TECHNICAL MANUAL

UNIT, DIRECT SUPPORT, AND GENERAL SUPPORT MAINTENANCE MANUAL

(INCLUDING REPAIR PARTS AND SPECIAL TOOLS LIST)

REFRIGERATOR, SOLID STATE, BIOLOGICAL MODEL DLA-50T

4110-01-287-7111

HEADQUARTERS, DEPARTMENT OF THE ARMY

JANUARY 1998

SAFETY STEPS TO FOLLOW IF SOMEONE IS THE VICTIM OF ELECTRICAL SHOCK

Do not try to pull or grab the individual.

If possible, turn off the electrical power.

If you cannot turn off the electrical power, pull, push, or lift the person to safety using a dry wooden pole or a dry rope, or some other insulating material.

Send for help as soon as possible.

After the injured person is free of contact with the source of electrical shock, move the person a short distance away and immediately start artificial resuscitation.

Throughout this manual are WARNINGS, CAUTIONS, and NOTES. Please take time to read these. They are there to protect you and the equipment.

WARNING

Procedures which must be observed to avoid personal injury, and even loss of life.

CAUTION

Procedures which must be observed to avoid damage to equipment, destruction of equipment, or long-term health hazards.

NOTE

Essential information that should be remembered.

ELECTRICAL AND ELECTRONIC HAZARDS

» Severe injury or death can result when any part of your body comes in contact with live electrical circuits. Medical Equipment Repairers must be especially alert to the dangers of exposed circuits, terminals, power panels, and the like.

» The electrical parameter that injures and kills is CURRENT; the force that caused current to flow is called VOLTAGE. Voltage ratings are normally assigned to live electrical circuits, power supplies, and transmission lines. You should consider all voltages of 30 or more to be hazardous.

» The physiological effect of current flowing through the human body is related to the following factors:

- The path of the current through the body.
- The magnitude of the current.
- The duration of the voltage shock or discharge that causes current flow.
- The frequency of the voltage if alternating current.
- The susceptibility of damage to your heart from the current and from repeated shocks.

» Alternating current tends to concentrate near the body's surface because of the phenomenon of "skin effect." The higher the frequency of the alternating current voltage source, the more likely the current will tend to flow in or near the skin and away from internal body organs.

» The effect of current becomes more severe with the length of time that it flows through the body; a prolonged current flow can cause severe internal burns, collapse, unconsciousness, or death.

TECHNICAL MANUAL

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HEADQUARTERS
DEPARTMENT OF THE ARMY
WASHINGTON, DC 1 JANUARY 1998

UNIT, DIRECT SUPPORT, AND GENERAL SUPPORT MAINTENANCE MANUAL (INCLUDING REPAIR PARTS AND SPECIAL TOOLS LIST) REFRIGERATOR, SOLID STATE, BIOLOGICAL MODEL DLA-50T 4110-01-287-7111

You can help improve this manual. If you find any mistakes or if you know a way to improve procedures, please let us know. Mail a memorandum to: U.S. Army Medical Materiel Agency, 1423 Sultan Drive, Suite 100, ATTN: MCMR-MMM, Fort Detrick, MD 21702-5001. A reply will be furnished directly to you.

Approved for public release; distribution is unlimited.

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HOW TO USE THIS MANUAL

This manual provides all the information needed to understand the capabilities, functions, and characteristics of this equipment. It describes how to set up, operate, test, and repair the equipment. You must familiarize yourself with the entire manual before operating or beginning a maintenance task.

The manual is arranged by chapters, sections, and paragraphs followed by appendixes, a glossary, an index, and DA Forms 2028-2. Use the table of contents to help locate the chapter or section for the general subject area needed. The index will help locate more specific subjects.

Chapter 3 provides a systematic method of inspecting and servicing the equipment. In this way, small defects can be detected early before they become a major problem causing the equipment to fail. Make a habit of doing the checks and services in the same order each time and anything wrong will be detected quickly.

Only perform maintenance functions specified in the maintenance allocation chart for your level of maintenance. Maintenance functions specified for higher levels of maintenance frequently require additional training; test, measurement, and diagnostic equipment; or tools.

CHAPTER 1

INTRODUCTION

Section I. GENERAL INFORMATION

1-1. Overview.

This manual describes the refrigerator (fig 1-1); provides equipment technical data; and provides operational and maintenance functions, services, and actions. Additional information follows:

a. Type of manual. Unit, direct support (DS), and general support (GS) maintenance (including repair parts and special tools list).

b. Model number and equipment name. Model number DLA-50T, Refrigerator, Solid State, Biological.

c. Purpose of equipment. To provide temperature controlled storage and transport of biological material (to include blood and blood products) in a field environment.

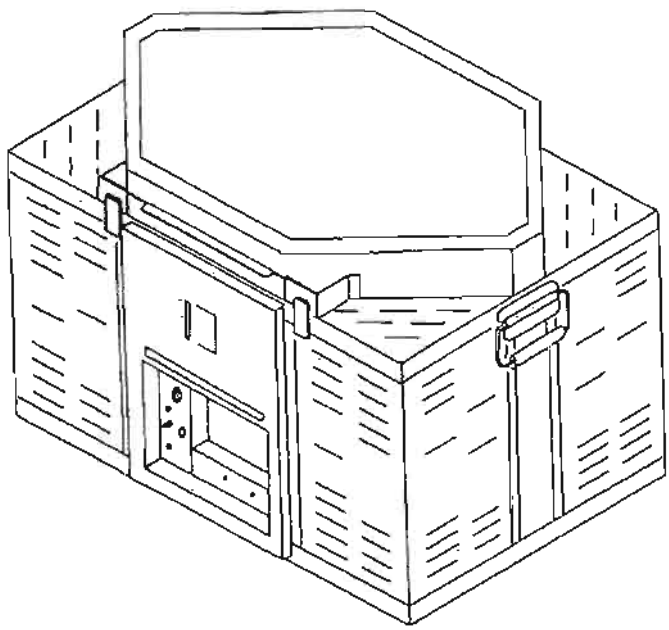


Figure 1-1. Solid state biological refrigerator.

1-2. Explanation of abbreviations and terms.

Special or unique abbreviations, acronyms, and terms used within this manual are explained in the glossary.

1-3. Maintenance forms, records, and reports.

TB 38-750-2 prescribes forms, records, reports, and procedures.

1-4. Destruction of Army materiel to prevent enemy use.

AR 40-61 contains instructions for destruction and disposal of Army medical materiel. Also, the SB 8-75 series provides periodic information and/or instructions on the destruction of medical materiel.

1-5. Administrative storage.

a. Place the refrigerator in administrative storage for only short periods of time when a shortage of maintenance effort exists. This equipment should be in mission readiness condition within 24 hours or within the time factors as determined by the directing authority. During the storage period, keep appropriate maintenance records.

b. Perform preventive maintenance checks and services (PMCS) listed in tables 3-1 and 3-2 before placing Army equipment in administrative storage. When equipment is removed from storage, perform PMCS to ensure its operational readiness.

c. Inside storage is preferred for equipment selected for administrative storage.

1-6. Preparation for storage or shipment.

Procedures to prepare the refrigerator for storing or shipping are listed in chapter 3, section X.

1-7. Quality control (QC).

TB 740-10/DLAM 4155.5/AFR 67-43 contains QC requirements and procedures.

1-8. Nomenclature cross-reference list.

Table 1-1 identifies official versus commonly used nomenclatures.

Table 1-1. Nomenclature cross-reference list.

Common name	*Official nomenclature*
Refrigerator	Refrigerator, solid state, biological
Door cover	Cover, door
Recorder	Temperature recorder
Storage compartment	Load chamber

1-9. Reporting and processing medical materiel complaints and/or quality improvement reports.

AR 40-61 prescribes procedures for submitting medical materiel complaints and/or quality improvement reports for the refrigerator.

1-10. Warranty information.

A warranty is not applicable.

Section II. EQUIPMENT DESCRIPTION AND DATA

1-11. Equipment characteristics, capabilities, and features.

a. The refrigerator is a solid state heating and cooling unit designed to maintain a constant, preset storage compartment temperature range of 1°C (33.8°F) to 6°C (42.8°F).

b. The refrigerator has no moving parts and does not require motors, fans, or gases. Cooling or heating is performed by thermoelectric technology.

c. A wire basket for the storage compartment is included with the refrigerator.

d. The refrigerator operates from multiple voltages and frequencies.

e. The storage compartment capacity is approximately 1 cubic foot.

1-12. Component and accessory descriptions.

a. Components.

(1) *Case assembly (fig 1-2).* The case assembly includes the complete refrigerator except the power supply, power cable, recorder, and wire basket.

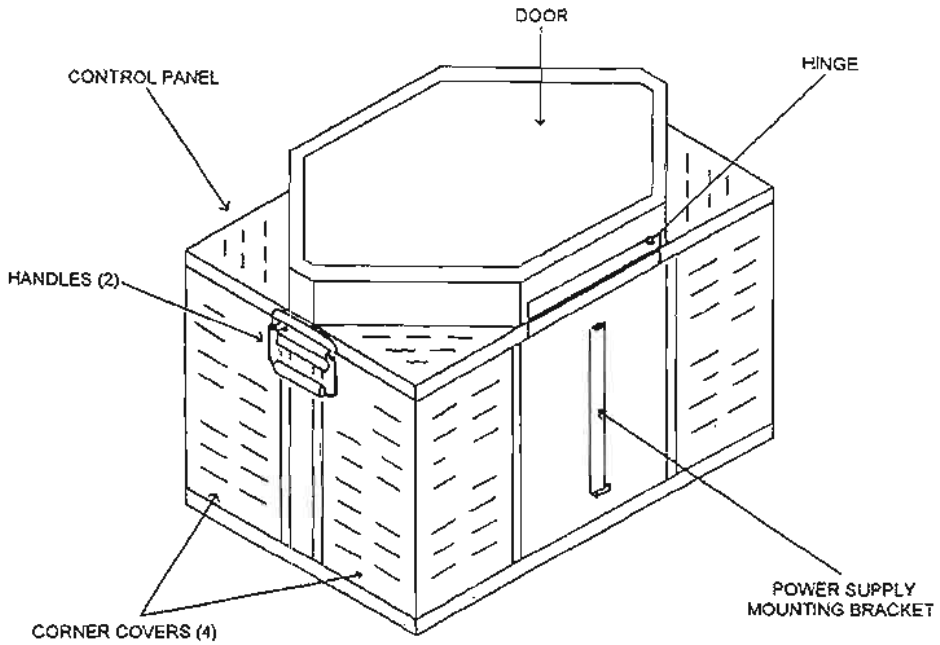


Figure 1-2. Components of the case assembly.

(2) *Cover assembly.* The door cover incorporates a gasket, a hinge, a latch, and a cable to prevent damage to the door cover (fig 1-3).

b. Accessories.

(1) *Wire basket (fig 1-4).* A wire basket is provided to facilitate loading and unloading of the storage compartment.

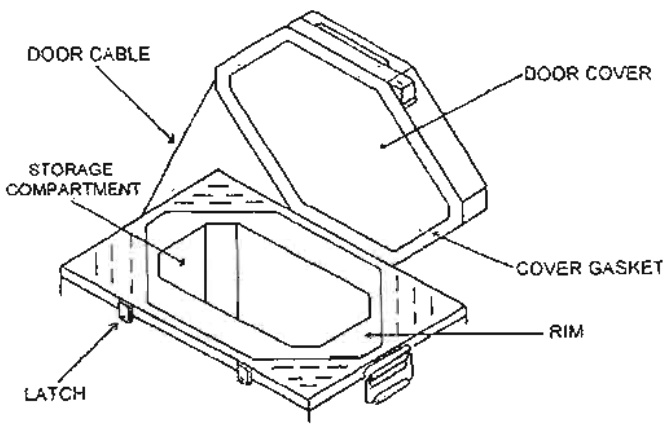


Figure 1-3. Door cover.

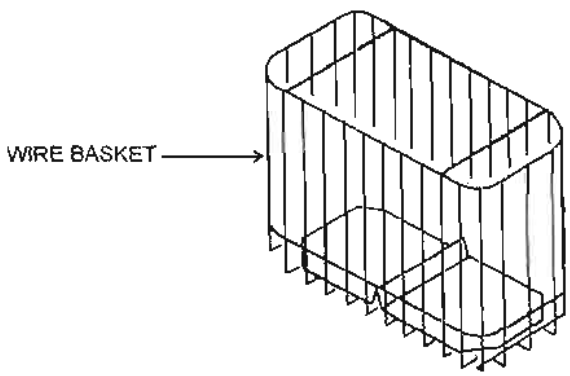


Figure 1-4. Wire basket.

(2) *Power supply (fig 1-5).* Alternating current (AC) voltages are provided by the power supply.

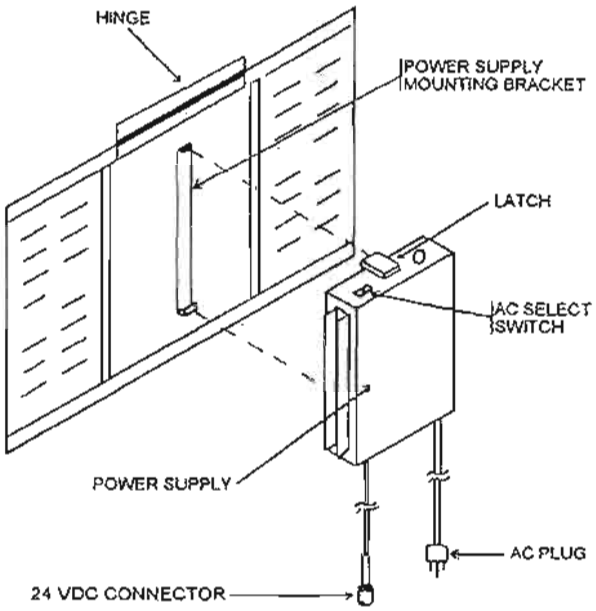


Figure 1-5. Power supply.

(3) *Recorder.* The temperature recorder is used inside the storage compartment to provide a paper copy for up to 10 days duration.

1-13. Tabulated data, decals, and data plates.

The tabulated data provides physical characteristics, electrical specifications, and other information for the refrigerator.

a. Physical characteristics and electrical specifications. Tables 1-2 and 1-3 provide a broad range of physical characteristics and electrical specifications to include operating voltages, dimensions, and weight.

Table 1-2. Physical characteristics.

Width	Outside - 66 cm (26 in)	Inside - 43 cm (16.9 in)
Depth	Outside - 48.9 cm (19.3 in)	Inside - 21.6 cm (8.5 in)
Height	Outside - 47 cm (18.5 in)	Inside - 30 cm (11.8 in)
Volume	Outside - 5.3 ft^3	Inside - 1 ft^3
Weight	31 kg (68 lbs)	

Table 1-3. Electrical specifications.

Voltages	*Current (Amps) (Maximum)*
12 VDC (nominal)	7 Amps
24/28 VDC (nominal)	4.5 Amps
120 VAC, 50 Hz	1.6 Amps
120 VAC, 60 Hz	1.6 Amps
220 VAC, 50 Hz	0.8 Amps
220 VAC, 60 Hz	0.8 Amps

b. Identification, instruction, and warning plates, decals, or markings.

(1) Temperature graduations for reading the storage compartment thermometer are depicted in figure 1-6.

(2) The manufacturer data plate, located on the control panel, is depicted in figure 1-7.

(3) Control panel information is depicted in figure 1-8.

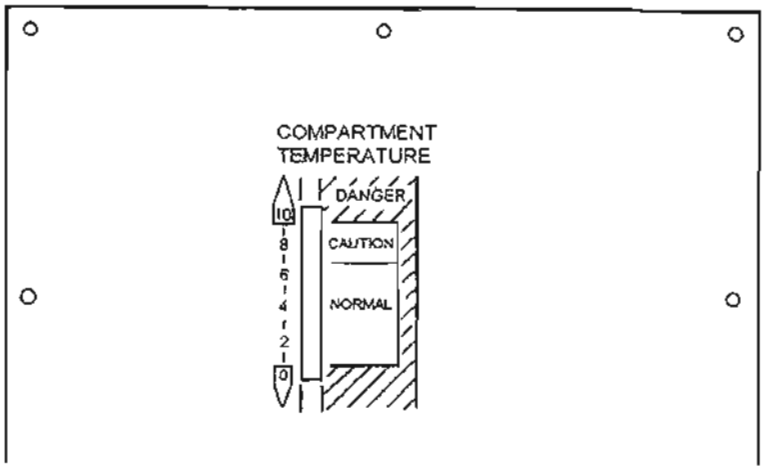


Figure 1-6. Temperature graduations.

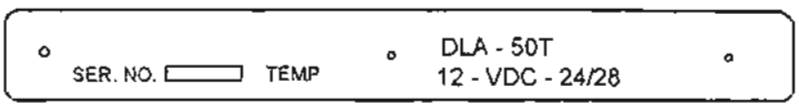


Figure 1-7. Data plate.

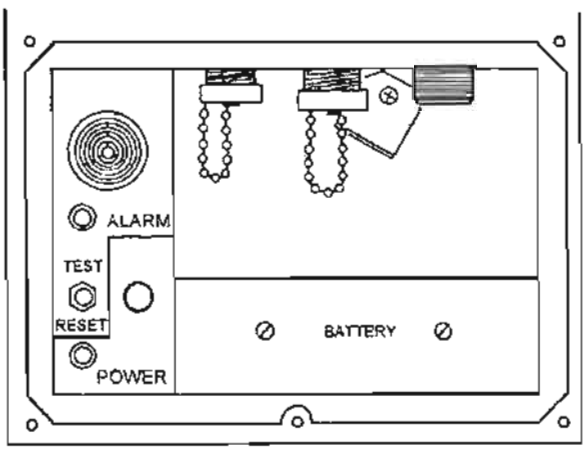


Figure 1-8. Control panel information.

1-14. Model differences.

Model differences are not applicable since this manual covers a single model.

1-15. Safety, care, and handling.

a. Observe each WARNING, CAUTION, and NOTE in this manual.

b. Read the operating instructions in this manual before operating the refrigerator. Refer servicing to qualified Medical Equipment Repairer personnel.

c. Ensure that the refrigerator is operated with the correct voltage.

Section III. PRINCIPLES OF OPERATION

1-16. Basic operation.

a. The solid state refrigerator/heater unit uses thermoelectric technology to maintain a narrow temperature range within the storage compartment over the operational ambient temperature range.

b. The refrigerator has no moving parts.

CHAPTER 2

OPERATING INFORMATION AND INSTRUCTIONS

Section I. PREPARATION FOR OPERATION

2-1. Scope.

This manual is primarily intended to provide information, instructions, and procedures for the maintenance of the refrigerator. The operating information and instructions, while valid, do not provide sufficient information to store biologicals.

2-2. Assembly.

a. Remove the refrigerator and accessories from their storage container.

b. Place the refrigerator in its operating location. The refrigerator is designed to operate at ambient temperatures of between -25°C and 49°C (-13°F and 120°F).

c. For DC operation, connect the power cable to the DC power source (fig 2-1) and the corresponding connector located and marked on the control panel.

d. For AC operation, notify your unit Medical Equipment Repairer.

NOTE

The refrigerator is set for normal operation. No initial adjustments are necessary.

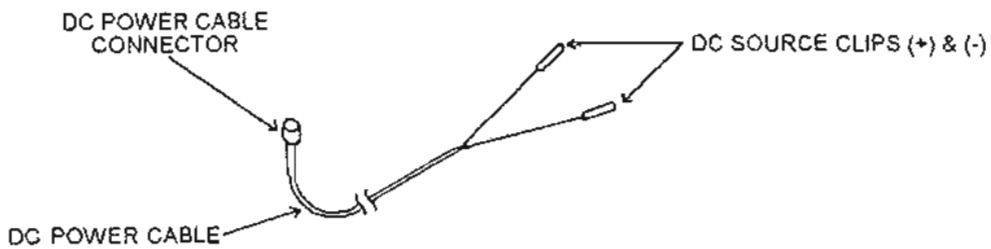


Figure 2-1. DC power cable connector.

Section II. OPERATING INFORMATION

2-3. Control panel functions (fig 2-2).

a. 24/28 VDC power receptacle. Connects a 24/28 VDC power source through the power cable. Alternatively, it connects the power supply.

b. 12 VDC power receptacle. Connects a 12 VDC power source through the power cable.

c. Interlock. Prevents plugging in two connectors at the same time.

d. Temperature receptacle. Used for optional remote thermometer or recorder.

e. Battery pack. Standby power for thermometer and alarm during power failure (continuously recharging).

f. Circuit breaker. Provides overcurrent protection, push to reset.

