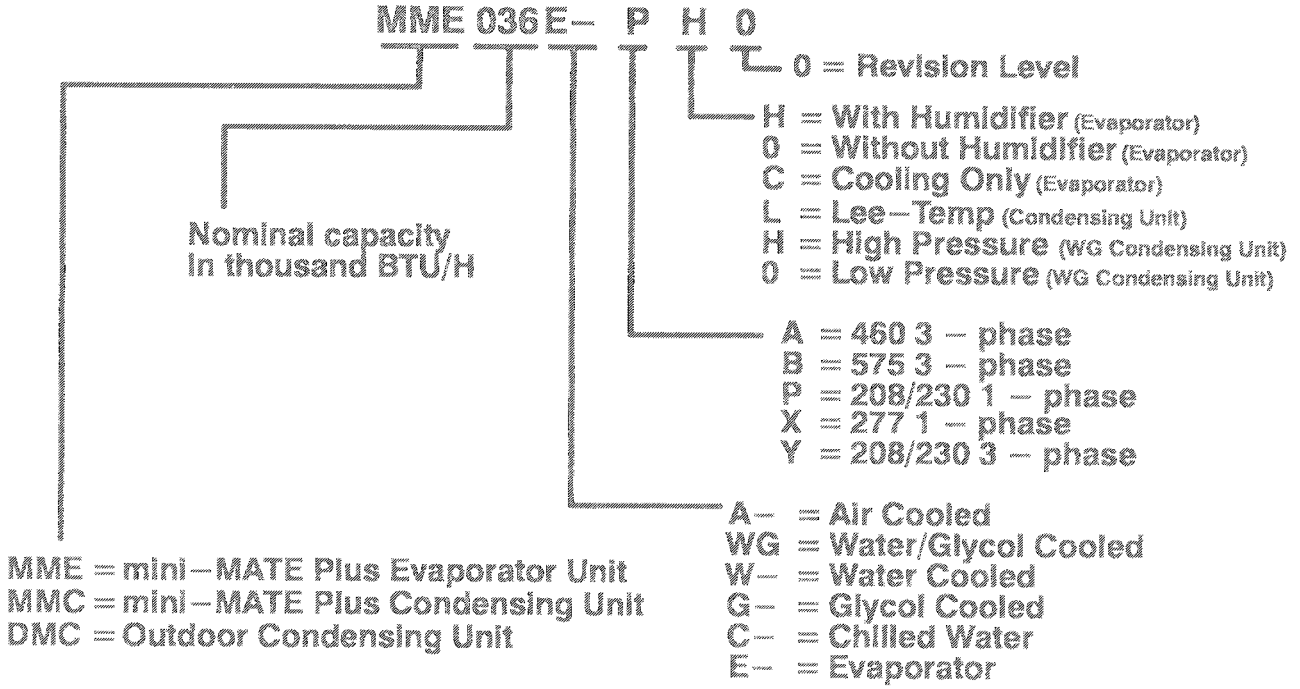
Liebert®
Keeping Business in Business™

MiniMate Plus
Key Pad Control
REV -1

MODEL NUMBER DESIGNATIONS



SYSTEM CONFIGURATIONS

		CONDENSING UNIT			
NOMINAL CAPACITY	EVAPORATOR UNIT	AIR COOLED CENTRIFUGAL FAN	AIR COOLED PROPELLER FAN	REMOTE WATER COOLED	REMOTE GLYCOL COOLED
2 TONS	MME024E	MMC024A	DMC027A	MMC026W	MMC023G
3 TONS	MME036E	MMC036A	DMC037A	MMC038W	MMC035G
	MME040C	Self Contained – Chilled Water			
5 TONS	MME060E	MMC065A	DMC067A	MMC069WG	
	MME092C	Self Contained – Chilled Water			

Table of Contents

Table of Contents (continued)

Figures

Section 1. INTRODUCTION

1.1. PRODUCT DESCRIPTION AND FEATURES

The mini–MATE Plus is a temperature/humidity control system with a nominal rating of 2, 3, or 5 tons. Actual capacity, in BTU/H, will depend on selected options. It is designed to be ducted for cooling an entire room, and mounts conveniently above the ceiling. The unit is available in Air, Water/Glycol, or Chilled Water models. The system may also include an optional humidifier package.

The mini–MATE Plus system includes two stages of cooling and one stage of heating, for temperature control. The humidity control uses one stage to dehumidify and an optional stage to humidify. The system controller automatically switches over to the required function (cool/heat, dehumidify/humidify) based on programmed setpoints and room conditions.

1.1.1. CONTROLS

The mini–MATE Plus system includes a wall–mounted control panel that contains a microcontroller. The control panel includes a liquid crystal display (LCD) screen and a membrane key pad with 8 selector switches. The display indicates temperature, humidity, system operating status, setpoints, and alarms. Use the selector switches (pads) to operate the system by adjusting control setpoints for cool/heat, dehumidify/humidify, and alarm setpoints. A separate User's Guide for the controls is provided with each system.

All control setpoints and alarm setpoints are programmable. The temperature can be displayed in degrees F or degrees C. The microprocessor can retain a programmed schedule of two control changes per day for the entire 7 day week. The program is stored in non–volatile memory, so it will not be lost during a power failure.

1.1.2. EVAPORATOR COMPONENTS AND AIR DISTRIBUTION SYSTEM

All mini–MATE Plus evaporator sections include the evaporator coil, thermostatic expansion valve, and blower. The reheat assembly and steam generating humidifier are available as options. The evaporator unit requires a power source and a power disconnect switch. Power options and requirements are shown on pages 6 and 7.

The evaporator coil is constructed of copper tubes and aluminum fins, and is designed for the high sensible heat ratio required for computer equipment. Room air circulation is accomplished by a double inlet, direct drive centrifugal blower that has been dynamically balanced. The blower motor has self–aligning bearings and lifetime lubrication. Two air delivery rates (high and low) are specified for each unit. The system pulls room air through a field supplied return duct and grille system, and delivers conditioned air to a field supplied discharge duct and grille system. Replaceable filter(s) are accessible from each unit filter box mounted in the return air duct system. An optional air distribution plenum (including filter) is available for 2 and 3 ton units.

1.1.3. CONDENSING COMPONENTS

The condensing unit is connected to the evaporator unit by two refrigerant lines and a low voltage control cable. The condensing unit requires a power source and a separate power disconnect switch. A single point power kit is available for close coupled 5 ton units. Power options and requirements are on pages 6 and 7.

Air Cooled Models

The 2 and 3 ton indoor Air Cooled units include the following components: hermetic compressor with crankcase heater, high pressure switch, condenser coil, sight glass, and filter/drier. Pressure is regulated by the fan speed controller (FSC) which automatically adjusts the centrifugal blower speed as required. All outdoor Air Cooled condensing units and the 5 ton indoor unit include the following components: hermetic compressor with crank case heater, high pressure switch, condenser coil, sight glass, filter/drier, propeller fan, and Lee–Temp flood back head pressure control.

Water/Glycol Cooled Model

The Water/Glycol Cooled condensing units include the following components: hermetic compressor with crankcase heater, high pressure switch, coaxial condenser, 2-way regulating valve, sight glass, and filter/drier. The Water/Glycol Cooled condensing unit is designed to operate with city water, cooling tower systems, or drycooler systems. Drycooler and pumps are selected separately.

Chilled Water Model

The Chilled Water model is designed for use with an existing chilled water loop. It contains a chilled water coil and an on/off valve to control the flow of chilled water.

1.2. OPTIONAL EQUIPMENT

1.2.1. HUMIDIFIER

The optional steam generating humidifier is factory installed and tested. It adds pure water vapor to the room air to maintain humidity within levels recommended for computer equipment. Humidifier capacity is 4.5 lbs/hr in 2 and 3 ton units, 10 lbs/hr in 5 ton units. The humidifier components include the steam canister with automatic flushing circuit, strainer, inlet, drain, solenoid valves, and copper discharge tube.

1.2.2. FILTER BOX

If the unit is to be connected to a duct system, a filter box is used that includes a box with flange connections, filter(s), and a duct flange that attaches to the return air opening of the unit.

1.2.3. CONDENSATE PUMP KIT

A condensate pump is required when the evaporator is installed below the level of the gravity-fed drain line. Components include the pump, check valve, sump, level sensor, float switch, and controls. The pump is automatically controlled by the water level in the sump. The condensate pump kit is field mounted to the evaporator housing or to ductwork.

1.2.4. 277 VOLT TRANSFORMER

For 2 and 3 ton condensing units using 277 VAC, single phase power, a field-installed transformer (37.5 amp) is required.

1.2.5. SINGLE POINT POWER KIT

A Single Point Power Kit allows the connection of a system (evaporator and condensing unit) to a single power source when the units are close coupled. This option is available on 5 ton (three phase) units only. The kit includes a junction box with fuse block, evaporator and condenser wiring, and fuses.

1.2.6. REFRIGERANT LINE SWEAT ADAPTER KIT

This kit includes the compatible fittings required (two for the insulated suction line and two for the liquid line) when using field supplied interconnecting refrigerant lines, instead of the pre-charged line sets.

1.2.7. PRE-CHARGED REFRIGERANT LINE SETS

Pre-charged refrigerant line sets are available in 15 and 30 foot lengths for 2 and 3 ton systems. They are factory-charged and sealed and used to connect the evaporator to the condensing units of remote Water, Glycol, and Air Cooled systems. Each set includes an insulated copper suction line and a copper liquid line.

1.2.8. AIR DISCHARGE PLENUM

A molded plastic 4-way air discharge plenum attaches to the evaporator and eliminates the need for ductwork in 2 and 3 ton systems. The plenum protrudes through a suspended ceiling directing the conditioned air throughout the room. The plenum includes a filter and sheet-metal block-off plates for covering the duct openings of the evaporator.

1.2.9. REMOTE MONITORING AND CONTROL

Liebert can provide a variety of remote monitoring and control devices to enhance your mini-MATE Plus system. These include water detection, remote monitoring of a single unit, remote control of multiple units, and remote monitoring and control of a complete building system, including security access control.

Section 2. SITE PREPARATION AND INSTALLATION

2.1. INSTALLATION CONSIDERATIONS

The evaporator unit is usually mounted above the suspended ceiling in the space to be conditioned. Ducted systems may be located in a different room. The location of the condensing unit (if required) will depend on the coolant used at your site. Refer to Figures 1 and 2 for possible configurations. The condensing unit may be:

- air cooled centrifugal fan mounted remotely or close coupled in the ceiling
- air cooled propeller fan mounted outdoors
- water/glycol cooled mounted remotely or close coupled in the ceiling

All evaporator units require a power source with disconnect switch, and a drain line. Models with the optional humidifier require a water supply line.

Required connections between the evaporator and condensing unit are the two refrigerant lines and a two wire control cable. A single point power kit is available for 5 ton close coupled installations. The outdoor propeller fan condensing units and indoor 2 and 3 ton condensing units also require a separate power source and disconnect switch. Water cooled, glycol cooled, and chilled water condensing units require piping to their cooling loops.

FOLLOW ALL UNIT DIMENSIONAL DRAWINGS CAREFULLY. DETERMINE WHETHER ANY BUILDING ALTERATIONS ARE REQUIRED TO RUN PIPING, WIRING, AND DUCTWORK. ALSO REFER TO THE SUBMITTAL ENGINEERING DIMENSIONAL DRAWINGS OF INDIVIDUAL UNITS FOR CLEARANCES.

APPLICATION LIMITS

INPUT VOLTAGE		DRY BULB AIR TEMPERATURE AT CONDENSER		
MIN	MAX	MIN		MAX
-10%	+10%	-20°F (units with fan speed control)	-30°F (units with Lee-Temp receiver)	115°F

2.1.1. COMPUTER ROOM PREPARATION

The room should be well insulated and must have a sealed vapor barrier. The vapor barrier in the ceiling and walls can be a polyethylene film. Paint on concrete walls and floors should contain either rubber or plastic. **The vapor barrier is the single most important requirement for maintaining environmental control in the conditioned room.**

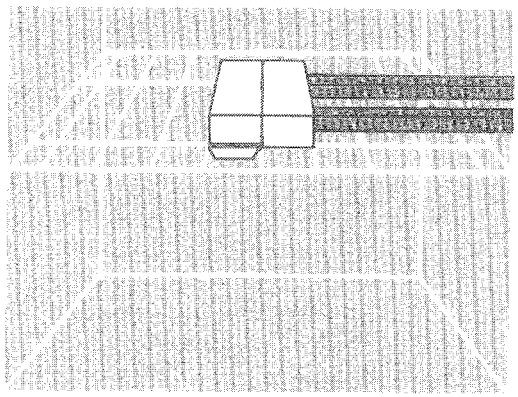
Outside or fresh air should be kept to a minimum. Outside air adds to the cooling, heating, dehumidifying, and humidifying loads of the site. The volume of outside air should be kept below 5% of the total air volume circulated in the computer room. Doors should be properly sealed to minimize leaks and should not contain ventilation grilles.

2.1.2. LOCATION CONSIDERATIONS

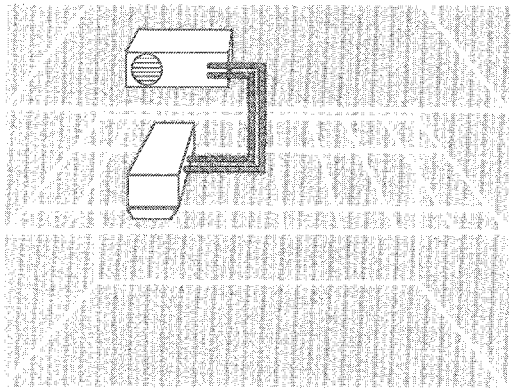
Locate the evaporator unit over an unobstructed floor space if possible. This will allow easy access for routine maintenance or service. Do not attach additional devices (such as smoke detectors, etc.) to the housing, as they would interfere with maintenance or service. Install the power disconnect switch and control panel in convenient locations.

When selecting a location for the condensing unit, consider distance between units, fan air flow and noise, and access for maintenance. Install the power disconnect switch in a convenient location.

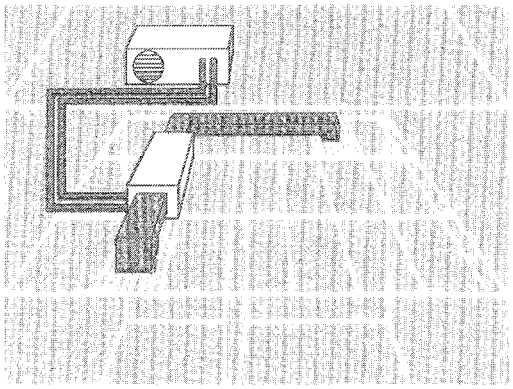
When using the optional air distribution plenum, avoid locating the evaporator unit in confined areas that affect the air flow pattern. Such locations could cause short cooling cycles, down drafts, and air noise. Avoid locating the unit in an alcove or at the extreme end of a long, narrow room. Avoid installing multiple units close to each other. This could result in crossing air patterns, uneven loads, and competing operating modes.



Air Cooled, with Indoor Centrifugal Fan Condensing Unit (shown close coupled, with optional plenum*)



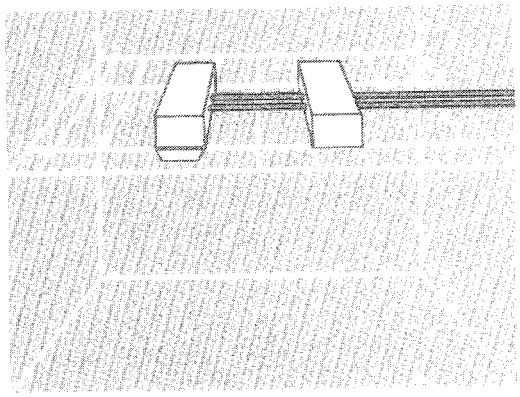
Air Cooled, Outdoor Propeller Fan Condensing Unit (shown with optional plenum*)



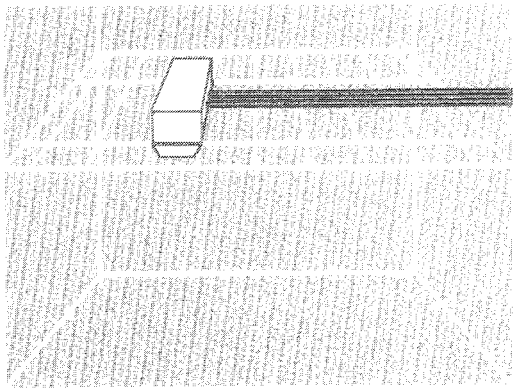
Air Cooled, Outdoor Propeller Fan Condensing Unit (shown with ducting)

* Optional plenum is available for 2 and 3 ton evaporator units.

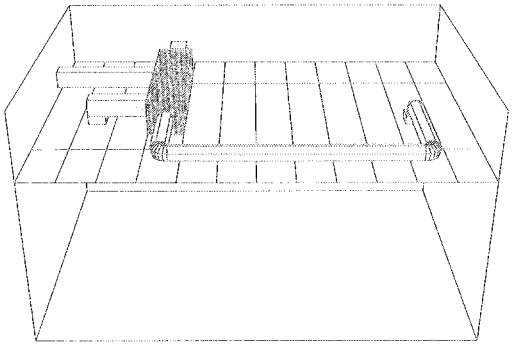
Figure 1. mini-MATE Plus Configurations (air cooled)



Water/Glycol Cooled (shown with optional plenum*, and with condensing unit remotely located)



Chilled Water, self–contained (shown with optional plenum*)



5–ton close coupled (air cooled)

* Optional plenum is available for 2 and 3 ton evaporator units.

Figure 2. mini–MATE Plus Configurations (water, glycol, chilled water, and 5–ton close coupled)

2.2. SYSTEM DATA

2 AND 3 TON ELECTRIC DATA

FLA = Full Load Amps
WSA = Wire Size Amps (minimum supply circuit current capacity)
OPD = Over Current Protection Device amperage rating (fuse, circuit breaker)

ELECTRICAL DATA

Evaporator Section 208/230v, 1ϕ, 60 Hz		
Nominal Tons	2	3
	MME024E	MME036E
COOLING ONLY		
FLA	2.6	2.6
WSA	3.3	3.3
OPD	15	15
WITH REHEAT		
FLA	21.4	27.6
WSA	26.8	34.5
OPD	30	40
WITH REHEAT AND HUMIDIFIER		
FLA	26.9	33.1
WSA	32.3	40.0
OPD	40	40
Evaporator Section 277v, 1ϕ, 60 Hz		
COOLING ONLY		
FLA	2.3	2.3
WSA	2.9	2.9
OPD	15	15
WITH REHEAT		
FLA	18.5	24.0
WSA	23.1	30.0
OPD	30	30
WITH REHEAT AND HUMIDIFIER		
FLA	24.0	29.5
WSA	28.6	35.5
OPD	30	40

Chilled Water 1ϕ, 60 Hz		
	208/230V	277V
	MME040C	MME040C
COOLING ONLY		
FLA	2.6	2.3
WSA	3.3	2.9
OPD	15	15
WITH REHEAT		
FLA	27.6	24.0
WSA	34.5	30.0
OPD	40	30
WITH REHEAT AND HUMIDIFIER		
FLA	33.1	29.5
WSA	40.0	35.5
OPD	40	40

ELECTRICAL DATA

Centrifugal Fan Condensing Unit 208/230v, 60 Hz			
	MMC024A	MMC036A	
	1ϕ	1ϕ	3ϕ
FLA	13.5	22.9	15.6
WSA	16.8	28.6	19.4
OPD	20	35	25
With Buck Transformer 277 to 230v, 1ϕ, 60 Hz			
FLA	11.2	19.0	
WSA	14.0	23.7	
OPD	20	30	

Propeller Fan Condensing Unit 208/230v, 60 Hz			
	DMC027A	DMC037A	
	1ϕ	1ϕ	3ϕ
FLA	14.1	17.0	12.3
WSA	17.3	20.9	15.0
OPD	25	35	25

Water/Glycol Condensing Unit 208/230v, 60 Hz			
	MMC026W	MMC038W	
	MMC023G	MMC035G	
	1ϕ	1ϕ	3ϕ
FLA	11.5	19.9	12.5
WSA	14.4	24.9	15.6
OPD	20	30	20
With Buck Tansformer 277/230v, 1ϕ 60 Hz			
FLA	9.5	16.5	
WSA	11.9	20.6	
OPD	15	25	

UNIT NET WEIGHTS

Evaporator Section	lbs	(kg)
MME024E	190	(86)
MME036E	195	(88)
MME040C (Chilled Water)	195	(88)
Centrifugal Fan Condensing Unit		
MMC024A	250	(113)
MMC036A	260	(118)
Propeller Fan Condensing Unit		
DMC027A	180	(82)
DMC037A	220	(100)
Water Cooled Condensing Unit		
MMC026W	190	(86)
MMC038W	205	(93)
Glycol Cooled Condensing Unit		
MMC023G	190	(86)
MMC035G	205	(93)

5 TON ELECTRICAL DATA

FLA = Full Load Amps
WSA = Wire Size Amps (minimum supply circuit current capacity)
OPD = Over Current Protection Device amperage rating (fuse or circuit breaker)

ELECTRICAL DATA

Evaporator Section 3ϕ, 60 Hz		
	MME060E and MME092C	
	208/230V	460V
COOLING ONLY		
FLA	6.6	3.3
WSA	8.3	4.1
OPD	25	15
WITH REHEAT		
FLA	30.7	15.3
WSA	38.3	19.2
OPD	50	25
WITH REHEAT AND HUMIDIFIER		
FLA	42.7	21.3
WSA	50.3	25.2
OPD	60	30

Close Coupled Systems–One Power Supply 3ϕ, 60 Hz		
	MME060E with MMC065A	
	208/230V	460V
COOLING ONLY		
FLA	35.5	16.3
WSA	40.9	18.7
OPD	60	25
WITH REHEAT		
FLA	59.5	28.3
WSA	70.9	33.7
OPD	80	40
WITH REHEAT AND HUMIDIFIER		
FLA	59.5	28.3
WSA	70.9	33.7
OPD	80	40

Close Coupled Systems–One Power Supply 3ϕ, 60 Hz		
	MME060E with MMC069WG	
	208/230V	460V
COOLING ONLY		
FLA	28.0	12.9
WSA	33.4	15.3
OPD	50	20
WITH REHEAT		
FLA	52.1	24.9
WSA	63.4	30.3
OPD	70	35
WITH REHEAT AND HUMIDIFIER		
FLA	52.1	24.9
WSA	63.4	30.3
OPD	70	35

ELECTRICAL DATA

Centrifugal Fan Condensing Unit			
	MMC065A, 3ϕ, 60 Hz		
	208/230V	460V	575V
FLA	28.0	12.9	10.8
WSA	33.4	15.3	12.8
OPD	50	20	20
Propeller Fan Condensing Unit			
	DMC067A, 3ϕ, 60 Hz		
	208/230V	460V	575V
FLA	24.2	11.0	9.1
WSA	29.6	13.4	11.1
OPD	50	20	15

UNIT NET WEIGHTS

Evaporator Section	lbs	(kg)
MME060E	260	(118)
MME092C (Chilled Water)	260	(118)
Centrifugal Fan Condensing Unit		
MMC065A	380	(172)
Propeller Fan Condensing Unit		
DMC067A	320	(145)
Water/Glycol Condensing Unit		
MMC069WG	215	(97)

2.3. EQUIPMENT INSPECTION (UPON RECEIPT)

When the unit arrives, inspect all items for any visible damage. DO NOT ACCEPT A DAMAGED UNIT FROM THE SHIPPER!

