

MINI CEILING SYSTEMS

OPERATION AND MAINTENANCE MANUAL

GENERAL

The mini series ceiling system is a self-contained environmental control system, factory wired and tested, and specifically designed to provide temperature, humidity and dust control for spaces where process cooling is required.

The unit shipped from the factory includes;

Air Cooled - a condenser blower motor package (or optional remote outdoor air cooled condenser), evaporator blower, evaporator coil, thermal expansion valve, compressor, condenser coil (unless shipped with remote condenser), and filter drier.

Water Cooled - an evaporator blower motor package, evaporator coil, thermal expansion valve, a filter drier, compressor, water regulating valve, and coaxial condenser.

Chilled Water - a blower motor package, chilled water valve, and chilled water coil.

TRANSPORTATION DAMAGE

File a claim with the shipping company if shipment is damaged or incomplete. Visual inspection of the outer casing provides a simple indication of possible internal damage to the equipment. Move unit to installation site in upright position. Damage claims are the responsibility of the purchaser.

IMPORTANT - READ BEFORE INSTALLING

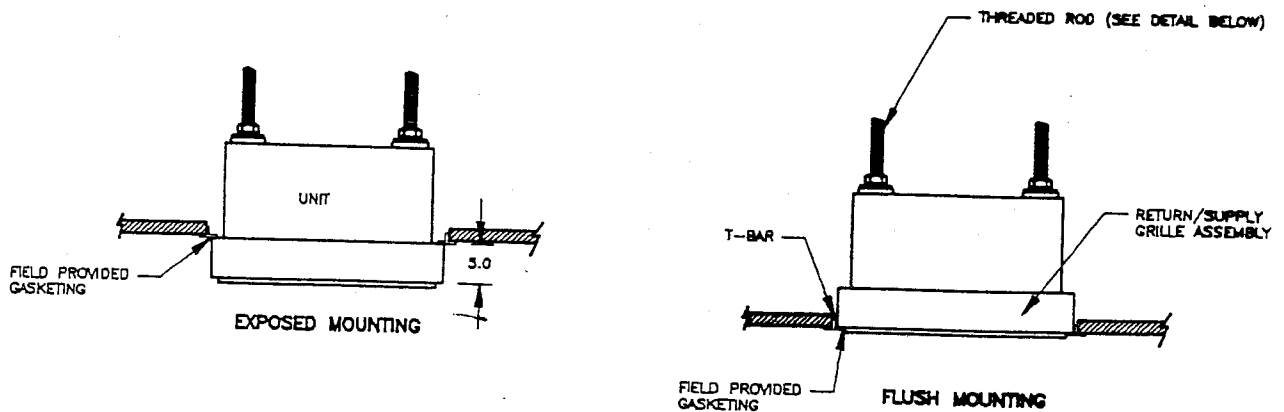
Check the power supply: voltage frequency and phase must correspond to that specified on the unit rating plate. The power supply must be able to handle the additional load imposed by this equipment.

LOCATING THE UNIT

Consult local building codes and national electrical code for special installation requirements. Allow sufficient clearance below the unit for regular maintenance access.

The unit is used for above the ceiling installation and it may be suspended from structural members of the building above the ceiling. Add 50% safety factor to the weight of the unit and accessories to determine what the strength of the supporting structural members should be.

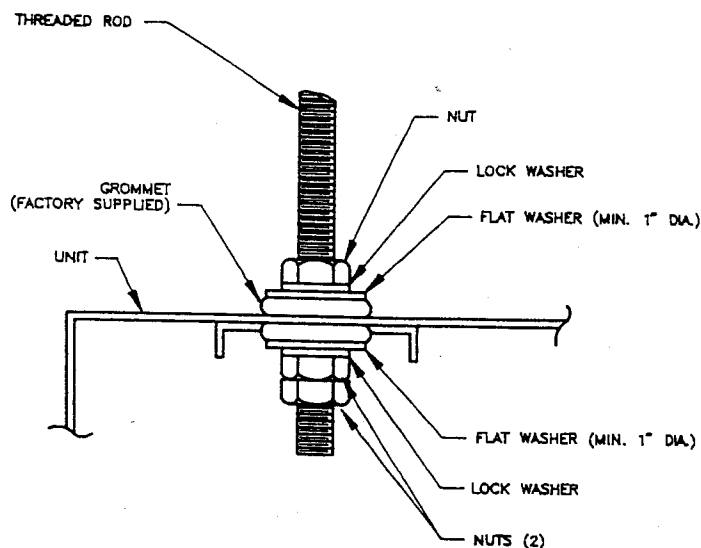
The unit may be mounted flush with the ceiling or partially exposed as shown below:



For flush mounting, the return/supply grille assembly may be removed prior to installation of the unit.

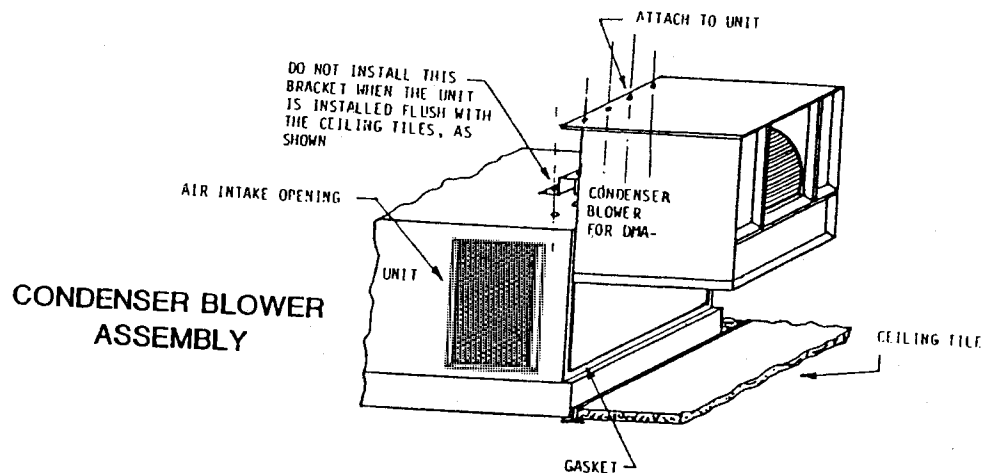
To remove the grille assembly, open the hinged grilles and loosen (6) screws. The whole assembly will come apart. Hang the unit, then re-install the grille assembly by reversing the above procedure.

To hang the unit, use 1/2" all-thread rods. Use factory provided grommets (vibration isolators) with the rods as shown below:



CONDENSER BLOWER INSTALLATION (AIR COOLED UNITS)

- A. Place gaskets all around condenser coil opening.
- B. Connect motor plug above condenser.
- C. Place blower package against condenser.
- D. Use (3) screws on top of unit to attach to condenser blower to the unit. Do not use screws longer than 3/4". Damage to coil may occur.



The air cooled unit may use building air for condenser heat rejection*. No ducting will be required. If outdoor air should be required, use ducting as follows:

1. Remove condenser return air grille. Install duct using flexible connector.
2. Connect the discharge air using flexible connector.
3. The condenser is designed for 1185 CFM at 0.50 E.S.P.(MAXIMUM). Size your ductwork accordingly.

* APPLICATION GUIDELINES FOR NON-DUCTED PLENUM CONDENSER AIR

1. Cavity size above ceiling t-bar should be large enough to handle condenser air.
2. Maximum ceiling plenum air temperature should not exceed 90°F.
3. There should be adequate space around the unit to avoid recirculation of condenser air and to allow for servicing.

ELECTRICAL CONNECTIONS

IMPORTANT - Before proceeding with the electrical connections, make certain that the volts, hertz, and phase correspond to that specified on the unit rating plate. Also, check to be sure that the service provided by the utility is sufficient to handle the additional load imposed by this equipment. Refer to unit rating plate for equipment electrical requirements.

The enclosed wiring diagram with the unit shows the proper field High and low voltage wiring. Make all electrical connections in accordance with national electrical code and any local codes or ordinances that might apply.

WARNING - The unit cabinet must have an uninterrupted or unbroken electrical ground to minimize personal injury if an electrical fault should occur. This may consist of electrical wire or approved conduit when installed in accordance with existing electrical codes.

High and low voltage wires are to be brought to the control box through the side of the cabinet.

INSTALLING WATER LINES

WATER COOLED UNITS

Two 5/8" male flare connections are provided at the side of the unit for water in and out. Larger tubing may be required depending on length of run of the tubing and accessories used such as balancing valves, strainers, etc. Shut off valves should be provided for future disconnecting if necessary. A strainer is also recommended, but should be cleaned regularly.

The water regulating valve is factory adjusted to maintain approximately 230 psi discharge pressure and higher.

