Liebert®
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# MiniMate Plus
# Solid State Controls

# TABLE OF CONTENTS

# PART ONE: INTRODUCTION

## PRODUCT DESCRIPTION AND FEATURES

The mini-MATE PLUS is an above-ceiling system designed for spot cooling or for cooling an entire room. It is available in 2 and 3 ton capacities in either Air, Water, or Glycol Cooled models. It is a split system (there are two separate major components: an indoor evaporator module and a condensing unit module) with the exception of the self-contained Chilled Water system.

## EVAPORATOR

All mini-MATE PLUS configurations use the same evaporator system which consists of the evaporator coil, blower assembly, wall-mounted control box, solid-state controls and electric reheat. The unit contains supply and return air openings for field supplied ducting. An optional air distribution plenum is available for non-ducted applications. A steam generating humidifier is also available as an option. All evaporators are 208/230-volt 1-phase.

## CONDENSING UNITS

### Air Cooled Models

There are two condensing units that can be used with Air Cooled models: the indoor centrifugal fan condensing unit and the outdoor propeller fan condensing unit.

* The centrifugal fan condensing unit is for indoor locations and includes the compressor, condenser unit coil, centrifugal blower assembly, high-pressure switch, electronic head pressure control, filter drier and sight glass. The maximum design ambient temperature is 95°F.
* The propeller fan unit is for outdoor locations and includes the compressor, condenser coil, propeller fan, high pressure switch, Lee-Temp/flood back head pressure control, filter drier and sight glass. The maximum design ambient temperature is 95°F.

### Water/Glycol Cooled Models

The condensing unit for Water/Glycol Cooled models includes the compressor, coaxial condenser coil, 2-way regulating valve, filter drier and sight glass. Glycol Cooled models are designed for use in a drycooler loop. Drycooler and pumps are selected separately.

## CHILLED WATER MODELS

The Chilled Water model is designed for use with an existing chilled water loop. Chilled Water models include a chilled water coil and 2-way solenoid valve. The design pressure is 300 PSIG.

## OPTIONAL EQUIPMENT AND SHIP-WITH KITS

### Air Discharge Plenum

A molded plastic 4-way air discharge plenum attaches to the evaporator and eliminates the need for ductwork. The plenum protrudes through a suspended ceiling directing the conditioned air throughout the room. The plenum includes a filter measuring 16" x 25" x 4" (406mm x 635mm x 102mm) and also sheet-metal block-off plates for covering the duct openings of the evaporator.

### 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, a filter measuring 20" x 20" x 4" (508mm x 508mm x 102mm), and a duct flange that attaches to the air-supply opening of the unit.

### Steam Generating Humidifier

If specified, a steam-generating humidifier is factory installed and tested. It adds pure water vapor to the room to maintain the humidity within the levels specified by computer manufacturers. It consists of the steam canister with automatic flushing circuit, strainer, inlet and drain, solenoid valves and a solid-state control system with both humidification and dehumidification controls to maintain proper humidity levels in the room.

### Condensate Pump

This pump is used to remove humidifier drain water and evaporator condensation. When the evaporator is installed below the level of the gravity-fed drain line, a condensate pump, equipped with a check valve, must be mounted on the side at the base of the unit cabinet. The sump, motor and pump assembly are automatically controlled.

### Pre-charged Refrigerant Line Sets

Pre-charged refrigerant line sets are available in 15 and 30 foot lengths. 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.

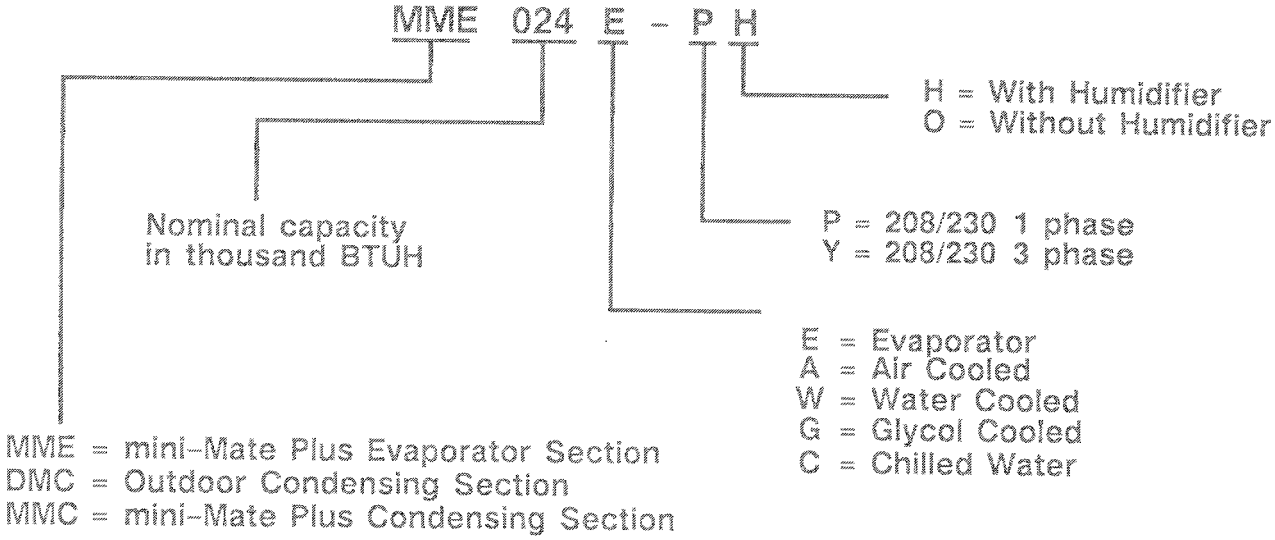
### Refrigerant Line Sweat Adapter Kit

This kit consists of two suction and two liquid line compatible fittings that allow the use of field supplied interconnecting refrigerant lines.

### 277-volt Transformer

277-volt split systems require 2 field-installed transformers (37.5 amp each). One is for the evaporator and one is for the condensing unit.

# EVAPORATOR AND CONDENSING UNIT MODEL NUMBER BREAKDOWN




# EVAPORATORS AND CORRESPONDING CONDENSING UNITS

| | CONDENSING UNIT | | | |
|---|---|---|---|---|
| EVAPORATOR | AIR COOLED CENTRIFUGAL FAN | AIR COOLED PROPELLER FAN | REMOTE WATER COOLED | REMOTE GLYCOL COOLED |
| MME024E | MMC024A | DMC027A | MMC026W | MMC023G |
| MME036E | MMC036A | DMC037A | MMC038W | MMC035G |
| MME040C | ——— | ——— | ——— | ——— |

# PART TWO: SITE PREPARATION AND INSTALLATION

## mini-MATE PLUS CONFIGURATION AND LOCATION CONSIDERATIONS

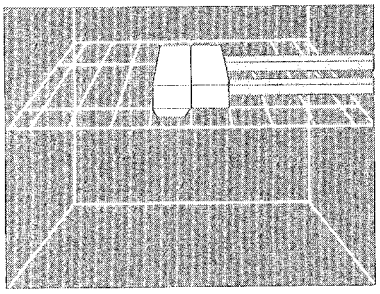
There are several ways the system can be installed. However, the evaporator is always mounted above the ceiling in the computer room. The condensing unit, on the other hand, can be mounted above the ceiling (attached directly to the evaporator or mounted remotely), underneath a raised floor, in another room or outside.

Air Cooled models may utilize an indoor centrifugal fan condensing unit if an outdoor location is impractical. The indoor condensing unit may be located near the evaporator to minimize refrigerant piping or near the outside wall to minimize air duct work.

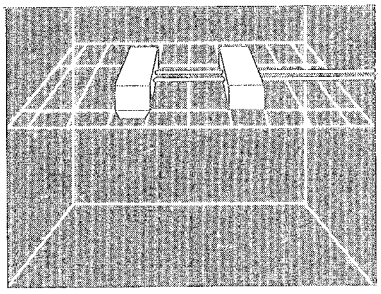
Air Cooled models may also use an outdoor condensing unit, which can be mounted on either the roof or the ground.

Water and Glycol Cooled condensing units may be located above the ceiling adjacent to or remote from the evaporator or under a raised floor.

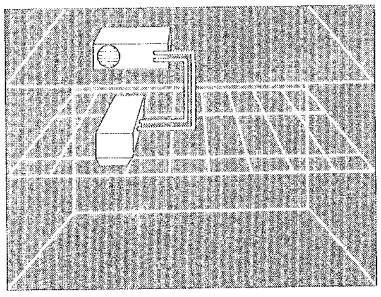
Chilled Water units are a one-piece, self-contained system, and need only to be connected to an existing chilled-water loop and source of electricity.



