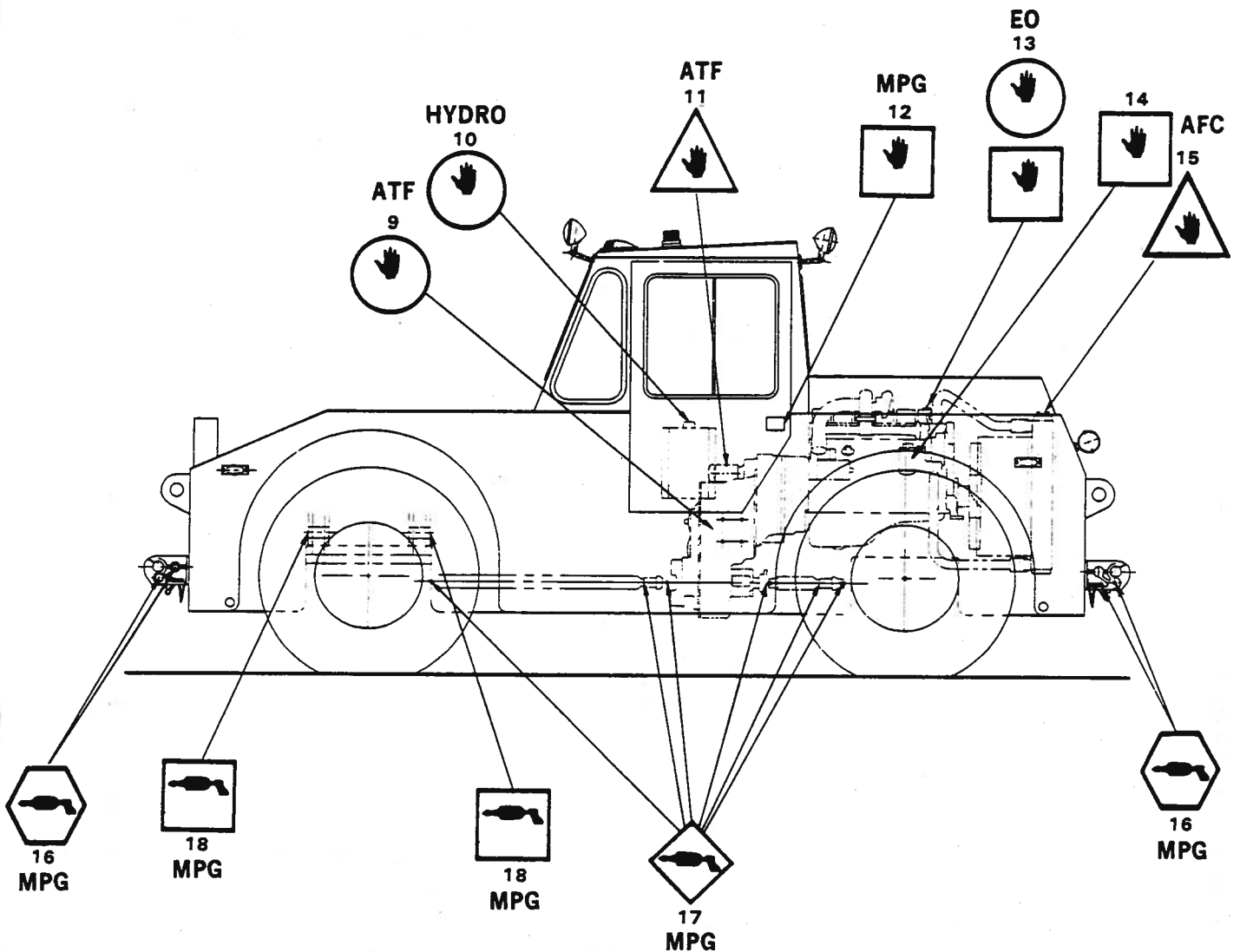
4-35. Figure 4-13 is the lubrication chart for the MB-2 Towing Tractor.



LEGEND FOR FIGURE 3-9.

- 1 STEERING CYLINDERS, MOUNTING PINS (8 PLACES) — NOTE 1. (FRONT AND REAR).
- 2 SILICONE BRAKE FLUID MASTER CYLINDERS (2 PLACES) — NOTE 3.
- 3 KING PIN BEARINGS (8 PLACES) — NOTE 1.
- 4 UNIVERSAL JOINTS (4 PLACES) — NOTE 1.
- 5 TIE ROD ENDS (4 PLACES) — NOTE 1.
- 6 FUEL TANK — NOTE 4.
- 7 AXLE DIFFERENTIALS — NOTE 5.
- 8 AXLE HUB ASSEMBLY (4 PLACES).
- 9 TRANSMISSION /TORQUE CONVERTER DIPSTICK — NOTE 6.
- 10 HYDRAULIC TANK — NOTE 7.
- 11 TRANSMISSION /TORQUE CONVERTER — NOTE 8.
- 12 DOOR LATCH (2 PLACES) — NOTE 9.
- 13 ENGINE — NOTE 10.
- 14 ENGINE OIL FILTER.
- 15 RADIATOR — NOTE 11.
- 16 PINTLE HOOKS, FRONT /REAR (4 PLACES) — NOTE 1.
- 17 DRIVELINE UNIVERSAL JOINTS, FRONT /REAR (6 PLACES) — NOTE 1.
- 18 FIFTH WHEEL PIVOT PIN (2 PLACES) — NOTE 1.

Figure 4-13. Lubrication Chart (Sheet 1 of 3)



LUBRICATION NOTES

1. Clean lubrication fittings with dry cleaning solvent, Federal Specification P-D-680, Type II. Dry before applying lubricant.
2. Intervals specified are for normal operation. The maintenance officer may adjust intervals to compensate for unusual climatic or operational conditions.
3. For towing tractors equipped with silicone brake fluid systems.
4. Add diesel fuel daily to fill tank.
5. Check monthly. If makeup amount is substantially more than 0.5 pint (0.23 L), check for leaks.
6. Check transmission fluid daily.
7. Check hydraulic oil level daily.
8. Replace hydraulic oil filter with each fluid change.
9. Apply grease to linkage pivot points and door latch moving parts.
10. Check engine oil level daily. Replace engine oil filter with oil change.
11. Use 50 /50 mixture of antifreeze and fresh water.

Figure 4-13. Lubrication Chart (Sheet 2 of 3)

LUBRICATION KEY

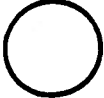




SERVICE INTERVAL	SYMBOLS AND TYPES OF LUBRICANTS	TEMPERATURE RANGE AND LUBRICATION SPECIFICATIONS		
		32°F (0°C) AND ABOVE	0°F (-18°C) TO 32°F (0°C)	0°F (-18°C) TO -65°F (-54°C)
DAILY 	MPG MULTIPURPOSE GREASE	MIL SPEC MIL-G-10924	MIL SPEC MIL-G-10924	MIL SPEC MIL-G-10924
	MPL MULTIPURPOSE TYPE GEAR LUBE	MIL SPEC MIL-L-2105 85 W140	MIL SPEC MIL-L-2105	MIL SPEC MIL-L-2105
WEEKLY 50 HRS 	AFC ANTIFREEZE COOLANT	FED SPEC O-A-548 MIL SPEC MIL-A-46153 MIL-A-11755	FED SPEC SPEC O-A-548 MIL SPEC MIL-A-46153 MIL-A-11755	MIL SPEC MIL-A-46153 MIL-A-11755
MONTHLY 100 HRS 	HYDRO HYDRAULIC OIL	MIL SPEC MIL-L-2104 10W	MIL SPEC MIL-L-2104 10W	MIL SPEC MIL-L-2104 10W
	EO ENGINE OIL	MIL SPEC MIL-L-2104 15 W40	MIL SPEC MIL-L-2104 10W	MIL SPEC MIL-L-46167
QUARTERLY 300 HRS 	SBF SILICONE BRAKE FLUID	MIL SPEC MIL-B-46174	MIL SPEC MIL-B-46176	MIL SPEC MIL-B-46176
	DF DIESEL FUEL	ASTM NO. 2	ASTM NO. 2	ARTIC DIESEL FUEL
ANNUALLY 1200 HRS 	ATF AUTOMATIC TRANSMISSION FLUID	DEXRON TYPE II	DEXRON TYPE II	DEXRON TYPE II

Figure 4-13. Lubrication Chart (Sheet 3 of 3)

SECTION V

REMOVAL AND DISASSEMBLY

5-1. GENERAL.

5-2. This section contains the instructions for removal and disassembly of components and assemblies of the towing tractor. Step by step procedures with exploded views have been provided. Observe all warnings and cautions when performing the maintenance procedures contained herein.

NOTE

Refer to Section VIII for applicable assembly and installation procedures.

5-3. ELECTRICAL SYSTEM.

5-4. The electrical system is divided into sections with each section being serviced by a wiring harness. The electrical system is shown in figure 5-1. Refer to figures 5-2 and 5-3 for components which make up the Fuse and Relay Panel and Harness Assemblies. Refer to figure 5-4 for replaceable connectors, plugs, and fittings

which comprise the Main Carrier Harness Assembly. Refer to figures 5-5 and 5-6 for the Control Panel Instruments and Lights and the Control Panel Harness Assembly. Refer to figure 5-7 for the components in the Engine Harness Installation and Engine Harness Assembly. Refer to figure 5-8 for information on the Cold Weather Harness Assembly for those towing tractors equipped with battery warmers, engine block heaters, and oil heaters. Refer to figure 5-9 for Electrical Schematic.

a. De-energize tractor's electrical system at battery disconnect switch.

b. Tag and disconnect wires or connectors from item being serviced or replaced.

c. Remove tags and install wires or connectors at installation.

d. Energize tractor's electrical system at battery disconnect switch.

LEGEND FOR FIGURE 5-1

1	FUSE /RELAY PANEL	22	HARNESS ASSEMBLY
2	RECEPTACLE	23	SILICONE COVER
3	EYELET	24	SILICONE COVER
4	FEMALE SHELL	25	RING TONGUE
5	WASHER	26	SOCKET
6	BULLET	27	INSERT
7	CONNECTOR	28	CARRIER HARNESS
8	CONNECTOR	29	COLD WEATHER HARNESS
9	CONNECTOR	30	RED LENS CAP
10	FUSE PANEL COVER	31	LAMP
11	WING NUT	32	BREAKER PANEL
12	TAB	33	POP RIVET
13	TUBING CLAMP	34	FLANGED INLET
14	TUBING CLAMP	35	SCREW
15	TUBING CLAMP	36	WELD STUD
16	TUBING CLAMP	37	LOCKWASHER
17	WELD STUD	38	NUT
18	LOCKWASHER	39	TUBING CLAMP
19	NUT	40	CIRCUIT BREAKER
20	CAPSCREW	41	LIGHT BASE
21	EYELET		

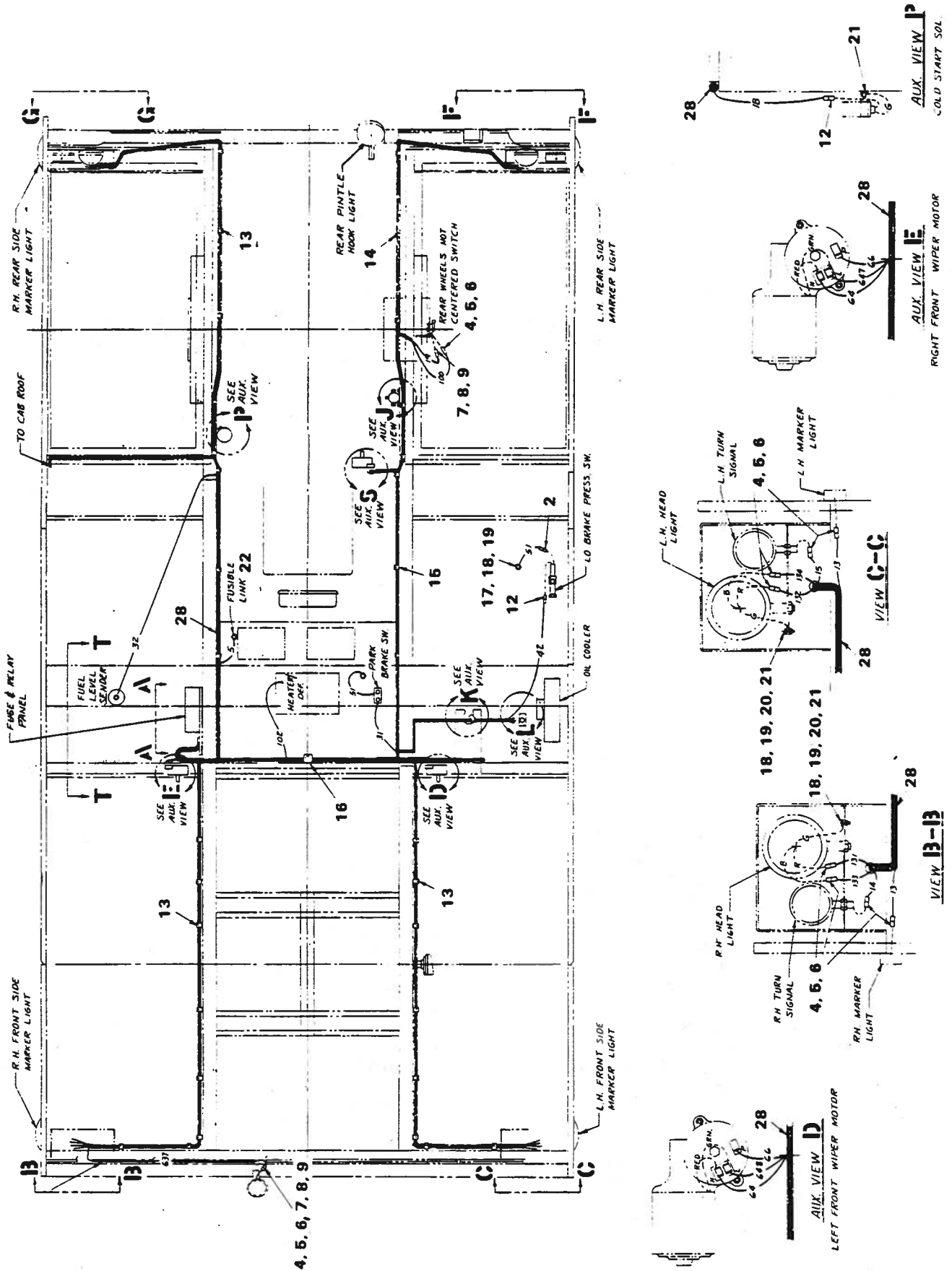
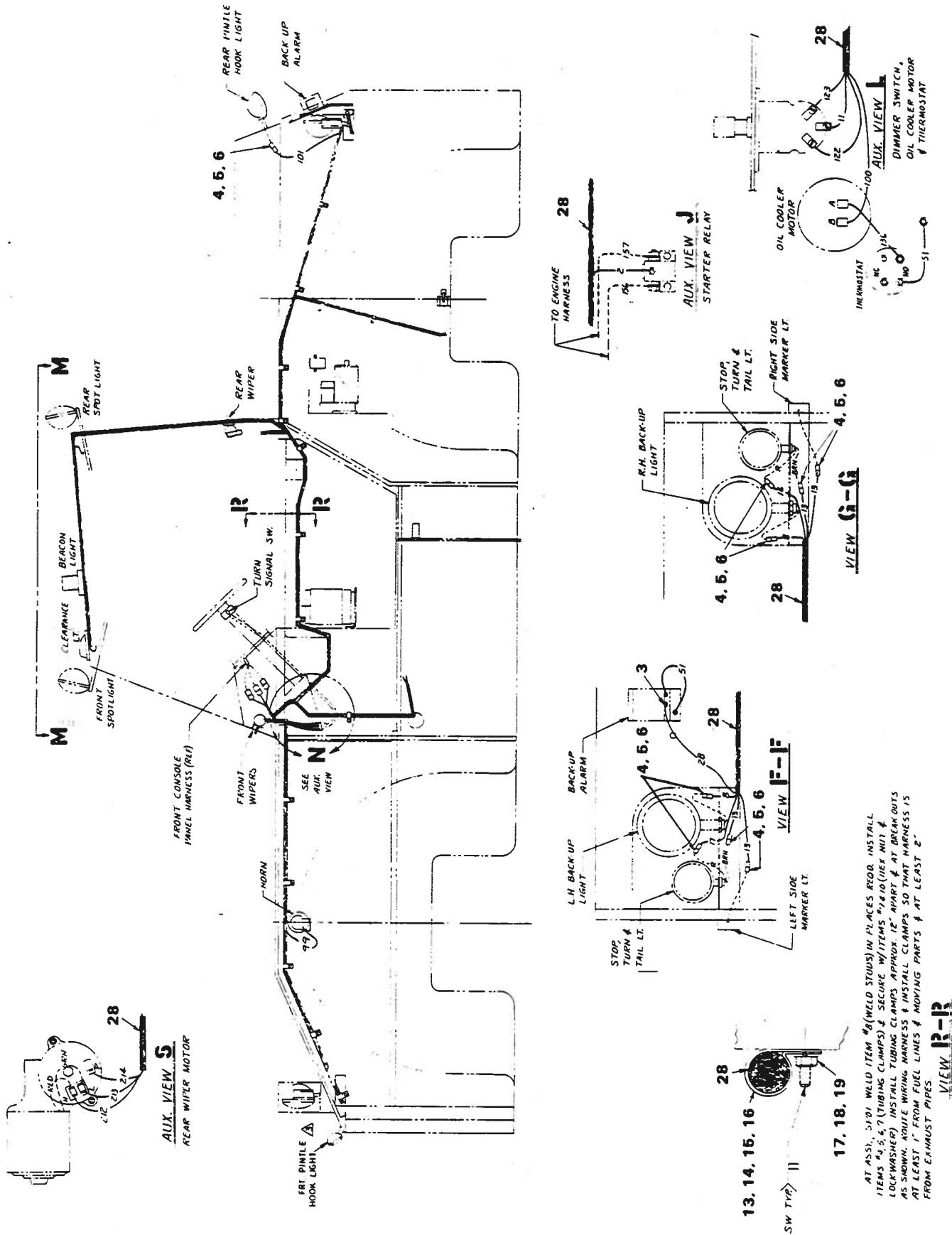
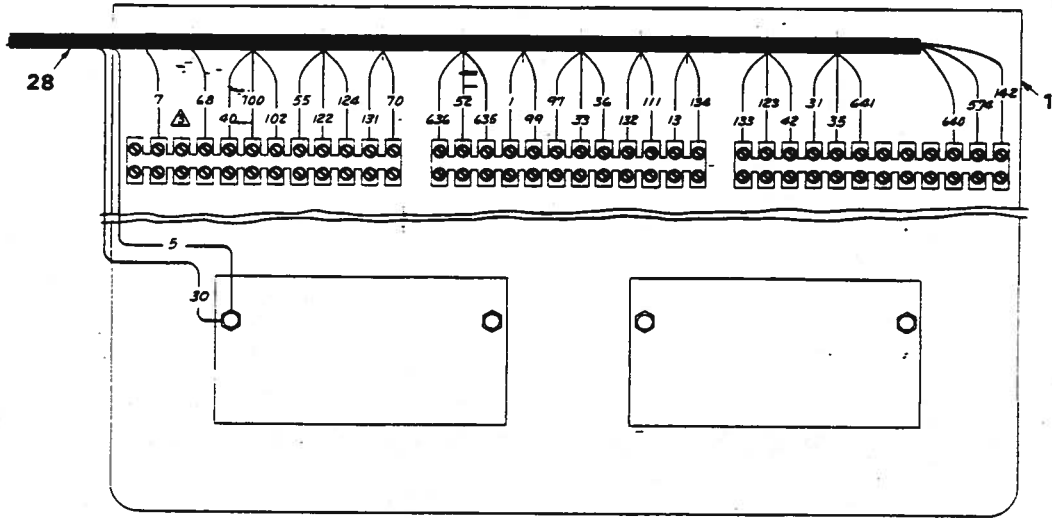


Figure 5-1. Electrical System (Sheet 1 of 4)

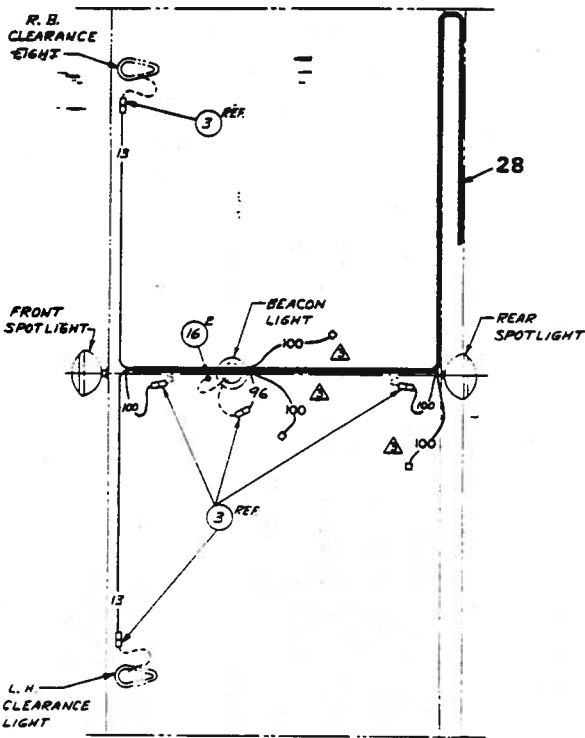


AT ASSY, 3/8" WELD ITEM #8 (WELD STUDS) IN PLACES RECD. INSTALL ITEMS #4, 5, 6, 7 (TUBING CLAMPS) & SECURE W/ITEMS #1, 8, 10 (HEX NUT & LOCKWASHER). INSTALL TUBING CLAMPS APPROX. 12" APART & AT BREAK OUTS AS SHOWN. ROUTE WIRING HARNESS & INSTALL CLAMPS SO THAT HARNESS IS AT LEAST 1" FROM FUEL LINES & MOVING PARTS & AT LEAST 2" FROM EXHAUST PIPES.

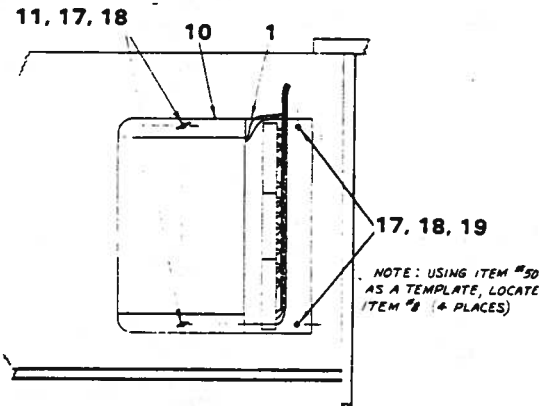
Figure 5-1. Electrical System (Sheet 2 of 4)



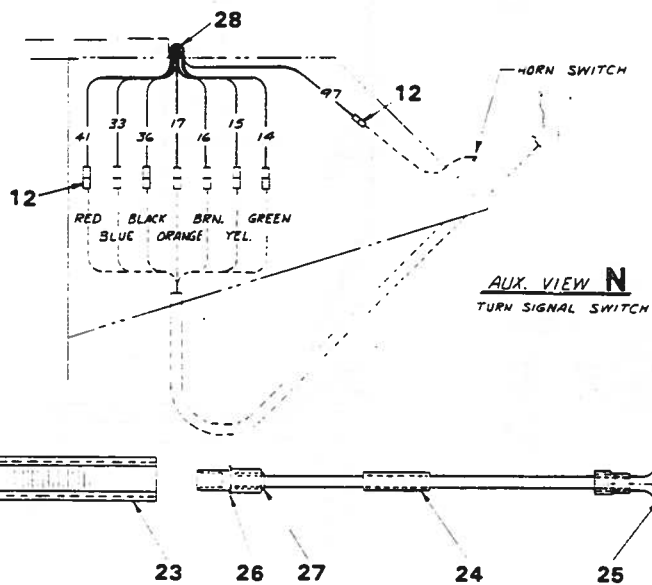
VIEW A-A
FUSE & RELAY PANEL



VIEW M-M
CAB ROOF



VIEW T-T
FUSE & RELAY PANEL MOUNTING



AUX. VIEW N
TURN SIGNAL SWITCH

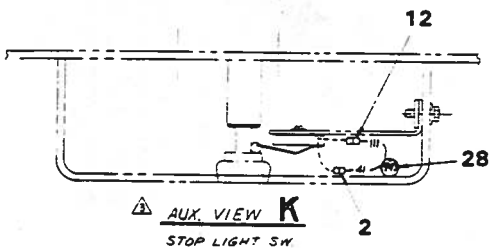


Figure 5-1. Electrical System (Sheet 3 of 4)

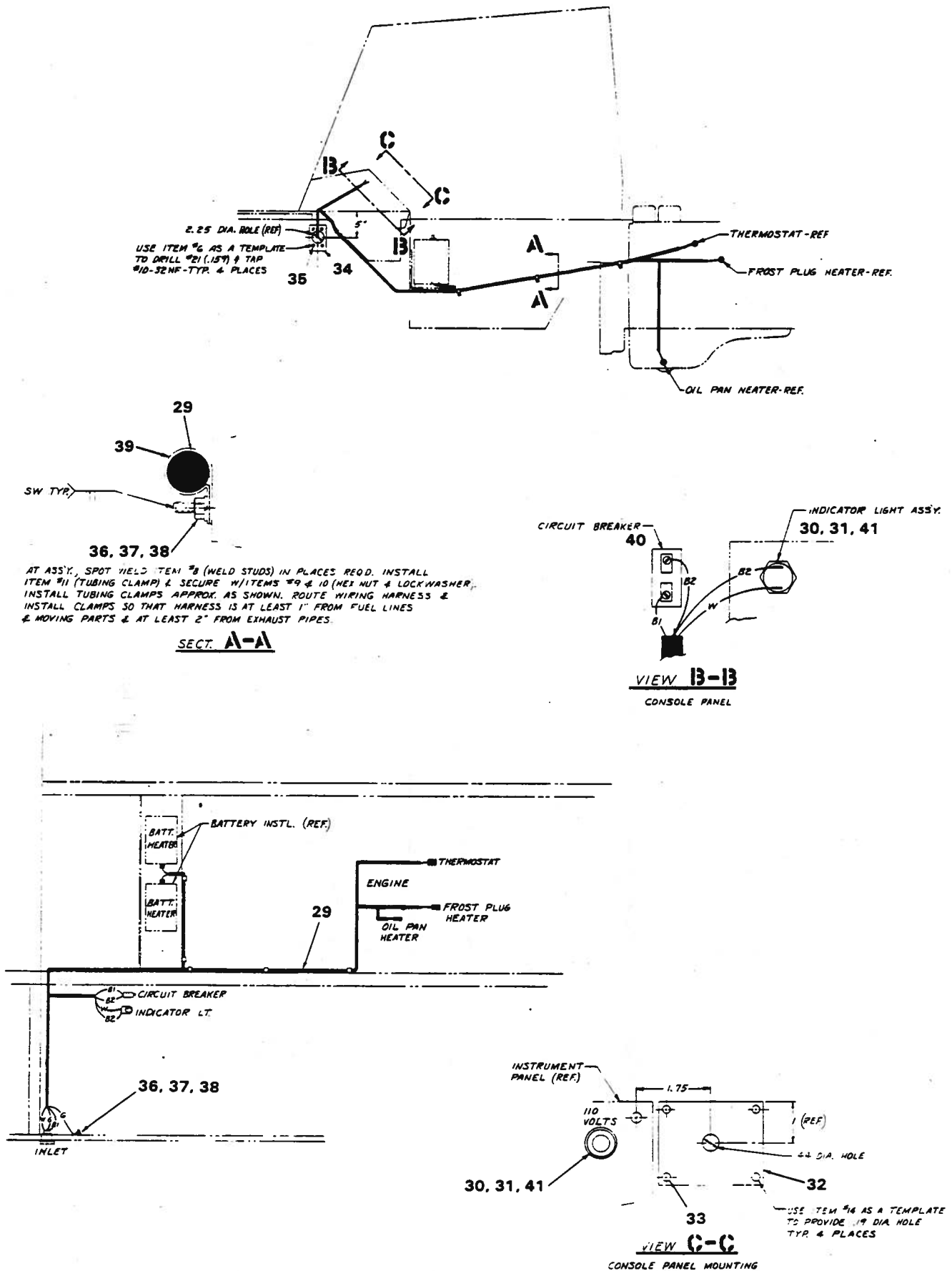


Figure 5-1. Electrical System (Sheet 4 of 4)

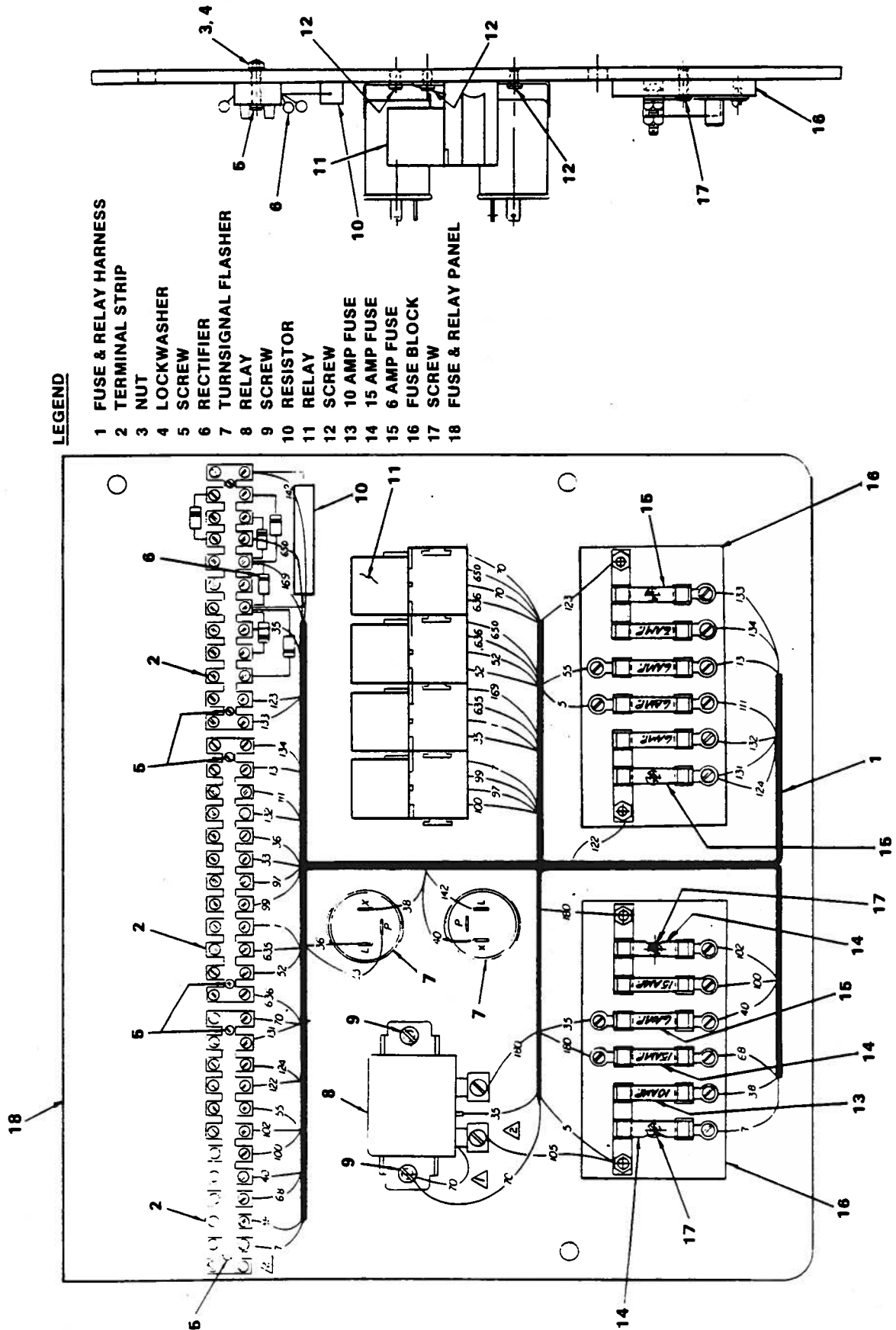


Figure 5-2. Fuse and Relay Panel Assembly

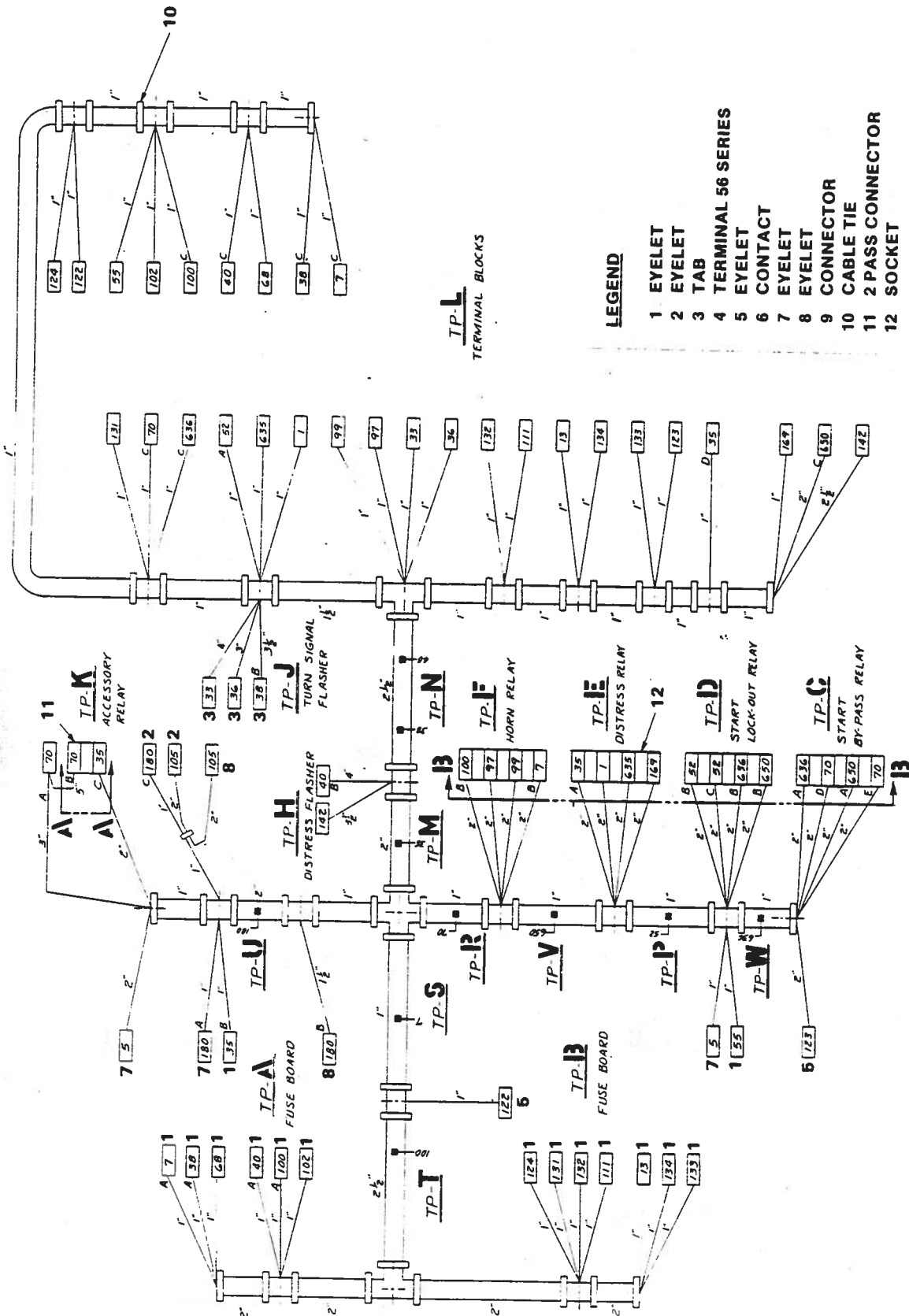


Figure 5-3. Fuse and Relay Harness Assembly (Sheet 1 of 2)

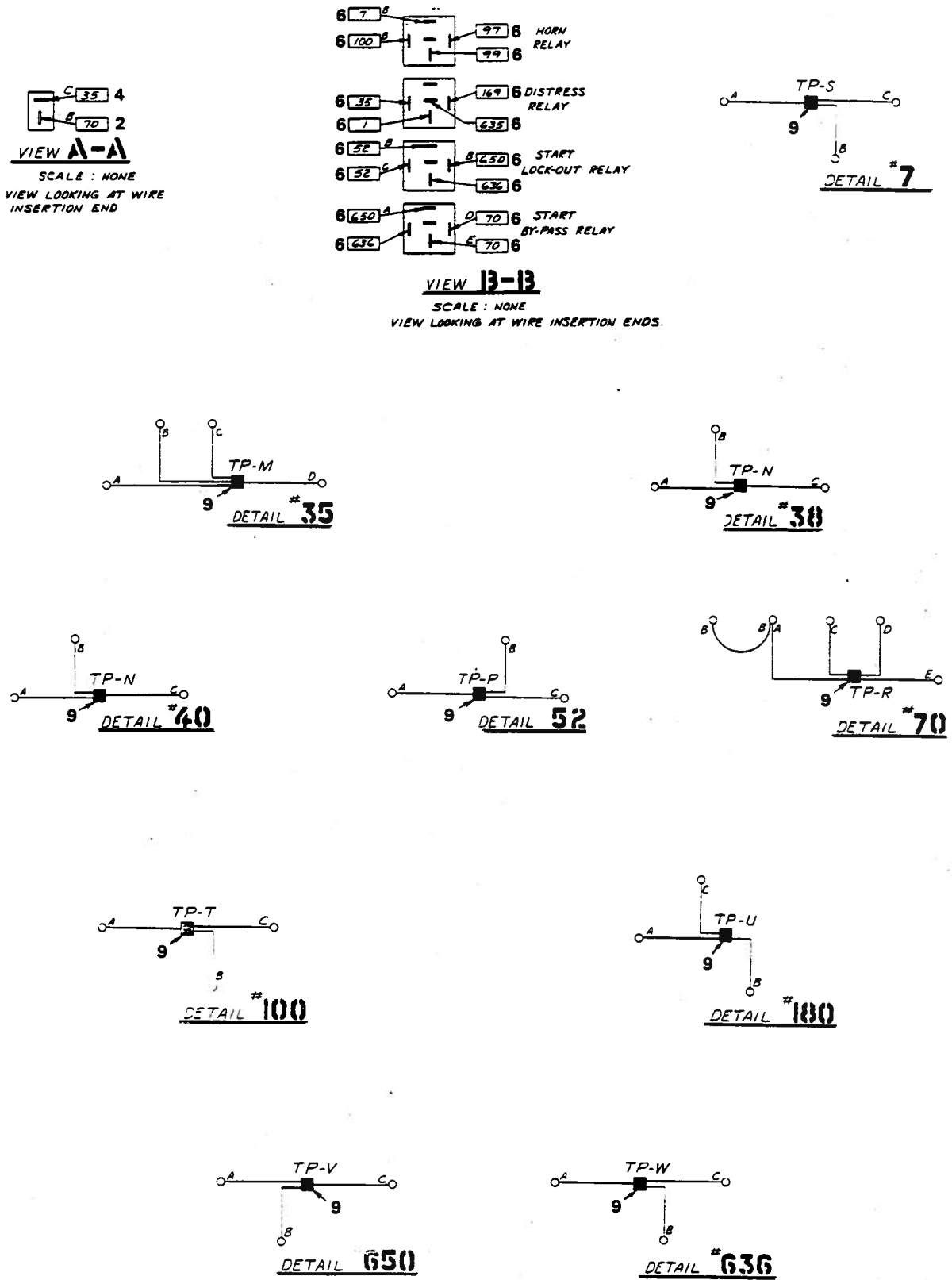


Figure 5-3. Fuse and Relay Harness Assembly (Sheet 2 of 2)

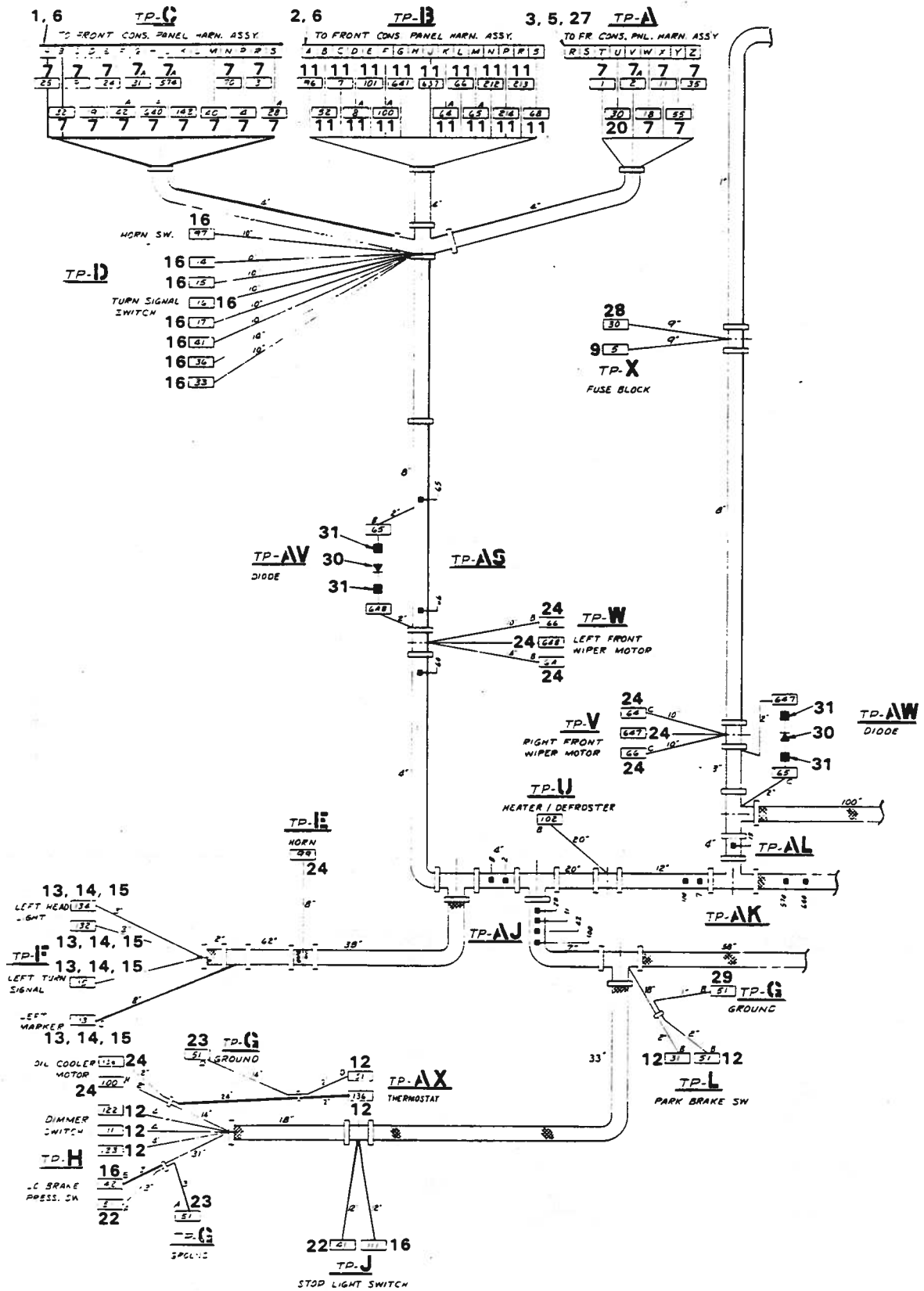


Figure 5-4. Carrier Harness Assembly (Sheet 1 of 4)

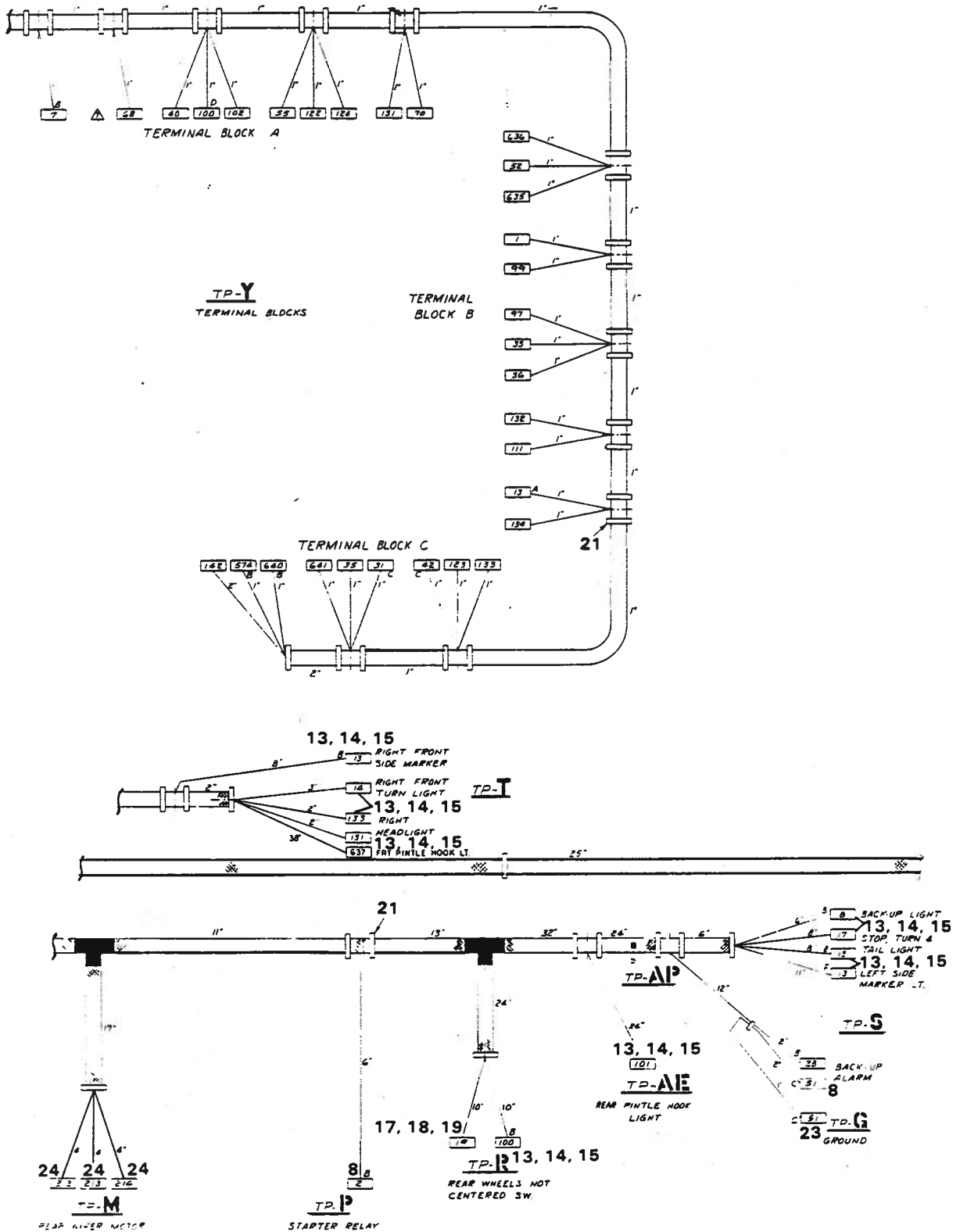


Figure 5-4. Carrier Harness Assembly (Sheet 2 of 4)

LEGEND

- | | |
|----------------|---------------|
| 1 RECEPTACLE | 12 EYELET |
| 2 RECEPTACLE | 13 CONNECTOR |
| 3 RECEPTACLE | 14 CONNECTOR |
| 4 RECEPTACLE | 15 CONNECTOR |
| 5 PLUG | 16 RECEPTACLE |
| 6 PLUG | 17 SHELL |
| 7 SOCKET | 18 WASHER |
| 8 EYELET | 19 BULLET |
| 9 EYELET | 20 SOCKET |
| 10 CONTACT PIN | 21 CABLE TIE |
| 11 CONTACT PIN | 22 TAB |
| | 23 EYELET |
| | 24 TAB |
| | 25 EYELET |
| | 26 CONNECTOR |
| | 27 PLUG |
| | 28 EYELET |
| | 29 EYELET |
| | 30 DIODE |
| | 31 CONNECTOR |

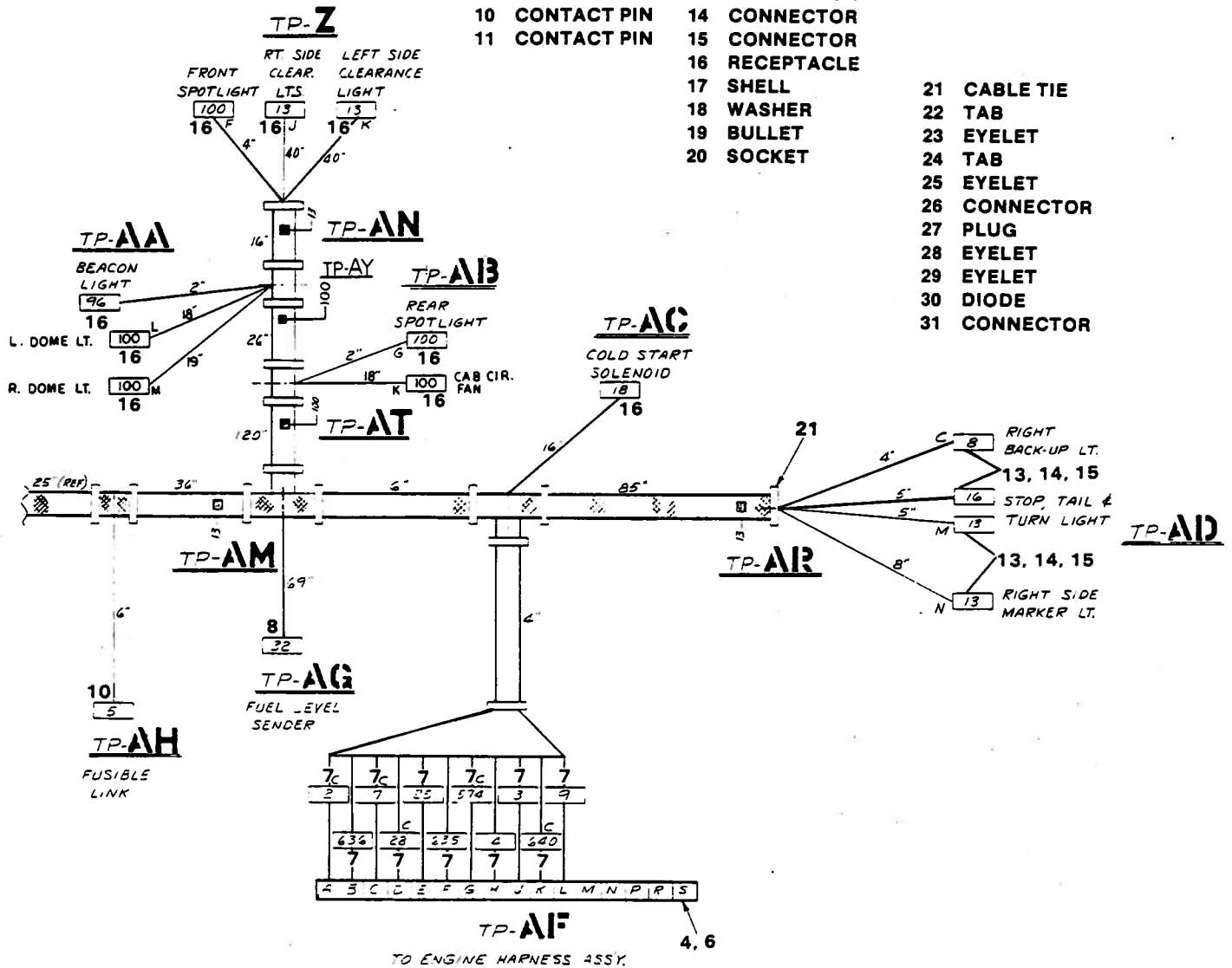
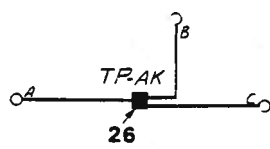


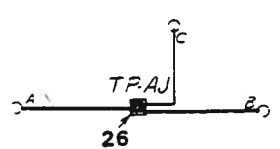
Figure 5-4. Carrier Harness Assembly (Sheet 3 of 4)



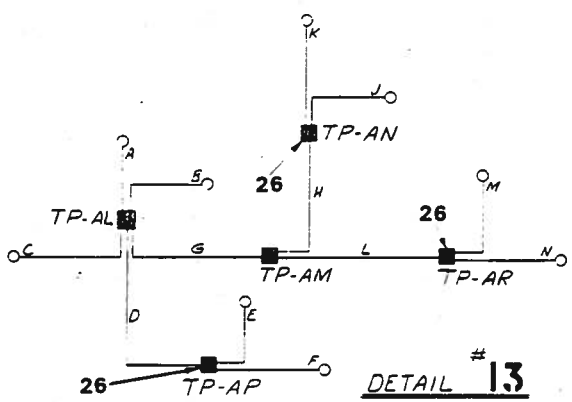
DETAIL #2



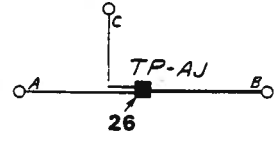
DETAIL #7



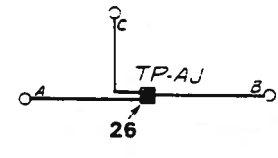
DETAIL #8



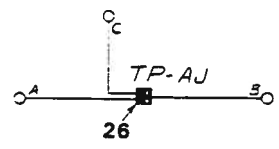
DETAIL #13



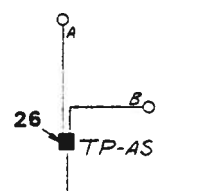
DETAIL #28



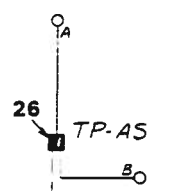
DETAIL #31



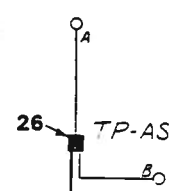
DETAIL #42



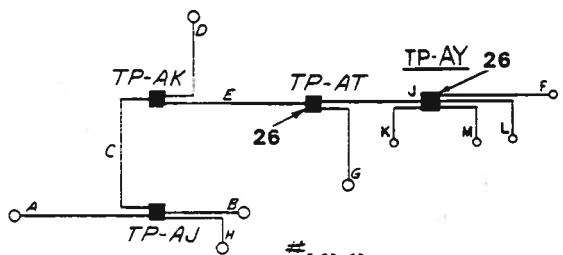
DETAIL #64



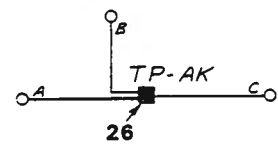
DETAIL #65



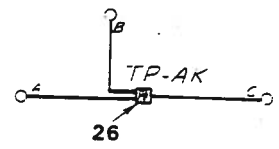
DETAIL #66



DETAIL #100

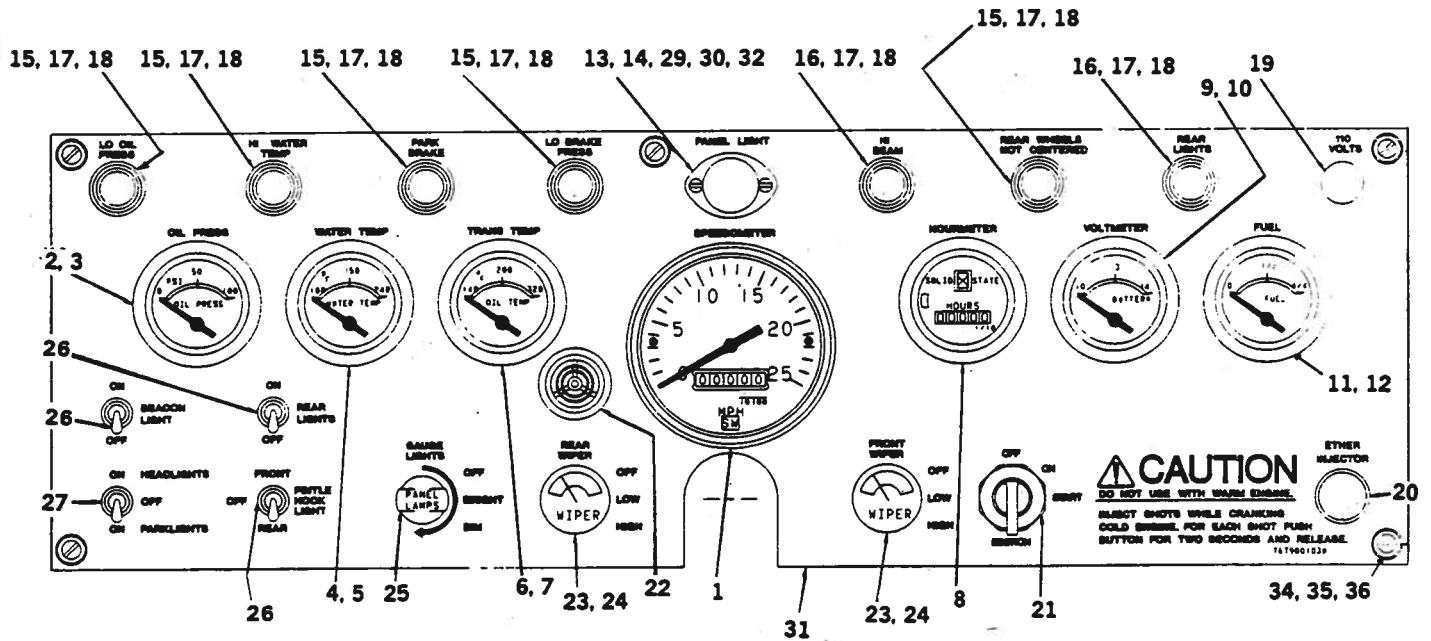


DETAIL #574



DETAIL #640

Figure 5-4. Carrier Harness Assembly (Sheet 4 of 4)



LEGEND

- | | | |
|---------------------------|----------------------|--------------------------|
| 1 SPEEDOMETER | 13 DASH LIGHT | 25 PANEL LIGHT SWITCH |
| 2 OIL PRESSURE GAUGE | 14 BULB | 26 TOGGLE SWITCH |
| 3 BULB | 15 RED LENS CAP | 27 TOGGLE SWITCH |
| 4 WATER TEMPERATURE GAUGE | 16 BLUE LENS CAP | 28 SCREW |
| 5 BULB | 17 INDICATOR BASE | 29 LOCKWASHER |
| 6 OIL TEMPERATURE GAUGE | 18 LAMP | 30 NUT |
| 7 BULB | 19 BUTTON PLUG | 31 CONSOLE PANEL |
| 8 HOURMETER | 20 COLD START SWITCH | 32 FRONT CONSOLE HARNESS |
| 9 VOLTMETER | 21 IGNITION SWITCH | 33 TAB |
| 10 BULB | 22 WARNING BUZZER | 34 SCREW |
| 11 FUEL LEVEL GAUGE | 23 SWITCH ASSEMBLY | 35 WASHER |
| 12 BULB | 24 KNOB | 36 FASTENER |

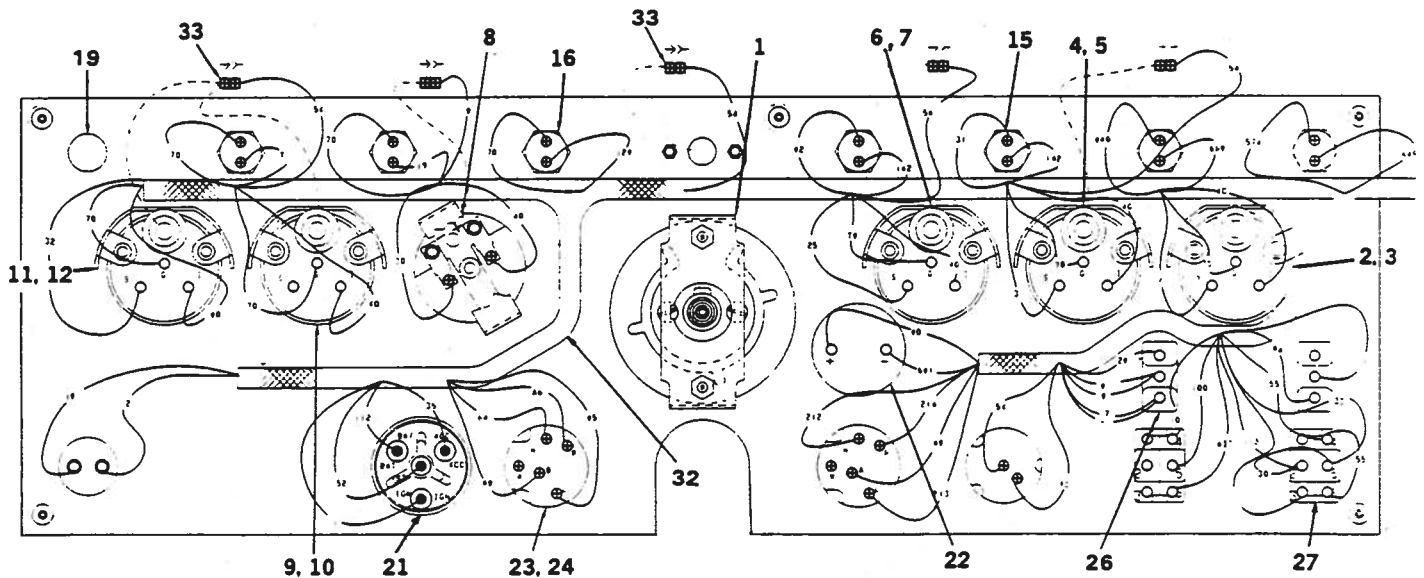
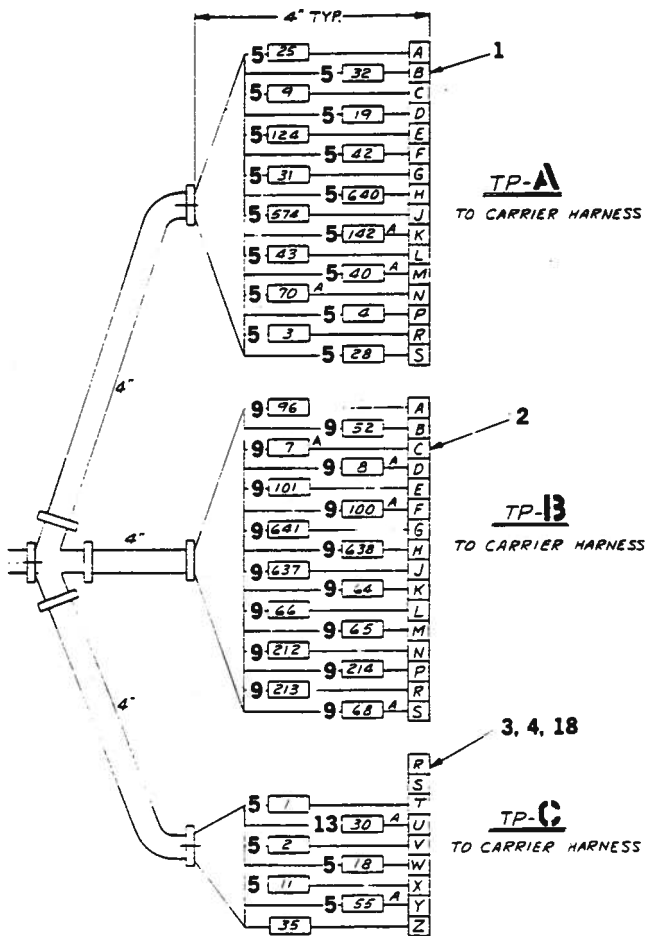


Figure 5-5. Control Panel Instruments and Lights Installation



LEGEND

- | | |
|-----------|---------------|
| 1 PLUG | 11 TAB |
| 2 PLUG | 12 RECEPTACLE |
| 3 PLUG | 13 PIN |
| 4 PLUG | 14 EYELET |
| 5 PIN | 15 SLIP-ON |
| 6 EYELET | 16 CABLE TIE |
| 7 EYELET | 17 CONNECTOR |
| 8 EYELET | 18 PLUG |
| 9 SOCKET | 19 CONNECTOR |
| 10 EYELET | 20 DIODE |

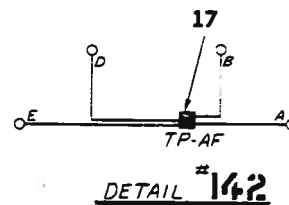
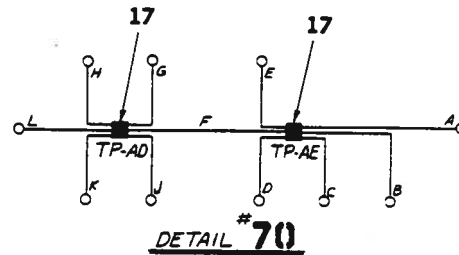
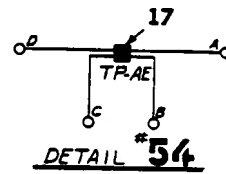
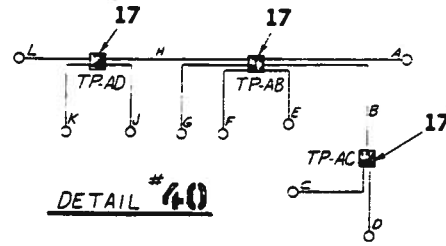


Figure 5-6. Control Panel Harness Assembly (Sheet 2 of 2)

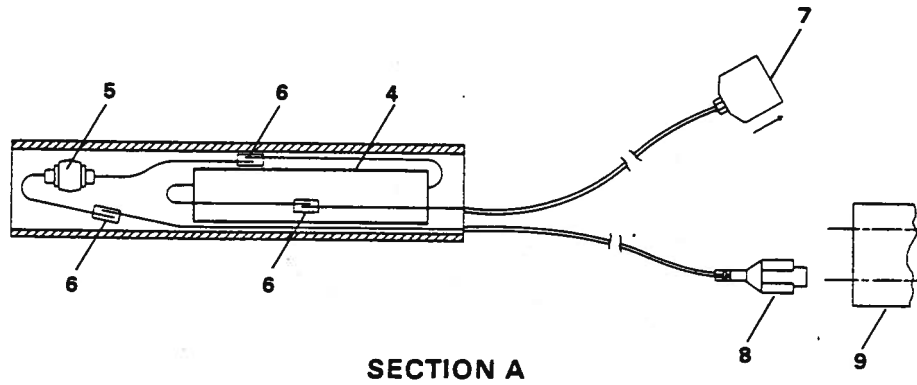
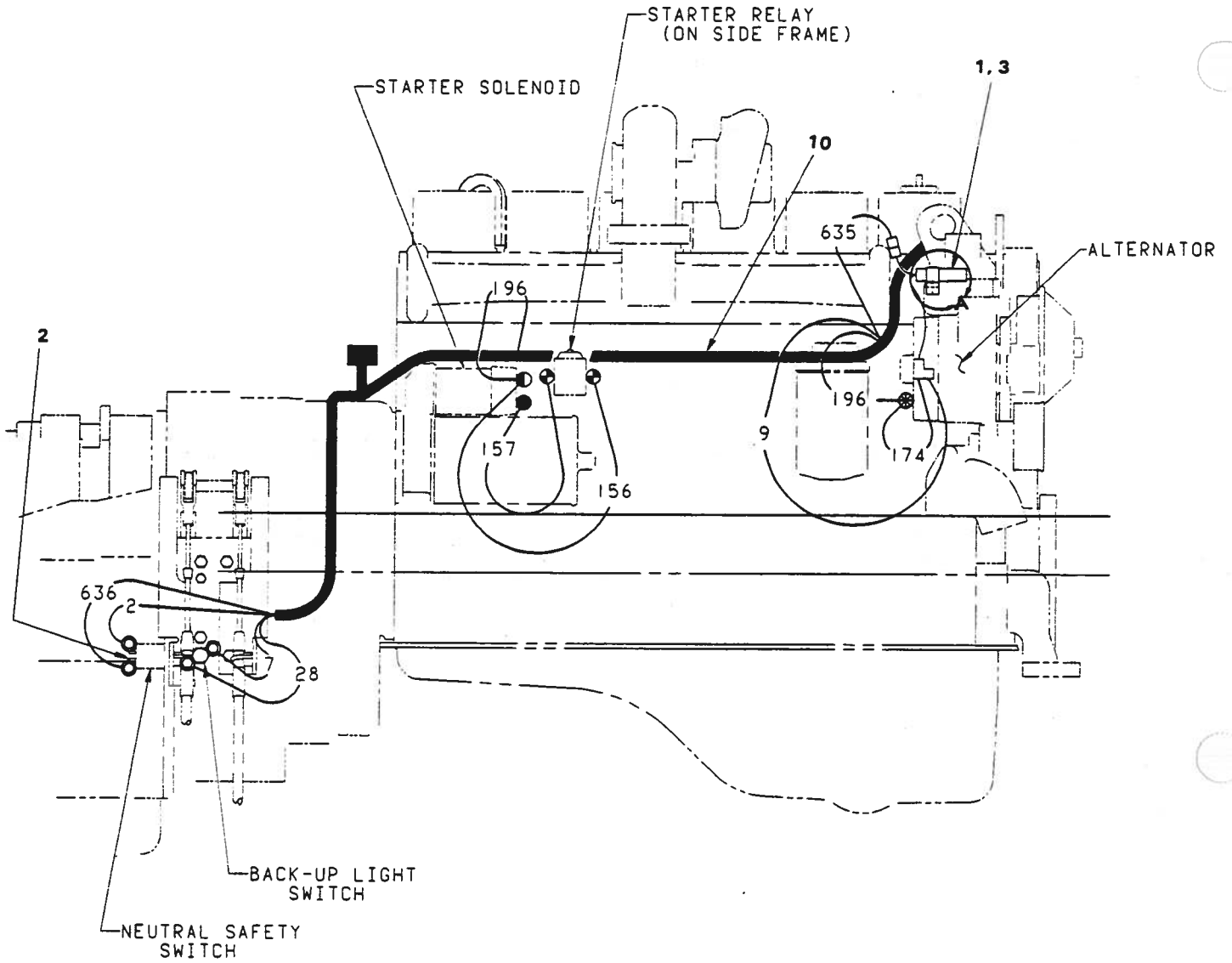


Figure 5-7. Engine Harness Installation (Sheet 1 of 3)

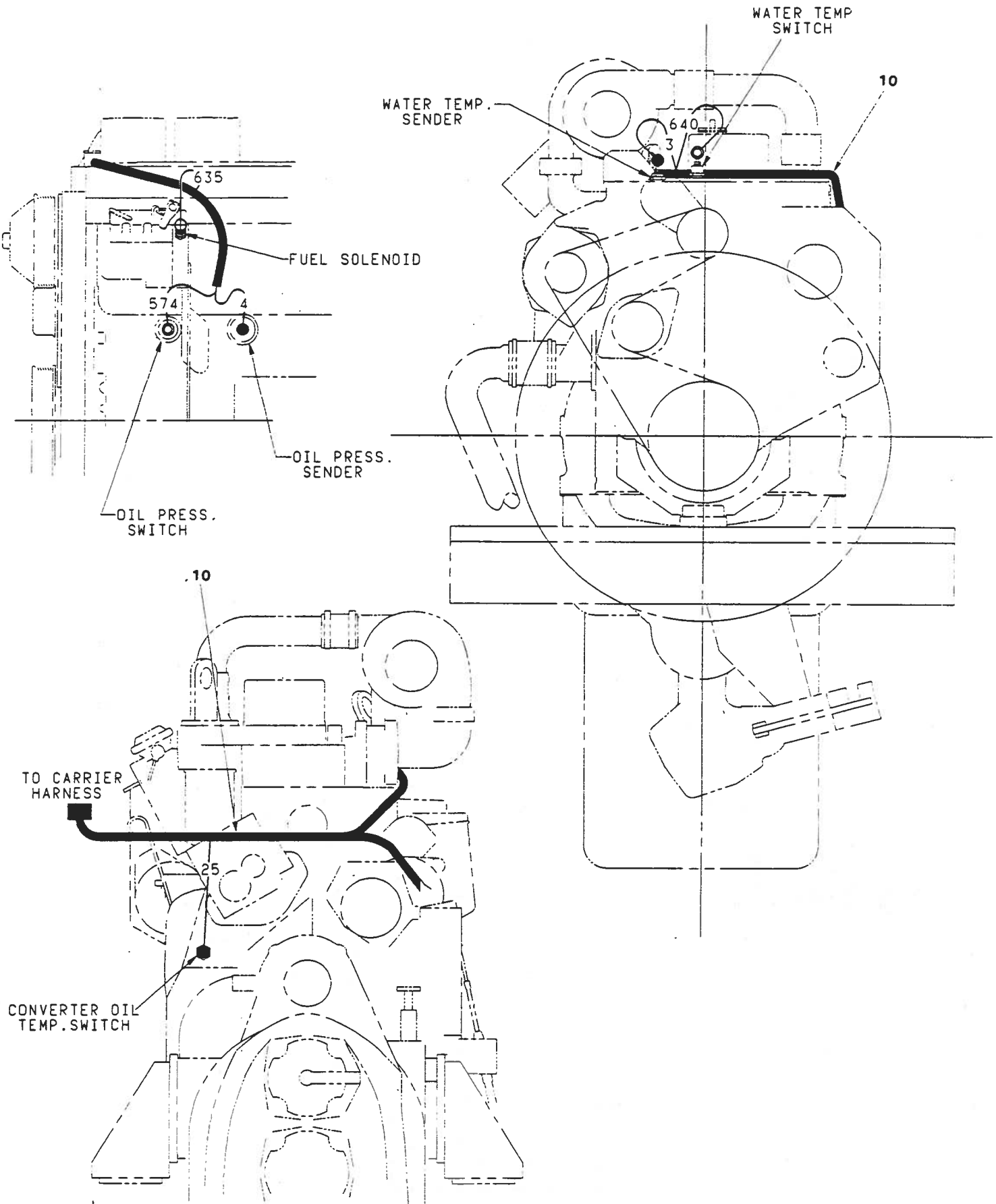


Figure 5-7. Engine Harness Installation (Sheet 2 of 3)

LEGEND

- 1 CLAMP
- 2 SCREW
- 3 RESISTOR
- 4 RESISTOR
- 5 DIODE
- 6 CONNECTOR
- 7 TAB
- 8 TERMINAL
- 9 3-PASS CONNECTOR

- 10 ENGINE HARNESS
- 11 PLUG
- 12 PLUG
- 13 PIN
- 14 EYELET
- 15 EYELET
- 16 TERMINAL
- 17 EYELET

- 18 EYELET
- 19 EYELET
- 20 RECEPTACLE
- 21 CONNECTOR
- 22 CABLE TIE
- 23 EYELET
- 24 EYELET
- 25 EYELET

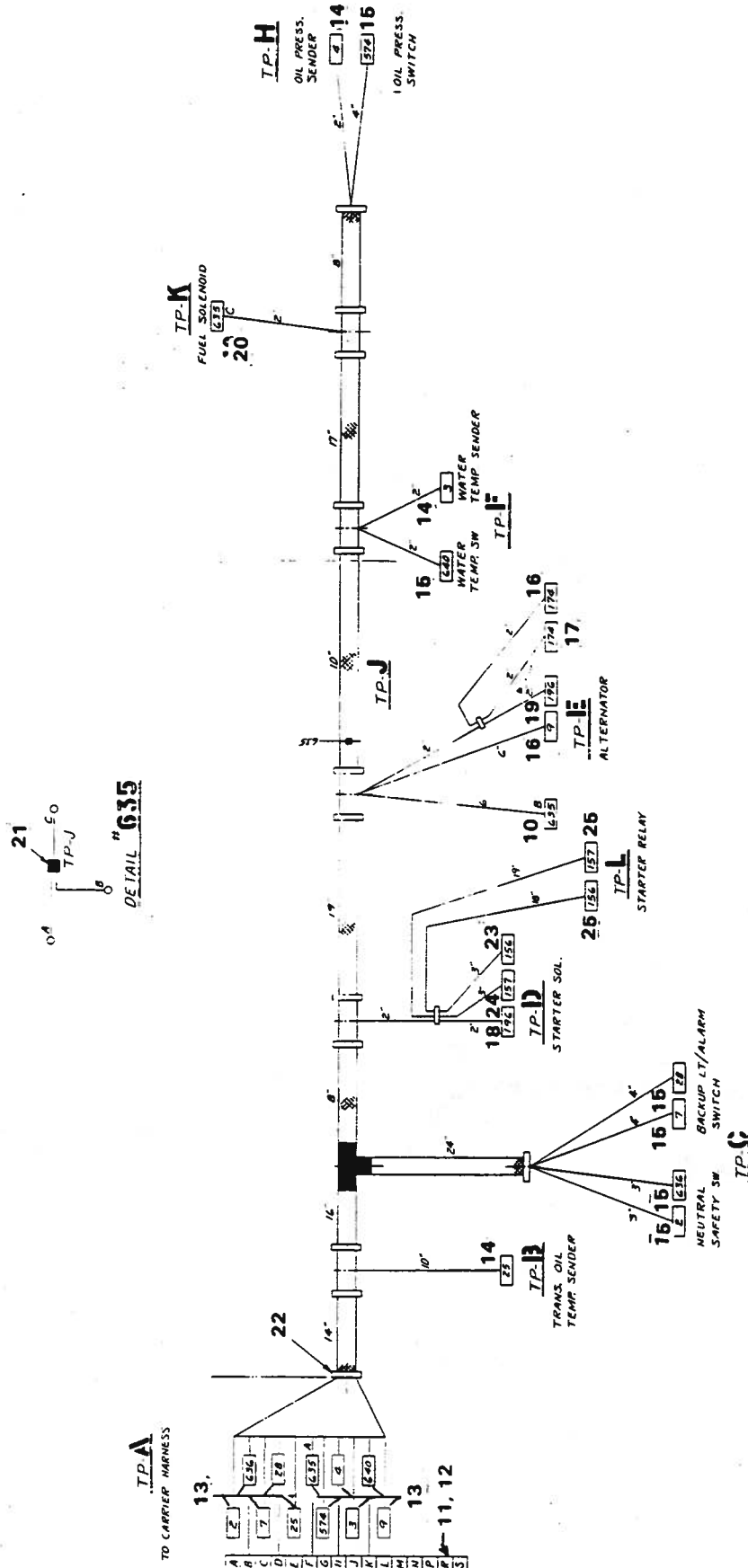


Figure 5-7. Engine Harness Installation (Sheet 3 of 3)

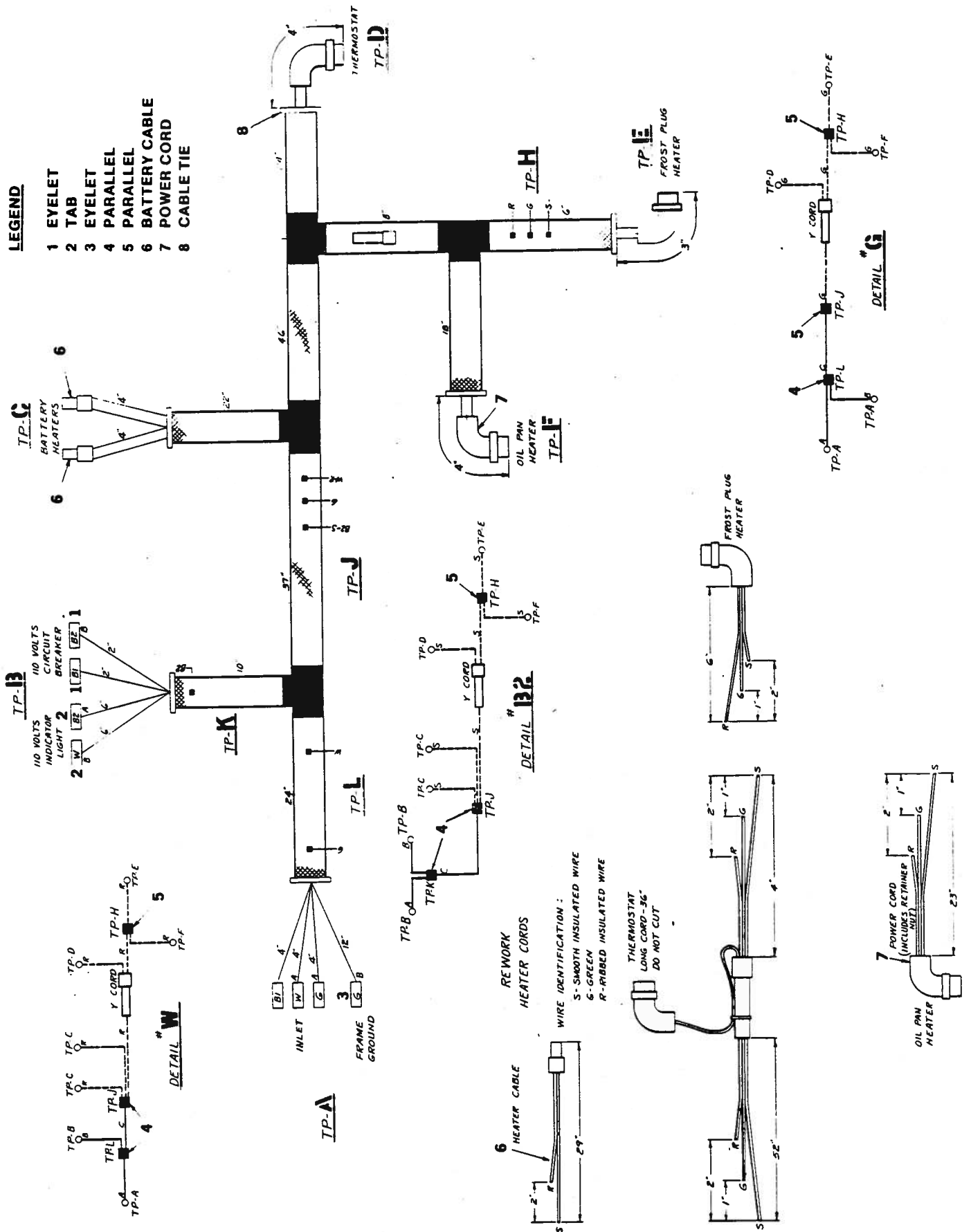


Figure 5-8. Cold Weather Harness Assembly

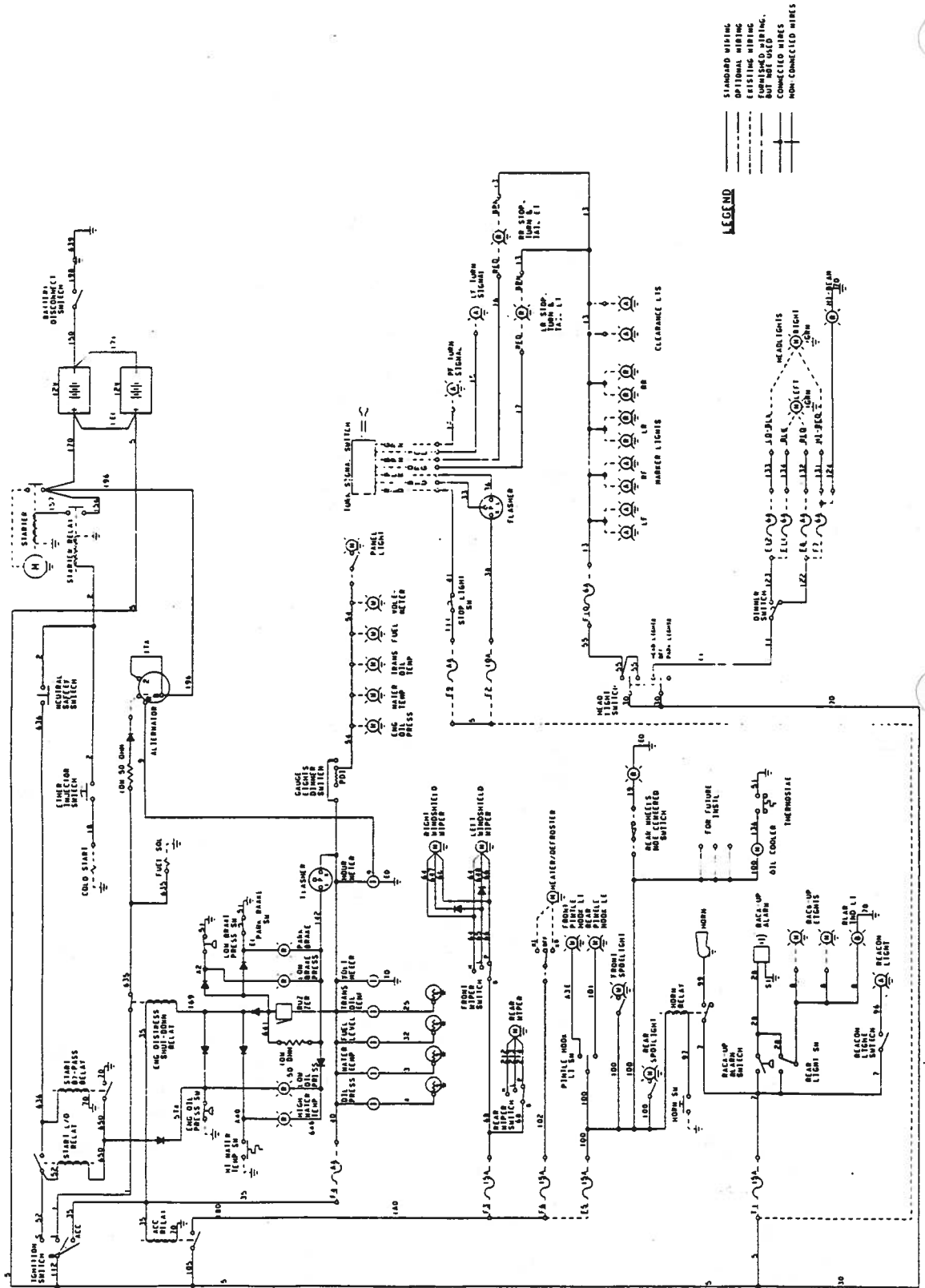


Figure 5-9. Electrical Schematic

5-5. BATTERIES.**5-6. REMOVAL.** (See figure 5-10.)

