TECHNICAL MANUAL

OPERATOR, UNIT, DIRECT SUPPORT AND GENERAL SUPPORT MAINTENANCE MANUAL (INCLUDING REPAIR PARTS AND SPECIAL TOOLS LIST)

FOR

WATER PURIFICATION BARGES (NSN 1930-01-234-2165) VOLUME 16 VENTILATION, HEATING AND AIR CONDITIONING SYSTEMS

This technical manual is an authentication of the manufacturer's commercial literature and does not conform with the format and content requirements normally associated with the Army technical manuals. This technical manual does, however, contain all essential information required to operate and maintain the equipment.

***This manual supersedes TM 55-1930-209-14&P-16, 30 January 1989.**

HEADQUARTERS, DEPARTMENT OF THE ARMY
15 OCTOBER 1992

WARNINGS AND SAFETY NOTICES

WARNING
DANGEROUS VOLTAGES AND HAZARDOUS MATERIALS
ARE USED IN THIS EQUIPMENT.
DO NOT TAKE CHANCES!

GENERAL WARNINGS

- Always redtag electrical equipment, controls, circuits, and switches before beginning repairs.
- Do not service or adjust high voltage electrical equipment when alone.
- Do not overload circuits.
- Always use authorized, Insulated tools and test equipment when working on electrical equipment.
- Remove all jewelry before working on or around electrical equipment with exposed current-carrying areas Do not wear clothing with exposed metal fasteners when working on electrical equipment.
- Always use approved breathing apparatus when working with chemicals Avoid chemical contact with eyes, skin, and clothing.
- Always wear safety glasses, gloves, and rubber aprons when handling chemicals.
- Wear protective clothing and safety glasses as required when working on barge equipment.
- Always wear approved ear protection in noise hazard areas.

SPECIFIC WARNINGS

- Do not connect any new circuit to an existing circuit.
- Do not energize circuits If water condensation is present.
- If any sparks are seen, stop operation immediately. Determine cause and take corrective action.
- Never touch radio antennas of fixed-base radio transmitters. When transmitting, antennas contain high voltage.
- Always use approved breathing apparatus when handling material in multimedia filters and chlorination unit descaling acid crystals. Do not breathe dust from these materials.
- Avoid breathing vapors from coagulant aid chemicals. Use in a well ventilated area. In case of chemical contact with skin, wash with water. For eyes, immediately flush at eyewash station and obtain medical help as soon as possible.
- Always wear work gloves and shirts with full length buttoned sleeves when handling fuel oil and gasoline.

- Do not smoke or have open flames within 10 feet when handling fuel oil or gas. Only minimum number of personnel necessary to conduct fueling operation is permitted in area.

- Before starting any repairs on compressed air system, always release pressure from air receiver and compressor and open and redtag circuit breakers On air compressor, do not adjust automatic regulator switch (pressure switch) and pilot valve settings To avoid flying particles lodging in eyes, do not use compressed air to "dust-off" clothing or workspace.

- Stay clear of anchor cables when operating anchor winches.

- Always wear safety glasses or face shield when using power tools.

- Always wear lifevests when on weatherdeck and throughout the barge during storm conditions.

- Lifevests are to be worn at all times aboard workboat.

- Only qualified persons will operate and maintain arc and fuel gas welders.
- When welding, always make sure those working with or near the welder wear proper clothing. heavy, hole-free gloves, heavy shirt, cuffless trousers, high shoes, and cap Keep clothing dry and free of oil and other flammable substances.
- Use dry heavy canvas drop cloth to cover work area and adjacent deck when arc welding.
- Before welding on bulkheads, deck plating and similar surfaces, always check carefully to make sure that the other side of the surface to be welded does not hide fuel or compressed gas tanks, flammable or hazardous materials, or electrical equipment or wiring.

- When welding, keep your head out of the fumes and make sure area is well ventilated.

- Before welding on surfaces which have been cleaned with cleaning solutions containing chlorinated hydrocarbons, always wash with water, dry and ventilate area thoroughly.

- Use shield with proper filter lens when welding. Do not allow others near welding operations to assist or observe without proper eye protection This must include side shields during slag chipping operations.

- Warn personnel in area during welding operations not to look at arc or expose themselves to hot spatter or metal.
- In an extreme emergency, when welding is required in void 2 port, shut down chlorination system. Close all valves Cover the parts of chlorination system not being welded with a heavy canvas drop cloth Turn on vent 8 and, if available, provide additional forced air ventilation.

- Before welding on fuel oil or sludge tank, make sure tank Is gas-free by: 1) removing all liquid from tank, 2) cleaning tank thoroughly, 3) seeing that tank Is thoroughly dry, and 4) force ventilating tank.

- Connect arc welding work cable as close to welding area as possible. Work cables connected to barge framework or other locations far from welding site increase the possibility of the welding current passing through lifting chains, crane cables or other possible circuit paths This can create fire hazards or weaken lifting chains or crane cables until they break or fall.

- Always weld with all doors, portholes, and hatches propped open and necessary ventilation systems operating.

- Take frequent breaks away from the area where you are welding Do not take oxygen and acetylene tanks into confined areas when welding.

- Always use a friction lighter to start oxyacetylene torch.

- Always maintain all welding equipment in proper working condition. If you have any doubts about the safety of any welding equipment, do not use the welder.

ELECTRICAL SHOCK SAFETY STEPS

Five safety steps to follow if someone is the victim of electrical shock.

1. Do not try to pull or grab individual.
2. Turn off electrical power when possible.
3. If you can not turn off electrical power, pull, push, or lift person to safety using a wooden pole, rope, or some other insulating material.
4. Get medical help as soon as possible.
5. After the injured person is free of contact with the source of electrical shock, move the person a short distance away and, if needed, start CPR Immediately.

INTRODUCTION TO

TM 55-1930-209-14&P-16

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. Mall 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, US Army Troop Support Command, ATTN AMSTR-MMTS, 4300 Goodfellow Blvd., St. Louis, MO 63120-1798 A reply will be furnished directly to you.

1. SCOPE

TM 55-1930-209-14&P covers the Reverse Osmosis Water Purification Barges, Models 300-WPB-1,300-WPB-2 and 300WPB-3, NSN 1930-01-234-2165 This manual consists of twenty-one volumes.

2. REVERSE OSMOSIS WATER PURIFICATION BARGES

The Reverse Osmosis Water Purification Barges provide up to 300,000 gallons of drinking water per 24 hour period. The drinking water, converted from seawater or brackish water, is for use by a Rapid Deployment Force In a forward area When needed, the drinking water can be pumped to a shore facility or to another vessel This manual provides operation and maintenance procedures for all the component systems on the barges

3. VOLUME 1 - NORMAL OPERATIONS

This volume provides Information and procedures on normal Reverse Osmosis Water Purification Barge operations, including barge movement and deployment, communications and electrical power systems, drinking water production, shutdown, and required operational maintenance Emergency shutdown procedures are also provided

4. VOLUME 2 - SEAWATER SYSTEM

This volume describes operation and maintenance of the seawater system which supplies seawater to the Reverse Osmosis Water Purification Units (ROWPUs) for processing to the air conditioning unit for cooling to the ballast tank for barge trimming to the chlorination unit for priming and cooling, and to the diesel generators for cooling.

5. VOLUME 3 - REVERSE OSMOSIS WATER PURIFICATION UNIT (ROWPU) SYSTEM

Volume 3 provides operation and maintenance procedures for the ROWPU System which processes seawater or brackish water to produce drinking water Normally, this system processes seawater supplied by the seawater system (TM 55-1930-209-14&P-2) to create product water. Chlorine is then added to this product water by the chlorination system (TM 55-1930-209-14&P-4) The resultant drinking water is discharged into four storage tanks that are part of the drinking water system (TM 551930-209-14&P-5)

6. VOLUME 4 - CHLORINATION SYSTEM

Operation and maintenance procedures for the chlorination system onboard the Water Purification Barges are contained In this volume This system produces chlorine in a sodium hypochlorite solution, upon demand, to water processed by the ROWPU system just before the water enters the four drinking water storage tanks

7. VOLUME 5 DRINKING WATER SYSTEM

The drinking water system provides storage for water produced by the ROWPUs and includes pumps and valves to move this water from onboard storage tanks to the shore discharge system, to another vessel, or overboard. The drinking water system also provides a pressurized water supply for drinking and washing onboard the barges.

8. VOLUME 6 SHORE DISCHARGE SYSTEM
This volume provides operation and maintenance procedures for the shore discharge system which transfers drinking water from barge storage tanks to holding/storage facilities ashore.

9. VOLUME 7-COMPRESSED AIR SYSTEM

Volume 7 describes the operation and maintenance of the compressed air system which provides compressed air to five air stations in the ROWPU space, one In the workshop, and one on stern weatherdeck. This system also provides compressed air to two air stations for blowdown of seachests in void 2 starboard and void 4 port. Compressed air is used on the barges to operate air-powered impact tools, to propel air through the shore discharge hose, to blowdown seachest, and for general cleaning blowdown.

10. VOLUME 8 FUEL OIL SYSTEM

This volume provides operation and maintenance procedures for the fuel oil system which functions as a centralized receiving storage and distribution system for diesel fuel used for barge operations. This onboard fuel system provides fuel for two 155 kW diesel ship service generators, a 20 kW ship auxiliary generator, two ROWPU high-pressure pump diesel engines, and a fueling station for the barge workboat.

11. VOLUME 9-ELECTRICAL POWER SYSTEMS

Operation and maintenance procedures for the two electrical power systems installed aboard the Water Purification Barges are contained in Volume 9. The normal electrical power system generates, controls and distributes all electrical power for operating the water purification system and its auxiliary systems The emergency electrical system supplies 24 Vdc from a battery bank to 24 Vdc equipment and converts to 24 Vdc through an Inverter to 120 Vac to power emergency lighting and equipment.

12. VOLUME 10-LIGHTING SYSTEM

Volume 10 contains operation and maintenance procedures for the onboard lighting systems for the Water Purification Barges. This system supplies interior and exterior lighting. Normal and emergency interior lighting is provided in the deckhouse ROWPU space, dayroom, workshop, and voids. Exterior lighting consists of searchlights and floodlights for use at night or during reduced visibility. Lights on the weatherdecks and standard navigation and status lights are for use during operation and towing.

13. VOLUME 11 EQUIPMENT MONITORING SYSTEM

This volume provides operation and maintenance procedures for the equipment monitoring system which monitors the operation of several equipment components onboard the Water Purification Barges. This system monitors operating conditions such as amount of drinking water in storage tanks and temperature of diesel engine cooling water. Sensors detect unacceptable operating conditions, the main processor flashes at double intensity and remote alarms (horns, strobe lights and buzzer alert crewmembers that corrective action is necessary.

14. VOLUME 12--COMMUNICATIONS SYSTEM

Operation and maintenance procedures for the communications system are provided In Volume 12 This system consists of three separate communications methods, radio communications, foghorn and intercom telephones

15. VOLUME 13-HANDLING EQUIPMENT

This volume contains operation and maintenance procedures for handling equipment used for lifting, transporting and repositioning equipment and materials onboard the barges. The system includes a bridge crane, bow crane and a void 4 trolley hoist.

16. VOLUME 14ANCHOR, MOORING, AND TOWING EQUIPMENT

Volume 14 describes the operation and maintenance procedures for the anchor mooring, and towing equipment on the Water Purification Barges This equipment provides a method to hold (anchor) the barges In a fixed position offshore, at dockside, or next to another vessel and a method to move the barges from one location to another

17. VOLUME 15 MISCELLANEOUS EQUIPMENT (DAYROOM, WORKSHOP, ACCESSES, AND SANITATION SYSTEMS)

Volume 15 addresses operation and maintenance procedures for miscellaneous equipment Installed on the Water Purification Barges. This equipment includes the dayroom on the forward starboard side of deckhouse, the workshop on the forward portside of deckhouse, accesses such as deckhouse doors and portholes and various accesses to and from the voids, and two separate sanitation systems (toilets and bilge) Additional equipment addressed In this volume includes. guard rails, rubber fenderinng, removable rubber floor mats, eyewash stations, component labels, caution, warning and danger signs, and storage areas.

18. VOLUME 16 VENTILATION, HEATING, AND AIR CONDITIONING SYSTEMS

This volume contains operation and maintenance procedures for the deckhouse and voids ventilation systems and the heating and air conditioning (HAC) system installed on the Water Purification Barges The ventilation system provides fresh air circulation In the deckhouse and voids with 17 hatches and 10 ventilation fans. The HAC controls the temperature In the dayroom and deckhouse.

19 VOLUME 17--WORKBOAT, LIFESAVING, AND FIREFIGHTING EQUIPMENT

Volume 17 includes procedures for the operation and maintenance of.

a. Workboat provides water transportation for crew members and visitors, small cargo Items, transportation of the messenger line for the shore discharge hose and similar work-related tasks associated with operating the Water Purification Barges.

b. Lifesaving Equipment installed on the barges and consisting of 2 liferafts, 15 Type II and 24 Type V lifevests and 4 lifesaving rings.

c. Firefighting Equipment Installed on the barges and consisting of Halon 1301 system, 2 CO_2 hose reel units, a smoke detector system, 17 portable CO_2 fire extinguishers, 5 dry chemical fire extinguishers, 5 self-contained breathing apparatuses, and a portable, engine driven firefighting pump. The workboat also has a 1 0-pound, portable, dry chemical fire extinguisher.

20. VOLUME 18 --SUPPORTING APPENDICES FOR VOLUMES 1-17.

Volume 18 contains the Maintenance Allocation Chart, Components of End Item List, Tools and Test Equipment List, Expendable/Durable Supplies and Materials List and the Repair Parts and Special

All of the Information contained in this volume is common to volumes 1-17 and does not appear in each Individual volume.

Appendix A in volumes 1-17 provides information unique to each volume. Appendix B In volumes 1-17 provides manufacturers manuals and Instructions unique to the system described in each volume. Appendixes C-G are located In Volume 18.

21 VOLUME 19 PREVENTIVE MAINTENANCE CHECKS AND SERVICES (PMCS)

Volume 19 contains PMCS pertinent to all onboard systems for the Reverse Osmosis Water Purification Barges.

22 VOLUME 20 SUPPLEMENTAL DATA

Volume 20 contains the Basic Issue Items List, and additional Authorization List for all onboard systems for the Reverse Osmosis Water Purification Barges.

23 VOLUME 21 WINCH, DOUBLE DRUM, DIESEL

This volume contains operation and maintenance procedures for the 20-ton double drum diesel engine winch used on the Water Purification Barges. Appendix B of Volume 21 contains the Maintenance Allocation Chart and the Repair Parts and Special Tools List for the winch.

TECHNICAL MANUAL
NO. 55-1930-209-14&P-16

HEADQUARTERS
DEPARTMENT OF THE ARMY,
WASHINGTON D.C., 15 OCTOBER 1992

TECHNICAL MANUAL

OPERATORS', UNIT, DIRECT SUPPORT
AND GENERAL SUPPORT
MAINTENANCE MANUAL
(INCLUDING REPAIR PARTS AND
SPECIAL TOOLS LIST)

FOR
WATER PURIFICATION BARGES
(NSN 1930-01-234-2165)

VOLUME
VENTILATION, HEATING AND AIR CONDITIONING SYSTEMS

REPORTING 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, US Army Troop Support Command, ATTN AMSTR-MMTS, 4300 Goodfellow Blvd., St. Louis, MO 63120-1798. A reply will be furnished directly to you

Approved for public release; distribution Is unlimited.

* Supersedes TM 55-1930-209-14&P-16, 30 January, 1989

TABLE OF CONTENTS

VOLUME 16

TABLE OF CONTENTS (Continued)

VOLUME 16

TABLE OF CONTENTS (Continued)

VOLUME 16

TABLE OF CONTENTS (Continued)

VOLUME 16

TABLE OF CONTENTS (Continued)

VOLUME 16

TABLE OF CONTENTS (Continued)

VOLUME 16

LIST OF APPENDICES

TABLE OF CONTENTS (Continued)
VOLUME 16
NOTE

The following appendices, common to all TM's In this series, are In TM-55-1930-209-14&P-18.

MAINTENANCE ALLOCATION CHART (MAC)
TOOLS AND TEST EQUIPMENT LIST (TTEL)
EXPENDABLE /DURABLE SUPPLIES AND MATERIALS LIST (ESML)
REPAIR PARTS AND SPECIAL TOOLS LIST (RPSTL)
REPAIR PARTS LIST TO FIGURE NUMBER CROSS-REFERENCE LIST

NOTE

The following appendices, common to all TM's in this series, are in TM 55-1930-20914&P-20.

COMPONENTS OF END ITEM LIST (COEIL) AND BASIC ISSUE ITEMS LIST (BILL)
ADDITIONAL AUTHORIZED ITEMS LIST (AAL)

LIST OF ILLUSTRATIONS

TABLE OF CONTENTS (Continued)
VOLUME 16
LIST OF TABLES

CHAPTER 1 INTRODUCTION

Section I. General information

1-1 Purpose. This Technical Manual (TM) describes operation and maintenance of the deckhouse and voids ventilation systems and the heating and air conditioning (HAC) system Installed onboard the Water Purification Barges. All material, unless otherwise noted, pertains to all barges. Differences between barges are listed In the text and shown on illustrations. Information about other systems installed onboard is in TM 551930-209-14&P-1 thru P-15, and P-17. TM 55-1930-209-14&P-18 and TM 55-1930-209-14&P-20 contains appendices common to all TM's

1-2 Scope. The ventilation system provides fresh air circulation in the deckhouse and voids with 17 hatches and 10 ventilation fans. The HAC controls air temperature in the workshop and dayroom 1-3 Warranties and guarantees. Warranty/guarantee Information is contained In Section VI of Chapters 2, 3 and 4.

1-4 Maintenance forms and records. These are explained In DA PAM 738-750, The Army Maintenance Management System (TAMMS) 1-5 Destruction of Army materiel to prevent enemy use. This shall be as directed In TM 750-244-3.

1-6 Storage. For storage procedures on these system, refer to Section IV of Chapters 2, 3, and 4

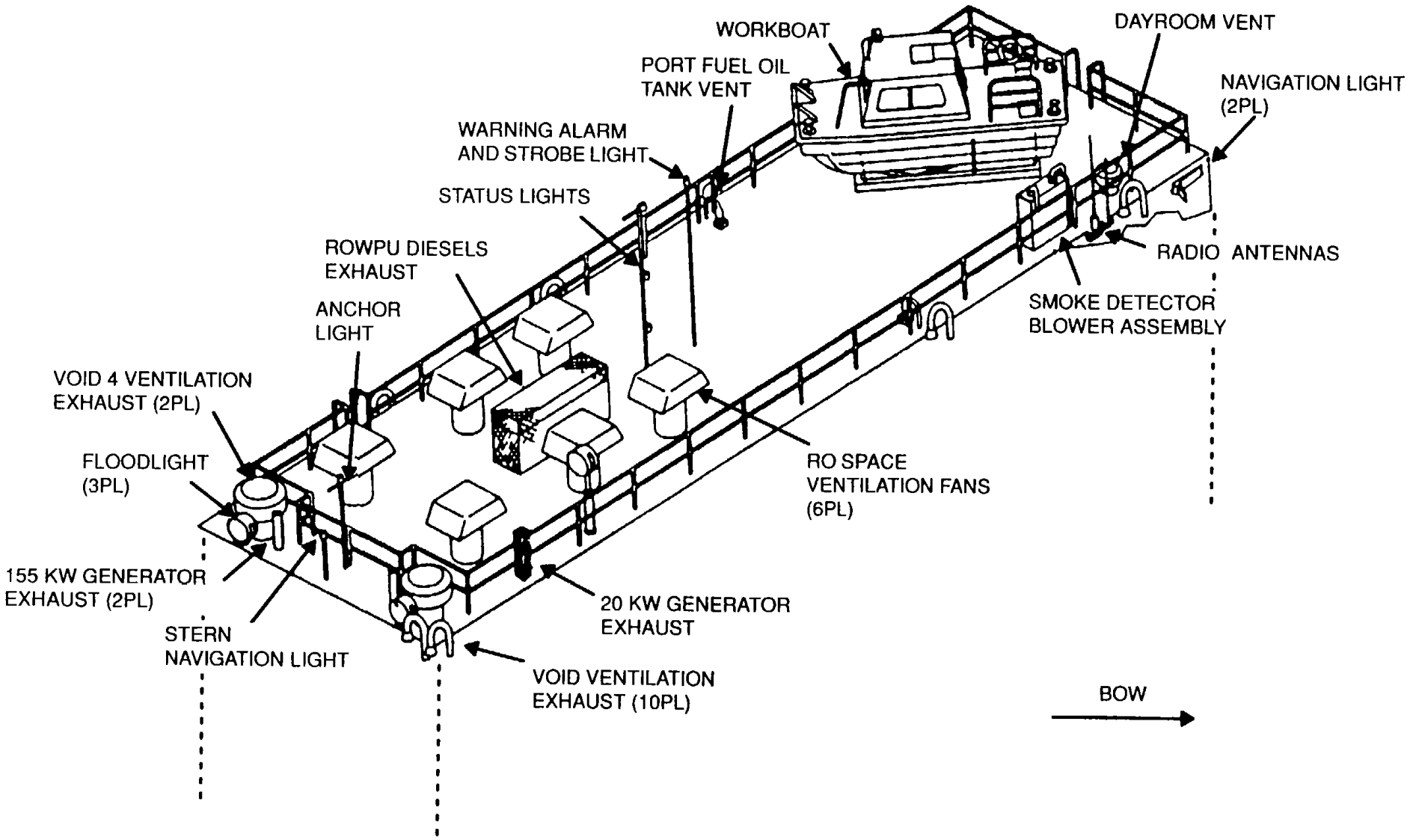


Figure 1-1. Major Components of ROWPU Barge Systems and Equipment - Deckhouse Roof (Sheet 1 of 3)

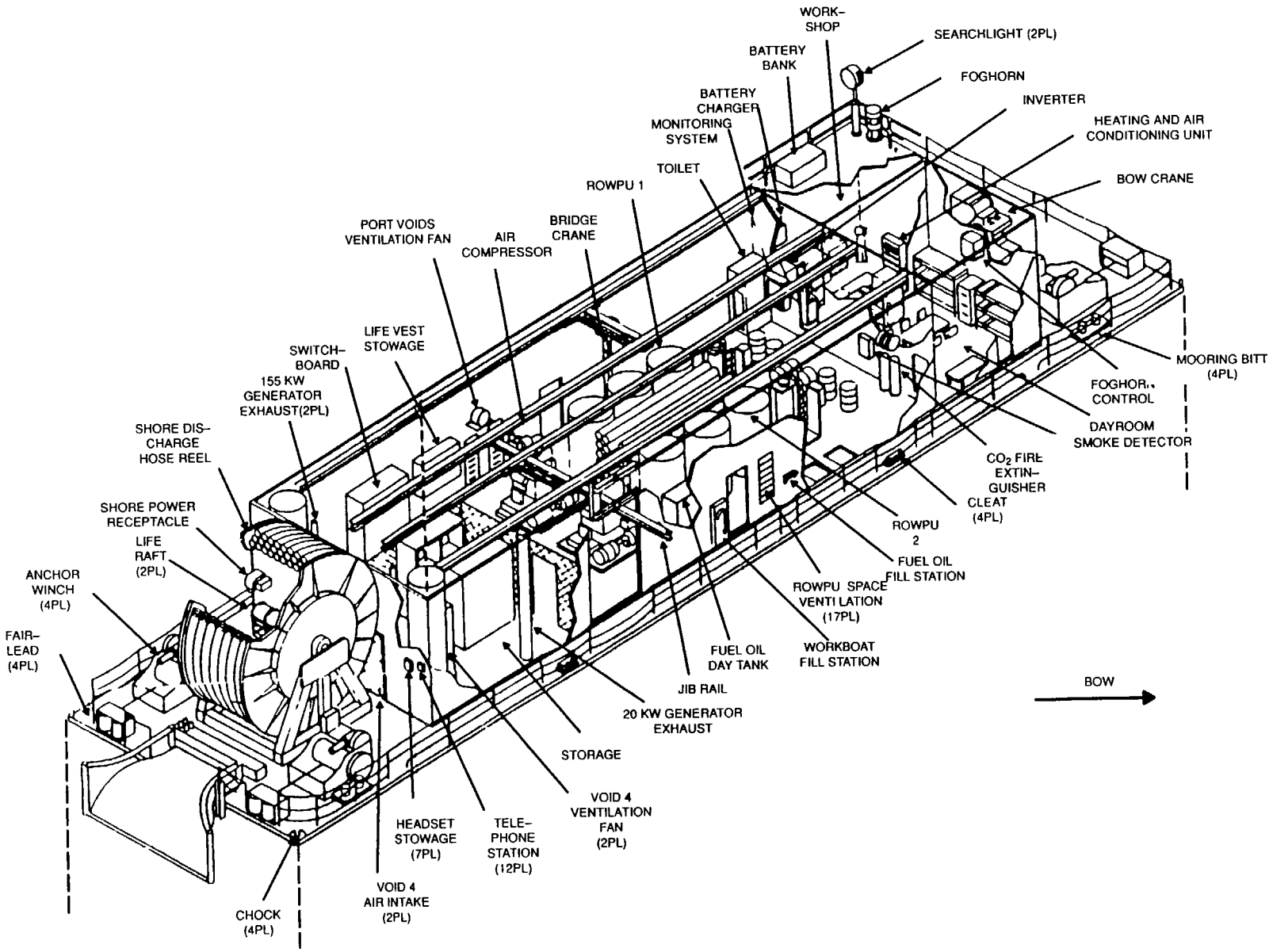


Figure 1-1. Major Components of ROWPU Barge Systems and Equipment - Deckhouse (Sheet 2 of 3)

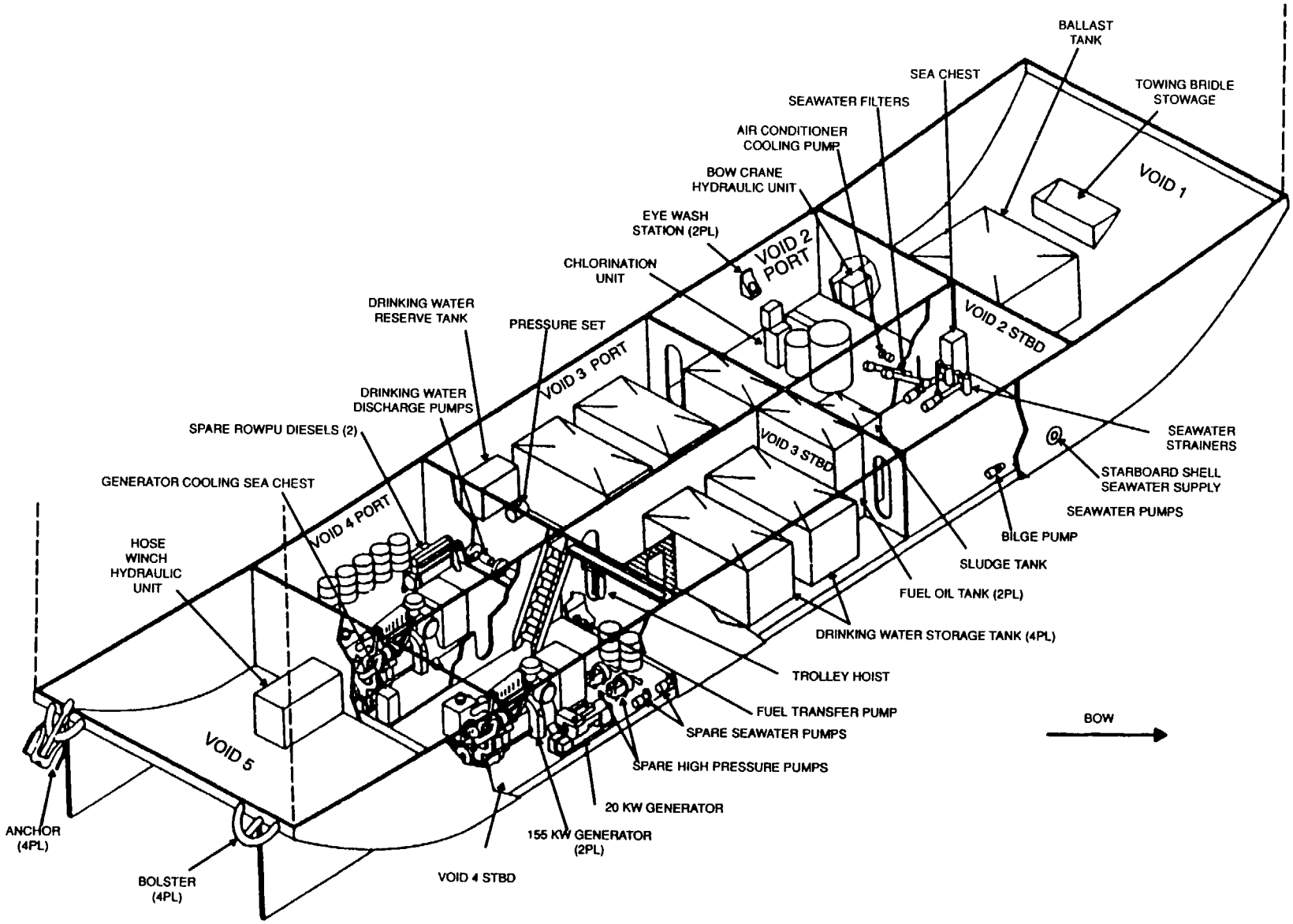


Figure 1-1. Major Components of ROWPU Barge Systems and Equipment - Voids (Sheet 3 of 3)

CHAPTER 2 DECKHOUSE VENTILATION SYSTEM

Section I. Description and data

2-1 Description. The deckhouse is provided with fresh air circulation by manually operated hatches and electrically driven fans Fresh air is supplied by opening 17 louvered hatches (Figure 2-1), 10 port and 7 starboard. (Doors may also be opened) Air circulation is increased by using six exhaust fans on the deckhouse top (Figure 2-2). These are controlled by circuit breakers on power panel 2 (Figure 2-3) and motor controllers on port and starboard bulkheads in the Reverse Osmosis Water Purification Unit (ROWPU) space. Fan motors and louvered hatches can be used in different combinations to control air movement. The deckhouse ventilation system also includes electrical wiring, controls, and an electrical emergency shutoff. Installation of this system is shown in drawings referenced in Appendix A Major components are listed in Table 2-1.

2-2 Capabilities. This system provides sufficient change of air in the deckhouse to maintain safe working conditions under normal operations 2-3 Performance characteristics. Each of the six exhaust fans on the deckhouse top moves air at the rate of 14,000 cubic feet per minute (cfm) at 1/2-Inch static pressure.

2-4 Equipment specifications

a. Watertight hatch	
Manufacturer	Julius Mock and Sons, Inc
Part No	413-A-1
CAGEC	6U135
Type	Watertight
Clear opening	18 in x 60 in
Coaming	4in
Fasteners	Wing nuts
Material	Steel
Quantity	17
b. Louvers	
Manufacturer	Arrow United Industries
Part No	FL-109
CAGEC	64787
Type	Flange face, sightproof
Size:	
Overall	18 in x 60 in x 4 in
Flange	3 1/2 In
Material	Galvanized steel
Quantity	17
c Hooded roof exhaust fan	
Manufacturer	Strobic Air Corporation
CAGEC	6M080
Part No.	HD361 5SP4XY
Size	36 in diameter
Type	Hooded top discharge, direct drive tube axial, flanged bottom
Motor	5 hp, 440 Vac, 3 ph, 60 Hz, 1150 rpm
Capacity	13,500 cfm at 0 75 in. static pressure
Finish	Carboline zinc no. 11 B coat and 190 FD top coat
Quantity	6

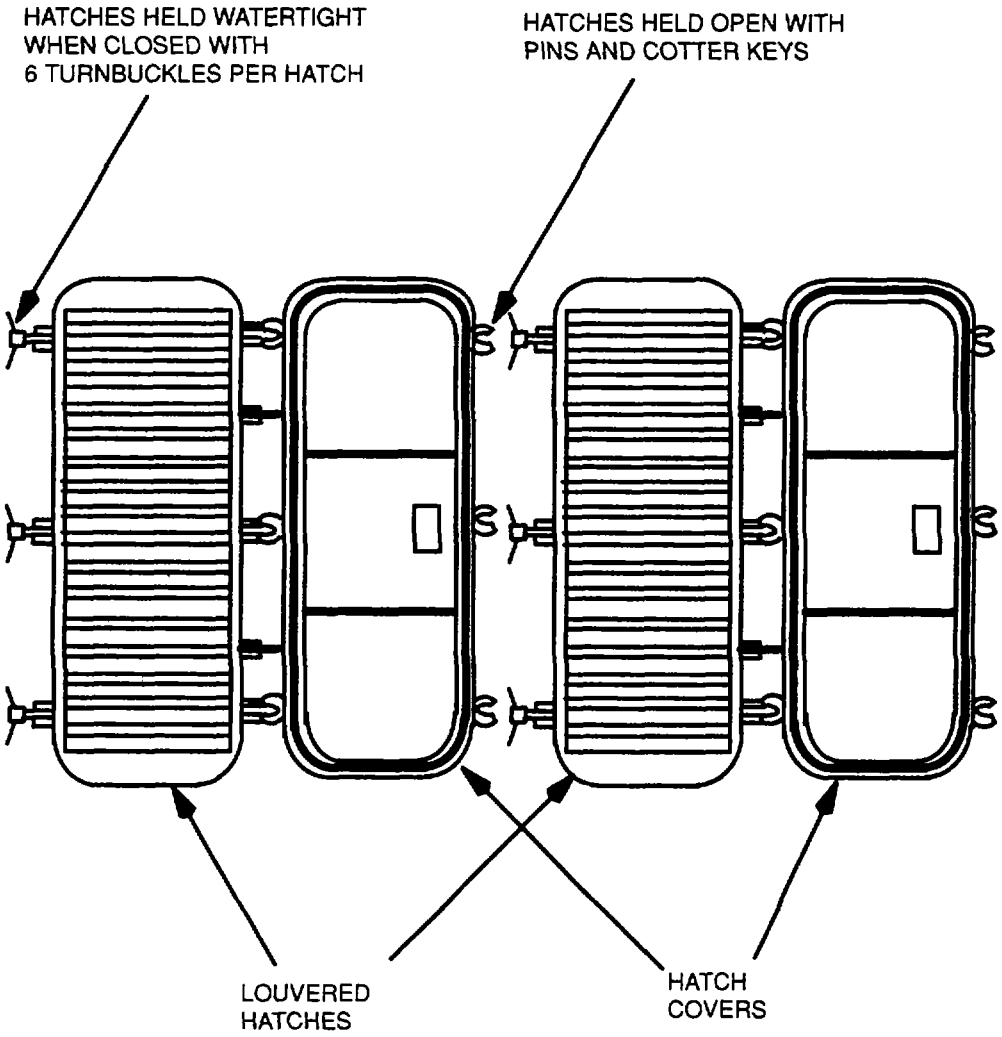
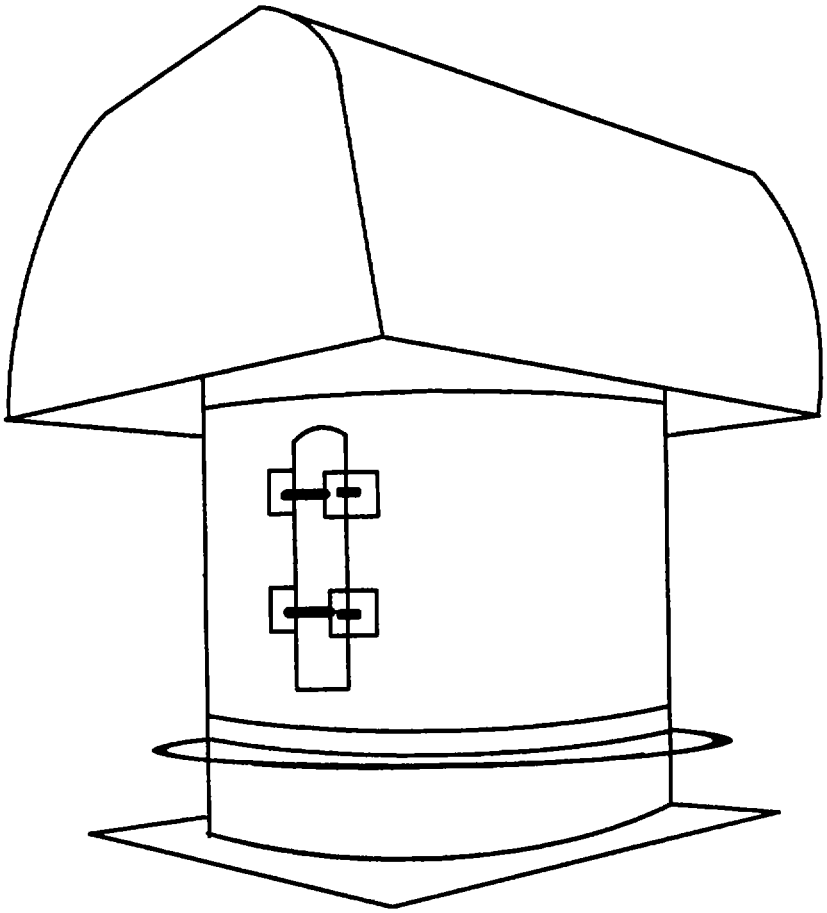
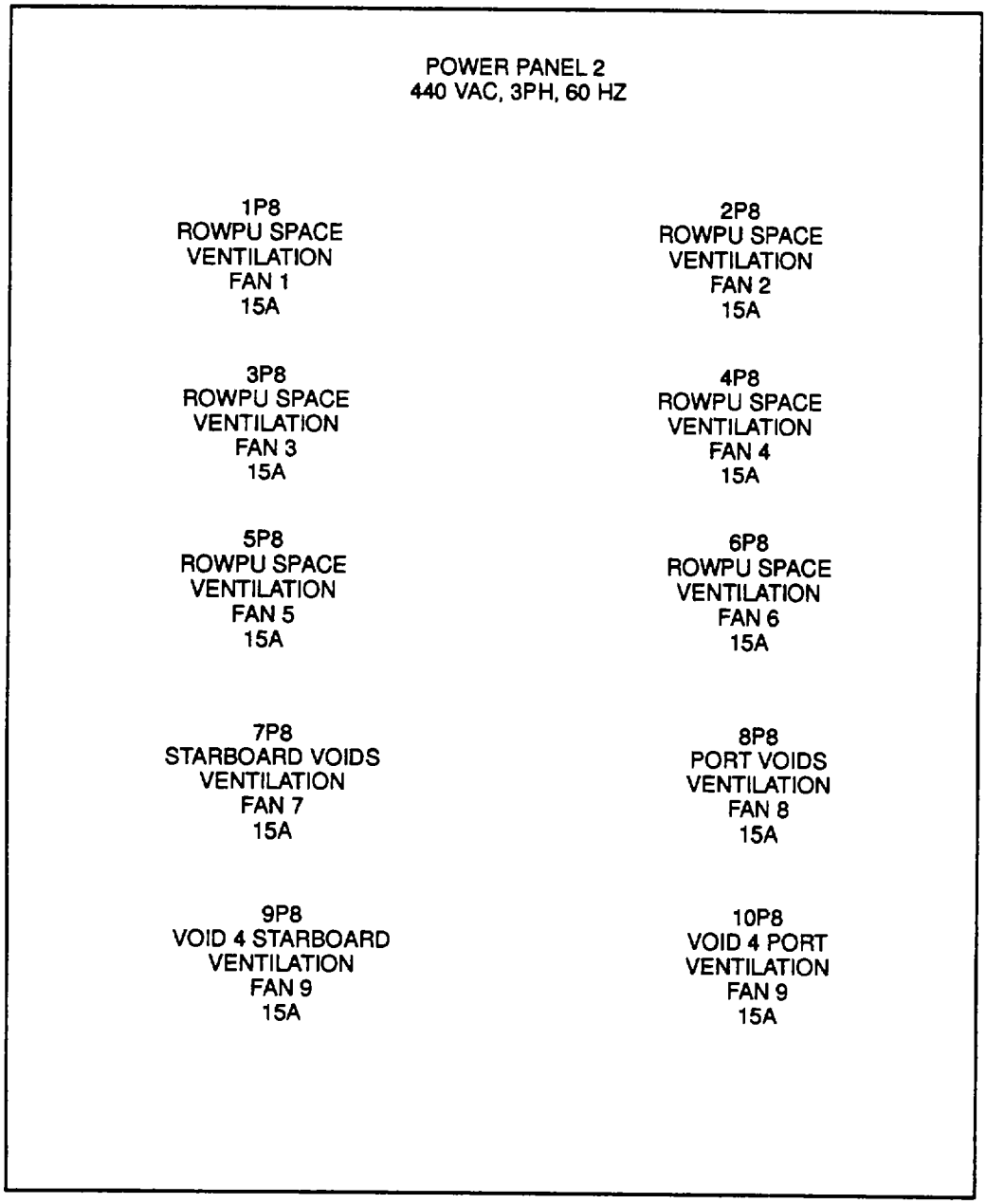


Figure 2-1. Example of Light-proof Louvered Hatches on Deckhouse Port and Starboard Bulkheads



Note:
Exhausts air from ROWPU space.
Figure 2-2. Example of Covered Fan Motors on Deckhouse Top



NOTE :
LOCATED IN ROWPU SPACE ON STARBOARD BULKHEAD FORWARD OF SLIDING DOOR. POWER INPUT FROM SWITCHBOARD CIRCUIT BREAKER P8.

Figure 2-3. Power Panel No. 2, 440 Vac

d. Fan motor controller (fans 1 thru 6)

Manufacturer	Square D Co. Bell Electric Products
CAGEC	Division
Part No.	81487
Type	2510 MCA-23 Manual w/low voltage
Rating	protection 10 Hp, 440 Vac, 3 ph,
Thermal unit	60 Hz
Part No	
Type	B11.5
Quantity	Melting alloy 6

Table 2-1. Major Components of Deckhouse Ventilation System

Component	Qty	Function	Location
Watertight hatches	17	Control supply of fresh air entering deckhouse	10 on deckhouse port and 7 on deckhouse starboard
Light-proof louvers	17	Prevent light penetration through open louvers	Inside deckhouse watertight hatches
Hooded roof for fans 1 thru 6	6	Exhaust air from ROWPU space	On deckhouse top
Fan motor controllers	6	Control fan motors 1 thru 6	In ROWPU space, fans 3 and 5 on starboard 1, bulkhead, fans 2, 4 and 6 on port bulkhead
Emergency shutdown button	1	Provides emergency shutdown of ventilating fan motors	Second button from left on row of seven RED buttons on starboard bulkhead aft of door
Power panel 2	1	Controls ventilating system fans in deckhouse and voids	Starboard bulkhead forward of sliding door

2-5 Items furnished

2-5.1 Components installed as part of the deckhouse ventilation system are listed on parts listsin drawings referenced in Appendix A and In Components of End Item List In TM 55-1930-209-14&P-20

2-5.2 Common and bulk items onboard are listed In Expendable Supplies and Materials List In TM 55-1930209-14&P-20

2-53 Repair parts and special tools onboard are listed In Repair Parts and Special Tools List in TM 55-1930209-14&P-18.

2-6 Items required but not furnished. All required items are furnished.

2-7 Tools and test equipment. Use existing tools and equipment onboard. A complete list of tools and test equipment onboard is In Tools and Test Equipment List in TM 55-1930-209-14&P-18.

Section II. Operating instructions

2-8 Operating controls and Indicators

a. Circuit breakers controlling power to six deckhouse ventilation fans are on power panel 2 on deckhouse starboard bulkhead forward of sliding door. Figure 2-3 shows location of circuit breakers for specific fans

b. Six fans are controlled by electric controllers with ON/OFF toggle switches Raise toggle switches to start fans. Lower toggle switches to stop fans. Location of controllers is provided in paragraph 2-10.1 and in Figure 2-4.

2-9 Prestart procedures

a. Open ventilation hatches as desired to provide fresh air ventilation There are 10 hatches on port and 7 on starboard. Secure hatch covers in open position with pins and cotter keys.

b. Make sure that air ducts are free of obstructions and not severely dented or damaged.

c. Visually inspect fans and motors to make sure they are not damaged, fan blades have sufficient clearance, motors and fans are properly secured, and electrical connections are tight. Make sure switchboard circuit breaker P8 is closed to provide power to power panel 2.

e. Make sure power panel 2 circuit breakers 1 P8 thru 6P8 are closed to provide power to six roof-mounted exhaust fan motors. Power panel 2 is on ROWPU space starboard bulkhead forward of sliding door.

2-10 Operating procedures

2-10.1 Increasing ventilation. Push controller ON switches to start ROWPU space ventilating fans Operate fans (Figure 2-4) as desired to provide ventilation.

a. Fan controllers on starboard bulkhead are located as follows:

(1) Fan 1 controller is aft of side door.

(2) Fan 3 controller is forward of sliding door.

(3) Fan 5 controller is aft of sliding door

b. Fan controllers on port bulkhead are located as follows.

(1) Fan 6 controller is aft of side door

(2) Fan 4 controller Is farther aft from side door

(3) Fan 2 controller is near air compressor

2-10.2 Decreasing ventilation. To control circulation, push controller switches to OFF to stop fans as desired. Close any or all 17 ventilation hatches as necessary

2-11 Shutdown procedures

2-11.1 Normal shutdown for less than 72 hours

a. Turn off deckhouse ventilating fans by pushing controller switches to OFF

b. Close ventilation hatches as desired

2-11.2 Normal shutdown for more than 72 hours

a. Turn off deckhouse ventilating fan motors by pushing controller switches to OFF

b. Close and secure 17 ventilation hatches

c. Open power panel 2 circuit breakers 1 P8 thru 6P8

d. Open switchboard circuit breaker P8

e. Emergency shutoff of ventilation system automatically shuts down chlorination system. Ventilation emergency shutdown RED button is second button from left in row of seven system emergency shutdown buttons aft of starboard personnel door When pushed, this button opens switchboard circuit breaker P8 which provides electricity to power panel 2 Circuit breakers on this panel, which provide power for 10 ventilating fans (Figure 2-3), trip OFF, and individual fan motor controllers also go to OFF. This also cuts power to fan motors providing ventilation to voids, including void 2 port where chlorination system is located. When power is cut to void fan 8, an electrical Interlock turns off chlorination system.

2-12 Emergency shutdown

2-12.1 General. The barge has two emergency shutdown modes. One mode shuts down individual systems such as the ventilation system or a diesel high pressure pump and the other mode shuts down all barge operating systems.

Both modes are activated by pushing a RED button protected by a metal guard. On individual system shutdowns, this button shuts off either fuel or electrical power On the total shutdown, this button shuts off all fuel and electrical power to all operating systems.

Seven red system shutdown buttons are located on the ROWPU space starboard bulkhead just aft of the personnel door These system shutdown buttons (Figure 2-5) control shore power, ventilation systems, ROWPU 1 diesel high pressure pump, ROWPU 2 diesel high pressure pump, 20 kW auxiliary generator, service generator 2, and service generator1.