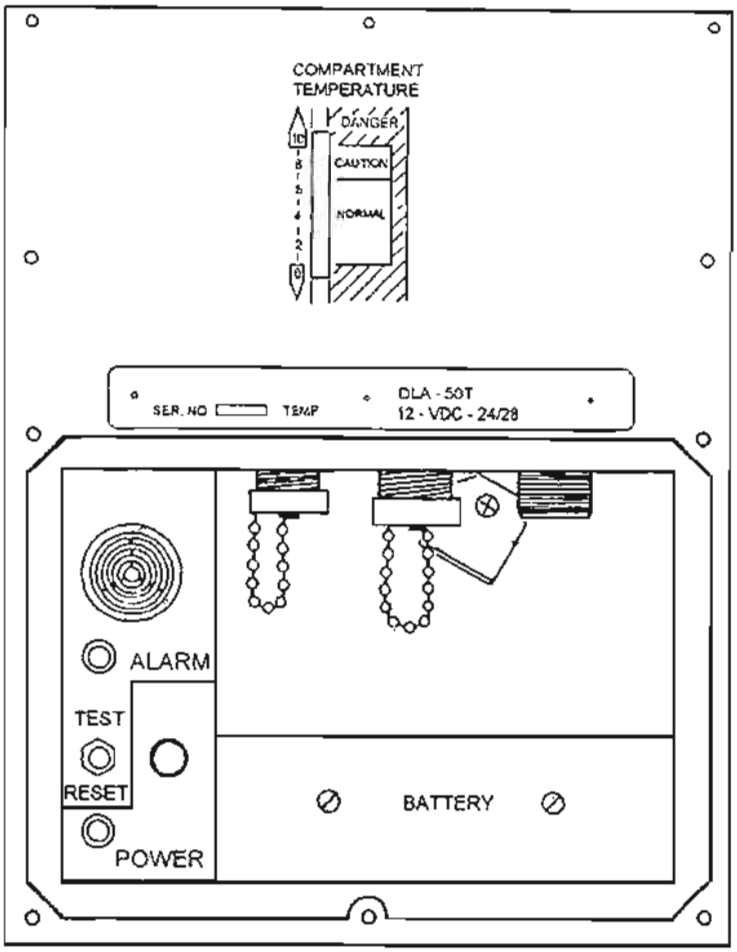


Figure 2-2. Control panel.

g. Power indicator. Lights green when unit is properly powered.

h. Alarm test/reset switch. Push up for testing, push down for resetting.

i. Visual alarm signal. Blinks red when alarm is activated.

j. Audio alarm signal. Beeps when alarm is activated.

k. Thermometer. Color coded display of compartment temperature. Red for DANGER ZONE 32°F (0°C) and below; 50°F (10°C) and above.

Section III. OPERATING INSTRUCTIONS

2-4. Start-up procedures.

a. Initial adjustments.

(1) The refrigerator is factory set for normal operation. No initial adjustments are necessary.

(2) The power supply is factory set to 110 VAC. If used at a 230 VAC location, the power supply must be set to that voltage. To adjust, use a flat screwdriver and move the slide switch to the 230 VAC position, as indicated on the power supply. Connect an appropriate AC power plug for operation in other than 110 VAC locations.

b. Starting, operating and stopping the equipment. To start the operation of the refrigerator, the unit must be connected into an appropriate power source. Once the unit has been properly connected, the green power

indicator light will be on. No switching or adjusting is necessary. The connector receptacles, switches and indicators of the unit are all located on the control panel (fig 2-3) and are marked with their functions.

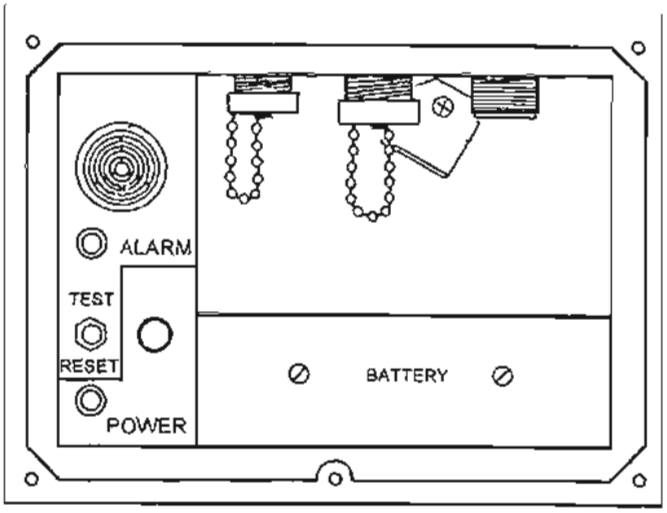


Figure 2-3. Control panel components.

c. Steps for starting the unit in operation.

(1) *Source voltage determination.* Ascertain available power source voltage: 110 VAC, 220 VAC, 12 VDC, or 24/28 VDC.

(2) *Connection to unit.* Connect the refrigerator in accordance with the source voltages shown in table 2-1.

Table 2-1. Source voltages.

Source	*Connection/Receptacle*
12 VDC	Power Cable/J2 - 12 VDC
24/28 VDC	Power Cable/J1 - 24 VDC
110 VAC or 220 VAC	Power Supply Plug/J1 - 24 VDC

(3) *Installation of alarm battery pack.* Install a charged battery pack in the front panel recess (fig 2-3). The indicator of the compartment thermometer will light. If the battery voltage is low, no light will appear on the thermometer. The battery pack will charge automatically when power is provided to the unit. To ascertain the performance of the battery pack, disconnect the refrigerator after approximately 15 minutes and observe the light on the thermometer, indicating proper operation.

NOTE

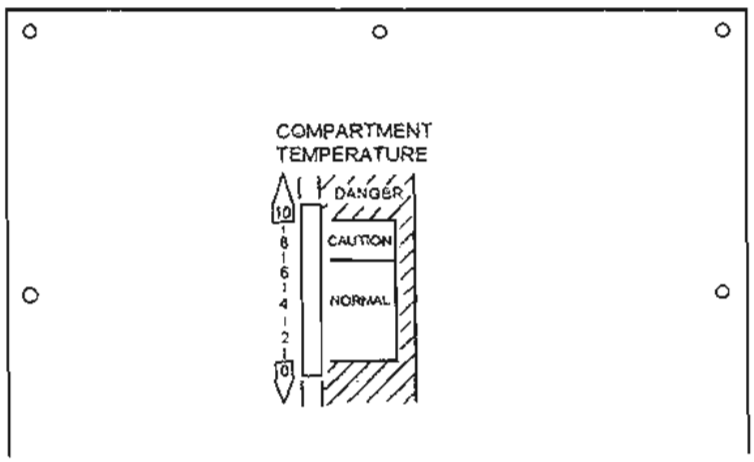
The alarm and thermometer will operate with or without the battery pack when power is provided to the unit.

(4) *Alarm/battery system test.* Push the lever of the alarm switch, located on the control panel, up to the test position. The temperature indicators will light sequentially and momentarily. The red alarm light will blink and the sound signal will beep. Push the lever of the alarm switch down to the reset position. The alarm mode will be off.

(5) *Connection to DC voltage.* For 12 VDC or 24/28 VDC, the red positive clip of the DC power cable must be connected to the positive (+) contact of the source, and the black negative clip, to the negative (-) contact of the source.

(6) *Connection to AC voltage.* For AC operation, the power supply is plugged into an AC line. Check and set correct voltage of the power supply before connecting the refrigerator. When correctly connected and powered, the green power indicator on the control panel will light, and the refrigerator will be in operation. The compartment temperature (fig 2-4) will be indicated by the color coded, solid state thermometer changing from

red to yellow to green in the normal range. The DC plug of the power supply must be connected to the 24/28 VDC receptacle (fig 2-5) of the control panel. The receptacle in the control panel marked TEMP is used to connect a remote temperature recorder or a remote thermometer.



2-5. Normal operation.

Operation is maintenance-free as long as the unit is properly connected to a correct power source. It will maintain a compartment temperature of 35.6°F (2°C) to 42.8° F (6°C).

2-6. Shut-down procedures.

Stopping the equipment requires unplugging it from its power source. It is advisable to remove the battery pack while unit is not in operation. If the unit is to be idle for an extended period of time, it is advisable to thoroughly wash the compartment with soap and water prior to storage.

Figure 2-4. Compartment temperature thermometer.

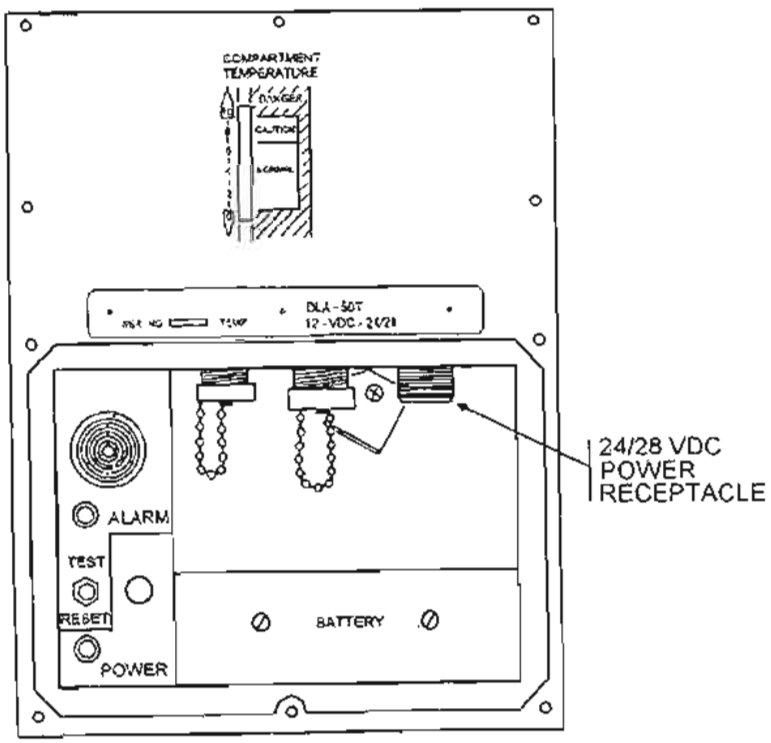


Figure 2-5. 24/28 VDC receptacle.

Section IV. OPERATION OF AUXILIARY EQUIPMENT

2-7. Associated support items of equipment.

The refrigerator requires no associated support items of equipment other than an electrical power generator, which is shared with multiple items of equipment for electrical power.

Section V. CLEANING AND DISINFECTING PROCEDURES

2-8. Cleaning and disinfecting.

a. The refrigerator should be clean at all times. Specific cleaning procedures are provided in subsequent paragraphs.

b. Follow your unit's standard operating procedures for the use of personal protective equipment when cleaning the refrigerator. Personal protective equipment may include goggles, mask, gloves, and gown or other suitable clothing.

c. Wipe the interior and exterior surfaces of the refrigerator periodically using a soft cloth dampened with soap and water.

CAUTION

Disconnect the power supply from its source of electrical power before using soap or detergent and water to clean exterior surfaces.

d. A detergent should be used to clean extremely soiled areas.

Section VI. OPERATION UNDER UNUSUAL CONDITIONS

2-9. General conditions.

The refrigerator is designed to operate only within specified ambient temperature range.

CHAPTER 3

UNIT LEVEL MAINTENANCE

Section I. GENERAL INFORMATION

3-1. Overview.

a. Unit level maintenance. This level of maintenance is the responsibility of and performed by a using unit on its assigned equipment. Responsibilities are stratified as follows:

(1) *Operator maintenance.* This segment of unit level maintenance is performed by operator/user personnel and consists of equipment operational functions; routine services like cleaning, dusting, washing, checking for frayed cables, and stowing items not in use; and checking for loose hardware, replacing operator accessories, and replacing operator repair parts. Replacing operator parts will not require extensive disassembly or assembly of the end item, critical adjustments after replacement, or the extensive use of tools.

(2) *Specialist maintenance.* This segment of unit level maintenance is performed only by trained Medical Equipment Repairers. The functions and services include—

(a) Scheduling and performing PMCS, electrical safety inspections and tests, and calibration/verification/certification (CVC) services.

(b) Performing unscheduled maintenance functions with emphasis on replacing assemblies, modules, or printed circuit boards (PCBs), when available.

(c) Operating a repair parts program to include Class VIII repair parts as well as other commodity class repair parts used on medical equipment.

(d) Maintaining a library of technical manuals (TMs), manufacturers' literature, repair parts information, and related materials.

(e) Conducting inspections on new or transferred equipment.

(f) Establishing administrative procedures for the control and administration of maintenance services in accordance with TB 38-750-2.

(g) Notifying support maintenance battalions of requirements and/or evacuating unserviceable equipment, assemblies, or modules.

b. Maintenance functions. Maintenance functions, both preventive and corrective, which are beyond the scope of the operator/user are assigned to unit level Maintenance Equipment Repairer personnel. These personnel will perform the majority of maintenance required for the equipment except some tasks involving the case and PCBs.

3-2. Tools and test equipment.

Common tools and test equipment required for unit level maintenance of the equipment are listed in appendix B, section III of this manual. Refer to your unit's modified table of organization and equipment (MTOE) for authorized items.

3-3. Components of end item and basic issue items.

Components of end item and basic issue items are listed in appendix C, sections II and III of this manual.

3-4. Expendable supplies.

Expendable and durable supplies and materials required for maintenance of the equipment are listed in appendix D, section II of this manual.

3-5. Repair parts.

Repair parts required for unit level maintenance are listed in appendix E, section II of this manual.

3-6. Special tools.

Special tools required for unit level maintenance of the equipment are listed in appendix E, section III of this manual.

Section II. SERVICE UPON RECEIPT OF EQUIPMENT

3-7. Unpacking the refrigerator.

a. Inspect the shipping box immediately for evidence of damage.

b. Place the carton in its upright position.

c. Cut the plastic packing bands.

d. Open the top flaps of the shipping box.

e. Lift the refrigerator upward out of the shipping box.

f. Open the refrigerator and remove all contents.

g. Ensure that the following components and/or accessories are with the refrigerator:

(1) Power supply, 1 each

(2) Maintenance manuals, 2 each

(3) Operational manuals, 2 each

(4) Wire basket, 1 each

(5) Power cable, DC, 1 each

(6) Temperature recorder, 1 each

Section III. LUBRICATION INSTRUCTIONS

3-8. General.

No lubrication of the refrigerator is required.

Section IV. PREVENTIVE MAINTENANCE CHECKS AND SERVICES

3-9. General.

a. The refrigerator must be inspected and serviced systematically to ensure that it is ready for operation at all times. Inspection will allow defects to be discovered and corrected before they result in serious damage or failure.

b. Table 3-1 contains a list of items to be performed by unit level operator/user personnel. This PMCS table is also referred to as "-10 PMCS" requirements. There are things operator/user personnel should do any time they need to be done, such as checking for general cleanliness, observing for improper operational indicators, and maintaining the proper quantities of operating supplies.

c. Table 3-2 contains a list of items to be performed by unit level Medical Equipment Repairers. This PMCS table is also referred to as "-20 PMCS" requirements.

d. Some items to be inspected will be listed in both table 3-1 and table 3-2 to stress their importance, to provide a quality control check on multiple operator/user personnel, and to identify more comprehensive procedures to be accomplished by unit level Medical Equipment Repairers.

e. The following is a list of the PMCS table column headings with a description of the information found in each column:

(1) *Item No.* This column shows the sequence in which to do the PMCS, and is used to identify the equipment area on the Equipment Inspection and Maintenance Worksheet, DA Form 2404.

(2) *Interval.* This column shows when each PMCS item is to be serviced: B - Before Operation, D - During Operation, A - After Operation, Q - Quarterly, and S - Semiannually. B, D, and A should be performed with daily use of the equipment.

NOTE

When the refrigerator must be kept in continuous operation, check and service only those items that will not disrupt operation. Perform the complete daily checks and services when the equipment can be shut down.

(3) *Item to be Inspected and Procedure.* This column identifies the general area or specific part to be checked or serviced.

(4) *Equipment is not Ready/Available If:* This column lists conditions that make the equipment unavailable or unusable.

Table 3-1. Operator preventive maintenance checks and services.

ITEM NO	INTERVAL					ITEM TO BE INSPECTED AND PROCEDURE	EQUIPMENT IS NOT READY/AVAILABLE IF:
	B	D	A	Q	S		
1						**Refrigerator.**	
	X		X		X	*a.* Ensure that all components and accessories are on hand.	Missing components or accessories prevent operation of the refrigerator.
	X				X	*b.* Test the alarm.	The alarm doesn't indicate an operating problem.
	X				X	*c.* Operate the unit.	The unit is inoperable.
2						**Case.**	
	X				X	*a.* Inspect the case for cracks, dents, and puncture holes.	Case damage prevents operation of the unit.
	X	X			X	*b.* Verify that the door cover closes and latches properly.	The door cover does not close or latch properly which prevents the correct storage compartment temperature.
3						**Power supply.**	
	X				X	Check the DC power cable for damaged connectors and deteriorated or frayed cabling.	A defective DC power cable prevents operation or causes an electrical hazard.

Table 3-2. Repairer preventive maintenance checks and services.

ITEM NO	INTERVAL					ITEM TO BE INSPECTED AND PROCEDURE	EQUIPMENT IS NOT READY/AVAILABLE IF:
	B	D	A	Q	S		
1					X	**Refrigerator.**	
						a. Verify that components and accessories have been inventoried by operator/user personnel.	Missing components or accessories prevent operation of the unit.
						b. Check the power indicator for proper operation.	An unserviceable power indicator prevents proper monitoring of unit operation.
						c. Test the alarm for proper operation.	The alarm would not indicate an operating problem.
						d. Verify accuracy of the thermometer.	A defective thermometer would not indicate the proper temperature.
						e. Check the battery pack for serviceability.	The battery pack would not provide temperature problem information during a power failure.
2					X	**Case.**	
						a. Check the case for structural integrity	Case damage or wear prevents operation or causes a safety hazard.
						b. Ensure that the door cover closes and latches properly.	A defective door cover prevents the proper temperature within the storage compartment.
3					X	**Power supply.**	
						a. Inspect the DC power cable for damaged connnectors or frayed cabling.	An unserviceable DC power cable prevents operation or causes an electrical hazard.
						b. Test the power supply for operation of the unit on AC voltages.	The power supply is unserviceable and the unit is operating in an alternate voltage environment.

3-10. Reporting deficiencies.

Operator/user personnel will report problems with the refrigerator discovered during their "-10 PMCS" that they are unable to correct. Refer to TB 38-750-2 and report the deficiency using the proper forms. Consult with your unit Medical Equipment Repairer if you need assistance.

Section V. TROUBLESHOOTING

3-11. General.

a. Troubleshooting information for refrigerator operator/user personnel and for Medical Equipment Repairer personnel is provided in this section. Corrective maintenance beyond the capability or authority of operator/user personnel will be indicated by the phrase "Notify your unit's Medical Equipment Repairer."

b. This manual cannot list all possible malfunctions. If a malfunction is either not listed or is not determined by routine diagnostic procedures, notify your appropriate maintenance support unit.

3-12. Operator/user troubleshooting.

Operator/user troubleshooting procedures are provided in table 3-3. Each symptom is followed by possible causes and corrective maintenance.

Table 3-3. Operator/user troubleshooting.

SYMPTOM POSSIBLE CAUSE CORRECTIVE MAINTENANCE
1. POWER INDICATOR LIGHT DOES NOT ILLUMINATE.
Defective DC power cable.
Acquire a replacement cable from another refrigerator or notify your unit's Medical Equipment Repairer.
Defective printed circuit board (PCB).
Notify your unit's Medical Equipment Repairer.
Defective power indicator light.
Notify your unit's Medical Equipment Repairer.
2. REFRIGERATOR IS INOPERATIVE.
Defective power source.
Check your source of electrical power or notify your unit's Medical Equipment Repairer.
Defective electronic component(s).
Notify your unit's Medical Equipment Repairer.
3. UNIT DOES NOT MAINTAIN TEMPERATURE.
Defective door cover.
Check that the door cover is properly latched and venting area is provided around the unit. If the problem continues, notify your unit's Medical Equipment Repairer.
Defective door cover gasket.
Notify your unit's Medical Equipment Repairer.
Thermoelectric assemblies clogged with dust and debris.
Notify your unit's Medical Equipment Repairer.
4. ALARM IS INOPERATIVE.
Defective control circuits.
Notify your unit's Medical Equipment Repairer.
Defective alarm components.
Notify your unit's Medical Equipment Repairer.

3-13. Medical Equipment Repairer troubleshooting.

