TM 5-4110-234-14
TO 40R7-5-7-1

TECHNICAL MANUAL

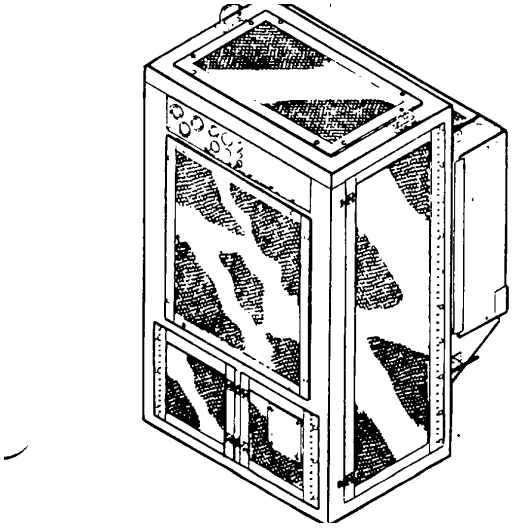
OPERATOR'S, ORGANIZATIONAL, DIRECT SUPPORT AND GENERAL SUPPORT MAINTENANCE MANUAL

REFRIGERATION UNIT, MECHANICAL PANEL MOUNTED FOR REFRIGERATOR PREFABRICATED

ELECTRIC MOTOR DRIVEN
KECO MODEL F10000 R-6
(4110-01-074-5175)

GASOLINE ENGINE DRIVEN
KECO MODEL F10 000 RG-2
(4110-01-074-5175)

THIS COPY IS A REPRINT WHICH INCLUDES CURRENT PAGES FROM CHANGE 1 & 2



CHAPTER/ APPENDIX

HEADQUARTERS, DEPARTMENT OF THE ARMY
25 SEPTEMBER 1981

TM 5-4110-234-14
TO 40R7-5-7-1
C2

CHANGE

NO. 2

HEADQUARTERS
DEPARTMENTS OF THE ARMY AND AIR FORCE
WASHINGTON, D.C., 1 JULY 1992

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

**REFRIGERATION UNIT, MECHANICAL PANEL MOUNTED
FOR REFRIGERATOR PREFABRICATED**

**ELECTRIC MOTOR DRIVEN
KECO MODEL F10000R-6
NSN 4110-01-077-8253**

**GASOLINE ENGINE DRIVEN
KECO MODEL F10000RG-2
NSN 4110-01-074-5175**

Approved for public release; Distribution is unlimited

TM 5-4110-234-14/TO 40R7-57-1, 25 September 1981 is changed as follows:

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

Remove pages	Insert pages
5-7 through 5-10	5-7 through 5-10
C-11 and C-12	C-11 and C-12

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

By Order of the Secretary of the Army:

GORDON R. SULLIVAN
General, United States Army
Chief of Staff

Official:

MILTON H. HAMILTON
Administrative Assistant to the
Secretary of the Army
01668

MERRILL A. McPEAK, General USAF
Chief of Staff

Offical:

CHARLES C. McDONALD, General, USAF
Commander, Air Force Logistics Command

CHANGE

NO. 1

HEADQUARTERS
DEPARTMENT OF THE ARMY
WASHINGTON, D.C., 8 November 1982

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

REFRIGERATION UNIT, MECHANICAL PANEL MOUNTED FOR REFRIGERATOR PREFABRICATED

ELECTRIC MOTOR DRIVEN
KECO MODEL F1OOOOR-6
(4110-01-077-8253)

GASOLINE ENGINE DRIVEN
KECO MODEL F1OOOORG-2
(4110-01-074-5175)

TM 5-4110-234-14 and TO 40R7-5-7-1, 25 September 1981, is changed as follows:

1. Remove and insert pages as indicated below:

	Remove pages	Insert pages
Table of Contents	i and ii	i and ii
Chapter 4	4-7 and 4-8	4-7 and 4-8
	4-13 and 4-14	4-13 and 4-14
	4-33 thru 4-36	4-33 thru 4-36
	4-45 and 4-46	4-45 and 4-46
	4-53 thru 4-56	4-53 thru 4-56
	4-59 thru 4-64	4-59 thru 4-64
	4-69 thru 4-70	4-69 thru 4-70
Chapter 5	5-71/5-72	5-71/5-72

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

By Order of the Secretaries of the Army, and the Air Force:

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General, United States Army
Chief of Staff

Official:

ROBERT M. JOYCE
Major General, United States Army
The Adjutant General

CHARLES A. GABRIEL, General, USAF
Chief of Staff

Official:

JAMES L. WYATT, JR., Colonel, USAF
Director of Administration

DISTRIBUTION:
To be distributed in accordance with DA Form 12-25C, Operator Maintenance Requirements for Refrigeration Equipment.

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 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 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 (2.1 kg/cm2).

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.

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. PD-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 100OF 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, fans, belts, etc.

Keep your hands away from moving parts. Do not operate without protective guards and screens securely in place. Model F10000R-6

WARNING

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 part 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 covers 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.

Model F10000RG-2

WARNING

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.

Model F10000RG-2 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.

ANTI DOTE:

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.

Model F10000RG-2

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 cable last.

Model F10000RG-2

WARNING

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

Model F10000RG-2 I 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.

Model F10000RG-2

WARNING

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 than 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 the above symptoms, get out into fresh air im mediately.

The best protection against carbon monoxide inhalation is a regular in spection 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 an repaired at once by a competent mechanic.

Model F1000ORG-2

WARNING

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

Model F10000RG-2

WARNING

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

Model F10000RG-2

WARNING

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

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 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 5-4110-234-14

HEADQUARTERS
DEPARTMENTOF THE ARMY
WASHINGTON, D.C. 25 September 1981

OPERATOR'S, ORGANIZATIONAL, DIRECT SUPPORT AND GENERAL SUPPORT MAINTENANCE MANUAL FOR REFRIGERATION UNIT, MECHANICAL PANEL MOUNTED FOR REFRIGERATOR PREFABRICATED

ELECTRIC MOTOR DRIVEN
KECO MODEL F1000OR4
(4110 01 0774253)
GASOLINE ENGINE DRIVEN
KECO MODEL F10000'G-2
(4110-01-074-5175)

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 & Aviation Materiel Readiness Command, ATTN: DRSTS-MPSD, 4300 Goodfellow Blvd., St. Louis, MO 63120. A reply will be furnished to you.

TABLE OF CONTENTS

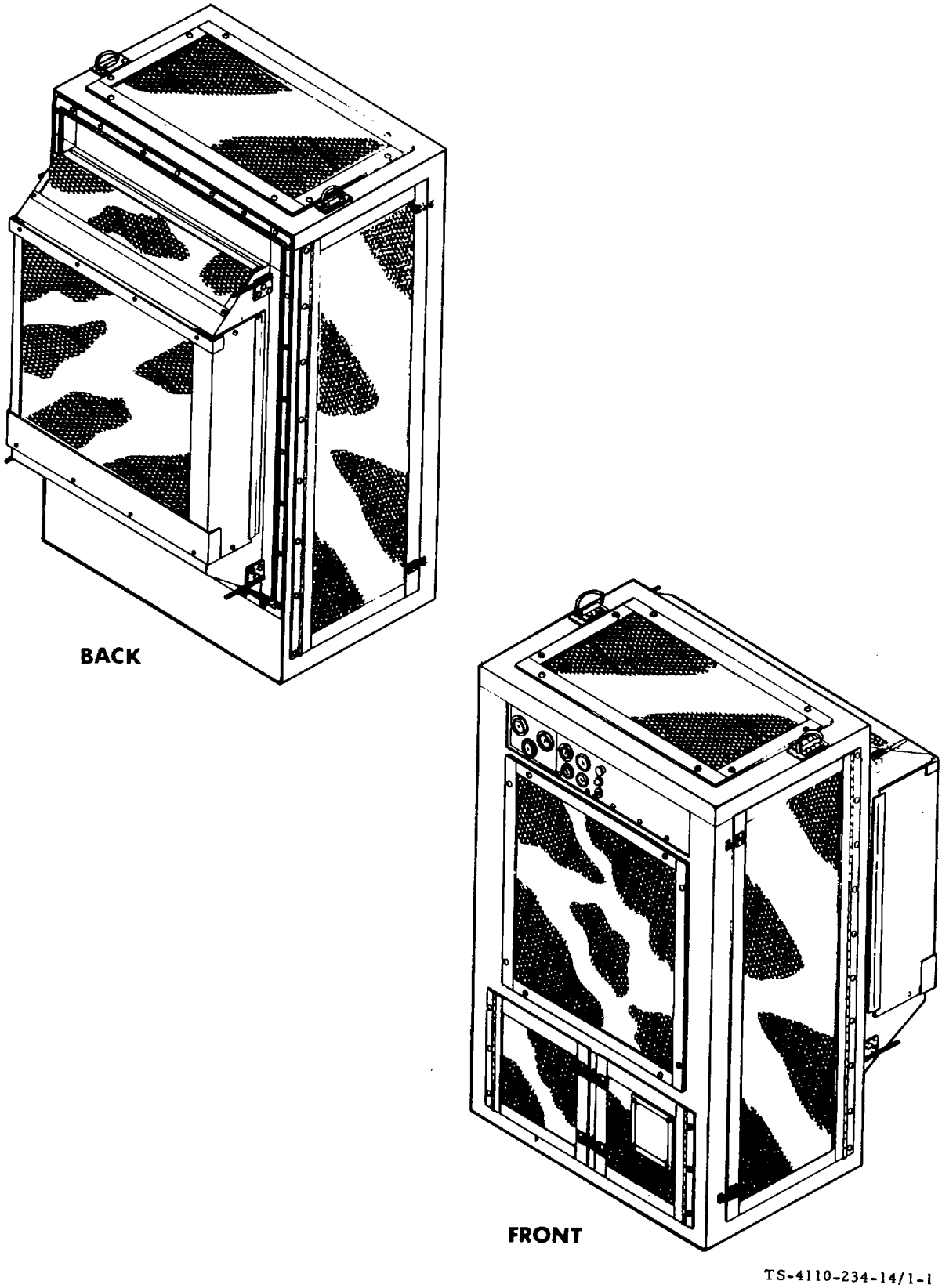


Figure 1-1. Refrigeration Unit

CHAPTER 1
INTRODUCTION

Section I GENERAL INFORMATION

1-1. SCOPE

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

b. Model Numbers and Equipment Names. F10000R-6 Refrigeration Unit, P/N 74600-1, and F10000RG-2 Refrigeration Unit, P/N 74800-1.

c. Purpose of Equipment. To cool air in an enclosed space by means of a wall-mounted, mechanical refrigeration unit.

d. Special Limitations. Model F10000R-6 is electric motor driven and requires 208 volt, 3 phase, 60 hertz power. Model F1000ORG-2 is gasoline engine driven.

1-2. MAINTENANCE FORMS AND RECORDS

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). Hand receipts for the End Item/Components of End Item (COEI), Basic Issue Item (Bll), and Additional Authorization List (AAL) items are published in a Hand Receipt Manual. The Hand Receipt Manual numerical designation is the same as the related Technical Manual with the letters HR added to the number. These manuals are published to aid in property accountability and are available through: Commander, US Army Adjutant General Publication Center, ATTN: ACDL-OD, 1655 Woodson Road, St. Louis, Mo. 63114.

1-3. REPORTING EQUIPMENT IMPROVEMENT RECOMMENDATIONS (EIR's)

If your refrigeration unit needs improvement, let us know. Send us an EIR. 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 or performance. Put it on a SF 368 (Quality Deficiency Report). Mail it to us at Commander, Headquarters, U.S. Army Troop Support and Aviation Materiel Readiness Command, ATTN: DRSTS-MEM, 4300 Goodfellow Blvd., St. Louis, Missouri 63120. We'll send you a reply.

Section II EQUIPMENT DESCRIPTION AND DATA

1-4. EQUIPMENT CHARACTERISTICS, CAPABILITIES, AND FEATURES

Characteristics, capabilities, and features of the refrigeration units include:

a. Provides refrigerated air for an enclosed space.

b. Automatically maintains temperature of enclosure at any setting between 0° and 50°F (-18° and +10°C).

c. The unit is designed for through-the-wall mounting in prefabricated panel type refrigerators.

d. The unit is designed to be highly portable and easily installed.

1-5. LOCATION AND DESCRIPTION OF MAJOR COMPONENTS

a. For the F10000R-6, electric motor driven unit, see figure 1-2.

- CONTROL PANEL (1) Contains controls, switches, gages and meters.
- CONDENSER COIL (2) This coil serves as a heat exchanger to remove the heat from the compressed refrigerant vapor that passes through it by transferring it to the air.
- CONDENSER FAN (3) Draws air in and over the condenser coil.
- ELECTRIC MOTOR (4) Drives the condenser and evaporator fans.
- RECEIVER (5) Collects and stores liquid refrigerant.
- EVAPORATOR FAN (6) Draws air in and over the evaporator coil.
- EVAPORATOR COIL (7) Removes heat from the air by transferring it to the refrigerant.
- SEMI-HERMETIC COMPRESSOR (8) Has its own self-contained motor. It compresses the refrigerant gas and pumps it through the system.
- MOUNTING BOLTS AND CLAMPS (9) Used to attach the unit to the prefabricated panel type refrigerator.

b. For the F10000RG-2, gasoline engine driven unit, see figure 1-3.

- CONTROL PANEL (1) Contains controls, switches, gases and meters.
- ENGINE EXHAUST (2) Includes exhaust header, pipes, muffler and rain cap.
- CONDENSER COIL (3) This coil serves as a heat exchanger to remove the heat from the compressed refrigerant vapor that passes through it by transferring it to the air.
- CONDENSER FAN (4) Draws air in and over the condenser coil.
- RECEIVER (5) Collects and stores liquid refrigerant.

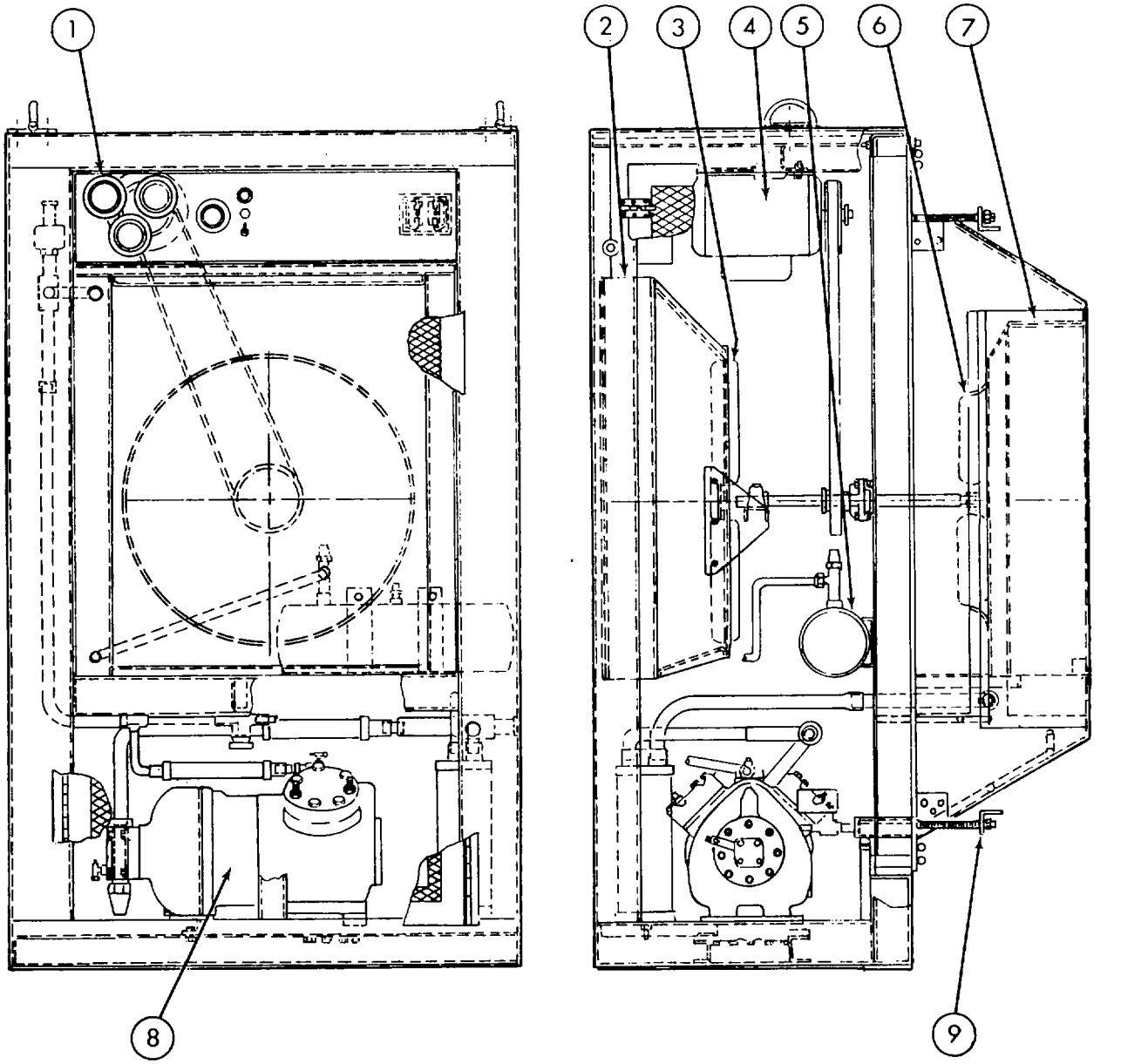


Figure 1-2. Major Components F10000R-6

• BATTERY (6) Provides 12 volt power for engine starting.

• EVAPORATOR FAN (7) Draws air in and over the evaporator coil.

• EVAPORATOR COIL (8) Removes heat from the air by transferring it to the refrigerant.

• GASOLINE ENGINE (9) Drives the compressor, condenser fan and evaporator fan.

• COMPRESSOR (10) Compresses the refrigerant gas and pumps it through the system.

•CLUTCH (11) Engages condenser and evaporator fan drive shaft.

• GASOLINE TANK (12) Stores gasoline.

• MOUNTING BOLTS AND CLAMPS (13) Used to attach the unit to the prefabricated panel type refrigerator.

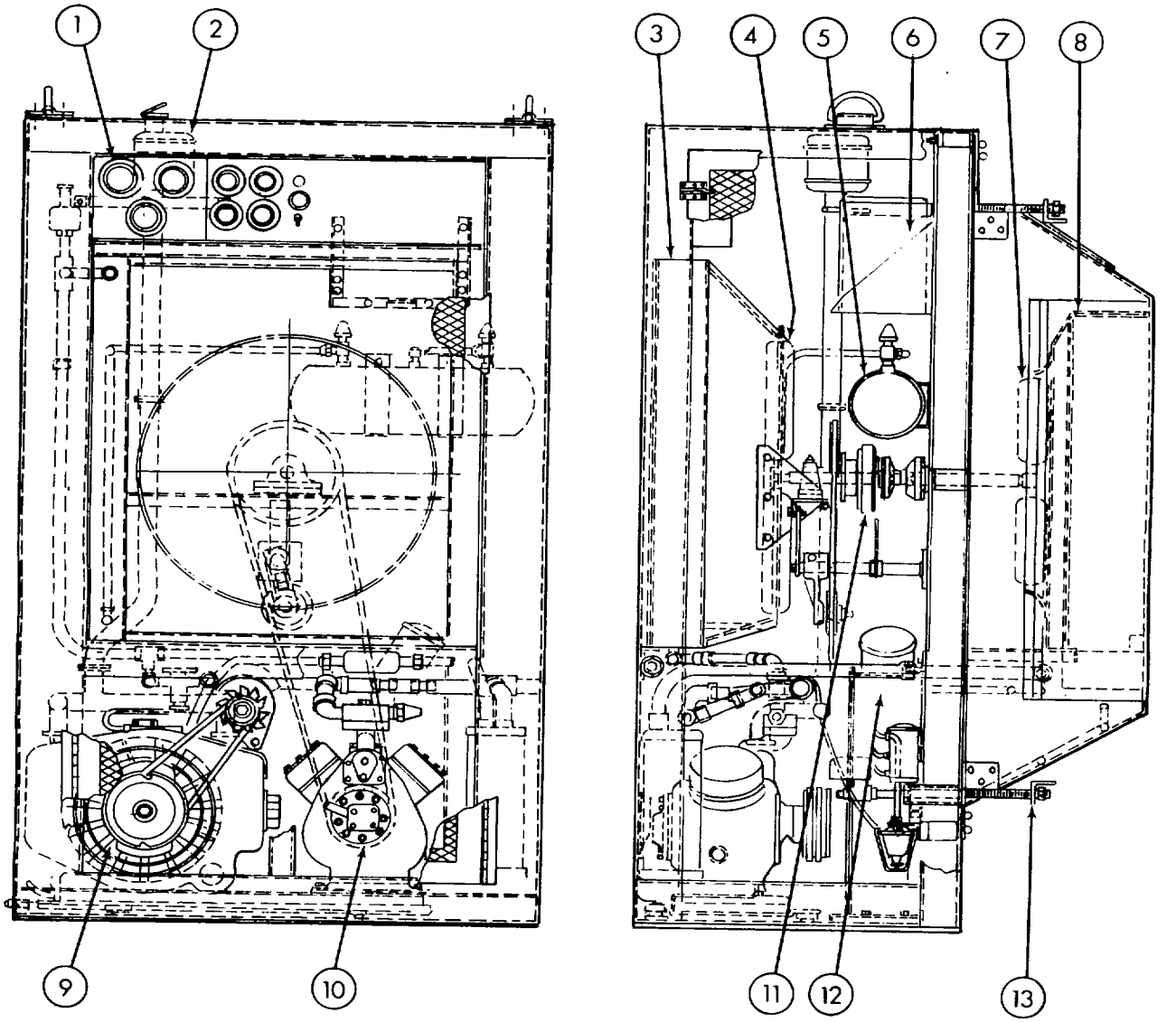


Figure 1-3. Major Components F10000RG-2

1-6. DIFFERENCES BETWEEN MODELS

a. The prime mover for the F10000R-6 is an electric motor.

b. The prime mover for the F1000O RG-2 is a gasoline engine.

c. Any difference between models with respect to operating instructions and maintenance procedures will

be clearly indicated in the applicable parts of this manual. Information and instructions throughout this manual shall apply to both models except where otherwise indicated.

1-7. PERFORMANCE DATA

OPERATING TEMPERATURES

LOW	0°F (-18°C)
HIGH	+120°F (+49°C)

PERFORMANCE (COOLING CAPACITY)

10,000 Btu/hr at 0°F (-180C)
18,000 Btu/hr at 35°F (+1.6°C)

POWER REQUIRED

(F10000R-6 Electric motor driven)

VOLTAGE	208
PHASE	3
HERTZ	60

(F10000RG-2 Gasoline engine driven)

12 volt, waterproof, lead-acid type battery MS35000-1

DIMENSIONS

WIDTH	43.74 inches (111.13 cm)
DEPTH	42.00 inches (106.68 cm)
HEIGHT	71.00 inches (180.34 cm)
WEIGHT	
F10000R-6	900 pounds (408.24 kg)
F1000O RG-2	1125 pounds (510.30 kg)

REFRIGERANT

TYPE	R-12
CHARGE	
F10000R-6	20 pounds (9.07 kg)
F10000RG-2	20 pounds (9.07 kg)

Section III TECHNICAL PRINCIPLES OF OPERATION

1-8. AIR FLOW

a. Condenser. The condenser fan draws ambient (outdoor) air through the condenser coil and expels it through top and side screens of refrigerator unit. This removes heat from the refrigerant passing through the coil.

b. Refrigerated Air (Air Inside Enclosure). The evaporator fan draws air through the evaporator coil and expels it through the top of the evaporator housing. This results in enclosure air losing its heat to the refrigerant passing through the tubes of the evaporator coil.

1-9. OPERATIONAL CYCLE See figure 1-4.

a. The electric motors (F10000R-6) or the gasoline engine (F10000RG-2) start automatically when the unit thermostat calls for cooling. This supplies power to the compressor and fans. On the F10000RG-2 only solenoid valve (item 24) opens during start up allowing the compressor to start with no refrigerant load.

b. The compressor (item 18) converts the low pressure gas refrigerant from the evaporator section to high pressure gas and sends it to the condenser coil (item 1).

(1) The high pressure refrigerant gas is cooled by ambient air flow across the condenser coil (item 1) and condenses to liquid which is stored in receiver tank (item 3).

(2) The liquid refrigerant then passes through a filter-drier (item 5) and liquid indicator sight glass (item 6) into heat exchanger (item 7).

(3) The expansion valve (item 8) regulates flow and reduces pressure so that the liquid refrigerant enters the evaporator (item 10) as a cold, low pressure liquid.

(4) The refrigerant absorbs heat from enclosure air being drawn over and around evaporator coil (item 10).

(5) The refrigerant evaporates to a low pressure gas which is drawn to compressor inlet.

(6) The cycle repeats until the thermostat requirements are met.

1-10. DEFROST CYCLE

To prevent an excessive buildup of frost and ice on the evaporator coil, this refrigeration unit is equipped with an automatic defrost cycle. See figure 1-4.

a. Defrost activating mechanism.

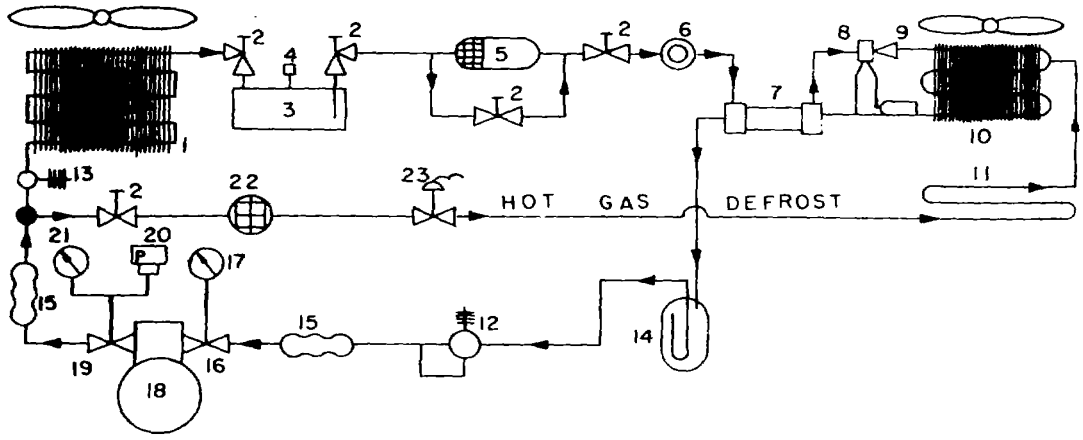
(1) The F10000R-6 is equipped with a timing mechanism which can be set for a 45 minute defrost cycle to occur at any convenient time within each 24 hour period. This control is equipped with a temperature sensor that will stop the defrost cycle prior to the 45 minute setting if a temperature of 43 ± 2°F (6± 1°C) is reached at the sensor location.

(2) The F10000RG-2 is equipped with a preset timing device that activates the defrost cycle every 12 hours. The defrost cycle will shut off when a temperature of 45 ± 4°F (7 ± 2°C) is reached at the sensor location.

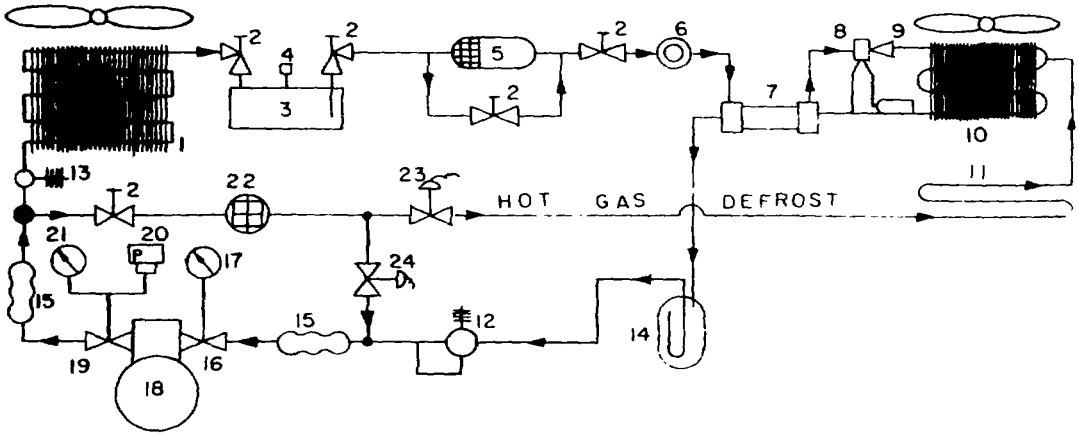
b. The timer opens the hot gas solenoid (23) allowing the hot refrigerant gas to be pumped through the drain pan coil (11) and the evaporator coil (10).

c. The ice and frost on the evaporator coil and the drain pan melt.

d. When the defrost cycle is complete the unit automatically returns to the refrigeration cycle.



F10 000R-6



F10 OOORG-2

1.CONDENSER
2.SHUT OFFVALVE
3.RECEIVER
4.FUSIBLE PLUG
5.FILTER DRIER
6.MOISTURE LIQUID INDICATOR
7.HEAT EXCHANGER
8.THERMOSTATIC EXPANSION VALVE
9.DISTRIBUTOR
IOEVAPORATOR
II.DRAIN PAN COIL
12.CRANKCASE PRESSURE REGULATOR
13.DISCHARGE PRESSURE REGULATOR
14.SUCTION ACCUMULATOR
15.VIBRATION ABSORBER
16.SUCTION SERVICE VALVE
17.COMPOUND GAGE
18.COMPRESSOR
19.DISCHARGE SERVICE VALVE
20.HEAD PRESS CUTOUT SWITCH
21.HEAD PRESSURE GAGE
22.STRAINER
23.HOTGAS SOLENOID
24.HOT GAS COMPRESSOR
BY PASS SOLENOID
(FIO,O00 RG-2 ONLY)

TS-4110-Z34-14/1-4

Figure 1-4. Refrigeration Flow Schematic

CHAPTER 2

OPERATING INSTRUCTIONS

Section DESCRIPTION AND USE OF OPERATOR'S CONTROLS AND INDICATORS

2-1. GENERAL

After the unit has been properly installed and initial preparation for operation is complete the basic unit operation is automatic. The operator should read and become totally familiar with all information pertaining to required observations and services necessary for this unit contained in chapters 1, 2 and 3 of this manual before starting unit.

2-2. OPERATOR'S CONTROLS AND INDICATORS

a. For instrument panel controls and indicators see figure 2-1 for the F10000R-6 and figure 2-2 for the F10000RG-2. After all other checks and services have been completed it is only necessary to turn REFRIGERATION ON-OFF switch to on for automatic operation.

Model F10000RG-2

WARNING

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 the above 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 exhaust system, shut the unit down immediately and have it inspected and repaired at once by a competent mechanic.

WARNING

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.

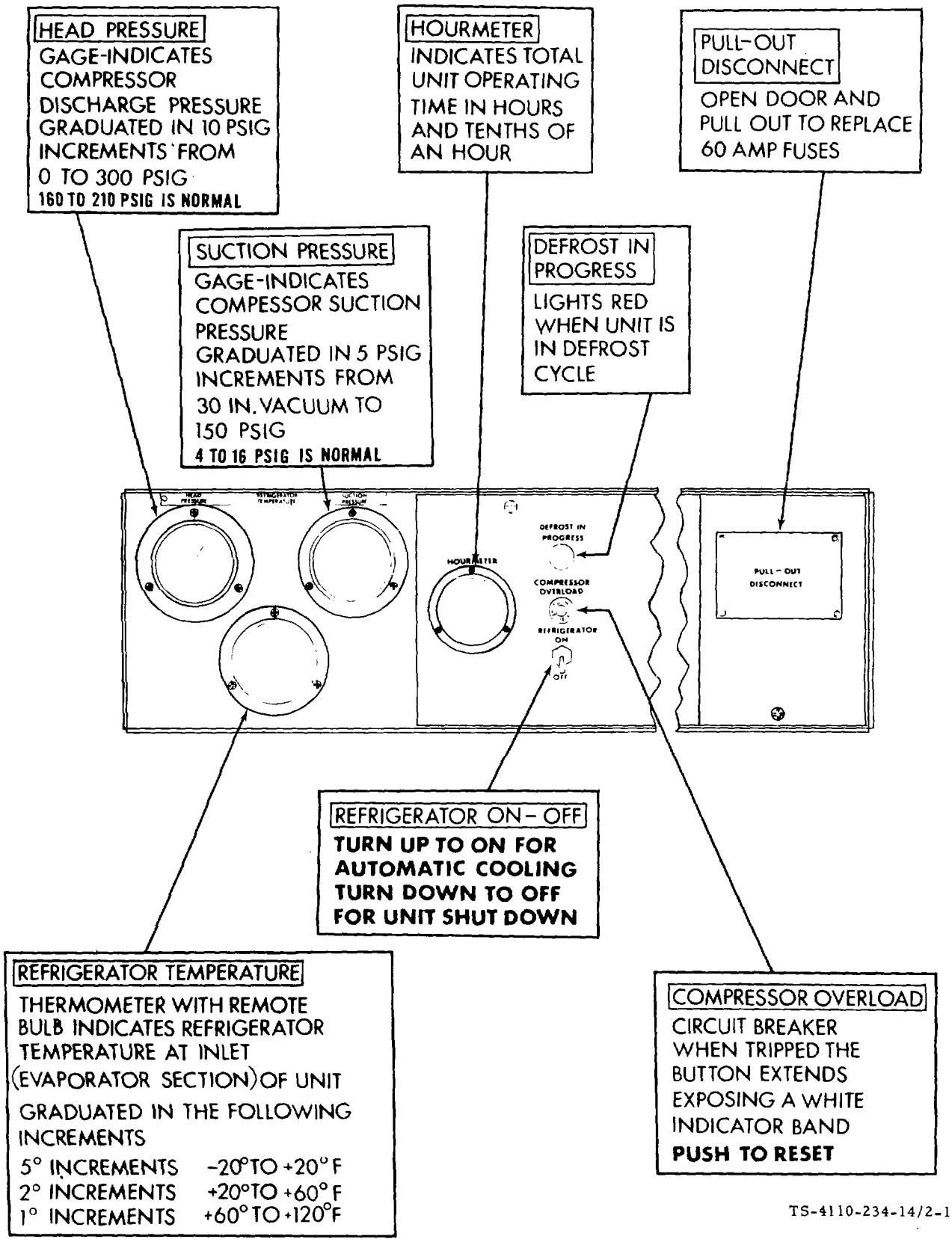


Figure 2-1. Instrument Panel F10000R-6

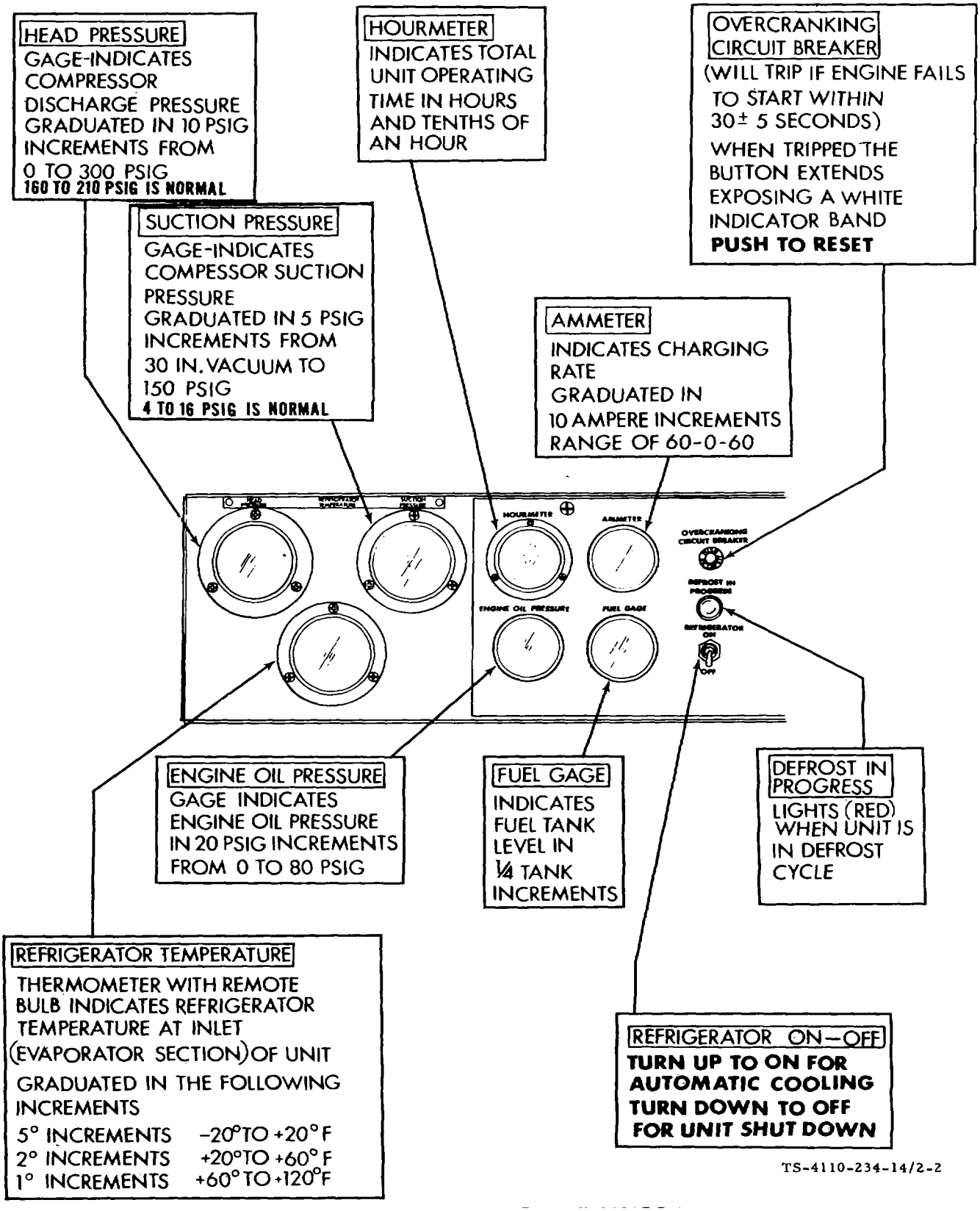


Figure 2-2. Instrument Panel F10000RG-2

b. The indicators located inside the unit are:

(1) Moisture indicating refrigerant sight glass. This indicator is located inside of the left side access door. It indicates the condition of the refrigerant. The moisture sensitive center "bulls eye" will have blue color when in good dry condition. It will change to pink when moisture (water) is present in the refrigerant system indicating possible problems. The actual refrigerant is also visible through this glass port. After 15 minutes of operation the refrigerant observed through this port should be clear and free of bubbles. If refrigerant has a milky appearance or bubbles are present a problem is indicated.

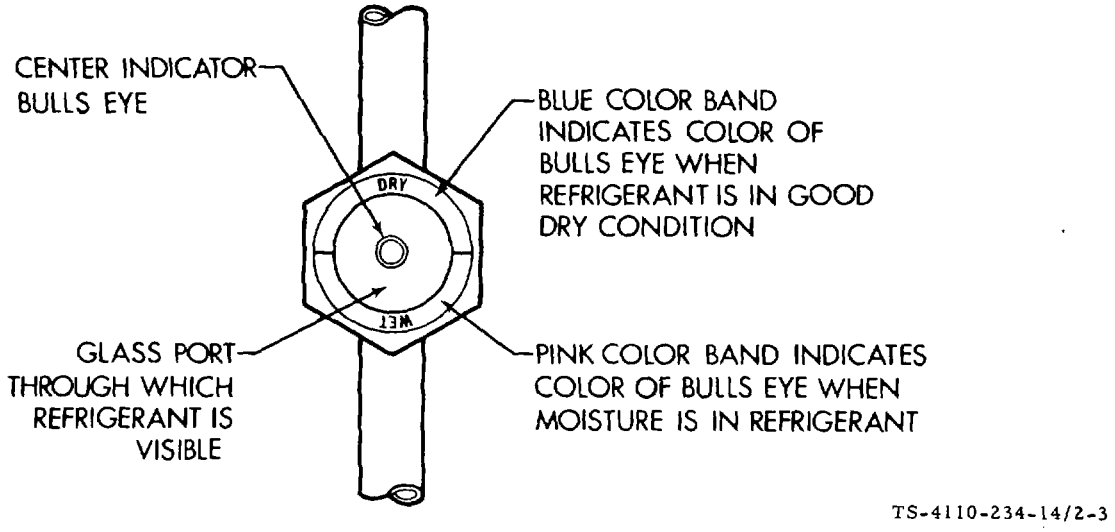


Figure 2-3. Refrigerant Sight Glass

(2) Compressor oil level sight glass. The compressor oil level should be observed with the compressor running. If the oil level in the sight glass is less than one-eighth (1/8) up from the bottom of the glass, this indicates a low oil level. If the oil level is up more than one-half (1/2) from the bottom, this indicates a high oil level. Therefore, the oil level should be 1/8 to 1/2 up the sight glass when the compressor is running.

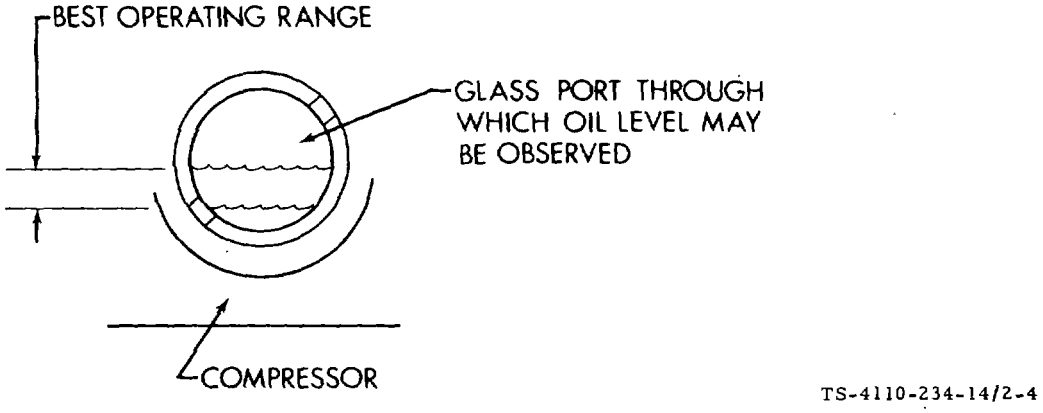


Figure 2-4. Compressor Oil Level Sight Glass

(3) Engine oil level indicator. (F1OOOORG-2 only)

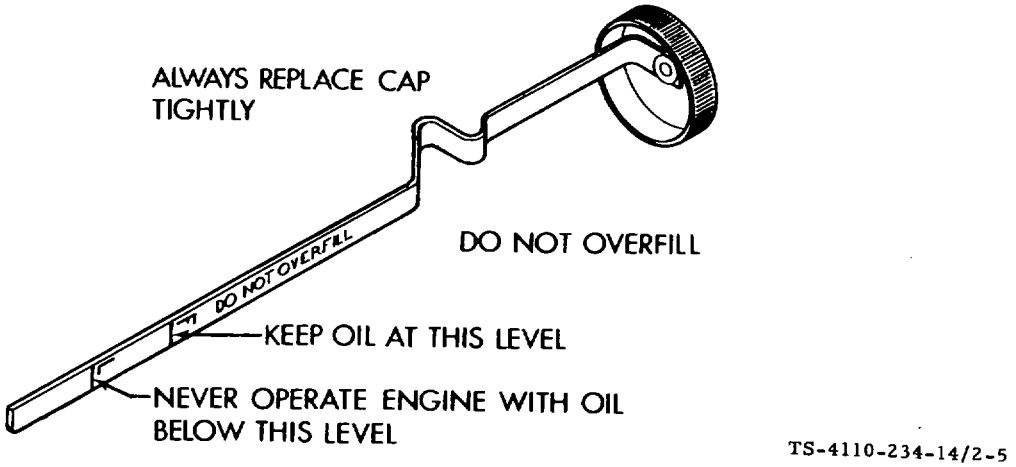


Figure 2-5. Engine Oil Level Indicator

Section II PREVENTIVE MAINTENANCE CHECKS AND SERVICES. (PMCS)

2-3. GENERAL

Preventive maintenance checks and services (PMCS) are essential to the efficient operation of the refrigerator 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 contained in this technical manual and plates installed on the equipment that are associated with operating functions. Perform your during (D) PMCS from Table 2-1.

b. While You Operate. Always keep in mind and observe the WARNINGS and CAUTIONS contained in this technical manual and plates installed on the equipment that are associated with operating functions. Perform your during (D) PMCS from Table 2-1.

c. After You Operate. Be sure to perform your after (A) PMCS from Table 2-1.

d. If Your Equipment Fails to Operate. Troubleshoot within your capabilities. Report any deficiencies as appropriate using the proper form as specified in TM 38-750.

NOTE

Within designated intervals, these checks are to be performed in the order listed.

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.

B - Before A - After M - Monthly

D - During W - Weekly

See figures 2-6, 2-7, 2-8 and 2-9 for location and identification of items.

Table 2-1.
OPERATOR PREVENTIVE MAINTENANCE
CHECKS AND SERVICES

ITEM NO	INTERVAL					Items to be Inspected	Procedures. Check for and have repaired or adjusted as necessary	For readiness reporting. Equipment is not ready/ not available if:
	B	D	A	W	M			
1	*					Panels, doors and screens	Check for obstructed screens, loose or missing hardware or parts, and obvious damage	Missing panels, doors or screens, or damage that would cause operating hazard.
2	*					Wires and cables	Inspect for cuts, broken or exposed wires, and loose connections.	Wires are cut, broken, loose or exposed.
3	*					Fans	Inspect for loose set screws or bent or broken blades	Set screws are loose or blades are missing or broken.
							Observe fans during operation for excessive vibration(Do not open door.)	Excessive vibration is observed.
4	*					Belts	Inspect for loose, worn or missing belts(1/2 inch (1.3 cm) defection midway between pulleys.)	Belts are loose, excessively worn or missing.
5	*					Clutch and Idler (F1OOOORG-2 only)	Inspect for loose or missing parts and proper belt tension.	Parts are loose or missing.
6	*	*				Bearings,pulleys, and fan shaft	Inspect for loose parts or obvious damage.	Parts loose or damaged.
7	*					Unit housing	Check for cracks and dents. Check for secure mounting to wall, condition of seal to wall and proper drainage of condensate water, loose mounting or missing lifting fittings.	Loose mountings, blocked drain or loose or damaged seal.
8	*					Condenser and Evaporator coils	Inspect for dirt, dented fins or other obstructions that would reduce air flow.	Coils are in any way obstructed for air flow.
9	*					Refrigeration tubing, valves and fittings	Inspect for obvious leaks, dented tubing	A leak is detected or tubing dented so as to interfere with flow.

Table 2-1.
OPERATOR PREVENTIVE MAINTENANCE
CHECKS AND SERVICES

ITEM NO	INTERVAL					Items to be Inspected	Procedures. Check for and have repaired or adjusted as necessary	For readiness reporting. Equipment is not ready/ not available if:
	B	D	A	W	M			
10	*					Compressor	Inspect flywheel on F10000R-6 for cracks and loose mountings.	Cracked or mounting is loose.
		*					Observe compressor oil level (see para 2-2b(2)	Oil level is excessively high or low.
11	*				*	Engine(F10000RG-2 only)	Check engine oil level (See para 2-2b(3), Add oil as needed.	
12	*					Fuel tank (F 1000RG-2 only)	Inspect for leaks or obvious damage, Add gasoline as needed.	Leaks or damage that would interfere with operation or create a hazard are found.
13	*					Fuel strainer (F10000RG-2 only)	Check sediment bowl for contaminants	Excessive dirt or other matter in sediment bowl.
14	*					Fuel lines (F10000RG-2 only)	Inspect for kinked lines, cuts, leaks and loose connections	Any problem is found that would create a hazard or interfere with the operation of the unit.
15	*					Gages, meters, lights and switches	Check for loose mountings, broken or missing parts.	Parts are broken or missing.
		*					Observe for proper indication during operation.	Parts are not functioning.
16		*				Refrigerant sight glass	After 15 minutes of operation in cooling cycle check for bubbles or milky flow indicating low refrigerant charge. Check for pink color which indicates presence of moisture.	Bubbles, milky flow or pink color is observed.
17	*		*			Battery (F10000RG-2 only)	Check water level and for loose or corroded terminals.	
18	*					Electric motor (F10000R-6 only)	Check for loose mountings.	

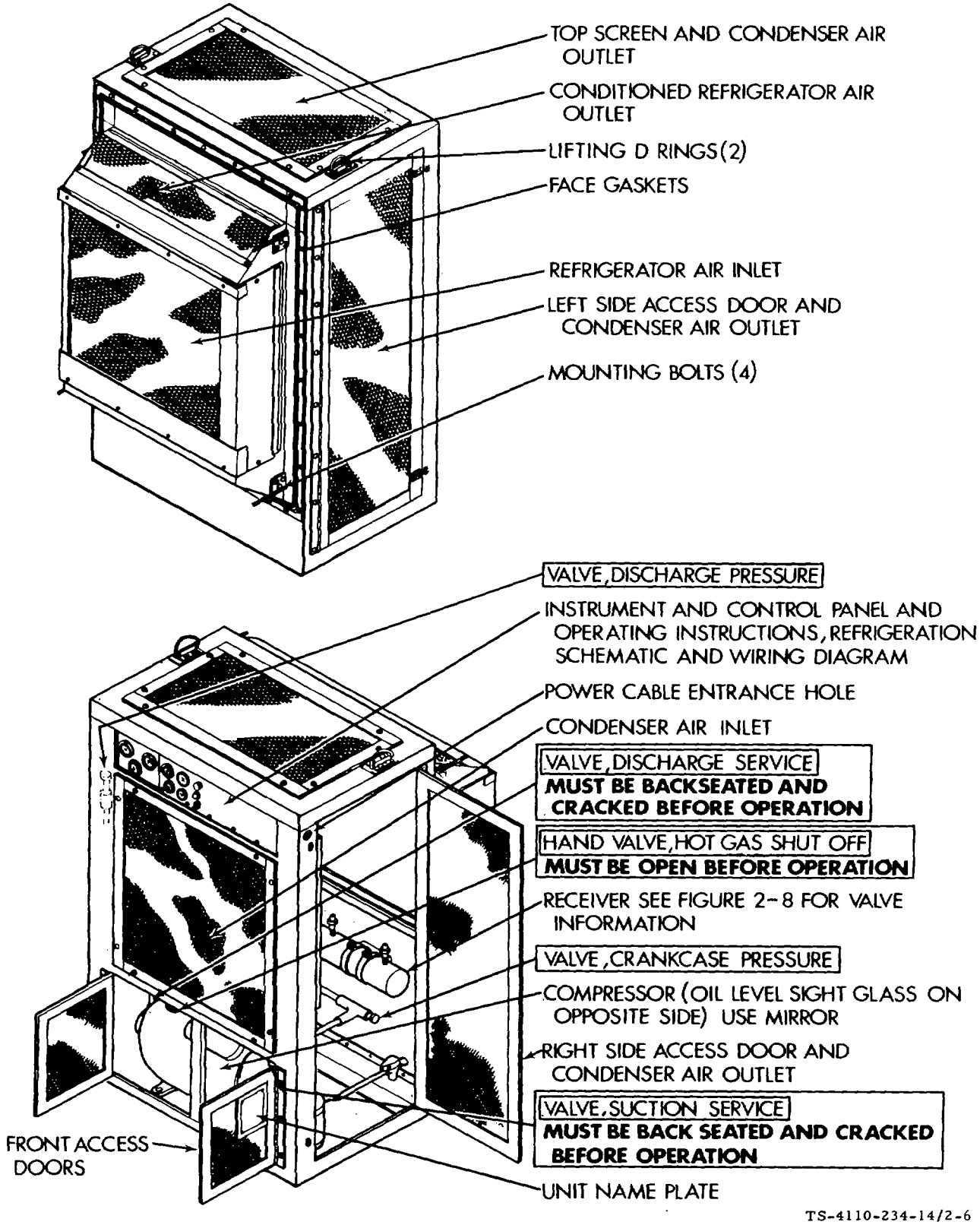


Figure 2-6. F10000R-6 General Identification of Items

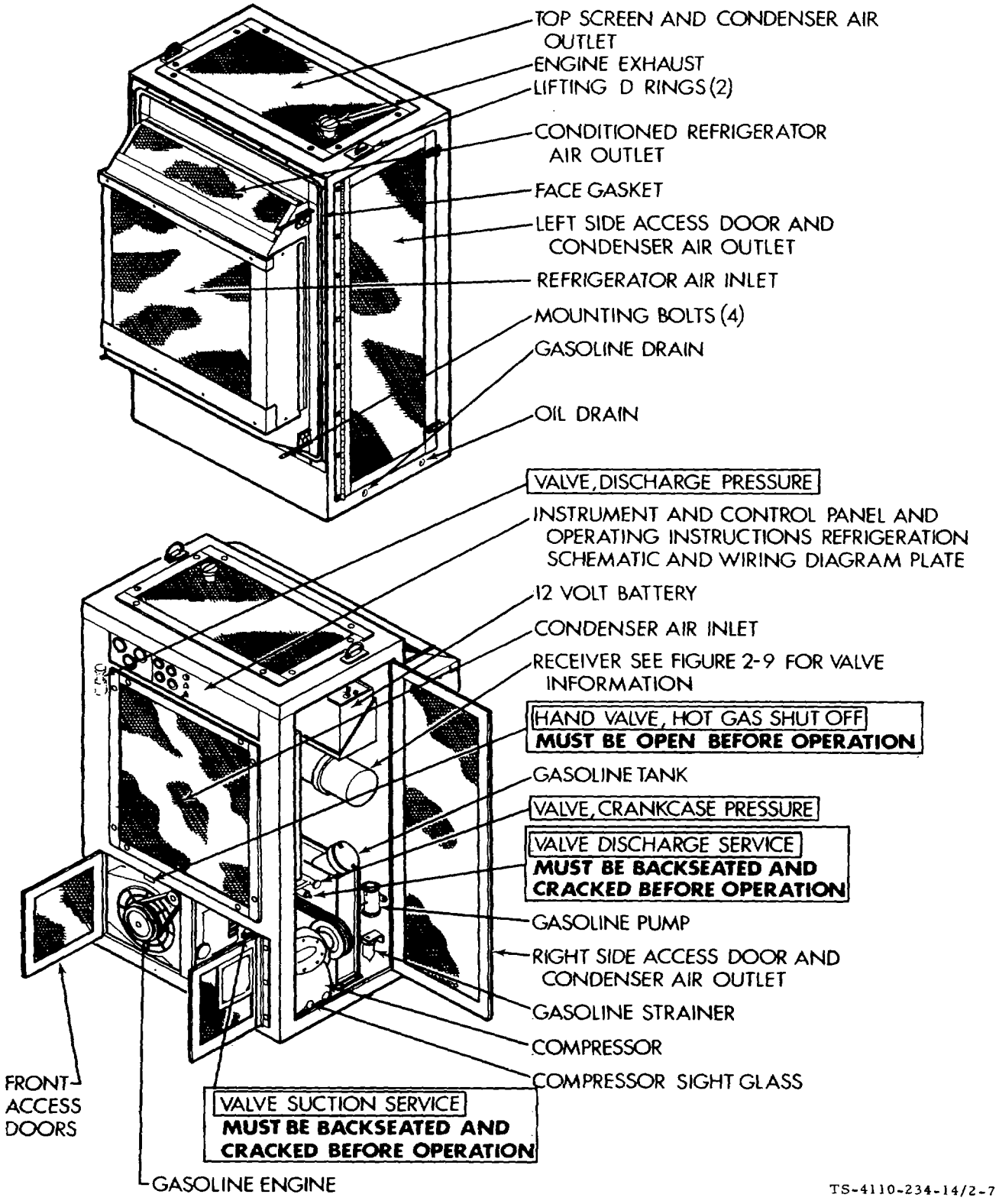


Figure 2-7. F10000RG-2 General Identification of Items

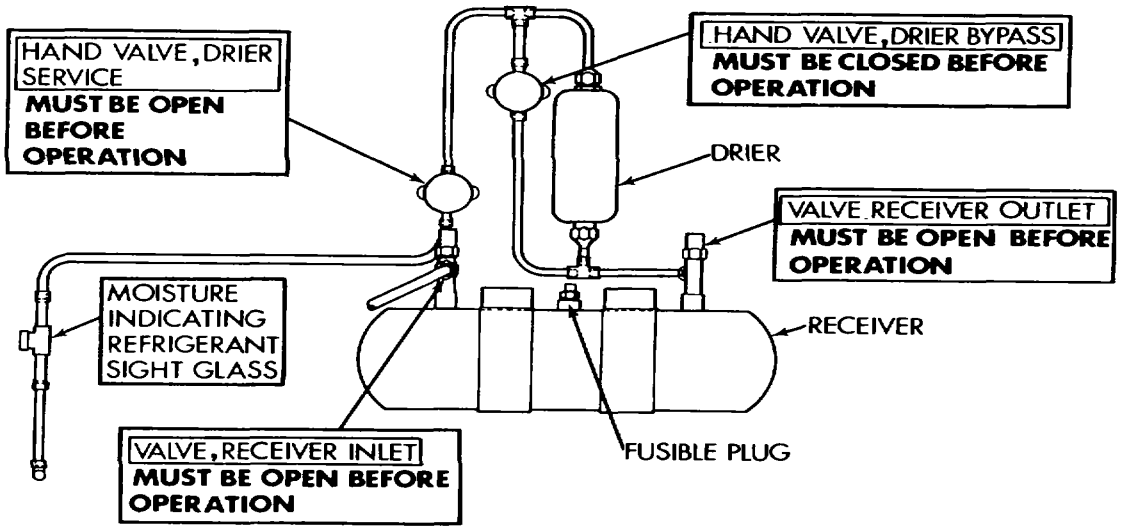


Figure 2-8. Receiver and Drier Valves F10000R-6

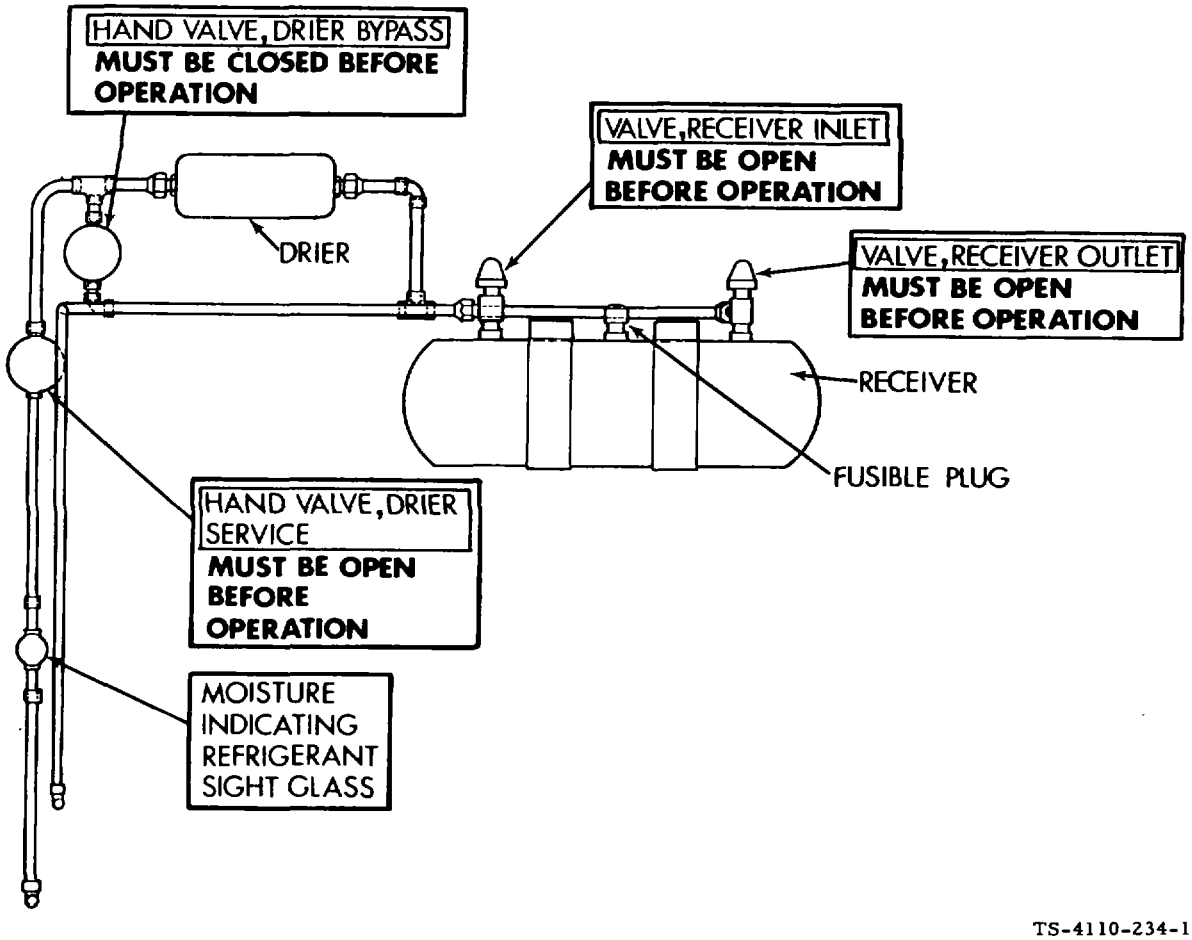


Figure 2-9. Receiver and Drier Valves F10000RG-2

Section III OPERATION UNDER USUAL CONDITIONS

2-4. ASSEMBLY AND PREPARATION FOR USE

Services of organizational maintenance should be employed for original unpacking, assembly installation and preparation for use. See paragraphs 4-4 through 4-9.

2-5. INITIAL ADJUSTMENTS AND CHECKS

a. Inspect all panels, doors, and screens for loose mounting, obstructions or shipping damages. See that all tubing and hoses are properly in place and that connections are tight. Inspect instrument panel for visual damage and loose mountings. Report any deficiencies to organizational maintenance.

b. Perform the preventive maintenance checks and services listed in Table 2-1.

Model F10000RG-2

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.

c. On Model F1000ORG-2 check the battery water level. Fill with distilled or drinking water up to approximately 9/16 inch (1.43 cm) above the top of the separators.

2-6. OPERATING PROCEDURES

CAUTION

Before initial start up and after periods of extended shut down check to see that organizational maintenance has properly set (Valves should be tagged) the following valves.

Operators should not adjust valves.

- VALVE, RECEIVER INLET must be open.
- VALVE, RECEIVER OUTLET must be open.
- HAND VALVE, HOT GAS SHUT OFF must be open.
- HAND VALVE, DRIER SERVICE must be open.
- HAND VALVE, DRIER BYPASS must be closed.
- COMPRESSOR VALVE, SUCTION SERVICE must be "backseated and cracked."
- COMPRESSOR VALVE, DISCHARGE SERVICE must be "backseated and cracked."

a. Fuel System Checks. (Model F10000RG-2 only).

WARNING

Do not fill gasoline tank while engine is in operation.

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) Checking Fuel Supply. The engine consumes approximately one gallon (3.8 litres) of fuel per hour. The fuel tank can hold 16 gallons (60.5 litres) of fuel.

(2) Add regular gasoline as needed.

b. Engine Checks and Services (Model F10000RG-2). Ensure that all the instructions of paragraph 4-5 have been followed, particularly those regarding crankcase oil.

c. The thermostat will have been set to the proper temperature at time of installation. Should it become necessary to change this setting contact organizational maintenance.

d. The main power pull out disconnect on the F10000R6 unit will have been set to the proper position at installation.

e. To start the unit, place the REFRIGERATOR ON-OFF toggle switch to the on position.

NOTE

In an emergency situation if a serviceable battery for Model F1000O RG-2 is not available, it is possible to rope start the engine.

f. Operation. After the start-up procedure, the unit will start, stop and defrost automatically while maintaining the required temperature as set on the thermostat.

g. Shutdown Procedure. To stop the unit place the REFRIGERATOR ON-OFF switch in the OFF position.

h. For extended shut down periods contact organizational maintenance.

2-7. PREPARATION FOR MOVEMENT

When the unit is to be moved, the services of organizational maintenance shall be employed for the necessary preparations. See Chapter 4, Section VI.

