TECHNICAL MANUAL

OPERATOR AND ORGANIZATIONAL MAINTENANCE MANUAL

CONVERSION, STORAGE AND CHARGING UNIT CARBON DIOXIDE: GASOLINE ENGINE OR ELECTRIC MOTOR DRIVEN; SEMI-TRAILER MTD, 16, 000 LB. CAPACITY: CARDIX MODEL E-46750

NSN 3655-00-062-7911

HEADQUARTERS, DEPARTMENT OF THE ARMY
10 JUNE 1976

WARNING

Take particular heed to specific cautions and warnings throughout this manual.

WARNING

Dry cleaning solvent, P-D-680 or P-S-661, used to clean parts is potentially dangerous to personnel and property. Use in a well-ventilated area as the fumes are dangerous if inhaled. Avoid repeated and prolonged skin contact. Do not use near open flame or excessive heat. Flash point of solvent is 100F. 138F. (38C. 59C.).

WARNING

Do not isolate sections of lines, components, or fittings not equipped with automatic pressure releases without first releasing all residual gases.

WARNING

Personnel entering the conversion compartment must be equipped with a safety line securely attached. A safety guard must be positioned to observed and assist persons working inside at all times.

SAFETY PRECAUTIONS

BEFORE OPERATION

Be sure the fire extinguisher is in place and in operating condition. Follow all lubrication and preventive maintenance procedures with care, to avoid damaging the equipment. Shut down the engine before filling the fuel tank. Do not fill the fuel tank while smoking, or within 50 feet of an open flame. Always provide a metal contact between the container and tank when filling the fuel tank. Be sure trailer is properly grounded. Do not overfill a battery or splash electrolyte. Spilled electrolyte will cause personal injury or equipment damage. Do not engage the starting motor for more than 30 seconds at a time, without allowing a 3-minute cooling off period.

DURING OPERATION

When the refrigeration unit is operated manually install two pressure gages on the compressor; one on the suction side and one on the discharge side, so that suction and discharge pressures may be checked. These pressures must not be allowed to exceed their normal limits. Do not allow the cylinder filling unit to idle at charging pressures for long periods of time. This will cause pressure buildup within the pressure vessels, and wear out the cylinder filling unit. Do not apply power to drive shaft while personnel are positioned inside of operating compartment.

AFTER OPERATION

Shut the pressure off to any line, fitting, or valve before loosening the connections. Shut off the electrical power before working on any electrical component. Disconnect the 220-volt power supply, disconnect one battery cable and set the gasoline engine control switch to "manual" before performing any maintenance or service in the power compartment. If this is not done, the equipment may start in response to the automatic controls. Before entering either pressure vessel, be sure the compartment has been thoroughly ventilated. Never enter, or let personnel enter, the pressure vessels unless personnel are stationed at the manway to observe continuously for signs of trouble caused by lack of air. While carbon dioxide is not poisonous, large quantities can cause suffocation. Pump down the refrigerant from the refrigeration compressor into the receiver before opening the compressor crankcase.

CHANGE

NO. 1

HEADQUARTERS
DEPARTMENT OF THE ARMY
WASHINGTON, D.C., 23 October 1990

Operator and Organizational Maintenance Manual

**CONVERSION, STORAGE AND CHARGING UNIT
CARBON DIOXIDE:
GASOLINE ENGINE OR ELECTRIC MOTOR DRIVEN;
SEMI-TRAILER MTD, 16, 000 LB.
CAPACITY: CARDIX MODEL E-46750
NSN 3655-04062-7911**

Approved for public release; distribution is unlimited

TM 5-3655-210-12, 10 June 1976, is changed as follows:

1. Remove and insert pages as indicated below. New or changed text material is indicated by a vertical bar in the margin. An illustration change is indicated by a miniature pointing hand.

Remove pages	**Insert pages**
2-27	2-27/2-28
3-9 and 3-10	3-9 and 3-10
4-3 and 4-4	4-3 and 4-4

2. Retain this sheet in front of manual for reference purposes.

By Order of the Secretary of the Army:

CARL E. VUONO
General, United States Army
Chief of Staff

Official:

HOMAS F. SIKORA
Brigadier General, United States Army
The Adjutant General

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TECHNICAL MANUAL

No. 56-3655-210-12

HEADQUARTERS,
DEPARTMENT OF THE ARMY
WASHINGTON, D.C., *10 June, 1976*

OPERATOR AND ORGANIZATIONAL MAINTENANCE MANUAL

CONVERSION, STORAGE AND CHARGING UNIT CARBON DIOXIDE: GASOLINE ENGINE OR ELECTRIC MOTOR DRIVEN; SEMI-TRAILER MTD, 16, 000 LB. CAPACITY: CARDIX MODEL E-46750 NSN 3655-00-062-7911

REPORTING OF ERRORS

You can help to improve this manual by calling attention to errors and by recommending improvements. Your letter, DA Form 2028 (Recommended Changes to Publications), and/or DA Form 2028-2 (Recommended Changes to Equipment Technical Manuals) may be used. Copies of DA Form 2028-2 are attached in the back of the manual for your use. Please mail your recommended changes directly to Commander, U. S. Army Troop Support Command, ATTN: DRSTS-MPP, 4800 Goodfellow Blvd, St. Louis, MO 63120. A reply will be furnished directly to you.

***This manual supersedes TM 5-865621012, 28 October 1968, including all changes.**

LIST OF ILLUSTRATIONS

LIST OF TABLES

CHAPTER 1
INTRODUCTION

Section I. GENERAL

1-1. Scope
These instructions are published for the use by personnel to whom the Cardox Model E-46750 conversion, storage and charging unit is issued. They provide information on the operation and organizational maintenance of the equipment. Also included are descriptions of main units and their functions in relationship to other components.

1-2. aintenance Forms and Records
Maintenance forms and records that you are required to use are explained in TM 38-750.

1-3. Equipment Serviceability Criteria
This equipment is not covered by an ESC.

1-4. Destruction of Army Material to Prevent
Enemy Use Refer to TM 750-244-3 for instructions to destroy material to prevent enemy use.

1-5. Administrative Storage
Refer to TM 740-90-1 for instructions on the administrative storage of this equipment.

Section II. DESCRIPTION AND DATA

1-6. Description
a. The Cardox Model E-46750 carbon dioxide liquid storage and conversion unit (figs 1-1 and 1-2) is self-contained, and is designed for road transportation by any suitable towing unit with air brake connections.

b. A cylindrical storage tank, located at the front of the unit, is divided by a bulkhead into two hermetically sealed pressure vessels: A 6-ton (5.4431 metric tons) pressure vessel (front section) for the storage of liquid carbon dioxide; and a 2-ton (1.8144 metric tons) pressure vessel (rear section) for the conversion of solid carbon dioxide (dry ice) into liquid carbon dioxide and for storage of liquid carbon dioxide. After the unit has been filled either liquid carbon dioxide or solid carbon dioxide (the latter is reduced to a liquid through the use of a heater), the temperature and pressure are controlled by mechanical refrigeration. The liquid carbon dioxide in each pressure vessel is maintained at a temperature of 17C. or OF., and a corresponding vapor pressure of 295-305 psi (20.7385 to 21.4415 kg per sq cm). Each pressure vessel is provided with a safety vent assembly for protection against abnormally high pressures. A manway cover is located at the top of each pressure vessel. Blocks of insulation surround each manway and must be kept in place to prevent heat transmission. Pipe outlets on the tank connect to the liquid fill lines, vapor equalizing lines, pressure and capacity gages, refrigerator coil (storage pressure vessel), and heater coil (a manway cover is located at the top of the conversion vessel) (conversion pressure vessel).

c. The power compartment is located at the rear section of the trailer completely enclosed by the housing and accessible through the doors at the rear of the housing. The refrigeration unit for maintaining storage tank temperature, automatic and semi-automatic refrigeration controls, transfer pump, cylinder filling unit, space heater, and drive units consisting of an electric motor and a gasoline engine are all mounted in this compartment. A countershaft with a one-way clutch is driven by either power unit as desired, but not simultaneously. The countershaft, through clutching, is used to drive the refrigeration unit, cylinder filling unit, and transfer pump. Operational gages, control equipment and valves are also located in this compartment.

d. The storage compartment, located below the storage tank in back of the landing gear, is completely enclosed by housing and accessible through the doors on either side of the compartment. The conversion heater, cylinder scale, tool box, transfer hoses, power cable, fire extinguisher, refrigerant

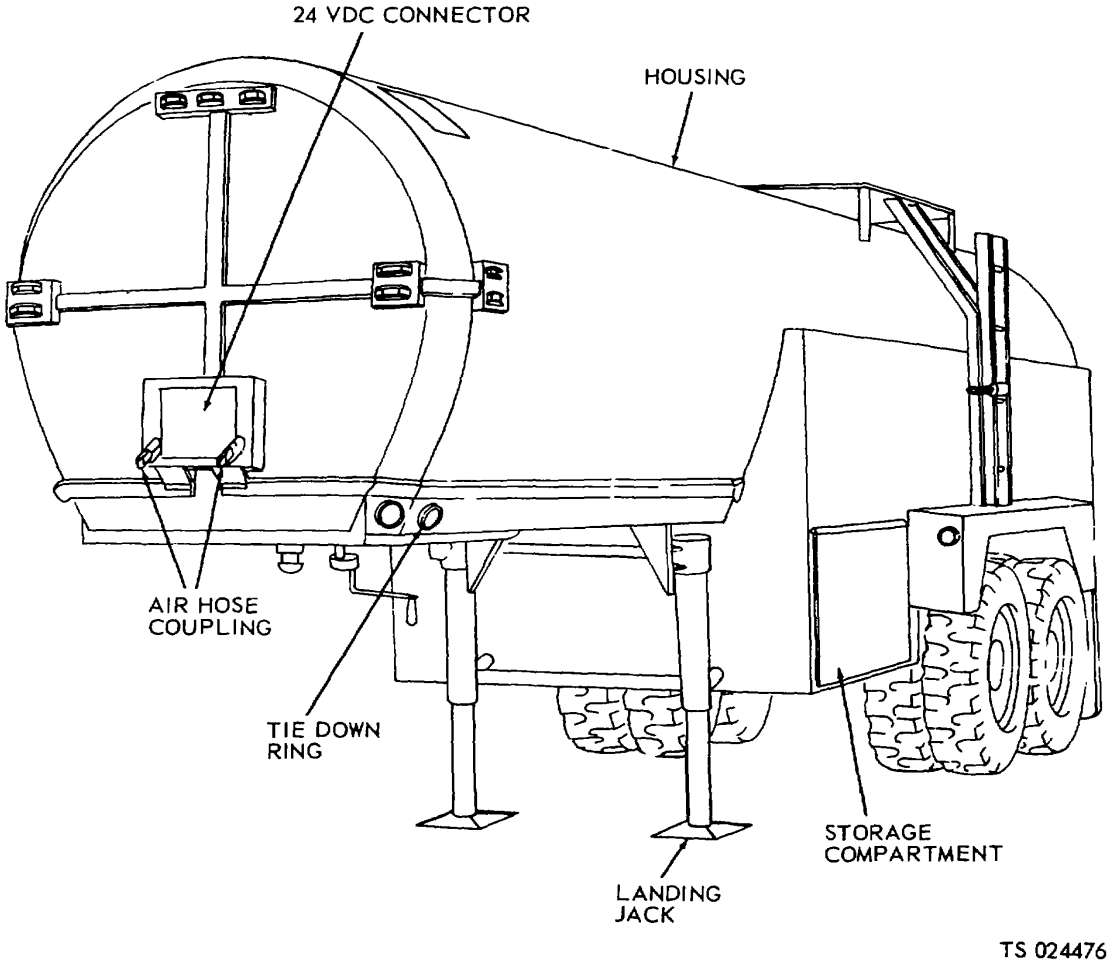


Figure 1-1. Conversion storage and charging unit, ¾ left front view.

cylinder, ground rod assembly and electrolyte are all enclosed in this compartment.

e. The chassis and housing completely support and cover the storage tank, power compartment, and storage, compartment. External clearance lights are provided on the housing for use during road transportation. Internal dome lights are provided in the power and storage compartments. The chassis is fitted with air brakes that operate in conjunction with the tractor towing the unit. Manually operated, two speed landing jacks are provided to support the front end of the unit. Removable lifting eye covers permits access to the lifting eye holes at the top of the tank body. The four tie-down rings are to be installed in the lifting eye holes when using a crane to lift the unit.

1-7. Tabulated Data

a. Identification. The conversion storage and charging unit has four major identification plates. The information contained on the plates is listed below:

(1) Engine plate.

Manufacturer	Wisconsin Motor Corp.
Model	MTHD
Size (bore; stroke)	3 x 3/, 4 (8.255 x 8.256 cm)
Specification No	147203
Serial No	as assigned
Additional	Operating instructions

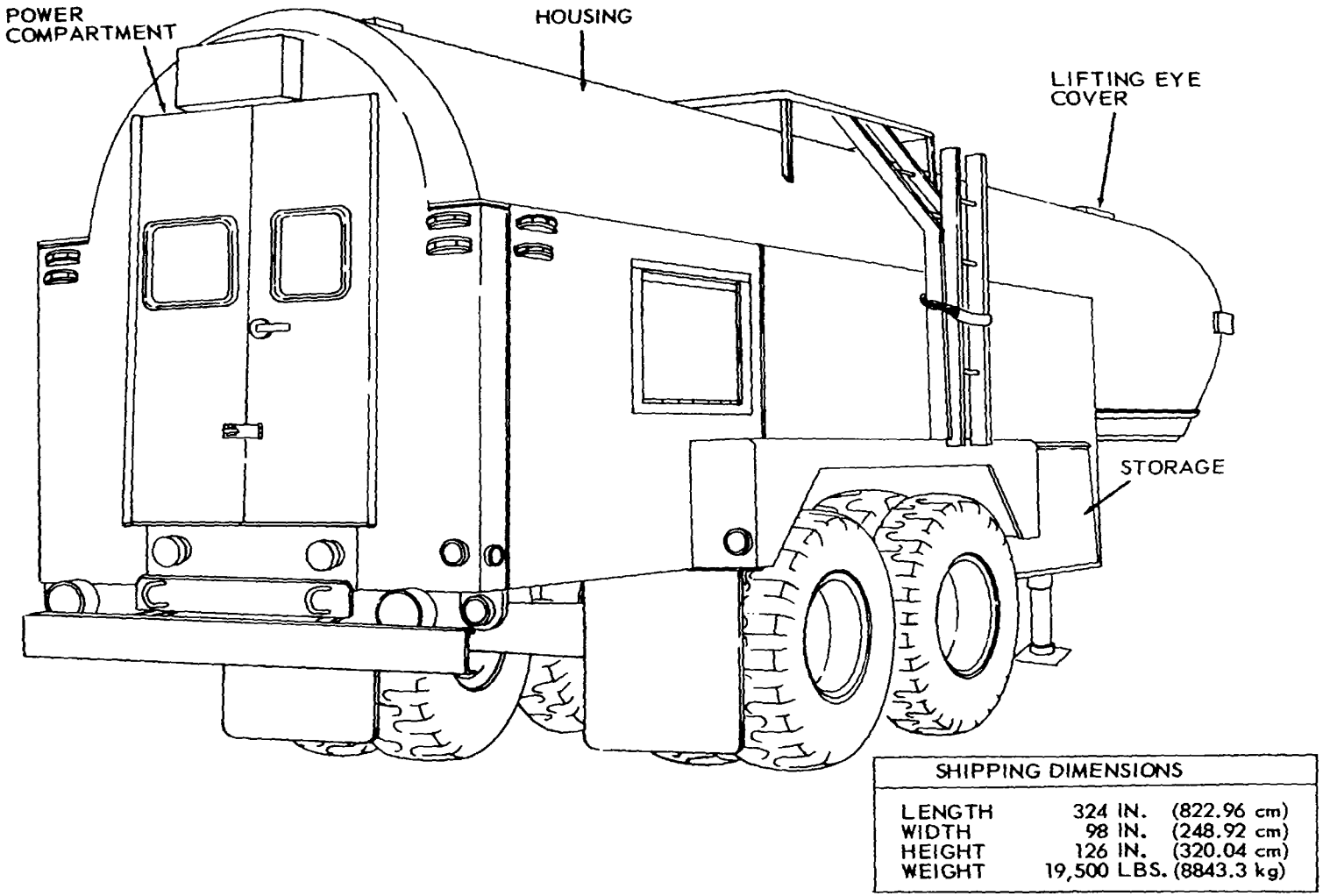


Figure 1-2. Conversion storage ad charging unit right rear view.

(2) Electric motor plate.

Manufacturer ..... General Electric
Models ..... 5K215BG215 TP and 5K184BL219
Horsepower 5
Phase .....
Volts 208
Cycles 60
RPM 1745
AMP 15
Deg C rise 55
Service factor 1
Time rating ..... cont.
NEMA class design ..... B
Frame 215
Type ..... K
Code ..... H
Shaft end brg AFBMA 35BC02XP
Opp end 25BC02/P

(3) Conversion, storage and charging unit data plate.

Nomenclature ..... Conversion storage and charging unit: C02 16, 000 lbs cap semi- (7200 kg) trl mtd.
TM ..... TM 5-3655-210
Stock No 3655-00-062-7911
Make ..... Cardox
Model E-46750
Serial Nos ..... L-1475-T to L-1478-T
Date mfd ..... as applicable
Contract No DAAK01-67-C-1355
Serial Nos ..... L-1666-T to L-1668-T
Contract No DSA700-69-C-H562

(4) (Transportation data plate.

Overall length ..... 324 in. (822.96 cm)
Overall height ..... 126 in. (320.04 cm)
Overall width ..... 96 in. (243.84 cm)
Shipping cubage ..... 2315 ft. (69450 cm)
Shipping weight ..... 19, 500 lbs (8775 kg)
Shipping tonnage ..... 10 tons (9.0719 metric tons)
Additional ..... Pictorial showing lift and tie-down points, center of gravity, and axle and kingpin loads (empty)

b. Tabulated Data

(1) Carbon dioxide conversion, storage and charging unit.

(a) Identification.

Manufacturer ..... Cardox
Model E-46750
Type ..... Semi-tlr mtd.
Serial Nos ..... L-1475-T to L-1478-T and L-1666-T to L-1668-T

(b) Dimensions and weights.

Overall length ..... 27 ft. (810 cm)
Overall width ..... 8 ft. (240 cm)
Overall height ..... 10 ft., 6 in. (315.24 cm)
Trailer weight empty ..... 19, 500 lbs (8775 kg)
Overall weight, loaded ..... 35, 000 lbs (15750 kg)
Shipping cubage ..... 2315 cu ft. (65553.855 cubic cm)

(c) Capacities.

Storage pressure vessel ..... 12, 000 lbs liquid (843.6 kg per sq cm)
Conversion pressure vessel .... 5, 000 lbs solid-liquid (2250 kg)
Gasoline fuel tank ..... 20 gal (gallon) (s) (76 liters)
Gasoline engine crankcase ..... 32 qt. (3.325 liters)
Refrigeration compressor crankcase ..... 22 qt (2.375 liters)
Cylinder filling unit crankcase ..... 5 qt (4.751 liters)
Conversion heater fluid ..... 10 gal (38 liters)
Gasoline engine air cleaner ..... / pt (.235 liters)

(2) Electric motor.

Manufacturer ..... General Electric Co.
Models ..... 5K215BG215 and 5K184BL219
Type ..... Induction
Horsepower .....
Voltage ..... 220 ac
Phase ..... :3
Cycles ..... (
Amperes 15
Rated speed ..... 1.745 rpm
Temperature rise ..... 55C ..... (1:1 F.)

(3) Gasoline engine.

(a) Identification.

Manufacturer ..... Wisconsin Motor Corp.
Model ..... MTHD
Specifications ..... 142703 MIL-E-112751D and 326500 MIL-E-11275D
Horsepower ..... 11.7 at 1.8(10 rpm
Type ..... 2 cylinder, 4-cycle, air cooled ..... heavy duty.
Bore and stroke ..... 3 ¾ x 3 1/4 in. (8.255 x 8.255 cm)
Displacement ... cu ..... in. (88:3.421 cc)

(b) Starter.

Manufacturer ..... Prestolite Co.
Model Nos. ..... MBP-40()12-T MBP-4(019-T
Voltage 24

(c) Generator.

Manufacturer..... Delco-Remy Division of General Motors Corp.
Model..... 1105970
Cold output .....18 amps at 28.5 volts at 1, 775 rpm.
Field current at 24 volts.....0.91 to 0.98 amps
Brushes.....
Frame size.....5 /18 in dia (13.0175 cm)
Brush spring tension..... 28 oz (784 grams)
Ground polarity .....Negative

(d) Generator regulator.

Manufacturer.....Cardox
Model..... 559770
Voltage setting ..... 27.5 to 29.5
Current limit 18
Ground polarity .....Negative
Air gap (voltage and current unit) ..... 0.087 in. (.2210 cm)
Air gap (cutout relay)..... 0.048 in. (.1219 cm)

(e) Magneto.

Manufacturer.....Wico Electric Co.
Model..... HS2390
Impulse range .....29°

(f) Carburetor.

Manufacturer..... Zenith Carburetor Division of Bendix Aviation Corp.
Model..... 12288
Type..... Updraft
Barrel size..... 1 in. (2.54 cm)
Flange size ..... 7/8 in. (2.2225 cm)

(g) Fuel pump.

Manufacturer..... Blackstone Mfg. Co.
Model.....LP1043
Type.....Diaphragm

(h) Air cleaner.

Manufacturer..... United Specialties Co.
Model.....T-12B-12 (Engine Spec 142703)
Model..... 12B12 (Engine Spec 326500)
Type.....Oil bath

(i) Oil filter.

Manufacturer..... Fram Corp.
Model.....F3P (Engine Spec 142703)
Model.....F21P (Engine Spec 326500)
Type.....Replacement element

(j) Fuel filter.

Manufacturer..... Tillotson Manufacturing Co.
Model.....OW-480-T (Engine Spec 142703)

(k)Adjustment data.

Spark plug gap .....0.030 in. (.0762 cm)
Valve clearance intake, cold
(Engine Spec 142703) ..... 0.012 in. (.0305 cm)
(Engine Spec 326500..... 0.008 in. (.0203 cm)
Valve clearance exhaust, cold
(engine Spec 142703)..... 0.012 in. (.0305 cm)
(Engine Spec 326500) ..... 0.016 in. (.0406 cm)
Magneto breaker point gap..... 0.015 in. (.0381 cm)

(l) Nut and bolt torque data.

Spark plugs to cylinder head24 to 26 ft-lb (foot-pounds) (3.3192 - 3.5958 kgm)
Manifold.....26 ft-lb (3.5958 kgm)
Cylinder head cap screw ..... 22 to 24 ft-lb (3.0426 - 3.3192 kgm)
Governor and magneto ..... 16 to 18 ft-lb (2.2128 - 2.4894 kgm)

(4) Cylinder filling compressor.

Manufacturer..... Cardox Corp.
Part No ..... 17123 (Ser Nos. L-1475-T through L-1478-T)
Part No ..... 17117 (Ser Nos.L-1666-T through L-1668-T)
Type..... Single stage, single cylinder
Transfer capacity (300 psi (21.09 kg per sq cm) suction pressure) 25 lb liquid C02 per minute (1.7575 kg per sq cm)
Transfer capacity (200 psi (14.06 kg per sq cm) suction pressure)20 lb liquid CO2 per minute (1.406 kg per sq cm)
Discharge pressure .... 1, 200 psi min (minimum) (84.36 kg per sq cm)

(5) Conversion heater.

Manufacturer.....Janitrol Aero Division, Midland Ross Corp.
Model..... B 39 B8 1
Heater output .....90, 000 BTU/(British thermal units) hour.
Fuel consumption..... 0.85 gal per hour (3.23 liters)
Voltage supply .....24 volts dc
Heater fluid ..... MIL-A-11755C arctic anti-freeze
Fuel pressure .....32 psi (2.2496 kg per sq cm)
Spark gap.....0.125 in. (.3175 cm)

(6) Circulating pump (conversion heater).

Manufacturer..... Marine Products Co.
Model ..... 3450 (Ser. Nos. L-1475-T through L-1478-T)
Model ..... 12204 (Ser. Nos. L-1666-T through L-1668-T)
Type .....Centrifugal

(7) Transfer pump.

Manufacturer ..... Smith Precision Products Co.
Model MC-1044H

Type.....Rotary gear
Transfer capacity .....12, 000 lb liquid $C0_2$ (843.6 kg per sq cm) minimum per hour
Discharge pressure (against a head of 50 feet (1500 cm) of liquid CO_2 at OF.) (-18C.) .....300 psi min (21.09 kg per sq cm)

(8) Refrigeration unit.

Manufacturer..... Copeland Refrigeration Corp.
Model (Compressor)..... 83, 000
Model (Condenser)26, 573 (Ser. Nos. L-1475-T through L-1478T)
Model (Condenser)066-0010-00 (Ser. Nos. L-1666-T through L-1668-T)
Model (Receiver).... K1670 (Ser. Nos. L-1475-T through L1478-T)
Model (Receiver577-0004-00 (Ser. Nos. L-1666-T through L-1668T)
Compressor cylinders.....2
Bore and stroke..... 3 ¼ x 3 in. (8.265 - 7.62 cm)
Condenser cooling ..... Cross-finned tube
Receiver capacity (maximum)..... 19.3 lb (1.3568 kg per sq cm)

(9) Compartment heater.

Manufacturer.....Evans Products Co.
Model.....HV220271 (Ser. Nos. L-1475-T through L-1478-T)
Model.....HV220272 (Ser. Nos. L-1666-T through L-1668-T)
Voltage 24
Type.....Hot water

(10) Running gear.

(a) Tandem axle.

Manufacturer..... Shuler Axle Co.
Model T-18C267-C27-CO0A-26 (Ser. Nos. L-1475-T through L-1478-T)
Model.....C27FOA1 (Ser. Nos. L-1666-T through L-1668-T)
Model..... 66580-3 (Ser. Nos. L-1475-T through L-1478-T)
Model..... 65950-8 (Ser. Nos. L-1666-T through L-1668T)
Rating .....18, 000 lbs ea. (8100 kg)
Track..... 70½ in. (179.07 cm)
Wheels.....Budd 66580-3

(b) Brakes.

Manufacturer..... Shuler Axle Co.
Type.....Air actuated

(c) Tires and tubes.

Size ..... 11.00 x 20
Rating ..... 12 ply
Tire inflation .....75 lbs (5.2725 kg per sq cm)

(d) Landing jacks.

Manufacturer.....Austin Trailer Equipment Co.
Model..... JH-3250-1-312 (Ser. Nos. L-1475T through L-1478-T)
Right hand leg... R1568SC (Ser. Nos. L-1666-T through L-1668-T)
Left hand leg ..... R1550SC (Ser. Nos. L-1666-T through L-1668-T)
Model No JH-320-15-312

(11) Electrical. Refer to Figure 1-3, wiring diagram.

1-8. Difference in Models

This manual covers the Cardox Conversion, Storage and Charging Units, Model E-46750, Serial Numbers L-1475-T through L-1478-T, and Serial Numbers L-1666-T through L-1668-T Any physical differences that exist between the units resulting in alternate text coverage are indicated in the text by the applicable serial numbers. The absence of serial numbers in the text means the instructions apply to all units.

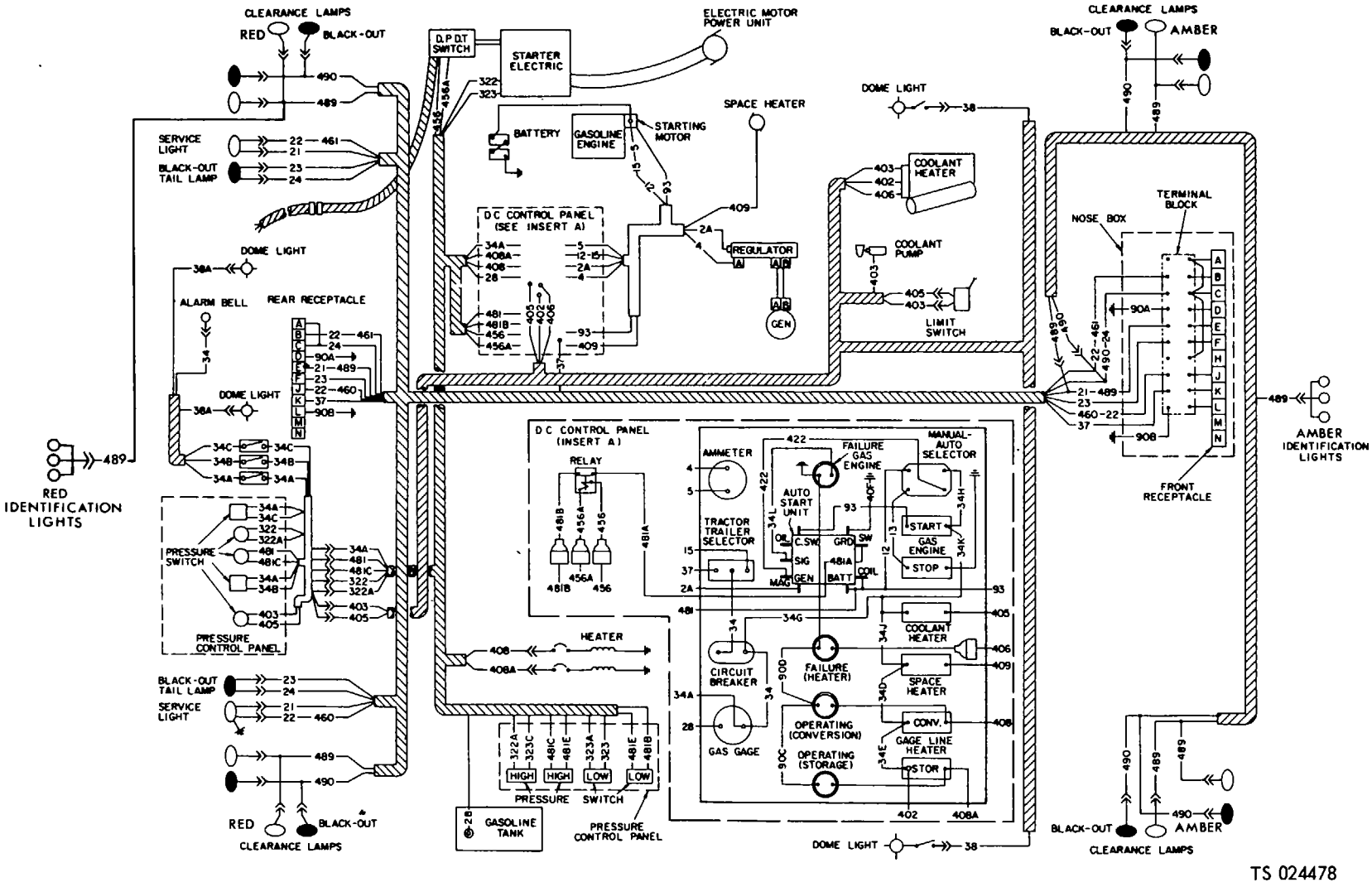


Figure 1-3. Wiring diagram.

CHAPTER 2
OPERATING INSTRUCTIONS

WARNING

If equipment fails to operate, refer to troubleshooting procedures in Chapter 3.

Section I. OPERATING PROCEDURES

2-1. General

This section describes, locates, illustrates, and furnishes the operator/crew sufficient information pertaining to the various controls and instruments provided for the proper operation of the conversion and storage unit.

2-2. Controls And Instruments

a. General. The purpose of controls and instruments and their reading are illustrated in Figures 2-1 to 2-11.

b. Shutter Control. The shutter control (7, fig.2-1) is located above the refrigeration condenser. It is used to ventilate the refrigeration system, allowing a flow of cool air to be drawn through the condenser fins by the fan.

c. Fuel Indicator. The fuel indicator (4, fig. 2-2) is electrically operated. It is mounted on the engine control panel. It shows the amount of gasoline in the fuel tank, and is graduated from empty to full in fourths of the tank capacity.

d. Cylinder Filling Pressure Gage. The cylinder filling pressure gage is located in the power compartment on the cylinder filling manifold, and indicates the pressures at which the cylinder is being filled. The gage registers from 0 to 2, 000 psi (140.6 kg per sq cm) and is graduated in 20 pound (1.406 kg per sq cm) divisions. Normal pressure is 800 psi, (56.24 kg per sq cm) but variance will occur depending on surrounding temperatures.

e. Liquid Level Gages (Pressure Vessels). Each pressure vessel is provided with a liquid level gage (2 and 4, fig. 2-4). The gages are mounted on a panel inside the power compartment. They can be viewed through the window in the rear door. The gages indicate the liquid level in each vessel and are graduated in tenths of the vessel capacity.

f. Vessel Pressure Gages. Each pressure vessel is provided with a pressure gage (1 and 3, fig. 2-4), located on a panel which is viewed through the window in the rear door, which indicates the pressure in each vessel. The gages register from 0 to 600 psi (42.18 kg per sq cm) in division of 20 pounds (1.406 kg per sq cm).

g. Ammeter. The ammeter (1, fig. 2-2) indicates the charging or discharging rate of the battery and is located on the engine control panel. It is graduated in divisions of 5 amperes and registers from 0 to 30 amperes on both charge and discharge sides.

h. Heater Fuel Pressure Gage. The heater fuel pressure gage (19, fig. 2-5) is part of the conversion heater and is located in the storage compartment. It indicates the pressure of the heater fuel supplied by the fuel pump to the combustion chamber. It is graduated in one pound divisions and registers from 0 to 60 psi (4.218 kg per sq cm). Normal fuel pressure is approximately 32 psi (2.2496 kg per sq cm).

i. Sight Glass, Expansion Tank. The sight glass (3, fig. 2-5) is installed on the expansion tank (heater fluid reservoir) is the storage compartment. It shows the level of the heater fluid.

j. Refrigerant Sight Glass. The refrigerant sight glass (1, fig. 2-12) is located in the line above the refrigeration compressor. It indicates the refrigerant flow.

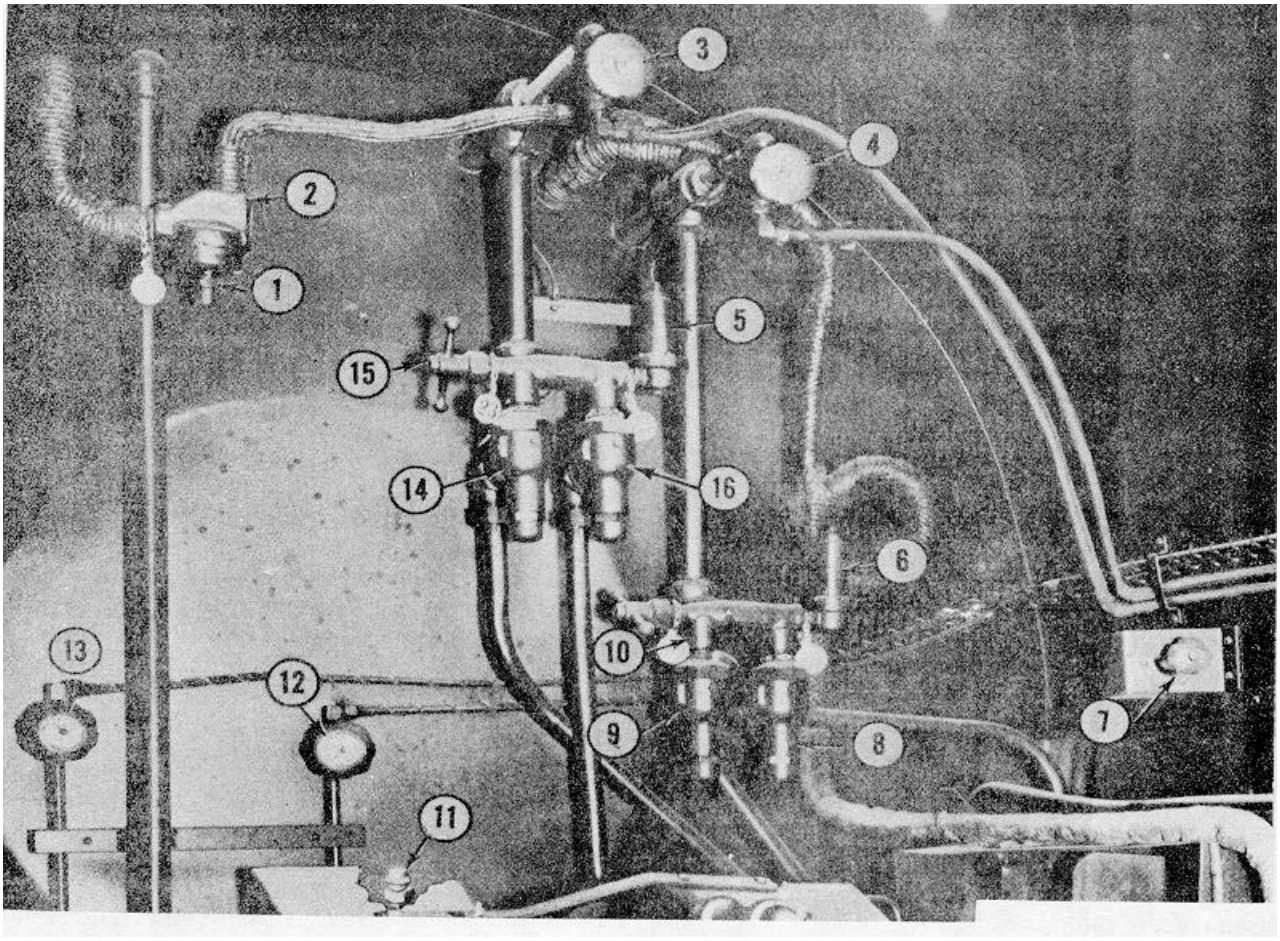
k. Compressor Oil Level Sight Glass. The compressor oil level sight glass (5, fig. 2-12) is located in the crankcase of the compressor. It shows the oil level in the compressor.

l. Manual Control Valves. The control valves are listed and identified in Table 2-1.

m. Light Switches. The dome light switch for the storage compartment light is located on the light. The toggle switch for the power compartment dome lights is located on the gage panel in the power compartment. These switches are single-pole, single-throw switches and are manually operated.

n. Alarm Bell Cutout Switch. The alarm bell cutout switch is mounted on the gage panel. It is a manually operated toggle switch used to cut out the alarm bell.

o. Gage Line Heater Switch. The gage line heater switches (6 and 7, fig. 2-2) used to turn on the gage 2-1



TS 024479

1. Expansion valve adjusting screw
2. Expansion valve
3. low pressure gage line valve, conversion
4. Low pressure gage line valve, storage
5. Bleeder valve for carbon dioxide, conversion
6. Bleeder valve for carbon dioxide, storage
7. Shutter control
8. Relief valve for carbon dioxide, storage
9. Relief valve for carbon dioxide, storage
10. Safety vent switching valve, storage
11. Safety relief valve, transfer pump
12. High pressure gage line valve, conversion
13. High pressure gage line valve, storage
14. Relief valve for carbon dioxide, conversion
15. Safety vent switching valve, conversion
16. Relief valve for carbon dioxide, conversion

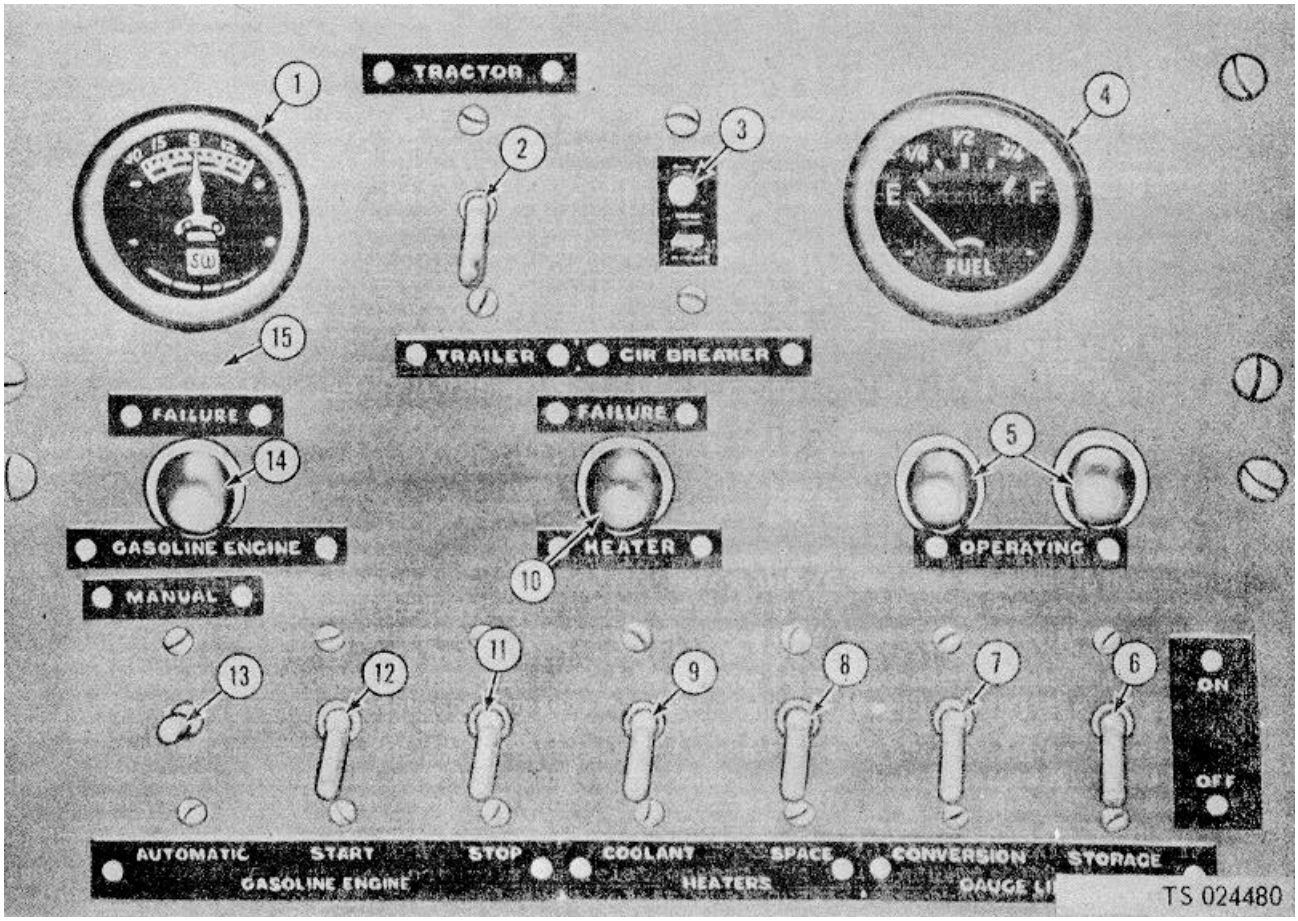
Figure 2-1. Power compartment valves and controls

line heaters in low temperatures to prevent the liquid carbon dioxide in the lines from solidifying, are located on the gasoline engine control panel.

p. Space Heater Switch. The space heater switch (8, fig. 2-2) is located on the engine control panel. It is a manually controlled switch controlling the heating of the power compartment in low temperatures.

q. Conversion Heater Switch. The conversion heater switch (9, fig. 2-2) is located on the engine control panel. It is a manually controlled switch operating the conversion heater.

r. Toggle Switches (Momentary).. These two toggle switches are located on the engine control panel. They are the gasoline engine START and STOP switches (11 and 12, fig. 2-2). They are normally in the OFF position and when moved to the ON position, will spring back to OFF when pressure is released. These switches are used to start and stop the engine when on manual control.



1. Ammeter
2. Electrical control switch (tractor or trailer)
3. Circuit breaker
4. Fuel indicator
5. Gage lines operating lights
6. Storage vessel gage line switch
7. Conversion vessel gage line switch
8. Compartment heater control switch
9. Conversion heater control switch
10. Conversion heater failure light
11. Gasoline engine manual stop switch
12. Gasoline engine manual starter switch
13. Gasoline engine control switch for automatic or manual control
14. Gasoline engine failure light
15. Engine control panel

Figure 2-2. Engine control panel

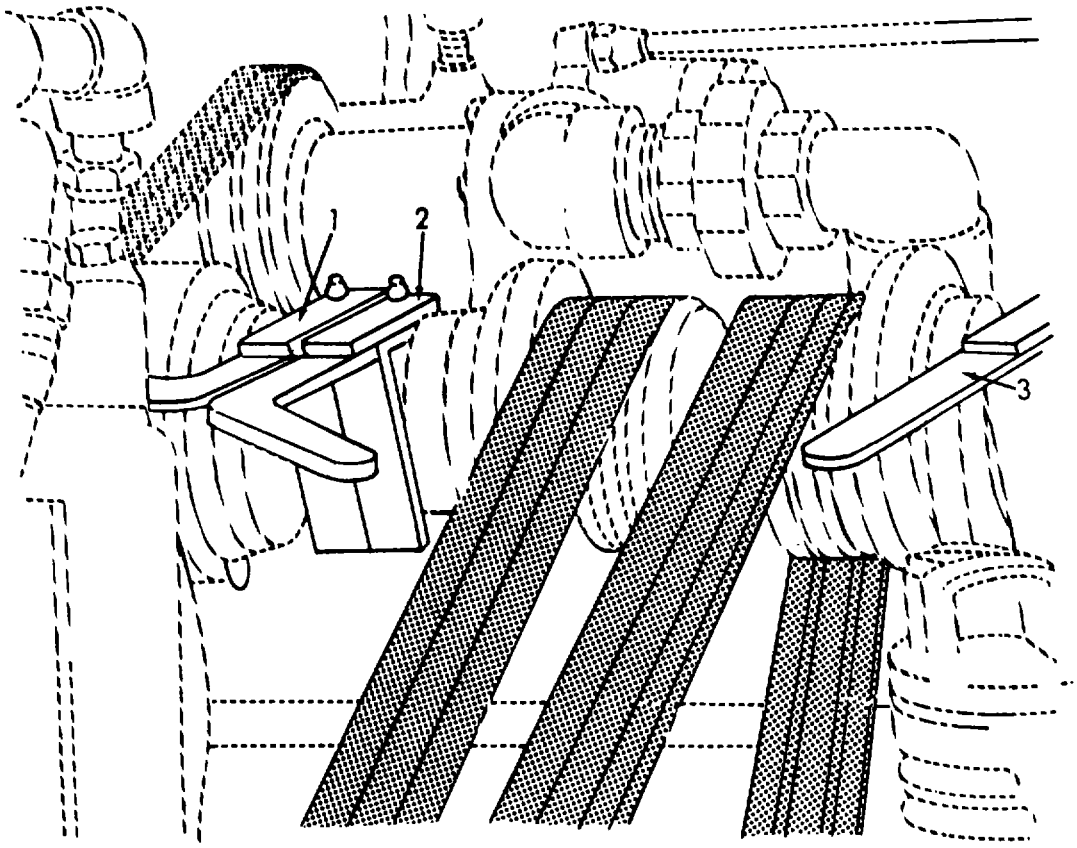
s. Battery Selector Switch. This switch (2, fig. 2-2) is mounted on the engine control panel. It is a single-pole, double-throw switch to supply power to the unit, from either the tractor or the trailer batteries.

t. Gasoline Engine Control Switch. The engine control switch (13, fig. 2-2) is located on the engine control panel. It is a double-pole, double-throw switch to set the engine for either "manual" or "automatic" starting.

u. Carburetor Priming Lever (Serial Nos. L-14 75Tthrough L-1478-T). The carburetor priming lever (27, fig. 2-8) is located in the crankcase of gasoline engine, on the right side at the governor mounting. It primes the carburetor when starting the engine.

v. Electric Motor Starting Switch. The electric motor starting switch (fig. 2-9) is located on the left wall of the power compartment. This switch is used for either manual or automatic starting of the electric motor. A reset button is located below the operating switch, to manually reset the switch should an overload occur.

w. Electric Motor Reversing Switch. The electric motor reversing switch (fig. 2-9) is located on the



1. Transfer pump clutch shifter
2. Cylinder filling compressor clutch shifter
3. Refrigeration compressor clutch shifter

Figure 2-3. Clutch controls, installed views

side of the power compartment. It is a three-pole, double-throw switch controlling the rotation of the electric motor.

x. Conversion Heater Vibrator Switch. The vibrator switch (20, fig. 2-5) is located on the ignition unit of the conversion heater. This switch is safety wired at the factory. The vibrator is wired with two sets of contacts. When the normal set of contacts have failed the wire must be cut to pull the switch out. The vibrator is then operating on the reserve contacts.

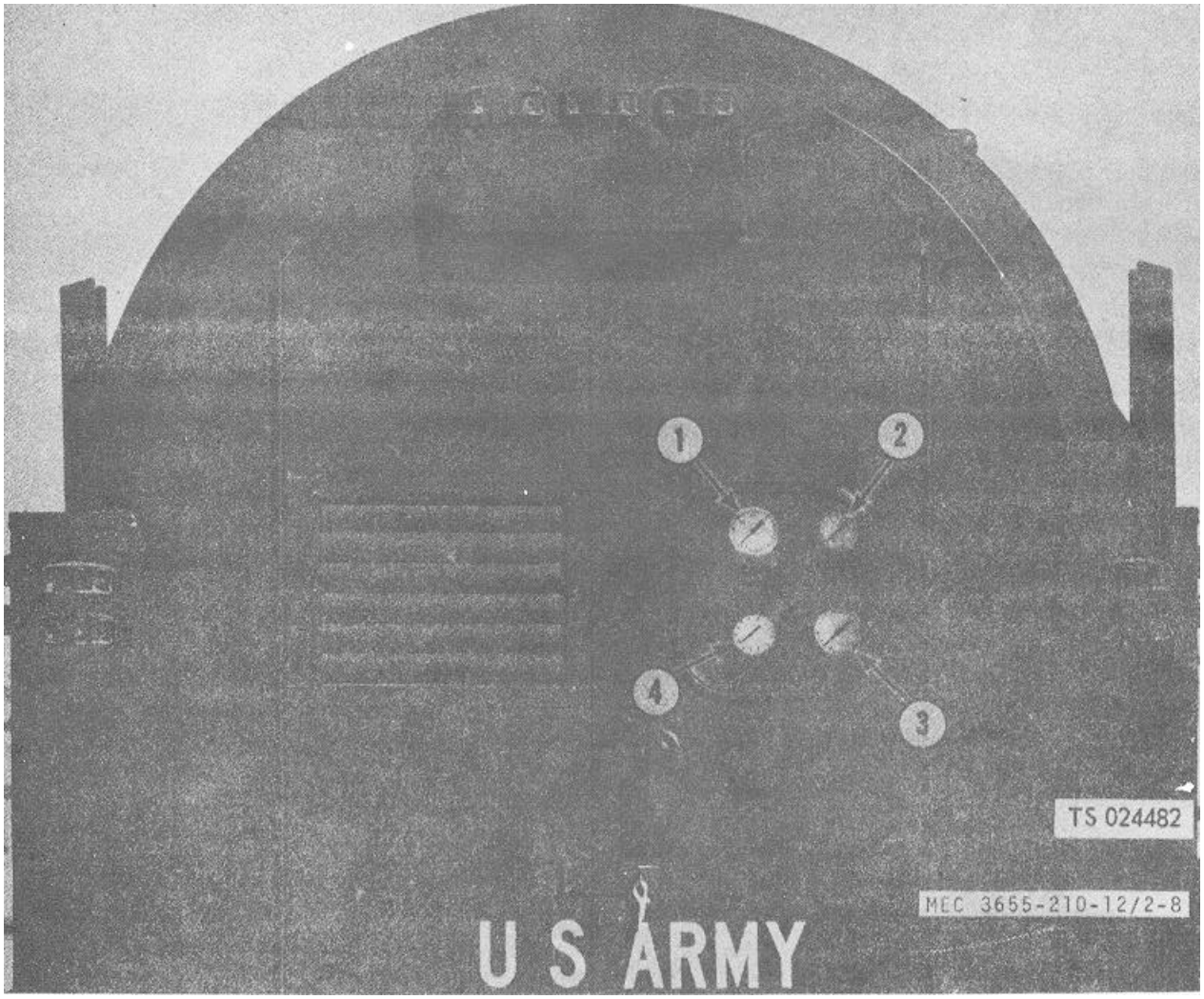
y. Battery Circuit Breaker. The battery circuit breaker (3, fig. 2-2) is mounted on the engine control panel and provides overload protection for voltage sensitive components.

z. Clutch Shifters. The three clutch shifters are mounted on the countershaft in the power compartment. They are manual controls to engage the three clutches which operate the transfer pump (1, fig.2-3), refrigeration compressor (3) and the cylinder filling compressor (2).

aa. Governor Controls. The governor control (24, fig. 2-10) is located on the left side of the gasoline engine. It controls the speed of the gasoline engine.

2-3. Operation Under Usual Conditions

a. General. Instructions in this section are published for the use of the personnel responsible for the operation of the conversion and storage unit.

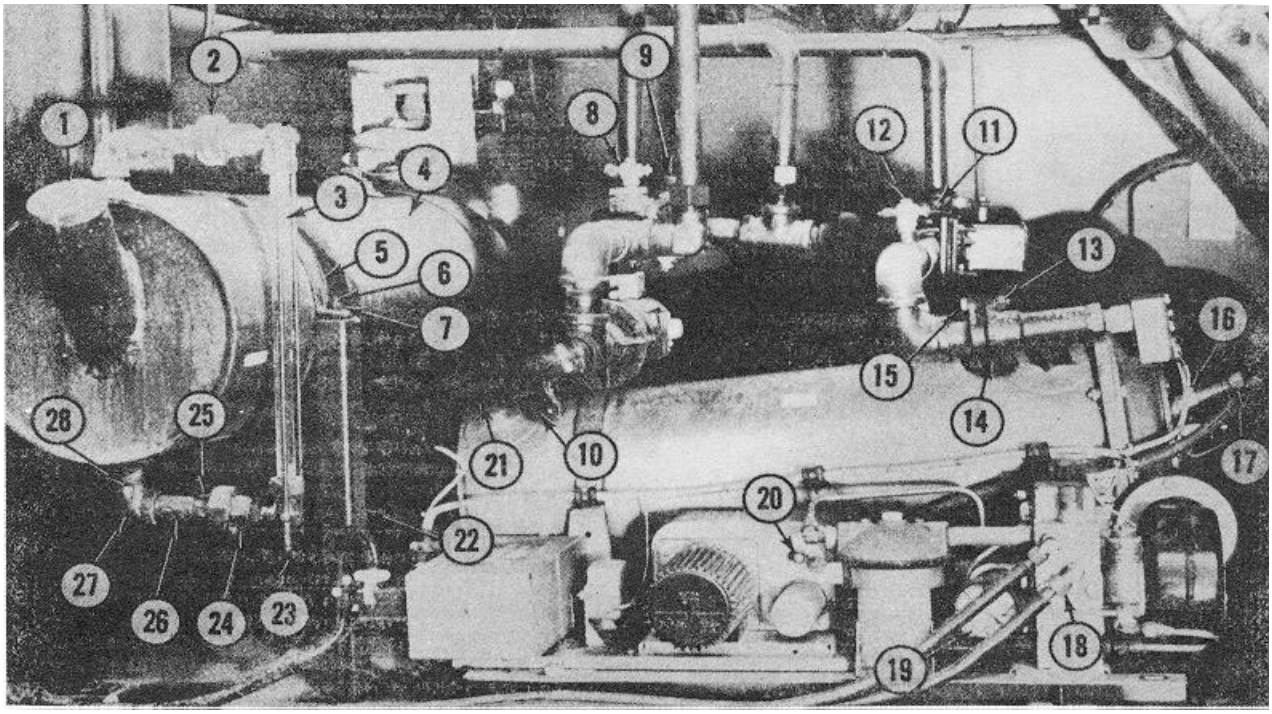


1. Storage tank pressure gage
2. Conversion tank level gage
3. Conversion tank pressure gage
4. Storage tank level gage

Figure 2-4. Liquid level gages, pressure vessels.

b. It is essential that the operator know how to perform every operation of which the conversion and storage unit is capable. This section gives instruction on starting and stopping the unit, and performing the various operations of which it is capable.

c. The unit can be used to fill high pressure cylinders with carbon dioxide, transport liquid and solid carbon dioxide transfer liquid carbon dioxide from the two ton (1.8144 metric tons) pressure vessel to the six ton (5.4431 metric tons) pressure vessel, transfer liquid carbon dioxide from an external source into the six ton (5.4431 metric tons) pressure vessel and into both pressure vessels simultaneously convert solid carbon dioxide (dry ice) in the two ton (1.8144 metric tons) pressure vessel into liquid carbon dioxide, transfer liquid carbon dioxide from the six ton (5.4431 metric tons) pressure vessel or both pressure vessels simultaneously into an external tank or transfer liquid carbon dioxide from one external tank into another external tank.



1. Filler cap
2. Union nut
3. Sight glass
4. Expansion tank
5. Saddle stand clamp
6. Cap screw
7. Nut
8. Anti-freeze bleed-off petcock
9. Compartment heater diversion valve
10. Tube nut
11. Conversion heater diversion valve
12. Anti-freeze bleed-off petcock
13. Nut
14. Gasket
15. Cap screw
16. Spark plug
17. Coupling nut
18. Tube nut
19. Fuel pressure gage
20. Vibrator switch
21. Heater fluid line
22. Saddle stand
23. Drain cock
24. 1/3 union
25. 1/3 union
26. Nipple
27. Elbow
28. Nipple

Figure 2-5. Conversion heater, installed view.

d. Since it is intended that the electric motor be used as the power source whenever electric power is available, circuitry has been installed to prevent the gasoline engine operating if the conversion and storage unit is connected to 208 volt power. Operation of the gasoline engine, under either manual or automatic control, requires that the power cable be disconnected.

e. $C0_2$ gas, when pure, is colorless, odorless, and 1.52 times as heavy as air. It is the by product of the combustion of all materials containing carbon. It can be condensed into a colorless liquid and stored in this state, under pressure, in cylinders. The pressure of the $C0_2$ in the cylinders is relative to the surrounding temperature. Liquid $C0_2$ will return to a gaseous state at a temperature of 87.7F. (31C.). It cannot be a liquid above this temperature, regardless of the pressure that is applied. When CO_2 liquid is allowed to expand rapidly, due to the drop in pressure and temperature, it forms $C0_2$ snow. This snow, when compressed into blocks or cubes, forms dry ice. Dry ice, in solid forms and at atmospheric pressure sublimates, remaining at 110F. (-76C) until it has disappeared. It is excellent for certain refrigeration purposes, because it will neither support combustion nor form explosive mixtures, $C0_2$ is of the chief fire extinguishing agents in use today. It is also used for inflatable equipment and as a propellant or expelling agent. Since $C0_2$ in addition to being heavier than air, is both invisible and odorless, it presents a particular hazard. It will tend to collect in low, unventilated places. The fact is obvious that the more of any gas, poisonous or not, that is present, the less breathable oxygen there will be present. Men going into these conditions or places, or left there run the risk of

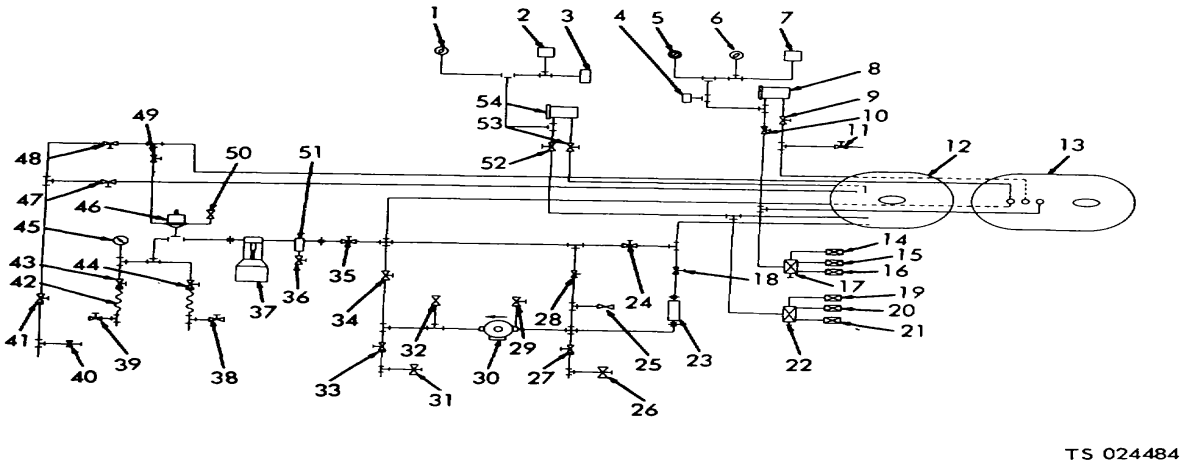
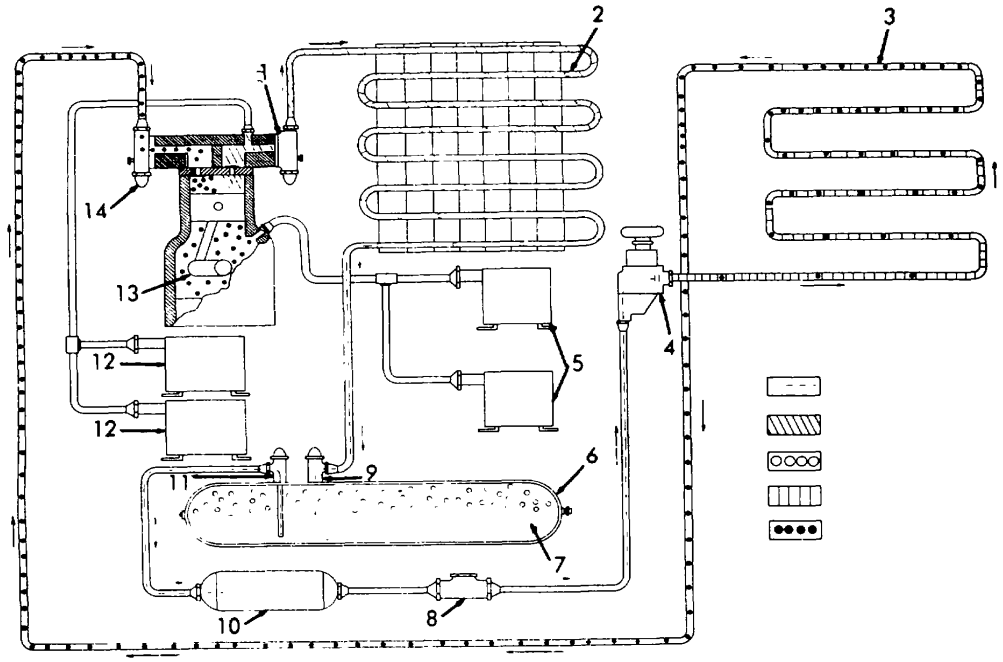


Figure 2-6. Schematic piping diagram.

1. Tank pressure control switch (conversion heater)
2. Alarm pressure switch conversion
3. Pressure gage (conversion)
4. Pressure gage (storage)
5. Tank pressure control switch (gasoline engine)
6. Tank pressure control switch (electric motor)
7. Alarm pressure switch (storage)
8. Liquid level gage (storage)
9. Low pressure gage line valve (storage)
10. High pressure gage line valve (storage)
11. Fire valve
12. Conversion pressure vessel
13. Storage pressure vessel
14. Bleeder valve for C02 (storage)
15. Relief valve for CO (storage)
16. Relief valve for C02 (storage)
17. Safety vent switching valve (storage)
18. Liquid line shut-off valve (conversion)
19. Bleeder valve for C02 (conversion)
20. Relief valve for C02 (conversion)
21. Relief valve for C02 (conversion)
22. Safety vent switching valve (conversion)
23. Dehydrator
24. Liquid equalizing line valve
25. Vapor relief valve (liquid line)
26. Transfer hose bleed-off valve (thru pump)
27. Liquid fill line valve (thru pump)
28. Dehydrator by-pass valve
29. Transfer pump bleed-off valve
30. Transfer pump
31. Transfer hose bleed-off valve (by-pass pump)
32. Safety relief valve (transfer pump discharge)
33. Liquid fill line valve (by-pass pump)
34. Liquid shut-off valve (storage)
35. Liquid shut-off valve to cylinder fill compressor
36. Strainer bleed-off valve
37. Cylinder filling unit
38. Cylinder filling hose bleed-off valve
39. Cylinder filling hose bleed-off valve
40. Transfer hose bleed-off valve (vapor)
41. Vapor equalizing line valve
42. Cylinder filling hose
43. Cylinder filling valve
44. Cylinder filling valve
45. Cylinder filling pressure gage
46. Pressure regulating valve (cylinder fill)
47. Vapor return valve (conversion)
48. Vapor return valve (storage)
49. High pressure vapor return valve
50. Safety relief valve cylinder fill
51. Strainer
52. High pressure gage line valve (conversion)
53. Low pressure gage line valve (conversion)
54. Liquid level gage conversion



1. Discharge service valve
2. Condenser
3. Evaporator coil
4. Expansion valve
5. Suction pressure switch (gas and electric)
6. Receiver
7. Refrigerant
8. Sight glass
9. Receiver inlet valve
10. Dehydrator
11. Receiver liquid outlet valve
12. Discharge pressure switch (gas and electric)
13. Compressor
14. Suction service valve

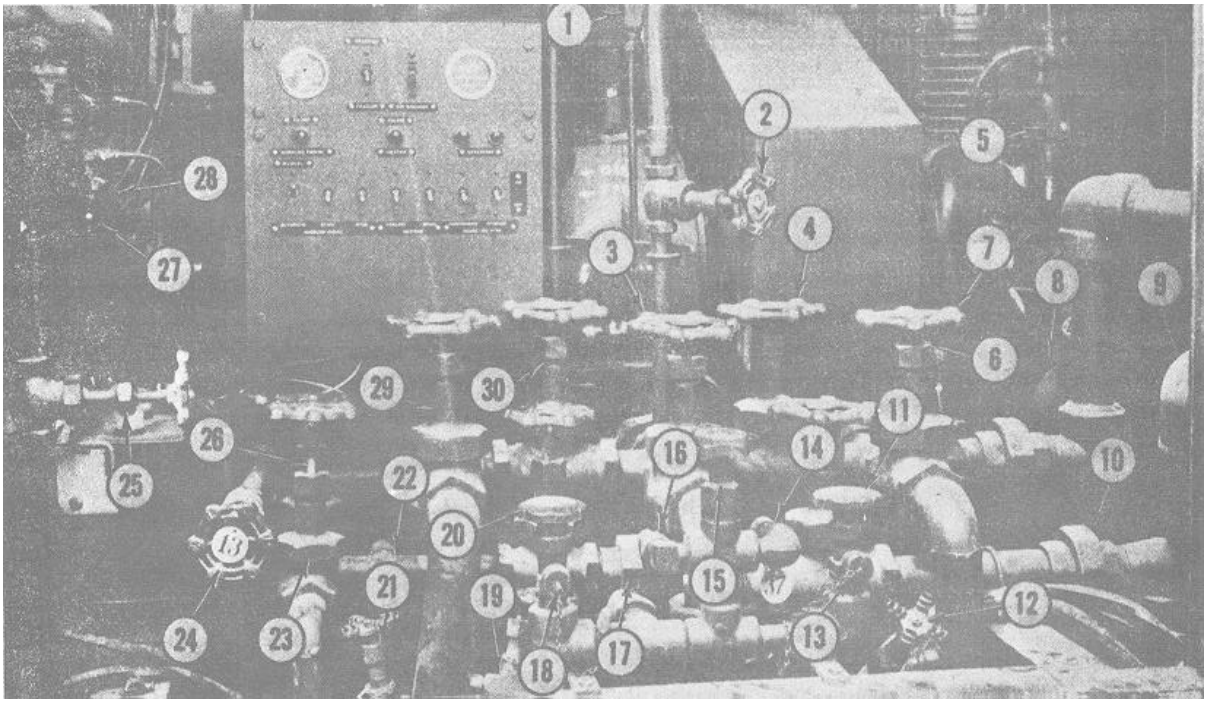
Figure 2-7. Refrigeration flow diagram.

smothering to death. Small percentages of C02 will cause tiredness and perhaps headaches. Three percent in the air doubles breathing efforts, and five percent causes panting. Eight percent will cause marked distress and ten percent causes unconsciousness very quickly.

2-4. Electric Motor Operation

a. Automatic Operation. Make certain the motor starting switch and the reversing switch are in the OFF position; and the power line is connected to the trailer 208 VAC-power receptacle (1, fig. 2-11). Disengage the three countershaft clutches (1, 2, and 9, fig. 2-3). Turn the motor starting switch (fig. 2-9) to the HAND position.

Turn the reversing switch to one of the ON positions only long enough to observe the rotation of the shaft. The shaft should rotate counterclockwise when viewed from the shaft end of the motor. If the shaft rotates in the proper direction, turn the motor starting switch to the AUTOMATIC position, and return the reversing switch to the same ON position. If the shaft rotates in the wrong direction, turn the motor starting switch to the alternate ON position. The position of the reversing switch must not be changed unless a power source of different phase sequence is used. With the above steps performed, the electric motor will start whenever the high tank pressures close the tank pressure switch, which controls the electric motor.



1. Strainer bleed-off valve
2. Cylinder filling compressor liquid shut-off valve
3. Liquid equalizing line valve
4. Dehydrator by-pass valve
5. Refrigeration suction valve
6. Transfer pump bleed-off valve
7. Liquid fill line valve thru pump
8. Receiver tank inlet line
9. Dehydrator
10. Union nut
11. Liquid line shut-off valve, conversion
12. Transfer hose bleed-off valve (thru pump),
13. Cylinder filling valve
14. Tube nut
15. Cylinder fill pressure regulating valve
16. Safety relief valve cylinder fill
17. Union nut
18. Cylinder filling valve
19. Transfer hose bleed-off valve
20. Vapor return valve, conversion
21. Transfer hose bleed-off valve vapor
22. Liquid line vapor relief valve
23. Vapor equalizing line valve
24. High pressure vapor return valve
25. Fire protection valve
26. Vapor return valve, storage
27. Carburetor priming lever (ser. Nos. L-1475-T through L-1478-T)
28. Stop pin (ser. Nos. L-1475-T through L-1478-T)
29. Liquid fill line valve, by-pass pump
30. Liquid shut-off valve to cylinder filling compressor

Figure 2-8. CO, manifolds, installed view;.

b. Manual Operation. Make certain the motor starting switch (fig. 2-9) and the reversing switch are in the OFF position; and the power line connected to the trailer. Disengage all countershaft shifters (1, 3 and 3, fig. 2-3). Turn the motor starting switch (fig. 2-9) to the HAND position. Turn the reversing switch to one of the ON positions only long enough to observe the rotation of electric motor shaft. The shaft should turn counterclockwise when viewed from the shaft end of the motor. If the shaft rotates in the proper direction, return the motor starting switch to the OFF position, turn the reversing switch to the proper ON position. The electric motor can now be manually operated when the motor starting switch is turned to the HAND position. To stop the electric motor, throw the motor starting switch and the reversing switch to the OFF position.

2-5. Gasoline Engine Operation

a. Automatic Operation. The tractor-trailer toggle switch (2, fig. 2-2) is located on the engine control panel. It should be in the trailer position. The circuit breaker (3), mounted on the control panel should be ON or in the up position. On serial number units L-1475-T through L-1478-T, prime the engine

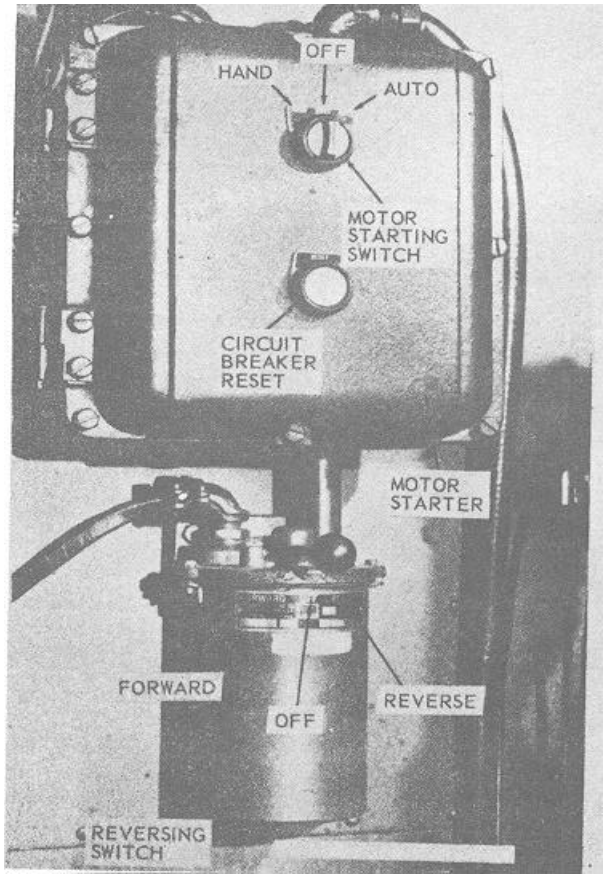


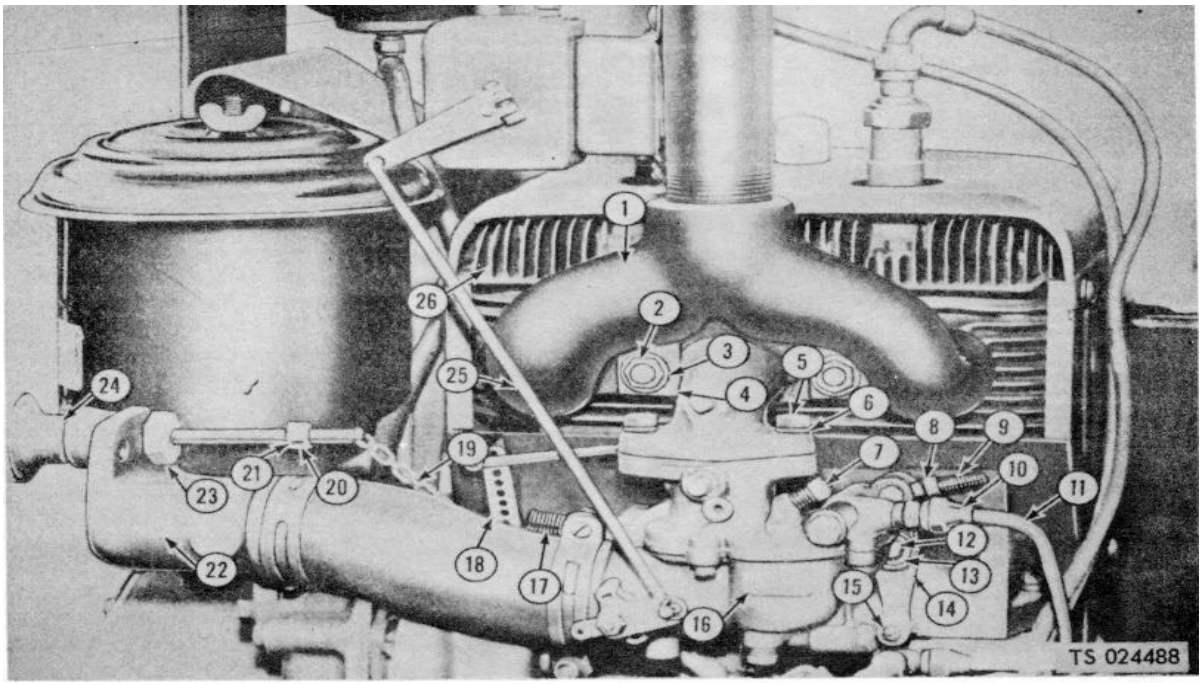
Figure 2-9. Electric motor starter and reversing switch

carburetor by working the priming lever (27, fig. 2-8) up and down until the carburetor is full. This is indicated by a reduction of pressure on the priming lever. It takes approximately 24 strokes to fill the carburetor. Close the manual-automatic toggle switch (13, fig. 2-2) on the engine control panel to the AUTOMATIC position. The gasoline engine will now start when high tank pressures close the circuit to the tank pressure switch.

b. Manual Operation. The tractor-trailer toggle switch (2) on the engine panel should be in the trailer position. The circuit breaker (3), mounted on the engine control panel should be ON or in the up position. On serial number units L-1475-T through L-1478-T, prime the carburetor (a. above). Hold the gasoline engine START switch (12) mounted on the engine control panel up, until the engine starts, then release the switch. To stop the engine hold the engine STOP switch (11) up until the engine is completely stopped.

Table 2-1. Valves

Tag No.	Description
1	Liquid fill line (storage compartment, thru pump)
2	Liquid shut-off (storage)
3	Liquid fill line (by-pass pump)
4	Liquid line shut-off (conversion)
5	Liquid equalizing line
6	Dehydrator by-pass
7	Vapor equalizing line
8	Vapor return (conversion)
9	Vapor return (storage)
10	Transfer pump bleed-off
11	Low pressure gage line (conversion)
12	Liquid shut-off to cylinder fill compressor
13	High pressure vapor return
14	Pressure regulating valve
15	Strainer bleed-off
16	Cylinder valve
17	Cylinder fill hose bleed-off
18	Cylinder valve
19	Cylinder fill hose bleed-off
18	Cylinder valve
19	Cylinder fill hose bleed-off
20	Low pressure gage line (storage)
21	High pressure gage line (conversion)
22	High pressure gage line (storage)
23	Safety vent switching valve (conversion)
24	Safety vent switching valve (storage)
25	Fire valve
26	Transfer hose bleed-off (by-pass pump)
27	Transfer hose bleed-off (thru pump)
28	Transfer hose bleed-off (vapor)
29	Relief valve--3/4 male (1.905 cm)-341 psi (23.9723 kg per sq cm) (storage)
30	Relief valve-3/4 male (1.905 cm)-341 psi (23.9723kg per sq cm) (storage)
31	Relief valve--3/4 male (1.905 cm)-341 psi (23.9723 kg per sq cm) (conversion)
32	Relief valve-3/4 male (1.905 cm)-341 psi (23.9723 kg per sq cm) (conversion)
33	Bleeder valve-3/8 female (.9525 cm)-330 psi (23.199 kg per sq cm) (conversion)
34	Bleeder valve-3/8 female (.9525 cm)-330 psi (23.199 kg per sq cm) (conversion)
35	Vapor line relief
36	Safety relief (pop type) 375 psi (26.3625 kg per sq cm) (transfer pump discharge)
37	Safety relief disc-1500 psi (105.45 kg per sq cm)
38	3 way valve (conversion heater coil)
39	3 way valve (compartment heater)
40	Expansion valve, refrigeration system
41	Air tank bleed-off (brakes)
42	Heater fluid pump bleed-off (outlet)
43	Refrigerator compressor suction valve
44	Refrigerator compressor discharge valve
45	Receiver tank shut-off (outlet)
46	Receiver tank shut-off (inlet)
47	Heater fluid pump bleed-off (inlet)



1 Exhaust manifold
2 Nut
3 Lockwasher
4 Saddle washer
5 Capscrew
6 Lockwasher
7 Adjusting needle screw
8 Adjusting nut
9 Governor control rod
10 Tube nut
11 Fuel tube
12 Support pin
13 Cotter pin
14 Governor control lever
15 Screw ser. nos, L1475-T through L-1478-T)
15 Screw (ser. nos, L-1666-T through L-1668-T)
16 Carburetor
17 Spring
18 Cross shaft lever
19 Chain
20 Setscrew
21 Stop collar
22 Air cleaner mounting bracket
23 Locknut
24 Governor control
25 Choke rod
26 Cylinder block

Figure 2-10. Governor controls, installed view

2-6. Normal Conversion Operation

Perform the following steps when converting solid carbon dioxide in the conversion pressure vessel into liquid carbon dioxide. If the storage pressure vessel contains liquid, set the refrigeration controls for automatic operation, and engage the refrigeration clutch (9, fig. 2-3). If the storage pressure vessel is empty, refrigeration is not required.

a. Position the valves as indicated in Figure 2-13. Refer to Table 2-1 for valve identification.

b. When the pressure in the conversion pressure vessel is 0 psi, close valve 8.

c. Open the manway on the conversion pressure vessel.

(1) Unlatch the four locks (4, fig. 2-14) securing the hatch cover (1) to the platform (3).

(2) Lift up the hatch and pull out the block of insulation (2).

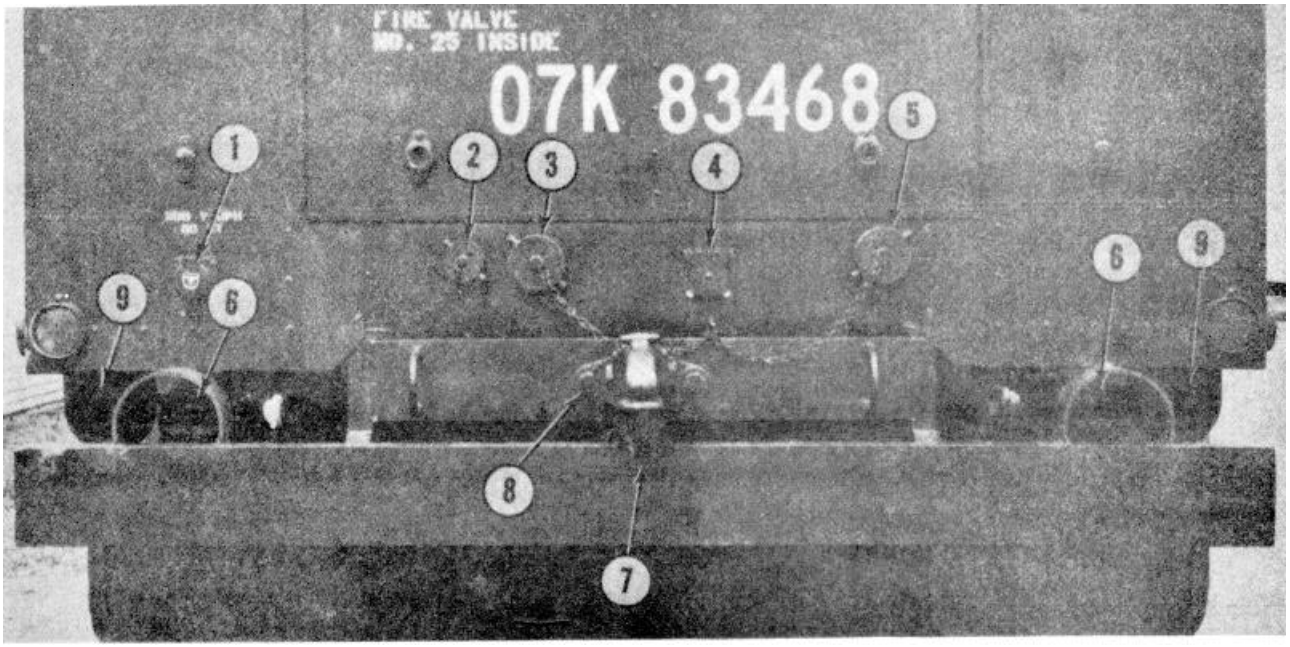
(3) Hold the cover and loosen the two nuts (3, fig. 2-15), flatwashers (4), two clamps (5), and the two bolts (6) securing the cover (1).

(4) Tilt the cover sideways, and pull the cover and the gasket (2) away from the vessel.

d. Inspect the threads and report any damage to proper authority. Inspect and replace a damaged gasket.

e. Pack the vessel with approximately 4,000 pounds (1800 kg) of solid carbon dioxide.

f. Reseal the manway by:



1. 208 v, ac power receptacle
2. Vapor equalizing line
3. Liquid fill line (pump by-pass)
4. 24 v, de receptacle
5. Liquid fill line
6. Blackout stop and taillight
7. Pintle hook
8. Capscrew
9. Stop and taillight, service

Figure 2-11 . Power receptacles, installed view.

(1) Install the gasket (2, fig. 2-15) on the cover (1).

(2) Position the cover in the vessel.

(3) Position the bolts (6), clamps (5), flatwashers (4), and secure with the nuts (3).

(4) Replace the block of insulation (2, fig. 2-14).

(5) Lower the hatch (1), and secure with locks (4).

g. Turn on the conversion heater switch (9, fig. 2-2), mounted on the direct current control panel to start the conversion heater.

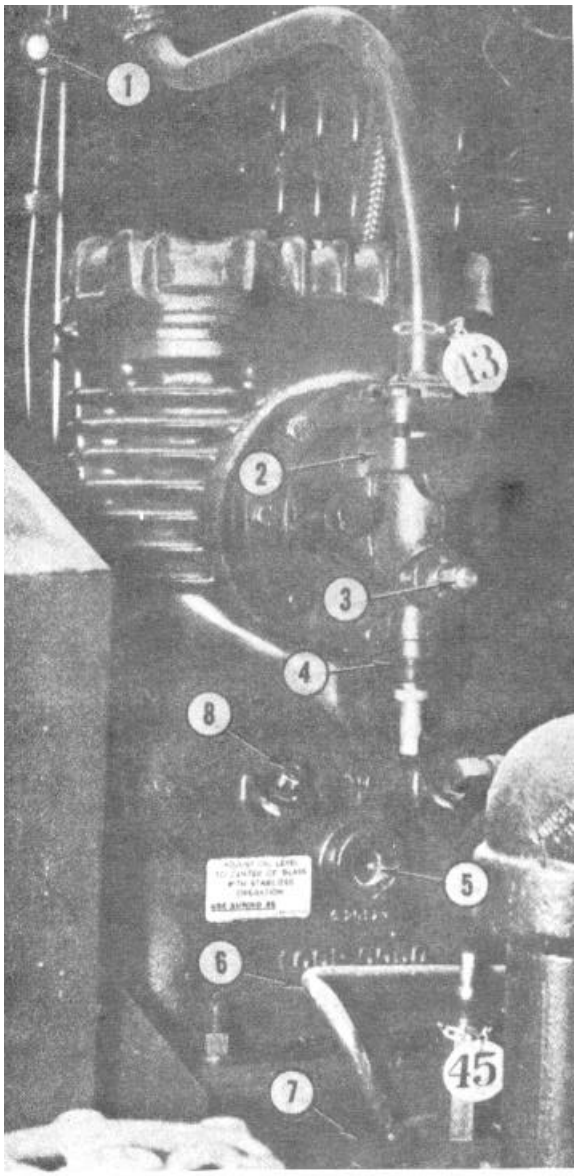
h. The conversion heater will cycle on and off during the initial stages of conversion. This will occur since the heater fluid circulating through the coil is not sufficiently cooled by the carbon dioxide, and causes the heater thermostat switch to open and close. The heater will continue to operate until the temperature of the heating fluid, returning to the heater, reaches 73.9C. (165F.). The heater will remain off until the fluid temperature reduces to 65.6C. (150F.). The conversion cycle will continue until the pressure in the conversion pressure vessel reaches 275 psi (19.3325 kg per sq cm). At this pressure, the tank pressure control switch will open the circuit, to stop the heater. During the use of the conversion vessel the hatch cover should be periodically leak tested by applying a solution of soap and water to the hatch seal. Bubbles will indicate a leak.

i. After conversion is completed, turn off the conversion heater control switch (9, fig. 2-2) and if the liquid is to be transferred to the storage pressure vessel, transfer as follows: (1) Set the driving unit for manual operation by placing toggle switch (2, fig. 2-2) in the trailer position. The circuit breaker (3), mounted on the engine control panel should be ON or in the up position. Prime the carburetor. Hold the gasoline engine START switch (12) mounted on the engine control panel up, until the engine starts, then release the switch. To stop the engine hold the engine STOP switch (11) up until the engine is completely stopped. Disengage all clutches (1, 2, and 3, fig. 2-3).

(2) Set the valves as indicated in figure 2-16 and start the driving unit. Refer to Table 2-1 for valve identification.

(3) Close valves 1, 3, 5 and 10 (fig. 2-16). Open valve 4. Open valves 2 and 10. When liquid carbon dioxide appears at valve 10, close the valve and engage the clutch to the transfer pump.

(4) Continue to operate the transfer pump until the conversion pressure vessel is empty, as indicated by the liquid level gage (2, fig. 2-4).



1. Refrigerant sight glass
2. Suction valve
3. Freon charging port
4. Suction valve shut-off
5. Oil level sight glass
6. Receiver tank inlet line
7. Receiver
8. Oil filler plug

Figure 2-12. Refrigeration compressor, installed view.

(5) Disengage the transfer pump clutch and close valves 2 and 9.

(6) Set the unit for automatic operation, and engage only the refrigeration clutch (3, fig. 2-3).
With all the liquid contained in the storage pressure vessel, the valves should be in the normal position as indicated in figure 2-13.

(7) If liquid was contained in the storage pressure vessel during conversion, close valve 7 (fig. 2-13) and then open valves 5, 8 and 9 to provide refrigeration for the contents of both pressure vessels, and to equalize the liquid levels and pressures.

2-7. Reduced Conversion Cycle

a. This operation can be performed only when liquid carbon dioxide is present in the storage pressure vessel. Perform the following steps when converting solid carbon dioxide into the conversion pressure vessel. The refrigeration controls should be set for automatic operation as follows: Make certain the motor starting switch and the reversing switch are in the OFF position; and the power line is connected to the trailer 208 VAC power receptacle (1, fig. 2-11). Disengage the three countershaft clutches (1, 2, and 3, fig. 2-3). Turn the motor' starting switch (fig. 2-9) to the HAND position. Turn the reversing switch to one of the ON positions only long enough to observe the rotation of the shaft. The shaft should rotate counterclockwise when viewed from the shaft end of the motor. If the shaft rotates in the proper direction, turn the motor starting switch to the AUTOMATIC position, and return the reversing switch to the same ON position. If the shaft rotates in the wrong direction, turn the motor starting switch to the alternate ON position. The position of the reversing switch must not be changed unless a power source of different phase sequence is used. With the above steps performed, the electric motor will start whenever the high tank pressures close the tank pressure switch, which controls the electric motor. The refrigeration clutch (3, fig. 2-3) engaged.

b. Position the valves as indicated in figure 2-17. Refer to Table 2-1 for valve identification.

c. When the pressure in the conversion pressure vessel is 0 psi, close valve 8. Open the manway on the conversion pressure vessel and pack the vessel with approximately 4,000 pounds (1800 kg) of solid carbon dioxide. Reseal the manway as follows:

(1) Install the gasket (2, fig. 2-15) on the cover (1).

(2) Position the cover in the vessel.

(3) Position the bolts (6), clamps (5), flatwashers (4), and secure with the nuts (3).

(4) Replace the block of insulation (2, fig. 2-14).

(5) Lower the hatch (1), and secure with locks (4).

d. Turn on the switch, (9, fig. 2-2), mounted on the dc control panel, to start the conversion heater.

e. To reduce the conversion cycle time, close valve 7 (fig. 2-17) and then open valves 8 and 9. Keep the valves in this position until the conversion pressure vessel pressure increases to 60 psi (4.218 kg per sq cm), or the storage pressure vessel pressure reduces to 150 psi (10.545 kg per sq cm). When either of these

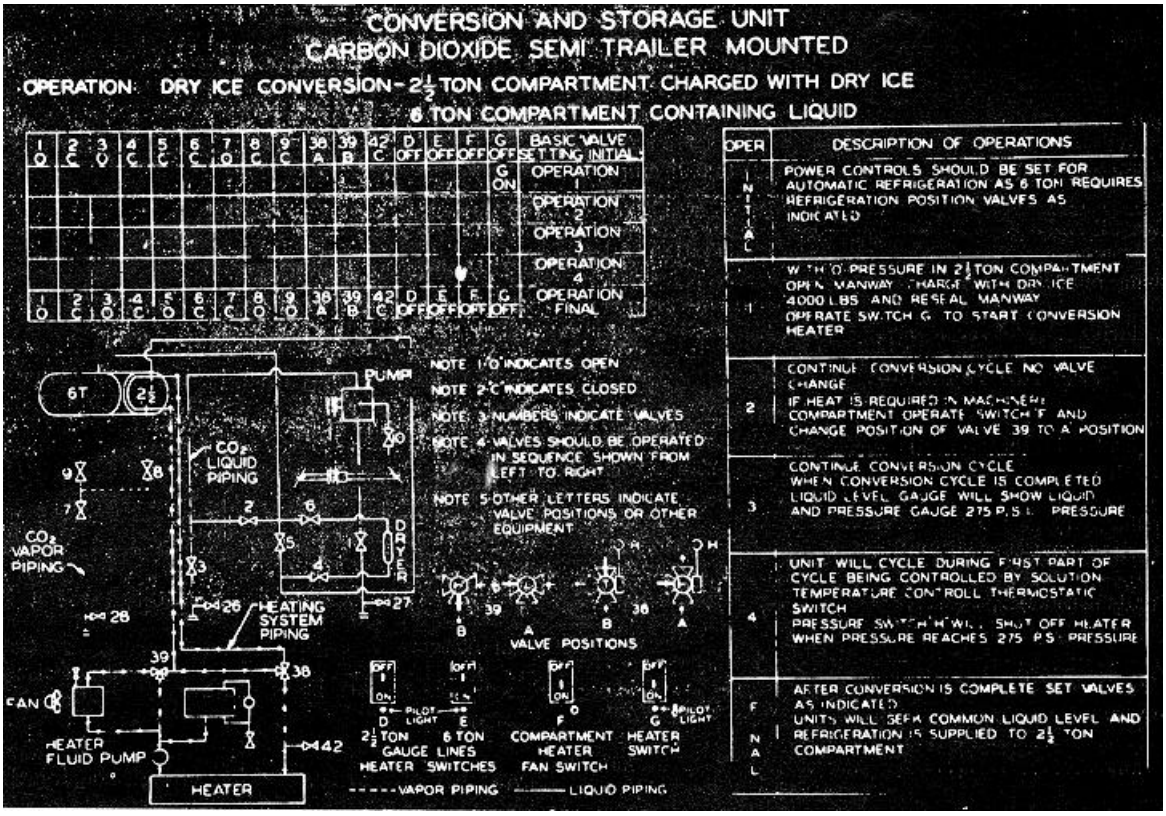
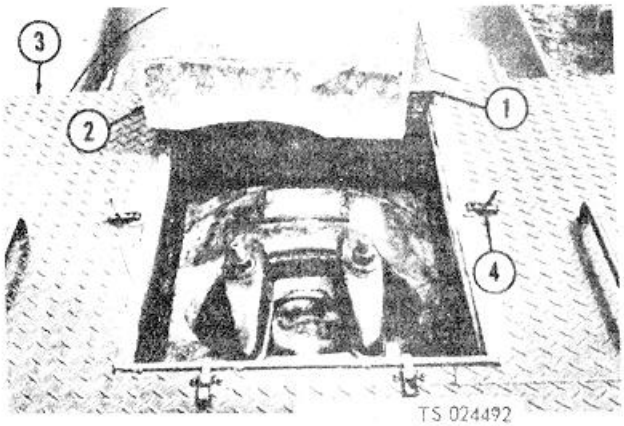
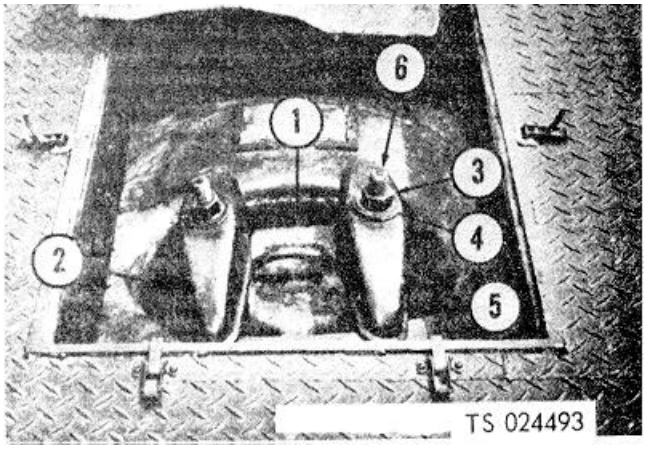


Figure 2-13 . Normal conversion operation .



1. Hatch cover
2. Insulation block
3. Platform
4. Locks

Figure 2-14 . Manway access .