Six red total shutdown buttons are.

- On ROWPU space starboard bulkhead aft of personnel door, above and forward of system shutdown buttons
- Outside ROWPU space starboard door on weatherdeck.
- Outside ROWPU space port door on weatherdeck.
- Inside ROWPU space port door to weatherdeck
- Outside dayroom door to weatherdeck
- Inside dayroom door to weatherdeck

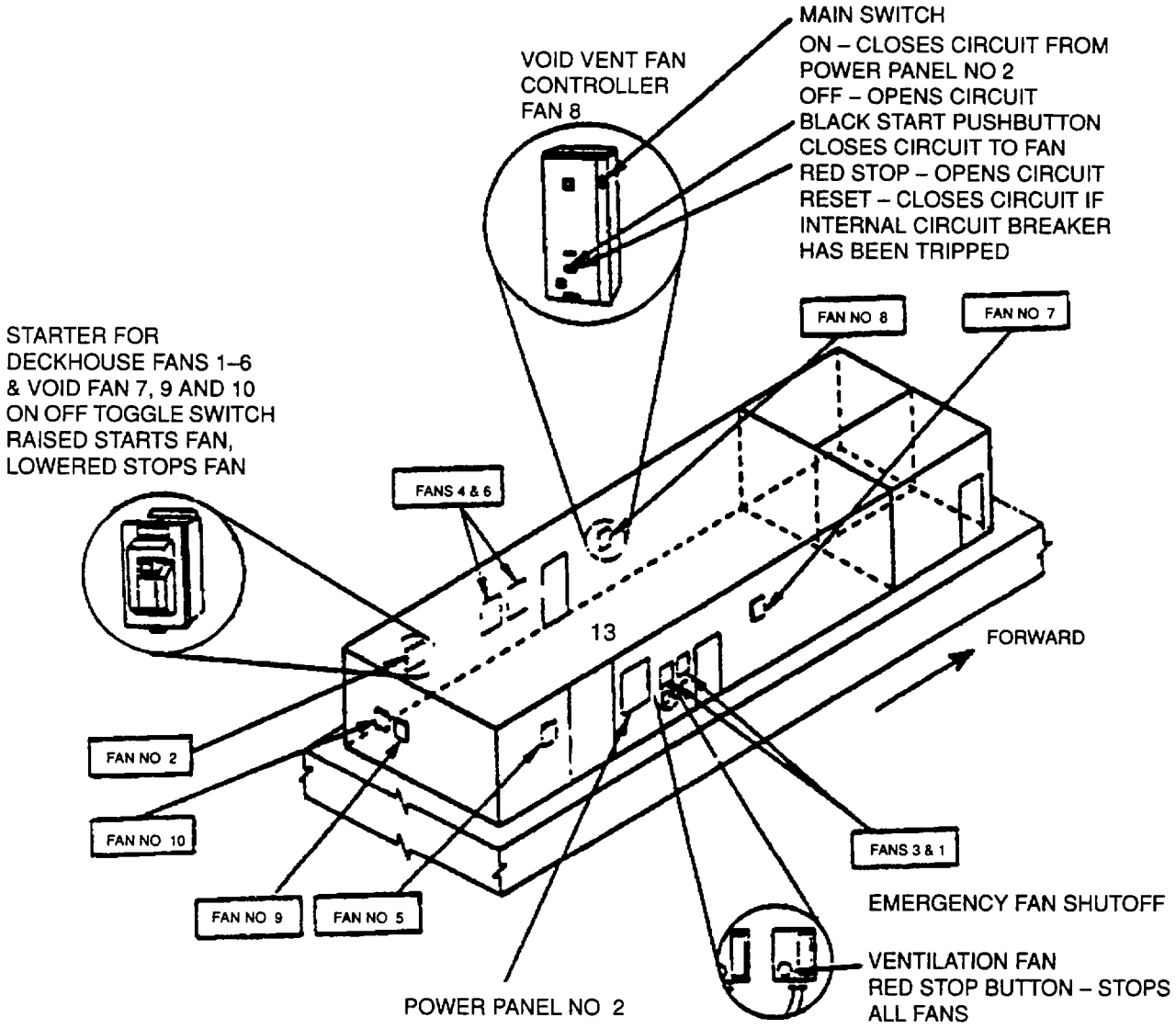


Figure 2-4. Ventilation System Operating Controls

2-12.2 Emergency shutdown procedures

a. In an emergency, push the appropriate RED button to shutdown either the ventilation system or all operating systems.

b. When emergency situation has been corrected, reset emergency button by turning collar behind button one-quarter turn clockwise Button will pop out and again be in the ready position.

c. When emergency button is reset, ventilation system must be restarted by performing procedures In paragraphs 2-9 and 2-10.

Section III. Maintenance instructions

2-13 General

2-13.1 Maintenance concept

2-13.1.1 Unit level and Intermediate Direct Support/Intermediate General Support (IDS/IGS) maintenance on the deckhouse ventilation system is performed onboard by crewmembers whenever possible.

2-13.1.2 Any IDS/IGS maintenance beyond capability of crewmembers will be provided by a shore-based area support maintenance unit. This unit also determines if depot support maintenance is required.

2-13.1.3 Intermediate support maintenance is accomplished by replacing components or major end items

2-13.1.4 Unless other intermediate support maintenance procedures are directed, IDS/IGS maintenance normally is provided by an Army Transportation Corps floating craft intermediate support maintenance unit serving terminal operating area. Components to be disposed of are processed by this unit.

2-13.1.5 Maintenance Allocation Chart (MAC) is in TM 55-1930-209-14&P-18. For maintenance of other onboard equipment, consult appropriate manual.

2-13.2 Maintenance Instructions. Maintenance instructions are presented in the following paragraphs Appendix C, Preventive maintenance checks and services; paragraph 2-15, Troubleshooting; and paragraph 2-16, Maintenance procedures

2-14 Preventive maintenance checks and services. See TM 55-1930-209-14&P-16, Appendix C for preventive maintenance checks and services for ventilation system See TM 55-1930-209-14&P-19 for complete preventive maintenance checks and services for all systems on the ROWPU Barge

2-15 Troubleshooting

NOTE

Troubleshooting procedures In Table 2-2 are used for both deckhouse and voids ventilation systems.

2-15.1 Troubleshoot deckhouse ventilation system by following procedures in Table 2-2

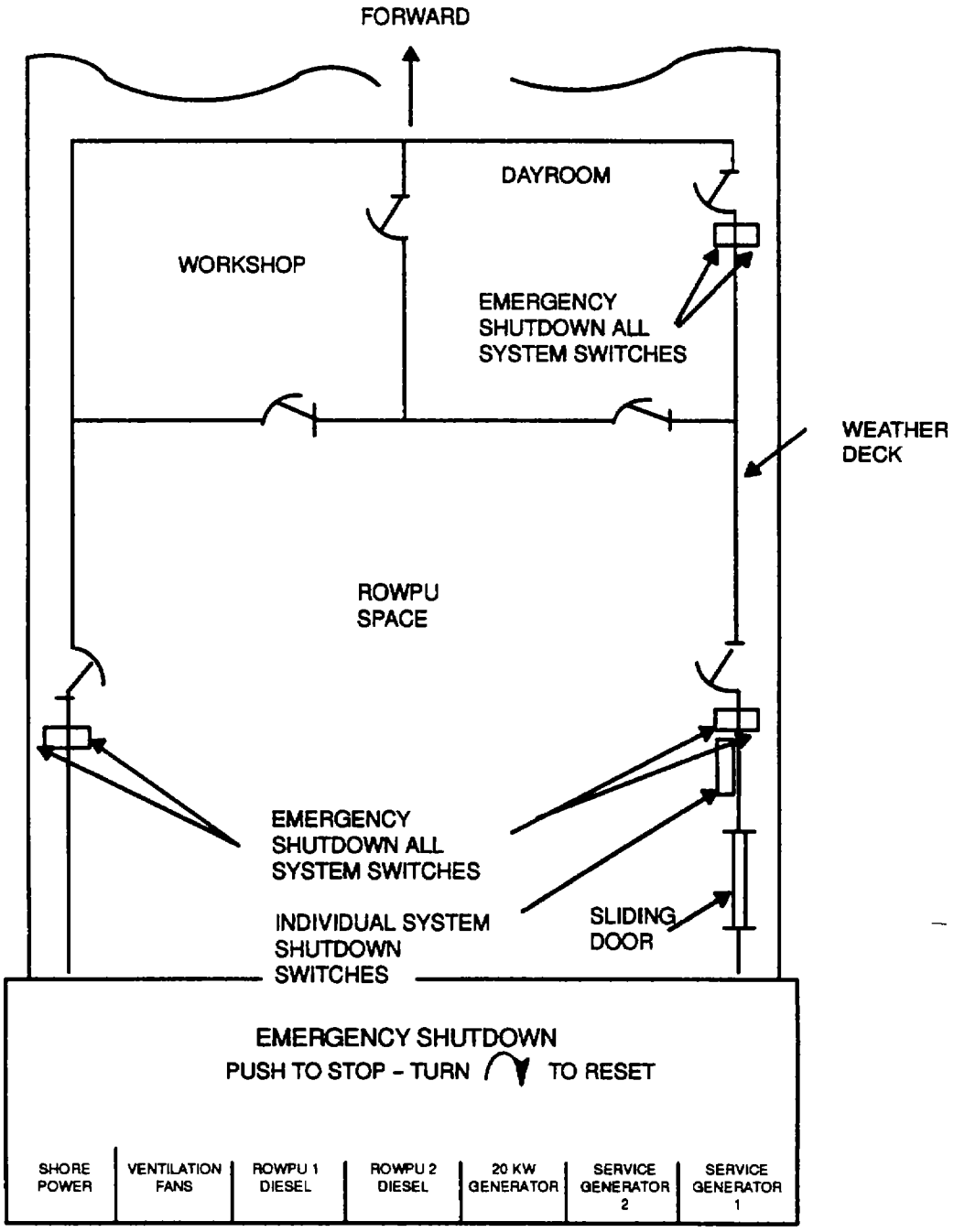


Figure 2-5. Location of Controls for Emergency Shutdown Systems

Table 2-2. Troubleshooting Procedures for Deckhouse and Voids Ventilation Systems

Condition	Possible Cause	Suggested Acton
1 Barge ventilation system does not operate	a Circuit breaker P8 on switchboard open	a. Close circuit breaker
	b. All circuit breakers open on power panel 2	b. Close circuit breakers
2. One or more vent fans does not operate	a Circuit breaker open on power panel 2 for non-operating fan motor(s)	a. Close circuit breaker
	b Electrical wiring defective to non-operating motor	b Troubleshoot electrical wiring*
	c. Fan motor defective	c Replace fan motor
	d Controller defective	d. Replace controller
3. Deckhouse or voids fans noisy	a Bearings need lubrication	a. Lubricate according to paragraph 2-14.3h
	b Fan blades dirty and fans out of balance	b. Clean fan blades
4 Little or no air entering voids	a. Blower covers dosed in open position	a. Open covers and secure
	b. Emergency mechanical shutoffs dosed	b. Open emergency shutoffs
	c. Void exhaust vent terminals covered	c. Uncover terminals located on deckhouse top
5. Void fan 8 does	a. Main switch off not operate, start button ON	a. Push OFF button, dose main switch and restart
	b. Electrical wiring defective	b. Troubleshoot electrical wiring*
	c. Fan motor defective	c. Replace fan motor
	d Controller Defective	d. Replace controller
6 Poor air circulation in deckhouse; fans on	Port/starboard hatches dosed	Open and secure 17 hatches
7 Ventilation emergency system activated; fans still operate	a Ventilation fans emergency shutdown switch defective	a Replace switch
	b. Switchboard circuit breaker P8 defective	b Replace circuit breaker
	c. Electrical wiring defective	c. Troubleshoot electrical wiring*

* Make sure electrical wiring is tight and free of frayed or broken cable insulation Ensure electrical connections are correct and in good repair.

2-16 Maintenance procedures

NOTE

The following maintenance procedures apply to both deckhouse and voids ventilation systems.

2-16.1 Servicing ventilation systems fans and motors. These procedures are in Chapter 2, TM 55-1930-209-14&P-19

2-16.2 Replacing ventilation systems fans and motors

NOTE

Each ventilation fan and motor is a unit and must be replaced by a like Item unit. Repair is beyond crew capability.

a. On power panel 2, on ROWPU space starboard bulkhead forward of sliding door, open the circuit breaker providing power to the fan to be replaced.

b. Redtag that circuit breaker indicating, "WARNING DO NOT ACTIVATE REPAIRS BEING MADE."

c. On controller for fan to be replaced, push switch OFF. Redtag controller as indicated in step b.

d. Remove fan motor access plate.

e. Disconnect electrical wiring to motor junction box. Label each wire and push out of working area.

f. Unbolt motor at base and remove motor and fan from ventilator shaft.

g. Install new motor and fan in reverse order.

h. Check that fan has proper clearance all around ventilating shaft. If not, loosen motor mounting bolts and adjust position of motor until fan has proper clearance.

i. Connect electrical wiring to motor junction box.

j. Check that fan housing is clear of all tools and cleaning cloths.

k. Close circuit breaker providing power to replaced fan. Do not remove red tag at this time.

l. On controller for replaced fan, push ON for just a moment. Check that fan rotates in proper direction to move air as desired If fan rotates In proper direction, go to step s If fan rotation is not correct, continue with step m.

m. Turn controller on replaced fan to OFF. Ensure red tag is still attached.

n. Open power panel 2 circuit breaker that controls power to replaced fan. Red tag should still be attached

o. Disconnect any two wires to motor junction box and reverse the wires

p. Check that fan housing is dear of all tools and cleaning cloths.

q. Close circuit breaker providing power to replaced fan but do not remove red tag.

r. On controller for replaced fan, push ON for just a moment Check that fan rotates in proper direction to move air as desired. Push controller to OFF.

s. Replace fan motor access plates. Coat bolts lightly with general purpose water-resistant grease (MIL-G-24139A). Make sure bolts are tight.

t. Remove red tags from fan motor controller and circuit breaker in power panel 2

u. Record completion of this maintenance item in log book.

2-16.3 Replacing gaskets on ventilation watertight hatches

a. Remove old gasket material and adhesive from groove In watertight hatch cover Clean groove with solvent and fine grade sandpaper Wipe clean with dry cloth.

b. Obtain replacement neoprene gasket for ventilation watertight hatches

c. Coat groove with adhesive that comes with gasket. Allow this to dry until very sticky

d. Place gasket In groove and press firmly In place

e. Close and latch that hatch shut for 24 hours

f. After 24 hours, open hatch for normal use and record repair in maintenance logbook

Section IV. Storage

2-17 Short-term storage. If barge Is to be taken out of service for more than 7 days but less than 30 days, follow shutdown procedures In paragraph 2-11.2.

2-18 Administrative storage. If barge is to be taken out of service for more than 30 days but less than 6 months, barge remains a unit responsibility and shall be maintained by unit personnel.

2-18.1 Administrative storage procedures

a. Shut down deckhouse ventilation system by following procedures in paragraph 2-11.2.

b. Perform monthly preventive maintenance checks and services by following procedures in Appendix C

2-18.2 Administrative storage Inspection. While in storage, this system should be operated and inspected every 90 days. In meeting this requirement:

a. Start up system In accordance with procedures in paragraphs 2-9 and 2-10.

b. Perform monthly periodic inspections and services as required by Appendix C

c. Return system to administrative storage by following shutdown procedures in paragraph 2-11.2.

2-19 Long-term storage. If barge Is to be taken out of service for 6 months or more, turn it in to depot for preparation and placement into long-term storage If barge is in administrative storage and is to be taken out of service and placed in depot long-term storage (6 months or more) process ventilation system for normal operation before releasing to depot.

Section V. Manufacturers' service manuals/instructions

2-20 General. Manufacturers' service manuals/instructions listed below provide additional information on components of deckhouse ventilation system A copy of each manual/set of instructions is in Appendix B. It may be necessary to refer to both these manuals/instructions and the drawings listed in Appendix A while performing procedures in this volume.

Component	Document Title	Manufacturer
Hooded roof fan model	Strobic Air Corporation Instructions No HD36H5K4Y	Strobic Air Corporation 1340 Ford Road Bensalem, PA 19020 (215) 244-1700
Fan motor controllers	TM 55-1930-209-14&P-9, Electrical Power System	

Section VI. Manufacturers' Warranties/Guarantees

2-21 General Information on the warranty/guarantee for components In the deckhouse ventilation system is listed below.

Component	Manufacturer	Duration	Coverage
Hooded roof fans	Strobic Air Corporation 1340 Ford Road Bensalem, PA 19020 (215) 244-1700	1 year	Limited
Fan motor controllers	TM 55-1930-209-14&P-9, Electrical Power System		

CHAPTER 3 VOIDS VENTILATION SYSTEM

Section I. Description and Data

3-1 Description. The void areas are provided with forced fresh air ventilation by electrically driven fans. Two fans mounted high on deckhouse port and starboard bulkheads (Figure 3-1) provide ventilation to eight void areas, void 1 In bow, voids 2 port and starboard, voids 3 port and starboard, voids 4 port and starboard, and void 5 in stern. In addition, two fans mounted In ducting at rear of ROWPU space (Figure 3-2) exhaust hot air from voids 4, which contain three diesel generators Two louvered hatches with covers and ducting provide fresh air intake from the stern weatherdeck Into voids 4 -one In port and the other In starboard The voids ventilation system also includes air ducts, electrical wiring, controls, and both mechanical and electrical emergency shutoffs Installation of this system is shown In drawings referenced in Appendix A Major components are listed in Table 3-1

3-2 Capabilities. This system provides sufficient change of air in the voids to maintain safe working conditions under normal operations

3-3 Performance characteristics. Two fans mounted on port and starboard bulkheads each move air at the rate of 1887 cfm at 1/2 Inch static pressure Generator exhaust fans each move air from voids 4 at the rate of 8500 cfm at 1 06 inches static pressure

3-4 Equipment specifications

a. Blower (horizontal installation on port/starboard bulkheads)

Manufacturer	American Davidson
CAGEC	07077
Part No.	S105MJ
Capacity	1887 cfm @ 1/2 In standard pressure
Motor	1 hp, 1140 rpm, 440 Vac, 3 ph,
60 Hz, clockwise rotation	
Quantity	2

b. Blower cover

Manufacturer	Juniper Elbow Company, Inc
CAGEC	97537
Part No.	Size 14
Type	Round, watertight
Clear opening	14-in diameter
Material	Steel
Quantity	2

c. Ventilation valve (mechanical emergency shutoffs)

Manufacturer	Juniper Elbow Company, Inc.
CAGEC	97537
Part No	Size R6
Type	Watertight round
Size	6 in nominal
Material	Steel
Quantity	6

d. Ventilation valve (mechanical emergency shutoff for void 5)

Manufacturer	Juniper Elbow Company, Inc.
CAGEC	97537
Part No	Size R10
Type	Watertight round
Size	10 In nominal
Material	Steel
Quantity	1

e. Terminal (end of ventilating passage)

Manufacturer	Juniper Elbow Company, Inc
CAGEC	97537
Part No. JE-108, Type D-3	
Type	Wire mesh
Size	6 in nominal
Material	Galvanized steel
Quantity	16

f. Ventilation Returns

Specification	ANS B16.9
CAGEC	80204
Part No	ANS B16 9 180 degree
Grade	WPC
Size	6 5/8 In X .135 wall thick
Material	Galvanized steel
Quantity	8

g. Blower in ROWPU space for voids 4)

Manufacturer	Strobic Air Corporation
CAGEC	6M080
Size	30-in diameter
Type	3 blade, tube axial, flanged both ends
Part No.	TD3012P4XY
Capacity	8500 ctm @ 1.06 In static pressure, discharge upward
Motor	5 hp, 1750 rpm, 440 Vac, 3 ph, 60 Hz
Quantity	2

h. Mushroom ventilator exhaust (on deckhouse top)

Manufacturer	Juniper Elbow Company, Inc.
CAGEC	97537
Part No. JE105	
Size	30 in inside diameter
Type	Mushroom
Material	Steel
Quantity	2

i Bellmouth ventilator intake (in void 4 intake)

Manufacturer	Juniper Elbow Company, Inc
CAGEC	97537
Part no. JE109 size A-10	
Type	Bellmouth intake with screen
Material	Steel
Quantity	2

j. Louvers (on ROWPU space aft bulkhead)

Manufacturer	Ruskin Manufacturing Co.
CAGEC	5M180
Part No. L375D	
Type	Stationary drainable, 16 gage
Material	Galvanized steel
Quantity	2

k. Grill (in void 4 air intake)

Manufacturer	Juniper Elbow Company, Inc.
CAGEC	97537
Part No.	JE-111
Type	Wire mesh 1 1/4 in U- frame
Size	36 X 20 in opening
Material	Galvanized steel
Quantity	2

l. Motor controller (fan 8)

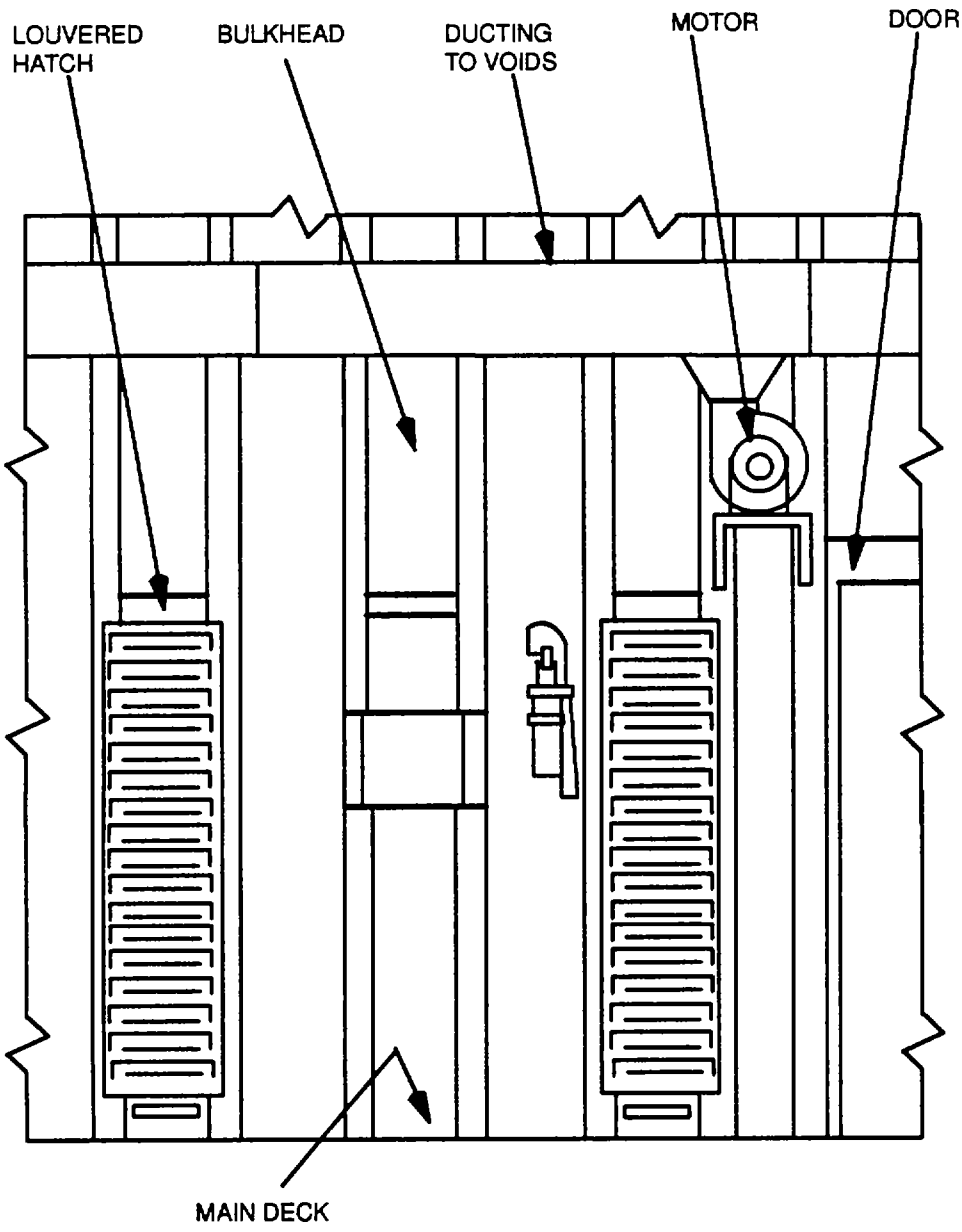
Manufacturer	Square D Co. Bell Electric Products Div.
CAGEC	81487
Part No	8538-SBA-21 -AFT
Type	Non-reversing w/nonfusible
disconnect switch	
Rating	5 hp, 440 Vac, 3 ph, 60 Hz
Thermal unit	
Part No.	B2 40
Type	Thermal alloy
Quantity	1

m. Motor controllers (fans 7, 9, and 10)

Manufacturer	Square D Co. Bell Electric Products Div.
CAGEC	81487
Part No	2510 MCA-23
Type	Manual w/low voltage protection
Rating	10 hp, 440 Vac, 3 ph, 60 Hz
Thermal unit	
Part No	B2.40 (fan 7) B11.5 (fans 9 and 10)
Type	Melting alloy
Quantity	3

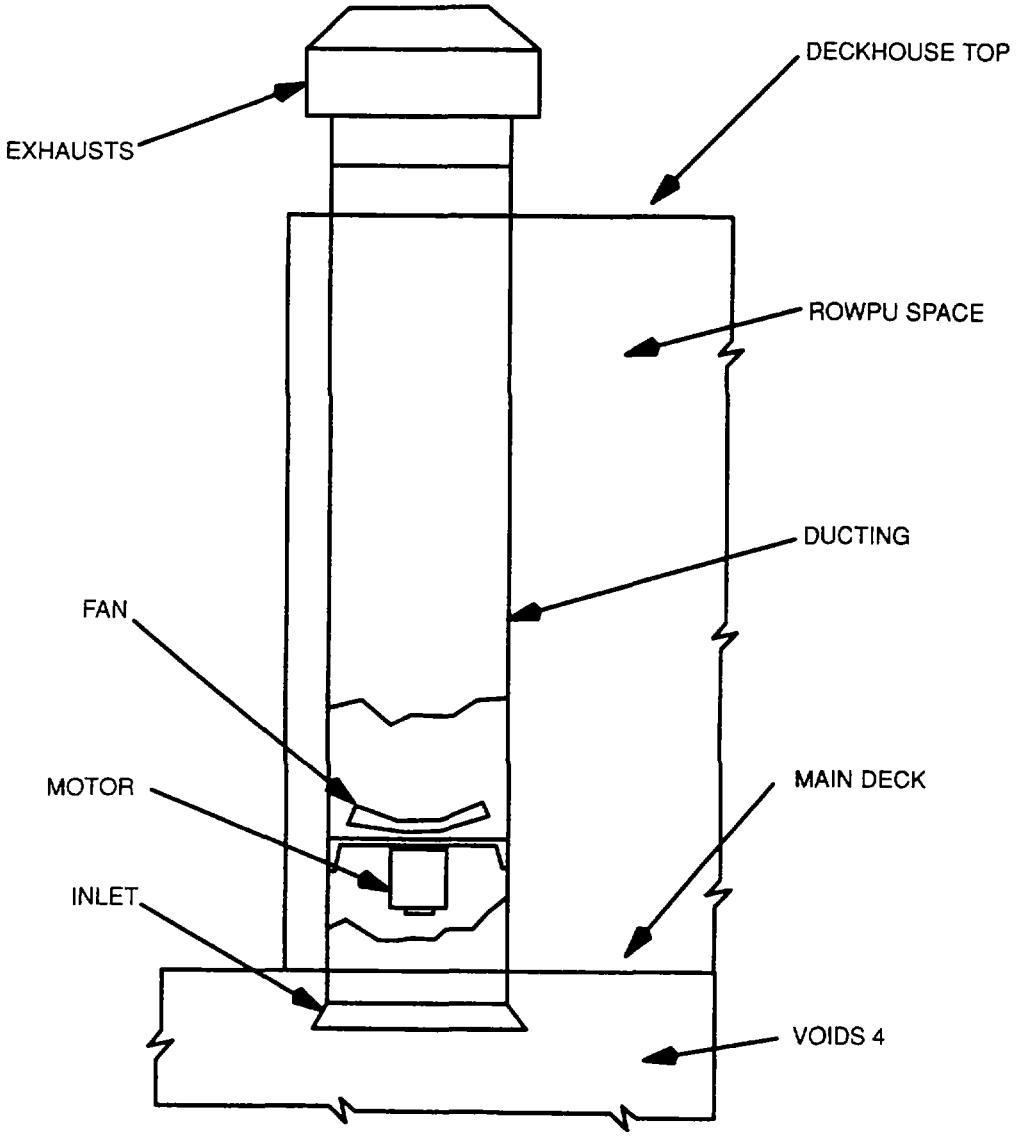
Table 3-1. Major Components of Voids Ventilation System

Component	Qty	Function	Indication
Mushroom exhaust air roof outlets	2	Exhaust air from voids 4 port and starboard	On topdeck for fans 9 and 10
Ventilating fans (vertical)	2	Exhaust air from voids 4 port and starboard	In ROWPU space near aft bulkhead
Ventilating fans (horizontal)	2	Blow forced air into voids port and starboard	In ROWPU space high on bulkheads
Round blower covers with fittings	2	Protect fan motors, provide air intake	In ROWPU space high on port and starboard bulkheads
Fan motor controller with interlock	1	Controls fan motor 8	In ROWPU space on port bulkhead forward of door
Fan motor controllers	3	Control fan motors 7, 9 and 10	1 on deckhouse starboard bulkhead, 2 on deckhouse aft bulkhead
Ventilation emergency button	1	Provides emergency shutdown of all ventilating fan motors	Second button from left on row of seven RED buttons located starboard bulkhead aft of door
Power panel 2	1	Controls ventilating system fans in voids and deckhouse	ROWPU starboard bulkhead forward of sliding door
Louvered air intake ventilation hatches	2	Provides fresh air to voids 4 for diesel engines	Aft deckhouse bulkhead
Louvered hatch covers	2	Provides weathertight seal on air intake ventilation hatches	Aft deckhouse bulkhead



Note. Provides forced air ventilation into all voids

Figure 3-1. Voids Ventilation Fan Motors on Port and Starboard Deckhouse Bulkheads (Portside Shown)



Note: Exhaust air from voids 4 through fans to ducting and outlet on deckhouse top.

Figure 3-2. Example of Vertical Fan Motors near ROWPU Space Aft Bulkhead

3-5 Items furnished

3-5.1 Components Installed as part of the voids ventilation system are listed on parts lists In drawings referenced in Appendix A and in Components of End Item List In TM 55-1930-209-14&P-20

3-5.2 Common and bulk items onboard are listed In Expendable Supplies and Material List in TM 55-1930-209-14&P-20.

3-5.3 Repair parts and special tools onboard are listed in Repair Parts and Special Tools List in TM 55-1930-209-14&P-1 8.

3-6 Items required but not furnished. All required items are furnished

3-7 Tools and test equipment. Use existing tools and equipment onboard A complete list of tools and test equipment Is in Tools and Test Equipment List in TM 55-1930-209-14&P-18.

Section II. Operating instructions

3-8 Operating controls and Indicators

a. Circuit breakers 7P8 thru 1 0P8 controlling power to four voids ventilation fans are on power panel 2 on deckhouse starboard bulkhead forward of sliding door Figure 2-3 shows location of circuit breakers for specific fans.
b. Voids ventilation fans 7, 9 and 10 are controlled by electric controllers with ON/OFF toggle switches. Raise toggle switches to start fans Lower toggle switches to stop fans. Starter/controller locations are shown In Figure 2-4.
c. Voids ventilation fan 8 contains an electrical interlock for chlorination system and requires slightly different procedures than for other voids ventilation fans. To start this fan, first move ON/OFF switch on top front of controller to ON, then raise toggle switch to start fan To stop this fan, lower toggle switch and then move controller switch to OFF This controller also contains a reset button that, when pushed, resets the internal circuit breakers for this fan and the electrical supply for the chlorination system.

3-9 Prestart procedures

a. Open blower inlet covers high on exterior sides of ROWPU space and secure In open position with drop chains (Figure 3-3).
b. Remove two large flat cover plates on louvered air intake hatches on deckhouse stem bulkhead exterior (Figure 3-1). Secure with bolts to special storage mounting brackets on either side of ventilator intakes These covers must be removed before starting fan motors 9 and 10 and diesel generators in voids 4.
c. Open all eight emergency ventilation shutoff valves (Figure 3-4) Six of these are on sides of ROWPU space, one In dayroom and one mounted overhead in void 4 port. Handles should be In vertical position in deckhouse and parallel to air duct In void 4 port Emergency ventilation shutoff valves are located in ventilation ductwork as follows:

    (1) Void 1 dayroom near starboard bulkhead
    (2) Void2 starboard ROWPU space near starboard bulkhead
    (3) Void 3 starboard same as void 2 starboard farther aft
    (4) Void 4 starboard same as void 3 starboard farther aft
    (5) Void 2 port ROWPU space near port bulkhead
    (6) Void 3 port same as void 2 port farther aft
    (7) Void 4 port same as void 3 port farther aft
    (8) Void 5 overhead In void 4 port. This is a branch from void 4 port, so closing void 4 port also shuts off air to void 5.

d. Close switchboard circuit breaker P8 to provide power to power panel 2.
e. Make sure power panel 2 circuit breakers 7P8 thru 10P8 (Figure 2-3) are dosed

3-10 Operating procedures

a. Turn on fan 7 by raising starter switch to ON on starboard deckhouse bulkhead forward of side door. This supplies fresh air to void 1 and starboard side of voids 2, 3 and 4
b Turn on fan 8 by raising starter switch to ON and then pushing black START button on controller located on port bulkhead forward of door. This supplies air to portside of voids 2, 3, and 4, and to void 5.
c. Turn on fans 9 and 10 by raising controller switches to ON on ROWPU space stem bulkhead. This exhausts air from voids 4, which contain three diesel-powered generators

3-11 Shutdown procedures

WARNING

Do NOT turn off voids ventilating fans while personnel are In voids or equipment In voids Is operating.

NOTE

Shutdown of voids ventilation system automatically turns off chlorination unit.

3-11.1 Normal shutdown for less than 72 hours

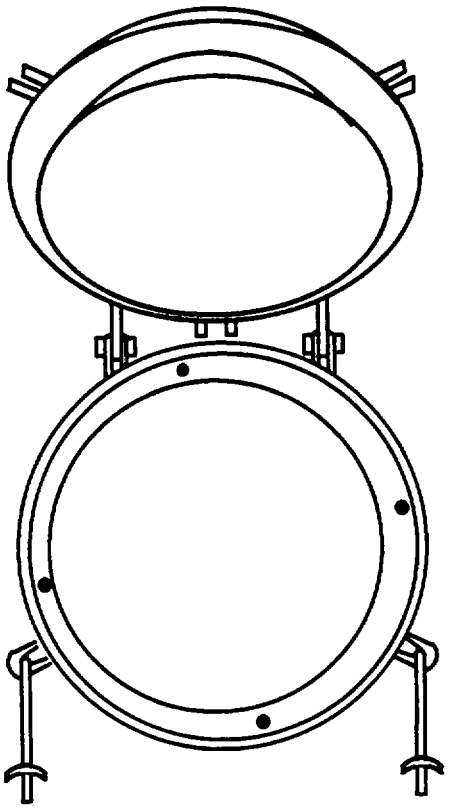
a. Turn off fan 7 by lowering starter switch to OFF.
b. Turn off fan 8 by pushing OFF button on controller and turning switch on side of controller to OFF.
c. Turn off fans 9 and 10 by lowering controller switches to OFF.

3-11.2 Normal shutdown for more than 72 hours

a. Perform shutdown procedures in paragraph 3-11.1, above
b. Lower blower inlet covers high on exterior sides of ROWPU space and secure in dosed position with bolts and wingnuts. Make sure seals are in good condition and fit properly
c. Secure two large flat ventilator intake covers on deckhouse stem bulkhead exterior Secure with bolts all around outside edge of covers and tighten.
d. Open power panel 2 circuit breakers 7P8 thru 10P8.
e. Open switchboard circuit breaker P8

3-12 Emergency shutdown

3-12.1 General. Paragraph 2-12 explains the barge's emergency shutdown systems, how they affect the ventilation system, and how they interact with the chlorination system. In addition to the electrical shutdown modes for both ventilation systems, the voids ventilation system also has a mechanical shutoff in the ventilation passage for each void area. Their locations are listed in paragraph 3-9 and indicated in figure 3-4.



Note: Provides weatherproof covers for voids ventilation fan motors

Figure 3-3. Example of Round Blower Covers on Port and Starboard Bulkhead Exteriors

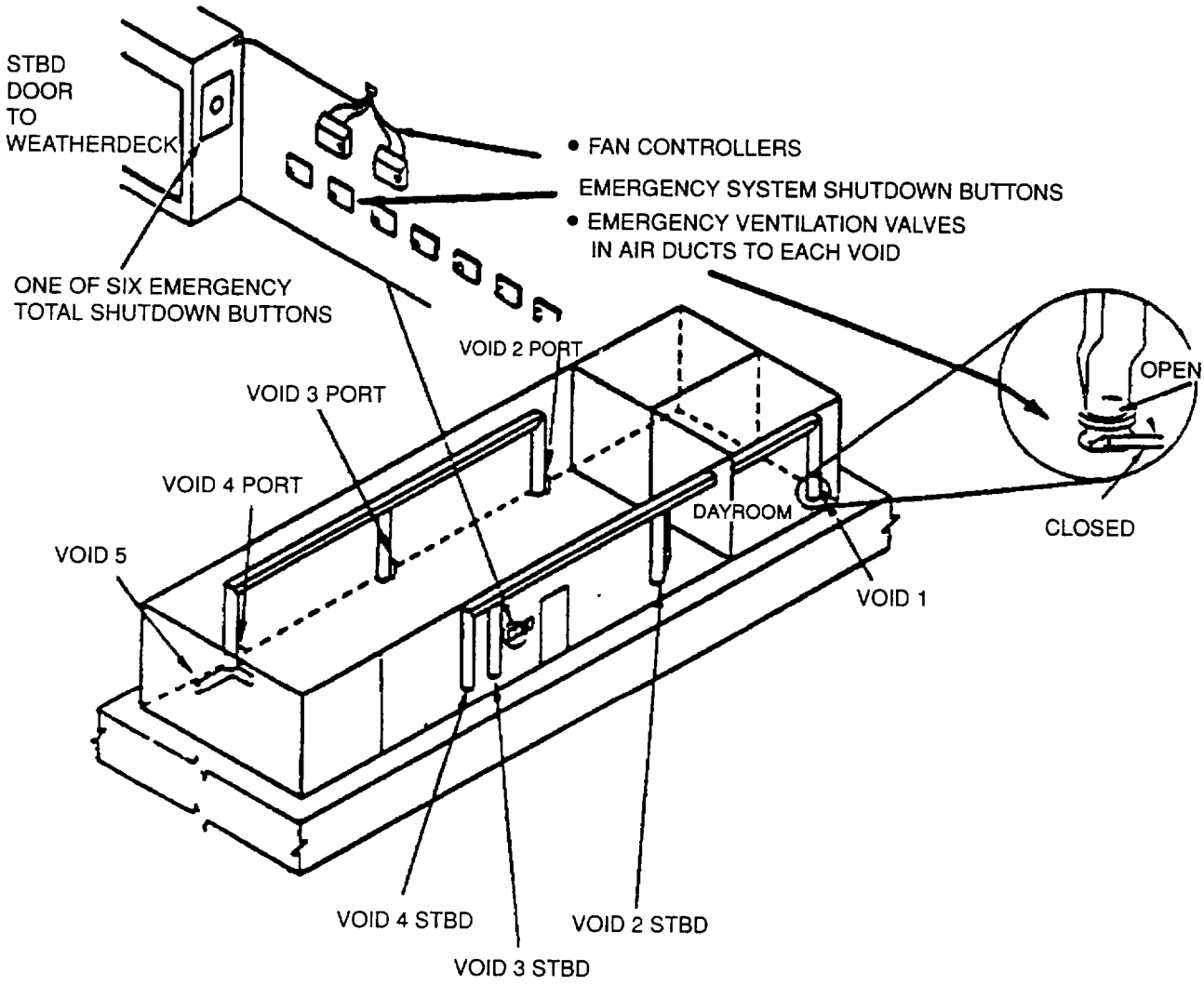


Figure 3-4. Voids Ventilation Emergency Shutdown Controls

3-12.2 Emergency shutdown procedures

a. In an emergency, push the appropriate RED button to shutdown either the ventilation system or all operating systems

b. Shut off air to voids 1 thru 4 by closing emergency shutoff valves on both sides of deckhouse When closed, handles are in horizontal position (Figure 3-4)

c. Shut off air to void 5 by closing emergency shutoff valve on overhead In void 4 port. When closed, handle should be at right angle to ductwork Since this air duct branches off from duct for void 4 port, closing emergency shutoff for void 4 port also shuts off air to void 5.

d. When emergency situation has been corrected, reset emergency button by turning collar behind button one-quarter turn clockwise Button will pop out and again be in the ready position

e. When emergency button is reset, ventilation system must be restarted by performing procedures in paragraphs 3-9 and 3-10

Section III. Maintenance instructions

3-13 General

3-13.1 Maintenance concept

3-13.1.1 Unit level and IDS/IGS maintenance on the voids ventilation system is performed onboard by crew members whenever possible.

3-13.1.2 Any IDS/IGS maintenance beyond capability of crew members will be provided by a shore-based area support maintenance unit. This unit also determines if depot support maintenance is required.

3-13.1.3 Intermediate support maintenance is accomplished by replacing components or major end items

3-13.1.4 Unless other intermediate support maintenance procedures are directed, IDS/IGS maintenance normally Is provided by an Army Transportation Corps floating craft intermediate support maintenance unit serving terminal operating area Components to be disposed of are processed by this unit.

3-13.1.5 Maintenance Allocation Chart (MAC) is in TM 55-1930-209-14&P-18 For maintenance on other onboard equipment, consult appropriate manual

3-13.2 Maintenance Instructions. Maintenance instructions are presented in the paragraphs that follow. Appendix C, Preventive Maintenance Checks and Services; paragraph 3-15, Troubleshooting; and paragraph 3-16, Maintenance procedures

3-14 Preventive maintenance checks and services. See TM 55-1930-209-14&P-16 for preventive maintenance checks and services for the voids ventilation system See TM 55-1930-209-14&P-19 for complete preventive maintenance checks and services for all ROWPU Barge System.

3-15 Troubleshooting. Troubleshoot voids ventilation system In accordance with the procedures in Table 2-2

3-16 Maintenance procedures. For maintenance procedures applicable to both deckhouse and voids ventilation systems, see paragraphs 2-16.1 and 2-16.2

Section IV. Storage

3-17 Short-term storage. If barge is to be taken out of service for more than 7 days but less than 30 days, follow shutdown procedures In paragraph 3-11.2

3-18 Administrative storage. If barge Is to be taken out of service for more than 30 days but less than 6 months, barge remains a unit responsibility and shall be maintained by unit personnel.

3-18.1 Administrative storage procedures

a. Shutdown voids ventilation system by following procedures in paragraph 3-11.2.
b. Perform monthly maintenance checks and services by following procedures in Chapter 3, TM 55-1930-209-14&P-19.

3-18.2 Administrative storage Inspection. While in storage, this system should be operated and inspected every 90 days. In meeting this requirement.

a. Start up system in accordance with procedures in paragraphs 3-9 and 3-10.
b. Perform monthly preventive maintenance checks and services as required by Appendix C
c. Shut down voids ventilation system by following procedures in paragraph 3-11.2.

3-19 Long-term storage. If barge is to be taken out of service for 6 months or more, turn it in to depot for preparation and placement into long-term storage. If barge is in administrative storage and is to be taken out of service and placed in depot long-term storage (6 months or more), process ventilation system for normal operation before releasing to depot.

Section V. Manufacturers' service manuals/instructions

3-20 General. The manufacturers' service manuals/instructions listed below provide additional information on voids ventilation system components. A copy of each manual/set of instructions is in Appendix B It may be necessary to refer to both the manuals/instructions and drawings listed in Appendix A while performing procedures in this TM.

Component	Document Title	Manufacturer
Vertical fan model	Strobic Air Corporation Instructions No. HD36H5K4Y	Strobic Air Corporation 1340 Ford Road Bensalem, PA 19020 (215) 244-1700
Fan motor controllers	TM 55-1930-209-14&P-9, Electrical Power System	

Section VI. Manufacturers' warranties/guarantees

3-21 General. Information on the voids ventilation system components warranties/guarantees is listed below.

Component	Manufacturer	Duration	Coverage
Horizontal fan model no. S105MJ	American Davidson	2 yrs from date of shipment	Parts/labor
Vertical fan model no. TD3012P4XY	Strobic Air Corporation	1 year	Limited
Fan motor controllers	TM 55-1930-209-14&P-9, Electrical Power System		

CHAPTER 4 HEATING AND AIR CONDITIONING (HAC) SYSTEM

Section I. Description and data

4-1 Description. The dayroom and workshop are provided with heated and cooled air from a HAC unit on the forward bulkhead in the workshop This unit forces either heated or cooled air through overhead ductwork into the workshop and dayroom. Bulkheads in both rooms are well insulated so that a reasonable temperature is maintained. The control to select either heating or air conditioning (AC) is on upper right side of box containing heating element above the AC unit (Figure 4-1). The AC controls (Figure 4-2) are on front of the unit. The heating unit, located In ductwork above the AC unit, uses an electrically powered element. Both heating and AC use the blower fan in the AC unit to move air into the dayroom and workshop. The thermostat for the heating portion of this system is on the port bulkhead in dayroom near the refrigerator receptacle. Both dayroom and workshop are also equipped with a mushroom-style, nonpowered ventilator In the deckhouse top.

The AC unit's water cooling condenser is provided seawater from one of two sources. if seawater pumps In void 2 starboard are operating, and the proper valves open, they provide seawater for cooling the AC condenser and for cooling the chlorination unit. When these pumps are not operating, seawater for cooling is provided by an AC cooling water pump. This pump draws seawater from the forward searchest through a set of AC seawater strainers in void 2 port and provides water for cooling both the AC unit and the chlorination unit. For details, see TM 55-1930-209-14&P-2, Seawater Systems.