CHILLED WATER UNITS

Two 3/4" chilled water connections are provided at the side of the unit for water in and out. Larger tubing may be required depending on length of run of the tubing and accessories such as balancing valves. Shut off valves are recommended for future use.

The 2-way chilled water valve is factory set to operate at a maximum pressure of 150 psi.

CONDENSATE LINE

Condensate drain connection is on either side of the unit. Plug the side not used. A trap should be field provided.

An optional condensate pump may be installed within the unit cabinet. A space is provided for this purpose inside the condensate pan. Use one of the rear knock-outs to route the electrical cord for the pump to a 110 volt receptacle.

NOTE: If purchased from data aire, a model 1-abs manufactured by little giant pumps will be provided. Shut off head is 10 feet. When a condensate pump is used, plug both sides of the condensate pan using 3/4" mpt plugs.

LEAK TESTING

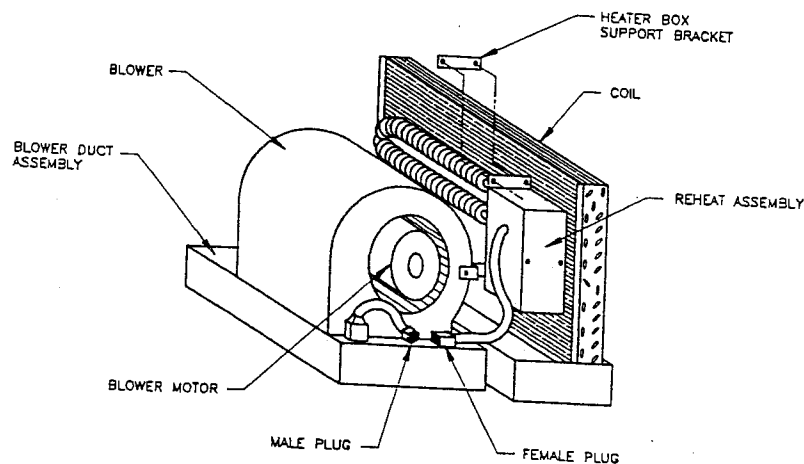
No installation is complete until the entire system has been checked for leaks.

OPTIONAL EQUIPMENT

ELECTRIC REHEAT WITH UNIT MOUNTED CONTROLS

INSTALLATION PROCEDURE:

1. Remove blower access panel adjacent to the blower motor
2. Attach reheat assembly with sheet metal screws to the heater box support bracket (sketch "A")
3. Attach lower left corner of reheat assembly to blower
4. Connect the female plug on the reheat assembly to the male plug of the unit



EVAPORATIVE PAD HUMIDIFIER WITH UNIT MOUNT CONTROLS

INSTALLATION PROCEDURE:

1. Attach rh bracket to the humidifier assembly using (2) sheet metal screws provided (sketch "B")
2. Remove blower access panel opposite the blower motor
3. Insert humidifier assembly with attached rh bracket as indicated
4. Attach lh bracket to coil tube sheet as shown using (2) screws or sheet metal clips
5. Attach lh bracket to front of humidifier assembly
6. Plug in humidifier solenoid valve to unit plug located in blower compartment (detail "D", sketch "B")
7. Attach humidity controls bracket onto the unit control mount. Holes have been provided next to the thermostat (sketch "C")
8. Connect the female plug (coming off the humidity controls bracket) to the male plug provided on the unit (coming off the terminal block). Set humidistat to approximately 40% or lower, dehumidistat to approximately 60% or higher
9. A 1/8" compression fitting is provided for the water supply, and 1/8" O.D. Copper tubing should be used for make-up water. A water line shut off valve must be provided outside the unit for future disconnection and service. A water strainer is provided with the humidifier and must be cleaned regularly. An in-line water pressure regulator should be installed and set between 30 and 50 PSIG. The humidifier make-up water should be provided from hot water building supply at 140°f, plus or minus 10°F

Units with electric reheat, humidification, and wall mount unit controls must use the data alarm mini processor. Please refer to the data alarm mini processor for instructions.

Units with steam generator humidifier require 1/4" O.D. Tubing for make-up water. Refer to the humidifier operation and maintenance provided for details on humidifier operation and service.

CHECKOUT LIST

(Checkout list is for all mini units; air cooled dx, water cooled dx, and chilled water. Follow instructions where applicable).

WITH ELECTRIC POWER OFF:

1. Check all electrical wiring (both factory and field) for completeness and tighten all electrical connections, (contactors, relays, etc.).
2. Tighten all set screws of evaporator blower.
3. Check condenser airflow for obstructions.
4. Leak-test all refrigerant connections (fittings, joints, gaskets, flanges, etc.), Both factory and field, with a halide torch or electronic leak detector.
5. Replace all caps on service valves, if used.
6. Check to be sure all tools and loose parts have been removed from unit.
7. Check to be sure all panels and covers are in place.
8. Following initial inspection, start unit and:
 - A. Check condenser and evaporator blowers for proper rotation.
 - B. Check line and low voltage (should be within plus or minus 5% of that stamped on unit rating plate).
 - C. Check unit for proper operating refrigerant charge.
 - D. Check compressor current draw.
 - E. Check unit for excessive noise, refrigerant tubing for excessive vibration and for contact with other parts.
 - F. Do not leave job site until unit has been observed through several complete cycles. Make certain at this time all components are operating in correct sequence.

*** When starting and stopping the equipment manually, do not jumper the compressor 3 minute time-delay relay. Excessive damage to the compressor may occur with rapid cycling. Note: never operate unit without filter. ***

SYSTEM CHECK FOR PROPER CHARGE

Since good system reliability depends on proper refrigerant charge, it is very important that the system be thoroughly checked for superheat and oil temperature after the unit is stabilized. A final check should be made after the unit is turned on and the room is fully loaded.

1. Connect the refrigerant drum to the low side of the system. Purge gauge and hoses.
2. Start the unit.
3. After the unit is stabilized for at least 30 minutes, check superheat temperature at the compressor suction at least 6" away from the compressor. Superheat should be between 6 and 18°F.
4. Check crankcase (oil) temperature at the bottom of the compressor. The oil temperature must be at least 35°F higher than saturated suction temperature at all times. Lower temperature indicates that the system is over-charged, the bearings are not properly lubricated, and may result in compressor failure(s). Refrigerant should be removed from the system. Never over-charge the system.

OPERATION

Set controls to the desired settings.

1. Units with unit mounted controls: set thermostat to the desired setting (between 70 and 75 degrees F). Set the humidistat (low humidity) between 35 and 40 percent, and the dehumidistat (high humidity) between 60 and 65 percent.
2. Units with wall mount data alarm mini processor: refer to Data Alarm Mini Processor Operation and Maintenance Manual.

THOROUGHLY EXPLAIN TO OWNER(S):

- A. Operation of the system (thermostat, reset control, etc.).
- B. Care and maintenance instructions (cleaning or replacing air filters, condenser and evaporator coils, blower wheel, and humidifier).
- C. Factory and contractor warranties and how to obtain service, if necessary.

CARE AND MAINTENANCE

****WARNING**DISCONNECT POWER TO EQUIPMENT BEFORE SERVICING.**

For continuing high performance and to minimize possible equipment failure, it is essential that periodic maintenance be performed on this equipment. The following items are to be inspected:

1. Air Filter - should be inspected monthly and replaced if necessary. The inlet and outlet grilles should also be kept clean and unobstructed.
2. Motor is sealed and self-lubricated. Check and clean vent holes monthly.
3. Humidifier (optional pad type) - it is necessary to thoroughly clean out the humidifier pad at regular intervals. The need for cleaning depends entirely on the nature of the water used, and the frequency at which the humidifier is called into operation.

To inspect the humidifier, disconnect the power to the unit at the "disconnect" switch. Open the access door. The humidifier is now fully exposed. Visually inspect the pad. Remove the inline strainer and clean thoroughly making certain that the screen is clean. Clean and install water flow restriction.

If unit power and blower fan is not disconnected during the humidifier pad inspection, water droplets from the pad will be carried over to the blower intake caused by high velocity through the service door.

Units with optional steam humidifier: refer to operation and maintenance manual provided by humidifier manufacturer for instructions.

4. Condensate pan and operation of (optional) condensate pump - inspect monthly and clean when necessary.
5. Electrical controls and wiring - with power disconnected to unit, check all electrical connections for tightness. Tighten all screws on electrical connections. If any smoky or burned connections are noticed, disassemble the connection, clean all parts and stripped wire, reassemble properly (use new connector if old one is burned or corroded) and secure tightly. Electrical controls are difficult to check without proper instrumentation; therefore, reconnect electrical power to unit and observe unit through one complete operating cycle. If there are any discrepancies in the operating cycle, contact your dealer and request service.
6. Refrigerant circuit
The refrigerant circuit is difficult to check for leaks without proper equipment. If low cooling performance is suspected, contact your local dealer.