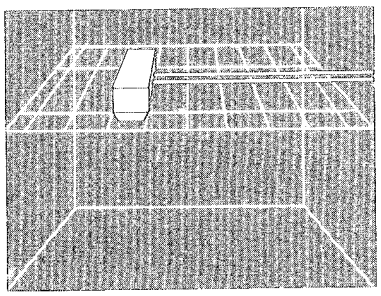
Air Cooled, Indoor Condensing Unit



Water/Glycol Cooled Condensing Unit



Air Cooled, Outdoor Condensing Unit



Chilled Water

Figure 1. mini-MATE PLUS Configurations

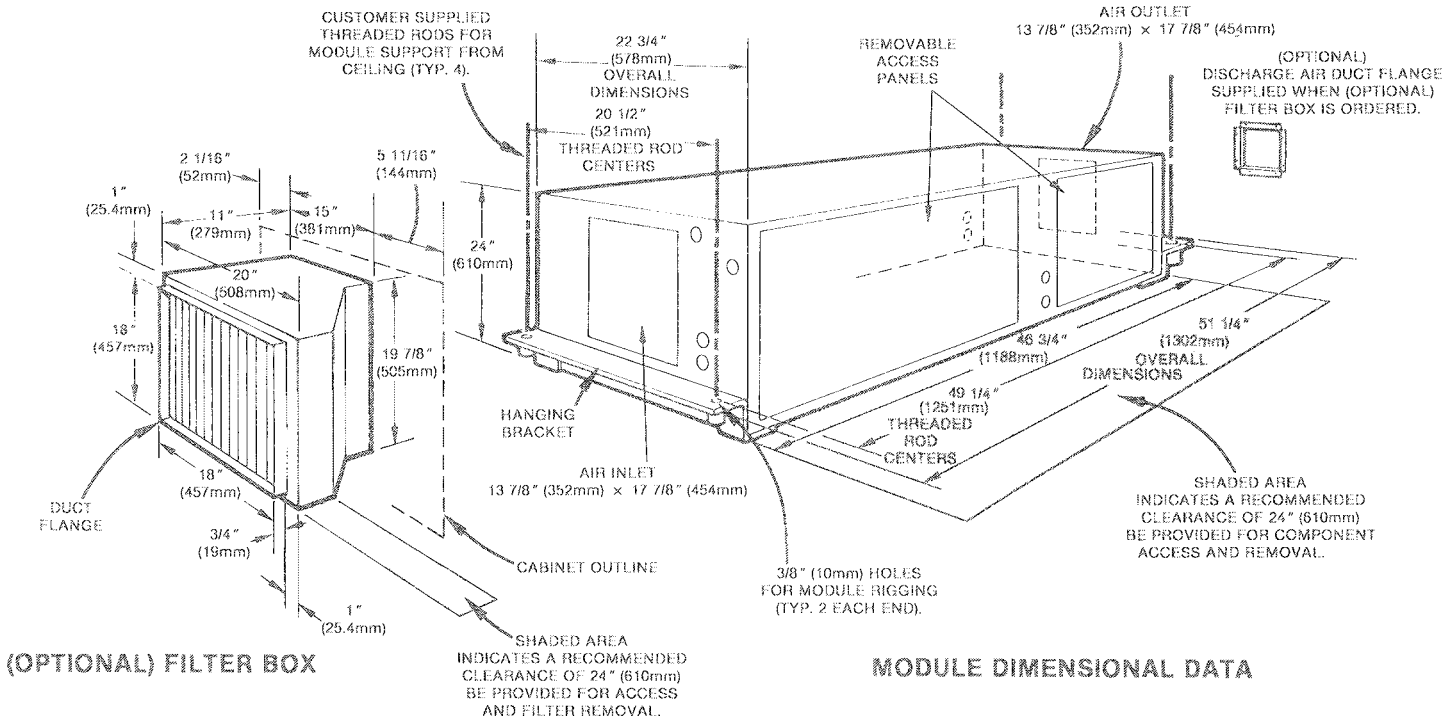
### Computer Room Preparation

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 type. Paint on concrete walls or floors should be either rubber or plastic based. Doors should be properly sized to minimize leaks and should not contain grilles.

Outside or fresh air should be kept to a minimum. Outside air adds to the heating, cooling, humidifying and dehumidifying loads of the site. It is recommended that outside air be kept below 5% of the total air circulated in the computer room.

### Location Considerations

Try to locate the evaporator over an unobstructed floor space to facilitate service. Avoid locations in confined areas that affect the air pattern and result in short cooling cycles, down-drafts and air noise. If the optional air distribution plenum is used, avoid locating the units in an alcove or at the extreme end of a room which has a high aspect ratio (long narrow room). Avoid installing multiple units close to each other. This can result in crossing air patterns, uneven loads and competing operating modes. Do not attach additional devices (such as smoke detectors, etc.) to the cabinet that will interfere with routine maintenance or service.




(OPTIONAL) FILTER BOX

MODULE DIMENSIONAL DATA

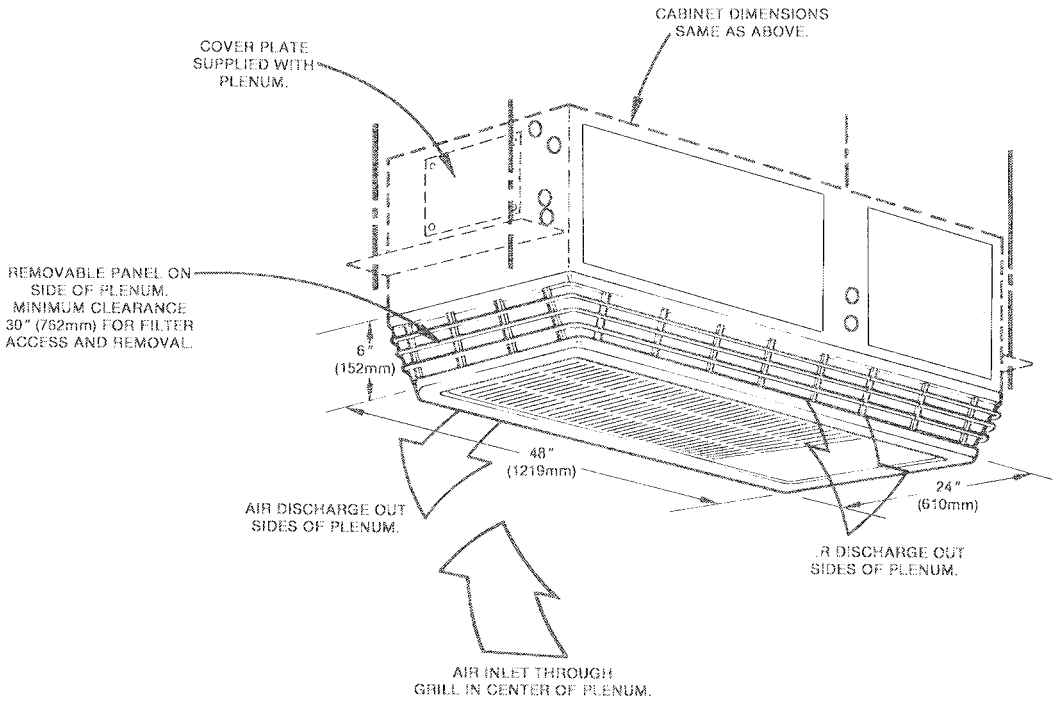



Figure 2. Dimensional Data

## APPLICATION PARAMETERS AND SPECIFICATIONS


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 | | AIR TEMPERATURE (°F) CONDENSER | | |
|---|---|---|---|---|
| MIN | MAX | MIN DB | | MAX DB |
| 187 | 253 | -20 (centrifugal) | -30 (prop fan) | 105 |

### 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)

### Evaporator Section 208/230v, Single Phase, 60Hz

| | MME024E | MME036E | MME040C |
|---|---|---|---|
| With Humidifier | | | |
| FLA | 26.9 | 33.1 | 33.1 |
| WSA | 32.3 | 40 | 40 |
| OPD | 40 | 40 | 40 |
| Without Humidifier | | | |
| FLA | 21.4 | 27.6 | 27.6 |
| WSA | 26.8 | 34.5 | 34.5 |
| OPD | 30 | 40 | 40 |

### Propeller Fan Condensing Unit 208v/230v, 60Hz

| | DMC027A | DMC037A | |
|---|---|---|---|
| | 1Ø | 1Ø | 3Ø |
| FLA | 14.1 | 17.0 | 12.5 |
| WSA | 17.3 | 20.9 | 15.0 |
| OPD | 25 | 35 | 25 |

### Centrifugal Fan Condensing Unit 208/230V, 60Hz

| | MMC024A | MMC036A | |
|---|---|---|---|
| | 1Ø | 1Ø | 3Ø |
| FLA | 13.5 | 22.9 | 15.5 |
| WSA | 16.8 | 28.6 | 19.4 |
| OPD | 20 | 35 | 25 |

### Water Cooled Condensing Unit 208/230V, 60Hz

| | MMC026W | MMC038W | |
|---|---|---|---|
| | 1Ø | 1Ø | 3Ø |
| FLA | 11.5 | 19.9 | 12.5 |
| WSA | 14.4 | 24.9 | 15.6 |
| OPD | 20 | 30 | 20 |