2-8. OPERATING INSTRUCTIONS ON DECALS AND INSTRUCTION PLATES

a. The control panel has basic operating and maintenance instructions printed on the front side. The wiring diagram is printed on the back side.

NOTE

Some of the instructions on this plate do not apply to the operator.

b. The unit identification nameplate is located on the lower right front access door.

c. The following valves are tagged for identification (See figures 2-6, 2-7, 2-8 and 2-9 for their locations in the unit).

(1) VALVE, DISCHARGE PRESSURE

(2) HAND VALVE, DRIER BYPASS

(3) HAND VALVE, HOT GAS SHUT OFF

(4) HAND VALVE, DRIER SERVICE

(5) VALVE, DISCHARGE SERVICE

(6) VALVE, SUCTION SERVICE

(7) VALVE, RECEIVER INLET

(8) VALVE, RECEIVER OUTLET

(9) VALVE, CRANKCASE PRESSURE

Section IV OPERATION UNDER UNUSUAL CONDITIONS

2-9. OPERATION IN EXTREME COLD

Operation is basically the same as under usual conditions. It is best not to disturb wiring during extremely cold weather since wire and insulation become brittle and may easily be broken. For Model F10000RG-2 check the following items closely:

a. Use correct oil for temperature conditions (fig. 3-1). Change oil only when engine is warm.

b. Use fresh fuel.

c. Keep fuel system clean and batteries in a well charged condition.

d. Partially restrict condenser air flow, but use care to avoid overheating.

2-10. OPERATION IN EXTREME HEAT

Operation is basically the same as under usual conditions, but take extra care that condenser air flow is not hampered by obstructions in front of coil. Notify direct support if coil is dirty. For Model F10000RG-2 when operating the engine in temperatures above 75°F (24°C), pay particular attention to the following items to prevent damage:

a. Keep the engine cooling fins clean and free of obstruction which would decrease air flow to and from the engine.

CAUTION

Plugged or clogged cooling fins can cause overheating and engine damage.

b. See that nothing obstructs air flow to and from the engine.

c. Ensure that you are using the proper grade and weight of oil for the temperature the engine is being used in (para. 3-2). Check the oil level each time you fill the fuel tank.

d. Check the battery water level more frequently than every 50 hours which is recommended under normal conditions. High temperatures cause faster evaporation.

2-11. OPERATION IN DUSTY OR SANDY AREAS

Sand, dust, dirt, smoke, soot and other debris can seriously reduce the efficiency of the air conditioner. Where this contamination is a problem, it is essential that the frequency of maintenance performed on the coils, filter and fans be increased. Observe the following precautions:

a. Clean refrigerator frequently. Dirt or dust accumulation on the condenser tubes and fins may cause increased compressor discharge pressure. If tubes or fins are coated, decreased efficiency of the refrigeration unit will result.

b. Keep all controls and wiring covered as much as possible.

c. For Model F10000RG-2 take these additional precautions:

(1) Keep engine clean. Keep cooling system clean.

(2) Service air cleaner as frequently as required.

(3) Change crankcase oil and filter more often than recommended under normal conditions.

2-12. OPERATION UNDER RAINY OR HUMID CONDITIONS

The equipment is reasonably weatherproof; however, during periods of extremely wet, windy and humid weather, the following precautions should be observed to provide maximum protection to the unit and to assure efficient operation:

a. Shield fuel tank opening on the F10000RG-2 when filling to avoid water contamination of gasoline.

b. Increase the frequency of maintenance performed on components subject to corrosion such as electrical points and contacts.

2-13. OPERATION IN SALT WATER AREAS

a. Increase the frequency of maintenance on electrical components with points and contacts and cleaning of the condenser tubes and fins.

b. All exposed areas should be spray-rinsed or sponged with clear water periodically to remove salt encrustations.

2-14. OPERATION AT HIGH ALTITUDES

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.

CHAPTER 3

OPERATOR'S MAINTENANCE INSTRUCTIONS

Section I LUBRICATION INSTRUCTIONS

3-1. GENERAL INFORMATIONI

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

b. Cleaning. Keep all external parts not requiring lubrication clean and free of lubricants. Wipe all lubrication points free of dirt and grease. Clean all lubrication points after lubrication to prevent accumulation of foreign matter.

3-2. ENGINE OIL LEVEL

WARNING

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

For the F10000RG-2 check the engine crankcase oil level every eight hours of operation. (See fig. 2-5). Add oil that conforms to MIL-L-2104. Do not use oil designated CD unless it also designates SE.

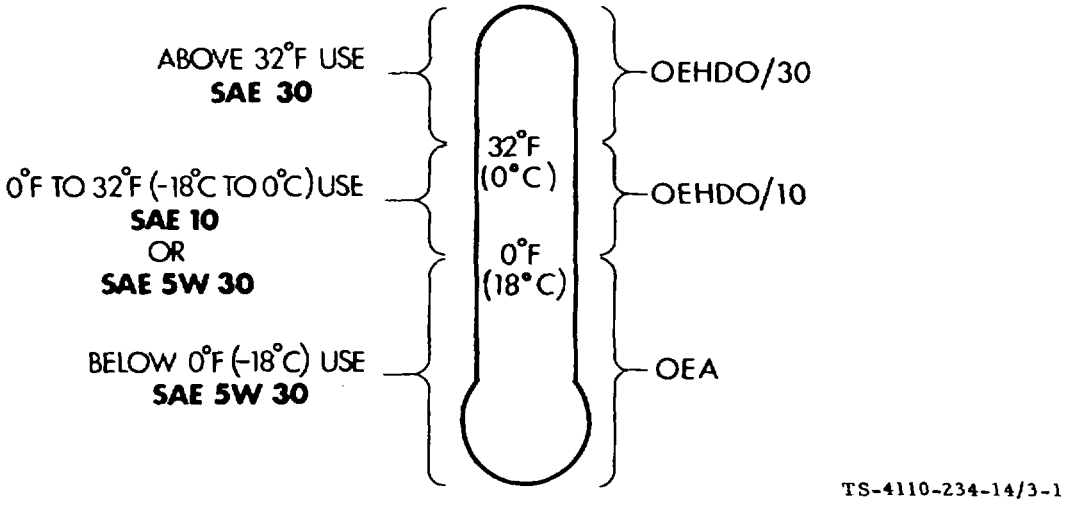


Figure 3-1. Engine Oil F10000RG-2

3-3. COMPRESSOR OIL LEVEL (See fig. 2-4)

Check the level in the compressor sight glass while the compressor is running. The oil level should be from one eighth to one half of the way up from the bottom of the sight glass. If the level is either less than one eighth or more than one half, report the condition to organizational maintenance.

Section II TROUBLESHOOTING PROCEDURES

3-4. USE OF TABLE

Table 3-1 contains troubleshooting instructions designed to be useful in diagnosing and correcting unsatisfactory operation or failure of the refrigerator.

a. Table 3-1 lists the common malfunctions which you may find during the operation or maintenance of the refrigeration unit or its components. 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.

c. Any trouble or corrective action beyond the scope of operator maintenance shall be reported to organizational maintenance.

TABLE 3-1. OPERATOR'S TROUBLESHOOTING

MALFUNCTION TEST OR INSPECTION CORRECTIVE ACTION
1. REFRIGERATION UNIT DOES NOT START
Step 1. Check that REFRIGERATOR ON-OFF Switch is in the ON position. Turn switch ON.
Step 2. On Model F10000R-6 check that main power cable is connected and that power source is on. Connect power cable and turn on power.
Step 3. On Model F10000RG-2 check that fuel tank is not empty. Fill with gasoline.
Step 4. On Model F10000RG-2 check that battery is not in discharged condition. Report to organizational maintenance.
Step 5. On Model F10000R-6 check to see if OOMPRESSOR OVERLOAD circuit breaker is tripped. Reset (push in) circuit breaker. If circuit breaker continues to trip or will not reset contact organizational maintenance.
Step 6 On Model F10000RG-2 check to see if OVERCRANKING CIRCUIT BREAKER is tripped. Reset (push in) circuit breaker. If circuit breaker continues to trip or will not reset contact organizational maintenance.
Step 7. On Model F10000RG-2 check gasoline strainer sediment bowl for dirt or visible contaminants. Contact organizational maintenance for cleaning of fuel strainer.
2. REFRIGERATION UNIT RUNS CONTINUOUSLY
Step 1. Check for excessive leakage of warm air into enclosure. Keep enclosure door closed and check gaskets for leaks.
Step 2. Check evaporator and condenser coils for blockages. Remove obvious blockages from outsides of screens. If coils are dirty or clogged inside of screens contact organizational maintenance.
Step 3. Check the refrigerant sight glass. If refrigerant has a milky appearance, bubbles are present or center indicator has a pink color contact organizational maintenance.
Step 4. Check arrangement of items in refrigerator enclosure for free air passage to and from evaporator coil.

TABLE 3-1. OPERATOR'S TROUBLESHOOTING (cont.)

MALFUNCTION TEST OR INSPECTION CORRECTIVE ACTION

Rearrange items in refrigerator enclosure.

Step 5. Check for loose or missing drive belts. 1/2 inch (1.3 cm) deflection midway between pulleys.
Contact organizational maintenance if belts are loose or missing.

3. INSUFFICIENT COOLING.

Step 1. Check for excessive leakage of warm air into enclosure.
Keep enclosure door closed and check gaskets for leaks.

Step 2. Check coils for blockages.
Remove obvious blockages from outsides of screens. If coils are dirty or clogged inside of screens contact organizational maintenance.

Step 3. Check the refrigerant sight glass.
If after 15 minutes of operation, the refrigerant has a milky appearance, bubbles are present or the center indicator has a pink color contact organizational maintenance.

Step 4. Thermostat may be set too high.
Contact organizational maintenance.

Step 5. Check arrangement of items in refrigerator enclosure for free air passage to and from evaporator coil.
Rearrange items in refrigerator enclosure.

Step 6. Check for loose or missing drive belts. 1/2 inch (1.13 cm) deflection midway between pulleys.
Contact organizational maintenance if belts are loose or missing.

CHAPTER 4

ORGANIZATIONAL MAINTENANCE INSTRUCTIONS

Section I REPAIR PARTS, SPECIAL TOOLS, TMDE, AND SUPPORT EQUIPMENT

4-1. GENERAL

a. For authorized common tools and equipment, refer to the 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 equipment found in any organizational maintenance shop.

c. Repair parts are listed and illustrated in the Repair Parts and Special Tools (RPSTL) List TM 5-4110-234-24P covering organizational and direct support maintenance for this equipment.

Section II SERVICE UPON RECEIPT

4-2. UNLOADING

The refrigeration unit may be removed from the bed of the carrier by either a crane or forklift truck. Be sure that the crane or forklift truck is large enough to handle the load. If the unit is to be removed with a crane, install suitable slings around the bottom of the shipping package. Keep the equipment in an upright position at all times.

WARNING

Do not allow the unit to swing while suspended from a lifting device. Failure to observe this warning may result in injury to personnel and damage to the equipment.

4-3. UNPACKING

a. General. Normally, the packaged refrigerator should be moved into the immediate area in which it is to be installed before it is unpacked.

NOTE

The shipping container is of such a design that it may be retained for reuse for mobility purposes if frequent relocation of the refrigerator is anticipated.

b. Remove Shipping Container.

(1) Remove top of the crate.

(2) Remove front and rear ends.

(3) Remove sides of crate.

(4) Remove the packing material and protective covering material.

(5) Remove the technical publications envelope and all other containers and put them in a safe place.

(6) Loosen the four mounting angle nuts that hold the unit to the center wood frame.

(7) Remove the center wood frame.

(8) Lift refrigerating unit from skid by the two Dee type lifting rings provided on top of the unit.

4-4. RECEIVING INSPECTION

Perform receiving inspection of the refrigerator in the following manner:

a. Inspect the equipment for damage incurred during shipment. If the equipment has been damaged, report / damage on DD Form 6, Packaging Improvement Report.

b. Check the equipment against the packing slip to see if the shipment is complete. Report all discrepancies in accordance with the instructions of TM 38-750.

c. Check to see whether the equipment has been modified.

4-5. SITE SELECTION

This refrigeration unit is designed for outdoor installation and is fitted for mounting to the outdoor side of a vertical wall. The evaporator section is designed to protrude inside the enclosure to be cooled. Select a site which meets the following requirements:

a. The prime consideration for the condenser is that there should be free access for outside air to and from the condenser coil. Keeping in mind that intake air is through the front of the condenser coil and that discharge is outward through the lower front expanded metal access doors, the left and right expanded metal access doors and the top screen. Locate the unit so that there is a minimum of 36 inches of free space to the front and both sides of the condenser section of the unit.

b. Make use of terrain features, trees or buildings, if possible, to provide a shaded location. This minimizes the cooling load on the refrigeration system.

c. Do not locate the condenser unit where intake air is likely to be laden with dust, dirt, soot, smoke or other debris.

d. For Model F10000R-6 the unit should be located as near as possible to a source of 208 volt, three phase, 60 hertz, 4 wire ac electric power.

e. For Model F1000ORG-2.

WARNING

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.

(1) The engine exhaust extends out of the top of the condenser section. Locate the unit so that exhaust is not obstructed and prevailing winds do not blow exhaust gas toward operating or maintenance personnel.

(2) Do not locate unit in an area where the handling of gasoline would be dangerous.

4-6. INSTALLATION SITE PREPARATION

The unit is designed to be installed with the evaporator section extending through a cutout in the prefabricated panel type refrigerator wall. See figure 4-1 for cutout dimensions.

4-7. REFRIGERATOR UNIT PREPARATION FOR INSTALLATION

a. Check to be sure that all shipping seals and protective pads and covers have been removed.

b. The F10000RG-2 is powered by a gasoline engine. Deprocess the engine in accordance with instructions contained on DA Form 2258 or DD Form 1397 attached to the equipment.

c. Inspect unit for any obvious shipping damage. Check the four mounting bolts and mounting angles.

d. Carefully inspect the gasket seal on the back of the condenser section. Any damages to this gasket will result in air and heat leakage to the refrigerator compartment.

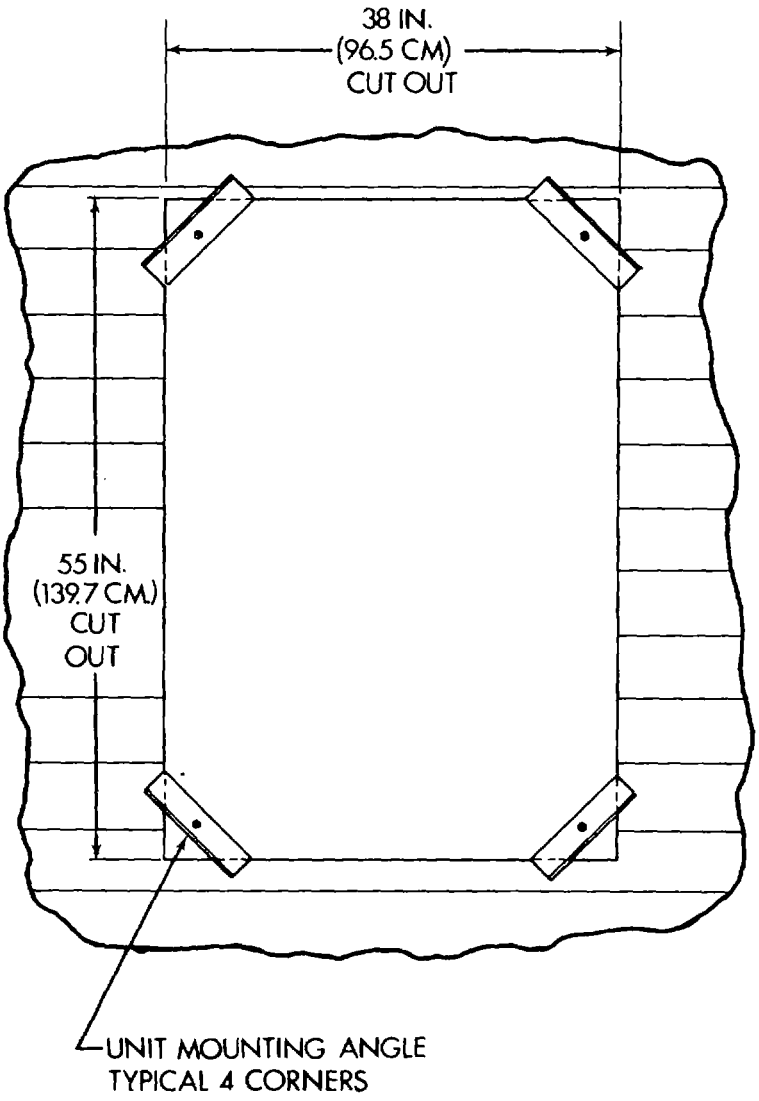


Figure 4-1. Wall Opening Dimensions

4-8. INSTALLATION INSTRUCTIONS

a. See paragraph 4-5 for site selection.

b. Remove the four mounting angles and the attaching hardware.

c. Move the unit into position.

d. Check the area of the wall where the gaskets will seal. This must be a smooth, clean, flat surface.

e. Carefully guide the evaporator section through the wall opening.

f. When the unit is approximately in place check gasket seal area for uniform clearance between the sides of the wall opening and slide the unit straight back until the gasket makes uniform contact with the wall.

g. If gasket contact is not uniform top to bottom, shim the unit until a uniform seal contact is obtained.

h. From the inside of the box, place the four mounting angles on the bolts extending through the four corners of the opening. See figure 4-1.

i. Holding the angles in place install the washers and nuts finger tight to all four corners.

j. Uniformly tighten all four points taking a few turns on each in rotation to insure an even seal.

k. When the gasket is compressed evenly to approximately 1/2 to 2/3 of its original thickness a good seal has been achieved.

4-9. UNIT PREPARATION FOR OPERATION

a. VALVE, RECEIVER INLET must be in the fully open position. Remove protective cap and using a refrigerant valve wrench or other suitable wrench open the valve. Screw the protective cap back in place. Tag the valve "THIS VALVE IS OPEN."

b. VALVE RECEIVER OUTLET must be in the fully open position. Remove protective cap and using a refrigerant valve wrench or other suitable wrench open the valve. Screw the protective cap back in place. Tag the valve "THIS VALVE IS OPEN."

c. HAND VALVE, HOT GAS SHUT OFF must be in the fully open position. Tag the valve "THIS VALVE IS OPEN."

d. HAND VALVE, DRIER SERVICE must be in the fully open position. Tag the valve "THIS VALVE IS OPEN."

e. HAND VALVE, DRIER BYPASS must be in the fully closed position. Tag the valve "THIS VALVE IS CLOSED."

f. Compressor VALVE, SUCTION SERVICE must be backseated and cracked. Remove the protective cap and using a refrigerant valve wrench or other suitable wrench turn the stem fully counterclockwise to "backseat" and then turn clockwise one turn to "crack." Screw the protective cap in place. Tag the valve "THIS VALVE IS BACKSEATED AND CRACKED."

g. Compressor VALVE, DISCHARGE SERVICE must be backseated and cracked. Remove the protective cap and using a refrigerant valve wrench or other suitable wrench turn the stem fully counterclockwise to "backseat" and then turn clockwise one turn to "crack." Screw the protective cap in place. Tag the valve "THIS VALVE IS BACKSEATED AND CRACKED."

h. Open the control panel by removing the two screws at the top of the control panel. (see figures 4-2 and 43 for internal component location.)

- Set the thermostat to the desired temperature.
- The time that the 45 minute defrost cycle starts can be changed on the F10000R6 by observing when the defrost cycle starts and rotating the shaft to a more desirable time. One full 3600 rotation is equal to a 24 hour period. The defrost timer on the F10000RG-2 is not adjustable
- Check components for loose wires or any obvious shipping damage.
- Close control panel and install screws.

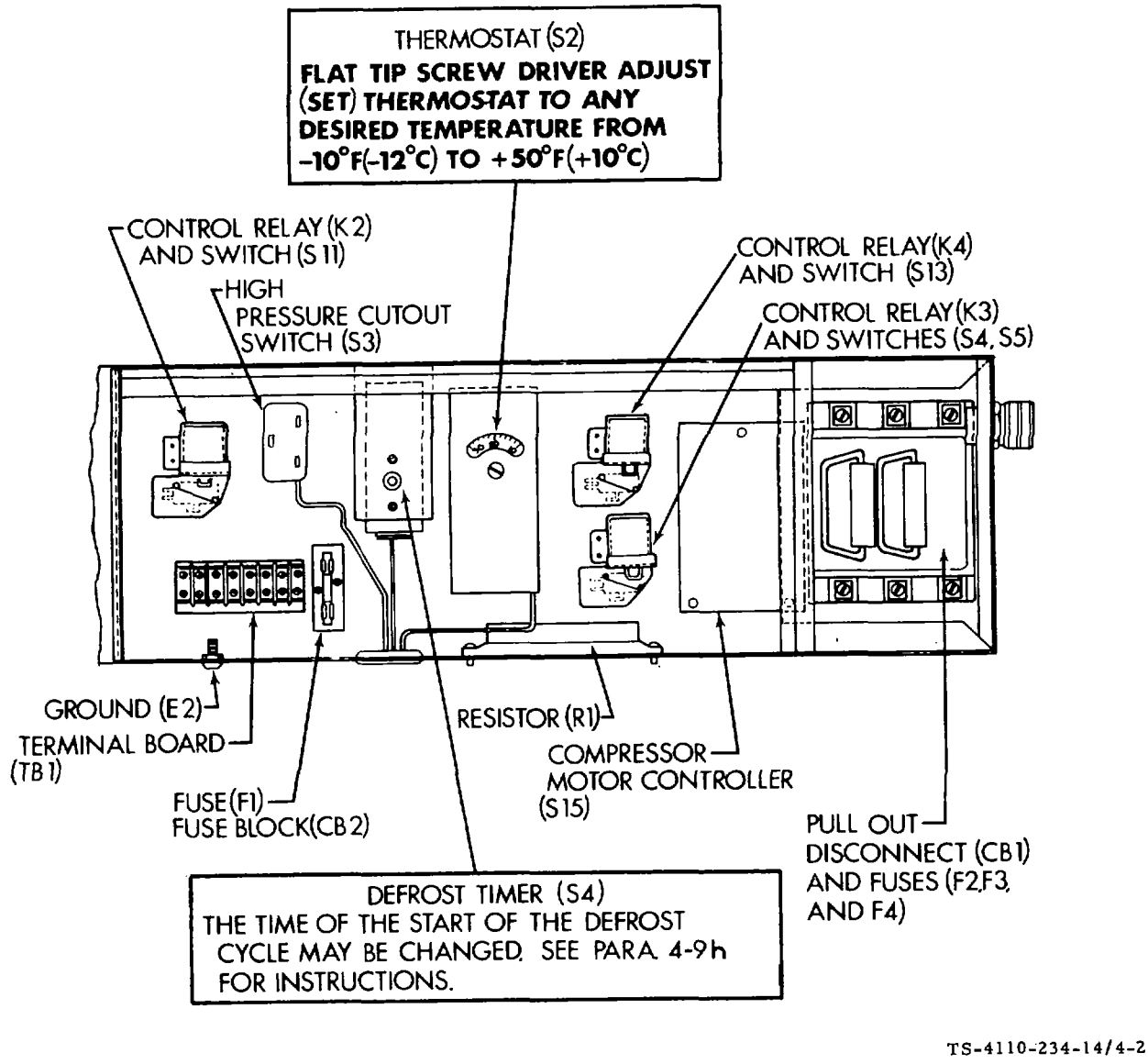


Figure 4-2. Control Panel Internal Components F1000OR-6

i. Belt Adjustment.

CAUTION

1. On Model F10000R-6 the fan drive belt was slackened for shipment. Do not operate the unit before adjusting the belt.
2. On Model F10000RG-2 the two compressor belts and the fan belt were slackened for shipment. Do not operate the unit before adjusting the belts.

(1) Model F10000R-6 Fan Belt. Open the left side access door. Loosen the four electric motor mounting bolts. Slide the motor away from the center of the unit to take up belt slack. Proper tension is a deflection of 1/2 V inch (1.3 cm) midway between pulleys. Tighten the four mounting bolts. Close and latch the door.

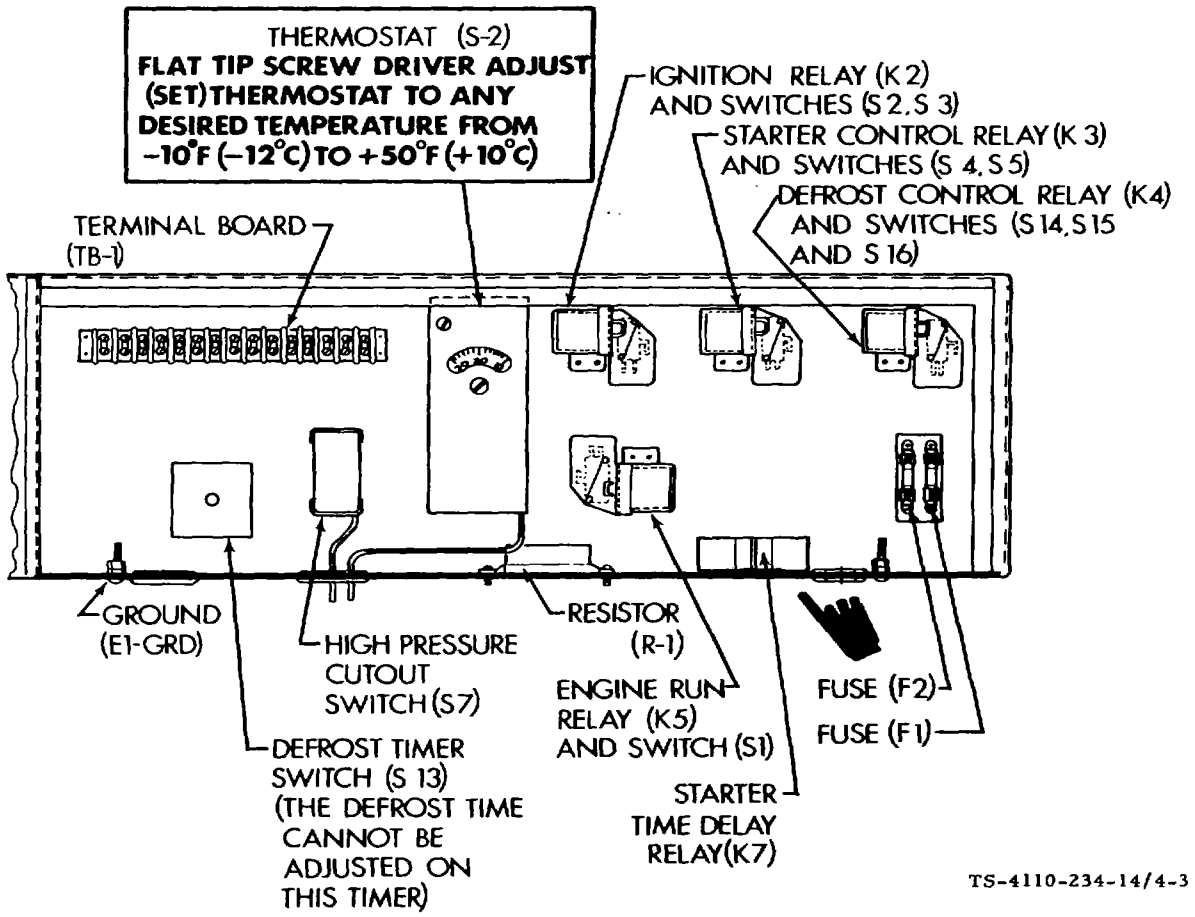


Figure 4-3. Control Panel Internal Components F10000RG-2

CAUTION

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

(2) Model F1000ORG-2 Compressor and Fan Belts.

(a) Compressor Drive Belt. Open the left side and front access doors. Loosen the four gasoline engine bolts. There is an access slot on the lower left front of the cabinet for the front bolts. Open the right access door. Use a 3/4 socket and socket wrench with an extension and turn the engine mount adjusting screws located under the compressor mount to move the engine thus taking up belt slack. Proper tension is a deflection of 1/2 inch (1.3 cm) midway between pulleys. Tighten the four engine mounting bolts. Close and latch the doors.

CAUTION

Both adjusting screws must be moved the same amount. Do not permit the engine to twist or cock on its mount. Uneven belt wear and bearing damage will result.

(b) Fan Drive Belt (fig. 2-). The idler pulley assembly is used to adjust belt tension. It is accessible through the right side door. Loosen the idler pulley set screw. Push idler pulley to bring proper tension in the belt. Proper tension is a deflection of 1/2 inch (1.3 cm) midway between pulleys. Tighten the idler pulley set screw and close access door.

j. Check engine on F10000RG-2 to see that oil filter is in place and is tight. Check to see if oil has been added. If it has not add oil per lubricating instructions (see para. 4-10).

k. Electrical power connections.

(1) Battery connection F10000RG-2 only. (See figure 4-2).

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 cable last.

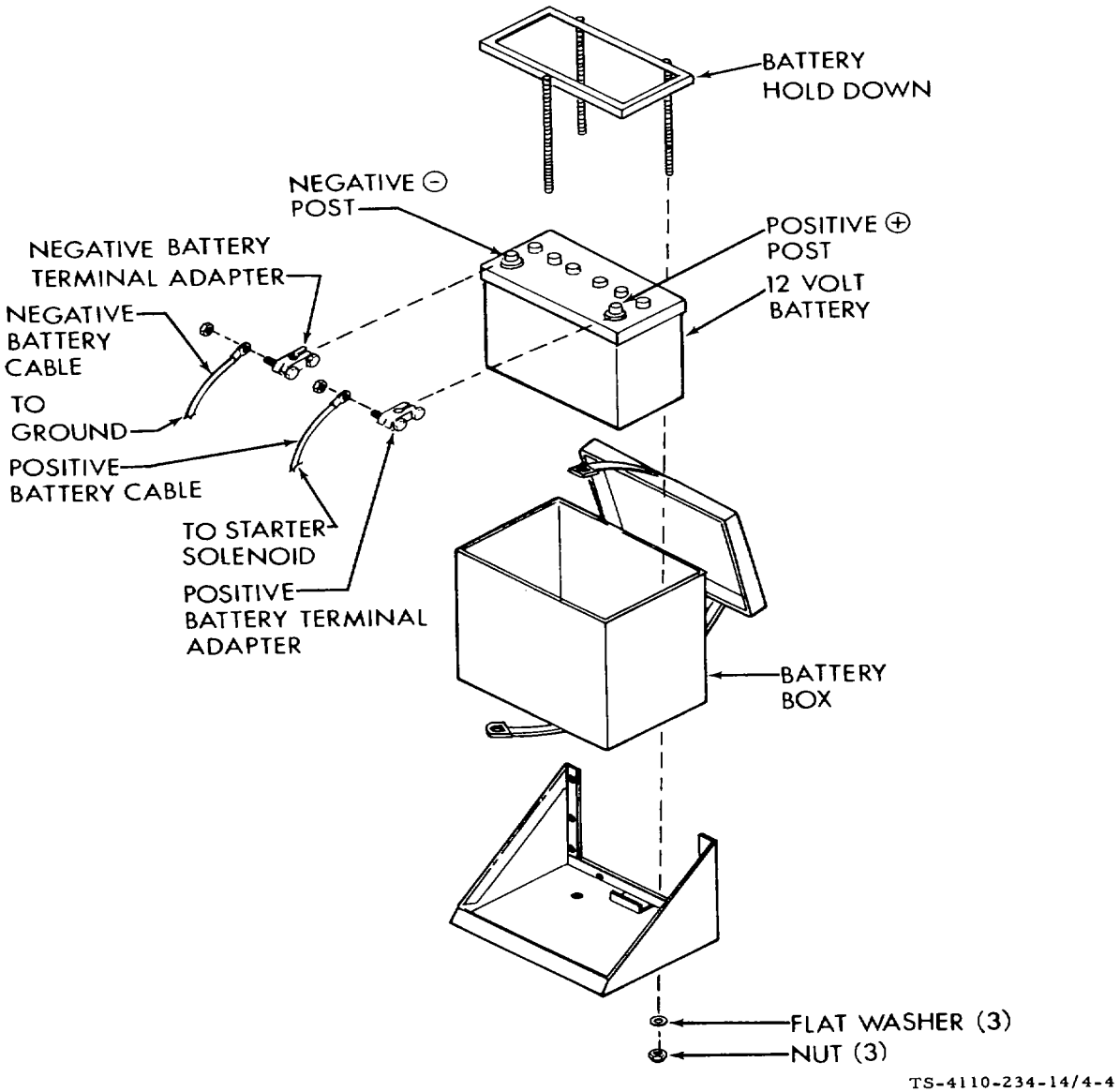


Figure 4-4. Battery F10000RG-2

- The battery may be removed from the unit to ease initial servicing.
- Wipe the preservative from the battery terminals.
- Remove the electrolyte pack from the shipping container and fill the battery.

1. Using thumb, push in small, perforated tab at dot on top of electrolyte pack. Tear up large tab as indicated on pack. Pull out dispensing hose.

WARNING

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.

ANTI DOTE:

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.

2. With clamp open, hold hose upright above pack and squeeze hose forcing all acid back into pack. Close clamp and then cut off tip of hose.

3. Remove vent caps from all cells. Insert end of hose into each cell. Control flow by pinching hose with thumb and forefinger.

4. On first filling, fill each cell until electrolyte level reaches top of separators only.

5. Temperature of the battery and the electrolyte must be above 60°F (15.60C) and below 100°F (37.8C).

6. Allow the battery to stand for 30 minutes after filling. Then check electrolyte specific gravity of each cell correcting the readings to 1.280 at 800F (26.7°C). Add electrolyte if necessary to bring the electrolyte up to the designated level.

7. The battery should be charged fully before it is put into service. If time or equipment is not available it may be used unless one of the following conditions exist:

The specific gravity of the electrolyte, corrected to 80°F (26.70C), of any cell is below 1.250 after the 30 minute stand. The battery is going into service at temperatures below 0°F (-17.80C).

8. If either of the two conditions exist, the battery should be charged constant current at the 20-hour rate until specific gravity becomes constant for three consecutive 30-minute readings. Constant potential may be used if battery electrolyte temperature is maintained below 1300F (54.70C) by interrupted charging or by lowering the charging voltage, and the final charging current is equal to the 20 hour rate. If the specific gravity of battery, temperature corrected, exceeds 1.290 it should be adjusted to 1.280 ± 0.010. After a short period of service (10 to 14 days) the specific gravity should be checked and if the battery is less than a 3/4 charged, it should be charged as indicated in the above instructions.

9. Check the electrolyte levels frequently. Add distilled or drinking water as required to maintain the proper level.

10. Keep the top and sides of the battery clean and dry. Make sure the vent filler plugs are clean. When cleaning is required wash with water.

11. Battery should be charged once a month and kept in cool, dry storage when not in use.

12. Before disposing of empty electrolyte container, neutralize excess acid with baking soda and rinse container with water.

13. Legibly stamp or brand the date (month and year) on the battery container adjacent to the negative post. The date should be preceded by the letter "S" (example: S-5-80).

If the battery was removed from the unit it should now be reinstalled. (See fig. 4-4)

Be sure the REFRIGERATOR ON-OFF toggle switch is in the off position.

Connect the positive battery cable to the positive terminal adapter. Be sure this is done prior to connecting the negative cable.

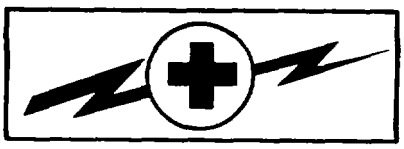
Connect the negative battery cable to the negative terminal adapter.

(2) Power cable connection for F10000R-6 only.

- The power cable is not supplied with the unit.
- Use type S or SO heavy duty portable cord with four conductors of AWG number 10 wires and of an overall jacket diameter not exceeding 0.745 inch (1.9 cm).
- Determine the length and type of connections required to connect to the power source.
- The power source must be 208 volt, three phase, 60 hertz, 4 wire ac electric power.
- The connection at the power source must be equipped with a positive shut off or disconnect so that power can be shut off for safe maintenance of the refrigerator.
- See wiring diagram figure 4-5 for correct phase and ground relationship.
- See figure 4-2 for identification of components.

- Route the end of the power cable through the grommeted hole in the upper right hand corner of the condenser section frame and the open seal grip in the control box.

WARNING



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 part before touching it.

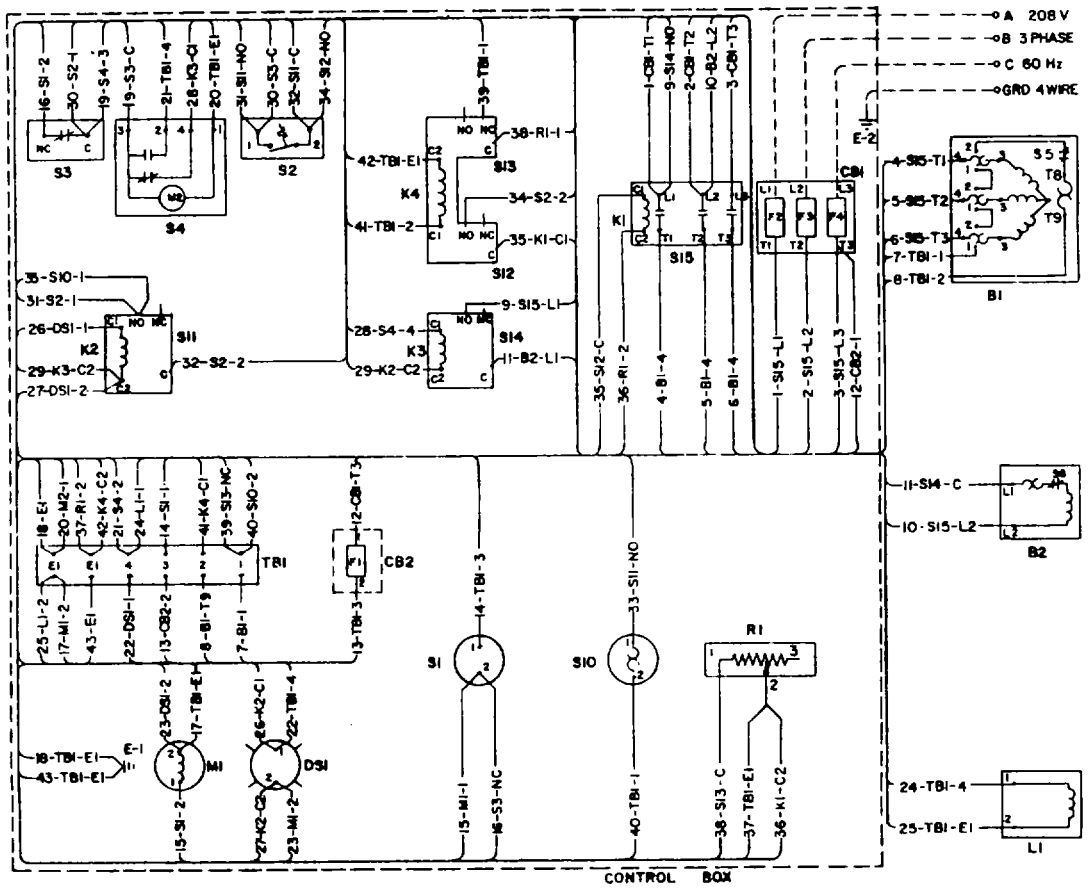
Be careful not to contact high-voltage connections of 208 volts ac input when installing or operating this equipment.

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 covers 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.

- Pull enough cable through the seal grip to reach the E2 ground post.
- Tighten the knurled nut on the seal grip.
- Strip cable jacket back to within 1/4 inch (.64 cm) of the inside of the seal grip.
- Install a terminal lug on the ground wire and connect the ground wire to the ground post.
- Cut the remaining three wires to length, strip ends and install in the screw connection on the CB1 pull- out disconnect (See wiring diagram figure 4-5 for correct phase relationship).
- The pull-out disconnect should be rotated to the on position.
- Close the control panel doors and install retaining screws.
- Connect or turn on power source.
- Turn the unit on and check to see that the rotation of the motor is clockwise as seen when facing the condenser side of the refrigeration unit. If rotation is incorrect, reverse any two of the three voltage input wires.



LEGEND			
SYMBOL	DESCRIPTION	SYMBOL	DESCRIPTION
B1	COMPRESSOR MOTOR	S2	THERMOSTAT
B2	FAN ELECTRIC MOTOR	S3	SWITCH, HIGH PRESSURE
CB1	PULL-OUT DISCONNECT	S4	SWITCH, DEFROST
CB2	FUSE BLOCK	S5	SWITCH, THERMAL OVERLOAD
DS1	PILOT LIGHT	S6	SWITCH, MOTOR OVERLOAD
F1	FUSE 6 AMP	S7,8&9	SWITCH, HIGH CURRENT OVERLOAD
F2,3&4	FUSE 60 AMP	S10	SWITCH, RESET OVERLOAD (B1)
K1	CONTROLLER (B1)	S11	THERMOSTAT BYPASS
K2 , 3	RELAY, CONTROL	S12	COMPRESSOR CONTROLLER
K4	RELAY , CONTROL	S13	COMPRESSOR OVERLOAD
L1	VALVE , SOLENOID , DEFROST	S14	FAN DEFROST CYCLE
M1	HOURMETER	S15	COMPRESSOR MOTOR CONTROLLER
M2	TIMER , DEFROST	E-1	GROUND , FRAME
R1	RESISTOR , 50 OHM , 50 WATT	E-2	GROUND , FRAME
S1	SWITCH, SELECTOR	TB1	TERMINAL BOARD

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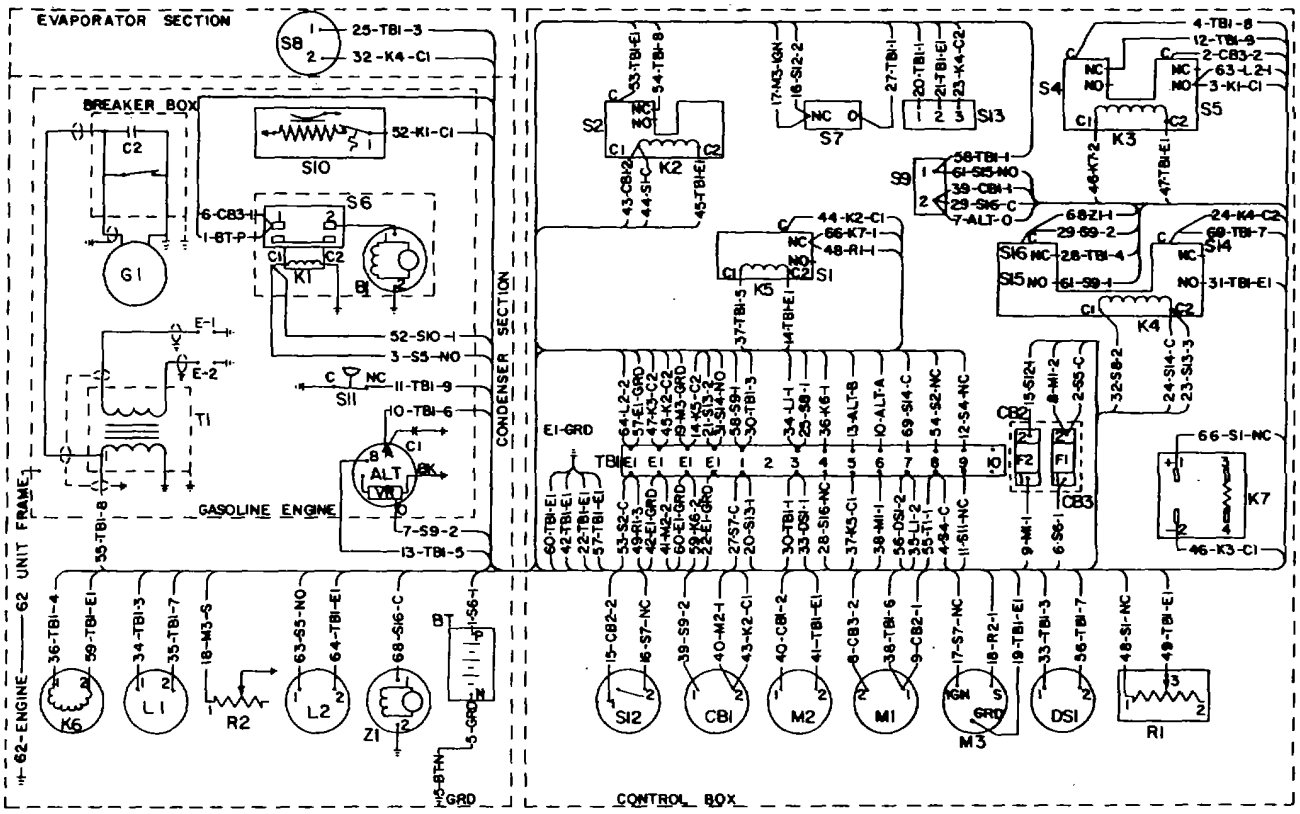
Figure 4-5. Wiring Diagram F10000R-6



LEGEND			
SYMBOL	DESCRIPTION	SYMBOL	DESCRIPTION
ALT	ALTERNATOR	M3	METER, FUEL
BI	MOTOR, STARTING 12 VOLT	RI	RESISTOR, STARTING UNIT
BT	BATTERY 12 VOLT	R2	SENDER, FUEL LEVEL
CI	CAPACITOR, ALTERNATOR	SI	SWITCH, STARTER MOTOR TERMINATION
C2	CAPACITOR, MAGNETO	S2	SWITCH, IGNITION
CBI	OVERLOAD, STARTER OVERCRANK	S4	SWITCH, OIL FAILURE BYPASS
CB2 & 3	FUSE BLOCK	S5	SWITCH, STARTER SOLENOID
DSI	INDICATOR, DEFROST	S6	STARTER, SOLENOID
E-1 & 2	SPARK PLUG	S7	SWITCH, HIGH PRESSURE SAFETY
FI	FUSE, 30 AMP	S8	THERMOSTAT, DEFROST TERMINATION
F2	FUSE, 15 AMP	S9	THERMOSTAT, ROOM TEMPERATURE
GI	MAGNETO	S10	THERMOSTAT, SISSON CHOKE
KI	RELAY, STARTER SOLENOID	SII	SWITCH, ENGINE OIL PRESSURE
K2	RELAY, IGNITION	SI2	SWITCH, SELECTOR
K3	RELAY, STARTER CONTROL	SI3	SWITCH, DEFROST TIMER
K4	RELAY, DEFROST CONTROL	SI4	DEFROST TERMINATION
K5	RELAY, ENGINE RUN	SI5	THERMOSTAT BY PASS
K6	COIL, CLUTCH	SI6	CLUTCH RELAY
K7	RELAY, STARTER TIME DELAY	TBI	TERMINAL BOARD
LI	VALVE, SOLENOID, HOT GAS BYPASS	TI	TRANSFORMER, HIGH VOLTAGE
L2	VALVE, SOLENOID, HOT GAS COMP. BYPASS	EI-GRD	GROUND, FRAME
MI	AMMETER	ZI	PUMP, FUEL
M2	METER, TOTAL TIME		

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Figure 4-6. Wiring Diagram F1000RG-2

Section III LUBRICATION

4-10. GENERAL

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

b. Keep all parts not requiring lubrication clean and free of lubricants. Wipe all lubrication points free of dirt and grease. Clean all lubrication points after lubrication to prevent accumulation of dirt.

c. Be sure the REFRIGERATOR ON-OFF toggle switch is in the off position before lubricating internal parts.

d. See figure 4-7 for F10000R-6 lubrication points and figure 48 for F10000RG-2 lubrication points.

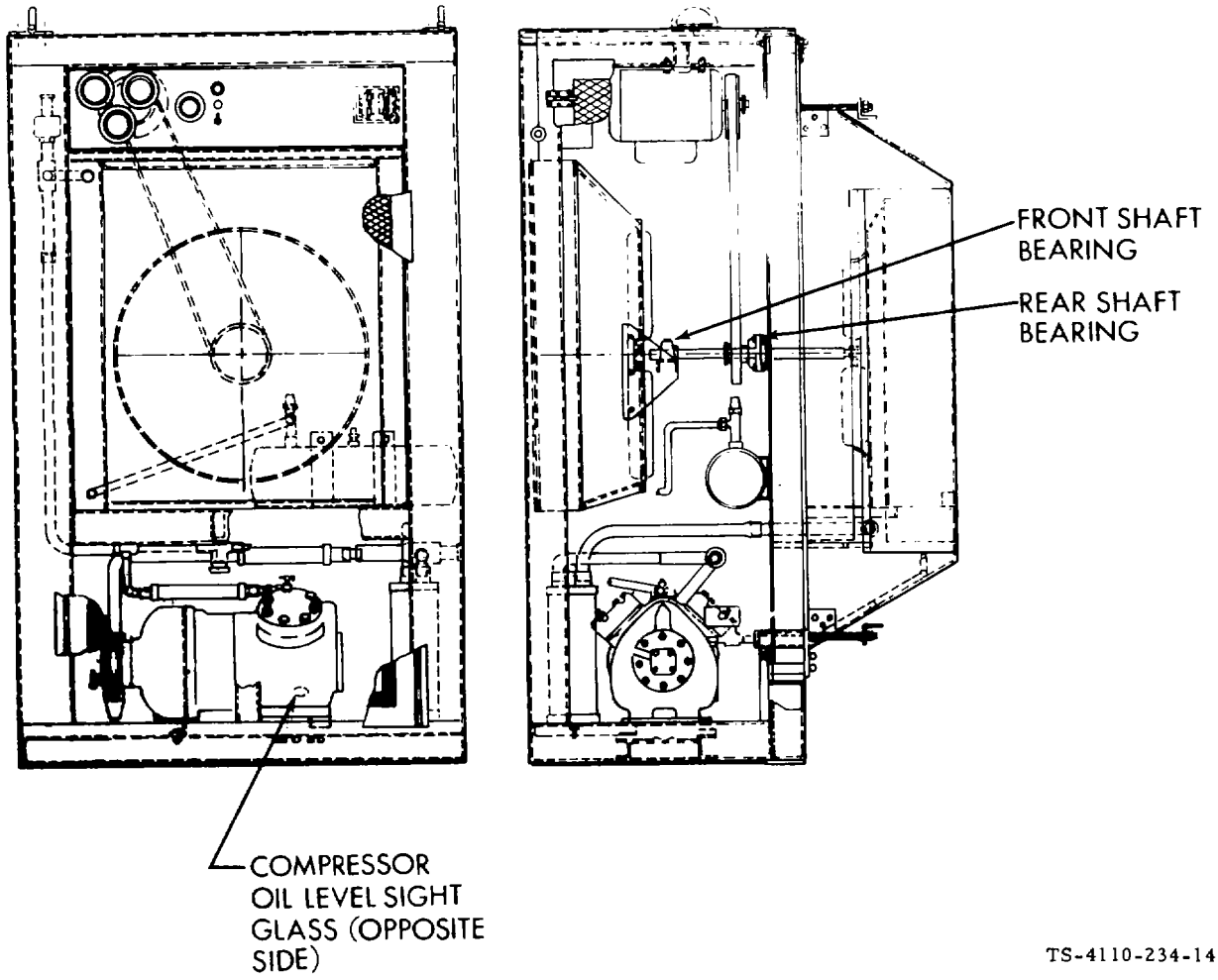


Figure 4-7. Lubrication Points F10000R-6

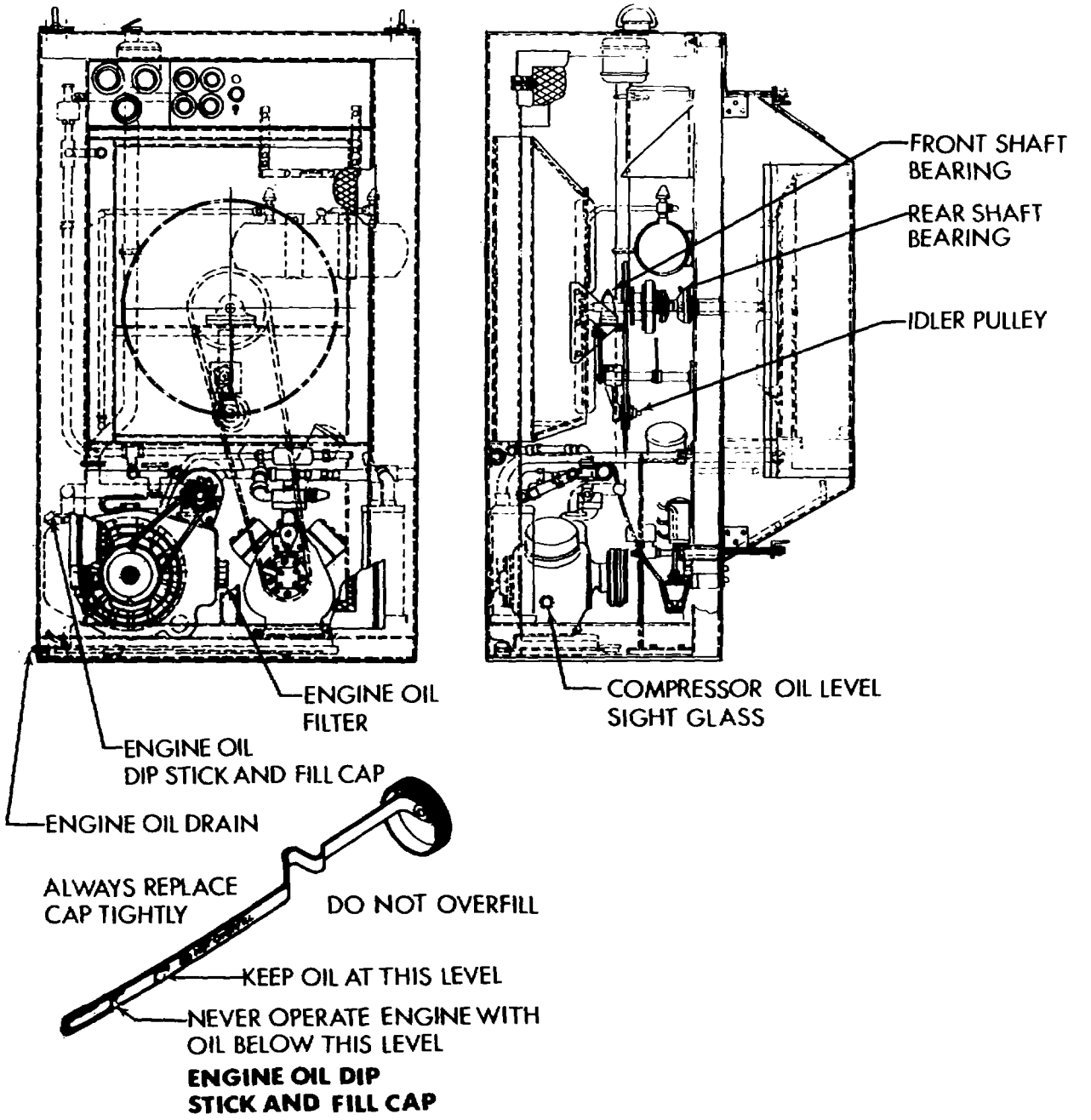


Figure 4-8. Lubrication Points F10000RG-2

4-11. FRONT AND REAR FAN SHAFT BEARINGS

Lubricate with ball and roller bearing grease MIL-G25013 using a low pressure grease gun every 1000 hrs.

4-12. IDLER PULLEY F10000RG-2 ONLY

Lubricate with ball and roller bearing grease MIL-G-25013 using a low pressure grease gun every 1000 hrs.

4-13. COMPRESSOR

The compressor will be serviced by Direct or General Support Personnel only. Refer to chapter 5.

4-14. ENGINE F10000RG-2 ONLY

a. The engine oil level is to be checked every eight hours (see para. 3-2).

b. The engine oil is to be changed every 100 hours. Drain oil while engine is still warm.

c. The engine oil filter should be replaced at each oil change. Remove and retain the air seal. Remove the filter by turning counterclockwise, using a filter wrench. When installing the filter first lubricate the gasket with engine oil. Screw the filter in until the gasket touches the base and then tighten 1/2 turn; do not over tighten. Install the air seal on the outside of the filter to prevent air loss from the cooling shroud.

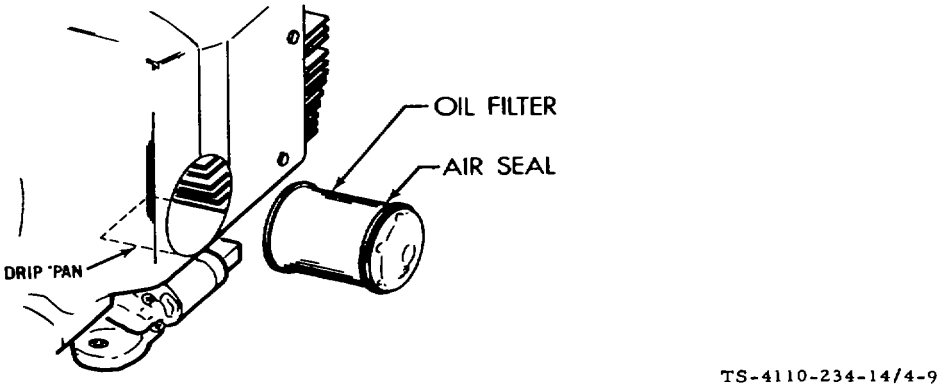


Figure 4-9. Oil Filter F10000RG-2

d. Use 4 quarts of oil when the filter is changed and 3-1/2 quarts if the filter is not changed. Do not overfill. Use oil with MIL-L-2104 designation OEHDO only.

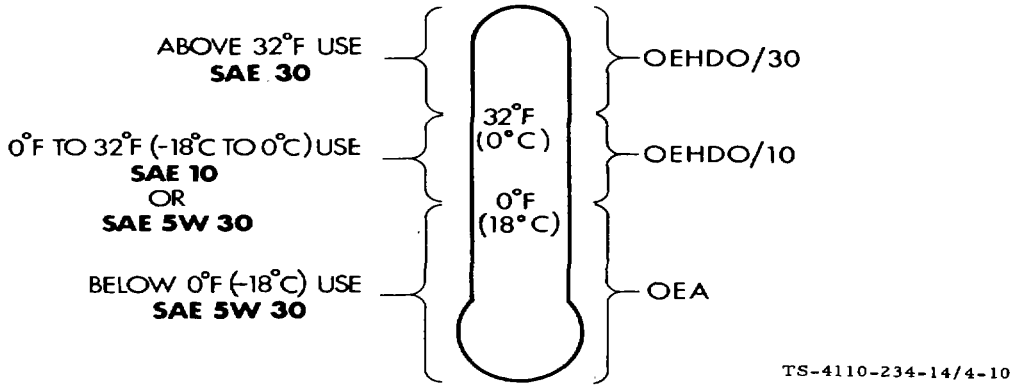


Figure 4-10. Engine Oil F10000RG-2

e. Operation Immediately After Lubrication. Operate the refrigeration unit as in paragraph 2-6.

On Model F10000RG-2 check engine and engine oil filter for oil leaks.

Section IV PREVENTIVE MAINTENANCE CHECKS AND SERVICES (PMCS)

4-15. INTRODUCTION, INSPECTION AND SERVICE

a. Systematic, periodic, preventive maintenance checks and services (PMCS) are essential to ensure that the refrigerator is ready for operation at all times. The purpose of a preventive maintenance program is to discover and correct defects and deficiencies before they can cause serious damage or complete failure of the equipment. Any effective preventive maintenance program must begin with the endoctrination of operators to report all unusual conditions noted during daily checks or actual operation to organizational maintenance. All defects and deficiencies discovered during maintenance inspections must be recorded, together with corrective action taken, on DA Form 2404 (Equipment Inspection and Maintenance Worksheet).

b. A schedule for organizational preventive maintenance inspection and service should be established immediately after installation of the refrigerator. A quarterly interval, equal to three calendar months or 250 hours of operation, whichever occurs first, is recommended for usual operating conditions. When operating under unusual conditions, such as a very dusty or sandy environment, it may be necessary to reduce the interval to monthly or even less if conditions are extreme.

c. Table 4-1 lists the organizational preventive maintenance checks and services that should be performed at quarterly (or otherwise established) intervals. Figure 4-11 shows the location of PMCS items. The PMCS items in the table have been arranged and numbered in a logical sequence to provide for greater personnel efficiency and least amount of required maintenance downtime. The "Para Ref" column on the right side of the table provides the paragraph number where detailed, step-by-step disassembly/reassembly maintenance procedures may be found.

d. Be sure the REFRIGERATOR ON-OFF switch is in the off position. Read and observe all WARNINGS printed in the front of this manual.

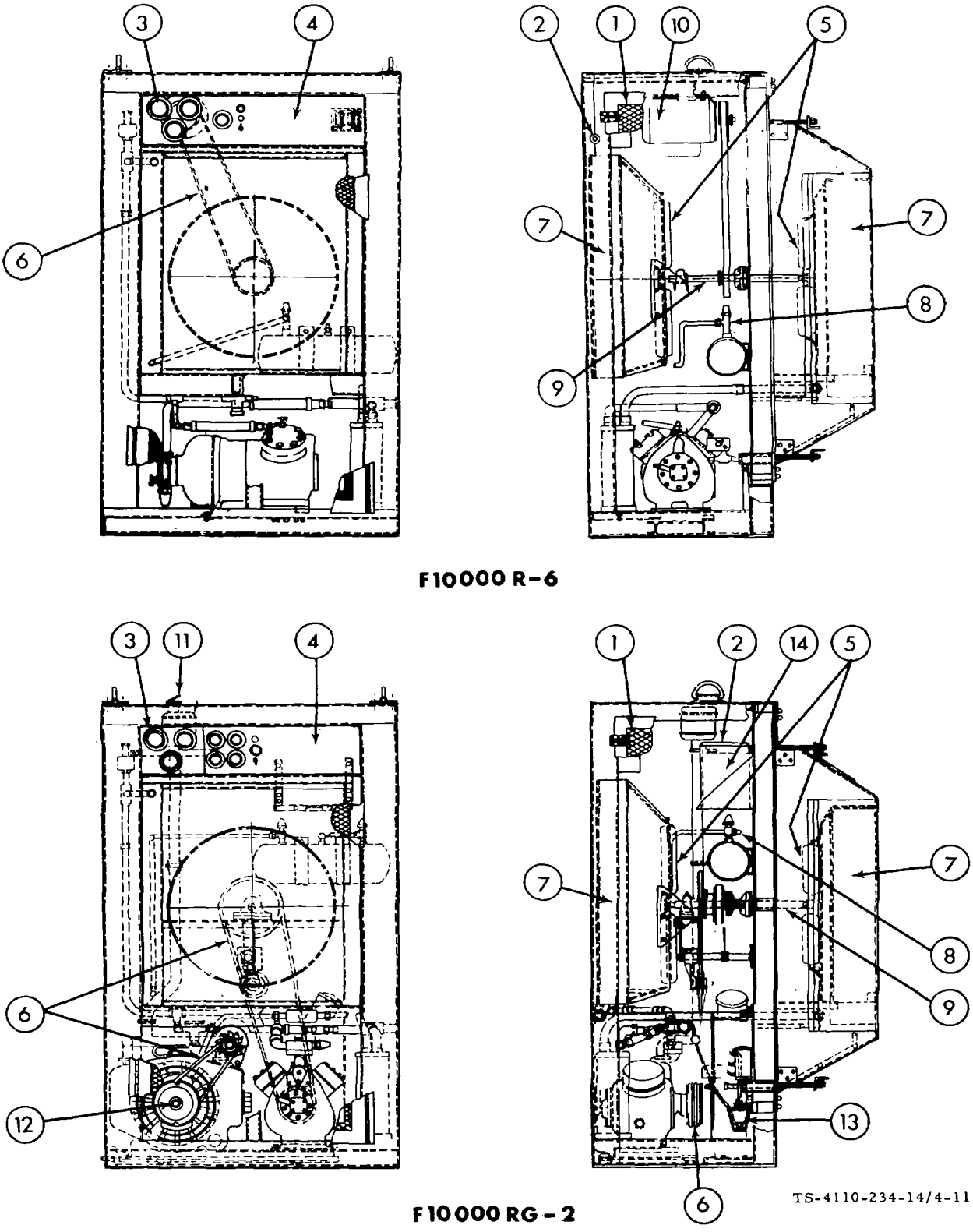


Figure 4-11. Location of PMCS Items

Table 4-1. ORGANIZATIONAL PREVENTIVE MAINTENANCE CHECKS AND SERVICES (PMCS)

ITEM NO.	ITEM T0 BE INSPECTED	PROCEDURES
1	Doors and Screens	a Check for loose, damaged or missing hardware.
		b Check screens for damage and obstructions Remove obstructions. Replace any door or screen if it is badly damaged.
2	Wires and Cables	Check for cuts, cracks, exposed copper conductors, abrasions, and loose connections Repair or replace damaged wires and tighten loose connections (see wiring diagrams 4-5 and 4-6).
3	Instrument Panel	a Check for obvious damage, loose gage connections and loose mountings.
		b Turn unit on and check gages and light for proper operation. Should malfunction be noted see Troubleshooting Chart and repair or report to higher maintenance level as indicated.
		Turn unit off and disconnect power.
4	Control Panel Internal Components 4-2 and 4-3)	a Check for physical damage, corrosion and signs of overheating. (See figures Clean, repair or replace as indicated.
		b Check thermostat for proper setting.
		c Check connections and mountings Tighten or replace as indicated.
5	Condenser and Evaporator Fans	a Check for accumulated dirt Clean if necessary.
		b Check for obvious damage, loose rivets and attachment to hub. Replace if loose rivets, hub attachment or fan is damaged.
		c Check attachment to shaft Tighten set screws if they are loose.
		d Check for evidence of rubbing Aline fan shaft if rubbing is indicated.
6	Drive Belts	Check for loose, damaged or missing belts Adjust tension or replace belts as indicated If belt is beginning to wear check component alinement.
7	Condenser and Evaporator Coils	a Check for dirt or any blockage of fins that would interfere with air flow Clean or report any damage to direct support as indicated.
8	Refrigeration System	a Check to see that valves are properly set.
		b Check for signs of obvious leakage, damage or defective parts. Report any problems to direct support.
9	Fan Drive Shaft	a Check fan drive shaft and related components for loose hardware, general condition and alinement Repair or replace parts as indicated.
		b Observe lubrication instructions for bearings.