Medical Equipment Repairer troubleshooting procedures are provided in table 3-4. Each symptom is followed by possible causes and corrective maintenance.

Table 3-4. Medical Equipment Repairer troubleshooting.

SYMPTOM POSSIBLE CAUSE CORRECTIVE MAINTENANCE
1. REFRIGERATOR IS INOPERATIVE.
Source of electrical power is defective.
Troubleshoot the source of electrical power and initiate repair action.
Defective DC power cable.
Repair or replace the cable.
Defective power supply.
Repair or replace the power supply.
Defective electronic circuitry or component.
Troubleshoot the unit and repair the electrical circuitry, replace defective components, or replace the PCB.
Defective circuit breaker.
Replace the circuit breaker.
Defective temperature control.
Troubleshoot the control and repair or replace as required.
2. UNIT DOES NOT MAINTAIN TEMPERATURE.
Defective cover door.
Replace cover door gasket.
Inadequate vent space around refrigerator.
Relocate refrigerator.
Thermoelectric assemblies clogged with dust and debris.
Clean thermoelectric assemblies.
Defective temperature control.
Troubleshoot temperature control and repair or replace as required.
3. POWER INDICATOR LIGHT INOPERATIVE (UNIT OPERATES).
Defective light.
Replace light.
Defective electronic circuitry.
Troubleshoot circuitry and repair as required.

Table 3-4. Medical Equipment Repairer troubleshooting - continued.

SYMPTOM POSSIBLE CAUSE CORRECTIVE MAINTENANCE
4. ALARM INOPERATIVE.
Defective electronic circuitry.
Troubleshoot the circuitry and repair as required.
Defective battery charger.
Repair or replace battery charger circuitry or components.
Defective battery.
Replace battery.
5. DEFECTIVE THERMOMETER/RECORDER.
Unit disconnected from refrigerator.
Reconnect thermometer/recorder.
Defective circuitry.
Troubleshoot unit and repair as required.

Section VI. CIRCUIT DESCRIPTIONS

3-14. Block diagram (fig 3-1).

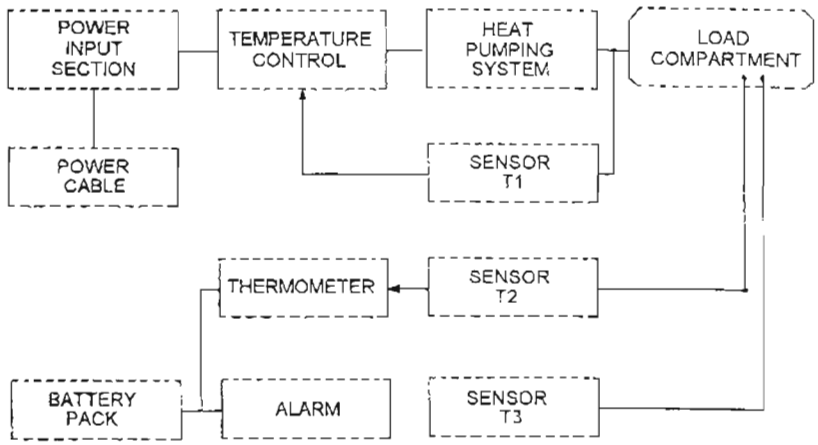


Figure 3-1. Block diagram.

a. A block diagram for the refrigerator is provided to assist you when troubleshooting. Isolate the problem to a functional segment of the circuitry.

b. Circuit descriptions are provided for the functional segments as well as individual component identification.

c. Functional description.

(1) The refrigerator utilizes a solid state thermoelectric effect in its heat pumping system. At high ambient temperatures, heat is pumped out of the compartment thereby cooling it. At low ambient temperatures, heating is achieved by reversing the pumped heat direction. The heat flow direction is controlled by the current direction

in the solid state heat pumping system (module) to keep the compartment temperature constant. The temperature control automatically determines the duty cycle and direction of the heat pumped.

(2) Sensor T1 reacts to the compartment temperature. It continuously provides the command signal to the temperature control.

(3) The power input section provides the refrigerator with the power source voltage by plugging the power cable of either the AC via the power supply or a DC source into the appropriate receptacle in the control panel. This section also provides the resettable overcurrent and reverse polarity protection.

(4) The alarm system and thermometer are powered by an independent battery pack to safeguard the temperature integrity of the compartment temperature. The thermometer measures and displays the compartment temperature. The input signal is fed from sensor T2 which senses the temperature inside the load compartment.

(5) An audio-visual alarm is triggered when the temperature inside the compartment falls outside the acceptable range of 35.6°F (2°C) to 42.8°F (6°C). The alarm is manually resettable.

(6) The alarm system and the thermometer are powered by a continuously recharging battery pack for standby operation during a power failure.

(7) Sensor T3 provides an output signal for an optional remote thermometer or recorder.

3-15. Heat pumping system.

a. The refrigerator utilizes the thermoelectric effect as its heat pumping device. When electric current passes through a junction of two dissimilar conductors, the thermocouple heat is absorbed and a cooling effect is produced at the junction.

b. The thermoelectric cooling couples (fig 3-2) are made of two elements of semiconductor material, primarily bismuth telluride, heavily doped to create an excess (N type) or deficiency (P type) of electrons. Heat absorbed at the cold junction, is pumped to the hot junction at a rate proportional to carrier current passing through the circuit, and the number of couples. Couples are connected in series electrically and in parallel thermally to form a thermoelectric module. The direction of the current flow dictates the heating mode of the load compartment under low temperature environmental conditions.

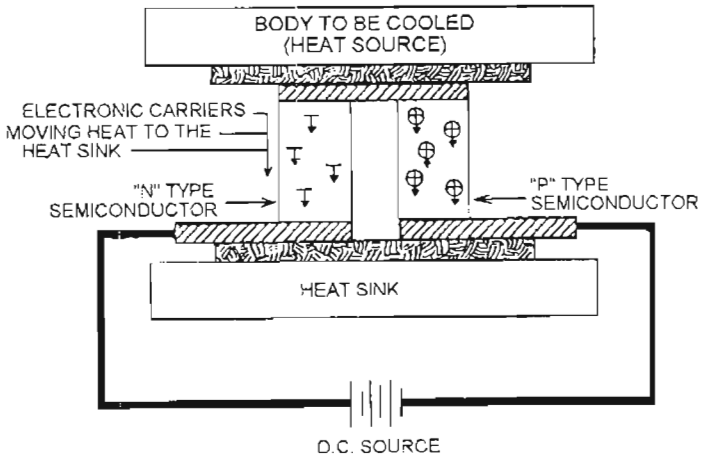


Figure 3-2. Thermoelectric cooling/heating couple.

3-16. Temperature control, thermometer, and alarm systems.

The control board (fig 3-3) provides the temperature control, thermometer, and alarm functions for the refrigerator. Refer to figure 3-4 for the component placement. The board is mounted on the inside of the control panel.

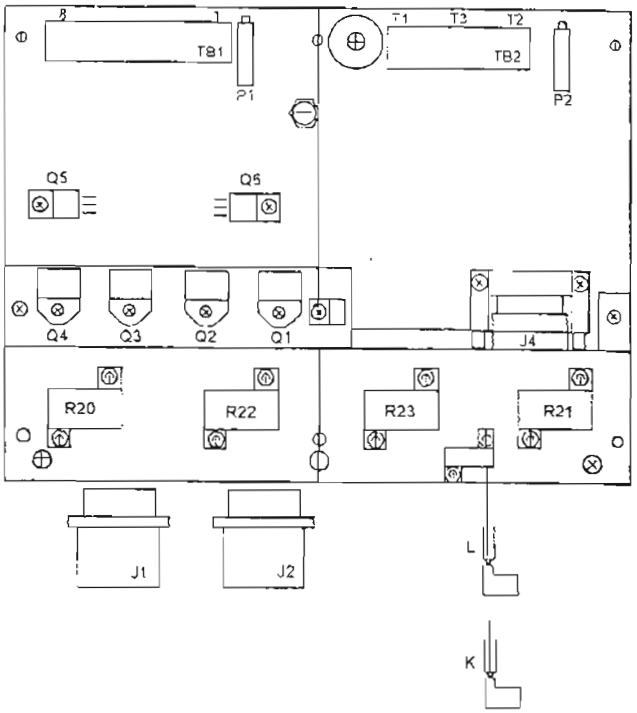
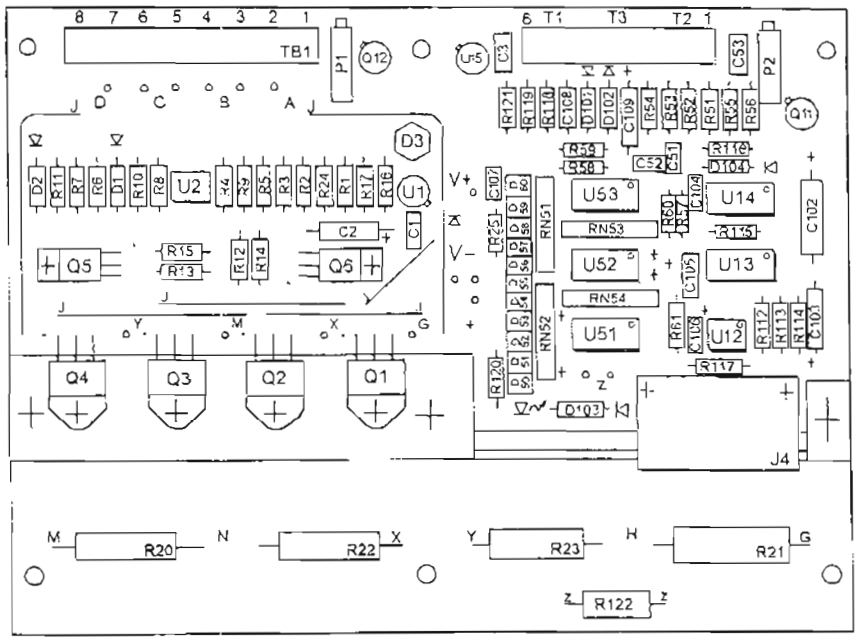


Figure 3-3. Control board.



NOTE D50 THRU D60 ARE MOUNTED ON THE CONDUCTOR SIDE

LEGEND

C - CAPACITOR
D - DIODE
P - POTENTIOMETER
Q - TRANSISTOR
R - RESISTOR
RN - RESISTOR NETWORK
TB - TERMINAL BOARD
U - INTEGRATED CIRCUIT

Figure 3-4. Component placement.

3-17. Temperature control section (fig 3-5).

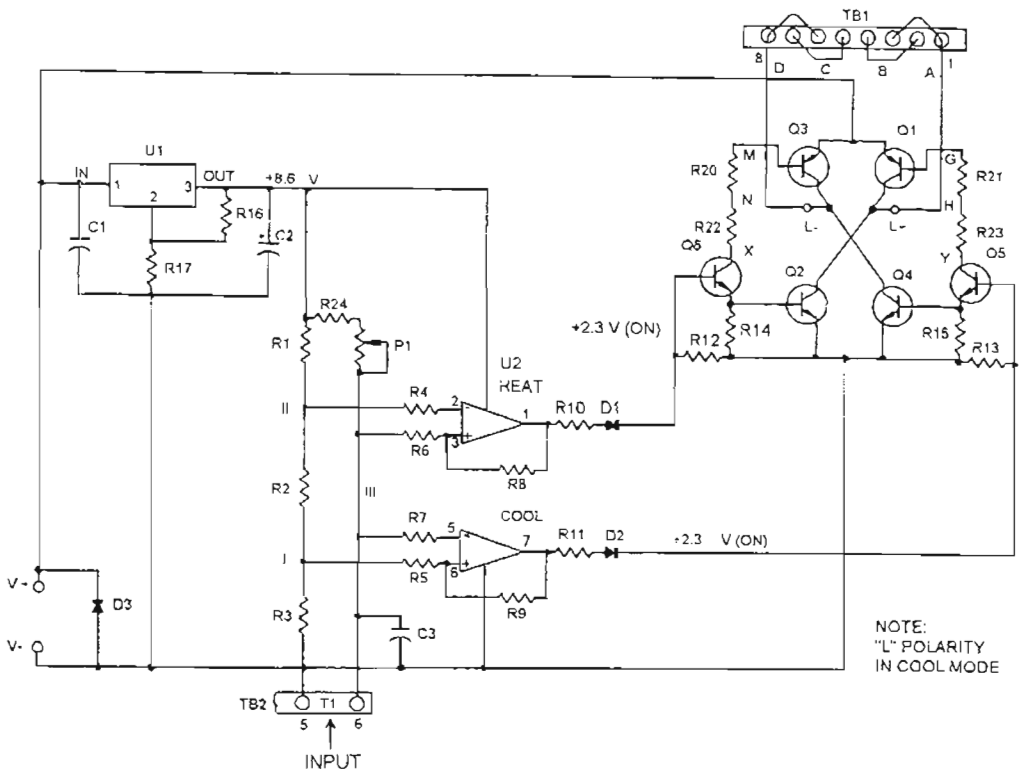


Figure 3-5. Temperature control section schematic.

a. The thermistor T1 senses the temperature at the control point. A change of temperature at T1 causes a change of its resistance and a corresponding voltage change at point "III" of the sensing bridge. The sensing bridge also consists of R1 and R3 with values close to the set point of T1, and P1 with R24 for the purpose of adjusting the set point. The bridge voltages are applied to the bipolar operational amplifiers (op-amps) U2 serving as voltage comparators. When the voltage "III" is higher than voltage "II", the system will operate in the heat mode. When the voltage "III" is lower than voltage "I", the system will operate in the cool mode. The gap between the two modes is determined by R2, and is directly proportional to the value of the resistor (fig 3-6).

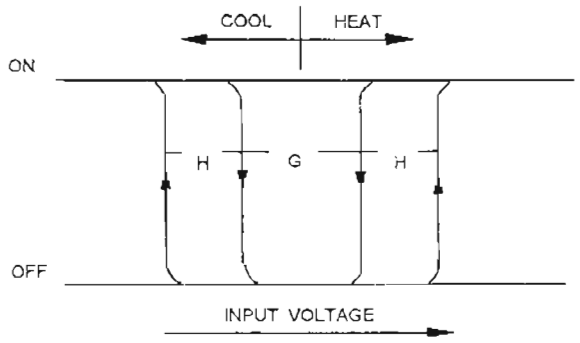


Figure 3-6. Control performance.

NOTE

P1 does not require any adjustment after initial setting.

b. The width "H" of the hysteresis loop represents the on-off temperature difference in the cool and heat modes. The width "G" represents the gap between the cool and heat modes. The built-in hysteresis assures that only one mode can be in operation at a time. R4, R5, R6, and R7 are input resistors and determine the hysteresis. The hysteresis width is directly proportional to the values of these resistors. R8 and R9 are positive feedback resistors.

c. R10 and R11 are current limiting resistors for U2. D1 and D2 establish the threshold and prevent backflow. The output of U2 is applied to the bases of Darlington drivers Q5 and Q6. R20, R21, R22, and R23 are current limiting resistors.

d. Transistors Q2 and Q3 conduct in the heat mode. Transistors Q1 and Q4 conduct in the cool mode.

e. U1 is the voltage regulator. The stabilized output voltage is supplied to the temperature control section.

f. D3 is a reverse voltage protection diode.

3-18. Thermometer section (fig 3-7).

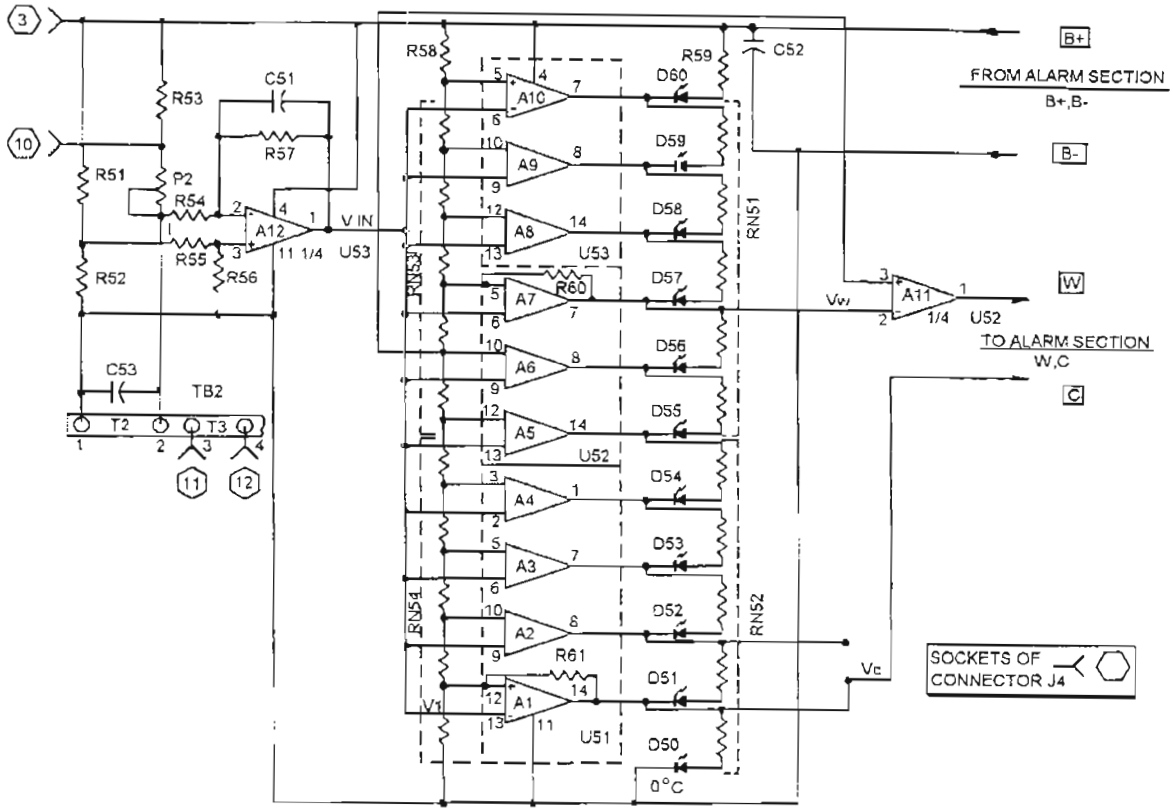


Figure 3-7. Thermometer section.

a. The thermistor T2 senses the compartment temperature. A change of the temperature at T2 causes a change of its resistance and a corresponding voltage change at point 1 of the sensing bridge.

b. Op-amp A12 (pins 1, 2 and 3) is connected as a differential amplifier whose inputs are fed from the bridge consisting of R51, R52, R53 and P2 for the purpose of adjusting the calibration point. The NTC thermistor connected to points T2 forms the variable arm of the bridge. With increasing temperature, the resistance of the thermistor decreases and the voltage across it falls, the ouput of the op-amp A12 increases.

c. The output voltage of the op-amp V-IN, is applied to the display array. When the V-IN is less than the threshold voltage V1 of the first op-amp A1, all op-amp outputs are high, and the first light emitting diode (LED) D50 will be on. As the V-IN increases and exceeds V1, the output of the first op-amp will conduct, thereby turning off the first LED and, at the same time, allow the second LED to turn on. As V-IN increases further and sequentially exceeds the individual threshold voltage of the op-amps, each LED will turn off when the next threshold voltage is achieved.

3-19. Alarm section (fig 3-8).