Installation of this system is shown in drawings referenced in Appendix A. Components are listed in Table 4-1

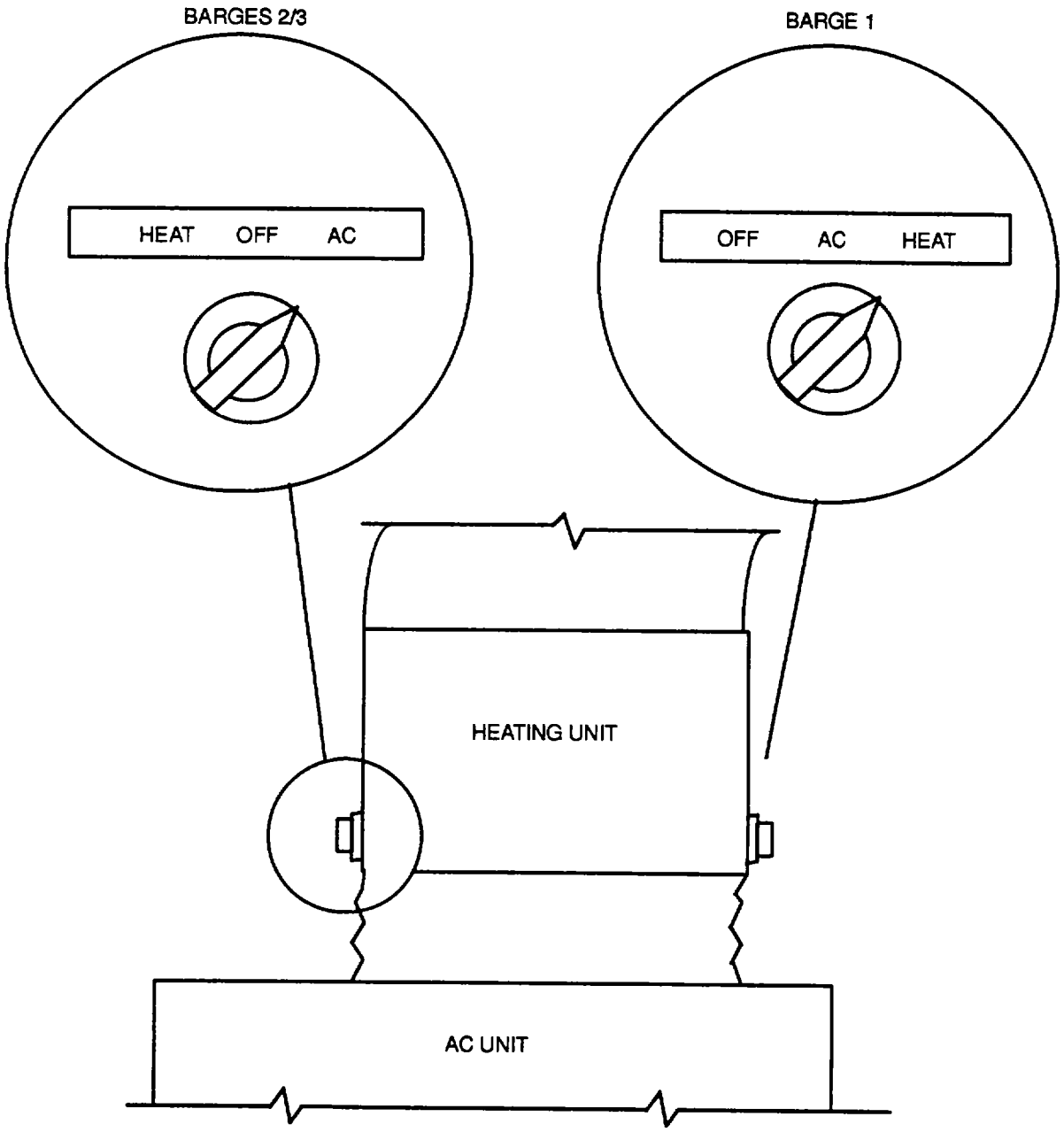
4-2 Capabilities. This system provides sufficient heating or cooling to maintain the dayroom and workshop at normal working temperatures.

4-3 Special limitations. The HAC system is designed to heat and cool the workshop and dayroom only Doors from workshop and dayroom to ROWPU space and weatherdeck must be closed when system is in operation. Failure to do so overloads the system and will lead to Its early failure

4-4 Performance characteristics. The AC unit provides up to 60,000 Btu of cooling per hour, and the heating unit provides heat equivalent of 15 Kw.

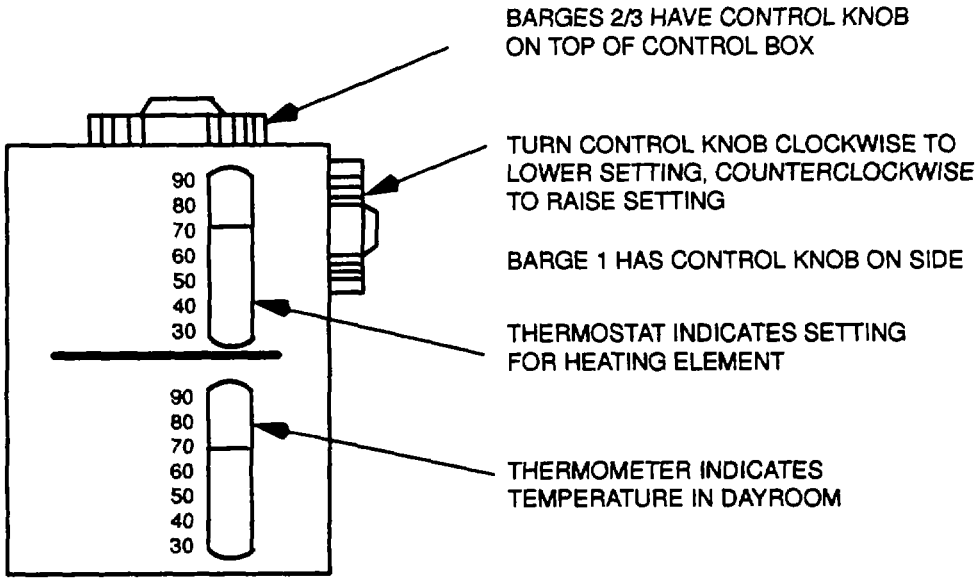
Table 4-1. Major Components of Heating and Air Conditioning System

Component	Qty	Function	Location
5-ton marine air conditioner	1	Provides cooled air for workshop and dayroom	On workshop forward bulkhead
In-line heating element	1	Heats air In workshop and dayroom	In air plenum above AC unit in workshop
Air outlets	2	Directs air flow	1 In workshop, 1 In dayroom
Air ventilators	2	Allows air to exit from workshop/dayroom	On deckhouse top, 1 in workshop, 1 in dayroom
Thermostat	1	Controls heating element	On dayroom bulkhead near refngerator receptacle
HEAT/COOU OFF switch	1	Selects heating or cooling	On side of heating element housing above AC unit in workshop
AC control unit	1	Selects AC or fan only	On front of AC unit In workshop
Cooling pump motor controller	Controls cooling pump		On centerline bulkhead in void 2 port

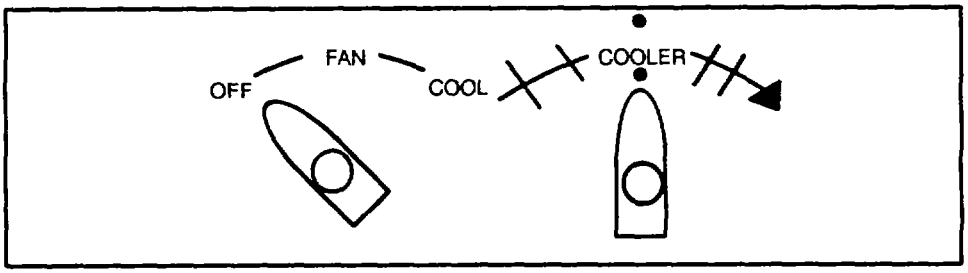


Selector switch, on heating element above AC unit in workshop, selects unit to be used. After unit has been selected, use controls shown in Figure 4-2.

Figure 4-1. Heating and AC Selector Switch



Heating element thermostat on longitudinal bulkhead in dayroom aft of refrigerator receptacle. Controls only heating element.



Air conditioning controls on front of AC unit in workshop

Figure 4-2. Heating and AC System Controls

4-5 Equipment specifications

a. Marine air conditioner

Manufacturer	A.R.E Manufacturing Co., Inc.
CAGEC	57107
Part No	NAC-600
Capacity	5-ton, 60,000 Btu/hr
Power	440 Vac, 3 ph, 60 Hz
Quantity	1

b. Electric heating element

Manufacturer	Electric Heaters, Inc.
CAGEC	23251
Part No.	Series DC 3
Type	Duct-heaters-upflow
Capacity	15 kW - 2 stage
Rating	440 Vac, 3 ph, 60 Hz
Quantity	1

c. Mushroom ventilator (overhead In deckhouse top)

Manufacturer	Juniper Industries, Inc.
CAGEC	97537
Type	Mushroom, watertight closure
Size	12 in
Part No	JE-105B
Material	Steel
Quantity	2

d. Registers

Manufacturer	Masco Corp. American Metal Products Co.
CAGEC	34557
Part No	405 B
Type	Trusteel face
Size	8 X 14 (workshop) 10 X 24 (dayroom)
Material	Steel
Quantity	2, 1 each size

e. Thermostat

Manufacturer	Honeywell Inc. Residential Division
CAGEC	27319
Part No	T6052A
Type	Bulkhead mounting
Quantity	1

4-6 Items furnished

4-6.1 Components installed as part of the HAC system are listed on parts lists in drawings referenced in Appendix A and Components of End Item List in TM 55-1930-209-14&P-20.

4-6.2 Common and bulk items onboard are listed in Expendable Supplies and Materials List in TM 55-1930-209-14&P-20.

4-6.3 Repair parts and special tools onboard are listed in Repair Parts and Special Tools List in TM 55-1930-209-14&P-18

4-7 Items required but not furnished. All required items are furnished.

4-8 Tools and test equipment. Use existing tools and equipment onboard. A complete list of tools and test equipment is in Tools and Test Equipment List in TM 55-1930-209-14&P-18

Section II. Operating instructions

4-9 Operating controls and Indicators

a. Heating and AC selector switch (Figure 4-1) On side of heating element above AC unit. Selects OFF, AC or HEAT by rotating switch.
b. AC controls (Figure 4-2) On front of AC unit In workshop.

(1) Left switch control fan and AC unit with settings of OFF/FAN/COOL OFF position turns off both fan and AC. FAN position turns fan on for use with either AC or heating element COOL position turns on AC and fan

(2) Right switch selects amount of cooling to be obtained from AC unit Turn clockwise to increase cooling, counterclockwise to decrease cooling

(3) AC electrical switch. Switch handle sticks out of lower right corner of AC unit front bottom panel Turns electric power ON (upper position) or OFF (lower position).

c. Heating element controls (Figure 4-2). On dayroom port bulkhead aft of refrigerator. Thermostat control on upper portion of control box sets temperature desired from heating element Bottom portion of control box displays a thermometer indicating temperature in the dayroom

NOTE

The following controls and Indicators are part of the seawater system but are critical to operation of the AC unit. For details see TM 55-1930-209-14&P-2, Seawater Systems.

d. Seawater valves SW3 and SW27 in void 2 port (Figure 4-3). SW3 controls water flow from forward searchest to seawater strainer 3 and SW27 controls flow of cooling water from seawater strainer 3 to cooling water pump.
e. Seawater valve SW28, in void 1 underneath AC unit (Figure 4-3) Controls flow of cooling water from cooling water pump to AC unit.

f. Seawater pressure gauges and their associated valves SW35 (seawater strainer 3 pressure in) and SW36 (seawater strainer pressure out) in void 2 port Gauges show seawater pressure going into strainer 3 and seawater pressure coming out of strainer 3. A pressure differential of 2 pounds per square inch (psi) or more indicates that the strainer must be switched and the clogged strainer basket cleaned. See TM 55-1930-209-14&P-2, Seawater Systems, for details. Valves control water pressure to pressure gauges and should normally remain open.
g. Seawater valve SW47 in void 2 port (Figure 4-3) Controls flow of seawater from cooling pump to chlonnation unit
h. Seawater valve SW48 in void 2 port. Controls flow of seawater from seawater pumps to air conditioning unit and chlorination unit.
i. Cooling water pump controller on centerline bulkhead In void 2 port (Figure 4-3). Controls electrical power to cooling water pump.

4-10 Prestart procedures

CAUTION

Keep doors to ROWPU space and weatherdeck closed. Failure to do so overloads HAC system and can lead to early failure.

a. Close doors to ROWPU space and weatherdeck and make sure they remain closed when this system is being used
b. Using vent handle extension stored in the dayroom, open HAC outlets in workshop and dayroom Make sure they are free from obstructions

c. Using vent handle extension stored in dayroom, adjust round watertight ventilator outlets in deckhouse top of workshop and dayroom.
d. Clean all components, including ventilator outlets, and make sure components are not damaged
e. Close switchboard circuit breaker P5 to provide electricity to power panel 1.
f Make sure power panel 1 circuit breaker 5P5 is closed.
g. If AC unit is to be used and seawater pumps are NOT operating, set seawater valves as follows. (Figure 4-3)

(1) Open SW3, SW27, SW28, SW35 and SW36.
(2) Close SW47.

h. If AC unit is to be used and seawater pumps ARE OPERATING, set seawater valves as follows (Figure 4-3)

(1) Open SW48, 47 and 28.

(2) Close SW27 and SW3.

4-11 Operating procedures

4-11.1 AC unit

a. If seawater pumps are NOT operating, push black START button on AC cooling water pump controller on centerline bulkhead in void 2 port. If seawater pumps ARE operating, do NOT activate AC cooling water pump
b. Turn OFF/AC/HEAT selector switch to AC. Switch is on side of heating element above AC unit (Figure 4-1).
c. Turn AC electrical switch to ON (up position). Switch handle protrudes from AC unit in lower right comer of front bottom panel.
d. Turn left switch OFF/FAN/COOL to COOL (Figure 4-2) on AC controls on front of unit.
e. Turn right cooler switch on AC controls clockwise to obtain desired amount of cooling. (Clockwise increases cooling, counterclockwise decreases cooling.) If unit has been operating within previous 30 minutes, a safety delay switch may activate and AC compressor will not come on for 5 minutes.

f. System is thermostatically controlled and cycles on and off as necessary to maintain amount of cooling selected with right-hand switch on AC controls. Check temperature indicated on thermometer in dayroom. Adjust cooler switch on AC unit to maintain desired temperature.
g. Monitor seawater strainer 3 pressure shown on the two gauges activated by SW35 and SW36. If difference in pressure is more than 2 psi, seawater strainer 3 must be switched and dogged basket cleaned. See TM 55-1930-209-14&P-2, Seawater Systems, for these procedures.

4-11.2 Heating unit

a. Turn OFF/FAN/COOL switch to FAN (Figure 4-2)
b. Turn AC electrical switch to ON (up position).
c. Turn OFF/FAN/COOL switch to FAN (Figure 4-2).
d. Set desired temperature on heater thermostat, in dayroom near refrigerator receptacle, by moving lever on right side up or down (Figure 4-2).
e. Make sure fan motor in AC unit comes on to move hot air into workshop and dayroom.

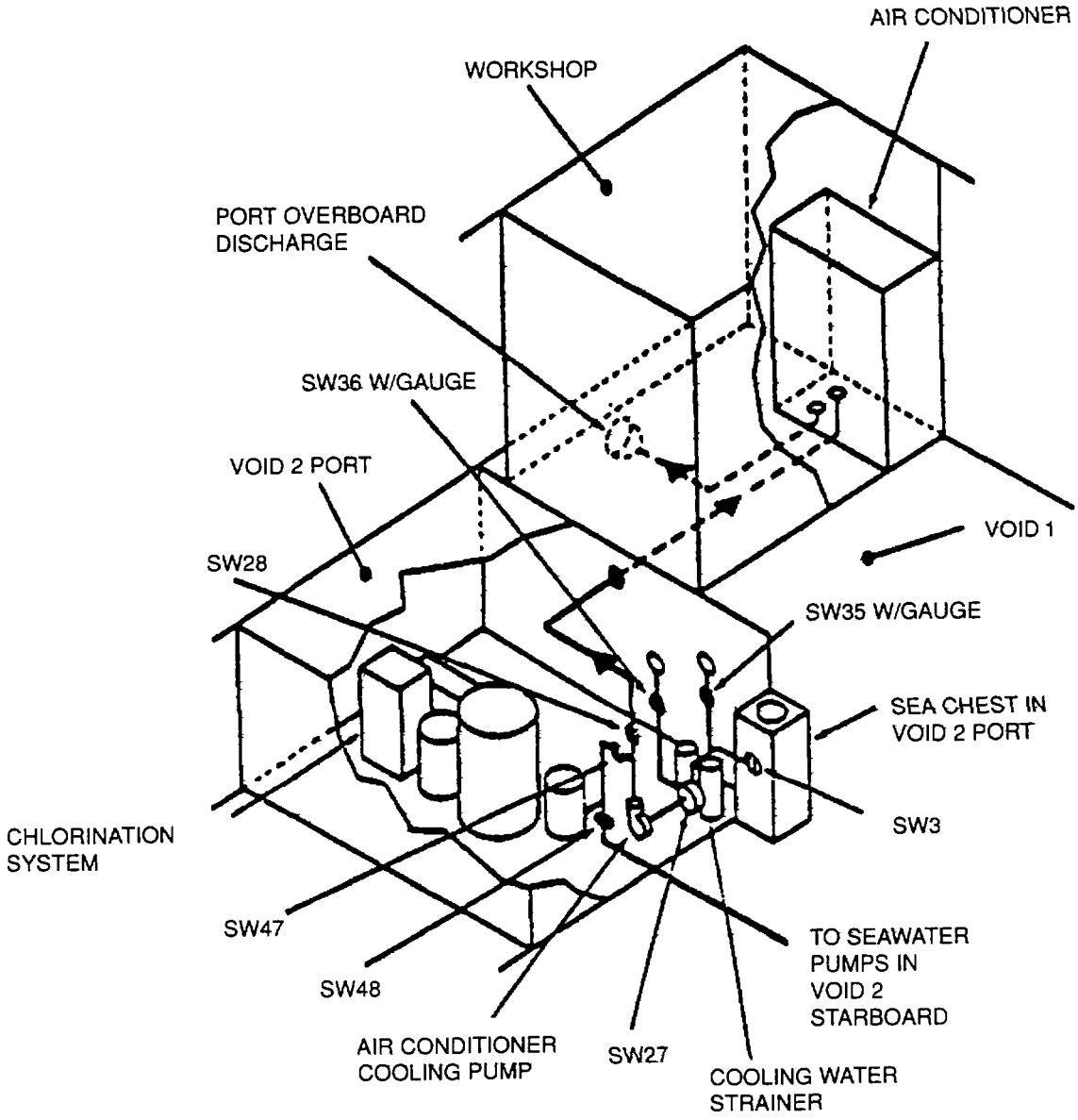


Figure 4-3. Location of Seawater Valves Affecting AC Unit

4-12 Shutdown procedures

4-12.1 AC unit

a. Rotate right cooler switch on AC controls fully counterclockwise to unload compressor (Figure 4-2).
b. Turn left OFF/FAN/COOL switch on AC controls to OFF.
c. Turn selector switch to OFF (Figure 4-1).
d. Turn HEAT/OFF/AC switch to OFF (down position).
e. If seawater pumps are NOT operating and cooling water pump is NOT being used to supply water to chlorination unit, turn cooling water pump off and close seawater valves SW3, SW27, SW28, SW35 and SW36
f. If seawater pumps are NOT operating and cooling water pump is supplying water to chlorination unit, close W2.
g. If seawater pumps are operating, close seawater valve SW47.

4-12.2 Heating unit

a. Turn thermostat to lowest possible setting by moving control lever to bottom of its travel (Figure 4-2)
b. Turn left OFF/FAN/COOL switch on AC controls to OFF.
c. Turn HEAT/OFF/AC selector switch to OFF (Figure 4-1).
d. Turn AC electrical switch to OFF (down position)

4-13 Emergency shutdown procedures

4-13.1 General. Paragraph 2-12 explains the barge's emergency shutdown systems. Any of the total shutdown buttons will cut off power to the HAC system. Any of the individual system shutdown buttons that shut down a generator supplying power to the switchboard will also shut down the HAC system.

4-13.2 Emergency shutdown procedures

a. In an emergency, push the appropriate RED button to shut down either all operating systems or the generator set providing power to the switchboard.
b. When emergency situation has been corrected, reset emergency button by turning collar behind button one-quarter turn clockwise. Button will pop out and again be in ready position
c. When emergency button is reset, HAC must be restarted by performing proceduresin paragraphs 4-10 and 4-11.

Section III. Maintenance instructions

4-14 General

4-14.1 Maintenance concept

4-14.1.1 Unit level and IDS/IGS maintenance on the HAC system Is performed onboard by crewmembers whenever possible.

4-14.1.2 Any IDS/IGS maintenance beyond capability of crewmembers will be provided by a shore-based area support maintenance unit. This unit also determines if depot support maintenance is required

4-14.1.3 Intermediate support maintenance is accomplished by replacing components or major end items

4-14.1.4 Unless other intermediate support maintenance procedures are directed, IDS/IGS maintenance normally is provided by an Army Transportation Corps floating craft intermediate support maintenance unit serving terminal operating area Components to be disposed of are processed by this unit.

4-14.1.5 Maintenance Allocation Chart (MAC) Is In TM 55-1930-209-14&P-18. For maintenance on other onboard equipment, consult appropriate manual.

4-14.2 Maintenance instructions. Maintenance instructions are presented In the paragraphs that follow paragraph 4-15, Preventive maintenance checks and services, paragraph 4-16, Troubleshooting; and paragraph 4-17, Maintenance procedures

4-15 Preventive maintenance checks and services. Refer to Chapter 3, TM 55-1930-209-14&P-19

4-16 Troubleshooting. Troubleshoot HAC system In accordance with Table 4-2

4-17 Maintenance procedures

4-17.1 Air conditioning unit. Maintenance procedures are provided in Chapter 6, Commercial Manual for 5 Ton Marine Air Conditioner Model NAC-600 This manual is In Appendix B

4-17.2 Air filter replacement

a. Remove two screws on each side of center section of front grill. Lift up and set away from work area. Remove air filter

WARNING

Never use alkaline solutions or cleaning solvents to clean air filter. Fumes from such substances may be harmful. In addition, they remove protective finish from filter surfaces.

CAUTION

Never operate AC unit without a filter. This allows foreign material to enter evaporator and fan section, causing them to clog, thus reducing cooling capacity and ultimately damaging system.

b. Clean air filter by washing with fresh water under pressure Water should be forced through filter in opposite direction from airflow to force dirt, lint, and foreign material out of and off of filter surfaces. If this does not clean filter, soak In warm soapy water and then thoroughly rinse with water under pressure. When filter Is dry, coat very lightly with an odorless lightweight lubricating oil. If filter shows signs of coming apart, replace with one measuring 18 Inches by 36 Inches by 1 inch
c. Inspect and clean interior surfaces and equipment behind grill. Use brush to remove dust and lint from AC coils
d. Reinstall filter and center section of front grill. Make sure two screws on side of grill are tight.

4-17.3 Fan belt replacement

a. Remove top center section of front grill by removing two screws on sides of grill Lift up and out and set away from work area
b. Check fan belt.
   (1) If loose, adjust by loosening four screws holding fan motor in place. Pull motor forward until belt is tight, hold In that position, and tighten four screws.
   (2) If a fan belt is frayed and worn on edges or has cracks penetrating at least 1/4 inch, replace belt Loosen four screws holding fan motor In place and push motor back in compartment. Replace old fan belt with new belt and pull motor forward until belt is firmly tight. Hold In that position and tighten four screws.

NOTE

Do not lubricate bearings in AC unit fan and motor. They are lubricated for life by manufacturer.

c. Clean motor exterior and make sure air inlet and outlet are clean and free of foreign material.
d. Reinstall top center section of front grill. Make sure two screws on sides of grill are tight.

Table 4-2. Troubleshooting Procedures for HAC System

Condition	Possible Cause	Suggested Action
1. AC compressor does not start	a. Improper switch settings	a. Make sure all switch settings are correct
	b. Thermostat set too high	b. Turn right control on AC controls fully clockwise
	c. Five-minute delay switch activated to protect unit	c. Wait 5 minutes
	d. Low on refrigerant	d. Notify support maintenance
2. AC not cooling	a. Improper switch settings	a. Make sure all switch settings are correct
	b. Dirty air filter	b. Clean or replace filter
	c. Loose or broken fan belt	c. Tighten or replace fan belt
	d. Condenser coils dirty	d. Clean condenser coils
	e. Improper valve settings	e. Make sure valves are set properly for water source being used
	f. Insufficient waterflow from AC water pump	f. Check seawater strainer pressure, if drop exceeds 2.0 psi, switch baskets and dean strainer
	g. Warm cooling water/ high humidity	g. Allow AC compressor to operate**
3. AC operates noisily	a. Fan belt loose or worn	a. Tighten or replace belt
	b. Belt sheaves loose or out-of-alignment	b. Align sheaves and tighten
	c. Fan blades bent or dirty	c. Clean fan blades; if vibration can be felt in AC cabinet, adjust fan blades
4 Compressor short cycles	a. Improper switch settings	a. Make sure all switch settings are correct
	b. Filter dirty	b. Clean or replace filter
	c. Fan belt slipping	c. Tighten fan belt
	d High/low pressure switches malfunctioning	d. Notify support maintenance
5. Heating unit does not operate	a. Improper switch settings	a. Make sure all switch settings are correct
	b. Filter is dirty	b. Clean filter
	c. Fan belt slipping	c. Tighten fan belt
	d. Internal fuse(s) blown	d. Replace fuse(s)
	e. Safety circuits not functioning properly	e Notify support maintenance

** On extremely humid days, AC compressor may run for several hours without any significant reduction in temperature in conditioned area. However, humidity content of air being conditioned will be greatly reduced and conditioned area will be more comfortable in spite of negligible reduction In temperature

4-17.4 Condenser servicing. Clean AC condenser annually. If AC cooling appears to be inadequate, this condenser cleaning may be required more often. When schedule or performance Indicates that condenser cleaning is required, request technical assistance from IDS/IGS maintenance support unit.

a. Shut down AC unit by following procedures In paragraph 4-12 1 and 4-12.2

b. Redtag circuit breaker 5P5 on power panel 1, indicating, "WARNING DO NOT ACTIVATE REPAIRS BEING MADE "

c. Redtag AC cooling water pump main switch, indicating, "WARNING DO NOT ACTIVATE REPAIRS BEING MADE"

d. With Intermediate support maintenance personnel assisting, follow procedures on page 37, section 4 9 of Commercial Manual for 5 Ton Marine Air Conditioner.

e. When complete, remove red tags and return AC unit to operation by following procedures in paragraphs 4-10 and 4-11.1

f. Record completion of this maintenance item in logbook.

4-17.5 Heater element

4-17.5.1 Repair. Replace internal fuses by following these procedures

a. Shut down AC unit by following procedures in paragraphs 4-12 1 and 4-12.2.

b. Redtag circuit breaker 5P5 on power panel 1, indicating, "WARNING DO NOT ACTIVATE REPAIRS BEING MADE."

c. Remove front cover on heating element plenum above AC unit by removing screws on each side and lifting off Place out of the work area

d. Check bayonet type fuses In two fuse blocks. Two fuses are 8A, 600 V and the other three are 25A, 600 V fuses Remove burned out fuse with fuse pliers and replace with same size fuse.

e. Replace front cover on heating element plenum and tighten screws on both sides

f. Start heating element by following procedures in paragraph 4-11.2 and verify that heating element works

g. Remove red tag from circuit breakers and record completion of maintenance Item In logbook

4-17.5.2 Replacement

a. Shut down AC unit by following the procedures in paragraphs 4-12 1 and 4-12.2

b. Redtag circuit breaker 5P5 on power panel 1, indicating, "WARNING DO NOT ACTIVATE REPAIRS BEING MADE."

c. Open the control box door Disconnect and tag the input wires from the terminal board and remove from heater

d. Disconnect and tag the control wires from the terminal board and remove from heater.

e. Remove the mounting screws and nuts from the air duct flanges.

f. Slide the heater unit and gasket from the duct flanges.

g. Install a new heater and two new gaskets.

h. Align the heater and the gaskets with air duct flange mounting holes and install the mounting screws and nuts and tighten

i. Reconnect the input wires to the terminal board and remove tags.

j. Reconnect the control wires to terminal board and remove tags.

k. Remove redtag from circuit breaker and return heater to operation.

Section IV. Storage

4-18 Short-term storage. If barge is to be taken out of service for more than 7 days but less 30 days, follow shutdown procedures in paragraph 4-12.

4-19 Administrative storage. If barge is to be taken out of service for more than 30 days but less than 6 months, barge remains a unit responsibility and shall be maintained by unit personnel

4-19.1 Administrative storage procedures

a. Shut down HAC system by following procedures in paragraph 4-12.

b. Perform preventive maintenance checks and services by following procedures in Appendix C.

4-19.2 Administrative storage Inspection. While In storage, this system should be operated and inspected every 90 days. In meeting this requirement:

a. Start up system in accordance with procedures in paragraphs 4-10 and 4-11.

b. Return system to administrative storage by following procedures in paragraph 4-19.1.

4-20 Long-term storage. If barge is to be taken out of service for 6 months or more, turn it in to depot for preparation and placement into long-term storage. If barge is in administrative storage and is to be taken out of service and placed in depot long-term storage (6 months or more), process HAC system for normal operation before releasing to depot.

Section V. Manufacturers' service manuals/instructions

4-21 General. The manufacturers' service manuals/instructions listed below provide additional information on components of the HAC system. A copy of each manual/set of instructions is in Appendix B. It may be necessary to refer to both these manuals/instructions and drawings listed in Appendix A, while performing procedures in this TM

Component	Document Title	Manufacturer
5-ton marine air conditioner model NAC-600	Commercial Tech Manual for 5-ton Marine Air Conditioner Model No NAC-600	A.R.E. Manufacturing Co. 4856-T Victor Street Jacksonville, FL 32207 (904) 739-1300
Cooling pump motor controller	TM 55-1930-209-14&P-9, Electrical Power System	

Section VI. Manufacturers' warranties/guarantees

4-22 General. Information on HAC system component warranties/guarantees is supplied below.

Component	Manufacturer	Duration	Coverage
Air conditioner	A.R.E. Manufacturing Co.	One year	Parts/labor
Cooling pump motor controller	TM 55-1930-209-14&P-9, Electrical Power System		

CHAPTER 5 ROWPU SPACE AND VOIDS HEATING SYSTEMS

Section I. Description and data

5-1 Description. On ROWPU Barge 1 only, ROWPU space and voids are provided with 12 forced air heaters Installed throughout the barge (Figure 5-1) There are four heaters installed in the RO space and one installed In each void Heater controls are located on the front of each electrically powered unit (Figure 5-2).

5-2 Capabilities. This heating system provides sufficient heating to maintain an ambient air temperature above 32 °F during cold weather conditions

5-3 Special limitations. The forced air heaters are Installed to provide sufficient heat to prevent freezing In the ROWPU space and voids only.

5-4 Performance characteristics. Each unit provides the heat equivalent of 3 kW which is equal to 36 kW of heat for the 12 heaters.

5-5 Equipment specifications

a. Electric space heater

Manufacturer	Valad Electric Heat Corp.
CAGEC	17032
Part No	20743.0-3
Capacity	3 kW
Power	440 Vac, 3 ph, 60 Hz
Quantity	12

b. Power panel No.4

Manufacturer	Westinghouse Electrical Supply Co., Norfolk, VA 11037
CAGEC	
Part No.	
Rating	440 Vac, 3 ph, 3w
Circuits	10
Quantity	1

5-6 Items furnished

5-6.1 Components of the forced air heaters Installed on Barge 1 are listed on parts lists in drawings referenced in Appendix A and in Components of End Item List In TM 55-1930-209-14&P-20.

5-6.2 Common and bulk items onboard are listed In Expendable Supplies and Materials List in TM 551930-209-14&P-20

5-6.3 Repair parts and special tools onboard are listed in Repair Parts and Special Tools List in TM 551930-209-14&P-18.

5-7 Items required but not furnished. All required items are furnished

5-8 Tools and test equipment. Use existing tools and equipment onboard. A complete list of tools and test equipment is in Tools and Test Equipment List In TM 55-1930-209-14&P-18.

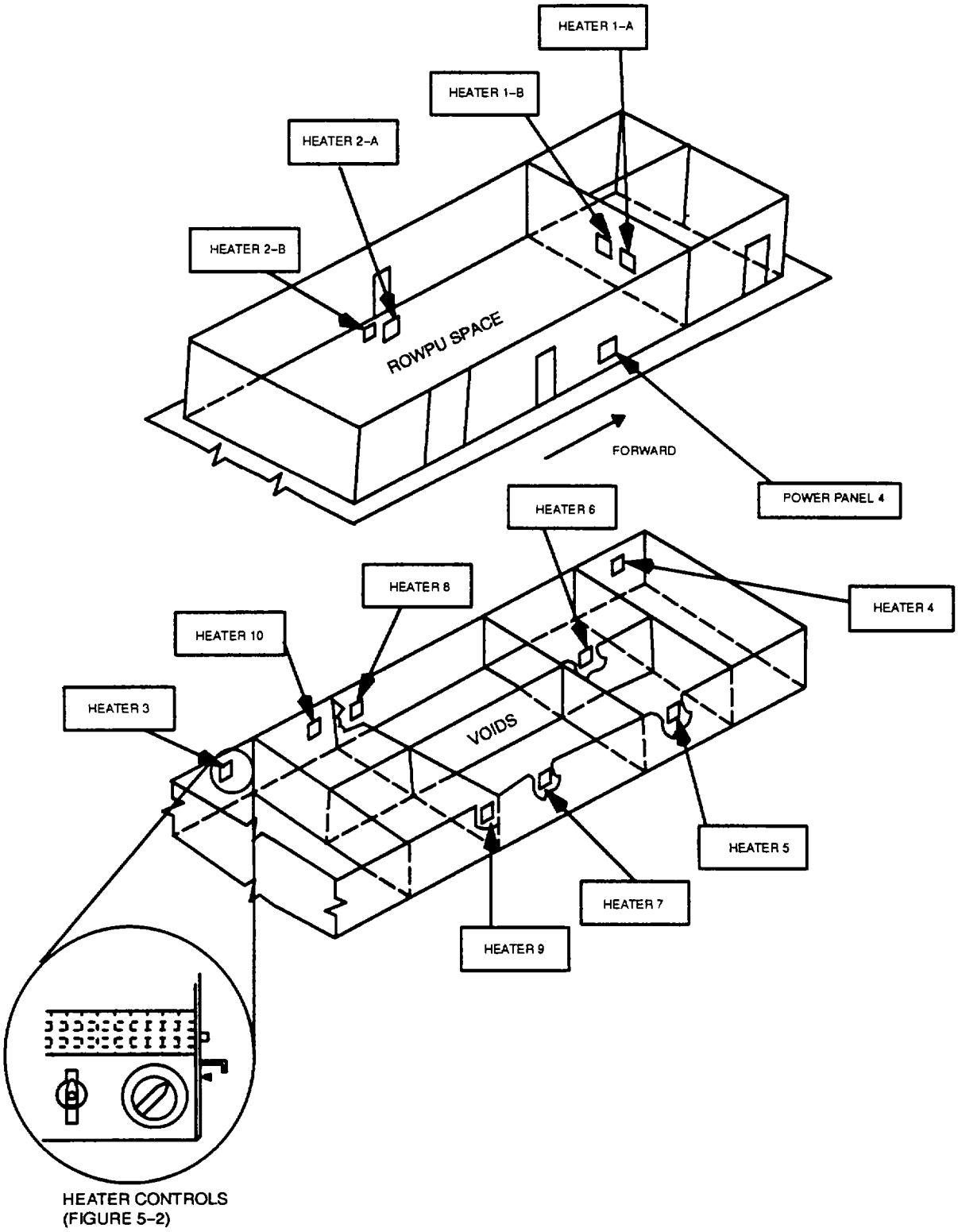


Figure 5-1. Heating Systems Locations and Operating Controls

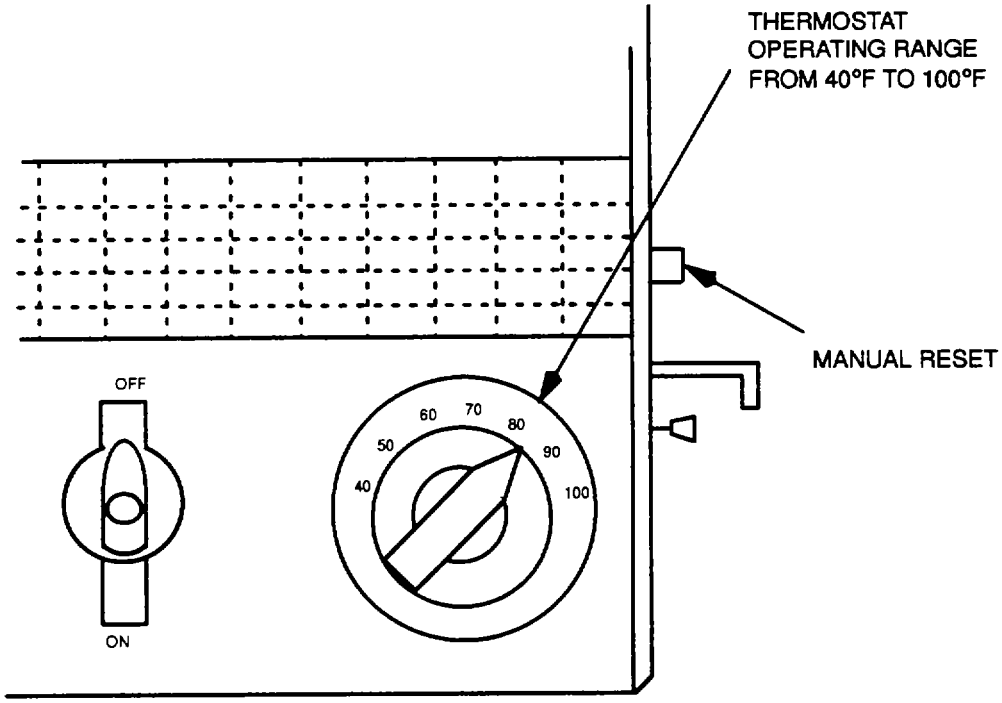


Figure 5-2. Heater Controls

Section II. Operating instructions

5-9 Operating controls and Indicators

a. Heater controls (Figure 5-2)

(1) ON/OFF selector switch. Move the selector switch to the up position to turn heater OFF and to the down position to turn heater ON.

(2) Thermostat. The thermostat dial operating range is marked from 40°F to 100 °F. Rotate the control knob to the desired heating temperature.

(3) Manual reset switch. The manual reset hi-limit thermostat switch is set to open at 350 °F and dose at 40 °F when it is reset.

b. Power distribution

(1) Barge 1 switchboard distribution panel (Figure 5-3) distributes electrical power for the forced air heaters to power panel 4. Circuit breaker P19.

(2) Power panel 4 (Figure 5-4) provides electrical power of each of the 12 forced air heaters using circuit breakers 1P19 thru 10P19. Electrical power for all 12 heaters may be shut off at switchboard distribution panel circuit breaker P19 Electrical power to any of the 12 heaters individually can be shutdown at power panel 4 by turning off circuit breakers 1P19 thru 10P19, as required

5-10 Prestart procedures

a. Make sure the space around the heater being used is unobstructed

b. Make sure switchboard circuit breaker P19 is closed

c. Check the heater being used for damage. Clean heater louvers and heater exterior shell as required. Report any discrepancies to shift leader or bargemaster for correction.

5-11 Operating procedures. To prevent ROWPU equipment and water piping from freezing during cold weather conditions turn forced air heater ON as required.

a. Set thermostat to desired temperature setting.

b. Turn ON/OFF selector switch to ON

c. If heater is ON but fails to operate, press manual reset hi-limit thermostat button. This thermostat functions as a circuit breaker. If heater fails to restart, turn heater selector switch to OFF and check for cause of failure

5-12 Shutdown procedures

a. Forced air heater normal shutdown procedure is to turn the ON/OFF selector switch to the OFF position

b. Electrical power can also be cut off to the heaters by opening circuit breaker P19 or to individual heater by opening any circuit breaker 1P19 thru 10P19 (paragraph 5-9b).

5-13 Emergency shutdown procedures

5-13.1 General. Paragraph 2-12 explains the barge's emergency shutdown systems. Any of the total shutdown buttons will cut off power to all of the forced air heaters on Barge 1. Any of the individual system shutdown buttons that shutdown a generator supplying power to the switchboard will also shutdown all of the forced air heaters.

5-13.2 Emergency shutdown procedures

a. In an emergency, push to appropriate RED button to shutdown either all operating systems or the generator set providing power to the switchboard

b. When emergency situation has been corrected, reset emergency button by turning collar behind button one-quarter turn clockwise button will pop out and again be in ready position.

c. When emergency button is reset Forced air heaters must be restarted by performing procedures in paragraph 5-11

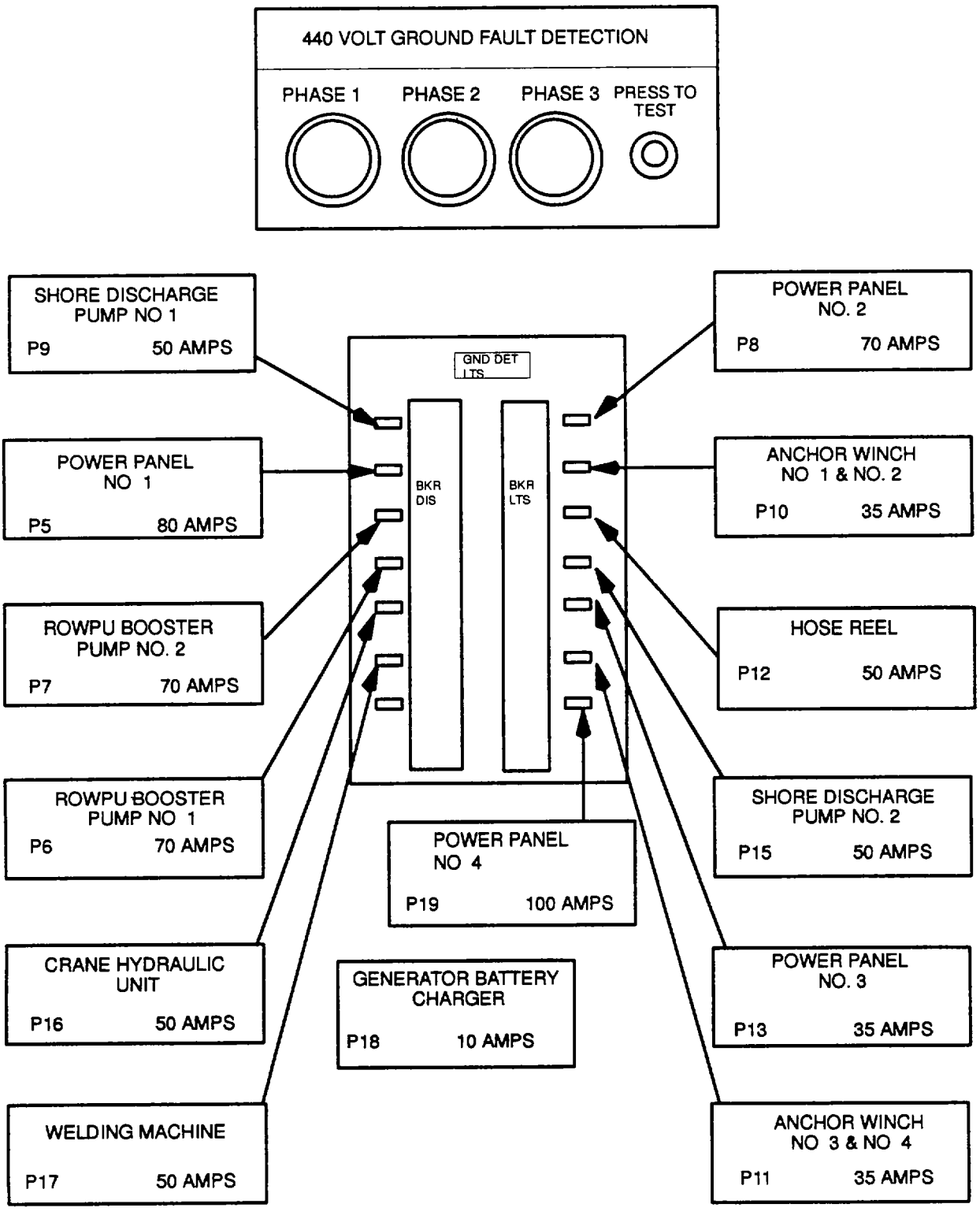
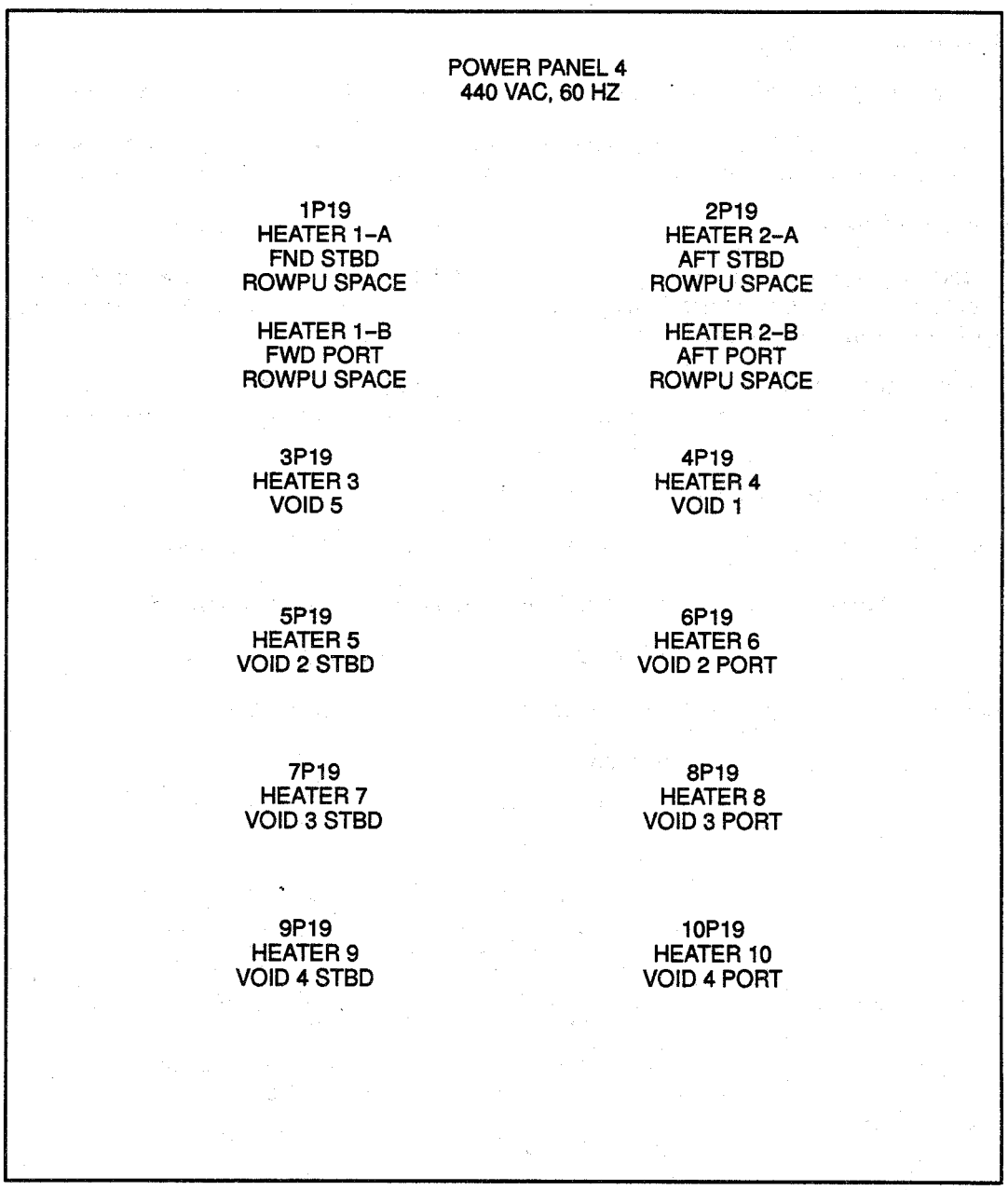


Figure 5-3. Switchboard Distribution Panel (Barge 1)



LOCATED IN ROWPU SPACE ON STARBOARD BULKHEAD FORWARD DOOR TO WEATHERDECK. POWER INPUT FROM SWITCHBOARD CIRCUIT BREAKER P19.

