Service Person - Rainbow Dale Refrig. (Weldon)

935-4484

Installation CGAE-IN-2

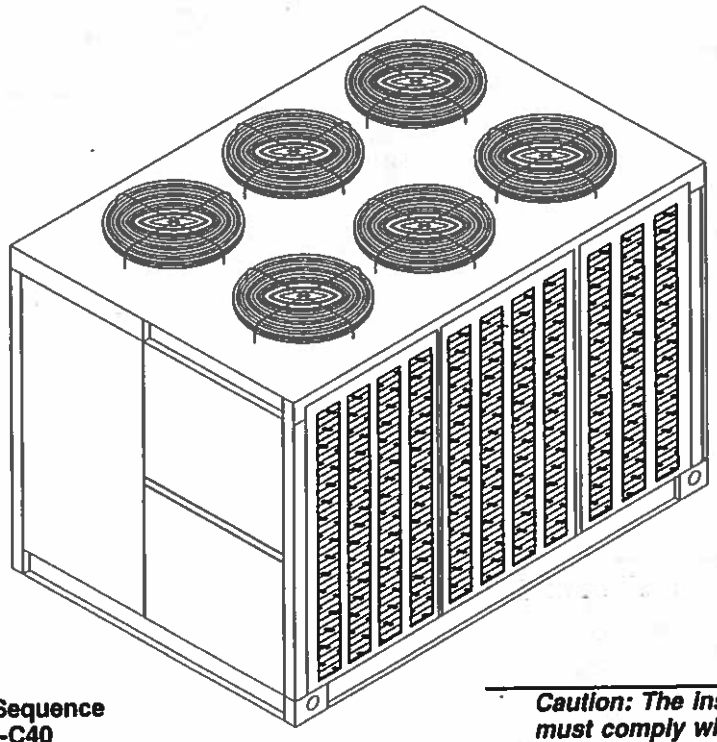
15683-2
GEM 056

Library	Service Literature
Product Section	Refrigeration
Product	Hermetic Scroll Liquid Chillers, Air Cooled
Model	CGAE
Literature Type	Installation
Sequence	2
Date	July 1996
File No.	SV-RF-CG-CGAE-IN-2 7/96
Supersedes	New

Important! This document is customer property and must be retained by the unit's Maintenance personnel.

Cold Generators®
Air-Cooled

Important! The procedures discussed in this manual should only be performed by qualified, experienced HVAC technicians. **Do Not release refrigerant to the atmosphere!** If adding or removing refrigerant is required, the service technician must comply with all federal, state, and local laws.



Models
"B" and Later Design Sequence

CGAE-C20	CGAE-C40
CGAE-C25	CGAE-C50
CGAE-C30	CGAE-C60

With 3-D™ Scroll Compressors

Caution: The installation of this equipment must comply with all National, State, and Local Codes.

Chiller # 2 - 50 TON

model # CGAEC504ADSOGTW YmH JPRD

Since the Trane Company has a policy of continuous product improvement, it reserves the right to change specifications and design without notice.

Figures and Tables

About the Manual & Unit

Literature Change History

CGAE-IN-2 (July 1996)
Original issue of manual, providing installation and operational information for CGAE-C20 through C60 Ton air-cooled Cold Generators® with "B" and later design sequence.

A bag containing the unit wiring diagrams, installation manual, and operation/maintenance manual is provided in the control panel. Be sure to read this literature before installing and operating the unit.

Installation Checklist

A "Checklist" is provided at the end of the "Installation" section in this manual. Use the checklist to verify that all necessary installation and pre-start procedures have been completed before starting the equipment. Do not use the checklist as a substitute for reading the detailed information contained in this manual.

Warnings and Cautions

"Cautions" are designed to alert personnel that equipment damage could occur if specific instructions are not followed.

"Warnings" are provided to alert installing contractors, operators, and service personnel of potential hazards that could result in personal injury or death.

Unit Description

Trane 20 though 60 Ton CGAE Air-Cooled Cold Generators are equipped with manifolded scroll compressors. Each manifolded pair of compressors is piped in parallel and utilizes a passive oil management system to maintain proper compressor oil level.

Before shipment, each unit is leak tested, dehydrated, charged with refrigerant and refrigerant oil, and run tested for proper control operation. A liquid line solenoid valve, filter drier, sight glass, thermostatic expansion valve, and service valves (liquid and discharge) are provided on each circuit.

Standard controls for these units is a microcomputer (UCM) that governs unit operation in response to chilled water temperature leaving the evaporator. The stages of capacity control for these units is achieved by starting and stopping the compressors.

The shell-and-tube type evaporator is manufactured in accordance with ASME standards. Each evaporator is fully insulated and equipped with a drain connection. The chilled water temperature sensor is located on the evaporator water outlet.

Field installed items such as isolators, pressure gauges, remote display panel, zone sensor, flow switch, or low ambient lockout T-stat are secured in the unit in the locations shown in Figure 1.

Overall unit dimensional data and solution connection sizes and locations are illustrated in Figure 2.

Figure 1
Ship With Items & Typical Exterior Components

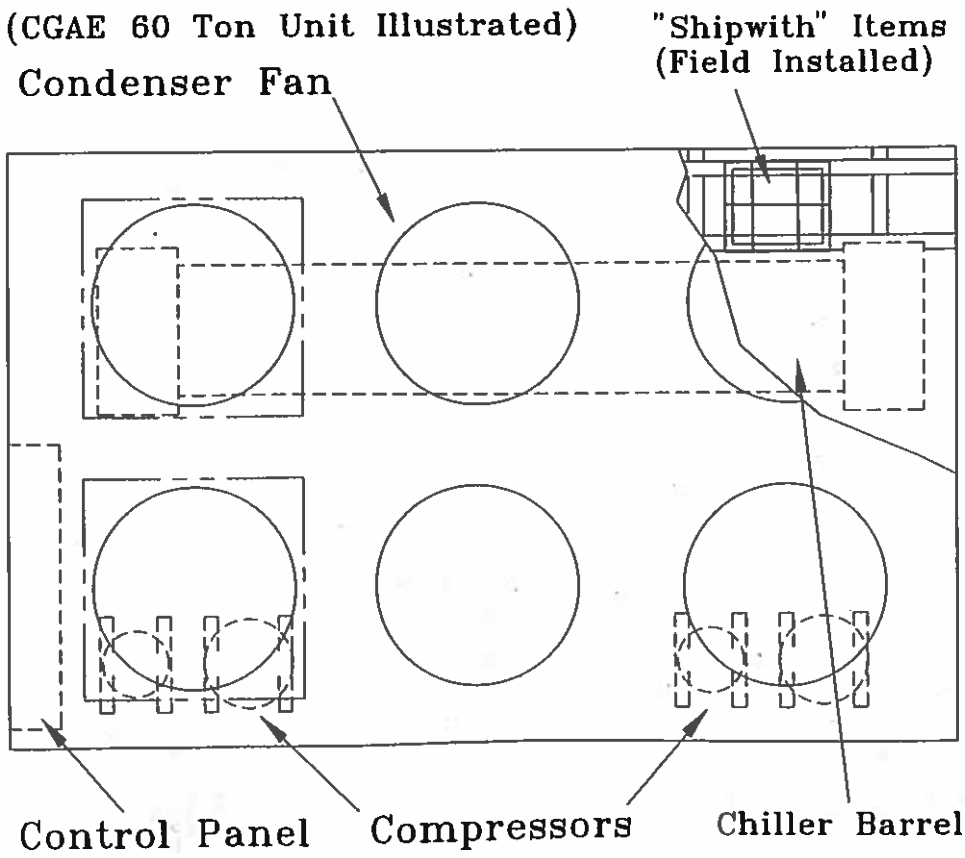
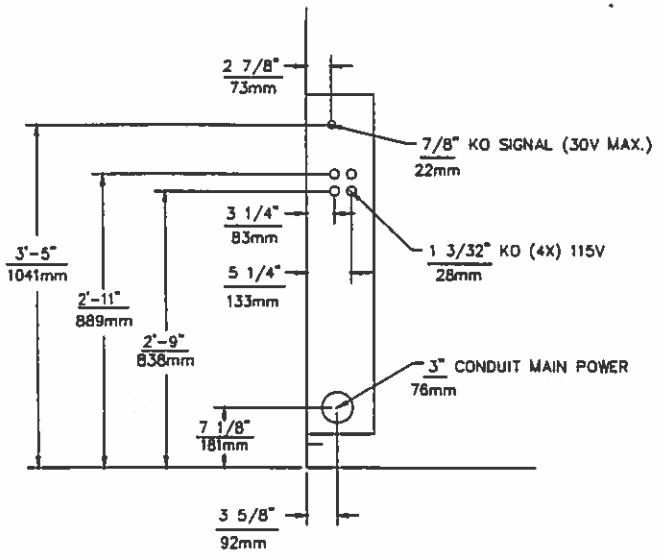
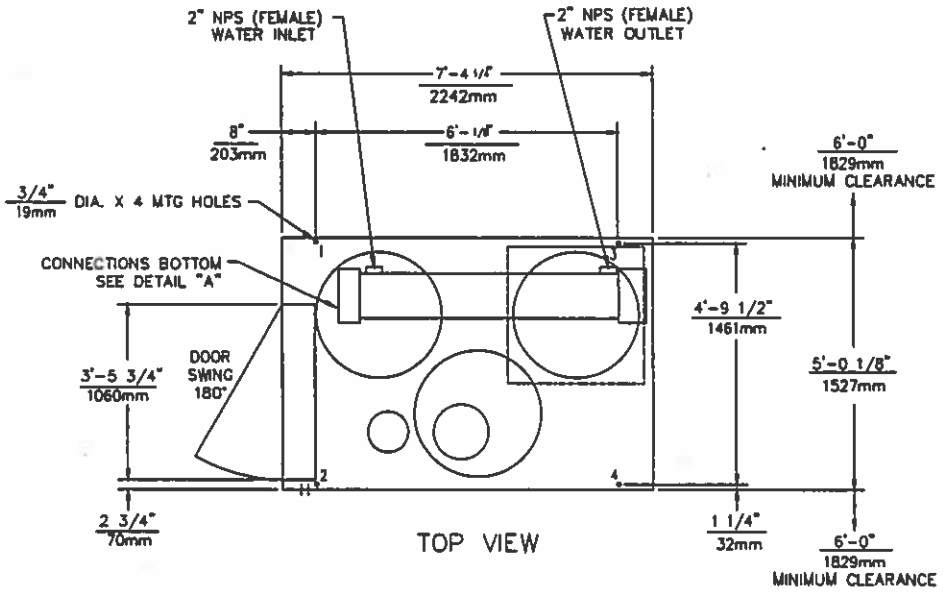