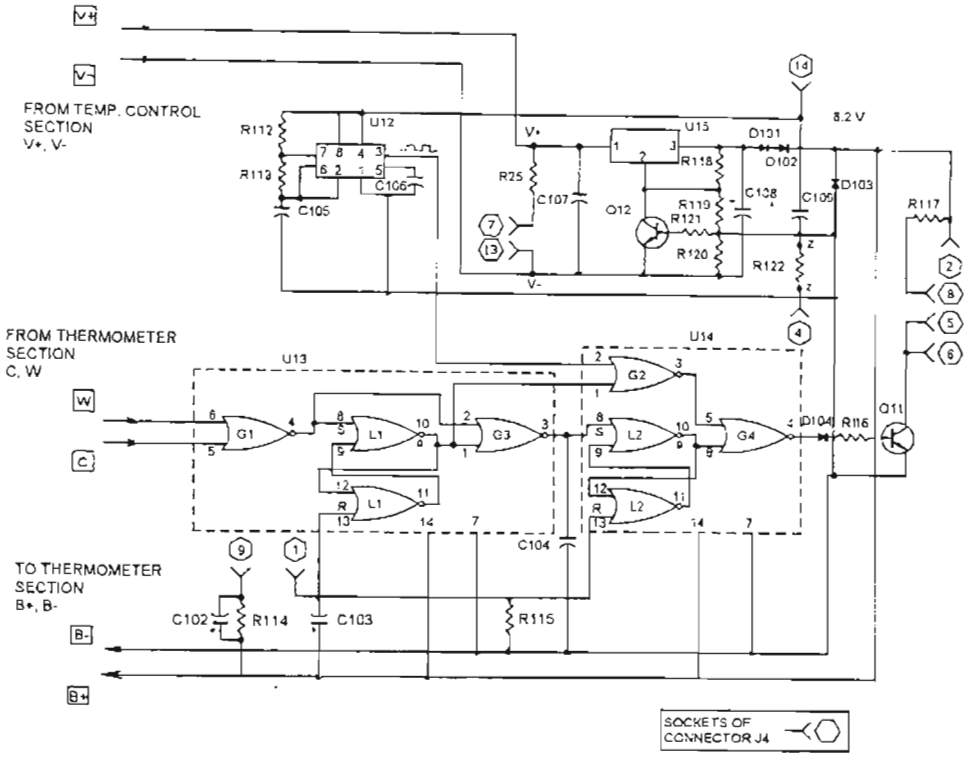


Figure 3-8. Alarm section.

a. The refrigerator incorporates an audio-visual alarm system, automatically activated when the compartment temperature falls outside the acceptable range. The alarm is powered continuously by recharging NiCad batteries. If the batteries are not inserted, the alarm system will operate on the power supplied to the unit.

b. The recharging battery pack should be in a charged condition when the unit is put in operation. The battery pack should be disconnected when the unit is not in operation.

c. The monitoring alarm point signals are taken from the thermometer section. When the temperature is above the acceptable range, the output of A7, W will be low. As the temperature enters the range, the output of A7 will go to high. This signal is inverted by op-amp A11. The inverted signal is applied to pin 6 of gate G1.

d. A temperature below the acceptable range will cause the output of A1, C to change from low to high. This signal is applied to pin 5 of gate G1.

e. The logic diagram (fig 3-9) shows the performance of the monitoring signals.

(1) *Switch on.* When the circuit is switched on, the capacitor C103 is charged and creates a pulse on pin 13 of latch L1 forcing the latch to reset. Pin 10 of L1 goes to high. This high is transferred to gates G2 and G3. G3 is low on pin 2, therefore, the output will be low. Latch L2 undergoes a similar reset, and the output at pin 10 will be high. The output of G4 at pin 4 will be low, and the alarm will be off.

(2) *Entering range.* When the temperature falls within the acceptable range, the output of the gate G1 on pin 4 will go to high. Pin 10 of L1 goes to low, therefore, the output of G3, with high on pin 2, will remain low. Latch L2 remains unchanged, and the alarm will remain off. At the moment of entering the range both inputs of G3 change simultaneously. The capacitor C104 suppresses the resulting narrow transient pulse at the output pin 3.

(3) *Leaving range.* A high will appear on the input of G1, causing a low on pin 4. Latch L1 remains unchanged. G3 will have both inputs low and a high will appear on the output at pin 3. Latch L2 is caused to change status and a low appears on output pin 10. Therefore, G4 is low on pin 6, and has pulses on pin 5. The

ouput of G4 will be pulsed signals on pin 4, which are applied to transistor Q11, driving the audio-visual signals D5 and D6. The pulses are provided by pulse generator U12, which provides 1Hz pulses with a 50% duty cycle.

(4) *Reset.* When the lever of S1 is pressed down to the reset position, a high pulse is created by pin 13 of L1 and L2, causing the resetting of the latches. The output of L1 will stay low. If the temperature is outside the range, L1 will change, and its output will go to high. L2 will go to high on pin 10. The alarm will remain off, and the system will be in the monitoring mode.

(5) *Test.* When the lever of S1 is pushed up to the test position, R53 is shortened, simulating a condition of entering and leaving the acceptable range. The system will therefore go into, and stay in the alarm mode until the lever is pressed down to the reset position. The current limited voltage regulator U15, provides 8.2 VDC to the thermometer and alarm sections, and supplies a charge current to the NiCad battery pack. D103 is a reverse voltage protection diode. R122 protects the NiCad batteries against short circuits.

3-20. Remote thermometer/recorder connection (fig 3-10).

The refrigerator incorporates a temperature sensor T3, to remotely monitor the compartment temperature. The connection to the sensor is provided through the connector J3 marked TEMP on the control panel. This connector also provides power for a remote temperature recorder or a remote thermometer (fig 3-11).

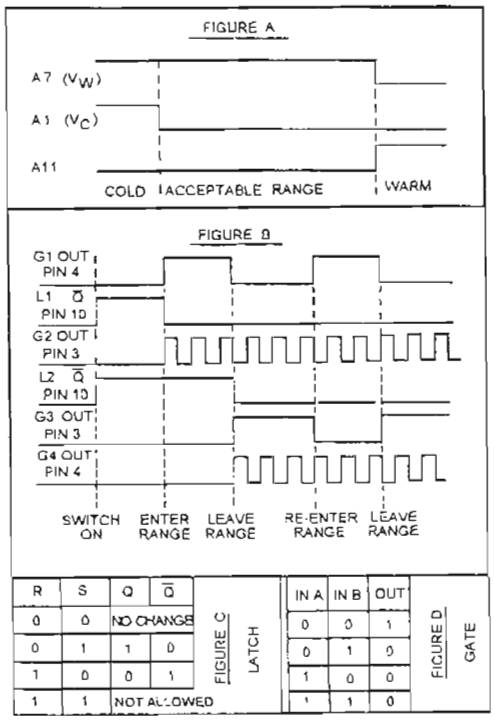


Figure 3-9. Logic diagram.

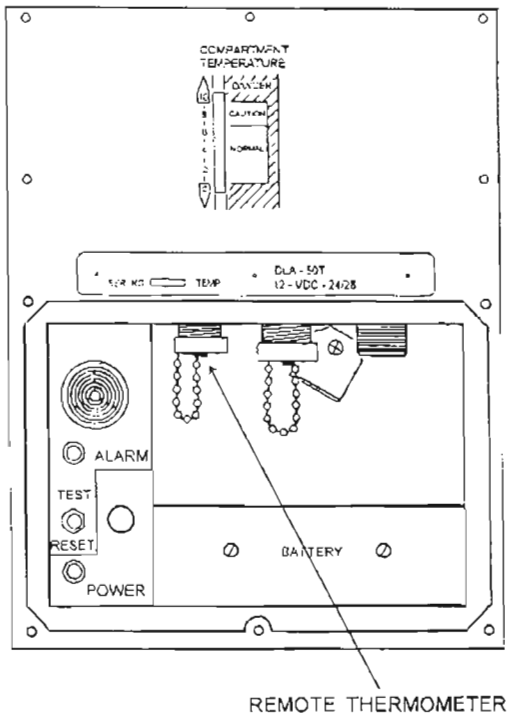


Figure 3-10. Remote thermometer/recorder connection.

Section VII. POWER SUPPLY

3-21. Power supply description.

a. The rectifier signed specifically to provide the power to operate the refrigerator from a 120 VAC or 220 VAC, 50/60 Hz in sheltered environments. The input voltage is selectable by the AC select switch of the power supply (fig 3-12).

b. The power supply is well protected within a closed metal box. Two cables extend from the unit. One cable connects the main AC source to the power supply, and one cable connects the power supply to the 24/28 VDC receptacle of the control panel (fig 3-13) marked 24/28 VDC.

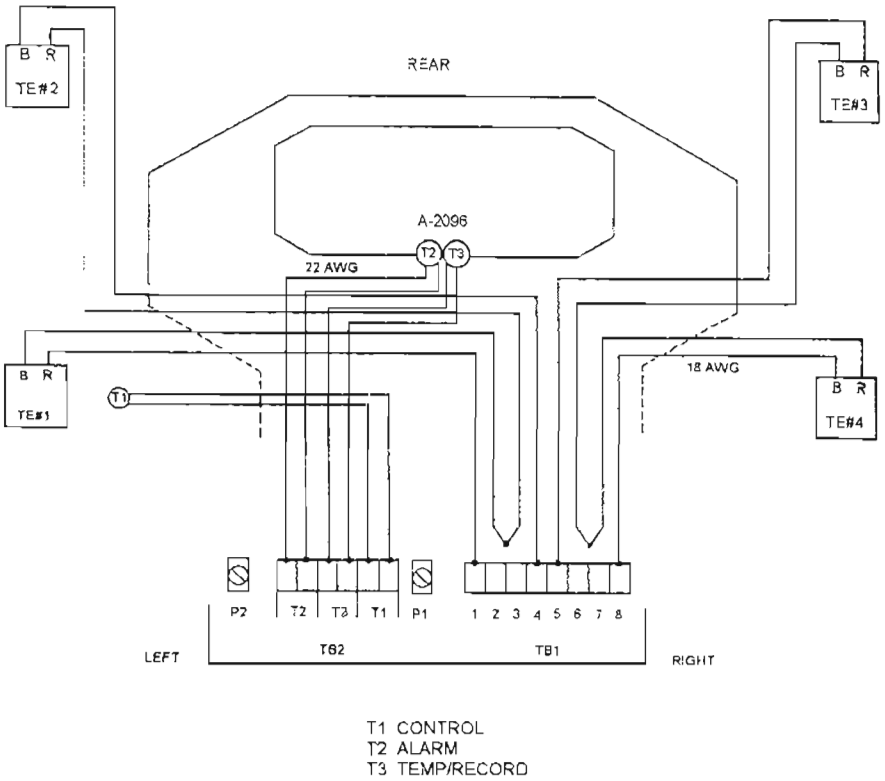


Figure 3-11. Remote thermometer/recorder connection schematic.

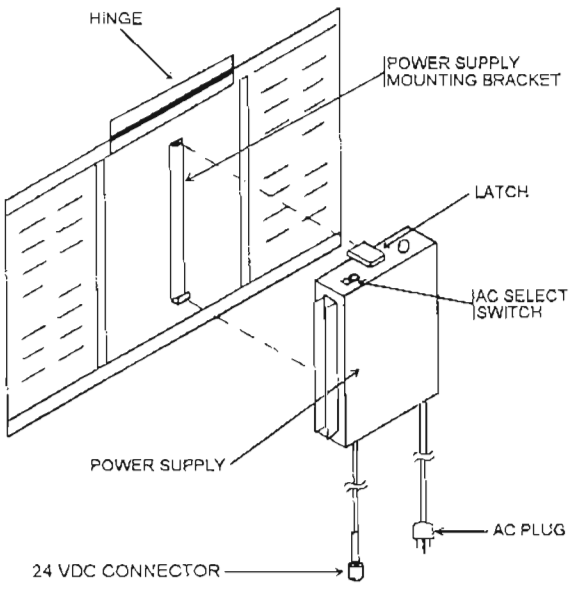


Figure 3-12. Power supply.

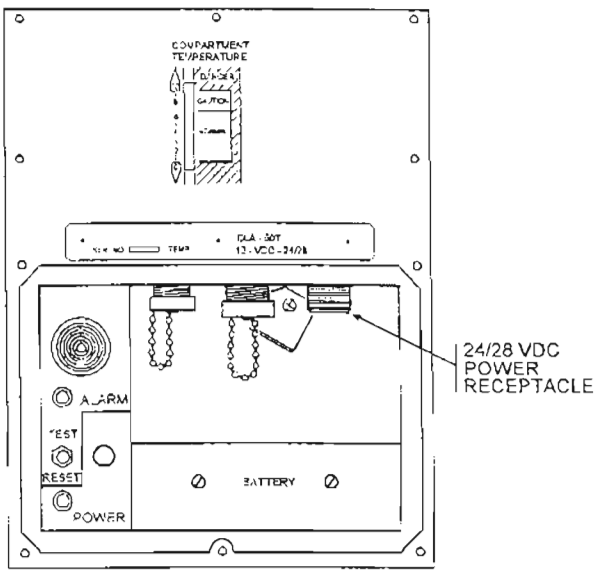


Figure 3-13. 24/28 VDC receptacle.

3-22. Installation.

a. The power supply is mounted on the back of the refrigerator. When correctly mounted, the mounting latch (fig 3-14) will be on top. Insert the slotted spacer plate into the mounting bracket on the back of the unit and fasten the latch located on the top of the power supply assembly.

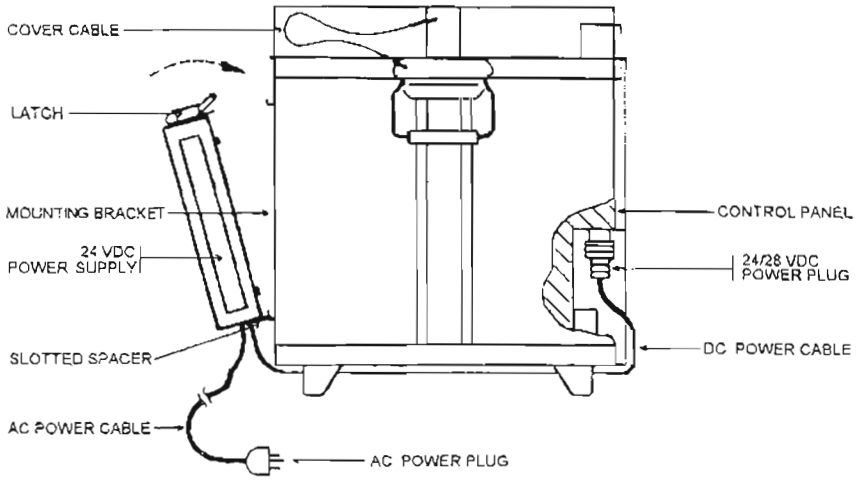


Figure 3-14. Mounting latch.

b. Both cables, the AC power cable and the DC power cable, will come out the bottom of the power supply when mounted correctly.

c. Connect the DC power cable to the 24/28 VDC receptacle of the control panel.

d. Set the AC selection switch to the correct AC voltage line, plug in to operate the unit.

e. Refer to power supply schematic (fig 3-15).

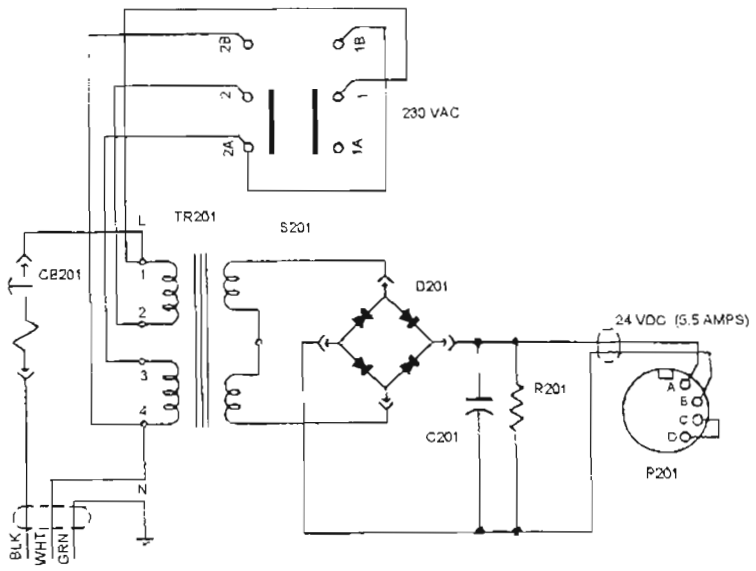


Figure 3-15. Power supply schematic.

Section VIII. RECORDER

3-23. Recorder activation description.

a. The refrigerator temperature recorder is a highly reliable instrument. The drive mechanism is tested and adjusted to close tolerances. The temperature coil is welded into place and cannot get out of adjustment. The recorder will provide a hard copy of the temperature maintained within the storage compartment (fig 3-16) of the refrigerator.

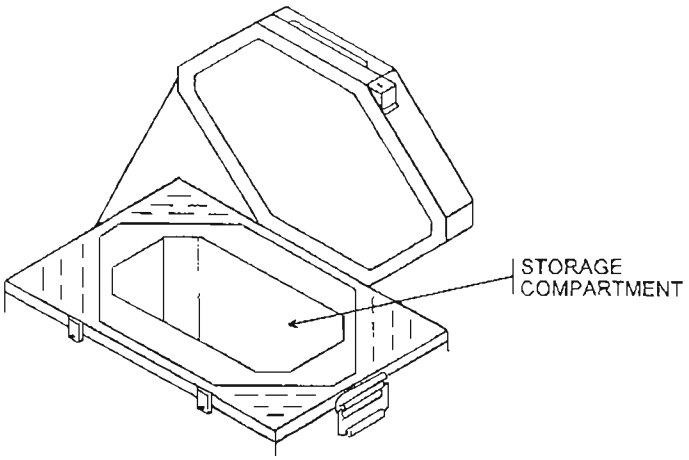


Figure 3-16. Storage compartment.

b. To obtain a hard copy, activate the recorder by following the instructions on the recorder. Place the activated recorder into the storage compartment (together with load). A hard copy will be generated from the moment of activation. The recorder will continue to produce the hard copy for 10 days. It will record the temperature of the storage compartment for as long as it is left inside the storage compartment up to 10 days.

3-24. Removal.

The recorder may be removed from the storage compartment at any time. Once removed, it will record the surrounding temperature for as long as it is left outside the storage compartment. To remove the hard copy from the recorder, follow the instructions listed on the recorder.

Section IX. REPAIR PROCEDURES

3-25. Maintenance information.

a. Procedures for disassembly, repair, or replacement of components, services, and reassembly are provided in this section of the manual.

b. Repair procedures are continuous from the first disassembly step to the final step.

3-26. Thermoelectric assembly.

a. Locating a defective thermoelectric assembly.

(1) Remove the ten screws securing the control panel (fig 3-17) to the unit.

(2) Carefully pull the panel back by 1/2 inch, top end only, to expose the terminal block TB1 (fig 3-18).

(3) Disconnect wires 1 and 4 from TB1 and connect them to a 12 VDC power source. The current reading should be 2-3 amps.

(4) Repeat step 3 with wire pair 5-8.

(5) Determine the pair with the defective thermoelectric assembly.

(6) Cut the connection between the two thermoelectric assemblies behind the control panel, wires 2-3 or 6-7 respectively.

(7) Connect a 6 VDC power source to the leads of each thermoelectric assembly between 1-2, 3-4, 5-6, and 7-8.

(8) Determine the defective thermoelectric assembly.

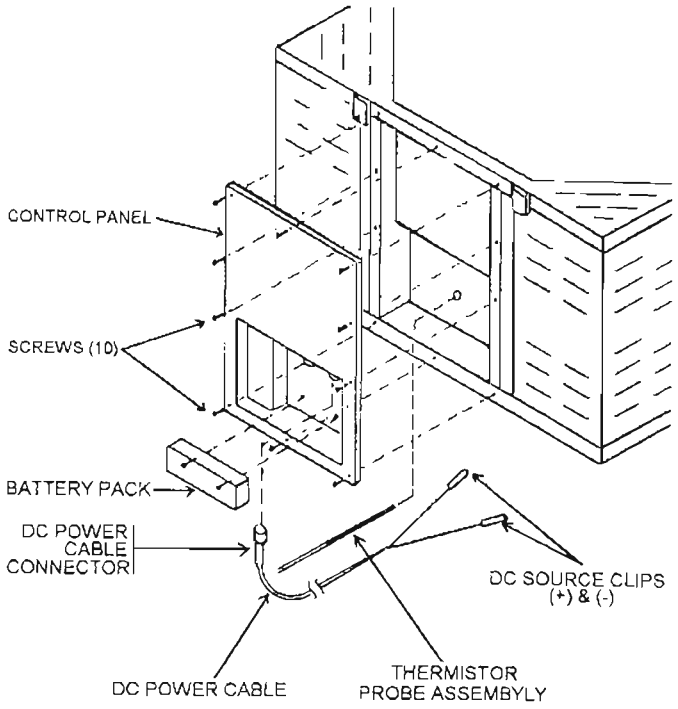


Figure 3-17. Removal of control panel.