Figure 5-4. Power Distribution Panel No. 4

Section III. Maintenance instructions

5-14 General

5-14.1 Maintenance concept

5-14.1.1 Unit level and IDS/IGS maintenance is performed onboard by crewmembers whenever possible

5-14.1.2 Any IDS/IGS maintenance beyond capability of crewmembers will be provided by a shore-based area support maintenance unit. This unit also determines if depot support maintenance is required.

5-14.1.3 Intermediate support maintenance is accomplished by replacing components or major end items.

5-14.1.4 Unless other intermediate support maintenance procedures are directed, IDS/IGS maintenance normally is provided by an Army Transportation Corps floating craft intermediate support maintenance unit serving terminal operating area. Components to be disposed of are processed by this unit

5-14.2 Maintenance instructions are presented in the paragraphs that follow: Appendix C, Preventive maintenance checks and services; paragraph 5-16, Troubleshooting, and paragraph 5-17, Maintenance procedures.

5-15 Preventive maintenance checks and services Refer to Appendix C.

5-16 Troubleshooting. Troubleshoot forced air heater in accordance with Table 5-1.

Table 5-1. Troubleshooting Procedures for Forced Air Space Heaters

Condition	Possible Cause	Suggested Action
1 Heater does not operate	a. Breaker P19 on main switch board not dosed	a. Close breaker
	b. Individual breaker on power panel 4 not dosed	b. Close breaker
	c. Manual reset switch	c. Push reset switch
	d. Fuse blown In bottom of heater	d. Open entry panel and replace fuse
2. Fan operating noisily	a. Fan back panel out of alignment	a. Readjust fan back panel
	b. Fan blades bent or dirty	b. Realign or clean blades
3. Fan operating but	a. Manual reset switch not heating	a. Push reset switch open
	b. Fuse blown in bottom of heater	b. Open entry panel and replace fuse
4 Unit heating but fan not turning	a. Fan motor bad	a. Replace motor
	b Fuse blown in bottom of heater	b. Open entry panel and replace fuse
	c Fan blades out of alignment	c. Readjust back panel or blades

5-17 Maintenance procedures

5-17.1 Fuses. Replace fuses by following these procedures.

a. Shut down heater by following procedures in paragraph 5-12.

b. Redtag circuit breaker P19 on the switchboard distribution panel, indicating, 'WARNING - DO NOT ACTIVATE - REPAIRS BEING MADE."

c. Remove screws holding bottom cover and unlatch cover.

d. Check fuses in fuse block Replace 2A and 15A fuses as necessary.

e. Close bottom cover, install and tighten the four holding screws.

f. Remove red tag and return forced air heater to operation

5-17.2 Heater replacement

a. Shut down heater by following procedures in paragraph 5-12.

b. Redtag circuit breaker P19 on switchboard distribution panel, indicating, 'WARNING - DO NOT ACTIVATE - REPAIRS BEING MADE."

c. Remove the terminal box cover.

d. Disconnect and tag the wires from the terminal block and remove cable from heater.

e. Remove the mounting hardware and remove heater.

f. Install a new heater and tighten the mounting hardware.

g. Remove the terminal box cover.

h. Feed the cable through the cable entrance plate.

i. Connect the wires to the terminal block and remove tags.

j. Replace the terminal block cover.

k. Remove the red tag from the circuit breaker and return the forced air heater to operation.

Section IV. Storage

5-18 Short-term storage. If barge is to be taken out of service for more than 7 days but less than 30 days, follow shutdown procedures in paragraph 5-12

5-19 Administrative storage. If barge is to be taken out of service for more than 30 days but less than 6 months, barge remains a unit responsibility and shall be maintained by unit personnel.

5-19.1 Administrative storage procedures.

a. Shut down Barge 1 forced air heaters by opening breaker P19 forced air heater switches.

b. Perform annual preventive maintenance checks and services by following procedures in Appendix C.

5-19.2 Administrative storage Inspection. While in storage, the forced air heaters should be Inspected and operated every 90 days In accordance with Appendix C. Return to administrative storage In accordance with paragraph 5-9.1.

5-20 Long-term storage. I Barge 1 is to be taken out of service for 6 months or more, turn it into depot for preparation and placement Into long term storage. If Barge 1 is in administrative storage and is to be taken out of service and placed In depot long term storage (6 months or more), process the forced air heaters for normal operation before releasing to depot.

Section V. Manufacturers' Service Manuals/Instructions.

5-21 General. The manufacturer's drawings provide additional information on forced air heater components A copy of the drawing is in Appendix A. if necessary, refer to these drawings listed in Appendix A when performing procedures in this TM.

Component	Document Title	Manufacturer
Heater, space electric Model 20743, 0-3 3.0 kW, 440 Volts, 3-phase.	Drawing No. 76-0402 Rev G	Valad Electric Heat Corp. Tarrytown, New York, 10591

Section VI. Manufacturers' Warranties/Guarantees.

5-22 General. Information on forced air heating system units is pending.

APPENDIX A

REFERENCES

A-1 Drawings

US Army Belvoir Research, Development and Engineering Center (97403)

13226E1892	ROWPU/Barge Arrangement
13226E1903	Voids Ventilation
13226E1926	Deckhouse Ventilation System
13226E1931	Heating and Air Conditioning, Dayroom and Workshop
13226E1932	Electrical Power Schematic Diagram
13226E1935	Electrical Power System Layout
13226E1936	Void No. 4 Ventilation System
13226E1939	Motor Controllers, Schematic and Wiring Diagram
13226E1944	Equipment Shutdown System

A-2 Painting

TB 43-0144	Painting of Vessels

A-3 Demolition to Prevent Enemy Use

TM 750-244-3	Procedures for Destruction of Equipment to Prevent Enemy Use

A-4 Maintenance

DA PAM 738-750	The Army Maintenance Management System (TAMMS)
TM 55-1930-209-14&P-9	Electrical Power Systems, Fan Motor Controllers
TM 55-1930-209-14&P-9	Electrical Power System, Cooling Pump Motor Controller

B-1 Deckhouse Ventilation System

Component	Document title	Manufacturer
Hooded roof fan model HD36H5K4Y (215) 244-1700	Strobic Air Corporation Instruction No. Bensalem, PA 19020	Strobic Air Corporation 1340 Ford Road

B-2 Voids Ventilation System

Component	Document title	Manufacturer
Vertical fan model Instructions No HD36H5K4Y (215) 244-1700	Strobic Air Corporation 1340 Ford Road Bensalem, PA 19020	Strobic Air Corporation

B-3 Heating and Air Conditioning (HAC) System

Component	Document title	Manufacturer
5-ton marine air conditioner model NAC-600 Model No. NAC-600	Commercial Tech Manual for 5-ton Marina Air Conditioner (904) 739-1300	A.R.E. Manufacturing Co. 4858-T Victor Street Jacksonville, FL 32207

B-4 ROWPU Space and Voids Heating Systems

Component	Document title	Manufacturer
Heater, space electric Model 20743, 0-3 3 0 kW, 440 Volts, 3 phase	Drawing No 76-0402 Rev G	Valad Electric Heat Corp. Tarrytown, New York, 10591

STROBIC AIR CORPORATION

INSTRUCTIONS

INSTALLATION	DIRECT DRIVE TUBE AXIAL
OPERATION	VENTURI, AND
MAINTENANCE	UPBLAST/HOODED ROOF FANS

Instructions for Direct Drive Tube Axial, Venturi &

Upblast/Hooded Roof Fans

TABLE OF CONTENTS

Instructions for Direct Drive Tube Axial, Venturi & Upblast/Hooded Roof Fans

FACTORY TESTED

Your fan has been factory tested to insure proper balance, alignment, air delivery correct motor load and that all moving parts are working correctly.

CUSTOMER INSPECTION

Prior to installing your fan, inspect the equipment to determine if any damage has been incurred through mishandling during shipment. Notify the trucker immediately to claim for damages.

INSTALLATION INSTRUCTIONS

DUCT FANS

The in-line fan is ruggedly constructed of heavy gauge cylindrical housing reinforced with angle iron rings at both ends of the tube. These rings provide an easy method of bolting the fan into either duct lines, hoods, walls, etc.

Axial and vane axial fans should be installed in accordance with general accepted practices as outlined by ASHRAE, AMCA or other duly authoritative body, and shall have a uniform velocity profile of +10%. Care should be taken to avoid the use of bends or dampers immediately preceding or following the fan with factory approval in writing.

VENTURI AND ROOF FANS

A three inch square housing base has been constructed for ease in installation to any frame opening. Refer to your certified drawing for other dimensions. Insure that proper support is provided to support the weight of your fan.

MOTOR CONNECTIONS

The motor on your fan has been shipped in a disconnected state. Connect the motor leads in accordance with the motor nameplate diagram for the desired voltage.

EXTERNAL WIRING

Starting and over-load control devices must be matched to motor rating. For safety or convenience they may need to be installed some distance from the motor. Follow the control manufacturer's instructions to make proper installation and connections. Observe the following:

a. Connect electrical power supply to conform with National Electrical Code and any local regulations. Line voltage and wire capacity must match motor rating stamped on the nameplate.

b. Momentarily energize the motor to check that rotation is in the proper direction. Observe the arrow markings on the fan housing for correct fan rotation.

c. If motor is three-phase type, reverse rotation (if required) by interchanging any two of the three power leads. If two-phase, interchange stator leads of either phase, being careful not to change leads from one phase to the other. If motor is single-phase, refer to the instructions on the motor nameplate.

OPERATION INSTRUCTIONS

INITIAL START

After installation is completed, but before fan is put in regular service, make an initial start as follows:

a. Visually check the blade tolerances to see that they are equal around the fan. Hand turn the impeller to determine that the motor has not shifted in shipment and/or erection. Be sure no blades are touching the housing when spun.

b. Check that motor, starting, and control device connections agree with wiring diagrams.

c. Check that voltage, phase and frequency of line circuit (power supply) agree with fan nameplate.

d. Check that all bolts on your fan supports are tight and no objects are left in the fan housing.

e. Check motor service record and tag accompanying motor to be certain bearings have been properly lubricated. When shipped from the factory, relubricable ball bearings have been lubricated to give six (6) months satisfactory service. Sealed ball bearings are lubricated for life and require no maintenance.

f. Bump start the fan to determine if the fan is turning the correct way in accordance with the rotation arrow on the outside of the fan casing.

WARNING

Repeated trial starts can overheat the motor (particularly for across-the-line starting) or the resistance of external starting equipment. If repeated trial starts are made, allow sufficient time between trials to permit heat to be dissipated from windings or external resistance and prevent overheating. Starting currents are several times running currents, and heating varies as the square of the current.

COMMERCIAL TECH MANUAL

FOR 5 TON MARINE AIR CONDITIONER

MODEL # NAC-600

LIST OF EFFECTIVE PAGES

The total number of pages in this publication is 114 consisting

of the following:

DESCRIPTION	PAGE NUMBER	CHANGE NUMBER
Cover	-	0
Title Page	-	0
List of Effective Pages	i	0
Record of Changes	ii	0
Safety Summary	iii	0
Resuscitation	iv	0
Approval and Procurement Record Page	v	0
Validation/Verification Performance (Content Assurance Page)	vi	0
List of Illustrations	vii	0
List of Tables	viii	0
Chapter 1 - General Information	1-9	0
Chapter 2 - Operations	10-18	0
Chapter 3 - Functional Description	19-29	0
Chapter 4 - Service and Maintenance	30-41	0

TABLE OF CONTENTS

Chapter 3 - Functional Description

Chapter 4 - Service and Maintenance

Chapter 5 - Troubleshooting Analysis

RECORD OF CHANGES

CHANGE NO.	DATE	TITLE OR BRIEF DESCRIPTION	ENTERED BY

SAFETY SUMMARY

The following are general safety precautions that are not related to any specific procedures and therefore do not appear elsewhere in this publication. These are recommended precautions that personnel must understand and apply during many phases of operation and maintenance.

KEEP AWAY FROM LIVE CIRCUITS

Operating personnel must at all times observe all safety regulations. Do not replace components or make adjustments inside the equipment with the high voltage supply turned on. Under certain conditions, dangerous potentials may exist when the power control is in the off position, due to charges retained by capacitors. To avoid casualties, always remove power and discharge and ground a circuit before touching it.

DO NOT SERVICE OR ADJUST ALONE

Under no circumstances, should any person reach into or enter the enclosure for the purpose of servicing or adjusting the equipment except in the presence of someone who is capable of rendering aid.

RESUSCITATION

Personnel working with or near high voltages should be familiarly with modern methods of resuscitation. Such information may be obtained from the Bureau of Medicine and Surgery.

The following warning appears in the text of this volume, and is repeated here for emphasis.

WARNING

High voltages capable of causing death are used in this equipment. Use extreme caution when servicing either the power supplies or their load components.

LIST OF ILLUSTRATIONS

LIST OF TABLES

CHAPTER 1 - General Information

1.1 This manual is written to explain and describe the functions, operations, maintenance, equipment component parts and parts breakdown for a 5 ton marine air conditioner, mechanically refrigerated, Model No. NAC-600, which is energized by 440 volt, 3 phase, 60 cycle power, manufactured by the A.R.E. Manufacturing Company, Inc., located in Jacksonville, Florida.

1.2 Equipment Description - The 5 ton water cooled marine air conditioner (See Figure 1) NAC-600, is classified a size 5 with minimum capacity of 60,000 BTU's per hour cooling. This air conditioner utilizes a sea water cooled condenser with capabilities of a totally incased unitary assembly with means of air circulation, ventilation, air cooling and dehumidification aboard naval vessels in accordance with MIL-A-19865B (Ships) as amended by Navsea Systems Command letter dated 02 December 1980, serial no. 930

1.2.1 The NAC-600 marine air conditioner consists of the following major equipment assemblies:

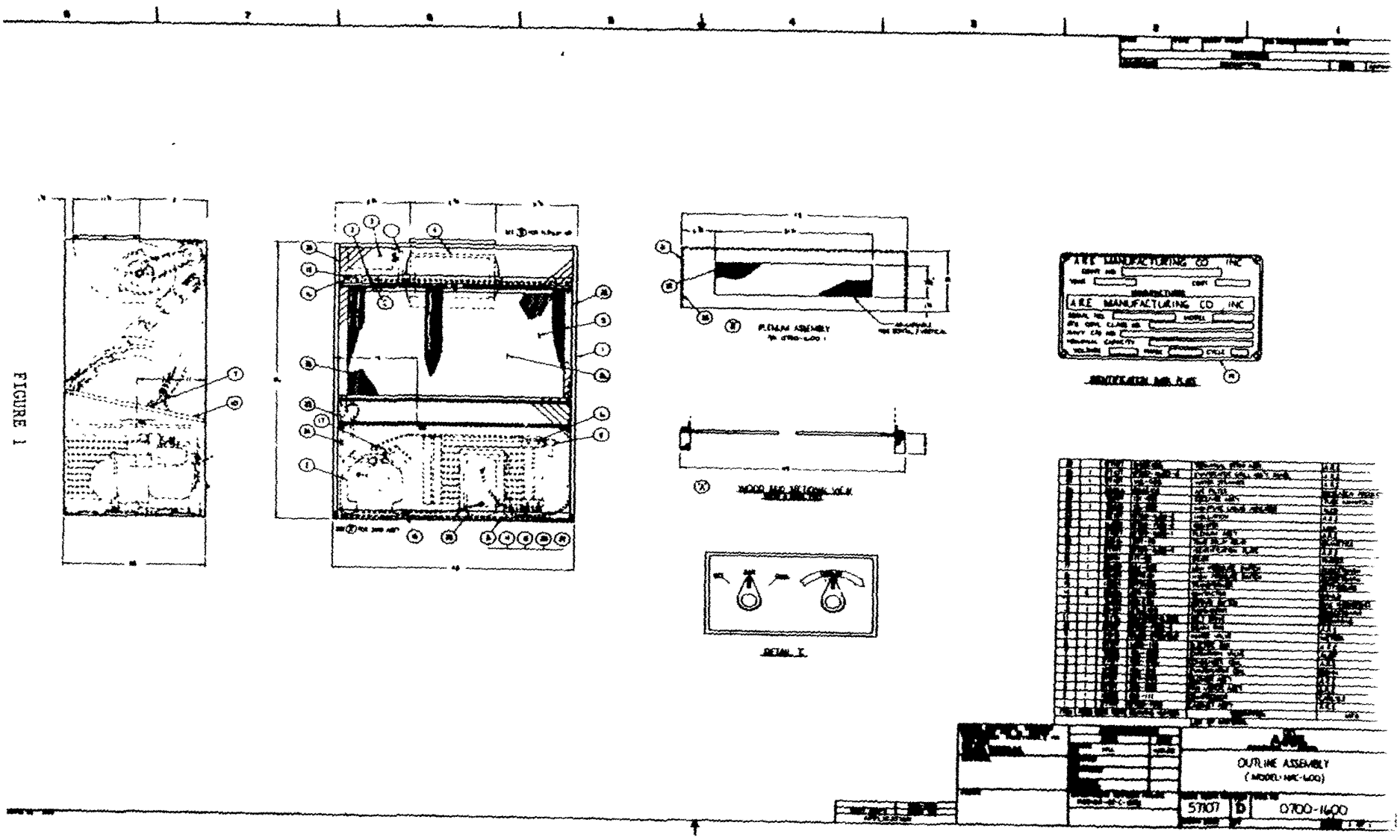


FIGURE 1

FIGURE 1

A)	Plenum Assembly	0700-1600-1
Al	Cabinet Assembly	0700-1942
B)	Refrigeration Compressor	108-111
C)	Condenser Assembly	105-006
D)	Coil, Evaporator Assembly	106-012
E)	Receiver Assembly	131-002
F)	Blower Assembly	207-004
G)	Valve, Thermo Expansion	156-002
H)	Motor, Evaporator Fan	325-005
I)	Water Regulating Valve	0600-092/360
J)	Junction Control Box Module Assy. With Electrical Disconnect	600-110-2

1.2.2 Detailed equipment component parts are described and defined in Chapter 3 Functional Description.

1.3 A pictorial illustration representing the equipments layout and component configurations and details is found on Figure 1. This pictorial illustration defines the major assembly items and relative assembly sizes with interconnections between components and their relationship with each other.

1.4 Reference Data The following reference data regarding A.R.E.'s Model NAC-600 marine air conditioner is as follows:

Contract #N00104-82-C-2052

Year 1982

Serial No.: To be determined Model: NAC-600

Navy CID No.: To be assigned

Nominal Capacity: 60,000 BTU

Voltage: 440 Phase: 3 Cycle: 60

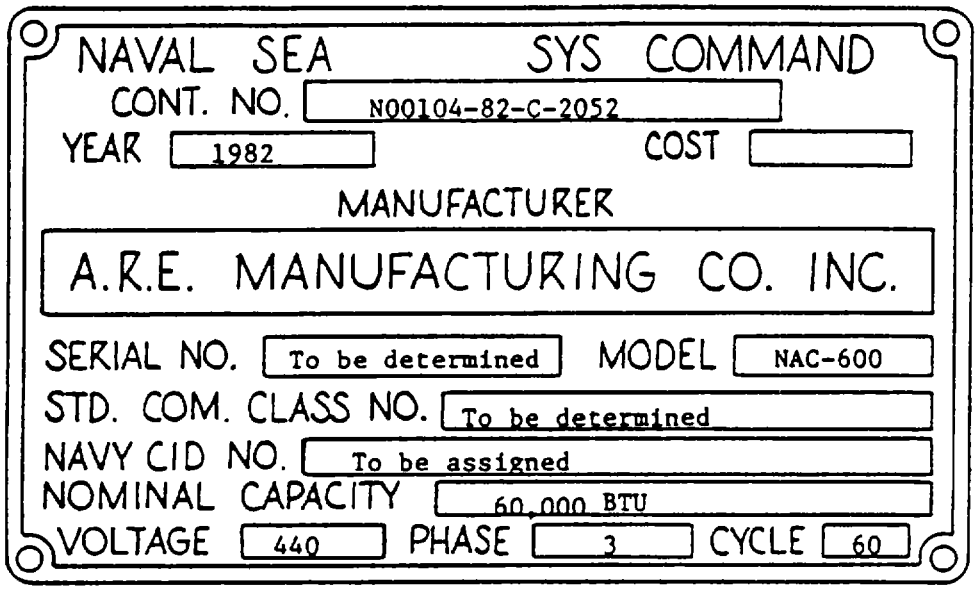


FIGURE 2
Nameplate data

1.4.1 The nameplate data and pictorial view of the nameplate to be affixed to each unit is as defined in Figure 2 above. The contract number, CID number, capacity, etc. have been affixed to the figure as the nameplate will be affixed to the front panel of the air conditioner.

1.4.2 The following Table 1 defines the capacity and physical data for the NAC-600 marine air conditioner:

TABLE 1

Capacity and Physical Data

Unit Model Number	NAC-600
Unit Size and Weight	5 Ton 732 Lbs. (Without spare parts)
Nominal Capacity, BTU/HR	60,000
Refrigerant - R-22, Charge/Lbs.	7 Lbs. 8 Oz.
Dimensional Data, Inches	
Height	66
Length	45
Depth	25
Fan Discharge, Length	13 1/4
Fan Discharge, Depth	11 3/4
Water Inlet, ODM	1 3/8
Water Outlet, ODM	1 3/8
Fan Data	
Wheel Diameter, Inches	10 5/8
Nominal CFM	2100
Motor Horsepower	1
Fan RPM	975
Condenser-Receiver Data	
Refrigerant Tube, O.D., Inches	1 1/4
Water Tube, O.D. Inches	7/8
Ref. Inlet, O.D. Inches	5/8
Ref. Outlet, O.D. Inches	5/8

TABLE 1

Capacity and Physical Data (Continued)

Direct Expansion Coil Data	
Face Area, Sq. Ft. 5.47	
Face Velocity, FPM	383
Fin Height, Inches	22 1/2
Fin Length, Inches	35
Number of Face Tubes	18
Total Number of Tubes	72
Number of Circuits	8
Tube O.D., Inches	1/2
Wall, Inches	.016
Fins per Inch	10
Compressor Data (Semi-Hermetic)	
Cylinders	4
Motor Cooling Medium	Suction
Horsepower	5
R.L.A. @ 460 Volts	9.4
Bore, Inches	1.8125
Stroke, Inches	1.250
Displacement, CFM	13.1
Oil Recharge	5 pints
Refrigerant Pressure Protection	
High Pressure Cut-In PSI	Manual Reset
Control Cut-Out PSI	295 + 5
Low Pressure Cut-In PSI	60 + 5
Control Cut-Out PSI	35 + 5

1.4.3 Table 2A defines the heat transfer data characteristics of the A.R.E. Model NAC-600 marine air conditioner:

TABLE 2A

HEAT TRANSFER DATA

MODEL	HEAT REJECTED BTU		CHARGE R-22	COND. GPM	OF SPLIT	KW INPUT
	TOTAL	SENSIBLE				
NAC600	60,000	42,000	7 lb 8 oz.	14.0	11.00	4.75

1.4.4 Table 2B describes the condenser water data, pressure drop and PSI for A.R.E. Model NAC-600 marine air conditioner.

Condenser

TABLE 2B

MODEL	GALLONS PER MINUTE						
NAC600	15	16	17	18	19	20	21
	16.2	17.3	18.1	19.2	20	21	21.7

1.4.5 Table 2C defines the water regulating valve data, the pressure drop and PSI for A.R.E. Model NAC-600 marine air conditioner.

Water Valve

TABLE 2C

MODEL	GALLONS PER MINUTE						
NAC600	15	16	17	18	19	20	21
	2.8	3.5	4.2	4.6	5.3	6.0	10

1.4.6 Table 3 describes the Model NAC-600 marine air conditioning unit electrical data and recommended component electrical information for field wiring and installation. (See Table 3, next page)

1.4.7 The NAC-600 marine air conditioner base mounting dimensions have been included in Figure 3. The discharge and/or duct work connection dimensions for the Model NAC-600 air conditioner are illustrated and defined in Figure 3 to provide for field installation dimensions when the use of a plenum is not required.

1.5 Equipment Accessories and Documents

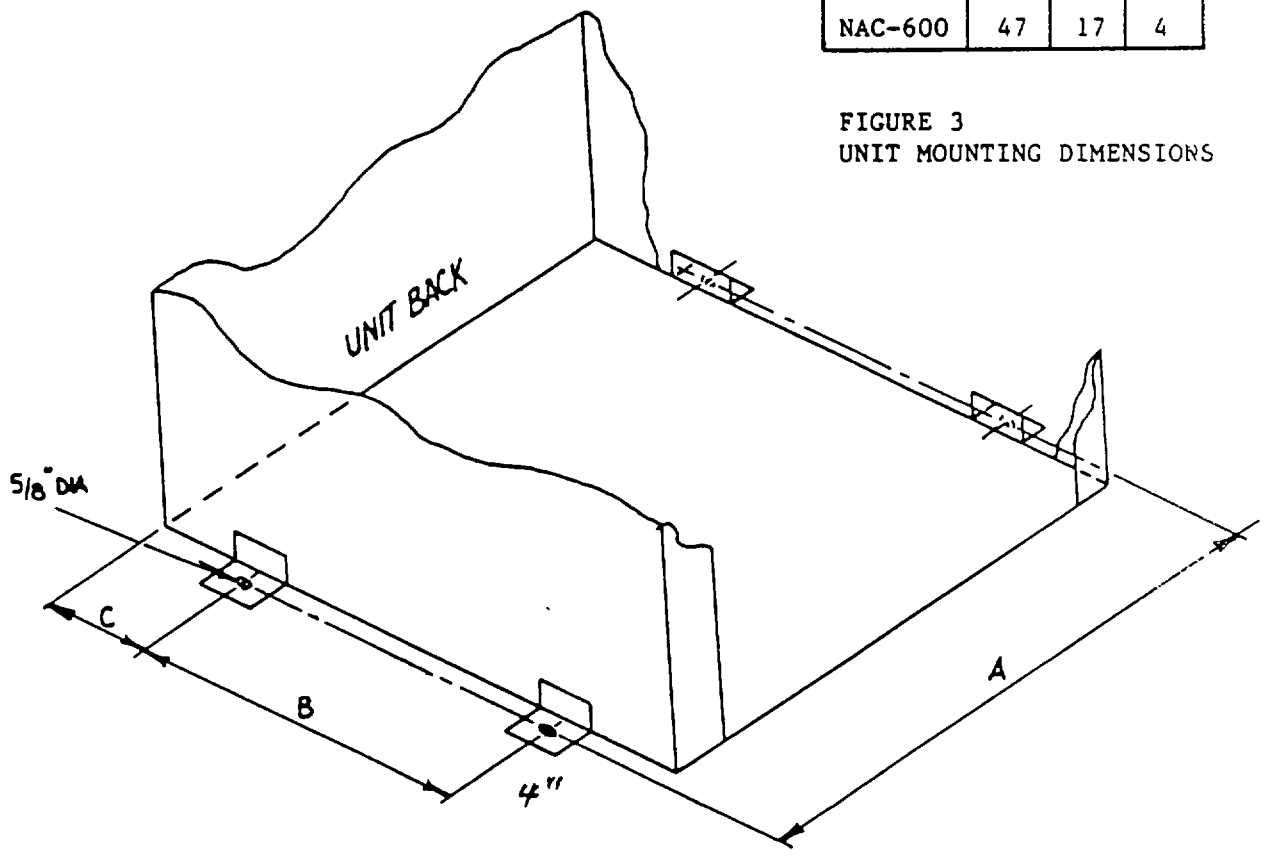
1.5.1 The following loose items as tabulated below are the NAC-600 equipment accessories and documents supplies with each air conditioner when shipped from A.R.E. Manufacturing Company, Inc. These items are as follows:

ELECTRICAL CHARACTERISTICS											FIELD WIRING	
MODEL	UNIT FLA	COMPRESSOR MOTOR				FAN MOTOR				NO. OF STD. SIZE		
		Volt	Ph	FLA	HP	Volt	Ph	FLA	HP	Cond	Fuse	Dis. Swt.
NAC600	10.8	460	3	9.4	5	460	3	1.40	1	3	30A	30A

TABLE 3
UNIT ELECTRICAL DATA AND RECOMMENDED COMPONENT SIZES FOR FIELD INSTALLATION

UNIT	A	B	C
NAC-600	47	17	4

FIGURE 3
UNIT MOUNTING DIMENSIONS



1 Complete Set

Compressor Repair Parts
Consisting Of The Following:

CARLYLE P/N	DESCRIPTION	QTY.
6D43-172	Gasket Set	1 Set
06DA6600-37	Valve Package Assembly R.H.	1
06DA6600-38	Valve Package Assembly LH.	1
6D75-1062	Discharge Valve Disks	4
6D45-1072	Suction Valve Disks	4
6D40-962	Piston With Pin	4
5D40-1372	Connecting Rods	4
AU-50CP250	Rings (1) Oil	4
AU-50CP350	Rings (1) Compression	4

As required plenum gasketing material; one (1) set of three (3) screws in duct bag for plenum installation:

1	each	plenum assembly	0700-1600-1
2	each	government furnished technical manuals	
1	each	water strainer	0600-0920/360

1.5.2 The following component items as tabulated below are the Model NAC-600 accessories which are supplied as fastened accessory items to the A.R.E. Model NAC-600 marine air conditioner when shipped:

1	each	Wood Pallet
4	each	Pallet Hold-Down Feet
4	each	Lag Bolts for Hold-Down Feet
4	each	1/4" Self Tapping Machine Screws For Air Conditioner Attachment To Pallet
8	each	Washers (4 Each For Lag Bolts; 4 each for self-tapping screws)
1	each	Wooden Crate for Shipment Consisting of 1 Front, 1 Back and 2 Sides and 1 Top.
1	each	Clear polyethalene bag to hold technical manuals.

CHAPTER 2 - Operations

2.1 Introduction

2.1.1 General Instructions

2.1.1.1 Inspection Upon receipt of unit, inspect the shipping crate for any evidence of damage in transit. If necessary, open the crate for a more complete examination.

2.1.1.2 Handling To help in handling, the unit is set on a wooden skid so that it may be picked up with a two-wheel hand truck. Under no circumstances should the unit be "walked" on the corners of the crate. Use dolly trucks or pipe rollers to move the unit to its proper location.

2.1.1.3 Moving and Unpacking the Unit

a) Remove the crate from the unit.
b) Take off the four (4) bolts holding the unit to the bottom of the skid.
c) Raise or slide unit from skid.
d) Take off front panels of unit.
e) Inspect for damage and proceed accordingly.

2.1.1.4 Installation of Unit These units are intended for installation in a vertical position only. For shipboard installation, it may be desired to install the units vertically on the deck in a fore-and -aft centerline position to reduce the effect of gyroscopic bearing loads when the ship rolls. Mount on deck with the steel angles furnished with the unit.

2.1.2 It is recommended by the manufacturer that the following procedure be utilized to initially start-up and operate the NAC-600 marine air conditioner:

1) Assure, by visual inspection, that the disconnect switch handle located in the lower front compartment panel is in the "OFF" position. See Figure 4.

2) Upon completion of (1) above, the removal of the compressor compartment panel can now be accomplished by the removal of two (2) screws which include washers.

3) Upon accomplishment of (2) above, the compressor which is color coded green includes a discharge and suction valve integrally attached to the compressor, color coded by a bronze alloy color, located at the bell of the compressor and between the cylinder heads of the compressor, requires back seating. The stems of both valves should be turned counterclockwise until full back seating has been accomplished.

Caution Label to be affixed to control box - - (here)

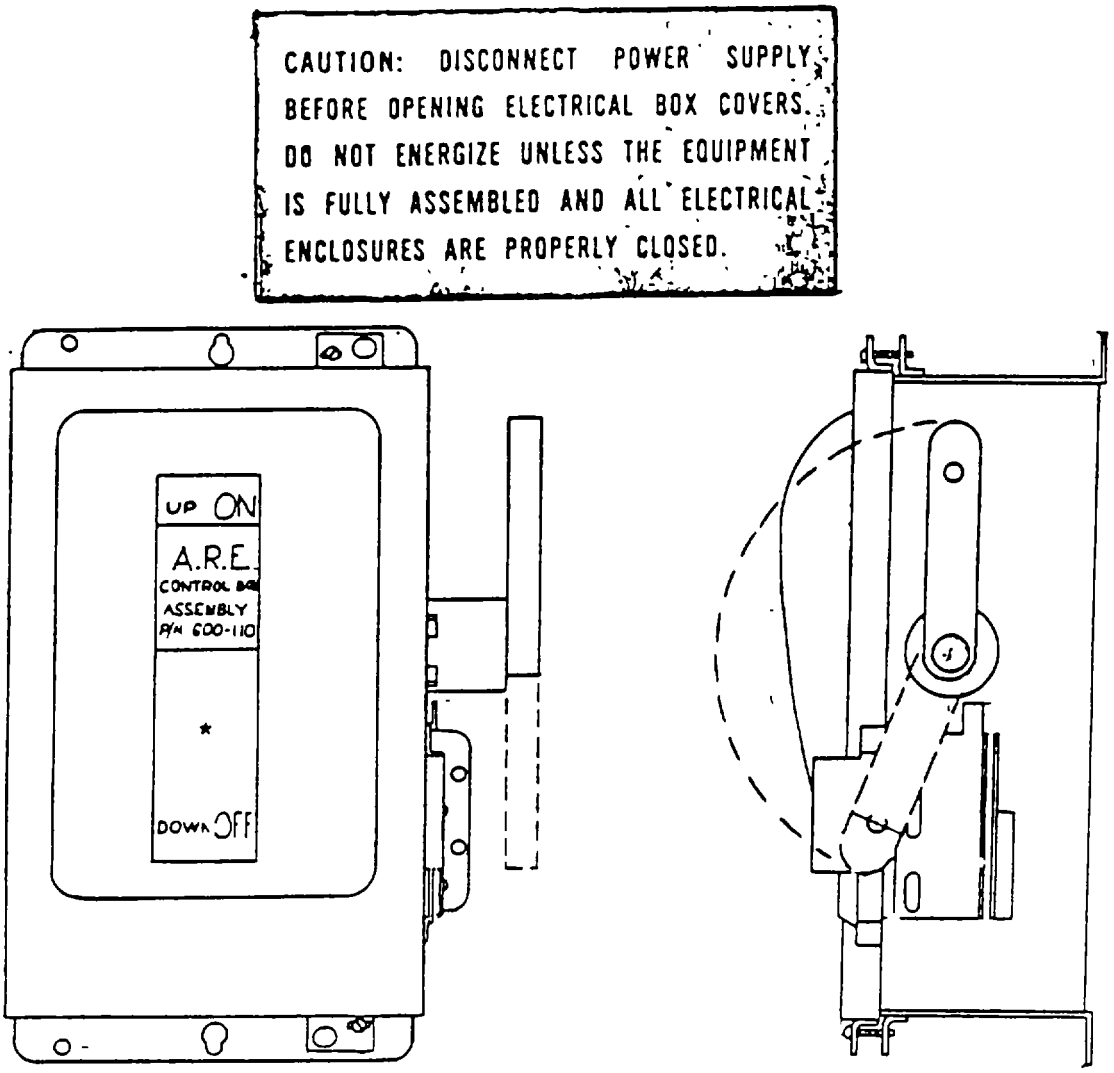


FIGURE 4

JUNCTION CONT5OL BOX ASSEMBLY

4) Remove service cap from each valve body.

5) Install a discharge (O" to 300" psig) and suction (30" to 150" psig) pressure gauges in each of their respective service valve ports. Front seat compressor valve 3/4 turn.

6) Purge service gauges.

7) Open main water supply and return valves if need be. CAUTION Read warning instructions page 14.

8) FULLY open inlet and outlet condenser package hand valves. Supplied by Navy Recommended field installation.

NOTE

There are no special type shipping clamps used to fasten the compressor to the base pan frame. The compressor is mounted ready for operation on spring isolators (rigid mount) specifically designed for shipboard use.

9) Engage unit disconnect switch. See Figure 4.

10) Turn selector switch from OFF to FAN position. Observe fan rotation. It is to be clockwise when looking onto the blower sheave.

11) Turn selector switch from FAN to COOL position. Also turn thermostat knob clockwise. See Figure 5 below:

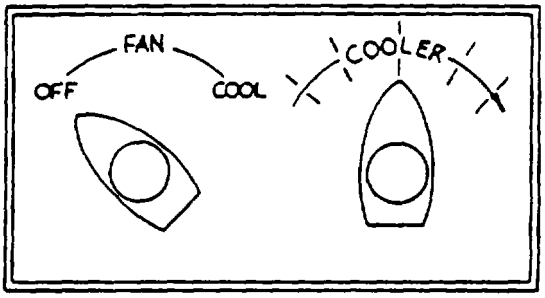


FIGURE 5. CONTROL SWITCHES

12) Observe operating discharge and suction pressures. The discharge pressure should be correspondent to the saturated temperature selected for refrigerant 22 (R-22). This pressure range should be approximately 190-245 psig. It is essential that the water regulating valve be rechecked by the installer, since the factory adjustment may have deviated through shipment and installation. Refer to paragraph on water regulating valve for valve adjustment instructions.

13) Backseat compressor suction and discharge service valve by turning stem counterclockwise. Remove pressure gauges and re install service cap in each valve.

14) Replace compressor compartment panel of the unit.

NOTE

Gauge ports of suctions and discharge line shutoff valves are 1/4" male flare size.

WARNING ----------WARNING ----------WARNING

REPLACE CONDENSER DRAIN PLUG PRIOR TO OPERATION OF UNIT. PLUG REMOVED AFTER TEST TO ELIMINATE POSSIBLE CONDENSER COIL FREEZE-UP DURING STORAGE AND SHIPMENT.

2.1.3 The NAC-600 marine air conditioner requires the following hookup and connections to assure its proper operation:

1) Water connections Install the sea water strainer (shipped as a loose part and unassembled) to the bottom connection of the condenser. Note the direction of flow indicated by the arrow on strainer. The strainer should be readily accessible for periodic maintenance and cleaning. Valves on both strainer in let and outlet are recommended. Connect strainer to pressurized sea water supply line with an inlet pressure of not less than 35 psi flowing at a rate of 14.0 gallons per minute. Connect the line from the water regulating valve to onboard piping utilizing the half-union which has been provided with the valve. The size of the pipe should be the same or larger than the inlet or discharge water lines as provided on the condenser and regulating valve.

2) Electrical connections The NAC-60O marine air conditioner is completely wired with the exception of supply current. To supply the NAC-600 unit with electrical power, a hole must be drilled in the water tight NEMA-12 junction box disconnect switch for access of the supply power lines. A water tight connector is recommended to be attached to the NEMA-12 junction box disconnect switch assuring the box of water tight integrity. A 440 volt, 3 phase, 3 wire power supply, capable of furnishing up to 20 amps of continuous service is required. The power supply should be fused or thermally protected for the amp rating previously defined with momentary surges up to 45 amps. A GOOD GROUND CONNECTION TO A BARE METAL SURFACE OF THE CABINET SHOULD BE MADE.

2.1.4 To provide ventilation without cooling, turn the knob of the selector switch to the FAN position. This operates the evaporator fan motor only. See Figure 5.

2.1.5 To condition the air, turn the selector switch and thermostat until they are located at the COOL/COOLER position. The compressor will start and conditioned air will be discharged from the unit after a 270 second time delay has occurred.

2.1.6 If the conditioned space becomes cooler than desired, turn the temperature switch counterclockwise toward the selector switch.

2.1.7 If the air in the conditioned area becomes too warm or more humidity is present than is desired, turn the temperature switch to the COOLER position.

2.1.8 If the compressor should fail to operate properly, take off front panel and check the wiring to make certain that there are no loose connections. For checking further, install test gauges on the compressor and check both the discharge and suction pressures, If the discharge pressure is higher than 260 lbs. psig, make certain the water flow rate through the condenser is adequate and that the water regulating valve is operating properly. If the suction pressure is lower than normal, make certain the passage of air through the filters is unrestricted.

2.1.9 For complete answers to abnormal unit operation, consult the Trouble Analysis Chart in this manual.

2.2 Controls The Model NAC-600 marine air conditioner is controlled electrically and mechanically through the following component items as described below and as pictorially illustrated on the corresponding drawing numbers found elsewhere in this manual.

2.2.1 Electrical Controls

A) The electrical controls for the NAC-600 air conditioner consists of two (2) switches:

1. A three (3) position rotary selector switch, Drawing 001R101, for positions of OFF-FAN-COOL.

2. A temperature control thermostat, Drawing 076R100, which decreases or increased the air conditioners cooling temperature (refer to Figure 5)

3. A time delay relay control provides a 270 second time delay for compressor restart after any type of shut-down or interruption of power. (See Drawing #337-001) 2.2.2 Electro-Mechanical Controls consist of pressure controls which are located as follows: A) High Pressure Control located in the upper recessed panel controls compartment and includes a manual reset capability. (See Drawing 057R101 for details).

B) Low Pressure Control mounted as an integral part of the refrigeration compressor assembly and has a fixed cut-out pressure. (See Drawing 144-002 for low temperature control details)

C) The functions of the pressure controls are to maintain a safe operating pressure for the entire system. The cut-in and cut out pressure settings for both the high and low pressure elements are tabulated at the factory and are found stamped on the elements located in the control panel and also in Table 1.

2.2.2 D) The low pressure cut-out will open the circuit if the filters are very dirty, if there is a restriction in the air ducts, and/or if the system is not fully charged due to refrigerant leaks, etc. This control is of the automatic reset type.

E) The high pressure cut-out will open the circuit if the condenser water circuit is fouled sufficiently to greatly impair the heat transfer, if there is a restriction in the water piping, if there is no water, if water regulating valve is set too high, and/or if the refrigerant system is greatly overcharged. This control is of the manual reset type.

F) Resetting of the high pressure control switch, P/N 057R101, is accomplished by depressing manual reset lever located in the controls section of the NAC-600 (See Drawing #0700-1600).

WARNING ---------- WARNING ---------- WARNING

IF UNIT IS STORED IN AN AREA WHERE THE TEMPERATURE MAY FALL BELOW FREEZING, DRAIN ALL WATER FROM THE CONDENSER.

WHEN SERVICING THE UNIT, PURGE AS LITTLE GAS AS POSSIBLE FOR THE UNIT CONTAINS A CRITICAL CHARGE THAT FACTORY METERED TO 1/2 POUND.

MINIMUM OPERATING CONDENSER WATER INLET PRESSURE OF 35 PSIG AT UNIT IS REQUIRED FOR SATISFACTORY PERFORMANCE.

WARNING ---------- WARNING ---------- WARNING

A SUCTION LINE FILTER CLEAN-OUT KIT SHOULD BE USED IN THE REFRIGERANT SYSTM AFTER A COMPRESSOR BURNOUT.

2.2.3 On extremely humid days, it may be noted that the compressor has operated a few hours without an apparent decrease in room temperature. On such days, the humidity content of air being conditioned will be greatly reduced and the conditioned area will be comfortable in spite of the small reduction in room temperature.

CHAPTER 3 - Functional Description

3.1 The Model NAC-600 marine air conditioner functions as a mechanically refrigerated air conditioner capable of providing air circulation, ventilation, air cooling and dehumidification for naval shipboard use with a minimum capacity of 60,000 BTU/HR. The air conditioning unit functions with the use of a sea water condenser which rejects heat from the compartment being conditioned. This is accomplished through the use of various component parts and assemblies allowing for cooling and ventilating through an evaporating section which discharges cooling air by means of a blower assembly coupled to a fan motor which is energized by an ON-OFF switch for the means of operation.

3.2 The following detailed component item functions are provided to allow for the proper component understanding of the equipment component defined.

3.2.1 Water Regulating Valve Each unit is equipped with a factory adjusted water regulating valve. This is a pressure operated type water valve. As the pressure rises in the condenser due to the accumulation of the gas, the valve is opened permitting water to flow into the condenser to cool the compressed gas. It opens the water circuit only when water is needed, that is, as the pressure rises. The valve is set to open at a certain pressure. As the head pressure (compressor discharge pressure) increases, the valve opens further; when the pressure and temperature drops the water flow is reduced and finally the pressure

3.2.1 and temperature drops, the water flow is reduced and finally shut-off. If it becomes necessary to change the factory adjustment, use a wrench or a pin and turn the adjusting screw on top of the spring housing. See Drawing #0600-0920-360.

3.2.2 Compressor The compressor is used to compress refrigerant vapor from the evaporator coil to high pressure gas and discharge it into the condenser. Refrigerant enters the compressor through a suction service valve and passes out through a discharge service valve. See Drawing #108-111, Sheets 1 thru 4. See Appendix 1 for compressor information.

3.2.3 Condenser The condenser coil is used to remove heat and condense refrigerant gas to a liquid. The condenser is water-cooled and is made of cupro nickel tubing enclosed within steel tubing. The inner tube carriers the water and the outer, the refrigerant. See Drawing #105-006.

3.2.4. Filter Frier The filter drier is a small cylindrical throw-away type vessel containing a drying chemical and a filter. It absorbs moisture and traps foreign material from the refrigerant as it leaves the condenser on its way to the expansion valve. See Drawing #117-001.

3.2.5 Evaporator The evaporator coil consists of an aluminum housing that contains circuits of parallel staggered copper tubes expanded into aluminum extended surfaces. The vaporizing refrigerant flows through the evaporator coil and absorbs heat from the air as it passes over the aluminum fins. The air is circulated by means of a fan located above the evaporator. See Drawing #106-012.