AIR COOLED PIPING (with DARC Condenser)

The interconnecting lines to the remote air cooled condenser must be installed by a qualified refrigeration mechanic.

To insure adequate oil return to the compressor, use the following recommendations:

1. Standard piping practice must be used to insure oil return and minimize pressure drops.
2. Piping sizes listed are for runs up to 200 equivalent feet. Qualified refrigeration installers may reduce the piping sized for runs less than 200 equivalent feet.
3. Discharge lines must be trapped at the bottom, the top, and every 20 feet of vertical rise.
4. Discharge check valves are recommended on long pipe runs or in cold climates.
5. Discharge line: recommended pressure drop should be between 3 and 6 psi. Minimum gas velocity for proper oil return is 1000 FPM
6. Liquid line: recommended pressure drop should be between 2 and 4 psi. Liquid line velocity from the condenser to the expansion valve should be between 200 and 300 FPM.

For more information on pipe sizing, refer to ASHRAE standards or other common practice trade publications. The information herein should be used as a guideline.

CHARGING PROCEDURE

1. Connect the refrigerant drum to the low side and charge with vapor. Charge approximately 3 lbs. per nominal ton.
2. State the unit. Observe the liquid sight glass indicator to check approximate charge for a normal refrigeration cycle. Bubbles in the sight glass can be caused by flashing due to excessive pressure drop from liquid line piping, low sub-cooling, or low charge.

3. The discharge pressure should be a minimum of 225 psi with the system stabilized.
4. Adjust refrigerant until the sight glass is cleared or exhibits only a slight number of bubbles with sub-cooling of approximately 8-10 degrees.
5. After the unit has stabilized, check the superheat temperature at the compressor suction line at least 6 inches away from the compressor. Superheat should be between 6 and 14 degrees, 10 degrees is recommended.
6. Check the crankcase (oil temperature at the bottom of the compressor. The oil temperature must be at least 35 degrees higher than the saturated suction temperature at all times. Smaller temperature difference indicates either that the system is overcharged or that the superheat is set too low, allowing liquid refrigerant to return to the compressor. Liquid return may result in compressor failures.

FAN MOTOR CONTROLS

Air cooled condensers have standard fan speed control. The variable speed motor modulates it's speed based on discharge pressure. The controller is factory set and does not require field adjustments.

CARE AND MAINTENANCE

For Continuing high performance, and to minimize possible equipment failure, it is essential that periodical maintenance be performed on this equipment.

The air for the condenser coil is drain into the unit on the side and discharged out the top. Keep the air inlet and outlet grille unplugged and clear of any obstructions at all times. Never cover the unit or lean anything against it which might restrict airflow or cause hot air from the grill to recirculate into the sides. Keep trash and debris away from unit at all times. Never stand on unit or use it as support for ladders, etc.

The refrigerant tubing connecting this unit with the cooling coil is easily crushed or crimped. Therefore, do not hang or stand anything on it. Do not move the unit after it has been installed as this may crimp tubing and cause the unit to malfunction.

The ability to properly perform maintenance on this equipment requires certain mechanical skills and tools. If you do not possess these, contact your Dealer for maintenance.

WARNING: DISCONNECT ALL ELECTRICAL POWER TO THE UNIT BEFORE PERFORMING ANY MAINTENANCE OR SERVICE ON CONDENSER. REMEMBER TO ALSO DISCONNECT POWER SUPPLY TO THE INDOOR EVAPORATOR SECTION AS THIS UNIT SUPPLIES LOW VOLTAGE POWER TO THE CONDENSER.

The minimum maintenance that should be performed on this equipment is as follows:

1. Check condenser coil for cleanliness each month. Clean as necessary
2. Check fan motor and blade for cleanliness and lubrication. Clean and lubricate as necessary.
3. Check electrical connections for tightness and controls for proper operation yearly. Service as necessary.

CAUTION: Because of possible damage to the equipment or personal injury, maintenance should be performed by qualified persons only.

CEILING SYSTEMS OUTDOOR CONDENSING UNIT

INSTALLATION INSTRUCTIONS

GENERAL

The condensing unit, as shipped from the factory, includes a compressor, a condenser fan and motor, an air-cooled condenser coil, a compressor, start assist, low-pressure switch, high-pressure switch, a crankcase heater, a fan guard and a solid-state motor speed controller suitable for operation to -20°F. Installation comprises the following steps (sections):

I. LOCATING THE UNIT

Select a location for the unit where ice and snow will not fall from an overhang and damage the unit top or fan blade. Care must be exercised to maintain the clearance requirements. Minimum coil clearance is 24", service door 30", top 60", other sides 1".

This condensing unit is approved for outdoor installations.

1. Consult local codes or ordinances for restrictions regarding location of unit.
2. Consult dimensional drawing for following:
 - a. Location of refrigerant connections and electrical connections.
 - b. Recommended clearances.
 - c. Direction of condenser airflow.
 - d. Mounting base dimensions.
3. Place unit on level base strong enough to support weight of unit and to resist effects of frost heaving, etc. Concrete lintels can be used if spaced to adequately support unit.
4. Allow air to circulate under unit. Channels are provided for this purpose, or unit may be set in a bituminous mixture, such as roofing tar to prevent base pan from rusting. Do not plug drain holes.
5. On rooftop applications, locate unit a least 6 inches above roof surface. Where possible, place unit above a load-bearing wall. Arrange supporting members to adequately support unit and minimize transmission of vibration to building. Either precast concrete lintels, concrete blocks, treated timbers, or steel beams can be used. Consult local codes governing rooftop applications. In cold climates, locate unit above expected snow level.
6. Avoid locations where flowers, shrubs, etc., are in pathway of condenser discharge air, or where condenser fan will discharge against prevailing wind, or building structure.

7. Avoid Locations where normal operating sounds may be objectionable, such as beneath windows, between structures, or near doors. Should operation sounds be objectionable, consideration should be given to a shielding barrier.
8. Keep distance between coil and condensing unit as short as possible.

II. **INSTALLING REFRIGERANT TUBES**

A. Determining Liquid-Tube Diameter

The correct liquid-tube diameter can be determined by using the appropriate table as described here. (See Table 1.)

1. Measure total one-way horizontal distance for intended tubing path.
2. Measure total one-way vertical distance for intended tubing path.
3. At left-hand end of table, select value that matches measured vertical length. Be sure to note that upper section of table is used if cooling coil is above unit, whereas lower section is used if cooling coil is below unit.
4. Move across this line towards right-hand side until correct vertical column is reached for measured horizontal length.
5. Correct diameter will be indicated at intersection of these lines.
6. For applications where cooling coil is to be placed more than 40 feet below unit, consult factory for specific recommendations.

EXAMPLE: Cooling coil is located 28 feet above unit. Horizontal distance is 52 feet. First in section marked "Coil Above Unit," find line showing measurements of 21-30 feet. Follow line toward right until it intersects vertical column marked 51-60 feet. Correct tube size is 5/16 inch O.D.

B. Determining Suction-Tube Diameter

The correct suction-tube diameter can be determined by using Table 2 as described here. (See Table 2).

1. Measure total length (vertical and horizontal) of intended tubing path.
2. Find correct unit size at left of table.
3. Tube lengths are shown in center of table with appropriate diameters on right.

TABLE 2
RECOMMENDED SUCTION-TUBE DIAMETER

REFER TO PAGE 22
FOR UPDATED PIPE SIZING

NOTE: The above table is based on a tube loss of 3°F. Longer lengths can be used in each diameter listed, but the result will be larger tube losses. Refer to factory for specific details.

Select an approved (type L) refrigerant tubing of the correct size. (**DO NOT USE WATER TUBING!**) Insulate the suction tube with an insulation having an adequate vapor barrier (e.g. Armaflex or Rubetex).

NOTE: All refrigerant tube joints erected on the premises should be exposed to view for visual inspection and leak testing before being covered or enclosed.

Install refrigerant tubes as follows:

1. Consult local codes or ordinances before running refrigerant tubes.
2. Install indoor section in accordance with instructions packaged with it.
3. Run refrigerant tubes as directly as possible, avoiding unnecessary turns and bends.
4. Tape liquid tube to top of insulated suction tube for support.
5. Suspend refrigerant tubes so they do not damage insulation on suction tube and do not transmit vibration to structure. Also, when passing refrigerant tubes through wall, seal opening so vibration is not transmitted to structure. Leave some slack in refrigerant tubes between structure and unit to absorb vibrations.
6. If refrigerant tubes are too long, they should be rolled into loop and placed in horizontal plane with end leaving loop going to compressor, coming out of bottom.
7. Suction line traps should be provided when evaporator is located below unit.