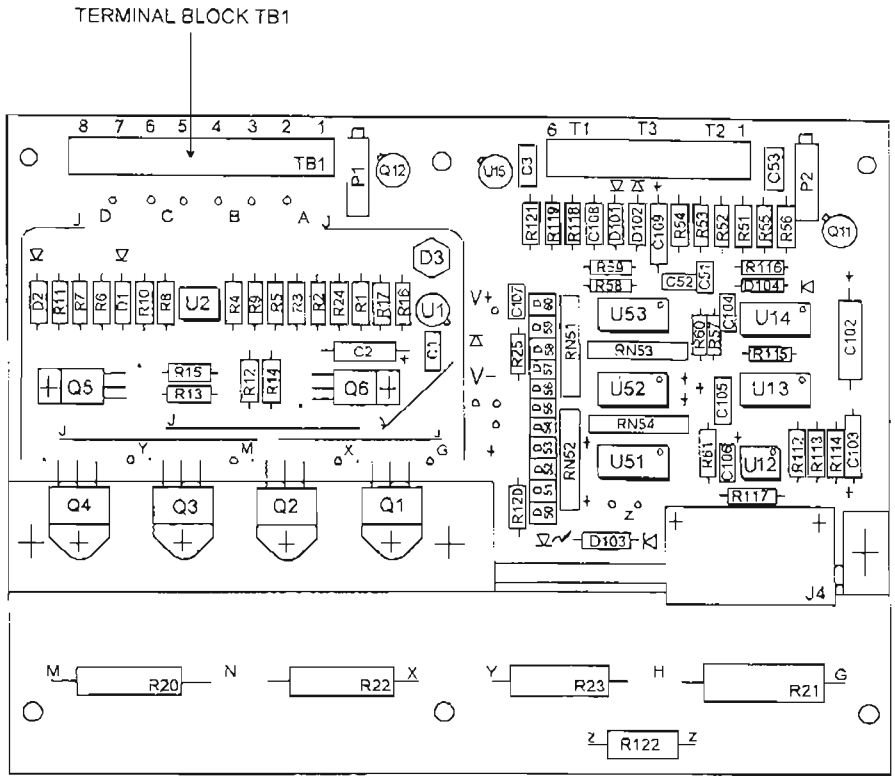


Figure 3-18. Terminal block TB1.

b. Removing a thermoelectric assembly.

(1) Drill out 10 pop rivets, securing a corner cover (fig 3-19) to the unit. Use a 1/8 inch diameter drill. Remove corner cover.

(2) Remove the 10 screws fastening the control panel.

(3) Remove the 4 screws located inside the cooling compartment securing the defective thermoelectric assembly.

(4) Remove the thermoelectric assembly from the unit, pulling the red and black wiring out of the insulation foam.

c. Replacing the thermoelectric assembly.

(1) Thoroughly wipe clean the top surface of the module support (fig 3-20) and the mounting surface in the corner mounting cavity.

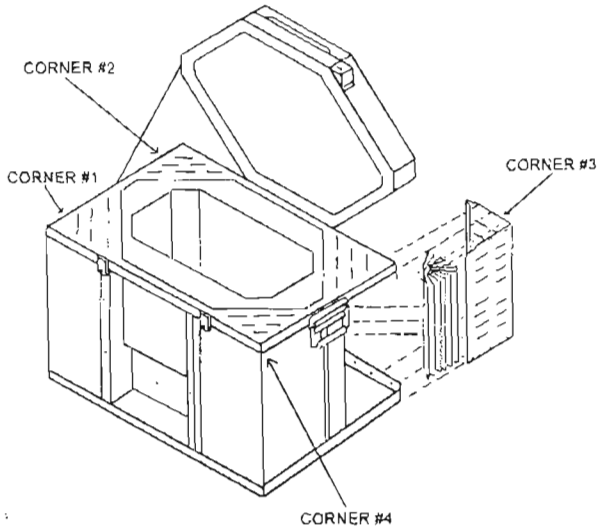


Figure 3-19. Corner covers.

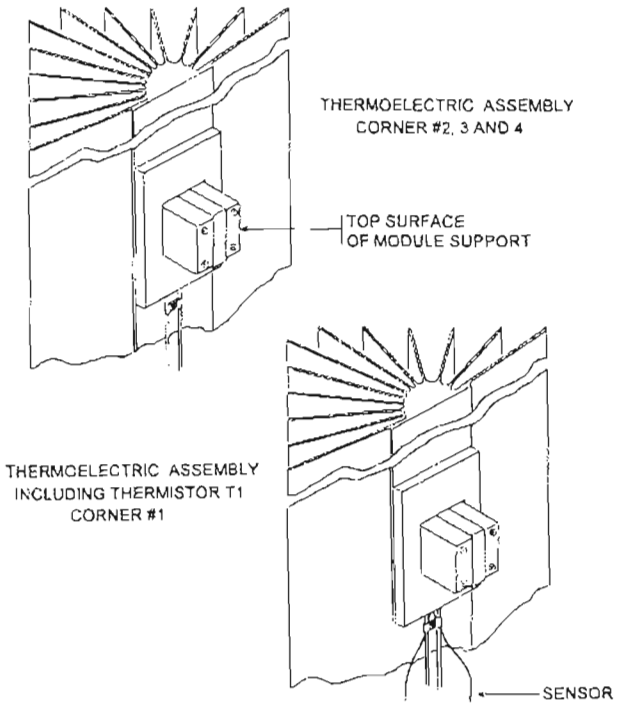


Figure 3-20. Thermoelectric assembly.

(2) Apply a thin, uniform film of thermal compound to the top surface of the module support and to the mounting surface.

(3) Thread the thermoelectric assembly red and black lead wires through the insulating foam, into the control panel cavity.

(4) Position the thermoelectric assembly in the mounting cavity, and tighten four screws from the inside of the cooling compartment.

(5) Splice the thermoelectric assembly's leads, and apply tape over the connections.

(6) Secure the corner cover with 1/8 inch pop rivets.

(7) Reconnect 1, 4, 5, and 8 wires to TB1.

(8) Secure the control panel with 10 screws to the unit.

NOTE

Thermoelectric assembly A-2437 is for corner #1. Thermoelectric assembly A-2436 is for corners #2, #3, and #4. Refer to figures 3-19 and 3-20.

3-27. Temperature control thermistor (T1).

a. Check for a defective thermistor (T1).

(1) Remove 10 screws securing the control panel (fig 3-17) to the unit.

(2) Carefully pull the panel back by 1/2 inch, to expose TB2 (fig 3-21).

(3) Disconnect wires T1 from TB2 and check resistance. Meter should read 10K ohms at 77°F (25°C).

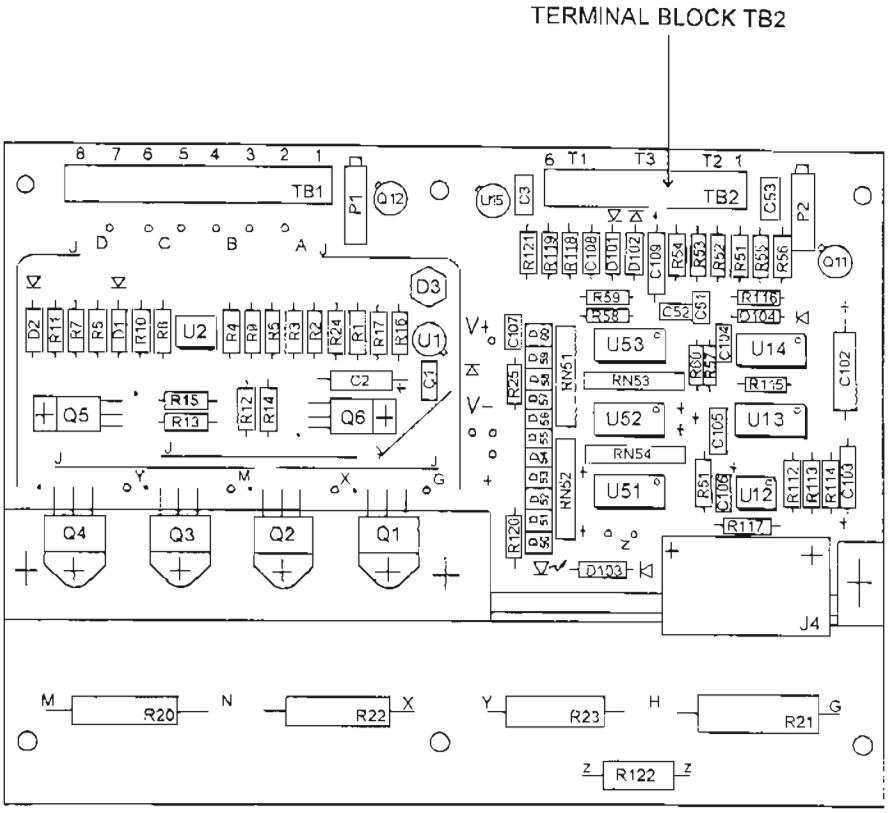


Figure 3-21. Terminal block TB2.

b. Replace the thermoelectric assembly including thermistor T1.

(1) Drill out 10 pop rivets, securing the front left corner cover (#1) to the unit. Use a 1/8 inch drill. Remove corner cover.

(2) Remove 4 screws securing the thermoelectric assembly #1 from the inside of the cooling compartment.

(3) Remove the thermoelectric assembly from the unit.

(4) Thoroughly wipe clean the top surface of the module support (fig 3-20) and the mounting surface in the corner mounting surface.

(5) Apply a thin, uniform film of thermal compound to the top surface of the module support and to the mounting surface.

(6) Thread the thermoelectric assembly red and black lead wires with the thermistor wires through the insulating foam, into the control panel cavity.

(7) Position the thermoelectric assembly in the mounting cavity, and tighten four screws from the inside of the cooling compartment.

(8) Splice the thermoelectric assembly's leads, and apply tape over the connections.

(9) Secure the corner cover with 1/8 inch pop rivets.

(10) Reconnect 1 and 4 wires to TB1, and the T1 wires to TB2.

(11) Secure the control panel with 10 screws to the unit.

3-28. Thermometer thermistor (T2).

a. Check for a defective thermistor (T2).

(1) Remove 10 screws securing the control panel (fig 3-17) to the unit.

(2) Carefully pull the control panel back by 1/2 inch, to expose the TB2 (fig 3-21).

(3) Disconnect wire T2 and TB2 and check resistance. Meter should read 10K ohms at 77°F (25°C).

b. Replace the thermistor (T2).

(1) Disconnect wires T3 from TB2.

(2) Remove the faulty thermistor probe assembly from the housing tube by pulling the assembly out of the tube.

(3) Install new thermistor probe assembly (A-2223) into the housing tube.

(4) Reconnect wires T2 and T3 to TB2.

(5) Reset thermometer with P2. To lower temperature setting, turn 3 turns clockwise or counterclockwise for approximately 1°F change.

(6) Secure the control panel with 10 screws to the unit.

3-29. Thermometer/recorder thermistor (T3).

a. Check for a defective thermistor (T3).

(1) Remove 10 screws securing the control panel (fig 3-17) to the unit.

(2) Carefully pull the control panel by 1/2 inch, to expose the TB2 (fig 3-21).

(3) Disconnect wire T3 from TB2 and check resistance. Meter should read 3K ohms at 77°F (25°C).

b. Replace the thermistor (T3).

(1) Disconnect wires T2 from TB2.

(2) Remove the faulty thermistor probe assembly from the housing tube by pulling the assembly out of the tube.

(3) Install new thermistor probe assembly (A-2223) into probe housing tube, reconnect wires T2 and T3 to TB2.

(4) Secure the control panel with 10 screws to the unit.

Section X. STORING AND SHIPPING PROCEDURES

3-30. Preparation for storing.

a. Shut down the refrigerator by following the procedures in chapter 2, section III of this manual.

b. Inventory the components and accessories. Replace unserviceable or missing items.

c. Remove the batteries from the battery pack.

d. Clean the refrigerator using the cleaning and disinfecting procedures in chapter 2, section V of this manual.

e. Pack the refrigerator and components for storage.

3-31. Preparation for shipping.

a. The refrigerator packed in the original shipping cartons is suitable for shipping.

b. The refrigerator packed in a military chest or other available container will be appropriately packed for shipping Notify your unit transportation point for assistance, if necessary.

CHAPTER 4

DIRECT SUPPORT AND GENERAL SUPPORT MAINTENANCE

Section I. GENERAL INFORMATION

4-1. Overview.

This chapter provides for maintenance that is beyond the capability, capacity, and authorization for unit level maintenance personnel. The procedures in this chapter should not be attempted at the unit level.

4-2. Tools and test equipment.

Common tools and test equipment required for support maintenance of the equipment are listed in appendix B, section III. Refer to your unit's MTOE or installation table of distribution and allowances (TDA) for authorized items.

4-3. Components of end item and basic issue items.

Components of end item and basic issue items are listed in appendix C, sections II and III.

4-4. Expendable supplies.

Expendable and durable supplies and materials for support maintenance are listed in appendix D, section II

4-5. Repair parts.

Repair parts required for support maintenance are listed in appendix E, section II.

4-6. Special tools.

Special tools required for support maintenance are listed in appendix E, section III.

Section II. MAINTENANCE PROCEDURES

4-7. General.

a. There are no specific troubleshooting procedures for these levels of maintenance.

b. Repair procedures for the case or thermoelectric assemblies have not been developed.

APPENDIX A

REFERENCES

A-1. Army regulations.

AR 40-61	Medical Logistics Policies and Procedures
AR 710-2	Supply Policy Below the Wholesale Level
AR 725-50	Requisitioning, Receipt, and Issue System
AR 750-1	Army Materiel Maintenance Policy and Retail Maintenance Operations

A-2. Technical manual.

TM-DPSC-6500-RPL	Medical Materiel: Medical Repair Parts Reference List

A-3. Technical bulletins.

TB MED 7	Maintenance Expenditure Limits for Medical Materiel
TB 8-6500-MPL	Mandatory Parts List for Medical Equipment
TB 38-750-2	Maintenance Management Procedures for Medical Equipment
TB 740-10/DLAM 4155.5/AFR 67-43	Quality Control, Depot Storage Standards, Appendix M, Medical Supplies

A-4. Field manual.

FM 21-11	First Aid for Soldiers

A-5. Supply bulletin.

SB 8-75-( )-series	Army Medical Department Supply Information

A-6. Other publication.

(This publication may be obtained from U.S. Army Medical Materiel Agency, 1423 Sultan Drive, Suite 100, ATTN: MCMR-MMM, Fort Detrick, MD 21702-5001.)

Maintenance Manual, Solid State Refrigerator, Biomedical, Drugs, and Whole Blood, PN A- 2244-2, PN A-2160-3, and PN A-2244-3, Thermopol Inc., 2468 Delta Lane, Elk Grove Village, IL 60007

APPENDIX B

MAINTENANCE ALLOCATION CHART

Section I. INTRODUCTION

B-1. General.

a. This section provides a general explanation of all maintenance and repair functions authorized at various maintenance levels.

b. Section II designates overall responsibility for the performance of maintenance functions on the identified end item or component. The implementation of the maintenance functions upon the end item or component will be consistent with the assigned maintenance levels.

c. Section III lists the tools and test equipment required for each maintenance function as referenced from section II.

d. Section IV contains supplemental instructions, explanatory notes, and/or illustrations required for a particular maintenance function.

B-2. Explanation of columns in section II.

a. Group Number, Column 1. The assembly group number (Group No.) column is a numerical group assigned to each assembly. The applicable assembly groups are listed in the maintenance allocation chart (MAC) in disassembly sequence beginning with the first assembly removed in a top down disassembly sequence.

b. Assembly Group, Column 2. This column contains a brief description of the components of each assembly group.

c. Maintenance Functions, Column 3. This column lists the various maintenance functions (A through K) and indicates the lowest maintenance level authorized to perform these functions. The symbol designations for the various maintenance levels are as follows:

C - Operator or crew

O - Unit maintenance

F - Direct support maintenance

H - General support maintenance

D - Depot maintenance

The maintenance functions are defined as follows:

A - Inspect. To determine serviceability of an item by comparing its physical, mechanical, and electrical characteristics with established standards.

B - Test. To verify serviceability and to detect electrical or mechanical failure by use of test equipment.

C - Service. To clean, to preserve, to charge, and to add lubricants, cooling agents, and air. If it is desired that elements, such as painting and lubricating, be defined separately, they may be so listed.

D - Adjust. To rectify to the extent necessary to bring into proper operating range.

E - Align. To adjust specified variable elements of an item to bring it to optimum performance.

F - Calibrate. To determine the corrections to be made in the readings of instruments or test equipment used in precise measurement. Consists of the comparison of two instruments, one of which is a certified standard of known accuracy, to detect and adjust any discrepancy in the accuracy of the instrument being compared with the certified standard.

G - Install. To set for use in an operational environment such as tents or International Standards Organization shelters.

H - Replace. To replace unserviceable items with serviceable like items.

I - Repair. Those maintenance operations necessary to restore an item to serviceable condition through correction of material damage to a specific failure. Repair may be accomplished at each level of maintenance.

J - Overhaul. Normally the highest degree of maintenance performed by the Army in order to minimize time work in process consistent with quality and economy of operation. It consists of that maintenance necessary to restore an item to completely serviceable condition as prescribed by a maintenance standard in technical publications for each item of equipment. Overhaul normally does not return an item to like new condition.

K - Rebuild. The highest degree of material maintenance. It consists of restoring equipment as nearly as possible to new condition in accordance with original manufacturing standards. Rebuild is performed only when required by operational considerations or other paramount factors and then only at the depot maintenance level.

d. Tools and Equipment, Column 4. This column is provided for referencing by code, the tools and test equipment (sec III) required to perform the maintenance functions.

e. Remarks, Column 5. This column is provided for referencing by code, the remarks (sec IV) pertinent to the maintenance functions.

B-3. Explanation of columns in section III.

a. Reference Code, Column 1. This column correlates to section II, column 4.

b. Maintenance Level, Column 2. This column identifies the maintenance levels using the tools and test equipment.

c. Nomenclature, Column 3. This column identifies the tools and test equipment.

d. National Stock Number, Column 4. This column provides the national stock number of the specific tools or test equipment.

B-4. Explanation of columns in section IV.

a. Reference Code, Column 1 This column correlates to section II, column 5.

b. Remarks, Column 2. This column provides supplemental information or explanatory notes pertinent to the maintenance function in section II.

Section II. MAINTENANCE ALLOCATION CHART FOR REFRIGERATOR

(1) GROUP NO.	(2) ASSEMBLY GROUP	(3) MAINTENANCE FUNCTIONS A	B	C	D	E	F	G	H	I	J	K	(4) TOOLS AND EQUIPMENT	(5) REMARKS
00	Refrigerator	O 0.3	O 0.6	O 0.5					O 1.0	O 1.4	F 5.2	D 11.4	01,02,03, 04	A,B
01	Thermoelectric Assembly		O 0.6						O 1.1			D 2.2		
02	Temperature Control Thermistor		O 0.3						O 0.4					
03	Thermometer Thermistor		O 0.3						O 0.4					
04	Thermometer/ Recorder Thermistor		O 0.3						O 0.4					
05	Power Supply		O 0.3						O 0.2		D 1.6			
06	Cover													
	Latch		O 0.2						O 0.6	F 0.3				
	Hinge		O 0.2						O 0.6	F 0.8				

Section III. TOOLS AND TEST EQUIPMENT FOR REFRIGERATOR

(1) REFERENCE CODE	(2) MAINTENANCE LEVEL	(3) NOMENCLATURE	(4) NATIONAL STOCK NUMBER
01	O,F,H,D	Tool Kit, Medical Equipment Maintenance and Repair: Repairmans	5180-00-611-7923
02	O,F,H,D	Tool Kit, Medical Equipment Maintenance and Repair: Organizational	5180-00-611-7924
03	O,F,H,D	Multimeter, AN/USM 486	6625-01-145-2430
		or	
		Multimeter, AN/PSM 45A	6625-01-265-6000
04	O,F,H,D	Tester, Current Leakage, TS 2514/P	6625-01-142-8233

Section IV. REMARKS FOR REFRIGERATOR

(1) REFERENCE CODE	(2) REMARKS
A	Tools and test equipment are listed for each assembly group.
B	Perform an annual electrical safety inspection and test. Perform the inspection and test after repair or replacement of electrical/electronic components.

APPENDIX C

COMPONENTS OF END ITEM AND BASIC ISSUE ITEMS LIST

Section I. INTRODUCTION

C-1. Scope.

This appendix lists components of end item and basic issue items for the equipment to help you inventory items required for safe and efficient operation.

C-2. General.

The Components of End Item and Basic Issue Items lists are divided into the following sections:

a. Section II. Components of End Item. These items are part of the end item, but are removed and separately packaged for transportation or shipment. As part of the end item, these items must be with the end item whenever it is issued or transferred between property accounts.

b. Section III. Basic Issue Items. These are the minimum essential items required to place the equipment in operation, to operate it, and to perform emergency repairs. Basic issue items must be with the equipment during operation and whenever it is transferred between property accounts. This manual is your authority to request or requisition basic issue items, based on MTOE authorization of the end item.

C-3. Explanation of columns.