1. Cover
2. Gasket
3. Nut
4. Washer, flat
5. Clamp
6. Bolt

Figure 2-15. Manway cover

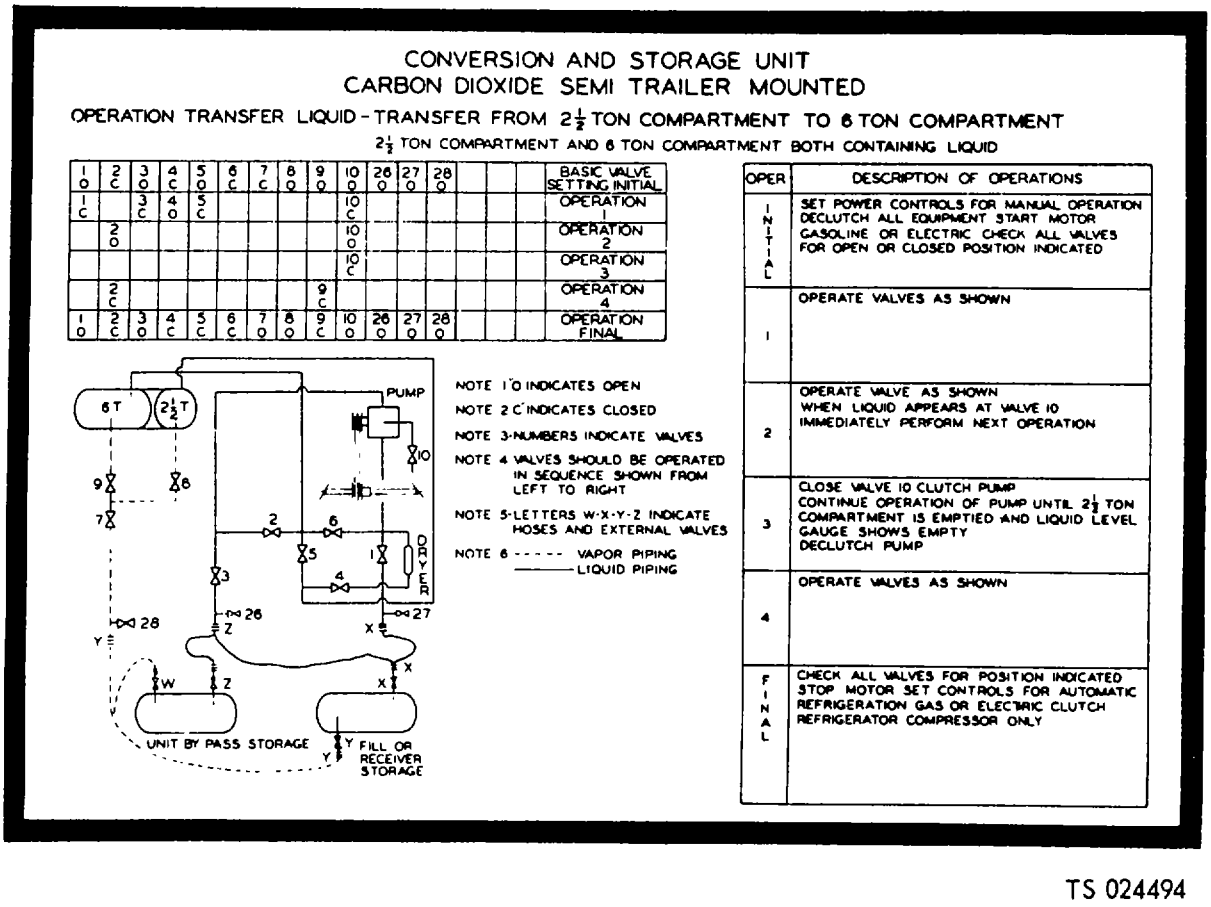


Figure 2-16. Transfer of liquid from the conversion pressure vessel to the storage pressure vessel.

values are indicated, close valves 8 and 9, and then open valve 7. This will allow liquid carbon dioxide to cover the heater coils at the bottom of the conversion pressure vessel, and prevent the heater thermostat switch from opening as often as in a normal conversion operation.

f. The conversion heater will cycle on and off during the initial stages of conversion. This will occur since the heater fluid circulating through the coil is not sufficiently cooled by the carbon dioxide, and causes the heater thermostat switch to open and close. The heater will continue to operate until the temperature of the heating fluid, returning to the heater, reaches 73.9C. (165F.). The heater will remain off until the fluid temperature reduces to 65.6C. (150F.). The conversion cycle will continue until the pressure in the conversion pressure vessel reaches 275 psi (19.3325 kg per sq cm). At this pressure, the tank pressure control switch will open the circuit, to stop the heater.

g. After conversion is complete, turn off the conversion heater switch (9, fig. 2-2) and if the liquid is to be transferred to the storage pressure vessel, transfer as follows:

(1) Set the driving unit for manual operation and disengage all clutches (1, 2, and 3, fig. 2-3).

(2) Set the valves as indicated in Figure 2-16 and start the driving unit. Refer to Table 2-1 for valve identification.

(3) Close valves 1, 3, 5, and 10 (fig. 2-16). Open valve 4. Open valves 2 and 10. When liquid carbon dioxide appears at valve 10, close the valve and engage the clutch to the transfer pump.

(4) Continue to operate the transfer pump until the conversion pressure vessel is empty, as indicated by the liquid level gage (6, fig. 2-4).

(5) Disengage the transfer pump clutch and close valves 2 and 9.

(6) Set the unit for automatic operation, and engage only the refrigeration clutch (3, fig. 2-3). With all the liquid contained in the storage pressure vessel, the valve should be in the normal position as indicated in Figure 2-13. If the liquid level and pressure is to be equalized in both tanks, close valve 7 and then open valves 5, 8 and 9. This will provide refrigeration for the contents of both pressure vessels.

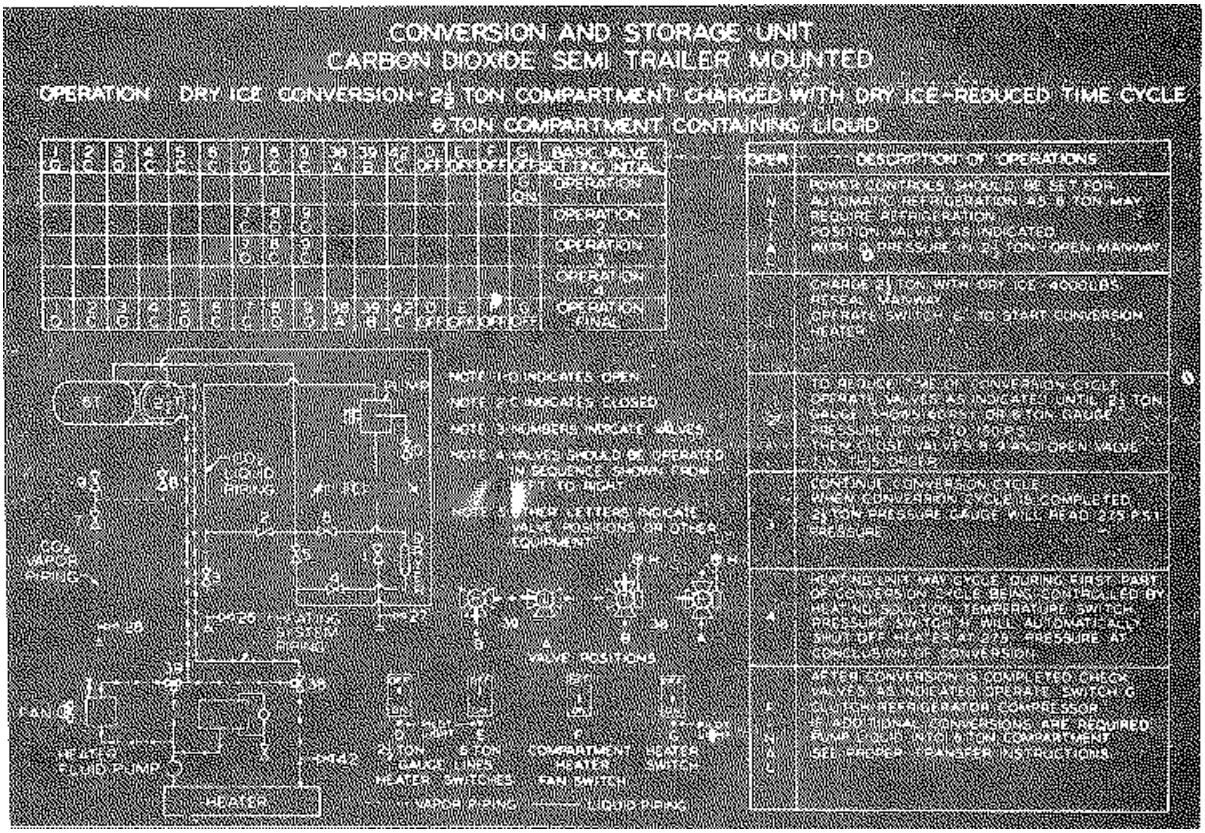


Figure 2-17 . Reduced conversion cycle .

2-8. Transfer of Liquid from the Conversion Pressure Vessel to the Storage Pressure Vessel

a. Set the driving unit for manual operation as follows: Make certain the motor starting switch (fig. 2-9) and the reversing switch are in the OFF position; and the power line connected to the trailer. Disengage all countershaft shifters (1, 2, and 3, fig. 2-3). Turn the motor starting switch (fig. 2-9) to the HAND position. Turn the reversing switch to one of the ON positions only long enough to observe the rotation of electric motor shaft. The shaft should turn counterclockwise when viewed from the shaft end of the motor. If the shaft rotates in the proper direction, return the motor starting switch to the OFF position, turn the reversing switch to the proper ON position. The electric motor can now be manually operated when the motor starting switch is turned to the HAND position. To stop the electric motor, throw the motor starting switch and the reversing switch to the OFF position. Then' disengage all clutches (1, 2, and 3, fig. 2-3).

b. Set the valves as indicated in Figure 2-16 and start the driving unit. Refer to Table 2-1 for valve identification.

c. Close valves 1, 3, 5, and 10 (fig. 2-16). Open valve 4. Open valves 2 and 10. When liquid carbon dioxide appears at valve 10, close the valve and engage the clutch to the transfer pump.

d. Continue to operate the transfer pump until the conversion pressure vessel is empty, as indicated by the liquid level gage (2, fig. 2-4).

e. Disengage the transfer pump clutch and close valves 2 and 10.

f. Set the unit for automatic operation, and engage only the refrigeration clutch (3, fig. 2-3). With all the liquid contained in the storage pressure vessel, the valves should be in the normal position as indicated in Figure 2-13.

2-9. Filling Both Pressure Vessels With Liquid Carbon Dioxide

a. Set the driving unit for manual operation and disengage all clutches as follows: The tractor-trailer

toggle switch (2, fig. 2-2) on the engine panel should be in the trailer position. The circuit breaker (3), mounted on the engine control panel should be ON or in the up position. Prime the carburetor. Hold the gasoline engine START switch (12) mounted on the engine control panel up, until the engine starts,; then release the switch. To stop the engine hold the engine STOP switch (11) up until the engine is completely stopped.

b. Set the valves as indicated in Figure 2-13 and start the driving unit. Refer to Table 2-1 for valve identification.

c. Remove the caps and connect the liquid and vapor transfer hoses (5 and 10, fig. 2-18) or (5 and 10, fig. 2-19) (stored in the storage compartment) to the liquid fill line (5, fig. 2-11) and vapor equalizing line (2) at the rear of the trailer, and to the liquid supply unit.

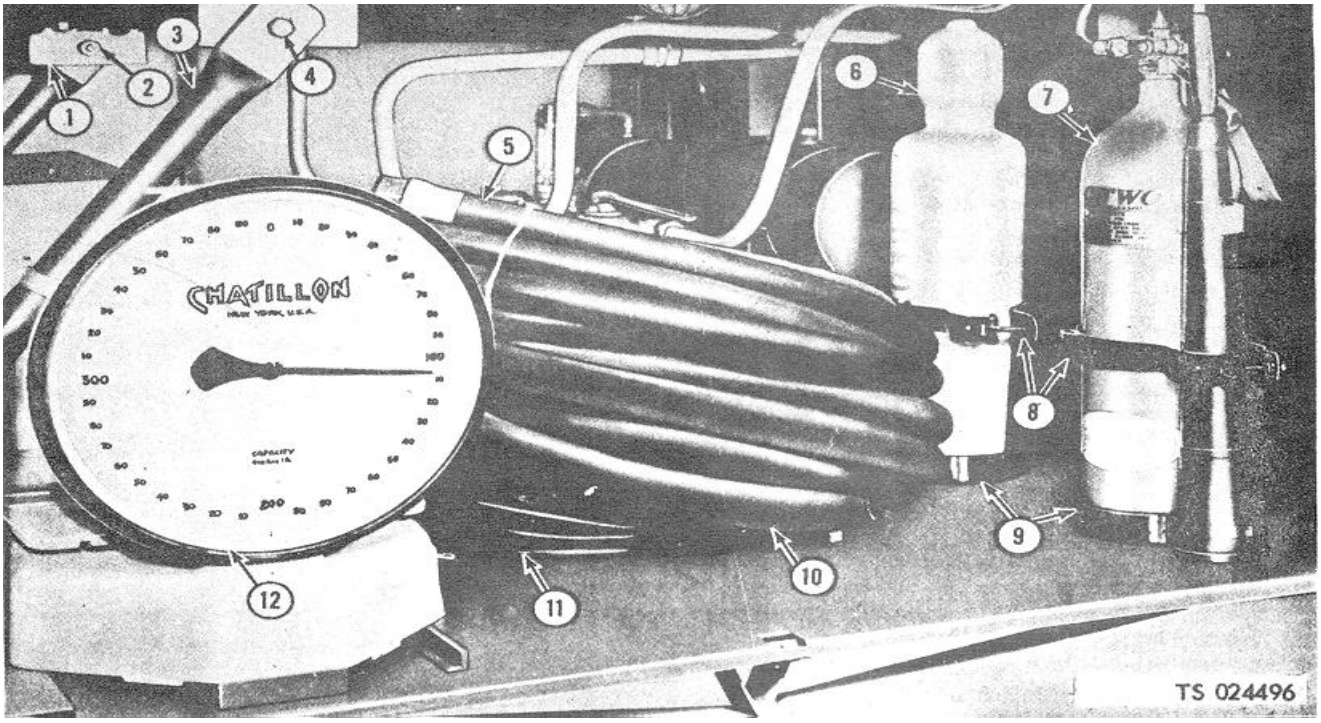
d. Close valves 1, 3, 10, 27, and 28 (fig. 2-20). Open the liquid fill and vapor equalizing valves on the liquid supply unit.

e. Open valves 1, 2, 7, and 10. When liquid appears at valve 10, close the valve and engage the transfer pump clutch. Continue to pump liquid into the pressure vessels until they are full. To determine when the tank is full, check as follows:

(1) Determining Liquid Level While Pumping.

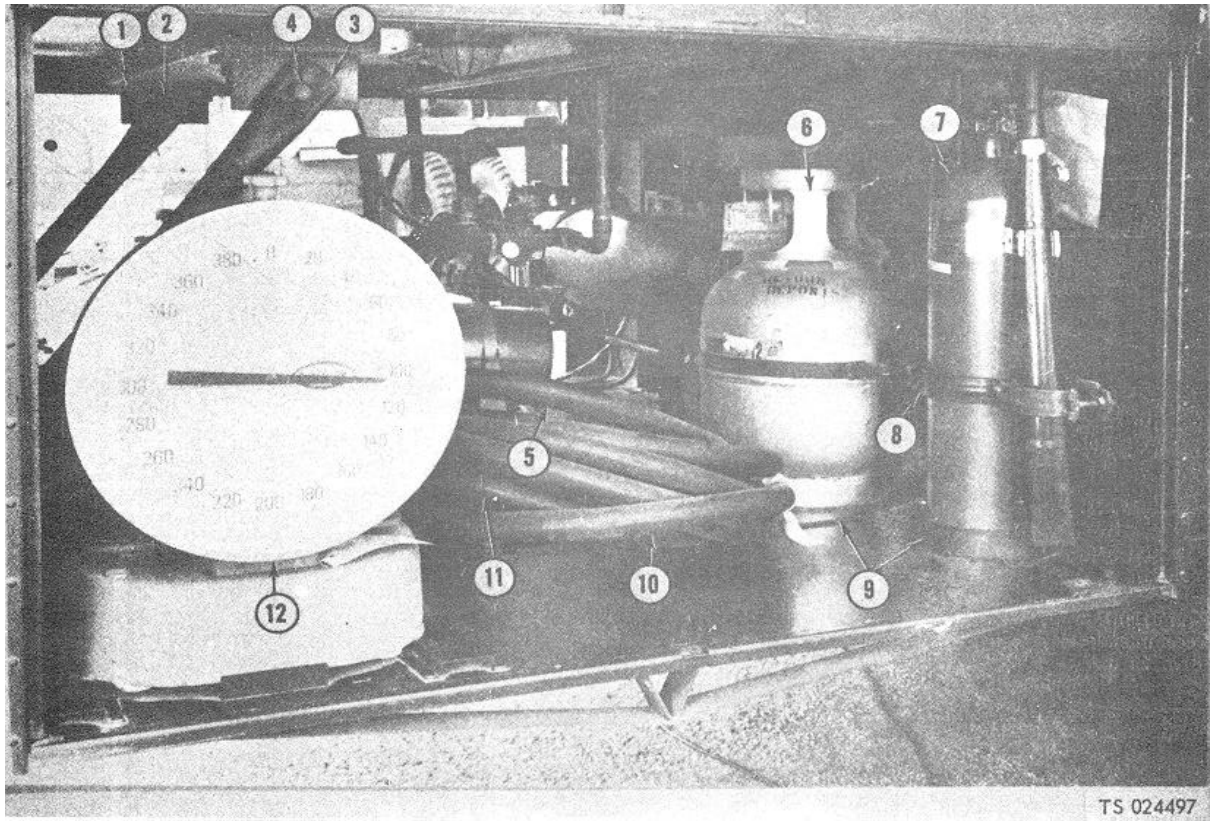
(a) Liquid Level Gage. The unit is equipped so that the liquid level gages (2 and 4, fig. 2-4) indicate the contents of the pressure vessels (in tenths of capacity) even during pumping. Thus the contents can be determined by reading the gages and allowing for slight time lag.

(b) Liquid in Vapor Equalizing Line. When filling the pressure vessels, it is usually desirable to fill them completely. The normal course of the carbon dioxide during filling is for liquid to enter at the bottom of the vessels while carbon dioxide vapor flows out at the top of the vessels, returning to the tank from which the liquid is being pumped. When the liquid level in the pressure vessel rises until it reaches the bottom of the vapor equalizing dip tube inside the vessel, the tank is at full capacity.



1.	Bracket	4	Capscrew	7	Fire extinguisher	10	Transfer hose (liquid)
2.	Nut	4	Transfer hose (vapor)	8	Quick release clamp	11	Cylinder filling hoses
3.	Brace	6	Freon tank	9	Holder	12	Scales

Figure 2-18. Storage compartment, face view (ser . nos . L-1475-T through L-1478-T) .



1. Bracket
2. Nut
3. Brace
4. Capscrew
5. Transfer hose (vapor)
6. Freon tank
7. Fire extinguisher
8. Quick release clamp
9. Holder
10. Transfer hose (liquid)
11. Cylinder filling hoses
12. Scale

Figure 2-19 . Storage compartment, face view (ser. nos . L-1666-T through L-1668-T) .

NOTE

If pumping is continued after capacity is reached, liquid carbon dioxide will enter the vapor equalizing line instead of vaporous carbon dioxide. The cold liquid in the vapor equalizing line will cause that line to accumulate frost, and indicate that complete filling has been obtained.

(c) Pressure Gage. Another method of determining when the tank is full is to observe the pressure gages (1 and 3, fig. 2-4). As long as liquid enters the bottom of the vessel and vapor returns through the vapor equalizing line, the pressure will remain approximately constant. As soon as the liquid level reaches the vapor equalizing dip tube and liquid is forced into the vapor equalizing line, the pressure will suddenly begin to rise.

(d) Amount of Carbon Dioxide Required to Fill Tank. If the pumping rate is known, it can be determined from the liquid level gage reading before pumping is started how much carbon dioxide will be required to fill the tank and approximately how long it will take to pump this amount of carbon dioxide. Be alert for the indications outlined in (b) and (c) above, several minutes before this time has elapsed. Stop the pump immediately when either indication is observed.

(2) Checking for Overfilling.' It is important that the level of the liquid carbon dioxide inside the pressure vessel be kept no higher than the bottom of the vapor equalizing line dip tube. After complete filling of the pressure vessel and after the hoses have been disconnected, open the vapor equalizing line valve (23, fig. 2-8) slightly to discharge carbon dioxide to atmosphere. If the discharge is clear or only slightly foggy, the tank has not been overfilled. However, if the discharge is a dense, white cloud containing particles of dry ice, the liquid level in the tank is too high. To remedy this, carbon dioxide discharge from the vapor equalizing line connection should be allowed to continue slowly until the dense white discharge changes to a clean or blue fog discharge.

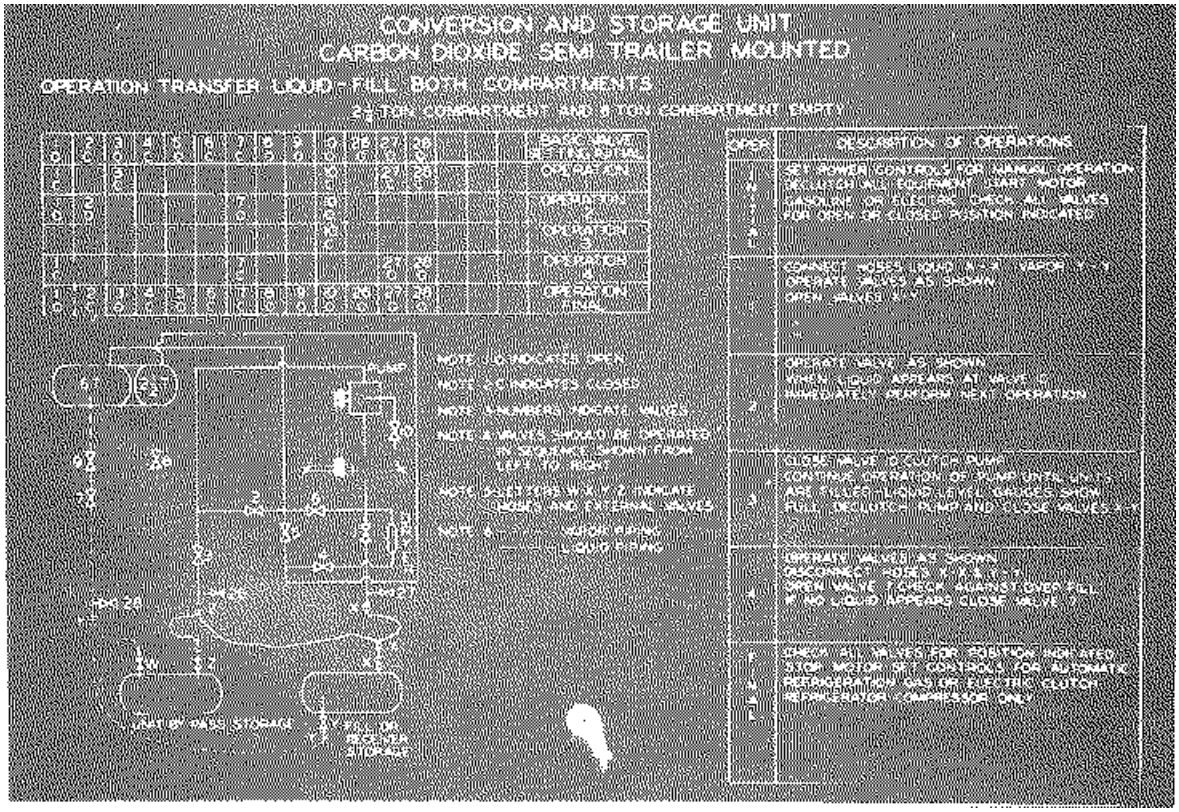


Figure 2-20. Filling both pressure vessels with liquid carbon dioxide.

f. Disengage the clutch to the transfer pump. Close the liquid fill and vapor equalizing line valves on the liquid supply unit.

g. Close valves 1 and 7. Open valves 27 and 28 to bleed off the carbon dioxide trapped in the transfer hoses, and then disconnect the transfer hoses. Open valve 7 slightly to check for overfilling. If no liquid carbon dioxide appears, close the valves. If the liquid carbon dioxide appears through the valve, leave the valve open until the discharge changes to a clean or blue fog discharge.

h. Set the unit for automatic operation and engage only the refrigeration clutch. Position the valves in the normal positions as indicated in Figure 2-13.

2-10. Filling The Storage Pressure Vessel With Liquid Carbon Dioxide (Both Pressure Vessels Empty)

a. Set the driving unit for manual operation, and disengage all clutches.

b. Set the valves as indicated in Figure 2-21 and start the driving unit. Refer to Table 2-1 for valve identification.

c. Connect the liquid and vapor transfer hoses (stored in the storage compartment) to the liquid fill line and vapor equalizing line at the rear of the trailer, and to the liquid supply unit.

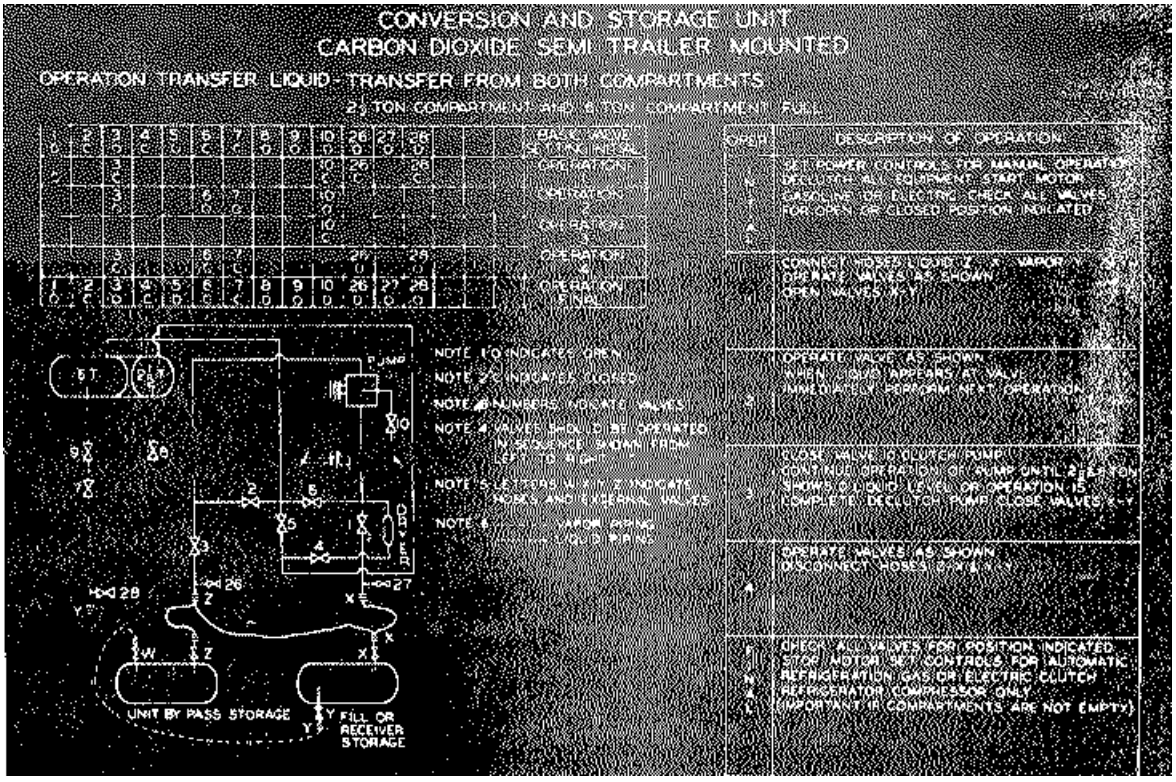
d. Close valves 1, 3, 5, 8, 10, 27, and 28 (fig. 2-21). Open valves 2 and 7. Open the liquid fill and vapor equalizing line valves on the liquid supply unit.

e. Open valves 1 and 10. When liquid appears at valve 10, close the valve and engage the transfer pump clutch. Continue to pump liquid into the storage pressure vessel until it is full. To determine when the pressure vessel is full, check as follows:

(1) Determining Liquid Level While Pumping.

(a) Liquid Level Gage. The unit is equipped so that the liquid level gages (2 and 4, fig. 2-4) indicate the contents of the pressure vessels (in tenths of capacity) even during pumping. Thus the contents can be determined by reading the gages and allowing for slight time lag.

(b) Liquid in Vapor Equalizing Line. When filling the pressure vessels, it is usually desirable to fill them completely. The normal course of the carbon dioxide during filling is for liquid to enter at the bottom of the vessels while carbon dioxide vapor flows out at the top of the vessels, returning to the tank from which the liquid is being pumped. When the liquid level in the pressure vessel rises until it



TS 024499

Figure 2-21 . Transfer operation liquid fill, storage compartment only .

reaches the bottom of the vapor equalizing dip tube inside the vessel, the tank is at full capacity.

NOTE

If pumping is continued after capacity is reached, liquid carbon dioxide will enter the vapor equalizing line instead of vaporous carbon dioxide. The cold liquid in the vapor equalizing line will cause that line to accumulate frost, and indicate that complete filling has been obtained.

(c) Pressure Gage. Another method of determining when the tank is full is to observe the pressure gages (1 and 3, fig. 2-4). As long as liquid enters the bottom of the vessel and vapor returns through the vapor equalizing line, the pressure will remain approximately constant. As soon as the liquid level reaches the vapor equalizing dip tube and liquid is forced into the vapor equalizing line, the pressure will suddenly begin to rise.

(d) Amount of Carbon Dioxide Required to Fill Tank. If the pumping rate is known, it can be determined from the liquid level gage reading before pumping is started how much carbon dioxide will be required to fill the tank and approximately how long it will take to pump this amount of carbon dioxide. Be alert for the indications outlined in (b) and (c) above, several minutes before this time has elapsed. Stop the pump immediately when either indication is observed.

(2) Check for Overfilling. It is important that the level of the liquid carbon dioxide inside the pressure vessel be kept no higher than the bottom of the vapor equalizing line dip tube. After complete filling of the pressure vessel and after the hoses have been disconnected, open the vapor equalizing line valve (23, fig. 2-8) slightly to discharge carbon dioxide to atmosphere. If the discharge is clear or only slightly foggy, the tank has not been overfilled. However, if the discharge is a dense, white cloud containing particles of dry ice, the liquid level in the tank is too high. To remedy this, carbon dioxide discharge from the vapor equalizing line connection should be allowed to continue slowly until the dense white discharge changes to a clear or blue fog discharge.

f. Disengage the transfer pump clutch, and close the liquid fill and vapor equalizing line valves on the liquid supply unit.

g. Close valves 1, 2, and 9. Open valves 27 and 28 to bleed off the carbon dioxide trapped in the transfer hoses, and then disconnect the transfer hoses. Check for overfilling.

h. Set the unit for automatic operation, and engage only the refrigeration clutch. With all the liquid contained in the storage pressure vessel, set the valves in the normal position as indicated in figure 2-13.

2-11. Transfer of Liquid Carbon Dioxide from Both Pressure Vessels Simultaneously.

a. Set the driving unit for manual operation, and disengage all clutches.

b. Set the valves as indicated in figure 2-22 and start the driving unit. Refer to table 2-1 for valve identification.

c. Connect the liquid and vapor transfer hoses (stored in the storage compartment) to the liquid fill line and vapor equalizing line at the rear of the trailer, and to the receiver unit.

d. Close valves 1, 3, 10, 26, and 28 (fig. 2-22). Open the liquid fill and vapor equalizing line valves on the receiver unit.

e. Open valves 3, 6, 7, and 10. When liquid appears at valve 10, close the valve and engage the transfer pump clutch. Continue to pump liquid into the receiver unit until the pressure vessels are empty, or sufficient liquid has been pumped into the. receiver unit.

f. Disengage the clutch to the transfer pump. Close the liquid fill and vapor equalizing line valves on the receiver unit.

g. Close valves 3, 6, and 7. Open valves 26 and 28 to bleed off carbon dioxide trapped in the transfer hoses, and then disconnect the transfer hoses.

h. Set the valves for the normal position as indicated in Figure 2-13. Set the controls for automatic operation, and engage the refrigeration clutch only if liquid carbon dioxide is remaining in the pressure vessels.

2-12. Transfer Of Liquid Carbon Dioxide From The Storage Pressure Vessel (Liquid In The Storage Pressure Vessel Only)

a. Set the driving unit for manual operation, and disengage all clutches.

b. Set the valves as indicated in Figure 2-23 and start the driving unit. Refer to Table 2-1 for valve identification.

c. Connect the liquid and vapor transfer hoses (stored in the storage compartment) to the liquid fill

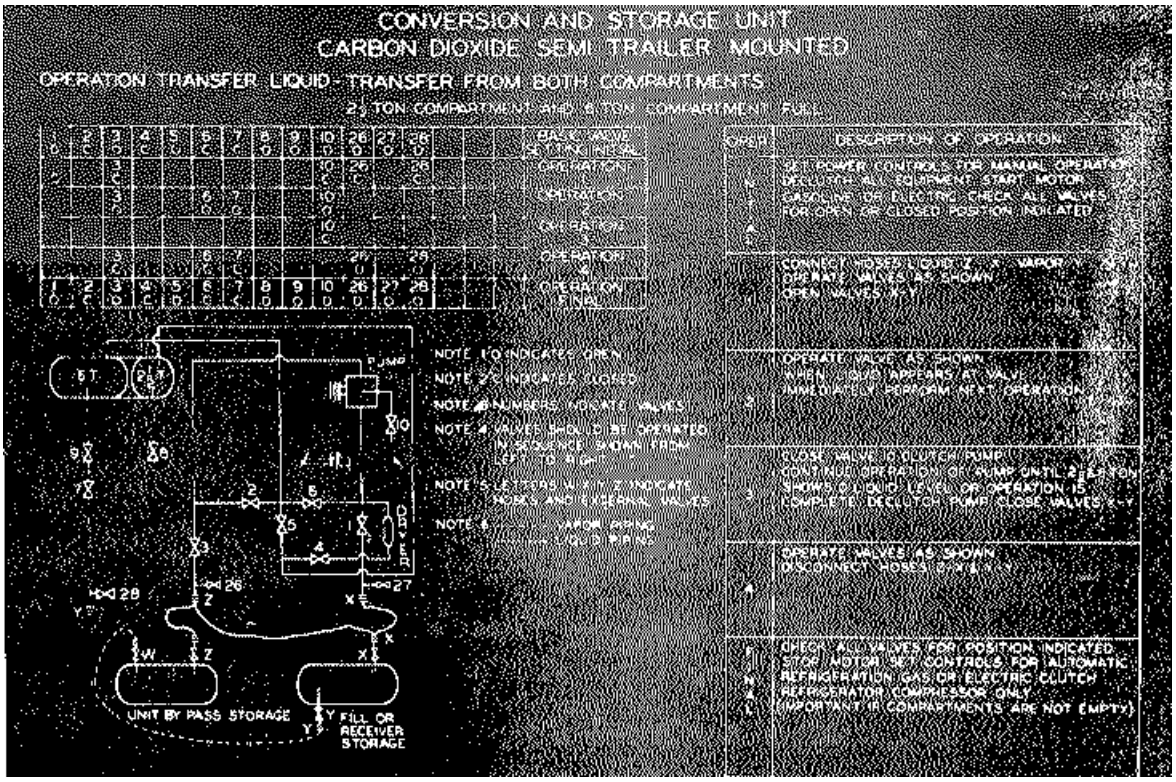


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Figure 2-22 . Transferring liquid from both compartments .

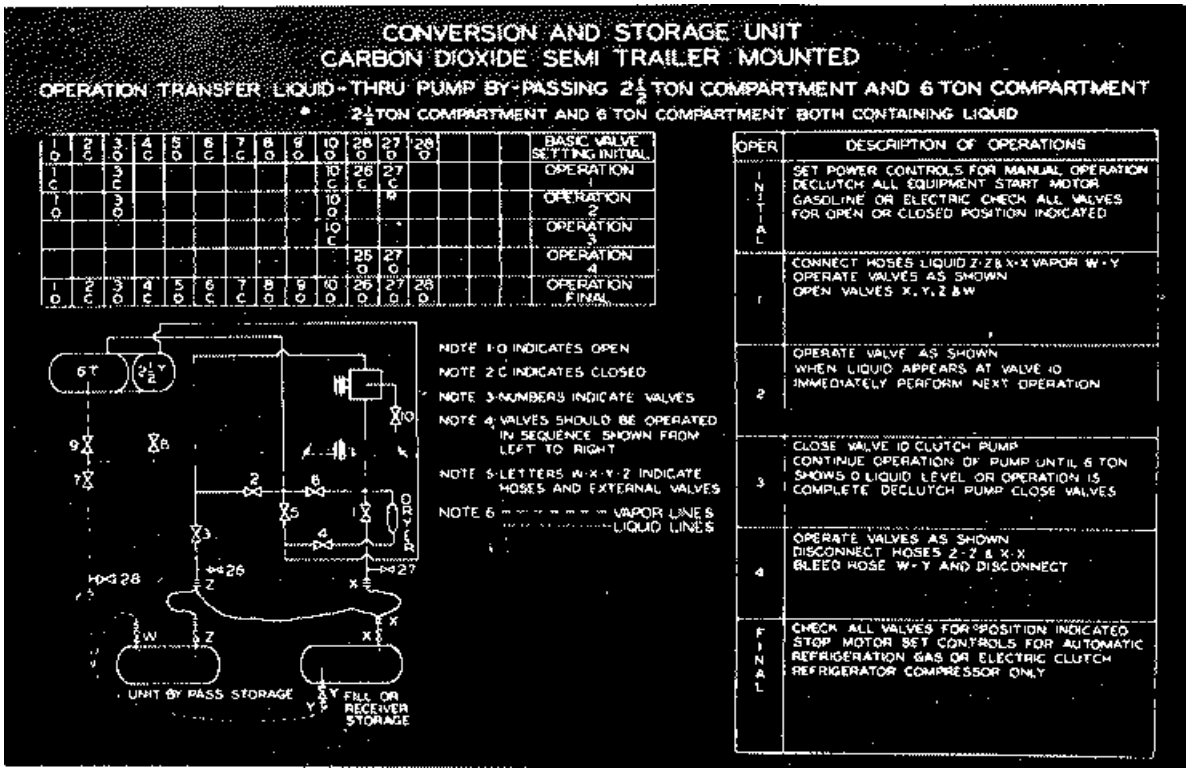

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Figure 2-23 . Transfer of liquid carbon dioxide from the storage pressure vessel .

line and vapor equalizing line at the rear of the trailer, and to the receiver unit.

d. Close valves 1, 3, 7, 8, 10, 26, and 28. Open the liquid fill and vapor equalizing line valves on the receiver unit.

e. Open valves 3, 6, 7, 9, and 10. When liquid appears at valve 10, close the valves and engage the transfer pump clutch. Continue to pump liquid into the receiver unit until the storage pressure vessel is empty, or sufficient liquid has been pumped into the receiver unit.

f. Disengage the clutch to the transfer pump. Close the liquid fill and vapor equalizing line valves on the receiver unit.

g. Close valve 3, 6, 7, and 9. Open valves 26 and 28 to bleed off carbon dioxide trapped in the transfer hoses, and then disconnect the transfer hoses.

h. Set the valves for the normal position as indicated in Figure 2-13. Set the controls for automatic operation, and engage only the refrigeration clutch if liquid remains in the storage pressure vessel.

2-13. Transfer Of Liquid Carbon Dioxide From One External Tank Into Another External Tank (Liquid In Both Pressure Vessels)

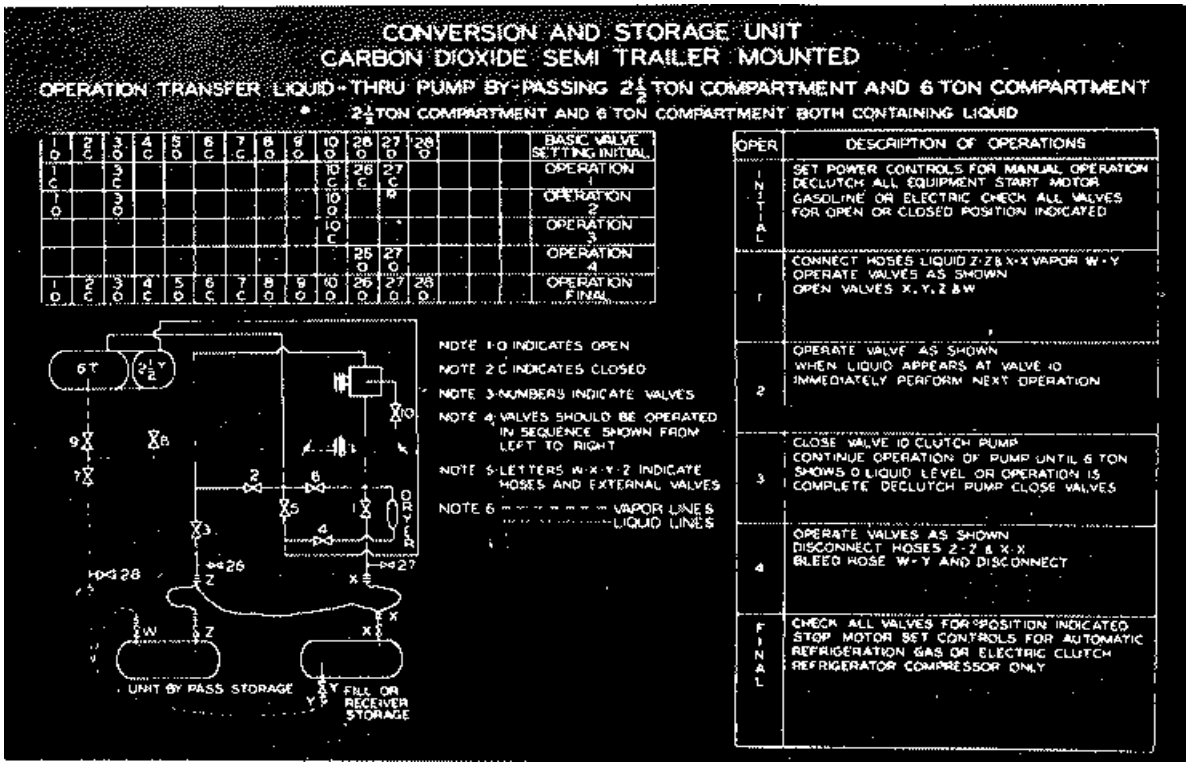
a. Set the driving unit for manual operation, and disengage all clutches.

b. Set the valves for the normal position as indicated in Figure 2-13 and start the driving unit. Refer to Table 2-1 for valve identification.

c. Connect the liquid and vapor transfer hoses to the liquid fill line (5, fig. 2-11) and liquid fill line (pump by-pass) (3) at the rear of the trailer. Connect one liquid fill line to each external tank, and connect the vapor equalizing line to both external tanks.

d. Close valves 1, 3, 10, 26, and 27 (fig. 2-24). Open the liquid fill and vapor equalizing line valves oi both external units.

e. Open valves 1, 3, and 10. When liquid appears at valve 10, close the valves and engage the transfer pump clutch (1, fig. 2-3). Continue operation of the transfer pump until sufficient liquid has been' pumped from one external tank into the other.



TS 024502

Figure 2-24 . Transfer of liquid carbon dioxide from one external tank to another external tank .

f. Open valves 26 and 27 to bleed off carbon dioxide trapped in the liquid fill lines, and disconnect the hoses. Bleed off the interconnecting vapor line between the external tanks, and then disconnect the hose.

g. Set the valves for the normal position as indicated in Figure 2-13. Set the controls for automatic operation, and engage refrigeration clutch (3, fig. 2-3).

2-14. Cylinder Filling Operation (Liquid in Both Pressure Vessels)

a Before performing any steps involving the storage tank, purge the cylinders completely to reduce pressure. Pressurized cylinders will slow up the filling time. Purge the cylinders just prior to the filling, as released vapor will cool the cylinder and reduce the filling time. Difficulty during filling may be experienced because of water in the cylinder. Open the cylinder valve, allow the cylinder to warm up and then invert to remove the water. After all pressure and water are removed, perform the following steps.

b. Set the driving unit for manual operation and disengage all the clutches.

c. Set the valves as indicated in Figure 2-25. Refer to Table 2-1 for valve identification.

d. Place the cylinder to be filled on the scales (12, fig. 2-18) or (12, fig. 2-19), and connect the cylinder filling hose to the cylinder and to valve(l3 or 18, fig. 2-8). A fiber gasket must be placed between the hose and cylinder being filled. Record the weight of the empty cylinder. Add to this weight, the weight necessary to fill the cylinder. This figure is the total weight. Close the cylinder filling valve 17 or 19 on the filling hose (fig. 2-25) when the scale indicates this weight.

e. Open valves 12, 13, 14, and 15 (fig. 2-25). When liquid appears at valve 15, close the valve, and engage the clutch to the cylinder filling compressor (2, fig. 2-3).

f. Slowly adjust the pressure regulating valve 14 (fig. 2-25), until a charging pressure of 600 to 800 psi (42.18 to 56.24 kg per sq cm) is indicated on the pressure gage in cool weather; 800 to 1000 psi (56.24 to 70.3 kg per sq cm) is suitable pressure in hot weather. However, experience on the part of the

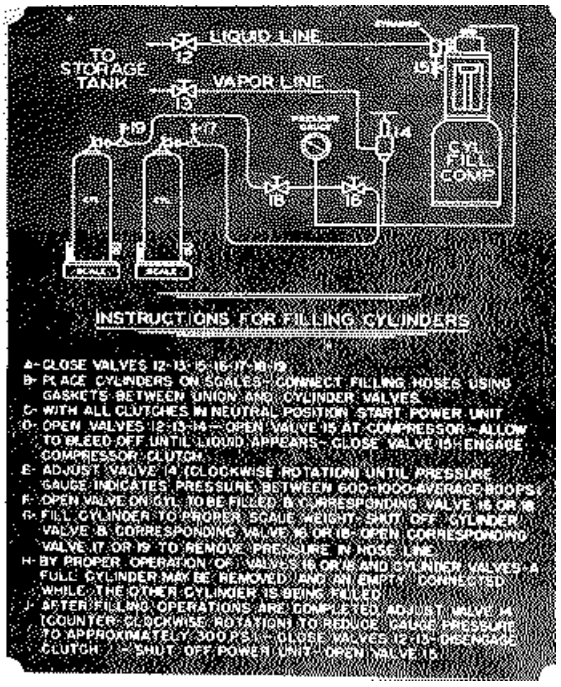


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Figure 2-25. Cylinder filling operation .

operator will determine a suitable charging pressure.

g. Open valve on cylinder to be filled and corresponding valve 16 or 18 (fig. 2-25).

NOTE

As the empty cylinder starts filling, the charging pressure, indicated on the pressure gage, will decrease and gradually regain the charging pressure as the cylinder fills.

h. Allow the cylinder to fill until the proper v/eight is reached. When the cylinder is full, close the valve on the cylinder and the corresponding valve 16 or 18. Bleed off pressure trapped in the hose through valve 17 or 19. Do not overfill the cylinder. The total weight of a completely charged cylinder is stamped on the cylinder.

CAUTION

If a cylinder is overfilled, discharge the excess carbon dioxide so that the frangible disc on the cylinder is not ruptured.

i. If cylinders of the same size are being filled alternately, in pairs, with continuous charging taking place, one connection is used for filling and the other connection is used for attaching or removing the second cylinder. Setting of the pressure regulating valve may remain constant until all cylinders have been filled. This will reduce packing wear.

CAUTION

Do not allow the cylinder filling unit to idle at charging pressure for long periods of time. This will cause pressure build-up within the pressure vessels and wear to the cylinder filling unit.

j. After the cylinder filling operations are complete, adjust valve 14 (fig. 2-25) counterclockwise to reduce the gage pressure to approximately 300 psi (21.18 kg per sq cm). Disengage the cylinder filling unit clutch (2, fig. 2-3) and set the valves for the normal position as indicated in Figure 2-13. Set the controls for automatic operation, and engage the refrigeration clutch (3) (fig. 2-3). Remove the cylinder filling hoses, and replace in the storage compartment.

2-15. Determining Liquid Level While Pumping

a. Liquid Level Gage. The unit is equipped so that the liquid level gages (2 and 4, fig. 2-4) indicate the contents of the pressure vessels (in tenths of capacity) even during pumping. Thus the contents can be determined by reading the gages and allowing for slight time lag.

b. Liquid in Vapor Equalizing Line. When filling the pressure vessels, it is usually desirable to fill them completely. The normal course of the carbon dioxide during filling is for liquid to enter at the bottom of the vessels while carbon dioxide vapor flows out at the top of the vessels, returning to the tank from which the liquid is being pumped. When the liquid level in the pressure vessel rises until it reaches the bottom of the vapor equalizing dip tube inside the vessel, the tank is at full capacity.

NOTE

If pumping is continued after capacity is reached, liquid carbon dioxide will enter the vapor equalizing line instead of vaporous carbon dioxide. The cold liquid in the vapor equalizing line will cause that line to accumulate frost, and indicate that complete filling has been obtained.

c. Pressure Gage. Another method of determining when the tank is full is to observe the pressure gages (1 and 3, fig. 2-4). As long as liquid enters the bottom of the vessel and vapor returns through the vapor equalizing line, the pressure will remain approximately constant. 'As soon as the liquid level reaches the vapor equalizing dip tube and liquid is forced into the vapor equalizing line, the pressure will suddenly begin to rise.

d. Amount of Carbon Dioxide Required to Fill Tank. If the pumping rate is known, it can be determined from the liquid level gage reading before pumping is started how much carbon dioxide will be required to fill the tank and approximately how long it will take to pump this among of carbon dioxide. Be alert for the indications outlined in *(b*) and *(c*) above, several minutes before this time has elapsed. Stop the pump immediately when either indication is observed.

2-16. Checking For Overfilling It is important that the level of the liquid carbon dioxide inside the pressure vessel be kept no higher than the bottom of the vapor equalizing line dip tube. After complete filling of the. pressure vessel and after the hoses have been disconnected, open the vapor equalizing line valve (23, fig. 2-8) slightly to discharge carbon dioxide to atmosphere. If the discharge is clear or only slightly foggy, the tank has not been overfilled. However, if the discharge is a dense, white cloud containing particles of dry ice, the liquid level in the tank is too high. To remedy this, carbon dioxide discharge from the vapor equalizing line connection should be allowed to continue slowly until the dense white discharge changes to a clear or blue fog discharge.

Section II. OPERATION OF AUZILIARY MATERIAL USED IN CONJUNCTION WITH CONVERSION AND STORAGE UNIT.

2-17. Fire Extinguisher

a. Description. The conversion and storage unit is equipped with a 15 pound (1.0545 kg per sq cm) carbon dioxide fire extinguisher (7, fig. 2-18) or (7, fig. 2-19) located in the left side of the storage compartment. It is held in with a quick release clamp (8) for easy access. Fifteen pounds (1.0545 kg per sq cm) of liquid carbon dioxide is held in the cylinder at 800 psi (56.24 kg per sq cm) at 70F. (21C.). When the extinguisher valve is opened, the carbon dioxide is released. The liquid carbon dioxide upon contact with the air turns into gas which has a smothering effect on fire.

b. Operation. Open the quick release clamp and lift out the extinguisher. Pull the pin which locks the handle, point the nozzle at the base of the fire and squeeze the handle to discharge the contents of the extinguisher at the fire. As soon as possible after use, recharge the extinguisher as instructed: NOTE
Do not put the extinguisher back in place in the equipment after use without recharging it.

Section III. OPERATION UNDER UNUSUAL CONDITIONS

2-18. Operation In Extreme Cold

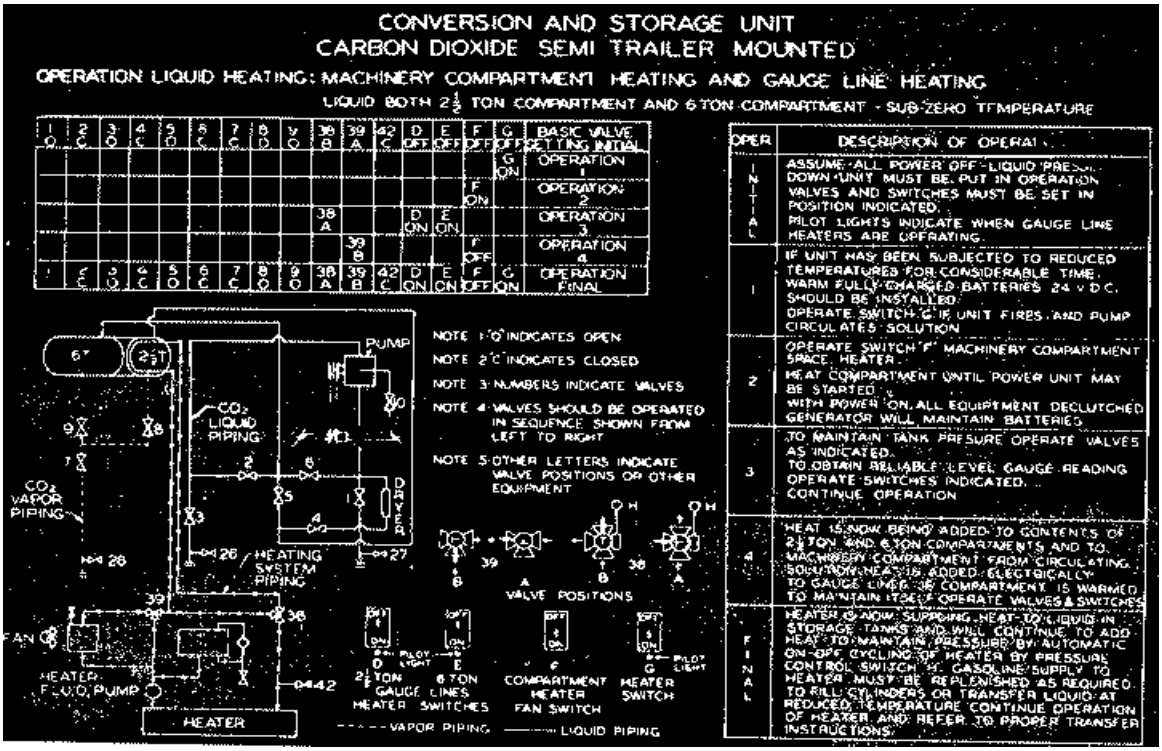
a. General. Operating the conversion and storage unit in extreme cold temperatures presents special problems. Careful inspection is necessary, particularly for the lubrication and electrical systems. Spend more time performing such operations as preventive maintenance and take extra care with pre-starting precautions. Failure to give this extra service may result in starting failures, inefficient operation, and serious or permanent damage to the unit.

b. Lubrication. At extreme low temperatures, lubricants that are too heavy a grade can make the operating machinery difficult to start or to operate.
Operating with too heavy a grade of grease or oil will cause rapid wear of the moving parts, as they receive no initial lubricating from heavy cold oils or grease. For lubrication at low temperatures refer to LO 5-3655-210-12.

c. Operating Precautions. Avoid all unnecessary shocks when operating the equipment. Metal becomes brittle at very low temperatures, and its ability to withstand shock becomes less as the temperature drops.

d. Low Temperature Operation. Perform the steps given below when liquid carbon dioxide is contained in both pressure vessels, and the surrounding temperature is below -38.9C. (20F.). If the unit has been subject to low temperatures for considerable time, install warm, fully charged batteries.

(1) Position the valves as indicated in Figure 2-26. Valves 38 and 39 are open to the compartment heater (valve handles turned 900 clockwise from



TS 024504

Figure 2-26. Power . Power compartment heating .

closed position). Refer to Table 2-1 for valve identification.

(2) Turn on the switch (9, fig. 2-2) to the conversion heater and the CONVERSION and STORAGE switches (6 and 7) to the gage line heaters.

(3) After the conversion heater is operating, turn on the SPACE switch (8) to the space heater.

(4) Turn valve 38 to the normal position (90° counterclockwise from the position indicated in step (1)). This will allow the heater fluid to circulate through the piping in the conversion pressure vessel and to the space heater in the power compartment.

(5) When the power compartment is warmed sufficiently to perform transferring and filling operations, turn valve 39 to the normal position (90° counterclockwise from the position indicated in step (1) above) and turn off the SPACE switch.

(6) The conversion heater is now warming up the carbon dioxide in the tank and will continue to operate until the pressure in the tank reaches 275 psi (19.3325 kg per sq cm). At this pressure, the tank pressure control switch will open the circuit to stop the heater.

2-19. Operation Under High Humidity Conditions

High moisture content in the air will cause the most difficulty in electrical system. The spark plug and breaker box wiring often becomes unserviceable due to high humidity. The parts that are affected must be removed and dried. If this does not remedy the trouble, report to the proper authority.

2-20. Operation In Extreme Heat

a. General. The operation of the conversion and storage unit in extreme heat will be the same as under normal conditions if care is taken t6 prevent overheating. The automatic controls will operate to keep the carbon dioxide liquid in the pressure vessels at the required pressure, and the entire unit will operate successfully at +130F. (54.4C.).

b. Cooling. Give extra care and service to the power compartment, for efficient operation.' Open the refrigeration shutter and the compartment doors. If necessary, install a circulating fan on the 220-volt circuit.

c. Air. Over a period of time, oil, dust, and dirt will collect on the condenser fins. Remove by using a long bristle brush. Keep any obstacles which might obstruct the flow of air between the condenser fins, away from the power compartment.

d. Lubrication. When operating under extreme heat, check the level of the oil, and the lubrication points frequently. Keep oil levels as close to the proper level as possible. For lubrication under extreme heat, refer to LO 5-3655-210-12.

2-21. Operation Under Dusty Or Sandy Conditions

a. General. Operation of the conversion arid storage unit under conditions of extreme dust or sand will cause wear, shorten the service life of the unit, and increase the servicing periods to keep the unit operating. Perform careful and frequent servicing.

b. Lubrication. Lubricate more frequently than specified in LO 5-3655-210-12, depending upon the amount of sand and dust in the area. Keep the covers on lubrication points tightly closed. When lubricating, make sure that no sand or dirt has entered lubrication point.

c. Protective Measures.

(1) Keep the air cleaner in the best operating condition.

(2) Keep the doors and shutters closed when possible, to keep excessive dust and sand from entering compartments.

(3) Seal instrument edges with masking or scotch tape to keep dust from entering.

(4) Batteries. Increase frequency of battery PMCS. Use distilled water or a good grade of drinking water (excluding mineral water).

d. Cleaning. Thoroughly clean and lubricate the entire unit as soon as possible, after exposure to severe dusty or sandy conditions.

2-22. Operation In High Altitude

a. The gasoline engine power output will gradually decrease as the operating altitude above sea level increases. This is due to less air being drawn into the cylinders, resulting in a richer fuel mixture and incomplete combustion. It may be necessary to readjust the carburetor for proper operation.

b. Be sure the air cleaner is operating properly.

2-23. Operation In Salt Water Areas

a. General. Salt water has a very corrosive action on metal. Avoid contact with salt water whenever possible.

b. Lubrication. Clean all lubricating points thoroughly. Refer to LO 5-3655-210-12 for proper lubricants.

c. Electrical System. Keep all electrical equipment clean and free from corrosion. Clean the spark plug terminals frequently.

d. Protection. If the conversion and storage unit is stored in an area where salt water spray is in the air, use a tarpaulin or other suitable cover for protection.

CHAPTER 3

OPERATOR/CREW MAINTENANCE INSTRUCTIONS

Section I. LUBRICATION INSTRUCTIONS

3-1. General

Keep all lubricants in closed containers and store in a clean, dry place away from external heat. Allow no dust, dirt, or other foreign material to mix with lubricants. Keep all lubrication equipment clean and ready to use.

3-2. Cleaning

Keep all external parts not requiring lubrication clean of lubricants. Before lubricating the storage and charging unit, wipe all lubrication points free of dirt and grease. Clean all lubrication points after lubricating to prevent accumulation of foreign matter.

3-3. Points of Lubrication

Service the lubrication points at proper intervals as shown in figure 3-1.

LUBRICATION ORDER

LO5-3655-210-12

CONVERSION, STORAGE AND CHARGING UNIT, CARBON DIOXIDE, GASOLINE ENGINE OR ELECTRIC MOTOR DRIVEN, SEMI-TRAILER MTD, 16,000 LB CAP., (CARDOX MODEL E-46750) W/ENGINE WISCONSIN MODEL MTHD

Reference. C9100-IL

Intervals are based on normal hours of operation. Adjust to compensate for abnormal operation and severe conditions. During inactive periods, sufficient lubrication must be performed for adequate preservation.

Clean fittings before lubricating.

Clean parts with SOLVENT, dry-cleaning, or with OIL, fuel, Diesel. Dry before lubricating.

Lubricate points indicated by dotted arrow shafts on both sides of equipment.

Drain crankcase when hot. Fill and check level.

LUBRICANT ● INTERVAL

INTERVAL ● LUBRICANT

Landing Gear (3 fittings) GAA 250

FOLD

FOLD

Wheel Bearings (See note 5) GAA 1000

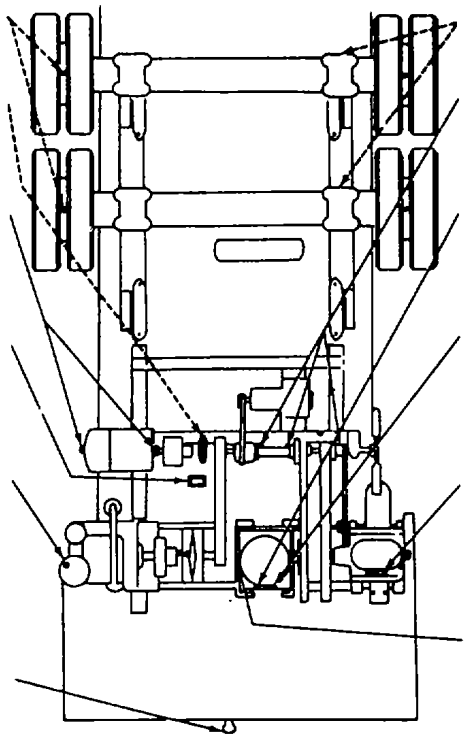
Pillow Block Bearing (Sealed bearings, no lubrication required)

Electric Drive Motor Bearings (See note 6) BR

Generator Sealed Bearings (No lubrication required)

Air Cleaner (Refill oil reservoir to level mark, every 50 hours, disassemble entire unit, clean, re-oil and reassemble) (See key) OE 10

Pintle Hook 2 fittings) GAA 250



500 GAA Brake Slack Adjuster and Shaft Bearing

100 GAA Counter Shaft Clutch Shifter (Sparingly)

OE Cylinder Filling Compressor Fill Plug (See key)

10 Cylinder Filling Compressor Level Plug (Check and maintain level to top of opening)

10 RCO Refrigeration Compressor Crankcase Level (Sight Glass) (Check level) (See note 7)

250 Cylinder Filling Unit Compressor Drain Plug (Drain and refill)

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Figure 3-1. Lubrication order (sheet 1 of 2).

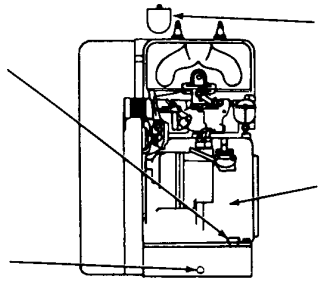
LUBRICANT ● INTERVAL

INTERVAL ● LUBRICANT

Engine Crankcase Oil Fill and Level Cap (Check level) (See key) OE 10

CAUTION: When OES oil is used the level will be checked more often.

Engine Oil Drain Plug (Drain and Refill) 50



Oil Filter (Disassemble, clean housing, renew element and reassemble) (See note 2)

Starter Motor (Sealed bearing, no lubrication required)

-KEY-

LUBRICANTS	CAPACITY	EXPECTED TEMPERATURES			INTERVALS
		Above + 32°F	+ 40°F to – 10°F	0°F to – 65°F	
OE-OIL, Engine, Heavy Duty					
Engine Crankcase	4-1/2 qt				
Engine Air Cleaner	1/2 qt	OE 30	OE 10	OES	Intervals given are in hours of normal operation
Oil Can Points					
Compressor Cylinder Filling	5 qt				
OES-OIL, Engine, Sub-zero					

FOLD FOLD

RCO-2-OIL, Lubricating Refrigerant		ALL TEMPERATURES	
Compressor Crankcase	2 1/2 qt		
BR-GREASE, Ball & Roller Bearing			
GAA-GREASE, Automotive & Artillery			

NOTES:

1. FOR OPERATION OF EQUIPMENT IN PROTRACTED COLD TEMPERATURES BELOW -10°F. Remove lubricants prescribed in the key for temperatures above -10°F. Relubricate with lubricants specified in the key for temperatures below -10°F.

2. OIL FILTERS. Every 50 hours, remove filter elements, clean housings; install new element, fill crankcase, operate engine for 5 minutes, check for leaks, check crankcase oil level, and bring to a full mark.

3. OIL CAN POINTS. Every 50 hours clean and lightly coat the governor and carburetor linkage and all hinges with OE.

4. LUBRICANTS. The following is a list of lubricants with the Military Symbols and applicable Specification numbers.

OE MIL-L-2104 GAA MIL-G-10924
OES MIL-L-10295 BR MIL-G-18709

RCO FED VV-L-825

5. WHEEL BEARINGS. Every 1000 hours, remove wheels, inspect all parts, replace damaged or worn parts, repack bearings, and reassemble.

6. ELECTRIC DRIVE MOTOR BEARINGS. Service by Direct Support Maintenance at Time of Disassembly.

7. REFRIGERATION COMPRESSOR CRANKCASE. Serviced by Direct Support Maintenance.

Copy of this Lubrication Order will remain with the equipment at all times; Instructions contained herein are mandatory.

BY ORDER OF THE SECRETARY OF THE ARMY:

WILLIAM C. WESTMORELAND
General, United States Army,
Chief of Staff.

OFFICIAL:

KENNETH G. WICKHAM,
Major General, United States Army,
The Adjutant General.

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Figure 3-1. Lubrication order (sheet 2 of 2).

Section II. PREVENTIVE MAINTENANCE CHECKS AND SERVICES (PMCS)

3-4. General

To insure that the conversion and storage unit is ready for operation at all times, it must be inspected systematically so that defects may be discovered and corrected before they result in serious damage or failure. Defects discovered during operation of the unit shall be noted for future correction, to be made as soon as operation has ceased. Stop operation immediately if a deficiency is noted which would damage the equipment if operation were continued. All deficiencies and shortcomings will be recorded together with the corrective action taken On DA Form 2404 (Equipment Inspection and Maintenance Worksheet) at the earliest possible opportunity.

3-5. Daily Preventive Maintenance Services

This paragraph contains an illustrated tabulated listing of preventive maintenance services which must be performed by the operator. The item numbers are listed consecutively and indicate the sequence of minimum requirements. Refer to Table 3-1 for the daily preventive maintenance services.

Table 3-1. Operator/Crew Preventive Maintenance Checks and Services

~~D-Daily~~ ~~W-Weekly~~
Total Man-Hours Required: 3.0

Internal and Sequence No.		Item to be Inspected Procedure	Work Time
D	W		(M/H)
1		GASOLINE ENGINE CRANKCASE Service per L05-3655-210-12.	1.0
2		FUEL PUMP FILTER (SERIAL NOS. L-1475-T THROUGH L-1478-T) Inspect filter through glass bowl. Remove any foreign matter from screen.	0.2
3		DRIVE BELTS Check that transfer pump belt tension permits only about 1 in. (2.54 cm) deflection under thumb pressure at midpoint between pulleys; tension of other belts, about 1 1/2 in. (3.81 cm) deflection under the same test.	0.2
4		GASTANK Fill with REGULAR grade gasoline, 74 octane preferred.	0.3
5		CYLINDER FILLING UNIT Service crankcase per figure 3-1.	0.5
6		REFRIGERATION COMPRESSOR Service crankcase per figure 3-1.	0.5
7		CONTROLS AND INSTRUMENTS With the unit operating inspect for improper operation. Normal operating ranges for instruments are as follows: DC Ammeter (on engine control panel) 0-20 amps Fuel Gage "E" to "F"	0.3

NOTE
During operation observe for any unusual noise or vibration.

Section III. TROUBLESHOOTING

3-6. General

a. This section contains troubleshooting information for locating and correcting most of the operating troubles which may develope in the conversion and storage unit. Each malfunction for an individual component, unit, or system is followed by a list of tests or inspections which will help to determine probably causes and corrective action to be taken. Perform the tests/inspections and corrective actions in the order listed.

b. This manual cannot list all malfunctions that may occur, nor all tests or inspections, and corrective action. If a malfunction is not listed or is not corrected by tested corrective actions, notify your supervisor.

3-7. Operator Maintenance Troubleshooting

Refer to Table 3-2 for troubleshooting pertaining to operator's maintenance.

Table 3-2. Troubleshooting

Malfunction Test or Inspection Corrective Action
1. GASOLINE ENGINE FAILS TO START
Step 1. Check for an empty fuel tank. **Fill the gasoline tank.**
Step 2. Check for loose or broken wiring. **Tighten connections or replace defective wiring.**
Step 3. Check for dirty spark plugs. **Clean or replace plugs.**
2. ENGINE MISFIRING
Check for dirty spark plugs. **Clean the plugs.**
3. ENGINE KNOCKS
Check for lack of oil **Refill.**
4. POWER LOSS IN ENGINE
Check for a dirty air cleaner. **Clean and refill air cleaner (para 3-10).**

Section IV. MAINTENANCE PROCEDURES

3-8. General

This section contains maintenance procedures that are the responsibility of the operator as allocated by the maintenance allocation chart and which are not covered elsewhere in this manual.

3-9. Engine Assembly

Refer to LO 5-3655-210-12 and service engine assembly.

3-10 Air Cleaner

a. Removal and Disassembly.

(1) Remove wingnut (2, fig. 3-2) and lift off oil cup assembly (4) from bracket (7). Do not tilt, as oil will spill from oil cup.

(2) Take cap and filter assembly (1) and gasket (3) from oil cup. Leave gasket (5) on bracket (7), and dispose of old oil from oil cup. Remove breather (11).

b. Inspection and Service.

(1) Wash filter assembly and oil cup in solvent.

(2) Put oil cup, with gasket (5, fig. 3-3) back on bracket (7) and add oil, of the same grade used in the crankcase, to the OIL LEVEL line.

(3) Replace gasket (3), cap and filter assembly and wingnut.

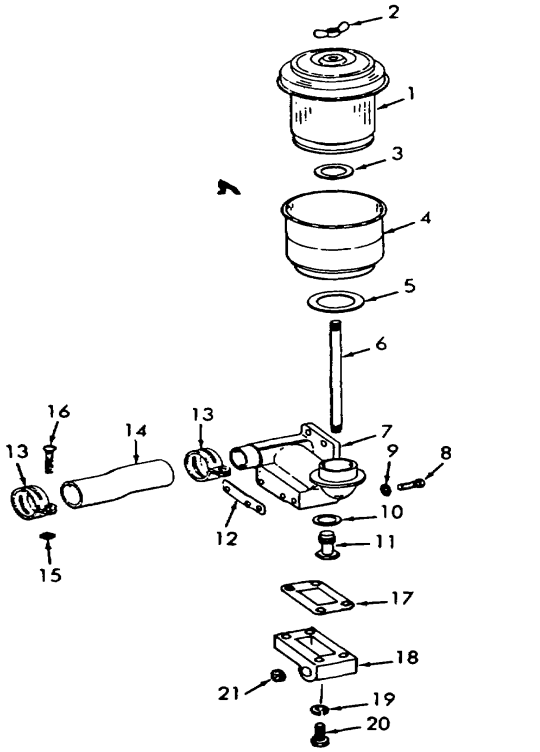
(4) Check that check ball (serial nos. L-1475-T through L-1478-T) or reed (serial nos. L-1666-T through L1668-T) in breather (11) is free in breather body. Wash breather in solvent and reinstall.

3-11. Fuel Filter Service (Ser. Nos. L-1475-T Through L-1478-T)

Refer to Figure 3-3 and service fuel filter as follows:

a. Turn shut-off valve (1) fully in to shut off fuel flow.

b. Loosen thumbnut (17) enough to free sediment bowl (18), and while holding bowl from dropping



1. Cap and filter assembly
2. Wingnut
3. Gasket
4. Oil cup assembly
5. Gasket
6. Stud
7. Air cleaner bracket
8. Machine bolt
9. Lockwasher
10. Gasket
11. Breather
12. Gasket
13. Hose clamp
14. Hose
15. Nut
16. Screw
17. Gasket
18. Breather
19. Washer
20. Screw
21. Preformed packing

Figure 3-2. Air cleaner, exploded view.

swing bail (16) aside. Remove bowl, gasket (19) and screen (20).

c. Clean screen of accumulated dirt, and reassemble, using a new gasket (19).

d. Open shut-off valve and check for leaks at gasket. Tighten thumbnut until any leak stops.

3-12. Muffler And Exhaust Pipe Inspection

Refer to Figure 3-4 and inspect the muffler (1) for leaks or signs of rusting through the metal.

NOTE

Surface rusting, if it doesn't weaken the muffler to the point of causing structural failure, is not enough to justify replacement of the muffler.

Inspect muffler, elbows (2), pipes (3, 4, and 14) for security of mounting, tight joints, and freedom from corrosion.

3-13. Cooling System Inspection

Refer to Figure 3-4 and inspect the cooling air shroud (5) and related sheet metal ducting for security of attachment and freedom from damage. Check flywheel cover (6) for any obstruction to air flow, such as dust accumulation.

3-14. Engine Control Panel Inspection

Refer to figure 3-5 and check that fuel gage (4) indicates quantity of fuel in tank (should be full before operation), and ammeter (1) indicates zero. Check for loose or damaged panel components.

3-15. Lights

a. Stop and Taillights.

(1) To remove either blackout or service stop and taillights (11 and 15, fig. 3-6) uncouple wire connectors (14) and tag leads for identification, then remove capscrews (12) and lockwashers (13) to free blackout units, or screws and nuts attaching service units. Reverse this procedure to install.

(2) To replace lamps, loosen screws, remove door (1, fig. 3-7) and remove defective lamp by pressing in while turning lamp to left, to disengage lamp base from socket, then remove lamp. Install new lamp by reversing removal procedure above.

NOTE

Procedure above is typical for both service and blackout taillights.

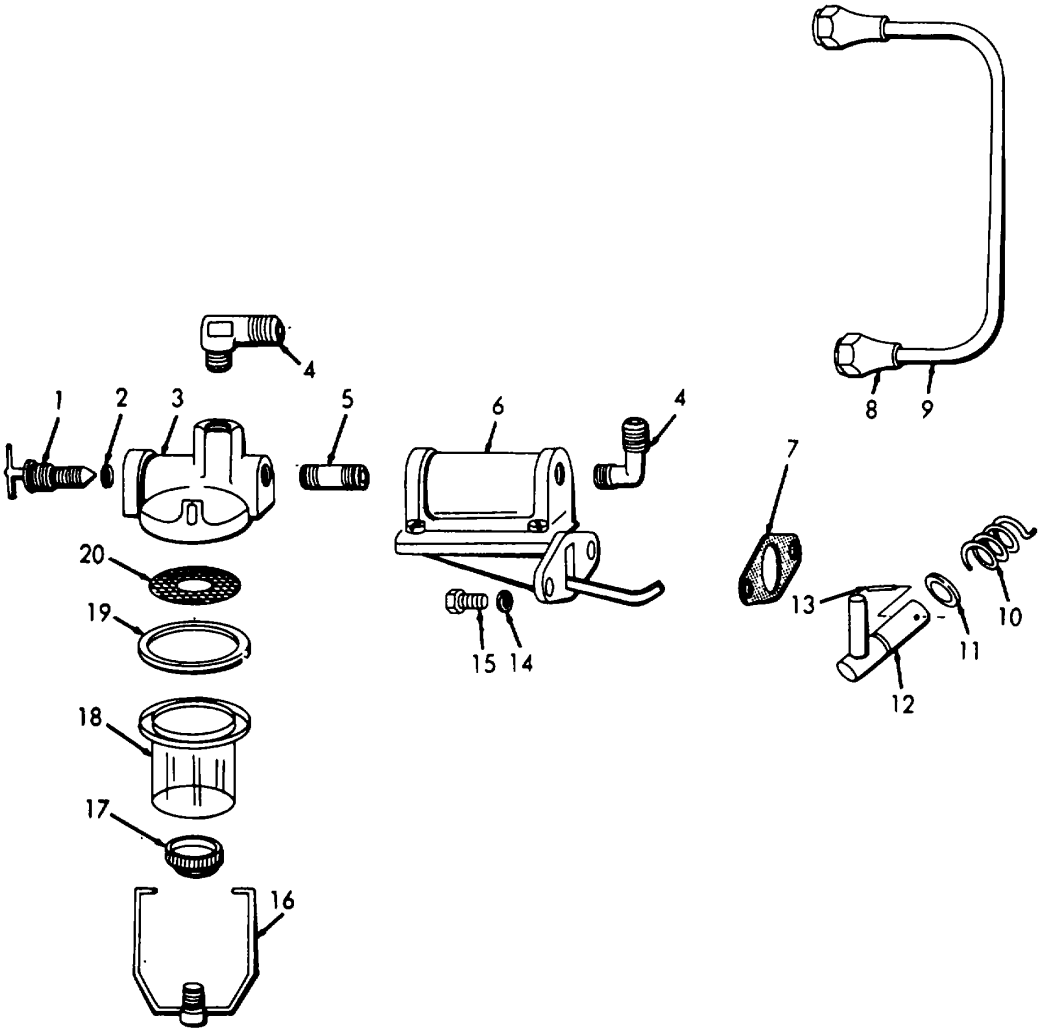
b. Clearance Lights. To replace lamp (3, fig. 3-8) remove screws (11), door (1), lens (2) and press and turn lamp left to release. Reverse these steps to complete operation. To replace entire light assembly proceed as follows:

(1) Remove door and lens as given above. Inside trailer body, at light to be replaced, disconnect electrical connector by pressing two halves together while twisting them.

(2) Remove screws (7) and take off clearance light and gasket (9). Reverse this procedure to install light.

c. Dome Lights.

(1) To remove dome lights, disconnect wire connector (10, fig. 3-9), remove three screws (2) holding base (4) to roof of compartment. Reverse procedure to install.



1. Shut-off valve and packing nut
2. Packing
3. Cover
4. Elbow
5. Pipe nipple
6. Fuel pump
7. Gasket
8. Tube nut
9. Fuel tube
10. Spring
11. Preformed packing
12. Primer lever
13. Pin
14. Lockwashers
15. Capscrew
16. Ball
17. Thumbnut
18. Sediment bowl
19. Gasket
20. Screen

Figure 3-3. Fuel filter, exploded view.

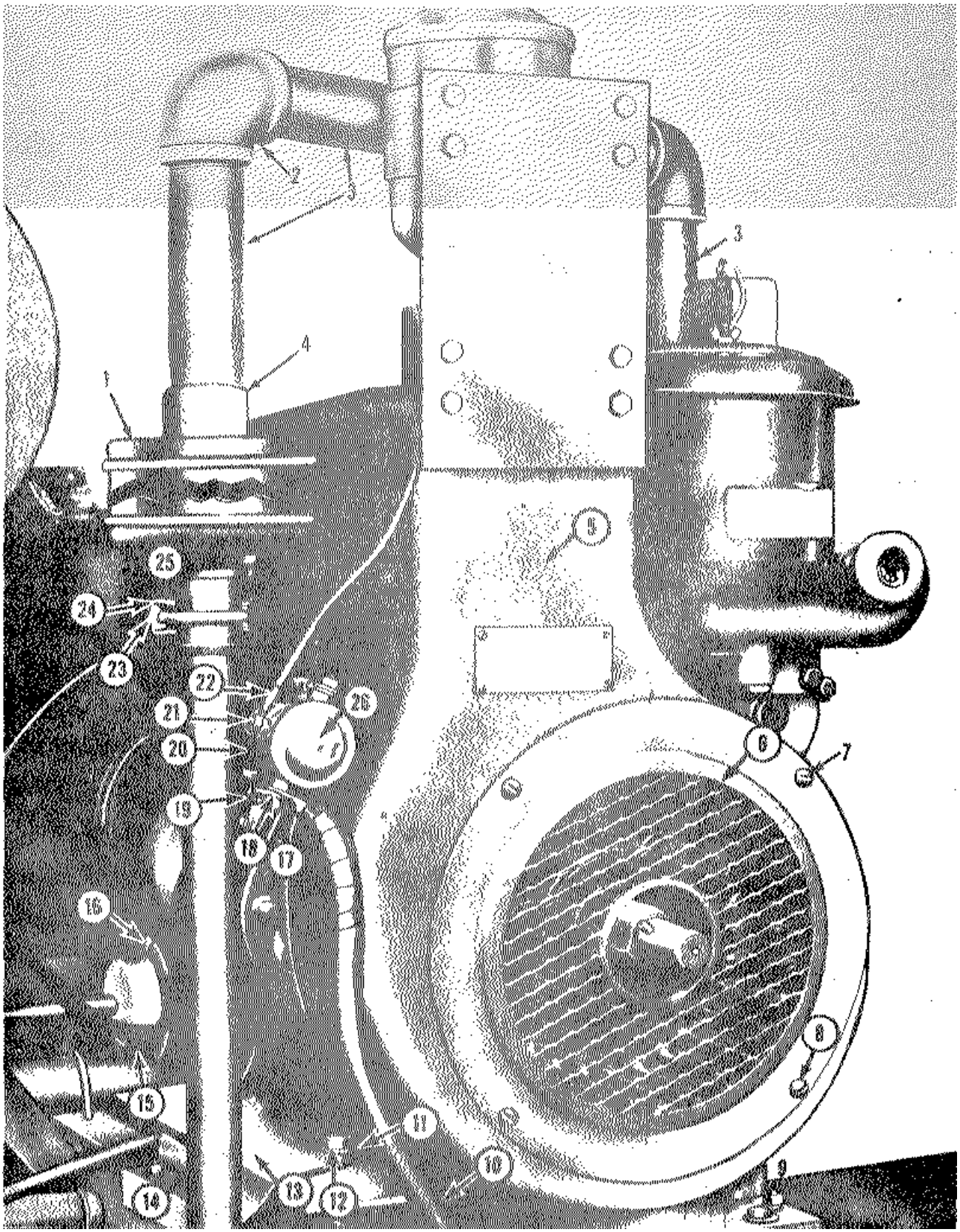


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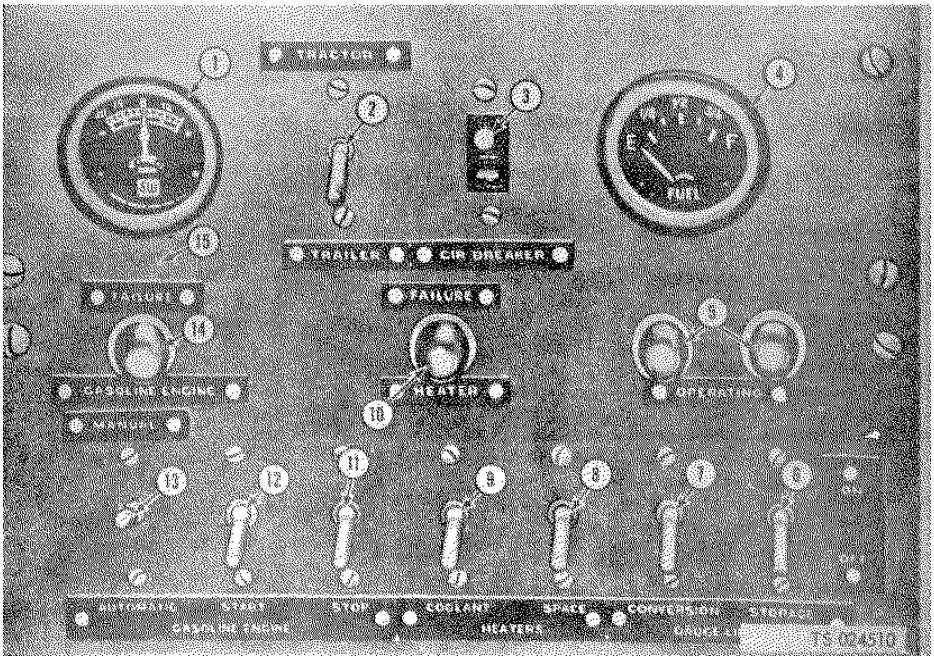
Figure 3-4. Muffler and exhaust pipes.

1. Muffler
2. Elbow
3. Pipe nipple
4. Pipe coupling
5. Shroud
6. Flywheel cover
7. Machine screw
8. Lockwasher
9. Capscrew
10. Battery lead
11. Lockwasher
12. Capscrew
13. Bracket
14. Tailpipe tube
15. Belt tightener mounting
16. Capscrew
17. Nut, terminal, lower
18. Lockwasher
19. Lead
20. Lead
21. Nut, terminal, upper
22. Lead
23. Nut, U-bolt clamp
24. Bracket
25. Clamp (U-bolt)
26. Solenoid

Figure 3-4 - Continued.



1. Ammeter
2. Electrical control switch (tractor or trailer)
3. Circuit breaker
4. Fuel indicator gage
5. Gage lines operating lights
6. Storage vessel gage line switch
7. Conversion vessel gage line switch
8. Compartment heater control switch
9. Conversion heater control switch
10. Conversion heater failure light
11. Gasoline engine manual stop switch
12. Gasoline engine manual starter switch
13. Gasoline engine control switch for automatic or manual control
14. Gasoline engine failure light
15. Engine control panel

(2) To replace lamp, loosen two screws (3) holding lens (5) to base (4), turn lens to remove it, and replace lamp. Reposition lens and tighten screws.

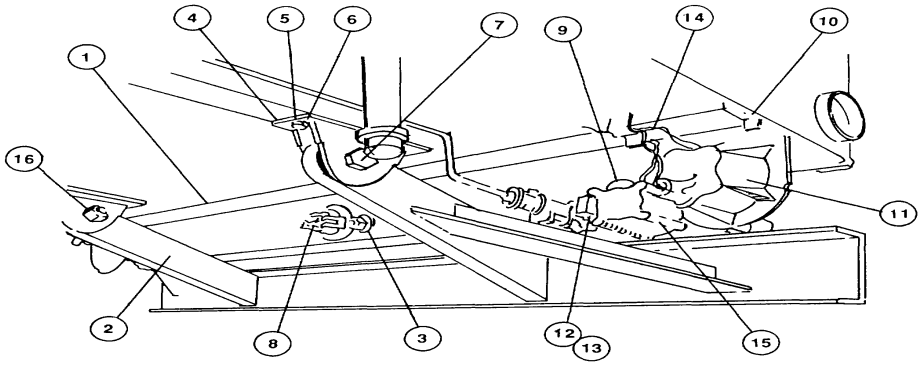
d. Failure and Gage Line Lights

(1) Removal. Tag the wires of the light to be removed. Then remove the nut and lockwasher securing the light to the panel and slide the assembly out the front of the panel.

(2) Cleaning, Inspection, and Repair.

WARNING

Dry cleaning solvent, P-D-680 or P-S661 used to clean parts is potentially dangerous to personnel and property. Use in a well-ventilated area as the fumes are dangerous if inhaled. Avoid repeated and prolonged skin contact. Do not use near open flame or excessive heat. Flash point of solvent is 100F. - 138F. (38C. - 59C.).



1. Frame
2. Bumper assembly
3. Nut
4. Bracket
5. Lockwasher
6. Capscrew
7. Machine bolt
8. Nut
9. Bracket
10. Bracket
11. Service stop and taillight
12. Capscrew
13. Lockwasher
14. Connector
15. Blackout stop and taillight
16. Nut

Figure 3-6. Taillight removal.

Clean with a cloth dampened in a cleaning solvent. Inspect for damaged threads, cracked or broken glass, or any other damage. Replace damaged parts. Reverse removal procedure to reinstall.

(3) Replacing. To replace a burned out lamp, unscrew the lens from the front of the light, replace the lamp and screw the lens back in place.

3-16. Batteries

a. Removal.

(1) Remove the band (4, fig. 3-10) holding the boxes (3) together.

(2) Remove the boxes from the storage compartment. Open the boxes and lift out the batteries and electrolyte containers.

b. Installation.

NOTE

Do not mix military batteries and maintenance-free batteries. Under charge or over charge will result.

(1) Place the two batteries (8, fig. 3-11) in position in the battery holder with the negative (-) terminals (1) on each battery nearest the rear of the unit.

(2) Place the two holddown bars (9) in position on the holddown rods (10) and secure with the four flatwashers (11) and nuts (12).

(3) Position the connector lead (4) with one end on the positive (+) terminal (5) of one battery and the other end on the negative terminal (1) of the other battery.

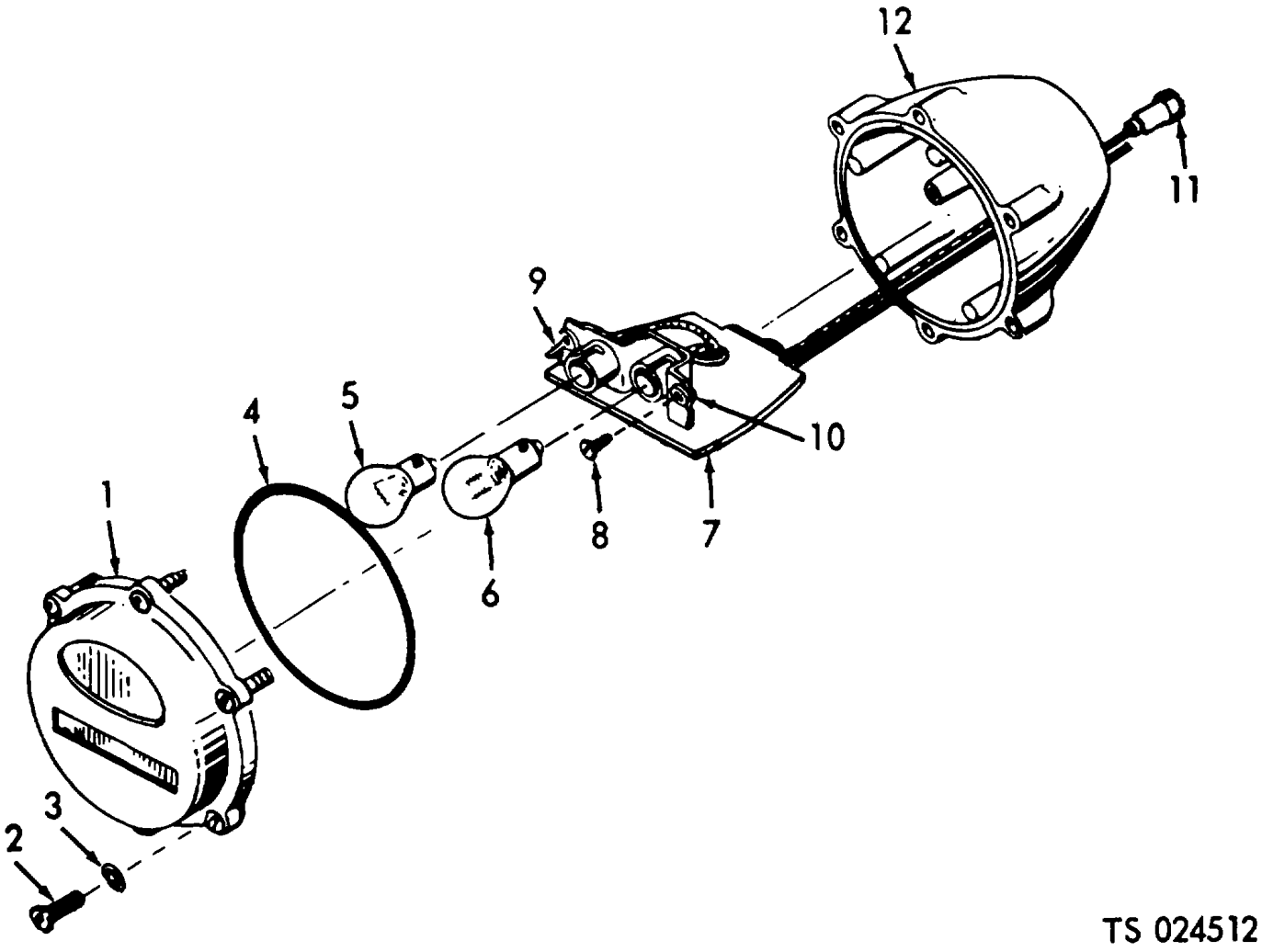
(4) Place the ground lead (2) on the negative terminal (1) nearest the side wall and the solenoid lead cable (7) on the positive terminal (5) of the other battery.

(5) Secure the cables to the four terminals with the four nuts (6).

NOTE

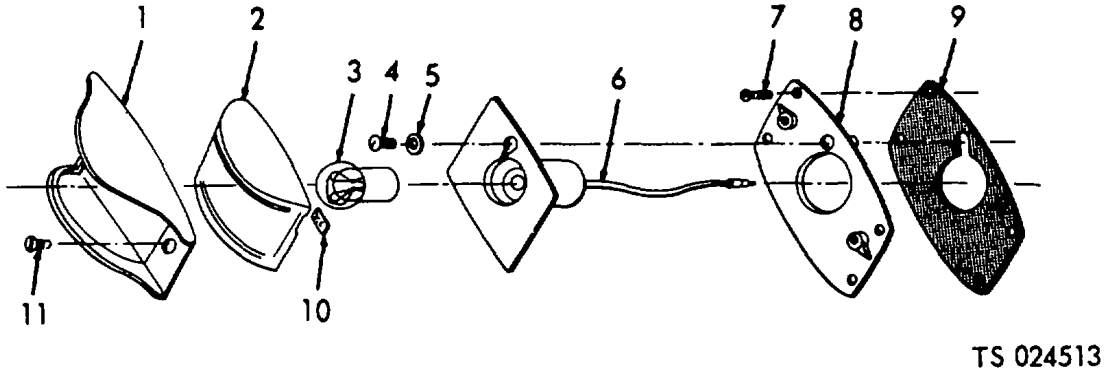
Use an electrolyte with a specific gravity of 1.280. Do not use tropical electrolyte, which will reduce battery reserve capacity.

(6) Remove the twelve cell caps from the batteries and add the electrolyte to each of the cells.



1. Door assembly
2. Machine screw
3. Retaining ring
4. Gasket
5. Lamp
6. Lamp
7. Socket and wiring assembly
8. Machine screw
9. Eyelet
10. Grommet
11. Connector
12. Body

Figure 3-7. Blackout stop and taillight, exploded view.



1. Door
2. Lens
3. Lamp
4. Screw
5. Washer
6. Wiring assembly
7. Screw
8. Base
9. Gasket
10. Spring nut
11. Screw

Figure 3-8. Clearance light, exploded view.

