TM 5-4110-238-14

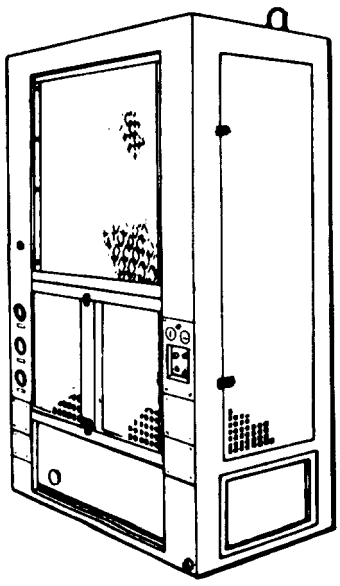
TECHNICAL MANUAL

OPERATOR'S, ORGANIZATIONAL, DIRECT SUPPORT AND GENERAL SUPPORT MAINTENANCE MANUAL

REFRIGERATION UNIT, MECHANICAL: PANEL TYPE; 10,000 BTU/HR

GASOLINE ENGINE DRIVEN A.R.E. MODEL RGMD-K/I-10 (4110-01-120-4604)

ELECTRIC MOTOR DRIVEN A.R.E. MODEL REMD-K/II-10 (4110-01-120-4605)



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Operator's, Organizational, Direct Support and General Support Maintenance Manual

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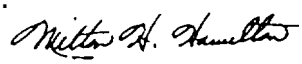

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10,000 BTU/HR
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(4110-01-120-4604)
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REFRIGERATION UNIT, MECHANICAL: PANEL TYPE; 10,000 BTU/HR

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A.R.E. MODEL RGMD–K/1–10
(4110-01-120-4604)

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A.R.E. MODEL REMD–K/11–10
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Operator's, Organizational, Direct Support and
General Support Maintenance Manual

**REFRIGERATION UNIT, MECHANICAL: PANEL TYPE;
10,000 BTU/HR**

**GASOLINE ENGINE DRIVEN
A.R.E. MODEL RGMD-K/l-10
(4110-01-120-4604)**

ELECTRIC MOTOR DRIVEN
A.R.E. MODEL REMD-K/11-10
(41 10-01-120-4605)

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Operator's, Organizational, Direct Support and
General Support Maintenance Manual
for

REFRIGERATION UNIT, MECHANICAL: PANEL TYPE;
10,000 BTU/HR

GASOLINE ENGINE DRIVEN
A.R.E. MODEL RGMD-K/I-10
(4110-01-120-4604)

ELECTRIC MOTOR DRIVEN
A.R.E. MODEL REMD-K/11-10
(4110-01-120-4605)

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WARNING (REMD-K/11-10)

HIGH VOLTAGE is used in the operation of this equipment.
DEATH ON CONTACT may result if personnel fail to observe safety precautions. Never work on electrical equipment unless there is another person nearby who is familiar with the operation and hazards of the equipment and who is competent in administering first aid, When the technician is aided by operators, he must warn them about dangerous areas. Whenever possible, the input power supply to the equipment must be shut off before beginning work on the equipment. Take particular care to ground every capacitor likely to hold a dangerous potential. When working inside the equipment, after the power has been turned off, always ground every pert before touching it. Be careful not to contact high voltage connections of 208 volts ac input when installing or operating this equipment. Whenever the nature of the operation permits, keep one hand away from the equipment to reduce the hazard of current flowing through vital organs of the body. Do not operate the equipment without all grilles, guards, louvers, and rovers in place and tightly secured. WARNING: Do not be misled by the term "low voltage." Potentials as low as 50 volts may cause death under adverse conditions.

WARNING (RGMD-K/1-10)

POISON
CAUSES SEVERE BURNS. ELECTROLYTE (ACID) BATTERY FLUID CONTAINS SULFURIC ACID. Avoid contact with skin, eyes, or clothing. To prevent accidents, neutralize excess acid with baking soda and rinse empty container with water.
ANTIDOTE:
EXTERNAL–Flush with water.
INTERNAL–Drink large quantities of water or milk. Follow with Milk of Magnesia, beaten eggs, or vegetable oil. Call physician immediately.
EYES-Flush with water for 15 minutes and get prompt medical attention.
KEEP OUT OF REACH OF CHILDREN.

WARNING (RGMD-K/l-10)

Before starting work on the engine, disconnect the battery to prevent inadvertent starting of the engine.

WARNING (RGMD-K/1-10)

DO NOT SMOKE or use an open flame in the vicinity of the engine or fuel tank. Internal combustion engine fuels are highly flammable.

WARNING

DANGEROUS CHEMICAL is used in this equipment.
DEATH or severe damage may result if personnel fail to observe safety precautions. Use great care to avoid contact with liquid refrigerant or refrigerant gas being discharged under pressure. Sudden and irreversible tissue damage can result from freezing. Wear thermal protective gloves and a face protector or goggles in any situation where skin - eye - contact is possible, Prevent contact of refrigerant gas with flame or hot surfaces. Heat causes the refrigerant to break down and form carbonyl chloride (phosgene), a highly toxic and corrosive gas.

WARNING

REFRIGERANT UNDER PRESSURE is used in this equipment.
DEATH or severe injury may result if you fail to observe safety precautions. Never use a heating torch on any part that contains Refrigerant R-12. Do not let liquid refrigerant touch you, and do not inhale refrigerant gas.

WARNING

Compressed air used for cleaning purposes will not exceed 30 PSI (2.lkg/cm2).

WARNING

Acetone and methyl-ethyl ketone (ME K) are f lammable, and their vapors can be explosive. Repeated or prolonged skin contact or inhalation of vapors can be toxic. Use a well-vent ilated area, wear gloves, and keep away from sparks or flame.

WARNING

Clean parts in a well-ventilated area. Avoid inhalation of solvent fumes and prolonged exposure of skin to cleaning solvent. Wash exposed skin thoroughly. Dry cleaning solvent (Fed.Spec. P-D-680) used to clean parts is potentially dangerous to personnel and property. Do not use near open flame or excessive heat. Flash point of solvent is 100°F to 138°F (38°C to 50°C). Wear eye protection when blowing solvent from parts. Air pressure should not exceed 30 PSIG (2.1 kg/cm2).

WARNING

PROTECT AGAINST MOVING PARTS
Do not wear loose clothing in the vicinity of moving parts, such as shafts, flywheels, fens, belts, etc. Keep your hands away from moving parts. Do not operate without protective guards and screens securely in place.

WARNING **{RGMD-K/1-10**

DO NOT fill fuel tank while engine is running. DO NOT smoke or use an open flame in the vicinity of the engine or fuel tank. Internal combustion engine fuels are highly flammable.

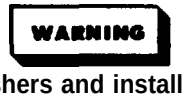
WARNING **(RGMD-K/1-10)**

DO NOT SMOKE while servicing batteries. Lend acid batteries give off highly explosive hydrogen gas which can be ignited by flame, electrical arcing or by smoking. Verify battery polarity before connecting battery cables. Connect negative cable last.

(RGMD-K/l-10)

Engine Exhaust Gas (Carbon Monoxide) is DEADLY

Carbon monoxide is an odorless, colorless gas formed by incomplete combustion of hydrocarbon fuels. Carbon monoxide is a dangerous gas that can cause unconsciousness and is potentially lethal. Some of the symptoms or signs of carbon monoxide inhalation are: Dizziness; Intense Headache; Weakness and Sleepiness; Vomiting; Muscular Twitching; Throbbing in Temples. If you experience any of these symptoms, get out into fresh air immediately. The best protection against carbon monoxide inhalation is a regular inspection of the complete exhaust system. If you notice a change in the sound or appearance of the exhaust system, shut the unit down immediately and have it inspected and repaired at once by a competent mechanic.



(RGMD-K/l-10)

Provide appropriate fire extinguishers and install them in convenient locations. Use an extinguisher rated ABC by NFPA.

(RGMD-K/l-10)

If it is necessary to make adjustments while the engine is running, use extreme caution when close to hot exhausts, moving parts, etc.

(RGMD-K/l-10)

Do not remove the dipstick while the engine is running. Oil may blow out the oil fill. tube causing injury.

The panels, doors and screens installed on this unit are there for a purpose. DO NOT operate this unit with them off or open unless the instructions tell you to. When this is necessary, do so with care.

- **Engine exhausts can burn.**
- **All electrical connections can shock and sometimes kill.**
- **Moving parts can cut off fingers or hands.**
- **Spilled or splashed fuels, lubricants, cleaning fluids and battery acid can blind.**
- **Read all Warnings and instructions carefully before operating or working on this unit. Read and understand all Warnings listed in the front of this manual.**

TECHNICAL MANUAL
TM 5-4110-238-14

HEADQUARTERS
DEPARTMENT OF THE ARMY
Washington, D. C., 6 January 1984

OPERATOR'S, ORGANIZATIONAL, DIRECT SUPPORT AND GENERAL SUPPORT MAINTENANCE MANUAL

FOR

REFRIGERATION UNIT, MECHANICAL: PANEL TYPE; 10,000 BTU/HR

GASOLINE ENGINE DRIVEN
A.R.E. MODEL RGMD-K/I-1O
(41 10-01-120-4604)

ELECTRIC MOTOR DRIVEN
A.R.E. MODEL REMD-K/II-10
(41 1041 -120-4605)

REPORTING OF ERRORS AND RECOMMENDING IMPROVEMENTS

You can help improve this manual. If you find any mistakes or if you know of a way to improve the procedures, please let us know. Mail your letter, DA Form 2028 (Recommended Changes to Publications and Blank Forms) or DA Form 2028-2 located in the back of this manual direct to:

Commander, U.S. Army Troop Support Command, ATTN: DRSTR-MCTS, 4300 Goodfellow Blvd. , St. Louis, Mo. 63120. A reply will be furnished to you.

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CHAPTER 1

INTRODUCTION

Section 1. GENERAL INFORMATION

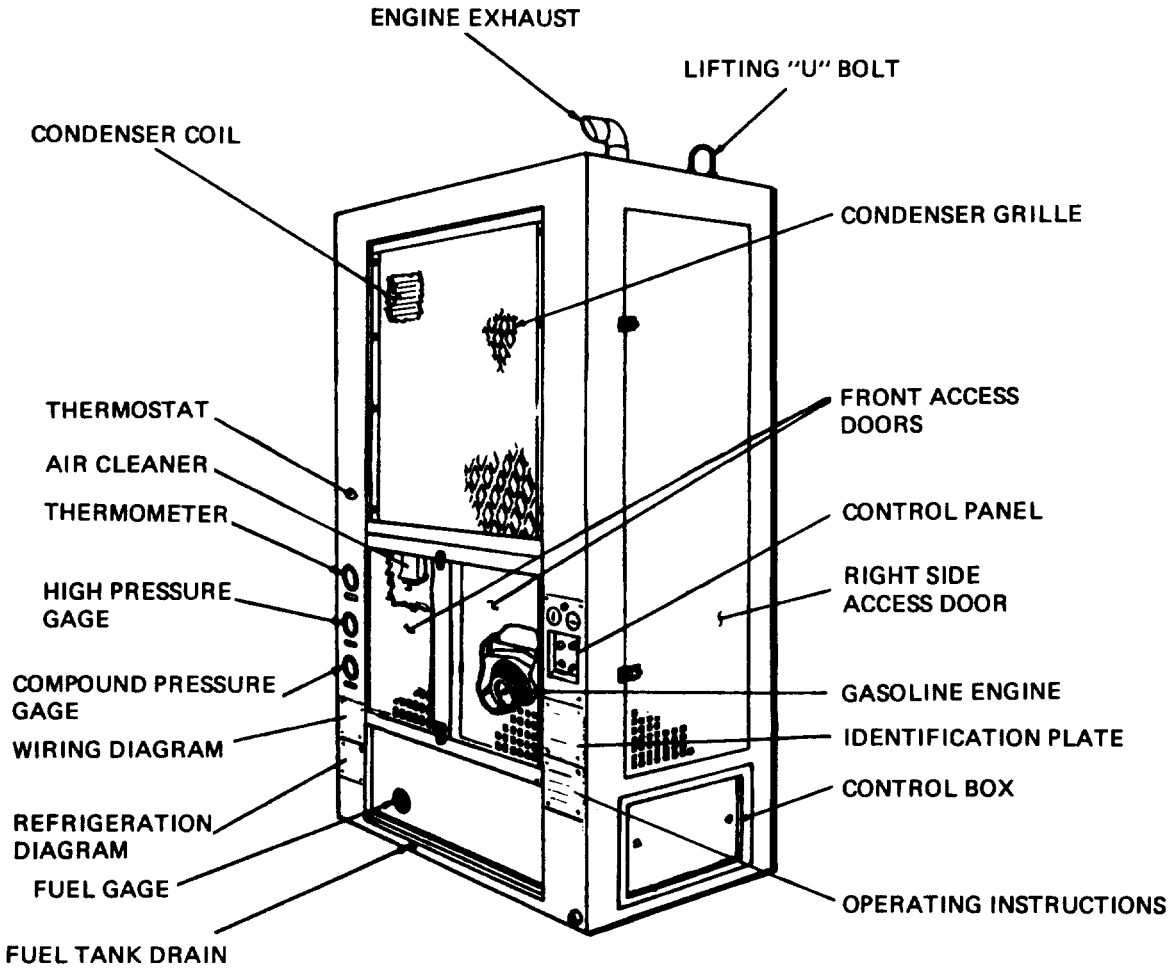

Figure 1-1. Refrigeration Unit Model RGMD-K/l-10, right-front view

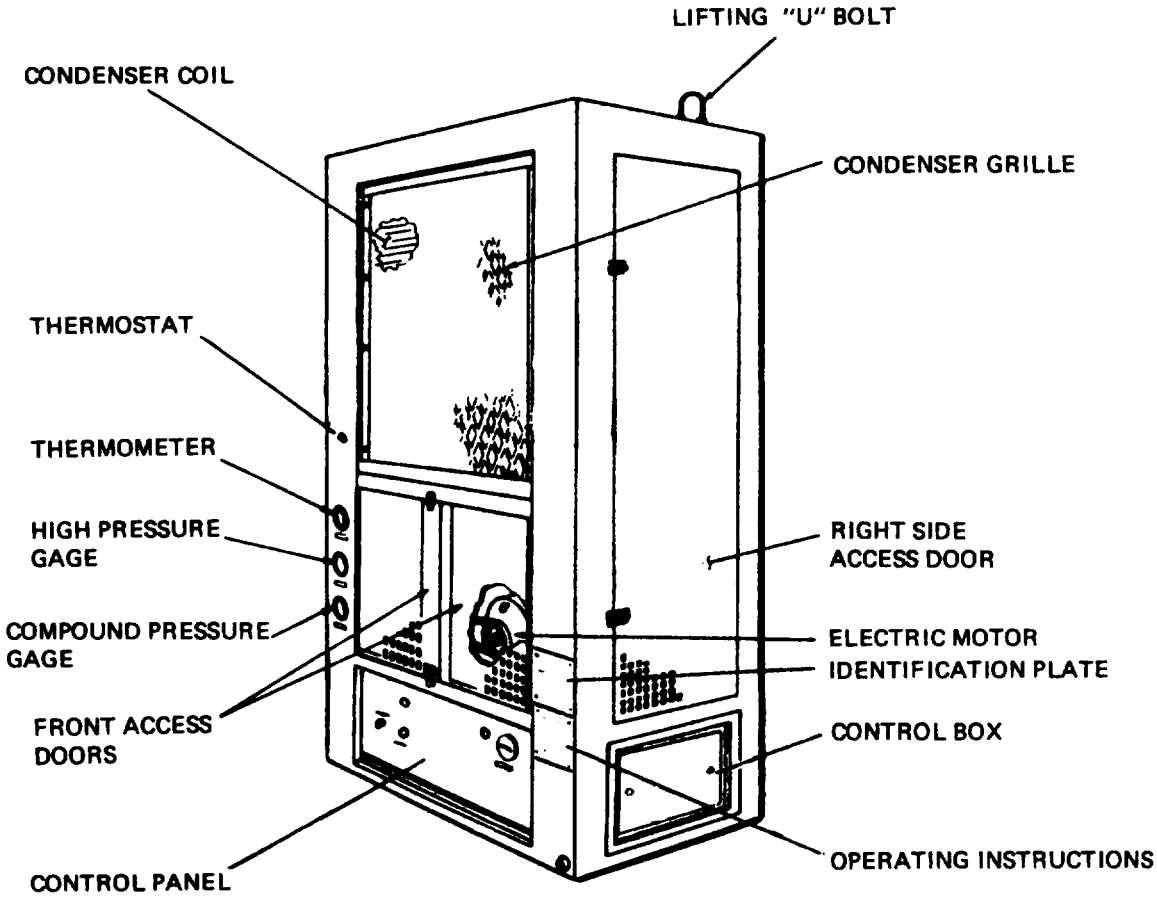

Figure 1-2. Refrigeration Unit Model REMD-K/11-10, right-front view

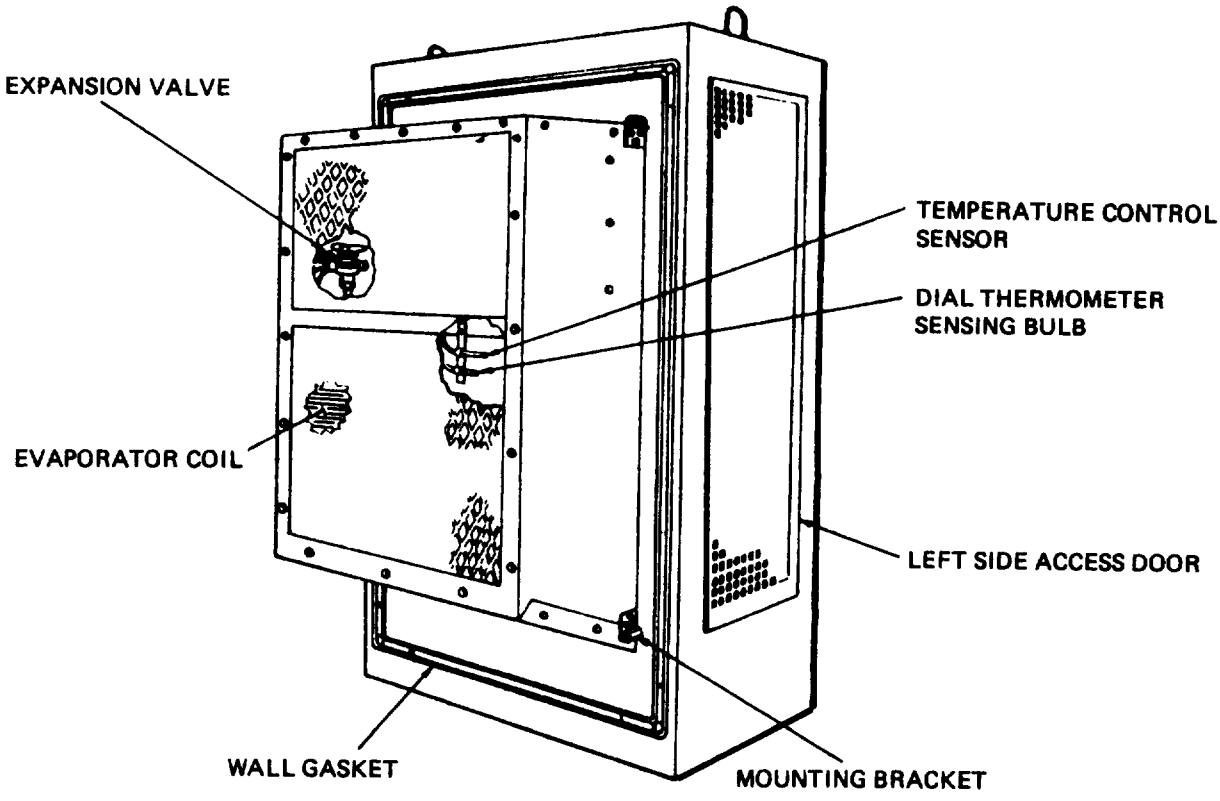

Figure 1-3. Refrigeration Unit, left-rear view

1-1. SCOPE

a. Type of Manual. Operator's, Organizational, Direct Support and General Support Maintenance Manual.

Model REMD-K/11-10 Refrigeration Unit, Mechanical: Panel Type; 10,000 BTU/HR Electric Motor Driven and Model RGMD-K/l -10 Gasoline Engine Driven.

c. Purpose of equipment. The refrigeration unit is used to cool a portable 600 cubic foot" (l 6.9 cu.meter) _ field container at either 0°F (-f7.78°C) to 35°F (1.67°C).

d.Special Feature. Defrosting of the refrigeration unit is activated by preselected time intervals on the defrost time clock.

1-2. MAINTENANCE FORMS, RECORDS AND REPORTS

Department of the Army forms and procedures used for equipment maintenance will be those prescribed by TM 38-750, The Army Maintenance Management System (TAMMS).

1-3. DESTRUCTION OF ARMY MATERIEL TO PREVENT ENEMY USE

Procedures for destroying Army materiel to prevent enemy use are listed in TM 750-244-3.

1-4. PREPARATION FOR STORAGE OR SHIPMENT

See Chapter 4, Section II for storage and shipment information.

1-5. REPORTING EQUIPMENT RECOMMENDATIONS (EIR)

If your Refrigeration Unit needs improvement, let us know. Send us an El R. You, the user, are the only one who can tell us what you don't like about your equipment. Let us know why you don't like the design. Tell us why a procedure is hard to perform. Put it on an SF 368 (Quality Deficiency Report). Mail it to us at Commander, U.S. Army Troop Support Command, ATTN: DRSTR-MCTS, 4300 Goodfellow Blvd., St. Louis, 63120. A reply will be furnished to you.

1-6. NOMENCLATURE CROSS-REFERENCE

Common Name	Official Nomenclature
Refrigeration Unit	Model REM D-K/l 1-10, Refrigeration Unit, Mechanical: Panel Type; 10,000 BTU/HR, Electric Motor Driven Model RGMD-K/l-10, Refrigeration Unit, Mechanical: Panel Type; 10,000 BTU/HR, Gasoline Engine Driven

1-7. LIST OF ABBREVIATIONS

ac	alternating current	fig.	figure	OD	outside diameter
BTU	British thermal units	ft	feet	oz	ounce
amps	amperes	hr	hour	para	paragraph
C	celcius	ID	inside diameter	psi	pounds per square inch
cm	centimeter	in.	inch	rpm	revolutions per minute
cu	cubic	kg	kilogram	v	volts
cfm	cubic feet per minute	lbs	pounds		
dc	direct current	min	minute		
F	farenheit	no.	number		

Section II. EQUIPMENT DESCRIPTION DATA

1-8. PURPOSE, CAPABILITIES AND FEATURES

a. Purpose. The refrigeration unit is used to cool air in a portable 600 cubic foot (16.9 cu meter) field refrigerator capacity-of 10,000 BTU/HR at 0°F (-17.78ºC).

b. capabilities and Features.

(1) The unit is a self-contained, package-type unit and consists of a condenser section and evaporator section. The evaporator is designed to fit into the wall opening of the refrigerator.

(2) The entire refrigeration unit is attached to the wall of the refrigerated container with four bolts.

(3) The temperature range for a 600 cubic foot (16.9 cu meter) refrigerator is 0°F to 35°F (-17.78°C to 1.67°C).

(4) Defrosting is automatic.

(5) Unit contains a magnetic clutch to deactivate fan rotation.

1-9. EQUIPMENT SPECIFICATIONS

REFRIGERATION UNIT:

Type	Air-cooled
Refrigerant	R12
Capacity	10,000 BTU/HR cooling@ 0°F (-17.78°C to 1.67°C)

ENGINE:

Manufacturer	Onan Corporation
Type	Air-cooled, gasoline

ENGINE ACCESSORIES:

Carburetor	Gasoline type
Fuel Filter	Military Std MS51086-1
Air Cleaner	Oil bath type
Fuel Pump	Onan type
Spark Plug	Military Std MS35909-1
Alternator	Motorola RA12NON451
Starter	Prestolite MBG4143T
Electric Fuel Pump	Bendix 480588

COMPRESSOR:

Model	MIL-Std-279, QPL1437
Type	Reciprocating, 4-cylinder air cooled

CAPACITIES:

Fuel Tank	16 gallons (60.5 liters)
Engine Crankcase	3-1/2 quarts (3.31 liters)
Compressor Oil	6 pints (2.83 liters)
Refrigerant	224 oz. (R12)

DIMENSIONS AND WEIGHT:

Length	45.0 Inches
Width	43.0 Inches
Height	74.0 Inches
Weight	1200 Lbs - Electric Drive Unit 1400 Lbs - Gasoline Drive Unit

POWER REQUIRED:

Electric Drive Model REMD-K/l1-10

voltage	208
Phase	3
Hertz	60
Amps	29.7
Fan amperage	2.9
Compressor amperage	15.7
Total amperage	18.6

POWER REQUIRED:

Gasoline Drive Model RGMD-K/l -10

12 Volt, Waterproof, Lead-Acid Type Battery MS35000-1

FUSES: (REMD-K/11-10)

Type	30 Amp
Quantity	3
Location	Top Right Side of Cabinet in Fuse Box

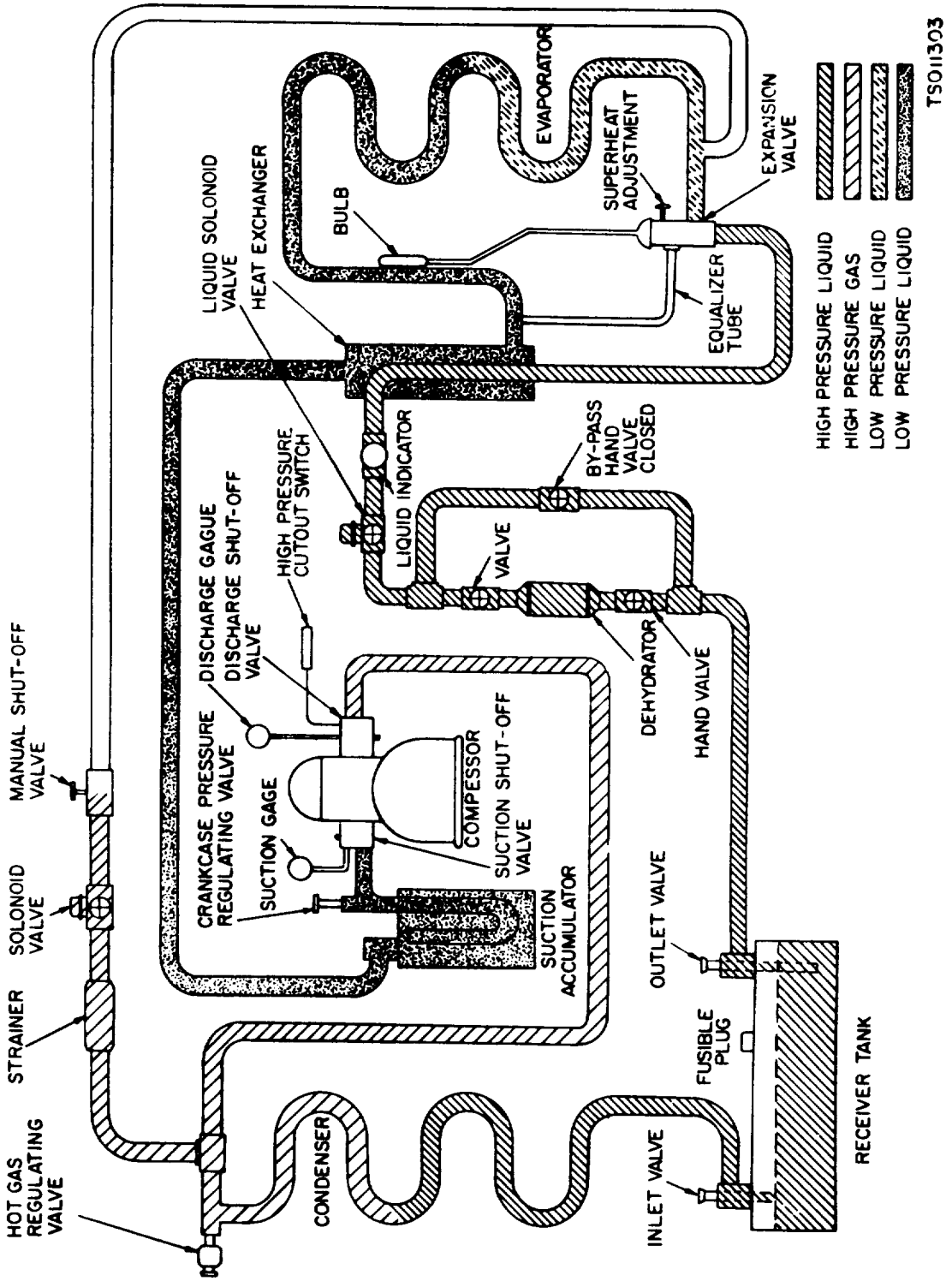

Figure 1-4. Refrigeration Diagram

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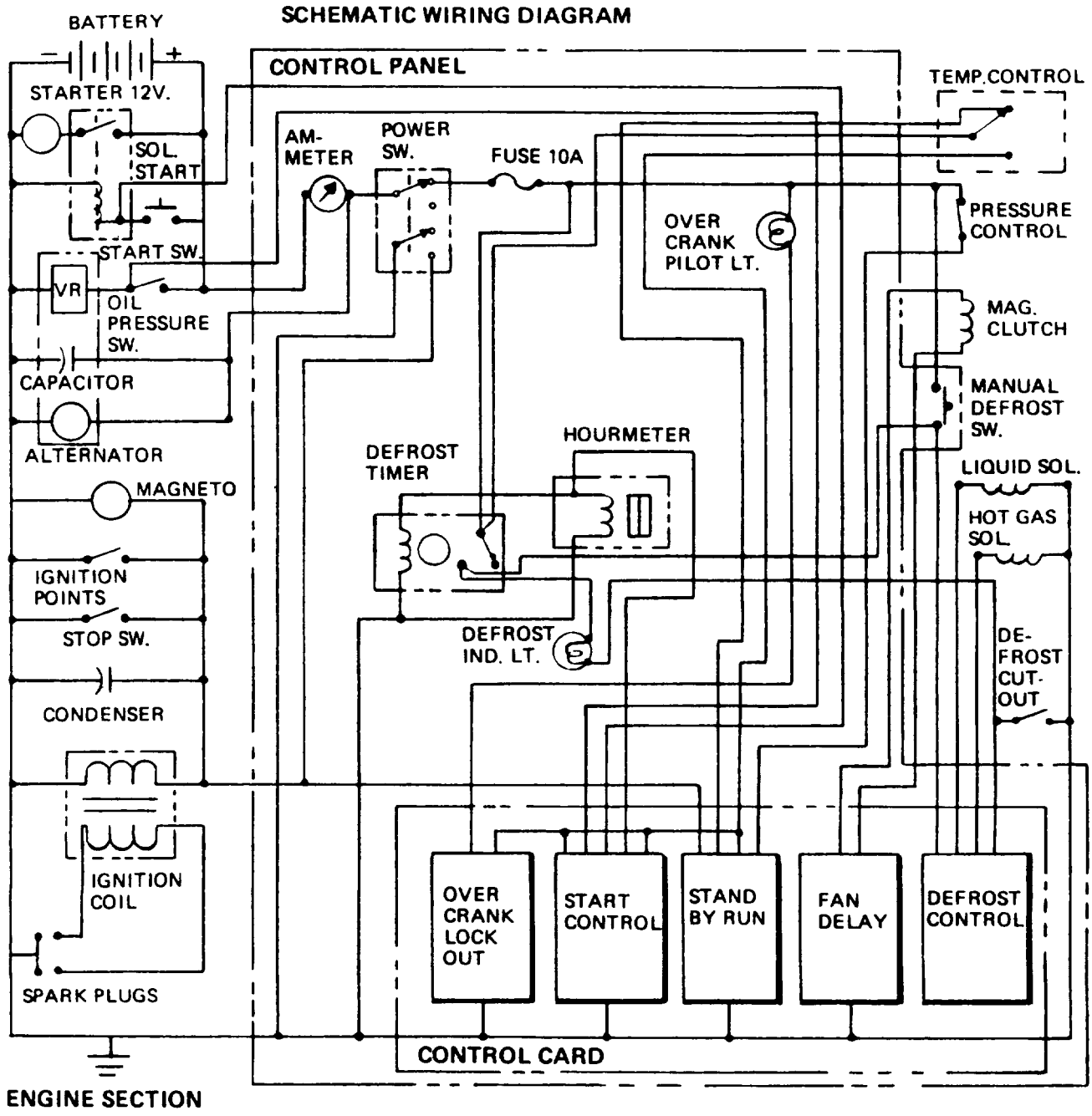

Figure 1-5. Wiring Diagram (RGMD-K/l-10)

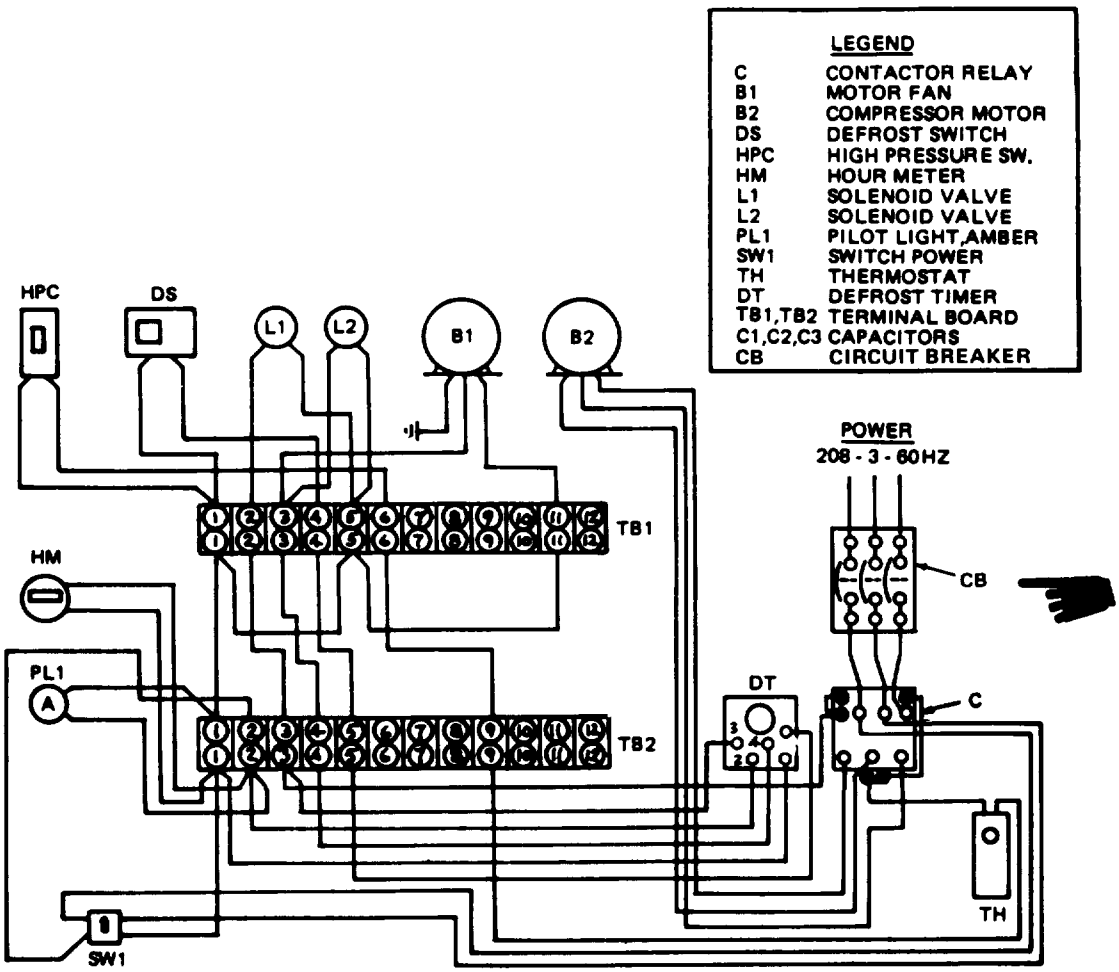

Figure 1-6. Wiring Diagram (REMD-K/l1-10)

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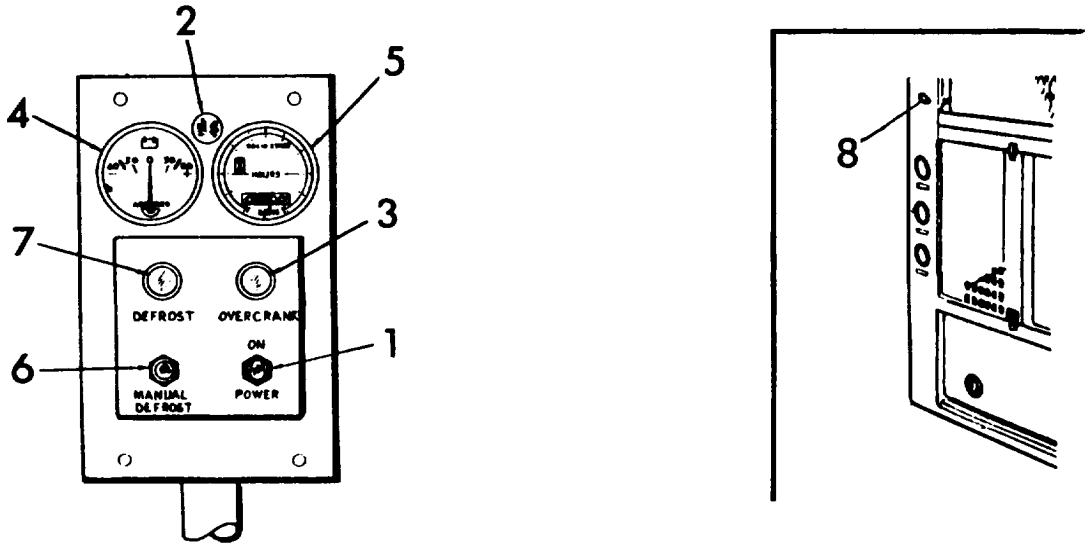
CHAPTER 2

OPERATING INSTRUCTIONS

Section 1. DESCRIPTION AND USE OF OPERATOR'S CONTROLS CONTROLS AND INDICATORS

2-1. CONTROL PANEL (RGMD-K/1-10)



1. POWER SWITCH – turns on battery or alternator power to equipment. When placed in "ON" position, the unit will run on thermostat demand, "OFF" position turns equipment off.

2.10 AMP FUSE – protects electrical system from overload.

3. OVERCRANK INDICATOR LIGHT – indicates an overcrank engine condition. Lights up after cranking engine more than 30 seconds.

4. AMP METER – indicates the amount and direction of flow of current in battery circuit.

5. HOUR METE R – records the hours the unit is in operation. It is non-resetting. Capable of recording a minimum of 9,999 hours. It is in operation as long as the temperature control switch is closed.

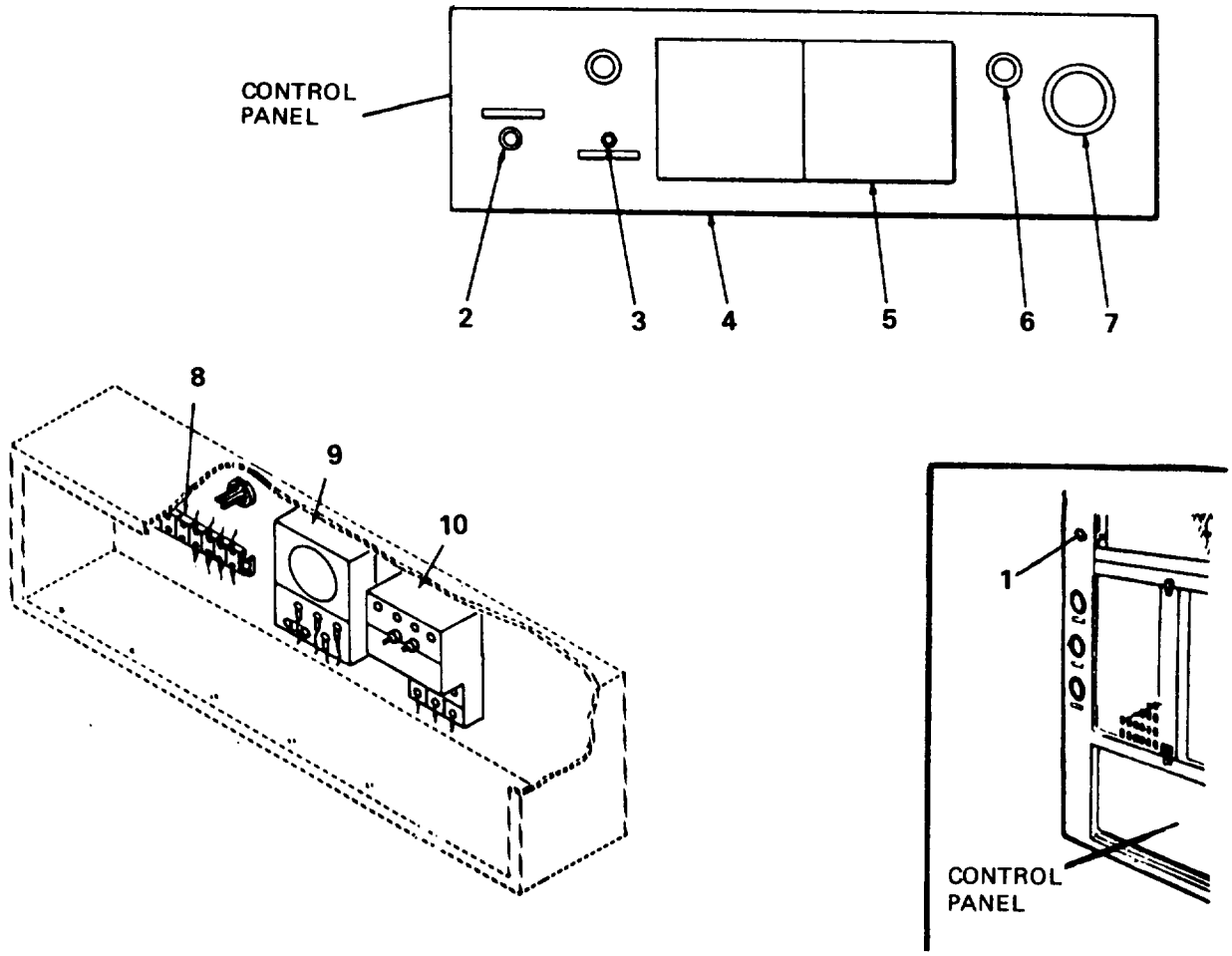
6. MANUAL START DEFROST SWITCH – press to start defrosting manually.

7. RED INDICATOR LIGHT – red light turns on when unit is defrosting.

8. TEMPERATURE CONTROL – thermostat that controls the operation of refrigeration unit. It automatically starts and stops unit to maintain desired temperature in the box. Selection of refrigerator temperature can be from O°F to 35°F (-17.78°C to 1.67°C).

Figure 2-1. Control Panel, Front (RGMD-K/l-10)

2-2. CONTROL PANEL (REMD-K/11–10)



1. TEMPERATURE CONTROL – Thermostat that controls the operation of refrigeration unit. It automatically starts and stops unit to maintain desired temperature in the box. Selection of refrigerator temperature can be from 0ºF to 35ºF (-17.78°C to 1.67°C).
2. DEFROST INDICATOR LIGHT – Indicates refrigeration unit is defrosting.
3. POWER SWITCH – Turns on power to equipment. When placed in "ON" position, the unit will run on thermostat demand. "OFF" position turns equipment off.
4. HINGE– Control panel.
5. INSTRUCTION AND DATA PLATES
6. LATCH – Turns to open control panel.
7. HOURMETER – Records the hours the unit is in operation. It is non-resetting. Capable of recording a minimum of 9,999 hours. It is in operation as long as the temperature control switch is closed.
8. TERMINAL BLOCK
9. TIMER, DEFROST
10. CONTACTOR STARTER

Figure 2-2. Control Panel (REMD-K/l 1-10)

2-3. HIGH PRESSURE CUTOUT SWITCH

a. General. The high pressure cutout switch consists of an electric switch and a pressure operated bellows. The switch is wired into the control circuit and the bellows is connected by tubing to the discharge side of the compressor. When the pressure of refrigerant rises to a preset I imit, the bellows is moved enough to open the electric switch and stop the unit.

b. Operation. Cutout and differential scale settings are preset by the manufacturer before the refrigeration unit is shipped. Those settings are 250 lbs (1 13.38 kilograms) for the high pressure side of the scale and must be manually reset if a high pressure condition occurs.

c. Location. The switch is located at the bottom of the cabinet on the left side of the back wall above the compressor.

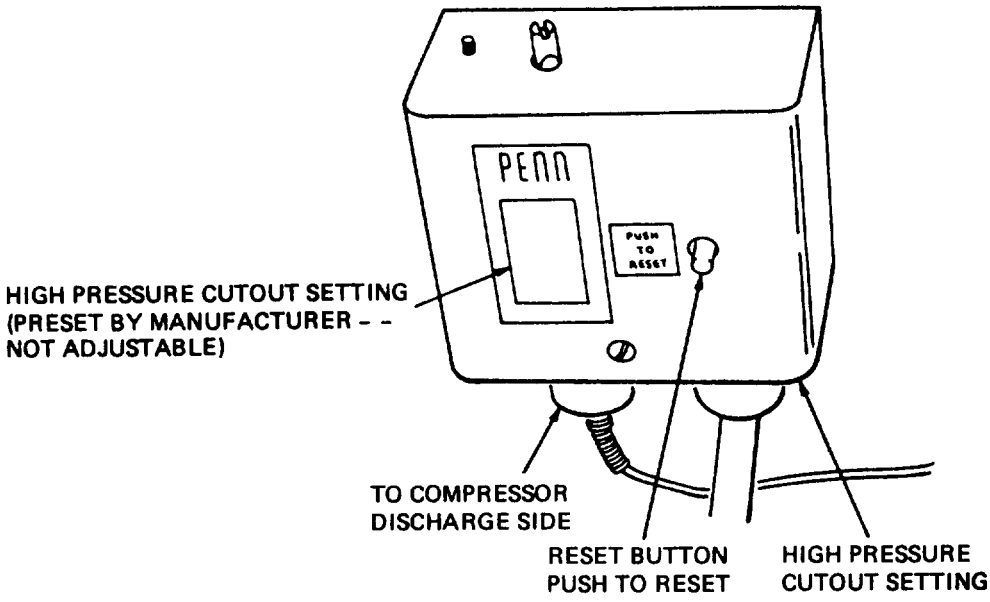
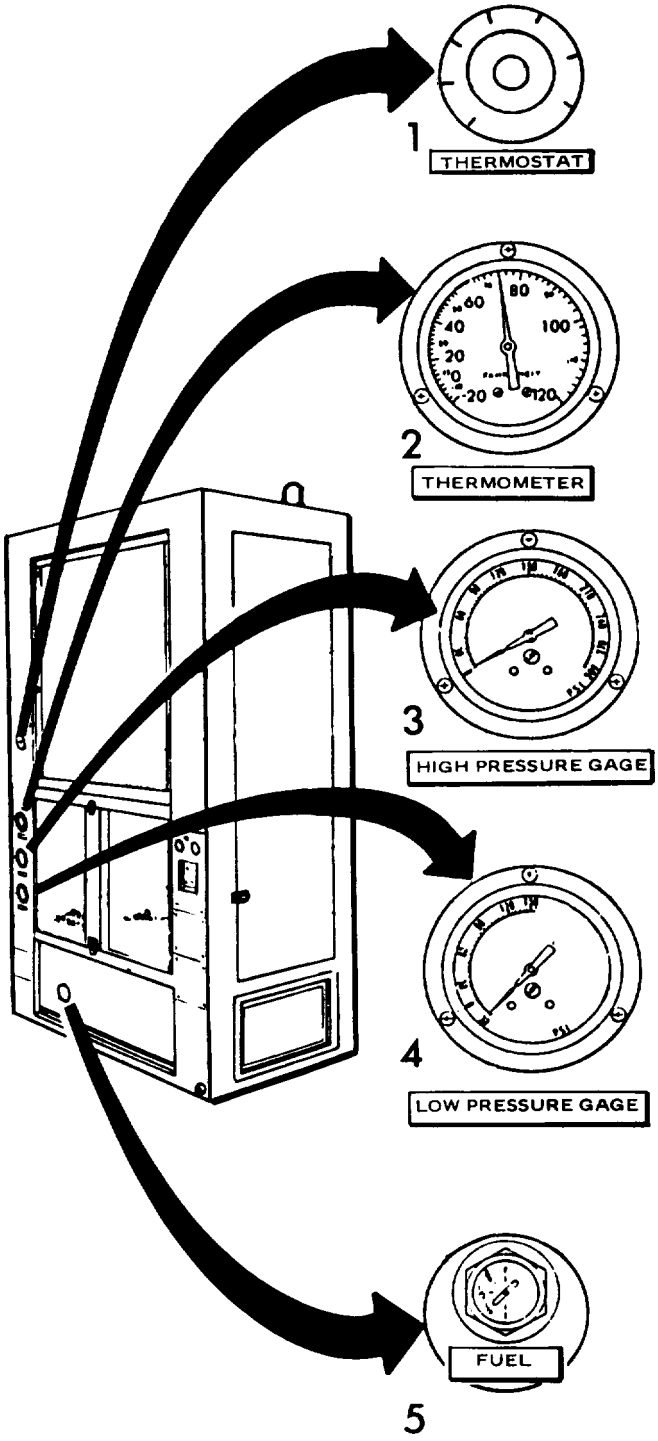


Figure 2-3. High Pressure Cutout Switch

2-4. DIAL CONTROLS



1. **TEMPERATURE CONTROL:**
   - Thermostat that controls the operation of the refrigeration unit.
   - It automatically starts and stops unit to maintain desired temperature in the box.
   - Selection of refrigerator temperature can be from 0ºF to 35°F (-17.78 to 1.67°C).

2. **DIAL THERMOMETER:**
   Indicates air temperature in refrigerated box.
   Range is -20°F to +120°F (-28.88°C to +84.44°C).

3. **HIGH PRESSURE GAUGE**
   - Indicates pressure in discharge side of compressor.
   - Graduated scale reading from 0-300 lbs per square inch (0-2068.5 kilopascals).
   - Operation automatic.

4. **COMPOUND PRESSURE GAUGE:**
   Indicates pressure on suction side of compressor.
   Records pressure range from 30-inch vacuum to 150 pound per square inch (1034.25 kilopascals).
   Operation automatic.

5. **FUEL TANK GAUGE: (Gasoline Engine Only):**
   - Indicates amount of fuel in gasoline tank.

Figure 2-4. Dial Controls

2-5. HAND VALVES AND SIGHT GLASS (FIG. 2-5)

1. "HOT GAS SHIJT-OFF" HAND VALVE:

Allows selection of low temperature mode of operation.

- Used for manual defrost.
- Open during normal operation.

Open during defrost.

2. "LIQUID SHUT-OFF" HAND VALVE:

- Closed position stops refrigerant from flowing.
- Used to by-pass dehydrator when filter is contaminated.
- Open during normal operation.

3. HAND VALVE:

- Liquid shut-off type.
- Closed position stops refrigerant flowing.
- Closed during normal operations.

4. "LIQUID INDICATOR" SIGHT GLASS:

- Indicates presence of moisture in refrigerant.
- Indicates shortage of refrigerant.
- Blue indication - free from moisture.
- Pink indication - moisture present.
- Bubbles or foam - refrigerant shortage.

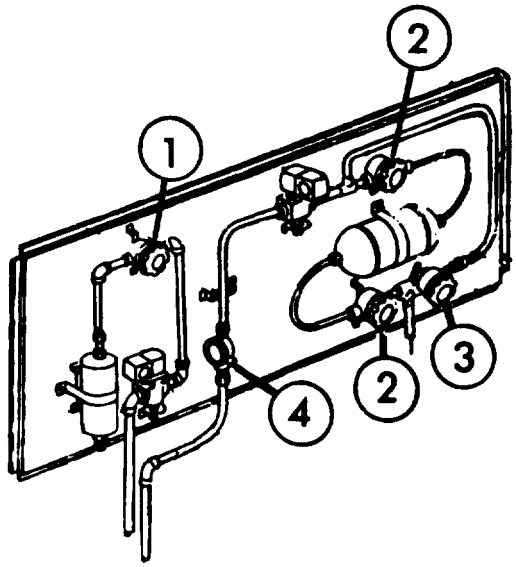
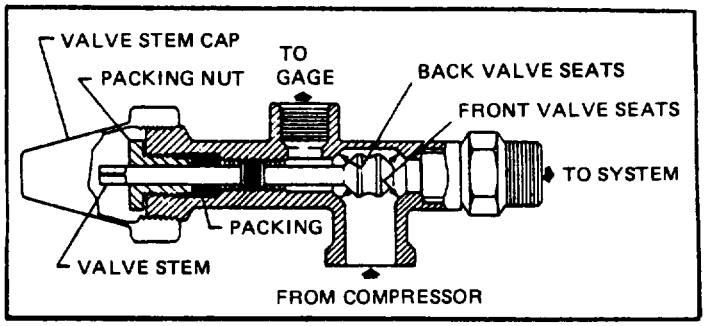


Figure 2-5, Hand Valves and Sight Glass

2-6, SERVICE VALVES (FIG. 2-6)



TYPICAL COMPRESSOR SUCTION AND DISCHARGE SERVICE VALVE

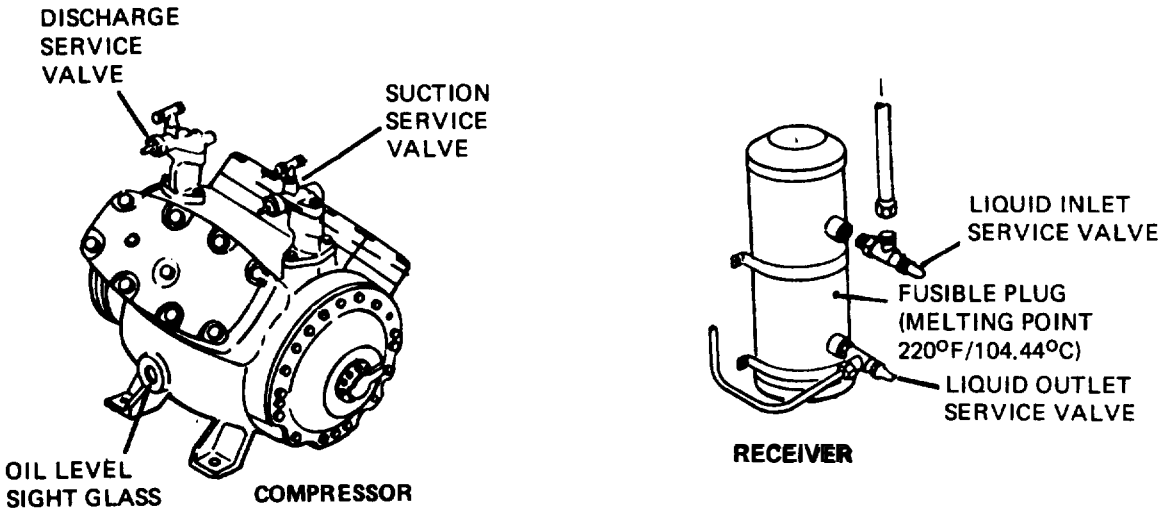


Figure 2-6. Service Valves

2-7. DEFROST TIMER (FIG. 2-7)

The defrost timer is set for a defrost cycle of 4 hours. Automatic defrosting occurs after 4 hours of the unit operation. Manual defrosting on gasoline model can be activated by pushing the "MANUAL DEFROST" switch on the control panel. (See figure 2-1.)

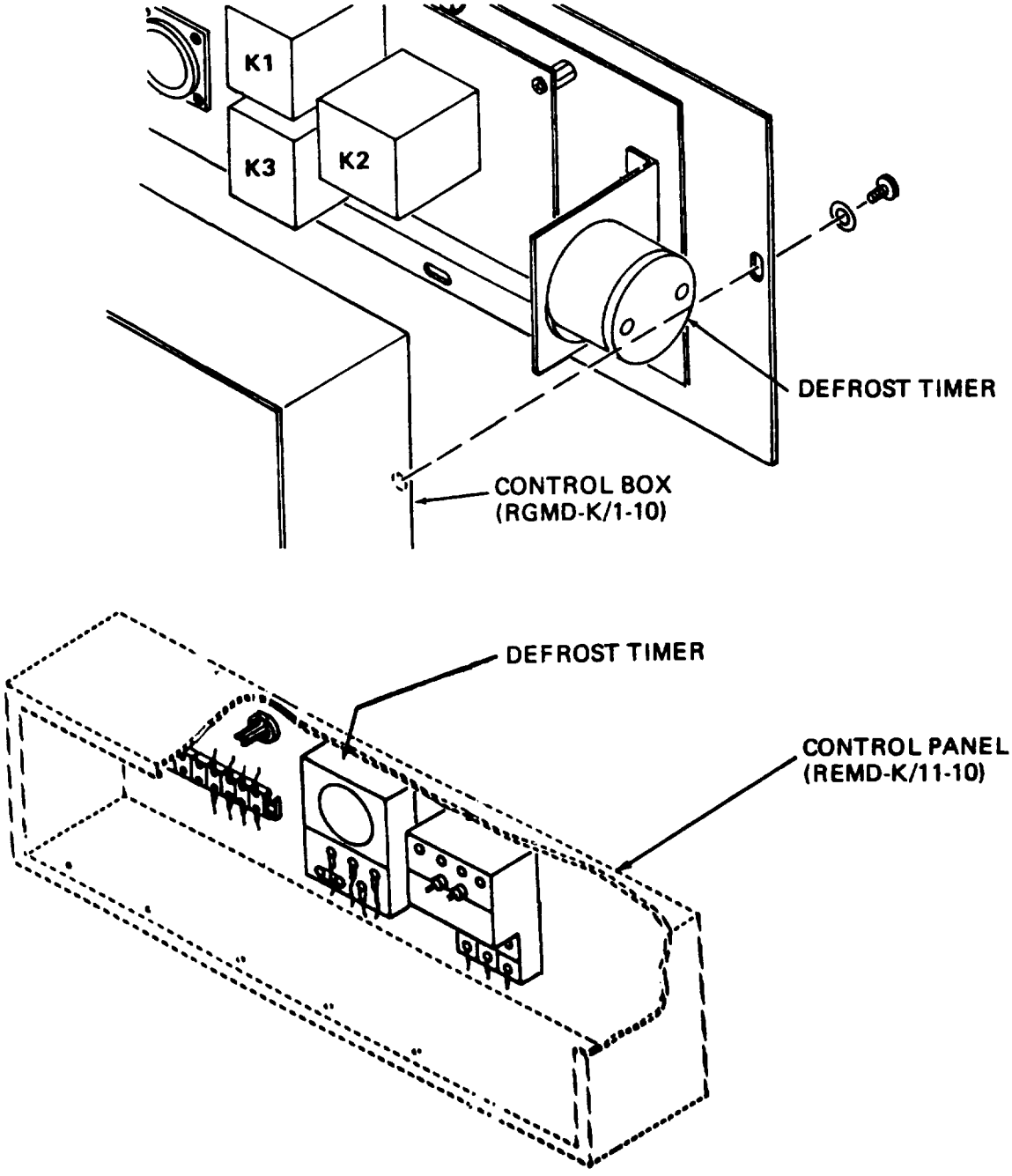


Figure 2-7. Defrost Timer

Section II. PREVENTIVE MAINTENANCE CHECKS AND SERVICES (PMCS)

2-8, GENERAL

Preventive maintenance checks and services (PMCS) are essential to the efficient operation of the refrigeration unit and to prevent possible damage that might occur through neglect or failure to observe warning symptoms in a timely manner. Checks and services performed by operators are limited to those functions which are described in table 2–1.

a Before You Operate. Always keep in mind and observe the WARNINGS and CAUTIONS. Perlorm your before (B) PMCS.

b. While You Operate. Always keep in mind and observe the WARNINGS and CAUTIONS. Perform your during ID) PMCS.

c. After You Operate. Be sure to perform your after (A) PMCS.

d. If Your Equipment Fails to Operate. Troubleshoot with proper equipment. Report any deficiencies using the proper forms. See TM 38-750.

e. Perform weekly as well as before operations PMCS if:

(1) You are the assigned operator and have not operated the item since the last weekly.

(2) You are operating the item for the first time,

NOTE

If the equipment must be kept in continuous operation, check and service only those items that can be checked and serviced without disturbing operation. Make the complete checks and services when the equipment can be shut down.

2-9. OPERATOR PREVENTIVE MAINTENANCE CHECK AND SERVICES TABLE

B - Before D –During A - After W – Weekly M - Monthly

Item No.	B	D	A	W	M	ITEM TO BE INSPECTED PROCEDURE	Equipment is Not Ready/ Available If:
						NOTE: Visually inspect for evidence of lubricant and fuel leaks concurrently with the daily service checks. Lubricate in accordance with current lubrication order.	
1	•					BATTERY NOTE: Use distilled water or a good grade drinking water (excluding mineral water). Inspect loose cables and mountings. Remove corrosion. Inspect for cracks and leaks. Fill to 3/8 inch (9518cm) above plates. Clean vent holes in filler caps before installing. In freezing weather, run engine a minimum of 1 hour after adding water (weekly).	Dead battery; engine will not start

Table 2-1. Operator Preventive Maintenance Checks and Services (Cont)

B–Before D–During A–After W–Weekly M–Monthly

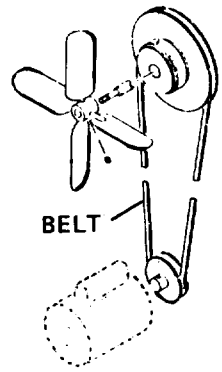
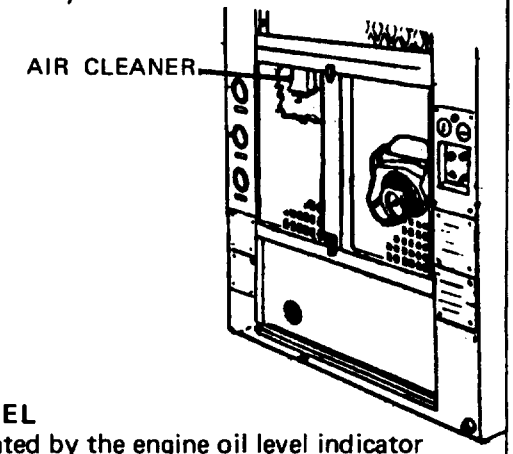
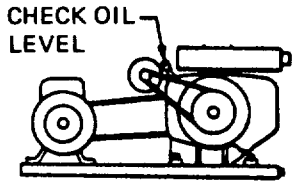
Item No.	B	D	A	W	M	ITEM TO BE INSPECTED PROCEDURE	Equipment is Not Ready/Available If:
2	•					**FAN BELT** Inspect fan belt for proper tension (Weekly).  	
3	•					**AIR CLEANER** Clean as required. This service will vary from a few days of operation in comparatively clean conditions to twice a day in dusty conditions.  	
4	•					**ENGINE OIL LEVEL** Add oil as indicated by the engine oil level indicator (dip-stick). Refer to current lubrication order (daily).  	

Table 2-1. Operator Preventive Maintenance Checks and Services (Cont)

B–Before D–During A–After W–Weekly M–Monthly

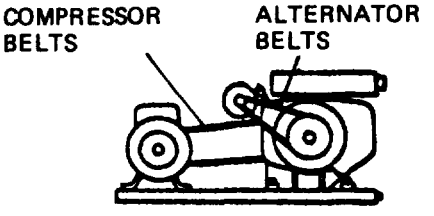
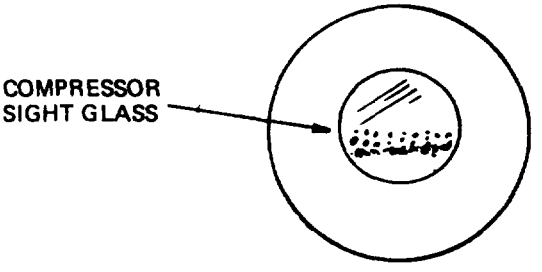
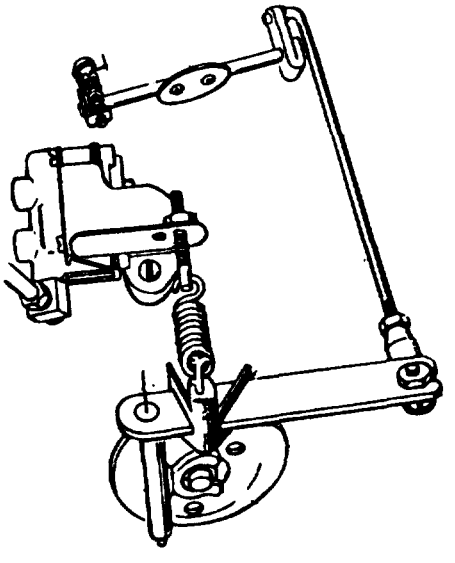
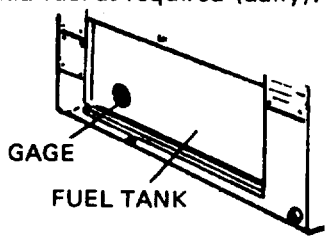
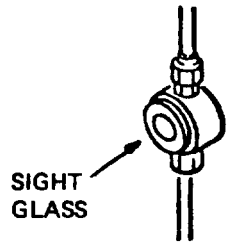
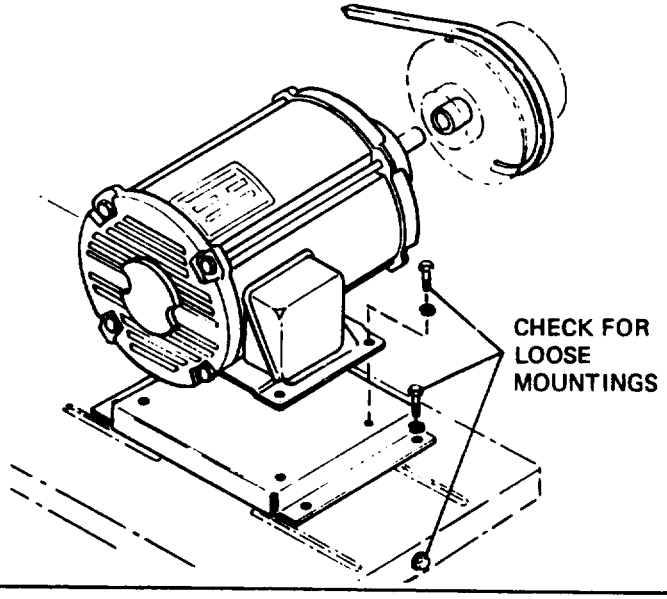
Item No.	B	D	A	W	M	ITEM TO BE INSPECTED PROCEDURE	Equipment is Not Ready/Available If:
5	•					**COMPRESSOR DRIVE BELTS AND ALTERNATOR BELTS** Check belts for proper tension (weekly). 	
6	•					**COMPRESSOR SIGHT GLASS** Oil level should be 1/2 to 3/4 up sight glass. Refer to Direct Support unit for adding oil (daily). 	
7	•					**GOVERNOR LINKAGE** Inspect and clean governor linkage (daily). 	

Table 2-1. Operator Preventive Maintenance Checks and Services (Cont)

B—Before D—During A—After W—Weekly M—Monthly

Item No.	B	D	A	W	M	ITEM TO BE INSPECTED PROCEDURE	Equipment is Not Ready/Available if:
8	•					**FUEL TANK** Add fuel as required (daily).  	Lack of fuel; engine will not run.
9		•				**OPERATION NOISE OR VIBRATION** During operation, observe for any unusual noise or vibration (daily).	
10		•				**REFRIGERATION SYSTEM** Visually check all connections of the refrigeration system for leaks. Check liquid line sight glass for air bubbles or milky appearance. Report deficiencies to Direct Support unit for correction (daily).  	
11	•					**ELECTRIC MOTOR (MODEL REMD-K/11-10 ONLY)** Check for loose mountings.  	

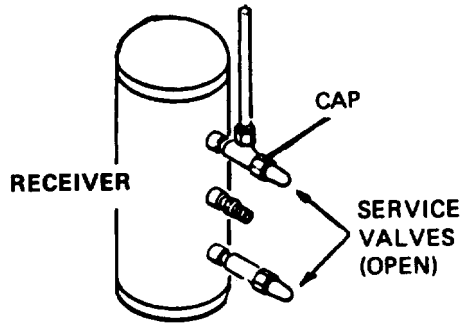
Section III. OPERATION UNDER USUAL CONDITIONS

2-10. STARTING THE EQUIPMENT

a. Check all service valves for operating positions.

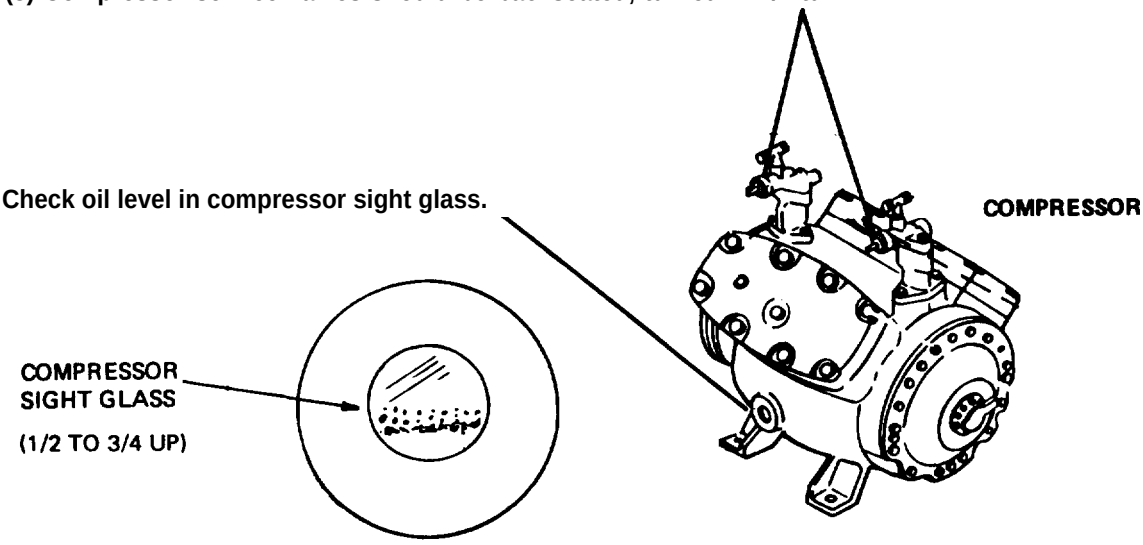
(1) Remove caps.