If possible, do not uncrate equipment until it is close to its final location. All required assemblies are banded and shipped in corrugated containers. If you discover any damage when you uncrate the unit, report it to the shipper immediately. If you later find any concealed damage, report it to the shipper and to your Liebert supplier.

2.4. INSTALLING THE CEILING UNITS

The evaporator unit and condensing unit are mounted above the ceiling and must be securely mounted to the roof structure. Use threaded suspension rods (SAE Grade 1 minimum) and 4 lock-nuts (⅜" – 16).

Recommended clearance between ceiling grids and structural members is unit height plus 3 inches.

Install the 4 field-supplied rods by suspending them from a suitable ceiling support. Locate the rods so that they mate with the 4 outside corner rigging holes.

Attach hanging brackets to the threaded rods with the supplied nuts and grommets. Hanging brackets are shipped inside the units. The rubber grommets provide vibration isolation. The ceiling and ceiling supports of existing buildings may require reinforcements. Be sure to follow all applicable codes.

BE SURE THE SUPPORTING ROOF STRUCTURE IS CAPABLE OF SUPPORTING THE WEIGHT OF THE UNIT(S) AND THE ACCESSORIES.

BE SURE TO SECURELY ANCHOR THE TOP ENDS OF THE SUSPENSION RODS. MAKE SURE ALL NUTS ARE TIGHT.

DO NOT INSTALL UNITS DIRECTLY ABOVE COMPUTER EQUIPMENT. INSTALL A SAFETY PAN, WITH DRAIN LINE, UNDER WATER/GLYCOL CONDENSING UNITS.

2.4.1. LIFTING THE UNITS INTO PLACE

Be sure to read the directions for installing each type of unit before proceeding.

Using a suitable lift device, raise each unit up to meet the bottom of the two hanging brackets suspended from the ceiling via the threaded rods. Center the unit so that the bolts can be easily inserted through the hanger and into the factory-supplied captive nuts.

Use bolts, washers, and lock-nuts to attach hanging brackets to the bottom of the cabinet.

Tighten lock-nuts sufficiently so that the weight of the unit is supported evenly by the 4 rods. Make sure the unit is level within the space by adjusting the lock-nuts.

The units must be level in order to operate properly.

Close Coupled Installations

If the evaporator and condensing unit are to be mounted back-to-back (close coupled), hang each unit before connecting them together. Refer to Figure 10. Use brackets provided. Use available bolt holes to avoid damage to refrigerant lines. Use 4 bolts and rubber spacers on 2 and 3 ton units. Use 5 bolts with no spacers on 5 ton units. Align the refrigerant connections and tighten them as described in Section 2.4.3. You will have to remove panels from 5 ton units for access to bolts and refrigerant connections.

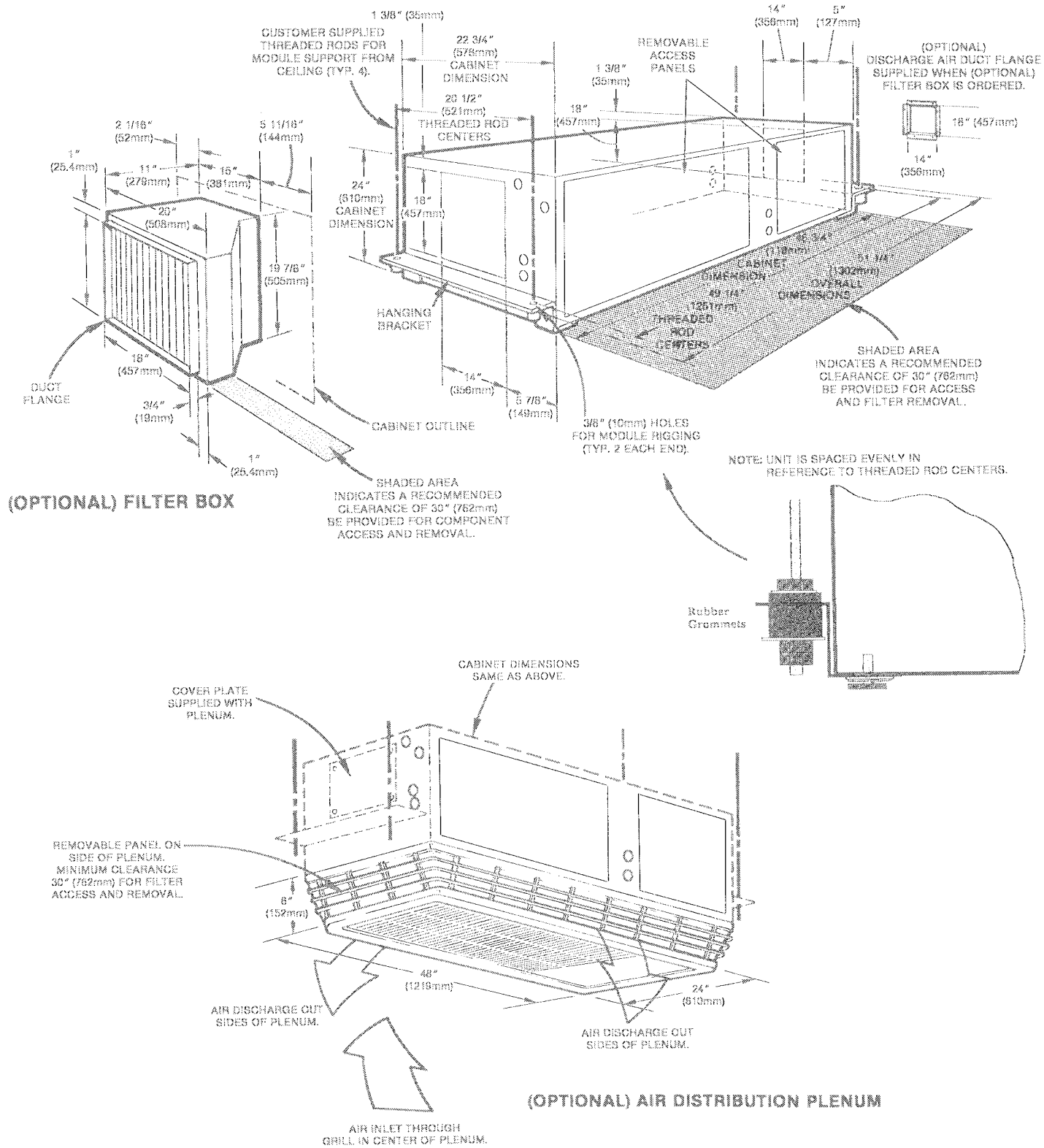


Figure 3. Evaporator Unit Installation (2 and 3 ton)

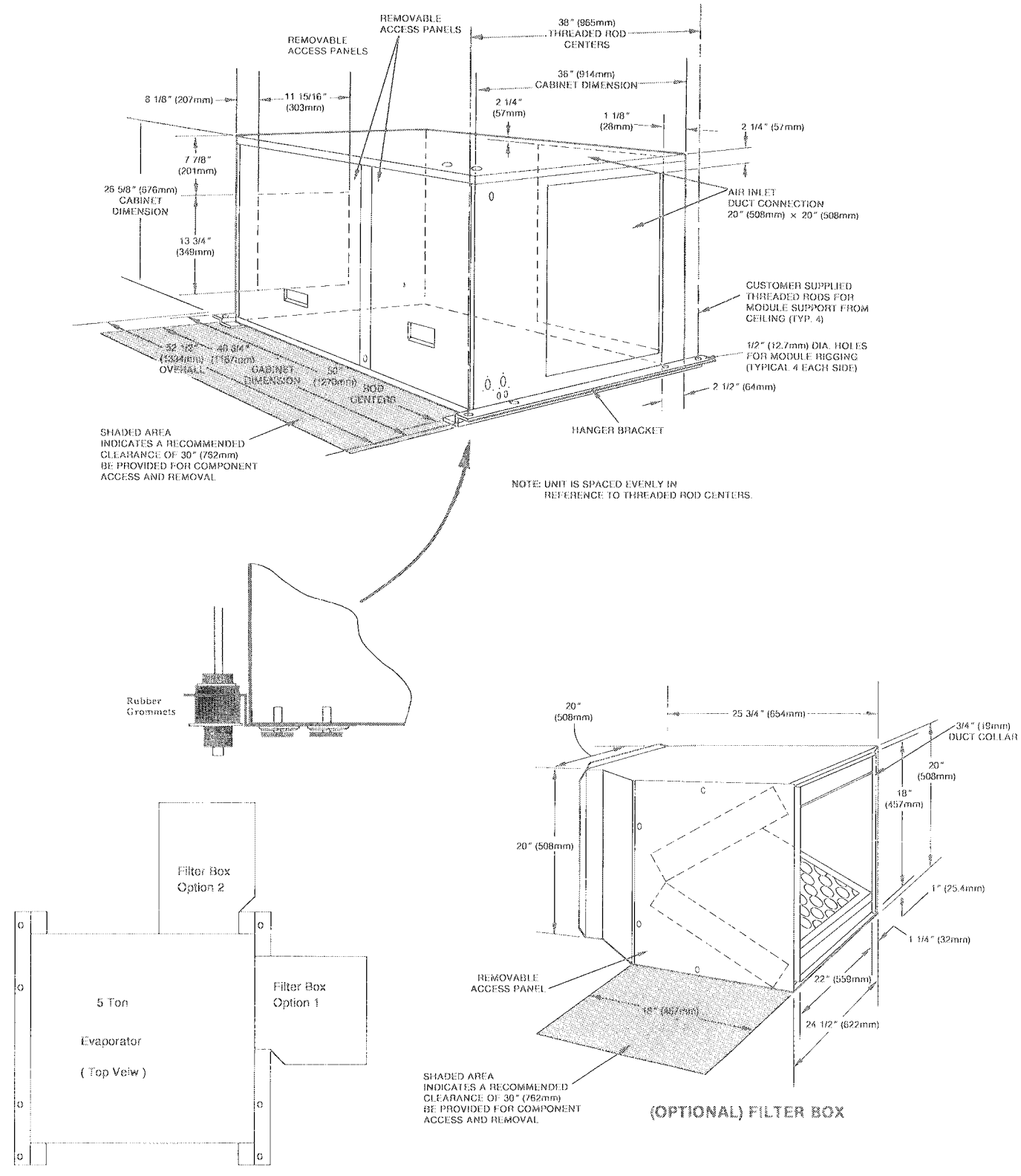


Figure 4. Evaporator Unit Installation (5 ton)

2.4.2. EVAPORATOR AIR DISTRIBUTION

Filter Box

The optional filter box is available for the unit and mounts directly to the return air opening of the evaporator. The 2 and 3 ton filter box is supplied with a filter measuring 20" x 20" x 4". The 5 ton filter box includes two filters, each 16"x25"x4".

Plenum Installation

The 2 and 3 ton non-ducted evaporators use the optional ceiling-mounted plenum to provide four-way air distribution. The plenum fastens to the bottom of the evaporator. The plenum includes a filter measuring 16" x 25" x 4".

1. The evaporator should be mounted 0.60 in. above the bottom of the T-bar supports with at least 30 in. clearance from return air end to wall (for replacing filter).
2. Check the contents of the plenum kit.
3. Carefully follow the installation instructions included with the plenum kit.

Never operate the unit without filters installed in the return air system.

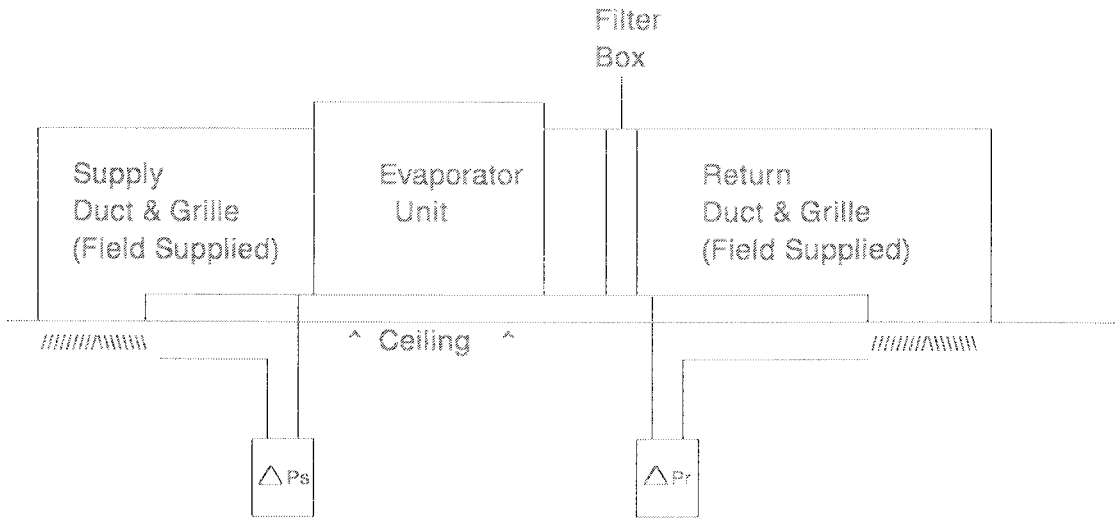
Connections for Ducted Systems

In a ducted configuration, the 5 ton evaporator has a maximum allowable external static pressure of 0.5 in. of H_20 (0.3 in. for 2 and 3 ton units). This includes allowance for filter losses. Use flexible ductwork or non-flammable cloth collars to attach ductwork to the unit and to help control the transmission of vibrations to building structures. Insulation of ductwork is vital to prevent condensation during the cooling cycle. The use of a vapor barrier is required to prevent absorption of moisture from the surrounding air into the insulation. Whenever possible, ductwork should be suspended using flexible hangers and not fastened directly to the building structure.

If the return air duct is short, or if noise is likely to be a problem, sound-absorbing glass fiber should be used inside the duct. Ductwork should be fabricated and installed in accordance with local and national codes.

AIR FLOW (CFM)

Fan Speed	2 Ton	3 Ton	5 Ton
High	885	1250	2350
Low	800	965	2150



External Static Pressure = △Ps + △Pr

2.4.3. PIPING CONNECTIONS AND COOLANT REQUIREMENTS

The following pipe connections are required:

- A drain line from the evaporator coil drain pan (this line also serves the optional humidifier).
- A water supply line to the optional humidifier (if applicable).
- Connections between the evaporator unit and the condensing unit (air, water, or glycol). If the evaporator unit is chilled water, connections to the building chilled water source are required.

Drain Line

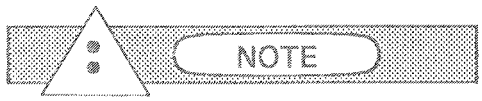
A 3/4" (19.1 mm) female pipe thread (FPT) connection is provided for the evaporator coil condensate drain. This line also drains the humidifier, if applicable. The drain line must be located so it will not be exposed to freezing temperatures. The drain should be the full size of the drain connection.

The drain line must not be trapped outside the unit.

This line may contain boiling water. Use copper or other suitable material for the drain line.

The evaporator drain pan includes a float switch to prevent operation if drain becomes blocked.

The optional condensate pump kit is required when the evaporator is installed below the level of the gravity-fed drain line.



Remove rubber band from float switch before operating unit. The rubber band prevents damage during shipment.

Humidifier Water Supply Line

Units supplied with the optional humidifier package have a 1/4" (6.4 mm) FPT connection for water inlet. Supply pressure range is 10 PSIG to 150 PSIG. Required flow rate is 1 gpm. A shut off valve should be installed in this line to isolate the humidifier for maintenance.

Loop Connections

Close coupled air cooled units do not require additional piping.

Chilled Water Loop

Install manual service shut-off valves at the supply and return lines of each unit. This will provide for routine service or emergency isolation of the unit.

The ambient conditions and the minimum water temperature to be supplied from the chiller will determine whether supply and return lines should be insulated. Insulating them will prevent condensation of the water supply and return lines to the unit.

The minimum recommended water temperature is 42°F. Design pressure is 125 PSIG. Connection sizes (FPT) are ¾" (19.1 mm) for 3 ton units, and 1" (25.4 mm) for 5 ton units.

Water/Glycol Loop

Water and Glycol cooled systems require coolant loop connections as specified in the condensing unit installation instructions.

Refrigerant (R-22) Loop

All split systems require two refrigerant lines (an insulated copper suction line and a copper liquid line) between the evaporator and the condensing unit.

Three possible methods exist for installing the copper suction and liquid lines.

A. Close coupling the units together using only the quick connects.

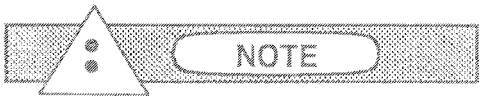
B. Using an optional Sweat Adapter Kit and hard piping between the two units.

C. Using optional pre-charged line sets (for 2 and 3 ton models only).

All refrigeration piping should be installed with high temperature brazed joints. Prevailing good refrigeration practices should be employed for piping supports, leak testing, dehydration, and charging of the refrigeration circuits. The refrigeration piping should be isolated from the building by the use of vibration isolating supports. To prevent tube damage when sealing openings in walls and to reduce vibration transmission, use a soft flexible material to pack around the tubes.

It is important to handle the pre-charged lines for 2 and 3 ton units with care so they will not get kinked or damaged. Use tube benders and make all bends before making connections to either end. Coil any excess tubing in a horizontal plane with the slope of the tubing toward the condensing unit.

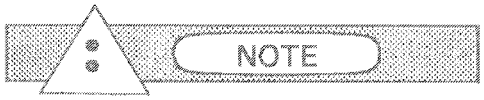
When installing remote condensing units above the evaporator, the suction gas line should be trapped at the evaporator. This trap will retain refrigerant oil in the off cycle. When the unit starts, oil in the trap is carried up the vertical riser and returns to the compressor.



When installing remote condensing units below the evaporator, the suction gas line should be trapped with an inverted trap the height of the evaporator. This prevents refrigerant migration to the compressor during off cycles.

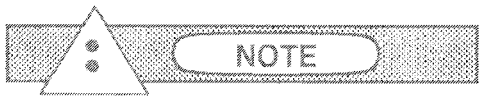
RECOMMENDED LINE SIZES O.D. Cu.			
Equivalent Feet	Model (Tons)	Liquid	Suction
45	(2 and 3)	3/8	7/8
50	(5)	1/2	1 1/8
100	(5)	5/8	1 1/8
150	(5)	5/8	1 1/8

CONNECTION SIZES AND TORQUE			
Size O.D. Cu.	Model (Tons)	Coupling Size	Torque lb.-ft.
3/8	(2 and 3)	#6	10–12
1/2 & 5/8	(5)	#10	35–45
7/8	(2 and 3)	#11	35–45
1 1/8	(5)	#12	50–65



If it is necessary to charge units after piping is complete, refer to page 36 for refrigerant charge (R-22) requirements.

Quick Connect Fittings



When hard piping is used, complete all piping and evacuate lines before connecting quick connects.

Be especially careful when connecting the quick connect fittings. Read through the following steps before making the connections.

A. Remove protector caps and plugs.

B. Carefully wipe coupling seats and threaded surfaces with a clean cloth.

C. Lubricate the male diaphragm and synthetic rubber seal with refrigerant oil.

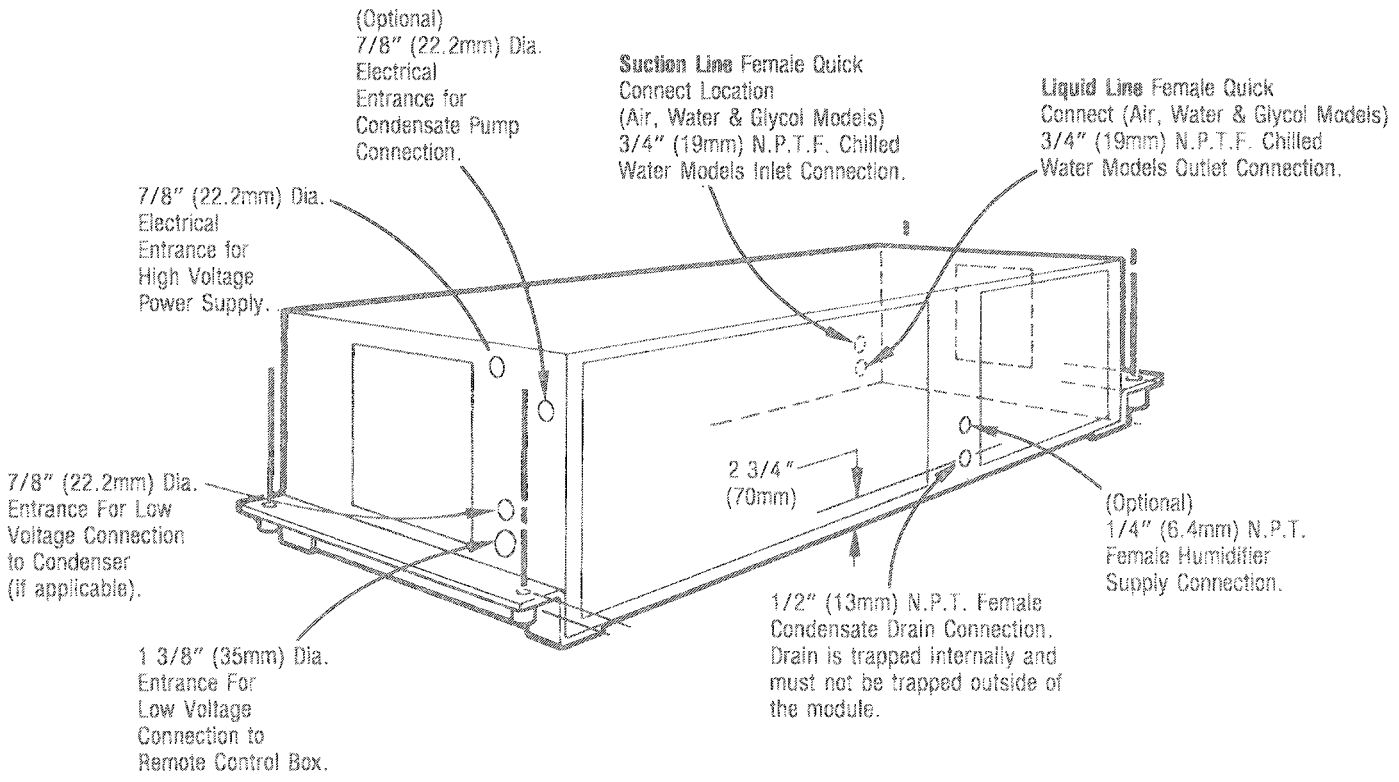
D. Thread the coupling halves together by hand to insure that the threads mate properly.