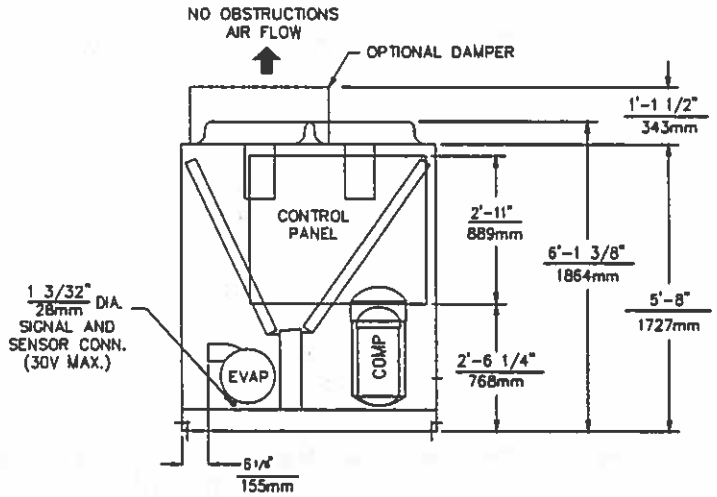
Figure 2 (Continued)
CGAE C25 Unit Dimensions, Recommended Clearances, Mounting Locations, Electrical and Solution Connection Sizes and Locations



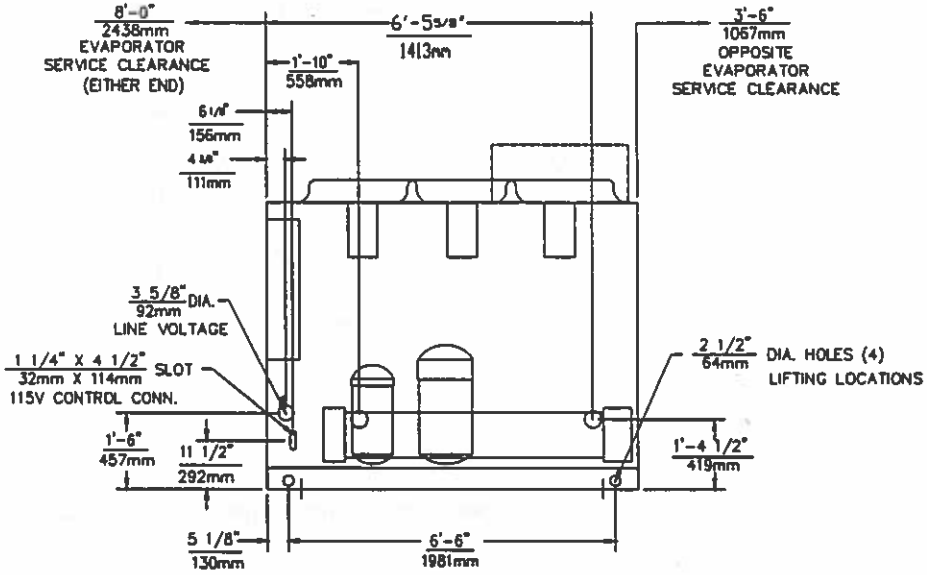
DETAIL "A"



TOP VIEW



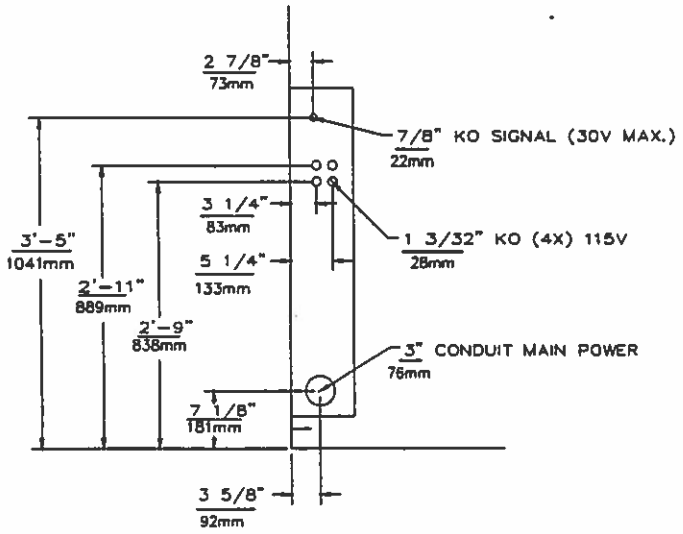
LEFT SIDE VIEW



FRONT VIEW

Figure 2 (Continued)

CGAE-C40 Unit Dimensions, Recommended Clearances, Mounting Locations, Electrical and Solution Connection Sizes and Locations