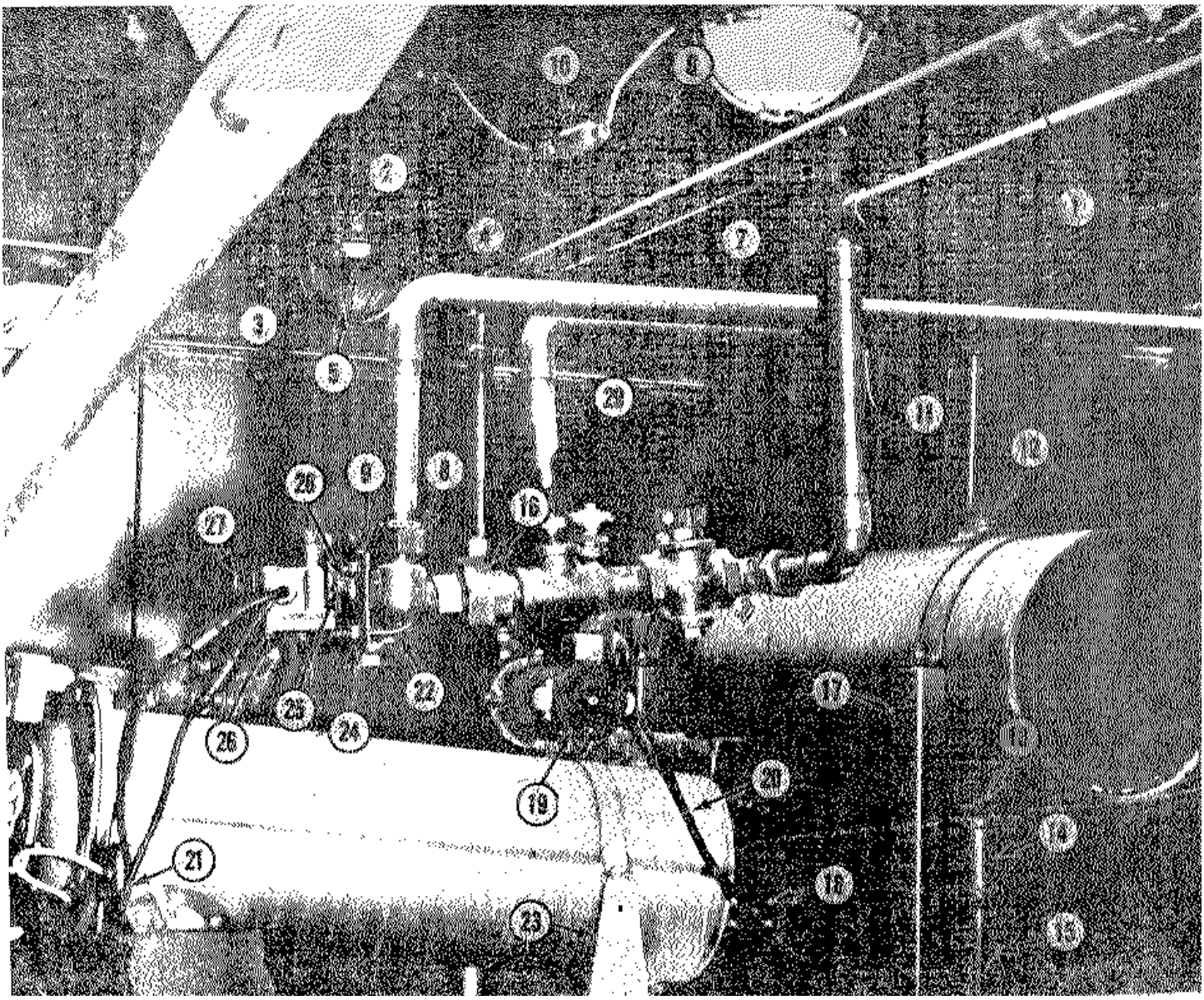
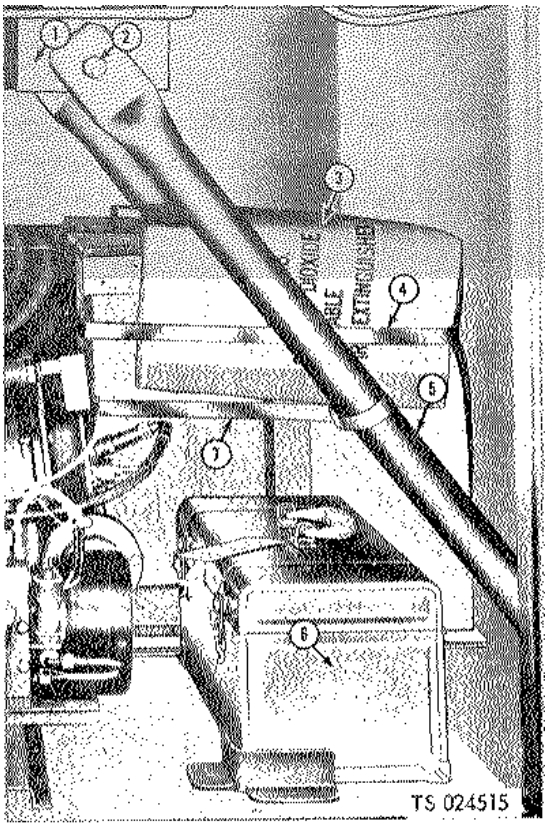


Figure 3-9. Heater compartment and dome lights, installed view.

1. Coolant line
2. Machine screw
3. Machine screw
4. Dome light base
5. Dome light lens
6. Housing
7. Coolant line
8. Tube nut
9. Bracket
10. Connector
11. Coolant line
12. Pipe plug
13. Nipple
14. Tee
15. Nipple
16. Pipe union
17. Saddle stand
18. Capscrew
19. Coolant pump
20. Coolant pump lead
21. Wiring harness
22. U-bolt
23. Bracket
24. Nut
25. Machine screw
26. Limit switch
27. Limit switch cover
28. Lockwasher
29. Coolant line

Figure 3-9 - Continued.



1. Landing jack brace, mounting bracket
2. Capscrew
3. Packing boxes
4. Band
5. Landing jack brace
6. Tool box'
7. Band

Figure 3-10. Electrolyte and batteries stored for shipment

Electrolyte must cover the plates by at least /4 inch (.635 cm).

WARNING

Do not overfill the batteries or splash electrolyte as it is an acid and can cause personal injury.

(7) Replace the twelve cell caps and wash off any acid that may have spilled.

3-17. Power Transfer Equipment

Check that transfer pump drive belt can be deflected no more than 1 in. (2.54 cm) at midpoint by thumb pressure; all other belts, no more than 1/2 in (3.81 cm). Lubricate in accordance with LO 5-3655-210-12.

3-18. Tires And Tubes

Inspect tires for wear, cuts which damage the cords of the carcass fabric, and inflation pressure, which should be 75 pounds per square inch (5.2725 kg per sq cm).

3-19. Pintle

Check that pintle assembly (7, fig. 3-12) unlatches readily and latches easily and securely. Clean as necessary to free up sticky mechanism.

3-20. Landing Gear

Wash or steam clean landing gear for inspection. Check for loose screws and nuts, damaged threads, corrosion, physical damage, leaking lubricant from gear box (7, fig. 3-13). Refer maintenance beyond lubrication to organizational maintenace.

3-21. Winterization Equipment

Operate conversion and storage gage line heater switches (6 and 7, fig. 3-5). If operating lights (5) do not light, replace bulbs as follows: To replace a burned out lamp, unscrew the lens from the front of the light, replace the lamp and screw the lens back in place.

3-22. Data Plates and Instruction Holders

Inspect data, plates for security of mounting and legibility of data. Inspect instruction holders for condition and that current copies of applicable instructions are installed.

3-23. Motor Starter and Protective Devices

Inspect exterior of starter (fig. 3-14) and reversing switch for general condition, loose attaching parts and condition of external wiring.

3-24. Gages, Lines, and Fittings

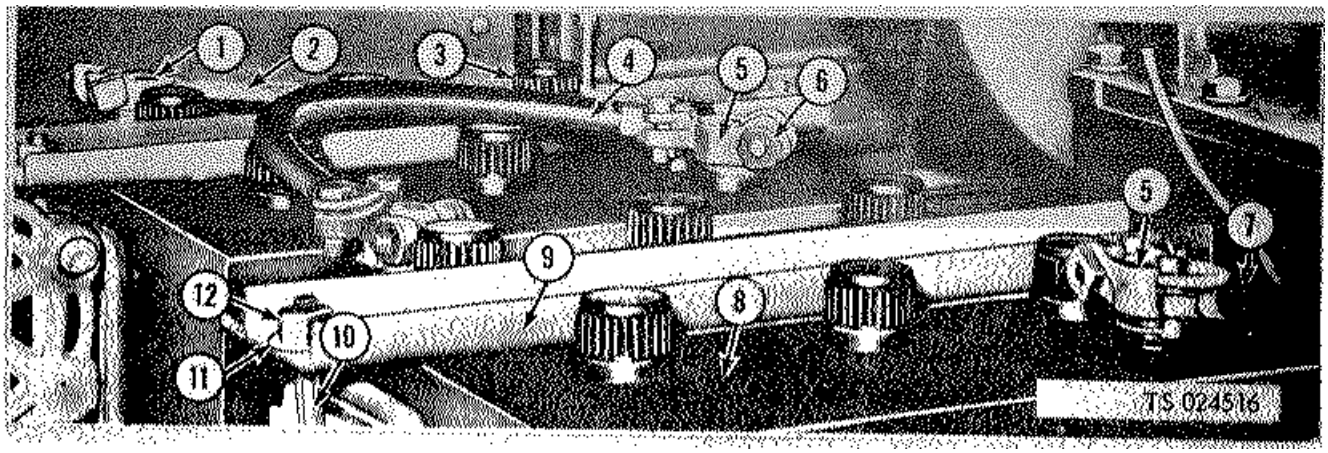
Inspect instruments and gages for proper indication as described, security of mounting and freedom from leakage (if applicable). Inspect gages and associated lines for physical damage.

3-25. Conversion Heater

Inspect heater fluid lines (fig. 3-15) and their fittings for leaks. Check sight glass indications for quantity of heater fluid in tank. Operate heater and check that exhaust from combustion is free of smoke.

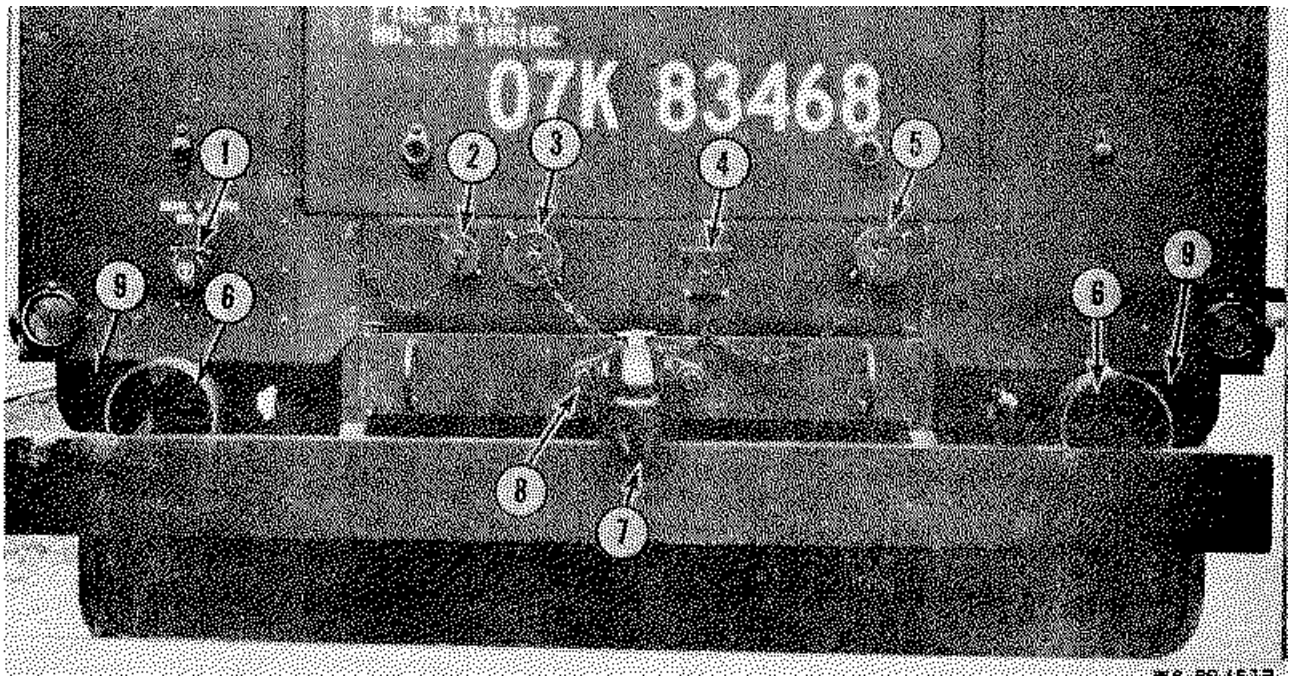
3-26. Cylinder Filling Compressor

a. Service compressor (26, fig. 3-16) according to LO 5-3655-210-12.



1. Negative terminal
2. Ground lead
3. Battery filler cap
4. Connector lead
5. Positive terminal
6. Nut
7. Battery to solenoid lead cable
8. Battery
9. Battery holddown bar
10. Bracket holddown rod
11. Washer
12. Nut

Figure 3-11. Batteries, installed view.



1. 208 v, ac power receptacle
2. Vapor equalizing line
3. Liquid fill line (pump by-pass)
4. 24 v, dc receptacle
5. Liquid fill line
6. Blackout stop and taillight
7. Pintle hook
8. Capscrew
9. Stop and taillight, service

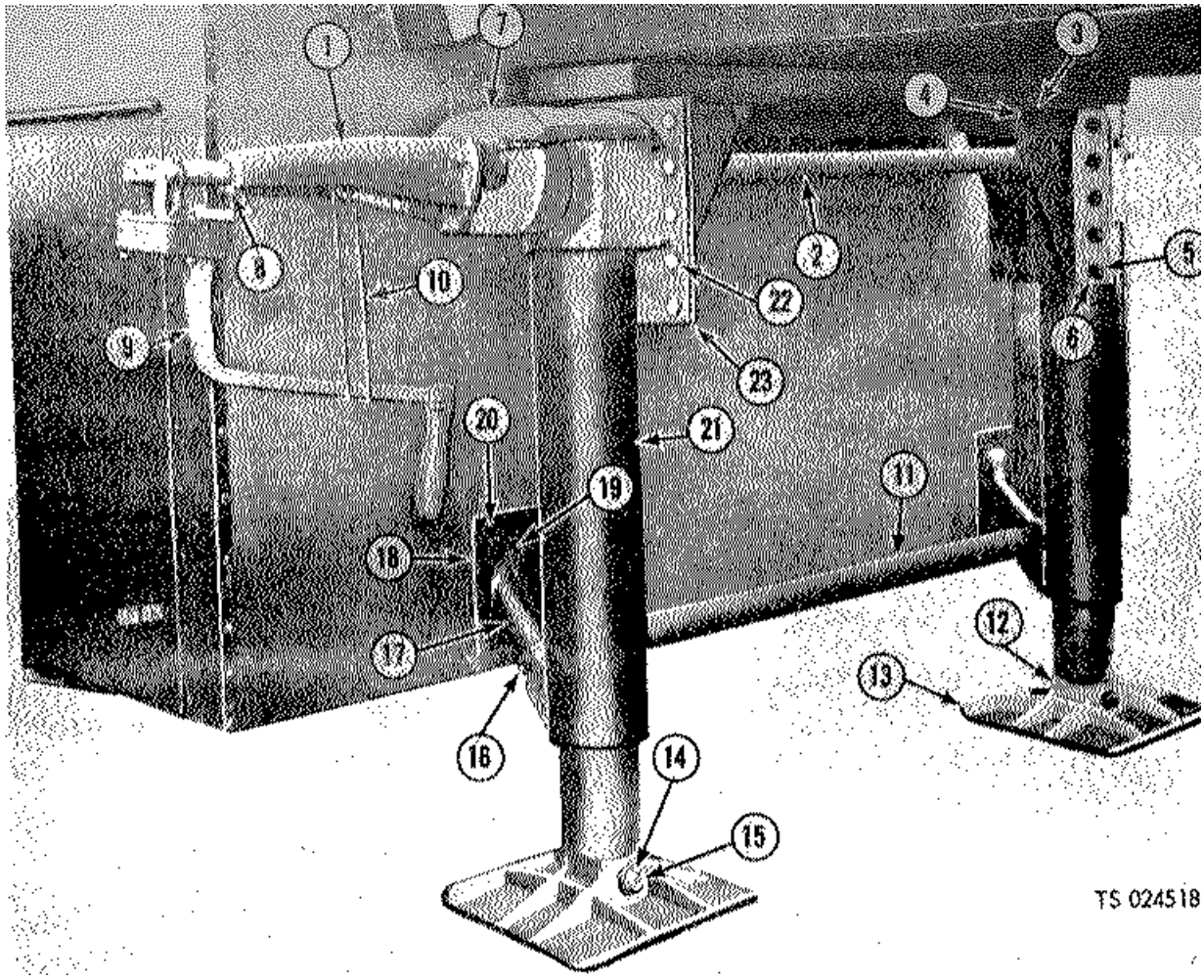
Figure 3-12. Power receptacles, installed view.

b. Inspect all hoses, lines, and fittings for leaks, security of attachment and general physical condition. Look for spurts of C02 snow from compressor packing nut during operation. Tighten nut if necessary.

c. Inspect C02 manifolds, piping and valves (fig. 3-17) for leaks, or damage. See that each valve bears a numbered identification tag.

3-27. Fire Extinguisher

Check that the weight of the hand fire extinguisher (7, fig. 3-18) or (7, fig. 3-19) corresponds to the "full weight" stamped on the body.



1. Shaft support
2. Crankshaft
3. Lockwasher
4. Nut
5. Nut
6. Lockwasher
7. Gear box
8. Fitting
9. Crank assembly
10. Crank holder
11. Cross brace
12. Machine bolt
13. Foot
14. Nut
15. Washer
16. Capscrew
17. Diagonal brace
18. Plate
19. Gasket
20. Screw
21. Landing jack leg
22. Capscrew
23. Bracket

Figure 3-13. Landing gear, installed view.

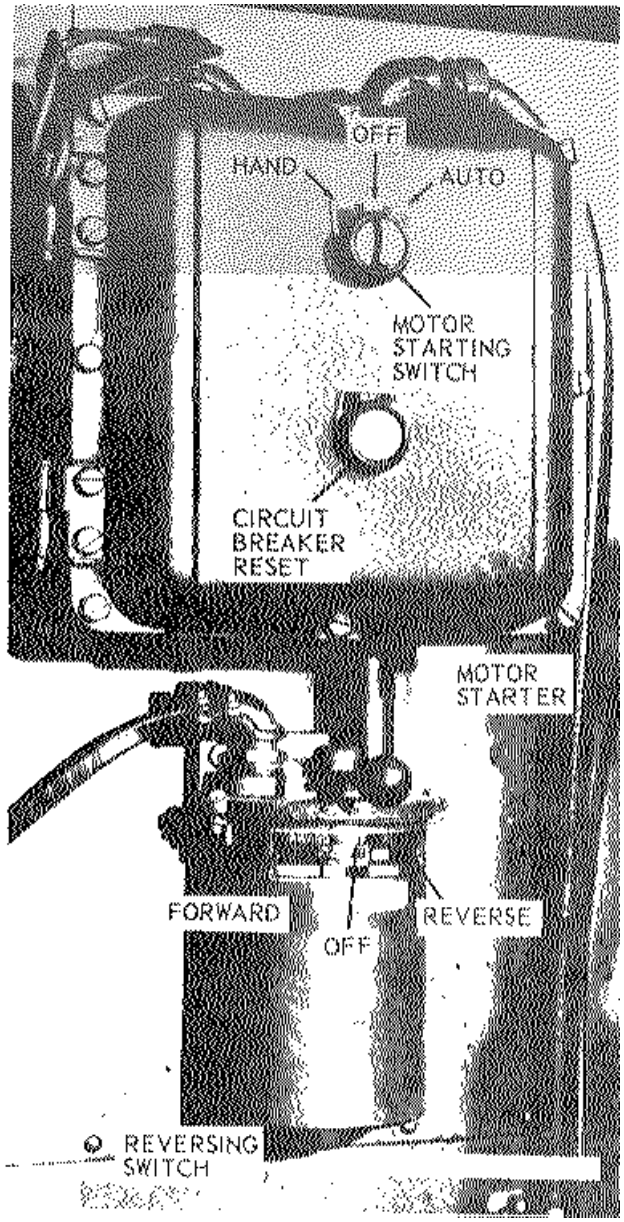


Figure 3-14. Electric motor starter and reversing switch.

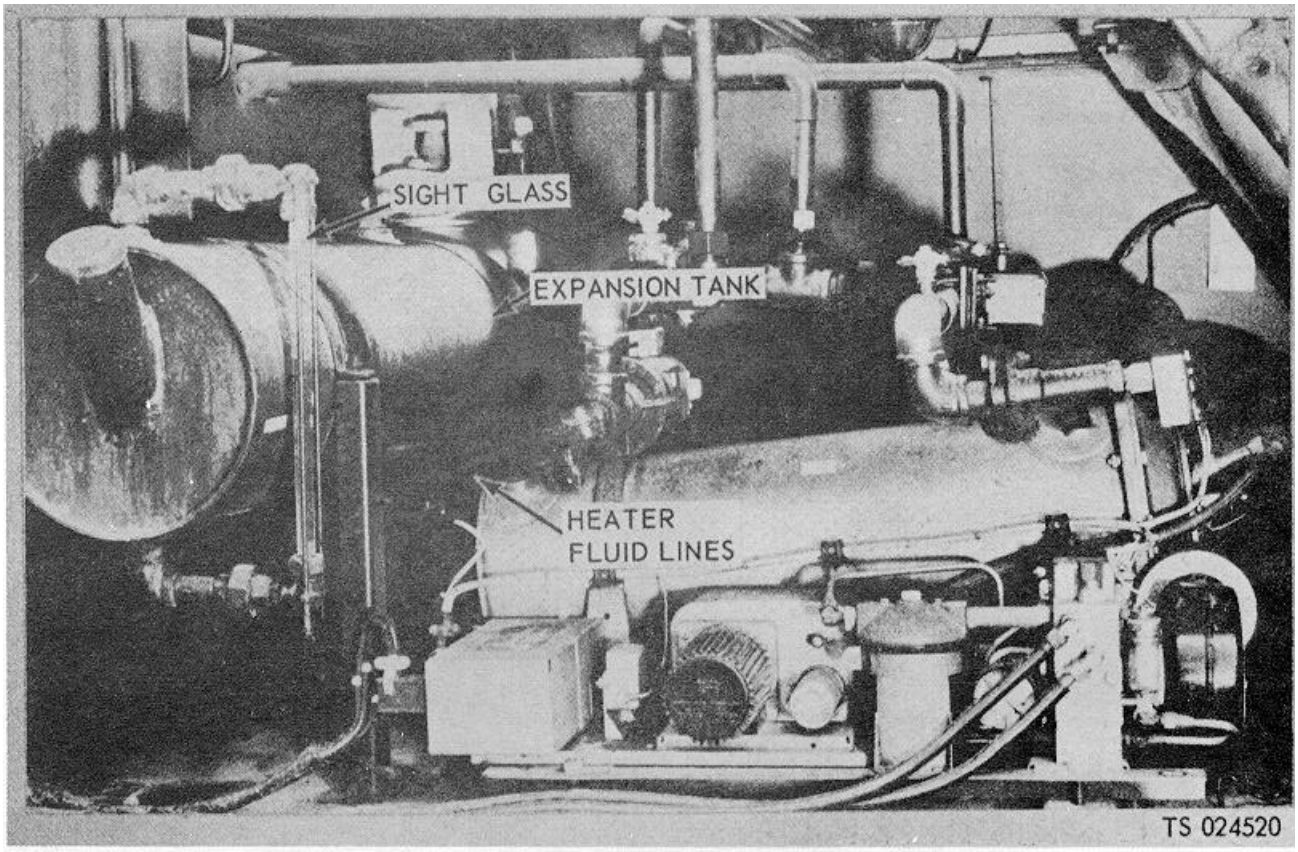


Figure 3-15. Conversion heater, installed view.

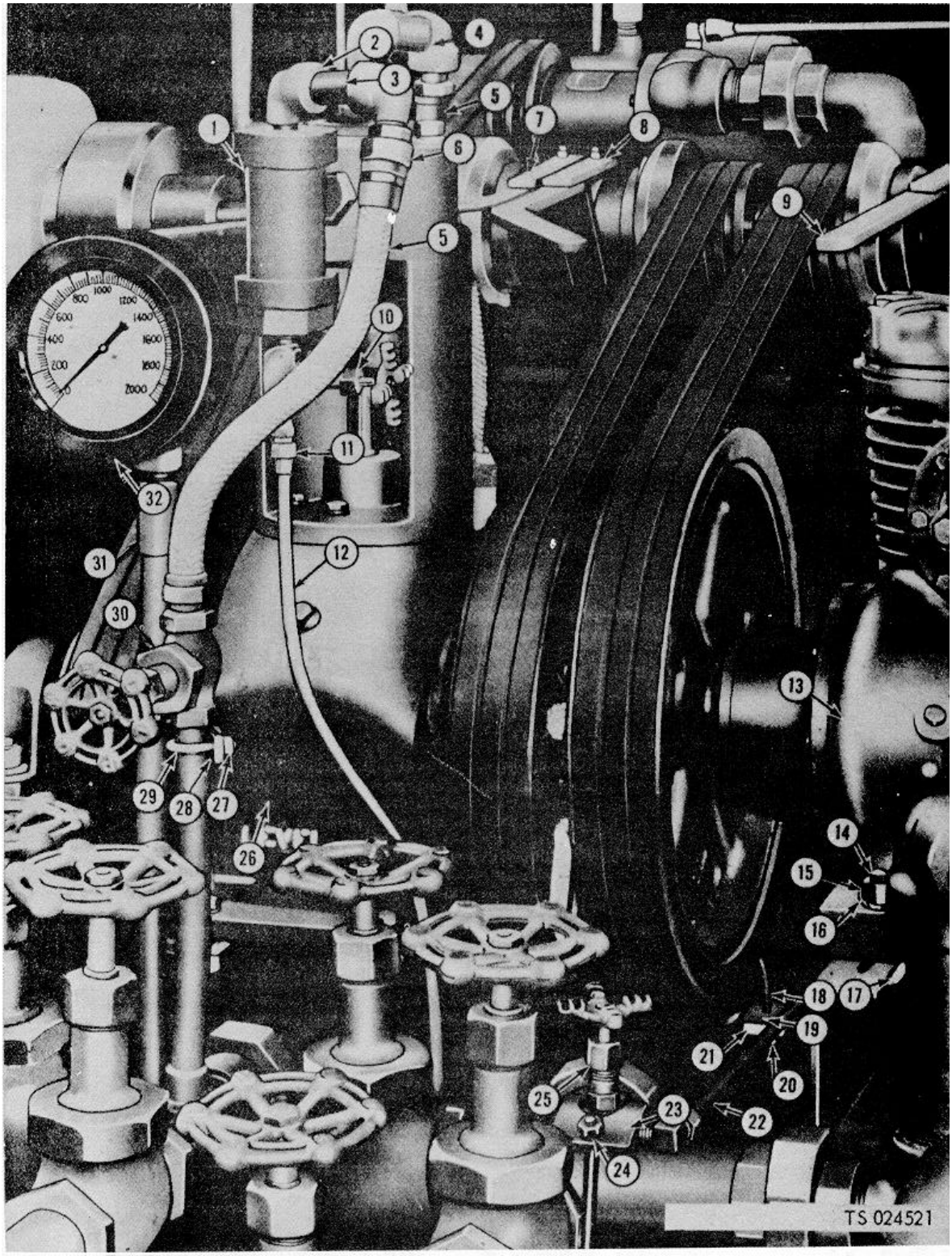
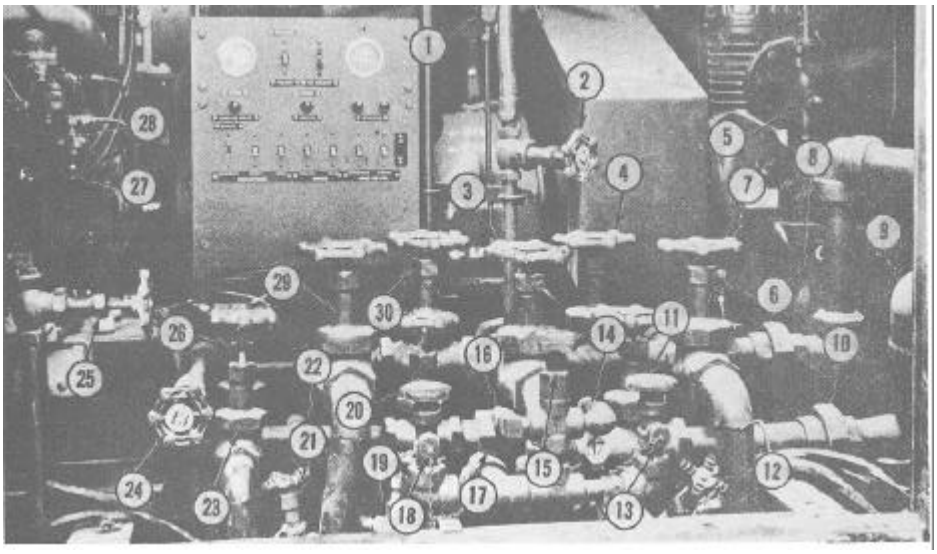


Figure 3-16. Clutch controls, installed view.

1. Strainer
2. Street elbow
3. Pipe nipple
4. Union nut
5. Hose
6. Hose nut
7. Transfer pump clutch shifter
8. Cylinder filling compressor clutch shifter
9. Refrigeration compressor clutch shifter
10. Strainer bleed-off valve
11. Tube nut
12. Bleed-off tube strainer
13. Refrigeration compressor
14. Capscrew
15. Nut
16. Lockwasher
17. Bevel washer
18. U-bolt
19. Frame
20. Nut
21. Bevel washer
22. Transfer pump bleed-off tube
23. Bracket
24. Lockwasher
25. Transfer pump bleed-off valve
26. Cylinder filling compressor
27. Nut
28. Bracket
29. U-bolt
30. Liquid shut-off valve cylinder fill compressor
31. Coupling
32. Cylinder filling pressure gage

Figure 3-16 - Continued.



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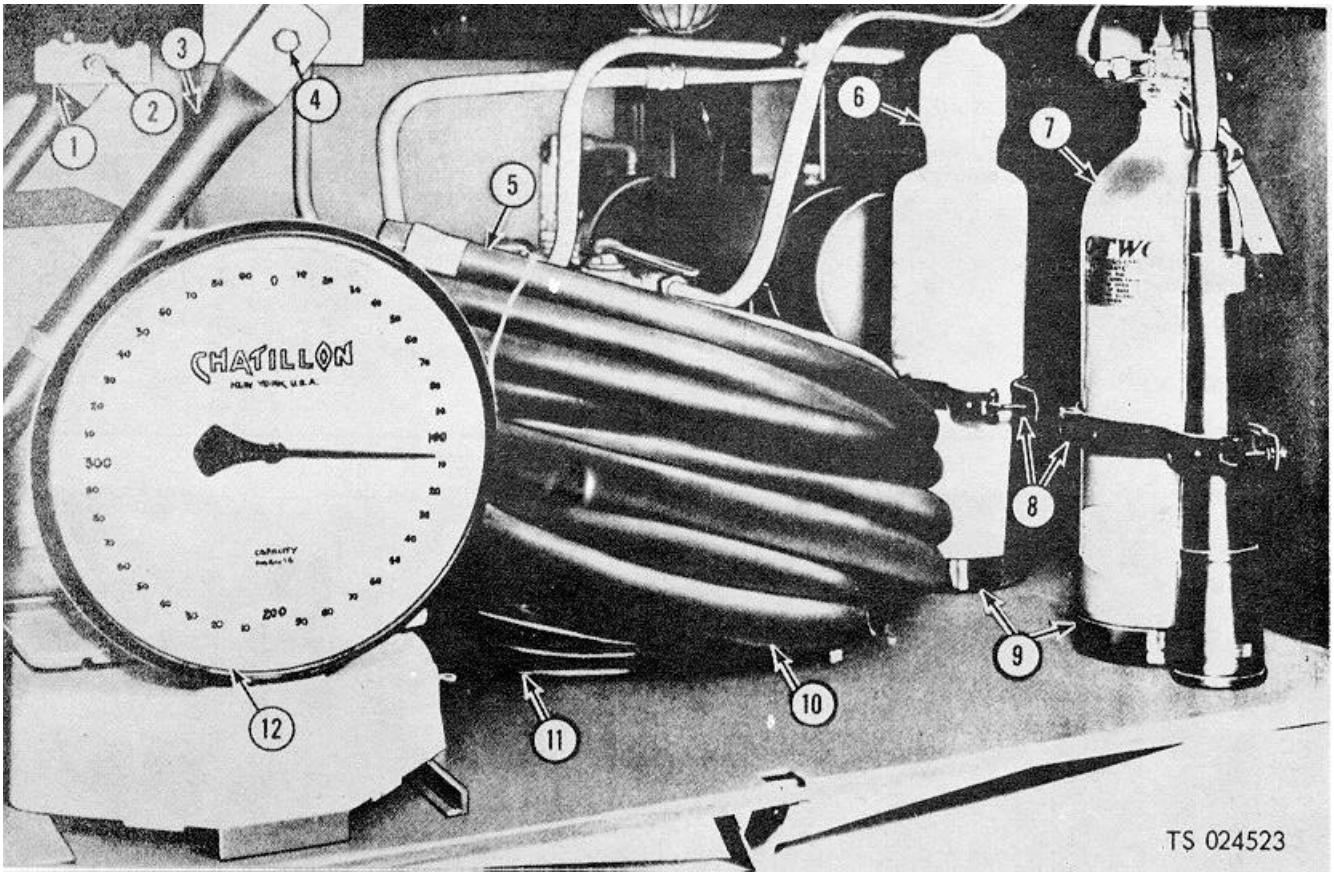
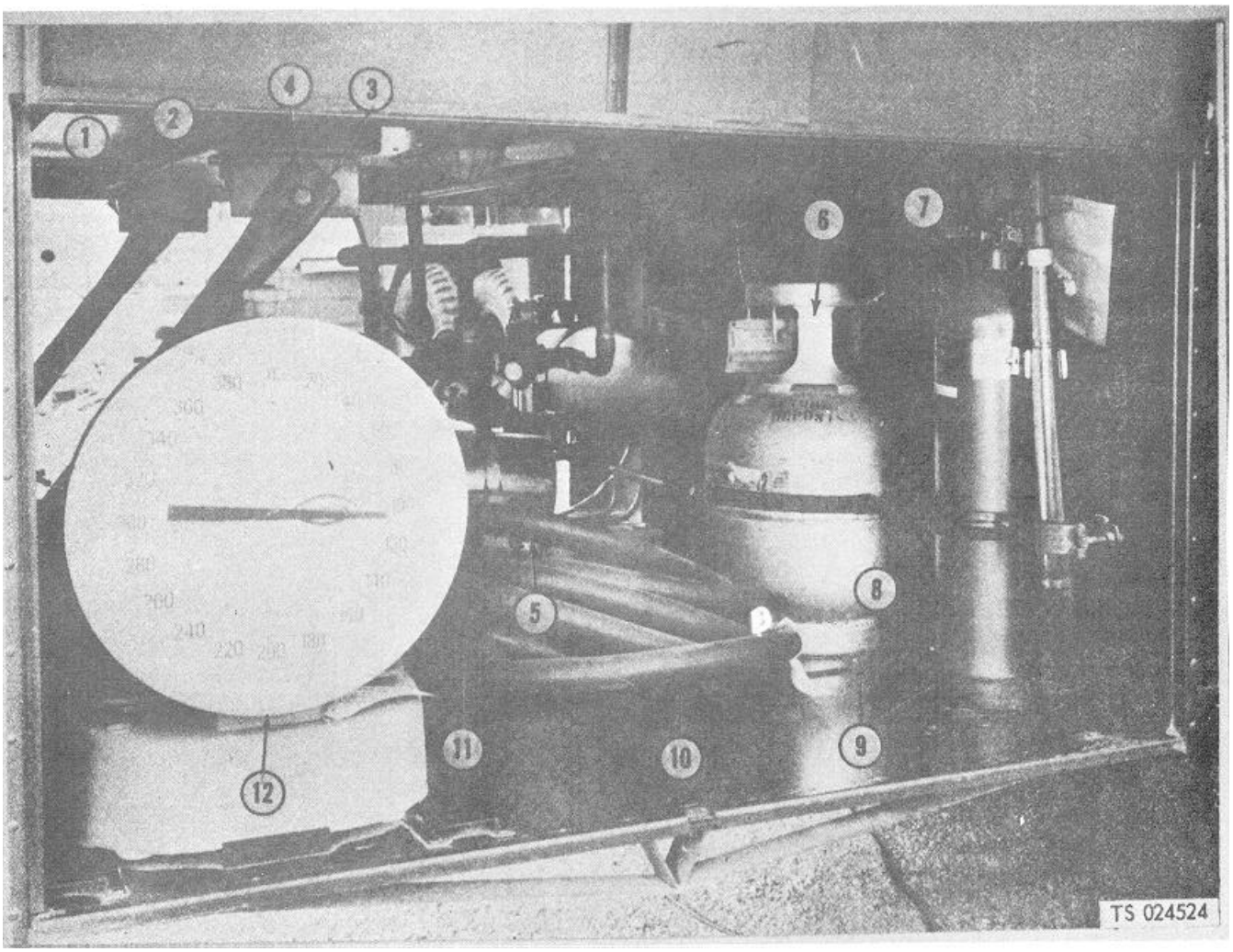
1. Strainer bleed-off valve
2. Cylinder filling compressor liquid shut-off valve
3. Liquid equalizing line valve
4. Dehydrator by-pass valve
5. Refrigerator suction valve
6. Transfer pump bleedoff valve
7. Liquid fill line valve thru pump
8. Receiver tank inlet line
9. Dehydrator
10. Union nut
11. Liquid line shut-off valve, conversion
12. Transfer hose bleed-off valve (thru pump)
13. Cylinder filling valve
14. Tube nut
15. Cylinder fill pressure regulating valve
16. Safety relief valve cylinder fill
17. Union nut
18. Cylinder filling valve
19. Transfer hose bleed-off valve
20. Vapor return valve, conversion
21. Transfer hose bleed-off valve vapor
22. Liquid line vapor relief valve
23. Vapor equalizing line valve
24. High pressure vapor return valve
25. Fire protection valve
26. Vapor return valve, storage
27. Carburetor priming lever
28. Stop pin
29. Liquid fill line valve, by-pass pump
30. Liquid shut-off valve to cylinder filling compressor

Figure 3-17. CO_2 manifolds, installed view.



1. Bracket
2. Nut
3. Brace
4. Capscrew
5. Transfer hose (vapor)
6. Freon tank
7. Fire extinguisher
8. Quick release clamp
9. Holder
10. Transfer hose (liquid)
11. Cylinder filling hoses
12. Scales

Figure 3-18. Storage compartment, face view.



1. Bracket
2. Nut
3. Brace
4. Capscrew
5. Transfer hose (vapor)
6. Freon tank
7. Fire extinguisher
8. Quick release clamp
9. Holder
10. Transfer hose (liquid)
11. Cylinder filling hose
12. Scale

Figure 3-19. Storage compartment face view (ser. nos. L-1666-T through L-1668-T).

CHAPTER 4
ORGANIZATIONAL MAINTENANCE INSTRUCTIONS

Section I. SERVICE UPON RECEIPT OF MATERIAL

4-1. Unloading New Conversion And Storage Unit

a. General. The conversion and storage units are shipped on railroad flatcars, securely blocked (fig. 4-1) and lashed with 1/2 inch (1.27 cm) steel cable or 2 inch (5.08cm) X 0.050 inch (0.127cm) high tension bands. They are completely assembled. To prevent possible loss in transit, the freon gas charge is pumped down from the refrigeration unit to the receiver tank. The crankcases of the gasoline engine, cylinder filling unit, and refrigerating unit are filled to the proper level. The tool box, with tools, and the electrolyte for the batteries, are secured in the storage compartment. The pressure vessels are drained of carbon dioxide liquid and filled with carbon dioxide vapor at 3 to 5 psi (pounds per square inch) (.2109 to .3515 kg per sq cm).

b. Unloading With Lifting Device.

(1) Remove the cables or bands (fig. 4-1) securing the rear of the unit to the flatcar.

(2) Remove the cables or bands securing the front of the trailer.

(3) Remove the blocking from the side of the wheels and the blocking from in front of, and behind the wheels.

(4) If a crane is to be used remove the four lifting eye covers by removing twelve sheet metal screws and lockwashers securing each cover to the tank body.

(5) Remove the insulation blocks from under the covers.

(6) Unscrew four tie-down rings from the trailer and install them in the lifting eye holes at the top of the tank body.

(7) Attach the slings and carefully remove the unit from the flatcar with a crane of ample lifting capacity.

(8) Remove the slings, replace the insulation and secure each cover with the twelve sheet metal screws and lockwashers.

c. Unloading By Use of Ramp.

(1) Place an unloading ramp at the end of the flatcar.

(2) Block the flatcar wheels with 6 x 6 inch (15.24 x 15.24cm) timbers on each side.

(3) Lower the landing jacks to support the weight of the front of the trailer, and remove all tie-down cable or bands, wheel and body blocks, and other bracing.

(4) Back an air brake equipped tractor up to the ramp to the trailer, and couple the tractor air and electrical connections to the trailer. Be sure the condensation drain petcock on the air reservoir is closed, and carefully tow the unit off the flatcar.

4-2. Unpacking New Conversion And Storage Unit Accessories

a. General. Table 4-1 contains a list of separate packed items that are furnished with and are

Table 4-1. Separate Packed Items

National Stock Number	Description	Quantity Furnished w/equip-ment
6140-00-057-2554	Battery, storage, 12V	2 ea.
6150-00-435-2322	Cable, electrical, main-power, 100 ft. (3000cm) w/conn (90129)x8702-17	1 ea.
2540-00-421-1521	Chock, wheel (07464) 3597	2 ea.
6830-00-292-0147	Dichlorodifluoromethane, fed. BB-F-671, type 12, 25 LB. (11.25kg) cylinder.	1 ea.
5975-00-369-9710	Ground, rod assembly w/ wire lug and clamp (07464) 3598.	1 ea.
3655-00-084-0464	Hose assembly, $C0_2$, cylinder filling 1/4"x6" (.635 x 15.24cm) (07464) 126200	2 ea.
3655-00-653-5713	Hose assembly, $C0_2$, transfer, 1" (2.54cm), ID, 50' (1500cm) lg. with 1/2" (1.27cm) cap-tive adapter.	1 ea.
4720-00-653-5717	Hose assembly, $C0_2$, transfer, 1-1/2"(3.81cm) ID, 50' (1500cm) lg. with 3/4" (1.905cm) captive adapter	1 ea.
6670-00-084-0530	Scale, dial indicating, 400 LB (180 kg) (07464) 559381.	1 ea.
6810-00-249-9354	Sulfuric acid, electrolyte	4 gal. (15.2 liters)

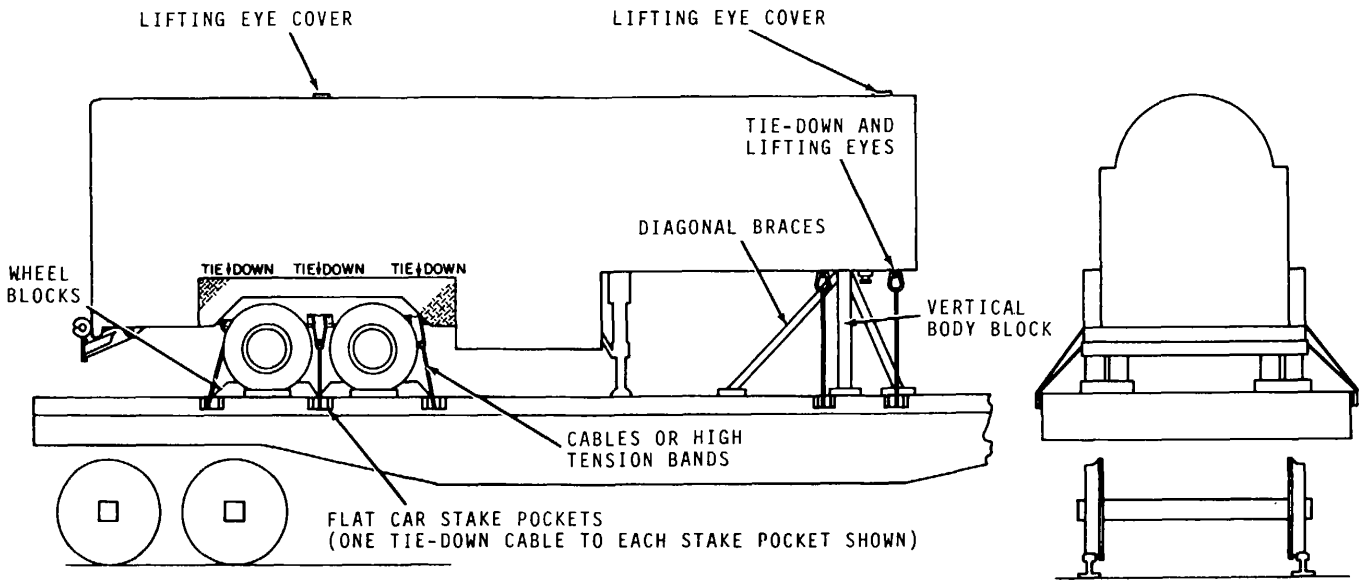
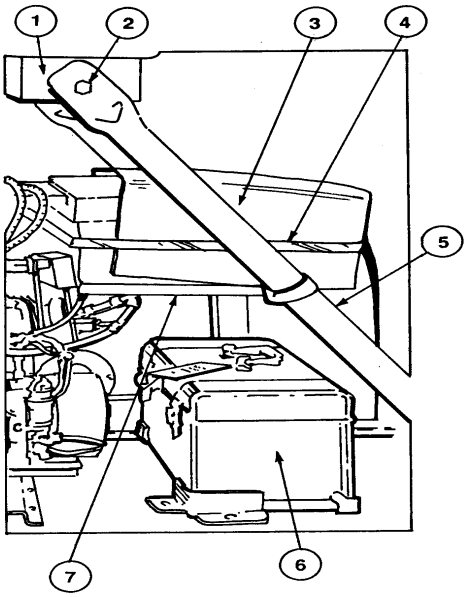


Figure 4-1. Conversion and storage unit tie-down and blocking.



1. Landing jack brace, mounting bracket
2. Capscrew
3. Packing boxes
4. Band
5. Landing jack brace
6. Toolbox
7. Band

Figure 4-2. Electrolyte and batteries stored for shipment.

required to complete an operational end item. This table does not constitute authority for requisitioning purposes. For requisitioning authority, refer to TM 5-3655-210-201 (when printed). The batteries are shipped dry charged. The batteries and electrolyte are packed in separate containers and stored in packing boxes secured in the storage compartment (fig. 4-2).

b. Removal.

(1) Remove the steel band (7, fig. 4-2) securing the boxes and attached to the landing jack braces (5).

(2) Remove the band (4) holding the boxes (3) together.

(3) Remove the boxes from the storage compartment. Open the boxes and lift out the batteries and electrolyte containers.

c. Installation.

NOTE

Do not mix military batteries and maintenance-free batteries. Under charge or over charge will result.

(1) Place the two batteries (8, fig. 4-3) in position in the battery holder with the negative (-) terminals (1) on each battery nearest the rear of the unit.

(2) Place the two hold-down bars (9) in position on the holddown rods (10) and secure with the four flat washers (11) and nuts (12).

(3) Position the connector lead (4) with one end on the positive (+) terminal of one battery and the other end on the negative terminal of the other battery.

(4) Place the ground lead (2) on the negative terminal (1) nearest the side wall and the solenoid lead cable (7) on the positive terminal (5) of the other battery.

(5) Secure the cables to the four terminals with the four nuts (6).

NOTE

Use an electrolyte with a specific gravity of 1.280. Do not use tropical electrolyte, which will reduce battery reserve capacity.

(6) Remove the twelve cell caps from the batteries and add the electrolyte to each of the cells. Electrolyte must cover the plates by at least 1/4 inch (.635 cm).

WARNING

Do not overfill the batteries or splash electrolyte as it is an acid and can cause personal injury.

(7) Replace the twelve cell caps and wash off any acid that may have spilled.

d. Removal of Protective Material and Devices. All the exterior trailer lights and reflectors, and the rear window in the power compartment are covered with masking tape. Remove the tape carefully. Remove the strap securing the rear door.

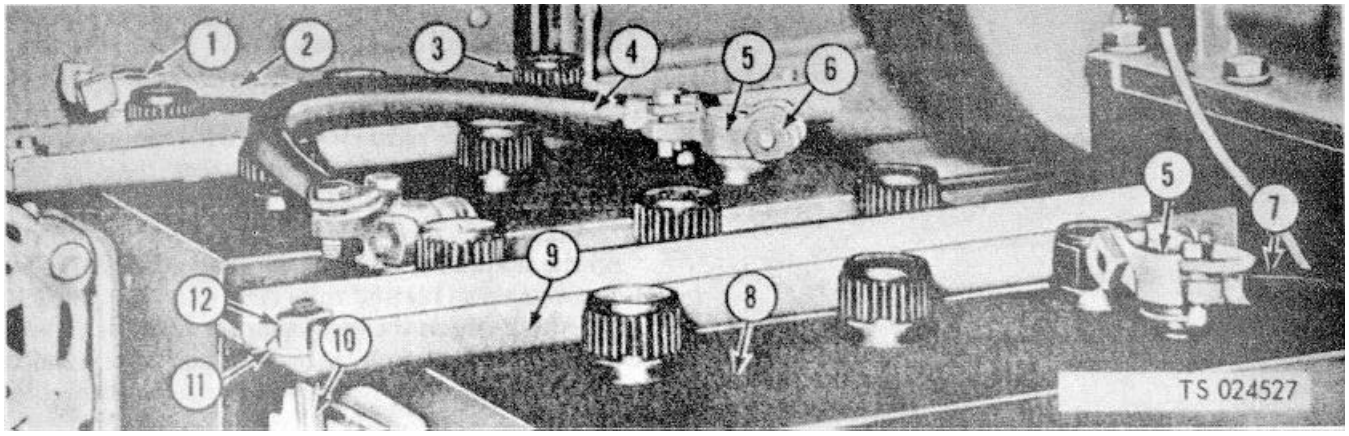
e. Services for Cold Weather Operation. Refer to LO 5-3655-210-12, note 1 and Table 4-2.

Table 4-2. Military Antifreeze Materials Used with Unit.

Ambient Temp–range for use	Compound	Application
All temperatures	MIL–A–11755C Arctic Type Antifreeze, Nonvolatile only.	Conversion heater heat transfer fluid.

NOTE

This fluid is used full strength to transfer heat from the conversion heater to the solid carbon dioxide in the conversion pressure vessel during conversion cycle of the unit. This fluid is used at all ambient temperatures, due to the extreme cold of the solid carbon dioxide being converted to liquid. Under no circumstances is this fluid to be diluted with water or any other substance. In this manual, references to 'heater fluid' refer to MIL-A-11755C Arctic Type Antifreeze.



1. Negative terminal
2. Ground lead
3. Battery filler cap
4. Connector lead
5. Positive terminal
6. Nut, 5/16-18
7. Battery to solenoid lead cable
8. Battery.
9. Battery hold-down bar
10. Bracket hold-down rod
11. Washer, flat, 4/16 in.
12. Nut, 5/16-18

Figure 4-3. Batteries installed view.

4-3. Inspecting And Servicing The Equipment

a. Make a complete inspection of the gasoline engine unit, visually checking for loss or damage which may have occurred in shipment. Inspect the magneto, spark plugs, cables, governor and linkage connections.

b. Check the tension of the belts. Tension is correct when the belts can be depressed by thumb pressure approximately 1-1/2 inches (3.81cm) at the center.

c. With the ignition off, turn the engine over by hand, to make sure that the crank shaft, connecting rods, pistons, and bearings move freely.

d. Make a complete visual check of the electric motor for loss or damage which may have occurred during Shipment.

e. Inspect all electrical terminals for tightness, make certain ground rod assembly is installed.

f. Turn the electric motor over by hand to make sure that all moving parts turn freely.

g. Check the condenser to make sure that all air circulating openings are free from dirt, dust, or other debris.

h. Make a complete inspection of the carbon dioxide transfer pump for loss or damage that may have occurred during shipment.

i. Turn the transfer pump by hand to make sure that all parts turn freely.

j. Inspect the cylinder filling unit for loss or damage during shipment.

k. Turn the cylinder filling unit pulley by hand to make sure that it turns freely.

l. Inspect the power train for damage.

m. Check the clutches for ease of operation.

n. Inspect the scale, fire extinguisher, freon tank, and transfer and cylinder filling hoses for damage during shipment.

o. Check the tools and toolbox for loss or damage.

p. Check the conversion heater and expansion tank for damage.

q. Check all the gages for any damage that may have occurred during shipment.

r. Report any loss or damage on DD Form 6 (Report of Damage or Improper Shipment) or report to the proper authority.

4-4. Installation

a. General. Move the conversion and storage unit to its operating location with a suitable tractor. If the equipment is located on marshy ground or ground with a high sand content, wood platforms should be constructed under the trailer wheels and under the landing jacks. Disconnect the tractor air lines and electrical cable from the trailer. When the tractor air lines are disconnected the trailer is in emergency braking condition and should not be moved. Release the towing pintle and remove the tractor. Remove the wheel chocks from the fenders and position them under the trailer wheels. Lower the landing jacks, if necessary, to level the trailer as the liquid level gages will not work if the trailer is not level.

b. Refrigeration System. Remove valve cover caps and open all valves necessary to allow refrigerant to

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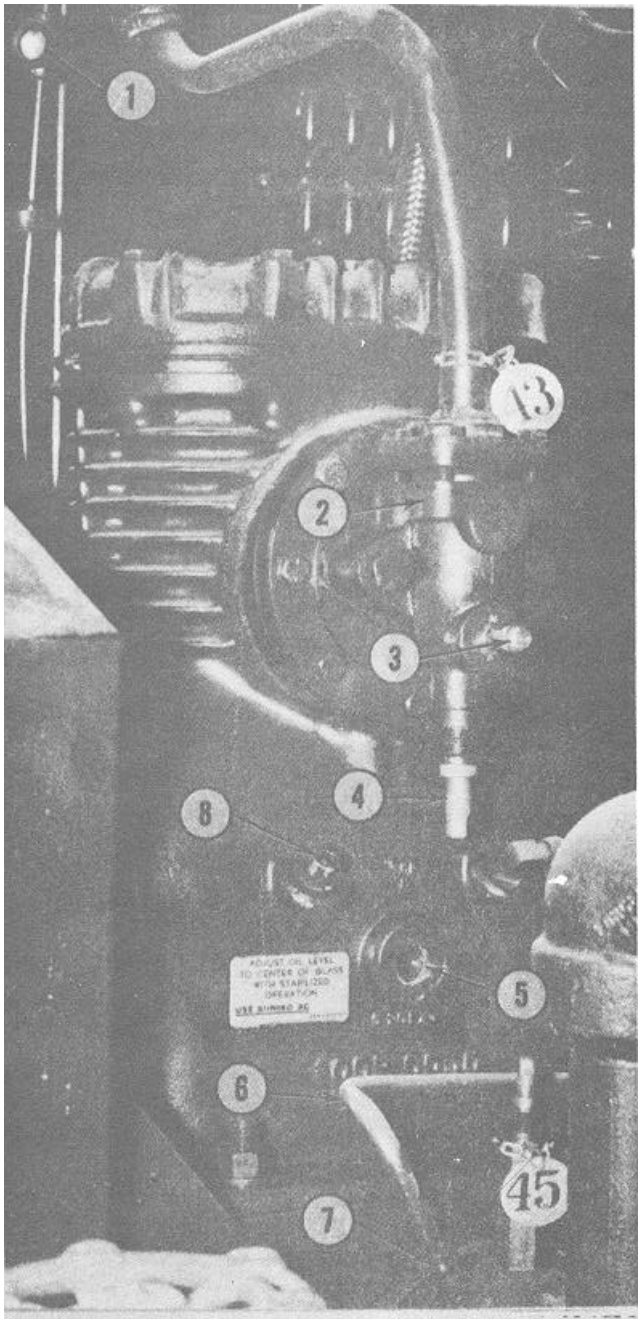
circulate through the refrigeration system. Observe the refrigerant sight glass (1, fig. 4-4), after approximately five minutes of operation the sight glass should not show arty gas bubbles. Bubbles indicate an insufficient charge of refrigeration.

c. Check carefully for wear of the pillow block bearing, frayed or excessive wear of the drive belts, and defective gages. Check thoroughly for loose lines and bolts. Check the electrical wiring for wear or loose connections. Check all valves and piping for damage. Check the batteries for proper electrolyte level. Check battery cables for looseness or excessive wear.

4-5. Maintenance And Operating Supplies

A list of maintenance and operating supplies required for initial operation of the conversion, storage and charging plant are contained in Table 4-3.



1. Refrigerant sight glass
2. Suction valve
3. Freon charging port
4. Suction valve shut-off
5. Oil level sight glass
6. Receiver tank inlet line
7. Receiver
8. Oil filler plug

Figure 4-4. Refrigeration compressor, installed view.

Table 4-3. Maintenance and Operating Supplies

(1) Component application	(2) National Stock Number	(3) Description	(4) Quantity required f/initial operation	(5) Quantity required F/8 hrs operation	(6) Notes
CRANKCASE		OIL, LUBRICATING 5 gal (19 liters) can as follows:			(1) Includes quantity of oil to fill engine oil system as follows: 3-1/2 qt crank-case 1 qt (.95 liters) Oil Filter.
	9150-00-265-9435 (2)	OE-30	3-1/2 qt (3.325 liters)	(3)	
	9150-00-265-9428 (2)	OE-10	3-1/2 qt	(3)	(2) See C9100-11 for additional data and requis-itioning procedure.
	9150-00-242-7603 (2)	OES	3-1/2 qt	(3)	
AIR CLEANER		OIL LUBRICATING (4)	½ (.475 liters)	(3)	(3) See current L.O. for grade application and replenishment intervals.
FUEL TANK	9130-00-160-1818 (2)	FUEL, GASOLINE: Bulk as follows: Automotive combat Grade 91A	20 gal(5) (76 liters) 18 gal (68.4 liters)		(4) Use oil as prescribed in Item 1.
CONVERSION VESSEL	6830-00-160-1818 (2)	CARBON DIOXIDE: Solid 50 lbs (22.5 kg) blocks	4,000 lbs(5) (1800 kg) 12,000 lbs		(5) Tank capacity.
	6830-00-292-0142	CARBON DIOXIDE: 50 lb cylinders (22.5 kg)	(5400 kg)		
REFRIGERANT COMPRESSOR CRANKCASE	9150-00-292-9657 (2)	LUBRICATING OIL: Refrigerant com-pressor RC02	2-1/2 qt (2.375 liters)	(3)	
HEATER EXPANSION TANK	6850-0174-1806	ANTIFREEZE: artic Grade 55 gal (209 liters) drum	10 gal (38 liters)		
CYLINDER FILLING COMPRESSOR CRANK CASE	9150-00-265-9435 (2)	OIL, LUBRICATING: 5 GAL (19 liters) drum as follows: OE-30			
	9150 0265-9428 (2)	OE-10	5 qt (4.75 liters)	(3)	
	9150-00-242-7603 (2)	OES	5 qt	(3)	

(1) Component application	(2) National Stock Number	(3) Description	(4) Quantity required f/initial operation	(5) Quantity required F/8 hrs operation	(6) Notes
GREASE PAINTS		GREASE, BALL AND BEARING: 1 lb (.45 kg) can as follows:			
		BR, 1 lb (.45 kg)		(3)	
	9150-00-526-4502 (2)	GREASE, AUTOMOTIVE AND ARTILLERY: 5 lb (2.25 kg) can as follows:			
	9150-0190-0905 (2)	GAA, 5 lb (2.25 kg)		(3)	
REFRIGERATION SYSTEM	6830-0(-292-0147	DICHLORODILFLUORO-METHANE: Refrig-erant Type R12 25 lbs (11.25 kg) Fed BB-F-671 lb cyl			

Section II. MOVEMENT TO A NEW WORKSITE

4-6. Dismantling for Movement

a. The conversion and storage unit is completely self-contained and required no disassembly in moving to a new location.

b. Stow the transfer hoses, electrical power supply extension cable, ground rod assembly and tools in the storage compartment.

c. Couple the towing tractor to the trailer and connect the air and electrical lines of the tractor to the trailer.

d. Raise the landing jacks.

e. Check the brakes and lights to see if they function properly.

f. Remove the chocks from under the trailer wheels and stow them in the storage racks located on the fenders.

g. Close and secure the doors and shutters.

h. The unit is now ready to be moved to a new work site.

4-7. Reinstallation After Movement

a. General. Move the conversion and storage unit to its operating location with a suitable tractor. If the equipment is located on marshy ground or ground with a high sand content, wood platforms should be constructed under the trailer wheels and under the landing jacks. Disconnect the tractor air lines and electrical cable from the trailer. When the tractor air lines are disconnected the trailer is in emergency braking condition and should not be moved. Release the towing pintle and remove the tractor. Remove the wheel chocks from the fenders and position them under the trailer wheels. Lower the landing jacks, if necessary, to level the trailer as the liquid level gages will not work if the trailer is not level.

b. Refrigeration System. Remove the caps and open the inlet line (6, fig. 4-4) and outlet shut-off valve on the receiver tank (7) to allow the refrigerant to circulate through the refrigeration system. Check that the refrigerant sight glass (1) is full of refrigerant, indicating an adequate charge.

Section III. REPAIR PARTS, SPECIAL TOOLS AND EQUIPMENT

4-8. Tools And Equipment

Tools, equipment and repair parts issued with or authorized for the conversion, storage, and charging unit are listed in TM 5-3655-210-20P.

4-9. Special Tools And Equipment

No special tools or equipment are required by organizational maintenance personnel for the maintenance of the conversion, storage and charging unit.

4-10 Maintenance Repair Parts

Repair parts and equipment are listed and illustrated in the repair parts and special tools list covering organizational maintenance for this equipment in TM 5-3655-210-20P.

Section IV. LUBRICATION INSTRUCTIONS

4-11. General Lubrication Information

This section contains lubrication instructions which are supplemental to and not specifically covered in the lubrication order.

4-12. Detailed Lubrication Information

a. Care of Lubricants. When lubricating the conversion and storage unit, care must be taken in handling and applying the various lubricants. The containers which house the lubricants must be free of dust, dirt, and water. Clean the lubrication equipment before and after it is used. Close the containers tightly after use, and keep in a protected place.

b. Cleaning. Clean the lubrication fittings, breathers, and other points by wiping with a cloth dampened in a cleaning solvent before lubrication. In making repairs, clean all parts with a cleaning solvent, and dry before they are lubricated.

c. Points of Lubrication. Service the lubrication points at proper intervals as illustrated in current lubrication order.

d. OES Oil

(1) Crankcase oil level must be checked frequently, as oil consumption may increase.

(2) Oil may require changing more frequently than usual because contamination by dilution and sludge formation will increase under cold weather

operation conditions. Apply the lubricant as directed by figure 3-1.

e. Refrigeration System. The refrigerant must be pumped down into the receiver tank before adding or changing the compressor crankcase lubricating oil.

f. Adding or Changing the Compressor Crankcase Lubricating Oil.

CAUTION

Pump down the compressor before opening the crankcase filler plug.

(1) To drain the oil, remove one of the bottom capscrews and remove the filler plug (8, fig. 4-4) to allow the oil to drain freely.

(2) After the oil has drained, replace the capscrew in the bottom of the compressor. Fill with the proper lubricant to the level of the sight glass (5) and replace the filler plug.

(3) Open the inlet (6) and outlet shut-off valves on the receiver tank (7) to allow the refrigerant to recirculate through the system.

(4) Place the unit in operation and inspect the oil level in approximately 30 minutes. Add more oil, if necessary, using the above procedure.

4-13. Brake System Detailed Lubrication Information

Sparingly grease friction surfaces of camshaft (fig. 4-5), cam roller and cam, and anchor pins by direct application of grease to camshaft supports, fittings as shown.

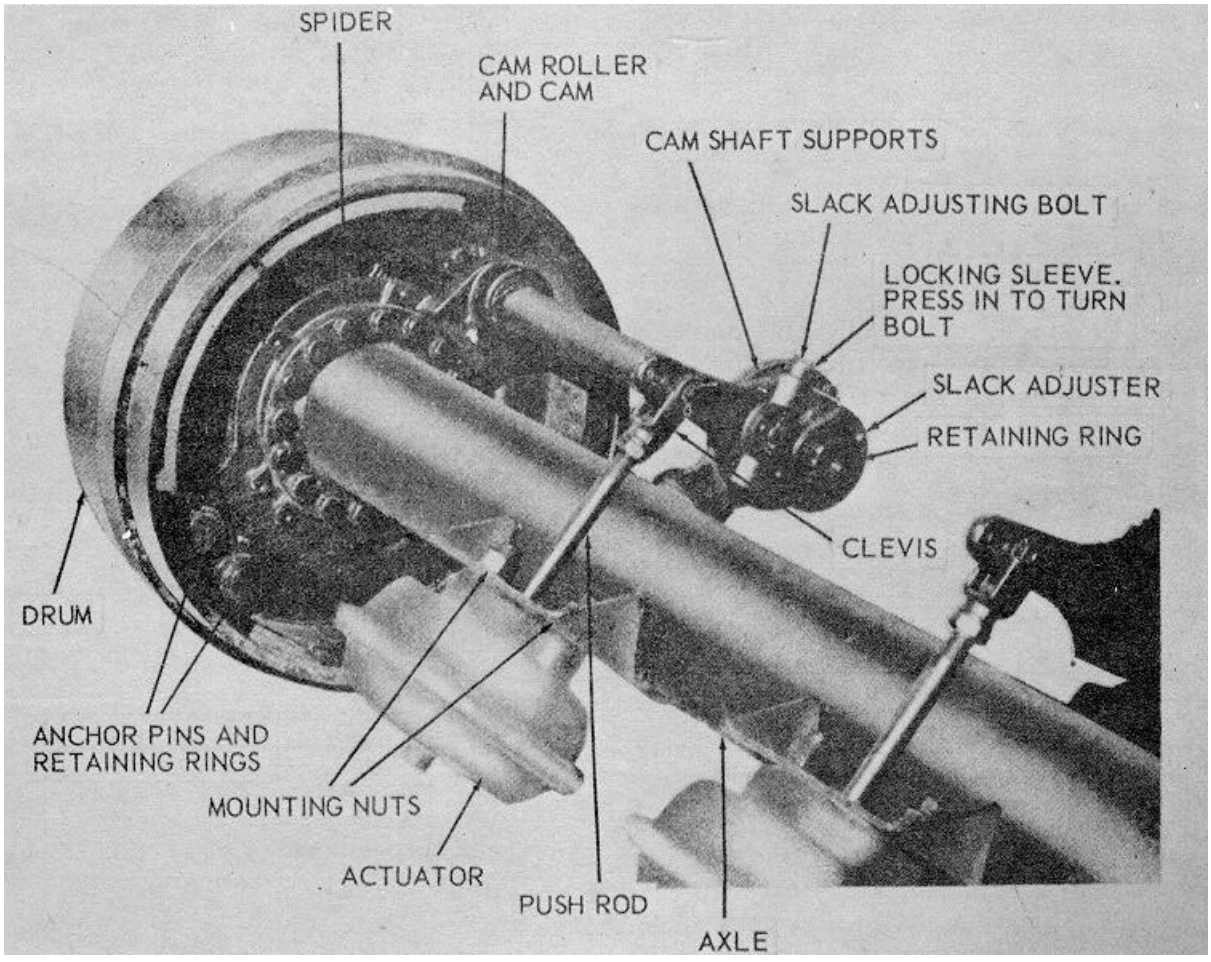


Figure 4-5. Axle with brake system parts removed

Section V. PREVENTIVE MAINTENANCE CHECKS AND SERVICES

4-14. General

To insure that the conversion and storage unit is ready for operation at all times, it must be inspected systematically so that defects may be discovered and corrected before they result in serious damage or failure. The necessary preventive maintenance services to be performed are listed in Table 4-4. Item numbers indicate the sequence of minimum inspection requirements. Defects discovered during operation of the unit shall be noted for future correction to be made as soon as operation has ceased. Stop operation immediately if a deficiency is noted which would damage the equipment if operation were continued. All deficiencies and shortcomings will be recorded together with the corrective action taken on DA Form 2404 (Equipment Inspection and Maintenance Worksheet) at the earliest possible opportunity.

4-15. Preventive Maintenance Checks And Services

a. This paragraph contains an illustrated tabulated listing of preventive maintenance services which must be performed by organizational maintenance personnel at quarterly intervals. A quarterly interval is equal to 3 calendar months, or 250 hours of operation, whichever occurs first.

b. The item numbers are listed consecutively and indicate the sequence of minimum requirements. Refer to Table 4-4 quarterly preventive maintenance services.

Table 4-4. Organizational Preventive Maintenance Checks and Services.

Q-Quarterly
Total man-hours required: 9.0

Sequence number	Item to be inspected procedure	Work time (M/H)
1	BATTERIES: Test and service batteries per TM96140-200-15.	0.4
2	ENGINE GOVERNOR: Check and adjust governor setting. (para 4-25)	0.5
2	IGNITION SYSTEM Clean, adjust or replace breaker points Set timing Set spark plug gap to 0.030 in (.0762cm)	1.0
2	GASOLINE ENGINE: Refer to paragraph 4-64 and remove shrouding Clean crankcase passages, shrouds, fan and cooling fins with dry compressed air.	1.0
3	ELECTRIC MOTOR: Report overheating or noises to direct support maintenance Adjust belt tension to 1-1/2 in (3.81cm) max deflection at midspan.	1.5
4	EXPANSION TANK: Maintain level Add MIL-A-11755C Artic Type Antifreeze only.	0.8
5	COUNTERSHAFT CLUTCHES: Test operation Adjust as required (para 4-91).	1.0
6	GENERATOR: Adjust belt tension to 1-1/2 in. (3.81cm) deflection at midspan. (apply thumb pressure)	1.5
7	REFRIGERATION UNIT: Clean dirt from condenser fins with dry compressed air.	0.8
8	CYLINDER FILLING UNIT: Adjust packing nut, if leaking. Adjust belt tension to 1-1/2 in. (3.81cm) deflection at midspan by applying thumb pressure 9	0.5
9	STORAGE VESSEL LINES, FITTINGS AND VALVES: Pressure test storage vessels, lines, fittings and valves by pressurizing with gaseous carbon dioxide and isolating by closing all valves. A drop of pressure registered on pressure gages will indicate a leak.	

Q-Quarterly
Total man-hours required. 9.0

Section VI. TROUBLESHOOTING

4-16. General

a. This section contains troubleshooting information for locating and correcting most of the operating troubles which may develop in the conversion, storage and charging unit. Each malfunction for an individual component, unit, or system is followed by a list of tests or inspections which will help to determine probable causes and corrective actions to be taken. Perform the tests/inspections and corrective action in the order listed.

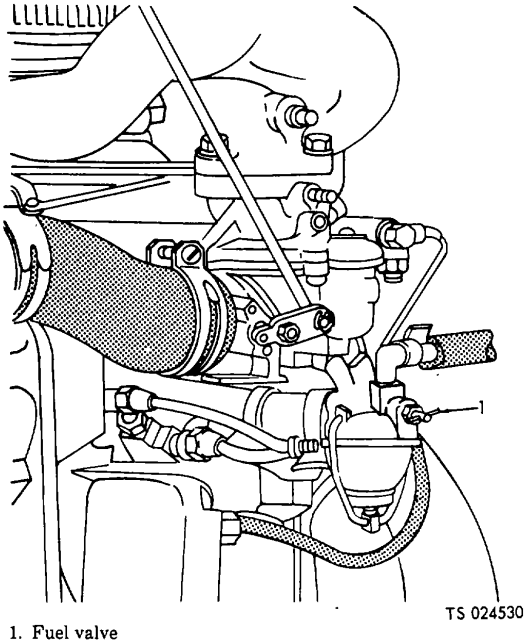
b. This manual cannot list all malfunctions that may occur, not all tests or inspections and corrective actions. If a malfunction is nor listed or is not corrected by listed corrective action, see your supervisor.

4-17. Organizational Maintenance Troubleshooting.

Refer to Table 4-5 for troubleshooting pertaining to organizational maintenance.

Table 4-5. Troubleshooting

Malfunction Test or Inspection Corrective Action
1. GASOLINE ENGINE FAILS TO START (SER. NOS. L1475T thru L-1478T).
Step 1. Check to see if the fuel valve (1, fig. 4-6) (located in the fuel filter assembly mounted on the fuel pump) is open. **Close the fuel valve.**
Step 2. Check for an empty fuel tank by adding fuel. **Fill the tank.**
Step 3. See if the 208-volt power cable is not connected to the receptacle (1, fig. 4-7). **Connect the cable.**
Step 4. Check for loose and broken wiring. **Tighten connections or replace defective wiring (para. 4-39).**
Step 5. Test and inspect spark plugs as follows: au Use a feeler gage and see if plugs have the proper gap. Plugs should indicate an 0.030 in. (.0762cm) gap. b. Remove the four coupling nuts (2, fig. 4-8) and spark plugs (1). Visually inspect plugs for carbon, corrosion and excessive dirt deposits. c. Test spark plugs by holding the plug about 1/4 in. (0.64cm) away from cylinder head. A bright blue spark should jump from tip of plug to the cylinder head. Clean, adjust or replace the spark plugs as follows: a, Clean by sand blasting.



1. Fuel valve

Figure 4-6. Shut-off valve.

Malfunction Test or Inspection Corrective Action
b. Adjust plug by bending the electrode up or down as necessary until 0.030 in. feeler gage fits the gap. *c*. Install new plug(s) (1, fig. 4-8) and secure with nuts (2).
Step 6. Inspect the magneto for cracks and distortion. Try to start the engine and observe any spark indicating a shorted wire. Remove cover from magneto and loosen the screw (1, fig. 4-9); turn the rotor (2) so the points are fully open and insert an 0.015 in. (.0381cm) feeler gage (3) **Replace magnet and wiring or adjust points, refer to paragraph 4-40.**

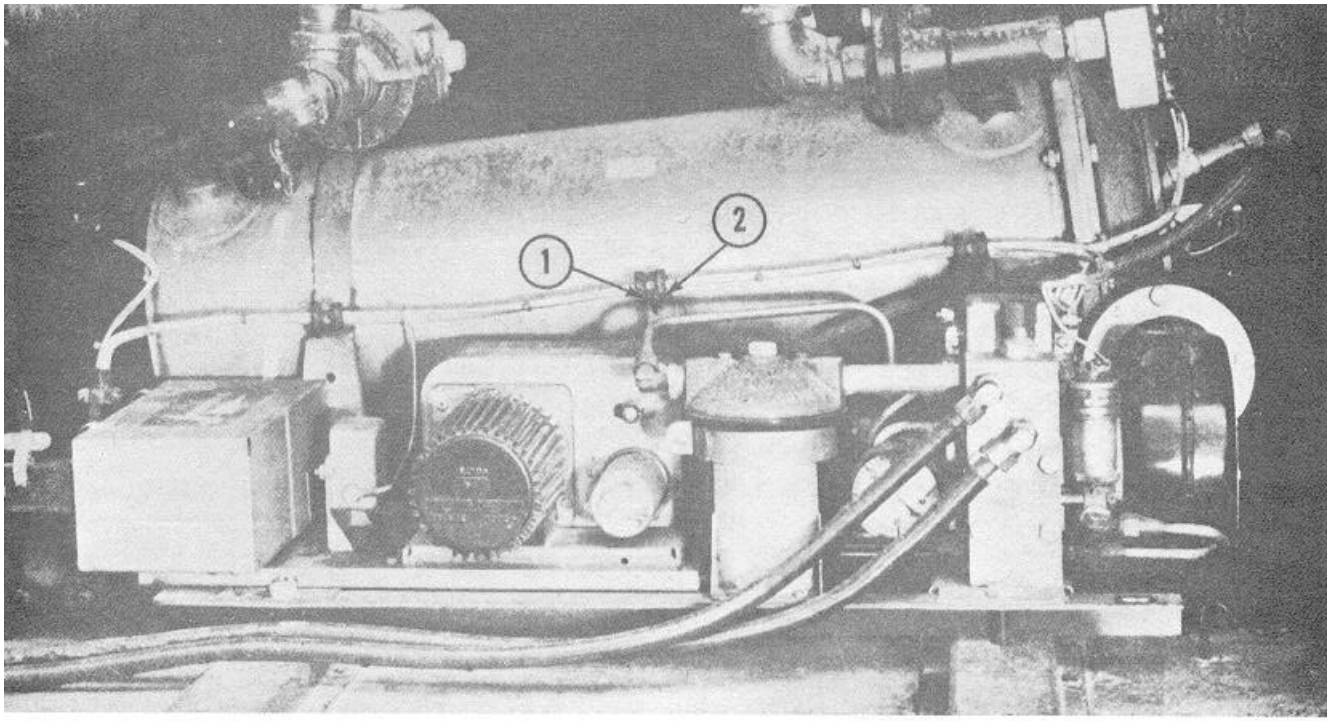
NOTE

If a new magneto is installed, it will have to be timed to the engine (para 4-40).

2. ENGINE MISFIRING
Step 1. Inspect for broken wiring. **See malfunction 1.**
Step 2. Check for fouled or cracked spark plug. **See malfunction 1.**
Step 3. Check for sticking or out of adjustment points. **See malfunction 1.**

1. 208v. receptacle

Figure 4-7. 208v, AC power receptacle

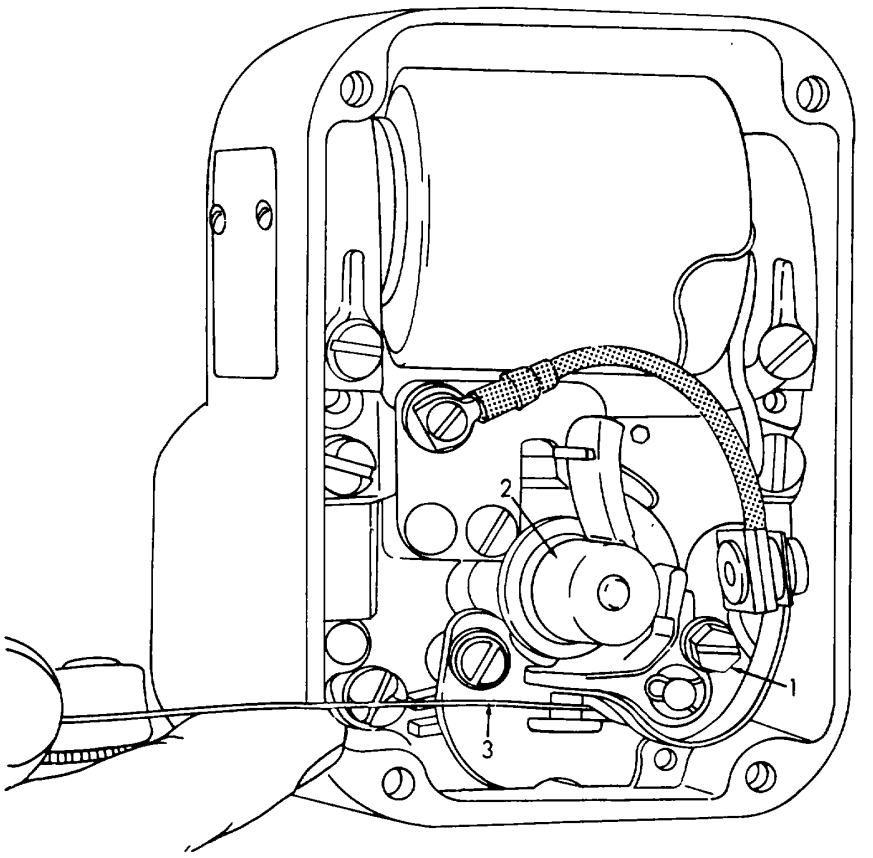


TS 024532

2.NUT

1. PLUG

Figure 4-8. Spark plug, removal.



1. Screw
2. Rotor
3. Feeler gage

Figure 4-9. Checking for correct breaker point gap.

Malfunction	Test or Inspection	Corrective Action
3. ENGINE KNOCKS		
Step 1.	Check to see if oil level is low.	**Refill.**
Step 2.	Check panel to see if engine is operating under heavy load at low speed.	**Adjust the governor, paragraph 4-27.**
Step 3.	Check for the running spark advance mark being advanced too far by removing screws (1, fig. 4-10) and screen (2). Observe timing mark (1, fig. 4-11) Time the magneto, paragraph 4-40.	
Step 4.	Check for a loose flywheel by removing the screen (fig. 4-10) and checking for a loose nut or key out of position.	**Place key in position in slot and tighten flywheel nut (2, fig. 4-11).**

Malfunction	Test or Inspection	Corrective Action
4. **ENGINE BACKFIRES**		
Step 1.	Listen for irregular engine performance and check exhaust for excessive black smoke indicating gasoline mixture being too lean.	**Adjust the carburetor by turning idle adjusting screw (1, fig. 4-12) as needed to get smoothest idle possible.**
Step 2.	Listen for sticking inlet valves (missing engine) (chattering noise) and check for possible backfire.	**Adjust valves as follows:** ***a.*** **Turn the crankshaft over by hand until the lifter (6, fig. 4-13) that is to be adjusted is at its lowest position.** ***b.*** **Insert 0.012 in. (.0305cm) feeler gage (5) between the valve stem (8) and lifter screw (7). Hold lifter (6) with wrench, and turn lifter adjusting screw into or out of the lifter with**

Malfunction

Test or Inspection

Corrective Action

another wrench until the correct clearance is obtained. A slight drag should be felt as the feeler gage is moved back and forth.

Step 3. Test and inspect spark plugs as follows:

a Use a feeler gage and see if plugs have the proper gap. Plugs should indicate an 0.030 in. (.0762cm) gap.

b. Remove the four coupling nuts (2, fig. 4-8) and spark plugs (1). Visually inspect plugs for carbon, corrosion and excessive dirt deposits.

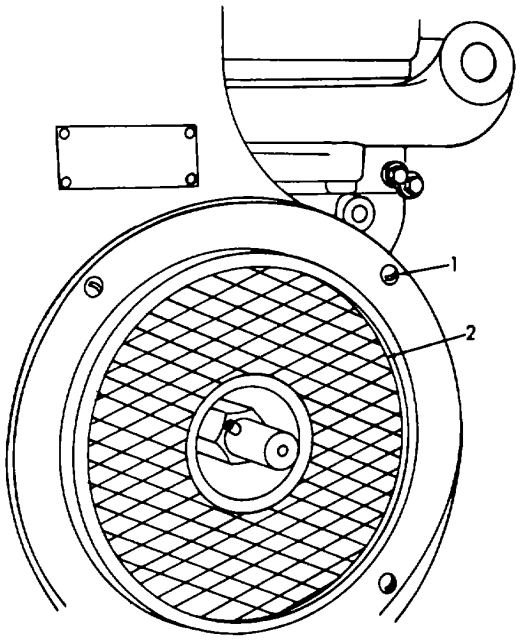
c. Test spark plugs by holding the plug about 1/4 in. (0.63cm) away from cylinder head. A bright blue spark should jump from the tip of plug to the cylinder head.

Clean, adjust or replace the spark plugs as follows:

a, Clean by sand blasting.

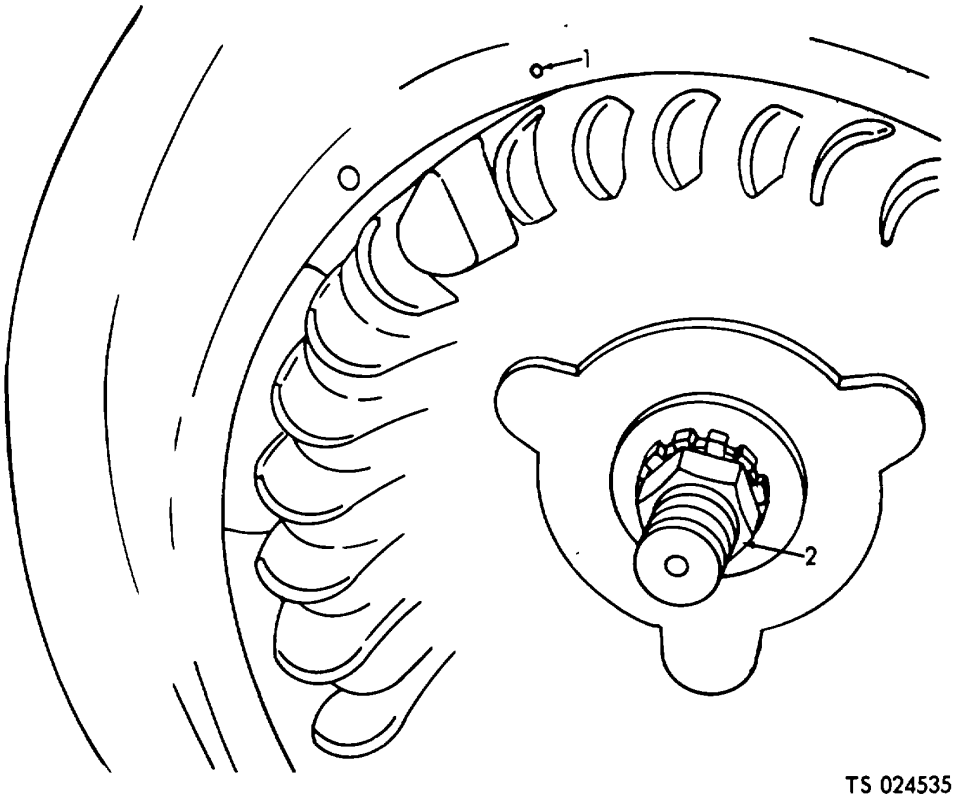
b. Adjust plug by bending the electrode up or down as necessary until 0.030 in. feeler gage fits the gap.

c. Install new plugs (1, fig. 4-8) and secure with nuts (2).



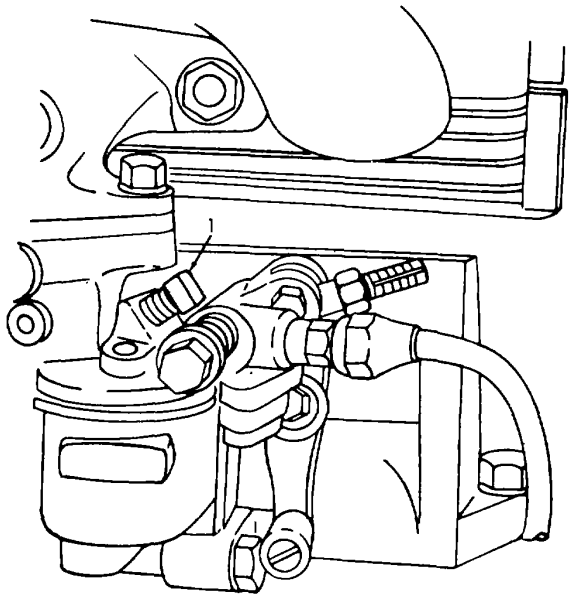
1. Screw 2. Screen

Figure 4-10. Flywheel screen, removal.



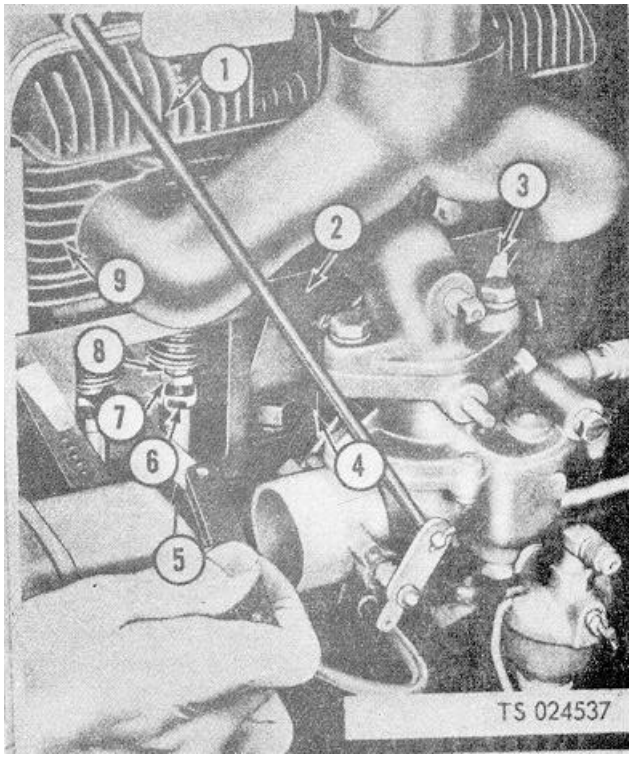
1. Running spark advance mark 2. Flywheel nut

Figure 4-11. Flywheel timing marks



1. Screw TS 024536

Figure 4-12. Idle adjusting screw.



1. Head
2. Air shroud heat deflector
3. Valve cover
4. Gasket
5. Feeler gage
6. Valve lifter
7. Adjusting screw
8. Valve stem
9. Block

Figure 4-13. Tappet adjustment.

Malfunction	Test or Inspection	Corrective Action
5.	**Engine Overheats**	
Step 1.	Check engine for hard starting or blow back indicating possible ignition spark out of time.	**Re-time the engine (para. 4-40).**
Step 2.	Check for part of the air shroud removed from the engine.	**Replace missing parts (para. 4-64).**
Step 3.	Check for restrictions in the exhaust.	Clean or replace the muffler and the exhaust pipe (para. 4-36).
6.	**Compression Low**	
Step 1.	Inspect for a loose or broken spark plug.	**Tighten spark plug. Replace a broken spark plug by removing the coupling nut (2, fig. 4-8) and removing plug (1).**
Step 2.	Check the valve adjustment with an 0.012 in. (0.0305cm) feeler gage.	**Adjust the valves as follows:** **a. Turn the crankshaft over by hand until the lifter (6, fig. 4-13) that is to be adjusted is at its lowest position.** **b. Insert 0.012 in. (.0305cm) feeler gage (5) between the valve stem (8) and lifter screw (7). Hold lifter (6) with wrench, and turn lifter adjusting screw into or out of the lifter with another wrench until the correct clearance is obtained. A slight drag should be felt as the feeler gage is moved back and forth.**
7.	**Power Loss In Engine**	
Step 1.	Check for a partly closed carburetor choke.	**Open choke as follows:** ***a.*** **Loosen the clamp screw (1, fig. 4-14) slightly so that there is still enough drag to rotate the choke control shaft.** ***b.*** **Lift up on the control lever (2) until the carburetor choke control lever (3) is in the up, or closed position.** ***c.*** **Tighten the clamp screw (1).** **d When the lever (2) is released it should go back to the intermediate position.**
Step 2.	Inspect for dirty air cleaner parts.	**Remove, disassembly and clean or replace parts as necessary (para. 4-26).**
Step 3.	Check instruments and observe sluggish engine running (overload).	**Correct operation of cylinder filling unit**
8.	**Pressure Vessel Pressure Too High, Alarm Bell Does Not Ring**	
Step 1.	Inspect tank alarm pressure switch out of adjustment (The correct setting is 305 on the high side (knob 5) and 295 on the low side (knob 6).	**Adjust setting of the pressure switch as follows: Adjust the tank pressure switches (4, fig. 4-15) by turning the adjusting knobs (5 and 6) to the desired setting on the scale. Set the pressure switch (8), connected to the conversion heater, at 275 on the high side and 260 on the low side.**

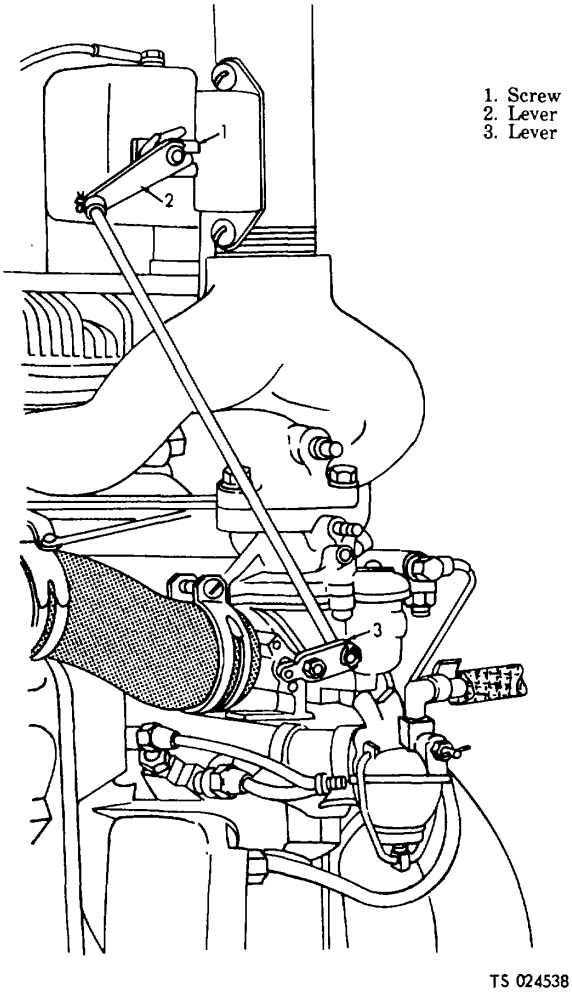


Figure 4-14. Choke control levers.

Malfunction	Test or Inspection	Corrective Action
Step 2.	Check for loose connection in tank alarm circuit.	**Tighten all loose connections.**
9.	**Pressure Vessel Pressure Too High, Refrigeration Unit Operates In Short Cycles**	
Step 1.	Check head pressure being too high due to service valves being partly closed.	**Completely open all refrigeration system** service valves as follows: Remove the caps and open the inlet line (6, fig. 4-4) and outlet shut-off valve on the receiver tank (7) to allow the refrigerant to circulate through the refrigeration system Check that the refrigerant sight glass (1) is full of refrigerant, indicating an adequate charge.
Step 2.	Check head pressure being too high due to air in the system.	**Discharge old refrigerant to air, and recharge system as follows:** ***a*** **Install a discharge pressure gage in the discharge service valve.** ***b.*** **Connect a full freon cylinder to the gage port (3, fig. 4-4), using a charging hose with dehydrator, and a vacuum-pressure gage.** ***c.*** **Before tightening the charging hose connection at the compressor, crack the cylinder valve slightly to purge air from the hose.** **d Close the suction service valve (2) one turn.** ***e.*** **Start the compressor, and slowly admit freon from the supply cylinder until the sight glass appears full of refrigerant.** **CAUTION** **If the compressor pounds, or frost forms on the cylinder head, throttle down the rate of the flow of refrigerant with the freon cylinder valve.**
Step 3.	Check for refrigeration compressor switch being out of adjustment. The compressor pressure switches (1 and 2, fig. 4-15).	**Set the suction pressure switch (2) to open at zero psi to shut off the engine or electric motor. The low pressure suction switches reset to allow operations to resume when the suction pressure rises to 12 psi (.8436 kg per sq cm). Set the discharge switches (high pressure) (1) to open at 240 psi (16.872 kg per sq cm) to stop the electric motor or gasoline engine. The high pressure switches close to resume operation when the pressure drops to 210 psi (14.763 kg per sq cm). Adjust the switches to the correct settings as indicated on the dial by using a screw driver on the adjusting screw.**
10.	**Pressure Vessel Pressure Too High, Refrigeration Unit Operates Continuously.**	
Step 1.	Check to see if belts or clutches are slipping.	**Adjust the belts or clutches as follows:** **a. Clutch adjustment.** **(1) Loosen the setscrew (11, fig. 4-16) in the adjustment nut (12).** **(2) Release the clutch as far as possible.** **(3) Unscrew the adjusting nut (12) until the clutch can easily be engaged.** **(4) Turn the adjusting nut (12) clockwise as far as possible by hand.** **(5) Release the clutch and tighten the adjusting nut 1/8 turn.**

Malfunction
Test or Inspection
Corrective Action

(6) Secure the adjusting screw in this position with the setscrew (11).

NOTE

If the clutch shows a tendency to slip when load is applied, tighten adjusting nut as above until there is no slippage.

b. Belts Adjustment All belts are adjusted to a tension permitting 1-1/2 inch (3.81cm) deflection under firm thumb pressure midway between pulleys, except the transfer pump belt, for which 1 inch (2.54cm) deflection is specified. All belts are tensioned by loosening the connected unit on its base, moving it as required, and tightening the base fasteners to hold the tension.

Step 2. Check the sight glass to see if refrigeration system is low on freon.