### Glycol Cooled Condensing Unit 208/230V, 60Hz

| | MMC023G | MMC035G | |
|---|---|---|---|
| | 1Ø | 1Ø | 3Ø |
| FLA | 11.5 | 19.9 | 12.5 |
| WSA | 14.4 | 24.9 | 15.6 |
| OPD | 20 | 30 | 20 |

## Evaporator and Condensing Unit Weights

### Evaporator Section Weights

| Model # | Lbs | Kg |
|---|---|---|
| MME024E | 190 | 86 |
| MME036E | 194 | 88 |
| MME040C | 194 | 88 |

### Outdoor, Propeller Fan Condensing Unit

| Model # | Lbs | Kg |
|---|---|---|
| DMC027A | 184 | 84 |
| DMC037A | 225 | 102 |

### Indoor, Centrifugal Fan Condensing Unit

| Model # | Lbs | Kg |
|---|---|---|
| MMC024A | 250 | 113 |
| MMC036A | 260 | 118 |

### Glycol Cooled Condensing Unit

| Model # | Lbs | Kg |
|---|---|---|
| MMC023G | 230 | 104 |
| MMC035G | 240 | 109 |

### Water Cooled Condensing Unit

| Model # | Lbs | Kg |
|---|---|---|
| MMC026W | 230 | 104 |
| MMC038W | 240 | 109 |

## EQUIPMENT INSPECTION (UPON RECEIPT)

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

If possible, do not uncrate it 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 carrier immediately. If there is concealed damage, report it to the carrier and to the vendor from which the unit was purchased.

## INSTALLING THE EVAPORATOR AND CEILING MOUNTED CONDENSING UNITS

The evaporator and condensing units that are mounted above the ceiling must be securely mounted to the roof structure. To do this, use the following:

* Threaded suspension rods [⅜" (9.53mm) – 16 SAE Grade 1 minimum] and 4 lock–nuts.

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. The ceiling and ceiling supports of existing buildings may require reinforcements. Be sure to follow all applicable codes.

**WARNING**

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

## LIFTING THE UNIT INTO PLACE

**NOTE**

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

Using a suitable lift device, raise the 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 into the factory-supplied captive nuts.

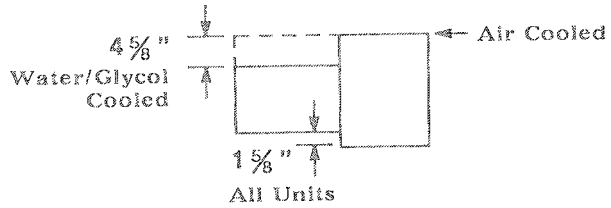
Use bolts, washers, and lock-nuts to attach handing brackets to the bottom of the cabinet.

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

**NOTE**

The unit must be level in order to operate properly.

If the evaporator and the condensing unit are to be mounted back to back, the units must be bolted together using the holes provided to prevent damage to the quick-connect fittings. Rubber spacers are provided.




When units are bolted together, the bottom of the condensing unit will be offset from the bottom of the evaporator by 1⅝". The top of the condensing unit will be flush on air cooled units; or approximately 4¾" below the top of the evaporator on water and glycol cooled units. Refrigerant connections should line up between the two modules.

## EVAPORATOR AIR DISTRIBUTION AND PLENUM INSTALLATION

The evaporator can be used in two air distribution configurations. The air can be discharged through ductwork, or the air can be distributed throughout the computer room through the optional ceiling-mounted air-distribution plenum.

### Connections for Ducted Systems

In a ducted configuration, the unit has a maximum allowable external static pressure of 0.3" of $H_2O$. 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's 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.

### Filter Box

The optional filter box is available for the unit and mounts directly to the return air opening of the evaporator. The filter box is supplied with a filter measuring 20" x 20" x 4" (508mm x 508mm x 102mm).

**CAUTION**

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

### Connections for Non-Ducted Systems

The non-ducted evaporator uses the optional ceiling-mounted air-distribution plenum to provide four-way air distribution. The plenum fastens to the bottom of the evaporator.

### Plenum Installation

1. Check the contents of the plenum kit.
2. The evaporator should be mounted as shown in the figure below.
3. Follow the installation instruction included with the plenum installation kit carefully.

# EVAPORATOR INSTALLATION

## PIPING CONNECTIONS

The following pipe connections need to be made before you put the mini-MATE PLUS into operation:

* Refrigeration connections between the indoor evaporator and the condensing unit.
* A drain line from the evaporator-coil drain pan.
* A supply and drain line to the steam generating humidifier (if applicable).

### Evaporator Coil and Humidifier Drain Line (All Models)

A ¾" (19.1mm) female lead pipe thread (FPT) drain connection is provided for the evaporator condensate and humidifier drain. **The drain line is trapped internally to the unit and must not be trapped outside the unit.** Trapping it outside the unit will prevent the condensate from draining from the unit.

All drain lines must be located so they will not be exposed to freezing temperatures. Drain lines should be the full size of the drain connection.

### Humidifier Water Supply Line (All Models)

Units supplied with a humidifier package have a ¼" (6.35mm) FPT water inlet connection. The humidifier requires a water source that can deliver 1 gallon of water per hour. The maximum supply pressure is 150 PSIG. The minimum supply pressure is 10 PSIG.

### Refrigerant Piping

Pre-charged refrigerant line sets (suction and liquid lines) are available from the factory in lengths of 15 and 30 feet. The maximum distance between the evaporator and condensing unit is 45' (connecting one 30 foot and one 15 foot line set together). For longer piping runs, contact your sales representative. A sweat adapter kit is also available to permit field piping. It is recommended that lines be sized so they do not exceed 2°F saturation loss for the total equivalent length.

It is important to handle the pre-charged lines with care so that they won't 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 towards the condensing unit.

To prevent tube damage when sealing openings in walls and to reduce future vibration transmission, use a soft flexible material to pack around the tubes.

### Connecting the Pre-Charged Lines

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 doesn't leak.

If a torque wrench is used, the following torque values are recommended:

| COUPLING SIZE | FT-LBS |
|---|---|
| -6 | 10-12 |
| -11 | 35-45 |

### Chilled Water Models

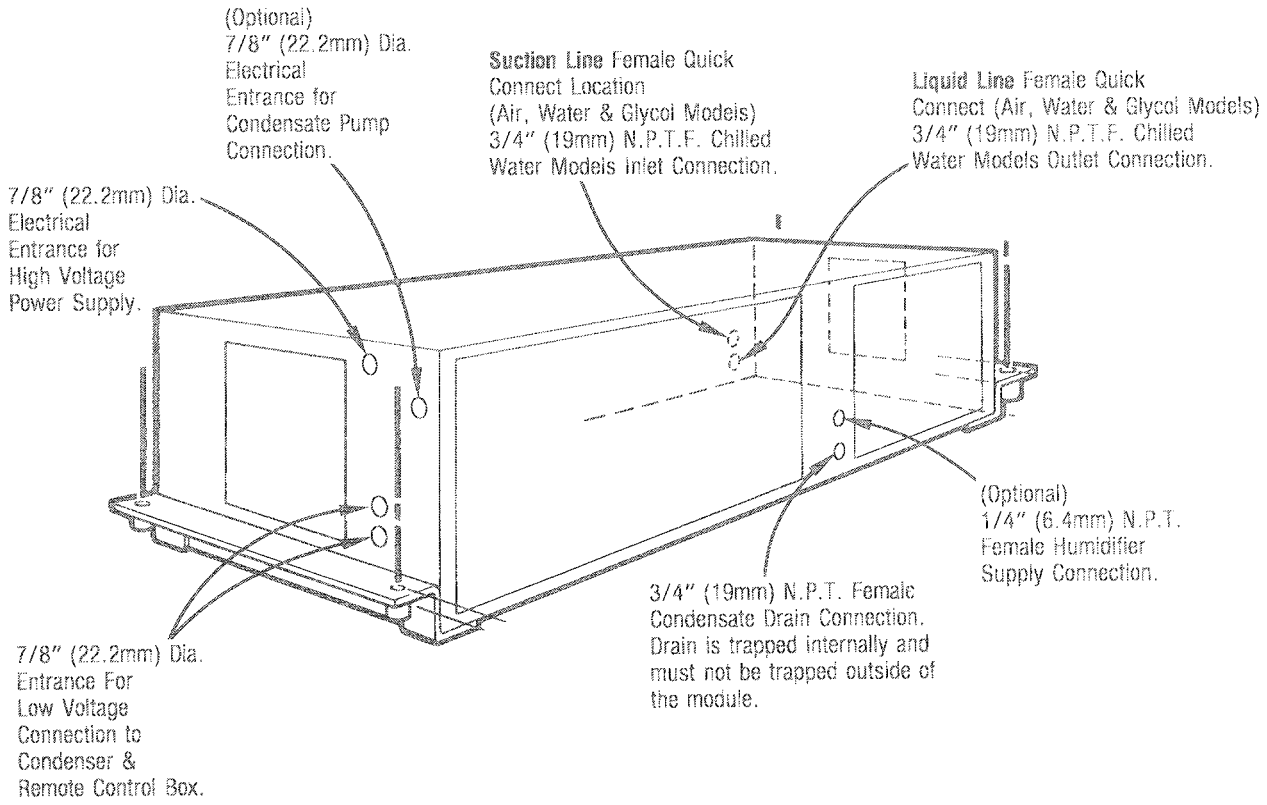
Install manual service shut-off valves at the supply and return lines of each unit. This will provide for routine service or emergency isolation of the unit.