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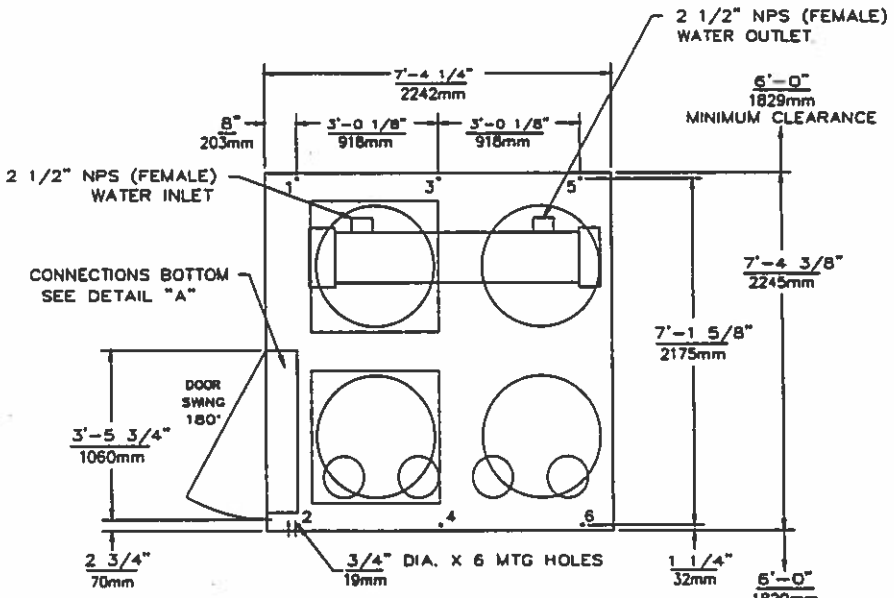
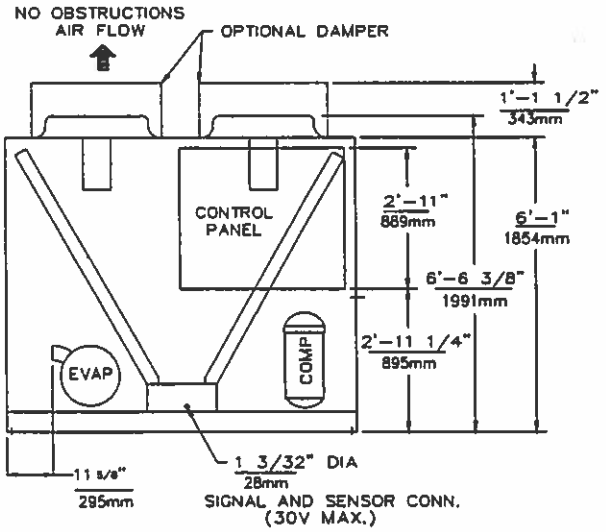
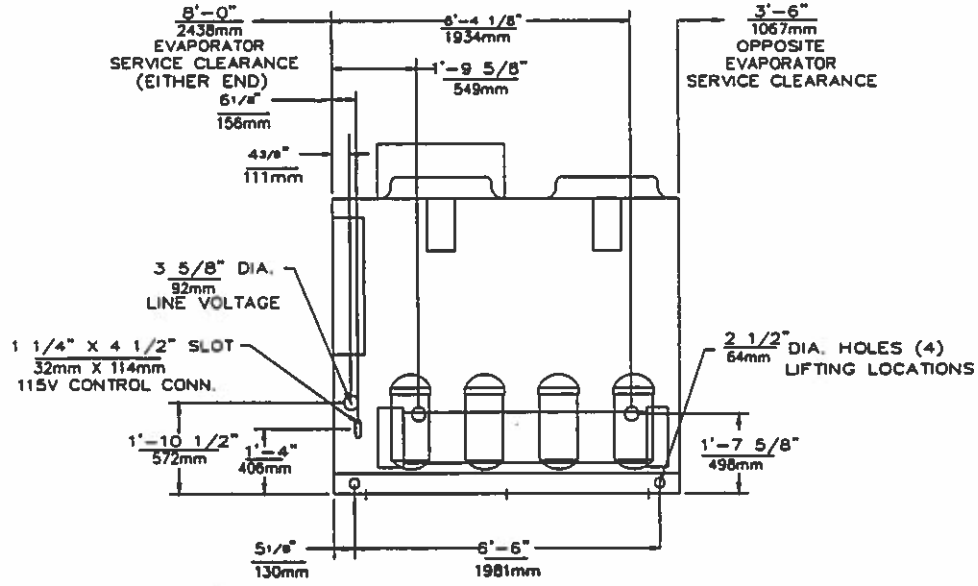


TOP VIEW



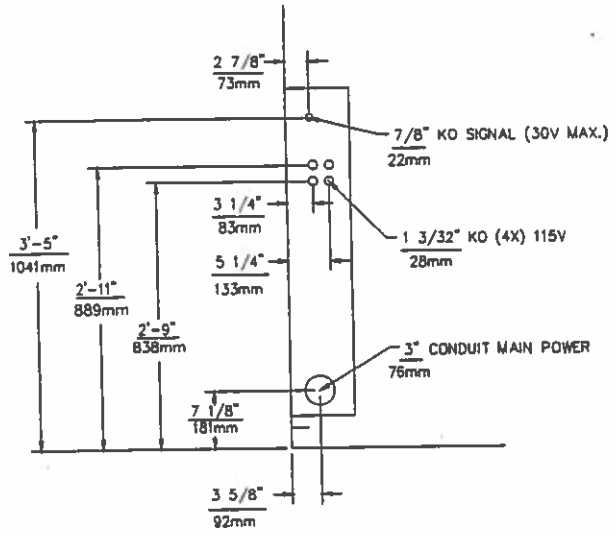
LEFT SIDE VIEW



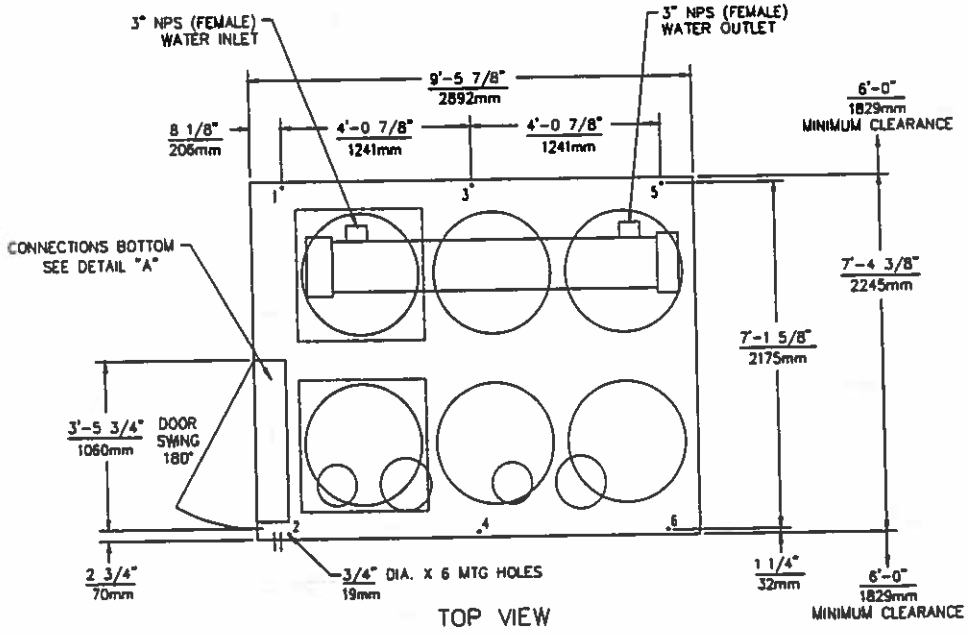
FRONT VIEW

Figure 2 (Continued)

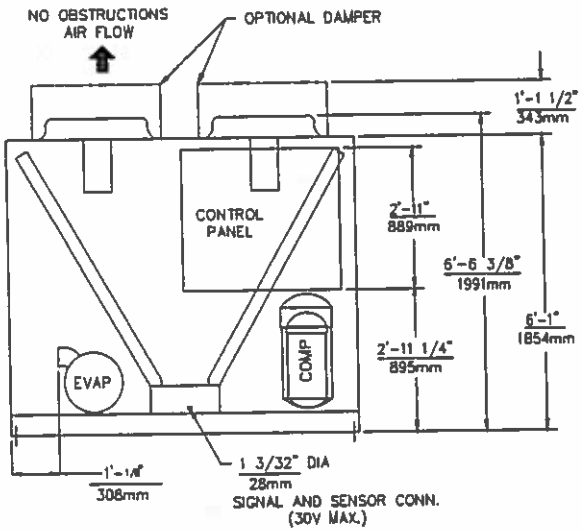
CGAE-C50 Unit Dimensions, Recommended Clearances, Mounting Locations, Electrical and Solution Connection Sizes and Locations



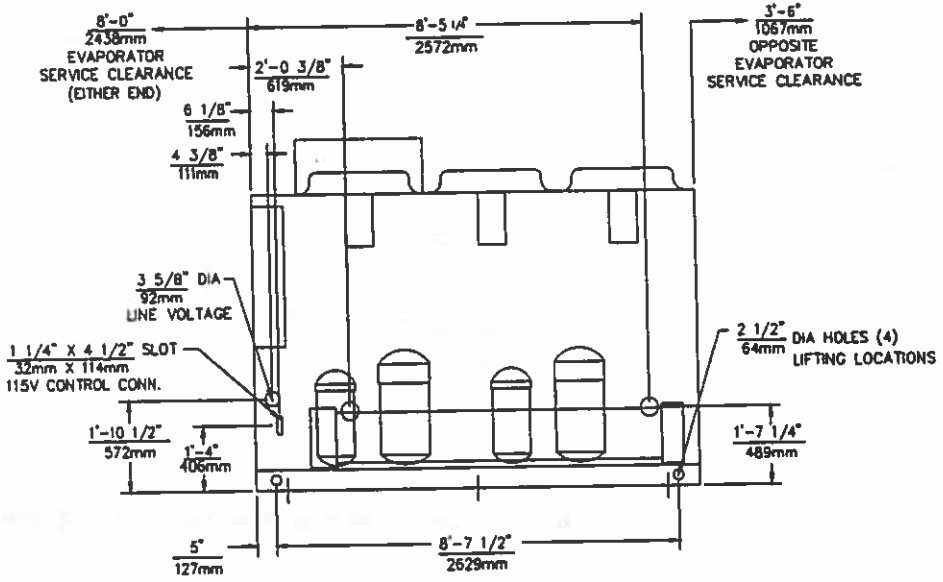
DETAIL "A"



TOP VIEW



LEFT SIDE VIEW



FRONT VIEW

Unit Inspection

As soon as the unit arrives at the job site

[ ] Verify that the nameplate data matches the data on the sales order and bill of lading (including electrical data).

[ ] Visually inspect the exterior of the unit, including the roof, for signs of shipping damage.