E. Tighten the coupling body hex nut and union nut with the proper sized wrench until the coupling bodies "bottom out" or until a definite resistance is felt.

F. Using a marker or pen, make a line lengthwise from the coupling union nut to the bulkhead.

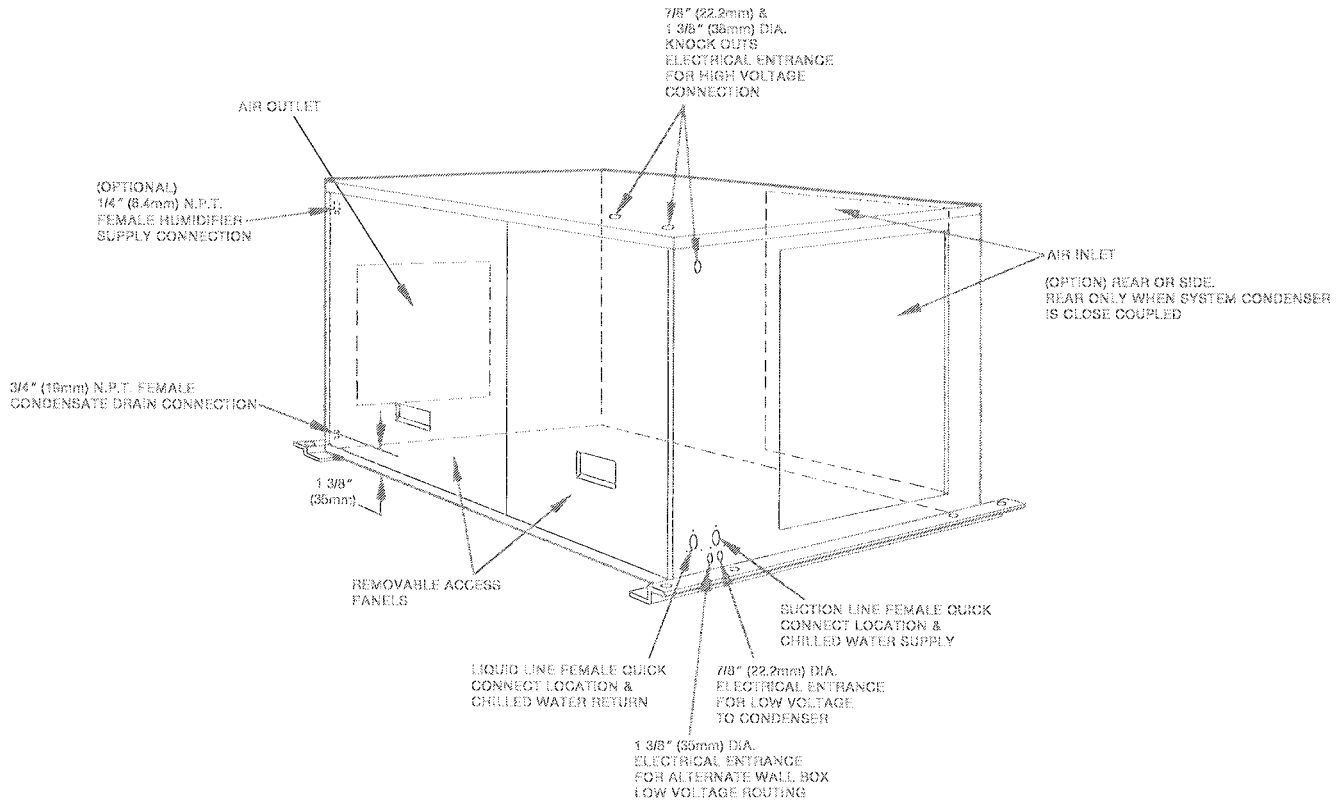
G. Tighten the nuts an additional quarter-turn; the misalignment of the lines shows how much the coupling has been tightened. This final quarter-turn is necessary to insure that the joint will not leak. Refer to chart at left for torque requirements.

DESIGNED REFRIGERANT PRESSURES (PSIG)	
Suction	53 TO 90
Discharge	
Air Cooled	260
Water Cooled	
65°F to 75°F water	210
85°F water	225
Glycol Cooled	295
Maximum	330
High pressure cut-out	360



UNIT PIPING CONNECTIONS SIZES - PIPE SIZE Inches (mm)/coupling		
MODEL NO.	LIQUID LINE A	SUCTION LINE B
MME024E MME036E	3/8" (9.5) / #6	7/8" (22.2) / #11
MME040C	3/4" Coolant Supply	3/4" Coolant Return

Figure 5. Evaporator Unit Piping Connections (2 and 3 ton)



UNIT PIPING CONNECTIONS SIZES – PIPE SIZE Inches (mm)/coupling		
MODEL NO.	LIQUID LINE A	SUCTION LINE B
MME060E	½" (12.7) / #10	1⅛" (28.6) / #12
MME092C	1" Coolant Supply	1" Coolant Return

Figure 6. Evaporator Unit Piping Connections (5 ton)

2.4.4. CONDENSATE PUMP KIT INSTALLATION

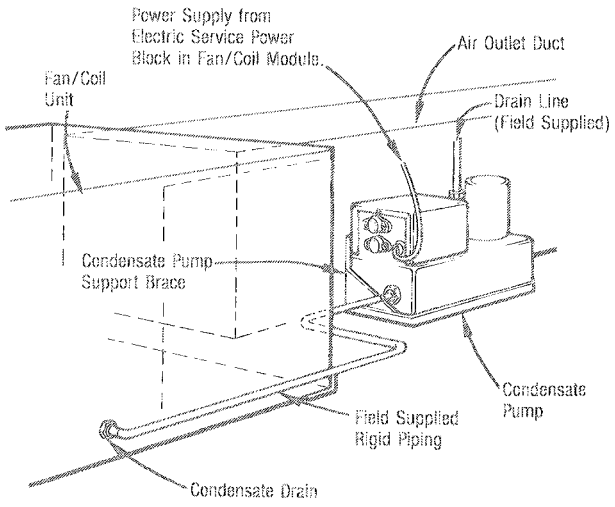
All Units

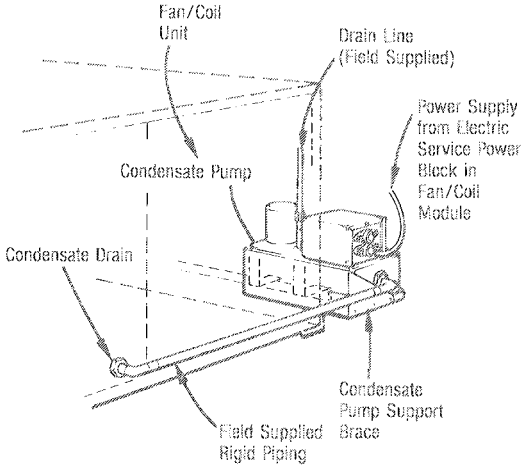
1. Refer to detailed instructions and drawings supplied with the pump.
2. Disconnect all power to the unit.
3. Remove access panels.

NOTE

Remove rubber band from float switch in evaporator pan.

4. Use mounting brackets if pump is not attached to ductwork. Pump inlet must be at least ½" below evaporator drain. Mount the pump to unit exterior as shown in **Figure 7**. Refer to pump kit instructions for 5 ton location.
5. Connect evaporator drain to pump inlet using ¾" hard pipe, with **no trap** in the line. Provide at least 1" clearance between the access panel and the drain line.
6. Connect a drain line to the pump discharge ⅜" O.D. Cu (compression fitting provided).
7. Connect electric leads L1 and L2 to the line voltage terminal block. Connect the ground lead to the lug near the terminal block.
8. Connect pump float switch wires (red) in parallel with float switch wires in unit (at P2–11 and P2–12). Wire splicing will be required.
9. Reinstall the access panels.
10. Reconnect power to the unit.
11. Run the unit to make sure the pump works properly. Check the drain line and connections for leaks before closing up the ceiling.





UNITS WITH AIR DISTRIBUTION PLENUM

Figure 7. Condensate Pump (2 and 3 ton)

2.4.5. ELECTRICAL CONNECTIONS

Each unit is shipped from the factory with all internal wiring completed. **Refer to electrical schematic when making connections.** Electrical connections to be made at the installation site are:

- Power supply to each ceiling unit.
- Control wiring between the evaporator unit and the condensing unit, if applicable.
- Control wiring between the control panel and the evaporator unit.

USE VOLT METER TO MAKE SURE POWER IS TURNED OFF BEFORE MAKING ANY ELECTRICAL CONNECTIONS.

Power Connections

All power and control wiring and ground connections must be in accordance with the National Electrical Code and local codes. Refer to pages 6 and 7 regarding wire size and circuit protection requirements.

Use copper, copper-clad aluminum, or aluminum wiring only. Make sure that all connections are tight.

Voltage supplied must agree with the voltage specified on the unit name plate. A power disconnect switch (field supplied) is required to isolate the unit for maintenance. The disconnect switch may be bolted to the ceiling unit, but not to any of the removable panels. This would interfere with access to the unit. **Make sure that no refrigerant lines are punctured when mounting the disconnect switch.**

Route the conduit through the hole provided in the cabinet. If the alternate power entrance on the side of the 5 ton evaporator is used, a short section of conduit must extend inside the unit to the terminal block. Route the supply power to the disconnect switch and then to the unit. Connect earth ground to lug provided near terminal board.

An optional single point power (SPP) kit is available for 5 ton units that are installed close coupled. Refer to **Figure 10.** You can mount the SPP kit inside the evaporator before installing the unit in the ceiling.

The ceiling unit power connections are made at the terminal block in the electric panel. The electrical schematic is attached to the electric panel. The power terminal connections are labeled L1, L2, and L3. For 208 VAC applications, you will have to change the input transformer connection. Refer to the electrical schematic. A transformer is available for 277 VAC, single phase, applications (2 and 3 ton condensing units).

Control Connections

The wall-mounted control panel (5"×3½"×1¼") is supplied with 12 colored leads. The remote panel has been pre-wired with a 30 foot cable on all units. Surface mount the control panel using 2 screws. Set DIP switches according to customer requirements. Refer to **Section 3 - OPERATION.**

Route the cable from the control panel to the unit.

Cable will go through two sheet metal holes, one in the unit enclosure and one in the electrical box. Remove split grommets to route cable. Both grommets must be replaced in sheet metal holes to maintain UL listing and CSA certification.

Connect the cable to the interface board and ground the cable shield. **Do not cut the cable or disconnect either end.** Coil excess cable.

A two-wire control connection (24 VAC) is required between the evaporator and the condensing unit. Refrigeration control wiring must be installed in accordance with the National Electrical Code (NEC) Class 2 circuit. Glycol cooled units also require a two-wire control connection to the drycooler and pump. A Class 1 circuit is required for Water/Glycol units.

Control wiring between the evaporator and the condensing unit must not allow a voltage drop in the line of more than 1 volt (16 gauge minimum for 75 feet). **Do not connect additional electrical devices to the control circuit.** The circuit breaker, contained in the transformer housing, is sized only for the factory-supplied control system.

Additonal control wiring will be required if your system includes other optional monitoring and control devices.

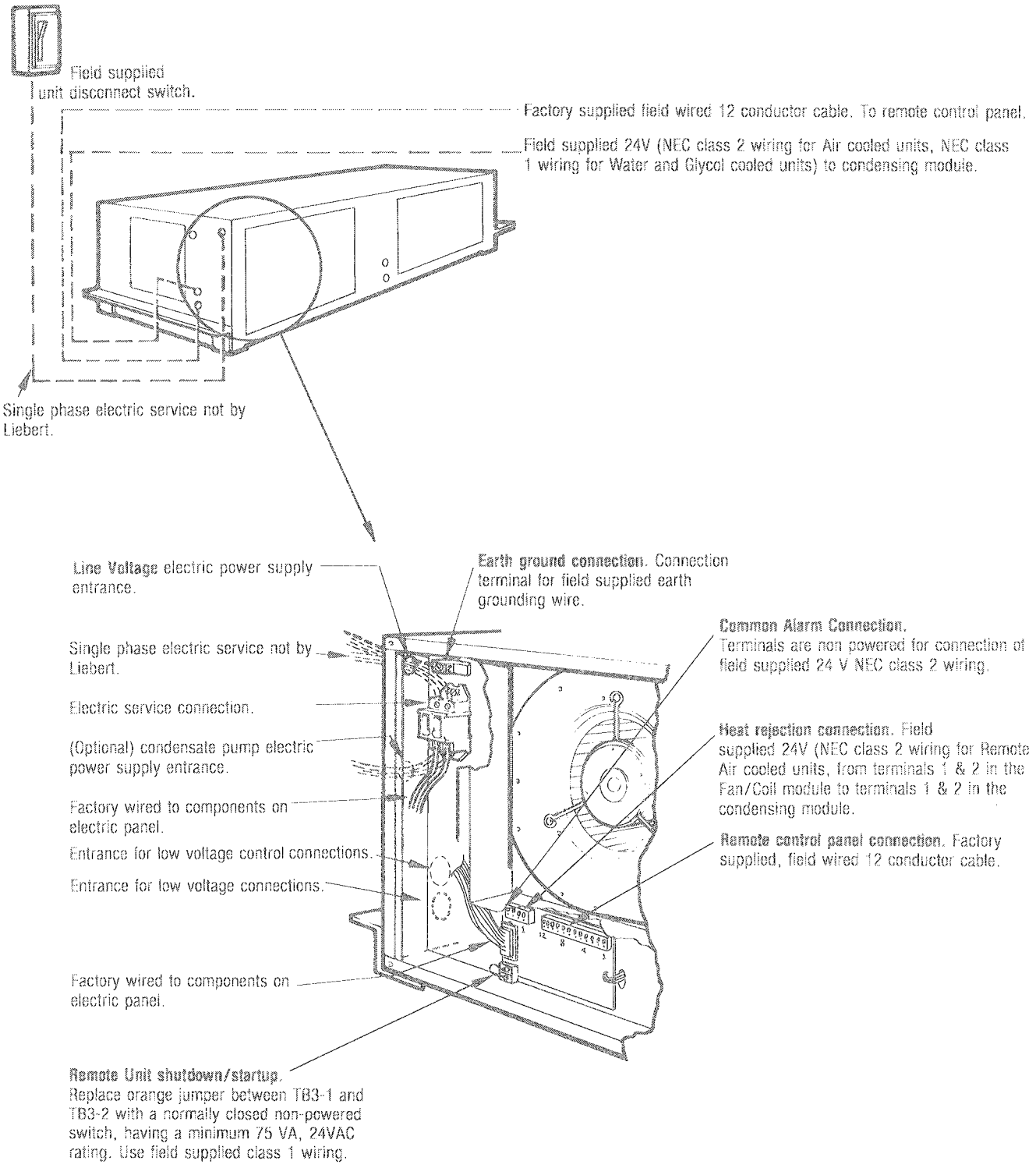
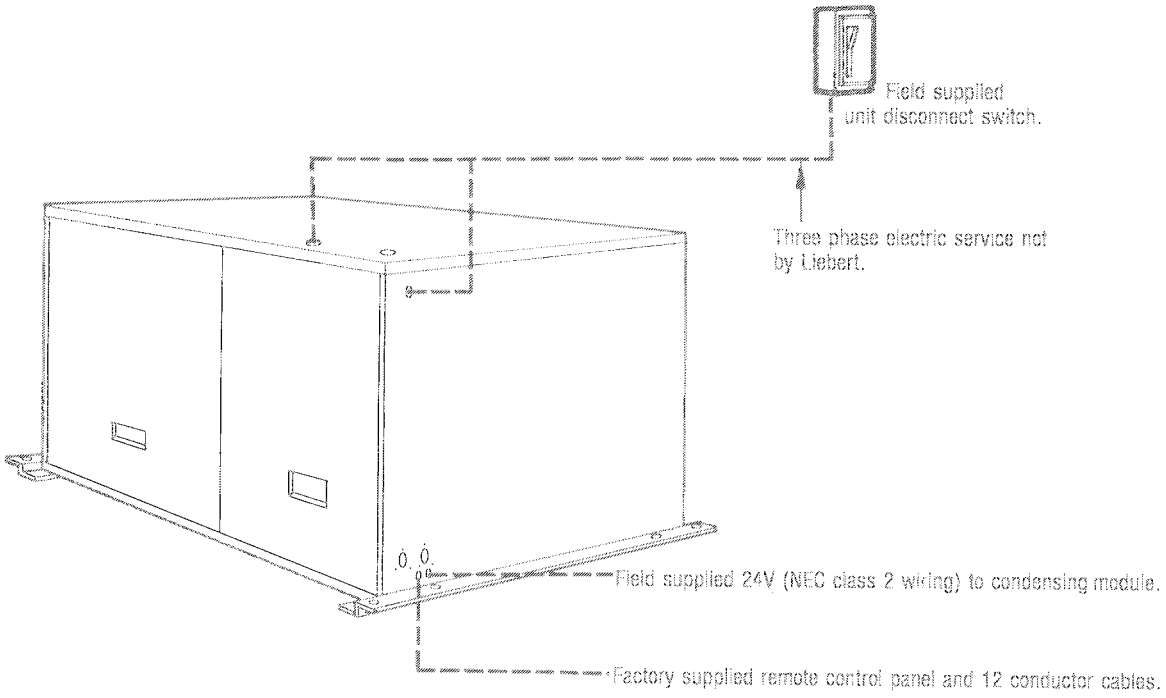


Figure 8. Evaporator Unit Electrical Connections (2 and 3 ton)



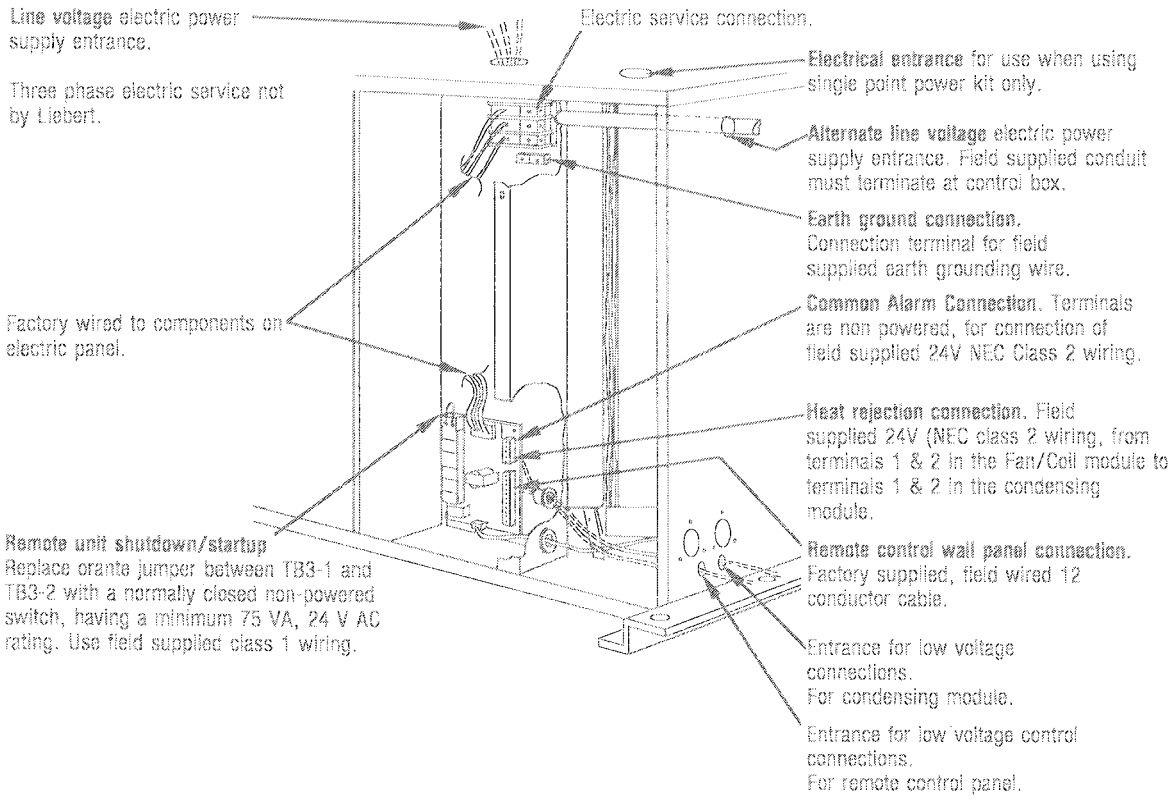
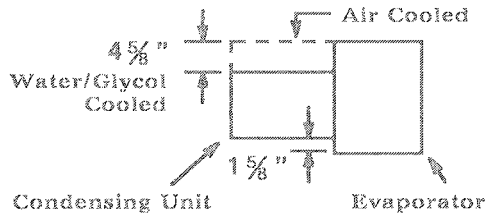
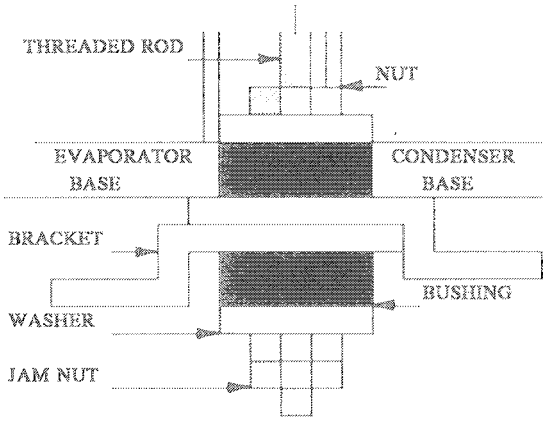