- a. Turn off power at battery disconnect switch.

WARNING

Batteries generate explosive gases. Keep sparks, flames, or other ignition sources away. Wear eye goggles when working near batteries.

CAUTION

Batteries are sealed except for small vent holes in cover. Cover vents require keeping battery in an upright position. Tipping beyond 45 ° in any direction will allow electrolyte to leak from vent holes. DO NOT exceed 45 ° angle when carrying or removing battery.

- b. Tag and disconnect cables attached to battery disconnect switch and starting motor.
- c. Remove hex nuts (4, figure 5-10). Disconnect battery cable assemblies (5) from batteries (10).
- d. Remove hex nuts (1), lockwashers (2), and flat washers (3) from tie down rods (8) and support angle (9).
- e. Remove tie down rods (8) and support angle (9).

CAUTION

Battery weight is 59 pounds. Use care when lifting. Do not tilt.

- f. Remove batteries (10) and battery warmers (11) (when provided) from tray.

5-7. EXTERIOR LIGHTS AND HORN INSTALLATION.**5-8. REMOVAL.** (See figure 5-11.)

- a. Refer to figure 5-11 for location of the tractor's exterior lights, horn, and backup alarm. Refer to paragraph 5-9 thru 5-34 for removal and

disassembly of the assemblies shown on figure 5-11.

5-9. FRONT DRIVING LIGHT.**5-10. REMOVAL.** (See figure 5-12.)

- a. Remove nuts (2, figure 5-12), lockwashers (3) and carriage bolts (4 and 5).
- b. Remove shell from bracket (1).
- c. Tag and disconnect electrical leads.
- d. Remove front driving light.

5-11. DISASSEMBLY. (See figure 5-12.)

- a. Remove capscrew (6, figure 5-12) securing ring to shell.
- b. Remove sealed beam lamp (8).

5-12. SPOTLIGHT.**5-13. REMOVAL.** (See figure 5-13.)**CAUTION**

When disassembling head assembly (1, figure 5-13) be certain sealed beam lamp (5) is secured in shell (8).

- a. Remove screw (2) securing ring (3) to shell (8). Remove ring (3).

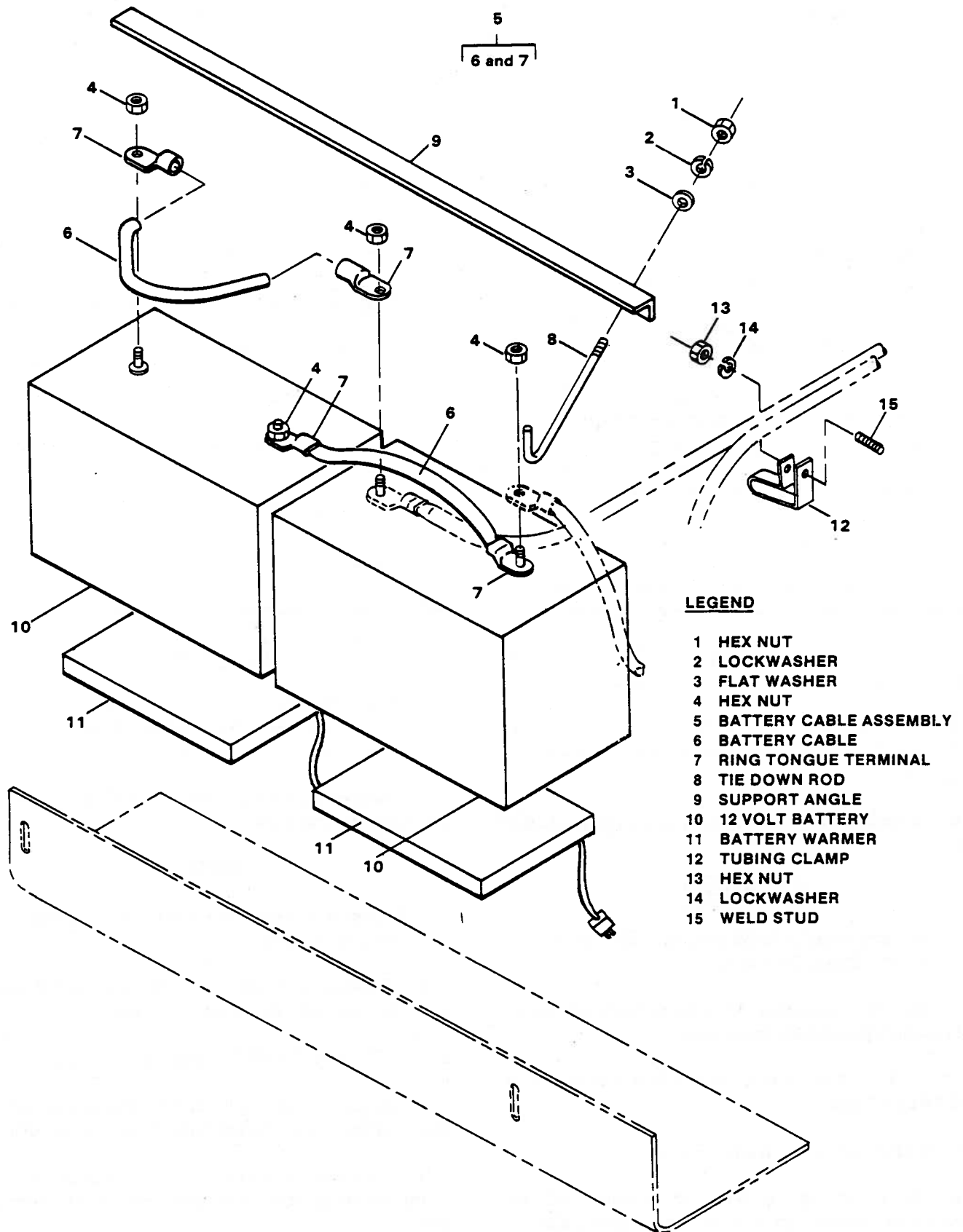
NOTE

Loosen screws securing electrical wiring to lamp.

- b. Release springs (4) retaining sealed beam lamp (5) in shell. Remove lamp (5).

5-14. DISASSEMBLY. (See figure 5-13.)

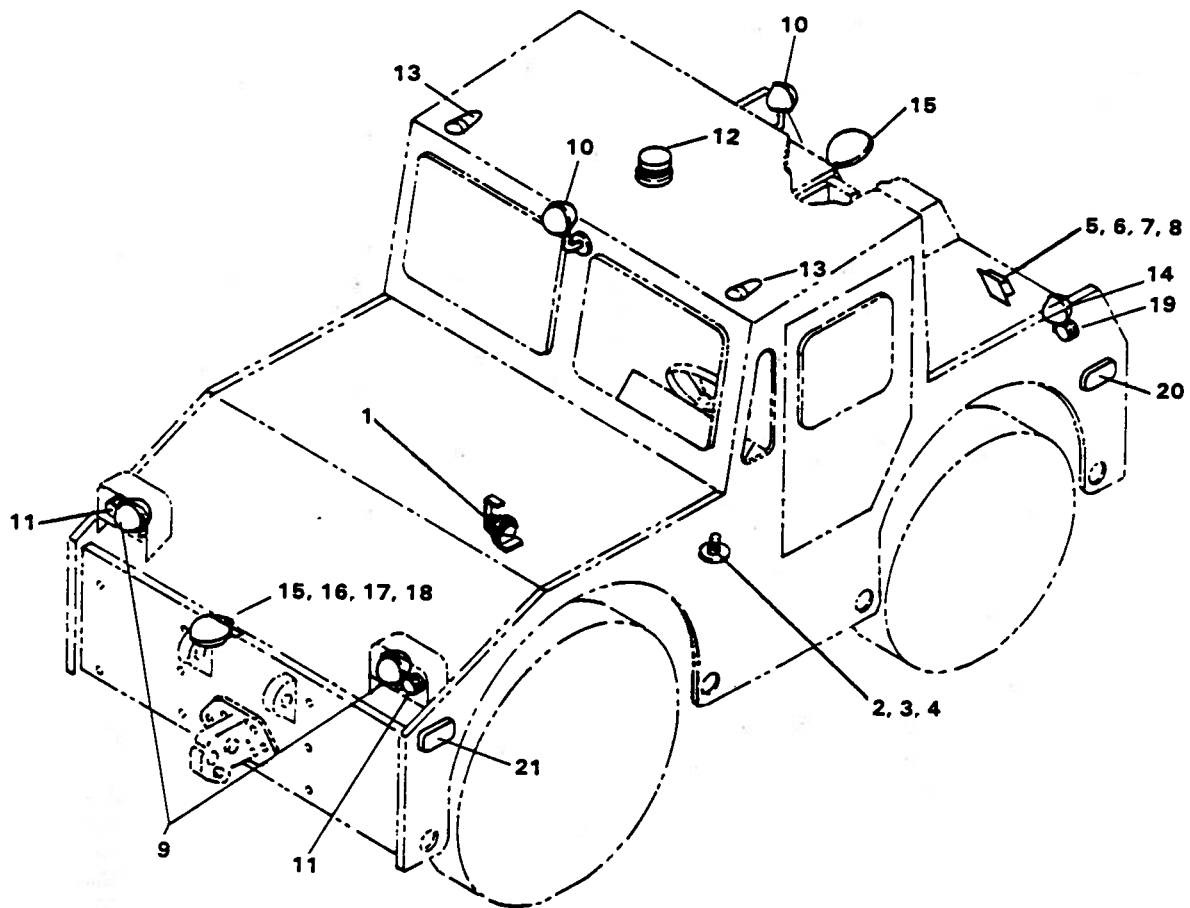
- a. Remove nuts (6, figure 5-13) and washer (7). Remove bushing (9), spring (11), and washer (10).
- b. Remove setscrew (17) and wedge pin (34) from housing and tube assembly (13). Remove gear (12).



LEGEND

- 1 HEX NUT
- 2 LOCKWASHER
- 3 FLAT WASHER
- 4 HEX NUT
- 5 BATTERY CABLE ASSEMBLY
- 6 BATTERY CABLE
- 7 RING TONGUE TERMINAL
- 8 TIE DOWN ROD
- 9 SUPPORT ANGLE
- 10 12 VOLT BATTERY
- 11 BATTERY WARMER
- 12 TUBING CLAMP
- 13 HEX NUT
- 14 LOCKWASHER
- 15 WELD STUD

Figure 5-10. Battery Installation



LEGEND

- 1 HI-TONE HORN
- 2 DIMMER SWITCH
- 3 LOCKWASHER
- 4 CAPSCREW
- 5 BACK-UP ALARM
- 6 NUT
- 7 LOCKWASHER
- 8 WELD STUD
- 9 FRONT DRIVING LIGHT
- 10 SPOTLIGHT
- 11 FRONT TURNSIGNAL
- 12 BEACON LIGHT
- 13 CAB MARKER LIGHT
- 14 REAR DRIVING LIGHT
- 15 PINTLE LIGHT
- 16 NUT
- 17 LOCKWASHER
- 18 WELD STUD
- 19 REAR TURNSIGNAL
- 20 RED CLEARANCE LIGHT
- 21 AMBER CLEARANCE LIGHT

Figure 5-11. Exterior Lights Installation

LEGEND

- 1 BRACKET
- 2 NUT
- 3 LOCKWASHER
- 4 CARRIAGE BOLT
- 5 CARRIAGE BOLT
- 6 CAPSCREW
- 7 NUT
- 8 SEALED BEAM LAMP

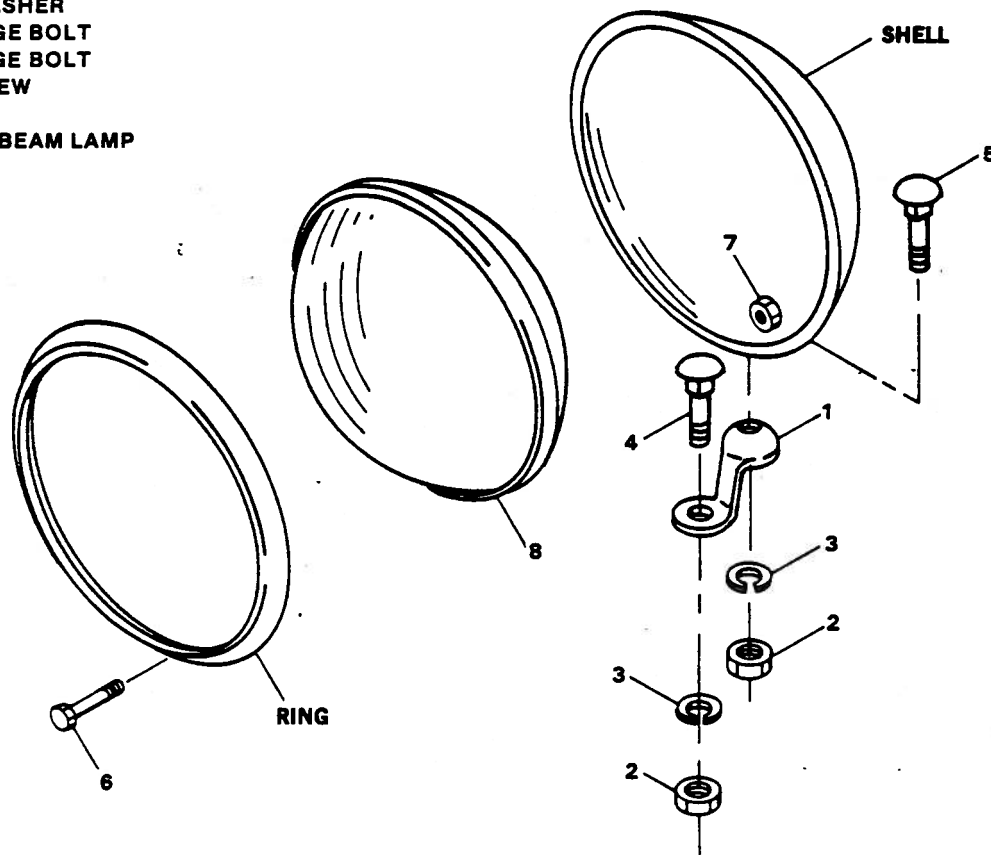


Figure 5-12. Front Driving Light Assembly

c. Remove screw (18) from housing and tube assembly (13). Slide cap (14) from housing and tube (21).

d. Turn inner tube assembly (15) and disengage threaded end from gear (32). Pull from housing and tube (21).

e. Remove screw (16). Slide outside tube (19) from housing and tube (21).

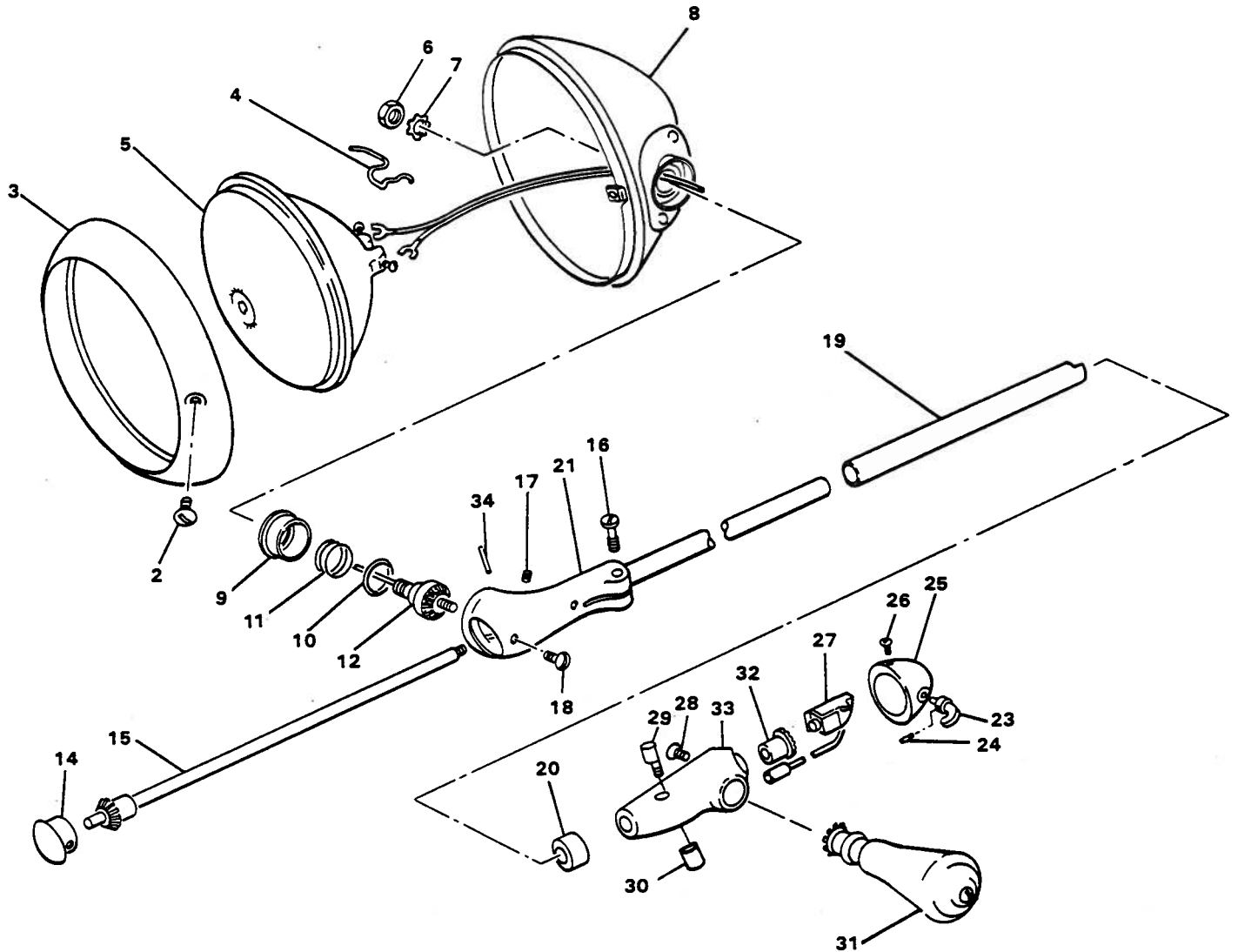
f. Remove bolt (29) and wedge (30). Slip

outside tube (19) and bushing (20) from handle housing (33).

g. Remove pin (24) and flipper (23). Remove screw (26) and cap (25).

h. Remove screw (28) and pull switch assembly (27) from handle housing (33).

i. Remove handle (31) and gear (32) from handle housing (33).



1
2 thru 12

13
14 thru 21

22
23 thru 33

LEGEND

- | | | |
|--------------------|------------------------------|--------------------|
| 1 HEAD ASSEMBLY | 13 HOUSING AND TUBE ASSEMBLY | 24 PIN |
| 2 SCREW | 14 CAP | 25 CAP |
| 3 RING | 15 INNER TUBE ASSEMBLY | 26 SCREW |
| 4 SPRING | 16 SCREW | 27 SWITCH ASSEMBLY |
| 5 SEALED BEAM LAMP | 17 SETSCREW | 28 SCREW |
| 6 NUT | 18 SCREW | 29 BOLT |
| 7 WASHER | 19 OUTSIDE TUBE | 30 WEDGE |
| 8 SHELL | 20 BUSHING | 31 HANDLE |
| 9 BUSHING | 21 HOUSING AND TUBE | 32 GEAR |
| 10 WASHER | 22 HANDLE WITH SWITCH | 33 HANDLE HOUSING |
| 11 SPRING | 23 FLIPPER | 34 WEDGE PIN |
| 12 GEAR | | |

Figure 5-13. Spotlight Assembly

5-15. REAR DRIVING LIGHT.

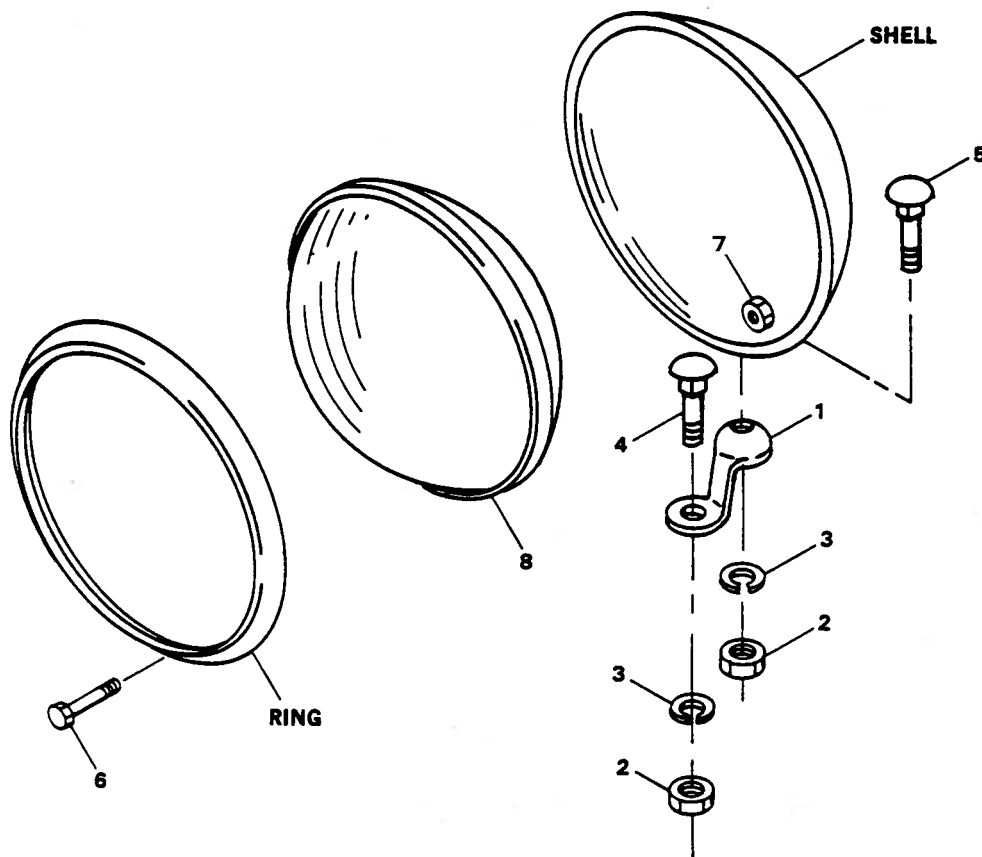
5-16. REMOVAL. (See figure 5-14.)

- a. Remove nuts (2, figure 5-14), lockwashers (3) and carriage bolts (4 and 5).
- b. Remove shell from bracket (1).
- c. Tag and disconnect electrical leads.

- d. Remove rear driving light.

5-17. DISASSEMBLY. (See figure 5-14.)

- a. Remove capscrew (6, figure 5-14) securing ring to shell.
- b. Remove sealed beam lamp (8).



LEGEND

- 1 BRACKET
- 2 NUT
- 3 LOCKWASHER
- 4 CARRIAGE BOLT
- 5 CARRIAGE BOLT
- 6 CAPSCREW
- 7 NUT
- 8 SEALED BEAM LAMP

Figure 5-14. Rear Driving Light Assembly

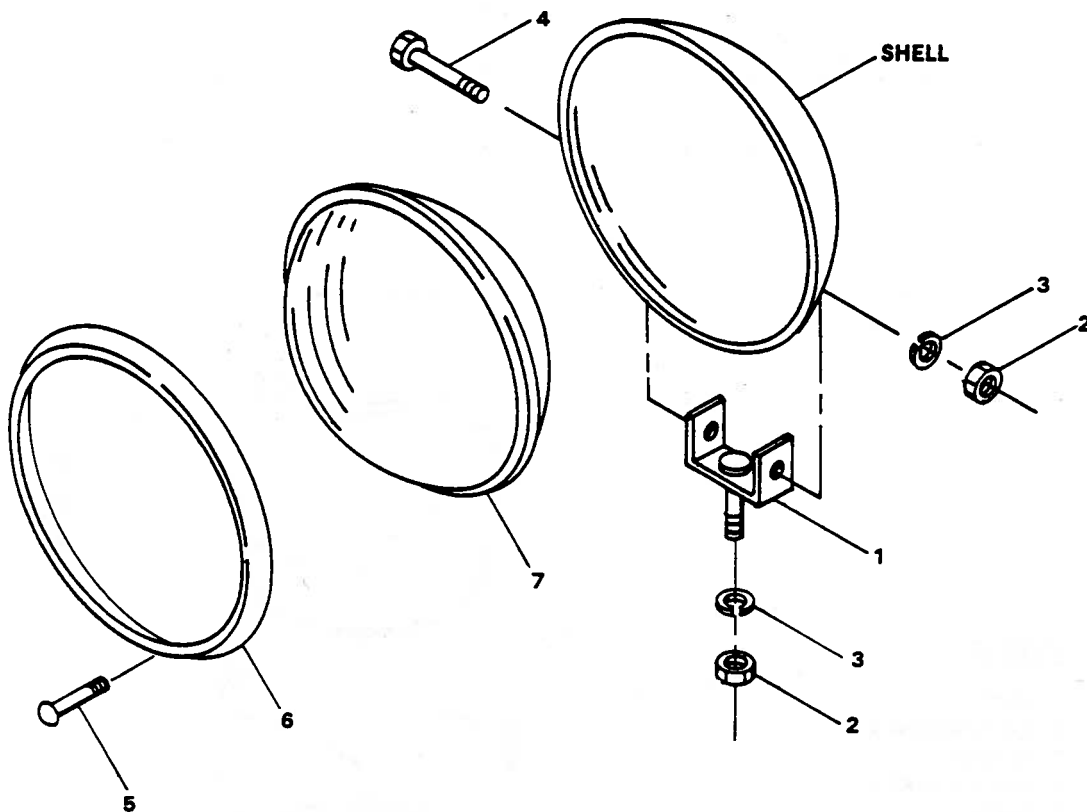
5-18. PINTLE LIGHT (FRONT OR REAR).**5-19. REMOVAL.** (See figure 5-15.)

- a. Remove nuts (2, figure 5-15), lockwashers (3) and carriage bolt (4).
- b. Remove shell from bracket (1).
- c. Tag and disconnect electrical leads.

- d. Remove pintle light.

5-20. DISASSEMBLY. (See figure 5-15.)

- a. Remove capscrew (5, figure 5-15) securing ring (6) to shell.
- b. Remove sealed beam lamp (7).

**LEGEND**

- 1 BRACKET
- 2 NUT
- 3 LOCKWASHER
- 4 CARRIAGE BOLT
- 5 CAPSCREW
- 6 RING
- 7 SEALED BEAM LAMP

Figure 5-15. Pintle Light Assembly (Front and Rear)

5-21. BEACON LIGHT.

5-22. REMOVAL. (See figure 5-16.)

- a. Remove nuts (1, figure 5-16), lockwashers (2) and screws (3).
- b. Tag and disconnect electrical leads.
- c. Remove beacon light.

5-23. DISASSEMBLY. (See figure 5-16.)

- a. Remove base gasket (4, figure 5-16) from base (8).
- b. Remove lens (5) from beacon light.
- c. Remove lens gasket (6) from lens (5).
- d. Remove bulb (7) from power supply (9).

5-24. FRONT OR REAR TURNSIGNAL.

5-25. REMOVAL. (See figure 5-17 or 5-18.)

- a. Tag and disconnect electrical leads.
- b. Remove nut (1, figure 5-17 or 5-18), lockwasher (2), washer (3) and gasket (4).
- c. Remove front or rear turnsignal.

5-26. DISASSEMBLY. (See figure 5-17 or 5-18.)

- a. Remove lens retainer(s) (5, figure 5-17 or 5-18).
- b. Remove lens(es) (6) as applicable.
- c. Remove lens gasket(s) (7).
- d. Remove bulb (8) from pigtail (9).

LEGEND

- 1 NUT
- 2 LOCKWASHER
- 3 SCREW
- 4 BASE GASKET
- 5 LENS
- 6 LENS GASKET
- 7 BULB
- 8 BASE
- 9 POWER SUPPLY

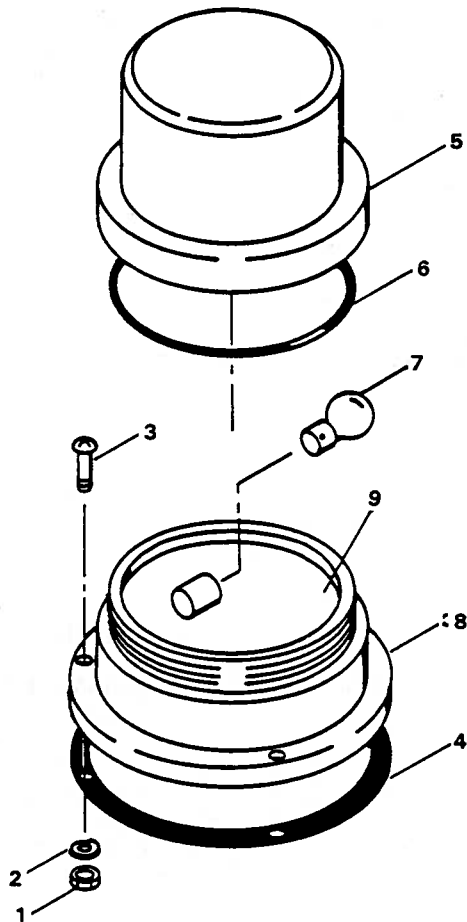


Figure 5-16. Beacon Light Assembly

LEGEND

- 1 NUT
- 2 LOCKWASHER
- 3 WASHER
- 4 GASKET
- 5 LENS RETAINER
- 6 LENS
- 7 LENS GASKET
- 8 BULB
- 9 PIGTAIL

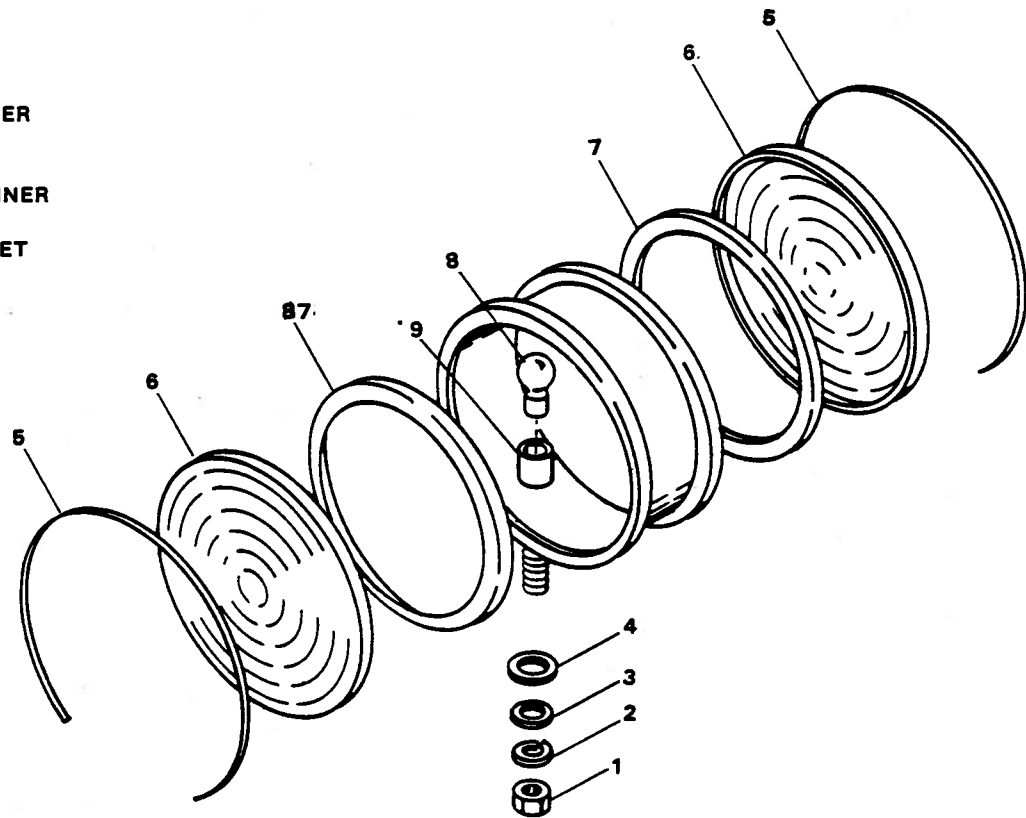
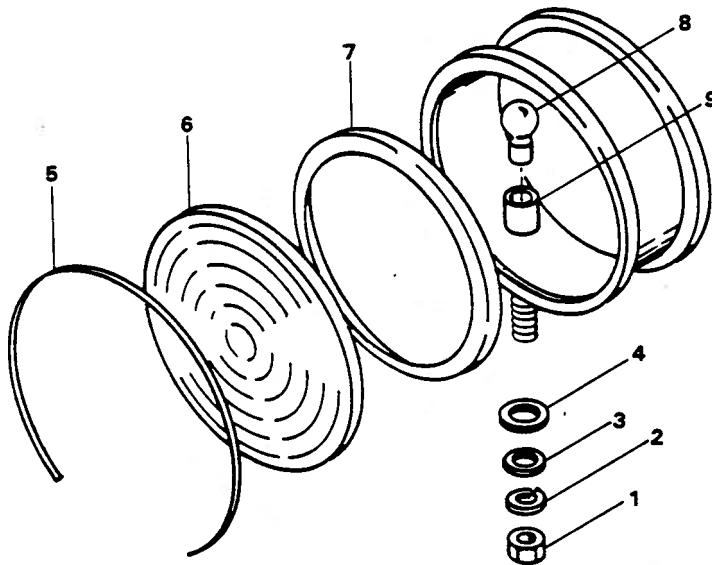


Figure 5-17. Front Turnsignal Assembly



LEGEND

- 1 NUT
- 2 LOCKWASHER
- 3 WASHER
- 4 GASKET
- 5 LENS RETAINER
- 6 LENS
- 7 LENS GASKET
- 8 BULB
- 9 PIGTAIL

Figure 5-18. Rear Turnsignal Assembly

5-27. CAB MARKER LIGHT.

5-28. DISASSEMBLY. (See figure 5-19.)

- a. Tag and disconnect electrical leads.
- b. Remove screw (1, figure 5-19) and lens (2).
- c. Remove screws (4).
- d. Remove base gasket (5) from base.
- e. Remove bulb (3).

5-29. CLEARANCE LIGHT.

5-30. DISASSEMBLY. (See figure 5-20.)

- a. Tag and disconnect electrical leads.

- b. Remove lens (1, figure 5-20).

- c. Remove nuts (3) and lockwashers (4).

- d. Remove bulb (2).

5-31. TURNSIGNAL SWITCH.

5-32. DISASSEMBLY. (See figure 5-21.)

- a. Tag and disconnect electrical leads.

- b. Loosen clamp and remove turnsignal switch assembly from steering column.

- c. Turn upside down and remove screws.

- d. Remove handle (3, figure 5-21) and bulb (2).

LEGEND

- 1 SCREW
- 2 LENS
- 3 BULB
- 4 SCREW
- 5 BASE GASKET

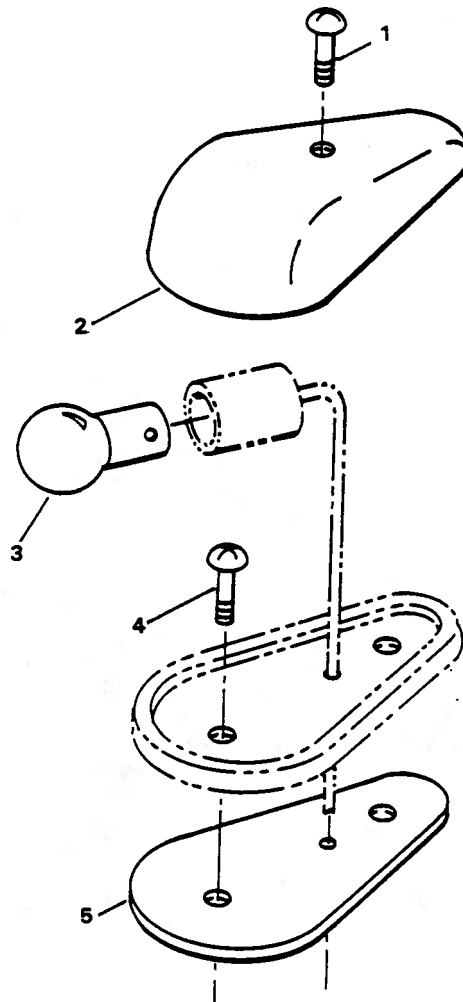


Figure 5-19. Cab Marker Light Assembly

- LEGEND**
- 1 LENS
 - 2 BULB
 - 3 NUT
 - 4 LOCKWASHER

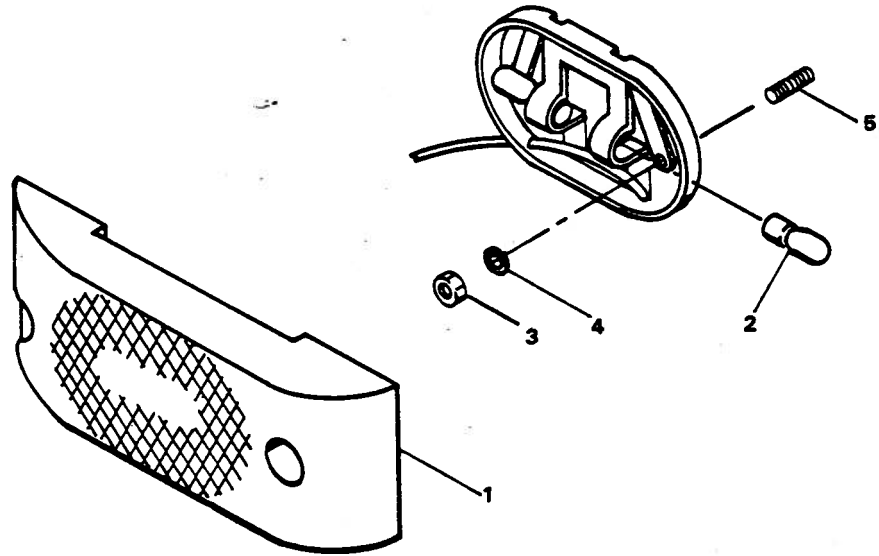


Figure 5-20. Clearance Light Assembly

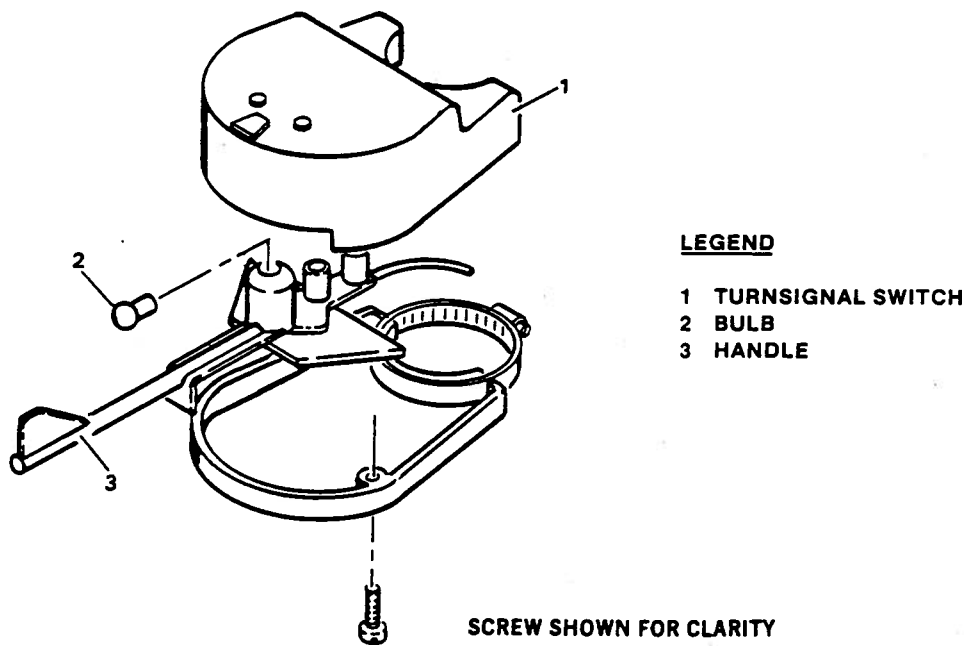


Figure 5-21. Turnsignal Switch Assembly

5-33. HI-TONE HORN.

5-34. REMOVAL. (See figure 5-22.)

NOTE

The hi-tone horn is located under the left-front wheel well

- a. Tag and disconnect electrical leads to horn (1, figure 5-22).
- b. Remove nut (2) and lockwasher (3).
- c. Remove horn (1). If necessary, remove nut (4) to replace bracket (5).

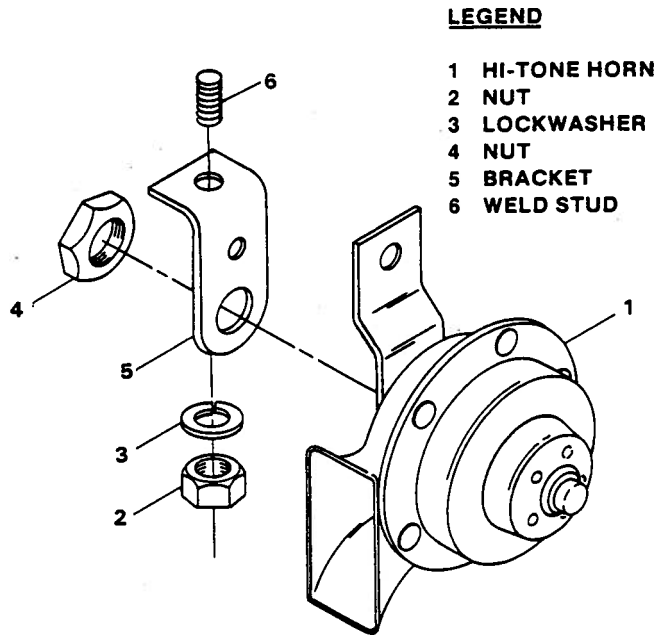


Figure 5-22. Hi-Tone Horn Assembly

5-35. ALTERNATOR.

5-36. REMOVAL. (See figure 5-23.)

- a. Turn off power at battery disconnect switch.
- b. Tag and disconnect electrical leads to alternator.
- c. Release tension and remove drive belt.

d. Remove capscrews (2, figure 5-23) and alternator brace (1).

e. Remove capscrew (3), alternator (9), and mounting spacer (4).

5-37. DISASSEMBLY. (See figure 5-24.)

NOTE

Scribe a locating mark to aid positioning during assembly.

a. Remove thru-bolts (5, figure 5-24) and separate the drive end frame (1) with rotor assembly (2) from the slip ring end frame (3) with stator assembly (4) by prying apart with a screwdriver at the stator slot.

NOTE

Perform rectifier bridge check para. 7-4h and stator check para. 7-4i prior to disassembly.

b. Remove nuts (6) then remove stator assembly (4) from slip ring end frame (3).

c. Remove screws (10 and 11) then remove diode trio (7) brush and arm (8) and brush and holder assembly (9).

d. Remove relay terminal (12).

e. Remove screw and lockwasher (14) and regulator (13).

f. Remove screw (16), screw and lockwasher (17) and capacitor (15).

g. Remove screw and washer (19) and rectifier bridge (18).

h. Press bearing (20) from slip ring end frame (3) with tube or collar that just fits inside slip ring end frame housing.

NOTE

Press from outside of housing towards inside. Support inside of frame with hollow cylinder to prevent breakage of frame.

LEGEND

- 1 ALTERNATOR BRACE
- 2 CAPSCREW
- 3 CAPSCREW
- 4 SPACER
- 5 SUPPORT
- 6 SCREW
- 7 PULLEY RETAINER
- 8 ALTERNATOR PULLEY
- 9 ALTERNATOR
- 10 FAN

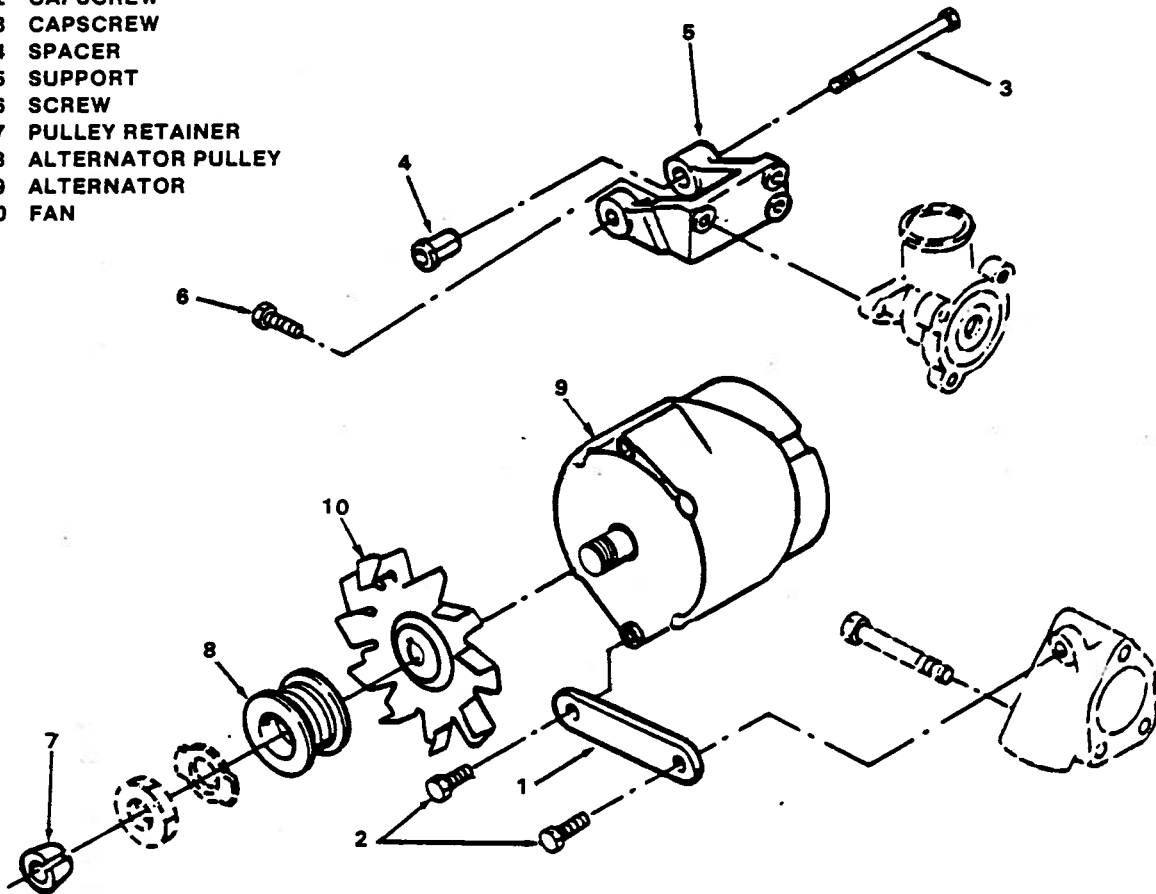


Figure 5-23. Alternator Installation

- i. Remove battery terminal (21) if necessary.
- j. Place rotor assembly (2) in vise and tighten.

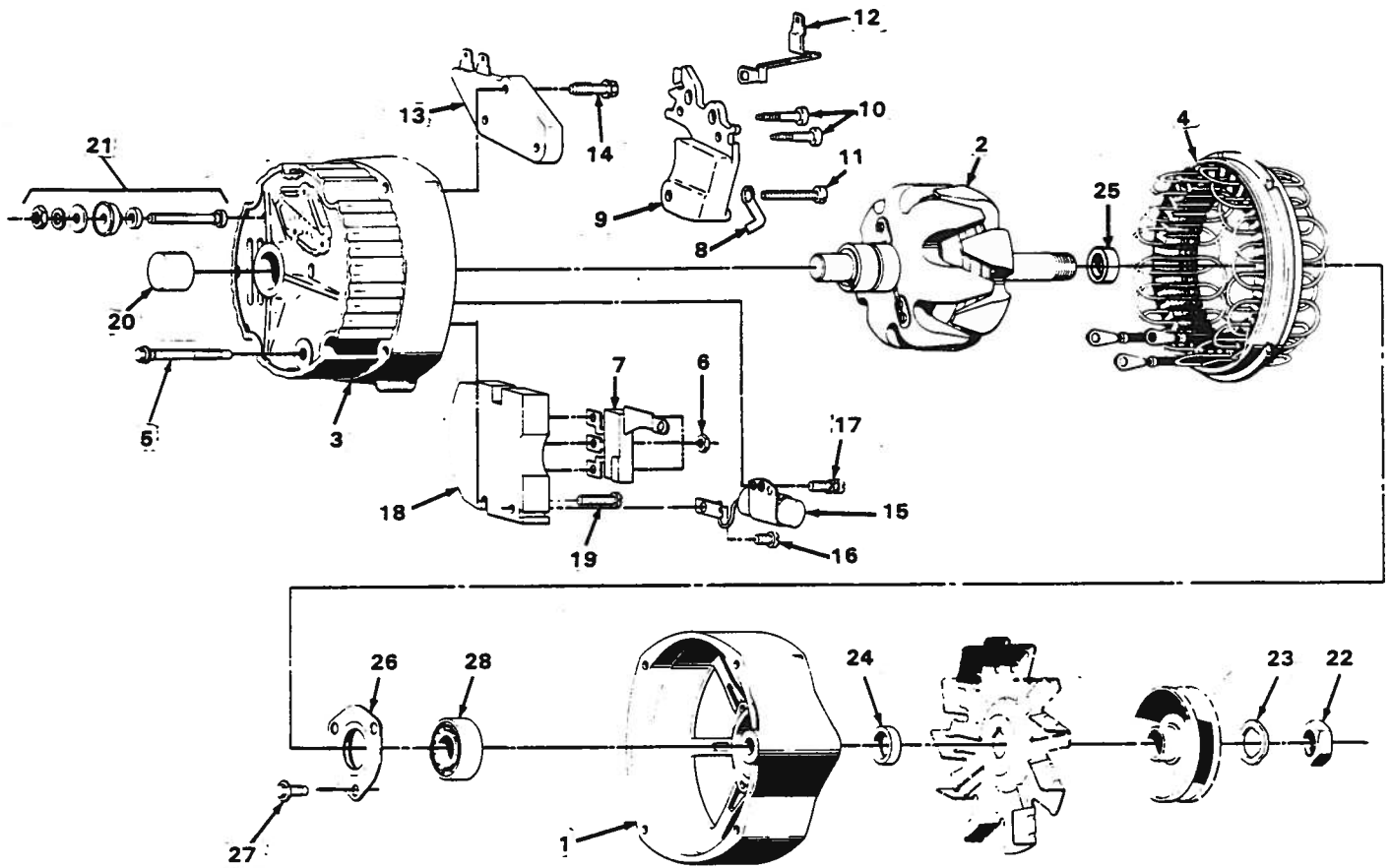
CAUTION

Avoid excessive tightening that could distort rotor.

- k. Remove drive end shaft nut (22), drive end lockwasher (23), pulley retainer (7, figure 5-23),

alternator pulley (8), fan (10), and outside collar (24, figure 5-24). Separate drive end frame (1) from rotor assembly (2).

- l. Remove drive end shaft collar (25).
- m. Remove screws (27) and plate retainer (26).
- n. Press drive end bearing (28) from drive end frame (1).



LEGEND

- | | | | |
|----|-------------------------|----|--------------------|
| 1 | DRIVE END FRAME | 15 | CAPACITOR |
| 2 | ROTOR ASSEMBLY | 16 | SCREW |
| 3 | SLIP RING END FRAME | 17 | SCREW & LOCKWASHER |
| 4 | STATOR ASSEMBLY | 18 | RECTIFIER BRIDGE |
| 5 | THRU BOLT | 19 | SCREW & WASHER |
| 6 | NUT | 20 | BEARING |
| 7 | DIODE TRIO | 21 | BATTERY TERMINAL |
| 8 | BRUSH & ARM | 22 | NUT |
| 9 | BRUSH & HOLDER ASSEMBLY | 23 | LOCKWASHER COLLAR |
| 10 | SCREW | 25 | SHAFT COLLAR |
| 11 | SCREW | 26 | PLATE RETAINER |
| 12 | RELAY TERMINAL | 27 | SCREW |
| 13 | REGULATOR | 28 | DRIVE END BEARING |
| 14 | SCREW & LOCKWASHER | | |

Figure 5-24. Alternator Assembly

5-38. STARTING MOTOR.**5-39. REMOVAL.** (See figure 5-25.)

- a. Turn off power at battery disconnect switch.
- b. Tag and disconnect electrical connection at starting motor.

WARNING

The starting motor weighs 32 pounds.

- c. Support starting motor from underneath. Remove screws (2, figure 5-25) and washers (3) securing motor (1) to engine. Remove starting motor (1).

5-40. DISASSEMBLY. (See figure 5-26.)**WARNING**

Safety glasses shall be worn when disassembling and assembling starting motor.

- a. Remove thru-bolts (9, figure 5-26) securing end frame (8) to drive housing (10).
- b. Remove screw (35) securing connector (34)

to switch (1) motor terminal. Remove grommet (36) from field frame assembly (50).

- c. Remove field frame assembly (50) and field coil assembly (30) from drive housing (10).
- d. Remove screws (3) and lockwashers (4) securing switch (1) to drive housing (10). Remove switch (1) and shift lever (21).

NOTE

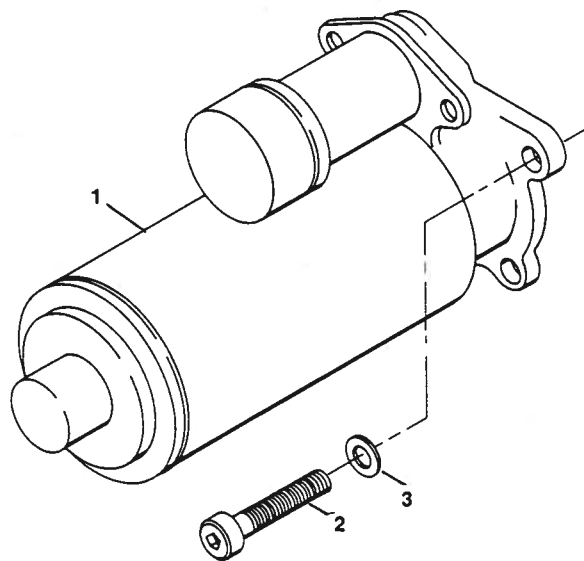
Test solenoid switch (1) prior to further disassembly of starting motor. Refer to para. 7-5g.

NOTE

Remove drive assembly from armature by sliding a metal cylinder onto shaft. Strike the metal cylinder against retainer, and drive retainer toward armature core and off retainer ring.

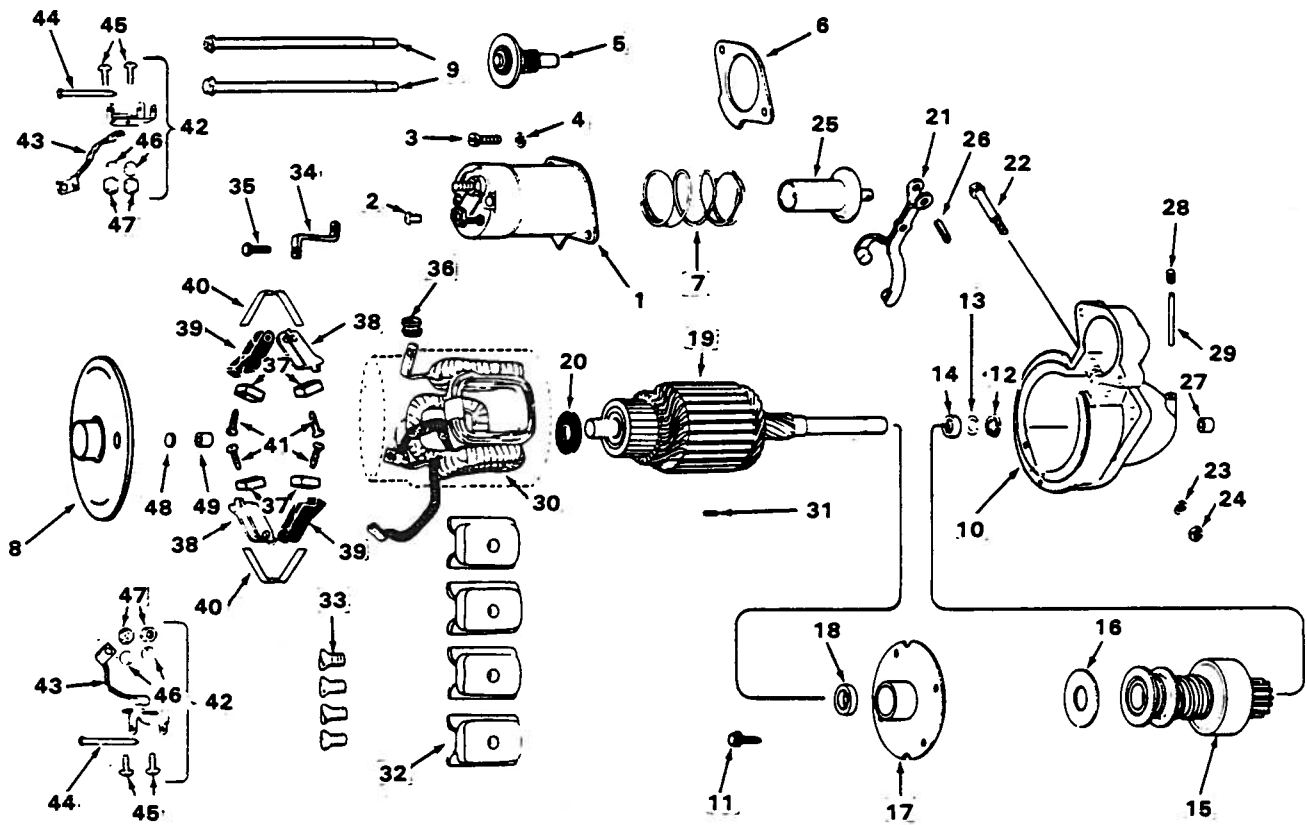
- e. Remove screw and lockwashers (11) thrust collar (12), retaining ring (13), and stop collar (14) from armature shaft groove. Remove drive assembly (15) from armature shaft.

- f. Remove washer (16), center bearing plate (17), and bushing (18) from armature shaft.

**LEGEND**

- 1 STARTING MOTOR
- 2 SCREW
- 3 WASHER

Figure 5-25. Starting Motor Installation



LEGEND

- | | | |
|-----------------------|------------------------|-------------------------|
| 1 SWITCH | 18 BUSHING | 35 SCREW |
| 2 SCREW | 19 ARMATURE | 36 GROMMET |
| 3 SCREW | 20 WASHER | 37 BRUSH |
| 4 LOCKWASHER | 21 SHIFT LEVER | 38 HOLDER |
| 5 CONTACT | 22 STUD | 39 HOLDER |
| 6 GASKET | 23 LOCKWASHER | 40 SPRING |
| 7 PLUNGER SPRING | 24 NUT | 41 SCREW |
| 8 END FRAME | 25 PLUNGER | 42 SUPPORT PACKAGE |
| 9 THRU BOLT | 26 PIN | 43 GROUND LEAD |
| 10 DRIVE HOUSING | 27 BUSHING | 44 PIN |
| 11 SCREW & LOCKWASHER | 28 PLUG | 45 SCREW |
| 12 THRUST COLLAR | 29 WICK | 46 LOCKWASHER |
| 13 RETAINING RING | 30 FIELD COIL ASSEMBLY | 47 NUT |
| 14 STOP COLLAR | 31 DOWEL PIN | 48 WICK |
| 15 DRIVE ASSEMBLY | 32 SHOE POLE | 49 BUSHING |
| 16 WASHER | 33 SCREW | 50 FIELD FRAME ASSEMBLY |
| 17 PLATE | 34 CONNECTOR | |

Figure 5-26. Starting Motor Assembly

5-41. ENGINE.

5-42. REMOVAL. (See figure 5-27.)

NOTE

Most engine repair procedures can be effected without removing the engine from the towing tractor.

NOTE

If it is necessary to remove the engine, both the engine and transmission must be removed.

- a. Turn off power at battery disconnect switch.
- b. Remove air cleaner assembly.
- c. Remove engine hood assembly.
- d. Drain radiator and remove radiator hoses and clamps. (See figure 5-27.)
- e. Remove radiator assembly.
- f. Disconnect all control cables to transmission and engine.
- g. Tag and disconnect electrical leads to sending units on transmission and engine.
- h. Tag and disconnect leads to starting motor and alternator. Remove starting motor (32) and alternator (44).
- i. Tag, disconnect, and cap hydraulic hoses to pump (mounted on torque converter housing).
- j. Disconnect exhaust tube at turbocharger.
- k. Remove plug and drain transmission oil.
- l. Remove oil pan plug and drain engine oil.
- m. Turn off fuel at fuel tank and disconnect fuel lines at transfer pump and fuel leakoff manifold.

WARNING

The engine and transmission weigh approximately 1800 pounds. Use caution when removing the engine and transmission.

- n. Attach chain hoist (two-ton minimum capacity) to engine lifting brackets.
- o. Remove front engine mounting capscrews (17, figure 5-27) and washers (14).
- p. Remove nuts (13), washers (14), mounts (15), and capscrews (16).
- q. Lift engine and transmission out of tractor frame and secure engine to overhaul fixture.
- r. Refer to paragraph 5-56 for removal of transmission.

5-43. DISASSEMBLY. Repair Engine as required per Engine Overhaul Instructions T.O. 36A10-3-5-83-1.

5-44. AIR CLEANER.

5-45. REMOVAL. (See figure 5-28.)

NOTE

During disassembly clamps, tubing and hardware shall be stored for cleaning and inspection.

CAUTION

Do not damage elbows and tubing when removing T-bolt clamp (1, figure 5-28), and hose clamps (3).

- a. Loosen nut (2) and remove T-bolt clamp (1) at turbocharger connection.
- b. Loosen hose clamps (3) from elbows (4 and 6). Remove elbow (4), tube (5), and elbow (6).
- c. Loosen clamp (9). Remove cap assembly (8).
- d. Remove nuts (13), lockwashers (14), and capscrews (15). Lift air cleaner assembly (16) and mounting bands (10) from mounting bracket (17).