(2) Receiver service valves should be open.

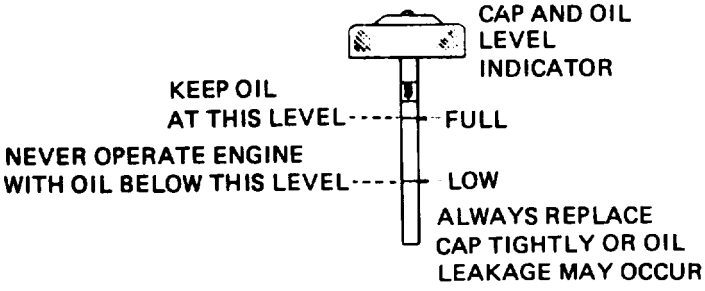


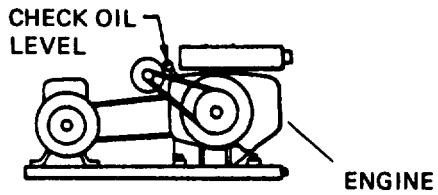
(3) Compressor service valves should be backseated, turned-in 1/4 turn.

b. Check oil level in compressor sight glass.

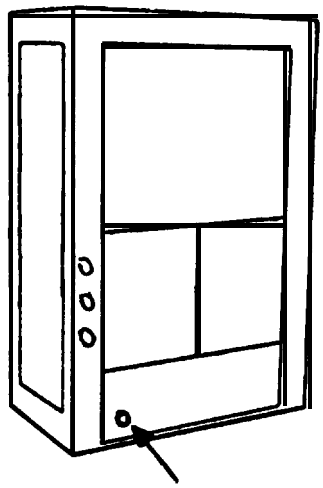


c. Check oil level in engine.





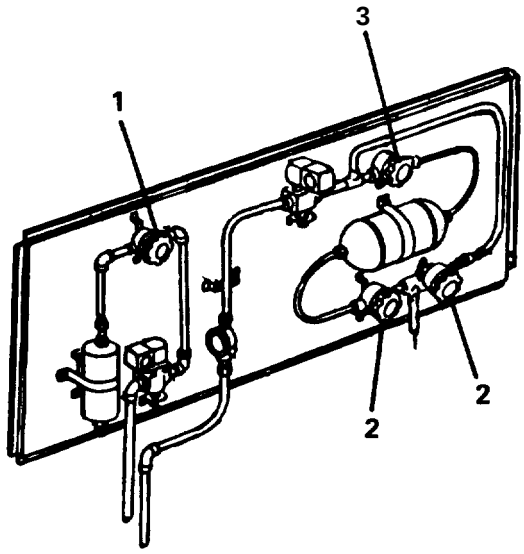
d. Check fuel gauge.



e. Close (clockwise) dehydrator by-pass hand valve (3), except in case of emergency.

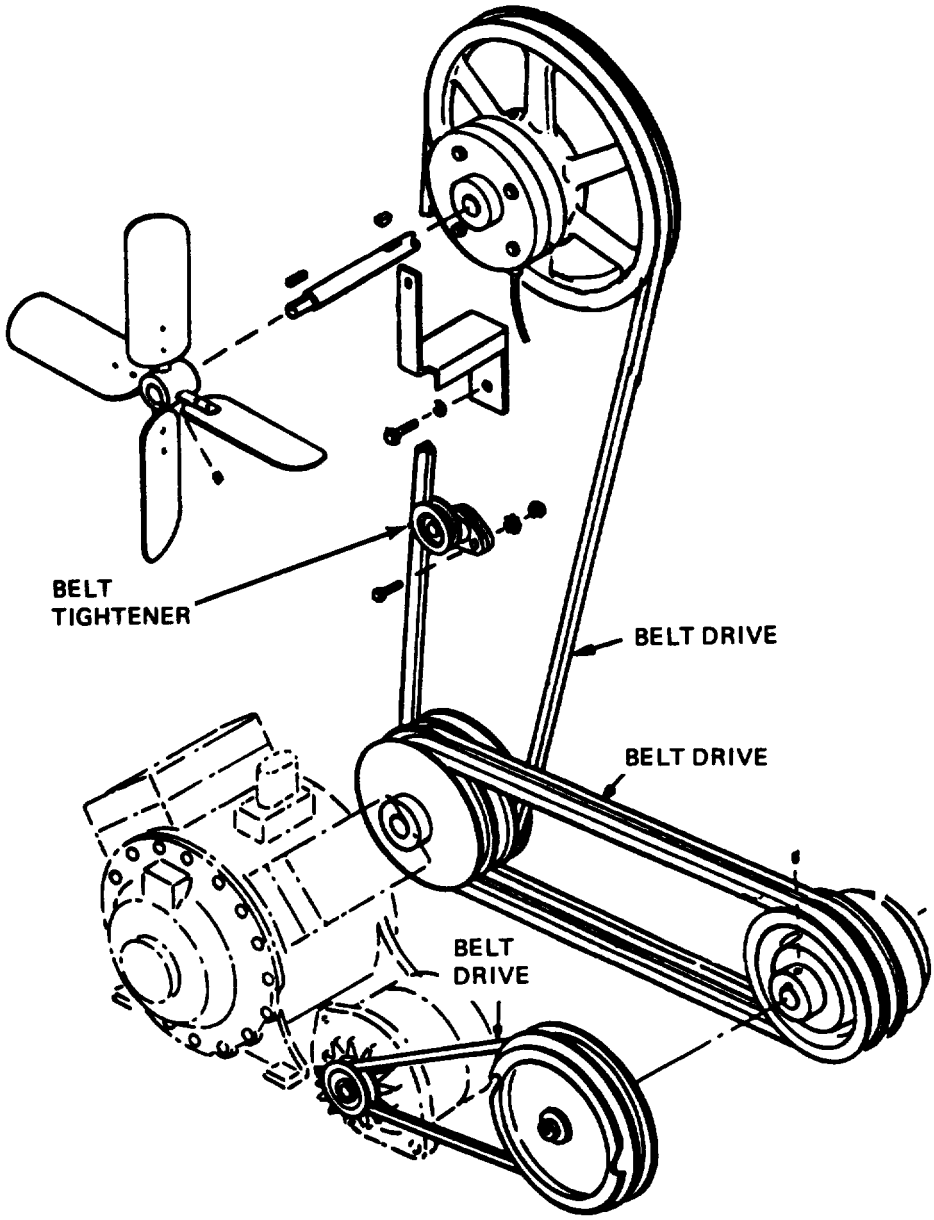
f. Open (counterclockwise) two liquid-line hand valves (2).

g. Open (counterclockwise) hot gas hand valve (1).

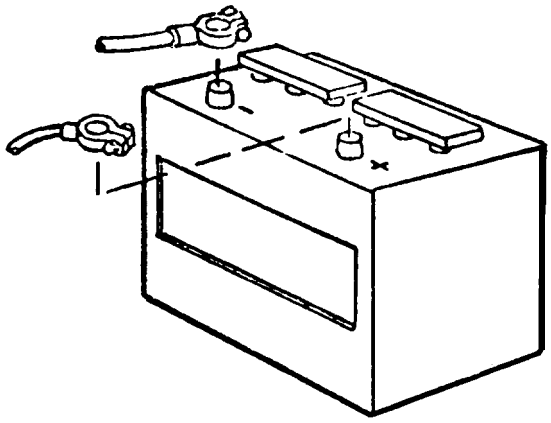


2-10. STARTING THE EQUIPMENT (CONT)

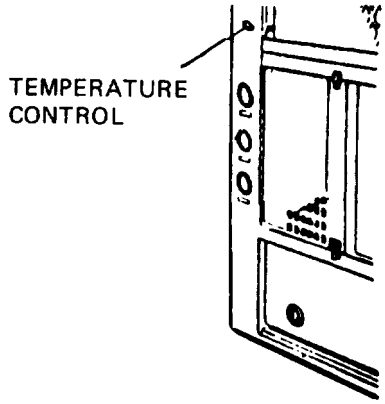
h. Check drive belts for tension. Allow 1/2 inch (1 .3cm) deflection.



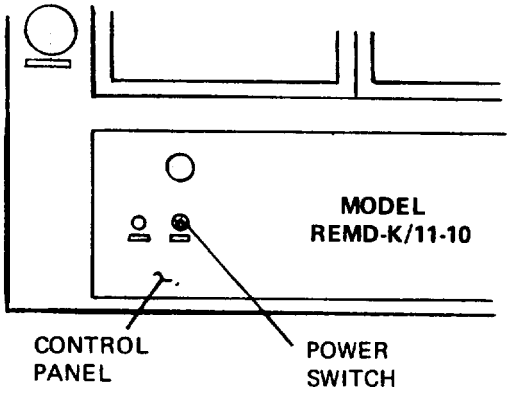
i. Check that battery cables are connected securely.

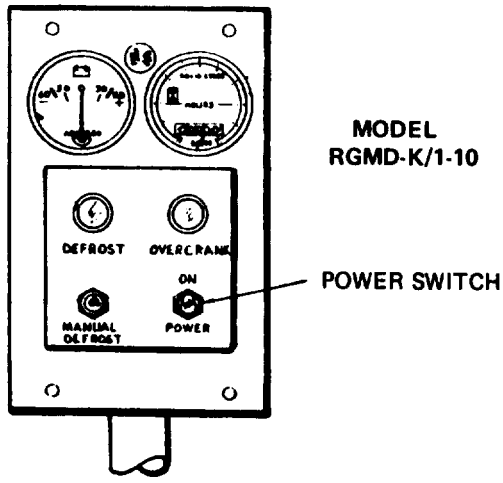


j. Set temperature control to desired temperature 0°F to 35°F (-17.78°C to 1.67°C).



k. Turn on power switch on control panel,

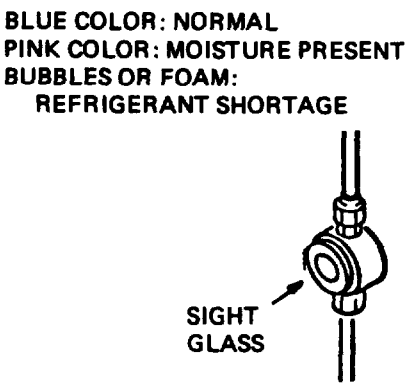


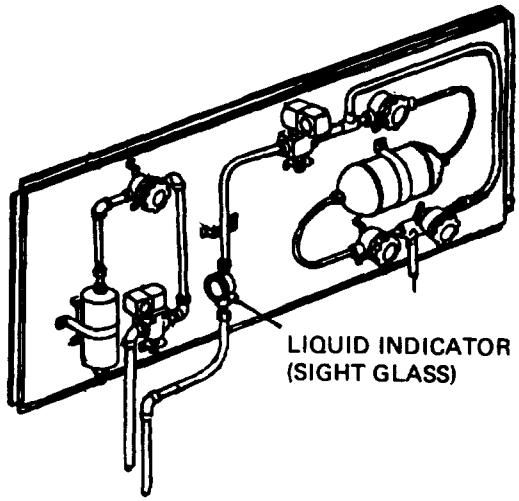


2-10. STARTING THE EQUIPMENT (CONT)

l. Check refrigerant liquid indicator during the first hour of operation. If pink, bubbles, or foam show, report to organizational maintenance. Blue color indicates OK to operate.

m. Keep the refrigerator door closed tight until the temperature is lowered. Don't load the refrigerator until the operating temperature is constant.





2-11. OPERATION UNDER USUAL CONDITIONS

WARNING

WHEN OPERATING GASOLINE ENGINE INDOORS, VENTILATION IS REQUIRED; EXHAUST GAS MUST BE PIPED OUTSIDE.

WARNING

THE UNIT IS GASOLINE OPERATED. USE CAUTION WITH OPEN FLAMES.

WARNING

WHEN WORKING WITH UNIT, USE CAUTION. THE UNIT IS APT TO START AUTOMATICALLY IF IT IS IN STANDBY MODE AND POWER SWITCH IS "ON."

a. For normal operation of the unit, head pressure on the refrigeration unit must not be so high as to trip the high pressure cutout switch (fig. 2-3).

b. Defrosting of the unit is automatic.

c. Manual defrosting can be activated by pushing the "MANUAL DEFROST" switch on the control panel of the gasoline engine model.

2-12. MANUAL DEFROST USING HAND VALVES

CAUTION

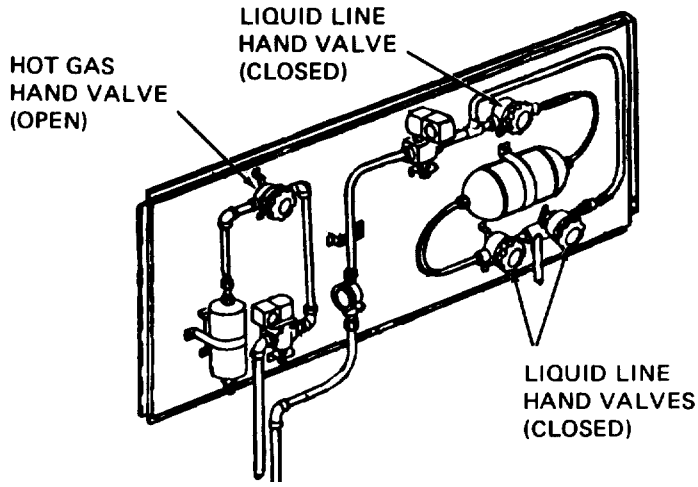
Unit should only be defrosted when unit is operating at O°F (-17.78°C), and frost has accumulated on evaporator.

a. Open hot gas hand valve (counterclockwise) while unit is operating.

b. Close (clockwise) liquid line hand valves.

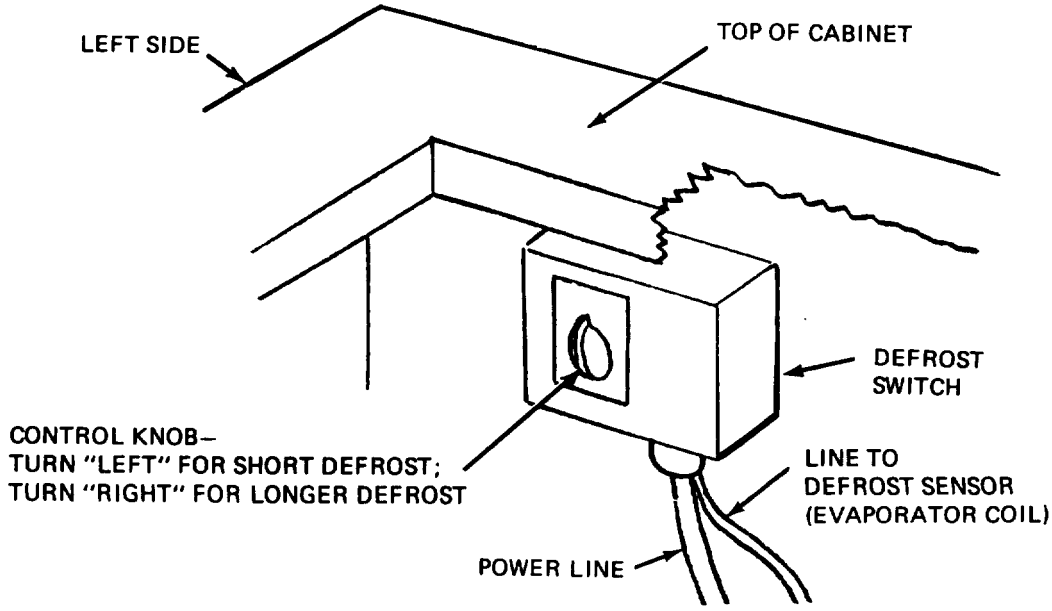
c. Allow unit to operate a sufficient time to defrost coil.

d. With evaporator clear of frost, place hand valves in original position.



2-13. DEFROST SWITCH

Defrost switch timer can be sat for a defrost cycle of approximately 4 to 24 hours. Turn knob left for short defrost; turn right for longer defrost.



2-14. MANUAL DEFROST USING TIMER (REMD-K/l1-10)

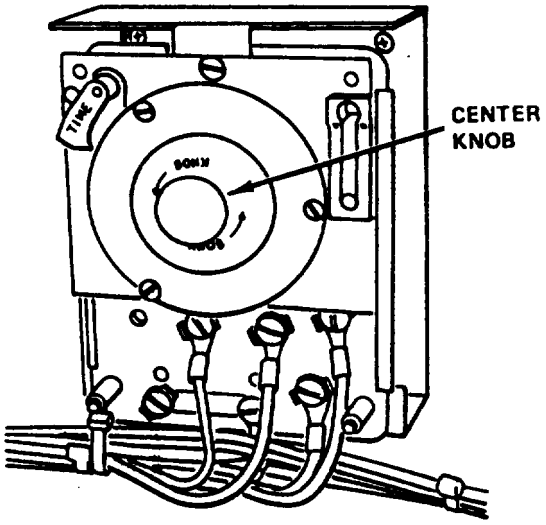
m

Unit should only be defrosted when unit is operating at 0°F (-17.78°C), and frost has accumulated on evaporator.

a. Open control panel.

b. Turn center knob on time clock face clockwise until fan motor stops and hot gas solenoid valve opens.

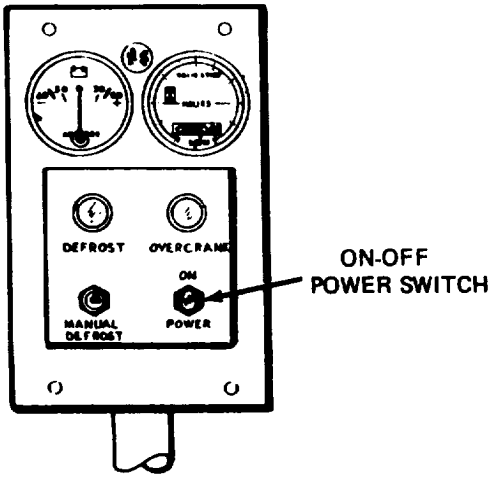
c. Unit will resume automatic cycle after the defrost is completed in approximately 20 to 25 minutes.



2-15. STOPPING THE EQUIPMENT

a. Move the ON-OFF power switch (item 1, fig. 2-1, or item 3, fig 2-2) to the OFF position to stop the refrigeration unit.

b. Perform the "B-Before" preventive maintenance checks and services (table 2-1).



Section IV. OPERATION UNDER UNUSUAL CONDITIONS

2-16. OPERATION IN EXTREME COLD (BELOW O°F/-17.78°C)

a. Keep batteries fully charged.

b. Keep fuel tank full at all times.

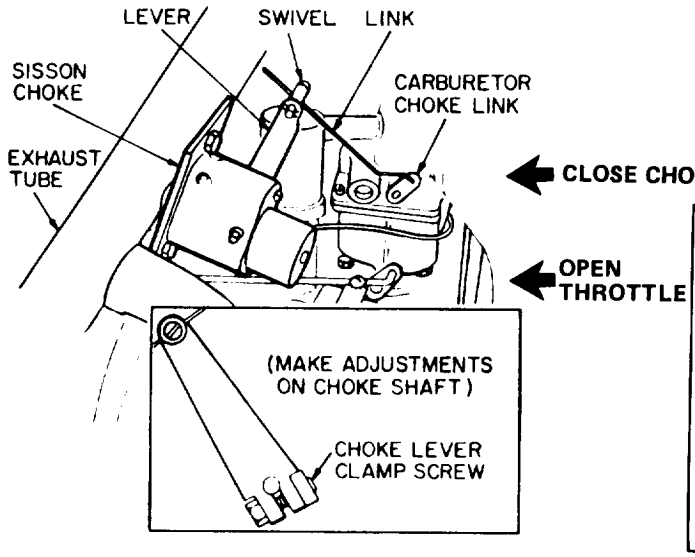
c. Drain and service the fuel filter.

d. Lubricate in accordance with the current lubrication chart (figure 3- 1).

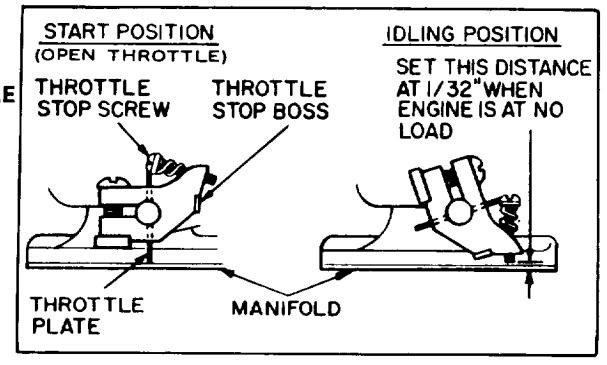
2-17. OPERATION IN EXTREME HEAT

a. Lubricate engine in accordance with current lubrication chart (figure 3- 1).

b. If carburetor floods when attempting to start engine, open throttle, close choke and turn engine crankshaft over several times. If vapor lock is evident, do not attempt to start engine for 15 minutes.



SISSON CHOKE (RGMD-K/1-10)



THROTTLE SCREW ADJUSTMENT (RGMD-K/1-10)

c. Check dial thermometer on refrigeration unit frequently to ascertain proper operation of the unit,

d. Increase frequency of periodic inspection and maintenance operations.

2-18. OPERATION IN DUSTY OR SANDY AREAS

a. Clean refrigeration unit frequently.

b. Remove dirt or dust that accumulates on the condenser or evaporator fans and housings.

c. Inspect condenser frequently. Dirt or dust accumulating on condenser tubes or fins causes increased discharge pressure. If tubes and fins are coated, clean with brush, clean cloth or compressed air.

d. Keep covers on all controls and wiring.

e. Check engine oil frequently for cleanliness.

f. Check air filter frequently for cleanliness.

2-19. OPERATION UNDER RAINY OR HUMID CONDITIONS

a. Inspect evaporator coil frequently. In humid areas, the evaporator coil rapidly collects frost. Any stead y drop in the compound pressure gauge reading generally indicates that the evaporator needs defrosting.

b. Read dial thermometer frequently to check proper operation of the unit.

c. Increase frequency of periodic inspections and maintenance operations.

d. Check engine oil level frequently.

e. High moisture content in the air will cause difficulty in the electrical system. The spark plug, magneto, and wiring may become unserviceable due to high humidity. Clean and dry the affected parts at frequent intervals.

2-20, OPERATION IN SALT WATER AREAS

a. Salt water corrodes metal rapidly. Avoid contact with salt water as much as possible. When equipment has been exposed to salt water, steam clean or wash exposed areas with clean, fresh water as soon as possible.

b. Inspect fins of condenser and evaporator frequently for clogging due to corrosion, and clean when necessary.

2-21. OPERATION IN HIGH ALTITUDES

a. The air pressure above sea level decreases as altitude is increased. The result is a decrease in air pressure to the carburetor causing a too-rich gasoline-air mixture, If this condition interferes with the operation of the refrigeration unit, report to the proper authority.

b. In extremely high altitudes, the conventional type of diaphragm fuel pump used on this equipment may not operate properly. If such a condition exists, report to the proper authority.

c. For each 1000 feet (304.88 meters) altitude above sea-level, there will be a reduction in engine horse-power of 3-1/2%.

2-22. EXTENDED PERIOD SHUTDOWN.

a. Turn off power.

b. Disconnect battery cables.

c. Close liquid line hand valve.

d. Drain fuel from fuel tank.

CHAPTER 3

OPERATOR MAINTENANCE INSTRUCTIONS

Section 1. LUBRICATION INSTRUCTIONS

3-1. GENERAL LUBRICATION INFORMATION

a. This section contains the lubrication chart and lubrication instructions which are supplement to, and not specifically covered in the lubrication chart.

b. The lubrication chart, figure 3-1, is the approved lubrication chart for the gasoline engine driven unit Model RGMD-K/l -10. Other than the power source, the electric motor driven model conversion kit has the same lubrication. No lubrication is required for the electric motor.

3-2. DETAILED LUBRICATION INFORMATION

a. 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 the lubricants, Keep all lubrication equipment clean and ready for use.

b. Cleaning. Keep all external parts not requiring lubrication clean of lubricants, Before lubricating the equipment, wipe all lubrication points free of dirt and grease. Clean all lubrication points after lubricating to prevent accumu l at ion of foreign matter.

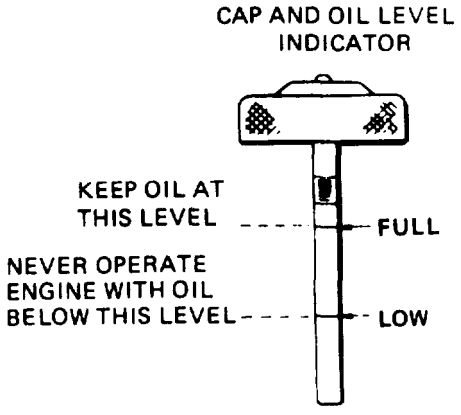
c. Points of Lubrication. Service the lubrication points at proper intervals as illustrated in figure 3-1.

d. Precautions. Before lubricating the equipment, be sure that the starter switch is OF F. Otherwise, automatic controls may start operation of the equipment and cause injury to personnel.

e. Engine Oil.

(1) The crankcase oil level must be checked frequently as oil consumption may increase,

(2) The 0il may require changing more frequently than usual, because contamination by dilution and sludge formation will increase under cold weather operation conditions.



LUBRICATION ORDER

L05-4110-238-12

REFRIGERATION UNIT, MECHANICAL: PANEL TYPE; 10,000 BTU/HR CAPACITY, FOR PORTABLE 600 CU.FT. REFRIGERATOR

(A.R.E. MFG CO., INC. MODEL RGMD–K/1–10 W/ONAN ENGINE MODEL CCKM–MS/2964G AND MODEL REMD–K/11–10 ELECTRIC MOTOR DRIVEN)

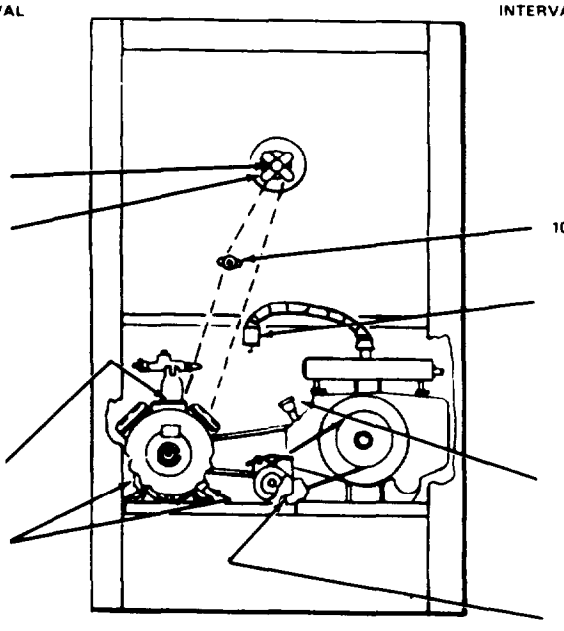
Intervals are based on normal hours of operation. Adjust to compensate for abnormal operation and severe conditions or contaminated lubricants. During inactive periods sufficient lubrication must be performed for adequate preservation.

Clean fittings before lubricating.

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

Drain crankcase when hot. Fill and check level.

LUBRICANT		INTERVAL
Front Shaft Bearing	GAA	1000
Rear Shaft Bearing	GAA	1000
Compressor Oil Fill (See Note 1)	RC0	
Sight Glass (Check Level)		10



INTERVAL		LUBRICANT
1000	GAA	Idler Pulley Bearing
10	0E	Air Cleaner (See Note 2)
10	0E	Engine Oil Fill And Level (Check Level)
50	0E	Engine Oil Drain (Drain and Refill)

TOTAL TASK–HR		TOTAL TASK–HR	
INTERVAL	TASK–HR	INTERVAL	TASK–HR
10	0 2	1000	0 2

Figure 3-1. Lubrication Order (Sheet 1 of 2)

☆U.S. Government Printing Office: 1990-754-029/20154

PIN: 054702-003

KEY

LUBRICANTS	CAPACITY	EXPECTED TEMPERATURES			TOTAL MAN-HR
		Above +32°F (0°C)	+40°F to -10°F (4.44°C to 12.22°C)	0°F to -65°F (-17.78 to 18.33°C)	
GAA–GREASE, Automotive & Artillery		ALL TEMPERATURES			*Intervals* given are in hours of normal operation.
0E–OIL, Engine, Heavy Duty		0E/HD030	0E/MD010	0EA	
Crankcase	3 1/2 qts (3.31 Liter)				
Oil Cleaner	6 ounces (176.47 ml)				
0ES–OIL, Engine, Sub zero	S/A Above				
RC0–OIL, Lubricating, Refrigerant, Compressor	**6 pints (2.83 liters)**	ALL TEMPERATURES			

NOTES:

1. COMPRESSOR UNIT. This unit will be serviced by Direct or General Support Personnel only.
2. AIR CLEANER. Refill oil reservoir to level mark every 50 hours; disassemble entire unit; re-oil and reassemble.
3. LUBRICANTS. The following is a list of lubricants with the Military Symbols and applicable Specification numbers.

   0E = MIL L 2104
   RC0 = VV G 825
   GAA = MIL G 10924
   0ES = MIL L 10295

4. FOR OPERATION OF EQUIPMENT IN PROTRACTED COLD TEMPERATURES BELOW 10°F (.23°C). Remove lubricants prescribed in the key for temperatures above 10°F (.12°C). Relubricate with lubricants specified in the key for *temperatures below* 10°F (.23°C).

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

General, United States Army
Chief of Staff

OFFICIAL

Major General, United States Army
The Adjutant General

Figure 3-1, Lubrication Order (Sheet 2 of 2)

3-2. DETAILED LUBRICATION INFORMATION (CONT)

f. Air Cleaner Service.

(1) **Remove screw and drop down oil cup to expose wire screen filter element as indicated in figure 3-2.**

(2) **Clean oil cup and wire screen filter element with an approved cleaning agent (App.E, Item 17).**

(3) **Fill oil cup with same grade of oil used in engine crankcase.**

(4) **Replace filter element every 200 hours of operation.**

(5) **Assemble oil cup with screw and lockwasher into air cleaner as shown in figure 3-2.**

NOTE

This service will vary from several days during operation in comparatively clean conditions, to twice a day in dusty conditions.

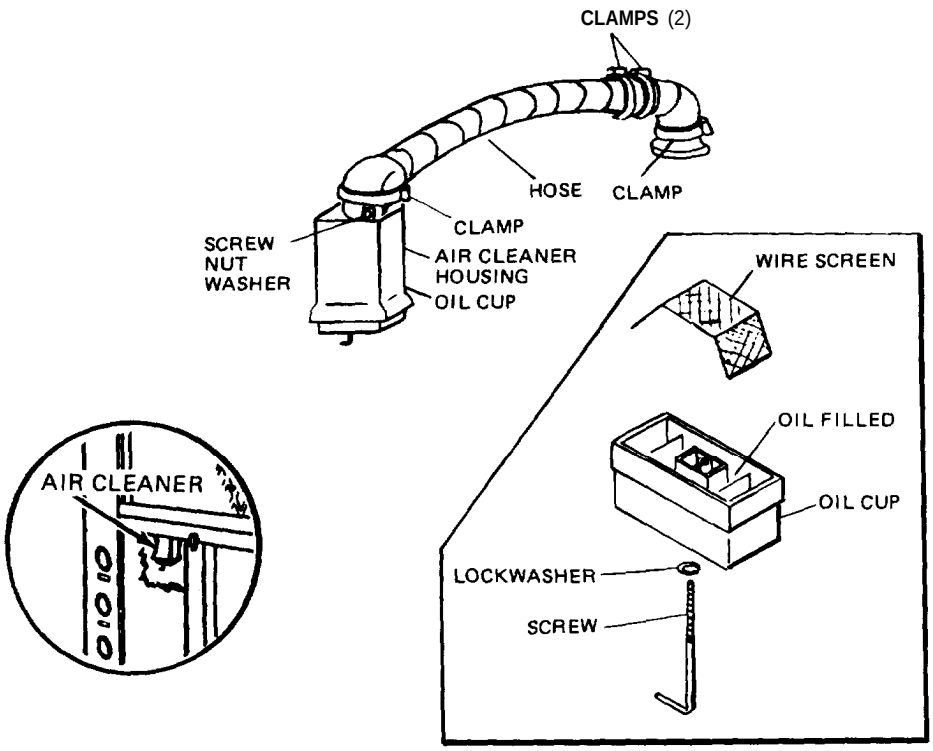
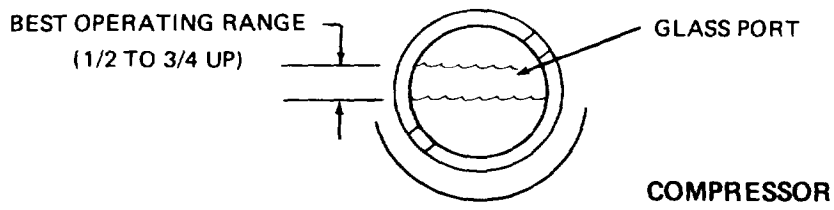


Figure **3-2. Air Cleaner Service**

g. Every 1000 operating hours, lubricate fan shaft and pulley bearings with GAA

h. Check the compressor oil level.



Section II. OPERATOR'S TROUBLESHOOTING

3-3. GENERAL

a. This section contains troubleshooting information for locating and correcting most of the operating troubles which may develop in the refrigeration unit. Each malfunction for an individual component, unit, or system is followed by a list of tests or inspections which may help you to determine probable cause and corrective actions to take. You should 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 actions, If a malfunction is not listed, or is not corrected by listed corrective actions, notify organizational maintenance.

3-4. TROUBLESHOOTING TABLE

NOTE

Before you use this table, be sure you have performed all applicable operating checks.

Table 3-1. Troubleshooting

MALFUNCTION TEST OR INSPECTION CORRECTIVE ACTION
ENGINE
1. ENGINE FAILS TO CRANK WHEN POWER SWITCH IS TURNED ON.
Step 1. Check to see if electrolyte level in battery cells is above the top of the plates.
If electrolyte is below top of plates, add distilled or clean water until electrolyte level is three-fourths of an inch above the separators. Recharge battery. Request organizational maintenance to replace defective battery.
Step 2. Inspect for loose, corroded, or broken battery cables.
Request organizational maintenance to replace defective cables.
2. ENGINE CRANKS BUT FAILS TO START.
Step 1. Check for empty fuel tank.
Refill fuel tank if empty or low.
Step 2. Check for dirty fuel filter, broken, or clogged fuel line.
Clean or replace filter. Report clogged line to organizational maintenance.
3. ENGINE MISSES OR RUNS ERRATICALLY,
Check for water or dirt in gasoline or for improper grade of gasoline.
Refer to organizational maintenance and refill tank with proper quality gasoline.

Table 3-1. Troubleshooting (Cont)

MALFUNCTION TEST OR INSPECTION CORRECTIVE ACTION
4. ENGINE KNOCKS OR DEVELOPS EXCESSIVE NOISE.
Step 1. Check oil level.
Add oil to crankcase.
Step 2. Check to see if oil may be diluted.
Refer to organizational maintenance for service and refill with proper oil according to current lubrication chart.
Step 3. Check for proper grade of gasoline.
Request organizational maintenance to drain and refill with proper grade.
Step 4. Inspect for worn muffler.
Request organizational maintenance to replace muffler.
5. ENGINE STOPS SUDDENLY.
Step 1. Check fuel supply
Refill fuel tank with gasoline.
Step 2. Check quality of gasoline for possible water, dirt or gum.
Refer to organizational maintenance and refill fuel tank with proper quality gasoline.
6. ENGINE WILL NOT IDLE SMOOTHLY.
Check quality of gasoline for water, dirt or gum.
Refer to organizational maintenance and refill with proper gasoline.
7. ENGINE OIL PRESSURE LOW.
Check oil level and oil quality (too light or diluted).
Fill crankcase with proper oil according to current lubrication chart.
8. ENGINE OVERHEATS.
Step 1. Check for overload on engine.
Refer to organizational maintenance for service.
Step 2. Check for low crankcase oil supply.
Replenish oil to proper level.
Step 3. Check for quality of oil.
Request organizational maintenance to drain and refill with proper oil.
Step 4. Check engine for restricted air cooling circulation.
Ventilate engine for sufficient supply of fresh air for cooling and combustion. Clean dirty or oily cooling fins.
Step 5. Check for restricted exhaust.
Clean or free restriction.

Table 3-1. Troubleshooting (Cont)

MALFUNCTION TEST OR INSPECTION CORRECTIVE ACTION
9. EXHAUST SMOKE EXCESSIVE.
Check for improper grade of engine oil.
Request organizational maintenance to drain and refill. Refer to current lubrication chart.
10. ENGINE LACKS POWER.
Inspect air cleaner for clogging.
Service air cleaner.
11. ENGINE OIL CONSUMPTION EXCESSIVE.
Check for leaky engine base drain plug.
Refer to organizational maintenance for service.
REFRIGERATION SYSTEM
12. REFRIGERATION UNIT WILL NOT OPERATE.
Step 1. Inspect thermostat for proper temperature.
Adjust for proper temperature.
Step 2. Break or short circuit in wiring.
Notify organizational maintenance.
13. REFRIGERATION UNIT RUNS CONTINUOUSLY.
Step 1. Check for low compressor speed.
Inspect drive belts for proper tension. Notify organizational maintenance.
Step 2. Check compressor discharge valve to see if closed too far.
Turn valve stem out.
Step 3. Check for possible abnormally warm product load.
Remove part of load or allow absorption of heat.
Step 4. Test for leeks through refrigerator walls or joints.
Seal all leaks or refer to organizational maintenance.
Step 5. Check to see if thermostat is set too low.
Reset thermostat to desired setting.

Table 3-1. TROUBLESHOOTING (Cont)

MALFUNCTION TEST OR INSPECTION CORRECTIVE ACTION
14. REFRIGERATION UNIT OPERATES TOO LONG.
Step 1. Check for loose compressor belts. Notify organizational maintenance.
Step 2. Check for abnormal heat leakage. Seal cracks. Notify organizational maintenance.
Step 3. Check for excessive product load. Remove part of load or allow more time for absorption of heat.
Step 4. Check for partial l y closed receiver inlet valve. Open valve as far as it will go.
Step 5. Check for dirty condenser. Clean condenser.
Step 6. Check evaporator coil for excessive frost. Defrost unit.
Step 7. Check for obstruction to air flow through evaporator. Notify general support maintenance.
Step 8. Check thermostat for too low setting. Reset thermostat.
Step 9. Check for shorted thermostat. Notify organizational maintenance.
15. OPERATION OF UNIT NOISY.
Step 1. Check for loose compressor pulley. Notify organizational maintenance.
Step 2. Check bearing lubrication. Notify organizational maintenance.
Step 3. Inspect for unserviceable bearings. Notify organizational maintenance.
Step 4. Check for loose drive pulley. Notify organizational maintenance.
Step 5. Inspect for worn belts. Notify organizational maintenance.
Step 6. Check for loose evaporator fan or condenser fan. Notify organizational maintenance.
Step 7. Check for fan blades striking housing. Notify organizational maintenance.

Section III. OPERATOR'S MAINTENANCE

3-5. GENERAL

The operator's maintenance is revered in this section.

3-6. FUEL CAP AND STRAINER SERVICE (FIG. 3-3)

Service the fuel cap and strainer after each 500 hours of operation. Clean the cap and strainer in an approved cleaning solvent (Appendix E, Item 17).

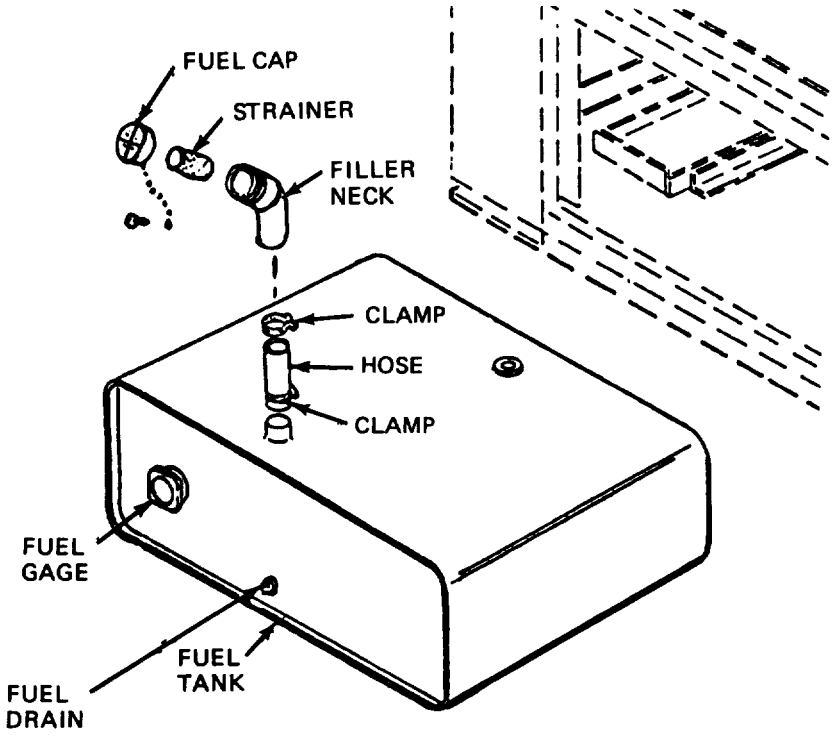


Figure 3-3. Fuel Cap and Strainer Service (Model RGMD-K/1-10)

CHAPTER 4

ORGANIZATIONAL MAINTENANCE INSTRUCTIONS

Section 1. REPAIR PARTS, SPECIAL TOOLS AND EQUIPMENT

4-1. SPECIAL TOOLS AND EQUIPMENT

No special tools or equipment are required for the operator or organizational maintenance personnel for the refrigeration unit.

4-2. ORGANIZATIONAL MAINTENANCE REPAIR PARTS

Organizational Maintenance repair parts are listed and illustrated in TM 5-4110-238-24P.

Section II. SERVICE UPON RECEIPT OF MATERIEL AND PREPARATION FOR MOVEMENT

4-3. SERVICE UPON RECEIPT

a. Unloading. The refrigeration unit is shipped in a crate which has a skid pallet base (fig. 4-1). It should be handled with fork lift equipment, but may be handled by crane and sling. Reasonable precaution should be taken to prevent damage by dropping or bumping.

NOTE

Do not destroy the shipping crate as it is designed for e-use.

b. Unpacking. The refrigeration unit (fig. 4-1) is secured in the shipping crate by two uprights with two horizontal bars and is supported by a skid base. First remove the crate top, then the four side panels. Remove the four bolts securing the uprights to the unit.

c. Inspecting and Servicing.

(1) Inspection.

(a) Visually inspect the unit for physical damage. Make certain all publications and overpack kit parts are on unit and in good condition,

(b) Open all doors and inspect for missing or damaged parts. Report all discrepancies to the proper authority.

(c) Check engine and compressor for oil leakage. Report any leakage to the proper authority.

(d) Check operation of valves, controls and gauges.

(e) Use a halide torch over the entire unit to inspect for refrigerant leakage.

(2) Servicing.

(a) Refer to para. 2-8 and 2-9 for operator preventive maintenance services.

(b) Lubricate the refrigeration unit in accordance with the current lubrication chart.

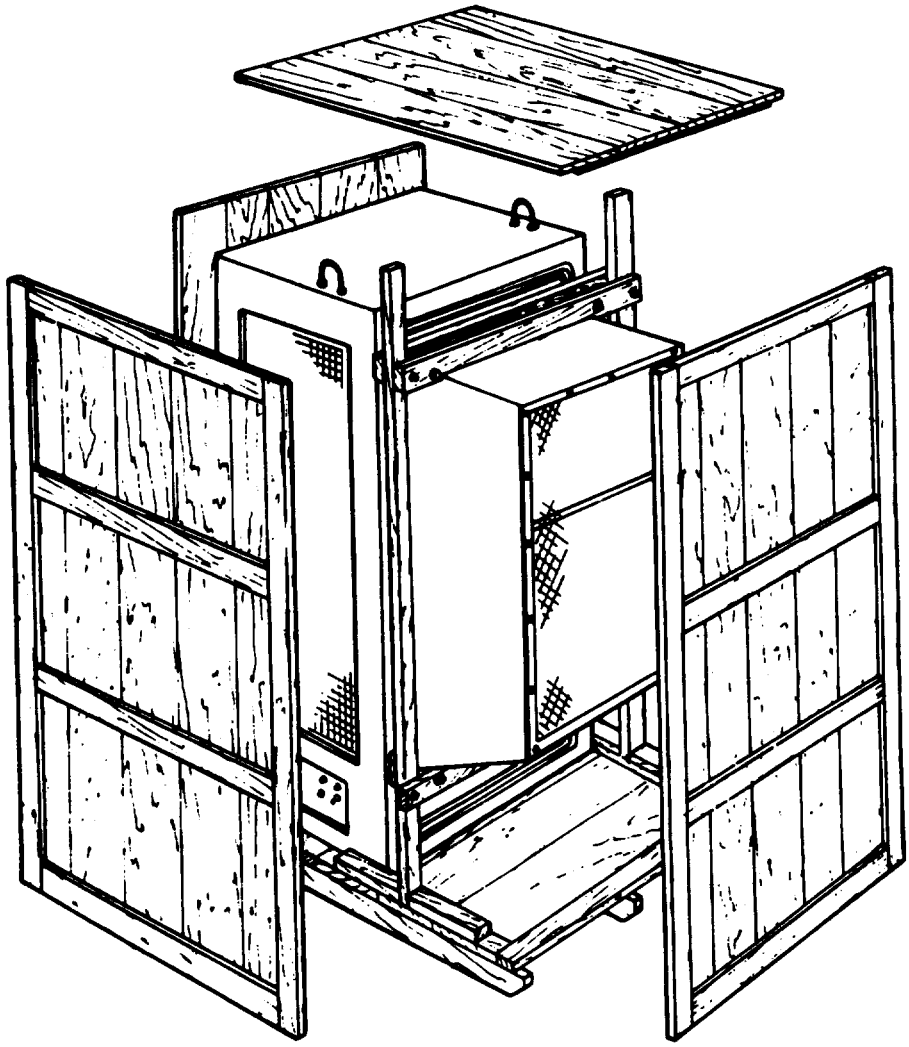


Figure 4-1. Unpacking Refrigration Unit

4-4. INSTALLATION, SETTING UP, DISMANTLING AND REINSTALLATION

WARNING

(RGMDK/1-10)

POISON
CAUSES SEVERE BURNS

ELECTROLYTE (ACID) BATTERY FLUID CONTAINS SULFURIC ACID. AVOID CONTACT WITH SKIN, EYES, OR CLOTHING. TO PREVENT ACCIDENTS, NEUTRALIZE EXCESS ACID WITH BAKING SODA AND RINSE EMPTY CONTAINER WITH WATER.

ANTIDOTE:

EXTERNAL- FLUSH WITH WATER.

INTERNAL- DRINK LARGE QUANTITIES OF WATER OR MILK. FOLLOW WITH MILK OF MAGNESIA, BEATEN EGGS, OR VEGETABLE OIL. CALL PHYSICIAN IMMEDIATELY.

EYES-FLUSH WITH WATER FOR 15 MINUTES AND GET PROMPT MEDICAL ATTENTION.

NOTE

Use an electrolyte with a specific gravity of 1.280. Do NOT use a tropical electrolyte which will lower battery reserve capacity.

a. Installation of Separatelv Packed Components. Battery acid pack must be used to fill lead acid storage battery before attempting to start refrigeration unit gas engine.

b. Installation or Setting Up Instructions.

(1) Location. The refrigeration unit must be mounted securely in the refrigerator wall. The evaporator air outlet and return must not be restricted by any type of covers. Adequate space should be provided at the front and sides of the unit for opening the doors in service or maintenance procedures.

(2) Outdoor Installation. Installation consists of positioning the unit in the refrigerator wall and securing the unit with four mounting studs in the unit. Tighten u nit to maximum limit of gasket compression provided by wood limit straps.

(3) Indoor Installation. Same as outdoor.

c. Dismantling for Movement.

(1) Limited Movement. For moving a short distance, involving limited handling, it is necessary only to detach the unit from the refrigerator and use forklift equipment to place the unit on a transport vehicle.

(2) Extensive Movement. Pump down refrigerant and close all refrigerant valves. Detach the unit from the refrigerator. Seal all openings in the cabinet with barrier material and sealing tape. Cover entire unit with barrier material. Repack the unit in its original shipping crate,by placing on skid base and securing the four side panels and crate top with four bolts. Use forklift equipment to place the unit in a transport vehicle.

d. Reinstallation After Movement. Refer to paragraph 4-4b. above.

¤ U.S. GOVERNMENT PRINTING OFFICE: 1991 554-123/20120

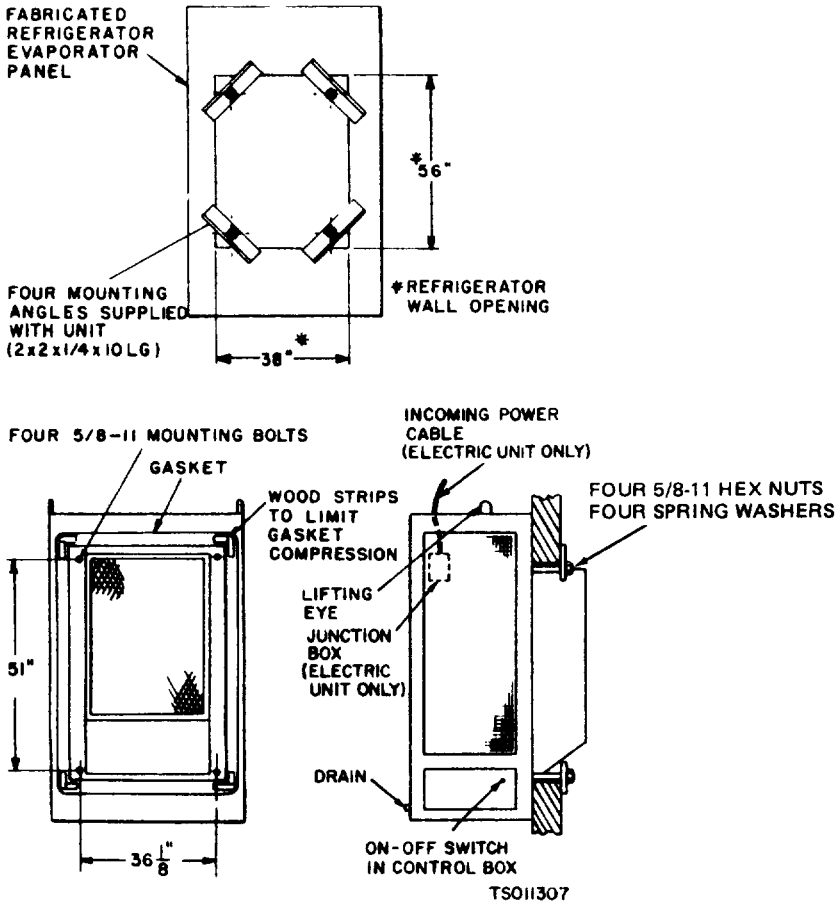


Figure 4-2. Installation Diagram

Section III. PREVENTIVE MAINTENANCE CHECKS AND SERVICES (PMCS)

4-5. GENERAL

a. This section contains a tabulated listing of preventive maintenance checks and services which must be performed by organizational maintenance 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 4-1 for quarter! y preventive maintenance services.

4-6. ORGANIZATIONAL PREVENTIVE MAINTENANCE CHECKS AND SERVICES TABLE

WARNING

BEFORE STARTING PMCS MAKE SURE POWER SWITCH ON CONTROL PANEL IS "OFF." OTHERWISE, AUTOMATIC CONTROLS MAY START OPERATION OF EQUIPMENT AND CAUSE INJURY TO PERSONNEL.

Table 4-1. Organizational Preventive Maintenance Checks and Services Quartley Schedule

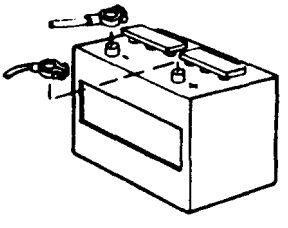
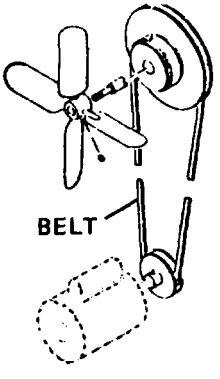
Item No.	ITEM TO BE INSPECTED PROCEDURE	Equipment is not Ready/Available If:
	NOTE: Visually inspect for evidence of lubricant and fuel leaks concurrently with the daily service checks. Lubricate in accordance with current lubrication chart,	
1	BATTERY Tighten loose cables and mountings, Remove corrosion. Fill to 3/8 inch (.95cm) above the plates. Clean vent holes in filler caps before installation. In freezing weather, run engine minimum of one hour after adding water. Replace a cracked or leaking battery. 	Dead battery.
2	FAN BELT Adjust the fan V-belt to three-fourths inch finger deflection midway between the pulleys. Replace a worn, frayed or cracked belt. 	Belts are cracked.

Table 4-1. Organizational Preventive Maintenance Checks and Services Quarterly Schedule (cont)

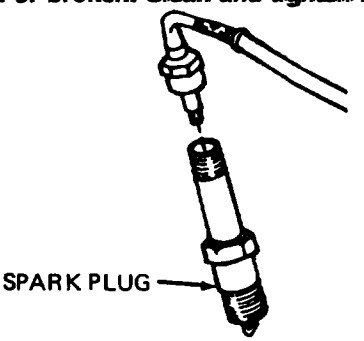
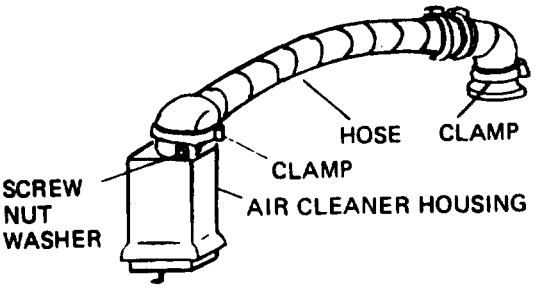
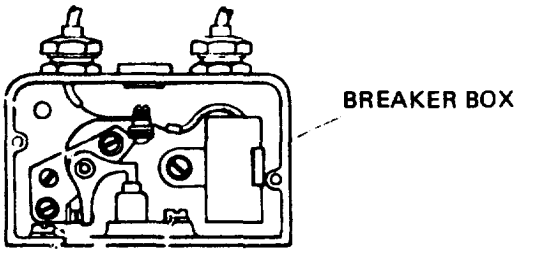
Item No.	ITEM TO BE INSPECTED PROCEDURE	Equipment is not Ready/Available If:
3	**ENGINE SPARK PLUG** Replace spark plug that has a cracked insulator or burned electrodes. 'Clean and set spark plug gap to 0.025 inch (.063cm). Torque spark plugs to 25 to 30 foot pounds (33.9 to 40.68 Newton-Meters). Replace lead which is frayed or broken. Clean and tighten lead connections.  	Corroded or cracked spark plug.
4	**AIR CLEANER** Clean as required. This service will vary from a few days operation in comparatively clean conditions to twice a day in dusty conditions.  	Dirty air cleaner.
5	**BREAKER POINTS** Replace pitted or burned breaker points. Proper point gap adjustment is 0.020 inch (.051 cm). Check adjustment every 200 hours of operation.  	Pitted or burned points.

Table 4-1. Organizational Preventive Maintenance Checks and Services Quarterly Schedule (Cont)

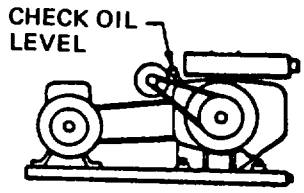
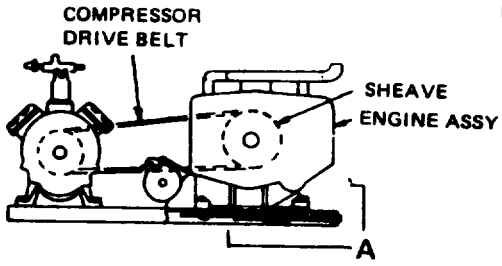
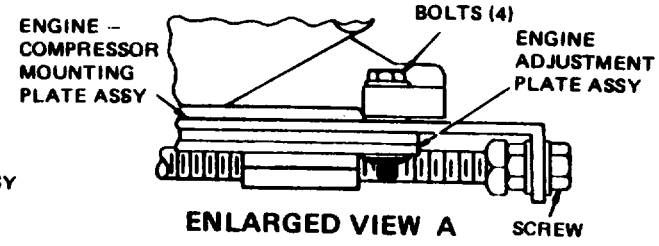
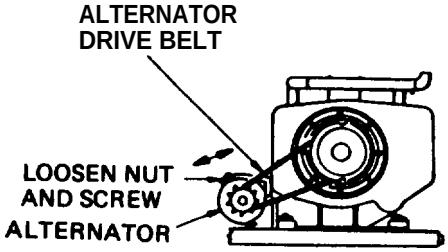
Item No.	ITEM TO BE INSPECTED PROCEDURE	Equipment is not Ready/Available If:
6	ENGINE OIL LEVEL Add oil as indicated by the engine oil level indicator (dip-stick). Refer to current lubrication chart.  	Low or no oil.
7	COMPRESSOR DRIVE V-BELTS Adjust belts to proper tension. Replace worn, frayed or cracked belts. If one belt is badly worn, both belts must be replaced.   NOTE: LOOSEN FOUR BOLTS. ADJUST COMPRESSOR DRIVE BELT BY TURNING SCREW. WHEN PROPER BELT TENSION IS OBTAINED, RE-TIGHTEN FOUR BOLTS HOLDING ENGINE TO ENGINE ADJUSTMENT PLATE ASSY.	Cracked belts.
8	ALTERNATOR V-BELT Adjust belt to proper tension. Replace worn, frayed or cracked belt.  NOTE: Move alternator forward to tighten belt, or away to loosen. Retighten nuts and screws after obtaining proper belt tension.	Cracked belt.

Table 4-1. Organizational Preventive Maintenance Checks and Services Quarterly Schedule (Cont)

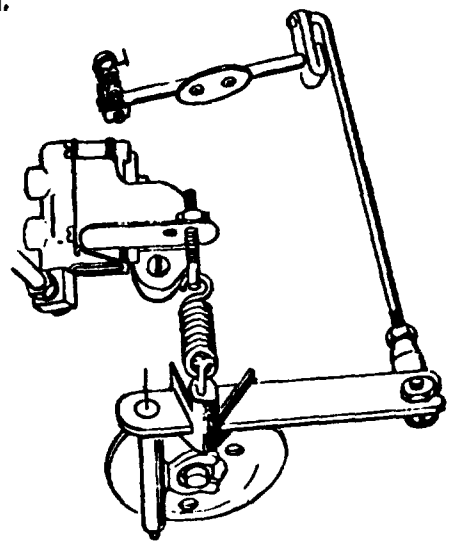
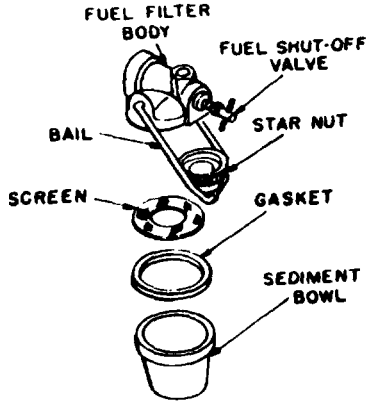
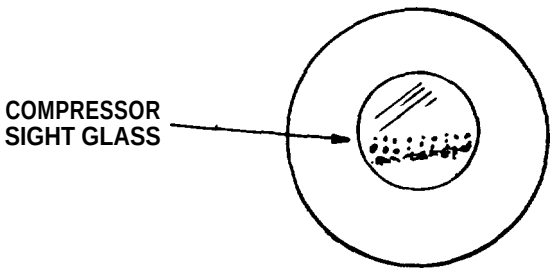
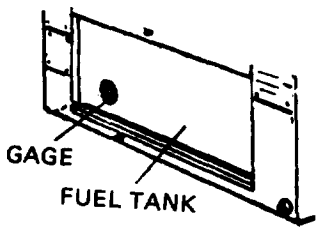
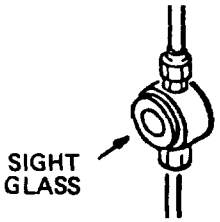
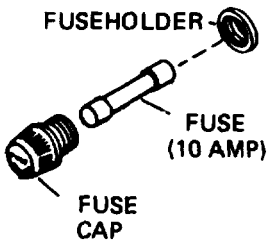
Item No.	ITEM TO BE INSPECTED PROCEDURE	Equipment is not Ready/Available if:
9	**GOVERNOR LINKAGE** Inspect and clean governor linkage. Adjust governor system for correct engine speed. 	Worn linkage.
10	**FUEL FILTER** Tighten thumb nut if leaking. Service the fuel filter by cleaning screen and bowl.  NOTE: Be sure fuel shutoff valve is closed before servicing fuel filter. Service fuel filter after each 100 hours of operation. Clean the screen and bowl with cleaning solvent (Appendix E, Item 17).	Dirty or clogged filter screen.

Table 4-1. Organizational Preventive Maintenance Checks and Services Quarterly Schedule (Cont)

Item No.	ITEM TO BE INSPECTED PROCEDURE	Equipment is not Ready/Available if:
11	**COMPRESSOR SIGHT GLASS** Oil level should be 1/2 to 3/4 up sight glass. Refer to Direct Support unit for adding oil.  	Cracked or broken sight glass.
12	**FUEL TANK** Add fuel as required. Tighten loose mounting. Replace leaking fuel tank. Replace cap gaskets. Clean fuel cap strainer.  	Leaking fuel tank.
13	**OPERATION NOISE OR VIBRATION** During operation, observe for any unusual noise or vibration.	
14	**REFRIGERATION SYSTEM** Check visually and check with halide detector all connections of the refrigeration system for leaks. Check liquid line sight glass for air bubbles or milky appearance. Report deficiencies to Direct Support unit.  	Refrigerant leaks.
15	**FUSE** Visually check fuse. Replace burned out fuse.  	Burned out fuse.

Section IV. ORGANIZATIONAL TROUBLESHOOTING

4-7. GENERAL

a. This section contains troubleshooting information for locating and correcting most of the operating troubles which may develop in the refrigeration unit. Each malfunction for an individual component, unit, or system is followed by a list of tests or inspections which will help you to determine probable causes and corrective actions to take. You should 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 actions. If a malfunction is not listed or is not corrected by listed corrective actions, notify Direct Support Maintenance.

4-8. TROUBLESHOOTING TABLE

NOTE

Before you use this table, be sure you have performed all applicable operating checks.

Table 4-2. Troubleshooting

MALFUNCTION TEST OR INSPECTION	CORRECTIVE ACTION
ENGINE	
1. ENGINE FAILS TO CRANK WHEN STARTER BUTTON IS DEPRESSED.	
Step 1. Check to see if electrolyte level in battery cells is above the top of the plates.	If electrolyte is below top of plates, add distilled or clean water until electrolyte level is three-fourths of an inch above the separators. Recharge batteries or replace battery.
Step 2. Inspect for loose, corroded, or broken battery cables.	Clean corroded cables. Tighten loose connections at battery, ground, and starter. Replace defective cables.
Step 3. Inspect and test starter assembly.	Replace defective starter assembly.
Step 4. Inspect and test starter solenoid.	Replace defective starter solenoid.
2. ENGINE CRANKS BUT FAILS TO START.	
Step 1. Check for empty fuel tank.	Refill fuel tank if empty or low.
Step 2. Check for dirty fuel filter, broken or clogged fuel line.	Clean or replace fuel filter and/or fuel line.
Step 3. Check and test ignition system for timing, spark plug gap, worn points, improper gap setting, bad ignition coil or condenser, faulty spark plug wires.	Tighten, adjust or replace plugs, points, coil or condenser, spark plug wires.

Table 4-2. Troubleshooting (Cont)

MALFUNCTION TEST OR INSPECTION	CORRECTIVE ACTION
Step 4. Check for proper functioning of carburetor.	Clean and adjust carburetor. Replace defective carburetor.
Step 5. Inspect and test for defective fuel pump.	Replace fuel pump.
Step 6. Check for leaky intake manifold.	Replace unrepairable gasket or intake manifold.
3. ENGINE MISSES OR RUNS ERRATICALLY.	
Step 1. Check for water or dirt in gasoline or for improper grade of gasoline.	Drain and refill tank with proper fuel.
Step 2. Check carburetor for proper functioning.	Adjust carburetor.
step 3. Inspect for loose or defective spark plug leads.	Tighten, clean or replace spark plug leads.
Step 4. Check for loose or defective spark plugs.	Tighten, clean or replace spark plugs.
Step 5. Check for defective magneto.	Clean, regap, or replace points.
Step 6. Check for defective fuel pump.	Replace fuel pump.
Step 7. Check for leaky manifold.	Replace gasket or manifold.
4. ENGINE KNOCKS OR DEVELOPS EXCESSIVE NOISE,	
Step 1. Check oil level.	Add oil to crankcase.
Step 2. Check to see if oil may be diluted.	Drain crankcase and refill with proper oil according to current lubrication chart.
Step 3. Check for proper grade of gasoline.	Drain and refill with proper grade.
Step 4. Check engine for proper timing.	Time engine,
Step 5. Inspect for worn muffler.	Replace muffler.

Table 4-2. Troubleshooting (Cont)

MALFUNCTION TEST OR INSPECTION CORRECTIVE ACTION
5. ENGINE STOPS SUDDENLY.
Step 1. Check fuel supply.
Refill fuel tank with gasoline.
Step 2. Check quality of gasoline for possible water, dirt or gum.
Drain and refill fuel tank with proper quality gasoline.
Step 3. Check engine for vapor lock.
Re-start engine after 15 minutes.
Step 4. Check for defective ignition system components.
Clean, adjust, repair or replace defective components.
6. ENGINE WILL NOT IDLE SMOOTHLY.
Step 1. Check setting of carburetor high speed needle valve.
Adjust high speed needle valve.
Step 2. Check quality of gasoline for water, dirt or gum.
Drain and refill with proper gasoline.
Step 3. Inspect fuel lines for restrictions or leaks.
Clean and replace lines.
Step 4. Check for defective ignition system components.
Clean, adjust, repair or replace defective components.
7. ENGINE OIL PRESSURE LOW.
Check oil level and oil quality (too light or dilute).
Fill crankcase with proper oil according to current lubrication chart.
8. ENGINE OVERHEATS.
Step 1. Check for overload on engine.
Reduce load.
Step 2. Check for low crankcase oil supply.
Replenish oil to proper level.
Step 3. Check for correct grade and quality of oil.
Drain and refill with proper oil.
Step 4. Check engine for restricted air cooling circulation.
Ventilate engine for sufficient supply of fresh air for cooling and combustion. Clean dirty or oily cooling fins .
Step 5. Check for restricted exhaust.
Clean or free restriction.
Step 6. Check for too rich fuel air mixture.
Adjust carburetor high speed needle valve.
Step 7. Check for faulty engine timing.
Time engine.

Table 4-2. Troubleshooting (Cont)

MALFUNCTION TEST OR INSPECTION CORRECTIVE ACTION
9. EXHAUST SMOKE EXCESSIVE.
Check for improper grade of engine oil.
Drain and refill. Refer to current lubrication chart,
10. ENGINE LACKS POWER.
Step 1. Inspect air cleaner for clogging.
Service air cleaner.
Step 2. Check for defective governor.
Adjust governor.
11. ENGINE OIL CONSUMPTION EXCESSIVE.
Check for leaky engine base drain plug.
Tighten or replace drain plug.
REFRIGERATION SYSTEM
12. REFRIGERATION UNIT WILL NOT OPERATE.
Step 1. Inspect thermostat for misadjustment.
Adjust or replace.
Step 2. Break or short circuit in wiring.
Trace wiring and repair.
13. REFRIGERATION UNIT RUNS CONTINUOUSLY.
Step 1. Check for low compressor speed.
Adjust engine governor; inspect drive belts for proper tension and adjust.
Step 2. Check compressor discharge valve to see if closed too far.
Turn valve stem out.
Step 3. Check for possible abnormally warm product load.
Remove part of load or allow absorption of heat.
Step 4. Test for leaks through refrigerator walls or joints.
Seal all leaks.
Step 5. Check to see if thermostat is set too low.
Reset thermostat to desired setting.
Step 6. Inspect thermostat terminal leads for shorting.
Repair leads or wiring.
Step 7. Inspect thermostat for contacts fused in closed position.
Replace thermostat.
Step 8. Inspect for loose thermostat bulb.
Tighten.