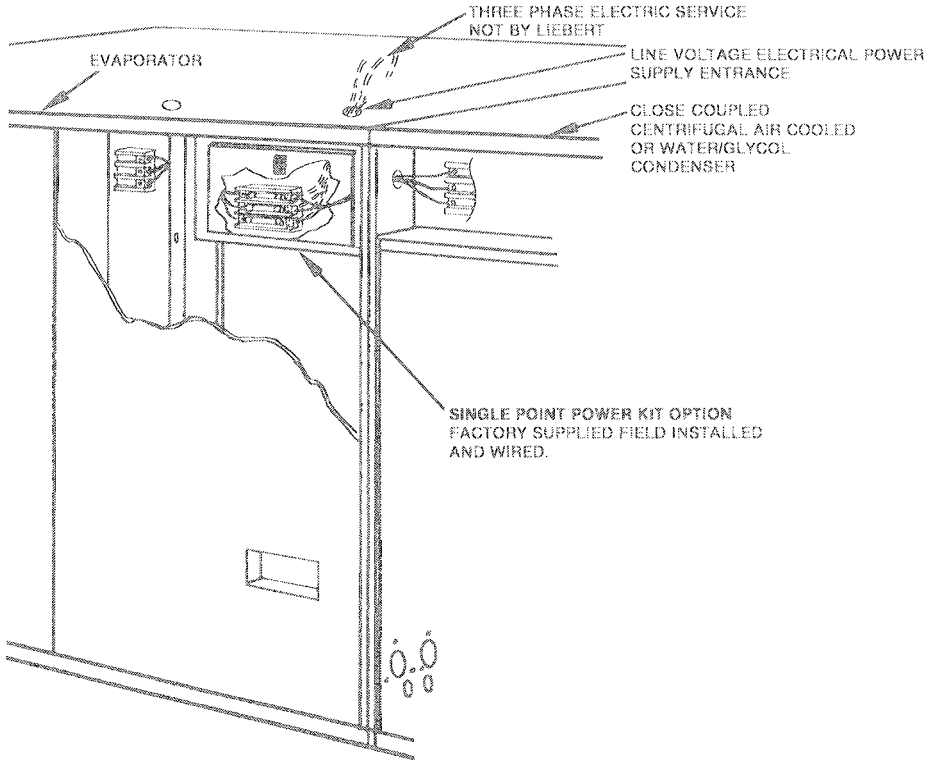
Figure 9. Evaporator Unit Electrical Connections (5 ton)



2 AND 3 TON UNITS
(end view)

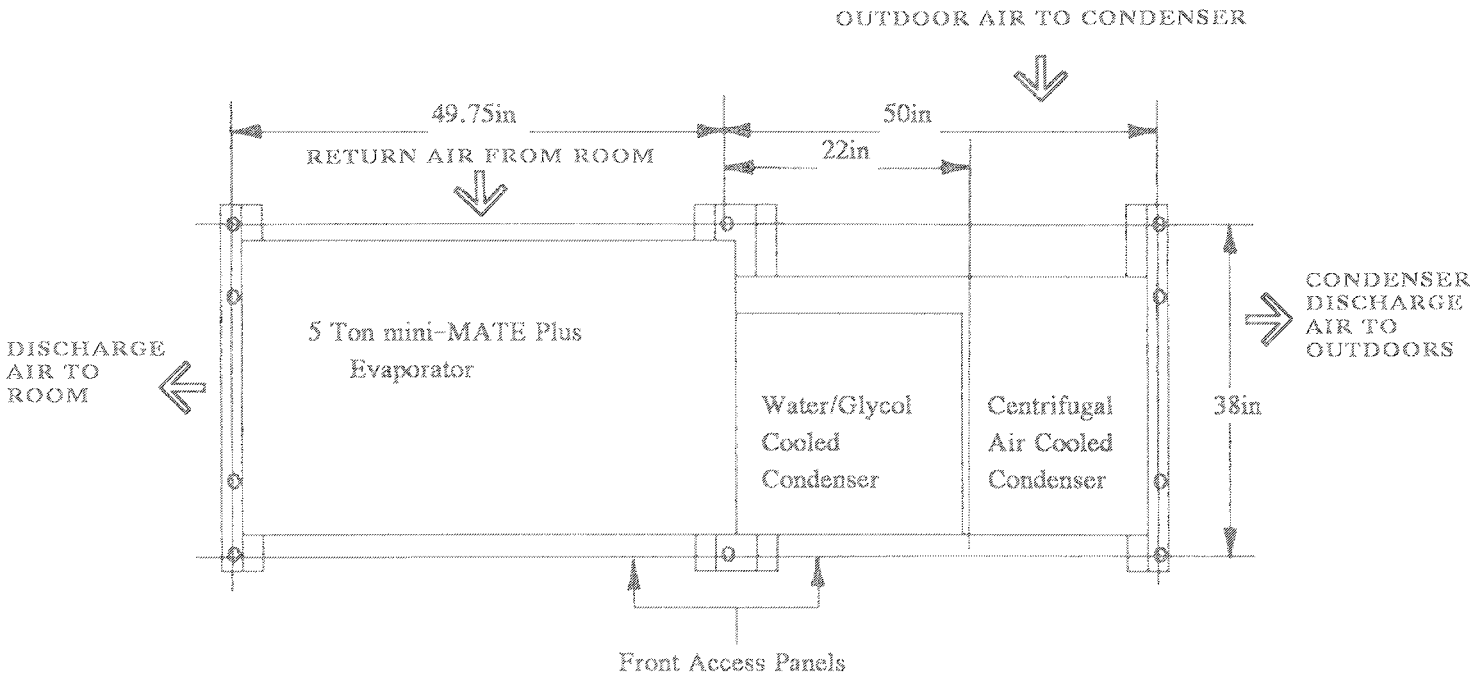


5 TON HARDWARE DETAILS

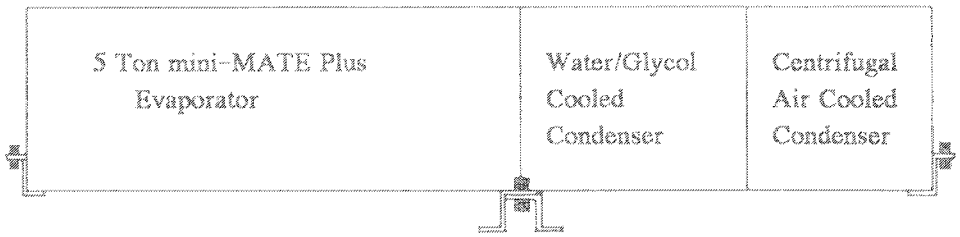


5 TON SINGLE POINT POWER KIT

Figure 10. Close Coupled Installation



Top View



Side View

5 TON UNITS

Figure 10. Close Coupled Installation (cont'd)

2.5. CENTRIFUGAL FAN CONDENSING UNIT INSTALLATION

2.5.1. LOCATION CONSIDERATIONS

The centrifugal fan air cooled condensing unit may be located above the dropped ceiling or any remote indoor area using the hangers and hardware provided.

To mount the unit in the ceiling, refer to Section 2.4 INSTALLING THE CEILING UNITS.

2.5.2. ELECTRICAL CONNECTIONS

Refer to Section 2.4.5. for general wiring requirements and cautions. Refer to electrical schematic when making connections.

USE VOLT METER TO MAKE SURE POWER IS TURNED OFF BEFORE MAKING ANY ELECTRICAL CONNECTIONS.

Power Connections

The centrifugal condensing unit requires its own power source and earth ground, with a disconnect switch (field supplied) to isolate the unit for maintenance. Voltage supplied must agree with the voltage specified on the unit nameplate. For 5 ton close coupled systems, the optional single point power kit allows use of a single power feed. Separate instructions are provided when this kit is ordered. Refer to Figure 10.

Control Connections

A two wire control connection is required from the evaporator unit to the condensing unit. Refer to Figure 12 or 14 and the electrical schematic.

2.5.3. PIPING CONNECTIONS

Details for refrigerant (R-22) loop piping are in Section 2.4.3. On 5 ton units, an optional vent line can be connected to the relief valve on the Lee-Temp receiver (⅜" 45° flare connection).

2.5.4. DUCTING

The total external static pressure for the inlet and outlet ducts, including grille, must not exceed 0.5 inches of water (refer to page 11). Hood intake dimensions should be the same as the condensing unit duct dimensions.

If the condensing unit draws air from the outside of the building, rain hoods must be installed. In addition, install a triple layer bird screen over rain hood openings to eliminate the possibility of insects, birds, water, or debris entering the unit.

Use flexible ductwork or nonflammable cloth collars to attach ductwork to the unit and to control vibration transmission to the building. Attach the ductwork to the unit using the flanges provided. Locate the unit and ductwork so that the discharge air does not short circuit to the return air inlet.

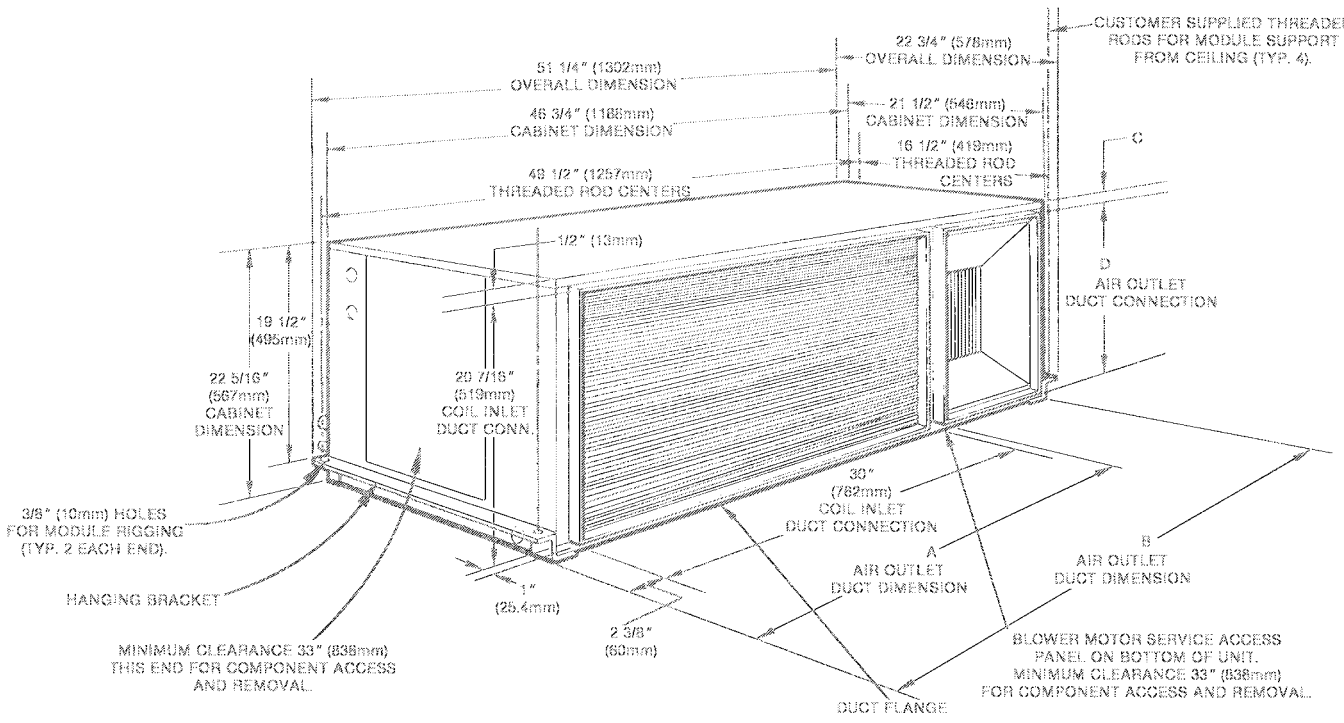
Avoid directing the hot exhaust air toward adjacent doors or windows.

Normal operating sound may be objectionable if the condensing unit is placed directly over quiet work areas. Ductwork that runs through a conditioned space or is exposed to areas where condensation may occur must be insulated. Whenever possible, ductwork should be suspended using flexible hangers. Ductwork should not be fastened directly to the building structure. In applications where the ceiling plenum is used as the heat rejection domain, the discharge air must be directed away from the condensing unit air inlet and a screen must be added to the end of the discharge duct to protect service personnel.

For multiple unit installations, space the units so that the hot condensing unit exhaust air is not directed toward the air inlet of an adjacent unit.

AIR FLOW (CFM)

2 Ton	3 Ton	5 Ton
1000	1650	3600



NOTE: UNIT IS EVENLY SPACED IN REFERENCE TO THREADED ROD CENTERS.

MODEL	DIMENSIONS IN (MM)			
	A	B	C	D
MMC024A MMC036A	33 13/16 (859)	45 1/4 (1149)	1/2 (13)	20 7/16 (519)
MMC040A	34 (864)	45 3/4 (1162)	5 3/6 (137)	11 3/4 (298)

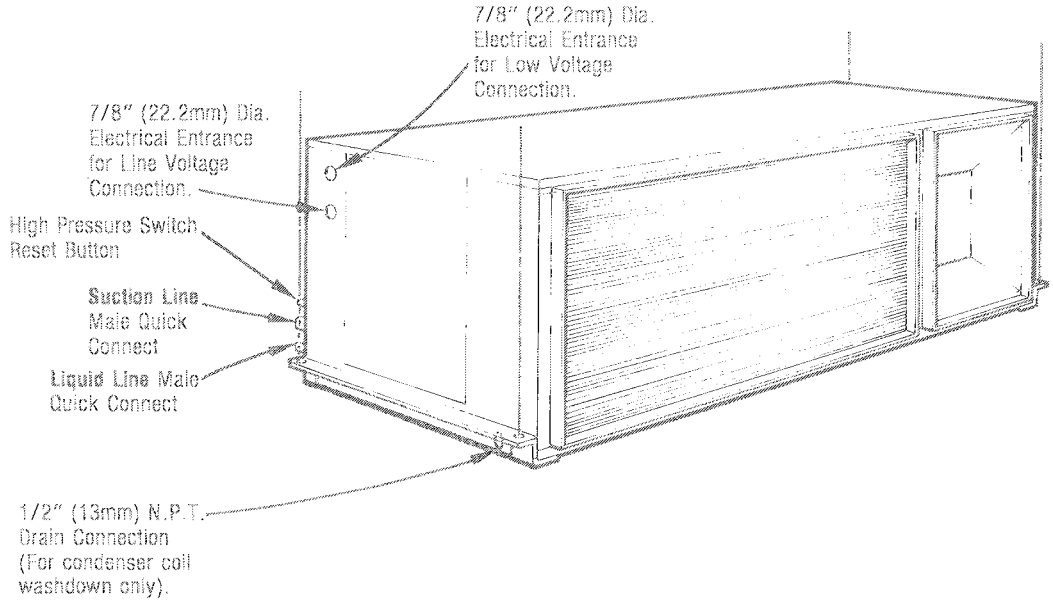


Figure 11. Centrifugal Condenser Dimensions and Pipe Connections (2 and 3 ton)

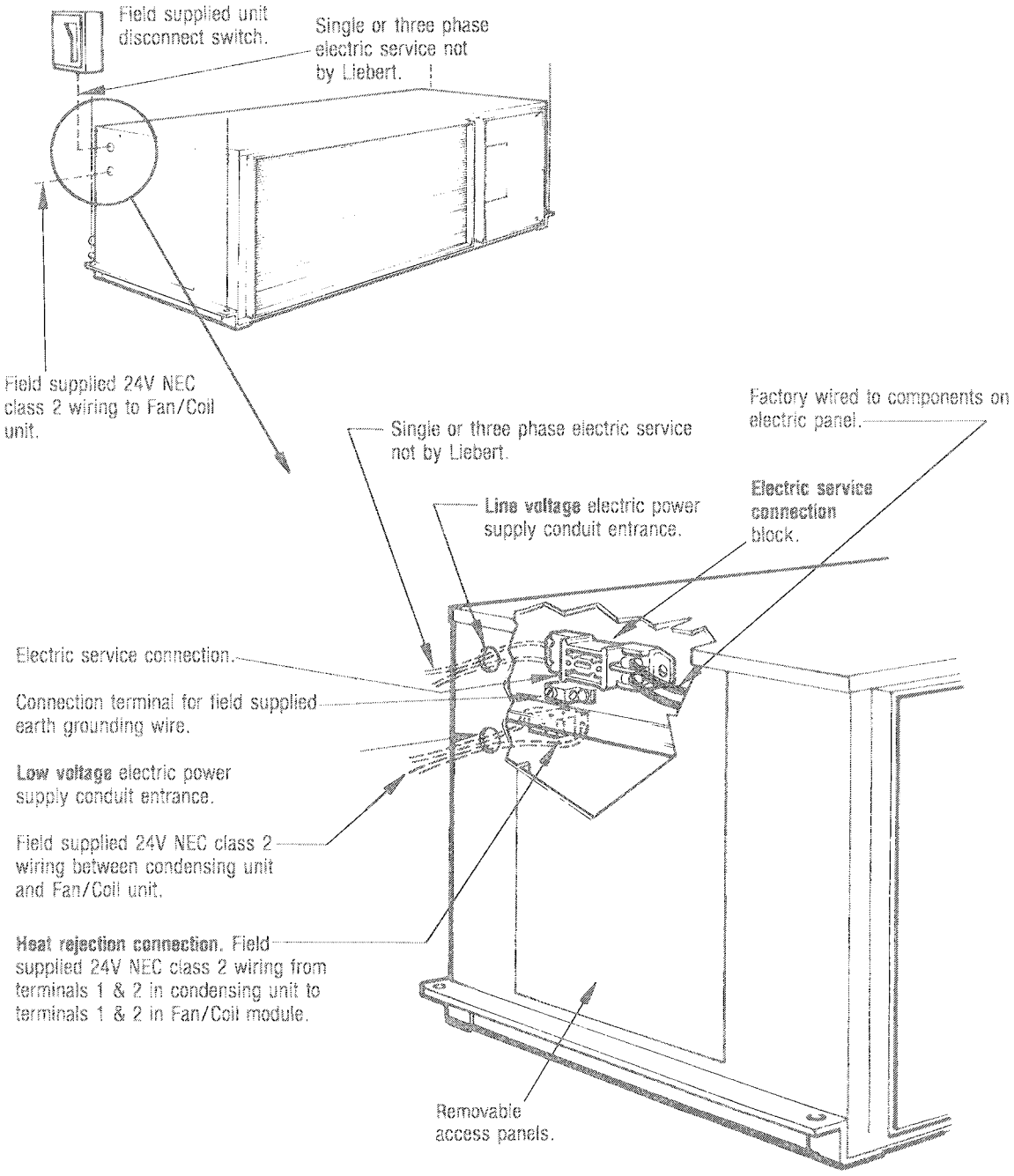
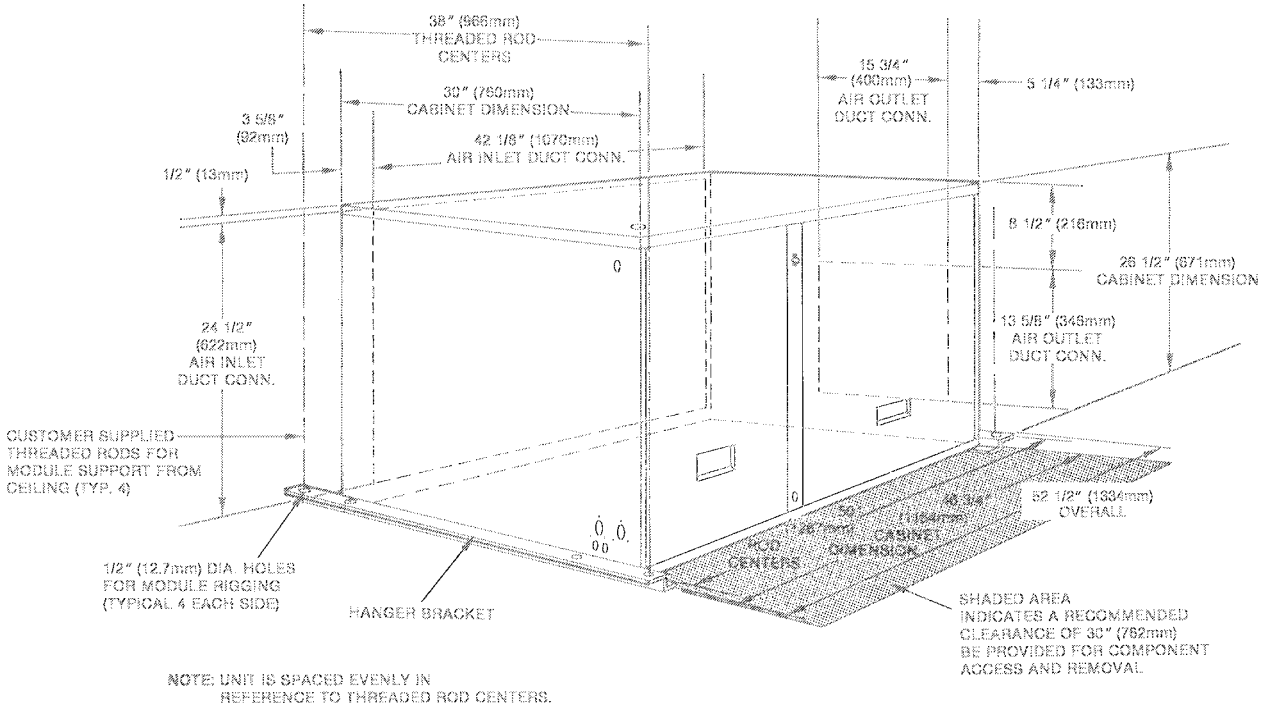


Figure 12. Centrifugal Condenser Electrical Connections (2 and 3 ton)



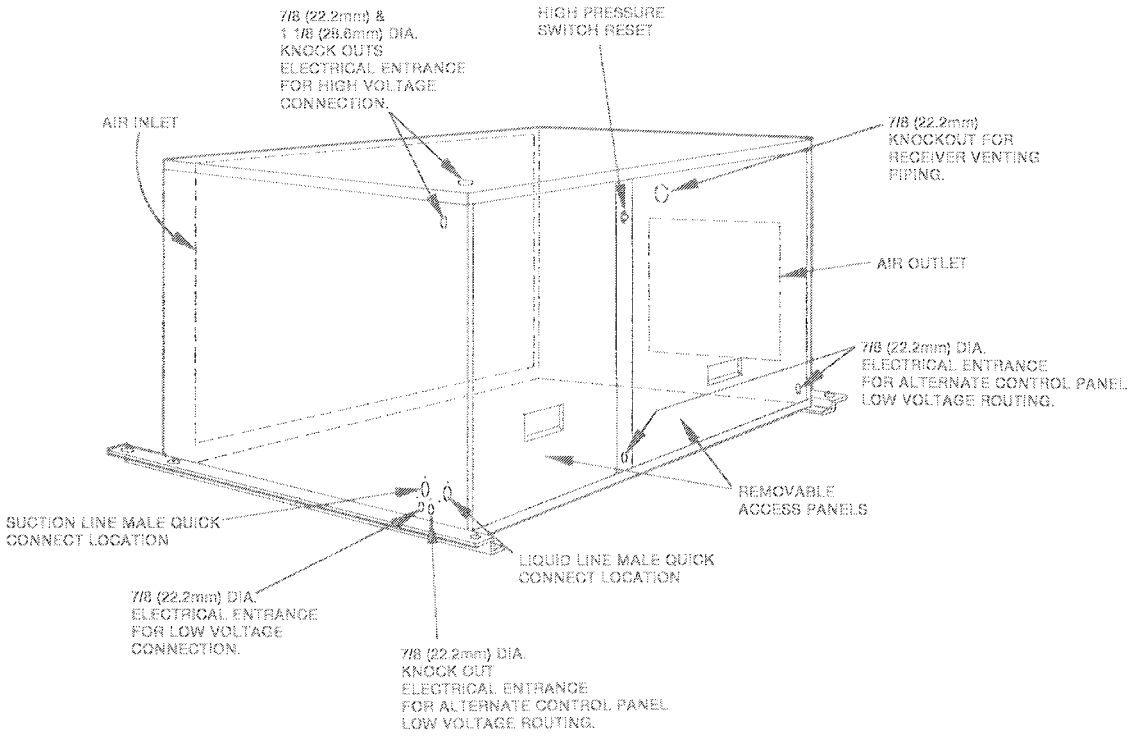


Figure 13. Centrifugal Condenser Dimensions and Pipe Connections (5 ton)