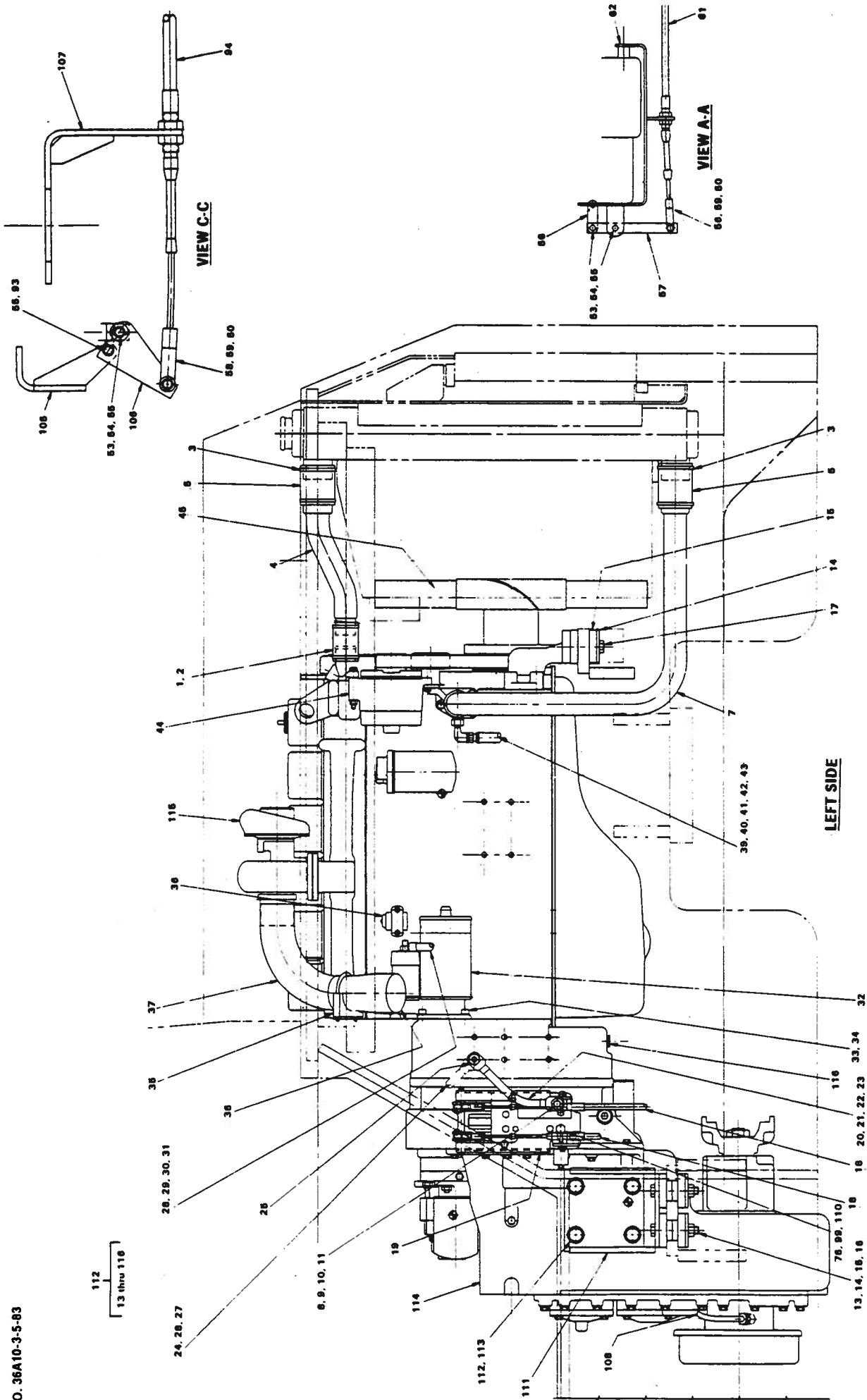


Figure 5-27. Engine/Transmission installation (Sheet 1 of 4)

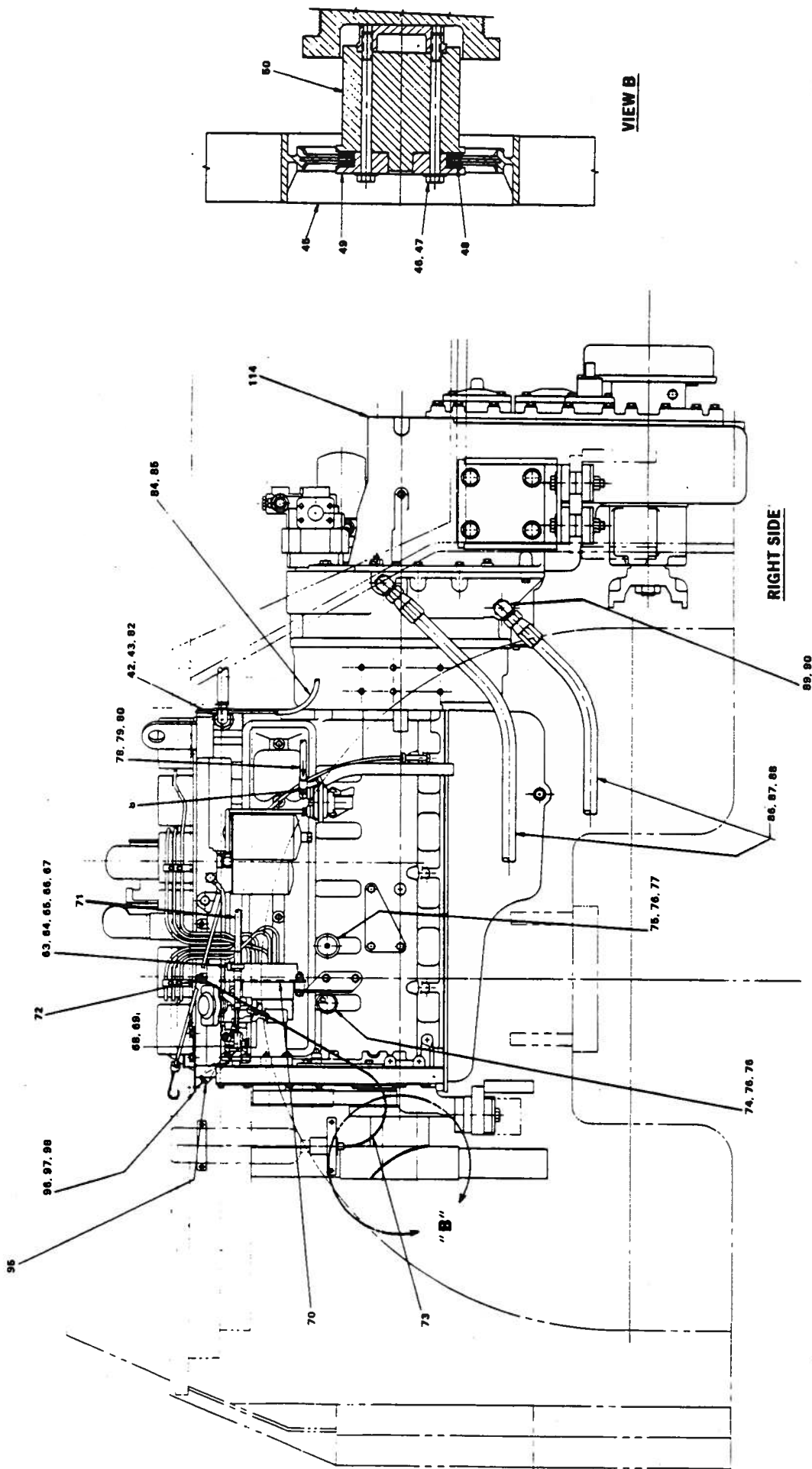


Figure 5-27. Engine/Transmission Installation (Sheet 2 of 4)
5-39

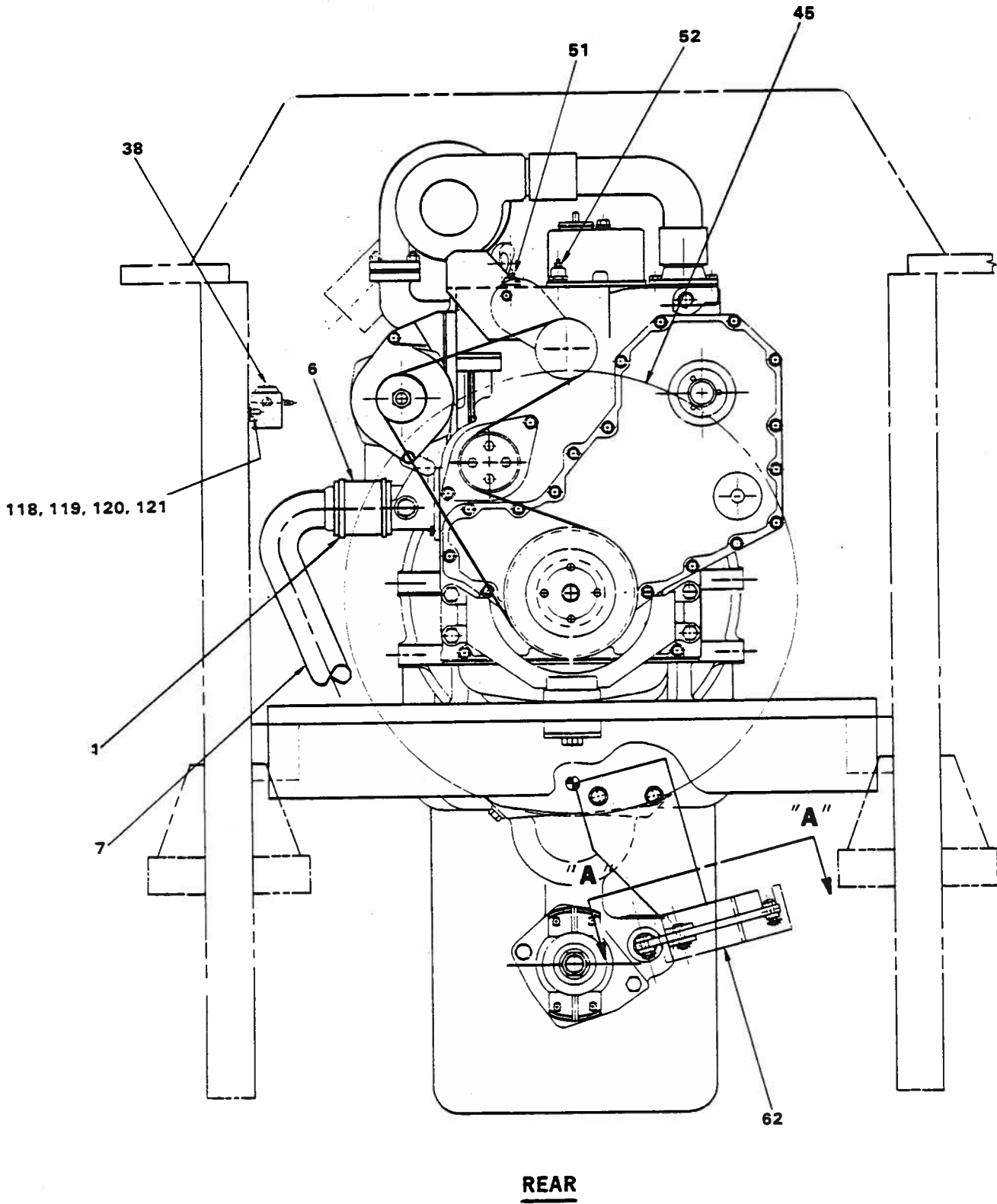
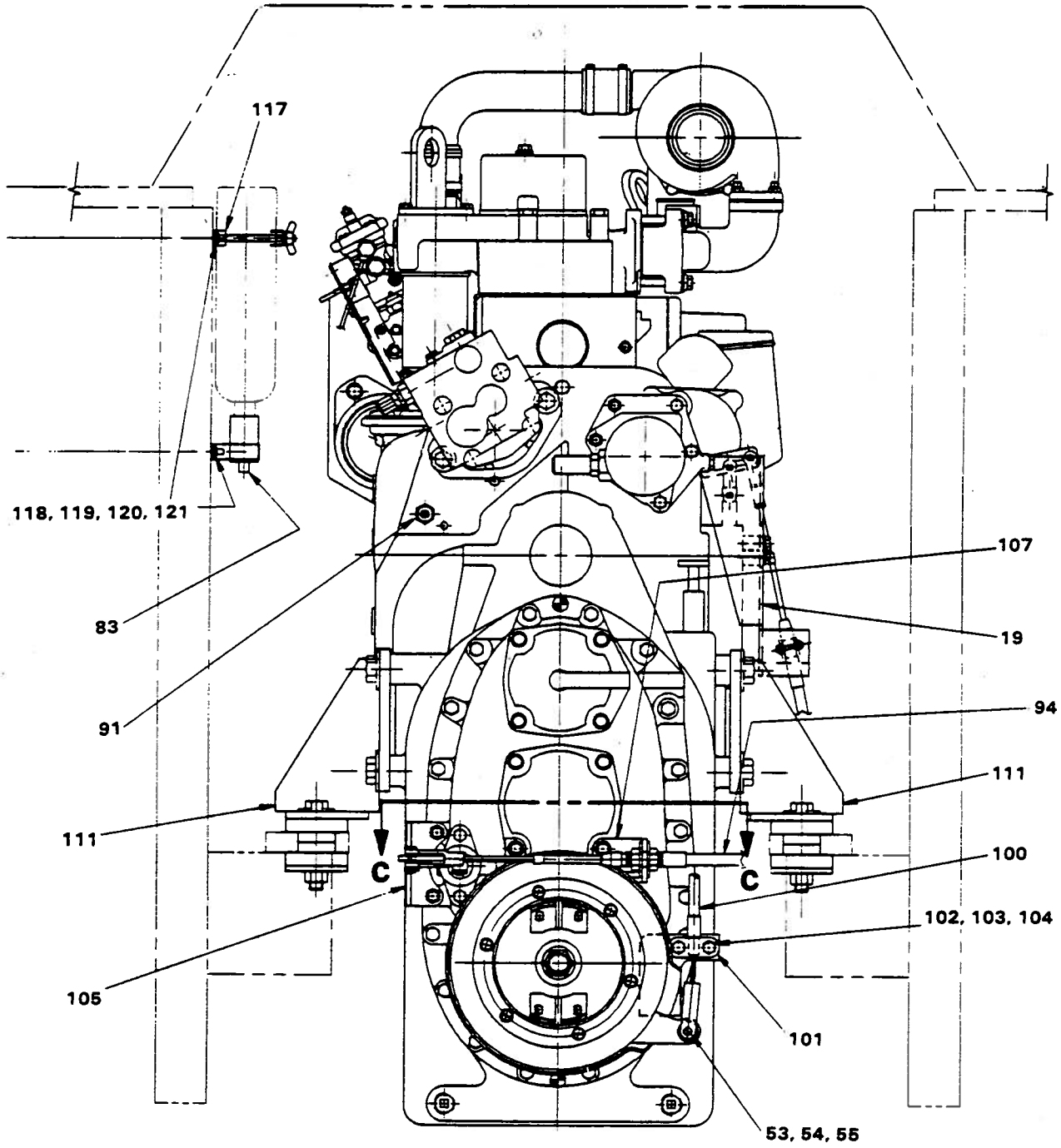


Figure 5-27. Engine/Transmission Installation (Sheet 3 of 4)



FRONT

Figure 5-27. Engine/Transmission Installation (Sheet 4 of 4)

LEGEND FOR FIGURE 5-27

1	HOSE CLAMP	63	CLAMP ASSEMBLY
2	RADIATOR HOSE	64	NUT
3	HOSE CLAMP	65	WASHER
4	TOP RADIATOR TUBE	66	SHIM
5	RADIATOR HOSE	67	U-BOLT
6	RADIATOR HOSE	68	NUT
7	BOTTOM RADIATOR TUBE	69	BALL JOINT
8	NUT	70	MOUNTING ANGLE
9	LOCKWASHER	71	ACCELERATOR CABLE
10	WASHER	72	ATOMIZER
11	CAPSCREW	73	TUBING
12	ENGINE /TRANSMISSION ASSEMBLY	74	LOW PRESSURE SWITCH
13	NUT	75	PIPE NIPPLE
14	DOCK WASHER	76	PIPE COUPLING
15	CENTER MOUNTING	77	OIL PRESSURE SENDER
16	CAPSCREW	78	HOSE ASSEMBLY
17	CAPSCREW	79	HOSE
18	CONTROL CABLE	80	FITTING
19	CABLE ENTRY ASSEMBLY	81	CONNECTOR
20	BATTERY CABLE ASSEMBLY	82	BUSHING
21	BATTERY CABLE	83	VALVE
22	TERMINAL	84	HOSE CLAMP
23	TERMINAL	85	HOSE
24	BATTERY CABLE ASSEMBLY	86	HOSE ASSEMBLY
25	CAPSCREW	87	HOSE
26	BATTERY CABLE	88	FITTING
27	TERMINAL	89	ELBOW
28	BATTERY CABLE ASSEMBLY	90	O-RING
29	BATTERY CABLE	91	TEMPERATURE SENDER
30	TERMINAL	92	ENGINE HARNESS
31	TERMINAL	93	CLEVIS PIN
32	STARTING MOTOR	94	CONTROL CABLE
33	CAPSCREW	95	GOVERNOR SPRING
34	WASHER	96	PLATE
35	MUFFLER CLAMP	97	CAPSCREW
36	REDUCER	98	LOCKWASHER
37	ADAPTER	99	PIPE NIPPLE
38	SOLENOID	100	BRAKE CABLE
39	HOSE CLAMP	101	CABLE CLAMP
40	HEATER HOSE	102	NUT
41	BUSHING	103	LOCKWASHER
42	PIPE NIPPLE	104	CAPSCREW
43	STREET ELBOW	105	BRACKET
44	ALTERNATOR	106	PLATE
45	FAN	107	BRACKET
46	CAPSCREW	108	CABLE
47	WASHER	109	NOT USED
48	RUBBER MOUNT	110	PRESSURE SWITCH
49	PLATE	111	REAR ENGINE MOUNT
50	SPACER	112	CAPSCREW
51	TEMPERATURE SENDER	113	WASHER
52	TEMPERATURE SWITCH	114	TRANSMISSION
53	COTTER PIN	115	ENGINE
54	WASHER	116	PIPE PLUG
55	CLEVIS PIN	117	CYLINDER CLAMP
56	LINKAGE BAR	118	NUT
57	ARM	119	LOCKWASHER
58	CLEVIS	120	HOSE CLAMP
59	COTTER PIN	120	WELD STUD
60	CLEVIS PIN	121	WASHER
61	CONTROL CABLE		
62	BRACKET		

LEGEND

- 1 T-BOLT CLAMP
- 2 NUT
- 3 HOSE CLAMP
- 4 ELBOW
- 5 TUBE
- 6 ELBOW
- 7 RESTRICTION INDICATOR
- 8 CAP ASSEMBLY
- 9 CLAMP
- 10 MOUNTING BAND
- 11 NUT
- 12 SCREW
- 13 NUT
- 14 LOCKWASHER
- 15 CAPSCREW
- 16 AIR CLEANER ASSEMBLY
- 17 MOUNTING BRACKET
- 18 HEX NUT
- 19 LOCKWASHER
- 20 FLAT WASHER
- 21 STUD

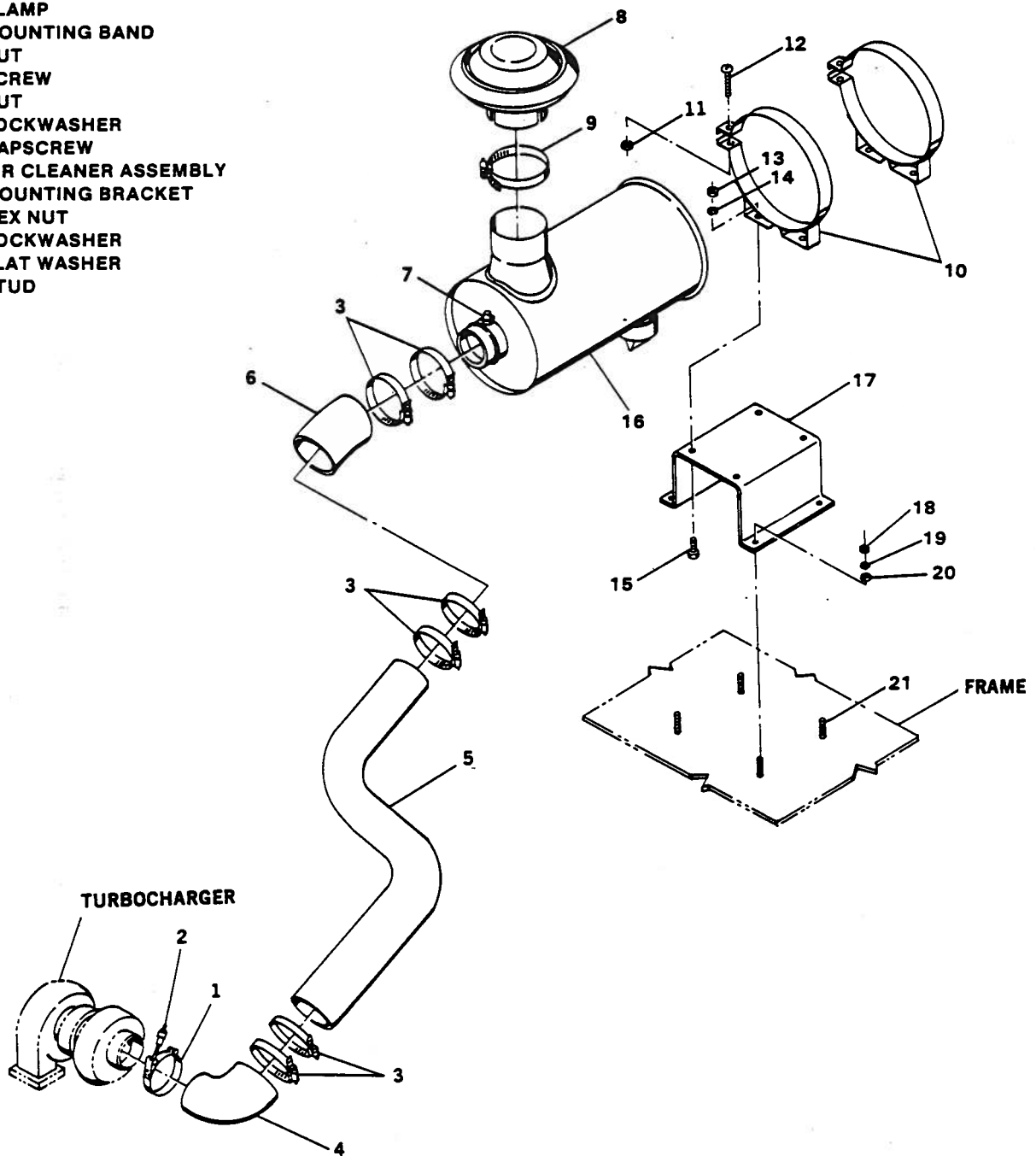


Figure 5-28. Air Cleaner Installation

e. Loosen mounting bands (10) by removing nuts (11) and screws (12). Remove mounting bands (10).

5-46. DISASSEMBLY. (See figure 5-29.)

- a. Remove vacuator valve (1, figure 5-29).
- b. Remove cover assembly (2).
- c. Remove nut assembly (3).

d. Remove element assembly (4) from body assembly (5). Discard element assembly.

5-47. FUEL TANK INSTALLATION.

5-48. DISASSEMBLY. (See figure 5-30.)

NOTE

Remove fuel hose connections and tag. Disconnect electrical lead to fuel level

sender (9, figure 5-30) and tag. Remove plug (8) and drain fuel tank content. Fuel tank capacity is thirty gallons.

- a. Remove capscrew (2). Remove plate (1) from frame.
- b. Remove nuts (4) and lockwashers (5). Remove fuel tank (3).

NOTE

Do not disassemble chain from cap. Chain shall remain locked through tank port.

c. Remove screws (10) securing fuel level sender (9). Remove gasket (11).

d. Remove nipple (16), fuel shutoff valve (17), elbow (12), and connector (18). Remove bushing (13), elbow (14), and nipple (15).

LEGEND

- 1 VACUATOR VALVE
- 2 COVER ASSEMBLY
- 3 NUT ASSEMBLY
- 4 ELEMENT ASSEMBLY
- 5 BODY ASSEMBLY

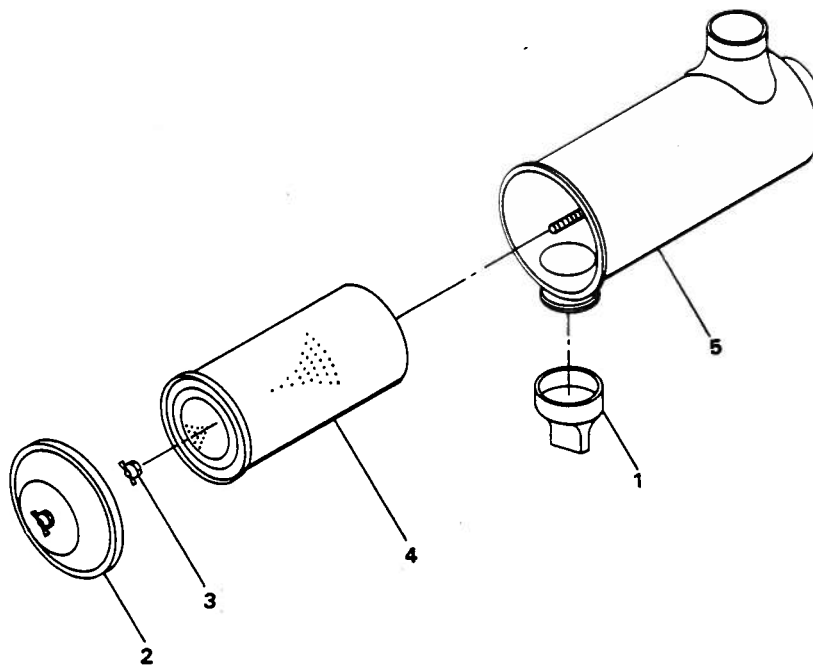


Figure 5-29. Air Cleaner Assembly

LEGEND

- 1 PLATE
- 2 CAPSCREW
- 3 FUEL TANK
- 4 NUT
- 5 LOCKWASHER
- 6 STRAP
- 7 CAP AND CHAIN
- 8 PLUG
- 9 FUEL LEVEL SENDER
- 10 SCREW
- 11 GASKET
- 12 ELBOW
- 13 BUSHING
- 14 ELBOW
- 15 NIPPLE
- 16 NIPPLE
- 17 FUEL SHUTOFF VALVE
- 18 CONNECTOR

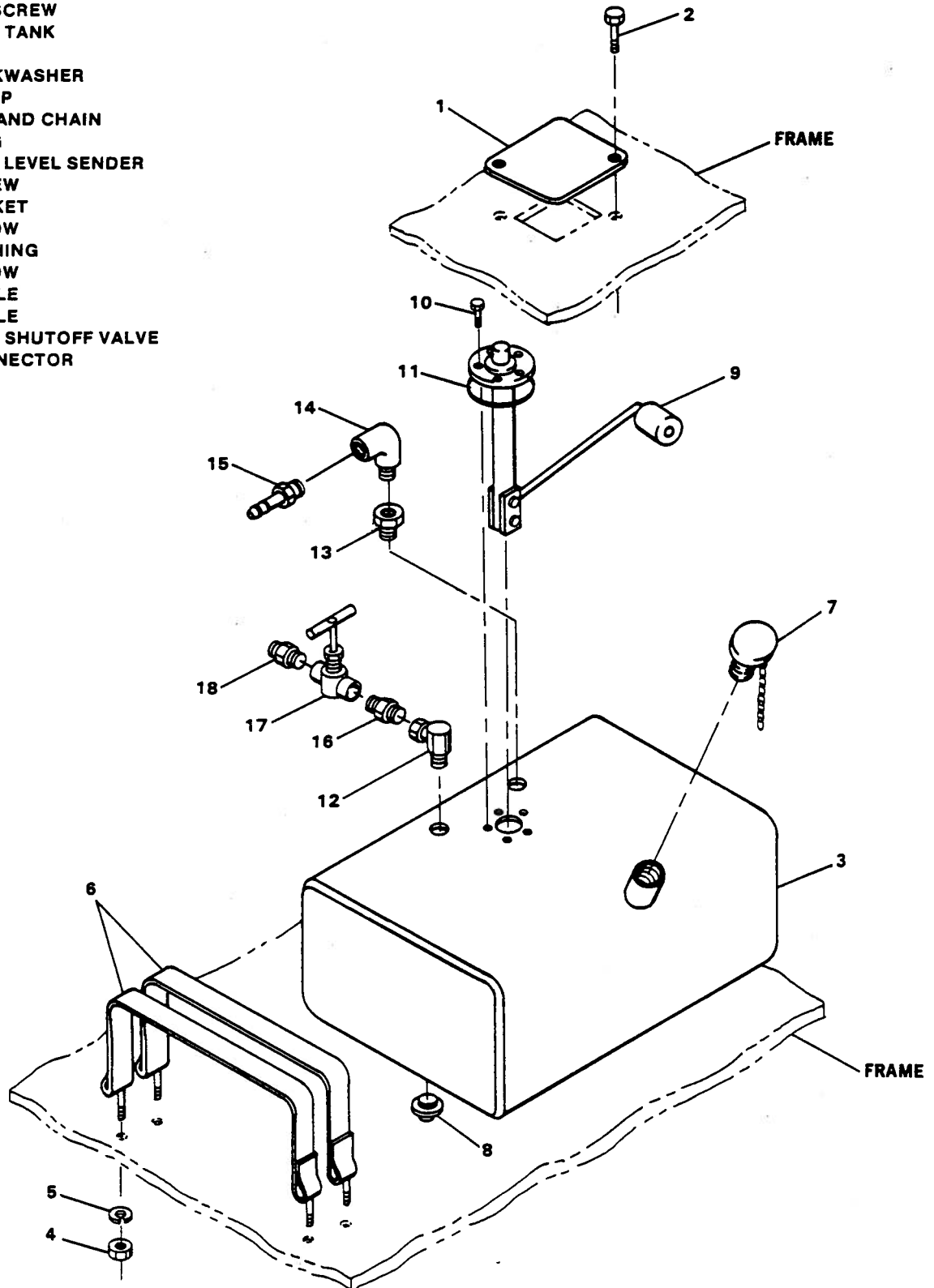


Figure 5-30. Fuel Tank Installation

5-49. EXHAUST SYSTEM.

5-50. DISASSEMBLY. (See figure 5-31.)

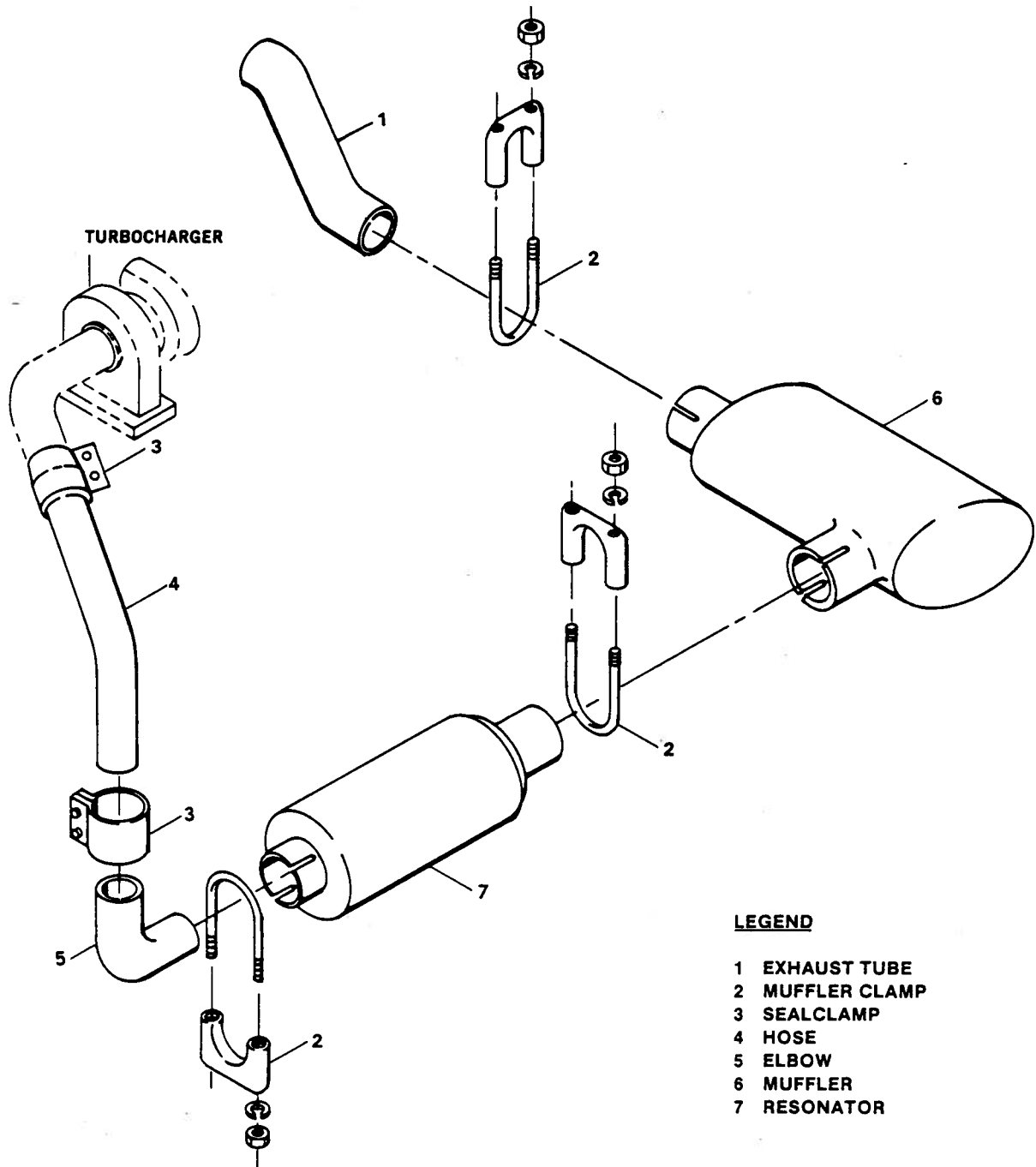
a. Loosen muffler clamp (2, figure 5-31) at exhaust tube (1) end of muffler (6).

b. Remove exhaust tube (1) from muffler.

c. Remove sealclamps (3) and hose (4).

d. Remove muffler clamps (2) both ends of resonator (7).

e. Remove elbow (5), resonator (7), and muffler (6).



LEGEND

- 1 EXHAUST TUBE
- 2 MUFFLER CLAMP
- 3 SEALCLAMP
- 4 HOSE
- 5 ELBOW
- 6 MUFFLER
- 7 RESONATOR

Figure 5-31. Exhaust System Installation

5-51. RADIATOR INSTALLATION.

5-52. DISASSEMBLY. (See figure 5-32.)

WARNING

Cooling system is pressurized. Personal injury may result when removing radiator cap (31, figure 5-32) after operating temperature is reached. Use proper protection when removing radiator cap.

When removing radiator cap (31), loosen slowly and stop. This avoids possible burning from hot water or steam. Continue turning cap to left until loose enough for removal.

- a. Remove engine hood and rear cowling.
- b. Remove radiator cap (31, figure 5-32). Open drain cock (10) and drain coolant into container.
- c. Remove and tag upper and lower hose connections to radiator (30). Remove and tag transmission oil cooler lines.
- d. Remove hex nut (2), lockwasher (3), and tubing clamp (1).
- e. Remove hex nut (2), lockwasher (3), flat washer (6), and capscrew (7). Remove capscrews (8) and lockwashers (9).
- f. Remove radiator assembly (5) from vehicle frame.
- g. Remove drain cock (10) and pipe coupling (11). Disassemble hose adapter (13) from hose (14) and 90 ° swivel adapter (15).
- h. Remove 90 ° street elbow (16) from 90 ° swivel adapter (15). Remove two 90 ° male elbows (17).

NOTE

If shutter assembly (19) is provided, remove with radiator shroud (18).

- i. Remove eight capscrews (20) and lockwashers (21). Remove radiator shroud (18).

- j. Remove capscrews (28) and lockwashers (29) securing fan guard (27) to radiator shroud (18).

- k. Remove ten hex nuts (25), lockwashers (24), capscrews (23), and mounting bracket weldment (22).

- l. Remove rubber molding (26), if required.

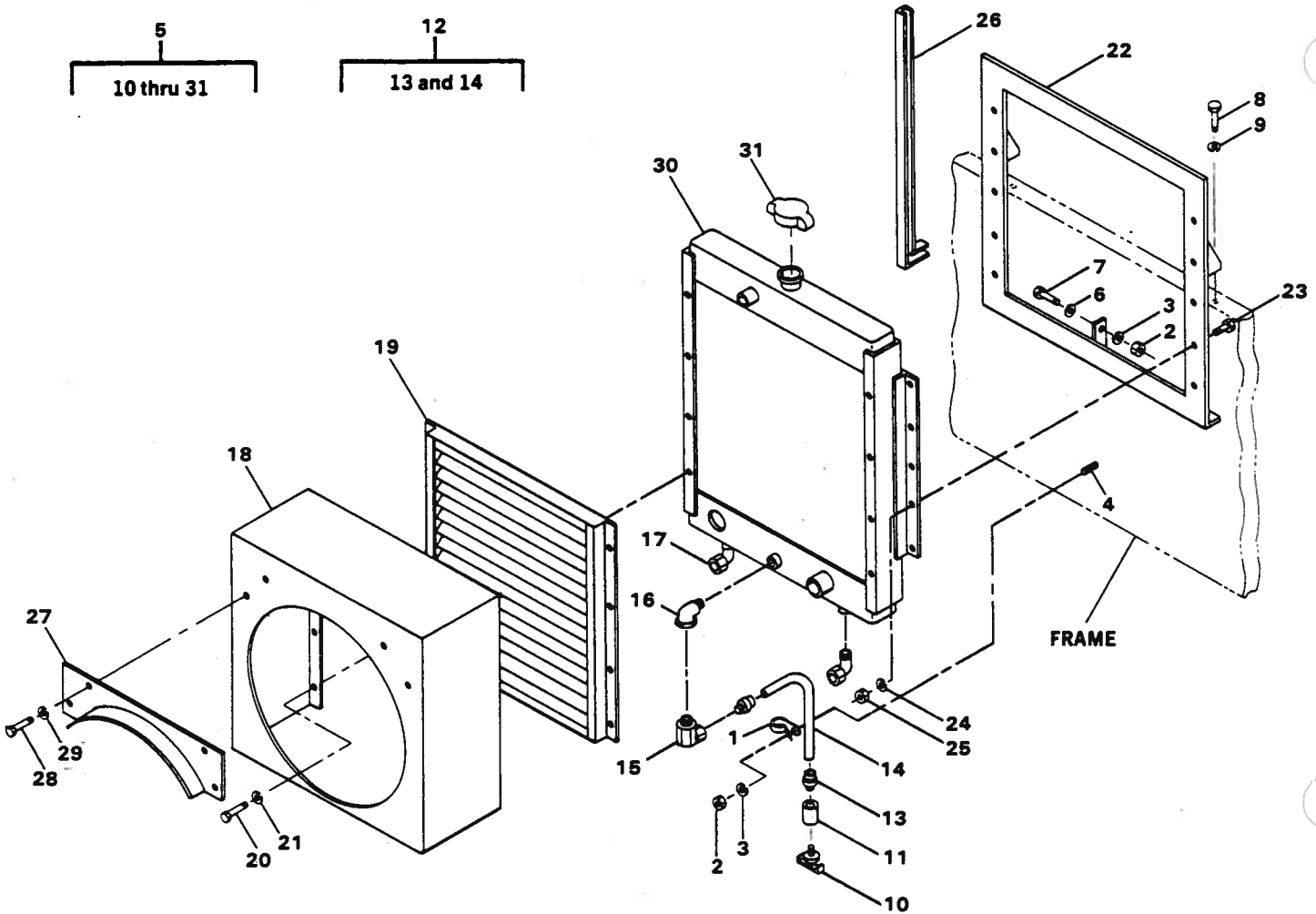
5-53. RADIATOR SHUTTER.

5-54. REMOVAL. (See figure 5-32.)

- a. Open drain cock (10, figure 5-32) and drain coolant.
- b. Remove engine hood.
- c. Remove radiator top hoses and clamps.
- d. Remove capscrews (9, figure 5-33) and lockwashers (9A).
- e. Support shutter assembly with chain hoist.
- f. Remove capscrews (20, figure 5-32) and lockwashers (21). Remove shroud (18) and radiator shutter (19).

5-55. DISASSEMBLY. (See figure 5-33.)

- a. Remove rod assembly (1, figure 5-33).
- b. Remove capscrew (2), star washer (3).
- c. Remove cotter pins (4), spring (5), and block (6).
- d. Remove nut (11), star washer (12), and capscrew (13). Remove lever (17).
- e. Remove nuts (14), bolt (16), and bushings (18 and 19).
- f. Loosen setscrews (22).
- g. Remove retaining rings (26) and shaft (27).
- h. Remove pin (23), plunger (24), and bushings (21).
- i. Remove felt washer (29), retaining ring (30), seats (31), and spring (32).



LEGEND

- | | | |
|---------------------|-----------------------|------------------------------|
| 1 TUBING CLAMP | 12 HOSE ASSEMBLY | 22 MOUNTING BRACKET WELDMENT |
| 2 HEX NUT | 13 HOSE ADAPTER | 23 CAPSCREW |
| 3 LOCKWASHER | 14 HOSE | 24 LOCKWASHER |
| 4 WELD STUD | 15 90° SWIVEL ADAPTER | 25 HEX NUT |
| 5 RADIATOR ASSEMBLY | 16 90° STREET ELBOW | 26 RUBBER MOLDING |
| 6 FLAT WASHER | 17 90° MALE ELBOW | 27 FAN GUARD |
| 7 CAPSCREW | 18 RADIATOR SHROUD | 28 CAPSCREW |
| 8 CAPSCREW | 19 SHUTTER ASSEMBLY | 29 LOCKWASHER |
| 9 LOCKWASHER | 20 CAPSCREW | 30 RADIATOR |
| 10 DRAIN COCK | 21 LOCKWASHER | 31 RADIATOR CAP |
| 11 PIPE COUPLING | | |

Figure 5-32. Radiator Installation

j. Loosen nut (34) and remove power element (35), gasket (37), and O-ring (36).

l. Remove screws (43), retaining rings (45 and 46), spring (41), and vanes (49).

k. Remove bushings (39).

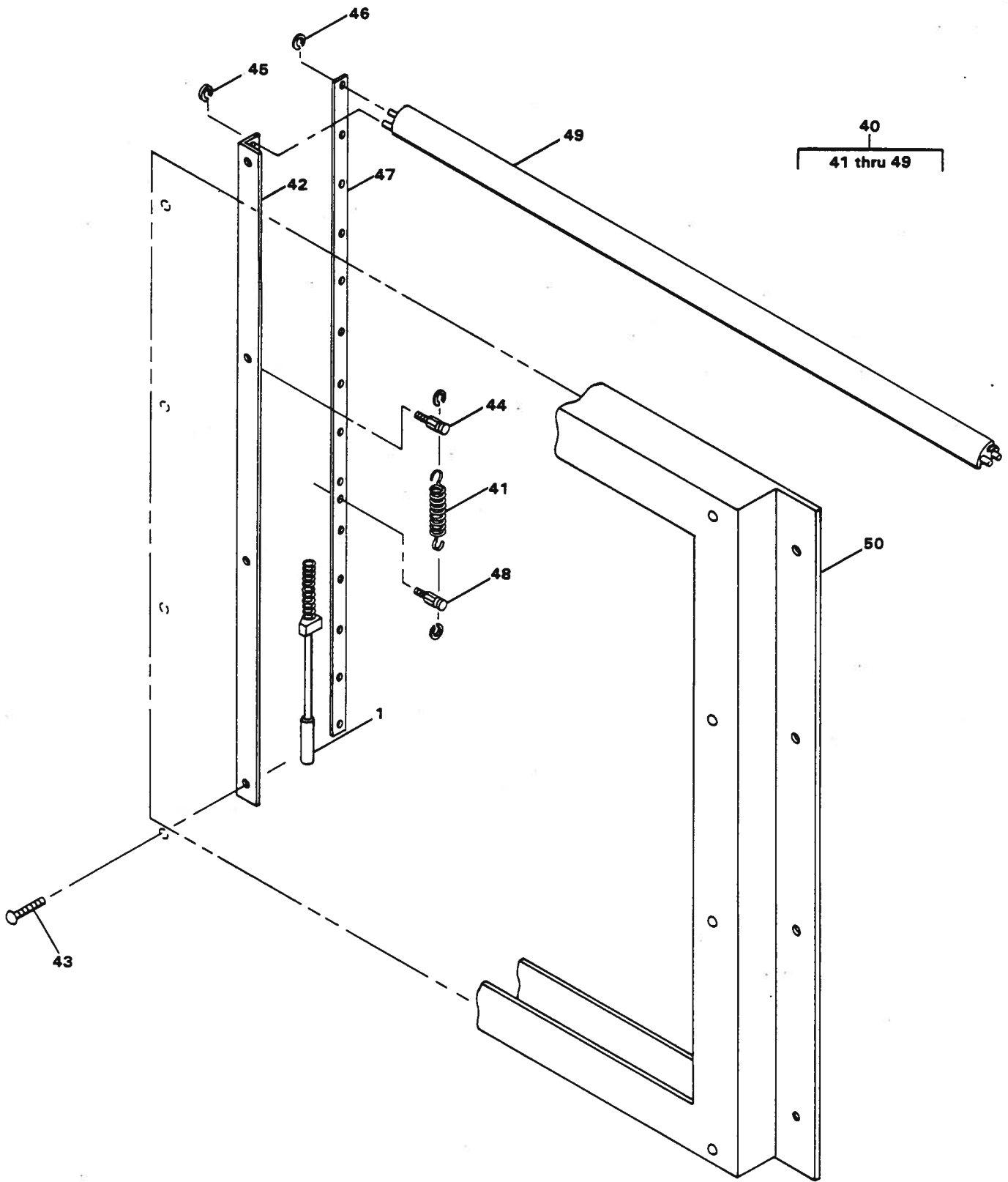


Figure 5-33. Radiator Shutter Assembly (Sheet 1 of 3)

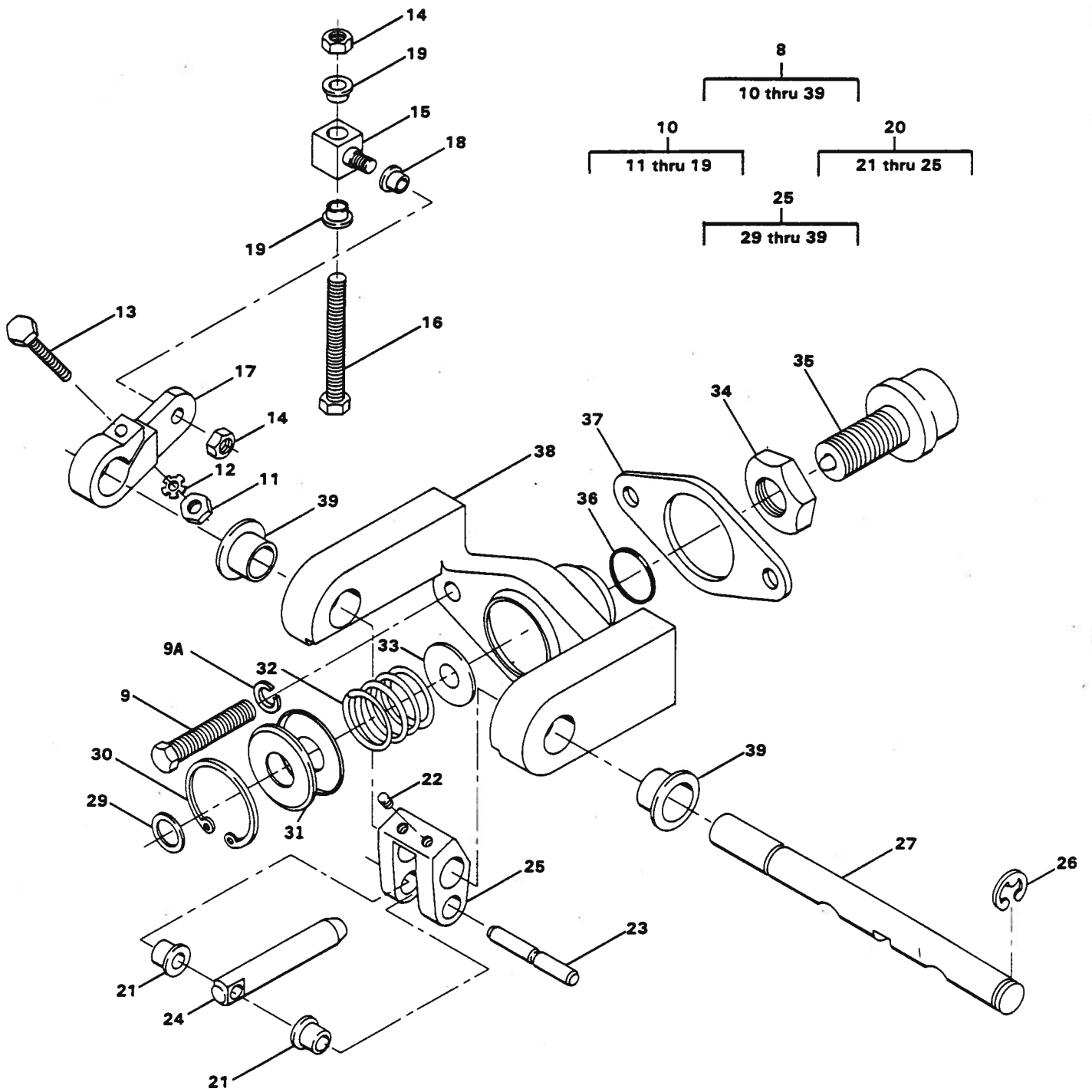


Figure 5-33. Radiator Shutter Assembly (Sheet 2 of 3)

LEGEND

- 1 ROD ASSEMBLY
- 2 CAPSCREW
- 3 STAR WASHER
- 4 COTTER PIN
- 5 SPRING
- 6 BLOCK
- 7 ROD
- 8 CONTROL ASSEMBLY
- 9 CAPSCREW
- 9A LOCKWASHER
- 10 LEVER ASSEMBLY
- 11 NUT
- 12 STAR WASHER
- 13 CAPSCREW
- 14 NUT
- 15 BLOCK
- 16 BOLT
- 17 LEVER
- 18 BUSHING
- 19 BUSHING
- 20 YOKE AND PLUNGER
- 21 BUSHING
- 22 SETSCREW
- 23 PIN
- 24 PLUNGER
- 25 YOKE
- 26 RETAINING RING
- 27 SHAFT
- 28 POWER ELEMENT ASSEMBLY
- 29 FELT WASHER
- 30 RETAINING RING
- 31 SEAT
- 32 SPRING
- 33 SEAT
- 34 NUT
- 35 POWER ELEMENT
- 36 O-RING
- 37 GASKET
- 38 FLANGE
- 39 BUSHING
- 40 SHUTTER
- 41 SPRING
- 42 ANGLE
- 43 SCREW
- 44 STUD
- 45 RETAINING RING
- 46 RETAINING RING
- 47 CONTROL BAR
- 48 STUD
- 49 VANE
- 50 FRAME

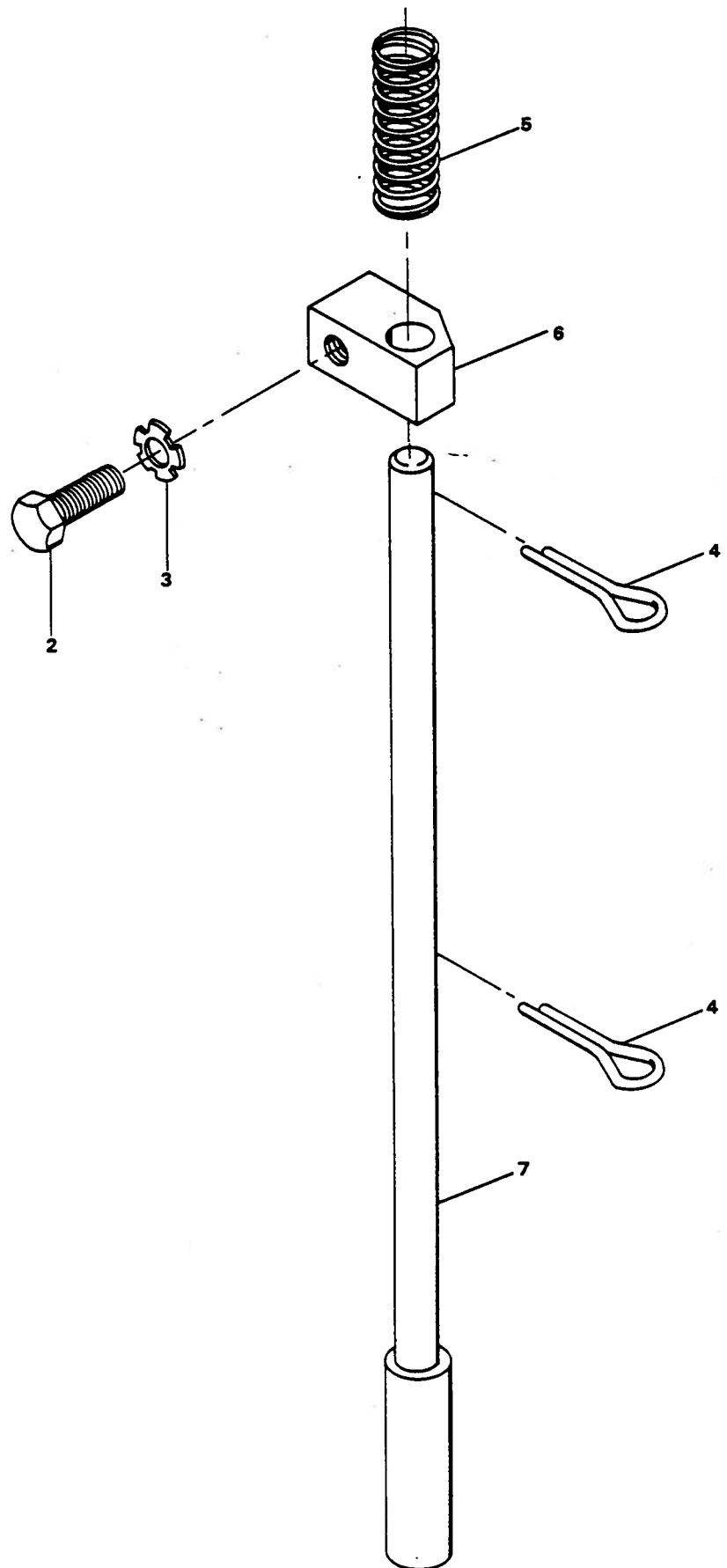


Figure 5-33. Radiator Shutter Assembly (Sheet 3 of 3)

5-56. TRANSMISSION.

5-57. REMOVAL. (See figure 5-34.)

- a. Remove engine (para. 5-41).
- b. Remove flywheel access cover (on flywheel housing opposite starting motor).

WARNING

Transmission weighs approximately 750 pounds. Use caution when lifting the transmission.

- c. Support transmission (1) with chain hoist.
- d. Remove capscrews (4, figure 5-34) and lockwashers (5).
- e. Remove capscrews (2) and lockwashers (3).
- f. Separate engine and transmission assemblies.
- g. Secure transmission (1) in overhaul fixture.

CAUTION

Cleanliness is of extreme importance and an absolute must in the repair and overhaul of this unit. Before attempting any repairs, the exterior of the unit must be thoroughly cleaned to prevent the possibility of dirt and foreign matter entering the mechanism.

5-58. CONVERTER DISASSEMBLY. Disassemble the converter as follows:

- a. Remove filter assembly (1, figure 5-35), screws (3 and 4), mounting nuts (5), and lockwashers (6). Remove charging pump assembly (2) with gasket (8) and O-ring (7).

NOTE

Use a small pan to catch the oil left in the filter assembly (1).

- b. Remove housing screws (12), lockwashers (13), and control valve assembly (11) with gasket (14). Use caution as not to lose detent balls (15) and

springs (16). Disassemble control valve assembly if necessary (para. 5-64).

- c. Remove screen assembly (19) and gasket (20).
- d. Remove screws and lockwashers (3, figure 5-36), backing ring (2), and driveplate assembly (1).
- e. Remove retaining ring (4), bore plug (5), and O-ring (6).
- f. Remove retaining ring (7) as shown in figure 5-37. Remove screws and lockwashers (9, figure 5-36), and impeller cover (8) with O-ring (10), retaining washer (11), turbine hub bearing (12), and locating ring (13). Disassemble if necessary.

CAUTION

Turbine (14) may remain in turbine hub bearing (12) and will come off with impeller cover (8).

- g. Remove turbine (14) and retaining ring (15).
- h. Remove retaining ring (16), reaction member (17), and hub bearing spacer (18).
- i. Remove impeller (19) with impeller hub gear (20), screw (21), lock tab (22), and O-ring (23). Disassemble these items if necessary.
- j. Using oil baffle puller holes provided, remove oil baffle assembly (24) with oil seal (25), as shown in figure 5-38.

NOTE

Oil baffle puller tool can be fabricated, as illustrated in figure 5-39.

- k. Support converter housing (26, figure 5-35) with a chain hoist and remove screws (27) and lockwashers (28).
- l. Separate converter housing (26) with gasket (29) from transmission case assembly (30), transport to work area, and secure.

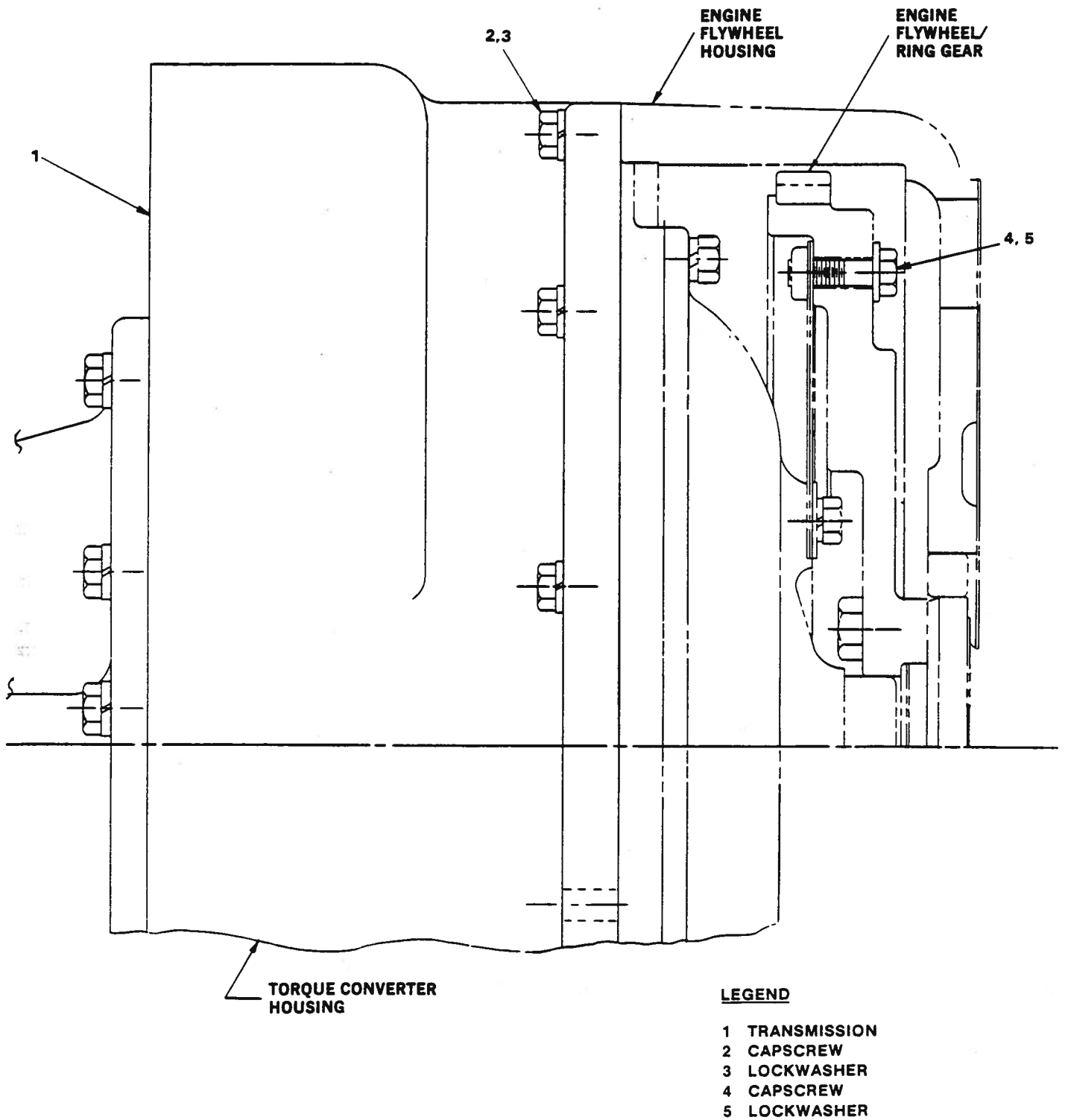


Figure 5-34. Transmission Installation

LEGEND FOR FIGURE 5-35

1 FILTER ASSEMBLY	21 PIPE PLUG	40 PLUG
2 CHARGING PUMP ASSEMBLY	22 PIPE PLUG	41 O-RING
3 SCREW	23 PIPE PLUG	42 TUBE SLEEVE
4 SCREW	24 PIPE PLUG	43 DOWEL PIN
5 NUT	25 SLEEVE	44 O-RING
6 LOCKWASHER	26 CONVERTER HOUSING	45 TUBE SLEEVE
7 O-RING	27 SCREW	46 PIPE PLUG
8 GASKET	28 LOCKWASHER	47 TUBE SLEEVE
9 STUD	29 GASKET	48 O-RING
10 STUD	30 TRANSMISSION CASE ASSEMBLY	49 3RD SPEED TUBE
11 CONTROL VALVE ASSEMBLY	31 DIPSTICK	50 CLUTCH LUBE TUBE
12 SCREW	32 DIPSTICK TUBE	51 SUCTION TUBE
13 LOCKWASHER	33 PIPE PLUG	52 SCREW
14 GASKET	34 PRESSURE TUBE	53 LOCKWASHER
15 DETENT BALL	35 O-RING	54 TUBE CLIP
16 SPRING	36 TUBE SLEEVE	55 SCREW
17 PIPE PLUG	37 O-RING	56 LOCKWASHER
18 AIR BREATHER	38 O-RING	57 O-RING
19 SCREEN ASSEMBLY	39 TUBE SLEEVE	58 DRAIN PLUG
20 GASKET		

NOTE

Reverse and 2nd clutch will remain with converter housing.

m. Remove locating ring (26, figure 5-36), idler gear (28) with retaining rings (27 and 30) and bearing (29). Disassemble if necessary. Remove locating ring (31).

n. Remove screws and lockwashers (35) then tap auxiliary pump drive gear (38), with bearing support (34), retaining ring (36), bearing (37), and locating ring (39), from housing using a soft mallet. Disassemble if necessary.

o. Remove bearing support screws and lockwashers (41) then tap pump drive gear (45), with locating ring (42), support (40), retaining ring (43), bearing (44), and locating ring (46), from housing using a soft mallet. Disassemble if necessary.

p. Open front bearing snap ring (101, figure 5-40) using spreading type snap ring pliers as shown in figure 5-41, then pry reverse and 2nd clutch assembly from converter housing (see figure 5-42). Disassemble reverse and 2nd clutch if necessary (para. 5-61).

q. Remove converter housing sleeve (25, figure 5-35) using a hook-type hammer puller.

r. Straighten tabs on lockplate (49, figure 5-36) from screws (48) then remove screws (48) and lockplate (49).

s. Remove screws (54) and lockwashers (55).

t. Remove idler gear assembly (50) with retaining plate (47), reverse idler gear (51), idler shaft (52), and pin (53).

u. Remove forward shaft pilot bearing (94, figure 5-40) from turbine shaft assembly (56, figure 5-36).

v. Spread ears on snap ring (58) and tap turbine shaft assembly (56), with piston ring (59), retaining ring (60), locating washer (61), and shaft bearing (62), from converter housing. Disassemble and remove turbine shaft bearing if necessary (see figure 5-43).

w. Remove screws (64, figure 5-36), lockwashers (65), and stator support (63). Remove hub gear bearing (66), piston ring (67), and expander spring (68) from stator support.

5-59. TRANSMISSION DISASSEMBLY.
Disassemble the transmission as follows:

a. Remove nuts (2, figure 5-40), lockwashers (3), and bearing cap assembly (1) with plug (4) and O-rings (5 and 7).

- b. Remove nuts (9), lockwashers (10), bearing cap (8), and O-ring (12).
- c. Remove flange nut (2, figure 5-44), flange washer (3), and O-ring (4).
- d. Remove screws (6) and lockwashers (7), then remove brake drum (5) and brake flange (1).
- e. Remove return springs (8), shoes and linings (9), actuating lever (12), and roller (13).
- f. Remove screws (15), lockwashers (16), backing plate assembly (14), and spacers (17).
- g. Remove nuts (14, figure 5-40), lockwashers (15), bearing cap (13), Orings (17 and 18), speedo drive gear (19), and oil seal (20).
- h. Remove oil seal (21), tube nut (22), O-ring (23), and speedo drive gear (24).
- i. Remove nuts (26), lockwashers (27), shift rail support (25), and O-ring (29). Be careful not to lose detent ball.
- j. Remove oil seal (30), detent plug (31), mesh lock ball (32), and spring (33).
- k. Remove low clutch, idler shaft, and output shaft rear bearing locating rings (part of items 43, 47, and 59).
- l. Remove screws (35) and lockwashers (36). Pry cover (34) with gasket (39) from transmission case using pry slots provided. Tap low clutch, idler, and output shafts with a soft hammer to prevent cover binding.
- m. Remove piston ring (40), retaining ring (41), and support washer (42). Remove bearing (43).
- n. Remove idler gear assembly (44) with retaining ring (45), support washer (46), and bearing (47). Disassemble if necessary.
- o. Remove shift fork (48) with shift rail (49) and lockscrew (50). Disassemble if necessary.
- p. Remove flange nut (52), washer (53), O-ring (54), and front output flange (51).
- q. Remove nuts (55), lockwashers (56), and disconnect housing assembly. Disassemble disconnect housing assembly if necessary (para. 5-65).

LEGEND FOR FIGURE 5-36

1 DRIVEPLATE ASSEMBLY	24 OIL BAFFLE ASSEMBLY	47 RETAINING PLATE
2 BACKING RING	25 OIL SEAL	48 SCREW
3 SCREW & LOCKWASHER	26 LOCATING RING	49 LOCKPLATE
4 RETAINING RING	27 RETAINING RING	50 IDLER GEAR ASSEMBLY
5 BORE PLUG	28 IDLER GEAR	51 REVERSE IDLER GEAR
6 O-RING	29 BEARING	52 IDLER SHAFT
7 RETAINING RING	30 RETAINING RING	53 PIN
8 IMPELLER COVER	31 LOCATING RING	54 SCREW
9 SCREW & LOCKWASHER	32 IDLER GEAR SHAFT	55 LOCKWASHER
10 O-RING	33 LOCK BALL	56 TURBINE SHAFT ASSEMBLY
11 WASHER	34 BEARING SUPPORT	57 RETAINING RING
12 HUB BEARING	35 SCREW & LOCKWASHER	58 SNAP RING
13 LOCATING RING	36 RETAINING RING	59 PISTON RING
14 TURBINE	37 BEARING	60 RETAINING RING
15 RETAINING RING	38 DRIVE GEAR	61 WASHER
16 RETAINING RING	39 LOCATING RING	62 SHAFT BEARING
17 REACTION MEMBER	40 SUPPORT	63 STATOR SUPPORT
18 HUB BEARING SPACER	41 SCREW & LOCKWASHER	64 SCREW
19 IMPELLER	42 LOCATING RING	65 LOCKWASHER
20 HUB GEAR	43 RETAINING RING	66 BEARING
21 SCREW	44 BEARING	67 PISTON RING
22 LOCK TAB	45 DRIVE GEAR	68 EXPANDER SPRING
23 O-RING	46 LOCATING RING	

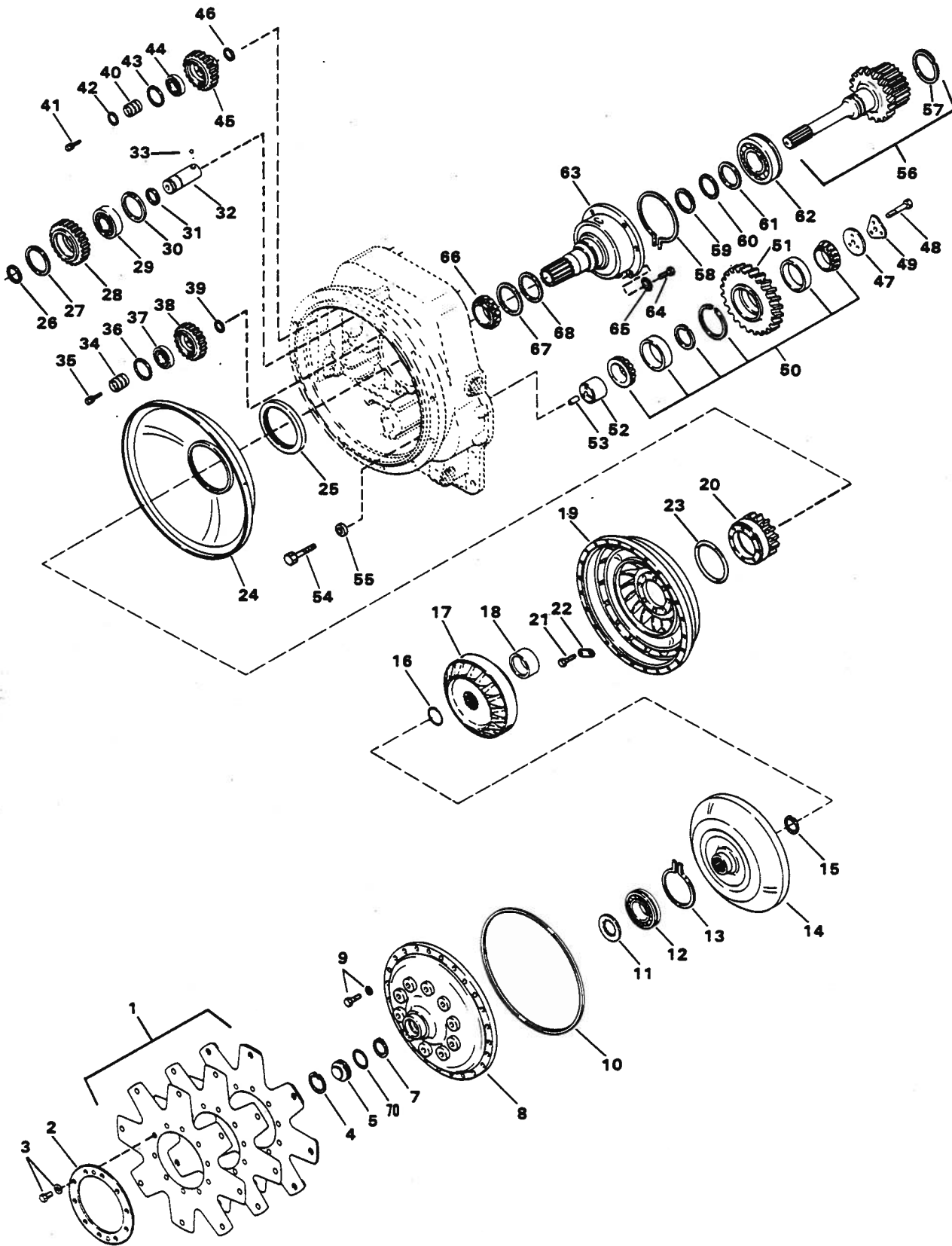


Figure 5-36. Transmission Converter Group

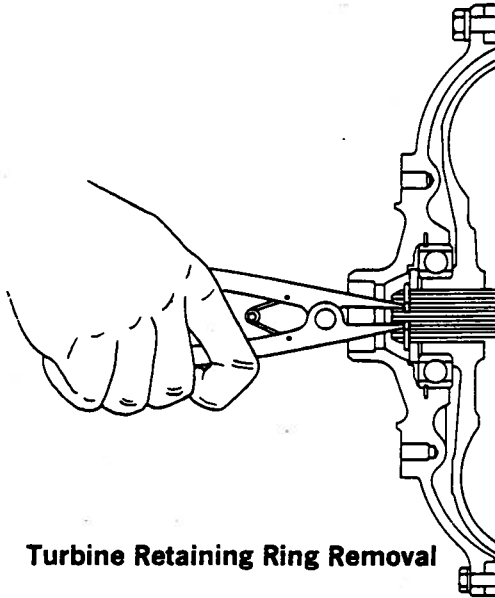


Figure 5-37. Turbine Retaining Ring Removal

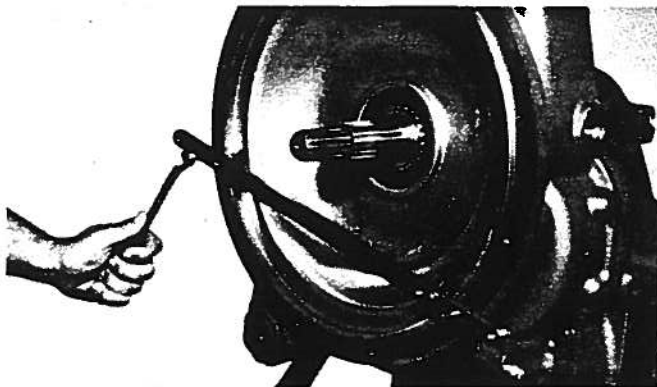


Figure 5-38. Oil Baffle Removal

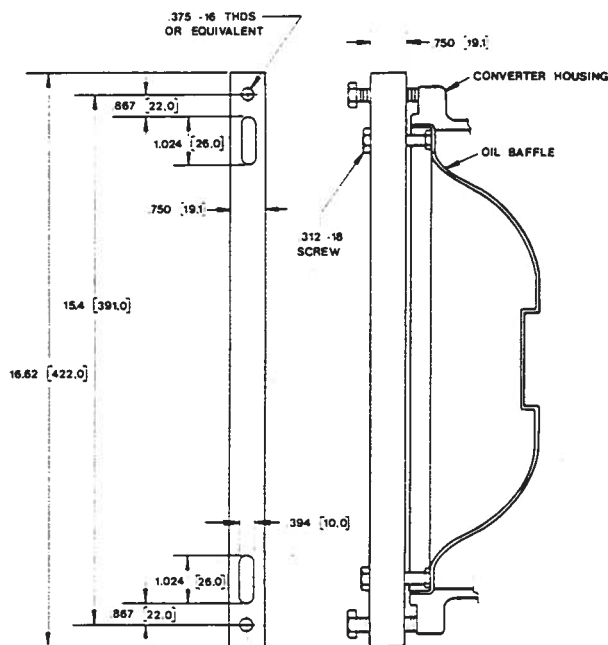


Figure 5-39. Oil Baffle Puller Tool

r. Tap output shaft and bushing assembly (72) to remove output shaft and bushing assembly from housing. Remove output oil seal (58).

s. Remove rear bearing (59), gear thrust washer (60), high range gear (61), high gear bearings (62 and 63), and range shift hub (64). Remove retaining ring (65), front bearing (66), gear thrust washer (67), low range gear (68), low gear bearing (69), bearing spacer (70), and low gear bearing (71) from shaft and bushing assembly (72).

t. Remove oil baffle (74).

u. Remove bearing (75). Remove snap ring (76) and hub assembly (77).

v. Tap low clutch assembly from housing. Disassemble clutch if necessary (para. 5-62).

CAUTION

The low clutch assembly should be supported to prevent it from dropping out of the housing.

w. Compress ears on locating ring (134) and remove ring from groove (see figure 5-45).

x. Contract locating ring (79, figure 5-40) using contracting-type snap ring pliers. Lock pliers to hold ring contracted.

y. From front of transmission, tap 3rd clutch assembly from housing with soft bar and mallet. Remove bearing carrier (80) with pilot bearing (81), disc hub assembly (82), carrier locating ring (79), locating ring (84), disc hub bearing (85), locating ring (86), and retaining ring (87). Disassemble if necessary.

z. Remove 3rd clutch assembly and disassemble if necessary (para. 5-63).

aa. Remove bore plug (88). Remove retaining ring (89) as shown in figure 5-46. Remove forward shaft gear (90, figure 5-40).

bb. Tap forward clutch assembly from forward shaft rear bearing (95) and remove from housing. Disassemble if necessary (para. 5-60). Remove retaining ring (91) then tap piston ring sleeve (92) and bearing (93) from rear of housing.