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.

| CONNECTION SIZES - Inches (mm) | |
|---|---|
| Chilled Water Supply (FPT) | ¾" (19.1mm) |
| Water Return (FPT) | ¾" (19.1mm) |

The minimum water temperature is 42°F.

## SMALL SYSTEMS
## PIPING: mini-MATE PLUS FAN COIL MODULE




| UNIT PIPING OUTLET CONNECTION SIZES – PIPE SIZE Inches (mm) | | |
|---|---|---|
| MODEL # | LIQUID LINE A | SUCTION LINE B |
| MME024E | 3/8 / #6 (9.53) | 7/8 / #11 (22.23) |
| MME036E | 3/8 / #6 (9.53) | 7/8 / #11 (22.23) |
| MME040C | 3/4" Water Supply | 3/4" Water Return |

Figure 3. Evaporator Piping Connections

# SMALL SYSTEMS
# ELECTRICAL FIELD CONNECTIONS
# mini-MATE PLUS EVAPORATORS

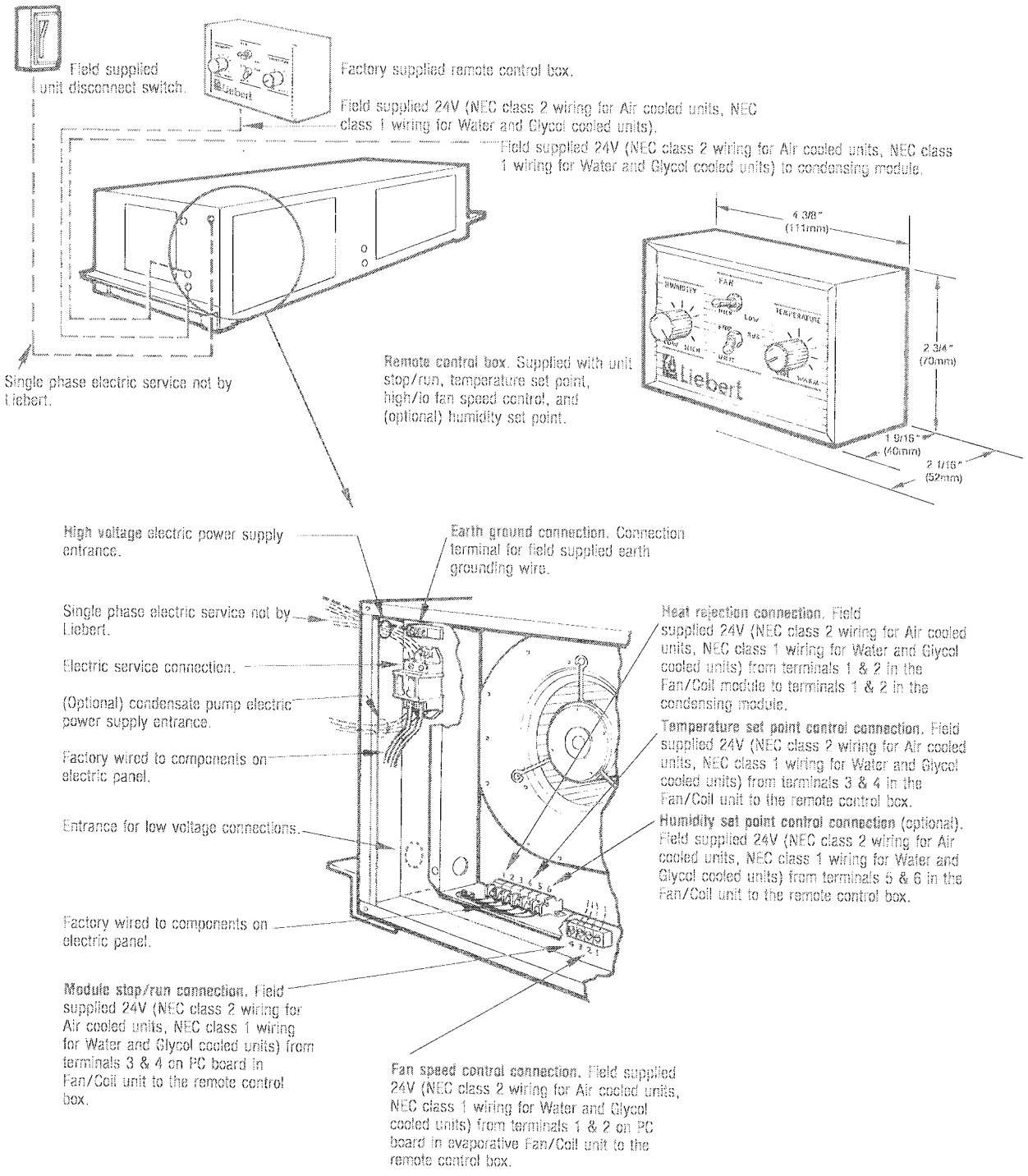



Figure 4. Electrical Field Connections

## ELECTRICAL CONNECTIONS

The unit is shipped from the factory with all internal wiring completed. Electrical connections to be made at the installation site are:

* High voltage supply to the evaporator.
* High voltage supply to the condensing unit.
* Low voltage interconnection wiring between the evaporator and the condensing unit (24 volt NEC Class 2 required).
* Low voltage wiring between the control box and the evaporator.

### High Voltage Connections

All power and control wiring must be in accordance with national and local electrical codes.

Make sure that the supply power is 208/230 volt, single phase, 60 Hz. If a disconnect switch is specified in the installation contract, route the supply power to the disconnect switch and then to the evaporator.

Route the conduit through the hold located in the side of the cabinet. The disconnect switch may be bolted to the side of the 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.


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

The evaporator high voltage connection is made at the high voltage terminal block in the upper right hand corner of the electric panel. (The electric panel is on the long side that has the two removable panels – it is the larger of the two panels. The electrical schematic is glued on the side of the electric panel.) The terminal connections are labeled L1 and L2.

### Transformer Taps

A control voltage transformer is provided with two taps to accommodate either 208 or 230 volt supplies. Connect the jumper from L2 to either the 208 or the 230 volt terminal. Make sure that the proper control voltage is supplied to the system.

### Low Voltage Connections

(Refer to the text in this manual on your specific condensing unit.)

All control wiring must be installed in accordance with the National Electrical Code (NEC) Class 2 circuit. Control-voltage 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 breakered transformer is sized only for the factory-supplied control system.

### Remote Wall Box Wiring

The small remote wall control box is supplied with 8 colored leads. Each lead must be wired into the correct terminal according to the electrical schematic included with the unit. The remote box has been pre-wired on most units. The wiring length merely has to be increased to the length necessary to mount it remotely.

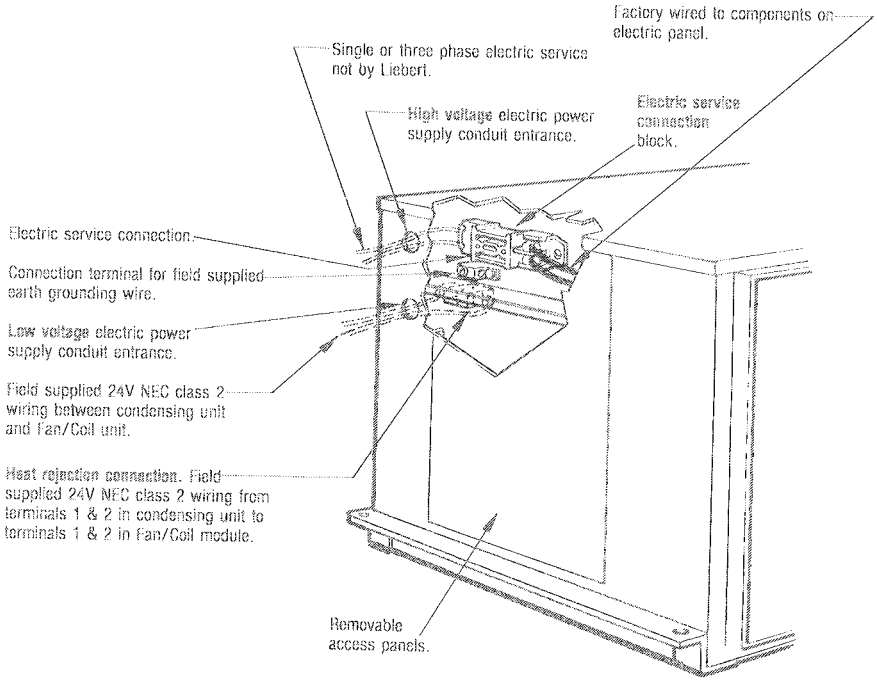
### Evaporator to Condensing Unit

A 2 wire connection is required between the evaporation section and condensing unit. The connection is made between terminals 1 and 2 on the terminal strip in the evaporator and:

**For outdoor propeller fan condensing units:** the C & Y pigtails located under the electric box; C is connected to terminal 1 and Y to terminal 2.