Recharge system as follows:

a. Install a discharge pressure gage In the discharge service valve.

b. Connect a full freon cylinder to the gage port (3, fig. 4-4), using a charging hose with dehydrator, and a vacuum-pressure gage.

c. Before tightening the charging hose connection at the compressor, crack the cylinder valve slightly to purge air from the hose.

d Close the suction service valve (2) one turn.

e. Start the compressor, and slowly admit freon from the supply cylinder until the sight glass appears full of refrigerant.

CAUTION

If the compressor pounds, or frost forms on the cylinder head, throttle down the rate of the flow of refrigerant with the freon cylinder valve.

11 Pressure Vessel Low, Refrigeration Unit Operates On Automatic Control

Check for tank alarm pressure switch being out of adjustment (The correct setting is 305 on the high side (knob 5) and 295 on the low side (knob 6).

Readjust the tank alarm pressure switch as follows:

Adjust the tank pressure switches (4, fig. 4-15) by turning the adjusting knobs (5 and 6) to the desired setting on the scale. Set the pressure switch (8), connected to the conversion heater at 275 on the high side and 260 on the low side.

12.Pressure Vessel Pressure Too Low, Refrigeration Unit Not Operating

Step 1. Check for no liquid carbon dioxide in the storage tank.

Fill the storage tank.

Step 2. Check for the tank being recently filled with relatively cold carbon dioxide.

Wait for newly installed carbon dioxide to warm up.

Malfunction
Test or Inspection
Corrective Action

13.Refrigeration Compressor Knocking

Step 1. Check for lack of oil in the crankcase.

Add oil (fig. 3-1).

Step 2. Check for oil or liquid refrigerant in the piston chamber.

Add oil compressor (fig. 3-1).

14.Carbon Dioxide Cylinder Filling Unit Capacity Low

Step 1. Check for obstruction in valves or loose nuts and crossed or worn valve threads.

Remove and clean or replace the defective valves (para. 4-96).

Step 2. Test the pressure regulating valve charging pressure by slowly operating valve and checking the pressure gage (fig. 4-17). Slowly adjust the pressure regulating valve 14 (fig. 4-18), until a charging pressure of 600 to 800 psi (42.18 to 66.24 kg per sq cm) is indicated on the pressure gage (1, fig. 4-17) in cool weather; 800 to 1,000 psi (56.24 to 70.30 kg per sq cm) is suitable in hot weather.

Step 3 Check for slipping clutch belts.

Adjust belts to a tension permitting 1-1/2 inch (3.81cm) deflection under firm' thumb pressure midway between pulleys. All belts are tensioned by loosening the connected unit on its base, moving it Ls required, and tightening the base fasteners to hold the tension.

Step 4. Check for a clogged strainer.

WARNING

Dry cleaning solvent, P-D-680 or P-S661, used to clean parts is potentially dangerous to personnel and property. Use in a well-ventilated area as the fumes are dangerous if inhaled. Avoid repeated and prolonged skin contact. Do not use near open flame or excessive heat. Flash point of solvent is 100F.-138F. (38C.-59C.).

Wash all parts in a cleaning solvent, Fed. Spec P-D-680 or P-S-661. Clean the gasket mating surfaces thoroughly.

15. Cylinder Filling Unit Compressor Knocking

Step 1. Check for a loose pulley by applying hand pressure back and forth.

Tighten the pulley bolts.

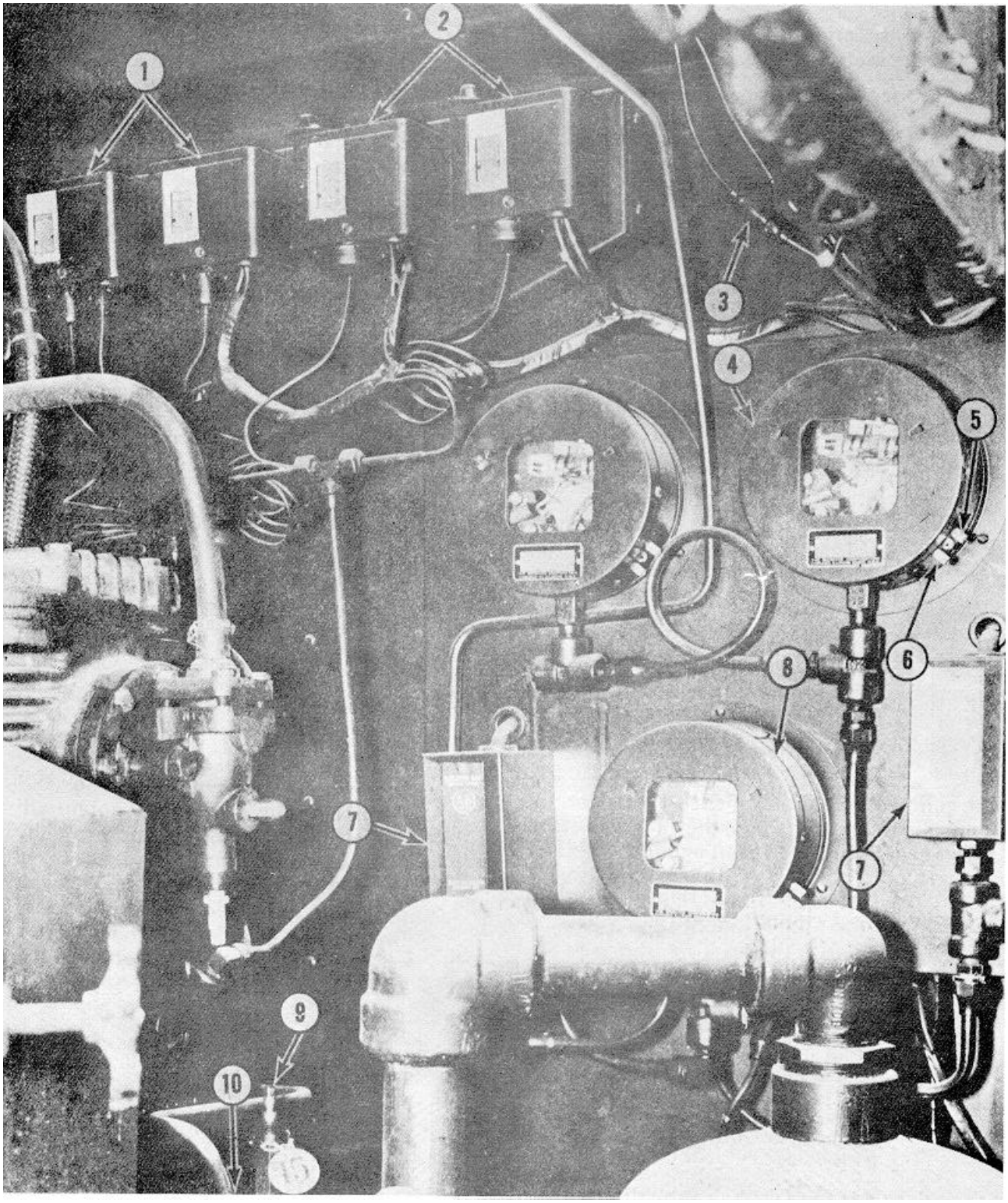
Step 2. Check for empty cylinder.

Stop the unit and prime, paragraph 2-14.

16. Liquid Level Gage Reads Low Or High

Step 1. Check the liquid level gage shutoff valve for leaks (water seepage).

Tighten the packing glands with valves partially open until the leakage stops.



1. Compressor pressure switch (discharge)
2. Compressor pressure switch (suction)
3. Connector
4. Tank pressure switch
5. Adjusting knob, high side
6. Adjusting knob, low side
7. Alarm bell pressure switch
8. Tank pressure switch low pressure
9. Receiver shut-off (inlet)
10. Receiver outlet line

Figure 4-15. Pressure witch adjustment.

Malfunction
Test or Inspection
Corrective Action

Step 2. Inspect for leakage from gage line panel liquid supply piping (water seepage).

Tighten until leakage stops.

Step 3. Check for a too tight piston rod packing gland (won't loosen normally).

Loosen packing gland.

17. Counter Shaft Clutches Slipping

Step 1. Check to see if the clutch adjusting nut (12, fig. 4-16) is tightened to a 1/8 turn.

Readjust the clutch as follows:

a. Loosen the setscrew (11, fig. 4-16 in the adjustment nut (12).

b. Release the clutch as far as possible.

c. Unscrew the adjusting nut (12) until the clutch can easily be engaged. & Turn the adjusting nut (12) clockwise as far as possible by hand.

e. Release the clutch and tighten the adjusting nut 1/8 turn.

f. Secure the adjusting screw in this position with the setscrew (11, fig. 4-16).

NOTE

If the clutch shows a tendency to slip when load is applied, tighten adjusting nut as above until there is no slippage.

Step 2. Visually check to see if there is lubricant between clutch disk plates.

WARNING

Dry cleaning solvent, P-D-680 or P-S661, used to clean parts is potentially dangerous to personnel and property. Use in a well-ventilated area as the fumes are dangerous if inhaled. Avoid repeated and prolonged skin contact. Do not use near open flame or excessive heat. Flash point of solvent is .100F.-138F. (38C.-

Clean disks with solvent (Fed. Spec. P-D-680 or P-D-661.

18. Clutch Running Hot

Step 1. Visually check or observe feel indicating a drag between clutch disk plates.

WARNING

Dry cleaning solvent, P-D-680 or P-S661, used to clean parts is potentially dangerous to personnel and property. Use in a well-ventilated area as the fumes are dangerous if inhaled. Avoid repeated and prolonged skin contact. Do not use near open flame or excessive heat. Flash point of solvent is 100F.-138F. (38C.-59C.).

Malfunction
Test or Inspection
Corrective Action

Wash out with solvent (Fed. Spec. P-D-680 or P-S-661).

Step 2. Check for the clutch slipping (observe delayed operating and noise).

Adjust clutch as follows:

***a.* Loosen the setscrew (11, fig. 4-16) in the adjustment nut (12).**

***b.* Release the clutch as far as possible.**

***c.* Unscrew the adjusting nut (12) until the clutch can easily be engaged.**

***d* Turn the adjusting nut (12) clockwise as far as possible by hand.**

***e.* Release the clutch and tighten the adjusting nut 1/8 turn.**

***f.* Secure the adjusting screw in this position with the setscrew (11, fig. 4-16).**

NOTE

If the clutch shows a tendency to slip when load is applied, tighten adjusting nut as above until there is no slippage.

19.Lack Of Spark In Conversion Heater

Step 1. Visually inspect contact points worn for %Pull vibrator switch or replace vibrator as follows:

The vibrator (28, fig. 4-19) has two sets of contact points. The switch (32) is safety wired at the factory. If the vibrator inoperative and the switch is still wired, cut the wire and pull the switch out. If the lockwire (33) has been cut, the switch pulled out and the vibrator is inoperative, install a new as follows:

***a.* Unplug the disconnect plug (31).**

***b.* Loosen the thumbscrew (27) and push the bail downward.**

***c.* Pull the vibrator (28) from the ignition unit (3).**

***d*. Push the switch (3?) in, and secure with the lockwire (33).**

***e*. Position the new vibrator (28, fig. 4-19) in the ignition unit (3) and secure with the bail and thumbscrew (27).**

***f.* Plug in the disconnect plug (31).**

Step 2. Visually check for a dirt) or cracked spark plug.

Clean plug or replace it as follows:

***a.* Pull the disconnect plug (31, fig. 4-19).**

***b*. Remove the spark plug cable (21, fig. 4-20) by loosening tie nut (20).**

***c.* Unscrew the two tube nuts (14) securing the fuel tube (17) and remove the tube.**

***d*. Remove the three capscrews (7) and lockwashers securing the combustion head (6) and gasket to the heater assembly and lift off the head and gasket.**

Step 3 Check for broken wiring and cracked ignition unit.

Replace wiring or ignition unit (para. 4-114).

20. Lack of Fuel At Conversion Heater

Step 1. Check for a clogged nozzle tip.

Malfunction
Test or Inspection
Corrective Action

WARNING

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Clean tip with solvent (Fed. Spec. P-D-680 or P-S-661).

Step 2. Check for a dirty or clogged fuel filter.
Replace fuel filter element as follows:
Refer to figure 4-21 and disassemble the fuel filter.

Step 3. Check for an air leak in fuel line.
Tighten or replace defective line.

Step 4. Inspect solenoid valve for cracks, breaks and wear.
Replace solenoid valve (para. 4-111).

Step 5. Check for a cracked, broken, or leaking fuel pump.
Replace fuel pump as follows:
a. **Pull the disconnect plug (30, fig. 4-19).**
b. **Remove the four capscrews (11) that secure the plate (13) to the combustion head.**
c **Remove the four machine screws and washers securing the blower (15) to the pump (10) and slide the blower (15), plate (13), and gasket (14) out and away from the heater.**
d. **Remove the two fuel tubes (6 and 7).**
e. **Disconnect and tag the taped leads (19).**

Malfunction
Test or Inspection
Corrective Action

f. **Remove the four capscrews (24) securing the pump (10). Remove the fuel pump from the heater.**

21. No Combustion Air Or Low Air Pressure

Step 1. Check for a cracked or broken motor.
Replace motor (fig. 4-22).

Step 2. Rotate blower fan to see if it is slipping on shaft.
Tighten fan lock screw.

Step 3 Check for a clogged blower housing.

WARNING

Dry cleaning solvent, P-D-680 or P-S661, used to clean parts is potentially dangerous to personnel and property. Use in a well-ventilated area as the fumes are dangerous if inhaled. Avoid repeated and prolonged skin contact. Do not use near open flame or excessive heat. Flash point of solvent is 100F.-138F. (38C.-59C.).

Wash all parts in a cleaning solvent (Fed. Spec. P-D-680 or P-S-661).

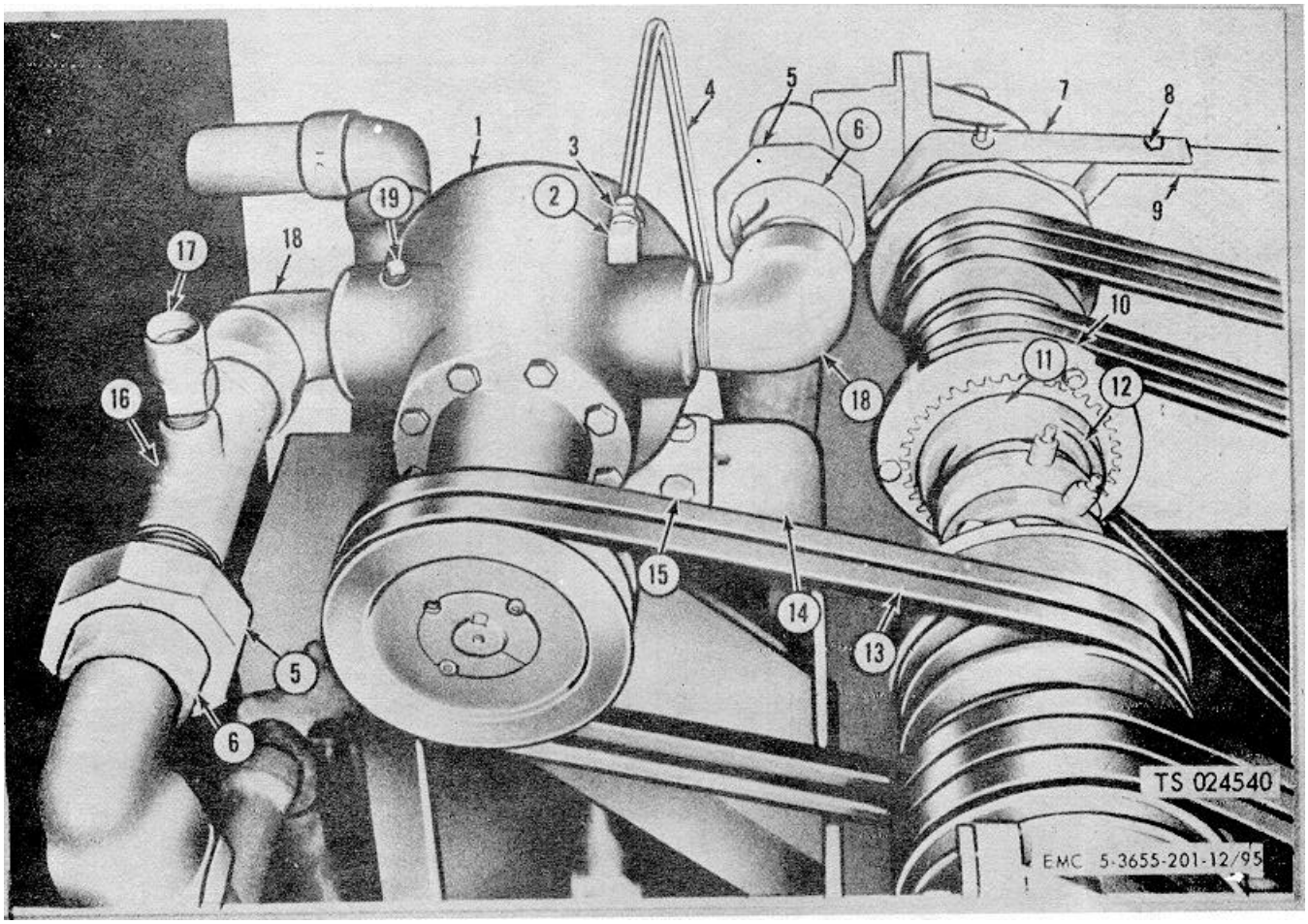
22. Conversion Heater Overheating Condition

Step 1. Check for low coolant level.
Add coolant.

Step 2. Check for loose wires in disconnect plug.
Tighten all loose connections.

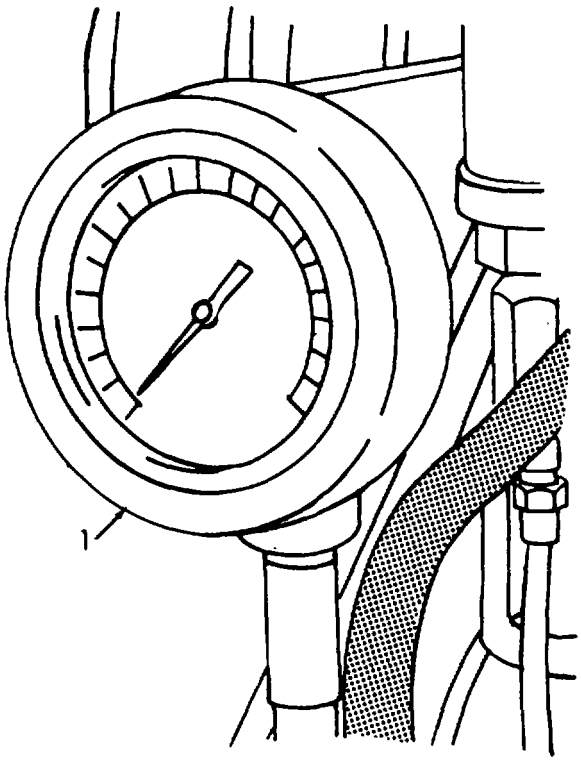
Step 3 Check for a cracked or broken water temperature switch.

Replace the switch (para. 4-113).



1. Transfer pump
2. Adapter
3. Tube nut
4. Tube
5. Union nut
6. 1/3 union
7. Clutch arm
8. Capscrew
9. Clutch arm
10. Clutch drive ring
11. Setscrew
12. Adjusting nut
13. Drive belt
14. Frame
15. Capscrew
16. Line assembly
17. Safety relief valve
18. Elbow
19. Pipe plug

Figure 4-16. Clutch adjusting points.



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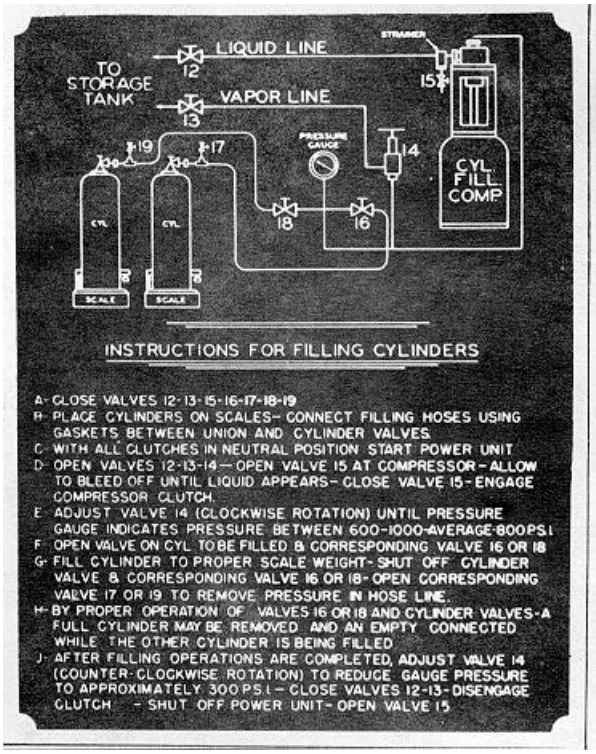
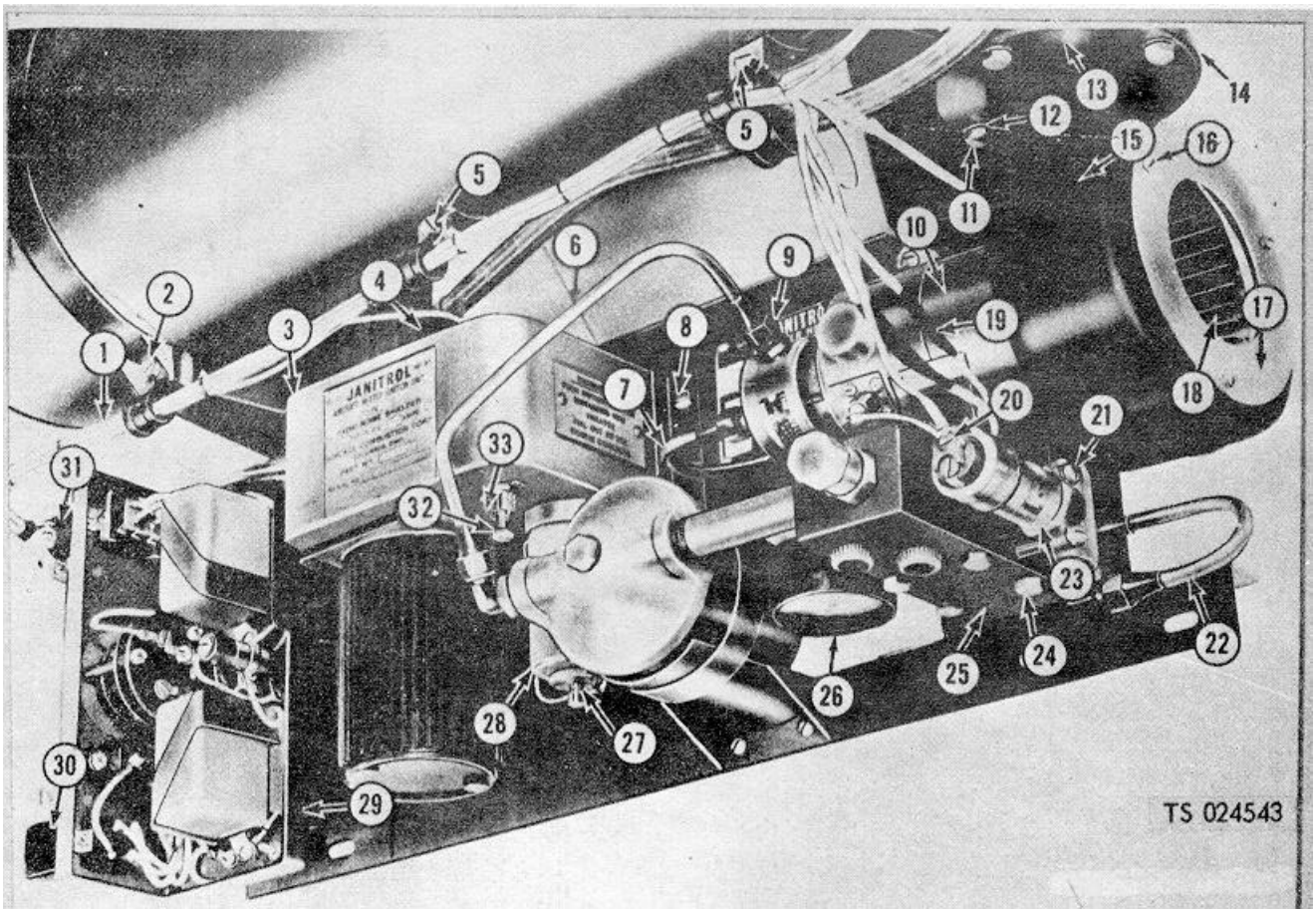
1. Pressure gage

Figure 4-17. Pressure gage.



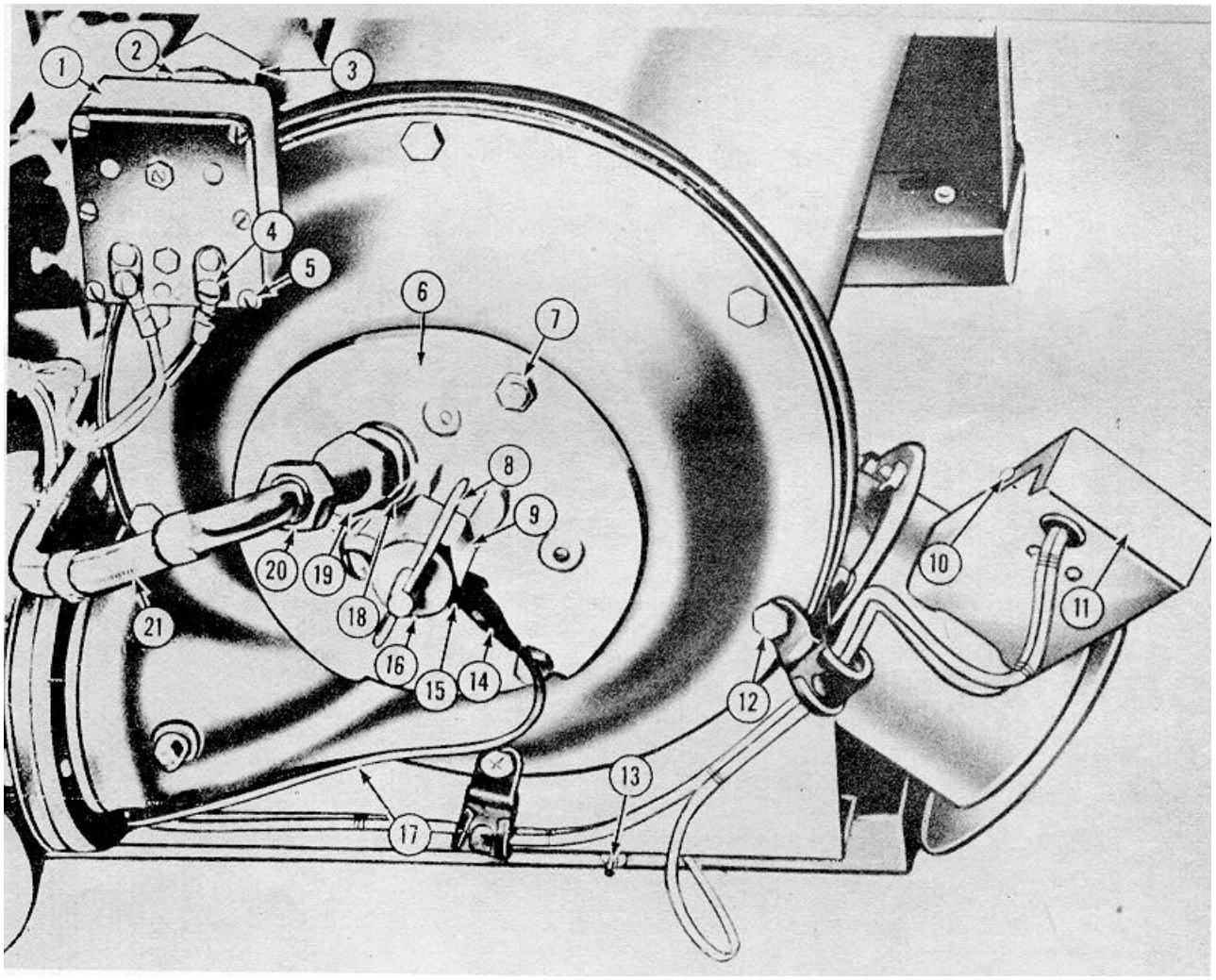
TS 024542

Figure 4-18. Cylinder filling operation.



1. Wiring harness
2. Capscrew
3. Ignition unit
4 Spark plug cable
5. Machine screw
6. Fuel tube
7. Fuel tube
8. Machine screw
9. Tube nut
10. Fuel pump
11. Capscrew
12. Lockwasher
13. Plate
14. Gasket
15. Blower
16. Self-tapping screw
17. Plate
18. Blower wheel
19. Taped lead
20. Screw
21. Screw
22. Fuel tube
23. Solenoid valve
14. Capscrew
25. Fuel manifold
26. Fuel gage
27. Thumbscrew
28. Vibrator
29. Control box
30. Disconnect plug
31. Disconnect plug
32. Switch
33. Lockwire

Figure 4-19. Blower and fuel pump, removal



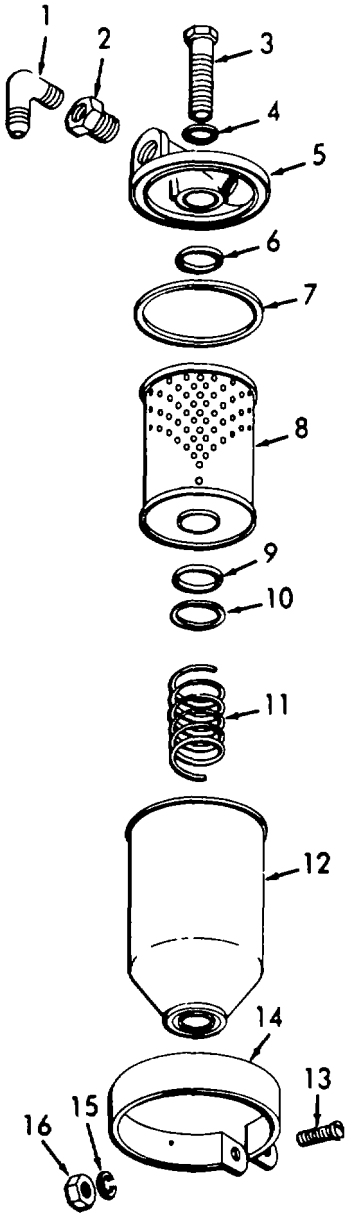
TS 02544

1. Water temperature limit switch
2. Hex nut
3. Hex nut
4. Machine screw
5. Machine screw
6. Combustion head
7. Capscrew
8. Bail
9. Nozzle assembly
10. Self-tapping screw
11. Cover
12. Capscrew
13. Nut, No.
14. Tube nut
15. Adapter
16. Thumb nut
17. Fuel tube
18. Gasket
19. Spark plug
10 20. Nut
21. Cable

Figure 4-20. Fuel line, removal

Table 4-6. Valves

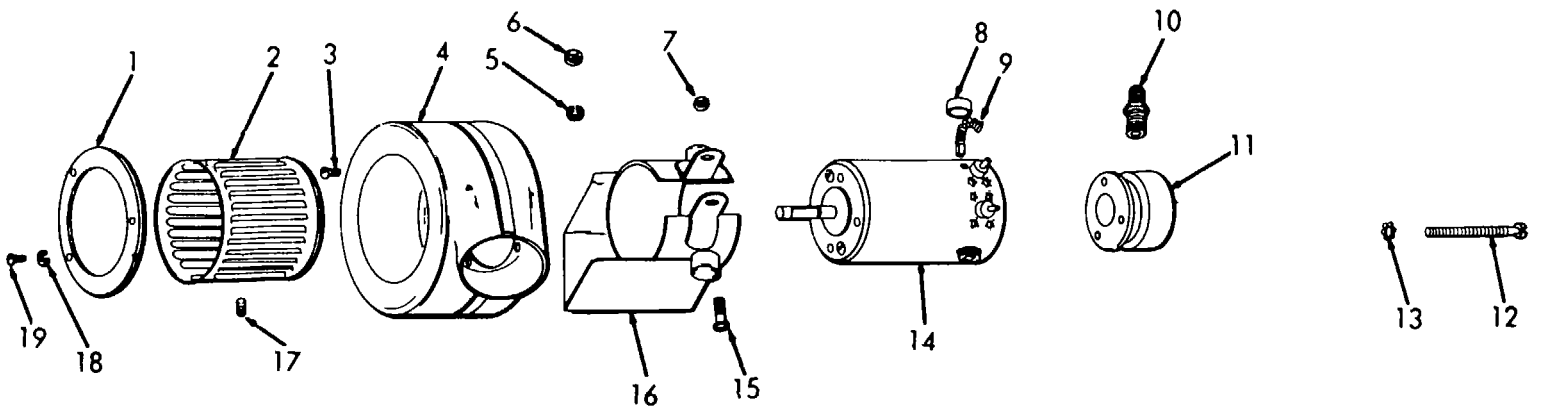
Tag No.	Description
1	Liquid fill line (storage compartment, thru pump).
2	Liquid shut-off (storage)
3	Liquid fill line (by-pass pump)
4	Liquid line shut-off (conversion)
5	Liquid equalizing line
6	Dehydrator by-pass
7	Vapor equalizing line
8	Vapor return (conversion)
9	Vapor return (storage)
10	Transfer pump bleed-off
11	Low pressure gage line (conversion)
12	Liquid shut-off to cylinder fill compressor
13	High pressure vapor return
14	Pressure regulating valve
15	Strainer bleed-off
16	Cylinder valve
17	Cylinder fill hose bleed-off
18	Cylinder valve
19	Cylinder fill hose bleed-off
20	Low pressure gage line (storage)
21	High pressure gage line (conversion)
22	High pressure gage line (storage)
23	Safety vent switching valve (conversion)
24	Safety vent switching valve (storage)
25	Fire valve
26	Transfer hose bleed-off (by-pass pump)
27	Transfer hose bleed-off (thru pump)
28	Transfer hose bleed-off (vapor)
29	Relief valve-3/4 male-341 psi (23.9723 kg per sq cm) (storage)
30	Relief valve-3/4 male-341 psi (storage)
31	Relief valve-3/4 male-341 psi (conversion)
32	Relief valve-3/4 male-341 psi (conversion)
33	Bleeder valve-3/8 female-330 psi (23.199 kg per sq cm) (conversion)
34	Bleeder valve-3/8 female-330 psi (conversion)
35	Vapor line relief
36	Safety relief (pop type) 375 psi (26.3625 kg per sq cm) (transfer pump discharge).
37	Safety relief disc-1500 psi (105.45 kg per sq cm)
38	3 way valve (conversion heater coil)
39	3 way valve (compartment heater)
40	Expansion valve, refrigeration system
41	Air tank bleed-off (brakes)
42	Heater fluid pump bleed-off (outlet)
43	Refrigerator compressor suction valve
44	Refrigerator compressor discharge valve
45	Receiver tank shut-off (outlet)
46	Receiver tank shut-off (inlet)
47	Heater fluid pump bleed-off (inlet)



TS 024545

1. Adapter elbow
2. Bushing
3. Machine bolt
4. Washer
5. Filter head
6. Gasket
7. Gasket'
8. Element
9. Washer
10. Flatwasher
11. Spring
12. Body
13. Machine screw
14. Clamp
15. Lockwasher
16. Nut

Figure 4-21. Fuel filter, exploded view .



1. Plate
2. Blower wheel
3. Machine screw
4. Housing
5. Lockwasher
6. Nut
7. Nut
8. Cap
9. Brush
10. Adapter
11. Fuel pump
12. Machine screw
13. Washer
14. Motor
15. Machine screw
16. Bracket
17. Setscrew
18. Washer
19. Self-tapping screw

Figure 4-22. Blower and fuel pump, exploded view.

Section VII. RADIO INTERFERENCE SUPPRESSION

4-18. Definitions

a. Interference. The term "interference" as used herein applies to electrical disturbances in the radio frequency range which are generated by the conversion and storage unit and which may interfere with the proper operation of radio receivers or other electronic equipment, or enable the enemy to locate the equipment.

b. Interference Suppression. The term “interference suppression” as used herein applies to the methods used to eliminate or effectively reduce radio interference generated by the conversion and storage unit.

4-19. General Methods Used To Attain Proper Suppression.

Essentially, suppression is attained by providing a. low resistance path to ground for the stray currents. The methods used to attain suppression include shielding the ignition and high-frequency wires, grounding the frame with bonding straps, and using capacitor and resistors where necessary.

4-20. Interference Suppression Components

a. Gasoline Engine Spark Plugs and Ignition Cables. The gasoline engine is equipped with shielded spark plugs (1, fig. 4-23 1) and shielded ignition cables (3). Braided metal covering woven around the insulation on high tension leads are grounded through the magneto to provide a low resistance path for grounding interference generated in the circuit.

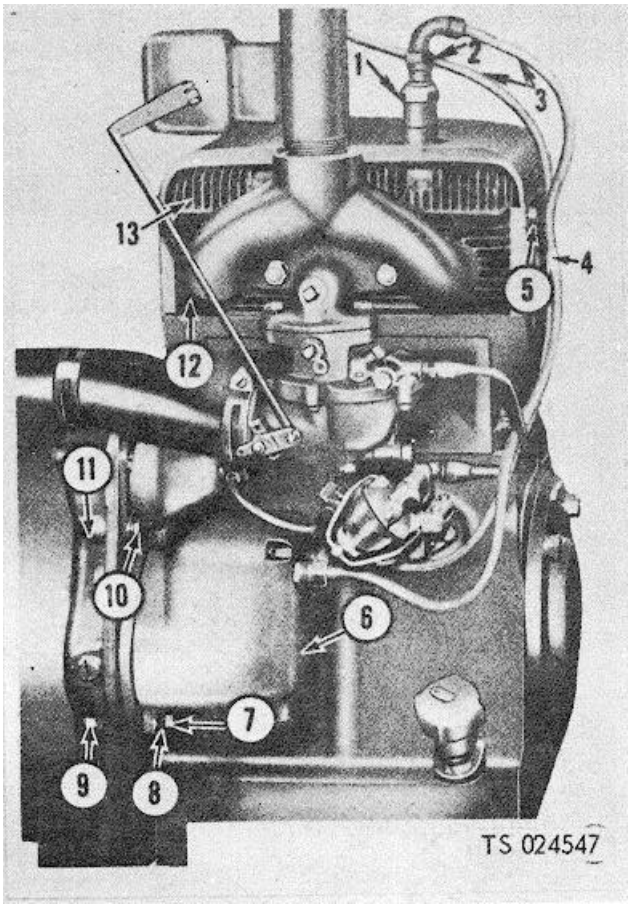
NOTE

Do not pull on cable or twist braided shielding. Gently work cable from side to side and free the rubber seal. Do not use sharp tools to install rubber seals.

b. Magneto. The magneto (6, fig. 4-23 1) is completely inclosed by a metal housing which is grounded by the mounting. Electrical contact between the mounting surfaces is accomplished by the use of internal-external tooth lockwashers (8). Shielded ignition cables (3) carry current from the magneto (6) to the shielded spark plugs (1).

c. Heater Spark Plug and Igniter Cable. The conversion heater is equipped with a shielded spark plug (6, fig. 4-23 2) and igniter cable (3). Braided metal around the high tension lead grounds interference from the circuit.

d. Ignition Unit. The ignition unit (13) is inclosed by a metal housing, grounded to the mounting. Internal-external tooth lockwashers (9) make electrical contact between the mounting surfaces. Suppressor



1. Shielded spart plug
2. Nut
3. Shielded ignition cable
4. Clip
5. Screw
6. Magneto assembly
7. Capscrew
8. IE toothed lockwasher
9. Nut
10. Capscrew
11. Timing gear cover
12. Cylinder block
13. Cylinder head

Figure 4-28. Ignition suppression components (sheet 1 of 2).

(14) on the ignition unit eliminates radio interference by the ignition unit.

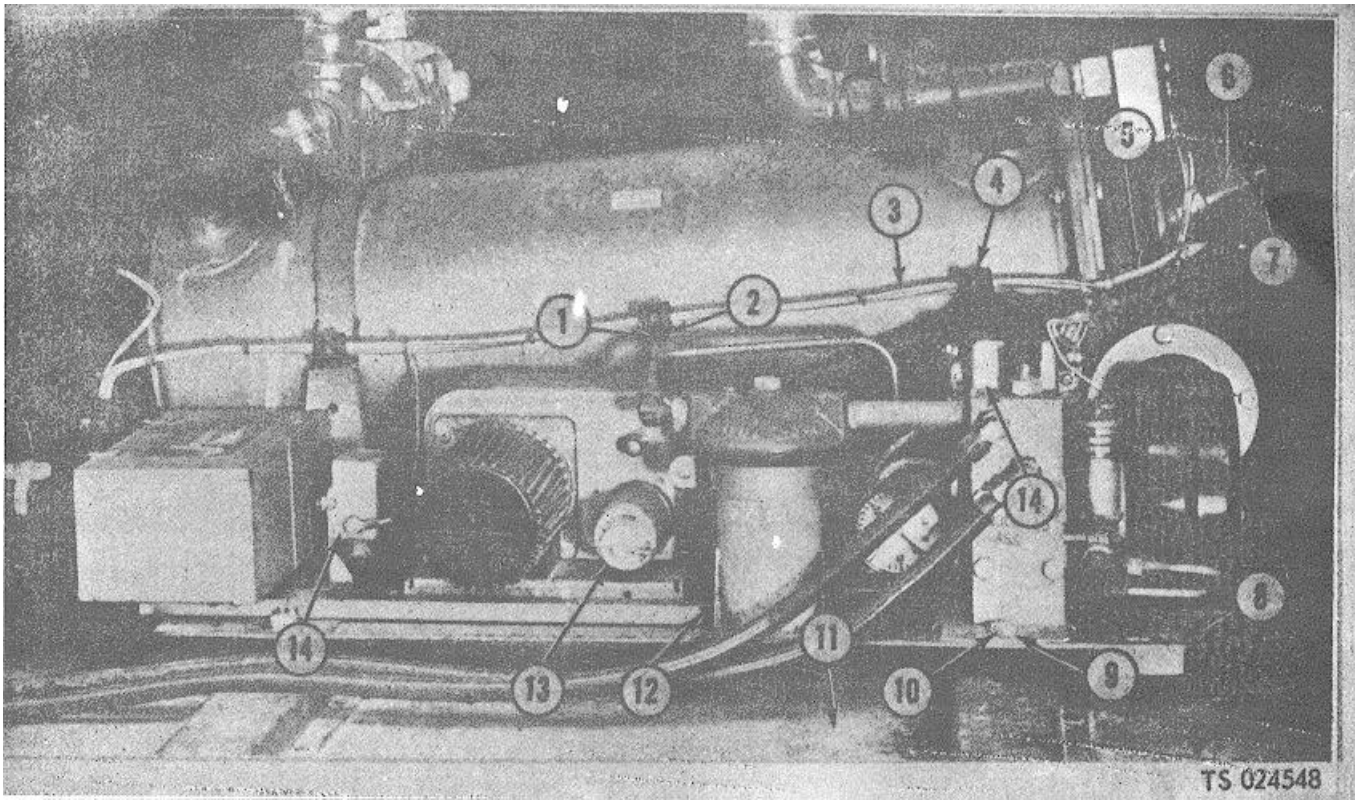
e. Conversion Heater. The conversion heater base (8) is grounded by the mounting to the housing. Electrical contact between mounting surfaces is accomplished by the use of internal-external tooth lockwashers (12). The pump and blower motor circuit is suppressed by suppressors (14) on the motor.

4-21. Replacement Of Suppression Components

Refer to figure 4-23 and replace suppression components.

4-22. Testing Of Radio Interference Suppression Components

The suppression components used on the equipment are not rated in measurable values by which failure can be determined. All shielding should indicate continuity with chassis ground of the trailer when tested with a low voltage ohmmeter. If interference is suspected, replace suppression components by trial-and-error method until trouble. Is corrected.



1. Nut
2. Machine screw
3. Shielded ignition cable
4. Clip
5. Combustion head
6. Shielded spark plug
7. Nut
8. Heater base
9. IE toothed lockwasher
10. Capscrew
11. Housing
12. IE toothed lock washer #10
13. Ignition unit
14. Radio interference suppressor

Figure 4-23. Ignition suppression components (sheet 2 of 2).

Section VIII. MAINTENANCE OF THE GASOLINE ENGINE FUEL SYSTEM

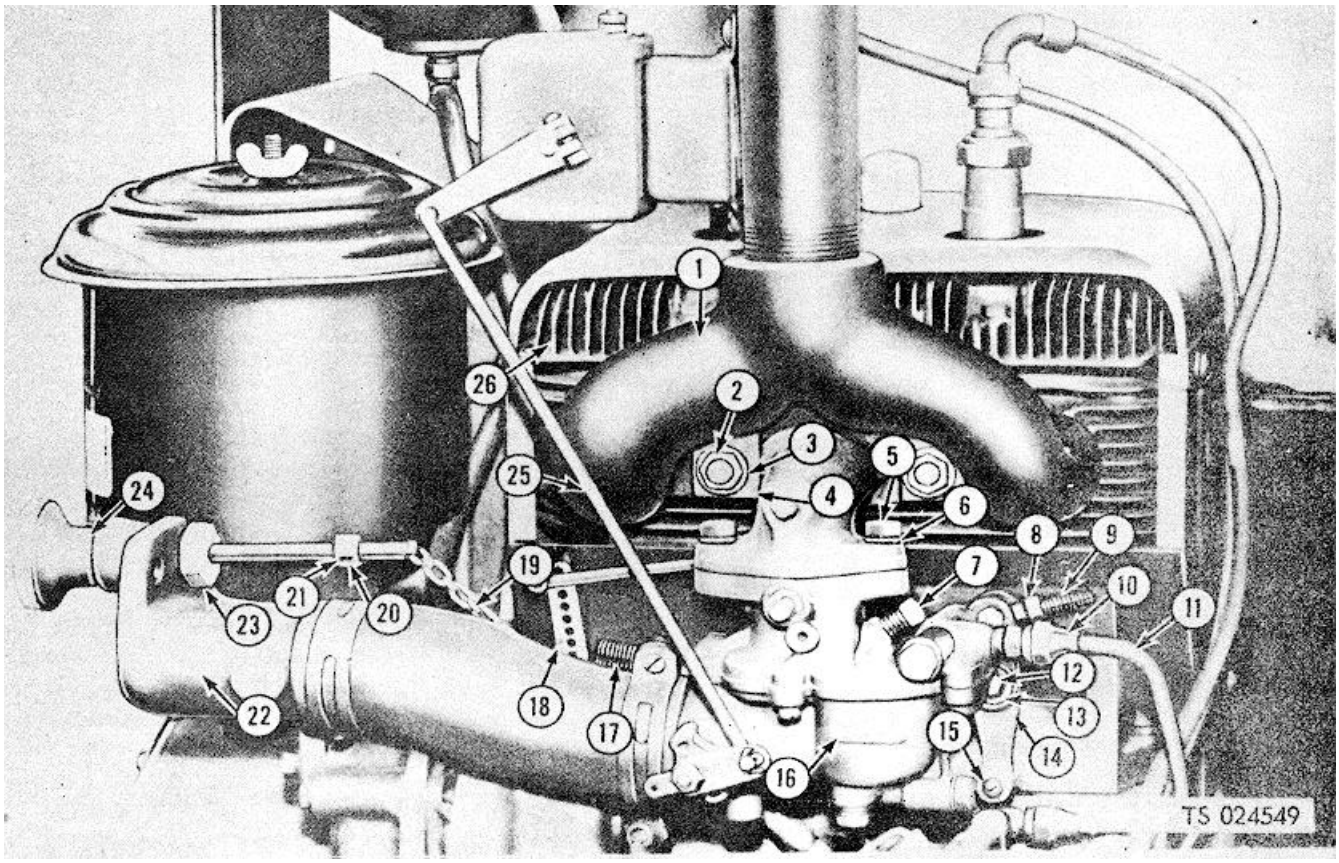
4-23. Description

The gasoline engine fuel system consists of a fuel tank, fuel pump, fuel filter (Serial Nos. L-1475-T through L-1478-T), carburetor, and fuel lines. The fuel tank is located under the right fender of the trailer. On Serial Nos. L-1475-T through L-1478-T units, the shut-off valve is located in the fuel filter assembly mounted on the fuel pump. An air cleaner is provided to protect the carburetor air intake from dirt and grit.

4-24. Governor Controls

a. Removal and Disassembly.

(1) Remove the cotter pin (13, fig. 4-24) securing the chain (19) to the governor control (24).



1. Exhaust manifold
2. Nut
3. Lockwasher
4. Saddle washer
5. Capscrew
6. Lockwasher
7. Adjusting needle screw
8. Adjusting nut
9. Governor control rod
10. Tube nut
11. Fuel tube
12. Support pin
13. Cotter pin
14. Governor control lever
15. Screw
16. Carburetor
17. Spring
18. Cross shaft lever
19. Chain
20. Setscrew
21. Stop collar
22. Air cleaner mounting bracket
23. Locknut
24. Governor control
25. Throttle rod
26. Cylinder block

Figure 4-24. Governor controls, installed view.

(2) Loosen the setscrew (20) securing the stop collar (21) to the throttle rod (25). Slide the stop collar (21) from the rod.

(3) Remove the locknut (23) securing the governor control to the air cleaner bracket (22). Slide the control out of the bracket.

(4) Remove the spring (17) from the lever (18).

(5) Remove the cotter pin (13) and the washer securing the lever (14) to the lever support pin (12). Remove the assembly from the pin.

(6) Remove the spring (1, fig. 4-25) from the screw (2).

(7) Unscrew the adjusting nut (8) from the screw (2). Remove the screw from the swivel pin (6) in the lever (5) and remove the spring (4) and the cotter pin (3) from the screw.

(8) Remove the machine screw (9) from the lever (5), releasing the chain (10).

(9) Remove the setscrew (11) from the collar (12) and press the swivel pin (6) from the lever (5). Remove the cotter pin (3) from the chain (10).

WARNING

Dry cleaning solvent, P-D-680 or P-S-661, used to clean parts is potentially dangerous to personnel and property. Use in a well-ventilated area as the fumes are dangerous if inhaled. Avoid repeated and prolonged skin contact. Do not use near open flame or excessive heat. Flash point of solvent is 100F.-138F. (38C.-59C.).

b. Cleaning, Inspection and Repair. Clean all parts in a cleaning solvent. Check all screws for damaged threads. Check the lever and control rods for bends or breaks. Check the springs for damage or loss of tension. Replace all damaged or badly worn parts.

c. Reassembly and Installation.

(1) Place the setscrew (11, fig. 4-26) in the stop collar (12).

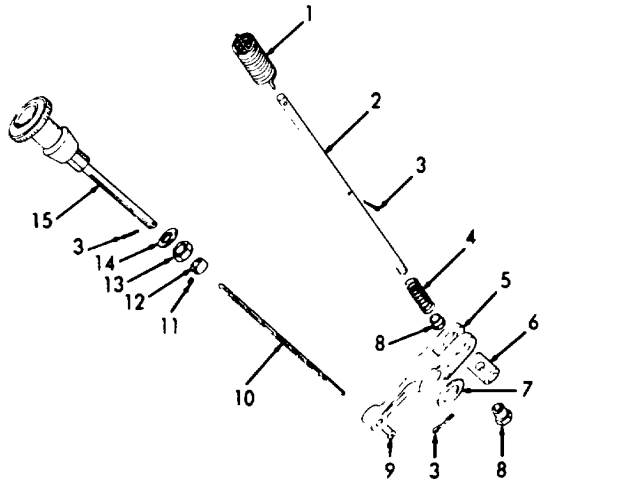
(2) Press the swivel pin (6) into place on the lever (5).

(3) Position the cotter pin (3) in the screw (2). Slide the spring (4) on the screw and slide the screw into the swivel pin. Secure with the adjusting nut (8).

(4) Position the cotter pin (3) in the chain (10) and move it into place in the lever (5), securing it with the machine screw (9).

(5) Place the spring (1) in position on the screw (2).

(6) Position the lever assembly on the support pin (12, fig. 4-25) on the engine and secure with the washer and cotter pin (13).



1. Spring
2. Rod screw
3. Cotter pin
4. Spring
5. Lever
6. Swivel pin
7. Washer, flat
8. Adjusting nut
9. Machine screw
10. Chain
11. Setscrew
11. Setscrew
12. Stop collar
13. Nut
14. Shakeproof washer
15. Governor control

Figure 4-25. Governor controls, exploded view.

(7) Position the governor control in the air cleaner bracket (22) and secure with the lockwasher and the nut (23).

(8) Position the stop collar (21) on the governor control (24) and secure with the setscrew (20).

(9) Position the chain (19) on the governor control (24) and secure with the cotter pin (13).

(10) Place the spring (17) in position on the lever (18).

4-25. Throttle And Choke Controls

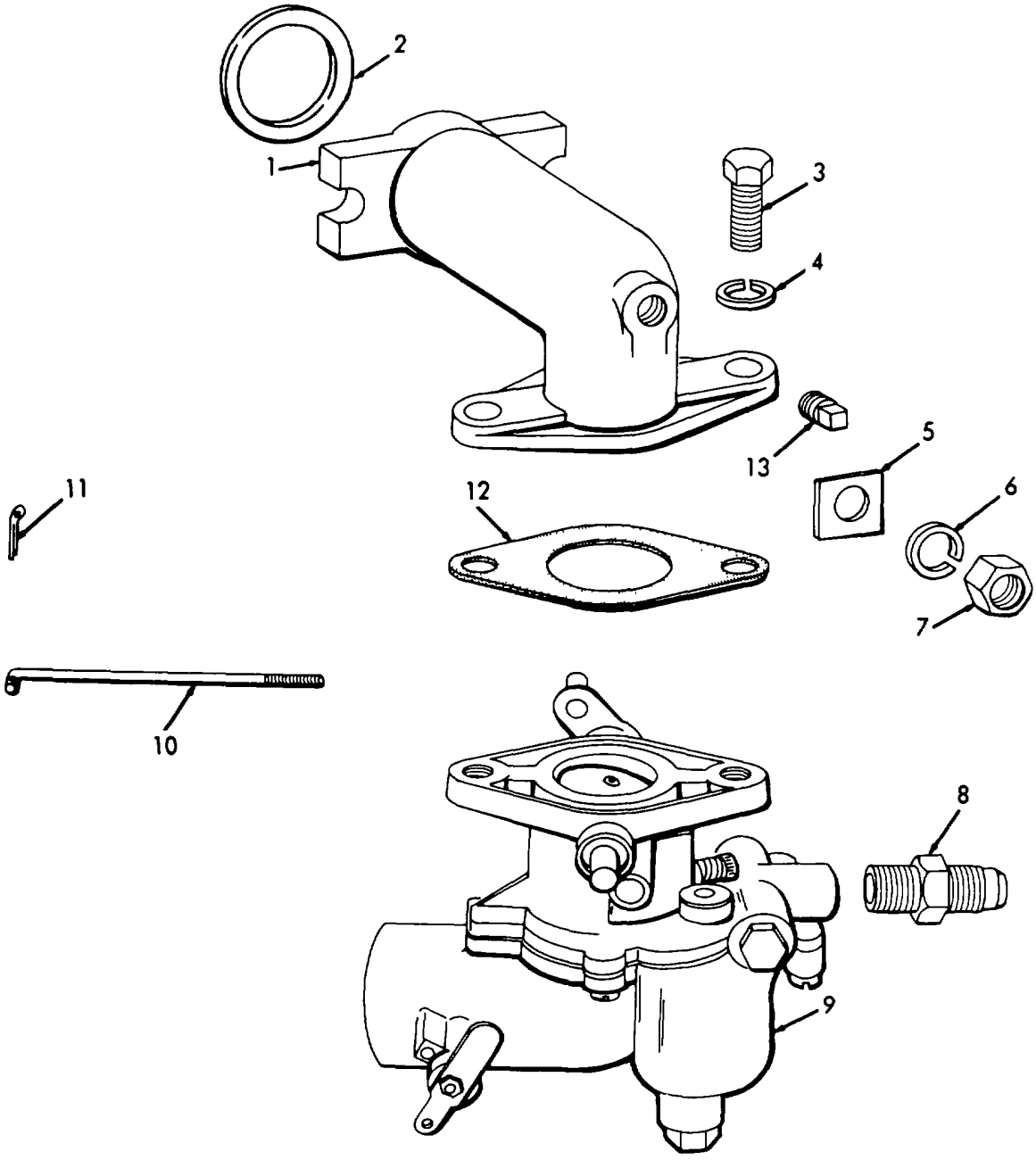
a. Removal and Disassembly.

(1) Remove the cotter pin securing the throttle control rod (10, fig. 4-26) to the lever.

(2) Remove the throttle rod from the lever and unscrew it from the carburetor throttle lever.

(3) Remove the nut (4, fig. 4-27) securing the choke control lead (3) to the choke control (5).

(4) Remove the two cotter pins (10)'(ser. nos. L-1475-T through L-1478-T) or two clips (10) (ser. nos.L-1666-T through L-1668-T) securing the choke control rod (11) to the automatic choke control lever (9) and the carburetor choke lever (13). Remove the rod (11).



TS 024551

1. Intake manifold
2. Gasket
3. Machine bolt
4. Lockwasher
5. Saddle washer
6. Lockwasher
7. Nut
8. Adapter
9. Carburetor
10. Throttle rod
11. Cotter pin
12. Gasket
13. Plug

Figure 4-26. Intake manifold and carburetor.

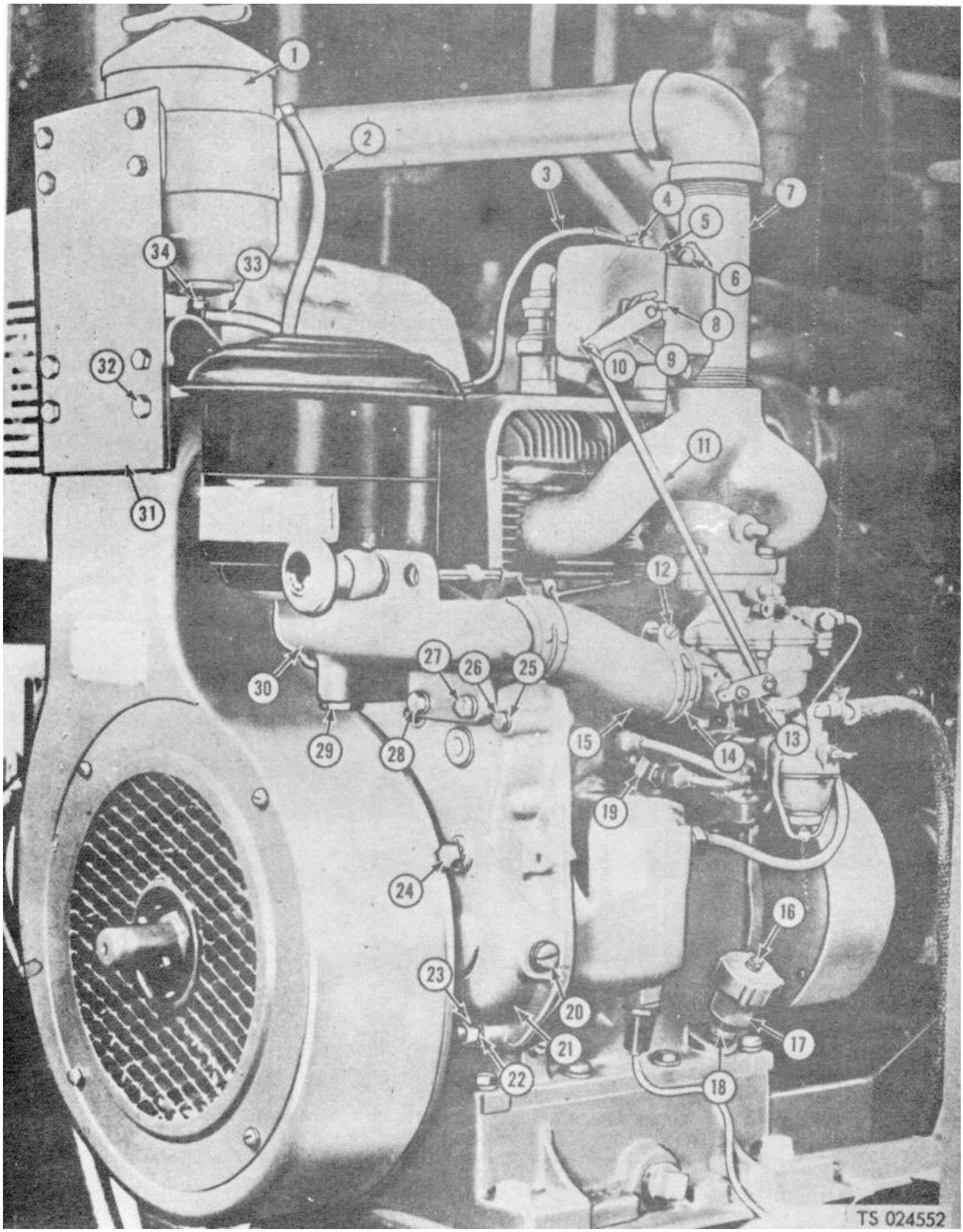


Figure 4-27. Engine, fuel system view.

1. Oil filter assembly
2. Oil filter inlet hose
3. Choke control lead
4. Nut
5. Automatic choke control
6. Machine screw
7. Exhaust pipe, nipple
8. Machine screw
9. Choke control lever
10. Cotter pin
10. Clip
11. Choke control rod
12. Hose clamp screw
13. Carburetor choke lever
14. Hose clamp
15. Hose
16. Oil filler and gage
17. Oil filler body
18. Oil filler nipple
19. Street tee fitting
20. Plug (timing)
21. Timing gear cover
22. IET lockwasher
23. Nut
24. Capscrew
25. Lockwasher
26. Machine bolt
27. Machine bolt
28. Lockwasher
29. Breather
30. Air cleaner mounting bracket
31. Oil filter mounting bracket
32. Machine bolt
33. Oil filter outlet hose
34. Hose nut

Figure 4-27 - Continued.

(5) Remove the two machine screws (6) securing the automatic choke control (5) to the exhaust pipe (7) and lift off the choke control (5).

WARNING

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b. Cleaning, Inspection and Repair. Wipe off the choke control with a rag dampened in cleaning solvent. Check for a damaged case or mounting plate. If the control is damaged it must be replaced. Check the screws for breaks or damaged threads. Replace the cotter pin.

c. Reassembly and Installation.

(1) Position the choke control (5) (fig. 4-27) to the exhaust pipe (7) and secure with the two machine screws (6).

(2) Position the control rod (11) on the carburetor choke control lever (13) and the automatic choke control lever (9). Secure with the two cotter pins (10) (ser. nos. L-1475-T through L-1478-T) or two clips (10) (ser. nos. L-1666-T through L- 1668-T).

(3) Position the control lead (3) on the choke control (5) and secure with the nut (4).

d. Adjustment.

(1) Loosen the clamp screw (8) slightly so that there is still enough drag to rotate the choke control shaft.

(2) Lift up on the control lever (9) until the carburetor choke control lever (13) is in the up, or closed position.

(3) Tighten the clamp screw (8).

(4) When the lever (9) is released it should go back to the intermediate position.

4-26 Air Cleaner

a. Removal and Disassembly.

(1) Remove the governor control lever.

(2) Loosen the hose clamp screw (12, fig. 4-27) securing the clamp (14) and hose (15) to the carburetor (16, fig. 4-24).

(3) Remove the two machine bolts (27, fig. 4-27) and lockwashers (28) securing the air cleaner bracket (30) to the timing gear cover (21) and lift off the air cleaner assembly and gasket (fig. 4-28).

(4) Remove the wing nut (2, fig. 4-28) securing the cap and filter unit assembly (1) and lift off cap assembly.

(5) Lift the cup assembly (4) with the gasket (3) from the bracket (7).

(6) Remove the gasket (5) and unscrew the stud (6) from the bracket.

(7) Loosen the hose clamp screw (16) and remove the hose (14) from the bracket.

(8) Remove the two hose clamps (13) from the hose (14).

(9) Remove the gasket (12) from the bracket (7).

(10) On all serial nos. L-1475-T through L-1478-T units, remove the breather (11) and the gasket (10) from the bracket (7).

(11) On serial nos. L-1666-T through L-1668-T units, remove four screws (20) and washers (19) securing breather (18) to air cleaner bracket (7). Remove breather (18), gasket (17), and performed packing (21).

Lines 7, 8 and 9 are superseded as follows: "for leaks or breaks, and on serial nos. L-1475-T through L-1478-T units, clean the hole in the timing gear breather plug. Replace all damaged parts. Replace gaskets".

WARNING

Dry cleaning solvent, P-D)-680 or P'-S-661, used to clean parts is potentially dangerous to personnel and property. Use in a well-ventilated area as the fumes al-e dangerous if inhaled. Avoid repeated and prolonged skin contact. Do not use near open flame or0 excessive heat. Flash point of solvent is 1OOF.-138F. (38C.-59C.).

b. Cleaning, Inspection and Repair. Empty the oil from the oil cup and remove the gasket from the cup.

Wash all parts in a cleaning solvent. Replace the hose if damaged. Clean all gasketed surfaces thoroughly, inspect the air cleaner and bracket for leaks or breaks, clean the hole in the timing gear breather plug. Replace all damaged parts. Replace gaskets.

c. Reassembly and Installation.

(1) Position the hose clamps (13) on the hose (14).

(2) Position the hose on the air cleaner bracket (7) and tighten the hose clamp screw (16) securing the hose to the bracket.

(3) Position the gasket (12) and the bracket (7) on the timing gear cover (21, fig. 4-27) and secure with the two lockwashers (28) and machine bolts (27).

(4) Screw the stud (6, fig. 4-28) into position in the bracket (7).

(5) On serial nos. L-1475-T through L-1478-T units, position the gasket (10) on the timing gear breather (11) and screw into position in the bracket. On serial nos. L-1666-T through L-1668-T units, position the gasket (17) and performed packing (21) on the breather (18) and secure to air cleaning mounting bracket (7) with four screws (20) and washers (19).

(6) Place the gasket (5) in position on the bracket assembly.

(7) Position the gasket (3) in the oil cup (4).

(8) Fill the oil cup (4) with oil to the oil level mark and position the cup on the bracket assembly (7).

(9) Position the cap and filter assembly (1) over the stud (6) and secure with the wing nut (2).

4-27. Governor

a. Removal.

(1) Remove the cotter pin securing the governor control rod to the lever (18, fig. 4-24) and remove the rod from the lever.

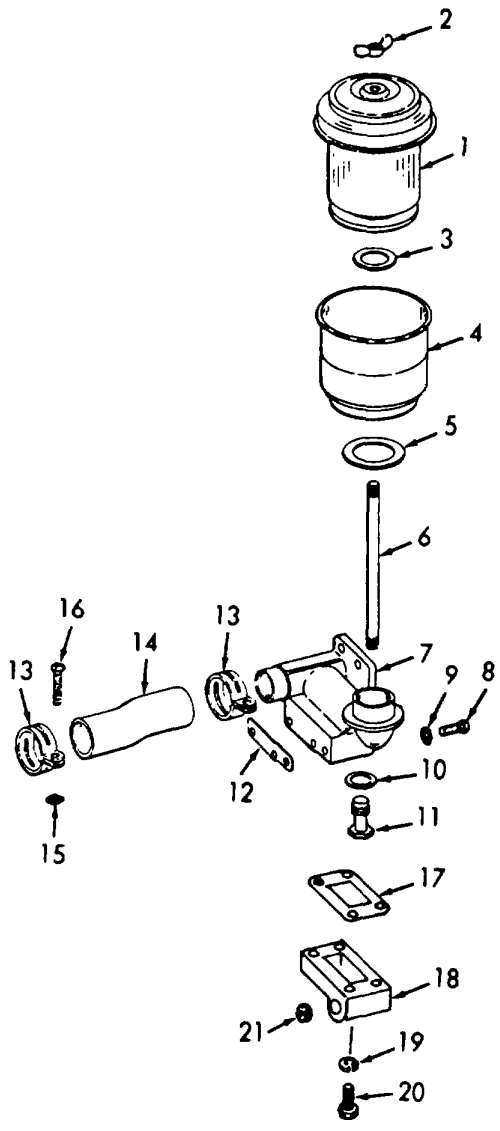
(2) Remove the spring (17) from the governor lever, marking the hole in the lever so that the spring may be replaced in its proper position.

(3) Remove the oil tube by unscrewing the two tube nuts, securing the tube to the governor, and to the street tee (19, fig. 4-27).

(4) Remove the two capscrews and lockwashers securing the governor to the gear cover (21, fig. 4-27).

(5) Remove the two machine bolts (26) and the lockwashers (25) securing the governor through the timing gear cover (21) and liftoff the housing(l, fig.4-29) and the gasket (2).

(6) Slide the thrust sleeve and flyweight assembly (6, fig. 4-29) and the shim washer (5) from



1. Cap and filter assembly
2. Wing nut
3. Gasket
4. Oil cup assembly
5. Gasket
6. Stud
7. Air cleaner bracket
8. Machine bolt
9. Lockwasher
10. Gasket
11. Breather
12. Gasket
13. Hose clamp
14. Hose
15. Nut
16. Screw
17. Gasket
18. Breather
19. Washer
20. Screw
21. Performed packing

Figure 4-28. Air cleaner, exploded view.

the shaft that is pressed into the timing gear cover (21, fig. 4-27).

WARNING

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b. Cleaning, Inspection and Repair. Wash all parts thoroughly in a cleaning solvent. Inspect the capscrews for damaged threads. Clean the gasket mating surfaces on the governor housing and the gear cover spacer. Inspect the housing for cracks and leaks. Inspect the shim washer for excessive wear. Inspect the flyweight and thrust sleeve assembly for bearing, gear, and bushing wear. Replace all damaged parts. Replace the gasket.

c. Installation.

(1) Position the shim washer (5, fig. 4-29) and the flyweight assembly (6) on the shaft in the timing gear cover (21, fig. 4-27).

(2) Position the gasket(2, fig. 4-29) and housing (1) and secure, with the four lockwashers (3), the two machine bolts (4) through the timing gear cover and the two capscrews (7) through the governor housing.

(3) Replace the oil tube.

(4) Replace the spring (17, fig. 4-24) in the proper hole in the lever (18).

(5) Slide the governor control rod into the lever (18) and secure with the cotter pin.

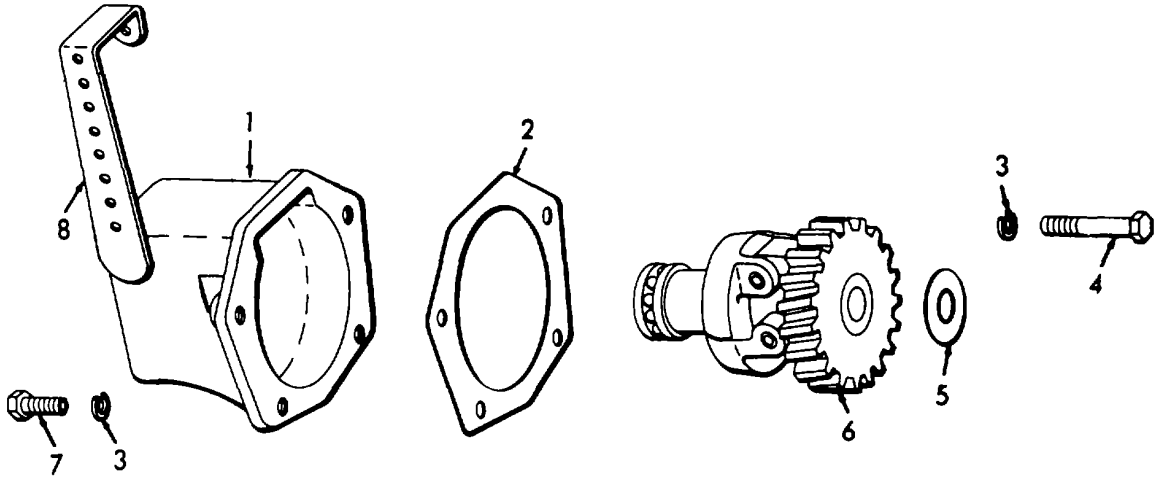
d. Adjustment. The rod from the governor to the carburetor must be adjusted to the proper length. With the engine stopped, the governor spring (17) will hold the flyweights "IN" and the rod must be of such length as to hold the carburetor throttle wide open at that point. To check the accuracy of this adjustment, remove the cotter pin securing the rod to the lever (18) and slide the rod from the lever. Push the rod toward the carburetor as far as possible. This will fully open the throttle. The bent end of the throttle rod should now line up exactly with the hole in the lever (18). If it does not, screw the rod in or out of the swivel block on the carburetor lever until it is lined up properly. Position the rod in the governor lever and secure with the cotter pin.

4-28. Fuel Pump And Fuel Strainer (Serial Nos.L-1475-T through L-1478-T.

a. Removal and Disassembly.

(1) Loosen the two tube nuts (10, fig. 4-24) securing the fuel tube (11) to the carburetor (16) and the fuel pump and remove the tube.

(2) Unscrew the tube nut securing the main fuel tube to the fuel strainer and push the fuel tube out of the way.



TS 024554

1. Housing
2. Gasket
3. Lockwasher
4. Machine bolt
5. Shim washer
6. Flyweight and thrust sleeve assembly
7. Capscrew
8. Control arm

Figure 4-29. Governor, partially exploded view.

(3) Remove the two capscrews and lockwashers securing the fuel pump to the engine. Lift off the fuel pump and strainer assembly and gasket.

(4) Using a pair of pliers, remove the priming lever stop pin (28, fig. 4-30), then remove the priming lever (27) from the crankcase and lift out priming lever spring (10, fig. 4-31).

(5) Unscrew the thumb nut '17, fig. 4-31) freeing the sediment bowl (18).

(6) Swing the bail (16) to the side and remove the bowl (18), gasket (19) and the screen (20).

(7) Lift the bail (16) from the cover (3) and remove the thumb nut (17) from the bail.

(8) Remove the shut-off valve and packing nut (1) from the cover. Lift the packing (2) from the cover.

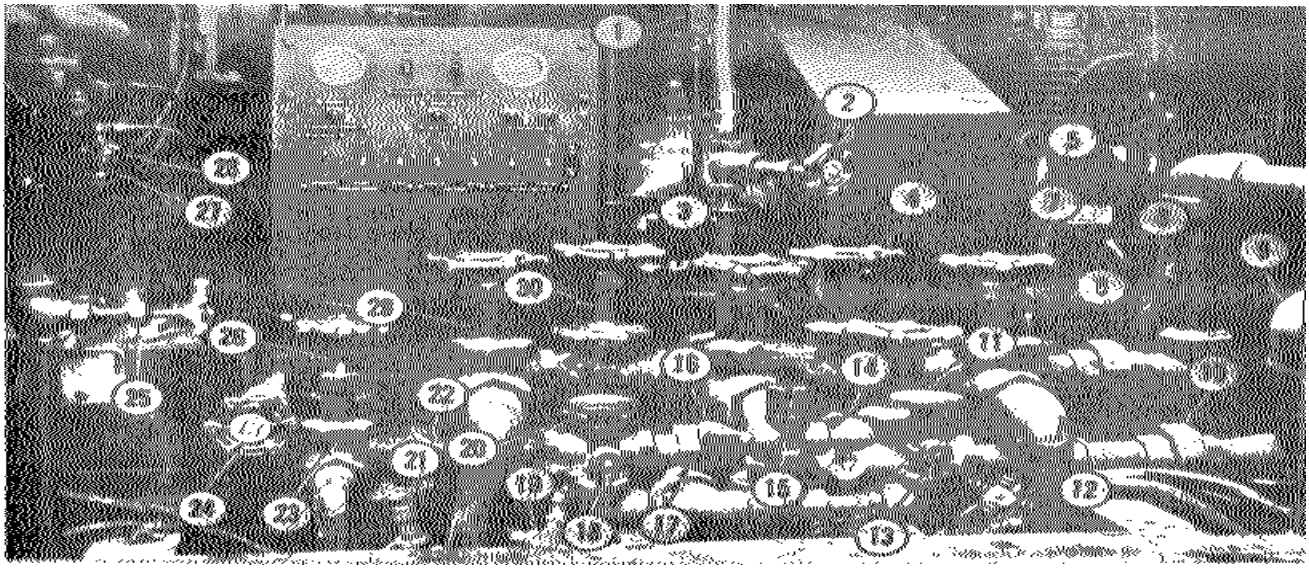
(9) Unscrew the cover from the fuel pump (6) and unscrew the fittings (4 and 5).

(10) Slide the performed packing (11) from the primer lever (12).

WARNING

Dry cleaning solvent, P-D-680 or P-S-661, used to clean parts is potentially dangerous to personnel and property. Use in a well-ventilated area as the fumes are dangerous if inhaled. Avoid repeated and prolonged skin contact. Do not use near open flame or excessive heat. Flash point of solvent is 100F.-138F. (38C.-59C.).

b. Cleaning, Inspection and Repair. Clean all parts in a cleaning solvent. Blow dry with com-



1. Strainer bleed-off valve
2. Cylinder filling compressor liquid shut-off valve
3. Liquid equalizing line valve
4. Dehydrator by-pass valve
5. Refrigerator suction valve
6. Transfer pump bleed-off valve
7. Liquid fill line valve thru pump
8. Receiver tank inlet line
9. Dehydrator
10. Union nut
11. Liquid line shutoff valve, conversion
12. Transfer hose bleed-off valve (thru pump)
13. Cylinder filling valve
14. Tube nut
15. Cylinder fill pressure regulating valve
16. Safety relief valve cylinder fill
17. Union nut
18. Cylinder filling valve
19. Transfer hose bleed-off valve
20. Vapor return valve, conversion
21. Transfer hose bleed-off valve vapor
22. Liquid line vapor relief valve
23. Vapor equalizing line valve
24. High pressure vapor return valve
25. Fire protection valve
26. Vapor return valve, storage
27. Carburetor priming lever
28. Stop pin
29. Liquid fill line valve, by-pass pump
30. Liquid shut-off valve to cylinder filling compressor

Figure 4-30. CO_2, manifolds, installed view.

pressed air making sure the passages are clean. Inspect the cover, bowl, and bail for chips, cracks, or other defects. Inspect the threads for damage. Inspect the screen for tears or enlarged opening. Check the fuel pump. Inspect the fuel line for breaks, thread damage or other defects. Replace all damaged parts. Install a new oil seal and gaskets.

c. Reassembly and Installation.

(1) Position the spring (10, fig. 4-31) on the engine crankcase.

(2) Install the packing (11) in the priming lever (12) and position the lever in the crankcase

.

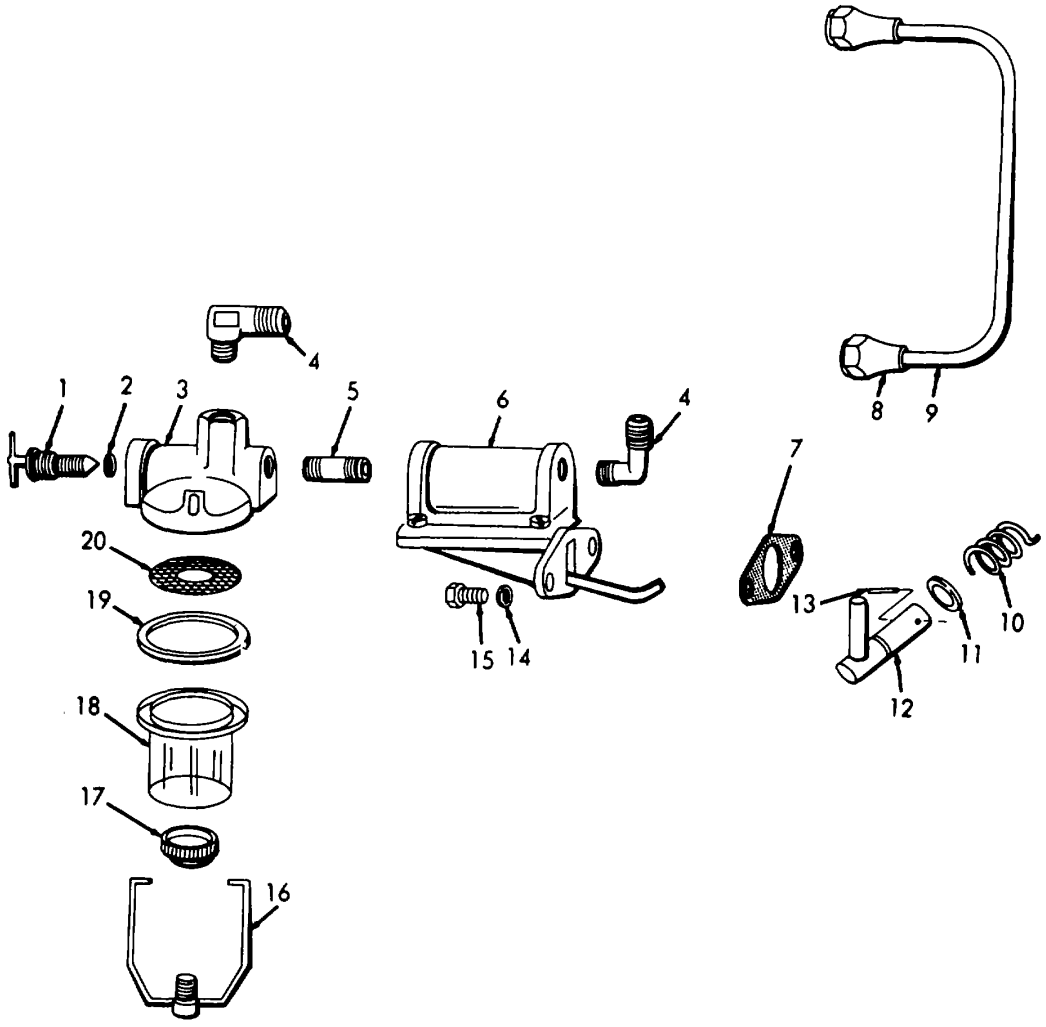
(3) Hook the spring into position on the priming lever and secure the lever with the pin (13).

(4) Screw the fittings (4 and 5) into position on the fuel pump.

(5) Position the gasket (7) and the fuel pump (6) on the engine crankcase and secure with the two capscrews (15) and lockwasher (14).

(6) Position the packing (2) and the shut-off valve and packing nut assembly (1) in the cover (3) and secure with the packing nut.

(7) Screw the fitting (4) into the cover (3) and screw the cover into position on the fuel pump (6).



1. Shut-off valve and packing nut
2. Packing
3. Cover
4. Elbow
5. Pipe nipple
6. Fuel pump
7. Gasket
8. Tube nut
9. Fuel tube
10. Spring
11. Preformea packing
12. Primer lever
13. Pin
14. Lockwashers
15. Capscrew
16. Ball
17. Thumb nut
18. Sediment bowl
19. Gasket
20. Screen

Figure 4-31. Fuel filter, exploded view.

(8) Position the fuel tube (9) on the carburetor and fuel pump and secure with the two tube nuts (8).

(9) Screw the thumb nut (17) into position on the bail (16).

(10) Position the bail in the cover (3).

(11) Swing the bail to one side and place the screen (20), gasket (19) and the sediment bowl (18) into position. Swing the bail (16) back into position under the sediment bowl and secure with the thumb nut (17).

(12) Position the main fuel tube on the fuel filter and secure with the tube nut (8, fig. 4-31).

d. Test.

(1) Remove the fuel tube (11, fig. 4-24) from the carburetor (16) and fuel pump (6, fig. 4-31).

(2) Install the pressure tester between the fuel pump and the carburetor.

(3) Start the engine and run at idle speed.

(4) Observe the pressure reading on the gage. The proper reading is between 3 and 4 lbs. (1.35 and 1.8 kg).

(5) If this reading is not obtained, check the fuel tubes and fitting between the fuel pump and the fuel tank for leaks.

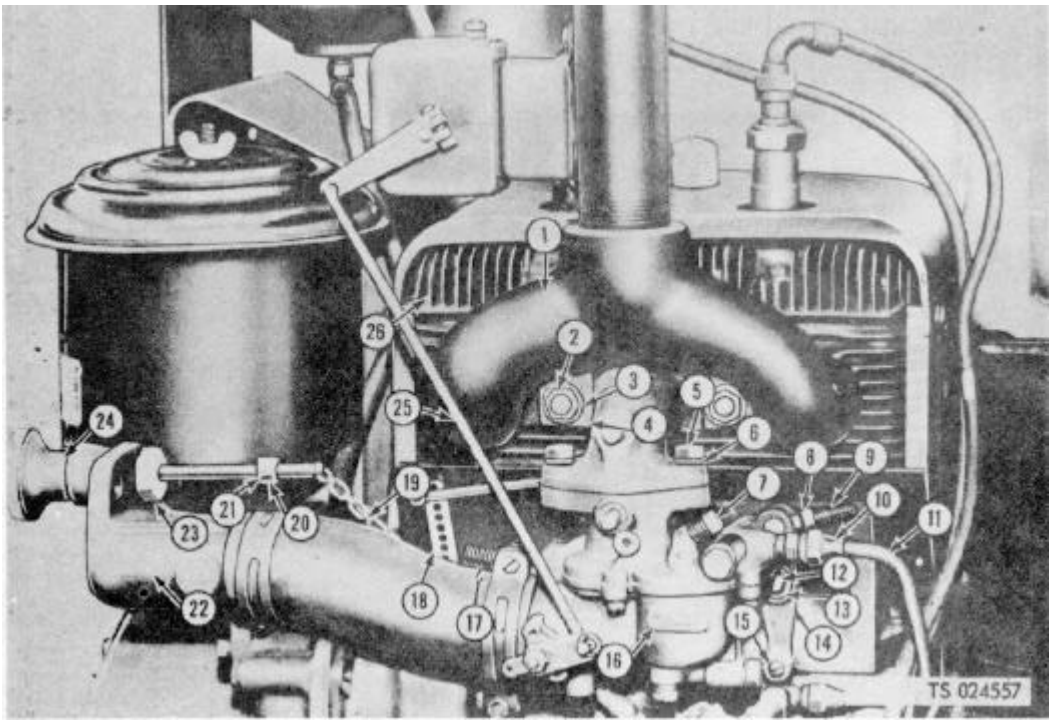
(6) Remove the pressure tester and adapter.

(7) Position the fuel tube (9, fig. 4-31) on the carburetor and fuel pump and secure with the two tube nuts (8).

4-29. Fuel Pump And Fuel Strainer (Serial Nos. L-1666-T through L-1668-T).

a. Removal and Disassembly.

(1) Loosen the two tube nuts (10, fig. 4-32) securing the fuel tube (11) to the carburetor (16) and the fuel pump, and remove the tube.



1. Exhaust manifold
2. Nut
3. Lockwasher
4. Saddle washer
5. Capscrew
6. Lockwasher
7. Adjusting needle screw
8. Adjusting nut
9. Governor control rod
10. Tube nut
11. Fuel tube
12. Support pin
13. Cotter pin
14. Governor control lever
15. Screw
16. Carburetor
17. Spring
18. Cross shaft lever
19. Chain
20. Setscrew
21. Stop collar
22. Air cleaner mounting bracket
23. Locknut
24. Governor control
25. Throttle rod
26. Cylinder block

Figure 4-32. Governor controls, installed view.

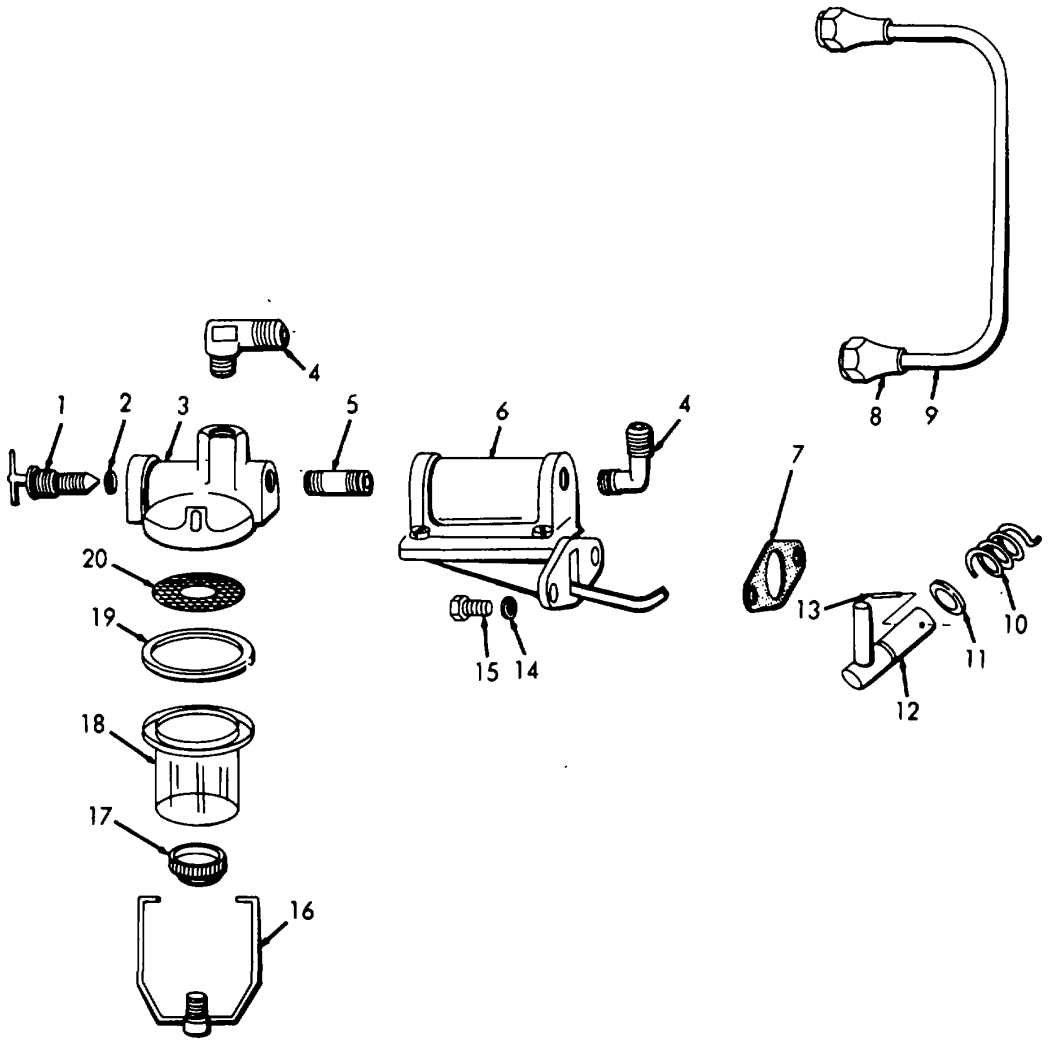
(2) Unscrew the tube nut securing the main fuel tube to the fuel pump and push the fuel tube out of the way.

(3) Remove the two capscrews and lockwashers securing the fuel pump to the engine. Lift off the fuel pump and gasket.

(4) Unscrew fittings (4, fig. 4-33) from fuel pump cover.

WARNING

Dry cleaning solvent, P-D-680 or P-S661, used to clean parts is potentially dangerous to personnel and property. Use in a well-ventilated area as the fumes are dangerous if inhaled. Avoid repeated and prolonged skin contact. Do not use near open flame or excessive heat. Flash point of solvent is 100F.-138F. (38C.-59C.).



TS 024558

1. Shut-off valve and packing nut
2. Packing
3. Cover
4. Elbow
5. Pipe nipple
6. Fuel pump
7. Gasket
8. Tube nut
9. Fuel tube
10. Spring
11. Performed packing
12. Primer lever
13. Pin
14. Lockwashers
15. Capscrews
16. Bail
17. Thumb nut
18. Sediment bowl
19. Gasket
20. Screen

Figure 4-33. Fuel filter, exploded view.

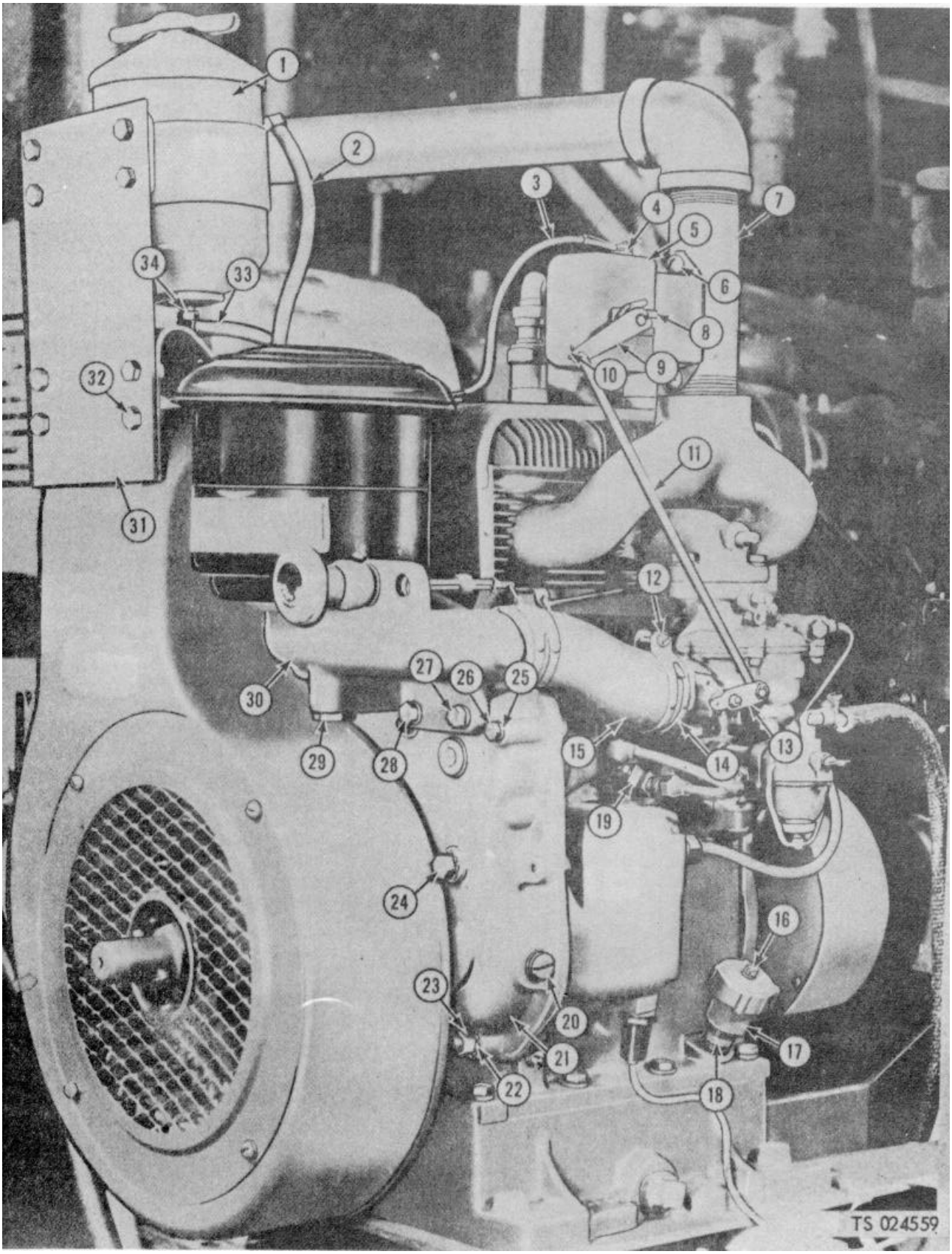


Figure 4-34. Engine, fuel system view.