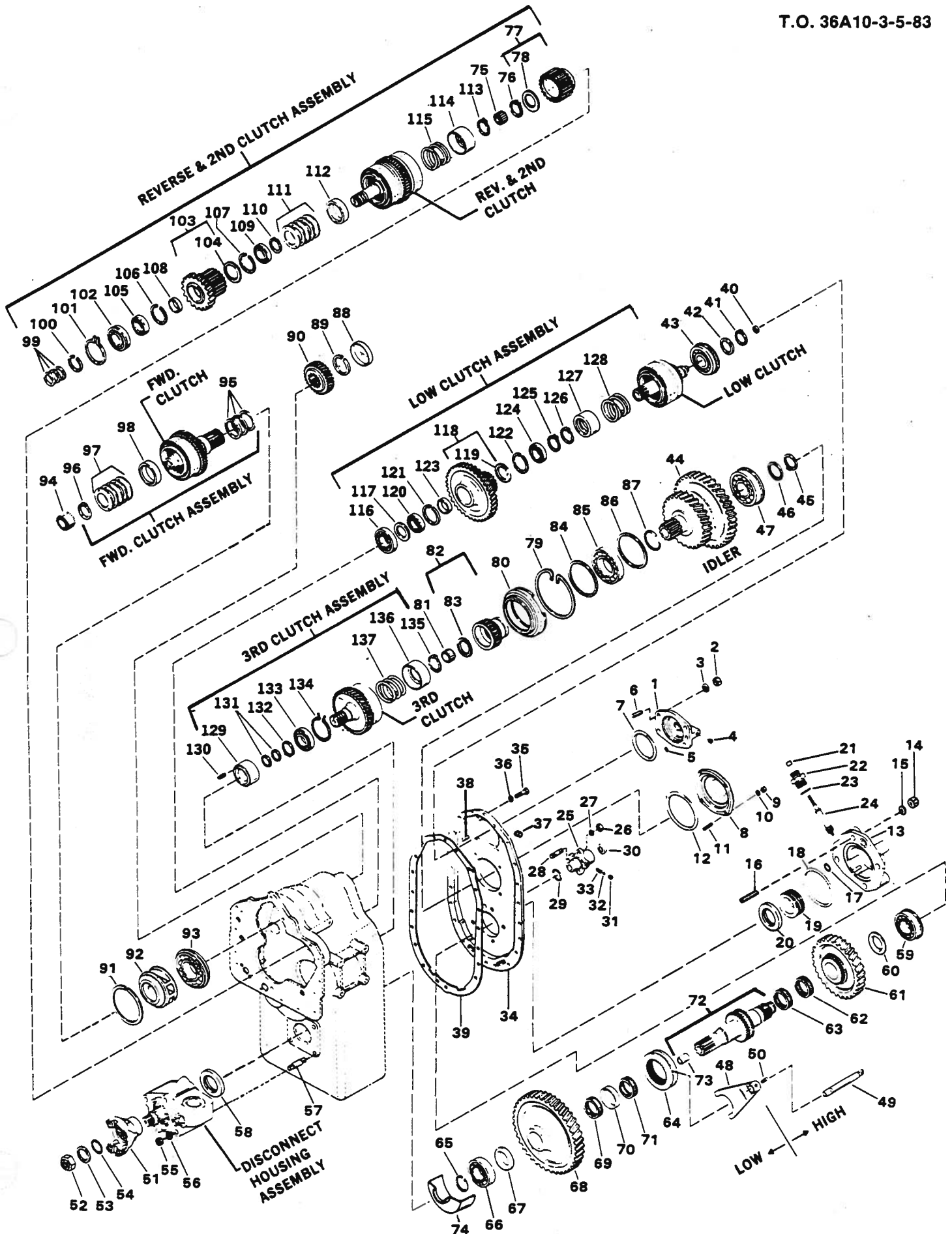


Figure 5-40. Transmission Clutch and Gear Group

LEGEND FOR FIGURE 5-40

1 BEARING CAP ASSEMBLY	47 BEARING	93 BEARING
2 NUT	48 SHIFT FORK	94 PILOT BEARING
3 LOCKWASHER	49 SHIFT RAIL	95 PISTON RING
4 PLUG	50 LOCK SCREW	96 SNAP RING
5 O-RING	51 FRONT OUTPUT FLANGE	97 SPRING
6 STUD	52 NUT	98 SPACER
7 O-RING	53 WASHER	99 PISTON RING
8 BEARING CAP	54 O-RING	100 RETAINING RING
9 NUT	55 NUT	101 SNAP RING
10 LOCKWASHER	56 LOCKWASHER	102 BEARING
11 STUD	57 STUD	103 CLUTCH GEAR ASSEMBLY
12 O-RING	58 OIL SEAL	104 RETAINING RING
13 BEARING CAP	59 BEARING	105 BEARING
14 NUT	60 THRUST WASHER	106 RETAINING RING
15 LOCKWASHER	61 HIGH RANGE GEAR	107 RETAINING RING
16 STUD	62 BEARING	108 SPACER
17 O-RING	63 BEARING	109 BEARING
18 O-RING	64 RANGE SHIFT HUB	110 SNAP RING
19 SPEEDO DRIVE GEAR	65 RETAINING RING	111 SPRING
20 OIL SEAL	66 BEARING	112 SPACER
21 OIL SEAL	67 THRUST WASHER	113 SNAP RING
22 NUT	68 LOW RANGE GEAR	114 RETAINER
23 O-RING	69 BEARING	115 SPRING
24 SPEEDO DRIVE GEAR	70 SPACER	116 BEARING
25 SUPPORT	71 BEARING	117 SPACER
26 NUT	72 SHAFT & BUSHING ASSEMBLY	118 LOW SHAFT GEAR
27 LOCKWASHER	73 BUSHING	119 RETAINING RING
28 STUD	74 OIL BAFFLE	120 BEARING
29 O-RING	75 BEARING	121 LOCATING RING
30 OIL SEAL	76 SNAP RING	122 LOCATING RING
31 DETENT PLUG	77 HUB ASSEMBLY	123 SPACER
32 LOCK BALL	78 RETAINING RING	124 BEARING
33 SPRING	79 LOCATING RING	125 RETAINING RING
34 REAR COVER	80 BEARING CARRIER	126 SNAP RING
35 SCREW	81 PILOT BEARING	127 RETAINER
36 LOCKWASHER	82 DISC HUB ASSEMBLY	128 SPRING
37 PIPE PLUG	83 RETAINING RING	129 OUTER RACE
38 DOWEL PIN	84 LOCATING RING	130 ROLL PIN
39 GASKET	85 HUB BEARING	131 PISTON RING
40 PISTON RING	86 LOCATING RING	132 RETAINING RING
41 RETAINING RING	87 RETAINING RING	133 BEARING
42 WASHER	88 BORE PLUG	134 LOCATING RING
43 BEARING	89 RETAINING RING	135 SNAP RING
44 IDLER GEAR ASSEMBLY	90 FORWARD SHAFT GEAR	136 RETAINER
45 RETAINING RING	91 RETAINING RING	137 SPRING
46 WASHER	92 PISTON SLEEVE	

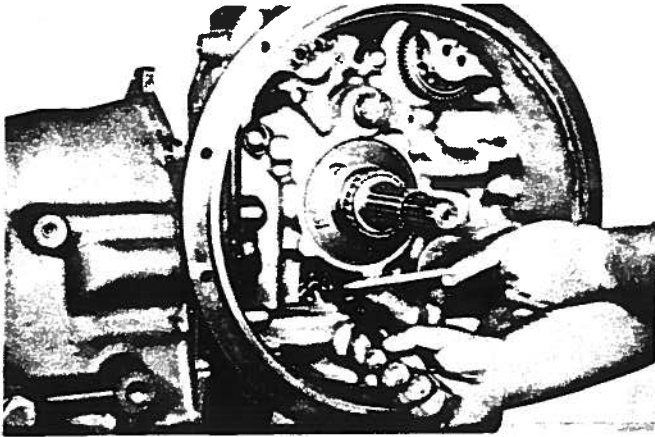


Figure 5-41. Front Bearing Snap Ring Removal

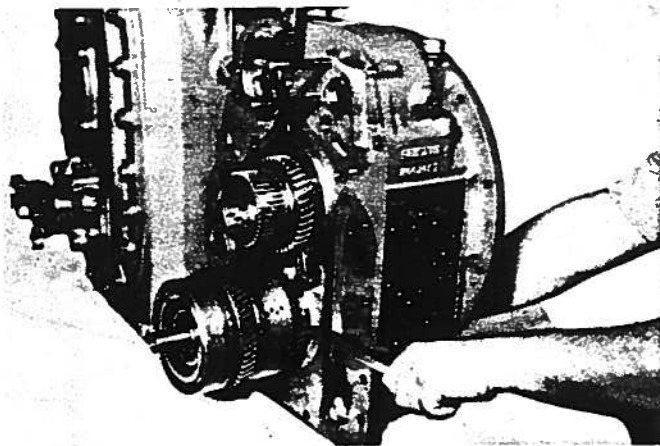


Figure 5-42. Reverse and 2nd Clutch Removal

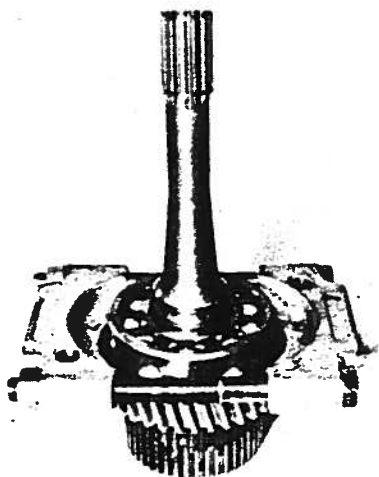


Figure 5-43. Bearing Removal Procedure

5-60. FORWARD CLUTCH ASSEMBLY. Disassemble the forward clutch assembly as follows:

- a. Remove piston rings (95, figure 5-40).
- b. Remove snap ring (1, figure 5-47), backing plate (2), inner discs (3), and outer discs (4).
- c. Remove snap ring (96, figure 5-40), return spring (97), and spring spacer (98) using a pipe sleeve.

NOTE

Sleeve is a common pipe with a 1-1/2" x 1" opening. The pipe is 6" x 3-1/4" x 2-3/4".

- d. Remove clutch piston (5, figure 5-47), outer seal (6), and inner seal (7) from shaft and drum assembly (8).

5-61. REVERSE AND 2ND CLUTCH ASSEMBLY. Disassemble the reverse and 2nd clutch assembly as follows:

- a. Remove piston rings (99, figure 5-40) retaining ring (100), snap ring (101), and front bearing (102). Use gear puller.

- b. Remove gear assembly (103) with bearing (105) and retaining rings (106 and 107). Disassemble if necessary.

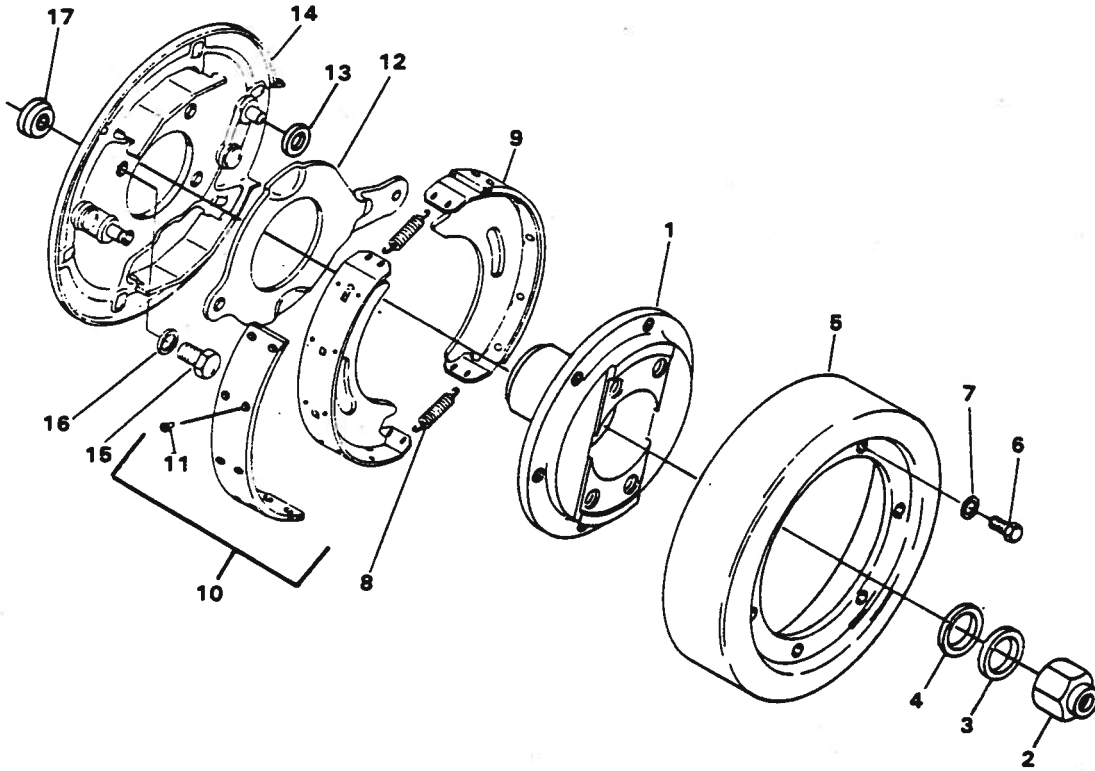
- c. Remove bearing spacer (108) and bearing (109).

- d. Remove snap ring (9, figure 5-47), backing plate (10), inner discs (11), and outer discs (12).

- e. Remove snap ring (110, figure 5-40), return springs (111), and spring spacer (112) using a pipe sleeve.

- f. Remove clutch piston (13, figure 5-47), outer seal (14), and inner seal (15) from shaft and drum assembly (16).

- g. Remove snap ring (17), backing plate (18), inner discs (19), and outer discs (20).



LEGEND

- 1 BRAKE FLANGE
- 2 NUT
- 3 WASHER
- 4 O-RING
- 5 BRAKE DRUM
- 6 SCREW
- 7 LOCKWASHER
- 8 SPRING
- 9 SHOE AND LINING
- 10 LINING
- 11 RIVET
- 12 ACTUATING LEVER
- 13 ROLLER
- 14 BACKING PLATE ASSEMBLY
- 15 SCREW
- 16 LOCKWASHER
- 17 SPACER

Figure 5-44. Park Brake Assembly

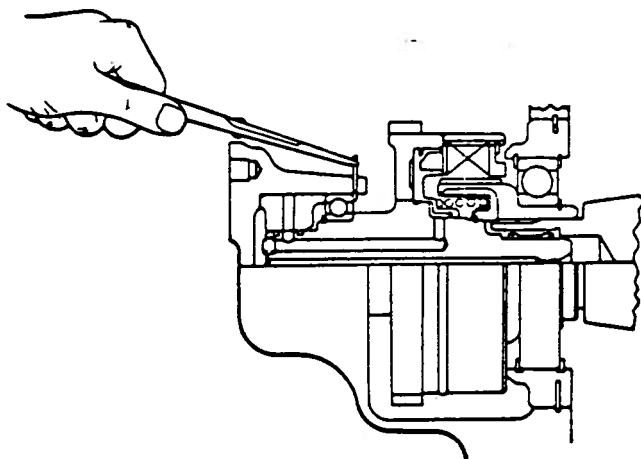


Figure 5-45. Locating Ring Removal

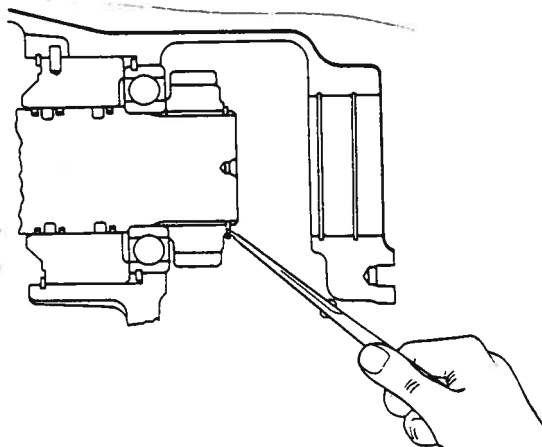


Figure 5-46. Retaining Ring Removal

h. Remove snap ring (113, figure 5-40), spring retainer (114), and return spring (115) using a pipe sleeve.

i. Remove clutch piston (21, figure 5-47), outer seal (22), and inner seal (23).

5-62. LOW CLUTCH ASSEMBLY. Disassemble the low clutch assembly as follows:

a. Remove front bearing (116, figure 5-40), spacer (117), and low shaft gear (118) with bearing (120) and locating rings (121 and 122). Disassemble if necessary.

b. Remove gear spacer (123), bearing (124), and retaining ring (125).

c. Remove snap ring (24, figure 5-47), backing plate (25), inner discs (26), and outer discs (27).

d. Remove snap ring (126, figure 5-40), spring retainer (127), and return spring (128) using a pipe sleeve.

e. Remove clutch piston (28, figure 5-47), outer seal (29), and inner seal (30) from shaft and drum assembly (31).

5-63. 3RD CLUTCH ASSEMBLY. Disassemble the 3rd clutch assembly as follows:

a. Remove outer race (129, figure 5-40), with roll pin (130). Remove piston rings (131), retaining ring (132), front bearing (133), and locating ring (134).

b. Remove snap ring (32, figure 5-47), backing plate (33), inner discs (34), and outer discs (35).

LEGEND FOR FIGURE 5-47

1 SNAP RING	14 OUTER SEAL	27 OUTER DISC
2 BACKING PLATE	15 INNER SEAL	28 CLUTCH PISTON
3 INNER DISC	16 SHAFT & DRUM ASSEMBLY	29 OUTER SEAL
4 OUTER DISC	17 SNAP RING	30 INNER SEAL
5 CLUTCH PISTON	18 BACKING PLATE	31 SHAFT & DRUM ASSEMBLY
6 OUTER SEAL	19 INNER DISC	32 SNAP RING
7 INNER SEAL	20 OUTER DISC	33 BACKING PLATE
8 SHAFT & DRUM ASSEMBLY	21 CLUTCH PISTON	34 INNER DISC
9 SNAP RING	22 OUTER SEAL	35 OUTER DISC
10 BACKING PLATE	23 INNER SEAL	36 CLUTCH PISTON
11 INNER DISC	24 SNAP RING	37 OUTER SEAL
12 OUTER DISC	25 BACKING PLATE	38 INNER SEAL
13 CLUTCH PISTON	26 INNER DISC	39 SHAFT & DRUM ASSEMBLY

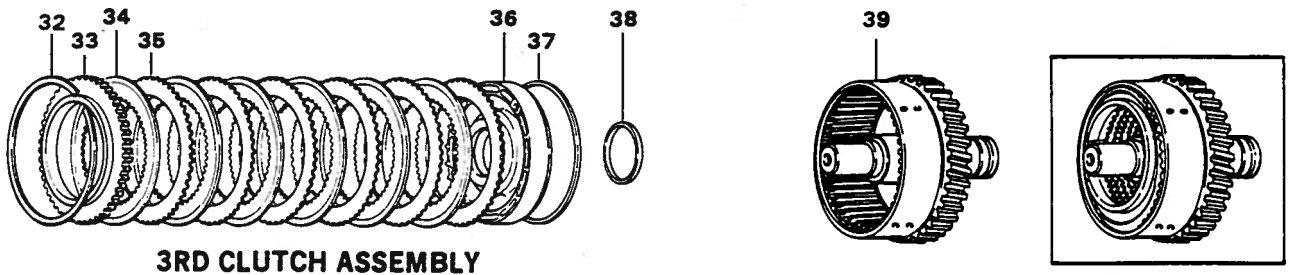
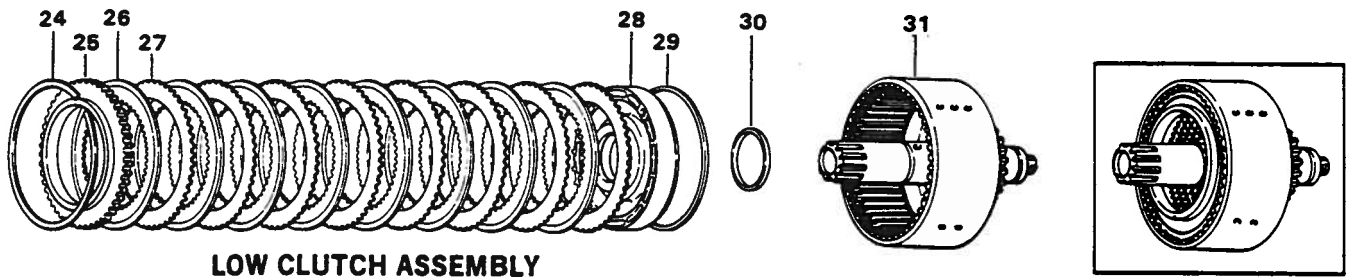
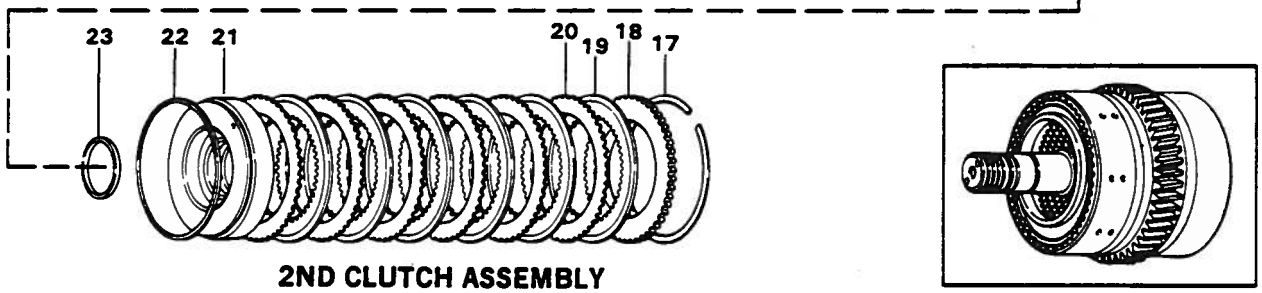
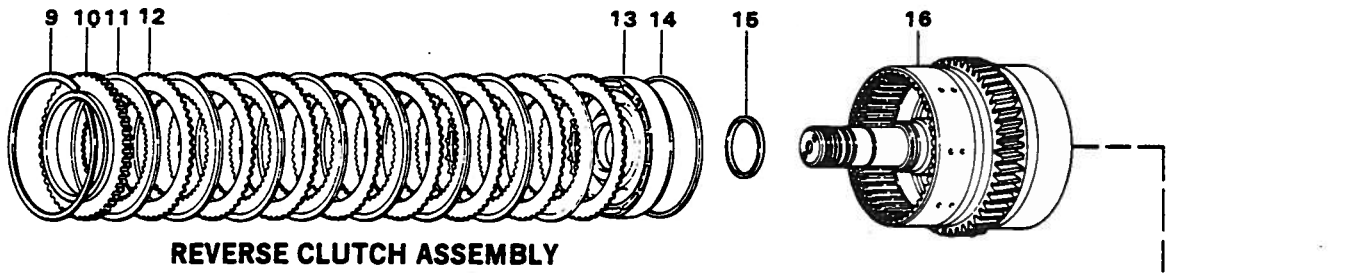
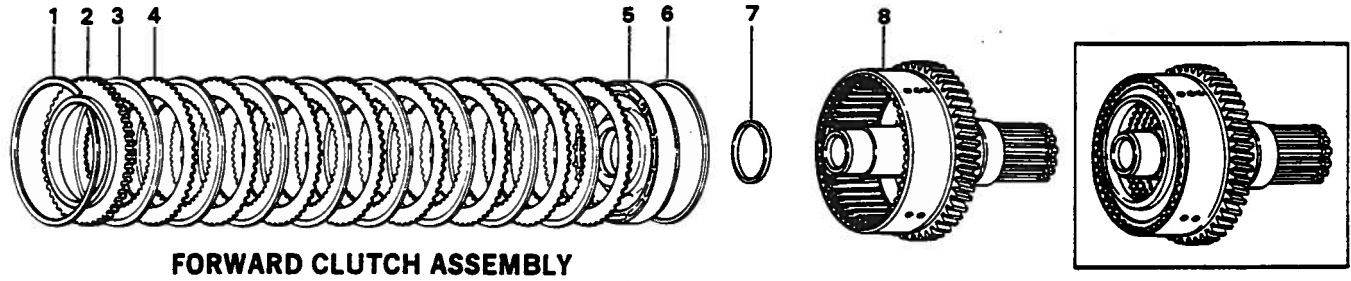


Figure 5-47. Transmission Clutch Assembly

c. Remove snap ring (135, figure 5-40), spring retainer (136), and return spring (137) using a pipe sleeve.

d. Remove clutch piston (36, figure 5-47), outer seal (37), and inner seal (38) from shaft and drum assembly (39).

5-64. CONTROL VALVE ASSEMBLY.
Disassemble the control valve assembly (figure 5-48) as follows:

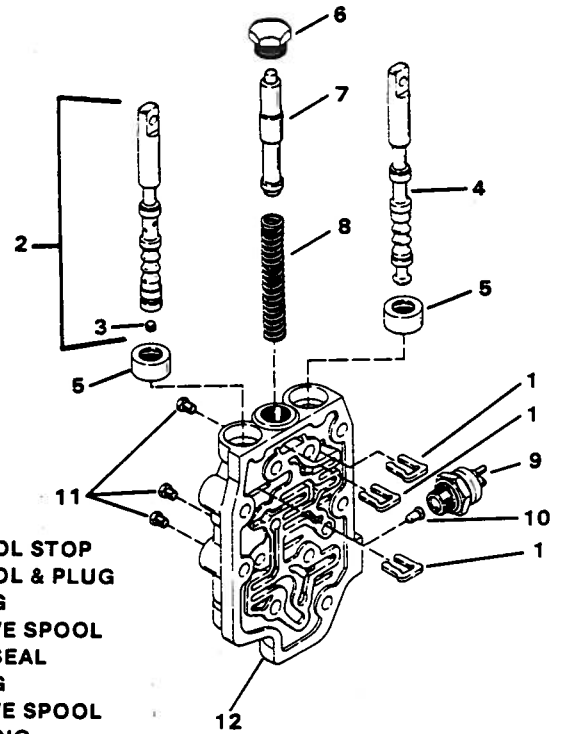
a. Remove spool stops (1) then remove spool and plug (2), valve spool (4), and oil seals (5).

b. Remove plug (6), valve spool (7), and spring (8).

5-65. DISCONNECT HOUSING ASSEMBLY.
Disassemble the axle disconnect housing (figure 5-49) as follows:

a. Remove cap (1) and lockscrew (2).

b. Remove retaining ring (3), bearing (4), retaining ring (5), and disconnect shaft (6).



LEGEND

- 1 SPOOL STOP
- 2 SPOOL & PLUG
- 3 PLUG
- 4 VALVE SPOOL
- 5 OIL SEAL
- 6 PLUG
- 7 VALVE SPOOL
- 8 SPRING
- 9 NEUTRAL SWITCH
- 10 PIN
- 11 PIPE PLUG
- 12 VALVE HOUSING

Figure 5-48. Transmission Control Valve Assembly

LEGEND

- 1 HOUSING PLUG
- 2 LOCK SCREW
- 3 RETAINING RING
- 4 BEARING
- 5 RETAINING RING
- 6 DISCONNECT SHAFT
- 7 PILOT RING
- 8 RETAINING RING
- 9 O-RING
- 10 SHIFT HUB
- 11 SHIFT FORK
- 12 OIL SEAL
- 13 SHIFT RAIL
- 14 DETENT SPRING
- 15 DETENT BALL
- 16 O-RING
- 17 DISCONNECT HOUSING

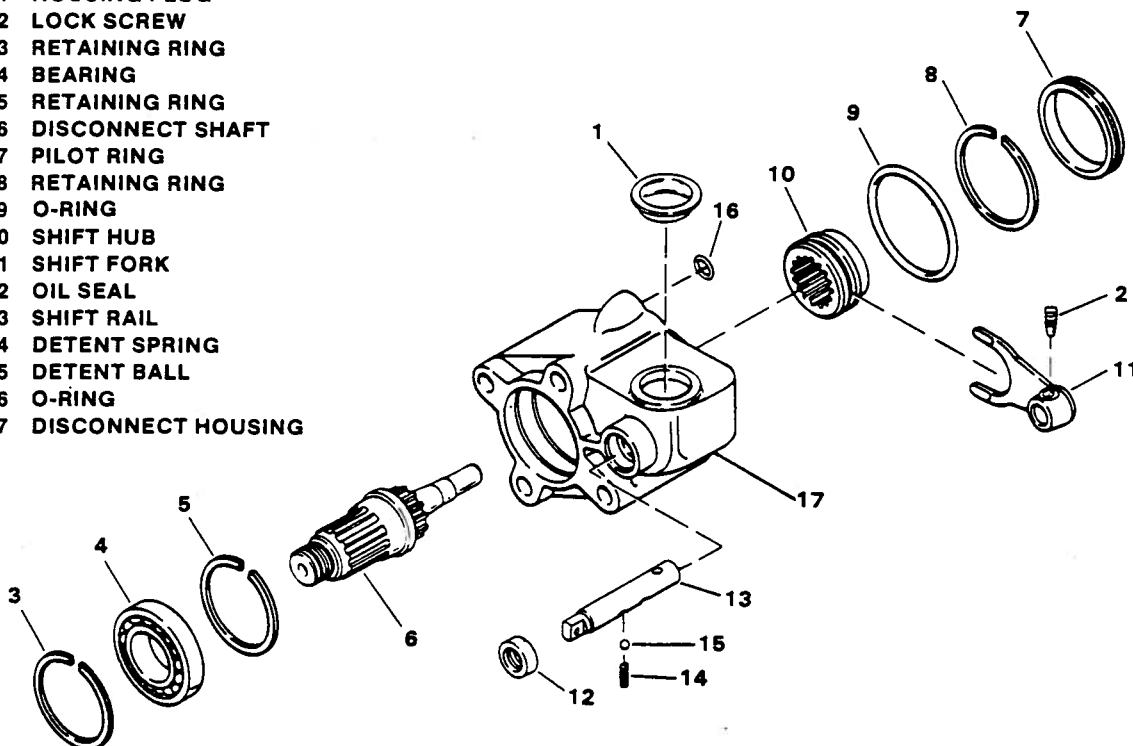


Figure 5-49. Rear Axle Disconnect Assembly

c. Remove pilot ring (7), retaining ring (8), O-ring (9), shift hub (10), and shift fork (11).

d. Remove oil seal (12) and shift rail (13). Be careful not to lose detent spring (14) and detent ball.

5-66. TRANSMISSION SHIFTER INSTALLATION.

5-67. REMOVAL. (See figure 5-50.)

a. Open battery access cover and remove capscrews (2, figure 5-50) and lockwashers (3). Lift out transmission shifter assembly (1).

b. Tag four control cables attached to transmission shifter assembly.

c. Remove cotter pins (3, figure 5-51) securing clevis pins (4) to cable terminals (2). Remove clevis pins (4).

d. Remove four cable terminals (2) from control cables.

e. Remove nuts (8), screws (9), clamps (5) and shims (6) securing cables (not shown). Remove shim (7) from left hand hanger (10) and right hand hanger (11).

5-68. DISASSEMBLY. (See figure 5-51.)

a. Remove screws (12, figure 5-51), left hand hanger (10) and right hand hanger (11).

b. Remove screws (14), splitwashers (15), and spacers (13).

c. Remove knobs (16).

d. Remove screws (19) and washers (20), both ends. Remove housing (17) and plate (18).

e. Remove spacers (22), and retaining rings (23), both sides.

f. Remove actuators (24) and spacers (31) from shaft (21).

g. Remove spring pins (26 and 33) and handles (25, 32, and 34). Remove ball (27), spring (28), and slug (29), if necessary.

5-69. DRIVE LINES.

5-70. REMOVAL. (See figure 5-52.)

a. Remove capscrews (2, figure 5-52) securing front drive line (1) to transmission flange and front axle flange.

b. Remove capscrews (12) securing rear drive line (11) to transmission flange and rear axle flange.

5-71. DISASSEMBLY. (See figure 5-52.)

a. Remove capscrews (3, figure 5-52) and lockwashers (4). Separate wing bearing (5) from slip yoke (7).

b. Remove capscrews (3) and lockwashers (4) to separate wing bearing (6) from yoke and tube (9).

CAUTION

Do not damage spline end of yoke and tube (9) when removing from slip yoke (7).

c. Loosen dust cap and seals (8). Remove yoke and tube (9) from slip yoke (7).

d. Remove dust cap and seals (8) from slip yoke (7).

e. Remove lubrication fitting (10).

f. Remove capscrews (13) and lockwashers (14). Separate wing bearing (15) from slip yoke (17).

g. Remove capscrews (13) and lockwashers (14) and separate wing bearing (16) from yoke and tube (19).

CAUTION

Do not damage spline end of yoke and tube (19) when removing from slip yoke (17).

h. Loosen dust cap and seals (18). Remove yoke and tube (19) from slip yoke (17).

LEGEND

- 1 TRANSMISSION SHIFTER ASSEMBLY
- 2 CAPSCREW
- 3 LOCKWASHER
- 4 COVER ASSEMBLY
- 5 NUT
- 6 LOCKWASHER
- 7 FLAT WASHER
- 8 CAPSCREW
- 9 LOCKWASHER
- 10 FLAT WASHER
- 11 WELD STUD
- 12 BARREL BOLT
- 13 WEATHERSTRIP
- 14 SELECTOR VALVE
- 15 CAPSCREW
- 16 LOCKWASHER
- 17 NUT
- 18 LOCKWASHER
- 19 HANDLE

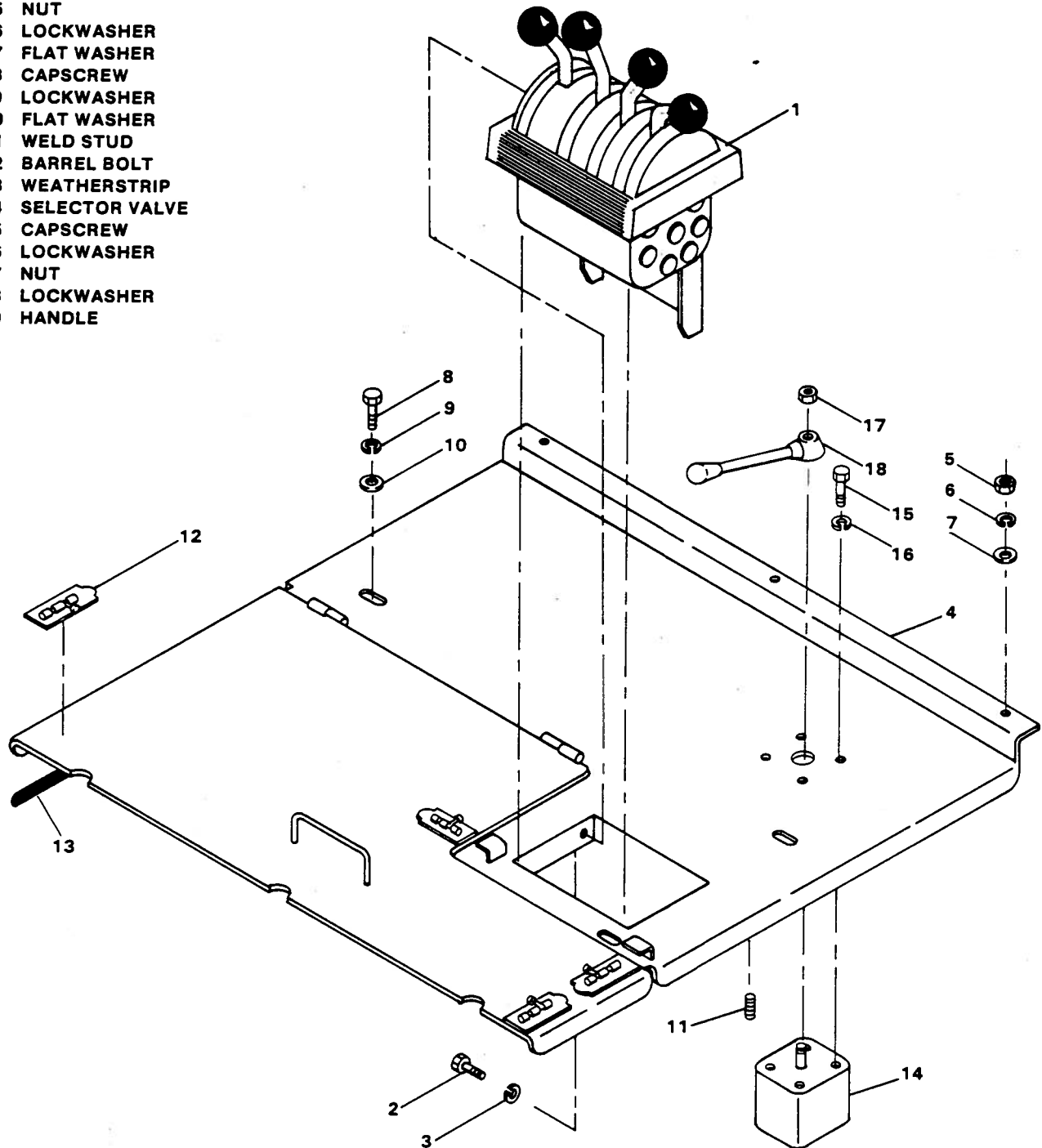


Figure 5-50. Transmission Shifter Installation

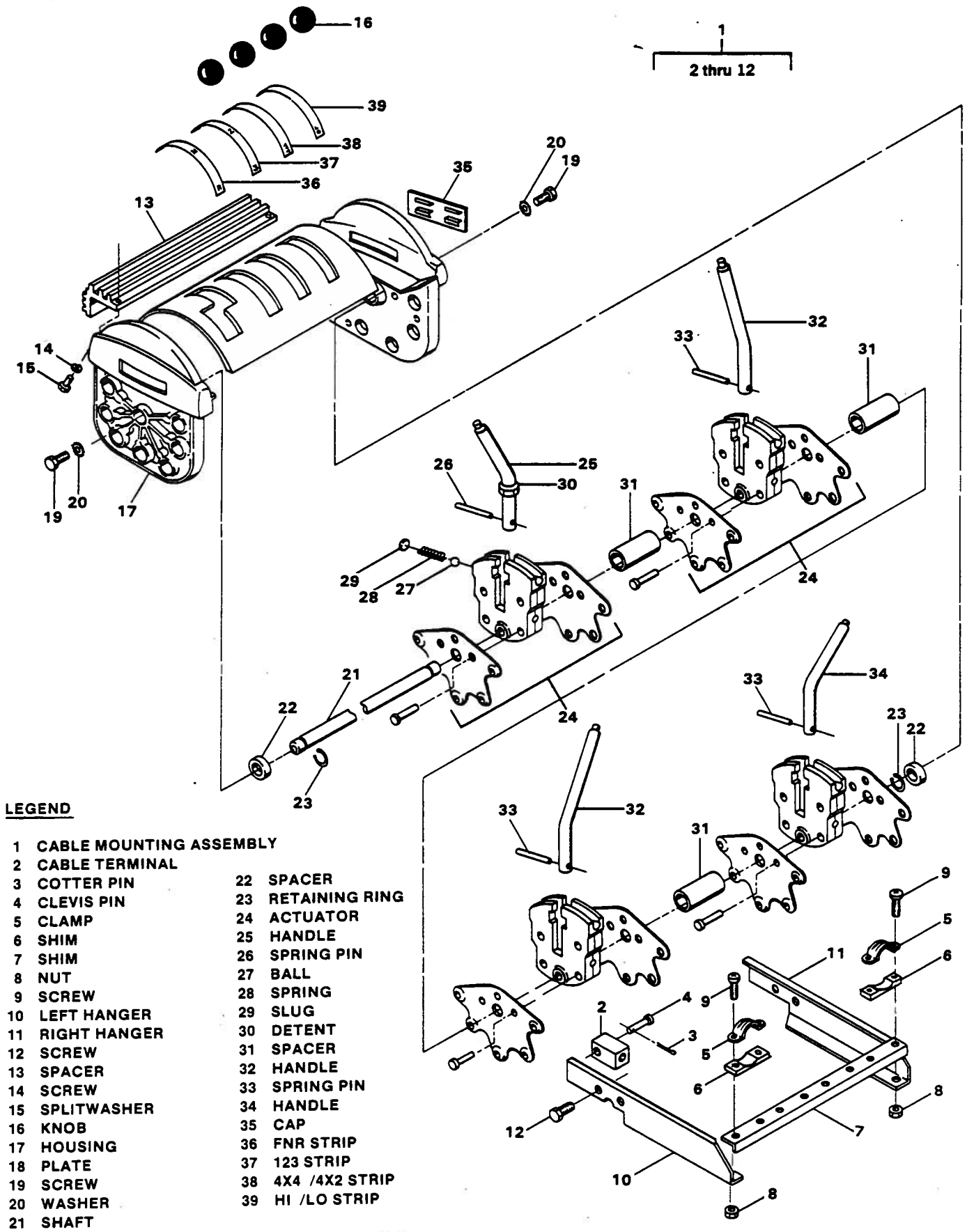


Figure 5-51. Transmission Shifter Assembly

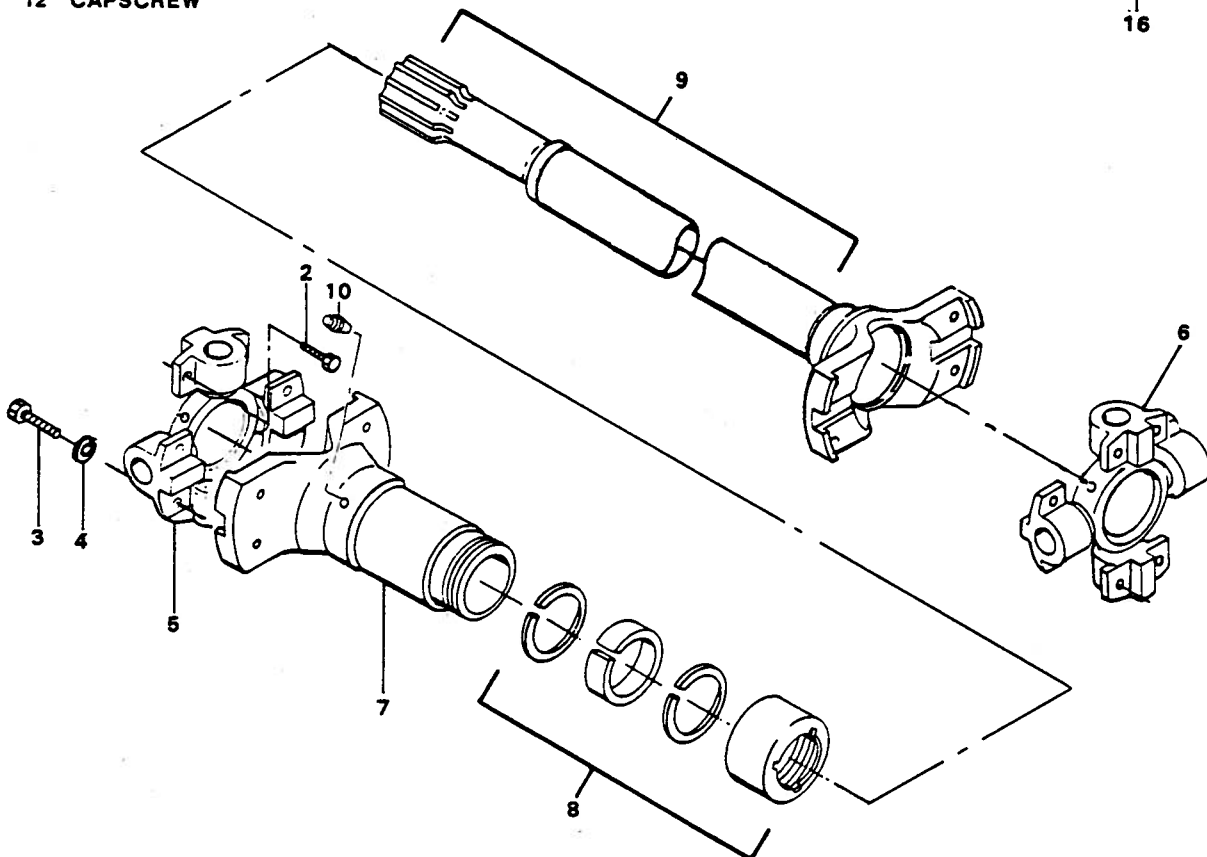
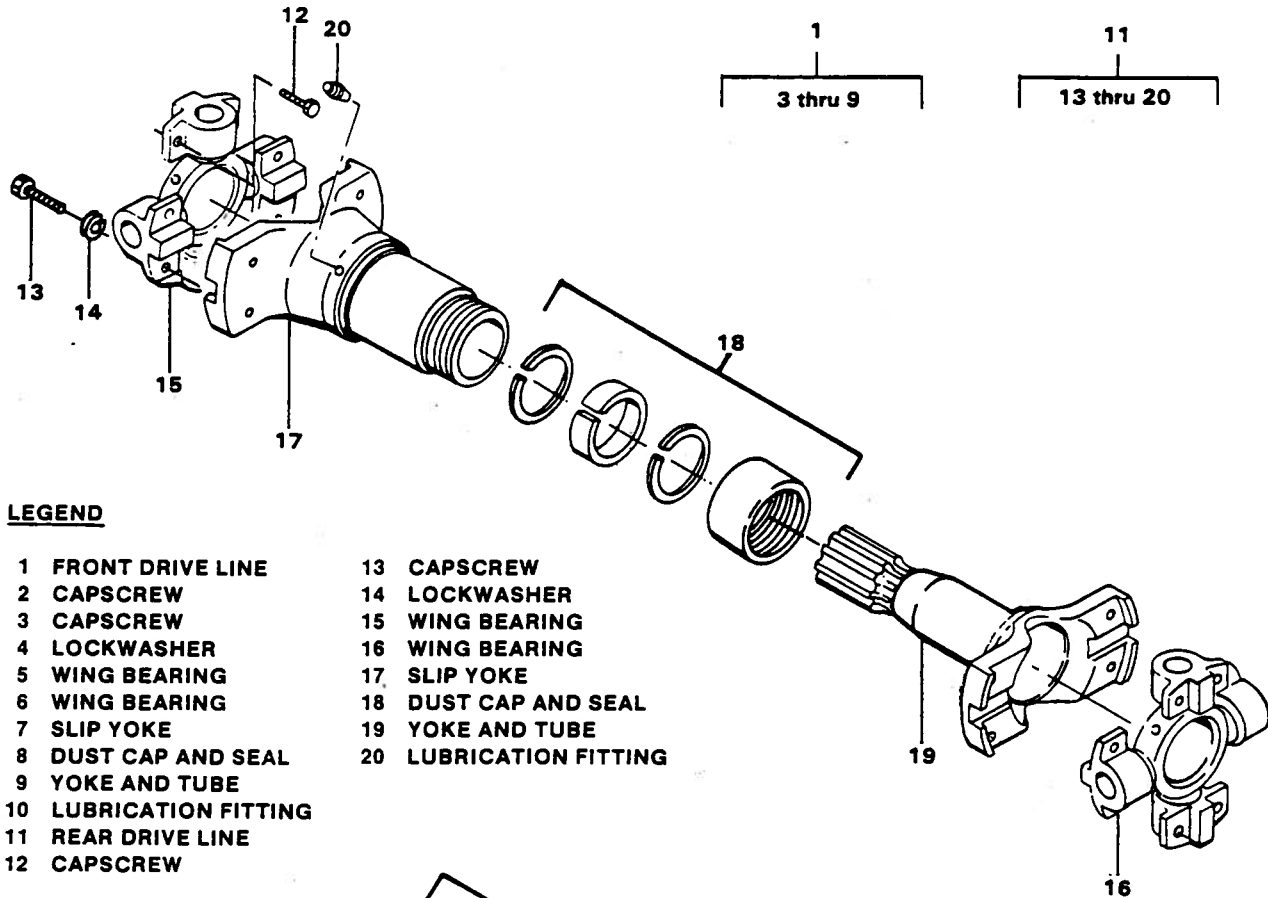


Figure 5-52. Drive Lines Assembly

- i. Remove dust cap and seals (18).
- j. Remove lubrication fitting (20).

5-72. FRONT AND REAR AXLES.

5-73. REMOVAL. (See figure 5-53.)

NOTE

Front and rear axles do not have to be removed for maintenance.

- a. Position jacks under frame. Lift wheels off ground. Place jack stands under frame.
- b. Remove lug nuts (44, figure 5-54), washers (45), and tire and wheel assemblies (not shown).
- c. Disconnect, cap, and tag hydraulic lines to steering cylinders (5, figure 5-53).
- d. Remove cotter pins (6), pins (8), washer (7), and steering cylinders (5).
- e. Remove plug (2, figure 5-55) and drain oil into suitable container. Disconnect brake lines and tag.

WARNING

Each axle assembly (1, figure 5-53) weighs approximately 900 pounds. Use caution when removing axle assemblies.

- f. Position jacks under axle assembly for support.
 - g. Remove hex nuts (2, figure 5-53), washers (3), and capscrews (4). Lower axle on to wheeled dolly and transport to clean work area.
- 5-74. DISASSEMBLY. (See figures 5-54 thru 5-56.)
- a. Remove capscrews (2, figure 5-54) and washer (3) securing spider (1) to hub (22).
 - b. Remove spider (1).
 - c. Remove thrust buttons (5 and 6).

d. Remove setscrews (7) retaining shafts (8). Remove shafts (8), O-rings (9), inner thrust washers (10), pinions (11), and outer thrust washers (12) from spider(1).

e. Remove snap ring (13), gear (14), gear washer (15), lock screws (16), lock plate (17) and nut (18).

f. Remove gear (19), gear hub (20), outer bearing cone (21), and outer bearing cup (23) from hub (22).

g. Remove inner bearing cup (24), inner bearing cone (26) and oil seal (27) from spindle (28).

h. Remove capscrews (29) and washers (30) securing brake assembly (see figure 5-56) and spindle (28, figure 5-54) to steering knuckle (40).

i. Remove bushing (31) and oil seal (32).

CAUTION

Support tie rod and end assembly (43) to prevent its falling.

- j. Remove nuts securing tie rod and end assembly (43).
- k. Remove tie rod and end assembly (43).
- l. Remove grease fitting (34) from upper cap (35). Remove capscrews (37) securing upper cap (35) to steering knuckle (40). Remove shims (38).
- m. Remove capscrews (37) securing lower cap (36) to steering knuckle (40). Remove shims (38).
- n. Remove steering knuckle (40) and universal joint assembly (33).
- o. Refer to para. 5-77 for removal and disassembly of axle differential carrier (figure 5-57).
- p. If necessary remove oil seal (3, figure 5-55), sleeve (4), and bushing (5). Remove king pin bushing (6) and king pin plug (7). Remove filler plug (8) and oil breather (14).

LEGEND

- 1 AXLE ASSEMBLY
- 2 HEX NUT
- 3 WASHER
- 4 CAPSCREW
- 5 STEERING CYLINDER
- 6 COTTER PIN
- 7 WASHER
- 8 PIN

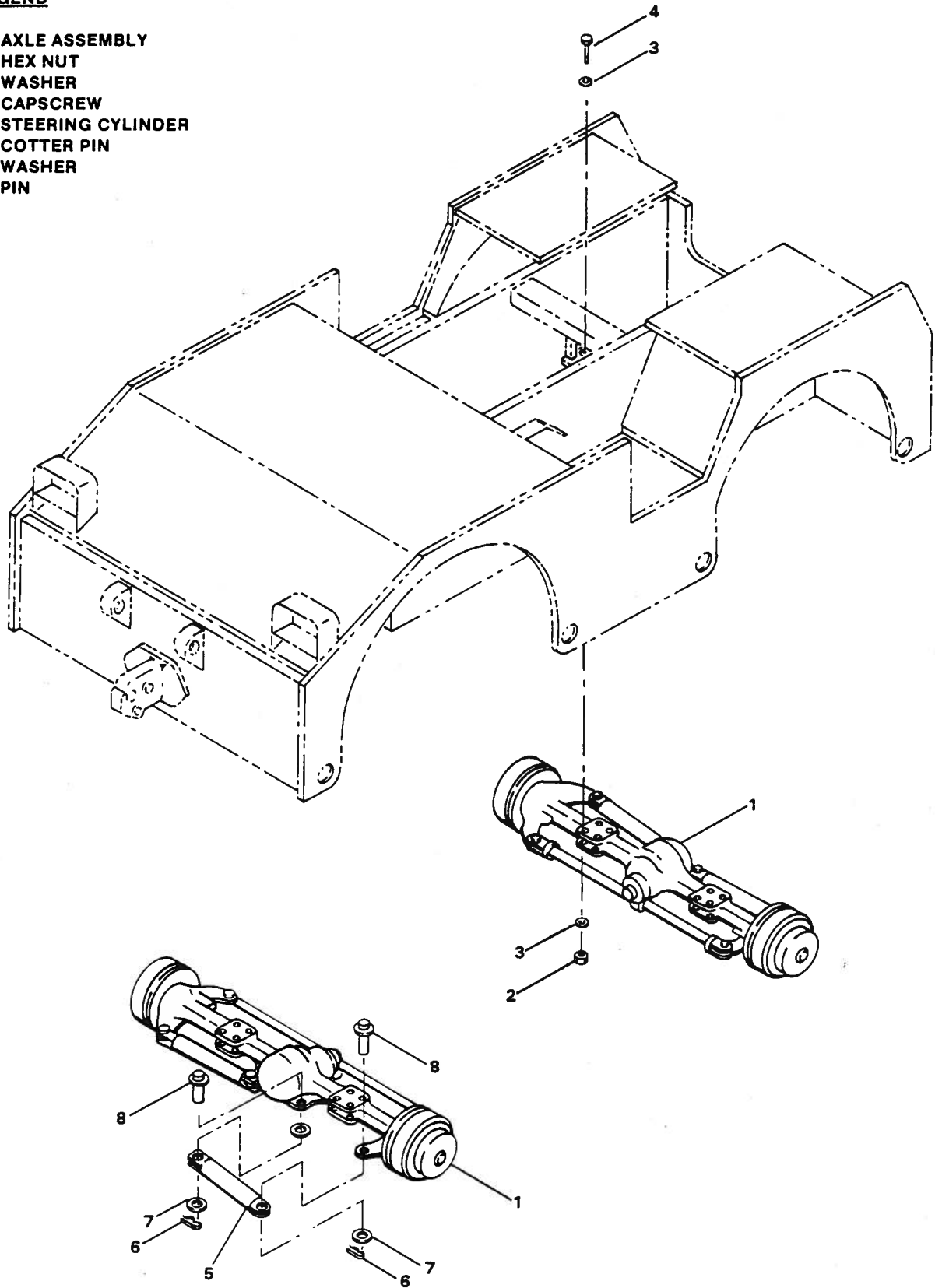


Figure 5-53. Axle and Steer Cylinders Installation

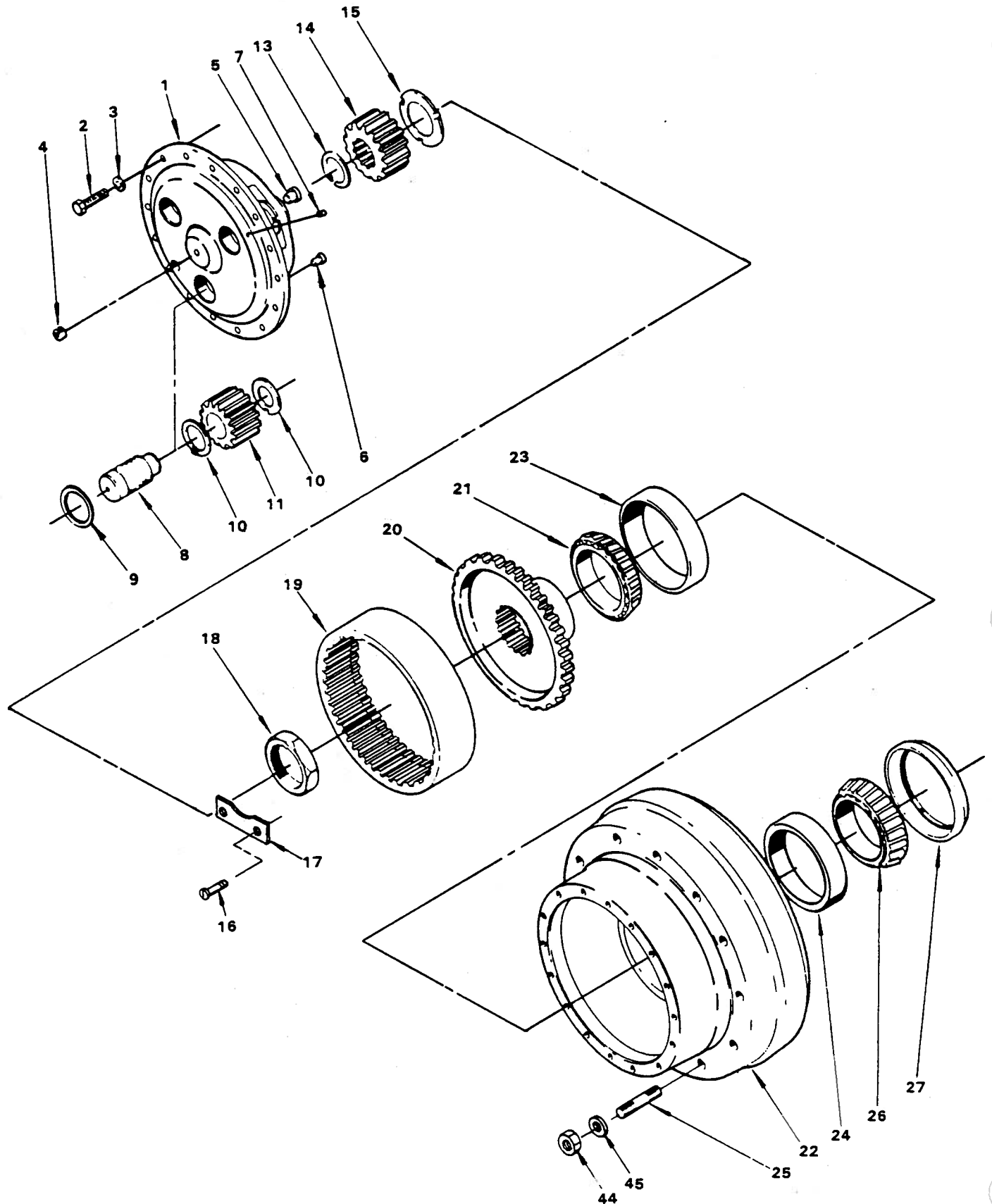


Figure 5-54. Axle Wheel End Parts Assembly (Sheet 1 of 2)

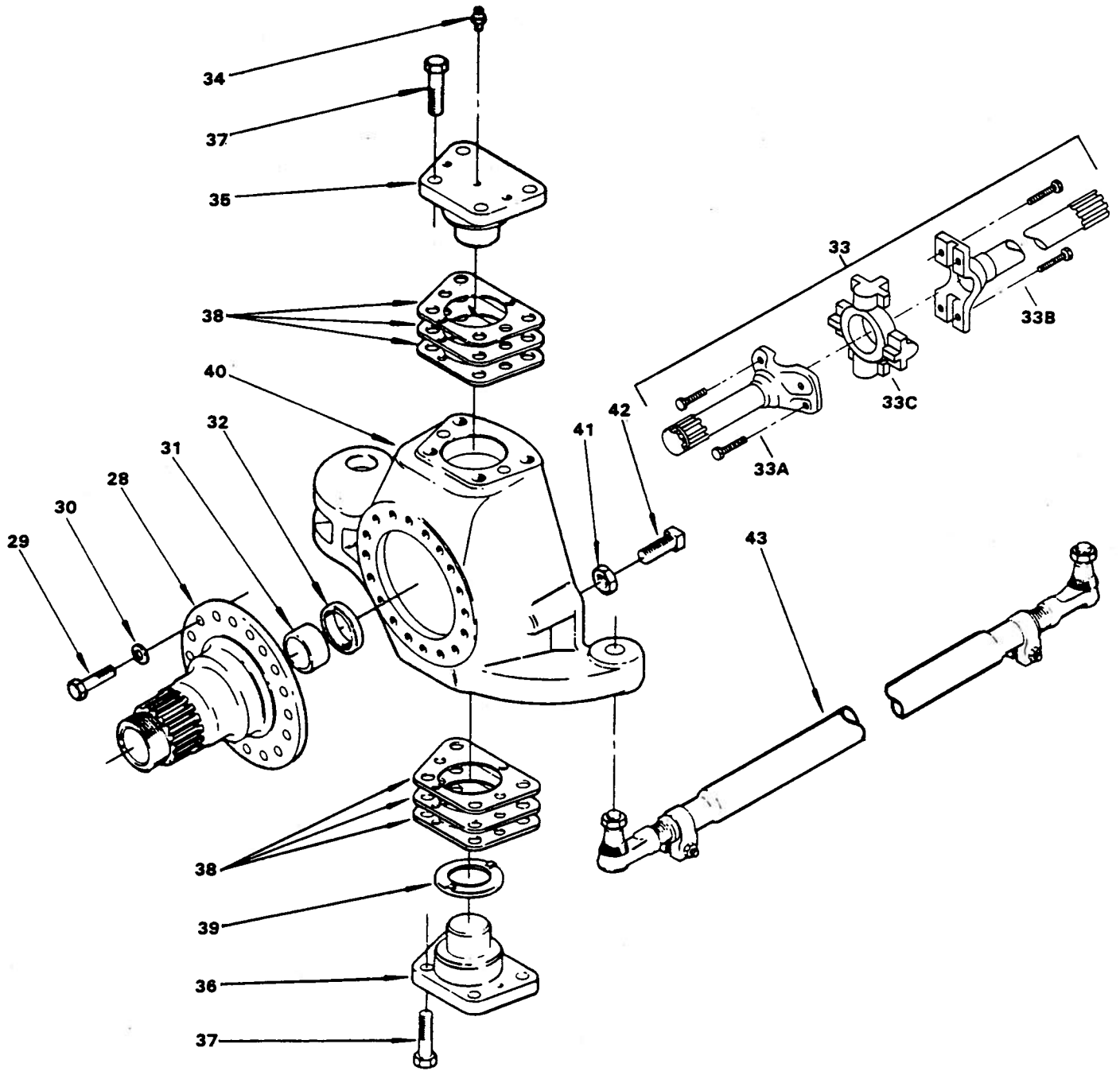


Figure 5-54. Axle Wheel End Parts Assembly (Sheet 2 of 2)

LEGEND FOR FIGURE 5-54

OUTER

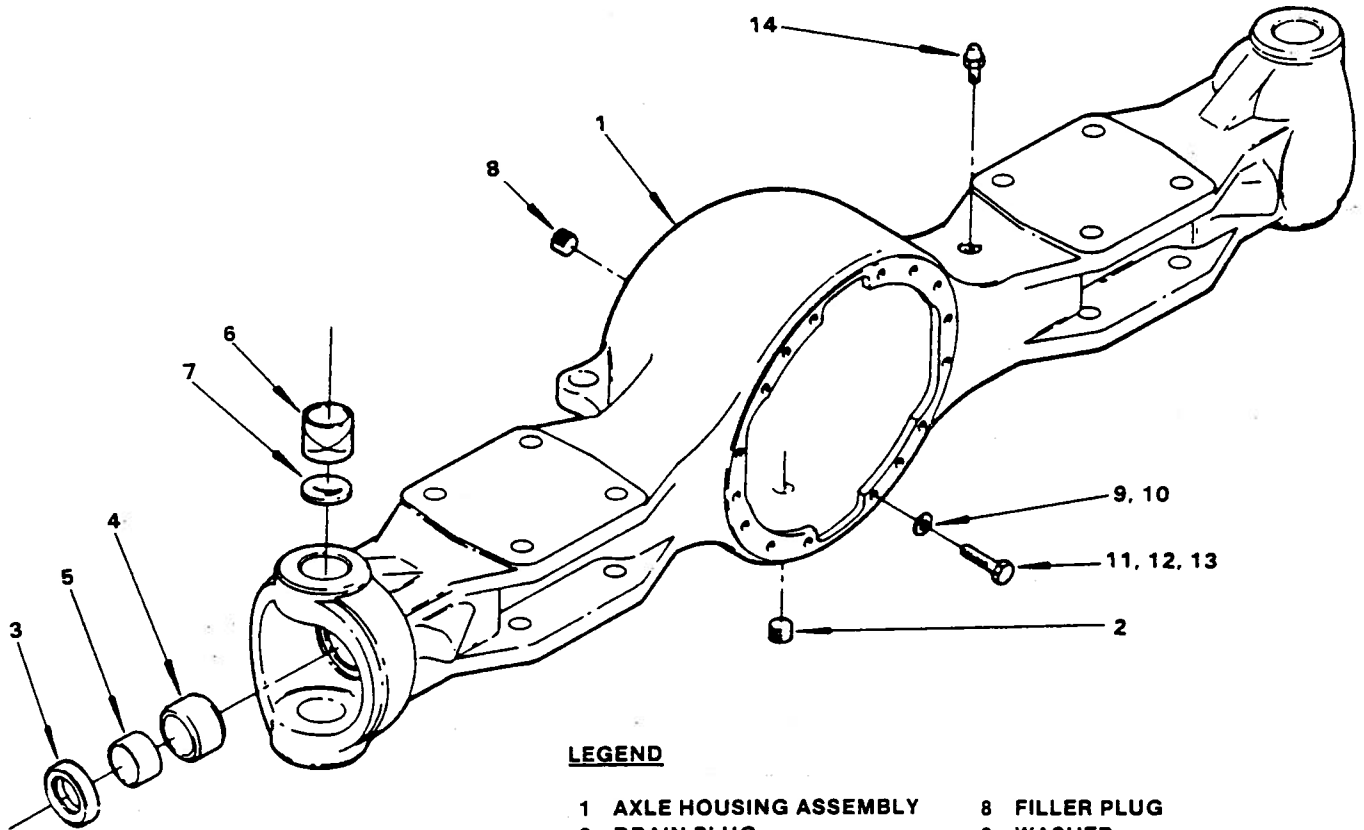
- 1 SPIDER
- 2 CAPSCREW
- 3 WASHER
- 4 OIL LEVEL PLUG
- 5 THRUST BUTTON
- 6 THRUST BUTTON
- 7 SETSCREW
- 8 SHAFT
- 9 O-RING
- 10 INNER THRUST WASHER
- 11 PINION
- 12 OUTER THRUST WASHER
- 13 SNAP RING
- 14 GEAR
- 15 GEAR WASHER
- 16 LOCK SCREW

- 17 LOCK PLATE
- 18 NUT
- 19 GEAR
- 20 GEAR HUB
- 21 OUTER BEARING CONE
- 22 HUB
- 23 OUTER BEARING CUP
- 24 INNER BEARING CUP
- 25 STUD
- 26 INNER BEARING CONE
- 27 OIL SEAL

INNER

- 28 SPINDLE
- 29 CAPSCREW
- 30 WASHER
- 31 BUSHING

- 32 OIL SEAL
- 33 UNIVERSAL JOINT ASSEMBLY
- 33A SHORT SHAFT
- 33B LONG SHAFT
- 33C CENTER PARTS GROUP
- 34 GREASE FITTING
- 35 UPPER CAP
- 36 LOWER CAP
- 37 CAPSCREW
- 38 SHIM
- 39 THRUST WASHER
- 40 STEERING KNUCKLE
- 41 NUT
- 42 STOPSCREW
- 43 TIE ROD & END ASSEMBLY
- 44 LUG NUT
- 45 WASHER



LEGEND

- 1 AXLE HOUSING ASSEMBLY
- 2 DRAIN PLUG
- 3 OIL SEAL
- 4 SLEEVE
- 5 BUSHING
- 6 KING PIN BUSHING
- 7 KING PIN PLUG
- 8 FILLER PLUG
- 9 WASHER
- 10 WASHER
- 11 SHORT CAPSCREW
- 12 MEDIUM CAPSCREW
- 13 LONG CAPSCREW
- 14 OIL BREATHER

Figure 5-55. Axle Housing Assembly

5-75. AXLE BRAKES.

5-76. REMOVAL. (See figure 5-56.)

- a. Remove tire and wheel assembly.
- b. Remove capscrews (2, figure 5-54), washers (3), and spider (1).
- c. Remove snap ring (13), gear (14), gear washer (15), lock screws (16), and lock plate (17).
- d. Remove nut (18), gear (19), gear hub (20), and hub (22).
- e. Remove springs (1 and 2, figure 5-56).

CAUTION

Note the way in which the brake shoes (3) are installed.

- f. Remove cotter pins (20), nuts (4), washers (5), and brake shoes (3).
- g. Disconnect brake line to wheel cylinder (9). Remove tube (8).
- h. Remove capscrews (10), washers (11), and wheel cylinders (9). Remove bleed screw (12) from one wheel cylinder.

LEGEND

- 1 SPRING
- 2 SPRING
- 3 BRAKE SHOE
- 4 NUT
- 5 WASHER
- 6 SPACER
- 7 CAPSCREW
- 8 TUBE
- 9 WHEEL CYLINDER
- 9A SEAL
- 9B CUP

- 10 CAPSCREW
- 11 WASHER
- 12 BLEED SCREW
- 13 PIN
- 14 PIN
- 15 WHEEL
- 16 ADJUSTER
- 17 CLIP
- 18 SCREW
- 19 SPIDER
- 20 COTTER PIN

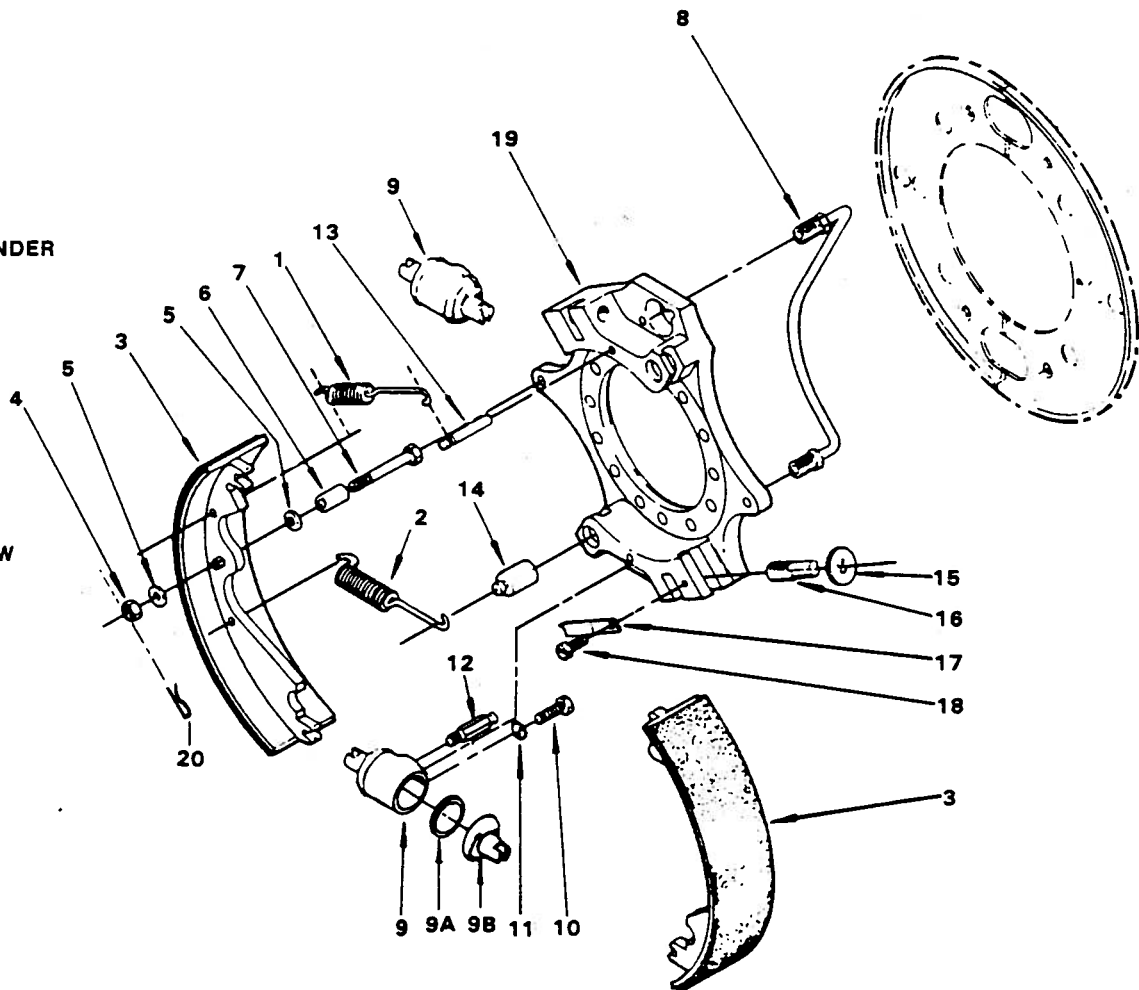


Figure 5-56. Axle Brake Assembly

5-77. AXLE DIFFERENTIAL CARRIER.

5-78. REMOVAL. (See figure 5-55.)

a. Remove plug (2, figure 5-55) and drain oil into a suitable container. Disconnect applicable drive line and remove capscrews (11,12, and 13). Remove differential carrier.

b. Place differential carrier in suitable holding fixture.

5-79. DISASSEMBLY. (See figure 5-57.)

NOTE

If initial inspection indicates that bevel gear (20, figure 5-57) and pinion (26) are not going to be replaced, the established backlash between these two gears should be measured and noted for reference during assembly.

a. Center punch one cap (4, figure 5-57) and carrier and cap leg on carrier (3) to identify in assembly.

b. Remove bolts (5), washers (6), and cotter pin (2).

c. Remove cap (4) and adjusting ring (8).

d. Repeat steps b and c for opposite side.

e. Lift out bevel gear (20) with case (11).

f. Punch mark case (11) and plain half case (12).

g. Remove capscrews (13) and washers (14) and separate halves.

h. Remove spider (17), side gears (16), pinions (19), and thrust washers (15 and 18).

i. If required to replace bevel gear (20), remove bolts (21), washers (23), and nuts (22).

j. Using puller, remove bearing cups (9) and bearing cones (10).

k. Hold yoke/flange (28) with suitable tool and remove nut (27) and washer (30).

l. Remove yoke/flange (28) using suitable puller. Remove deflector (29).

m. Remove capscrews (34).

n. Tap end of pinion (26) with brass mallet to remove pinion (26) and cage (33).

o. Remove shims (39). Use same number and size shims for assembly.

p. Tap pinion (26) out of cage (33) with brass mallet.

q. Remove lock ring (24) and bearing (25) with suitable puller.

r. Remove oil seal (31), bearing cone (32), and bearing cup (35) with suitable puller.

s. Remove spacer (36), thrust washer (37), and bearing cone (38) with suitable puller.

5-80. STEERING CYLINDER

5-81. REMOVAL. (See figure 5-53.)

a. Tag, disconnect, and cap hydraulic lines to steering cylinder.

b. Remove cotter pins (6) and washers (7).

c. Remove pins (8) and steering cylinder (5).

5-82. DISASSEMBLY. (See figure 5-58.)

CAUTION

Disassemble and repair hydraulic components in a clean environment.

a. Locate spanner wrench in holes in cylinder head (1, figure 5-58). Rotate spanner wrench counterclockwise to remove cylinder head (1).

b. Remove rod (2) from barrel (3).

c. Remove locknut (5) and piston (4).

d. Remove and discard seal (6), backup ring (7), and O-ring (8).

e. Remove and discard O-ring (9), backup ring (10), wear ring (11), seal (12), and wiper ring (13).