Table 4-2. Troubleshooting (Cont)

MALFUNCTION TEST OR INSPECTION CORRECTIVE ACTION
14. REFRIGERATION UNIT OPERATES TOO LONG.
Step 1. Check for loose compressor belts.
Adjust drive belt tension,
Step 2. Check for abnormal heat leakage from refrigerator.
Seal cracks, replace, gaskets
Step 3. Check for excessive product load.
Remove part of load or allow more time for absorption of heat.
Step 4. Check for partially closed receiver inlet valve.
Open valve as far as it will go.
Step 5. Check for dirty condenser.
Clean condenser.
Step 6. Check evaporator coil for excessive frost.
Defrost unit.
Step 7. Check for obstruction to air flow through evaporator.
Clean dirt from evaporator or move stored material that restricts air circulation through coil.
Step 8. Check thermostat for too low setting.
Reset thermostat.
Step 9. Check for shorted thermostat.
Repair wiring or replace thermostat.
15. OPERATION OF UNIT NOISY.
Step 1. Check for loose compressor pulley.
Tighten pulley screws.
Step 2. Check bearing lubrication.
Lubricate bearing.
Step 3. Inspect for unserviceable bearing.
Replace bearings.
Step 4. Check for loose drive pulley.
Tighten pulley screws.
Step 5. Inspect for worn belts.
Replace belts.
Step 6. Check for loose evaporator fan or condenser fan.
Tighten fan screws or replace fans as necessary.
Step 7. Check for fan blades striking housing.
Align blades or orifices; or replace fan.

Section V. MAINTENANCE PROCEDURES

4-9. GENERAL

The procedures in this section cover the items which appear in the organizational (0) maintenance level on the Maintenance Allocation Chart (MAC) which is provided in Appendix C. Step-by-step procedures have been provided for all actions authorized to be performed by organizational maintenance which appear on the MAC. Actions authorized to be performed by direct and general support maintenance have been d ul y noted; step-by-step procedures for these actions may be found in Chapters 5 and 6 respective y.

WARNING

- The panels, doors and screens installed on this unit are there for a purpose.
- Do not operate this unit with them off or open unless the instructions tell you to. When this is necessary, do so with care.
- Engine exhaust can burn.
- All electrical connections can shock and sometimes kill.
- Moving parts can cut off fingers or hands.
- Spilled or splashed fuels, lubricants, cleaning fluids and battery acid can blind.

Read all WARNINGS and instructions carefully before operating or working on this unit. Read and understand all WARNINGS listed in the front of this manual.

4-10. CABINET PANELS, DOORS, AND SCREENS

The components of the refrigeration unit are enclosed in a metal frame with doors at both sides and at the bottom front; a screen assembly on the top of the frame; and an evaporator guard and condenser grille.

CAUTION

The hinges are part of the doors and cannot be removed without damaging either the hinge or the door. Do not attempt removal.

a. Panels and Guards.

(1) Removal,

(a) Remove top panel grille (2, fig. 4-3) by removing screw(1).

(b) Remove evaporator guard (3) by removing fourteen screws (1) and washers.

(c) Remove battery cover (9) by removing screw (1).

(d) Remove fuel tank cover (14) by removing screw{ 13).

(2) Cleaning and Inspection.

(a) Clean with an approved cleaning solvent (Appendix E, Item 1;) and dry thoroughly.

b. Condenser Grille.

{1) Remove eight screws and washers (5, 6, 7) to remove condenser grille (8).

(2) Clean grille with an approved cleaning solvent (Appendix E, Item 17) and dry thoroughly.

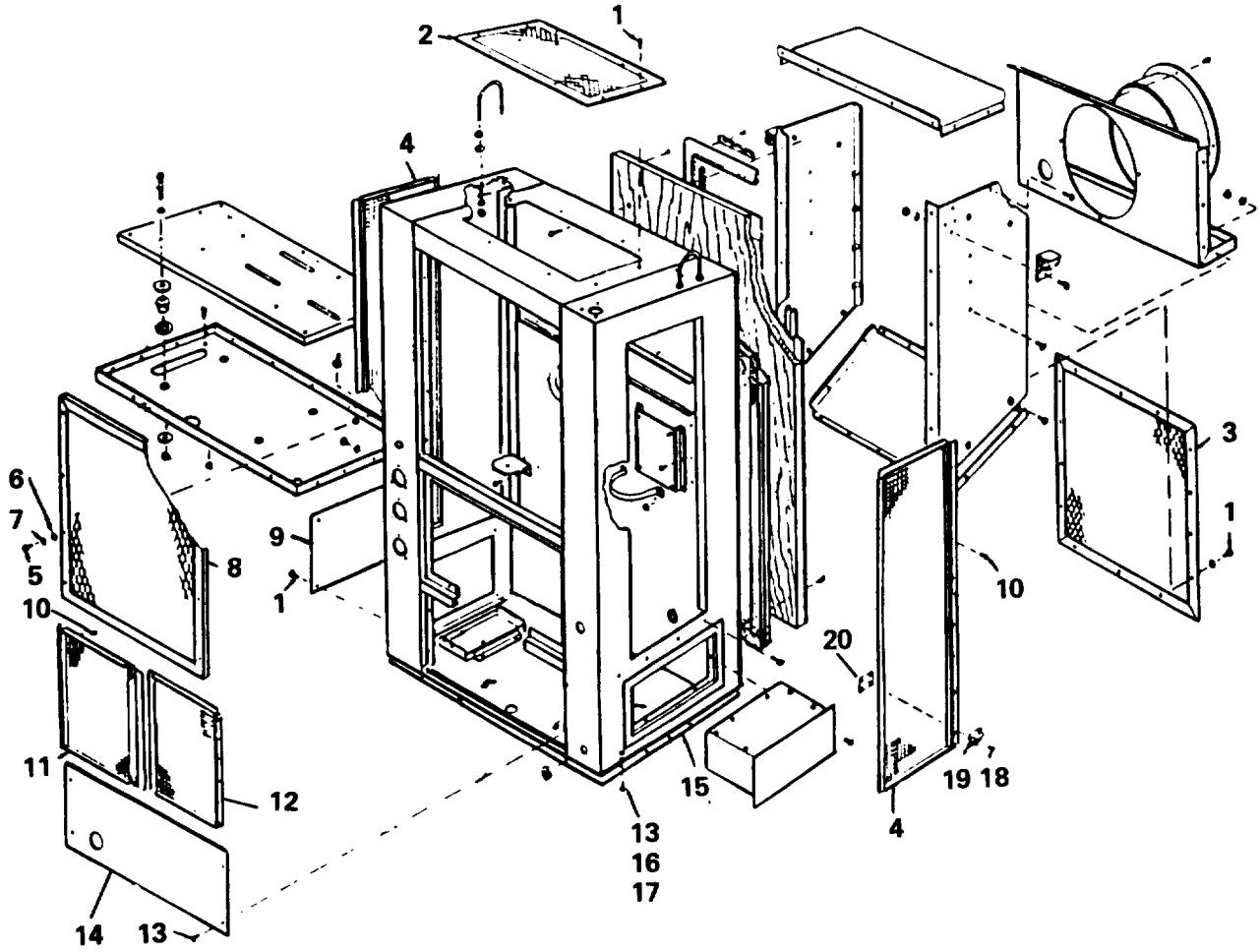
(3) Inspect for cracks, dents or other damage. Replace defective parts if unrepairable,

c. Doors.

(1) Remove screw (10) to remove doors (4, 11 and 12).

(2) Clean doors with an approved cleaning solvent (Appendix E, Item 17) and dry thoroughly.

(3) Inspect for cracks, dents or other damage. Replace defective parts if unrepairable.



1. SCREW
2. GRILLE
3. GUARD
4. DOOR, LEFT & RIGHT
5. SCREW
6. SCREW
7. LOCKWASER
8. GRILLE
9. BATTERY COVER
10. SCREW
11. DOOR, LEFT FRONT
12. DOOR, RIGHT FRONT
13. SCREW
14. FUEL TANK COVER
15. PLATE
16. LOCKWASHER
17. NUT
18. RIVET
19. BARREL BOLT
20. PLATE

Figure 4-3. Cabinet Pane Is, Doors and Screens

4-11. ELECTRICAL WIRING

WARNING

Disconnect power from refrigerator before performing maintenance on electrical components. The voltage used can be lethal.

a. Access.

(1) Disconnect power.

Disconnect from the power source on the REMD-K/11-10.

Disconnect the battery cables from the battery on the RGMD-K/1 -10.

(2) Open the control panel door by releasing two top latches and opening the hinged panel on R EM D-K/11-10.

(3) Remove four screws holding the control panel assembly and carefully pull out panel on RGMD-K/1-10.

(4) Open the four access doors.

b. Inspect/Test. Using wiring diagram in figures 1-5 or 1-6, check individual wires with an ohmmeter for continuity. If continuity is not indicated, check solder and terminal lug connections and condition of wire. Repair all bad solder connections and replace all damaged wires.

c. Repair or Replacement. Preferred repair methods consist of replacing wires, terminals, connectors,etc. rat her than splicing wires, bend ing ends to form terminals, and other makeshift procedures, although the latter may be appropriate for emergency field repairs. Determine the proper size of wire, terminal or connector to be used for replacement by referring to the applicable wire list (figures 4-4 or 4-7) and wiring diagram (figs. 1-5 or 1-6).

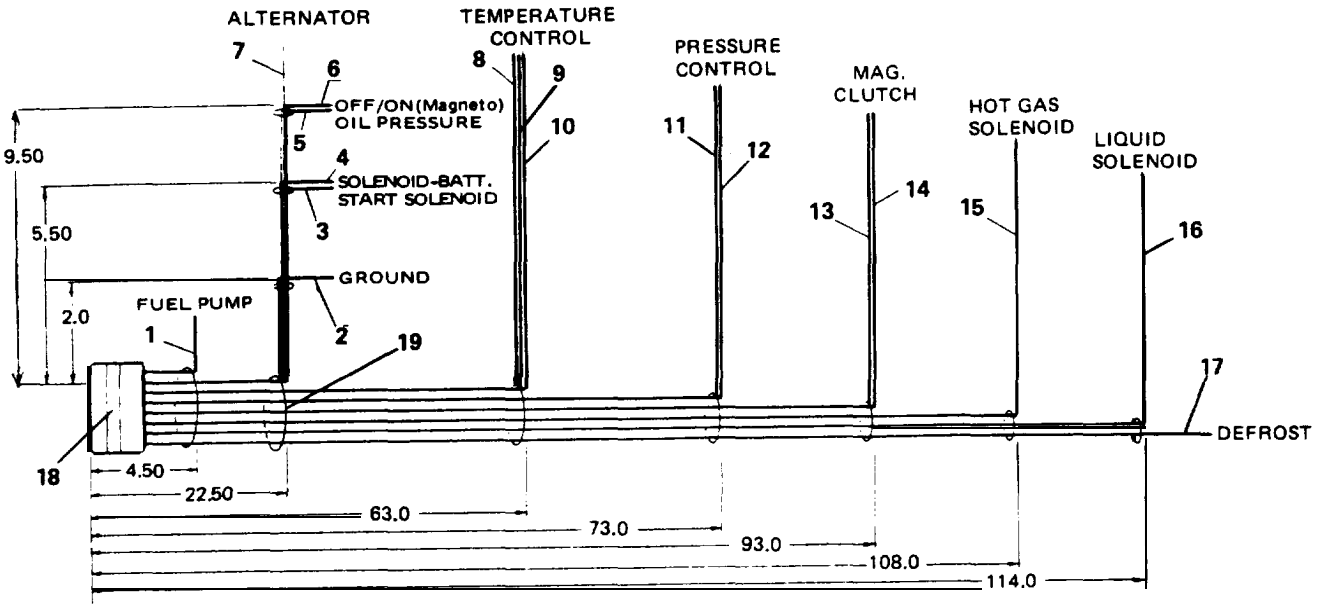
(1) Soldering Connections. Wire connections must be made mechanically sound before they are soldered; solder alone does not provide sufficient strength to prevent breakage. Surfaces of connections to be soldered must be clean and bright. If a separate flux is used, it shou ld conform to Specification MI L-F-4995, Type 1, rosin-alcohol flux and should be brushed onto the joint before soldering. If a flux-core solder is used, it should always be rosin-core electrical solder. If an uncored solder is used, it shou ld be a lead-tin solder conforming to Specif ication QQ-S-571. Wires should always be heated to the point at which the solder will melt completely and flow into all parts of the joint. Excessive build-up of solder globs on the joint should be avoided or removed.

(2) Insulating Joints. The preferred method of insulating electrical joints is by the use of heat-shrink tubing. To apply, cut a piece of heat-shrink tubing of suitable diameter to a one-inch (2.54cm) length for covering joints at terminals or connectors, or to a length about 1/2 inch (1 .27cm) longer than the joint to be insulated, and slide the tubing over the wire before making the joint. After the joint is made, slide the tubing over the joint, and shrink in place with moderate heat.

(3) Splicing Wires. To repair broken or cut wires that are otherwise sound, the mating ends can be stripped and spliced. A commercial butt splice can be crimped onto the ends to join them, or a Western Union wire splice can be made. The latter is made by stripping 1-1/4 inch (3.18 cm) of insulation from the wire ends, holding the ends parallel and facing opposite directions, then twisting each end around the other wire at lease three turns. Solder and apply insulation as described.

(4) Crimping Terminals. To install a terminal on the end of a wire, strip 1/4 to 1/2 inch (0.66 to 1.27 cm) of insulation from the end of the wire, apply a one-inch (2.54cm) piece of heat-shrink tubing (if the terminal is of the uninsulated type), and insert wire-end into the shank of the terminal. Crimp the shank, and install heat-shrink tubing if necessary.

d. Close hinged control panel and install the retaining screws. Close access doors and connect power source.



ITEM No.	DESCRIPTION	WIRE LTR	WIRE LENGTH	REF.
1	WIRE, FUEL PUMP	L	18" ± 1/2"	
2	WIRE, GROUND	K	43" ± 1/2"	NOTE 1
3	WIRE, START SOLENOID	J	33" ± 1/2"	NOTE 1
4	WIRE, SOLENOID-BAITER'	A	33" ± 1/2"	NOTE 2
5	WIRE, OIL PRESSURE	N	42" ± 1/2"	NOTE 1
6	WIRE MAGNETO	D	42" ± 1/2"	NOTE 1
7	WIRE, ALTERNATOR	B	35" ± 1/2"	
8	WIRE, TEMP. CONTROL	c	111" ± 1/2"	NOTE 1
9	WIRE, TEMP. CONTROL	E	111" ± 1/2"	NOTE 1
10	WIRE, TEMP. CONTROL	F	111" ± 1/2"	NOTE 1
11	WIRE, PRESS. CONTROL	H	84" ± 1/2"	NOTE 1
12	WIRE, PRESS. CONTROL	s	84" ± 1/2"	NOTE 1
13	WIRE, CLUTCH	M	120" ± 1/2"	NOTE 1
14	WIRE, CLUTCH	T	120" ± 1/2"	NOTE 1
15	WIRE, HOT GAS SOLENOID	R	122" ± 1/2"	
16	WIRE, LIQUID SOLENOID	P	138" ± 1/2"	
17	WIRE, DEFROST	G	119" ± 1/2"	NOTE 1
18	PLUG, ANGLE			
19	TIE WRAP (P/N 408-002) (AITACH EVERY 6")			

NOTES:

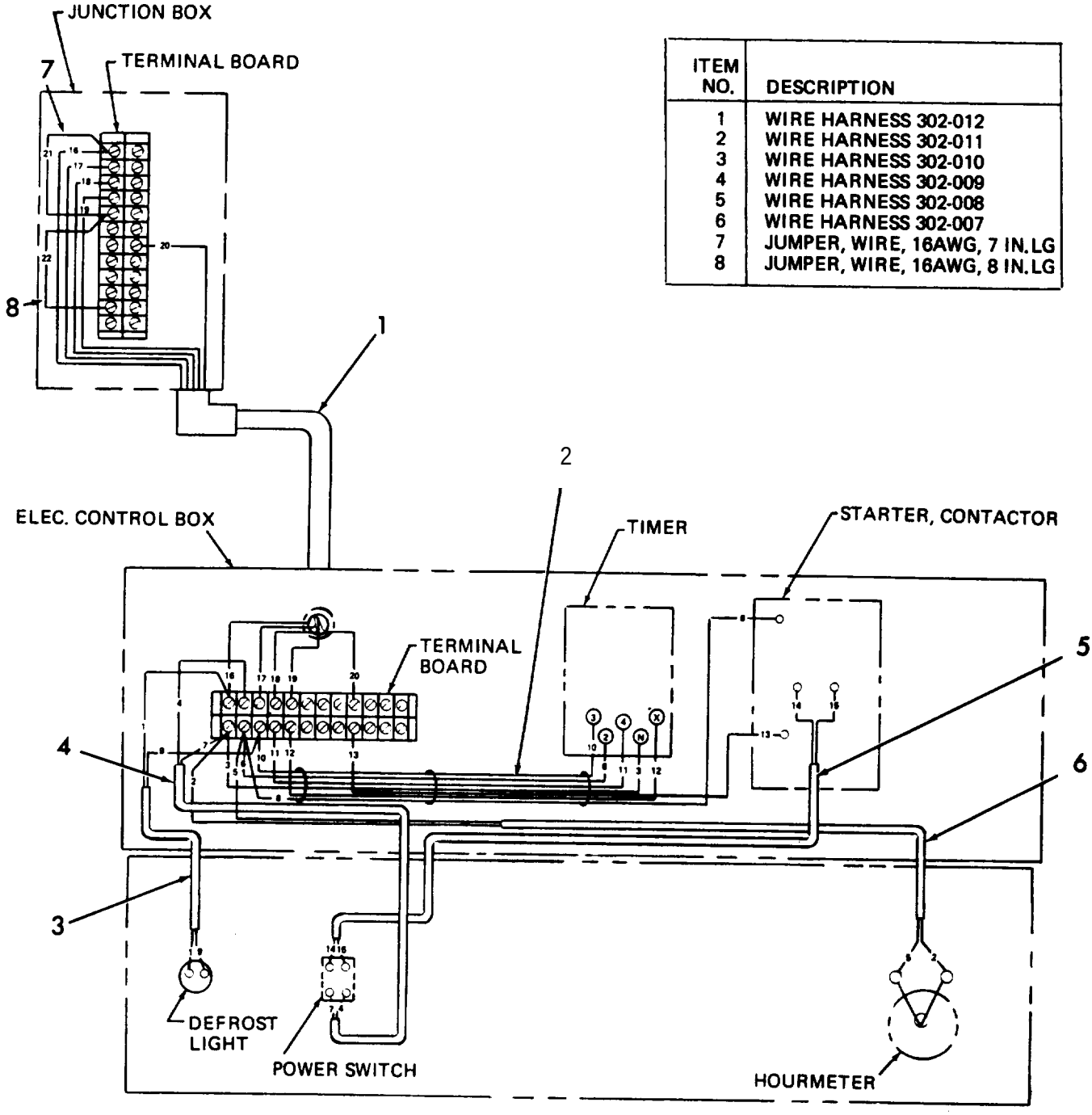
1. RING TERMINAL, NO. 8STUD (HOLLINGSWORTH P/N XR1890S).
2 RING TERMINAL, NO. 3/8 STUD (HOLLINGSWORTH P/N XR 1896S)

WIRE LETTER INDICATES iDENTIFICATION LETTER OF WIRE AND LETTER LOCATION OF PLUG.

WIRE TYPE IS M5086/2-18-9.

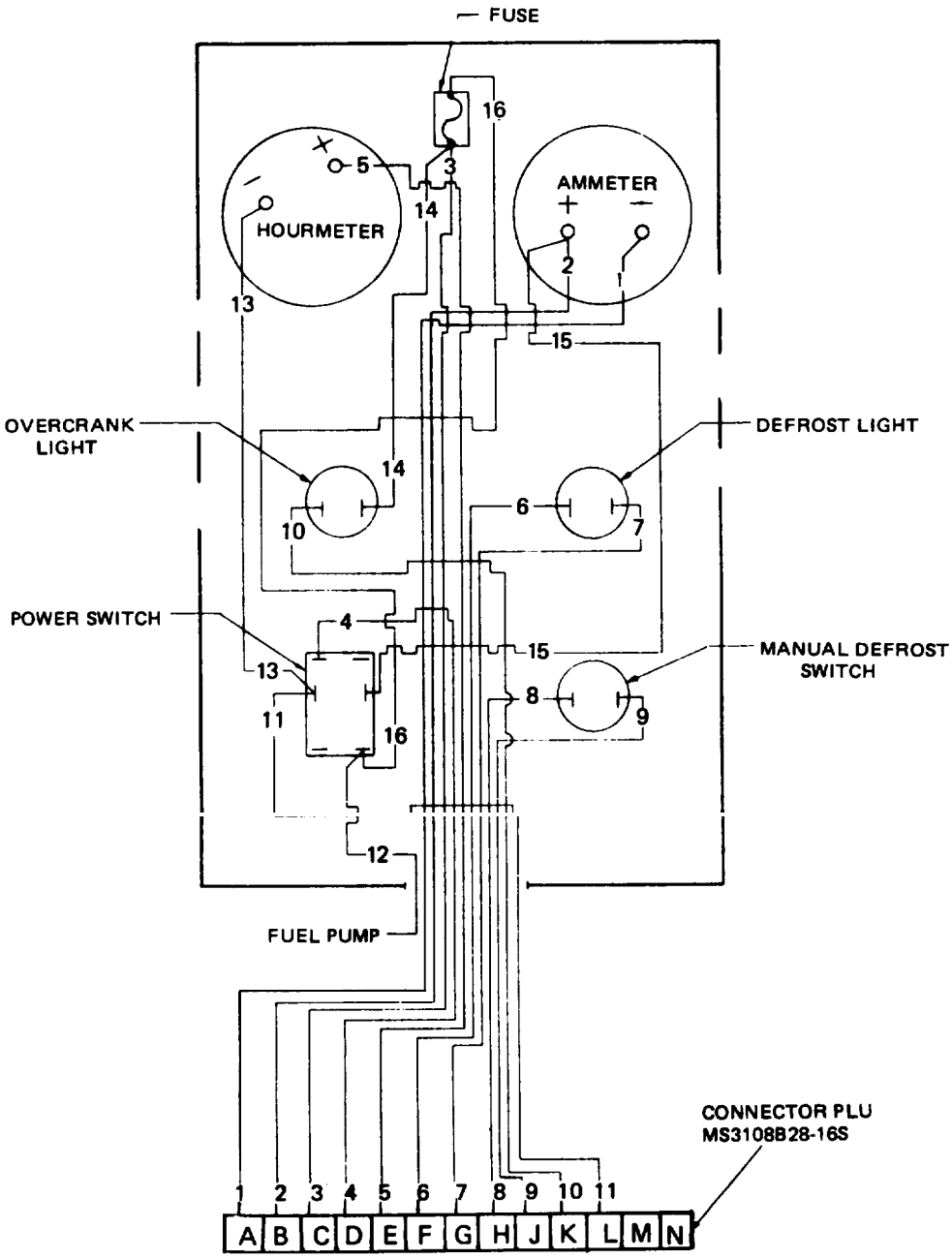
PIN TERMINAL CONTACT (AMPHENOL P/N 97-45-1820P-4010) APPLY TO ONLY ONE END OF EACH WIRE FOR PLUG SIDE.

Figure 4-4. Wiring Harness (RGMD-K/l-10)
(Sheet 1 of 3)



ITEM NO.	DESCRIPTION
1	WIRE HARNESS 302-012
2	WIRE HARNESS 302-011
3	WIRE HARNESS 302-010
4	WIRE HARNESS 302-009
5	WIRE HARNESS 302-008
6	WIRE HARNESS 302-007
7	JUMPER, WIRE, 16AWG, 7 IN.LG
8	JUMPER, WIRE, 16AWG, 8 IN.LG

Figure 4-4. Wiring Harness (REMD-K/11-10) (Sheet 2 of 3)



WIRE NO.	LG	RING TERMINAL MS-25036-108	FEMALE SLIP ON AMP. NO. 42332-2
1	48"	1 REQ'D	
2	48"	1 REQ'D	
3	48"		
4	47"		
5	48"		1 REQ'D
6	47"		
7	47"		
8	47"		

WIRE NO.	LG	RING TERMINAL MS25036-108	FEMALE SLIP ON AMP. NO. 42332-2
9	47"		
10	47"		
11	47"		
12	38"		
13	6"		1 REQ'D
14	7"		
15	7"	1 REQ'D	
16	9"		

WIRE = MIL-W-5086/2-16-9
WIRE= 16 GAUGE

Figure 4-4. Wiring Harness - Control Box (RGMD-K/1-10)
(Sheet 3 of 3)

4-12. CONTROLS AND INSTRUMENTS (RGMD-K/1-10)

a. The major controls and instruments consist of a control panel and a control box. Additionally, three gages and a thermostat are mounted on the chassis frame.

b. The hourmeter, ammeter, on-off switch, manual-start-defrost push switch, indicator light, fuseholder and fuse are part of the control panel. The control panel is mounted on the right side of the chassis frame.

c. The control box has the defrost timer and printed circuit control card.

d. Three plug-in relays are mounted on a printed circuit board on the front inside of the control box. These are an over-crank limit safety relay, starter relay, and defrost relay.

e. A thermometer, compound pressure gage, high pressure gage and thermostat are mounted on left side of the front refrigeration unit chassis frame.

WARNING

Before starting any maintenance procedure, make sure main power source is disconnected on electric motor unit and battery cables are disconnected on gasoline engine unit,

4-13. CONTROL BOX ASSEMBLY REMOVAL (RGMD-K/1-10)

a. Remove two screws and washers (1 & 2, fig. 4-5) holding control box assembly (26)to unit.

b. Pull the control box from the unit. Be careful not to damage the wiring or connectors.

c. Remove four screws (3) from backplate of control box to expose components for possible replacement.

4-14. CONTROL PANEL ASSEMBLY REMOVAL (RGMD-K/1-10)

a. Remove the four screws (45) holding the control panel assembly to the unit.

b. Pull out the control panel assembly carefully to expose components for possible replacement. Be caref u l not to damage the wiring or connectors.

4-15. HOURMETER (RGMD-K/1-10)

a. Test/Operate. Observe the meter from time to time while the unit is operating. If there is no change in the reading and there is no wiring defect, the meter is defective and must be replaced.

b. Removal.

(1) Refer to paragraph 4-14 and remove the control panel assembly.

(2) Disconnect positive and negative wire from back of hourmeter (32); carefully label each wire.

(3) Remove washer (31) and nut (30) securing hourmeter to control box front panel.

c. Clean and Inspect.

(1) Clean hourmeter with a clean lint-free cloth.

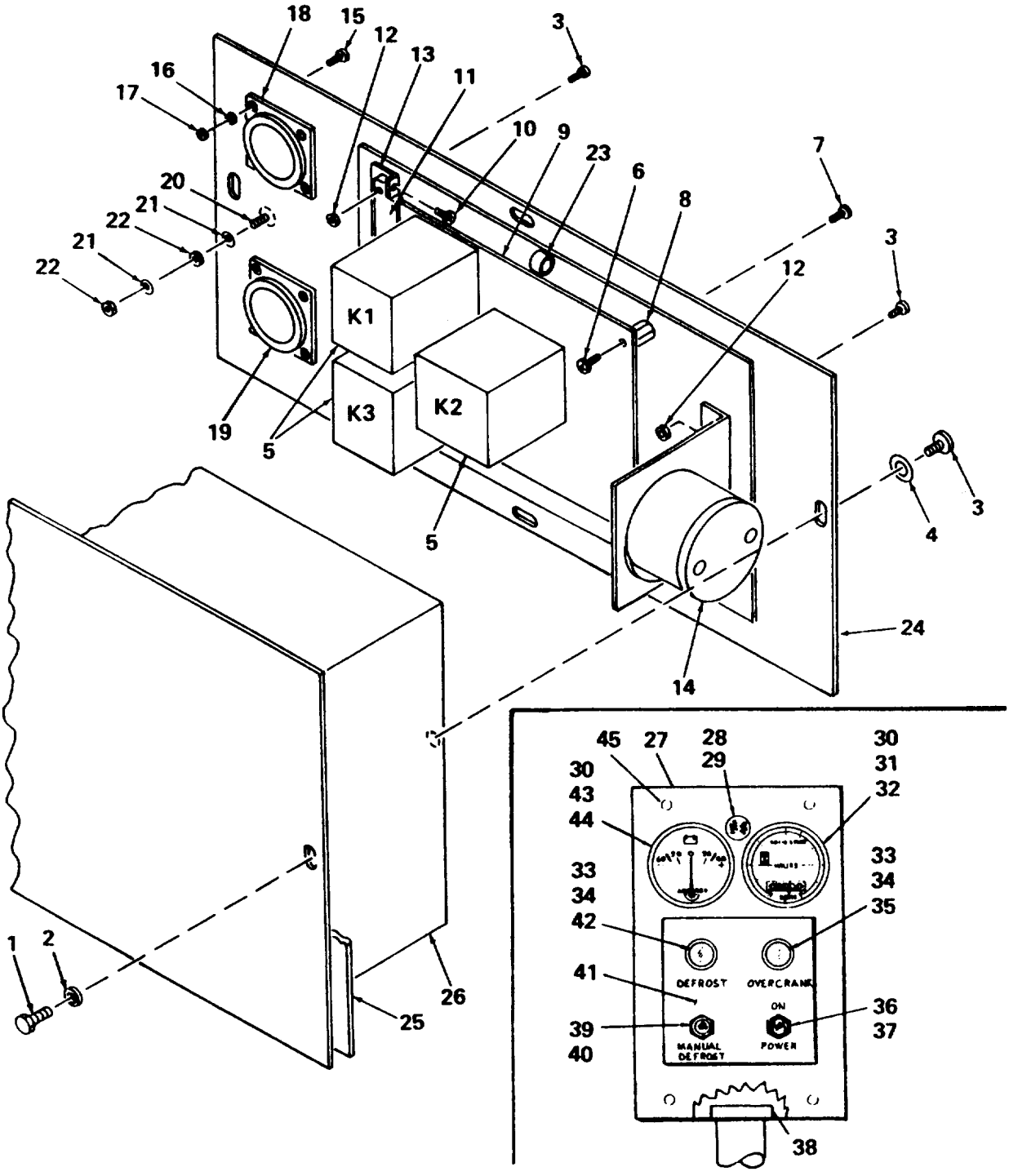
(2) Inspect hourmeter for dents, cracks, or other damage. If hourmeter is defective, it must be replaced.

d. Installation.

(1) Align hourmeter (32) in panel and secure with washer (31) and nut (30).

(2) Connect wire on positive terminal and wire on negative terminal at back of hourmeter.

(3) Install control panel assembly into refrigeration unit and fasten with two screws.



1. SCREW
2. WASHER, Lock
3. SCREW
4. WASHER, Flat
5. RELAY
6. SCREW
7. SCREW
8. SPACER
9. P.C. BOARD
10. SCREW
11. CONNECTOR, P.C.
12. NUT
13. BRACKET
14. TIMER, Defrost
15. SCREW
16. WASHER
17. NUT
18. CONNECTOR
19. CONNECTOR
20. SCREW, Ground
21. WASHER, Lock
22. NUT
23. CLAMP
24. PLATE
25. GASKET
26. CONTROL BOX
27. CONTROL PANEL
28. FUSEHOLDER
29. FUSE
30. NUT, Hex
31. WASHER, Lock
32. HOURMETER
33. LAMP
34. SOCKET, Lamp
35. LENS, Amber
36. SWITCH, Power
37. BOOT, Rubber
38. CONNECTOR
39. SWITCH, Manual Defrost
40. BOOT, Rubber
41. PANEL, Instrument
42. LENS, Red
43. WASHER, Flat
44. AMMETER
45. SCREW

Figure 4-5. Control Box and Control Panel (RGMD-K/1-10)

4-16. AMMETER (RGMD-K/1-10)

a. Removal.
(1) Refer to paragraph 4-14 and remove control panel assembly.
(2) Disconnect all wires at ammeter (44, fig. 4-6) terminals; carefully label each terminal.
(3) Remove two nuts and washers (30,43) securing ammeter (44) to control panel bracket.

b. Cleaning and Inspection.
(1) Clean ammeter with clean lint-free cloth.
(2) Inspect ammeter for dents, cracks, or other damage. If ammeter is defective, it must be replaced.

c. Installation.
(1) Replace nuts and washers (30,43) that secure ammeter (44) to panel.
(2) Connect all wires as in original configuration.
(3) Replace control panel assembly and fasten with two screws.

4-17. FUSEHOLDER (RGMD-K/1-10)

a. Removal.
(1) Refer to paragraph 4-14 and remove control panel assembly.
(2) Disconnect wires and carefully label each for proper terminal.
(3) Remove nut and lockwasher securing fuseholder (28) to control panel an

b. Cleaning and Inspection.
(1) Clean fuseholder with clean lint-free cloth.
(2) Inspect for cracks, chips, or other damage. Replace if defective.

c. Installation.
(1) Place fuseholder (28) in hole in control panel and secure with nut and loc

4-18. ON-OFF SWITCH (RGMD-K/1-10)

a. Removal.
(1) Refer to paragraph 4-14 and remove control panel assembly.
(2) Remove retaining nut that secures switch (36) to panel at front of panel.
(3) Remove wires at rear of switch, carefully labeling each wire for correct terminal.

b. Cleaning and Inspection.
(1) Clean switch with a clean lint-free cloth.
(2) In spect for cracks, chips, or other damage. Replace if defective.
(3) Install control panel assembly into refrigeration unit and fasten with four screws (45).

4-19. CRANK LIMIT RELAY K1 (RGMD-K/1-10)

a. Removal.
(1) Refer to paragraph 4-13 and remove control box assembly.
(2) Remove K1 Plug-in type crank limit relay (5) from printed circuit board (9).

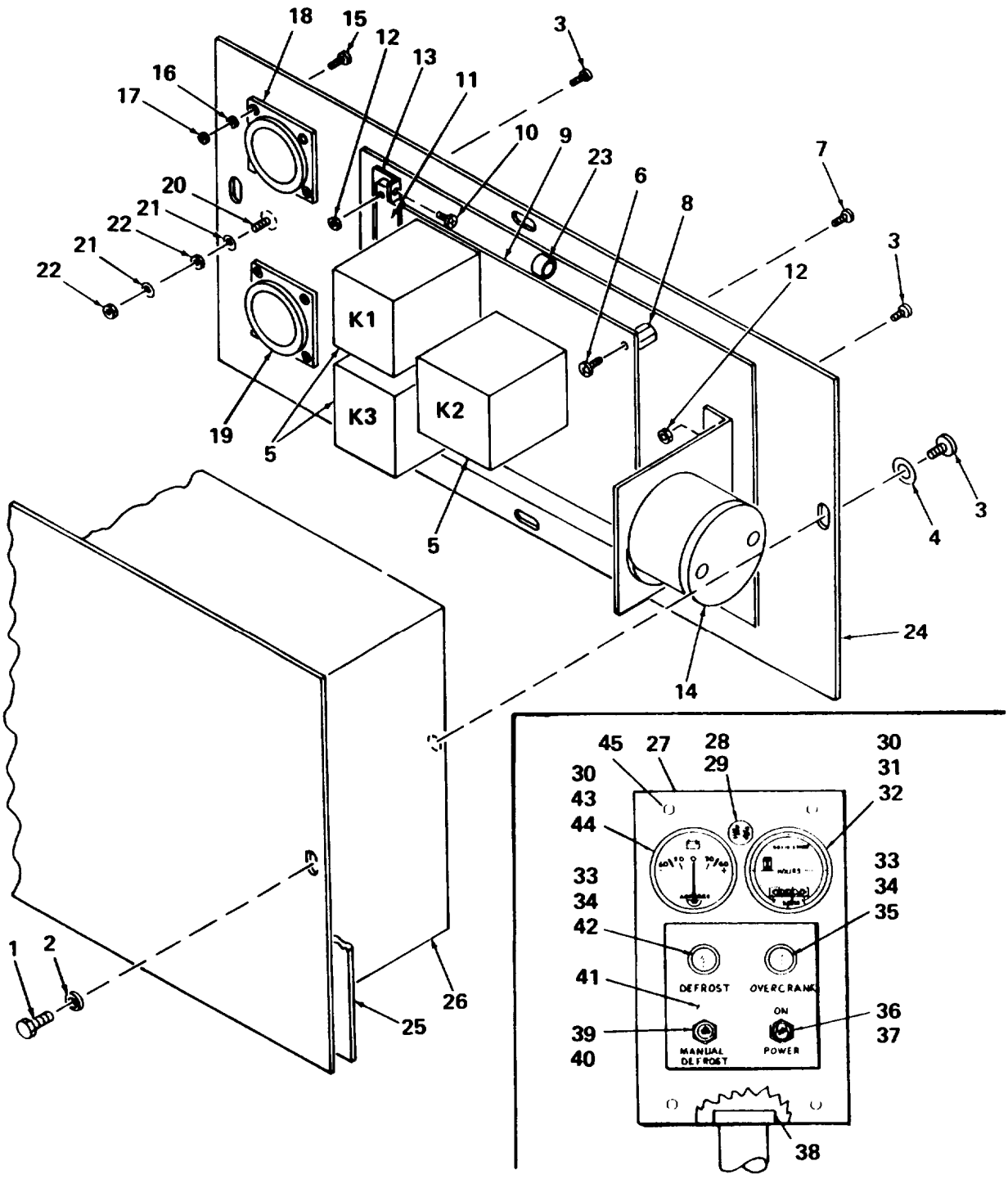
b. Cleaning and Inspection.
(1) Clean relay with a clean lint-free cloth.
(2) Inspect relay for cracks, chips, or other damage. Replace if defective.

c. Installation,

CAUTION

When reassembling relays (Kl, K2, K3), don't push in relays too forcefully, Printed circuit card may crack.

(1)Plug in K1 relay (5) to printed circuit board (9).
(2) Install backplate (24) onto control box with four screws (3). Install control box assembly into refrigeration unit and fasten with two screws and washers (1) and (2).



1. SCREW
2. WASHER, Lock
3. SCREW
4. WASHER, Flat
5. RELAY
6. SCREW
7. SCREW
8. SPACER
9. P.C. BOARD
10. SCREW
11. CONNECTOR, P.C.
12. NUT
13. BRACKET
14. TIMER, Defrost
15. SCREW
16. WASHER
17. NUT
18. CONNECTOR
19. CONNECTOR
20. SCREW, Ground
21. WASHER, Lock
22. NUT
23. CLAMP
24. PLATE
25. GASKET
26. CONTROL BOX
27. CONTROL PANEL
28. FUSEHOLDER
29. FUSE
30. NUT, Hex
31. WASHER, Lock
32. HOURMETER
33. LAMP
34. SOCKET, Lamp
35. LENS, Amber
36. SWITCH, Power
37. BOOT, Rubber
38. CONNECTOR
39. SWITCH, Manual Defrost
40. BOOT, Rubber
41. PANEL, Instrument
42. LENS, Red
43. WASHER, Flat
44. AMMETER
45. SCREW

Figure 4-6. Control Box and Control Panel (RGMD-K/1-10)

4-20. STARTER RELAY K2 (RGMD-K/1-10) (FIG. 4-6)

a. Removal.

(1) Refer to paragraph 4-13 and remove control box assembly.

(2) Remove K2 plug-in type starter relay (5, fig. 4-6) from printed circuit board (9).

b. Cleaning and Inspection.

(1) Clean relay with a clean lint-free cloth.

(2) Inspect relay for cracks, chips, or other damage. Replace if defective.

c. Installation.

(1) Plug-in K2 starter relay (5) to printed circuit board (9).

(2) Install backplate (24) on to control box with four screws (3). Install control box assembly into refrigeration unit and fasten with two screws and washers (1) and (2).

4-21. DEFROST RELAY K3 (RGMD-K/1-10) (FIG. 4-6)

a. Removal.

(1) Refer to paragraph 4-13 and remove control box assembly.

(2) Remove K3 plug-in type defrost relay (5) from printed circuit board (9).

b. Cleaning and Inspection.

(1) Clean defrost relay with a clean lint-free cloth or compressed air.

(2) Inspect relay for cracks, chips, burned or pitted points or other damage. Replace if defective.

c. Installation.

(1) Plug in K3 defrost relay (5) to printed circuit board (9).

(2) Install backplate (24) on to control box with four screws (3). Install control box assembly into refrigeration unit and fasten with two screws and washers (1) and (2).

4-22. DEFROST TIMER (RGMD-K/1-10)(FIG. 4-6)

a. Removal.

(1) Refer to paragraph 4-13 and remove control box assembly.

(2) Remove two screws (3) and nuts (12) attaching defrost timer (14) to control box side panel. Loosen capillary line and bulb and carefully thread out through heat shield wall.

(3) Disconnect all wires; carefully labeling each for proper terminal.

b. Cleaning and Inspection.

(1) Clean timer with a clean lint-free cloth.

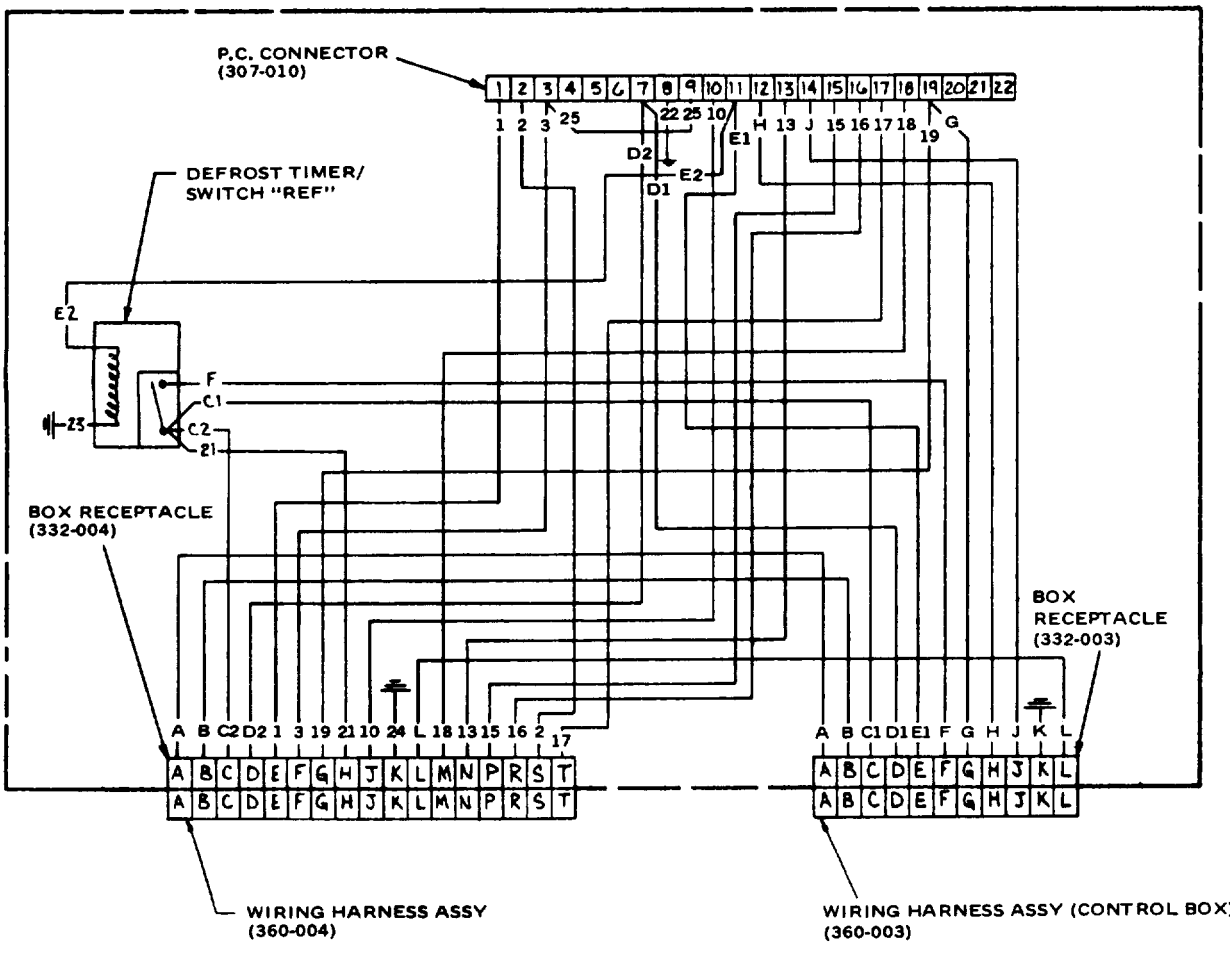
(2) Inspect timer for physical damage and signs of overheating. Replace if defective.

c. Installation.

(1) Connect all wires, capillary tube and bulb, as in original configuration.

(2) Align holes in defrost timer(14)with holes on control box side panel and secure with two screws (3) and nuts (12).

(3) Install backplate (24) on to control box with four screws (3). Install control box assembly into refrigeration unit and fasten with two screws and washers (1) and (2).



Wire No.	GA.	LG.	SOLDER (SN60)	TERMINAL (307-103)	TERMINAL (307-015)	TERMINAL (307-016)	TERMINAL (307-017)	Wire No.	GA.	LG.	SOLDER (SN60)	TERMINAL (307-014)	TERMINAL (307-013)	TERMINAL (307-015)	TERMINAL (307-016)	TERMINAL (307-017)	TERMINAL (307-012)	TERMINAL (307-011)
1	22	7.0	A/R	1				A	16	7.0							1	1
2	22	7.0	A/R	1				B	16	7.0							1	1
3	22	7.0	A/R	1				C1	22	18.0		1				1		
10	22	7.50	A/R	1				C2	22	18.0			1			1		
13	22	7.50	A/R	1				D1	22	7.0	A/R	1						
15	22	7.50	A/R	1				D2	22	7.0	A/R		1					
16	22	7.50	A/R	1				E1	22	7.0	A/R	1						
17	22	7.50	A/R	1				E2	22	20.0	A/R				1			
18	22	7.50	A/R	1				F	22	20.0		1				1		
19	22	8.0	A/R	1				G	22	7.0	A/R	1						
21	22	15.0		1			1	H	22	7.0	A/R	1						
22	22	7.0	A/R		1			J	22	7.0	A/R	1						
23	22	19.0			1	1		K	22	7.0		1		1				
24	22	10.0		1	1			L	22	7.0		1	1					
25	22	4.50	A/R															

ALL WIRE = MI L-W-5088/2

Figure 4-7. Wiring – Control Box (RGMD-K/1-10)

4-23. THERMOSTAT (TEMPERATURE CONTROL)

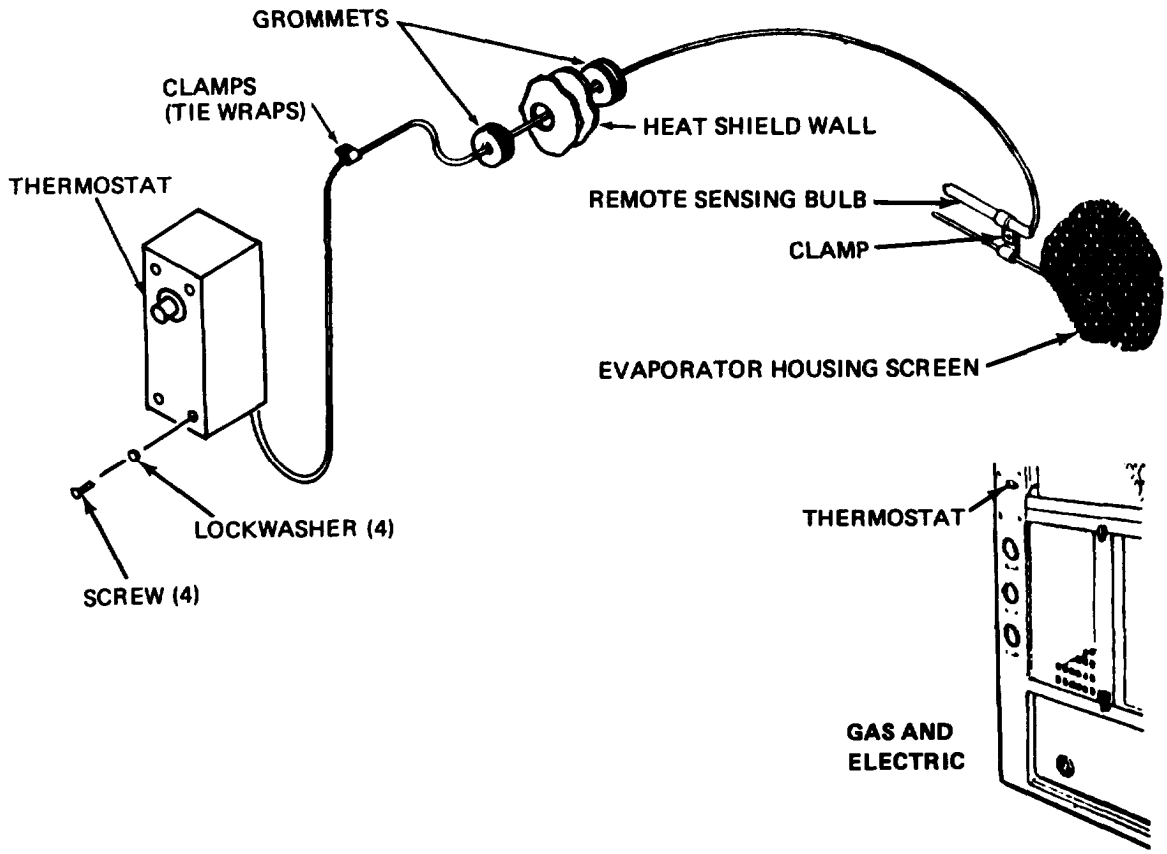


Figure 4-8. Thermostat

a. Removal.

(1) Disconnect power.

(2) See figure 4-3 and remove the evaporator screen.

(3) Loosen the screw and nut holding the clamp and slip the remote sensing bulb out of the clamp.

(4) Remove the tube clamps and carefully cut the plastic tie wraps that hold the capillary line in place.

(5) Carefully thread the capillary line and bulb through the heat shield wall, Take care not to damage the other capillary lines.

(6) Remove the four screws and lockwashers and remove the thermostat.

(7) Tag and disconnect the wires.

b. Inspection.

(1) Inspect for physical damage.

(2) Inspect for signs of overheating.

c. Testing.

(1) Using an accurate thermometer, measure the temperature at the remote bulb location.

(2) Perform continuity checks with ohmmeter as follows:

(a) With the thermostat set below the thermometer reading there should be continuity between the two terminals.

(b) With the thermostat set above the thermometer reading there should be no continiuty.

(3) This can be checked at several points by placing the sensing bulb and the thermometer in a warm or cold container of water. Be sure to allow time for temperature balance of both thermometer and sensing bulb to be reached.

d. Installation.

(1) Thread the sensing bulb and capillary down through the grommeted hole in the bottom of the control box.

(2) Secure the thermostat with four screws and lockwashers.

(3) Taking care not to damage the other capillary lines, thread the bulb and capillary through the hole in the heat shield wall.

(4) Reclamp the capillary line in its original clamps. Install new plastic tie wraps or use electricians tape to secure the capillary l ines together.

(5) Insert the bulb in the mounting clamp and tighten the retaining screw and nut.

(6) Check to see that grommets are in place at heat shield wall.

(7) See figure 4-3 and reinstall the evaporator screen.

(8) See wiring diagram figures 1-5 or 1-6 and tag and connect wire leads.

(9) Set thermostat temperature to desired setting.

(10) Close access doors and connect power.

4-24. THERMOMETER

a. Removal.

(1) Carefully pull thermometer bulb through the condenser section.

(2) Remove three screws (1, fig. 4-9), washers (3) and nuts (2) that secure thermometer (4) to the refrigeration unit frame and remove thermometer.

b. Cleaning and Inspection.

(1) Clean thermometer with a clean lint-free cloth.

(2) Inspect thermometer for dents, cracks, or other damage. Thermometer must be replaced if defective.

c. Installation.

(1) Align holes in thermometer (4) with holes in refrigeration unit frame and secure with three screws (1), washers (3) and nuts (2).

(2) Carefully thread thermometer bulb through condenser to panel and grille in rear of evaporator section.

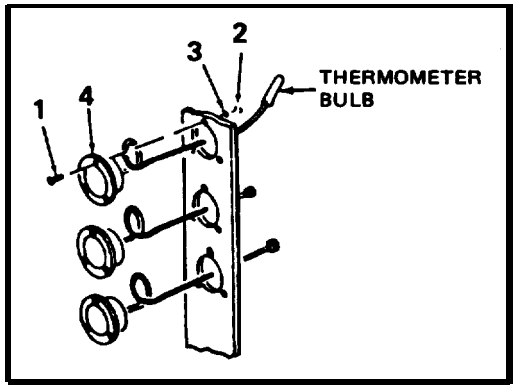


Figure 4-9. Thermometer

4-25. CONTROLS AND INSTRUMENTS (REMD-K/11-10)

a. The major controls and instruments consist of a controll panel assembly which includes an hourmeter, on-off switch and indicator light. These items are mounted on the front panel of the control panel assembly.

b. A defrost timer and contactor starter are mounted inside the control panel assembly.

c. A thermometer, compound pressure gauge, high pressure gauge, thermostat mounted on the left front side of the refrigeration unit frame.

4-26. CONTROL PANEL (REMD-K/11-10)

a. Open the front panel to expose components for possible replacement by turning two latches (9, figure 4-1 0).

b. Component replacement and repairs can be made without actual removal of the control panel assembly which is riveted to the chassis.

4-27. HOURMETER (REMD-K/11-10)

a. Removal.

(1) Refer to paragraph 4-26 to open control panel.

(2) Label and remove electrical connections (2 wires) from back of hourmeter(13).

(3) Remove three screws, washers and nuts (14, 15 and 16) securing hourmeter to front panel.

b Cleaning and Inspection.

(1) Clean hourmeter with a clean lint-free cloth.

(2) Inspect hourmeter for dents, cracks, or other damage. If hourmeter is defective, it must be replaced.

c. Installation.

(1) Align holes in hourmeter (13) with holes in panel and secure with three screws, washers and nuts (14, 15 and 16).

(2) Connect wires at back of hourmeter.

4-28. ON-OFF SWITCH (REMD-K/11-10)

a. Removal.

(1) Refer to paragraph 4-26 and open control panel.

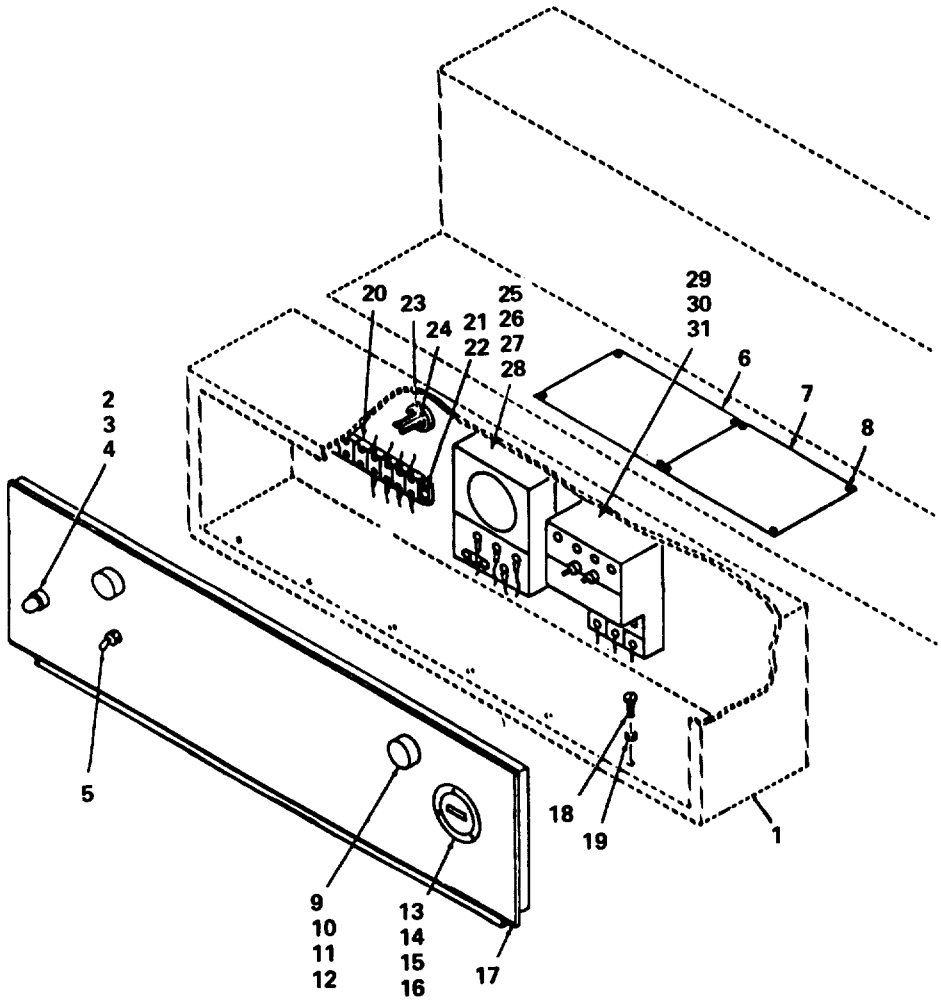
(2) Remove retaining nut that secures switch (5, figure 4-10) to panel at front of panel.

(3) Remove wires at rear of switch carefully labeling each wire for correct terminal.

b. Cleaning and Inspection,

(1) Clean switch with a clean lint-free cloth.

(2) Inspect for cracks, chips or other damage. Replace if defective.



1. PANEL BOX
2. RED LENS
3. LAMP
4. SOCKET
5. ON-OFF SWITCH
6. WIRING SCHEMATIC
7. REFRIGERATION DIAGRAM
8. RIVET
9. LATCH
10. SCREW
11. WASHER
12. NUT
13. HOURMETER
14. SCREW
15. LOCKWASHER
16. NUT
17. PANEL
18. SCREW
19. WASHER
20. TERMINAL BLOCK
21. SCREW
22. WASHER
23. CONNECTOR
24. WIRING HARNESS
25. TIMER
26. SCREW
27. LOCKWASHER
28. NUT
29. STARTER
30. SCREW
31. WASHER

Figure 4-10. Control Panel (REMD-K/11-10)

4-29. FUSE REPLACEMENT (RGMD-K/1-10)

a. Disconnect battery cables.

b. Remove fuse cap and fuse.

c. Replace burned-out fuse; install fuse cap.

Figure 4-11. Fuse Replacement (RGMD-K/1-10)

4-30. CIRCUIT BREAKER BOX (REMD-K/11-10)

a. Removal.

(1) Move the control switch on the control panel to "OFF" position. Disconnect the electrical power at source.

(2) Remove cover from box.

b. Repair. Check circuit breaker and replace as necessary.

c. Assembly.

(1) Replace cover to box.

(2) Connect electrical power at source.

(3) Move control switch on control panel to "ON" position.

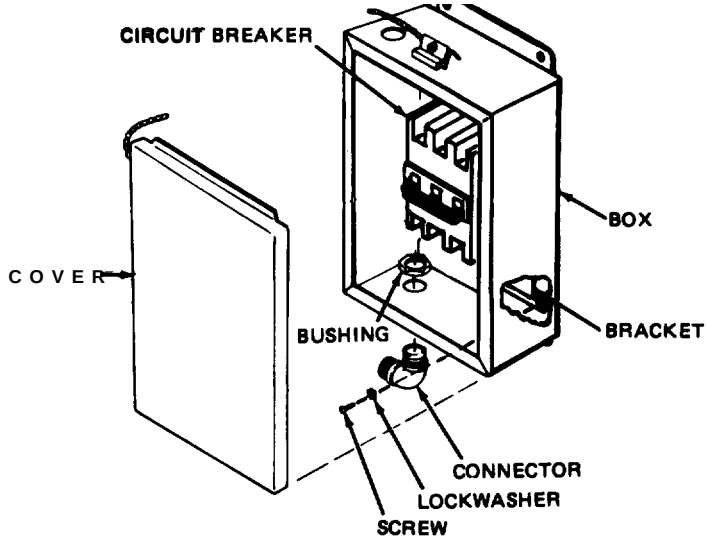


Figure 4-12. Power Supply (REMD-K/11-10)

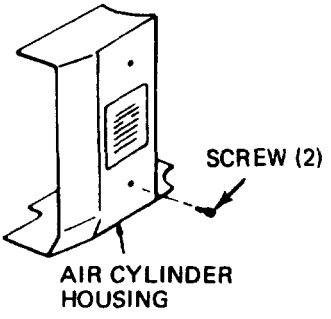
4-31. ENGINE OIL PRESSURE GAGE (RGMD-K/1-10)

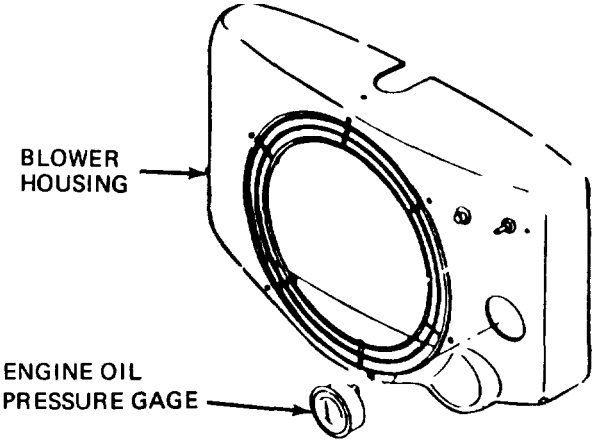
a. **Removal.**

(1) Disconnect battery cables.

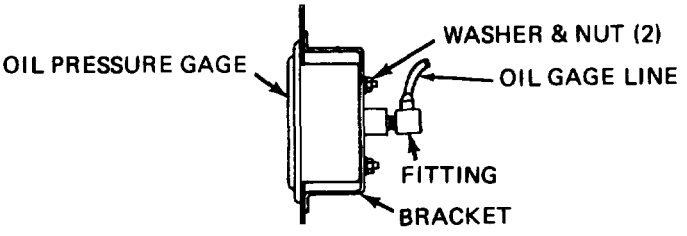
(2) Open refrigeration unit right side door for access to engine.

(3) Remove two screws holding right hand air cylinder housing to engine. Remove housing.





(4) Disconnect oil gage line from pressure gage.



(5) Remove two nuts and washers and bracket from back of gage.

(6) Pull the gage from blower housing.

b. <u>Installation.</u>

(1) Install the gage on the blower housing with two nuts, washers and clamp.

(2) Reconnect oil gage line. Install air cylinder housing with two screws.

(3) Close door and reconnect battery cables.

4-32. DRIVE SYSTEM

WARNING

Always disconnect the battery (RGMD-K/1-10) or power source (REMD-K/11) prior to performing internal maintenance.

WARNING

When checking an operating unit, PROTECT AGAINST MOVING PARTS. DO NOT wear loose clothing in the vicinity of moving parts, such as shafts, flywheels, fans, belts, etc. Keep your hands away from moving parts. Do not operate without protective guards and screens securely in place.

4-33. CONDENSER FAN

a. Removal.

(1) Open side doors and remove the top screen (1, figure 4-3).
(2) Loosen setscrew (2, figure 4-1 3) holding the condenser fan (1).

b. Cleaning and Inspection.

(1) Clean fan with an approved cleaning solvent (Appendix E, Item 17) and dry thoroughly.
(2) Inspect fan for cracks, dents, and other damage. Replace if defective.

c. Installation.

(1) Place key (5) on fan shaft and install fan (1) as in original configuration.
(2) Secure fan with setscrew (2).
(3) Install top screen (1, figure 4-3).

4-34. FAN PULLEY, MAGNETIC CLUTCH AND BELTS

a. Removal.

(1) Refer to paragraph 4-33 and remove condenser fan (1, figure 4-13}.
(2) Loosen belt tensioner (6) to loosen fan belt (11) and slip belt off rear of pulley (19).
(3) Loosen screw and washer (16,1 7) securing bracket (18) and clutch (15). Loosen sets crew (34) to release pulley (19) from fan shaft (13).
(4) Slide clutch and pulley off end of shaft. Use a suitable puller if necessary. Remove key (14).

b. Cleaning and Inspection.

(1) Clean pulley and clutch with approved cleaning solvent (Appendix E, Item 17) and dry thoroughly.
(2) Inspect pulley for cracks, chips or other damage. Replace if defective.
(3) Replace defective or burned clutch.
(4) Replace worn or damaged fan (11) and compressor belts (1 2).

c. Installation and AdiustmenL

(1) Slide pulley (19) to key (14) on shaft (13). Slide magnetic clutch (15) on shaft. Secure pulley (19) as in original configuration with setscrew (34) and screw, washer and bracket (16,17,18). Adjust air gap on magnetic clutch to 0.005 by using two adjusting setscrews on clutch.
(2) Slip fan belt (11) on to pulley (19) and adjust to 1/2 inch finger deflection midway between pulleys.
(3) Refer to paragraph 4-33 and replace condenser fan (1).

4-35. EVAPORATOR FAN AND FAN SHAFT

Removal.

(1) Remove evaporator guard (3, figure 4-3).
(2) Remove condenser fan (1) per paragraph 4-33.
(3) Loosen setscrews securing fan shaft (13) to bearings (29). Loosen setscrew (34) securing pulley to fan shaft.
(4) Slide out fan shaft until evaporator fan (3) can be removed. Loosen setscrew (4) securing evaporator fan (3) to shaft. Remove keys.

b. Cleaning and Inspection.

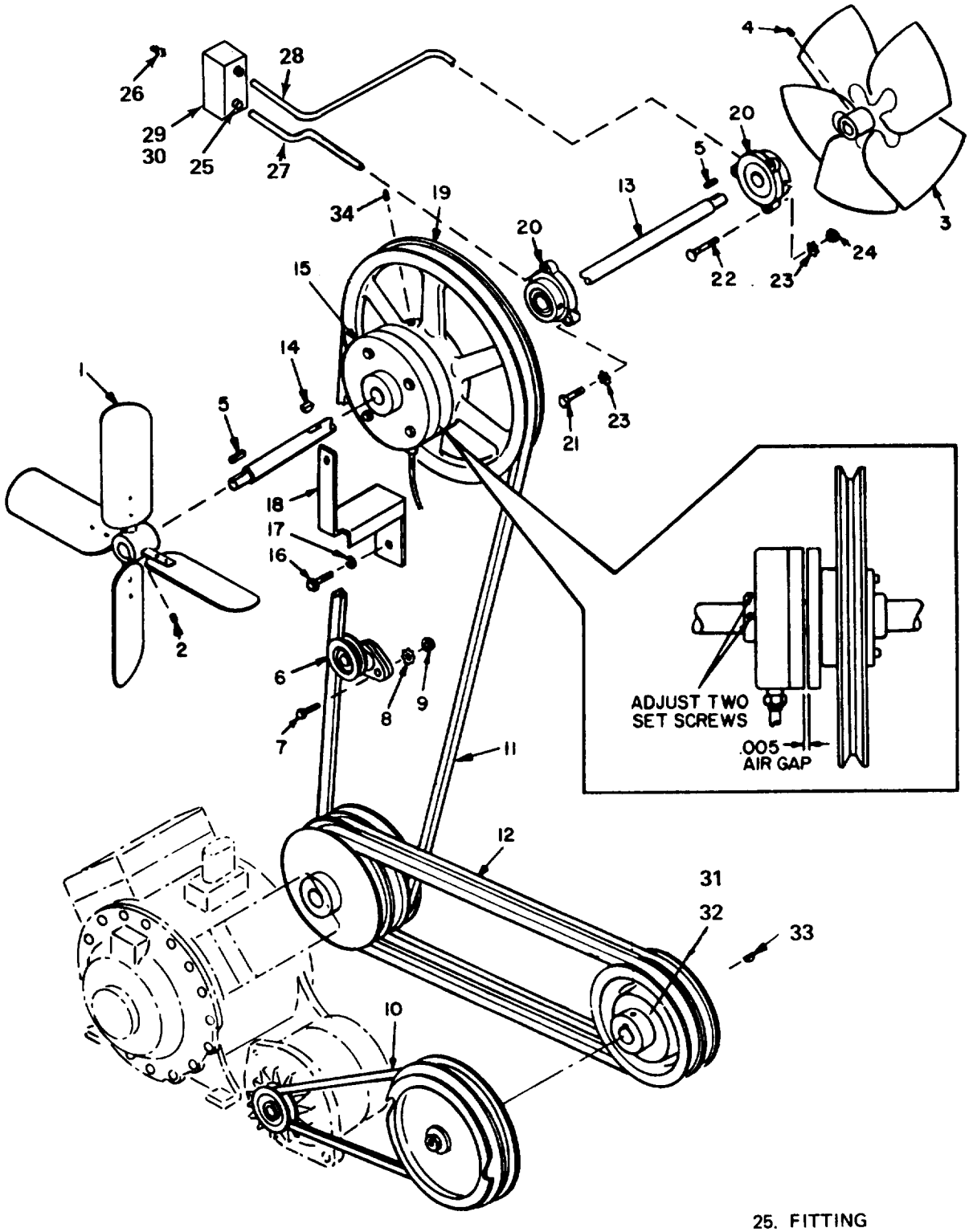
(1) Clean fan and shaft with an approved cleaning solvent (Appendix E, Item 17) and dry thoroughly.
(2) Inspect fan and shaft for cracks, dents, or other damage. Replace if defective.
(3) Replace defective belts.

4-36. BEARINGS

a. Removal.

(1) Remove condenser fan (1), evaporator fan (3) and fan shaft (13) per paragraphs 4-33 to 4-35.
(2) Remove screw (21) and washer (23) that secure the front bearing (20).
(3) Remove bolt (22), washer (23) and nut (24) securing rear bearing (20) and lube tubing (27 & 28).

b. installation. Using serviceable shaft and bearings, reverse procedures above. Tighten belt .