1. Oil filter assembly
2. Oil filter inlet hose
3. Choke control lead
4. Nut
5. Automatic choke control
6. Machine screw
7. Exhaust pipe, nipple
8. Machine screw
9. Choke control lever
10. Choke control rod
12. Hose clamp screw
13. Carburetor choke lever
14. Hose clamp
15. Hose
16. Oil filler and gage
17. Oil filler body
18. Oil filler nipple
19. Street tee fitting
20. Plug (timing)
21. Timing gear cover
22. IET lock washer
23. Nut
24. Cap screw
25. Lock washer
26. Machine bolt
27. Machine bolt
28. Lock washer
29. Breather plug
30. Air cleaner mounting bracket
31. Oil filter mounting bracket
32. Machine bolt
33. Oil filter outlet hose
34. Hose nut

Figure 4-34 - Continued.

b. Cleaning, Inspection and Repair.

(1) Clean all parts with a cleaning solvent.

(2) Blow dry with compressed air; make sure the passages are clean.

(3) Inspect the fuel pump cover and body for chips, cracks, or other defects. Inspect the threads for damage. Inspect the fuel line for breaks, thread damage, or other defects.

(4) Replace all damaged parts. Install a new gasket.

c. Reassembly and Installation.

(1) Screw the fittings (4, fig. 4-33) into position on the fuel pump.

(2) Position the gasket (7) and the fuel pump (6) on the engine crankcase and secure with the two cap screws (15) and lock washer (14

(3) Position the fuel tube (9) on the carburetor and fuel pump and secure with the two tube nuts (8).

(4) Position the main fuel tube on the fuel pump and secure with the tube nut.

d. Test.

(1) Remove the fuel tube (11, fig. 4-32) from the carburetor (16) and fuel pump (6, fig. 4-33). (2) Install a pressure tester and adapter between the fuel pump and the carburetor.

(3) Start the engine and run at idle speed.

(4) Observe the pressure reading on the gage. The correct reading is between 3 and 4 lbs. (1. 35 and 1. 8 kg).

(5) If the correct reading is not obtained, check the fuel tubes and fitting between the fuel pump and fuel tank for leaks. (6) Remove the pressure tester and adapter.

(7) Position the fuel tube (11, fig. 4-32 on the carburetor and fuel pump and secure with the two tube nuts (10).

4-30. Carburetor And Intake Manifold

a. Removal and Disassembly.

(1) Remove the fuel tube (11, fig. 4-32).

(2) Remove the throttle rod (25) from the lever and unscrew it from the carburetor throttle lever.

(3) Loosen the hose clamp (14, fig. 4-34).

(4) Remove the cotter pin (10) (serial nos. L1475-T through L-1478-T) securing the choke rod (11) to the carburetor choke, lever (13), and slide the rod from the choke lever.

(5) Remove the two nuts (2, fig. 4-32), lock washers (3) and washers (4) securing the intake manifold and carburetor (16) to the block (26) and remove the intake manifold and carburetor assembly, and manifold gasket.

NOTE

These nuts also retain the exhaust manifold. Support the exhaust system before removing the intake manifold.

(6) Remove the two machine bolts (3, fig. 4-35) and lock washers (4) securing the carburetor (9) and gasket (12) to the intake manifold (1).

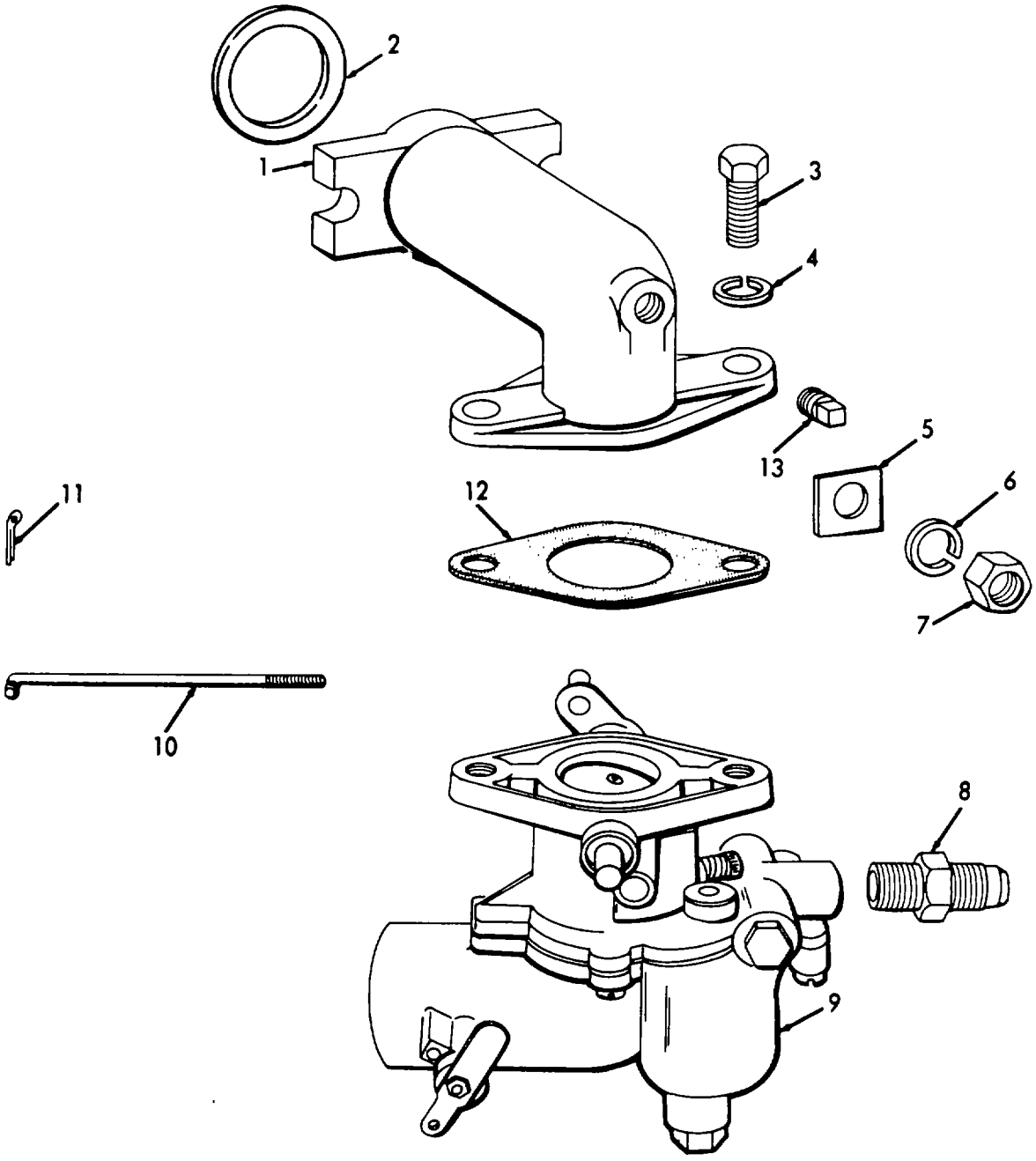
(7) Remove the adapter (8) from the carburetor and, on serial nos. L-1475-T through L1478-T units, the pipe plug (13) from the manifold.

WARNING

Dry cleaning solvent, P-D-680 or P-S-661, used to clean parts is potentially dangerous to personnel and property. Use in a well-ventilated area as the fumes are dangerous if inhaled. Avoid repeated and prolonged skin contact. Do not use near open flame or excessive heat. Flash point of solvent is 100F. -138F. (38C. -59C.).

b. Cleaning and Inspection. Wipe the carburetor with a cloth dampened in cleaning solvent. Wash all the other parts in cleaning solvent. Replace all damaged parts and gaskets. Replace the carburetor if it is defective.

c. Reassembly, Installation and Adjustment. Reverse the removal and disassembly procedures. Turn idle adjusting screw (7, fig. 4-32) as needed to get smoothest idle possible.



1. Intake manifold
2. Gasket
3. Machine bolt
4. Lock washer
5. Saddle washer
6. Lock washer
7. Nut
8. Adapter
9. Carburetor
10. Throttle rod
11. Cotter pin
11. Cotter pin
12. Gasket
13. Plug

Figure 4-35. Intake manifold and carburetor.

Section IX. GASOLINE ENGINE LUBRICATION SYSTEM AND VALVE TAPPETS

4-31. Description

A plunger type pump supplies oil through a spray nozzle to holes in the connecting rods, and to an oil header line and the timing gear train. A line goes to a restricted flow type oil filter. The oil returns to the pan from the timing gear housing through the front main bearing.

4-32. Oil Filter

a. Removal

(1) Remove the inlet (2, fig. 4-34) and the outlet (33) oil hoses from the oil filter (1) by unscrewing the two hose nuts (34).

(2) Remove the four nuts, lock washers, and machine bolts (32) securing the oil filter (1) to the mounting bracket (31). Lift off the filter assembly.

b. Disassembly

(1) Unscrew the wing nut (1, fig. 4-36) securing the cover assembly (2) to the body assembly (11). Lift off the cover assembly.

(2) Remove the gasket (13) from the cover assembly and lift the element (12), from the body. Discard the gasket and the element.

(3) Remove the nut (10), the lock washer (17) and the machine screw (16) securing the strap (9) to the body. Remove the strap from the body assembly (11).

WARNING

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c. Cleaning, Inspection and Repair. Wash all parts thoroughly in cleaning solvent, inspect the body, cover assembly and the strap for cracks or leaks. Replace all damaged parts.

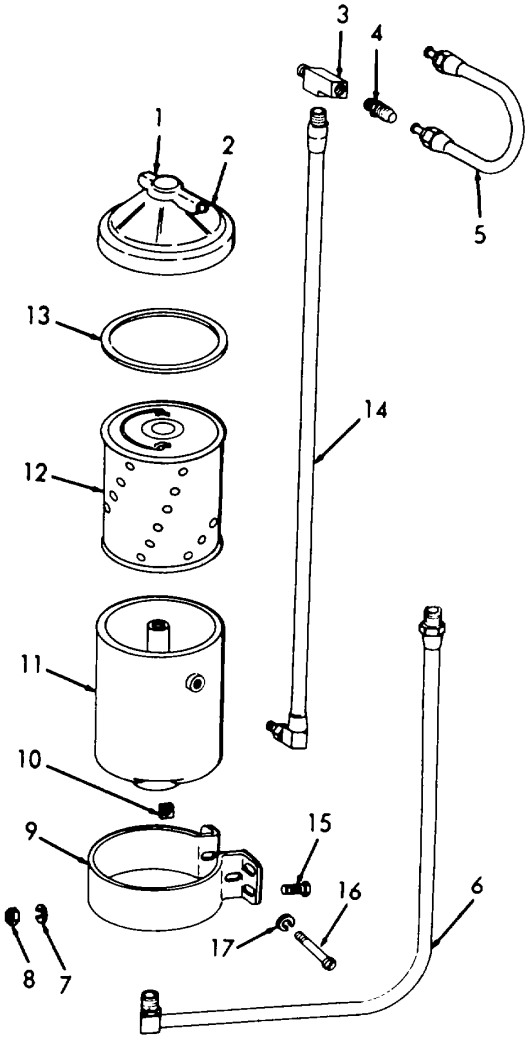
d. Reassemnbly and Installation. Reverse the disassembly and removal procedures.

4-33. Oil Lines

a. Removal and Disassembly

(1) Remove the two oil filter lines at the oil filter.

(2) Unscrew the oil filter inlet hose (2, fig. 4-34) from the street tee (19), and unscrew the oil filter outlet hose (33) from the top of the timing gear cover (21) (serial nos. L-1475-T through L-1478-T) or from TS 024561



1.	Wing nut	9.	Strap
2.	Cover assembly	10.	Nut
3.	Street tee	11.	Body assembly
4.	Adapter	12.	Filter element
5.	Hose assembly	13.	Gasket
6.	Hose assembly	14.	Oil line
7.	Lock washer	15.	Machine bolt
8.	Nut	16.	Machine screw
		17.	Lock washer

Figure 4-36. Oil filter, exploded view.

the engine base (serial nos. L-1666-T through L-1668-T).

(3) Remove the oil tube by unscrewing the two tube nuts securing the tube to the street tee (19) and the governor. Lift out the tube.

(4) Unscrew the street tee from the engine crankcase.

(5) Unscrew the adapter (4, fig. 4-36) from the street tee (3).

WARNING

Dry cleaning solvent, P-D-680 or P-S661, used the clean parts is potentially dangerous to personnel and property. Use in a well-ventilated area as the fumes are dangerous if inhaled. Avoid repeated and prolonged skin contact. Do not use near open flame or excessive heat. Flash point of solvent is 100F. -138F. (38C. -59C.).

b. Cleaning, Inspection and Repair. Clean all the parts in a cleaning solvent. Inspect the lines for cracks or evidence of leakage. Check the fittings and tube nuts for damaged threads. Replace all damaged parts.

c. Reassembly and Installation. Reverse the disassembly and removal procedure.

4-34. Tappets

a. Valve cover, removal and disassembly.

(1) Remove the fuel tube (11, fig. 4-32).

(2) Remove the throttle rod (25).

(3) Loosen the hose clamp (14, fig. 4-34).

(4) Remove the cotter pin (10) securing the choke rod (11) to the carburetor choke lever (13) and slide the rod from the choke lever.

(5) Remove the two nuts (2, fig. 4-32), lock washers (3) and washers (4) securing the intake manifold and carburetor (16) to the block (26) and remove the intake manifold carburetor assembly, and manifold gasket.

NOTE

These nuts also retain the exhaust manifold. Support the exhaust system before removing the intake manifold.

(6) Remove the two machine bolts (3, fig. 4-35) and lock washers (4) securing the carburetor (9) and gasket (12) to the intake manifold (1).

(7) Remove the adapter (8) from the carburetor and the pipe plug (13) from the manifold.

(8) Remove the cap screw (1, fig. 4-37), the support pin (6), and the valve covers (3) and gaskets (4) from the engine block.

WARNING

Dry cleaning solvent, P-D-680 or P-S661, used to clean parts is potentially dangerous to personnel and property. Use in a well-ventilated area as the fumes are dangerous if inhaled. Avoid repeated and prolonged skin contact. Do not use near open flame or excessive heat. Flash point of solvent is 100F. -138F. (38C. -59C.).

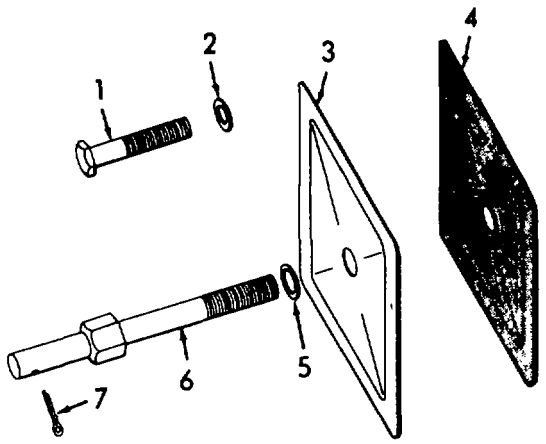
b. Cleaning, Inspection and Repair. Clean the valve cover gasket surface on the engine block. Wash the covers, washers, and hardware in solvent. Inspect the threads for damage. Replace all damaged parts and install new gaskets.

c. Tappet adjustment.

(1) Turn the crankshaft over by hand until the lifter (6, fig. 4-38) that is to be adjusted is at its lowest position.

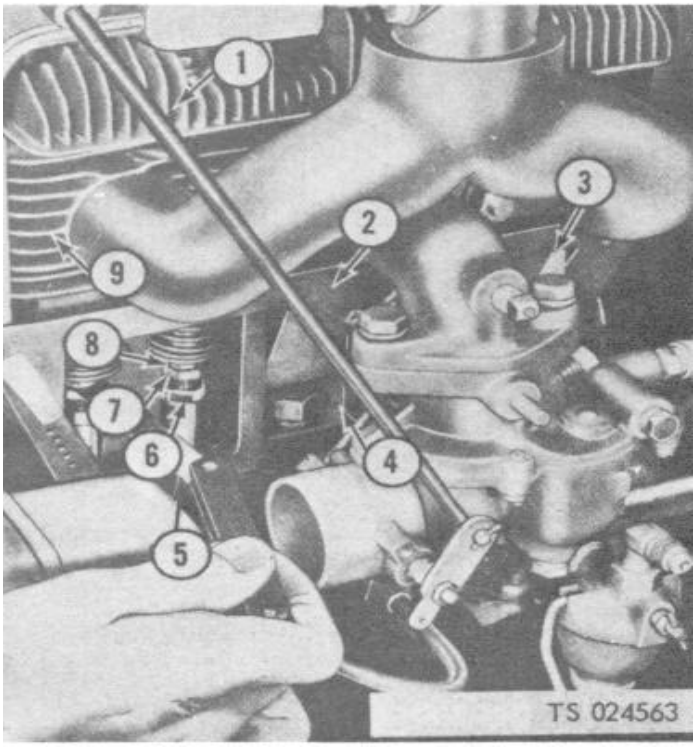
(2) On serial nos. L-1475-T through L-1478-T units, insert a 0, 012 inch (. 0305cm) feeler gage (5) between the valve stem (8) and lifter screw (7). On serial nos. L-1666-T through L-1668-T units, insert a 0. 008 inch (. 0203cm) feeler gage for the two intake valves and a 0. 016 inch (. 0406cm) feeler gage for the two exhaust valves.

i. Installation. Reverse the removal procedures.
TS 024562



1. Cap screw
2. Washer
3. Cover
4. Gasket
5. Washer
6. Support pin
7. Cotter pin

Figure 4-37. Valve cover and gasket.



1. Head
2. Air shroud heat deflector
3. Valve cover
4. Gasket
5. Feeler gage
6. Valve lifter
7. Adjusting screw
8. Valve stem
9. Block

Figure 4-38. Tappet adjustment.

Section X. EXHAUST SYSTEM

4-35. Description

The exhaust system consists of the exhaust manifold, the exhaust pipes, muffler, and tail pipe.

4-36. Tail Pipe-and Muffler

a. Removal and Disassembly.

(1) Remove the two nuts (23, fig. 4-39) and

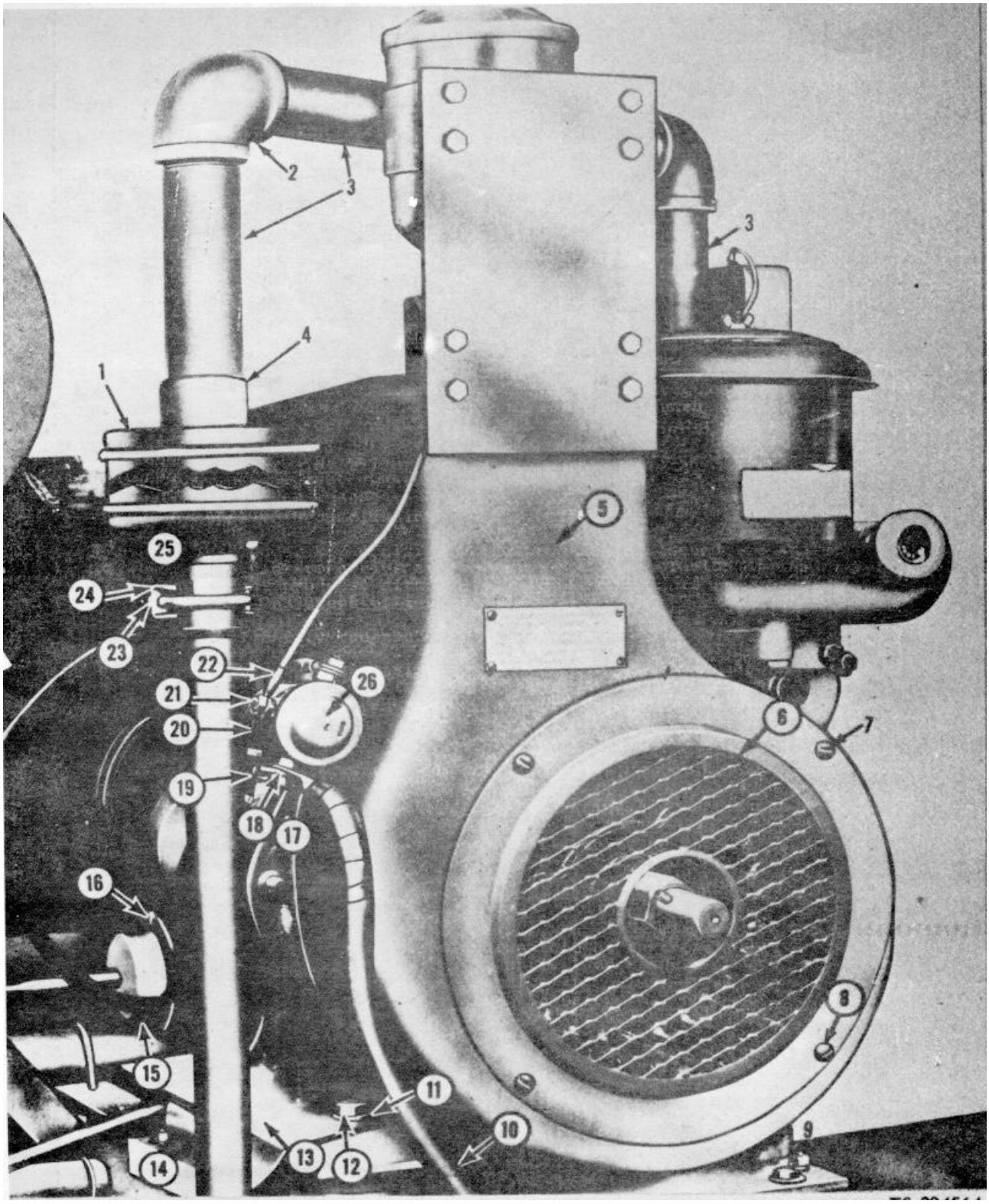


Figure 4-39. Muffler and exhaust pipes.

1 Muffler
2 Elbow
3 Pipe nipple
4 Pipe coupling
*5 Shroud
6 Flywheel cover
7 Machine screw
8 Lock washer
9 Caps crew
10 Battery lead
11 Lock washer
12 Cap screw
13 Bracket
14 Tail pipe tube
15 Belt tightener mounting
16 Cap screw
17 Nut, terminal, lower
18 Lock washer
19 Lead
20 Lead
21 Nut, terminal, upper
22 Lead
23 Nut, U-bolt clamp
24 Bracket
25 Clamp (U-bolt)
26 Solenoid

Figure 4-39. - Continued

lock washers securing the bracket (24) and clamp (25). Lift off the clamp and bracket.

(2) Slide the tail pipe (14) downward away from the muffler (1).

(3) Unscrew the muffler (1) from the elbow (2) and remove. Lift the tail pipe (14) up through the mounting bracket (13) and remove.

(4) Remove the cap screw (12) and lock washers (11) securing the bracket (13) and remove the bracket.

b. Inspection and Repair. Wash all parts in a cleaning solvent. Inspect the muffler and pipe for holes, leaks or cracks. Inspect the mounting bracket for cracks or breaks. Weld minor cracks in the bracket. Replace all other damaged parts.

c. Reassembly and Installation. Reverse the disassembly and removal procedures.

4-37. Exhaust Manifold and Pipes

a. Removal.

(1) Remove the muffler and tail pipe.

(2) Unscrew the elbow (2, fig. 4-39) from the pipe (3) and the pipe (3) from the other elbow (2).

(3) Unscrew the elbow from the exhaust pipe (4).

(4) Remove the two machine screws (6, fig. 4-34) securing the automatic choke control (5) to the exhaust pipe (7) and lower the choke control out of the way.

(5) Remove the two nuts (2, fig. 4-32), lock washers (3) and clamp washers (4) securing the exhaust manifold (1) to the block (26).

(6) Lift off the manifold (1) and gaskets and unscrew the pipe.

b. Inspection and Repair. Inspect for cracks or breaks. Inspect the threads for damage. If the threads are not too badly damaged rechase the threads with a pipe die. Replace all damaged parts. Discard the old gaskets and replace.

c. Installation. Reverse the removal procedure.

Section XI. GASOLINE ENGINE IGNITION SYSTEM

4-38. Description

The spark is produced by a magneto. The ignition current is transmitted into the engine cylinder through an ignition cable and spark plug. A ground out cable which connects to the shut-off switch on the engine control panel is provided to ground out the magneto and shut off the engine.

4-39. Spark Plugs and Wiring

a. Removal and Disassembly.

(1) Remove the four coupling nuts (2, fig. 4-401) securing the two spark plug cables (3) to the spark plugs (1) and the magneto (6).

(2) Remove the machine screw (5), securing the clip (4) and the spark plug cables to the cowling. Remove the spark plug cables.

(3) Clean the dirt from around the spark plugs. With a spark plug wrench, remove the plugs and gaskets.

b. Cleaning, Inspection and Repair. Clean the spark plugs by sand blasting. If the plugs are pitted or burned, replace them. Replace damaged parts. Reset plug gap to 0. 030 in. (. 0762 cm). Replace the spark plug gaskets, if necessary.

c. Reassembly and Installation. Reverse the removal and disassembly procedures.

4-40. Magneto

a. Removal

(1) Remove the spark plug cables and the ground cable from the magneto.

(2) Hold a wrench on the cap screw (7, fig. 4-401) securing the magneto (6) and remove the nut (23, fig. 4-34) and the lock washer (22).

(3) Remove the cap screw.

(4) Hold the magneto and remove the cap screw (24, fig. 4-34) and the internal-external lock washer (22) securing the magneto to the timing gear cover (21). Lift out the magneto and the gasket.

WARNING

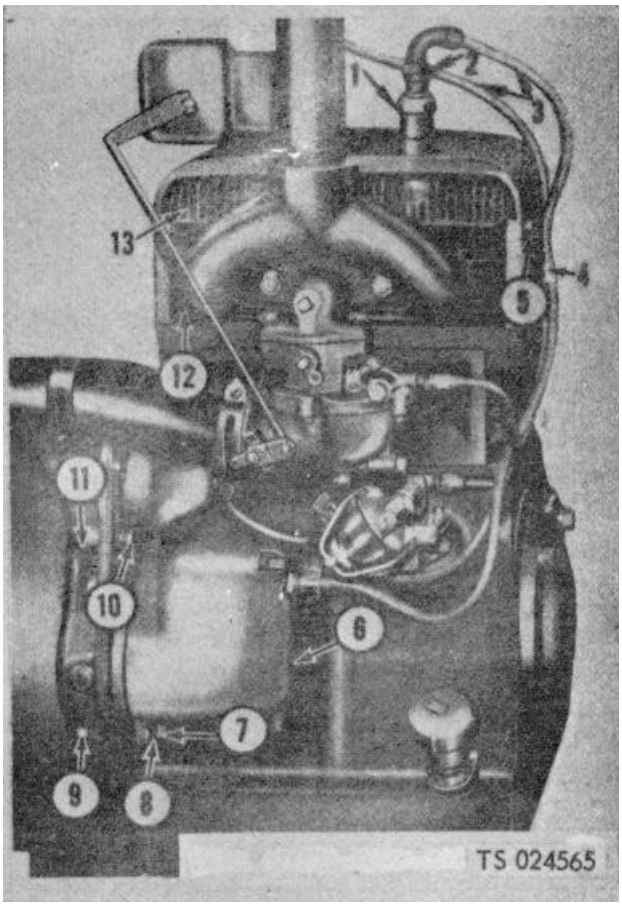
Dry cleaning solvent: P-D-680 or P-S-661, used to clean parts is potentially dangerous to personnel and property. Use in a well-ventilated area as the fumes are dangerous if inhaled. Avoid repeated and prolonged skin contact. Do not use near open flame or excessive heat. Flash point of solvent is 100F. -138F. (38C. -59C.).

b. Cleaning and Repair. Wipe with a clean cloth dampened in a cleaning solvent. Inspect the magneto cover for breaks or cracks. Replace all damaged parts.

c. Installation and Timing. When the magneto has been removed it must be retimed to the engine.

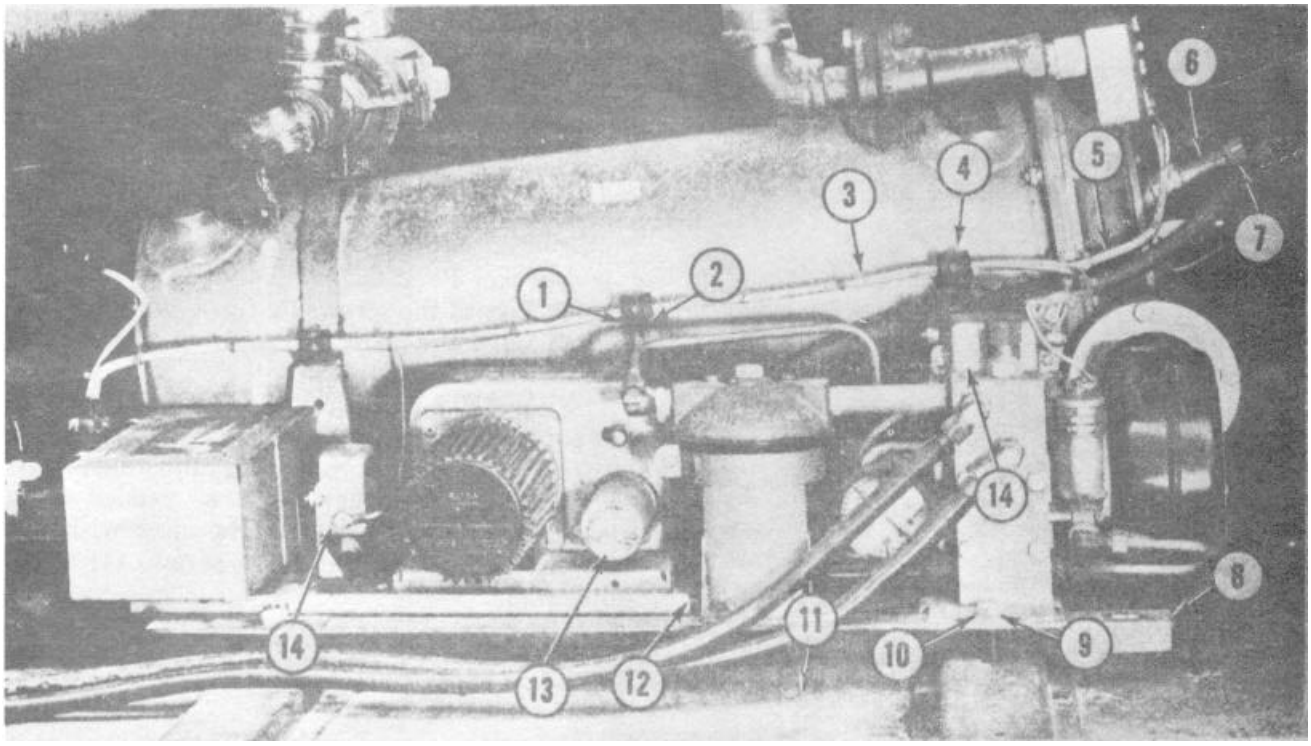
(1) Remove the four machine screws (7, fig. 4-39) and lift off the screen (6).

(2) Remove the spark plug closest to the flywheel. Hold the thumb over the spark plug hole and turn the engine over slowly with the hand crank until a definite pressure can be felt. When this occurs, the number one piston is coming up on the compression stroke. Reinstall the spark plug.



1. Shielded spark plug
2. Nut
3. Shielded ignition cable
4. Clip
5. Screw
6. Magneto assembly
7. Cap screw,
8. IE toothed lock washer
9. Nut
10. Cap screw
11. Timing gear cover
12. Cylinder block
13. Cylinder head

Figure 4-40. Ignition suppression components (Sheet 1 of 2)



1. Nut
2. Machine screw
3. Shielded ignition cable
4. Clip
5. Combustion head
6. Shielded spark plug
7. Nut
8. Heater base
9. IE toothed lock washer
10. Cap screw
11. Housing
12. IE toothed lock washer
13. Ignition unit
14. Radio interference suppression

Figure 4-40. Ignition suppression components (Sheet 2 of 2)

(3) Continue to turn the engine until the edge (6, fig. 4-41) of the vane (4) marked X is in line with the vertical center line mark (5) on the shroud (1). Leave the' flywheel in this position as the number one piston is now on top dead center. Note the flywheel (2) is marked with "DC" (7) near the marked vane.

(4) Remove the plug (20, fig. 4-34).

(5) Turn the magneto gear (3, fig. 4-42) clockwise until the impulse coupling snaps.

(6) Hold the gear in this position and mount the gasket and magneto to the engine meshing the gears so that the "X" marked tooth (4) is centrally located in the inspection hole.

(7) Replace the attaching hardware, and the wiring.

(8) Whiten tip of vane (4, fig. 4-41) next to timing mark (7) on the engine flywheel with chalk or paint. Connect a timing light to the engine. With engine operating at governed speed, timing light should cause vane (4) to appear stationary in alignment with mark (3) in shroud.

(9) Install the inspection hole plug (20, fig. 4-34) in the timing gear cover and replace-the screen.

d. Breaker Point and Condenser Removal.

(1) Remove the ground and spark plug cables.

(2) Remove the magneto cover and gasket from the magneto.

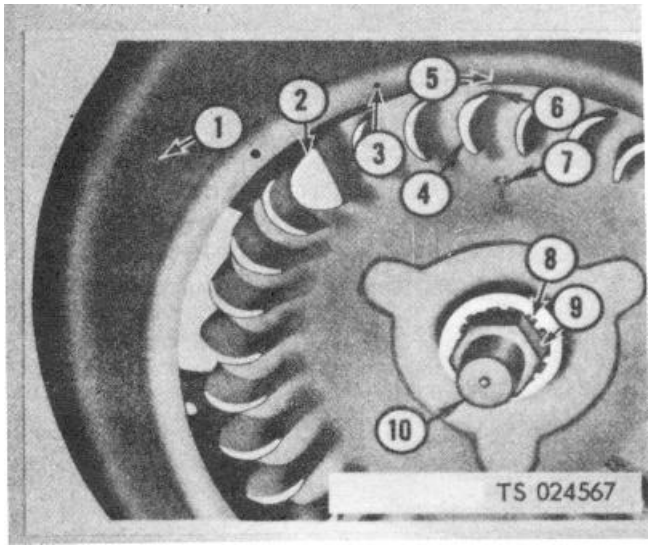
(3) Remove the terminal screw (3, fig. 4-43).

(4) Remove the breaker arm lock (7) and washers (5), and take the breaker arm (8) off the pin (6).

(5) Remove the aligning washer (11, fig. 4-44) from the pin.

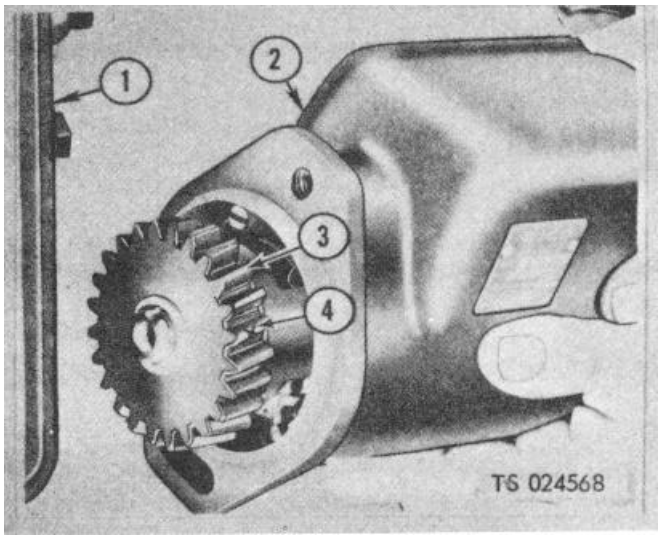
WARNING

Dry cleaning solvent, P-D-680 or P-S661, used to clean parts is potentially dangerous to personnel and property. Use in a well-ventilated area as the fumes are dangerous if inhaled. Avoid repeated and prolonged skin contact. Do not use near open flame or excessive heat. Flash point of solvent is 100F. -138F. (38C. -59C.).



1	Shroud	6	Edging vane
2	Flywheel	7	Flywheel timing mark
3	Running spark advance mark	8	Lock washer
4	Timing vane	9	Flywheel nut
5	Top dead center mark	10	Pin

Figure 4-41. Flywheel timing marks.



1. Timing gear cover
2. Magneto
3. Magneto drive gear
4. Magneto drive gear timing mark

Figure 4-42. Magneto gear timing marks.

e. Cleaning and Inspection. Wipe all parts with a clean rag dampened in a solvent. Inspect contact points for burning or pitting. Replace damaged parts, except lightly pitted points may be filed to a smooth mating surface.

f. Breaker Point and Condenser Installation. Reverse the removal procedures in d. above.

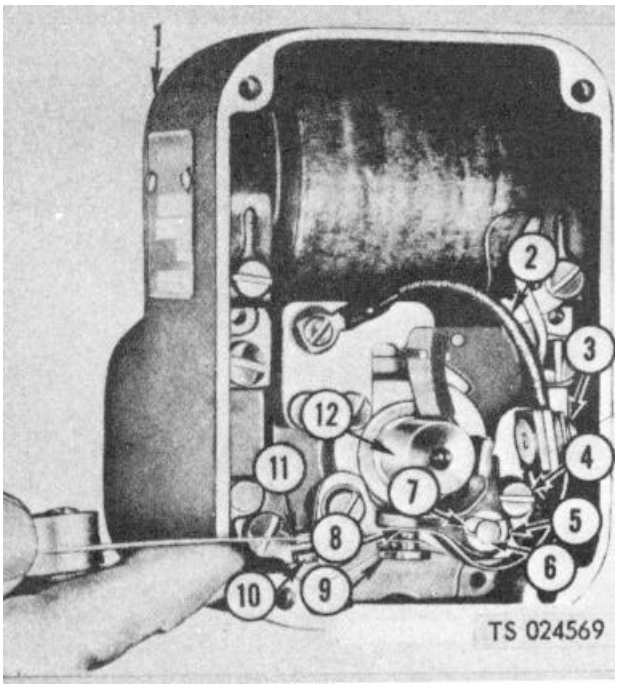
g. Breaker Point Gap Adjustment.

(1) Loosen the screws (4, fig. 4-43).

(2) Turn the rotor (12) so the points are fully open.

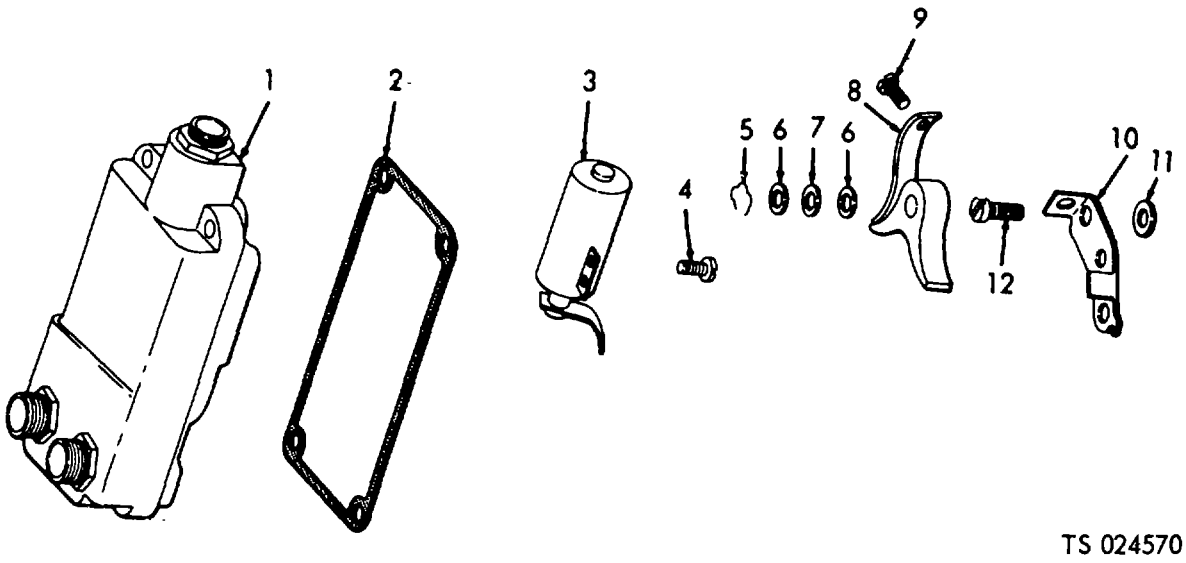
(3) Insert a 0. 015 in. feeler gage (11) between the points.

(4) Use a screwdriver in the adjusting slot (10) to move the stationary point as needed to get clearance producing just slight drag with gage between points, and retighten screws (4) to hold adjustment.



1.	Magneto	7.	Lock
2.	Condenser lead	8.	Breaker arm
3.	Terminal screw	9.	Fixed contact
4.	Screw	10.	Adjusting slot
5.	Washer	11.	Feeler gage
6.	Pivot pin	12.	Rotor

Figure 4-43. Breaker point, removal and adjustment



1.	Magneto cover	5.	Lock	9.	Screw
2.	Gasket	6.	Washer	10.	Fixed contact
3.	Condenser	7.	Washer	11.	Aliening washer
4.	Screw	8.	Breaker arm	12.	Screw

Figure 4-44. Condenser and breaker points, exploded view.

Section XII. 24 VOLT ELECTRICAL SYS. TEMS ENGINE AND VEHICULAR

4-41. Description

a. The 24 volt electrical system is comprised of three circuits. (fig. 4-45).

b. The running light circuit is operated from the towing vehicle batteries and comprises the front trailer receptacle, the rear receptacle, the trailer tail lights, the service clearance lights, and the blackout service lights.

c. The dome light circuit is powered by either the tractor (1, fig. 4-46) or trailer (2) batteries through the TRACTOR-TRAILER control switch (6). The other components are the three dome light switches (3), the storage compartment dome lights (5) and power compartment dome lights (4).

d. The DC control circuit is controlled through the trailer batteries and consists of the toggle switches (13, 9, 8, 7, 6, 11, and 12, fig. 4-47) heater failure lights (10, 14), the gage line heater lights (5), ammeter (1) circuit breaker (3), and the fuel gage (4), all mounted on the DC control panel (fig. 4-47). Two refrigeration compressor pressure switches (22, 23, fig. 4-48) are connected to the ignition system of the engine. The low pressure switch (22) opens to ground out the magneto to stop the engine at zero pounds per square inch suction pressure. The high pressure switch opens to stop the engine when the discharge pressure reaches 240 psi (16. 872 kg per sq. cm). The low pressure switch will close again when the suction pressure rises to 12 psi (. 8436 kg per sq. cm), and the high pressure switch will close when the pressure drops to 240 psi (16. 872 kg per sq. cm). The tank pressure control switch (10) closes the circuit to the gasoline engine at 305 psi (21. 4415 kg per sq. cm) and opens the circuit when the pressure drops to 295 psi (20. 7385 kg per sq. cm). An alarm pressure switch (14) is provided for each pressure vessel, which closes the circuit to the alarm bell (15) when tank pressures exceed 325 psi (22. 8475 kg per sq. cm) or are below 250 psi (17. 575 kg per sq. cm).

e. When the unit is set for automatic operation, using the gasoline engine for power, the automatic engine control (17) will crank the engine for a predetermined time interval. If the engine fails to start after the cranking cycle, the control will cease to function and a failure, light will light on the control panel. Power is supplied to the control when the tank pressure control switches close.

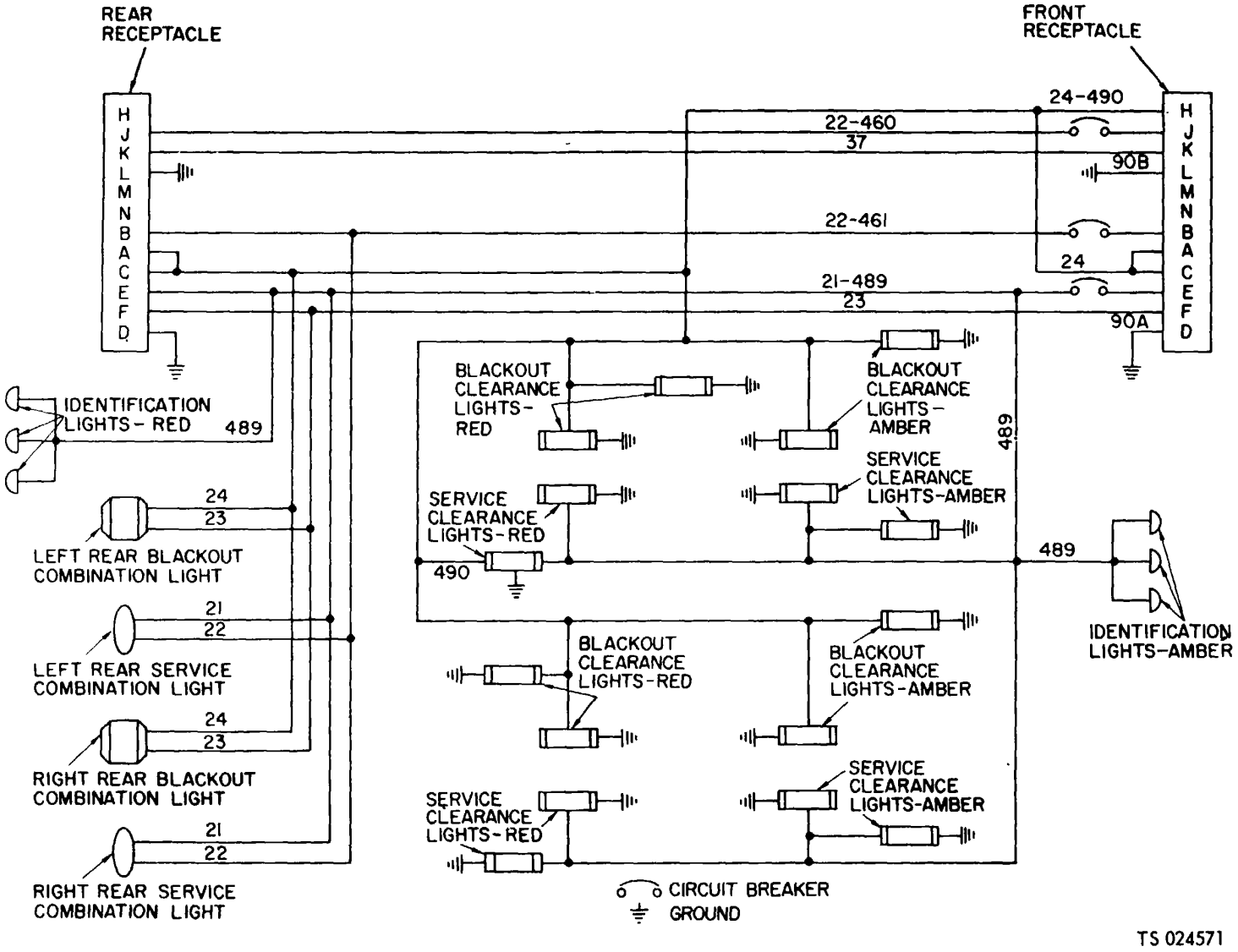
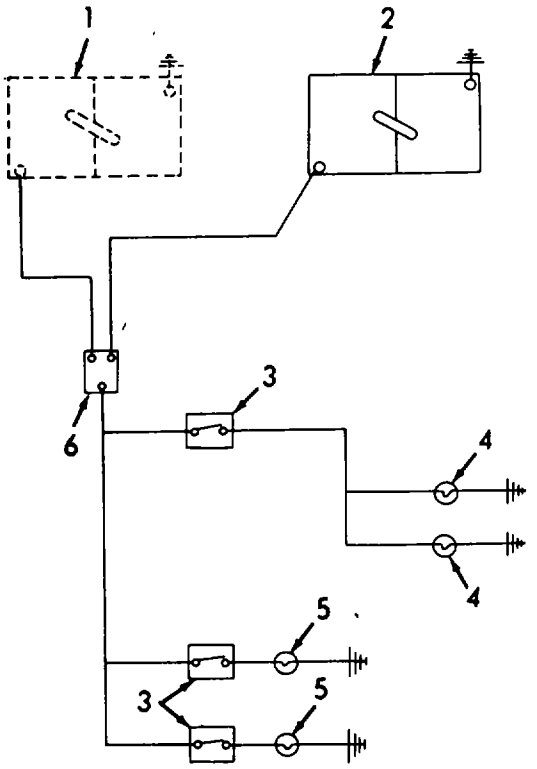


Figure 4-45. Trailer running light wiring schematic.



TS 024572

1. Tractor batteries
2. Trailer batteries
3. Dome light switches
4. Power compartment dome lights
5. Storage compartment dome lights
6. "Tractor-trailer" control switch

Figure 4-46. Dome light schematic.

f. The generator regulator (3, fig. 4-48) contains a cut-out to prevent reverse current flow from the battery to the generator when the generator is not operating. It also contains a voltage limiter set at 28 ½ ± 1 volt. A current limiter, incorporated as protection for the generator, is set for maximum output of 18 amperes.

g. The generator (4) supplies all the current required by the equipment and maintains the batteries (21) in a fully charged condition for cranking the gasoline engine.

h. Two 12-volt batteries connected in series supply power to the 24-volt DC system. The negative terminal of the battery is the ground.

4-42. Batteries

a. Removal.

(1) Loosen the nuts (4, fig. 4-49) securing the leads (2, 8 and 9) to the batteries (12) and lift the lead free of the battery.

(2) Remove the four nuts (7) and lock washers (6) securing the hold-down bars (5) and remove the bars.

(3) Lift the batteries from the battery retainer (13)

b. Installation. Reverse procedure in a. above.

c. Testing. Refer to TM 96140-200-15.

4-43. Starter and Solenoid

a. Removal.

(1) Remove the battery ground lead (2, fig. 4-49) from the battery.

(2) Remove the nut (17, fig. 4-39) from the solenoid (26) releasing the battery lead (10). Remove the regulator lead (20) wire.

(3) Remove the nut (21), releasing the switch lead (20) and the automatic choke lead (22).

(4) Remove the nut (10, fig. 4-50) and lock washer securing the starter lead (16) to the solenoid (11) and remove the lead.

(5) Remove the nut (18) and lock washer securing the lead (16) to the starter (17).

(6) Remove the two machine screws (12) and lock washers securing the solenoid (11) to the shroud (9). Lift off the solenoid.

(7) Remove the two caps crews (20) and lock washers (21) securing the starter bracket(19)to the crankcase (22). Remove the bracket from the starter.

(8) Remove the three cap screws (15) and lock washers (14) securing the starter (17) to the timing gear plate (13). Remove the starter from the plate.

b. Installation. Reverse the procedure in a above.

4-44. Generator Regulator

a. Removal.

(1) Remove the screw (25, fig. 4-51) releasing the lead (24) from the regulator (20).

(2) Remove the two wiring harnesses (15 and 19) from the regulator.

(3) Remove the four cap screws (21) nut, and lock washers securing the regulator (20) to the mounting plate (22). Remove the regulator.

(4) Remove the two cap screws (23), nuts, and lock washers (26) securing the mounting plate (22) to the frame (27). Remove the plate.

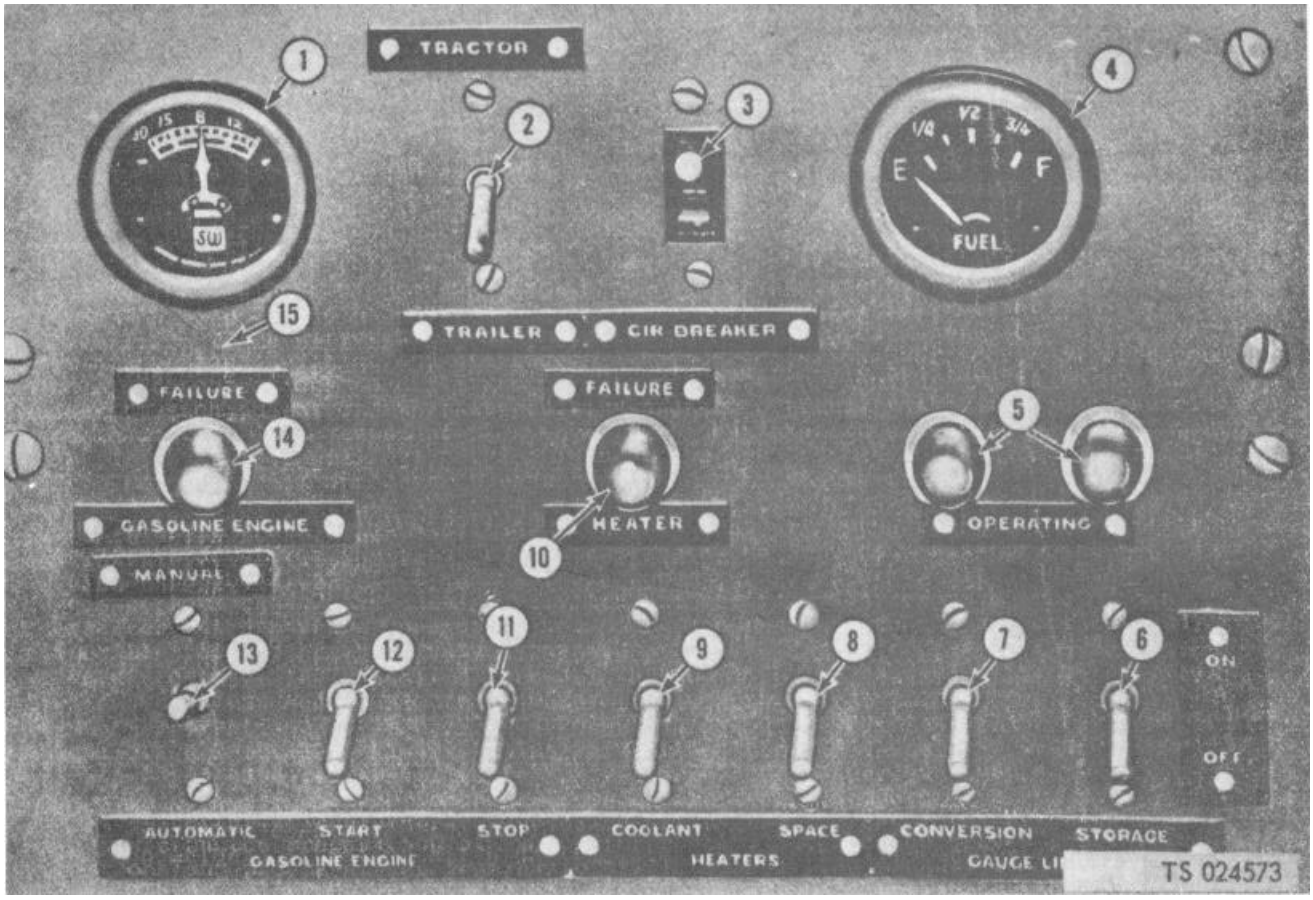
b. Installation. Reverse the removal procedure in a above.

4-45. Generator

a. Generator Removal.

(1) Loosen the coupling nut securing the wiring harness (15, fig. 4-51) to the generator (31) and disconnect the harness.

(2) Remove the cap screw (13) securing the generator (31) to the adjusting bracket (14).



1. Ammeter
2. Electrical control switch (tractor or trailer)
3. Circuit breaker
4. Fuel indicator gage
5. Gage lines operating lights
6. Storage vessel gage line switch
7. Conversion vessel gage line switch
8. Compartment heater control switch
9. Conversion heater control switch
10. Conversion heater failure light
11. Gasoline engine manual stop switch
12. Gasoline engine manual starter switch
13. Gasoline engine control switch for automatic or manual control
14. Gasoline engine failure light
15. Engine control panel

Figure 4-47. Engine Control Panel

(3) Raise the generator and slip off the generator drive belt (1).

(4) Remove the two nuts (29), lock washers (30), and cap screws (28) securing the generator (31) to the frame (27). Lift out the generator.

(5) Remove the nut (3, fig. 4-52), lock washer (4) and cap screw (6) securing the adjusting bracket (9) to the frame, releasing the strap.

b. Brush Replacement.

(1) Loosen the screw (1, fig. 4-52) securing the strap (2) on the generator (5) and slide the strap from the generator.

(2) Remove the screw (13) securing the brush (-12) to the brush holder' (15).

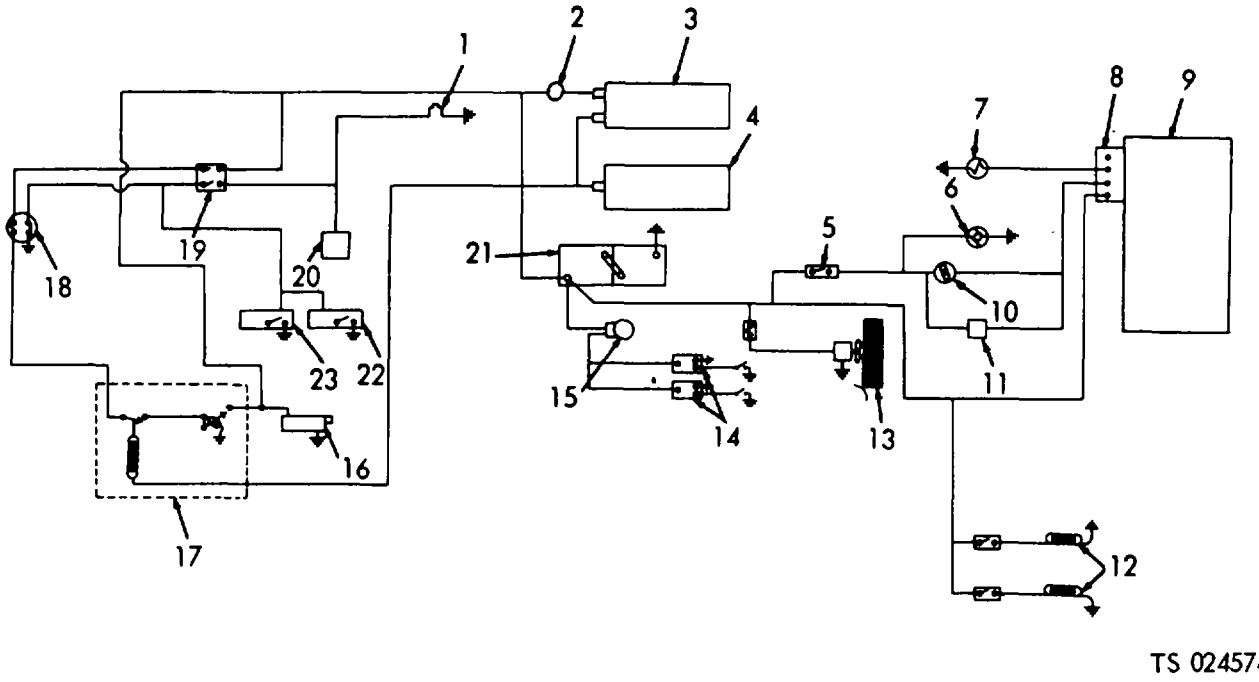
(3) Lift the brush arm with a stiff wire and remove the brush.

(4) Reverse steps (1) to (3) to install brushes.

c. Generator Installation. Reverse the removal procedure to install the generator, and tighten drive belt to 1-% in. (3. 81 cm) deflection at midspan.

4-46. Pressure Switches

a. Refrigeration Compressor Pressure Switch Adjustment. The compressor pressure switches are set with the adjusting screws on top of the switches (1 and 2, fig. 4-53). Set the suction pressure switch (2) to open at zero psi to shut off the engine or electric motor. The low pressure suction switches reset to



1. Gasoline engine start and stop switches
2. Ammeter
3. Voltage regulator
4. Generator
5. Heater switch
6. Coolant circulating pump
7. Warning light
8. Heater control plug
9. Heater
10. Tank pressure control switch
11. Limit switch
12. Heating element
13. Space heater
14. Pressure alarm switch
15. Alarm bell
16. Starting motor
17. Automatic engine control
18. Pressure control switch
19. Automatic-manual engine control switch
20. Magneto
21. Batteries
22. Low pressure control switch
23. High pressure control switch

Figure 4-48. DC control wiring schematic

allow operations to resume when the suction pressure rises to 12 psi (. 8436 kg per sq. cm). Set the discharge switches (high pressure) (1) to open at 240 psi (16. 872 kg per sq. cm) to stop the electric motor or gasoline engine. The high pressure switches close to resume operation when the pressure drops to 210 psi (14. 763 kg per sq. cm). Adjust the switches to the correct settings as indicated on the dial by using a screw driver on the adjusting screw.

b. Tank Pressure Switch Adjustment. Adjust the tank pressure switches (4) by turning the adjusting knobs (5 and 6) to the desired setting on the scale. The correct setting is 305 on the high side (knob 5) and 295 on the low side (knob 6). The pressure switch (8), connected to the conversion heater, is set at 275 on the high side and 260 on the low side.

4-47. Ammeter and Fuel Gage

a. Removal.

(1) Disconnect battery ground lead (2, fig. 4-54).

(2) Remove the two nuts (3, fig. 4-55) securing the wires to the fuel gage (2) or ammeter (8). Remove the wires from the ammeter.

(3) Remove the two nuts (3) securing the clamp (7) and the unit to the control panel (19) and remove the clamp (7) and ammeter (8).

b. Installation. Reverse removal procedure.

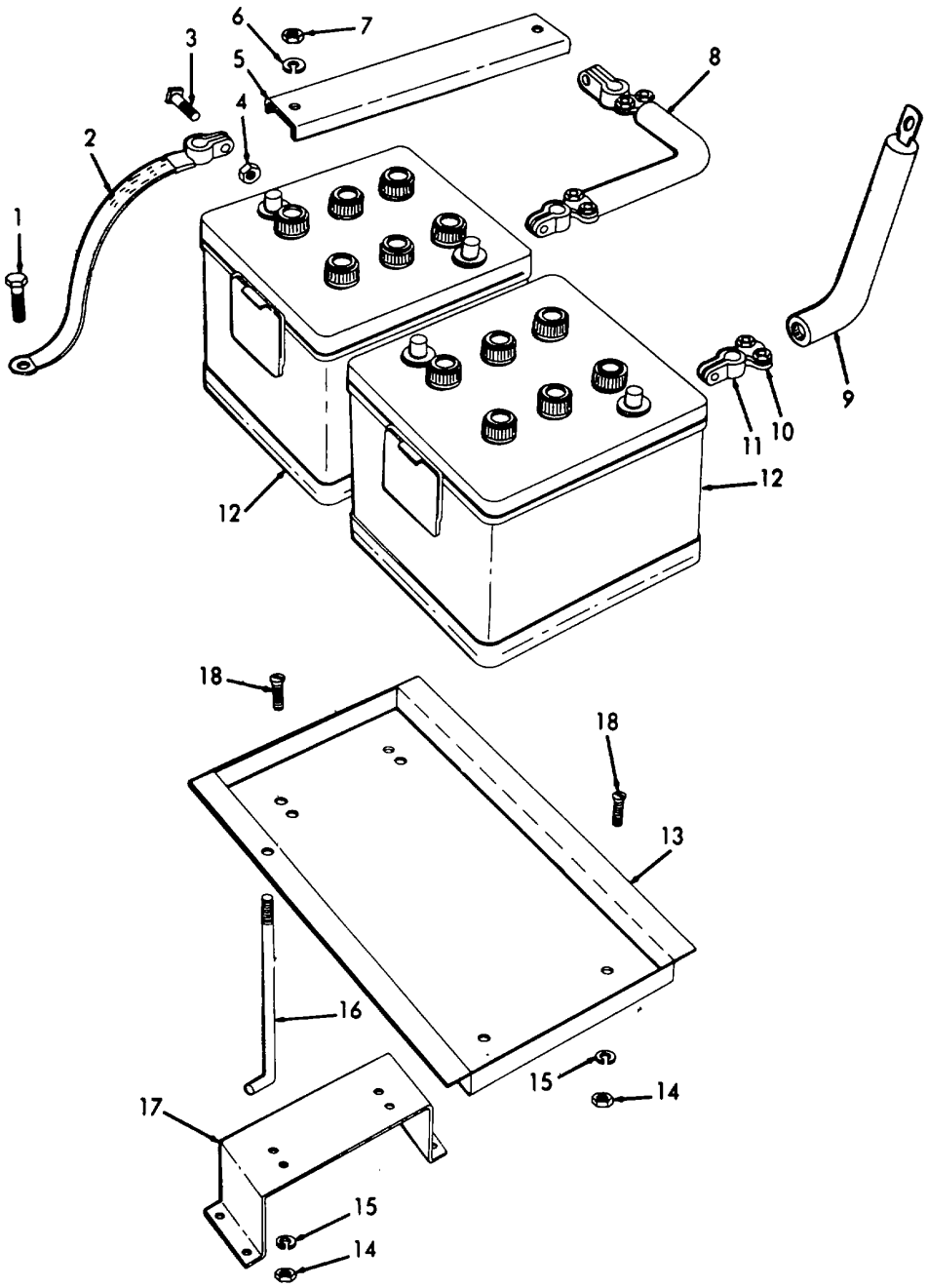
4-48. Automatic Starter Control

a. Removal.

(1) Refer to the wiring diagram (fig. 4-56) and tag the wire leads connected to the starter control (9, fig. 4-55).

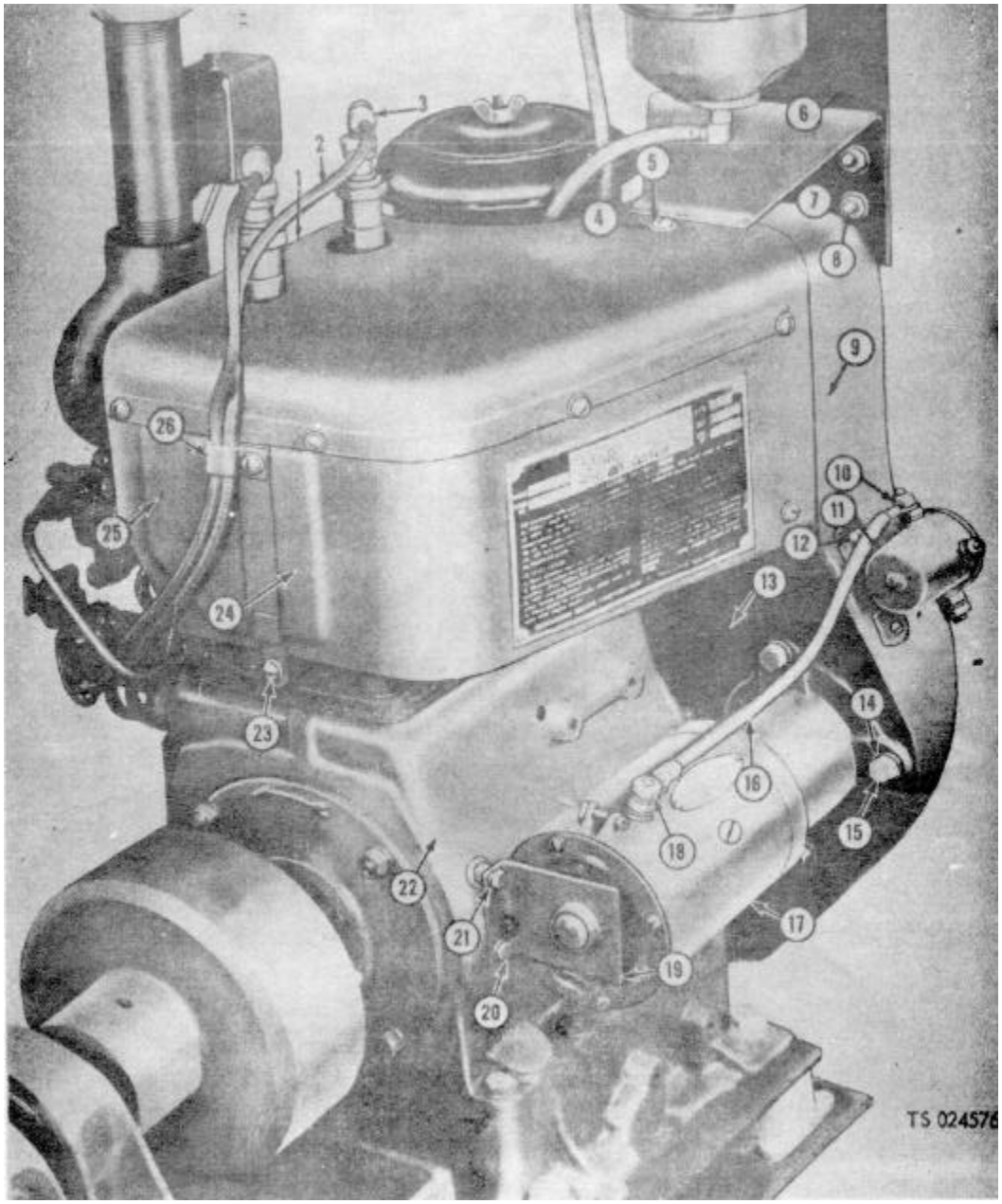
(2) Remove the nuts securing the leads to the control terminals and remove the leads.

(3) Remove the two nuts (21) and lock washers (22) securing the control and shock mounts (20) to the mounting bracket (18) and lift out the control and mounts.



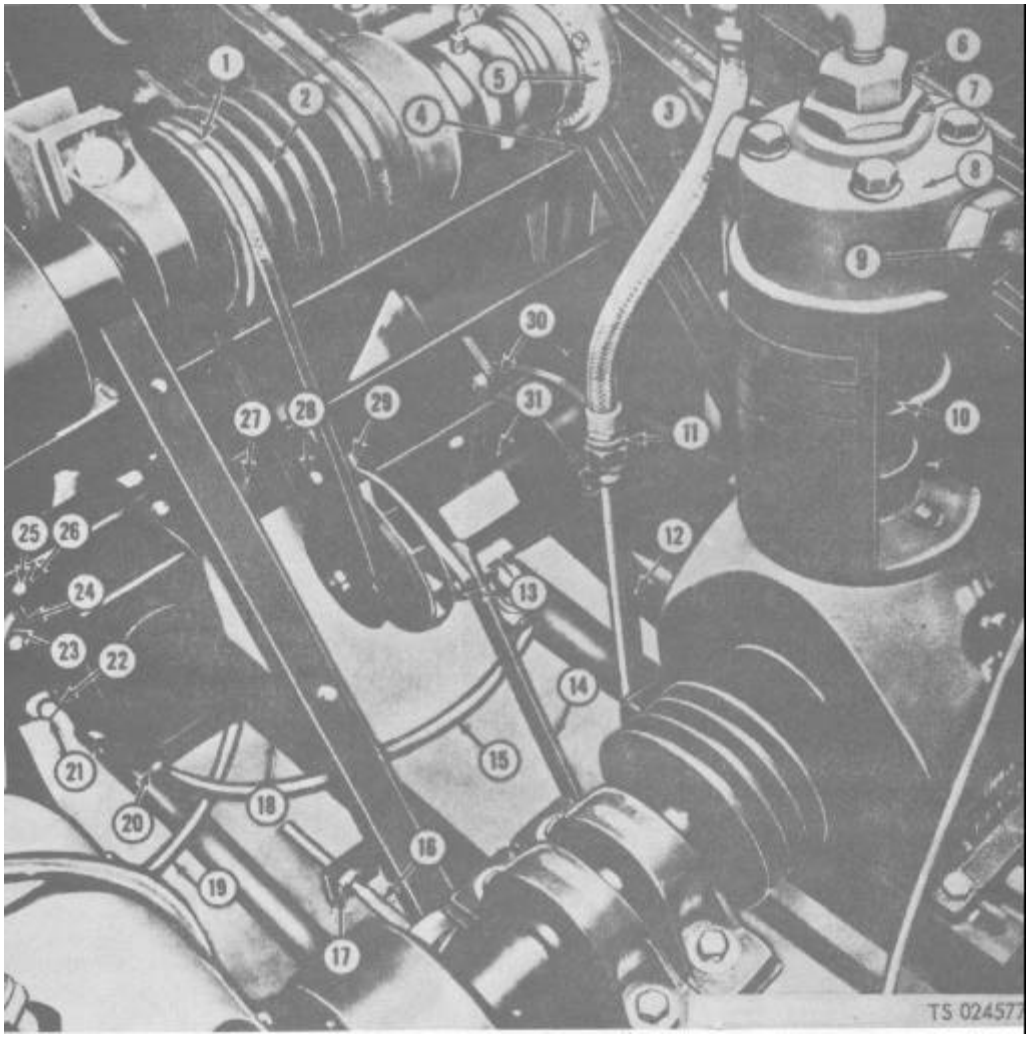
1	Cap screw	7	Nut	13	Battery retainer
2	Ground lead	8	Battery connector lead	14	Nut
3	Battery cable bolt	9	Battery to solenoid lead	15	Lock washer
4	Nut	10	Cap screw	16	Hold-down rod
5	Hold-down bar	11	Terminal lug	17	Support
6	Lock washer	12	Battery	18	Machine screw

Figure 4-49. Batteries and box, exploded view.



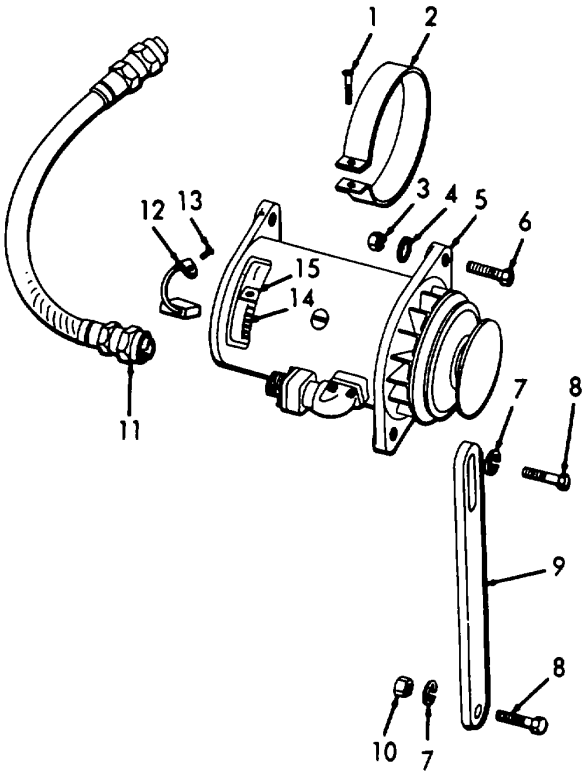
1. Shroud cover
2. Spark plug cable
3. Cable nut
4. Lockwasher
5. Machine screw
6. Oil filter bracket clamp
7. Lockwasher
8. Nut
9. Shroud
10. Nut
11. Solenoid
12. Machine screw
13. Timing gear plate
14. Lockwasher
15. Capscrew
16. Lead
17. Starter
18. Nut
19. Bracket
20. Capscrew
21. Lockwasher
22. Crankcase
23. Machine screw
24. Cylinder shroud
25. Heat deflector
26. Spark plug cable

Figure 4-50. Starter and solenoid removal



1. Generator drive belt
2. Jack shaft drive pulley
3. Hose
4. Cylinder filling unit drive belt
5. Clutch
6. Valve cap
7. Cylinder head plug adapter
8. Cylinder head
9. Nipple
10. Packing retainer nut
11. Adapter
12. Pipe
13. Capscrew
14. Adjusting bracket
15. Wiring harness
16. Belt tightener stud
17. Nut
17. Nut
18. Mounting bracket
19. Wiring harness
20. Regulator
21. Capscrew
22. Mounting plate
23. Capscrew
24. Lead
25. Machine screw
26. Lockwasher
27. Frame
28. Capscrew
29. Nut
30. Lockwasher
31. Generator

Figure 4-51. Generator and regulator removal.



1. Screw
2. Strap
3. Nut
4. IE washer
5. Generator
6. Capscrew
7. Lockwasher
8. Capscrew
9. Adjusting bracket
10. Nut
11. Wiring harness
12. Brush
13. Screw
14. Lead
15. Holder

Figure 4-52. Generator brush installation

b. Installation.

(1) Position the two shock mounts (20) and starter control (9) on the bracket (18) and secure with the two nuts (21) and lockwashers (22).

(2) Connect the wires to the terminals, refer to figure 4-56.

4-49. Control Panel Switches

a. General. The gage line heater switches(16 and 17, fig. 4-55), the conversion heater switch (14), the space heater switch (15), the gasoline engine start and stop switches (11 and 13), the automatic manual control switch (10), the circuit breaker (4), and the tractor-trailer switch (5) are all removed, cleaned, inspected and installed in the same manner. Disconnect the battery ground lead (2, fig. 4-54) before working on any of these switches.

b. Replacement.

(1) Tag the wire leads on the switch to be removed, refer to the wiring diagram, figure 4-56.

(2) Remove the screws (6, fig. 4-55) securing the wires to the switch to be removed and lift the wires from switch.

(3) Remove the two screws (12) securing the switch to the engine control panel and remove the switch.

(4) Reverse steps (l)to (3) to install new switch.

4-50. Gage Panel Switches

The power compartment dome light switch (18, fig. 4-57) and the two vessel alarm bell cut-out switches (16 and 17) are removed, inspected, cleaned, and installed in the same manner as all other switches.

4-51. Alarm Bell

a. Removal and Disassembly.

(1) Disconnect the three identification lights on the bell cover at the connector (fig. 4-56).

(2) Remove the nine machine screws (2, fig. 4-58) and lockwashers securing the bell cover (3) to the rear housing (1) and remove the cover.

(3) Refer to figure 4-59 1 or figure 4-59 2 and disassemble the alarm bell.

b. Assembly and Installation. Reverse a. above to assemble and install the alarm bell.

4-52. Blackout and Service Stop and Taillights

a. Removal

(1) To remove either blackout or service stop and taillights (11) and 15, fig. 4-60) uncouple wire connectors (14) and tag leads for identification, then remove capscrews (12) and lockwashers (13) to free blackout units, or screws and nuts attaching service units. Reverse this procedure to install.

(2) To replace lamps, loosen screws, remove door (1, fig. 4-61) and remove defective lamp by pressing in while turning lamp to left, to disengage lamp base from socket, then remove lamp. Install new lamp by reversing removal procedure above.

NOTE

Procedure above is typical for both service and blackout taillights.

b. Disassembly. Refer to figures 4-61 and 4-62 and disassemble the light.

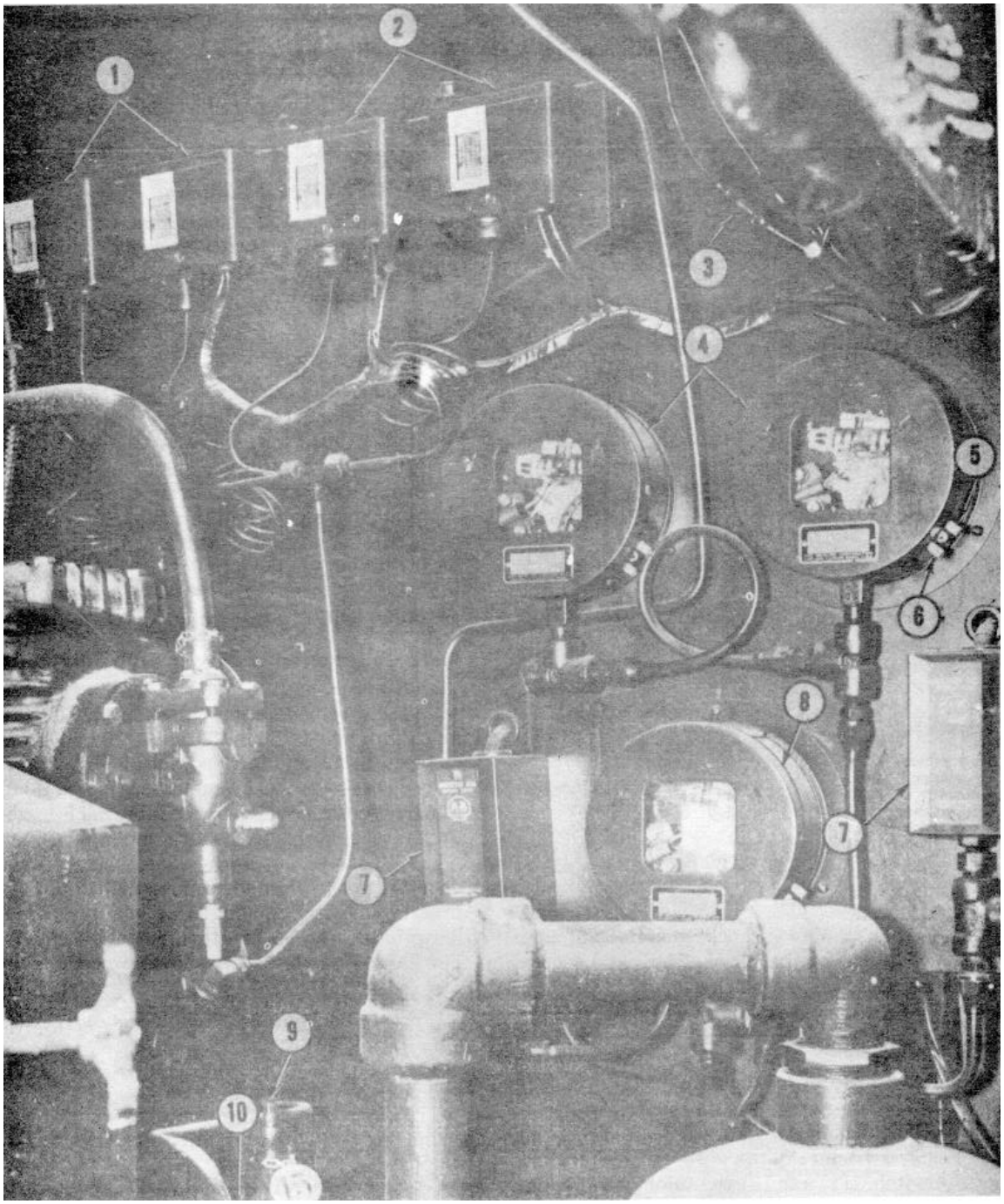
c. Repair. Replace all damaged parts.

d. Reassembly. Reverse disassembly procedures.

4-53. Clearance Lights

a. To replace lamp, (3, fig. 4-63), remove screws (11), door (1), lens (2) and press and turn lamp left to release. Reverse these steps to complete operation. To replace entire light assembly proceed as follows:

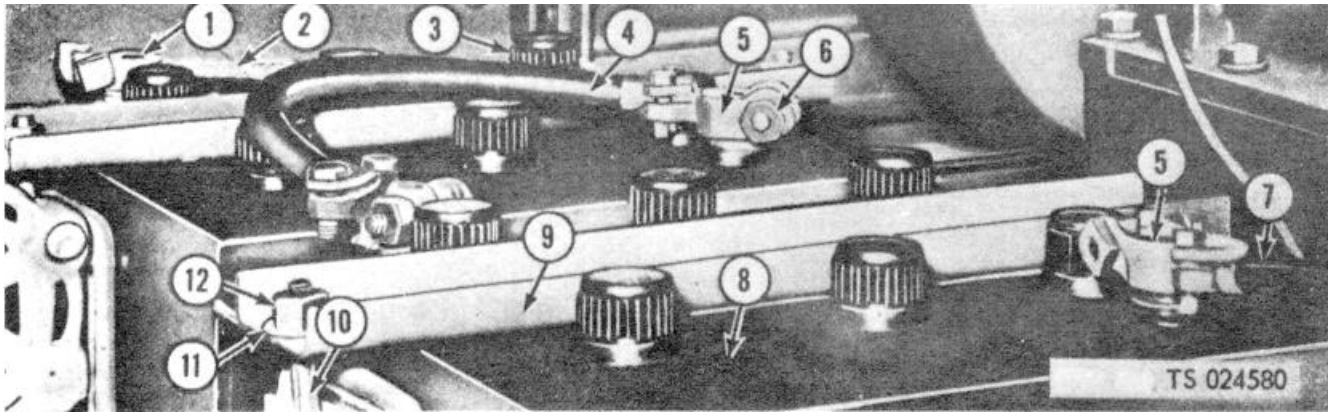
b. Remove door and lens as given above. Inside trailer body, at light to be replaced, disconnect electrical connector by pressing two halves together while twisting them.



TS 024579

1. Compressor pressure switch (discharge)
2. Compressor pressure switch (suction)
3. Connector
4. Tank pressure switch
5. Adjusting knob, high side
6. Adjusting knob, low side
7. Alarm bell pressure switch
8. Tank pressure switch low pressure
9. Receiver shut-off (inlet)
10. Receiver outlet line

Figure 4-53. Pressure switch adjustment.



1. Negative terminal
2. Ground lead
3. Battery filler cap
4. Connector lead
5. Positive terminal
6. Nut
7. Battery to solenoid lead cable
8. Battery
9. Battery hold-down bar
10. Bracket hold-down rod
11. Washer, flat
12. Nut

c. Remove screws (7) and take off clearance light and gasket (9). Reverse this procedure to install light.

4-54. Dome Lights

a. To remove dome lights, disconnect wire connector (10, fig. 4-64), remove three screws (2) holding base (4) to roof of compartment. Reverse procedure to install.

b. To replace lamp, loosen two screws (3) holding lens (5) to base (4), turn lens to remove it, and replace lamp. Reposition lens and tighten screws.

4-55. Failure and Gage Line Lights

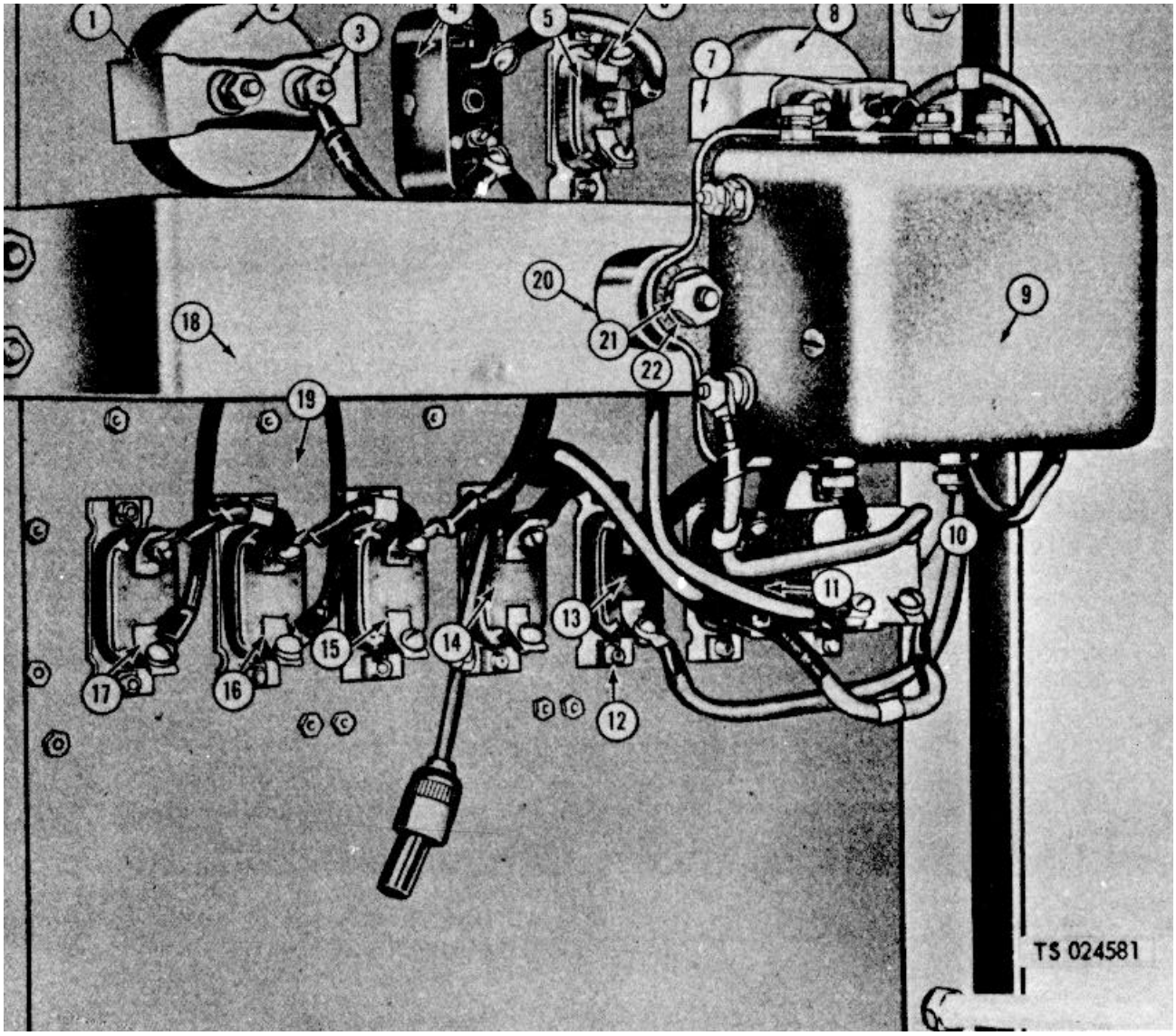
a. Removal. Tag the wires of the light to be removed. Then remove the nut and lockwasher securing the light to the panel and slide the assembly out the front of the panel.

WARNING

Dry cleaning solvent, P-D-680 or P-S-661, used to clean parts is potentially dangerous to personnel and property. Use in a well-ventilated area as the fumes are dangerous if inhaled. Avoid repeated and prolonged skin contact. Do not use near open flame or excessive heat. Flash point of solvent is 100F.-138F. (38C.-59C.).

b. Cleaning, Inspection and Repair. Clean with a cloth dampened in a cleaning solvent. Inspect for damaged threads, cracked or broken glass, or any other damage. Replace damaged parts. Reverse removal procedure to reinstall.

c. Replacing. To replace a burned out lamp, unscrew the lens from the front of the light, replace the lamp and screw the lens back in place.