3.2.6 Evaporator Fan Motor Assembly The evaporator fan, which is mounted on a bearing supported shaft driven by an electric motor is designed to pull air through the evaporator coil and discharge it through the opening at the top of the unit. See Drawing 1325-005 and #207-004.

3.2.7 Receiver The receiver is a cylindrical reservoir of welded steel construction. The tank is equipped with an inlet and outlet tube and a fusible type plug. Although the receiver is capable of holding the entire charge of refrigerant in the system, only a part of this refrigerant will be in the receiver at any one time during normal operation. Liquid refrigerant from the condenser flows through an inlet tube and leaves through the outlet tube. See Drawing #131-002.

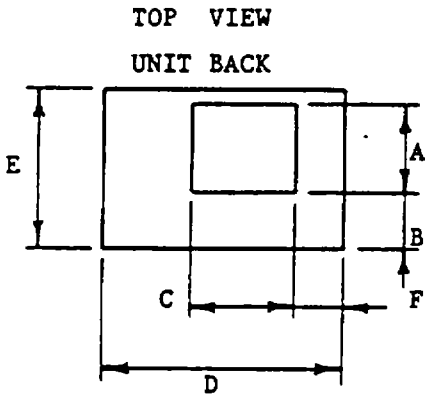
3.2.8 Moisture Liquid Indicator (Sight Gauge) The sight gauge is used to observe liquid refrigerant as it flows through the system. If the unit contains sufficient refrigerant and is operating normally, the glass will show a full presence of refrigerant and the sight gauge will display a blue or navy blue color for a dry reading and will display a purple or orange color for a wet reading. See Drawing #136-002.

3.2.9 Thermostatic Expansion Valve The thermostatic expansion valve has an external equalizer and a fixed superheat setting. This valve acts as a metering device for the flow of liquid refrigerant into the evaporator to the suction line and an external equalizer which senses pressure in the suction line at the thermal bulb location giving an accurately controlled superheat. See Drawing 1156-002.

NOTE
Superheat is the heating of the refrigerant vapor above its vaporizing temperature.

3.2.10 Water Piping and Connections Do not reduce any pipe sizes from the factory connections on the unit. Both the water inlet and outlet of the condensing package should be equipped with gate valves. This is needed for shut-down of water supply during long periods of unit shut-down and/or condenser removal. It is important that both condensate pan drain connections be piped. This is necessary to compensate for the ships pitch and roll. The condensate drain line should be pitched downward from the unit to a sump or open drain.

NOTE: ALL DIMENSIONS ARE IN INCHES



UNIT	A	B	C	D	E	F
NAC-600	11 5/8	11 7/8	13 1/4	45	25	15 7/8

Figure 6 - Unit Discharge, Ductwork Connection Dimensions

WARNING ----------WARNING ----------WARNING

THIS DRAIN LINE SHOULD NOT BE CONNECTED TO THE CONDENSER OUTLET AS FLOODING IS LIKELY TO OCCUR. PROVISIONS SHOULD BE MADE FOR EASE OF PIPING CLEANING BY:

A) USING PLUGGED TEES AT ALL TURNS RATHER THAN ELBOWS:

B) EXTERNALLY INSTALLING, IN AN EASILY ACCESSIBLE LOCATION, THE INLET WATER STRAINER.

3.2.11 Ductwork (No Discharge Plenum) The ductwork is connected to the fan outlet. Refer to Figure 6 for fan outlet dimensions. A short piece of canvas should be connected at the fan discharge to minimize the possibility of compressor and fan noise being transmitted along the duct to the conditioned area. The duct should be sized for minimum static pressure loss. Consult Table for the required fan speed and horsepower at different external static pressures for designed air delivery.

3.2.12 Refrigerant Only Refrigerant 22 (R-22) is to be used in the air conditioning units.

3.2.13 Air Filters The function of the air filter is to remove particles of dirt, lint, soot and pollen from the air. The "life" of the filter will vary with the amount of foreign matter in the air. That is, the period of time allowed between cleaning them. When the circulated air contains considerable lint or dust, it may be necessary to clean or replace the filters several times each month. A dirty or clogged filter reduces the air flow, which impairs the operating efficiency of the cooling system by restricting the air flow through the air conditioning unit. Access to the filter is obtained on the unit by removing the front grill section. The recommended filter size is 18 x 36 x 1 and a quantity of one (1) each is used. See Drawing #024R102.

WARNING ---------- WARNING ---------- WARNING

OPERATE WITH CLEAN FILTERS. A CLEAN FILTER IS EQUALLY AS IMPORTANT AS THE PROPER OPERATION OF A REFRIGERANT CYCLE.

NEVER OPERATE WITHOUT A FILTER. DIRT AND DUST NORMALLY FILTERED FROM THE AIR WILL ENTER THE EVAPORATOR AND FAN SECTION OF THE UNIT CAUSING THEM TO CLOG. THIS COULD RESULT IN EXPENSIVE SERVICING AND/OR REPAIRS TO THE UNIT.

3.3 Protection Features The air conditioning unit has the following protective/preventive features.

1) Electrical and mechanical:

a) The use of high-low pressure cut-outs. Fusible plugs 280° ± 3° receiver tank and condenser coil.

2) Electrical:

a) The use of inherent overload protector on both the compressor and fan motors. Compressor overloads will be either internally or externally mounted.

3.3 Continued

3) Mechanical:

a) The compressor mounted for operation on isolators. No special shipping fasteners are installed or required.

b) The condenser is designed for easy cleaning from the front by a spiral wire cleaning tool. This tool is so designed to be driven either by hand or by a suitable electrical hand drill.

3.4 Refrigeration Cycle

3.4.1 The refrigerant cycle can be traced from any point in the system. Therefore, we will start with the liquid refrigerant entering the evaporator. Entrance of the liquid to the evaporator is controlled by an automatic throttling device called the expansion valve, which is controlled by temperature and pressure in the suction line. This valve is designed to meter the refrigerant flow in such a way that refrigerant vapor leaving the coil is superheated 10° F.

3.4.2 Due to the "sucking" action of the compressor, the gas is drawn through the suction line into the compressor cylinders. The downstroke of the piston admits a cylinder full of gas through the suction valve and then compresses the gas on the upstroke, therefore, raising its temperature and pressure. The compressed gas is kept from re-entering the cylinder on its next downstroke by the compressor discharge valve. The pressure thus produced causes the hot gas to flow to the condenser.

3.4.3 After the compressed gas passes the discharge service valve and has entered the condenser, heat flows from the hot gas into the condensing medium (water), removes heat from the compressed gas and a change of state from a gas to liquid occurs. This liquid forced through the liquid line to the expansion valve for a repetition of the cycle.

3.5 Equipment Diagrams

3.5.1 Electrical Wiring Schematic Diagram The NAC-600 marine air conditioner is wired electrically through the junction box assembly, part number 600-110, is energized by 440 volts,

3.5.1 3 phase, 60 hertz power transformed in the control circuit through a step-down transformer, part number 097R100, to 24 volt AC and provides electrical current to the ON-OFF switch and thermostat, part number 001R101 and 076R100, respectively, solid state time delay, part number 337-001, as well as high and low pressure controls which are part of the control circuit. The 440 volts, 3 phase, 60 hertz power is directly transferred through the special purpose contractors and fed through the circuit to energize the fan motor and the refrigeration compressor. Drawing #600-002 depicts the circuit analysis as described above in schematic form and is found elsewhere in this technical manual.

3.5.2 Refrigerant and Water Piping Diagram Drawing #180-001 depicts the travel of the incoming sea water through the condenser and its flow for cooling purposes of the condenser refrigerant side and through its circulation out of the condenser through the sea water valve. The refrigerant side is depicted through its travel in each component starting with the compressor to the condenser, the receiver, etc.

CHAPTER 4 - Service and Maintenance

4.1 Introduction

4.1.1 The NAC-600 marine air conditioner requires periodic servicing and preventive maintenance to assure its proper operation. The service information and maintenance requirements are found below. Periodic maintenance, as prescribed in the following paragraphs for the compressor, air filters and condenser, are defined.

4.2 Removal of Compressor

1) Make sure electrical power to unit is OFF.
2) Front seat suction and discharge service valves.
3) Slowly remove refrigerant charge from compressor. Remove low pressure wires from junction box.
4) Disconnect high pressure control tubing.
5) Remove compressor conduit fasteners and disconnect wires from terminals.
6) Remove nuts which hold compressor unit to vibration isolators.
7) Remove compressor Care must be taken in this removal operation to prevent damage to the refrigerant lines.

4.2.1 Reinstalling Compressor -

1) Slide compressor unit up and onto isolators and bolt in place.
2) Replace old discharge and suction service valve gaskets with new ones before attaching the valves to the compressor.

4.2.1 Reinstalling Compressor - Continued

3) Replace high pressure control tubing.

4) Replace low pressure control tubing and rewire to junction box making certain that the posts are in good condition and maintaining proper contact between these posts and the connecting wires. Replace the compressor conduit fasteners.

5) Draw suction with vacuum pump to 29.8" absolute. Maintain vacuum for at least one (1) hour.

6) Backseat suction and discharge service valves.

7) Pressure test connections at suction and discharge service valves using refrigerant gas detector.

8) Connect suction and discharge service gauges.

9) Operate air conditioner and observe compressor operating pressures and conditions.

10) Add refrigerant if necessary, DO NOT OVERCHARGE.

4.3 Compressor Oil Level, Lubrication and Oil Addition On this unit, oil may be added by attaching a charging manifold to the gauge port on the suction valve and putting a 1/4" copper tube to the center connection of the charging manifold well down into a container of refrigerant oil. With a positive pressure on the gauge, open the hand valve momentarily to purge the copper tube of air, then close the suction shut off valve to suck in oil from container slowly until proper level is visible in the sight glass.

4.3 The oil level in the compressor can be checked by the sight glass. To make sure that proper oil level is observed, operate the compressor for 15 minutes then stop the compressor. Oil should appear 1/8 to 1/2 in the sight glass with the compressor stopped. Oil should never be drained from a semi-hermetic compressor. If oil is dirty, the catch-all cartridge in the liquid line should be changed periodically until the oil is clear.

4.3.1 Compressor Oil Specifications (SUNISO 3GS)

(1) Viscosity, S.S.U. (a) 100

(2) Gravity, API at 600 F.

(3) Flash Point, ASTM Open Cup

(4) Fire Point

(5) Pour Test ASTM (Max.)

(6) Color, ASTM

(7) Neutralization No.

(8) Steam Emulsion No. (Max.)

(9) Dielectric Strength (Min.)

(10) Slight Oxidation

(11) Floc Test For Wax (Max.) The mixing of oils is not recommended. If ocher than standard SUNISO 3GS is used, entire oil charge should be replaced. Oil used must conform to specifications noted.

4.4 Replacing Compressor Valve Plate - If valve replacement becomes necessary, follow these instructions:

1) Close suction and discharge service and slowly remove refrigerant from compressor.

2) Remove heads.

3) If the suction valve has failed, remove any raised places from the piston. This can be accomplished with a pocket knife on those models with cast iron pistons. If there have been any sharp edges raised on the suction valve stop, they should be removed by the use of a small honing stone or a similar type stone.

CAUTION

CARE SHOULD BE EXERCISED TO SEE THAT GRIT OR OTHER FOREIGN PARTICLES DO NOT GET IN THE CRANKCASE

4) Remove the old gaskets from compressor and replace with new gaskets that come with replacement valve plate. Make sure the gasket is positioned properly.

CAUTION

DO NOT LEAVE OLD GASKET ON THE MACHINE WHEN INSTALLING NEW GASKET SINCE THIS WILL AFFECT DESIGN CLEARANCE AND CAUSE SUCTION VALVE TO FAIL.

5) Replace valve plate and heads.

6) Purge and evacuate compressor.

7) Start compressor.

CAUTION

VALVE FAILURES ARE OFTEN CAUSED BY THE ENTRANCEINTO THE CYLINDERS OF SOLID MATTER (EITHER LIQUID REFRIGERANT, OIL OR BOTH). AFTER A FAILURE, IT MAY BE WISE TO OBSERVE THE COMPRESSOR THROUGHOUT ITS ENTIRE CYCLE AND CORRECT ANY OBSERVED MALFUNCTION THAT COULD CAUSE VALVE FAILURE.

4.5 Replacing Piston, Piston Rings, Piston Pin and Connecting Rod

1) Compressor must be removed from unit. Follow compressor removal instructions.
2) Drain oil from compressor crankcase.
3) Connecting rods are accessible from the bottom of the compressor. Remove the compressor bottom plate by removing 16 bottom plate capscrews.
4) Remove connecting rod cap bolts and connecting rod caps. By rotating compressor crankshaft, connecting rods may be cleared from their bearings and connecting rod and piston may be removed from cylinder bore as a unit.
5) Remove piston from crankshaft before removing piston pin lock ring and piston pin.
6) Check for wear on these wear surfaces listed below. The allowable wear on these surfaces is as follows:

Piston Diameter	.001
Cylinder Bore	.001
Piston Pin	.0001
Piston Pin Bushing	.002
Crank Pin	.001
Rod at Crankshaft	.001

7) Remove old piston compression and oil rings by expanding ring at ring gap and carefully removing over top of piston.

4.5 Continued

8) Clean any grit or foreign material from ring groove and remove any raised sharp edges with a honing stone. Install a new oil ring and then the new compression ring over top of piston carefully as they may snap if expanded too much. They should move freely in their respective ring grooves of the piston after installation.

9) Reassemble piston/piston pin/piston pin lock ring/ connecting rod combination with new parts as required and replace into cylinder bore taking care not to damage piston rings by jamming. A coating of oil may help.

10) Replace connecting rod into bearing and secure with connecting rod cap and connecting rod cap bolts.

11) Replace compressor bottom plate and bottom plate capscrews.

12) Refill compressor crankcase with required type and amount of oil and follow directions for reinstalling compressor.

4.6 Compressor Bolt Torquing - Bolt torquing specifications are as follows:

All 5/16 - 18 compressor bolts; 17 ft. - lbs.

All 3/8 - 18 compressor bolts; 32 ft. - lbs

4.6.1 Inspection of the Unit - The unit should be given a thorough checking and cleaning prior to the cooling season. Organize and follow a good preventative maintenance schedule.

4.7 Lubrication - The bearings of the fan and fan motor are pre-lubricated. These bearings are sealed for "lifetime operation".

4.8 Filter Cleaning (Permanent Type)

4.8.1 How to Clean: Under ordinary conditions, filters may be readily cleaned with water. A garden hose with a pressure nozzle and water pressure of 30 to 40 psig is satisfactory. Do not direct the stream of water through the dirty side of the filter. This will drive the dirt into the filter. Direct the water stream through the filter in a direction opposite to the air flow.

4.8.2 Cleaning Materials When dirt loads are heavy or tenacious, or where a considerable number of filters are involved and economy demands a faster cleaning operation, the filters should be presoaked in a cleaning solution. Recommendation of the exact material to use should be obtained from a manufacturer of cleaning products.

WARNING ---------- WARNING ---------- WARNING

ALLOF THE CLEANING SOLUTIONS SHOULD BE THOROUGHLY WASHED OUT OF THE FILTERS WITH FRESH WATER. DO NOT USE ALKALINE CLEANING SOLUTIONS OR SOLVENTS, AS FILTERS HAVE A PROTECTIVE FINISH WHICH SHOULD NOT BE REMOVED.

4.8.3 Draining After the filters have been washed and rinsed, they should be drained until substantially dry and then oiled with the proper type of adhesive for the operating conditions.

4.8.4 Type of Adhesive Any good grade of commercial motor lubricating oil can be used effectively. Odorless oils with a flash point above 350° F. are recommended. For special applications, oils have been developed that contain tacking additives.

Any oil company can supply filter adhesive and their local representatives should be contacted for additional information. The SAE viscosity of 60 to 75 to 130° F. entering air range is recommended.

4.9 Condenser Cleaning (Cleanable Type)

4.9.1 Mechanical Cleaning of Condenser - The marine condenser supplied in this air conditioner are fabricated with cupro-nickel water tubes and four (4) headers removable for cleaning from both ends of the condenser for use in sea water or other highly corrosive water. It is of the mechanically cleanable type.

The feature ofmechanical cleanability is especially important in salt water application. Salt water mineral scale and sludge deposits seriously reduce heat transfer in any condenser and affect system performance unless removed.

4.9.1 These deposits can be cleaned safely/mechanically from the condenser without risking acid damage to condenser pumps and valves.

The endplates are removed quickly to provide complete access to the water tubes. A simple cleaning tool is inserted and powered by an ordinary electric drill to remove the corrosive material.

NOTE
REPLACING THE GASKETS ON THE ENDPLATE IS ADVISED WITH EACH CLEANING.

4.9.2 Alternate Chemical Cleaning of Condenser: The following alternate procedure is recommended as a combined cleaning and descaling process. It will quickly and economically restore the original operation efficiency of the sea water refrigeration condenser when thorough mechanical cleaning cannot be performed.

4.9.2.1 Detailed Procedure:

a) Drain and flush the water circuit of the condenser coil; if scale on the tube inner surfaces is accompanied by slime, mechanical cleaning is necessary before descaling process can be accomplished.

4.9.2.1 Detailed Procedure: (Continued)

b) To remove slime or mud, use a composition containing silicates (free caustic soda with resin and mixed base soaps), 6 ounces per gallon of water. Warm this solution and circulate through the tube until all slime and mud have been removed.

c) Prepare a 15% by volume solution of descaling by diluting a properly inhibited muriatic acid type product with water. This is accomplished by slowly adding a pint of the acid to 3 quarts of water.

WARNING ---------- WARNING ---------- WARNING

THIS SOLUTION IS AN ACID !!!!!!! THEREFORE, BE SURE THAT THE ACID IS SLOWLY ADDED TO THE WATER, DO NOT PUT WATER INTO THE ACID!!' THIS WILL CAUSE SPLATTERING AND EXCESSIVE HEAT. WEAR RUBBER GLOVES AND WASH THE SOLUTION FROM THE SKIN IMMEDIATELY IF ACCIDENTAL CONTACT OCCURS. DO NOT ALLOW THE SOLUTION TO SPLASH ONTO CONCRETE.

d) Fill the tubes with this solution by filling from the bottom.

WARNING ---------- WARNING ---------- WARNING

BE SURE TO PROVIDE A VENT AT THE TOP FOR ESCAPING GAS

e) Allow the muriatic acid solution to soak in the tube coils for several hours, periodically pump circulating it with an acid-proof pump. An alternate method whereby a bottle is filled with the solution and attached to the coils by a hose can serve the same purpose, by raising and lowering the bottle. The solution must contact the scale at every point for thorough descaling, therefore, insure that no air pockets exist, by regularly opening the vent to release gas. KEEP FLAMES AWAY FROM THE VENT GASES.

f) The time required for descaling will vary, depending upon the extent of the deposits. One way to determine when descaling has been completed is to titrate the solution periodically. As scale is being dissolved, titration readings will indicate the muriatic acid solution is losing strength. When the readings remain constant for a reasonable time, this is an indication that scale has been dissolved.

g) When descaling is complete, drain the solution and flush thoroughly with water.

h) Next circulate a two (2) ounce per gallon of alkaline salts through tubes to neutralize. Drain this solution.

i) Flush tubes thoroughly with water.

J) Put the unit back in service and operate under normal load. Check the head pressure. If normal, a thorough descaling has been achieved.

4.9.2.2 In Summary ..... What you will do is:

1) Drain water from condenser tubing circuit.

2) Clean water tubes with alkaline to remove mud and slime.

3) Flush.

4) Descale water tubes with muriatic acid solution to remove seals.

5) Flush.

6) Neutralize.

7) Flush.

8) Put unit back into service under normal load and check head pressure.

NOTE

THE CLEANING AGENT IS A BALANCED BLEND OF ALKALINE SALTS CONTAINING SILICATES, FREE CAUSTIC SODA WITH RESIN AND MIXED BASE SOAPS. THE DESCALING AGENT IS A MURIATIC ACID TYPE PRODUCT ADEQUATELY AND PROPERLY INHIBITED TO PREVENT ATTACK ON FERROUS METALS.

CHAPTER 5 - Troubleshooting

5.1 The NAC-600 marine air conditioner will function under normal conditions when serviced and maintained as described elsewhere herein in a trouble-free condition, however, in certain circumstances and in varying conditions of electrical circuit failures of incoming power and/or mechanical failures with regard to water flow and piping, troubleshooting may be required from time to time.

5.2 The following troubleshooting analysis has been provided which will assist Navy personnel in assuring the equipments normal performance under any trouble conditions which may prevail.

5.2.1 Troubleshooting Analysis - See following pages.

(A) High Discharge Pressure

Probable Cause	Remedy
Non-condensable gases in the system. Recharge system if necessary.	Purge these gases from the system.
Excessive charge of refrigerant in the system.	Purge or pump out excessive charge.
Discharge service valve clogged.	Open discharge valve.
Clogged water strainer.	Clean strainer.
Inadequate supply of water to the condenser.	Make certain that inlet and outlet water valves are fully open. Adjust water regulating valves if necessary. Make certain the condenser coil is not fouled.

(B) Low Discharge Pressure

Probable Cause	Remedy
System low on refrigerant.	Charge system until sight glass is clear of bubbles, or until unit contains a total amount of poundage listed.
Excessive flow of water to the condenser.	Adjust water regulating valve.
Compressor valve broken.	Replace valve.

(C) High Suction Pressure

Probable Cause	Remedy
Suction and/or discharge.	Replace valves.
No air filters.	Install filters.
Air delivery too great.	Check and adjust fan speed.

(D) Low Suction Pressure

Probable Cause	Remedy
Suction valve not backseated properly.	Backseat suction valve accordingly.
Restricted liquid line.	Replace dryer, distributor.
System low on refrigerant.	Test the unit for leaks. Add refrigerant until sight glass is free of bubbles, or until unit contains total amount of poundage listed.
Dirty filters.	Clean or replace filters.
Coil frosted up.	Defrost and clean coil. Clean or replace filter. Avoid low temperature operation,
Quantity of air through evaporator not adequate.	Increase to recommended blower speed.
Slipping fan belt.	Tighten if loose Replace if worn.
Fan belt broken.	Replace fan belt.
Leaking fusible plug.	Replace plug and recharge.
Discharge pressure too low.	Adjust water regulating valve accordingly,
Improper fan rotation.	Correct by rephrasing.

(E) Compressor Will Not Start

Probable Cause	Remedy
Disconnect switch open.	Close disconnect switch.
Blown fuse or fuses at disconnect switch.	Check for cause of failure and replace the fuse or fuses.
Selector switch on OFF position.	Adjust the selector switch to COOL position.
Thermostat set too high.	Adjust to a lower temperature setting.
Temperature satisfied.	Check thermostat setting.
Overload protectors open.	Check for short circuit or malfunction of protectors.
High pressure cut-out.	Reset by depressing pressure cut-out button located on box.
Starter holding coil open.	Replace coil.
Ruptured fusible plug.	Replace plug and recharge.
Loose or open electrical connection in either the control or power circuit.	Inspect and secure all electrical connections.
Low on refrigerant.	Recharge after checking for leaks and/or repairing.

(F) Compressor Short Cycles

Probable Cause	Remedy
Dirty Filters.	Clean or replace filters.
Overload heaters tripping out.	Check for high suction and/or discharge pressure and adjust accordingly.

(F) Compressor Short Cycles (Continued)

Probable Cause	Remedy
Fast recycling remote thermostat (when applicable).	Adjust thermostat differential.
Fan not operating.	Check and repair accordingly.
Low pressure control cycling.	Check for leaks, also check discharge pressure and adjust accordingly.
Loose, slipping or fallen off fan belt.	Replace, realign and/or retighten.
Possible low voltage condition.	Check to determine cause and adjust accordingly.

(G) Noisy Fan and/or Compressor Assembly

Probable Cause	Remedy
Belt uneven or bumping	Readjust and realign. Replace if required.
Sheaves loose or out of line.	Align and tighten.
Loose fan belt.	Tighten fan belt.
Excessive motor speed.	Reduce speed of blower by adjusting variable pitch pulley. Check for high voltage, adjust accordingly if so found.
Bent fan blades. Usually result of some extraneous material getting into fan because of operation without filters and/or blower compartment panels.	Replace blower wheel and housing if need be. Also replace filters and/or secure all unit panels.

CHAPTER 6 - Corrective Maintenance

6.1 Introduction

The Model NAC-600 marine air conditioner is assembled and disassembled by means of module component items which have been designated as major assembly items, color-coded for ease of distinguishability and are defined in four (4) main categories as follows:

(A) The plenum assembly.

(B) Blower assembly and fan motor controls compartment.

(C) The evaporator coil, distributor, expansion valve compartment.

(D) The condensing assembly compartment including refrigeration compressor, condenser, receiver, moisture liquid indicator, filter dryer and junction control box.

6.2 Removal, Disassembly and Reassembly

6.2.1 Plenum assembly removal is accomplished by the removal of three (3) screw hold-downs in the front section of the plenum. The screws are installed or removed depending upon the plenum's use aboard the Naval vessel the air conditioner has been assigned to. The plenum assembly, once the screws have been removed, can be moved laterally from the front face

6.2.1 of the air conditioner in a sliding motion and will come loose from the two (2) plenum clips which have been factory installed to assure the plenum assembly of proper placement and location of the air conditioning unit.

Once the plenum has been removed from the top of the air conditioner, disassembly of the discharge grill can be accomplished by the removal of the screws holding the discharge grill in the plenum assembly.

6.2.2 Blower Assembly - Is assembled and disassembled in the following manner:

1) Remove the upper panel face by the removal of two (2) screws.

2) With the plenum assembly removed, the fan belt will be removed as defined in paragraph 6.2.2 (a). The blower assembly compartment area can now be disassembled or reassembled in the following manner:

a) Remove the fan belt the fan belt can be removed by loosening the four (4) adjustment screws which hold the fan motor in place and pushing the fan motor to the rear of the air conditioner compartment.

b) The fan belt is now removable.

c) To remove the fan motor, the removal of the four (4) loosened bolts can now be accomplished and upon removal of said bolts and washers, the motor is easily removed from the front of the air conditioner for disassembly service and reassembly.

d) The blower assembly can be serviced or disassembled in the following manner:

1) Remove the two (2) forward bolts which hold the blower assembly housing.

2) Loosen the two (2) rear bolts and the blower assembly will now drop and be free to service.

3) Removal of the assembly would be accomplished by the removal of the two (2) loosened bolts.

NOTE: THE BLOWER ASSEMBLY CAN ONLY BE REMOVED THROUGH THE REAR ACCESS AS A COMPLETE ASSEMBLY. THIS WOULD REQUIRE THE REMOVAL OF THE BACK PANEL OF THE NAC-600 AIR CONDITIONER.

4) Should removal be desired from the top of the NAC-600, the blower assembly bearings and blower wheel should first be removed from the front of the NAC-600 marine air conditioner while in the servicing condition.

6.2.3 To remove the three (3) controls in the upper blower compartment area, the following procedure should be utilized.

WARNING ---------- WARNING ---------- WARNING

MAKE SURE THAT THE CONTROL BOX LEVER AS DESCRIBED ELSEWHERE IN THIS TECHNICAL MANUAL IS IN THE OFF POSITION

1. Disconnect all the quick plug-in connectors from the controls.
2. With a hex key, loosen the socket set screw on the two (2) electrical controls and remove the knobs.
3. Unscrew the two (2) holding nuts which are located on the shafts of the two (2) controls and remove the two (2) controls.
4. Backseat the compressor discharge and suction valves and bleed down the compressor for the removal of the high and low pressure controls.
5. The high pressure control can now be unscrewed from the channel bracket and removed after the sensing bulb has been removed from its refrigeration line by the use of a brazing torch.

6. Evaporator Assembly - The evaporator assembly is disassembled or reassembled in the following manner:

   a) Remove the rear panel of the NAC-600 air conditioner.

   b) The evaporator assembly can now be removed from the NAC-600 air conditioner by the removal of six (6) nuts located on the extreme right and left hand sides of the evaporator coil. (Three (3) nuts on the left side; three (3) nuts on the right side).

   c) The suction line coming from the lower compartment of the NAC-600 specifically the compressor which is brazed to the evaporator suction line tube, must be unbrazed at the evaporator joint prior to removal of the evaporator.

   d) In addition to step (c) above, the distributor, located in the front of the NAC-600 air conditioner, must be disconnected from the thermo expansion valve through the application of a heating torch to unbraze the connection.

   e) The evaporator coil is now capable of being removed from the frame assembly.

7. Thermo Expansion Valve - The thermo expansion valve can be removed or installed through the front of the NAC-600 air conditioner after the front panels have been completely removed from the unit. The thermo expansion valve is located above the drain pan and set on the left side of the NAC-600. The disassembly or reassembly of a thermo expansion valve is accomplished by the unbrazing of the valve from on (1) copper line below the valve and

the evaporator distributor above the valve. In addition, the capillary tube must be removed from the suction line wrapping prior to removal.

8. Condensing Assembly Compartment - The condensing assembly compartment houses the following components and those components can be assembled and disassembled as described below:

    Refrigeration Compressor

    Condenser

    Receiver

    Moisture Liquid Indicator

    Filter Dryer

    Junction Control Box

The following steps will be maintained to properly disassemble the NAC-600 condensing assembly components.

WARNING ---------- WARNING ---------- WARNING

THE ELECTRIC CONTROL BOX ASSEMBLY
HANDLE MUST BE IN THE OFF POSITION
TO OPEN THE CONTROL BOX FOR SERVICE
OR DISCONNECTION OF WIRES

NOTE -------- NOTE ---------- NOTE --------- NOTE

THE SHIP'S CONTROL BOX CURRENT ENTERING THE UNIT AIR CONDITIONER CONTROL BOX ASSEMBLY MUST BE TURNED OFF PRIOR TO THE CONTROL BOX ASSEMBLY'S REMOVAL FROM THE UNIT AIR CONDITIONING MODEL NAC-600

1. The electric control box assembly is now ready for removal from the NAC-60 air conditioner in the following manner:

   A) Open the control box door and unscrew the three (3) incoming power leads to the disconnect switch. Unscrew all the wiring lines and leads in the control box from the various controls thereby disconnecting all the leads from the compressor, the fan motor and the controls. Remove all cable assemblies connected to the outside of the box through the conduit/cable connections. The cables should now be pulled out of the box and lay free. The box is now removable.

   B) Water Regulating Valve - To remove the water regulating valve, remove the collars by counterclockwise turns through the use of a pipe wrench. In addition,

B) remove the capillary line from the "T" connection located in the high pressure control fitting on the compressor. The valve is now removable.

C) Condenser - To remove the condenser, unbraze the water inlet line from the ships piping. Remove the refrigeration line going to the receiver by unbrazing it at condenser. Remove the discharge line going to the compressor by unbrazing it at condenser. Remove the four (4) nuts and washers holding down the condenser to the NAC-600 base. The condenser is now removable.

D) Receiver - Unbraze the two (2) refrigerant lines connected to the receiver and unscrew the receiver from the weld nut holding the receiver and the removal of the upper strap through the removal of the nut. The receiver is now removable.

E) Dehydrator (Drier) - The drier can be removed and replaced through the unbrazing of both sides of the drier and replacement with another drier.

F) Liquid Moisture Indicator (Sight Glass) -

The sight glass can be removed by the unbrazing of the pipes on either side of the sight glass.

G) Refrigeration Compressor - The refrigeration compressor can be replaced in the following manner:

Remove the suction and discharge valves by the removal of two (2) bolts in each valve and the valves will then become free. By the removal of four (4) bolts at the base of the refrigeration compressor mounting feet, the compressor can now be removed from the NAC-600 marine air conditioner.

CHAPTER 7 - Parts List

7.1 The following is the parts breakdown for A.R.E.'s Model NAC-600 marine air conditioner which details, in tabular form, the following itemizations:

1) Item or sequence number

2) Manufacturer's drawing number

3) Assigned NSN

4) Item name description

5) Manufacturer's federal identification code number

6) Manufacturer's part number

7) Recommended maintenance quantity per NAC-600

8) Recommended overhaul quantity per NAC-600

9) The unit measure of recommended parts

10) The unit prices for each item description

BUREAU OF SHIPS ..HANICAL/ELECTRICAL EQUIPMENT

ORIGINAL

☐ PRODUCTION LIST ☐ PROVISIONING LIST

1 ITEM OR SEQUENCE NUMBER / 13 SMR CODE	2 INCREMENT	3 MANUFACTURER'S DRAWING NUMBER / 14 STOCK NUMBER	4 ITEM NAME / 15	16 FEDERAL SUPPLY CODE	5 PRIME CONTRACTOR'S PART NUMBER / 17 MANUFACTURER'S PART NUMBER	6 QTY PER ASSY / 18 RFCM MAINT QTY	7 QTY PER COMP / 19 RFCM OVHL QTY	8 QTY IN-SVC ASSY / 20	9 SHELF LIFE / 21-A BOM NO	10 TOTAL RFCM/ ORDERED / 21-B UNIT	11 UNIT PRICE SPARES 22 / 22-A APPROV CH-80 ALLOW	22-B	12 EXTENDED UNIT PRICE ALLOCATIONS / 22-C	22-D	REMARKS
001		0700-1600	Air Conditioner		NAC-600		1								
		NSN 1H 4120 00 933 3496		57107		0	0			EA					
002		0207-004	Blower Assembly		0207-004		1								
				47107	05251300	1	0			EA					
003		0207-004-1	Sheave, Blower		034R101		1								
				71176	SA 90 x 3/4"	1	0			EA					
004		325-005	Motor, Blower Assy		325-005		1								
				57107	PL2857/327P373	2	0			EA					
005		325-005-2	Sheave, Motor		325-005-2		1								
				71176	IVL 3/4" x 5/8"	1	0			EA					
006		034R102	Belt		034R103		1								
				71176	4L300	6	1			EA					
007		108-111	Compressor		108-111		1								
				57107/ 10855	06DA3138FA0630	0	1			EA					
008		111-002	Piston & Pin Pkg		111-002		4								
				57107/ 10855	6D40-962	4	4			PKG					
009		111-008	Disch.Vlv. Disk		111-008		4								
				57107/ 10855	6D75-1062	4	4			SET					

CONTRACT NUMBER: N00104-82-C-2052 | NOMENCLATURE: Air Conditioner | MODEL TYPE NO: NAC-600 | COMPILATOR: A.R.E. Manufacturing Co , Inc. | DATE OF LIST | REVISION | PAGE OF

BUSHIPS 4784A (1 59)

57

BUREAU OF SHIPS . .HANICAL/ELECTRICAL EQUIPMENT

ORIGINAL

☐ PRODUCTION LIST ☐ PROVISIONING LIST

1 ITEM OR SEQUENCE NUMBER	2 INCREMENTAL	3 MANUFACTURER'S DRAWING NUMBER	4 ITEM NAME	5 PRIME CONTRACTOR'S PART NUMBER	6 QTY PER ASSY	7 QTY PER COMP	8 QTY PER ASY	9 SHELF LIFE	10 TOTAL REQM/ ORDERED	11 UNIT PRICE		12 EXTENDED UNIT PRICE		REMARKS
13 SMR CODE		14 STOCK NUMBER	15 / 16 FEDERAL SUPPLY CODE	17 MANUFACTURER'S PART NUMBER	18 REQM MAINT QTY	19 REQM OVHL QTY	20	21-A SOS NO	21-B UNIT	22 SHARES 22-A APPROX OVHD ALLOW	22-B	23 ALLOCATIONS 23-C	23-D	
010		111-003	Oil Ring, Piston	111-003		4								
			57107/ 10855	AU50CP250	4	4			SET					
011		111-005	Connector, Rod	111-005		4								
			57107/ 10855	5D40-1372	4	4			PKG					
012		111-001	Gasket, Set	111-001		1								
			57107/ 10855	6D43-172	1	1			SET					
013			Mount,Compressor			4								
			57107/ 10855	6D44-492	8	4			SET					
014		105-006	Coil, Condenser	105-006		1								
			57107	105-006	1	1			EA					
015		117-001	Filter Drier	117-001-165A		1								
			57107	165S	2	1			EA					
016		152-002	Valve, Expansion	156-002		1								
			70255	ANE 5 HW	4	1			EA					
017		106-012	Coil, Evaporator	106-012		1								
			14852	M8911	1	0			EA					
018		0700-1600-1	Plenum Assy.	0700-1600-1		1								
			57107	0700-1600-1	0	0			EA					

CONTRACT NUMBER: N00104-82-C-2052 | NOMENCLATURE: Air Conditioner | MODEL TYPE NO: MAC-600 | CONTRACTOR: A.R.E. Manufacturing Co., Inc. | DATE OF LIST | REVISION | PAGE OF

DISTRIBUTION STMT A (1-99)

BUREAU OF SHIPS .. ..HANICAL/ELECTRICAL EQUIPMENT

ORIGINAL ☐ PRODUCTION LIST ☐ PROVISIONING LIST

1 ITEM OR REFERENCE NUMBER	2 IMD	3 MANUFACTURER'S DRAWING NUMBER	4 ITEM NAME		5 PRIME CONTRACTOR'S PART NUMBER	6 QTY PER ASSY	7 QTY PER COMP	8 QTY IN-SVC ASY	9 SHELF LIFE	10 TOTAL ITEMS ORDERED	11 UNIT PRICE		12 EXTENDED UNIT PRICE		REMARKS
13 SMR CODE		14 STOCK NUMBER	15	16 PROGRAM APPR CODE	17 MANUFACTURER'S PART NUMBER	18 ITEMS ALLOW QTY	19 ITEMS OVHL QTY	20	21-A BOX NO	21-B UNIT	SPARES 22-A APPROV ONE-TIME ALLOW	22-B	ALLOCATIONS 23-C	23-D	
019		0600-0920/360	Valve, Water		0600-0920/360		1								
				21013	WCM3080UFM-2	2	1			EA					
020		0600-0920/360	Strainer, Water		0600-0920/360		1								
				57107	142-003	2	1			EA					
021		0700-1920-2	Grill, Discharge		0700-1920-2		1								
				23575	6" x 30"	0	0			EA					
022		024R102	Filter, Air		024R102		1								
				82866	A21-10833	12	1			EA					
023		0700-1600-3	Evaporator Grill, Assy.		0700-1600-3		1								
				57107	0700-1600-3	0	0			EA					
024		309-003	Contactor		309-003		2								
				57107	2210 DP	4	2			EA					
025		057R101	High Pressure Switch		057R101		1								
				80411	AP21-2150	4	1			EA					
026		144-022	Low Pressure Switch		144-002		1								
				80411	MG20-1000	2	1			EA					
027		097R100	Transformer		097R100		1								
				57107	B-1306-1	2	1			EA					

CONTRACT NUMBER	NOMENCLATURE	MODEL TYPE NO	CONTRACTOR	DATE OF LIST	REVISION	PAGE OF
N00104-82-C-2052	Air Conditioner	NAC-600	A.R.E. Manufacturing Co., Inc.			

SHIPS 4788A (1-59)

BUREAU OF SHIPS MECHANICAL/ELECTRICAL EQUIPMENT

ORIGINAL ☐ PRODUCTION LIST ☐ PROVISIONING LIST

1 ITEM OR SEQUENCE NUMBER / 13 SAR CODE	2 UNITS	3 MANUFACTURER'S DRAWING NUMBER / 14 STOCK NUMBER	4 ITEM NAME / 15	16 FEDERAL SUPPLY CODE	5 PRIME CONTRACTOR'S PART NUMBER / 17 MANUFACTURER'S PART NUMBER	6 QTY PER ASSY / 18 RFCM MAINT QTY	7 QTY PER COMP / 19 RFCM OVHL QTY	8 QTY END ART / 20	9 SHELF LIFE / 21-A BOX NO	10 TOTAL RFCM/ ORDERED / 21-B UNIT	11 UNIT PRICE / SPARES 22-A APPROV OH-RD ALLOW	22-B	12 ESTIMATED UNIT PRICE / 23 ALLOCATIONS 23-C	23-D	REMARKS
028		076R100	Thermostat		076R100		1								
				80411	RC32-1285	2	1			EA					
029		600-110	Junction Box Assembly		600-110		1								
				57107	600-110	1	1			EA					
030		001R101	Rotary Switch, Selector		001R101		1								
				89489	5-57324-315	2	1			EA					
031		042R100	Terminal Strip Assembly		042R100		1								
				71785	4-141 and MS-141	0	1								
032		136-002	Moisture Liq. Ind.		136-002		1								
				72055	AMI-ISS5	0	1			EA					
033		337-001	Solid State Time Delay		337-001		1								
				57107	MMS-24A-1Y270	2	1			EA					
034		131-002	Receiver		131-002		1								
				57107	80114	0	1			EA					
035		111-006	Valve Plate Assembly R.H.		111-006		4								
				57107/ 10855	06DA6600-37	4	4			EA					
036		111-009	Suction Valve Disk		111-009		4								
				57107/ 10855	6D45-1072	4	4			SET					

CONTRACT NUMBER	NOMENCLATURE	MODEL TYPE NO	CONTRACTOR	DATE OF LIST	REVISION	PAGE OF
N00104-82-C-2052	Air Conditioner	NAC-600	A.R.E. Manufacturing Co., Inc.			

NAVSHIPS 47044 (1-59)

BUREAU OF SHIP MANICAL ELECTRICAL EQUIPMENT

SIGNAL

☐ PRODUCTION LIST ☐ PROVISIONING LIST

1 ITEM OR IDENTIFYING NUMBER / 13 BAR CODE	2 AMENDMENT	3 MANUFACTURER'S DRAWING NUMBER / 14 STOCK NUMBER	4 ITEM NAME / 15	16 FEDERAL MFR CODE	5 PRIME CONTRACTOR'S PART NUMBER / 17 MANUFACTURER'S PART NUMBER	6 QTY PER ASSY / 18 EACH ASSY QTY	7 QTY PER COMP / 19 EACH COMP QTY	8 QTY IN SHIP / 20	9 SHELF LIFE / 21-A SCE NO	10 TOTAL EACH ORDERED / 21-B UNIT	11 UNIT PRICE / 22 SPARES 22-A APPROV CH-BD ALLOW	22-B	12 EXTENDED UNIT PRICE / 22 ALLOCATIONS 22-C	22-D	REMARKS
037		111-004	Compression Ring		111-004		4								
				57107/ 10855	AU50CP-350	4	4			SET					
038		111-007	Valve Plate Assembly Kit L.H.		111-007		4								
				57107/ 10855	06DA6600-38	4	4			EA					

CONTRACT NUMBER	NOMENCLATURE	MODEL TYPE NO	CONTRACTOR	BAR OF LIST	REVISION	PAGE OF
N00104-82-C-2052	Air Conditioner	NAC-600	A.R.E. Manufacturing Co., Inc.			

DAYTRON 47064 (1-59)

CHAPTER 8 - Installation

8.1 The following drawings comprise a detailed set of assembly and component drawings which have been listed on Table 4.

8.1.1 The corresponding drawings as detailed on Table 4 have been itemized in this chapter in the sequence order as defined in the table, following page.

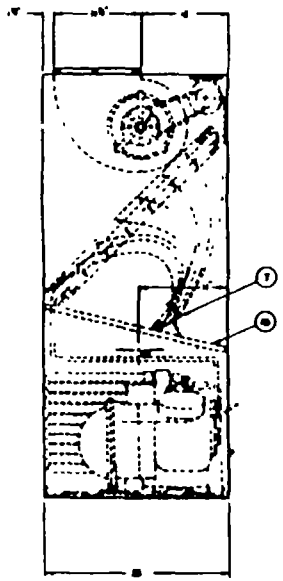
TABLE 4

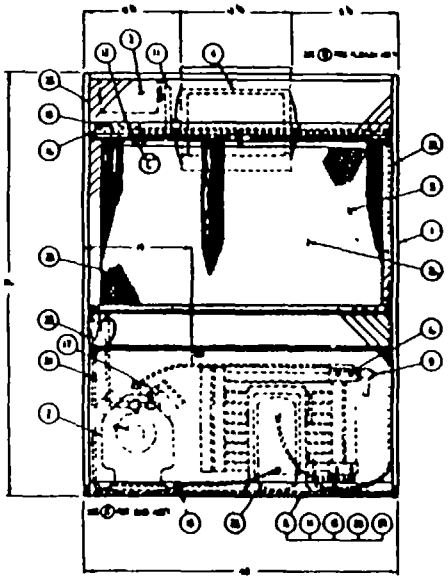
ASSEMBLY AND COMPONENT DRAWINGS LISTING

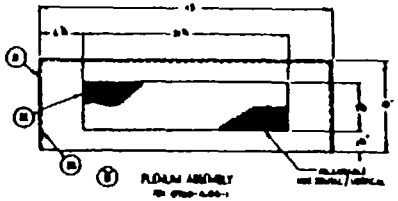
WITH COLOR CODING

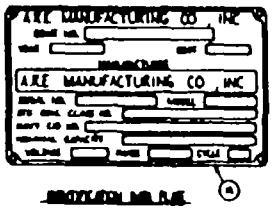
	DRAWING	COLOR CODE DESCRIPTION
A)	Outline and Installation Assembly Drawing #0700-1600	Hammerton Blue
B)	Plenum Outline Assembly See Drawing #0700-1600	
C)	Refrigeration Compressor Drawing #108-111, Shts. 1 thru 3	Green
D)	Condenser Assembly Drawing #105-006	Bronze
E)	Condensing Unit Assembly See Drawing #0700-1600	
F)	Coil, Evaporator Assembly Drawing #106-012	Silver Aluminum
G)	Receiver Assembly Drawing #131-002	Black
H)	Valve, Thermo Expansion Drawing #156-002	Lt. Gray
I)	Moisture Liquid Indicator Drawing #136-002	Bronze with Blue and Red Dial
J)	Drier (Dehydrator) Jade Green Drawing #117-001	
K)	Valve, Regulator Water Drawing #0600-0920/360	Bronze and Black

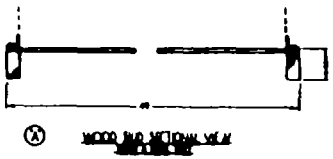
	DRAWING	COLOR CODE DESCRIPTION
L)	Strainer, Water Drawing #0600-0920/360	Navy Bronze
M)	Motor, Evaporator Fan Assembly Drawing #325-005	Gray
N)	Blower Assembly Drawing #207-004	Blue
O)	Junction Box, Electrical Disconnect Drawing #600-110	Gray
P)	Air Filter Drawing #024R102	Aluminum Silver
Q)	Terminal Strip Assembly Drawing #042R100	
S)	Solid State Time Delay Drawing #337-001	
T)	Transformer Drawing #097R100	
U)	Special Purpose Contactor Drawing #309-003	
V)	Pressure Switch, Low Drawing #144-002	
W)	Thermostat Drawing #076R100	
X)	Rotary Selector Switch Assembly Drawing #001R101	
Y)	High Pressure Control Drawing #057R101	
Z)	Electrical Wiring Schematic Drawing #920-002	
A.1)	Junction Control Box Module Assembly Drawing #600-110-2	
B.1)	Fan Motor Performance Data Curve #710762	
C.1)	Refrigeration and Water Flow Chart Drawing #180-001	

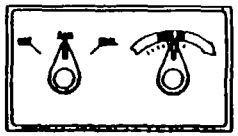












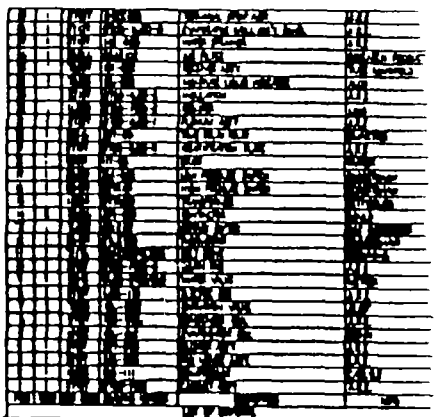
NOTES.