[ ] Check for material shortages. Figure 1 illustrates where the "ship-with" items are located.

If the job site inspection of the unit reveals damage or material shortages, file a claim with the carrier immediately. Specify the type and extent of the damage on the "bill of lading" before signing. Do not install a damaged unit without the appropriate Trane sales representative's approval!

[ ] Visually inspect the internal components for shipping damage as soon as possible after delivery, before it is stored. Concealed damage must be reported within 15 days.

[ ] If concealed damage is discovered, stop unpacking the shipment. Do not remove damaged material from the receiving location. Take photos of the damage, if possible. The owner must provide reasonable evidence that the damage did not occur after delivery.

[ ] Notify the carrier's terminal of damage immediately by phone and by mail. Request an immediate joint inspection of the damage by the carrier and the consignee. Do not repair the unit until damage is inspected by the carrier's representative.

[ ] Remove the protective plastic coverings that shipped over the compressors.

Drainage

Locate a large-capacity drain near the unit for system drainage during shutdown or repair. A 3/4-inch NPT drain connection is provided at the leaving chilled water end of the chiller.

Location and Clearances

Select a location for the unit where air will flow, without obstruction, through the coil and upward from the fan discharge.

Caution: To prevent coil starvation, do not locate the unit under any type of overhanging obstruction.

Do not place the unit near any obstruction which may hinder the condenser airflow. Refer to Table 1 for the minimum condenser clearances for; single or multiple unit installations & pit or well installations.

Foundation

Ground Level Applications

Elevate the unit above the snow line. Provide concrete footings at each support location or a slab foundation for support. Refer to Table 2 for the operating & point loading weights when constructing the footing foundation.

Install isolators, if desired, or hold down bolts in the footings or slab to anchor the unit. Refer to the "Chiller Isolation" section for spring or rubber isolator installation instructions.

Rooftop Applications

Ensure the roof is strong enough to support the unit. Refer to Table 2 for the unit operating weights.

To minimize the transmission of vibrations into the building, use isolators. Anchor the unit to the roof with hold-down bolts or isolators. Follow the instructions under "Chiller Isolation" for proper isolator placement and installation.

Check with a roofing contractor for proper waterproofing procedures.

Table 1
Unit Clearance

20	4' 0"	6' 0"	12' 0"	5' 2-1/2"	12' 0"
25	4' 0"	6' 0"	12' 0"	5' 8"	12' 0"
30	4' 0"	6' 0"	12' 0"	6' 1"	12' 0"
40	4' 0"	6' 0"	12' 0"	6' 1"	12' 0"
50	4' 0"	6' 0"	12' 0"	6' 1"	12' 0"
60	4' 0"	6' 0"	12' 0"	6' 1"	12' 0"

* - Includes unit sides not affected by entering airflow.

Unit Isolation

Mounting methods that will minimize sound and vibration problems are:

1. Mount the unit directly on an isolated concrete pad or on isolated concrete footings at each unit mounting point.
2. Install the optional neoprene or spring mounting isolators at each mounting location. Refer to "Neoprene Isolators" or "Spring Isolators".

Neoprene Isolators

Install the neoprene isolators at each unit mounting (load) point using the following procedure:

Refer to Figure 2 for the unit point loading locations and dimensions. Refer to Table 2 for the unit operating weights and point loading weights.

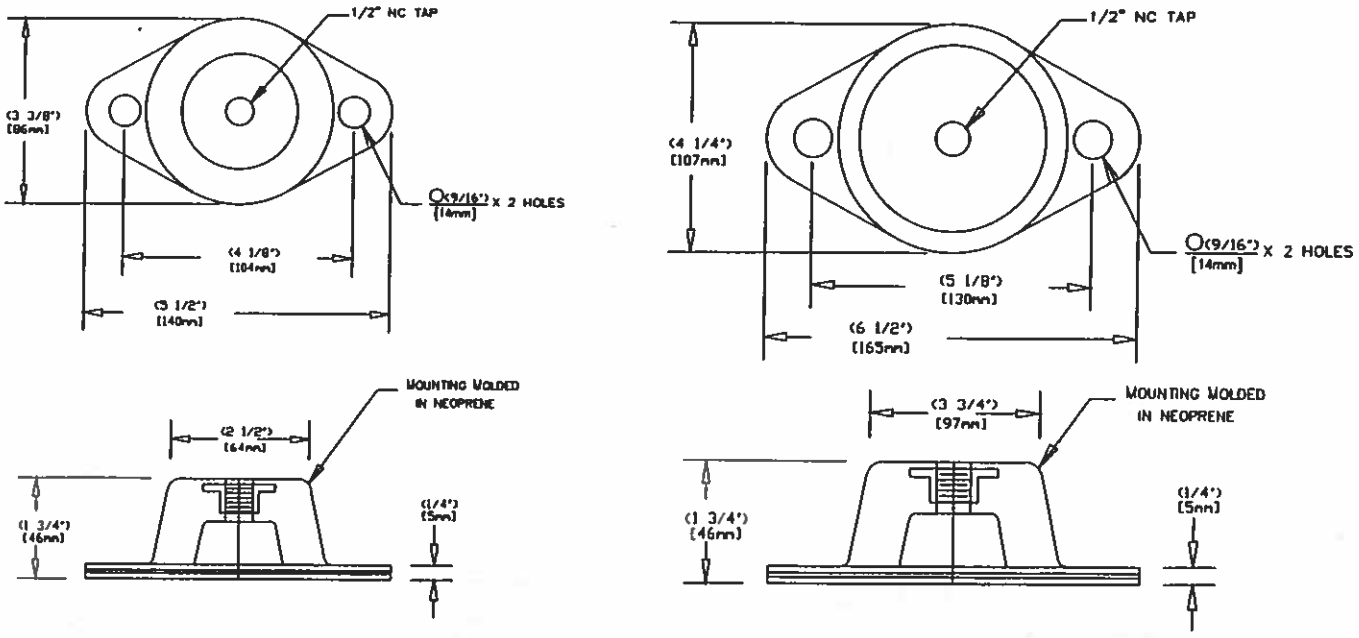
⚠WARNING: ***Use solid type blocks, i.e. 4" X 4" wood blocks or similar material to prevent collapsing. Keep hands and other body limbs clear of elevated base rail while installing isolators to prevent personal injury.***

1. Elevate the unit (one side at a time) to allow access to the base rail mounting holes.
2. Align the mounting holes in the base rail of the unit with the holes in the top of the appropriate isolator. Refer to Figure 4 for the appropriate isolator for each load point.
3. Install a 1/2" NC bolt (field supplied) through the base rail of the unit into the threaded bolt hole of the isolator. Position the isolator to allow access to the mounting holes in the base of the isolator, then tighten securely.
4. Lower the unit and isolator onto the mounting surface. The maximum isolator deflection should be approximately 1/4 inch.
5. Secure the isolator to the mounting surface using the base holes in the isolator.
6. Level the unit carefully. Refer to the "Leveling the Unit" section below.
7. After the unit is level, tighten the isolator base mounting bolts to secure them to the mounting surface.

Figure 4
Typical Neoprene Isolator Selection & Location

C20	R-3-GRY	R-3-GRY	R-3-GRY	R-3-GRY	R-3-GRN	R-3-GRN	R-3-GRN	R-3-GRN				
C25	R-3-GRY	R-3-GRY	R-3-GRY	R-3-GRY	R-3-GRN	R-3-GRY	R-3-GRN	R-3-GRY				
C30	R-3-GRY	R-3-BLK	R-3-GRY	R-3-GRY	R-3-GRY	R-3-GRY	R-3-GRY	R-3-GRN	R-3-GRY	R-3-GRN	R-3-GRY	R-3-RED
C40	R-4-BLK	R-3-GRY	R-3-GRY	R-3-GRY	R-3-GRY	R-3-GRY	R-3-GRN	R-3-GRY	R-3-GRN	R-3-GRN	R-3-RED	R-3-GRY
C50	R-3-GRY	R-4-BLK	R-3-GRY	R-4-BLK	R-3-GRY	R-3-GRY	R-3-GRY	R-3-GRY	R-3-GRY	R-3-GRY	R-3-GRY	R-3-GRY
C60	R-4-BLK	R-4-BLK	R-4-BLK	R-4-RED	R-3-GRY	R-4-BLK	R-4-BLK	R-4-BLK	R-3-GRY	R-3-GRY	R-4-BLK	R-4-BLK

Notes:
1. Mounting locations above (1 through 6) correlate with the mounting locations shown in Figure 2.



Leveling the Unit

Before tightening the mounting bolts, level the unit carefully. Use the unit base rail as a reference. Level the unit to within 1/4 inch over its entire length. Use shims if adjustable isolators are not used. Unit mounting locations and dimensions are shown in Figure 2. Refer to Table 2 for the unit operating weights and point loading weights.