1. CONDENSER FAN
2. SETSCREW
3. EVAPORATOR FAN
4. SETSCREW
5. KEY
6. TENSIONER, BELT
7. SCREW
8. WASHER
9. NUT
10. BELT, ALTERNATOR
11. BELT, FAN
12. BELT, COMPRESSOR
13. SHAFT
14. KEY
15. CLUTCH
16. SCREW
17. WASHER
18. BRACKET
19. PULLEY
20. BEARING
21. SCREW
22. BOLT
23. LOCKWASHER
24. NUT
25. FITTING
26. FITTING
27. TUBING
28. TUBING
29. BLOCK
30. SCREW
31. SHEAVE
32. BUSHING
33. KEY
34. SETSCREW

Figure 4-13. Fans and Drive

4-37. SHEAVE AND BUSHING AND COMPRESSOR BELTS

a. Removal.

(1) Remove the gasoline engine from the refrigeration unit per paragraph 4-44a. Refer to paragraph 4-66 for electric motor removal.

(2) Loosen and remove belts

(3) Loosen and remove three screws securing bushing to sheave.

(4) If necessary, use an appropriate pully to remove sheave from shaft of engine or electric motor. Remove key.

b. Installation.

(1) Assemble bushing into sheave with key.

(2) Slide sheave with bushing onto shaft of engine or motor.

(3) Secure sheave and bushing with three screws.

(4) Replace worn or defective belts.

(5) Re-install gasoline engine per paragraph 4-44c.

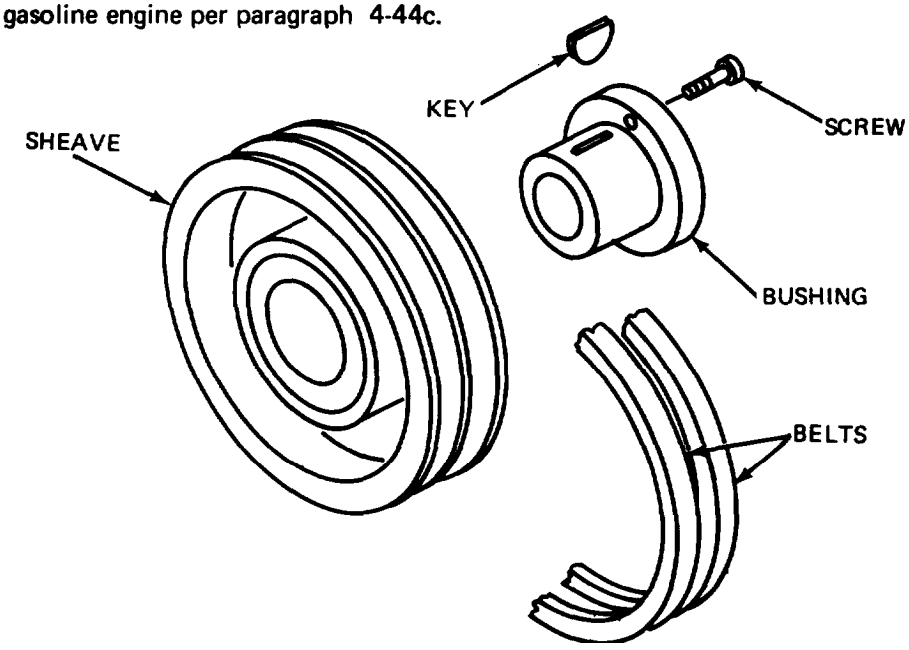


Figure 4-14. Sheave and Bushing

4-38. REFRIGERATION PIPING AND COMPONENTS

Organizational maintenance service on the refrigeration piping and components is restricted to the setting of valves as described in para. 2-10 and the cleaning of the coils. Refer all other maintenance to direct support.

WARNING

REFRIGERANT UNDER PRESSURE is used in the operation of this equipment. DEATH or severe injury may result if you fail to observe safety precautions. NEVER use a heating torch on any pert that contains Refrigerant R-12. DO NOT let liquid refrigerant touch you, and DO NOT inhale refrigerant gas.

WARNING

Always disconnect power from battery RGMD-K/1-10) or power source (REMD-K/11-10) prior to peforming internal-maintenance.

4-39. CONDENSER COIL AND HOUSING

a. Access.

(1) Disconnect power.

(2) Remove screws (5, figure 4-3) and washers (6& 7) and remove the condenser grille (8).

(3) Open the side access doors.

h Cleaning.

WARNING

Compressed air used for cleaning purposes will not exceed 30 PSI (2.1 kg/cm^2).

(1) Clean coil with a soft bristled brush, or use compressed air at 30 psi or less from the inside face of the coil to blow the dirt out. Take care to avoid fin damage.

(2) Check fins for dents, bent edges or any condition that would block or distort air flow. Straighten all damaged fins with a plastic fin comb.

(3) Should a leak or any other damage to the coil or housing be noted, contact direct support maintenance.

(4) Install the condenser grille (5) with screws (5) and washers (6& 7).

(5) Close access doors.

(6) Connect power.

4-40. EVAPORATOR COIL AND HOUSING

NOTE

For best results, wait until a defrost cycle has been completed or unit has been shut down long enough for coil to be defrosted.

Access.

(1) Disconnect power.

(2) Remove fourteen screws (1, figure 4-3) and washers and remove the evaporator guard (3).

(3) Remove nine screws (1) and remove the top panel grille (2).

Cleaning.

(1) Clean coil with a clean soft bristled brush, or use compressed air at 30 psi or less from inside face of the coil to blow the dirt out. Take care to avoid fin damage. Take care that supplies stored in the refrigerator box are not contaminated.

(2) Wipe the inside and outside surfaces of the housing with a clean cloth.

(3) Check fins for dents, bent edges or any condition that would block or distort air flow. Straighten all damaged fins with a plastic fin comb.

(4) Should a leak or any other damage to the coil or housing be noted, contact direct support maintenance.

(5) Install the top panel grille with nine screws.

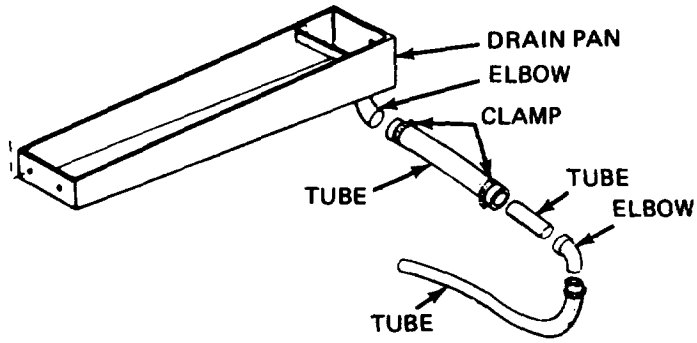
(6) Install the evaporator guard with fourteen screws and washers.

(7) Connect power.

4-41. DRAIN LINE

a. Inspect drain line for leaks or damage.

b. Replace tubes, clamps and elbows, as necessary.



4-42. EXHAUST SYSTEM

The exhaust system consists of an exhaust outlet, muffler and tubing which carries the exhaust fumes out the top of the unit.

WARNING

Engine Exhaust Gas (Carbon Monoxide) is DEADLY!

The best protection against carbon monoxide inhalation is a regular inspection of the complete exhaust system. If you notice a change in the sound or appearance of exhaust system, shut the unit down immediately and have it inspected and repaired at once by a competent mechanic.

WARNING

Before starting work on the engine, disconnect the battery to prevent inadvertent starting of the engine.

4-43. EXHAUST TUBE AND MUFFLER

a. Removal.

(1) Loosen screw on exhaust outlet.

(2) Remove exhaust outlet.

(3) Loosen clamps securing exhaust tubes.

(4) Remove muffler and exhaust tubes.

b. Cleaning and Inspection.

(1) Use wire brush or scraper to clean all parts. Blow all dirt from parts. Repoint cleaned bored areas.

(2) Inspect all threads. Check all parts for cracks, bends, dents, or other visible damage. Replace defective parts.

c. Installation.

(1) Position muffler and exhaust tubes into unit.

(2) Tighten clamps.

(3) Install exhaust outlet; tighten screw.

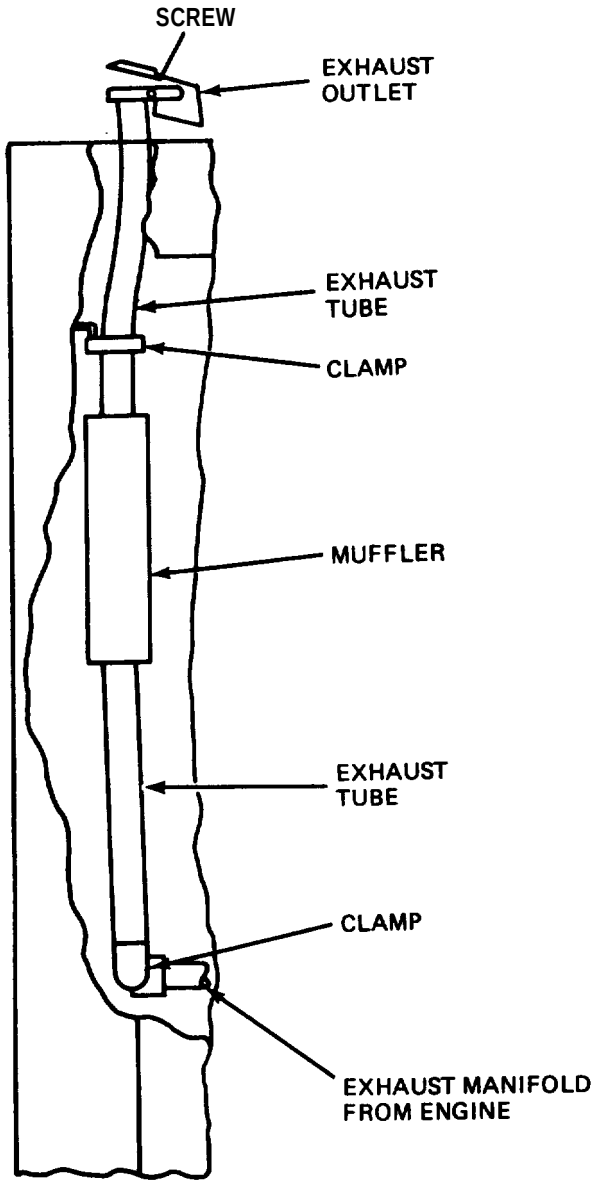
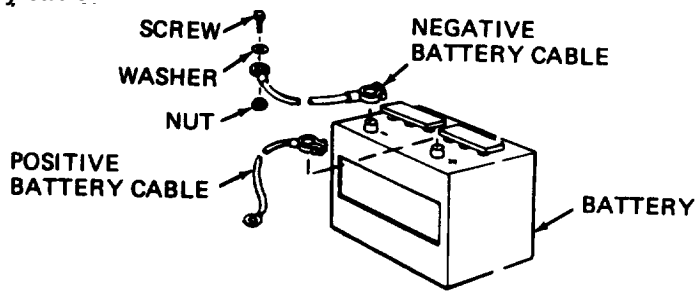


Figure 4-15. Exhaust System

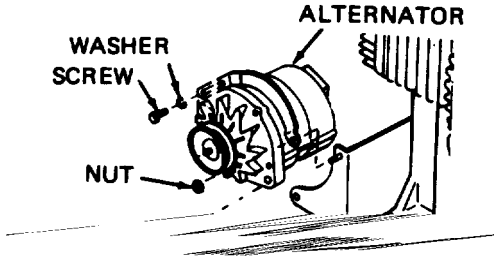
4-44. GASOLINE ENGINE (RGMD-K/1-10)

a. Removal.

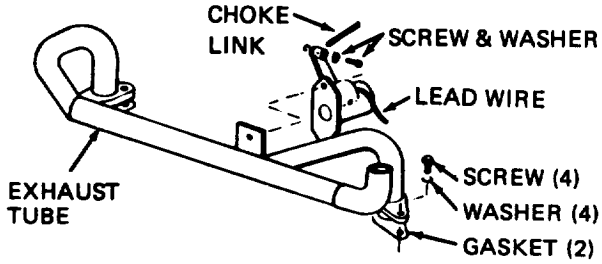
(1) Disconnect negative battery cable.



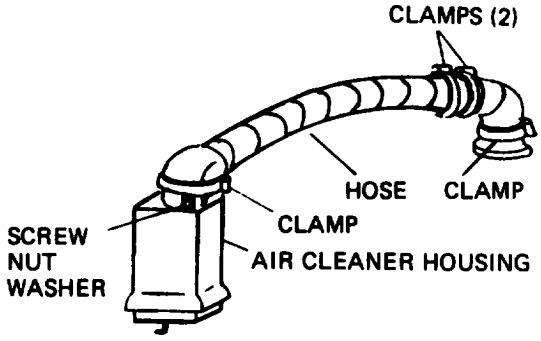
(2) Remove alternator from engine by removing screws, washers and nuts. Disconnect wiring to alternator and control panel.



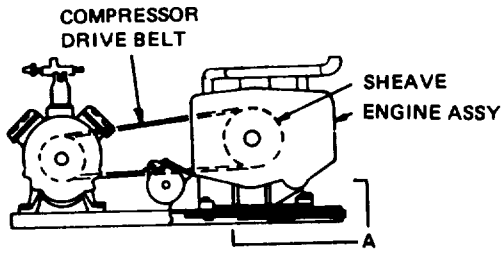
(3) Remove exhaust tube by removing four screws and washers and loosening screw to remove choke link. Disconnect electrical lead wire off sisson choke.

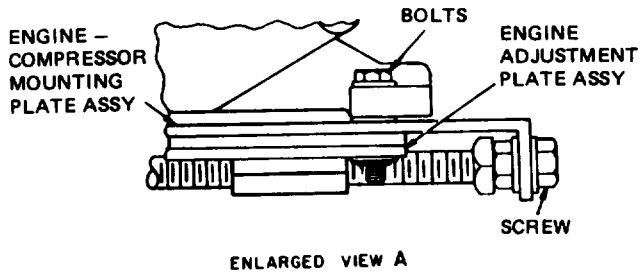


4) Remove air cleaner by loosening clamps and removing screw, washer and nut.

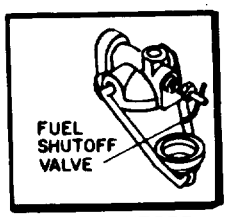


(5) Loosen four bolts. Turn screw to loosen and remove compressor drive V-belts worn sheave.

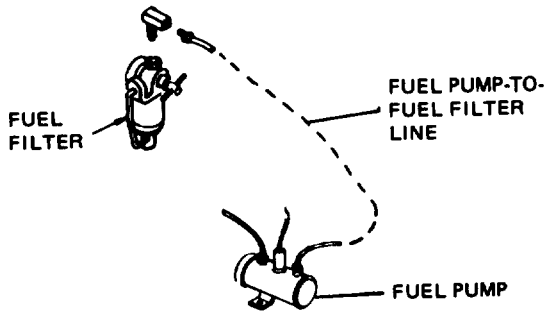




(6) Close the fuel shutoff valve (clockwise) on fuel filter. Disconnect fuel pump-to-fuel filter line from engine.



FUEL SHUTOFF VALVE (TURN CLOCKWISE TO CLOSE)



(7) Remove four bolts and washers (figure 4-16) securing engine to mounting plate. Lift engine out through side of unit.

b. Cleaning and Inspection.

(1) Clean engine with an approved cleaning solvent (Appendix E, Item 17) and dry thoroughly.

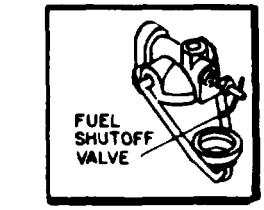
(2) Inspect engine for any external damage. Replace or repair defective parts.

4-44. GASOLINE ENGINE (Cont)

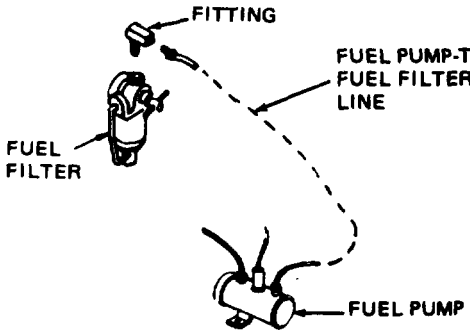
c. Installation.

(1) Reinstall engine in unit through side of unit. Secure engine to mounting plate with four bolts and washers.

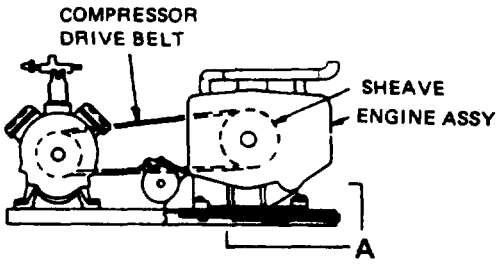
(2) Connect fuel pump-to-fuel filter line to engine at fuel filter fitting. Open fuel shutoff valve on fuel filter.

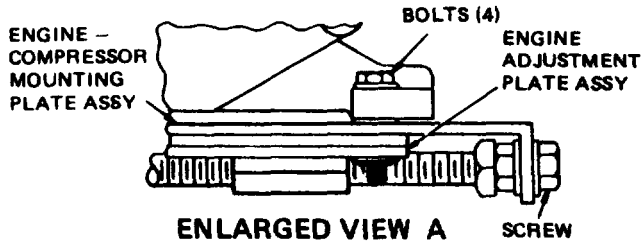


(TURN COUNTERCLOCKWISE TO OPEN)



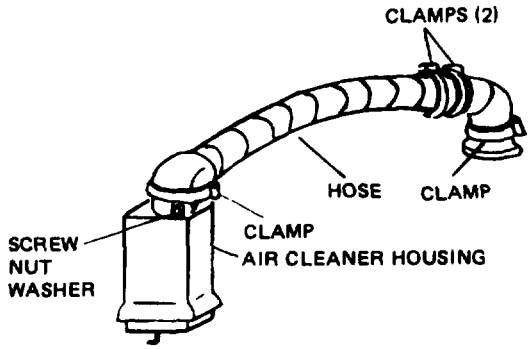
(3) Replace compressor drive V-belts on to sheave and adjust belts.





NOTE: LOOSEN FOUR BOLTS. ADJUST COMPRESSOR DRIVE BELT BY TURNING SCREW. WHEN PROPER BELT TENSION IS OBTAINED, RE-TIGHTEN FOUR BOLTS HOLDING ENGINE TO ENGINE ADJUSTMENT PLATE ASSY.

(4) Install air cleaner. Tighten screw and four clamps.



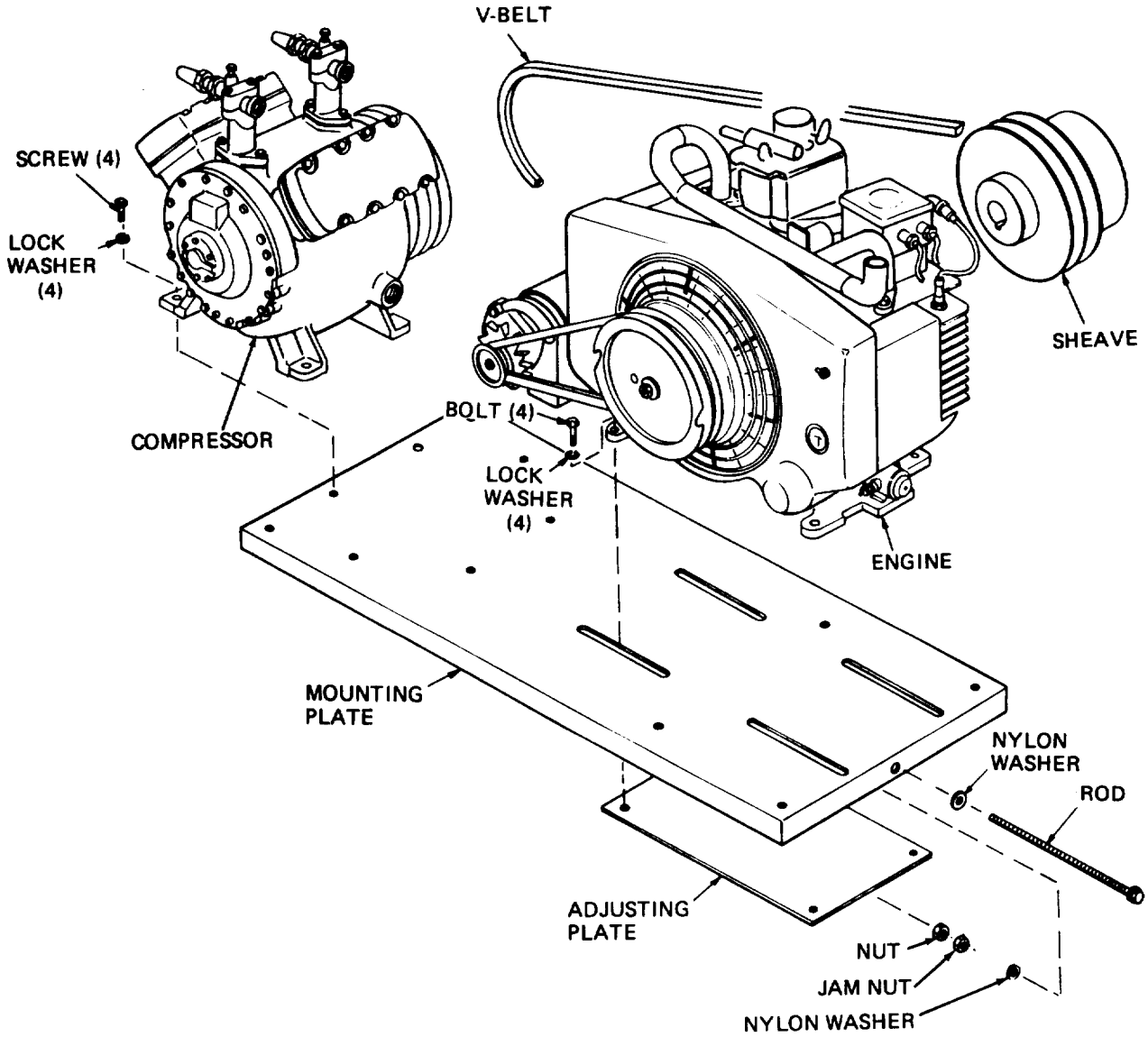
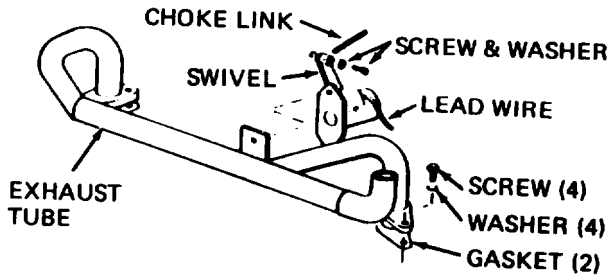


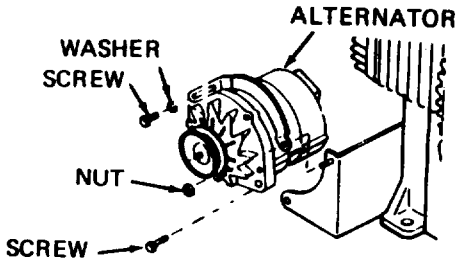
Figure 4-16. Engine Removal (RGMD-K/1-10)

4-44. GASOLINE ENGINE (Cont)

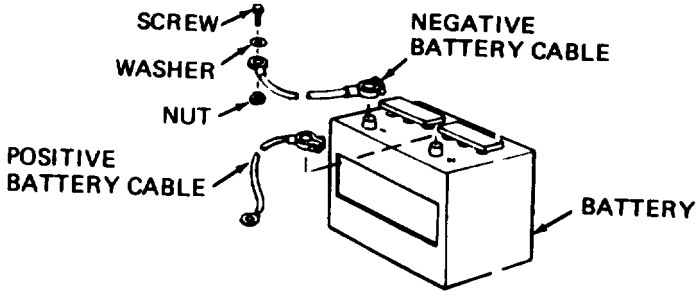
(5) Install exhaust tube with four screws and washers. Install choke link into swivel choke and tighten screw. Connect electrical lead wire to sisson choke,



(6) Replace alternator onto engine with screws and washers.



(7) Reconnect negative battery cable.



4-45. ALTERNATOR BELT (RGMD-K/1-10)

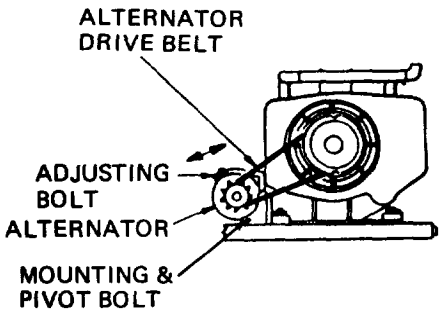


Figure 4-17. Alternator Belt

a. Be sure the refrigeration unit is turned off or disconnected and open lower access doors.

b. Loosen the mounting and pivot bolt and the adjusting bolt.

c. If belt is bad replace it.

d. Be sure that belt is properly seated in the two pulleys.

e. Use a small pinch bar to pry up and apply tension on the belt. Proper tension is a deflection of 1/2 inch (1.3 cm) midway between the pulleys.

f. Tighten the adjusting bolt and then the mounting and pivot bolt.

g. Close access door and connect power.

h. Check belt for proper tension after a few hours operating time.

4-46. ALTERNATOR (RGMD-K/1-10)

a. Inspection.

(1) Be sure that unit is turned off or disconnected at battery.

(2) Open the front access doors.

(3) Check to see that belt is in place and tight (para. 4-45).

(4) Check that wire connections are tight and not broken.

(5) Check that both the adjusting screw and mounting and pivot bolts are tight.

4-46. ALTERNATOR (Cont)

b. Testing.

(1) Remove brush assembly.

(a) Remove the three screws which fasten the voltage regulator to the alternator. Disconnect the regulator leads and remove the regulator.

(b) Remove the two screws on the phenolic cover and lift out the cover and gasket.

(c) Pull the brush assembly straight up and lift out.

(2) Connect an ohmmeter or test lamp (12 or 120 volts) to the field terminal and to the bracket. The test lamp shouldn't light and resistance reading should be high (infinite). If not there is a short and the assembly must be replaced.

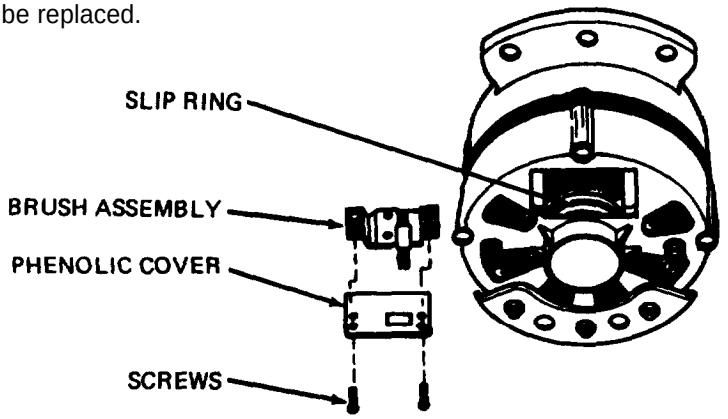


Figure 4-18. Alternator Brush Removal (RGMD-K/1-10)

(3) Now move the one ohmmeter lead from the bracket to the insulated brush. Use an alligator clip directly on the brush. Be careful not to chip it. Resistance reading should be zero (continuity).

(4) Connect the ohmmeter leads to the grounded brush and the bracket. Resistance should be zero (continuity).

(5) Reverse the procedure in (1) above to reinstall the brush,

c. Removal. (See figure 4-17.)

(1) Tag and disconnect the wires from terminals located at the rear of the alternator.

(2) Loosen the drive belt adjusting bolt and remove the belt from the alternator pulley.

(3) Remove the adjusting bolt from the adjustment bracket and the mounting and pivot bolt near the lower right corner.

d. Installation.

(1) Install, but do not tighten, using the two bolts removed in (3) above.

(2) Install the drive belt on the pulley. Adjust the position of the alternator to achieve proper tension in belt and tighten the two bolts, Proper tension in the belt is achieved by obtaining a deflection of 1/2 inch midway between the two pulleys.

(3) See tags and wiring diagram (figure 1-5). Reconnect the wires to the terminals on the back of the alternator.

(4) Close access doors and connect power.

4-47. AIR CLEANER (RGMD-K/1-10)

a. Removal.

(1) Remove oil cup.

(2) Loosen clamps.

(3) Remove screw, nut and washer.

b. Cleaning. Release wire screen from oil cup and clean with approved cleaning solvent (Appendix E, Item 17).

c. Installation.

(1) Install air cleaner housing with screw, nut and washer.

(2) Fill oil cup with approved lubricant (sea Lubrication Order Figure 3-1).

(3) Install oil cup with screw and washer into air cleaner housing.

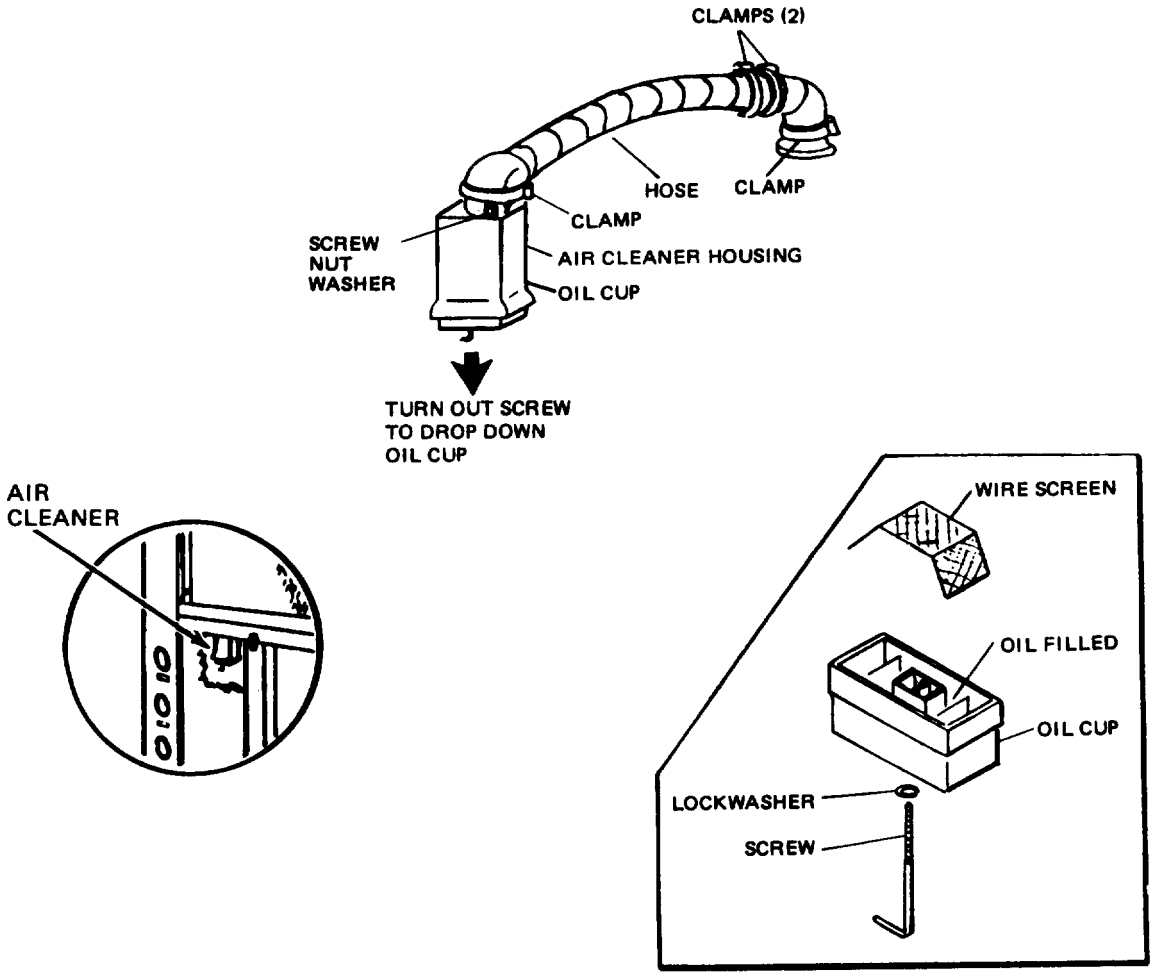


Figure 4-19. Air Cleaner (RGMD-K/1-10)

4-48. CHOKE (RGMD-K/1-10)

a. Access

(1) Be sure that the unit is turned off. If there is a chance that someone will turn it 01, disconnect the

(2) Open the front and side access doors.

b. Adjustment. The choke should not require any seasonal readjustment, but if adjustment becomes necessary, proceed as follows:

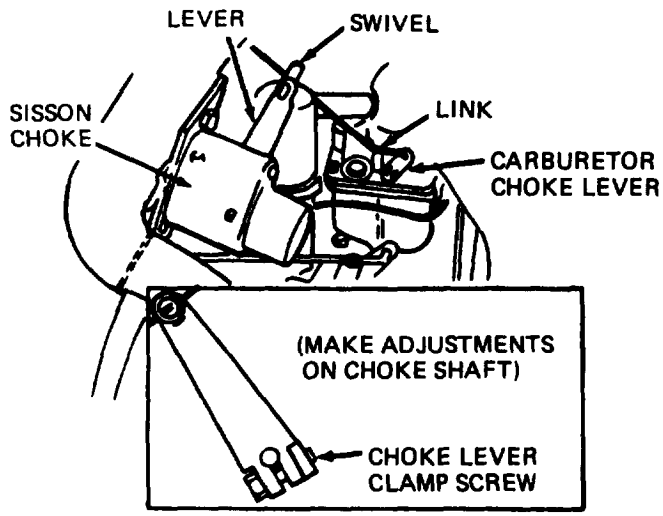


Figure 4-20. Choke (RGMD-K/1-10)

(1) Pull choke lever up and insert a 1/16-inch (1.59mm) diameter rod through shaft hole (opposite end from lever) and engage rod in notch of mounting flange, to lock shaft in place,

(2) Loosen the choke lever clamp screw.

(3) With air inlet removed, adjust choke lever so carburetor choke plate is completely closed, or not more than 5/16-inch (7.94 mm) open.

(4) Tighten choke lever clamp screw and remove locking rod from shaft,

c. Removal,

(1) Loosen the screw in the end of the swivel and remove the link.

(2) Remove two mounting screws and pull the choke from the unit.

d. Installation.

(1) Position the choke and secure it with two screws.

(2) Hook the bent end of the link to the carburetor choke lever and insert the link through the hole in the swivel,

(3) Tighten swivel screw.

(4) See paragraph b. above for adjustments.

(5) Connect battery if it was disconnected.

(6) Close access doors.

4-49. CARBURETOR (RGMD-K/1-10)

a. Access.

(1) Be sure that the unit is turned off. If there is a chance that someone will turn it on, disconnect the battery.

(2) Open front and side access doors.

(3) See paragraph 4-47 and remove the air cleaner.

b. Inspection.

(1) Check for signs of fuel leakage.

(2) Check for loose or missing linkages.

(3) Check that float is not damaged.

c. Adjustment.

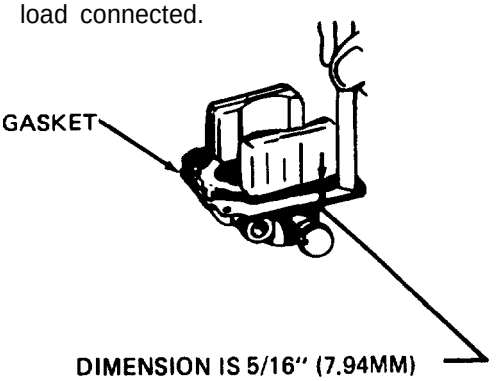
(1) If necessary to reset the float level, use long round nose pliers to bend the lip of the float. With the carburetor casting inverted and the float resting lightly against the needle in its seat, there should be 5/16-inch (7.94 mm) with metal float or 1/4 inch (6.35 mm) with Styrofoam plastic float clearance between the bowl cover gasket and the free end of the float (side opposite needle seat).

(2) The carburetor has a fuel idle adjustment which affects operation under light or no load conditions. If the adjustment has been disturbed, turn the idle adjustment screw (needle off its seat) 1 to 1% turns to permit starting. Then readjust for smooth idle condition.

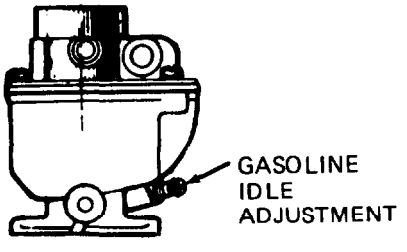
CAUTION

Forcing the needle against its seat will damage it. The needle does not completely shut off fuel when turned fully in.

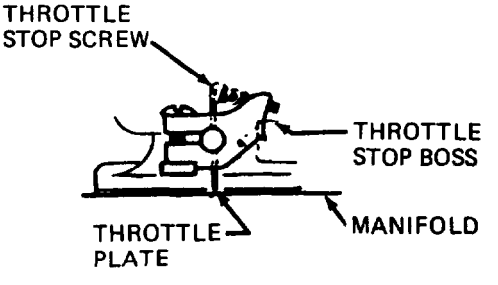
(3) The throttle stop screw should be set for the desired idle speed when the engine is operating with load connected.



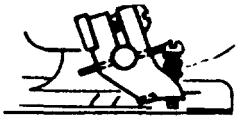
FLOAT LEVEL ADJUSTMENT



NEEDLE VALVE ADJUSTMENT



STARTING POSITION



IDLING POSITION

THROTTLE STOP
SCREW ADJUSTMENT

Figure 4-21. Carburetor Adjusting Points (RGMD-K/1-10)

4-49. CARBURETOR (Cont)

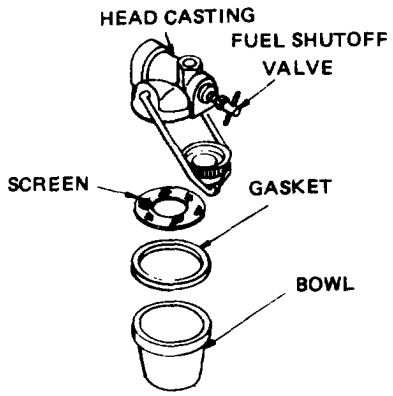
d. Removal.

WARNING

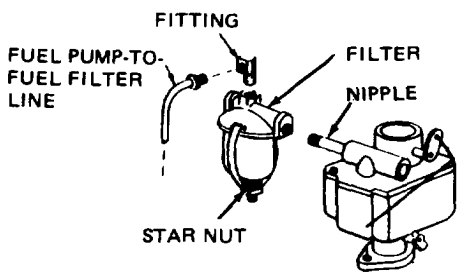
DO NOT SMOKE or use an open flame in the vicinity of the engine or fuel tank. Internal combustion engine fuels are highly flammable.

(1) Remove air cleaner (para. 4-47).

(2) Turn fuel shutoff valve on fuel filter clockwise to full closed position.



(3) Disconnect fuel pump-to-filter line at filter.



(4) Loosen star nut on bail to remove bowl from head casting. Remove screen and gasket.

(5) Unscrew head casting from carburetor nipple.

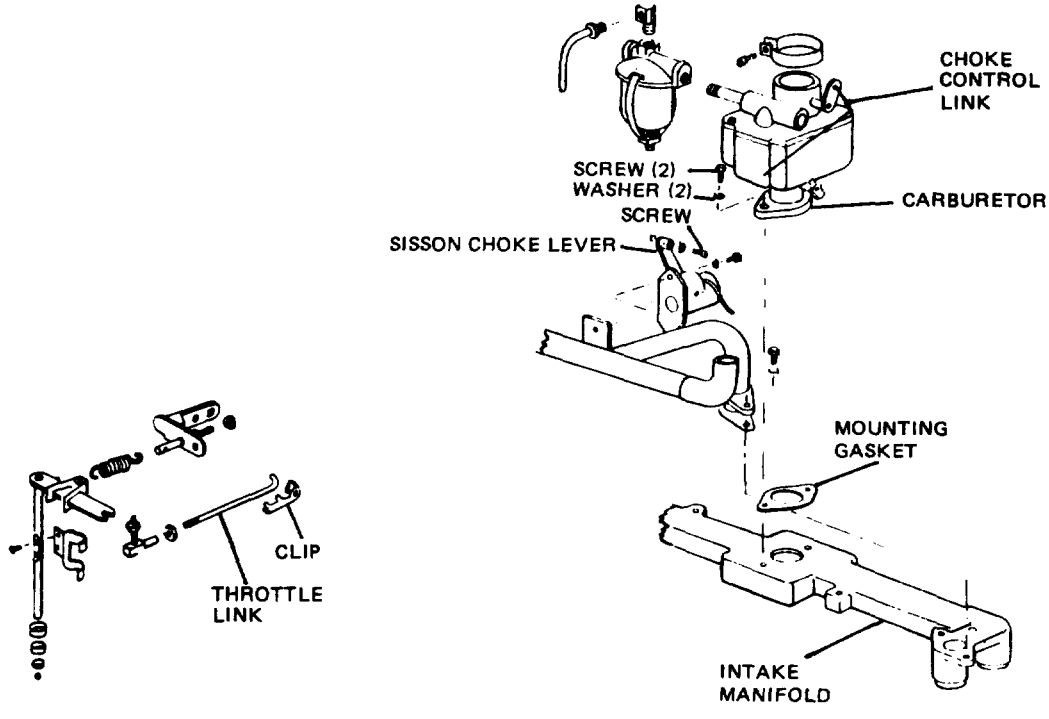
(6) Loosen screw to release choke control link at sisson choke lever.

(7) Remove clip to release throttle link at carburetor.

(8) Remove two screws and Iockwashers that attach carburetor to intake manofild.

(9) Remove carburetor and carburetor mounting gasket. Remove choke control link from carburetor.

(10) If repair is necessary, notify direct support maintenance.



e. Installation.

(1) Install the carburetor (with a new gasket) to the manifold.

(2) Attach the choke control link to the carburetor.

(3) Attach throttle link clip at carburetor.

(4) Fasten choke control link at sisson choke lever with screw.

4-50. GOVERNOR (RGMD-K/1-10)

a. Access.

(1) Be sure that the unit is turned off. If there is any chance that someone will turn it on, disconnect the battery.

(2) Open the front access doors and the side access doors.

(3) See paragraph 4-47 and remove the air cleaner.

b. Inspection.

(1) Check to see that all parts are in place and free of dirt and obstruction,

(2) Clean and lubricate the steel ball joints of the governor linkage, using a drop of light oil or graphite. The linkage must be able to move freely through its entire range.

(3) Check the governor arm, linkage, throttle shaft and lever for a binding condition or excessive slack and wear at connecting points. A binding condition at any point will cause the governor to act slowly and regulation will be poor. Excessive looseness will cause a hunting condition and regulation will be erratic.

(4) Install the air cleaner (paragraph 4-47).

c. Adjustment.

WARNING

If it is necessary to make adjustments while the engine is running, use extreme caution when close to hot exhausts, moving parts, etc.

NOTE

On a new replacement engine, the governor is set at the factory to allow a nominal engine speed of 2400 rpm at no load operation. Proper adjustment is one of the most important factors in maintaining desired engine power and speed.

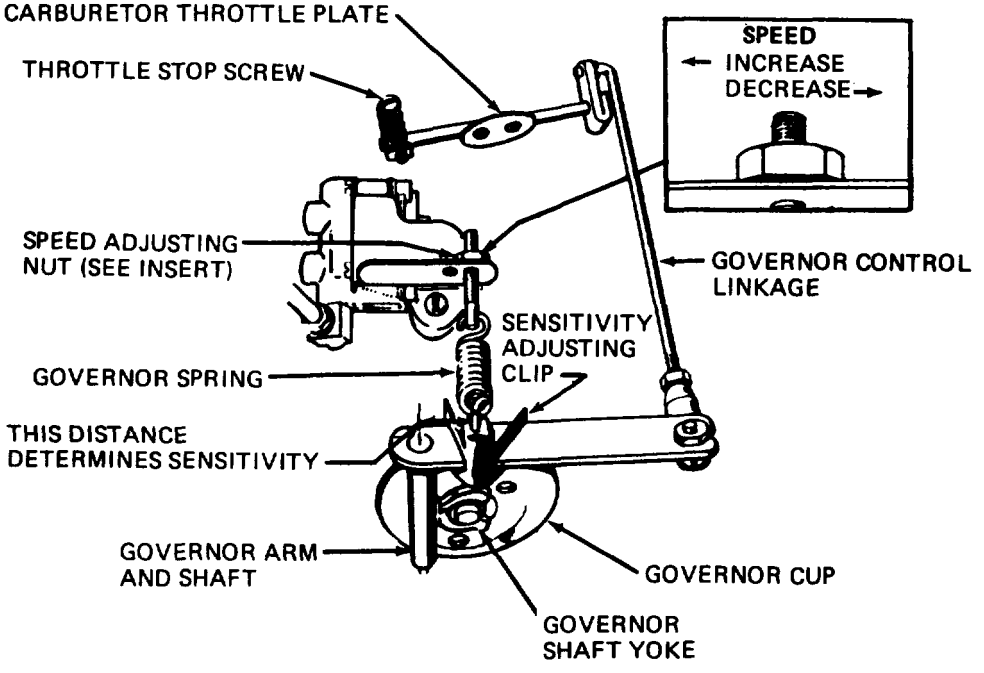


Figure 4-22. Governor Adjustment (RGMD-K/1-10)

(1) Before making voernor adjustment, run the engine abut 15 minutes to reach normal operating temperature. If the engine runs with the throttle wide open, either the governor is not properly adjusted or the engine is overloaded.

(2) Adjust the carburetor idle needle with no load connected. See paragraph 4-44a(5) for belt removal. The belts need only be disconnected from the engine. Tie or tape them up out of the way so that they will not be damaged or contaminated with oil or fuel.

(3) Adjust the length of the governor linkage.

NOTE

The engine starts at wide open throttle. The length of the linkage connecting the governor arm to the throttle shaft and lever is adjusted by rotating the ball joint. Adjust this length so that with the engine stopped and tension on the governor spring, the stop on the carburetor throttle shaft just contacts the underside of the carburetor bowl, This setting allows immediate control by the governor after starting, It also synchronizes the travel of the governor arm and the throttle shaft.

(4) Speed Adjustment. Adjust the governor spring tension for nominal engine speed at no load operation (fig. 4-22). The no load speed should be slightly higher than the speed under load. A reliable instrument for checking engine speed is required for accurate governor adjustment. Engine speed can be checked with a tachometer.

NOTE

It is difficult to determine after long usage, if the governor spring has become fatigued. If after properly making all other adjustments, the regulation is still erratic, install a new spring,

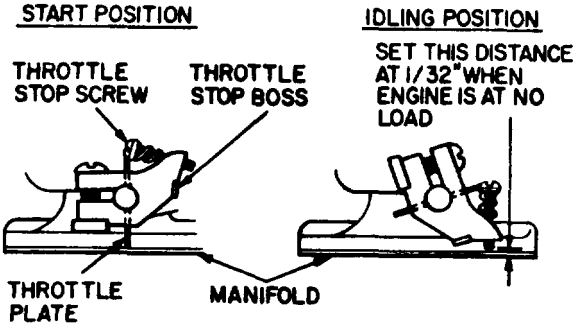
(5) Sensitivity Adjustment. Check engine rpm drop between no load and full load operation. The drop must not exceed 100 rpm. To increase sensitivity shift the adjusting clip (fig. 4-22) toward the governor shaft. To decrease it, shift toward the linkage end.

NOTE

Too sensitive a setting will result in a surging speed (hunting) condition (alternate increase and decrease in engine speed). An opposite setting will result in too much speed variation between no load and full load conditions. Thus, the correct position of the clip (or stud) will result in the most stable speed regulation without causing a surge condition.

(6) Always recheck the speed adjustment after a sensitivity adjustment. Increasing sensitivity will cause a slight decrease in speed and will require a slight increase in the governor spring tension.

(7) Throttle Stop Screw. The throttle stop screw should be set at 1/32-inch (0.794mm) distance from the manifold when the engine is operating with no load connected.



THROTTLE SCREW ADJUSTMENT (RGMD-K/1-10)

4-51. COOLING SHROUD (RGMD-K/1-10)

Inspection procedures follow:

a. Check for loose or missing hardware.

b. Check for obvious damage.

c. Replace missing hardware and contact direct support maintenance for any necessary replacements or repairs,

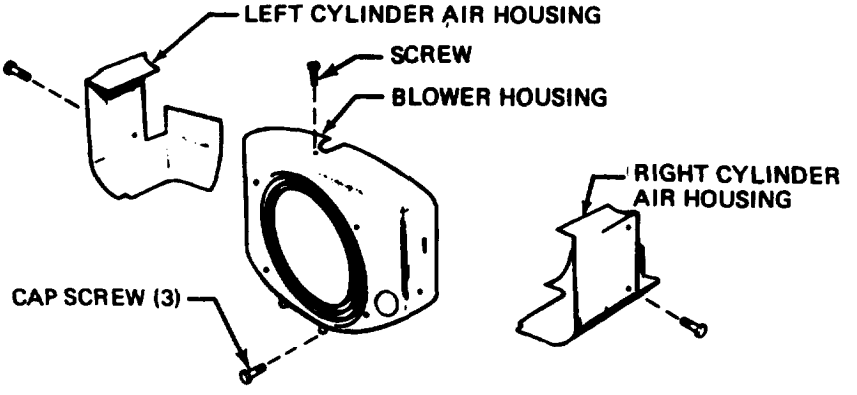


Figure 4-23. Cooling Shroud (RGMD-K/1-10)

4-52. SPAR K PLUGS AND LEADS (RGMD-K/1-10)

a. Access.

(1) Be sure that unit is turned off. If there is a chance that someone will turn it on, disconnect the battery.

(2) Open the front and side access doors.

(3) See paragraph 4-47 and remove the air cleaner.

b. Inspection. Cleaning and Adjustment.

(1) Inspect the leads for cuts, breaks and worn areas.

(2) Check for loose connections.

(3) To maintain maximum efficiency the spark plugs should be replaced every 100 hours. Between replacement times, the spark plugs may be inspected and cleaned by wire brushing the shell and threads and filing the electrode surfaces with a point file.

(4) Check that the spark plugs are gapped at 0.025 inch (0.64mm).

(5) With an ohmmeter, check the spark plug leads for continuity.

c. Replacement.

(1) Replace spark plugs every 100 hours.

(2) Set gap at 0.025 inch (0.64mm).

(3) Install plugs and leads. Be sure they are tight.

(4) Install the air cleaner (para. 4-47).

(5) Connect the battery if it was disconnected.

(6) Close access doors.

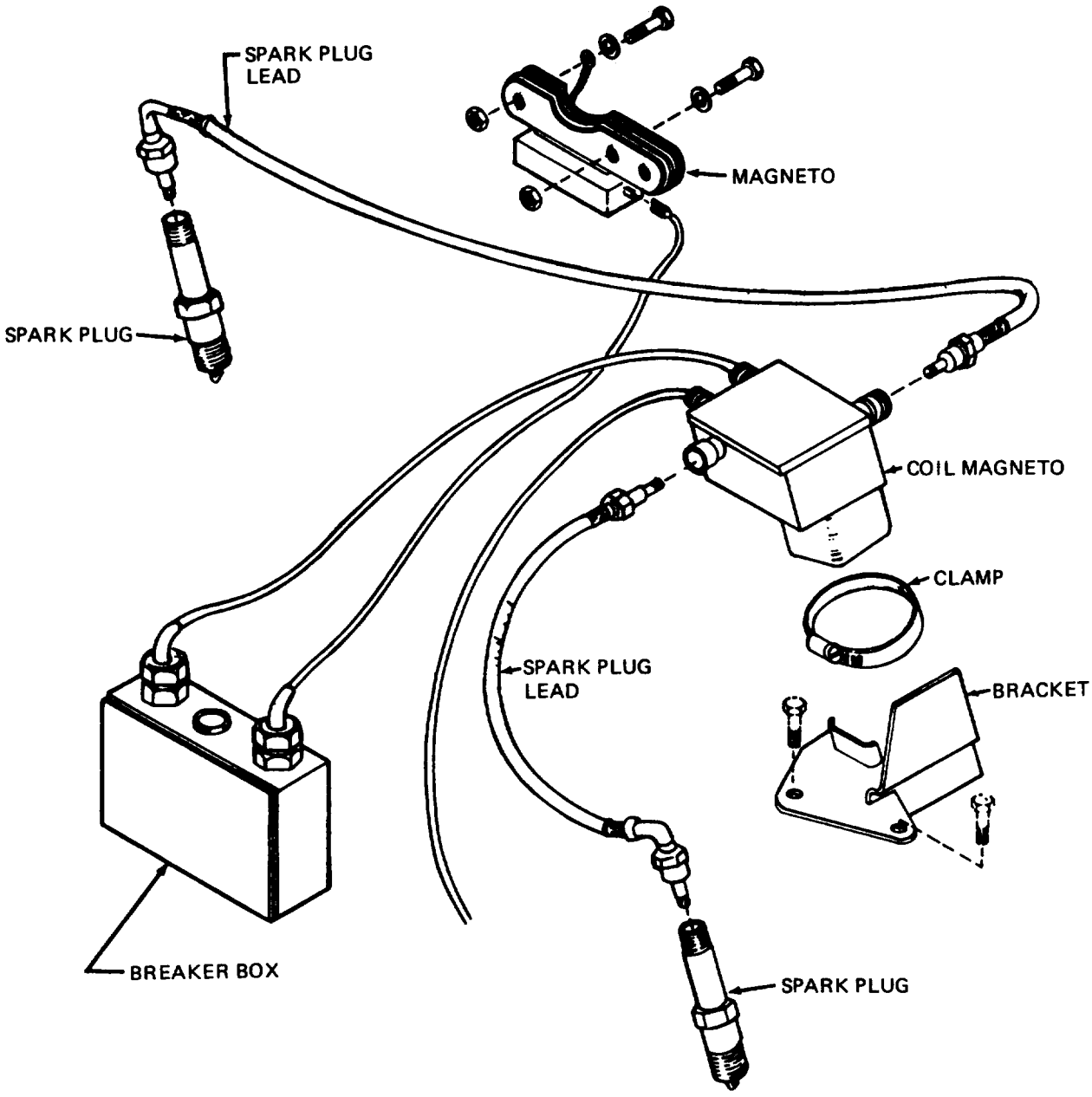


Figure 4-24. Ignition System (RGMD-K/1-10)

4-53. IGNITION POINTS (RGMD-K/1-10)

a. Access.

(1) Be sure that unit is turned off.

(2) Open the left side access door.

(3) Remove the two screws and the cover on the breaker box.

b. Inspection. To maintain maximum efficiency from the engine, inspect the breaker points and replace the spark plugs every 100 hours of operation and replace the breaker points every 200 hours of operation.

c. Replacement.

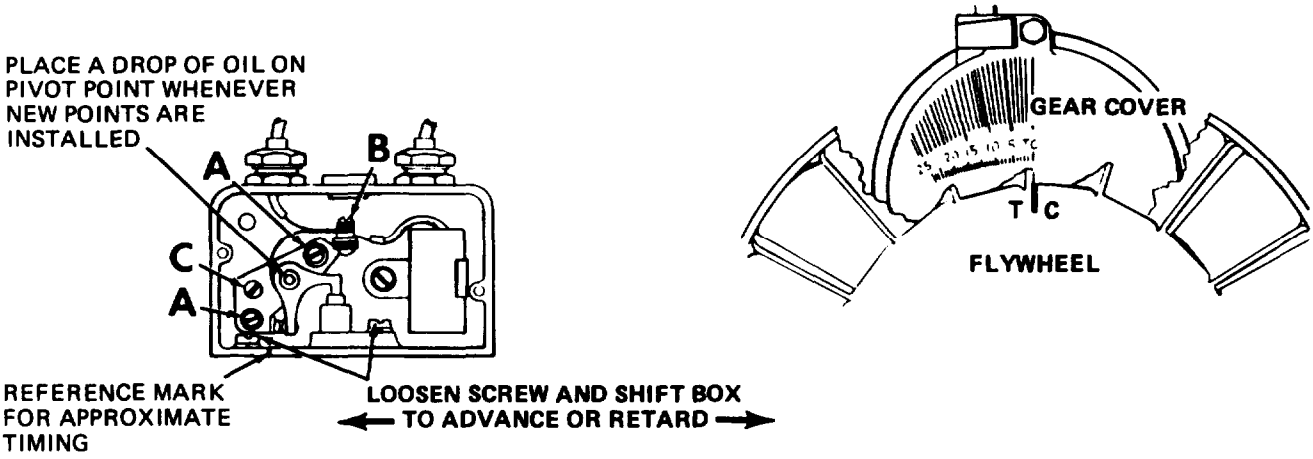


Figure 4-25. Ignition Timing (RGMD-K/1-10)

(1) Using the left pert of figure 4-25 as a guide, remove the two mounting screws (A) and pull the points out of the box just far enough so screw (B) can be removed. Replace points and condenser with a new set, but do not completely tighten mounting screws (A),

(2) Rotate crankshaft clockwise (facing flywheel) until points are fully open. Turn screw (C) until point gap measures 0.020 inch (0.51 mm) with a flat thickness gage.

(3) Tighten mounting screws (A) and recheck point gap. Place one drop of oil on breaker point pivot,

(4) Proceed to Ignition Timing procedure which follows.

d. Ignition Timing. Always check timing after replacing ignition points or if noticing poor engine performance. The timing marks will be visible through the flywheel. See figure 4-25 and proceed as follows.

(1) To check the ignition timing accurately, use a timing light when the engine is running. Connect the timing light to spark plug according to its manufacturer's instructions. Either spark plug can be used as they fire simultaneous y.

(2) Place a white chalk or paint mark on the timing mark.

(3) Start the engine and check the timing for 20° BTC to 24° BTC.

(4) If timing needs adjustment, loosen the mounting screws on breaker box and move it left to advance or right to retard the timing.

(5) Tighten the screws on the breaker box and recheck timing.

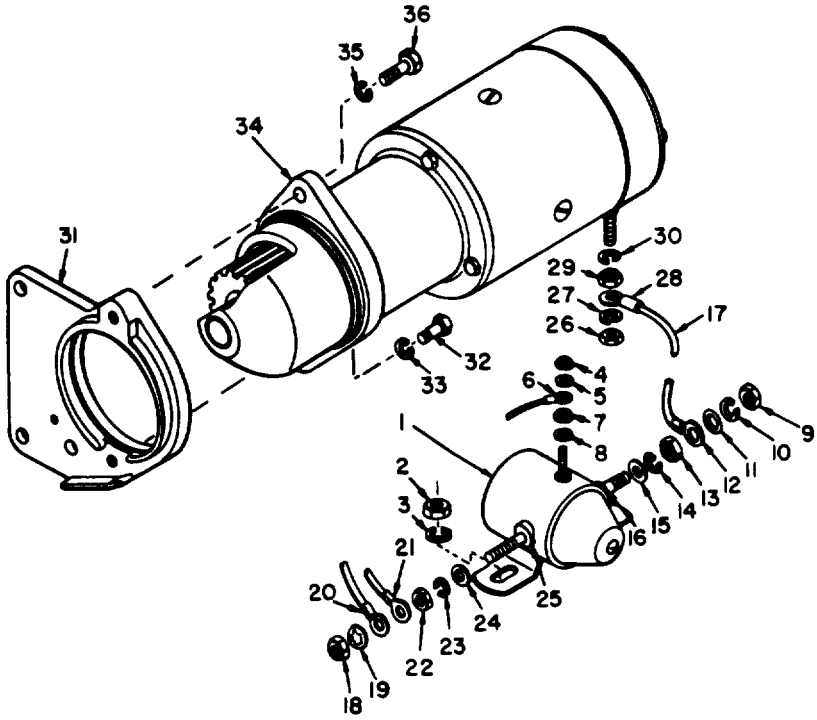
(6) Replace breaker box cover and any other hardware removed.

4-54. STARTER SOLENOID

a. Removal.
   (1) Disconnect battery cables (para. 4-56).
   (2) Disconnect starter cable (17, figure 4-26). Disconnect wiring harness at solenoid (1).
   (3) Remove two nuts (2) and washer (3) that attach solenoid to engine frame.

b. Cleaning and Inspection.
   (1) Clean solenoid with an approved cleaning solvent (Appendix E, Item 17) and dry thoroughly.
   (2) Inspect for cracks, dents and other damage. Replace ff defective.

c. Installation.
   (1) Align-holes of starter solenoid (1) with holes on engine frame and attach with two nuts (2) and washers (3).
   (2) Connect starter cable (17) and wires from harness to solenoid.
   (3) Reconnect battery cables.



1. SOLENOID
2. NUT
3. WASHER
4. NUT
5. WASHER
6. TERMINAL
7. NUT
8, WASHER
9. NUT
10. WASHER, LOCK
11. WASHER, FLAT
12. TERMINAL
13. NUT
14. WASHER, LOCK
15. WASHER, FIAT
16. GROMMET
17. CABLE,
18. NUT
19. WASHER, LOCK
20. TERMINAL
21. TERMINAL
22. NUT
23. WASHER, LOCK
24. WASHER, FLAT
25. GROMMET
26. NUT
27. WASHER, LOCK
28. TERMINAL
29. NUT
30. WASHER, LOCK
31. FLANGE, STARTER MTG
32. SCREW
33. WASHER, LOCK
34. STARTER MOTOR
35. WASHER, LOCK
36. SCREW

Figure 4-26. Starter Motor and Starter Solenoid (RGMD-K/1-10)

4-55. STARTER MOTOR

a. Removal.

(1) Remove blower housing (fig. 4-23) by removing three cap screws and a screw on top of housing,

(2) Remove solenoid starter per paragraph 4-54.

(3) Remove three cap screws (32, figure 4-26) and washers (33) attaching starter mounting flange (31) to engine.

(4) Remove two cap screws (36) and Iockwashers (35) attaching starter motor (34) to flange.

b. Cleaning and Inspection.

(1) Clean starter with a clean lint-free cloth.

(2) Inspect starter for cracks, chips, worn drive, and worn brushes. Refer to direct support unit for repairs.

c. Installation.

(1) Assemble starter mounting flange (31) to starter motor (34) using two cap screws (36) and lock-washers (35).

(2) Attach starter mounting flange with starter motor to engine with three cap screws (32) and washers (33).

NOTE

When installing starter to engine oil base, do not draw the mounting bolts up tight, The gears should have 0,004 to 0.007 inch backlash. Tap the starter in or out from the oil base to adjust. Then tighten bolts securely.

(3) Install Solenoid starter per paragraph 4-54.

(4) Install blower housing with screws

4-56. BATTERY, BATTERY CABLES AND HOLD DOWN (RGMD-K/1-10)

WARNING

DO NOT SMOKE while servicing batteries. Lead acid batteries give off highly explosive hydrogen gas which can be ignited by flame, electrical arcing or by smoking. Verify battery polarity before connecting battery cables. Connect negative cables last.

a. Access.

(1) Turn unit off.

(2) Open left side access door.

b. Testing.

(1) Check specific gravity in each cell with a hydrometer. It should be 1.280 at 80°F (27°C), If not, recharge the battery to bring it up to this level.

(2) Check battery cells to make sure they are filled to the desired level–about 9/16 inches (1.4cm) above the tops of the separators. Add distilled or drinking water as required.

c. Charging. Use any commercial type battery charger for charging the battery. Refer to charger manufacturer's instructions for proper use of charger.

NOTE

As a precautionary measure, disconnect positive battery terminal when charging battery in unit. Connecting charger in reverse will destroy the rectifier diodes in alternator. Possible damage to regulator may occur if the battery is charged without disconnecting the positive battery terminal. Most commercial charges contain a high AC ripple voltage which can be 4 or 5 volts in excess of the DC voltage indicated on charger. This voltage may exceed the maximum rating of rectifier diodes and regulator.

d. Removal.

(1) Remove two nuts and studs securing battery bracket and battery.

(2) Remove battery cables from battery terminals.

(3) Lift battery from battery well.

e. Cleaning and Inspection.

(1) Clean battery with an approved cleaning solvent (Appendix E, Item 17) and dry thoroughly.

(2) Inspect battery for cracks, chips and other damage. Replace if defective.

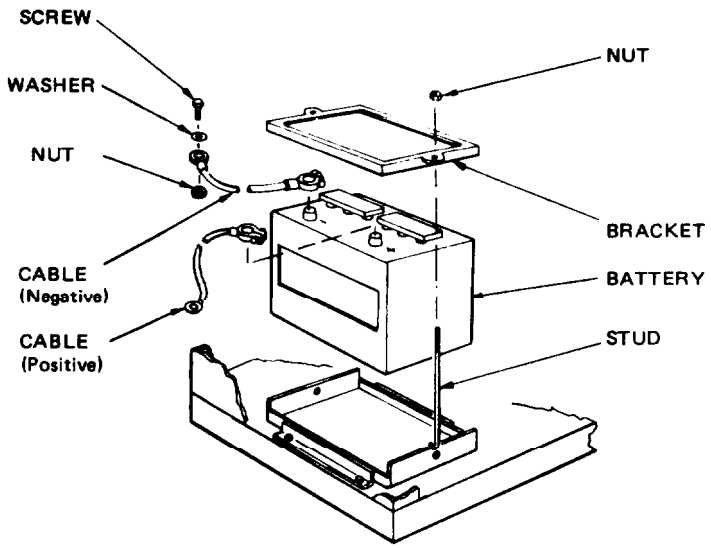


Figure 4-27. Battery (RGMD-K/1-10)

f. Installation.

CAUTION

Observe proper polarity when installing battery; negative battery terminal must be grounded. Reverse polarity will destroy the rectifier diodes in alternator.

(1) Place battery in battery well and secure with two studs, brackets and nuts..

(2) Connect battery cables to proper battery terminals.

NOTE

Poor contact at the battery cable connections is often a source of trouble. Make sure battery cables are in good condition and that contacting surfaces are clean and tightly connected.

4-57. FUEL TANK (RGMD-K/1-10)

WARNING

DO NOT SMOKE or use open flame in the vicinity of the engine or fuel tank. Internal combustion engine fuels are highly flammable.

a. Removal.

(1) Remove panel by removing four screws.
(2) Drain fuel tank by removing drain plug.
(3) Disconnect fuel line hose by removing clamps.
(4) Disconnect gas tank-to-pump line.
(5) Remove screws and remove straps.
(6) Push fuel tank slightly forward to clear drain pipe. Lift tank out of unit.

b. Cleaning and Inspection.

(1) Clean all parts with approved cleaning solvent (Appendix E, Item 17) and dry thoroughly.
(2) Inspect tank for leaks or other damage. Replace defective parts.

c. Installation.

(1) Place tank into unit as in original configuration. Lineup drain pipe with hole in unit.
(2) Tighten fuel tank hold down clamps on straps.
(3) Connect gas tank-to-pump line.
(4) Connect gas tank-to-pump line.
(5) Fill fuel tank with fuel.
(6) Re-install panel with screws.

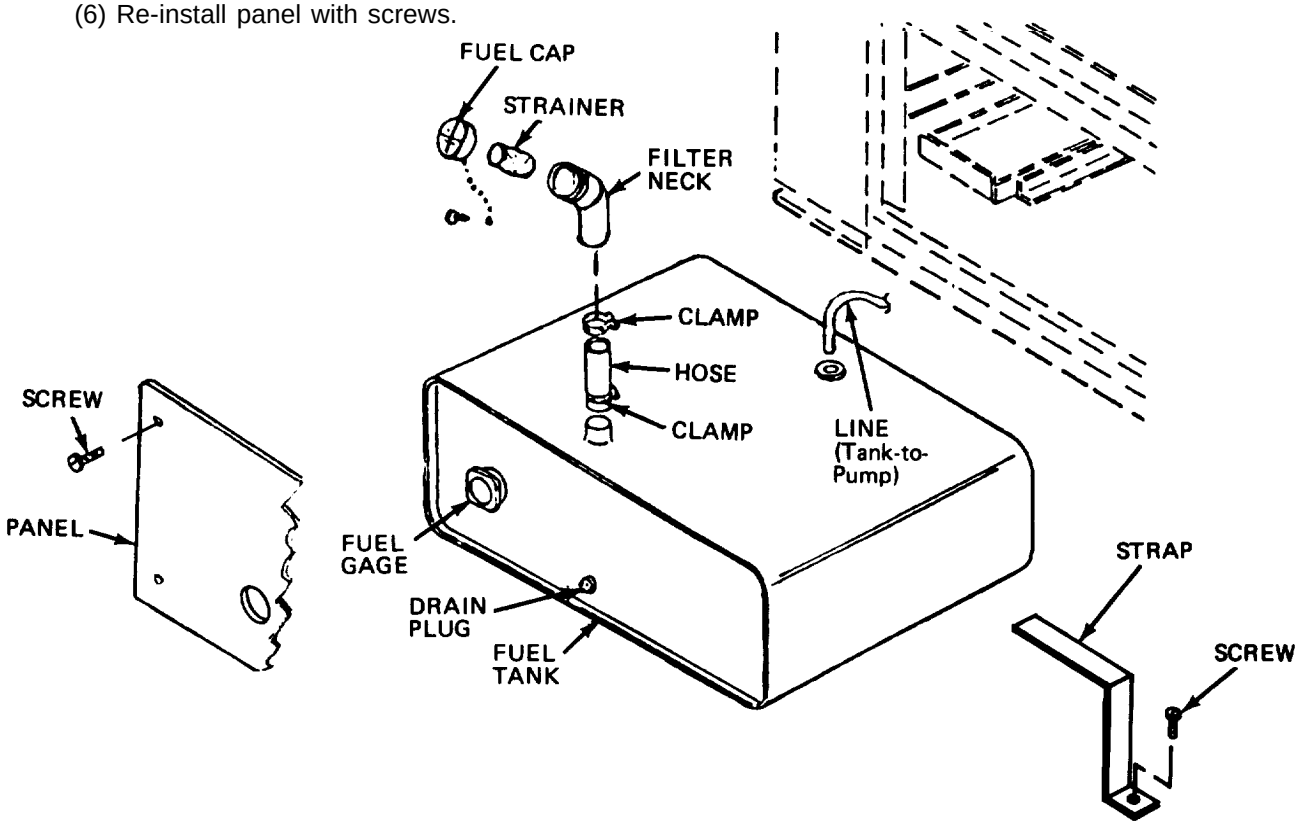


Figure 4-28. Fuel Tank (RGMD-K/1-10)

4-58. FUEL FILTER (RGMD-K/1-10)

WARNING

DO NOT SMOKE or use open flame in the vicinity of the engine or fuel tank. Internal combustion engine fuels are highly flammable.

a. Removal and Disassembly.