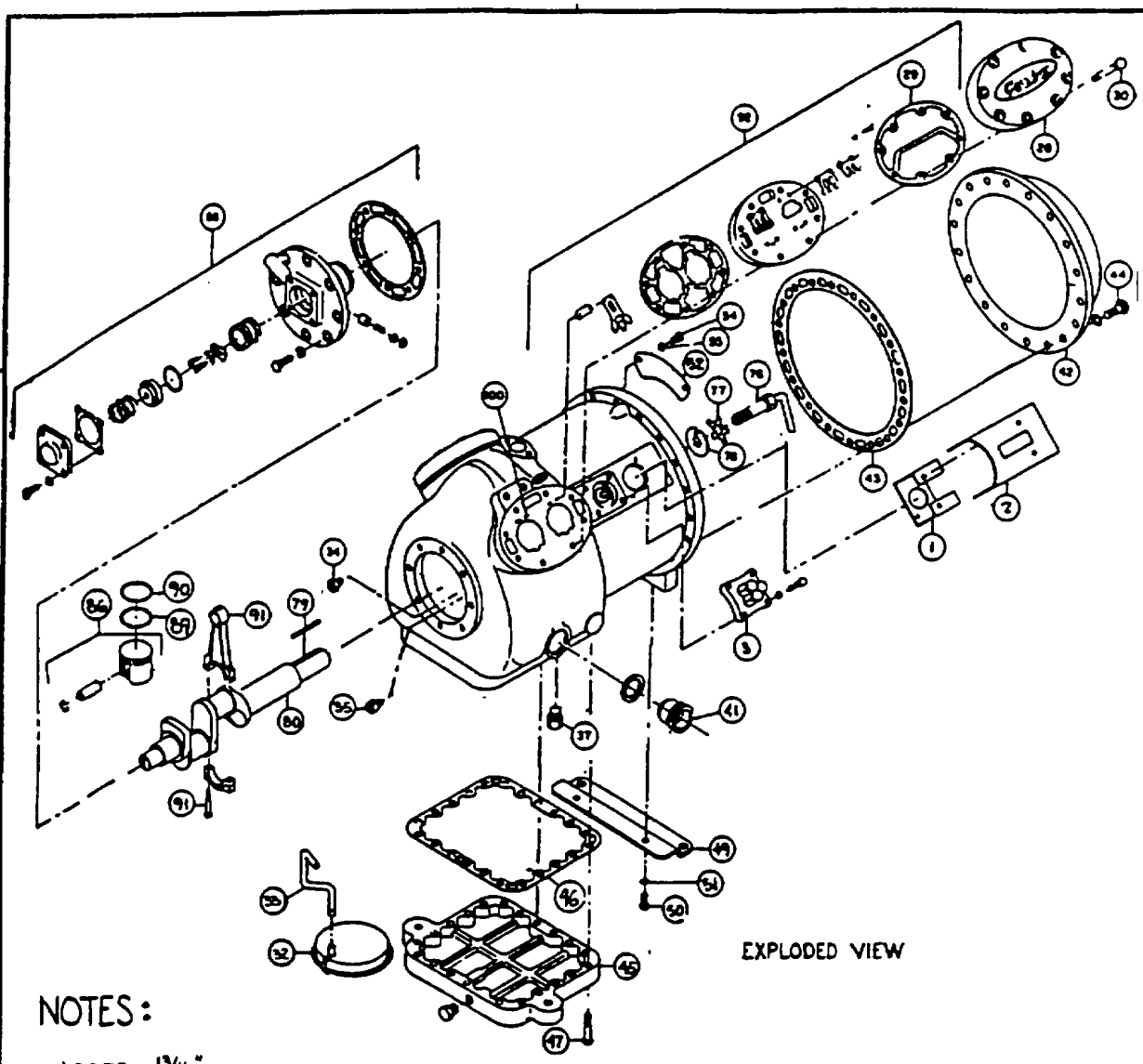
1. Cabinet finish - Hammertone blue.
2. Equipment contained herein complies with specification MIL-A-19865B Ships - As amended in contract.
3. Brazing procedure - all copper to copper joints Phos -Silver. All metal and brass to copper joints silver solder.
4. Suction Line - Refrigerant - Insulated between compressor and suction header.
5. Cabinet Insulation - Fiberglass with coating 1/2 - 3/4 lbs. density
6. Plenum insulation - Fiberglass with coating 1/2 - 3/4 lbs density
7. Plenum depth 25"
8. Front cover panels and grill not shown in their entirety
9. Water strainer (item 27) included as loose part - not on drawing
10. Total weight as shown 745 lbs wet - 732 lbs. dry

S-SERVICE CONNECTION OUTLETS

2 Drain holes - 2" dia. each

2 Water holes. (inlet - Outlet) 4" dia typ





EXPLODED VIEW

NOTES:

1.) BORE : 1 13/16"
2.) STROKE : 1 1/4"
3.) NO. OF CYLINDERS : 4
4.) RPM : 1750
5.) CAPACITY : 5 TON
6.) DESIGN SUCTION RATING : 40°F SATURATED SUCTION TEMP.
7.) DESIGN CONDENSING TEMP : 120°F
8.) COMPRESSOR MOTOR RATED : 5 H.P.
9.) MOTOR FRAME SIZE : N/A
10.) ELECTRICAL CHARACTERISTICS : 460 VOLT - 3 PHASE - 60 HZ.
9.4 F.L.A. , 43.0 L.R.A.
11.) WEIGHT : 203 LBS.
12.) (1) REQ'D PER NAC-600 UNIT, (2) REQ'D. PER NAC-1200 UNIT

CARLYLE COMPRESSOR MODEL
06DA3138FA0630
CARLYLE CODE IDENT. 10855

0700-1600	NAC-600
0700-1200	NAC-1200
NEXT ASS'Y	USED ON
APPLICATION	

SPEC	TYPE	PROD. ORDER	PO QUAN	SCHEDULE DATE

REVISIONS

ZONE	SYM	DESCRIPTION	DATE	APPROVED
A1	⚠	REDRAWN DUE TO FORMAT & CHANGED EXPLODED VIEW	4/19/82	

ITEM NO.	UNIT USAGE	PART NAME	REPLACEMENT PART NO.
1	1	Terminal Box	06DA501063
2	1	Terminal Box Cover	06DA400163
3	1	Terminal Plate	6D75-173
28	2	Cylinder Head	6D40-2163
29	2	Cylinder Head Gskt. (part of	6D43-172)
30	16	Cylinder Hd. Capscrew 3/8"-16 x 2 1/2"	N/A
32	1	Oil Filter Screen Assy.	6D40-103
33	1	Oil Suction Tube	6D40-1092
34	1	Oil Return Check Vlv. Assy.	N/A
35	1	Oil Relief Vlv. Package	6D40-212
37	1	Pipe Plug	CA63AA-G51
41	1	Sight Glass Pkg. (5F20-152 &	5F20-1631)
42	1	Motor End Cover	6D40-1024
43	1	Motor End Cover Gskt.	6F25-1013
44	18	Motor End Cover Capscrew 7/16" 14 x 1 1/4" Lg.	N/A
45	1	Bottom Plate	6D40-1033
46	1	Bottom Plate Gskt. (part of	6D43-172)
47	1	Bottom Plate Capscrew 3/8" 16 x 2 3/4" Lg.	N/A
49	1	Compressor Mounting	N/A
50	2	Mounting Foot Capscrew 3/8" 16 x 7/8" Lg.	N/A
51	2	Mounting Foot Capscrew Lockwasher 3/8"	N/A
52	1	Suction Strainer Assy.	6D40-112
54	2	Strainer, Machine Screw #10 32 x 7/16" Lg.	N/A
55	2	Strainer Lockwasher #10	N/A
56	1	Brg. Hd. & Oil Pump Pkg. (Aluminum)	6D68-952
76	1	Equalizer Tube & Lockscrew Assy.	6D48-122
77	1	Equalizer Tube Lockwasher 5/8"	6D40-1001
78	1	Rotor L'Wa.	6D40-1011
79	1	C'Shaft Dr. Key 1/4x1/4x3"	N/A
80	1	C'Shaft Assy.	N/A
86	4	Piston & Piston Pin Pkg.	6D40-967
89	4	Oil Ring, Piston	AU-50CP250
90	4	Compr. Ring	AU-50CP350
91	4	Con. Rod & Cap Pkg.	5D40-1372
92	1	Vlv.Pkg.Assy. L.H.	06DA6600-37
92	1	Vlv.Pkg.Assy. R.H.	06DA6600-38
100	8	Vlv. Plate Dowel	N/A
NI	4	Disch.Vlv. Disk	6D75-1062
NI	4	Suct. Vlv. Disk	6D45-10/2

ITEM	DESCRIPTION	A.R.E. PART NO.
29/46	Gasket Set	111-001
92	Vlv. Pkg. Assy. R.H.	111-006
92	Vlv. Pkg. Assy. L.H.	111-00.
NI	Disch. Vlv. Disks	111-008
NI	Suct. Vlv. Disks	111-009
86	Piston & Pin Pkg.	111-002
91	Con. Rod/Cap	111-005
89	Oil Ring	111-003
90	Compression Ring	111-004

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES TOLERANCES FRACTIONAL ± ANGLES ± 3 PLACE DECIMALS ± 2 PLACE DECIMALS ±

MATERIAL

FINISH

AUTHENTICATION	NAME	DATE
DRAWN BY	HILL	4/19/82
CHECKED BY		
APPROVED BY		
PROJECT ENGINEER		

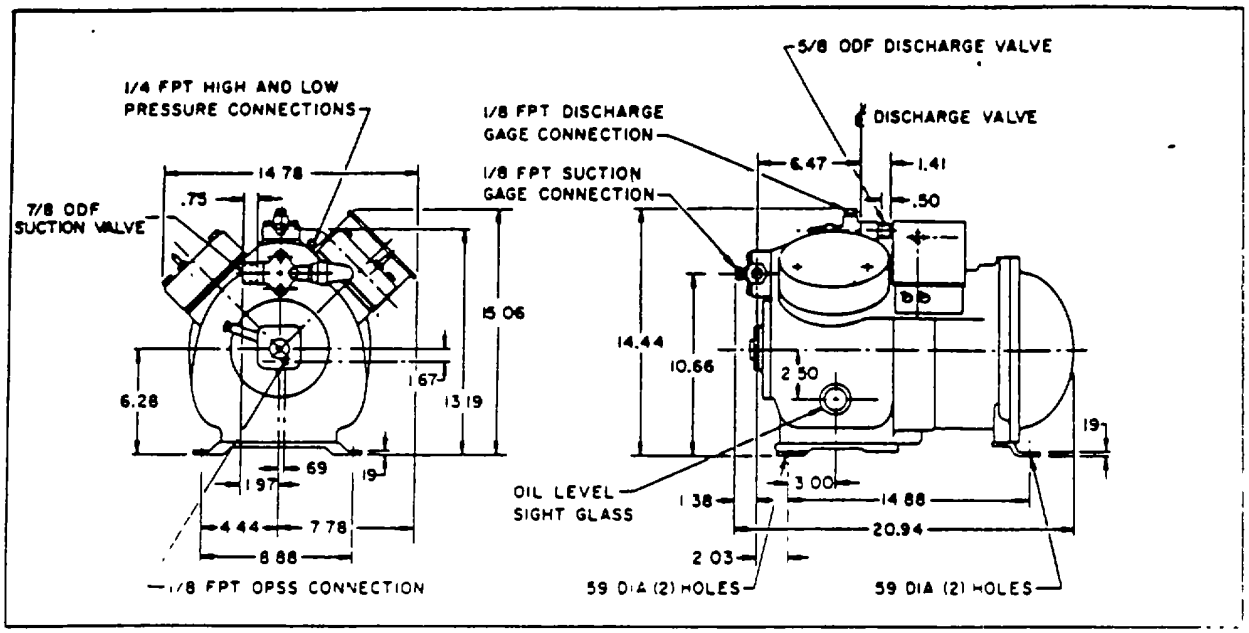
JACKSONVILLE ARE FLORIDA

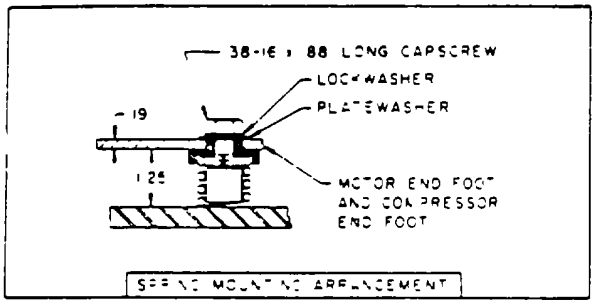
REFRIGERATION COMPRESSOR

CODE IDENT. NO.	SIZE	DWG. NO.	REV
57107	B	108-111	⚠

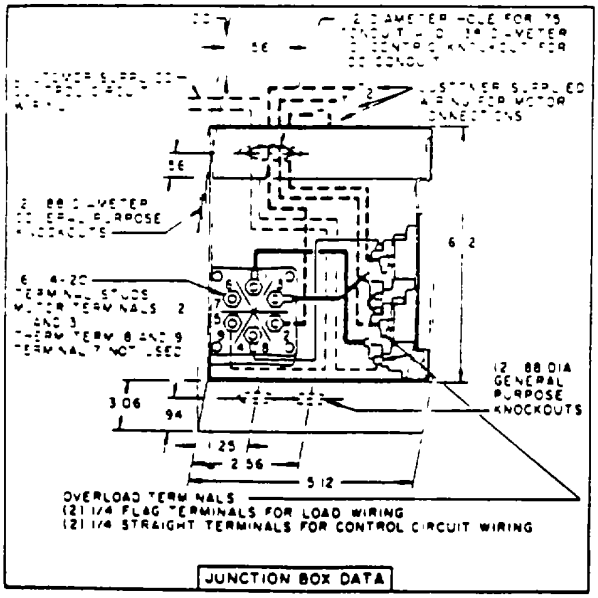
SCALE NONE SHEET 1 OF 3

REFRIGERATION COMPRESSOR
R-22 • 06DM313





SPRING MOUNTING ARRANGEMENT



JUNCTION BOX DATA

COMPRESSOR DATA

Bore x Stroke	1-13/16x1 1/4
No. of Cylinders	4
Displacement	13.1 cfm (786 c'h)
Speed (rpm)	1750
Suction Conn. ID (in.)	7/8
Discharge Conn. ID (in.)	5/8

MOTOR DATA

Hp	5
Phase	3
Voltage Range (230v XL)	198-264
Full Load Amps (230v XL)	18.3
Locked Rotor Amps (230v XL)	86.0

For other voltages refer to Application Section

APPLICATION

Sat. Suction Temp. Range (°F)	0 to 50
Refrigerant	R-22

RATED PERFORMANCE

Capacity (Btu/hr)	50,500
Power Input (kw)	5.2
Amps @ 230v	15.0
Performance (Btu/watt-hr)	9.70
Rating Condition:	
Suction Temp.	40° F
Condensing Temp. @ 0° F Subcooling	120° F
Return Gas Temp.	55° F

MOTOR PROTECTION

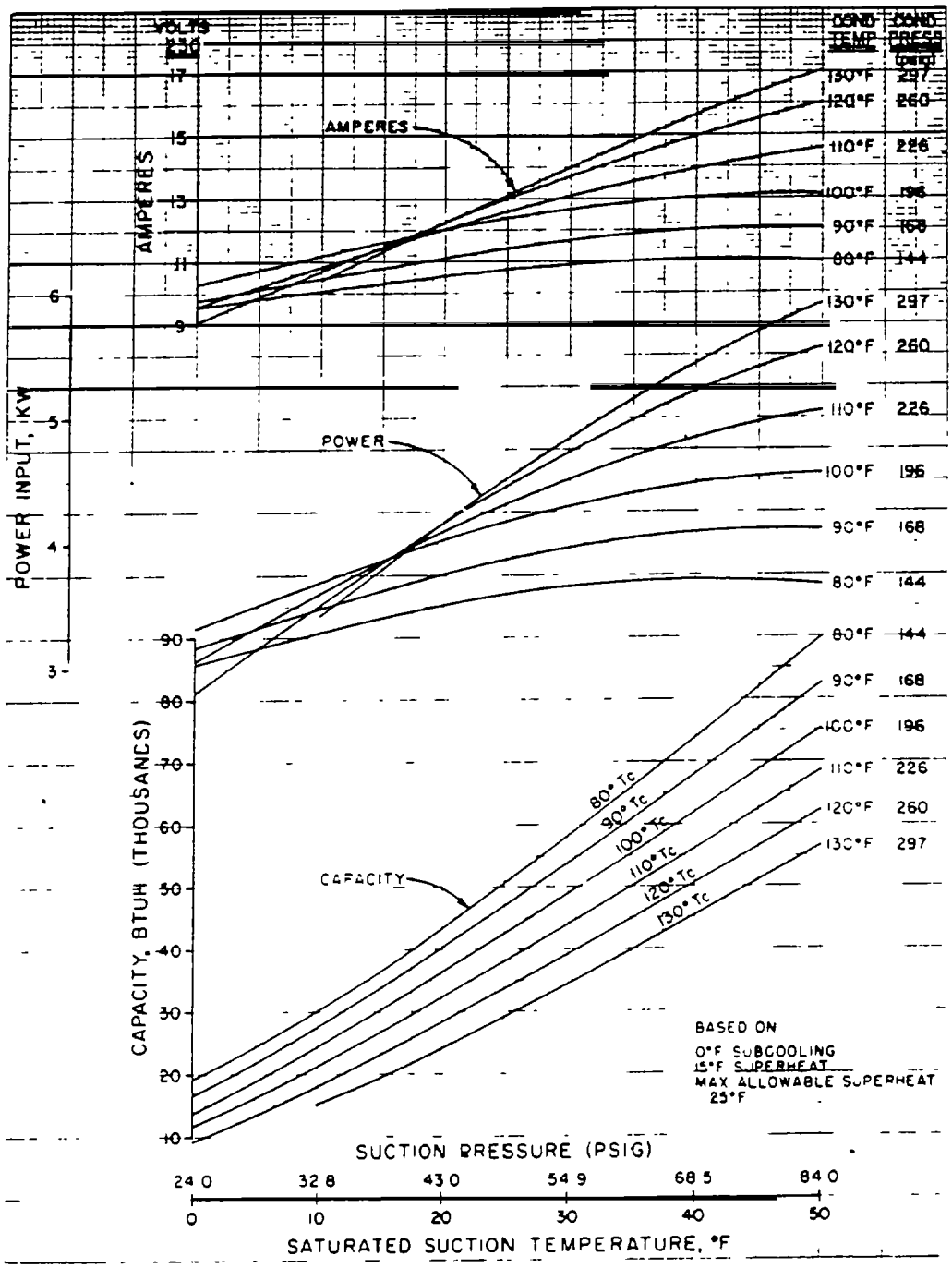
Internal Thermostat & Supplementary Overloads (both Pilot Duty) Supplied with Compressor

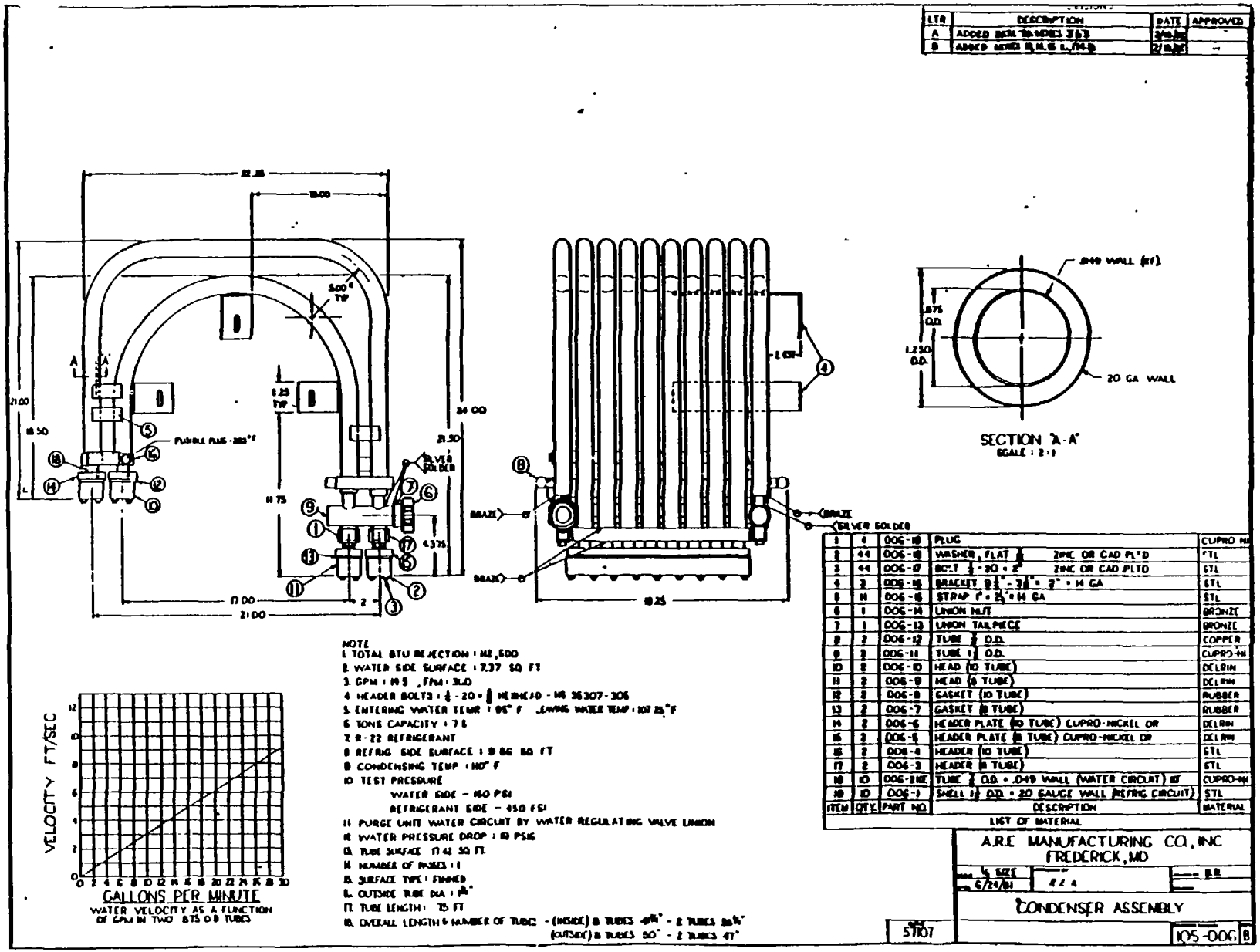
Supplementary Overload Protector			
Volts	Phase	Hertz	Carrier No.
200/3/60			HN69GZ024
230/3/60			HN69GZ031
460/3/60			HN69GZ014
575/3/60			HN69GZ032

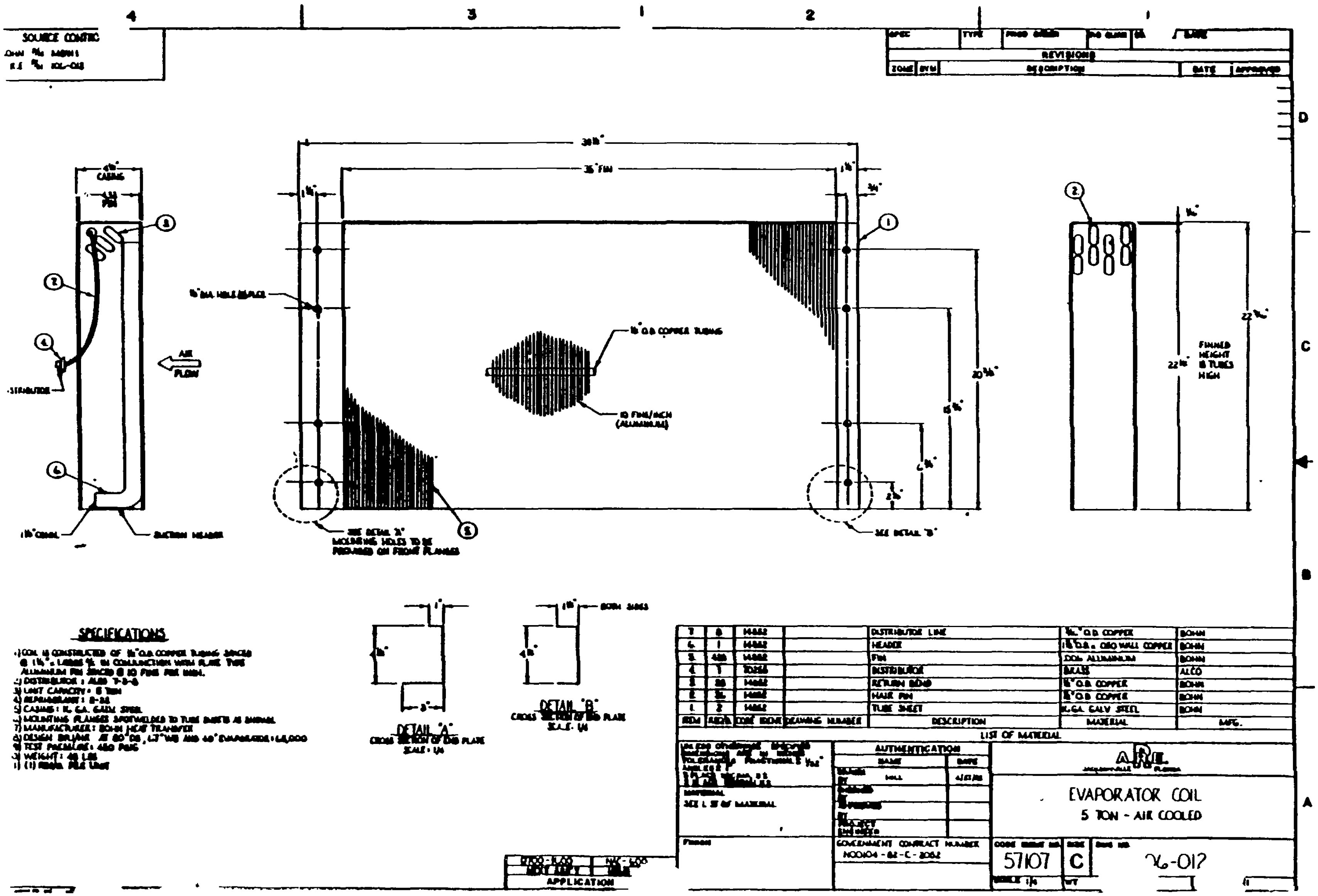
OIL CHARGE

Viscosity (SSU)	150
Grade	Capella BI or Suniso 3GS
Charge (Pints)	5

APPROX. NET WEIGHT ..... 203 lb


VOLTS
AMPERES
POWER INPUT, KW
CAPACITY, BTUH (THOUSANDS)
COND TEMP
COND PRESS (psig)
130°F 297
120°F 260
110°F 226
100°F 196
90°F 168
80°F 144
AMPERES
POWER
CAPACITY
80°Tc
90°Tc
100°Tc
110°Tc
120°Tc
130°Tc
BASED ON
0°F SUBCOOLING
15°F SUPERHEAT
MAX ALLOWABLE SUPERHEAT
25°F
SUCTION PRESSURE (PSIG)
24 0
32 8
43 0
54 9
68 5
84 0
SATURATED SUCTION TEMPERATURE, °F

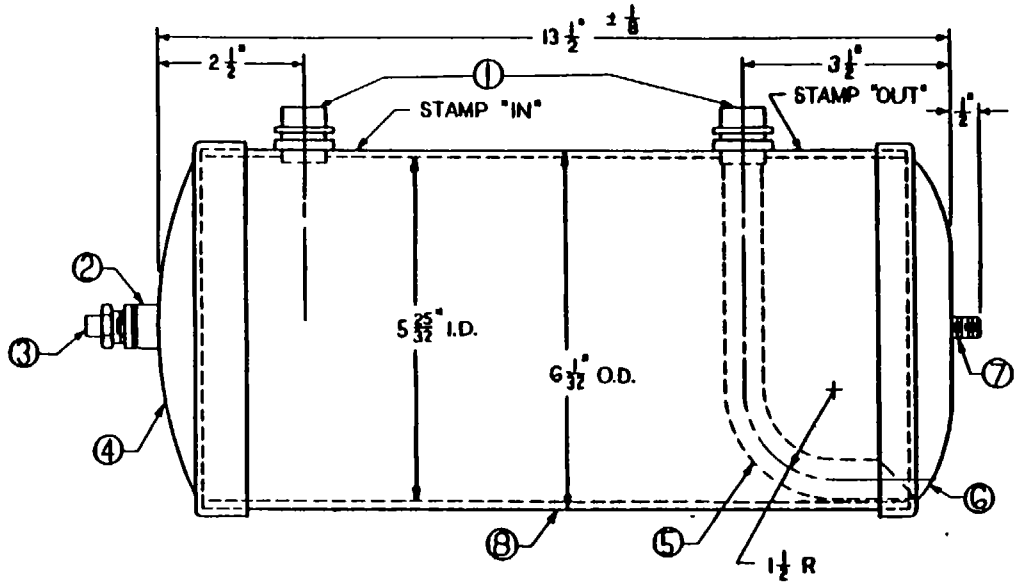

REVISION
LTR | DESCRIPTION | DATE | APPROVED
A | ADDED [illegible] | [illegible] | --
B | ADDED [illegible] | [illegible] | --
SECTION "A-A"
SCALE : 2 : 1
.049 WALL (ref)
.875 O.D.
1.250 O.D.
20 GA WALL
BRAZE
SILVER SOLDER
NOTE
1. TOTAL BTU REJECTION : 42,500
2. WATER SIDE SURFACE : 2.37 SQ FT
3. GPM : 14.5 , FPM : 3.0
4. HEADER BOLTS : 1/4 - 20 x 1 1/2 HEXHEAD - MS 35307-306
5. ENTERING WATER TEMP : 95° F LEAVING WATER TEMP : 107.25° F
6. TONS CAPACITY : 7.5
7. R-22 REFRIGERANT
8. REFRIG SIDE SURFACE : 9.86 SQ FT
9. CONDENSING TEMP : 110° F
10. TEST PRESSURE
WATER SIDE - 150 PSI
REFRIGERANT SIDE - 450 PSI
11. PURGE UNIT WATER CIRCUIT BY WATER REGULATING VALVE UNION
12. WATER PRESSURE DROP : 10 PSIG
13. TUBE SURFACE 17.42 SQ FT
14. NUMBER OF PASSES : 11
15. SURFACE TYPE : FINNED
16. OUTSIDE TUBE DIA : 1/4"
17. TUBE LENGTH : 75 FT
18. OVERALL LENGTH & NUMBER OF TUBES - (INSIDE) 8 TUBES 49 1/2" - 2 TUBES 38 1/2"
(OUTSIDE) 8 TUBES 50" - 2 TUBES 47"
VELOCITY FT/SEC
GALLONS PER MINUTE
WATER VELOCITY AS A FUNCTION OF GPM IN TWO .875 O.D. TUBES
ITEM | QTY. | PART NO. | DESCRIPTION | MATERIAL
1 | 1 | 006-18 | PLUG | CUPRO NI
2 | 44 | 006-18 | WASHER, FLAT 1/4 ZINC OR CAD PL'D | STL
3 | 44 | 006-17 | SCKT 1/4-20 x 1/2 ZINC OR CAD PLTD | STL
4 | 2 | 006-16 | BRACKET 3 1/2" - 3 1/2" x 2" x 14 GA | STL
5 | 14 | 006-15 | STRAP 1" x 2 1/2" x 14 GA | STL
6 | 1 | 006-14 | UNION NUT | BRONZE
7 | 1 | 006-13 | UNION TAILPIECE | BRONZE
8 | 2 | 006-12 | TUBE 1/2 O.D. | COPPER
9 | 2 | 006-11 | TUBE 1 O.D. | CUPRO-NI
10 | 2 | 006-10 | HEAD (10 TUBE) | DELRIN
11 | 2 | 006-9 | HEAD (8 TUBE) | DELRIN
12 | 2 | 006-8 | GASKET (10 TUBE) | RUBBER
13 | 2 | 006-7 | GASKET (8 TUBE) | RUBBER
14 | 2 | 006-6 | HEADER PLATE (10 TUBE) CUPRO-NICKEL OR | DELRIN
15 | 2 | 006-5 | HEADER PLATE (8 TUBE) CUPRO-NICKEL OR | DELRIN
16 | 2 | 006-4 | HEADER (10 TUBE) | STL
17 | 2 | 006-3 | HEADER (8 TUBE) | STL
18 | 10 | 006-2RE | TUBE 1/2 O.D. x .049 WALL (WATER CIRCUIT) RT | CUPRO-NI
19 | 10 | 006-1 | SHELL 1/2 O.D. x 20 GAUGE WALL (REFRIG CIRCUIT) | STL
LIST OF MATERIAL
A.R.E MANUFACTURING CO., INC
FREDERICK, MD
SIZE B
6/24/81
CONDENSER ASSEMBLY
5T107
105-006 B

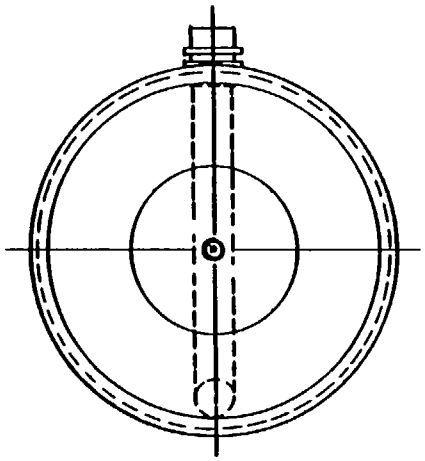


SPECIFICATIONS
DETAIL "A"
DETAIL "B"
REVISIONS
DISTRIBUTOR LINE
HEADER
FIN
DISTRIBUTOR
RETURN BEND
HAIR PIN
TUBE SHEET
DESCRIPTION
MATERIAL
MFG.
BOHN
ALCO
LIST OF MATERIAL
AUTHENTICATION
APPLICATION
EVAPORATOR COIL
5 TON - AIR COOLED
57107
C

SUGGESTED SOURCE
TUBE MANIFOLD
NORTH TONAWANDA, N.Y.
P/N 80114

REVISIONS			
LTR	DESCRIPTION	DATE	APPROVED
A	ADDED WEIGHT	6/10/81	R E A
B	ADDED REFRIGERANT CAPACITY AND I.D., O.D.	6/17/81	R E A
C	CHANGED SUPPLIER	7/16/81	





MATERIAL LIST			
	P/N	DESCRIPTION	A.R.E. P/N
①	2173	1/2" SWEAT CONNECT 2 REQD	131002-1
②	2150	1/4" FEM. FLARE FTG.	131002-2
③	983	280° F REMOVABLE FUSIBLE FTG.	131002-3
④	254	END CAP	131002-4
⑤	6365-8	5/8" QUILL	131002-5
⑥	1376	END CAP	131002-6
⑦	1300	STUD 3/8-16 NC-2 THD CAP	131002-7
⑧	3509-1	6" O.D. × .125 WALL STEEL	131002-8

USED ON MODEL: NAC360; NAC600; NAC920

NOTES:
1. U.L. IDENT. CONTROL NO. 82IG - FILE NO. SA2400
2. PAINT BLACK
3. WEIGHT: 13 1/4 LBS.
4. REFRIGERANT: R-22
   : 15 LBS. CAPACITY

A.R.E. MANUFACTURING CO., INC.
FREDERICK, MD.

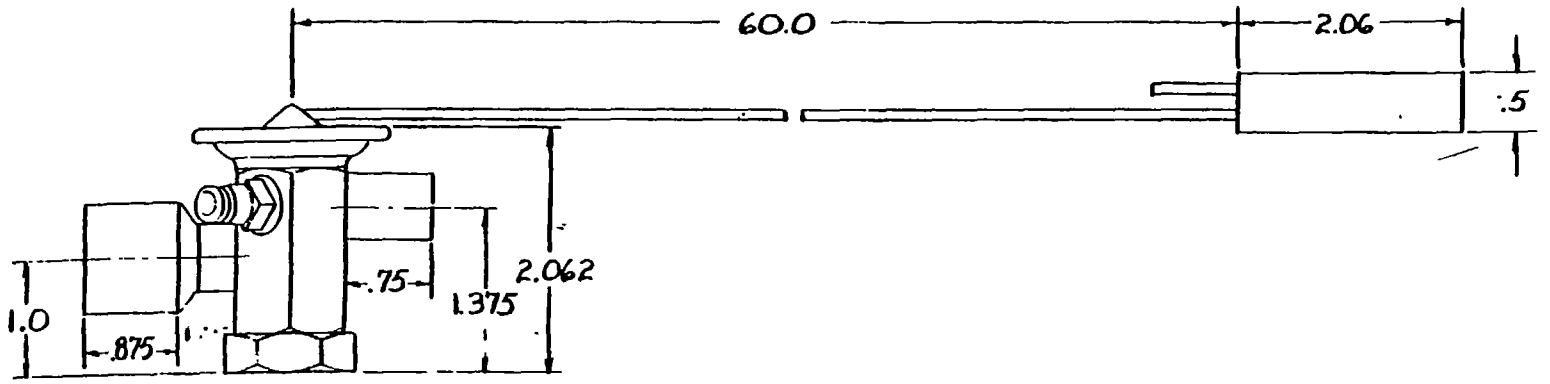
SCALE	1/2	APPROVED BY	R E A	DRAWN BY	B.R.
DATE	4-22-81			REVISED	

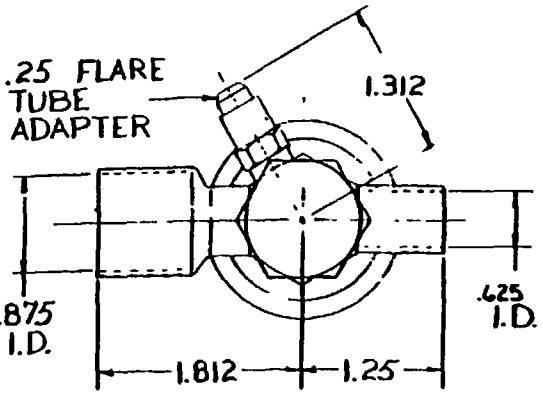
RECEIVER ASSEMBLY

IDENT. 57107 | DRAWING NUMBER 131-002 | REV C

SUGGESTED SOURCE
ALCO CONTROLS
ST. LOUIS, MISSOURI
P/N ANE 5 HW

REVISIONS			
LTR	DESCRIPTION	DATE	APPROVED
A	ADDED WEIGHT	6/10/81	
B	ADDED CHARACTERISTIC DATA REQ'D PARAGRAPH 3.16.1.3.1 NSPCC LTR 6/15/81	6/19/81	





NOTES:
1. NOMINAL REFRIGERATION CAPACITY - 5 TONS R-22.
2. WEIGHT : ½ LB.
3. EXTERNAL EQUALIZER ¼" ODF
4. 225 PSIG WITH 7.5 PRESSURE DROP

ARE. MANUFACTURING CO., INC.
FREDERICK, MD

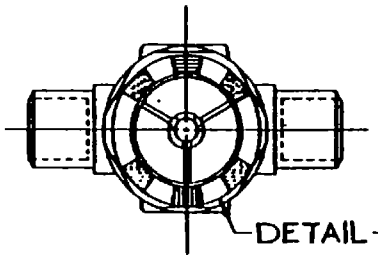
SCALE NTS	APPROVED BY	DRAWN BY K.M.
DATE 4-7-81		APPROVED

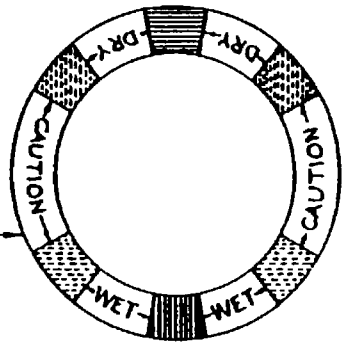
VALVE, THRMO. EXPANSION
EXTERNALLY EQUALIZED

IDENT		DRAWING NUMBER	REV
57107	AIRCONDITIONER 5 TON	156-002	B

SUGGESTED SOURCE
ALCO CONTROLS
ST. LOUIS, MISSOURI
P/N AMI-1555

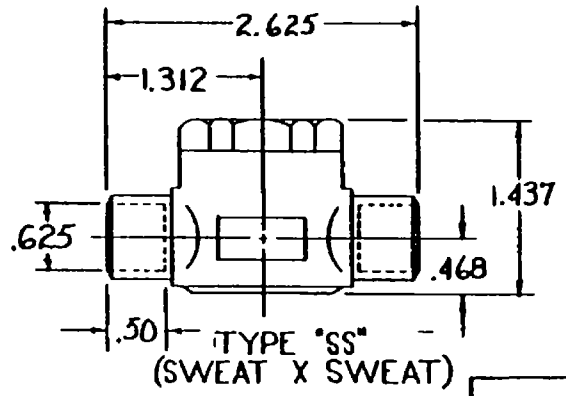
MOISTURE CONTENT CODE				
LIQUID TEMP (DEG. F)	BLUE	NAVY BLUE	PURPLE	ORANGE
	VERY DRY	DRY TO CAUTION	CAUTION TO WET	VERY WET
	R22	R22	R22	R22
	PARTS PER MILLION - WATER			
75	4	15	45	75
100	10	30	90	195
125	16	60	180	300





AMI
LABEL

NOTES:
1. UL APPROVED FILE NO. SA4876
2. BURST PRESSURE - 2500 PSI.
3. WEIGHT : ½ LB.



USED ON MODEL: NAC360; NAC600; NAC920

REVISIONS			
LTR	DESCRIPTION	DATE	APPROVED
A	ADDED WEIGHT	6/12/81	

IDENT. 57107

A.R.E. MANUFACTURING CO., INC.
FREDERICK, MD

SCALE N T S | APPROVED BY | DRAWN BY K.M.
DATE 4-8-81 | | DETAILED

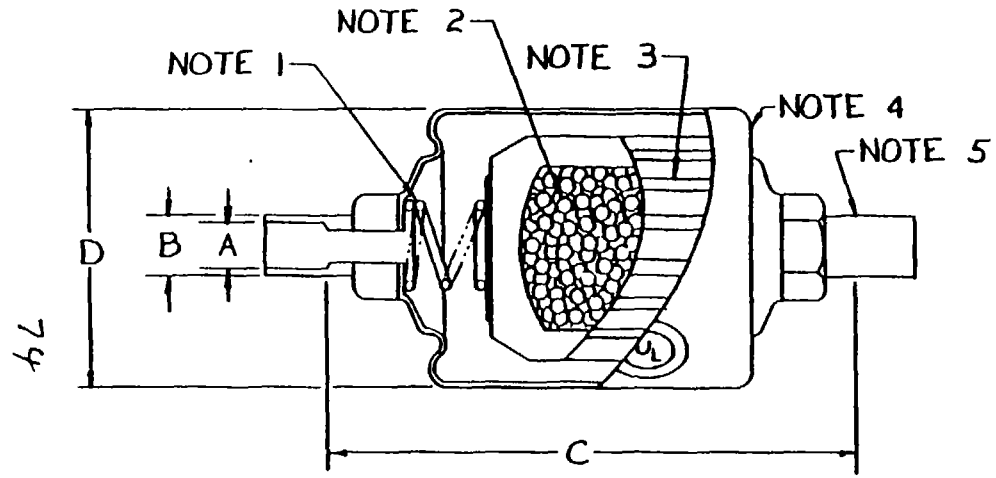
MOISTURE-LIQUID INDICATOR

136-002 A

73

SUGGESTED SOURCE
PARKER
LYONS, NEW YORK
P/N 0835 & 165S

TABLE OF DIMENSIONS					
P/N	TON	A	B	C	D
117-001-083S	3	.375	.50	4.5	2.34
117-001-165S	7.5	.625	.75	5.312	3.0



NOTES:
1. SPRING-LOADED INTERIOR PREVENTS CONTAMINANT BYPASS.
2. CHEMICALLY INERT, MOLECULAR-SIEVE BEADS HAVE GREATEST CAPACITY FOR ACID AND WATER PICKUP
3. FLUTED, INERT CERAMIC CORE INSURES PRODUCT UNIFORMITY AND CONSISTENCY.
4. HEAVY-GAUGE STEEL SHELL WITH EXTRA-HEAVY PHOSPHATE COATING AND CORROSION RESISTANT VINYL PAINT.
5. COPPER-PLATED SWEAT FITTINGS.
6. 100 % MOLECULAR-SIEVE BEADS. APPROVED FOR R-22.
7. UL LISTED FOR 2500 PSIG ULTIMATE STRENGTH (UL FILE NO SA3441).
8. PART NO 0835 FOR 3 TON HAS 27 SQ IN FILTER AREA AND WATER CAPACITY IN DROPS IS 99.1 AT 125°F FOR REFRIGERANT 22
9. PART NO 165S FOR 7.5 TON HAS 34 SQ IN FILTER AREA AND WATER CAPACITY IN DROPS IS 176 AT 125°F FOR REFRIGERANT 22.
10. WEIGHT : 1¼ LB.