Table 4-1. ORGANIZATIONAL PREVENTIVE MAINTENANCE CHECKS AND SERVICES (PMCS) (cont.)

ITEM NO.	ITEM T0 BE INSPECTED	PROCEDURES
10	Electric Motor (F10000R-6)	a Check attaching hardware and general condition. b Check lateral end play of shaft If there is excessive end play notify direct support.
11	Exhaust System (F10000RG-2)	a Inspect for holes, cracks and loose connections or mounting. Repair or replace as indicated. b Check to see that rain cap is in place and in good condition.
12	Gasoline Engine (F10000RG-2)	a Turn unit on and check the following: 1 Check for excessive vibration. 2 Observe ammeter and oil pressure gage for proper readings. b Turn engine off. 1 If excessive vibration was noted in 12a above check engine mounts and attaching hardware. Tighten or replace as indicated. c See paragraph 4-14 for lubrication instructions. d Check for oil leaks Repair as indicated. e Replace air cleaner element. f Compression check. g Check, clean and reset spark plugs Replace spark plugs that show signs of fouling or electrode wear. h Check and clean cooling fins Remove all dust, dirt and oil. i Clean and lubricate governor linkages Do not lubricate plastic joints. j Inspect carburetor for general condition Clean and adjust as indicated. k Inspect spark plug leads for obvious damage, breaks in insulation and tight connections Replace if defective. I Inspect breaker points for corrosion Check gap and clean and adjust as indicated.
13	Fuel System (F10000 RG-2)	a Inspect for leaks Repair or replace parts as indicated. b Check sediment bowl on fuel filter Clean the filter and glass bowl if any dirt accumulation is visible.
14	Battery (Flb000RG-2)	a Test each cell Charge or replace battery if indicated. b Clean battery terminals and make sure all connections are tight. c Check water level

Section V TROUBLESHOOTING

4-16. 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 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.

c. Tables 4-2 and 43 list the common malfunctions which you may find during the operation or maintenance of the refrigeration unit or its components. You should perform the tests/inspections and corrective actions in the order listed. Remember that Table 4-2 covers Model F10000R-6 and Table 43 covers Model F10000RG-2.

NOTE

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

Table 4-2. MODEL F10000R-6 TROUBLESHOOTING

MALFUNCTION TEST OR INSPECTION CORRECTIVE ACTION

1. REFRIGERATOR DOES NOT START
   - Step 1. Check to be sure main power cable is connected and that power is on. Connect power cable and turn power on.
   - Step 2. Check to be sure that pull out disconnect is rotated to the on position. Pull the disconnect out, rotate it to the on position and plug back in place.
   - Step 3. Check to see that refrigerator switch is in the ON position. Turn switch to ON.

WARNING

Disconnect power from the refrigeration unit before doing maintenance work on the electrical system. The voltage used can be dangerous to life.

- Step 4. Make sure that power supplied is compatible with unit's 4-wire, 208 V, three phase, 60 Hz requirement.
  Check each wire of supply line with voltmeter per wiring diagram provided in figure 4-5.
- Step 5. Check to see if COMPRESSOR OVERLOAD circuit breaker is tripped. Reset (push in) circuit breaker. If circuit breaker continues to trip or will not reset check compressor and compressor circuit.
- Step 6. Inspect main power cable connections for defects. Repair or replace if defective.
- Step 7. Check for loose electrical connections.

Table 4-2. MODEL F10000R-6 TROUBLESHOOTING (cont.)

MALFUNCTION TEST OR INSPECTION CORRECTIVE ACTION	
	Tighten all loose connections.
Step 8.	Check continuity of fuses F2, F3 and F4. Replace bad fuses. See paragraph 4-38.
Step 9.	Check for defective compressor. Report to direct support maintenance.
2. INSUFFICIENT COOLING	
Step 1.	Check for closed receiver valves. Open receiver valves.
Step 2.	Check evaporator air intake and outlet screens to make sure they are not obstructed. Remove obstruction.
Step 3.	Test evaporator fan for defects. See paragraph 4-41. Replace defective fan.
Step 4.	Check evaporator and condenser coil for dirt or any obstruction that would block air flow. Clean coils.
Step 5.	Check thermostat for defects. Replace defective thermostat.
Step 6.	With unit operating in cooling cycle check the refrigerant sight glass. If center indicator is pink or if numerous bubbles appear contact direct support maintenance.
Step 7.	Check for clogged filter-drier. Feel filter-drier for temperature difference. Discharge end will either feel cooler than input end if clogged, or may be sweaty or frosty. Report to direct support maintenance.
Step 8.	Check whether compressor is operating. Report problems to direct support maintenance.
3. EXCESSIVELY NOISY OPERATION	
Step 1.	Check for low oil level in compressor. Oil not visible in compressor crankcase sight glass. Report to direct support maintenance.
Step 2.	Check for defective compressor. Report to direct support maintenance.
Step 3.	Check evaporator fan for looseness, vibration or interference. See paragraph 4-41. Tighten setscrews. Look for bent or broken blades that would cause an out-of-balance condition. Replace defective fan as necessary.
Step 4.	Check condenser fan for looseness, vibration or interference. See paragraph 4-42. Tighten setscrews. Look for bent or broken blades that would cause an out-of-balance condition. Replace defective fan as necessary.
Step 5.	Check if drive belt is loose or broken. Adjust or replace (para 4-43).
Step 6.	Check for loose mounting hardware. Tighten as needed.
4. EVAPORATOR AIR OUTPUT VOLUME INSUFFICIENT	
Step 1.	Inspect screen for dirt and clogging. Clean or replace screen (para 4-18).

Table 4-2. MODEL F10000R-6 TROUBLESHOOTING (cont.)

MALFUNCTION TEST OR INSPECTION CORRECTIVE ACTION

WARNING

Disconnect power from the refrigeration unit before doing maintenance work on the internal parts. The voltage used can be dangerous to life.

Step 2. Evaporator fan loose, binding or damaged.
Tighten setscrews or relieve binding as necessary. Replace damaged fan.

Step 3. Drive belt is loose or broken.
Adjust or replace (para 4-43).

Step 4. Check evaporator coil for dirt.
Clean the coil.

Step 5. Check evaporator coil for iced-up condition. If icing is found, it will usually indicate a low cooling load or that the thermostat is set too low or that the air flow is blocked.

CAUTION

Do not use steam, open flame, heat gun or any other high-temperature heat source to thaw an iced coil. Thaw an iced coil with a lamp bulb (75-watt maximum), hair drier, electric fan or by leaving the unit shut down until ice melts.

5. COMPRESSOR FAILS TO OPERATE

Step 1. Make sure refrigerator switch is set to ON.
Place switch in ON position.

Step 2. Check if thermostat is not set at low enough temperature.
Adjust thermostat (fig. 4-2).

Step 3. Check for loose connections in wiring.
Tighten loose connections.

Step 4. Inspect compressor motor controller for breaks, cracks, corrosion, rust and loose electrical connections. Also check continuity after removing controller.
Replace defective controller (para 4-39).

Step 5. Check for defective compressor.
Report to direct support maintenance.

6. UNIT RUNS CONTINUOUSLY

Step 1. Check for defective electric motor.
Adjust or replace (para 4-76).

Step 2. Check whether fans are operating.
Adjust drive belt or replace (4-43).

Step 3. Check for defective relay.
Replace relay (para 4-33).

Step 4. Check whether compressor service valves are stuck open or leaking.
Report to direct support maintenance.

Step 5. With unit operating in cooling cycle check the refrigerant sight glass.
If center indicator is pink or if numerous bubbles appear contact direct support maintenance.

Table 4-2. MODEL F10000R-6 TROUBLESHOOTING (cont.)

MALFUNCTION TEST OR INSPECTION CORRECTIVE ACTION	
Step 6.	Check for defective expansion valve. Report to direct support maintenance.
Step 7.	Check if thermostat set too low. Reset thermostat (fig. 4-2).
Step 8.	Check for excessive leakage of cooled air from enclosure. Keep enclosure closed. Check gaskets.
7. UNIT WILL NOT DEFROST	
Step 1.	Check if hot gas line shut off valve is closed. Open valve.
Step 2.	Check for defective defrost timer. Replace timer (para 4-31).
Step 3.	Check for broken or leaking refrigerant line. Notify direct support maintenance.
Step 4.	Check for defective defrost relay. Repair or replace (para 4-33).
Step 5.	Possible clogged refrigerant strainer. Report to direct support maintenance.

Table 4-3. MODEL F10000RG-2 TROUBLESHOOTING

MALFUNCTION TEST OR INSPECTION CORRECTIVE ACTION	
1. REFRIGERATOR DOES NOT START	
Step 1.	Check to see that refrigerator on-off switch is in on position.
Step 2.	Check if engine is out of fuel. Fill fuel tank with proper fuel.
Step 3	Check battery for loose or disconnected cables. Tighten or connect cables.
Step 4.	Check for weak or dead battery. Recharge or replace (para 4-71).
Step 5.	Check to see if OVERCRANKING CIRCUIT BREAKER is tripped. Reset (push in) circuit breaker. If circuit breaker continues to trip or will not reset. Check engine or circuit breaker for defects (para 4-25).
Step 6.	Check gasoline strainer sediment bowl for dirt or visible contaminants. Clean strainer.
Step 7.	Check for blown fuses. Replace bad fuses (para 4-38).
Step 8.	Check fuel pump. Repair or replace fuel pump (para 4-74).

Table 4-3. MODEL F10000RG-2 TROUBLESHOOTING (cont.)

MALFUNCTION TEST OR INSPECTION CORRECTIVE ACTION	
Step 9.	Check for defective starter relay. Replace relay (para 4-33).
Step 10.	Check for choke out of adjustment. Adjust per paragraph 4-3.
Step 11.	Check for defective magneto ignition. Repair or replace (para 4-69).
Step 12.	Check for defective starter solenoid. Replace (para 4-70).
Step 13.	Check for defective starting motor. Replace (para 4-70).
Step 14.	Check for defective ON-OFF switch. Replace (para 4-27).
Step 15.	Check for defective high pressure cutout switch. Replace (para 4-35).
Step 16.	Check for engine defects. Repair or replace defective parts or notify higher level maintenance, as necessary (para 4-59).
2. INSUFFICIENT COOLING	
Step 1.	Check for closed receiver valves. Open receiver valves.
Step 2.	Check evaporator air intake and outlet screens to make sure they are not obstructed. Remove obstruction.
Step 3.	Check evaporator fan for defects. See paragraph 4-41. Replace defective fan.
Step 4.	Check evaporator and condenser coil for dirt or any obstruction that would block air flow. Clean coils.
Step 5.	Check thermostat for defects. Replace defective thermostat (para 4-36).
Step 6.	With unit operating in cooling cycle check the refrigerant sight glass. If center indicator is pink or if numerous bubbles appear contact direct support maintenance.
Step 7.	Check whether compressor is operating. Report problems to direct support maintenance.
Step 8.	Check for clogged filter-drier. Feel filter-drier for temperature difference. Discharge end will either feel cooler than input end if clogged, or may be sweaty or frosty. Report to direct support maintenance.
3. EXCESSIVELY NOISY OPERATION	
Step 1.	Check for low oil level in compressor. Oil not visible in compressor crankcase sight glass. Report to direct support maintenance.
Step 2.	Check for defective compressor. Report to direct support maintenance.
Step 3.	Check evaporator fan for looseness, vibration or interference. See para 4-41. Tighten setscrews. Look for bent or broken blades that would cause an out-of-balance condition. Replace defective fan as necessary.
Step 4.	Check condenser fan for looseness, vibration or interference. See para 4-42. Tighten setscrews. Look for bent or broken blades that would cause an out-of-balance condition. Replace defective fan as necessary.

Table 4-3. MODEL F10000RG-2 TROUBLESHOOTING (cont.)

MALFUNCTION TEST OR INSPECTION CORRECTIVE ACTION

Step 5. Check if drive belt is loose or broken.
Adjust or replace (para 4-44).
Step 6. Check for loose mounting hardware.
Tighten as needed.
Step 7. Check engine (see para 4-59).
Repair or refer to higher level of maintenance as indicated.

4. EVAPORATOR AIR OUTPUT VOLUME INSUFFICIENT
Step 1. Inspect screen for dirt and clogging.
Clean or replace screen (para 4-18).

WARNING

Disconnect power from the refrigeration unit before doing maintenance work on the internal parts. Moving parts can cause injuries to personnel.

Step 2. Evaporator fan loose, binding or damaged.
Tighten setscrews or relieve binding as necessary. Replace damaged fan (para 4-41).
Step 3. Drive belt is loose or broken.
Adjust or replace (para 4-44).
Step 4. Check evaporator coil for dirt.
Clean the coil.
Step 5. Check evaporator coil for iced-up condition. If icing is found, it will usually indicate a low cooling load, or that the thermostat is set too low, or that the air flow is blocked.

CAUTION

Do not use steam, open flame, heat gun or any other high-temperature heat source to thaw an iced coil. Thaw an iced coil with a lamp bulb (75-watt maximum), hair drier, electric fan or by leaving the unit shut down until ice melts.

5. COMPRESSOR FAILS TO OPERATE
Step 1. Make sure refrigerator switch is set to ON.
Place switch in ON position.
Step 2. Check if thermostat is not set at low enough temperature.
Adjust thermostat (fig. 4-3).
Step 3. Check for loose or broken drive belt.
Adjust or replace (para 4-45).
Step 4. Inspect power relay for breaks, cracks, corrosion, rust and loose electrical connections. Also check continuity after removing relay.
Replace defective relay (para 4-33).

Table 4-3. MODEL F10000RG-2 TROUBLESHOOTING (cont.)

MALFUNCTION TEST OR INSPECTION CORRECTIVE ACTION
6. UNIT RUNS CONTINUOUSLY
Step 1. Check for loose compressor drive belt. Adjust or replace (para 4-45).
Step 2. Check whether fans are operating. Adjust drive belt or replace (para 4-44).
Step 3. Check for defective relay. Replace relay (para 4-33).
Step 4. Check whether compressor service valves are stuck open or leaking. Report to direct support maintenance.
Step 5. With unit operating in cooling cycle check the refrigerant sight glass. If center indicator is pink or if numerous bubbles appear, contact direct support maintenance.
Step 6. Check for defective expansion valve. Report to direct support maintenance.
Step 7. Check if thermostat set too low. Reset thermostat (fig. 4-3).
Step 8. Check for excessive leakage of cooled air from enclosure. Keep enclosure closed. Check gaskets.
7. UNIT WILL NOT DEFROST
Step 1. Check if hot gas line shut off valve is closed. Open valve.
Step 2. Check for defective defrost timer. Replace timer (para 4-32).
Step 3. Check for broken or leaking refrigerant line. Notify direct support maintenance.
Step 4. Check for defective defrost relay. Repair or replace (para 4-33).
Step 5. Possible clogged refrigerant strainer. Report to direct support maintenance.

Section VI MAINTENANCE PROCEDURES

4-17. GENERAL

The procedures in this section have been arranged in the order in which the items appear in the organizational (O) maintenance level column 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 in the order in which they appear on the MAC. Actions authorized to be performed by direct and general support maintenance have been duly noted; step-by-step procedures for these actions may be found in Chapters 5 and 6 respectively.

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 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.

4-18. CABINET PANELS, DOORS, AND SCREENS See figure 4-12.

The components of the refrigeration unit are enclosed in a metal frame with doors at both sides, and at the bottom front, and a screen assembly on the top of the frame.

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. Remove the defective door, center post, or screen, using figure 4-12 as a guide. All panels, doors and screens are held in place with screws and lockwashers.

WARNING

Dry cleaning solvent (Fed Spec P-D680) 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 59°C).

b. Cleaning. Clean the panels with a cloth dampened with a detergent solution or dry cleaning solvent (Fed Spec P-D680). Use a soft brush if necessary to dislodge caked on dirt. Dry the items thoroughly.

c. Inspection/Repair. Inspect panels for breaks, cracks, dents, loose or missing mounting hardware or other defects. Refer parts that can be repaired to direct support maintenance. Replace missing mounting hardware and panels damaged beyond repair. Inspect the identification plate riveted to the outside of the lower front door for legibility and obvious damage. Replace it if you cannot read all of the information shown on the plate.

d. Reinstall the repaired or new panel using screws and lock washers as shown on figure 4-12. Take care not to strip screw threads in the unit frame.

4-19. ELECTRICAL WIRING I (See fig. 4-13, Tables 44 and 4-5)

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 F10000R4.
- Disconnect the battery cables from the battery on the F10000RG-2.

(2) Open the control panel door by removing two top screws and opening the hinged panel.

(3) Open the four access doors.

b. Inspect/Test. Using wiring diagram in figures 4-5 or 4-6, 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.

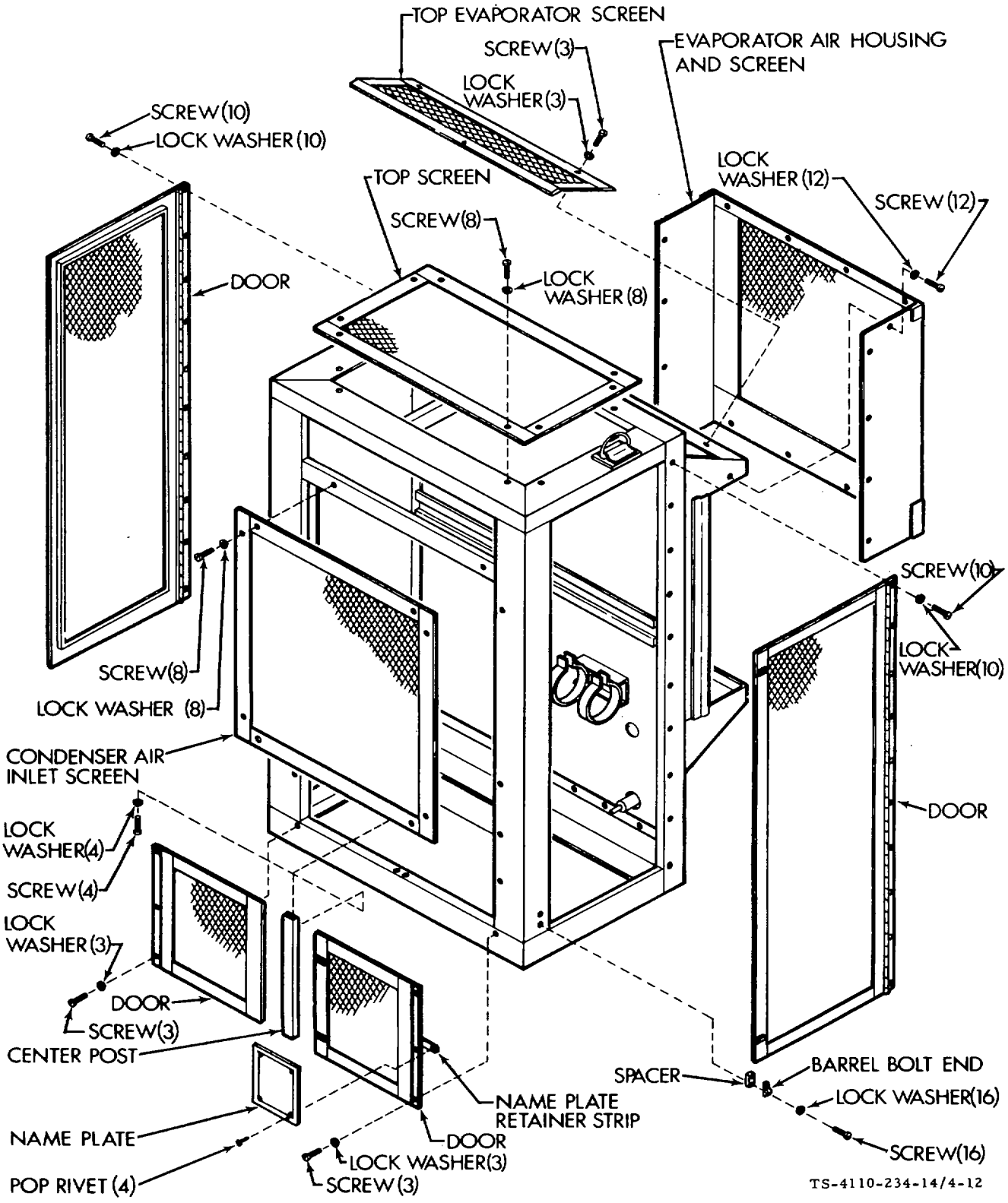


Figure 4-12. Panels, Door and Screens

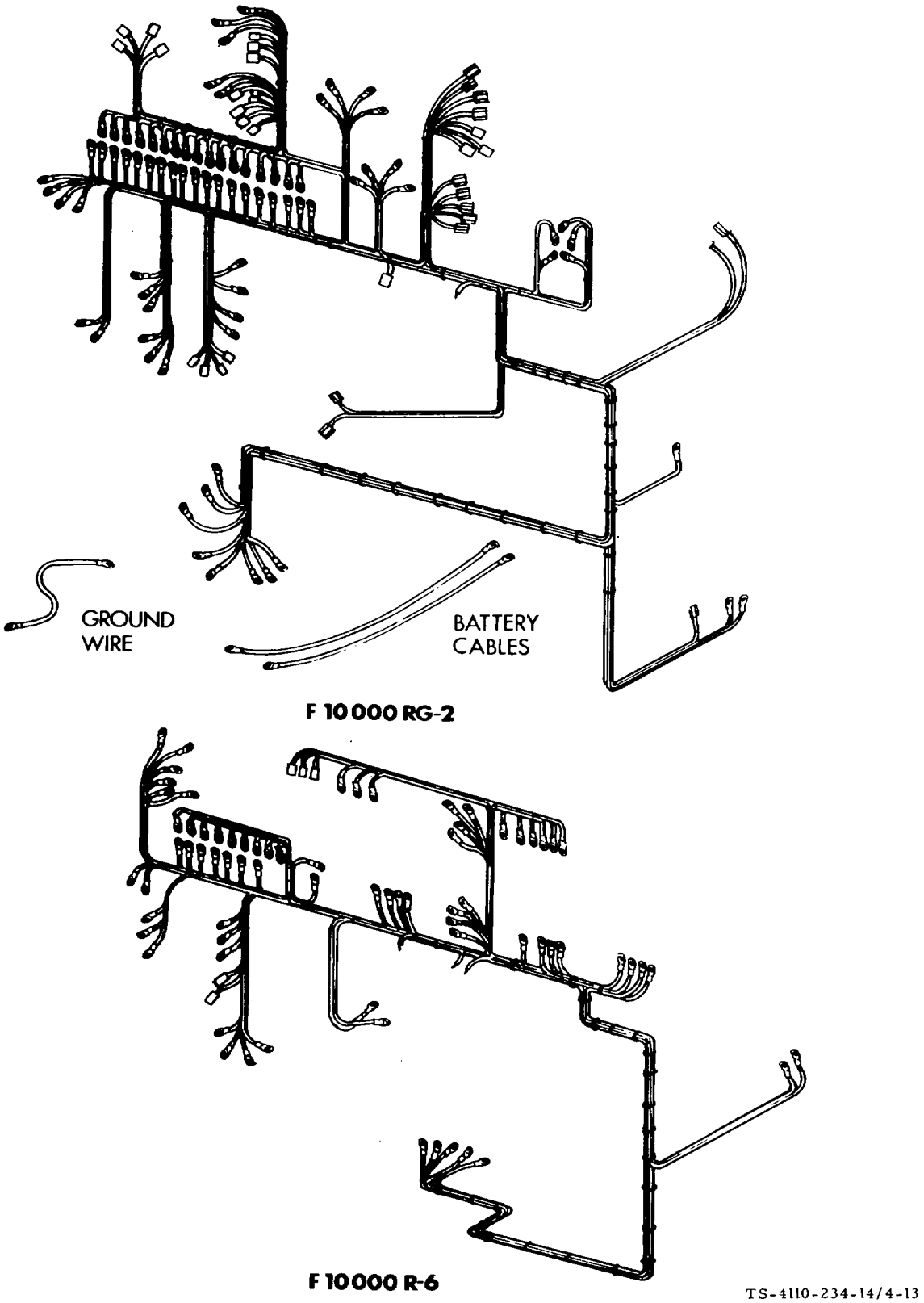


Figure 4-13. Wiring Harness

c. Repair or Replacement. Preferred repair methods consist of replacing wires, terminals, connectors, etc., rather than splicing wires, bending 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 (tables 4-4 or 4-5) and wiring diagram (figs. 4-5 or 4-6).

(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 should conform to Specification MIL-F-4995, Type I, 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 should be a lead-tin solder conforming to Specification 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 (2.54 cm) length for covering joints at terminals or connectors, or to a length about 1/2 inch (1.27 cm) 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 least three turns. Solder and apply insulation as described above.

(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 (2.54 cm) 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.

4-20. INSTRUMENT PANEL See figure 4-14.

The instrument panel is partially rigid and partially hinged to allow access to controls. The hinged portion has operating instructions and the refrigeration schematic printed on the front and the wiring diagram printed on the back.

WARNING

Always disconnect power from battery (F10000RG-2) or power source (F10000R-6) prior to opening the hinged instrument panel.

4-21. HOURMETER See figure 4-14.

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) Disconnect power.

(2) Remove the three screws and nuts that secure the meter in place.

(3)Disconnect and tag the leads to the meter.

Table 4-4. WIRE LIST F10000R-6

TERMINATION		TERMINATION		AWG Wire Size	LENGTH	
FROM	TERMINAL TYPE	TO	TERMINAL TYPE		IN	CM
CB1-T1	MS-25036-112	S15-L1	MS-25036-112	10	19	48.3
CB1-T2	MS-25036-112	S15-L2	MS-25036-112	10	20	50.1
CB1-T3	MS-25036-112	S15-L3	MS-25036-112	10	21	53.3
S15-T1	MS-25036-112	B1-4	MS-25036-112	10	12	30.5
S15-T2	MS-25036-112	B14	MS-25036-112	10	12	30.5
S1 5-T3	MS-25036-112	B1-4	MS-25036-112	10	12	30.5
B1-1	MS-25036-108	TB1-1	MS-25036-108	16	24	61.0
B1-T9	MS-25036-108	TB1-2	MS-25036-108	16	24	61.0
S15-L1	MS-25036-108	S14-NO	42332-2 (00779)	16	13	33.0
S15-L2	MS-25036-108	B2-L2	MS-25036-108	16	36	91.4
B2-L1	MS-25036-108	S1 4-C	42332-2 (00779)	16	36	91.4
CB1-T3	MS-25036-108	CB2-1	MS-25036-108	16	26	66.0
CB2-2	MS-25036-108	TB1-3	MS-25036-108	16	6	15.2
TB1-3	MS-25036-108	S1-1	MS-25036-108	16	21	53.3
S1-2	MS-25036-108	M1-l	MS-25036-108	16	9	22.9
S1-2	MS-25036-108	S3-NC	42332-2 (00779)	16	25	63.5
M1-2	MS-25036-108	TB1-E1	MS-25036-108	16	24	61.0
TB1-E1	MS-25036-108	E1-GRD	MS-25036-108	16	15	38.1
S4-3	MS-25036-108	S3-C	42332-2 (00779)	16	21	53.3
M2-1	MS-25036-108	TB1-E1	MS-25036-108	16	18	45.7
S4-2	MS-25036-108	TB1-4	MS-25036-108	16	17	43.2
DS1-1	MS-25036-108	TB14	MS-25036-108	16	20	50.1
DS1-2	MS-25036-108	M1-2	MS-25036-108	16	7	17.8
L1-1	MS-25036-108	TB1-4	MS-25036-108	16	160	406.4
L1-2	MS-25036-108	TB1-E1	MS-25036-108	16	160	406.4
DS1-1	MS-25036-108	K2-C1	42332-2 (00779)	16	21	53.3
DS1-2	MS-25036-108	K2-C2	42332-2 (00779)	16	21	53.3
S4-4	MS-25036-108	K3-C1	42332-2 (00779)	16	17	43.2
K3-C2	42332-2 (00779)	K2-C2	42332-2 (00779)	16	27	68.6
S2-1	MS-25036-108	S3-C	MS-25036-108	16	34	86.4
S11 -NO	42332-2 (00779)	S2-1	MS-25036-108	16	34	86.4
S11-C	42332-2 (00779)	S2-2	MS-25036-108	16	20	50.1
S10-1	42332-2 (00779)	S11-NO	42332-2 (00779)	16	20	50.1
S12-NO	42332-2 (00779)	S2-2	MS-25036-108	16	16	40.6
S12-C	42332-2 (00779)	K1-C1	42332-2 (00779)	16	10	25.4
K1-C2	42332-2 (00779)	R1-2	SOLDER	16	21	53.3
R1-2	SOLDER	TB1-E1	MS-25036-108	16	25	63.5
S13-C	42332-2 (00779)	R1-1	SOLDER	16	19	48.3
S1 3-NC	42332-2 (00779)	TB1-1	MS-25036-108	16	25	63.5
TB1-1	MS-25036-108	S10-2	42332-2 (00779)	16	22	55.9
TB1-2	MS-25036-108	K4-C1	42332-2 (00779)	16	22	55.9
K4-C2	42332-2 (00779)	TB1 -El	MS-25036-108	16	22	55.9
TB1-El	MS-25036-108	El-GRD	MS-25036-1 08	16	12	30.5

Table 4-5. WIRE LIST F1000ORG-2

TERMINATION		TERMINATION		AWG Wire Size	LENGTH	
FROM	TERMINAL TYPE	TO	TERMINAL TYPE		IN	CM
BT-P	MS-25036-122	S6-1	MS-25036-120	6	48	121.9
CB3-2	MS-25036-112	S5-C	42563-7(00779)	10	17	43.2
K1-C1	MS-25036-108	S5-NO	42332-2(00779)	16	160	406.4
S4-C	42563-7(00779)	TB1-8	MS-25036-112	10	17	43.2
BT-N	MS-25036-122	GRD	MS-25036-120	6	48	121.9
S6-1	MS-25036-112	CB3-1	MS-25036-112	10	120	304.8
S9-2	MS-25036-108	ALT-O	MS-25036-108	16	120	304.8
M1-2	MS-25036-112	CB3-2	MS-25036-112	10	48	121.9
CB2-1	MS-25036-108	M1-i	MS-25036-108	16	46	116.8
ALT-A	MS-25036-112	TB1-6	MS-25036-112	10	120	304.8
TB1-9	MS-25036-108	S11-NC	42332-2 (00779)	16	160	406.4
S4-NC	42332-2 (00779)	TB1-9	MS-25036-108	16	11	27.9
ALT-B	MS-25036-108	TB1-5	MS-25036-108	16	120	304.8
K5-C2	42332-2 (00779)	TB1-El	MS-25036-108	16	18	45.7
CB2-2	MS-25036-108	S12-1	MS-25036-108	16	43	109.2
S7-NC	MS-25036-108	S12-2	MS-25036-108	16	22	55.9
S7-NC	MS-25036-108	M3-1GN	MS-25036-108	16	22	55.9
M3-S	MS-25036-108	R2-1	MS-25036-108	16	160	406.4
TB1-E1	MS-25036-108	M3-GRD	MS-25036-108	16	24	61.0
TB1-1	MS-25036-108	S13-2	42332-2 (00779)	16	10	25.4
S13-2	42332-2 (00779)	TB1-E1	MS-25036-108	16	15	38.1
TB1-E1	MS-25036-108	E1-GRD	MS-25036-108	16	12	30.5
S13-3	42332-2 (00779)	K4-C2	42332-2 (00779)	16	21	53.3
S14-C	42332-2 (00779)	K4-C2	42332-2 (00779)	16	17	43.2
TB1-3	MS-35036-108	S8-1	42332-2 (00779)	16	5	12.7
S7-C	MS-25036-108	TBI-1	MS-25036-108	16	17	43.2
S16-NC	42332-2 (00779)	TB1-4	MS-25036-108	16	15	38.1
S9-2	MS-25036-108	S16-C	42332-2 (00779)	16	13	33.0
TB1-3	MS-25036-108	TB1-1	MS-25036-108	16	14	35.6
S14-NO	42332-2 (00779)	TB1-E1	MS-25036-108	16	96	243.8
K4-C1	42332-2 (00779)	S8-2	42332-2 (00779)	16	96	243.8
DS1-1	MS-25036-108	TB1-3	MS-25036-108	16	26	66.0
L1-1	32446 (00779)	TB1-3	MS25036-108	16	160	406.4
TB1-7	MS-25036-108	L1-2	32446 (00779)	16	160	406.4
K6-1	42460-1	TB1-4	MS-25036-108	16	160	406.4
K5-C1	42332-2 (00779)	TB1-5	MS-25036-108	16	16	40.6
M1-1	MS-25036-112	TB1-6	MS-25036-112	10	32	81.3
S9-2	MS-25036-108	CB1-1	42332-2 (00779)	16	33	83.8
M2-1	MS-25036-108	CB1-2	42332-2 (00779)	16	19	48.3
TB1-E1	MS-25036-108	M2-2	MS-25036-108	16	28	71.1
E1-GRD	MS-25036-108	TB1-E1	MS-25036-108	16	15	38.1
K2-C1	42332-2 (00779)	CB1-2	42332-2 (00779)	16	48	121.9
S1-C	42332-2 (00779)	K2-C 1	42332-2 (00779)	16	9	22.9
K2-C2	42332-2 (00779)	TB1-E1	MS-25036-108	16	23	58.4
K7-2	42332-2 (00779)	K3-C1	42332-2 (00779)	16	25	63.5
K3-C2	42332-2 (00779)	TB1-El	MS-25036-108	16	18	45.7
S1-NC	42332-2 (00779)	R1-1	SOLDER	16	30	76.2
TB1-E1	MS-25036-108	R1-3	SOLDER	16	23	58.4
S10-1	MS-25036-108	K1-C1	MS-25036-108	16	48	121.9
TB1-E1	MS-25036-108	S2-C	42332-2 (00779)	16	30	76.2
TB1-8	MS-25036-108	S2-NC	42332-2 (00779)	16	20	50.8
T1-1	MS-25036-108	TB1-8	MS-25036-108	16	160	406.4

Table 4-5. WIRE LIST F10000RG-2 (cont.)

TERMINATION		TERMINATION		AWG Wire Size	LENGTH	
FROM	TERMINAL TYPE	TO	TERMINAL TYPE		IN	CM
TB1-7	MS-25036-108	DS1-2	MS-25036-108	16	26	66.0
E1-GRD	MS-25036-108	TB1-E1	MS-25036-108	16	14	35.6
TB1-1	MS-25036-108	S9-1	MS-25036-108	16	18	45.7
TB1-El	MS-25036-108	K6-2	42460-1 (00779)	16	160	406.4
TB1-E1	MS-25036-108	El-GRD	MS-25036-108	16	13	33.0
S9-1	MS-25036-108	S-15-NO	42332-2 (00779)	16	15	38.1
Engine	MS-25036-157	Unit Frame	MS-25036-157	10	10	25.4
L2-1	MS-25036-108	S5-NO	42332-2 (00779)	16	160	406.4
L2-2	MS-25036-108	TB1-E1	MS-25036-108	16	160	406.4
K7-1	MS-25036-108	S1-NC	42332-2 (00779)	16	25	63.5
S16-C	42332-2 (00779)	Z1-1	42332-2 (00779)	16	120	304.8
TB1-7	MS25036-108	S14-C	42332-2 (00779)	16	15	38.1

(4) Remove the meter.

c. Replacement.

(1) Position the meter on the panel and, while observing the meter lead tags, reconnect the meter.

(2) Secure the meter in place using the three screws and nuts.

(3) Reconnect power.

4-22. OIL PRESSURE GAGE (Model F10000RG-2 Only). See figures 4-14 and 4-15.

a. Removal.

(1) Disconnect power.

(2) Remove the two screws and lock washers and open the hinged control panel.

(3) Disconnect the flare nut joint to the female coupling.

(4) Remove the female coupling.

(5) Remove the two nuts and lock washers and the clamp from the back of the gage.

(6) Pull the gage from the panel.

b. Installation.

(1) Install the gage through the panel and clamp in place using the clamp, nuts and lock washers supplied with the gage.

(2) Connect the female coupling and the flare nut and tube assembly to the gage.

(3) Close the hinged control panel and secure with two screws and lock washers.

(4) Connect power.

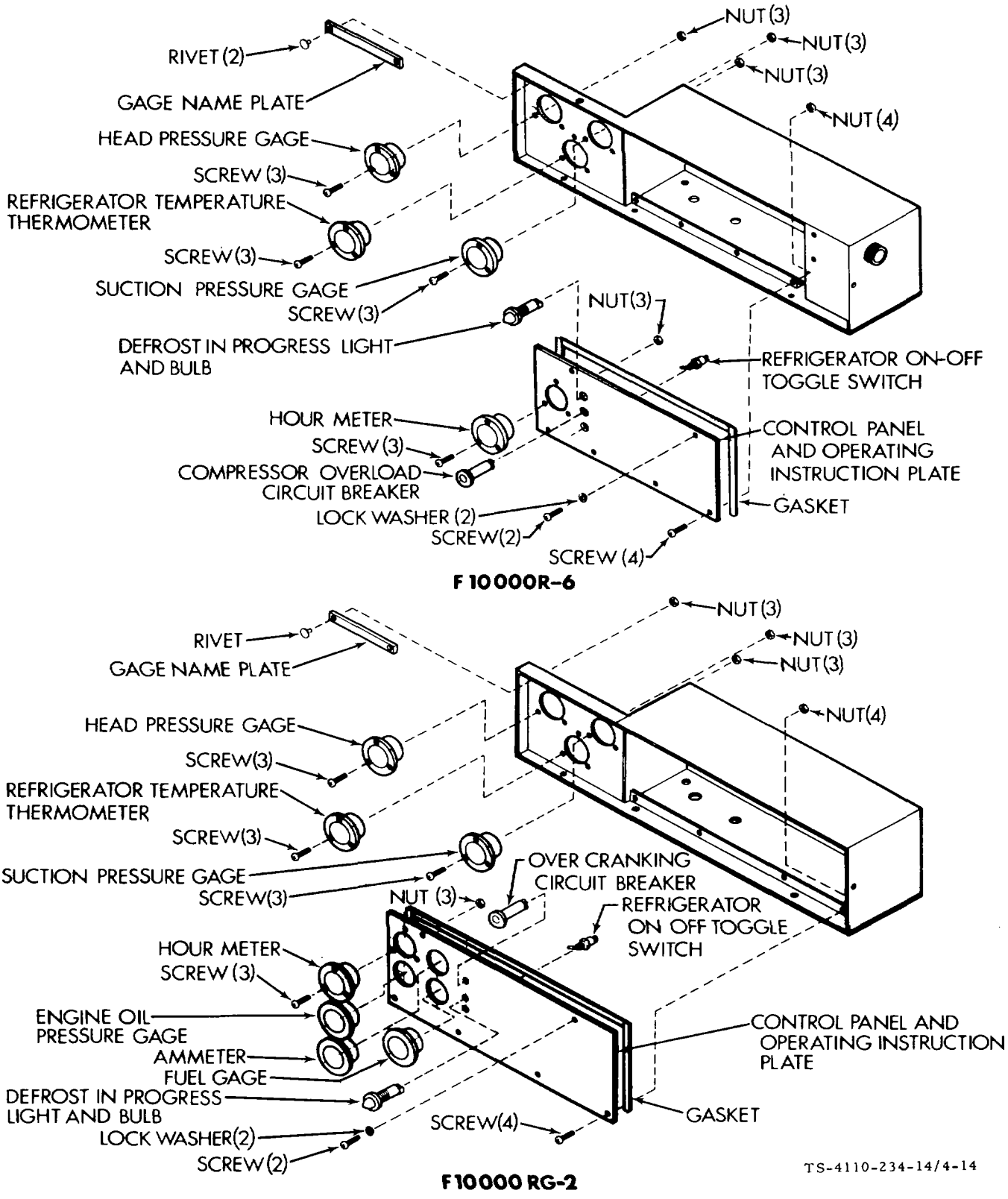


Figure 4-14. Instrument Panel

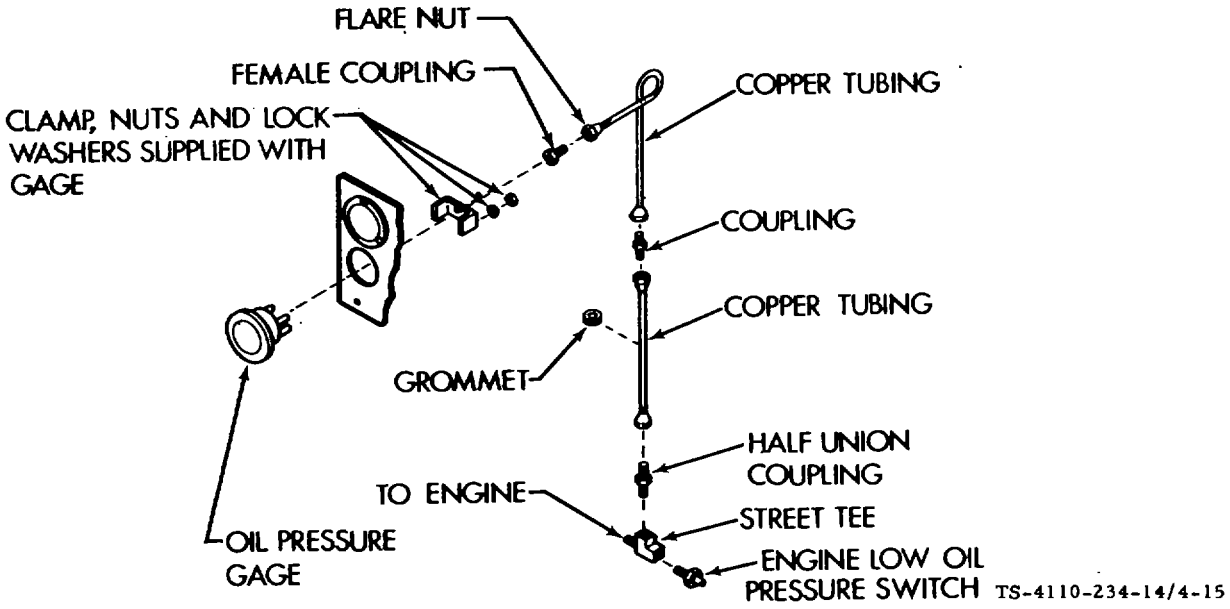


Figure 4-15. Oil Pressure Gage F10000RG-2

4-23. AMMETER (Model F1000RG-2 Only) See figure 4-14.

a. Removal.

(1) Disconnect power.

(2) Remove the two screws and lock washers and open the hinged control panel.

(3) Tag and remove the wires.

(4) Remove the nuts, lock washers, and clamp that secure the gage to the control panel.

(5) Pull the gage from the front of the control panel.

b. Installation.

(1) Install the gage through the panel and clamp in place using the clamp, nuts and lock washers supplied with the gage.

(2) Connect the wire leads. See tags and wiring diagram figure 4-6.

(3) Close the hinged control panel and secure with two screws and lock washers.

(4) Connect power.

4-24. FUEL LEVEL GAGE (ModelF10000RG-2Only) See figure4-14.

a. Removal.

(1) Disconnect power.

(2) Remove the two screws and lock washers and open the hinged control panel.

(3) Tag and remove the wires.

(4) Remove the nuts, lock washers, and clamp that secure the gage to the control panel.

(5) Pull the gage from the front of the control panel.

b. Installation.

(1) Install the gage through the panel and clamp in place using the clamp, nuts and lock washers supplied with the gage.

(2) Connect the wire leads. See tags and wiring diagram figure 4-6.

(3) Close the hinged control panel and secure with two screws and lock washers.

(4) Connect power.

4-25. CIRCUIT BREAKERS I See figure 4-14.

a. Removal.

(1) Disconnect power.

(2) Remove the two screws and lock washers and open the hinged control panel.

(3) Tag and remove the wires.

(4) For testing of installed part see step b.

(5)Detach retaining clip and remove circuit breaker.

b. Testing. With leads disconnected check resistance of circuit breaker. For Model F10000R-6 the resistance should be 0.09 ohms. For Model F10000RG-2 the resistance should be 12.0 ohms.

c. Installation.

(1) Insert circuit breaker into panel and secure it in place with press-on retaining clip.

(2) Connect the wire leads. See tags and wiring diagram figures 4-5 or 4-6.

(3) Close the hinged control panel and secure with two screws and lock washers.

(4) Connect power.

4-26. DEFROST IN PROGRESS LIGHT See figures 4-14 and 4-16.

a. Bulb removal.

(1) Unscrew the lens and lens holder.

(2) Push in and turn bulb counterclockwise.

(3) Check bulb for loose or broken filaments.

b. Bulb replacement.

(1) Insert bulb, push and turn clockwise.

(2) Screw lens and lens holder in place finger tight.

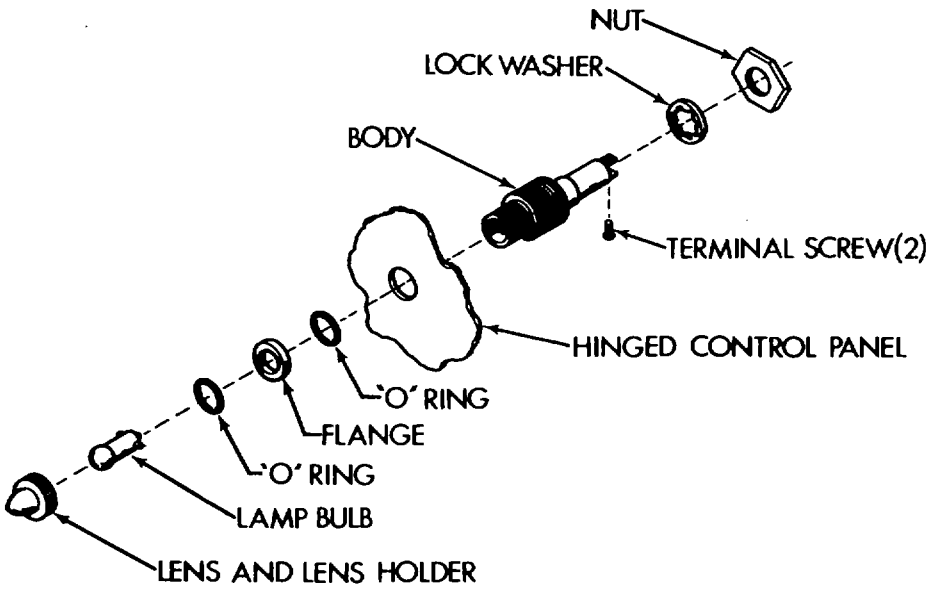


Figure 4-16. Defrost in Progress Light

c. Should the total assembly be damaged and need replacement.

(1) Disconnect powep.

(2) Remove the two screws and lock washers and open the hinged control panel.

(3) Tag and remove the wires.

(4) Remove the nut and lock washer from the back side and pull the light assembly from the panel.

d. Installation.

(1) Assemble parts as shown on figure 4-16. Note that bulb is not supplied as part of light assembly. It must be ordered separately.

(2) Connect the wire leads. See tags and wiring diagram figures 4-5 or 4-6.

(3) Close the hinged control panel and secure with two screws and lock washers.

(4) Connect power.

4-27. REFRIGERATOR ON-OFF SWITCH See figure 4-14.
This is a two-position toggle switch.

a. Removal.

(1) Disconnect power.

(2) Remove the two screws and lock washers and open the hinged control panel.

(3) Tag and remove the wires.

(4) Remove the hex nut and washers that secure the switch to the panel and remove the switch.

b. Testing.

(1) With an ohmmeter check for zero ohms resistance with the switch in the ON position (this would be upward on the panel).

(2) Check for infinite resistance with the switch in the OFF position (this would be downward on the panel).

c. Installation.

(1) Position the switch on the panel with the ON position on top, but with the toggle pointing down, and secure it to the panel with the hex nut and washers.

(2) Connect the wire leads. See tags and wiring diagram figures 4-5 or 4-6.

(3) Close the hinged control panel and secure with two screws and lock washers.

(4) Connect power.

4-28. HEAD PRESSURE GAGE See figures 4-14 and 4-17.

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

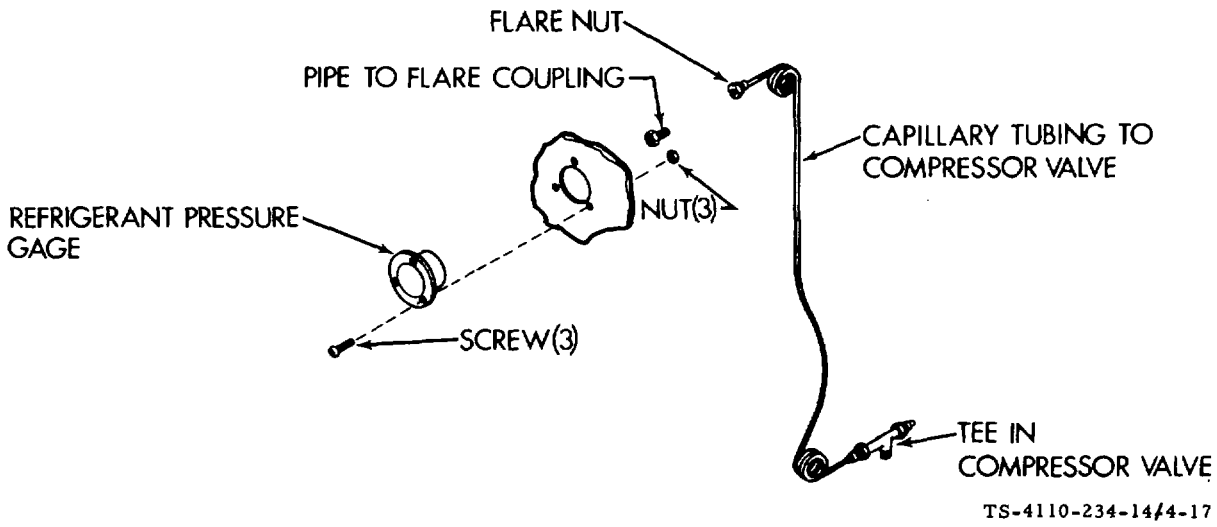


Figure 4-17. Refrigerant Pressure Gages

a. Removal.

(1) Disconnect power.

(2) Open doors to have access to the left rear of the control panel 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 backseated.

(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.

4-29. REFRIGERATOR TEMPERATURE THERMOMETER | See figures 4-14 and 4-18.
This is a remote bulb thermometer with a panel mounted indicating dial.

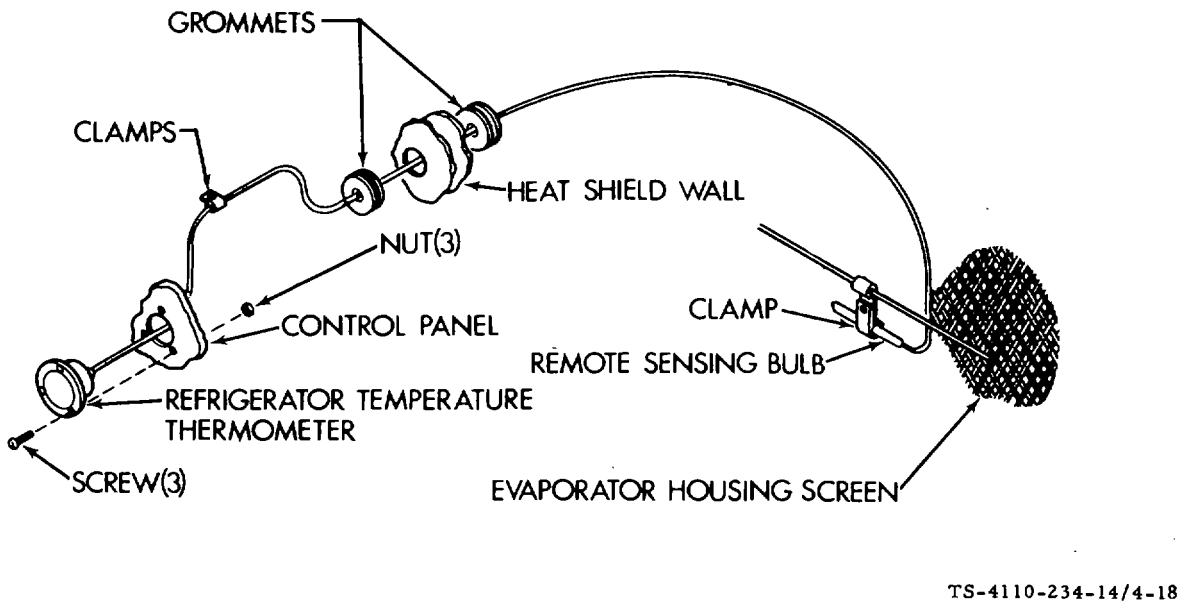


Figure 4-18. Refrigerator Temperature Thermometer

a. Removal.

(1) Disconnect power.

(2) See figure 4-12 and remove the evaporator air housing and screen.

(3) Loosen 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 three attaching screws and nuts and pull the thermometer from the panel.

b. Calibration. Immerse the remote bulb in a container of cracked ice for several minutes. The dial should indicate 32°F (0°C). If it does not, remove the crystal and correct the dial indication by means of the calibration adjustment on the face of the dial. If the gage can't be calibrated, it must be replaced.

c. Installation.

(1) Thread the bulb and capillary through the panel hole and mount the thermometer using three screws and nuts.

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

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

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

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

(6) See figure 4-12 and reinstall the evaporator air housing and screen.

(7) Close access doors and connect power.

4-30. SUCTION PRESSURE GAGE See figures 4-14 and 4-17.

This gage indicates the pressure at the input to the compressor. It is called a compound gage because its scale 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 left rear of the control panel 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 backseated.

(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 suction 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 suction 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.

4-31. DEFROST TIMER (MODEL F10000R-6) See figures4-2 and figure 4-19.

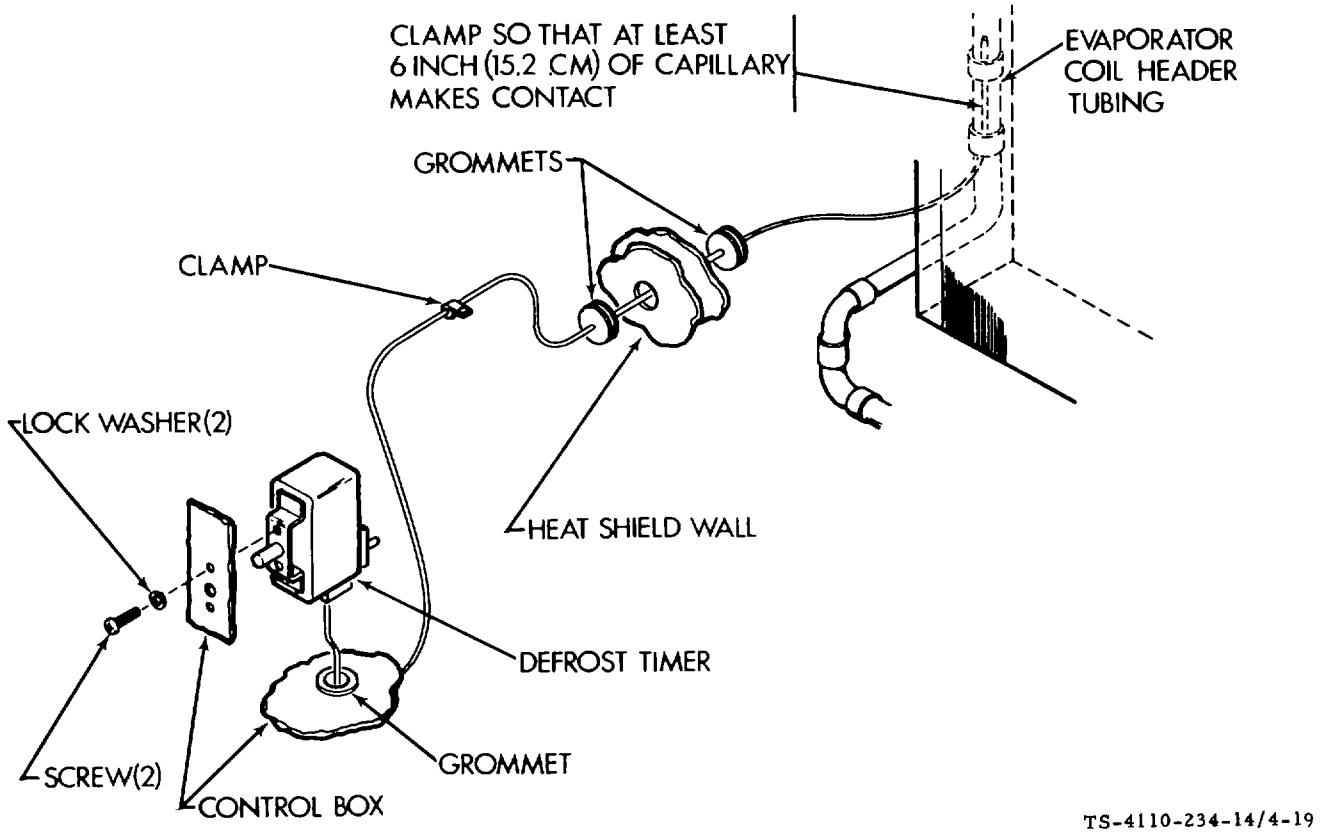


Figure 4-19. Defrost Timer F10000R-6

a. Removal.

(1) Disconnect power.

(2) See figure 4-12 and remove the evaporator air housing and screen.

(3) Remove two screws and lock washers and open the control panel door.

(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 two screws and lock washers and remove the defrost timer.

(7) Tag and disconnect the wires.

b. Inspection.

(1) Inspect for physical damage.

(2) Inspect for signs of overheating.

c. Testing. Perform continuity checks with ohmmeter as follows:

(1) There should be continuity between terminals 1 and 3.

(2) There should be continuity between terminals 3 and 4.

d. Installation.

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

(2) See wiring diagram figure 4-5 and connect wire leads.

(3) Secure the defrost timer with two screws and lock washers.

(4) Thread the capillary through the heat shield wall.

(5) Clamp the capillary end to the evaporator coil header as shown on figure 4-19. At least 6 inches (15.2cm) of the capillary end must make contact with the header.

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

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

(8) See figure 4-12 and reinstall the evaporator air housing and screen.

(9) Close the control panel and secure with two screws and lock washers.

(10) Close access doors and connect power.

4-32. DEFROST TIMER (MODEL F10000RG-2) I See figure4-3.

a. Removal.

(1) Disconnect power.

(2) Remove two screws and lock washers and open the control panel door.

(3) Tag and disconnect wires.

(4) Remove the screw and lock washer and remove the defrost timer.

b. Inspection.

(1) Inspect for physical damage.

(2) Inspect for signs of overheating.

c. Testing. Using ohmmeter, make the following continuity checks:

(1) There should be continuity between terminals 1 and 2 of S13.

(2) With C2 lead of relay K4 disconnected, there should be continuity between terminals C1 and C2.

d. Installation.

(1) Place the defrost timer in the box and secure with a screw and lock washer.

(2) See the wiring diagram figure 46 and tags and connect wire leads.

(3) Close the control panel and secure with two screws and lock washers.

(4) Connect power.

4-33. RELAYS See figures 4-2 and 4-3.

The following information applies to relays K2, K3 and K4 on the F10000R6 and relays K2, K3, K4 and K5 on the F10000RG-2.

a. Disconnect power.

b. Remove two screws and lock washers and open the control panel door.

c. Inspect for cracks, corrosion, loose electrical connections and loose mounting hardware. Repair and tighten loose electrical connections and tighten loose mounting hardware. Replace relay if it is cracked, broken or badly corroded.

d. Wipe parts with a clean dry cloth.

e. Testing.

(1) Tag and disconnect the wires.

(2) Touch the probes of a continuity tester to the C1 and C2 pins. If an open circuit is indicated, replace the relay.

f. Removal. Remove the screw and lock washer and remove the relay.

g. Installation.

(1) Position the relay so that the mounting boss sticks into one hole and attach with a screw and lock washer.

(2) See the wiring diagram figure 4-5 or 4-6 and tags and connect wire leads.

(3) Close the control panel and secure with two screws and lock washers.
(4) Connect power.

4-34. TIME DELAY RELAY (F0000RG-2) See figure 4-3.

a. Disconnect power.

b. Remove two screws and lock washers and open the control panel door.

c. Removal.

(1) Tag and disconnect the wires.

(2) Remove the screw and lock nut.

(3) Remove time delay relay.

d. Inspect for cracks, loose, broken, missing or badly corroded terminal connections and evidence of overheating.

e. Installation.

(1) Secure the relay with a screw and lock nut.

(2) See the wiring diagram 4-6 and tags and connect wire leads.

(3) Close the control panel and secure with two screws and lock washers.

(4) Connect power.

4-35. HIGH PRESSURE CUTOUT SWITCH See figures 4-2, 4-3 and 4-20.
This switch deenergizes the unit when the compressor discharge pressure reaches 250 psig.

a. Testing installed.

(1) Disconnect power.

(2) Remove the two screws and lock washers and open the control panel.

(3) 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.

(4) Tag and disconnect wires.

(5) Use a continuity tester or multimeter to check for continuity between terminals 1 and 2 on 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 left rear of the control panel 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.

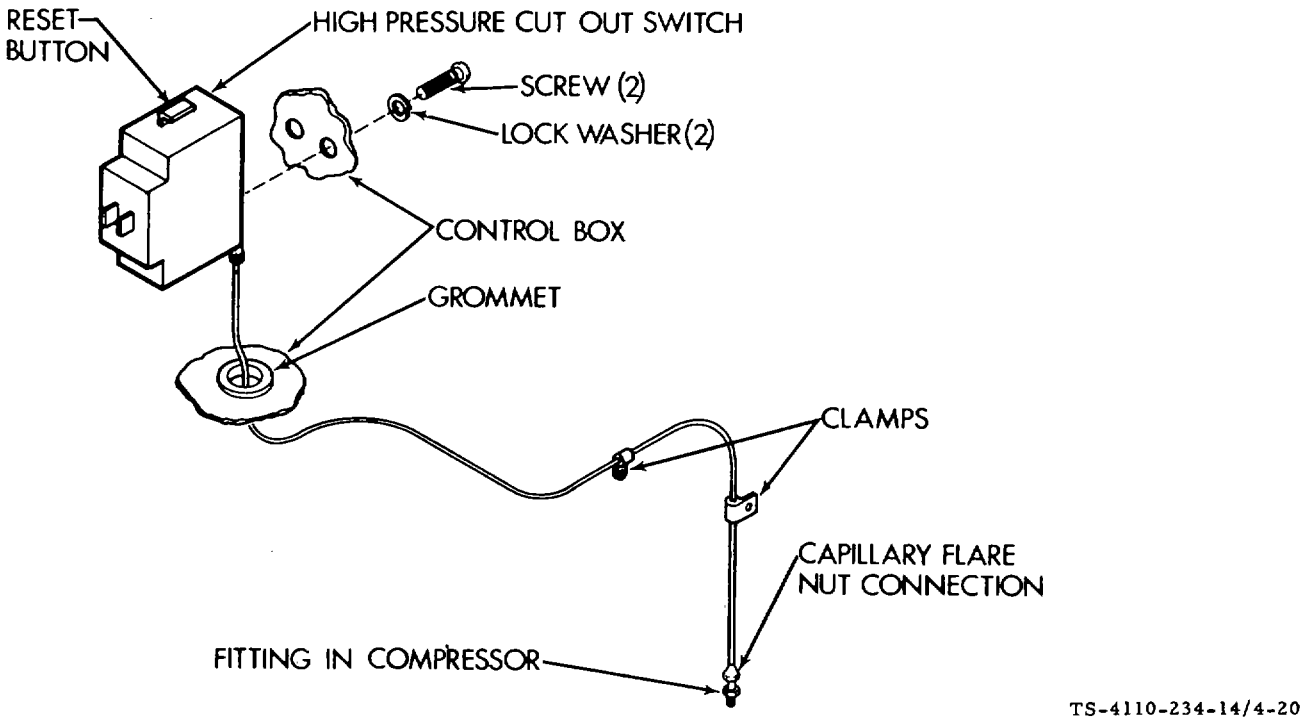


Figure 4-20. High Pressure Cutout Switch

(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.