1. Clamp
2. Fuel indicator gage
3. Nut
4. Circuit breaker
5. Tractor-trailer switch
6. Screw
7. Clamp
8. Ammeter
9. Automatic engine control
10. Manual-automatic control switch
11. Gasoline engine start switch
12. Screw
13. Gasoline engine stop switch
14. Conversion heater switch
15. Heater switch
16. Conversion vessel gage line heater switch
17. Storage vessel gage line heater switch
18. Bracket
19. Engine control panel
20. Shock mount
21. Nut
22. Lockwasher

Figure 4-55. Control panel unit removal

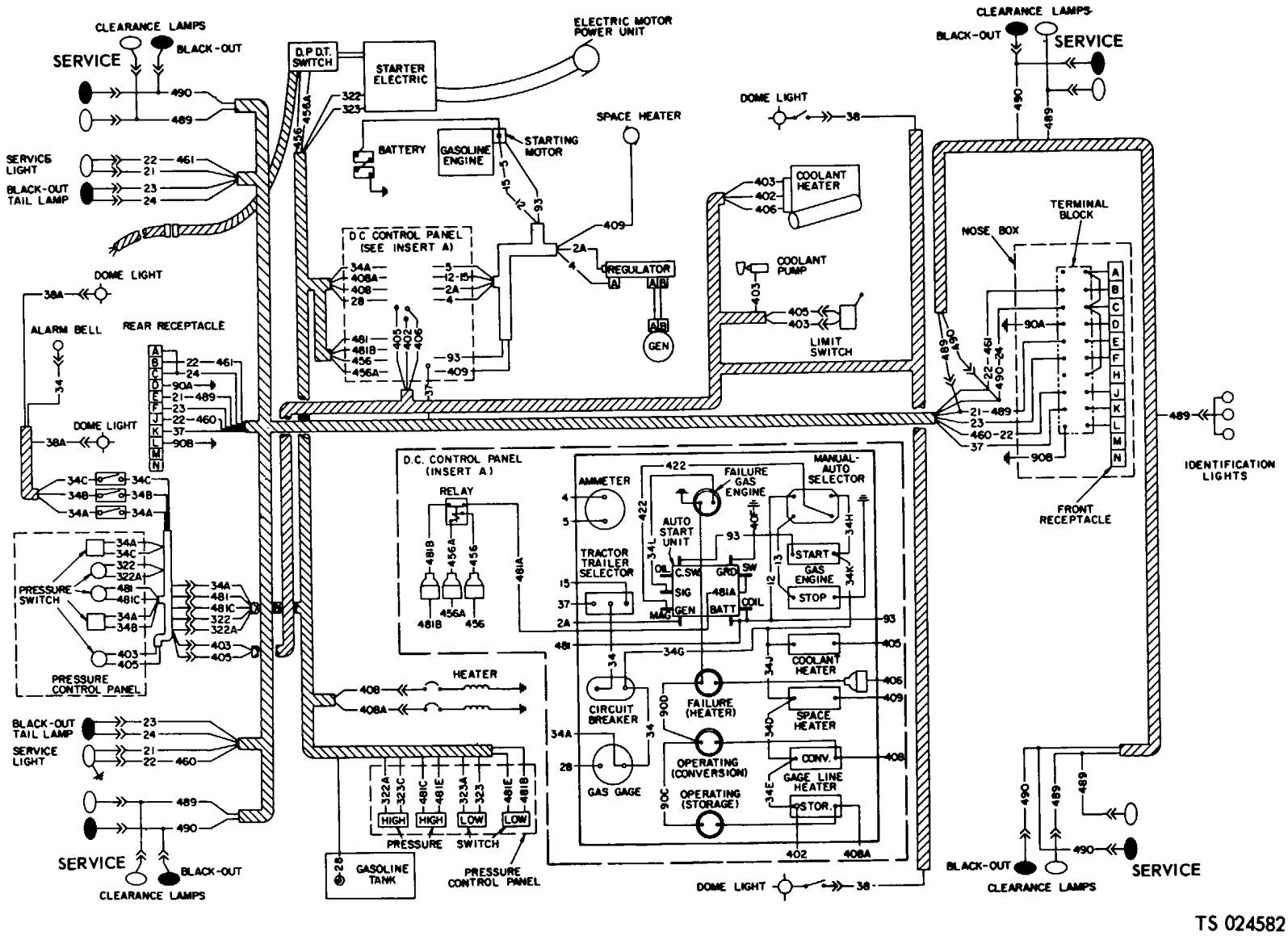
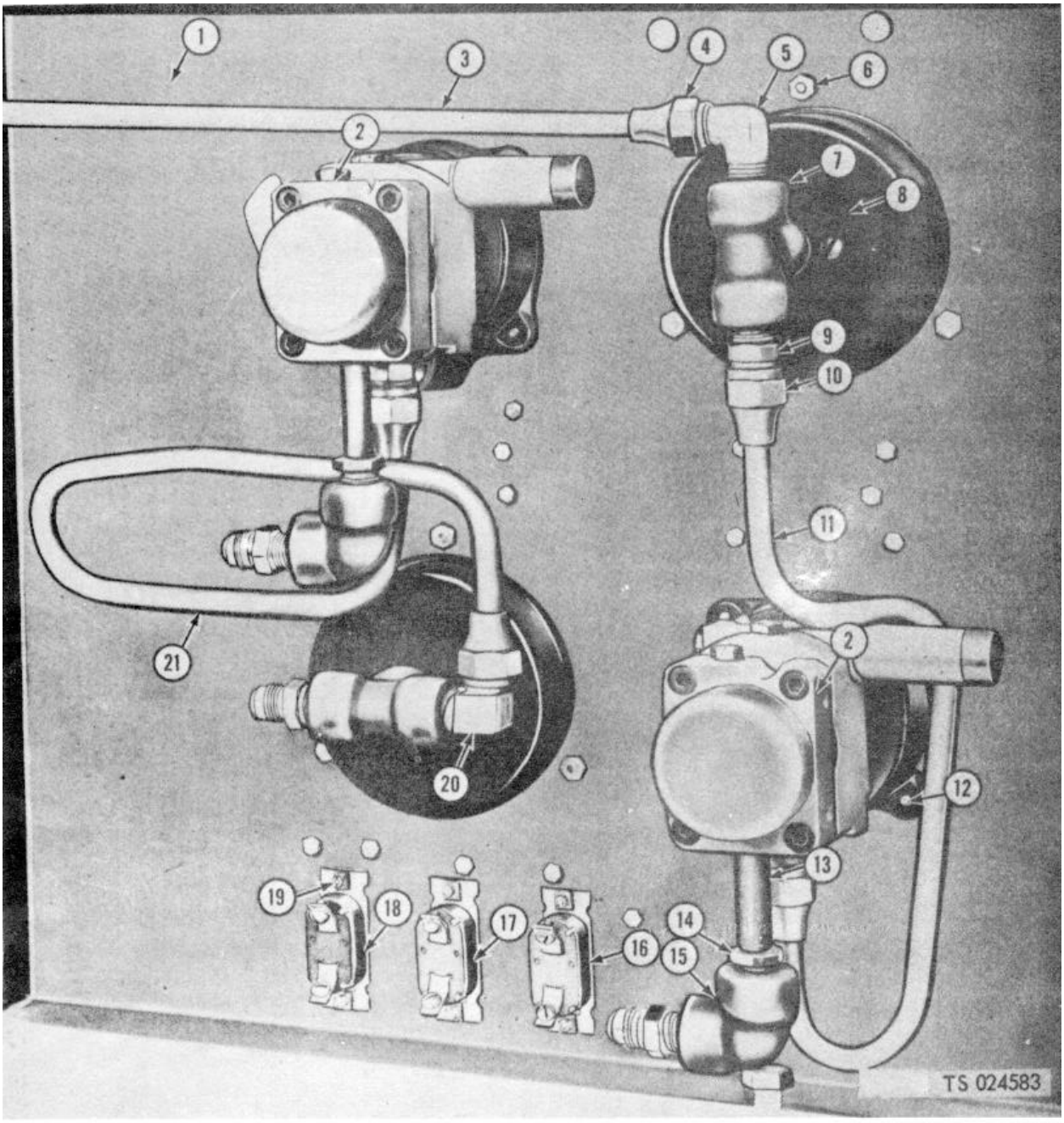
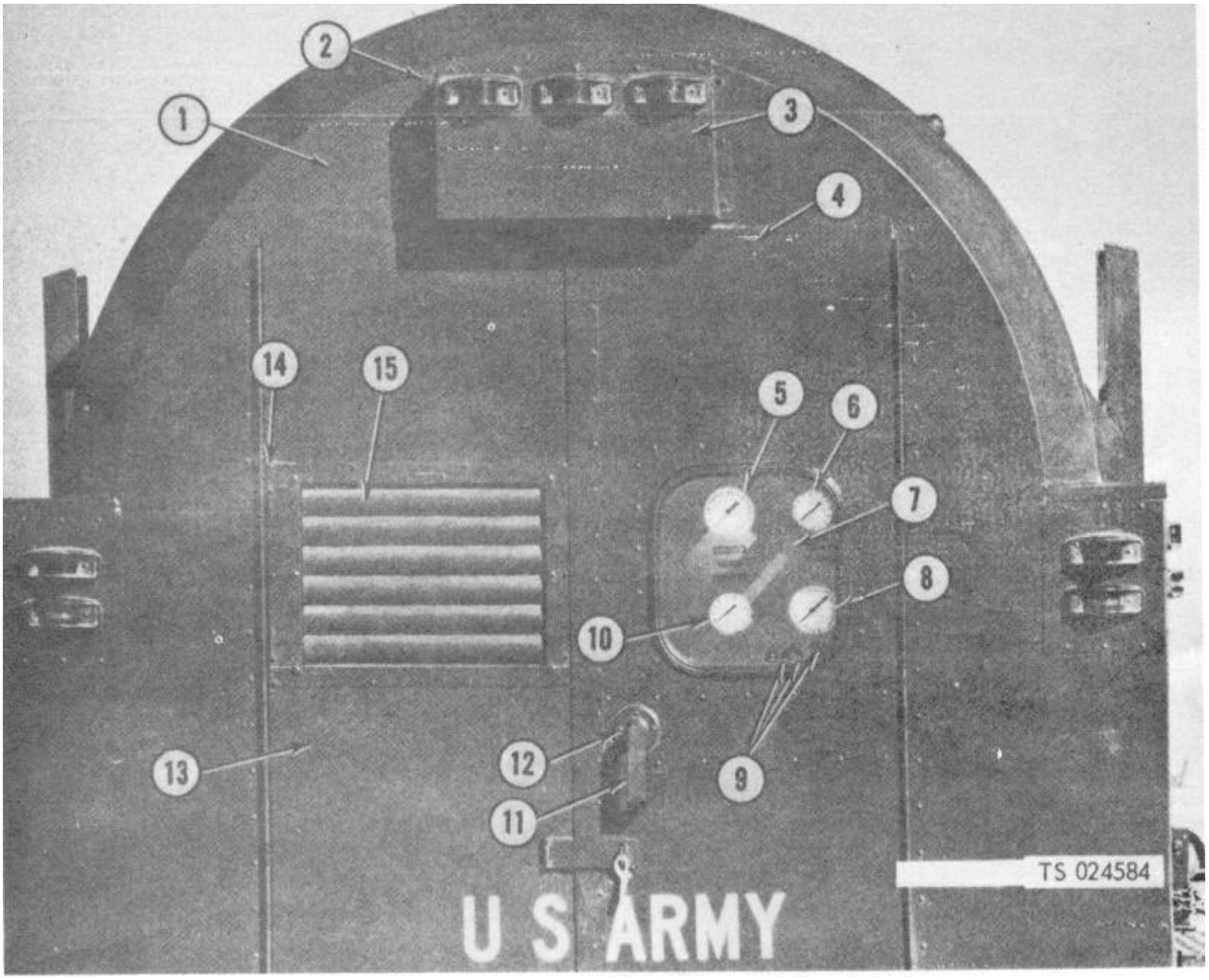


Figure 4-56. Wiring diagram



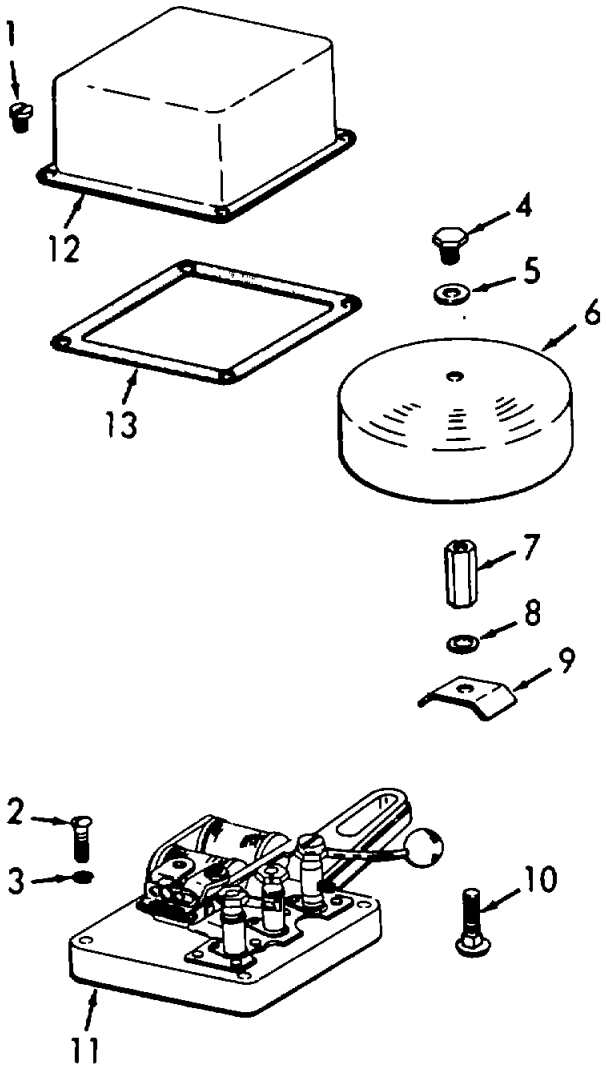
1. Gage panel
2. Level gage
3. Hose
4. Hose nut
5. Elbow
6. Nut
7. Tee
8. Pressure gage
9. Adapter
10. Tube nut
11. Tube
12. Screw
13. Nipple
14. Bushing
15. Elbow
16. Alarm bell cut-out switch, storage vessel
17. Alarm bell cut-out switch conversion vessel
18. Dome light switch
19. Nut
20. Elbow
21. Tube

Figure 4-57. Gage panel, rear view.



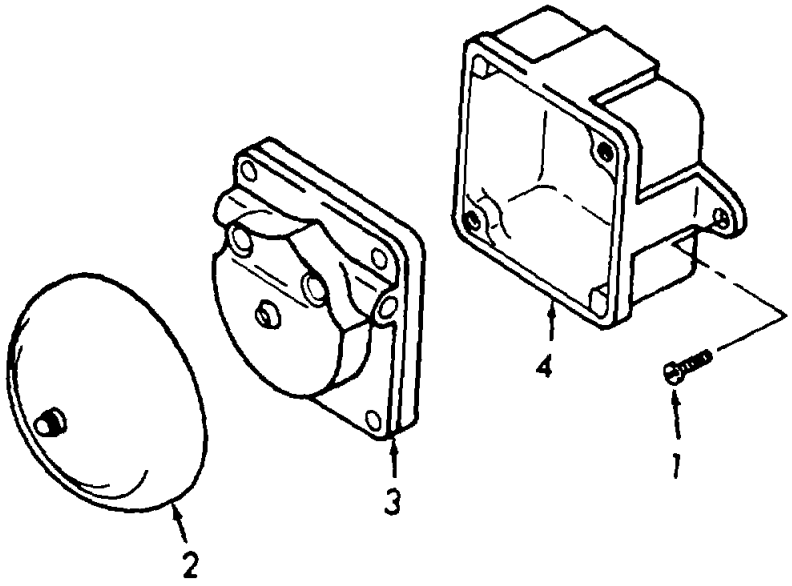
1. Rear housing
2. Machine screw
3. Bell cover
4. Right rear door
5. Storage tank pressure gage
6. Conversion tank level gage
7. Adjusting screw
8. Conversion tank pressure gage
9. Toggle switch
10. Storage tank level gage
11. Door handle
12. Screw
13. Left rear door
14. Machine screw
15. Shutter

Figure 4-58. Liquid level gages, pressure vessels.



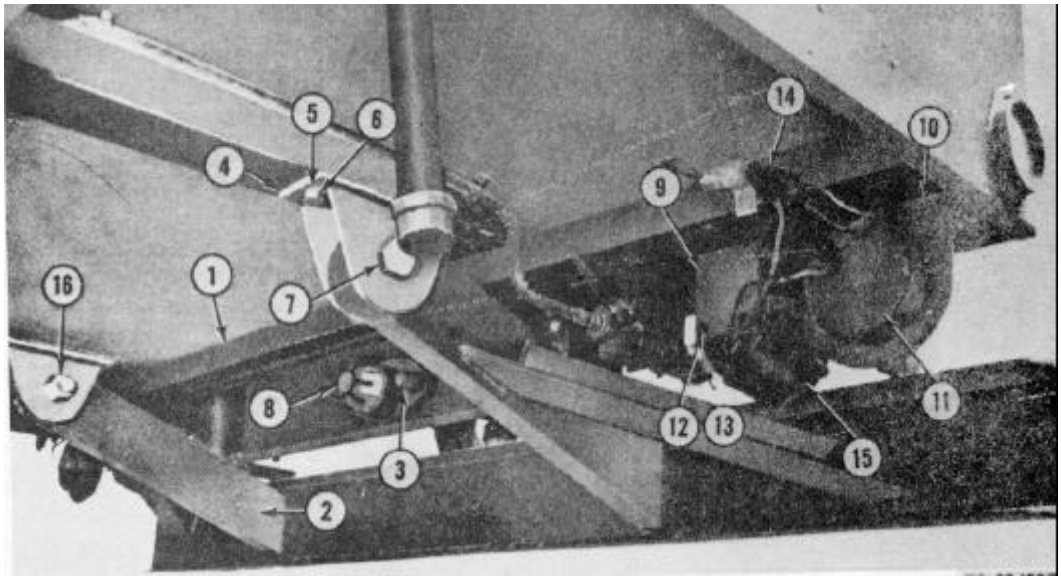
1. Machine screw
2. Machine screw
3. Lockwasher, No. 10
4. Capscrew
5. Washer
6. Gong
7. Gong post
8. Shakeproof washer
9. Gong adjusting plate
10. Carriage bolt
11. Frame and pad assembly
12. Cover
13. Gasket

Figure 4-59. Alarm bell, partially exploded view (ser. nos. L-1475-T through L-1478-T) (Sheet 1 of 2).



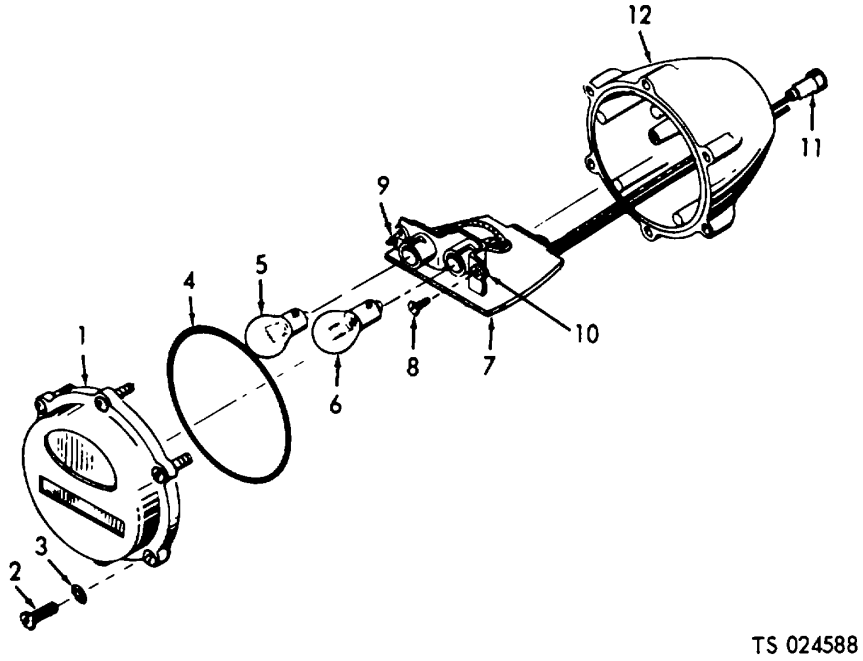
1. Screw machine (2)
2. Gong
3. Bell mechanism
4. Mounting box

Figure 4-59. Alarm bell, partially exploded view (ser. nos. L-1666-T through L-1668-T) (Sheet 2 of 2).



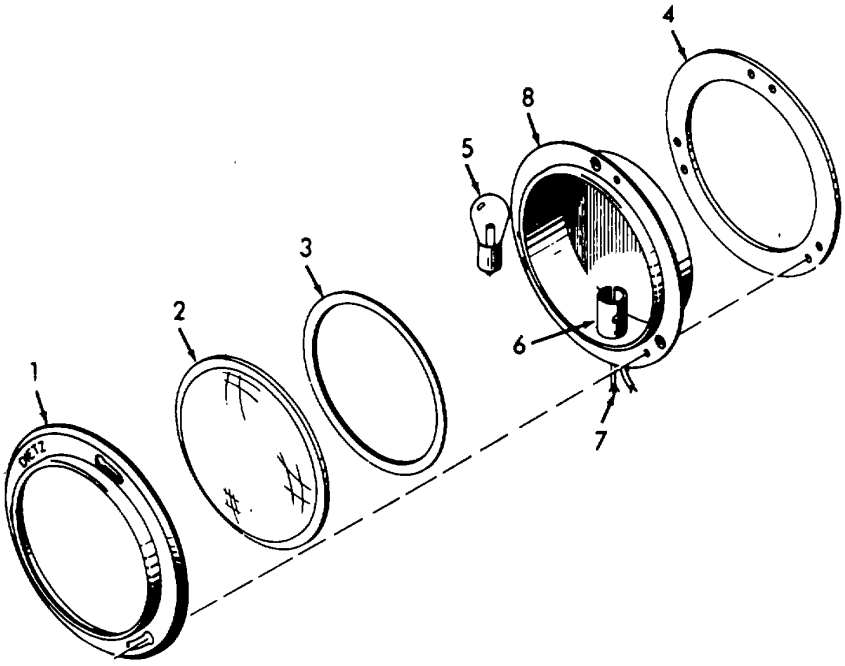
1. Frame
2. Bumper assembly
3. Nut
4. Bracket
5. Lockwasher
6. Capscrew
7. Machine bolt
8. Nut
9. Bracket
10. Bracket
11. Service stop and taillight
12. Capscrew
13. Lockwasher
14. Connector
15. Blackout stop and taillight
16. Nut

Figure 4-60. Taillight removal,



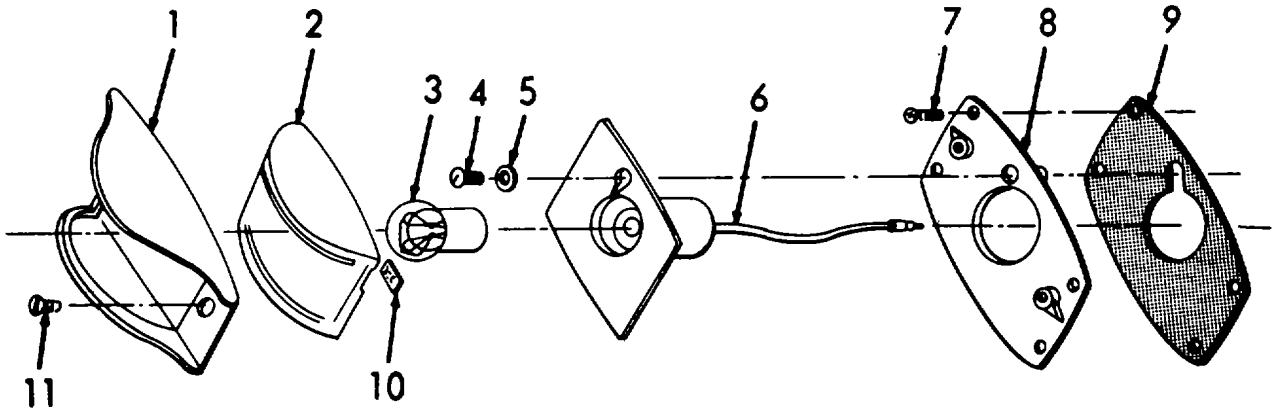
1.Door assembly
2. Machine screw
3. Retaining ring
4. Gasket
5. Lamp
6. Lamp
7. Socket and wiring assembly
8. Machine screw
9. Eyelet
10. Grommet
11. Connector
12. Body

Figure 4-61. Blackout stop and taillight, exploded view.



1. Door
2. Lens
3. Gasket
4. Gasket
5. Lamp
6. Socket
7. Wiring
8. Body

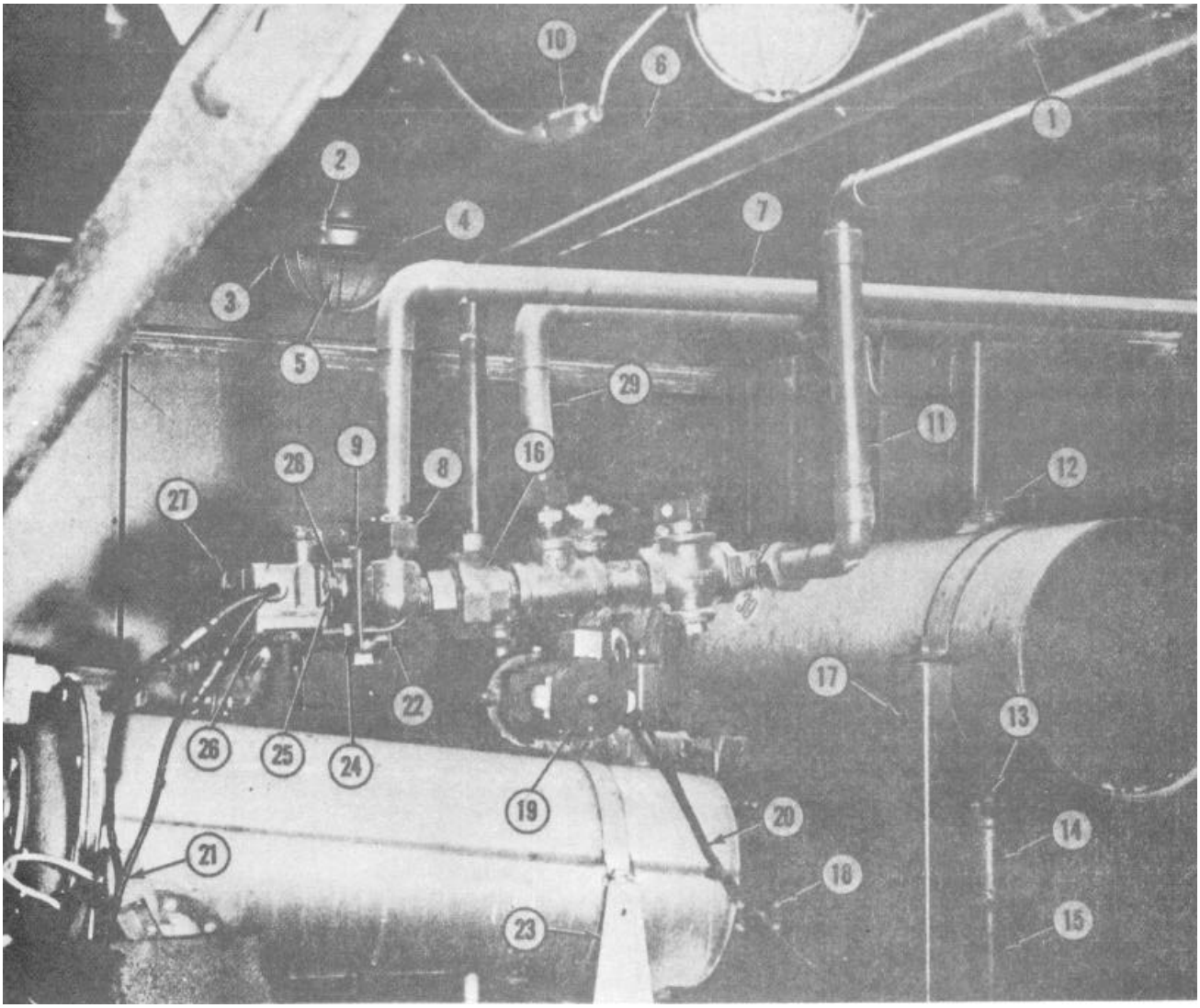
Figure 4-62. Service taillight, exploded view.



TS 024590

1. Door
2. Lens
3. Lamp
4. Screw
5. Washer
6. Wiring assembly
7. Screw
8. Base
9. Gasket
10. Spring nut
11. Screw

Figure 4-63. Clearance light, exploded view.



1. Coolant line
2. Machine screw
3. Machine screw,
4. Dome light base
5. Dome light lens
6. Housing
7. Coolant line
8. Tube nut
9. Bracket
10. Connector
11. Coolant line
12. Pipe plug
13. Nipple
14. Tee
15. Nipple
16. Pipe union
17. Saddle stand
18. Capscrew
19. Coolant pump
20. Coolant pump lead
21. Wiring harness
22. U-bolt
23. Bracket
24. Nut
25. Machine screw
26. Limit switch
27. Limit switch cover
28. Lockwasher
29. Coolant line

Figure 4-64. Heater compartment and dome lights, installed view.

Section XIII. 220 VOLT AC ELECTRICAL SYSTEM

4-56. Description

The conversion and storage unit is equipped with a 20-volt electrical system, shown schematically in Figure 4-65. This system consists of the electrical motor, motor starter, reversing switch, high pressure switch, low pressure switch, refrigeration control switches, tank pressure control switch, power receptacle, and electrical motor interlock control.

4-57. Pressure Switches

The refrigeration pressure control switches (4 and 8, fig. 4-53) and the tank pressure switch are identical to the gasoline engine pressure switches and are adjusted in the same manner, as follows:

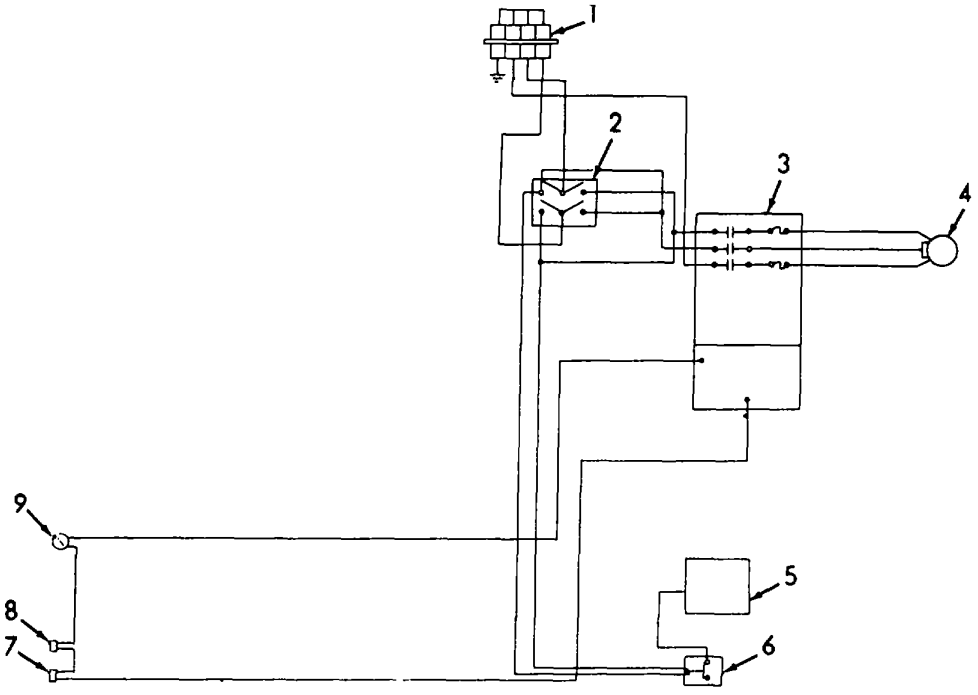
a. Regrigeration Compressor Pressure Switch Adjustment. The compressor pressure switches are set with the adjusting screws on top of the switches (1 and 2, fig. 4-53). '.Set the suction pressure switch (2) to open at zero psi to shut off the engine or electric motor. The low pressure suction switches reset to allow operations to resume when the suction pressure rises to 12 psi (.8436 kg per sq cm). Set the discharge switches (high pressure) (1) to open at 240 psi (16.872 kg per sq cm) to stop the electric motor or gasoline engine. The high pressure switches close to resume operation when the pressure drops to 210 psi (14.763 kg per sq cm). Adjust the switches to the correct settings as indicated on the dial by using a screw driver on the adjusting screw.

b. Tank Pressure Switch Adjustment. Adjust the tank pressure switches (4) by turning the adjusting knobs (5 and 6) to the desired setting on the scale. The correct setting is 305 on the high side (knob 5) and 295 on the low side (knob 6). The pressure switch (8), connected to the conversion heater, is set at 275 on the high side and 260 on the low side.

4-58. Electric Motor Removal

a. Disconnect the 220-volt power cable from the power receptacle.

b. Remove the screws (26, fig. 4-66) securing the correction box cover (27) to the motor (1), and remove the cover.



TS 024592

1. Power receptacle
2. Reversing switch
3. Control box
4. Electric motor
5. D.C. control panel
.6. Gasoline engine-electric motor interlock
7. Low pressure switch refrigeration
8. High pressure switch refrigeration
9. Tank pressure switch

Figure 4-65. 220-volt wiring schematic.

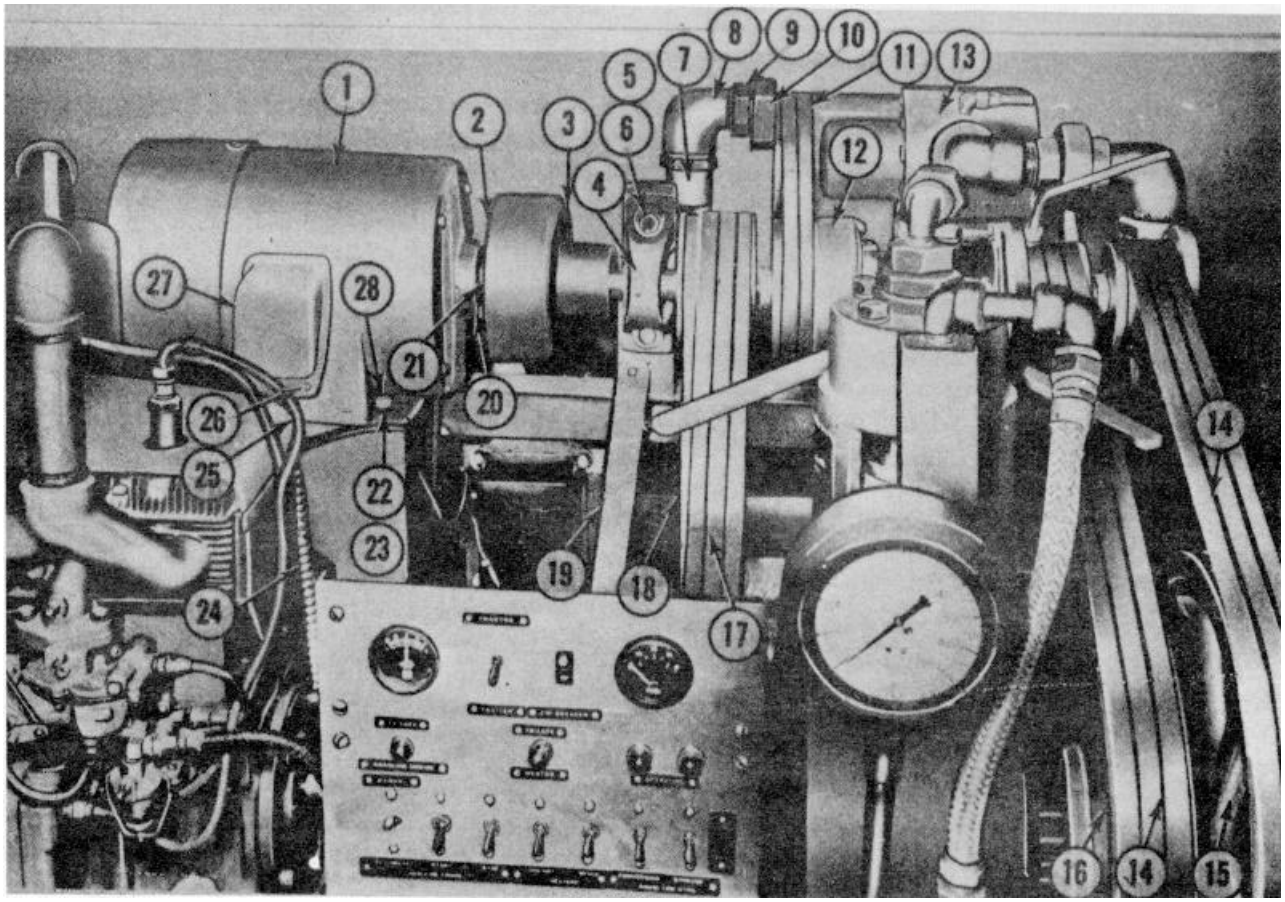
c. Tag the wires and remove the three terminal screws which connect the wiring to the motor.

d. Remove the nut (25) securing the cable assembly (24) to the motor.

e. Remove the three screws (2) securing the clutch cover (20) to the clutch sleeve (3).

f. Remove the four nuts (22), lockwashers (23), and capscrews (28) securing the motor (1) to the frame (19).

g. Slide the motor (1) to the left until the shaft(21) clears the sleeve (3) and lift the motor from the compartment.



1. Motor, alternating current
2. Screw, internal wrenching head
3. Clutch sleeve
4. Pillow block bearing
5. Plain washer
6. Capscrew
7. Hose assembly, rubber
8. Elbow, pipe
9. Pipe union
10. Nut, pipe union
11. Belts, transfer pump
12. Countershaft assembly
13. Transfer pump
14. Drive belts
15. Flywheel compressor
16. Flywheel, cylinder filling unit
17. Drive belts
18. Belt, generator drive
19. Frame
20. Clutch housing cover
21. Motor shaft
22. Nut, plain
23. Lockwasher
24. Cable assembly
25. Conduit nut
26. Machine screw
27. Cover
28. Capscrew

Figure 4-66. Electric motor, installed view

Section XIV. ENGINE AND POWER COMPARTMENT COOLING SYSTEM

4-59. Description

a. The gasoline engine is air-cooled. The air is sucked in by the vanes on the engine flywheel and blown through the air shroud to cool the engine.

b. The power compartment has three shutters to control the temperature. One shutter controls the air flow to the gasoline engine and with the shutter in the rear door is operated by preset thermostatic controls. The third shutter, located in front of the refrigeration condenser, is manually operated.

4-60. Rear Door Shutter and Control Rod

a. Control Removal and Disassembly.

(1) Remove the cotter pin (3, fig. 4-67) and washer (4) securing the control rod (6) to the shutter arm (5) and slide the control rod from the arm.

(2) Remove the nut (7) from the top of the control rod (6) and slide the rod from the control arm (8). Remove the nut (7) from the rod.

(3) Remove the two capscrews (11) and lockwashers (10) securing the bracket (9) to the door (1). Remove the bracket and control.

(4) Remove the bracket from the control by removing the two capscrews and lockwashers.

b. Shutter Removal. Remove the 14 machine screws (14, fig. 4-58) and lockwashers securing the shutter (15) to the door (13) and lift out the shutter assembly.

WARNING

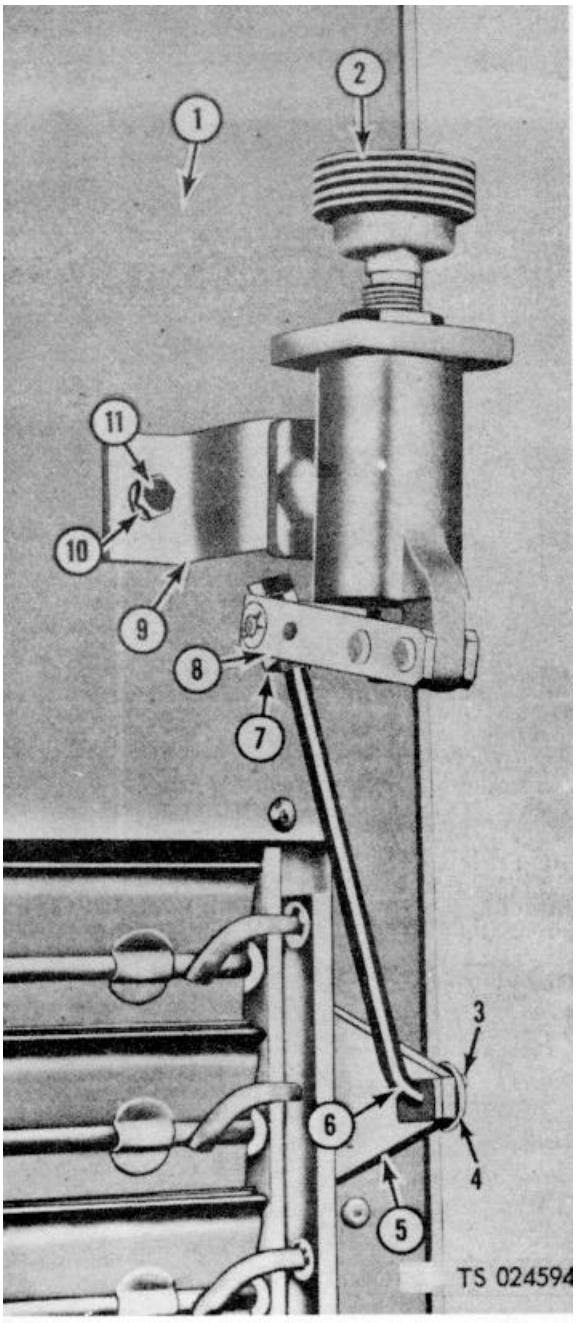
Dry cleaning solvent, P-D-680 or P-S-661, used to clean parts is potentially dangerous to personnel and property. Use in a well-ventilated area as the fumes are dangerous if inhaled. Avoid repeated and prolonged skin contact. Do not use near open flame or excessive heat. Flash point of solvent is 1OOF.-138F. (38C.-59C.).

c. Control and Shutter Cleaning, Inspection and Repair. Clean all parts in a cleaning solvent. Inspect the threads for damage. Inspect the control mounting bracket and shutter for bends, cracks, or distortion. Straighten any bends, if possible. Replace all damaged parts.

d. Shutter Installation. Reverse the removal procedures in b above.

e. Control Reassembly and Installation. Reverse the procedure in a above.

f. Adjustment. If the shutter fails to open or close properly loosen one of the nuts (7, fig. 4-67) and turn the other one up or down as necessary. Secure by tightening the nut.



1. Door
2. Control
3. Cotter pin
4. Washer
5. Shutter arm
6. Control rod
7. Nut
8. Control arm
9. Bracket
10. Lockwasher
11. Capscrew

Figure 4-67. Rear door shutter control removal.

4-61. Engine Shutter and Control Rod

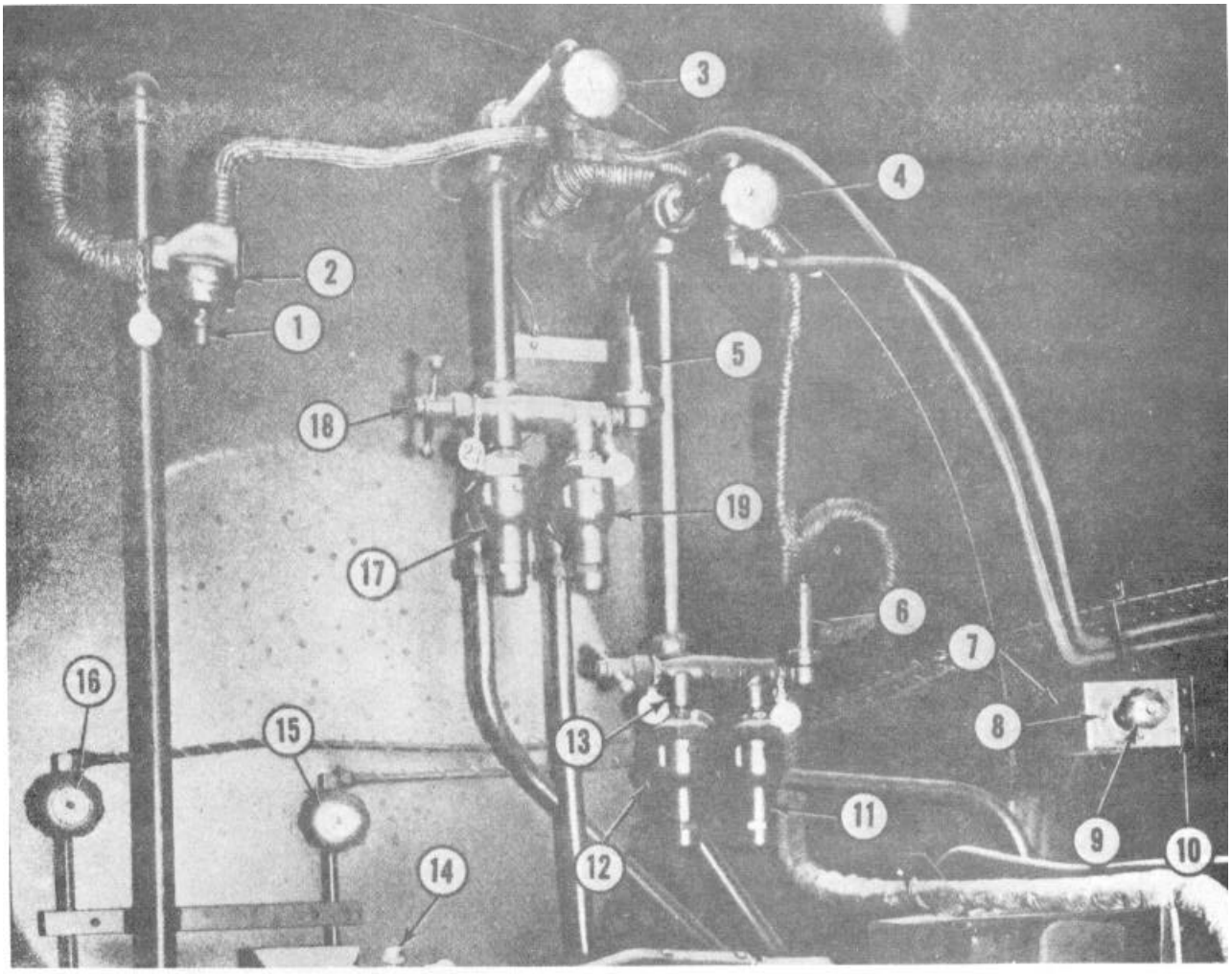
Repair and replacement procedures are similar to those given in the instructions above for the rear door shutter and control rod.

4-62. Refrigeration Shutter Control

a. Control Removal.

(1) Disconnect the control cable from behind the shutter control (9, fig. 4-68) by loosening the setscrew securing the cable in position.

(2) Remove the three nuts, lockwashers, and machine screws (8) securing the control assembly (9) to the bracket (7). Remove the control.



TS 024595

1. Expansion valve adjusting screw
2. Expansion valve
3. Low pressure gage line valve, conversion
4. Low pressure gage line valve, storage
5. Bleeder valve for carbon dioxide, conversion
6. Bleeder valve for carbon dioxide, storage
7. Shutter control mounting bracket
8. Machine screw
9. Shutter control
10. Capscrew
11. Relief valve for carbon dioxide, storage
12. Relief valve for carbon dioxide, storage
13. Safety vent switching valve, storage
14. Safety relief valve, transfer pump
15. High pressure gage line valve, conversion
16. High pressure gage line valve, storage '
17. Relief valve for carbon dioxide, conversion
18. Safety vent switching valve, conversion
19. Relief valve for carbon dioxide, conversion

Figure 4-68. Power compartment valves and controls.

(3) Remove the four capscrews (10) and lockwashers securing the bracket to the wall. Remove the bracket.

WARNING

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b. Cleaning, Inspection and Repair. Clean all parts in a cleaning solvent. Inspect the mounting bracket for breaks, bends, or cracks. Repair or replace as necessary. Inspect for damaged threads, bent, broken, or distorted cable casing and cable. Replace all damaged parts.

c. Installation. Reverse the removal procedure.

4-63. Flywheel

a. Removal

(1) Remove the four machine screws (7, fig. 4-39) and lockwashers (8). Remove the cover (6).

(2) Loosen the flywheel nut (9, fig. 4-41) two or three threads.

(3) Take a firm grip on the flywheel (2), pull outward and at the same time strike the end of the flywheel nut (9) with a babbitt hammer, loosening the flywheel from the tapered crankshaft.

(4) Remove the nut (9) and lockwasher (8) and slide the flywheel from the crankshaft.

(5) Remove the woodruff key from the crankshaft.

b. Installation. Reverse the removal procedure.

4-64. Engine Shrouding

a. Removal and Disassembly.

(1) Remove the four coupling nuts (2, fig. 4-40 1) securing the two spark plug cables (3) to the spark plugs (1) and the magneto (6).

(2) Remove the machine screw (5), securing the clip (4) and the spark plug cables to the cowling. Remove the spark plug cables.

(3) Remove the nine machine screws (5, fig.4-50) and lockwashers (4), and lift off the cover (1).

(4) Remove the two machine screws (23).

(5) Remove the two machine screws (5) and lockwasher (4), and lift off the heat deflector and cylinder shroud.

(6) Remove the four machine screws (7, fig. 4-39) and lockwashers (8). Remove the cover (6).

(7) Loosen the flywheel nut (9, fig. 4-41) two or three threads.

(8) Take a firm grip on the flywheel (2), pull outward and at the same time strike the end of the flywheel nut (9) with a babbitt hammer, loosening the flywheel from the tapered crankshaft.

(9) Remove the nut (9) and lockwasher (8) and slide the flywheel from the crankshaft.

(10) Remove the woodruff key from the crankshaft.

(11) Remove the battery ground lead (2, fig.4-49) from the battery.

(12) Remove the nut (17, fig. 4-39) from the solenoid (26) releasing the battery lead (10). Remove the regulator lead wire (20).

(13) Remove the nut (21), releasing the switch lead (20) and the automatic choke lead (22).

(14) Remove the nut (10, fig. 4-50) and lockwasher securing the starter lead (16) to the solenoid (11) and remove the lead.

(15) Remove the nut (18) and lockwasher securing the lead (16) to the starter (17).

(16) Remove the two machine screws (12) and lockwashers securing the solenoid (11) to the shroud (9). Lift off the solenoid.

(17) Remove the two capscrews (20) and lockwashers (21) securing the starter bracket (19) to the crankcase (22). Remove the bracket from the starter.

(18) Remove the three capscrews (15) and lockwashers (14) securing the starter (17) to the timing gear plate (13). Remove the starter from the plate.

(19) Remove the three capscrews and lockwashers (7), and capscrews securing the bracket (6) to the air shroud (9) and remove the bracket.

WARNING

Dry cleaning solvent, P-D-680 or P-S-661, used to clean parts is potentially dangerous to personnel and property. Use in a well ventilated area as the fumes are dangerous if inhaled. Avoid repeated and prolonged skin contact. Do not use near open flame or excessive heat. Flash point of solvent is 100F.-138F. (38C.-59C.).

b. Cleaning, Inspection and Repair. Clean all parts in a cleaning solvent. Inspect all sheet metal parts for damage. Bent parts may be straightened and minor damage repaired. Replace all badly damaged or missing parts. Inspect hardware for damaged threads or any other damage. Replace all damaged parts.

c. Reassembly and Installation. Reverse the removal and disassembly procedures.

Section XV. WHEELS, TIRES, TUBES AND BEARINGS

4-65. Description

The wheels are demountable, steel, open ventilated type, complete with rim. The tires are tube-type with flap.

4-66. Wheels

a. Removal

(1) Jack up the wheel to be removed.

(2) Remove the ten outer cap nuts (3, fig. 4-69), and lift off the outer wheel.

(3) Remove the ten inner wheel nuts (4) and lift off the inner wheel.

b. Installation. Refer to Figure 4-70 and install wheels.

4-67. Tires and Tubes a. Removal.

a. Removal.

(1) Jack up the wheel to be removed.

(2) Remove the ten outer cap nuts (3, fig. 4-69), and lift off the outer wheel.

(3) Remove the ten inner wheel nuts (4) and lift off the inner wheel.

(4) Deflate the tire completely (remove valve core).

(5) Tap the side ring lightly with a hammer.

(6) Insert a tire tool into the recess of the locking ring and pry the locking ring out of the groove of the side ring. Remove the side ring.

(7) Remove the tire and tube from the wheel rim.

(8) Remove the flap and inner tube from the tire.

b. Inspection and Repair. Inspect the tire and tube for breaks and cuts. Remove any foreign matter imbedded in the tire. Repair tube. Replace tire if damaged.

c. Installation.

(1) Position the tube in the casing with the valve stem to the outside.

(2) Position the casing flap in the tire with the opening over the valve stem. Inspect the tube and flap to make sure they lap smoothly in the tire.

(3) Place the casing on the wheel making sure the valve stem is centered in the valve stem opening in the wheel.

(4) Place the side ring on the wheel and pry it down so that the split locking ring may be entered.

(5) Wedge the split locking ring into place for seating.

(6) Inflate the tires to 70 psi (4.921 kg per sq cm).

WARNING

Inflate the tire with the locking-ring down.

(7) Install the wheel (fig. 4-70).

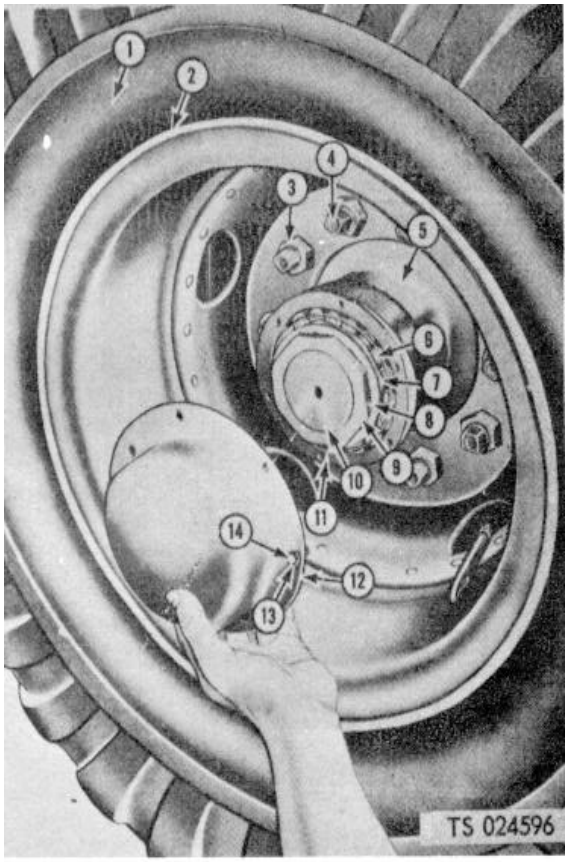
4-68. Wheel Bearings and Hubs a. Removal.

a. Removal

(1) Jack up the wheel to be removed.

(2) Remove the ten outer cap nuts (3, fig. 4-69), and lift off the outer wheel.

(3) Remove the ten inner wheel nuts (4) and lift off the inner wheel.



1. Tire
2. Wheel
3. Outer cap nut
4. Inner cap nut
5. Hub
6. Bearing cone
7. Inner retaining nut
8. Retaining ring
9. Outer retaining nut
10. Axle
11. Gasket
12. Hubcap
13. Lockwasher
14. Capscrew

Figure 4-69. Wheel and hub removal.

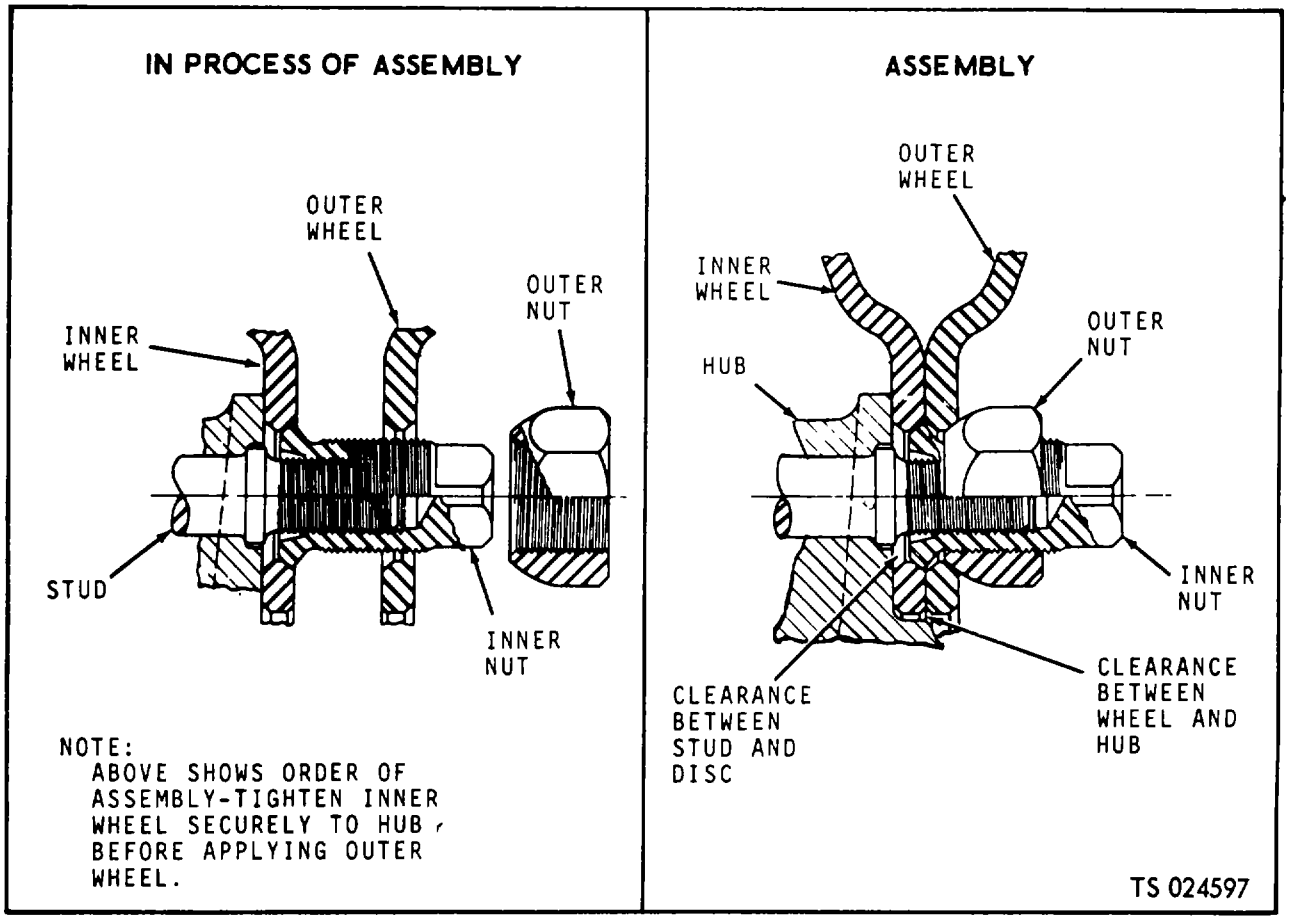


Figure 4-70. Wheel mounting details.

(4) Remove the six capscrews(14, fig. 4-69) and lockwashers (13) securing the hub cap (12) and gasket (11) to the hub (5) and remove the hub cap and gasket.

(5) Remove the outer retaining nut (9), retaining ring (8) and inner retaining nut (7) from the axle (10).

(6) Pull the hub (5) outwards until the outer bearing cone (6) rests on the end of the axle. Then push the hub back and remove the cone.

(7) Remove the hub assembly (5) from the axle.

(8) Remove the wiper (8, fig. 4-71) from the axle.

b. Disassembly.

(1) Remove the ten nuts (13, fig. 4-71), and lockwashers (12) securing the adapter flange (5) to the brake drum (2) and remove the drum and hub (4) from the flange (5).

(2) Press the seal (7), bearing (6) and the two cups (3) from the hub.

WARNING

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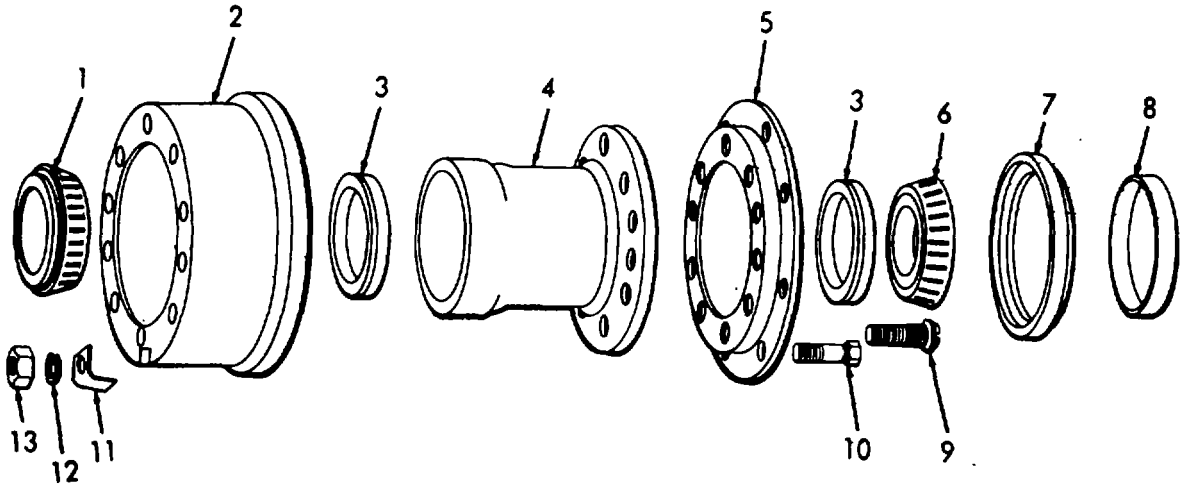
c. Cleaning, Inspection and Repair. Wash all parts in a cleaning solvent. Inspect the bolts for damaged threads. Inspect the bearings, cups, and seal for excessive wear; replace if damaged. Inspect the drum and flange for wear or breaks. If grooved or damaged report to the proper authorities.

d. Reassembly. Reverse the disassembly procedure.



1. Bearing cone
2. Brake drum
3. Bearing cup
4. Hub
5. Adapter flange
6. Bearing cone
7. Seal
8. Wiper
9. Shoulder bolt
10. Shoulder bolt
11. Clamp,
12. Lockwasher
13. Nut

Figure 4-71. Hub and drum assembly, exploded view.

e. Installation

(1) Make sure all the old grease has been removed.

(2) Pack the bearings with lubricants; kneading the lubricant between the inner race and the cage by hand. Coat the inside of the hub and the axle with grease to prevent rusting.

(3) Position the rear bearing cone (6, fig. 4-69) and the grease seal in the hub.

(4) Slide the wiper (8, fig. 4-71) into position on the axle.

(5) Position the hub (5, fig. 4-69) on the axle, being careful not to damage the axle threads.

(6) Position the outer bearing cone (6) on the axle.

(7) Install the inner retaining nut (7) and tighten while turning the wheel until the bearing just seats. Back off the nut one-third turn so that the wheel and bearings turn freely.

(8) Position the retaining ring (8) on the axle (10) and the dowel on the nut(7), and secure with the outer nut (9).

(9) Position the gasket (11) and hub cap (12) on the axle and secure with the six lockwashers (13) and capscrews (14).

Section XVI. BRAKE SYSTEM

4-69. Description (See Fig, 4-72)

a. General. Air brake equipment on trailers operates the trailer brakes through compressed air in conjunction with the air brake system on the truck or tractor towing the trailer. As shown in figure 4-72, trailer air brake system consists of the air devices necessary to direct and control the flow of the compressed air and those necessary to transform the energy of compressed air into the mechanical force and motion necessary to apply the brakes. The system includes connections at the front so the air brake system can be connected to and operated by the air brake system of the truck or tractor towing the trailer. Connections are provided also at the rear of the trailer to permit connecting to a second trailer. Following are the devices composing the trailer air brake system with a brief description of the function of each device.

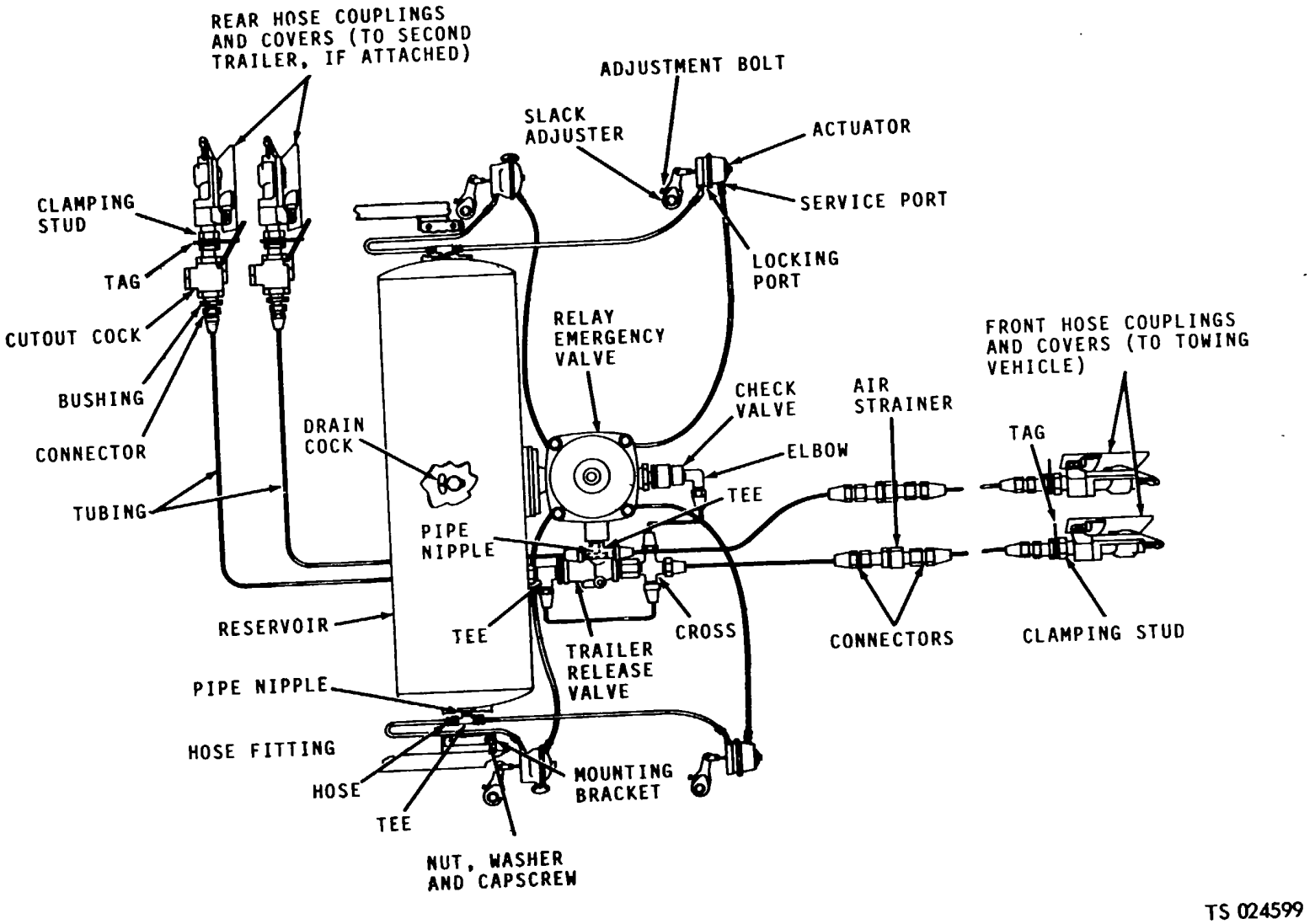


Figure 4-72. Air brake system layout.

b. Relay-Emergency Valve. The relay emergency valve relays the braking action from the truck or tractor and provides an automatic application of the trailer brakes in the event the trailer breaks away from the truck or tractor.

c. Actuator. Actuators transform the energy of compressed air into the mechanical force necessary to apply the brakes. One actuator is used to operate the brakes on each wheel.

d. Slack Adjusters. Slack adjusters, on the brake camshaft, provide a quick and easy method of adjusting the brakes to compensate for lining wear. One slack adjuster is used for the brakes on each wheel.

e. Reservoir. The reservoir stores the compressed air until it is needed for brake operation.

f. Drain Cock. A drain cock at the bottom of the reservoir permits the draining of condensation, which normally collects there.

g. Hose Couplings. Hose couplings mounted at the ends of the service line and the emergency line provide a means of attaching hose connections from the truck or tractor air brake system.

h Tubing and Tubing Fittings. Tubing and tubing fittings connect the air brake devices in the air brake system.

i. Hose Assemblies. Hose assemblies are used where it is necessary to' have a flexible air line between two points of the trailer which change their position in relation to each other.

4-70. Operation

a. Normal. The trailer reservoir is kept charged by compressed air flowing from the tractor reservoir through the emergency line and through the relay-emergency valve to the reservoir on the trailer. When the brakes are applied compressed air flows from the brake valve on the tractor through the service line to the relay-emergency valve. The relay-emergency' valve then operates to permit air pressure to flow from the trailer reservoir to the trailer brake chambers, applying the brakes. If the brakes on the tractor are released the relay emergency valve permits air pressure in the trailer brake chambers to escape to atmosphere. The relay emergency valve always reacts to keep the same air pressure in the trailer brake chambers as the brake valve is delivering through the service line. Thus the air pressure in the trailer brake chambers and the effectiveness of the trailer brakes are controlled by the driver operating the brake valve on the towing vehicle.

b. Emergency. In the event the trailer breaks away from the towing vehicle breaking the emergency line, or if the emergency line is disconnected, the relay-emergency valve operates to prevent air pressure in the trailer reservoir from escaping through the broken or disconnected line, and at the same time permits air pressure in the trailer reservoir to flow to the trailer brake chambers, applying the brakes.

c. Parking. Disconnecting the trailer from the tractor will automatically apply the brakes on the trailer. Do not, however, leave the trailer parked depending on the air brakes to hold it if there is any danger of it moving should the air pressure leak off and, the ,brakes release. In such cases, the wheels must be blocked to prevent the trailer moving. If the brakes on a trailer have been applied automatically and it is necessary to release them without reconnecting the trailer to the truck or tractor, open the trailer reservoir drain cock. This will release the air pressure in the trailer brake system and the brakes will release.

4-71. Brake Adjustment

Refer to figure 4-73 and adjust each slack adjuster so the wheel brake just drags slightly, and the angle between the push rod and slack adjuster arm is greater than 90° when brakes are applied, as shown in figure 4-74.

4-72. Wheel Brake Replacement

a. Jack up trailer and remove wheel and brake drum.

b. Refer to figure 4-75 and remove items in the following order:

(1) Brake spring.
(2) Anchor pin retaining rings and spring pins.
(3) Anchor pins and brake shoes.
(4) Cam roller retaining rings and the rollers.

c. Reverse steps a and b above to complete replacement and adjust brakes as follows: -Refer to figure 4-73 and adjust each slack-adjuster so the wheel brake just drags slightly, and the angle between the push rod and slack adjuster arm is greater than 90° when brakes are applied, as shown in figure 4-74.

4-73. Slack Adjuster Replacement

a. Refer to figure 4-73 and disconnect push rod clevis from slack adjuster.

b. Remove retaining ring from camshaft., splined end and take off slack adjuster.

c. Reverse a and b above to install replacement slack adjuster, then adjust brakes as follows: Refer to figure 4-73 and adjust each slack adjuster so the wheel brake just drags slightly, and the angle between the push rod and slack adjuster arm is greater than 900 when brakes are applied as shown in figure 4-74.

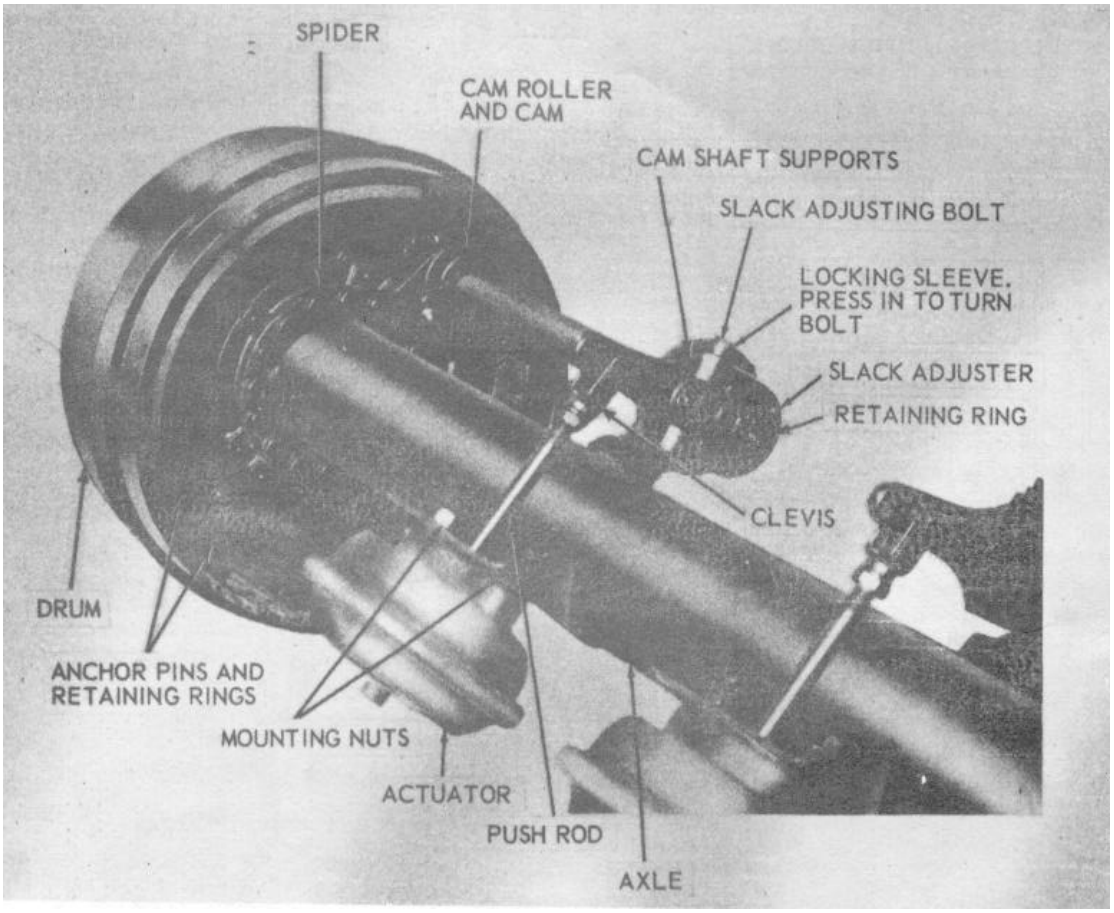


Figure 4-73. Axle with brake system parts, removed.

4-74. Actuator

a. Removal. Block and hold the vehicle by chock blocks.

(1) To remove the actuator in a locked condition when the trailer is disconnected.

(a) Completely drain trailer reservoir.

(b) Remove delivery and lock port lines from actuator (fig. 4-79).

(c) Back off slack adjuster or actuator mounting nuts until sufficient force has been displaced to permit removal of the yoke pin from the clevis (fig. 4-78).

(d) Completely remove actuator mounting nuts and remove actuators.

(2) To remove the safety actuator in an unlocked or unapplied condition.

(a) With the actuator in the released position and the tractor and trailer connected, remove yoke pin, mounting nuts, and washers, and actuator from mounting flange.

(b) Let the actuator hang free by its hoses and actuate the tractor protection valve, then drain tractor reservoir. Vehicle will be held by wheel chocks.

(c) Disconnect hoses from actuator and remove.

b. Installation.

NOTE

Safety actuator must be installed with the drain slot pointing down.

(1) With shaft in fully released position, mount actuator to mounting bracket and tighten securely.

(2) Fasten actuator push rod yoke to slack adjuster with yoke pin. Lock yoke pin with cotter pin.

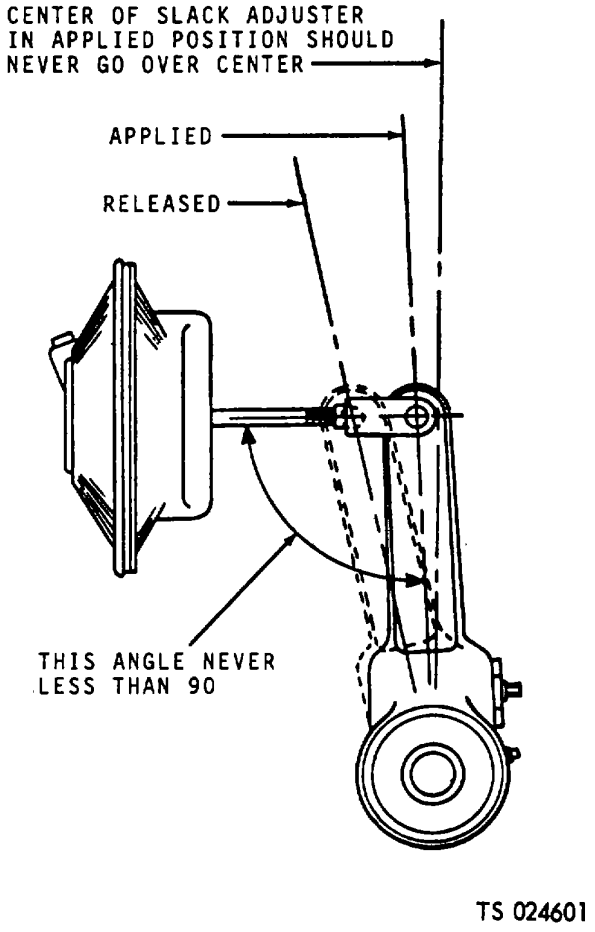


Figure 4-74. Slack adjuster, correct travel

(3) Connect air lines to actuators. Take care that the correct lines are installed in correct port.

(4) Adjust brakes to correct shoe to drum clearance as follows: Refer to figure 4-73 and adjust each slack adjuster so the wheel brake just drags slightly, and the angle between the push rod and slack adjuster arm is greater than 90° when brakes are applied, as shown in figure 4-74.

c. Operating Test.

(1) With actuator in the released position, make several service brake applications and note that actuator applies and releases properly.

(2) Disconnect trailer emergency line or throw trailer into emergency by use of tractor protection valve and observe that the actuator applies. Drain trailer reservoir and observe that actuator remains applied.

(3) Close trailer reservoir drain and fully charge trailer air supply. Make and hold a heavy service application (about 5 seconds). Actuator should release as service application is released.

d. Leakage Test.

(1) With system pressure up and actuators in the released position, check drain slot and around push rod boot with soap solution to detect possible leakage by the locking piston grommet.

(2) Make and hold a service brake application, and again check the actuator drain slot for diaphragm leakage. Continue to hold the service application and coat around the clamping ring with soap solution to detect seal leakage. Should leakage be detected at the clamping ring, tighten the clamping ring nuts evenly but only enough to stop leakage.

4-75. Trailer Release Valve Replacement

a. Refer to figure 4-72 and disconnect, cap and tag the lines to the trailer release valve.

b. Unscrew the valve and pipe nipple from the relay-emergency valve.

c. Reverse steps a. and b. above to install valve.

4-76. Check Valve Replacement

a. Refer to figure 4-72. Disconnect, tag and cap lines and fittings to check valve.

b. Unscrew and remove check valve from relay emergency valve.

c. Reverse steps a. and b. above to install.

4-77. Relay Emergency Valve

a. Removal

(1) Block trailer wheels and drain air from reservoir.

(2) Remove trailer release valve.

(a) Refer to figure 4-72 and disconnect, cap and tag the lines to the trailer release valve.

(b) Unscrew the valve and pipe nipple from the relay-emergency valve.

(c) Reverse steps (a) and (b) above to install valve.

(3) Refer to figure 4-72. Disconnect, cap and tag lines to valve.

(4) Remove mounting bolts and take valve from reservoir.

b. Installation. Reverse procedure in a. above and test as given below.

c. Operating and Leakage Test. Check tractor dash air gage against' a test gage known to be accurate prior to performing these tests. 'Connect tractor air lines to the trailer on which valve is to be tested. Block wheels or otherwise hold both vehicles by a means other than air brakes during these tests.

(1) Start these tests with no air pressure in tractor or trailer air brake system. During the initial charge of the tractor-trailer air brake system, note that the trailer brakes are applied as the trailer emergency

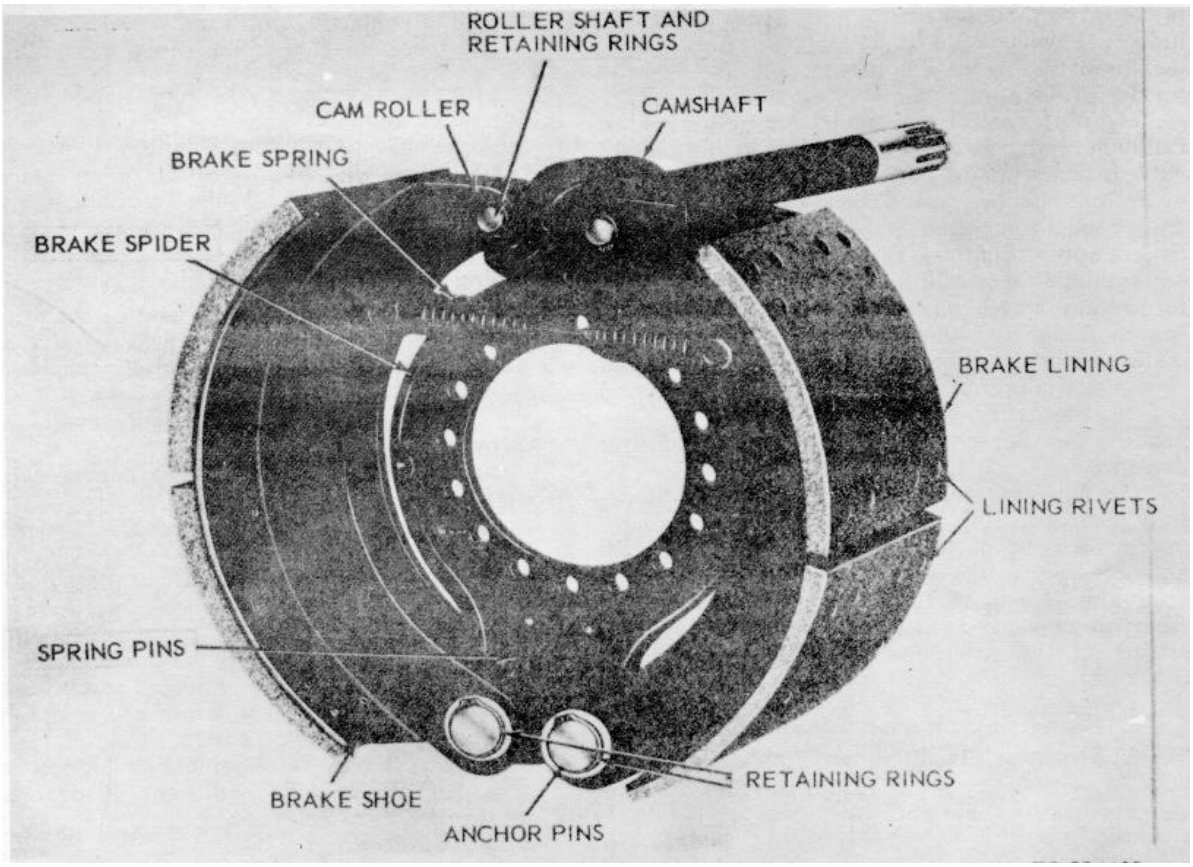


Figure 4-75. Wheel brake assembly

line is charged. However, remember that under these conditions, the trailer emergency line will not be charged until the tractor pressure increases to the point, of opening the emergency valve in the tractor protection valve if installed. Note further that this brake application is completely released as trailer emergency line pressure reaches approximately 60-65 psi (4.2184.5695 kg per sq cm).

(2) Fully charge tractor and trailer air brake systems. Make several service brake applications and check for prompt braking response at all trailer wheels. With brakes released and system reservoir pressure stabilized at 90-100 psi (6.327-7.03 kg per sq cm), with engine stopped, a two minute check should result in no more than a six pound pressure drop for the combination vehicle system. If this check indicates possible excessive leakage of valve, soap suds should be applied to coverplate, coverplate vent, and exhaust port of valve to detect possible inlet valve, inlet valve guide grommet and emergency piston grommet leakage. A combined leakage as indicated by a one-inch (2.54 cm) soap bubble in not less than 5 seconds is permissible. No leakage is permissible at pipe plugs or fittings.

(3) Make and hold a full service brake application with system reservoir pressure stabilized at 90100 psi (6.327-7.03 kg per sq cm) with engine stopped. A two minute check should result in no more than an eight pound pressure drop for the combination vehicle system. If this check indicates possible excessive leakage of valve, soap suds should be applied to cover plate, cover plate vent, and exhaust port to detect exhaust valve, valve guide grommet,

emergency piston grommet, and relay piston grommet leakage. A combined leakage as indicated by a one-inch (2.54 cm) soap bubble in not less than two seconds is permissible. Release the service brake application.

(4) With tractor and trailer air brake system fully charged, move the tractor protection control valve to "emergency" position or close the emergency line cut-out cock on the tractor and uncouple the trailer emergency line coupling. Note that trailer brakes apply promptly. Check at valve, and at the emergency line coupling at the front of the trailer for leakage. No leakage is permissible at emergency line coupling. Reconnect and recharge tractor and trailer air brake system, noting that trailer brakes release at a maximum of 65 psi (4.5695 kg per sq cm) trailer emergency line pressure as the trailer air brake system is recharged to full normal operating pressure.

(5) With tractor and trailer air brake systems fully charged, stop engine. Reduce pressure by making a series of at least five brake applications and note that trailer brakes apply automatically at approximately 45 psi. (3.1635 kg per sq cm) tractor reservoir pressure or at the automatic emergency setting of the tractor protection equipment, if installed.

4-78. Hose Couplings, Cutout Cocks, Air Strainers, Replacement

a. Refer to figure 4-72. Open drain cock to drain air pressure from system.

b. Disconnect, cap and tag lines and fittings to item to be replaced, until item is free.

c. Reverse steps a. and b. above to install item being replaced.

4-79. Reservoir a. Removal.

a. Removal

(1) Block trailer wheels and drain air from reservoir.

(2) Remove trailer release valve.

(a) Refer to figure 4-72 and disconnect, cap and tag the lines to the trailer release valve.

(b) Unscrew the valve and pipe nipple from the relay-emergency valve.

(c) Reverse steps (a) and (b) above to install valve.

(3) Refer to figure 4-72. Disconnect, cap and tag lines to valve.

(4) Remove mounting bolts and take valve from reservoir.

(5) Refer to figure 4-72. Disconnect lines and remove fittings connected to reservoir.

(6) Remove attaching parts at mounting brackets and lift off reservoir.

b. Installation. Reverse procedures in a. Above

c. Inspection. Inspect exterior of reservoir for unpainted areas, and corrosion.

d. Test. Pressure test for leaks, using water pressure only, at not more than 150 pounds per square inch (10.545 kg per sq cm).

Section XVII. FRAME

4-80. Pintle Hook

a. Removal. Remove the nuts, lockwashers and capscrews (8, fig. 4-76), securing the pintle hook (7) to the frame, and remove the pintle hook.

b. Disassembly. Refer to figure 4-77 and disassemble the pintle hook.

WARNING

Dry cleaning solvent, P-D-680 or P-S-661, used to clean parts is potentially dangerous to personnel and property. Use in a well-ventilated area as the fumes are dangerous if inhaled. Avoid repeated and prolonged skin contact. Do not use near open flame or excessive heat. Flash point of solvent is 100F.-138F. (38C.-59C.).

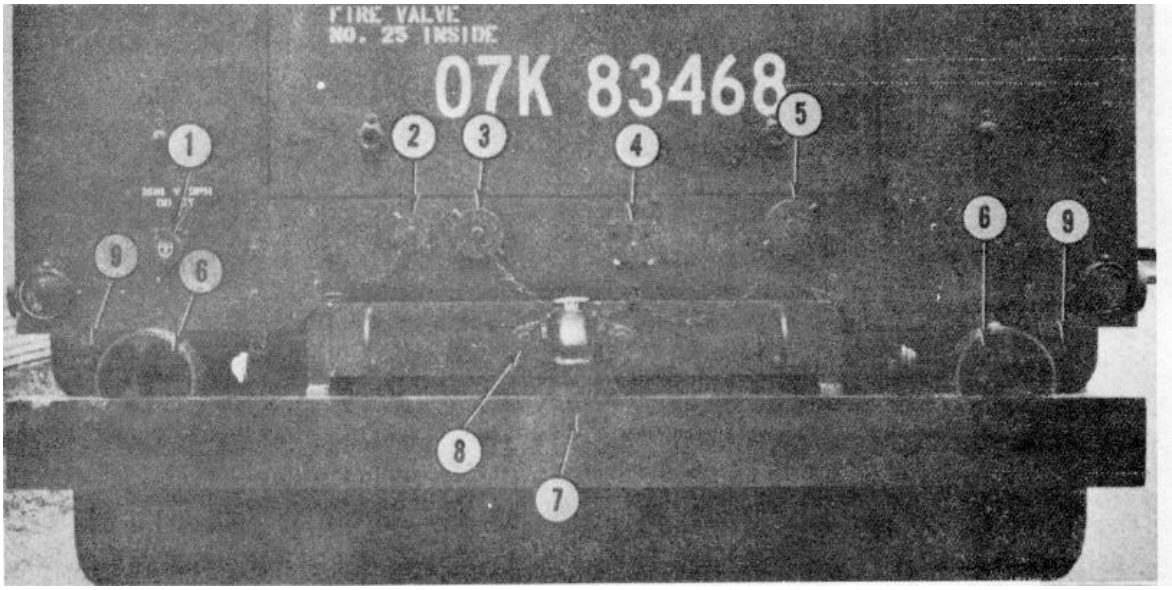
c. Cleaning, Inspection and Repair. Wash all parts in a cleaning solvent. Inspect the grease fittings and spring for breaks or damage. Replace if broken or damaged. Inspect the threads for damage. Replace if broken or damaged. Inspect the threads for damage, and repair or replace nuts and capscrews. Inspect the latch, lock, and pintle hook for breaks or cracks. Weld minor cracks. Replace parts, if badly damaged. Inspect the pins for wear or other damage; replace if worn or damaged excessively.

d. Reassembly. Refer to figure 4-77 and assemble the pintle hook.

e. Installation. Reverse step a. above.

4-81. Landing Gear and Braces

a. Removal and Disassembly.



TS 024603

1 208 v, ac power receptacle
2 Vapor equalizing line
3. Liquid fill line(pump by-pass)
4. 24 v., dc receptacle
5. Liquid fill line
6 Blackout stop and taillight
7. Pintle hook
8 Capscrew
9 Stop and taillight, service

Figure 4-76. Power receptacles, installed view.

(1) Remove the nut (2, fig. 4-78) or (2, fig. 4-79), lockwasher and capscrew (4), securing the diagonal brace (3) to the mounting bracket (1).

(2) Remove the nut, lockwasher, and capscrew (16, fig. 4-80) securing the brace (17) to the landing jack (21), and slide the brace out through the power compartment.

(3) Remove the four screws (20), securing the plate (18) and gasket(19) to the housing, and remove the plate and gasket.

(4) Remove the nuts, lockwashers, and capscrews, securing the cross brace (11) to the landing jacks (21), and remove the brace.

(5) Remove the nut (14), machine bolt (12), and the two washers (15), securing the foot (13) to the landing jack, and remove the foot and slide the spacer from the jack.

(6) Remove the nuts, lockwashers, and capscrews, securing the crank handle (9) and bracket (23) to the jack and remove the handle.

(7) Remove the nine nuts (5), lockwashers (6), and capscrews (22), securing the landing jack to the mounting bracket (23), and remove the jack.

(8) Remove the four nuts (4) and lockwashers (3) securing the mounting bracket to the frame, and remove the bracket.

WARNING

Dry cleaning solvent, P-D-680 or P-S-661, used to clean parts is potentially dangerous to personnel and property. Use in a well-ventilated area as the fumes are dangerous if inhaled. Avoid repeated and prolonged skin contact. Do not use near open flame or excessive heat. Flash point of solvent is 100F.-138F. (38C.-59C.).

b. Cleaning, Inspection and Repair. Wash all parts with a cleaning solvent. Inspect the threads for damage, and replace damaged nuts. and capscrews. Inspect for cracks, breaks, bends and distortion. Repair minor breaks by welding, and straighten any bends. Replace all badly damaged parts.

c. Reassembly and Installation. Reverse the procedure in a. above.

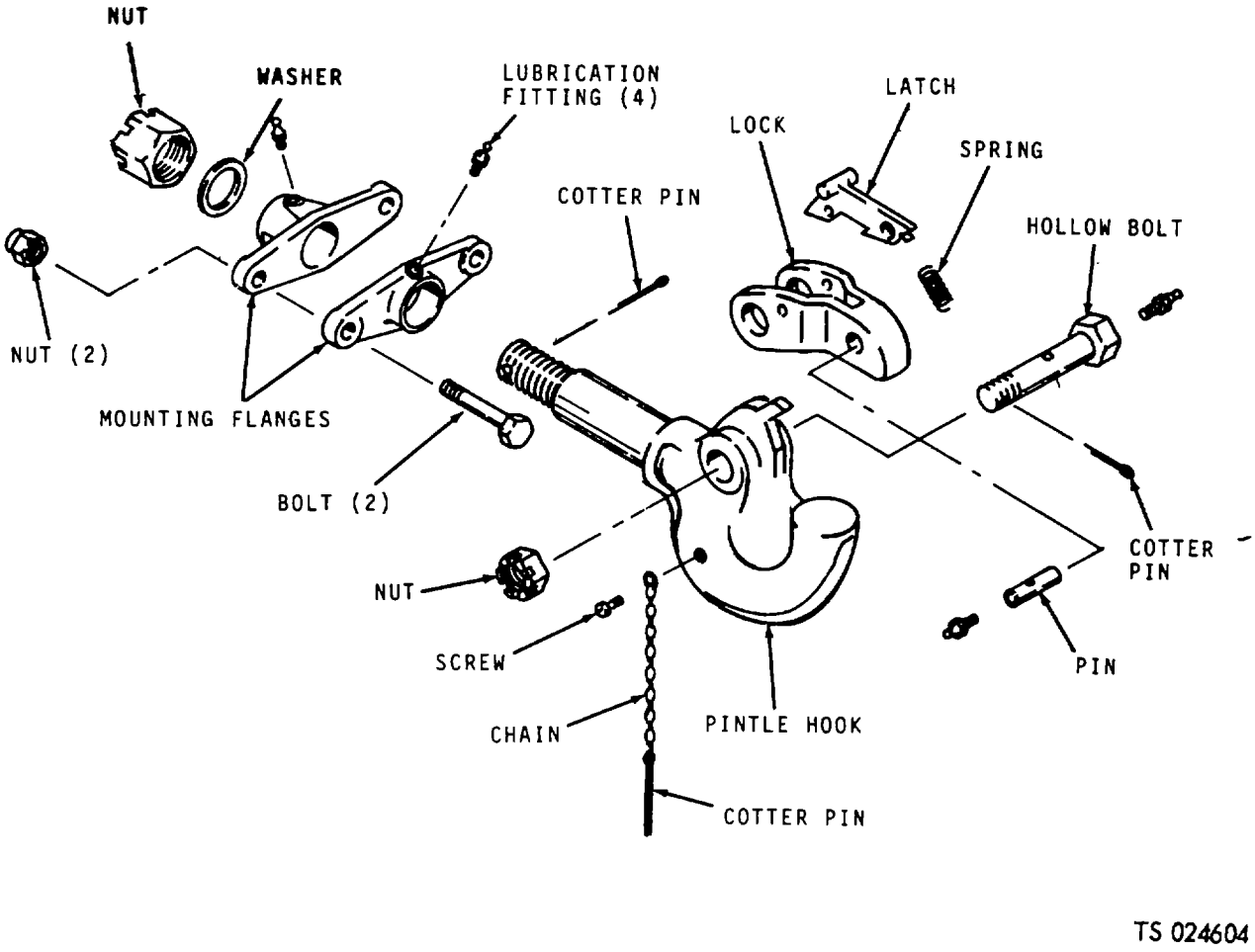
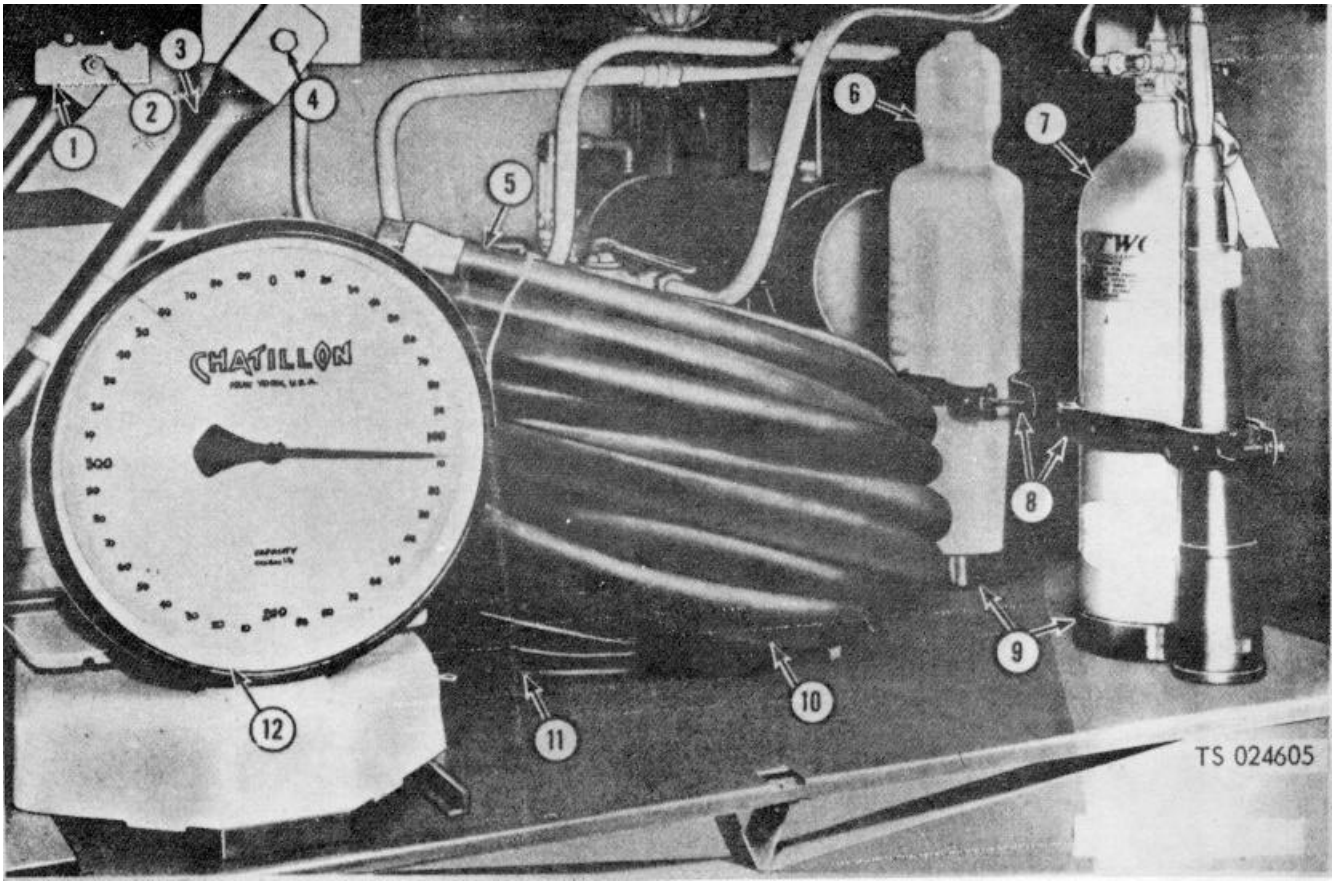
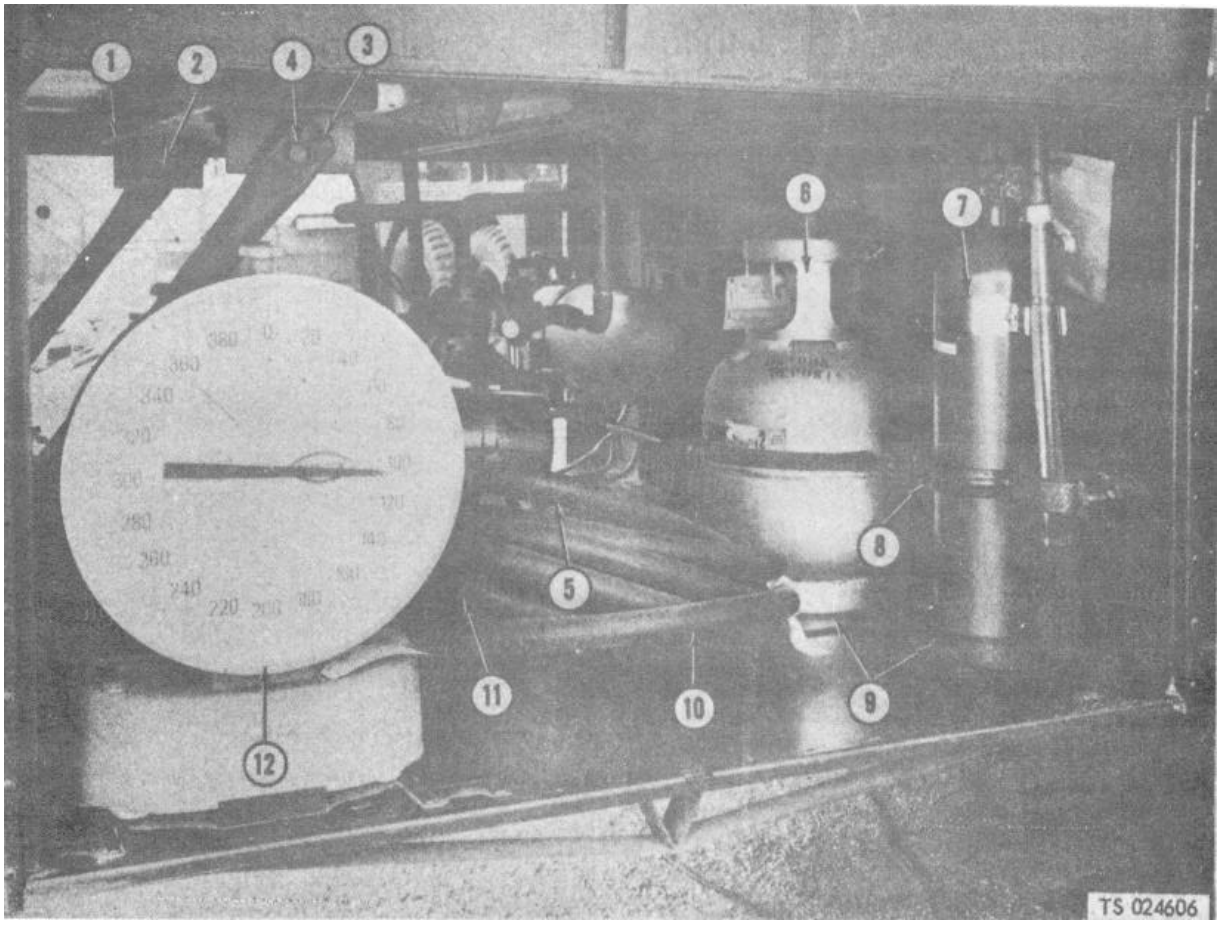


Figure 4-77. Pintle hook, exploded view.