The following provides an explanation of columns found in both listings:

a. Item Number, Column 1. This column indicates the item number assigned to the item.

b. National Stock Number, Column 2. This column indicates the national stock number assigned to the item.

c. Description, Column 3. This column indicates the federal item name and, if required, a minimum description to identify and locate the item. The last line for each item indicates the commercial and government entity (CAGE) code in parentheses followed by the part number.

d. Unit of Measure, Column 4. This column indicates the unit of measure used in performing the actual operational or maintenance function. This measure is expressed by a two-character alphabetical abbreviation. These abbreviations are listed in the glossary.

e. Quantity, Column 5. This column indicates the quantity (QTY) of the item(s) provided with the equipment.

Section II. COMPONENTS OF END ITEM FOR REFRIGERATOR

(1) ITEM NUMBER	(2) NATIONAL STOCK NUMBER	(3) DESCRIPTION	(4) UNIT OF MEASURE	(5) QTY
1	6680-01-184-1780	Power Supply (97484) PS-50B	EA	1
2		Wire Basket (97484) WB-30B	EA	1
3	5985-01-024-4503	Power Cable, DC (97484) PC-30B	EA	1
4		Recorder (Temperature) (97484) DTR-50-10	EA	1

Section III. BASIC ISSUE ITEMS FOR REFRIGERATOR

(1) ITEM NUMBER	(2) NATIONAL STOCK NUMBER	(3) DESCRIPTION	(4) UNIT OF MEASURE	(5) QTY
1		Maintenance Manual (0HAP0) DLA-50T-MMI	EA	2
2		Operational Manual (0HAP0) DLA-50T-OP1	EA	2

APPENDIX D

EXPENDABLE AND DURABLE SUPPLIES AND MATERIALS LIST

Section I. INTRODUCTION

D-1. Scope.

This appendix lists expendable and durable supplies and materials that are required to maintain the equipment. This listing is authorization to requisition and retain the items if not otherwise authorized.

D-2. Explanation of columns.

a. Item Number, Column 1. The item number (Item No.) is sequentially assigned.

b. Level, Column 2. This column identifies the lowest level of maintenance that requires the listed item. An explanation of the alphabetical character is provided in appendix B, section I of this manual.

c. National Stock Number, Column 3. This column indicates the national stock number assigned to the item.

d. Description, Column 4. This column indicates the federal item name and, if required, a minimum description to identify and locate the item. The last line for each item indicates the CAGE code in parentheses followed by the part number.

e. Unit of Measure, Column 5. This column indicates the unit of measure used in performing the actual operational or maintenance function. This measure is expressed by an alphabetical abbreviation. These abbreviations are listed in the glossary.

f. Quantity, Column 6. This column indicates the quantity (QTY) of the item(s) provided with the equipment.

Section II. EXPENDABLE AND DURABLE SUPPLIES AND MATERIALS LIST FOR REFRIGERATOR

(1) ITEM NO.	(2) LEVEL	(3) NATIONAL STOCK NUMBER	(4) DESCRIPTION	(5) UNIT OF MEASURE	(6) QTY
1	O	7530-01-280-0613	Cloth, Cleaning (97327) Rymple Cloth 301	EA	AR
2	O	6840-00-783-0050	Disinfectant, Spray, 7 oz (73820) Lysolspray	CN	AR

APPENDIX E

REPAIR PARTS AND SPECIAL TOOLS LIST

Section I. INTRODUCTION

E-1. Scope.

This manual lists spare and repair parts, special tools, special test equipment; and other special support equipment required for the performance of unit level, direct support, general support, and depot level maintenance. It authorizes the requisitioning and issue of spare and repair parts in consonance with the MAC (app B).

E-2. General.

The Repair Parts and Special Tools List is divided into the following sections:

a. Repair Parts, Section II. A list of repair parts authorized for the performance of maintenance in figure number and item number sequence.

b. Special Tools, Test, and Support Equipment, Section III. A list of special tools, test, and support equipment authorized for the performance of maintenance.

E-3. Explanation of columns in section II.

a. Illustration, Column 1.

(1) *Figure Number.* This column indicates the figure number (FIG NO.) of the illustration on which the item is shown.

(2) *Item Number.* This column indicates the item number (ITEM NO.) used to identify each item on the illustration.

b. National Stock Number, Column 2. This column indicates the national stock number assigned to the item.

c. Description, Column 3. This column indicates the federal item name of the item. The last line for each item indicates the CAGE code in parentheses followed by the part number.

d. Unit of Measure, Column 4. This column indicates the unit of measure used in performing the actual operational or maintenance function. This measure is expressed by a two-character alphabetical abbreviation.

e. Quantity, Column 5. This column indicates the quantity (QTY) of the item(s) to be used with or on the illustrated component, assembly, module, or end item.

E-4. Explanation of columns in section III.

a. Item Number, Column 1. This number is sequentially assigned.

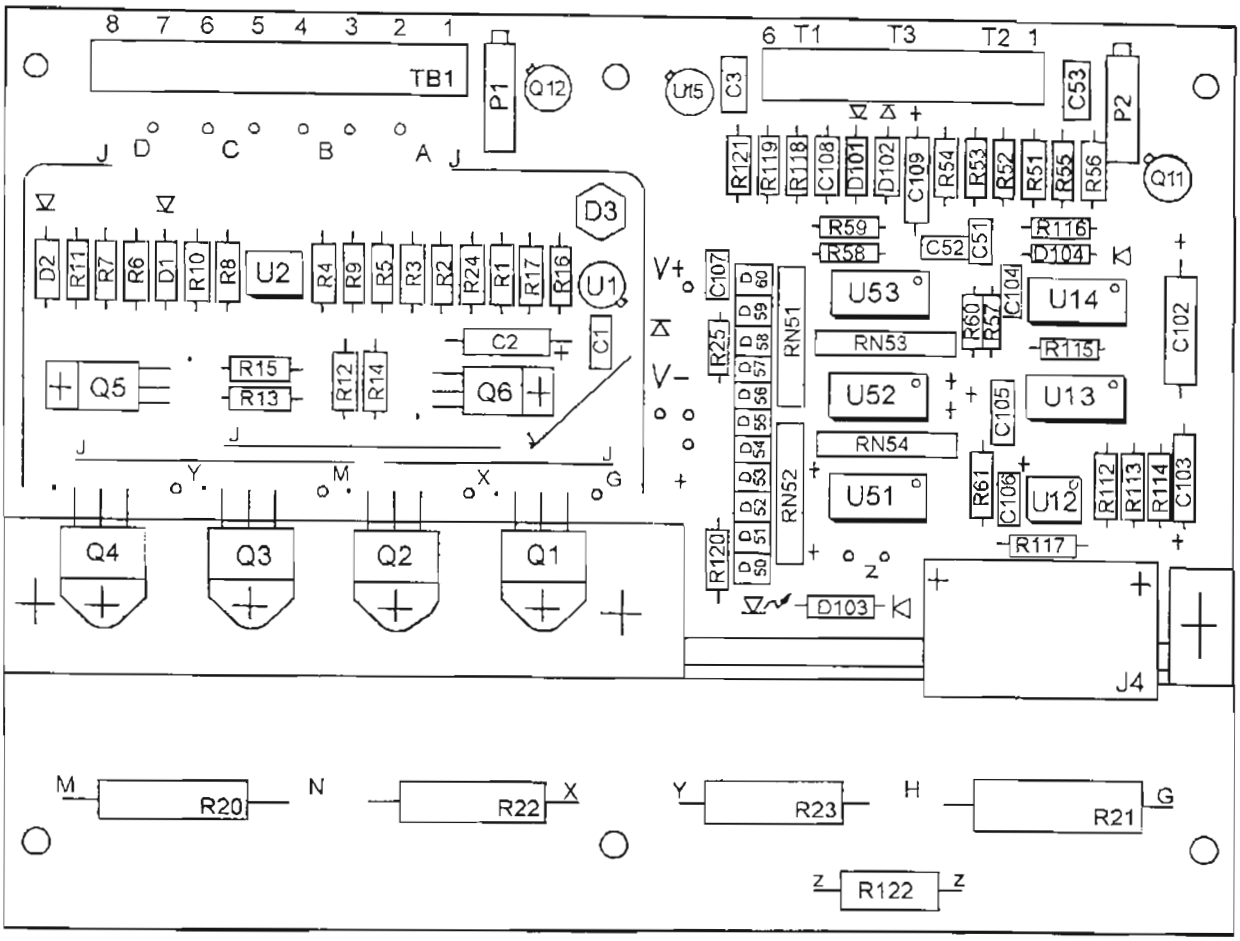
b. Level, Column 2. This column identifies the lowest level of maintenance that requires the listed item. An explanation of the alphabetical character is provided in appendix B, section I of this manual.

c. National Stock Number, Column 3. This column indicates the national stock number assigned to the item.

d. Description, Column 4. This column indicates the federal item name and, if required, a minimum description to identify and locate the item. The last line for each item indicates the CAGE code in parentheses followed by the part number

e. Unit of Measure, Column 5. This column indicates the unit of measure used in performing the actual operational or maintenance function. This measure is expressed by a two-character alphabetical abbreviation.

f. Quantity, Column 6. This column indicates the quantity (QTY) of the item(s) to be used with or on the equipment.



NOTE: D50 THRU D60 ARE MOUNTED ON THE CONDUCTOR SIDE

LEGEND

C - CAPACITOR	R - RESISTOR
D - DIODE	RN - RESISTOR NETWORK
P - POTENTIOMETER	TB - TERMINAL BOARD
Q - TRANSISTOR	U - INTEGRATED CIRCUIT

Figure E-1. Printed circuit board.

Section II. REPAIR PARTS LIST FOR REFRIGERATOR

(1) ILLUSTRATION		(2)	(3)	(4)	(5)
FIG NO.	ITEM NO.	NATIONAL STOCK NUMBER	DESCRIPTION	UNIT OF MEASURE	QTY
E-1	1		Resistor, 30.1 KΩ, 1%, 1/4 W (0HAP0) R1	EA	1
E-1	2		Resistor, 30.1 KΩ, 1%, 1/4 W (0HAP0) R3	EA	1
E-1	3		Resistor, 30.1 KΩ, 1%, 1/4 W (0HAP0) R51	EA	1
E-1	4		Resistor, 30.1 KΩ, 1%, 1/4 W (0HAP0) R52	EA	1
E-1	5		Resistor, 30.1 KΩ, 1%, 1/4 W (0HAP0) R53	EA	1
E-1	6		Resistor, 221 Ω, 1%, 1/4 W (0HAP0) R2	EA	1
E-1	7		Resistor, 100 KΩ, 5%, 1/4 W (0HAP0) R4	EA	1
E-1	8		Resistor, 100 KΩ, 5%, 1/4 W (0HAP0) R5	EA	1
E-1	9		Resistor, 100 KΩ, 5%, 1/4 W (0HAP0) R6	EA	1
E-1	10		Resistor, 100 KΩ, 5%, 1/4 W (0HAP0) R7	EA	1
E-1	11		Resistor, 100 KΩ, 5%, 1/4 W (0HAP0) R54	EA	1
E-1	12		Resistor, 100 KΩ, 5%, 1/4 W (0HAP0) R55	EA	1
E-1	13		Resistor, 10 MΩ, 5%, 1/4 W (0HAP0) R8	EA	1
E-1	14		Resistor, 10 MΩ, 5%, 1/4 W (0HAP0) R9	EA	1
E-1	15		Resistor, 1 KΩ, 5%, 1/4 W (0HAP0) R10	EA	1
E-1	16		Resistor, 1 KΩ, 5%, 1/4 W (0HAP0) R11	EA	1
E-1	17		Resistor, 1 KΩ, 5%, 1/4 W (0HAP0) R116	EA	1

Section II. REPAIR PARTS LIST FOR REFRIGERATOR

(1) ILLUSTRATION		(2)	(3)	(4)	(5)
FIG NO.	ITEM NO.	NATIONAL STOCK NUMBER	DESCRIPTION	UNIT OF MEASURE	QTY
E-1	18		Resistor, 1 KΩ, 5%, 1/4 W (0HAP0) R117	EA	1
E-1	19		Resistor, 22 KΩ, 5%, 1/4 W (0HAP0) R12	EA	1
E-1	20		Resistor, 22 KΩ, 5%, 1/4 W (0HAP0) R13	EA	1
E-1	21		Resistor, 4.7 KΩ, 5%, 1/4 W (0HAP0) R14	EA	1
E-1	22		Resistor, 4.7 KΩ, 5%, 1/4 W (0HAP0) R15	EA	1
E-1	23		Resistor, 270 Ω, 5%, 1/4 W (0HAP0) R16	EA	1
E-1	24		Resistor, 1.62 KΩ, 1%, 1/4 W (0HAP0) R17	EA	1
E-1	25		Resistor, 1.62 KΩ, 1%, 1/4 W (0HAP0) R119	EA	1
E-1	26		Resistor, 40 Ω, 1%, 25 W (0HAP0) R20	EA	1
E-1	27		Resistor, 40 Ω, 1%, 25 W (0HAP0) R21	EA	1
E-1	28		Resistor, 12 Ω, 1%, 25 W (0HAP0) R22	EA	1
E-1	29		Resistor, 12 Ω, 1%, 25 W (0HAP0) R23	EA	1
E-1	30		Resistor, 22.1 Ω, 1%, 1/4 W (0HAP0) R24	EA	1
E-1	31		Resistor, 2.2 KΩ, 5%, 1/4 W (0HAP0) R25	EA	1
E-1	32		Resistor, 680 KΩ, 1%, 1/4 W (0HAP0) R56	EA	1
E-1	33		Resistor, 680 KΩ, 1%, 1/4 W (0HAP0) R57	EA	1
E-1	34		Resistor, 470 KΩ, 5%, 1/4 W (0HAP0) R58	EA	1

Section II. REPAIR PARTS LIST FOR REFRIGERATOR

(1) ILLUSTRATION		(2)	(3)	(4)	(5)
FIG NO.	ITEM NO.	NATIONAL STOCK NUMBER	DESCRIPTION	UNIT OF MEASURE	QTY
E-1	35		Resistor, 470 KΩ, 5%, 1/4 W (0HAP0) R113	EA	1
E-1	36		Resistor, 470 Ω, 5%, 1/4, W (0HAP0) R59	EA	1
E-1	37		Resistor, 5.6 MΩ, 5%, 1/4 W (0HAP0) R60	EA	1
E-1	38		Resistor, 5.6 MΩ, 5%, 1/4 W (0HAP0) R61	EA	1
E-1	39		Resistor, 10 KΩ, 5%, 1/4W (0HAP0) R112	EA	1
E-1	40		Resistor, 82 KΩ, 5%, 1/4 W (0HAP0) R114	EA	1
E-1	41		Resistor, 8.2 KΩ, 5%, 1/4 W (0HAP0) R115	EA	1
E-1	42		Resistor, 243 Ω, 1%, 1/4 W (0HAP0) R118	EA	1
E-1	43		Resistor, 15 Ω, 5%, 1/4W (0HAP0) R120	EA	1
E-1	44		Resistor, 100 Ω, 5%, 1/4 W (0HAP0) R121	EA	1
E-1	45		Resistor, 10 Ω, 1%, 5 W (0HAP0) R122	EA	1
E-1	46		Resistor Network, 5 x 470 KΩ, 2%, 1/4 W (0HAP0) RN51	EA	1
E-1	47		Resistor Network, 5 x 470 KΩ, 2%, 1/4 W (0HAP0) RN52	EA	1
E-1	48		Resistor Network, 5 x 100 KΩ, 2%, 1/4 W (0HAP0) RN53	EA	1
E-1	49		Resistor Network, 5 x 100 KΩ, 2%, 1/4 W (0HAP0) RN54	EA	1
E-1	50		Capacitor, 47 K pF, 10%, 50 V (0HAP0) C1	EA	1

Section II. REPAIR PARTS LIST FOR REFRIGERATOR

(1) ILLUSTRATION		(2)	(3)	(4)	(5)
FIG NO.	ITEM NO.	NATIONAL STOCK NUMBER	DESCRIPTION	UNIT OF MEASURE	QTY
E-1	51		Capacitor, 6.8 µF, 20%, 35 W VDC (0HAP0) C2	EA	1
E-1	52		Capacitor, 12 K pF, 10%, 50 V (0HAP0) C3	EA	1
E-1	53		Capacitor, 12 K pF, 10%, 50 V (0HAP0) C53	EA	1
E-1	54		Capacitor, 0.1 µF, 10%, 50 V (0HAP0) C51	EA	1
E-1	55		Capacitor, 0.1 µF, 10%, 50 V (0HAP0) C52	EA	1
E-1	56		Capacitor, 0.1 µF, 10%, 50 V (0HAP0) C104	EA	1
E-1	57		Capacitor, 0.1 µF, 10%, 50 V (0HAP0) C106	EA	1
E-1	58		Capacitor, 0.1 µF, 10%, 50 V (0HAP0) C107	EA	1
E-1	59		Capacitor, 47 µF, 20%, 20 W VDC (0HAP0) C102	EA	1
E-1	60		Capacitor, 10 µF, 20%, 20 W VDC (0HAP0) C103	EA	1
E-1	61		Capacitor, 1.2 µF, 20%, 20 W VDC (0HAP0) C105	EA	1
E-1	62		Capacitor, 1.2 µF, 20%, 20 W VDC (0HAP0) C108	EA	1
E-1	63		Capacitor, 22 µF, 20%, 15 W VDC (0HAP0) C109	EA	1
E-1	64		Potentiometer, 10 K, 10%, 0.75 W (0HAP0) P1	EA	1
E-1	65		Potentiometer, 5 K, 10%, 0.75 W (0HAP0) P2	EA	1
E-1	66		Transistor, TIP 36 B, PNP Power Transistor (0HAP0) Q1	EA	1
E-1	67		Transistor, TIP 36 B, PNP Power Transistor (0HAP0) Q3	EA	1

Section II. REPAIR PARTS LIST FOR REFRIGERATOR

(1) ILLUSTRATION		(2)	(3)	(4)	(5)
FIG NO.	ITEM NO.	NATIONAL STOCK NUMBER	DESCRIPTION	UNIT OF MEASURE	QTY
E-1	68		Transistor, TIP 35 B, NPN Power Transistor (0HAP0) Q2	EA	1
E-1	69		Transistor, TIP 35 B, NPN Power Transistor (0HAP0) Q4	EA	1
E-1	70		Transistor, TIP 121, NPN Power Transistor (0HAP0) Q5	EA	1
E-1	71		Transistor, TIP 121, NPN Power Transistor (0HAP0) Q6	EA	1
E-1	72		Transistor, 2N2219, NPN Power Transistor (0HAP0) Q11	EA	1
E-1	73		Transistor, 2N2219, NPN Power Transistor (0HAP0) Q12	EA	1
E-1	74		Integrated Circuit, LM 117 H, Voltage Regulator (0HAP0) U1	EA	1
E-1	75		Integrated Circuit, LM 117 H, Voltage Regulator (0HAP0) U15	EA	1
E-1	76		Integrated Circuit, LM 158 J, Dual Operational Amplifier (0HAP0) U2	EA	1
E-1	77		Integrated Circuit, LM 555, Timer (0HAP0) U12	EA	1
E-1	78		Integrated Circuit, MC 14001 BAL, Quad 2 Input Nor Gate (0HAP0) U13	EA	1
E-1	79		Integrated Circuit, MC 14001 BAL, Quad 2 Input Nor Gate (0HAP0) U14	EA	1

Section II. REPAIR PARTS LIST FOR REFRIGERATOR

(1) ILLUSTRATION		(2)	(3)	(4)	(5)
FIG NO.	ITEM NO.	NATIONAL STOCK NUMBER	DESCRIPTION	UNIT OF MEASURE	QTY
E-1	80		Integrated Circuit, LM 124 J, Quad Operational Amplifier (0HAP0) U51	EA	1
E-1	81		Integrated Circuit, LM 124 J, Quad Operational Amplifier (0HAP0) U52	EA	1
E-1	82		Integrated Circuit, LM 124 J, Quad Operational Amplifier (0HAP0) U53	EA	1
E-1	83		Diode, IN 4148 (0HAP0) D1	EA	1
E-1	84		Diode, IN 4148 (0HAP0) D2	EA	1
E-1	85		Diode, IN 4148 (0HAP0) D104	EA	1
E-1	86		Diode, MBR3545, Schottky Rectifier (0HAP0) D3	EA	1
E-1	87		Diode, IN 4001 (0HAP0) D101	EA	1
E-1	88		Diode, IN 4001 (0HAP0) D102	EA	1
E-1	89		Diode, IN 4001 (0HAP0) D103	EA	1
E-1	90		Diode, LED RED MV 57123, LED Lamp, Red (0HAP0) D50	EA	1
E-1	91		Diode, LED RED MV 57123, LED Lamp, Red (0HAP0) D60	EA	1
E-1	92		Diode, LED GRN MV 54123, LED Lamp, Green (0HAP0) D53	EA	1
E-1	93		Diode, LED GRN MV 54123, LED Lamp, Green (0HAP0) D54	EA	1