LEGEND

- 1 PLUG
- 2 COTTER PIN
- 3 CARRIER AND CAP
- 4 CAP
- 5 BOLT
- 6 WASHER
- 7 DOWEL
- 8 ADJUSTING RING
- 9 BEARING CUP
- 10 BEARING CONE
- 11 CASE
- 12 PLAIN HALF CASE
- 13 CAPSCREW

- 14 WASHER
- 15 THRUST WASHER
- 16 SIDE GEAR
- 17 SPIDER
- 18 THRUST WASHER
- 19 PINION
- 20 BEVEL GEAR
- 21 BOLT
- 22 NUT
- 23 WASHER
- 24 LOCK RING
- 25 BEARING
- 26 PINION

- 27 NUT
- 28 YOKE /FLANGE
- 29 DEFLECTOR
- 30 WASHER
- 31 OIL SEAL
- 32 BEARING CONE
- 33 CAGE
- 34 CAPSCREW
- 35 BEARING CUP
- 36 SPACER
- 37 THRUST WASHER
- 38 BEARING CONE
- 39 SHIM

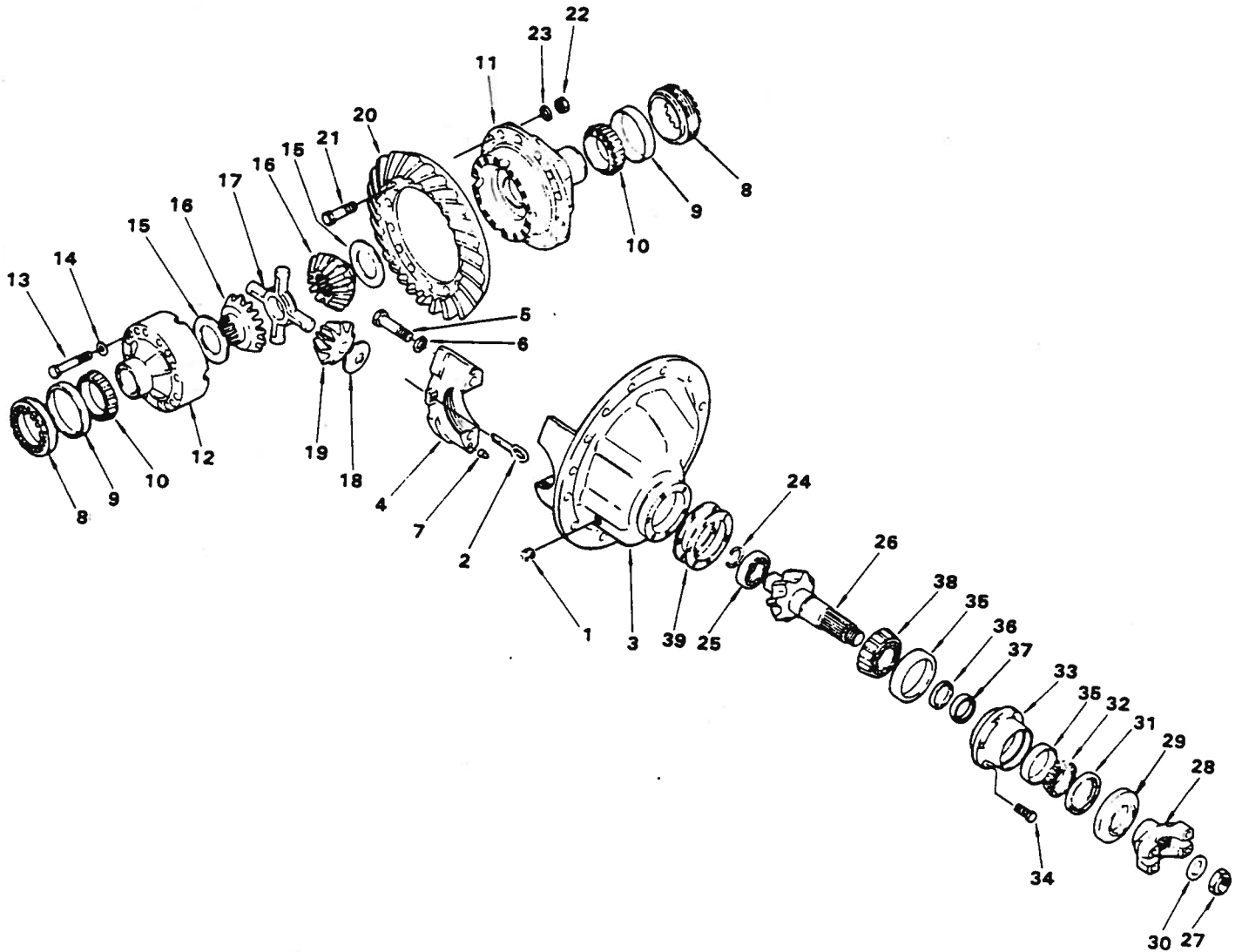
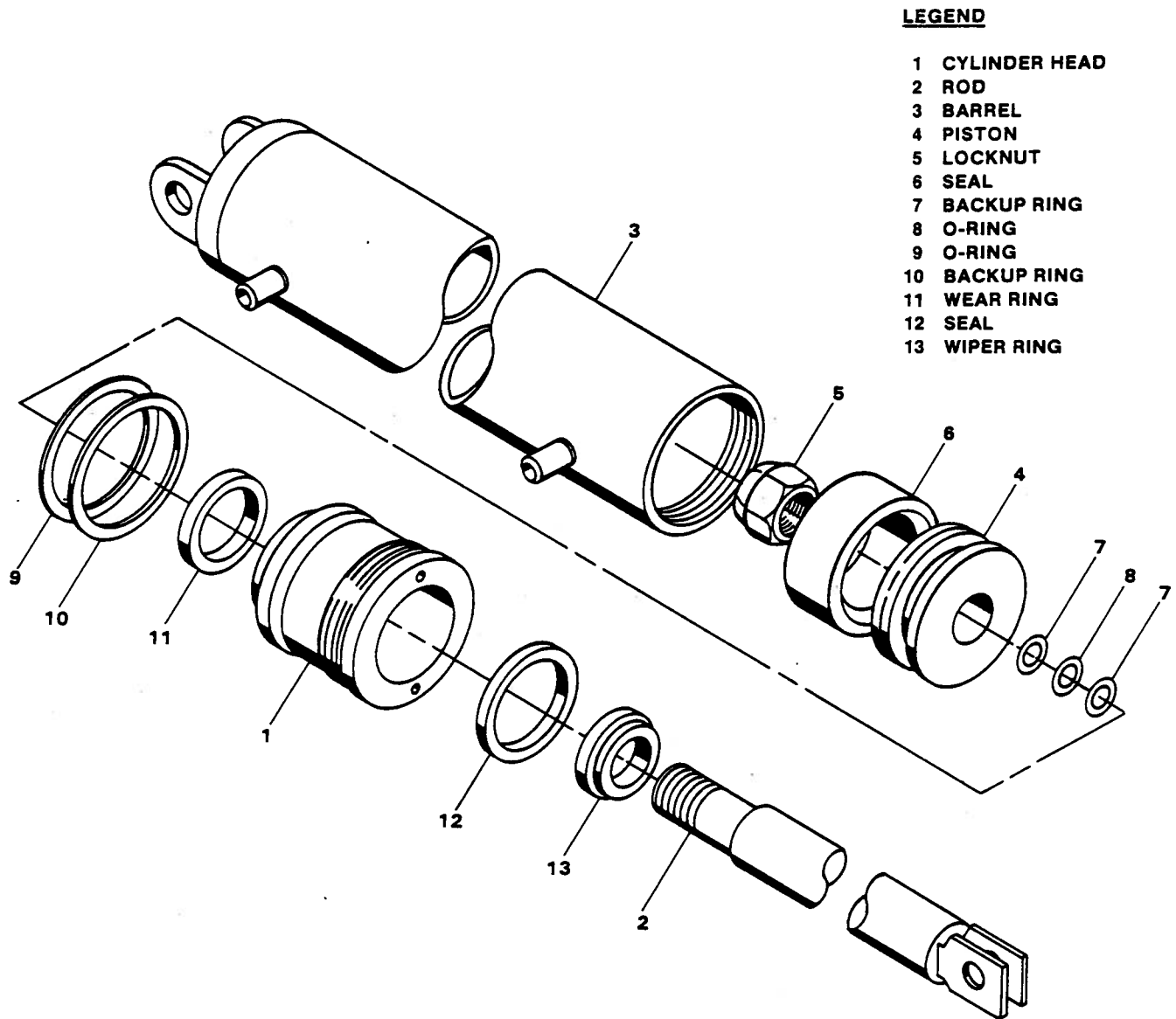


Figure 5-57. Axle Differential Carrier Assembly



- LEGEND**
- 1 CYLINDER HEAD
 - 2 ROD
 - 3 BARREL
 - 4 PISTON
 - 5 LOCKNUT
 - 6 SEAL
 - 7 BACKUP RING
 - 8 O-RING
 - 9 O-RING
 - 10 BACKUP RING
 - 11 WEAR RING
 - 12 SEAL
 - 13 WIPER RING

Figure 5-58. Steer Cylinder Assembly

5-83. BRAKE AND THROTTLE PEDAL.

5-84. REMOVAL. (See figure 5-59.)

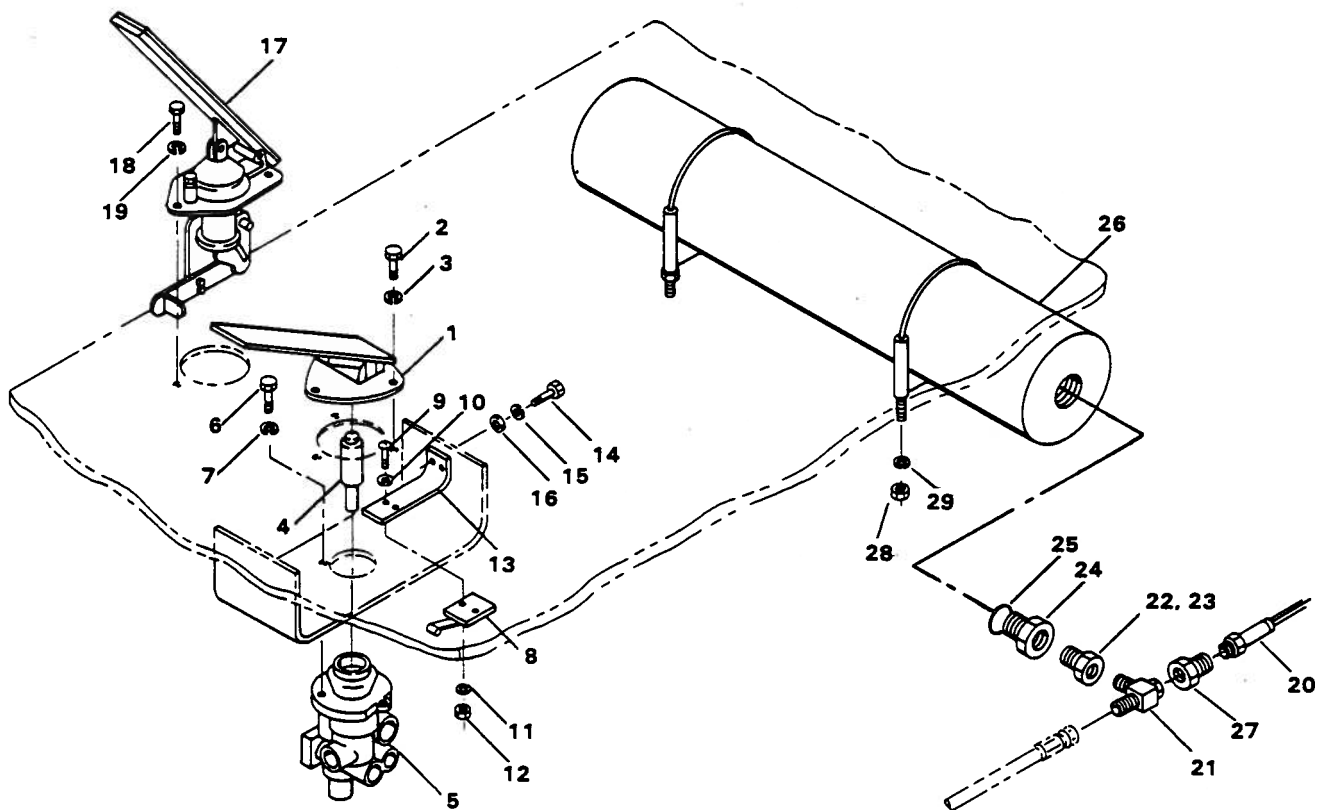
- a. Shut off power at battery disconnect switch.
- b. Remove capscrews (2, figure 5-59), lockwashers (3), and brake pedal (1).
- c. Remove shaft (4).

d. If necessary, tag and disconnect leads to switch (8). Remove screws (9), washers (10), lockwashers (11), nuts (12), and switch (8).

e. Remove cotter pin and clevis pin that secure control cable to accelerator pedal.

f. Remove U-clamp and control cable.

g. Remove capscrews (18), lockwashers (19), and accelerator pedal (17).



LEGEND

- | | |
|-------------------|----------------------|
| 1 BRAKE PEDAL | 16 WASHER |
| 2 CAPSCREW | 17 ACCELERATOR PEDAL |
| 3 LOCKWASHER | 18 CAPSCREW |
| 4 SHAFT | 19 LOCKWASHER |
| 5 BRAKE VALVE | 20 PRESSURE SWITCH |
| 6 CAPSCREW | 21 TEE |
| 7 LOCKWASHER | 22 REDUCER |
| 8 SWITCH | 23 O-RING |
| 9 SCREW | 24 CONNECTOR |
| 10 FLAT WASHER | 25 O-RING |
| 11 LOCKWASHER | 26 ACCUMULATOR |
| 12 NUT | 27 REDUCER |
| 13 MOUNTING ANGLE | 28 NUT |
| 14 CAPSCREW | 29 LOCKWASHER |
| 15 LOCKWASHER | |

Figure 5-59. Brake and Throttle Pedals Installation

5-85. BRAKE VALVE.

5-86. REMOVAL. (See figure 5-59.)

WARNING

Exhaust the pressure in the hydraulic lines by depressing and releasing the brake pedal (approximately 15 cycles).

- a. Shut off power at battery disconnect switch.
- b. Tag and disconnect hydraulic lines to brake valve (5, figure 5-59). Cap ends of hydraulic hoses.
- c. Remove capscrews (6), lockwashers (7), and brake valve (5) with shaft (4).

5-87. DISASSEMBLY. (See figure 5-60.)

- a. Remove ring (2, figure 5-60) and boot (1).
- b. Remove piston (4), shims (5 and 6), spacer (7), and spring (8). Remove O-ring (9) from piston (4).
- c. Remove retaining ring (10), washer (11), and retaining ring (13) securing piston (12) and sleeve (14) to control section (3).
- d. Remove piston (12) and sleeve (14) from valve body. Remove piston from sleeve. Remove O-ring (15) and back-up ring (16) from sleeve (14). Remove cup (17) from piston (12).
- e. Remove spring (18).
- f. Remove plug (20), O-ring (21), and back-up ring (22), seal (23), washer (24), spring (25), and guide (19). Separate guide (19) from plug (20). Remove washer (24) and spring (25) from guide (19). Remove O-ring (21), seal (23), and back-up ring (22) from plug (20).
- g. Remove valve and ball (27) with wooden dowel. Remove O-ring (26).
- h. Remove plug (33), pin (28), and O-ring (29).
- i. Tip control section to remove spring (30), seat (31), and ball (32). Do not drop pieces.
- j. Remove O-ring (29).

k. Remove spool (37), O-ring (34), spring (35), and stop (36). Remove O-ring (34) from plug (37).

l. Tip control section to remove ball (38) and spool (39). Do not drop pieces.

m. Remove insert (40) with point of wooden dowel. Remove O-rings (41 and 42).

n. Depress plug (44) and remove retaining ring (48). Remove plug (44), O-ring (45), spring (47), and stop (46). Remove O-ring (45) from plug (44).

o. Depress plug (44) and remove retaining ring (48) from opposite end of charging section (43). Remove plug (44) and O-ring (45). Remove O-ring (45) from plug (44).

CAUTION

Use extreme care when removing spool (49) and O-ring (50). Spool and O-ring can be guided from charging section (43) by reaching into either large ports on bottom of valve. Do not force spool and O-ring during removal.

p. Remove spool (49) and O-ring (50). Remove O-ring from spool.

q. Remove nut (53) screw (52) and, O-ring (51). Remove O-ring (51) from screw.

r. Remove spring (54), poppet (55), seat (56), O-ring (57), washer (58), and filter (59) with wooden dowel.

s. Remove capscrews (60) and lockwashers (61) from control section of valve body. Remove screw (62) and lockwasher (61) from charging section of valve body.

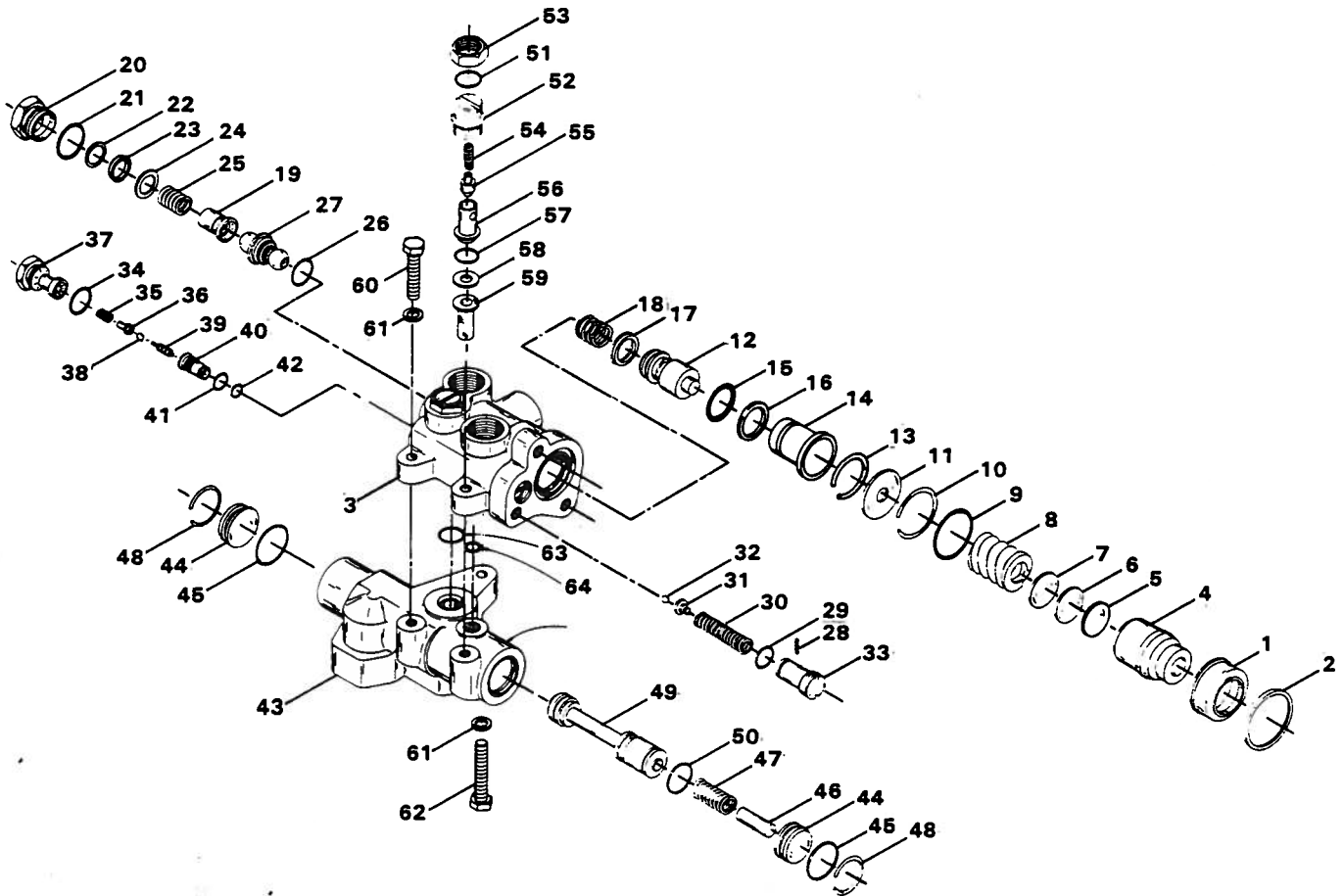
t. Separate two valve body sections and remove O-rings (63 and 64).

5-88. ACCUMULATOR ASSEMBLY

5-89. REMOVAL. (See figure 5-59.)

WARNING

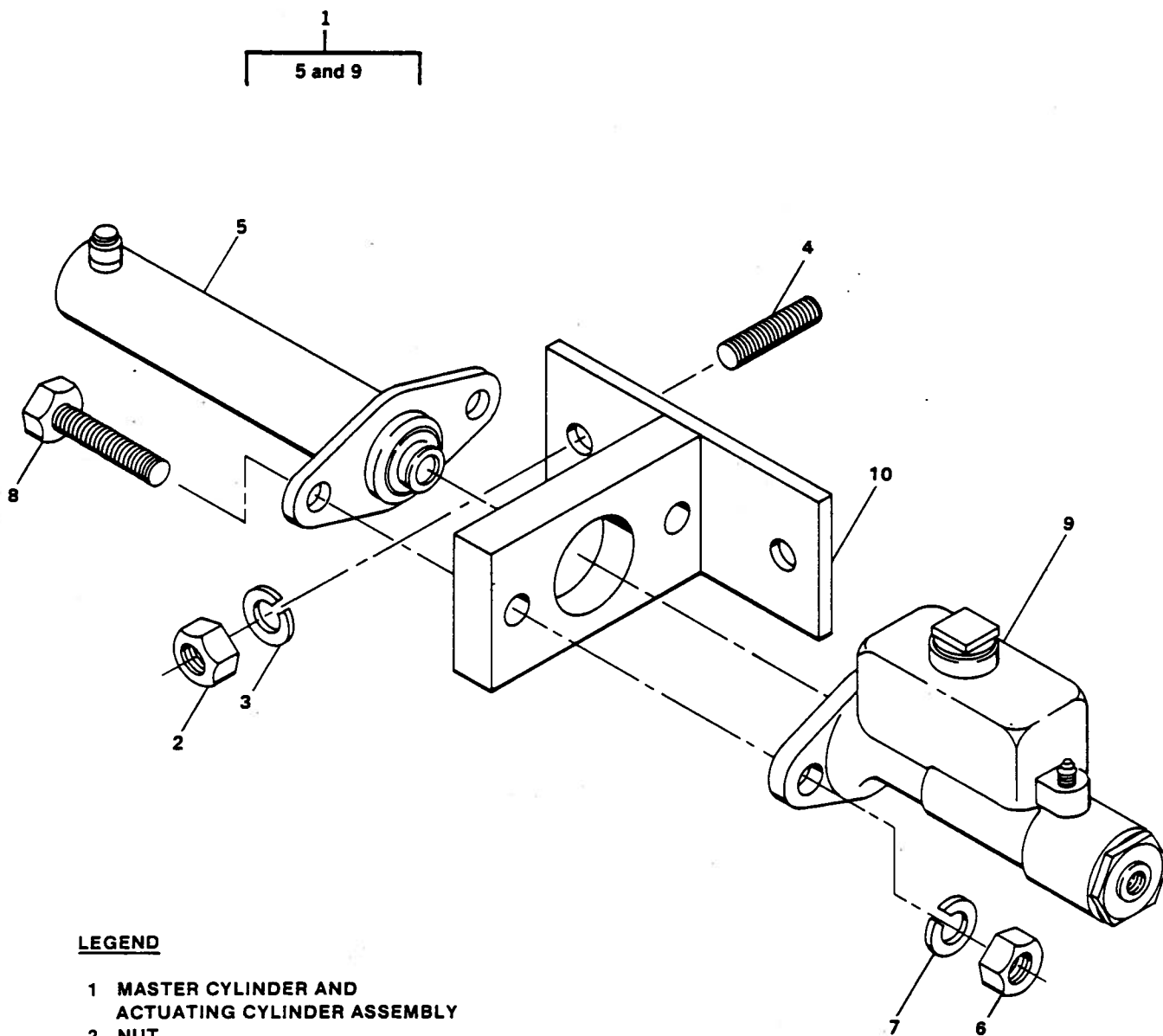
Exhaust the pressure in the hydraulic lines by depressing and releasing the brake pedal (approximately 15 cycles).



LEGEND

- | | | |
|-------------------|---------------------|-------------------|
| 1 BOOT | 23 SEAL | 44 PLUG |
| 2 RING | 24 WASHER | 45 O-RING |
| 3 CONTROL SECTION | 25 SPRING | 46 STOP |
| 4 PISTON | 26 O-RING | 47 SPRING |
| 5 SHIM | 27 VALVE AND BALL | 48 RETAINING RING |
| 6 SHIM | 28 PIN | 49 SPOOL |
| 7 SPACER | 29 O-RING | 50 O-RING |
| 8 SPRING | 30 SPRING | 51 O-RING |
| 9 O-RING | 31 SEAT | 52 SCREW |
| 10 RETAINING RING | 32 BALL | 53 NUT |
| 11 WASHER | 33 PLUG | 54 SPRING |
| 12 PISTON | 34 O-RING | 55 POPPET |
| 13 RETAINING RING | 35 SPRING | 56 SEAT |
| 14 SLEEVE | 36 STOP | 57 O-RING |
| 15 O-RING | 37 PLUG | 58 WASHER |
| 16 BACKUP RING | 38 BALL | 59 FILTER |
| 17 CUP | 39 SPOOL | 60 CAPSCREW |
| 18 SPRING | 40 INSERT | 61 LOCKWASHER |
| 19 GUIDE | 41 O-RING | 62 SCREW |
| 20 PLUG | 42 O-RING | 63 O-RING |
| 21 O-RING | 43 CHARGING SECTION | 64 O-RING |
| 22 BACKUP RING | | |

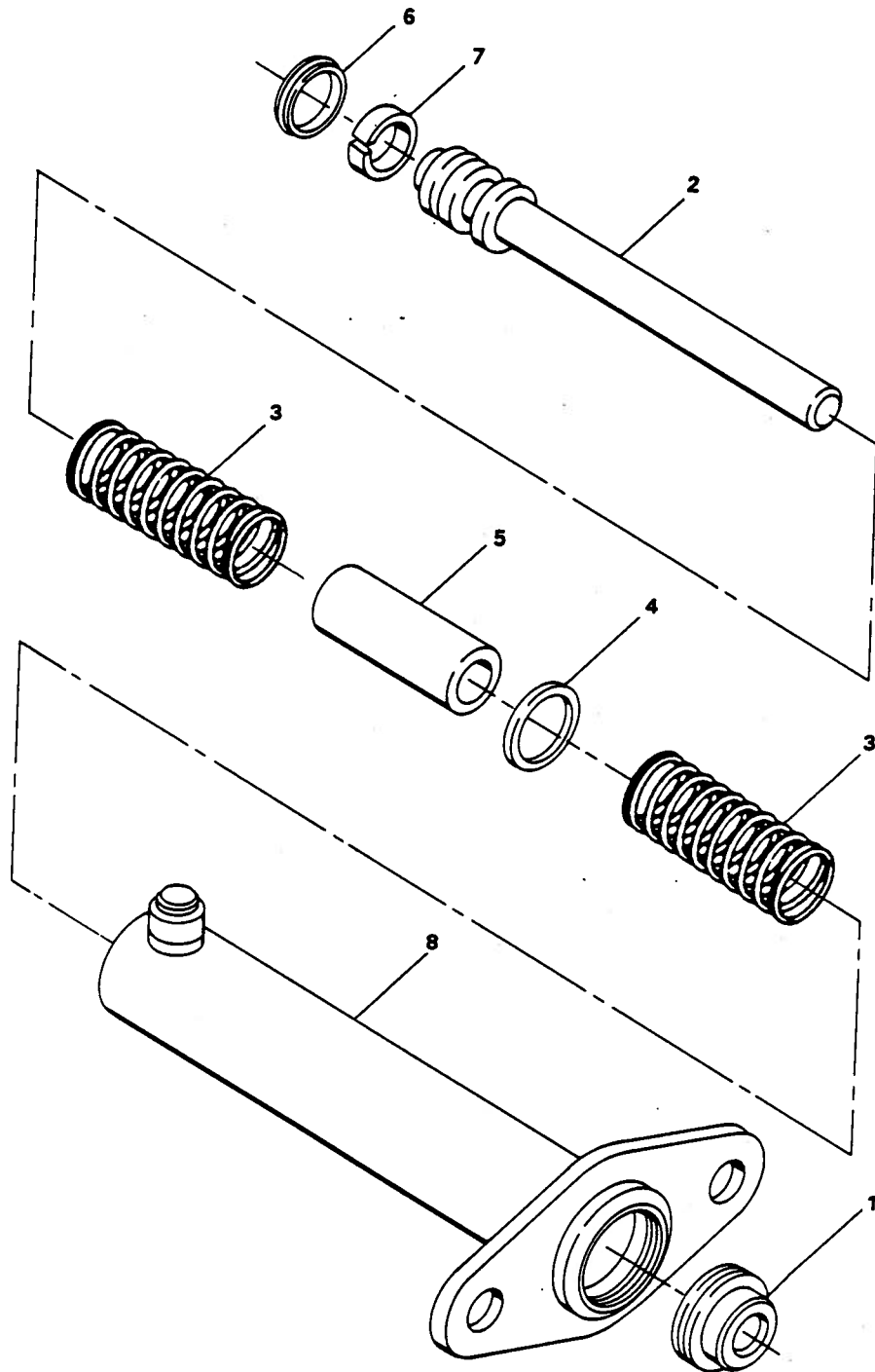
Figure 5-60. Brake Valve Assembly



LEGEND

- 1 MASTER CYLINDER AND ACTUATING CYLINDER ASSEMBLY
- 2 NUT
- 3 LOCKWASHER
- 4 STUD
- 5 ACTUATING CYLINDER
- 6 NUT
- 7 LOCKWASHER
- 8 CAPSCREW
- 9 SILICONE BRAKE SYSTEM MASTER CYLINDER
- 10 BRACKET

Figure 5-62. Silicone Brake System Installation



LEGEND

- 1 HEAD
- 2 ROD
- 3 SPRING
- 4 WASHER
- 5 SPACER
- 6 WEAR RING
- 7 PISTON RING
- 8 BARREL

Figure 5-63. Silicone Brake Actuating Cylinder Assembly

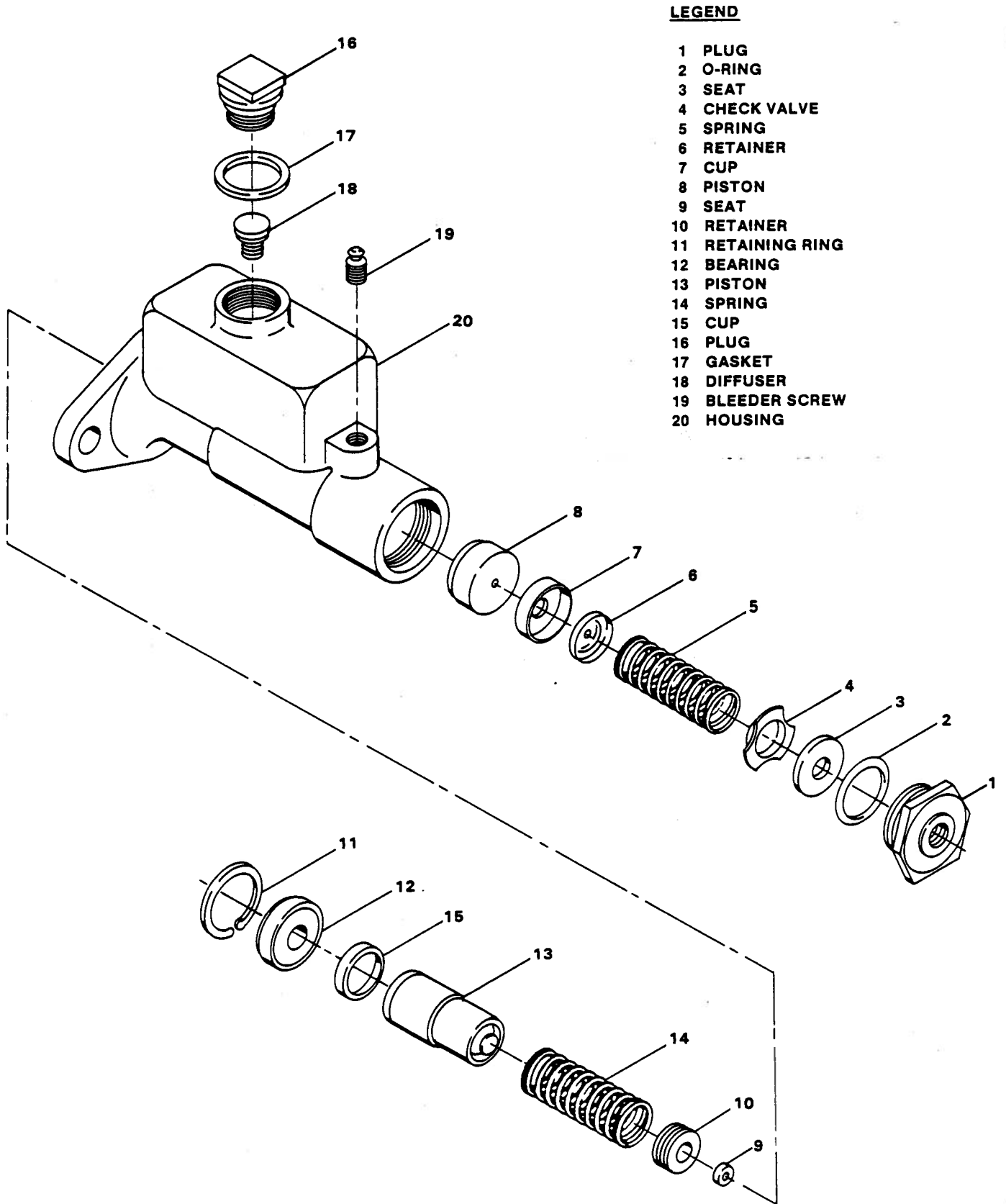
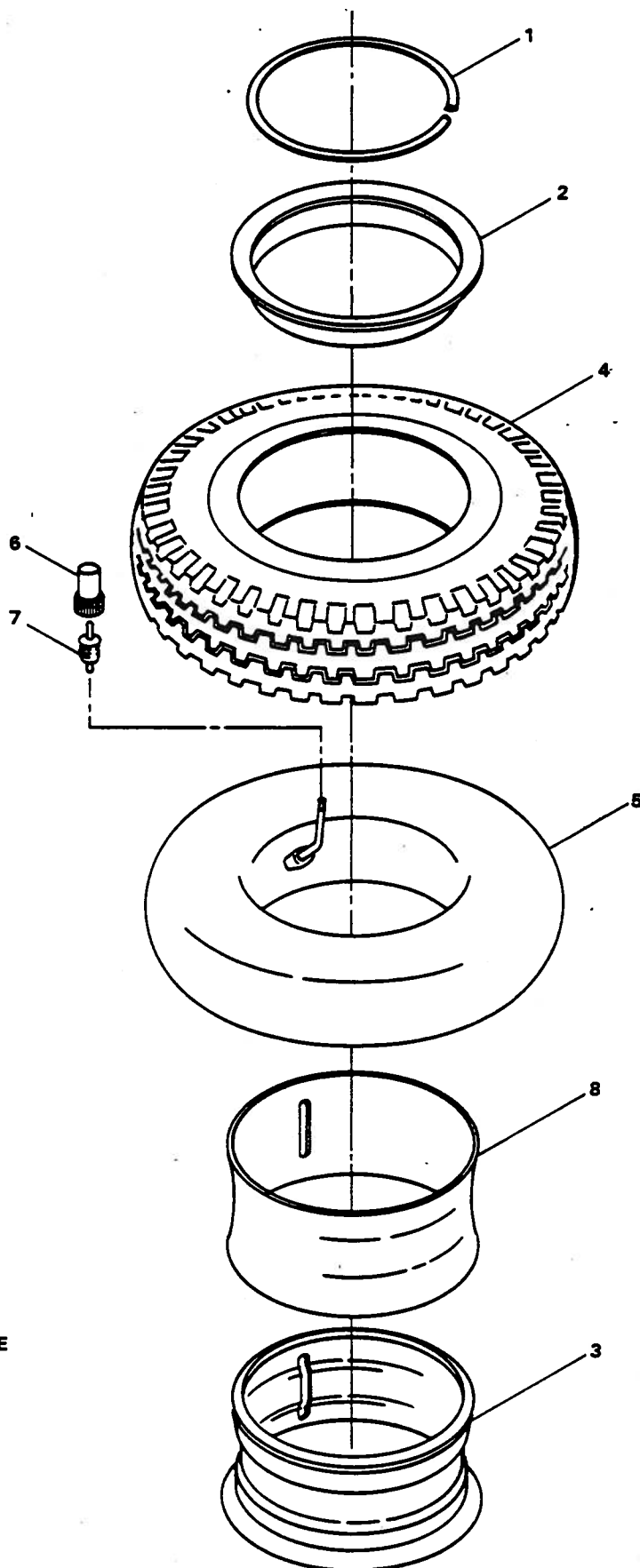


Figure 5-64. Silicone Brake Master Cylinder Assembly



LEGEND

- 1 LOCKING RING
- 2 SIDE RING
- 3 WHEEL
- 4 TUBE TYPE TIRE
- 5 TUBE
- 6 VALVE CORE CAP
- 7 VALVE STEM CORE
- 8 TIRE FLAP

Figure 5-65. Wheel and Tire Assembly

WARNING

Completely deflate tire before loosening lug nuts.

b. Remove valve core cap (6, figure 5-65) and valve stem core (7).

c. Remove lug nuts and washers (not shown). Remove tire and wheel assembly and place on floor with locking ring (1) side up.

5-99. DISASSEMBLY. (See figure 5-65.)

a. Drive goose-neck end of two TO-399 tools between side ring (2) and tire. Pry down and out. Leave one tool in position and place second tool about five inches beyond. Repeat steps until tire bead is separate from side ring (2).

b. Insert tapered end of TO-399 tool between locking ring (1) and side ring (2) and pry locking ring from its groove.

c. Remove locking ring (1) and side ring (2).

NOTE

Turn assembly over and separate bead from wheel (3). Refer to para. a above.

CAUTION

Do not tear or pinch tube when removing tube from tire.

d. Remove tube (5) from tire-wheel assembly.

e. Remove wheel (3) from tire (4).

f. If necessary, strip tire flap (8) from wheel (3).

5-100. STEERING WHEEL AND COLUMN.

5-101. REMOVAL. (See figure 5-66.)

a. Tag and disconnect electrical leads to horn switch and turnsignal switch.

b. Remove turnsignal switch.

c. Tag, disconnect, and cap hydraulic lines to steering control valve (3, figure 5-66).

d. Remove horn button (8) and nut (7). Use puller to remove steering wheel (1).

e. Remove capscrews (4), and lockwashers (6), and separate steering column (5) and steering control valve (3).

5-102. STEERING CONTROL VALVE.

5-103. REMOVAL. (See figure 5-66.)

a. Tag, disconnect and cap hydraulic lines to steering control valve (3, figure 5-66). Cap ports in steering control valve.

b. Remove capscrews (4) and lockwashers (6).

CAUTION

Do not damage splines on shaft of steering column (5) when removing steering control valve (3).

c. Remove steering control valve (3).

5-104. DISASSEMBLY. (See figure 5-67.)

CAUTION

Use protective material on vise jaws. Do not overtighten jaws.

a. Clamp unit in vise, end cap (1, figure 5-67) up.

b. Remove seven capscrews (2) and end cap (1).

c. Remove seal (3) from end cap (1).

d. Remove gear set (4).

CAUTION

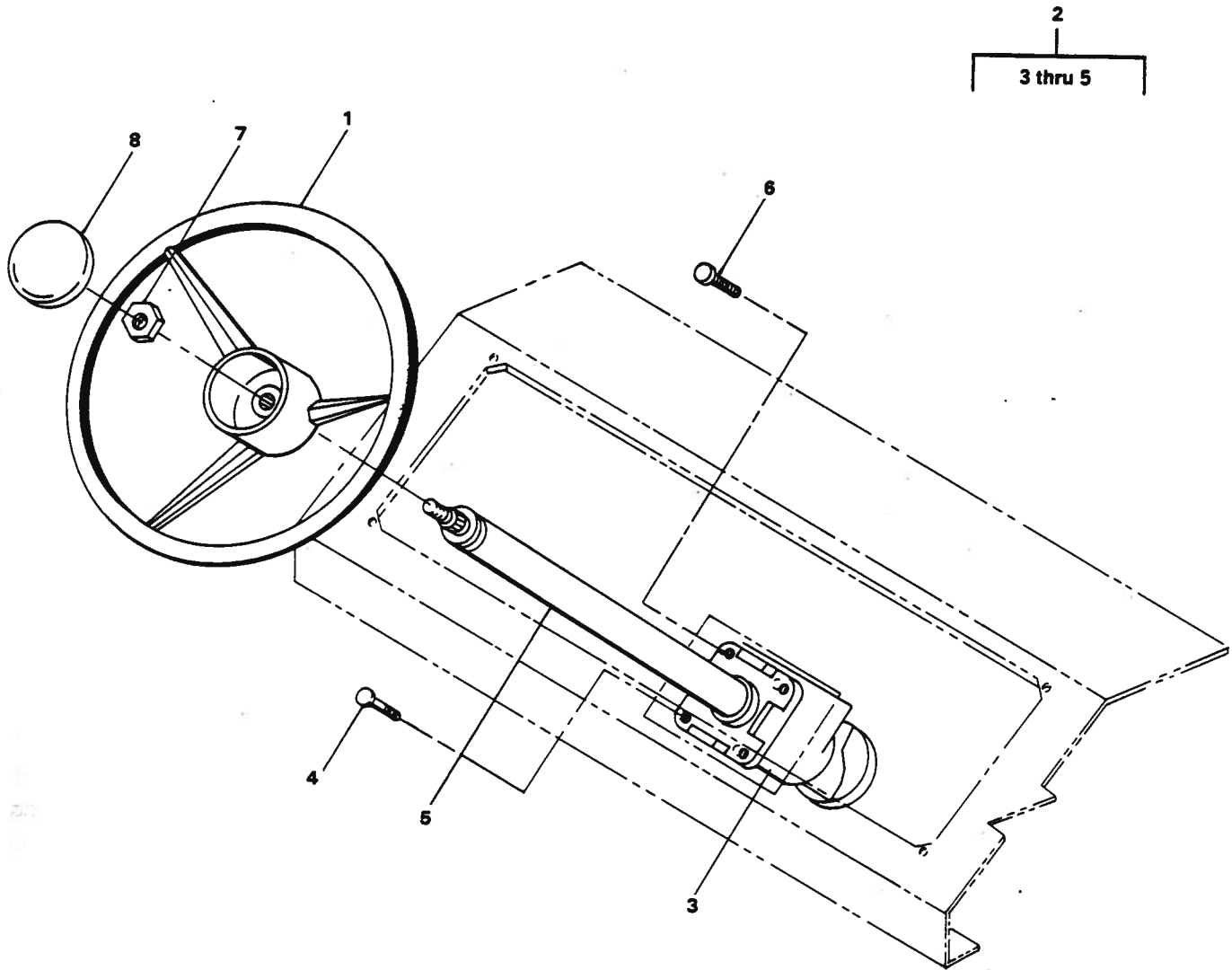
Be careful not to drop gerotor star (5).

e. Remove seal (6) from gear set (4).

f. Remove drive spacers (7).

g. Remove drive (8).

h. Remove spacer plate (9).



LEGEND

- 1 STEERING WHEEL
- 2 STEERING CONTROL VALVE AND COLUMN
- 3 STEERING CONTROL VALVE
- 4 CAPSCREW
- 5 STEERING COLUMN
- 6 LOCKWASHER
- 7 NUT
- 8 HORN BUTTON

Figure 5-66. Steering Valve and Column Installation

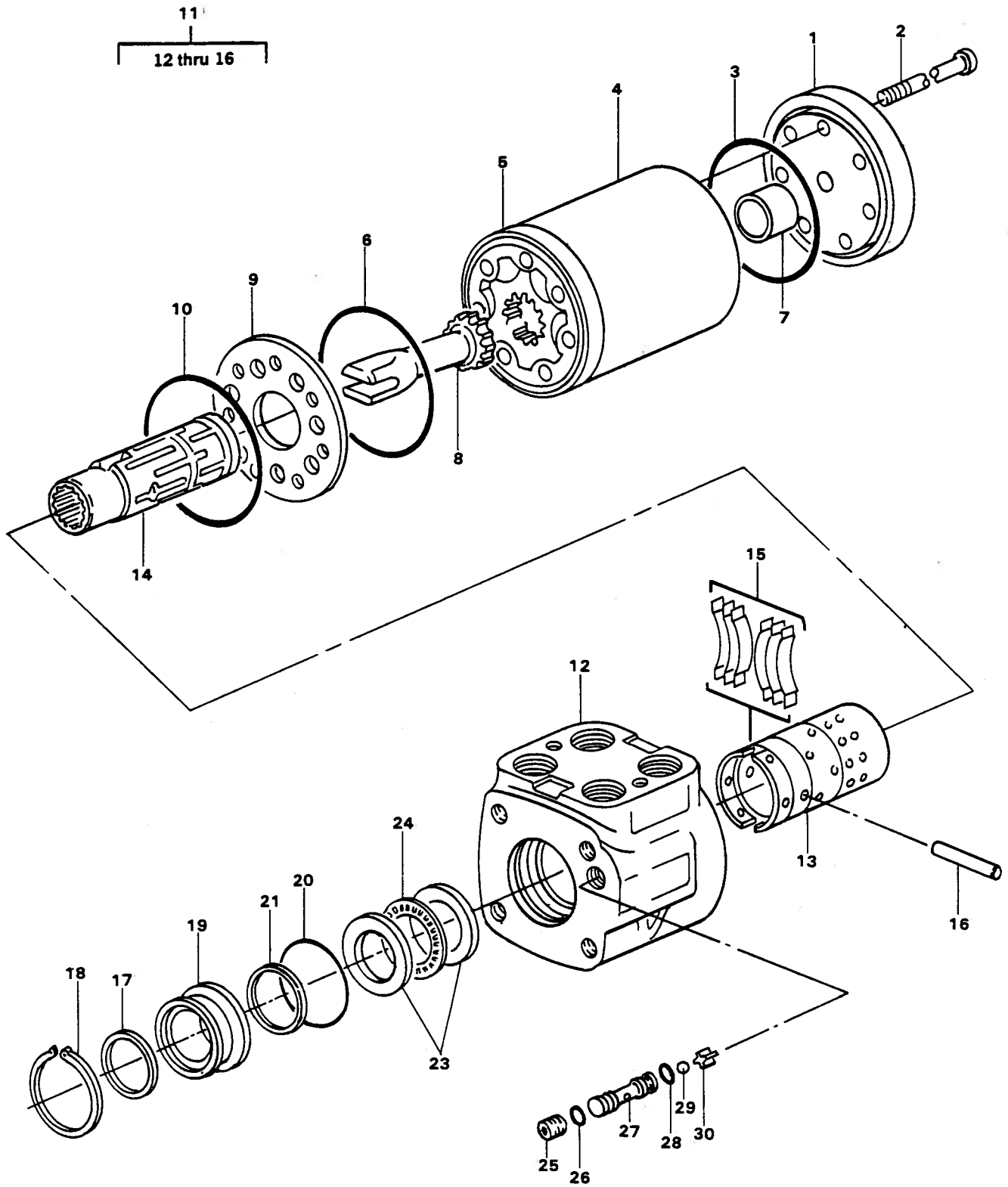


Figure 5-67. Steering Control Valve Assembly

LEGEND FOR FIGURE 5-67

1	END CAP	11	CONTROL PARTS ASSEMBLY	21	QUAD RING SEAL
2	CAPSCREW	12	VALVE HOUSING	22	NEEDLE BEARING
3	SEAL	13	CONTROL SLEEVE	23	BEARING RACE
4	GEAR SET	14	CONTROL SPOOL	24	NEEDLE THRUST BEARING
5	GEROTOR STAR	15	CENTERING SPRING	25	SETSCREW
6	SEAL	16	CENTERING PIN	26	SEAL
7	DRIVE SPACER	17	SEAL	27	CHECK BALL SEAT
8	DRIVE	18	RETAINING RING	28	SEAL
9	SPACER PLATE	19	SEAL GLAND BUSHING	29	CHECK BALL
10	SEAL	20	SEAL	30	CHECK BALL RETAINER

- i. Remove seal (10) from valve housing (12).
- j. Remove valve housing (12) from vise.

CAUTION

Place valve housing (12) on clean soft cloth to protect surface finish.

- k. Remove retaining ring (18) from valve housing (12).

NOTE

Rotate control parts assembly (11) until centering pin (16) is horizontal.

- l. Push control parts assembly (11) forward to free seal gland bushing (19) from valve housing (12).

CAUTION

Do not damage seal gland bushing (19) surfaces.

- m. Remove seal gland bushing (19).
- n. Remove quad ring seal (21) from seal gland bushing (19).
- o. Remove seal (17) from seal gland bushing (19).
- p. Remove two bearing races (23) and needle thrust bearing (24) from control sleeve (13) and control spool (14).

CAUTION

Do not bind control sleeve and control spool in valve housing. Rotate slowly when removing from gear side of valve housing.

- q. Remove control sleeve (13) and control spool (14) from valve housing (12).
- r. Remove centering pin (16) from control sleeve (13) and control spool (14).
- s. Push control spool (14) partially from control end of control sleeve (13).

CAUTION

Centering springs (15) shall be removed carefully by hand.

- t. Remove six centering springs (15) from control spool (14).
- u. Rotate control spool (14) from control sleeve (13) slowly until disengaged.
- v. Remove seal (20) from valve housing (12).
- w. Remove setscrew (25) from valve housing (12).
- x. Screw a 1/8-24 machine screw into end of check ball seat (27). Pull on screw with pliers and lift check ball seat (27) out of valve housing (12).
- y. Remove two seals (26 and 28) and check ball seat (27).
- z. Tip valve housing (12) to remove check ball (29) and check ball retainer (30).

5-105. STEERING SELECTOR VALVE.

5-106. REMOVAL. (See figure 5-50.)

a. Tag, disconnect, and cap hydraulic lines to steering selector valve (14, figure 5-50).

b. Remove nut (17), lockwasher (18), and handle (19).

c. Support steering selector valve (14) from under towing tractor.

d. Remove capscrews (15), lockwashers (16), and steering selector valve (14).

5-107. DISASSEMBLY. (See figure 5-68.)

CAUTION

Disassemble the steering selector valve in a clean environment.

a. Match mark body (4, figure 5-68) and cap (6) to aid in reassembly.

b. Remove capscrews (5) and body (4). Note relative position of plate (14).

NOTE

Disk (9) and seals (10) are matched sets. The relative position and location of these parts must be noted. Tag these parts to aid in reassembly. Mark body and cap faces of disk (9).

c. Remove disk (9) and shaft (21).

d. Remove four seals (10) with a small wire hook. Remove back-up rings (12), O-ring (11), and seals (13).

e. Remove O-ring (7), washer (8), O-ring (22), and back-up ring (23).

f. Remove plate (14), bearing (15), race (16), balls (17), and springs (18). If necessary, remove bushings (19) and pin (20). Note hole from which pin (20) was removed.

LEGEND

- 1 HANDLE
- 2 NUT
- 3 WASHER
- 4 BODY
- 5 CAPSCREW
- 6 CAP
- 7 O-RING
- 8 WASHER
- 9 DISK
- 10 SEAL
- 11 O-RING
- 12 BACKUP RING
- 13 SEAL
- 14 PLATE
- 15 BEARING
- 16 RACE
- 17 BALL
- 18 SPRING
- 19 BUSHING
- 20 PIN
- 21 SHAFT
- 22 O-RING
- 23 BACKUP RING

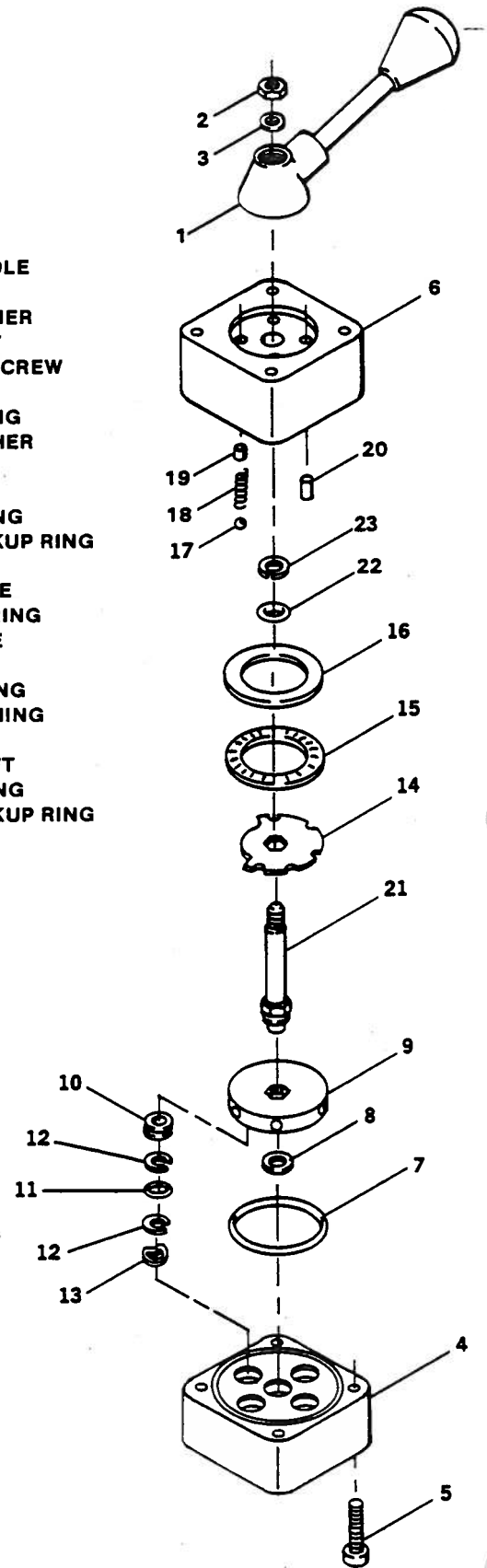


Figure 5-68. Steering Selector Valve Assembly

5-108. REAR STEERING INDICATOR.

5-109. REMOVAL. (See figure 5-69.)

- a. Shut off power at battery disconnect.
- b. Tag and disconnect electrical leads to switch (4, figure 5-69). Switch is located on rear on left side.
- c. Remove capscrews (2), lockwashers (3), and cam (1).
- d. Remove nuts (5), lockwashers (6), capscrews (7), and switch (4).
- e. Remove nuts (9), lockwashers (10), capscrews (11), and bracket (8).

5-110. HYDRAULIC PUMP ASSEMBLY.

5-111. REMOVAL. (See figure 5-70).

- a. Tag and disconnect hydraulic hoses at hydraulic pump.
- b. Remove two capscrews (2) and lockwashers (3) securing hydraulic pump (1) to torque converter housing.

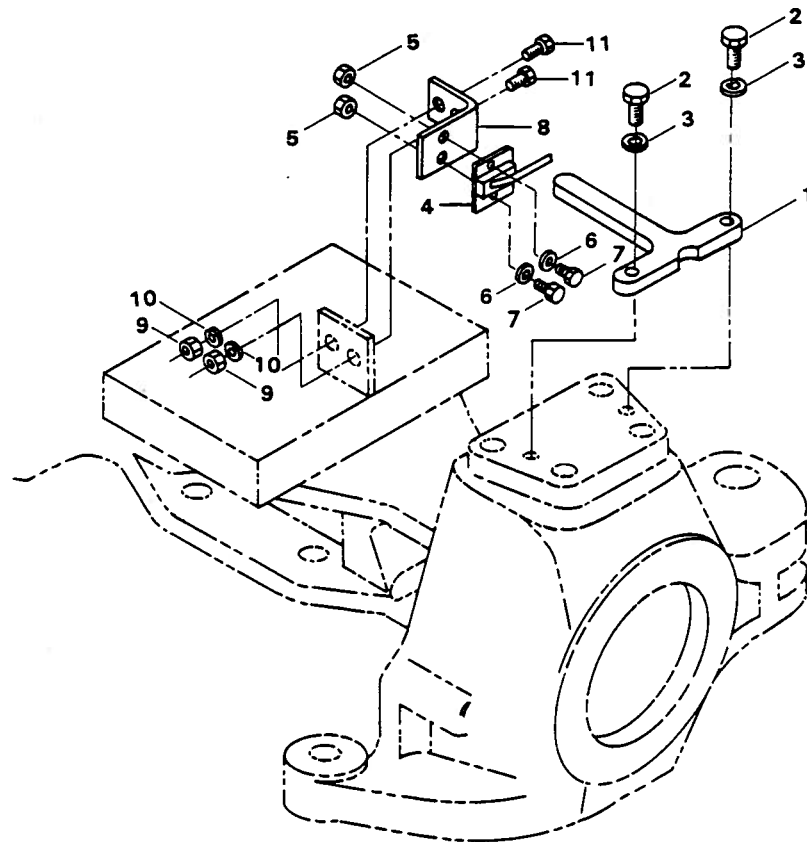
5-112. DISASSEMBLY. (See figure 5-71.)

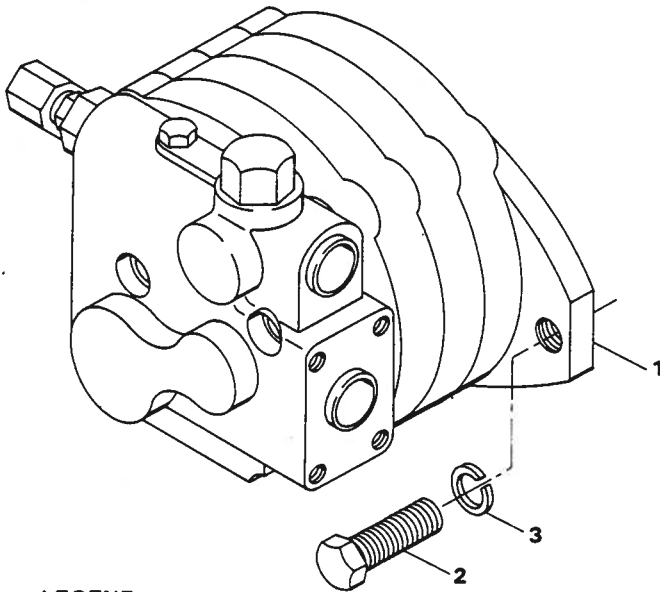
CAUTION

Disassemble pump in a clean area.

LEGEND

- 1 CAM
- 2 CAPSCREW
- 3 LOCKWASHER
- 4 SWITCH
- 5 NUT
- 6 LOCKWASHER
- 7 CAPSCREW
- 8 BRACKET
- 9 NUT
- 10 LOCKWASHER
- 11 CAPSCREW

**Figure 5-69. Rear Steering Indicator Installation**



LEGEND

- 1 HYDRAULIC PUMP
- 2 CAPSCREW
- 3 LOCKWASHER

Figure 5-70. Hydraulic Pump Installation

WARNING

When removing plug (1, figure 5-71) and O-ring (2) care should be taken to restrain spring (3) from popping out.

- a. Remove plug (1) and O-ring (2).
- b. Remove spring (3) and spring guide and orifice (4).

CAUTION

When removing spool (5) care shall be taken to avoid scratching or scoring port surface in cover plate (20).

- c. Remove spool (5).
- d. Remove nut (6) and O-ring (7).
- e. Remove locknut (8) and O-ring (7).

WARNING

When removing setscrew (9) care shall

be taken to restrain spring (10) from popping out.

- f. Remove setscrew (9), spring (10), and cone (11).

WARNING

When removing plug (12) care shall be taken to restrain spring (14) from popping out.

- g. Remove plug (12), O-rings (2 and 13), and spring (14).

CAUTION

When removing spool (15) and back-up ring (16) care shall be taken to avoid scratching or scoring port surfaces in cover plate (20).

- h. Remove spool (15) and back-up ring (16).

NOTE

Mark all pump plates on the side nearest the drive shaft extension. These marks shall be used to position the plates during assembly.

CAUTION

Protect pump surfaces with wood blocks or heavy cardboard between pump and vise jaws.

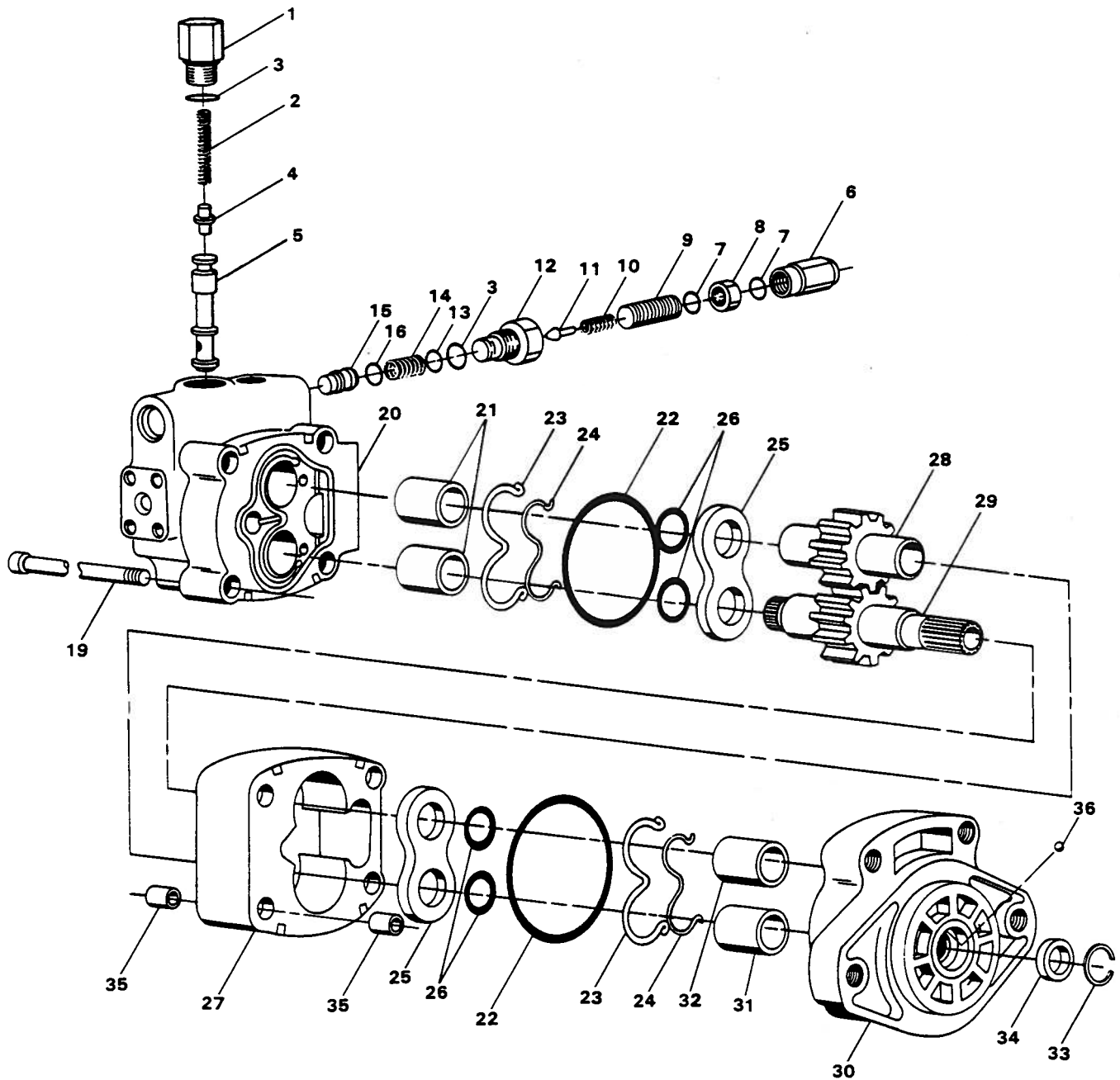
- i. Place pump in vise, remove four capscrews (19).

- j. Remove pump from vise. Use a plastic mallet and tap connector bosses to loosen cover plate (20).

- k. Remove O-rings (22 and 23) and back-up ring (24) from cover plate (20).

CAUTION

When removing pressure plate (25), carefully start lifting it out of gear bores. If it hangs up, work it back and forth until it slides out freely.



LEGEND

- 1 PLUG
- 2 O-RING
- 3 SPRING
- 4 SPRING GUIDE AND ORIFICE
- 5 SPOOL
- 6 NUT
- 7 O-RING
- 8 LOCKNUT
- 9 SETSCREW
- 10 SPRING
- 11 CONE
- 12 PLUG

- 13 O-RING
- 14 SPRING
- 15 SPOOL
- 16 BACK-UP RING
- 17 NOT USED
- 18 NOT USED
- 19 CAPSCREW
- 20 COVER PLATE
- 21 BUSHING
- 22 O-RING
- 23 O-RING
- 24 BACK-UP RING

- 25 PRESSURE PLATE
- 26 GEAR PLATE
- 27 O-RING
- 28 IDLER GEAR
- 29 DRIVE GEAR
- 30 FLANGE
- 31 BUSHING
- 32 BUSHING
- 33 SNAP RING
- 34 SEAL
- 35 DOWEL
- 36 BALL

Figure 5-71. Hydraulic Pump Assembly

l. Remove pressure plate (25) from gear plate (26). Remove O-ring (27) from journal bores of pressure plate.

m. With gear plate (26), (cover plate mounting surface up), slide idler gear (28) and drive gear (29) straight up and out of gear plate.

n. Remove gear plate (26) by tapping on exposed edges while holding flange (30). When loose, lift off.

o. Remove pressure plate (25) from gear plate (26). Remove O-rings (27) from journal bores of pressure plate.

p. Remove O-rings (22 and 23) and back-up ring (24) from flange (30).

q. Remove snap ring (33) and seal (34) from bore of flange (30).

5-113. HYDRAULIC TANK INSTALLATION

5-114. DISASSEMBLY. (See figure 5-72.)

WARNING

When draining hydraulic tank assembly, care shall be taken not to spill hydraulic fluid.

a. Remove drain plug (16, figure 5-72). Drain content into 10 gal (37.85 l) container.

b. Tag and remove two hydraulic hoses.

c. Remove filter assembly (1) by disconnecting at nipple (3).

d. Remove nipple (3) from tank.

e. Remove filter cartridge (2) from filter assembly (1).

f. Remove four nuts (5), lockwashers (6), flat washers (7), and hydraulic tank assembly (4) from mounting studs (8).

g. Remove cap (10) from filler cap assembly (9).

h. Remove setscrew (12), flange (11), gaskets (13), and screen (14) from hydraulic tank assembly (4).

i. Remove dipstick (15).

5-115. HYDRAULIC LINES.

5-116. REMOVAL. (See figure 5-73.)

WARNING

Exhaust the pressure in the hydraulic lines by depressing and releasing the brake pedal (approximately 15 cycles).

a. Remove applicable hydraulic fitting or line.

b. Tag and cap hydraulic line(s).

c. Remove and discard O-rings on fittings that are removed.

5-117. HYDRAULIC OIL COOLER.

5-118. REMOVAL. (See figure 5-74.)

a. Tag and disconnect electrical leads to motor (11, figure 5-74).

b. Tag, disconnect, and cap hydraulic lines to oil cooler (6).

c. Remove capscrews (2), lockwashers (3), washers (4), nuts (5), and grill (1).

d. Remove capscrews (7) lockwashers (8), washers (9), oil cooler (6) and fan assembly (10).

e. Remove nuts (15) and capscrews (14) to separate oil cooler (6) and fan assembly (10).

f. If necessary, separate motor (11), fan blade (12), and shroud (13).

5-119. CAB.

5-120. REMOVAL. (See figure 5-75.)

a. Tag and disconnect electrical leads to front and rear wiper motors, front and rear spotlights, cab marker lights, and beacon light.