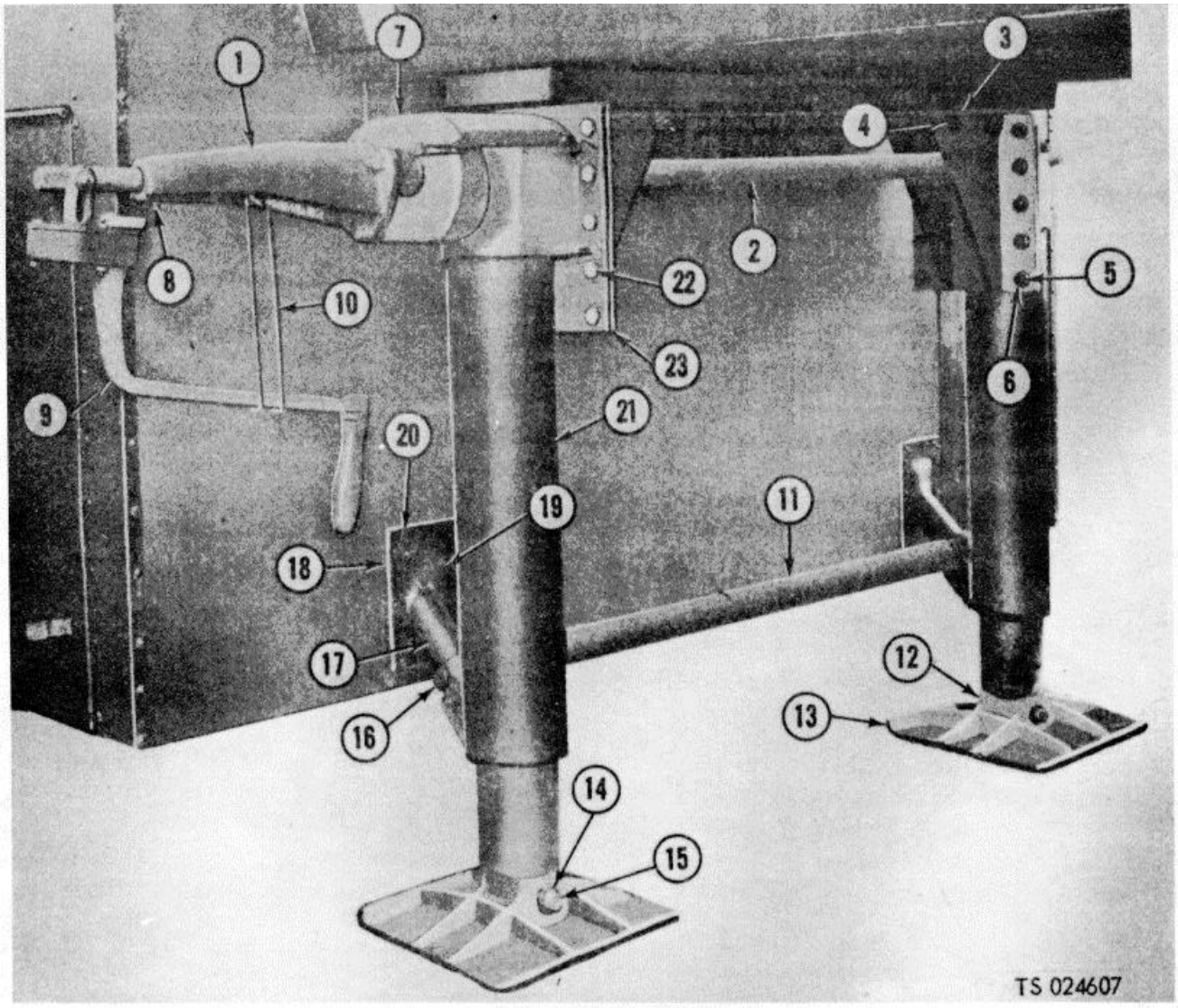
1. Bracket
2. Nut
3. Brace
4. Capscrew
5. Transfer hose (vapor)
6. Freon tank
7. Fire extinguisher
8. Quick release clamp
9. Holder
10. Transfer hose (liquid)
11. Cylinder filling hoses
12. Scales

Figure 4-78. Storage compartment, face view.



1. Bracket
2. Nut
3. Brace
4. Capscrew
5. Transfer hose (vapor)
6. Freon tank
7. Fire extinguisher
8. Quick release clamp
9. Holder
10. Transfer hose (liquid)
11. Cylinder filling hoses
12. Scale

Figure 4-79. Storage compartment, face view (ser. nos. L-1666-T through L-1688-T).



1. Shaft support
2. Crankshaft
3. Lockwasher
4. Nut
5. Nut
6. Lockwasher
7. Gear box
8. Fitting
9. Crank assembly
10. Crank holder
11. Cross brace
12. Machine bolt
13. Foot
14. Nut
15. Washer
16. Capscrew
17. Diagonal brace
18. Plate
19. Gasket
20. Screw, 10-32
21. Landing jack leg
22. Capscrew
23. Bracket

Figure 4-80. Landing gear, installed view.

Section XVIII. SPRINGS

4-82. Torque Arms

a. Removal. Refer to figure 4-81 and remove the torque arms.

b. Installation. Refer to figure 4-81 and install the torque arms. If replacement adjustable arms are installed, take care to maintain axle alinement dimensions presented on figure 4-81.

c. Adjustment. Refer to figure 4-81 and adjust axle spacing as indicated to within 1/16 in. (.1588 cm) of values given.

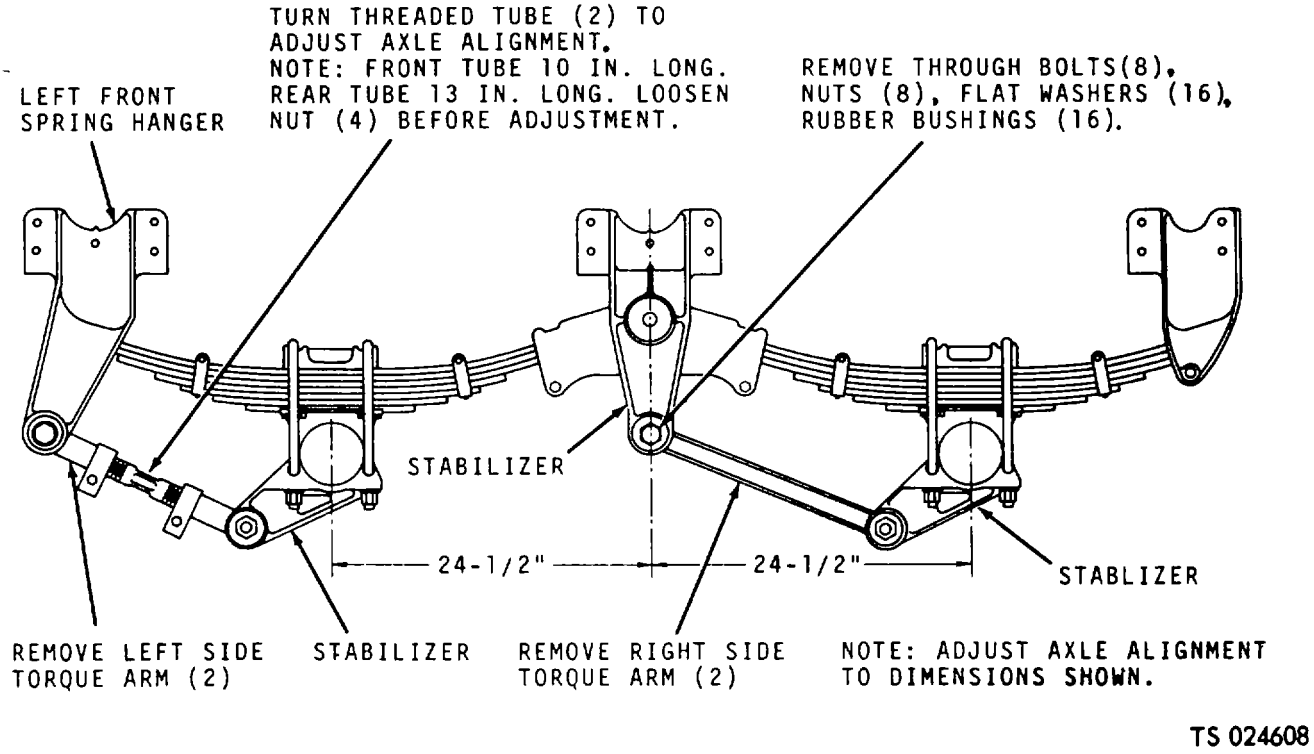


Figure 4-81. Torque arm adjustment and removal.

Section XIX. BODY

4-83. Description

The pressure vessel power compartment and storage compartment are completely inclosed by aluminum panels. Two access doors are provided in both the power and storage compartments and the rear pressure vessel. Access plates are provided to the gas tank, over each of the four lifting eyes, the front pressure vessel, and one at the front of the trailer for the wiring connections. Reflectors are provided at each corner of the trailer and at the front and rear of the trailer fenders.

4-84. Reflectors

a. Removal. Remove the two machine screws securing the reflector to the trailer, and remove the reflector.

b. Installation. Position the reflector on the trailer and secure with the two machine screws.

4-85. Power Compartment Door

a. Door Removal. Remove the rivets securing the door to the housing and lift off the door.

b. Disassembly.

(1) Remove the two cotter pins (20, fig. 4-82) and washers (19) securing the two rods (1 and 14) to the lock (15).

(2) Lift the rods from the lock and remove them through the holes in the door brackets.

(3) Lift the spring (18) from the lock.

(4) Remove the four machine screws (26) and lockwashers (27) securing the lock to the door (4), and remove the lock.

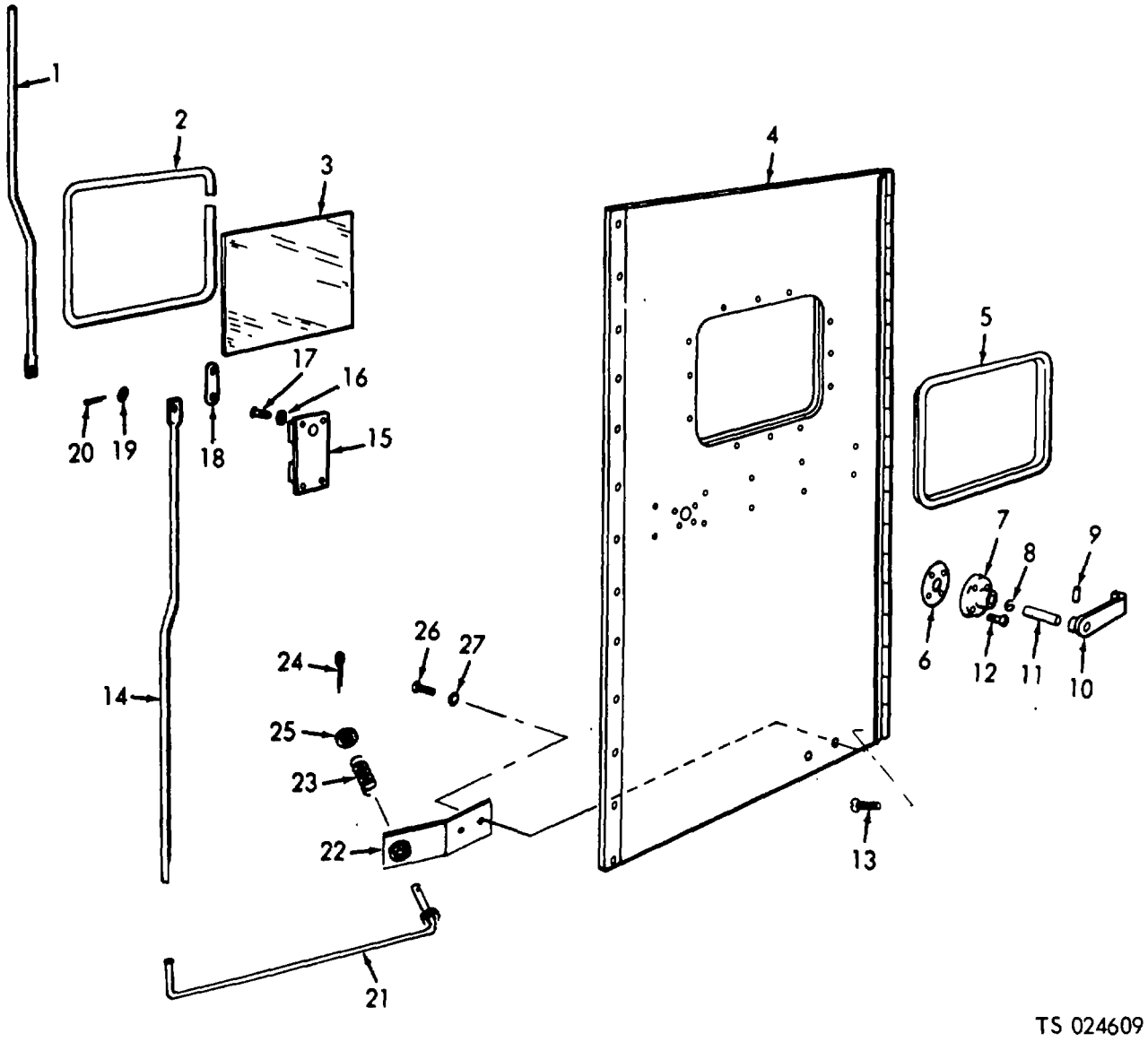


Figure 4-82. Power compartment door, exploded view

1. Rod
2. Lock strip
3. Glass
4. Door
5. Molding
6. Gasket
7. Bracket
8. Retaining ring
9. Pin
10. Handle
11. Shaft
12. Screw, F.H. (4)
13. Screw, F.H. (20) (ser. Nos. L-1475-T through L-1478-T)
13. Screw, F.H. 12) (ser. nos. (L-1666-T through L-1668-T)
14. Rod
15. Lock
16. Lockwasher, #10
16. Lockwasher, #10
17. Machine screw, #10-32
17. Machine screw, #10-32
18. Spring
19. Washer
20. Cotter pin,
21. Rod
22. Bracket
23. Spring
24. Cotter pin
25. Flatwasher
26. Machine screw
27. lockwasher,

(5) Remove the four flathead screws (12) securing the handle assembly and gasket (6) to the door, and lift off the gasket and handle assembly.

(6) Remove the snap ring (8) securing the shaft (11) in the bracket (7), and remove the shaft and handle from the bracket.

(7) Using a punch and hammer, remove the pin (9) securing the handle (10) to the shaft, and slide the handle from the shaft.

(8) Pull the locking strip (2) securing the glass (3) from the molding (5).

(9) Remove the glass and molding from the door.

(10) Remove screws (26) and lockwashers (27), and remove door holder assembly.

(11) Remove cotter pin (24) and disassemble door assembly.

c. Reassembly.

(1) Position the molding (5, fig. 4-82) and glass (3) in the door (4) and -secure with locking strip, using a glass installing tool.

(2) Position the handle (10) on the shaft (11) and secure with the pin (9).

(3) Position the shaft in the bracket (7) and secure in place with the snap ring (8).

(4) Position the gasket (6) and the bracket on the door and secure with the four flathead screws (12).

(5) Position the lock (15) on the door and secure with the four lockwashers (16) and machine screws (17).

(6) Position the spring (18) and the two rods (1, 14) on the door and secure with the two washers (19) and cotter pins (20). Assemble and install door holder assembly.

d. Installation. Position the door on the housing and secure with the twelve flathead screws (13).

4-86. Storage Compartment Door

a. Removal. Remove the ten flathead securing the door to the housing, and remove the door.

b. Disassembly.

(1) Remove the two nuts (15, fig. 4-88), lockwashers (12), and machine screws (9) securing the plate (14) and catch (10) to the door (1), and remove the plate and catch.

(2) Remove the six machine screws (13) and lockwashers (12) securing the lock (11) to the door, and remove the lock.

(3) Remove the three machine screws (4)securing the handle guide (5) and gasket (3) to the door, and remove the, guide and gasket.

(4) Remove and disassemble the handle assembly.

c. Installation. Place the door on the housing and attach with the ten screws.

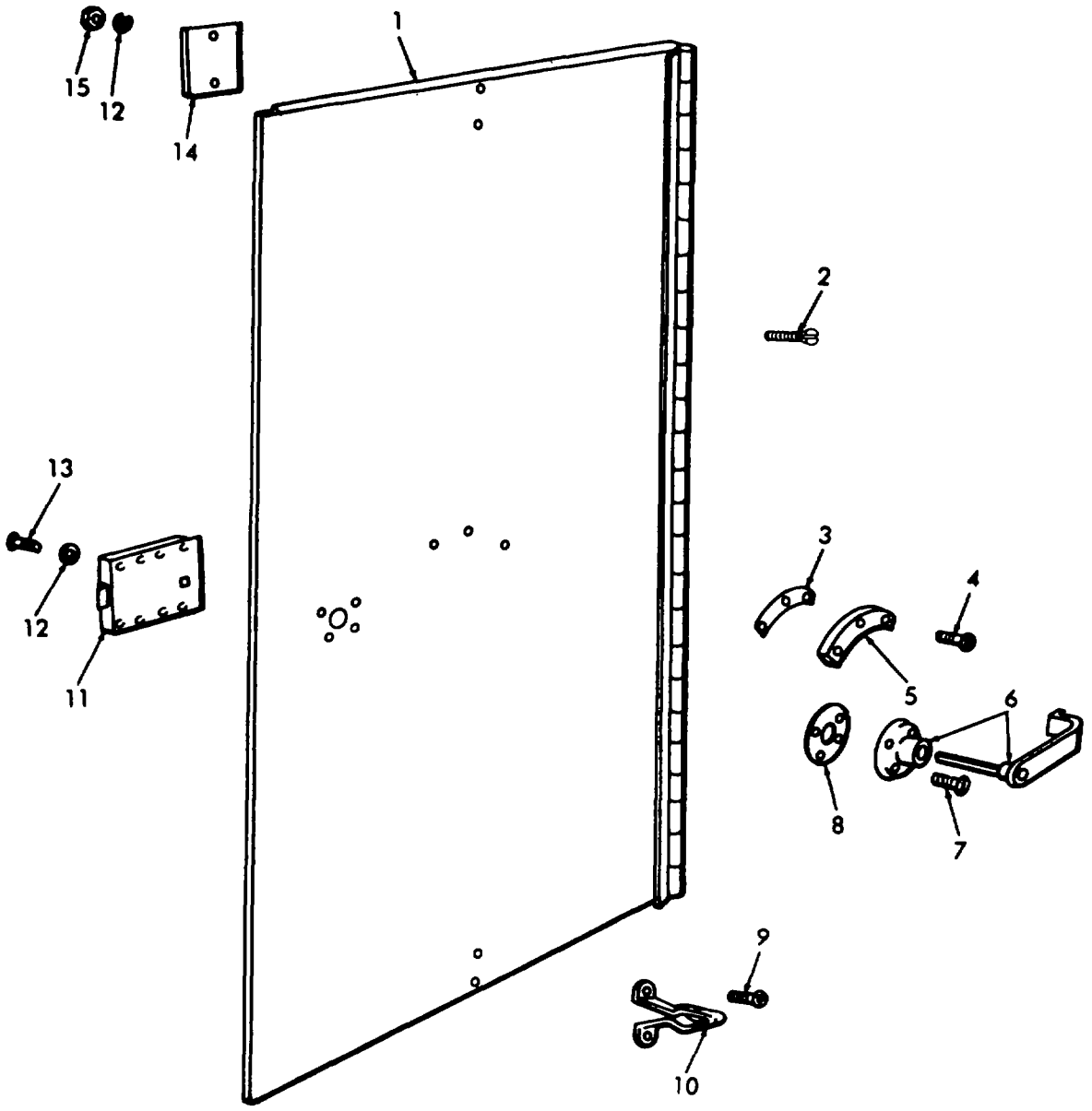
d. Reassembly.

(1) Reassemble the handle assembly (6, fig. 4-83) and secure to the door (1).

(2) Position the gasket (3) and guide (5) on the door and secure with the three machine screws (4).

(3) Position the lock (11) on the door and secure with the six lockwashers (12) and screws (18).

(4) Position the catch (10) and plate (14) on the door and secure with the two screws (9), lockwashers (12) arid nuts (15).



1. Door
2. Flathead screw, 10-32
3 Gasket
4. Machine screw, 10-32
5. Guide
6. Handle assembly
7. Screw, flathead, 10-32
8. Gasket
9. Machine screw, 10-32
10. Catch
11. Lock
12. Lockwasher, No. 10
13. Machine screw, 10-32
14. Plate
15. Nut, 10-32

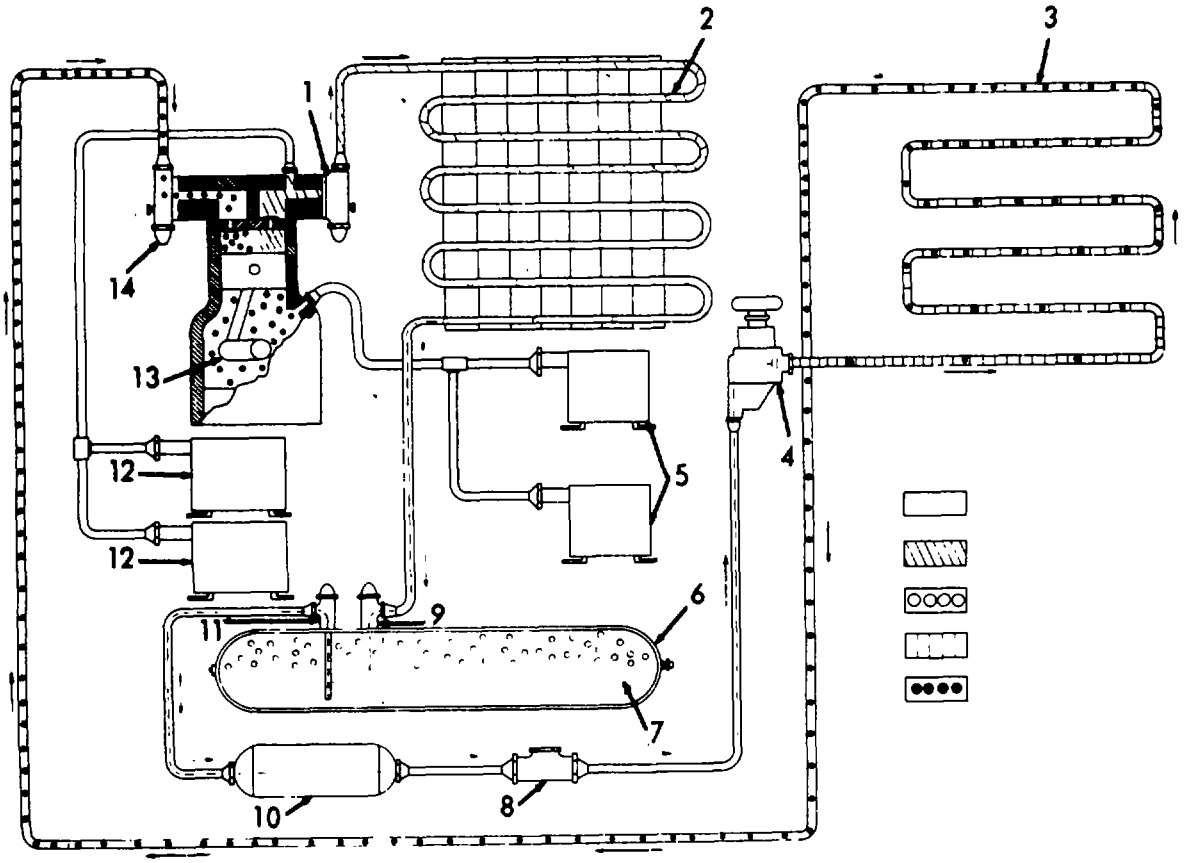
Figure 4-83. Storage compartment door, exploded view.

Section XX. REFRIGERATION SYSTEM

4-87. General

a. A conventional commercial refrigeration unit, in the power compartment, limits pressure of stored carbon dioxide to 305 psi (21.4416 kg per sq. cm) in response to pressure sensitive automatic controls. The system is shown schematically in figure 4-84. During normal operation, the driving unit is energized by the associated tank pressure control switch. When the tank pressure rises to 305 psi, (21.4415 kg per sq. cm) this switch closes the circuit to the driving unit. If the unit is operated manually by either driving unit, the tank pressure switches are bypassed and do not control operation of the driving unit, when the tank pressure exceed the limit of 2953056 psi (20.7385-21.44156 kg per sq. cm). The driving unit, through a clutch, turns the counter shaft which, through another clutch, turns the compressor. As the compressor operates, it draws refrigerant in at the suction port and discharges it out of discharge port.

b. The flow of refrigerant and the pressure in the evaporator coil is controlled by the expansion valve. This valve is a pressure-regulating device which acts to maintain a constant pressure of approximately 5 psi (.3515 cm) in the evaporator coil. When the compressor reduces the suction pressure



1. Discharge service valve
2. Condenser
3. Evaporator coil
4. Expansion valve
5. Suction pressure switch (gas and electric)
6. Receiver
7. Refrigerant
8. Sight glass
9. Receiver inlet valve
10. Dehydrator
11. Receiver liquid outlet valve
12. Discharge pressure switch (gas and electric)
13. Compressor
14. Suction service valve

Figure 4-84. Refrigeration flow diagram

to 5 psi (.3515 cm), the expansion valve opens, admitting liquid refrigerant from the receiver into the evaporator coil. At this pressure, the liquid refrigerant will boil at approximately -23.3C. (-010F). Since the refrigerant is considerably warmer than this when it first enters the evaporator it begins to absorb heat from its surroundings, until it and the evaporator coil are cooled at approximately -23.3 C. (-10F). From this point on the heat for boiling the refrigerant comes from the carbon dioxide outside of the evaporator. The refrigerant continues to absorb heat until it is entirely vaporized and at a temperature approximately the same as that of the carbon dioxide in the tank.

c. While the refrigerant has been boiling and absorbing heat, it has been moving through the evaporator coil. The final condition, when the refrigerant is entirely boiled away into vapor at the temperature of the carbon dioxide, is obtained just as the refrigerant reaches the end of the evaporator coil. From the evaporator, the refrigerant enters the compressor where the pressure is raised, to cause condensation of the vapor and liberation of the absorbed heat in the condenser. Air removes the heat, and the refrigerant is liquefied. Thus, the heat removed from the carbon dioxide is transferred by the refrigerant to the outside air. From the condenser, the liquefied refrigerant flows to the receiver to complete the cycle.

d. When the carbon dioxide has been refrigerated to the extent that the tank pressure is reduced to 295 psi (20.7385 kg per sq. cm), the tank pressure switch opens, breaking the circuit to the driving unit, and the compressor stops. While the compressor is idle, the refrigerant in the evaporator coil will warm up to the temperature of the carbon dioxide in the tank. This increases the suction pressure of the refrigeration system to 11 psi (.7733 kg per sq. cm), which holds the expansion valve entirely closed, until the compressor starts again.

e. The service values shut off the flow of refrigerant when service is required on the system. The sight glass permits operation of the refrigerant flow. The dehydrator is used to remove moisture from the refrigerant.

f. Four compressor pressure switches act as a safety device for the compressor. Two of these switches, one for low pressure and one for high pressure, are connected with the electric motor circuit and the other two, one for low pressure and one for high pressure, are connected to the gasoline engine circuit. The low pressure switches open to stop the electric motor or the gasoline engine at 0O psi suction pressure. The high pressure switches open to stop the electric motor or the gasoline engine at 240 psi (16.872 kg per sq. cm) discharge pressure. The low pressure switches will close again when the suction pressure rises to 12 psi (.8436 kg per sq. cm). The high pressure switches will close when the discharge pressure drops to 210 psi (14.763 kg per sq. cm). The four compressor pressure switches operate only when the unit is operated manually by either driving unit, take care to prevent the suction and discharge pressures from exceeding the normal limits. Two pressure gages shall be installed on the compressor, one on the suction side and one on the discharge side so that the suction and discharge pressures may be checked.

4-88. Compressor

Inspect the general condition of the compressor (fig. 4-85) for cleanliness, freedom from oil leaks and unusual noises during operation. Keep compressor and condenser cooling surfaces particularly clean to maintain full operating efficiency.

4-89. Receiver

Inspect receiver (7, fig. 4-85) for security of attachment, and general freedom from visible damage or surface corrosion. Check sight glass (1) for adequate charge in receiver. To add refrigerant, proceed as follows:

a. Install a discharge pressure gage in the discharge service valve.

b. Connect a full freon cylinder to the gage port(3, fig. 4-85), using a charging hose with dehydrator, and a vacuum-pressure gage.

c. Before tightening the charging hose connector at the compressor crack the cylinder valve slightly to purge air from the hose.

d. Close the suction service valve (2) one turn.

e. Start the compressor, and slowly admit freon from the supply cylinder until the sight glass appears full of refrigerant.

CAUTION

If the compressor pounds, or frost forms on the cylinder head, throttle down the rate of flow of refrigerant with the freon cylinder valve.

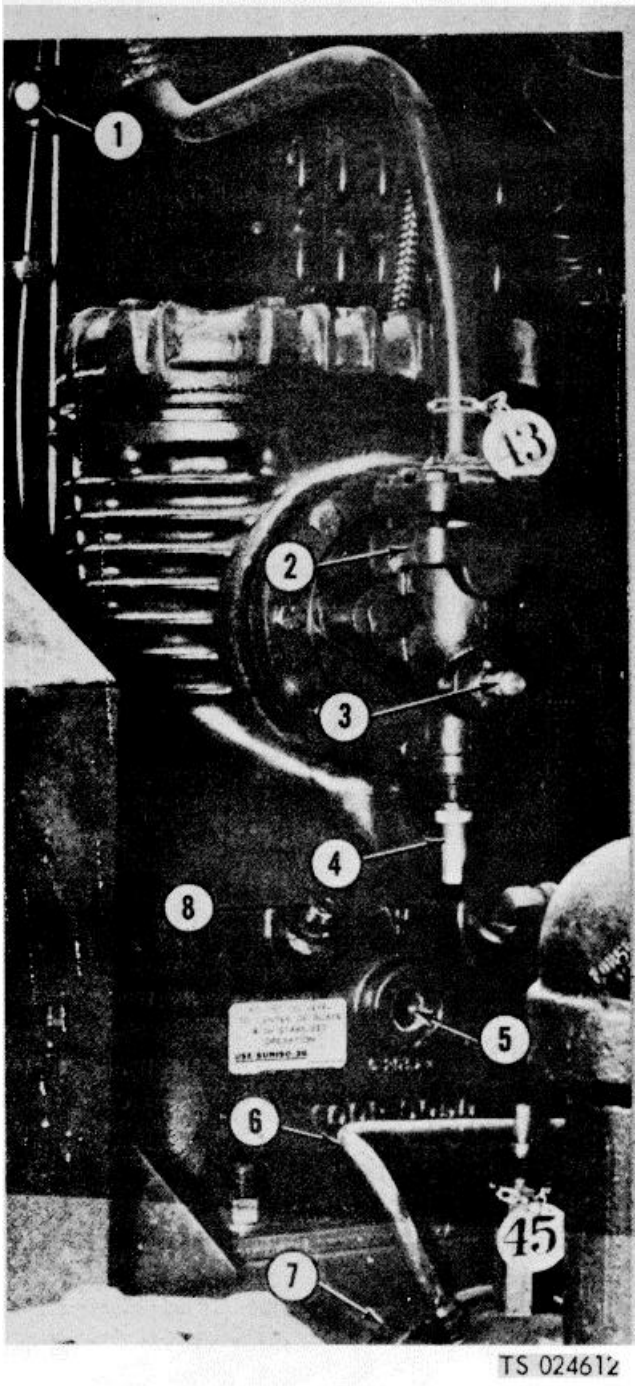
4-90. Pumping Down the System

NOTE

The refrigerant must be pumped down into the receiver when the unit is put in storage, shipped, adding or changing oil.

a. Remove the valve cap (fig. 4-86) and close the receiver liquid outlet valve tightly.

b. Remove the plug from the compressor suction valve (1, fig. 4-87) and install an adapter (2) and pressure gage, with a range of 30 inches of mercury (vacuum) -0 to 100 psi (7.03 kg per sq. cm).



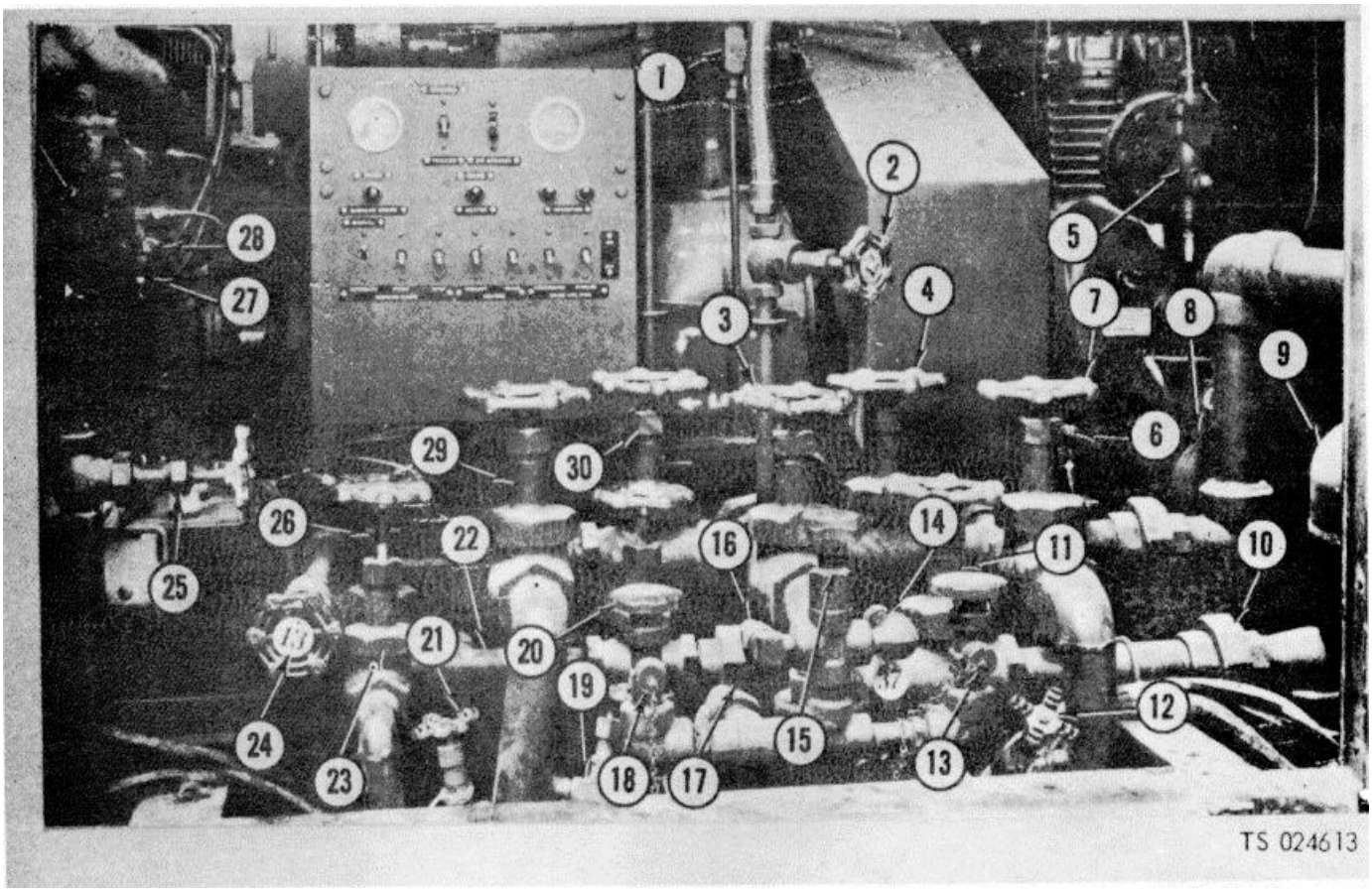
1. Refrigerant sight glass
2. Suction valve
3. Freon charging port
4. Suction valve shut-off
5. Oil level sight glass
6. Receiver tank inlet line
7. Receiver
8. Oil filler plug

Figure 4-85. Refrigeration compressor, installed view.

c. Operate the refrigeration compressor so that the refrigerant is pumped from the suction side of the compressor into the receiver until the suction pressure drops to 0 psi.

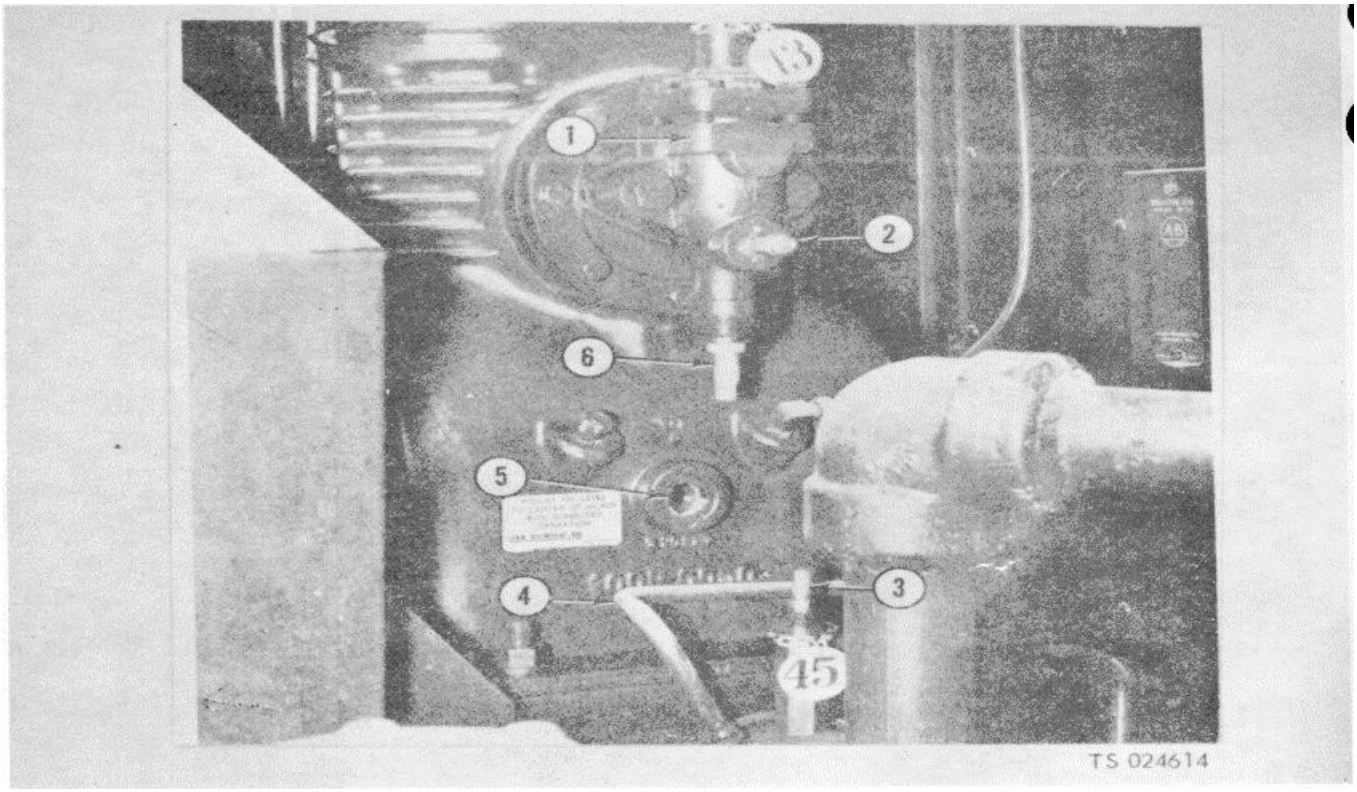
d. Allow the unit to stand for a few minutes; then if the pressure gage shows a rise above zero, restart the compressor to get rid of the refrigerant which has come out of the oil.

e. If removing or opening the condenser, shut off the receiver inlet valve at the front end of the inlet line (4). A small amount of refrigerant will probably be lost unavoidably, whenever the system is opened. This is not serious as long as the foregoing steps to prevent major loss of refrigerant are observed.



1. Strainer bleed-off valve
2. Cylinder filling compressor liquid shut-off valve
3. Liquid equalizing line valve
4. Dehydrator by-pass valve
6. Refrigerator suction valve
6. Transfer pump bleed-off valve
7. Liquid fill line valve thru pump
.8. Receiver tank inlet line
9. Dehydrator
10. Union nut
11. Liquid line shut-off valve, conversion
12. Transfer hose bleed-off valve (thru pump)
13, Cylinder filling valve
14. Tube nut
15. Cylinder fill pressure regulating valve
16. Safety relief valve cylinder fill
17. Union nut
18. Cylinder filling valve
19. Transfer hose bleed-off valve
20. Vapor return valve, conversion
21. Transfer hose bleed-off valve vapor
22. Liquid line vapor relief valve
23. Vapor equalizing line valve
24. High pressure vapor return valve
25. Fire protection valve
26. Vapor return valve, storage
27. Carburetor priming lever
28. Stop pin
29. Liquid fill line valve, by-pass pump
30. Liquid shut-off valve to cylinder filling compressor

Figure 4-86. CO2, manifolds, installed view.



1. Suction valve
2. Adapter,
3. Receiver liquid outlet valve
4. Receiver inlet line
5. Lubricating oil sight glass
6 Suction valve shut-off

Figure 4-87. Refrigeration receiver and suction value.

Section XXI. CLUTCHES AND DRIVE BELTS

4-91. Clutch Adjustment

a. Loosen the setscrew (11, fig. 4-88) in the adjustment nut (12).

b. Release the clutch as far as possible.

c. Unscrew the adjusting nut(12) until the clutch can easily be engaged.

d. Turn the adjusting nut (12) clockwise as far as possible by hand.

e. Release the clutch and tighten the adjusting nut 1/8 turn.

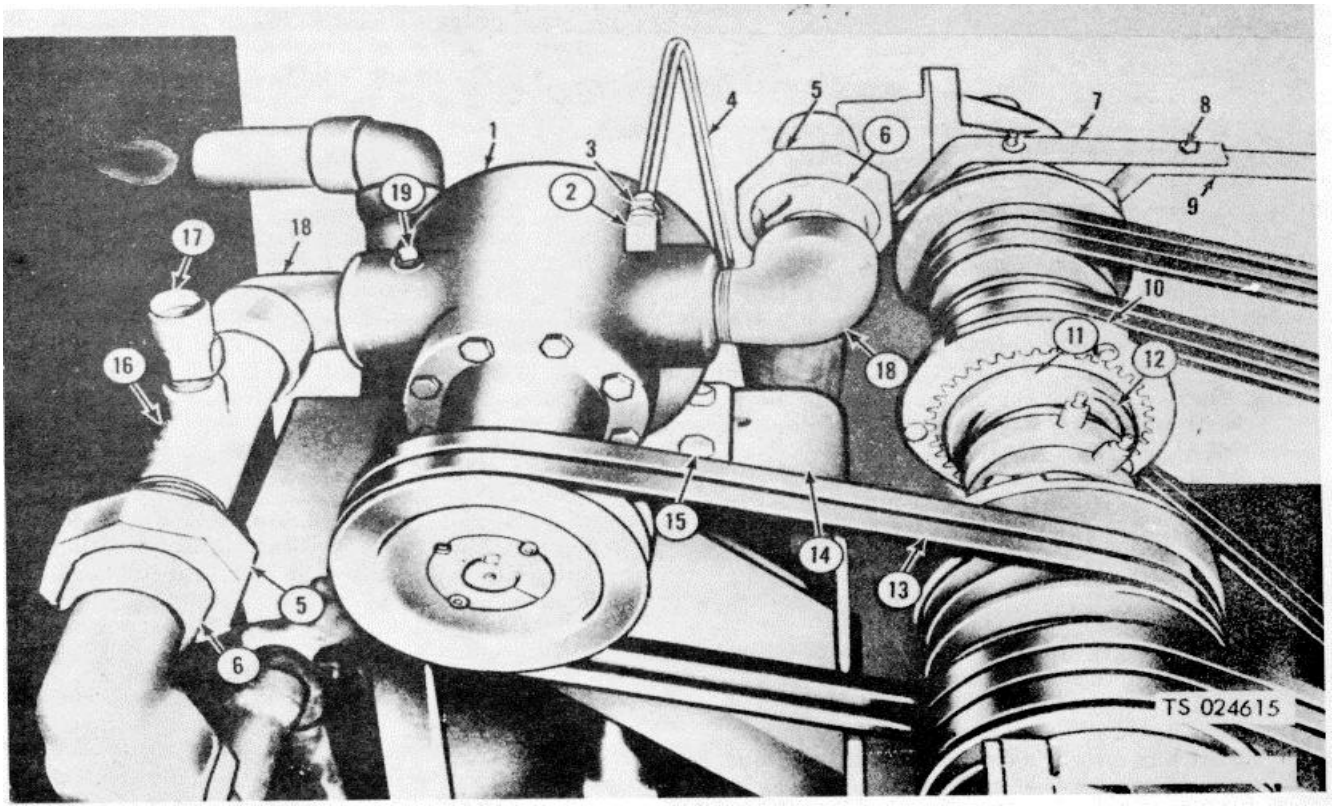
f. Secure the adjusting screw in this position with the setscrew (11).

NOTE

If the clutch shows a tendency to slip when load is applied, tighten adjusting nut as above until there is no slippage.

4-92. Drive Belts

a. General. Power is transmitted from the electric motor and gasoline engine by V-belts to line shafting, then from the shaft to the driven unit. Driven units are: C02, transfer pump; refrigeration compressor; cylinder filling compressor; generator.



1. Transfer pump
2. Adapter
3. Tube nut
4. Tube
5. Union nut
6. 1/3 union
7. Clutch arm
8. Capscrew
9. Clutch arm
10. Clutch drive ring
11. Setscrew
12.. Adjusting nut
13. Drive belt
14. Frame
15. Capscrew
16. Line assembly
17. Safety relief valve
18. Elbow
19. Pipe plug

Figure 4-88. Clutch adjusting points.

b. *Adjustment.* All belts are adjusted to a tension permitting 1-/2 inch (3.81 cm) deflection under firm thumb pressure midway between pulleys, except the transfer pump belt, for which 1 inch (2.54 cm) deflection is specified. All belts are tensioned by loosening the connected unit on its base, moving it as required, and tightening the base fasteners to hold the tension.

Section XXII. CARBON DIOXIDE TRANSFER AND CYLINDER FILLING SYSTEM

4-93. Description

The carbon dioxide system (fig. 4-89) through the use of the transfer pump (30), cylinder filling unit (37), valving, and clutches is used to perform the various conversion and storage functions of the unit. This system consists of the transfer pump, cylinder filling unit, a liquid level and pressure gage for each tank, dehydrator, cylinder filling manifold, vapor manifold, and carbon dioxide manifold.

4-94. Transfer Pump

a. Removal.

(1) Close valves (4, 11 and 30, fig. 4-86)

(2) Open pump bleed-off valve (6).

(3) Unscrew the tube nut (3, fig. 4-88) securing the tube (4) to the adapter (2).

(4) Unscrew the two union nuts (5).

(5) Slide the drive belt (13) off the pump.

(6) Remove the four capscrews (15), nuts, washers, and lockwashers, securing the transfer pump to the frame, and lift out the pump assembly.

(7) Remove the line (16) and the close nipple from the two elbows (18).

(8) Remove the two elbows, adapter (2), and pipe plug (19) from the pump assembly.

(9) Remove the two 1/3 unions from the two pipes.

(10) Remove the safety relief valve (17) from the line (16).

WARNING

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b. Cleaning, Inspection and Repair. Clean the pump with a clean cloth dampened in a cleaning solvent. Wash all other parts in a cleaning solvent. Inspect the pump for loose bearings, bushings, pulley, cracks, and leaks. Tighten a loose pulley. Replace a damaged pump or report to the proper authority. Inspect the pipes and capscrews for damaged threads or any other damage. Replace badly damaged pipe fittings.

c. Installation.

(1) Screw the two elbows (18, fig. 4-88), pipe plug (19), and adapter (2) into position in the pump (1).

(2) Screw the line (16) and the close nipple into position in the two elbows.

(3) Screw the two 1/3 unions into position on the line (16) and nipple.

(4) Screw the safety relief valve (17) into position on the line (16).

(5) Position the pump assembly (1) on the frame (14) with the drive belts (13) in position on the pulley and secure with the four nuts, washers, lockwashers, and capscrews (15).

(6) Secure the pipes with the two union nuts.

(7) Position the tube (4) on the adapter (2) and secure with the tube nut (3).

(8) Open valves (4, 11 and 30, fig. 4-86) and close valve (6).

4-95. Dehydrator

a. Removal.

(1) Close valves (4, 7 and 11, fig. 4-86).

(2) Unscrew the two union nuts (10), securing the-dehydrator assembly (9), and lift the assembly from the unit.

b. Installation. Reverse procedure in a. above.

4-96. C02 Liquid Manifold

a: Removal.

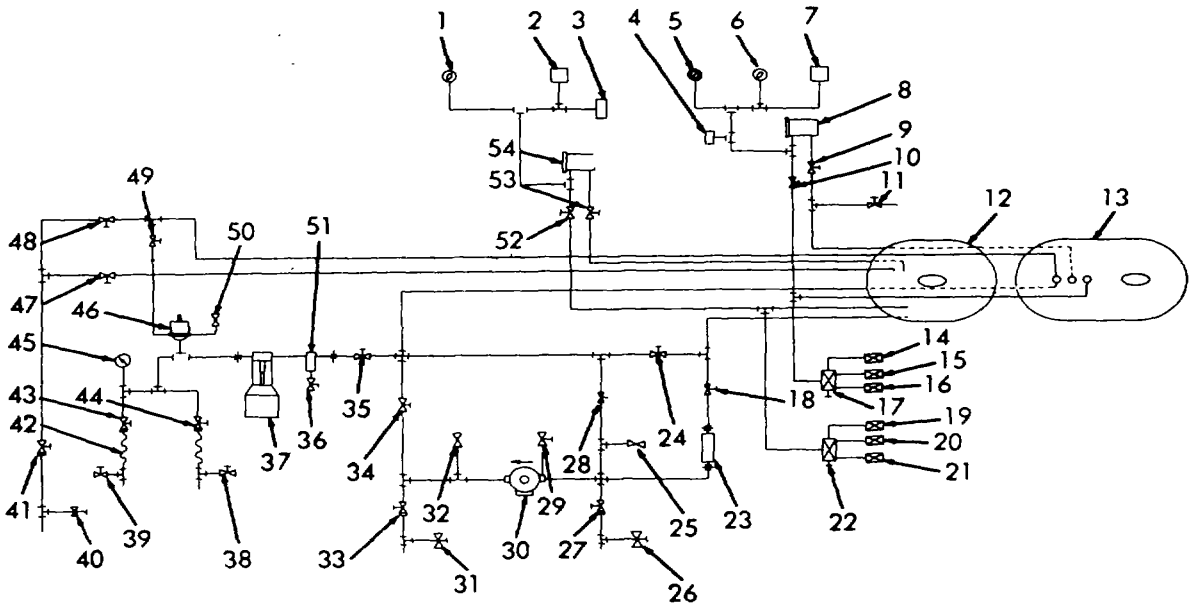
(1) Remove the carbon 'dioxide from both vessels.

(2) Remove the two unions (18, fig. 4-90) and nipples (17) from the manifold, at 3 and 5, figure 4-91.

(3) Loosen the hose nut (6, fig. 4-92) and remove the hose (5) from the valve (30).

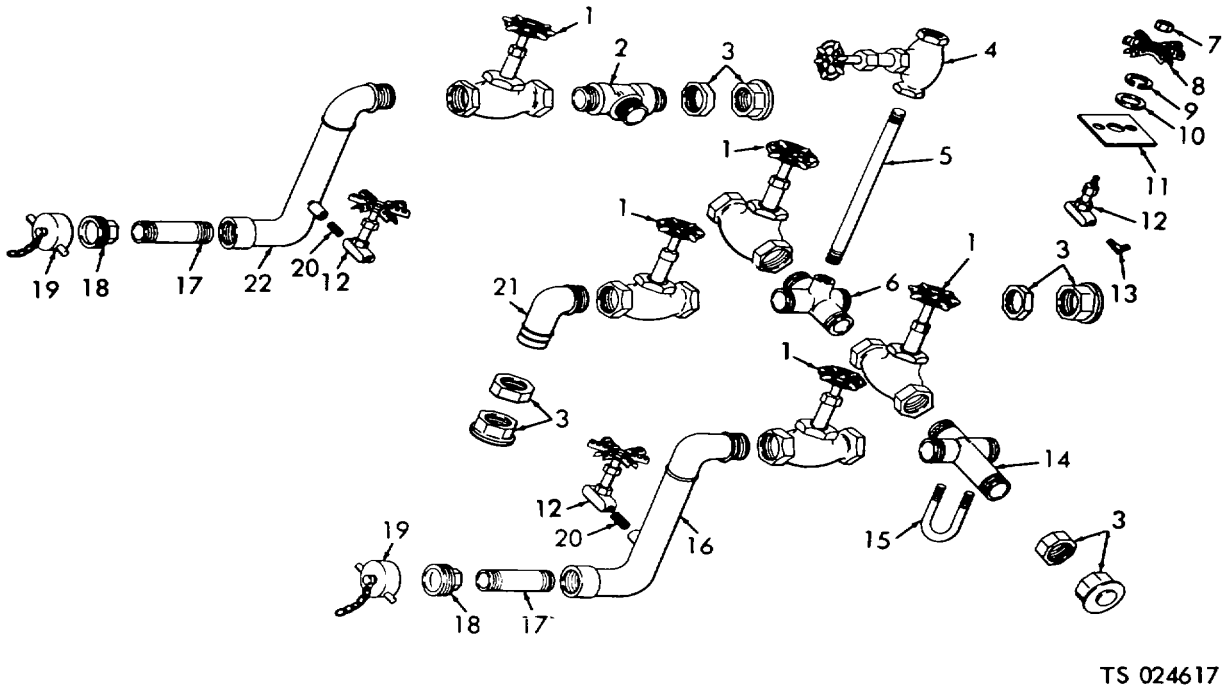
(4) Remove the two nuts (27) and U-bolt (29) securing the pipe and valve (30) to the bracket (28).

(5) Loosen the tube nut securing the tube (22) to the valve assembly (25).



1. Tank pressure-control switch (conversion heater)
2. Alarm pressure switch conversion
3. Pressure gage (conversion)
4. Pressure gage (storage)
5. Tank pressure control switch (gasoline engine)
6. Tank pressure control switch (electric motor)
7. Alarm pressure switch (storage)
8. Liquid level gage (storage)
9. Low pressure gage line valve (storage)
10. High pressure gage line valve (storage)
11. Fire valve
12. Conversion pressure vessel
13. Storage pressure vessel
14. Bleeder valve for C02 (storage)
15. Relief valve for C02 (storage
16. Relief valve for C02 (storage
17. Safety vent switching valve (storage)
18. Liquid line shut-off valve (conversion)
19. Bleeder valve for CO2 (conversion)
20. Relief valve for CO2 (conversion)
21. Relief valve for CO2 (conversion)
22. Safety vent switching valve (conversion)
23. Dehydrator
24. Liquid equalizing line valve
25. Vapor relief valve(liquid line)
26. Transfer hose bleed off valve (thru pump)
27. Liquid fill line valve (thru pump)
28. Dehydrator by-pass valve
29. Transfer pump bleed-off valve
30. Transfer pump
31. Transfer hosebleed-off valve (by-pass pump)
32. Safety relief valve (transfer pump discharge)
33. Liquid fill line valve (by-pass pump)
34. Liquid shut-off valve (storage)
35. Liquid shut-off valve to cylinder fill compressor
36. Strainer bleed-off valve
37. Cylinder filling unit
38. Cylinder filling hose bleed-off valve
39. Cylinder filling hose bleed-off valve
40. Transfer hose bleed-off valve (vapor)
41. Vapor equalizing line valve
42. Cylinder filling hose
43. Cylinder filling valve
44. Cylinder filling valve
45. Cylinder filling pressure gage
46. Pressure regulating valve (cylinder fill)
47. Vapor return valve (conversion)
48. Vapor return valve (storage)
49. High pressure vapor return valve
50. Safety relief valve cylinder fill
51. Strainer
52. High pressure gage line valve (conversion)
53. Low pressure gage line valve (conversion)
54. Liquid level gage conversion

Figure 4-89. Schematic piping diagram.



1. Valve
2. Tee assembly
3. 2/3 union
4. Valve
5. Nipple
6. Cross assembly
7. Nut
8. Handle
9. Lockwasher
10. Flatwasher
11. Bracket
12. Valve (3) (includes items (7) and (8)
13. Adapter
14. Cross assembly
15. U-bolt
16. Elbow assembly adapter
17. Nipple
18: 1/3 union
19. Cap (2)
20. Nipple
21. Elbow assembly
22. Elbow assembly adapter

Figure 4-90. CO2, liquid manifold, exploded view.

(6) Remove the four nuts (20) bevel washers (21) and the two U-bolts (18) securing the cylinder filling manifold to the liquid manifold.

(7) Loosen the five union nuts (10, fig. 4-93) securing the manifold to the piping and lift out the manifold assembly.

b. *Disassembly.* Refer to figure 4-90 and disassemble the manifold.

WARNING

Dry cleaning solvent, P-D-680 or P-S-661, used to clean parts is potentially dangerous to personnel and property. Use in a well-ventilated area as the fumes are dangerous if inhaled. Avoid repeated and prolonged skin contact. Do not use near open flame or excessive heat. Flash point of solvent is 100F.-138F. (38C.-59C).

c. *Cleaning, Inspection and Repair*. Wash all parts in a cleaning solvent. Inspect the valves for loose nuts, damaged threads, or any other damage. Tighten loose nuts and replace damaged valves. Inspect for broken pipes and fittings or damaged threads. Replace broken pipes and fittings.

d. *Reassembly.* Refer to figure 4-90 and reassemble the manifold.

e. Installation. Reverse the procedures in a. above.

4-97. Carbon Dioxide Vapor Manifold

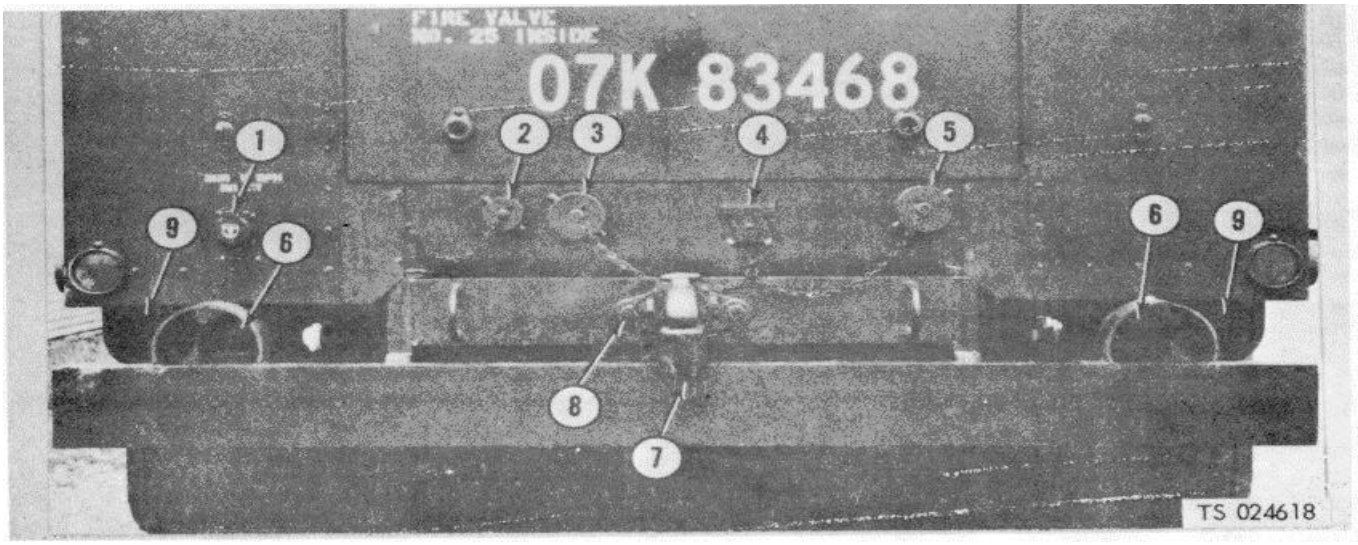
a. Removal.

(1) Empty the pressure vessels.

(2) Remove the liquid manifold.

(3) Remove the 1/3 union (13, fig. 4-94) and nipple (12) from the vapor manifold connection at 2, figure 4-91.

(4) Remove the tube nut (14, fig. 4-86) securing the copper tube to the valve (15).



1. 208 v, ac power receptacle
2. Vapor equalizing line
3. Liquid fill line (pump by-pass)
4. 24 v, dc receptacle
5. Liquid fill line
6. Blackout stop and taillight
7. Pintle hook
8. Capscrew
9. Stop and taillight, service

Figure 4-91. Power receptacles, installed view.

(5) Unscrew the two union nuts (17), securing the vapor manifold, and lift out the assembly.

b. Disassembly. Refer to figure 4-94 and disassemble the manifold.

WARNING

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c. Cleaning, Inspection and Repair. Wash all parts in a cleaning solvent. Inspect the valves for loose nuts, damaged threads, or any other damage. Tighten loose nuts and replace damaged valves. Inspect for broken pipes and fittings or damaged threads. Replace broken pipes and fittings.

d. Reassembly. Refer to figure 4-94 and reassemble the manifold.

e. Installation. Reverse the procedure in a above.

4-98. Cylinder Filling Manifold

a. Removal.

(1) Empty the pressure vessels.

(2) Remove the two unions (18, fig. 4-90) and nipples (17) from the manifold, at 3 and 5, figure 4-91.

(3) Loosen the hose nut(6, fig. 4-92) and remove the hose (5) from the valve (30).

(4) Remove the two nuts (27) and U-bolt (29) securing the pipe and valve (30) to the bracket (28).

(5) Loosen the tube nut securing the tube (22) to the valve assembly (25).

(6) Remove the four nuts (20) bevel washers (21) and the two U-bolts (18) securing the cylinder filling manifold to the liquid manifold.

(7) Loosen the five unions nuts (10, fig. 4-93), securing the manifold to the piping and lift out the manifold assembly.

(8) Remove the 1/3 union (13, fig. 4-94) and nipple (12) from the vapor manifold connection at 2, figure 4-91.

(9) Remove the tube nut (14, fig. 4-93) securing the copper tube to the valve (15).

(10) Unscrew the two union nuts (17), securing the vapor manifold, and lift out the assembly.

(11) Remove the hose(3, fig. 4-95) from the pipe (12) by unscrewing the hose nut (10).

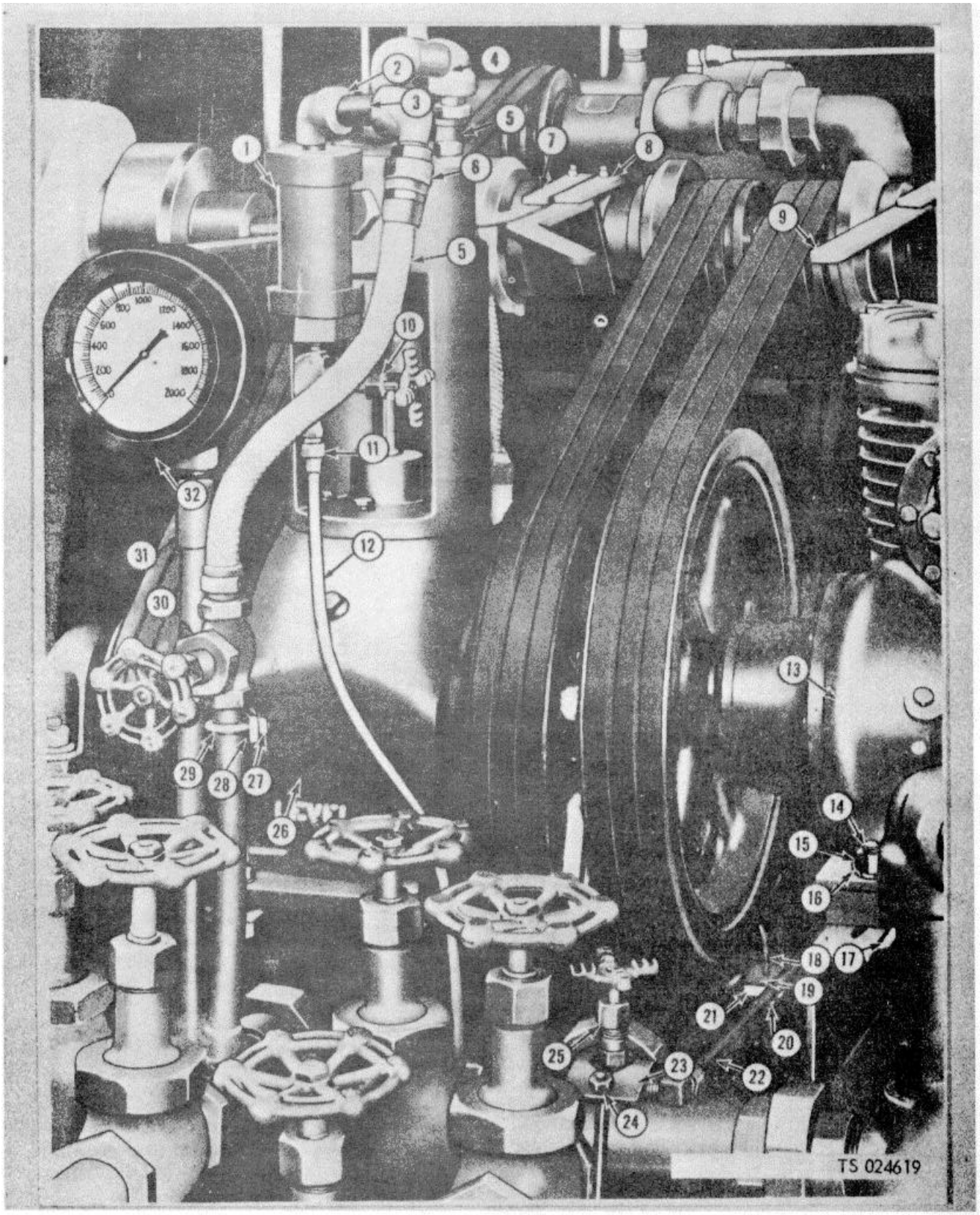
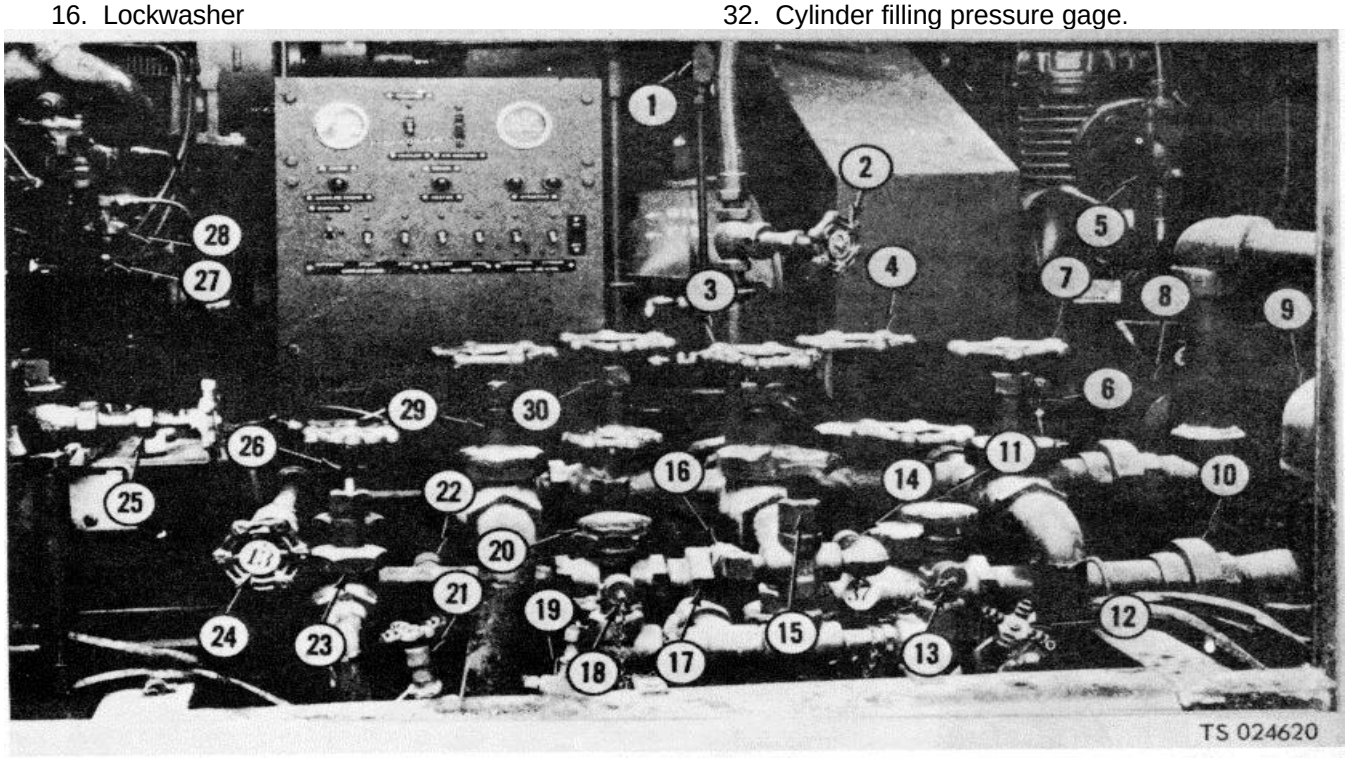


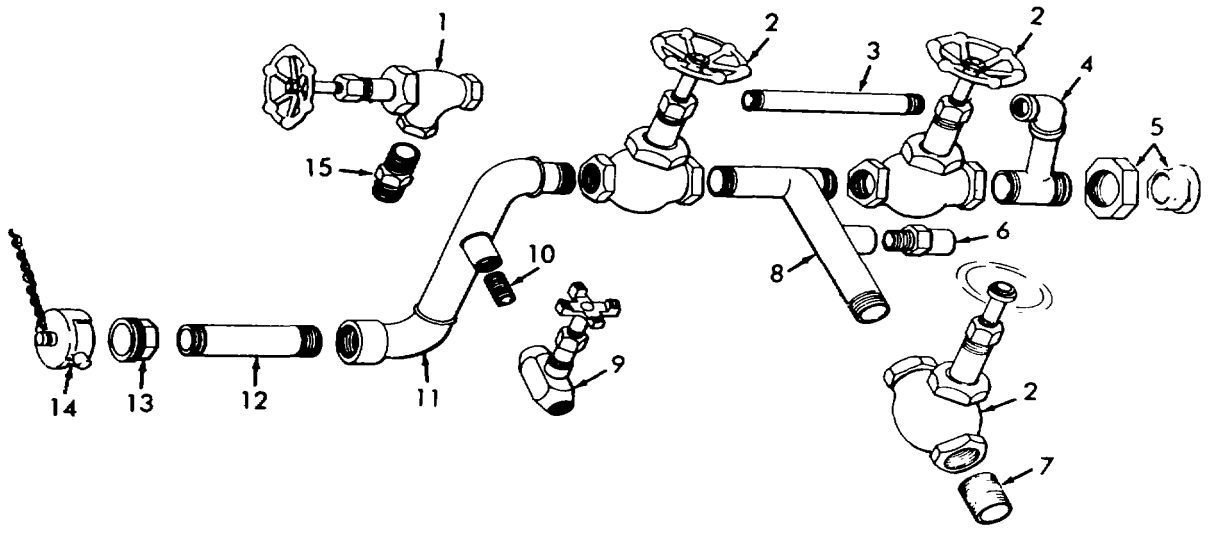
Figure 4-92. Clutch controls, installed view.

1. Strainer
2. Street elbow
3. Pipe nipple
4. Union nut
5. Hose
6. Hose nut
7. Transfer pump clutch shifter
8. Cylinder filling compressor clutch shifter
9. Refrigeration compressor clutch shifter
10. Strainer bleed off valve
11. Tube nut
12. Bleed off tube strainer
13. Refrigeration compressor
14. Capscrew
15. Nut
16. Lockwasher
17. Bevel washer
18. U-bolt
19. Frame
20. Nut
21. Bevel washer
22. Transfer pump bleed off tube
23. Bracket
24. Lockwasher
25. Transfer pump bleed off valve
26. Cylinder filling compressor
27. Nut
28. Bracket
29. U-bolt
30. Liquid shut-off valve cylinder fill compressor
31. Coupling
32. Cylinder filling pressure gage.



1. Strainer bleed-off valve
2. Cylinder filling compressor liquid shut-off valve
3. Liquid.
4. Dehydrator by-pass valve
5. Refrigerator suction valve
6. Transfer pump bleed-off valve
7. Liquid fill line valve thru pump
8. Receiver tank inlet line
9. Dehydrator
10. Union nut
11. Liquid line shut-off valve, conversion
12. Transfer hose bleed-off valve (thru pump)
13. Cylinder filling valve
14. Tube nut
15. Cylinder fill pressure regulating valve
16. Safety relief valve cylinder fill
17. Union nut
18. Cylinder filling valve
19. Transfer hose vapor return valve
20. Vapor return valve, conversion
21. Transfer hose bleed-off valve vapor
22. Liquid line vapor relief valve
23. Vapor equalizing line valve
24. High pressure vapor return valve
25. Fire protection valve
26. Vapor return valve, storage
27. Carburetor priming lever
28. Stop pin
29. Liquid fill line valve, by-pass pump
30. Liquid shut-off valve to cylinder filling compressor

Figure 4-93. CO2 manifolds, installed view.



1. Valve
2. Valve (3)
3. Nipple
4. Elbow, and tee assembly
5. 2/3 union
6. Relief valve
7. Nipple
8. Tee assembly
9. Valve
10. Nipple
11. Elbow assembly adapter
12. Nipple
13. 1/3 union
14. Cap
15. Adapter

Figure 4-94. CO2 vapor manifold, exploded view.

(12) Unscrew the pipe (12) from the cylinder filling manifold and lift the manifold from the assembly.

b. Disassembly. Refer to figure 4-96' and disassemble the manifold.

WARNING

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c. Cleaning, Inspection and Repair. Wash all parts in a cleaning solvent. Inspect the valves, frangible disc gage, and washer for any type of damage and replace if necessary. Inspect the welds for breaks or cracks and repair if necessary. Replace all fittings which have damaged threads.

d. Reassembly. Refer to figure 4-96, and reassemble the manifold.

4-99. CO2 Liquid Level Gases

a. Removal.

(1) Close the valves (3, 4, 15, 16, fig. 4-97).

(2) Loosen the hose nut (4, fig. 4-98) slightly to relieve the pressure, then loosen entirely, and remove the hose (3).

(3) Unscrew the tube nut (10) securing the tube (11 or 21) depending on which gage is being removed.

(4) Remove the adapter (9), elbow (15), bushing (14), and nipple (13) from the gage.

(5) Remove the four machine screws(12) securing the gage to the panel, and remove the gage.

WARNING

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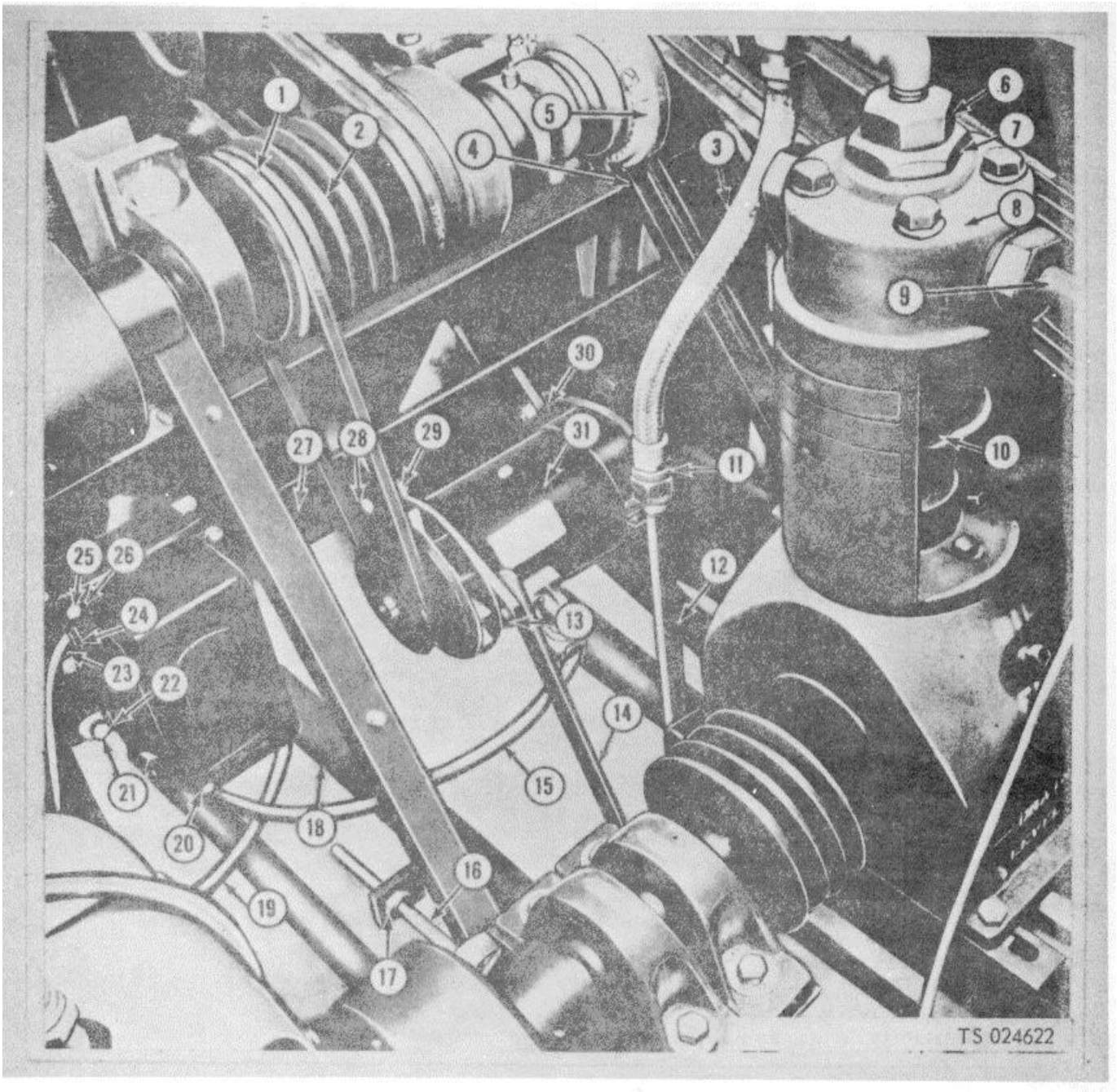
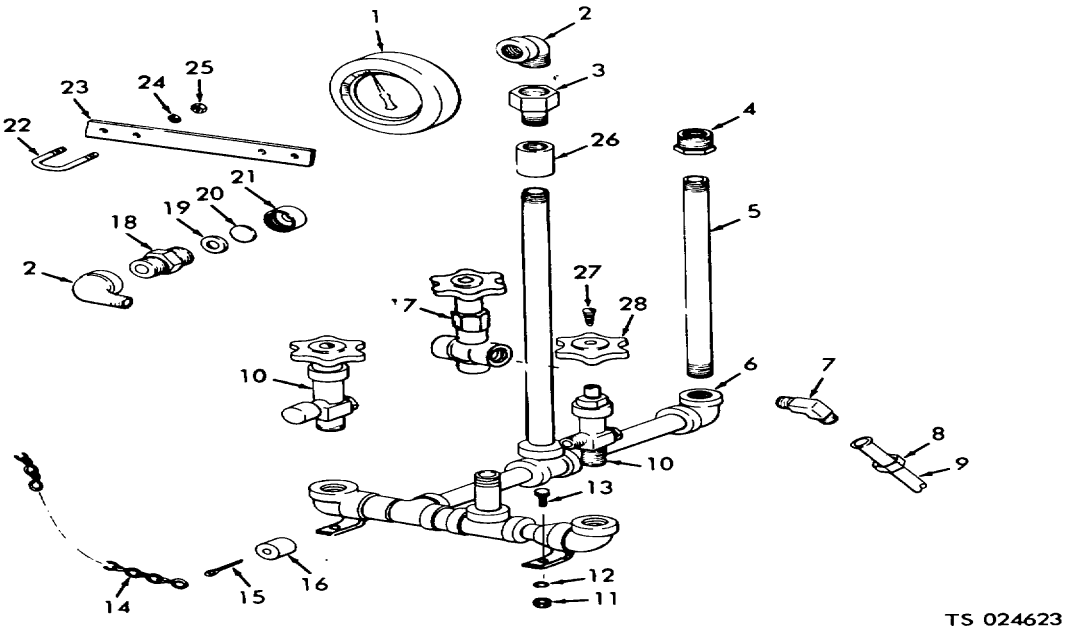


1. Generator drive belt
2. Jack shaft drive pulley
3. Hose
4. Cylinder filling unit drive belt
5. Clutch
6. Valve cap
7. Cylinder head plug adapter
8. Cylinder head
9. Nipple
10. Packing retainer nut
11. Adapter
12. Pipe
13. Capscrew
14. Adjusting bracket
15. Wiring harness
16. Belt tightener stud
17. Nut
18. Mounting bracket
19. Wiring harness
20. Regulator

Figure 4-95. Generator and regulator removal.



1. Gage
2. Street elbow
3. Dampener
4. Adapter bushing
5. Pipe
6. Manifold assembly
7. Elbow
8. Tube nut
9. Tube
10. Cylinder filling valve
11. Nut
12. Lockwasher
13. U-bolt
14. Chain
15. Cotter pin
16. Cap
17. Valve, pressure regulating
18. Adapter
19. Washer
20. Frangible disc
21. Cap
22. U-bolt
23. Bracket
24. Lockwasher
25. Nut
26. Coupling
27. Screw
28. Handle

Figure 4-96. Cylinder filling manifold, exploded view.

b. Cleaning, Inspection and Repair. Clean the gage with a cloth dampened in a cleaning solvent. Wash all other parts in a cleaning solvent. Inspect for a broken or damaged gage. Replace if broken or damaged. Inspect for damaged or cracked fittings and damaged threads and replace all damaged parts.

c. Installation. Reverse the procedure in a. above.

d. Adjustment.

(1) Shutoff the valves (3,4,15 and 16, fig. 4-97).

(2) Loosen the tube nut (10, fig. 4-98) on the gage to be adjusted, to relieve the pressure.

(3) After waiting for several minutes for the indicator to stabilize, tap the face of the gage slightly to be sure the indicator is not sticking.

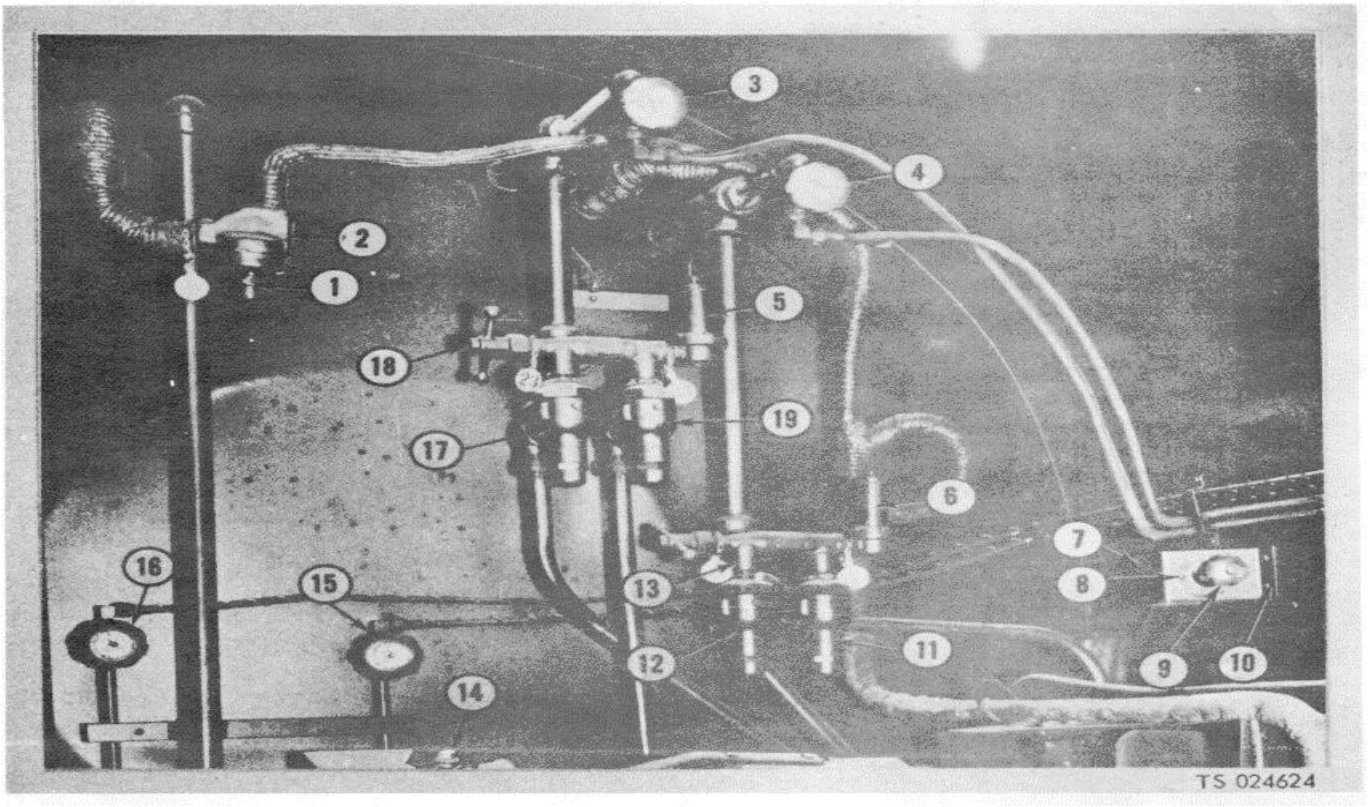
(4) Turn the adjusting screw until the "zero" mark is directly under the indicator.

(5) Tighten the tube nut.

(6) Turn on the valves.

Note

The trailer must be level for the gages to read correctly.



1. Expansion valve adjusting screw
2. Expansion valve
3. Low pressure gage line valve, conversion
4. Low pressure gage line valve, storage
5. Bleeder valve for carbon dioxide, conversion
6. Bleeder valve for carbon dioxide, storage
7. Shutter control mounting bracket
8. Machine screw
9. Shutter control
10. Capscrew
11. Relief valve for carbon dioxide, storage
12. Relief valve for carbon dioxide, storage
13. Safety vent switching valve, storage
14. Safety relief valve, transfer pump
15. High pressure gage line, valve, conversion
16. High pressure gage line valve, storage
17. Relief valve for carbon dioxide, conversion
18. Safety vent switching valve, conversion
19. Relief valve for carbon dioxide, conversion

Figure 4-97. Power compartment valves and controls.

4-100. C02 Tank Pressure Gages

a. Removal.

(1) Shut off the four valves (3, 4, 15 and 16, fig. 4-97).

(2) Remove the hose nut (4, fig. 4-98) and tube nut (10) securing the hose (3) and tube (11) to that gage.

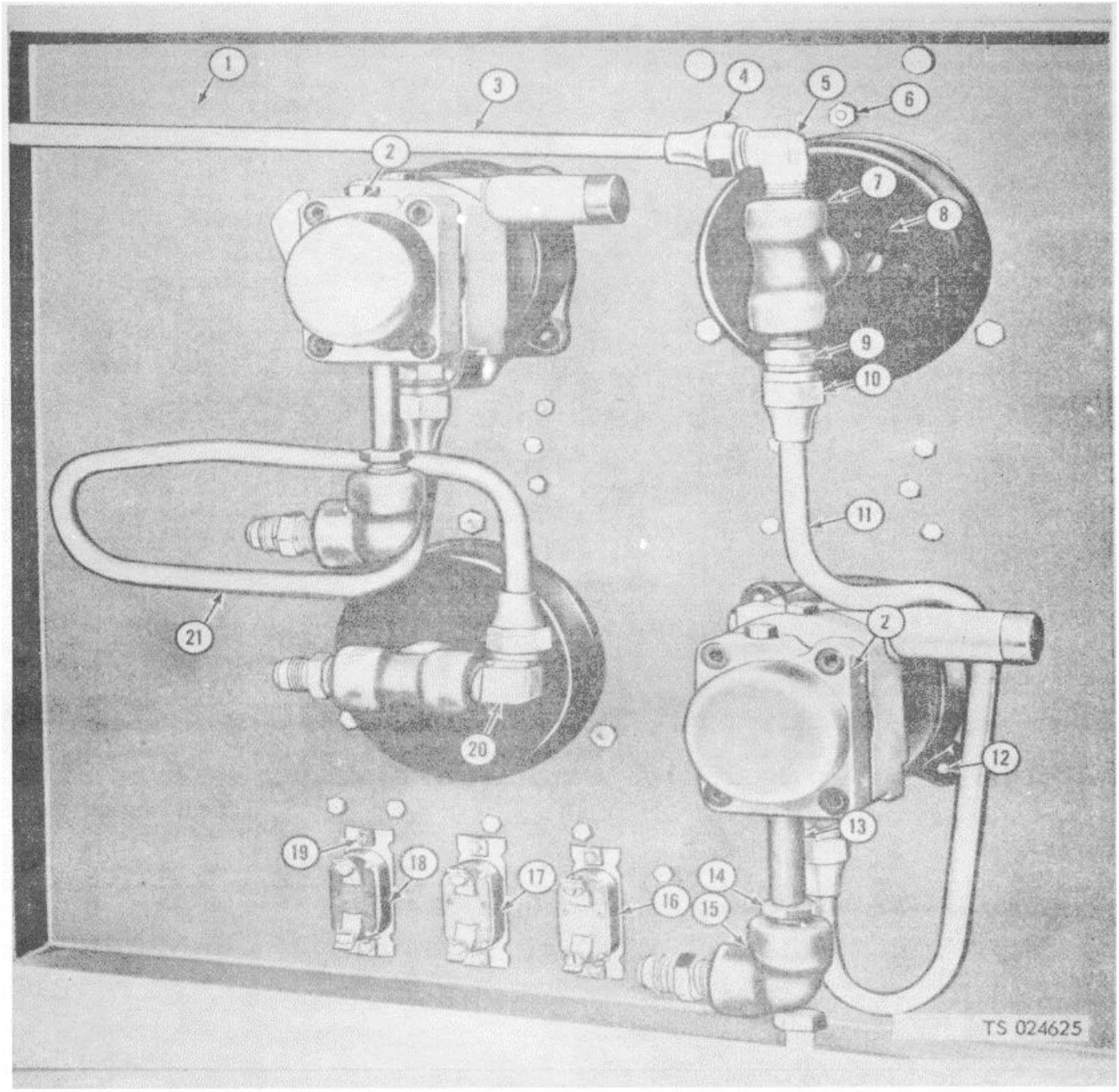
(3) Remove the elbow (5) and adapter (9) from the tee.

(4) Remove the tee from the gage.

(5) Remove the machine screws securing the gage to the panel and remove the gage.

WARNING

Dry cleaning solvent, P-D-680 or P-S-661, used to clean parts is potentially dangerous to personnel and property. Use in a well-ventilated area as the fumes are dangerous if inhaled. Avoid repeated and prolonged skin contact. Do not use near open flame or excessive heat. Flash point of solvent is 100F.-138F (38C.-59C.).



1. Gage panel
2. Level gage
3. Hose
4. Hose nut
5. Elbow
6. Nut, 8-32
7. Tee
8. Pressure gage
9. Adapter
10. Tube nut
11. Tube
12. Screw
13. Nipple
14. Bushing
15. Elbow
16. Alarm bell cut-out switch, storage vessel
17. Alarm bell cut-out switch, conversion vessel
18. Dome light switch
19. Nut, 8-32
20. Elbow
21. Tube

Figure 4-98. Gage panel, rear view.

b. *Cleaning, Inspection and Repair.* Clean the gage with a cloth dampened in a cleaning solvent. Wash all other parts in a cleaning solvent. Inspect for a broken or damaged gage. Replace if broken or damaged. Inspect for damaged or cracked fittings and damaged threads and replace all damaged parts.

c. Installation. Remove the procedure in a. above.

4-101. Cylinder Filling Compressor

The cylinder filling unit draws the carbon dioxide in from the storage tank at 300 psi (21.09 kg per sq cm) and raises the pressure to approximately 600 to 1,000 psi (42.18-70.3 kg per sq cm) for charging the cylinders, 800 psi (56.24 kg per sq cm) is normal. The unit is operated through a clutch engagement on the countershaft.

4-102. Lines And Fittings

a. *Removal.*

(1) Make sure valves(2, 24, fig. 4-93) are closed.

(2) Unscrew the hose nut (6, fig. 4-92) securing the hose (5) to the elbow (2) and remove the hose from the valve (30).

(3) Remove the rear hose (5) from the cylinder filling manifold pipe.

(4) Unscrew the nipple (3) from the elbow (2).

(5) Remove the elbow (2) from the strainer (1).

(6) On serial nos. L-1475-T through L-1478-T units, unscrew the union nut (4) releasing the 1/3 union and the elbow, and remove the 1/3 union from the elbow.

(7) On serial nos. L-1475-T through L-1478-T units, unscrew the elbow and 2/3 union from the compressor, and remove the union and nipple from the elbow.

WARNING

Dry cleaning solvent, P-D-680 or P-S-661, used to clean parts is potentially dangerous to personnel and property. Use in a well-ventilated area as the fumes are dangerous if inhaled. Avoid repeated and prolonged skin contact. Do not use near open flame or excessive heat. Flash point of solvent is 100F.-138F. (38C.-59C.).

b. *Cleaning, Inspection and Repair.* Wash all the parts in a cleaning solvent. Inspect the hoses and fittings for cracks, breaks, or damaged threads. Replace all damaged parts.

c. Installation. Reverse the procedure in a. above.

4-103. Strainer

a. *Removal*.

(1) Make sure valves(2, 24, fig. 4-93) are closed.

(2) Remove the strainer intake line and fittings.

(3) Unscrew the tube nut (11, fig. 4-92) securing the tube (12) to the valve (10) and remove the tube.

(4) Remove the strainer (1) and nipple from the compressor.

b. Disassembly. Refer to figure 4-99 and disassemble strainer.