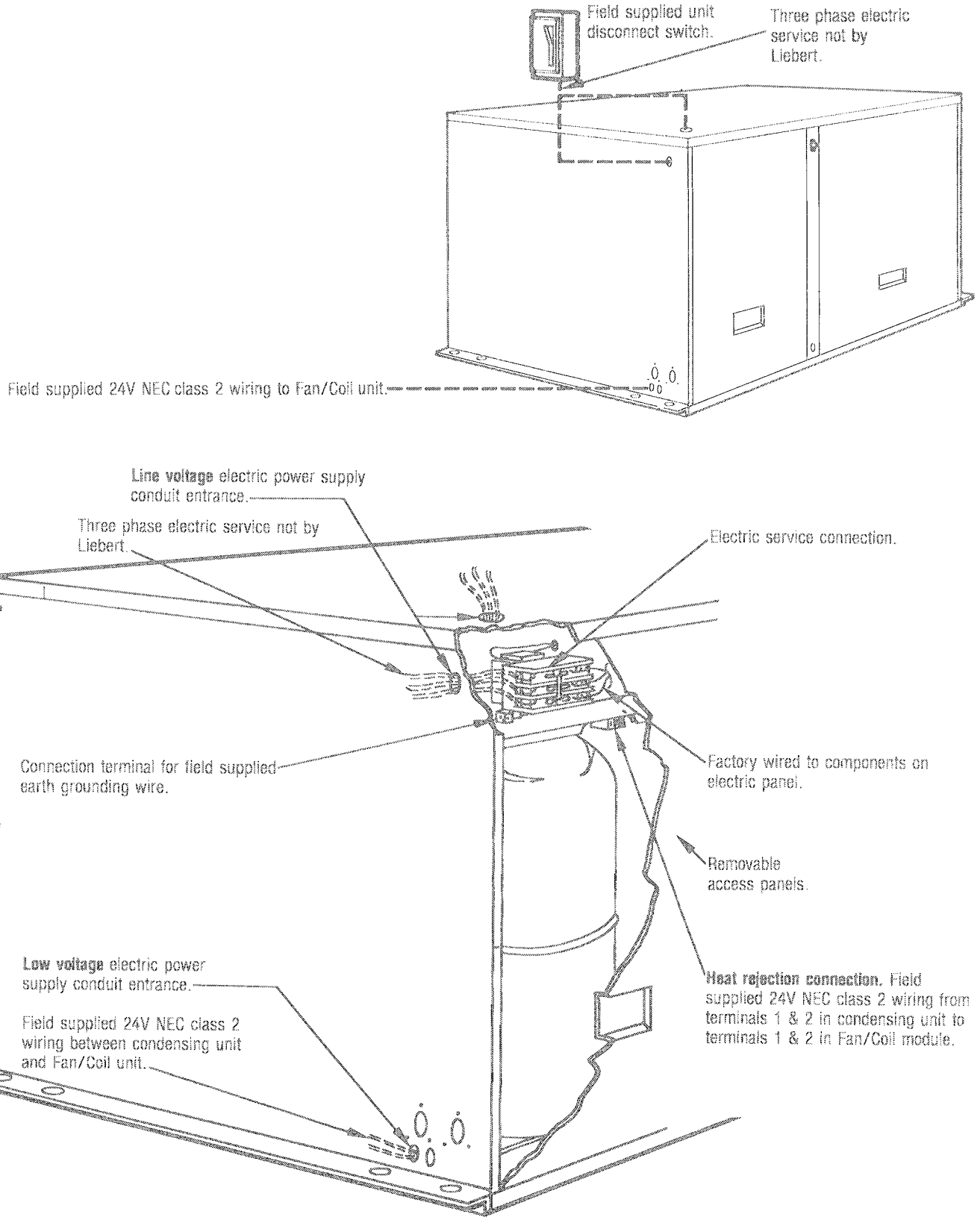


Figure 14. Centrifugal Condenser Electrical Connections (5 ton)

2.6. OUTDOOR AIR COOLED CONDENSING UNIT INSTALLATION

2.6.1. LOCATION CONSIDERATIONS

To insure a satisfactory air supply, locate air cooled propeller fan condensing units in a clean area, away from loose dirt and foreign matter that may clog the coil. Condensing units must not be located in the vicinity of steam, hot air, or fume exhausts, or closer than 18 inches from a wall, obstruction, or adjacent unit. Avoid areas where heavy snow will accumulate at air inlet and discharge locations.

The condensing unit should be located for maximum security and maintenance accessibility. Avoid ground-level sites with public access. Note that recommended maximum refrigerant line length is 45 feet.

Install a solid base, capable of supporting the weight of the condensing unit. The base should be at least 2 inches higher than the surrounding grade and 2 inches larger than the dimensions of the condensing unit base.

Unit Dimensions– Inches (mm)

MODEL	WIDTH(A)	HEIGHT(B)	DEPTH(C)
DMCO27A	40 (1016)	22.5 (572)	18 (457)
DMCO37A	48 (1219)	31 (787)	18 (457)
DMCO67A	53 (1346)	36¼ (921)	18 (457)

2.6.2. PIPING CONNECTIONS

Two refrigerant lines are required to connect the outdoor condensing unit to the evaporator unit. The bottom connection is for the insulated copper suction line. The top connection is for the copper liquid line. Details are given in Section 2.4.3.

2.6.3. ELECTRICAL CONNECTIONS

Refer to Section 2.4.5. for general wiring requirements and cautions. Refer to the electrical schematic when making connections.

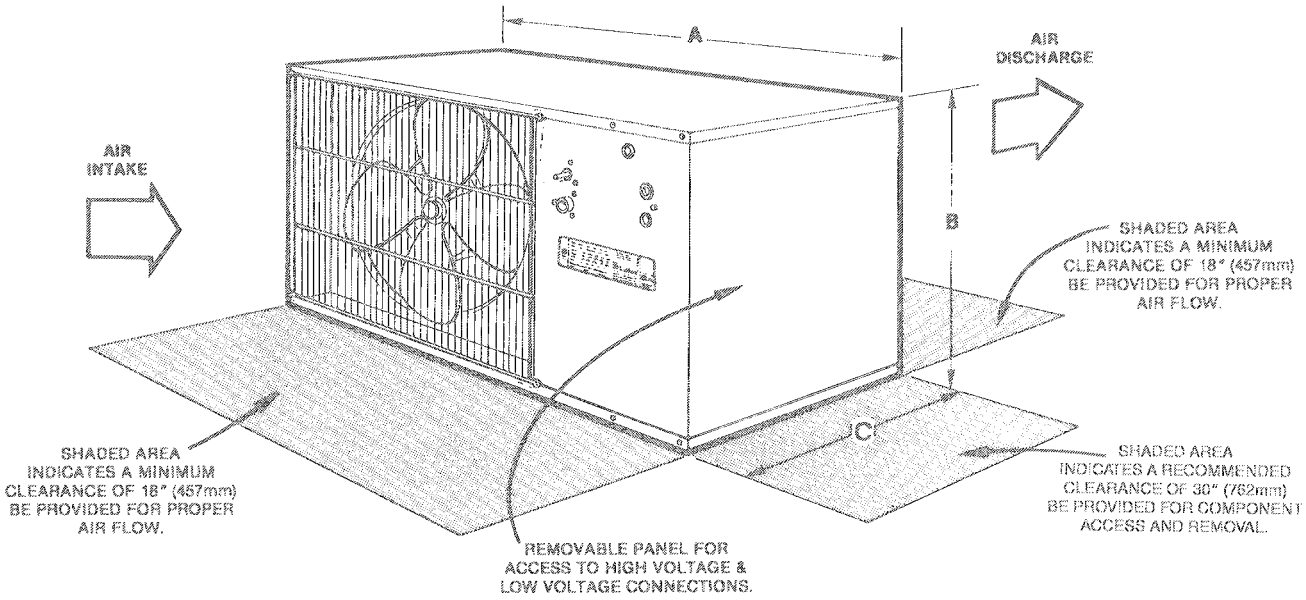
USE VOLT METER TO MAKE SURE POWER IS TURNED OFF BEFORE MAKING ANY ELECTRICAL CONNECTIONS.

Power Connections

The outdoor condensing unit requires its own power source and earth ground, with a disconnect switch (field supplied) to isolate the unit for maintenance. Voltage supplied must agree with the voltage specified on the unit nameplate. A transformer is available for 277 VAC, single phase, applications (2 and 3 ton).

Control Connections

A two wire control connection is required between the outdoor condensing unit and the evaporator. Refer to Figure 15 and the electrical schematic.



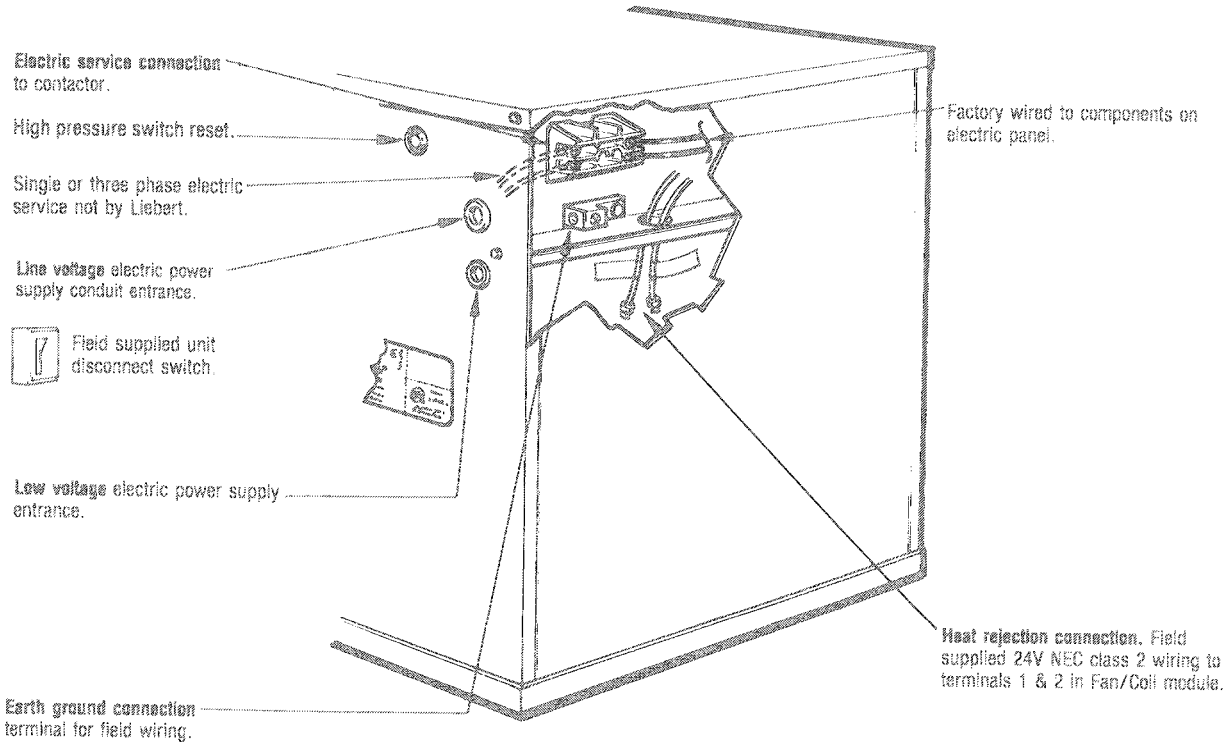


Figure 15. Outdoor Air Cooled Condensing Units

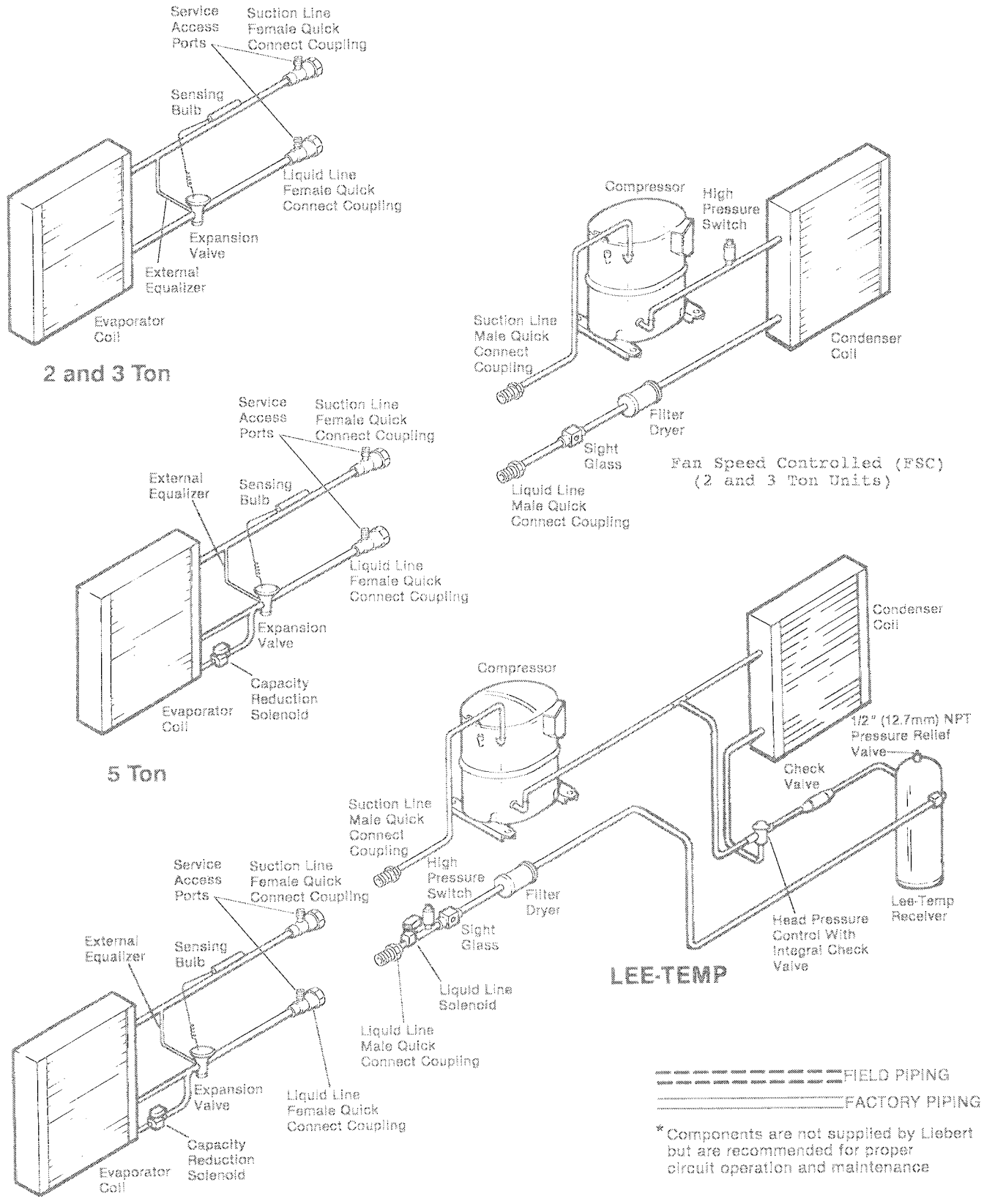


Figure 16. General Arrangements (Air Cooled Models)

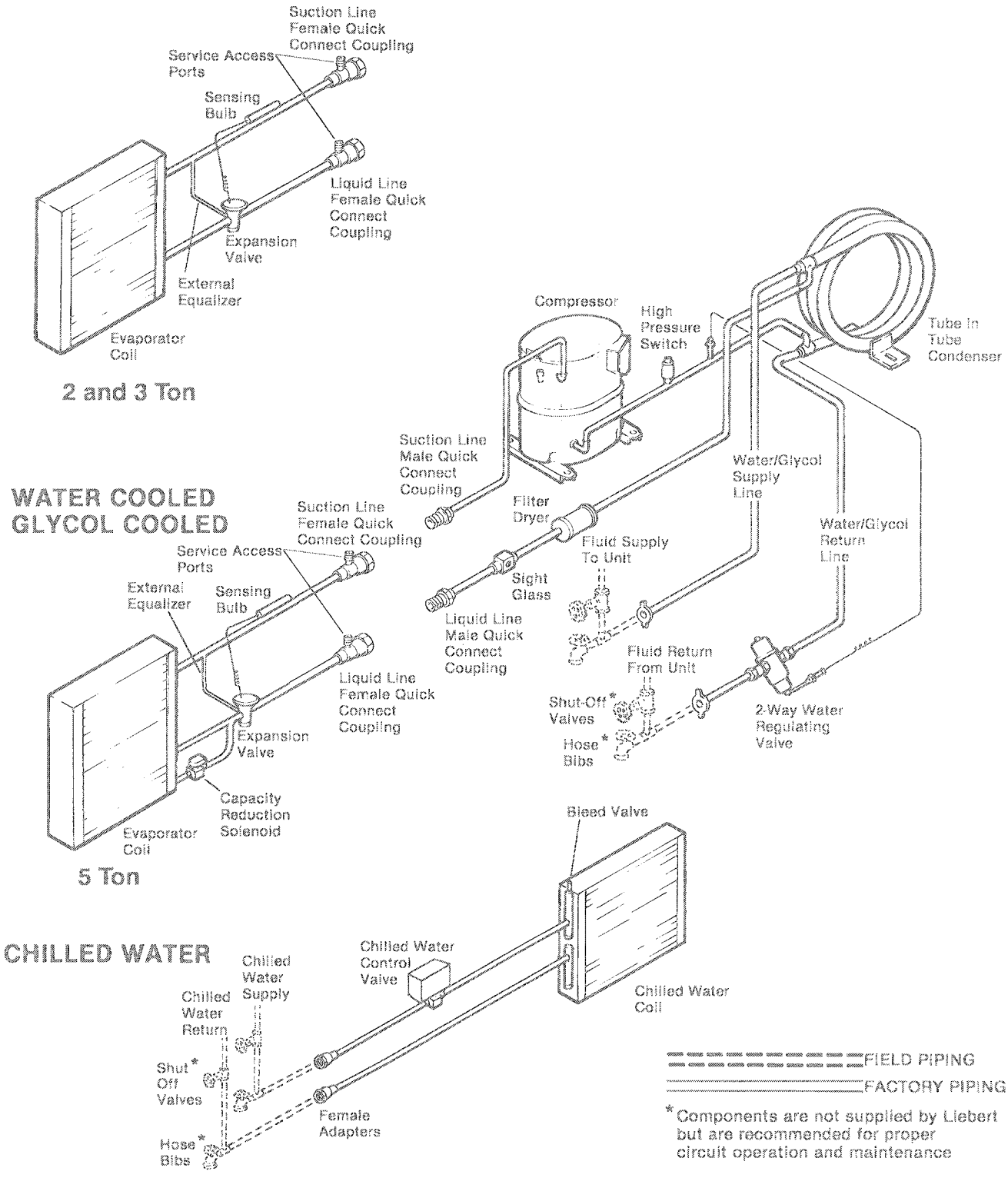


Figure 17. General Arrangements (Water/Glycol Cooled and Chilled Water Models)

2.7. WATER AND GLYCOL COOLED CONDENSING UNIT INSTALLATION

2.7.1. LOCATION CONSIDERATIONS

The Water and Glycol Cooled condensing units may be located above the dropped ceiling or any remote indoor area using the hangers and hardware provided.

To mount the unit in the ceiling, refer to Section 2.4. INSTALLING THE CEILING UNITS.

2.7.2. ELECTRICAL CONNECTIONS

Refer to Section 2.4.5. for general wiring requirements and cautions. Refer to the electrical schematic when making connections.

USE VOLT METER TO MAKE SURE POWER IS TURNED OFF BEFORE MAKING ANY ELECTRICAL CONNECTIONS.

Power Connections

The condensing unit requires its own power source and earth ground, with a disconnect switch (field supplied) to isolate the unit for maintenance. Voltage supplied must agree with the voltage specified on the unit nameplate. A transformer is available for 277 VAC, single phase, applications (2 and 3 tons). For 5 ton close coupled systems, the optional single point kit allows use of a single power feed. Separate instructions are provided when this kit is ordered. Refer to Figure 10.

Control Connections

A two-wire control connection is required from the evaporator unit to the condensing unit. Glycol cooled units also require a two-wire control connection to the drycooler and pump package. Refer to Figure 19 or 21 and the electrical schematic.

2.7.3. PIPING CONNECTIONS

Piping Considerations

Manual service shut-off valves should be installed at the supply and return line to each unit. This enables routine service and/or emergency isolation of the unit. When the condensing unit fluid quality is poor, filters that can be easily replaced or cleaned should be placed in the supply line. These filters extend the service life of the condensing units.

Condensing fluid connections (FPT) are ¾ in. for 2 and 3 ton units, and 1 in. for 5 ton units. Details for refrigerant (R-22) loop piping are in Section 2.4.3.

Condensing Unit Fluid Requirements

The maximum fluid pressure is 150 PSIG. A high pressure (300 PSIG) option is available on 5 ton units. The water cooled system will operate in conjunction with either a cooling tower or city water. Glycol cooled systems will operate in conjunction with a cooling tower, city water, or drycooler.

Automotive anti-freeze must not be used in glycol systems. Prepare glycol solution using customary practices.

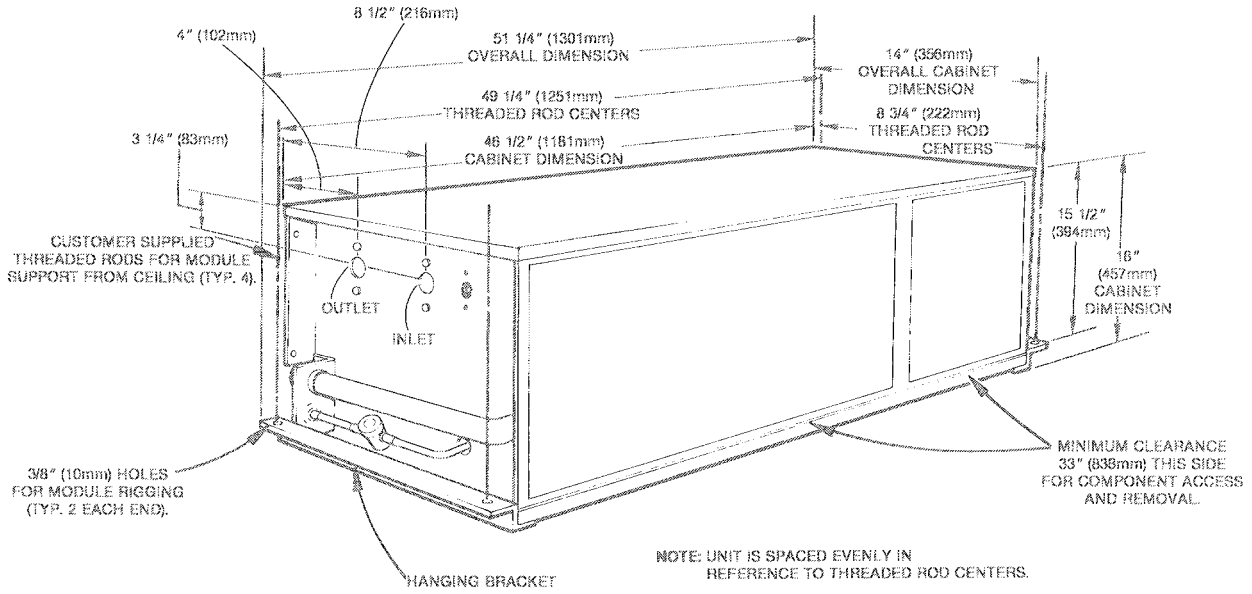
Regulating Valve

Water/Glycol cooled units include a coolant flow regulating valve which may require adjustment.