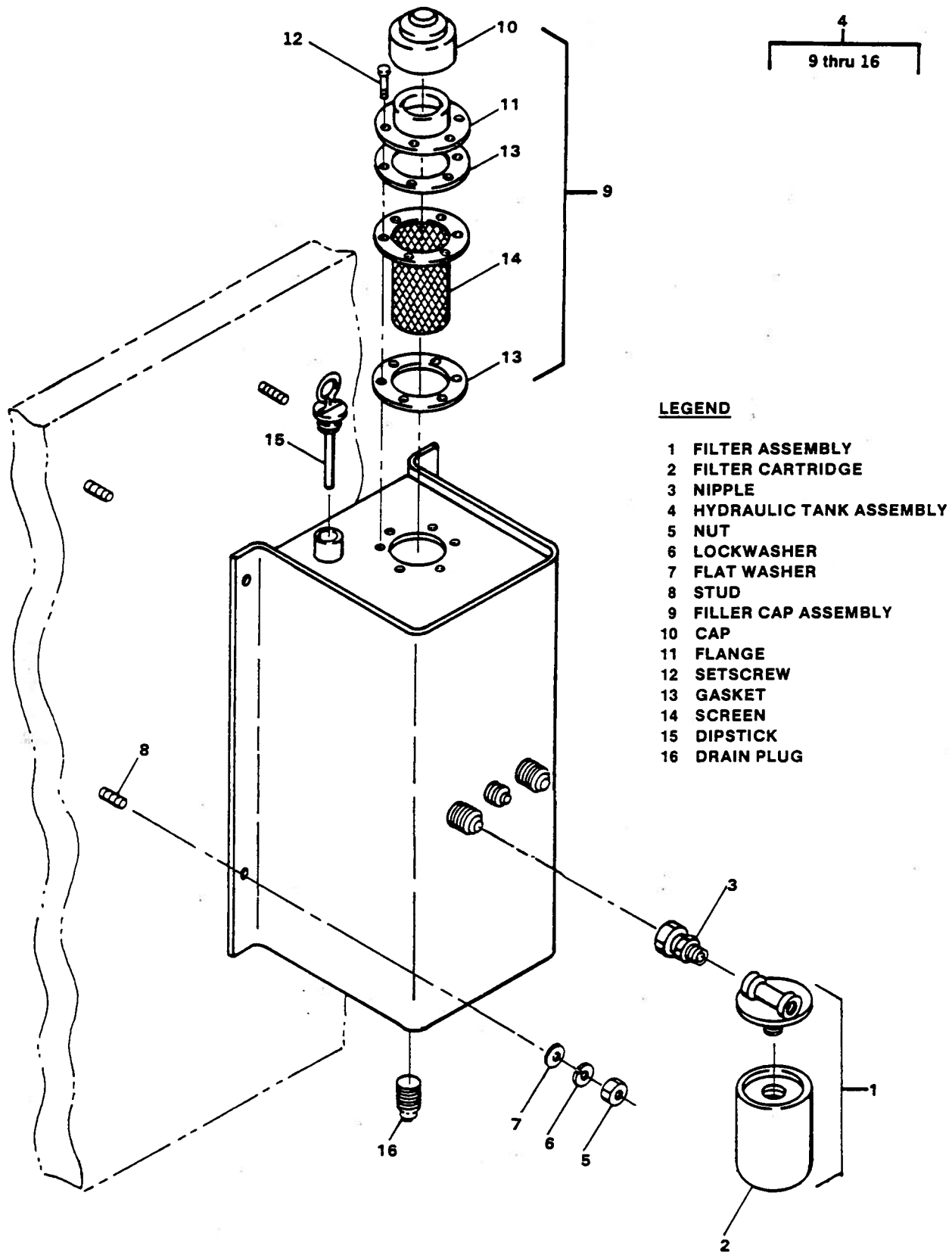


Figure 5-72. Hydraulic Tank Installation

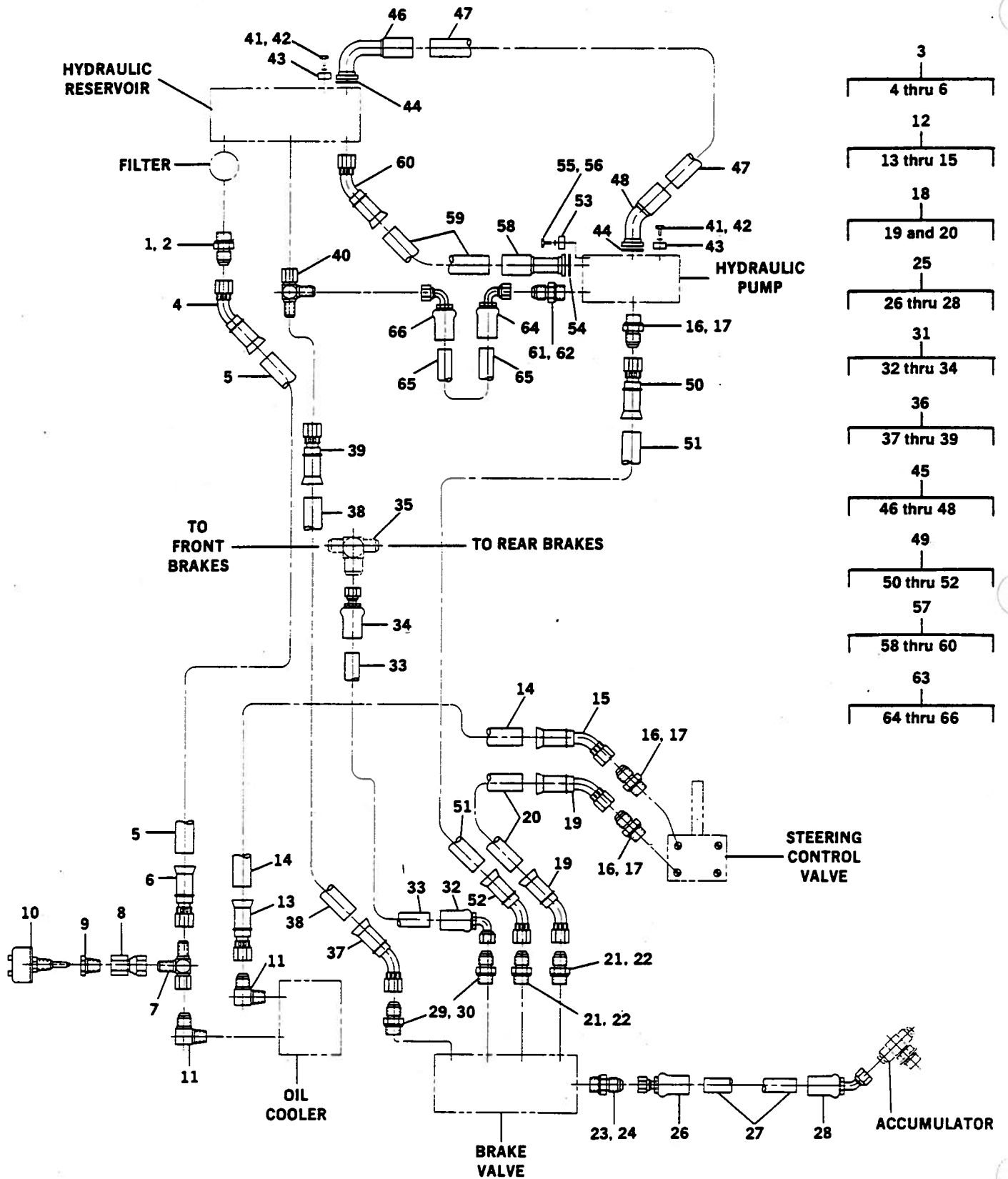


Figure 5-73. Hydraulic Lines Installation (Sheet 1 of 3)

- 67 thru 70
- 73
- 74 thru 76
- 77
- 78 thru 82
- 83
- 84 and 85
- 86
- 87 thru 89
- 90
- 91 thru 93
- 94
- 95 and 96
- 97
- 98 thru 100
- 101
- 102 thru 104
- 105
- 106 thru 108

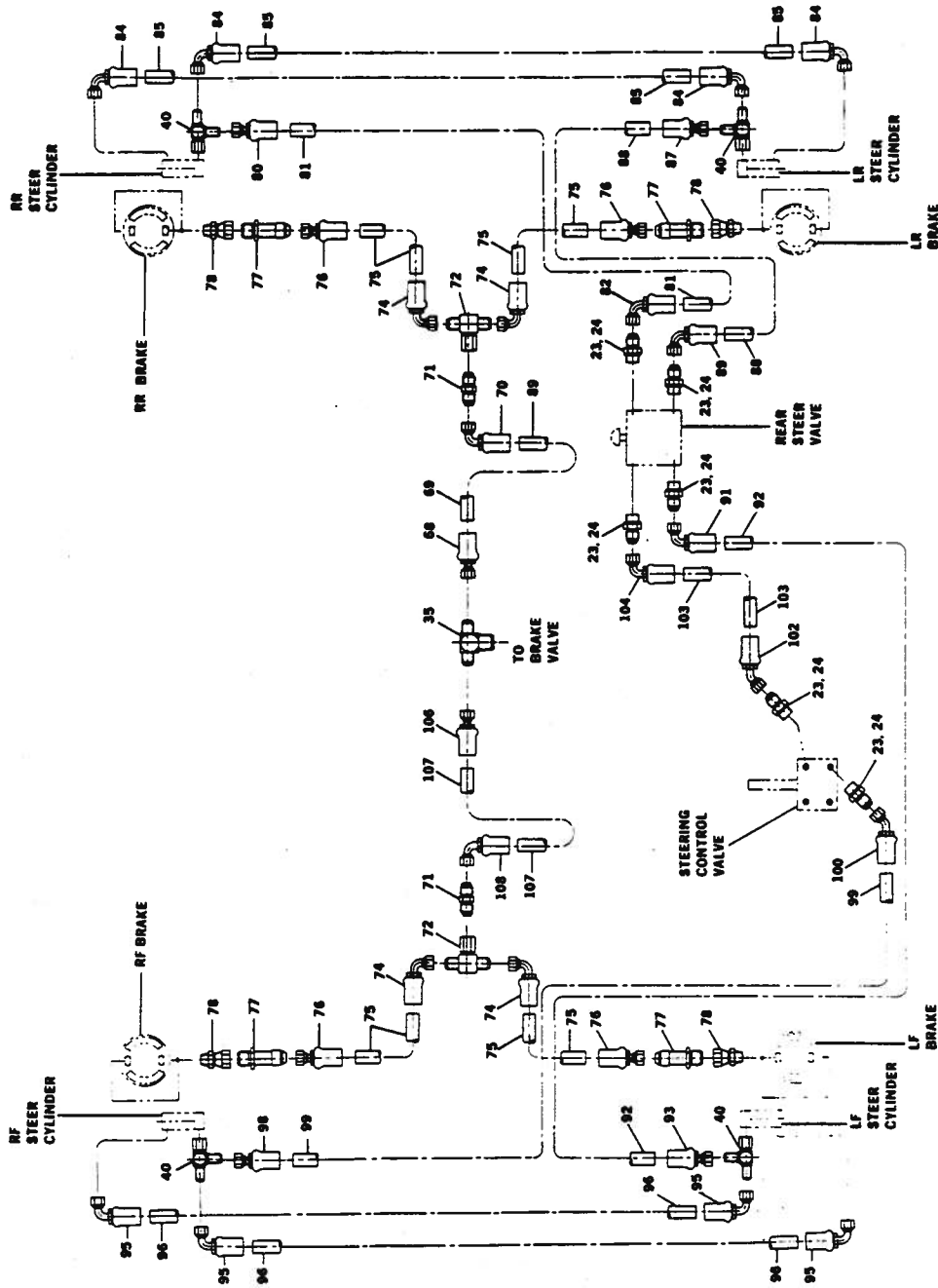
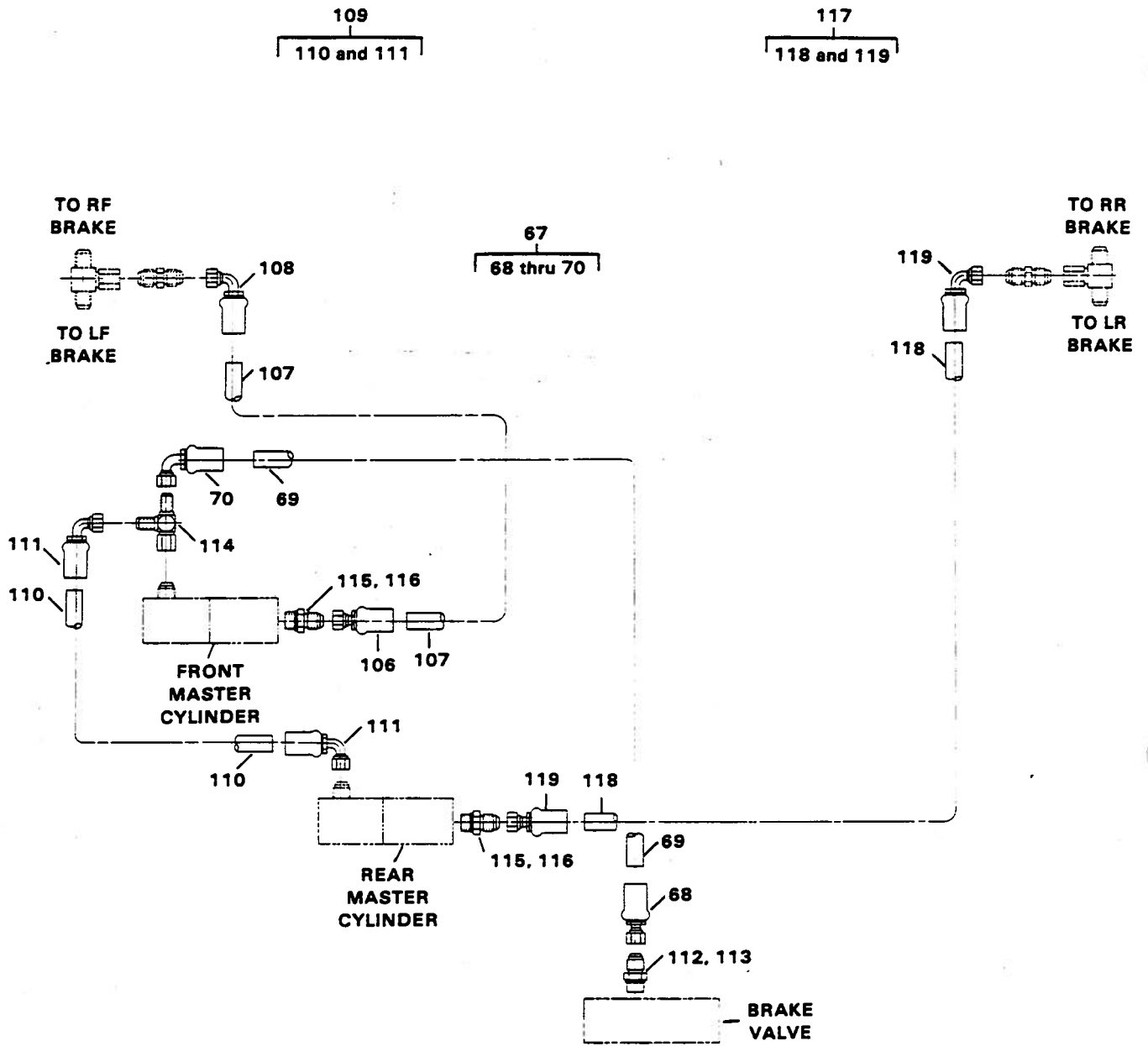


Figure 5-73. Hydraulic Lines Installation (Sheet 2 of 3)



NOTE

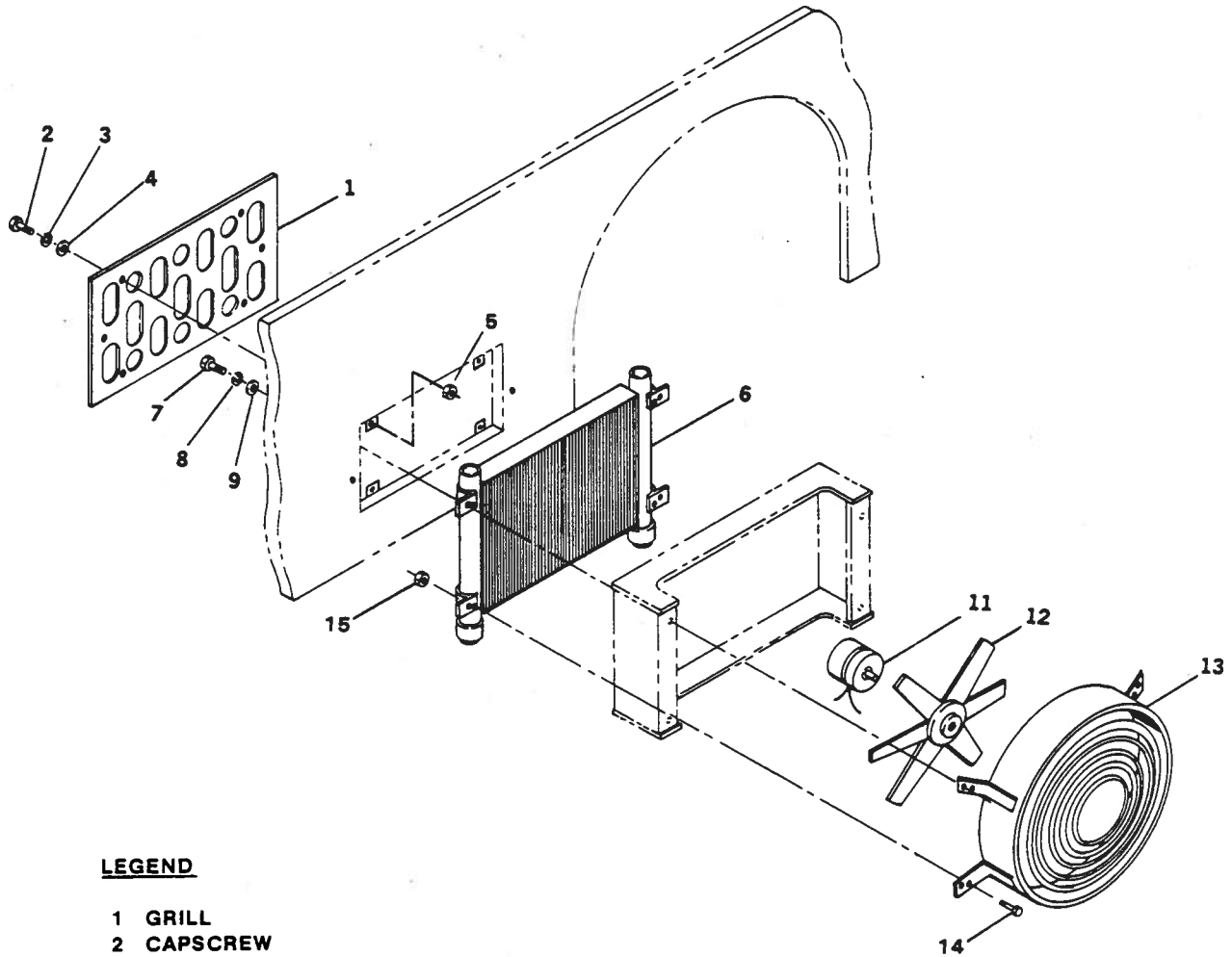
This sheet applies to tow tractors equipped with silicone brake fluid.

Figure 5-73. Hydraulic Lines Installation (Sheet 3 of 3)

LEGEND FOR FIGURE 5-73

1	MALE CONNECTOR	62	O-RING
2	O-RING	63	HOSE ASSEMBLY
3	HOSE ASSEMBLY	64	FITTING
4	FITTING	65	HOSE
5	HOSE	66	FITTING
6	FITTING	67	HOSE ASSEMBLY
7	TEE	68	FITTING
8	ADAPTER	69	HOSE
9	REDUCER	70	FITTING
10	TEMPERATURE SWITCH	71	UNION
11	MALE ELBOW	72	FITTING
12	HOSE ASSEMBLY	73	HOSE ASSEMBLY
13	FITTING	74	FITTING
14	HOSE	75	HOSE
15	FITTING	76	FITTING
16	MALE CONNECTOR	77	ADAPTER
17	O-RING	78	UNION
18	HOSE ASSEMBLY	79	HOSE ASSEMBLY
19	45° ELBOW	80	FITTING
20	HOSE	81	HOSE
21	MALE CONNECTOR	82	FITTING
22	O-RING	83	HOSE ASSEMBLY
23	MALE CONNECTOR	84	FITTING
24	O-RING	85	HOSE
25	HOSE ASSEMBLY	86	HOSE ASSEMBLY
26	FITTING	87	FITTING
27	HOSE	88	HOSE
28	FITTING	89	FITTING
29	MALE CONNECTOR	90	HOSE ASSEMBLY
30	O-RING	91	FITTING
31	HOSE ASSEMBLY	92	HOSE
32	FITTING	93	FITTING
33	HOSE	94	HOSE ASSEMBLY
34	FITTING	95	FITTING
35	UNION TEE	96	HOSE
36	HOSE ASSEMBLY	97	HOSE ASSEMBLY
37	FITTING	98	FITTING
38	HOSE	99	HOSE
39	FITTING	100	FITTING
40	TEE	101	HOSE ASSEMBLY
41	LOCKWASHER	102	FITTING
42	CAPSCREW	103	HOSE
43	SPLIT FLANGE	104	FITTING
44	O-RING	105	HOSE ASSEMBLY
45	HOSE ASSEMBLY	106	FITTING
46	90° ELBOW	107	HOSE
47	HOSE	108	FITTING
48	45° ELBOW	109	HOSE ASSEMBLY
49	HOSE ASSEMBLY	110	HOSE
50	FITTING	111	FITTING
51	HOSE	112	MALE CONNECTOR
52	FITTING	113	O-RING
53	SPLIT FLANGE	114	TEE
54	O-RING	115	MALE CONNECTOR
55	CAPSCREW	116	O-RING
56	LOCKWASHER		
57	HOSE ASSEMBLY		
58	SPLIT FLANGE		
59	HOSE		
60	45° ELBOW		
61	MALE CONNECTOR		

10
11 thru 15



LEGEND

- 1 GRILL
- 2 CAPSCREW
- 3 LOCKWASHER
- 4 WASHER
- 5 NUT
- 6 OIL COOLER
- 7 CAPSCREW
- 8 LOCKWASHER
- 9 WASHER
- 10 FAN ASSEMBLY
- 11 MOTOR
- 12 FAN BLADE
- 13 SHROUD
- 14 CAPSCREW
- 15 NUT

Figure 5-74. Hydraulic Oil Cooler Installation

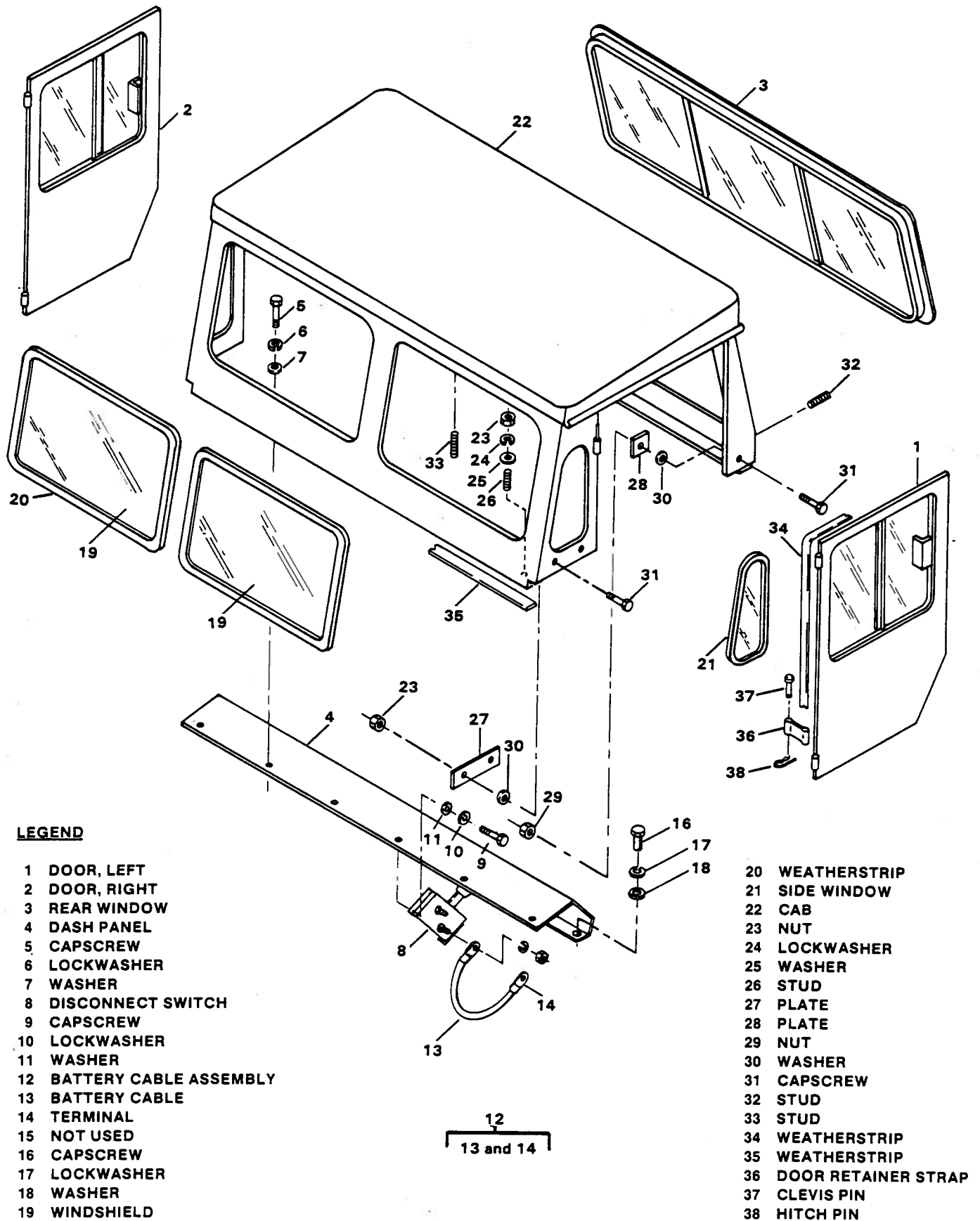


Figure 5-75. Cab Installation

b. Remove rear wiper motor, front wiper motors, front spotlight, rear spotlight, beacon light, and cab marker light.

c. Remove acoustical pads and insulation (figure 5-90). Remove clamps and cab wiring harness assembly.

d. Remove hitch pins (38, figure 5-75), clevis pins (37), and door retainer straps (36). Remove cab doors (1 and 2).

e. If necessary, remove rear window (3), windshields (19), and side windows (21).

f. Remove nuts (29), capscrews (31), washers (30), and plate (28).

g. Remove nuts (23), capscrews (31), plate (27), and washers (30).

h. Remove nuts (23), lockwasher (24), and washers (25).

i. Lift off cab (22). Remove and discard

weatherstrips (34 and 35).

5-121. WIPER MOTOR.

5-122. REMOVAL. (See figure 5-76.)

a. Tag and disconnect electrical leads to wiper motor (8, figure 5-76).

b. Remove wiper blade (1).

c. Remove nuts and lockwashers (part of wiper arm). Remove wiper arm (2).

d. Remove bushing, washer, nut, and washers securing pivot shaft (6).

e. Support wiper motor (8) and remove capscrews (4) and lockwashers (5). Remove adapter (3).

f. Remove wiper motor (8) and crank (7). Remove nut securing crank (7) to wiper motor (8).

g. Remove capscrews (9) and pivot shaft (6).

LEGEND

- 1 WIPER BLADE
- 2 WIPER ARM
- 3 ADAPTER
- 4 CAPSCREW
- 5 LOCKWASHER
- 6 PIVOT SHAFT
- 7 CRANK
- 8 WIPER MOTOR
- 9 CAPSCREW

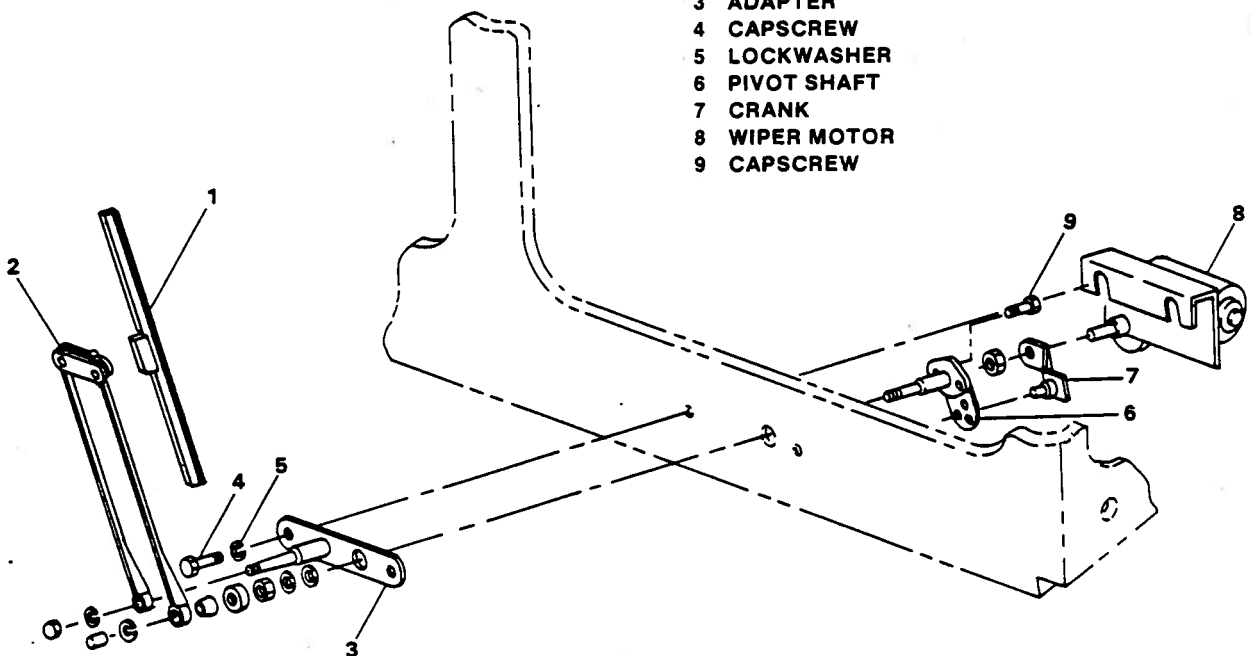


Figure 5-76. Wiper Motor Installation

5-123. CAB DOORS AND SIDE WINDOWS.**5-124. DISASSEMBLY.** (See figure 5-77.)

a. Remove nut (4, figure 5-77), capscrew (2), and washers (3). Disconnect latch extension (1) at latch (10).

b. Remove cotter pins (5) and latch extension (1).

c. Remove nuts (7), lockwashers (8), capscrews (9), and handle (6).

d. Remove nuts (11A), lockwashers (11B), screws (11), washers (11C), and latch (10).

e. Remove moulding (not shown) around window assembly (13). Lift out window assembly.

f. Disassemble side window assembly (13) as follows:

1. Remove screws (24) and tie bar (23). Pry apart frame enough to remove glass (21 and 22).

2. Remove screws (20), post (19), weatherseal (30), and channels (27 and 28).

3. Remove screw (15) and slide stop (14).

4. Remove screws (17), nuts (18), and lock (16).

5. Remove screws (26) and catch (25).

5-125. REAR WINDOW ASSEMBLY.**5-126. REMOVAL.** (See figure 5-75.)

a. Pry weatherstrip (20, figure 5-75) out of rear window channel and remove rear window (3).

5-127. DISASSEMBLY. (See figure 5-78.)

a. Separate frame (13, figure 5-78) enough to remove glass (10 and 11).

b. Remove screws (1), bar (3), and wiper (4).

c. Remove screws (7), washers (9), grommets (8), and latches (5).

d. Remove screws (2), gusset (6), and flocked—rubber (12).

5-128. PARK BRAKE LEVER INSTALLATION.**5-129. DISASSEMBLY.** (See figure 5-79.)

a. Tag and disconnect electrical wire to switch (6, figure 5-79).

b. Remove nuts from switch (6). Remove switch (6).

c. Remove cotter pin (14), washer (15), pin (16), and park brake cable (not shown) from brake lever (8).

d. Remove nuts (9), lockwashers (10), and capscrews (12) securing brake lever (8) to mounting plate (17).

e. Remove brake lever (8).

f. Remove nuts (9), lockwashers (10), washers (13), and capscrews (11) securing angle (7) to mounting plate (17). Remove angle (7).

5-130. HEATER.**5-131. REMOVAL.** (See figure 5-79.)

a. Tag and disconnect control panel harness. Remove five screws (34, figure 5-5), washers (35), and fasteners (36). Lift out console panel (31).

b. Tag and disconnect electrical leads to heater (3, figure 5-79).

c. Loosen hose clamps (1) and disconnect heater hoses.

d. Loosen setscrew on control cable at valve (2). Disconnect control cable and remove valve (2).

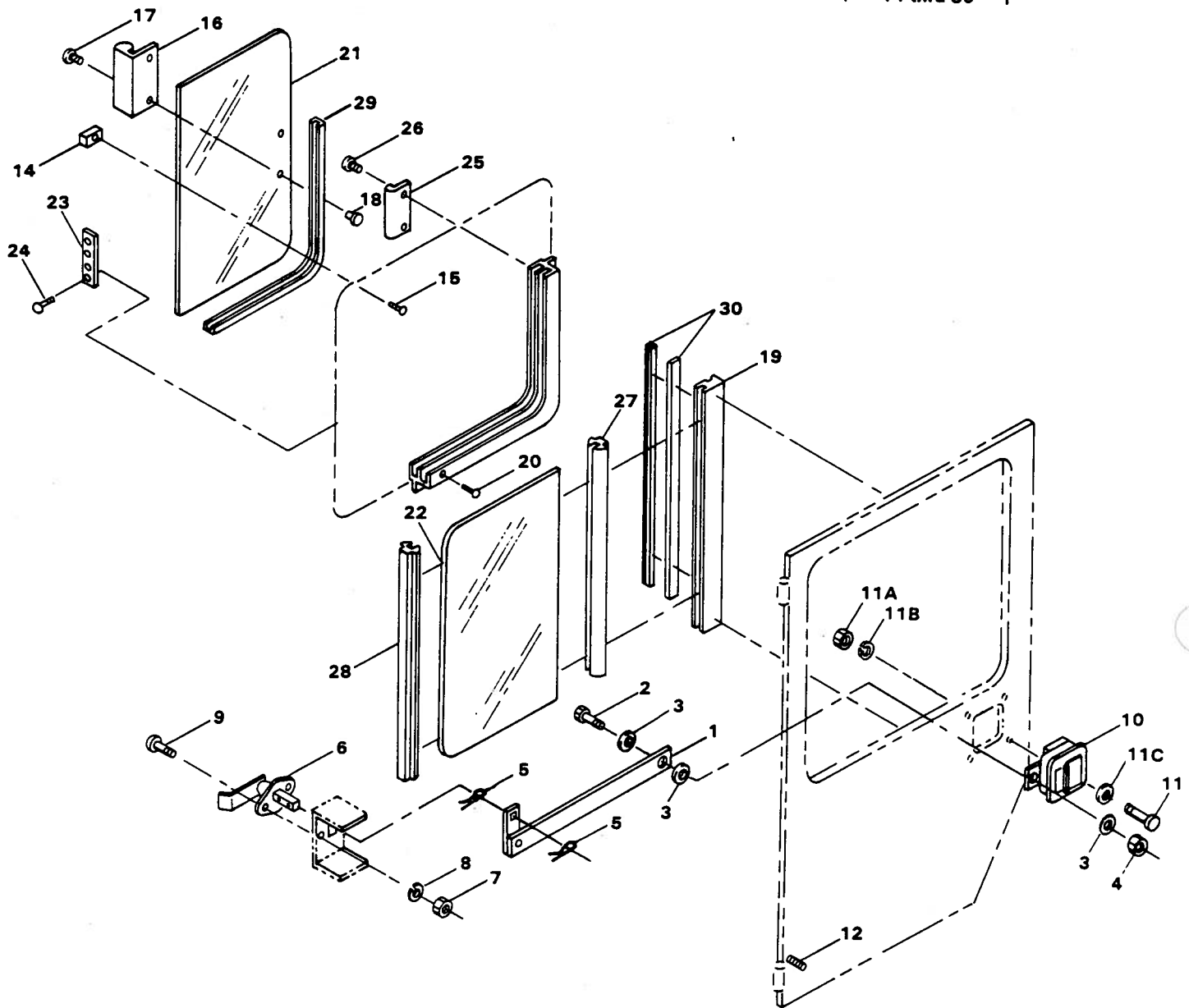
e. Remove nuts (4) and lockwashers (5).

f. Remove heater (3).

5-132. DISASSEMBLY. (See figure 5-80.)

a. Remove screws (2, figure 5-80), washers (3), and motor (1).

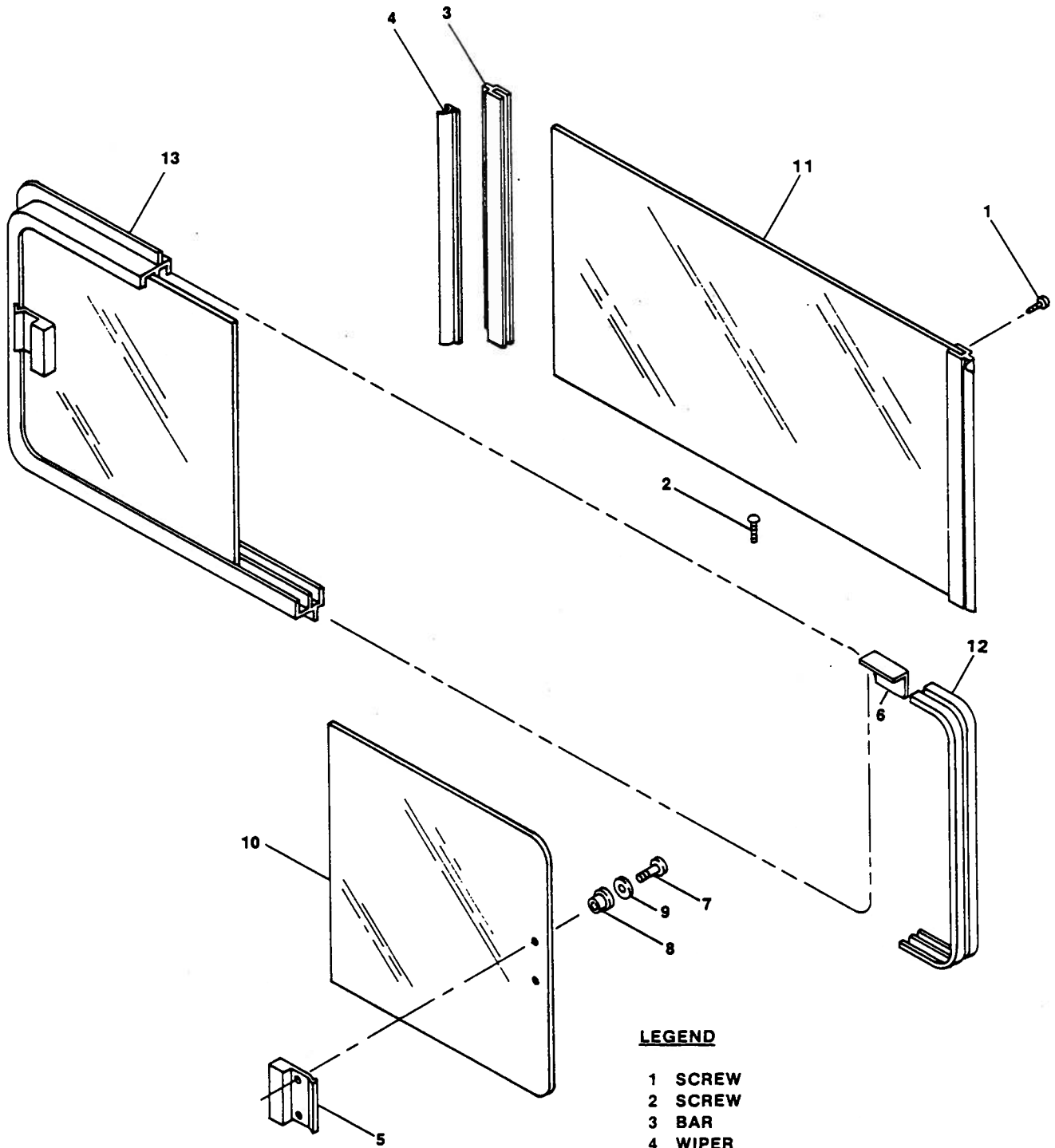
13
14 thru 30



LEGEND

- | | | |
|-------------------|--------------------|----------------|
| 1 LATCH EXTENSION | 11A NUT | 20 SCREW |
| 2 CAPSCREW | 11B LOCKWASHER | 21 GLASS |
| 3 WASHER | 11C FLATWASHER | 22 GLASS |
| 4 NUT | 12 WELD STUD | 23 TIE BAR |
| 5 COTTER PIN | 13 WINDOW ASSEMBLY | 24 SCREW |
| 6 HANDLE | 14 SLIDE STOP | 25 CATCH |
| 7 NUT | 15 SCREW | 26 SCREW |
| 8 LOCKWASHER | 16 LOCK | 27 CHANNEL |
| 9 SCREW | 17 SCREW | 28 CHANNEL |
| 10 LATCH | 18 NUT | 29 RUBBER |
| 11 SCREW | 19 POST | 30 WEATHERSEAL |

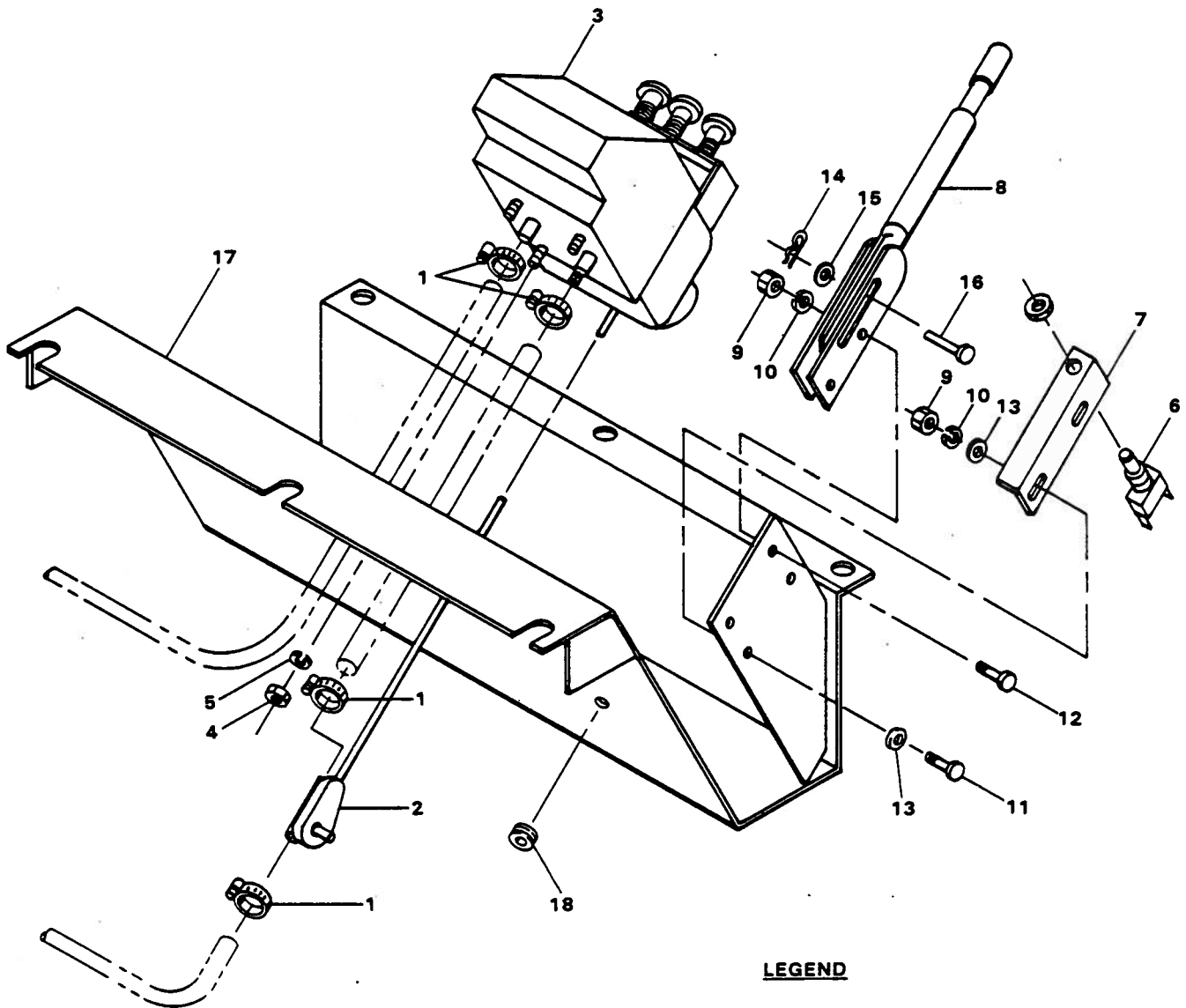
Figure 5-77. Cab Doors and Side Windows Assembly



LEGEND

- 1 SCREW
- 2 SCREW
- 3 BAR
- 4 WIPER
- 5 LATCH
- 6 GUSSET
- 7 SCREW
- 8 GROMMET
- 9 WASHER
- 10 GLASS
- 11 GLASS
- 12 FLOCKED RUBBER
- 13 FRAME

Figure 5-78. Rear Window Assembly



LEGEND

- 1 CLAMP
- 2 VALVE
- 3 HEATER
- 4 NUT
- 5 LOCKWASHER
- 6 SWITCH
- 7 ANGLE
- 8 BRAKE LEVER
- 9 NUT
- 10 LOCKWASHER
- 11 CAPSCREW
- 12 CAPSCREW
- 13 WASHER
- 14 COTTER PIN
- 15 WASHER
- 16 PIN
- 17 MOUNTING PLATE
- 18 GROMMET

Figure 5-79. Park Brake Lever and Heater Installation

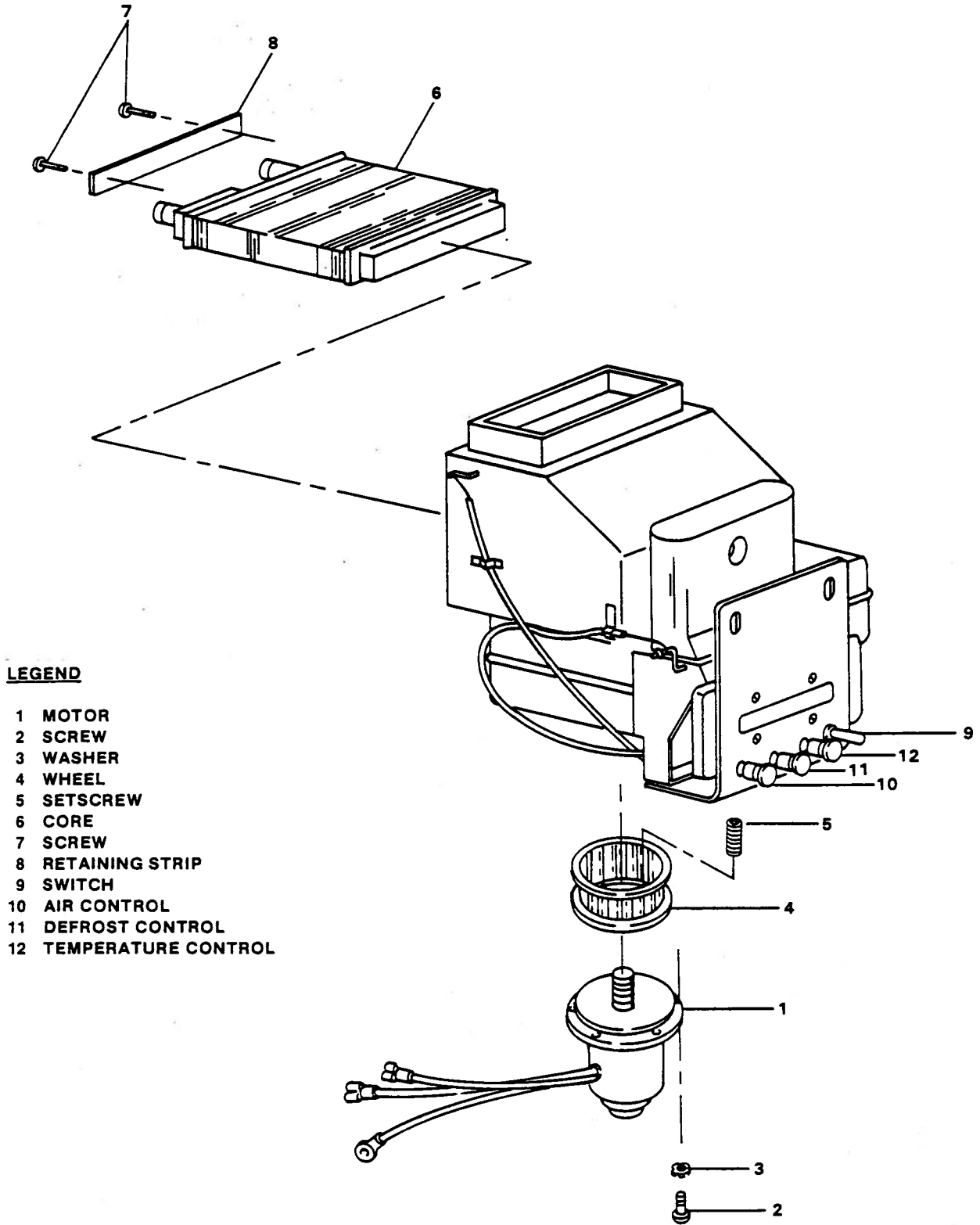


Figure 5-80. Heater Assembly

- b. Remove setscrew (5) and wheel (4).
- c. Remove screws (7), retaining strip (8), and core (6).
- d. Remove switch (9), air control (10), defrost control (11), and temperature control (12) if necessary.

5-133. SEAT AND PEDESTAL ASSEMBLY.

5-134. DISASSEMBLY. (See figure 5-81.)

- a. Remove nuts (2, figure 5-81), lockwashers (3) and carriage bolts (4) securing seat belt kit (1) to upper base (22).
- b. Remove nuts (6) and lockwashers (7) securing seat assembly (5). Remove seat assembly (5).
- c. Remove capscrews (10) securing back (9) to frame (11). Remove capscrews (14) securing seat (8) to frame (11). Lift frame (11) from track (12) and control track (13).
- d. Remove capscrews (16) and lockwashers (17) securing seat pedestal assembly (15) to frame.
- e. Remove hair pin (18), pin (19), and lock bolt (20) to separate lower pedestal (21) from upper base (22).

5-135. ENGINE HOOD.

5-136. REMOVAL. (See figure 5-82.)

- a. Remove air cleaner hood (not shown).
- b. Unlatch hooks (6, figure 5-82) and remove hood (14). Remove weatherstrip (38).
- c. Remove cotter pins (7), clevis pins (8), and hooks (6).
- d. Remove nuts (2), lockwashers (3), capscrews (5), washers (4), and bumpers (1).
- e. Remove nuts (10), lockwashers (11) washers (12), screws (13), and brackets (9).
- f. Remove capscrews (17), lockwashers (18), and front cowl (16). Remove weatherstrips (37 and 39).

g. Remove capscrews (28), lockwashers (29), washers (30), and rear cowl (27).

h. Remove nuts (22), lockwashers (23), screws (24), spring (21), hinge (20), spacer (25), and cover (26). Remove weatherstrip (40).

i. Remove nuts (33), lockwashers (34), washers (35), and grill (32).

j. Remove acoustical blankets (refer to figure 5-88).

5-137. FRAME.

5-138. DISASSEMBLY. (See figure 5-83 or 5-84.)

NOTE

The following procedure is typical for a Class I towing tractor frame (figure 5-83). Refer to figure 5-84 for Class II units.

- a. Support pintle hook (1, figure 5-83) to prevent its falling.
- b. Remove nuts (4), washers (3), capscrews (2), and pintle hooks (1).

WARNING

Front end plate (5) weighs 2249 pounds.

c. Remove dust caps in tapped holes on front plate (5). Thread lifting eyes into tapped holes. Attach lifting eyes to overhead hoist (2-ton minimum capacity). Take up slack on hoist chain.

WARNING

If towing tractor is a Class II, removing capscrews (9, figure 5-84) will also free plates (7). Plates (7) weigh 2194 pounds each.

d. Remove capscrews (7, figure 5-83), washers (8), nuts (9), and front plate (5).

WARNING

Rear plate (6) weighs 1932 pounds.

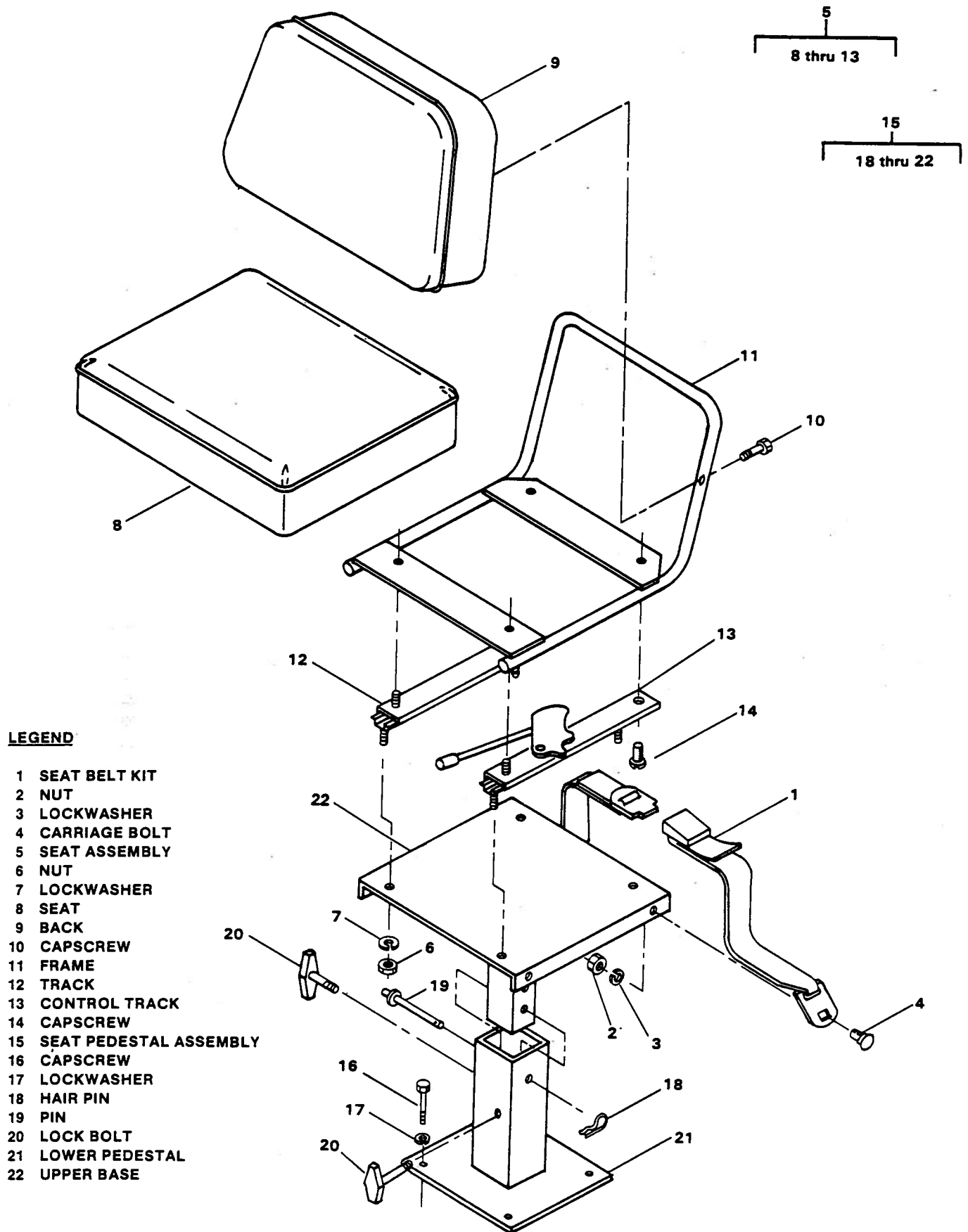


Figure 5-81. Seat and Pedestal Installation

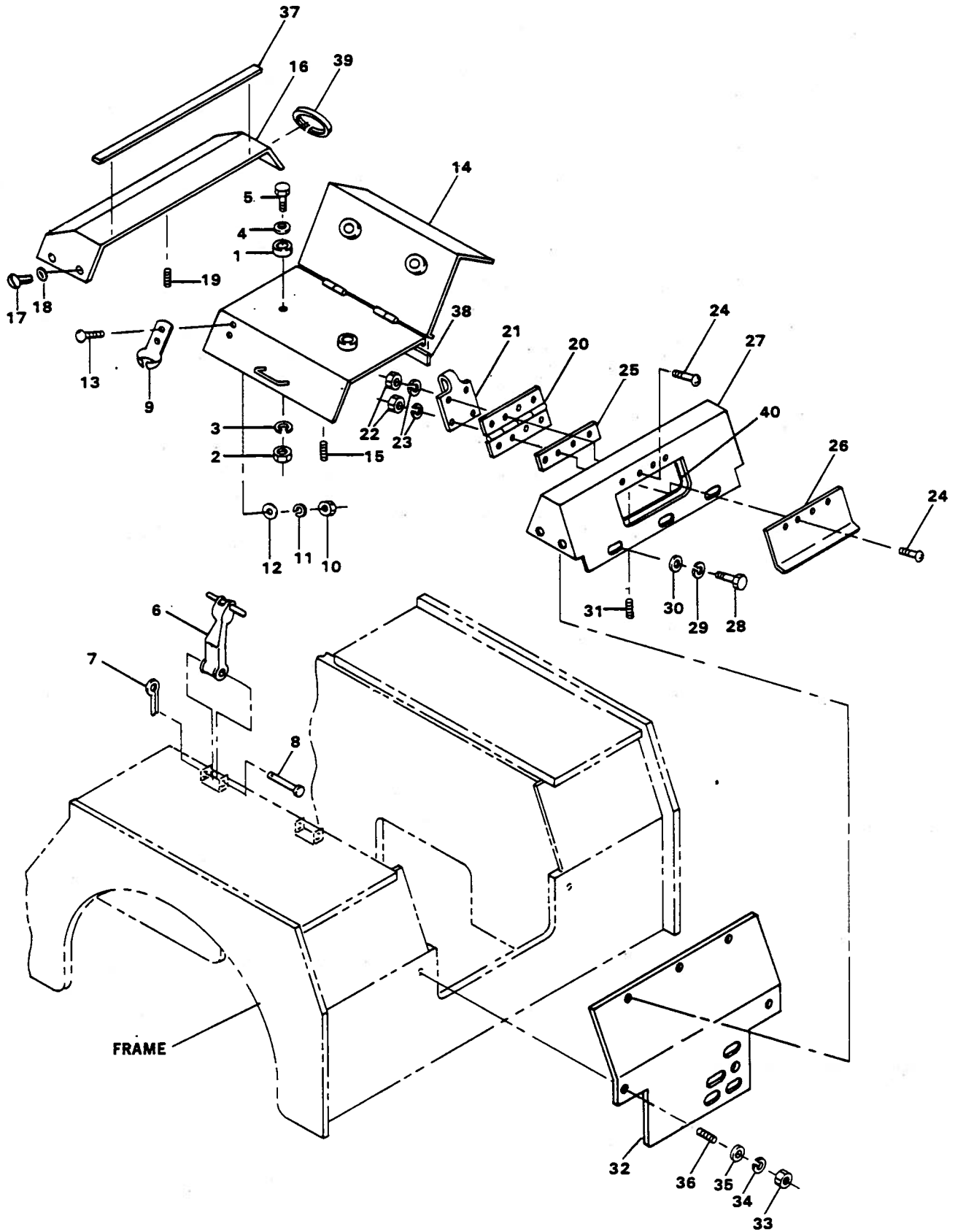
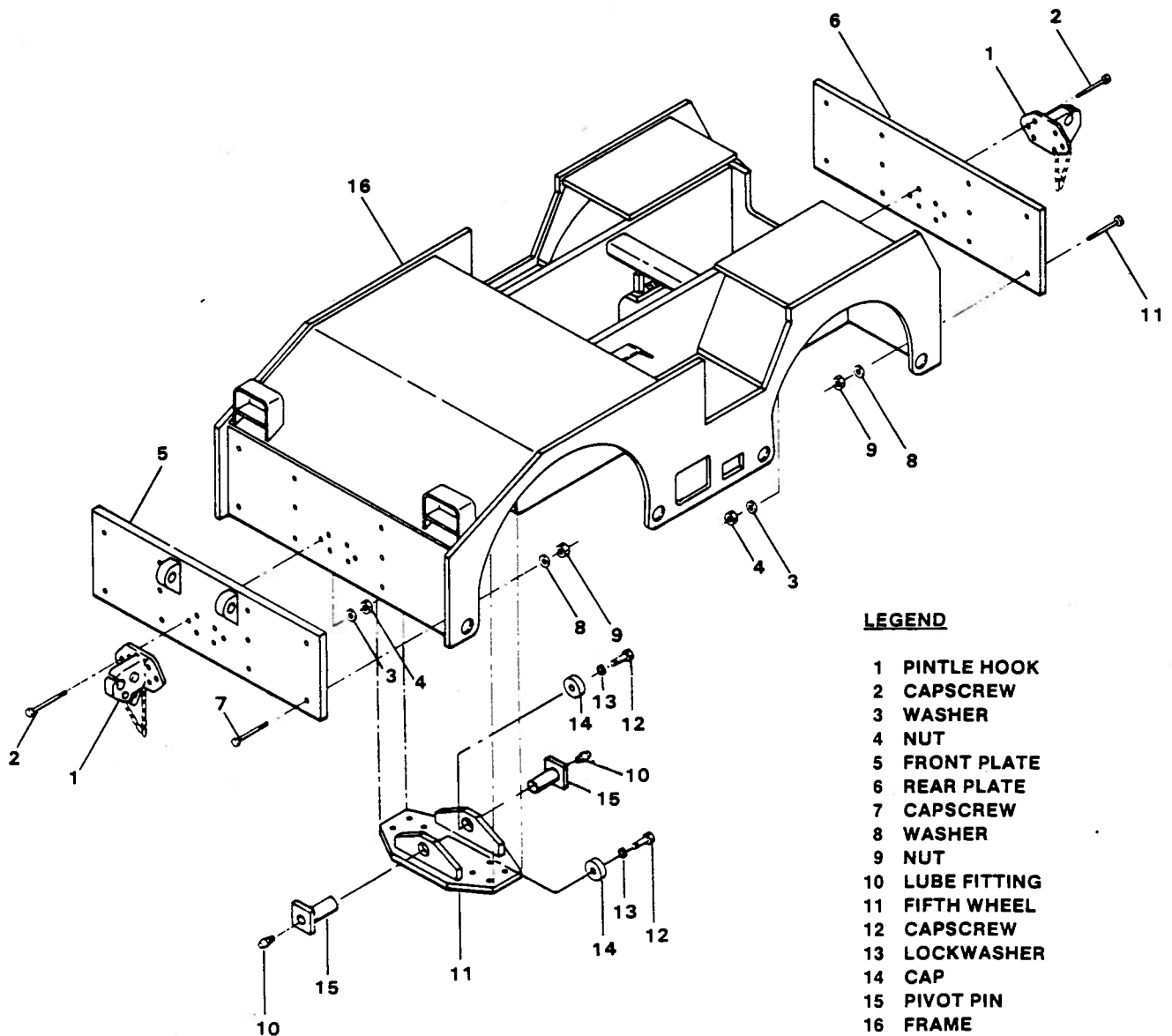


Figure 5-82. Engine Hood Installation

LEGEND FOR FIGURE 5-82

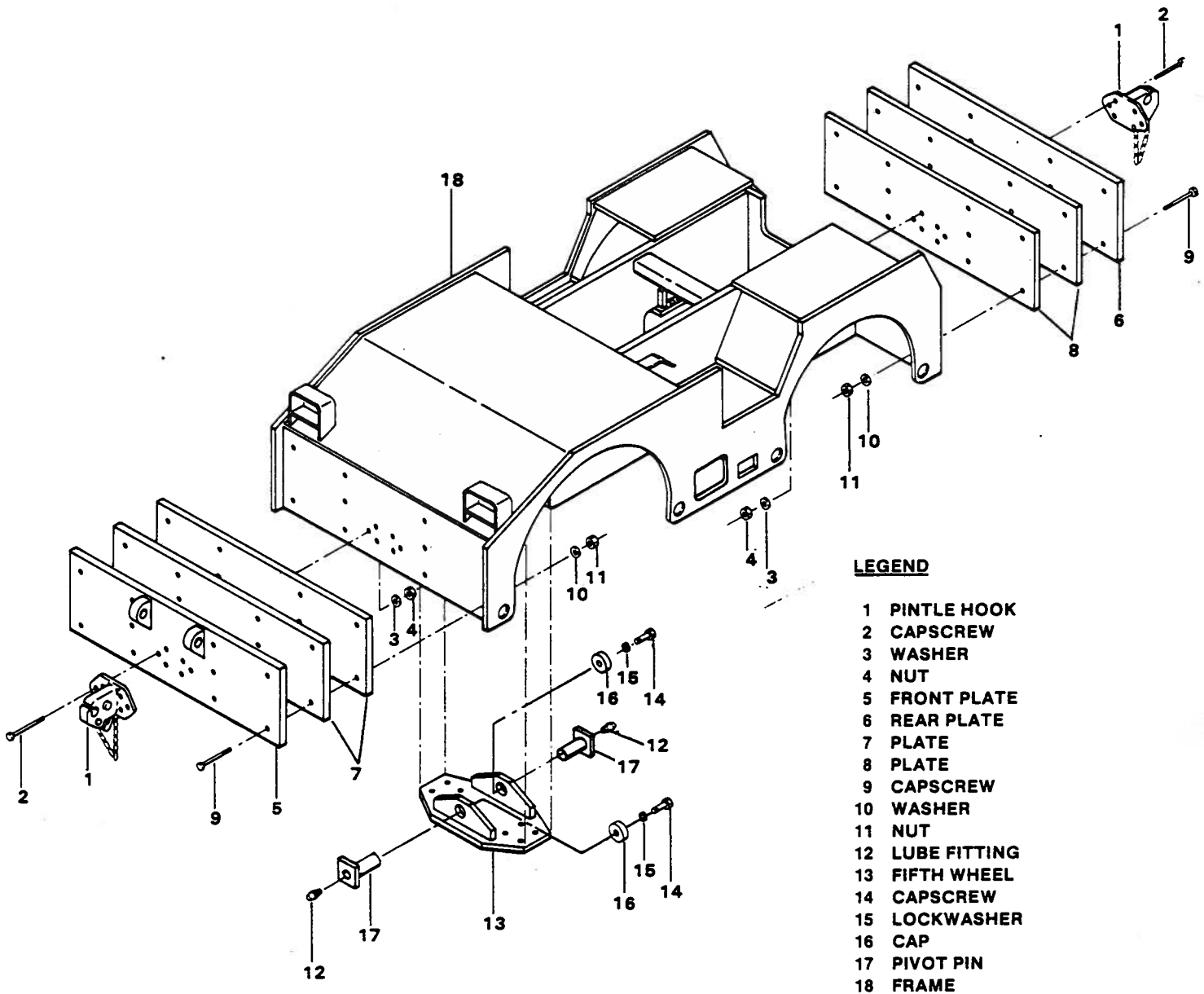
- | | | |
|---------------|---------------|-----------------|
| 1 BUMPER | 15 STUD | 28 CAPSCREW |
| 2 NUT | 16 FRONT COWL | 29 LOCKWASHER |
| 3 LOCKWASHER | 17 CAPSCREW | 30 WASHER |
| 4 WASHER | 18 LOCKWASHER | 31 STUD |
| 5 CAPSCREW | 19 STUD | 32 GRILL |
| 6 HOOK | 20 HINGE | 33 NUT |
| 7 COTTER PIN | 21 SPRING | 34 LOCKWASHER |
| 8 CLEVIS PIN | 22 NUT | 35 WASHER |
| 9 BRACKET | 23 LOCKWASHER | 36 STUD |
| 10 NUT | 24 SCREW | 37 WEATHERSTRIP |
| 11 LOCKWASHER | 25 SPACER | 38 WEATHERSTRIP |
| 12 WASHER | 26 COVER | 39 WEATHERSTRIP |
| 13 SCREW | 27 REAR COWL | 40 WEATHERSTRIP |
| 14 HOOD | | |



LEGEND

- | |
|-----------------|
| 1 PINTLE HOOK |
| 2 CAPSCREW |
| 3 WASHER |
| 4 NUT |
| 5 FRONT PLATE |
| 6 REAR PLATE |
| 7 CAPSCREW |
| 8 WASHER |
| 9 NUT |
| 10 LUBE FITTING |
| 11 FIFTH WHEEL |
| 12 CAPSCREW |
| 13 LOCKWASHER |
| 14 CAP |
| 15 PIVOT PIN |
| 16 FRAME |

Figure 5-83. Frame Installation (Class I)



LEGEND

- 1 PINTLE HOOK
- 2 CAPSCREW
- 3 WASHER
- 4 NUT
- 5 FRONT PLATE
- 6 REAR PLATE
- 7 PLATE
- 8 PLATE
- 9 CAPSCREW
- 10 WASHER
- 11 NUT
- 12 LUBE FITTING
- 13 FIFTH WHEEL
- 14 CAPSCREW
- 15 LOCKWASHER
- 16 CAP
- 17 PIVOT PIN
- 18 FRAME

Figure 5-84. Frame Installation (Class II)

e. Remove dust caps on tapped holes on rear plate (6). Thread lifting eyes into tapped holes. Attach lifting eyes to overhead hoist (2-ton minimum capacity). Take up slack on hoist chain.

WARNING

If towing tractor is a Class II, removing cap screws (9, figure 5-84) will also free

plates (8). Plates (8) weigh 1876 pounds each.

f. Remove cap screws (7, figure 5-83), washers (8), nuts (9), and rear plate (6).

g. If necessary, remove cap screws (12), lock washers (13), caps (14), pivot pins (15), and fifth wheel (11).

5-139. PINTLE HOOK INSTALLATION.**5-140. REMOVAL.** (See figure 5-83.)

a. Remove six capscrews (2), lockwashers (3), and nuts (4) securing pintle hook (1) to frame.

5-141. DISASSEMBLY. (See figure 5-85.)

a. Remove drive screw (1, figure 5-85), S-link (2), chain (3), and ball lock pin (4) from coupler body (17).

b. Remove lubrication fittings (5) from coupler pin (7).

c. Remove two lock nuts (6) from coupler pin (7) and slip pin from coupler body (17).

d. Remove coupler jaw (8).

e. Tap two groove pins (9) to free release lever (10), pin (11), and latch lock (12) from coupler body (17).

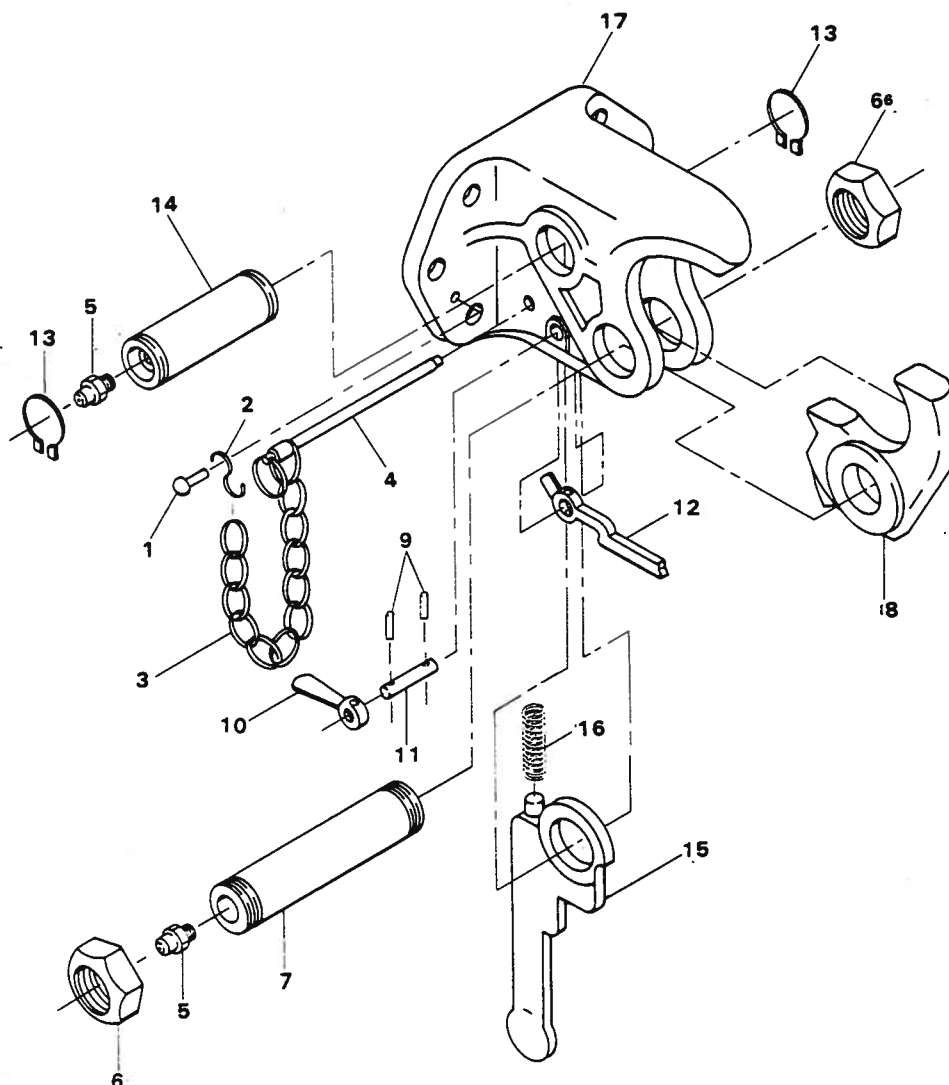
f. Remove lubrication fitting (5) from pin (14).

CAUTION

Removal of pin (14) releases coupler latch (15) and compression spring (16).

g. Remove retaining ring (13) from pin (14). Remove pin (14) from coupler body (17).

h. Remove coupler latch (15) and compression spring (16).

**LEGEND**

- 1 DRIVE SCREW
- 2 S-LINK
- 3 CHAIN
- 4 BALL LOCK PIN
- 5 LUBRICATION FITTING
- 6 LOCK NUT
- 7 COUPLER PIN
- 8 COUPLER JAW
- 9 GROOVE PIN
- 10 RELEASE LEVER
- 11 PIN
- 12 LATCH LOCK
- 13 RETAINING RING
- 14 PIN
- 15 COUPLER LATCH
- 16 COMPRESSION SPRING
- 17 COUPLER BODY

Figure 5-85. Pintle Hook Assembly

5-142. FIRE EXTINGUISHER.

5-143. REMOVAL. (See figure 5-86.)

- a. Loosen clamp on bracket (2, figure 5-86).
- b. Remove fire extinguisher (1).
- c. If necessary, remove nuts (3), lockwashers (4), capscrews (5), and bracket (2).

NOTE

Repair of the fire extinguisher shall be limited to the replacement of the chain (8, figure 5-87) and the pull tite seal (6).

5-144. ACOUSTICAL BLANKETS.

5-145. REMOVAL. (See figures 5-88, 5-89, and 5-90.)

- a. Disassembly of the acoustical installations is limited to the replacement of individual blankets or pads as needed.
- b. Refer to figure 5-88 for the engine hood acoustical installation. Refer to figure 5-89 for the transmission acoustical installation. Refer to figure 5-90 for the cab acoustical installation.