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

(5) Remove the clamps that secure the capillary line.

(6) From the back side of the control panel, remove the two screws and lock washers that mount the high pressure cutout switch.

(7) Remove the switch and carefully thread the capillary line up and out of the grommeted hole.

c. Installation.

(1) Carefully thread the capillary down through the grommeted hole in the bottom of the control box while directing the end of the capillary tube over toward the compressor.

(2) Secure the high pressure cutout switch with two screws and lock washers.

(3) Taking care not to crimp the tubing bend the capillary so that it runs down to the compressor and is clamped at the original clamping points.

(4) Carefully coil the excess capillary tubing and connect the flare nut to the fitting on the compressor.

(5) Be sure that the flare nut is tight. Turn the discharge valve stem one turn clockwise to "crack" the valve.

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

(7) Reinstall the protective cap over the valve stem.

(8) See wiring diagram figures 4-5 or 4-6 and tags and connect wire leads.

(9) Close the control panel and secure with two screws and lock washers.

(10) Close access doors and connect power.

4-36. THERMOSTAT See figures 4-2, 4-3 and 4-21.

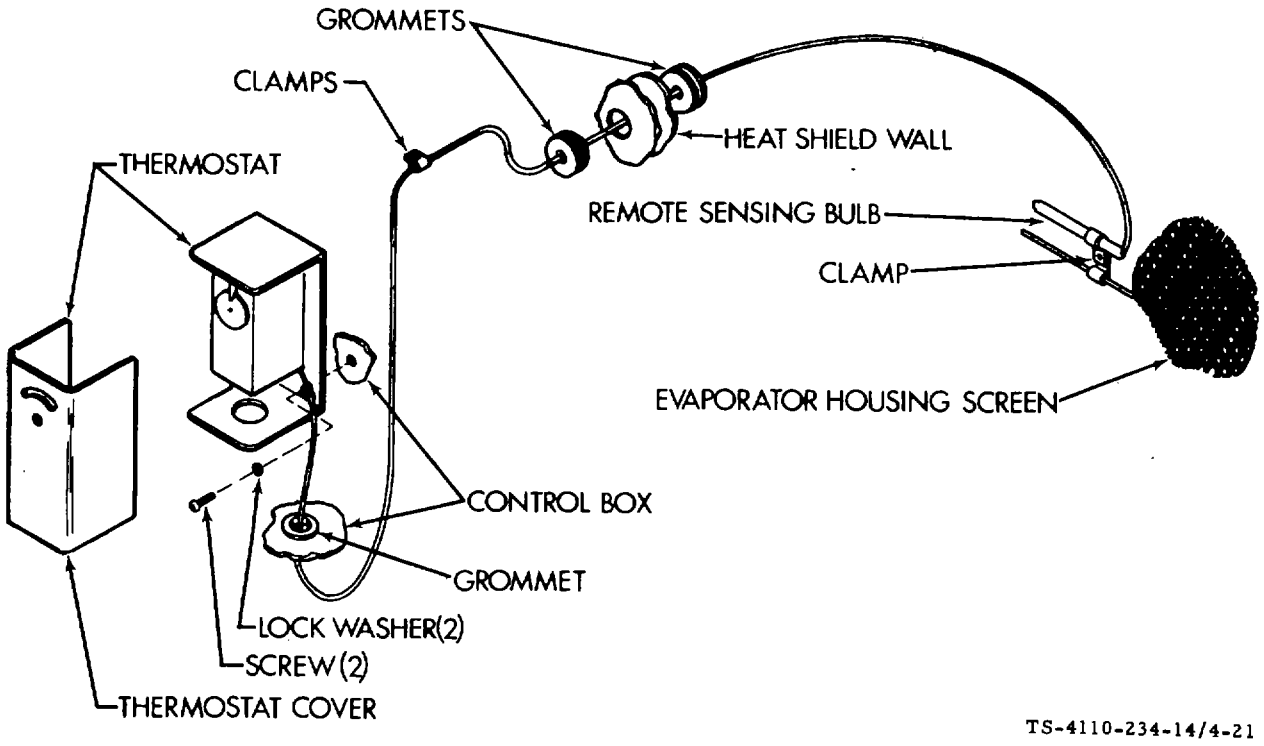


Figure 4-21. Thermostat

a. Removal.

(1) Disconnect power.

(2) See figure 4-12 and remove the evaporator air housing and screen.

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

(4) Remove two screws and lock washers and open the control panel door.

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

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

(7) Remove the thermostat cover and remove the two screws and lock washers and remove the thermostat.

(8) 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: With the thermostat set below the thermometer reading there should be continuity between the two terminals. With the thermostat set above the thermometer reading there should be no continuity.

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 two screws and lock washers.

(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 lines 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 4-12 and reinstall the evaporator air housing and screen.

(8) Install a grommet in the bottom knockout hole in the thermostat.

(9) See wiring diagram figures 4-5 or 4-6 and tags and connect wire leads.

(10) Set thermostat temperature to desired setting.

(11) Close the control panel and secure with two screws and lock washers.

(12) Close access doors and connect power.

4-37. RESISTOR See figure 4-2 or 4-3.

a. Access.
(1) Disconnect power.

(2) Remove two screws and lock washers and open the control panel.

b. Testing.

Tag and unsolder the lead from one end of the resistor and measure the resistance with an ohmmeter. For Model F10000R6 the resistance should be 50 ohms. For the Model F10000RG-2 variable resistor the maximum resistance should be 20 ohms. If the correct reading is not obtained, the resistor is defective and must be replaced.

c. Removal.

(1) Tag and unsolder the remaining lead.

(2) Remove two screws and lock washers and remove resistor.

d. Installation.

(1) Secure resistor with two screws and lock washers.

(2) See wiring diagram figures 45 or 4-6 and tags and solder wire leads.

(3) Close the control panel door and secure with two screws and lock washers.

(4) Connect power.

4-38. FUSES See figure 4-2 or 43.

a. Access.

(1) Disconnect power.

(2) Remove two screws and lock washers and open the control panel.

(3) On the F10000R-6 remove the screw and washer from the pull out disconnect cover and open the cover.

b. Test/Remove.

(1) On the F10000R-6 there are 4 fuses. F1 is clearly visible in the lower left center of the control box. Fuses F2, F3 and F4 are located in the pull out disconnect. To gain access to these fuses pull the disconnect portion straight out.

(2) On the F10000RG-2 there are 2 fuses. Both are clearly visible in the lower right corner of the control box.

(3) Pull a suspected bad fuse and check it for continuity with an ohmmeter. Replace the fuse if it is bad.

c. Installation.

(1) Install new fuse.

(2) If the pull out disconnect (F10000R-6 only) was removed, be sure it is put back in the on position.

(3) Close the panel(s) and reinstall screws and lock washers.

(4) Connect power.

4-39. COMPRESSOR MOTOR CONTROLLER (F10000R-6 ONLY) See figure 4-2.

a. Access.

(1) Disconnect power.

(2) Remove two screws and lock washers and open control panel door.

b. Inspect.

(1) Inspect for physical damage, loose connections and loose or missing mounting hardware.

(2) Inspect for signs of overheating.

c. Test.

(1) Use a continuity tester or a multimeter set on the lowest OHMS (RX 1) scale to check continuity between terminals L1 and T1, L2 and T2 and L3 and T3. All three contacts should be open. If there is continuity between any of these terminals, replace the controller.

(2) Check continuity between coil terminals C1 and C2. If there is no continuity, the coil is open; replace the controller.

d. Removal. Assuming that power has been disconnected and that control panel door is open

(1) Tag and disconnect the wires.

(2) Remove the three screws and lock washers and remove the compressor motor controller.

e. Installation.

(1) Position the compressor motor controller in the box and secure it with three screws and lock washers.

(2) See wiring diagram figure 4-5 and tags and connect wire leads.

(3) Close the control panel and secure with two screws and lock washers.

(4) Connect power.

4-40. MAINTENANCE OF DRIVE SYSTEM

WARNING

Always disconnect power from battery (F10000RG-2) or power source (F10000R-6) prior to performing internal maintenance. The unit could be turned on while you are working inside.

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.

4-41. EVAPORATOR FAN See figure 4-22 or4-23.

a. Access.

(1) Disconnect power.

(2) See figure 4-12 and remove the top evaporator screen.

b. Check fan for loose or missing setscrews, breaks, cracks, dents, loose or missing rivets, bent or deformed blades and accumulated dirt. Tighten or replace missing setscrews.

c. Cleaning. If the fan is to be removed wait till fan is out of the unit to clean it.

WARNING

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 (380C to 590C).

Wipe the fan blades with a clean cloth dampened slightly with dry cleaning solvent (Fed Spec P-D-680) or a solution of detergent and water. Do not use a contaminated cleaning solution that would leave any residue on the fan. Dry thoroughly.

d. Removal. (On the F10000RG-2 only restrain fan shaft on evaporator side, with appropriate tool, and remove the nut from the end of the shaft.) Loosen the two setscrews and slide the fan off of the end of the shaft. Take care not to damage the coil fins.

e. Installation.

(1) Check to see that the key is in place on the shaft.

(2) Aline the key and keyway in the hub and slide the fan in place on the shaft. Take care not to damage the coil fins.

(3) Apply loctite to both setscrews and tighten them on the shaft and key.

(4) On the F10000RG-2 restrain fan shaft on evaporate side with appropriate tool and install the nut on the end of the shaft.

(5) See figure 4-12 and reinstall the top evaporator screen.

(6) Connect power.

4-42. CONDENSER FAN See figure 4-22 or 4-23.

a. Access.

(1) Open condenser side access doors.

b. Check fan for loose or missing setscrews, breaks, cracks, dents, loose or missing rivets, bent or deformed blades and accumulated dirt. Tighten or replace missing setscrews.

c. Cleaning. If the fan is to be removed wait until fan is out of the unit to clean it.

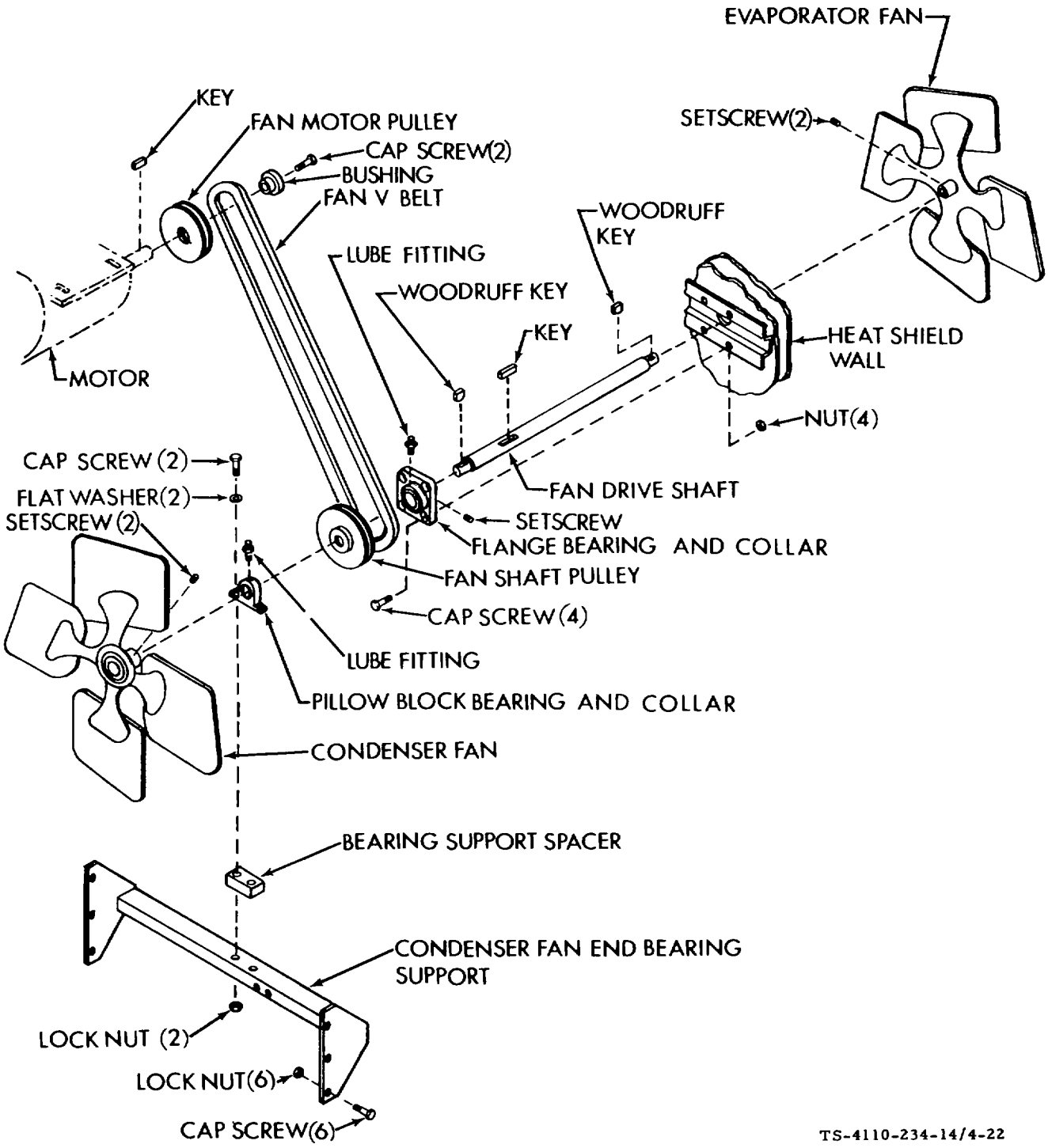


Figure 4-22. Fan Drive F1000R-6

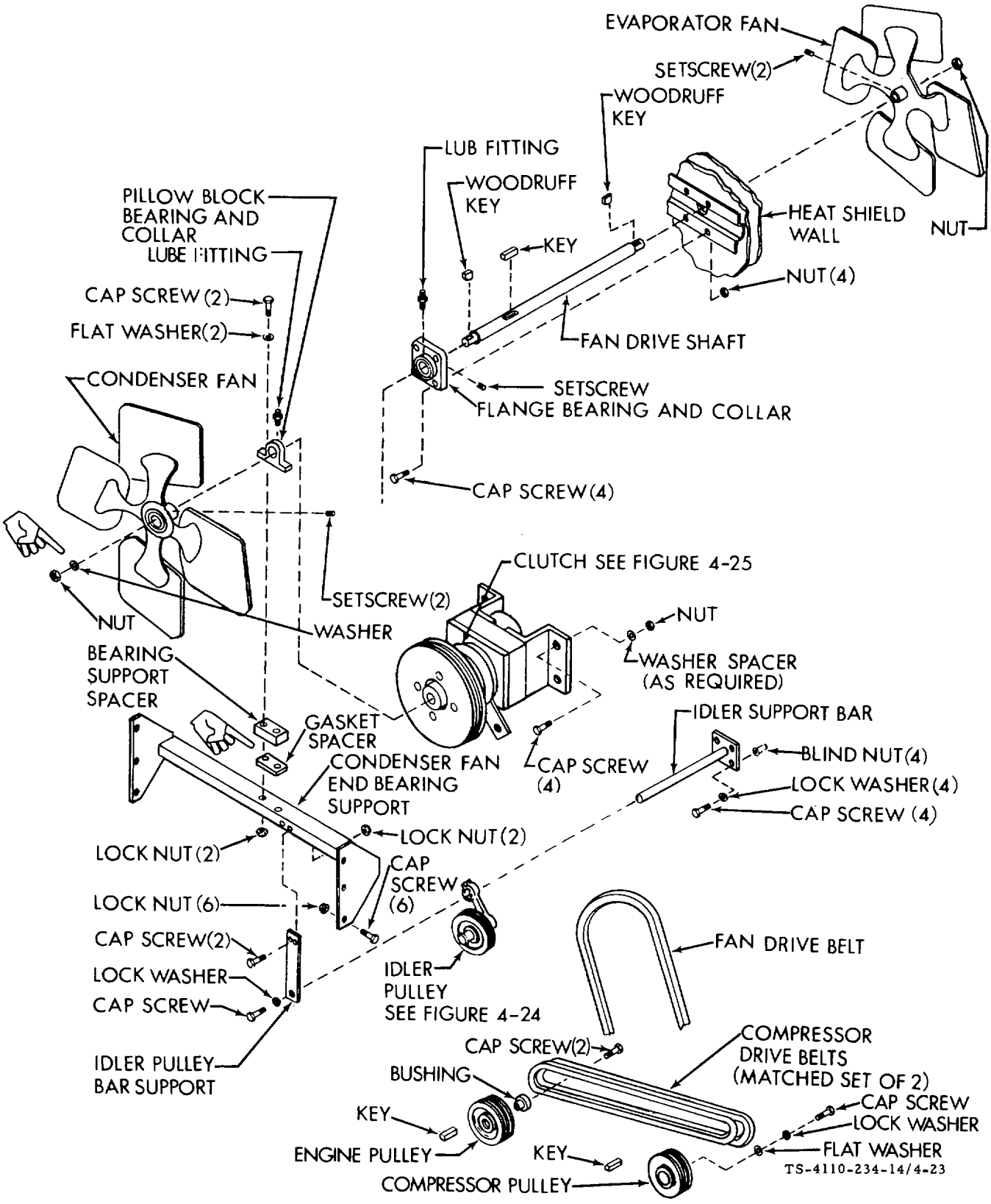


Figure 4-23. Fan and Compressor Drive F10000R-6

WARNING

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 1380F (380C to 590C).

Wipe the fan blades with a clean cloth dampened slightly with dry cleaning solvent (Fed Spec P-D-680) or a solution of detergent and water. Do not use a contaminated cleaning solution that would leave any residue on the fan. Dry thoroughly.

d. Removal. (On the F1OOOORG-2 only restrain fan shaft with appropriate tool and remove the nut and washer from the end of the shaft.) Loosen the two setscrews and slide the fan off of the end of the shaft. Take care not to damage the coil fins.

e. Installation:

(1) Check to see that the key is in place on the shaft.
(2) Aline the key and keyway in the hub and slide the fan in place on the shaft. Take care not to damage the coil fins.
(3) Apply loctite to both setscrews and tighten them on the shaft and key.
(4) On the F1000O RG-2 restrain fan shaft with appropriate tool and install the nut and washer on the end of the shaft.
(5) Connect power.

4-43. FAN DRIVE BELT (F10000R-6) See figure 4-22.

a. Removal.

(1) Disconnect power and open side access doors.
(2) Loosen the motor mounting bolts and slide the motor so that the fan drive belt can be removed from the motor pulley.
(3) Remove the two cap screws, flat washers and lock nut from the pillow block bearing.
(4) Slip the bearing support spacer out from under the pillow block bearing.
(5) Slip the belt through the space left under the bearing. Work the belt up and over the condenser fan one blade at a time.

b. Installation.

(1) Work the belt over the condenser fan and through the space under the bearing.
(2) Slip the bearing support spacer back in place and secure with two each cap screws, lock washers and lock nuts.
(3) Place the belt on both pulleys and slide the motor away from the center of the unit to take up belt slack. Proper belt tension is a deflection of 1/2 inch (1.3 cm) midway between pulleys.

WARNING

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

(4) Tighten the motor mounting bolts.

(5) Close the access doors.

(6) Connect power.

4-44. FAN DRIVE BELT (F10000RG-2) See figure 4-23.

a. Removal.

(1) Disconnect power and open side access doors.

(2) Loosen the idler arm screw and relax the belt tension.

(3) Remove the belt from the compressor pulley.

(4) Remove the two cap screws, flat washers and lock nut from the pillow block bearing.

(5) Slip the bearing support spacer out from under the pillow block bearing.

(6) Remove the upper two cap screws and lock nuts and the lower screw and lock washer and remove the idler pulley bar support.

(7) Remove the six cap screws and slide the condenser fan end bearing support toward the fan shroud.

(8) Slip the belt through the space left under the bearing. Work the belt up and over the condenser fan one blade at a time.

b. Installation.

(1) Work the belt over the condenser fan and through the space under the bearing.

(2) Install the condenser fan end bearing support bracket with six screws.

(3) Slip the bearing support spacer back in place and secure with two each cap screws, lock washers and lock nuts.

(4) Position the idler bar support and secure it in place with two each cap screws and lock nuts in the upper holes and a cap screw and lock washer in the lower hole.

(5) Place the belt on both pulleys and push the idler pulley to bring proper tension in the belt. Proper tension is a deflection of 1/2 inch (1.3 cm) midway between pulleys. Tighten idler pulley setscrew.

(6) Close the access door.

(7) Connect power.

4-45. COMPRESSOR DRIVE BELTS (F10000RG-2) See figure 4-23.

a. Removal.

(1) Disconnect power and open side access doors.
(2) Loosen the idler arm screw and relax the belt tension.
(3) Remove the fan drive belt from the compressor pulley.
(4) Loosen the four gasoline engine bolts. There is an access slot on the lower left front of the cabinet for the front bolts.

(5) Use a 3/4 socket and socket wrench with an extension and turn the engine mount adjusting screws located under the compressor mount to move the engine and release belt tension. Be sure you turn both screws the same number of full turns.

(6) Remove the belts.

b. Installation.

NOTE

Use only matched sets of two belts on the engine to compressor drive. Unmatched sets are difficult or impossible to adjust and result in excessive wear and improper misalined drive.

(1) Place a matched set of two belts on the engine and compressor pulleys. Be sure that the belts are in the two grooves closer to the compressor.

(2) Use a 3/4 socket and socket wrench with an extension and turn the engine mount adjusting screws located under the compressor mount to move the engine. Proper belt tension is a deflection of 1/2 inch (1.3 cm) midway between the pulleys.

CAUTION

Both adjusting screws must be moved the same amount. Do not permit the engine to twist or cock on its mount. Uneven belt wear and bearing damage will result.

(3) Tighten the four engine mounting bolts.

(4) Place the fan drive belt back on the compressor pulley.

(5) Push the idler pulley to bring proper tension in the fan belt. Proper tension is a deflection of 1/2 inch (1.3 cm) midway between pulleys. Tighten the idler pulley setscrew.

(6) Close the access doors.
(7) Connect power.

4-46. IDLER PULLEY PARTS (F10000RG-2)

See figure 4-23.

a. Lubrication. See paragraph 4-12.

b. Removal/Disassembly.

(1) Disconnect power and open the side access doors.

(2) Remove the upper two cap screws and lock nuts and the lower cap screw and lock washer and remove the idler pulley bar support.

(3) Loosen the idler arm setscrew and pull the assembled idler arm, shaft and pulley from the support bar.

(4) See figure 4-24 and loosen the setscrew in the idler shaft collar.

(5) Pull the collar and the idler pulley off of the shaft.

(6) If the shaft is bad, place a wrench on the machined flats on the end of the shaft and unscrew the shaft from the arm.

c. Installation/Assembly.

(1) Screw the idler shaft into the idler arm and tighten using an open end wrench on the machined flats. Do not use vise grips or a pipe wrench or any device that would mark the shaft bearing surface.

(2) Slide the idler pulley on the shaft and place the collar on the end of the shaft, snug against the pulley. Be sure the pulley spins freely.

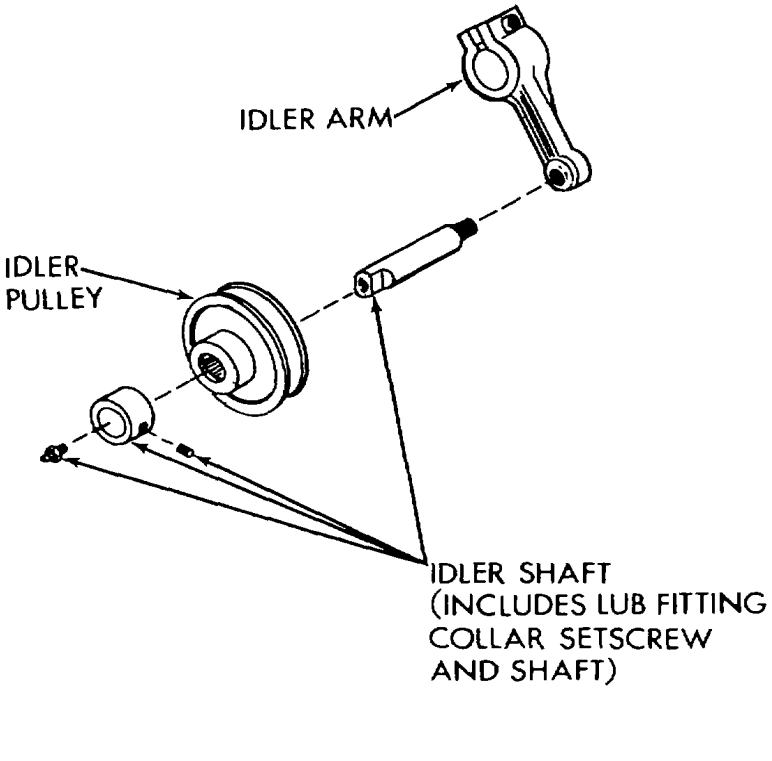


Figure 4-24. Idler Pulley F10000RG-2

(3) Tighten the collar setscrew.

(4) Slide the assembled idler pulley, shaft and arm onto the idler support bar. See figure 4-23.

(5) Position the idler pulley bar support and secure it in place with two each cap screws and lock nuts in the upper holes and a cap screw and lock washer in the lower hole.

(6) Be sure the belt is in place on the clutch pulley and the outer groove of the compressor pulley.

(7) Position the idler pulley against the belt being careful that the three pulleys aline and that the belt is running parallel with the face of the pulleys.

(8) Push the idler pulley to bring proper tension in the belt. Proper tension is a deflection of 1/2 inch (1.3 cm) midway between the pulleys. Tighten the idler pulley setscrew.

(9) Close the access doors.

(10) Connect power.

4-47. PILLOW BLOCK (FRONT) BEARING See figures 4-22 or4-23.

a. Access.

(1) Disconnect power.
(2) Open condenser side access doors.

b. Lubrication. See paragraph 4-11.
c. Removal.

(1) On the F1000O RG-2 only, restrain fan shaft with appropriate tool and remove the nut and washer from the end of the shaft.

(2) Loosen the two setscrews and slide the fan off the end of the shaft. Take care not to damage the coil fins. Take care that the shaft key is not lost.

(3) Remove the two cap screws and lock nuts and the bearing support spacer.

(4) Loosen the setscrew in the bearing locking collar and using a spanner wrench or a brass drift pin turn the collar opposite to the direction of the shaft rotation to release the locking device.

(5) Slide the bearing and locking collar off the shaft.

d. Installation.

(1) Slide the locking collar and bearing on the shaft.

(2) Slip the bearing support spacer into place and secure the bearing with two cap screws and lock nuts.

(3) Using a spanner wrench or a brass drift pin turn the bearing locking collar the same direction as the shaft rotation to lock in place on the end of the bearing and tighten the setscrew.

(4) If a lubrication fitting was not supplied with the new bearing, remove the fitting from the old bearing or obtain a new one. Remove the plug in the bearing and install the lubrication fitting.

(5) Check to see that the fan key is in place on the shaft.

(6) Aline the fan hub keyway and the shaft and key and slide the fan into place on the shaft. Take care not to damage the coil fins.

(7) Apply loctite to both fan hub setscrews and tighten them on the shaft and key.

(8) On the F10000RG-2 only, restrain fan shaft with appropriate tool and install the nut and washer on the end of the shaft.

(9) Close access doors.

(10) Connect power.

4-48. FAN SHAFT PULLEY (F10000R-6) See figure 4-22.

a. Access.

(1) Disconnect power.

(2) Open condenser side access doors.

b. Removal.

(1) Loosen the two setscrews and slide the fan off the end of the shaft. Take care not to damage the coil fins. Take care that the shaft key is not lost.

(2) Remove the two cap screws and lock nuts and the bearing support spacer.

(3) Loosen the setscrew in the pillow block bearing locking collar and using a spanner wrench or a brass drift pin turn the collar opposite to the direction of the shaft rotation to release the locking device.

(4) Slide the bearing and locking collar off the shaft.

(5) Loosen the motor mounting bolts and slide the motor so that the belt can be removed from the shaft pulley.

(6) Remove the two cap screws from the pulley bushing.

(7) Remove the pulley from the bushing. If necessary the two cap screws removed in (6) above can be used as jack screws by screwing them into the tapped holes in the bushing flange.

(8) Remove the bushing from the shaft. Take care that shaft key is not lost.

c. Installation.

(1) Loose assemble the pulley and pulley bushing and slide them on the shaft over the shaft key.

(2) Aline the pulley face with the pulley on the motor and tighten the cap screws in the pulley bushing.

(3) Slide the locking collar and bearing on the shaft.

(4) Slip the bearing support spacer into place and secure the bearing with two cap screws and lock nuts.

(5) Using a spanner wrench or a brass drift pin turn the bearing locking collar the same direction as the shaft rotation to lock in place on the end of the bearing and tighten the setscrew.

(6) Check to see that the fan key is in place on the shaft.

(7) Aline the fan hub keyway and the shaft and key and slide the fan into place on the shaft. Take care not to damage the coil fins.

(8) Apply loctite to both fan hub setscrews and tighten them on the shaft and key.

(9) Place the belt on both pulleys and slide the motor away from the center of the unit to take up belt slack. Proper belt tension is a deflection of 1/2 inch (1.3 cm) midway between pulleys.

CAUTION

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

(10) Tighten the motor mounting bolts.

(11) Close the access doors.

(12) Connect Power.

4-49. CLUTCH (F10000RG-2) See figures 4-23,4-25 and 4-26.

a. Access.

(1) Disconnect power.

(2) Open condenser side access doors.

b. Adjust. (See figure 4-25).

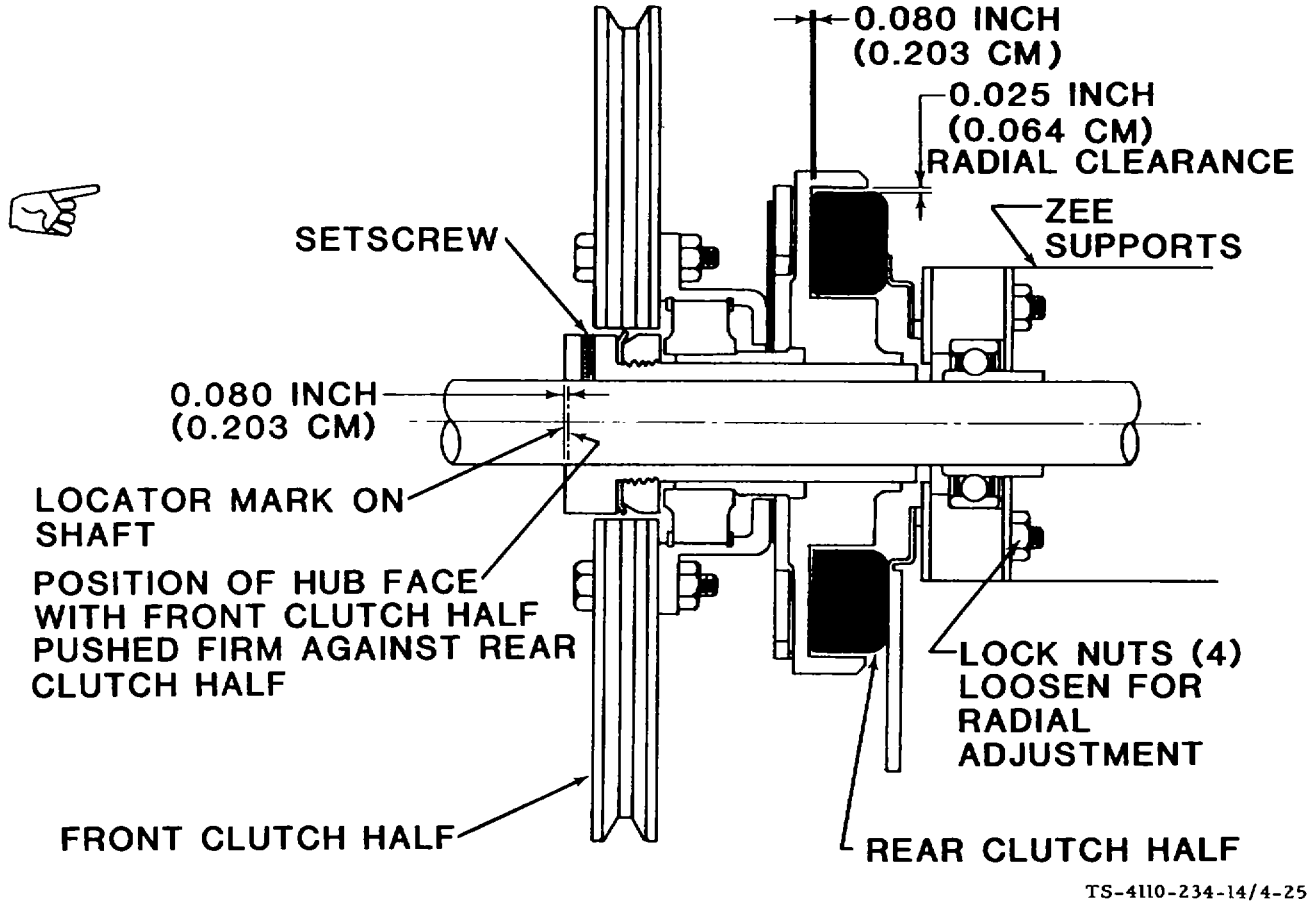


Figure 4-25. Clutch Adjustment F10000RG-2

Preliminary procedure: Remove fan drive belt
(See paragraph 444.)

(1) Check that hardware attaching rear clutch half zee supports to rear wall is tight.

(2) Using a 0.025 inch (0.064 cm) feeler gauge, check that radial clearance is even all around face area between front and rear clutch halves.

(3) If adjustment is necessary, loosen four lock nuts and adjust rear clutch half to provide 0.025 inch (0.064 cm) radial clearance. Retighten lock nuts to a torque value of 80 inch pounds.

(4) Loosen the two setscrews in front clutch half hub end.

(5) Push front clutch half back firm against rear clutch half.

(6) Mark shaft at 0.080 inch (0.203 cm) out from face of front clutch half face.

(7) Move front clutch half out to mark and tighten the two setscrews.

Follow-on procedure: Install fan drive belt.
(See paragraph 4-44.)

c. Removal. (See figure 4-23).

(1) Remove the nut and washer from the condenser end of the fan drive shaft.

(2) Loosen the two setscrews and slide the fan off of the end of the shaft. Take care not to damage the coil fins. Take care that the shaft key is not lost.

(3) Remove the two cap screws and lock nuts and the bearing support spacer and gasket.

(4) Loosen the setscrew in the pillow block bearing locking collar. Using a drift pin or a spanner wrench turn the collar opposite to the direction of the shaft rotation to release the locking device.

(5) Slide the bearing and locking collar off of the shaft.

(6) Loosen the idler arm setscrew and release belt tension.

(7) Slip belt off clutch pulley and place it out of the way toward the heat shield wall.

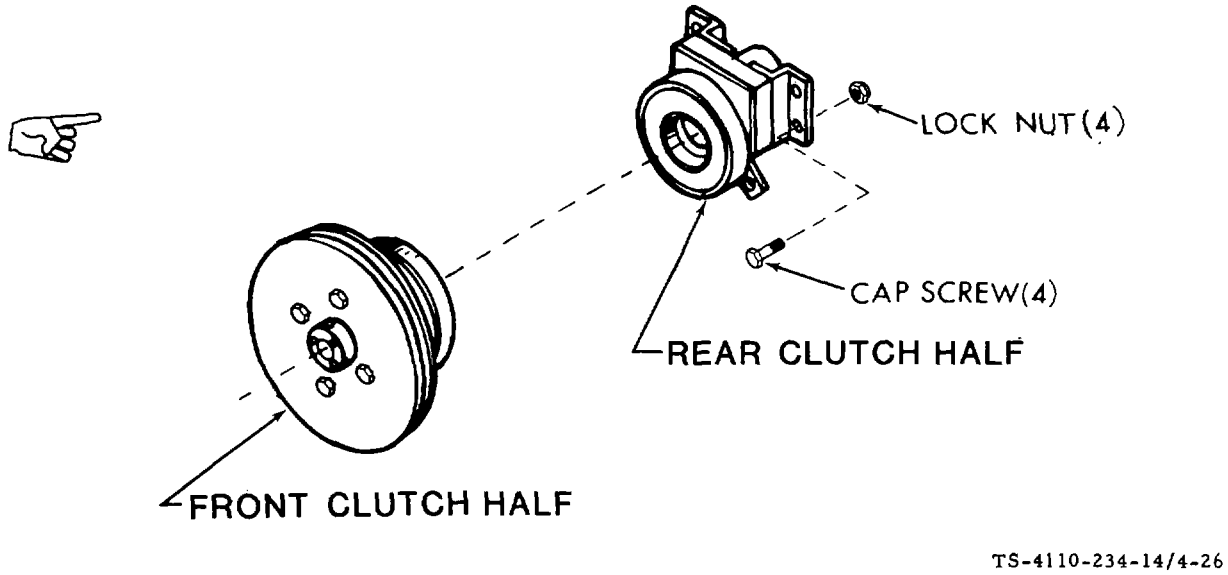


Figure 4-26. Clutch F10000RG-2

(8) Loosen the two setscrews in the hub of the clutch armature and slip the armature off of the shaft.

(9) Remove the four cap screws and lock nuts that attach the clutch support zees to the heat shield wall.

(10) Loosen the two setscrews in the bearing collar and slip the remaining clutch parts off of the shaft.

d. Installation.

(1) Slip the rear clutch half on to the shaft and secure with four cap screws and lock nuts.

(2) Tighten the setscrews in the bearing.

(3) Slip the front clutch half on the shaft and adjust per figure 4-25 and paragraph 449b. Tighten setscrews.

(4) Loose assemble the belt on the pulley.

(5) Slide the locking collar and bearing on the shaft.

(6) Install the condenser fan and bearing support bracket with six cap screws.

(7) Position the idler pulley bar support and secure it in place with two each cap screws and lock nuts in the upper holes and a cap screw and lock washer in the lower hole.

(8) Slip the bearing support spacer and gasket into place and secure the bearing with two cap screws and lock nuts.

(9) Using a spanner wrench or a drift pin turn the bearing locking collar the same direction as the shaft rotation to lock in place on the end of the bearing and tighten the setscrew.

(10) Check to see that the fan key is in place on the shaft.

(11) Aline the fan hub keyway and the shaft and key and slide the fan into place on the shaft. Take care not to damage the coil fins.

(12) Apply loctite to both fan hub set screws and tighten them on the shaft and key.

(13) Restrain shaft with appropriate tool and install the nut and washer on the end of the shaft.

(14) Push the idler pulley to bring proper tension in the fan belt. Proper tension is a deflection of 1/2 inch (1.3 cm) midway between the pulleys. Tighten the idler pulley setscrew.

(15) Close the access doors.

(16) Connect power.

4-50. FLANGE BEARING See figure 4-22 or 4-23.

a. Access.

(1) Disconnect power.

(2) Open condenser side access doors.

b. Lubrication. See paragraph 4-11.

c. Removal.

(1) For the F10000R-6 see paragraph 4-48b and remove the fan shaft pulley. For the F10000RG-2 see paragraph 4-49c and remove the clutch.

(2) Remove four cap screws and nuts from the flange bearing.

(3) Loosen the setscrew in the bearing locking collar and using a spanner wrench or a brass drift pin turn the collar opposite to the direction of the shaft rotation to release the locking device.

(4) Slide the bearing and locking collar off of the shaft.

d. Installation.

(1) Slide the bearing and the locking collar on to the shaft.

(2) Attach the bearing using 4 cap screws and nut.

(3) Using a spanner wrench or a brass drift pin turn the bearing locking collar the same direction as the shaft rotation to lock in place on the end of the bearing and tighten the setscrew.

(4) If a lubrication fitting was not supplied with the new bearing, remove the fitting from the old bearing or obtain a new one. Remove the plug in the bearing and install the lubrication fitting.

(5) For the F10000R-6 see paragraph 4-48c and install the fan shaft pulley. For the F10000RG-2 see paragraph 4-49d and install the clutch.

4-51. MOTOR PULLEY (F10000R-6)

See figure 4-22.

a. Access.

(1) Disconnect power.

(2) Open the left side condenser access door.

b. Removal.

(1) Loosen the motor mounting bolts and slide the motor so that the belt can be removed from the pulley.

(2) Remove the two cap screws from the pulley bushing.

(3) Remove the pulley from the bushing. If necessary the two cap screws removed in (2) above can be used as jack screws by screwing them into the tapped holes in the bushing flange.

(4) Remove the bushing from the shaft. Take care that shaft key is not lost.

c. Installation.

(1) Loose assemble the pulley and pulley bushing and slide them on the shaft over the shaft key.

(2) Aline the pulley face with the pulley on the fan shaft and tighten the cap screws in the pulley bushing.

(3) Place the belt on both pulleys and slide the motor away from the center of the unit to take up belt slack. Proper belt tension is a deflection of 1/2 inch (1.3 cm) midway between pulleys.

CAUTION

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

(4) Tighten the motor mounting bolts.

(5) Close the access doors.

(6) Connect power.

4-52. ENGINE PULLEY (F10000RG-2) See figure 4-23.

a. Removal.

(1) Disconnect power and open side access doors.

(2) Loosen the four gasoline engine bolts. There is an access slot on the lower left front of the cabinet for the front bolts.

(3) Use a 3/4 inch socket and socket wrench with an extension and turn the engine mount adjusting screws located under the compressor mount to move the engine and release belt tension. Be sure you turn both screws the same number of full turns.

(4) Remove the belts from the engine pulley.

(5) Remove the two cap screws from the pulley bushing.

(6) Remove the pulley from the bushing. If necessary the cap screws removed in (5) above can be used as jack screws by screwing them into the tapped holes in the bushing flange.

(7) Remove the bushing from the shaft. Take care that shaft key is not lost.

b. Installation.

(1) Loose assemble the pulley and pulley bushing and slide them on the shaft over the shaft key.

(2) Align the engine pulley with the pulley on the compressor and tighten the cap screws in the pulley bushing.

(3) Place the belts on the pulley.

(4) Use a 3/4 inch socket and socket wrench with an extension and turn the engine mount adjusting screws located under the compressor mount to move the engine. Proper belt tension is a deflection of 1/2 inch (1.3 cm) midway between the pulleys.

CAUTION

Both adjusting screws must be moved the same amount. Do not permit the engine to twist or cock on its mount. Uneven belt wear and bearing damage will result.

(5) Tighten the four engine mounting bolts.

(6) Close the access doors.

(7) Connect power.

4-53. COMPRESSOR PULLEY (F10000RG-2)

See figure 4-23.

a. Removal.

(1) Disconnect power and open side access door.

(2) Loosen the idler arm screw and relax the belt tension.

(3) Remove the fan drive belt from the compressor pulley.

(4) Loosen the four gasoline engine bolts. There is an access slot on the lower left front of the cabinet for the front bolts.

(5) Use a 3/4 inch socket and socket wrench with an extension and turn the engine mount adjusting screws located under the compressor mount to move the engine and release belt tension. Be sure you turn both screws the same number of full turns.

(6) Remove the belts from the compressor pulley.

(7) Remove the cap screw, lock washer and flat washer from the center of the compressor shaft.

(8) Remove the pulley. Take care that the shaft key is not lost.

b. Installation.

(1) Aline the key and keyway and slide the pulley into place on the compressor shaft. Secure with a cap screw, lock washer and flat washer.

(2) Place the two belts from the engine on the two inside grooves.

(3) Use a 3/4 inch socket and socket wrench with an extension and turn the engine mount adjusting screws located under the compressor mount to move the engine. Proper belt tension is a deflection of 1/2 inch(1.3 cm) midway between the pulleys.

CAUTION

Both adjusting screws must be moved the same amount. Do not permit the engine to twist or cock on its mount. Uneven belt wear and bearing damage will result.

(4) Tighten the four engine mounting bolts.

(5) Place the fan drive belt back on the compressor pulley.

(6) Push the idler pulley to bring proper tension in the fan belt. Proper tension is a deflection of 1/2 inch (1.3 cm) midway between pulleys. Tighten the idler pulley setscrew.

(7) Close the access doors.

(8) Connect power.

4-54. REFRIGERATION PIPING AND COMPONENTS I

Organizational maintenance service on the refrigeration piping and components is restricted to the setting of valves as described in paragraph 4-9 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 part that contains Refrigerant R-12. Do not let liquid refrigerant touch you, and do not inhale refrigerant gas.

WARNING

Always disconnect power from battery (F10000RG-2) or power source (F10000R-6) prior to performing internal maintenance. The unit could get turned on while you are working inside.

4-55. CLEANING OF CONDENSER COIL AND HOUSING

a. Access (See fig. 4-12)

(1) Disconnect power.
(2) Remove 8 screws and lock washers and remove the condenser air inlet screen.
(3) Open the side access doors.

b. Cleaning.

WARNING

Compressed air used for cleaning purposes will not exceed 30 PSI (2.1 kg/cm2)

(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 air inlet screen with 8 screws and lock washers.
(5) Close access doors.
(6) Connect power.

4-56. CLEANING OF 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.

a. Access. (See fig. 4-12).

(1) Disconnect power.
(2) Remove 12 screws and lock washers and remove the evaporator air housing and screen.
(3) Remove 3 screws and lock washers and remove the top evaporator screen.

WARNING

Compressed air used for cleaning purposes will not exceed 30 PSI (2.1 kg/cm2).

b. Cleaning.

(1) Clean coil with a clean 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. 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 evaporator screen with 3 screws and lock washers.

(6) Install the evaporator air housing and screen with 12 screws and lock washers.

(7) Connect power.

4-57. DEFROST TERMINATION THERMOSTAT (F10000RG-2)

a. Access. (See fig. 4-12).

(1) Disconnect power.

(2) Remove 12 screws and lock washers and remove the evaporator air housing and screen.

b. Removal. (See fig. 4-27).

(1) Tag and disconnect wire leads.

(2) Remove two screws and lock nuts and take the clamp and thermostat off of the refrigerant line.

c. Testing. The thermostat opens on temperature rise at 45 ± 4°F (7.2 ± 2.2°C). It closes on temperature decrease at 25 ± 4°F (3.9 ± 2.2°C).

(1) Connect a continuity tester to the wire leads. At temperatures above 45 ± 4°F (7.2 ± 2.2°C) there should be no continuity.

(2) Place the thermostat in a freezer with a known temperature less than 25 ± 4°F (3.9 ± 2.2°C). At temperatures below 25 + 4°F (3.9 + 2.2°C) there should be continuity.

d. Installation.

(1) Place the thermostat and clamp on the refrigeration tubing below the evaporator coil in the location shown in figure 4-27. Be sure that the thermostat makes good contact with the tubing. Secure it with two screws and lock nuts.

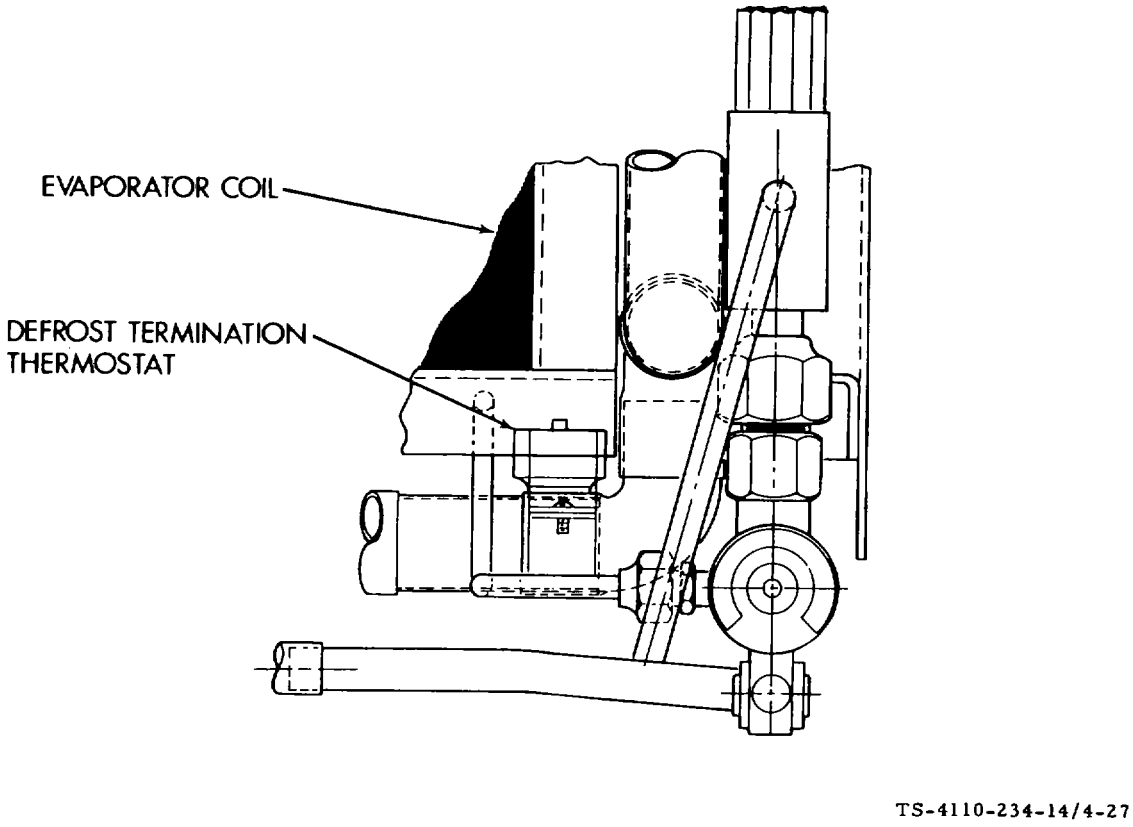


Figure 4-27. Defrost Termination Thermostat F10000RG-2

(2) Connect the wire leads. See tags and wiring diagram figure 46.

(3) Install the evaporator air housing and screen and secure it with 12 screws and lock washers.

(4) Connect power.

4-58. MUFFLER AND ENGINE EXHAUST SYSTEM (F1000RG-2) See figure 4-28.

WARNING

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

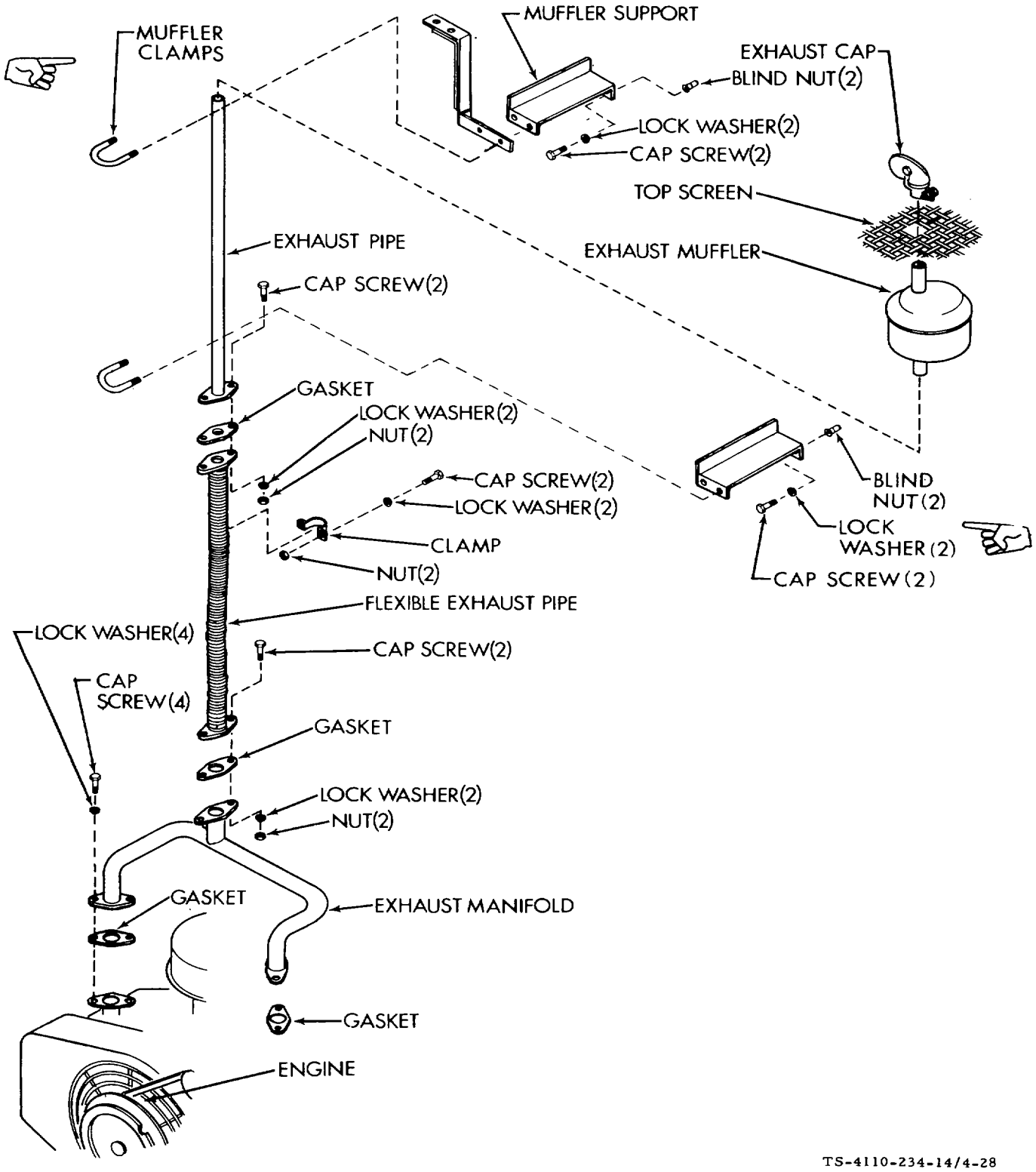


Figure 4-28. Engine Exhaust System F10000RG-2

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.

a. Access.

(1) Disconnect power.
(2) Open left side access door.

b. Inspection.

(1) If engine has been running let exhaust cool.
(2) Check to see that all parts are in place and that hardware is not loose or missing.
(3) Inspect entire system for excessive rust, obvious damage, loose connections and holes of any type that would cause leakage.

c. Replacement.

(1) With the exception of the exhaust manifold all parts of the exhaust system are easily replaced. See figure 4-28 and remove any clamps and attaching hardware from the part to be replaced. Carefully disconnect it from its mating part or parts and remove it from the unit.

(2) When it is necessary to remove the exhaust manifold the air cleaner and the scissor choke (see paragraph 4-63 for choke removal, adjustment and installation.) must be removed prior to removing the manifold.

d. Installation.

(1) See figure 4-28 and install the part or parts using attaching hardware and clamps shown. Be sure that all joints are tight and free of leaks.
(2) Close access doors and connect power.

4-59. ENGINE (F10000RG-2)

WARNING

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

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.

a. Inspection.

(1) Turn refrigerator on-off switch to off. Disconnect at the battery if there is any chance that the unit might get turned on while you are inspecting the unit.

(2) Check oil level and condition. See paragraph 4-14 for oil changing instructions.

(3) Check for fuel and oil leaks.

(4) Inspect the following items. See paragraphs referenced for specific instructions.

Alternator belt (para 4-60).

Alternator (para 4-61).

Air cleaner (para 4-62).

Choke (para 4-63).

Carburetor (para 4-64).

Governor (para 4-65).

Cooling shroud (para 4-66).

Oil filter (para 4-67).

Spark plugs (para 4-68).

Spark plug leads (para 4-68).

Points (para 4-69).

Starter (para 4-70).

Starter solenoid (para 4-71).

Spark advance (para 4-72).

(5) Check block for cracks and visible damage.

b. Test, Adjust and Repair. See specific paragraph for component of engine to be tested, adjusted or repaired.

c. Compression testing. (with warm engine)

(1) Remove the spark plugs.

(2) Insert a compression gage in one of the spark plug holes.

(3) Crank the engine and record the reading indicated on DA Form 2404 (Equipment Inspection and Maintenance Worksheet). The correct reading is 100-120 psi (690-810 kpa).

(4) Test each cylinder as in (3) above.

(5) Install the spark plugs.

(6) If the gage readings are below 90 psi or if the readings vary more than 10 psi between cylinders, report the condition to direct support maintenance.

d. Remove.

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

(2) Open all four access doors.

(3) In order to remove the engine the fuel tank must be removed. (See fig. 4-29).

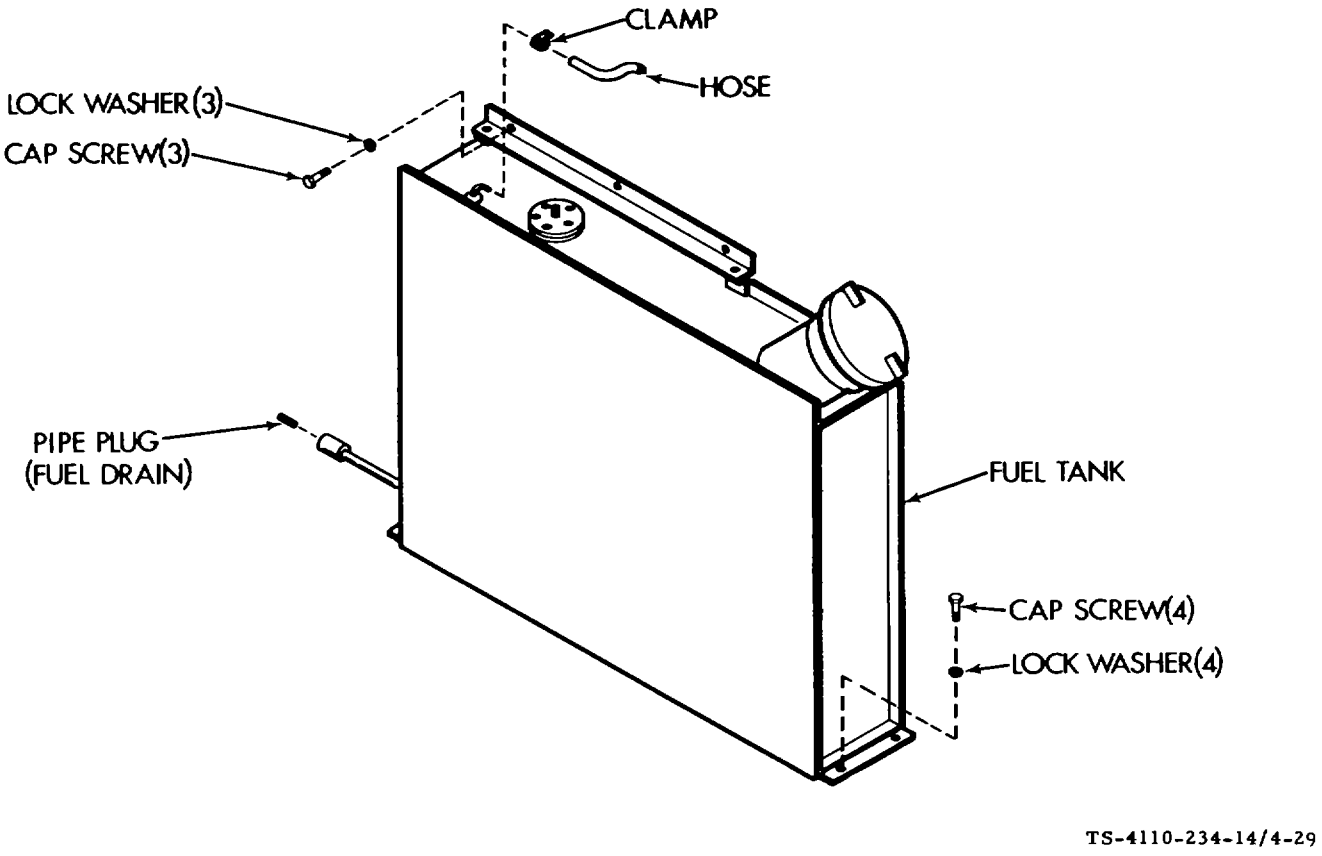


Figure 4-29. Fuel Tank F10000RG-2

(4) The fuel drain pipe plug is accessible through a hole on the lower left side of the unit.
(5) Drain the gasoline into a suitable container. Reinstall pipe plug.
(6) Wipe up or flush away all spilled gasoline.
(7) Loosen clamps and disconnect fuel hoses at the fuel tank and the engine carburetor.

(8) Remove the 3 upper and 4 lower sets of cap screws and lock washers and carefully remove the fuel tank through the left side door opening.

NOTE

It may be necessary to push the refrigeration line from the bottom of the sight glass into the heat shield wall slightly to gain clearance.

(9) Disconnect the engine exhaust at the connection between the flexible exhaust pipe and the exhaust manifold. (See fig. 4-28)

(10) Tag and disconnect the wires to the engine. This includes the wires to the choke, the alternator, the oil pressure switch, the starter and solenoid, and ground wires.

(11) Loosen the four gasoline engine bolts. There is an access slot on the lower left front of the cabinet for the front bolts.

(12) Use a 3/4 inch socket and socket wrench with an extension and turn the engine mount adjusting screws located under the compressor mount to move the engine and release belt tension. Be sure you turn both screws the same number of full turns.

(13) Remove the belts from the engine pulley. Tie or tape the belts up out of the way where they will not have oil or fuel spilled on them.

(14) Remove the four sets of engine attaching hardware.

WARNING

The engine weighs 148 pounds (67.0 kg). Use adequate personnel or lifting devices.

(15) Lift the engine from the frame.

(16) If engine is to be replaced with a new one, remove the exhaust manifold and install them on the replacement engine. See paragraph 4-63 for choke installation and adjustment.

e. Installation.

WARNING

The engine weighs 148 pounds (67.0 kg). Use adequate personnel or lifting devices.

(1) Using a suitable lifting device, lower the engine to the mounting base and aline the holes.

(2) Loosely install the four sets of mounting hardware.

(3) Place the two belts from the compressor pulley on the engine pulley.

(4) Use a 3/4 inch socket and socket wrench with an extension and turn the engine mount adjusting screws located under the compressor mount to move the engine. Proper belt tension is a deflection of 1/2 inch (1.3 cm) midway between the pulleys.

CAUTION

Both adjusting screws must be moved the same amount. Do not permit the engine to twist or cock on its mount. Uneven belt wear and bearing damage will result.

(5) Check the belt alinement, adjust using the adjusting screws under the compressor mount if necessary.

(6) Tighten the four engine mounting bolts.

(7) See tags and wiring diagram figure 4-6 and connect all wires.

(8) See figure 4-28 and connect the flexible exhaust pipe to the exhaust header. Be sure that the connection is tight and free of leaks.

(9) Carefully install the fuel tank through the left side door opening.

NOTE

It may be necessary to push the refrigeration line from the bottom of the sight glass into the heat shield wall slightly to gain clearance.

(10) Aline the fuel tank mounting holes and secure the tank in place with 7 cap screws and lock washers.

(11) Connect the fuel hoses to the fuel tank and engine carburetor.

(12) Check engine to see that oil filter is in place and is tight. Check to see that oil has been added. If it has not, add oil per lubricating instructions (see para. 4-10).