Section II. REPAIR PARTS LIST FOR REFRIGERATOR

(1) ILLUSTRATION		(2)	(3)	(4)	(5)
FIG NO.	ITEM NO.	NATIONAL STOCK NUMBER	DESCRIPTION	UNIT OF MEASURE	QTY
E-1	94		Diode, LED GRN MV 54123, LED Lamp, Green (0HAP0) D55	EA	1
E-1	95		Diode, LED YEL MV 53123, LED Lamp, Yellow (0HAP0) D51	EA	1
E-1	96		Diode, LED YEL MV 53123, LED Lamp, Yellow (0HAP0) D52	EA	1
E-1	97		Diode, LED YEL MV 53123, LED Lamp, Yellow (0HAP0) D56	EA	1
E-1	98		Diode, LED YEL MV 53123, LED Lamp, Yellow (0HAP0) D57	EA	1
E-1	99		Diode, LED YEL MV 53123, LED Lamp, Yellow (0HAP0) D58	EA	1
E-1	100		Diode, LED YEL MV 53123, LED Lamp, Yellow (0HAP0) D59	EA	1
E-1	101		Terminal Board, NTC 10 K, Thermistor (0HAP0) T1	EA	1
E-1	102		Terminal Board, NTC 10 K, Thermistor (0HAP0) T2	EA	1
E-1	103		Terminal Board, NTC 3 K, Thermistor (0HAP0) T3	EA	1
E-1	104		Connector, MS-3102A-18-01P, Box Mounting Receptacle (0HAP0) J1	EA	1
E-1	105		Connector, MS-3102A-18-01P, Box Mounting Receptacle (0HAP0) J2	EA	1

Section II. REPAIR PARTS LIST FOR REFRIGERATOR

(1) ILLUSTRATION		(2)	(3)	(4)	(5)
FIG NO.	ITEM NO.	NATIONAL STOCK NUMBER	DESCRIPTION	UNIT OF MEASURE	QTY
E-1	106		Connector, AMP-205868-1, Receptacle (0HAP0) J4	EA	1

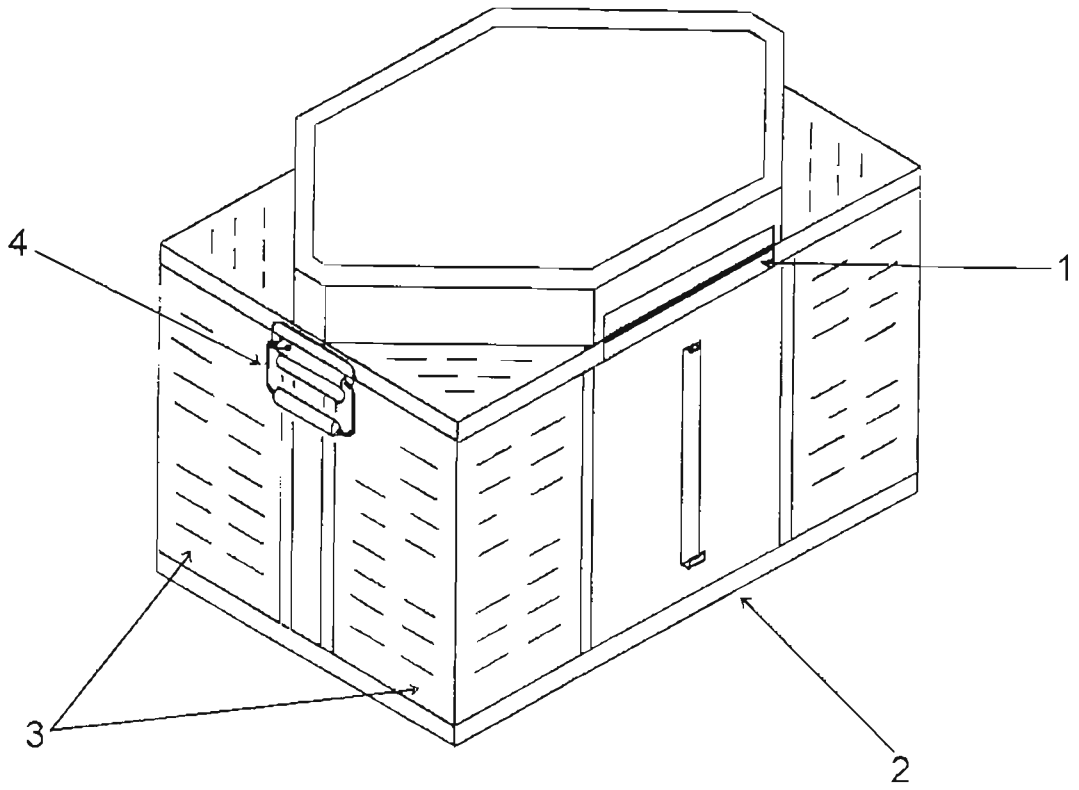


Figure E-2. Case.

Section II. REPAIR PARTS LIST FOR REFRIGERATOR

(1) ILLUSTRATION		(2)	(3)	(4)	(5)
FIG NO.	ITEM NO.	NATIONAL STOCK NUMBER	DESCRIPTION	UNIT OF MEASURE	QTY
E-2	1		Hinge (0HAP0) P-2239	EA	1
E-2	2		Case Assembly (0HAP0) A-2219	EA	1
E-2	3		Cover, Corner (0HAP0) P-2258	EA	4
E-2	4		Handle (0HAP0) P-2264	EA	2

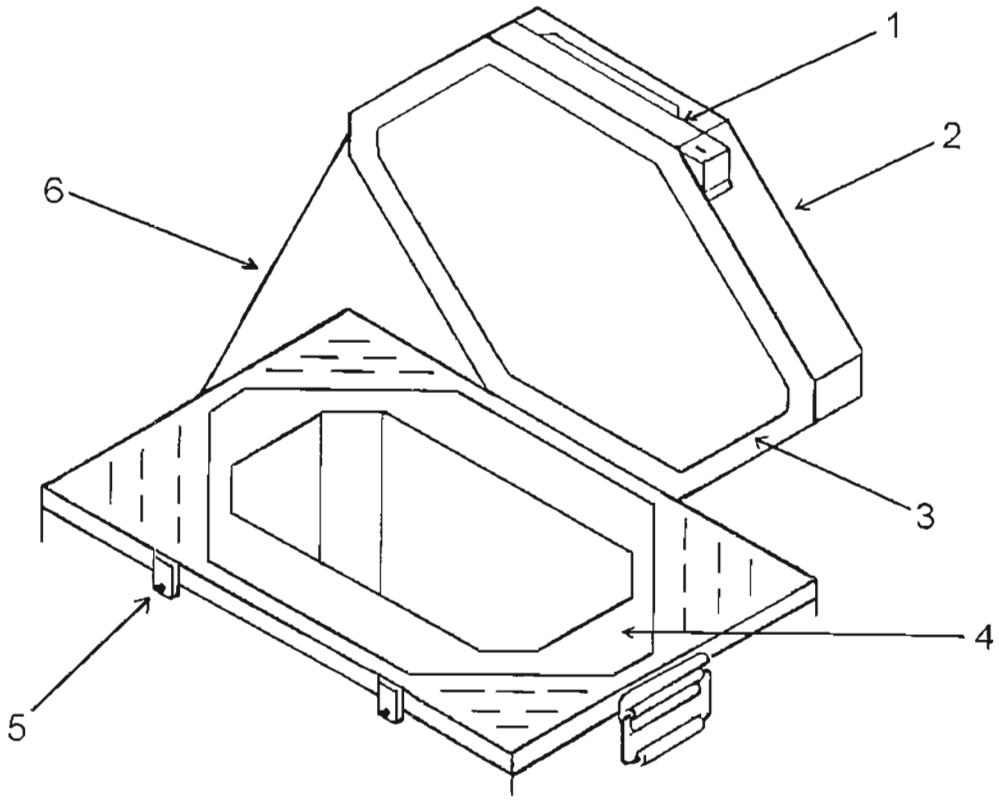


Figure E-3. Cover door assembly.

Section II. REPAIR PARTS LIST FOR REFRIGERATOR

(1) ILLUSTRATION		(2)	(3)	(4)	(5)
FIG NO.	ITEM NO.	NATIONAL STOCK NUMBER	DESCRIPTION	UNIT OF MEASURE	QTY
E-3	1		Bracket, Strike (0HAP0) P-2257	EA	1
E-3	2		Cover Door Assembly (0HAP0) A-2435	EA	1
E-3	3	5330-01-387-8842	Gasket, Cover (0HAP0) P-2063	EA	1
E-3	4		Rim (0HAP0) P-2261	EA	1
E-3	5		Latch (Catch) (0HAP0) C-2091 and	EA	2
			Latch (0HAP0) C-2091-1	EA	2
E-3	6	4010-01-387-8849	Door Cable (Wire Rope Assembly) (0HAP0) P-2097	EA	1

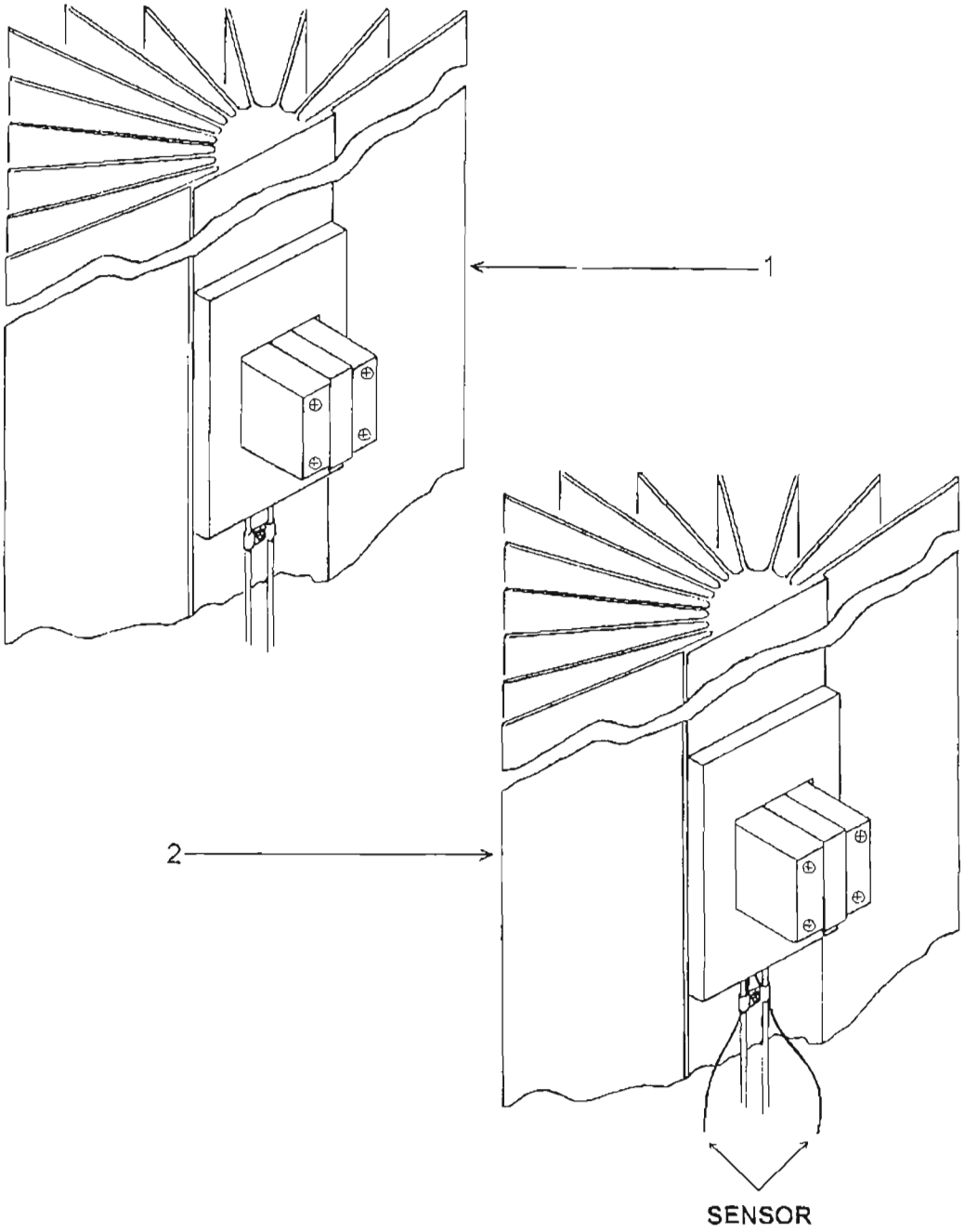


Figure E-4. Thermoelectric assembly.

Section II. REPAIR PARTS LIST FOR REFRIGERATOR

(1) ILLUSTRATION		(2)	(3)	(4)	(5)
FIG NO.	ITEM NO.	NATIONAL STOCK NUMBER	DESCRIPTION	UNIT OF MEASURE	QTY
E-4	1	4110-01-387-2400	Thermoelectric Assembly (0HAP0) A-2436	EA	3
E-4	2	4110-01-387-8507	Thermoelectric Sensor Assembly (0HAP0) A-2437 (NOTE: In corner #1 only)	EA	1

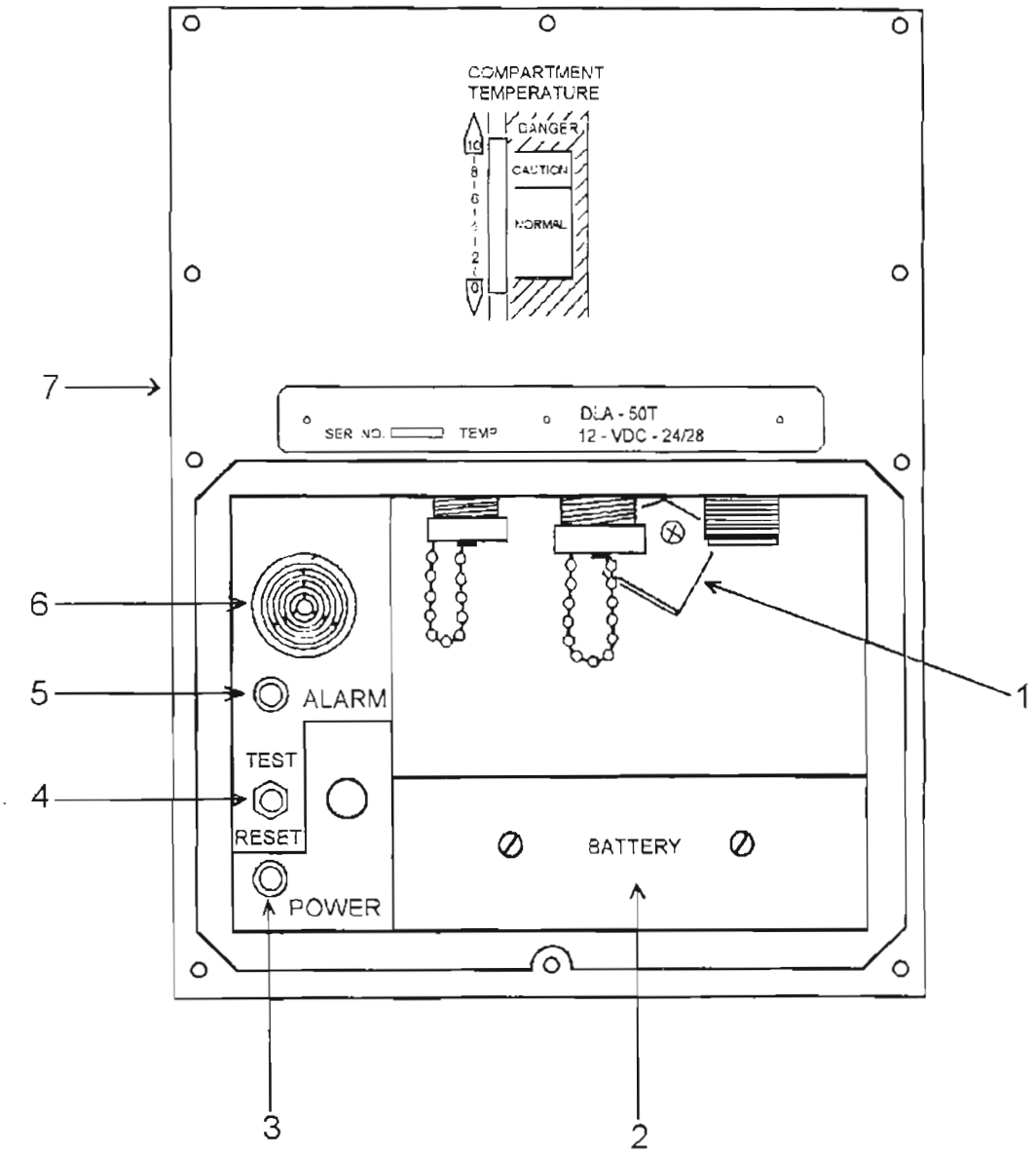


Figure E-5. Control panel assembly.

Section II. REPAIR PARTS LIST FOR REFRIGERATOR

(1) ILLUSTRATION		(2)	(3)	(4)	(5)
FIG NO.	ITEM NO.	NATIONAL STOCK NUMBER	DESCRIPTION	UNIT OF MEASURE	QTY
E-5	1		Interlock (0HAP0) P-2214	EA	1
E-5	2		Battery Pack (BP-50) (0HAP0) A-2321	EA	1
E-5	3		Power Indicator (0HAP0) C-4106-2	EA	1
E-5	4		Alarm Test/Reset Switch (0HAP0) C-4104	EA	1
E-5	5		Visual Alarm Signal (0HAP0) C-4106-1	EA	1
E-5	6	1670-00-803-8209	Audio Alarm Signal (Sonolet) (0HAP0) C-4105	EA	1
E-5	7		Control Panel Assembly (0HAP0) A-2209	EA	1

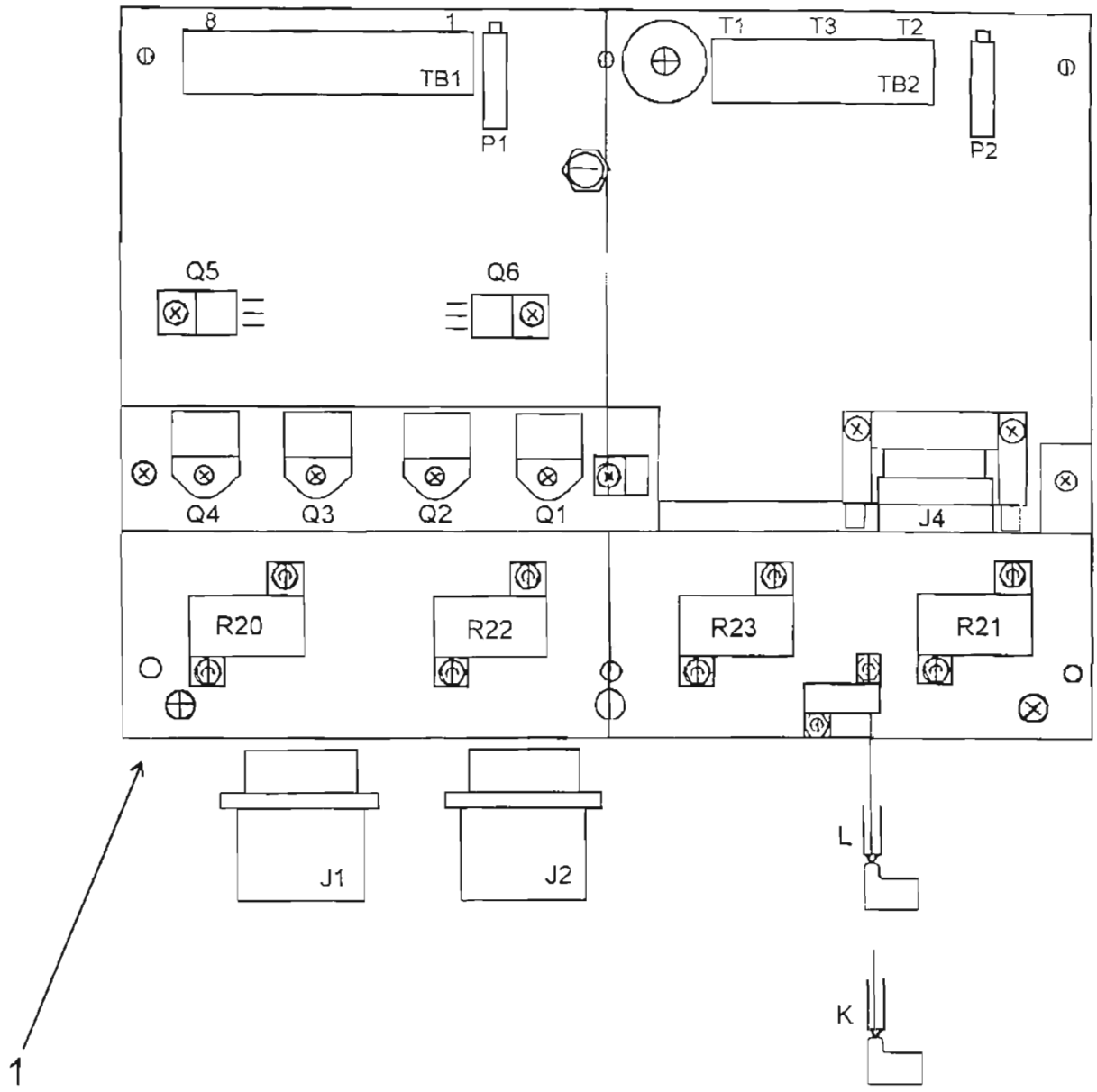


Figure E-6. Control board assembly.