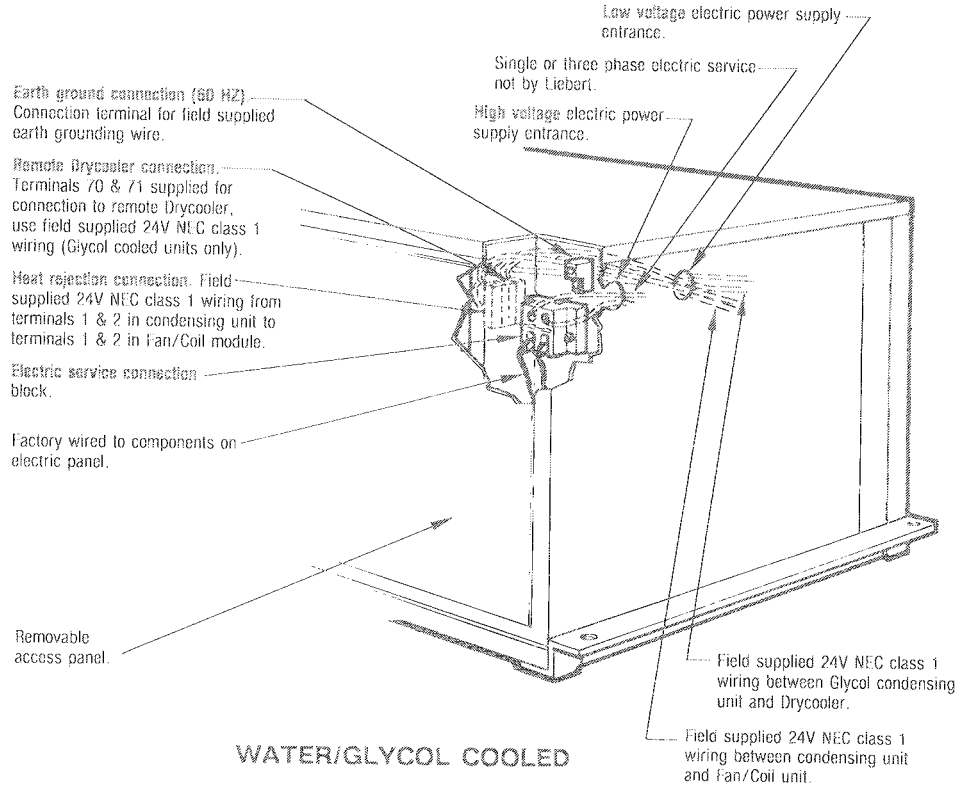
**For indoor centrifugal fan condensing units:** the terminal strip located in the electric compartment; terminals 1 & 2 in the evaporator are connected to terminals 1 & 2 in the condensing unit.

**For Water and Glycol Cooled condensing units:** the terminal strip located in the electric compartment; terminals 1 & 2 in the evaporator are connected to terminals 1 & 2 in the condensing unit.




INDOOR AIR COOLED

(See page 14 for outdoor, air cooled condensing unit.)




WATER/GLYCOL COOLED

Figure 5. Condensing Unit Electrical Connections

## OUTDOOR AIR COOLED PROPELLER FAN CONDENSING UNITS

### Location Considerations

To insure a satisfactory air supply, it is recommended that air cooled propeller fan condensing units be located 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" 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 situated for maximum security and maintenance accessibility. Avoid ground-level sites with public access.

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

Propeller Fan Condensing Unit - Inches (Mm)

| MODEL | WIDTH(D) | DEPTH(E) | HEIGHT(F) |
|---|---|---|---|
| DMCO27A | 40 (1016) | 18 (457) | 22.5 (572) |
| DMCO37A | 48 (1219) | 18 (457) | 31 (787) |

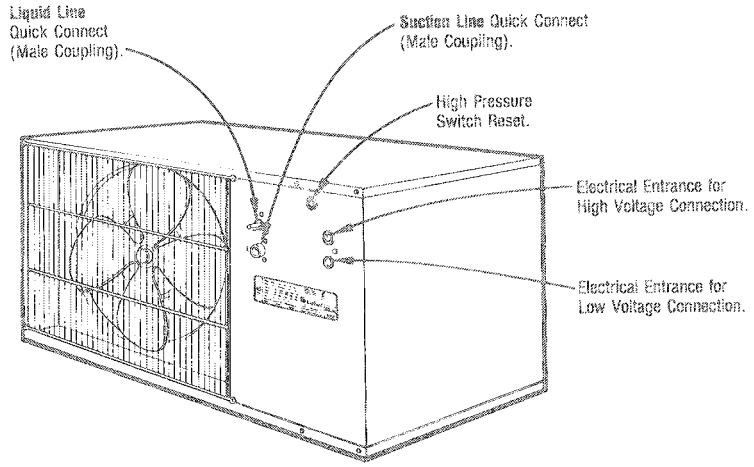



Figure 6. Outdoor Air Cooled Condensing Unit Piping Connections

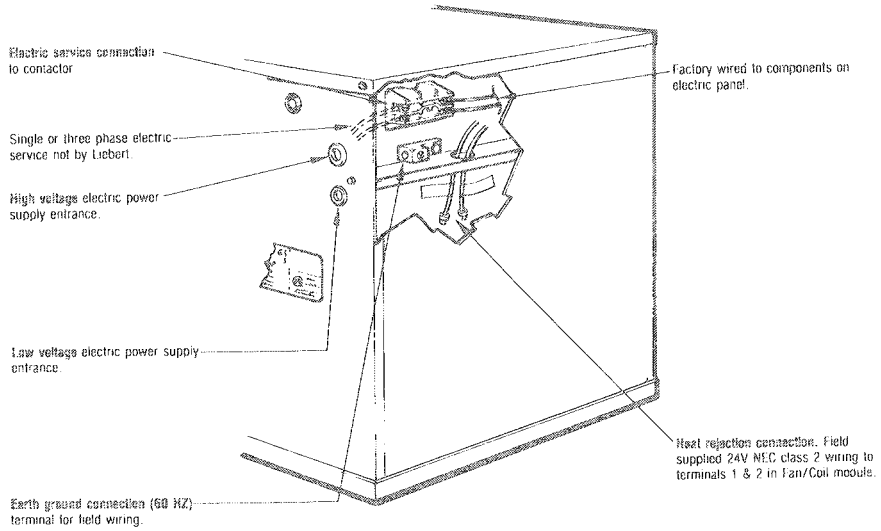



Figure 7. Outdoor Air Cooled Condensing Unit Electrical Connections

## INDOOR AIR COOLED CENTRIFUGAL CONDENSING UNITS

### Location Considerations

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

To mount the unit in the ceiling, see INSTALLING EVAPORATOR AND CEILING MOUNTED CONDENSING UNITS.

### Ducting

The total external static pressure for the inlet and outlet ducts, including grille, must not exceed 0.5 inches of $H_2O$. Hood intake dimensions should be the same as the condensing unit duct dimensions.

If the condensing unit is located close to 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 return air does not short-circuit to the supply air inlet.

Avoid directing the hot exhaust air towards 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's 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.

### Multiple-unit Installation

Space the units so that the hot condensing unit exhaust air is not directed toward the air inlet of an adjacent unit.