Shipping Fasteners

Removing Compressor Assembly Shipping Hardware
Each manifolded compressor assembly is rigidly bolted to a mounting rail assembly. The rail assembly sets on four (4) rubber isolators. The assembly is held in place by isolator bolts and two shipping braces that secure each mounting rail assembly to the unit's base rail. To locate and remove the shipping hardware, refer to Figure 6 and the following procedure.

1. Remove the four anchor bolts (2 front and 2 rear), used to secure the shipping brace to the unit's base rail (Two assemblies on 40 through 60 Ton units).
2. Remove the three self-tapping screws that secure each shipping brace to the compressor mounting rails.
3. Remove and discard the two 30-1/2" long shipping braces for each assembly.
4. Remove the four isolator bolts located in the compressor plates and reinstall them at the same location by screwing them into the base rail two to three turns only. Refer to "Isolator Bolts" detail in Figure 6.
5. Ensure that the compressor rail assembly is free to move on the rubber isolators.

Water Access Holes

These units have water access panels that contain perforated "circles" and panel separations. (See Figure 7). Removing these "circles" provides piping access to the chiller barrel. Each panel contains one or two perforated "circles", but only one is to be removed per panel. Therefore, follow these steps to ensure proper panel modification.

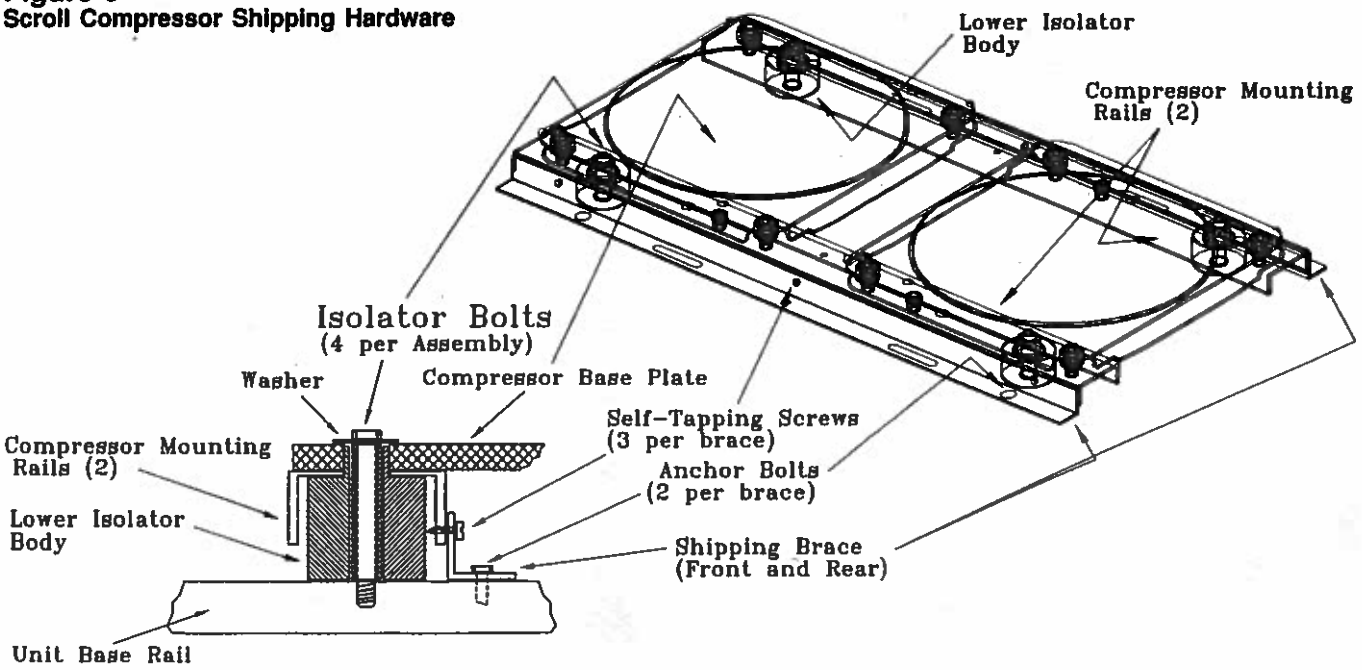
1. Refer to Figure 7 and mark an "X" on the outer perforated "circle" in each water access panel. (These are aligned with the water inlet and outlet piping on the chiller barrel).
2. Remove all the screws located below the perforation of both panels. Do not remove any screws above the perforation.
3. Break both panels at the perforation by grasping them near the bottom and bending with a back and forth motion.

⚠WARNING: ***Sharp edges result when sheet metal is cut or broken. Use extreme caution when handling the modified water access panels.***

4. Remove the resulting "half-moon" sections that were marked with an "X".

Important! Remove only the "half-moon" sections that were marked with an "X".

Figure 6
Scroll Compressor Shipping Hardware



5. For 50 and 60 Ton units, an additional perforated section in the upright brace behind the access panels must be removed. Break this piece out with pliers and discard.

6. Apply edge protector to the upper and lower portions of both panels along the entire length of the broken perforation as shown in Figure 8. (The edge protector is factory provided, and is secured to the chiller barrel foot).

7. Reinstall the lower halves of the water access panels and secure them with the screws that were removed in step two.

Note: The gap between the insulated pipe and the access holes must not exceed 1/2 inch. (Refer to Figure 9).

Figure 8
Edge Protector Installation

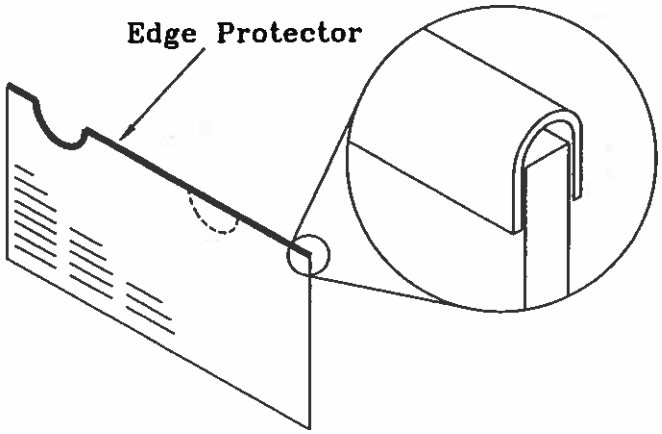
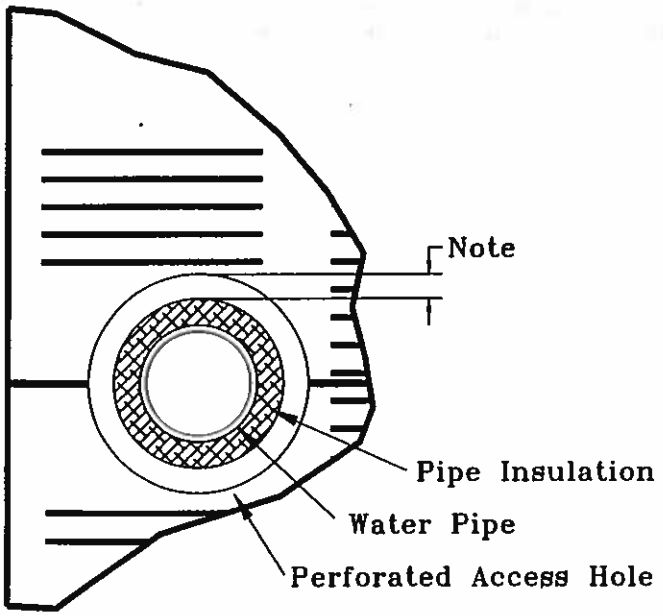


Figure 9
Clearance Requirements Around Water Piping



Note: 1/2" Maximum Clearance Between Access Hole and Pipe Insulation

Chilled Water Piping

Evaporator water inlet and outlet types, sizes and locations are shown in Figure 2. Figure 10 illustrates the typical water piping components. Refer to this illustration while following the discussion on the various piping components.

Isolate the water pumps from the system to avoid vibration transmission. To minimize heat gain and prevent condensation, insulate all water piping. Use a pipe sealant or teflon tape on all threaded connections.

Air Vents
A vent port is located on top of the chiller near the return end. Additional vents must be installed at high points in the piping system to facilitate air purging during the filling process.

Pressure Gauges
Install pressure gauge(s) to monitor the entering and leaving chilled water pressure.

Caution: To prevent evaporator damage, do not exceed 150 psig evaporator pressure.

Shutoff Valves
Provide shutoff valves in the "Supply" and "Return" pipe near the chiller so the gauge(s), thermostats, sensors, strainer, etc., can be isolated during service.

Pipe Unions
Use pipe unions to simplify disassembly for system service. Use vibration eliminators to prevent transmitting vibrations through the water lines.