(1) Disconnect battery cable at starter.
(2) Screw fuel shutoff valve on fuel filter clockwise to full closed position.
(3) Disconnect fuel pump-to-filter line at filter.
(4) Loosen star nut on bail to remove bowl from head casting. Swing bail to one side. Remove filter screen and gasket from head casting.
(5) Unscrew head casting from carburetor nipple.

b. Cleaning and Inspection.

(1) Empty sediment and gasoline from bowl. Dry bowl with clean, lint-free cloth.
(2) BIow all sludge from filter screen and fuel passages in head casting.
(3) Inspect all components for damage or deterioration. Check bail and bowl for dents or cracks. Inspect star nut for damaged threads. Replace defective parts with new items during reassembly.

c. Reassembly and Installation.

(1) Screw head casting on carburetor nipple.
(2) Place gasket, filter screen and bowl in place. Swing bail in place and tighten star nut.
(3) Connect fuel pump-to-fuel filter line at fuel filter.
(4) Turn fuel shutoff valve on fuel filter counterclockwise to fuII open position.

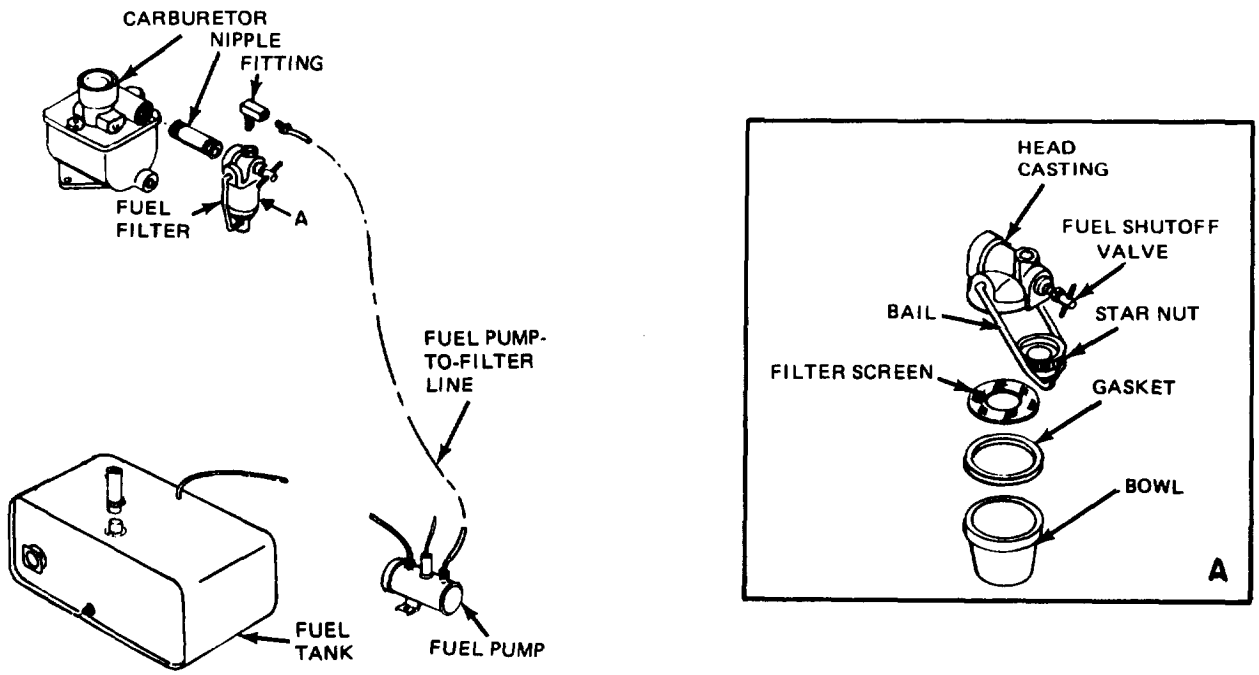


Figure 4-29, Fuel Filter, Lines and Fittings (RGMD-K/1-10)

4-59. FUEL LINES AND FITTINGS (RGMD-K/1-10)

WARNING

DO NOT SMOKE or use open flame in the vicinity of the engine or fuel tank. Internal combustion engine fuels are highly flammable.

a. Removal.

(1) Remove drain plug and drain gasoline tank of fuel.

(2) Disconnect and remove fuel pump-to-fuel filter line. Disconnect and remove fuel tank-to-fuel pump

(3) Unscrew fitting and nipple.

(4) Unscrew filter sediment bowl from fuel filter assembly.

b. Cleaning and Inspection.

(1) Clean all lines and fittings and filter sediment bowl in an approved cleaning solvent (Appendix E, Item 17). Use compressed air to blow all dirt and sludge from fuel passages. Dry external surfaces with clean, lint-free cloth,

(2) Inspect fuel lines for cracks, dents, and other damage. Pay particular attention to root of flare. Check fittings and shut-off valve for damage threads and other defects. Check operation of fuel shut-off valve on fuel filter assembly. Replace all defective parts.

c. Installation.

(1) Install filter sediment bowl to fuel filter assembly.

(2) Screw fitting to fuel filter assembly.

(3) Install nipple between fuel filter assembly and carburetor.

(4) Connect fuel pump-to-fuel filter line.

(5) Connect fuel tank-to-fuel pump line.

(6) Screw in drain plug to gasoline tank.

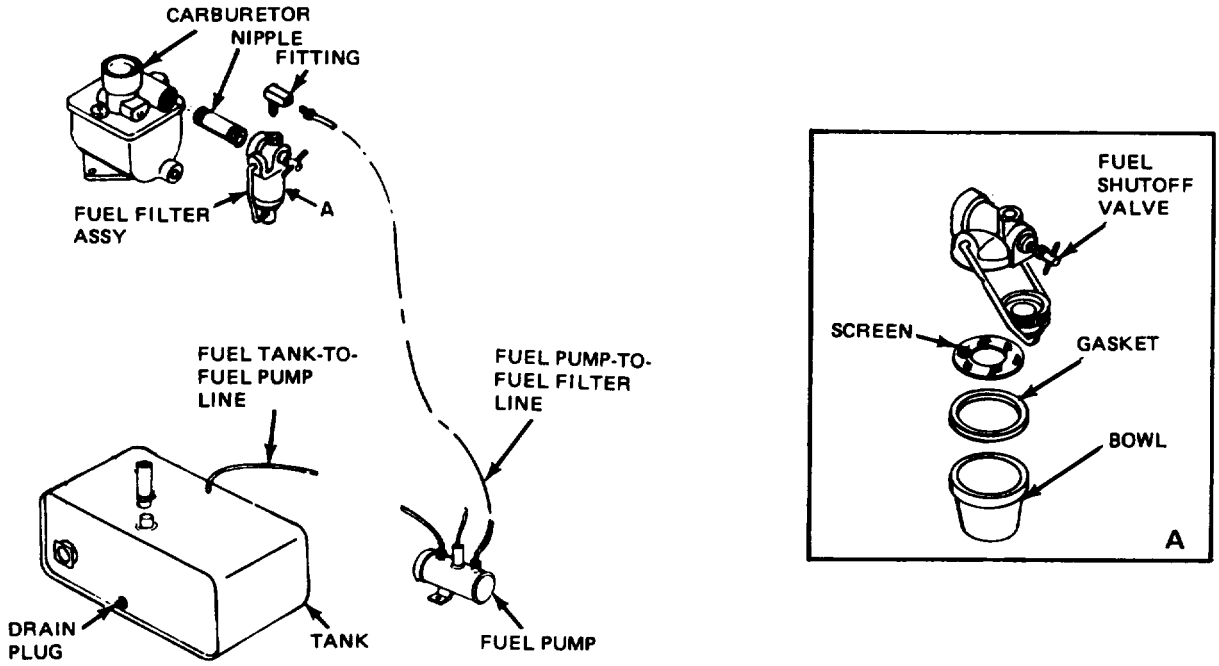


Figure 4-30. Fuel Lines and Fittings (RGMD-K/1-10)

4-60. FUEL PUMP

WARNING

DO NOT SMOKE or use open flame in the vicinity of the engine or fuel tank. Internal combustion engine fuels are highly flammable.

a. Removal.

(1) Disconnect fuel lines from fuel pump.

(2) Disconnect electrical wire from fuel pump.

(3) Remove two screws and washers attaching fuel pump to floor of unit. Remove fuel pump.

b. Installation.

(1) Align holes of fuel pump with holes in floor of unit. Fasten fuel pump with two screws and washers.

(2) Connect fuel pump-to-fuel filter line at fuel pump.

(3) Connect fuel tank-to-fuel filter line at fuel pump.

(4) Connect electrical wire to fuel pump.

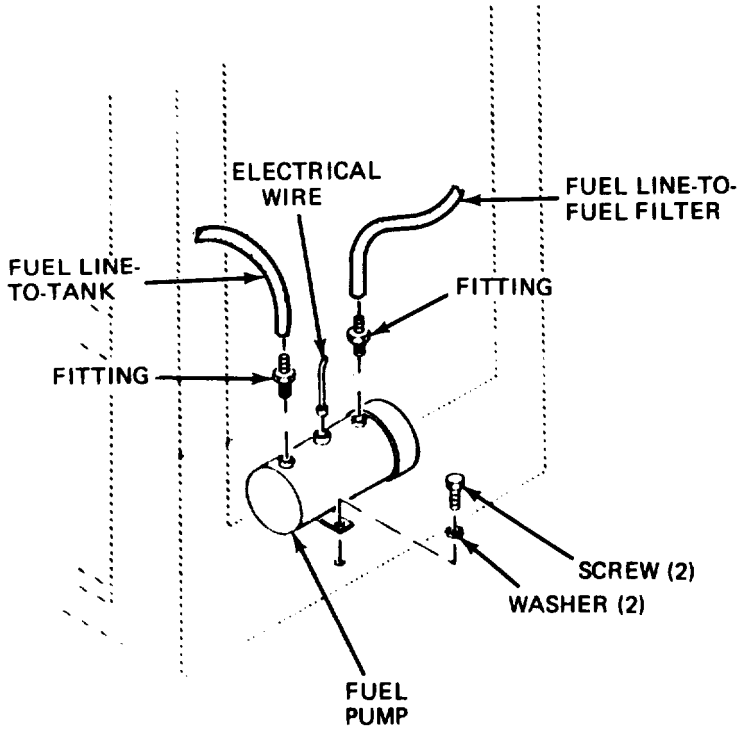


Figure 4-31. Fuel Pump (RGMD-K/1-10)

4-61. HOUSING LIFTING FITTINGS

Replacement procedures follow.

a. Remove eight screws to remove top grille.

b. Remove washers and nuts to replace U-bolt lift fittings.

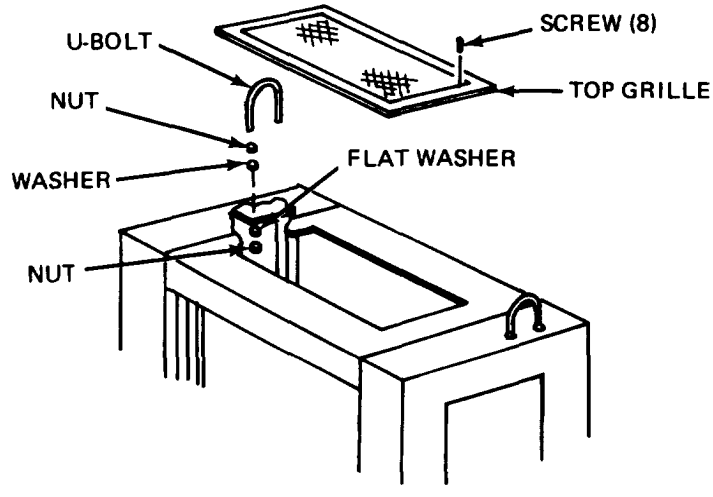


Figure 4-32. Housing Lifting Fittings

4-62. HOUSING HEAT SHIELD GASKET

Replacement and repair procedures follow.

a. Pry off gasket stops that fasten gasket to housing.

b. Should replacement gasket not be cut to length with corners mitered at 450 angles, be sure that you measure and duplicate the gasket being replaced prior to removing the old one.

c. Remove as much old gasket material as possible by pulling or scraping it away from the metal surface.

WARNING

Acetone and methyl-ethyl ketone (MEK) are flammable and their vapors can be explosive. Repeated or prolonged skin contact or inhalation of vapors can be toxic. Use a well ventilated area, wear gloves, and keep away from sparks or flame.

d. Soften and remove old adhesive and gasket residue, using acetone or methyl-ethyl ketone (ME K) and a stiff brush.

e. Coat the mating surfaces of the metal and the gasket with adhesive. Let both surfaces air dry until the adhesive is tacky but will not stick to the fingers.

f. Starting with an end, carefully attach the gasket or insulation to the metal. Press into firm contact all over.

4-63. UNIT MOUNTS

Replacement procedures follow.

a. Remove fourteen screws to remove evaporator guard.
b. Remove set of five screws and set of four screws to remove top panel.
c. Remove three screws, washers and nuts to remove and replace two mounts.

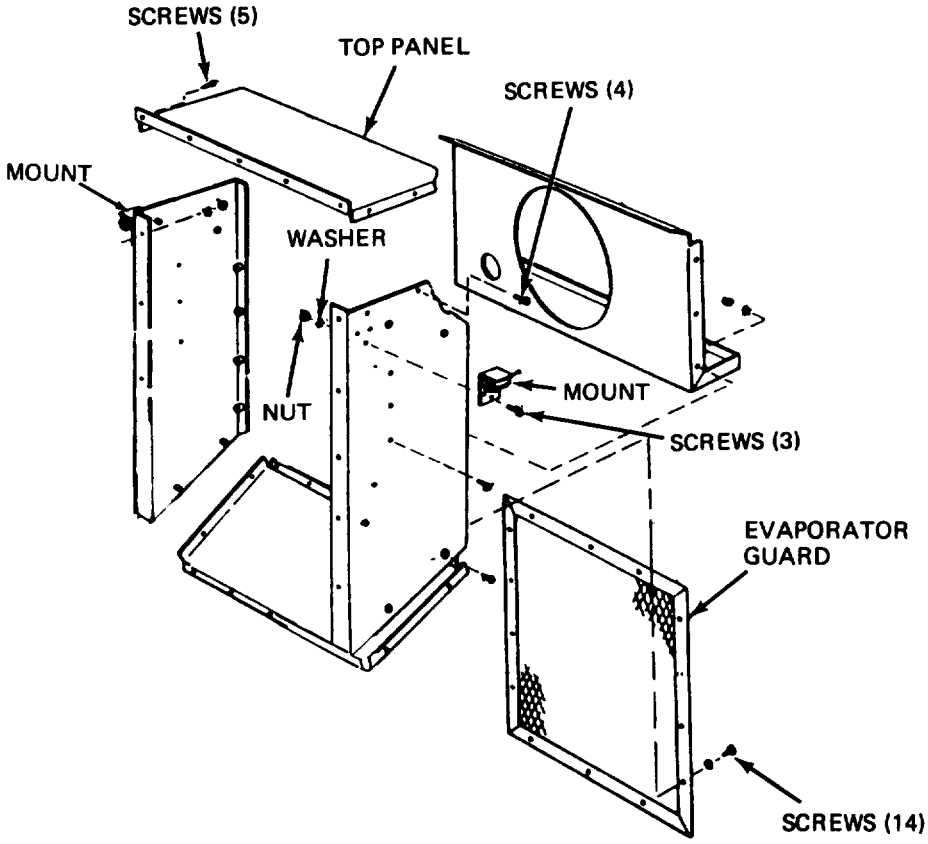


Figure 4-33. Unit Mounts

4-64. ELECTRIC MOTOR (REMD-K/11-10)

WARNING

Disconnect power from refrigeration unit before performing maintenance on electrical components. The voltage used can be lethal.

a. Access.

(1) Disconnect power.

(2) Open the left side access door.

b. Inspection/Testing/Removal.

(1) Turn rod assembly and slide the motor in far enough to remove the belt.

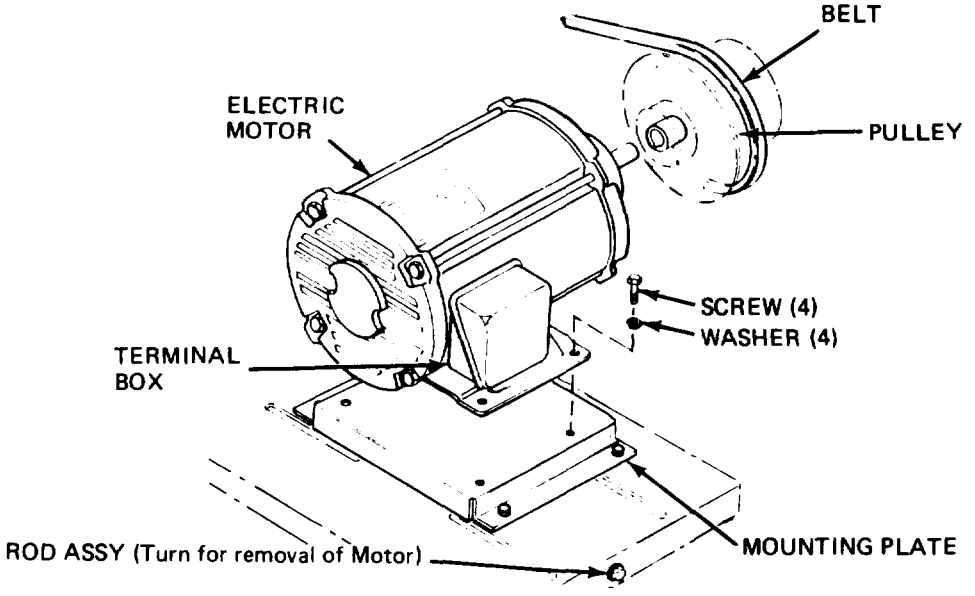


Figure 4-34. Electric Motor (REMD–K/11-10)

(2) Spin the pulley hand hand. If there is any binding or uneven pressure or unusual noises, remove the motor for further repair.

(3) Push the shaft in and out and from side to side. If there is excessive lateral or end play, remove the motor for further repair.

(4) Be sure that power has been disconnected.

(5) Remove the terminal box lid.

(6) Tag and disconnect the leads to the motor,

(7) Use a continuity tester or a multimeter set on the lowest OHMS scale to check for continuity between motor leads. If there is no continuity between any two leads, an open motor winding or open motor protector is indicated. Remove for repair.

(8) Use a continuity tester or a multimeter set on the lowest OHMS scale to check for continuity between each lead and the motor housing. If continuity is found between any lead and the housing, the motor winding is shorted. Remove for repair,

(9) If a motor is defective, contact direct support maintenance for repairs.

(10) Two people are required to remove the motor. Support the motor and remove the 4 sets of hardware and remove the motor from the unit.

c. Installation.

(1) Two people are required to mount the motor. Lift the motor into place and install but do not tighten the motor mounting hardware.

(2) See tags and wiring diagram figure 1-6 and connect leads.

(3) Install the terminal box cover.

(4) Place the fan belt on the motor pulley. Tighten the rod assembly to take up belt slack. Proper tension is a deflection of 1/2 inch(1.3cm) midway between the pulleys. Tighten the four mounting bolts.

CAUTION

Do not permit the motor to twist or cock on its mount. Uneven belt wear and bearing damage will result.

(5) Close access doors.

(6) Connect power.

4-65. FAN ELECTRIC MOTOR (REMD-K/11-10)

WARNING

Disconnect power from refrigerator before performing maintenance on electrical components, The voltage used can be lethal.

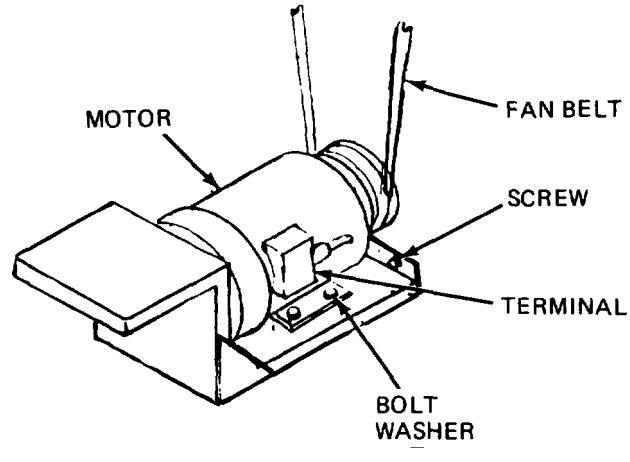


Figure 4-35. Fan Electric Motor

Maintenance of the fan motor is the same as in previous paragraph 4-64 electric motor, except for mounting hardware. See above illustration for mounting hardware,

CHAPTER 5

DIRECT SUPPORT MAINTENANCE INSTRUCTIONS

Section I. REPAIR PARTS, SPECIAL TOOLS AND EQUIPMENT

5-1. SPECIAL TOOLS AND EQUIPMENT

The following are special tools recommended by the engine manufacturer for repair and overhaul.

Bearing Clearance Guide (Plasti-Gauge):
.002" to .006'' (.005cm to .015cm) . 420-0256
.004" to .009'' (.010cm to .023cm) . 420-0257
Combination Bearing Remover–
Main and Cam 420-0325
Combination Bearing Driver–
Main and Cam 420-0324
Crankshaft Gear Puller. 420-0072
Gear Puller Ring 420-0248
Flywheel Puller 420-0100
Carburetor Adjustment Wrench . . . 420-0169
Continuity Tester. 420-0290
Series Circuit Tester 420-0288
Torque Wrench–1/2 In. Drive (1.27cm):
0 to 100 Ft-Lb 420-0222
(0 to 135.6 Newton Meters)
Valve Seat Driver 420-0071
Valve Guide Driver 420-0300
Valve Spring Compressor 420-0119
Valve Lock Replacer 420-0105
Valve Guide Honing Set 420-0305
Ridge Reamer 420-0260
Cylinder Hone 420-0304
Cylinder Wall Micro-
Finishing Brush 420-0320
Ring Compressor 420-0214
Ring Spreader 420-0146
Piston Groove Cleaner 420-0332
Oil Seal Guide and Driver
Bearing Plate 420-0181
Gear Cover 420-0313
Timing Advance Mechanical
Cover Driver. 420-0296

5-2. DIRECT AND GENERAL SUPPORT MAINTENANCE REPAIR PARTS

Direct support and general support maintenance repair parts are listed and illustrated in TM 5-4110-238-24P.

Section II. TROUBLESHOOTING

5-3. GENERAL

a. This section contains troubleshooting information for locating and correcting most of the operating troubles which may develop in the refrigeration unit. Each malfunction for an individual component, unit, or system is followed by a list of tests or inspections which will help you to determine probable causes and corrective actions to take, You should 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 actions. If a malfunction is not listed or is not corrected by listed corrective actions, notify your supervisor.

Table 5-1. Troubleshooting

MALFUNCTION TEST OR INSPECTION CORRECTIVE ACTION

NOTE: Before you use this table, be sure you have performed all applicable operating checks (table 3-1). This table should be used in conjunction with table 4-2 troubleshooting in organizational maintenance.

ENGINE

1. ENGINE FAILS TO START OR HARD TO START.

   Check for seized engine, loose, worn or damaged engine parts.

   Repair worn or damaged parts or refer to General Support maintenance.

2. ENGINE MISSES OR RUNS ERRATICALLY.

   Check for loose, worn or damaged engine parts.

   Repair worn or damaged parts or refer to General Support maintenance.

3. ENGI NE KNOCKS OR DEVELOPS EXCESSIVE NOISE.

   Check for loose, worn or damaged engine parts.

   Repair worn or damaged parts or refer to General Support maintenance.

4. ENGI NE OIL PRESSURE LOW.

   Step 1, Check for sticky plunger on oil by-pass relief valve.

   Remove spring and plunger with a magnet tool. Clean plunger and spring with approved solvent and reinstall.

   Step 2. Check for defective oil pump assembly.

   Replace oil pump assembly.

   Step 3. Check for defective oil gauge.

   Replace oil gauge.

   Step 4. Inspect bearings for wrong clearings.

   Replace bearings.

Table 5-1. Troubleshooting (Cont)

MALFUNCTION TEST OR INSPECTION CORRECTIVE ACTION
5. EXHAUST SMOKE EXCESSIVE.
Check for defective piston rings.
Replace piston rings.
6. ENGINE NOISY.
Check for damaged, broken, or worn engine parts.
Repair or replace defective parts.
7. ENGINE OIL CONSUMPTION EXCESSIVE.
Step 1. Check for gasket oil leaks.
Replace gaskets.
Step 2. Check for defective piston rings.
Replace piston rings.
REFRIGERATION SYSTEM
8. REFRIGERATION UNIT WILL NOT OPERATE.
Check for break or short in wiring.
Trace wiring and repair.
9. REFRIGERATION UNIT RUNS CONTINUOUSLY.
Step 1. Check for compressor valves holding open or leaking.
Replace compressor valve plates.
Step 2. Check for blown gasket on compressor cylinder head.
Replace gasket.
Step 3. Check for refrigerant shortage or leak.
Repair leak and add refrigerant.
Step 4. Check for restricted discharge tube or service inlet valve.
Service compressor discharge valve, tubing and receiver inlet valve.
Step 5. Check for air in system.
Purge air from system.
Step 6. Check for refrigerant overcharge.
Purge excess refrigerant.
Step 7. Check for fan blades not turning.
Clutch not working. Replace or repair clutch.

Table 5-1. Troubleshooting (Cont)

MALFUNCTION TEST OR INSPECTION CORRECTIVE ACTION
10. REFRIGERATION UNIT OPERATES TOO LONG.
Step 1. Check to see if expansion valve is open too far. Adjust expansion valve.
Step 2. Check for stuck-open or leaking compressor valves. Clean or replace valve plates.
Step 3. Check for blown cylinder head gasket. Replace gasket.
Step 4. Check for shortage of refrigerant and/or leaks. Repair leaks/add refrigerant.
Step 5. Check for air in system. Purge air from system.
Step 6. Check for overcharge or refrigerant. Purge excess refrigerant.
Step 7. Check for partly closed receiver inlet valve. Open valve as far as it will go.
Step 8. Check for incorrectly adjusted expansion valve. Adjust expansion valve to admit more refrigerant.
Step 9. Check for possible restriction in liquid line, Locate and remove restrictions.
Step 10. Check to see if expansion valve is open too far. Adjust expansion valve to admit less refrigerant. Replace valve, if stuck open.
Step 11. Check for loose expansion valve bulb. Tighten clamp.
Step 12. Check for restriction in expansion valve or liquid line. Locate and remove restrictions.
11. NOISY OPERATION.
Step 1. Check for compressor pumping oil. Drain oil to correct level.
Step 2. Check for unserviceable compressor bearings. Repair or replace compressor.
Step 3. Check for unserviceable compressor valve plate. Replace valve plate.
Step 4. Check for loose expansion valve feeler bulb. Tighten feeler bulb.
Step 5. Check to see if expansion valve is operating, Replace expansion valve.
Step 6. Check to see if expansion valve is stuck. Replace expansion valve.
Step 7. Check if expansion valve is stuck shut. Replace expansion valve.
Step 8. Check for moisture frozen in expansion valve. Thaw expansion valve and replace dehydrator.
Step 9. Check for air in system. Purge air from system.
Step 10. Check for overcharge or refrigerant. Purge excess refrigerant.

Section III. MAINTENANCE PROCEDURES

5-4. PANELS, DOORS AND SCREENS

a. Removal/insllection/installation. Refer to paragraph 4-10.

b. Repair. Repairs are limited to the straightening of minor dents, rewelding of broken welds and touch up of painted surfaces. See TM 43-0139 Painting Instructions for Field Use. Replace all badly damaged panels that would be a safety hazard or in any way lessen the performance capabilities of the unit.

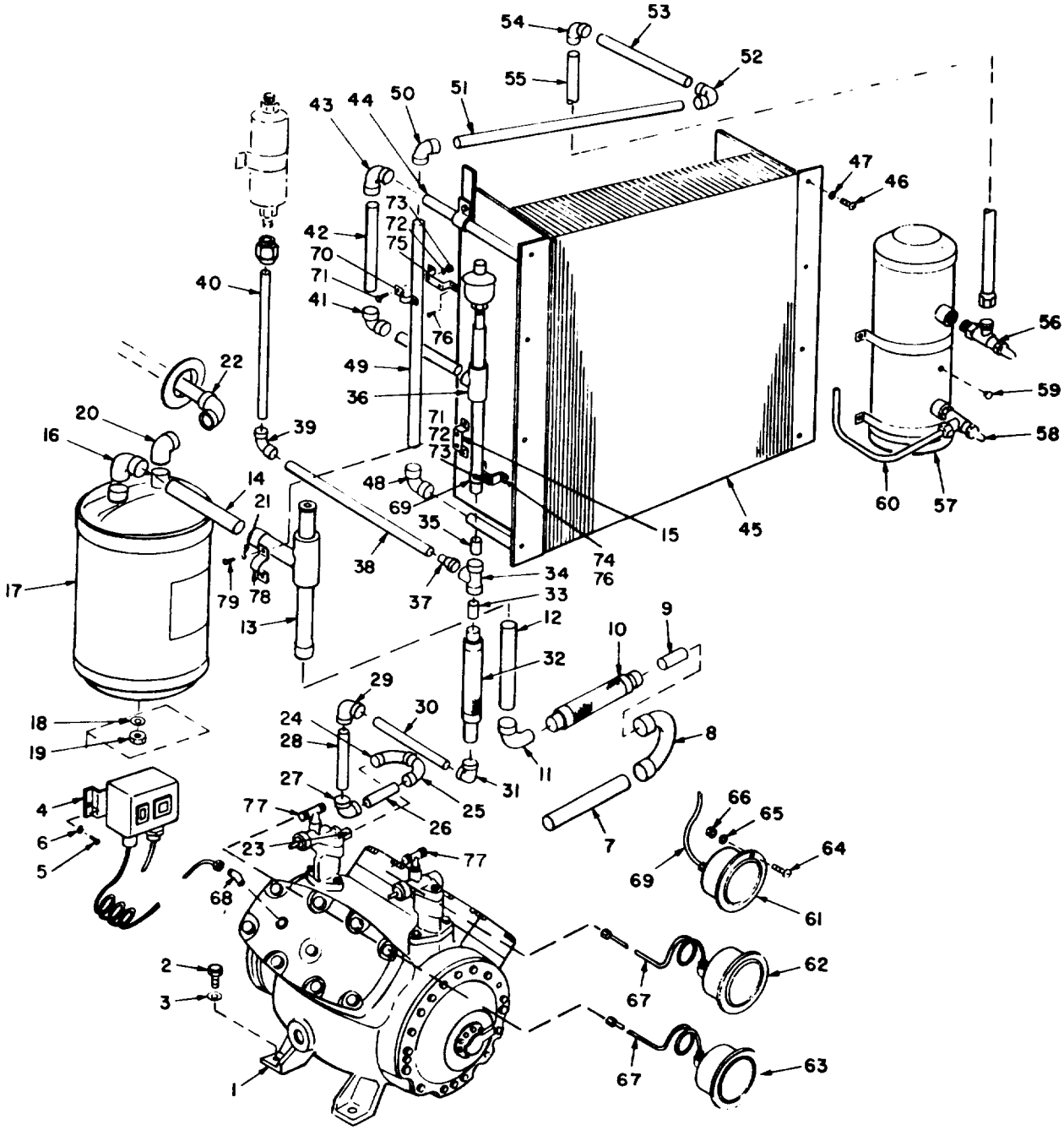


Figure 5-1. Refrigeration Components, Condenser and Compressor (Sheet 1 of 2)

1. COMPRESSOR
2. BOLT
3. WASHER, LOCK
4. SWITCH, HIGH-PRESSURE
5. SCREW
6. WASHER
7. TUBE
8. FITTING, “U” Bend
9. NIPPLE
10. VIBRATION ELIMINATOR
11. ELBOW
12. TUBE
13. VALVE
14. TUBE
15. CLAMP
16. ELBOW
17. ACCUMULATOR
18. WASHER, LOCK
19. NUT
20. ELBOW
21. WASHER
22. ELBOW
23. TUBE
24. ELBOW
25. ELBOW
26. TUB E
27. ELBOW
28. TUBE
29. ELB0W
30. TUBE
31. ELBOW
32. VIBRATION ELIMINATOR
33. NIPPLE
34. TEE
35. NIPPLE
36. VALVE, PRESSURE CONTROL
37. REDUCER
38. TUBE
39. ELBOW
40. TUBE
41. ELBOW
42. TUBE
43. ELBOW
44. TUBE
46. SCREW
47. WASHER
48. ELBOW
49. TUBE
50. ELBOW
51. TUBE
52. ELBOW
53. TUBE
54. ELBOW
55. TUBE
56. VALVE, INLET
57. RECEIVER
58. VALVE, OUTLET
59. PLUG
60. TUBE
61. THERMOMETER
62. GAGE, HIGH PRESSURE
63, GAGE, COMPOUND PRESSURE
64. SCREW
65. WASHER
66. NUT
67. TUBE
68. FITTING
69. CLAMP
70. CLAMP
71. SCREW
72. WASHER, LOCK
73. NUT
74. BRACKET
75. BRACKET
76. RIVET
77. TEE
78. CLAMP
79. SCREW
80. CLAMP
61. SCREW

Figure 5-1. Refrigeration Components, Condenser and Compressor (Sheet 2 of 2)

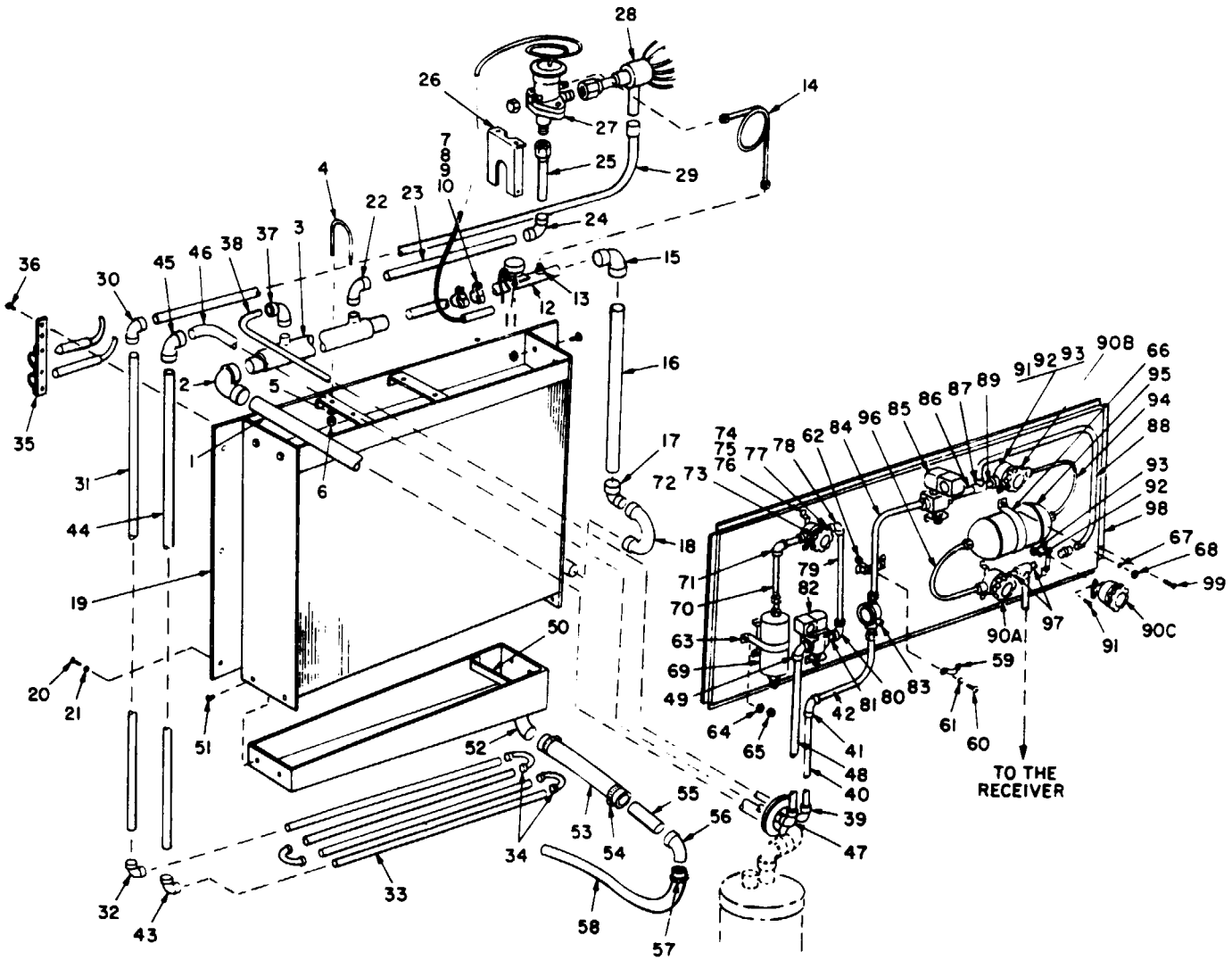


Figure 5-2. Refrigeration Panel and Evaporator (Sheet 1 of 2)

1. TUBE
2. ELBOW
3. HEAT EXCHANGER
4. “U” BOLT
5. LOCKWASHER
6. NUT
7. CLAMP
8. SCREW
9. NUT
10. WASHER
11. THERMOSTAT
12. TUBE
13. CONNECTOR
14. TUBE
15. ELBOW
16. TUBE
17. ELBOW
18. FITTING
19. EVAPORATOR
20. SCREW
21. WASHER
22. ELBOW
23. TUBE
24. ELBOW
25. TUBE
26. BRACKET
27. VALVE
28. DISTRIBUTOR
29. TUB E
30. ELBOW
31. TUBE
32. ELBOW
33. TUBE
34. FITTING
35. BRACKET
36. SCREW
37. ELBOW
36. TUBE
39. ELBOW
40. TUBE
41. ELBOW
42. TUBE
43. ELBOW
44. TUBE
45. ELBOW
46. TUBE
47. ELBOW
48. TUBE
49. ELBOW
50. PAN
51. RIVET
52. ELBOW
53. TUBE
54. CLAMP
55. TUBE
56. ELBOW
57. CLAMP
58. TUBE
59. CLAMP
60. SCREW
61. LOCKWASHER
62. NUT
63. CLAMP
64. LOCKWASHER
65. NUT
66. CLAMP
67. LOCKWASHER
68. NUT
69. STRAINER
70. TUBE
71. ELBOW
72. TUBE
73, VALVE
74. SCREW
75. LOCKWASHER
76. NUT
77. TUBE
78. ELBOW
79. TUBE
80. ELBOW
81. TUBE
82. VALVE
83. INDICATOR
84. TUBE
85. VALVE
86. TUBE
87. TEE
88. TUBE
89. TUBE
90. VALVE
91. SCREW
92. LOCKWASHER
93. NUT
94. TUBE
95. STRAINER
96. TUBE
97. TUBE
98. PANEL
99. RIVET

Figure 5-2. Refrigeration Panel and Evaporator (Sheet 2 of 2)

5-5. REFRIGERATION SYSTEM REPAIRS.

The refrigeration system must be pumped down and in some actions totally discharged before any maintenance is performed on system components. Be sure that all refrigerant in the section of the system that you are working on has been discharged. Read and understand all instructions prior to attempting repairs, Leak testing and dehydrator replacement are required after any system component has been removed and replaced. The section of the system that was opened must be evacuated before it is charged, The system must be properly charged to function properly.

WARNING

DANGEROUS CHEMICAL
is used in this equipment
DEATH
or serious injury may result if

personnel fail to observe proper safety precautions. Great care must be exercised to prevent contact of liquid refrigerant, or refrigerant gas discharged under pressure, with any part of the body. The extremely low temperature resulting from the rapid expansion of liquid refrigerant, or refrigerant gas released under pressure, can cause sudden and irreversible tissue damage through freezing. As a minimum, all personnel must wear thermal proactive gloves and a face shield or goggles when working in any situation where refrigerant contact with the skin or eyes is possible. Application of excessive heat to any component in a charged system will cause extreme pressure that may result in a rupture, possibly explosive in nature. Exposure of Refrigerant-12 to an open flame or very hot surface will cause a chemical reaction in the gas to form carbonyl chloride (phosgene), a highly toxic and corrosive gas. In its natural state, Refrigerant-12 is a colorless, odorless vapor with no toxic characteristics. It is lighter than air and in a well ventilated area will disperse rapidly. However, in an unventilated area it presents danger as a suffocant.

5-6. DETECTING AND REMOVING MOISTURE

a. Detecting Moisture. Excessive water vapor may enter the refrigeration system. At the low temperatures developed in the system, this vapor condenses and may freeze the expansion valve in an open or closed position. The operating characteristics of a unit with a frozen expansion valve are given below.

(1) Valve Frozen Shut. If expansion valve (figure 5-19 is frozen shut, the following operating characteristics may be observed:
  (a) Unit operates continuously; box temperature remains high.
  (b) Suction pressure remains abnormally low.
  (c) Suction tubing remains abnormally warm.

(2) Valve Frozen Open. If the expansion valve is frozen open, the following characteristics maybe observed:
  (a) suction pressure remains abnormally high,
  (b) Compressor pounds.

(3) Liquid Moisture Indicator. If color indicator is pink, moisture is present in system.

b. Removing Moisture. The following means maybe used to remove moisture from the refrigeration system. It will be necessary to artificially warm the expansion valve or shut off and warm the entire unit for a long enough period of time to thaw the frozen water in the system, enabling it to be recirculated with the refrigerant.

5-6. DETECTING AND REMOVING MOISTURE (CONT)

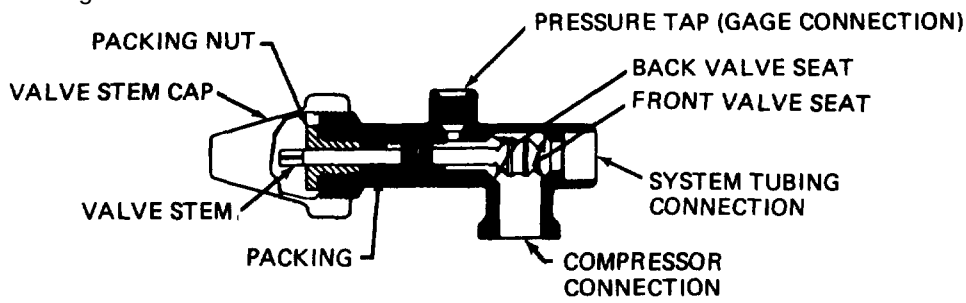
(1) Change Dehydrator. If activated silicagel charge of dehydrator has absorbed all the moisture it can hold, change the dehydrator (para. 5-24). Run on this for approximate y one day; then change again to another fresh dehydrator. This may strip enough moisture from system to *correct* the condition.

(2) Use Service Dehydrator. Operate the unit approximately an hour with service drier and replace dehydrator on unit with a fresh dehydrator.

5-7. PUMPDOWN

Pumpdown is the operation by which the refrigerant in a charged system is pumped into and maintained within the receiver. Pumpdown is performed before transportation to a new site and before replacing refrigeration components on the low pressure side of the system. The refrigerant must be discharged in order to replace the receiver.

a. Check to see that the compressor valves are open (back seated and cracked). To backseat and crack the service valve you must turn the valve stem fully counterclockwise to backseat and then turn clockwise one turn to "crack." See figure below.



COMPRESSOR SERVICE VALVES

b. Close the defrost hand valve and the receiver outlet valve.

c. Adjust the thermostat to a lower setting so that unit will run continuously.

d. Connect power and move the ON-OFF switch to the ON position.

CAUTION

Serious damage can occur to the equipment if the suction pressure is permitted to drop below 0 psig during pumpdown. If there is a leak in the system, this will cause air to be drawn into the system through the leak.

e. Turn the switch to OFF when the suction pressure gage reaches the range of 0 to 2 psig. Do not permit the pressure to drop below 0 psig.

f. Observe the suction pressure gage and when pressure increases above 2 psig, turn the unit on again until the pressure remains in the range of 0 to 2 psig.

g. The system refrigerant charge is now contained in the receiver tank. Close the receiver inlet valve and the compressor service valves.

h. Reset the thermostat.

i. If the unit is to remain in a pumped down condition for storage or shipment, a tag should be placed on the control panel with a statement similar to the following:

"THIS UNIT HAS BEEN PUMPED DOWN. Prior *to* operation, open both receiver valves, the defrost hand valve and backseat and crack the compressor suction and discharge service valves."

5-8. LEAK TESTING

If a refrigerant leak is suspected or repairs have been made, the refrigeration system or repaired section should be tested using one of the following methods.

a. Access.

WARNING

ALWAYS DISCONNECT POWER from battery (RGMD-K/1-10) or power source (REMD-K/11-10) prior to performing internal maintenance.

(1) Open all access doors,

(2) Remove the evaporator housing and guard (fig. 4-3).

b. Testing Method. There are two acceptable methods for leak testing the refrigeration system.

(1) Refrigerant Gas Leak Detector. If an electronic refrigerant gas leak detector is available, it should be used in accordance with the procedures contained in TM 9-4940-435-14, "Leak Detector, Refrigerant Gas,"

NOTE

The electronic refrigerant gas tester is highly sensitive to the presence of a minute quantity of gas in the air and due to this factor is quite effective in the detection of small leaks. However, due to the rapid dispersion of refrigerant gas into the surrounding air, difficulty may be encountered in pinpointing large leaks. The detector must be used in a well ventilated but draft-free area,

(2) Soap Solutions. In this method, a strong solution of a liquid detergent and water is brushed onto all points of leakage while closely observing for the formation of bubbles.

CAUTION

If the soap solution testing method is used, thoroughly rinse with fresh water after testing is completed. A residual soap film will attract and accumulate an excessive amount of dust and dirt during operation.

c. Testing Procedures. To perform leak testing by use of the electronic detector, it is necessary that the system be pressurized with a proportion of refrigerant gas. To perform leak testing by use of the soap solution method, the system may be pressurized with refrigerant gas or dry nitrogen.

(1) To test a unit known to have some charge, it is only necessary to check all points at which a leak could exist using one of the two recommended methods.

(2) If a unit has been totally discharged or pumped down and opened for repairs, it will have to be pressurized before it can be leak tested,

(a) Backseat (remove the valve stem cap and turn the stem fully counterclockwise) on both compressor service valves.

(b) Remove the flare caps from the compressor suction and discharge service valve gage port tees.

(c) Connect hoses from a testing manifold to the suction and discharge valve gage port tees.

(d) Connect the center hose on the testing manifold to a drum of Refrigerant-12.

CAUTION

If the refrigerant drum has a selector valve that allows either vapor or liquid refrigerant to be dispensed, be sure it is in the vapor position, When dispensing refrigerant vapor always do so at a slow enough rate so that frost does not form on the drum or on components of the servicing fixture.

(e) If the unit has been pumped down, open all valves except the two receiver valves.
(f) If the unit has been totally discharged, open all valves including the receiver.
(9) Open the refrigerant drum valves. Open the testing manifold valve slightly and adjust as necessary to prevent formation of frost; and allow system pressure to build up until the manifold gage reads 40-50 psi (2.8-3. 5 kg/cm^2).
(h) Close the refrigerant drum valve and the testing manifold valves.
(i) Remove the refrigerant drum hose from the testing manifold.
(j) Connect a hose from a cylinder of dry nitrogen to the testing manifold.
(k) Open the nitrogen cylinder valve and the testing manifold valves; allow system pressure to buildup until both manifold gages read 350 psi (24.7 kg/cm^2).
(1) Perform leak tests, then discharge and purge the system in accordance with paragraphs 5-9 and 5-10 before performing maintenance, or before evacuating and charging the system, as appropriate. Leave the service manifold attached.
(m) If no repairs are necessary to the evaporator section, install the evaporator air housing and grill. See figure 4-3.

5-9. DISCHARGING REFRIGERANT

a. Be sure that power has been disconnected.

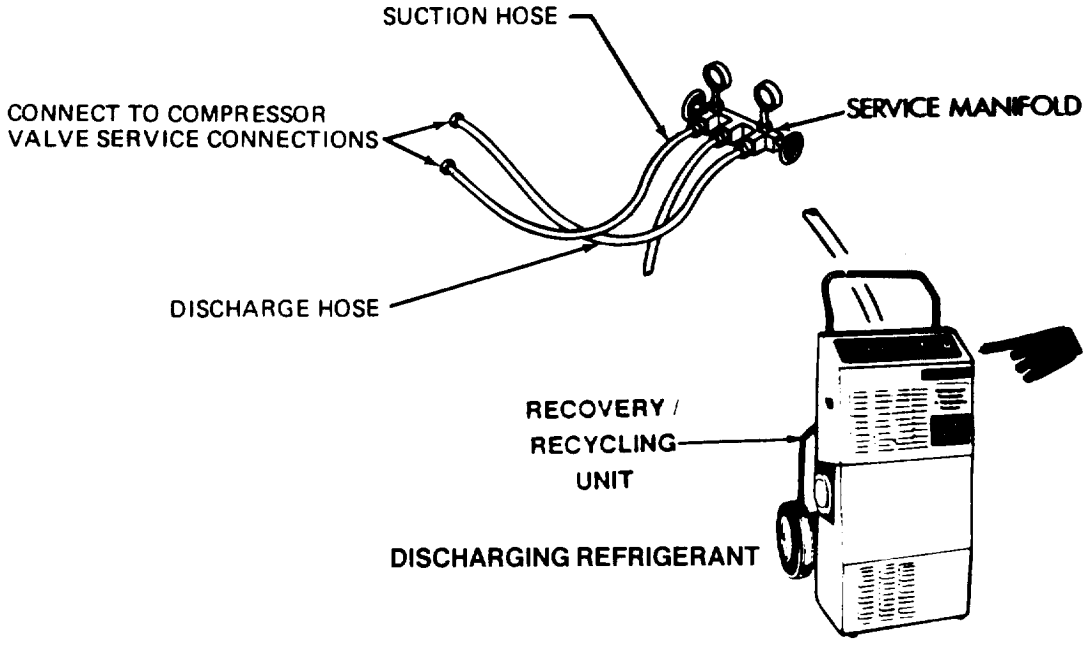
WARNING

Work in a well ventilated area. Read and understand the complete WARNING at the beginning of paragraph 5-5.

b. If a unit has been pumped down for system repairs other than in the receiver area, it is only necessary to open the system at the compressor service valve pressure taps and release the small pressure remaining prior to purging and repair.

c. Discharging a total system or a system that has been pressurized for leak testing.

(1) If the service manifold was left hooked up after leak testing, skip steps (2), (3) and (4).
(2) Backseat (remove the valve stem cap and turn the stem fully counterclockwise) on both compressor service valves.
(3) Remove the flare caps from the compressor suction and discharge service valve gage port tees.
(4) Connect hoses from a testing manifold to the suction and discharge valve gage port tees.



5-9. DISCHARGING REFRIGERANT (CONT)

NOTE

In accordance with Environmental Protection Agency regulations refrigerants cannot be discharged into the atmosphere. A refrigerant recovery & recycling unit must be used whenever discharging the refrigerant system.

Operation of the recovery/recycling unit must be by AUTHORIZED PERSONNEL ONLY

(5) Connect and operate a recovery/recycling unit in accordance with the manufacturer's instructions.

(6) If the system is to be repaired, purge the system (para. 5-10). If the system is to be charged, evacuate the system to remove all moisture (para. 5-11).

5-10. PURGING REFRIGERATION SYSTEM OF AIR.

When the refrigeration system is opened for servicing, there is a possibility of air entering the system. Before closing the system, that portion opened must be purged to eliminate air.

a. Purging System When Unit Has Lost Complete Charge.
(1) Test for and repair leak.
(2) Attach charging line from drum of R-12 to charging port of suction service valve.
(3) Remove expansion valve outlet flare nut.
(4) Fully close suction service valve.
(5) Partly open valve on charging drum and let gas enter system. Refrigerant will travel through compressor, discharge line, condenser, receiver, liquid line, and expansion valve. Let gas pass through system for ten seconds.
(6) Open compressor suction service valve 3 or 4 turns and close compressor discharge valve.
(7) Partly open valve on charging drum and let gas pass through system for ten seconds. The refrigerant will travel through the crankcase pressure regulating valve, heat exchanger, and evaporator.
(8) Replace expansion valve outlet flare nut.
(9) Return all service valves to normal operating position.
(1 O) Charge system with refrigerant (para. 5-13).

b. Purging Low Side of System. When unit has been pumped down in order to service a part on the low side, and there is refrigerant in the receiver tank, proceed as follows:
(1) Close discharge service valve fully clockwise. Remove cap from discharge service valve tee.
(2) Open receiver outlet valve and let gas escape through discharge service port for 10 seconds. Replace cap on port.
(3) Open discharge service valve to normal position. Open receiver outlet valve slightly and build pressure to pounds. Check for leaks.
(4) Reset valves on unit for normal operation.

c. Purging the System When Brazing. The refrigeration system must be purged with dry nitrogen before any brazing is performed on any component. A flow of dry nitrogen at the rate of 1-2 cfm (0.028-0.057m^3/minute) should be continued during all brazing operations to minimize internal oxidation and scaling.

WARNING

Nitrogen is an inert gas; however, it also presents danger as a suffocant and therefore must also be discharged in a ventilated location.

5-11. EVACUATING THE SYSTEM OF MOISTURE

The refrigeration system or portion of system that was opened must be evacuated to remove all moisture before it is charged with Refrigerant-12.

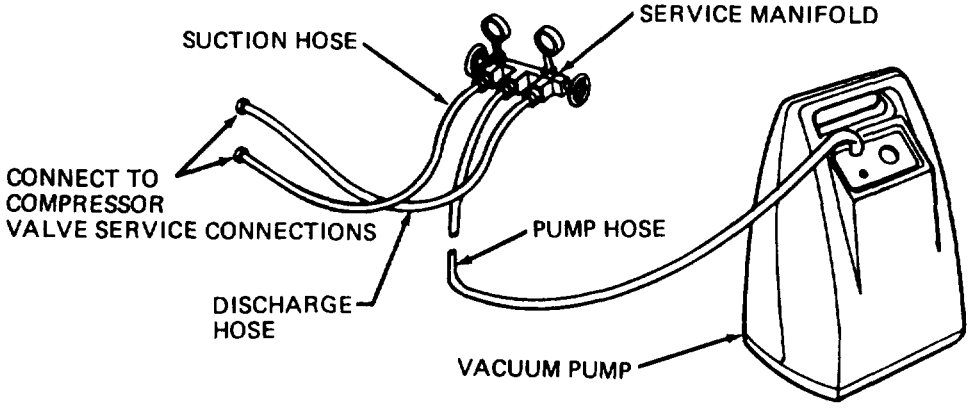
a. Check that system was leak tested and has NO LEAKS.
b. Check that new filter-drier was installed. If not, install one.
c. Check that both compressor service valves are backseated and manifold valves are closed.
d, Attach hole assemblies to service valves and manifold valves.
e. Attach hole assembly to vacuum pump and manifold center connection.
f. Start vacuum pump.
g. Open manifold valves.
h. Open or “crack” both service valves.
i. Run the vacuum pump until at least 29 inches of mercury, measured on the gage, is reached.

NOTE

Inability to reach 29 inches of mercury may indicate either a leak or a problem with the pump.

Continue running the pump for one more hour, while observing the gage. If the gage needle moves back and forth, you have a leak which must be located and corrected first.

k. Close manifold valves.
l. Backseat both compressor service valves.
m. Stop vacuum pump.
n. Disconnect hose from vacuum pump and go to paragraph 5-13 for charging instructions.



EVACUATING THE SYSTEM

5-12. OPENING SYSTEM

Before opening the refrigeration system, the pressure in the system should be known. If the system is open under high pressure, excessive loss of refrigerant will occur; if opened under vacuum, air is drawn into the equipment and causes future operating difficulties. If pressure gage indicates a vacuum after system has been pumped down, cautiously open receiver outlet valve enough to build a slight pressure in the system. When a positive pressure is assured, the part of system to be opened should be shut off from remainder of system. Thus, if the compressor is to be removed, compressor suction and discharge valves should be closed after system is pumped down. In opening the system, observe the following precautions:

a. Clean and dry equipment at the point to be opened. Use a clean lint-free cloth for this purpose.

b. Open the necessary joints and plug and cover opening to prevent dirt from entering.

c. After opening the system, do not touch internal parts unless hands are thoroughly dry and clean.

d. If a spare part is to be installed, clean and dry the part as follows:
(1) Clean the part by brushing it while immersed in an approved cleaning solvent (Appendix E, Item 17).
(2) Dry the part with heat by placing part on blocks above large electric light bulb. If heat from other sources is used, be sure that temperature is not raised above 175°F (81.6°C).

e. Use of Wrenches on Flared Fittings. The following precautions are advised in regard to flare nuts used in conjunction with copper tubing.
(1) Overtightening of Flare Nuts. As copper tubing is relatively soft, overtightening of flare nuts will ruin the copper flare.
(2) Hardening of Flares. Continued tightening of flare nuts will in time cause a hardening effect of the copper flare. To soften tubing which has become hard, apply torch to the hardened section until dull red; then quench in water.

5-13. CHARGING THE SYSTEM

After the system, or portion of the system, has been satisfactorily evacuated, the unit is ready to be charged.

NOTE

Whenever available, use recycled refrigerant for charging the refrigeration system.

a. If the system was pumped down prior to repairs the original charge is contained in the receiver.
(1) Connect Refrigerant-12 tank in accordance with steps (1) thru (3) of para. b.
(2) Operate, test and charge if necessary in accordance with steps (7) thru (16) of para. b.

b. If the unit was not pumped down prior to repairs, it must be fully charged with Refrigerant-l 2.

CAUTION

Always charge the refrigeration system with Refrigerant-12 vapor. NEVER introduce LIQUID refrigerant into the service valves.

(1) Assuming that the service manifold was left in place after the unit was evacuated, remove hose end from vacuum pump and connect it to Refrigerant-12 tank valve.
(2) Backseat and crack the compressor service valves.
(3) Open refrigerant tank valve slightly and loosen hose fittings for a few seconds at the compressor service valves to purge hoses. Then tighten hose fittings.
(4) Using scales, measure and record weight of tank with liquid refrigerant.

CAUTION

If the refrigerant drum has a selector valve that allows either vapor or liquid refrigerant to be dispensed, be sure it is in the vapor position.

(5) Open manifold valves and service valves and allow refrigerant vapor to flow into the system.
(6) Allow refrigerant vapor to flow into the system until both manifold gages show a positive pressure of at least 50 psi (3.5 kg/cm^2).
(7) Determine which hose is connected to the discharge service valve, and close the manifold valve to that hose,
(8) Be sure that hoses are out of the way of all moving parts on the refrigerator.
(9) Prepare unit for operation and set refrigeration system valves in accordance with para. 2-10.
(10) Connect power and turn unit on. Reset pressure switch.
(11) Continue to charge the unit and monitor the weight of the refrigerant drum as the compressor pulls additional refrigerant vapor into the system until the drum weight has decreased by 20 pounds (9.07 kg).
(12) When the system is fully charged, immediately close the refrigerant drum valve.
(13) Run the refrigeration unit in COOL mode (with temperature control in coolest position) for 15 minutes.

CAUTION

Do not skip next step.

(14) After 15 minutes, observe the sight glass through the left access door;
BLUE CENTER means the refrigerant moisture content is acceptable.
PINK CENTER means there is too much moisture in the system. It must be discharged, evacuated and charged again.
MILKY WHITE OR BUBBLY liquid means the system has a low charge.
CLEAR BUBBLE-FREE Liquid around the center means the system is fully charged.
(15) If charge is low, add refrigerant vapor.
(a) Open the drum valve.
(b) Continue to charge until sight glass is clear and bubble-free.
(c) Close the refrigerant drum valve.
(16) Turn the unit off.
(17) Backseat the compressor service valves.
(18) Disconnect hoses from the valve tees.
(19) Place flare nuts on the suction and discharge valve tees.
(20) Crack the backseated compressor valves.
(21) Close access doors.

5-14. BRAZING/DEBRAZING PROCEDURES

WARNING

All Refrigerant R 12 must be discharged from the system (para. 5-9) and the section of the system being repaired must be purged with dry nitrogen before beginning any debrazing operation. When R 12 comes in contact with f lames, phosgene gas is formed. This is a deadly poison (it has the odor of new mown hay). Be sure of sufficient fresh air and ventilation when brazing, soldering or using the halide torch.

a. Debrazing.

(1) Before debrazing a joint on a valve, disassemble the valve to the extent possible; then wrap all but the joint with a wet cloth to act as a heat sink.

CAUTION

No attempt should be made to repair a leak while the system is under pressure. Neither should bed joints be repaired by remelting and adding more brazing material. The joints should be taken apart, thoroughly cleaned and remade as a new joint.

(2) Protect insulation, wiring harnesses, and other surrounding components with appropriate shields.

(3) Be sure the work area is well ventilated and that dry nitrogen is flowing through the repair area at a rate of 1-2 cfm (0.0283–0.0566 m^3/minute).

(4) Apply sufficient heat uniformly around the joint to quickly melt the filler alloy. If heat is applied slowly, or only on one side, the entire component or length of tubing will be heated and filler alloy in adjacent joints may also be melted. Remove heat as soon as the joint separates.

WARNING

Wear welder's gloves or other thermal protective gloves when performing the following operation.

b. Cleaning Debrazed Joints. All filler alloy must be cleaned from debrazed joints before reassembly. Heat each piece of the joint until the filler alloy is melted and then wipe it away with a fiber-glass cloth. Be sure no filler alloy or other debris is left inside any tubing, fitting, or component.

c. Reassembly. If tubing sections or fittings were removed with a component, debraze them from the component, clean the joints, and braze them to the new component before reinstallation.

d. Brazing.

(1) Position the component to be installed.

(2) To prepare for brazing a joint on a valve, disassemble the valve to the extent possible, then wrap all but the joint with a wet cloth to act as a heat sink.

(3) Protect insulation, wiring harnesses, and surrounding components with appropriate heat shields.

(4) Be sure the work area is well ventilated and that dry nitrogen is flowing through the refrigeration system at a rate of 1-2 cfm (0.0283-0.0566 m^3/minute).

(5) Apply sufficient heat uniformly around the joint to quickly raise it to a temperature that will melt the filler alloy. Remove heat as soon as brazing is completed.

5-15. HIGH PRESSURE GAGE

This gage indicates the discharge pressure at the output of the compressor.

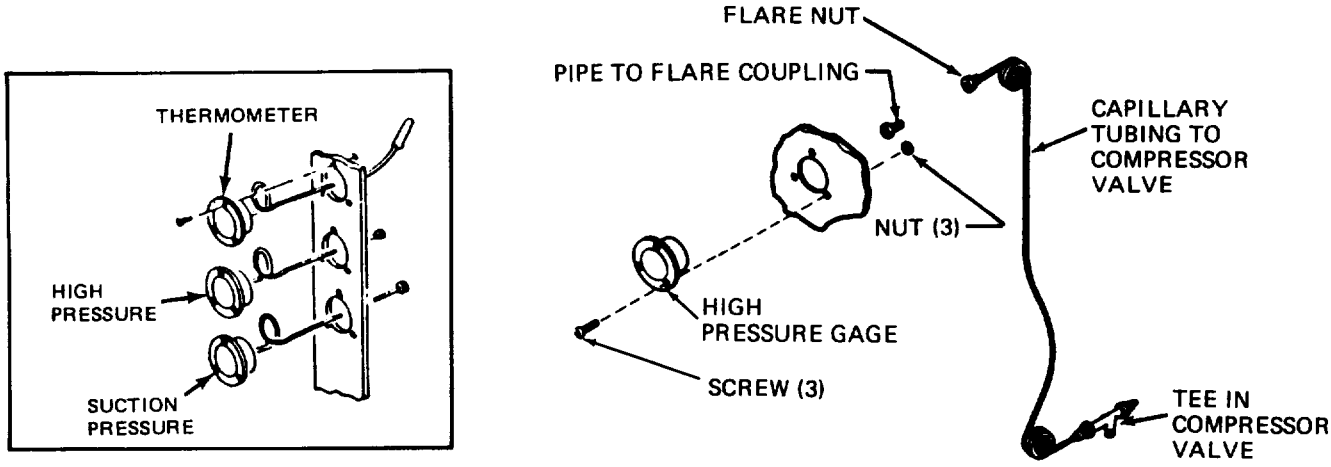


Figure 5-3. High Pressure Gage

a. Removal.

(1) Disconnect power.
(2) Open doors to have access to the gage and the compressor discharge valve.
(3) Remove the protective cap from the discharge valve stem. Use a refrigerant valve wrench or other suitable wrench and totally backseat (turn fully counterclockwise) the valve.
(4) Carefully and slowly loosen the flare nut from the coupling on the back of the gage. Use two wrenches, one to hold the coupling and the other to loosen the flare nut. Allow the small amount of refrigerant that is in the capillary to escape. Should refrigerant continue to leak out after a few seconds, tighten the flare nut and check to see that the compressor valve has been properly back-seated.
(5) Remove the flare nut from the coupling and remove the coupling from the gage.
(6) Remove the three attaching screws and nuts and pull the gage from the panel.

b. Installation.

(1) Mount the gage in the panel with the three screws and nuts.
(2) Install the coupling on the valve and loosely connect the flare nut.
(3) Slightly crack (turn valve stem clockwise) the compressor discharge valve to allow a very slight amount of refrigerant to escape through the capillary line at the flare nut to clear the capillary of moisture and air.
(4) Immediately tighten the flare nut.
(5) Again turn the discharge valve stem fully counterclockwise and then turn it one turn clockwise to "backseat and crack" the valve. Reinstall the protective cap over the valve stem.
(6) Using a water and soap solution, check the newly connected fittings for leaks.
(7) Close the access doors and connect power.

5-16. SUCTION PRESSURE GAGE

This gage indicates the pressure at the input to the compressor. It is called a compound gage because its scale is graduated for pressures above atmospheric pressure in psig and for pressures below atmospheric pressure (vacuum) in inches of mercury.

a. Removal.

(1) Disconnect power.

(2) Open doors to have access to the gage and the compressor suction valve.

(3) Remove the protective cap from the suction valve stem. Use a refrigerant valve wrench or other suitable wrench and totally backseat (turn fully counterclockwise) the valve.

(4) Carefully and slowly loosen the flare nut from the coupling on the back of the gage. Use two wrenches, one to hold the coupling and the other to loosen the flare nut. Allow the small amount of refrigerant that is in the capillary to escape. Should refrigerant continue to leak out after a few seconds, tighten the flare nut and check to see that the compressor valve has been properly back-seated.

(5) Remove the flare nut from the coupling and remove the coupling from the gage.

(6) Remove the three attaching screws and nuts and pull the gage from the panel.

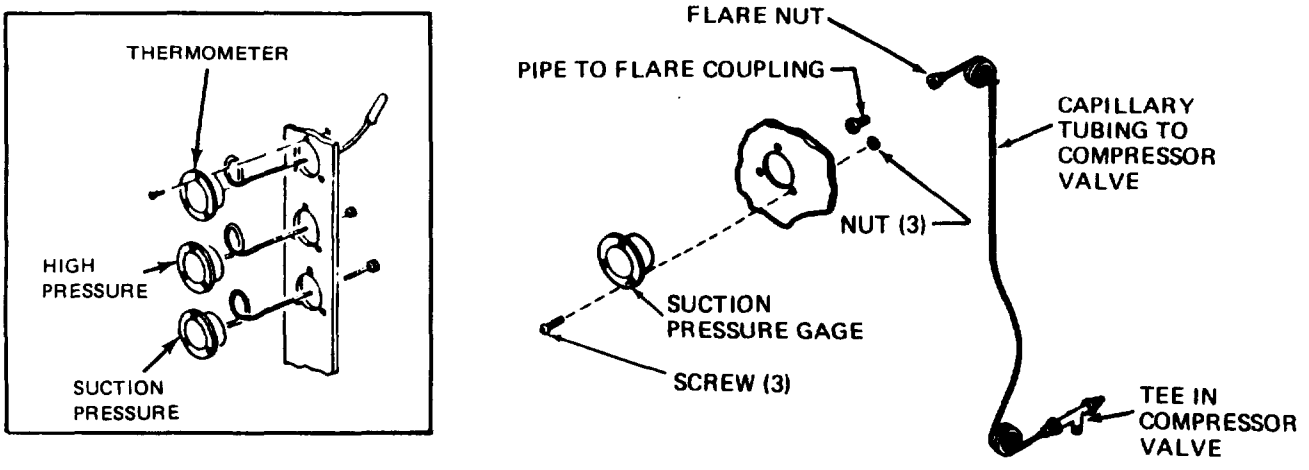


Figure 5-4. Suction Pressure Gage

b. Installation.

(1) Mount the gage in the panel with the three screws and nuts.

(2) Install the coupling on the valve and loosely connect the flare nut,

(3) Slightly crack (turn valve stem clockwise) the compressor discharge valve to allow a very slight amount of refrigerant to escape through the capillary line at the flare nut to clear the capillary of moisture-and air,

(4) Immediately tighten the flare nut,

(5) Again turn the discharge valve stem fully counterclockwise and then turn it one turn clockwise to "backseat and crack" the valve. Reinstall the protective cap over the valve stem.

(6) Using a water and soap solution, check the newly connected fittings for leaks.

(7) Close the access doors and connect power.