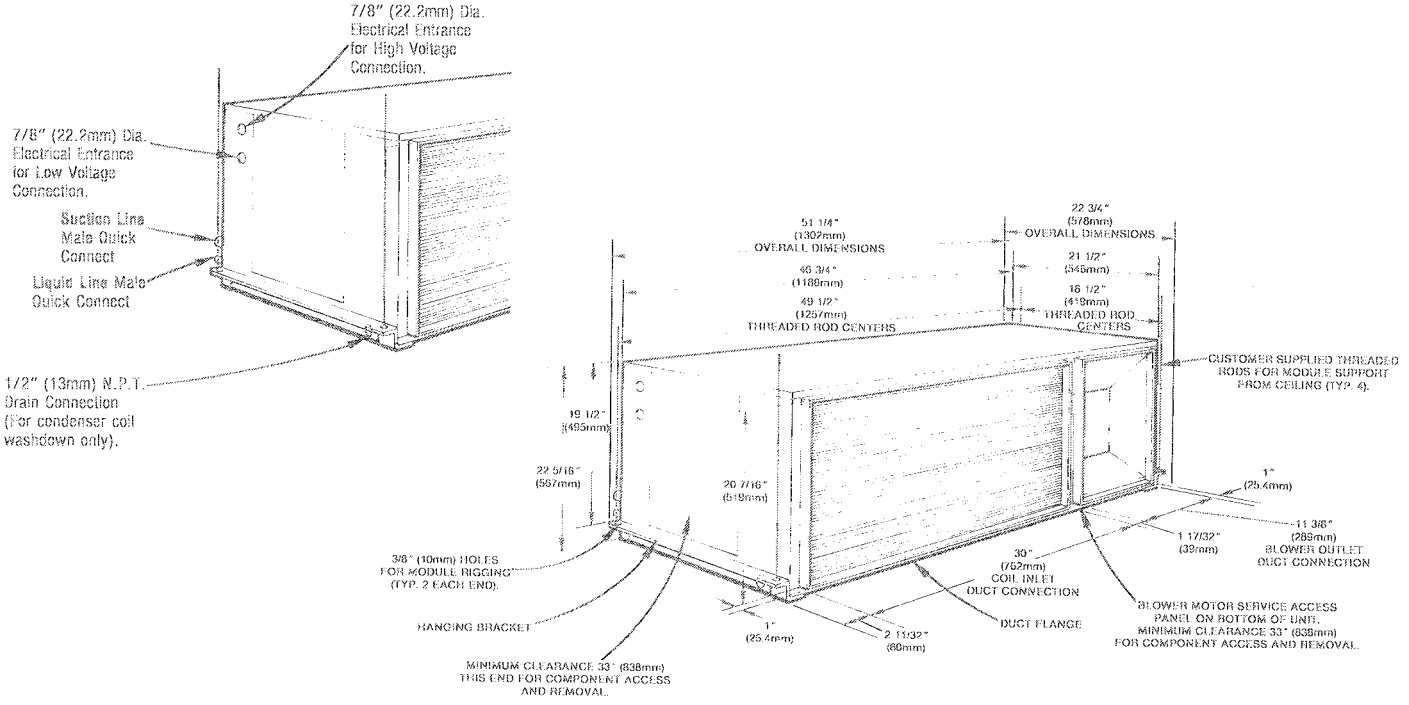



Figure 8. Indoor Air Cooled Condensing Unit Dimensions and Piping Connections

## WATER AND GLYCOL COOLED CONDENSING UNITS

### Location Considerations

The Water and Glycol Cooled condensing units may be located beneath the raised floor or above a dropped ceiling using the hangers and hardware provided.

To mount the unit in the ceiling, see the INSTALLING THE EVAPORATOR AND CEILING MOUNTED CONDENSING UNITS.

### Piping Considerations

It is recommended that manual service shut-off valves 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 source quality is poor, it is recommended that filters that can be easily replaced or cleaned be placed in the supply line. These filters extend the service life of the condensing unit.

Connection Sizes

| | |
|---|---|
| Condensing Unit Fluid Inlet (FPT) | ¾" (19.1mm) |
| Condensing Unit Fluid Outlet (FPT) | ¾" (19.1mm) |
| Suction Line | #11 male quick connect |
| Liquid Line | #6 male quick connect |

### Condensing Unit Fluid Requirements

The maximum fluid pressure is 150 PSIG. For applications above this pressure, consult the factory.

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.

### Water Regulating Valve

Water valves are factory-installed on Water and Glycol Cooled units. The valves automatically open when refrigerant pressure increases and close when the pressure decreases. See the OPERATION section for more information.

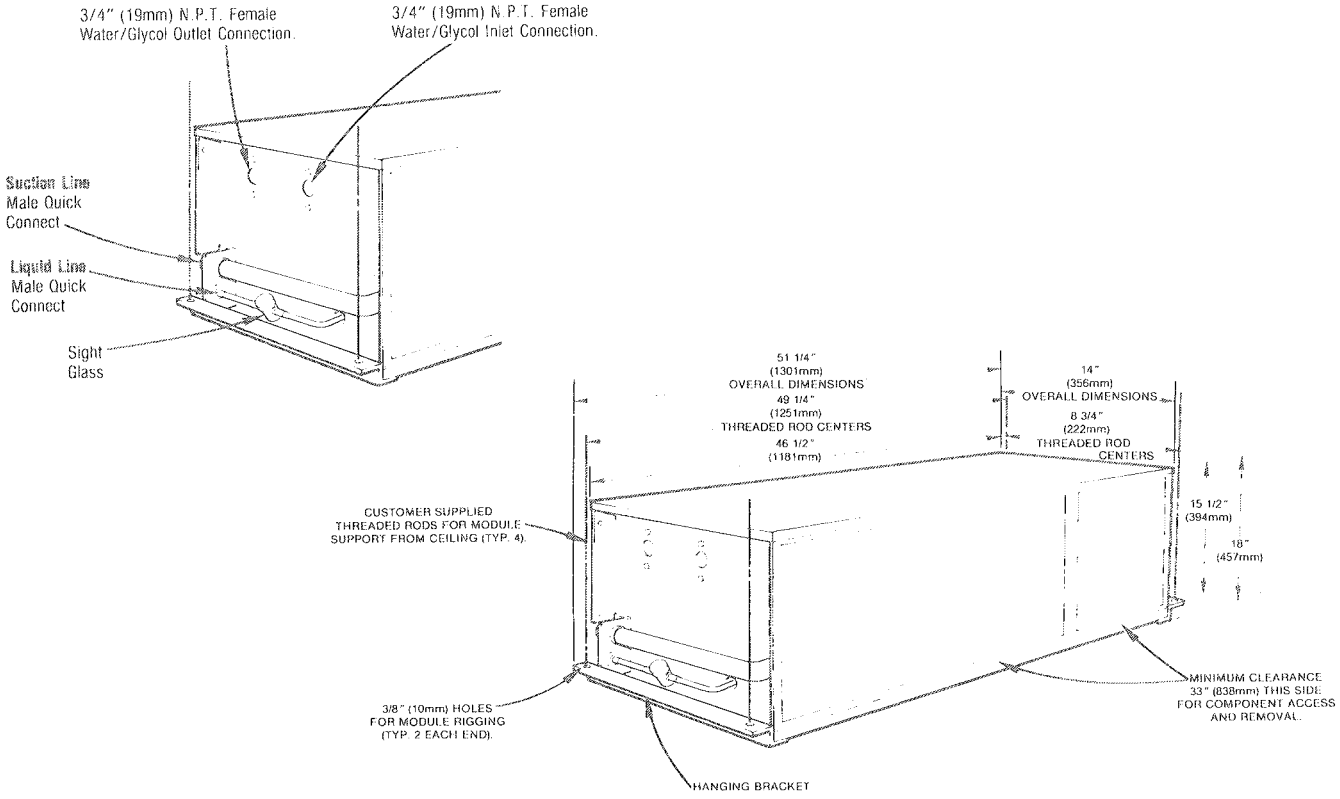



Figure 9. Water and Glycol Cooled Condensing Unit Dimension and Piping Connections

## CONDENSATE PUMP KIT INSTALLATION

### Kit Contents

* Collecting tank with attached pump, float switch and wiring
* 5/8" rubber hose
* Copper plug
* Copper straight fitting
* Two-lead jumper harness with nylon connector (early models only)
* 3" of 1/4"-bore pvc tubing

### Installation Instructions

**CAUTION**

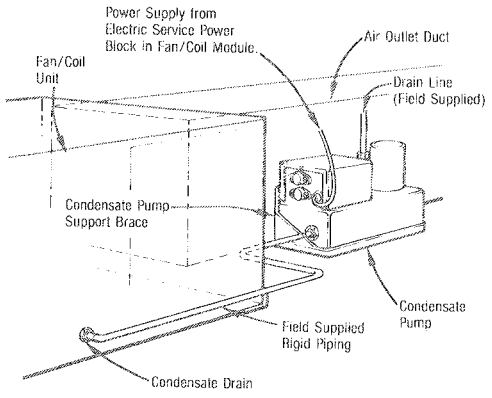
**Disconnect the mini-MATE PLUS from the power source before continuing. Remove the cover. Remove the packing rubber band from the float switch.**

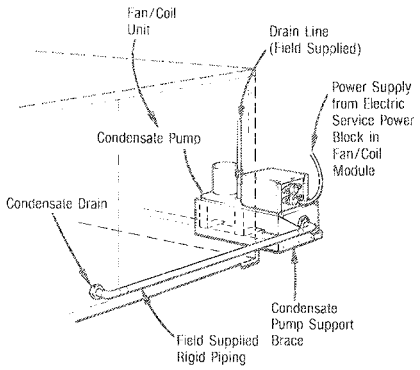
1. Disconnect all power to the unit.
2. Remove the reheat access panel.
3. If discharge air is to be ducted, the pump should be mounted to the duct. In this case the 2 standoff brackets supplied with the pump are not required. If the discharge air is not ducted, mount the pump to the discharge end of the evaporator, using the standoff brackets supplied.
4. Install a rigid drain line of not less than 1/2" (12.7mm) ID between the unit drain connection and the condensate pump. The drain connection at the evaporator is 3/4" (19.1mm) NPT female and the pump is 3/4" (19.1mm) NPT female. Provide at least 1" (25.4mm) clearance between the access panel and the drain line to allow enough room to remove the panel. DO NOT put a trap in the line between the unit and the condensate pump.
5. The pump must be mounted so that the drain line is pitched downward a minimum of 1/2" (12.7mm) from the unit drain outlet to the pump inlet. To accomplish this, the bottom of the pump mounting bracket must be no higher than 1" (25.4mm) from the bottom of the unit. The pump must be level within 1/8" per foot (13.9mm per meter) to assure proper operation and achieve published capacity.
6. Remove the electrical components access panel.
7. Run wiring from the condensate pump to the electrical connection located on the opposite end of the unit below the high-voltage wiring entrance. Connect leads L1 and L2 to the high-voltage terminal block. Connect the ground lead to the grounding lug located above the terminal block. Fuses are internal to the pump.