USED ON MODEL: NAC360; NAC600; NAC920

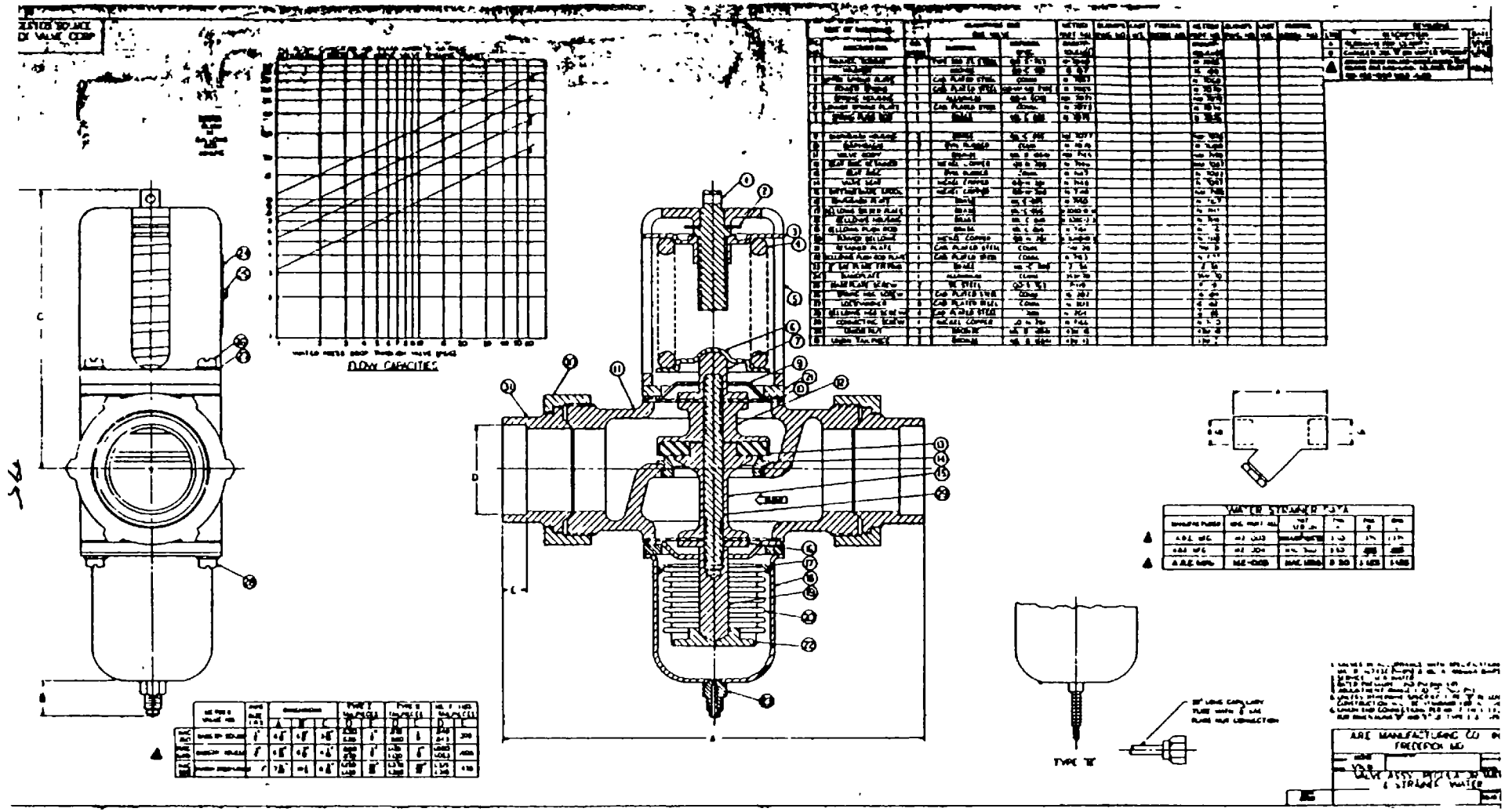
REVISIONS			
LTR	DESCRIPTION	DATE	APPROVED
A	ADDED WEIGHT	6/12/81	

A.R.E. MANUFACTURING CO., INC.
FREDERICK, MD

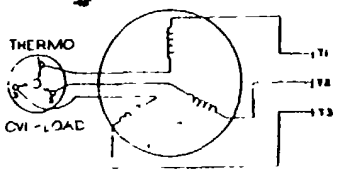
SCALE N.T.S	APPROVED BY:	DRAWN BY K.M.
DATE 4-8-81		REVISED

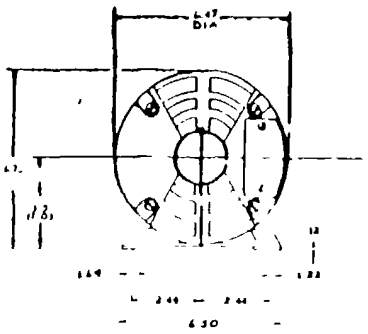
CERAMIC FILTER-KORE
MOLECULAR-SIEVE DRYER

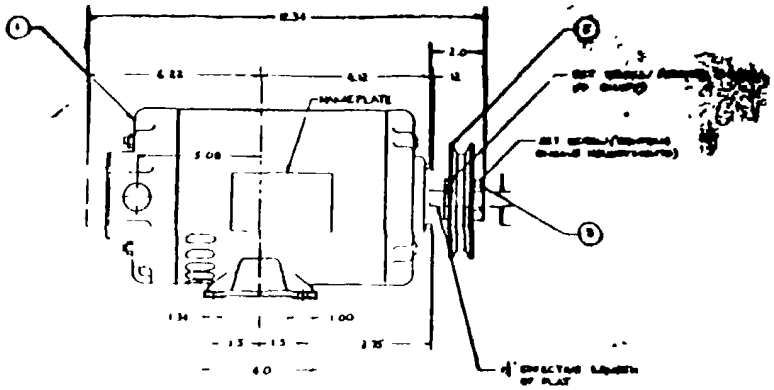
SIZE 57107		DRAWING NUMBER 117-001 REV A



USED ON MODEL: NAC360, NAC600; NAC9



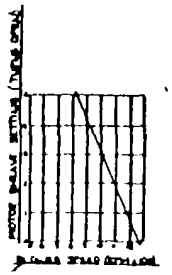




SLEEVE	
	SEE DETAIL A

	AMPS	WATTS	OZ FT	RPM
	5	70	0	3595
LOAD	1.40	861	24	3502
AT FACTOR LOAD	1.60	1083	30	3450
BREAKDOWN			91	2574

LOCKED ROTOR TORQUE HOT 68 OZ FT
COLD 72 OZ FT
COLD AMPS 11.3

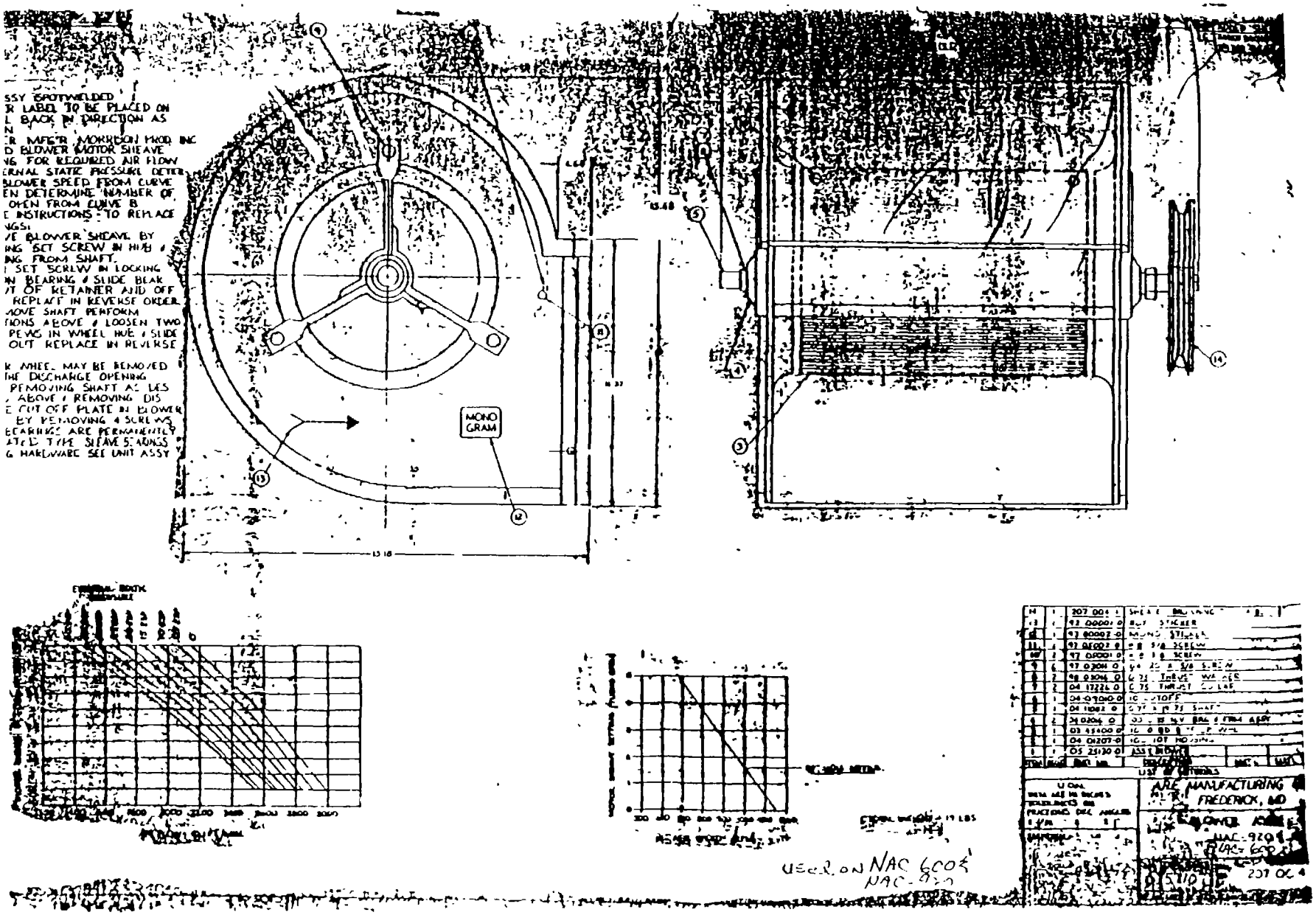


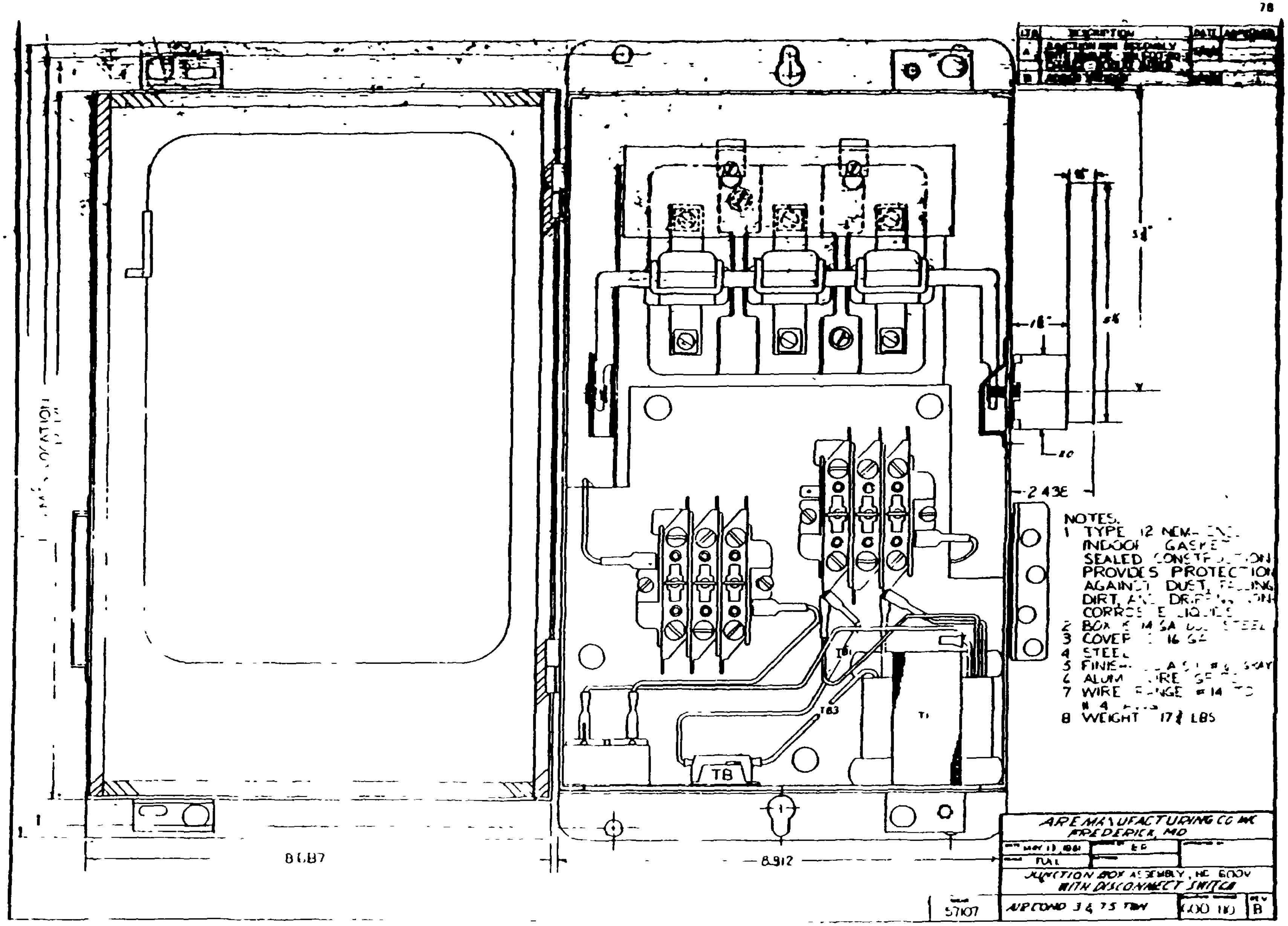
NAMEPLATE DATA	
FRAME SIZE	42
ELECTRONIC	CAP - START
FULL LOAD RPM	3450
SYNC. RPM	3600
H.P.	1
VOLTS	460
CYCLES	3ONO
PHASE	3
S.F.	0.1610
SERVICE	CONTINUOUS
AMB. °C	70
FULL LOAD AMPS	1.60
AMB. °C	50
SERVICE FACTOR	CLASS "B"
THERMAL PROT.	TYPE "A"

NOTES
1. MOTOR CONFORMS TO MIL A-18635 B (SHIPS) AND MIL M 17059 (SHIPBOARD USE)
2. UL CONSTRUCTION APPPOVAL E46491
3. CSA CONSTRUCTION APPROVAL LR5072

Blower Motor

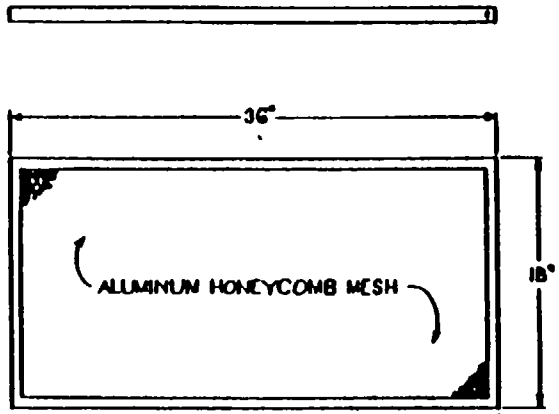
MOTOR
EVAP FAN ASSY 1 HP


MONO GRAM
ARE MANUFACTURING
FREDERICK, MD
Used on NAC 600E
NAC-820


NOTES.
1 TYPE 12 NEMA
INDOOR GASKET
SEALED CONSTRUCTION
PROVIDES PROTECTION
AGAINST DUST, FALLING
DIRT, AND DRIPPING
CORROSIVE LIQUIDS
2 BOX 14 GA
3 COVER 16 GA
4 STEEL
5 FINISH
6 ALUM
7 WIRE RANGE #14
8 WEIGHT 17 LBS
TB
2.438
8.687
8.912
ARE MANUFACTURING CO INC
FREDERICK, MD
FULL
JUNCTION BOX ASSEMBLY, HE 600V
WITH DISCONNECT SWITCH
AIR COND 3 & 7.5 TON
57107
B

SUGGESTED SOURCE
RESEARCH PRODUCTS CORP.
MADISON, WI.
P/N A21-10833

REVISIONS			
LTR	DESCRIPTION	DATE	APPROVED
A	ADDED WEIGHT	6/10/81	R & A
B	DELETED USE ON NAC 360 AND CHANGED DIMENSION	7/27/81	



USED ON MODELS NAC-60; NAC-600;
NAC-90; NAC-92 & NAC-920

NOTES :
1. PERMANENT AIR CLEANER - WASHABLE TYPE
2. RUST RESISTANT
3. MATERIAL - ALUMINUM
4. WEIGHT : 1¼ LB.

A.R.E. MANUFACTURING CO., INC.
FREDERICK, MD.

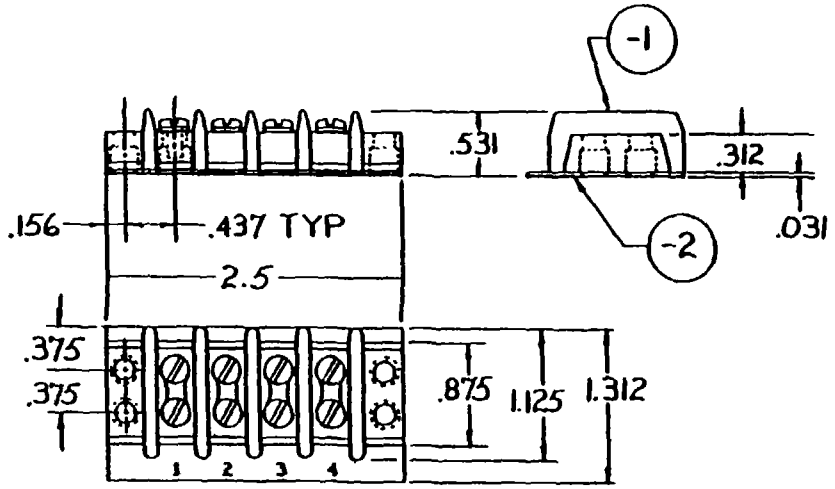
SCALE 1½" = 1'-0"		DRAWN BY B.R.
DATE 4/20/81		

ALUMINUM HONEYCOMB MESH AIR FILTER

5T107	024 R102	REV B

SUGGESTED SOURCE
CINCH
ELKGROVE VILLEGE, ILL
P/N 4-141 / MS-141

	MATERIAL LIST		
	P/N	DESCRIPTION	A.R.E. P/N
1	4-141	TERMINAL BOARD	042R100-1
2	MS-141	MARKER STRIP	042R100-2



08

USED ON MODEL: NAC36; NAC60; NAC90;
NAC92; NAC360; NAC600;
NAC920

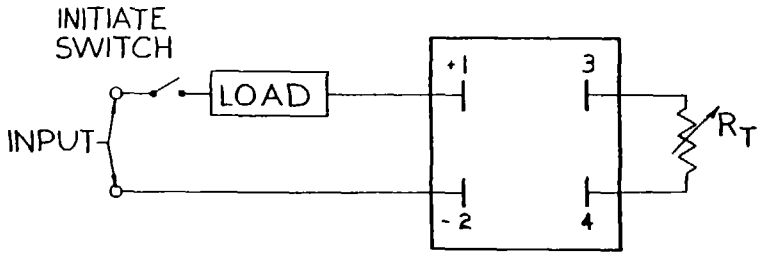
A.R.E. MANUFACTURING CO., INC.
FREDERICK, MD

N T S		R.M.
4-8-81		

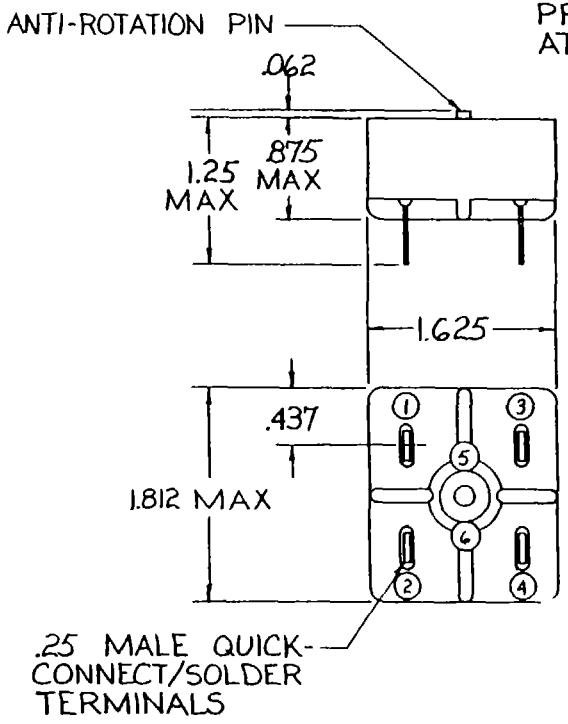
TERMINAL STRIP ASSEMBLY

SCALE 57107	042R100

SUGGESTED SOURCE
OMNETICS
SYRACUSE, NY
P/N MMS-24A 1Y270



FIXED TIME DELAY UNITS ARE PROVIDED WITH A RESISTOR ATTACHED TO TERMINALS 3 & 4



NOTES:
1. INPUT VOLTAGE - 24 VAC.
2. FREQUENCY: 50 OR 60 HERTZ.
3. ADJUSTMENT - FIXED.
4. TIME DELAY TOLERANCE - ± 10%.
5. MOUNTING - SURFACE MOUNTING.
6. TIME DELAY IN SECONDS: 270 ± 10%.
7. 100% ENCAPSULATED AGAINST HUMIDITY, SHOCK, AND VIBRATION.
8. CSA RECOGNIZED. FILE #30320.
9. U.L. RECOGNIZED. FILE #E53944.
10. LIFE: 100,000,000 OPERATIONS.
11. TRANSIENT: ±1400 VOLTS FOR 100 MICROSECONDS.
12. WEIGHT: 6 OUNCES (170 GRAMS).
13. OPERATING TEMPERATURE: -20° C TO + 55° C.
14. STORAGE TEMPERATURE: -30° C TO +65° C.
15. HUMIDITY: 95% RELATIVE.

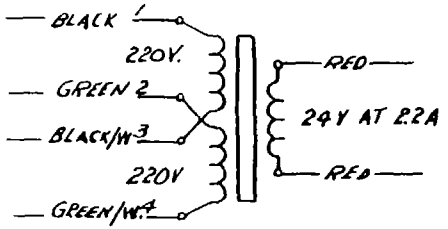
A.R.E. MANUFACTURING CO., INC.
FREDERICK, MD

SCALE N.T.S	APPROVED BY	DRAWN BY K.M.
DATE 4-9-81		REVISED

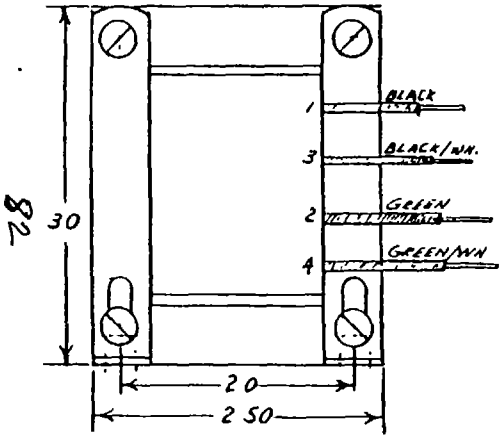
SOLID STATE TIME DELAY

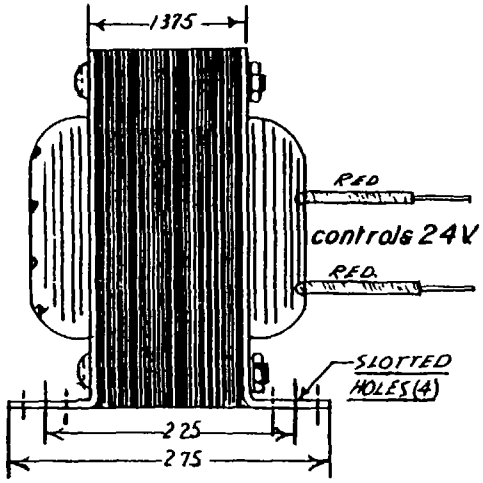
IDENT		DRAWING NUMBER
57107	AIRCONDITIONER, 3 & 7.5 TON	337-001

SUGGESTED SOURCE=
Gettysburg Transformer Co.
P/N B1306-1



WIRING DIAGRAM



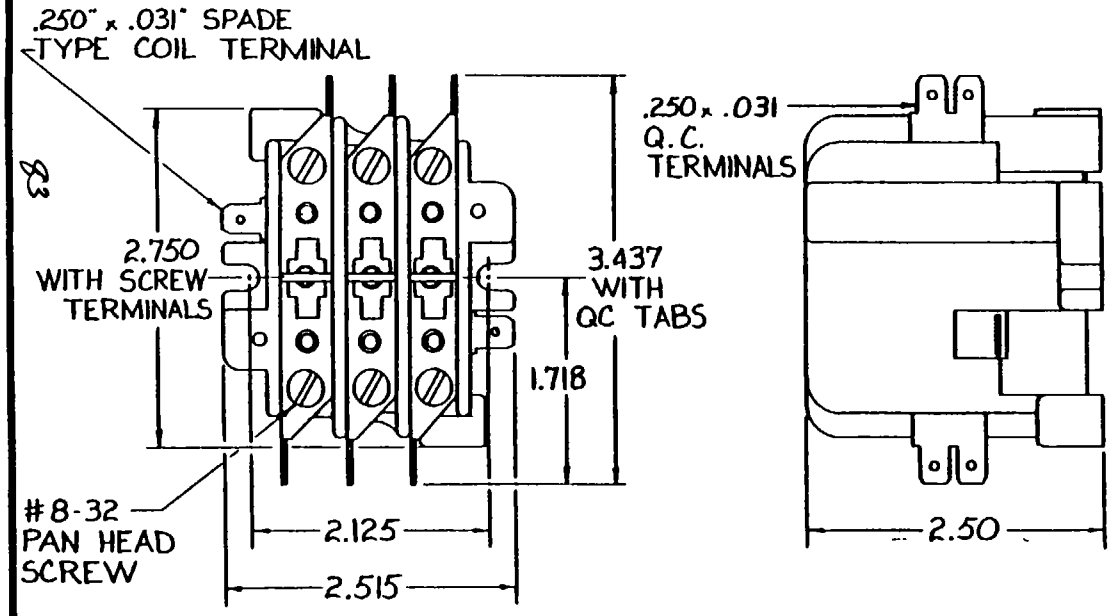


Notes=
1 For use on 220Volts connect:
(a)Green and black 1 & 2
(b)Black/white and green/white 3 & 4
2 For use on 440Volts connect:
(a)Black/white and green 2 & 3
(b)Use 1 & 4 as primary
3 Inspection:verify
Dimensions
Continuity, electrically, each leg

A.R.E. MANUFACTURING CO.INC. FREDERICK, MD		
SCALE	APPROVED BY	DRAWN BY Jhy
DATE 2-10-81		REVISED
TRANSFORMER STEP DOWN INPUT 220 OR 440VOLTS OUTPUT 24V AC.		
IDENT 57107	Air conditioner = 3 or 7.5 ton	DRAWING NUMBER 097R100

SUGGESTED SOURCE
GOULD, INC.
LANHAM, MD
P/N TYPE 2210DP

	MAXIMUM MOTOR AMPERES RATING						MAXIMUM HORSEPOWER		
	RESISTIVE LOAD AMPERES		FULL LOAD AMPERES	LOCK ROTOR AMPERES 3 PHASE, 3 POLE BREAK					
	277V	600V		277V	480V	600V	VOLTS	3 PHASE	POLES
FAN MOTOR									
COMPRESSOR	31.5	31.5	25	125	105	90	460/575	7½	3



NOTES:
1. NEMA TYPE 1.
2. U.L. RECOGNIZED COMPONENT UNDER FILE E37024, GUIDE NLDX-2 (SUBJECT TO MODIFICATIONS).
3. AMPERE RATING U.L. TESTED FOR 100,000 CYCLES OF OPERATION FOR USE IN HEATING EQUIPMENT.
4. COIL DATA: COIL VOLTAGE = 24, STANDARD AC COILS RATED 50/60 HZ, UNLESS OTHERWISE SPECIFIED, IN-RUSH VA-MAX = 35, SEALED VA-MAX = 9.5, SEALED WATTS = 3.6, DC RES ± 10% OHMS, RESISTANCE MEASURED AT 25° C.

USED ON MODEL: NAC360; NAC600; NAC920

A.R.E. MANUFACTURING CO., INC.
FREDERICK, MD.

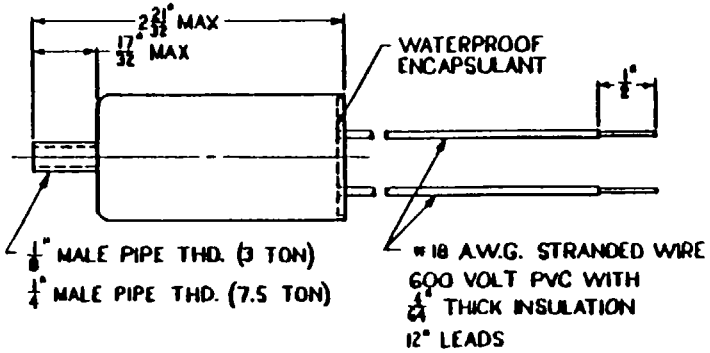
SCALE NTS	APPROVED BY:	DRAWN BY K.M.
DATE 4-9-81		REVISED

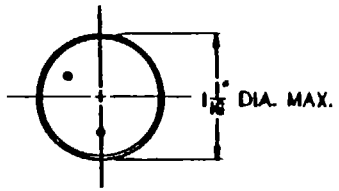
20-25 INDUCTIVE
SPECIAL PURPOSE CONTACTOR

SHEET 57107		DRAWING NUMBER 309-003

SUGGESTED SOURCE
ROBERTSHAW CONTROLS
MILFORD, CONNECTICUT
P/N MG20-1000

REVISIONS			
LTR	DESCRIPTION	DATE	APPROVED
A	ADDED PIPE THD. SIZE FOR 3 TON	7/31/81	





NOTES:
1. 1/4 - 18 NPTF MALE (7.5 TON), 1/8 - 18 NPTF MALE (3 TON)
2. PRESSURE PORT - STYLE 5
3. MOUNTING PROVISION - PIPE STUD
4. TERMINAL LEAD
5. CONTACTS SPST
6. VOLTAGE - 24 VAC

USED ON MODEL: NAC360; NAC600; NAC920

LOW PRESSURE MINI-GARD	
RANGE	14" HG VAC TO 100 PSI
DIFFERENTIAL	35 CO. PSI - 60 CL. PSI
BURST	1000 PSI
PROOF	500 PSI

WEIGHT 2 5/8 OZS

MINIMUM LIFE EXCEEDS 100,000 CYCLES

IDENT. 57107

A.R.E. MANUFACTURING CO., INC
FREDERICK, MD.

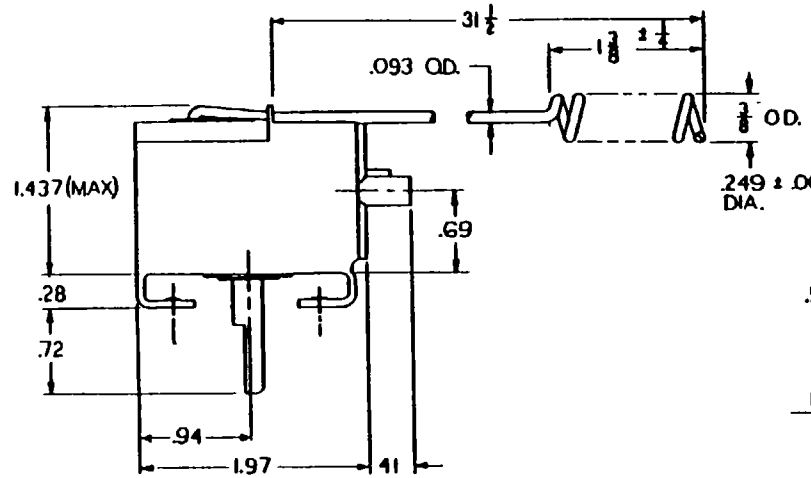
SCALE	FULL	APPROVED BY	DRAWN BY	B.R.
DATE	4/24/81	R.E.A	REVISED	

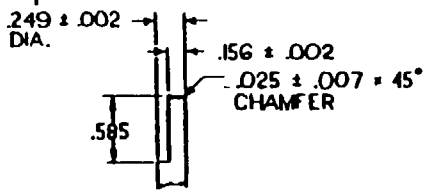
PRESSURE SWITCH, LOW

DRAWING NUMBER 144-002 REV. A

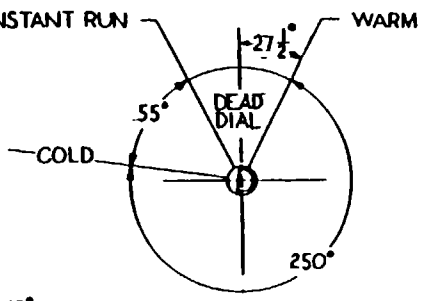
SUGGESTED SOURCE
ROBERTSHAW CONTROLS
MILFORD, CONNECTICUT
P/N RC32 - 1285

REVISIONS			
LTR.	DESCRIPTION	DATE	APPROVED



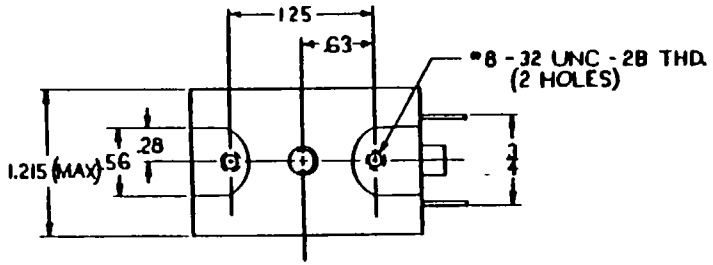


DIAL SHAFT DETAIL



DIAL LAYOUT

USED ON MODEL NAC36; NAC60; NAC92;
NAC360; NAC 600; NAC920



3. CONTROL IS CALIBRATED TO 29.98" HG. USE BAROMETRIC CORRECTION CHART 904562
2. CONTROL CALIBRATED IN COLD POSITION AS SHOWN AND ROTATES C.C.W. TO WARM
1. CONTROL IS S.P.S.T. CONTACTS CLOSE ON TEMP. RISE.
NOTES :

ELECTRICAL RATING					
VOLTS A.C.	120	240	68±1	60±1	97±3
AMPS F.L.	20	20	C.I.	C.O.	C.I. °F
AMPS L.R.	96	96	COLD °F		WARM

A.R.E. MANUFACTURING CO., INC
FREDERICK, MD.

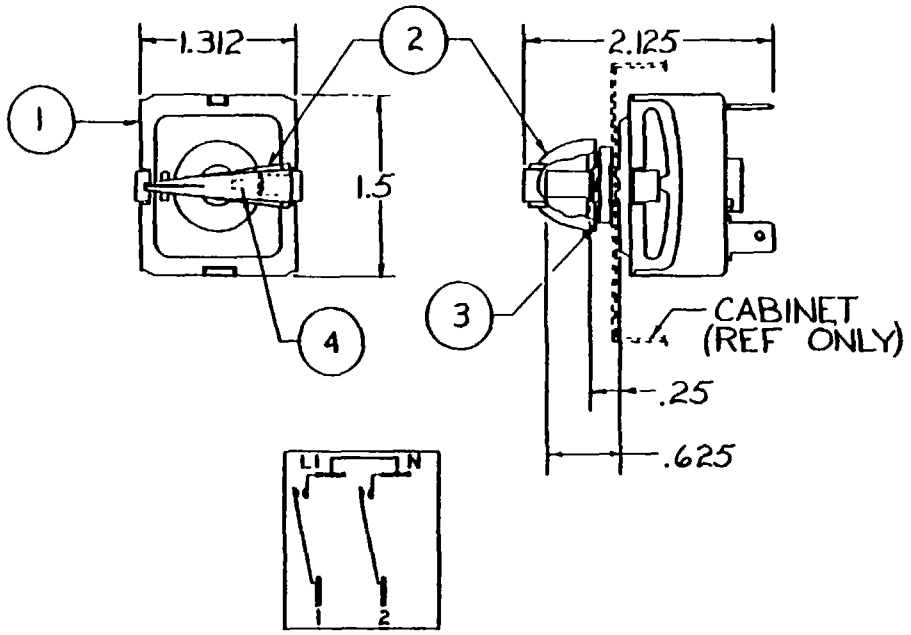
SCALE	FULL	APPROVED BY	DRAWN BY	B.R.
DATE	4/23/81		REVISED	

THERMOSTAT

ISSUE	57107
DRAWING NUMBER	076R100

SUGGESTED SOURCE
OAK INDUSTRIES, INC.
CRYSTAL LAKE, ILL
P/N 5-57324-315

	MATERIAL LIST		
	P/N	DESCRIPTION	A.R.E. P/N
1	5-57324-315	ROTARY SWITCH	001R101-1
2	5-57324-315-1	SELECTOR SWITCH KNOB	001R101-2
3	5-57324-315-2	HEX NUT	001R101-3
4	5-57324-315-3	SET SCREW	001R101-4



SEE NOTE 3

NOTE:
1. UL APPROVED - RANGE FROM 7.5 AMPERES TO 38 AMPERES.
2. ELECTRICAL RATINGS VARY AS TO APPLICATION, AND ARE AVAILABLE TO 38 A 120/240 V. RATING WITH 20 AMPS MAX ON INSIDE TERMINALS (2 & 4) AND 25 AMPS MAX ON OUTSIDE TERMINALS (1 & 3) RESISTIVE LOAD. DOUBLE POLE APPLICATIONS CAN HAVE 30 AMPS MAX RATING WITH 20 AMPS MAX ON ANY ONE CIRCUIT.
3. OFF - NORMALLY OPEN FAN ON - #1 TO L1 CLOSED COMPRESSOR ON - #2 TO N CLOSED, TYPICAL SWITCH OPERATION.

USED ON MODEL NAC360; NAC600; NAC920

A.R.E. MANUFACTURING CO., INC.
FREDERICK, MD

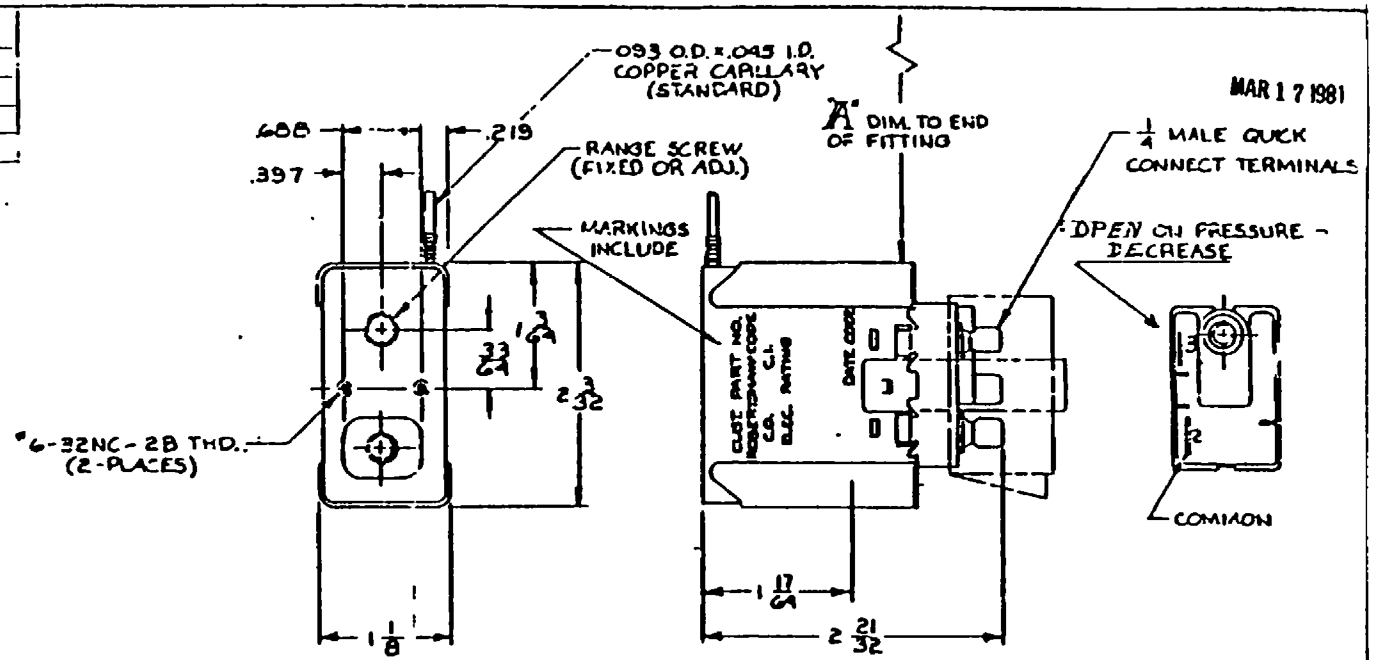
SCALE NTS		DRAWN BY K.M.
DATE 4-10-81		

ROTARY SELECTOR SWITCH ASSY.

CODE 57107		DRAWING NUMBER 001R101

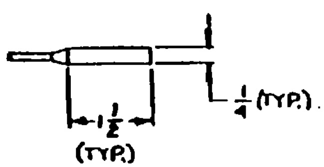
ELECTRICAL RATING		B			
VAC		120	240		
AMPS (FL)		16	8		
AMPS (LR)		96	48		
PILOT DUTY (VA)		750	750		

MAR 17 1981



USED ON MODEL NAC36; NAC60; NAC90; NAC92; NAC360; NAC600; NAC920

CUSTOMER PART NO.	ROBERTSHAW CODE NO.		C.O. PRES. SETTING	C.I.	'A' DIM.		SPST TERM.
	A°20·1235		35±3	65±3	36±3		2-3



STYLE A (STANDARD)

NOTES:-

Hi PRESSURE CONTROL

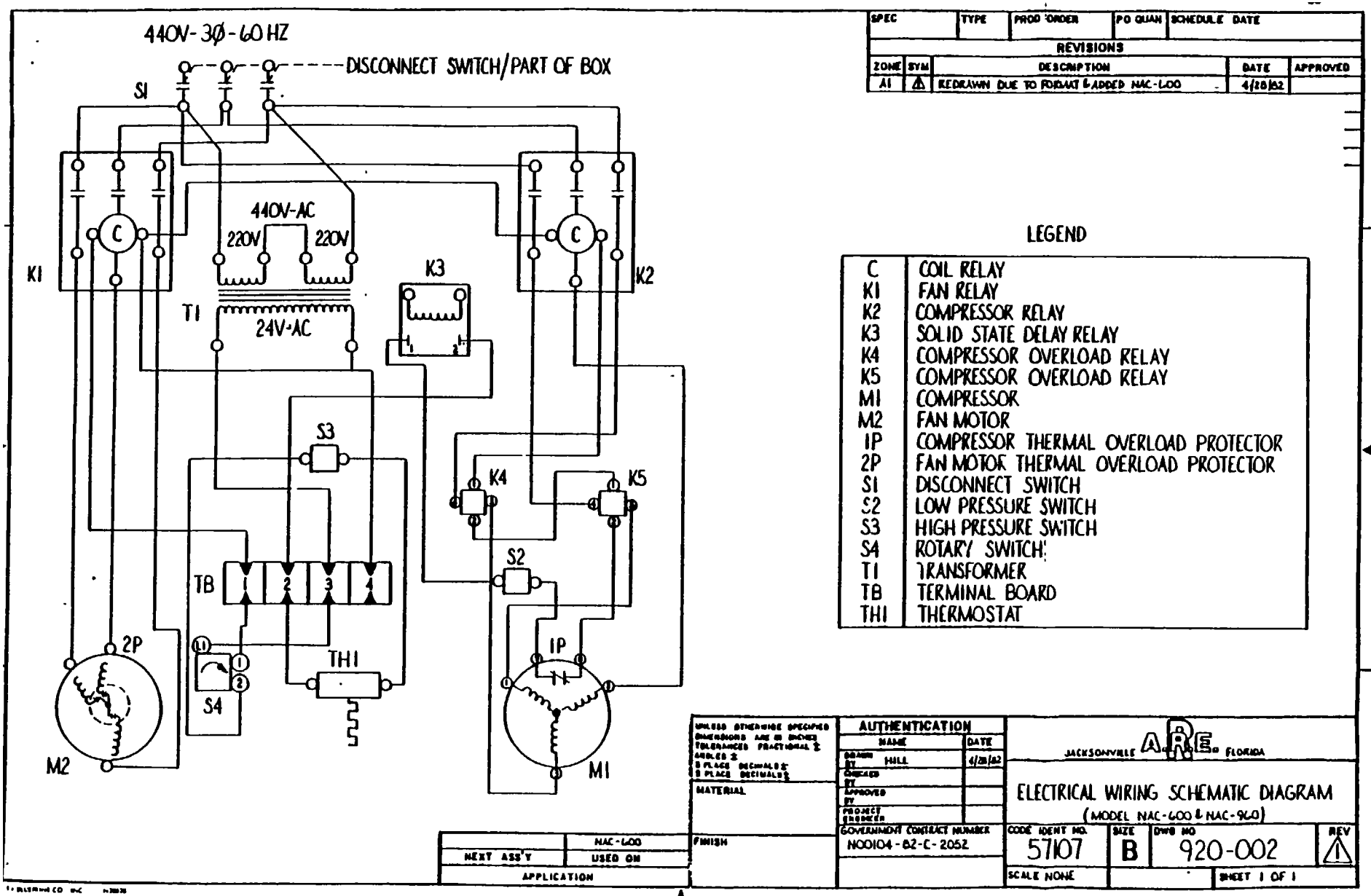
A.R.E. MFG. Co. Inc.

DWG INTERPRETATION

CERT. OF CONF.

O.D.D.