III. LEAK TESTING

No installation is complete until the entire system has been checked for leaks. This check should include all field and factory joints. To check a system for leaks, proceed as follows:

1. Attach gauge manifold to gauge ports and purge hoses.
2. Pressurize the system with vapor from an external refrigerant cylinder of R-22 until system and cylinder pressures are equalized.
3. Leak-test with electronic detector, a halide torch, or liquid-soap solution.

4. Release pressure and repair any leaks found. Repeat leak test as necessary.
5. When system is free of leaks, proceed to Section IV.

WARNING: NEVER ATTEMPT TO REPAIR ANY SOLDER CONNECTIONS WHILE SYSTEM IS UNDER PRESSURE. PERSONAL INJURY COULD RESULT.

IV. EVACUATION

It is extremely important to have an installation in which all refrigerant tubes and system components are completely free of air and moisture.

If the installer can pull the system down to a reading of 200 microns or less with his deep vacuum equipment, he can consider the system free of air and moisture when this level is reached. Unit must be under vacuum for a minimum of 8 hours.

V. ELECTRICAL CONNECTIONS

IMPORTANT: Before proceeding with the electrical connections, make certain that the volts, hertz, and phase correspond to that specified on the unit rating plate. Also, check to be sure that the service provided by the utility is sufficient to handle the additional load imposed by this equipment. Refer to the Ratings and Performance table in the detailed unit instruction and unit rating plate for equipment electrical requirements.

The unit wiring diagram shows the proper field high and low-voltage wiring. Make all electrical connections in accordance with the National Electrical Code and any local codes or ordinances that might apply.

Use a separate branch electrical circuit for this unit. A disconnecting means must be located within sight of, and readily accessible to, the unit.

CAUTION: If disconnect switch is to be mounted on the condensing unit, select a location where drill or fastener will not contact electrical or refrigerant components.

WARNING: The unit cabinet must have an uninterrupted or unbroken electrical ground to minimize personal injury if an electrical fault should occur. This may consist of electrical wire or approved conduit when installed in accordance with existing electrical codes.

MR. ELECTRICIAN, PLEASE NOTE: DO NOT ATTEMPT TO OPERATE THIS CONDENSING UNIT UNTIL ALL REFRIGERANT CONNECTIONS HAVE BEEN MADE AND SYSTEM IS CHARGED.

The single-phase compressor motor used in this condensing unit is a permanent-split-capacitor-type (PSC) motor, designed to start under low-load conditions only; therefore, make sure that the system pressures have equalized before attempting to start the unit (this takes approximately 5 minutes). Do not short-cycle the unit with the thermostat or disconnect, as this will cause the compressor to trip-out on overload.

VI. **CHECKING CHARGE**

No installation is complete until the operating charge level of the unit is checked. The level of refrigerant operating charge will determine how efficiently and economically the unit will operate. An overcharged or undercharged unit will lead to insufficient cooling, high operating costs, and the possibility of a compressor failure. To check the refrigerant charge level, proceed as follows:

1. Connect the refrigerant drum to the low side and charge with vapor. Charge approximately 2 lbs. after purging gauge and hoses.

CAUTION: Before starting compressor, make sure that the crankcase heater is energized for a minimum period of 12 HOURS to reduce the possibility of liquid slugging at start-up. Failure to do this may result in compressor failure.

2. Start the unit. Observe the liquid indicator to see if the system is properly charged for normal refrigerant cycle. Bubbles in the sight glass can be caused by flashing due to excessive pressure drop from liquid line piping, or excessive pressure drop in the filter drier caused by accumulation of dirt, metal chips and brazing flux which might have been introduced during field piping. CLEAN refrigeration tubing must be used for piping.
3. If the discharge pressure is less than 300 psi, then block the condenser coil surface until the discharge pressure is approximately 300 psi. The system must be stabilized.
4. Add refrigerant vapor until the sight glass is cleared or with some bubbles.
5. After the unit is stabilized for at least 30 minutes, check superheat temperature at the compressor suction at least 6" away from the compressor. Superheat should be between 6°F to 18°F.
6. Check crankcase (oil) temperature at the bottom of the compressor. The oil temperature must be at least 35°F higher than saturated suction temperature at all times. Lower temperature indicates that the system is over-charged, the bearings are not properly lubricated, and may result in compressor failures. Refrigerant should be removed from the system. Some bubbles may be seen in the sight glass due to changes in sub-cooling and discharge pressures. Slight bubbles in the sight glass are permissible as long as the crankcase oil temperature is within limits.
7. Remove block off from the condenser coil, and re-check superheat and oil temperature.

VII. **SYSTEM CHECK FOR OVER-CHARGING**

Since good system reliability depends on proper refrigerant charge, it is very important that the system is thoroughly checked for superheat and oil temperature AFTER the unit is stabilized, as shown above. A final check should be made after the room is turned on and the unit is fully loaded.

VIII. SEQUENCE OF OPERATION

When thermostat "calls for cooling," thermostat contacts close, energizing contactor holding coil, through pressure switches with a 24-volt external power source. As the contactor closes, it energizes compressor motor. At the same time, condenser fan motor is energized. If air temperature is below 60°F, fan will start and modulate through pressure-activated speed controller. The controller is factory set to start the condenser fan at approximately 170 psi.

CHECKOUT LIST

With Electric Power OFF:

1. Check all electrical wiring (both factory and field) for completeness and tighten all electrical connections (contactor, capacitors, relays, etc.)
2. Check condenser fan blade for proper insertion depth in orifice plate.
3. Tighten all setscrews evaporator blower, and condenser fan blade.
4. Check condenser airflow for obstructions.
5. Clean or replace air filter. Do not operate system without air filter in place.
6. Leak-test all refrigerant connections (fittings, joints, gaskets, flanges, etc.) both factory and field with halide torch or electronic leak detector.
7. Replace all caps on service valves, if used.
8. Check to be sure all tools and loose parts have been removed from the unit.
9. Check to be sure all panels and covers are in place.
10. Following initial inspection, start unit and:
 - a. Check condenser fan and evaporator blower for proper rotation.
 - b. Adjust evaporator blower for proper airflow (approximately 400 cfm/ton \pm 10%). Factory set at high speed.
 - c. Check line and low voltage (should be within \pm 5% of that stamped on unit rating plate.)
 - d. Check unit for proper operating refrigerant charge.
 - e. Check compressor current draw.
 - f. Check unit for excessive noise, refrigerant tubing for excessive vibration and for contact with other parts.
 - g. Do not leave installation until unit has been observed through several complete cycles. Make certain at this time all components are operating in correct sequence.

11. Thoroughly explain to owner(s):

- a. Operation of the system (thermostat, reset controls, etc.)
- b. Care and maintenance instructions (cleaning air filters, condenser and evaporator coils, blower wheel, lubrication, and humidifier).
- c. Factory and contractor warranties and how to obtain service, if necessary.

IX. **CARE AND MAINTENANCE**

For continuing high performance, and to minimize possible equipment failure, it is essential that periodic maintenance be performed on this equipment.

The air for the condenser coil is drawn into the unit on the side and discharged out the top. Keep the air inlet and outlet grille unplugged and clear of any obstructions at all times. Never cover the unit or lean anything against it which might restrict airflow or cause hot air from the top grille to recirculate into the sides. Keep trash and debris away from unit at all times. Never stand on unit or use it as a support for ladders, etc.

The refrigerant tubing connecting this unit with the cooling coil is easily crushed or crimped. Therefore, do not hang or stand anything on it. Do not move the unit after it has been installed as this may crimp tubing and cause the unit to malfunction.

The ability to properly perform maintenance on this equipment requires certain mechanical skills and tools. If you do not possess these, contact your Dealer for maintenance.

WARNING: Disconnect all electrical power to unit before performing any maintenance or service on condensing unit. Remember also to disconnect power supply to the air handler as this unit supplies low-voltage power to condensing unit.

The minimum maintenance that should be performed on this equipment is as follows:

1. Check condenser coil for cleanliness each month. Clean as necessary.
2. Check fan motor and blade for cleanliness and lubrication. Clean and lubricate as necessary.
3. Check electrical connections for tightness and controls for proper operation yearly. Service as necessary.

CAUTION: Because of possible damage to the equipment or personal injury, maintenance should be performed by qualified persons only.

WARNING: As with any mechanical equipment, personal injury can result from sharp metal edges, etc. therefore, be careful when removing parts.

A. Condenser Coil

Remember to disconnect electrical power before removing any panels.

This unit is equipped with a multirow condenser coil. Since the air is drawn into the side of the unit and discharged out the top, most of the dirt will collect on the outside surface of the

coil. However, some dirt will penetrate the first row of the coil and collect on the second row. This is very difficult to see without removing the top cover.