**NOTE**

Use the wire harness supplied with the pump. Wire according to the national Electric Code and all local codes. A wiring diagram is supplied with the pump. The unit wiring diagram is located on the access panel.

8. Reinstall the access panels.
9. Reconnect power to the unit.
10. Run the unit to make sure that the pump works properly. Check the drain line and connections for leaks before closing up the ceiling.




(OPTIONAL FIELD INSTALLED) CONDENSATE PUMP UNITS WITH AIR DISTRIBUTION PLENUM

# PART THREE: OPERATION

## PRE-START CHECK

Before starting the mini-MATE PLUS, complete the following checklist. Make sure that:

1. the proper installation clearances were considered.
2. all foreign matter has been removed from the interior of the unit (tools, construction or shipping materials).
3. all fans and blower wheels rotate freely.
4. the filter is in place.
5. all wiring connections are tight.
6. the available current is the same as mini-MATE PLUS nameplate voltages.
7. the fuses are correct for your application.
8. the controls are set at their proper set points.

Make sure that the following applicable connections have been properly made to the evaporator:

* Source power to terminals L1 and L2 of the power distribution block for high-voltage, 208/230-volt, 1-phase 60 Hz.
* Earth ground line to the ground lug.
* The condensing unit control circuit interlock to the low-voltage terminal strip, terminals 1 and 2.
* The temperature setpoint control to the low-voltage terminal strip, terminals 3 and 4.
* The fan speed (HI/LO) select switch to the PCB terminal block, terminals 1 and 2.
* The Stop/Run switch to the PCB terminal block, terminals 3 and 4.

## START-UP PROCEDURE

To start the mini-MATE PLUS, turn on the main power supply, then set the Stop/Run switch on the remote wall control box to Run. To check cooling operation, adjust the thermostat to a setting below room temperature. The compressor starts when the cooling contactor closes. A time delay control is provided to prevent immediate compressor starts (this reduces the possibility of inrush current surges when the unit restarts after a power failure is restored).

To check heating operation, adjust the thermostat to a setting above room temperature.


Figure 10. Control Box

## POST-START CHECKLIST

After the entire control circuit has been energized, check the following:

* Cooling system start-up: make sure that there are no signs of leaking compressor oil or refrigerant.
* Correct rotation of the blower wheels: make sure that there is no unusual noise and that the blower rotates freely.

After the unit is functioning properly, instruct the user(s) to operate the unit. Replace all panels before leaving the job site.

## SHUTDOWN PROCEDURE

To shut the mini-MATE PLUS off, set the Stop/Run switch on the remote wall box to the Stop position.

### High Water Shutdown

The evaporator is equipped with a float switch that will shut the unit down if the drain is not functioning. Reset the system at the control box by turning the selector switch to Stop and then to Run.

### High Head Pressure Shutdown

The condensing unit is provided with a manual-reset high-pressure switch. Restart the compressor by resetting the switch in the compressor compartment.

# DESCRIPTION OF OPERATION

When power is supplied to the mini-MATE PLUS, activating the Run switch on the control panel energizes the evaporator fan and the temperature sensing equipment (also the humidity sensing elements, if so equipped). The unit is supplied with a two speed fan motor. Select High or Low speed with the HI/LO switch. All other operations are automatic and based on the settings of the thermostat and humidistat. The operation of individual components is explained below.

## WALL-MOUNTED CONTROL BOX

The solid-state wall-mounted control box consists of a Stop/Run switch, temperature setpoint adjustment knob, humidity setpoint adjustment knob (if so equipped), thermostat, and fan-speed (HI/LO) selector switch.

### Control Switches

This section consists of two switches (in the center of the control box):

* A Stop/Run switch. Flipping the switch to Run activates the evaporator fan motor and readies the unit for normal operation by supplying control voltage to the sensing equipment and control components.

* A fan HI/LO button that controls the evaporator fan speed. When the unit is in the dehumidification mode (if so equipped), the Low fan speed is selected automatically.

### Fan Motor Control

The multi-speed fan motor is supplied with internal overload protection. The fan speed will automatically change from high to low speed during dehumidification and return to high speed when the call for dehumidification stops.

### Temperature Knob

This knob is turned to achieve the desired temperature. Allow enough time for the room conditions to stabilize before re-adjusting the knob. Avoid frequent adjustments.

### Cooling

When the air temperature rises to a preset level above the temperature setpoint, the temperature controller is alerted by the temperature sensor. The temperature controller then activates the refrigeration system or the Chilled Water solenoid valve. This continues until room temperature has dropped to the preset level.

### Freeze Protection

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 condensing unit until the evaporator temperature rises to 42°F.

### Heating

If air temperature drops to a preset level below the setpoint, the temperature controller activates the reheat element which is located above the evaporator coil in the evaporator. The reheat element continues to operate until the temperature rises to the preset level.

### Reheat Safety

The electric tubular fin reheat is supplied with a line-break safety which cuts out if the temperature inside the evaporator reaches 120°F. The single phase electric service power source is connected to the power block terminal connections L1, L2 and earth ground in the electric control box. This is the power connection for the system.

### Humidity Knob (Optional)

The humidity knob is included on the remote wall control box for units that contain steam generating humidifiers. Set the humidity knob for the desired room humidity. Allow enough time for room conditions to stabilize before re-adjusting the wheel. Avoid frequent adjustments.

### Humidification

When the air humidity drops to a preset level below the humidity setpoint, the humidity controller activates the steam generating humidifier which continues to operate until the room humidity has increased to the preset level.

### Dehumidification

When the humidity rises to a preset level above the humidity setpoint, the humidity controller activates the refrigeration system or the Chilled Water solenoid valve and sets the fan speed to Low. This continues until the humidity has dropped to a preset level. Note that the refrigeration system is used to lower the humidity. This may cool the room to a level below the temperature setpoint and thereby activate the reheat elements. It is possible that both the refrigeration system and reheat elements will be operating at the same time for dehumidification.

## CONDENSING UNIT OPERATION

The condensing units contain the compressor, condenser, electrical components and head pressure controls. The compressor is equipped with crankcase heaters. This prevents refrigerant migration into the compressor during the off cycle and permits smoother start-up. A manual reset high pressure cut-out is supplied and is factory pre-set at 360 PSIG. All models are equipped with a filter drier and sight glass through which you can see the condition of the refrigerant.

An explanation of each type of condensing unit follows.

### Air Cooled Units

There are two different Air Cooled units. They are the indoor, centrifugal fan condensing unit and the outdoor, propeller fan condensing unit. The outdoor propeller fan unit incorporates a flood back head pressure control (Lee-Temp) which consists of a receiver and head pressure control valve. This control floods the condenser coil with refrigerant that is warmed in a special receiver during low ambient temperatures to maintain head pressure.

The indoor centrifugal condensing unit uses a fan speed control device to help regulate cooling when there are variances in the ambient temperature indoors. The indoor unit does not have a receiver that warms the refrigerant.

### Water and Glycol Cooled Units

There are two different units available. Both water and glycol units may be connected to the evaporator with pre-charged refrigerant lines or close coupled.

Regulating valves are factory installed on all these units. Valves automatically open as refrigerant pressure increases and close when pressure decreases.

### Regulating Valve Adjustment

#### Adjusting Head Pressure

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.

#### Testing the Function of the Valve

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

#### Manual Flushing

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.

## HUMIDIFIER OPERATION

The 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 in the coil bypass section.

During start–up, when the humidity control calls for humidification, the fill valve opens and allows water to enter 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, in turn, rises. Boiling soon commences and the humidifier operates normally.

There are several processes that control operation. They are described in the following paragraphs.

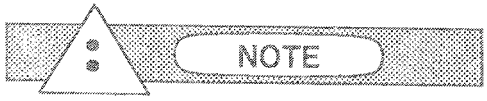
If the current flow in the canister reaches a set level above the normal operating amperage, an overcurrent breaker shuts off power to the electrodes while the drain valve opens, flushing some of the water out of the canister. Within about 15 to 20 seconds, the over current breaker automatically resets. 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 in excessive amounts and pressure builds up in the canister. This pressure build–up displaces water out of the canister through the level tube (overflow). Again less water is exposed to the electrode surface, so less steam is generated and normalization occurs.