(13) Check to see that the fuel drain plug is tight and fill the fuel tank.

(14) Check engine and fuel tank for leaks.

(15) Connect battery cables.

(16) Close access doors.

(17) Start unit and operate for a short time and again check engine and fuel tank for oil or fuel leaks.

4-60. ALTERNATOR BELT (F10000RG-2)

See figure 4-30.

Adjust/Replace.

a. Be sure that unit is turned off or disconnected and open lower left front access door.

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.

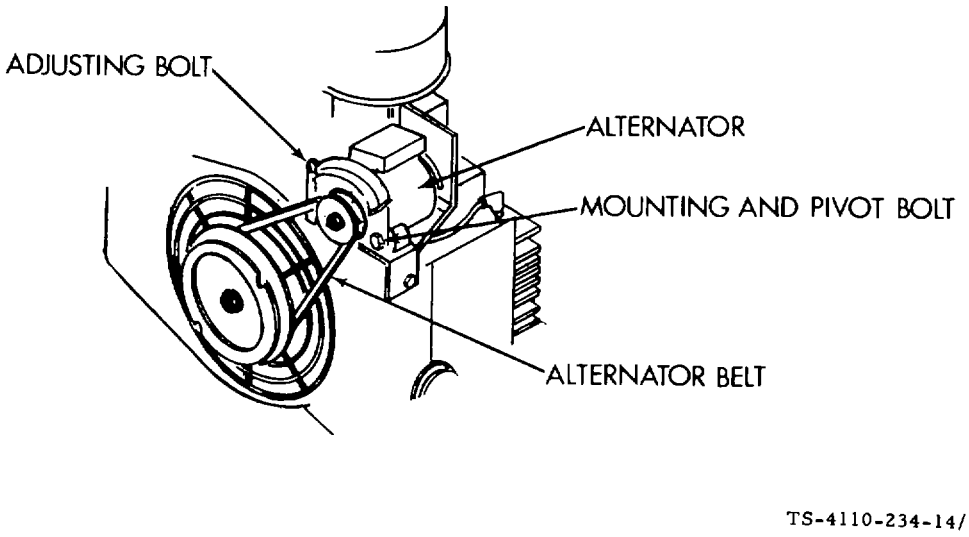


Figure 4-30. Alternator Belt F10000RG-2

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

4-61. ALTERNATOR (F10000RG-2)

a. Inspect.

(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 (see para 4-60)

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

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

b. Test.

(1) Remove brush assembly (see figure 4-31).

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

Remove the two screws on the phenolic cover and lift out the cover and gasket. See figure 4-31. 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 or resistance reading should be high (infinite). If not, there is a short and the assembly must be replaced.

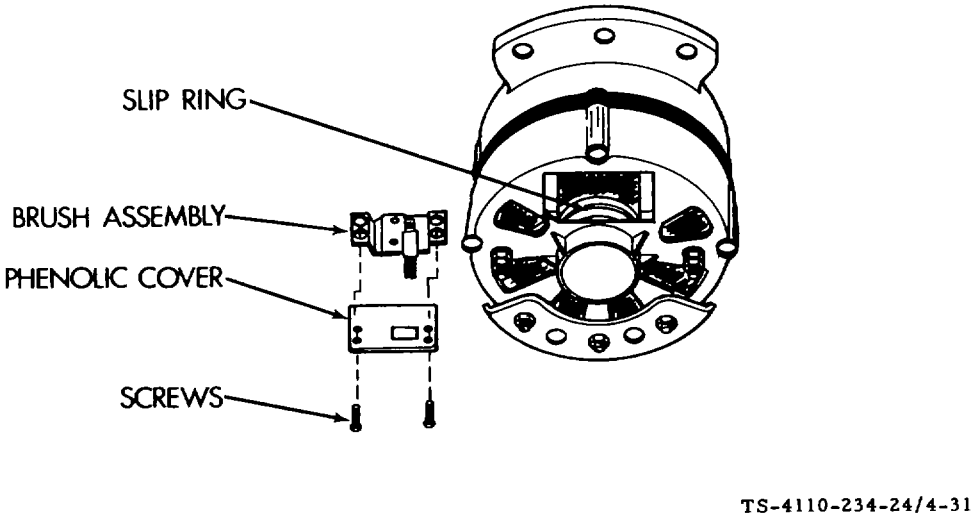


Figure 4-31. Alternator Brush Removal F10000RG-2

(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 4-30).

(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 46. Reconnect the wires to the terminals on the back of the alternator.

(4) Close access doors and connect power.

4-62. AIR CLEANER (F10000RG-2)

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 left side access doors.

b. Removal. (See figure 4-32).

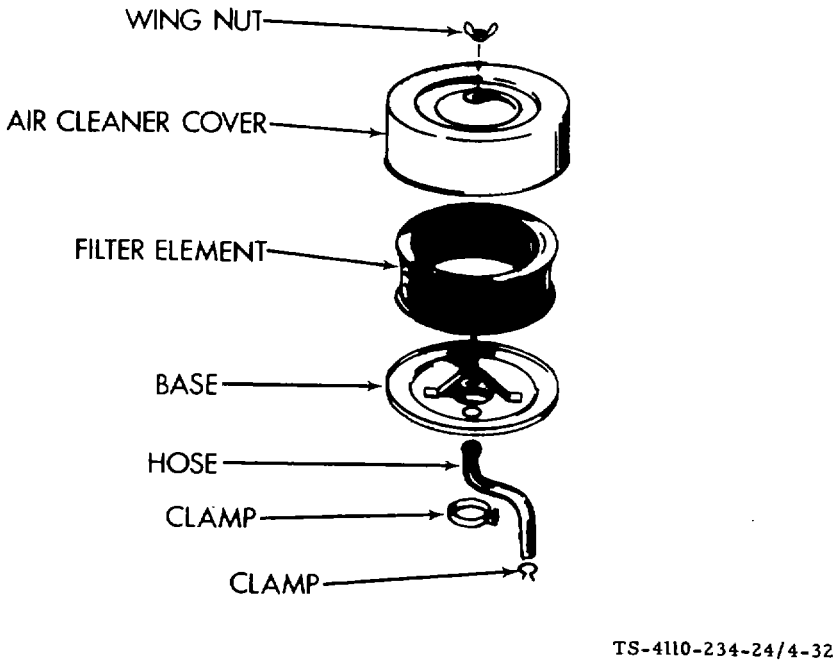


Fig. 4-32. Air Cleaner F10000RG-2

(1) Remove the wing nut.

(2) Lift the air cleaner cover and the filter element up and out of the unit.

c. Cleaning.

(1) Check and clean the air cleaner every 25 hours. Replace it with a new one every 100 hours. Increase frequency in extreme dusty conditions.

(2) Clean by tapping the element gently on a flat surface.

CAUTION

Do not run engine with air cleaner removed. Intake of dirty air or solid materials could cause severe damage to engine parts.

d. Installation.

(1) Place the filter element and the air cleaner cover on the base.

(2) Secure with the wing nut finger tight.

(3) Connect battery if it was disconnected.

(4) Close access doors.

4-63. CHOKE (F1OOOORG-2)

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 the left side access door.

b. Adjust. (See figure 4-33).

This choke should not require any seasonal readjustment, but if adjustment becomes necessary proceed as follows:

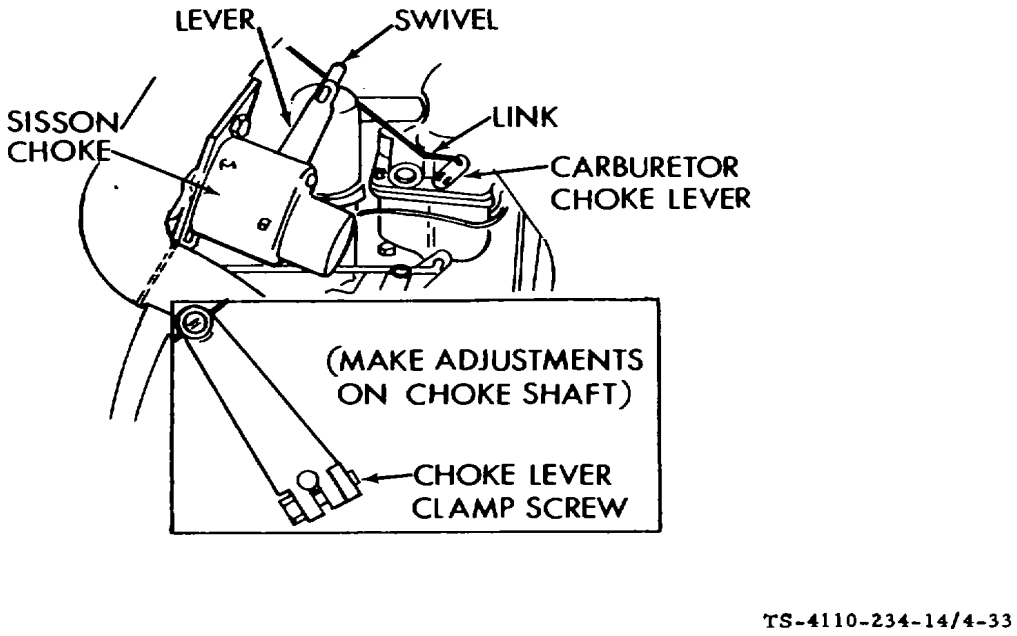


Figure 4-33. Choke F10000RG-2

(1) Pull choke lever up and insert a 1/16-inch (1.59 mm) 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. Remove. (See figure 4-33).

(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. Install.

(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 para 463b for adjustments.

(5) Connect battery if it was disconnected.

(6) Close access doors.'

4-64. CARBURETOR (F10000RG-2)

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 the left side access door.

(3) See paragraph 4-62 and remove the air cleaner.

b. Inspect.

(1) Check for signs of fuel leakage.

(2) Check for loose or missing linkages.

(3) Check that float is not damaged.

c. Adjust. (See figure 4-34).

(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 1-1/2 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 no load connected.

(4) If repair or replacement is necessary, notify direct support maintenance.

(5) Install the air cleaner (see para 4-62).

(6) Connect battery if it was disconnected.

(7) Close access doors.

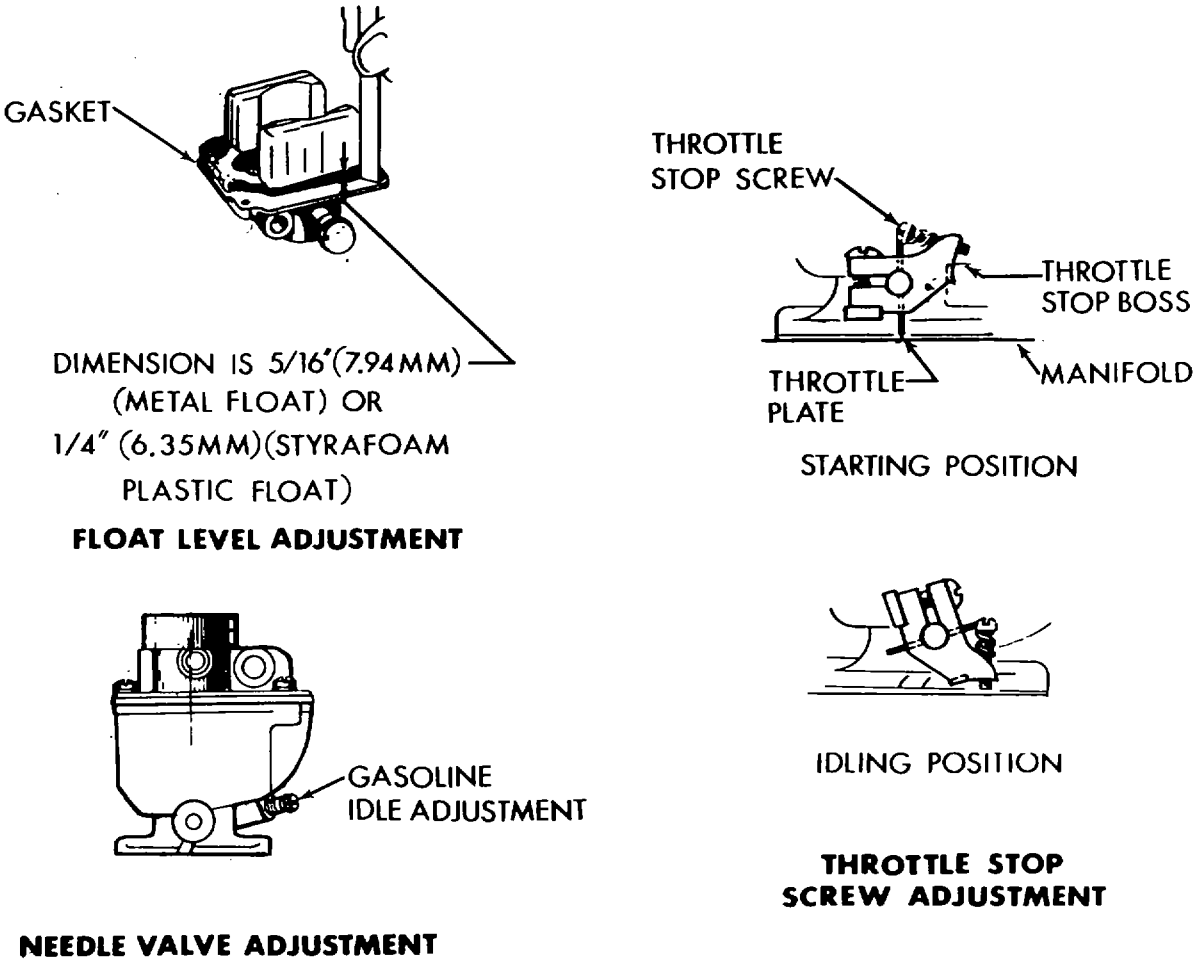


Figure 4-34. Carburetor Adjusting Points F10000RG-2

4-65. GOVERNOR (F10000RG-2)

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 the front access doors and the left side access door.

(3) See paragraph 4-2 and remove the air cleaner.

b. Inspect.

(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 (see para 4-62).

c. Adjust. (see figure 4-35).

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.

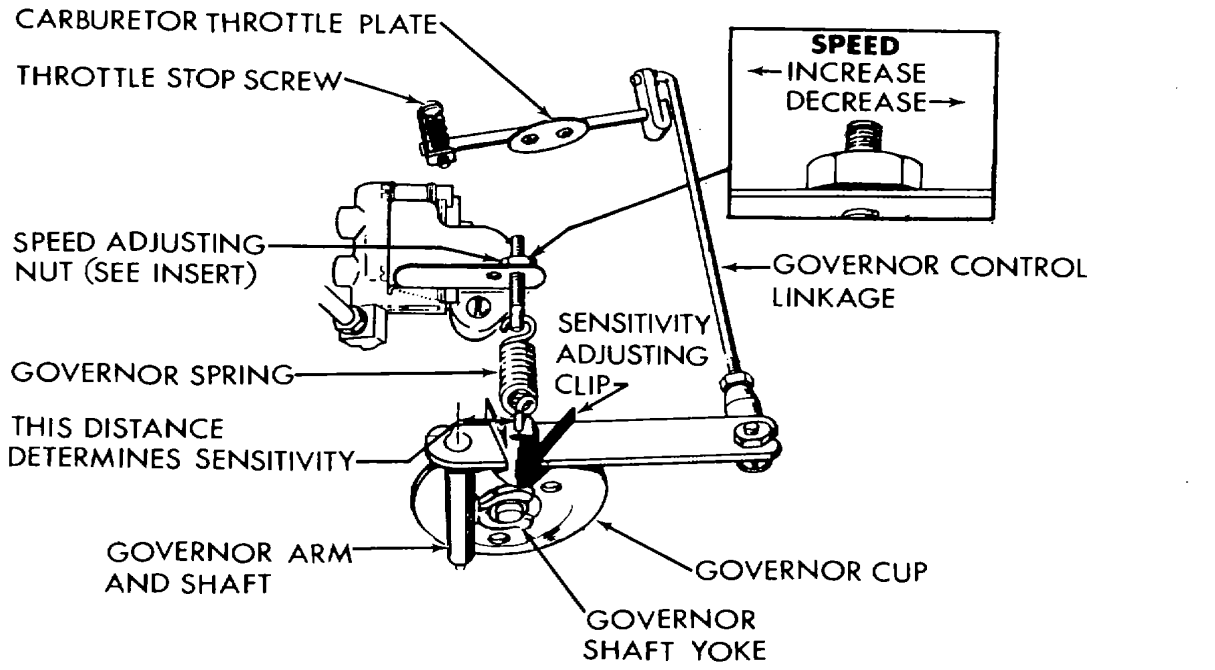


Figure 4-35. Governor Adjustment F10000RG-2

(1) Before making governor adjustment, run the engine about 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 4-45 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. 4-35). 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. 4-35) 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 (0.794 mm) distance from the manifold when the engine is operating with no load connected (fig. 4-34).

4-66. COOLING SHROUD (F10000RG-2)

Inspect.

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.

4-67. OIL FILTER (F10000RG-2)

a. Inspect. Check oil filter for leaks.

b. Replacement. See paragraph 4-14.

4-68. SPARK PLUGS AND LEADS (F10000RG-2)

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 left side access door.

(3) See paragraph 4-62 and remove the air cleaner.

b. Inspect, clean and adjust (see figure 4-36).

(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 (0.64 mm).

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

c. Replace.

(1) Replace spark plugs every 100 hours.

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

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

(4) Install the air cleaner.

(5) Connect the battery if it was disconnected.

(6) Close access doors.

4-69. IGNITION POINTS (F10000RG-2)

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. Replace. (see figure 4-37).

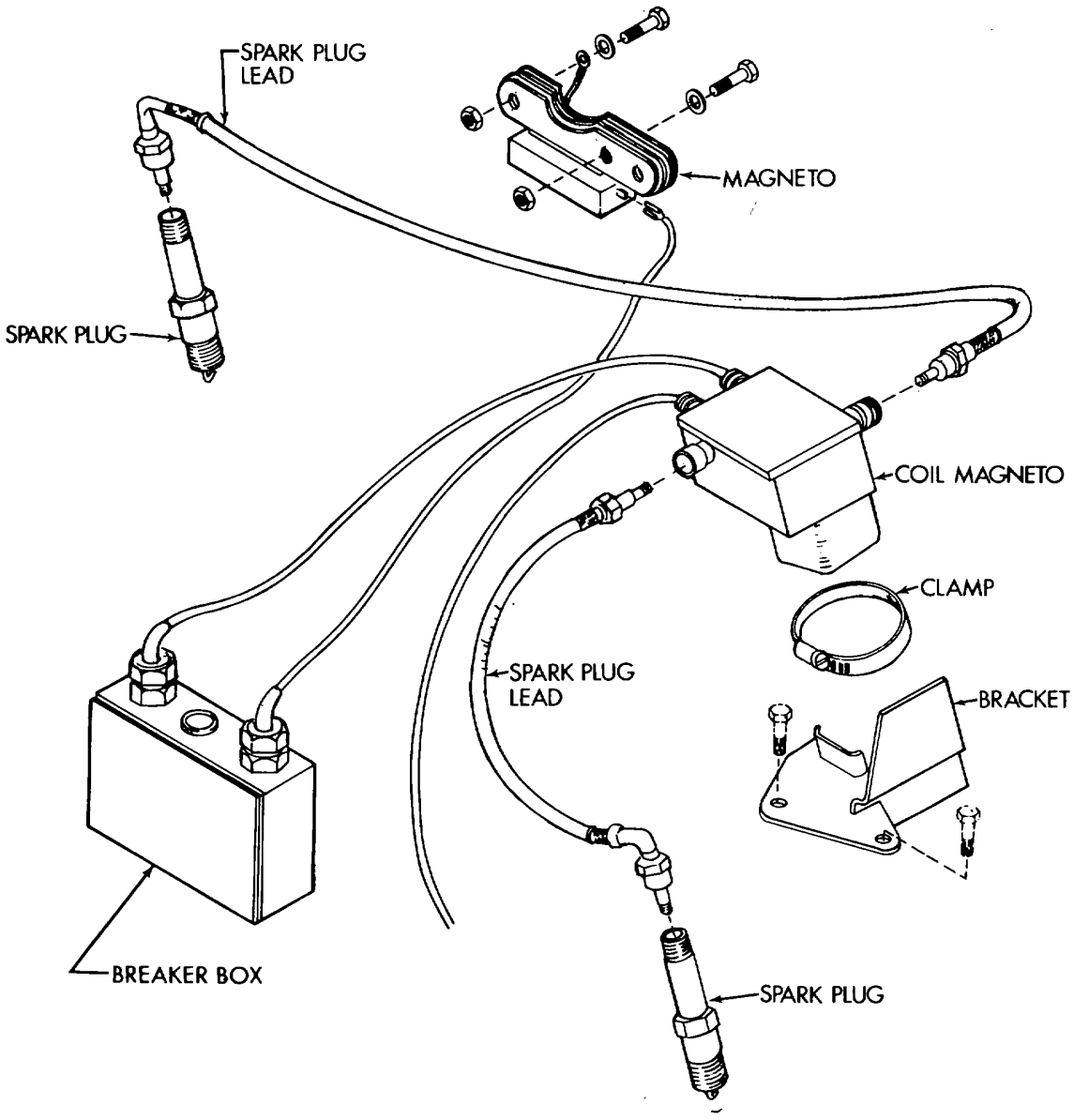


Figure 4-36. Ignition System F10000RG-2

(1) Using the upper part of figure 4-37 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.

d. Ignition Timing. Always check timing after replacing ignition points or if noticing poor engine performance. See figure 4-37 and proceed as follows.

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

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

(3) Start the engine and check the timing (20° 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.

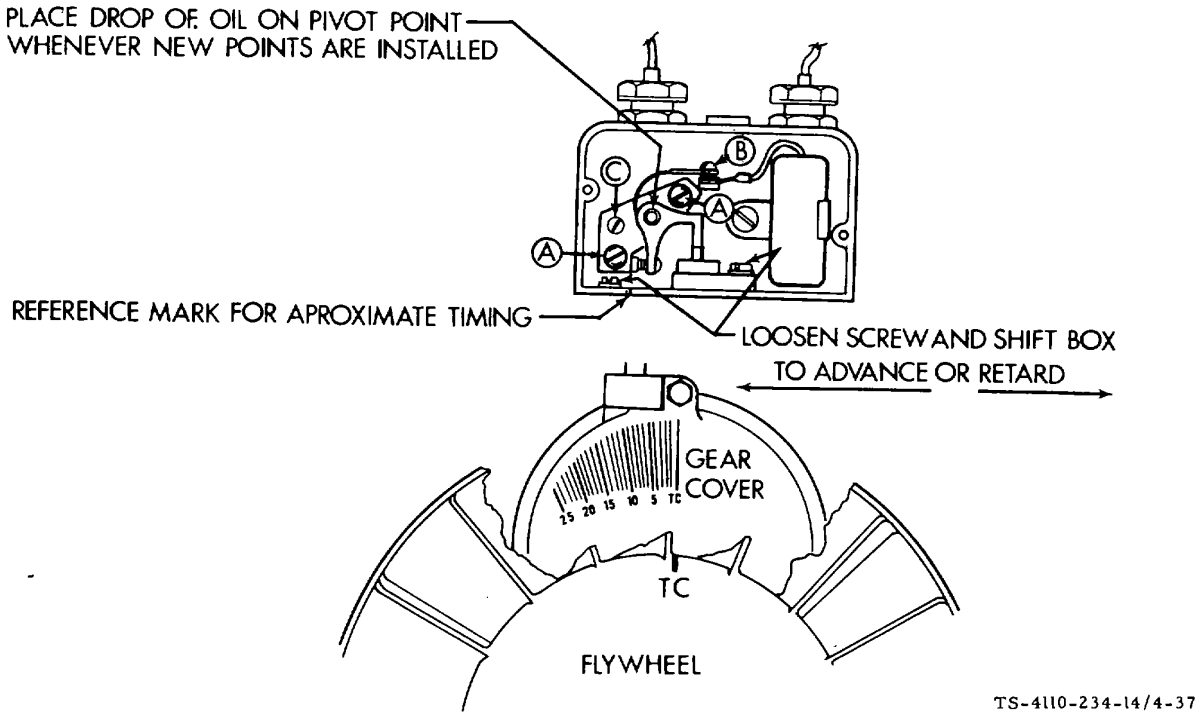


Figure 4-37. Ignition Timing F1000ORG-2

4-70. STARTER AND STARTER SOLENOID (F10000RG-2)

a. The starting system for this engine is of the type known as a solenoid-shift starter. See figure 4-38. When the starter circuit is activated, battery current energizes the start solenoid. The solenoid causes an arm to push the starter pinion into the flywheel ring gear. Simultaneously, the start solenoid contacts close and allow the starter motor to start running. An overrunning clutch protects the starter from damage before it can be disengaged from the flywheel. The refrigerator unit circuit is designed so that it will trip a circuit breaker on the control panel if the engine does not start in 30 seconds. This feature protects the starter from serious damage. Starter motors are not designed for continuous service.

b. Inspect.

(1) Turn unit off.

(2) Check mounting for loose or missing hardware.

(3) Examine for obvious damage.

(4) Refer all repairs to direct support maintenance.

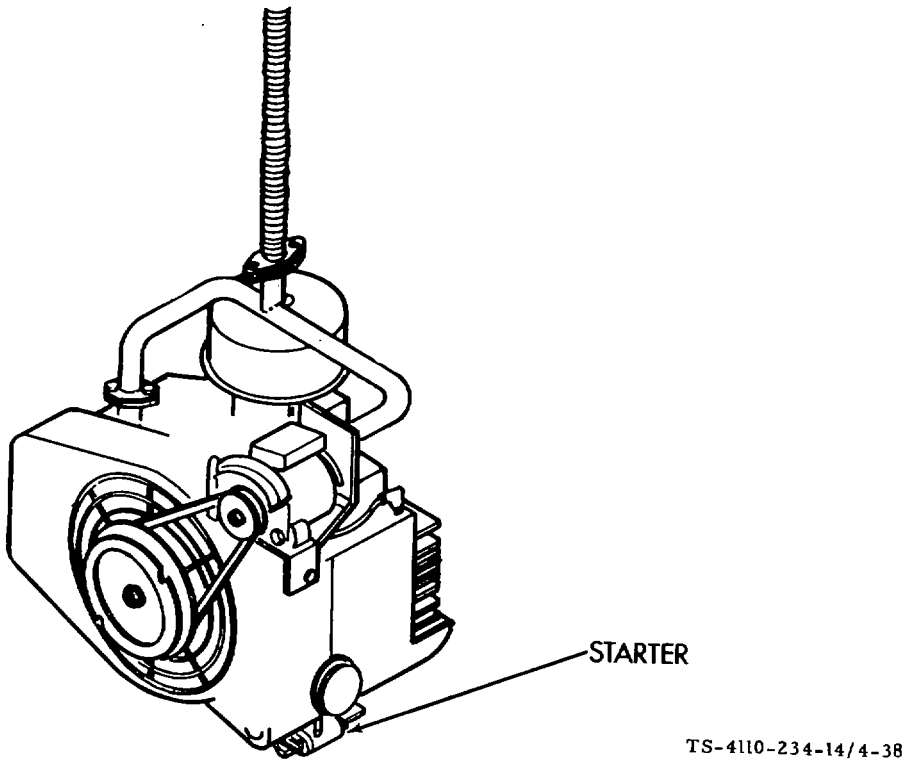


Figure 4-38. Starter Location

4-71. BATTERY, BATTERY TERMINAL ADAPTERS AND HOLD DOWN (F10000RG-2)

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 cable last.

See paragraph 4-9 k(1) for service of new units and replacement batteries.

a. Access. (See figure 4-4).
(1) Turn unit off.
(2) Open right side access door.
(3) Remove protective cover.

b. Test.

(1) Check specific gravity in each cell with a hydrometer. It should be 1.280 at 80°F (27°C). If it is 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 (1.4 cm) above the tops of the separators. Add distilled or drinking water as required.

c. Remove.

(1) To disconnect cables remove the nut from the terminal adapter and remove the cable.
(2) To remove the battery remove the three nuts and flat washers and pull the battery hold down up and out. Carefully lift the battery and battery box up and out of the unit. The battery can then be lifted out of the battery box.

d. Install. (See figure 4-4).

(1) Place the battery in the battery box.
(2) Carefully lift the battery and battery box and position on mounts.
(3) Aline the battery hold down studs with the holes through the battery mount and secure with three nuts and flat washers.
(4) Connect the battery cables and the terminal adapters if they were removed. Connect negative cable last.
(5) 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. Do not reverse battery leads.
(6) Keep the battery case clean and dry. An accumulation of moisture will lead to a more rapid discharge and battery failure.
(7) Keep the battery terminal adapters clean and tight. After making connections, coat the terminals with a light application of petroleum jelly or grease to retard corrosion.
(8) Close and secure the battery box cover.
(9) Close access doors.

4-72. FUEL TANK (F1OOOORG-2) See figure 4-39

If fuel tank leaks or has minor repairable damage notify direct support maintenance.

a. Removal.

WARNING

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

(1) Be sure that unit is turned off or that battery is disconnected.
(2) Open both side access doors.
(3) The fuel drain pipe plug is accessible through a hole on the lower left side of the unit.
(4) Drain the gasoline into a suitable container. Reinstall pipe plug.
(5) Wipe up or flush away all spilled gasoline.
(6) Tag and disconnect wire to fuel level sender.
(7) Loosen clamps and disconnect fuel hoses at the fuel tank.
(8) Remove the 3 upper and 4 lower sets of cap screws and lock washers and carefully remove the fuel tank through the left side door opening. Leave the top support attached until the tank is out of the unit.

NOTE

It may be necessary to push the refrigeration line from the bottom of the sight glass into the heat shield wall slightly to gain clearance.

b. For component part replacement see figure 4-39. Note that with the exception of the tank body most parts can be replaced with the tank installed.

c. Install.

(1) Carefully install the fuel tank through the left side door opening.

NOTE

It may be necessary to push the refrigeration line from the bottom of the sight glass into the heat shield wall slightly to gain clearance.

(2) Aline the fuel tank mounting holes and secure the tank in place with 7 cap screws and lock washers.
(3) Connect the fuel hose to the fuel tank.
(4) See tags and wiring diagram figure 4-6 and connect wire.
(5) Check to see that the fuel drain plug is tight and fill the fuel tank.
(6) Check for leaks.

(7) Reconnect battery if it was disconnected..

(8) Close access doors.

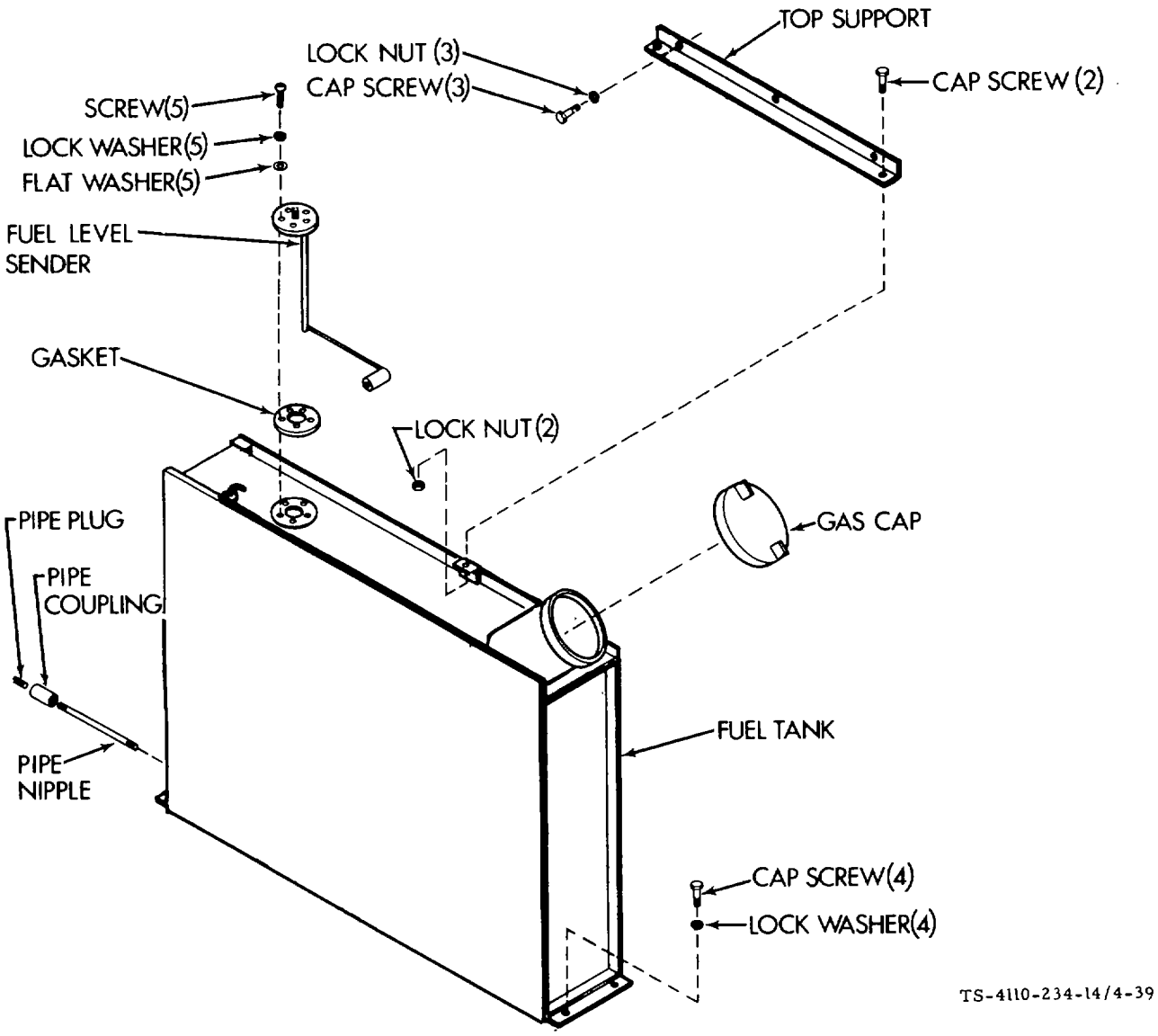


Figure 4-39. Fuel Tank and Components F10000RG-2

4-73. FUEL STRAINER (F1000l RG-2) See figure4-40.

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 right side access door.

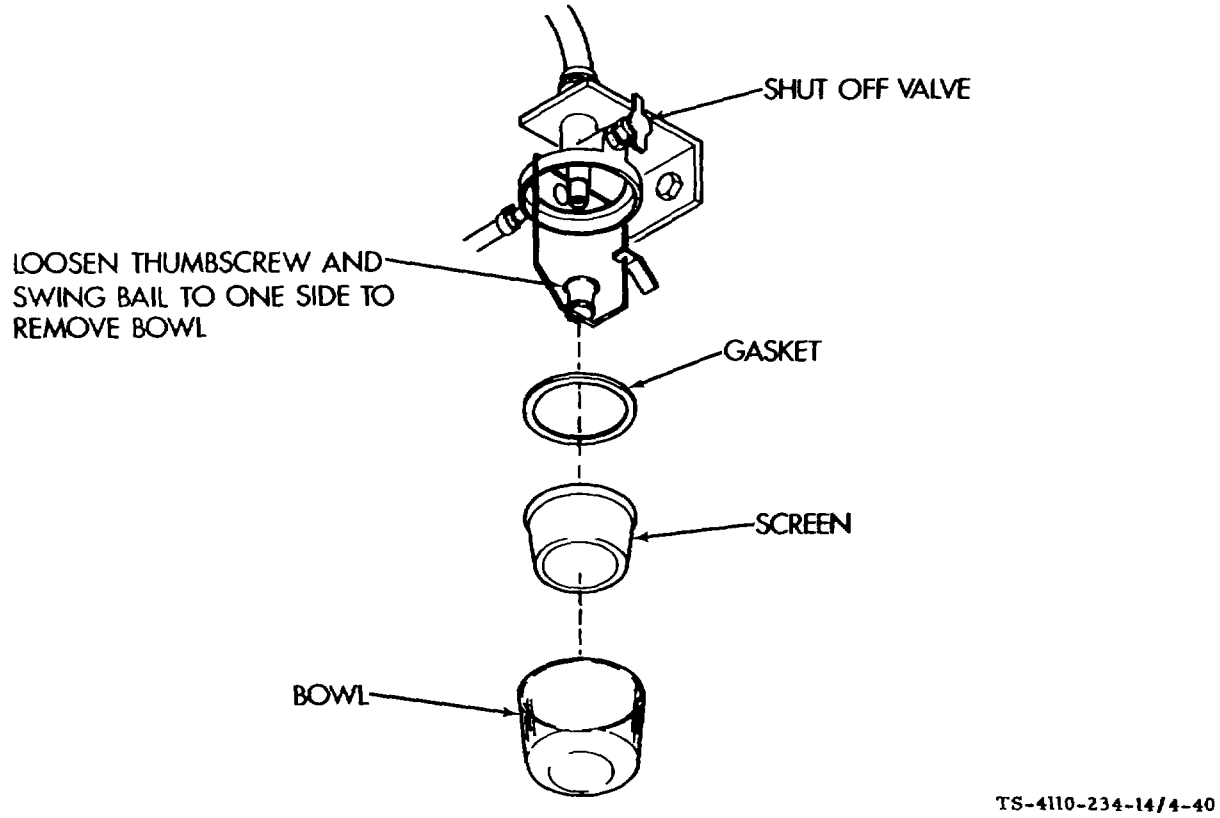


Figure 4-40. Fuel Strainer F1000ORG-2

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.

(3) Close the shut off valve on the strainer.

(4) Place a container or rags under the strainer to catch any spilled gasoline and loosen thumbscrew and swing bail to one side.

(5) Remove the bowl strainer and gasket.

(6) Wipe inside of bowl with a clean cloth.

WARNING

Compressed air used for cleaning purposes will not exceed 30 PSI (2.1 kg/cm2).

(7) Tap the strainer on a firm surface. If some sediment still remains, back flush it with compressed air at a pressure no greater than 30 PSI (2.1 kg/cm2).

(8) Wipe the gasket clean. If it is pinched or at all distorted replace it.

b. Install.

(1) Carefully aline the gasket, strainer and bowl.

(2) Swing the bail into place and tighten the thumbscrew.

(3) Open the shut off valve.

(4) Wipe up any spilled gasoline and dispose of rags in a safe place.

(5) Connect the battery if it was disconnected.

(6) Close access doors.

(7) Turn unit on and check strainer for leaks.

4-74. FUEL PUMP (F10000RG-2) See figure 4-41

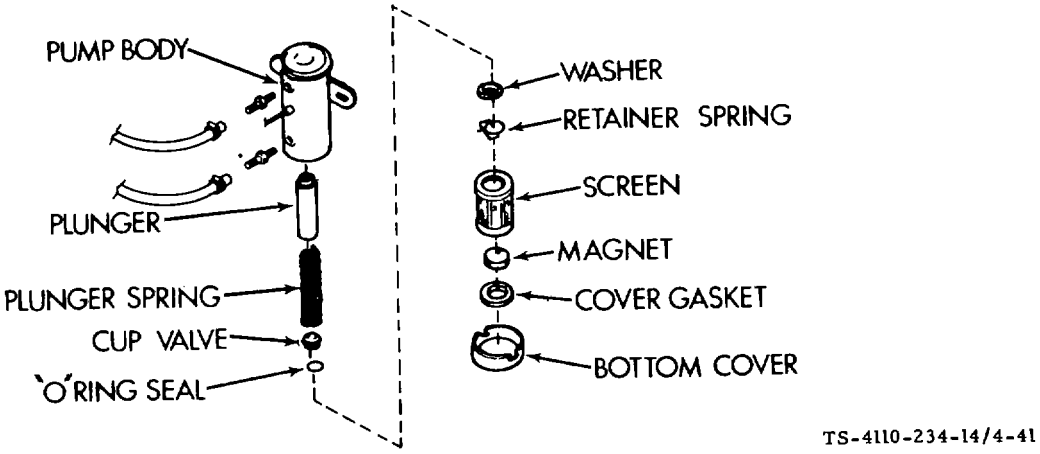


Figure 4-41. Fuel Pump F1000ORG-2

a. Disassembly, Clean and Inspect.

(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 right side access door.

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.

(3) Close the shut off valve on the strainer.
(4) Place a container or rags under the fuel pump to catch any spilled gasoline.

(5) Using a wrench on the hex portion of the bottom cover release it from the side bayonet fittings. Twist cover by hand to remove it from pump body.

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).

(6) Remove filter, magnet, and cover gasket. Wash filter in cleaning solvent and blow out dirt and cleaning solvent with air pressure. Check cover gasket and replace if deteriorated. Clean cover.

(7) Remove retainer spring from plunger tube using thin nose pliers to spread and remove ends of retainer from tube. Then remove washer, "O" Ring seal, cup valve, plunger spring and plunger from tube.

(8) Wash parts in cleaning solvent and blow out with air pressure. If plunger does not wash clean or if there are any rough spots, gently clean surface with crocus cloth. Slosh the pump assembly in cleaning solvent. Blow out the tube with air pressure. To do a complete job, swab the inside of the tube with a cloth wrapped around a stick.

CAUTION

DO NOT TAMPER WITH SEAL at center of mounting bracket at side of pump as it retains the dry gas, which surrounds the Electrical System, in the upper portion of the pump.

b. Assembly.

(1) Moisten the plunger assembly and tube with motor oil. Insert the plunger assembly in the tube with the buffer spring end first. Check fit by slowly raising and lowering the plunger in the tube. It should move fully without any tendency to stick. If a click cannot be heard, the interrupter assembly is not functioning properly in which case the pump should be replaced.

(2) To complete the assembly, install the plunger spring, cup valve, "O" Ring seal and washer as shown. Compress spring and assemble retainer with ends of retainer in side holes of tube.

(3) Place cover gasket and magnet in bottom cover and assemble filter and cover assembly. Twist cover by hand to hold in position on pump housing. With a wrench, securely tighten bottom cover.

(4) Open the strainer shut off valve.

(5) Wipe up any spilled gasoline and dispose of rags in a safe place.

(6) Connect the battery if it was disconnected.

(7) Close access doors.

(8) Turn unit on and check fuel pump for leaks.

4-75. FUEL HOSES (F10000RG-2) See figure 4-42.

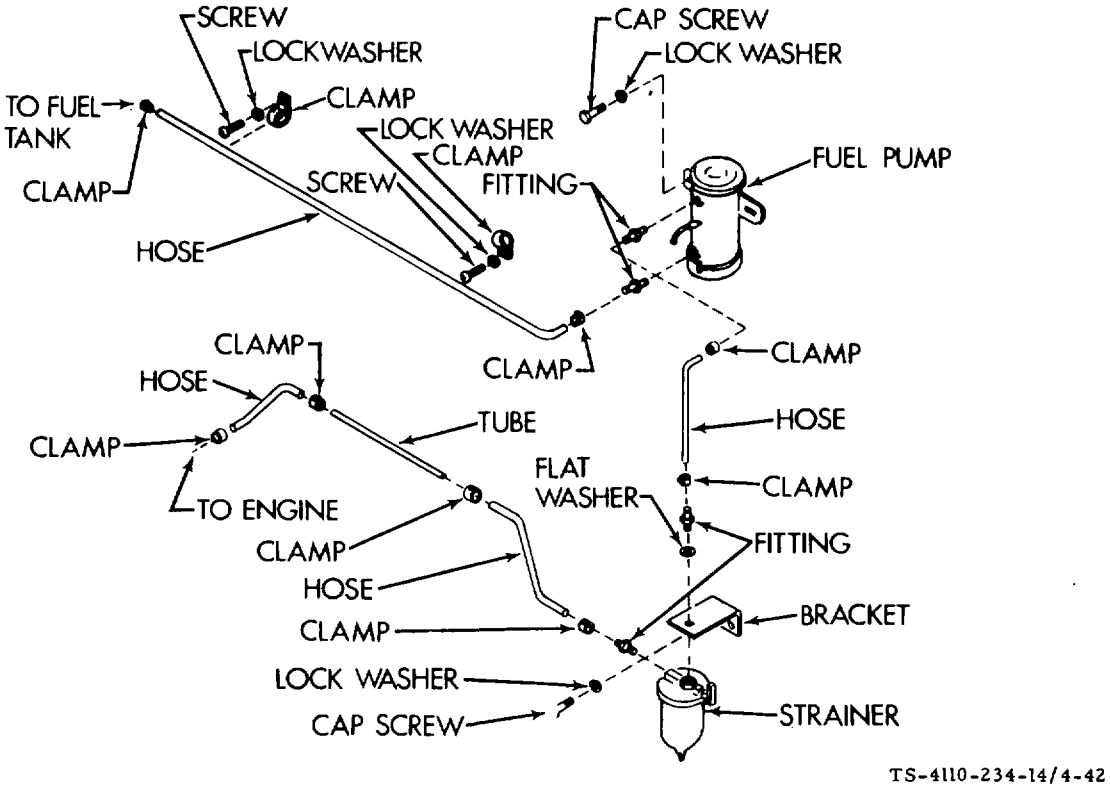


Figure 4-42. Fuel Hoses F10000RG-2

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 right side access door.

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.

b. Removal.

(1) Place a container or rags under the hose that is to be removed.
(2) Loosen the hose clamps and remove the hose.

c. Install.

(1) Slip the clamps onto the hose ends and slide hose onto the fitting.

(2) Tighten the clamps.

(3) Wipe up any spilled gasoline and dispose of rags in a safe place.

(4) Connect the battery if it was disconnected.

(5) Close access doors.

(6) Turn unit on and check hose for leaks.

4-76. ELECTRIC MOTOR (F1OOOOR-6)

WARNING

Disconnect power from refrigerator 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/Test installed.

(1) Loosen the motor mounting hardware and slide the motor in far enough to remove the belt.
(2) Spin the pulley by 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 conduit 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 found bad 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 4-6 and connect leads.
(3) Install the terminal box cover.

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

WARNING

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

(5) Close access door.
(6) Connect power.

4-77. UNIT HOUSING ITEMS See figure 4-43.

a. Replacement of the dee ring lifting fittings and drain tube items can be done easily by opening the appropriate access door, removing the hardware and replacing the affected part.

b. For replacement of the unit mounts and heat shield gaskets it is necessary to remove the refrigerator unit from the wall of the box.

c. To remove the unit mounts it is also necessary to remove the top evaporator screen or the evaporator air housing and screen depending on which mount must be replaced. (See figures 4-43 and 4-12.)

d. For heat shield gasket replacement it is also necessary to:

(1) Remove the heat shield spacers (2 each gasket) and screws (2 each spacer).

(2) 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.

(3) 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.

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

(5) 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.

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

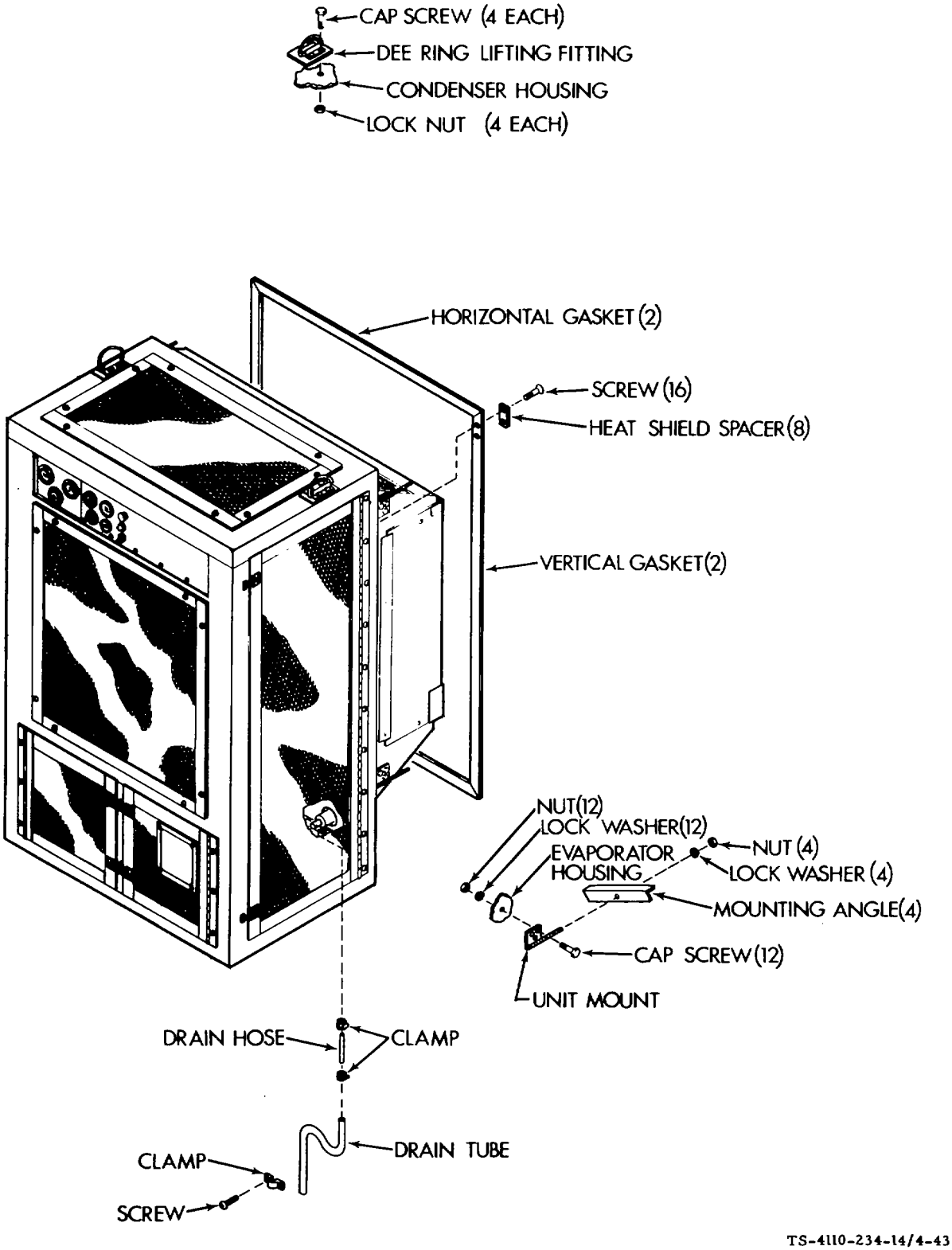


Figure 4-43. Housing Items

e. If it was necessary to remove the refrigerator from the box wall (c and d above):

(1) Remove the four mounting angles and the attaching hardware.

(2) Move the unit into position.

(3) Check the area of the wall where the gaskets will seal. This must be a smooth, clean, flat surface.

(4) Carefully guide the evaporator section through the wall opening.

(5) When the unit is approximately in place check gasket seal area for uniform clearance between the sides of the wall opening and slide the unit straight back until the gasket makes uniform contact with the wall.

(6) If gasket contact is not uniform top to bottom, shim the unit until a uniform seal contact is obtained. a

(7) From the inside of the box, place the four mounting angles on the bolts extending through the four corners of the opening. See figure 4-1.

(8) Holding the angles in place install the washers and nuts finger tight to all four corners.

(9) Uniformly tighten all four points taking a few turns on each in rotation to insure an even seal.

(10) When the gasket is compressed evenly to approximately 1/2 to 2/3 of its original thickness a good seal has been achieved.

Section VII PREPARATION FOR STORAGE OR SHIPMENT

4-78. PREPARATION FOR STORAGE

a. Administrative Storage of Equipment. See TM 740-90-1. Administrative storage is short term storage - 1 to 45 days. It covers storage of equipment which can be readied for mission performance within 24 hours. Before placing an item in administrative storage, the next scheduled preventive maintenance checks and services should be performed, all known deficiencies corrected, and all current modification work orders applied. The administrative storage site should provide required protection from the elements and allow access for visual inspection when applicable.

b. Intermediate Storage - 46 to 180 days. No special handling is required other than protection from damage and the elements.

c. Long Term or Flyable Storage. There is no time limit for this type of storage. It is advisable to pump down the refrigeration system and close the valves as instructed in paragraph 5-6. Then follow the preservation directions provided in paragraphs 4-79 and 4-80.

4-79. ENGINE STORAGE PROCEDURE (F10000RG-2)

(For Model F1000ORG-2 only). Protect an engine that will be out-of-service for more than 30 days as follows:

a. Run engine until thoroughly warmed up.

b. Turn off fuel supply and run until engine stops from lack of fuel.

c. Drain oil from oil base while still warm. Attach a warning tag to refill before operation (state viscosity used).

d. Remove each spark plug. Pour one ounce (two tablespoons) of rust inhibitor (or SAE #50) oil into cylinder. Crank engine over a few times to distribute oil film on cylinder walls and rings. Reinstall each spark plug.

NOTE

When engine is returned to service, after start-up much blue smoke will be exhausted until the rust inhibitor has burned away.

e. Service air cleaner per maintenance schedule.

f. Lubricate governor linkage. Protect against dust, etc. by wrapping with a clean cloth.

g. Wipe entire engine. Coat parts likely to rust with a light film of grease or oil.

CAUTION

Discharged batteries are subject to severe damage if exposed to freezing temperatures. Store all batteries in a fully charged condition and maintain charge during storage.

h. Disconnect battery and follow standard battery storage procedure.

i. To return the engine to service follow the procedures in paragraph 4-7.

4-80. PRESERVATION

Use a cloth dampened with an approved cleaning solvent to clean the refrigeration unit. Dry thoroughly. Touch up paint all surfaces as needed (see TM 43-0139). Coat machined surfaces with preservative or cover with barrier material. Coat exposed metal surfaces with preservative. Store all refrigeration units in an area where a low relative humidity and an even temperature are maintained, if possible. Where no suitable storage facility is available, cover the entire unit with a tarpaulin.

4-81. PREPARATION FOR SHIPMENT

a. For refrigeration system pump down refer to direct support maintenance.

b. Loosen the drive belt(s).

c. Perform the preservation procedure of paragraph 4-80.

d. Remove the mounting hardware which fastens the unit to the enclosure wall. Carefully slide the unit out of the wall opening.

Maintain the unit in a vertical position at all times.

e. On Model F1000ORG-2 perform the engine storage procedure of paragraph 4-79.

f. Wrap the refrigerator in two layers of barrier paper and pack in a wooden crate, preferably the original if it has been preserved.

CHAPTER 5

DIRECT SUPPORT MAINTENANCE INSTRUCTIONS

Section I GENERAL INFORMATION

5-1. TOOLS AND LISTS

a. For authorized common tools and equipment, refer to the 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 direct support refrigeration shop. For Model F10000RG-2 the tools and equipment needed for maintenance of the gasoline engine are such as would be found in any direct support gasoline engine repair shop.

c. Repair parts are listed and illustrated in the Repair Parts and Special Tools List (RPSTL) list TM 5-4110-234-24P covering organizational, direct, and general support maintenance for this equipment.

Section II MAINTENANCE PROCEDURES

a. See paragraph 4-18 for removal, inspection and installation.

b. Repair. Repairs are limited to the straightening of minor dents, rewelding of broken welds and touch up of painted surfaces. See T.M. 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.

5-3. COMPRESSOR MOTOR CONTROLLER (F10000R-6)

a. See paragraph 4-39 for access, test, removal and installation.

b. Repair. Repairs are limited to holding coil and contact replacement.
(1) Coil inspection/replacement.

To remove the coil loosen the two captive screws marked coil access.
Tag and disconnect leads on coil.
Lift the cover off.
Remove the coil assembly and remove the coil from the magnet.
Reverse the procedure to reassemble.

(2) Contact inspection/replacement.

To remove the contacts, loosen the two screws marked contact access and remove the power pack assembly.

Lift the bell-crank armature off.

Lift the contact assembly out and inspect for pitting, corrosion and obvious defects or wear. If they are bad replace them. Do not attempt to file or dress these contacts.

If replacement of any contact is indicated it is recommended that the complete set be replaced.

Reverse the procedure to reassemble.

5-4. FAN SHAFT REPLACEMENT

a. Removal. (See figs. 54 and 4-22 or 4-23 as applicable).
   (1) See paragraph 5-13 and remove the condenser coil and shroud.
   (2) See paragraph 4-41 and remove the evaporator fan.
   (3) See paragraph 4-50c and remove all items necessary to remove the flange bearing.
   (4) Slip the fan shaft out of the condenser coil opening.

b. Installation.

   (1) Slip the flange bearing onto the fan shaft and see paragraph 4-50d for installation of fan shaft drive items.
   (2) See paragraph 4-41 and install the evaporator fan.
   (3) See paragraph 5-13 and install the condenser coil and shroud.

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 protective 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 a 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. PUMPDOWN (See figures 2-6 and 2-8 or 2-7 and 2-9 for valve identification).

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 (backseated 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 5-1.

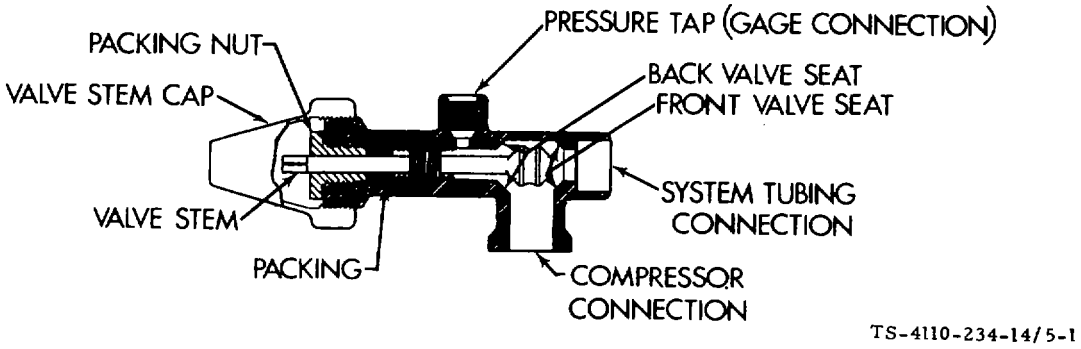


Figure 5-1. Compressor Service Valves.

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

WARNING

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

c. Disconnect power, open control box and adjust the thermostat to a lower setting so that unit will run continuously. In cases of extreme low temperatures the thermostat can be bypassed by adding a jumper between the two terminals.

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 and if a jumper was added, (step c above) it should be removed.

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.

5-7. 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 (F1OOOORG-2) or power source (F10000R-6) prior to performing internal maintenance. The unit could be turned on while you are working inside.

(1) Open all condenser section access doors.

(2) Remove the evaporator air housing and screen. (See fig. 4-12).

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 94940435-14, "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. See figure 5-1.

(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.

(g) 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/cm2).

(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 build up until both manifold gages read 350 psi (24.7 kg/cm2).

(l) Perform leak tests, then discharge and purge the system in accordance with paragraphs 5-8 and 5-9 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 fig. 4-12).

5-8. 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.

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.

(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. See figure 5-1.

(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) Attach a hose to the center service manifold.

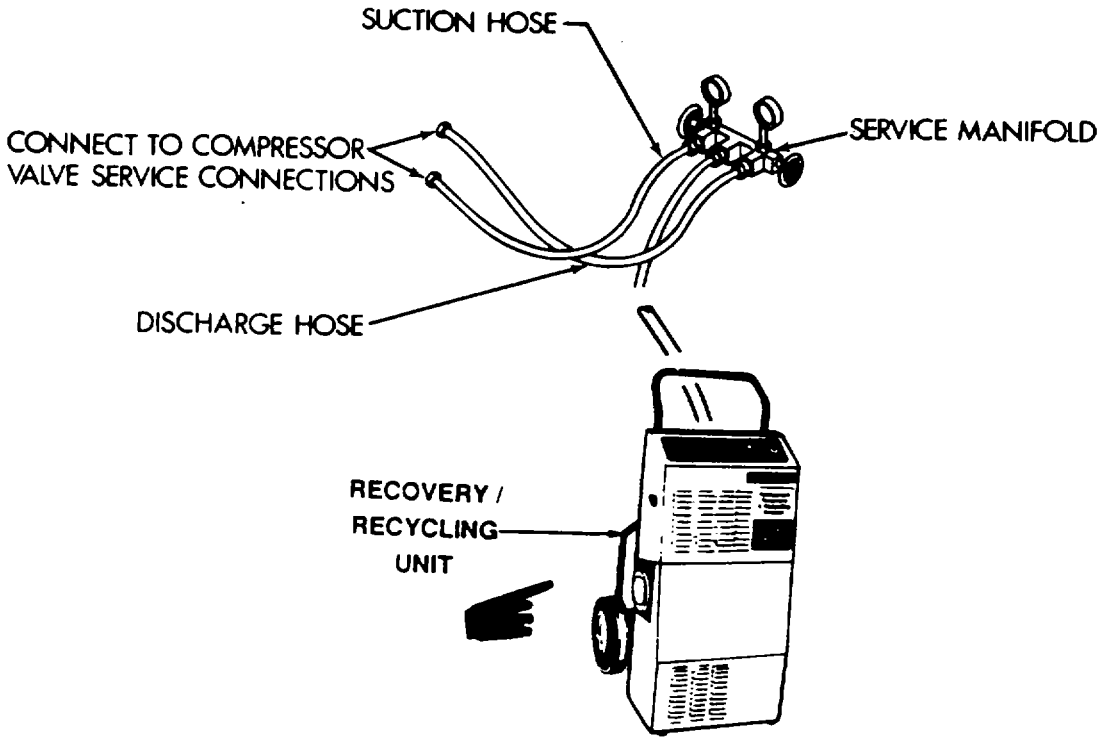


Figure 5-2. Discharging Refrigerant

NOTE

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

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

(7) If the system is to be repaired, go to paragraph 5-9. If the system is to be charged, go to paragraph 5-10.

5.9. PURGING THE SYSTEM

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 (0.028-0.057 m3/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.

See specific item maintenance instructions for hook up procedures.

5-10. EVACUATING THE SYSTEM

See figure 5-3.

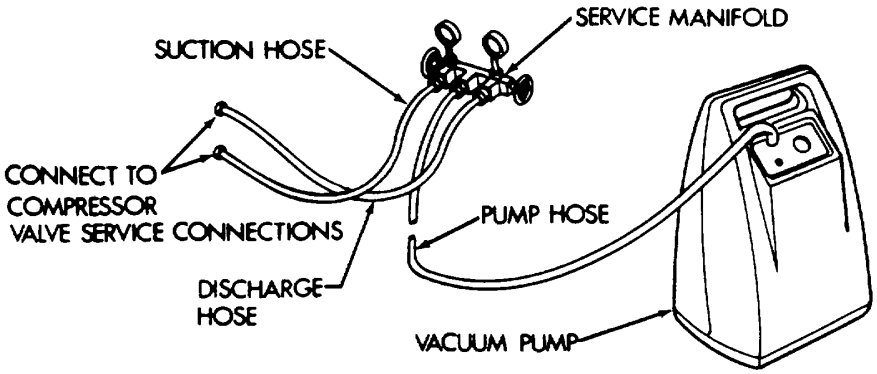


Figure 5-3. Evacuating the System

The refrigeration system or portion of system that was opened must be evacuated to remove all moisture before it is charged with Refrigerant-1i 2.

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 hose assemblies to service valves and manifold valves.

e. Attach hose 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.

j. 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.
I. Backseat both compressor service valves.
m. Stop vacuum pump.
n. Disconnect hose from vacuum pump and go to paragraph 5-11 for charging instructions.

5-11. 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 paragraph 5-11 b(1) through (3).
(2) Operate, test and charge if necessary in accordance with paragraph 5-11 b(7) through (16).

b. If the unit was not pumped down prior to repairs, it must be fully charged with Refrigerant-1i 2.

CAUTION

Always charge the refrigeration system with Refrigerant-1i 2 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-1i 2 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/cm2).

(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) Set refrigeration system valves in accordance with paragraph 4-9a through g. (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 air conditioner in COOL mode (with temperature control in coolest position) for 15 minutes.

Do not skip the 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.

5-12. BRAZING/DEBRAZING PROCEDURES

WARNING

All Refrigerant R12 must be discharged from the system (para 58) and the section of the system being repaired must be purged with dry nitrogen before beginning any debrazing operation. When R12 comes in contact with flames, 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 bad 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 m3/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 m3/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.

5-13. CONDENSER COIL AND SHROUD See figure 5-4.