WARNING

Dry cleaning solvent, P-D-680 or P-S-661, used to clean parts is potentially dangerous to personnel and property. Use in a well-ventilated area as the fumes are dangerous if inhaled. Avoid repeated and prolonged ski' contact. Do not use near open flame or excessive heat. Flash point of solvent is 100F.-138F. (38C.-59C.).

c. *Cleaning and Inspection*. Wash all parts in a cleaning solvent. Clean the gasket mating surfaces thoroughly. Inspect for cracks, leaks, or damaged threads. Inspect the screen for tears, holes, or other damage and replace strainer if necessary.

d. *Reassembly.* Reverse procedure in b. above.

e. *Installation.* Reverse procedures in a. above.

4-104. Suction And Discharge Valves

a. *Suction Valve Removal*.

(1) Make sure valves (2,24, fig.4-93) are closed.

(2) Unscrew the hose nut (6, fig. 4-92) securing the hose (5) to the elbow (2) and remove the hose from the valve (30).

(3) Remove the rear hose (5) from the cylinder filling manifold pipe.

(4) Unscrew the nipple (3) from the elbow (2).

(5) Remove the elbow (2) from the strainer (1).

(6) Unscrew the union nut (4) releasing the 1/3 union and the elbow, and remove the 1/3 union from the elbow.

(7) Unscrew the tube nut (11) securing the tube (12) to the valve (10) and remove the tube.

(8) Remove the strainer (1) and nipple from the compressor.

(9) Remove the valve cap (6, fig. 4-95).

(10) Pull the outer gasket, valve, and the inner gasket from the cylinder head (8) and discard the gaskets. Replace the new gaskets.

b. Discharge Valve Removal.

(1) Make sure valves (2, 24, fig. 4-93) are closed.

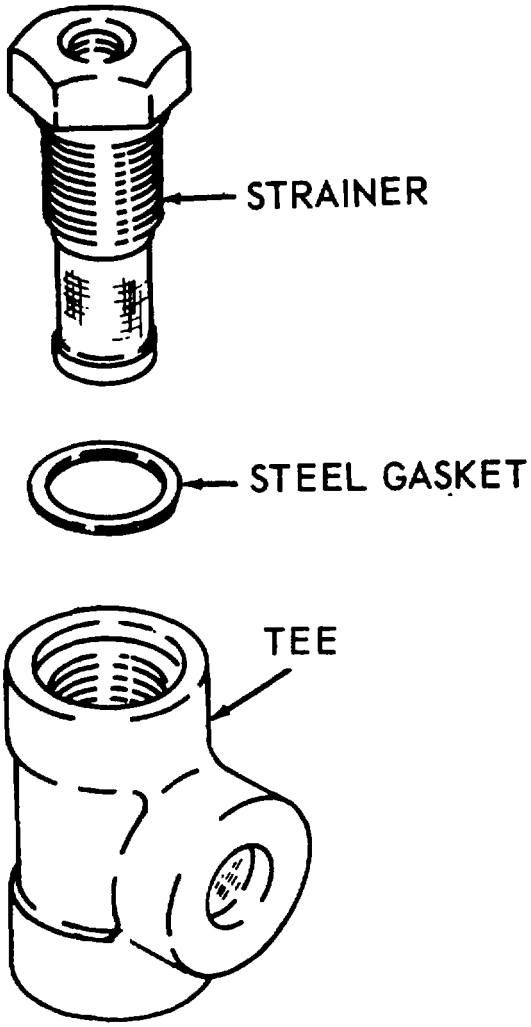


Figure 4-99. Strainer, exploded view.

(2) Unscrew the hose nut (6, fig. 4-92) securing the hose (5) to the elbow (2) and remove the hose from the valve (30).

(3) Remove the rear hose (5) from the cylinder filling manifold pipe.

(4) Unscrew the nipple (3) from the elbow (2).,

(5) Remove the elbow (2) from the strainer (1).

(6) Unscrew the union nut (4) releasing the 1/3 union and the elbow, and remove the 1/3 union from the elbow.

(7) Unscrew the elbow and 2/3 union from the compressor, and remove the union and nipple from the elbow.

(8) Remove the valve cap (6, fig. 4-95) from the adapter (7).

(9) Lift the outer gasket, valve, and the inner gasket from the adapter (7) and discard the gaskets. Replace the new gaskets.

WARNING

Dry cleaning solvent, P-D-680 or P-S-661, used to clean parts is potentially dangerous to personnel and property. Use in a well-ventilated area as the fumes are dangerous if inhaled. Avoid repeated and prolonged skin contact. Do not use near open flame or excessive heat. Flash point of solvent is 100F.-138F. (38C.-59C.).

c. *Cleaning, Inspection and Repair*. Wash all the parts in a cleaning solvent and dry thoroughly with, compressed air. Inspect the valves to see if they have been seated properly; if not, replace the valves.

NOTE

Loss of capacity in the cylinder filling unit is usually due to faulty valve operation.

d. Suction Valve Installation. Reverse procedures in a. above.

e Discharge Valve Installation. Reverse procedures in b. above.

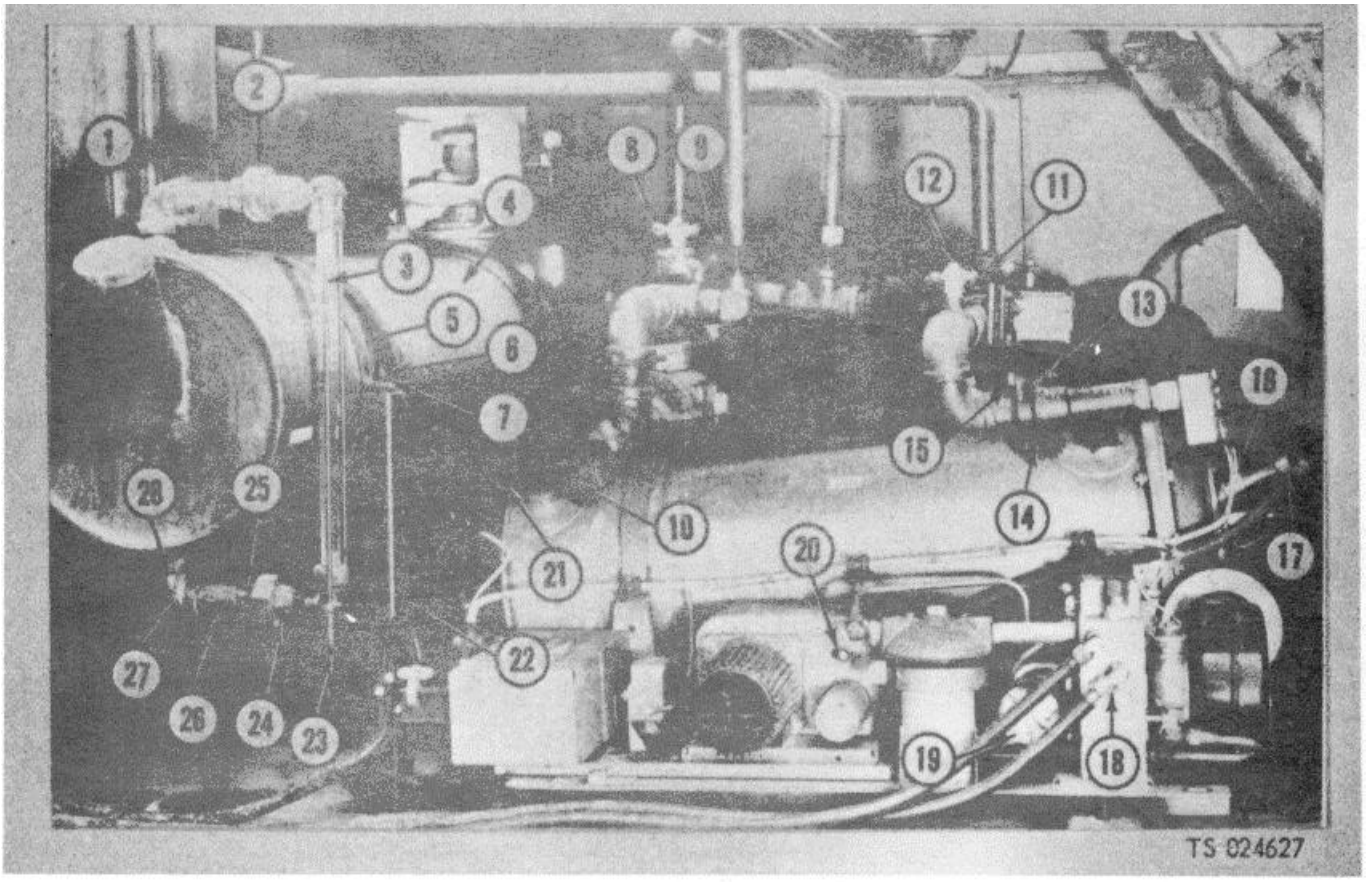
4-105. Packing Nut Adjustment

Leakage past the packing retainer nut (10. fig. 4-95) is usually shown by excessive spurts of snow past the packing nut. This can be corrected by tightening the packing nut. It is important that the packing is not too tight, as this will cause undue wear. If adjusting the packing nut does not stop the leak, report the deficiency to the proper authority.

Section XXIII. CONVERSION HEATER

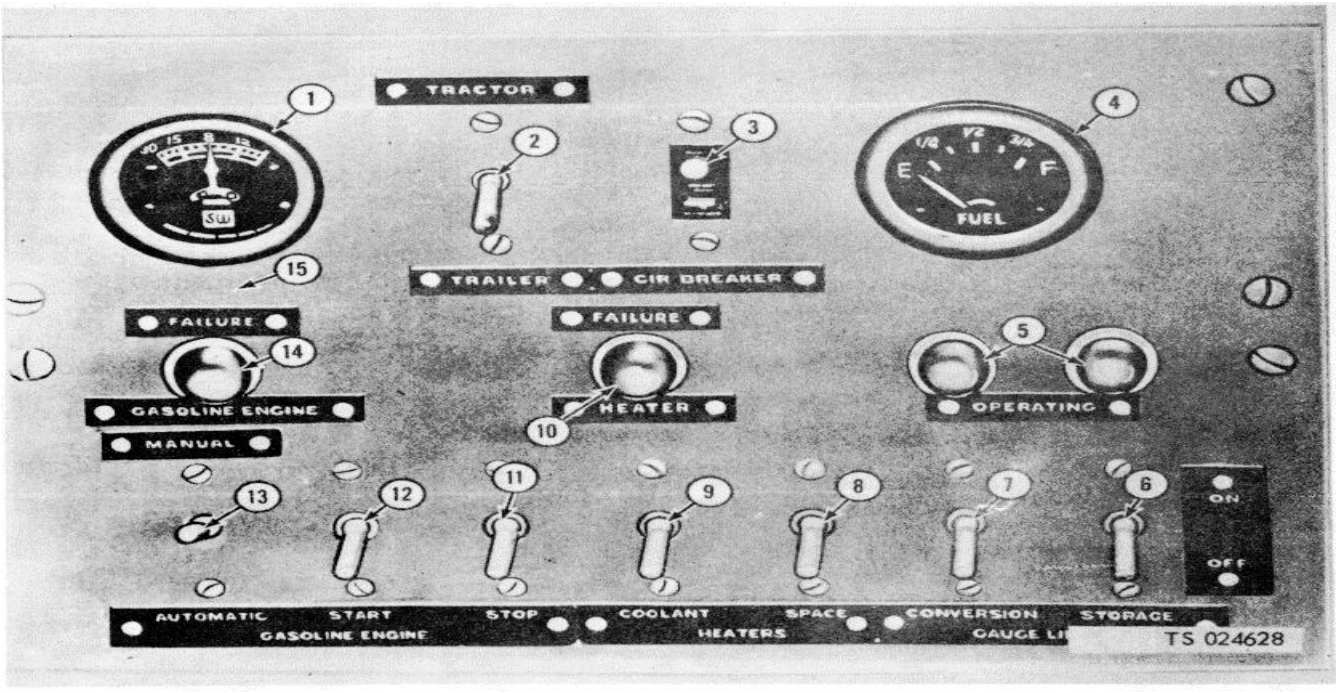
4-106. Description

The conversion heater speeds the process of converting solid carbon dioxide into liquid carbon dioxide in the conversion pressure vessel. The heater is mounted in the storage compartment (fig. 4-100) and can be operated manually by a toggle switch (9, fig. 4-101) on the DC control panel. The heater is normally operated automatically, except when used in conjunction with the space heater in the power compartment. Heat is produced by burning gasoline supplied by a motor driven fuel pump. The fuel system also contains a fuel filter pressure gage, solenoid valve, and a fuel manifold. The heater is operated on 24-volt DC from' the electrical system of the vehicle. It is hooked to the heater control panel (8, fig. 4-102) by disconnect plug (10). Power is transmitted through the control panel to the water pump (9), ignition unit (6), water temperature thermostat (1), water temperature limit switch (2), stack temperature switch (3), and the fuel pump and blower motor (5). The current to the spark plug (7) in turn comes from the ignition unit. An expansion tank (4, fig. 4-100) is the reservoir for the heater fluid.



1. Filler cap
2. Union nut
8. Sight glass
4. Expansion tank
5. Saddle stand clamp
6. Capscrew
7. Nut
8. Anti-freeze bleed-off petcock
9. Compartment heater diversion valve
10. Tube nut
11. Conversion heater diversion valve
12. Anti-freeze bleed-off petcock,
14. Gasket
15. Capscrew
16. Spark plug
17. Coupling nut
18. Tube nut
19. Fuel pressure gage
20. Vibrator switch
21. Heater fluid line
22. Saddle stand
23. Drain cock
24. 1-3 union
25. 1/3 union
26. Nipple
27. Elbow
28. Nipple

Figure 4-100. Conversion heater, installed view.



1. Ammeter
2. Electrical control switch (tractor or trailer)
3. Circuit breaker
4. Fuel indicator
5. Gage lines operating lights
6. Storage vessel gage line switch
7. Con version vessel gage line switch
8. Compartment heater control switch
9. Conversion heater control switch
10. Conversion heater failure light
11. Gasoline engine manual stop switch
12. Gasoline engine manual starter switch
13. Gasoline engine control switch for automatic or manual
14. Gasoline engine failure light
15. Engine control panel

Figure 4-101. Engine control panel.

4-107. Expansion Tank And Fluid Lines

a. *Removal.*

(1) Drain the coolant into a container by removing the cap from the drain nipple (15, fig. 4-103) under the unit. Remove the nipple.

(2) Unscrew the two tube nuts (10, fig. 4-100) securing the line (21) and remove the line.

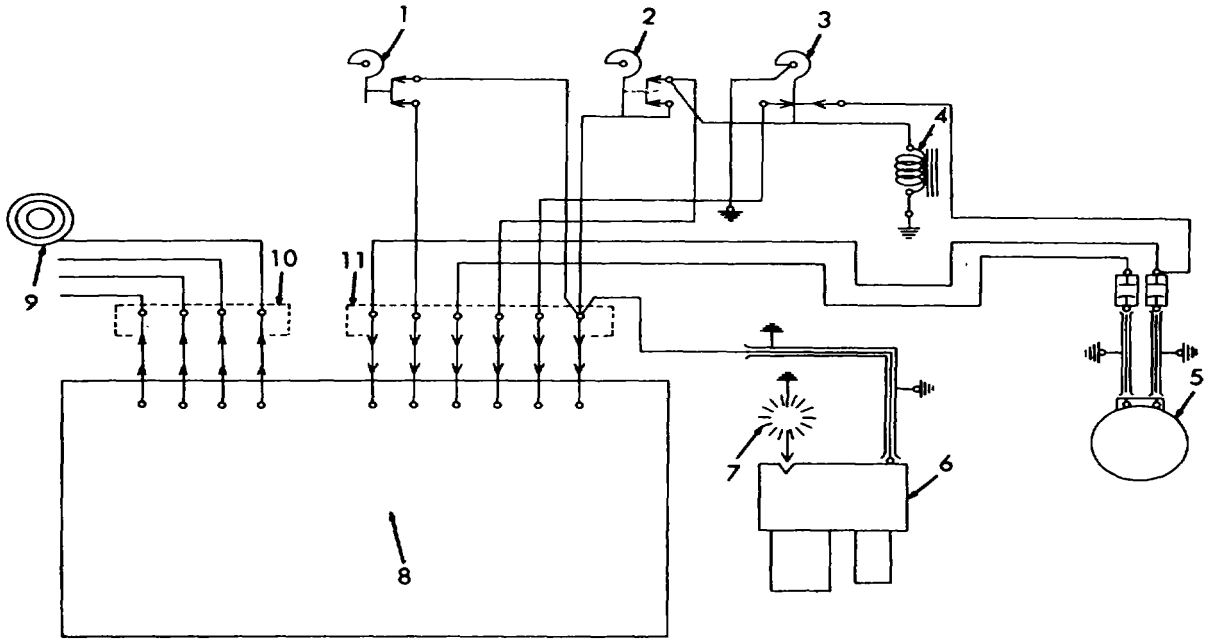
(3) Unscrew the two union nuts (2) and remove the sight glass (3).

(4) Remove the two 1/3 unions (24) and the drain cock (23).

(5) Remove the two 2/3 unions (25).

(6) Remove the two nipples (26), elbows (27), and nipples (28) from the tank (4).

(7) Remove the four nuts (7), lockwashers, and capscrews (6), two clamps (5).



1. Water temperature thermostat
2. Water temperature limit switch
3. Stack temperature switch
4. Solenoid valve
5. Pump and blower motor
6. Ignition unit
7. Spark plug
8. Control panel
9. Water pump
10. Disconnect plug
11. Disconnect plug

Figure 4-102. Heater wiring diagram.

(8) Remove the tee (14, fig. 4-103), and nipple (13).

WARNING

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b. *Cleaning and Inspection.* Clean the tank with a cloth dampened in a cleaning solvent. Wash all other parts in a cleaning solvent and dry thoroughly. Inspect the pipes and fittings for cracks, leaks, or damaged threads. Replace cracked or badly damaged pipes and fittings. Inspect the sight glass for broken glass or any other damage. Replace a damaged sight glass assembly. Test the tank for breaks by filling with water. Repair leaks by brazing.

c. Reassembly. Reverse the procedure in a. above.

4-108. Water Manifold

a. *Removal*.

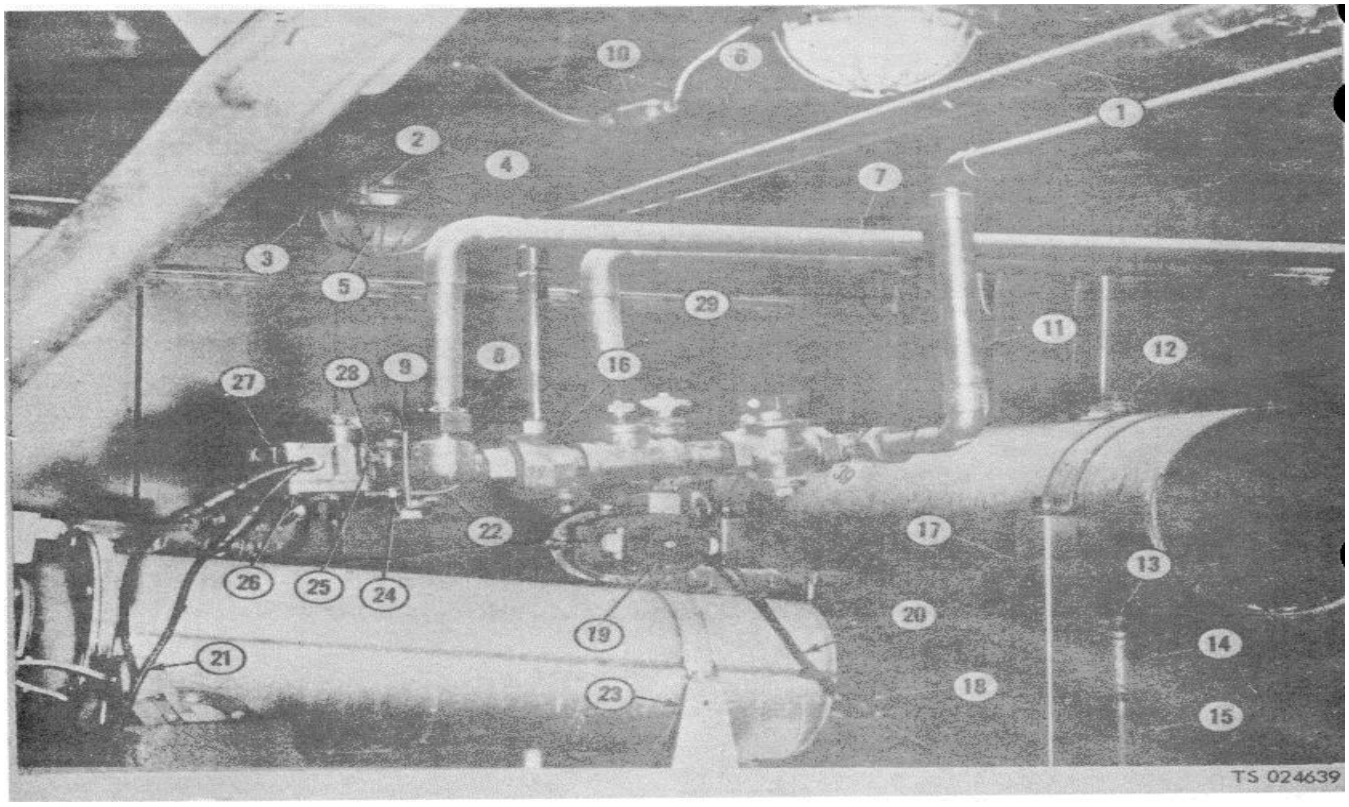
(1) Drain the system.

(2) Remove the limit switch cover (27, fig. 4-103).

(3) Tag and remove the leads.

(4) Uncouple the lead (20 to the pump motor (19).

(5) Remove the two lines (and 29).



1. Coolant line
2. Machine screw
3. Machine screw
4. Dome light base
5. Dome light lens
6. Housing
7. Coolant line
8. Tube nut
9. Bracket
10. Connector
11. Coolant line
12. Pipe plug
13. Nipple
14. Tee
15. Nipple
16. Pipe union
17. Saddle stand
18. Capscrew
19. Coolant pump
20. Coolant pump lead
21. Wiring harness
22. U-bolt
23. Bracket
24. Nut
25. Machine screw
26. Limit switch
27. Limit switch cover
28. Lockwasher
29. Coolant line

Figure 4-103. Heater compartment and dome lights, installed view.

(6) Unscrew the two tube nuts (10, fig. 4-100) securing the line (21) and remove the line.

(7) Remove the two capscrews (15) securing the front end of the manifold to the heater and the two capscrews (15) securing the rear end and lift out the manifold and the two gaskets (14). Discard the gaskets.

b. *Disassembly.* Refer to figure 4-104 or 4-105 and disassemble the manifold.

WARNING

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c. *Cleaning, Inspection and Repair*. Wipe off the motor and limit switch with a cloth dampened in a cleaning solvent. Wash all other parts in a solvent. Inspect the brushes for wear and replace if worn excessively. Inspect the pump, motor, and switch for cracks, breaks, or any other damage. Replace if damaged. Inspect the pipes and fittings for breaks, leaks and damaged thread. Replace all excessively damaged parts.

d. Refer to figure 4-104 and 4-105 and reassemble the manifold, installing new gaskets at all points where they are needed.

e. Installation. Reverse the procedures in a. above, installing new gaskets (14, fig. 4-100).

4-109. Blower

a. *Removal.*

(1) Pull the disconnect plug (30, fig. 4-106).

(2) Remove the four capscrews (11) that secure the plate (13) to the combustion head.

(3) Remove the four machine screws and washers securing the blower (15) to the pump (10) and slide the blower (15), plate (13), and gasket (14) out and away from the heater.

(4) Remove the two fuel tubes (6 and 7, fig. 4-106).

(5) Disconnect and tag the taped leads (19).

WARNING

Dry cleaning solvent, P-D-680 or P-S-661, used to clean parts is potentially dangerous to personnel and property. Use in a well-ventilated area as the fumes are dangerous if inhaled. Avoid repeated and prolonged skin contact. Do not use near open flame or excessive heat. Flash point of solvent is 100F.-138F. (38C.-59C.).

b. Cleaning, Inspection and Repair. Wash all parts in a cleaning solvent, inspect for bent, cracked, or broken housing or fan. Straighten bent fins and solder cracks. Replace the gasket if worn or damaged. Inspect for damaged threads and replace damaged parts.

c. *Installation.* Reverse procedures in a. above.

4-110. Fuel Pump

a. Removal.

(1) Pull the disconnect plug (31, fig. 4-106).

(2) Remove the four capscrews (11) that secure the plate (13) to the combustion head.

(3) Remove the four machine screws and washers securing the blower (15) to the pump (10) and slide the blower (15), plate (13), and gasket (14) out and away from the heater.

(4) Remove the two fuel tubes (6 and 7).

(5) Disconnect and tag the taped leads (19).

(6) Remove the four capscrews (24) securing the pump (10). Remove the fuel pump from the heater.

b. *Disassembly.* Refer to figure 4-107 and disassemble the fuel pump.

c. *Installation*. Reverse procedures in a. above.

4-111. Fuel Manifold And Filter Assembly

a. *Fuel Manifold Removal.*

(1) Disconnect the plug (31, fig. 4-106).

(2) Remove the wire to the solenoid valve (23)

(3) Loosen the two tube nuts (18, fig. 4-100) and remove the tubes.

(4) Remove the three fuel tubes (6,7, and 22, fig. 4-106) by unscrewing the six tube nuts (9) and lifting out.

(5) Remove the fuel tube (17, fig. 4-108).

(6) Remove the two screws (8, fig. 4-106), nuts, and washers securing the fuel filter bracket.

(7) Remove the four nuts, washers, and capscrews (24) securing the manifold to the pump assembly (10).

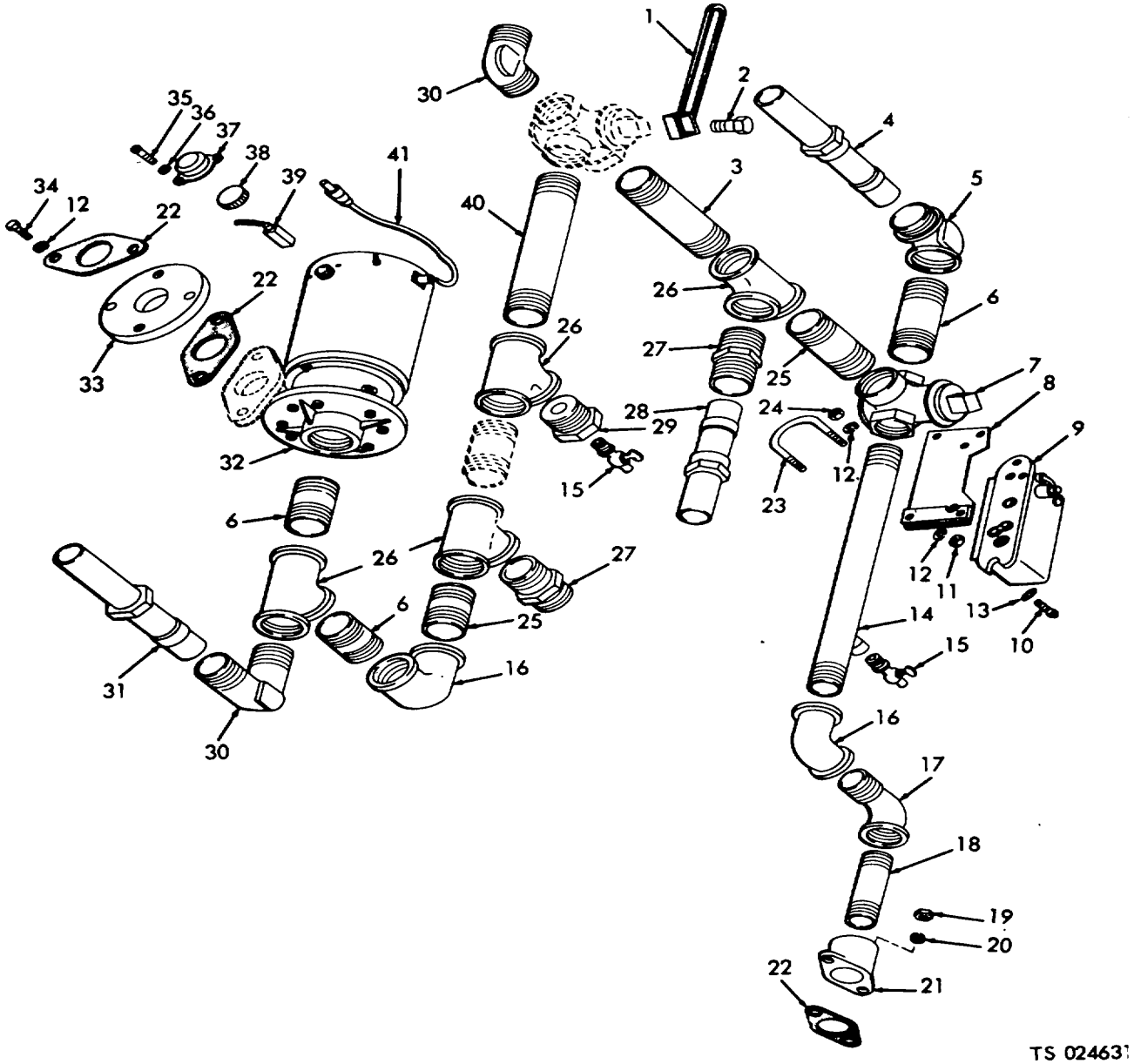
(8) Remove the two capscrews and lockwashers securing the manifold to the base. Remove the manifold.

b. *Fuel Filter Disassembly*. Refer to figure 4-109 and disassemble the fuel filter.

c. *Manifold and Solenoid Disassembly*. Refer to figure 4-110 and disassemble the manifold and solenoid.

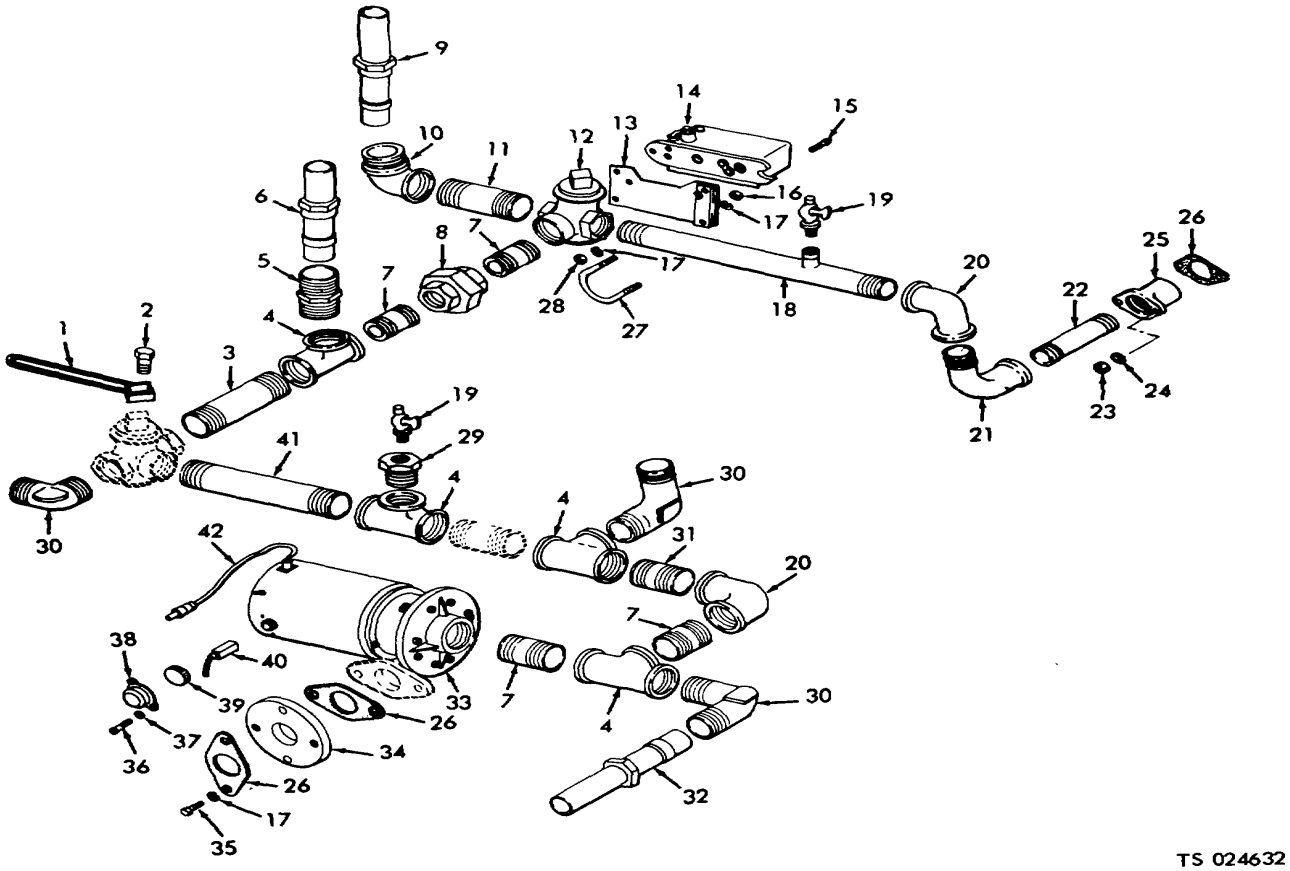
WARNING

Dry cleaning solvent, P-D-680 or P-S-661, used to clean parts is potentially dangerous to personnel and property. Use in a well-ventilated area as the fumes are dangerous if inhaled. Avoid repeated and prolonged skin contact. Do not use near open flame or excessive heat. Flash point of solvent is 100F.-138F. (38C.-59C.).



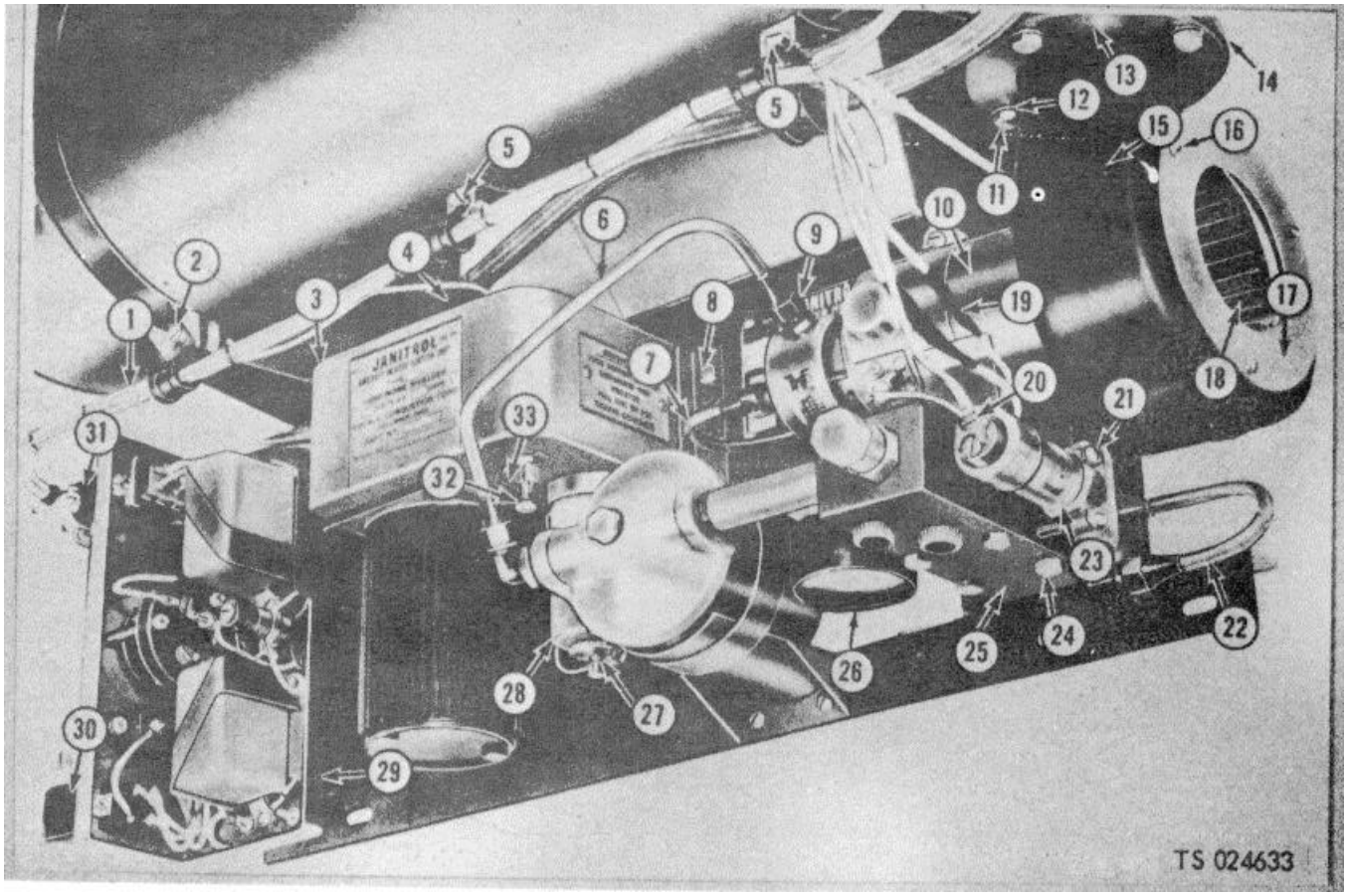
1. Valve handle
2. Setscrew
3. Nipple
4. Tube
5. Elbow, adapter
6. Nipple
7. Valve
8. Plate
10. Screw, flat head
11. Nut,
12. Washer
13. Washer
14. Nipple
15. Drain cock
16. Elbow
17. Street elbow
18. Nipple
19. Nut
20. Lockwasher
21. Flanged coupling
22. Gasket
23. U-Bolt
24. Nut
25. Nipple
26. Tee
27. Adapter
28. Tube
29. Bushing
30. Elbow, adapter
31. Tube
32. Pump assembly
33. Adapter plate
34. Capscrew
35. Machine screw
36. Lockwasher
37. Guard
38. Cap
39. Brush
40. Nipple
41. Lead

Figure 4-104. water manifold, exploded view. (ser. nos. L1475-T through L-1478-T).



1. Valve handle
2. Setscrew
3. Nipple
4. Tee
5. Adapter
6. Tube
7. Nipple
8. Union
9. Tube
10. Elbow, adapter
11. Nipple
12. Valve
13. Plate
14. Limit switch
15. Screw, flathead
16. Nut
17. Lockwasher
18. Nipple cock
19. Drain cock
20. Elbow
21. Elbow, street
22. Nipple
23. Nut
24. Lockwasher
25. Flanged coupling
26. Gasket
27. U-bolt
28. Nut
29. Bushing
30. Elbow adapter
31. Nipple
32. Tube
33. Pump assembly
34. Adapter plate
35. Screw, cap
36. Screw, machine
37. Lockwasher, No. 8
38. Guard
39. Cap
40. Brush
41. Nipple
42. Lead

Figure 4-105. Water manifold, exploded view (serial nos. L-1666-Tthrough L1668-T).



1. Wiring harness
2. Capscrew
3. Ignition unit
4. APk plug cable
5. Machine screw
6. Fuel tube
7. Fuel tube
8. Machine screw
9. Tube nut
10. Fuel pump
11. Capscrew
12. Lockwasher
13. Plate
14. Gasket
15. Blower
16. Self-tapping screw
17. Plate
18. Blower wheel
19. Taped lead
20. Screw
21. Screw
22. Fuel tube
23. Solenoid valve
24. Capscrew
25. Fuel manifold
26. Fuel g
27. Thumb screw
28. Vibrator
29. Control box
30. Disconnect plug
31. Disconnect plug
32. Switch
33. Lockwire

Figure 4-106. Blower and fuel pump removal

d. *Cleaning, Inspection and Repair*. Clean the upper (magnetic) part of the solenoid valve with a cloth dampened in a cleaning solvent. Wash all other parts in a solvent. Replace any part with damaged threads. Replace a damaged valve or spring. Inspect the solenoid valve and the pressure gage for any damage and replace if damaged.

e. *Manifold Fuel Filter, Solenoid, Reassembly and Installation*. Reverse the procedure in a. b. and c. above.

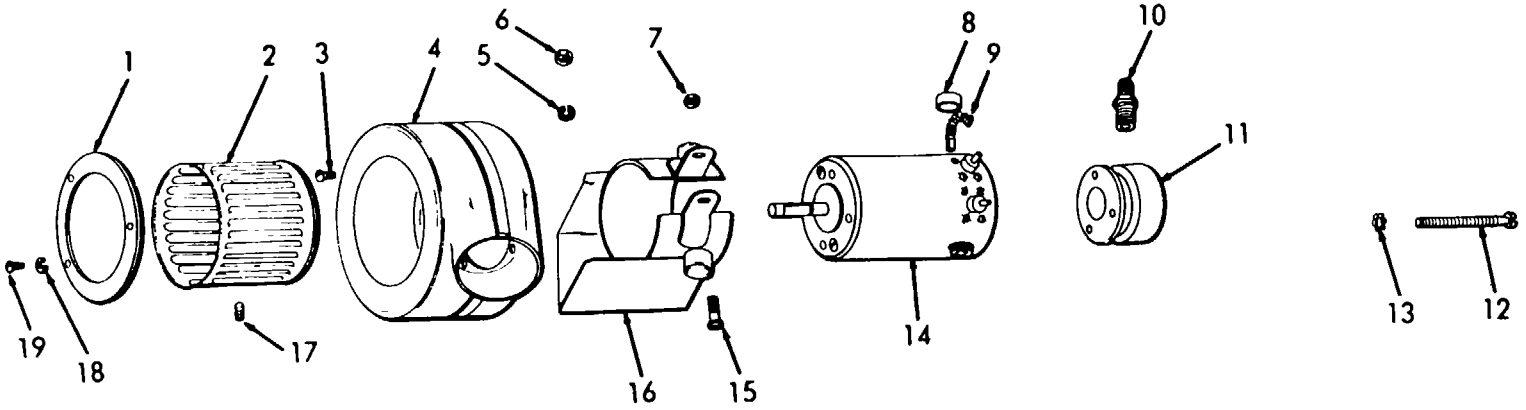
f. Adjustment and Testing.

(1) Check the fuel pressure gage with the heater in operation. It should read 30 + 3 psi (2.109 + .2109 kg per sq cm). If the pressure is outside these limits, remove the adjusting screw (4, fig. 4-110) and the pressure relief stud (6). Reinstall .the adjusting screw without the stud so that it plugs the opening and then operate the pump to flush the valve seat. Clean and reinstall the stud and adjusting screw in the correct position.

(2) Adjust the fuel pressure to 30 psi (2.109 kg. per sq cm) by loosening the locknut (3) and turning the screw (4).

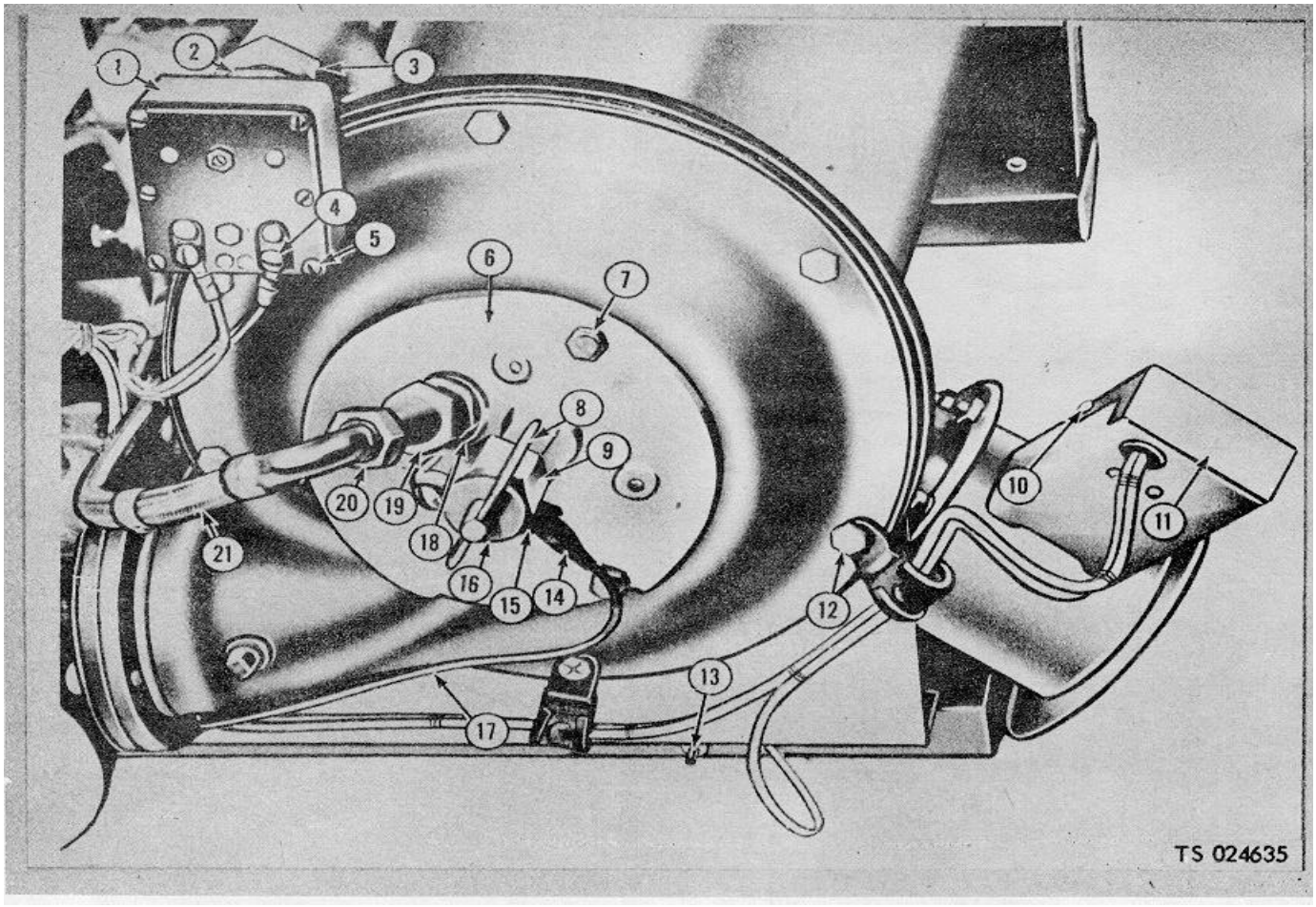
(3) Check the bypass flow by removing the fuel line nearest the solenoid valve.

(4) If the pressure cannot be raised to 30 psi (2.109 kg per sq cm), and there is a good bypass flow, replace pressure relief stud.



1. Plate
2. Blower wheel
3. Machine screw
4. Housing
5. Lock washer
6. Nut
7. Nut
8. Cap
9. Brush
10. Adapter
11. Fuel pump
12. Machine screw
13. Washer
14. Motor
15. Machine screw
16. Bracket
17. Set screw
18. Washer, No6
19. Self-tapping screw

Figure 4-107. Blower and fuel pump, exploded view.



1. Water temperature limit switch
2. Hex nut
3. Hex nut
4. Machine screw
5. Machine screw
6. Combustion head
7. Cap screw
8. Bail
9. Nozzle assembly
10. Self-tapping screw
11. Cover
12. Cap screw
13. Nut, No 10
14. Tube nut
15. Adapter
16. Thumb nut
17. Fuel tube
18. Gasket
19. Spark plug
20. Nut
21. Cable

Figure 4-108. Fuel line removal.

(5) If the pressure cannot be raised to 30 psi (2.109 kg per sq. cm) by adjusting the relief stud, and the bypass flow is unsteady or there is no flow, the fuel pump is worn and should be replaced.

NOTE

An air leak can result from the "0" ring gasket in the filter cover not sealing properly against the filter body. Check the fittings with soapy water to detect leaks.

4-112. Combustion Head

a. Removal.

(1) Pull the disconnect plug (31, fig. 4-106).

(2) Remove the spark plug cable (21, fig. 4-108) by loosening the nut (20).

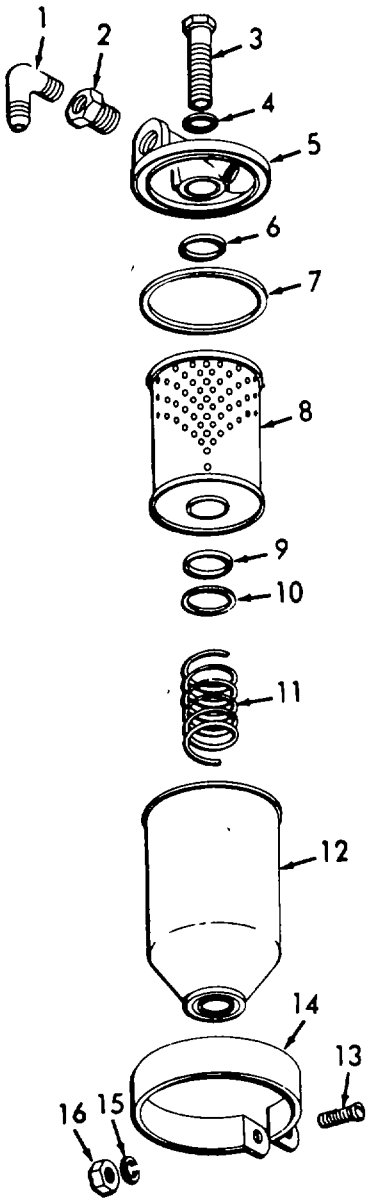
(3) Unscrew the two tube nuts(14) securing the fuel tube (17) and remove the tube.

(4) Remove the three cap screws (7) and lock washers securing the combustion head (6) and gasket to the heater assembly and lift off the head and gasket.

b. Disassembly.

(1) Remove the spark plug (13, fig. 4-111) and packing (14) from the head (3).

(2) Loosen the thumbnut (8) and lift the bail (9) and thumbnut from the head.



1. Adapter elbow
2. Bushing
3. Machine bolt
4. Washer
5. Filter head
6. Gasket
7. Gasket
8. Element
9. Washer
10. Flat washer
11. Spring
12. Body
13. Machine screw
14. Clamp
15. Lock washer
16. Nut

Figure 4-109. Fuel filter, exploded view.

(3) Remove the nut from the bail.

(4) Lift the nozzle holder (10) and packing (12) from the head.

(5) Remove the nozzle assembly (11) and adapter (7) from the holder.

(6) Remove the electrode (6) and lock washer (4) from the head.

(7) Remove the three screws (16) and washer (15) securing the chamber (1) and gasket (2) to the head. Remove the gasket and chamber.

WARNING

Dry cleaning solvent, P-D-680 or P-S-661, used to clean parts is potentially dangerous to personnel and property. Use in a well-ventilated area as the fumes are dangerous if inhaled. Avoid repeated and prolonged skin contact. Do not use near open flame or excessive heat. Flash point of solvent is 100F.-138F. (38C.-59C.).

c. Cleaning, Inspection and Repair. Clean all parts in a cleaning solvent. Inspect the spark plug and electrodes. Inspect the plug for cracked or broken porcelain. Replace the plug if damaged. Inspect for worn electrodes. Replace ground electrode if worn. Inspect the spray nozzle for cracks, burrs, broken screen, or any other damage and replace if damaged. Inspect for damaged threads and gaskets. Replace all damaged hardware and gaskets.

NOTE

When the spark plug and the ground electrode are installed, the gap between the two should be 3/16 (0.188) to 1/8 (0.125) inch (.4775 -.3175 cm).

d. Reassembly. Reverse the disassembly procedures in b. above to reassemble the combustion head.

e. Installation. Reverse the removal procedures in a. to install the combustion head.

f. Spark and Plug Gap Testing

(1) Disconnect the solenoid wire by removing the machine screw (20, fig. 4-106) and lifting the wire out of position to shut off the fuel supply.

(2) Remove the fuel tube (17, fig. 4-108).

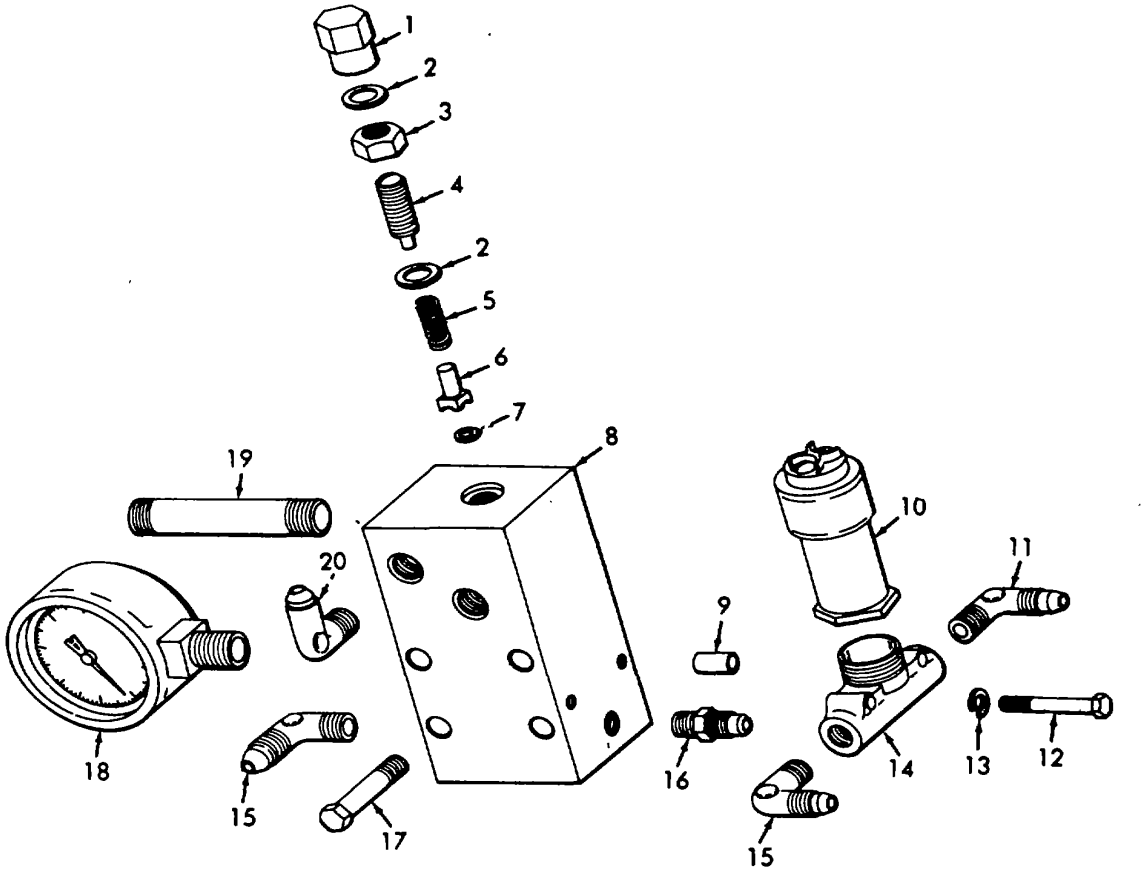
(3) Remove the head assembly with plug wire installed.

(4) Start the unit and check the spark for intensity (it should be a vivid blue in color). Check the spark plug gap (3/16 (0.188) to 1/8 (0.126) inch (.4775-.3175 cm).

(5) Secure the combustion head to the heater.

(6) Install the fuel tube and solenoid lead.

g. Spray Nozzle Test. Remove the nozzle holder from the head and with the fuel pump working check the angle of fuel spray. It should be 600 to 1200 with a uniform cone. If the spray angle is not



1	Cap nut	6	Pressure relief stud	11	Elbow	16	Adapters
2	Washer	7	Preformed packing	12	Machine screw	17	Cap screw
3	Lock nut	8	Manifold	13	Lock washer, No. 10	18	Fuel pressure g
4	Adjusting screw	9	Spacer	14	Solenoid valve, lower section	19	Nipple
5	Spring	10	Solenoid valve, upper section	15	Elbow	20	Elbow

Figure 4-110. Fuel manifold, exploded view.

correct, clean off the tip and strainer assembly, or replace the tip and strainer assembly if necessary.

4-113. Water Limit Switch And Thermostat

a. Removal and Disassembly.

(1) Drain the coolant system.

(2) Pull out the disconnect plug (31, fig. 4-106).

(3) Tag the leads and remove the two screws (4, fig. 4-108) securing the leads to the switch to be removed.

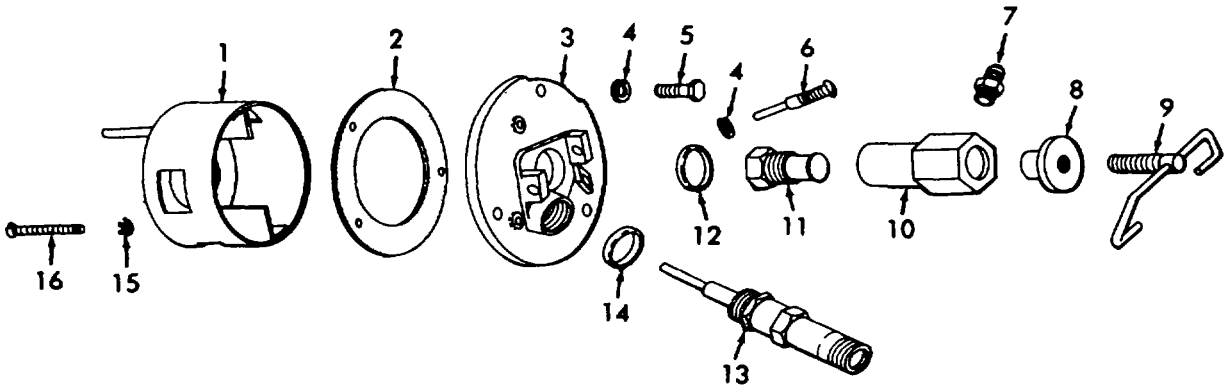
(4) Unscrew the switch (1) from the heater using two wrenches, with one on the hex part of the switch and the other on the hex part of the heater pipe.

(5) Remove six screws (5) securing the cover to the switch and lift off the cover.

WARNING

Dry cleaning solvent, P-D-680 or P-S-661, used to clean parts is potentially dangerous to personnel and property. Use in a well-ventilated are as the fumes are dangerous if inhaled. Avoid repeated and prolonged skin contact. Do not use near open flame or excessive heat. Flash point of solvent is 100F.-138F. (38C.-59C.).

b. Cleaning, Inspection and.. Repair. Wipe off the switch with a cloth dampened in a cleaning solvent. Inspect the contact points in the switch. Clean the points if they are dirty, pitted, or burned, using only soft tissue or fine cloth. Open the points, with the



TS 024638

1	Combustion chamber	7	Adapter	12	Packing
2	Gasket	8	Thumbnut	13	Spark plug
3	Combustion head	9	Bail	14	Packing
4	Lock washer	10	Nozzle holder	15	Washer, No 10
6	Cap screw	11	Spray nozzle	16	Machine screw, flat head
6	Electrode, ground				

fingers and insert the tissue or cloth between them. Permit the points to close and pull the tissue gently from between the points. Replace the switch if the points are badly pitted or burnt. Replace the switch if any other damage is noticed.

NOTE

Do not use point file or emery cloth in cleaning points.

c. Reassembly and Installation. Reverse the removal and disassembly given in a. above.

4-114. Wiring And Ignition Unit

a. Removal

(1) Remove the disconnect plug (31, fig. 4-106).

(2) Tag the leads and remove the two screws (4, fig. 4-108) securing the leads to the switch to be removed.

(3) Unscrew the switch (1) from the heater using two wrenches, with one on the hex part of the switch and the other on the hex part of the heater pipe.

(4) Remove six screws (5) securing the cover to the switch and lift off the cover.

(5) Remove the limit switch cover (27, fig.4-112).

(6) Tag and remove the leads.

(7) Uncouple the lead (20) to the pump motor (19).

(8) Remove the two lines (7 and 29).

(9) Unscrew the two tube nuts (10, fig. 4-100) ;securing the line (21) and remove the line.

(10) Remove the two cap screws (15) securing the front end of the manifold to the heater and the two cap screws (15) securing the rear end and lift out the manifold and the two gaskets (14). Discard the gaskets.

(11) Pull the disconnect plug (31, fig. 4-106).

(12) Remove the four cap screws (11) that secure the plate (13) to the combustion head.

(13) Remove the four machine screws and washers securing the blower (15) to the pump (10) and slide the blower (15), plate (13), and gasket (14) out and away from the heater.

(14) Remove the two fuel tubes (6 and 7).

(15) Disconnect and tag the taped leads (19).

(16) Remove the four cap screws (24) securing the pump (10). Remove the fuel pump from the heater.

(17) Remove the wire to the solenoid valve (23).

(18) Loosen the two tube nuts (18, fig. 4-100) and remove the tubes.

(19) Remove the three fuel tubes (6, 7, and 22, fig. 4-106) by unscrewing the six tube nuts (9) and lifting out.

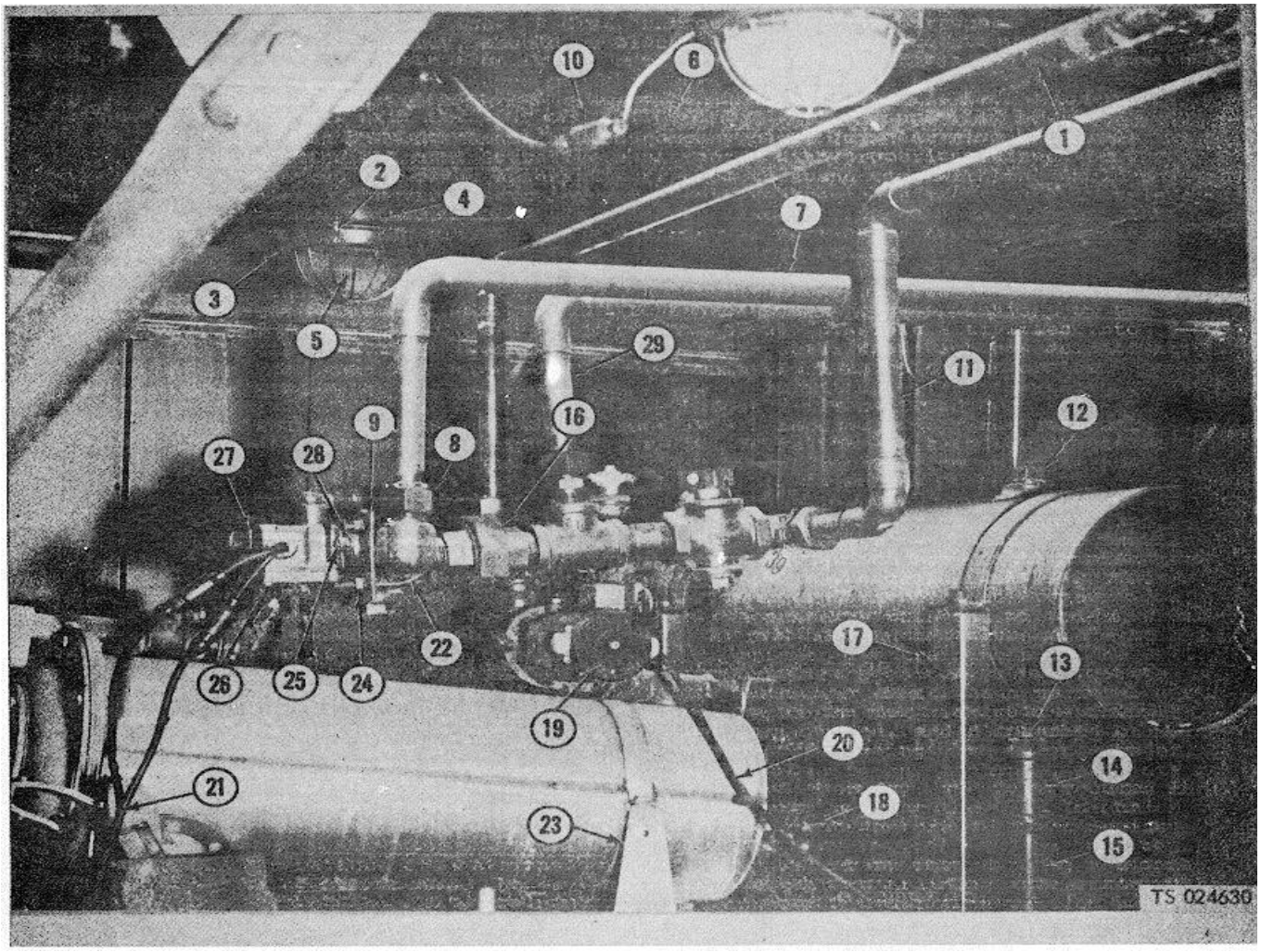
(20) Remove the fuel tube (17, fig. 4-108).

(21) Remove the two screws (8, fig. 4-106), nuts, and washers securing the fuel filter bracket.

(22) Remove the four nuts, washers, and cap screws (24) securing the manifold to the pump assembly (10).

(23) Remove the two cap screws and lock washers securing the manifold to the base. Remove the manifold.

(24) Remove the two screws (10, fig. 4-108) securing the stack switch cover (11) to the stack and remove the cover.



1. Coolant line
2. Machine screw
3. Machine screw
4. Dome light base
5. Dome light lens
6. Housing
7. Coolant line
8. Tube nut
9. Bracket
10. Connector
11. Coolant line
12. Pipe plug
13. Nipple
14. Tee
15. Nipple
16. Pipe union
17. Saddle stand
18. Cap screw
19. Coolant pump
20. Coolant pump lead
21. Wiring harness
22. U-bolt
23. Bracket
24. Nut
25. Machine screw
26. Limit switch
27. Limit switch cover
28. Lock washer
29. Coolant line

Figure 4-112. Heater compartment and dome lights, installed view.

(25) Tag the leads and remove the two screws securing the two wires to the stack switch.

(26) Remove the nut (13) securing the ground lead to the frame.

(27) Remove the two cap screws (12), nuts, and washers securing the harness to the heater.

(28) Remove the screw securing the wire to the ignition unit (3, fig. 4-106).

(29) Remove the cap screw (2), nut, and washer and the two screws (5), nuts, and washers securing the wiring harness to the heater. Remove the harness.

(30) Remove the four screws (8), nuts, and washers securing the ignition unit to the frame. Remove the ignition unit.

WARNING

Dry cleaning solvent, P-D-680 or P-S-661, used to clean parts is potentially dangerous to personnel and property. Use in a well-ventilated area as the fumes are dangerous if inhaled. Avoid repeated and prolonged skin contact. Do not use near open flame or excessive heat. Flash point of solvent is 100F.-138F. (38C.-59C.).

b. Cleaning, Inspection and Repair. Wipe all parts with a cloth dampened in a cleaning solvent. Inspect for broken or cracked wires and connections. Repair minor damage. If the wiring harness is badly damaged, replace the harness. Inspect the damaged threads and replace any damaged hardware. Inspect 'the ignition unit for damage. Replace a damaged unit or report the damage to the proper authority.

c. Installation. Reverse the removal procedures in a above.

d. Vibrator Replacement. The vibrator (28, fig. 4-106) has two sets of contact points. The switch (32) is safety wired at the factory. If the vibrator is inoperative and the switch is still wired, cut the wire and pull the switch out. If the lock wire(33) has been cut, the switch pulled out and the vibrator is inoperative install a new vibrator as follows.

(1) Unplug the disconnect plug (31).

(2) Loosen the thumb screw (27) and push the bail downward.

(3) Pull the vibrator (28) from the ignition unit ·(3).

(4) Push the switch (32) in, and secure with the lock wire (33).

(5) Position the new vibrator (28) in the ignition unit (3) and secure with the bail and thumb screw (27).

(6) Plug in the disconnect plug (31).

4-115. Power Compartment Heater (Ser. Nos. L-1475-T through L-1478-T)

a. Removal

(1) Disconnect the lead connector (5, fig. 4-113). Close coolant line shutoff valve. Prepare to drain residual fluid from heater and connective lines (about 3 quarts) 2.85 liters) into a container. If clean, save coolant for use.

(2) Loosen the four hose clamps (11) securing the two hoses (13) to the heater (6) and the coolant lines (14).

(3) Remove the four cap screws (9) and lock washers (10) securing the heater (6) and the four mounts (8) to the floor (7).

(4) Slide the two hoses (13) off the heater and lift out the heater (6) and the four mounts (8).

(5) Remove the two hoses (13) off the lines (14) and slide the four clamps (11) from the hoses.

WARNING

Dry cleaning solvent, P-D-680 or P-S-661, used to clean parts is potentially dangerous to personnel and property. Use in a well-ventilated area as the fumes are dangerous if inhaled. Avoid repeated and prolonged skin contact. Do not use near open flame or excessive heat. Flash point of solvent is 100F.-138F. (38C.-59C.).

b. Cleaning, Inspection and Repair. Clean the heater sheet metal with a cloth dampened in a cleaning solvent. Wash all other metal parts in a solvent. Inspect the heater for cracked or frayed wire. Repair a damaged wire or connector. Report any other damage to the heater to the proper authority. Inspect for cracked or damaged hoses and clamps, damaged threads, or any other damage. Replace all damaged parts.

c. Installation.

(1) Position the four clamps (11, fig. 4-113) on the two hoses (13) and slide the hoses far enough on the two lines (14) to allow the heater (6) to be installed.

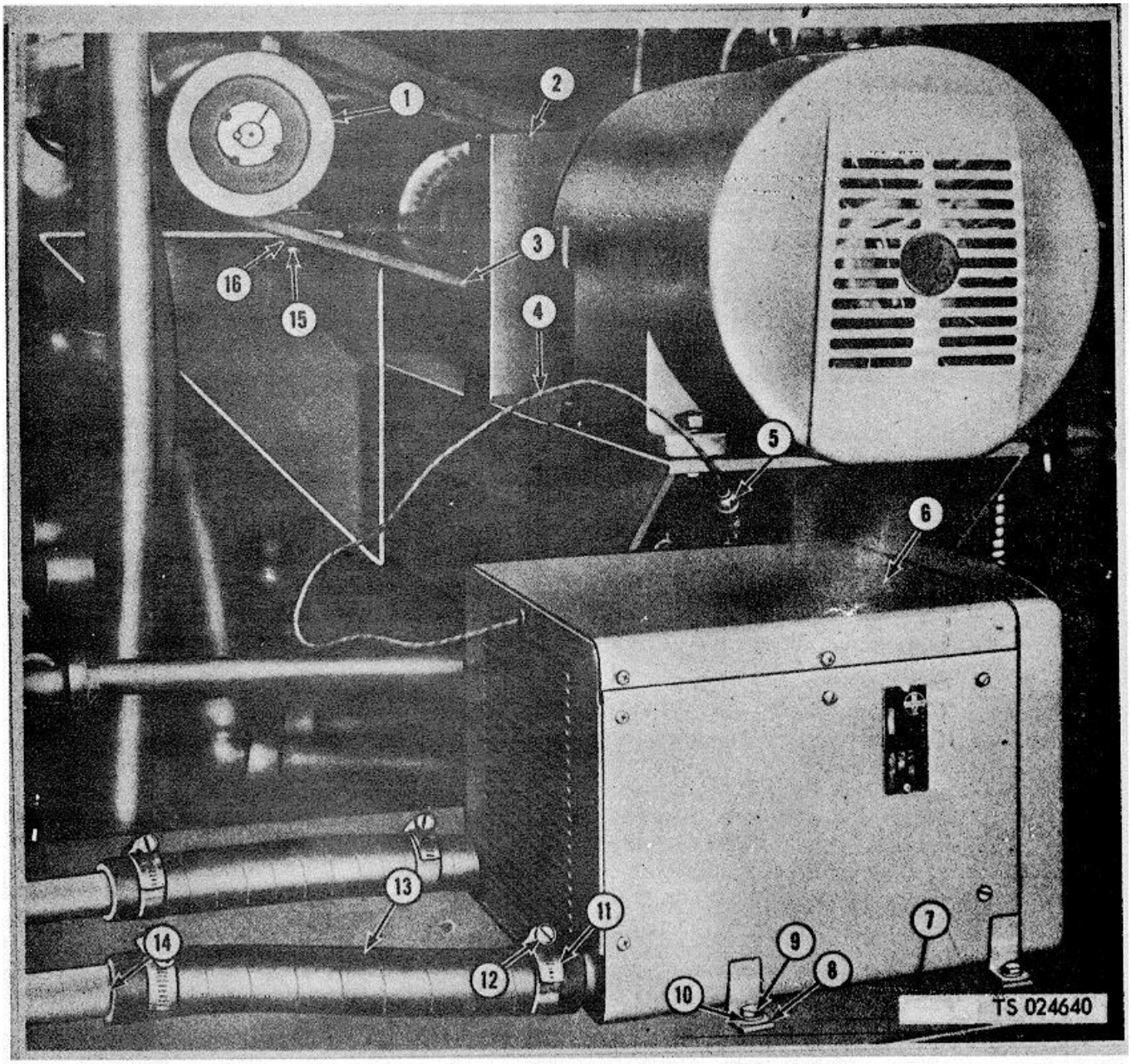
(2) Position the heater (6) and the four mounts (8) on the floor (7) and secure with the four lock washers (10) and cap screws (9).

(3) Couple the connector (5).

4-116. Power Compartment Heater (Serial Nos. L-1666-T through L-1668-T

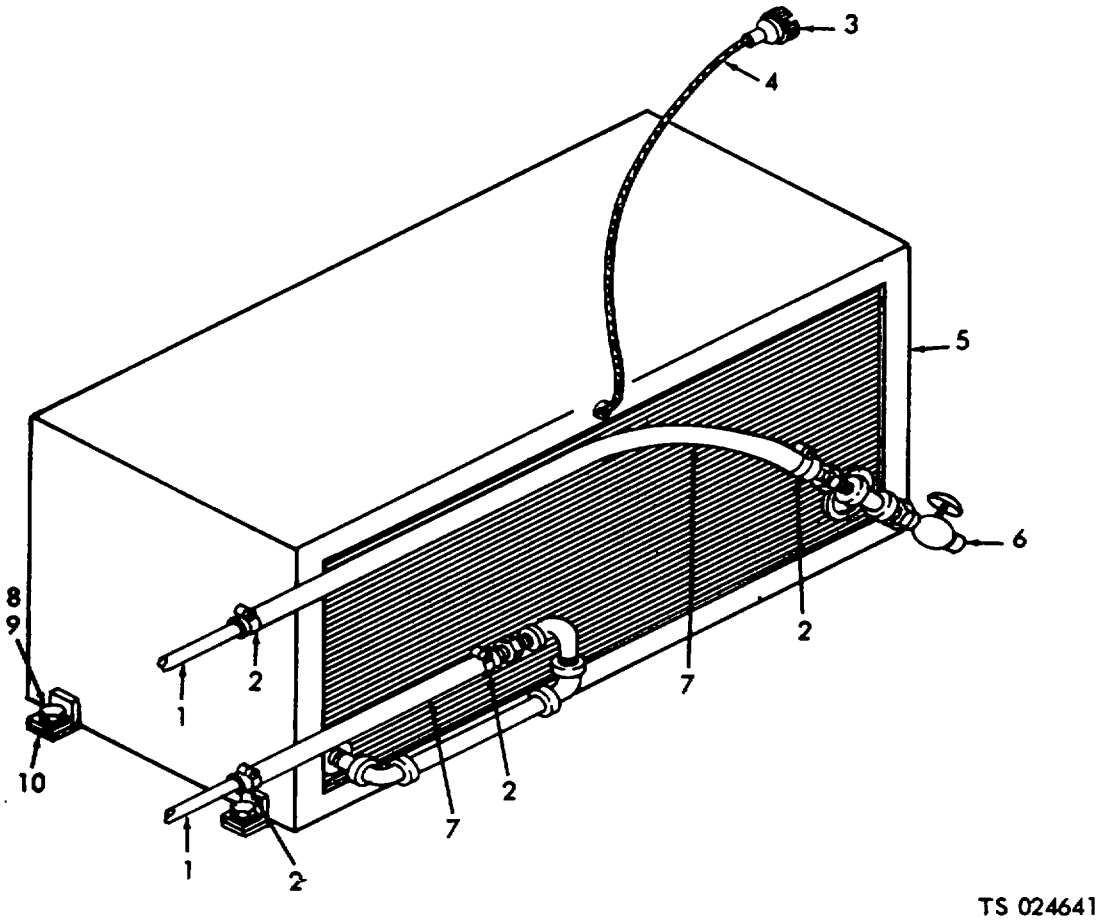
a. Removal.

(1) Disconnect the lead connector(3, fig. 4-114). Close coolant line shutoff valve. Open drain cock (6)



1. C02 pump
2. Frame
8. Pump drive belts
4. Lead
5. Connector
6. Heater
7. Floor
8. Resilient mount
9. Cap screw
10. Lock washer
11. Clamp
12. Screw
18. Hose
14. Coolant lines ·
15. Nut
16. Washer

Figure 4-113. Heater removal points (ser. no. L-1475-Tthrouh L-1478-T).



1. Coolant lines
2. Clamp
3. Connector
4. Lead
5. Heater
6. Drain cock
7. Hose
8. Cap screw
9. Lock washer
10. Spacer

Figure 4-114. Heater removal points (ser. nos. L-1 666-T through L1668-T).

and drain residual fluid from heater and connective lines (about 8 quarts) into a container. If clean, save coolant for reuse.

(2) Loosen the four hose clamps (2) securing the two hoses (7) to the heater fittings and the coolant lines (1).

(3) Remove the four cap screws (8) and lock washers (9) securing the heater (5) and the four spacers (10) to the floor.

(4) Slide the two hoses (7) off the heater fittings and lift out the heater (5) and the four spacers (10).

(5) Remove the two hoses (7) from the lines (1) and slide the four clamps (2) off the hoses.

WARNING

Dry cleaning solvent, P-D-680 or P-S-661, used to clean parts is potentially dangerous to personnel and property. Use in a well-ventilated area as the fumes are dangerous if inhaled. Avoid repeated and prolonged skin contact. Do not use near open flame or excessive heat. Flash point of solvent is 100F.-188F. (88C.-59C.).

b. Cleaning, Inspection and Repair.

(1) Clean the heater sheet metal with a cloth dampened in a cleaning solvent. Wash all other metals in a solvent.
(2) Inspect the heater lead for cracked or frayed wire. Inspect for cracked or damaged hoses and clamps, damaged threads, or any other damage.
(3) Repair a damaged wire or connector.
Report any other heater damage to direct support maintenance.

(4) Replace all damaged parts.

c. Installation.

(1) Position the four clamps (2, fig. 4-114) on the two hoses (7) and slide the hoses far enough o0 the two lines (1) to allow the heater (5) to be installed.

(2) Position the heater (5) and the four spacer, (10) on the floor and secure with the four: lock washers (9) and cap screws (8).

(3) Couple the connector.

APPENDIX A
REFERENCES

A-1. Fire Protection

TB 5-4200-200-10	Hand Portable Fire Extinguishers Approved for Army Users.

A-2. Lubrication

LO 5-365210-12	Lubrication Order.

A-3. Painting

TM 43-0139	Painting Instructions for Field Use.

A-4. Radio Suppression

TM 11-483	Radio Interference Suppression.

A-5. Maintenance

MIL-A-11755C	Compound, Anti-Freeze, Artic.
TM 38-750	Army Equipment Record Procedure.
TM 5-351	Gas Generating.
TM 5-3656-210-35	Direct Support, General Support and Depot Maintenance Manual.
TM 750-244-3	Procedure for Destruction of Equipment to Prevent Enemy Use (Mobility Equipment Command)
TM 9-1870-1	Care and Maintenance of Pneumatic Tires.
TM 9-6140-200-15	Operator and Organizational Field and Depot Maintenance Storage Batteries, Lead Acid Type.

A-6.Shipment and Storage

TB 740-93-2	Preservation of USAMECOM Mechanical Equipment for Shipment and Storage.
TM 740-90-1	Administrative Storage of USAMECOM Mechanical Equipment.

APPENDIX B
MAINTENANCE ALLOCATION CHART

B-1. General

a. This section provides a general explanation of all maintenance and repair functions authorized at various maintenance levels.

b. Section II designates overall responsibility for the performance of maintenance functions on the identified end item or component and the work measurement time required to perform the functions by the designated maintenance level. The implementation of the maintenance functions upon the end item or component will be consistent with the assigned maintenance functions.

c. Section III lists the tools and test equipment required for each maintenance function as referenced from Section II.

B-2. Explanation Of Columns In Section II

a. Column (1), Group Number. Column (1) lists group numbers to identify related components, assemblies, sub-assemblies, and modules with their next higher assembly. The applicable groups are listed in the MAC in disassembly sequence beginning with the first group removed.

b. Column (2), Component/Assembly. This column contains the noun names of components, assemblies, sub-*assemblies and modules for which maintenance is authorized.*

c. Column (3), Maintenance Functions. This column lists the functions to be performed on the item listed in Column (2). The maintenance functions are defined as follows:

(1) *Inspect*. To determine serviceability of an item by comparing its physical, mechanical, and/or electrical characteristics with established standards through examination.

(2) *Test.* To verify serviceability and detect incipient failure by measuring the mechanical or electrical characteristics of an item and comparing those characteristics with prescribed standards.

(3) *Service.* Operations required periodically to keep an item in proper operating condition, i.e., to clean (decontaminated), to preserve, to drain, to paint, or to replenish fuel, lubricants, hydraulic fluids, or compressed air supplies.

(4) *Adjust.* To maintain within prescribed limits, by bringing into proper or exact position, or by setting the operating characteristics to specified parameters.

(5) *Align.* To adjust specified variable elements of an item to bring about optimum or desired performance.

(6) *Calibrate*. To determine and cause corrections to be made or to be adjusted on instruments or test measuring and diagnostic equipments used in precision measurement. Consists of comparison of two instruments, one of which is a certified standard of known accuracy, to detect and adjust any discrepancy in the accuracy of the instrument being compared.

(7) *Install.* The act of emplacing, seating, or fixing into position an item, part or module (component or assembly) in a manner to allow the proper functioning of an equipment or system.

(8) *Replace.* The act of substituting a serviceable like type part, sub-assembly, or module (component or assembly) for an unserviceable counterpart.

(9) *Repair*. The application of maintenance services (inspect, test, service, adjust, align, calibrate, or replace) or other maintenance Actions (welding, grinding, riveting, straightening, facing, remachining or resurfacing) to restore serviceability to an item by correcting specific damage, fault, malfunction, or failure in a part, sub-assembly, module (component or assembly), end item, or system.

(10) *Overhaul.* That maintenance effort (service/action) necessary to restore an item to a completely serviceable/operational condition as prescribed by maintenance standards (i.e., DMWR) in appropriate technical publications. Overhaul is normally the highest degree of maintenance performed by the Army. Overhaul does not normally return an item to like new condition.

(11) *Rebuild.* Consists of those services/actions necessary for the restoration of unserviceable equipment to a like new condition in accordance with original manufacturing standards. Rebuild is the highest degree of materiel maintenance applied to Army equipment. The rebuild operation includes the act of returning to zero those age measurements (hours/miles, etc.) considered in classifying Army equipment/components.

d. Column (4), Maintenance Category. This column is made up on sub-columns for each category of maintenance. Work time figures are listed in these sub-columns for the lowest level of maintenance authorized to perform the function

listed in Column 3. These figures indicate the average active time required to perform the maintenance function at the indicated category of maintenance under typical field operating conditions.

e. Column (5), Tools and Equipment. This column is provided for referencing by code, the common tool sets (not individual tools) special tools, test and support equipment required to perform the designated function.

B-3. Explanation Of Columns In Section III

a. Column (1), Reference Code. This column consists of an arabic number listed in sequence from Column 5 of Section II. The number references the common tool sets, special tools and test equipment requirements.

b. Column (2), Maintenance Category. This column shows the lowest category of maintenance authorized to use the special tools or test equipment.

c. Column (S), Nomenclature. This column lists the name or identification of the common tool sets, special tools or test equipment.

d. Column (4), National/Nato Stock No. (NSN). This column is provided for the NSN of common tool sets, special tools and test equipment listed in the nomenclature column.

e. Column (5), Tool Number. This column lists the manufacturer code and part number of tools and test equipment.

B-4. Explanation Of Columns In Section IV

a. Reference Code. This column consists of the maintenance functions as described in paragraph B-2, step c.

b. Remarks. This column lists information pertinent to the maintenance function to be performed.

Section II. MAINTENANCE ALLOCATION CHART - Continued

(1) Group number	(2) Component/assembly	(3) Maint. function	(4) Maint. category C	O	F	H	D	(5) Tool/ equipment
01	FILL MANIFOLD	Inspect	0.3					
		Test		0.5				
		Replace		0.5				
		Repair		1.7				
02	STORAGE BATTERIES	Inspect	0.1					1- (2)
		Test		0.2				
		Service	0.2					
		Install	0.3					
		Replace		0.3				
		Repair		0.4				
03	ENGINE CONTROL PANEL	Inspect	0.3					
		Replace		1.5				
		Repair		1.6				
04	GASOLINE ENGINE ACCESSORIES	Inspect	0.4					
		Replace		10.0				
		Repair		12.0				
		Overhaul			12.0			
05	ENGINE ASSEMBLY	Inspect	0.5					
		Service		1.0				
		Replace			2.0			
		Repair		8.0				
		Overhaul			16.0			
	Crankcase; Block, Cylinder Head; Flywheel	Inspect			10.8			
		Replace			4.7			
		Repair			3.5			
	Crankshaft; Bearing; Pistons; Rods; Valves	Inspect			1.0			2 - (4)
		Replace					6.0	
		Repair					5.0	
06	CYLINDER FILLING UNIT	Inspect	0.4					
		Service		0.5				
		Replace			1.5			
		Repair			5.0			
		Overhaul					5.8	
	Strainer; Valve	Inspect	0.2					
		Service	0.8					
		Replace		1.0				
07	DRIVE SHAFTS, CLUTCHES AND BELT TIGHTENER	Inspect	0.3					
		Test		0.5				
		Service	0.2					
		Adjust		0.5				
		Align		0.5				
		Replace			3.0			
		Repair			5.0			
08	REFRIGERATION SYSTEM	Inspect	0.3					3- (3)
		Test		0.8				
		Service		0.5				
		Replace			6.0			
		Repair			8.0			
		Overhaul					9.0	

*SUBCOLUMNS ARE AS FOLLOWS: C-OPERATOR/CREW, O-ORGANIZATIONAL, F-DIRECT SUPPORT H-GENERAL SUPPORT, D-DEPOT

**INDICATES WT/MH REQUIRED

Section II. MAINTENANCE ALLOCATION CHART - Continued

(1) Group number	(2) Component/assembly	(3) Maint. function	(4) Maint. category C	O	F	H	D	(5) Tool/ equipment
09	LIQUID QUANTITY AND PRESSURE CONTROL	Inspect	0.5					
		Test			1.1			
		Adjust		0.5				
		Replace		3.0				
		Repair		4.0				
	Pressure Control	Inspect		0.3				
		Replace			1.0			
10	TRANSFER PUMP, SUCTION AND DISCHARGE LINE	Inspect	0.3					
		Replace		1.0				
		Repair			2.5			
11	ELECTRIC MOTOR AND CONTROL PANEL	Inspect	0.3					
		Replace		0.8				
		Repair			3.0			
	Bearing	Inspect				1.0		
		Replace				3.0		
12	POWER COMPARTMENT HEATER	Inspect	0.3					
		Replace		1.0				
		Repair		2.0				
13	PRESSURE VESSEL VALVES LINES AND FITTINGS	Inspect	0.5					
		Replace		1.0				
		Repair		2.0				
14	INTERIOR LIGHTING	Inspect	0.3					
		Replace		0.8				
		Repair		0.5				
15	STORAGE COMPARTMENT COMPONENTS	Inspect	0.8					
		Replace		2.5				
		Repair		6.0				
16	STOPLIGHTS, TAILLIGHT, CLEARANCE LIGHTS AND REFLECTORS	Inspect	0.3					
		Replace		1.5				
		Repair		2.0				
17	LANDING JACK ASSEMBLY FENDERS, CHOCK BLOCK AND LADDER	Inspect	0.5					
		Replace		2.0				
		Repair			3.0			
18	HOUSING COMPONENTS	Inspect	0.5					
		Replace		2.0				
		Repair		2.5				
19	CHASSIS ASSEMBLY	Inspect	0.5					
		Replace		3.0				
		Repair		5.0				
	Air Brake Chamber; Valves	Inspect	0.5					
		Replace		1.5				
		Repair			2.0			
	Brake Lining	Inspect		0.5				
		Replace			1.5			
	Tandem Assembly	Inspect		0.5				
		Replace			3.0			

'SUBCOLUMNS ARE AS FOLLOWS: C-OPERATOR/CREW. O-ORGANIATIONAL, P-DIRECT SUPPORT. H-GENERAL SUPPORT, D-DEPOT

*INDICATES WT/MH REQUIRED

SECTION III. TOOL AND TEST EQUIPMENT REQUIREMENTS FOR AN/GRC-240

(1)	(2)	(3)	(4)	(5)
REFERENCE CODE	**MAINTENANCE LEVEL**	**NOMENCLATURE**	**NATIONAL/NATO STOCK NUMBER**	**TOOL* NUMBER**
1-(2)	0	Tester, battery		P/N515TB (30327)
2-(4)	0	Gage, thickness		P/N 166 (74855)
3-(3)	F	Gage, pressure		P/N CR1790 (61349)

Section IV. REMARKS

Reference	Remarks
(2)	Test batteries for specific gravity.
(4)	Adjust valves.
(3)	Determine if refrigerant system requires charge.

APPENDIX C

BASIC ISSUE ITEMS LIST AND ITEMS TROOP INSTALLED OR AUTHORIZED

Section I. INTRODUCTION

C-1. Scope

This appendix lists items required by the operator for operation of the conversion, storage and charging unit.

C-2. General

This list is divided into the following sections:

a. Basic Issue Items List Section II. Not applicable.

b. Items Troop Installed or Authorized List Section III. A list of items in alphabetical sequence, which at the discretion of the unit commander may accompany the conversion, storage and charging unit. These items are NOT subject to turn-in with the conversion, storage and charging unit.

C-3. Explanation Of Columns

The following provides an explanation of columns in the tabular list of Basic Issue Items List, Section II, and Items Troop Installed or Authorized, Section III.

a. Source, Maintenance, and Recoverability Code(s) (SMR):

(1) Source code indicates the source for the listed item. Source codes are:

Code	*Explanation*
P	Repair parts, special tools and test equipment supplied from GSA/DSA or Army supply system and authorized for use at indicated maintenance levels.
P2	Repair parts, special tools and test equipment which are procured and stocked for insurance purposes because the combat or military essentially of the end item dictates that a minimum quantity be available in the supply system.

(2) Maintenance code indicates the lowest level of maintenance authorized to install the listed item. The maintenance level code is:

Code	*Explanation*
C	Crew/Operator

(3) Recoverability code indicates whether unserviceable items should be returned for recovery or salvage. Items not coded are non-recoverable.

Recoverability codes are:

Code	*Explanation*
R	Applied to repair parts (assemblies and components), special tools and test equipment which are considered economically reparable at direct and general support maintenance levels.
S	Repair parts, special tools, test equipment and assemblies which are economically reparable at DSU and GSU activities and which normally are furnished by supply on an exchange basis.

b. National Stock Number. This column indicates the National stock number assigned to the item and will be used for requisitioning purposes.

c. Description- This column indicates the Federal item name and any additional description of the item required.

d. Unit of Measure (U/M). A two character alphabetic abbreviation indicating the amount or quantity of the item upon which the allowances are based, e.g., ft, ea, pr, etc.

e. Quantity Furnished with Equipment (BIIL Only). This column indicates the quantity of an item furnished with the equipment.

f. Quantity Authorized (Items Troop Installed or Authorized Only). This column indicates the quantity of the item authorized to be used with the equipment.

g. Illustration (BIIL ONLY). This column is divided as follows:

(1) *Figure number*. Indicates the figure number of the illustration in which the item is shown.

(2) *Item number*. Indicates the callout number used to reference the item in the illustration.

Section III. ITEMS TROOP INSTALLED OR AUTHORIZED LIST

(1) SMR CODE	(2) NATIONAL STOCK NUMBER	(3) DESCRIPTION REF. NUMBER & MFR. CODE / USABLE ON CODE	(4) Unit of Meas	(5) QTY Auth
PC	4210-00-655-1283	BRACKET, FIRE EXTINGUICHER	EA	1
PC	7520-00-5569-9618	CASE, MAINTENANCE AND OPERATIONAL MANUAL	EA	1
PC	4210-00-202-78568	EXTINGUISHER, FIRE	EA	1

ALPHABETICAL INDEX

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P.S.—IF YOUR OUTFIT WANTS TO KNOW ABOUT YOUR RECOMMENDATION MAKE A CARBON COPY OF THIS AND GIVE IT TO YOUR HEADQUARTERS.

The Metric System and Equivalents

Linear Measure

1 centimeter = 10 millimeters = .39 inch
1 decimeter = 10 centimeters = 3.94 inches
1 meter = 10 decimeters = 39.37 inches
1 dekameter = 10 meters = 32.8 feet
1 hectometer = 10 dekameters = 328.08 feet
1 kilometer = 10 hectometers = 3,280.8 feet

Weights

1 centigram = 10 milligrams = .15 grain
1 decigram = 10 centigrams = 1.54 grains
1 gram = 10 decigram = .035 ounce
1 dekagram = 10 grams = .35 ounce
1 hectogram = 10 dekagrams = 3.52 ounces
1 kilogram = 10 hectograms = 2.2 pounds
1 quintal = 100 kilograms = 220.46 pounds
1 metric ton = 10 quintals = 1.1 short tons

Liquid Measure

1 centiliter = 10 milliters = .34 fl. ounce
1 deciliter = 10 centiliters = 3.38 fl. ounces
1 liter = 10 deciliters = 33.81 fl. ounces
1 dekaliter = 10 liters = 2.64 gallons
1 hectoliter = 10 dekaliters = 26.42 gallons
1 kiloliter = 10 hectoliters = 264.18 gallons

Square Measure

1 sq. centimeter = 100 sq. millimeters = .155 sq. inch
1 sq. decimeter = 100 sq. centimeters = 15.5 sq. inches
1 sq. meter (centare) = 100 sq. decimeters = 10.76 sq. feet
1 sq. dekameter (are) = 100 sq. meters = 1,076.4 sq. feet
1 sq. hectometer (hectare) = 100 sq. dekameters = 2.47 acres
1 sq. kilometer = 100 sq. hectometers = .386 sq. mile

Cubic Measure

1 cu. centimeter = 1000 cu. millimeters = .06 cu. inch
1 cu. decimeter = 1000 cu. centimeters = 61.02 cu. inches
1 cu. meter = 1000 cu. decimeters = 35.31 cu. feet

Approximate Conversion Factors

To change	*To*	*Multiply by*	*To change*	*To*	*Multiply by*
inches	centimeters	2.540	ounce-inches	newton-meters	.007062
feet	meters	.305	centimeters	inches	.394
yards	meters	.914	meters	feet	3.280
miles	kilometers	1.609	meters	yards	1.094
square inches	square centimeters	6.451	kilometers	miles	.621
square feet	square meters	.093	square centimeters	square inches	.155
square yards	square meters	.836	square meters	square feet	10.764
square miles	square kilometers	2.590	square meters	square yards	1.196
acres	square hectometers	.405	square kilometers	square miles	.386
cubic feet	cubic meters	.028	square hectometers	acres	2.471
cubic yards	cubic meters	.765	cubic meters	cubic feet	35.315
fluid ounces	milliliters	29,573	cubic meters	cubic yards	1.308
pints	liters	.473	milliliters	fluid ounces	.034
quarts	liters	.946	liters	pints	2.113
gallons	liters	3.785	liters	quarts	1.057
ounces	grams	28.349	liters	gallons	.264
pounds	kilograms	.454	grams	ounces	.035
short tons	metric tons	.907	kilograms	pounds	2.205
pound-feet	newton-meters	1.356	metric tons	short tons	1.102
pound-inches	newton-meters	.11296			

Temperature (Exact)

°F	Fahrenheit temperature	5/9 (after subtracting 32)	Celsius temperature	°C

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