To properly check the condenser coil for cleanliness, or to clean the coil, proceed as follows:

1. Remove top cover. Enough motor wire is provided so top cover can be laid on edge over compressor section without disconnecting motor leads. (Clip wire tie to release wire.)
2. Clean coil by spraying from inside outward with high-velocity stream of water (garden hose is sufficient). Care should be used not to damage coil fins. Be sure to wash dirt from between coil rows. Drain holes are provided in base pan for drainage. Be sure they are open. If coil is coated with oil or grease it may be cleaned with mild detergent or approved cleaning agent then rinsed with clear water. Be careful not to get water in compressor and unit control boxes.

Replace top cover and secure with screws.

B. Condenser Fan and Motor Blade

Remember to disconnect electrical power before removing any panels.

1. Remove screws holding fan grille to top cover.
2. Lift grille with motor and fan blade out of hole and place on top of compressor compartment. Do not cut or stretch motor electrical leads. Also be careful not to bend fan blade.
3. Clean motor and blade with soft brush or rag. Be careful not to disturb balance weights on fan blade.
4. Check fan blade setscrews for tightness.
5. Lubricate fan motor (if oil holes are provided).
 - a. Remove dust caps or plugs from oil holes located at each end of motor.
 - b. Use teaspoon, 5cc, 3/6 oz. or 16 to 25 drops of good grade SAE 20 nondetergent motor oil in each hole. Allow for total quantity to absorb into each bearing.
 - c. Wipe excess oil from motor housing.
 - d. Replace dust caps or plugs in oil holes.
6. To reassemble unit:
 - a. Reinstall fan motor and blade in hole of top cover.
 - b. Push excess motor leads back into compressor compartment.
 - c. Reconnect electrical power and check fan for proper operation.

C. Electrical Controls and Wiring

With power disconnected to unit, check all electrical connections for tightness.

Tighten all screws on electrical connections. If any smoky or burned connections are noticed, disassemble the connection, clean all parts and stripped wire, reassemble properly (use new connector if old one is burned or corroded) and secure tightly. Electrical controls are difficult to check without proper instrumentation; therefore, reconnect electrical power to unit and observe unit through one complete operating cycle.

If there are any discrepancies in the operating cycle, contact your Dealer and request service.

D. Refrigerant Circuit

The refrigerant circuit is difficult to check for leaks without proper equipment. Therefore, if low cooling performance is suspected, contact you local Dealer for service.

RECOMMENDED LINE SIZING UP TO 200 EQUIVALENT FEET FOR SPLIT AIR COOLED SYSTEMS

HOT GAS AND LIQUID LINES SINGLE CIRCUIT SYSTEMS

UNIT TONNAGE	TONS PER CIRCUIT	50 EQUIV FEET		100 EQUIV FEET		150 EQUIV FEET		200 EQUIV FEET	
		HOT GAS	LIQUID	HOT GAS	LIQUID	HOT GAS	LIQUID	HOT GAS	LIQUID
1.5	1.5	5/8	3/8	5/8	3/8	5/8	3/8	7/8	3/8
2	2	5/8	3/8	7/8	1/2	7/8	1/2	7/8	1/2
2.5	2.5	5/8	3/8	7/8	1/2	7/8	1/2	7/8	1/2
3	3	7/8	1/2	7/8	1/2	7/8	1/2	7/8	1/2
4	4	7/8	1/2	7/8	5/8	7/8	5/8	1-1/8	5/8
5	5	7/8	1/2	1-1/8	5/8	1-1/8	5/8	1-1/8	5/8
6	6	7/8	1/2	1-1/8	5/8	1-1/8	5/8	1-1/8	5/8
8	8	1-1/8	5/8	1-1/8	7/8	1-3/8	7/8	1-3/8	7/8
10	10	1-1/8	5/8	1-1/8	7/8	1-3/8	7/8	1-3/8	7/8
13	13	1-1/8	7/8	1-3/8	7/8	1-3/8	7/8	1-3/8	7/8
15	15	1-3/8	7/8	1-3/8	7/8	1-3/8	7/8	1-5/8	7/8

DUAL CIRCUIT SYSTEMS

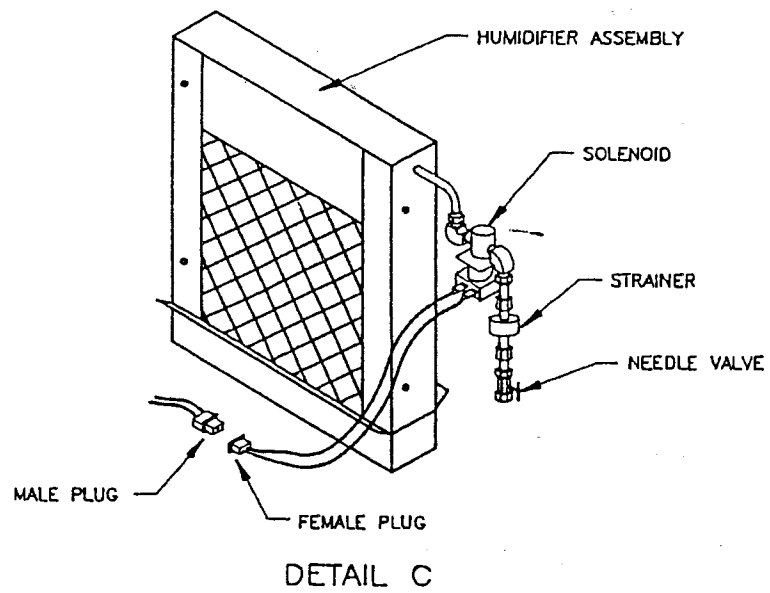
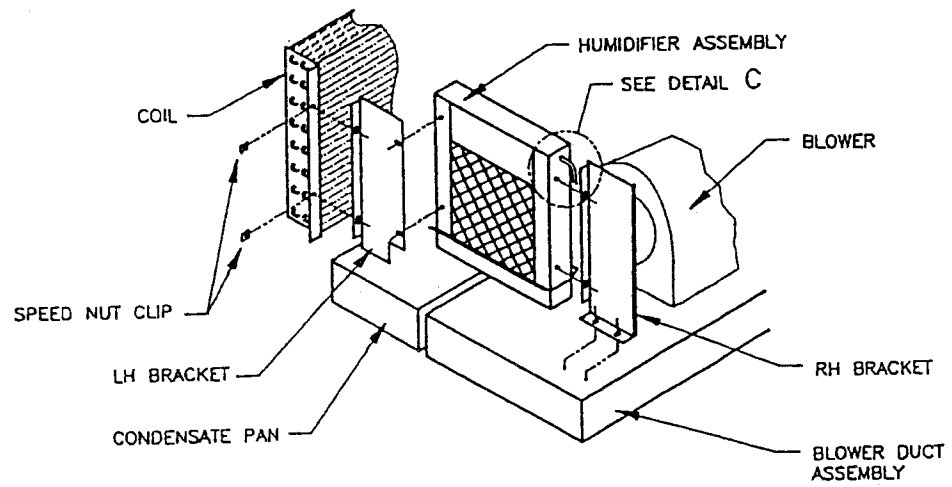
UNIT TONNAGE	TONS PER CIRCUIT	50 EQUIV FEET		100 EQUIV FEET		150 EQUIV FEET		200 EQUIV FEET	
		HOT GAS	LIQUID	HOT GAS	LIQUID	HOT GAS	LIQUID	HOT GAS	LIQUID
6	3	7/8	1/2	7/8	1/2	7/8	1/2	7/8	1/2
8	4	7/8	1/2	7/8	5/8	7/8	5/8	1-1/8	5/8
10	5	7/8	1/2	1-1/8	5/8	1-1/8	5/8	1-1/8	5/8
13	6.5	7/8	1/2	1-1/8	5/8	1-1/8	5/8	1-1/8	5/8
16	8	1-1/8	5/8	1-1/8	7/8	1-3/8	7/8	1-3/8	7/8
20	10	1-1/8	5/8	1-1/8	7/8	1-3/8	7/8	1-3/8	7/8
26	13	1-1/8	7/8	1-3/8	7/8	1-3/8	7/8	1-3/8	7/8
30	15	1-3/8	7/8	1-3/8	7/8	1-3/8	7/8	1-5/8	7/8