Attach refrigeration gauges to the compressor discharge and suction lines. Raise the head pressure by turning the adjusting screw clockwise. Lower the head pressure by turning the adjusting screw counter-clockwise. Allow enough time between adjustments for the system to stabilize.

When the refrigeration system has been off for approximately 10 to 15 minutes, the coolant flow should stop. If the coolant continues to flow, the valve is either improperly adjusted (head pressure too low) or the pressure-sensing capillary tube is not properly connected to the condensing unit.

Flush the valve by inserting a screw driver or similar tool under the two sides of the main spring and lifting. This will open the valve seat and flush out any dirt particles.



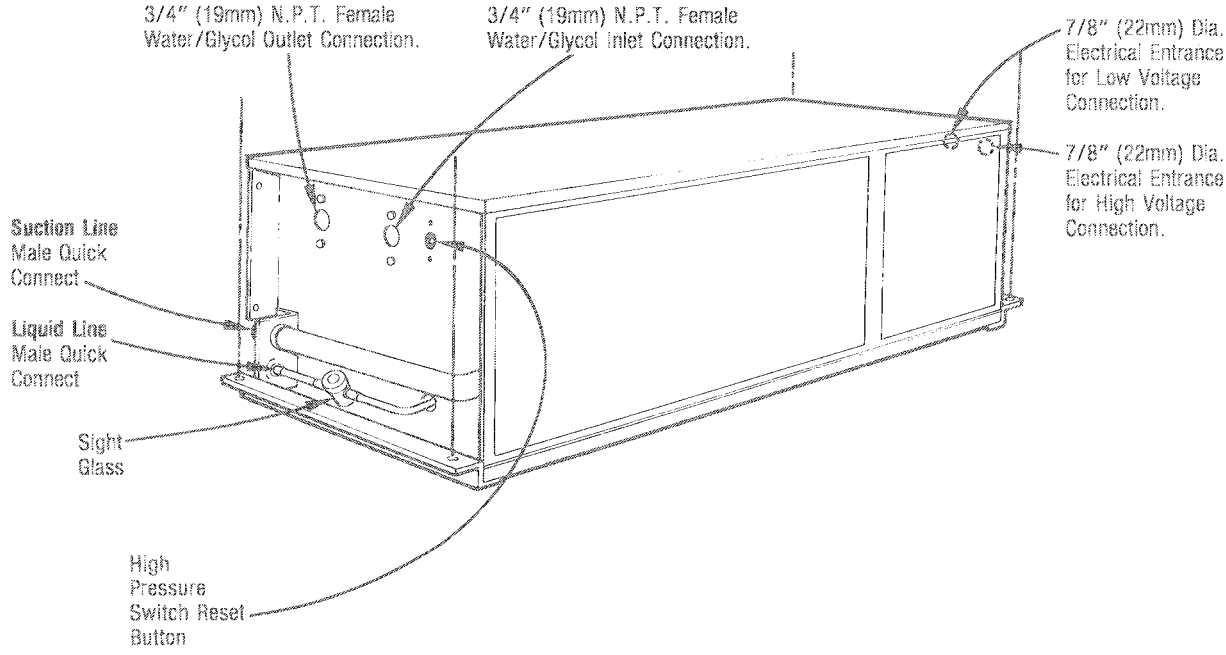


Figure 18. Water and Glycol Cooled Condensing Units Dimensions and Pipe Connections (2 and 3 ton)

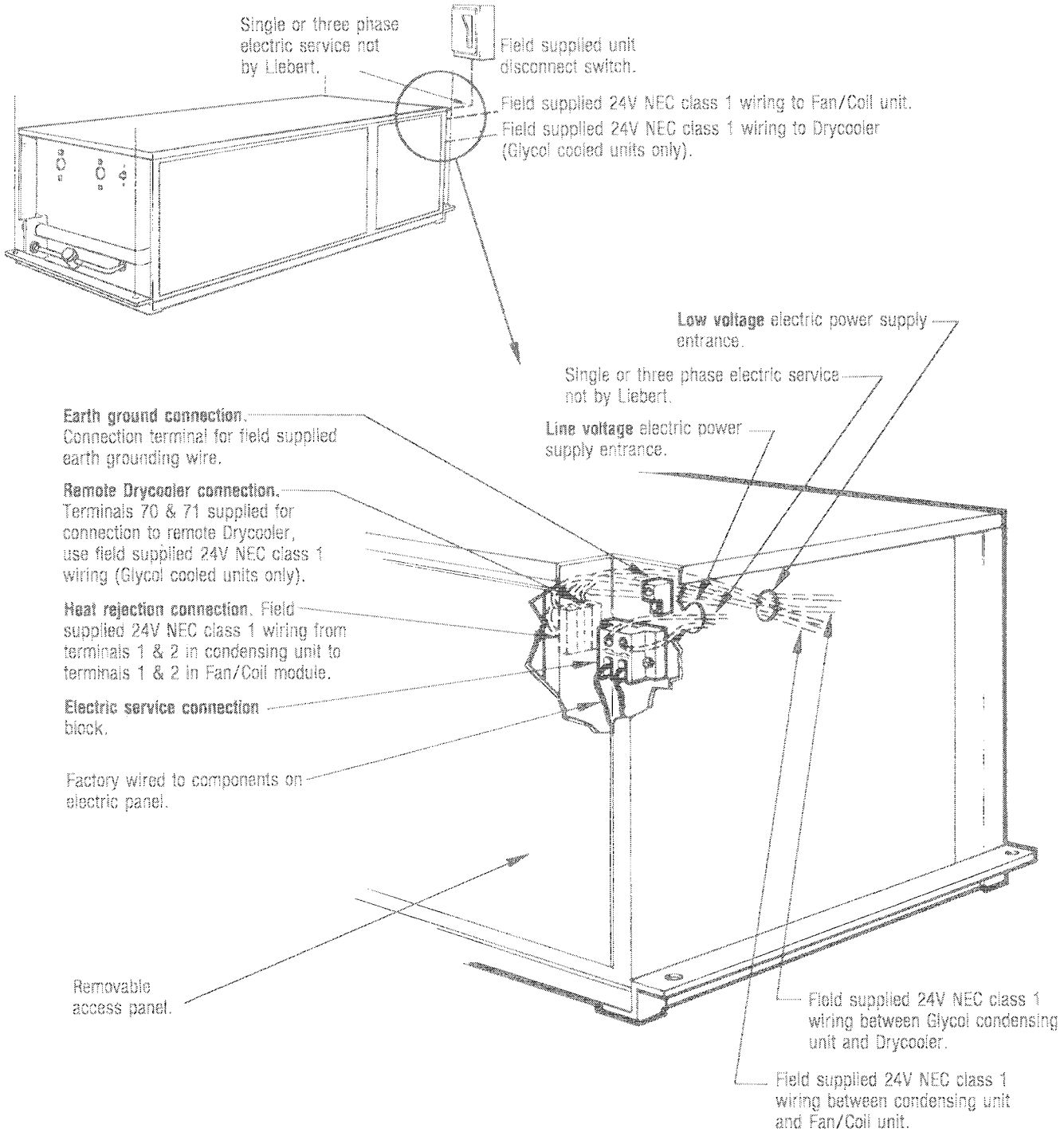
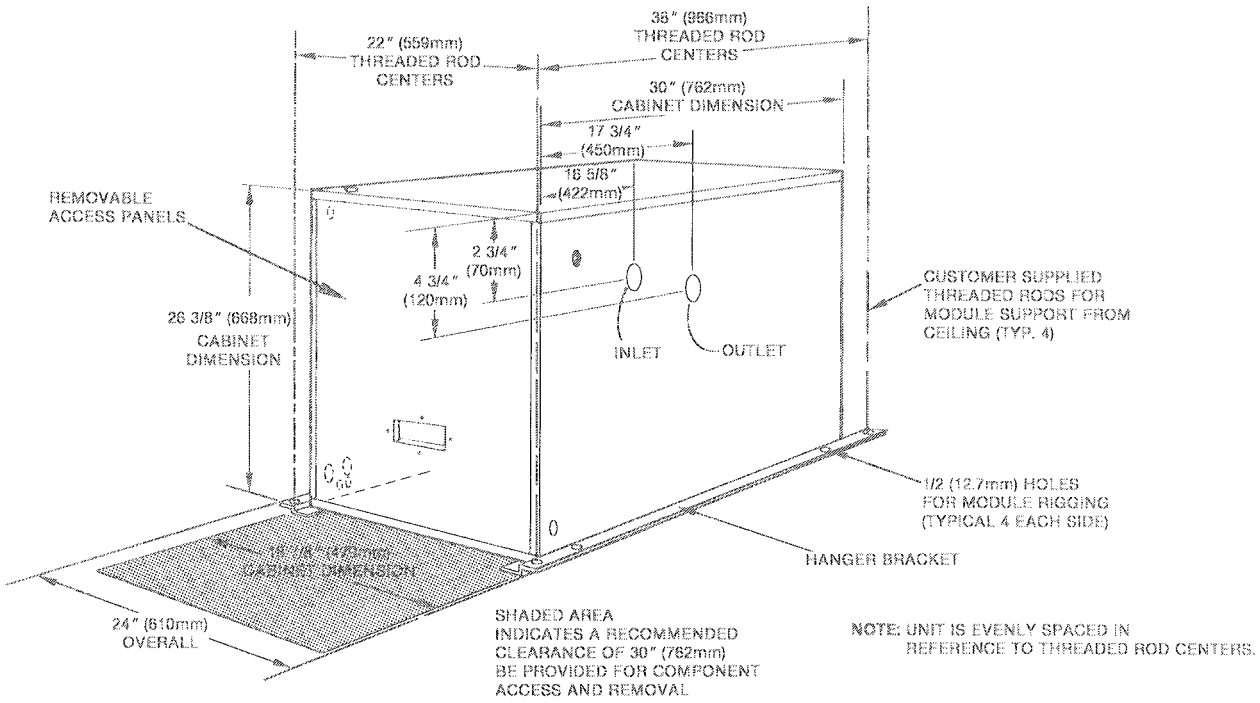


Figure 19. Water and Glycol Cooled Condensing Units Electrical Connections (2 and 3 ton)



DIMENSIONAL DATA

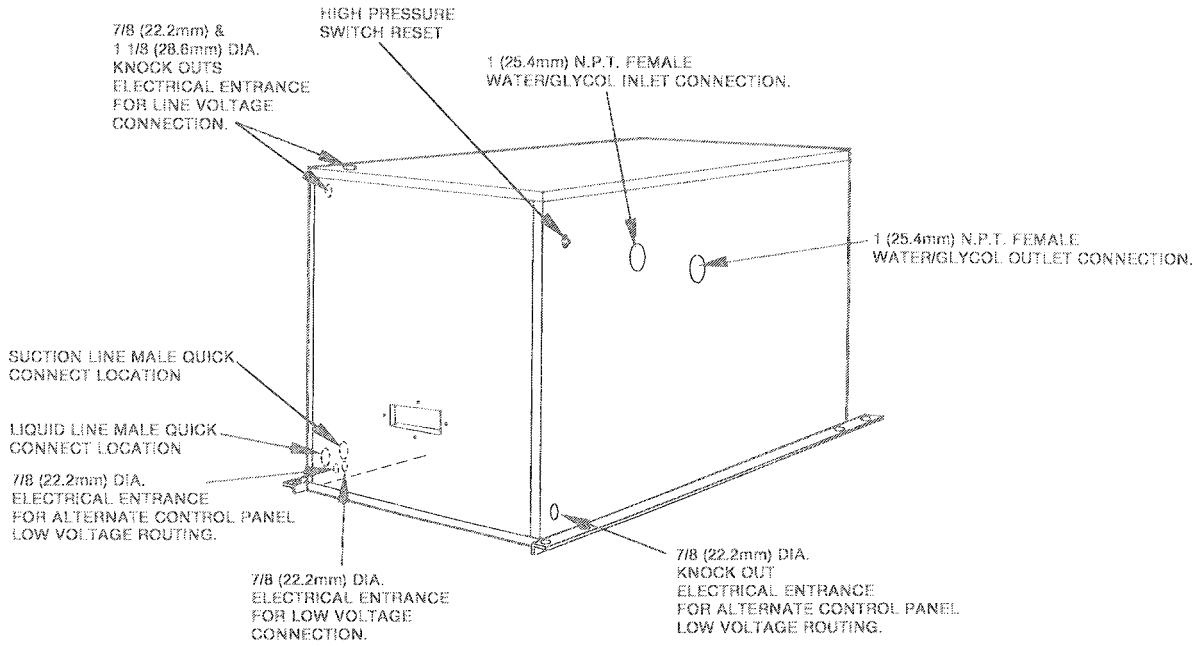
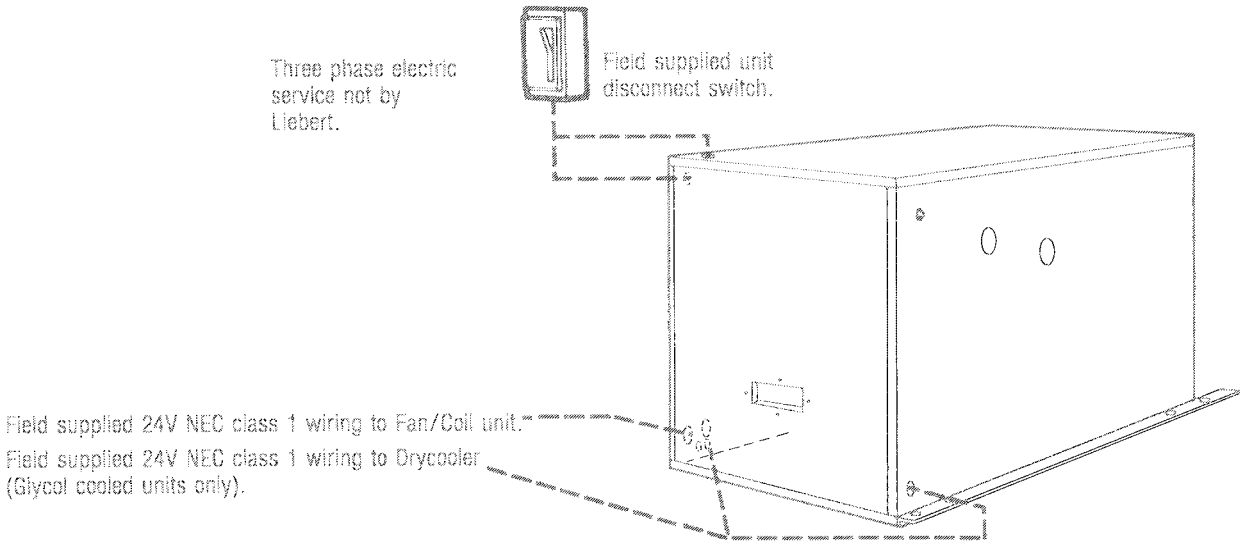


Figure 20. Water and Glycol Cooled Condensing Units Dimensions and Pipe Connections (5 ton)



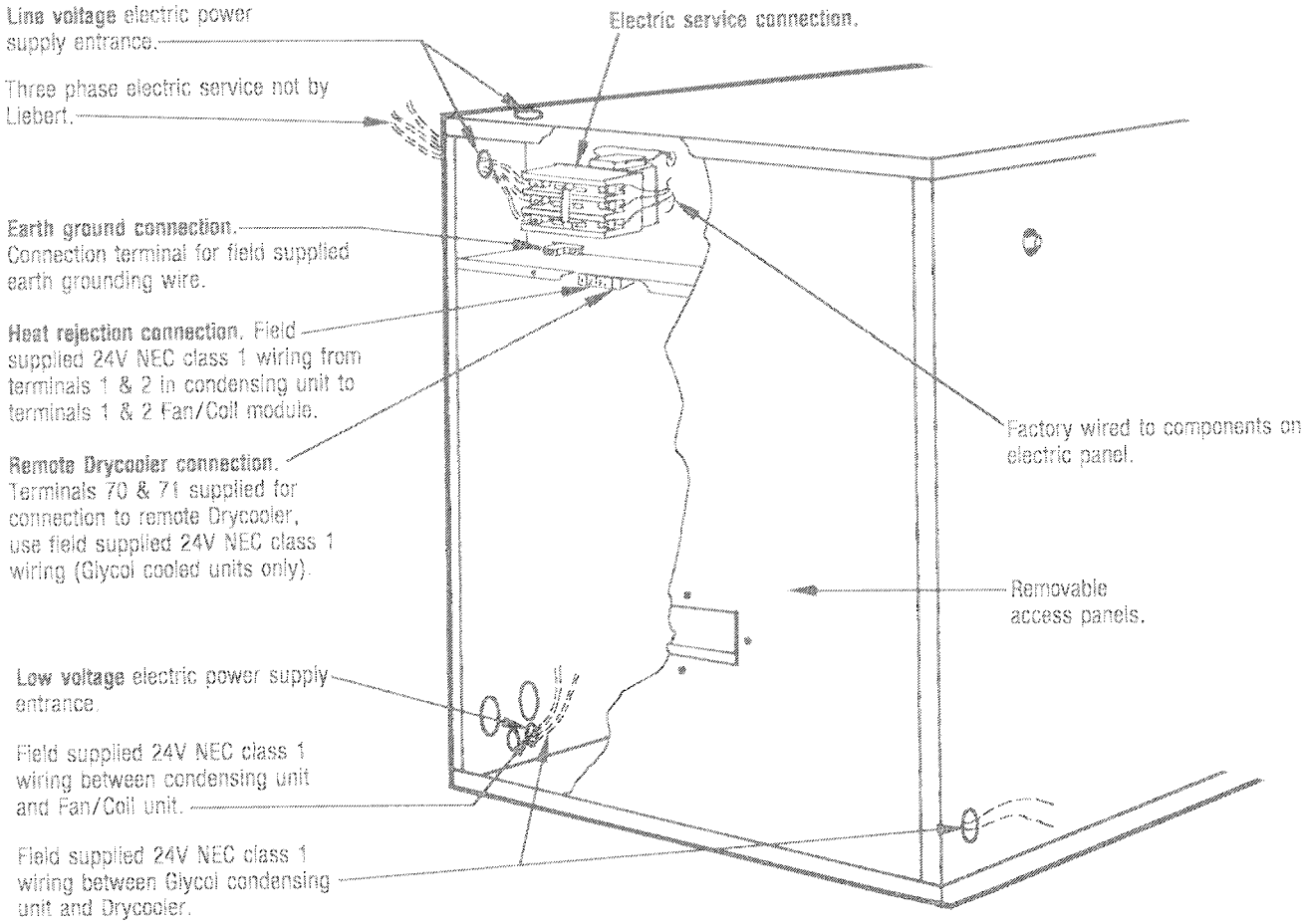


Figure 21. Water and Glycol Cooled Condensing Units Electrical Connections (5 ton)

2.8. CHECKLIST FOR COMPLETED INSTALLATION

1. Proper clearances for service access have been maintained around the equipment.
2. Equipment is level and mounting fasteners are tight.
3. Piping completed to refrigerant or coolant loop (if required). Refrigerant charge added (if required).
4. Condensate pump installed (if required).
5. Drain line connected.
6. Water supply line connected to humidifier (if required).
7. All piping connections are tight.
8. Safety pan installed under ceiling mounted water/glycol condensing units.
9. Filter box installed on ducted units.
10. Ducting completed or optional plenum installed.
11. Filter(s) installed in return air duct.
12. Line voltage to power wiring matches equipment nameplate.
13. Power wiring connections completed to disconnect switch, evaporator, and condensing unit, including earth ground.
14. Power line circuit breakers or fuses have proper ratings for equipment installed.
15. Control wiring connections completed to evaporator and condensing unit (if required), including wiring to wall-mounted control panel and optional controls.
16. Control panel DIP switches set based on customer requirements.
17. All wiring connections are tight.
18. Foreign materials have been removed from in and around all equipment installed (shipping materials, construction materials, tools, etc.).
19. Fans and blowers rotate freely without unusual noise.
20. Inspect all piping connections for leaks during initial operation.

Refrigerant Charge Requirements

Total refrigerant charge (R-22) will be required only if units are evacuated during installation or maintenance. During operation, refer to pressures on page 13.

Total Refrigerant = Units and Lines

2 AND 3 TON UNITS

Model #	Charge Lbs-oz	Charge Kg
MME024E	0-4	0.11
MME036E	0-7	0.20
MMC024A	4-2	1.87
MMC036A	5-5	2.41
MMC023G	2-9	1.16
MMC035G	3-6	1.53
MMC026W	2-1	0.94
MMC038W	2-9	1.16
DMC027A	8-12	3.97
DMC037A	15-12	7.14

5 TON UNITS

Model No.	Charge Lbs-oz	Charge Kg
Evaporator Units		
MME060E	0-13	0.37
Indoor Condensing Units		
MMC065A	27-0	12.25
MMC069WG	5-14	2.66
Outdoor, Propeller Fan Condensing Unit		
DMC067A	28-0	12.70

LINE SETS

Line Size (in)	Length (ft)	Charge Lbs-oz	Charge Kg
¼ liq, ⅝ suct	15	0-4	0.11
	30	0-8	0.23
⅜ liq, ⅞ suct	15	0-10	0.28
	30	1-4	0.57
½ liq, 1⅛ suct	15	1-4	0.57
	30	2-8	1.13

Section 3. OPERATION

3.1. SYSTEM OPERATION

With power supplied to the mini–MATE Plus, pressing the ON/OFF pad at the control panel will turn on the evaporator unit fan and the system will begin monitoring room conditions (temperature and humidity). The display will indicate present system operation. System operation is automatically controlled by the microcontroller, based on room conditions and the programmed setpoints. **If this is a new installation, perform a start–up procedure (3.1.2) before operating unit.**

The mini–MATE Plus will operate based on the following default setpoints until they are changed by using the controls described in this Section.