5-17. HIGH PRESSURE CUTOUT SWITCH

This switch deenergizes the unit when the compressor discharge pressure reaches 250 psig.

a. Testing (Installed).

(1) Refer to paragraph 5-7 and pump down refrigeration system.

(2) Disconnect power.

(3) Open left side access door. Switch is located at bottom of cabinet on left side of back wall.

(4) Check to see that reset button is not tripped (push it in). If the reset button was tripped, see troubleshooting chart. The problem is most likely not in the high pressure cutout switch.

(5) Tag and disconnect wires.

(6) Use a continuity tester or multimeter to check for continuity between the two leads to the switch. If there is continuity, the switch is properly closed. if no continuity is found on the switch, press and release the reset button again on that switch. If there is still no continuity, that switch must be replaced.

b. Removal. Assuming the above tests have been performed, remove a defective pressure cutout switch as follows:

(1) Open doors to have access to the switch and the compressor discharge valve.

(2) Remove the protective cap from the discharging valve stem. Use a refrigerant valve wrench or other suitable wrench and totally backseat (turn fully counterclockwise) the valve.

(3) Carefully and slowly loosen the flare nut on the end of the high pressure switch capillary line that connects to the fitting in the compressor body. Allow the small amount of refrigerant in the capillary to escape. Should refrigerant continue to leak out after a few seconds, tighten the flare nut and check to see that the compressor valve has been properly backseated.

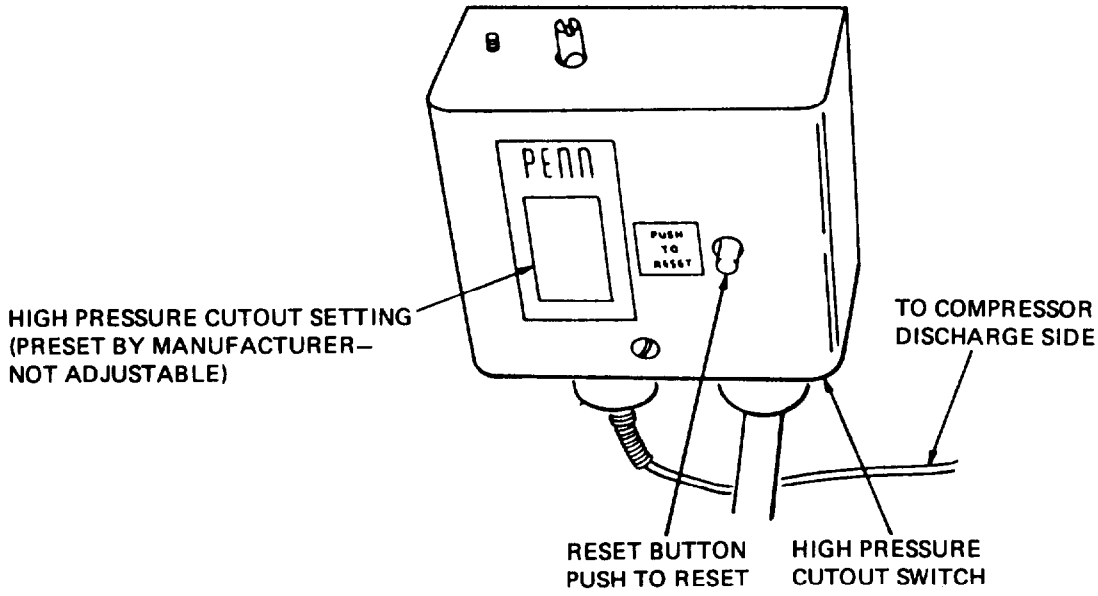


Figure 5-5. High Pressure Cutout Switch

(4) Totally disconnect the flare nut from the fitting.

(5) Remove the two screws and lockwashers that mount the high pressure cutout switch.

(6) Remove the switch.

5-17. HIGH PRESSURE CUTOUT SWITCH (Cont)

c. Installation.

(1) Secure the high pressure cutout switch with two screws and lockwashers.

(2) Taking care not to crimp the tubing, bend the capillary so that it runs down to the compressor.

(3) Carefully coil the excess capillary tubing and connect the flare nut to the fitting on the compressor.

(4) Close access doors and connect power.

5-18. CONDENSER COIL

a. Removal.

(1) Refer to paragraph 5-7 and pump down the refrigeration system.

(2) Remove condenser grille by removing fourteen screws and washers.

(3) Unsweat two elbows on the condenser coil.

(4) Loosen and remove three clamps holding piping to coil.

(5) Remove screws and washers attaching condenser to unit.

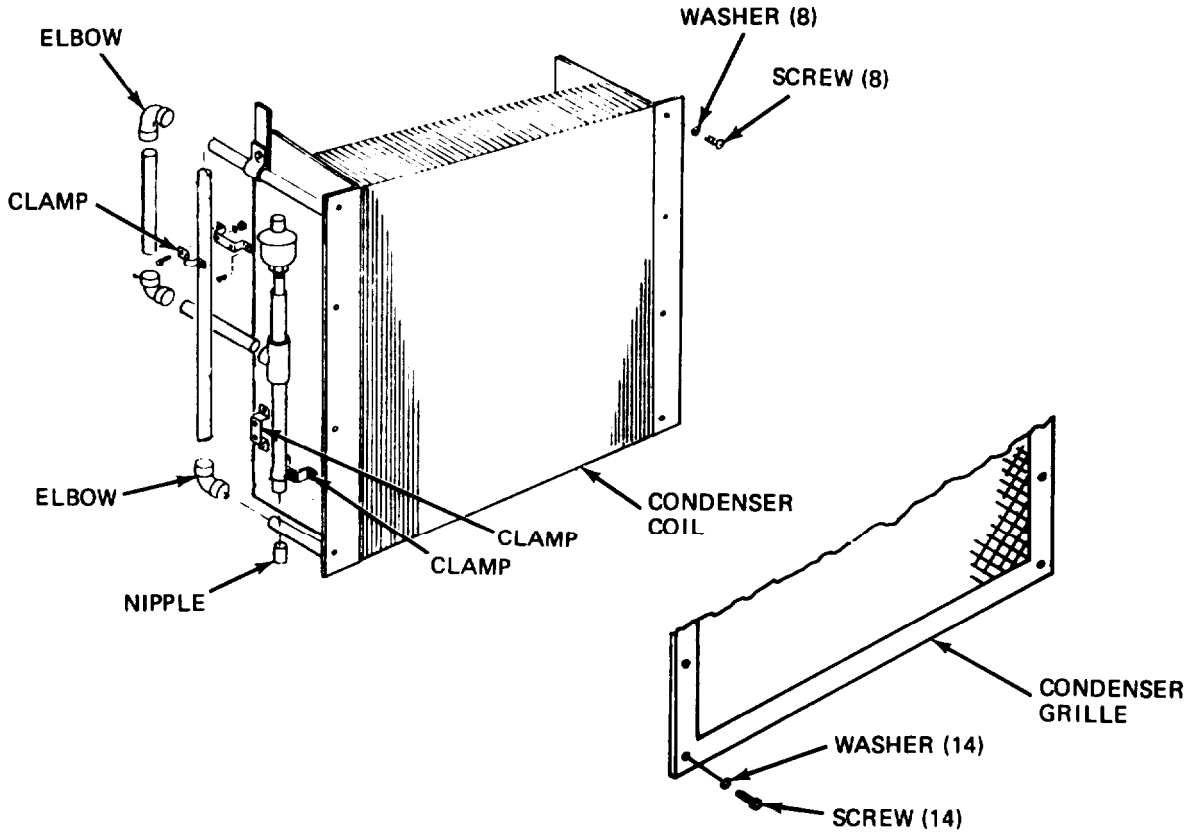


Figure 5-6. Condenser Coil

b. Cleaning and Inspection.

(1) Use stiff brush or compressed air to remove dust or other foreign matter from between fins of condenser coil. If compressed air is used, force air through fins in a direction opposite from normal circulation.

(2) Clean external surfaces with an approved cleaning solvent (Appendix E, Item 17) and dry thoroughly.

(3) Inspect condenser coil for bent fins. Straighten fins as necessary to permit free passage of air.

(4) Repair leaks in condenser coil tubing by brazing or soldering with a compound having a melting point of more than 1000°F. Use flux sparingly.

c. Installation.

(1) Attach condenser to unit with screws and washers,

(2) Connect tubing at elbows.

(3) Tighten clamps.

(4) Place condenser grill in position and secure with screws and washers.

(5) Refer to paragraph 5-10 and purge refrigeration system.

(6) Refer to paragraph 5-8 and test for leaks.

5-19. DISCHARGE PRESSURE REGULATING VALVE

a. Access. Open left side condenser section access door.

b. Removal.

(1) Pump the system down in accordance with paragraph 5-7.

(2) Connect a dry nitrogen source to the compressor discharge service tea and loosen the flare nut to the receiver inlet valve. Purge this section of tubing in accordance with paragraph 5-10.

(3) Remove clamp holding valve.

(4) Debraze (para. 5-1 4) the tubes to the valve and remove the discharge pressure regulating valve.

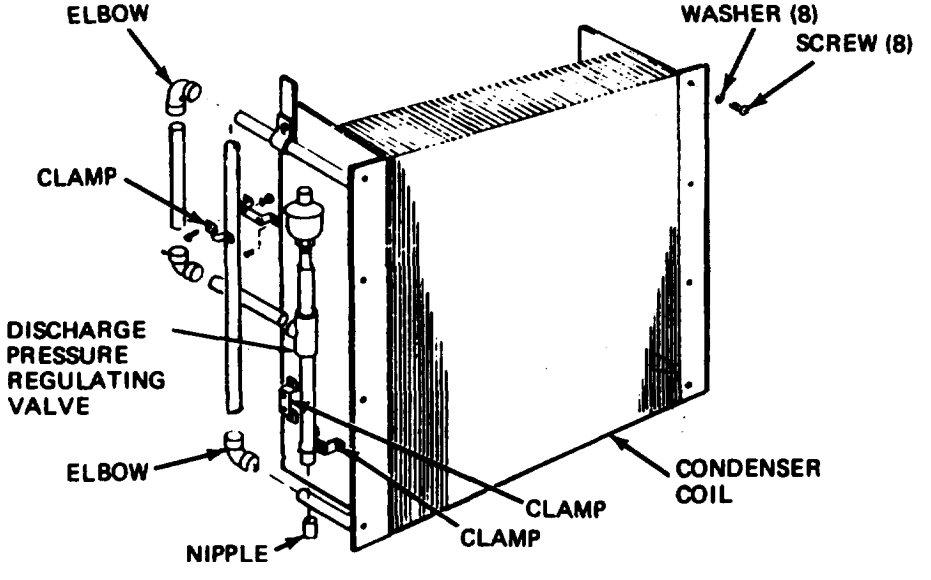


Figure 5-7. Discharge Pressure Regulating Valve

c. Installation.

(1) Braze (para. 5-14) the tubas to the discharge pressure regulating valve.

(2) Fasten clamp.

(3) Tighten the flare nut to the receiver inlet valve and remove the nitrogen source connection.

(4) Replace the dehydrator (para. 5-24).

(5) Leak test the valve, the newly connected tubing connections and the tubing connections in the area of the newly brazed joints per paragraph 5-8.

(6) Evacuate and charge the system as directed in paragraphs 5-11 and 5-13.

(7) Close all access doors,

5-20. HAND VALVES

The refrigeration system has four hand shut-off valves: a hot gas shut-off valve, a drier bypass valve, and two drier service valves. The same replacement procedure is used for any of these valves.

a. Removal.

(1) Open the appropriate access doors.
(2) Pump down the system (para, 5-7).
(3) Connect a dry nitrogen source to the compressor discharge service tea.
(4) For the hot gas shut-off valve, disconnect the flare nut on the inlet of the strainer in the hot gas bypass line.
(5) For either drier valves, disconnect the flare nut on the receiver inlet line.
(6) Debraze the tubes to the valve (para. 5-14).
(7) Remove the attaching hardware and remove the valve.

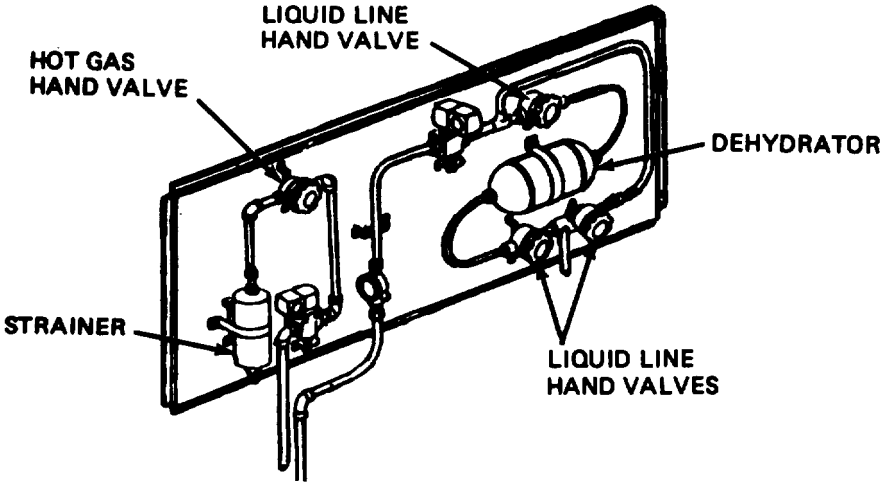


Figure 5-8. Hand Valves

b. Installation.

(1) Secure the valve with appropriate mounting hardware.
(2) Braze the tubing in place.
(3) Connect flare nut that was disconnected for nitrogen purging and remove nitrogen source.
(4) Replace the dehydrator (para. 5-24).
(5) Leak teat the valve, the newly connected tubing connections and the tubing connections in the area of the newly brazed joints par paragraph 5-8.
(6) Evacuate and charge the system as directed in paragraphs 5-11 and 5-13.
(7) Close all access doors.

5-21. STRAINER

a. Removal.

(1) pump the system down in accordance with paragraph 5-7.

(2) Open the left front access door.

(3) Disconnect the flare nuts and remove the strainer.

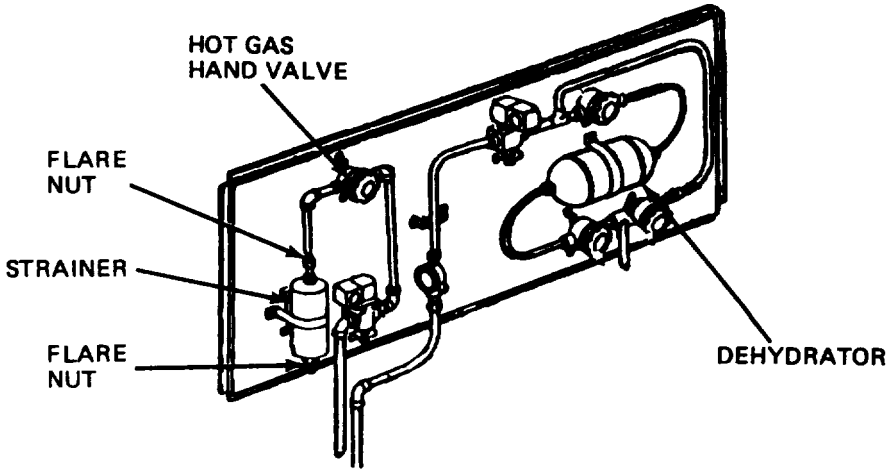


Figure 5-9. Strainer

b. Installation.

(1) Place the strainer in the unit. Check to see that the flow arrow is pointing away from the hand valve.

(2) Tighten the flare nuts.

(3) Replace the dehydrator (para. 5-24).

(4) Leak test the flare nuts and tubing in the area of the strainer.

(5) Evacuate and charge the system as directed in paragraphs 5-11 and 5-13.

(6) Close all access doors.

5-22. SOLENOID VALVES

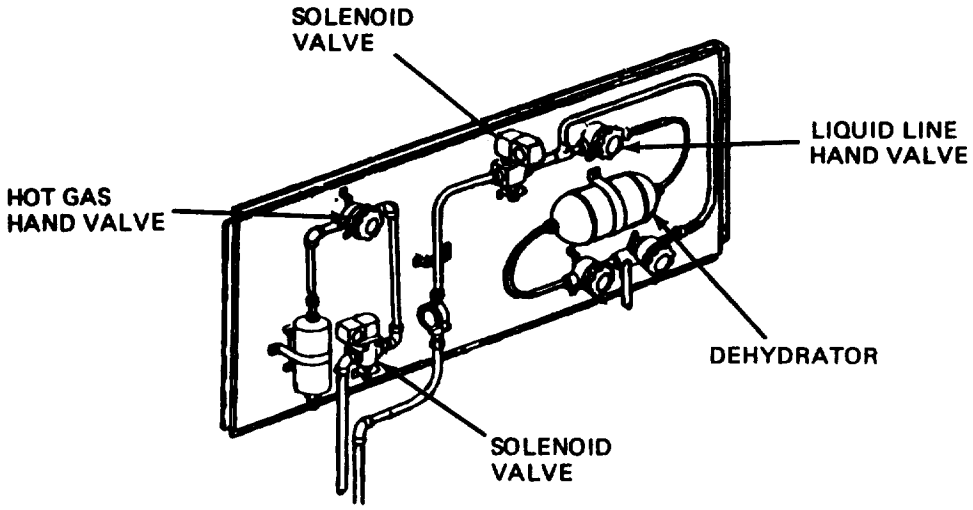


Figure 5-10. Solenoid Valves

a. Testing

WARNING

Disconnect input power to, the refrigeration unit before performing any maintenance on the electrical system. Voltages used can be lethal.

(1) Disconnect power.

(2) Tag and disconnect leads.

(3) Use a continuity tester or a multimeter set on the lowest OHMS scale to check for continuity between leads. If continuity is not found, the coil is open and the valve must be replaced.

(4) Use the continuity test or multi meter to check for continuity between each lead and the coil casing. If continuity is found between either lead and the case, the coil is grounded and the valve should be replaced,

(6) Using an external power source connect power (12 volt dc for the RGMD-K/1-10 or 115 volt ac for the R EM D-K/l 1-10) to the leads. When power is applied, listen for a sharp click when the valve changes position. If a click is not heard, internal valve problems are indicated and the valve should be replaced.

b. Valve Replacement.

NOTE

It is not necessary to debraze valve body from copper tubing unless valve body is damaged.

(1) Pump the system down in accordance with paragraph 5-7.

5-22. SOLENOID VALVES (Cont)

(2) Connect a dry nitrogen source to the compressor discharge service tee and loosen the flare nut to the receiver outlet valve. Purge this section of tubing in accordance with paragraph 5-10.

(3) Remove the lock nut or coil retainer that attaches the coil to the body assembly and remove the coil.

(4) Remove the enclosing tube capscrew and all other removable internal components from the valve body.

(5) Be sure to note original configuration of internal components.

(6) Note the direction of flow arrow on the valve body. Debraze the joints of the refrigerant tubing from the valve body, and remove the valve body.

c. Installation.

(1) New valves shipped from the factory are assembled hand tight to ease disassembly.

(2) Remove all components from the new valve body.

(3) Be careful that the flow arrow on the valve body is pointing in the proper flow direction. See refrigeration schematic figure 1-4.

(4) Be sure dry nitrogen is following through the system; then position the valve body and braze the joints of the refrigerant tubing to the valve body.

(5) Be sure that the inside surfaces of the valve body are clean,

(6) Disconnect the nitrogen source and connect the flare nuts to the receiver outlet valve.

(7) Assemble internal components per original configuration and tighten enclosing tube capscrew.

(8) Install the coil and nameplate and secure with the locknut or coil retainer.

(9) Install the connector (may be removed from old solenoid valve if not damaged).

(10) See tags and wiring diagram figure 1-5 or 1-6 and connect wires.

(11) Replace the dehydrator (para, 5-24).

(12) Leak test the valve, all newly connected tubing connections and all connections in the area of the newly brazed joints per paragraph 5-8.

(13) Evacuate and charge the system as directed in paragraph 5-11 and 5-13.

(14) Close all access door.

5-23. FUSIBLE PLUG

a. Removal.

(1) Discharge the system (para. 5-9).

(2) Unscrew the threaded fusible plug, which is located on the top center portion of the receiver tank.

(3) Examine the plug. If it is blown, replace it with a new one.

b. Installation.

(1) Screw the fusible plug into the receiver.

(2) Replace the dehydrator (para. 5-24).

(3) Leak test the newly installed plug and drier connections per paragraph 5-8.

(4) Evacuate and charge the system per paragraphs 5-11 and 5-13.

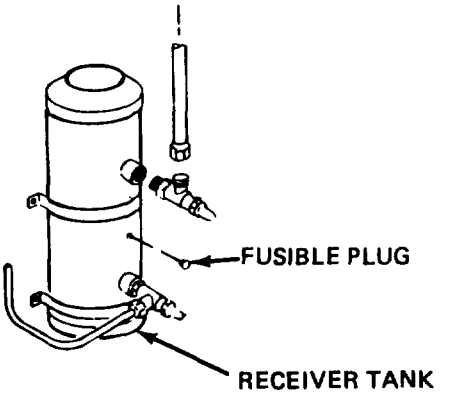


Figure 5-11. Fusible Plug

5-24. DEHYDRATOR (FILTER DRIER)

a. General.

(1) The dehydrator is a cylindrical vessel attached by a clamp on the refrigeration panel assembly. The body of the dehydrator contains activated alumina, a material which removes moistures from the refrigerant by absorption. A filter in the inlet end of the dehydrator prevents activated alumina and other material from entering other parts of the refrigeration system,

(2) A new dehydrator must be installed in the refrigerant system whenever the system has been opened. Replacement of the dehydrator should be the final maintenance action before evacuating and charging the system.

{3) A three-valve by-pass makes it possible to by-pass the dehydrator or change the dehydrator without pumping down the system.

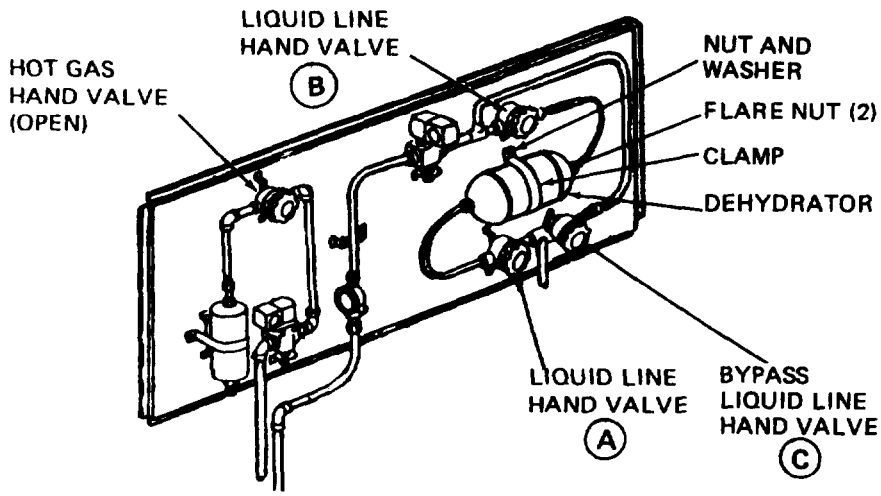


Figure 5-12, Dehydrator

b. Emergency Operation. If the dehydrator is plugged by dirt, oil or saturated with moisture, the unit may be operated until a replacement dehydrator is available. To operate, close valves (A and B) and open by-pass valve (C) below dehydrator but do not remove dehydrator. This-will allow the refrigerant to flow direct from the receiver outlet valve to the expansion valve, bypassing the dehydrator. A replacement dehydrator should be installed as soon as possible.

c. Removal.

(1) Refer to paragraph 5-7 and pump down the refrigeration system. Close the dehydrator valves and the receiver valve.

(2) Disconnect flare nuts at dehydrator inlet and outlet.

(3) Loosen nut and washer on dehydrator mounting clamp and remove dehydrator.

d. Installation.

NOTE

Always install a new dehydrator when one has been removed.

(1) Install dehydrator in clamp as in original configuration and tighten washer with nut.

(2) Tighten inlet nut but leave outlet nut off. Open receiver outlet valve (figure 5-2) slightly to purge line; then tighten outlet nut.

(3) Refer to paragraph 5-8 and test for leaks before operating unit.

(4) If unit was operated by bypassing dehydrator, be sure that bypass valve (C) is closed and valves (A and B) are open.

5-25. RECEIVER TANK

The receiver tank is a cylindrical reservoir of welded steel construction. The tank is equipped with inlet and outlet angle valves and a fusible type plug. The receiver tank valves are standard two-way valves, The outlet valve is installed below the liquid level of the receiver. Although the receiver is capable of holding the entire charge of refrigerant in the system, only a part of this refrigerant will be in the receiver at any one time during normal operation. Liquid refrigerant from the condenser flows through an inlet valve and leaves through the outlet valve.

a. Removal.

(1) Disconnect power.

(2) Discharge the system (para. 5-9).

(3) Disconnect brass flare nuts at inlet valve and outlet valve connections of receiver tank.

(4) Remove four nuts securing clamps around tank and remove tank.

b. Cleaning and Inspection.

(1) Clean external surface with an approved cleaning solvent (Appendix E, Item 17) and dry thoroughly.

(2) Inspect tank and valves for cracks, dents, or other damage. Replace if defective.

c. Installation.

(1) Place receiver tank inside clamps and secure with four nuts.

(2) Connect brass flare nuts from lines to inlet valve and outlet valve.

(3) Refer to paragraph 5-13 and recharge refrigeration system.

(4) Refer to paragraph 5-10 and purge refrigeration system.

(5) Refer to paragraph 5-8 and test for leaks.

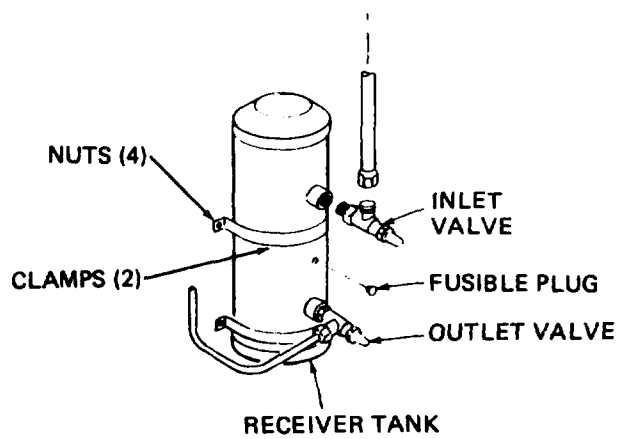


Figure 5-13. Receiver Tank

5-26. SIGHT GAUGE

The sight gauge assembly consists of a flare fitting containing a sight glass. The sight gauge is used to observe liquid refrigerant as it flows through the system. If the unit contains sufficient refrigerant and is operating normally, the sight gauge will appear clear. If insufficient refrigerant is present, bubbles will show in the sight glass

a. Removal.
   (1) Refer to paragraph 5-7 and pump down refrigeration system.
   (2) Remove flare nuts at liquid indicator sight gauge and remove gauge.

b. Cleaning and Inspection.
   (1) Clean all parts with an approved cleaning solvent (Appendix E, Item 17) and dry thoroughly.
   (2) Inspect sight gauge for cracks, chips, or other damage paying particular attention to the threaded parts. Replace if defective.

c. Installation.
   (1) Place sight gauge in position and tighten flare nuts.
   (2) Refer to paragraph 5-10 and purge refrigeration system.
   (3) Refer to paragraph 5-8 and test for leaks.
   (4) Evacuate and charge system per paragraphs 5-11 and 5-13.
   (5) Close access doors.

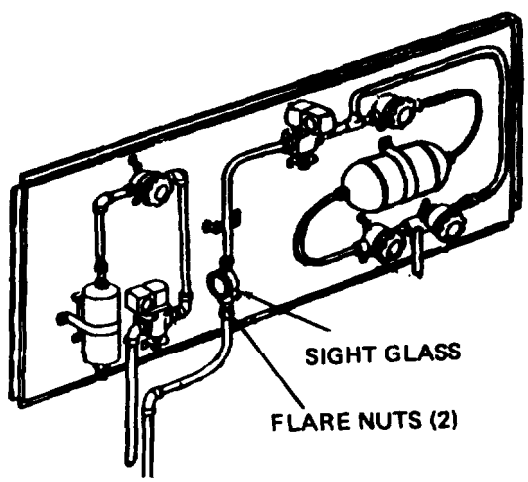


Figure 5-14. Sight Gauge

5-27. EXPANSION VALVE

The expansion valve acts as a pressure-sensitive variable restriction between the high and low pressure sides of the refrigeration system. The flow of refrigerant through the valve is controlled by the opening and closing movement of a plunger connected to the diaphragm of the expansion valve. The coupled plunger and diaphragm are acted upon by two forces. The pressure of the liquid in the bulb of the expansion valve causes a downward or opening movement on the diaphragm and plunger. The valve plunger and diaphragm are spring-loaded to assist the evaporator pressure to cause an upward or closing movement. A gas-filled thermo bulb is clamped to the evaporator outlet line and connected to the diaphragm by means of a capillary tube. When the evaporator is refrigerated and the thermo bulb is cold, the gas in the bulb contracts and the pressure on the diaphragm decreases in direct proportion. As pressure on the diaphragm decreases, the plunger spring in the valve housing forces the plunger against the valve orifice, shutting flow of refrigerant to the evaporator. An external equalizer line connects a chamber under the valve diaphragm to the suction line, which enables the expansion valve to make an accurate reading of and response to the suction pressure at the thermo bulb. Any increase in suction line temperature causes the gas in the thermo bulb to expand and the diaphragm then forces the valve plunger away from the orifice, allowing refrigerant to enter the vaporator.

a. Adjusting.

NOTE

The expansion valve is preset by the manufacturer to maintain a balance when the temperature of the thermo bulb is approximately 40° to 50°F above the temperature of refrigerant entering the evaporator. The valve adjustment should not be disturbed or adjusted unnecessarily.

(1) Remove guard at rear of evaporator section (figure 5-62).
(2) Remove superheat adjustment cap and turn square adjusting stem only 1/4 turn at a time. Turning stem to right decreases flow and raises superheat. Turning stem to left increases flow and lowers superheat. The superheat is correctly adjusted when the suction line at the expansion valve thermo bulb is 10°F warmer than the saturated refrigerant in the coil.
(3) Replace adjustment cap.
(4) Replace guard at rear of evaporator section.

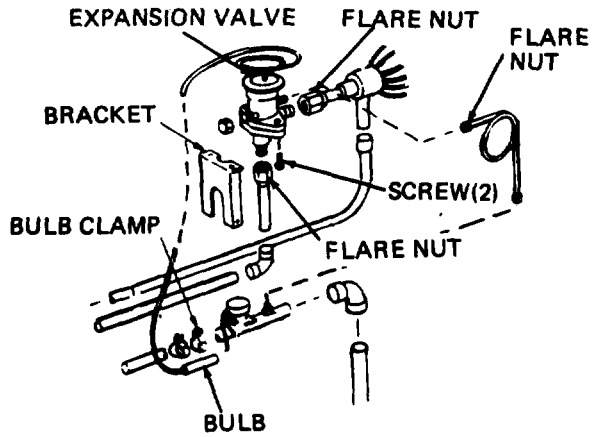


Figure 5-15. Expansion Valve

b. Removal.
(1) Refer to paragraph 5-7 and pump down refrigeration system.
(2) Remove guard at rear of evaporator section (fig. 5-62).
(3) Loosen screws holding expansion valve bulb clamp to suction line and remove bulb.
(4) Disconnect three flare nuts at expansion valve,
(5) Remove screw, nut, lockwasher and clamp that attach power bulb lead to evaporator coil.
(6) Remove two screws that attach expansion valve to bracket and remove expansion valve.

c. Cleaning and Inspection.
(1) Clean expansion valve with an approved cleaning solvent (Appendix E, Item 17) and dry thoroughly.
(2) Inspect expansion valve for cracks, chips, or other damage. Replace If defective.

d. Installation.
(1) Secure expansion valve on bracket with two screws.
(2) Place expansion valve power bulb in clamp in suction line and tighten clamp screws,
(3) Secure power bulb lead to evaporator coil with clamp, screw, nut and lockwasher.
(4) Connect three flare nuts at expansion valve,
(5) Refer to paragraph 5-10 and purge refrigeration system.
(6) Refer to paragraph 5-8 and test for leaks.
(7) Replace guard at rear of evaporator section (figure 5-62).
(8) Replace the dehydrator (para. 5-24).
Leak tact all newly connected fittings.
(9) Evacuate and charge the system as directed in paragraphs 5-11 and 5-13.
(11) Close all access doors.

5-28. EVAPORATOR COIL

The evaporator coil consists of an aluminum housing containing a series of parallel tubes equipped with external radiator type fins. Liquid refrigerant enters the evaporator and vaporizes as it passes through the tubes. The low temperature produced by the vaporizing refrigerant cools the evaporator coils and the air surrounding the coils. Air is recirculated over the coils through the refrigerator by means of a fan located between the evaporator and the forward plate of the evaporator housing. The vaporized refrigerant is collected in a header and carried back to the compressor by the suction line.

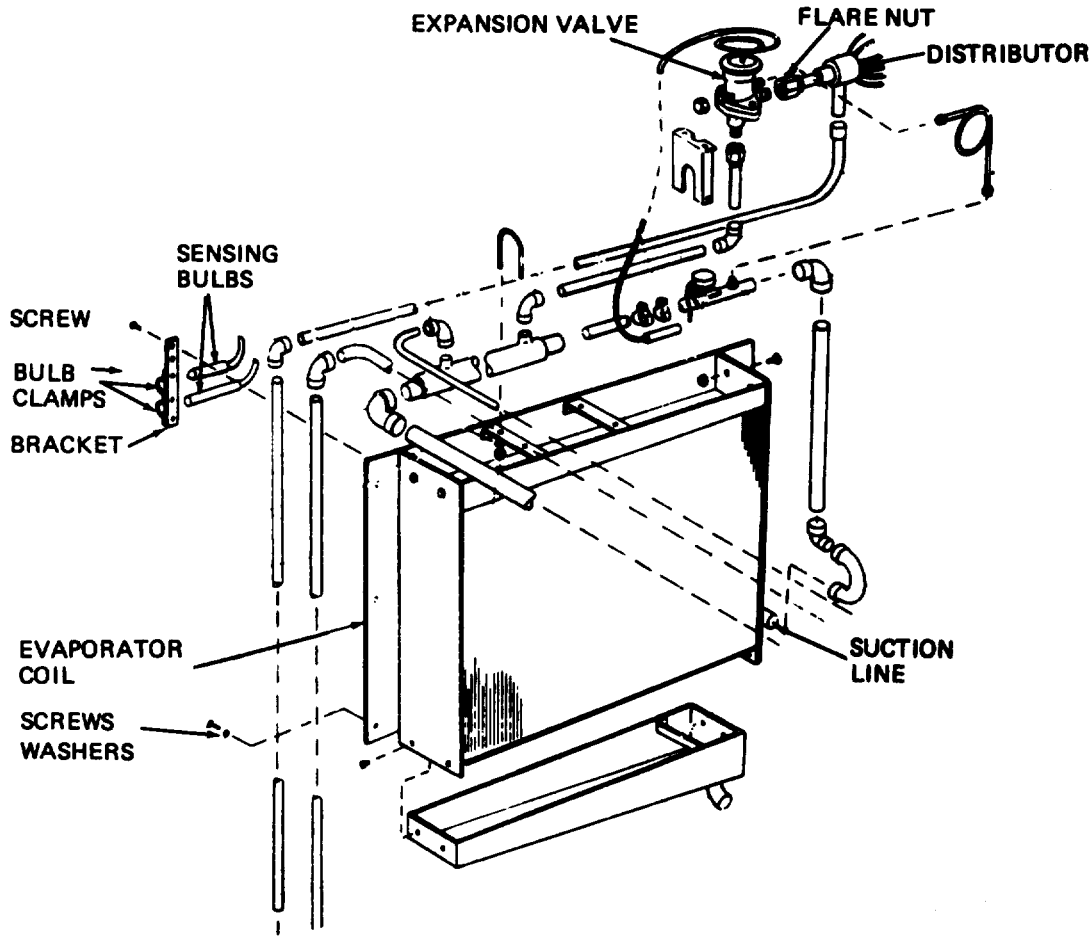


Figure 5-16. Evaporator Coil

a. Removal.

(1) Pump the system down in accordance with paragraph 5-7.

(2) Remove fourteen screws and washers and remove the evaporator guard (figure 5-62).

(3) Loosen the sensing bulb clamps and remove the sensing bulbs. Tape them up and out of the way.

(4) If the coil is to be replaced, remove the sensing bulb bracket.

(5) Connect a dry nitrogen source to the compressor suction service tee and loosen the flare nut to the receiver outlet valve. Purge this section of tubing in accordance with paragraph 5-10.

(6) Debraze the tubing at the suction header using the techniques of paragraph 6-4.

(7) Disonnect the flare nut at the distributor and expansion valve connection.

(8) Use gloves when handling roils to avoid cuts and to reduce the possibility of fin damage.

(9) Support the evaporator coil and remove the screws and Iockwashers securing the coil.

(10) Remove the coil.

b. Repair. If serious damage or if a leak should be evident in any part of the coil, notify general support maintenance.

c. Installation.

(1) Secure the evaporator coil to its mounting flanges with screws and Iockwashers.

(2) Connect the flare nut from the distributor to the expansion valve.

(3) Braze the suction header connections (paragraph 5-14).

(4) Tighten the flare nut to the receiver outlet valve and remove the nitrogen source connection. Replace the dehydrator (paragraph 5-24).

(5) Install the sensing bulb bracket.

(6) Slip the sensing bulbs back in their clamps and tighten the clamps.

(7) Leak test the coil, newly connected tubing and tubing connections in the area of the newly brazed joints per paragraph 5-8.

(8) Evacuate and charge the system as described in paragraphs 5-11 and 5-13.

(9) Install the evaporator guard with fourteen screws and washers.

(10) Close all access doors.

5-29. ACCUMULATOR

The accumulator tank is in the refrigeration circuit. Its function is to trap liquid in the suction line and permit gradual evaporation of trapped liquid.

a. Removal.

(1) Pump the system down in accordance with paragraph 6-7.

(2) Connect a dry nitrogen source to the compressor suction service tea and loosen the flare nut to the receiver outlet valve. Purge this section of tubing in accordance with paragraph 5-10.

(3) Debraze the inlet and outlet elbows using the techniques of paragraph 5-14.

(4) Remove the nut and washer that secures the accumulator to the bracket and lift the accumulator from the unit.

b. Installation.

(1) Position the accumulator on the bracket and tighten the nut and washer that secures it.

(2) Braze the piping connections (para. 5-14). Make sure that the suction line from the heat interchanger is attached to the inlet marked IN. The outlet (which is marked OUT) must be connected to the line leading to the crankcase pressure regulator valve.

(3) Tighten the flare nut to the receiver outlet valve and remove the nitrogen source connection.

(4) Replace the dehydrator (para. 5-24).

(6) Leak test the accumulator, newly connected tubing and tubing connections in the area of the newly brazed joints per paragraph 5-8,

(6) Evacuate and charge the system as directed in paragraphs 5-11 and 5-13.

(7) Close all access doors.

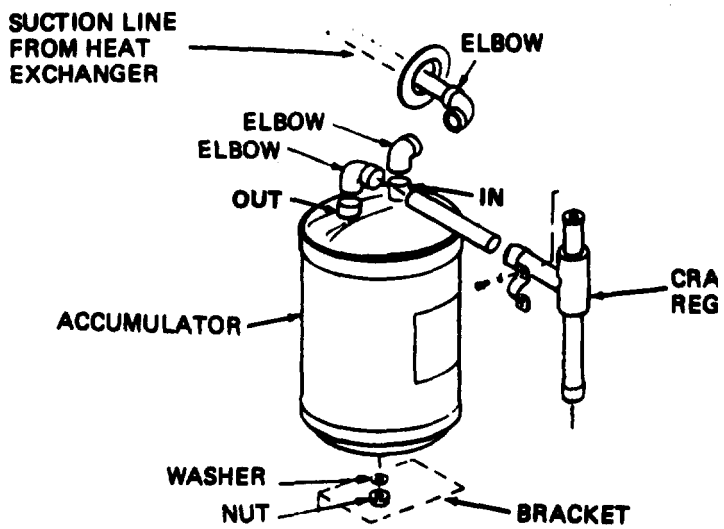


Figure 5-17. Accumulator

5-30. CRANKCASE PRESSURE REGULATING VALVE

The crankcase pressure regulating valve is designed to limit the maximum pressure at the compressor inlet to prevent overloading the engine. At high load conditions, the valve imposes a partial restriction in the suction line. When the condition has passed, and suction pressures drop below the valve setting, the valve assumes an open position. The correct pressure of the valve is between 8 and 10 pounds.

a. Access. Open left side condenser section access door.

b. Adjust.

(1) Operate unit with 70°F air passing through evaporator coil for five minutes and read suction pressure gage.

(2) If pressure needs adjustment, remove protector cap from valve adjustment and then using a screwdriver, adjust the valve. Turn adjustment clockwise to raise pressure and counterclockwise to lower pressure as observed on suction pressure gage, to between 8 and 10 pounds.

c. Removal.

(1) Pump the system down in accordance with paragraph 5-7.

(2) Connect a dry nitrogen source to the compressor suction service tee and loosen the flare nut to the receiver outlet valve. Purge this section of tubing in accordance with paragraph 5-10.

(3) Detach clamp holding valve.

(4) Debraze (para. 5-14) the tubes to the valve and remove the crankcase pressure regulating valve.

d. Installation.

(1) Braze (para. 5-14) the tubes to the regulating valve.

(2) Attach clamp.

(3) Tighten the flare nut to the receiver outlet valve and remove the nitrogen source connection.

(4) Leak test the valve, the newly connected tubing connections and the tubing connections in the area of the newly brazed joints per paragraph 5-8.

(5) Evacuate and charge the system as directed in paragraphs 5-11 and 5-13.

(6) Close all access doors.

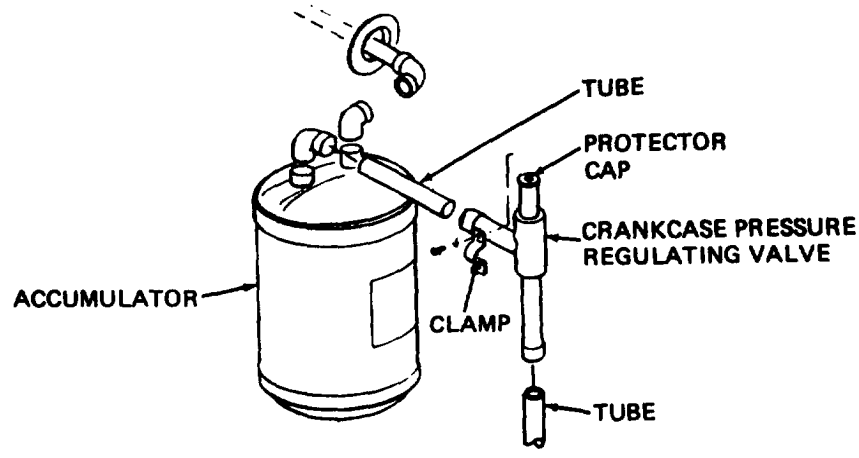


Figure 5-18. Crankcase Pressure Regulating Valve

5-31. TUBING AND FITTINGS (FIGURES 5-1 and 5-2)

The refrigeration system contains a number of pieces of copper tubing in a variety of material, grades, sizes, lengths, and shapes, and a number of elbows, tees and adapters in several sizes. Observe the following when replacing any piece of tubing or fitting in the system.

WARNING

Be sure the refrigeration system is pumped down or fully discharged and that dry nitrogen is flowing through the section of the system you are brazing at a rate of 1-2 cmf (0.028-0.057 m^3/minute) before brazing or debrazing.

a. Replace tubing and fittings only with equal material, grade, size, length, and shape as the item removed,

b. Leak test in accordance with paragraph 5-8 after any replacement action that required brazing.

c. Replace the dehydrator and leak test the dehydrator flare fittings as the final step in any maintenance action that required the refrigeration pressure system to be opened.

d. Evacuate and charge the refrigeration system in accordance with paragraphs 5-11 and 5-13 after all other maintenance actions are completed.

5-32. COMPRESSOR

The Dunham-Bush Model BP44-1 compressor is a four cylinder piston type pump, constructed mainly of cast iron. The aluminum pistons and connecting rods are driven in a reciprocating motion by an iron crankshaft, To prevent leakage around the crankshaft, a rotary seal is used. Lubrication to the connecting rods and bearing is provided by a vane type oil pump. The oil level can be observed through a sight glass in the compressor body.

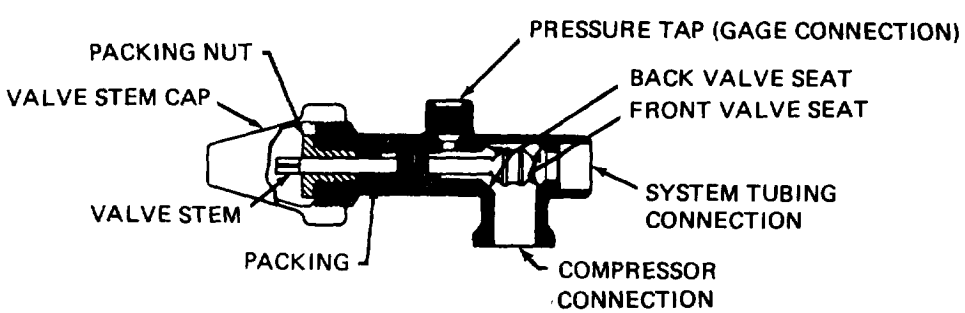
a. Lubrication. Refrigeration oil in the unit travels through a sealed system and cannot escape. It should be necessary to add oil only after repair of the refrigeration system. To inspect compressor oil level, proceed as follows:

(1) Operate unit with 70°F air passing through evaporator coil for fifteen minutes.

(2) With unit running, inspect oil level through sight glass at side of compressor. If the oil level in the sight glass is less than one-half (1/2) up from the bottom of the glass, this indicates a low oil level. If the oil level is up more than three-quarters from the bottom, this indicates a high oil level. Therefore, the oil level should be 1/2 to 3/4 up the sight glass when the compressor is running, The refrigeration unit is shipped from the factory with a full charge of oil. If a new compressor is installed or if service work has been done to the refrigeration system, check the oil level carefully since very low or high oil levels will damage the compressor.

(3) Refer to Figure 3-1 Lubrication Order for type of oil.

(4) Adding oil.



(h) Pump down the refrigeration system. (Refer to paragraph 5-7 Pumpdown.)

(b) Make sure both compressor suction and discharge service valves are closed (frontseated).

(c) Remove the compressor oil fill plug slowly to prevent sudden discharge of refrigerant trapped in compressor.

(d) Use a small clean funnel to pour oil into compressor through oil filler plug opening. Use only new oil. See figure 3-1 Lubrication Order.

NOTE

Add oil till level is approximately 1/2 to 3/4 up sight glass. Do not overfill. Use the oil drain plug for an overfill condition.

(e) Replace oil plug. Crack one of the fittings on the compressor discharge service valve tee.

(f) Backseat the compressor suction service valve and purge the compressor through the fittings on the tee.

(g) Tighten the fittings and backseat the discharge service valve. Crack to operate the gages.

(h) Operate the unit and check oil level.

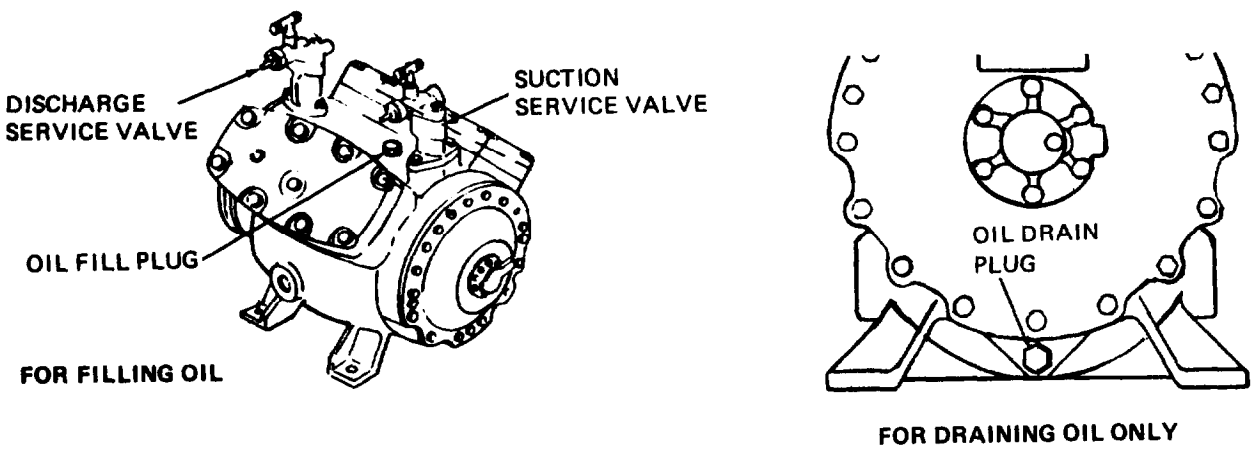


Figure 5-19. Oil Plugs

b. Removal,

(1) Pump the system down; turn the unit off and disconnect input power.

(2) Remove drive belts from compressor pulley as follows:

(a) Loosen four bolts holding engine.
(b) Turn adjusting rod and push engine (or electric motor) toward compressor to release tension on belts.
(c) Release tension on fan belt by loosening idler pulley,
(d) Remove belts.

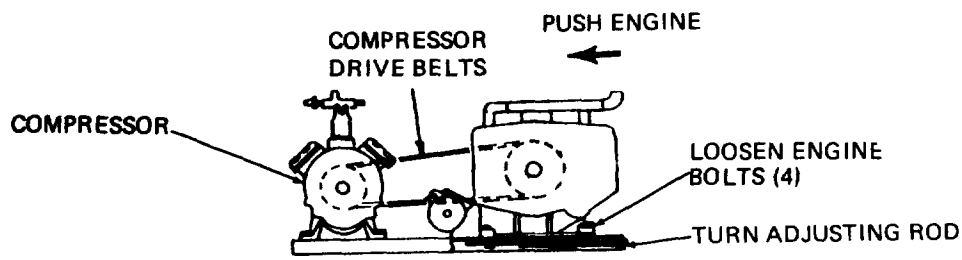


Figure 5-20. Compressor Removal

5-32. COMPRESSOR (Cont)

(3) Close (frontseat) the two compressor service valves.

(4) Loosen the flare caps on the suction and discharge valve tee fittings to permit the refrigerant trapped in the compressor to escape.

(5) Remove the gage connections from the service valves (figure 5-23).

(6) Unbolt the two service valves from the compressor (figure 5-23).

WARNING

Avoid injury by using adequate equipment and personnel to remove compressor from frame.

(7) Remove the four mounting bolts and pull the compressor from the frame,

c. Disassembly. Use figure 5-22 as a guide. Disassemble the compressor only to the extent necessary to reach and replace a defective part See paragraphs 5-33 through 5-35 for specific instructions.

CAUTION

Prior to touching or otherwise handling any interior machined compressor parts, thoroughly coat hands with compressor oil to neutralize acids contained on skin. Always leave hands coated with oil when working with or handling compressor parts.

d. Reassembly. Use figure 5-22 as a guide. see paragraphs 5-33 through 5-35 for specific instructions. See table 5-2 for torque values.

e. Installation.

(1) Check to see that compressor contains an oil charge. See paragraph 5-32a.

(2) Place the compressor in position in the unit. Line up the compressor pulley with the engine pulley (or electric motor sheave) and install compressor belts.

(3) Secure compressor with four sets of mounting hardware.

(4) Install fan belt, tighten idler pulley to 1/2 inch deflection.

(5) Turn adjusting rod and push engine (or electric motor) away from compressor to tighten compressor belts to 1/2 inch deflection.

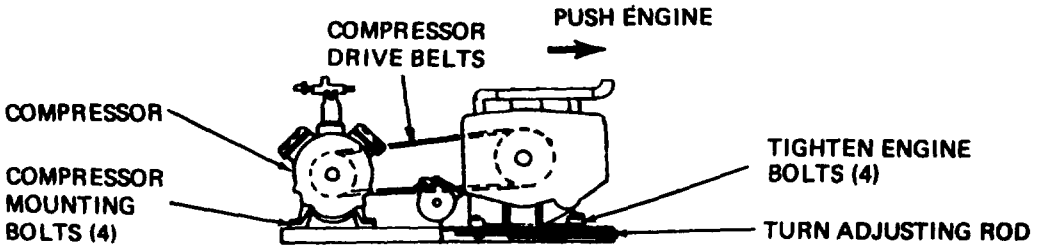


Figure 5-21. Compressor Installation

(7) Connect the service valves to the compressor using new valve gaskets which have been soaked in compressor oil.

(8) Replace the dehydrator (paragraph 5-24).

(9) Leak test, evacuate and charge the system as applicable. (See paragraphs 5-8,5-11 and 5-13.)

Table 5-2, Compressor Torque Values

Part	Torque Range
Cylinder head screw	44-48 max.
Cylinder head plug	18 nominal
Valve screw	26-30
Valve adapter screw	17 nominal
Pulley screw	26–30
Pulley pintle screw	10 nominal
Seal cover screw	10 nominal
Retainer, sight glass	1/2 turn (180°) max.
End plate screw	34-38 max.
Pump plate plug	18 nominal
Pump plate screw	8 nominal
Oil drain plug	18 nominal
Suction & discharge valve screw	17 nominal
Flywheel pipe plug (3/4")	433 nominal
Pipe plug (1/4”)	39 nominal

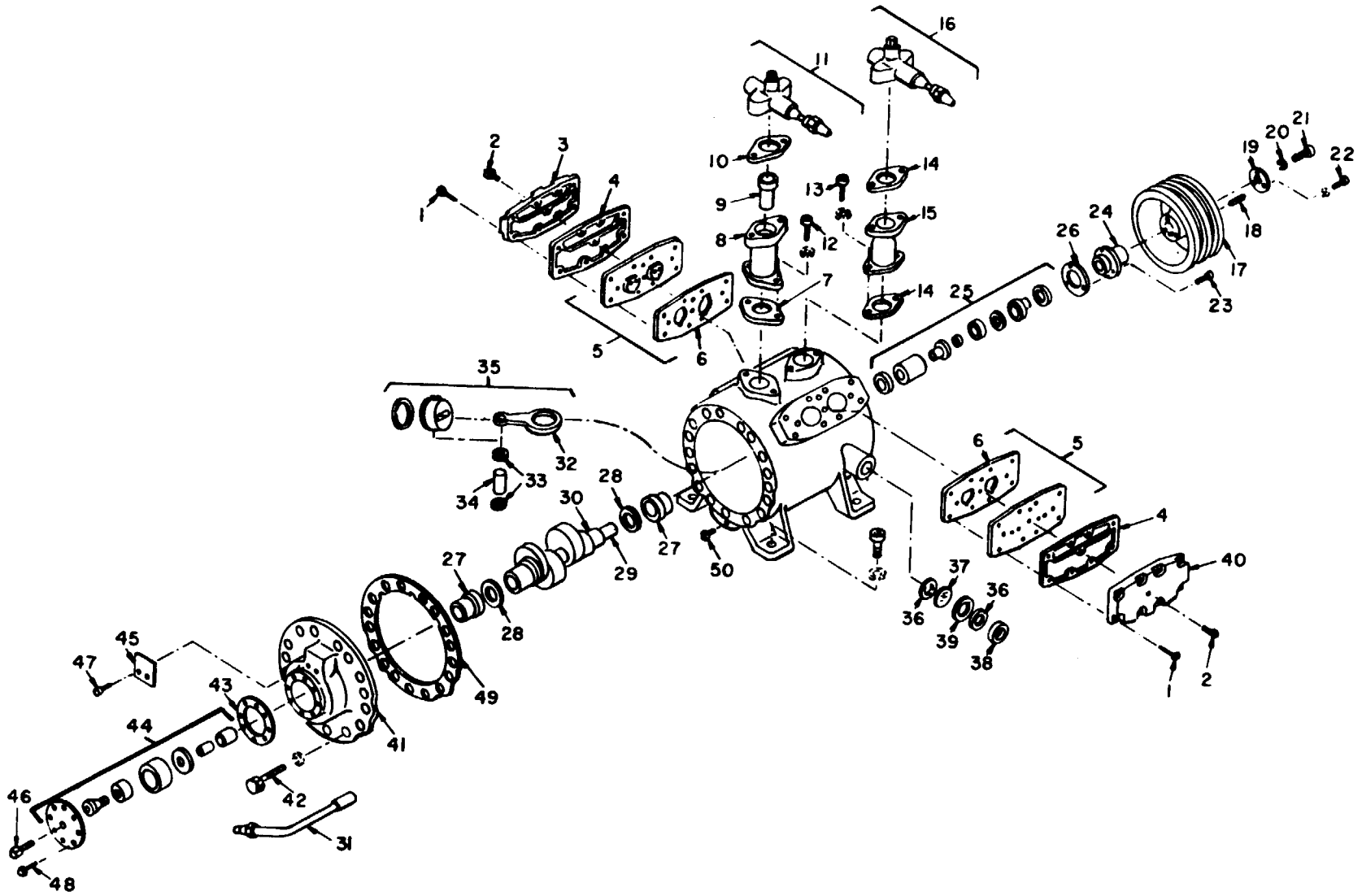


Figure 5-22. Compressor (Sheet 1 of 2)

1. SCREW
2. PLUG
3. CYLINDER HEAD, R.H.
4. GASKET
6. PLATE ASSEMBLY
6. GASKET
7. GASKET
8. ADAPTER
9. STRAINER
10. GASKET
11. VALVE
12. SCREW
13. SCREW
14. GASKET
15. ADAPTER
16. VALVE
17. PULLEY
18. KEY
19. PLATE
20. LOCKWASHER
21. SCREW
22. SCREW
23. SCREW
24. PLATE
25. SEAL ASSEMBLY
26. GASKET
27. BEARING
28. THRUST WASHER
29. CRANKSHAFT
30. BEARING
31. OIL PICKUP ASSEMBLY
32. CONNECTING ROD
33. WASHER
34. PISTON PIN
36. PISTON ASSEMBLY
36. GASKET
37. SIGHT GLASS
38. RETAINER
39. RING
40. CYLINDER HEAD, L.H.
41. END PLATE
42. SCREW
43. GASKET
44. OIL PUMP ASSEMBLY
45. NAMEPLATE
46. PLUG
47. DRIVE SCREW
48. SCREW
49. GASKET
50. PLUG

Figure 5-22. Compressor (Sheet 2 of 2)

5-33. COMPRESSOR SERVICE VALVES

a. Removal.

(1) Pump down the refrigeration system (para. 5-7).

(2) Disconnect the gage capillary line and remove the tee.

(3) Loosen the cap screws that attach the valve to the compressor.

(4) Disconnect the flare nut from the inlet or outlet receiver valve as applicable. Purge the line to be debrazed.

(5) Debraze tubing from the valve (para. 5-14). Remove valve and its gasket.

(6) Remove strainer from suction valve adapter. Clean strainer of any foreign matter. Replace with a new strainer if damaged.

(7) Plug the tube and compressor openings.

b. Installation.

(1) Remove plugs,

(2) Open the valve and wrap the valve in wet rags,

(3) Braze the tubing to the valve (para. 5-14).

(4) Tighten the flare nut to the receiver valve and disconnect nitrogen purging connections.

(5) Drop-in suction valve strainer into adapter.

(6) Using new valve gaskets that have been soaked in compressor lubricating oil, secure the valve to the compressor with the cap screws.

(7) Replace the dehydrator (para. 5-24).

(8) Leak test all newly connected tubing and tubing connections in the area of newly brazed joints per para. 5-8.

(9) Evacuate and charge the system per paragraphs 5-11 and 5-13.

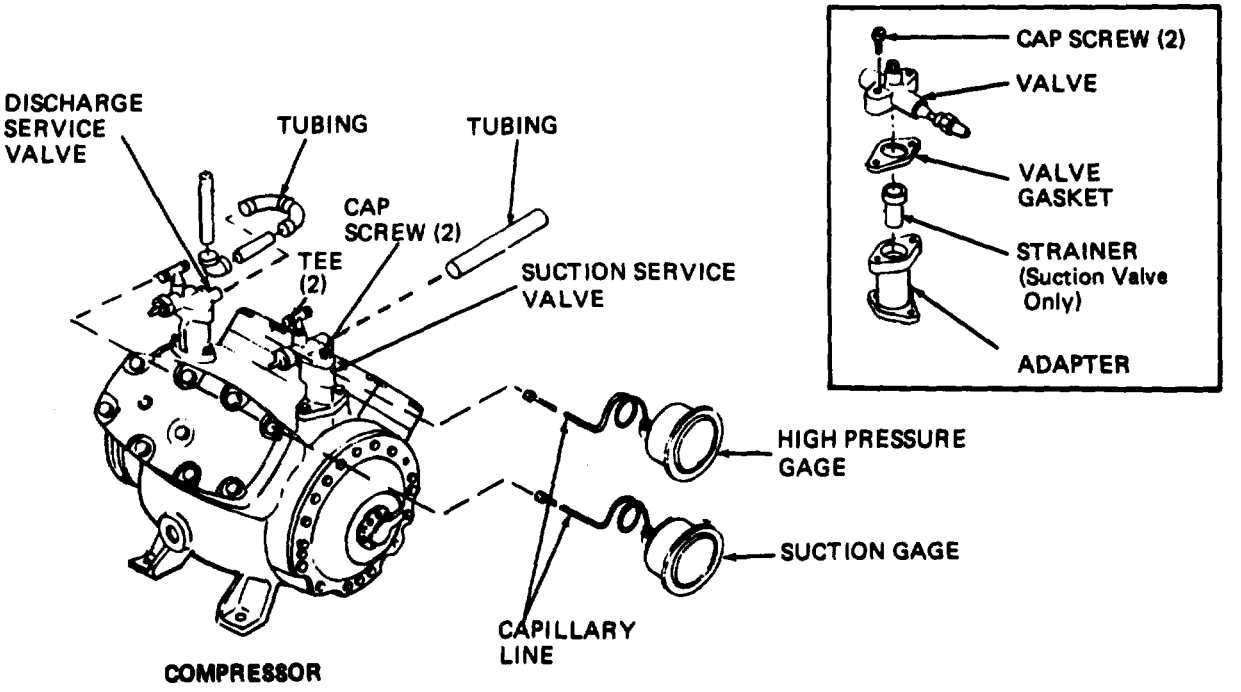


Figure 5-23, Compressor Service Valves

5-34. COMPRESSOR CYLINDER HEADS AND VALVE PLATES

a. Disassembly.

(1) Pump down refrigeration system (para. 5-7). Shut off the compressor and front seat the suction and discharge service valves.

(2) Turn off power.

(3) After the compressor valves are shut off, crack open the gauge port on the discharge service valve and release the pressure in the compressor,

(4) Remove the cylinder head screw.

(5) Tap the head with a soft faced hammer or block of wood to loosen it. Remove the head.

(6) Remove the head gasket.

(7) Remove the valve plate assembly and gasket.

(8) Check cylinder heads for warping, cracks and damage to gasket surfaces. Replace if necessary.

(9) Clean all parts with dry cleaning solvent (Appendix E, Item 17) and dry thoroughly. Remove all gasket remains from the compressor housing and cylinder head.

NOTE

Prior to valve removal, record original valve position.

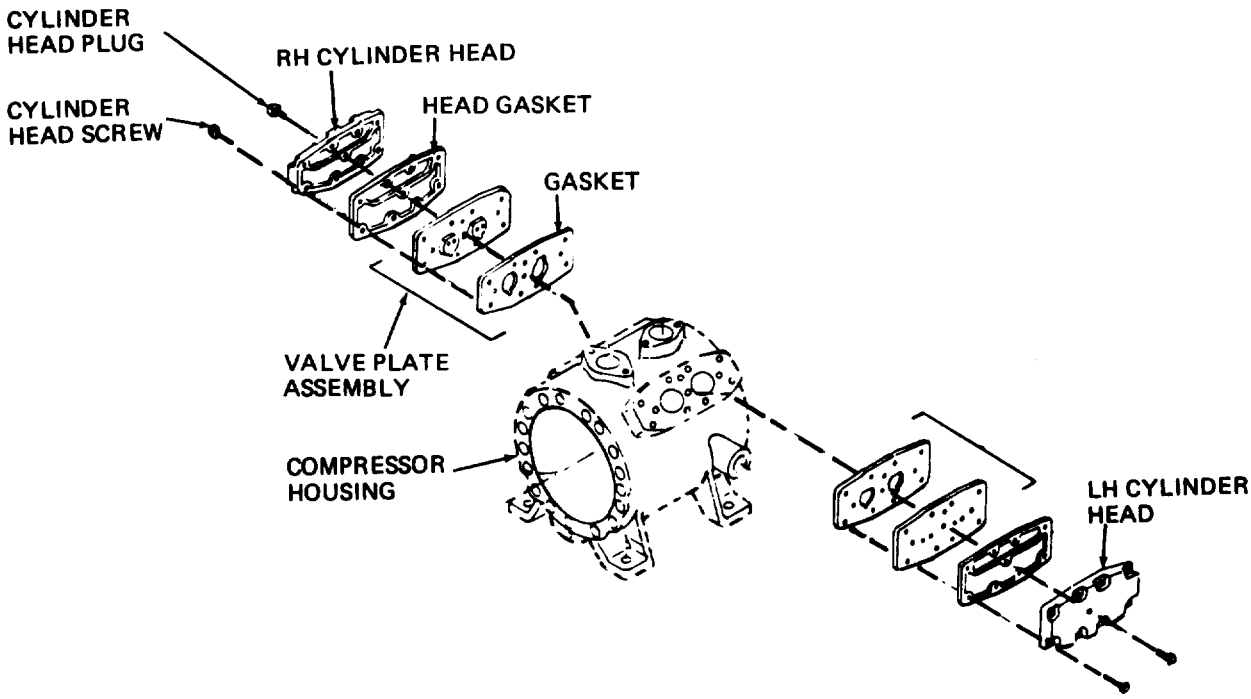


Figure 5-24, Compressor Cylinder Heads and Valve Plates

b. Reassembly.

(1) Apply new gaskets coated with compressor oil to the valve plate and cylinder head,

(2) Place valve plate and cylinder head in position on compressor housing.

(3) Replace and tighten cylinder head screw to 30 ft-lb torque.

5-34. COMPRESSOR CYLINDER HEADS AND VALVE PLATES (Cont)

c. Checking Valve Plate Assembly.

(1) Close compressor suction valve and pump the compressor down until the suction gauge shows a vacuum.

(2) Turn off power.

(3) Observe the pressure gauges to see if the unit will hold a vacuum. If the compressor will hold a vacuum, compressor valve plates are not leaking.

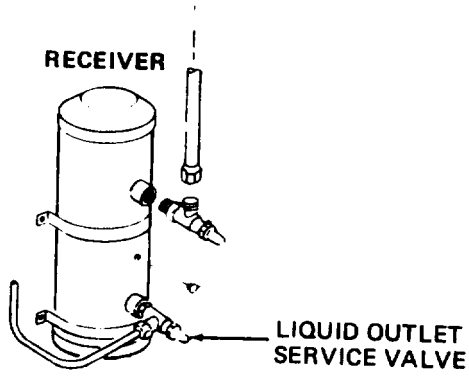
(4) Open the compressor suction valve and start up unit.

5-35. COMPRESSOR SEAL ASSEMBLY AND PULLEY

a. Disassembly,

(1) Close receiver liquid line valve and pump the system down (para. 5-7).

(2) Turn off power.



(3) Close compressor service valves, crack open the gauge port on the discharge service valve and release the pressure in the compressor. (See figure 5-23.)

(4) Loosen the drive belts and remove them from the pulley.

(5) Remove the compressor pulley.

(6) If the seal plate can be worked on in the unit, then it is not necessary to remove the compressor from the unit. Otherwise, remove the compressor.

(7) Remove the seal plate and gasket from the compressor body.

(8) Remove the seal assembly.

(9) Inspect the shaft for pitting or other damage that may make the new seal malfunction.

b. Inspection.

(1) Inspect the seal seat and seal face for excess wear.

(2) Replace the whole seal assembly if any of its components are damaged.

(3) When a seal assembly is taken out of the compressor, a new seal assembly should be installed.

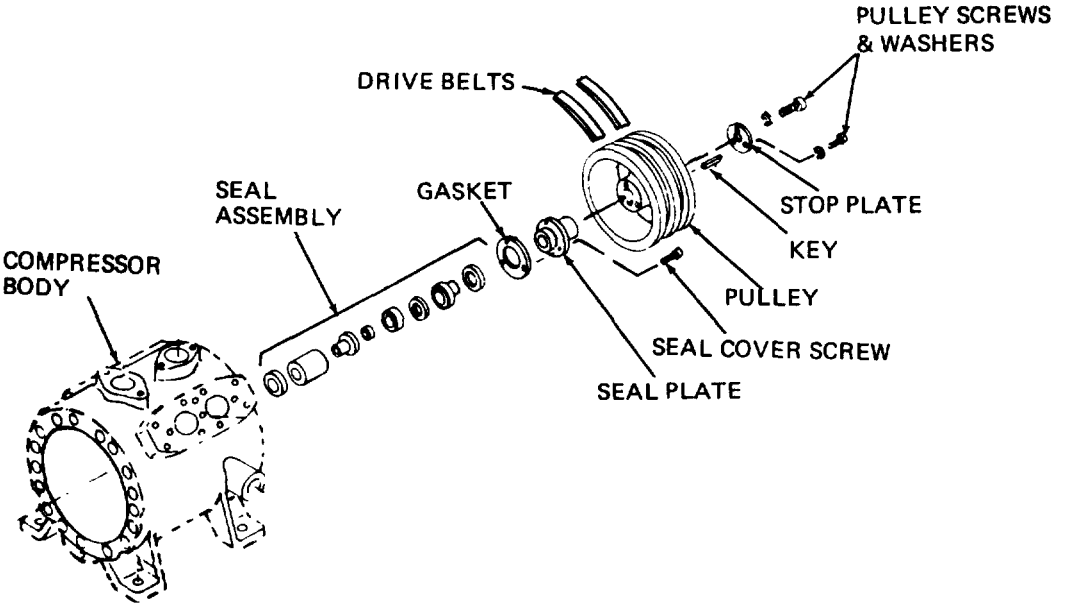


Figure 5-25. Compressor Seal Assembly

c. Installation.