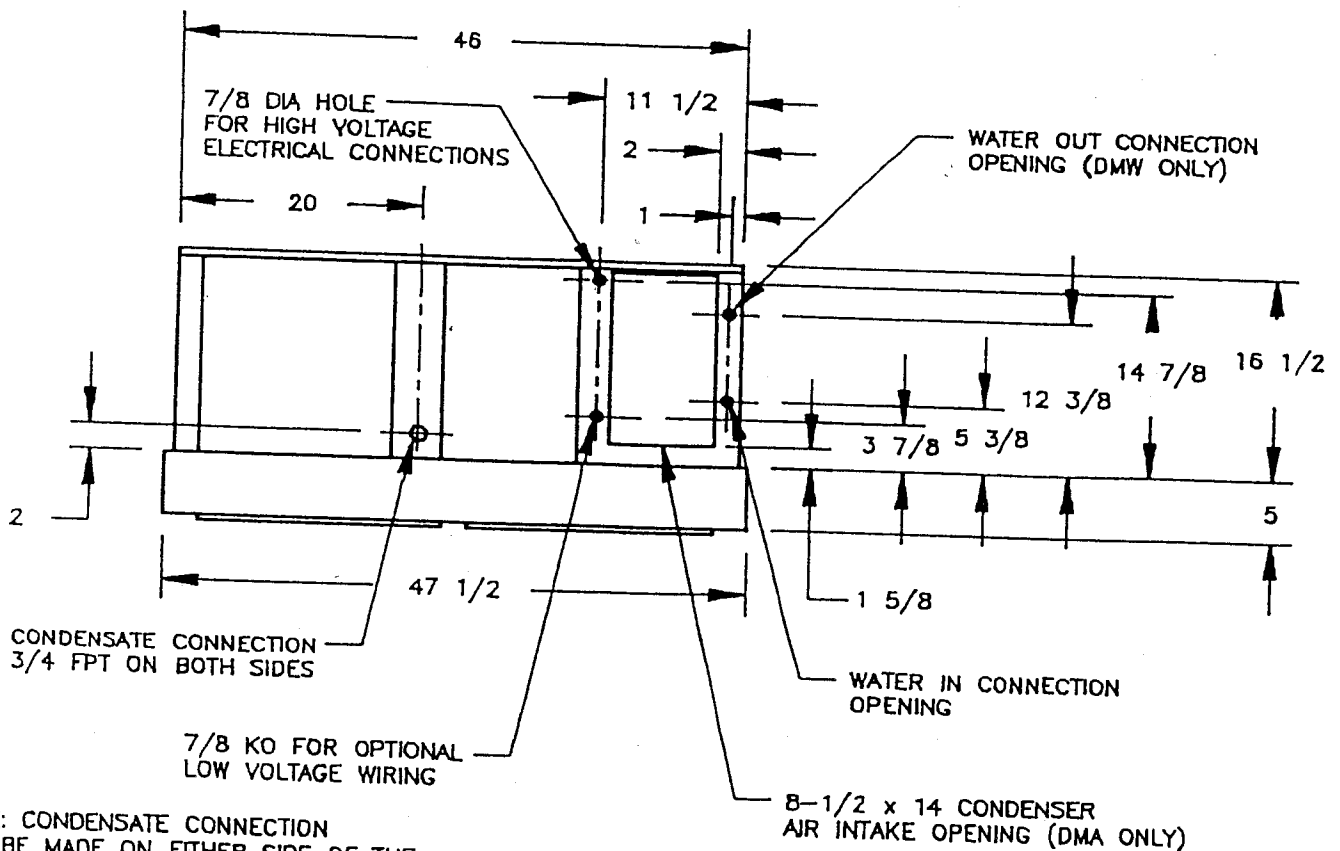
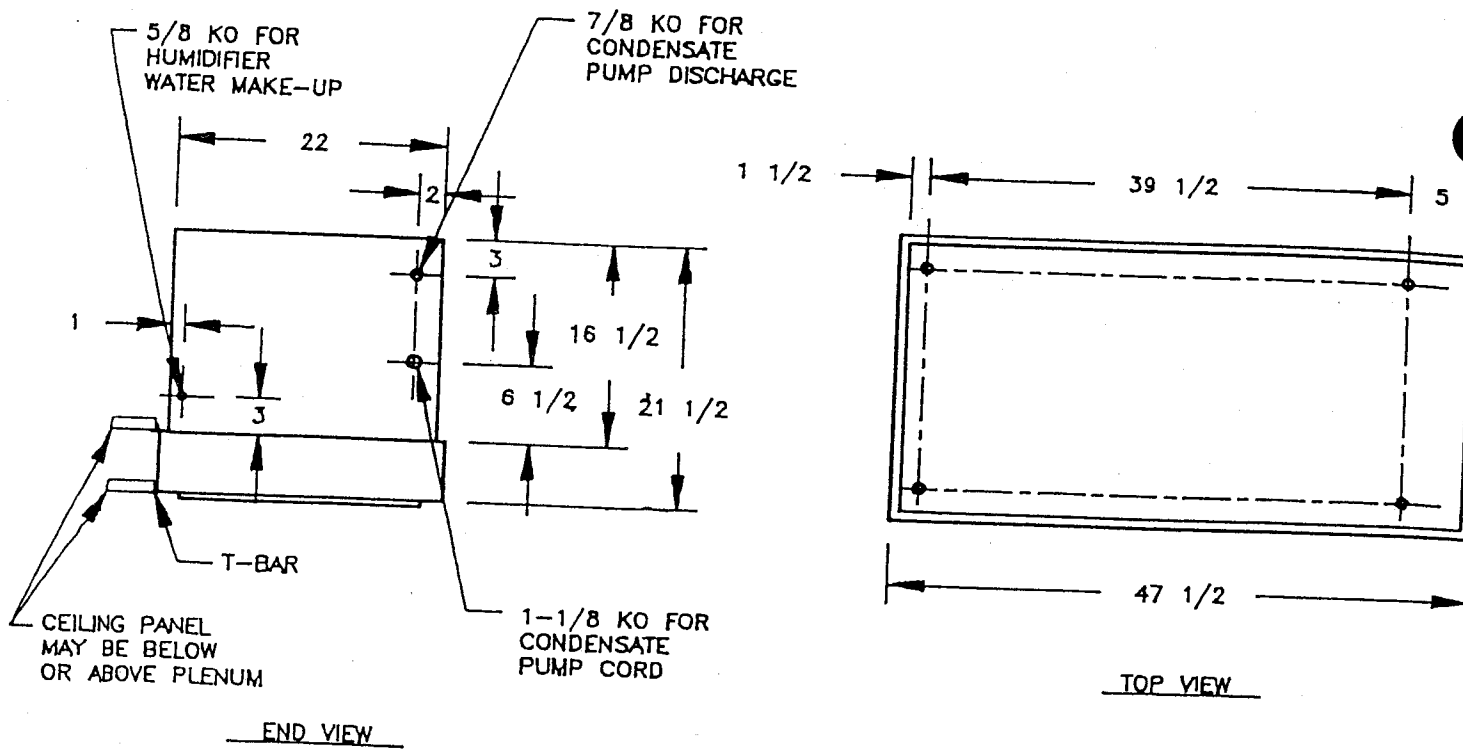
SUCTION LINES SINGLE CIRCUIT SYSTEMS

UNIT TONNAGE	TONS PER CIRCUIT	50 EQUIV FEET		100 EQUIV FEET		150 EQUIV FEET		200 EQUIV FEET	
		HORIZ	VERT	HORIZ	VERT	HORIZ	VERT	HORIZ	VERT
1.5	1.5	7/8	7/8	7/8	7/8	7/8	7/8	7/8	7/8
2	2	7/8	7/8	7/8	7/8	7/8	7/8	1-1/8	7/8
2.5	2.5	7/8	7/8	7/8	7/8	7/8	7/8	1-1/8	7/8
3	3	7/8	7/8	1-1/8	7/8	1-1/8	7/8	1-1/8	1-1/8
4	4	1-1/8	1-1/8	1-1/8	1-1/8	1-1/8	1-1/8	1-3/8	1-1/8
5	5	1-1/8	1-1/8	1-1/8	1-1/8	1-3/8	1-1/8	1-3/8	1-1/8
6	6	1-1/8	1-1/8	1-3/8	1-1/8	1-3/8	1-1/8	1-5/8	1-3/8
8	8	1-3/8	1-3/8	1-3/8	1-3/8	1-3/8	1-3/8	1-5/8	1-3/8
10	10	1-3/8	1-3/8	1-5/8	1-3/8	1-5/8	1-5/8	2-1/8	1-5/8
13	13	1-3/8	1-3/8	1-5/8	1-5/8	1-5/8	1-5/8	2-1/8	1-5/8
15	15	1-5/8	1-3/8	1-5/8	1-5/8	2-1/8	1-5/8	2-1/8	1-5/8