High temperature control	75°F
Low temperature control	65°F
High humidity control	60% RH
Low humidity control	40% RH
High temperature alarm	80°F
Low temperature alarm	60°F
High humidity alarm	70% RH
Low humidity alarm	30% RH

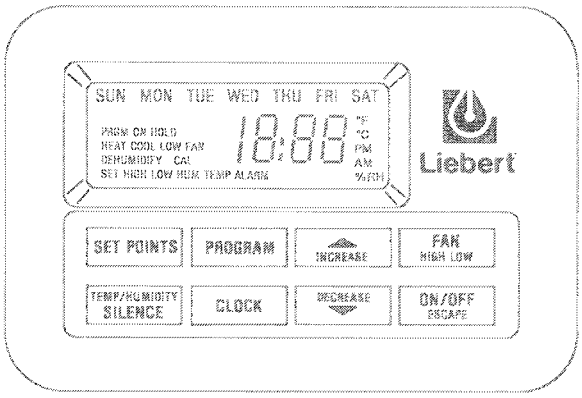


Figure 22. Control Panel

NOTE

Refer to the separate User's Guide for operating the control panel.

3.1.1. CONTROL PANEL

Selection Keypads

ON/OFF ESCAPE – Turns unit on, turns unit off, or returns the display to normal mode from one of the set (adjustment) modes. Determine present mode by reading display screen: OFF means unit is off (with power applied), On or present time and day means display is in the normal mode, and a flashing (blinking) number means a set mode. Time and day are displayed only if the Scheduled Program mode is enabled.

TEMP/HUMIDITY SILENCE – Initiates a 10 second display of present room temperature and humidity. During an alarm condition, silences audible alarm and allows alarm to reset when alarm condition is cleared.

FAN HIGH/LOW – Selects fan speed control mode: either automatic fan speed selection (high speed when required), or manual override so low fan speed only will be used.

SET POINTS – Selects and allows adjustment of the operating control setpoints and alarm setpoints.

PROGRAM – Press and hold for 3 seconds to allow review and programming of the automatic Scheduled Program. Note that this mode must be enabled by DIP switch 4 (inside the control panel) if required for this unit.

CLOCK – Allows setting of the present day and clock time (required at start–up and after a power failure), if Scheduled Program mode is enabled. Also allows access to extended setpoint adjustment mode (sensor calibration).

INCREASE – Raises the value of displayed parameter while in a set mode (setpoints, program, clock).

DECREASE – Lowers the value of displayed parameter while in a set mode.

Display Screen

During Normal Mode

Displays On or present day and time. Clock is displayed only if the Scheduled Program mode is enabled.

Displays system operating status: cool, heat, dehumidify, humidify, low fan (manual override selected).

Displays system alarms: high/low temperature and humidity.

During Set (adjustment) Modes

In any of the set modes (CLOCK, PROGRAM, or SET POINTS), the value that can be modified with the INCREASE/DECREASE pads will flash (blink).

You may exit any set mode at any time by pressing the ON/OFF pad, returning the display to normal mode. If no pad is pressed for 20 seconds the display will automatically return to normal mode.

The screen displays temperature/humidity control setpoints and alarm setpoints when the SET POINTS pad is pressed.

The screen displays times and control setpoints for 2–day/5–day automatic Scheduled Program when the PROGRAM pad is pressed for 3 seconds.

If the Scheduled Program mode is used, day and time can be set when the CLOCK pad is pressed.

During Off Mode

The display screen indicates OFF when the unit is turned off at the control panel, but power is still supplied to the controls and equipment through the disconnect switch.

3.1.2. START–UP PROCEDURE

For new installations, make sure the unit is ready to operate by going through the checklist at the end of the installation instructions.

Dip Switches

The microprocessor control panel contains four DIP switches. For access to DIP switches, pry open the control panel enclosure.

#1 On/closed = no reheat option
Off/open = reheat available

#2 On /closed = no humidity control option
Off/open = humidity control available

#3 On/closed = Special operation for European models
Off/open = Standard control operation

#4 On/closed = Scheduled Program mode enabled
Off/open = Scheduled Program mode disabled

The unit is shipped with the Scheduled Program mode disabled (DIP switch 4 Off/Open). During installation, determine if this user wants the Scheduled Program mode enabled on this unit.

Applying Power

To start the mini–MATE Plus system, turn on power at the disconnect switch. The display screen will indicate OFF. The condensing unit will also require power if it is separate from the evaporator unit. Press the ON/OFF pad at the control panel to energize the controls.

For air cooled outdoor condensing units, apply power to condenser 8 hours before operating system. This time is required to allow liquid refrigerant to be driven out of the compressor. The compressor crankcase heater is energized as long as power is supplied to the unit.

Clock Setting

If the Scheduled Program mode is used, the clock will need to be set to the present day and time for a new installation and when recovering from a power outage. Pressing the CLOCK pad will display the day of the week and time. The day can be set. Press the CLOCK pad to sequence through setting hours and minutes, and again to return the display to the normal mode.

Setpoint Adjustments

If no setpoints are entered in the set points mode, the controller will retain the default setpoints (previously listed). If the Scheduled Program mode is not used, the control setpoints will always remain as entered in the set points mode. Note that setpoints are stored in non−volatile memory, and will be retained during a power failure. No battery is required.

Subsequent depressions of the SET POINTS pad will display setpoint parameters and values presently selected (manually or by the automatic Scheduled Program). Values will be blinking. Use INCREASE or DECREASE pad to change value. Note that cooling, heating, dehumidification, and humidification operation may be individually disabled by adjusting the setpoint value out of range (dashes will be displayed). If a setpoint is not displayed, the control function (reheat or humidity) is not available on this unit (or the DIP switches are not properly set).

SET HIGH TEMP − temperature at which cooling is turned on (85°F maximum)

SET LOW TEMP − temperature at which heating is turned on (40°F minimum)

Note that a difference of at least 2 degrees between the HIGH TEMP and LOW TEMP setpoints is required by the control program.

SET HIGH HUM − humidity at which dehumidification is turned on, measured in % relative humidity (80% RH maximum)

SET LOW HUM − humidity at which humidification (optional) is turned on (20% RH minimum)

Note that a difference of at least 4% between the HIGH HUM and LOW HUM setpoints is required by the control program.

SET HIGH TEMP ALARM (90°F maximum)

SET LOW TEMP ALARM (35°F minimum)

SET HIGH HUM ALARM (85% RH maximum)

SET LOW HUM ALARM (15% RH minimum)

Note that any alarm can be disabled by adjusting its setpoint out of range (dashes will be displayed).

After the last setpoint is displayed, pressing the SET POINTS pad again returns the display to normal mode.

Scheduled Program Modification

Pressing and holding the PROGRAM pad for 3 seconds displays the automatic Scheduled Program if this mode is enabled by DIP switch 4. Note that the alarm setpoints are adjusted in the SET POINTS mode only. Alarms are not affected by the schedule.

Initially the weekend days of the 2−day/5−day schedule will be displayed. The desired time of the first automatic Scheduled Program change for both weekend days can be set. Subsequent depressions of the PROGRAM pad will select the control setpoints for the first change followed by the time and control setpoints for the second change:

SUN SAT SET 12:00 A.M. (set time for first change, INCREASE or DECREASE in 15 minute increments)

SUN SAT SET HI TEMP
(set high temp control for first change)

SUN SAT SET LOW TEMP
(set low temp control for first change)

SUN SAT SET HI HUM
(set high hum control for first change)

SUN SAT SET LOW HUM
(set low hum control for first change)

Messages repeat for second change setpoints.

Depressing the PROGRAM pad again will display the weekdays (MON − FRI) of a 2−day/5−day schedule. The desired time of the first automatic Scheduled Program change for all weekdays can be set. Subsequent depressions of the PROGRAM pad will select the control setpoints for the first change, followed by the time and control setpoints for the second change:

MON TUE WED THU FRI SET 12:00 AM
(set time for first change)

MON TUE WED THU FRI SET HI TEMP
(set high temp control for first change)

MON TUE WED THU FRI SET LOW TEMP
(set low temp control for first change)

MON TUE WED THU FRI SET HI HUM
(set high hum control for first change)

MON TUE WED THU FRI SET LOW HUM
(set low hum control first change)

Messages repeat for second change setpoints.

Note that any program step can be disabled by setting the time for that step out of range (dashes will be displayed).

The system can be programmed to shut off completely (fan off) by adjusting all control setpoints out of range (dashes will be displayed). Increase HI setpoints to out of range and decrease LOW setpoints to out of range. The system will automatically turn on at the time of the next scheduled change containing a valid setpoint.

Holding the INCREASE or DECREASE pad down will cause an automatic repeat of the pad function.

After the last step is displayed, pressing the PROGRAM pad again returns the display screen to the normal mode. It is a good idea to write down the scheduled program (form available in Appendix A).

Sensor Calibration

If the CLOCK pad is pressed while in the HIGH TEMP set point mode, the following additional adjustments may be selected by subsequent depressions of the SET POINTS pad:

Calibrate temperature and/or humidity sensor by adjusting the display to agree with a portable calibrated sensor (supplied by user), if you suspect that readings displayed are not accurate. For best accuracy, calibrate a sensor near the middle of its range.

SET CAL TEMP – calibrate temperature sensor (adjustable ± 5)

SET CAL HUM – calibrate humidity sensor (adjustable ± 10%)

SET DE – adjust sensor response delay (adjustable 1 to 90 seconds, factory set at 50 seconds)

SET F C – select degrees F or C display

Do not calibrate sensors until the unit has maintained stable room conditions for at least 15 minutes.

Start–up Checklist

1. Test cooling operation by adjusting the HIGH TEMP setpoint below room temperature. The compressor should start and discharge air should feel cooler. Note that the compressor controls include a 3 minute delay from stop to start.

If cooling does not seem adequate, refer to installation instructions for recommended compressor suction and discharge pressures. Water and Glycol Cooled units each have a regulating valve that has been factory set. A valve adjustment may be required based on conditions at your site (especially water temperature).

2. Test heating operation by adjusting the LOW TEMP setpoint above room temperature. The electric reheat element should be energized to warm the discharge air.

3. Test dehumidify operation and humidify operation (if option included) by adjusting setpoints and observing results on the display.

4. **Check evaporator and compressor areas for leaking refrigerant, water, or compressor oil.**

5. Check that all blowers and fans rotate freely without unusual noise.

6. Replace all equipment and ceiling panels removed to perform start–up checks.

3.1.3. OPERATING PROCEDURE

Refer to start–up procedure for energizing unit and adjusting setpoints.

Press TEMP/HUMIDITY SILENCE pad to read present room temperature and humidity.

If room temperature or humidity exceeds an alarm setpoint for 30 seconds, the display screen will indicate an alarm message and a beeper will be energized. Press the TEMP/HUMIDITY SILENCE pad to silence the beeper.

Press the FAN HIGH LOW pad if you want the fan (blower) to operate at low speed only. The display will indicate LOW FAN. If LOW FAN is not displayed, fan will operate at high speed when required (during cooling without dehumidification, and during cooling with dehumidification if room temperature rises to 2 degrees F above high temperature setpoint).

Refer to start–up procedure for detailed instructions on adjusting setpoints or changing the Scheduled Program. Allow some time for room environment to stabilize after adjusting a control setpoint. Avoid frequent setpoint adjustments.

3.1.4. SHUTDOWN PROCEDURE

To turn off the mini–MATE Plus, press the ON/OFF ESCAPE pad at the control panel.

For a maintenance shutdown, also turn OFF power disconnect switches.

Automatic Shutdowns

High Water

The evaporator pan (and condensate pump) is equipped with a float switch that will turn off the unit if the drain line is blocked. Clear the drain line. Reset the system by pressing the ON/OFF ESCAPE pad twice (OFF, then ON).

High Head Pressure

The condensing unit includes a high pressure cutoff switch with a manual reset button. System should operate after the reset button at the condensing unit is pressed.

3.2. EQUIPMENT OPERATION

3.2.1. EVAPORATOR COMPONENTS

Cooling

When the return air temperature rises to the high temperature setpoint, the control activates the refrigeration system or the Chilled Water control valve. Cooling continues until the temperature decreases to 1 degree F below the setpoint. If the refrigeration system has two stages of cooling (an evaporator coil split into two sections, with a capacity reduction solenoid), the second stage is activated if the air temperature rises to 1 degree F above the high temperature setpoint.

An automatic reset freeze–stat is supplied on all evaporator coils to prevent freezing. If the evaporator temperature falls below 28°F, the freeze–stat will open, shutting down the compressor until the evaporator temperature rises to 42°F.

Heating (Optional)

If the return air temperature drops to the low temperature setpoint, the control activates the electric reheat which is located in the evaporator unit. The reheat continues to operate until the temperature rises to 1 degree F above the setpoint.

The electric reheat is supplied with an over–temperature safety switch that opens if the temperature inside the evaporator reaches 120°F.

Humidification (Optional)

When the air humidity drops to the low humidity setpoint, the control activates the steam generating humidifier, which continues to operate until the room humidity has increased to 2% RH above the setpoint.

Dehumidification

When the humidity rises to the high humidity setpoint, the control activates the refrigeration system or the Chilled Water control valve. The fan will operate at low or high speed depending on temperature control requiremetns. This continues until the humidity has dropped to 2% RH below the setpoint. Note that the refrigeration system is used to lower the humidity. This may cool the room to a level below the low temperature setpoint and thereby
activate the electric reheat. It is possible that both the refrigeration system and electric reheat will be operating at the same time for dehumidification. **The dehumidify function of the mini–MATE Plus is active only if the optional humidifier is included in your system.**

3.2.2. CONDENSING COMPONENTS

The condensing components include the compressor with crankcase heater, condenser, filter/drier, sight glass, high pressure cutout switch, and controls. The crankcase heater prevents liquid refrigerant migration into the compressor during the off cycle, to prevent damage to the compressor when it is turned on. The high pressure switch is factory set to trip at 360 PSIG, and has a manual reset button. The compressor circuit includes an automatic short cycle control to prevent frequent starts. The minimum time from compressor stop to start is 3 minutes.

Indoor Air Cooled Condensing Unit

The unit uses a centrifugal blower. The 2 and 3 ton units include a fan speed controller (FSC) to adjust fan speed to control refrigerant condensing temperature based on compressor discharge pressure. Units in 5 ton systems include Lee–Temp components, described below.

Outdoor Air Cooled Condensing Unit

The outdoor air cooled unit uses a propeller fan. The outdoor unit also includes a Lee–Temp flood back head pressure control, which includes a receiver and a head pressure control valve. This control system floods the condenser coil with refrigerant that is warmed in the receiver to maintain head pressure during low ambient temperature operation.

Water/Glycol Cooled Unit

The condensing components for this model are self contained in the ceiling unit. This unit includes a 2–way regulating valve that is factory installed and factory set. The valve automatically opens as refrigerant pressure increases, and closes when pressure decreases. Refer to the installation instructions for the procedure to flush or adjust this valve.

Chilled Water Unit

This unit has chilled water flowing through the evaporator coil. A factory installed control valve is included in the chilled water loop, and is operated by the mini–MATE Plus control system.

3.2.3. HUMIDIFIER

The optional humidifier system consists of a water canister with an internal set of electrodes that generate the steam used for humidification. The steam is introduced into the air through a copper discharge tube in the coil bypass section.

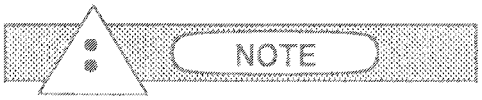
The humidifier RUN/DRAIN switch is located near the humidifier canister. This switch should be in the RUN position when the humidifier is in normal operation, and in the DRAIN position when a manual drain sequence is required.

The humidifier is designed to operate with water systems having 10 to 150 PSIG water pressure. Steam generating capacity is 4.5 lbs/hr for 2 and 3 ton units, and 10 lbs/hr for 5 ton units.

2 and 3 Ton Humidifier Operation

During start-up, when the controller calls for humidification, the fill valve opens and water enters the canister. When the water level reaches the electrodes, current flows and the water begins to warm. The canister fills continuously as long as there is a call for humidification. As the water warms, its conductivity increases and the current flow rises. Boiling soon commences and the humidifier operates normally.

Steam output varies greatly with water conditions. The humidifier on/drain cycle, which limits output, will vary depending on the water condition. Normal duration of this cycle is 2 to 3 minutes.



If the conductivity of the local water is extremely low or high, a non-standard canister may be required. Contact your sales representative if the humidifier does not operate properly with the standard canister.

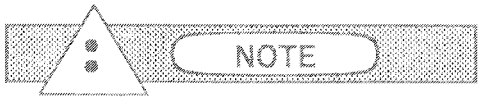
If the current flow in the canister reaches a set level above the normal operating amperage, an overcurrent breaker shuts off power to the electrodes while the drain valve opens, flushing some of the water out of the canister. Within about 15 to 20 seconds, the over current breaker automatically resets. Less water is then exposed to the electrodes and the current flow should resume without tripping the overcurrent breaker. Boiling soon resumes and the canister operates normally.

If the conductivity of the water is high, steam is generated with less of the electrodes exposed to the water. The humidifier cycle time (from fill to drain) will be shorter.

If the conductivity of the water is low, the canister fills until the water level reaches the overflow bypass level and drains. Boiling should commence in time. As water is boiled off, the mineral concentration in the canister increases and current flow also increases. The canister eventually reaches full output and goes to normal operation.

Over a period of time, the electrode surface will become coated with a layer of insulating minerals, which causes a drop in current flow. As this happens, the water level in the canister will slowly rise because less steam is being produced. This exposes more electrode surface to the water and maintains normal output. Eventually, the steady state water level will reach the overflow tube and drain. At this point, all of electrode surface has been used up and the canister should be replaced.

After the entire electrode surface has been coated, the output will slowly decrease. This should allow enough time to schedule maintenance.



When the unit stays in humidification mode and no longer produces steam, the humidifier canister needs to be replaced.

Refer to Section 4 – MAINTENANCE for instructions to replace the canister.

5 Ton Humidifier Operation

1. During start–up, when the controller calls for humidification, the fill valve opens and water enters the canister. When the water level reaches the electrodes, current flows and heats the water. The canister fills until the amperage reaches the setpoint and the fill valve closes. As the water warms, its conductivity increases and the current rises. If the amperage reaches 115% of the setpoint, the drain valve opens momentarily. This reduces electrode contact with the water and lowers the current to 100%. Boiling soon commences, and the canister operates normally.
2. Normal operation is controlled by a time cycle which is factory set at 60 seconds. At the end of each cycle, the fill valve opens to replenish the water boiled off so a "steady state" is maintained.
3. If the conductivity of the water is low, the fill valve will remain open. Before the amperage reaches setpoint, the water level may reach the overflow tube and drain. Boiling should commence in time. As water is boiled off, the mineral concentration increases. The humidifier eventually reaches full output and goes into normal operation. Refer to Circuit Board Adjustments for the "%" pot.
4. During canister operation, the mineral concentration increases and water boils off rapidly. The current decreases quickly because water contacts less electrode surface. When the current decreases to the low threshold point before the end of the time cycle, the drain valve opens. The mineral laden water drains out and is replaced with fresh water. This lowers the mineral concentration and returns the canister to "steady state" operation and prolongs canister life. The frequency of drains depends on water conductivity.
5. The electrode surface will eventually become coated with a layer of insulating material, which causes a drop in current flow. The water level in the canister will slowly rise exposing new electrode surface to the water to maintain normal output. Eventually, the steady state water level will reach the overflow tube and continuously drain water out of the canister. Steam capacity will decline. At this point, all of electrode surface has been used up and the canister should be replaced.

NOTE

When the unit stays in humidification mode and no longer produces steam, the humidifier canister needs to be replaced.

6. If the mineral concentration is too high, arcing can occur. If the electrodes start to arc, turn off the humidifier immediately and replace the canister.

Refer to Section 4 – MAINTENANCE for instructions to replace the canister.

5 Ton Circuit Board Adjustments

WARNING

CIRCUIT BOARD ADJUSTMENT SHOULD BE PERFORMED BY QUALIFIED PERSONNEL ONLY. HAZARDOUS VOLTAGES ARE PRESENT IN THE EQUIPMENT. USE EXTREME CAUTION. POWER MAY BE DISCONNECTED WHILE MAKING ADJUSTMENTS.

Humidifier operation is governed by the humidifier control board. This board is located on the left side of the humidifier. Three potentiometers are mounted on the board. These pots can be used to adjust for extreme water conductivity conditions and capacity.

The "%" pot controls the amperage at which the drain will energize. This adjustment is factory set at 80%, which indicates that the unit will drain when the amperage decreases to 80% of the setpoint. The % value should be increased for highly conductive water and decreased for less conductive water. If a change of three to four percent in either direction does not resume normal operation, consult Customer Service and Support.

The pot marked "sec" controls the duration of the drain cycle. This adjustment is factory set at 60 seconds. The pot marked "cap adj" controls humidifier capacity. Consult Customer Service and Support before adjusting either of these two pots.

Section 4. MAINTENANCE

Use copies of the Maintenance Inspection Checklist in this manual to record preventive maintenance inspections. For assistance, contact your Liebert supplier.

WARNING

TURN OFF POWER TO UNIT AT DISCONNECT SWITCH UNLESS YOU ARE PERFORMING TESTS THAT REQUIRE POWER. WITH POWER AND CONTROLS ENERGIZED, UNIT COULD BEGIN OPERATING AUTOMATICALLY AT ANY TIME.

HAZARDOUS VOLTAGE WILL STILL BE PRESENT AT EVAPORATOR, CONDENSER, REHEAT, AND HUMIDIFIER, EVEN WITH THE UNIT TURNED OFF AT THE CONTROL PANEL. TO ISOLATE UNIT FOR MAINTENANCE, TURN OFF POWER AT DISCONNECT SWITCH.

4.1. EVAPORATOR UNIT

MAINTENANCE ACCESS

Access to the evaporator unit is through two removable panels, both on the same side of the housing. The panel on the left provides access to:

- blower
- evaporator coil
- humidifier (optional)
- condensate pump (optional)

The panel on the right provides access to the following components (if applicable):

- thermostatic expansion valve
- electric reheat element (with over– temperature switch)
- chilled water valve

FILTER

The filter is usually the most neglected item in an air conditioning system. To maintain efficient operation, it should be checked monthly and cleaned or replaced as required.

On the optional plenum for 2 and 3 ton units, lift up the filter door on the end of the plenum and remove it for access to the filter.

AIR DISTRIBUTION SYSTEM

Periodic checks of the blower system should include checking the fan motor mounts, housing, and impellers. Check that all mounts are secure and that impellers are tightly mounted on the fan shaft and do not rub against the fan housing. The entire fan area including the air discharge grilles should be free of debris. The evaporator fan motor is direct–drive, two–speed, and requires no adjustment.

If you need to remove the optional plenum from a 2 or 3 ton unit, remove the filter door for access to the two hex head bolts. Remove the two bolts. Support the far end of the plenum. Lower the door end and pull it toward you. The plenum will slide off the two mounting brackets. Note that the plenum weighs about 20 pounds.