Section II. REPAIR PARTS LIST FOR REFRIGERATOR

(1) ILLUSTRATION		(2)	(3)	(4)	(5)
FIG NO.	ITEM NO.	NATIONAL STOCK NUMBER	DESCRIPTION	UNIT OF MEASURE	QTY
E-6	1		Control Board Assembly (0HAP0) A-2205	EA	1

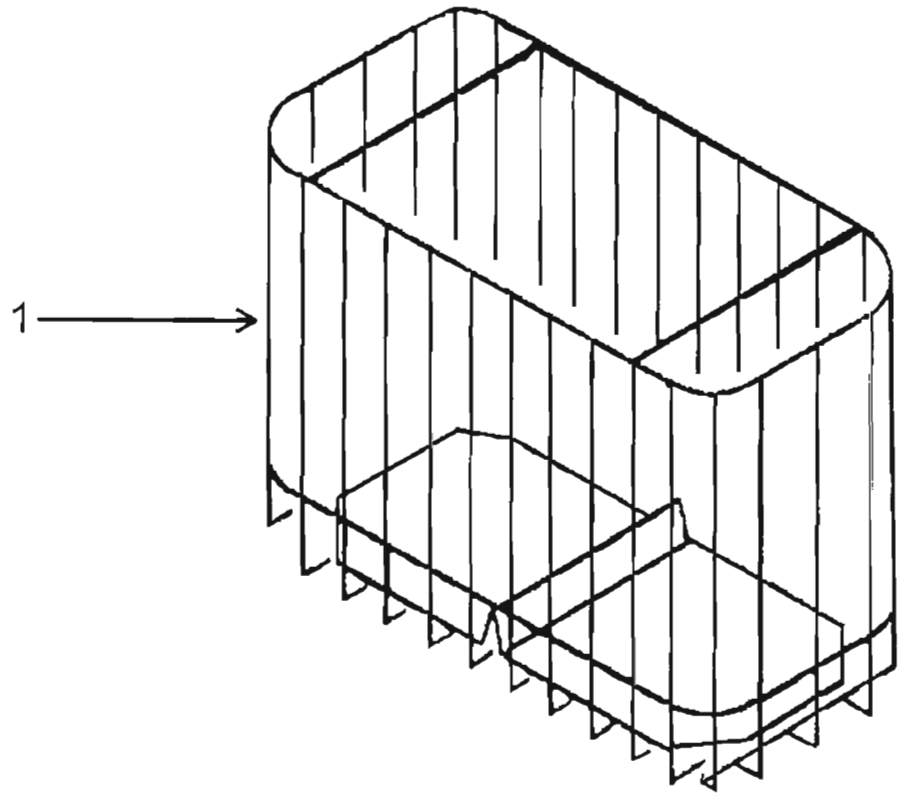


Figure E-7. Wire basket.

Section II. REPAIR PARTS LIST FOR REFRIGERATOR

(1) ILLUSTRATION		(2)	(3)	(4)	(5)
FIG NO.	ITEM NO.	NATIONAL STOCK NUMBER	DESCRIPTION	UNIT OF MEASURE	QTY
E-7	1		Wire Basket (WB-30B) (0HAP0) A-2428	EA	1

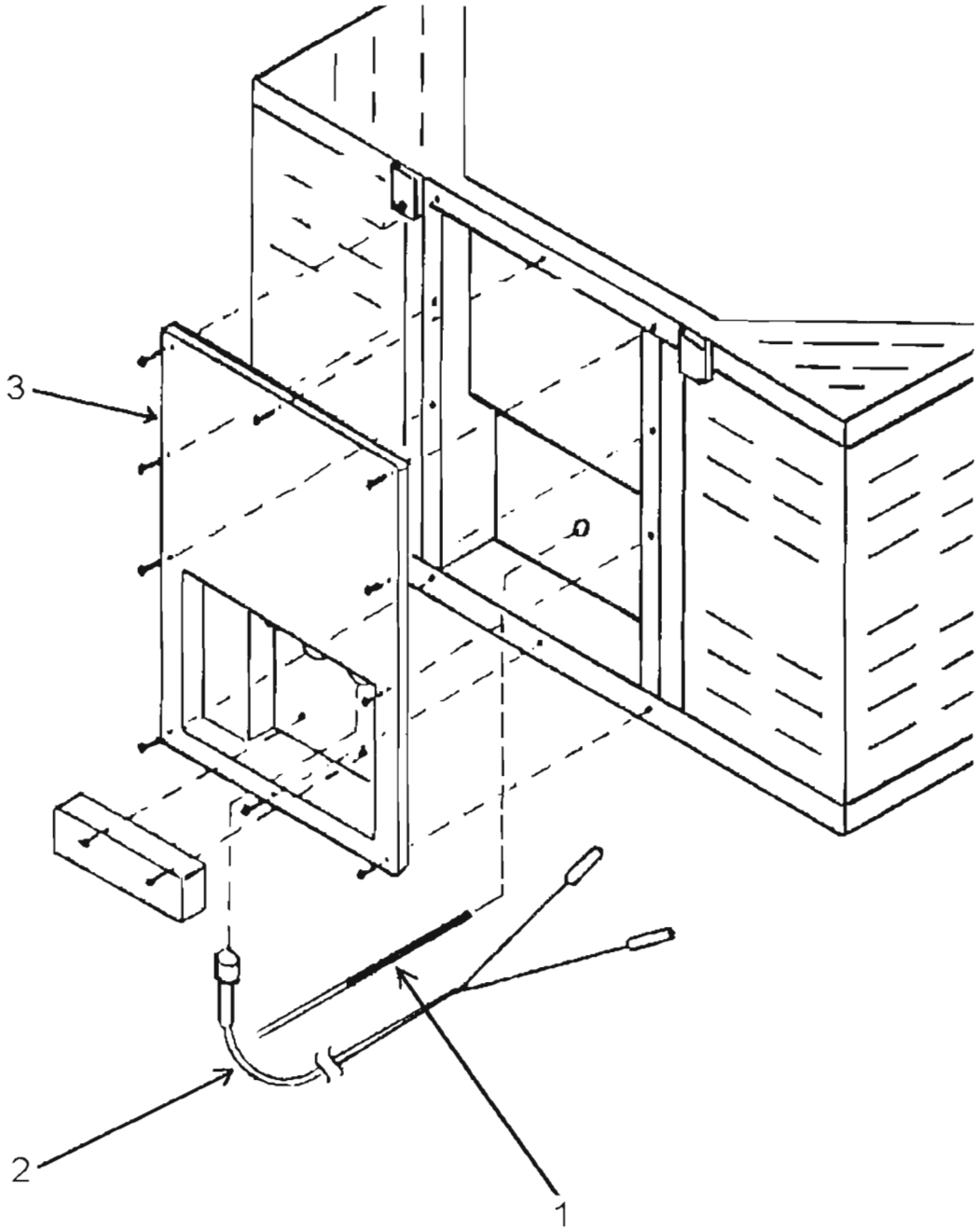


Figure E-8. Thermistor probe.

Section II. REPAIR PARTS LIST FOR REFRIGERATOR

(1) ILLUSTRATION		(2)	(3)	(4)	(5)
FIG NO.	ITEM NO.	NATIONAL STOCK NUMBER	DESCRIPTION	UNIT OF MEASURE	QTY
E-8	1	6685-01-387-8840	Thermistor Probe Assembly (0HAP0) A-2223	EA	1
E-8	2	6145-01-387-8463	Power Cable (0HAP0) A-2089	EA	1
E-8	3		Front Panel Assembly (0HAP0) A-2211	EA	1

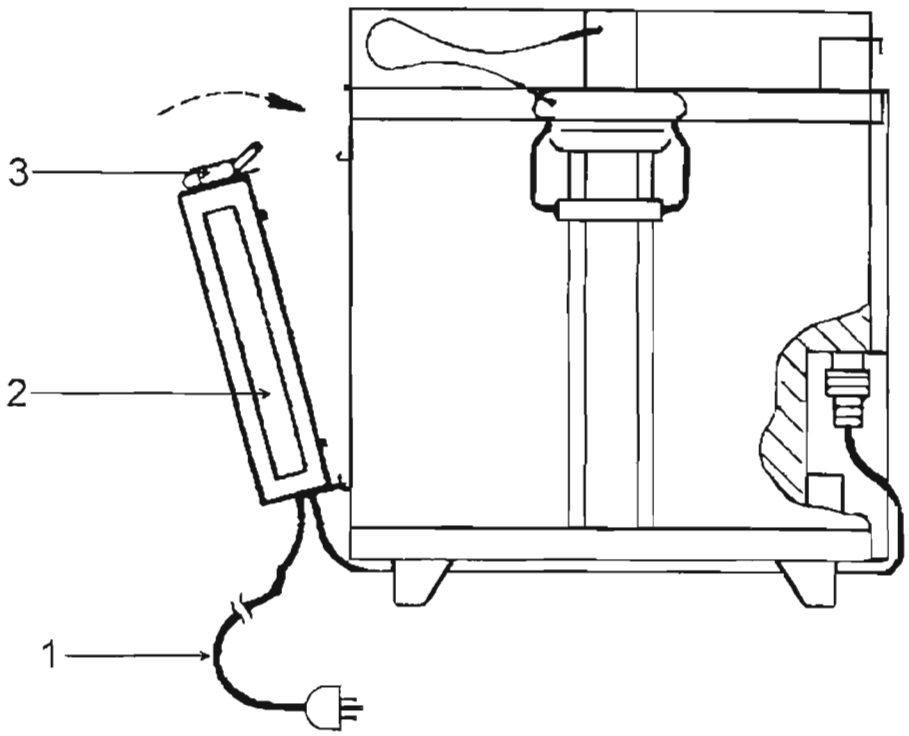


Figure E-9. Installing power supply.

Section II. REPAIR PARTS LIST FOR REFRIGERATOR

(1) ILLUSTRATION		(2)	(3)	(4)	(5)
FIG NO.	ITEM NO.	NATIONAL STOCK NUMBER	DESCRIPTION	UNIT OF MEASURE	QTY
E-9	1		Line Power Cable (0HAP0) A-2440	EA	1
E-9	2	6130-01-387-3152	Power Supply (PS-50B) (0HAP0) A-2160-3	EA	1
E-9	3		Latch (0HAP0) C-2091-1	EA	1

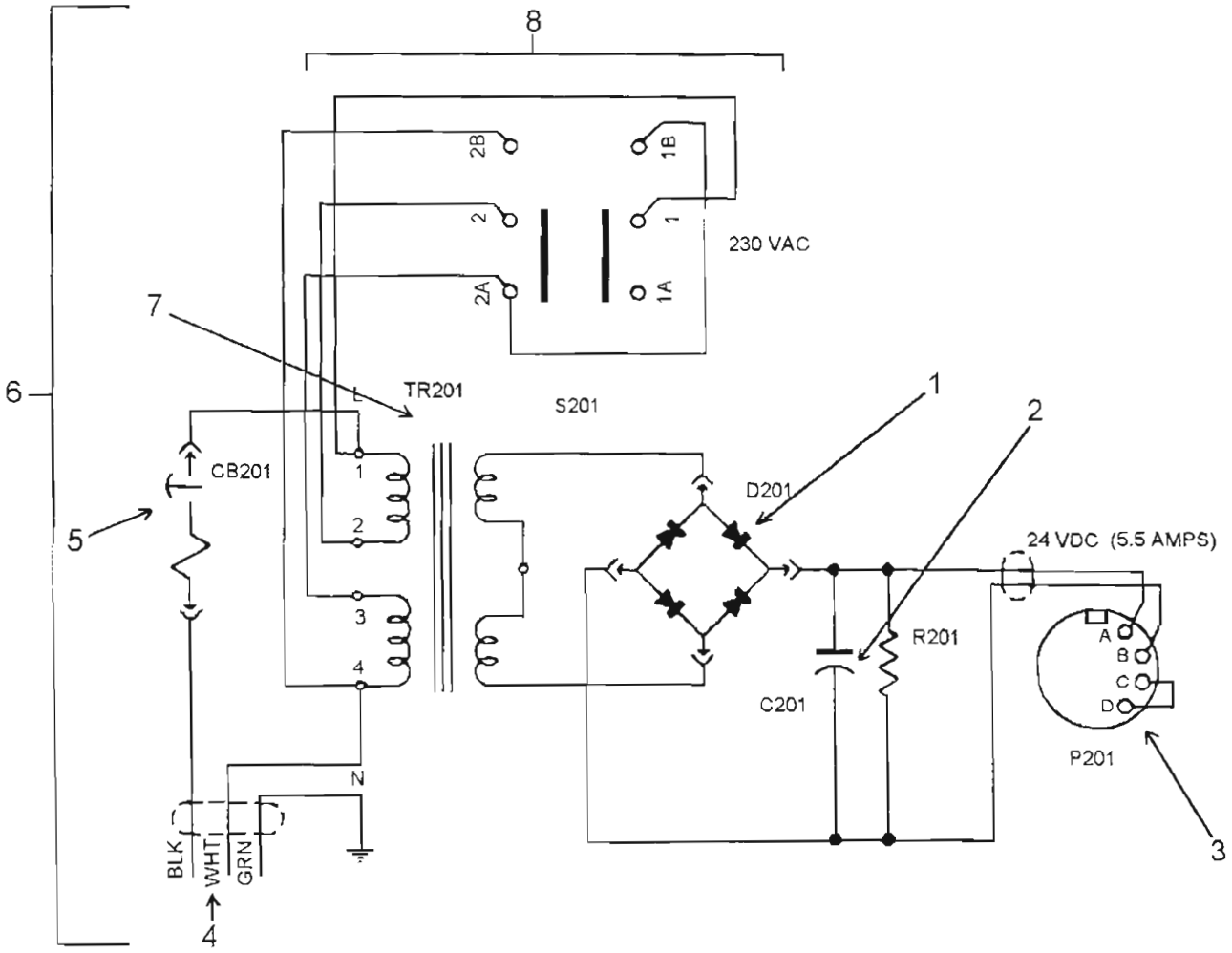


Figure E-10. Power supply components.

Section II. REPAIR PARTS LIST FOR REFRIGERATOR

(1) ILLUSTRATION		(2)	(3)	(4)	(5)
FIG NO.	ITEM NO.	NATIONAL STOCK NUMBER	DESCRIPTION	UNIT OF MEASURE	QTY
E-10	1	5961-01-386-2979	Rectifier, C-4107 (0HAP0) D201	EA	1
E-10	2		Capacitor, C-4109 (0HAP0) C201	EA	1
E-10	3		Connector, MS-3106A-18-015 (0HAP0) P201	EA	1
E-10	4		Power Cable (0HAP0) A-2440	EA	1
E-10	5		Circuit Breaker, KDI-3, CB201 (0HAP0) C-4110-03	EA	1
E-10	6	6680-01-184-1780	Power Supply, A-2160-3 (0HAP0) PS-50B	EA	1
E-10	7		Transformer, C-2312 (0HAP0) TR201	EA	1
E-10	8		Voltage Select Switch, C-4108 (0HAP0) S201	EA	1

Section III. SPECIAL TOOLS, TEST, AND SUPPORT EQUIPMENT FOR REFRIGERATOR

(1) ILLUSTRATION		(2)	(3)	(4)	(5)
FIG NO.	ITEM NO.	NATIONAL STOCK NUMBER	DESCRIPTION	UNIT OF MEASURE	QTY
		THERE ARE NO SPECIAL TOOLS, TEST, OR SUPPORT EQUIPMENT APPLICABLE FOR THIS END ITEM.			

GLOSSARY

A	Ampere
AC	Alternating current
AFR	Air Force regulation
AR	Army regulation
C	Operator or crew
CAGE	Commercial and government entity
cm	Centimeter
CN	Can
CTA	Common table of allowances
CVC	Calibration/verification/certification
D	Depth
D	Depot level maintenance
D	Diode
DA	Department of the Army
DC	Direct current
DLA	Defense Logistics Agency
DLAM	Defense Logistics Agency manual
DPSC	Defense Personnel Support Center
DS	Direct support
EA	Each
F	Direct support maintenance
FM	Field manual
FSC	Federal supply class
FSCM	Federal supply code for manufacturers. This is an obsolete term. CAGE (commercial and government entity) is the correct acronym.
ft	Foot (feet)
GS	General support
H	General support maintenance
H	Height
Hz	Hertz
in	Inch
ISO	International Standards Organization
JTA	Joint table of allowances
kg	Kilogram
KΩ	Kilohm
L	Length

lbs	Pounds
LED	Light emitting diode
m	Meter
MAC	Maintenance allocation chart
MAN	Manual
min	Minute
mm	Millimeter
MPL	Mandatory parts list
MTOE	Modified table of organization and equipment
MΩ	Megohm
N/A	Not applicable
NO. (No.)	Number
NSN	National stock number
NTC	Negative temperature coefficient
O	Unit maintenance
PMCS	Preventive maintenance checks and services
QC	Quality control
QTY	Quantity
RO	Roll
RPL	Repair parts list
S	Switch
SB	Supply bulletin
TB	Technical bulletin
TDA	Table of distribution and allowances
TM	Technical manual
VAC	Volts alternating current
VDC	Volts direct current
W	Watts
W	Width
°C	Degrees Celsius
°F	Degrees Fahrenheit
µF	Microfarad (one-millionth)

INDEX

This index is organized alphabetically by topic and by subtopic. Topics and subtopics are identified by paragraph number.

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E-11		E-4	

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METRIC SYSTEM CONVERSIONS

CHANGE	*TO*	*MULTIPLY*
inches	centimeters	2.540
feet	meters	.305
yards	meters	.914
sq inches	sq centimeters	6.451
sq feet	sq meters	.093
cubic feet	cubic meters	.028
fluid ounces	milliliters	29.573
pints	liters	.473
quarts	liters	.946
gallons	liters	3.785
ounces	grams	28.349
pounds	kilograms	.454

CHANGE	*TO*	*MULTIPLY*
centimeters	inches	.394
meters	feet	3.280
meters	yards	1.094
sq centimeters	sq inches	.155
sq meters	sq feet	10.764
cubic meters	cubic feet	35.315
milliliters	fluid ounces	.034
liters	pints	2.113
liters	quarts	1.057
liters	gallons	.264
grams	ounces	.035
kilograms	pounds	2.205

TEMPERATURE CONVERSION

Degrees Fahrenheit to Degrees Celsius: (°F - 32) X .5555 = °C
Degrees Celsius to Degrees Fahrenheit: (°C X 1.8) + 32 = °F

WEIGHTS

1 gram = 10 decigrams = .035 ounce
1 dekagram = 10 grams = .35 ounce
1 hectogram = 10 dekagrams = 3.52 ounces
1 kilogram = 10 hectograms = 2.2 pounds

CUBIC MEASURE

1 cu centimeter = 1000 cu millimeters = .06 cu inch
1 cu decimeter = 1000 cu centimeters = 61.02 cu inches
1 cu meter = 1000 cu decimeters = 35.31 cu feet

LINEAR MEASURE

1 centimeter = 10 millimeters = .39 inch
1 decimeter = 10 centimeters = 3.94 inches
1 meter = 10 decimeters = 39.37 inches

LIQUID MEASURE

1 centiliter = 10 milliliters = .34 fluid ounce
1 deciliter = 10 centiliters = 3.38 fluid ounces
1 liter = 10 deciliters = 33.81 fluid ounces