057R101



SPEC	TYPE	PROD ORDER	PO QUAN	SCHEDULE DATE

REVISIONS

ZONE	SYM	DESCRIPTION	DATE	APPROVED
A1	⚠	REDRAWN DUE TO FORMAT & ADDED NAC-L00	4/28/82	

LEGEND

C	COIL RELAY
K1	FAN RELAY
K2	COMPRESSOR RELAY
K3	SOLID STATE DELAY RELAY
K4	COMPRESSOR OVERLOAD RELAY
K5	COMPRESSOR OVERLOAD RELAY
M1	COMPRESSOR
M2	FAN MOTOR
1P	COMPRESSOR THERMAL OVERLOAD PROTECTOR
2P	FAN MOTOR THERMAL OVERLOAD PROTECTOR
S1	DISCONNECT SWITCH
S2	LOW PRESSURE SWITCH
S3	HIGH PRESSURE SWITCH
S4	ROTARY SWITCH
T1	TRANSFORMER
TB	TERMINAL BOARD
TH1	THERMOSTAT

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES TOLERANCES FRACTIONAL ± ANGLES ± 2 PLACE DECIMALS ± 3 PLACE DECIMALS ±

MATERIAL

FINISH

NEXT ASS'Y	NAC-L00
APPLICATION	USED ON

AUTHENTICATION

	NAME	DATE
DRAWN BY	HILL	4/28/82
CHECKED BY		
APPROVED BY		
PROJECT ENGINEER		

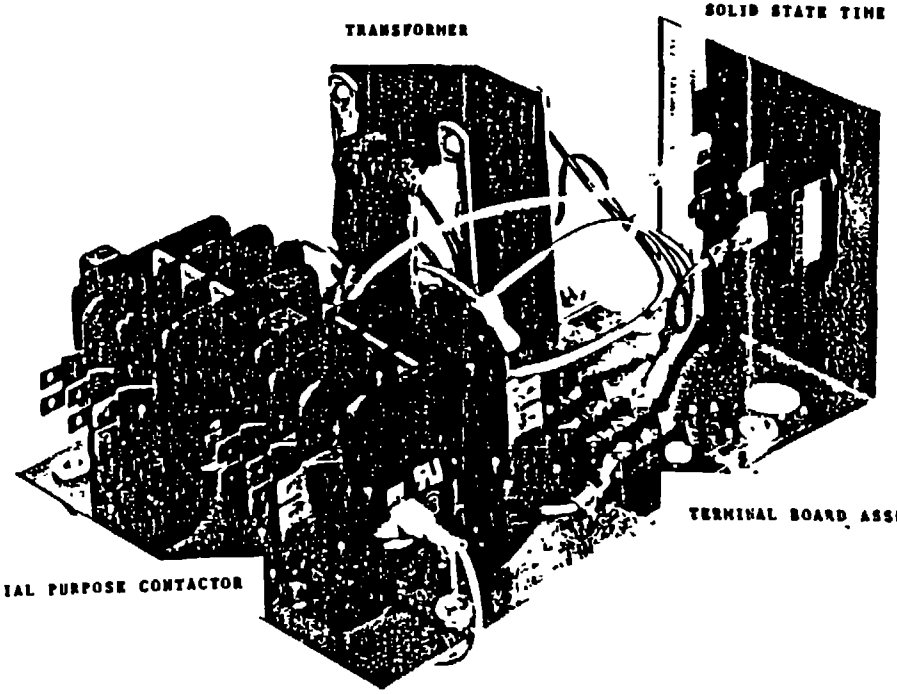
GOVERNMENT CONTRACT NUMBER N00104-82-C-2052

JACKSONVILLE ARE FLORIDA

ELECTRICAL WIRING SCHEMATIC DIAGRAM
(MODEL NAC-600 & NAC-960)

CODE IDENT NO.	SIZE	DWG NO	REV
57107	B	920-002	⚠1
SCALE NONE		SHEET 1 OF 1	

REVISIONS			
LTR	DESCRIPTION	DATE	APPROVED
A	DRAWING NUMBER WAS 600-110-2	2/18/80	



LIST OF ITEMS:

Solid State Time Delay -
Drawing #337-001
Transformer -
Drawing #097R100
Special Purpose Contactor -
Drawing #309-003
Terminal Board Assembly
Drawing #042R100
Module Plate

USED ON MODEL MAC360; MAC600; MAC920

A.R.E. MANUFACTURING COMPANY, INC.
Frederick, Maryland

JUNCTION CONTROL BOX MODULE ASSEMBLY

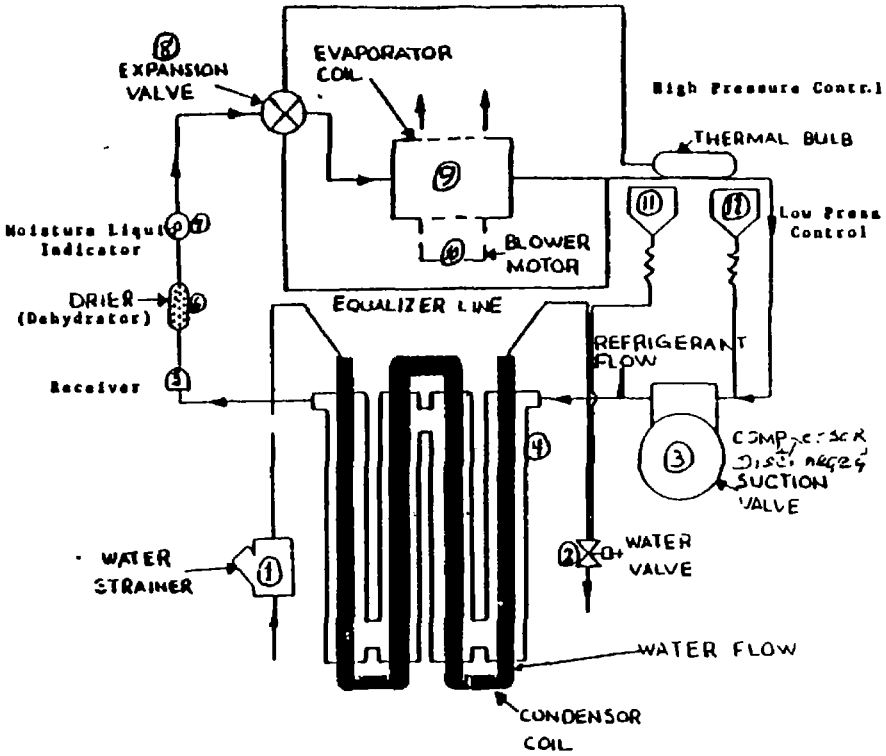
Drawing #600-110-2		SCALE 57107	REV. A

LIST OF ITEMS

Item	Description
1.	Water Strainer
2.	Water Valve, Regulator
3.	Compressor with discharge and suction valves
4.	Condenser
5.	Receiver
6.	Drier (Dehydrator)
7.	Moisture Liquid Indicator (Sight Glass)
8.	Expansion Valve
9.	Evaporator Coil
10.	Blower Motor
11.	High Pressure Control
12.	Low Pressure Control

NOTES:

1. Water Strainer field installed.
2. This drawing typical for Model A.B.E. 7½ and 3 ton Marine air conditioners NAC-360 and 920.



NAC-360 & 920 & 600
REFRIGERANT AND WATER FLOW CHART

IDENT 57107

A.B.E. MFG. CO. INC.
FREDERICK, MD. 21701

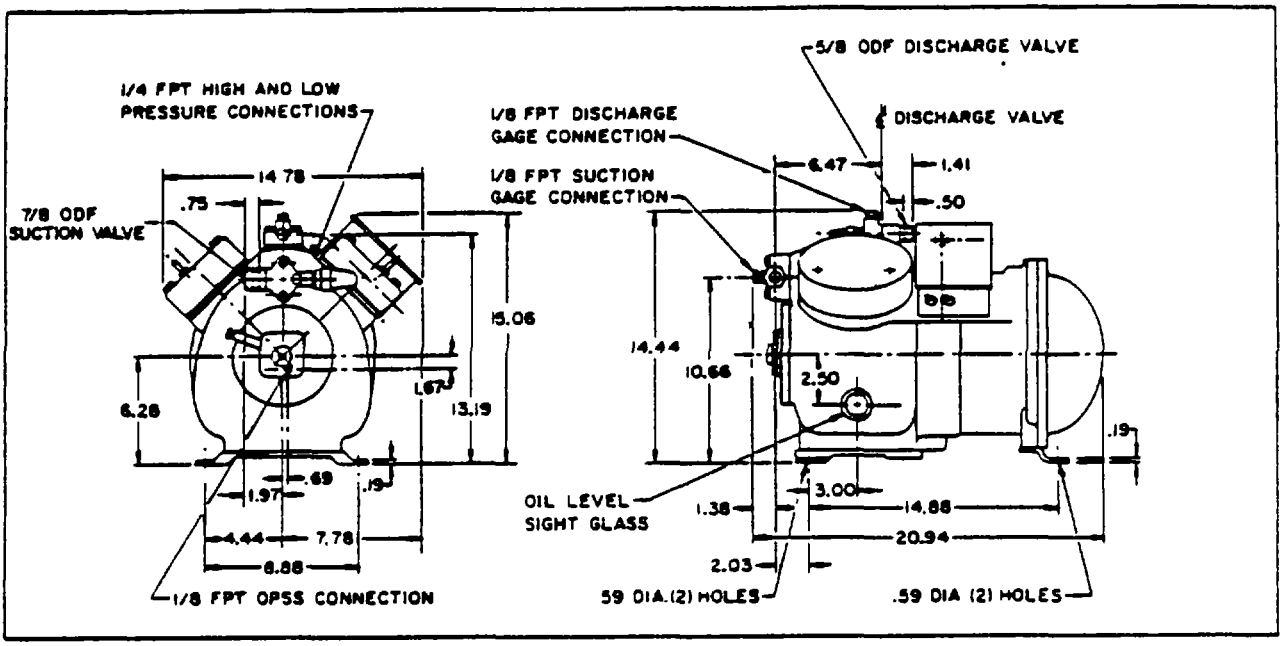
DRWG: No. 180-001
5/4/81

TABLE OF CONTENTS

APPENDIX I

COMPRESSOR INFORMATION A.R.E. MFG. CO., INC.

P/N 108-111



DESCRIPTION OF COMPRESSOR FEATURES

The compressor is a reciprocating semi-hermetic type that operates at 1750 rpm to give dependable high performance operation. The compressor is UL and CSA, approved. Some features include:

1. Crankcase Pressure Equalizing Tube To equalize crankcase and system pressures quickly on start-up. This prevents oil from leaving compressor due to high refrigerant concentration which occurs in crankcase on start-up.

2. Suction Inlet Strainer Compressor is equipped with a screen located in the suction manifold of the motor and belt to stop installation scale or abrasives from entering the compressor and shortening the life of the motor and compressor.

3. Oversize Suction Gas Passages To give less turbulence and more efficient motor cooling by suction gas. A cool motor will give more economical operation and longer life.

4. Lubrication Oil Passages Lubrication is provided by a combination of oil pressure and oil splash. Passages carry oil to internal bearing and running gear surfaces in large volume at low oil pressure.

5. Oversize Oil Sump On shutdown, oil is diluted by refrigerant. On start-up, oil level can temporarily drop too low causing unnecessary wear. Oversize oil sump holds extra oil in crankcase to prevent normal oil migration from dropping oil level below safe lubrication range.

DESCRIPTION OF COMPRESSOR FEATURES (Continued)

6. Automatic Reversible Oil Pump To provide full volume and pressure regardless of motor rotation. Oil pump is positive displacement vane type pumps. Pump produces high volume oil flow at low oil pressure.

7. Suction and Discharge Valves of Swedish Steel Both valves could operate 2 1/2 million times per day. Swedish steel is finest available anywhere for this application and is designed to handle some oil and refrigerant slugs.

8. Main bearings and Running Surface Steel Backed Aluminum or Tin Base Babbitt-Aluminum or tin based babbitt material used on bearing surfaces provide greater load carrying ability than other materials and are less susceptible to damage from overheating or liquid refrigerant.

COMMENTS ON COMPRESSOR LUBRICATION

All refrigeration compressors must have adequate lubrication to ensure trouble-free operation and a long life. On the start-up of any new system, some oil will be lost to coat the inside of the piping, some lodged in low velocity areas of the system after the initial start-up, for very low compressor oil levels can cause complete loss of lubrication and will result in an immediate compressor failure if it is not protected.

The loss of oil can also be caused by flooded starts refrigerant migrating to the oil during an off period and pulling the oil out of its sump during the sudden pressure drop of a start-up.

The level should be observed in the sight glass while the compressor is running. The level observed when the compressor is not running may be a mixture of oil and refrigerant, which would not be a true indication of the oil level when the compressor is running. Note that the sight glass is a prism type, with vertical or circular lines which can be seen in the glass when the oil level is below the bottom of the glass. If no oil level is observed and the vertical or circular lines cannot be seen, the oil level is above the top of the sight glass.

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.

Figures 6, 7 and 8 show different oil levels when a single compressor is running. The photos in each figure show the right and left sight glass of the same compressor. If the level is not the same in each glass, consider the true oil level to be the lower level. The difference in levels is due to the rotation of the crankshaft. The crankshaft and running gear are producing the windage required to push the oil down on one side while raising it on the other. Reversing the direction of rotation of the motor will reverse this relationship.

To check for excessive system oil charges, it is recommended that the oil levels of the compressors in the system be brought down to approximately 1/4 of the sight glass. If the system is overcharged, the oil levels will rise to a 1/2 sight glass level within a short time (usually within an hour). Continue removing oil until the oil level does not rise after removal.

It is also recommended that the oil levels be kept at this 1/4 level, or between the levels shown in Figure 8. This is especially true if any compressors have experienced any repeat gasket failures. To summarize the advantages of keeping the oil at this level:

1. It ensures that excessive oil is not being lodged in the system. This will elt1nste many gasket problems.

2. The compressor, oil and motor run cooler 200 or more in many cases.

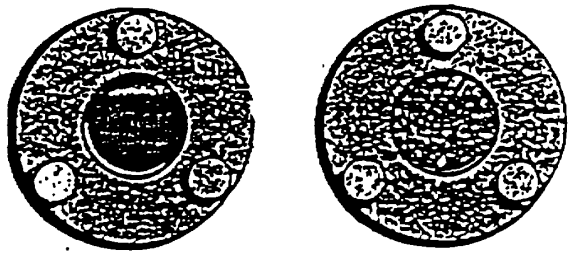


FIGURE 6 HIGH OIL LEVEL
The oil level in Figure 6 is at least 7/8 of a sight glass. Note the high oil level in the left sight glass and solid foam in the right sight glass. Anytime the glass is filled with foam, excessive oil is indicated and oil should be removed.

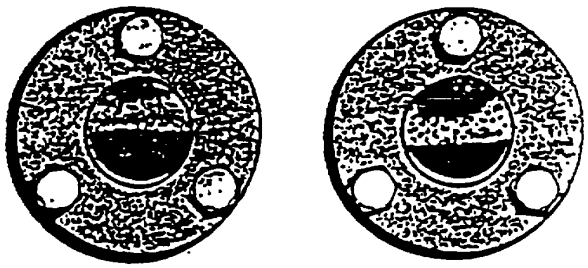


FIGURE 7 BETTER RUNNING OIL LEVEL
The oil level in Figure 7 is 3/8 1/2 of a sight glass. This is an acceptable oil level on single compressor systems but does not always. give a true indication of an excessive oil charge on multiple compressor systems.

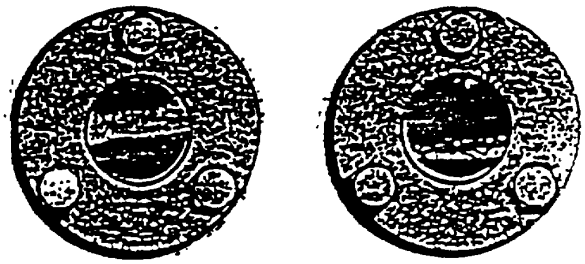


FIGURE 8 PREFERRED RUNNING OIL LEVEL
The oil level in Figure 8 is 1/8-1/4 of a sight glass. The sight glasses are showing a different level because of the crankcase rotation. Note the amount of clear glass above the levels. These levels will ensure against the possibility of excessive oil in the system.

USE OF FILTER-DRIER

Clean and dry systems are essential for long compressor and motor life, and satisfactory operation. This cannot be over-emphasized.

Liquid line refrigerant filter driers maintain low moisture content, and in the event of a motor burnout, prevent contamination of the evaporator and other parts of the refrigeration system.

Liquid line moisture indicators are recommended in all systems which use semi-hermetic compressors because they provide a continuous check on the system's moisture content. Excessive moisture in combination with a high operating temperature can lead to motor winding breakdown and burnout.

When moisture is indicated, prompt corrective action, such as changing the filter-drier core or dehydrating the system, can prevent serious compressor damage.

Suction line filter driers are recommended for all systems because they assure adequate filtration Bust ahead of the compressor. This is especially important on refrigeration systems where long suction lines are common and where these filter driers would collect any dirt or other contaminants left in the piping during installation.

COMPRESSOR NAMEPLATE DATA

The compressor nameplate specifies voltage, phase, frequency, and lock rotor current.

The rated load current shown is the ,-mum must trip current that the motor draws when tripping the overload relays, divided by 1.25.

The allowable variation in voltage at the motor terminals is within 10 percent of the rated nameplate voltage. A 460 volt motor can, therefore, operate satisfactorily between 414 and 506 volts at the motor terminals.

MOTOR PROTECTION

This compressor is provided with overcurrent and overtemperature protection which complies with UL and NEC definitions of inherent motor protection. Full protection is provided for lock rotor, running overcurrent, primary and secondary single phasing, and loss of refrigerant conditions.

1. PRIMARY MOTOR OVERCURRENT PROTECTION is provided by two (2) Texas Instruments' supplementary overloads. These are pilot duty, automatic reset, current sensitive devices mounted in the compressor terminal box. Load terminals of the overloads are 1/4 inch quick connect for ratings of 30 amps and below, and #10 screw terminals for ratings over 30 amps. Control circuit terminals of the overloads are 1/4 inch quick connects.

MOTOR PROTECTION (Continued)

2. THERMAL MOTOR PROTECTION is provided by a pilot duty, automatic reset, internal thermostat located in the motor windings. The thermostat relay contacts are rated at 240 VA and care must be taken that this rating is not exceeded. Thermostat connections are made at terminals #8 and #9 on the compressor terminal block in the terminal box.*

CAUTION

(* Please note that the relay contact as defined above are rated at 240 Volt-Amperes and should not be considered volts only).

COMPRESSOR DATA AND ELECTRICAL SPECIFICATIONS - A.R.E. P/N 108-109

Compressor Data

Bore x Stroke	1 13/16 x 1 1/4
No. of Cylinders	4
Displacement	13.1 cfm
Speed (rpm)	1750
Suction Conn. ID (in.)	7/8
Discharge Conn. ID (in.)	5/8

Motor Data

HP	5
Phase	3
Voltage Range	414-506
Pull Load Amps	9.4
Locked Rotor Amps	43.0

Application

Sat. Suction Temp. Range (P)	0 to 50
Refrigerant	R-22

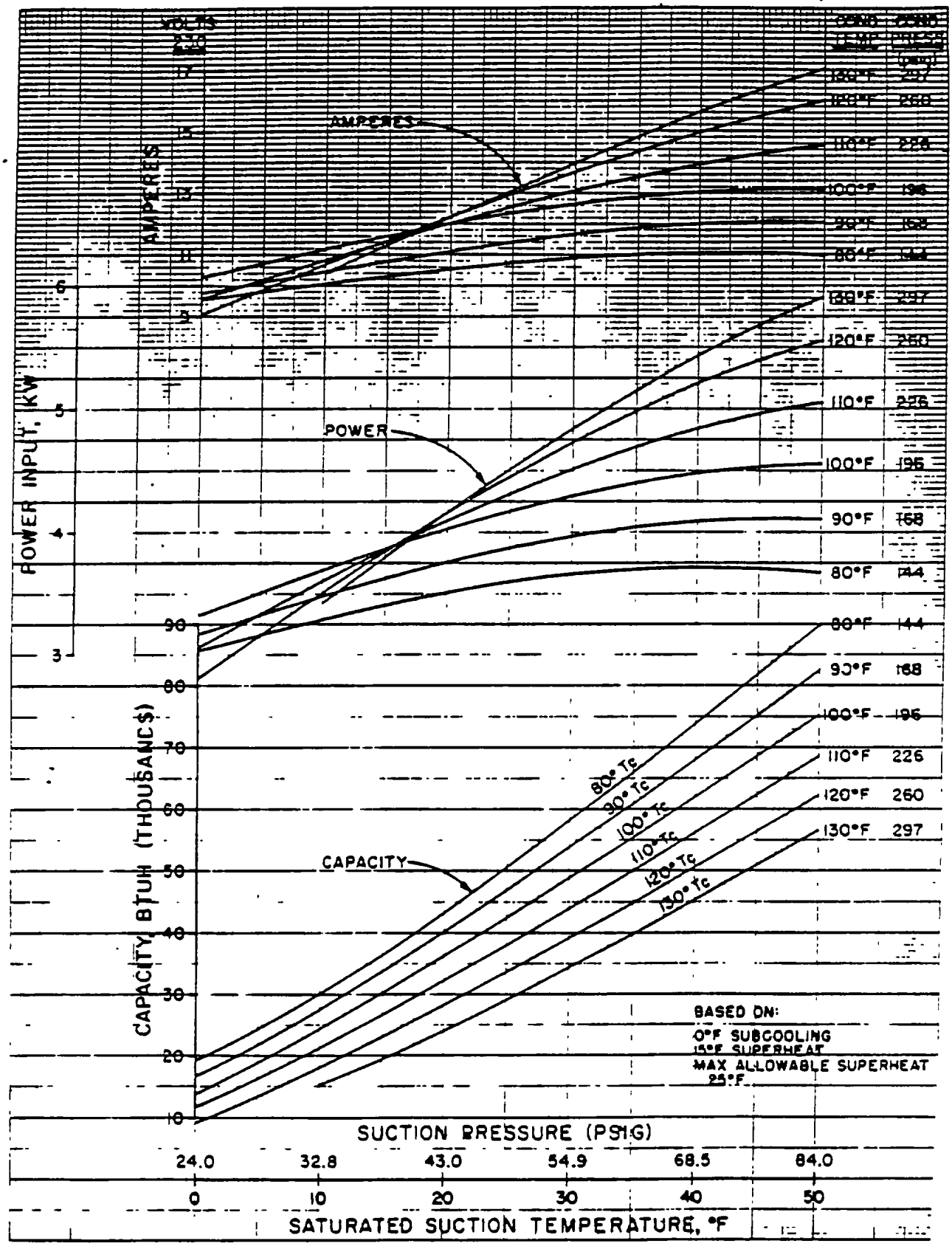
Rated Performance

Capacity (BTU/HR)	50,500
Power Input (kw)	5.2
Amps @ 46V	7
Performance (BTU-WATT-ER)	9.7
Rating Condition:	
Suction Temp	40 P
Condensing Temp. @ 0 F Subcooling	120 F
Return Gas Temp	55 F

Oil Charge

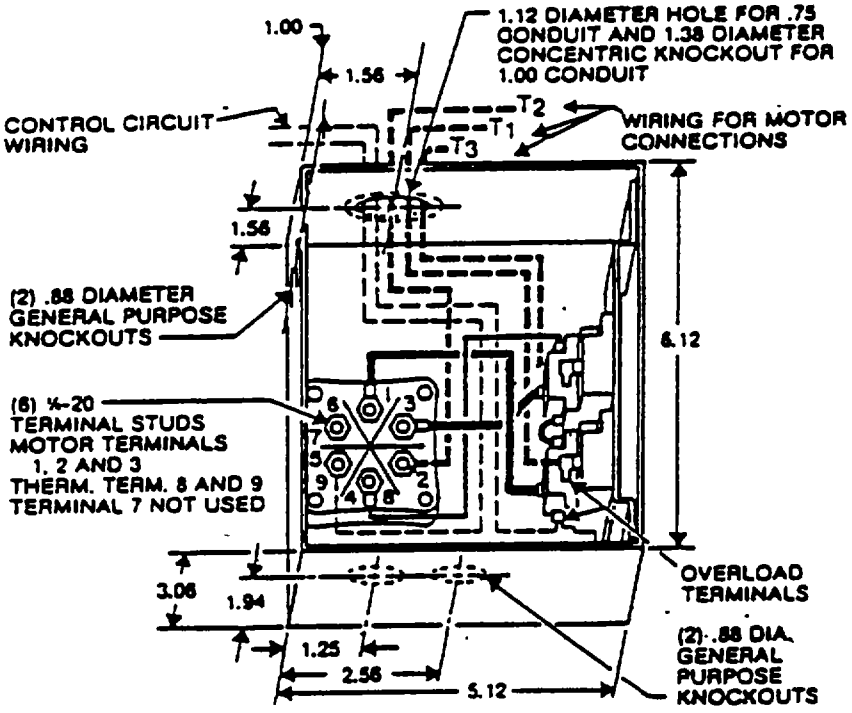
Viscosity (SSU)	150
Grade	Capella BI or Suniso 3GS
Charge (Pints)	5

Approximate Net Weight 203 Lb.



Specifications and ratings subject to change without notice.

JUNCTION BOX DATA DRAWING



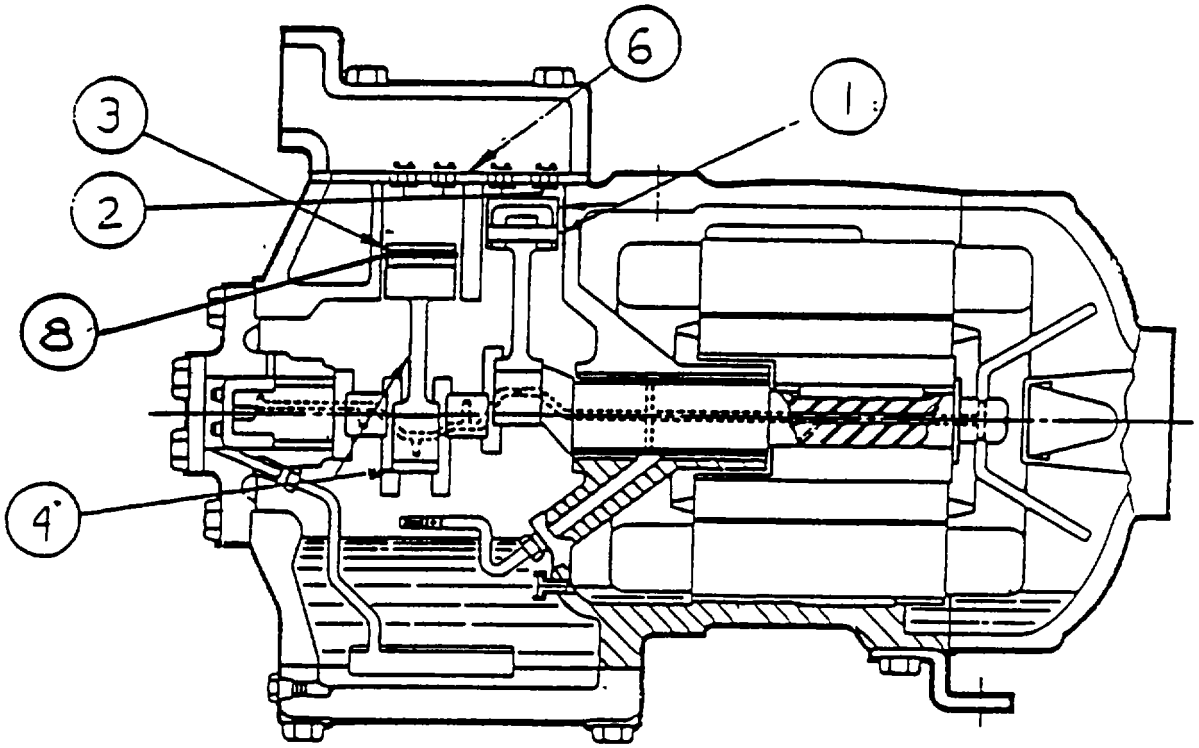
RECOMMENDED POWER WIRE SIZE: #10 AWG

RECOMMENDED CONDUIT SIZE FOR POWER: 3/4" OR 1"

COMPRESSOR SERVICE PARTS

A spare parts package for the 108-111 compressor includes items listed below and are shown on the cut-away drawing:

ITEM	QTY.	A.R.E. P/N	DESCRIPTION
1	4	111-002	Piston and Pin Pkg.
2	4 Sets	111-008	Discharge Valve Disks
	"	111-009	Suction Valve Disks
3	4	111-004	Compression Ring
4	4	111-005	Connecting Rod and Cap
5	1	111-001	Gasket Set
6	1	111-006	Valve Plate Assy. R.H.
7	1	111-007	Valve Plate Assy. L.H.
8	4	111-003	Oil Ring, Piston



APPENDIX C

Preventive maintenance checks and services (PMCS) for Seawater System

C-1 Introduction to PMCS

NOTE

TM 55-1930-209-14&P-19 contains PMCS for all systems on the ROWPU Barge. This appendix contains only PMCS for the Seawater System

a. General.

(1) Systematic (B) before, (D) during, (A) after, and scheduled periodic PMCS are essential to ensure that the Reverse Osmosis Water Purification Barge is in operational readiness at all times. The purpose of the PMCS program is to discover and correct deficiencies and malfunctions before they cause serious damage or failure of the barges and their support systems An effective PMCS program requires that operators report all unusual conditions noticed before, during and after operation as well as while performing periodic PMCS All deficiencies and malfunctions discovered during maintenance inspections must be recorded, together with the corrective action taken, on DA Form 2404 (Equipment Inspection and Maintenance Worksheet).

(2) A schedule for preventive maintenance inspections and service should be established and adhered to. When operating under unusual conditions, such as extreme heat or cold, It may be necessary to perform PMCS more frequently.

(3) The PMCS items have been arranged and numbered in a logical sequence to provide for greater efficiency and the least amount of downtime required for maintenance

b. PMCS columnar entries.

(1) Item Number Column. Checks and services are numbered in chronological order regardless of interval. This column is used as a source of item numbers for the "Item Number" column on DA Form 2404, Equipment Inspection and Maintenance Worksheet, in recording results of PMCS

(2) Interval Column. The interval columns tell you when to do a certain check or service: before, during, or after operation. Sometimes a dot may be placed in more than one interval column which would mean you should do the check or service at each of those intervals

(3) Item to Be Inspected Column. This column lists the common name of the item to be Inspected such as "Air Filters."

(4) Procedures Column. This column tells you how to do the required checks and services. Carefully follow these instructions.

(5) Equipment is Not Ready/Available if Column. This column tells you when and why your equipment cannot be used.

NOTE

The terms "Ready/Available" and "Mission Capable" refer to the same status: equipment Is on hand and Is able to perform Its combat missions. (See DA PAM 738-750).

(6) Increased Inspections. Perform weekly as well as Before Operations PMCS if-

(a) You are the assigned operator and have not operated the item since the last weekly PMCS

(b) You are operating the item for the first time.

(7) Leakage definitions. In checking for fluid leaks, the following leakage definitions apply to all ROWPU barges and barge equipment, product water, and seawater leakage by class type.

(a) Class I - Seepage of fluid (as indicated by wetness or discoloration) not great enough to form drops.
(b) Class II - Leakage of fluid great enough to form drops, but not enough to cause drops to drip from the item being checked/inspected.
(c) Class III - Leakage of fluid great enough to form drops that fall from the item being checked/inspected

CAUTION

Equipment operation is allowable with minor leakages (Class I or II). However, the fluid level or operating pressure of the Item being checked/inspected must be considered. When in doubt, notify the shift leader or bargemaster.

When operating with Class I or Class II leaks, continue to check fluid levels as required by PMCS and operating instructions.

(8) The following fuel and hazardous material leakage procedures apply for any fuel, chemical, or bilge system.

WARNING

Class I, II or III leaks or seepage occurring in a fuel, chemical, or bilge container, tank, line, piping, or valve can cause fire or health hazards.

(a) If any leaks or seepage from a fuel, chemical, or bilge container, tank, or fluid line is detected, it must be immediately reported to the shift leader or bargemaster for corrective action.

(b) To prevent combustible or toxic fumes from collecting or contaminated material from spilling, exercise extreme caution after detecting leaks or seepage of flammable or hazardous material.

c. Continuous operation. When equipment must be kept in continuous operation for extended periods of time, check and service only those items that can be checked and serviced without disturbing operations. Perform complete checks and services when the equipment can be shut down.

d. Maintenance log. Always record the time and date of PMCS, any deficiencies noted, and corrective action taken in the PMCS log book

C-2 Major components for these systems can be found in Chapter 1.

C-3 Systems description

C-3.1 Deckhouse ventilation system description. The deckhouse is provided with fresh air articulation by manually operated hatches and electrically driven fans. Fresh air is supplied by opening 17 louvered hatches, 10 port and 7 starboard. (Doors may also be opened.) Air circulation is increased by using six exhaust fans on the deckhouse top . These are controlled by circuit breakers on power panel 2 and motor controllers on port and starboard bulkheads in the Reverse Osmosis Water Purification Unit (ROWPU) space. Fan motors and louvered hatches can be used in different combinations to control air movement. The deckhouse ventilation system also includes electrical wiring, controls, and an electrical emergency shutoff.

C-3.2 Voids ventilation system description. The void areas are provided with forced fresh air ventilation by electrically driven fans. Two fans mounted high on deckhouse port and starboard bulkheads provide ventilation to eight void areas; void 1 In bow, voids 2 port and starboard, voids 3 port and starboard, voids 4 port and starboard, and void 5 in stem. In addition, two fans mounted In ducting at rear of ROWPU space exhaust hot air from voids 4, which contain three diesel generators. Two louvered hatches with covers and ducting provide fresh air Intake from the stem weatherdeck into voids 4 - one in port and the other In starboard. The voids ventilation system also includes air ducts, electrical wiring, controls, and both mechanical and electrical emergency shutoffs.

C-3.3 Heating and air conditioning system. The dayroom and workshop are provided with heated and cooled air from a HAC unit on the forward bulkhead in the workshop . This unit forces either heated or cooled air through overhead ductwork into the workshop and dayroom. Bulkheads In both rooms are well Insulated so that a reasonable temperature is maintained. The control to select either heating or air conditioning (AC) is on upper right side of box containing heating element above the AC unit. The AC controls are on front of the unit. The heating unit, located in ductwork above the AC unit, uses an electrically powered element. Both heating and AC use the blower fan In the AC unit to move air into the dayroom and workshop The thermostat for the heating portion of this system Is on the port bulkhead in dayroom near the refrigerator receptacle Both dayroom and workshop are also equipped with a mushroom-style, nonpowered ventilator in the deckhouse top

The AC unit's water cooling condenser is provided seawater from one of two sources. If seawater pumps In void 2 starboard are operating, and the proper valves open, they provide seawater for cooling the AC condenser and for cooling the chlorination unit. When these pumps are not operating, seawater for cooling is provided by an AC cooling water pump. This pump draws seawater from the forward seachest through a set of AC seawater strainers in void 2 port and provides water for cooling both the AC unit and the chlorination unit For details, see TM 55-1930-209-14&P-2, Seawater Systems.

Table C-1. Preventive Maintenance Checks and Services for Ventilation, Heating and Air Conditioning System (Continued)

B - Before
D - During
A - After

D - Daily
W - Weekly
M - Monthly

Q - Quarterly
S - Semiannually
A - Annually

ITEM NO.	INTERVAL B	D	A	D	W	M	Q	S	A	ITEM TO BE INSPECTED	PROCEDURES CHECK FOR AND HAVE REPAIRED OR ADJUSTED AS NECESSARY	EQUIPMENT IS NOT READY/ AVAILABLE IF
										DECKHOUSE VENTILATION SYSTEM	NOTE If the deckhouse ventilation system equipment falls to operate, troubleshoot according to TM 55-1930-209-14&P-16. Report deficiencies and failures to the shift leader or bargemaster. Use proper forms to describe maintenance or repair problems. Keep ventilation, heating, and air conditioning system operations and PMCS logs current	
1	I					I				Hatches	a. Make sure hatch covers that are In open position are secured with cotter pins and cotter keys.	
		I				I					b Check for damage to watertight hatches and light-proof louvers. Rep air as necessary	Hatches leak

Table C-1. Preventive Maintenance Checks and Services for Ventilation, Heating and Air Conditioning System (Continued)

B - Before
D - During
A - After

D - Daily
W - Weekly
M - Monthly

Q - Quarterly
S - Semiannually
A - Annually

ITEM NO.	INTERVAL B	D	A	D	W	M	Q	S	A	ITEM TO BE INSPECTED	PROCEDURES CHECK FOR AND HAVE REPAIRED OR ADJUSTED AS NECESSARY	EQUIPMENT IS NOT READY/ AVAILABLE IF
			I			I					c .Check for rust, corrosion, and worn or chipped paint Remove by wire brushing. chipping or scraping. Immediately paint cleaned area with zinc chromate paint and finish to match surrounding area In accordance with TB 43- 0144 **WARNING** **Always make sure that electrical power is OFF before performing any maintenance on electrical systems. Red tag appropriate switches and circuit breakers with: "WARNING DO NOT ACTIVATE.** REPAIRS BEING MADE." Observe all safety precautions listed at the beginning of this manual.	
2	I		I							Air Ducts	a. Make sure that air ducts are free of obstructions, dents, and other damage	Air ducts obstructed or damaged
	I		I			I					b. Check for rust, corrosion, and worn or chipped paint. Remove by wire brushing, chipping, or scraping. Immediately paint cleaned area with zinc chromate paint and finish to match surrounding area in accordance with TB 43-0144 Do not paint threads or labels.	
	I		I								c. Check for loose or missing fasteners and securements Tighten or replace as necessary.	
3										Fans and Motors	**WARNING** **Always make sure that electrical power is OFF before performing any maintenance on electrical systems. Redtag appropriate switches and circuit breakers with: "WARNING DO NOT ACTIVATE. REPAIRS BEING MADE." Observe all safety precautions listed at the beginning of this manual.**	
	I		I		I						a. Visually inspect fans and motors for damage.	Fans or motors damaged.
	I		I		I						b. Check fan blades for sufficient clearance and cleanliness	Fan blades do not have
	I		I		I						c. Check that electrical connections are tight. Tighten or repair as necessary using insulated tools	sufficient clearance.

Table C-1. Preventive Maintenance Checks and Services for Ventilation, Heating and Air Conditioning System (Continued)

B - Before
D - During
A - After

D - Daily
W - Weekly
M - Monthly

Q - Quarterly
S - Semiannually
A - Annually

ITEM NO.	INTERVAL B	D	A	D	W	M	Q	S	A	ITEM TO BE INSPECTED	PROCEDURES CHECK FOR AND HAVE REPAIRED OR ADJUSTED AS NECESSARY	EQUIPMENT IS NOT READY/ AVAILABLE IF
		I									d. Listen for and check any fan or motor which indicates a motor overload condition or unusual vibraton which could result In or be caused by loose mount-qings, bad bearings, broken impeller blades, or a broken housing Shutdown and notify shift leader for repair or replacement	
			I								e Visually check deckhouse roof fans for corrosion or damage. Repair as necessary	
			I		I						f. Check all fans and motors for rust and corrosion Remove with wire brush and paint as necessary in accordance with TB 43-0144 Do not paint threads or labels	
										VOIDS VENTILATION SYSTEM	**NOTE** **If the voids ventilation system equipment fails to operate, troubleshoot according to TM 55-1930-209-14&P-1 6. Report deficien-cies and failures to the shift leader or bargemaster. Use proper forms to describe maintenance or repair problems. Keep ven-tilation, heating, and air conditioning sys-tem operations and PMCS logs current.**	
1	I									Hatches	a Make sure hatch covers that are In open position are secured with cotter pins and cotter keys	
			I								b Check for damage to watertight hatches and light-proof louvers. Repair as neces-sary	Hatches are damaged or leak
			I								c. Check for rust, corrosion, and worn or chipped paint. Remove by wire brushing, chipping or scraping Immediately paint cleaned area with zinc chromate paint and finish to match surrounding area in accordance with TB 430144	
2	I		I							Air Ducts	**WARNING** **Always make sure that electrical power Is OFF before performing any maintenance on electrical systems. Redtag appropriate switches and circuit breakers with: "WARNING - DO NOT ACTIVATE. REPAIRS BEING MADE." Observe all safety precau-tions listed at the beginning of this manual.**	

Table C-1. Preventive Maintenance Checks and Services for Ventilation, Heating and Air Conditioning System (Continued)

B - Before
D - During
A - After

D - Daily
W - Weekly
M - Monthly

Q - Quarterly
S - Semiannually
A - Annually

ITEM NO.	INTERVAL B	D	A	D	W	M	Q	S	A	ITEM TO BE INSPECTED	PROCEDURES CHECK FOR AND HAVE REPAIRED OR ADJUSTED AS NECESSARY	EQUIPMENT IS NOT READY/ AVAILABLE IF
											a Make sure that air ducts are free of obstructions, dents, and other damage obstructed	Air ducts are damaged or
	I		I								b Check for rust, corrosion, and worn or chipped paint Remove by wire brushing, chipping, or scraping Immediately paint cleaned area in accordance with TB 43-0144 Do not paint threads or labels	
	I		I								c Check for loose or missing fasteners and securements Tighten or replace as necessary	
3										Fans and Motors	**WARNING** **Always make sure that electrical power is OFF before performing any maintenance on electrical systems. Redtag appropriate switches and circuit breakers with: "WARNING - DO NOT ACTIVATE. REPAIRS BEING MADE." Observe all safety precautions listed at the beginning of this manual.**	
	I										a Visually inspect fans and motors for damage	Fans or motors damaged
	I										b Check fan blades for sufficient cleanliness and clearance Clean as necessary	Fan blades do not have enough clearance
	I										c Check that electrical connections are tight Tighten or repair as necessary using insulated tools	
		I									d Listen for and check any fan or motor which indicates a motor overload conditon or unusual vibration which could result in or be caused by bad bearings, broken Impeller blades, or housing shutdown and notify shift leader for repair or replacement	
			I								e Visually check deckhouse roof fans for corrosion or damage Repair as necessary	
			I								f Check all fans and motors for rust and corrosion Remove with wire brush and paint as necessary in accordance with TB 43-0144 Do not paint threads or labels	

Table C-1. Preventive Maintenance Checks and Services for Ventilation, Heating and Air Conditioning System (Continued)

B - Before	**D - Daily**	**Q - Quarterly**
D - During	**W - Weekly**	**S - Semiannually**
A - After	**M - Monthly**	**A - Annually**

ITEM NO.	INTERVAL B	D	A	D	W	M	Q	S	A	ITEM TO BE INSPECTED	PROCEDURES CHECK FOR AND HAVE REPAIRED OR ADJUSTED AS NECESSARY	EQUIPMENT IS NOT READY/ AVAILABLE IF
										HEATING AND AIR CONDITIONING (HAC) SYSTEM	WARNING Make sure electrical components and circuits are turned OFF before starting any Inspection and/or cleaning. Observe safety precautions specified in this manual.	
											a. Make sure that air outlets and ventilators are free of obstruction and not damaged	Air outlets and ventilators are damaged or obstructed
											b. Inspect HAC system operating controls for damage. Notify shift leader of deficencies	Controls not operable
											c Check HAC cooling and heating systems for proper operation. Notify shift leader of deficiencies	
											d. On barge 1 only, check each activated forced air heater for proper operation Check fuses and replace as necessary	Fuses blown
											e On barge 1 only, check that air flow from activated forced air heater is unobstructed Clear area around heater of any material which could be a fire or safety hazard	
											f Check drain for condensation or leaks. Notify shift leader of class III leaks	Class Ill leaks

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
06890

DISTRIBUTION
To be distributed in accordance with DA Form 12-25E, qty rqr block no. 3645, requirements for TM 55-1930-209-14&P-1 6.

*U S. GOVERNMENT PRINTING OFFICE 1994-555-121/80084

* U S. GOVERNMENT PRINTING OFFICE 1992-756-030

RECOMMENDED CHANGES TO EQUIPMENT TECHNICAL PUBLICATIONS

THEN...JOT DOWN THE DOPE ABOUT IT ON THIS FORM. CAREFULLY TEAR IT OUT, FOLD IT AND DROP IT IN THE MAIL.

SOMETHING WRONG WITH PUBLICATION

FROM: (PRINT YOUR UNIT'S COMPLETE ADDRESS)

DATE SENT

PUBLICATION NUMBER	PUBLICATION DATE	PUBLICATION TITLE

BE EXACT PIN-POINT WHERE IT IS

PAGE NO.	PARA-GRAPH	FIGURE NO.	TABLE NO.

IN THIS SPACE, TELL WHAT IS WRONG AND WHAT SHOULD BE DONE ABOUT IT.

PRINTED NAME, GRADE OR TITLE AND TELEPHONE NUMBER	SIGN HERE

DA FORM 1 JUL 79 2028-2

PREVIOUS EDITIONS ARE OBSOLETE.

P.S.--IF YOUR OUTFIT WANTS TO KNOW ABOUT YOUR RECOMMENDATION MAKE A CARBON COPY OF THIS AND GIVE IT TO YOUR HEADQUARTERS.

The Metric System and Equivalents

Linear Measure

1 centimeter = 10 millimeters = .39 inch
1 decimeter = 10 centimeters = 3.94 inches
1 meter = 10 decimeters = 39.37 inches
1 dekameter = 10 meters = 32.8 feet
1 hectometer = 10 dekameters = 328.08 feet
1 kilometer = 10 hectometers = 3,280.8 feet

Weights

1 centigram = 10 milligrams = .15 grain
1 decigram = 10 centigrams = 1.54 grains
feet
1 gram = 10 decigram = .035 ounce
1 decagram = 10 grams = .35 ounce
acres
1 hectogram = 10 decagrams = 3.52 ounces
1 kilogram = 10 hectograms = 2.2 pounds
1 quintal = 100 kilograms = 220.46 pounds
1 metric ton = 10 quintals = 1.1 short tons

Liquid Measure

1 centiliter = 10 milliters = .34 fl. ounce
1 deciliter = 10 centiliters = 3.38 fl. ounces
1 liter = 10 deciliters = 33.81 fl. ounces
1 dekaliter = 10 liters = 2.64 gallons
1 hectoliter = 10 dekaliters = 26.42 gallons
1 kiloliter = 10 hectoliters = 264.18 gallons

Square Measure

1 sq. centimeter = 100 sq. millimeters = .155 sq. inch
1 sq. decimeter = 100 sq. centimeters = 15.5 sq. inches
1 sq. meter (centare) = 100 sq. decimeters = 10.76 sq.

1 sq. dekameter (are) = 100 sq. meters = 1,076.4 sq. feet
1 sq. hectometer (hectare) = 100 sq. dekameters = 2.47

1 sq. kilometer = 100 sq. hectometers = .386 sq. mile

Cubic Measure

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

Approximate Conversion Factors

To change	*To*	*Multiply by*	*To change*	*To*	*Multiply by*
inches	centimeters	2.540	ounce-inches	Newton-meters	.007062
feet	meters	.305	centimeters	inches	.394
yards	meters	.914	meters	feet	3.280
miles	kilometers	1.609	meters	yards	1.094
square inches	square centimeters	6.451	kilometers	miles	.621
square feet	square meters	.093	square centimeters	square inches	.155
square yards	square meters	.836	square meters	square feet	10.764
square miles	square kilometers	2.590	square meters	square yards	1.196
acres	square hectometers	.405	square kilometers	square miles	.386
cubic feet	cubic meters	.028	square hectometers	acres	2.471
cubic yards	cubic meters	.765	cubic meters	cubic feet	35.315
fluid ounces	milliliters	29,573	cubic meters	cubic yards	1.308
pints	liters	.473	milliliters	fluid ounces	.034
quarts	liters	.946	liters	pints	2.113
gallons	liters	3.785	liters	quarts	1.057
ounces	grams	28.349	liters	gallons	.264
pounds	kilograms	.454	grams	ounces	.035
short tons	metric tons	.907	kilograms	pounds	2.205
pound-feet	Newton-meters	1.356	metric tons	short tons	1.102
pound-inches	Newton-meters	.11296			

Temperature (Exact)

°F	Fahrenheit temperature	5/9 (after subtracting 32)	Celsius temperature	°C

PIN: 065367-000