DUAL CIRCUIT SYSTEMS

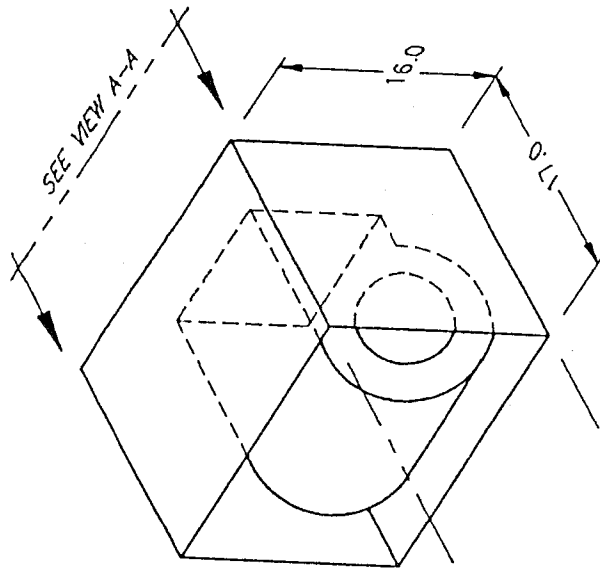
UNIT TONNAGE	TONS PER CIRCUIT	50 EQUIV FEET		100 EQUIV FEET		150 EQUIV FEET		200 EQUIV FEET	
		HORIZ	VERT	HORIZ	VERT	HORIZ	VERT	HORIZ	VERT
6	3	7/8	7/8	1-1/8	7/8	1-1/8	7/8	1-1/8	1-1/8
8	4	1-1/8	1-1/8	1-1/8	1-1/8	1-1/8	1-1/8	1-3/8	1-1/8
10	5	1-1/8	1-1/8	1-1/8	1-1/8	1-3/8	1-1/8	1-3/8	1-1/8
13	6.5	1-1/8	1-1/8	1-3/8	1-1/8	1-3/8	1-1/8	1-5/8	1-3/8
16	8	1-3/8	1-3/8	1-3/8	1-3/8	1-3/8	1-3/8	1-5/8	1-3/8
20	10	1-3/8	1-3/8	1-5/8	1-3/8	1-5/8	1-5/8	1-5/8	1-5/8
26	13	1-3/8	1-3/8	1-5/8	1-5/8	1-5/8	1-5/8	2-1/8	1-5/8
30	15	1-5/8	1-3/8	1-5/8	1-5/8	2-1/8	1-5/8	2-1/8	1-5/8



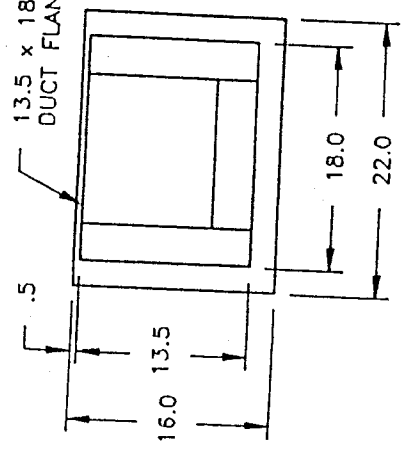


NOTE: CONDENSATE CONNECTION MAY BE MADE ON EITHER SIDE OF THE UNIT, PLUG THE SIDE NOT USED IF A CONDENSATE PUMP IS USED PLUG BOTH SIDES USING 3/4 MPT PLUGS.

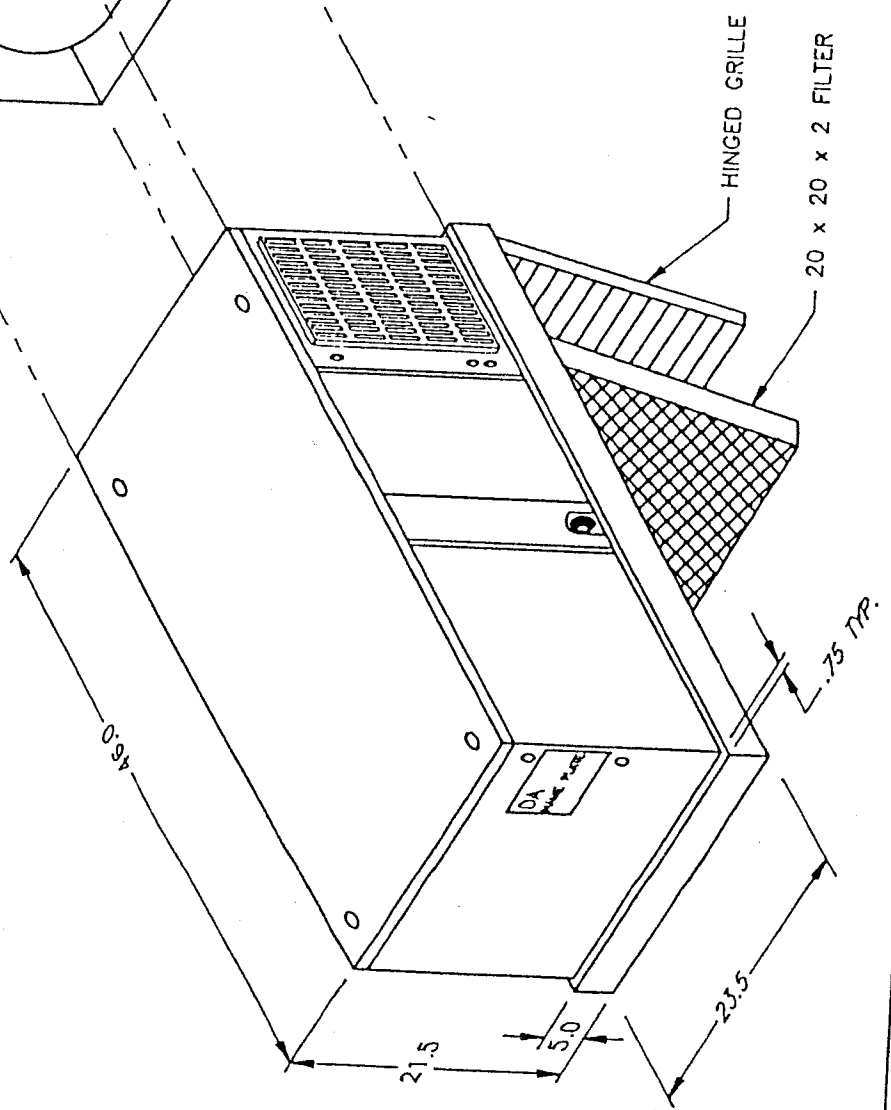
NOTE: FOR DUCTED CONDENSER AIR, REMOVE GRILLE FROM AIR INTAKE OPENING.