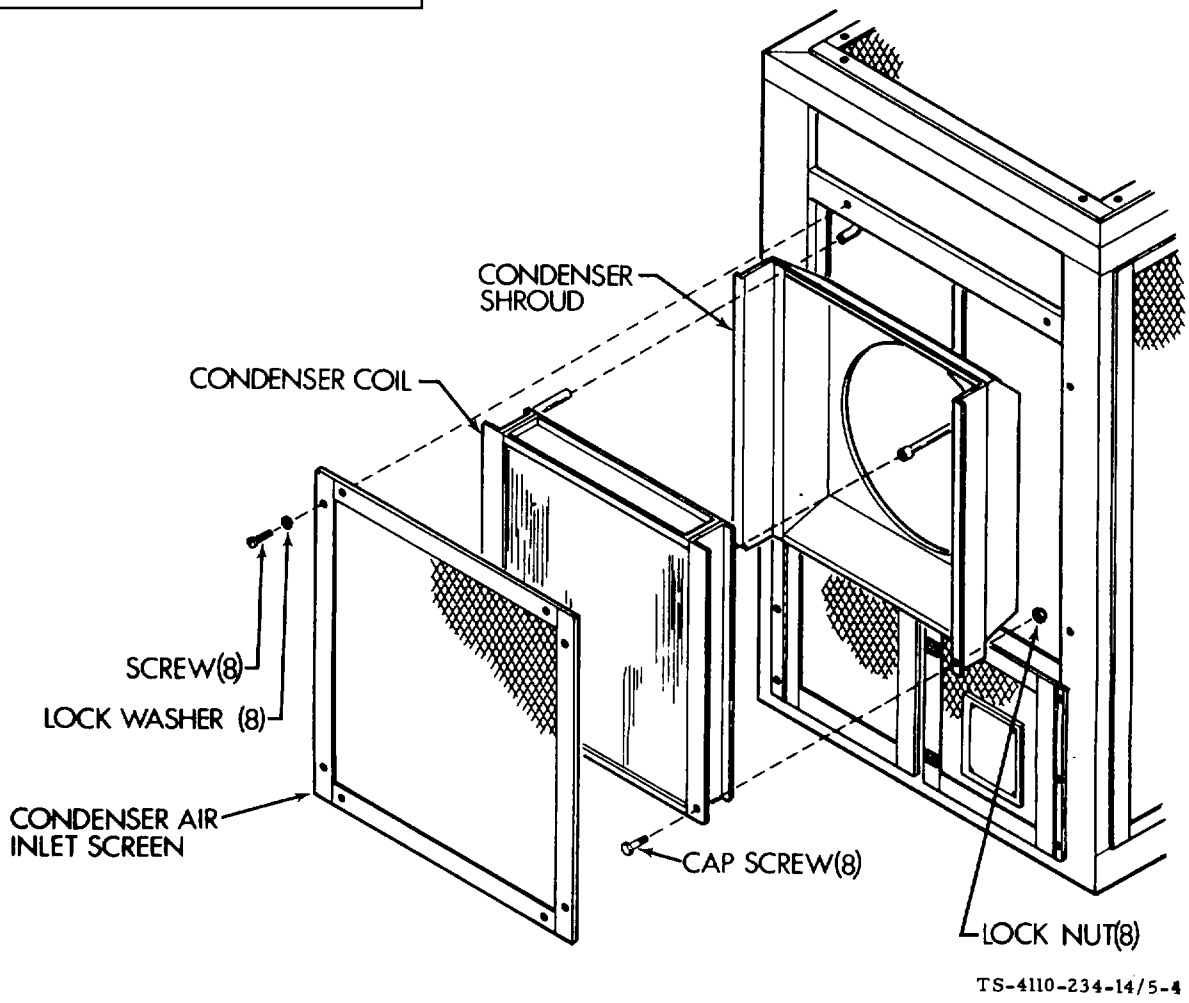


Figure 5-4. Condenser Coil and Shroud

a. Removal.

(1) Pump the system down in accordance with paragraph 5-6.

(2) Remove 8 screws and lock washers and remove the condenser air inlet screen.

(3) Connect a dry nitrogen source to the compressor discharge service tee and loosen the flare nut to the receiver inlet valve. Purge this section of tubing in accordance with paragraph 5-9.

(4) Debraze the condenser inlet and outlet tubing, using the techniques of paragraph 5-12.

(5) Remove the mounting screws that hold the condenser and shroud to the refrigerator frame.

(6) Lift condenser and shroud from the frame. Use gloves when removing coil to avoid cuts from and/or damage to the fins.

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) Install condenser coil and shroud to the frame and secure them with 8 each cap screws and lock nuts.

(2) Braze the inlet and outlet connections.

(3) Tighten the flare nut to the receiver inlet valve and remove the nitrogen source connection.

(4) Replace the drier (See para 5-19.)

(5) Leak test the coil, newly connected tubing and tubing connections in the area of the newly brazed joints per paragraph 5-7.

(6) Evacuate and charge the system as directed in paragraphs 5-10 and 5-11a.

(7) Install the condenser air inlet screen and secure with 8 each screws and lock washers.

(8) Close all access doors.

5-14. DISCHARGE PRESSURE REGULATING VALVE See figure 5-5 or 5-6.

a. Access. Open left side condenser section access door.

b. Adjust. Factory set point of assembled refrigerators is 100 psig (689.5 kPa) minimum.

(1) This valve has an operating point adjusting range of 50 to 195 psig (344.8 to 1344.5 kPa).

(2) One full turn of the adjusting stem will change the setting by 21 psig (144.8 kPa). Turn the stem clockwise to increase, counterclockwise to decrease.

(3) After a new valve is installed, operate the unit, remove the cap and adjust the valve stem to a gage indication of 100 psig (689.5 kPa) minimum.

c. Removal.

(1) Pump the system down in accordance with paragraph 5-6.

(2) Connect a dry nitrogen source to the compressor discharge service tee and loosen the flare nut to the receiver inlet valve. Purge this section of tubing in accordance with paragraph 5-9.

(3) Debraze (See para 5-12) the tubes to the valve and remove the discharge pressure regulating valve.

d. Installation.

(1) Braze (see para 5-12) the tubes to the discharge pressure regulating valve.

(2) Tighten the flare nut to the receiver inlet valve and remove the nitrogen source connection.

(3) Replace the drier. (See para 5-19).

(4) Leak test the valve, the newly connected tubing connections and the tubing connections in the area of the newly brazed joints per paragraph 5-7.

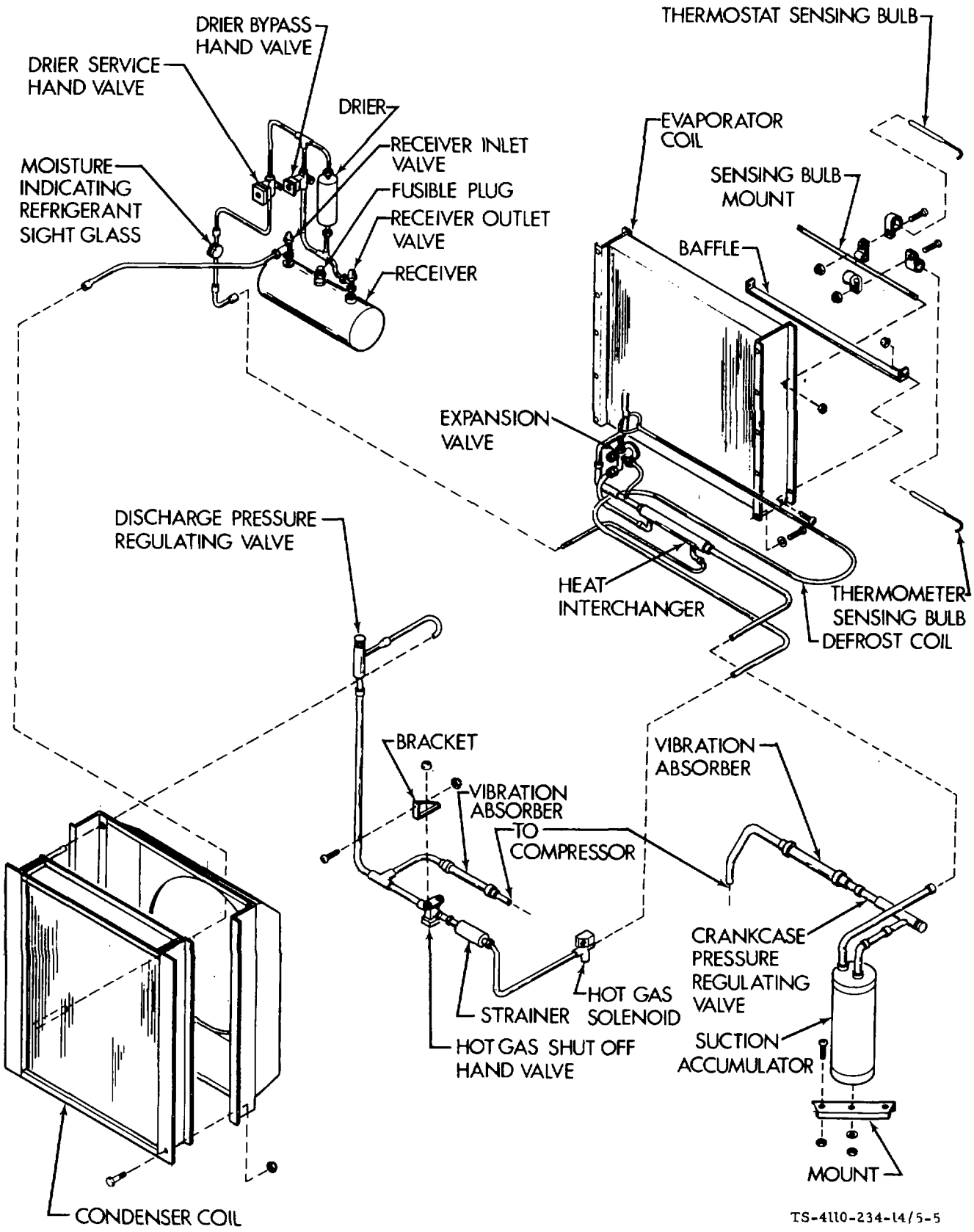


Figure 5-5. Refrigeration System F10000R-6

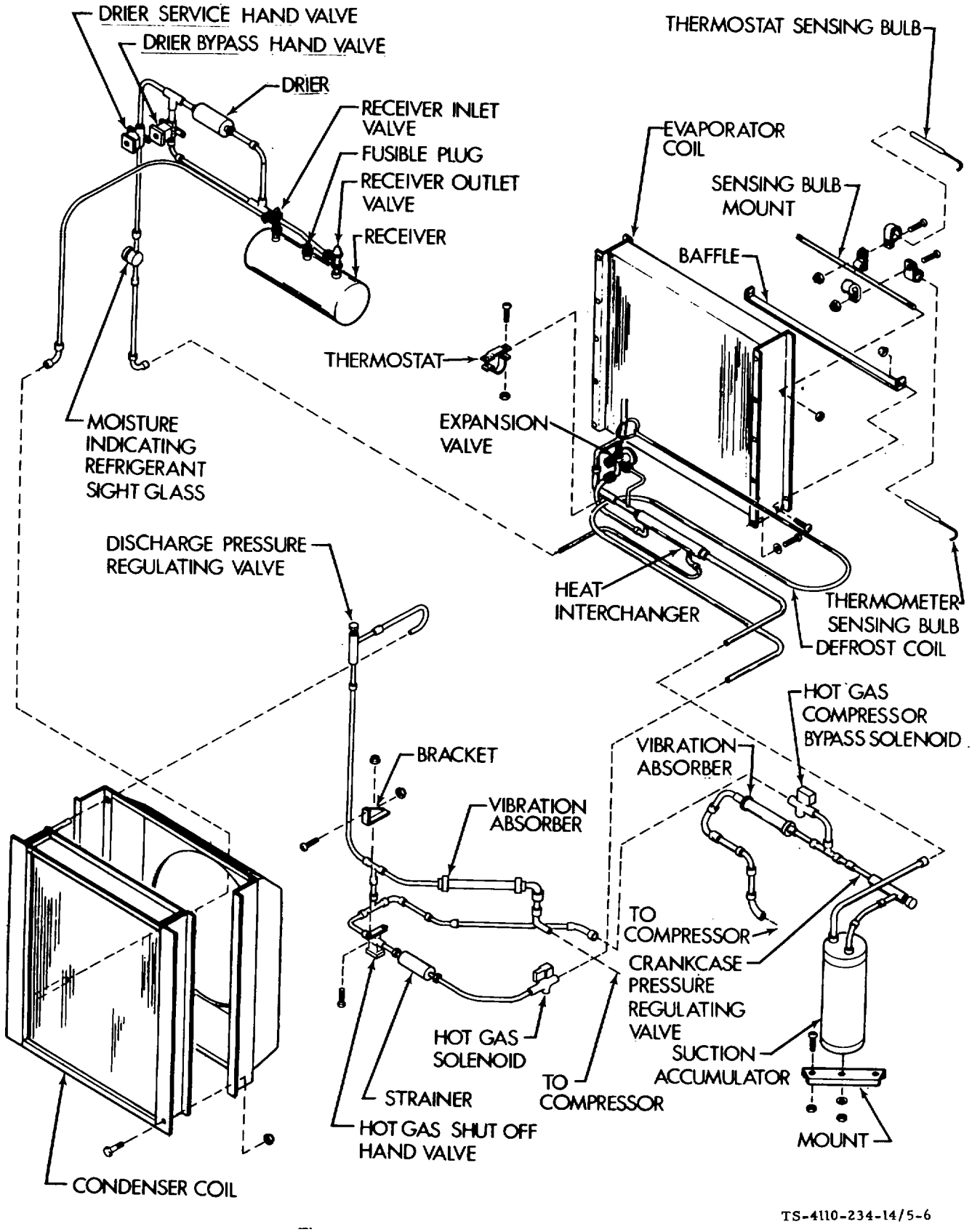


Figure 5-6. Refrigeration System F10000RG-2

(5) Evacuate and charge the system as directed in paragraphs 5-10 and 5-11a.

(6) Close all access doors.

5-15. HAND VALVES See figure 5-5 or 5-6.

The refrigeration system has three hand shut-off valves: a hot gas shut off valve, a drier bypass valve, and a drier service valve. The same replacement procedure is used for any of these valves.

a. Removal.

(1) Open the appropriate access door.

(2) Pump down the system (para 5-6).

(3) Connect a dry nitrogen source to the compressor discharge service tee.

(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 5-12).

(7) Remove the attaching hardware and remove the valve.

b. Install.

(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 drier. (see para 5-19).

(5) Leak test the valve, the newly connected tubing connections and the tubing connections in the area of the newly brazed joints per paragraph 5-7.

(6) Evacuate and charge the system as directed in paragraphs 5-10 and 5-11a

(7) Close all access doors.

5-16. REFRIGERANT STRAINER See figure 5-5 or 5-6.

a. Remove.

(1) Pump the system down in accordance with paragraph 5-6.

(2) Open the lower left front access door.

(3) Disconnect the flare nuts and remove the strainer.

b. Install.

(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 drier. (see para 5-19).

(4) Leak test the flare nuts and tubing in the area of the strainer.

(5) Evacuate and charge the system as directed in paragraphs 5-10 and 5-11a.

(6) Close all access doors.

5-17 SOLENOID VALVES See figure 5-5 or 5-6 and figure 5-7.

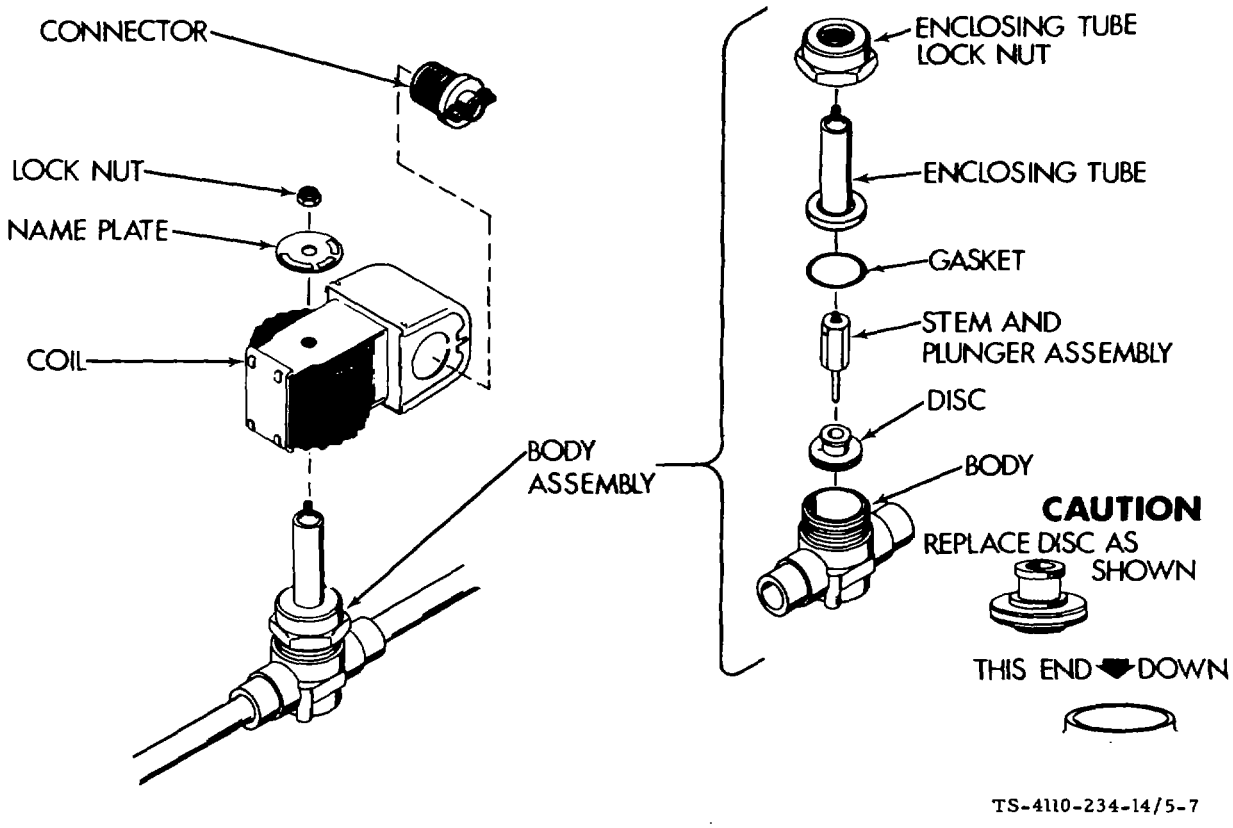


Figure 5-7. Solenoid Valve

a. Testing.

WARNING

Disconnect input power to the air conditioner 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 must be replaced.

(4) Use the continuity test or multimeter 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 should be replaced.

(5) Using an external power source connect power (12 volt dc for the F10000RG-2 or 115 volt ac for the F10000R-6) 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 entire valve should be replaced.

b. Coil Replacement. The coil can be replaced without opening the refrigeration pressure system. Refer to figure 5-7 and replace the coil as follows:

WARNING

Do not attempt any disassembly of the solenoid valve other than coil removal with a refrigerant charge in the system. Refrigerant will be sprayed out dangerously if the enclosing tube lock nut that attaches the enclosing tube and plunger assembly to the valve body is loosened.

(1) Remove the nut that attaches the coil to the valve body, and remove the coil.
(2) If the leads have not already been disconnected, tag and disconnect them.
(3) Remove the connector for reuse unless it is damaged.
(4) Position the replacement coil on the enclosing tube and install the top lock nut.
(5) Reuse the old box connector or install a new one.
(6) See tags and wiring diagram figure 4-5 or 4-6 and connect wires.

c. Total 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 5-6.

(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 5-9.

(3) Remove the lock nut that attaches the coil to the body assembly and remove the coil.

(4) Remove the enclosing tube lock nut and all other removable internal components from the valve body.

(5) 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.

d. Install.

(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 flowing 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) Place the seat disc into the valve body with the smaller diameter end facing up.

(8) With the other hand, place the enclosing tube over the plunger, making sure the gasket is in position.

(9) Install the enclosing tube lock nut and tighten to 20 ft/lbs (27.1 N•m).

(10) Install the coil and nameplate and secure with the lock nut.

(11) Install the connector. (May be removed from old solenoid valve if not damaged.)

(12) See tags and wiring diagram figure 4-5 or 4- and connect wires.

(13) Replace the drier. (See para 5-19).

(14) Leak test the valve, all newly connected tubing connections and all connections in the area of the newly brazed joints per paragraph 5-7.

(15) Evacuate and charge the system as directed in paragraphs 5-10 and 5-11a.

(16) Close all access doors.

5-18. FUSIBLE PLUG See figure 5-5 or 5-6.

a. Removal.

(1) Discharge the system (para 5-8).

(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 drier. (See para 5-19).

(3) Leak test the newly installed plug and drier connections per paragraph 5-7.

(4) Evacuate and charge the system per paragraphs 5-10 and 5-11b.

5-19. FILTER-DRIER See figure 5-5 or 5-6.

The filter-drier assembly is a metal container which contains desiccant dehydrating and filtering media through which the liquid refrigerant must flow. A new filter-drier 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.

a. Removal. If system has already been opened go to step (3).

(1) Pump down the system per paragraph 5-6.

(2) Disconnect power.

(3) Unscrew flare fittings slowly to release any slight remaining pressure.

(4) Lift the filter-drier from the unit and plug the tube ends.

b. Installation.

(1) Connect flare fittings (after removing plugs) loosely to filter-drier. Check that flow arrow indicates flow away from receiver and toward sight glass.

(2) Tighten the flare nuts.

(3) Leak test the newly connected fittings per paragraph 5-7.

(4) Evacuate and charge the system as directed in paragraphs 5-10 and 5-11a or b as applicable.

(5) Close all access doors.

5-20. RECEIVER See figure 5-5 or 5-6.

a. Removal.

(1) Disconnect power.

(2) Discharge the system. (See para 58.)

(3) Disconnect the flare nuts on the inlet and outlet valves.

(4) Remove the hardware from the support clamp flanges and spring the clamps open enough to slide the receiver out.

b. Repair. Repairs are limited to replacement of valves and fusible plug. Repair of welds on high pressure tanks is not recommended.

(1) Assuming that the system has been discharged the inlet valve and the fusible plug can be replaced by unscrewing and screwing a new one in place.

(2) The outlet valve can also be removed and installed in a like manner. This valve must have a quill or liquid pickup tube soldered at its base.

c. Install.

(1) Slide the receiver into the support clamps and connect the flare nuts to the valves.

(2) Secure the clamp flanges with two each cap screws, flat washers and lock nuts.

(3) Replace the drier (see para 5-19).

(4) Leak test the tank and all newly connected fittings.

(5) Evacuate and charge the system as directed in paragraphs 5-10 and 5-11b.

(6) Close all access doors.

5-21. MOISTURE INDICATING REFRIGERANT SIGHT GLASS See figure 2-3 for functional description and figure 5-5 or 5-6 for location and removal.

a. Removal.

(1) Pump the system down in accordance with paragraph 5-6.

(2) Connect a dry nitrogen source to the compressor discharge service tee and loosen the flare nut to the receiver inlet valve. Purge this section of tubing in accordance with paragraph 5-9.

(3) Debraze (see para 5-12) the tubes to the sight glass and remove the sight glass.

b. Installation.

(1) Braze (see para 5-12) the tubes to the sight glass.

(2) Tighten the flare nut to the receiver inlet valve and remove the nitrogen source.

(3) Replace the drier (see para 5-19).

(4) Leak test the sight glass area per paragraph 5-7.

(5) Evacuate and charge the system as directed in paragraphs 5-10 and 5-11a.

(6) Close all access doors.

5-22. EXPANSION VALVE See figures 5-5 and 5-7 for location.

a. Access. Remove the evaporator air housing and screen. (See figure 4-12.)

b. Adjust. (See figure 58.) The expansion valve, as supplied with the unit, is preset at the factory. This valve should not be adjusted unnecessarily. When a new valve is installed or adjustment is necessary, see the following instructions:

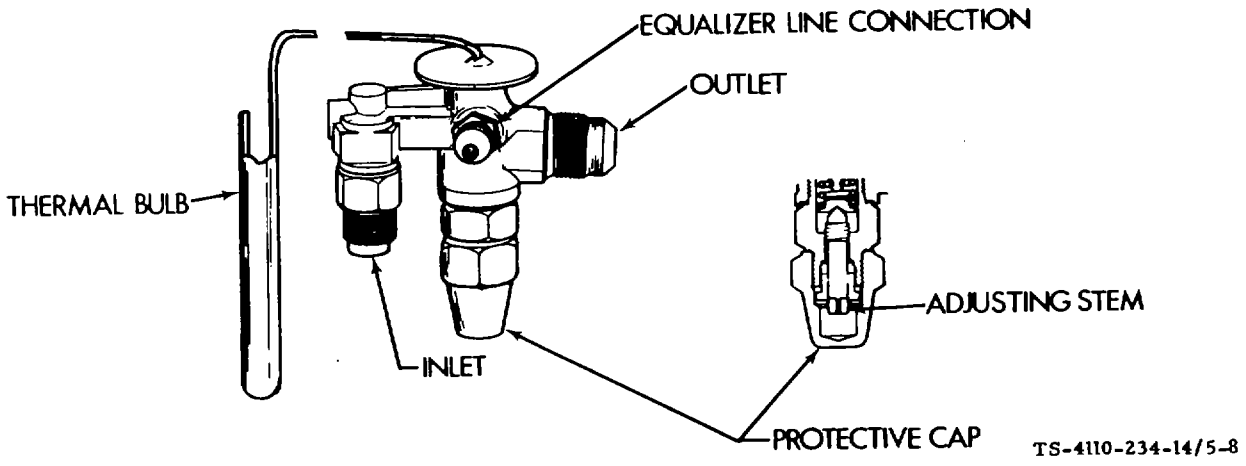


Figure 5-8. Expansion Valve

(1) Remove insulation from a spot on the suction line near the sensing bulb of the expansion valve.

(2) Install an accurate thermometer or the probe of a thermocouple on the bare spot, using a small amount of thermal mastic, if available, to improve conductivity. Tap the thermometer bulb or thermocouple junction in position. Cover with insulating material.

(3) Adjust suction crank case pressure regulating valve so that it is wide open.

(4) Operate the unit for approximately 30 minutes and take a reading from the thermometer or thermocouple on the suction line.

(5) Take a reading from the suction pressure gage on the control panel. Add two pounds to the reading to allow for the pressure drop in the suction line. This sum will equal the approximate suction line pressure at the sensing bulb.

(6) Convert pressure obtained in step (5) to saturated evaporator temperature by using a temperature-pressure chart. See Table 5-1.

(7) Subtract the temperature obtained in step (6) from temperature obtained in step (4). The difference is superheat.

NOTE

Subtracting the difference between the temperature at the inlet and outlet of the evaporator is not an accurate measure of superheat. This method is not recommended since any evaporator pressure drop will result in an erroneous superheat indication.

(8) Remove the protective cap from the expansion valve (fig. 5-8). Use two wrenches, one on the cap, and one on the hex of the valve body.

(9) To reduce superheat, turn the adjusting stem counterclockwise; to increase superheat, turn stem clockwise. Make no more than one turn of the stem at a time and observe the change in superheat closely to prevent overshooting the desired setting. As much as 30 minutes may be required for the new balance to take place after an adjustment is made. The correct superheat setting for this unit is 6 degrees F (3.30C).

(10) Replace the protective cap on the valve adjusting stem.

(11) Remove the thermometer or the thermocouple probe from the suction service line and replace the insulating material. Adjust the crankcase pressure regulating valve per paragraph 5-25 b.

c. Removal.

(1) Pump down the system (para 5-6).

(2) Slowly disconnect flare fittings from expansion valve to release any remaining refrigerant pressure.

(3) Note the position of the sensing bulb and loosen the clamp holding thermal bulb to suction line. Remove the bulb.

(4) Remove expansion valve.

d. Installation.

(1) Connect the expansion valve to the system by tightening the flare fittings.

(2) Insert the thermal bulb in the clamp in the same position as the one that was removed. Make sure it makes good contact with the suction line. Tighten the clamp.

(3) Replace the drier (See para 5-19.)

Table 5-1. Pressure-Temperature Relationship of Saturated R 12 Refrigerant

Temperature		Pressure		Temperature		Pressure	
Deg F	Deg C	psig	kg/cm2	Deg F	Deg C	psig	kg/cm2
10	-12.3	14.64	1.029	66	18.9	65.03	4.572
12	-11.1	15.84	1.113	68	20.0	67.58	4.751
14	-10.0	17.08	1.200				
16	-8.9	18.36	1.291	70	21.1	70.19	4.934
18	-7.8	19.68	1.384	72	22.2	72.86	5.122
74	23.3	75.60	5.315				
20	-6.6	21.04	1.479	76	24.4	78.39	5.511
22	-5.5	22.44	1.578	78	25.6	81.25	5.712
24	-4.3	23.88	1.679				
26	-3.4	25.36	1.783	80	26.7	84.17	5.917
28	-2.2	26.88	1.890	82	27.8	87.16	6.127
84	28.9	90.22	6.342				
30	-1.1	28.45	2.000	86	30.0	93.34	6.562
32	0	30.06	2.113	88	31.1	96.53	6.786
34	1.1	31.72	2.230				
36	2.2	33.42	2.349	90	32.2	99.79	7.015
38	3.3	35.17	2.472	92	33.3	103.12	7.249
94	34.5	106.52	7.488				
40	4.4	36.97	2.599	96	35.6	110.00	7.733
42	5.5	38.82	2.729	98	36.7	113.54	7.982
44	6.6	40.71	2.862				
46	7.7	42.66	2.999	100	37.8	117.16	8.236
48	8.8	44.65	3.139	102	38.9	120.86	8.496
104	40.0	124.63	8.761				
50	10.0	46.70	3.283	106	41.1	128.48	9.032
52	11.1	48.80	3.431	108	422	132.41	9.308
54	12.2	50.95	3.582				
56	13.3	53.16	3.737	110	43.3	136.41	9.590
58	14.5	55.42	3.896	112	44.4	140.49	9.874
114	45.6	144.66	10.170				
60	15.6	57.74	4.019	116	46.7	148.91	10.468
62	16.7	60.11	4.226	118	47.8	153.24	10.773
64	17.8	62.54	4.397				

(4) Leak test all newly connected fittings.

(5) Evacuate and charge the system as directed in paragraphs 5-10 and 5-1 la.

(6) Install the evaporator air housing and screen (See figure 4-12).

(7) Close all access doors.

5-23. EVAPORATOR COIL See figure 5-5 or5-6.

a. Removal.

(1) Pump the system down in accordance with paragraph 5-6.

(2) Remove 12 screws and lock washers and remove the evaporator air housing and screen. (See fig. 4-12.)

(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 mount and the baffle.

(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 5-9.

(6) Debraze the tubing at the suction header using the techniques of paragraph 5-12.

(7) Disconnect the flare nut at the distributor and expansion valve connection.

(8) Use gloves when handling coils to avoid cuts and to reduce the possibility of fin damage.

(9) Support the evaporator coil and remove the screws and lock washers 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 lock washers.

(2) Connect the flare nut from the distributor to the expansion valve.

(3) Braze the suction header connections. (See para 5-12.)

(4) Tighten the flare nut to the receiver outlet valve and remove the nitrogen source connection. Replace the drier (see para 5-19).

(5) Install the sensing bulb mount and the baffle if they were removed.

(6) Slip the sensing bulb 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 5-7.

(8) Evacuate and charge the system as directed in paragraphs 5-10 and 5-11a.

(9) Install the evaporator air housing and screen. (see fig. 4-12.)

(10) Close all access doors.

5-24. SUCTION ACCUMULATOR See figure 5-5 or 5-6.

a. Removal.

(1) Pump the system down in accordance with paragraph 5-6.

(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 5-9.

(3) Debraze the inlet and outlet tubing, using the techniques of paragraph 5-12.

(4) Remove the nut that secures the accumulator to the mount and lift the accumulator from the unit.

b. Installation.

(1) Position the accumulator on the mount and tighten the nut that secures it.

(2) Braze the piping connections (para 5-12). 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 drier (see para 5-19).

(5) Leak test the accumulator, newly connected tubing and tubing connections in the area of the newly brazed joints per paragraph 5-7.

(6) Evacuate and charge the system as directed in paragraphs 5-10 and 5-11a.

(7) Close all access doors.

5-25. CRANKCASE PRESSURE REGULATING VALVE

a. Access. Open right side condenser section access door.

b. Adjust. Factory set point of assembled refrigerators is 14 psig (96.5 kPa) for the F10000RG-2 and 13 psig (89.6 kPa) for the F10000R-6.

(1) This valve has an operating point adjusting range of 0 to 40 psig (O to 275.8 kPa).

(2) One full turn of the adjusting stem will change the setting by 11.5 psig (79.3 kPa). Turn the stem clockwise to increase, counterclockwise to decrease.

(3) After a new valve is installed, assuming that the refrigerator box temperature is above 35°F (1.70C), operate the unit, remove the cap and adjust the valve stem to a gage indication of 14 psig (96.5 kPa) for the F1000O RG-2 and 13 psig (89.6 kPa) for the F10000R-6. Note that under normal loads, the suction pressure will drop to well below the 13 or 14 psig (89.6 or 96.5 kPa) set points.

c. Removal.

(1) Pump the system down in accordance with paragraph 5-6.

(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 5-9.

(3) Debraze (see para 5-12) the tubes to the valve and remove the crankcase pressure regulating valve.

d. Installation.

(1) Braze (see para 5-12) the tubes to the regulating valve.

(2) Tighten the flare nut to the receiver outlet valve and remove the nitrogen source connection.

(3) Leak test the valve, the newly connected tubing connections and the tubing connections in the area of the newly brazed joints per paragraph 5-7.

(4) Evacuate and charge the system as directed in paragraphs 5-10 and 5-11a.

(5) Close all access doors.

5-26. TUBING AND FITTINGS See figure 5-5 or 5-6.

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 that you are brazing at a rate of 1-2 cfm (0.028- 0.057 m3/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 5-7 after any replacement action that required brazing.

c. Replace the filter drier and leak test the filter drier 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 5-10 and 5-11 after all other maintenance actions are completed.

5-27. COMPRESSOR

a. Lubrication.

(1) General. (See fig. 2-4). The compressor oil level should be observed with the compressor running. If the oil level in the sight glass is less than one-eighth (1/8) up from the bottom of the glass, this indicates a low oil level. If the oil level is up more than one-half (1/2) from the bottom, this indicates a high oil level. Therefore, the oil level should be 1/8 to 1/2 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.

NOTE

To observe the oil sight glass on the compressor of Model F1000OR-6 it will be necessary to hold a mirror behind the compressor near the back wall of the condenser section.

(2) Type of oil. Use refrigerant compressor lubricating oil VV-L-825, type II.

(3) Adding oil.

(a) Frontseat the compressor suction service valve.
(b) Start the unit and operate until suction gage indicates 2 PSIG.

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.

(c) Stop the unit. Repeat step (b) until pressure holds.
(d) Frontseat the compressor discharge service valve. Remove the compressor oil plug slowly to prevent sudden discharge of refrigerant trapped in compressor.
(e) Pour oil into compressor. Use only new oil. See paragraph 5-27a(2).
(f) Replace oil plug. Crack one of the fittings on the compressor discharge service valve tee.
(g) Backseat the compressor suction service valve and purge the compressor through the fittings on the tee.
(h) Tighten the fittings and backseat the discharge service valve. Crack to operate the gages.
(i) Operate the unit and check oil level.

b. Electrical testing F1000OR-6.

WARNING

If a refrigerant leak is found at the compressor terminal box, do not operate unit or disturb the wires or terminals prior to shut off of compressor service valves and release of refrigerant in the compressor.

(1) Disconnect power.
(2) Remove the cover of the terminal box.
(3) Check internal wiring in the terminal box to ensure that no wires are broken or grounded.
(4) Using an ohmmeter set on the lowest scale, check for continuity between control circuit leads. If there is no continuity, the compressor motor thermal overloads are defective and must be replaced.
(5) Check for continuity between terminal studs T1 and T2, T1 and T3, and T2 and T3. If there is no continuity between any of these terminal pairs, the compressor motor winding is open and the compressor must be replaced.

c. Operational Testing.

(1) Cylinder Head and Valve Plate Assembly.

(a) Test for leaking discharge valves or blown cylinder head or valve plate gaskets by pumping compressor down and observing suction and discharge pressure equalization.

(b) If valves are leaking or a gasket is blown, the pressure will equalize rapidly. Maximum allowable discharge pressure drop is 3 psi per minute after initial drop of 10-15 psi in first half minute. The compressor bank with a blown gasket can also usually be detected by touch, since the head temperature will normally be much hotter than a bank with good gaskets.

(c) If there is an indication of loss of capacity, and discharge valves check properly, remove valve plate assembly and inspect suction valves.

(2) Excessive or unusual noise.

(a) Check oil level.

(b) Check mounting.

(c) Check for broken connecting rods, valves or bearing problems.

d. Motor burnout. (F1OOOOR-6 only.) When a compressor motor burns out it is necessary to replace the complete motor compressor assembly and clean the refrigeration system of all contaminants. Burnout of a compressor motor is indicated by lack of continuity of the motor windings and the condition of compressor oil. Cause of compressor motor burnout include the following:

(1) Low line voltage, which causes motor windings to overheat. Before burning out completely, the overheated windings cause chemical breakdown of the refrigerant and the oil to form sludge and other system contaminants.

(2) Loss of refrigerant. An inadequate charge of refrigerant. gas in the system reduces the amount of cooling gas within the compressor, resulting in gradual overheating of the motor and failure of the winding.

(3) High head pressure. High head pressures can be caused by clogged or dirty condenser coils or screens, or by an inoperative condenser fan. High head pressure requires the compressor to work harder, creating additional heat which ultimately can result in motor burnout. Poor ventilation around the condenser, and extremely high ambient temperatures can also cause motor failures.

(4) Moisture in system. Leakage of air into the refrigeration system starts a chain reaction which can result in motor burnout. Air contains oxygen and moisture which combined with refrigerant gas form hydrochloric and hydrofluoric acids. These combined with compressor oil form an acid sludge which is carried throughout the system, and which attacks the motor windings, causing short circuits and burnout.

(5) It is important to diagnose the type of compressor motor failure for two reasons. Simple failure, without motor burnout, does not require the extensive cleaning of the entire refrigeration system that burnout requires. Also, motor burnout indicates other problems that have contributed to the failure, and these problems must be corrected or avoided to prevent repetition of the burnout. Drain a small quantity of oil into a clear glass container. If the oil is clean and clear, and does not have an acrid smell, the compressor did not fail because of motor burnout. If the oil is black, contains sludge and has an acrid odor, the compressor failed because of motor burnout, and the refrigeration system must be cleaned to prevent residual contaminants from causing repeated burnouts when the compressor is replaced.

e. Clean-up procedure after a burnout. (F10000RG-6 only.)

(1) Close compressor suction and discharge service valves and bleed refrigerant from compressor. Save remaining refrigerant in system.

(2) Remove suction and discharge shut-off valve bolts and all other connections to damaged compressor. Remove damaged compressor and replace with a new compressor. On severe motor burnouts, discharge the system and clean all valves and components before connecting the replacement compressor.

(3) Install new liquid line filter-drier.

(4) Evacuate and dehydrate replacement compressor and check to see that oil in compressor is at proper level.

(5) Place compressor in operation. After 2 to 4 hours of operation, check compressor oil for discoloration and/or acidity. If oil shows signs of contamination, replace oil charge and filter-drier.

(6) Check oil daily for discoloration and acidity. If oil stays clean and acid-free, the system is clean. If oil shows signs of contamination, change oil and filter-drier. If filter-drier is dirty or discolored, repeat this step until system is clean.

f. Removal.

(1) Pump the system down, turn the unit off and disconnect input power.

(2) On Model F1000ORG-2 remove the drive belts (para 4-45).

(3) Close (frontseat) the two compressor service valves.

(4) On Model F10000R-6 tag and disconnect all wiring to the terminal box.

(5) Loosen the flare caps on the suction and discharge valve tee fittings to permit the refrigerant trapped in the compressor to escape.

(6) Remove the gage connections from the service valves.

(7) Unbolt the two service valves from the compressor.

WARNING

Avoid injury by using adequate equipment and personnel to remove compressor from frame. The compressor for Model F10000R-6 weighs 233 pounds and the compressor for Model F1000ORG-2 weighs 112 pounds.

(8) Remove the four mounting bolts and pull the compressor from the frame.

g. Disassembly. Use figure 5-9 or 5-10 (whichever is applicable) as a guide. Disassemble the compressor only to the extent necessary to reach and replace a defective part. See paragraphs 5-28 through 5-33 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.

h. Reassembly. Use figure 5-9 or 5-10 as a guide. See paragraphs 5-28 through 5-33 for specific instructions. See table 5-2 for torque values.

i. Installation.

(1) Check to see that compressor contains an oil charge. See para 5-27a.

(2) Place the compressor in position in the unit. On Model F1000O RG-2 line up the compressor pulley with the engine pulley and install belts. (See para 4-45.)

(3) Install the four sets of mounting hardware.

(4) Connect the service valves to the compressor using new valve gaskets which have been soaked in compressor oil.

Table 5-2. Compressor Torque Values

Size Dia (in.)	Threads Per In	Torque Range (ft-lb)	Usage
1/16	27 (pipe)	8-12	Pipe Plug - Crankshaft
1/8	20 (pipe)	6-10	Oil Return Check Valve - Crankcase
1/4	20 (pipe)	20-25	Pipe Plug - Press
1/4	20	8-10 12-15 12-16	Connecting Rod Capscrew Baffle Plate - Crankshaft Side Shield
1/4	28	6-10 12-16 16-20	Oil Pump Drive Segm25-30ent Unloader Valve Cover Plate - Pump End Bearing Head
5/16	18	16-20 16-20 16-20 25-30 25-30	Terminal Block Cap Screws Suction Service Valve Discharge Service Valve Pump End Bearing Head Bottom Plate - Crankcase
3/8	16	25-30 30-35 25-30	Compressor Foot Cylinder Head Motor End Cover - Crankcase
7/16	14	55-60	Motor End Cover-- Crankcase
5/8	11	25-30	Crankshaft - Equalizer Tube Ass'y.
5/8	18	60-75	Oil Bypass Plug Crankcase
No. 10	32	4-6	Oil Pump Drive Segment
1-1/2	18NEF	35-45	Oil Level Sight Glass

NEF - National Extra Fine

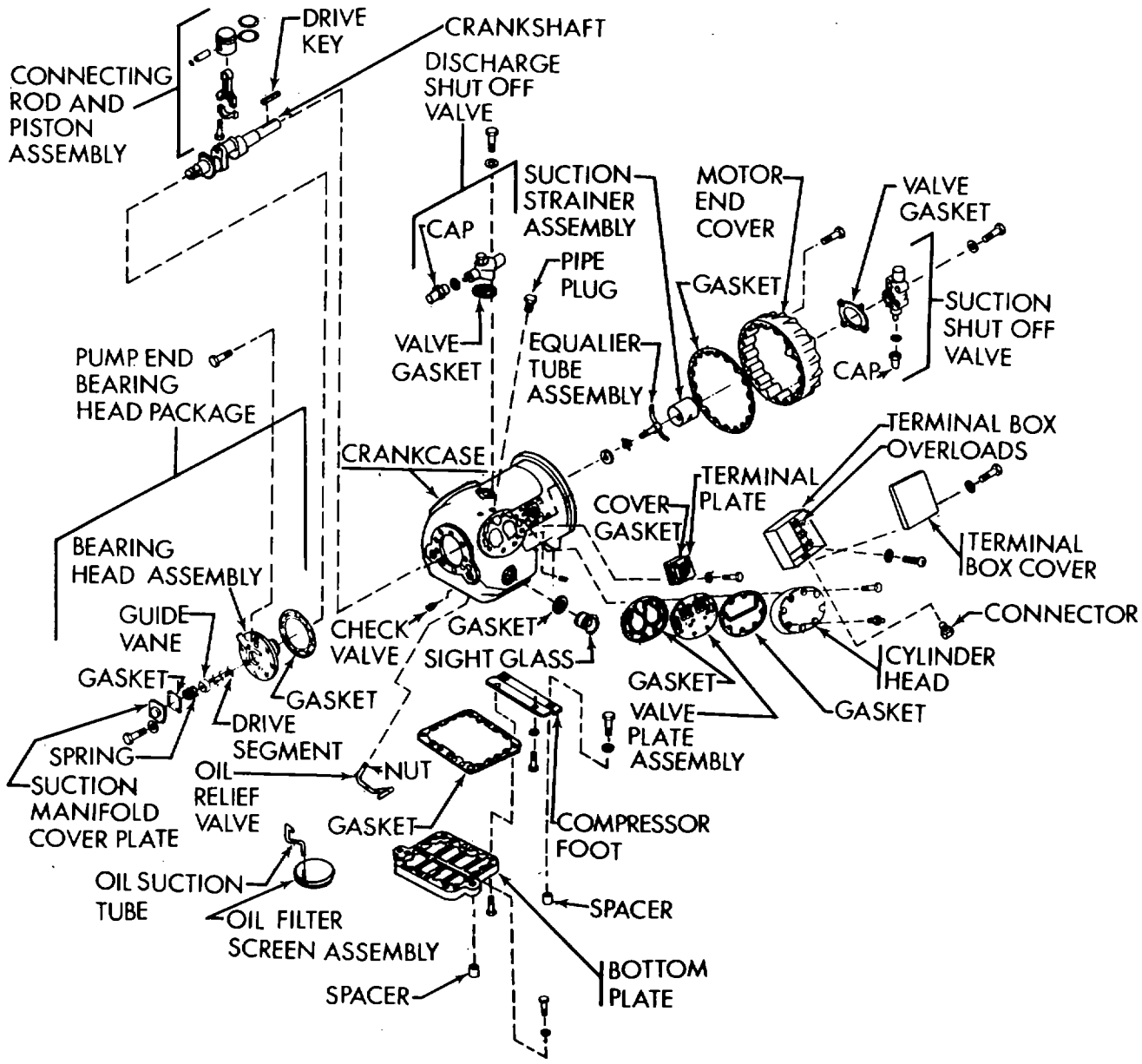


Figure 5-9. Compressor F1000R531

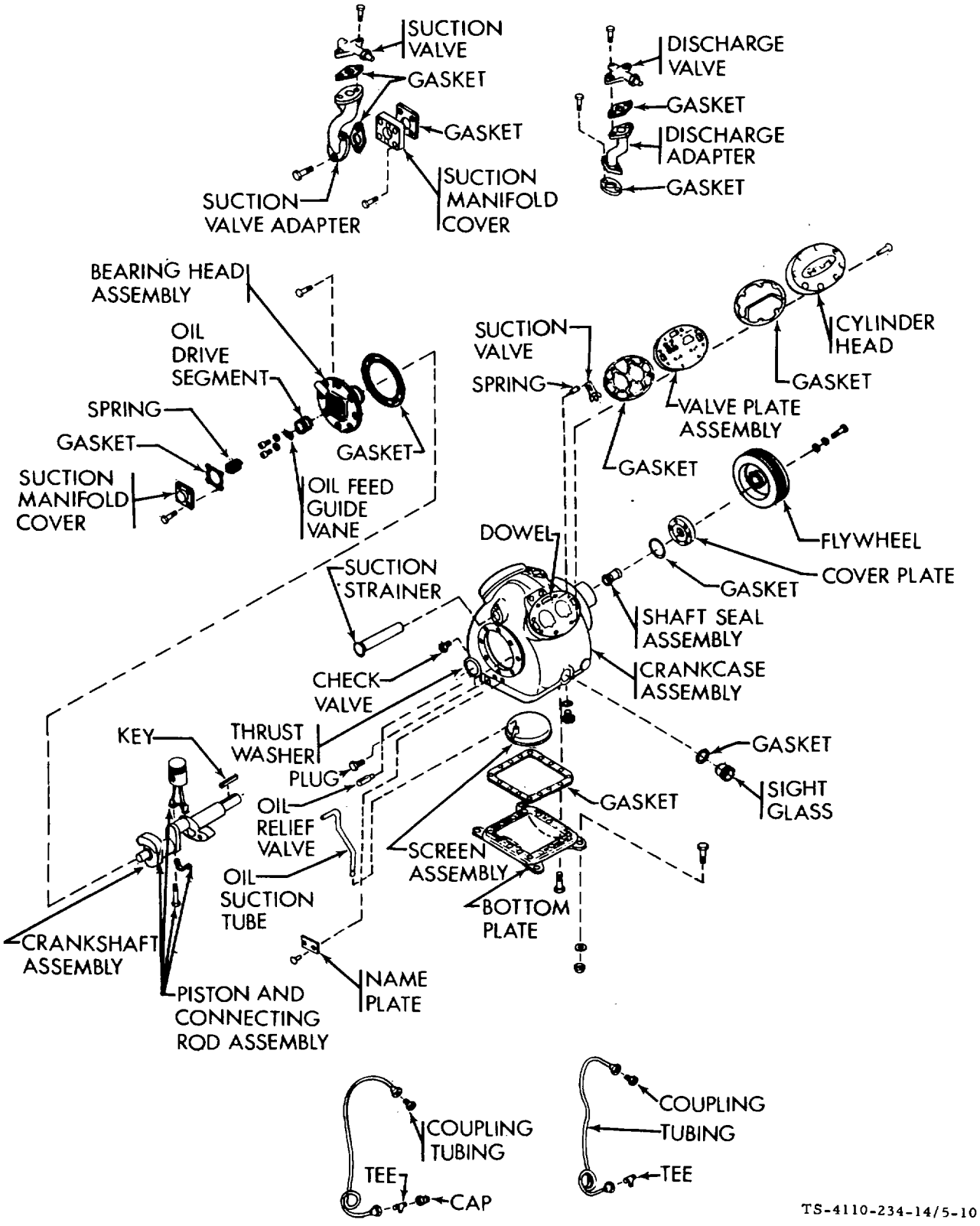


Figure 5-10. Compressor F10000RG-2

(5) Replace the drier (see para 5-19).

(6) Leak test, evacuate and charge the system as applicable. (See paragraphs 5-7, 5-10 and 5-11.)

5-28. COMPRESSOR SERVICE VALVES I See figures 5-1 and 5-9 or 5-10.

a. Removal.

(1) Pump down the refrigeration system (para 5-6).

(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 5-12).

(6) 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 5-12).

(4) Tighten the flare nut to the receiver valve and disconnect nitrogen purging connections.

(5) Using new valve gaskets that have been soaked in compressor lubricating oil, secure the valve to the compressor with the cap screws.

(6) Replace the drier (see para 5-19).

(7) Leak test all newly connected tubing and tubing connections in the area of newly brazed joints perpara 5-7.

(8) Evacuate and charge the system per paragraphs 5-10 and 5-11.

5-29. COMPRESSOR CYLINDER HEADS AND VALVE PLATES I

a. Disassembly.

(1) Disassemble cylinder heads by removing cap screws and prying up on the side (between cylinder headand valve plate) to break heads loose from valve plate. Do not hit cylinder heads to break loose.

(2) Check cylinder heads for warping, cracks and damage to gasket surfaces. Replace if necessary.

NOTE

Prior to valve removal record original valve position.

(3) Pry up on side of valve plate to remove plate from crankcase and expose suction valves. See figure 5-11.

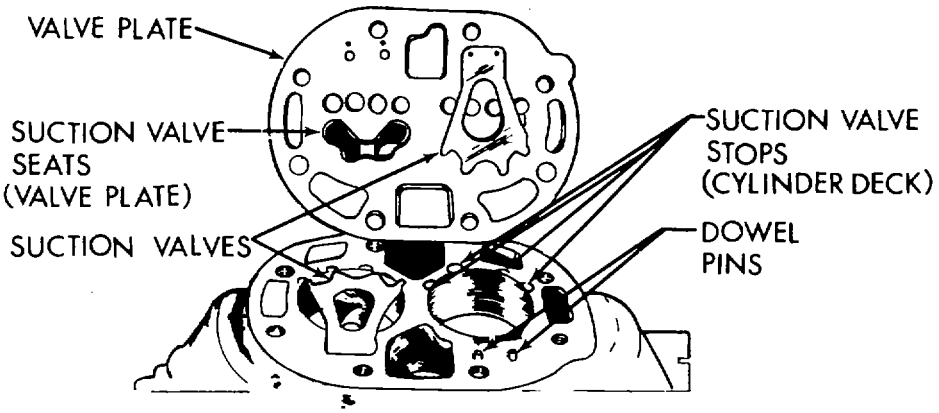


Figure 5-11. Valve Plate Removed

(4) Remove suction valves and suction valve positioning springs from dowel pins. See figure 5-12.

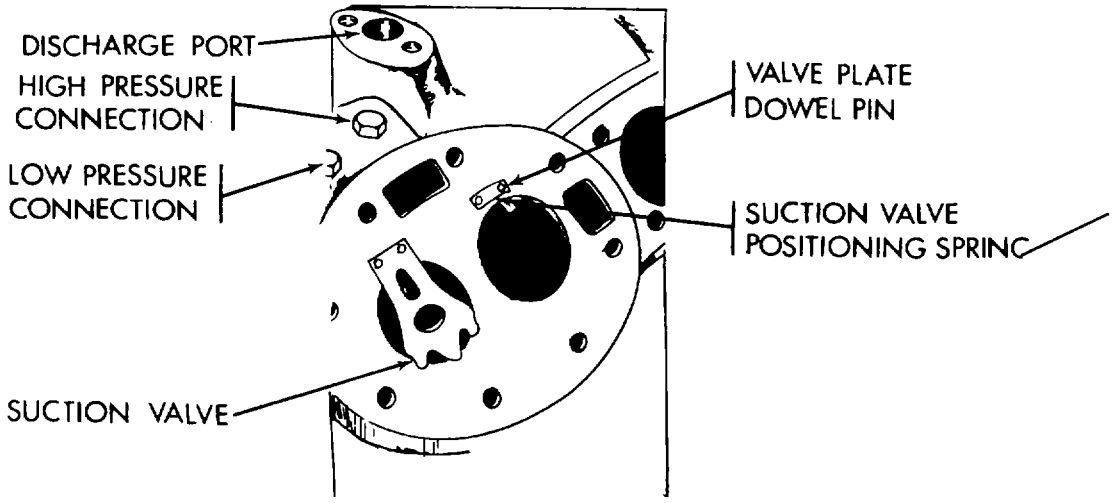


Figure 5-12. Suction Valve and Positioning Springs in Place

(5) Inspect the valves, valve seats, and valve springs for wear or damage. Replace complete valve plate if cracked or worn.

WARNING

Dry cleaning solvent (Fed Spec P-D-680) used to clean parts is potentially dangerous to personnel and property. Do not use open flame or excessive heat. Flash point of solvent is 100°F to 138°F (38°C to 59°C).

(6) Clean all parts with dry cleaning solvent (Fed Spec P-D-680) and dry thoroughly. Remove all gasket remains from the compressor housing and cylinder head.

b. Prior to reassembly check to see if there are other parts to be inspected, repaired or replaced that would require head and valve plate removal.

c. Reassembly. Use either figure 5-9 or 5-11 as a guide to reassembly. Use new gaskets at reassembly.

(1) Do not interchange valves. They should be reassembled in their original position. Install the suction valve positioning springs on dowel pins. Assemble positioning springs with spring ends bearing against cylinder deck (fig. 5-12). Spring bow upward.

(2) Install suction valves on dowel pins over positioning springs.

(3) Install new valve plate gasket. Oiling gaskets for reassembly is not recommended. Using proper hold-down torque will prevent any leaks.

(4) Place valve plate on cylinder deck.

(5) Install new cylinder head gasket. Make sure gasket is lined up correctly with the cylinder head and valve plate.

(6) Replace cylinder head. To prevent high to low side leak in center portion of cylinder head gasket, torque cylinder head cap screws to 30-35 ft-lb.

(7) Certain high compression ratio applications develop high discharge gas temperatures which sometimes allows the cylinder head and valve plate gaskets to develop a set. Under these conditions the cap screws could lose some of their hold-down torque. It is therefore recommended all head cap screws be retorqued 24 hours after new gaskets have been installed.

5-30. COMPRESSOR OIL PUMP ASSEMBLY

See figures 5-9 or 5-10 and 5-13. Note that figure 5-13 shows the compressor used on the F1000ORG-2. The suction strainer is located on the opposite end on the F1OOOOR-6. -All other features are the same.

a. Disassembly.

(1) See figure 5-9 or 5-10 as applicable and remove the four cap screws from the cover plate and remove the oil feed guide vane and spring. In figure 5-13 this has already been done.

(2) Remove the drive segment cap screws (6, fig. 5-13) from the end of the crankshaft. This must be done before step 3.

(3) Remove the eight cap screws (7, fig. 5-13) holding the bearing head assembly to the crankcase.

(4) Remove the bearing head assembly by pulling forward.

b. Inspection.

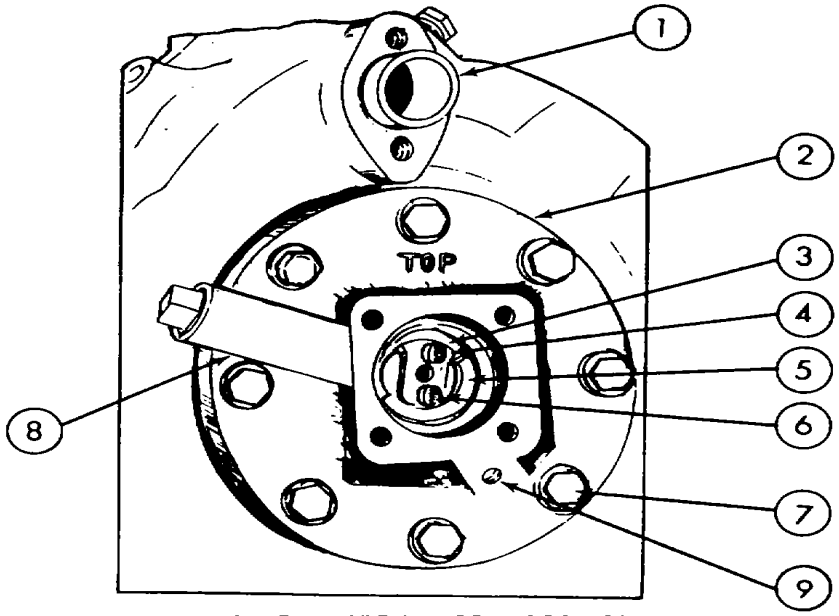
(1) Inspect the bearing surfaces for evidence of wear or damage.

(2) Check internal running gear for any obvious problems such as broken rods or pistons.

(3) If the drive segment (4, fig. 5-13) appears worn, replace it.

(4) If the bearing head appears worn or scored, the complete bearing head assembly should be replaced.

c. Prior to reassembly check to see if there are other parts to be inspected, repaired or replaced that would require oil pump assembly removal.



1 — SUCTION STRAINER ASSEMBLY
2 — OIL PUMP BEARING HEAD ASSEMBLY
3 — ROTOR RETURNING RING
4 — OIL PUMP DRIVE SEGMENT
5 — OIL PUMP ROTOR
6 — DRIVE SEGMENT CAP SCREWS
7 — BEARING HEAD CAP SCREWS
8 — OIL PUMP INLET PASSAGE
9 — OIL PRESSURE TAP

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Figure 5-13. Compressor Pump End Bearing Head

d. Replacement/Reassembly.

(1) Bolt the bearing head to the crankcase, using the eight cap screws (7, fig. 5-13). The bolt torque should ' be 25 to 30 ft-lb.

(2) Bolt the drive segment (4, fig. 5-13) to the crankshaft, using the two cap screws (6, fig. 5-13). Bolt torque 4 to 6 ft-lb on the No. 10 screw and 8 to 14 ft-lb on the 1/4 inch screw.

(3) Insert the oil feed guide vane with the large diameter inward.

NOTE
The guide vane must be installed before the vane spring.

(4) Place the oil feed vane spring over the small diameter of the guide vane.

CAUTION

Do not over-torque the four cover plate cap screws, since aluminum threads in bearing head could be stripped.

(5) Install the cover plate with a bolt torque of 16 to 24 ft-lb.

5-31. CRANKSHAFT SEAL ASSEMBLY (F10000RG-2) See figures 5-10 and 5-14.

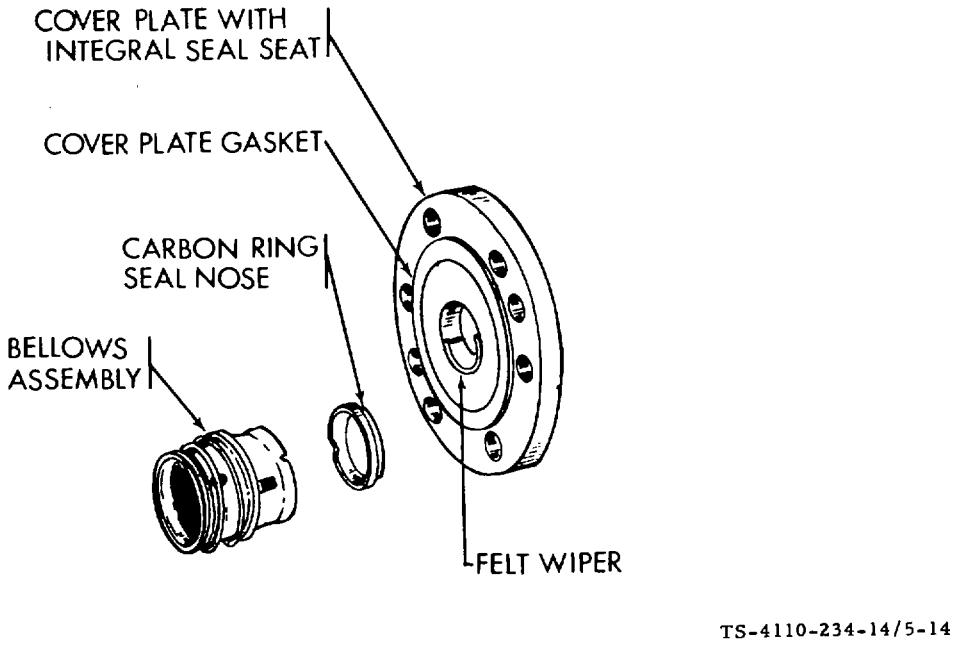

Figure 5-14. Seal Assembly

The crankshaft oil seal is a sleeve type with rotating bellows and integral seal seat.

a. Disassembly.

(1) Remove the cap screws and slip the cover plate, gasket and shaft seal from the crankshaft.

(2) Inspect all parts including crankshaft for obvious wear, broken parts and other visible damage.

b. Replacement/Reassembly.

CAUTION

Do not attempt to repair or replace seal components. Replace complete seal assembly with current sleeve type. The bellows assembly of the service replacement seal must not be taken apart.

(1) Pump end bearing head must be in place for proper positioning of seal on crankshaft.

(2) Be sure shaft extension, expecially the edges of the keyway, is free of sharp edges and nicks. Also, shaft must be clean and free of rust. Polish the shaft with crocus cloth.

(3) Check seal assembly to be sure the bellows are properly in place and are clean.

(4) Lubricate shaft and neoprene bellows (with compressor oil only) where it contacts shaft. Slide seal assembly onto shaft until neoprene starts to grasp the shaft. (See fig. 5-15.)

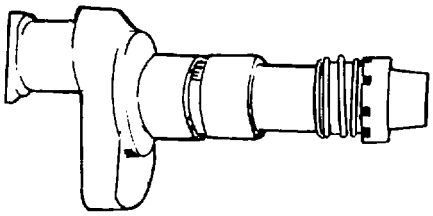

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Figure 5-15. Step 1 Seal Assembly Installation

(5) Using seal cover plate, push seal assembly on crankshaft until spring guide is tight against shaft shoulder. (Do not use cover plate bolts to push seal into position.) Remove cover plate being careful not to damage carbon washer. (See fig. 5-16.)

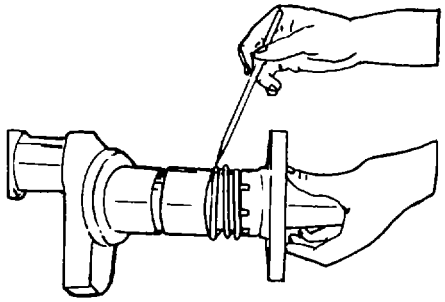

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Figure 5-16. Step 2 Seal Assembly Installation

(6) Be sure that driving band lugs are positioned in center of seal retainer shell slots. Lubricate carbon washer seal seat. Reinstall cover plate, drawing bolts down evenly to prevent damage to carbon washer. (See fig. 5-17.)