(1) Install new seal assembly.

(2) Replace the seal plate and a new seal gasket.

(3) Secure seal plate with seal cover screws.

(4) Attach pulley to shaft. Be sure key is on shaft.

(5) Install stop plate with lockwashers and pulley screws.

(6) Install the compressor in unit if compressor was removed.

5-36. ENGINE (RGMD-K/1-10)

a. General. See paragraph 4-44 for Removal/Installation instructions.

b. Disassembly/Reassembly. When engine disassembly is necessary, remove all of the complete assemblies first, such as the manifold with the carburetor and air cleaner. An individual assembly such as the carburetor can always be removed and serviced later.

(1) Keep all parts in their respective order; for example, valve assemblies and rod caps for their respective rod and piston assemblies, etc.

(2) Investigate reasons for parts failures.

(3) Use new gaskets for assembly.

c. Overhaul. See specific paragraph for the part or parts for repair instructions.

5-37. ALTERNATOR

CAUTION

Do not remove alternator from unit without first disconnecting the negative (-) battery cable.

a. Removal. Refer to paragraph 4-46 and remove alternator.

b. Brush Assembly Insulation Test.

(1) Remove two screws (9), brush holder cover (8) and brush holder (11).

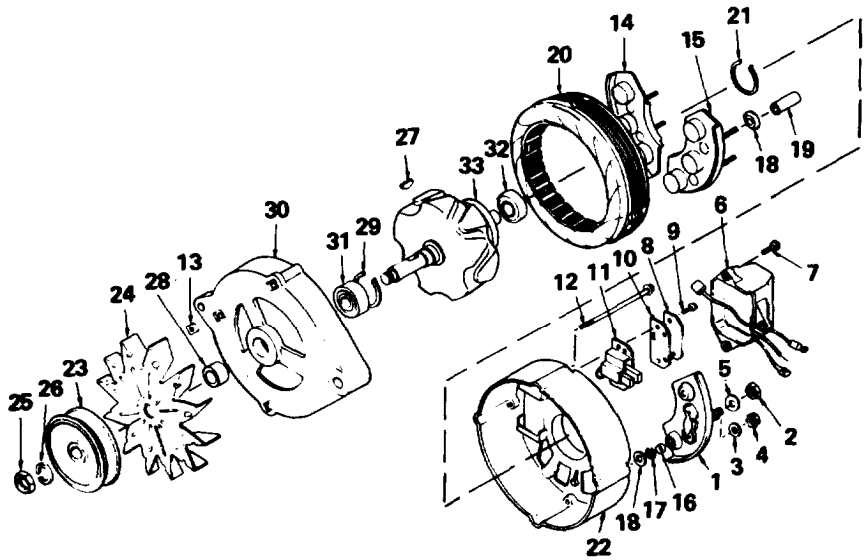
(2) Insulation Test. Connect ohmmeter or test lamp to field terminal and bracket. Resistance should be high (infinite) or test lamp should not light. If resistance is low or test lamp lights, brush assembly is shorted and must be replaced.

(3) Continuity Test. Connect an ohmmeter to field terminal and insulated brush. Use an alligator clip to assure good contact to brush.

NOTE

Do not chip brush. Resistance reading should be zero. Move brush and brush lead wires to make certain that the brush lead wire connections are not intermittent. Resistance reading should not vary when brush and wire lead is being moved around.

(4) Connect ohmmeter to bracket and grounded brush. Resistance reading should be zero. Repeat same test on brush lead wire as described in para. (3) above.



1. DIODE
2. NUT
3. LOCKWASHER
4. NUT
5. WASHER
6. VOLTAGE REGULATOR
7. SCREW
8. COVER
9. SCREW
10. DUST SHIELD
11. BRUSH ASSY
12. BOLT
13. NUT
14. DIODE, NEGATIVE
15. DIODE, POSITIVE
16. INSULATOR
17. NUT
18. WASHER
19. INSULATOR
20. STATOR ASSY
21. RETAINER, REAR BRG
22. HOUSING, REAR
23. PULLEY
24. FAN
25. NUT
26. WASHER
27. KEY
28. SPACER
29. RETAINER, FRONT BRG
30. HOUSING, FRONT
31. BEARING, FRONT
32. BEARING. REAR
33. ROTOR ASSY

Figure 5-26. Alternator

c. Isolation Diode Test. If a commercial diode tester is used, follow tester manufacturer's instructions. If a commercial tester is not available, use a 12-volt DC test lamp. Connect the test lamp to output terminal and auxiliary terminal of isolation diode (1). Then reverse test probes. The test lamp should light in one direction but should not light in the other direction. If the test lamp lights in both directions, the isolation diode is shorted. If the test lamp does not light in either direction, isolation diode is open. Repeat test after isolation diode has been removed to ascertain findings.

d. In-Circuit Rectifier Diode Test. Any commercial in-circuit diode taster will suffice to make the check. Follow tester manufacturer's recommended testing procedure. If the in-circuit tester indicates that the diodes (14) and (15) are faulty, recheck diodes individually after diode assemblies have bean disconnected from stator assembly (20). Shorted stator coil (20) or shorted insulation washers (18) or sleeves (16) on positive diode assembly (15) would make diodes appear to be shorted.

(1) To check negative diode assembly (14), connect tester to ground terminal and first diode to right of brush cover. Then successively check between ground terminal and second diode to right of brush cover and ground terminal and third diode to right of brush cover.

(2) To check the positive diode assembly (15), connect tester to regulator (auxiliary) terminal and first diode to the left of brush cover. Then successively check between regulator terminal and second diode to left of brush cover and regulator terminal and third diode to left of brush cover.

e. Rectifier Diode Test Using a Test Lamp. A test lamp will not indicate an open condition unless all three diodes of either assembly are open. However, a shorted diode can be detected. This test is not 100 percent effective but can be used if so desired when an in-circuit diode tester is not available. Use a 12-volt DC test lamp only; otherwise diodes will be damaged.

(1) Connect test lamp probes to ground terminal and first diode to right of brush cover, then reverse test probes. The test lamp should light in one direction but not in the other direction, If the lamp lights in both directions, one or more of the rectifier diodes of the assembly being tested are shorted. If the lamp does not light in either direction, al I three diodes in the assembly are open. Recheck diodes individually after disassembly to ascertain findings.

NOTE

A shorted stator coil (20) to core would appear as a shorted negative rectifier diode assembly (14).

(2) To check the positive diode assembly (15), connect test probes to regulator (auxiliary) terminal and the first diode left of brush cover. Then reverse test probes. The same procedure and results apply as in paragraph (1) above.

NOTE

If the above procedures do not find the difficulties in the alternator, replace with a new alternator.

f. Installation. Refer to paragraph 4-46 and install alternator.

5-38. CARBURETOR (RGMD-K/1-10)

a. General. See paragraph 4-49 for access, inspection and adjustment

b. Repair.

(1) Carburetor maintenance should consist of regular cleaning. Some gasolines have a tendency toward formation of gum deposits inside the carburetor which can usually be removed by soaking in acetone. A fine soft wire maybe used to clean jets.

(2) When adjusting the idle jet needle, the engine should be running at normal operating temperature and without a load connected. Turn the idle adjusting needle in until the engine loses considerable speed. Then turn it out until the engine runs smoothly. A hunting condition at no load can sometimes be corrected by an idle adjustment (See figure 5-28.)

(3) To adjust the carburetor float level, bend the float tab near the shaft as needed to obtain the correct level. (See figure 5-28)

(4) For further adjustment instructions, see paragraph 4-49.

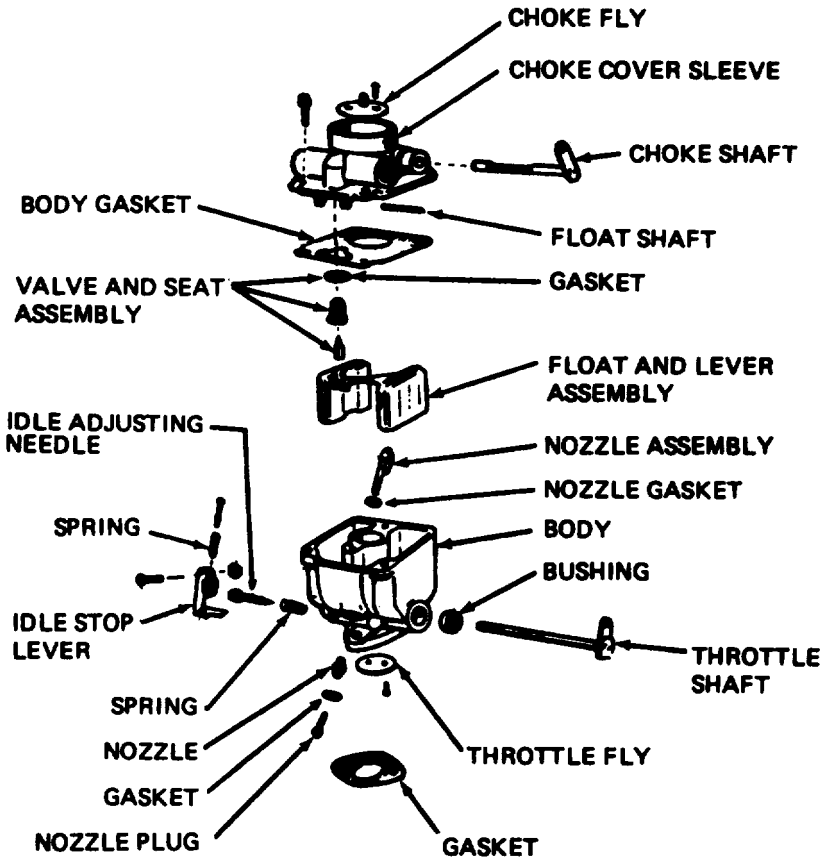


Figure 5-27. Carburetor (RGMD-K/1-10)

c. Removal.

(1) Remove the air cleaner by loosening the screw at its base.

(2) Remove the manifold from the engine.

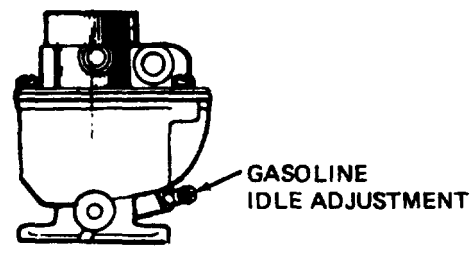
(3) Remove two screws securing the carburetor to the manifold.

d. Replacement,

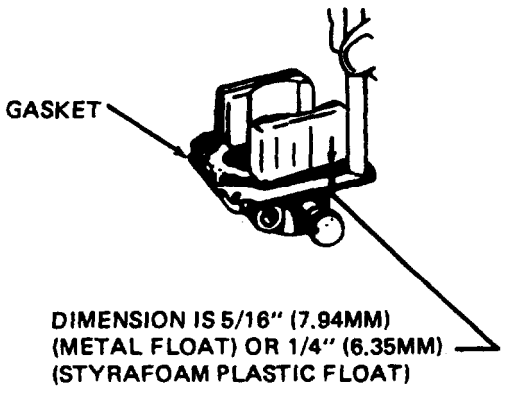
(1) Install the carburetor (with a new gasket) to the manifold.

(2) Install the manifold (with new gaskets) on the engine.

(3) lnstall the air cleaner onto the carburetor and tighten the screw at its base.



NEEDLE VALVE ADJUSTMENT



FLOAT LEVEL ADJUSTMENT

Figure 5-28. Carburetor Needle Valve and Float Level Adjustment

5-39. STARTER (RGMD-K/1-10)

a. General. For proper cranking motor operation with a minimum of trouble, a periodic maintenance procedure should be followed. Periodic lubrication, inspection of the brushes and commutator as described will ensure long cranking motor life. Periodic disassembly of the cranking motor for a thorough overhaul is recommended as a safeguard against accumulations of dust, grease and parts wear. (See figure 5-31.)

b. Lubrication. Lubricate all oil-type bearings with 8 to 10 drops of light engine oil, All oil-less type bearings and bushings should be given a few drops of light oil. Lubricate the cranking motor drives with a few drops of light engine oil.

CAUTION

Never oil the commutator, Oil on the commutator reduces the cranking ability of the motor,

c. Commutator. The commutator can be cleaned by using number 00 sandpaper. Never use emery cloth. If the commutator is out of round or has high mica, remove it from the cranking motor. Turn the commutator down on a lathe being careful to remove only enough material to true up the commutator and remove high mica.

NOTE

It is not necessary to undercut mica on starter motor commutators.

d. Replacement of Worn Brushes. If brushes wear rapidly, check for excessive brush spring tension and roughness or high mica on the commutator.

e. Bendix Drive. The starter uses a bendix-drive shown in figure 5-29. The bendix-drive starting system is mounted on a shaft which extends from the starter motor. When not running, the bendix is retracted so it clears the flywheel ring gear. When starting, a spiral spring on the bendix through increasing speed forces the bendix-drive pinion into the flywheel ring gear. Pinion and flywheel ring gear teeth are beveled on ends to ensure their engaging properly.

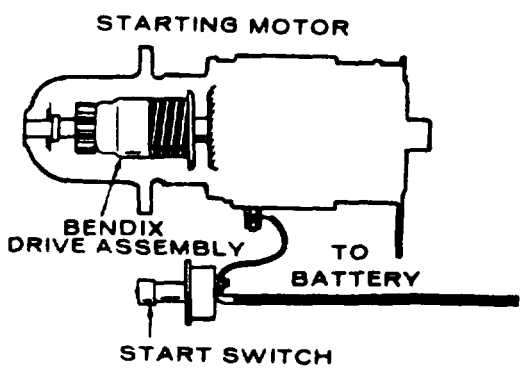


Figure 5-29. Bendix-Drive Starter

f. Bendix Drive Pinion.

(1) The teeth of the bendix pinion are chamfered on only one side and specially rounded and polished to make the automatic meshing with the flywheel ring gear more efficient. The bendix is designed so if the ends of the pinion teeth meet end to end with the ring gear teeth (keeping in mind that the threaded screw shaft is freely mounted on the bendix drive shaft), the bendix assembly can move back slightly against the pressure of the driving spring. The longitudinal movement of the screw shaft permits the pinion to turn slightly farther and enter the flywheel ring gear.

(2) Keep the bendix drive shaft free of rust, burrs or bends so the screw shaft can move freely along it. A damaged bendix pinion necessitates the replacement of the assembly.

g. Pinion Clearance. The clearance between the pinion and the housing should be approximately 1/16 to 1/8-inch (0.16 to 0.31 cm) when the pinion is in the operating position.

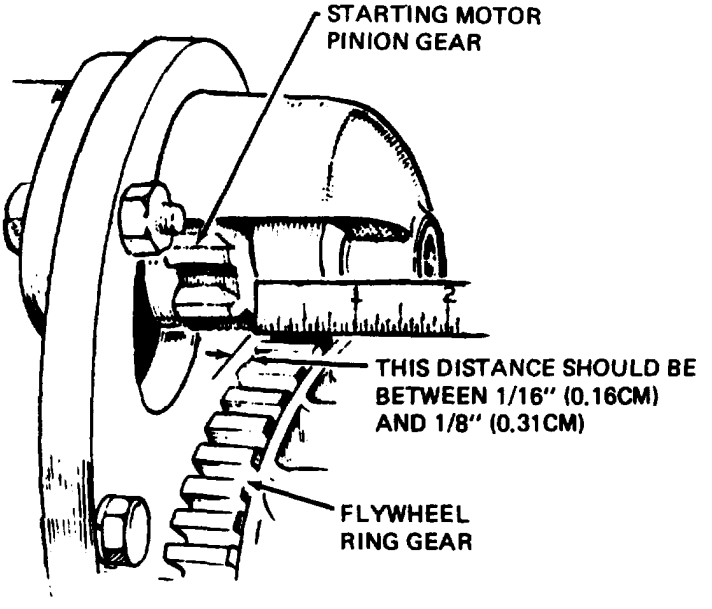


Figure 5-30. Pinion Clearance

5-39. STARTER (RGMD-K/1-10) (Cont)

h. Removal. Refer to paragraph 4-54 and remove the starter.

i. Disassembly.

(1) Tag and disconnect a II wires to the starter.

(2) Remove band cover (1) by loosening its clamping screw.

(3) Remove four screws (2) and washers (3) to partially detach heed assembly (4). Release brushes (7) from brush springs (5) to fully detach head assembly (4).

(4) Brush springs (5), strap (6) and brushes (7) can be removed if replacement is required.

(5) Remove armature thrust washer (8) from shaft.

(6) Remove two screws and Iockwashers (10) to release pinion housing (11). Remove drive end bearing (12) if required.

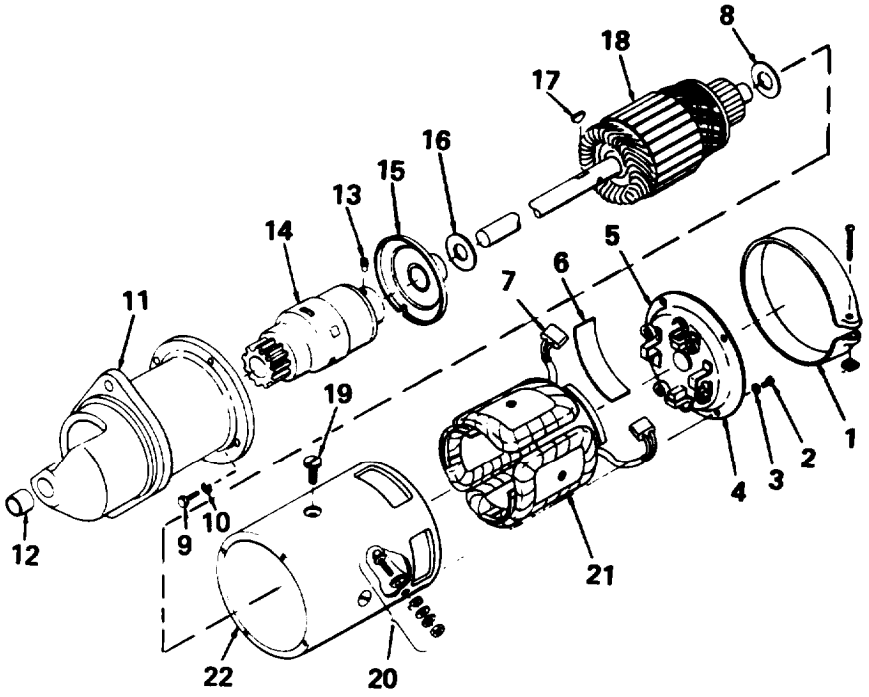
(7) Loosen setscrew (13) to slide off drive assembly (14) from armature shaft. Remove key (17).

CAUTION

Care must be taken not to thread-out the worm gear on the drive assembly. It is difficult to rethread. Keep it in a fully closed position unless further maintenance is required on the drive assembly.

(8) Slide off intermediate bearing assembly (15) and washer (16) from armature shaft.

(9) Remove four flat head screws (19) and terminal stud and washers (20) holding coil assembly (21) to frame (22).



1. COVER, BAND
2. SCREW
3. LOCKWASHER
4. HEAD ASSEMBLY, COMMUTATOR END
5. BRUSH SPRING
6. STRAP
7. BRUSH
8. WASHER
9. SCREW
10. LOCKWASHER
11. HOUSING, PINION
12. BEARING
13. SETSCREW
14. DRIVE ASSEMBLY
15. BEARING ASSY
16. WASHER
17. KEY
18. ARMATURE
19. SCREW
20. TERMINAL STUD & WASHER SET
21. COIL ASSEMBLY
22. FRAME

Figure 5-31. Starter

j. Brush and Spring Repairs.

(1) When brushes are worn more than 0.3 inch (.762 cm), replace them. Check to see that the brushes move smoothly in the brush holder.

(2) Measure brush spring tension with a tension meter. Push the brush into its holder and take the reading just as the brush slightly projects from the brush holder. On a new brush, the spring tension should be 29 to 39 ounces (822.12 to 1105.61 grams).

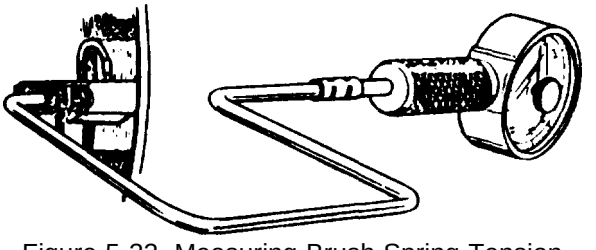


Figure 5-33. Measuring Brush Spring Tension

k. Armature Testing.

(1) Testing for grounds. Test the armature for grounds by touching the armature shaft or core and the end of each commutator bar with a pair of ohmmeter leads, If the ohmmeter reading is low, it indicates a grounded armature. Replace armature.

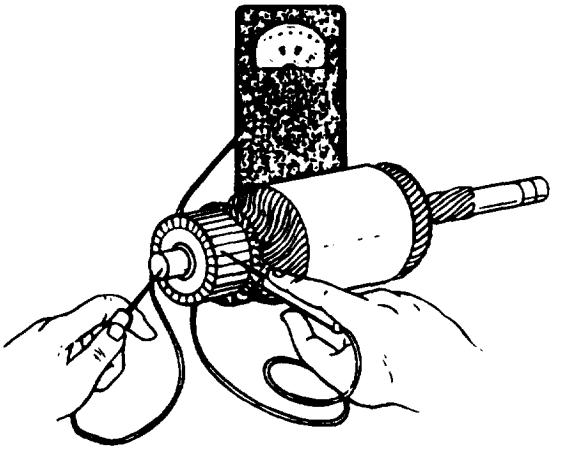


Figure 5-34. Test for Grounded Armature

5-39. STARTER (RGMD-K/1-10) (Cont)

(2) Testing for open circuit. The most common place for an open circuit to occur is at the commutator riser bars. Inspect the points where the conductors are joined to the commutator bars for loose connections.

(3) Testing commutator runout. Place the commutator in a test bench and check out runout with a dial indicator. When commutator runout exceeds .004 inch (,010 cm), reface the commutator.

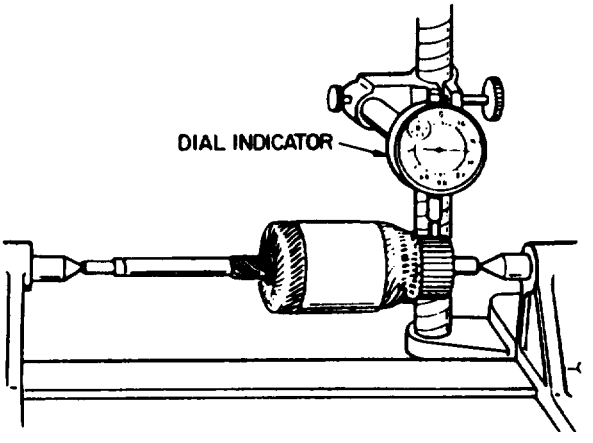


Figure 5-35. Checking Commutator Runout

(4) Testing armature shaft runout. The armature shaft as wall as the commutator maybe checked. A bent armature can often be straightened, but if the shaft is worn, a new armature is required.

(5) Testing field coils for grounds. Place one test lamp prod on the connector and the other on a clean spot on the frame after unsoldering shunt field coil wire. If the lamp lights, the fields are grounded either at the connector or in the windings.

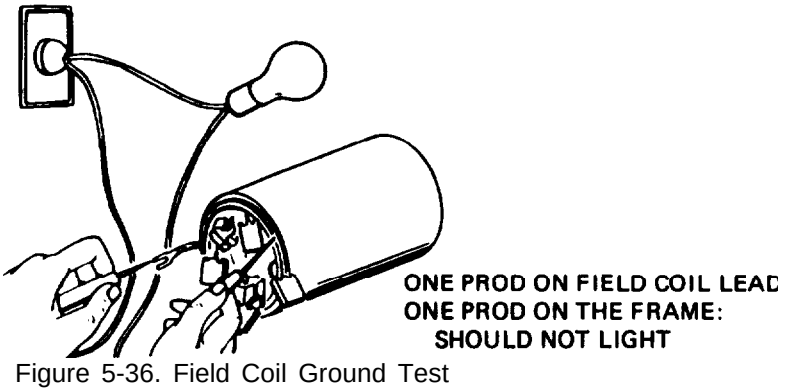


Figure 5-36. Field Coil Ground Test

(6) Testing field coils for open circuit. Place one prod on the connector and the other on a clean spot on the brushholder. If the test lamp lights, the field coil is okay. Check all brushholders in the same manner.

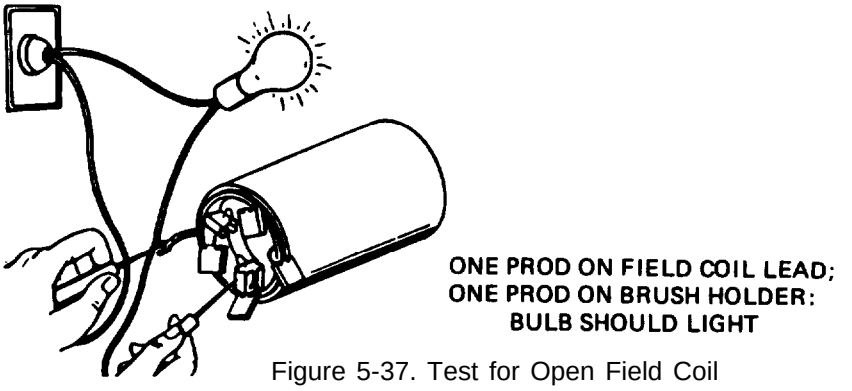


Figure 5-37. Test for Open Field Coil

l. Drive Assembly Inspection. Check for damage of the pinion gear. Verify that the drive shaft is free of rust, burrs, or bends so the screw shaft can move freely along it. A damaged pinion or screw shaft requires replacement of the drive assembly.

m. Cleaning and Lubrication.

(1) Clean all parts carefully with a dry cloth and compressed air if available.

CAUTION

Do not immerse bearing equipped parts in cleaning fluid. Clean with a brush dipped in mineral spirits. Do not immerse the overrunning clutch in cleaning solvent.

(2) Apply 20 weight oil to armature shaft and splines. Use grease sparingly on intermediate bearing assembly and spacing washers at end of the shaft.

n. Reassembly. Reverse disassembly procedure (para. i). Use spacing washers to adjust armature end play of 0,004 to 0.020 inch (,010 to .051 cm).

o. Installation. Refer to paragraph 4-54 and install starter. Check pinion clearance (figure 5-30) between starting motor pinion gear and flywheel ring gear.

5-40. COOLING SHROUD (RGMD-K/1-10)

The air cooling system on the engine consists of heat radiating f ins, the flywheel blower, and the cooling shroud for channeling the airflow. Heat radiating fins are located on the cylinder head and cylinder because the greatest concentration of heat is in this area, The fins increase the heat radiating surface of these parts allowing the heat to be carried away more quickly. The flywheel blower consists of air vanes cast as a part of the flywheel. As the flywheel revolves, these vanes blow cool air across the fins, carrying away the heated air and replacing it with cool air. The shroud directs the path of the cool air to the areas that demand cooling. It must be in place if the cooling system is to operate at its maximum efficiency.

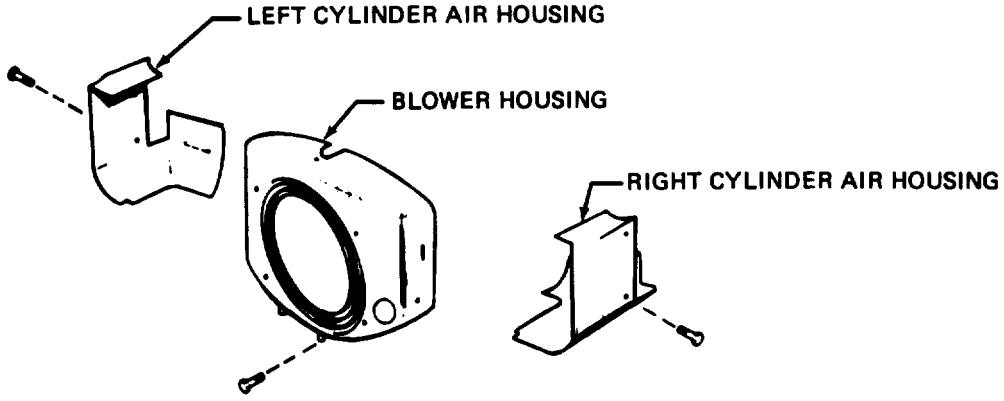


Figure 5-38. Cooling Shroud

a. Replacement. The shroud consists of three parts as illustrated. They are removed or installed by removing or installing the eight attaching screws.

b. Repair. Repair is limited to the pounding out of dents. Touch up paint where necessary.

5-41. FLYWHEEL, GEARCASE, GOVERNOR, CAMSHAFT AND CRANKSHAFT (RGMD-K/1-10)

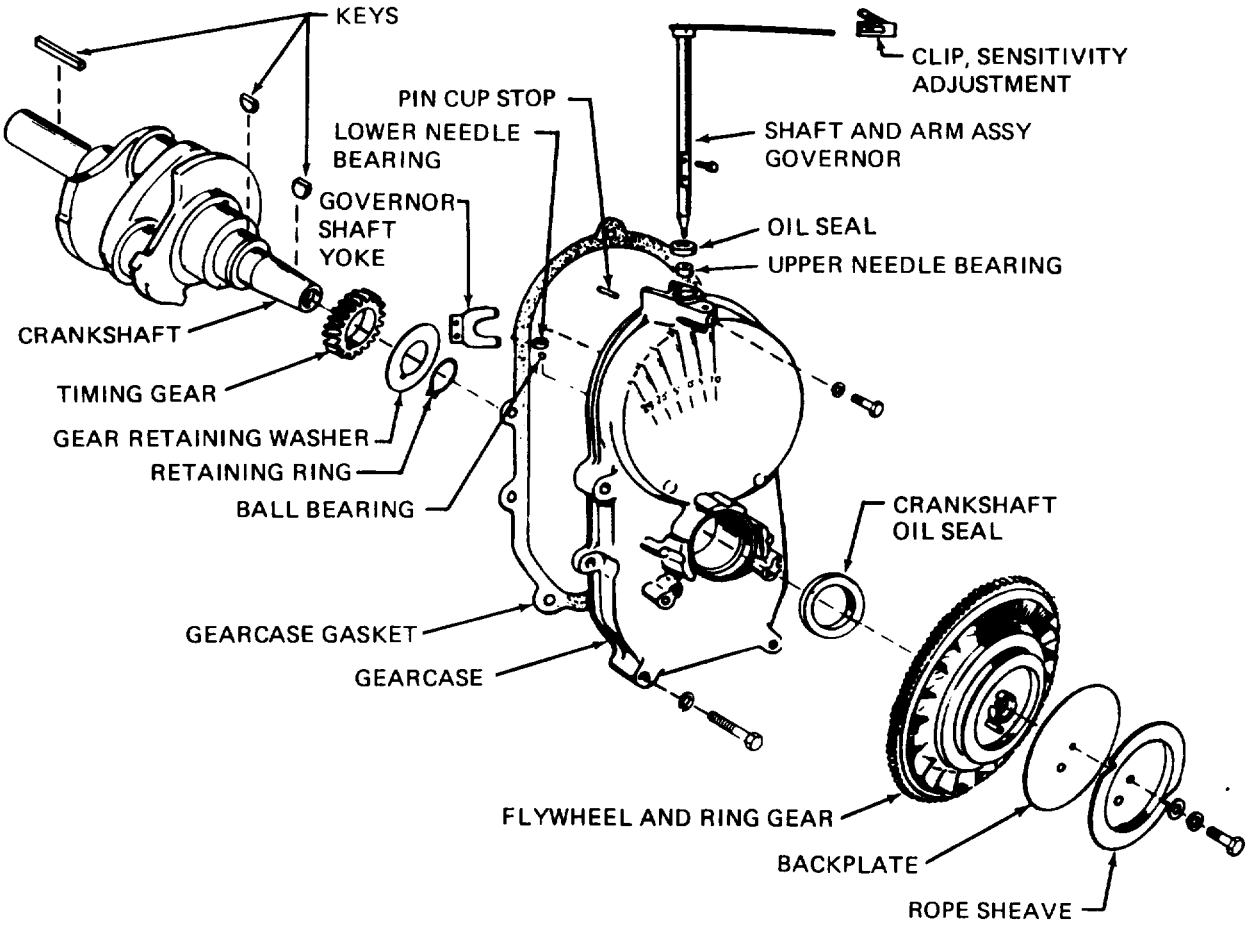


Figure 5-39. Flywheel, Gearcase, Governor and Crankshaft

a. Flywheel.

CAUTION

Do not use a screwdriver or similar tool to pry behind the flywheel against the gearcase. The gearcase cover is die-cast material and will break if undue pressure is applied in this manner.

(1) To remove the flywheel, turn the flywheel mounting screw outward about two turns and pull the flywheel off with a flywheel puller.

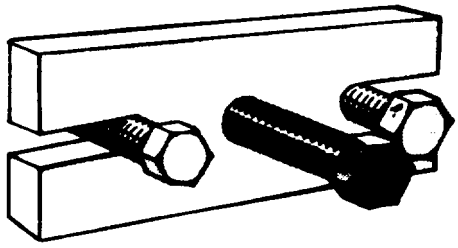


Figure 5-40. Flywheel Puller

WARNING

All damaged flywheels must be replaced not repaired, otherwise serious personal injury may result.

(2) Do not drop the flywheel. A broken fin will destroy the balance. Always use a steel key for mounting the flywheel.

(3) A magneto flywheel which has lost its magnetism can be remagnetized. The spark should jump a 3/16-inch (4.7 mm) gap with ease, as tested by holding the spark plug wire away from a clean metal part of the engine while cranking.

b. Gear Cover Assembly.

(1) After removing the flywheel key and mounting screw, tap the gear cover gently with a soft-faced hammer to loosen it.

CAUTION

When installing the gear cover, make sure that the pin in the gear cover engages the governor cup correctly.

(2) Turn the governor cup so that the metal lined hole is at the three o'clock position. The smooth side of the governor yoke must ride against the governor cup.

(3) Turn the governor arm and shaft clockwise as far as possible and hold in this position until the gear cover is installed flush against the crankcase. Be careful not to damage the gear cover oil seal.

(4) Adjust the roll (stop) pin to protrude to a point 3/4 inch (1.91 cm) from the cover mounting surface.

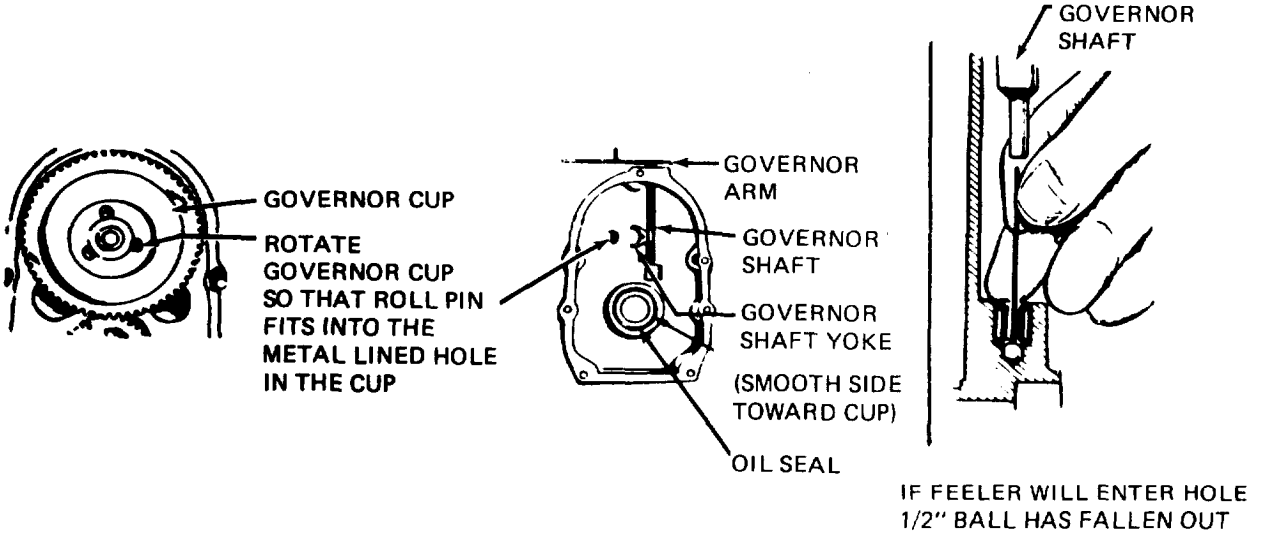


Figure 5-41. Gear Cover Assembly

5-41. FLYWHEEL, GEARCASE, GOVERNOR, CAMSHAFT AND CRANKSHAFT (RGMD-K/1-10) (Cont)

c. Governor Cup.

(1) With the gear cover removed, the governor cup can be taken off after removing the snap ring from the camshaft center pin. Catch the fly balls while sliding the cup off.

(2) Replace any flyball that is grooved or has a flat spot. If the arms of the ball spacer are worn or otherwise damaged, replace the entire timing gear set. The governor cup must spin freely on the camshaft center pin without excessive looseness or wobble. If the race surface of the cup is grooved or rough, replace it with a new one.

(3) When installing the governor cup, tilt the engine so the gear is up, put the flyballs in place and install the cup and snap ring on the center pin.

(4) The camshaft center pin extends out 3/4 inch (1.91 cm) from the end of the camshaft. This distance provides an in and out travel distance of 7/32 inches (5.6 mm) for the governor cup as illustrated. Hold the cup against the fly balls when measuring. If the distance is less (the engine may race, especially at no load), remove the center pin and press a new pin in for only the required amount. Otherwise, grind off the hub of the cap as required. The camshaft center pin cannot be pulled outward or removed without damage. If the center pin extends out too far, the cup will not hold the fly balls properly.

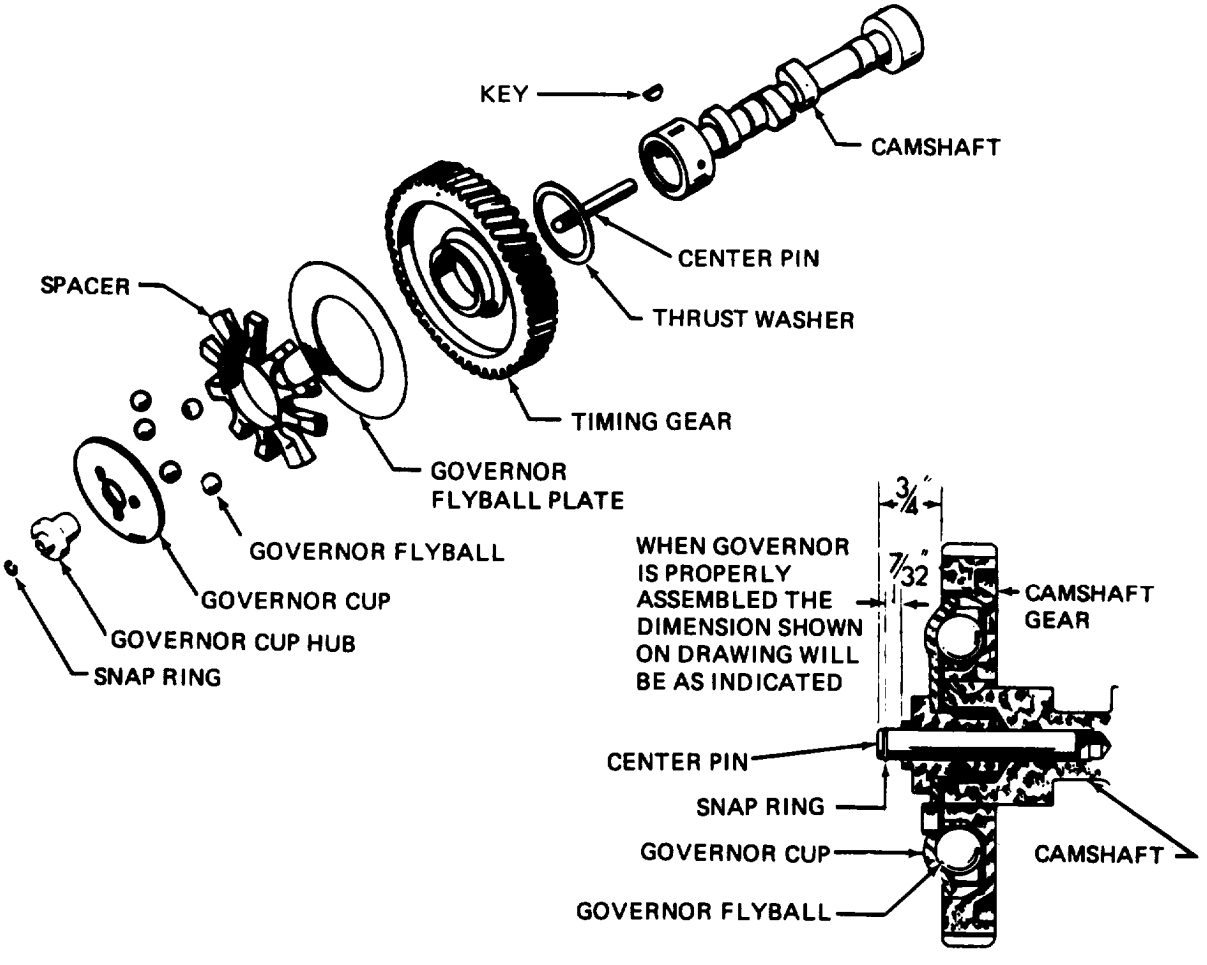


Figure 5-42. Camshaft and Governor Cup

d. Timing Gears.

(1) If replacement of either the crankshaft gear or the camshaft gear becomes necessary, install both gears new; never only one. Use a gear pulling ring to remove the crankshaft gear, Be sure to remove the snap ring first.

(2) The camshaft gear is pressed on and keyed to the camshaft. The camshaft and gear must be removed as an assembly after first removing the crankshaft gear lock ring and washer. Before removing the camshaft and gear assembly, remove the cylinder head and valve assemblies. Remove the operating plunger for the breaker points. Remove the tappets.

(3) The camshaft may be pressed out of the gear by use of a hollow tool or pipe which will fit over the camshaft center pin. Do not press on the center pin or damage it in any way. The governor ball spacer is a press fit to the camshaft gear.

(4) When pressing a camshaft gear onto the camshaft, be sure the gear is started straight and that the key is properly in place. Install the governor cup assembly before installing the camshaft and gear in the engine.

(5) Each timing gear is stamped with an 0-mark near the edge. The gear teeth must mesh so that these marks coincide exactly when the gears are installed in the engine. Be sure, when installing the camshaft gear and shaft assembly, that the thrust washer is properly in place behind the camshaft gear. Replace the camshaft retaining ring, washer and lock ring to the crankshaft.

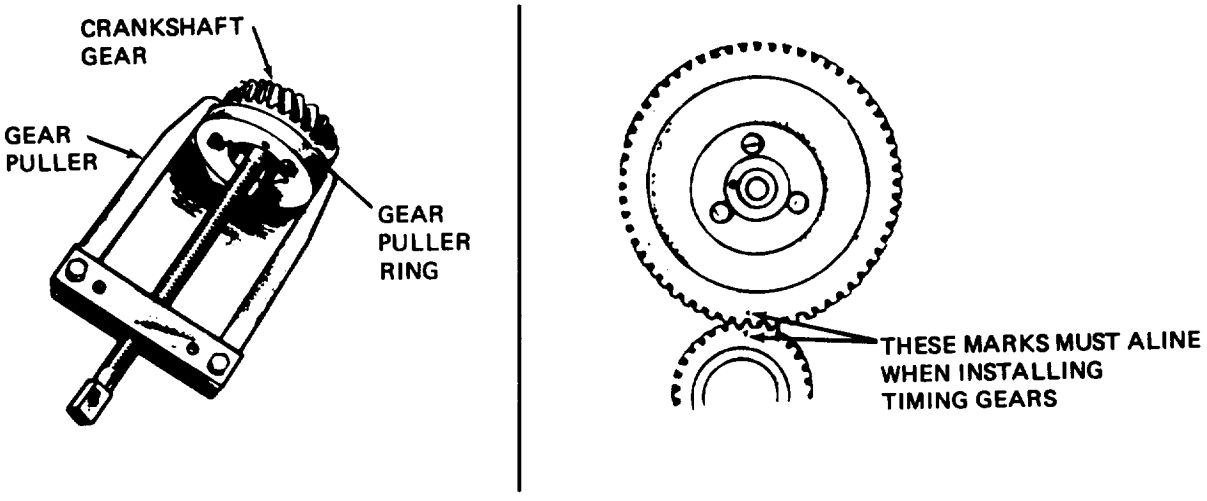


Figure 5-43. Timing Gear Removal and Installation

5-42. CYLINDER HEADS AND VALVES (RGMD-K/1-10)

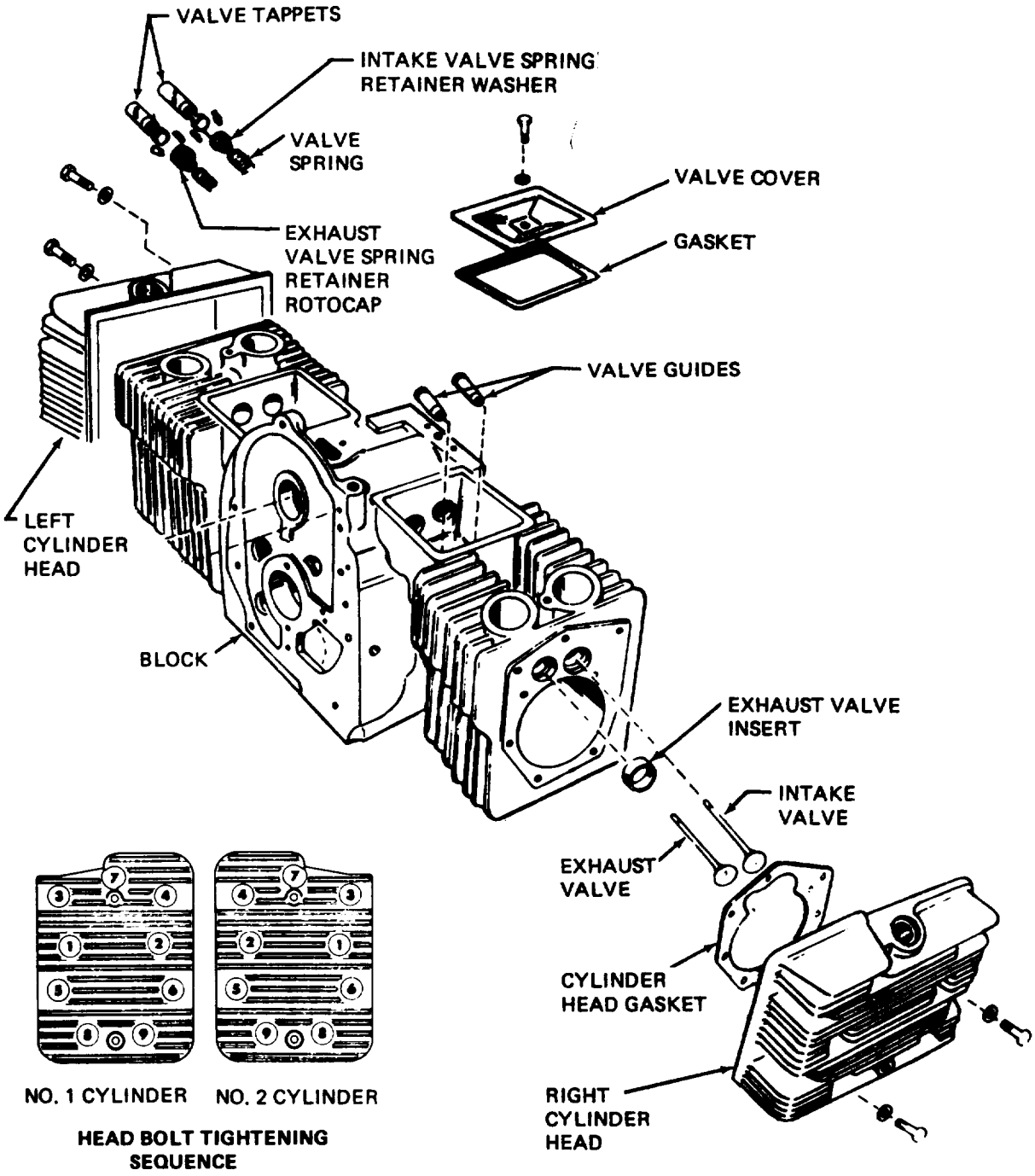


Figure 5-44. Cylinder Heads and Valves

CAUTION

Do not remove heads when they are hot. Warping may occur.

a. Cylinder Heads. The cylinder head bolts should be tightened in the sequence indicated in figure 5-44 to a torque of 5 foot-pounds, then 10 foot-pounds, and so on until all are torqued to 29 to 31 foot-pounds.

b. Valves.

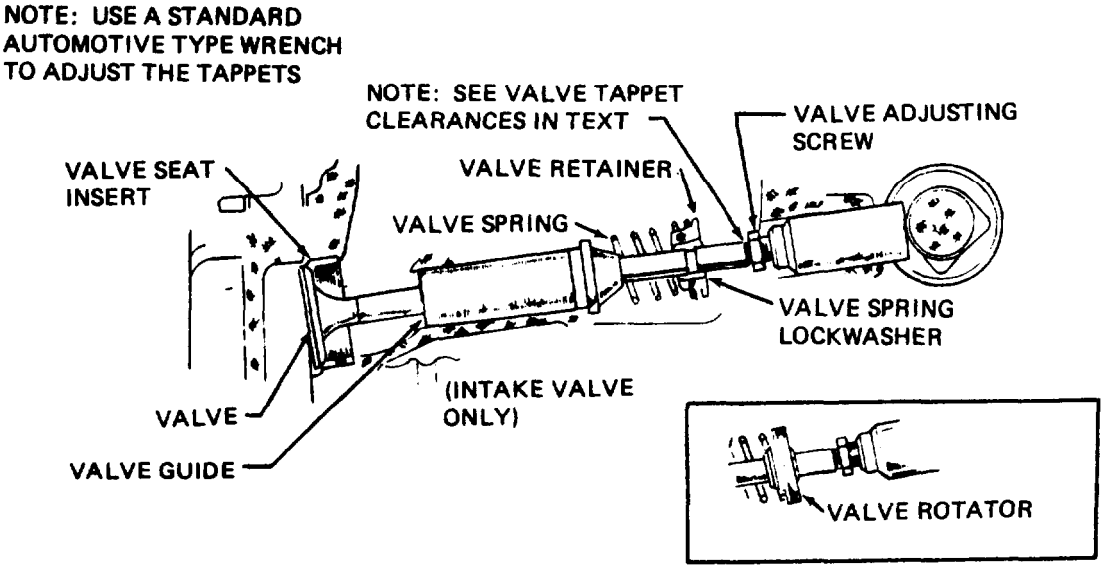


Figure 5-45. Valve Components

(1) Properly seated valves are essential to good engine performance. The cylinder head is removable for valve servicing. Do not use a pry to loosen the cylinder head. Rap sharply on the edge with a soft-faced hammer, taking care not to break any cooling fins. A conventional type valve spring lifter may be used when removing the valve spring locks, which are of the split type. Clean all carbon deposits from the cylinder head, piston top, valves, guides, etc. If a valve face is burned or warped, or the stem worn, install a new valve.

(2) Worn valve stem guides may be replaced from inside the valve chamber. A seal is provided behind the intake valve guides only. The smeller diameter of the tapered valve guides must face toward the valve head.

(3) Tappets are also replaceable from the valve chamber, after first removing the valve assemblies.

(4) The valve face angle is 44 degrees. The valve seat angle is 45 degrees. This 1 degree interference angle results in a sharp seating surface between the valve and the top of the valve seat. The interference angle method of grinding valves minimizes face deposits and lengthens valve life. See figure 5-46.

(5) The valves should not be hand lapped, if at all avoidable, since the sharp contact maybe destroyed. This is especially important where stellite faced valves and seats are used. Valve faces should be finished in a machine to 44 degrees. Valve seats should be ground with a 45-degree stone and the width of the seat bend should be 1/32 to 3/64 of an inch (,79 to 1.19 mm) wide. Grind only enough to assure proper seating.

5-42. CYLINDER HEADS AND VALVES (RGMD-K/1-10) (Cont)

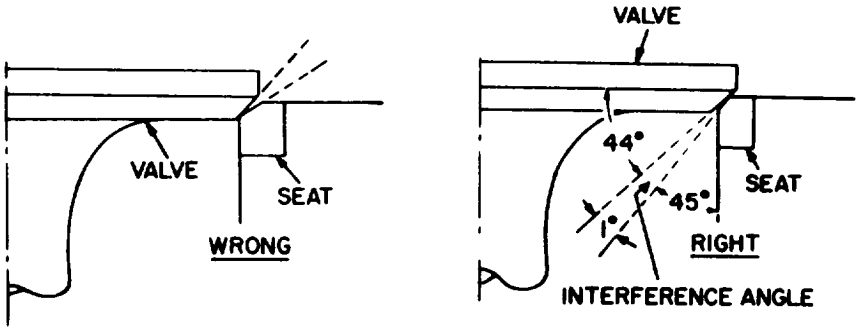


Figure 5-46. Valve Face and Seat Angles

(6) Remove all grinding compound from engine parts and place each valve in its proper location. Check each valve for a tight seat, using an air pressure type testing tool. If such a tool is not available, make pencil marks at intervals across the valve face and observe if the marks rub off uniformly when the valve is rotated part of a turn against the seat.

(7) Lightly oil the valve stems and reassemble all parts removed. Adjust the valve clearance. Refer to tappet adjustment procedure in subparagraph c.

(8) The positive type valve rotocoils serve to prolong valve life and decrease valve repairs. Check the rotocoils periodically by removing the cylinder heads and cranking the engine. When functioning properly, the valve is rotated a fraction of a turn each time it opens. If rotocoils are faulty, install new ones.

c. Tappet Adjustment.

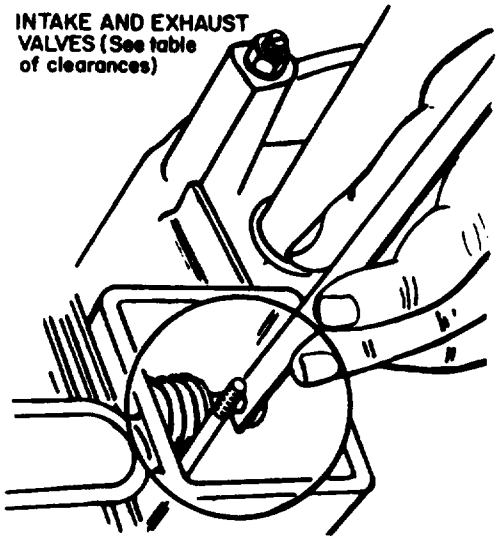


Figure 5-47. Adjusting Tappets

(1) The engine is equipped with adjustable tappets. To make a valve adjustment, remove the valve covers. Crank the engine over slowly by hand until the left hand intake valve, when facing the flywheel, opens and closes. Continue about 1/4 turn until the correct timing marks aline. This should place the left hand piston at the top of its compression stroke, which position it must be in to get proper valve adjustment for the left hand cylinder, Clearances are shown in Table 5-3. For each valve, the gage should just pass between the valve stem and valve tappet.

(2) To correct the valve clearance, turn the adjusting screw as needed to obtain the right clearance. The screw is self-locking.

(3) To adjust the valves on the right hand cylinder, crank the engine over one complete revolution and main line up the correct timing marks. Then follow the adjustment given for the valves of the left hand cylinder.

Table 5-3. Engine Dimensions and Clearances

All clearances given at room temperature of 70°F (21.1°C).
All dimensions in inches unless otherwise specified.

	Minimum	Maximum
Valve Tappet to Cylinder Block Clearance	0.0015 (0.038 mm)	0.0030 (0.08 mm)
Valve Stem in Guide – Intake	0.0010 (0.03 mm)	0.0025 (0.06 mm)
Valve Stem in Guide – Exhaust	0.0025 (0.06 mm)	0.0040 (0. 10 mm)
Valve Seat Interference Width	1/32 inch (.79 mm)	3/64 inch (1.19 mm)
Valve Face Angle	44°	
Valve Seat Angle	45°	
Valve Interference Angle	1°	
Crankshaft Main Bearing	0.0024 (0.061 mm)	0.0042 (0.10 mm)
Crankshaft End Play	0.006 (0. 15 mm)	0.012 (0.30 mm)
Camshaft Bearing	0.0015 (0.04 mm)	0.0030 (0.08 mm)
Camshaft End Play	0.003 (0.08 mm)	- -
Rod Bearing (Forged Rod)	0.0005 (0.01 mm)	0.0023 (0.06 mm)
Connecting Rod End Play (Ductile Iron)	0,002 (0.05 mm)	0.016 (0.41 mm)
Timing Gear Backlash	0.002 (0.05 mm)	0.003 (0.08 mm)
Oil Pump Gear Backlash	0.002 (0.05 mm)	0.005 (0.1 3 mm)
Piston to Cylinder, Strut Type (Measured below Oil Controlling Ring – 900 from Pin) Clearance	0.0025 (0.06 mm)	0.0045 (0.11 mm)
Piston Pin in Piston	Thumb Push Fit	
Piston Pin in Rod	0.0001 (0.0025 mm)	0.0006 (0.01 52 mm)
Piston Ring Gap in Cylinder	0.010 (0.254 mm)	0.023 (0.584 mm)
Crankshaft Main Bearing Journal - Standard Size	1.9992 (50.779 mm)	2.000 (50.8 mm)
Crankshaft Rod Bearing Journal - Standard Size	1.6252 (41 .280 mm)	1.6260 (41.300 mm)
Cylinder Bore - Standard Size	3.2490 (82.525 mm)	3.2500 (82.550 mm)
Piston Ring Side Clearance	0.0020 (0.05 mm)	0.0080 (0.20 mm)

5-43. PISTONS AND RINGS (RGMD-K/1-10)

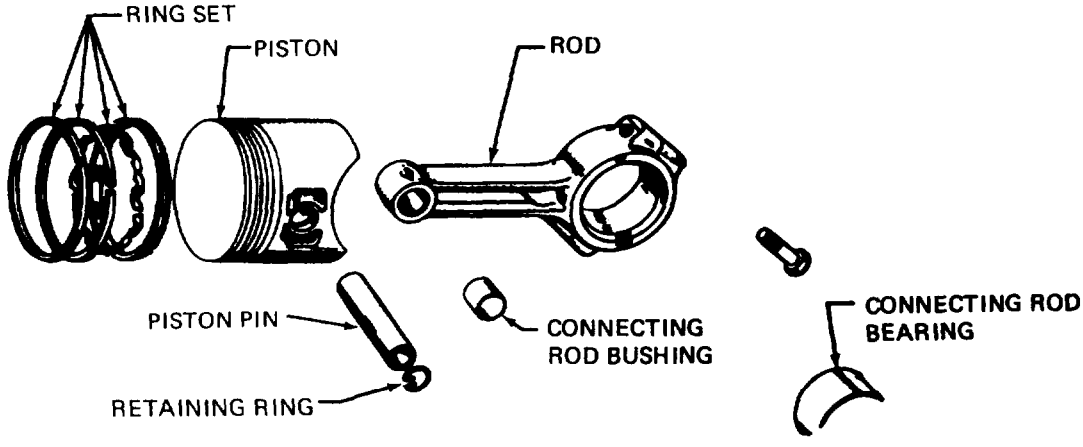


Figure 5-48. Pistons and Rings

a. Pistons and Rings.

(1) Whenever there is a noticeable wear ridge at the top of each cylinder, remove the ridge with a ridge reamer before removing the pistons. If not, the rings can catch the ridge when pushing out the pistons and cause a ring land fracture. See figure 5-49.

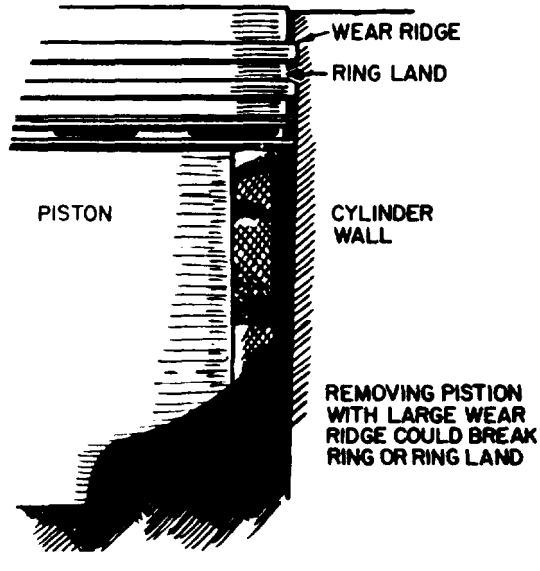


Figure 5-49. Wear Ridge and Cylinder Wall

(2) To remove the piston and connecting rod assemblies, turn the crankshaft until a piston is at the bottom of the stroke. Remove the nuts from the connecting rod bolts. Lift the rod bearing cap from the rod and push the rod and piston assembly out the top of the cylinder with the handle end of a hammer. Be careful not to scratch the crankpin or the cylinder wall when removing these parts.

NOTE

Keep the connecting rod bearing caps and bearings with their respective rods.

(3) The pistons are fitted with two compression rings and one oil control ring with an expander. Remove these rings from the piston using a piston ring spreader.

(4) Clean the piston ring grooves with a groove cleaner or the end of a broken ring filed to a sharp point. See figure 5-50. All passages should be cleaned with a non-caustic solvent. Clean the rod bore and the back of the connecting rod bearings thoroughly.

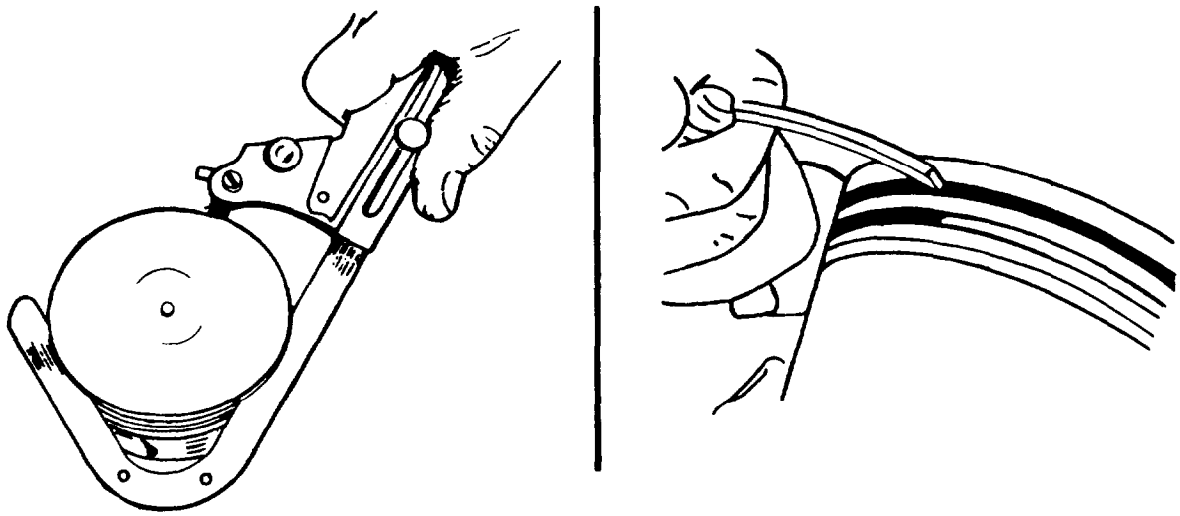


Figure 5-50. Cleaning Piston Ring Grooves

(5) Mark each piston to make sure the rod will be assembled on the piston from which it was removed. Remove the piston pin retainer from each side and push the pin out.

(6) Inspect the pistons for fractures at the ring lands, skirts and pin bosses. Check for wear at the ring land using new rings and a feeler gage as shown in figure 5-51. See Table 5-3 for proper side clearance measurement.

(7) Improper width rings or excessive ring side clearance can result in ring breakage. New rings in worn ring grooves do not-have good cylinder wall contact. See figure 5-52.

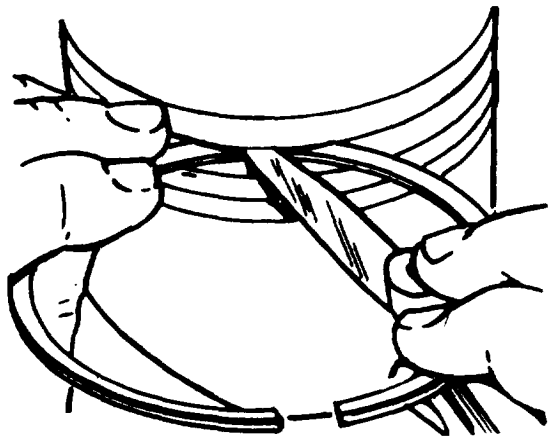


Figure 5-51. Inspecting Ring Lands

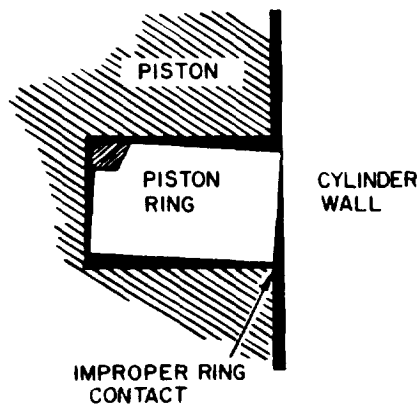


Figure 5-52. New Ring in Worn Piston Ring Groove

5-43. PISTONS AND RINGS (RGMD-K/1-10) (Cont)

(8) Replace pistons showing signs of bad scoring or burring, excessive skirt clearance, wavy or worn ring lands, fractures or damage from detonation. Replace piston pins showing fractures, scored bores or bore out of round more than 0.002 inch (0.051 mm).

(9) Use a new piston to check the pin bushing in the connecting rod for wear. The clearance should be as shown in Table 5-3.

(10) Before installing new rings on the piston, check the ring gap by placing each ring squarely in its cylinder at a position corresponding to the bottom of its travel. See figure 5-53. The gap between the ends of the ring is given in Table 5-3. Rings which are slightly oversize maybe filed as necessary to obtain the correct gap, but do not use rings which require too much filing. Standard size rings may be used on 0.005-inch (0- 127mm) oversize pistons. Other oversize rings must be used with corresponding oversize pistons Rings of the tapered type are usually marked top on one side, or identified in some other manner and the ring must be installed with this mark toward the closed end of the piston.

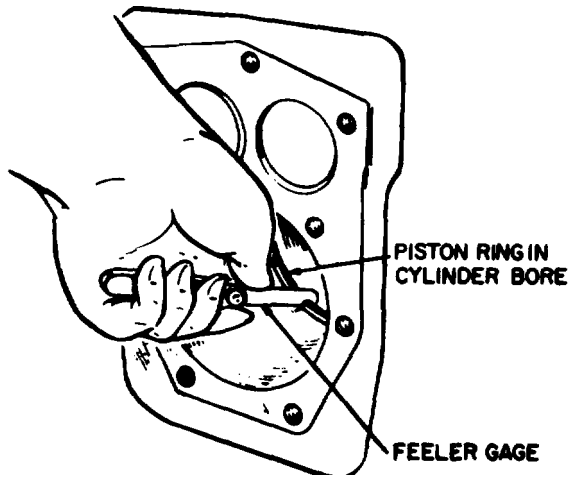


Figure 5-53. Fitting Piston Rings to Cylinder

(11) Space each ring gap one third of the way around the piston from the preceding one, with no gap directly in line with the piston pin. The bottom piston ring groove should be fitted with an expander and an oil control ring and the two upper grooves fitted with compression rings. If a chrome faced ring is used, it will be in the top groove. The oil control ring is selected for best performance in regard to the correct unit pressure characteristics.

(12) The piston is fitted with a full-floating type piston pin. The pin is keptt in place by two lock rings in the piston, one at each side, Be sure these lock rings are properly in place before installing the piston and connecting rod in the engine. Refer to Table 5-3 for the correct piston-to-cylinder clearance.

b. Connecting Rods (Figure 5-48).

(1) The connecting rods should be serviced at the same time the pistons or rods are serviced. Rods must be removed with the piston.

CAUTION

Make certain that all parts are marked or identified so that they are reinstalled in their original positions.

(2) Proper clearance is obtained by replacing the pin bushing and the bearings. The rod bearings are precision size and require no reaming.

(3) Install the connecting rods and caps with raised lined (witness marks) alined and with the caps facing toward the oil base. The rod and cap numbered 2 fits on the crankshaft journal nearest the bearing plate. Coat the crankshaft journal bearing surfaces with oil before installing the rods. Crank the engine by hand to see that the rods are free. If necessary, rap the connecting rod cap screws sharply with a soft-faced hammer to set the rod square on the journal.

(4) See figure 5-54 and check bearing clearance with Plasti-Gage as follows:

(a) Place a piece of correct size PIasti-Gage in the bearing cap the full width of the bearing insert about 1/4 inch (6.35 mm) off center.