Thermometers
Install thermometers in the lines to monitor the evaporator entering and leaving water temperatures.

Balancing Valves
Install a balancing cock (valve) in the leaving water line. It will be used to establish a balanced flow.

Note: Both the entering and leaving water lines should have shutoff valves installed to isolate the evaporator for service.

Strainer
Install a pipe strainer in the water return line to protect the components from entrapped debris.

Chiller Drain
The chiller drain should be piped to a suitable drain facility to facilitate evaporator draining during service or shutdown procedures. Provide a shutoff valve in the drain line.

Caution: The EVP chiller ships without the drain plug installed. If drain piping is not installed, remove the drain plug from the EVP control panel and install it in the drain port before filling the system with water.

Final Water Piping Connections

1. All water piping to the system should be flushed thoroughly before making the final connections to the EVP chiller.

Caution: If an acidic commercial flushing solution is used, construct a temporary bypass around the EVP chiller barrel to prevent damage to the internal components of the evaporator.

2. Connect the water pipe to the EVP chiller.

3. Install the drain plug, (if no drain is used) or ensure the drain shut-off valve is closed.

Caution: To prevent possible damage to the equipment, do not use untreated or improperly treated water in the system.

Freeze Protection

Chilled Water System
Freeze proof the system by adding a non-freezing, low-temperature, heat-transfer fluid to the chilled water. This solution must provide protection against ice formation at the lowest expected ambient and operating temperatures.

Ice making units with a termination setpoint of 27° F minimum entering chilled water temperature require a 25 percent glycol solution (minimum requirement by weight) to provide system freeze protection.

For evaporator water capacities, refer to "Chilled Water System" under "Pre-Start Procedures". Follow the manufacturer's recommendations for the use and testing of the antifreeze solution.

Note: Use of an ethylene glycol-type antifreeze reduces unit cooling capacity; this condition must be accounted for during total system design. Also, the low pressure control may need to be changed. Contact the local Trane® representative.

Chilled Water Piping
Use the procedure described below to ensure that the chilled water system is adequately protected from freeze-up in applications where the unit remains operational at sub-freezing ambient temperatures.

For all 60 Hz units, heat tape is factory-installed on the unit evaporator and all internal water piping. On 50 Hz units, factory-installed heat tape is optional. If digit 13 or later is a B in the model number, the 50 Hz unit will not have heat tape. This heat tape will protect the evaporator and internal piping from freeze up due to low ambient temperatures down to -20° F. Heat tape power draw for 60 Hz units is 210 Watts on 20 through 30 Ton units, and 420 Watts on 40 through 60 Ton units. For 50 Hz units, heat tape power draw is 420 Watts on 20 through 60 Ton units.

Install an appropriately sized fused disconnect switch for the heat tape when applying it to all exposed piping. Be sure to use heat tape that is recommended for low-temperature applications, it should be thermostatically controlled and dissipate 7 watts per linear foot. A field installed thermostat must be installed for heat tapes not thermostatically controlled.

To install the heat tape properly, follow the instructions provided by the heat tape manufacturer. If no instructions are provided, use the recommendations outlined below:

1. Wrap the heat tape around the pipe or apply it straight along the pipe, as necessary, to provide the required protection. Refer to Tables 3 and 4.

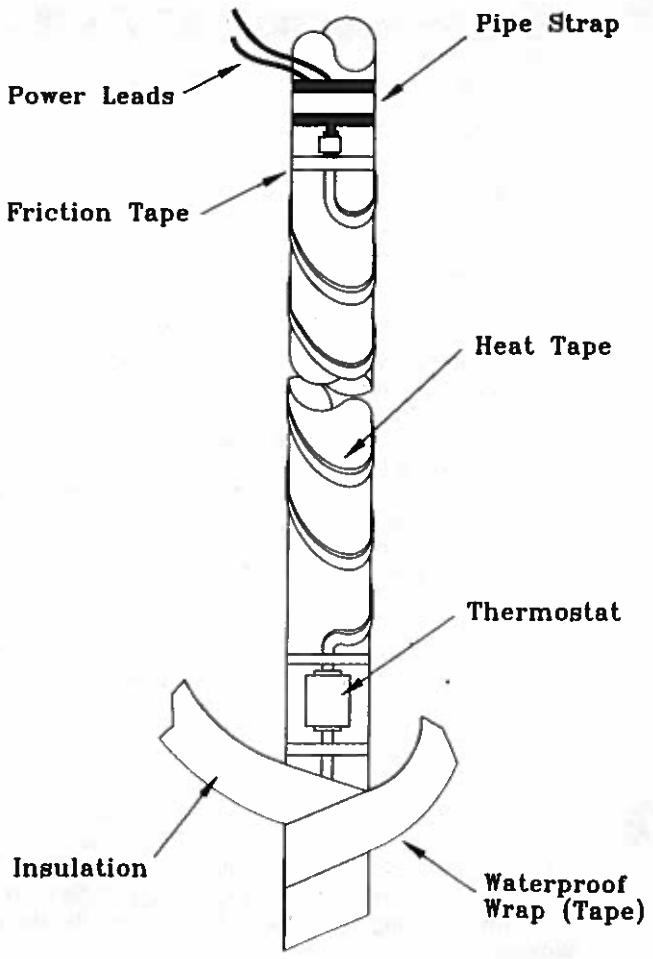
2. Use friction tape to secure the heat tape to the solution pipe.

3. Place the thermostat parallel to the water pipe and tape it tightly in place at both ends. Be sure to install the thermostat on the most exposed (i.e., coldest) portion of the pipe.

4. Wrap the pipe with an insulation material (if additional protection is required) and cover it with a weatherproof tape. On vertical pipe runs, start the wrap at the bottom and work up as shown in Figure 11. Be sure to overlap the tape so that it will shed moisture.

Caution: To prevent heat tape failure, frozen pipes, and other unit damage, do not install insulation under the outer weatherproof wrap if a non-thermostatic controlled heat tape is used.

Figure 11
Typical Insulated, Spiralled Heat Tape Installation



Field Installed Power Wiring

General Recommendations

⚠WARNING: ***To prevent injury or death from electrical shock, disconnect the power source before making any wiring connections to the unit.***

An overall dimensional layout for the field installed wiring entrance into the unit is illustrated in Figure 2. To insure that the unit's supply power wiring is properly sized and installed, follow the guidelines outlined below.

Note: All field installed wiring must conform to NEC guidelines as well as State and Local codes.

The installer must provide properly sized power supply wiring with fused disconnect switches. Type and locations of the disconnects must comply with all applicable codes.

Caution: To avoid component failure, use copper conductor wire only between the main power distribution source and the unit's power terminals.

1. Verify that the power supply available is compatible with the unit's nameplate ratings. The available supply power must be within 10% of the rated voltage stamped on the nameplate.

2. A field connection wire range table for the main power terminal block 1TB1 and the optional unit mounted non-fused disconnect switch 1S1 is given in Figure 12. Table 5 lists the condensing unit electrical data. The electrical service must be protected from over current and short circuit conditions in accordance with NEC requirements. Protection devices must be sized according to the electrical data on the nameplate. Refer to Table 5 for determining;

   a. the appropriate electrical service wire size based on "Minimum Circuit Ampacity" (MCA).

   b. the "Maximum Over Current Protection" (MOP) device.

   c. the "Recommended Dual Element fuse size" (RDE).

3. If the unit is not equipped with an optional factory mounted non-fused disconnect switch, a field supplied disconnect switch must be installed at or near the unit in accordance with the National Electrical Code (NEC latest addition). To determine the correct DSS size, use the following formula:

   DSS = 1.15 X Total FLA's of all loads

4. Complete the unit's power wiring connections onto either the main terminal block 1TB1, or the factory mounted non-fused disconnect switch 1S1, inside the unit control panel. Refer to the customer connection diagram that shipped with the unit for specific termination points.

5. Provide proper supply power to the circulating pump motor as illustrated in Figure 12. Be certain that these components are properly grounded.

6. Provide proper grounding for the unit in accordance with local and national codes.

Disconnect Switch External Handle
(Factory Mounted Option)

Units ordered with the factory mounted disconnect switch comes equipped with an externally mounted handle. This allows the operator to disconnect power from the unit without having to open the control panel door. The handle locations and its three positions are shown below;

"ON" - Indicates that the disconnect switch is closed, allowing the main power supply to be applied at the unit.

"OFF" - Indicates that the disconnect switch is open, interrupting the main power supply to the unit controls.

"OPEN COVER/RESET" - Turning the handle to this position releases the handle form the disconnect switch, allowing the control panel door to be opened.

⚠WARNING: ***Line side of the disconnect switch inside the control panel remains powered. To prevent injury or death due to electrocution, turn the power Off at the main distribution panel before working on switch.***

Once the door has been opened, it can be closed with the handle in any one of the three positions outlined above, provided it matches the disconnect switch position.