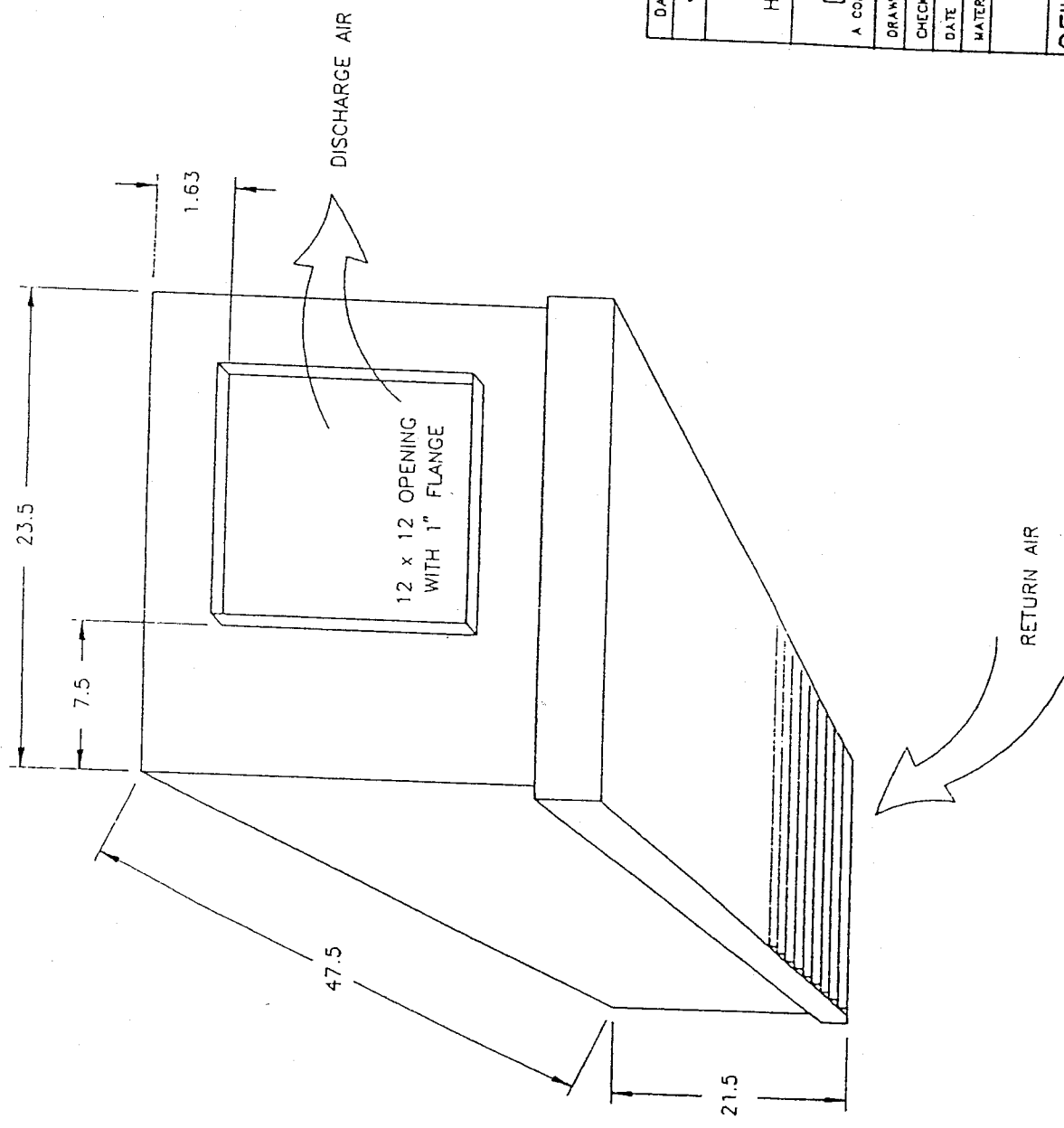


13.5 x 18 x 1
DUCT FLANGE



VIEW A-A





DATE	REVISON	LET INT.
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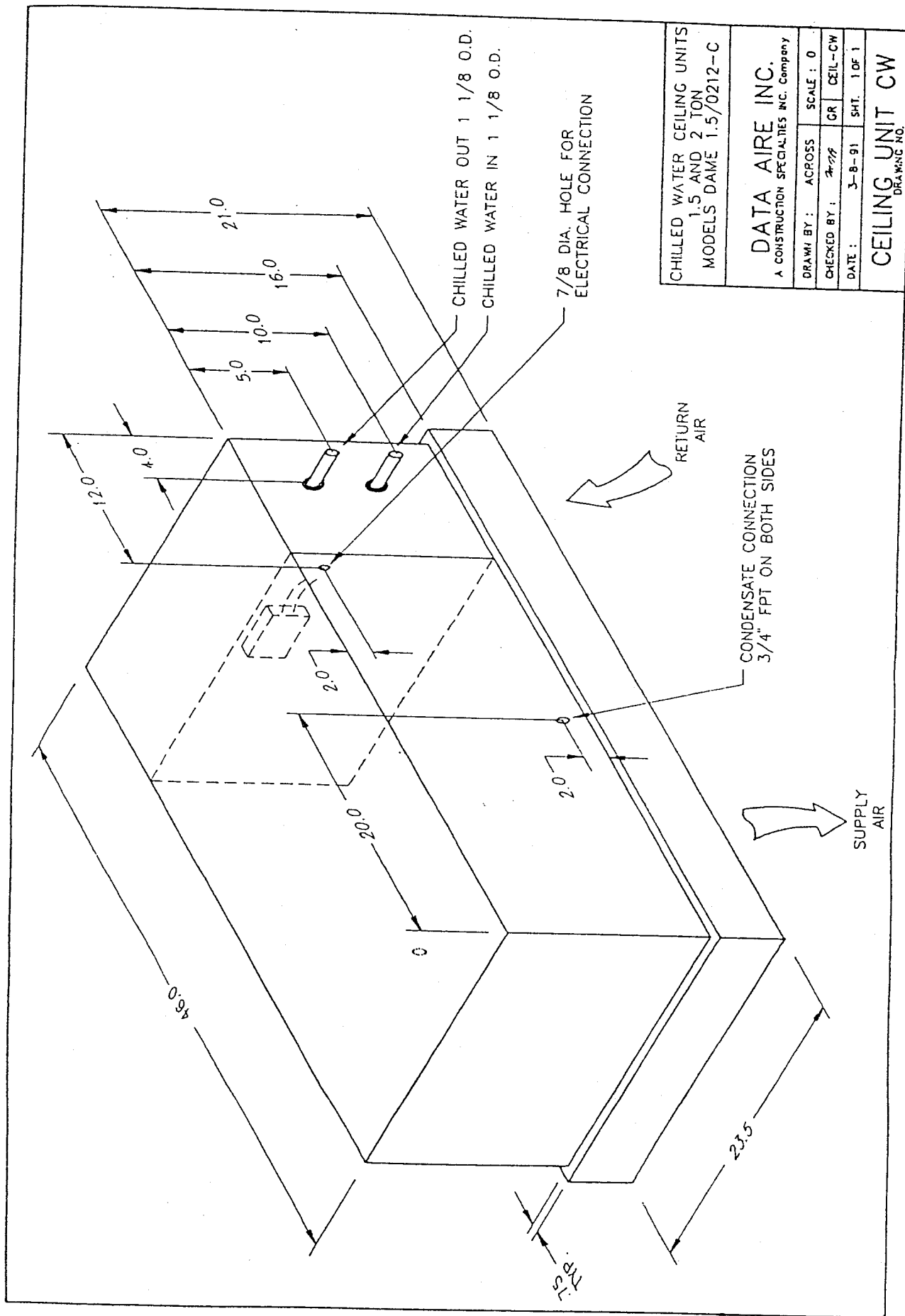
CEILING UNIT
1.5 & 2 TON
HORIZONTAL DISCHARGE

DATA AIRE INC.
A CONSTRUCTION SPECIALTIES INC. Company

DRAWN BY:	ACROSS	SCALE:	0
CHECKED BY:	27/1/1	CR/N-DISCHG	
DATE:	8-17-90	SHT.	1 OF 1
MATERIAL:		P/S	1 = 8

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PART OF

CEIL--END DISCHARGE
PART NO.



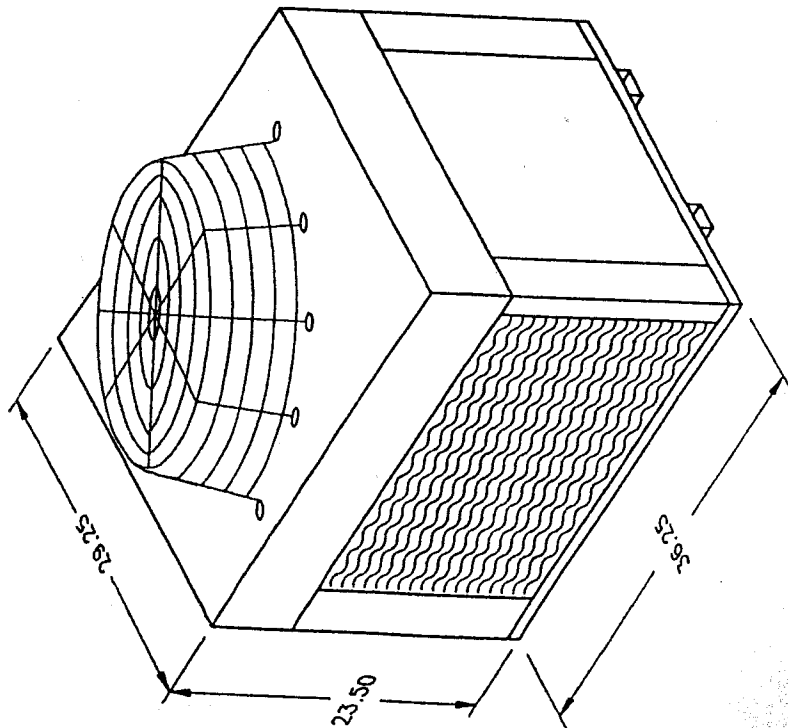
CHILLED WATER CEILING UNITS
1.5 AND 2 TON
MODELS DAME 1.5/0212-C

DATA AIRE INC.

A CONSTRUCTION SPECIALTIES INC. Company

DRAWN BY:	ACROSS	SCALE:	0
CHECKED BY:	2-77	GR	CEIL-CW
DATE:	3-8-91	SHT.	1 OF 1

CEILING UNIT CW
DRAWING NO.



DARC 2, 3, 4

MODEL NUMBER	FANS		APPROX. NET WT.#
	QTY	TOTAL CFM	
DARC 2	1	5200	145
DARC 3	1	5000	155
DARC 4	1	4900	175

MODEL NUMBER	QTY MOTORS	RPM	MOTOR FLA	
			208/230	460
DARC 2	1	1075	4.2	2.1
DARC 3	1	1075	4.2	2.1
DARC 4	1	1075	4.2	2.1

DATA AIRE INC.

A CONSTRUCTION SPECIALTIES INC. Company

DRAWN BY : SCALE :

CHECKED BY :

DATE : SHT. 1 OF 1

DRAWING NO.

Data Aire, Inc. reserves the right to make design changes for the purpose of product improvement, or to withdraw any design without notice.



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(714) 921-6000 / FAX (714) 921-6010

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