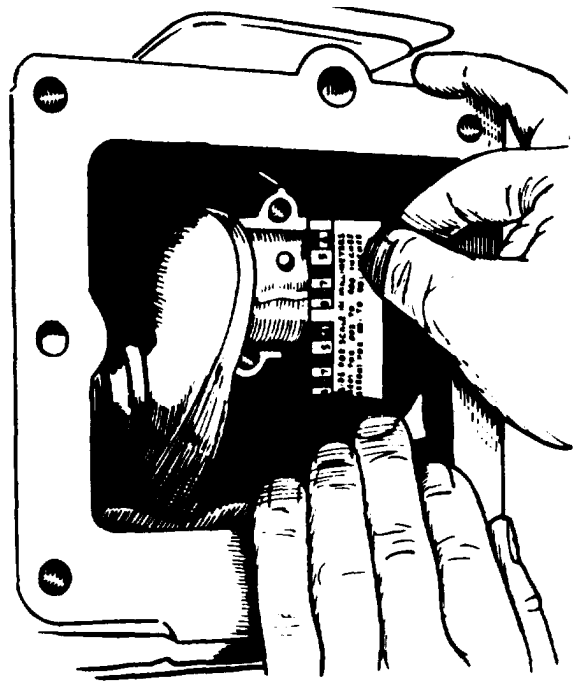


Figure 5-54. Measuring Bearing Clearance with Plasti-Gage (RGMD-K/1-10)

(b) Rotate the crank about 30 degrees from bottom dead center and reinstall the bearing cap. Tighten the bolts to the torque specified in Table 5-4. Do not turn the crankshaft.

Table 5-4. Engine Assembly Torques

	LB.-FT.	N m
Blower Housing Screws	8-10	(10.9-1 3.6)
Connecting Rod Bolts	27-20	(36.6-39.3)
Cylinder Head Screws	29-31	(39.3-42.0)
Exhaust Manifold Screws	15-20	(20.3-27.1)
Flywheel Mounting Screws.	35-40	(47.5-54.2)
Fuel Pump Mounting Screws		(6.8-8.1)
Intake Manifold Screws	15-20	(20.3-27.1)
Oil Base Screws	43-48	(58.3-65.1)
Oil Pump Mounting Screws.	7-9	(9.5-12.2)
Rear Bearing Plate Capscrews	20-25	(27.1-33.9)
Spark Plugs,	25-30	(33.9-40.7)
Timing Gear Cover Screws	10-13	(1 3.6-1 7.6)
Valve Cover Nut	4-8	(5.4-10.9)
Magneto Stator Screws	15-20	(20.3-27.1)
Starter Mounting Bolts	25-28	(33.9-37.9)

(c) Remove the bearing cap. Leave the flattened Plasti-Gage on the part to which it has adhered and compare the widest point with the graduations on the Plasti-Gage envelope to determine bearing clearance.

5-44. ENGINE BLOCK (RGMD-K/1-10)

a. Inspection.

(1) Make a thorough check for cracks. Minute cracks maybe detected by coating the suspected area with a mixture of 25 percent kerosene and 75 percent light motor oil. Wipe the part dry and immediately apply a coating of zinc oxide (white lead) dissolved in wood alcohol. If cracks are present, the white coating wiII become discolored at the defective area.

(2) Inspect the cylinder bore for scoring. Check the Welsh plugs for a tight, even fit and the fins for breakage.

(3) Check the cylinder bore for taper, out of round and wear with a cylinder bore gage, telescope gage or inside micrometer (fig. 5-55). These measurements should be taken at four places-two at the top and two at the bottom of piston ring travel.

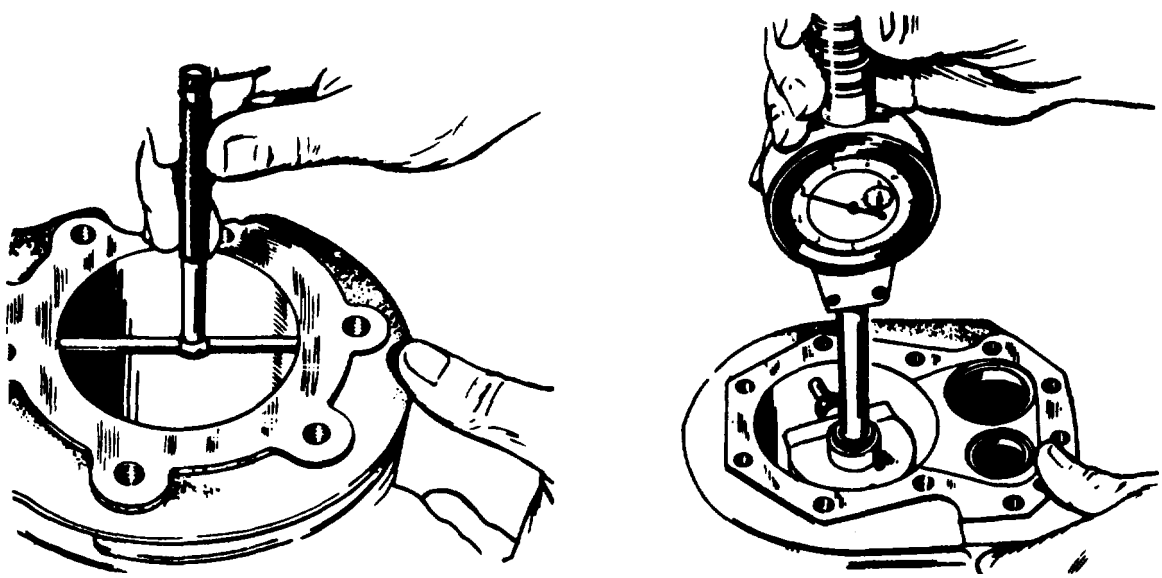


Figure 5-55. Methods of Cylinder Bore Inspection

(4) Record measurements taken lengthwise at the top and bottom of the piston travel as follows:

(a) Lengthwise of the block, measure and record as “A” the diameter of the cylinder at the top of the cylinder where the greatest ring wear occurs.

(b) Also, lengthwise of the block, measure and record as “B” the cylinder diameter at the piston skirt travel.

(c) Crosswise of the block, measure and record as “C” the diameter of the top of the cylinder at the greatest point of wear.

(d) Measure and record as “D” the diameter at the bottom of the cylinder bore and crosswise of the block.

(e) Reading “A” compared to reading “6” and reading “C” compared to reading “D” indicates cylinder taper,

(f) Reading “A” compared to reading “C” and reading “B” compared to reading “D” indicates whether or not the cylinder is out of round.

(5) If the cylinder taper exceeds 0.005 inch (.127 mm) it must be rebored and honed to accommodate the next size piston. Refer to general support maintenance.

(6) If the out of round exceeds 0.002 inch (.051 mm) the cylinder must be rebored and honed for the next size piston. Refer to general support maintenance.

5-45. MAIN BEARINGS (RGMD-K/1-10)

a. Inspection, Check bearings for wear, loose, broken, cracked, or missing parts.

b. Removal. Removal of the camshaft or crankshaft bearings requires complete disassembly of the engine. Use a press or suitable drive plug to remove the bearings. Support the casting to avoid distortion and avoid damaging the bearing bore during removal and installation. Use oil on the bearings to reduce friction when installing and again lubricate with oil after installing (figure 5-56). Use combination bearing driver to install the camshaft bearings.

(1) Camshaft Bearings. See figure 5-56. Replacement camshaft bearings are precision type which do not require line reaming or line boring after installation. Coat the bearing with lubricating oil to reduce friction. Place the bearing on the crankcase over the bearing bore with the lubricating hole (front only) in proper position. Be sure to start the bearing straight. Press the front bearing in flush with the outside end of the bearing bore. Press the rear bearing in until past the ignition plunger hole.

(2) Crankshaft Bearings. See figure 5-56. New crankshaft main bearings are precision type which do not require line reaming or line boring after installation.

(a) Before putting in the main bearings, expand the bearing bore by placing the casting in hot water or in an oven heated 200°F (93°C). If practical, cool the precision bearing to shrink it.

CAUTION

If a torch is used to heat bearing bore, apply only a little heat evenly to prevent warping and loss of temper in the steel.

(b) When putting in either the front or rear main bearing, always aline the oil hole(s) in the bearing with the oil hole(s) in the bearing bore. The oil passage must beat least halfway open. The cold oiled precision bearing should require only light taps to position it.

(c) Install the bearing flush with the inside end of the bore, If the head of a lock pin is damaged, use side cutters or “Easy-Out” tool to remove pin. Then install a new lock pin.

(d) Apply oil to the thrust washers to hold in place when the crankshaft is installed, The oil grooves in the thrust washer bearings must face the crankshaft. Be sure two notches fit over lock pins.

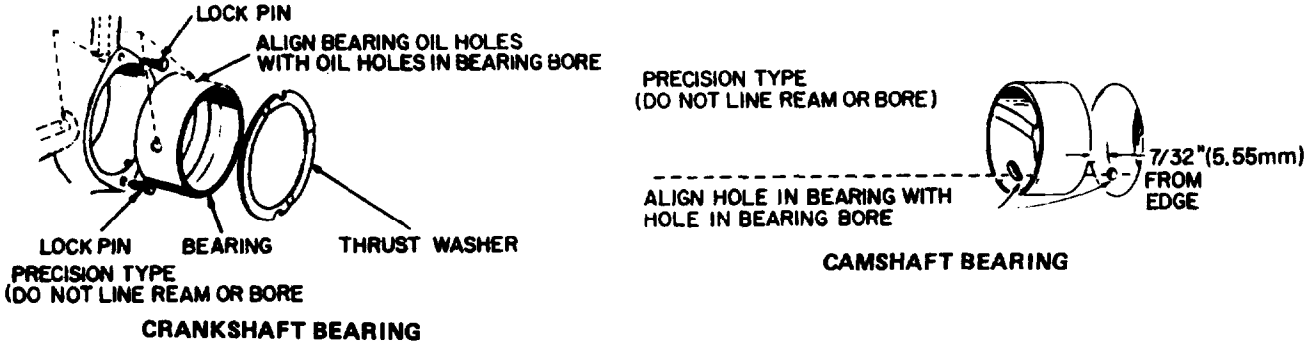


Figure 5-56. Installation of Crankshaft and Camshaft Bearings

5-45. MAIN BEARINGS (RGMD-K/1-10) (Cont)

(3) Before installing the seals, fill the space between seals with a fibrous grease or stiff cup grease. This will improve sealing, See figure 5-57.

(4) When installing the gear cover oil sad, tap the seal inward until rear (spring side) of casing is 1-1/32 inch (2.62 cm) from the mounting face of the gear cover. Install new style, thin open face seal, 1-7/64 inches (2.82 cm) from mounting face of cover.

(5) When installing the bearing plate oil seal, tap the seal into the bearing plate bore to bottom against the shoulder in the plate bore. Use a seal expander, or place a piece of shim stock around the end of the crankshaft, when replacing the bearing plate to avoid damaging the seal. Remove the shim stock as soon as the plate is in place.

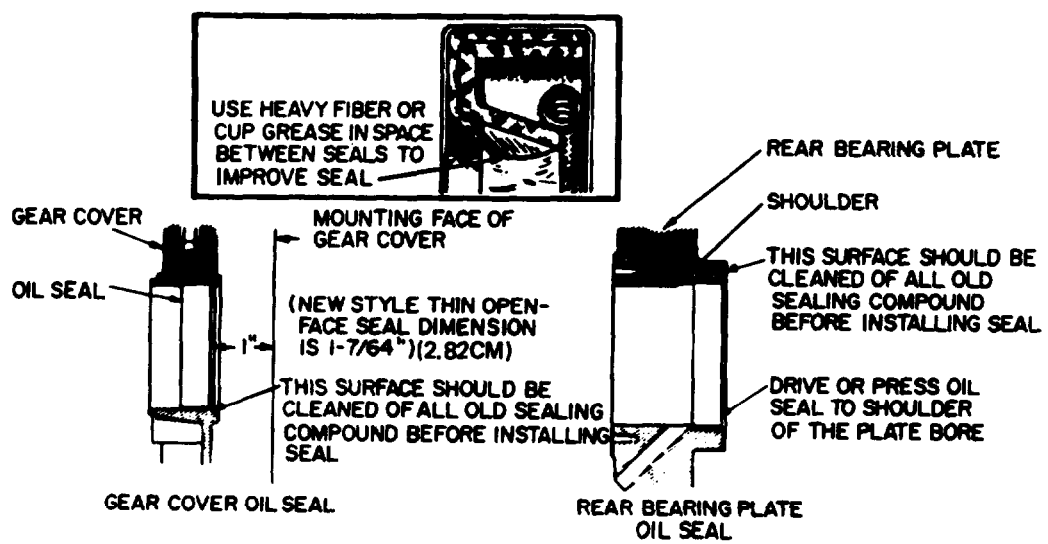


Figure 5-57. Gear Cover and Rear Bearing Plate Oil Seals

c. Crankshaft Endplay.

(1) After the rear bearing end plate has been tightened using the torque recommended in Table 5-4, check the crankshaft endplay shown in figure 5-58.

(2) Refer to Table 5-3 for minimum and maximum endplay. If there is too much endplay, remove the rear bearing end plate and replace the gasket with a thinner gasket from the gasket kit. For too little end play, remove the rear bearing end plate and replace the gasket with a thicker one, Reinstall the end plate making sure the thrust washer notches line up with the lock pins. Torque and recheck endplay of the crankshaft.

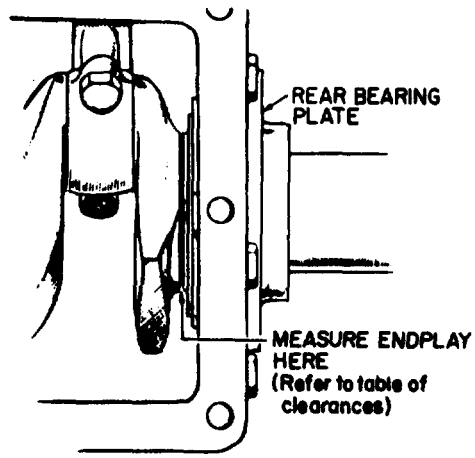


Figure 5-58. Measuring Crankshaft Endplay

5-46. OIL SYSTEM (RGMD-K/1-10)

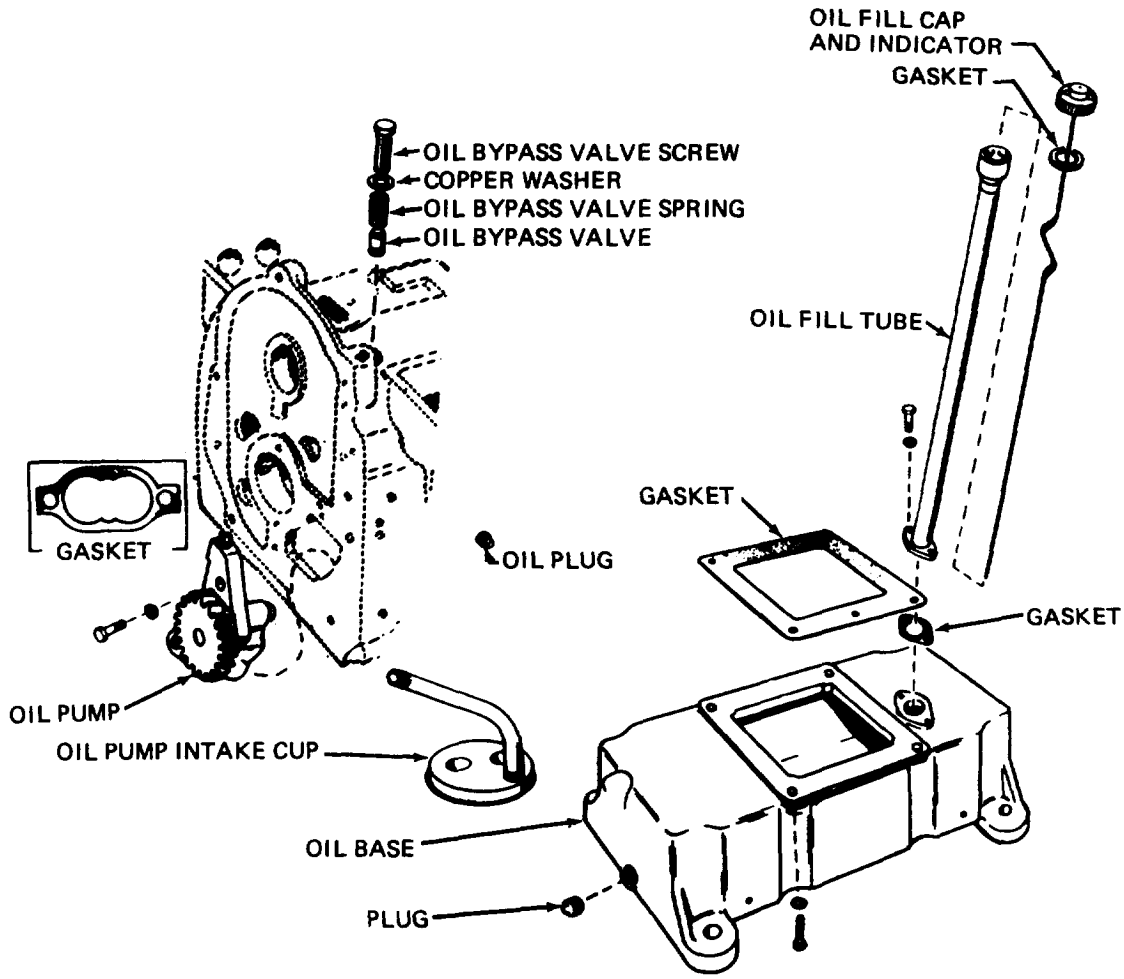


Figure 5-59. Engine Oil System

a. General.

(1) The engine uses an oil pump to lubricate engine parts.

(2) Normal oil pressure should be 30 psi or higher when the engine is at operating normal temperature. If pressure drops below 30 psi at governor speed, inspect the oil system for faulty components.

(3) If oil pressure is low, first check oil level. If oil level is correct, the oil pump should be checked.

b. Oil Pump. The oil pump is mounted on the front of the crankcase behind the gear cover and is driven by the crankshaft gear, The inlet pipe and screen assembly is attached directly to the pump body. A discharge passage in the cover of the pump registers with a drilled passage in the crankcase. Parallel passages distribute oil to the front main bearing, rear main bearing and pressure control bypass valve. Circumferential I grooves in the main bearings supply oil to the connecting rod bearings through drilled passages from each main journal. A drilled passage connects the front main bearing oil supply to the front camshaft bearing, The fly-ball governor is lubricated by a drilled passage in the front camshaft journal. The oil overflow from the bypass valve furnishes lubrication to the camshaft drive gears.

(1) Check the oil pump thoroughly for worn parts. Oil the pump to prime it before reinstalling. Except for gaskets and suction cup, the component parts of the pump are not available individually. Install a new pump assembly if required. See figure 5-60.

(2) If new oil pump gaskets are installed, they should be the same thickness as those removed.

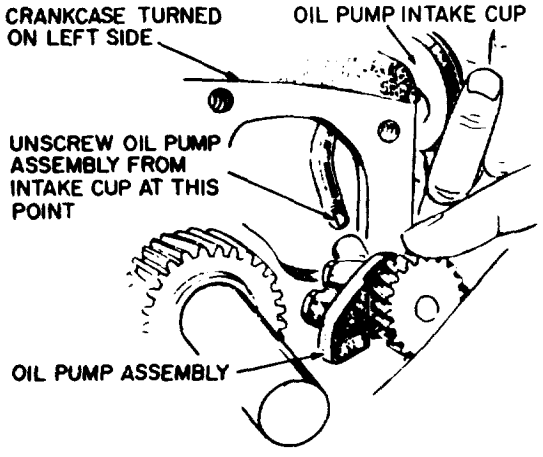


Figure 5-60. Oil Pump Disassembly

c. Oil Bypass Valve Inspection, Sea figure 5-61. The bypass valve (located to the right and behind the gear cover fig. 5-59) controls 011 pressure by allowing excess oil to flow directly back to the crankcase. Normally the valve begins to open about 30 psi. The valve is non-adjustable and normally needs no maintenance. To determine if abnormal (high or low) oi I pressure is caused by a sticky plunger, inspect as follows:

(1) Remove 3/8"-24 X 3/4 inch cap screw located behind gear cover and under governor arm.

(2) Remove spring and plunger with a magnet tool. Clean plunger and spring with approved cleaning solvent (Appendix E, Item 17) and reinstall.

d. Oil Bypass Valve Removal. To remove the valve, unscrew the recessed plug in the rear bearing plate and and lift out the spring and plunger assembly. Determine proper valve operation by checking the spring and plunger according to the following measurements:

Hunger Diameter . . . . . 0.3365” to 0.3380” (8.55 to 8.59 mm)

Spring Free Length . . . . . 2-5/16” (58.74mm)
22.225 (1 .Okg). 11 lb. (49.9g) at 1-3/16" (30.16mm)

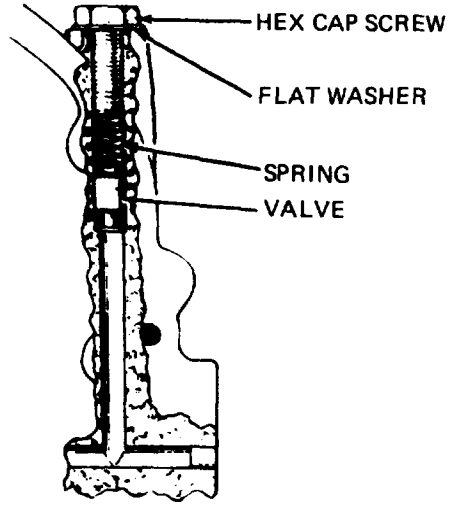


Figure 5-61. Oil Bypass Valve

5-47. EVAPORATOR HOUSING

a. Removal.

(1) Remove screws (2) to remove evaporator guard (1).

(2) Remove screws (4) to remove bottom panel (3).

(3) Remove screws (6 and 7) to remove top panel (5).

(4) Remove screws (13), washer (15) and nuts (14) to remove shroud (12).

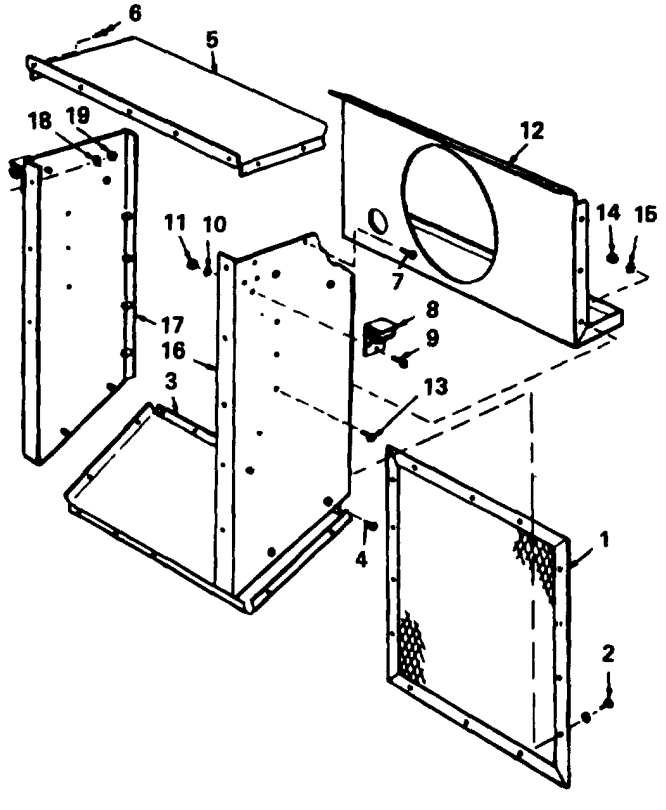
(5) Remove washers (18) and nuts (19) to remove side panels (16 and 17).

(6) Remove screw (9), washer (10) and nut (11) to remove mount (8).

b. Cleaning and Inspection.

(1) Clean all panels, guard and mounts with approved cleaning solvent (Appendix E, Item 17) and dry thoroughly.

(2) Inspect for cracks, dents, or other damage. Replace defective parts if unrepairable.



1. GUARD, EVAPORATOR
2. SCREW
3. PANEL, BOTTOM
4. SCREW
5. PANEL, TOP
6. SCREW
7. SCREW
8. MOUNT
9. SCREW
10. WASHER
11. NUT
12. SHROUD
13. SCREW
14. NUT
15, WASH ER
16. PANEL, SIDE
17. PANEL, SIDE
18. WASHER
19. NUT

Figure 5-62. Evaporator Housing

5-48. ELECTRIC MOTOR (MODEL REMD-K/11-10)

The 7.5 horsepower electric motor used on the Model REM D-K/11-10 refrigeration unit is a 208-volt 3-phase, 60 cycle, alternating current motor that requires 25.3 amperes for proper operation. The 213T type motor operates at 1750 rpm. The electric motor is grounded. Rotation of the motor may be reversed by reversing the position of any two power leads.

CAUTION

Be sure the power source is correct before connecting unit. Otherwise damage to equipment or personnel may result.

An electrical connection box is supplied to provide the means for disconnection and overload protection of all power.

CAUTION

Disconnect main power source before working on electrical components.

a. Removal.

(1) Remove the electric motor (paragraph 4-64),

(2) Loosen screw (3, figure 5-63) and remove bushing (1) and sheave (4) assembly from the motor shaft.

b. Disassembly.

(1) Remove cap screws (6), brackets (5) and nuts (7) that secure the end bells (8) and (16) to the frame (21).

(2) Remove the rotor (12) with the bearings (9 and 14) attached.

(3) Remove spring washer (15) from end bell.

(4) Using a suitable puller, remove the bearings and dust shields (10 and 13).

c. Inspection and Testing. Test the rotor and field windings for shorts, open circuits, grounding, burned insulation and inspect for damage to machined surfaces. Replace motor assemb lv as a unit if rotor or windings are defective. Refer to the manufacturer's data plate on the motor for replacement bearings if they are required.

d. Assembly.

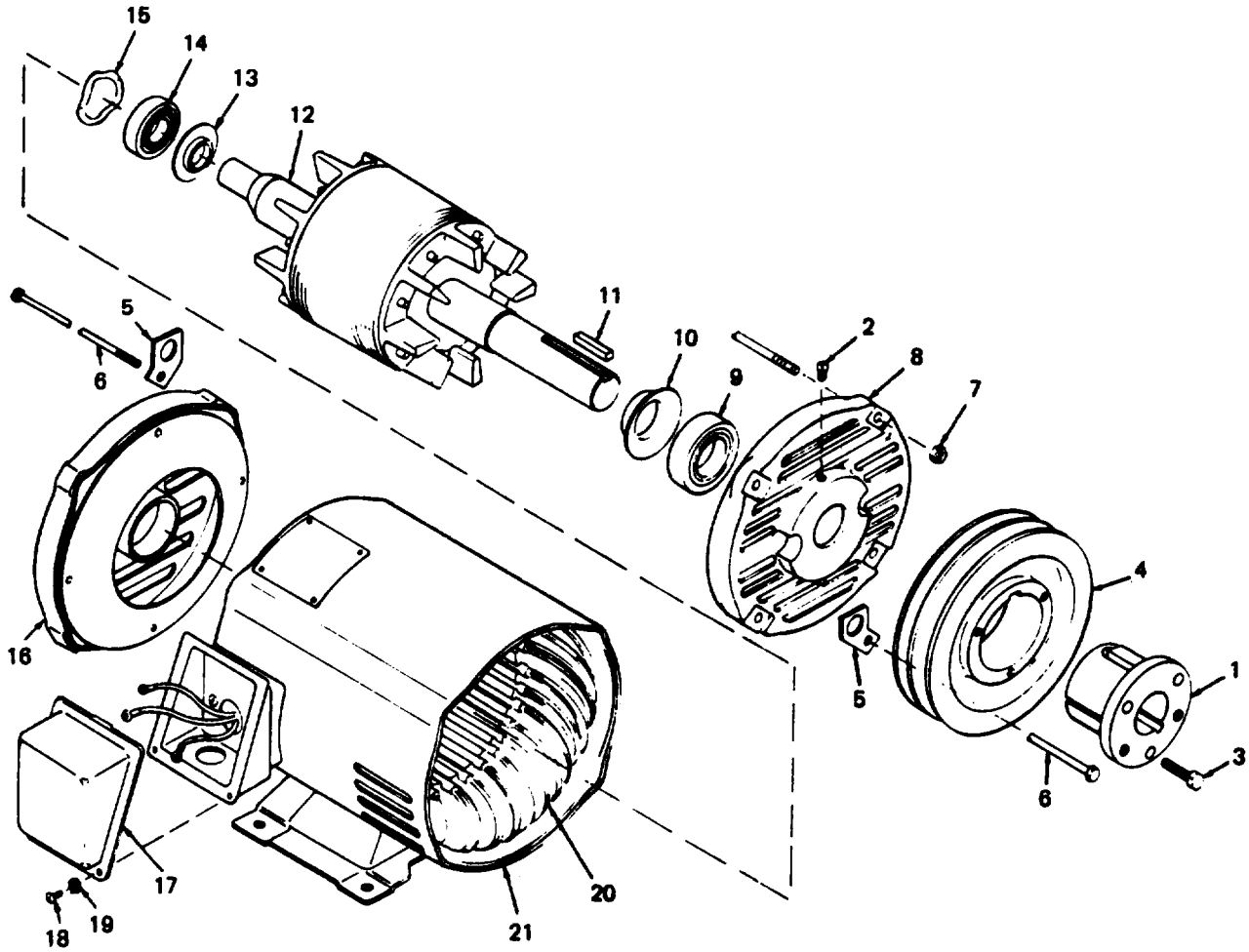
(1) Install the dust shields (10 and 13) on the shaft and press the bearings (9 and 14) into place.

(2) Install the spring washer (15) in the end bell (16).

(3) Install the rotor (12) in the end bell (16) and frame (21). Be careful not to damage the windings or the rotor when insta l ling the rotor.

(4) Install the drive end bell (8) and secure it with the brackets (5), screws (6) and nuts (7).

e. Installation. Reverse removal procedure above to instal l the motor. After connecting the power source, turn unit on momentarily to check direction of rotation. If direction of rotation is wrong, reverse the two power leads at the cable.



1. BUSHING
2 SETSCREW
3. SCREW
4. SHEAVE
6. BRACKET
6. SCREW
7. NUT
8. END BELL
9. BEARING
10. DUST SHIELD
11. KEY
12, ROTOR
13. DUST SHIELD
14. BEARING
16. WASHER
16. END BELL
17. COVER
18. SCREW
19. WASHER
20. WINDINGS, COIL
21. FRAME

Figure 5.63. Electric Motor

CHAPTER 6

GENERAL SUPPORT MAINTENANCE INSTRUCTIONS

Section I. GENERAL INFORMATION

6-1. TOOLS AND LISTS

a. For authorized common tools and equipment, refer to Modified Table of Organization and Equipment (MTOE) applicable to your unit.

b. No special tools are required for maintenance of the equipment. Test, maintenance and diagnostic equipment (TMDE) and support equipment include standard pressure and vacuum gages, vacuum pump and charging manifolds found as standard equipment in any general support refrigeration shop. For Model RGMD-K/1-10 the tools and equipment needed for maintenance of the gasoline engine are such as would be found in any general support gasoline engine repair shop.

c. Repair parts are listed and illustrated in the Repair Parts and Special Tools (RPSTL) list TM 5-4110-238-24P covering organizational, direct, and general support maintenance for this equipment.

Section II. MAINTENANCE PROCEDURES

6-2. CONDENSER AND EVAPORATOR COIL REPAIRS

a. Condenser Coil. See paragraph 4-39 for cleaning and 5-18 for removal and installation.

b. Evaporator Coil . See paragraph 4-40 for cleaning and 5-28 for removal and installation.

c. Repairs are limited to brazing of return bends and on the evaporator coil the distributor and distributor line connections. See paragraph 5-14 for brazing/debrazing instructions. Badly dented fins can be straightened using a fin comb. Internal leaks in the fin area are not normally repairable.

6-3. ENGINE OVERHAUL (RGMD-K/1-10)

a. General. See paragraphs 5-36 through 5-46.

b. Crankshaft. Inspect the bearing journals. If they are scored and cannot be smoothed out by dressing down, the bearing journals should be refinished to use nearest available undersize bearings or a new crankshaft should be installed. If a worn main bearing journal cannot be fitted with an available precision type undersize bearing, then refinish it to the next undersize. If a worn rod journal cannot be fitted by installing a new bearing insert (forged rod), then refinish it to take the corresponding undersize bearing insert available. Whenever making major repairs on the engine, always inspect the drilled passages of the crankshaft. Clean them to remove any foreign material and to assure proper lubrication of the connecting rods.

c. Engine Block. See paragraph 544,

(1) Reboring and honing of cylinders that are out of round or tapered.

(a) A hone can be used to rebore a cylinder (figure 6-1). Remove stock to 0.002 inch (0.051 mm) undersize of finish bore with coarse hone (100 grit); then complete honing with finish hones (300 grit).

(b) Anchor the block solidly for either vertical or horizontal honing. Use either a drill press or a heavy-duty drill which operates at approximately 250 to 450 rpm.

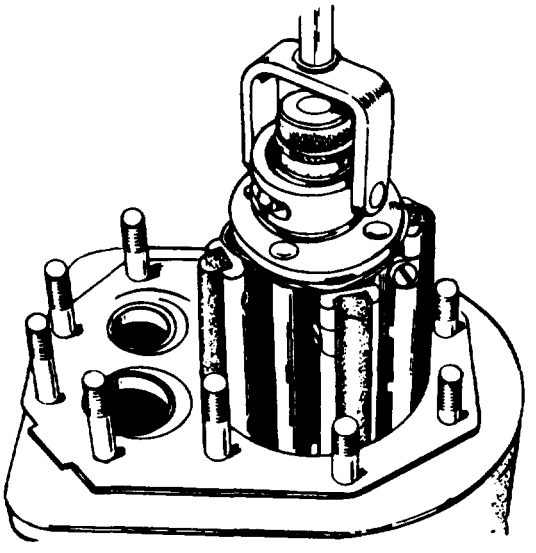


Figure 6-1, Honing a Cylinder (RGMD-K/1-10)

(c) Lower the hone into the cylinder until it protrudes 1/2 to 3/4 inch (1 .27 to 1.91 cm) past the end of the cylinder. Rotate the adjusting nut until the stones come in contact with the cylinder wall at the narrowest point.

(d) Turn the hone by hand. Loosen the adjusting nut until the hone can be turned.

(e) Connect drill to hone and start drill. Move the hone up and down in the cylinder approximately 40 cycles per minute. Usually the bottom of the cylinder must be worked out first because it is smaller. Then when the cylinder takes a uniform diameter, move the hone up and down all the way through the bore. Follow the hone manufacturer's recommendations for wet or dry honing and oiling the hone.

(f) Check the diameter of the cylinder regularly during honing. A dial bore gage is the easiest method but a telescope gage can be used. Check the size at six places in the bore; measure twice at the top, middle and bottom at 90 degree angles,

(g) When the cylinder is approximately 0.002 inch (0.051 mm) within the desired bore, change to fine stones and finish the bore. The finish should not be smooth but as shown in figure 6-2. The crosshatch formed by the scratching of the stones shou ld form an angle of 23 degrees. This can be achieved by moving the hone up and down in the cylinder about 40 cycles per minute.

(h) Clean the cylinder block thoroughly with soap, water and clean rags. A clean white rag should not be soiled by the wall after cleaning is complete.

(i) Do not use solvent or gasoline since they wash the oil from the walls but leave the metal particles.

(j) Dry the crankcase and coat it with oil.

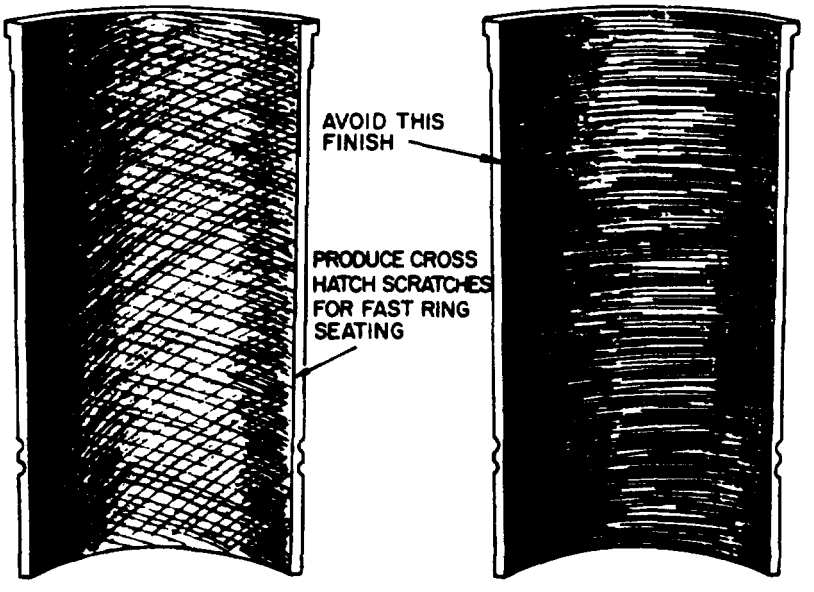


Figure 6-2. Correct Hone Finish (R GM D-K/l -1 O)

6-4, COMPRESSOR OVERHAUL

a. General. Refer to paragraph 5-32 for lubrication, removal and installation procedures for the compressor and paragraph 5-33 for Compressor Service Valves, paragraph 5-34 Compressor Cylinder Heads and Valve Plates and paragraph 5-35 for Compressor Seal Assembly and Pulley.

b. Oil Pump Assembly and End Plate.

(1) Removal.

(a) Close the liquid line valve and pump down the system (para. 5-7).

(b) Shut off the compressor and front seat the suction and discharge service valves.

(c) After the compressor valves are shut off, crack open the gage port on the discharge service valve and release the pressure in the compressor.

(d) If necessary to remove compressor, follow procedures in paragraph 5-32 b.

(e) Drain oil from compressor by opening the drain plug (figure 5-19).

(f) Remove oil pump assembly with cover and gasket.

(g) Remove end plate and end plate gasket.

(h) Unscrew the oil pickup from the end plate.

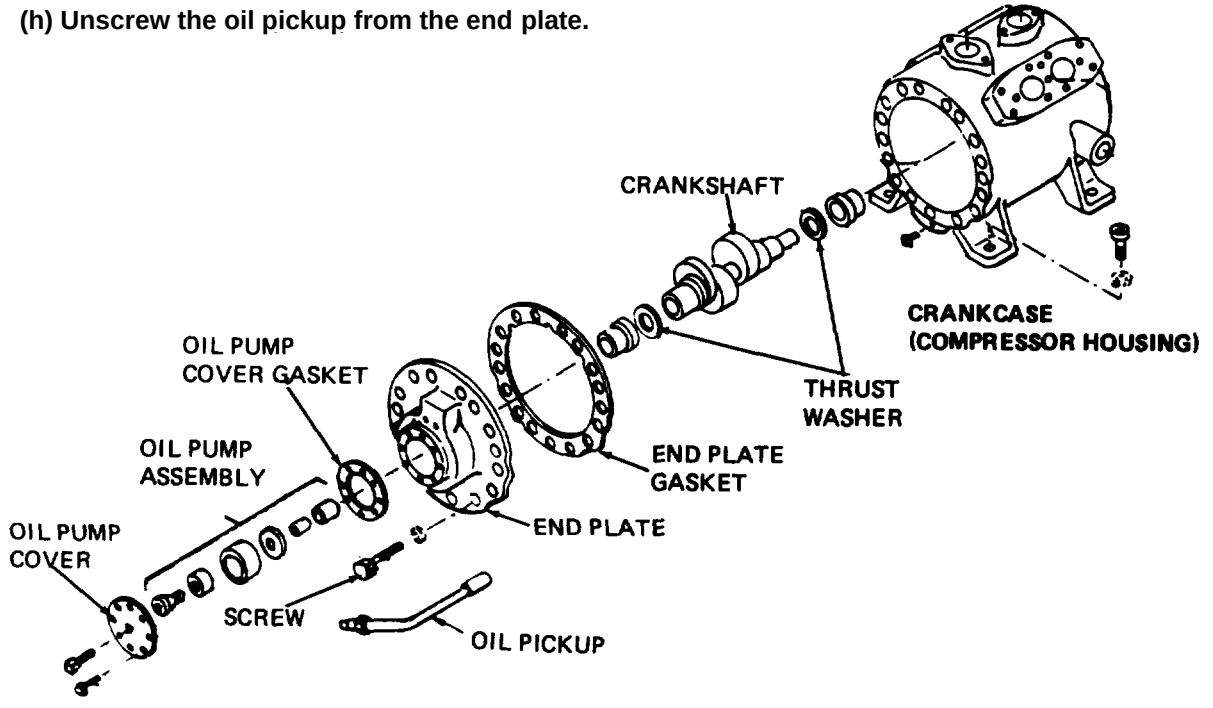


Figure 6-3. Oil Pump Assembly

(2) Installation.

(a) Attach the oil pickup to the new end plate.

(b) Install the new end plate with gasket and screw onto crankcase. Check to make sure the crankshaft thrust washers are on.

(c) Install new oil pump assembly with cover and gasket.

(d) Follow instructions in paragraph 5-32 e. for reinstalling compressor.

(e) Add oil till level is approximately 1/2 to 3/4 up sight glass. (See figure 5-19.)

c. Crankshaft, Piston Assembly and Connecting Rod.

(1) Removal.

(a) Close liquid line valve and pump the system down (para. 5-7).

(b) Close the discharge and suction service valves.

(c) Follow procedures in paragraph 5-32 for removal of the compressor,

(d) Crack open the gage port on the d ischarge service valve and release the pressure in the compressor.

(e) Remove the cylinder heads and valve plate assemblies (para. 5-34).

(f) Remove the oil pump assembly with cover and gasket.

(9) Remove the end plate and gasket.

(h) Remove the seal plate and seal assembly (figure 5-25).

(i) Through the end plate opening, gently pull and rotate the crankshaft working the connecting rods over the eccentric. Be carefu l not to scrape the crank throws or shaft. Remove the crankshaft.

(j) Remove the piston assembly with connecting rod from the cylinders by pulling them down into the the crankcase and out the pump end of the compressor.

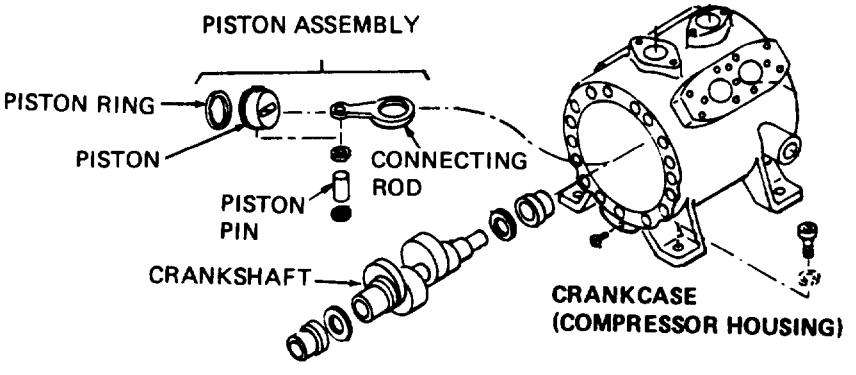


Figure 6-4. Crankshaft, Connecting Rod and Piston Assembly

(2) Installation.

(a) Insert all pistons and connecting rods through the opening in the end of the compressor working them up into the cylinders. Be careful not to break the piston rings.

(b) Gently push the crankshaft (with thrust washers) through each connecting rod working them on the eccentric as it is being pushed. DO NOT FORCE.

(c) Replace the end plate and end plate gasket.

(d) Replace oil pump assembly with cover and gasket.

(e) Install a new seal assembly (figure 5-25).

(f) Replace the cylinder heads and valve plates (figure 5-24).

(g) Check end clearance for a minimum of .004 to a maximum of .026 end play of the shaft.

(h) Follow instructions in paragraph 5-32 e. for reinstalling compressor.

APPENDIX A

REFERENCES

A-1 . FIRE PROTECTION AND SAFETY

TM 5-4200-200-10	Hand Portable Fire Extinguishers Approved for Army Users
TB MED 251	Noise and Conservation of Hearing

A-2. LUBRICATION

C9100IL	Fuels, Lubricants, Oils and Waxes
LO 54110-238-12	Lubrication Order

A-3. PAINTING

TM 43-0139	Painting Instructions for Field Use
AR 746-5	Color and Marking of Army Materiel

A-4. MAINTENANCE

TM 38-750	The Army Maintenance Management System (TAM MS)
TM 5-4110-238-24P	Organizational, Direct and General Support Maintenance Repair Parts and Special Tools List, Refrigeration Unit, Mechanical: Panel Type; 10,000 BTU/HR Gasoline Engine Driven (R GM D-K/l -10) and Electric Motor Driven (REMD-K/11-10)
TM 5-670	Repairs and Utilities; Preventive Maintenance for Refrigeration, Air Conditioning, Mechanical Ventilation and Evaporative Cooling
TM 9-6140-200	Operator and Organizational Maintenance Manual for Lead-Acid Storage Batteries
TM 9-4940-435-14	Leak Detector, Refrigerant Gas

A-5. SHIPMENT AND STORAGE

TM 740-90-1	Administrative Storage of Equipment

A-6. DESTRUCTION OF ARMY EQUIPMENT

TM 750-244-3	Procedures for Destruction of Equipment to Prevent Enemy Use

APPENDIX B

COMPONENTS OF END ITEMS LIST (COEIL)

Section I. INTRODUCTION

B-1. SCOPE

This appendix lists Integral Components of and Basic Issue Items (BII) for the Refrigeration Unit to help you inventory items required for safe and efficient operation.

B-2. GENERAL

This Component of End Items List is divided into the following sections:

a. Section II. Components of End Item. These items, when assembled, constitute the Refrigeration Unit and must accompany it whenever it is transferred or turned in. An illustration is furnished to help you identify these items.

b. Section III. Basic Issue Items. These are minimum essential items required to place the Refrigeration Unit in operation, to operate it and to perform emergency repairs. Although shipped separately packaged, ' they must accompany the Refrigeration Unit during operation and whenever it is transferred between accountable officers. The illustrations will assist you with hard-to-identify items. This manual is your authority to requisition replacement BII based on Table(s) of Organization and Equipment (TOE)/ Modification Table of Organization and Equipment (MTOE) authorization of the end item.

B-3. EXPLANATION OF COLUMNS

The following provides an explanation of co lumns found in the tabular listings:

a. Column (1) – Illustration Number, This column indicates the number of the illustration in which the item is shown.

b. Column (2) – National Stock Number. Indicates the National stock number assigned to the item and will be used for requisitioning purposes.

c. Column (3) - Description. Indications the Federal item name and, if required, a minimum description to identify and locate the item. The last line for each item indicates the FSCM (in parentheses) followed by the pert number. If item needed differs for different models of this equipment, the model is shown under the "Usable On" heading in this column.

d. Column (4) - Unit of Measure (U/M). Indicates the measure used in performing the actual operational/ maintenance function. This measure is expressed by a two-character alphabetical abbreviation (e.g., es, in, pr).

e. Column {5) - Quantity required (Qty Reqd). Indicates the quantity of the item authorized to be used with/on the equipment.

Section II. COMPONENTS OF END ITEMS

(1) ILLUS. NUMBER	(2) NATIONAL STOCK NUMBER	(3) DESCRIPTION FSCM and Part Number	USABLE ON CODE	(4) U/M	(5) QTY REQD
4-2		Plain Hex Nut, 5/8-11 53578-12			
4-2		Spring Lockwasher, 5/8 53574-12			
4-2		Unit Mounting Angle, 2 x 2 x 1/4 x 10 Long (FSCM 57107) A3030122			

Section III. BASIC ISSUE ITEMS

(1) ILLUS. NUMBER	(2) NATIONAL STOCK NUMBER	(3) DESCRIPTION FSCM and Part N umber	USABLE ON CODE	(4) U/M	(5) QTY REQD
		Department of Army Technical Manual; Operator's, Organizational, Direct Support and General Support Maintenance Manual TM 5-4110-238-14		EA	1
		Department of Army Technical Manual; Organizational, Direct Support and General Support Maintenance Repair Parts and special Tools List TM 5-4110-238-24P		EA	1
	5220-00-559-9618	Case, Manuel		EA	1

APPENDIX C
MAINTENANCE ALLOCATION CHART

Section I. INTRODUCTION

C-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 components 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.

d. Section IV contains explanatory remarks required for the maintenance functions listed in Section II.

C-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, subassemblies 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 examinations.

(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, Clean, Lubricate. Operations required periodically to keep an item in proper operating condition, i.e., to clean (decontaminate), 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) Repair. The application of maintenance services (inspect, test, service, adjust, align, calibrate or replace) or other maintenance actions (welding, grinding, riveting, straightening, feting, remaching or resurfacing) to restore serviceability to an item by correcting specific damage, fault, malfunction, or failure in e pert, subassembly, module (component or assembly), and item, or system.

(6) Replace. The act of substituting a serviceable like type part, sub-assembly or module (component or assembly) for an unserviceable counterpart.

(7) Overhaul. The maintenance effort (service/action) necessary to restore an item to a completely serviceable/operations condition as prescribed by maintenance standards in appropriate technical manuals. Overhaul is normally the highest degree of maintenance performed by the Army. Overhaul does not normally return an item to a like new condition.

C-2. EXPLANATION OF COLUMNS IN SECTION II (Cont)

d. Column (4) - Maintenance Level. This column is made up of 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 et 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 functions.

f. Column 6- Remarks. Column 6 contains an alphabetial code which shall be keyed to the remarks contained in Section IV.

Section II. MAINTENANCE ALLOCATION CHART

(1) GROUP NUMBER	(2) COMPONENT/ASSY	(3) MAINTENANCE FUNCTION	(4) Maintenance Level C	O	F	H	D	(5) TOOLS & EQUIPMENT	(6) REMARKS
01	CABINET, PANELS, DOORS & SCREENS								
	Panels	Inspect	0.1						
		Repair			.0			1	
		Replace		0.5					
	Doors	Inspect	0.1						
		Repair			I.0			1	
		Replace		0.5					
	Screens	Inspect	0.1						
		Repair			I.0			1	
		Replace		0.5					
02	WIRING HARNESS & INSTRUMENT CONTROL PANEL								
	Wires and cables	Inspect	0.1						
		Test		0.5					
		Repair		1.0				1	
		Replace		2.0					
	Hourmeter	Inspect	0.1						
		Test		0.2				1	
		Replace		0.5					
	Gags Ammeter	Inspect	0.1						
		Replace		1.0				1	
	Lights	Inspect	0.1						
		Test		0.1				1	
		Replace		0.1					
	Switches	Inspect	0.1						
		Test		0.1				1	
		Replace		0.5					
	Gage, Heed Pressure (Discharge)	Inspect	0.1						
		Replace			'.0			1	
	Gage, Refrigerator Temperature	I nspect	0.1						
		Replace		1.0					
	Gage, Suction Pressure	Inspect	0.1						
		Replace			.0			1	

Section II. MAINTENANCE ALLOCATION CHART (Cont)

(1) GROUP NUMBER	(2) COMPONENT/ASSY	(3) MAINTENANCE FUNCTION	(4) Maintenance Level C	O	F	H	D	(5) TOOLS & EQUIPMENT	(6) REMARKS
02	Defrost Timer	Inspect		0.1					
		Test		0.5				1	
		Replace		1.0					
	Relays	Inspect		0.1					
		Test		0.5				1	
		Replace		1.0					
	Pressure Switch	Inspect			0.1				
		Test			0.5			1	
		Replace			1.0				
	Thermostat	Inspect		0.1					
		Test		0.5				1	
		Replace		1.0					
	Fuse	Test		0.1					
		Replace		0.1				1	
	Gage, Oil Pressure	Inspect	).1						
		Replace		1.0				1	
03	FANS AND DRIVE								
	Fans	Inspect	1.1						
		Replace		2.0				1	
	Belts	Inspect	0.1						
		Adjust		0.5				1	
		Replace		0.5					
	Idler Assembly	Inspect	0.1						
		Service		0.2					
		Adjust		0.5				1	
		Replace		1,0					
	Bearings	Inspect	0.1						
		Service		0.2				1	
		Replace		3.0					
	Clutch	Inspect	0.1						
		Adjust		1.0					
		Service		0.5				1	
		Replace		3,0					
	Pulleys	Inspect	0.1						
		Replace		3,0				1	
	Shaft	Inspect	1.0						
		Replace		3.0				1	

Section II. MAINTENANCE ALLOCATION CHART (Cont)

(1) GROUP NUMBER	(2) COMPONENT/ASSY	(3) MAINTENANCE FUNCTION	(4) Maintenance Level C	O	F	H	D	(5) TOOLS & EQUIP-WENT	(6) REMARKS
04	**REFRIGERANT PIPING & VALVES**								
	Condenser Coil	Inspect	0.1						
		Clean		1.0					
		Repair				2.0		1-2	A
		Replace			4.0				
	Valve, Discharge Pressure Regulator	Inspect	0.1						
		Adjust			1.0			1-2	
		Replace			3.0				
	Valve, Hand	Inspect	0.1						
		Replace			2,0			1 –2	
	Strainer, Refrigerant	Inspect	0.1						
		Replace			3.0			1-2	
	Valve, Solenoid	Inspect	0.1						
		Replace			3.0			1 –2	
	Fusible Plug	Inspect	0.1					1 –2	
		Replace			3.0				
	Filter Drier	Inspect	0.1					1-2	
		Replace			3.0				
	Receiver Tank	Inspect	0.1						
		Replace			3.0			1 –2	
	Sight Glass	Inspect	0.1						
		Replace			3.0			1 –2	
	Valve, Expansion	Inspect	0.1						
		Replace			4.0				
	Coil, Evaporator	Inspect	0.1						
		Clean		2.0					
		Repair				3.0		1:2	A
		Replace			4.0				
	Accumulator	Inspect	0.1						
		Replace			1.0			1 –2	
	Crankcase Pressure Regulating Valve	Inspect	0.1						
		Adjust			0.5				
		Replace			5.0			1 –2	
	Drain Line	Inspect	0.1						
		Repair		0.5					
		Replace		0.2					

Section II. MAINTENANCE ALLOCATION CHART (Cont)

(1) GROUP NUMBER	(2) COMPONENT/ASSY	(3) MAINTENANCE FUNCTION	(4) Maintenance Level C	O	F	H	D	(5) TOOLS & EQUIPMENT	(6) REMARKS
04	Tubing and Fittings	Inspect	0.1						
		Repair			1.0			1-2	
		Replace			2.0				
05	COMPRESSOR ASSEMBLY								
	Compressor	Inspect		0.1					
		Lubricate			0.5			1-2	
		Test			0.5				
		Repair			4.0				
		Replace			4.0				
		Overhaul				16.0			
	Valves, Suction and Discharge	Inspect	0.1						
		Replace			4.0			1-2	
	Cylinder Heads and Valve Plates	Inspect			0.5				
		Replace			4.0			1-2	
	Crankshaft and Bearings	Inspect				0.5		1-2	
		Replace				5.0			
	Piston and Rod Assembly	Inspect				0.5			
		Replace				3.5			
	seal Assembly	Inspect			0.5				
		Replace			5.0			1-2	
	Flywheel (Pulley)	Inspect	0.1						
		Replace			2.0			1	
	Oil Pump Assy	Inspect			0.5			1-2	
		Replace				6.0			
06	ENGINE ASSEMBLY								
	Muffler	Inspect		0.1					
		Replace		0.5				1	
	Engine	Inspect		0.3					
		Test		0.5					
		service		1.0					
		Adjust		0.4					
		Replace		4.0					
		Repair			8.0				
		Overhaul				6.0			

Section II. MAINTENANCE ALLOCATION CHART (Cont)

(1) GROUP NUMBER	(2) COMPONENT/ASSY	(3) MAINTENANCE FUNCTION	(4) Maintenance Level C	O	F	H	D	(5) TOOLS & EQUIPMENT	(6) REMARKS
	Belt, Alternator	Inspect	0.1						
		Adjust		0.3				1	
		Replace		0.5					
	Alternator	Inspect		0.1					
		Test		0.3				1	
		Repair			2.0				
		Replace		I .0					
	Air Cleaner	Inspect	0.1						
		service	0.3					1	
		Replace	1.0						
	Choke	Inspect		0.1					
		Adjust		3.5					
		Replace		1.0					
	Carburetor	Inspect		0.2					
		Adjust		0.5				1	
		Repair			2.0				
		Replace		1.0					
	Governor	I nspact		0.1					
		Adjust		0.5				1	
		Repair			2.0				
		Replace			3.0				
	Cooling Shroud	Inspect		0.2					
		Repair			I .0			1	
		Replace			2.0				
	Spark Plugs	Inspect		0.1					
		Adjust		0.3				1	
		Test		0.1					
		Replace		0.5					
	Lead, Spark Plug	Inspect		0.1					
		Test		0.2				1	
		Replace		0.5					
	Points, Ignition	Inspect		0.1					
		Adjust		0.5				1	
		Replace		2 .0					
	Starter	Inspect		0.1					
		Test			2.(				
		Repair			2.0			1	
		Replace		1.0					

Section II. MAINTENANCE ALLOCATION CHART (Cont)

(1) GROUP NUMBER	(2) COMPONENT/ASSY	(3) MAINTENANCE FUNCTION	(4)				(5) TOOLS & EQUIP-MENT	(6) REMARKS
06	Solenoid, Starter	Inspect	0.1					
		Test	0.2				1	
		Replace	1.0					
	Flywheel	Inspect		2.0				
		Replace		2.0			1	
	Crankshaft	Inspect		0.1				
		Repair			4.0		1	B
		Replace		6.0				
	Piston and Rod Assembly	Inspect		2.0				
		Repair		4.0			1	
		Replace		4.0				
	Piston Assembly	Inspect		0.1				
		Replace		6.0			1	
	Piston Rings	Inspect		2.0				
		Replace		2.0			1	
	Gears, Timing	Inspect		2.0				
		Replace		6.0			1	
	Camshaft	Inspect		3.0				
		Replace		3.0			1	
	Cylinder Heed	Inspect		1.0				
		Replace		2.0			1	
	Springs, Valves	Inspect		1.0				
		Test		1,0			1	
		Replace		2.0				
	Valves	Inspect		1.0				
		Test		3.0			1	
		Repair		4.0				
		Replace		4.0				
	Tappets	Inspect		1.0				
		Adjust		1.0			1	
		Replace		3.0				
	Engine Block	Inspect	0.3					
		Repair			6.0			
		Replace			6.0		1	B

Section II. MAINTENANCE ALLOCATION CHART (Cont)

(1) GROUP NUMBER	(2) COMPONENT/ASSY	(3) MAINTENANCE FUNCTION	(4) Maintenance Level C	O	F	H	D	(5) TOOLS & EQUIPMENT	(6) REMARKS
	Bearing, Main	Inspect			2.0				
		Replace			4.0			1	
	Guides, Valve	inspect			1.0				
		Test			2.0				
		Replace			4.0			1	B
	Seats, Valve	Inspect			1.0				
		Test			1.0			1	
		Repair			1.0				
		Replace			4.0				B
	Pump, Oil	Inspect			0.2				
		Test			0.5			1	
		Replace			2.0				
07	BATTERY								
	Battery	Inspect	0.1						
		Test		0.2				1	
		Replace		0.2					
	Battery cable	Inspect		D. 1					
		Replace		0.2				1	
	Battery Holddown	Inspect		D. 1					
		Replace		0.5				1	
08	FUEL SYSTEM								
	Fuel Tank	Inspect	0.1						
		Service	0.3						
		Replace		1.0				1	
	Strainer, Fuel	Inspect	0.1						
		Service	0.2						
		Replace		0.5				1	
	Fuel Pump	Inspect		0.1					
		Service		0.3				1	
		Replace		1.0					
	Fuel Line	Inspect	0.4						
		Repair		1.0				1	
		Replace		0.5					

Section II. MAINTENANCE ALLOCATION CHART (Cont)

(1) GROUP NUMBER	(2) COMPONENT/ASSY	(3) MAINTENANCE FUNCTION	(4) Maintenance Level C	O	F	H	D	(5) TOOLS & EQUIPMENT	(6) REMARKS
09	HOUSING								
	Lifting Fittings	inspect	0.1						
		Repair			1.0				
		Replace		0.5					
	Unit Mounts	inspect	0.1						
		Repair			1.0				
		Replace		0.5					
	Gaskets, Heat Shield	spect	0.1						
		Replace		1.0					
	Housing, Evaporator	Inspect	0.1						
		Repair			1.0				
		Replace			2.0				
10	ELECTRIC MOTOR AND CONTROLS								
	Motor, Electric	Inspect	0.1						
		Test		0.2					
		Repair			2.0			1	c
		Replace		1.0					

Section III. TOOL AND TEST EQUIPMENT REQUIREMENTS

(1) Reference Code	(2) Maintenance Level	(3) Nomenclature	(4) National/NATO Stock Number	(5) Tool Number
		No special tools and test equipment required, Standard tools and test equipment in the following kits are adequate to accomplish the maintenance functions listed in Section II.		
1	O-F-H	Tool kit, service, Refrigeration Unit (SC 5180-90-CL-N1 8)	5180-00-596-1474	
2	F-H	Pump, Vacuum	4310-00-098-5272	
		Soldering Gun Kit	3439-00-930-1638	
3	F-H	Recovery and Recycling Unit, Refrigerant	4130-01-338-2707	17500B (07295)

Section IV. REMARKS

REFERENCE CODE	REMARKS
A	Internal Tube Repair or Replacement.
B	Replacement of Valve Seats and Guides with Crankshaft Polishing of Journals.
c	Limited to Bearing Replacement.
	Other than those items listed above there are no supplemental instructions or explanatory remarks required for the maintenance functions listed in Section 11. Ail functions are sufficiently defined in Section 1. Active time listed for maintenance task functions are with the refrigerator in off-equipment position.

* U.S. GOVERNMENT PRINTING OFFICE, 1992. 654-028/60261

APPENDIX D

ADDITIONAL AUTHORIZATION LIST

Section I. INTRODUCTION

D-1. SCOPE

This appendix lists additional items you are authorized for the support of the refrigeration unit.

D-2. GENERAL

This list identifies items that do not have to accompany the refrigeration unit and that do not have to be turned in with it. These items are authorized to you by CTA, MTOE, TDA or JTA.

D-3. EXPLANATION OF LISTING

National stock number, descriptions, and quantities are provided to help you identify and request the additional items you require to support this equipment. "USABLE ON" codes are identif ied as follows:

CODE	USED ON
	Model

Section II. ADDITIONAL AUTHORIZATION LIST

(1) NATIONAL STOCK NUMBER	(2) PART NUMBER AND FSCM	DESCRIPTION	(3) USABLE ON CODE	[4] U/M	QTY AUTH
7520-00-559-9618		COTTOM DUCK CASE	I	EA	1
7510-00-889-3494		LOG BOOK BINDER		EA	1

APPENDIX E

EXPENDABLE SUPPLIES AND MATERIALS LIST

Section I. INTRODUCTION

E-1. SCOPE

This appendix lists expendable supplies and materials you will need to operate and maintain the Refrigeration Unit. These items are authorized to you by CTA50-970, Expendable Items (except Medical, Class V, Repair Parts, and Heraldic Items),

E-2. EXPLANATION OF COLUMNS

a. Column (1) – Item Number. This number is assigned to the entry in the listing and is referenced in the narrative instructions to identify the material e.g., "Use lubricating oil (Appendix E, Item 14) ."

b. Column (2) – Level. This column identifies the lowest level of maintenance that requires the listed item.

C-Operator/Crew	F–Direct Support Maintenance
O–Organizational Maintenance	H–General Support Maintenance

c. Column (3) - National Stock Number. This is the National stock number assigned to the item; use it to request or requisition the item.

d. Column (4) – Description. Indicates the Federal item name and, if required, a description to identify the item. The last line for each item indicates the Federal Supply Code for Manufacturer (FSCM) in parentheses followed by the part number.

e. Column (5) – Unit of Measure (U/M). Indicates the measure used in performing the actual maintenance function. This measure is expressed by a two-character alphabetical abbreviation (e.g., ea, in, pr). If the unit of measure differs from the unit of issue, requisition the lowest unit of issue that will satisfy your requirements.

section II. EXPENDABLE SUPPLIES AND MATERIALS LIST

(1) Number	(2) Level	(3) NATIONAL STOCK NUMBER	(4) Description	(5) U/M
1	O		Silicone Adhesive Sealant RTV General Purpose MI L-A-46106, Type I	
2	O		Solder, Lead-Tin, QQ-S-571 Type SN60WRP2	
3	F	3040-00-664-0439	Adhesive, General Purpose 1 pint container	EA
4	F	6830-00-292-0732	Nitrogen	CY
5	F		Brazing Alloy, Silver QQ-B-564, Grade O, I or II	
6	F		Brazing Alloy, Silver QQ-B-564, Grade III	
7	F	3439-00-640-3713	Flux, Brazing, O-F-499, Type B	
8	F	5350-00-192-5047	Abrasive Cloth	PG
9	F	7920-00-205-1711	Rags	
10	F	6830-00-290-4377	Dichlorodif luoromethane (Type R 12 Refrigerant)	CY
11	F		Tape, PPP-T-60, Type IV, Casss I	ROLL
12	F	6830-00-872-5120	Trichloromonofluoromethane Technical: w/cylinder 50 lb. (Refrigerant-11) BB-F-1421 Type II (8 348)	
13	F	8030-00-889-3534	Tape, Antisieze, Polytetrafluorethy lene MI L-T-27730, Size I	ROLL
14	F		Lubricating Oil, VV-L-825, Type IV	QT
15	F	9150-00-058-2301	Oil, Vacuum Pump, Duo Seal	QT
16	O	3439-01-045-7940	Flux, Soldering, Liquid Rosin Base, MI L-F-14256	QT
17	O.F	6850-00-264-9037	Dry Cleaning Solvent P-D-680 (81 348)	QT

ALPHABETICAL INDEX

ALPHABETICAL INDEX (Cent)

ALPHABETICAL INDEX (Cent)

ALPHABETICAL INDEX (Cont)

By Order of the Secretary of the Army:

JOHN A. WICKHAM, JR.
General, *United States Army*
Chief of Staff

Official:

ROBERT M. JOYCE
Major General, United States Army
The Adjutant General

DISTRIBUTION:
To be distributed in accordance with DA Form 12-25C, Operator's Maintenance requirements for Refrigeration Equipment.

*U.S. GOVERNMENT PRINTING OFFICE: 1984-764-120/52

RECOMMENDED CHANGES TO EQUIPMENT TECHNICAL PUBLICATIONS

SOMETHING WRONG WITH THIS PUBLICATION?

FROM: (PRINT YOUR UNIT'S COMPLETE ADDRESS)
PFC JOHN DOE
COA, 3d ENGINEER BN
FT. LEONARDWOOD, MO. 63108

DATE SENT

PUBLICATION NUMBER	PUBLICATION DATE	PUBLICATION TITLE
TM 5-4110-238-14	6 Jan 84	Refrigeration Unit, Mechanical

BE EXACT. . .PIN-POINT WHERE IT IS

PAGE NO	PARAGRAPH	FIGURE NO	TABLE NO
6	2-1 a		
B1		4-3	
125	line 20		

IN THIS SPACE TELL WHAT IS WRONG AND WHAT SHOULD BE DONE ABOUT IT:

In line 6 of paragraph 2-1a the manual states the engine has 6 Cylenders. The engine on my set only has 4 Cylenders. Change the manual to show 4 Cylenders.

Callout 16 on figure 4-3 is pointing at a bolt. In key to figure 4-3, item 16 is called a shim - Please Correct one or the Other.

I ordered a gasket, item 19 on figure B-16 by NSN 2910-00-762-3001. I got a gasket but it doesn't fit. Supply says I got what I ordered, so the NSN is wrong. Please give me a good NSN

PRINTED NAME, GRADE OR TITLE, AND TELEPHONE NUMBER
JOHN DOE, PFC (263) 317-7111

SIGN HERE John Doe
JOHN DOE

DA FORM 1 JUL 79 2028-2

PREVIOUS EDITIONS ARE OBSOLETE.

DRSTS-M Overprint 1, 1 Nov 80

P.S.--IF YOUR OUTFIT WANTS TO KNOW ABOUT YOUR RECOMMENDATION MAKE A CARBON COPY OF THIS AND GIVE IT TO YOUR HEADQUARTERS.

TEAR ALONG PERFORATED LINE

TEAR ALONG PERFORATED LINE

RECOMMENDED CHANGES TO EQUIPMENT TECHNICAL PUBLICATIONS

SOMETHING WRONG WITH THIS PUBLICATION?

FROM: (PRINT YOUR UNIT'S COMPLETE ADDRESS)

DATE SENT

PUBLICATION NUMBER	PUBLICATION DATE	PUBLICATION TITLE
TM 5-4110-238-14	6 Jan 84	Refrigeration Unit, Mechanical

BE EXACT. . PIN-POINT WHERE IT IS

PAGE NO	PARA-GRAPH	FIGURE NO	TABLE NO

IN THIS SPACE TELL WHAT IS WRONG AND WHAT SHOULD BE DONE ABOUT IT:

PRINTED NAME, GRADE OR TITLE, AND TELEPHONE NUMBER

SIGN HERE

DA FORM 1 JUL 79 2028-2

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REVERSE OF DA FORM 2028–2 Reverse of DRSTS-M Overprint 2, 1 Nov 80

TEAR ALONG PERFORATED LINE

FILL IN YOUR UNITS ADDRESS

FOLD BACK

DEPARTMENT OF THE ARMY

OFFICIAL BUSINESS

COMMANDER
U.S. ARMY SOLDIER SYSTEMS COMMAND
ATTN: AMSSB–RIM–E
KANSAS STREET
NATICK, MA 91760–5000

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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