DRAIN PAN

To assure proper drainage, inspect the drain pan regularly. Make sure the drain pan outlet is always free of debris and make sure that the drain pan does not leak.

ELECTRIC REHEAT

The reheat consists of an electric heating element surrounded by a finned tube. The reheat should be free of dust and debris. During normal operation, the element will last indefinitely. Inspect semi–annually to make sure it is still operational.

HUMIDIFIER

Because water conditions vary greatly, it is difficult to establish intervals for changing the canister. Individual maintenance schedules must be determined for each location, based upon periodic examination of the humidifier.

If the canister must be removed or replaced, decreasing the low humidity setpoint to below ambient humidity will allow the canister to cool before removing it. Drain it by pushing the Run/Drain switch to the Drain position. Disconnect power to the unit. Turn off valve in the humidifier supply line.

The canister and discharge tube may be hot!

2 and 3 Ton Canister Replacement

Remove the discharge tube and the two electrode terminals connected to the canister. Lift the canister out and tilt it so you can loosen the drain fitting lock nut. Install the new canister the same way, except that it does not require new water fitting lock nuts and ferrules on the canister connections. Apply power and water to the unit and push the Run/Drain switch to the Run position. Adjust low humidity setpoint to call for humidification. When you restart the unit, the canister will take about 20 minutes to produce steam. If it does not start producing steam, add some salt or other electrolyte to the water.

5 Ton Canister Replacement

1. Remove the three power wire quick connects at terminals 1, 2, and 3.
2. Disconnect the steam outlet hose from the canister fitting and from the discharge tube by loosening the hose clamps.
3. Remove canister by placing fingers at the bottom of the canister on both sides of the neck. Push upward firmly to separate the canister from the drain valve.
4. Make sure both O–rings come out with the canister.
5. Install two new O–rings on the bottom neck of the new canister. The larger O–ring should be closer to the canister.
6. Insert new canister firmly into the drain valve.
7. Connect steam outlet hose to the canister fitting and to the discharge tube with hose clamps. Make sure discharge tube is in proper position.
8. Connect power wires to terminals 1, 2, and 3.
9. Make sure all electrical and water connections are tight. Apply water and power to the unit.
10. Push the Run/Drain switch to the Run position. Adjust low humidity setpoint to call for humidification. When you restart the unit, the canister will take about 20 minutes to produce steam.
11. Check for proper operation and leaks.

4.2. CONDENSING UNIT

Maintenance access to the condensing unit is through one or two removable panels (depending on model).

Clean the air cooled condenser coil of all debris that will inhibit air flow. This can be done with compressed air or with a commercial coil cleaner. Check for bent or damaged coil fins and repair as necessary. On outdoor units in winter, do not permit snow to accumulate on or around the condensing unit. Check all refrigerant lines and capillaries for vibration isolation and support as necessary. Check all refrigerant and coolant lines for signs of leaks.

The compressor crankcase heater is energized as long as power is supplied to the unit. If the main switch is disconnected for long periods, do not attempt to start a condensing unit until 8 hours after applying power. This allows enough time for all liquid refrigerant to be driven out of the compressor. Note that this is especially important at low ambient temperatures, and for units with Lee–Temp receivers.

4.2.1. COMPRESSOR FAILURE

If a compressor motor burns out, the stator wiring insulation decomposes, forming carbon, water and acid. Not only must the compressor be replaced, but the entire refrigeration circuit must be cleaned of the harmful contaminants left by the burnout. Successive burnouts of the same system can usually be attributed to improper system cleaning.

DAMAGE TO A REPLACEMENT COMPRESSOR CAUSED BY IMPROPER SYSTEM CLEANING CONSTITUTES ABUSE UNDER THE TERMS OF THE WARRANTY.

Before proceeding with a suspected burnout, check all electrical components.

1. Check all fuses, contactors, and wiring.
2. Check Hi Pressure switch operation. If a compressor failure has occurred, determine whether it is an electrical or mechanical failure.
3. Replace the compressor using procedure on the next page.

ELECTRICAL – An electrical failure will be indicated by the distinct pungent odor when some refrigerant is released through the service port. If a severe burnout has occurred, the oil will be black and acidic.

MECHANICAL – No burned odor from gas released at service port. Motor attempts to run.

Electrical Failure (Burnout)

In the event that there is an electrical failure and a complete burnout of the refrigeration compressor motor, the proper procedures must be performed in order to clean the system to remove any acids that would cause a future failure.

Failure to properly clean the system after a compressor motor burnout will VOID THE COMPRESSOR WARRANTY.

There are two kits that can be used with a complete compressor burnout – Sporlan System Cleaner and Alco Dri-Kleener. Follow the manufacturer's procedure.

Avoid touching or contacting the gas and oils with exposed skin. Severe burns will result. Use long rubber gloves in handling contaminated parts.

Mechanical Failure

If it has been determined that a mechanical failure has occurred, the compressor must be replaced.

Compressor Replacement

Replacement compressors are available from the vendor. They will be shipped in a permanent crate to the job site as required by the service contractor.

Upon shipping a replacement compressor, the service contractor will be billed in full for the compressor until the replacement has been returned to the factory.

The compressor should be returned in the same container used for shipping to the job. The possible damage causes or conditions that were found should be recorded by marking the compressor return tag.

1. Disconnect power.
2. Attach suction and discharge gauges to access fittings.
3. Recover refrigerant using standard recovery procedures and equipment. Use a filter–drier when charging the system with recovered refrigerant.

CAUTION

Do not loosen any refrigeration or electrical connections before relieving pressure.

NOTE

Release of refrigerant to the atmosphere is harmful to the environment. Refrigerant must be recycled or discarded in accordance with federal, state, and local regulations.

4. Unsweat refrigerant connections and disconnect electrical connections.
5. Remove failed compressor.
6. Install replacement compressor and make all connections.
7. Pressurize and leak test the system.
8. Follow manufacturer's instructions for clean out kits.
9. Evacuate the system twice to 1500 microns, and the third time to 500 microns.
10. Charge the system with refrigerant based on requirements of the evaporator, condensing unit, and lines. Refer to page 36 or unit nameplate.
11. Apply power and operate system. Check for proper operation. Refer to design pressures on page 9.

MAINTENANCE INSPECTION CHECKLIST

MAKE PHOTOCOPIES OF THIS FORM FOR YOUR RECORDS

DATE: _____ PREPARED BY: _____

MODEL #: _____ SERIAL #: _____

MONTHLY

Filters

- ☐ Restricted air flow
- ☐ Check filter
- ☐ Wipe section clean

Fan Section

- ☐ Impellers free of debris
- ☐ Bearings free

Humidifier

- ☐ Check canister for mineral deposits
- ☐ Check condition of electrodes
- ☐ All hoses and fittings tight
- ☐ Check water make-up valve for leaks

SEMI-ANNUALLY

Compressor Section

- ☐ Signs of oil leaks
- ☐ Liquid Indicator
- ☐ Vibration Isolation

Air Cooled Condensing Unit (if applicable)

- ☐ Condenser coil clean
- ☐ Motor mount tight
- ☐ Bearings free
- ☐ Refrigerant lines properly supported

Water or Glycol Cooled Condensing Unit (if applicable)

- ☐ Water valve adjustment
- ☐ Check strainer
- ☐ Water leaks
- ☐ Water flow

Refrigeration Cycle

- ☐ Suction pressure
- ☐ Head pressure
- ☐ Superheat
- ☐ Evaporator Coil Clean
- ☐ Insulation intact

Flood Back Head Pressure Control (if applicable)

- ☐ Check refrigerant level

Glycol Pump (if applicable)

- ☐ Glycol leaks
- ☐ Pump operation
- ☐ Glycol solution
- ☐ pH level

Electric Panel

- ☐ Check electrical connections
- ☐ Operational sequence

NOTES: _____

_____

_____

SIGNATURE _____

Section 5. TROUBLESHOOTING

WARNING

TURN OFF POWER TO UNIT AT DISCONNECT SWITCH UNLESS YOU ARE PERFORMING TESTS THAT REQUIRE POWER. WITH POWER AND CONTROLS ENERGIZED, UNIT COULD BEGIN OPERATING AUTOMATICALLY AT ANY TIME.

HAZARDOUS VOLTAGE WILL STILL BE PRESENT AT EVAPORATOR, CONDENSER, REHEAT, AND HUMIDIFIER, EVEN WITH THE UNIT TURNED OFF AT THE CONTROL PANEL. TO ISOLATE UNIT FOR MAINTENANCE, TURN OFF POWER AT DISCONNECT SWITCH.

SYMPTOM	POSSIBLE CAUSE	CHECK OR REMEDY
Unit will not start	No power to unit	Check voltage at input terminal block.
	Control voltage circuit breaker (at transformer) open	Locate short and reset circuit breaker.
	Float switch relay has closed due to high water in the condensate pan	Has rubber band been removed from float switch? Check drain and line. Reset unit by pressing the ON/OFF pad twice (OFF, then ON).
	All control setpoints are out of range (dashes are displayed for setpoint)	Verify at least one control setpoint is in range.
No cooling	"COOL" is not displayed at the control panel	Adjust HIGH TEMP control setpoint to require cooling
	Short cycle prevention control	Control software delays compressor 3 minutes from stop to start.
	Compressor contactor not pulling in	Check for 24 VAC ± 2 VAC at terminals P2-3 and P2-4. If voltage, check contactor. If no voltage at P2-3 and P2-4, check at terminals P2-3 and P2-8. If voltage, check freeze stat. Check wiring and/or replace interface board. Check wiring from control panel to interface board.
	Compressor high head pressure	Push reset switch in condensing unit. See below for cause and remedy.
	Plugged filter/drier	Replace filter/drier.
	Low refrigerant charge	Check pressure with gauges. See Section 2.4.3 for recommended pressures. At low ambient temperatures, proper refrigerant charge is very important on units with Lee-Temp receivers.

SYMPTOM	POSSIBLE CAUSE	CHECK OR REMEDY
Compressor high head pressure	Insufficient air flow across condenser coil	Remove debris from coil and air inlets.
	Water/Glycol Cooled only: No fluid flowing through condenser	Check fluid supply to regulating valve. Adjust valve if necessary. See **Section 2.7.3** for procedure.
	Self Contained Air Cooled only: Condenser fan not operating	Check fan operation.
Humidifier does not operate	DIP switch not set to enable humidifier option	See Start–Up Procedure **Section 3.1.2**.
	"HUMIDIFY" not displayed at the control panel	Decrease LOW HUM control setpoint to require humidification.
	Defective interface board or humidifier circuit board	Check voltage at P2–16 and P2–15 on interface board for 24 VAC ± 2VAC. If no voltage, check wiring and/or replace interface board. Check wiring from control panel to interface board. Also check humidifier circuit board on 5 ton units.
	Failed humidity sensor	Humidity display will indicate dashes. Check wiring from temperature/humidity board to the interface board and from the control panel to the interface board. Replace temperature/humidity circuit board.
	No water flow	Make sure switch is in Run position. Check humidifier water supply, including filter screen. Check nylon overflow line if canister is full.
	Canister fill rate is not keeping up with steam output	Check fill valve screen opening and capillary tube for obstructions. Check water supply pressure (minimum 10 PSIG).
Reheat will not operate	DIP switch not set to enable reheat	See Start–Up Procedure **Section 3.1.2**.
	"HEAT" not displayed at the control panel	Decrease LOW TEMP setpoint to require heating.
	Reheat safety open, defective reheat contactor, or defective interface board	Check voltage at P2–14 and P2–13 on interface board for 24 VAC ± 2 VAC. If voltage, check reheat contactor and reheat safety. If no voltage, check wiring and/or replace interface board. Check wiring from control panel to interface board.
	Element is burned out	Turn off power. Check element continuity with ohm meter.

SYMPTOM	POSSIBLE CAUSE	CHECK OR REMEDY
Fan will not operate at low speed when selected from control panel	Open wiring or failed interface board	Verify "LOW FAN" is displayed at the control panel. Check for 24 VAC ± 2 VAC at terminals P2–9 and P2–10. If no voltage, check wiring and/or replace interface board. Check fan contactors.
Fan will not operate at low speed during dehumidification	Temperature is more than 2 degrees F above the HIGH TEMP setpoint	Verify with display. COOL requirement overrides DEHUMIDIFY.
Cooling cycle too short	Sensor response delay too short	Increase sensor response delay. See Sensor Calibration under Start–Up Procedure, Section 3.1.2.
Control setpoint cannot be adjusted to desired value	Improper setpoint adjustment attempted	Control will not allow LOW control setpoint (temperature or humidity) to be set above the HIGH control setpoint. Decreasing the HIGH control setpoint will automatically decrease the LOW control setpoint.
Display freezes and control pads do not respond	Static discharge	During periods of low humidity, static electricity can cause the control program to freeze or display incorrect information. Although this is unlikely, the control can be reset by cycling power from the disconnect switch.
Condensate pump does not operate	Open or short circuit in wiring	Find open or short circuit and repair power to pump.
Continuous Cooling*	Failed temperature sensor	Temperature display will indicate dashes. Check wiring from temperature/humidity board to the interface board and from the control panel to the interface board. Replace temperature/humidity circuit board.
Continuous Heating* Dehumidification* Humidification*	Shorted wiring or failed interface board	Check wiring and/or replace interface board. Also check humidifier circuit board on 5 ton units.

* Assuming the load is within the limits of the unit's rating.

APPENDIX A
User's Guide for Environmental System Micro-Control Panel

NORMAL OPERATION

- **To turn system ON or OFF** press [ON/OFF ESCAPE].

  If OFF is displayed power is available but the system is OFF.

  If On or time is displayed the system is operating.

  On indicates that the Scheduled Program mode has not been selected.

  Time is displayed if the Scheduled Program mode (2 day / 5 day) has been selected. This mode is enabled by a switch inside the control panel.

- **To set the clock** press [CLOCK] then [INCREASE] or [DECREASE] to select the day.

  Press [CLOCK] then [INCREASE] or [DECREASE] to set the hour.

  Press [CLOCK] then [INCREASE] or [DECREASE] to set the minutes.

  Press [CLOCK] to return to normal display.

  Note that a clock displaying a wrong time could indicate a temporary loss of power.

- **To read present temperature and humidity** press [TEMP/HUMIDITY SILENCE].

  The temperature will be displayed for 5 seconds, then the humidity will be displayed for 5 seconds.

- **To limit the fan speed to low** press [FAN HIGH/LOW] and LOW FAN will be displayed.

  If LOW FAN is not displayed the control will select the fan speed.

  Press [FAN HIGH/LOW] again to change your selection.

- **To silence an alarm** press [TEMP/HUMIDITY SILENCE]. The beeper will stop and the alarm message will be displayed as long as the alarm condition remains.

- **To review or change set points and alarms** refer to CHANGING THE SET POINTS.

- **To enable, review, or program scheduled set point changes** refer to CHANGING THE SCHEDULED PROGRAM.

CHANGING THE SET POINTS

- **To review room condition control set points** press [SET POINTS]. Set points will be displayed in the order listed below.

  Press [SET POINTS] to see the next control set point. Note that some set points will not be displayed if your system does not include one of the optional modes (heating and humidification).

  SET HIGH TEMP to control cooling (85°F maximum).

  SET LOW TEMP to control heating (40°F minimum).

  SET HIGH HUM to control dehumidification (80% RH maximum).

  SET LOW HUM to control humidification (20% RH minimum).

- **To change a room condition set point** press [△ INCREASE] or [DECREASE ▽] while the set point is flashing during the review.

  Press [SET POINTS] to enter your selection and display the next control set point.

- **To disable an operating mode** adjust the set point to a number beyond its limit. Dashes will be displayed instead of a number. For example, if you adjust SET LOW TEMP to below 40°F the heating will not operate.

- **To review system alarm set points** press [SET POINTS] after reviewing or changing room condition control set points. System alarm set points will be displayed in the order listed below.

  Press [SET POINTS] to see the next alarm set point.

  SET HIGH TEMP ALARM (90°F maximum).

  SET LOW TEMP ALARM (35°F minimum).

  SET HIGH HUM ALARM (85% RH maximum).

  SET LOW HUM ALARM (15% RH minimum).

- **To change a system alarm set point** press [△ INCREASE] or [DECREASE ▽] while the set point is flashing during the review. Press [SET POINTS] to enter your selection and display the next alarm set point.

- **To disable a system alarm** adjust the set point to a number beyond its limit. Dashes will be displayed instead of a number. For example, if you adjust SET LOW TEMP ALARM to below 35°F the LOW TEMP ALARM will not be displayed.

- **To return to normal display** press [ON/OFF ESCAPE] at any time during review or changing of set points.

CHANGING THE SCHEDULED PROGRAM

The system can be programmed to change room condition control set points **two times each day**, normally morning and evening. If no scheduled changes are programmed, the system will use operator adjusted set points. If scheduled changes are programmed, it is good to write them down. Refer to chart on last page.

- **To enable the Scheduled Program** set DIP switch number 4 to ON. This switch is inside the control panel and should be set only by qualified maintenance personnel.
- **To review scheduled set point changes** press and hold PROGRAM for **3 seconds**.

  SUN and SAT will be displayed with the **first scheduled time** for weekend control. If no time is scheduled dashes will be displayed.

  Press PROGRAM to review the SET HI TEMP control set point. Repeat pressing PROGRAM to review the next three control set points for the first scheduled time. Press PROGRAM again.

  SUN and SAT will be displayed with the **second scheduled time** for weekend control.

  Press PROGRAM to review the SET HI TEMP control set point. Repeat pressing PROGRAM to review the next three control set points for the second scheduled time. Press PROGRAM again.

  MON TUE WED THU FRI will be displayed with the **first scheduled time** for weekday control.

  Press PROGRAM to review the SET HI TEMP control set point. Repeat pressing PROGRAM to review the next three control set points for the first scheduled time. Press PROGRAM again.

  MON TUE WED THU FRI will be displayed with the **second scheduled time** for weekday control.

  Press PROGRAM to review the SET HI TEMP control set point. Repeat pressing PROGRAM to review the next three control set points for the second scheduled time.

  Press PROGRAM again to return to normal display (clock).
- **To change a scheduled time or control set point** press INCREASE or DECREASE while the time or set point is flashing during the review. Press PROGRAM to enter your selection and display the next set point or time. Scheduled times are at 15 minute intervals.
- **To turn the system OFF for evenings or weekends** adjust each of the four control set points to a number beyond its limit. Use INCREASE to go above HI limits and DECREASE to go below LOW limits. Dashes will be displayed instead of numbers.
- **To erase a program** change all scheduled times to dashes. Press and hold DECREASE to erase the first time each day and press and hold INCREASE to erase the second time each day.
- **To return to normal display (clock)** press ON/OFF ESCAPE at any time during review or changing of scheduled program changes.

RECORD OF SCHEDULED PROGRAM

Use pencil to write times and set points.

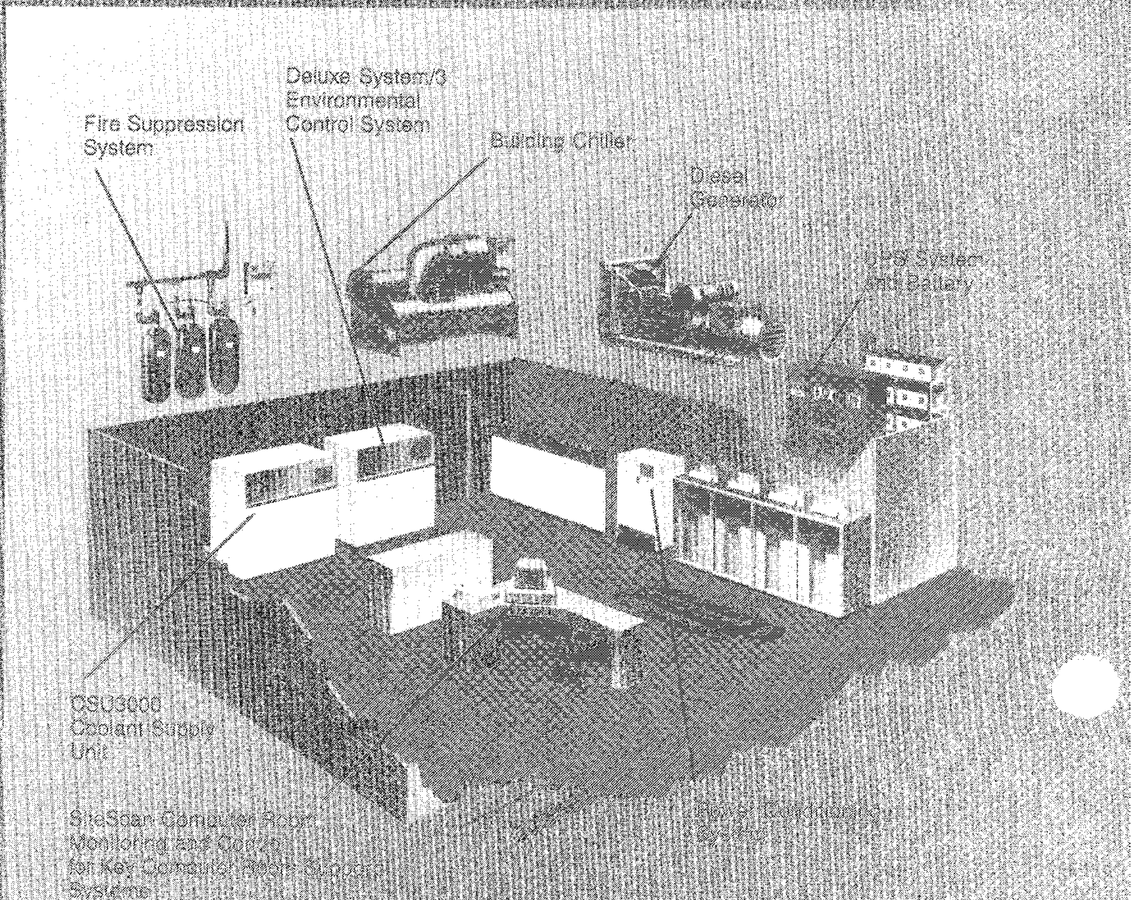
DAY	1ST TIME	2ND TIME	HIGH TEMP	LOW TEMP	HIGH HUM	LOW HUM
WEEKENDS (SAT-SUN)						
WEEKDAYS (MON-FRI)						

MAKE PHOTOCOPIES OF THIS FORM FOR YOUR RECORDS

A World Leader in Computer Support Systems

Environmental Control
Power Protection
Site Monitoring
Control

Liebert Corporation designs, manufactures and markets computer support systems for improvement of computer uptime and performance. The result is improved business operations, increased productivity and higher return on the computer investment. Liebert Systems provide dependable environmental control and electrical power protection combined with centralized monitoring and control. This approach represents a single-source integrated computer support network. Based on over two decades of experience and over 80,000 installations worldwide, Liebert is committed to offering the highest quality products and services for applications requiring computer support.



SL-11050

World Headquarters

Europe Headquarters