If the conductivity of the water is low, the canister fills until the water level reaches the canister full electrode. The humidifier stops filling to prevent overflow. 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 canister full electrode. 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 begin to fall off to 0. This should allow enough time to schedule maintenance. Personnel that work around the mini–MATE PLUS should be aware that when the unit stays in humidification mode and no longer produces steam, the humidifier canister needs to be replaced.




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.

The humidifier is designed to operate with water systems having 10 to 150 PSIG water pressure. 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.

# PART FOUR: MAINTENANCE

## 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 plenum (if applicable) should be free of debris. The evaporator fan motor is direct-drive, two-speed, and requires no adjustment.

### FILTERS

Filters are usually the most neglected items in an air-conditioning system. To maintain efficient operation, they should be checked monthly and cleaned or replaced as required.

### DRAIN PAN

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

### ELECTRIC REHEATS

The reheats consist of a calrod heating element surrounded by a tubular heat dissipating finned sheathing. The finned design of the sheathing reduces surface temperature which prevents ionization of air particles and extends operation life. The reheats should be free of dust and debris. During normal operation, the elements will last indefinitely. They should be inspected semi-annually to make sure that they are still operational.

### HUMIDIFIER MAINTENANCE

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, drain it first. Be sure to disconnect power to the unit.


The Run/Stop switch does not disconnect the 230-volt supply to the humidifier!


**The canister and distributor tube will be hot!**

Press the manual drain switch to stop filling and start draining.

Remove the distributor connected to the canister and the two electrode terminals. lift the canister out and swing it around to 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. When you restart the unit, the canister will take about 20 minutes to produce steam. If it won't start producing steam, add some salt or other electrolyte to the water.

## CONDENSING UNIT

Clean the 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 around or on the condensing unit. Check all refrigerant lines and capillaries for vibration isolation and support as necessary. Check all refrigerant lines for signs of leaks.

### WASH-DOWN DRAIN PLUG

A ½" (12.7mm) FPT connection is provided for condenser coil wash-down. The condenser wash-down pan is plugged at the factory. This drain is to be used only when the condenser coil is being cleaned. The plug must be replaced when cleaning is completed.


**The compressor is equipped with a crankcase heater that prevents the migration of refrigeration into the compressor. The heater is energized as long as power is supplied to the unit and regulates itself as required by changes in the temperature of the compressor oil. If the main switch is disconnected for long periods, do not attempt to start unit for 8 hours after the switch has been reconnected. This allows enough time for all liquid refrigerant to be driven out of the compressor.**

# PART FIVE: TROUBLESHOOTING – ALL SYSTEMS

| SYMPTOM | POSSIBLE CAUSE | CHECK OR REMEDY |
|---|---|---|
| Unit will not start | No power to unit | Check voltage at input terminal block. |
| | Control voltage circuit breaker open | Locate short and reset circuit breaker. |
| | Float switch relay has opened due to high water in the condensate pan | Reset unit by switching Stop/Run switch to Stop, then to Run. See section below. |
| No cooling | Compressor high head pressure | 1. Call for cooling.<br>2. Push reset switch in condensing unit. See below for cause and remedy. |
| | Low refrigerant charge | Check pressure with gauges. |
| | Compressor contactor not pulling in | Check terminals P2–10 and P2–15 for 24 V a.c. ± 2V. If no voltage, defective solid state board. |
| | | Check voltage at contactor. |
| Compressor will not operate | Poor jumper connection | Check continuity with ohm meter. |
| | (Outside air condenser only) Temperature below 30°F – Low ambient stat in condenser fan section open | Check outside temperature. Make sure low ambient stat is turned completely clockwise. |
| Compressor high head pressure | Water and Glycol Cooled—No fluid flowing through condenser | Check fluid supply to adjust water–regulating valve. |
| | Air Cooled—Condenser fan not operating | Check fan operation. |
| | Insufficient air flow across condenser coil | Remove debris from coil and air inlets. |
| Humidifier does not operate | No water flow | Check canister water level for possible boil–off. 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. |

| SYMPTOM | POSSIBLE CAUSE | CHECK OR REMEDY |
|---|---|---|
| Reheat will not operate | Defective solid state board | Check voltage at P2–9 and P3–4 on solid state board 24 V a.c. ± 2V. |
| | Reheat safety open | Jumper high temp stat. If reheat functions, stat is open. |
| | Element is burned out | Turn off power. Check element continuity with ohm meter. |
| Continuous Heating* | Open sensor circuit | Find open circuit and repair. Check sensor out of circuit. |
| Continuous Cooling* | Shorted sensor circuit | Find short and repair. |
| Continuous Humidification* | Open sensor circuit | Find open circuit and repair. |
| Continuous Dehumidification* | Shorted sensor circuit | Find short and repair. |
| Condensate pump does not operate | Open or short circuit in wiring | Find open or short circuit and repair power to pump. |

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

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Computer Support Systems

# MAINTENANCE INSPECTION CHECKLIST

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

## 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 _____

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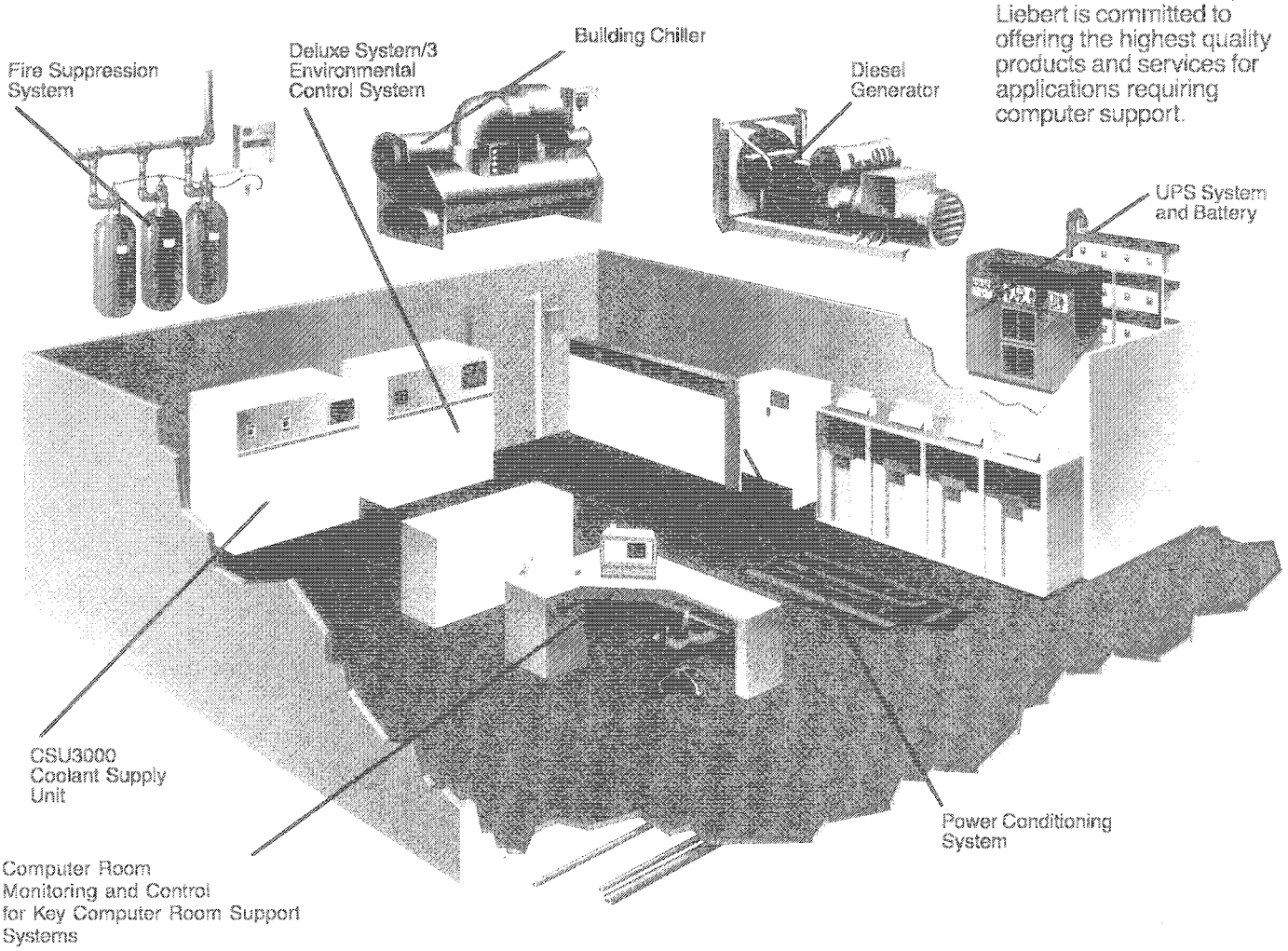


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**World Headquarters**

**Liebert Corporation**
1050 Dearborn Drive, P.O. Box 29186
Columbus, Ohio 43229
614-888-0246
Telex 246-655 LIEBERT WOGN

**Europe Headquarters**

**Liebert International B.V.**
Model Farm Road
Cork, Ireland
(021) 41633
Telex 75203 LBRT EI



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