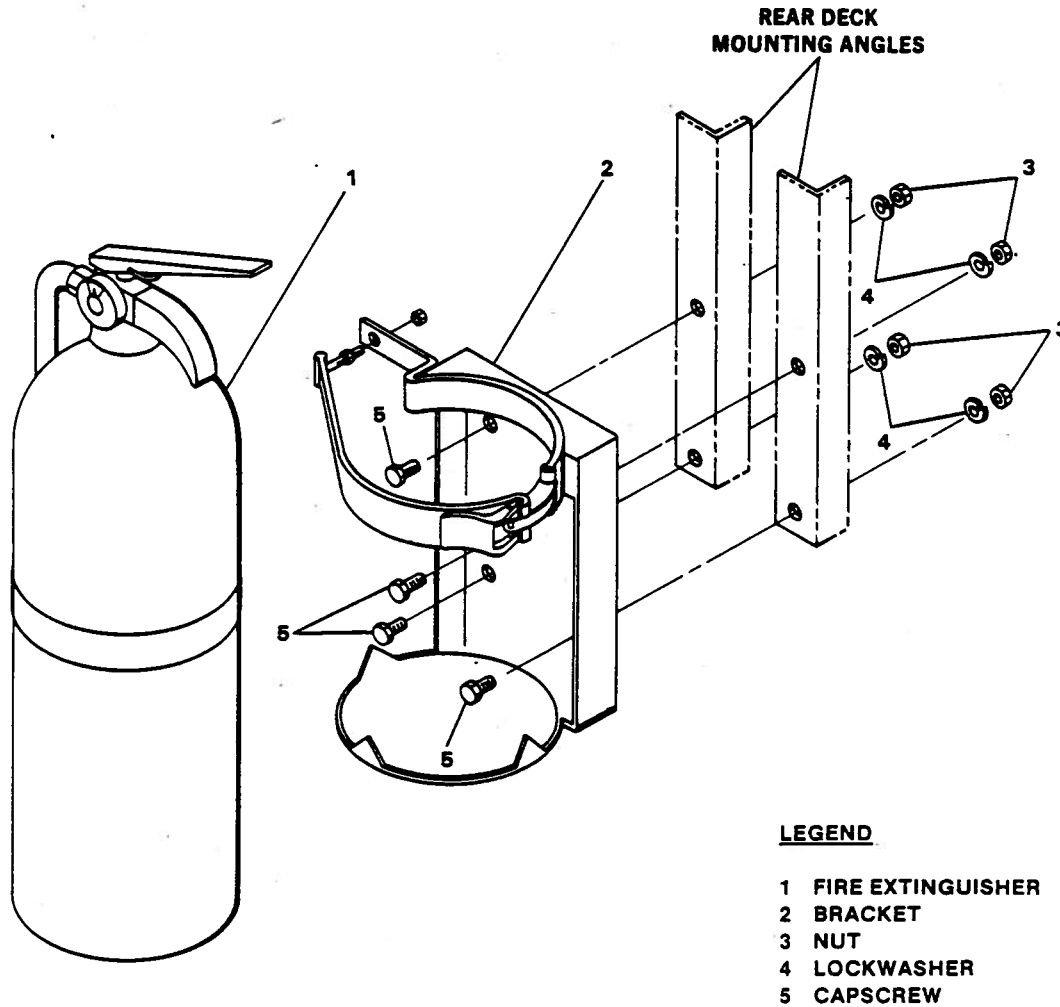
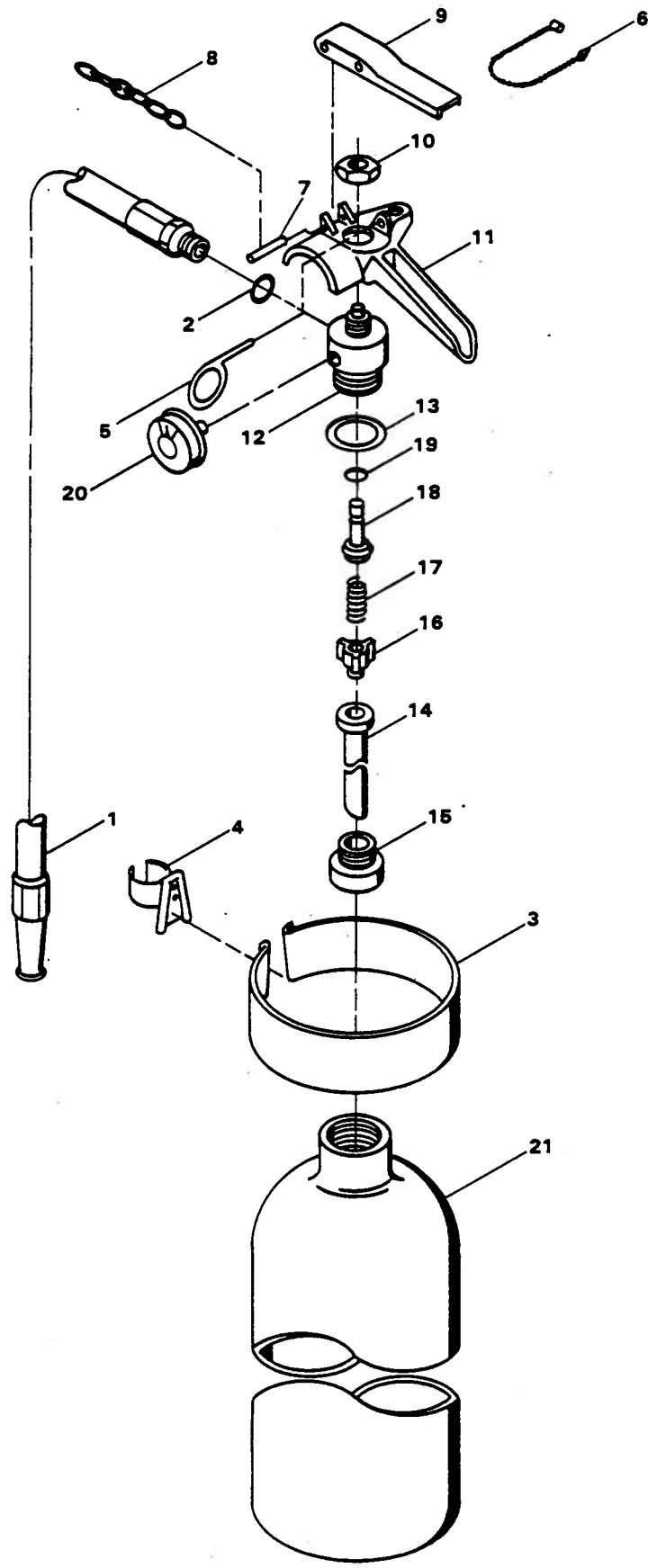


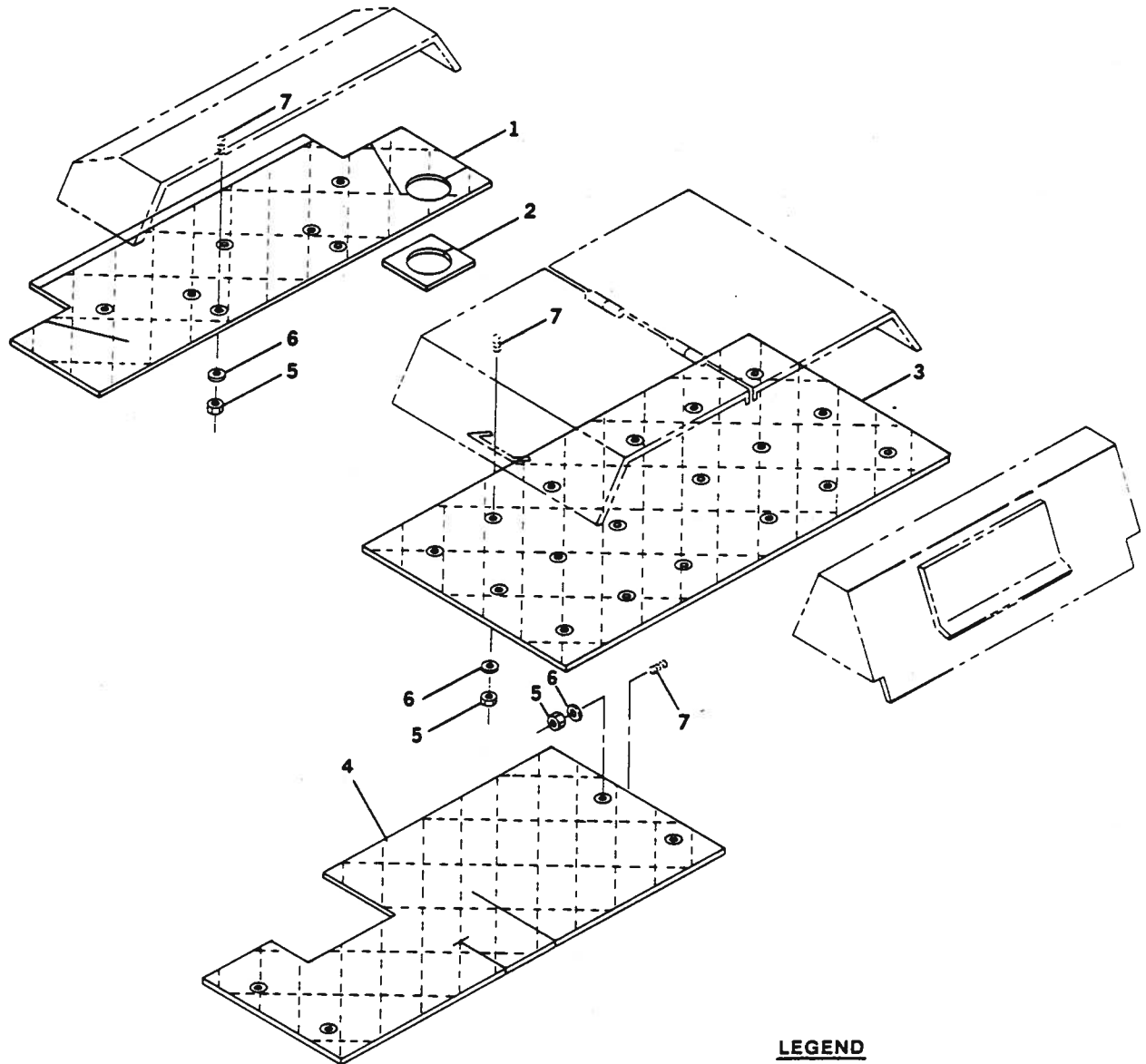
Figure 5-86. Fire Extinguisher Installation



LEGEND

- 1 HOSE & NOZZLE ASSEMBLY
- 2 O-RING
- 3 NAME PLATE
- 4 HORN CLIP
- 5 PULL OUT PIN
- 6 PULL TITE SEAL
- 7 SPIROL PIN
- 8 CHAIN
- 9 LEVER
- 10 NUT
- 11 HANDLE
- 12 VALVE BODY
- 13 O-RING
- 14 SYPHON TUBE
- 15 RETAINER
- 16 SPRING RETAINER
- 17 SPRING
- 18 STEM ASSEMBLY
- 19 O-RING
- 20 GAGE

Figure 5-87. Fire Extinguisher Assembly



LEGEND

- 1 ACOUSTICAL BLANKET
- 2 COVER BLANKET
- 3 ACOUSTICAL BLANKET
- 4 ACOUSTICAL FOAM
- 5 NUT
- 6 WASHER
- 7 WELD STUD

Figure 5-88. Engine Hood Acoustical Installation

LEGEND

- 1 SIDE ACOUSTICAL BLANKET
- 2 TOP ACOUSTICAL BLANKET
- 3 NUT
- 4 WASHER
- 5 WELD STUD
- 6 FOAM

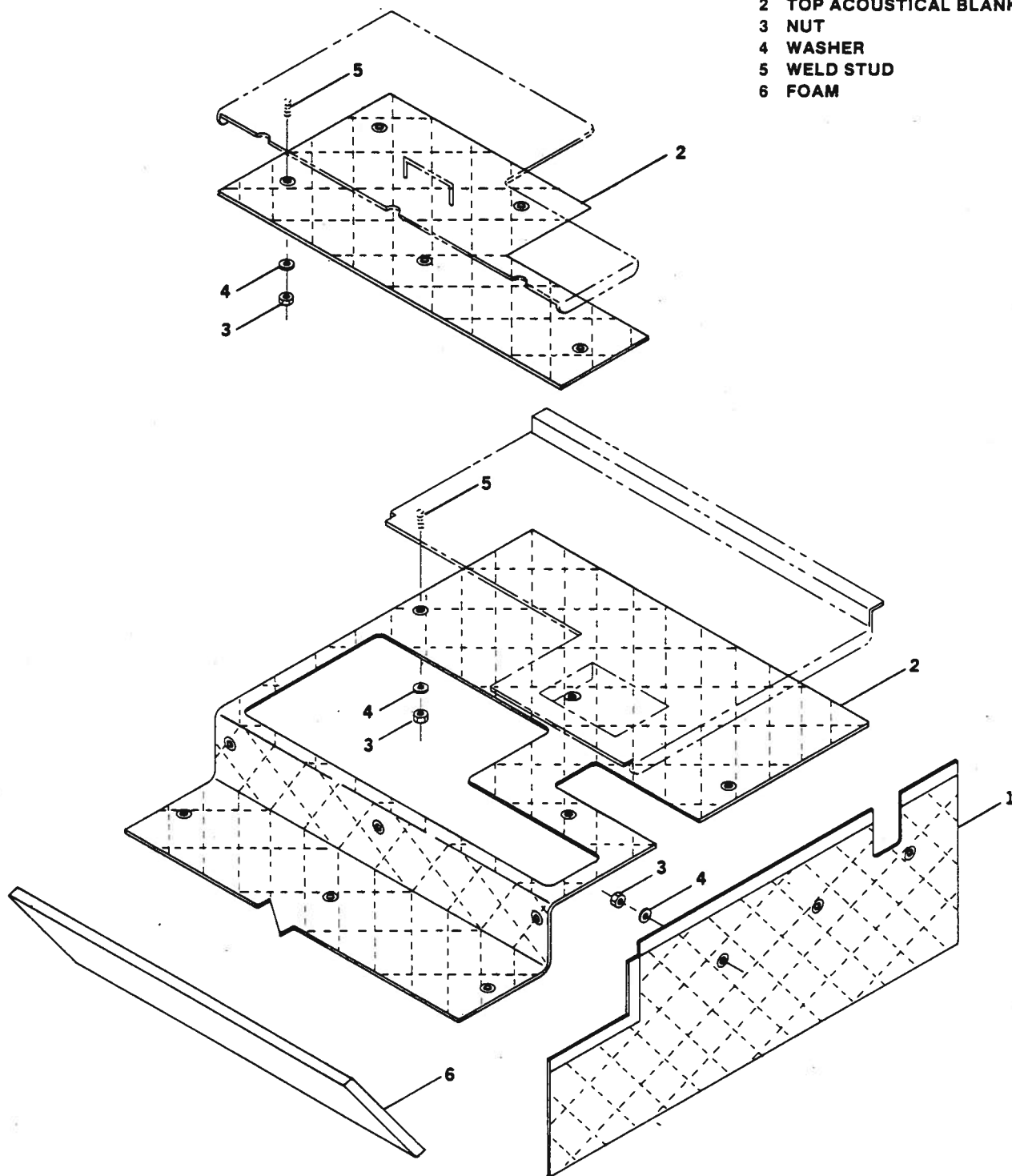
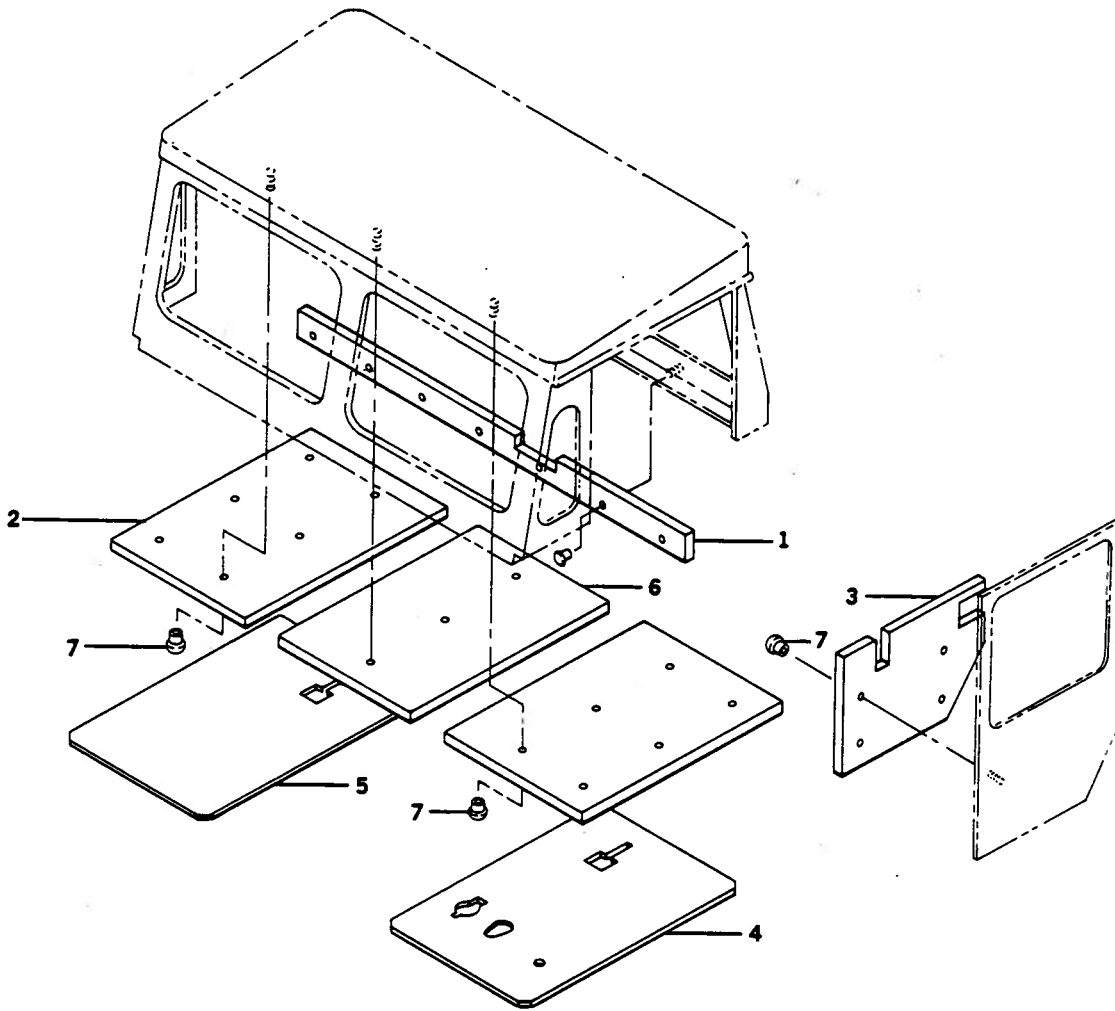


Figure 5-89. Transmission Acoustical Installation



LEGEND

- 1 ACOUSTICAL FOAM
- 2 ACOUSTICAL FOAM
- 3 ACOUSTICAL FOAM
- 4 ACOUSTICAL FOAM
- 5 FLOOR MAT
- 6 ACOUSTICAL FOAM
- 7 NUT
- 8 MAT PANEL
- 9 ACOUSTICAL FOAM
- 10 MAT PANEL
- 11 MAT PANEL
- 12 MAT PANEL
- 13 MAT PANEL
- 14 ACOUSTICAL FOAM
- 15 MOULDING
- 16 STEER VALVE COVER
- 17 NUT
- 18 WELD STUD
- 19 WELD STUD
- 20 WELD STUD

Figure 5-90. Cab Acoustical Installation (Sheet 1 of 2)

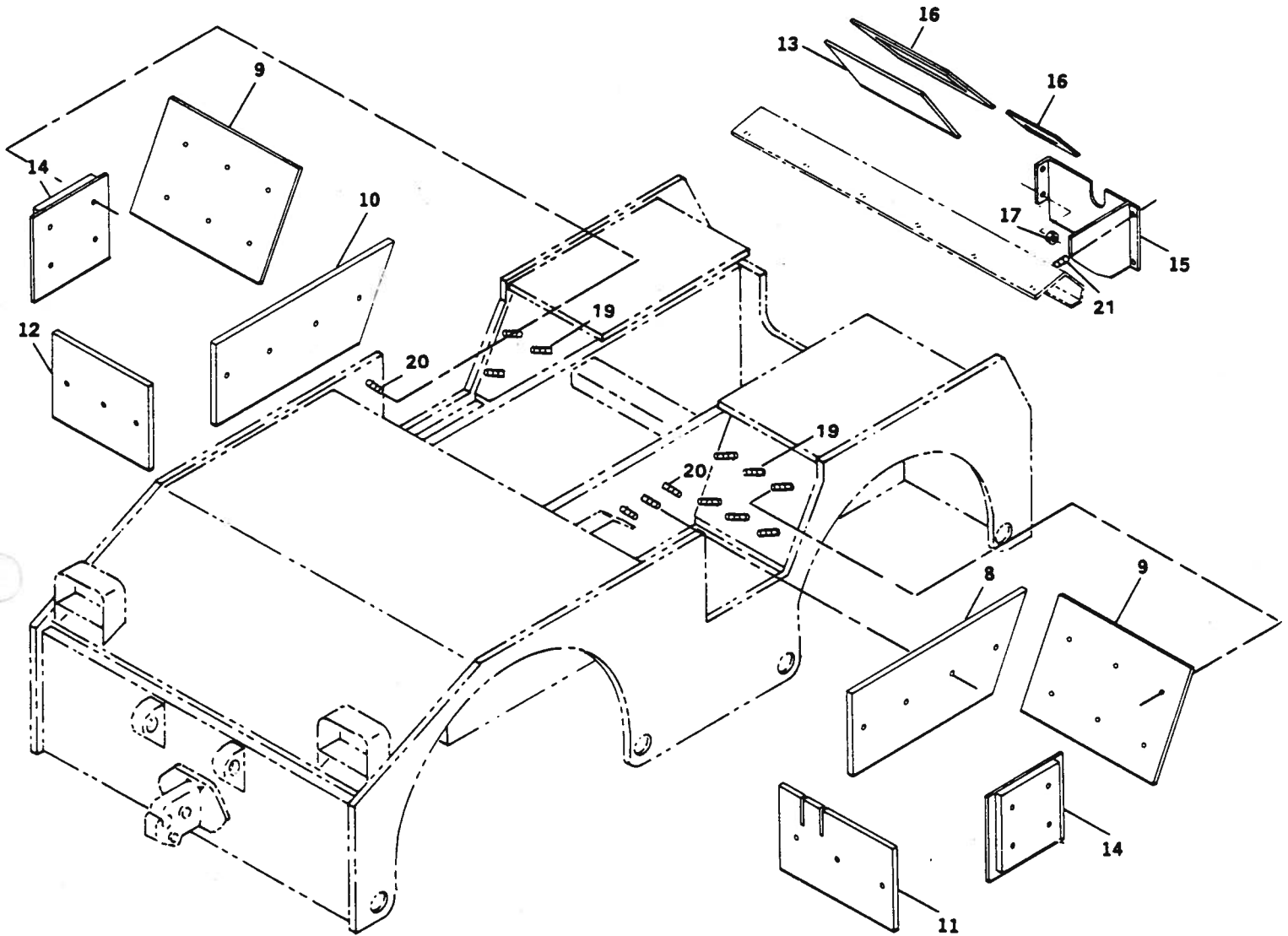
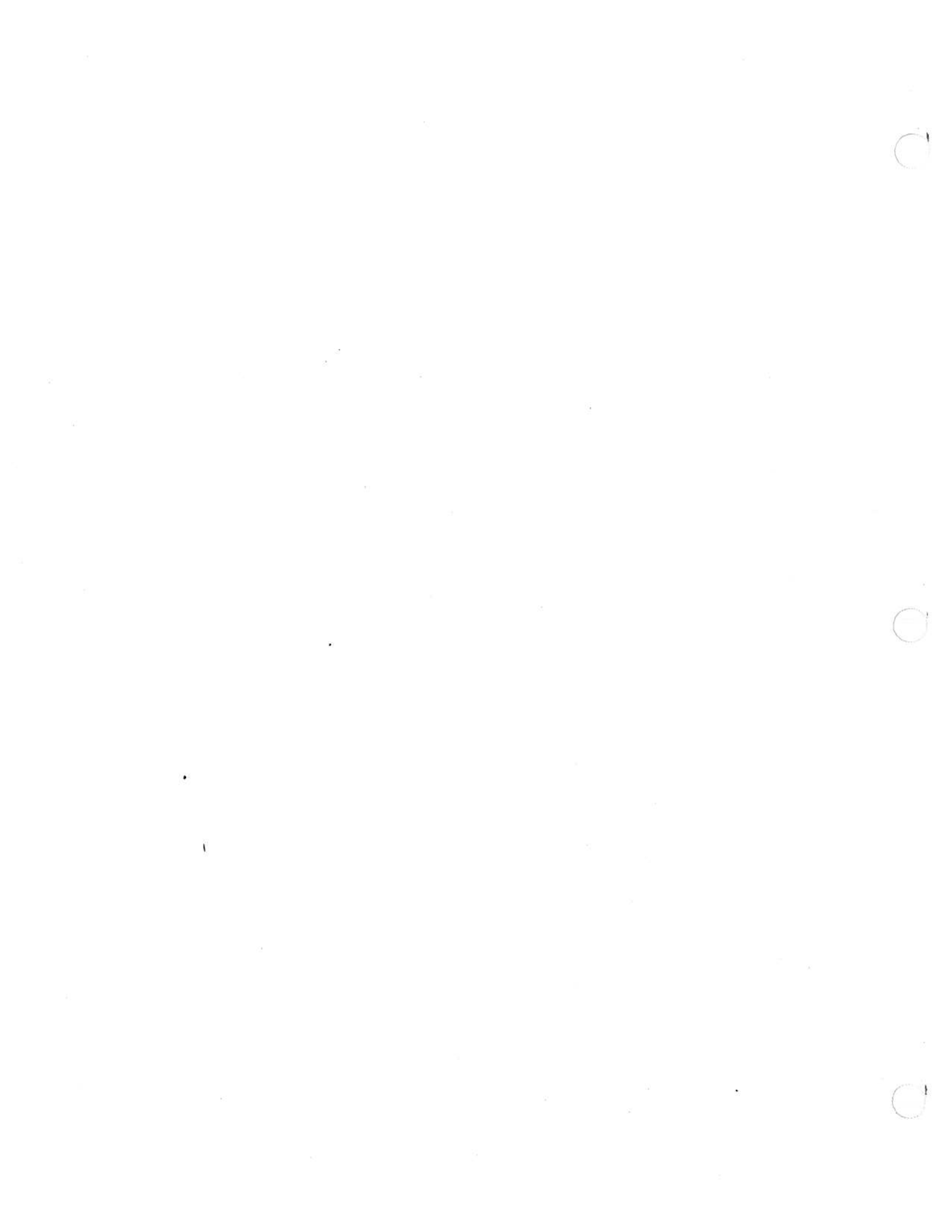


Figure 5-90. Cab Acoustical Installation (Sheet 2 of 2)



SECTION VI

CLEANING

6-1. GENERAL.

6-2. There are no special cleaning procedures required for assemblies and parts of the MB-2 towing tractors.

6-3. CLEANING SOLVENT.

6-4. In general, all parts should be cleaned and degreased with cleaning solvent P-D-680, Type II prior to reassembly. The following warnings and cautions apply when using cleaning solvent P-D-680, Type II.

WARNING

Solvent fumes are toxic. Use solvent in a well-ventilated area. Use goggles to protect eyes. If solvent is splashed on bare skin, rinse skin with fresh water immediately.

Solvent is flammable. Keep solvent away from heat and open flame.

CAUTION

Do not use cleaning solvent P-D-680, Type II to clean rubber parts (i.e., moulding, weatherstrips, and gaskets).

CAUTION

Use clean, low-pressure compressed air to dry clean parts. When air is unavailable, use clean, lint-free cloth.

CAUTION

Do not use cleaning solvent P-D-680, Type II to clean roller bearings.

6-5. COMPRESSED AIR.

6-6. Low-pressure compressed air (when available) shall be used to dry parts that have been cleaned with solvent P-D-680, Type II. Use of compressed air shall be limited to air that has been passed through filters to remove moisture and contaminants.

WARNING

Wear goggles to protect eyes when using compressed air.

6-7. NATURAL AND SYNTHETIC RUBBER PARTS.

6-8. Rubber parts should be cleaned by washing with a mild solution of soap and water. After cleaning, these parts should be rinsed with clean water and dried in a well-ventilated area. Petroleum solvents such as cleaning solvent P-D-680, Type II should not be used to clean rubber or synthetic parts.



SECTION VII

INSPECTION, REPAIR, AND REPLACEMENT

7-1. INSPECTION.

7-2. GENERAL. The following is a list of general inspection procedures:

a. Electrical Plugs and Connectors. Inspect all plugs and connectors for looseness and corrosion.

b. Bearings, Caps, and Cones. Inspect for:

1. Large ends of rollers worn flush to recess or radii worn sharp.

2. Visible step wear at end of roller track.

3. Deep indentations, cracks, or breaks in bearing cups and/or cone surfaces.

4. Bright rubbing marks on dark phosphate surfaces of bearing cage.

5. Etching or pitting on functional surfaces.

c. Attaching Parts. Inspect all capscrews, studs, washers, and nuts for damaged threads and corrosion. Replace all cotter pins.

d. Clamps and Tubes. Inspect for corrosion, damage, or distortion.

e. Valves and Fittings. Inspect for damage, corrosion, and evidence of leakage. Replace O-rings on fittings as required.

f. Springs. Inspect for twisted coils, corrosion, and stretching.

g. Bushings, Oil Seals, and Spacers. Inspect for wear, scoring, and distortion.

h. Pins and Clevis Pins. Inspect for wear, cracks, corrosion, and distortion.

i. Shifts and Cylinder Rods. Inspect for pitting, wear, cracks, and distortion.

j. Housings, Castings, and Flanges. Inspect for corrosion, cracks, wear, and distortion.

k. Screens, Filters, and Breathers. Inspect for contamination and damage.

l. Gears and Splined Shafts. Inspect for chipped or missing teeth. Inspect for cracks and wear. Replace gears if teeth show spots where case hardening has worn through.

m. Hydraulic Hoses. Inspect for cuts and deterioration. Inspect fitting ends for damaged threads.

n. Glass. Inspect for damage.

o. Electric Motors. Inspect for damage, corrosion, and evidence of overheating.

p. Gaskets, Seals, and Weatherstrips. Inspect for cracks and deterioration. Inspect gaskets for compression.

q. Radiator. Inspect for damaged fins and tubes. Check for evidence of leakage and corrosion.

7-3. SPECIFIC. Apply specific inspection procedures in addition to the general inspection requirements for the following assemblies:

7-4. ALTERNATOR. Inspect the following alternator components:

a. Pulley (8, figure 5-23) for cracks and wear.

b. Fan (10) for wear and damaged vanes.

c. Collars (24 and 25, figure 5-24) for wear and damage.

d. Rotor (2) for corrosion and wear.

e. Brush (8) for wear.

f. Check rotor assembly (2) as follows:

1. Connect ohmmeter to each slip ring (figure 7-1).

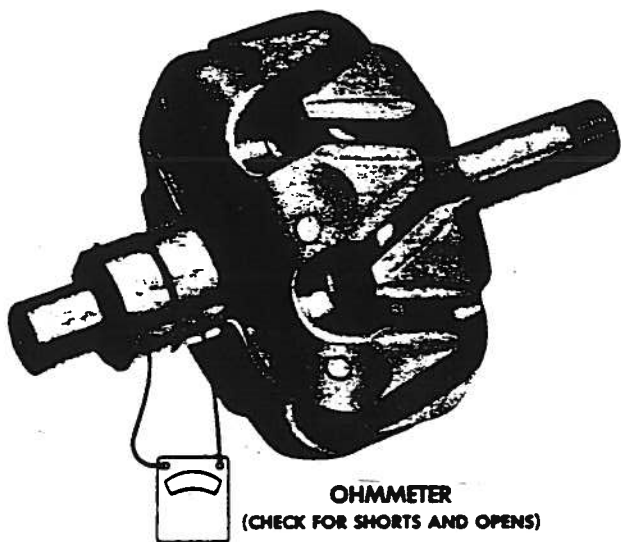


Figure 7-1. Rotor Check

2. If ohmmeter reading is high (infinite), then rotor winding is open.
3. Connect ohmmeter from one slip ring to shaft.
4. If ohmmeter is low, then rotor winding is grounded.
5. Check rotor winding for short-circuit by connecting ohmmeter to each slip ring (figure 7-1).
6. If ohmmeter reading is above 3.0, the rotor winding has excessive resistance.
7. If ohmmeter reading is below 2.4, the rotor winding is shorted.

NOTE

If the rotor assembly is not defective but the generator fails to supply rated output, then defect is in diode trio (7, figure 5-24), rectifier bridge (18), stator (4), or voltage regulator (3).

- g. Check diode trio (7) as follows:

1. Connect ohmmeter (having a 1-1/2 volt cell) to single side connector and one of three connectors (figure 7-2).

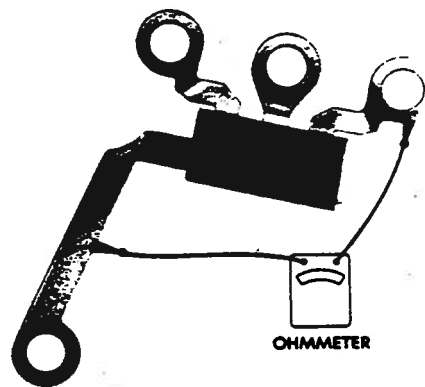


Figure 7-2. Diode Trio Test

2. Observe and record reading on lowest range scale and reverse leads to same two connectors (figure 7-2).
3. Observe ohmmeter reading.
4. If readings are the same, replace diode trio (7, figure 5-24).
5. Repeat steps 1 thru 4 for the other two short connectors.
6. Connect ohmmeter to each pair of three connectors (not shown).
7. If any reading is zero, replace diode trio panel (7).
- h. Check rectifier bridge (18, figure 5-24) as follows:

1. Connect ohmmeter to grounded heat sink (figure 7-3) and one of three terminals on rectifier bridge.

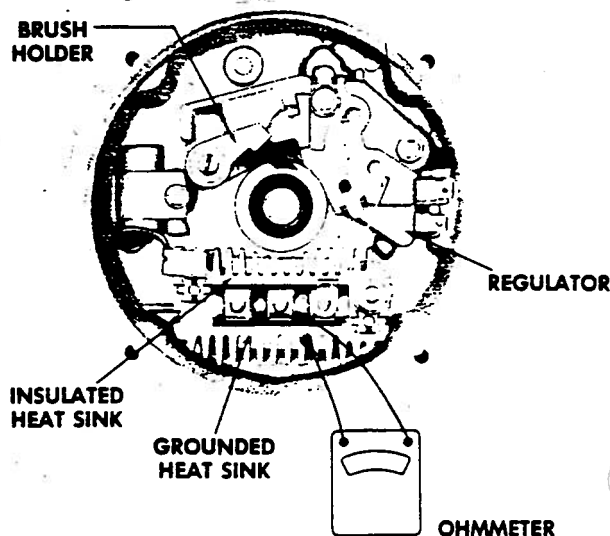


Figure 7-3. Rectifier Bridge Check

2. Press down firmly on flat metal connector of rectifier bridge then reverse leads to heat sink and same terminal.

3. If both readings are same, replace rectifier bridge.

4. Repeat steps 1 thru 3 for other two terminals on rectifier bridge (18, figure 5-24).

i. Check stator (4, figure 5-24) as follows:

1. Connect ohmmeter from any stator lead to frame (figure 7-4).

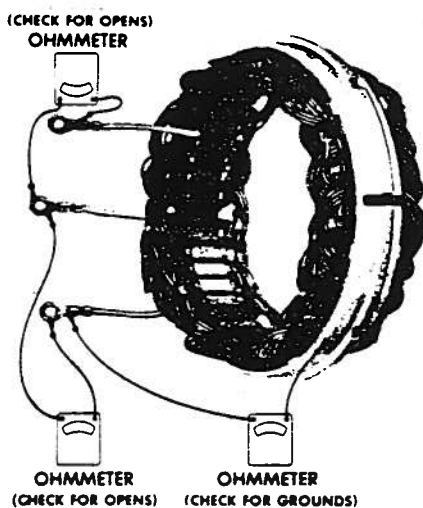


Figure 7-4. Stator Check

2. If ohmmeter reading is low, then windings are grounded. Replace stator.

3. Connect ohmmeter leads from each set of stator leads.

4. If ohmmeter readings are high, then windings are open. Replace stator.

7-5. STARTING MOTOR. Inspect the following starting motor components:

a. Drive (15, figure 5-26) for damaged gear teeth and wear.

b. Shift lever (21) for distortion.

c. Armature (19) for corrosion, dirt, and scored shaft.

d. Brushes (37) for wear.

e. Test armature (19) as follows:

1. Rotate armature in growler and hold hacksaw blade on armature.

2. Hacksaw blade will vibrate on area of short circuit.

3. Inspect points where conductors are joined to commutator for loose connections evidenced by arching and burning of commutator.

NOTE

If bars are not badly burned, leads can be resoldered to the riser bars.

4. Use test lamp to test for grounds. Place one test prod on commutator and one on armature shaft. If test lamp lights, armature is grounded.

f. Check field coil (30, figure 5-26) as follows:

1. Disconnect field coil ground connections.

2. Connect one test lamp prod to field frame and other to field connector.

3. If test lamp lights, then field coils are grounded and must be replaced.

4. Connect test lamp prods to ends of field coils. If test lamp does not light then field coils are open.

g. Test solenoid switch (1, figure 5-26) as follows:

1. Connect 12 volt battery, switch, and ammeter to two switch windings as shown in figure 7-5.

2. Make test connections as shown to switch "S" terminal and ground "G".

3. Use carbon pile across battery to decrease battery voltage to 10 volts.

4. Record ammeter reading.

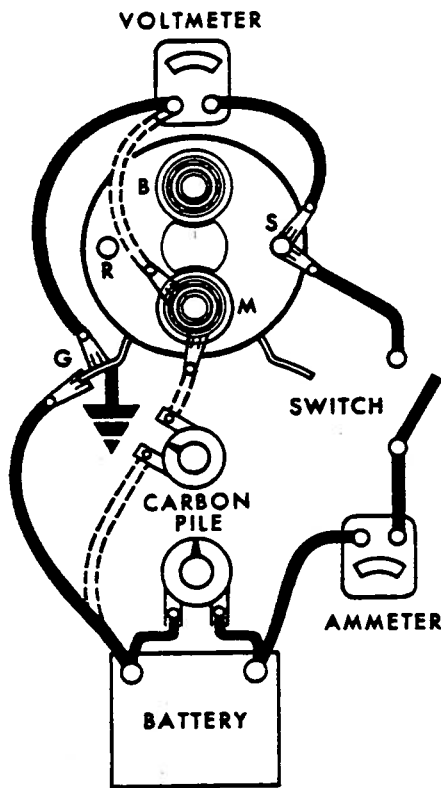


Figure 7-5. Connections for Checking Solenoid

5. A high ammeter reading indicates shorted or grounded hold-in winding. A low reading indicates excessive resistance.

6. Connect voltmeter to switch "S" terminal and "M" terminal. See figure 7-5.

7. Connect carbon pile between battery and "M" terminal.

CAUTION

To avoid solenoid overheating, do not leave pull-in windings generated for more than 15 seconds.

8. The current draw should decrease as the winding temperature increases. This indicates solenoid is good.

7-6. **DRIVE LINES.** Inspect the following drive line components:

a. Wing bearings (5, 6, 15, and 16, figure 5-52) for wear, cracks, galling, and burrs.

b. Yoke and tubes (9 and 19) for damaged splines and bent shafts.

7-7. **AXLES.** Inspect the following axle parts:

a. Hub (22, figure 5-54) for corrosion, warping, and scoring.

b. Tie rod (43) for damage or worn ends and bent rod.

c. Brake shoes (3, figure 5-56) for wear below 0.188 inch minimum.

d. Wheel cylinders (9) for evidence of leaks.

7-8. **BRAKE VALVE.** Inspect the following brake valve parts:

CAUTION

Any part of the brake valve which requires replacement other than those parts contained in seal kit 06-459-004 shall be cause for replacement of the entire brake valve assembly.

a. Piston surface (4, figure 5-60) for nicks and scratches at O-ring sealing surface. Check piston where it engages push rod for dirt and corrosion.

b. Apply prussian blue (McMaster-Carr No. 6165K11 or equivalent) to valve seat in guide (19). Install valve and ball (27) in valve seat of guide (19). The seat is satisfactory if there is a well-defined line without breaks.

c. Inspect guide (19) for nicks, scratches, and wear.

d. Apply prussian blue to valve and ball (27). Seat ball in guide (19). Ball and valve are acceptable if there is a well-defined line without breaks.

e. Apply prussian blue to seat in piston (12). Apply valve and ball (27) to seat of piston. Piston seat is acceptable if there is a well-defined line without breaks.

f. Use prussian blue to check contact between insert seat (40) and ball (38). Contact is acceptable if there is a well-defined line without breaks.

g. Assemble spool (39), insert (40), and balls (32 and 38). Measure and record assembly length from ball to ball with micrometer.

h. Remove balls (32 and 38) and spool (39). Reinstall balls (32 and 38) in their respective seats in insert (40). Measure and record length with micrometer. Subtract larger measurement from smaller measurement. If difference is less than 0.004 inch, reject spool (39).

7-9. WHEEL AND TIRE. Inspect the following wheel and tire parts:

a. Locking ring (1, figure 5-65), side ring (2), and wheel (3) for rust, cracks, burrs, and distortion. Clean and repaint as necessary.

b. Tire (4) for wear, cuts, and nicks. Inspect inside for bruises and evidence of cord and thread separation.

7-10. HYDRAULIC PUMP. Inspect the following hydraulic pump parts:

a. Gear plate (26, figure 5-71). Inspect depth of milled groove centered on discharge side. Nominal depth is .008 inch and shall not exceed .015 inch. Replace gear plate if cut is deeper than .015 inch or if plate is cracked or scored.

b. Pressure plates (25) for excessive wear on bronze surfaces.

c. Bushings (21, 31, and 32) for worn grey teflon coating. Replace bushings if bronze color is exposed.

d. Spools (5 and 15) for burrs and sharp edges.

7-11. HEATER. Inspect the following heater parts:

a. Motor (1, figure 5-80) for wear and evidence of overheating.

b. Core (6) for corrosion, damaged vanes and tubes, and evidence of leaks.

7-12. PINTLE HOOK. Inspect the following pintle hook parts:

a. Lock pin (4, figure 5-85) for distortion.

b. Pins (7 and 14) for distortion, scoring, and corrosion.

c. Jaw (8) and body (17) for cracks, corrosion, wear, and distortion.

7-13. REPAIR AND REPLACEMENT.

7-14. In general, repair shall be limited to the replacement of all parts that fail inspection.

a. Remove minor blemishes, nicks, and corrosion with fine or medium grit sandpaper. Clean parts thoroughly after using sandpaper.

b. Welding or braising to repair critical structural components of the towing tractor is not recommended.

c. Replace all O-rings and seals where applicable with the recommended repair kit.

SECTION VIII

ASSEMBLY AND INSTALLATION

8-1. GENERAL.

8-2. This section contains the instructions for assembly and installation of components and assemblies of the towing tractor. Observe all warnings and cautions when performing the maintenance procedures contained herein.

NOTE

Refer to Section V for the applicable removal and disassembly procedures.

8-3. ACOUSTICAL BLANKETS.

8-4. INSTALLATION. (See figures 5-88, 5-89, and 5-90.)

a. Installation of the acoustical blankets and pads is limited to individual parts as needed.

b. Refer to figure 5-88 for the engine hood acoustical installation. Refer to figure 5-89 for the transmission acoustical installation. Refer to figure 5-90 for the cab acoustical installation.

8-5. FIRE EXTINGUISHER ASSEMBLY.

8-6. INSTALLATION. (See figure 5-86.)

a. Install bracket (2, figure 5-86) with cap-screws (5), lockwashers (4), and nuts (3).

b. Install fire extinguisher (2) and secure bracket.

NOTE

Repair of the fire extinguisher assembly, is limited to the replacement of the pull tite seal (6, figure 5-87) and chain (8). Refer to base Fire Fighting unit for other repairs or recharging of the extinguisher.

8-7. PINTLE HOOK.

8-8. ASSEMBLY. (See figure 5-85.)

a. Install compression spring (16, figure 5-85) and coupler latch (15) in position to receive pin (14).

b. Install pin (14) and retaining rings (13) in coupler body (17). Install lubrication fitting (5) in pin (14).

c. Install release lever (10) on pin (11) and secure with groove pin (9).

CAUTION

Slip release lever, groove pin, and pin assembly into coupler body (17) in alignment with latch lock.

d. Install latch lock (12) and secure to pin (14) with groove pin (9).

e. Insert coupler jaw (8) in coupler body yoke and install coupler pin (7). Secure with locknut (6) on each end of coupler pin.

f. Install lubrication fitting (5) in coupler pin (7).

g. Install ball lock pin (14) and chain (3) in coupler body (17). Secure ball lock pin to coupler body with S-link (2) and drive screw (1).

8-9. INSTALLATION. (See figure 5-83.)

a. Install pintle hook to frame with six cap-screws (2, figure 5-83) washers (3), and nuts (4). Torque capscrews (2) from 240 to 260 lbs-ft.

8-10. FRAME.

8-11. ASSEMBLY. (See figure 5-83 or 5-84.)

NOTE

The following procedure is typical for a Class I towing tractor frame (figure 5-83). Refer to figure 5-84 for a Class II towing tractor frame.

- a. If removed, install fifth wheel (11, figure 5-83) and secure with pivot pin (15), cap (14), lockwasher (13), and capscrew (12).

WARNING

Rear plate (6) weighs 1932 pounds.

- b. Install lifting eyes in tapped holes of rear plate (6). Attach lifting eyes to overhead hoist (2-ton minimum capacity) and lift rear plate into position on frame. Align drilled holes through frame.

NOTE

If towing tractor is a Class II, plates (8, figure 5-84) must also be installed. Each plate (8) weighs 1876 pounds.

- c. Install capscrews (7, figure 5-83) washers (8), and nuts (9). Torque nuts (9) from 560 to 606 lbs-ft.

WARNING

Front plate (5) weighs 2249 pounds.

- d. Install lifting eyes in tapped holes of front plate (5). Attach lifting eyes to overhead hoist (2-ton minimum capacity) and lift front plate into position on frame. Align drilled holes through frame.

NOTE

If towing tractor is a Class II, plates (7, figure 5-84) must also be installed. Each plate (7) weighs 2194 pounds.

- e. Install capscrews (7, figure 5-83), washers (8), and nuts (9). Torque nuts (9) from 560 to 606 lbs-ft.

- f. Install pintle hooks (1) fore and aft. Install capscrews (2), washers (3), and nuts (4). Torque nuts (4) from 240 to 260 lbs-ft.

8-12. ENGINE HOOD.

8-13. INSTALLATION. (See figure 5-82.)

NOTE

If removed, install acoustical blankets (refer to figure 5-88).

- a. Install grill (32, figure 5-82) with nuts (33), lockwashers (34), and washers (35).

- b. Install cover (26) with spacer (25), hinge (20), and spring (21) and weatherstrip (40). Secure with screws (24), lockwashers (23), and nuts (22).

- c. Install rear cowl (27) and secure with capscrews (28), lockwashers (29), and washers (30).

- d. Install capscrews (5), washers (4), bumpers (1), lockwashers (3), and nuts (2).

- e. Install brackets (9), screws (13), washers (12), lockwashers (11), and nuts (10).

- f. Install weatherstrip (38). Install weatherstrip (37 and 39).

- g. Install front cowl (16) and secure with capscrews (17) and lockwashers (18).

- h. Install hood (14). Install hook (6), clevis pin (8), and cotter pin (7). Secure hood (14) with hook (6).

- i. Install air cleaner hood (not shown).

8-14. SEAT AND PEDESTAL.

8-15. INSTALLATION. (See figure 5-81.)

- a. Install lower pedestal (21, figure 5-81) to frame. Secure with lockwashers (17) and capscrews (16).

- b. Install upper base (22) to lower pedestal (21). Secure with pin (19) and hair pin (18). Thread lock bolts (20) to lower pedestal and upper base.

- c. Install back (9) to frame (11) and secure with capscrews (10).

- d. Install seat (8), track (12) and control track (13) to frame (11). Secure with capscrews (14).

- e. Install seat assembly (5) to seat pedestal assembly (15). Secure with lockwashers (7) and nuts (6).

f. Install seat belt kit (1). Secure with carriage bolts (4), lockwashers (3), and nuts (2).

8-16. HEATER.

8-17. ASSEMBLY. (See figure 5-80.)

a. Install switch (9, figure 5-80), air control (10), defrost control (11), and temperature control (12) if previously removed.

b. Install core (6) and secure with retaining strip (8) and screws (7).

c. Install wheel (4) and setscrew (5).

d. Install motor (1) and secure with screws (2) and washers (3).

8-18. INSTALLATION. (See figure 5-79.)

a. Install heater hoses and clamps (1, figure 5-79) at heater inlet and outlet ports.

b. Install heater (3) and secure with lockwashers (5) and nuts (4).

c. Install valve (2) and secure control cable with setscrew (not shown).

d. Install remaining heater hoses and clamps (1).

e. Remove tags and connect electrical leads to heater (3).

f. Install console panel (31, figure 5-5) and secure with five screws (34), washers (35), and fasteners (36).

g. Remove tags and connect console panel harness at pin connector.

8-19. PARK BRAKE LEVER.

8-20. INSTALLATION. (See figure 5-79.)

a. Install angle (7, figure 5-79) to mounting plate (17). Secure with capscrews (11), washers (13), lockwashers (10), and nuts (9).

b. Install switch (6) to angle (7). Secure with nuts (supplied with switch).

c. Install brake lever (8) to mounting plate (17). Secure with capscrews (12), lockwashers (19), and nuts (9).

d. Install park brake cable (not shown) to brake lever (8). Secure with pin (16) washer (15), and cotter pin (14).

e. Remove tags and install electrical wire to switch (6).

8-21. REAR WINDOW ASSEMBLY.

8-22. ASSEMBLY. (See figure 5-78.)

a. Assemble side window assembly (13, figure 5-77) as follows:

b. Install latches (5), grommets (8), washers (9), and screws (7).

c. Install wiper (4), bar (3), and screws (1).

d. Install glass (10 and 11) and secure frame (13).

8-23. INSTALLATION. (See figure 5-75).

a. Install rear window (3, figure 5-75) with new weatherstrip (14).

8-24. CAB DOORS AND SIDE WINDOWS.

8-25. ASSEMBLY. (See figure 5-77.)

a. Assemble side window assembly (13, figure 5-77) as follows:

1. Install catch (25) and screws (26).

2. Install lock (16), nuts (18), and screws (17).

3. Install slide stop (14) and screw (15).

4. Install post (19), screws (20), weatherstrip (30), and channels (27 and 28). Secure weatherseal (30) with waterproof glue.

5. Install glass (21 and 22) and close frame break. Secure frame with tie bar (23) and screws (24). Use metal sealant to seal frame at tie bar.

b. Install side window assembly (3) in cab door with moulding (not shown).

c. Install latch (10), screws (11), washers (11C), lockwashers, (11B), and nuts (11A).

d. Install latch extension (1) and secure with capscrew (2), washers (3) and nut (4).

e. Install handle (6) through latch extension (1) and secure with cotter pins (5).

f. Install screws (9), lockwashers (8), and nuts (7).

8-26. WIPER MOTOR.

8-27. INSTALLATION. (See figure 5-76.)

a. Install crank (7, figure 5-76) on wiper motor (8) and secure with nut.

b. Install pivot shaft (6) and secure with capscrews (9).

c. Install adapter (3) and wiper motor (8). Secure with capscrews (4) and lockwashers (5). Engage pivot shaft (6) and crank (7).

d. Install washers, nuts, washer, and bushing securing pivot shaft (6) to adapter (3).

e. Install wiper arm (2) and secure with lockwashers and nuts.

f. Install wiper blade (1).

g. Remove tags and install electrical leads to wiper motor.

8-28. CAB.

8-29. INSTALLATION. (See figure 5-75.)

a. Install weatherstrips (34 and 35, figure 5-75).

b. Position cab (22) on frame studs (26).

c. Install nuts (23), lockwashers (24), and washers (25).

d. Install plate (27), washers (30), capscrews (31), and nuts (23).

e. Install plate (28), washers (30), capscrews (31), and nuts (29).

f. If removed, install rear window (3), side windows (21), and windshield (19) with new weatherstrip (20).

g. Install cab doors (1 and 2) and door retainer straps (36) with clevis pins (37) and hitch pins (38).

h. Install cab wiring harness and secure with clamps.

i. Install acoustical pads and insulation (figure 5-90).

j. Install cab marker lights, beacon light, front spotlight, rear spotlight, rear wiper motor, and front wiper motors.

k. Remove tags and install electrical leads to front and rear wiper motors, front and rear spotlights, cab marker lights, and beacon lights.

8-30. HYDRAULIC OIL COOLER.

8-31. INSTALLATION. (See figure 5-74.)

a. Assemble shroud (13, figure 5-74), fan blade (12), and motor (11).

b. Assemble oil cooler (6) and fan assembly (10) and secure with capscrews (14) and nuts (15).

c. Install oil cooler (6) with capscrews (7), lockwashers (8), and washers (9).

d. Install grill (1) with capscrews (2), lockwashers (3), washers (4), and nuts (5).

e. Remove tags and caps and install hydraulic lines to oil cooler (6).

f. Remove tags and install electrical leads to motor (11).

8-32. HYDRAULIC LINES.

8-33. INSTALLATION. (See figure 5-73.)

a. Manufacture hydraulic hose assembly in accordance with T.O. 36A10-3-5-84 MB-2 Illustrated Parts Breakdown.

- b. Install new O-rings on fittings and connectors.
- c. Install applicable fittings and connectors.
- d. Remove tags and caps and install hydraulic hoses.
- e. Start towing tractor and inspect hydraulic lines for leaks.

8-34. HYDRAULIC TANK INSTALLATION.

8-35. INSTALLATION. (See figure 5-72.)

NOTE

Replace filter cartridge (2, figure 5-72) and gaskets (13).

- a. Install gaskets (13), screen (14), flange (11), and setscrew (12).
- b. Install nipple (3) and filter assembly (1).
- c. Install drain plug (16) and dipstick (15).
- d. Install hydraulic tank assembly (4) using flatwasher (7), lockwasher (6), and hex nut (5) to studs (8).
- e. Fill hydraulic tank and secure filler cap (10).

8-36. HYDRAULIC PUMP ASSEMBLY.

8-37. ASSEMBLY. (See figure 5-71.)

NOTE

Replace all O-rings and back-up rings.

NOTE

Lay two 2 x 4 x 10 inch pieces of wood parallel to each other, with four inch dimension vertical to bench.

- a. Install seal (34, figure 5-71) and snap ring (33) in flange (30).
- b. Position flange (30), with O-ring groove up and match mark toward assembler. Place flange on blocks with seal centered between blocks.

NOTE

Coat O-rings (22 and 23) with thin layer of clean grease MIL-G-10929.

- c. Install back-up ring (24), O-ring (23) and O-ring (22) in respective flange grooves.

NOTE

If gear plate (26) has been replaced, dowels (35) must be installed on both sides of gear plate before assembly to flange plate.

CAUTION

When starting dowels be sure they are straight in the bores.

- d. With a hammer or dowel guide and press, slowly install dowels (35) until they bottom against shoulder.

NOTE

Turn gear plate (26) so that cast recesses in its outer edge face up and align its matching mark with the mark on flange (30).

- e. Match dowels (35) with bores in flange (30). Tap gear plate lightly with plastic mallet until it rests on O-ring in flange.
- f. Install O-ring (27) in pressure plate (25).

NOTE

Position small oblong hole in pressure plate facing toward discharge side of gear plate (26) and bronze side facing up.

- g. Slide pressure plate (25) down gear bores until it rests against O-ring (23) and back-up ring (24).
- h. Grease splined end of drive gear shaft (29).
- i. Install drive gear shaft (29) in gear bore nearest matching mark.

- j. Install idler gear shaft (28) in opposite bore.
- k. Install O-ring (27) in pressure plate (25).

NOTE

Position small oblong hole in pressure plate facing toward discharge side of gear plate (26) and bronze side facing down.

- l. Place pressure plate (26) against gear face.

NOTE

Coat O-rings (22 and 23) with thin layer of clean grease MIL-G-10929.

- m. Install back-up ring (24), O-ring (23) and O-ring (22) in respective cover plate (20) grooves.

NOTE

Use hand pressure to push cover plate (20) down on drive plate (26) until O-rings make contact with drive gear plate surface.

- n. Install cover plate (20).

NOTE

Coat four capscrews (19) with thin layer of clean oil MIL-G-2104, SAE 10.

- o. Install capscrews (19) using diagonally opposite sequence of tightening. Torque capscrews from 80 to 90 lbs-ft.

- p. Install O-ring (16) on spool (15).

- q. Slide spool (15) and O-ring into cover plate (20) until spool bottoms.

- r. Insert spring (14) into inner bore of spool (15).

- s. Install O-rings (2 and 13) into plug (12).

CAUTION

When inserting plug (12) into cover plate (20) care shall be taken not to twist or score O-rings (2 and 13).

- t. Install plug (12) into cover plate (20).
- u. Install cone (11) and spring (10) into bore of plug (12).
- v. Thread setscrew (9) into tapped hole of plug (12).
- w. Install O-ring (7) in locknut (8) groove.

CAUTION

When threading locknut (8) on setscrew (9) care shall be taken not to twist or score O-ring (7).

- x. Install locknut (8) on setscrew (9) until it bottoms.
- y. Install O-ring (7) in groove of plug (6).

CAUTION

When threading plug (6) on setscrew (9) care shall be taken not to twist or score O-ring (7).

- z. Install plug (6) on setscrew (9) until it bottoms.
- aa. Insert spool (5) into cover plate (20) until it bottoms.

CAUTION

Do not force spring guide and orifice (4) to engage spool (5).

- bb. Slide spring guide and orifice (4) into cover plate (20) port until it seats in spool (5).
- cc. Insert spring (3) into cover plate (20) port until it engages spring guide and orifice (4).
- dd. Install O-ring (2) on plug (1).

CAUTION

When installing plug (1), do not twist or score O-ring (2) or distort spring (3).

- ee. Install plug (1) into cover plate (20).

ff. Coat splines of drive gear (29) with clean grease MIL-G-10929.

8-38. INSTALLATION. (See figure 5-70.)

a. Secure hydraulic pump to torque converter housing with two capscrews (2, figure 5-70) and lockwashers (3). Torque capscrews (2) to 75 lbs-ft.

b. Remove tags and connect hydraulic hoses.

8-39. REAR STEERING INDICATOR.

8-40. INSTALLATION. (See figure 5-69.)

a. Install bracket (8, figure 5-69) with capscrews (11), lockwashers (10), and nuts (9).

b. Install switch (4) with capscrews (7), lockwashers (6), and nuts (5).

c. Install cam (1) with lockwashers (3) and capscrews (2).

NOTE

Ensure that cam (1) contacts switch lever (4) with rear wheels centered.

8-41. STEERING SELECTOR VALVE.

8-42. ASSEMBLY. (See figure 5-68.)

NOTE

Replace all O-rings and back-up rings. Use seal kit SKSH-FSL8-5H (Teledyne Republic).

CAUTION

Ensure that all parts are clean prior to assembly. Assemble the steering selector valve in a clean environment.

a. Coat all parts with clean hydraulic oil.

CAUTION

Ensure that pin (20) is installed in the correct hole.

b. Install bushings (19, figure 5-68) and pin (20) if removed.

c. Install springs (18), balls (17), race (16), bearing (15), and plate (14).

d. Install O-ring (22), back-up ring (23), and washer (8) on shaft (21).

e. Install shaft (21) and disk (9). Ensure that disk is installed with its cap face against cap (6) as tagged during disassembly.

f. Install seals (13), back-up rings (12), O-rings (11), back-up rings (12), and seals (10). If seals (10) are reused, ensure that they are installed in the same relative locations as tagged during disassembly.

g. Install O-ring (7) and cap (4). Install capscrews (5) but do not tighten.

h. Install handle (1), washer (3), and nut (2). Move handle (1) through five cycles to align body, cap, disk, and seals.

i. Tighten capscrews (5). Remove handle (1), washer (3), and nut (2) prior to installation of steering selector valve.

8-43. INSTALLATION. (See figure 5-50.)

a. Align steering selector valve (14, figure 5-50) with mounting holes in transmission cover (4).

b. Install capscrews (15) and lockwashers (16).

c. Install handle (19) and secure with washer (18) and nut (17).

d. Remove tags and caps and install hydraulic lines to steering selector valve.

WARNING

Ensure that hydraulic lines are connected to proper ports on steering selector valve. (14).

8-44. STEERING CONTROL VALVE.

8-45. ASSEMBLY. (See figure 5-67.)

a. Using needle nose pliers, lower check ball retainer (30, figure 5-67) into check valve hole of valve housing (12).

CAUTION

Make sure check ball retainer is straight (not tilted on edge) in valve housing.

- b. Install check ball (29) in valve housing (12).
- c. Lubricate seals (26 and 28) with oil MIL-L-2104, SAE 10.
- d. Install seals (26 and 28) on check ball seat (27).
- e. Lubricate check ball seat (27) thoroughly before installing seat into valve housing (12).

CAUTION

Do not twist or damage seals (26 and 28) when installing seat into housing.

- f. Install check ball seat (27), open end of seat first. Push check valve seat to bottom of hole.
- g. Install setscrew (25) using 5/16 allen wrench. Torque setscrew to 100 lbs-in.

CAUTION

Prevent interference. Make sure that top of setscrew (25) is below valve housing (12) mounting surface.

- h. Assemble control sleeve (13) and control spool (14). Rotate spool while sliding parts together.

NOTE

Control sleeves (13) and control spool (14) sets have identification marks. Align these marks. Test for free rotation with fingertip force applied at splined end.

- i. Align centering spring slots of control sleeve (13) and control spool (14).
- j. Insert centering spring installation tool part number 600057 through centering spring slot of control sleeve (13) and control spool (14).

NOTE

Position three pairs of centering springs (15) (or two sets of three each) so that the extended edge is down and the arched center section is together.

- k. Insert one end of centering spring set (15) into spring installation tool.
- l. Compress extended end of centering spring set (15) and insert into control parts assembly (11) withdrawing installation tool at same time.

CAUTION

Push centering spring set evenly and flush with upper surfaces of control parts assembly (11).

- m. Install centering pin (16) through control parts assembly (11) until flush both sides.
- n. Install control parts assembly (11) through gear set end of valve housing (12).

CAUTION

Do not tilt control parts assembly (11) when inserting into valve housing. Push into place with minimum rotation. Keep centering pin (16) in a near horizontal position. Control parts assembly (11) shall be entirely within the valve housing bore with a flush fit at gear set end of valve housing. Do not pull control parts assembly beyond this point.

With the control parts assembly (11) in position, check for free rotation within valve housing (12) by turning with light fingertip force at the splined end.

- o. Place valve housing (12) on clean, lint-free cloth. Install seal (10) in valve housing.
- p. Install two bearing races (23) and needle thrust bearing (24) in place on control parts assembly (11).
- q. Install seal (17) in seal gland bushing (19), flat or smooth side facing toward bushing.

r. Install dry quad ring seal (21) in seal gland bushing (19). Smooth seal in place with clean finger.

CAUTION

Do not use a seal that falls freely into pocket of seal gland bushing.

s. Install seal gland bushing (19) and seal (20) over control spool (14) end with twisting motion. Tap bushing into place with rubber mallet.

CAUTION

Ensure that seal gland bushing (19) is flush against the bearing race (23).

t. Install retaining ring (18) in valve housing (12).

NOTE

Ensure that the entire circumference of retaining ring (18) is properly seated in ring groove.

CAUTION

Use protective material on vise jaws. Do not overtighten jaws.

u. Clamp valve housing in vise with gear set end up.

NOTE

Ensure that control sleeve (13) and control spool (14) are flush or slightly below mounting hole surface of valve housing (12).

CAUTION

Clean upper surface of valve housing (12) by wiping with the palm of clean hand. Clean flat surfaces of meter (4) before assembling. Do not use cloth or paper to clean surfaces.

v. Install seal (10) in valve housing (12).

w. Install spacer plate (9). Align bolt holes in

spacer plate with tapped holes in valve housing (12).

x. Rotate control sleeve and spool assembly until pin (16) is parallel with port face. Install drive (8) and make sure drive and pin are engaged.

NOTE

To assure proper alignment, mark drive (8) as shown in figure 8-1. Note relationship between slotted end of drive to splined end of drive when marking.

y. Install seal (6) on gear set (4).

z. With seal side of gear set toward spacer plate, align star valleys (ref A) on drive (ref B). Note the parallel relationship of reference lines A, B, C, and D, figure 8-1. Align bolt holes without disengaging gear set from drive.

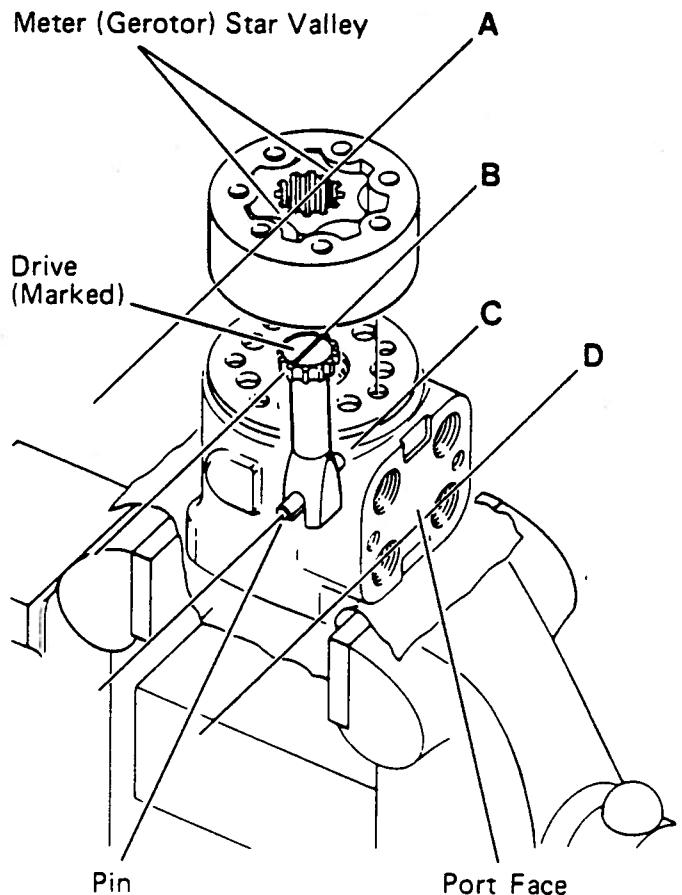


Figure 8-1. Drive, Gear Set, and Housing Alignment

- aa. Install drive spacer(s) (7, figure 5-67) in gear set.
- bb. Install seal (3) in end cap.
- cc. Install end cap (1) on gear set, align holes.
- dd. Install seven dry capscrews (2) in end cap (1). Pretighten screws to 150 lbs-in, then torque screws to 275 lbs-in in the sequence shown in figure 8-2.

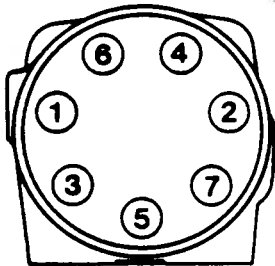


Figure 8-2. Tightening Sequence — Steering Control Valve

- 8-46. INSTALLATION. (See figure 5-66.)
- a. Install steering control valve (3, figure 5-66) and steering column (5). Ensure that splined shaft of column (5) is fully engaged control spool (14, figure 5-67).
 - b. Install capscrews (4, figure 5-66) and lockwashers (6). Torque capscrews (4) from 30 to 32 lbs-ft.
 - c. Remove caps and tags and install hydraulic hoses.

8-47. STEERING WHEEL AND COLUMN.

- 8-48. INSTALLATION. (See figure 5-66.)

CAUTION

Do not damage splines of steering column (5, figure 5-66).

- a. Install steering control valve (3) and steering column (5). Secure with capscrews (4) and lockwashers (6). Torque capscrews (4) from 30 to 32 lbs-ft.

- b. Install steering wheel (1), nut (7), and horn button (8).
- c. Remove tags and caps and install hydraulic lines.

WARNING

Ensure that hydraulic lines are connected to the correct ports on steering control valve (3).

- d. Install turnsignal switch.
- e. Remove tags and install electrical leads to horn switch and turnsignal switch.

8-49. TIRE AND WHEEL ASSEMBLY.

- 8-50. ASSEMBLY. (See figure 5-65.)

WARNING

Do not mix one type of wheel (3, figure 5-65) with a different type of side ring (2) and locking ring (1). Improper seating of these parts can cause side ring and locking ring to fly apart with explosive force.

Use rubber or plastic mallet to tap parts together, if required.

- a. Install lubricated tire flap (8, figure 5-65) on wheel (3), if previously removed.
- b. Insert lubricated tube (5) into tire (4).

NOTE

Position wheel (3) flat on floor, valve slot up.

- c. Align valve with wheel valve slot. Work tube (5) and tire (4) assembly on wheel (3).
- d. Place side ring (2) on wheel (3). Stand on side ring to position it below locking ring groove on wheel.

WARNING

Be sure safety tab in locking ring (1) points away from side ring (2)

e. Snap leading end of locking ring (1) into groove. Walk locking ring into place. Check to ensure that locking ring (1) is positioned properly. Replace valve stem core (7) and valve core cap (6).

WARNING

Always use a safety cage to inflate tire and wheel assembly to avoid serious injury or death from exploding rim parts.

f. Place tire and wheel assembly into safety cage. Partially inflate tire to approximately 3 psi. Again check to ensure that locking ring (1) is seated properly.

g. Inflate tire to fully seat tire beads.

CAUTION

Completely deflate tire to prevent localized over-stretching of tube.

h. Reinflate 11.00 x 24 (Class I) tire to 85 psi. Inflate 12.00 x 24 (Class II) tire to 105 psi.

8-51. INSTALLATION.

NOTE

Do not lubricate lug nuts.

a. Install tire and wheel assembly on axle. Install lug nuts and washers. Torque lug nuts to 360 lbs-ft.

b. Remove jack stands and lower floor jack.

8-52. SILICONE BRAKE SYSTEM MASTER CYLINDER.

8-53. ASSEMBLY. (See figure 5-64.)

NOTE

Replace all gaskets and seals prior to assembly. Use seal kit 20-100-155 (92865).

a. Lubricate all rubber parts with silicone brake fluid.

b. Install bearing (12, figure 5-64) and retaining ring (11).

c. Install cup (15) on piston (13).

d. Install piston (13) and spring (14) with seat (9) and retainer (10) through mounting flange end of housing (20). Note direction of piston and spring.

CAUTION

Do not mar cylinder bore when installing piston (8).

e. Install piston (8). Note direction of piston.

f. Install cup (7). Note direction of cup.

g. Install retainer (6) and spring (5) with retainer end first.

h. Install check valve (4) and seat (3).

i. Install O-ring (2) on plug (1). Install plug (1).

j. If removed, install diffuser (18) and bleeder screw (19).

k. Install gasket (17) on plug (16).

l. Install plug (16).

8-54. INSTALLATION. (See figure 5-62.)

NOTE

Ensure that silicone brake system master cylinder and actuating cylinder are properly aligned before tightening nuts and capscrews.

a. Assemble silicone brake system master cylinder (9, figure 5-62) and actuating cylinder (5). Secure with nuts (6), lockwashers (7), and capscrews (8). Torque nuts (6) from 144 to 156 lbs-ft.

b. Remove tags and caps and install hydraulic lines.

c. Remove plug (16, figure 5-64) and fill with silicone brake fluid.

d. Bleed brake lines. Refer to para. 8-65.

8-55. SILICONE BRAKE ACTUATING CYLINDER.

8-56. ASSEMBLY. (See figure 5-63.)

- a. Lubricate new wear ring (6, figure 5-63) and piston ring (7) with clean silicone brake fluid.
- b. Install wear ring (6) and piston ring (7).
- c. Install rod (2) with springs (3), spacer (5), and washer (4).
- d. Install head (1).

8-57. INSTALLATION. (See figure 5-62.)

NOTE

Ensure that silicone brake system master cylinder and actuating cylinder are properly aligned before tightening nuts and capscrews.

- a. Assemble silicone brake system master cylinder (9, figure 5-62) and actuating cylinder (5). Secure with nuts (6), lockwashers (7), and capscrews (8). Torque nuts (6) from 144 to 156 lbs-ft.
- b. Remove tags and caps and install hydraulic lines.
- c. Remove plug (16, figure 5-64) and fill with silicone brake fluid.
- d. Bleed brake lines. Refer to para. 8-65.

8-58. ACCUMULATOR ASSEMBLY.

8-59. ASSEMBLY. (See figure 5-61.)

NOTE

Replace seals when unit is completely disassembled.

- a. Wet T-ring (9, figure 5-61) with hydraulic oil. Assemble into piston (7) groove. Do not twist seals.
- b. Insert back-up rings (8). Do not over stretch.

CAUTION

With a wooden hammer tap piston (7)

into cylinder (11). Do not pinch back-up rings (8). Avoid cocking or damage to piston and seal on threads.

- c. Insert piston (7) into cylinder (11).
- d. Insert back-up ring (5) and O-ring (6) into gas end cap (4). Back-up ring shall be toward outside end of end cap.

CAUTION

Apply light grease to threads and O-ring of gas end cap.

- e. Insert gas end cap (4) into cylinder (11).
- f. Insert gas valve (3).
- g. Charge accumulator. Refer to para. 8-60.
- h. Install guard (1) and capscrews (2).

8-60. CHARGING ACCUMULATOR.

NOTE

If charging accumulator while it is installed in the towing tractor, depress and release brake pedal (approximately 15 cycles) to relieve hydraulic pressure in accumulator. Accumulator must be lowered to accomodate installation of gage assembly.

- a. Loosen nut of gas valve on accumulator.
- b. Install charging hose and gage assembly (figure 8-3) to gas valve.
- c. Install gas chuck end of charging hose to tank valve. Install tail piece of charging hose to nitrogen cylinder.
- d. Open gas cock on gage assembly.
- e. Open nitrogen cylinder valve. When pressure reading on gage is 1200 psi, close cylinder valve.
- f. Close gas cock.
- g. Remove charging hose and gage assembly. Tighten nut on gas valve (3, figure 5-61).

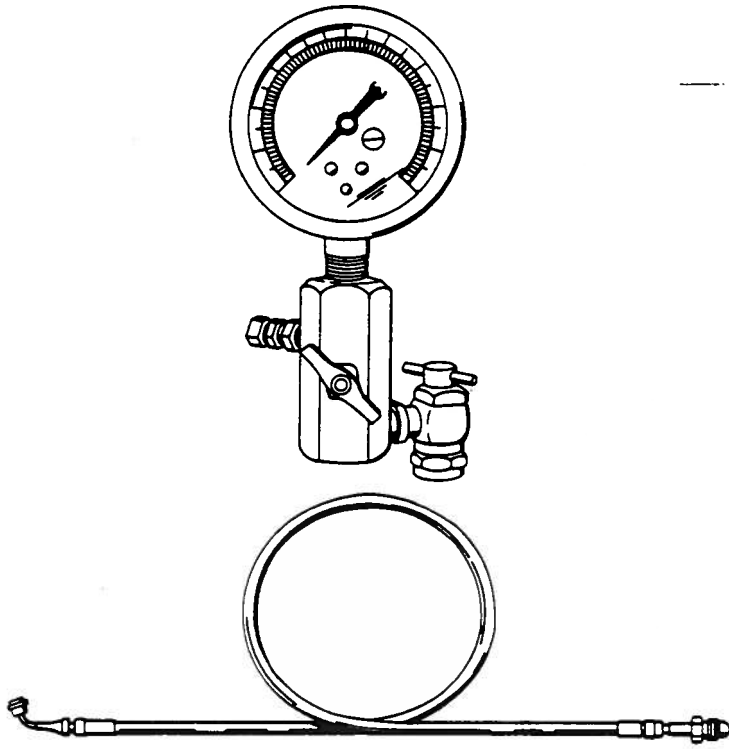


Figure 8-3. Charging Hose and Gage Assembly

h. Install guard (1) and secure with two capscrews (2).

8-61. INSTALLATION. (See figure 5-59.)

a. Install accumulator (26, figure 5-59) and secure with lockwashers (29) and nuts (28).

b. Install connector (24) and new O-ring (25).

c. Install reducer (22) with new O-ring (23).

d. Install tee (21), reducer (27) and pressure switch (20). Connect electrical leads to pressure switch (20).

e. Remove tag and cap and install hydraulic line.

8-62. BRAKE VALVE ASSEMBLY.

8-63. ASSEMBLY. (See figure 5-60.)

NOTE

Replace all O-rings, back-up rings, seals, etc. with repair kit 06-459-004.

a. Lubricate all rubber parts with brake fluid.

b. Assemble control section (3, figure 5-60) and charging section (43) with O-rings (63 and 64), screw (62), capscrews (60), and lockwashers (61).

c. Install filter (59), washer (58), O-ring (57), seat (56), poppet (55), spring (54), and screw (52). Torque screw (52) from 15 to 20 lbs-ft.

d. Install O-ring (51) on screw and install nut (53) torqued from 15 to 20 lbs-ft.

e. Install O-ring (26) on ball and seat (27) and use wooden dowel to install ball and valve with flange up.

f. Install spring (25) and washer (24) on guide (19).

g. Install back-up ring (22) and seal (23) in plug (20).

h. Carefully install O-ring (21) on plug (20). Insert guide (19) in plug (20) with a twisting motion.

i. Install plug assembly into valve body and torque from 40 to 50 lbs-ft.

j. Install O-rings (41 and 42) on insert (40). Use wooden dowel to push insert (40) into position.

k. Install spool (39) with long end up.

l. Place ball (38) on insert (40).

m. Place small amount of grease on end of spring (35) to hold it in place on stop (36). Install stop (36) and spring (35).

n. Install O-ring (34) on plug (37). Install plug (37) and torque from 40 to 50 lbs-ft.

o. Install ball (32), seat (31), and spring (30). Use grease to hold ball and seat to spring.

CAUTION

Ensure that ball (32) is on seat (31).

p. Install O-ring (29) and pin (28) on plug (33).

NOTE

Maximum accumulator hydraulic pressure is adjusted by turning plug (33). The high limit is raised by screwing the plug into the valve body or lowered by screwing the plug out.

q. Install plug (33) and adjust accumulator hydraulic pressure as follows:

1. Attach gage (0-3000 psi) to accumulator port on valve.
2. Attach hydraulic hand pump to pressure port on valve.
3. Pump up valve until decisive click is heard.
4. Record pressure shown on gage at time click was heard.

NOTE

The system is designed so that the accumulator charge cycle will begin when hydraulic pressure to the accumulator is below 1900 \pm 50 psi. The charge cycle will end at 2300 \pm 50 psi.

5. Turn plug (33) in if pressure is lower than 1850 psi or turn plug out if pressure is greater.

6. Remove pressure gage and hand pump.

r. Install O-rings (45) on plugs (44). Install left-side plug (44) and retaining ring (48) in valve body.

CAUTION

Do not force spool (49) into valve body.

s. Install O-ring (50) on spool (49). Carefully install spool (49) so as not to damage bands on either side of spool or body. Be sure spool is pushed all the way into body so that end of spool contacts plug on opposite end.

t. Install spring (47), stop (46), right-side plug (44), and retaining ring (48) in valve body.

u. Install back-up ring (16) and O-ring (15) on sleeve (14).

v. Install spring (18), cup (17), piston (12), sleeve (14), retaining ring (13), washer (11), and retaining ring (10).

w. Install O-ring (9) in valve body.

x. Install spring (8), spacer (7), shims (6 and 5), and piston (4).

y. Install boot (1) and ring (2).

8-64. INSTALLATION. (See figure 5-59.)

a. Install brake valve assembly (5, figure 5-59) with shaft (4). Secure brake valve assembly with capscrews (6) and lockwashers (7). Torque capscrews (6) from 53 to 57 lbs-ft.

b. Remove caps and tags and install hydraulic lines to brake valve assembly.

c. Turn on power at battery disconnect.

d. Bleed brake lines per para 8-65.

8-65. BLEEDING BRAKE SYSTEM.

a. Start engine and allow accumulator to reach full charge. Shutdown engine, then apply and release brake pedal. Wait one minute between applications until brakes do not apply. Repeat this step three times.

NOTE

Operate engine to maintain accumulator pressure within working limits throughout the bleeding procedure.

b. Open bleeder screw at left-front wheel and apply brake pedal cautiously until all air is bled from brake line. Close bleeder screw.

c. Repeat step b at right-front, right-rear, and left-rear wheels.

d. Release brake pedal for one minute.

e. Apply brake pedal for ten seconds and release for one minute. Repeat this step two times.

f. With brake pedal released, open bleeder screw at each wheel in turn until air and fluid stop flowing.

g. Repeat steps d, e, and f until no air escapes upon first opening bleeder screw.

8-66. BRAKE AND THROTTLE PEDAL.

8-67. INSTALLATION. (See figure 5-59.)

a. Install accelerator pedal (17, figure 5-59) and secure with capscrews (18) and lockwashers (19).

b. Secure control cable to accelerator pedal with clevis pin and cotter pin (not shown). Install U-clamp.

c. If removed, install switch (8) and secure with screws (9), washers (10), lockwashers (11), and nuts (12). Remove tags and install leads to switch (8).

d. Install shaft (4).

e. Install brake pedal (1). Install capscrews (2) and lockwashers (3).

f. Turn on power at battery disconnect switch.