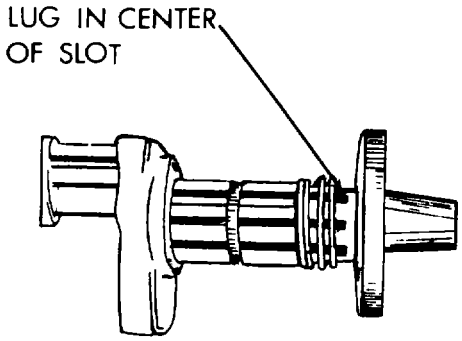

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Figure 5-17. Step 3 Seal Assembly Installation

5-32. COMPRESSOR CRANKSHAFT BEARINGS

a. Access. See paragraph 5-30 and remove the oil pump assembly.
b. Inspect/Replace.

(1) Inspect the crankshaft for wear or out-of-round journals. Inspect the journals and bearing surfaces for scratches, scoring or other defects. Remove minor burrs with a fine mill file. Replace damaged bearings. Replace a damaged or defective crankshaft.

NOTE

When crankshaft is replaced, there must be a minimum of 0.005 inch and a maximum of 0.11 inch end play on the shaft.

(2) Inspect the oil filter for a loose or damaged oil tube. Replace a damaged or defective oil filter.

(3) Inspect all hardware for worn or damaged threads. Replace damaged or defective hardware.

c. See paragraph 5-30 and install the oil pump assembly.

5-33. COMPRESSOR PISTON AND ROD ASSEMBLY

a. Access. See paragraph 5-30 and remove oil pump assembly.
b. Inspect/Replace.

(1) Inspect the pistons and connecting rods for cracks, burrs and nicks. Remove small nicks and burrs from the pistons and connecting rods. Replace damaged or defective parts.

(2) Check the piston pin bore in the bosses, using a new pin to determine the proper fit. Check the clearance between the piston and cylinder wall. Recommended clearance is 0.0016/0.0025 inch (0.041/0.064 mm). Make sure the clearance is checked both in line with the piston pin and at 90° from the axis of the pin.

(3) Piston rings should be installed by placing the open end of the ring on the piston first. Spread the rings gently and only far enough to slip over the piston and into the proper grooves. Check the clearance between the ring and the piston land. Recommended clearance is 0.0005/0.0015 (0.0127/0.0381 MM).

(4) Inspect the piston pins for wear and score marks. Replace a worn or defective piston pin.

c. See paragraph 5-30 and install the oil pump assembly.

5-34. ENGINE (F10000RG-2) |

a. General. See paragraph 4-59 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 served 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 overhaul instructions.

5-35. CARBURETOR (F10000RG-2) (See figure 5-18.)

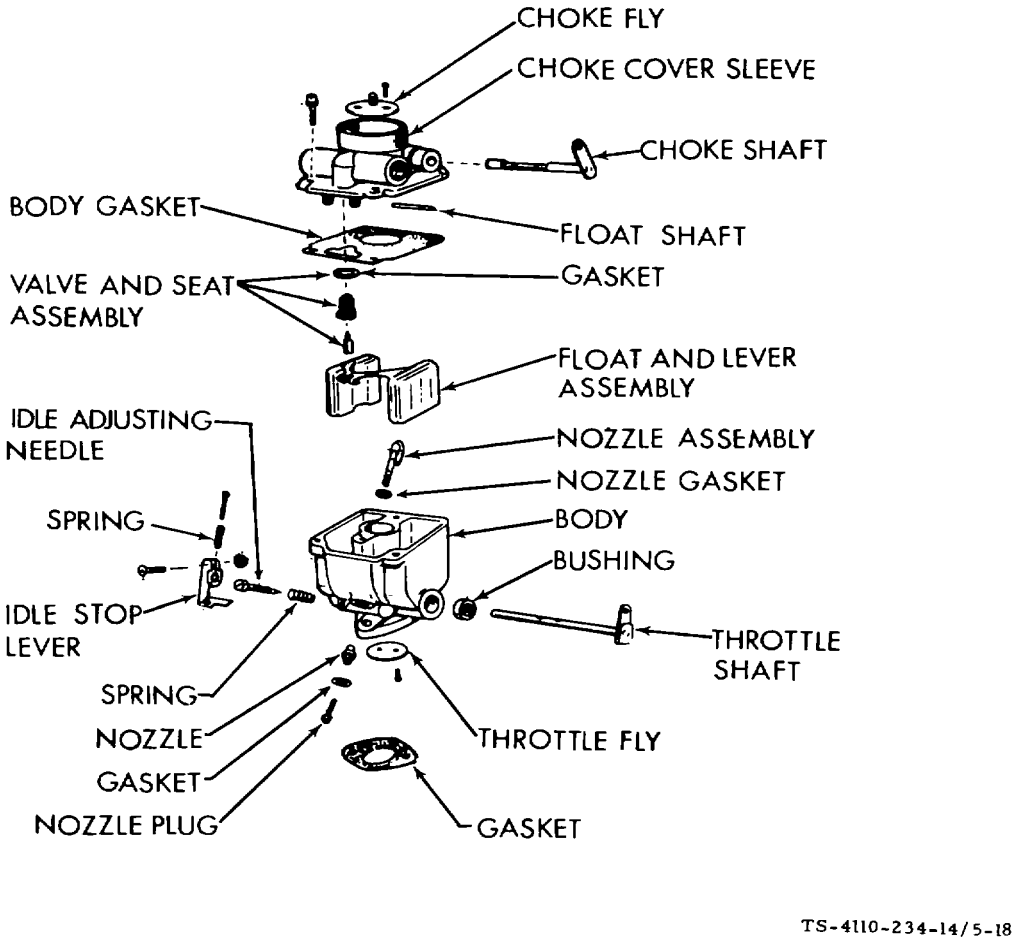


Figure 5-18. Carburetor F10000RG-2

a. See paragraph 464 for access, inspection and adjustments.

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 may be 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 5-19.)

(3) To adjust the carburetor float level, bend the float tab near the shaft as needed to obtain the correct level. (See figure 5-19.)

(4) For further adjustment instructions see paragraph 464.

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) Install the air cleaner onto the carburetor and tighten the screw at its base.

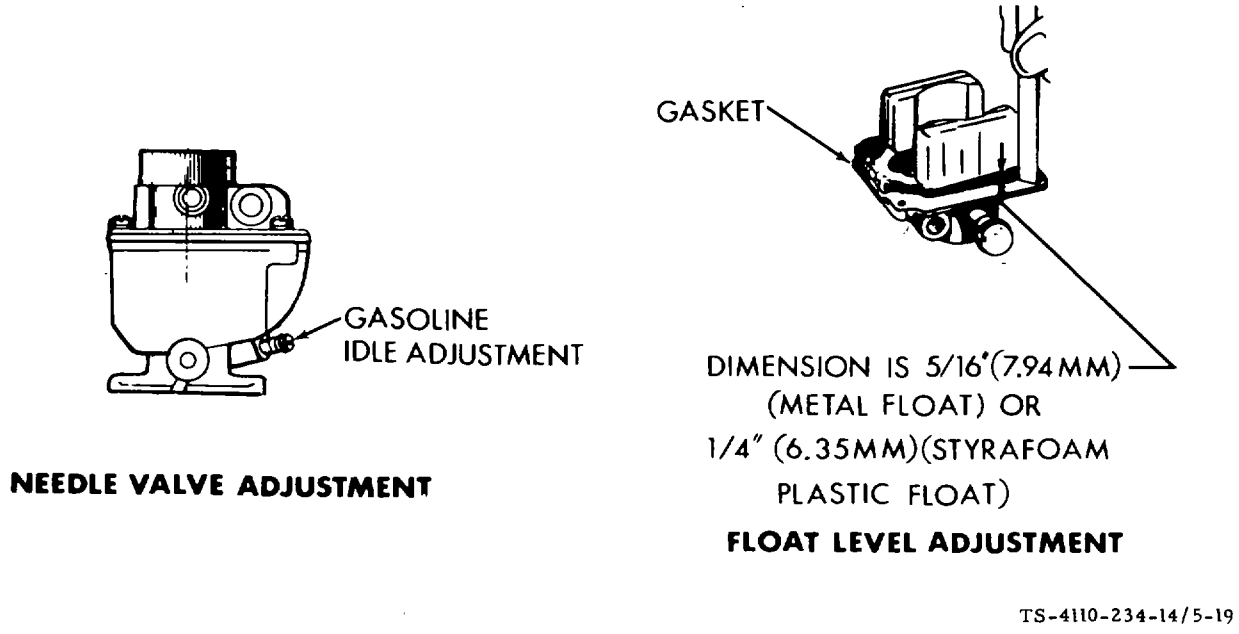


Figure 5-19. Carburetor Needle Valve and Float Level Adjustment F10000RG-2

5-36. STARTER (F10000RG-2)

a. 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 in this section 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 fig. 5-20.

b. Lubricate all oil-type bearings with 8 to 10 drops of light engine oil. All oil-less type bearings and brushings should be given a few drops of light oil. Lubricate the cranking motor drives with a few drops of light engine oil.

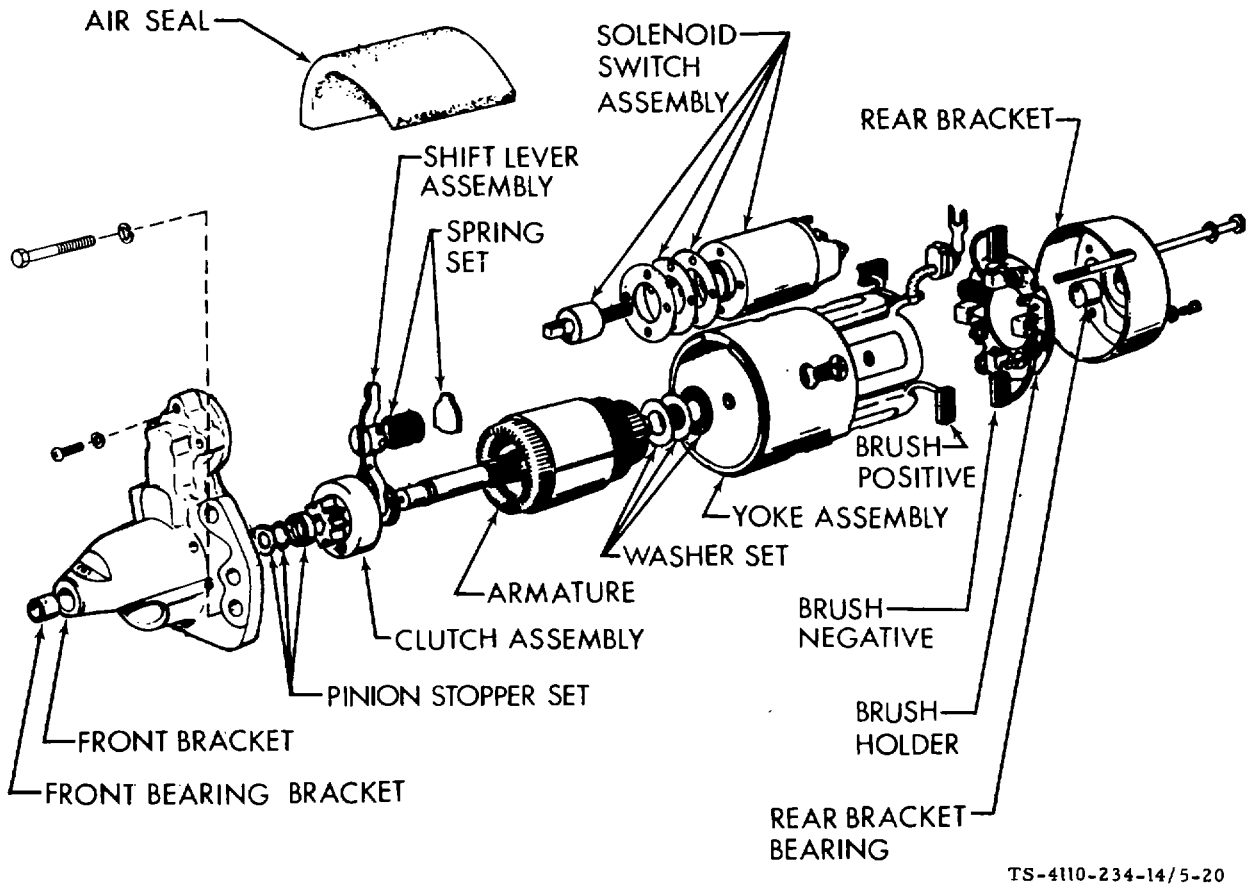


Figure 5-20. Starter F10000RG-2

CAUTION

Never oil the commutator. Oil on the commutator reduces the cranking ability of the motor.

c. 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. Replace worn brushes. If brushes wear rapidly, check for excessive brush spring tension and roughness or high mica on the commutator.

e. Solenoid Shift.

(1) Periodically inspect solenoid and shift lever to make sure they are operating properly. Keep the solenoid shift lever free of dirt and excess grease.

(2) The overrunning clutch is packed in a special high melting point grease and after its initial assembly, needs no further lubrication. This clutch prevents the engine from turning starter motor at too high a speed once it is started. Do not subject the overrunning clutch to grease dissolving or high temperature cleaning methods. This may cause the clutch to lose some or all of its grease.

(3) If the pinion does not turn freely in the clutch in the overrunning direction, or the clutch tends to slip in the opposite direction, replace the assembly. A worn clutch indicated by excessive looseness of the pinion requires replacement.

NOTE

Never attempt to repair or relubricate a defective clutch.

(4) 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. See figure 5-21.

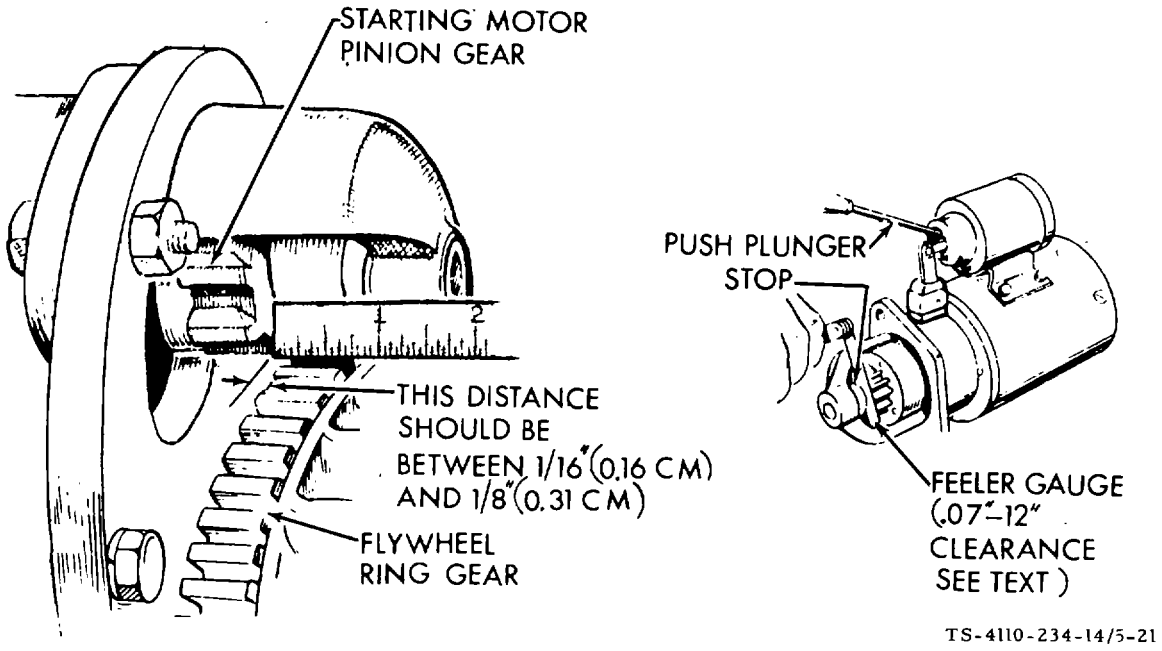


Figure 5-21. Pinion Clearance F1000ORG-2

f. Drive Pinion.

(1) The teeth of the drive 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 drive is designed so if the ends of the pinion teeth meet end to end with the ring gear teeth (keeping in mind that the drive is freely mounted on the drive shaft), the drive assembly can move back slightly against the pressure of the driving spring. The longitudinal movement permits the pinion to turn slightly farther and enter the flywheel ring gear.

(2) Keep the drive shaft free of rust, burrs or bends so the drive can move freely along it. A damaged pinion necessitates the replacement of the assembly. See figure 5-22.

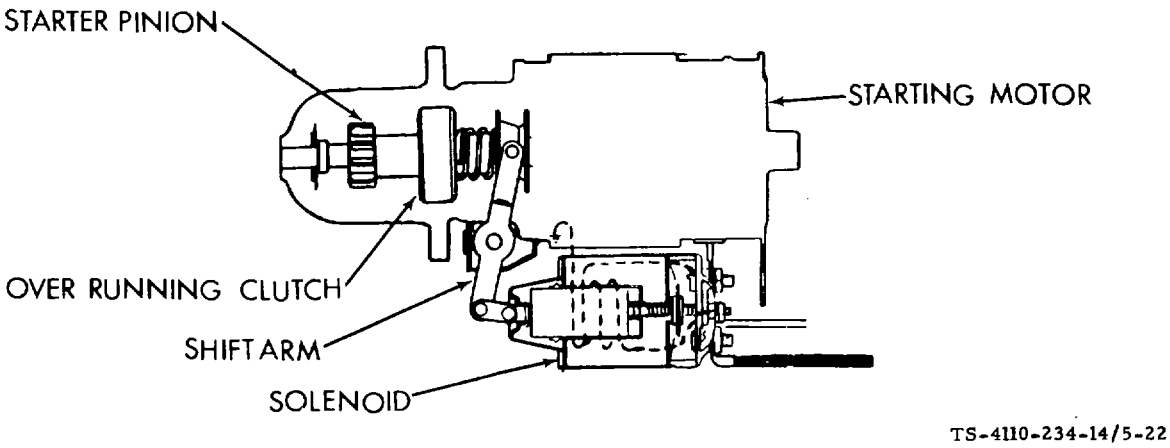


Figure 5-22. Solenoid Shift Starter F10000RG-2

g. Disassembly. See figure 5-20.

(1) Tag and disconnect all wires to the starting unit.

(2) Remove the solenoid (where applicable).

(3) Remove the starter motor thru-bolts and divide the starter into three main assemblies- the front bracket, the housing and the rear bracket. The spacers on the solenoid starters are used for adjustment of the thrust gap of the armature shaft and are located between the rear bracket and the commutator shaft.

(4) The armature can now be removed from the front bracket. Be careful not to miss the small steel washer used in the end of the armature shaft. Remove the shift lever at the same time the armature is removed. The spring holder, lever springs and retainer can be removed prior to the lever.

(5) Remove the ring after driving the pinion stopper toward the pinion gear using a cylindrical tool or a short piece of pipe (fig. 5-23). Remove the overrunning clutch and the pinion stopper at the same time.

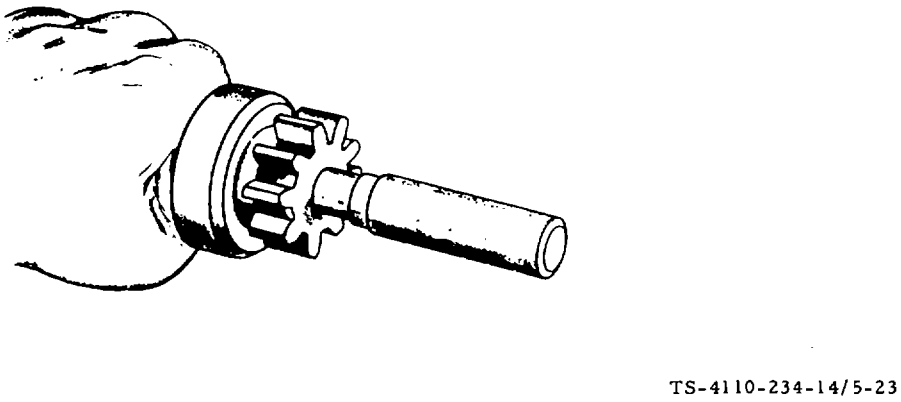
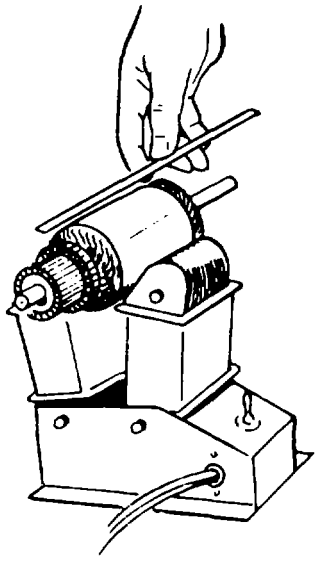


Figure 5-23. Tool for Driving Pinion Stopper F10000RG-2

h. Testing the Inspection.

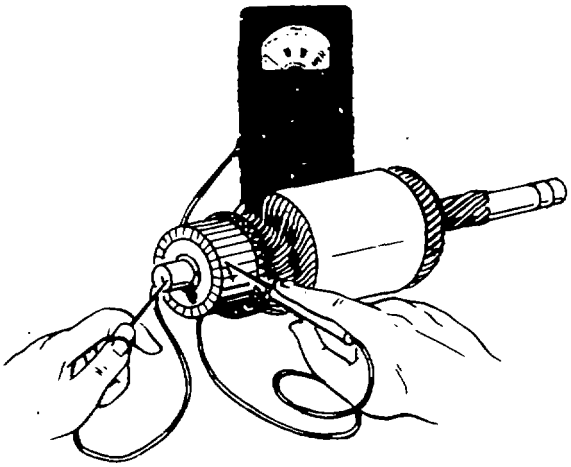
(1) Testing the Armature for Shorts: Place the armature in a growler and hold a thin steel blade parallel to the core and just above it, while slowly rotating the armature in the growler (fig. 5-24). A shorted armature causes the blade to vibrate and move toward the core. A shorted armature must be replaced.



TS-4110-234-14/5-24

Figure 5-24. Test for Shorted Armature F10000RG-2

(2) Testing Armature for Grounds: Touch armature shaft or core and the end of each commutator bar with a pair of ohmmeter leads (fig. 5-25). If the ohmmeter reading is low, it indicates a grounded armature. Replace armature.

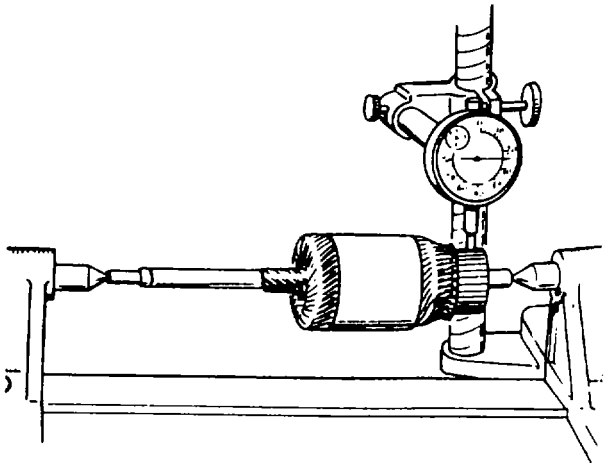


TS-4110-234-14/5-25

Figure 5-25. Test for Grounded Armature F10000RG-2

(3) Testing the Armature 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.

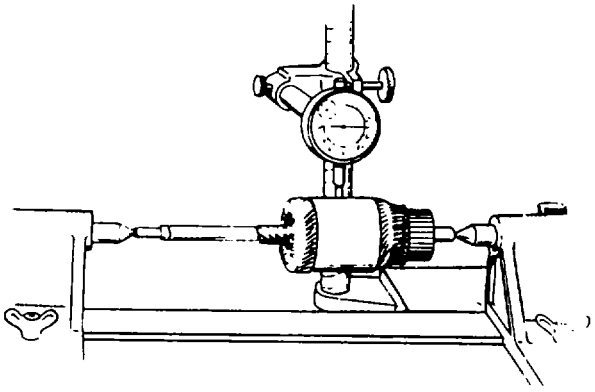
(4) Testing Commutator Runout: Place the commutator in a test bench and check runout with a dial indicator (fig. 5-26). When commutator runout exceeds 0.004 inch (.010 cm), reface the commutator.



TS-4110-234-14/5-26

Figure 5-26. Checking Commutator Runout F10000RG-2

(5) Testing Armature Shaft Runout: The armature shaft, as well as the commutator, may be checked. A bent armature can often be straightened, but if the shaft is worn, a new armature is required (fig. 5-27).



TS-4110-234-14/5-27

Figure 5-27. Checking Armature Shaft Runout F10000RG-2

(6) Testing Field Coils for Grounds: Place one test prod on the connector and the other on a clean spot on the frame after unsoldering shunt field coil wire. If the ohmmeter indicates continuity, the fields are grounded either at the connector or in the windings (fig. 5-28).

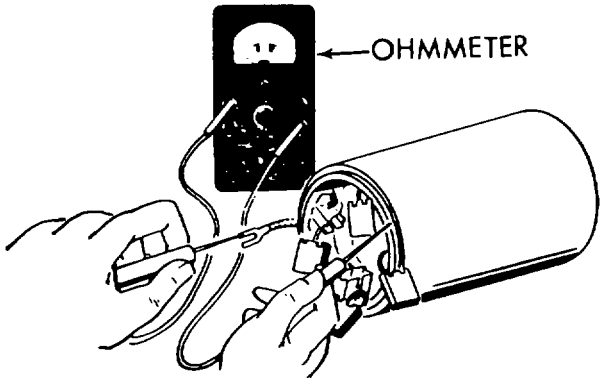


Figure 5-28. Field Coil Ground Test F10000RG-2

(7) Testing Field Coils for Open Circuit: Place one prod on the connector and the other on a clean spot on the brushholder (fig. 5-29). If continuity is good, the field coil is okay. Check all brushholders in the same manner.

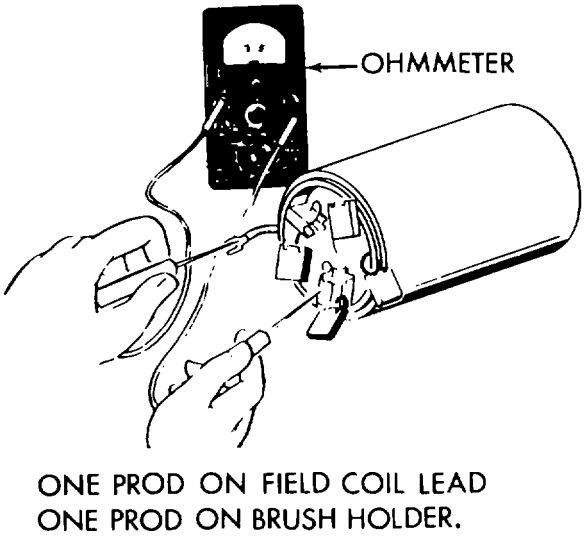
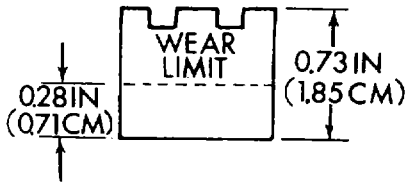


Figure 5-29. Test for Open Field Coil F10000RG-2

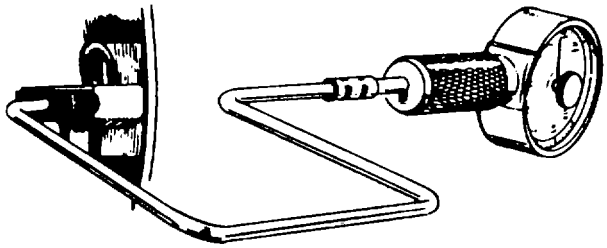
(8) Inspection of Brushes: When brushes are worn more than 0.3 inch, replace them. Figure 5-30 shows the wear limit. See that the brushes move smoothly in the brushholders.



TS-4110-234-14/5-30

Figure 5-30. Brush Wear Limits F10000RG-2

(9) Inspection for Brush Spring Tension: Measure brush spring tension with a tension meter (fig. 5-31). Push the brush into its holder and take the reading just as the brush slightly projects from the brushholder. On a new brush the spring tension should be 49 to 59 ounces (1.37-1.65 kPa).



TS-4110-234-14/5-31

Figure 5-31. Measuring Brush Spring Tension F10000RG-2

i. Assembly. See figure 5-20.

WARNING

Compressed air used for cleaning purposes will not exceed 30 PSI (2.1 kg/cm2).

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.

(1) Clean all parts carefully with a dry cloth and compressed air, if available.

(2) Apply 20 weight oil to armature shaft and splines. Use grease sparingly for solenoid starter shift lever pin, joint of shift lever and plunger, plunger and spacing washers at end of shaft.

(3) Install the overrunning clutch and the pinion stopper.

(4) Install the shift lever after replacing the spring holder, lever springs and retainer.

(5) Install the armature. Use spacing washers to adjust armature end play of 0.004 to 0.020 inch (0.102 to 0.508 mm).

(6) Install the starter motor thru-bolts.

(7) Reinstall the solenoid and all wires, while carefully observing the tags on the wires.

(8) When assembling starter to engine oil base, do not draw the mounting bolts up tight. The gears should have 0.004- to 0.007-inch (0.102 to 0.178 mm) backlash. Tap the starter in or out from the oil base to adjust. Then tighten starter mounting bolts to 30 foot-pounds.

5-37. COOLING SHROUD (F10000RG-2) See figure 5-32.

The air-cooling system on the engine consists of heat radiating fins, 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.

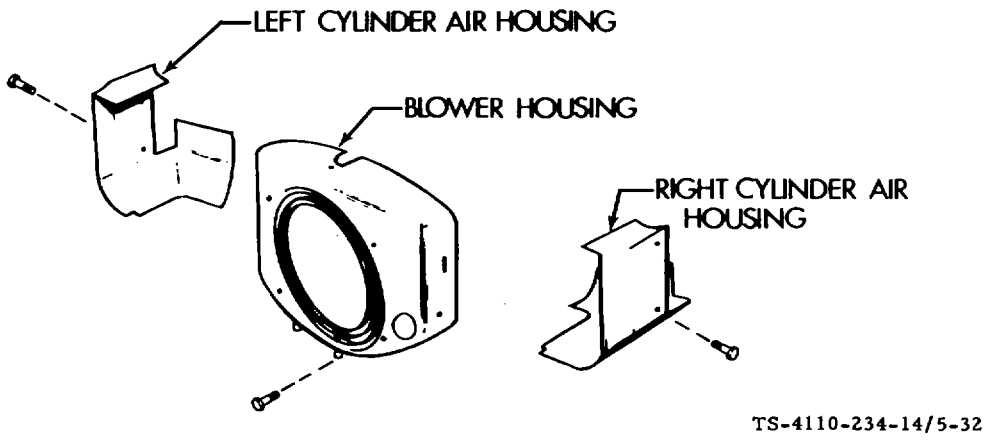


Figure 5-32. Cooling Shroud F10000RG-2

a. Replacement. The shroud consists of three parts as figure 532 shows. 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.

5-38. FLYWHEEL, GEARCASE, GOVERNOR, CAMSHAFT AND CRANKSHAFT (F10000RG-2)

See figure 5-33.

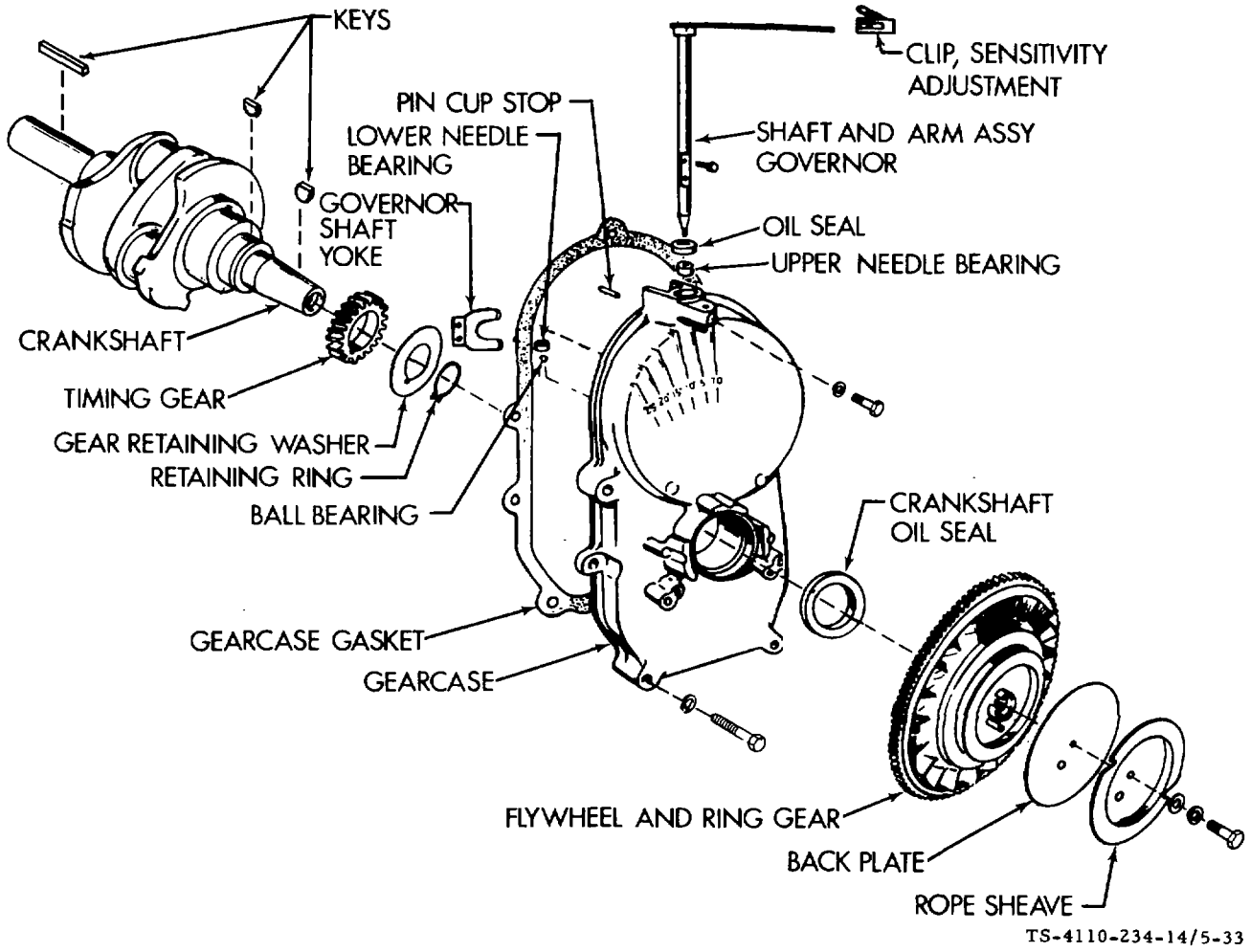


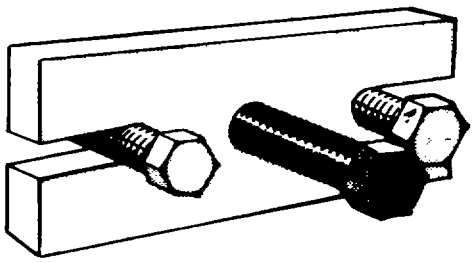
Figure 5-33. Flywheel, Gearcase, Governor and Crankshaft F10000RG-2

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 (fig. 5-34).



TS-4110-234-14/5-34

Figure 5-34. Flywheel Puller F10000RG-2

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. See figure 5-35.

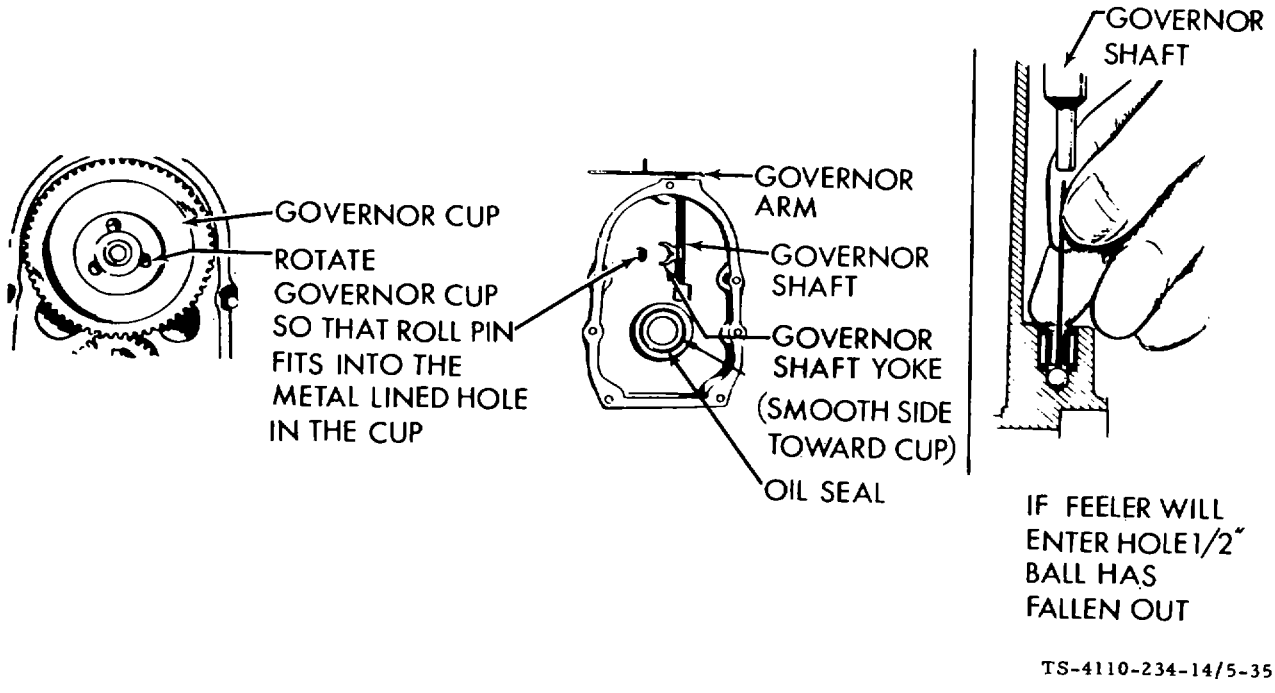


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Figure 5-35. Gear Cover Assembly F10000RG-2

(1) After removing the flywheel key and mounting screws, 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.

c. Governor Cup. See figure 5-36.

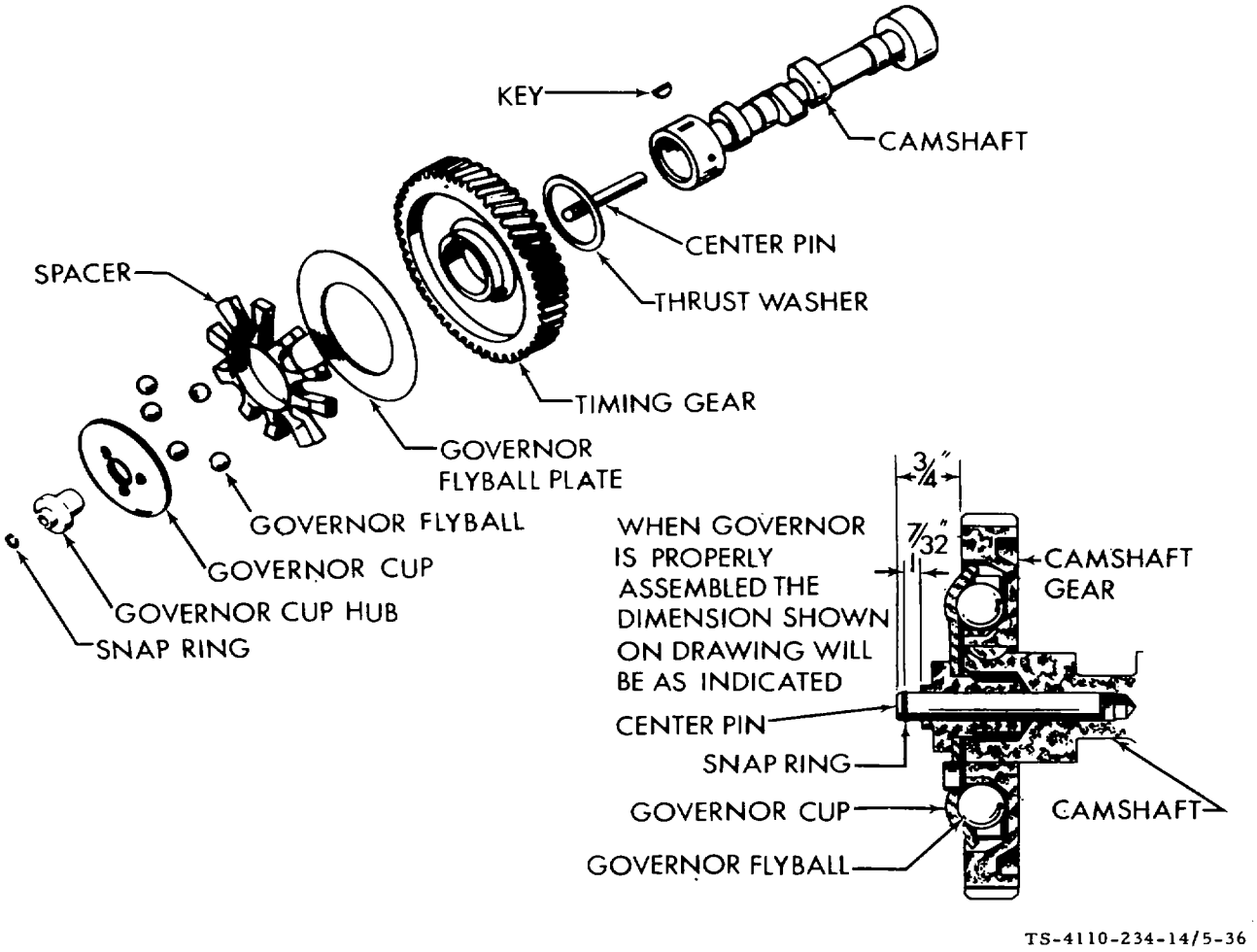

Figure 5-36. Camshaft and Governor Cup F10000RG-2

(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 flyballs 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 flyballs 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 cup 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 flyballs properly.

d. Timing Gears. See figure 5-37.

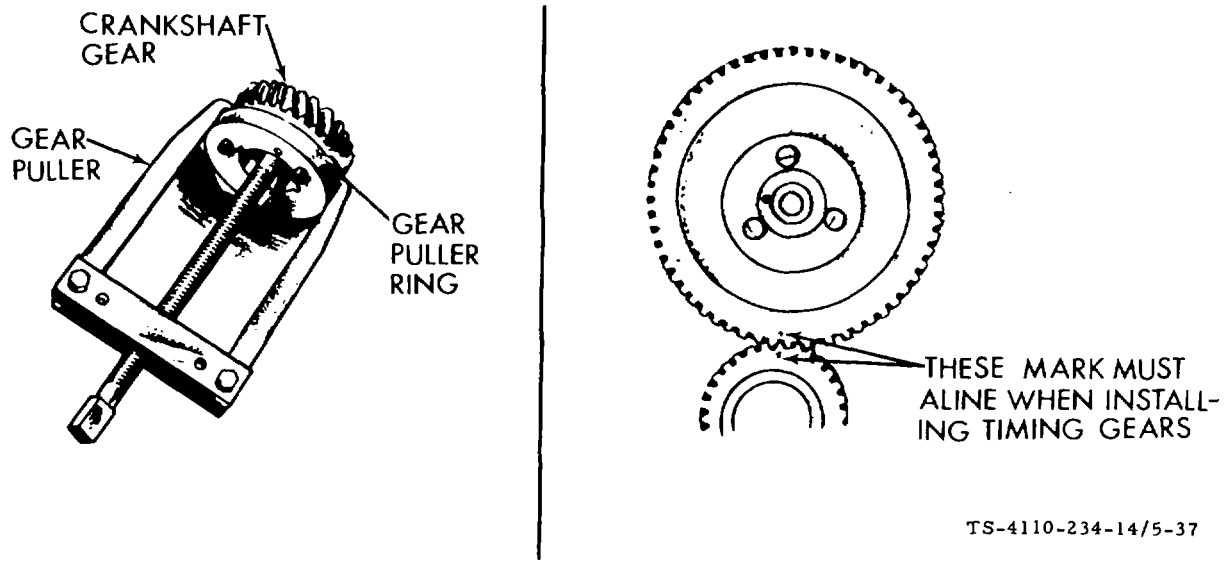

Figure 5-37. Timing Gear Removal and Installation F10000RG-2

(1) If replacement of either the crankshaft gear or the camshaft gear becomes necessary, install both gears new, never one only. 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.

5-39. CYLINDER HEADS AND VALVES (F10000RG-2)I See figure 5-38.

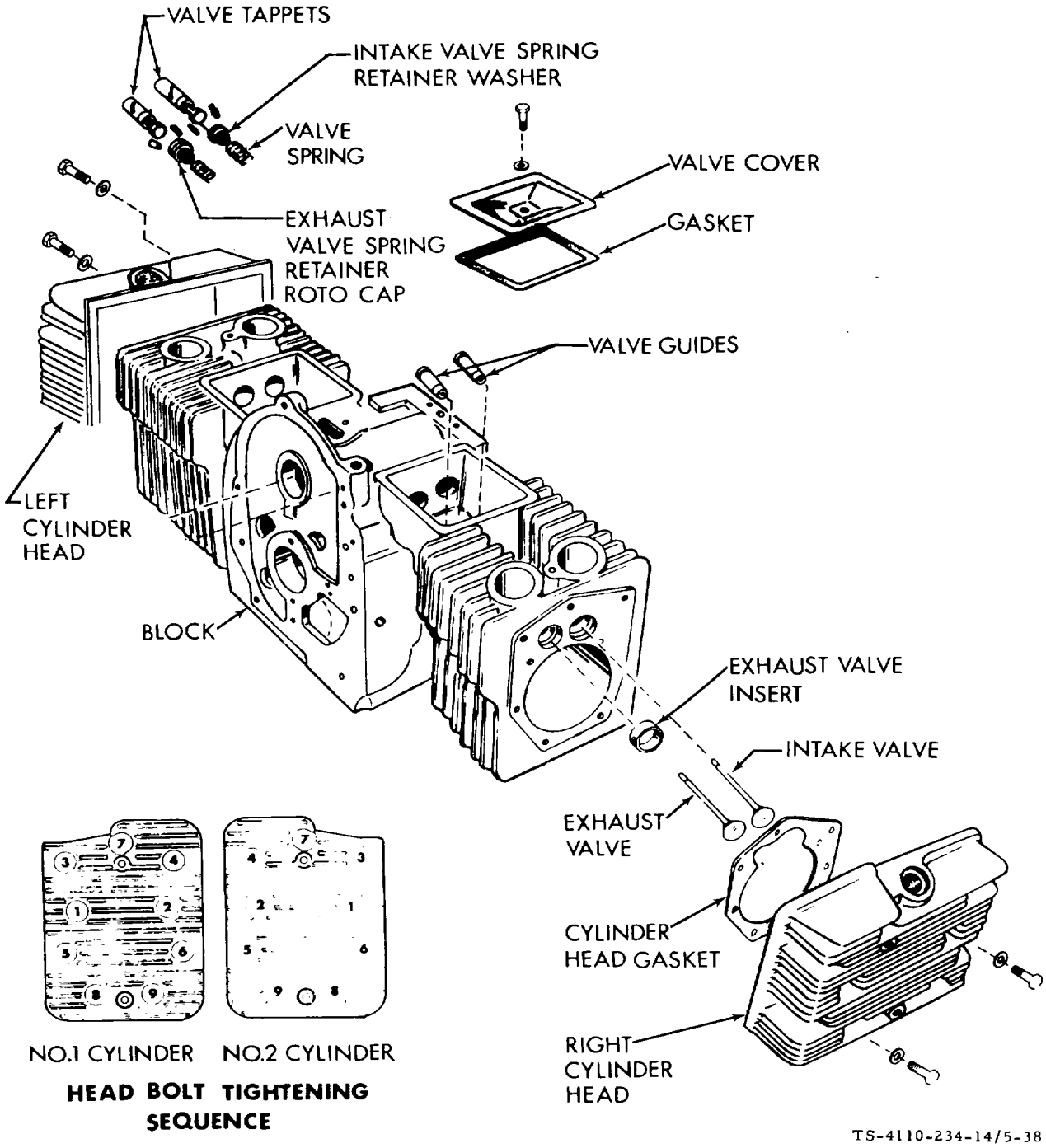

Figure 5-38. Cylinder Heads and Valves F10000RG-2

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 5-38 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. See figure 5-39.

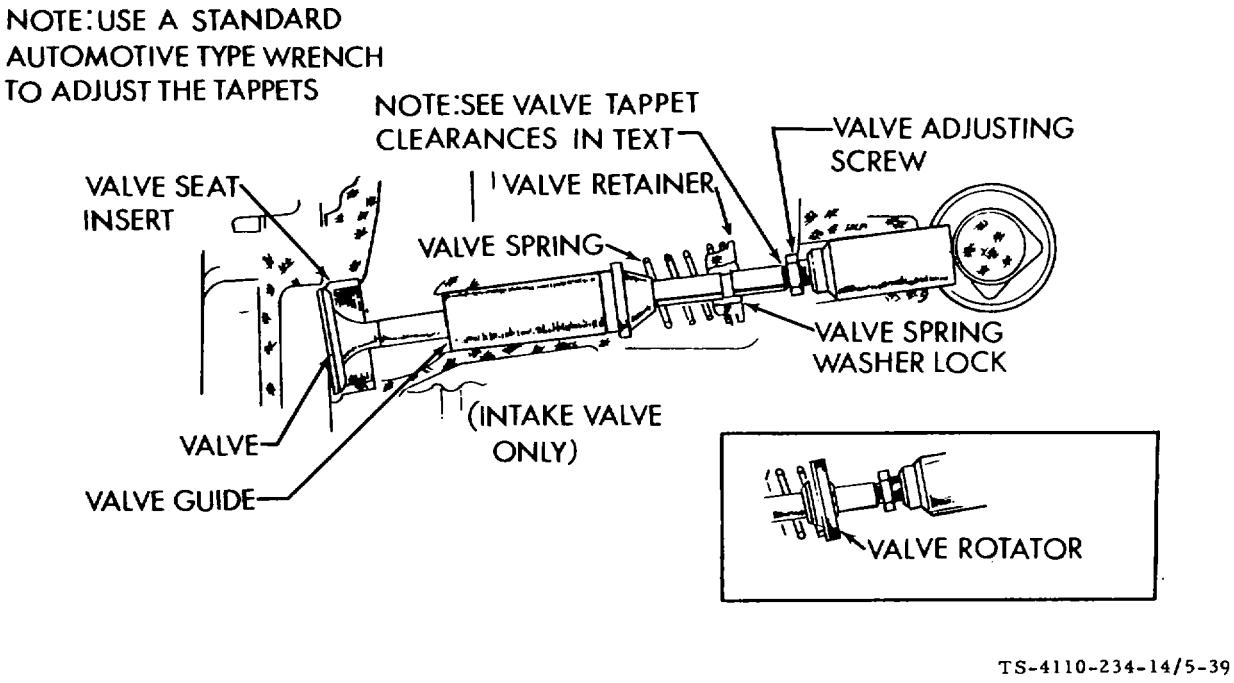

Figure 5-39. Valve Components F10000RG-2

(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 smaller 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 5-40.

(5) The valves should not be hand lapped, if at all avoidable, since the sharp contact may be 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 band should be 1/32 to 3/64 of an inch (.79 to 1.19 mm) wide. Grind only enough to assure proper seating.

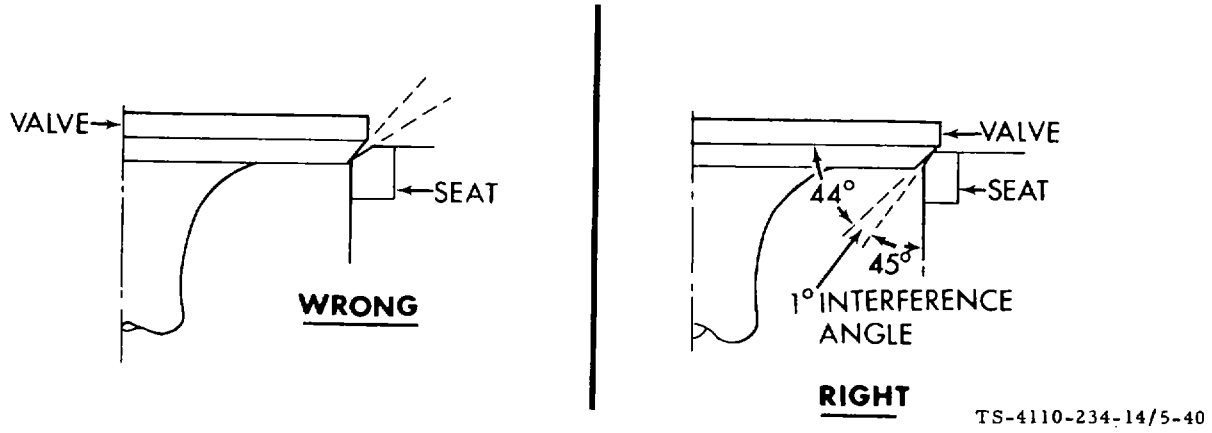

Figure 5-40. Valve Face and Seat Angles F10000RG-2

(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 the 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. See figure 5-41.

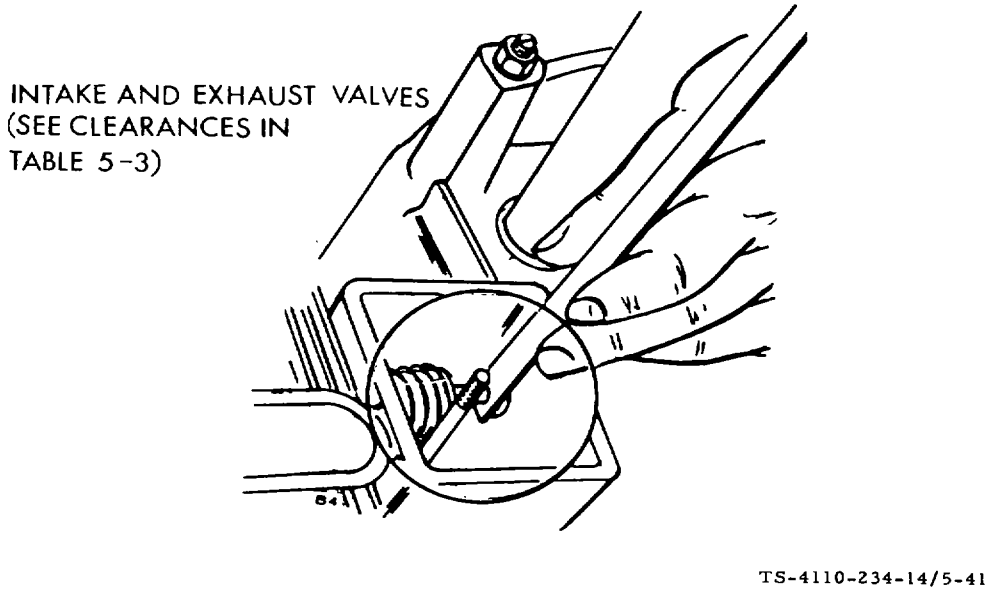

Figure 5-41. Adjusting Tappets F10000RG-2

(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, the 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.

Table 5-3. Engine Dimensions and Clearances

All clearances given at room temperature of 700F.
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 (0.13 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 (0.0152 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)

(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 again line up the correct timing marks. Then follow the adjustment given for the valves of the left hand cylinder.

5-40. PISTONS AND RINGS (F10000RG-2) See figure 5-42.

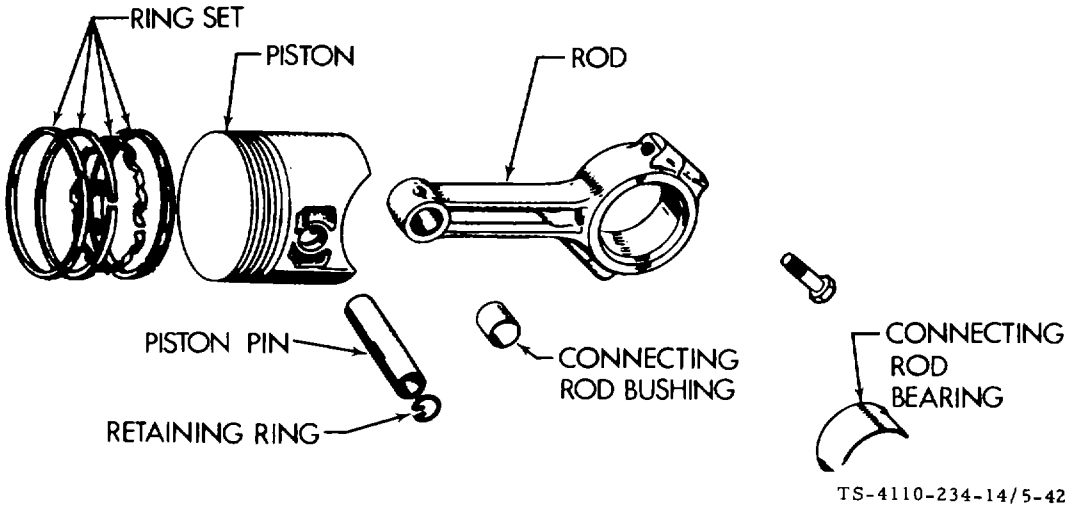

Figure 5-42. Piston and Rings F10000RG-2

a. Rings and Pistons.

(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 5-43.

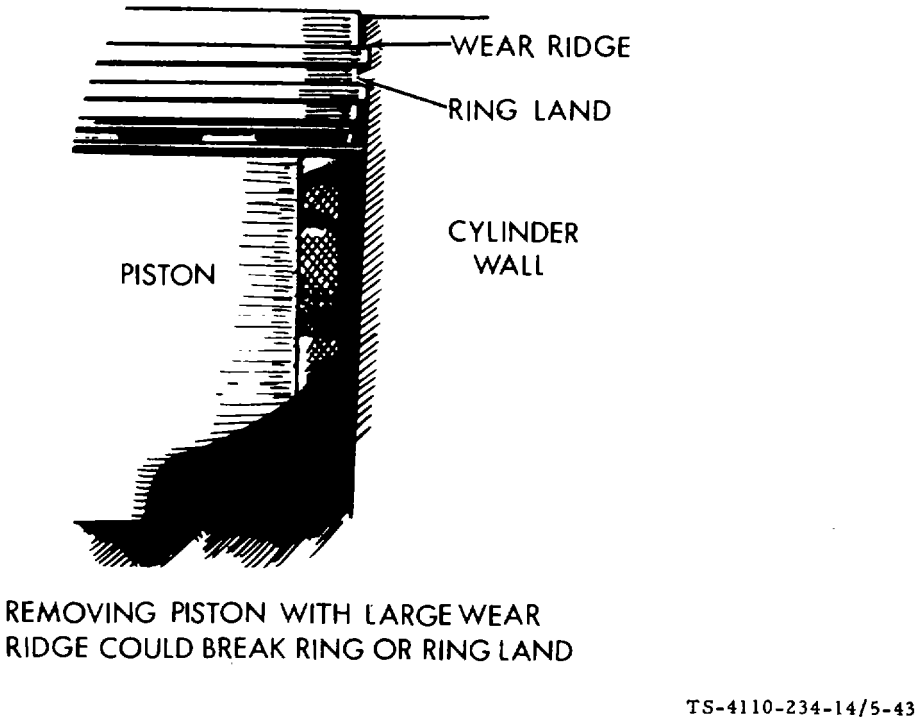

Figure 5-43. Wear Ridge and Cylinder Wall F10000RG-2

(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 5-44. All passages should be cleaned with a non-caustic solvent. Clean the rod bore and the back of the connecting rod bearings thoroughly.

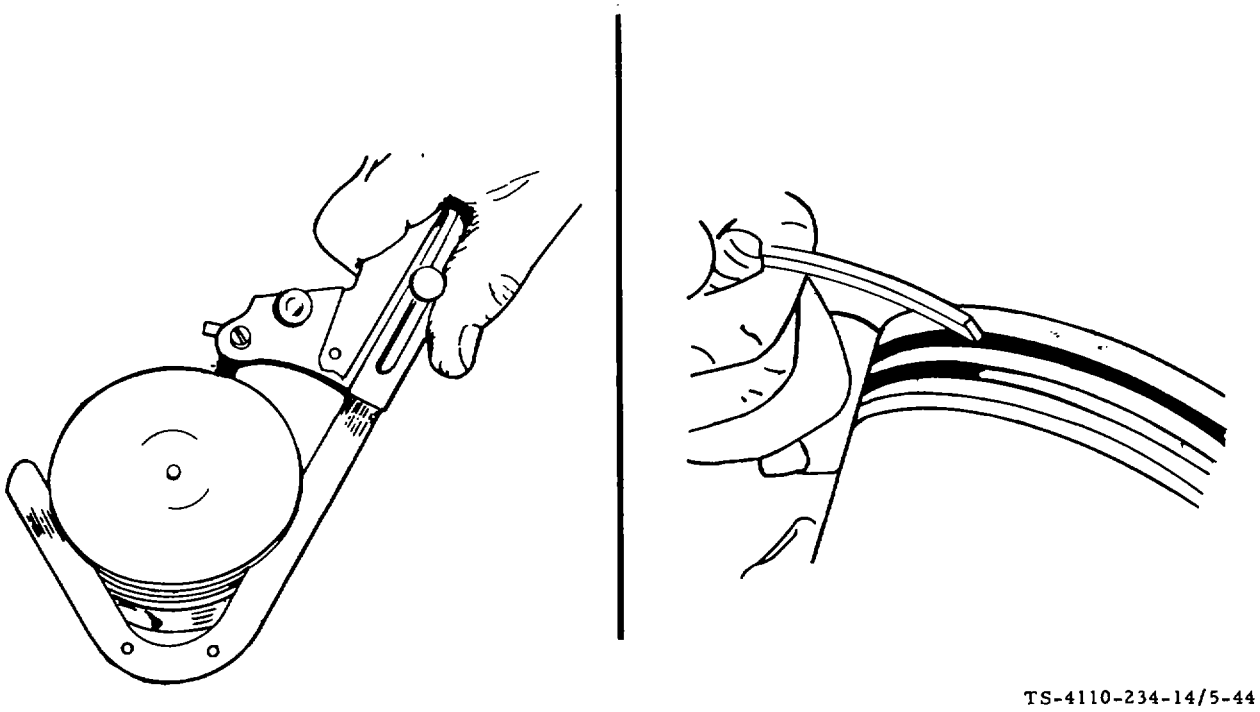

Figure 5-44. Cleaning Piston Ring Grooves F10000RG-2

(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 5-45. 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 546.

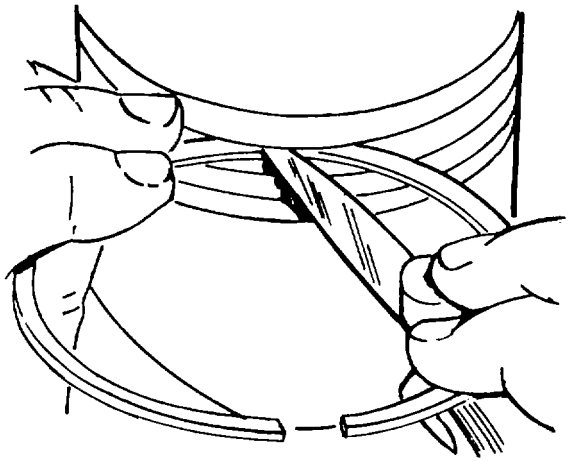

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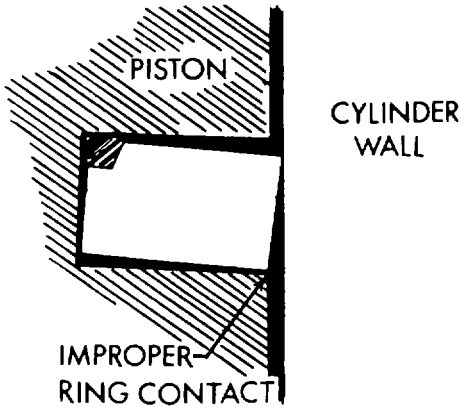
Figure 5-45. Inspecting Ring Lands F10000RG-2



TS-4110-234-14/5-46

Figure 5-46. New Ring in Worn Piston Ring Groove F10000RG-2

(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 5-47. The gap between the ends of the ring is given in Table 5-3. Rings which are slightly oversize may be 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 (0-127 mm) 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.