The handle can be locked in the "OFF" position. While holding the handle in the "OFF" position, push the spring loaded thumb key, attached to the handle, into the base slot. Place the lock shackle between the handle and the thumb key. This will prevent it from springing out of position.

Normally, manual shutdown of the unit is accomplished by turning the "Chiller" control switch, located on the UCM, to the "Off" position. Then, open the main power and the 115 volt control power (if used) fused disconnects.

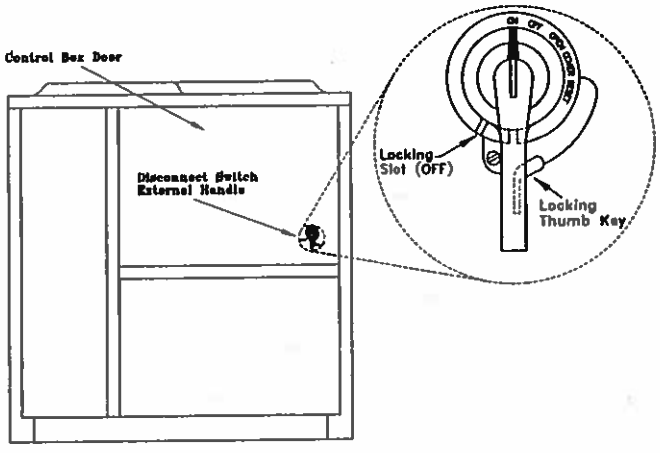


Figure 12 (Continued)
Typical CGAE Field Wiring Diagram

CUSTOMER WIRE SELECTION AND FUSE REPLACEMENT TABLE			
POWER WIRE SELECTION TO DISCONNECT SWITCH (1S1)			
UNIT SIZE	UNIT VOLTAGE	DISCONNECT SWITCH SIZE	CONNECTOR WIRE RANGE
20 – 40 TON	200/230 VOLT	225 AMP	(1) #1 -- 300 MCM
50 & 60 TON	200/230 VOLT	400 AMP	(1) 250 -- 500 MCM
20 – 40 TON	380/415/460/575 VOLT	100 AMP	(1) #14 – 1/0
50 TON	575 VOLT	100 AMP	
50 TON	380/415/460 VOLT	250 AMP	(1) #4 – 350 MCM
60 TON	380/415/460/575 VOLT	250 AMP	
POWER WIRE SELECTION TO MAIN TERMINAL BLOCK (1TB1)			
UNIT SIZE	UNIT VOLTAGE	TERMINAL BLOCK SIZE	CONNECTOR WIRE RANGE
20 – 60 TON	ALL VOLTAGES	310 AMP	(1) #6 -- 350 MCM
CONTROL WIRE SELECTION FOR 30 VOLT OR LESS CIRCUITS – "SEE NOTE 28"			
WIRE GAUGE		MAXIMUM LENGTH FOR SENSOR LEADS	
14 AWG		3000 FT	
16 AWG		2000 FT	
18 AWG		1000 FT	

FUSE REPLACEMENT SELECTION				
FUSE DESCRIPTION	UNIT SIZE	UNIT VOLTAGE	FUSE TYPE	FUSE SIZE
CONDENSER FAN FUSE (1F1–1F3 ON 20 – 30 TON) (1F1–1F6 ON 40 – 60 TON)	ALL	200/230 VOLT	CLASS RK5	25 AMP
		460/575 380/415 VOLT		15 AMP
CONTROL CKT FUSE (1F7)	ALL	ALL	BUSSMANN S – 6.25	6.25 AMP
MICRO MODULE POWER SUPPLY FUSE 1F8 – 1F10	ALL	ALL	BUSSMANN MDX – 5	5 AMP

⚠ WARNING

HAZARDOUS VOLTAGE!

DISCONNECT POWER BEFORE SERVICING.

FAILURE TO DISCONNECT POWER BEFORE SERVICING CAN CAUSE SEVERE PERSONAL INJURY OR DEATH.

⚠ AVERTISSEMENT

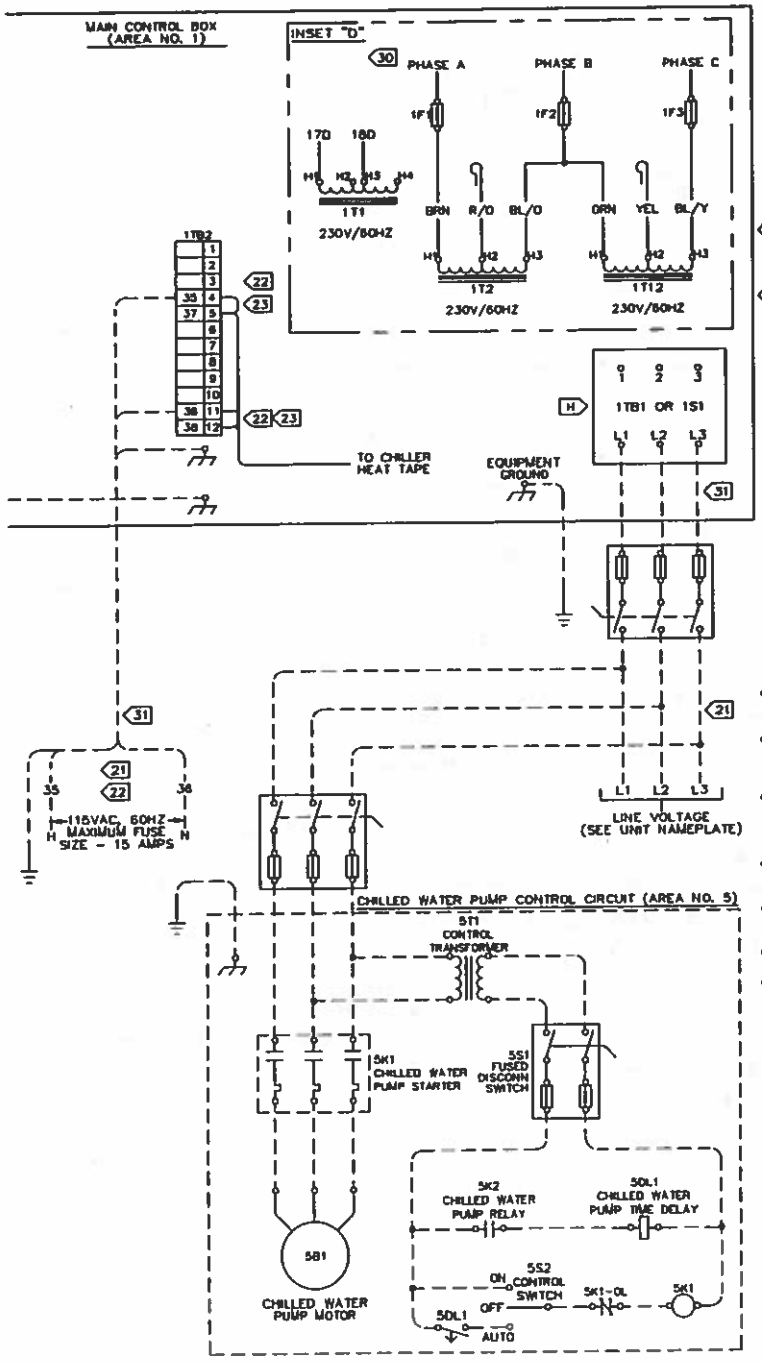
VOLTAGE HASARDEUX!

DECONNECTEZ LA SOURCE ELECTRIQUE AVANT D'EFFECTUER L'ENTRETIEN.

FAUTE DE DECONNECTER LA SOURCE ELECTRIQUE AVANT D'EFFECTUER L'ENTRAINER DES BLESSURES CORPORELLES SEVERES OU LA MORT.

USE COPPER CONDUCTORS ONLY
UNIT TERMINALS ARE NOT DESIGNED TO ACCEPT ANY OTHER WIRING

IMPORTANT!
DO NOT ENERGIZE UNIT UNTIL CHECK-OUT AND START-UP PROCEDURE HAS BEEN COMPLETED



NOTES:

1. DASHED LINES INDICATE RECOMMENDED FIELD WIRING BY OTHERS. PHANTOM LINES INDICATE ALTERNATE CIRCUITRY OR AVAILABLE SALES OPTION. CHECK SALES ORDER TO DETERMINE IF WIRING IS REQUIRED FOR SPECIFIC OPTIONS.
2. ALL 3-PHASE MOTORS, SUPPLIED WITH UNIT, ARE PROTECTED UNDER PRIMARY SINGLE PHASE FAILURE CONDITIONS.