8-68. STEERING CYLINDER.

8-69. ASSEMBLY. (See figure 5-58.)

a. Lubricate all parts with clean oil MIL-L-2104 SAE 10.

NOTE

Replace all O-rings and seals with repair kit 9-752-100533 (12361).

CAUTION

Do not stretch seals.

b. If disassembled, install wiper ring (13, figure 5-58), rod seal (12), wear ring (11), back-up ring (10) and O-ring (9) on cylinder head (1), then

install assembly on rod (2).

c. Install O-ring (8) in groove on rod (2).

d. If disassembled, install wear ring (7) and crown seal (6) on piston (4). Install locknut (4) and torque to 115 lbs-ft.

e. Install rod (2) in cylinder barrel (3) then thread cylinder head (1) clockwise into barrel. Insert spanner wrench and tighten cylinder head (1).

8-70. INSTALLATION. (See figure 5-53.)

a. Position steering cylinder (5, figure 5-53) on axle. Install pins (8).

b. Secure pins (8) with washers (7) and cotter pins (6).

c. Remove tags and caps and install hydraulic lines to steering cylinder (5).

NOTE

When installed (with all wheels straight), steering cylinder(s) should measure 22.847 inches in length from center of rod end pivot pin to barrel end pivot pin.

8-71. AXLE DIFFERENTIAL CARRIER ASSEMBLY.

8-72. ASSEMBLY. (See figure 5-57.)

a. Lubricate bearing cones (25, 32, and 38, figure 5-57) with light machine oil.

b. Press bearing cones (25 and 38) onto pinion (26) with suitable sleeve that will bear only the bearing inner race. Install bearing cup (35).

c. Install lock ring (24) into pinion groove (26).

d. Insert pinion (26) into cage. Install spacer (36) and thrust washer (37).

e. Install bearing cone (32) and bearing cup (35).

f. Rotate cage (33) several times to ensure normal bearing contact.

g. Check pinion bearing preload as follows:

1. Install nut (27) and torque from 300 to 400 lbs-ft.

2. Check bearing preload with torque wrench. Use rotating torque not starting torque.

3. If rotating torque is greater than 5 to 25 lbs-in for new bearings or 5 to 15 lbs-in for used bearings, use thicker spacer (36) to decrease preload. If less, use thinner spacer to increase preload.

h. Recheck pinion bearing preload.

i. Remove nut (27).

j. Lubricate oil seal (31) and cover outer edge of seal body with non-hardening sealing compound. Use seal driver to press oil seal into cage (33).

k. Install deflector (29) and press yoke/flange (28) onto pinion (26).

l. Install washer (30) and nut (27). Torque nut (27) from 300 to 400 lbs-ft.

m. Install same number and size shims (39).

n. Position cage (33) with pinion (26) over carrier and cap (3). Secure with capscrews (34). Torque capscrews (34) from 60 to 80 lbs-ft.

o. Heat bevel gear (20) in hot water (160 to 180 degrees F).

p. Install heated bevel gear (20) onto case (11). Secure with bolts (21), washers (23), and nuts (22).

q. Lubricate inner walls of case (11) with axle lubricant.

r. Position thrust washer (15) and side gear (16) in bevel gear (20).

s. Assemble spider (17), pinion (19), and thrust washers (18). Install spider (17).

t. Install second side gear (16) and thrust washer (15).

NOTE

Do not apply Loctite if new capscrews (13) are to be installed.

u. If capscrews (13) are to be reused, apply liquid Loctite No. 277 to threaded holes of case (11). Allow four or five drips to run down side of each hole. Visually check to ensure that Loctite has contacted threads.

v. Align punched marks on case (11) and plain half case (12). Draw assembly together with three equally spaced capscrews (13) and washers (14).

w. Install remaining capscrews (13) and washers (14). Torque capscrews (13) from 90 to 120 lbs-ft.

x. Press bearing cones (10) squarely and firmly on case halves with suitable sleeve.

y. Install bearing cups (9) and caps (4) with bolts (5) and washers (6). Torque bolts (5) from 160 to 180 lbs-ft.

z. Bearing cups (9) must be hand push fit into bores of caps (4). If they do not, bores must be reworked with scraper or emery cloth until hand push is obtained. Use blued bearing cup as gauge and check fit as work progresses. When bearing cups fit properly, remove caps (4).

aa. Lubricate bearing cones (10) and bearing cups (9) with oil MIL-L-2105.

bb. Place bearing cups (9) over cones and place assembly into carrier and cap (3).

cc. Install adjusting rings (8) and turn handtight against bearing cups (9).

dd. Install caps (4) in correct location as marked and tap lightly into position.

ee. Install bolts (5) and washers (6). Torque bolts (5) from 160 to 180 lbs-ft.

ff. Adjust bearing preload as follows:

1. Using dial indicator at backface of bevel gear (20), loosen adjusting ring (8) on side opposite gear only sufficient to notice end play on indicator.

2. Tighten same side adjusting ring (8) only enough to obtain 0.000 end play.

3. Check bevel gear (20) for runout. If runout exceeds 0.0008 inch, remove differential and check for cause.

4. Tighten adjusting rings (8) one notch each from 0.000 end play to preload differential bearings.

gg. Check bevel gear (20) backlash as follows:

NOTE

If bevel gear (20) was not replaced, use backlash established before disassembly. For new gears, initial backlash should be 0.010 inch. Adjust backlash by backing off one adjusting ring (8) and advancing opposite ring same amount. After satisfactory gear contacts have been established, backlash can be altered within 0.0005 to 0.015 inch to obtain better contact pattern.

1. Apply oiled red lead lightly to bevel gear teeth (20). Coating twelve teeth is sufficient.

2. Using wrench, rotate pinion (26) while applying slight resistance to bevel gear (8) with flat steel bar.

3. Compare contact pattern obtained with examples should in figure 8-4. Take corrective actions as indicated.

hh. Install cotter pins (2).

8-73. INSTALLATION. (See figure 5-55.)

WARNING

Minor concentration of acetic vapor may be produced during application of silicone RTV gasket material. Provide adequate ventilation when working in confined area.

Eye contact with silicone RTV gasket material can cause irritation. Flush immediately with fresh water for fifteen minutes. Obtain medical

attention immediately.

a. Apply silicone RTV gasket material in 1/8-inch bead completely around mating surface of axle housing (1, figure 5-55).

CAUTION

Driving the differential carrier into the housing with a steel hammer will damage the carrier flange.

b. Roll carrier into position on a roller jack. Start carrier into axle housing with four washers and nuts equally spaced and tighten alternately to draw carrier squarely into axle housing.

c. Remove nuts and washers and install washers (9 and 10) and capscrews (11, 12, and 13). Torque capscrews (12 and 13) from 50 to 75 ft lbs. Torque capscrews (11) from 75 to 115 ft lbs.

d. Remove fill plug (8) and fill axle with oil MIL-L-2105 until oil flows from filler opening. Install filler plug.

e. Install applicable drive line.

8-74. AXLE BRAKES.

8-75. INSTALLATION. (See figure 5-56.)

NOTE

Repair of the wheel cylinders (9, figure 5-56) shall be limited to the replacement of seals and cups.

a. Install bleed screw (12) in one wheel cylinder (9).

b. Install wheel cylinders (9) and secure with washers (11) and capscrews (10).

c. Install tube (8) and brake line (not shown).

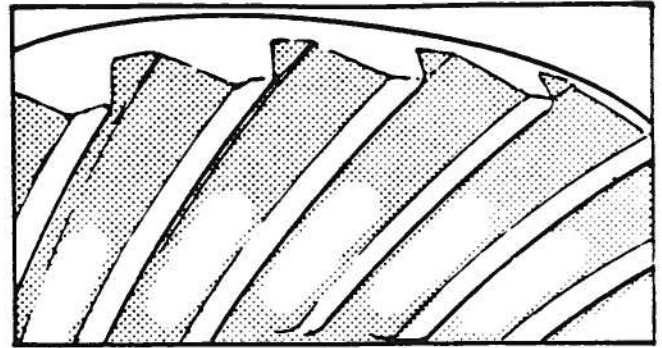
WARNING

The brake shoes (3) must be installed with the primary brake shoe in the exact position as it was removed.

Replace brake shoes (3) if linings are worn below 0.188 inch.

GEAR AND PINION TOOTH CONTACT PATTERNS

The gear tooth contact patterns illustrated are approximate shapes. Actual contact may vary, however the same general shape should be obtained. When adjusting gear sets that have been in service, tooth contact may vary because of wear. To obtain best results, strive to obtain a pattern coinciding with original patterns.



PATTERN "A" — CORRECT TOOTH CONTACT

Correct adjustment is obtained when pattern of tooth bearing (both lengthwise and profile) appear as shown.



PATTERN "B" — CONCENTRATED BEARING AT TOE

Not enough backlash . . . move gear away from pinion to increase lengthwise bearing. This may change the profile bearing to some extent and an adjustment of the pinion may be required.



PATTERN "C" — CONCENTRATED BEARING AT HEEL

Too much backlash . . . move gear toward pinion to obtain correct lengthwise bearing. This may change the profile bearing to some extent and an adjustment of the pinion may be required.



PATTERN "D" — PROFILE BEARING HIGH

Pinion is out too far . . . remove shims to move pinion toward gear. Then move gear away from pinion to obtain correct lengthwise bearing.



PATTERN "E" — PROFILE BEARING LOW

Pinion is in too far . . . add shims to move pinion away from gear. Then move gear toward pinion to obtain correct lengthwise bearing.

Figure 8-4. Differential Carrier Backlash Pattern

d. Position brake shoes (3) on capscrews (7). Ensure that spacers (6) and washers (5) are in place.

e. Install washers (5) and nuts (4). Install new cotter pin (20) through each nut (4).

f. Install springs (1 and 2) with brake spring tool.

g. Install hub (22, figure 5-54), gear hub (20), gear (19), and nut (18). Torque nut (18) until nut is snug against hub. Do not use excessive force. Oscillate bearings to be sure oil bearing surfaces are in contact. Retorque nut until nut is snug against hub. Back off nut (18) 1/6 to 1/4-turn.

h. Install lock plate (17), lock screws (16), gear washers (15), gear (14), and snap ring (13).

i. Turn wheel (15) until brake linings make contact with hub (22). Back-off wheel (15) until there is 0.0004 inch between hub (22) and brake shoes.

WARNING

Minor concentration of acetic vapor may be produced during application of silicone RTV gasket material. Provide adequate ventilation when working in confined area.

Eye contact with silicone RTV gasket material can cause irritation. Flush immediately with fresh water for fifteen minutes. Obtain medical attention immediately.

j. Apply silicone (RTV) gasket material in one continuous 1/8-inch wide bead to inside mating surface of spider (1). Install spider (1) and secure with washers (3) and capscrews (2). Wipe off excess gasket material.

k. Install tire and wheel assembly. Torque lug nuts to 360 lbs-ft.

l. Bleed brake lines if wheel cylinders were repaired or replaced per para 8-65.

8-76. FRONT AND REAR AXLE INSTALLATION.

8-77. ASSEMBLY. (See figures 5-54 and 5-55.)

NOTE

The following procedures shall be followed at assembly for front and rear axles, right and left sides.

WARNING

Minor concentration of acetic acid vapor may be produced during application of silicone RTV gasket material. Provide adequate ventilation when working in confined area.

Eye contact with silicone RTV gasket material can cause irritation. Flush eyes immediately with fresh water for fifteen minutes. Obtain medical attention immediately.

a. Install assembled axle differential carrier per para. 8-71.

CAUTION

Do not use excessive pressure to install oil seal (3, figure 5-55) or tap seal after it has bottomed. This will crush the seal retainer resulting in seal damage.

b. Install sleeve (4, figure 5-55), bushing (5), and oil seal (3).

c. If plugs (7) were removed, apply coat of silicone (RTV) gasket material to mating surface of plug only. Install plug (7) immediately so that concave side of plug is facing outward. Wipe top of plug and bearing bore to remove excess gasket material.

d. Install bushings (6).

e. Assemble thrust washer (39, figure 5-54), same number and size shims (38), and lower cap (36).

f. Position steering knuckle (40) on axle housing and install lower cap (36) and capscrews (37). Torque capscrews (37) from 290 to 370 lbs-ft.

g. Assemble new shims (38) and upper cap (35). Use same number and size shims (38) removed during disassembly.

h. Install assembled upper cap (35). Install capscrews (37). Torque capscrews (37) from 290 to 370 lbs-ft.

i. Check steering knuckle bearing preload as follows:

1. Wrap soft wire or cord through rod end boss of steering knuckle (40) and attach pound scale to wire or cord.

2. Rotate knuckle with pound scale. Note rotation torque on pound scale (not starting torque).

3. If scale indicates between 10 and 19 pounds, bearing preload is correct.

4. To increase bearing preload, remove shims (38).

5. To decrease bearing preload, add shims (38).

j. Grease universal joint (33). Ensure that grease purges from all seals.

CAUTION

Do not use excessive pressure to install oil seal (32) or tap seal after it has bottomed. This will crush the seal retainer resulting in seal damage.

k. Install new oil seal (32).

l. Assemble short shaft (33A), long shaft (33B), and universal joint (33C). Torque capscrews (supplied with universal joint) to 128 lbs-ft.

m. Carefully install universal joint (33). Align splined end of inner shaft with differential gear splines and install.

n. Assemble spindle (28) and bushing (31).

o. Install assembled brake assembly (figure 5-56) and spindle (28, figure 5-54) and secure with washers (30) and capscrews (29). Torque capscrews (29) from 185 to 235 lbs-ft.

p. Coat bearing cones (21 and 26) with oil MIL-L-2105. Coat hub (22) bearing bores with oil.

q. Install bearing cup (24) and bearing cone (26) in hub (22). Install bearing cup (23).

CAUTION

Do not use excessive pressure to install oil seal (27) or tap seal after it has bottomed. This will crush the seal retainer resulting in seal damage.

r. Install new oil seal (27).

s. Install wheel hub (22) on spindle (28) being careful not to damage oil seal (27). Install bearing cone (21). Ensure that bearing cone (26) is seated flush on spindle. Adjust brake shoe to wheel hub clearance. See para. 8-75.

t. Install gear hub (20) and gear (19).

u. Install nut (18) and torque until nut is snug against hub. Do not use excessive force. Oscillate bearings to be sure oil bearing surfaces are in contact. Retorque nut until nut is snug against hub.

v. Back off nut (18) 1/6 to 1/4 turn.

w. Install lock plate (17) and lock screws (16). Torque lock screws (16) from 14 to 16 lbs-ft.

x. Install gear washer (15) and gear (14) to universal joint (33). Secure with snap ring (13).

y. Install outer thrust washer (12), pinion (11), and inner thrust washer (10). Install new O-ring (9). Insert pinion assembly into spider (1) and secure with setscrew (7).

z. Install thrust buttons (5 and 6).

aa. Apply silicone (RTV) gasket material in one continuous 1/8-inch wide bead to inside mating surface of spider (1).

bb. Install spider (1), capscrews (2) and washers (3). Torque capscrews (2) from 116 to 149 lbs-ft. Wipe off excess gasket material.

cc. Repeat steps b thru bb for opposite side of axle.

dd. Install tie rod and end assembly (43 figure

5-54) at steering knuckle. Torque nut on rod end from 165 to 180 lbs-ft. Advance nut to install cotter pin (do not back off). Check final torque value. Value not to exceed 180 lbs-ft.

ee. Install steer cylinders, (5, figure 5-53) with pins (8), washers (7), and cotter pins (6).

8-78. INSTALLATION. (See figure 5-53.)

a. If removed, install front or rear axle as follows:

1. Position axle under frame using wheeled dolly.

2. Use floor jacks to raise axle into position.

3. Install capscrews (4, figure 5-53), washers (3), and nuts (5). Torque nuts (5) from 355 to 385 ft lbs.

b. Install tires and wheels and secure with washers and nuts. Torque lug nuts to 360 lbs-ft.

c. Install plug (2, figure 5-55) and fill axle with lubrication oil MIL-L2105 until oil flows from filler hole. Install filler plug (8).

d. Remove fill plugs at each wheel end and fill with lubrication oil MIL-L2105.

e. Remove caps and tags and install hydraulic lines to steer cylinders.

f. Connect brake lines at wheel cylinders on axle housing.

g. Install applicable drive line.

h. Bleed brake lines. Refer to para. 8-65.

i. Adjust axle toe-in as follows:

1. With wheels off ground, scribe a line at center of each tire around its entire circumference with white chalk.

2. Remove jack stands and lower wheels to ground.

3. Drive tractor forward and backward approximately six feet.

4. Set sliding scale end of trammel bar on zero and lock in place.

5. Position trammel bar at rear of tires and adjust pointers to line up with scribe lines and lock in place.

6. Position trammel bar at front of tires. Adjust scale end so that pointers line up with scribe marks.

7. Read toe-in (or toe-out) from scale. Toe-in should be 0 inches.

8. If adjustment is required, loosen nuts on tie rod adjustment clamp and rotate tie rod as required. Tighten nuts.

9. Recheck axle toe-in by repeating steps 3 thru 7.

8-79. DRIVE LINE.

8-80. INSTALLATION. (See figure 5-52.)

a. Install lubrication fitting (20, figure 5-52).

b. Install dust cap and seals (18).

CAUTION

When assembling yoke and tube (19) to slip yoke, do not damage spline end of yoke and tube.

c. Install yoke and tube (19) into slip yoke (17). Tighten dust cap and seals (18) to secure slip yoke (17) and yoke and tube (19).

d. Assemble wing bearing (16) to yoke and tube (19) and secure with capscrews (13) and lockwashers (14).

e. Assemble wing bearing (15) to slip yoke (17) and secure with capscrews (13) and lockwashers (14).

f. Install rear drive line (11) to rear axle flange and transmission flange with capscrews (12). Torque capscrews (12) from 90 to 110 lbs-ft.

g. Install lubrication fitting (10).

- h. Install dust cap and seal (8).

CAUTION

When assembling yoke and tube (9) to slip yoke (7), do not damage spline end of yoke and tube.

- i. Install yoke and tube (9) into slip yoke (7). Tighten dust cap and seals (8) to secure slip yoke (7) and yoke and tube (9).

- j. Assemble wing bearing (6) to yoke and tube (9) and secure with capscrews (3) and lockwashers (4).

- k. Assemble wing bearing (5) to slip yoke (7) and secure with capscrews (3) and lockwashers (4).

- l. Install front drive line to front axle flange and transmission flange with capscrews (2). Torque capscrews (2) from 90 to 110 lbs-ft.

8-81. TRANSMISSION SHIFTER INSTALLATION.

8-82. ASSEMBLY. (See figure 5-51.)

- a. Install slug (29, figure 5-51), spring (28), and ball (27).

- b. Install handles (25, 32, and 34) into actuator (24) and secure with spring pins (26 and 33).

- c. Install retaining ring (23) on shaft (21). Install assembled actuators (24) and handles on shaft with spacers (31) as shown in figure 5-51.

- d. Install retaining ring (23) and spacers (22).

- e. Assemble housings (17), shaft (21) with actuators (24), and plate (18). Secure assembly with screws (19) and washers (20), both sides.

- f. Install spacers (13) and secure with washers (15) and screws (14).

- g. Install right hand hanger (11) and left hand hanger (10) with screws (12).

8-83. INSTALLATION. (See figures 5-50 and 5-51)

- a. Remove tags and secure control cables (not shown) with clamps (5, figure 5-51), shims (6), shim (7), nuts (8), and screws (9).

- b. Install cable terminals (2) on four control cables.

- c. Secure each control cable and cable terminal (2) to it's actuator (24) with clevis pin (4) and cotter pin (3).

- d. Install transmission shifter assembly (1, figure 5-50) with four capscrews (2) and lockwashers (3).

- e. Close battery access cover and secure bolt locks.

8-84. TRANSMISSION.

NOTE

Replace all O-rings, seals, and snap rings prior to assembly. Lubricate O-rings and seals in oil MIL-L-2104 SAE 10.

8-85. DISCONNECT HOUSING. Assemble the axle disconnect housing (figure 5-49) as follows:

- a. Install detent ball (15), detent spring (14), shift rail (13), and oil seal (12).

- b. Install disconnect shaft (6), retaining ring (5), bearing (4), and retaining ring (3).

- c. Install shift fork (11), shift hub (10), O-ring (9), retaining ring (8), and pilot ring (7).

- d. Install lockscrew (2) and cap (1).

- e. Install O-ring (16).

8-86. CONTROL VALVE ASSEMBLY. Assemble the control valve assembly (figure 5-48) as follows:

- a. Install spring (8), valve spool (7), and plug (6).

- b. Install oil seals (5).

- c. Install spool and plug (2) and valve spool (4) being careful not to damage oil seals (5).

- d. Install spool stops (1).

8-87. 3RD CLUTCH ASSEMBLY. Assemble the 3rd clutch assembly as follows:

- a. Install outer seal (37, figure 5-47). Size seal until flush with outer diameter of clutch piston (36). Install inner seal (38).

- b. Install clutch piston (36) being careful not to damage seals.

- c. Install return spring (137, figure 5-40), spring retainer (136), and snap ring (135) using a pipe sleeve. Install pilot bearing (81).

- d. Starting with outer disc (35, figure 5-47) alternately install outer discs (35) and inner discs (34) until six of each have been installed. Install backing plate (33) and snap ring (32).

- e. Install locating ring (134, figure 5-40), front bearing (133), retaining ring (132), piston rings (131), and outer race (129) with roll pin (130).

8-88. LOW CLUTCH ASSEMBLY. Assemble the low clutch assembly as follows:

- a. Install outer seal (29, figure 5-47). Size seal until flush with outer diameter of clutch piston (28). Install inner seal (30).

- b. Install clutch piston (28) being careful not to damage seals.

- c. Install return spring (128, figure 5-40), spring retainer (127), and snap ring (126) using a pipe sleeve.

- d. Starting with outer disc (27, figure 5-47), alternately install outer discs (27) and inner discs (26) until eight of each have been installed.

- e. Install backing plate (25) and snap ring (24).

- f. Install retaining ring (125, figure 5-40).

- g. Install locating ring (122), bearing (124), gear spacer (123), low shaft gear (118), locating ring (121), bearing (120), spacer (117), and front bearing (116).

8-89. REVERSE AND 2ND CLUTCH

ASSEMBLY. Assemble the reverse and 2nd clutch assembly as follows:

- a. Install outer seals (14 and 22, figure 5-47). Size seals until flush with outer diameter of clutch pistons (13 and 21). Install inner seals (15 and 23).

- b. Install clutch piston (21) being careful not to damage seals.

- c. Install return spring (115, figure 5-40), spring retainer (114), and snap ring (113) using a pipe sleeve.

- d. Starting with outer disc (20, figure 5-47), alternately install outer discs (20) and inner discs (19) until six of each have been installed.

- e. Install backing plate (18) and snap ring (17).

- f. Install clutch piston (13) being careful not to damage seals.

- g. Install spring spacer (112, figure 5-40), return springs (111), and snap ring (110) with pipe sleeve.

- h. Starting with outer disc (12, figure 5-47), alternately install outer discs (12) and inner discs (11) until eight of each have been installed.

- i. Install backing plate (10) and snap ring (9).

- j. Install bearing (109, figure 5-40) and bearing spacer (108).

- k. Install retaining rings (107 and 106) if removed. Install gear assembly (103) into shaft and drum assembly (16, figure 5-47).

CAUTION

Align splines on gear assembly with internal teeth of inner discs. Do not force this operation. Gear splines must be in full position with internal teeth of all inner discs.

- l. Install bearing (105, figure 5-40), front bearing (102), snap ring (101), retaining ring (100), and piston rings (99).

8-90. FORWARD CLUTCH ASSEMBLY. Assemble the forward clutch assembly as follows:

- a. Install outer seal (6, figure 5-47). Size seal until flush with outer diameter of clutch piston (5). Install inner seal (7).
- b. Install clutch piston (5) being careful not to damage seals.
- c. Install spring spacer (98, figure 5-40), return spring (97), and snap ring (96) using a pipe sleeve.
- d. Starting with outer disc (4, figure 5-47), alternately install outer discs (4) and inner discs (3) until eight of each have been installed.
- e. Install backing plate (2) and snap ring (1).
- f. Install piston rings (95, figure 5-40).

8-91. TRANSMISSION ASSEMBLY. Assemble the transmission assembly as follows:

- a. Tap bearing (93, figure 5-40) into bearing bore with bearing snap ring toward front of housing. Tap piston sleeve (92) into position and secure with retaining ring (91).
- b. Position the forward clutch assembly in transmission housing. Use caution as not to damage piston rings (95). Tap clutch assembly into position.
- c. Position forward shaft gear (90) on shaft and install retaining ring (89) (see figure 8-5). Install bore plug (88, figure 5-40).

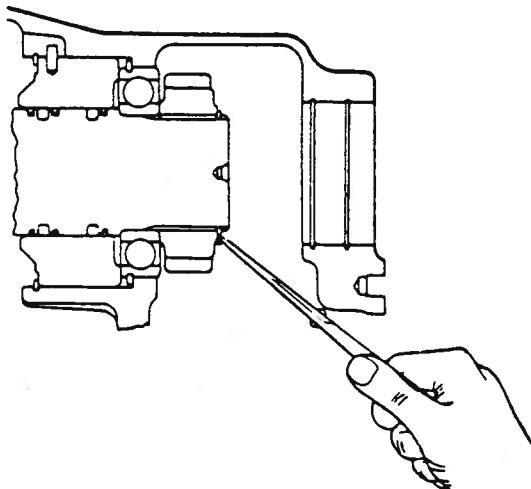


Figure 8-5. Forward Shaft Gear Retaining Ring Installation

d. If 3rd clutch rear bearing carrier (80) was disassembled, install locating ring (84) into bearing carrier (80). Press disc hub bearing (85) into carrier and secure with locating ring (86). Press disc hub assembly (82) into disc hub bearing (85) and secure with retaining ring (87).

e. Position bearing carrier (80) on 3rd clutch assembly. Align splines on disc hub assembly (82) with internal teeth of internal discs in clutch. Do not force. Disc hub splines must be in full position with internal teeth of all discs.

f. Contract locating ring (79) using contracting-type snap ring pliers. Lock pliers to hold ring contracted. Tap 3rd clutch assembly into housing until locating ring groove in housing is aligned with ring. Remove pliers being sure ring is in full position in groove.

g. Compress ears on locating ring (134) and install ring in groove in front of housing (see figure 5-45).

h. Position oil baffle (74, figure 5-40) in housing.

i. Assemble the output shaft assembly (see figure 8-6) by installing the range shift hub (64, figure 5-40), low gear bearings (69 and 71), and bearing spacer (70) on shaft and bushing assembly (72). Position low range gear (68) on bearings and spacer. Use caution as not to damage bearings.

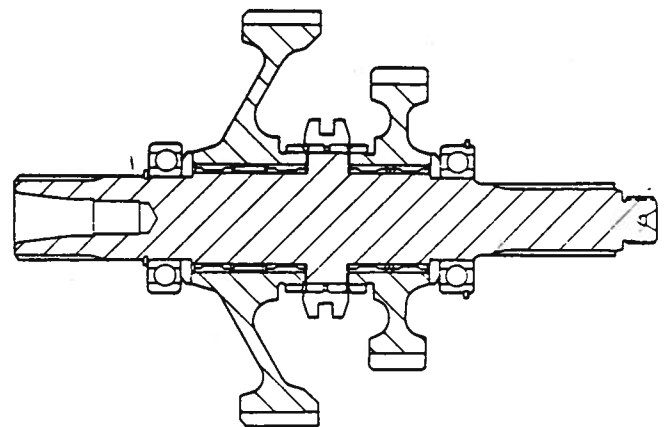


Figure 8-6. Output Shaft Assembly

NOTE

Long hub of low range gear (68) should be up.

j. Position gear thrust washers (67) on shaft with bevel of washer up. Install front bearing (66) and retaining ring (65). Install high gear bearings (63 and 62), high range gear (61), gear thrust washer (60), and rear bearing (59).

k. Install output shaft assembly in housing and tap into position.

l. Insert pilot bearing (81).

m. Position low clutch assembly in bearing bore and tap in place.

n. Position shift fork (48) with shift rail (49) and lockscrew (50) in range shift hub (64).

o. From front of housing, install hub assembly (77) on low clutch shaft and install snap ring (76).

p. Install bearing (47) on idler gear assembly (44) and secure with support washer (46) and retaining ring (45) if disassembled.

q. Position idler gear assembly (44) in end of 3rd clutch assembly. Align splines on gear shaft with splines on disc hub assembly (82).

r. Position bearing (43) on low clutch shaft, with snap ring groove out. Tap bearing into position. Install support washer (42) and retaining ring (41).

s. Install piston ring (40) on low clutch shaft.

NOTE

New ring must be sized before installing bearing cap assembly (1). To facilitate sizing, fabricate tool from diagram (see figure 8-7).

t. Position new gasket (39, figure 5-40) on housing and install cover (34). Two aligning studs will facilitate cover to housing assembly. Tap cover into place aligning shaft bearings with bearing bores. Remove studs and install screws (35) and lockwashers (36). Torque screws (35) from 37 to 41 lbs-ft.

u. Install low clutch, idler shaft, and output shaft rear bearing locating rings (part of items 43, 47, and 59).

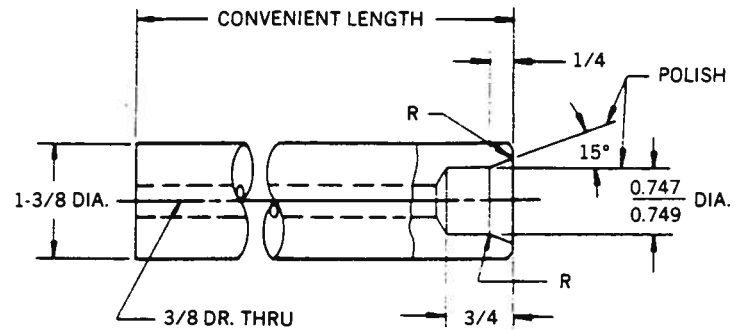


Figure 8-7. Piston Ring Sizing Tool

v. Position mesh lock spring (33) and lock ball (32) in shift rail support (25). Ball and spring can be depressed with a blunt tool to hold in spring pocket until rail is in position.

w. Install support (25) with O-ring (29). Secure support with nuts (26) and lockwashers (27). Torque nuts (26) from 26 to 29 lbs-ft. Install oil seal (30).

x. Install speedo driven gear (24), O-ring (23), tube nut (22), and oil seal (21).

y. Install oil seal (20) and speedo drive gear (19) on shaft and bushing assembly (72).

z. Apply a light coat of Permatex No. 2 to the outer diameter of O-ring (18) then press into bearing cap (13) with lip of seal toward bearing side of cap. Position O-rings (17) in cap, then position bearing cap (13) on bearing cap studs (16) and install lockwashers (15) and nuts (14). Torque nuts (14) from 91 to 100 lbs-ft.

aa. Position O-ring (12) on bearing cap (8). Install cap (8) and secure with lockwashers (10) and nuts (9). Torque nuts from 41 to 45 lbs-ft.

bb. Position O-rings (5 and 7) on bearing cap assembly (1). Install cap (1) with plug (4) and secure with lockwashers (3) and nuts (2). Torque nuts from 41 to 45 lbs-ft.

cc. If disassembled, assemble disconnect housing assembly (see para. 8-85). Install oil seal (58) on shaft and bushing assembly (72) then position disconnect housing assembly on housing studs (57) and secure with lockwashers (56) and nuts (55). Torque nuts from 64 to 70 lbs-ft.

dd. Install front output flange (51), O-rings (54), washer (53), and flange nut (52). Torque flange nut from 200 to 250 lbs-ft. Block flange to prevent turning.

ee. Install bearing (75) on reverse and 2nd clutch assembly shaft. Position clutch assembly on hub assembly (77) aligning splines of hub with teeth of clutch internal discs. Hub must be in full position with discs. Do not force this operation.

ff. Install pilot bearing (94).

gg. Install backing plate assembly (14, figure 5-44) with spacers (17), lockwashers (16), and screws (15).

hh. Install roller (13), actuating lever (12), shoes and linings (9), and return springs (8).

NOTE

Replace brake shoes if linings are worn below .031-inch.

ii. Install brake flange (1) with O-ring (4), flange washer (3), and flange nut (2). Torque flange nut from 200 to 250 lbs-ft. Block flange to prevent turning.

jj. Install brake drum (5) with lockwashers (7) and screws (6).

8-92. CONVERTER ASSEMBLY. Assemble the converter as follows:

a. Install O-rings (35, 37, 38, 41, 44, and 48, figure 5-35).

b. Install converter housing sleeve (25).

c. Install expander spring (68, figure 5-36) and piston ring (67) on stator support (63).

NOTE

Expander spring (68) gap to be 180° from piston ring (67) hook joint.

d. Press hub gear bearing (66) into position on stator support (63) with bearing part number up.

e. Position stator support (63) in converter housing, aligning holes of support with housing,

and tap into position. Install lockwashers (65) and screws (64) then torque screws from 23 to 25 lbs-ft.

f. If disassembled, press shaft bearing (62) into position. Install locating washer (61), retaining ring (60), and piston ring (59). Spread ears of snap ring (58) and tap turbine shaft assembly (56) into position.

g. Position idler gear assembly (50) with idler shaft (52) and pin (53) into converter housing with long hub of gear (51) out. Install lockwashers (55) and screws (54). Torque screws (54) from 58 to 64 lbs-ft.

h. Install retaining plate (47), lockplate (49), and screws (48). Torque screws (48) from 58 to 64 lbs-ft. Bend lockplate (49) tabs over screw heads to prevent loosening.

i. Position gasket (29, figure 5-35) on front of transmission housing.

j. Position converter housing (26) on transmission case. Use caution as not to disturb O-rings or gasket.

k. Spread ears on front bearing snap ring (101, figure 5-40) and lock pliers to hold snap ring open (see figure 5-41).

l. Tap converter housing in place. Use caution as not to damage reverse clutch front piston ring.

m. Install a lockwasher (28, figure 5-35) and case screw (27) in the front and the rear of the converter housing and snug up but do not tighten. This will hold the converter housing to the transmission housing.

n. Using a hook type hammer puller, pull the reverse and 2nd clutch assembly forward to align the snap ring groove in the front bearing (102, figure 5-40) with the snap ring (101) in the housing then remove pliers.

o. Install remaining lockwashers (28, figure 5-35) and case screws (27) and torque case screws from 37 to 41 lbs-ft.

p. Position gasket (20) on screen assembly (19) then install screen assembly and torque from 10 to 15 lbs-ft.

q. If disassembled, assemble and install locating ring (46, figure 5-36), pump drive gear (45), bearing (44), retaining ring (43), support (40), and locating ring (42). Install screws and lockwashers (41) and torque from 23 to 25 lbs-ft.

r. If disassembled, assemble and install locating ring (39), auxiliary pump drive gear (38), bearing (37), retaining ring (36), and bearing support (34). Install screws and lockwashers (35) and torque from 23 to 25 lbs-ft.

s. Install locating ring (31). If disassembled, assemble idler gear (28) with bearing (29) and retaining rings (27 and 30) and install on idler gear shaft (32). Install locating ring (26).

t. Apply a light coat of Permatex Form-A-Gasket #6 to O.D. of oil baffle assembly (24) or counter bore in converter housing. Immediately remove any excess sealant that could enter the oil circuit.

u. Install oil seal (25) in oil baffle assembly (24). Position oil baffle assembly (24) puller screw holes 15° to 30° either side of vertical center line then tap into position in converter housing.

v. If disassembled, assemble O-ring (23) and impeller hub gear (20) with lock tabs (22) and screws (21) to impeller (19).

w. Install impeller (19) using caution as not to damage oil seal (25).

CAUTION

Be careful not to cut, break, or unhook oil seal ring on support.

x. Install hub bearing spacer (18), reaction member (17), and retaining ring (16).

y. Position retaining ring (15) on turbine shaft then install turbine (14).

z. If the turbine hub bearing (12) or retaining washer (11) was disassembled, perform the following:

1. Heat impeller cover (8) from 200° to 250°F.

2. Position locating ring (13) in groove.

3. Place retaining washer (11) in cover.

4. While cover is hot, press turbine hub bearing (12) into position, spreading ears on locating ring (13) at the same time.

5. Align bearing locating ring groove with locating ring then release locating ring. Be certain ring is in full position in groove.

aa. Position new O-ring (10) on impeller cover (8) then install assembly on impeller (19). Use caution as not to damage O-ring. Bearing retaining plate must be aligned with turbine shaft. Install lockwashers and screws (9) and torque from 23 to 25 lbs-ft.

bb. Install retaining ring (7).

cc. Lubricate and position O-ring (6) on bore plug (5) then install in impeller cover (8).

dd. Install retaining ring (4).

ee. Install backing ring (2) and drive plate assembly (1) with screws and lockwashers (3). Note two dimples 180° apart in backing ring (2) must be out. Torque screws (3) from 23 to 25 lbs-ft.

ff. Install detent balls (15, figure 5-35), detent springs (16), gasket (14), and control valve assembly with lockwashers (13) and housing screws (12). Torque housing screws (12) from 23 to 25 lbs-ft.

gg. Install O-rings (7), gasket (8), and charging pump assembly (2) with lockwashers (6), screws (3 and 4), and mounting nuts (5). Torque screws (3 and 4) from 37 to 41 lbs-ft. Torque mounting nuts (5) from 41 to 45 lbs-ft.

hh. Install filter assembly (1). Torque from 20 to 25 lbs-ft.

8-93. INSTALLATION. (See figure 5-34.)

a. Align torque converter housing and engine flywheel housing. Install one capscrew (4, figure 5-34) and lockwasher (5).

b. Install capscrews (2) and lockwashers (3). Torque capscrews (2) from 30 to 32 lbs-ft.

c. Torque capscrew (4) from 28 to 30 lbs-ft.

d. Manually turn crankshaft until next hole in engine flywheel is visible. Install capscrew (4) and lockwasher (5).

e. Repeat steps c and d until a total of eight capscrews (4) have been installed.

f. Install engine flywheel access cover (on flywheel housing opposite starting motor).

g. Install engine and transmission. Refer to para. 8-108.

8-94. RADIATOR SHUTTER.

8-95. ASSEMBLY. (See figure 5-33.)

a. Attach vanes (49, figure 5-33) to angles (42) and control bars (47) and secure with retaining rings (45 and 46).

b. Attach angles (42) to frame (50) and secure with screws (43).

c. Install studs (44 and 48) and spring (41) with retaining rings.

d. Install bushings (39), O-ring (36), gasket (37), power element (35), and nut (34).

e. Install seat (33), spring (32), seats (31), and retaining ring (30). Install felt washer (29).

f. Install bushings (21), plunger (24), pin (23), and setscrews (22).

g. Install bushings (39), yoke (25), shaft (27), and retaining ring (26).

h. Install bushings (18 and 19), bolt (16), block (15), and nut (14).

i. Install block (15) and secure to lever (17) with nut (14).

j. Install lever (17), capscrew (13), star washer (12), and nut (11).

k. Install block (6), with capscrew (2) and star washer (3).

l. Install spring (5) and cotter pins (4).

m. Install rod assembly (1) and control assembly (8).

8-96. INSTALLATION. (See figure 5-32.)

a. Install radiator shutter (19, figure 5-32) with shroud and secure with capscrews (20) and lockwashers (21). Torque capscrews (20) from 12 to 14 lbs-ft.

b. Install capscrews (9, figure 5-33) and lockwashers (9A).

c. Install radiator top hoses and clamps.

d. Install engine hood.

e. Fill radiator with 50/50 mixture of fresh water and antifreeze. Install radiator cap (31, figure 5-32).

f. Start engine and run for five minutes. Check for leaks.

WARNING

The cooling system is pressurized. Personal injury may result when removing the radiator cap after operating temperature has been reached. Use proper protection when removing radiator cap.

Loosen radiator cap slowly and stop. This avoids possible burning from hot water or steam. Continue turning the cap to the left until loose for removal.

g. Remove radiator cap (31) and check coolant level. Add coolant as required.

8-97. RADIATOR INSTALLATION.

8-98. INSTALLATION. (See figure 5-32.)

NOTE

Coat inside radiator hose ends with Permatex Type II compound.

a. Place rubber molding (26, figure 5-32) on mounting bracket weldment (22), if previously removed.

b. Attach mounting bracket weldment (22) to radiator (30) using capscrews (23), lockwashers (24) and hex nuts (25). Torque nuts (25) from 30 to 32 lbs-ft.

NOTE

If shutter assembly (19) is provided install with radiator shroud assembly.

c. Install radiator shroud (18) using capscrews (20) and lockwashers (21) to radiator (30). Torque capscrews (20) from 12 to 14 lbs-ft.

d. Install elbows (17 and 16) to radiator (30). Install adapter (15). Install fan guard (27) with screws (28) and lockwashers (29).

NOTE

Assemble hose adapter (13) to each end of hose (14).

e. Install hose assembly (12) to adapter (15) and assemble pipe coupling (11) to opposite end.

f. Install drain cock (10).

g. Install tubing clamp (1), lockwasher (3), and hex nut (2) on weld stud (4).

h. Install radiator assembly (5) and secure with capscrews (8) and lockwashers (9). Install capscrew (7), flat washer (6), lockwasher (3), and hex nut (2).

i. Install upper and lower hose connections to radiator (30). Remove tags.

j. Install transmission oil cooler lines and remove tags. Check transmission oil level. Add oil if needed.

NOTE

Ensure that drain cock (10) is closed.

k. Fill radiator (30) with 50/50 solution of anti-freeze and fresh water, approximate capacity is 20.2 quarts (19.1 liters).

l. Install radiator cap (31). Run engine for five minutes and check all connections for leaks. Adjust if required.

WARNING

Cooling system is pressurized. Personnel injury may result when removing radiator cap (31) after operating temperature is reached. Use proper protection when removing radiator cap.

WARNING

When removing radiator cap (31), loosen slowly and stop. This avoids possible burning from hot water or steam. Continue turning cap to the left until loose for removal.

m. Remove radiator cap (31) and recheck coolant level. Add coolant if needed.

8-99. EXHAUST SYSTEM.

8-100. INSTALLATION. (See figure 5-31.)

NOTE

Sealclamps (3, figure 5-31) are not reusable. Once removed, these clamps must be replaced to prevent exhaust system leaks.

a. Install hose (4) at turbocharger exhaust side and secure with sealclamp (3).

b. Install elbow (5) and secure with sealclamp (3).

c. Assemble resonator (7) and muffler (6) and secure with muffler clamps (2).

d. Install exhaust tube (1) and muffler clamp (2).

8-101. FUEL TANK.

8-102. INSTALLATION. (See figure 5-30.)

a. Install nipple (15, figure 5-30), elbow (14), and bushing (13) to tank (3).

b. Install gasket (11) to fuel level sender (9). Install fuel level sender (9) and secure with screws (10).

c. Install plug (8) to tank (3).

d. Install elbow (12), nipple (16), fuel shutoff valve (17), and connector (18).

e. Install tank (3) to location on frame. Install strap (6) and secure with lockwashers (5) and nuts (4).

f. Secure plate (1) to frame with capscrews (2).

g. Remove tags and caps and install fuel hoses to tank.

h. Connect electrical leads to fuel level sender (9).

i. Fill tank with diesel fuel (approximately 30 gallons (113.6 L) and install cap (7).

8-103. AIR CLEANER INSTALLATION

8-104. ASSEMBLY. (See figure 5-29.)

a. Slip element assembly (4, figure 5-29) into body assembly (5). Install nut assembly (3).

b. Install cover assembly (2) to body assembly (5).

c. Install vacuator valve (1).

8-105. INSTALLATION. (See figure 5-28.)

a. Install mounting bracket (17, figure 5-28) to frame studs (21) using nuts (18), lockwashers (19), and washers (20).

NOTE

Align air cleaner assembly (16) and mounting bands (10) to match mounting holes of mounting bracket (17).

b. Install mounting bands (10) to air cleaner assembly (16) using nuts (11) and screws (12).

c. Install air cleaner assembly (16) to mounting bracket (17) using capscrews (15), lockwashers (14), and nuts (13).

d. Install cap assembly (8) and secure with clamp (9).

e. Install restriction indicator (7).

f. Slip two hose clamps (3) on elbow (6). Install elbow to air cleaner assembly (16). Tighten hose clamps.

g. Slip two hose clamps (3) on elbow (6). Install tube (5) into elbow. Tighten hose clamps (3).

h. Slip two hose clamps (3) on elbow (4). Install tube (5) into elbow. Tighten hose clamps (3).

i. Slip T-bolt clamp (1) on elbow (4). Install elbow to turbocharger (intake side). Tighten nut (2) on T-bolt clamp (1).

8-106. ENGINE.

8-107. ASSEMBLY. Assemble the engine as required per Engine Overhaul Instructions T.O. 36A10-3-5-83-1.

8-108. INSTALLATION. (See figure 5-27.)

NOTE

Refer to para 8-93 for transmission installation to the engine.

a. Install starting motor, alternator, and hydraulic pump.

WARNING

The engine and transmission weigh approximately 1800 pounds. Use caution when installing the engine and transmission.

b. Attach chain hoist (two-ton minimum capacity) to engine lifting brackets.

NOTE

Ensure that transmission mounts (11, figure 5-27) have been installed.

c. Lift engine and transmission and position in frame. Ensure that all mounting locations match.

d. Secure transmission to frame with capscrews (16) dock washers (14), new center mounts (15), and nuts (13). Torque nuts (13) from 144 to 156 lbs-ft.

e. Apply Loctite to capscrew (17) and secure front engine mount with dock washers (14), new center mount (15), and capscrew (17). Torque capscrew (17) from 363 to 393 lbs-ft.

f. Disconnect chain hoist.

g. Connect fuel lines at transfer pump and fuel leakoff manifold.

h. Install oil pan plug and fill engine with engine oil per lubrication chart, figure 4-13.

i. Install transmission drain plug and fill transmission with oil per lubrication chart, figure 4-13.

j. Connect exhaust tube at turbocharger.

k. Remove tags and caps and install hydraulic lines to hydraulic pump.

l. Remove tags and install electrical leads to alternator and starting motor.

m. Remove tags and install electrical leads to sending units on engine and transmission.

n. Connect all control cables at engine (accelerator) and transmission (rear axle disconnect, hi-low shift range, speed selector, and forward-reverse selector).

o. Install radiator. Refer to para 8-97.

p. Install hoses (2, 5, and 6), tubes (4 and 7) and secure with clamps (1 and 3).

q. Install engine hood assembly. Refer to para 8-12.

r. Install air cleaner assembly. Refer to para 8-103.

s. Turn on power at battery disconnect switch.

t. Bleed fuel lines. Refer to para 4-29.

8-109. STARTING MOTOR.

8-110. ASSEMBLY. (See figure 5-26.)

a. Lubricate bushings (18 and 49, figure 5-26) with oil MIL-L-2104 SAE 20 before assembly.

b. Assemble bushing (18), center bearing plate (17), washer (16), drive assembly (15), stop collar (14), retainer ring (13), and thrust collar (12) on armature (19).

c. Install armature (19) in drive housing (10) using screws and lockwashers (11).

d. Position switch lever (21) on drive assembly (15).

CAUTION

Use care when installing the field coil (30) to prevent grounding or shorting.

e. Install field frame assembly (50) and field coil assembly (30).

f. Assemble end frame (8) and field frame aligning match marks. Install thru bolts (9).

g. Install switch (1) with contact (5), plunger spring (7), and gasket (6) using screws (3) with lockwashers (4) and screw (2).

h. Check pinion clearance as follows:

NOTE

Pinion clearance cannot be adjusted but improper clearance is an indicator of worn parts.

1. Disconnect motor field coil connector from solenoid. Insulate terminal carefully.

2. Connect 12-volt battery from solenoid switch terminal to starting motor frame. Refer to figure 8-8.

3. Momentarily flash jumper from solenoid motor terminal to starting motor frame.

NOTE

Drive pinion will shift into cranking position and remain so until battery is disconnected.

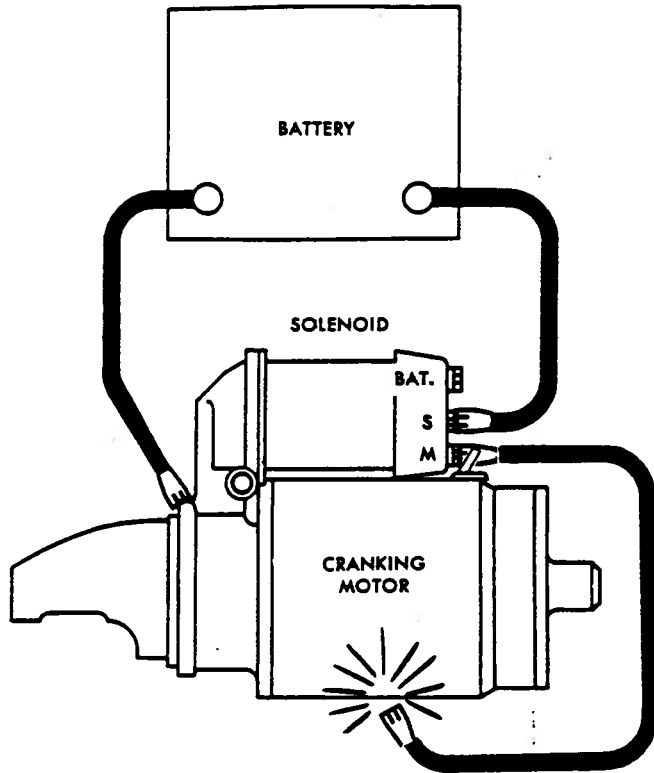


Figure 8-8. Circuit for Checking Pinion Clearance

4. Push drive pinion back towards commutator end to eliminate stock movement.

5. Use feeler gage to measure clearance between drive pinion and pinion stop. Pinion clearance should be from .010 to .140 inch.

i. Perform no-load test on starting motor. Refer to para. 4-3.

8-111. INSTALLATION. (See figure 5-25.)

WARNING

The starting motor weighs 32 pounds.

a. Install starting motor (1, figure 5-25) in engine flywheel housing and secure with capscrews (2) and lockwashers (3). Torque capscrews (2) from 31 to 33 lbs-ft.

b. Connect leads to solenoid and starting motor. Remove tags.

c. Turn on power at battery disconnect switch.

8-112. ALTERNATOR.

8-113. ASSEMBLY. (See figure 5-24.)

a. Press drive end bearing (28, figure 5-24) into drive end frame (1) with tube or collar that just fits over outer race.

b. Install plate retainer (26) with screws (27).

CAUTION

Avoid excessive tightening that could distort rotor.

c. Place rotor assembly in (2) vice and tighten.

d. Install drive end shaft collar (25).

e. Install drive end frame (1) on rotor assembly (2) and install outside collar (24).

f. Install fan (10, figure 5-23), alternator pulley (8), pulley retainer (7), lockwasher (23, figure 5-24), and drive end shaft nut (22). Torque shaft nut (22) from 40 to 60 lbs-ft.

CAUTION

Do not apply excessive pressure that could cause distortion.

g. Install battery terminal (21), if removed.

h. Place a flat plate over bearing (20) and push bearing into slip ring end frame (3) until bearing is flush with outside of end frame.

CAUTION

Be certain slip ring end frame (3) is clean. Support inside of frame with a hollow cylinder to prevent breakage of frame. Use care to avoid misalignment or place undue stress on bearing.

i. Install rectifier bridge (18) with screw and washer (19).

j. Install capacitor (15) using screw and lockwasher (17) and screw (16).

k. Install regulator (13) using screw and lockwasher (14).

l. Install relay terminal (12).

m. Install brush and holder assembly (9), brush and arm (8), and diode trio (7) using screws (10 and 11).

NOTE

Ensure that these screws have special insulating sleeves.

n. Install stator assembly (4) into slip ring end frame (3). Attach stator assembly leads to diode trio (7) with nuts (6).

NOTE

Make sure rotor assembly shaft is clean. Insert pin through hole to hold up brushes during assembly. Remove pin after thru-bolts are tightened to allow brushes to fall down into slip rings.

o. Assemble slip ring end frame (3) with stator assembly (4) to drive end frame (1) with rotor assembly (2). Align scribe mark on frames then install thru-bolts (5).

p. Bench test alternator as follows:

1. Connect ammeter, voltmeter, resistor (10 ohms at 6 watts), alternator, and fully charged battery as shown in figure 8-9.

2. Slowly increase alternator speed and observe voltage.

3. If voltage is uncontrolled with speed and increases above 15.5 volts, test voltage regulator and recheck field winding.

NOTE

Battery used for bench check must be fully charged.

4. If voltage is below 15.5 volts, connect carbon pile as shown in figure 8-9.

5. Operate alternator at moderate speed and adjust carbon pile as required to obtain maximum current output.

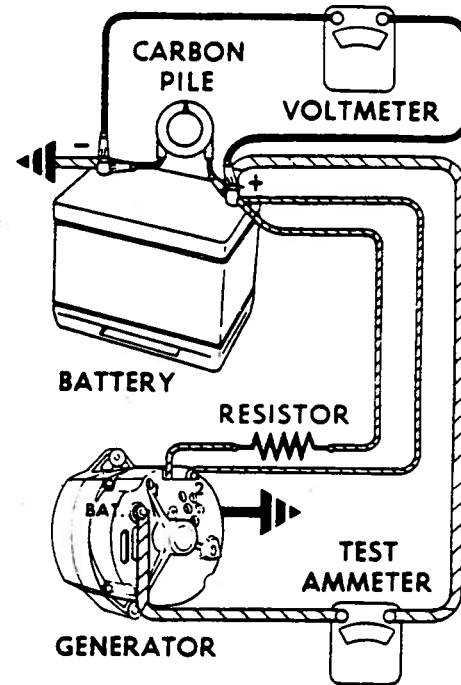


Figure 8-9. Circuit for Alternator Bench Check

6. If output is within 10 amperes of 63 amperes, then alternator is good.

7. If output is not within 10 amperes of 63 amperes, troubleshoot alternator per para. 4-5.

8-114. INSTALLATION. (See figure 5-23.)

a. Install mounting spacer (4, figure 5-23), alternator (9), and capscrew (3).

b. Install alternator brace (1) using capscrews (2).

c. Install drive belt and apply tension.

d. Connect electrical leads to alternator and remove tags.

e. Turn on power at battery disconnect switch.

8-115. HI-TONE HORN.

8-116. INSTALLATION. (See figure 5-22.)

a. Assemble bracket (5, figure 5-22) to horn (1) with nut (4) if necessary.

b. Locate mounting stud (6) (under left-front wheel well) and install horn (1).

- c. Install lockwasher (3) and nut (2).

8-117. TURNSIGNAL SWITCH.

8-118. ASSEMBLY. (See figure 5-21.)

- a. Insert handle (3, figure 5-21) and bulb (2).
- b. Replace cover and secure with screws.
- c. Attach turnsignal switch to steering column with clamp.
- d. Remove tags and connect electrical leads.

8-119. CLEARANCE LIGHT.

8-120. ASSEMBLY. (See figure 5-20.)

- a. Install bulb (2, figure 5-20).
- b. Place base in position and secure with lockwashers (4) and nuts (3).
- c. Install lens (1).
- d. Remove tags and connect electrical leads.

8-121. CAB MARKER LIGHT.

8-122. ASSEMBLY. (See figure 5-19.)

- a. Install bulb (3, figure 5-19) and base gasket (5).
- b. Install screws (4).
- c. Secure lens (2) with screw (1).
- d. Remove tags and connect electrical leads.

8-123. FRONT OR REAR TURNSIGNAL.

8-124. ASSEMBLY. (See figure 5-17 or 5-18.)

- a. Install bulb (8, figure 5-17 or 5-18) into pigtail (9).
- b. Place lens gasket(s) (7), and lens(es) (6) on shell.
- c. Secure lens(es) (6) with lens retainer(s) (5).

- d. Remove tags and connect electrical leads.

e. Place turnsignal in position on towing tractor.

f. Secure with gasket (4), washer (3), lockwasher (2) and nut (1).

8-125. BEACON LIGHT.

8-126. ASSEMBLY. (See figure 5-16.)

- a. Install bulb (7, figure 5-16) in power supply (9).
- b. Place lens gasket (6) and lens (5) on base (8).
- c. Place base gasket (4) on base (8).
- d. Remove tags and connect electrical leads.
- e. Place beacon light in position on towing tractor.
- f. Insert screws (3) and secure with lockwashers (2) and nuts (1).

8-127. PINTLE LIGHT (FRONT OR REAR).

8-128. ASSEMBLY. (See figure 5-15.)

- a. Install sealed beam lamp (7, figure 5-15) in shell.
- b. Secure ring (6) over sealed beam lamp with capscrew (5).
- c. Remove tags and connect electrical leads.
- d. Place pintle light into position on towing tractor.
- e. Insert carriage bolt (4) through bracket (1) securing with lockwashers (3) and nuts (2).

8-129. REAR DRIVING LIGHT.

8-130. ASSEMBLY. (See figure 5-14.)

- a. Install sealed beam lamp (8, figure 5-14) in shell.
- b. Secure ring over sealed beam lamp with capscrew (6).

- c. Remove tags and connect electrical leads.
- d. Place rear driving light assembly into position on towing tractor.
- e. Insert carriage bolts (4 and 5) through bracket (1) securing with lockwashers (3) and nuts (2).

8-131. SPOTLIGHT ASSEMBLY.

8-132. ASSEMBLY. (See figure 5-13.)

- a. Install handle (31, figure 5-13) and gear (32) to handle housing (33).
- b. Install switch assembly (27) in handle housing (33). Insert screw (28).
- c. Install cap (25) to handle housing (33). Insert screw (26). Install flipper (23) and secure with pin (24).
- d. Install bushing (20) and outside tube (19) to handle housing (33). Secure with bolt (29) and wedge (30).
- e. Install outside tube (19) to yoke end of housing and tube (21). Secure with screw (16).
- f. Thread inner tube assembly (15) through housing and tube assembly (13) into gear (32). Install cap (14) and screw (18).
- g. Install gear (12), washer (10), spring (11), and bushing (9) into housing and tube assembly (13). Secure with setscrew (17) and wedge pin (34).
- h. Insert gear (12) into shell (8). Secure with washer (7) and nut (6).

NOTE

Attach electrical wiring to sealed beam lamp (5).

- i. Install lamp (5) to shell (8). Secure with springs (4). Install ring (3) and secure with screw (2).

8-133. FRONT DRIVING LIGHT.

8-134. ASSEMBLY. (See figure 5-12.)

- a. Install sealed beam lamp (8, figure 5-12) in shell.
- b. Secure ring over sealed beam lamp with capscrew (6).
- c. Remove tags and connect electrical leads.
- d. Place front driving light assembly into position on towing tractor.
- e. Insert carriage bolts (4 and 5) through bracket (1) securing with lockwashers (3) and nuts (2).

8-135. BATTERY INSTALLATION.

8-136. INSTALLATION. (See figure 5-10.)

WARNING

Batteries generate explosive gases. Keep sparks, flames or other ignition sources away. Wear eye goggles when working near batteries.

- a. Place battery warmer (11, figure 5-10), if provided, in battery tray.

NOTE

Replace batteries with sealed maintenance-free batteries with same rating as original equipment.

CAUTION

The batteries are sealed except for small vent holes in the cover. These vents require keeping the batteries in the upright position. Tipping beyond 45° in any direction will allow electrolyte to leak from vent holes.

Battery weight is 59 pounds. Use care when lifting.

- b. Install batteries (10) on battery warmers (11).

c. Position support angle (9) with tie down rods (8) in slots in battery tray. Install flat washers (3), lockwashers (2), and hex nuts (1) to tie down rods (8). Ensure that batteries are secured.

NOTE

When replacing battery cable assembly (5) follow procedures described in paragraphs d and e for the manufacture of new cable assemblies.

d. Cut battery cable (6) to required length. Strip 7/8-inch insulating off each end. Slide

shrinkable tubing over each cable end.

e. Power crimp terminal to cable ends. Pull shrinkable tubing over crimp section of terminal and cable. Heat shrinkable tubing until secured.

f. Install battery cable assembly (5) to battery posts with hex nuts (4).

g. Install battery cables from disconnect switch and starting motor.

h. Turn on power at battery disconnect switch.

SECTION IX

TESTING

9-1. GENERAL

9-2. The following is a list of checks and functional tests that shall be performed after assembly/overhaul of the towing tractor. Any problems noted during testing should be documented and corrected.

a. Lights - Functional Test of:

1. Headlights
2. Turnsignals
3. 4-Way Flashers
4. Clearance Lights
5. Tail Lights
6. Rear Steer Indicator
7. Water High Temp Light
8. Brake Lights
9. Back-up Lights
10. Brake Low-Hyd Pressure Light
11. Cab Dome Light and Fans
12. Park Brake Light
13. Console Panel Lights
14. Beacon Light
15. Spotlights

b. Instruments - Functional Test of (record readings):

1. Oil Pressure Gage _____ psi
2. Water Temperature Gage _____ degrees F
3. Hourmeter _____ hours
4. Fuel Gage _____ % full
5. Voltmeter _____ amps
6. Transmission Temperature Gage _____ degrees F
7. Horn
8. Brake Low Hydraulic Press Buzzer
9. Back-up Light in FRWD Gear
10. Back-up Alarm
11. Speedmeter

c. Controls - Functional Test of:

1. Steering (Track)
2. Steering (Crab)
3. Steering (Coordinated)

4. Windshield Wipers
5. Battery Disconnect Switch
6. Cole Weather Start
7. Cab Heater

d. Brakes - Functional Test of:

1. Service Brakes
2. Parking Brake

e. General - Check:

1. Tire Pressure

R/F _____ L/F _____
L/R _____ R/R _____

2. Engine RPM

Idle _____ RPM (Spec.: 600)
Max _____ RPM (Spec.: 2615)
Stall _____ RPM (Spec.: 1945)

3. Verify that starter does not engage with engine running.

4. Verify that starter does not engage with transmission in gear.

5. Check hydraulic pump output and system main pressure relief setting. Refer to para. 4-15. _____ psi

6. Check brake valve operation. Perform troubleshooting check per para. 4-17.

7. Check accumulator charge. Refer to para. 4-33.

8. Check and record battery charge. _____ volts

9. Ensure all hoses and wiring clear engine exhaust manifold by a minimum of three inches.

10. Check charge of fire extinguishers.

f. Drawbar Pull Test:

1. Warm up engine
2. Operate towing tractor through full range of gears for 15 minutes and check all instruments for proper function.
3. Operate service and park brakes.
4. Attach load cell or comparable measuring device to rear pintle hook. Attach measuring device to load capable of applying 30,000 pounds drawbar load.
5. Drive forward on dry, level paved surface until 30,000 pound minimum draw bar pull is obtained.
6. Repeat steps (4) and (5) with load attached to front pintle hook and operate tractor in reverse.

g. Steering Test:

1. Position steering selection valve for coordinated steering.

2. Cramp steering wheel and drive 360 degrees (one full circle) in clockwise (CW) direction.

3. Measure and record diameter of turning circle (measure from outside of tire tread). _____ CW dia. (Note: The diameter should not exceed 420 inches (35 feet)

4. Repeat steps (2) and (3) for counter-clockwise (CCW) direction _____ CCW dia.

h. Brake Test:

1. Accelerate towing tractor to 15 MPH.
2. Apply brakes (in gear) and bring towing tractor to a complete and safe stop without wheel lockup.
3. Measure and record braking distance. _____ feet
4. Verify that braking distance was within 15 feet (Class I) or 19 feet (Class II).

SECTION X

DIFFERENCE DATA SHEETS

10-1. GENERAL

10-2. The following difference data sheets list the six models of the MB-2 Towing Tractor. The sheets show which maintenance procedures contained in this manual apply (and do not apply) to the specific model.

10-3. INDEX OF DATA SHEETS

10-4. The following is a list of the models and data sheets covered in this section.

PART NO.	PAGE NO.
1-905-000001	10-2
1-905-000002	10-3
1-905-000003	10-4
1-905-000004	10-5
1-905-000005	10-6
1-905-000006	10-7

DIFFERENCE DATA SHEET

CLASS I TOWING TRACTOR

PART NO. 1-905-000001

THE INSTRUCTIONS CONTAINED IN THE PRECEDING CHAPTERS OF THIS TECHNICAL ORDER ARE APPLICABLE TO THIS MODEL EXCEPT FOR THE DIFFERENCES CITED IN THIS DIFFERENCE DATA SHEET

1. **INTRODUCTION.** The towing tractors manufactured as part number 1-905-000001 are Class I type without winterization kits and snow tires. These units are not equipped with silicone brake systems. Towing tractors with the following serial numbers are affected.

84L174 thru 84L181; 84L200 thru 84L203;
84L233 thru 84L264; and 84L344 thru
84L407.

2. **SPECIAL TOOLS AND TEST EQUIPMENT.** All special tools and test equipment apply.

3. **PREPARATION FOR USE AND SHIPMENT.** All procedures apply.

4. **OPERATION INSTRUCTIONS.** All procedures contained in T.O. 36A10-3-5-81 apply.

5. **MAINTENANCE.** All maintenance procedures apply except for those contained in paragraphs 5-53, 5-91, 5-94, 8-52, 8-55, and 8-94.

6. **DIAGRAMS.** Not applicable.

7. **ILLUSTRATED PARTS BREAKDOWN.** All figures and parts lists in T.O. 36A10-3-5-84 apply except for figures 10, 65, 66, 88, 89, 90, 100 (sheet 3), 111, and 119.

DIFFERENCE DATA SHEET**CLASS II TOWING TRACTOR****PART NO. 1-905-000002**

THE INSTRUCTIONS CONTAINED IN THE PRECEDING CHAPTERS OF THIS TECHNICAL ORDER ARE APPLICABLE TO THIS MODEL EXCEPT FOR THE DIFFERENCES CITED IN THIS DIFFERENCE DATA SHEET

1. **INTRODUCTION.** The towing tractors manufactured as part number 1-905-000002 are Class II type without winterization kits and snow tires. These units are not equipped with silicone brake systems. Towing tractors with the following serial numbers are affected:

84L173; 84L182 thru 84L199; 84L206 thru 84L231; 84L267 thru 84L319; and 84L408 thru 84L436.
2. **SPECIAL TOOLS AND TEST EQUIPMENT.** All special tools and test equipment apply.
3. **PREPARATION FOR USE AND SHIPMENT.** All procedures apply.
4. **OPERATION INSTRUCTIONS.** All procedures contained in T.O. 36A10-3-5-81 apply.
5. **MAINTENANCE.** All maintenance procedures apply except for those contained in paragraphs 5-53, 5-91, 5-94, 8-52, 8-55, and 8-94.
6. **DIAGRAMS.** Not applicable.
7. **ILLUSTRATED PARTS BREAKDOWN.** All figures and parts lists in T.O. 36A10-3-5-84 apply except for figures 10, 65, 66, 88, 89, 90, 100 (sheet 3), 110, and 119.

DIFFERENCE DATA SHEET

CLASS I TOWING TRACTOR

PART NO. 1-905-000003

THE INSTRUCTIONS CONTAINED IN THE PRECEDING CHAPTERS OF THIS TECHNICAL ORDER ARE APPLICABLE TO THIS MODEL EXCEPT FOR THE DIFFERENCES CITED IN THIS DIFFERENCE DATA SHEET

1. INTRODUCTION. The towing tractors manufactured as part number 1-905-000003 are Class I type with winterization kits but without snow tires and silicone brake systems. Towing tractors with the following serial numbers are affected:

84L172, 84L204, 84L205, 84L265, 84L266,
84L341, 84L342, and 84L343.
2. SPECIAL TOOLS AND TEST EQUIPMENT. All special tools and test equipment apply.
3. PREPARATION FOR USE AND SHIPMENT. All procedures apply.
4. OPERATION INSTRUCTIONS. All procedures contained in T.O. 36A10-3-5-81 apply.
5. MAINTENANCE. All maintenance procedures apply except for those contained in paragraphs 5-91, 5-94, 8-52, and 8-55.
6. DIAGRAMS. Not applicable.
7. ILLUSTRATED PARTS BREAKDOWN. All figures and parts lists in T.O. 36A10-35-84 apply except for figures 88, 89, 90, 100 (Sheet 3), and 111.

DIFFERENCE DATA SHEET**CLASS II TOWING TRACTOR****PART NO. 1-905-000004**

THE INSTRUCTIONS CONTAINED IN THE PRECEDING CHAPTERS OF THIS TECHNICAL ORDER ARE APPLICABLE TO THIS MODEL EXCEPT FOR THE DIFFERENCES CITED IN THIS DIFFERENCE DATA SHEET

1. **INTRODUCTION.** The towing tractors manufactured as part number 1-905-000004 are Class II type with winterization kits but without snow tires and silicone brake systems. The towing tractor with serial number 84L232 is affected.
2. **SPECIAL TOOLS AND TEST EQUIPMENT.** All special tools and test equipment apply.
3. **PREPARATION FOR USE AND SHIPMENT.** All procedures apply.
4. **OPERATION INSTRUCTIONS.** All procedures contained in T.O. 36A10-3-5-81 apply.
5. **MAINTENANCE.** All maintenance procedures apply except for those contained in paragraphs 5-91, 5-94, 8-52, and 8-55.
6. **DIAGRAMS.** Not applicable.
7. **ILLUSTRATED PARTS BREAKDOWN.** All figures and parts lists in T.O. 36A10-3-5-84 apply except for figures 88, 89, 90, 100 (sheet 3), and 110.

DIFFERENCE DATA SHEET

CLASS I TOWING TRACTOR

PART NO. 1-905-000005

THE INSTRUCTIONS CONTAINED IN THE PRECEDING CHAPTERS OF THIS TECHNICAL ORDER ARE APPLICABLE TO THIS MODEL EXCEPT FOR THE DIFFERENCES CITED IN THIS DIFFERENCE DATA SHEET

1. INTRODUCTION. The towing tractors manufactured as part number 1-905-000005 are Class I type with snow tires. These units are not equipped with winterization kits or silicone brake systems. The towing tractors with the following serial numbers are affected:

84L320 thru 84L324

2. SPECIAL TOOLS AND TEST EQUIPMENT. All special tools and test equipment apply.

3. PREPARATION FOR USE AND SHIPMENT. All procedures apply.

4. OPERATION INSTRUCTIONS. All procedures contained in T.O. 36A10-3-5-81 apply.

5. MAINTENANCE. All maintenance procedures apply except for those contained in paragraphs 5-53, 5-91, 5-94, 8-52, 8-55, and 8-94.

6. DIAGRAMS. Not applicable.

7. ILLUSTRATED PARTS BREAKDOWN. All figures and parts lists in T.O. 36A10-3-5-84 apply except for figures 10, 65, 66, 88, 89, 90, 100 (sheet 3), 111, and 119.

DIFFERENCE DATA SHEET**CLASS I TOWING TRACTOR****PART NO. 1-905-000006**

THE INSTRUCTIONS CONTAINED IN THE PRECEDING CHAPTERS OF THIS TECHNICAL ORDER ARE APPLICABLE TO THIS MODEL EXCEPT FOR THE DIFFERENCES CITED IN THIS DIFFERENCE DATA SHEET

1. **INTRODUCTION.** The towing tractors manufactured as part number 1-905-000006 are Class I type with silicone brake systems. These units are not equipped with snow tires or winterization kits. Towing tractors with the following serial numbers are affected:

84L325 thru 84L340
2. **SPECIAL TOOLS AND TEST EQUIPMENT.** All special tools and test equipment apply.
3. **PREPARATION FOR USE AND SHIPMENT.** All procedures apply.
4. **OPERATION INSTRUCTIONS.** All procedures contained in T.O. 36A10-3-5-81 apply.
5. **MAINTENANCE.** All maintenance procedures apply except for those contained in paragraphs 5-53 and 8-94.
6. **DIAGRAMS.** Not applicable.
7. **ILLUSTRATED PARTS BREAKDOWN.** All figures and parts lists in T.O. 36A10-3-5-84 apply except for figures 10, 65, 66, 111, and 119.





APPENDIX A

TORQUE CHARTS

**NOTE — TORQUE VALUES FOR UNFINISHED FASTENERS
WITH NO SPECIAL LUBRICATION**





— COARSE THREADS —

TORQUE VALUES (Pounds-Foot)

COARSE THREAD	TENSILE STRENGTH (MIN) ----- SURFACE HARDNESS		TORQUE VALUES (Pounds-Foot)											
			1/4	3/8	7/16	1/2	9/16	5/8	3/4	7/8	1	1-1/4	1-3/8	1-1/2
 SAE Grade 1 and Grade 2	60,000 PSI ----- RB 70-100	Wrench Setting	7	19	30	45	66	93	150	202	300	659	884	1057
		Acceptable Range	8 5	20 18	31 29	47 43	69 63	97 89	156 144	210 194	312 288	685 633	919 849	1100 1015
 SAE Grade 5	105,000 PSI ----- RC 19-30	Wrench Setting	13	31	50	75	110	150	250	378	583	1097	1461	1748
		Acceptable Range	14 12	32 30	52 48	78 72	114 106	156 144	260 240	393 363	606 560	1141 1053	1519 1403	1818 1678
 SAE Grade 7	133,000 PSI ----- RC 28-34	Wrench Setting	14	43	69	106	150	209	350	550	825	1815	2434	2913
		Acceptable Range	15 13	45 41	72 66	110 102	156 144	217 201	364 335	572 528	858 792	1888 1742	2531 2337	3030 2797
 SAE Grade 8	150,000 PSI ----- RC 33-39	Wrench Setting	15	46	75	115	165	225	370	591	893	1964	2633	3150
		Acceptable Range	16 14	48 44	78 72	120 110	172 159	234 216	385 355	615 567	929 857	2043 1885	2738 2528	3276 3024

— FINE THREADS —

TORQUE VALUES (Pounds-Foot)

FINE THREAD	TENSILE STRENGTH (MIN) ----- SURFACE HARDNESS		TORQUE VALUES (Pounds-Foot)											
			1/4	3/8	7/16	1/2	9/16	5/8	3/4	7/8	1	1-1/4	1-3/8	1-1/2
 SAE Grade 1 and Grade 2	60,000 PSI ----- RB 70-100	Wrench Setting	8	21	33	50	73	104	165	221	327	722	992	1174
		Acceptable Range	9 7	22 20	34 32	52 48	76 70	108 100	172 158	230 212	340 314	751 693	1032 952	1221 1127
 SAE Grade 5	105,000 PSI ----- RC 19-30	Wrench Setting	15	35	55	83	121	168	276	413	633	1203	1638	1942
		Acceptable Range	16 14	36 34	57 53	86 80	126 116	175 161	287 265	430 396	658 608	1251 1155	1704 1572	2020 1864
 SAE Grade 7	133,000 PSI ----- RC 28-34	Wrench Setting	16	48	76	118	165	234	387	601	896	1992	2730	3238
		Acceptable Range	17 15	50 46	79 73	123 113	172 158	243 225	402 360	625 505	932 860	2072 1912	2839 2621	3368 3108
 SAE Grade 8	150,000 PSI ----- RC 33-39	Wrench Setting	17	51	82	128	183	251	409	646	970	2154	2953	3500
		Acceptable Range	18 16	53 49	85 79	133 123	190 176	261 241	425 393	672 620	1009 931	2240 2068	3071 2835	3640 3360