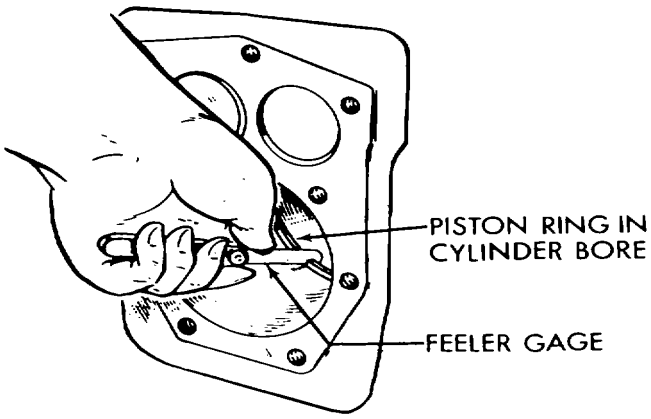


Figure 5-47. Fitting Piston Rings to Cylinder F10000RG-2

(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 kept 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 53 for the correct piston-to-cylinder clearance.

b. Connecting Rods. See figure 5-42.

(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) Checking Bearing Clearance with Plasti-Gage. See figure 5-48.

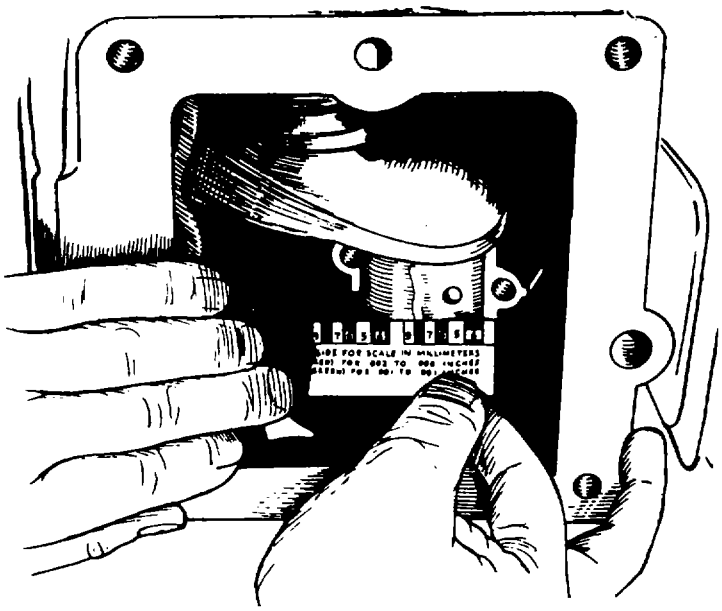


Figure 5-48. Measuring Bearing Clearance with Plasti-Gage F10000RG-2

(a) Place a piece of correct size Plasti-Gage in the bearing cap the full width of the bearing insert about 1/4 inch (6.35 mm) off center.

(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	(10.9-13.6)
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	5-6	(6.8-8.1)
Intake Manifold Screws	15-20	(20.3-27.1)
Oil Base	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	(13.6-17.6)
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.

5-41. CRANKCASE BREATHER (F10000RG-2) See figure 549.

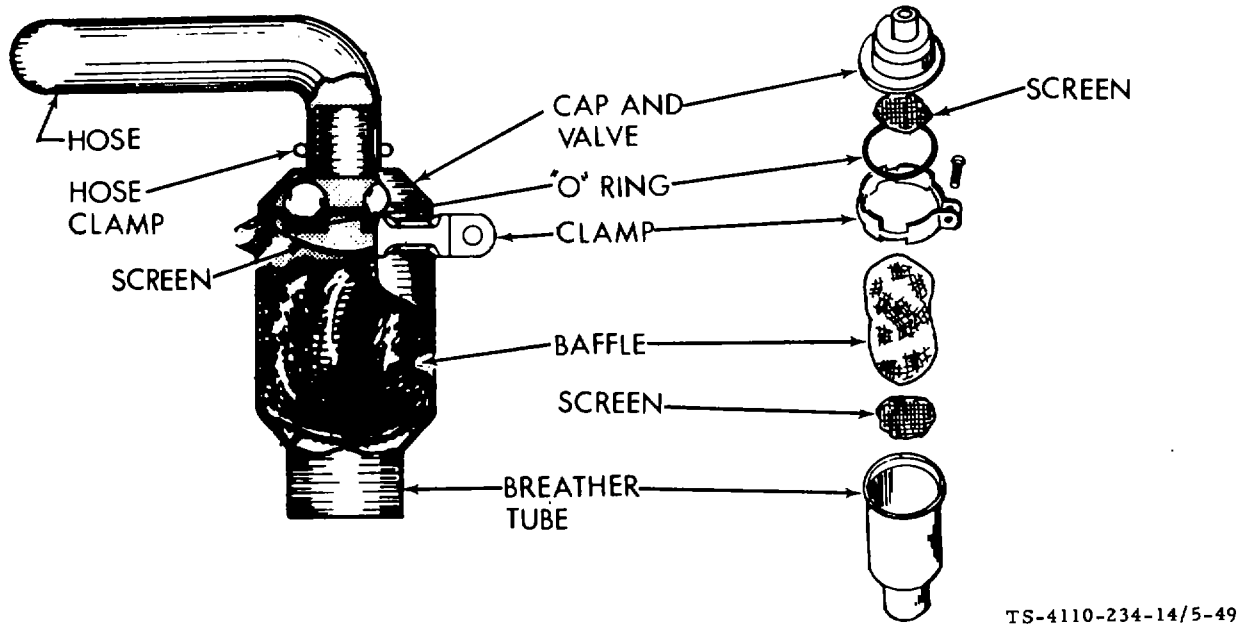


Figure 5-49. Crankcase Breather F10000RG-2

a. The crankcase breather maintains a partial vacuum in the crankcase during operation to control oil loss and ventilate the crankcase.

b. To disassemble, remove the rubber cap from the crankcase tube and pry the valve out of the cap. Wash the valve in suitable solvent at regular intervals and, if defective, replace it. Also, pull the baffle out of the breather tube and clean it. Be sure the baffle material does not come apart and work into the manifold. Install the valve with the perforated disc toward the engine.

5-42. ENGINE BLOCK (F10000RG-2) See figure 5-38.

a. Inspection.

(1) Make a thorough check for cracks. Minute cracks may be 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 will 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. 5-50). These measurements should be taken at four places - two at the top and two at the bottom of piston ring travel.

(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.

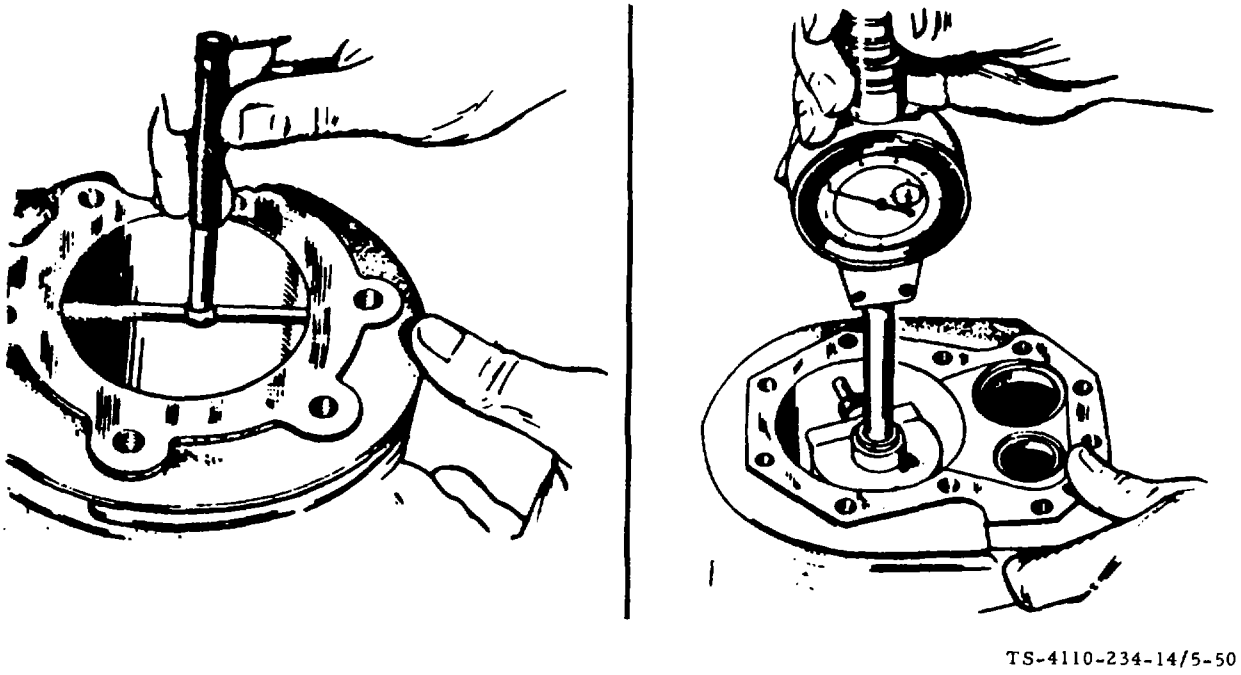


Figure 5-50. Methods of Cylinder Bore Inspection F10000RG-2

(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 "B" 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.

5-43. MAIN BEARINGS (F10000RG-2)

a. Inspection. Check bearings for wear, loose, broken cracked, or missing parts.

b. 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 (fig. 5-51). Use combination bearing driver to install the camshaft bearings.

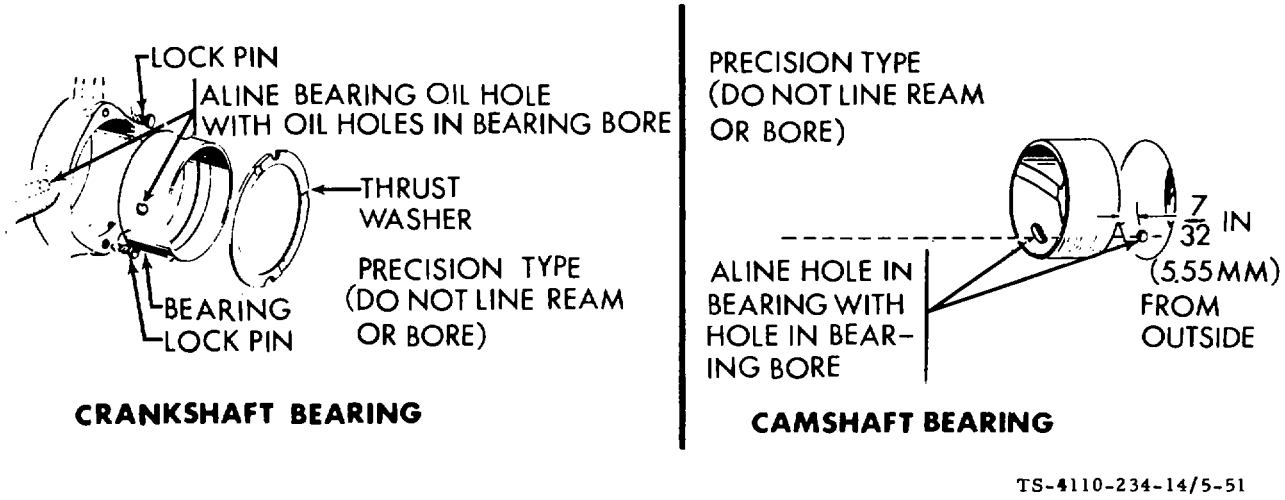


Figure 5-51. Installation of Camshaft and Crankshaft Bearings F10000RG-2

(1) Camshaft Bearings. See figure 5-51. 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 5-51. 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 2000F (930C). 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 be at 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.

(3) Before installing the seals, fill the space between seals with a fibrous grease or stiff cup grease. This will improve sealing. See figure 5-52.

(4) When installing the gear cover oil seal, 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.

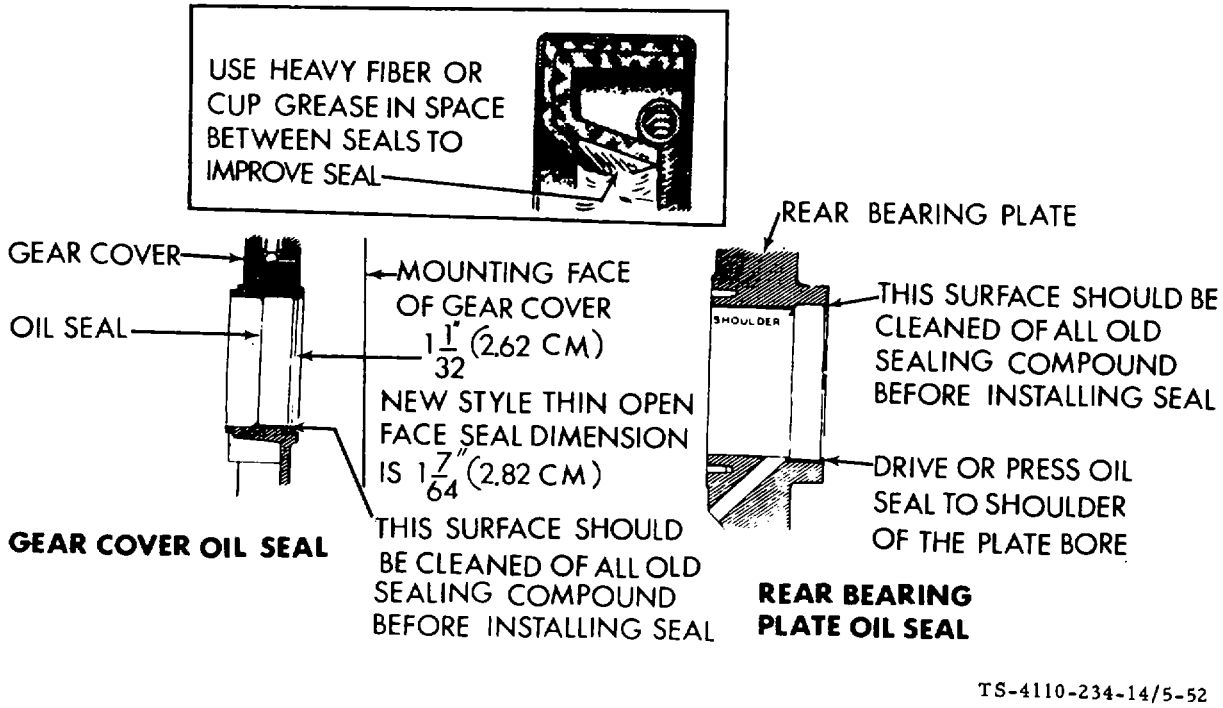


Figure 5-52. Gear Cover and Rear Bearing Plate Oil Seals F10000RG-2

(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.

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 5-53.

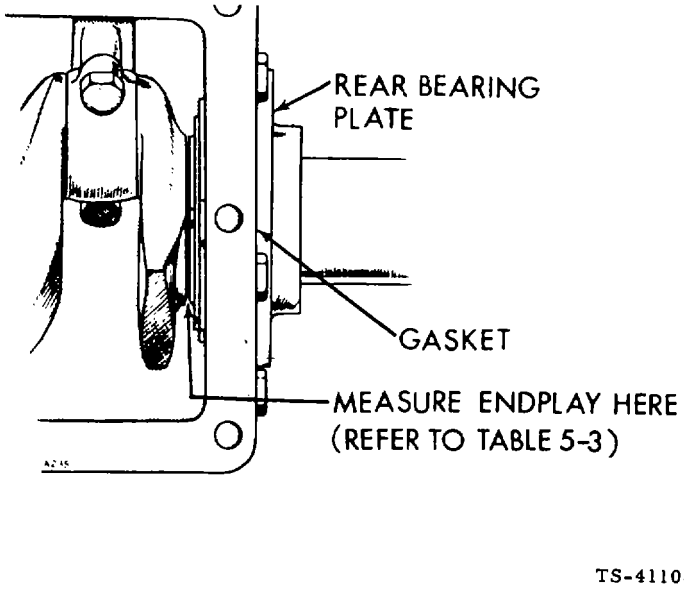


Figure 5-53. Measuring Crankshaft Endplay F100000RG-2

(2) Refer to Table 5-3 for minimum and maximum endplay. If there is too much endplay, remove the rearbearing end plate and replace the gasket with a thinner gasket from the gasket kit. For too little endplay, 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.

5-44. OIL SYSTEM (F10000RG-2) See figure 5-54.

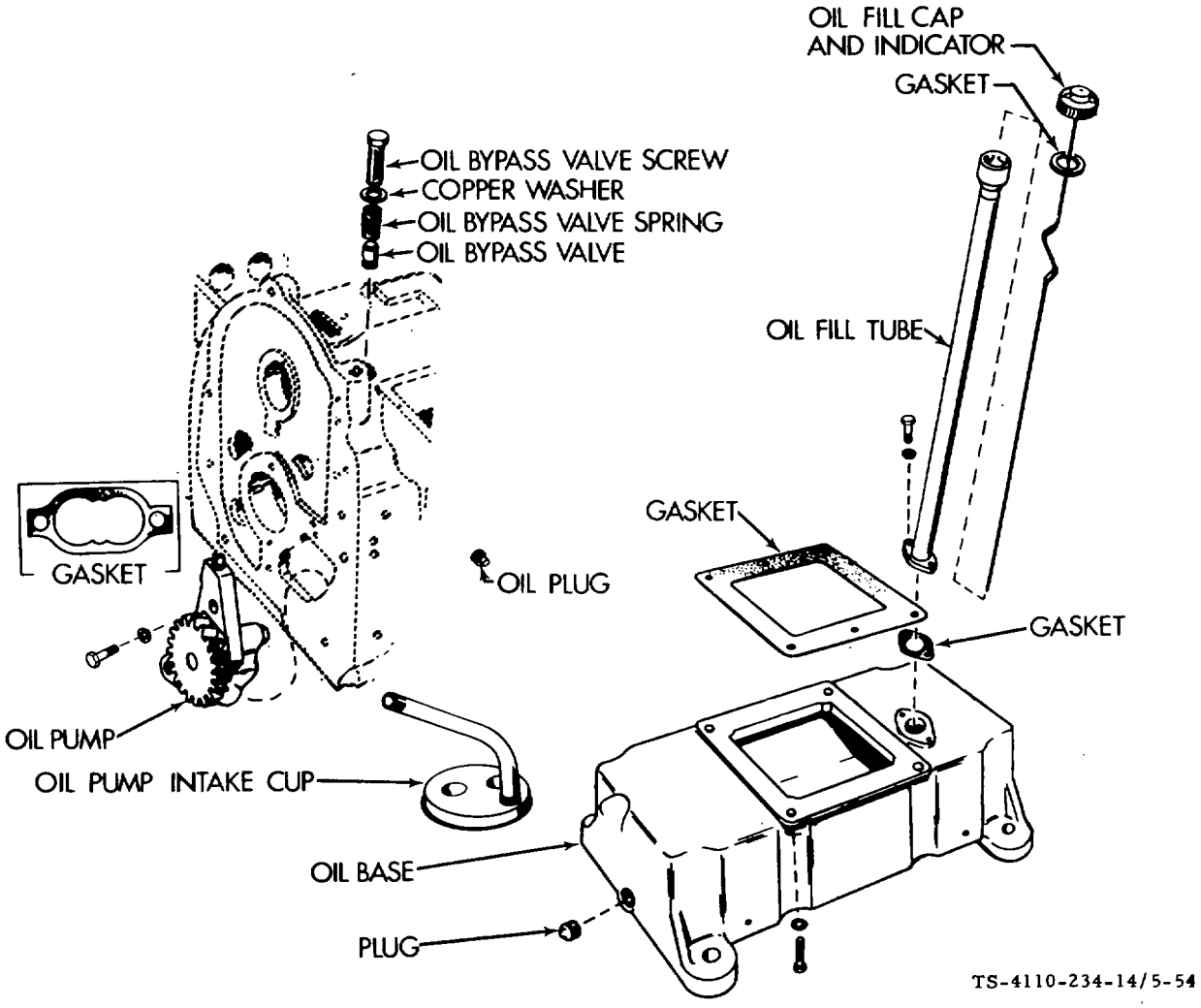


Figure 5-54. Engine Oil System F10000RG-2

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 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 flyball 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 5-55.

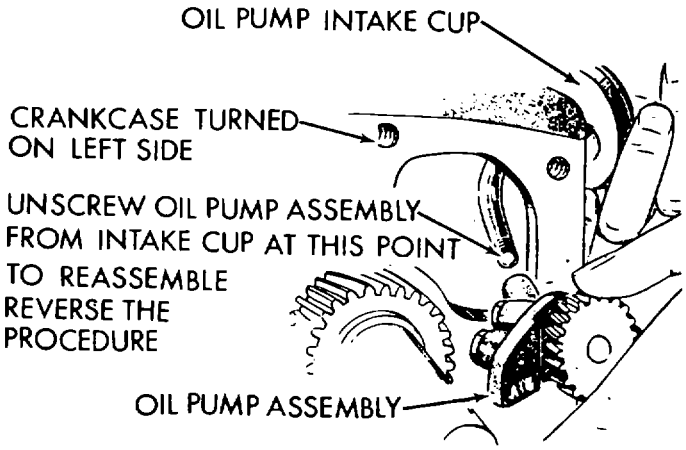


Figure 5-55. Oil Pump Disassembly F10000RG-2

(2) If new oil pump gaskets are installed, they should be the same thickness as those removed. c. Oil Bypass Valve Inspection. See figure 5-56. The bypass valve (located to the right and behind the gear cover (fig. 5-54) controls oil 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) oil 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 a suitable solvent and reinstall.

d. Oil Bypass Valve Removal. To remove the valve, unscrew the recessed plug in the rear bearing plate and lift out the spring and plunger assembly. Determine proper valve operation by checking the spring and plunger according to the following measurements:

Plunger Diameter .... 0.3365" to 0.3380"
(8.55 to 8.59 mm)

Spring
Free Length ....2-5/16" (58.74 mm)
22.225 (1.0 kg). 11 lb. (49.9g) at 1-3/16" (30.16 mm)

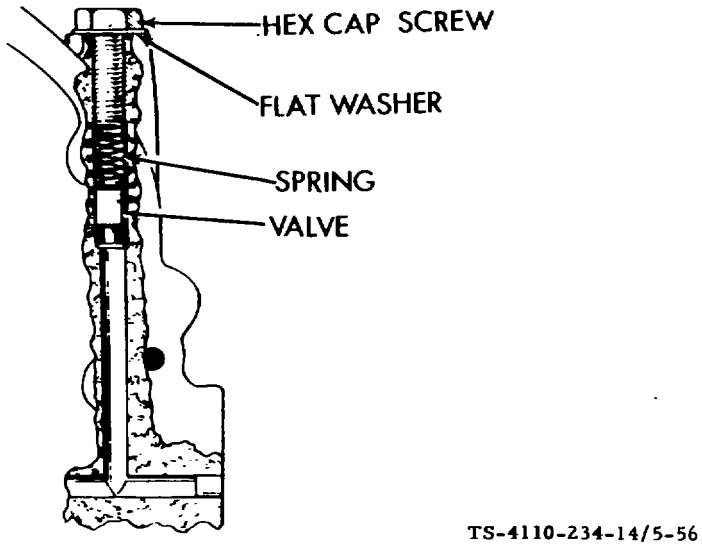


Figure 5-56. Oil Bypass Valve F10000RG-2

15-45. ELECTRIC MOTOR REPAIR (F10000R-6) See figure 5-57

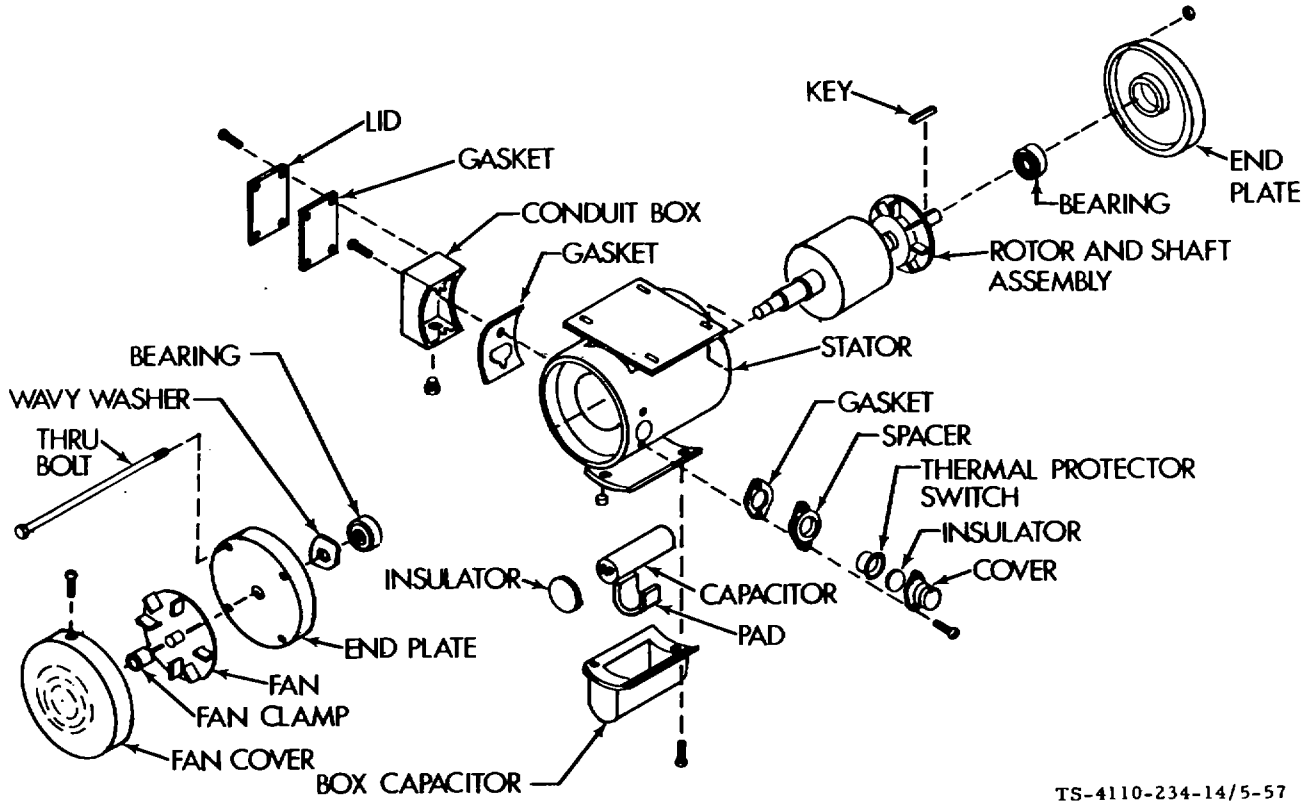


Figure 5-57. Electric Motor F10000R-6

a. General. See paragraph 4-76 for access, inspection, testing, removal and installation instructions.

b. Repair. Repairs are limited to bearing replacement. See figure 5-57.

(1) Remove the fan cover, fan clamp and fan.

(2) Remove the thru bolts and carefully pull the end plates.

(3) Remove the bearings and wavy (spring) washer.

(4) Check bearings and wavy washer and replace if found bad.

(5) Reassemble taking care to install wavy washer prior to installing bearing.

(6) Check assembled motor to be sure shaft rotates freely with no bindings or rubbing.

5-46. HOUSING COMPONENT REPAIRS I

Repairs to the housing components are limited to the rework of broken or cracked welds on lifting fittings, unit mounts, condenser and evaporator frames and the engine and compressor mounting frame on the F1 000ORG-2.

It is possible to replace the evaporator frame and on the F10000RG-2 the engine and compressor frame. In both cases it is necessary to remove all components that attach to these frames prior to their removal. See individual part removal instructions for component removal. See figure 5-58 for identity and removal of the various housing components.

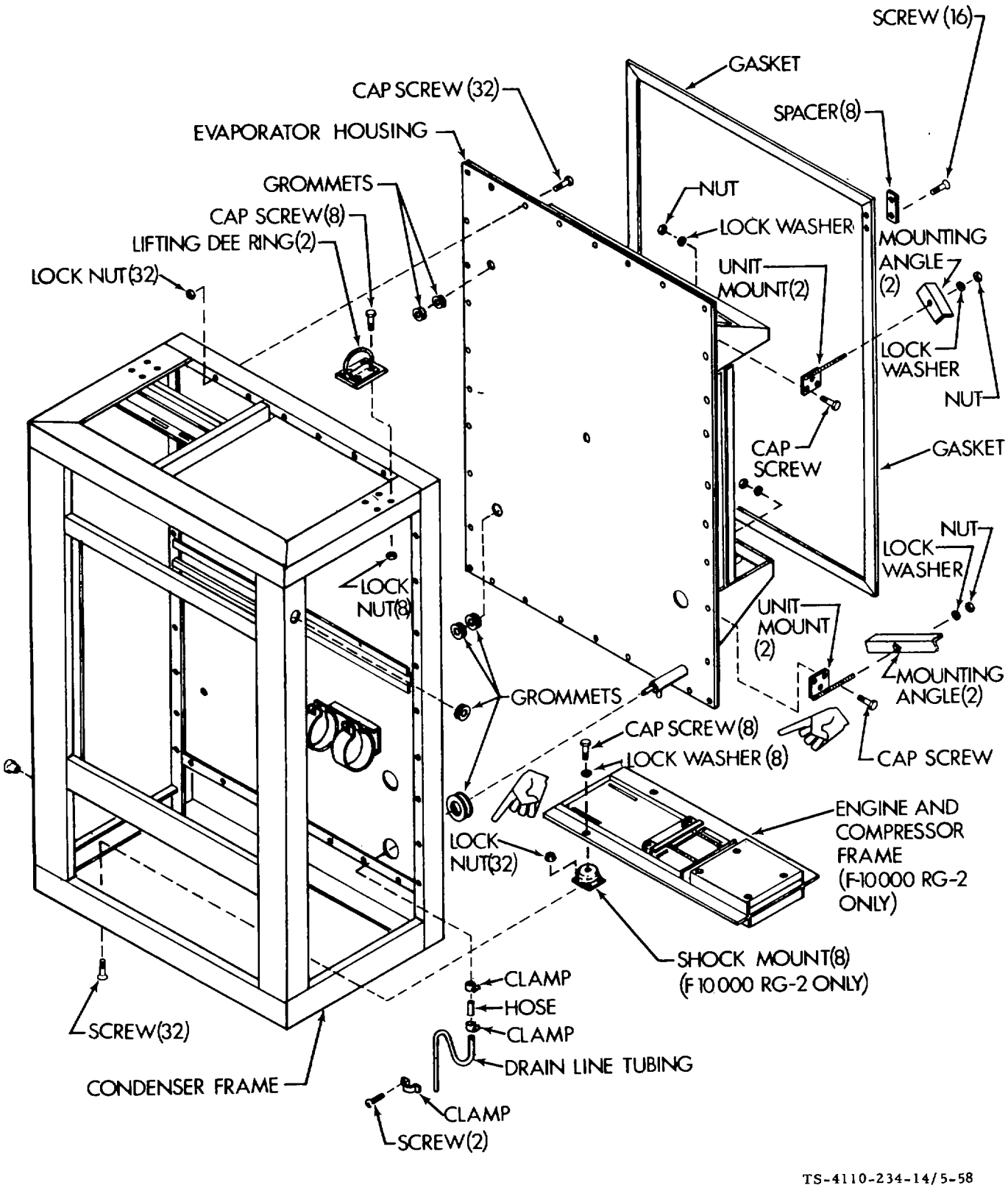


Figure 5-58. Housing Components

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 F10000RG-2 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 5-4110-234-24P 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 4-55 for cleaning and 5-13 for removal and installation.

b. Evaporator Coil. See paragraph 4-56 for cleaning and 5-23 for removal and installation.

c. Repairs are limited to rebrazing of return bends and on the evaporator coil the distributor and distributor line connections. See paragraph 5-12 for brazing/debrazing instructions. Badly dented fins can be straightened using a fin comb. Internal leaks in the fin area are not normally repairable.

16-3. ENGINE OVERHAUL (F10000RG-2)

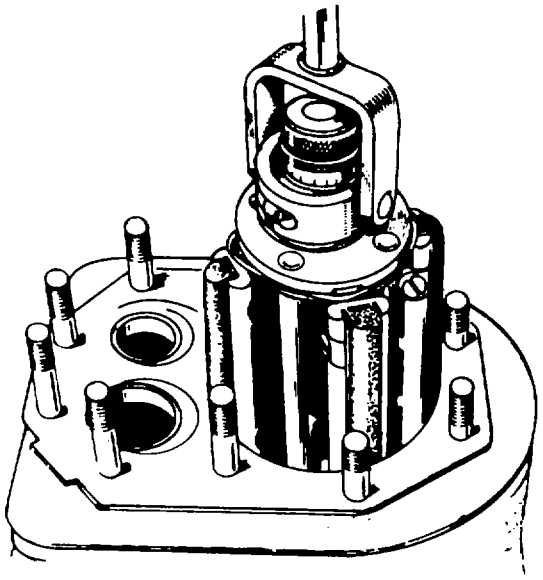
a. See paragraphs 5-34 through 5-44.

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 5-42.

(1) Reboring and honing of cylinders that are out of round or tapered.

(a) A hone can be used to rebore a cylinder (fig. 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).



TS-4110-234-14/6-1

Figure 6-1. Honing a Cylinder F10000RG-2

(b) Anchor the block solidly for either vertical or horizontal honing. Use either a drill press or heavy-duty drill which operates at approximately 250 to 450 rpm.

(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 should 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.

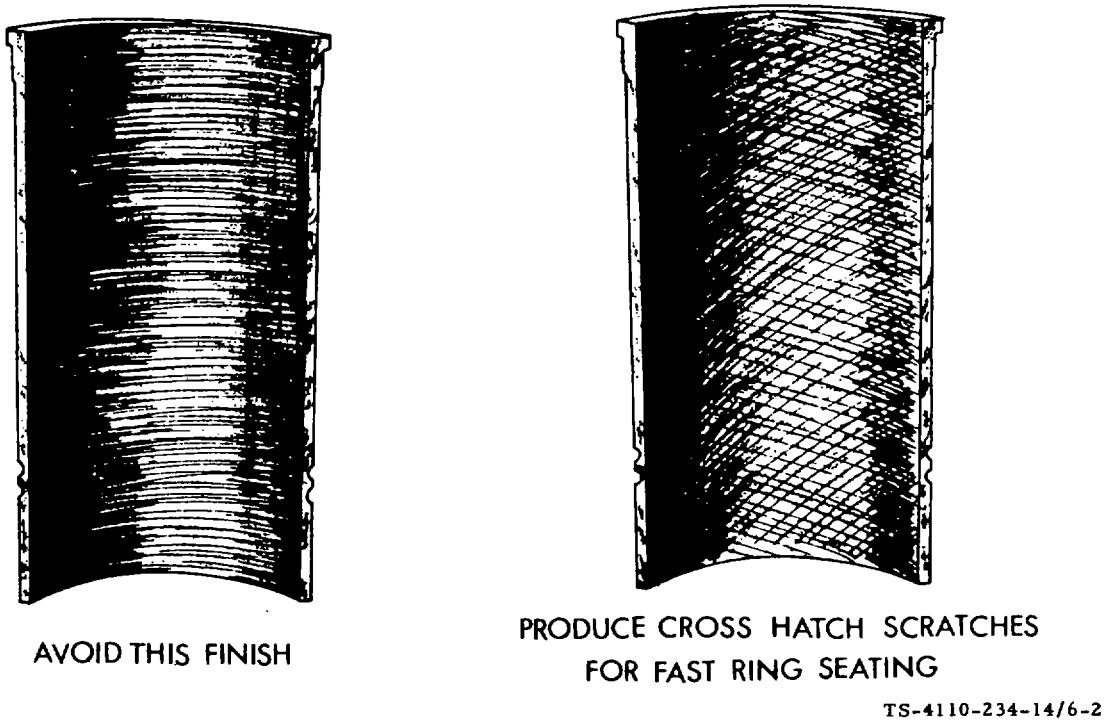


Figure 6-2. Correct Hone Finish F10000RG-2

APPENDIX A

REFERENCES

A-1. FIRE PROTECTION

TB 5-4200-200-10	Hand Portable Fire Extinguishers Approved for Army Users

A-2. LUBRICATION

C91001 L	Fuels, Lubricants, Oil and Waxes

A-3. PAINTING

TM 43-0139	Painting Instructions for Field Use

A-4. MAINTENANCE

TM 38-750	The Army Maintenance Management System (TAMMS)
TM5-4110-234-24P	Organizational, Direct Support and General Support Maintenance Repair Parts and Special Tools List
TM5-764	Electric Motor and Generator Repair

A-5. CLEANING

Fed. Spec. P-D680	Dry Cleaning Solvent

A-6. TESTING

TM 9-4940-435-14	Leak Detector, Refrigerant Gas

APPENDIX B
CONPONENTS 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. Integral Components of the End Item. These items, when assembled, constitute the Refrigeration Unit and must accompany it whenever it is transferred or tuned in. These illustrations will 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 Bll 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

a. Illustration: This column is divided as follows:

(1) Figure Number. Indicates the figure number of the illustration on which the item is shown (if applicable).
(2) Item Number. The number used to identify item called out in the illustration.

b. National Stock Number (NSN): Indicates the national stock number assigned to the end item which will be used for requisitioning.

c. Part Number (P/N): Indicates the primary number used by the manufacturer which controls the design and characteristics of the item by means of its engineering drawings, specifications, standards and inspection requirements to identify an item or range of items.

d. Description: Indicates the federal item name and, if required, a minimum description to identify the item. ©

e. Location: The physical location of each item listed is given in this column. The lists are designed to inventory all items in one area of the major item before moving on to an adjacent area.

f. Usable on Code: "USABLE ON" codes are included to help you identify which component items are used on the different models.

Identification of the codes used in this list are:

CODE	USED ON

g. Quantity Required (Qty Reqd): This column lists the quantity of each item required for a complete major item.

h. Quantity: This column is left blank for use during inventory. Under the received column, list the quantity you actually receive on your major item. The date columns are for use when you inventory the major item at a later date, such as for shipment to another site.

(1) Illustration		(2)	(3)	(4)	(5)	(6)	(7)	(8) Quantity			
(a) Figure No.	(b) Item No.	National Stock Number	Part No.	Description	Location	Usable On Code	Qty Reqd	Revd	Date	Date	Date
				Section II.							
				INTEGRAL COMPONENTS OF END ITEM							
5-58-		53578-12		Plain Hex Nut			4				
5-58-		53574-12		Spring Lock Washer			4				
5-58-		72645		Unit Mounting Angle			4				
				Section III							
				BASIC ISSUE ITEMS							
			5220-00-559-9618	Case, Manual			1				
				Department of Army Technical Manuals; Operator, Organizational, Direct Support and General Support Maintenance Manual TM 5-4110-234-14 and Organizational, Direct Support and General Support Maintenance Repair Parts and Special Tools List TM 5-4110-234-24P			1 1 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. The Maintenance Allocation Chart (MAC) in Section II designates overall responsibility for the performance of maintenance functions on the identified end item or component. The implementation of the maintenance functions upon the end item or component will be consistent with the assigned maintenance functions.

c. Section III lists the special tools and test equipment required for each maintenance function as referenced from Section II.

d. Section IV contains supplemental instructions or explanatory notes for a particular maintenance function.

C-2. MAINTENANCE FUNCTIONS

a. Inspect. To determine the serviceability of an item by comparing its physical, mechanical and/or electrical characteristics with established standards through examination.

b. 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.

c. Service. 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.

d. Adjust. To maintain, within prescribed limits, by bringing into proper or exact position, or by setting the operating characteristics to specified parameters.

e. Aline. To adjust specified variable elements of an item to bring about optimum or desired performance.

f. Calibrate. To determine and cause corrections to be made or to be adjusted on instruments or test measuring and diagnostic equipments used in precision measurement. Consists of comparisons of two instruments, one of which is a certified standard of known accuracy, to detect and adjust any discrepancy in the accuracy of the instrument being compared.

g. Install. The act of emplacing, seating, or fixing into position an item, part, or module (component or assembly) in a manner to allow the proper functioning of an equipment or system.

h. Replace. The act of substituting a serviceable like type part, subassembly, or module (component or assembly) for an unserviceable counterpart.

i. Repair. The application of maintenance services (inspect, test, service, adjust, aline, calibrate, or replace) or other maintenance actions (welding, grinding, riveting, straightening, facing, remachining, or resurfacing) to restore serviceability to an item by correcting specific damage, fault, malfunction, or failure in a part, subassembly, module (component or assembly), and item, or system.

j. Overhaul. That maintenance effort (service/actions) necessary to restore an item to a completely serviceable/operational condition as prescribed by maintenance standards (i.e., DMWR) in appropriate technical publications. Overhaul is normally the highest degree of maintenance performed by the Army. Overhaul does not normally return an item to like new condition.

k. Rebuild. Consists of those services/actions necessary for the restoration of unserviceable equipment to a like new condition in accordance with original manufacturing standards. Rebuild is the highest degree of material maintenance applied to Army equipment. The rebuild operation includes the act of returning to zero those age measurements (hours/miles, etc.) considered in classifying Army equipments/components.

C-3. COLUMN ENTRIES

Columns used in the maintenance allocation chart will be limited to those shown. Entries for those columns are explained below.

a. Column 1, Group Number. Column 1 lists group numbers, the purpose of which is to identify components, assemblies, subassemblies, and modules with the next higher assembly.

b. Column 2, Component/Assembly. Column 2 contains the noun names of components, assemblies, subassemblies, and modules for which maintenance is authorized.

c. Column 3, Maintenance Functions. Column 3 lists the functions to be performed on the item listed in column 2. (For detailed explanation of these functions, see paragraph C-2.)

d. Column 4, Maintenance Level. Column 4 specifies, by the listing of a "work time" figure in the appropriate subcolumn(s), the lowest level of maintenance authorized to perform the function listed in column 3. This figure represents the active time required to perform the maintenance function at the indicated level of maintenance. If the number or complexity of the tasks within the listed maintenance function vary at different maintenance levels, appropriate "work time" figures will be shown for each level. The number of man-hours specified by the "work time" figure represents the average time required to restore an item (assembly, subassembly, component. module, end item, or system) to a serviceable condition. The symbol designations for the various maintenance levels are as follows:

C ..... Operator or Crew
O ..... Organizational Maintenance
F ..... Direct Support Maintenance
H ..... General Support Maintenance
D ..... Depot Maintenance

e. Column 5, Tools and Equipment. Column 5 specifies, by code, those common tool sets (not individual tools) and special tools, test, and support equipment required to perform the designated function.

f. Column 6, Remarks. Column 6 contains a letter code in alphabetical order which shall be keyed to the remarks contained in Section IV.

C-4. COLUMN ENTRIES USED IN TOOL AND TEST EQUIPMENT REQUIREMENTS I

a. Column 1, Tool or Test Equipment Reference Code. The tool and test equipment reference code correlates with a maintenance function on the identified end item or component.

b. Column 2, Maintenance Level. The lowest level of maintenance authorized to use the tool or test equipment.

c. Column 3, Nomenclature. Name or identification of the tool or test equipment.

d. Column 4, National/NATO Stock Number. The National or NATO stock number of the tool or test equipment.

e. Column 5, Tool Number. The manufacturer’s part number.

C-5. EXPLANATION OF COLUMNS IN SECTION IV

a. Reference Code. The code scheme recorded in column 6, Section II.

b. Remarks. This column lists information pertinent to the maintenance function being performed as indicated on the MAC, Section II.

APPENDIX C
Section II
MAINTENANCE ALLOCATION CHART

(1) GROUP NUMBER	(2) COMPONENT ASSEMBLY	(3) MAINTENANCE FUNCTION	(4) MAINTENANCE CATEGORY C	O	F	H	D	(5) TOOLS AND EQUIPMENT	(6) REMARKS
01	CABINET PANELS, DOORS AND SCREENS								
0101	Panels	Inspect	0.1						
		Repair		1.0				1	
		Replace		0.5					
0102	Doors	Inspect	0.1						
		Repair		1.0				1	
		Replace		0.5					
0103	-Screens	Inspect	0.1						
		Repair		1.0				1	
		Replace		0.5					
02	WIRING HARNESS'AND INSTRUMENT CONTROL PANEL								
0201	Wires and Cables	Inspect	0.1						
		Test		0.5					
		Repair		1.0				1	
		Replace		2.0					
0202	Hourmeter	Inspect	0.1						
		Test		02				1	
		Replace		0.5					
0203	Gage Oil Pressure	Inspect	0.1						
		Replace		1.0				1	
0204	Gage Ammeter	Inspect	0.1						
		Replace		1.0				1	
0205	Gage Fuel Level	Inspect	0.1	1					
		Replace		1.0					
0206	Circuit Breakers	Inspect	0.1						
		Test		0.1				1	
		Replace		0.5					
0207	Lights	Inspect	0.1						
		Test		0.1				1	
		Replace		0.1					
0208	Switches	Inspect	0.1						
		Test		0.1				1	
		Replace		0.5					

APPENDIX C
Section II
MAINTENANCE ALLOCATION CHART

(1) GROUP NUMBER	(2) COMPONENT ASSEMBLY	(3) MAINTENANCE FUNCTION	(4) MAINTENANCE CATEGORY C	O	F	H	D	(5) TOOLS AND EQUIPMENT	(6) REMARKS
0209	Gage, Head Pressure (Discharge)	Inspect	0.1						
		Replace		1.0				1	
0210	Gage, Refrigerator Temperature	Inspect	0.1						
		Calibrate		2.1				1	
		Replace		1.0					
0211	Gage, Suction Pressure	Inspect	0.1						
		Replace		1.0				1	
0212	Defrost Timer	Inspect	0.1						
		Test		0.5				1	
		Replace		1.0					
0213	Relays	Inspect	0.1						
		Test		0.5				1	
		Replace		1.0					
0214	Pressure Switch	Inspect	0.1						
		Test		0.5				1	
		Replace		1.0					
0215	Thermostat	Inspect	0.1						
		Test		0.5				1	
		Replace		1.0					
0216	Resistor	Inspect	0.1						
		Test		0.5				1	
		Replace		0.5					
0217	Fuse	Test		0.1					
		Replace		0.1				1	
0218	Compressor Motor Controller	Inspect	0.1						
		Test		0.2					
		Repair		1.0				1	D
		Replace		1.0					
03	FAN AND DRIVE								
0301	Fans	Inspect	0.1						
		Replace		2.0				1	
0302	Belts	Inspect	0.1						
		Adjust		0.5				1	
		Replace		0.5					

APPENDIX C
Section II
MAINTENANCE ALLOCATION CHART

(1) GROUP NUMBER	(2) COMPONENT ASSEMBLY	(3) MAINTENANCE FUNCTION	(4) MAINTENANCE CATEGORY C	O	F	H	D	(5) TOOLS AND EQUIPMENT	(6) REMARKS
0303	Idler Assembly	Inspect	0.1						
		Service		0.2					
		Adjust		0.5				1	
		Replace		1.0					
0304	Bearings	Inspect	0.1						
		Service		0.2				1	
		Replace		3.0					
0305	Clutch	Inspect	0.1						
		Adjust		1.0					
		Service		0.5			1		
		Replace		3.0					
0306	Pulleys	Inspect	0.1						
		Replace		3.0				1	
0307	Shaft	Inspect	1.0						
		Replace			6.0			1	
04	REFRIGERANT PIPING AND VALVES								
0401	Shroud, Condenser	Inspect	0.1						
		Repair			1.0			1	
		Replace			5.0				
0402	Condenser Coil	Inspect	0.1						
		Clean		1.0					
		Repair		2.0				1-2	A
		Replace			4.0				
0403	Valve, Discharge Pressure Regulator	Inspect	0.1						
		Adjust			1.0			1-2	
		Replace			3.0				
0404	Valve, Hand	Inspect	0.1						
		Replace			2.0			1-2	
0405	Strainer, Refrigerant	Inspect	0.1						
		Replace			3.0			1-2	
0406	Valve, Solenoid	Inspect	0.1						
		Test			0.5			1-2	
		Replace			3.0				
0407	Fusible Plug	Inspect	0.1					1-2	
		Replace		3.0					

APPENDIX C
Section II
MAINTENANCE ALLOCATION CHART

(1) GROUP NUMBER	(2) COMPONENT ASSEMBLY	(3) MAINTENANCE FUNCTION	(4) MAINTENANCE CATEGORY C	O	F	H	D	(5) TOOLS AND EQUIPMENT	(6) REMARKS
0408	Filter Drier	Inspect	0.1					1-2	
		Replace			3.0				
0409	Receiver Tank	Inspect	0.1						
		Repair			2.0			1-2	
		Replace			3.0				
0410	Sight Glass	Inspect	0.1						
		Replace			3.0			1-2	
0411	Valve, Expansion	Inspect	0.1						
		Adjust			1.0			1-2	
		Replace			4.0				
0412	Coil, Evaporator	Inspect	0.1						
		Clean		2.0				1	
		Repair				3.0		1-2	A
		Replace			5.0				
0413	Thermostat	Inspect	0.1						
		Test		0.2				1	
		Replace		0.5					
0414	Accumulator	Inspect	0.1						
		Replace			3.0			1-2	
0415	Regulator, Crankcase Pressure	Inspect	0.1						
		Adjust			0.5				
		Replace			5.0			1-2	
0416	Tubing and Fittings	Inspect	0.1						
		Repair			1.0			1-2	
		Replace			2.0				
05	COMPRESSOR ASSEMBLY								
0501	Compressor	Inspect	0.1						
		Lubricate			0.5			1-2	
		Test			0.5				
		Repair			4.0				
		Replace			4.0				
0502	Valve, Suction and Discharge	Inspect	0.1						
		Replace			4.0			1-2	
0503	Cylinder Heads and Valve Plates	Inspect			0.5				
		Replace			5.0			1-2	

APPENDIX C
Section II
MAINTENANCE ALLOCATION CHART

(1) GROUP NUMBER	(2) COMPONENT ASSEMBLY	(3) MAINTENANCE FUNCTION	(4) MAINTENANCE CATEGORY C	O	F	H	D	(5) TOOLS AND EQUIPMENT	(6) REMARKS
0504	Crankshaft Bearings	Inspect			0.5			1-2	
		Replace			10.0				
0505	Piston and Rod Assembly	Inspect			0.5				
		Replace			8.0				
0506	Seal Assembly	Inspect			0.5				
		Replace			4.0			1-2	
0507	Flywheel	Inspect	0.1						
		Replace		1.0				1	
0508	Oil Pump Assy	Inspect			0.5			1-2	
		Replace			6.0				
06	ENGINE ASSEMBLY								
0601	Muffler	Inspect		0.1					
		Replace		0.5				1	
0602	Engine	Inspect		0.3					
		Test		0.5					
		Service		1.0					
		Adjust		0.4				1	
		Replace		4.0					
		Repair		6.0					
		Overhaul			6.0				
0603	Belt, Alternator	Inspect	0.1						
		Adjust		0.3				1	
		Replace		0.5					
0604	Alternator	Inspect		0.1					
		Test		0.3				1	
		Repair			2.0				
		Replace		1.0					
0605	Air Cleaner	Inspect		0.1					
		Service		0.3				1	
		Replace		1.0					
0606	Choke	Inspect		0.1					
		Adjust		0.5					
		Replace		1.0					
0607	Carburetor	Inspect		0.2					
		Adjust		0.5				1	
		Repair			2.0				
		Replace		1.0					

APPENDIX C
Section II
MAINTENANCE ALLOCATION CHART

(1) GROUP NUMBER	(2) COMPONENT ASSEMBLY	(3) MAINTENANCE FUNCTION	(4) MAINTENANCE CATEGORY C	O	F	H	D	(5) TOOLS AND EQUIPMENT	(6) REMARKS
0608	Governor	Inspect		0.1					
		Adjust		0.5				1	
		Repair			2.0				
		Replace			3.0				
0609	Cooling Shroud	Inspect		0.2					
		Repair			1.0			1	
		Replace			2.0				
0610	Oil Filter	Inspect		0.1				1	
		Replace		0.1					
0611	Spark Plugs	Inspect		0.1					
		Adjust		0.3				1	
		Test		0.1					
		Replace		0.5					
0612	Lead Spark Plug	Inspect		0.1					
		Test		0.2				1	
		Replace		0.5					
0613	Points, Ignition	Inspect		0.1					
		Adjust		0.5				1	
		Replace		1.0					
0614	Starter	Inspect		0.1					
		Test			2.0				
		Repair			2.0			1	
		Replace			2.0				
0615	Solenoid, Starter	Inspect		0.1					
		Test		0.2				1	
		Replace		1.0					
0616	Flywheel	Inspect			2.0				
		Replace			2.0			1	
0617	Crankshaft	Inspect			2.0				
		Repair				4.0	1	B	
		Replace			4.0				
0618	Piston and Rod Assembly	Inspect			2.0				
		Replace			4.0			1	
0619	Piston Assy	Inspect			2.0				
		Replace			2.0			1	

APPENDIX C
Section II
MAINTENANCE ALLOCATION CHART

(1) GROUP NUMBER	(2) COMPONENT ASSEMBLY	(3) MAINTENANCE FUNCTION	(4) MAINTENANCE CATEGORY C	O	F	H	D	(5) TOOLS AND EQUIPMENT	(6) REMARKS
0620	Piston Rings	Inspect			2.0				
		Replace			2.0			1	
0621	Gears, Timing	Inspect			2.0				
		Replace			4.0			1	
0622	Camshaft	Inspect			3.0				
		Replace			3.0			1	
0623	Head, Cylinder	Inspect			1.0				
		Replace			2.0			1	
0624	Springs, Valves	Inspect			1.0				
		Test			1.0			1	
		Replace			2.0				
0625	Valves	Inspect			1.0				
		Test			3.0			1	
		Repair			4.0				
		Replace			4.0				
0626	Tappets	Inspect			1.0				
		Adjust			1.0			1	
		Replace			3.0				
0627	Block, Engine	Inspect			0.3				
		Repair				6.0			
		Replace				6.0			
								1	B
0628	Bearing, Main	Inspect			2.0				
		Replace			4.0			1	
0629	Guides, Valve	Inspect			1.0				
		Test			2.0				
		Replace				4.0		1	B
0630	Seats, Valve	Inspect			1.0				
		Test			1.0			1	
		Repair			1.0				
		Replace				4.0			B
0631	Pump, Oil	Inspect			0.5				
		Test			0.5			1	
		Replace			2.0				

APPENDIX C
Section II
MAINTENANCE ALLOCATION CHART

(1) GROUP NUMBER	(2) COMPONENT ASSEMBLY	(3) MAINTENANCE FUNCTION	(4) MAINTENANCE CATEGORY C	O	F	H	D	(5) TOOLS AND EQUIPMENT	(6) REMARKS
0701	Battery	Inspect	0.1						
		Test		0.2				1	
		Replace		0.2					
0702	Terminal Adapter	Inspect		0.1					
		Replace		0.2				1	
0703	Battery Hold Down	Inspect		0.1					
		Replace		0.5				1	
08	FUELSYSTEM								
0801	Fuel Tank	Inspect	0.1						
		Service	0.3						
		Replace		1.0				1	
0802	Strainer, Fuel	Inspect	0.1						
		Service		0.1					
		Replace		0.5					
0803	Fuel Pump	Inspect		0.1					
		Service		0.3					
		Replace		1.0					
0804	Fuel Line	Inspect	0.1						
		Repair		1.0					
		Replace		0.5					
09	ELECTRIC MOTORS								
0901	Motor, Electric	Inspect	0.1	,					
		Test		0.2					
		Repair			2.0			1	C
		Replace		1.0					
10	HOUSING								
1001	Mounting Frame	Inspect	0.2						
	Engine and	Repair			1.0				
	Compressor	Replace			2.0				
1002	Lifting Fittings	Inspect	0.1						
		Repair			1.0				
		Replace		0.5					

APPENDIX C
Section II
MAINTENANCE ALLOCATION CHART

(1) GROUP NUMBER	(2) COMPONENT ASSEMBLY	(3) MAINTENANCE FUNCTION	(4) MAINTENANCE CATEGORY C	O	F	H	D	(5) TOOLS AND EQUIPMENT	(6) REMARKS
1003	Unit Mounts	Inspect	0.1						
		Repair			1.0				
		Replace		0.5					
1004	Drain Line	Inspect	0.1						
		Repair		0.5					
		Replace		0.2					
1005	Gaskets, Heat Shield	Inspect	0.1						
		Replace		1.0					
1006	Housing Evaporator	Inspect	0.1						
		Repair			1.0				
		Replace			2.0				
1007	Frame, Condenser Section	Inspect	0.2						
		Repair			1.0			1-2	

APPENDIX C
Section III TOOL AND TEST EQUIPMENT REQUIREMENTS

MAINTENANCE ALLOCATION CHART

(1) Reference Code	(2) Maintenance Category	(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-N 18)	5180-00-596-1474	
2	F-H	Pump, Vacuum	4310-00-098-5272	
3	O-F-H	Soldering Gun Kit	3439-00-930-1638	
	F-H	Recovery and Recycling Unit, Refrigerant	4130-01-338-2707	17500B (07295)

APPENDIX C
Section IV REMARKS
MAINTENANCE ALLOCATION CHART

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
D	Limited to Holding Coil and Contact Point Replacement
	Other than those items listed above there are no supplemental instructions or explanatory remarks required for the maintenance functions listed in Section II. All functions are sufficiently defined in Section I. Active time listed for maintenance task functions are with the refrigerator in off-equipment position.

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 identified as follows:

CODE	USED ON
	Model

Section II ADDITIONAL AUTHORIZATION LIST

(1) NATIONAL STOCK NUMBER	(2) PART NUMBER AND FSCM	DESCRIPTION, NUMBER	(3) USABLE ON CODE	(4) U/M	QTY AUTH
7520-00-559-9618		Cotton Duck Case		EA	1
7510-00-8893494		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 authorized to you by CTA 50-970, 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.

b. Column 2 - Level. This column identifies the lowest level of maintenance that requires the listed item.

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 part number followed by the Federal Supply Code for Manufacturer (FSCM) in parentheses, if applicable.

e. Column 5 - Unit of Measure (UM). Indicates the measure used in performing the actual maintenance function. This measure is expressed by a two-character alphabetical abbreviation, e.g., each (ea), inch (in), pair (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) ITEM NUMBER	(2) LEVEL	(3) NATIONAL STOCK NUMBER	(4) DESCRIPTION	(5) UM
1	O		Lubricating Oil, SE or Se/CC, SAE 30, 10W, 20 and 5W-30, MIL-L-2140	GL
2	O	6850-00-264-9037	Dry Cleaning Solvent P-D-680, (81348)	GL
3	C		Gasoline, Automotive, Unleaded, VV-G-1690	GL
4	F		Dichlorodifluoromethane, Technical w/cylinder 22 lb (Refrigerant- 12), BB-F-1421, Type 12 (81348)	CY
5	O		Insulation, Slvg, Elec MIL-1-3190/4 C1 155 (81349)	
6	O	7920-00-205-1711	Rags	
7	F	3439-00-184-8952	Brazing Alloy, QQ-B-654 (81348)	
8	F	3439-00-640-3713	Brazing Flux, 0-F-499 Type B (81348)	
9	F	6830-00-292-0732	Nitrogen	CY
10	F		Compressor Oil, CPP33-2	GL
11	O		Electrolyte, approx. 70% H2SO4, (battery acid)	GL
12	O		Lead Tin Solder, Sb5 of QQ-S-571 (81348)	
13	O		Soldering Flux, Type I of O-F-506	
14	O		Ball and Roller bearing Grease MIL-G-25013	

ALPHABETICAL INDEX

ALPHABETICAL INDEX (Cont.)

ALPHABETICAL INDEX (Cont.)

ALPHABETICAL INDEX (Cont.)

ALPHABETICAL INDEX (Cont.)

ALPHABETICAL INDEX (Cont.)

W

X, Y, Z
NONE

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THE METRIC SYSTEM AND EQUIVALENTS

LINEAR MEASURE

1 Centimeter = 10 Millimeters = 0.01 Meters = 0.3937 Inches

1 Meter = 100 Centimeters = 1,000 Millimeters = 39.37 Inches

1 Kilometer = 1,000 Meters = 0.621 Miles

SQUARE MEASURE

1 Sq Centimeter = 100 Sq Millimeters = 0.155 Sq Inches

1 Sq Meter = 10,000 Sq Centimeters = 10.76 Sq Feet

1 Sq Kilometer = 1,000,000 Sq Meters = 0.386 Sq Miles

CUBIC MEASURE

1 Cu Centimeter = 1,000 Cu Millimeters = 0.06 Cu Inches

1 Cu Meter = 1,000,000 Cu Centimeters = 35.31 Cu Feet

LIQUID MEASURE

1 Milliliter = 0.001 Liters = 0.0338 Fluid Ounces

1 Liter = 1,000 Milliliters = 33.82 Fluid Ounces

TEMPERATURE

5/9 (°F -32) = °C

212° Fahrenheit is equivalent to 100° Celsius

90° Fahrenheit is equivalent to 32.2° Celsius

32° Fahrenheit is equivalent to 0° Celsius

9/5 C° +32 = F°

WEIGHTS

1 Gram = 0.001 Kilograms = 1,000 Milligrams = 0.035 Ounces

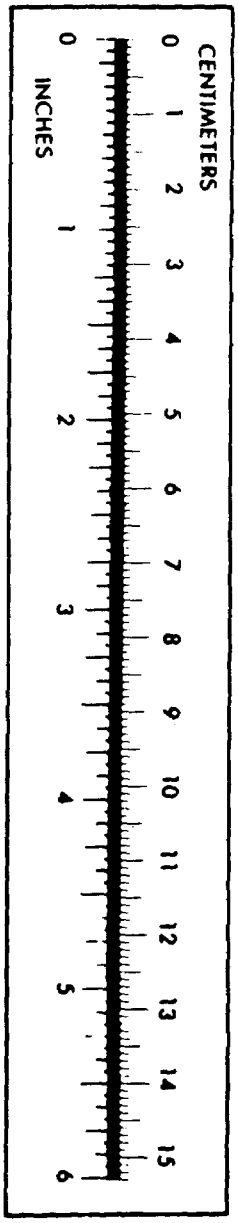
1 Kilogram = 1,000 Grams = 2.2 Lb.

1 Metric Ton = 1,000 Kilograms = 1 Megagram = 1.1 Short Tons

APPROXIMATE CONVERSION FACTORS

TO CHANGE	TO	MULTIPLY BY
Inches	Centimeters	2.540
Feet	Meters	0.305
Yards	Meters	0.914
Miles	Kilometers	1.609
Square Inches	Square Centimeters	6.451
Square Feet	Square Meters	0.093
Square Yards	Square Meters	0.836
Square Miles	Square Kilometers	2.590
Acres	Square Hectometers	0.405
Cubic Feet	Cubic Meters	0.028
Cubic Yards	Cubic Meters	0.765
Fluid Ounces	Milliliters	29.573
Pints	Liters	0.473
Quarts	Liters	0.946
Gallons	Liters	3.785
Ounces	Grams	28.349
Pounds	Kilograms	0.454
Short Tons	Metric Tons	0.907
Pound-Feet	Newton-Meters	1.356
Pounds Per Square Inch	Kilopascals	6.895
Miles Per Gallon	Kilometers Per Liter	0.425
Miles Per Hour	Kilometers Per Hour	1.609

TO CHANGE	TO	MULTIPLY BY
Centimeters	Inches	0.394
Meters	Feet	3.280
Meters	Yards	1.094
Kilometers	Miles	0.621
Square Centimeters	Square Inches	0.155
Square Meters	Square Feet	10.764
Square Meters	Square Yards	1.196
Square Kilometers	Square Miles	0.386
Square Hectometers	Acres	2.471
Cubic Meters	Cubic Feet	35.315
Cubic Meters	Cubic Yards	1.308
Milliliters	Fluid Ounces	0.034
Liters	Pints	2.113
Liters	Quarts	1.057
Liters	Gallons	0.264
Grams	Ounces	0.035
Kilograms	Pounds	2.205
Metric Tons	Short Tons	1.102
Newton-Meters	Pound-Feet	0.738
Kilopascals	Pounds Per Square Inch	0.145
Kilometers Per Liter	Miles Per Gallon	2.354
Kilometers Per Hour	Miles Per Hour	0.621



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