4. SEE INSET "B" FOR RESISTOR CONNECTIONS TO PROGRAM AN EXTERNAL CHILLED WATER SETPOINT WHEN A 4 – 20 mA OR A 0 – 10 VDC SIGNAL IS NOT USED. SEE THE OPERATORS MANUAL FOR RESISTOR CONNECTIONS FOR USE ON EITHER NORMAL COOLING OR ICE-MAKING APPLICATIONS.
5. SEE INSET "C" FOR CONNECTIONS TO CONTACTS (IN PLACE OF THE ZONE TEMP SENSOR) FOR ICE MACHINE CONTROL – OPTION "A".
6. THE FOLLOWING CAPABILITIES ARE OPTIONAL – THEY ARE IMPLEMENTED AND WIRED AS REQUIRED FOR A SPECIFIC SYSTEM APPLICATION.
   - A ICE-MACHINE CONTROL (CANNOT BE USED W/ OPTION "L")
   - B COMMUNICATIONS INTERFACE
   - G REMOTE RUNNING INDICATION AND ALARM CONTACTS
   - H UNIT DISCONNECT, NON FUSED
   - J CHILLED WATER RESET – RETURN WATER – OUTDOOR AIR
   - L CHILLED WATER RESET – ZONE AIR (CANNOT BE USED WITH OPTION "A")
   - O LOW AMBIENT THERMOSTAT
   - R REMOTE DISPLAY PANEL
   - S CHILLED WATER FLOW SWITCH

WIRING AND CONTACT REQUIREMENTS:

20. ALL FIELD WIRING MUST BE IN ACCORDANCE WITH THE NATIONAL ELECTRICAL CODE (NEC), STATE AND LOCAL REQUIREMENTS. OUTSIDE THE UNITED STATES, OTHER COUNTRIES APPLICABLE NATIONAL AND/OR LOCAL REQUIREMENTS SHALL APPLY.
21. FOR CANADIAN INSTALLATION (CSA) ONLY. LOCAL INSPECTION AUTHORITIES MAY REQUIRE SINGLE POWER SOURCE DISCONNECTING MEANS.
22. ON 60 HZ UNITS WITHOUT CONTROL POWER TRANSFORMER OPTION, HEAT TAPE TERMINALS 1TB2–5 & 12, ARE JUMPERED TO CONTROL POWER INPUT. CUSTOMER MUST PROVIDE 115 VAC POWER AT 1TB2–4 & 11 AS SHOWN.
23. FOR UNITS WITH CONTROL TRANSFORMER (1T1) OPTION, OR ALL 50HZ UNITS, JUMPERS (1TB2–4 & 5 AND 1TB2–11 & 12) ARE DELETED. CUSTOMER MUST PROVIDE POWER OF 115 VAC FOR 60HZ UNITS & 240 VAC FOR 50HZ AT 1TB2–5 & 12 FOR HEAT TAPE AS SHOWN. SEE INSET "A".
25. CUSTOMER SUPPLIED CONTACTS MUST BE COMPATIBLE WITH DRY CIRCUIT 12 VDC, 48 mA RESISTIVE LOAD. SILVER OR GOLD PLATED CONTACTS ARE RECOMMENDED.
26. 30 VOLT OR LESS CIRCUIT. DO NOT RUN IN CONDUIT WITH HIGHER VOLTAGE CIRCUITS. USE #14 – #18 AWG WIRE, SEE CUSTOMER WIRE SELECTION TABLE.
27. MINIMUM CONTACT RATING AT 115 VAC: 6.9 VA INRUSH, 1.3 VA SEALED.
28. FIELD WIRED ELECTRICAL LOADING IS NOT TO EXCEED THE FOLLOWING RATINGS:

TERMINALS	DEVICE	VOLTAGE	VA SEALED	VA INRUSH
1U1A9–TB1–8,6	A9K2,NO	115	115	1150•
1U1A9–TB1–8,7	A9K2,NC	115	115	1150•
1U1A9–TB1–11,9	A9K3,NO	115	115	1150•
1U1A9–TB1–11,10	A9K3,NC	115	115	1150•

• = STANDARD PILOT DUTY RATING (35% POWER FACTOR).

29. WHEN CUSTOMER INPUT IS REQUIRED, REMOVE JUMPER AND INSTALL CUSTOMER WIRING.
30. AS SHIPPED 200/230 VOLT UNIT TRANSFORMERS 1T1 – (OPTIONAL), 1T2 & 1T12, ARE WIRED FOR 200 VOLT OPERATION. IF UNIT IS TO BE OPERATED ON 230 VOLT POWER SUPPLY, RE-CONNECT AS SHOWN IN INSET "D". WIRE NUT AND TAPE UN-USED LEADS FROM 1T2 & 1T12.
31. REQUIRED WIRING FOR BASIC UNIT OPERATION. ALL OTHER WIRING IS EITHER FOR OPTIONS OR AT THE CUSTOMERS DISCRETION.

115 Volt Control Power

The wiring procedures described in this portion of the manual must be completed at the Unit Control Module 1U1 (UCM) to obtain proper basic UCM operation. Electrical wiring instructions for all optional UCM features are discussed below.

60 Hz units
Standard 60 Hz units are not equipped with a control power transformer (1T1). A field installed control power fused disconnect switch must be installed for the unit controls. Figure 12 illustrates connecting control power to the proper terminal strip 1TB2 in the unit control panel. Control power requirements are 115 VAC, single phase, 60 Hertz with 5 amp maximum fuse size.

50 Hz units
Units ordered for 50 Hz applications are equipped with a 115V control power transformer (1T1).

Caution: Transformers 1T1, 1T2 and 1T12 are wired for 200-volt operation. If the unit is applied to a 230-volt power supply, rewire the transformers as shown in "Inset D" of Figure 12. Tape any unused transformer leads.

Chilled Water Pump Interlock
A field installed pump interlock must be connected between the pump starter auxiliary contacts (5K1) and terminals 4 & 5 on the UCM terminal strip 1U1A7-TB1 as shown in Figure 12. Minimum contact rating @ 115 VAC is 6.9 VA inrush and 1.3 VA sealed. Refer to the "field wiring" diagrams inside of the control panel door.

Remote Running/Alarm Indicator (Optional)
If the remote run indication and alarm contacts are used, a 115 Volt control circuit must be provided between the Remote Running/Alarm Indicator panel and terminals 6 through 11 on terminal strip 1U1A9-TB1 located at the UCM as shown in Figure 12. Minimum contact rating @ 115 VAC is 1150 VA inrush and 115 VA sealed. Refer to the "field wiring" diagrams inside of the control panel door. Provide a proper remote panel ground connection.

External Auto/Stop (Optional)
If the unit utilizes an optional remote Auto/Stop function, the installer must provide control wiring from the remote pump relay contacts (5K2) to terminals 6 and 7 of terminal strip 1U1A7-TB1 on the UCM as shown in Figure 12.

When this set of 5K2 contacts opens, the UCM reads it as a command to stop chiller operation and begin the pumpdown cycle. An additional set of 5K2 contacts may be wired into the chilled water pump circuit to stop the solution pump when the unit is stopped, however, a time delay such as 5DL1 must be used to ensure water flow during pumpdown.

Circuit requirements are 2-wire, 115 VAC; w/minimum contact rating @ 115 VAC of 6.9 VA inrush and 1.3 VA sealed. Refer to the field wiring diagram inside of the control panel door.

Note: Remove the jumper wire connected between terminals 6 and 7 of 1U1A7-TB1 (Figure 12) before making connections.

Remote Display Panel

The remote display panel is shown in Figure 13. It is designed to be mounted on an indoor wall.

The ambient temperature and humidity limits are as follows:

Ambient Operating Temperature
32° - 140° F (0° C-60° C)
Ambient Storage Temperature
-40° - 160° F (-40° C - 71° C)
Humidity Storage and Operating
5 - 95% Relative Humidity, Non-Condensing

The remote display panel must be mounted within 5,000 feet of the unit.

Mounting The Panel
All mounting hardware (tools, screws, etc.) must be provided by the installer. Figure 13 shows the mounting holes in the back of the remote panel. Also shown are the electrical access knockouts in the back and bottom of the panel. Remove the knockouts that will be used for wire entry prior to mounting the panel.

To attach the remote display panel to the mounting surface using the 1/4 inch keyhole slot in the back panel, hold the panel on the surface and mark the position of the two 1/4 inch holes. Remove the remote display panel and drill the marked mounting holes. Set the panel in position and secure to the mounting surface using the keyhole slot and two mounting screws.

Remote Display Panel Wiring
The required wiring for the remote display panel includes a shielded, twisted pair cable between the panel and the unit UCM (1U1) and a 115 volt power source.

⚠WARNING: ***To prevent injury or death from electrocution, disconnect electrical power source before making connections to the unit.***

Field wiring for the remote panel communication link must meet the following requirements:

All wiring must be in accordance with the NEC and local codes.

Communication link wiring must be 18 AWG shielded, twisted-pair wire (Belden 8760 or equivalent).

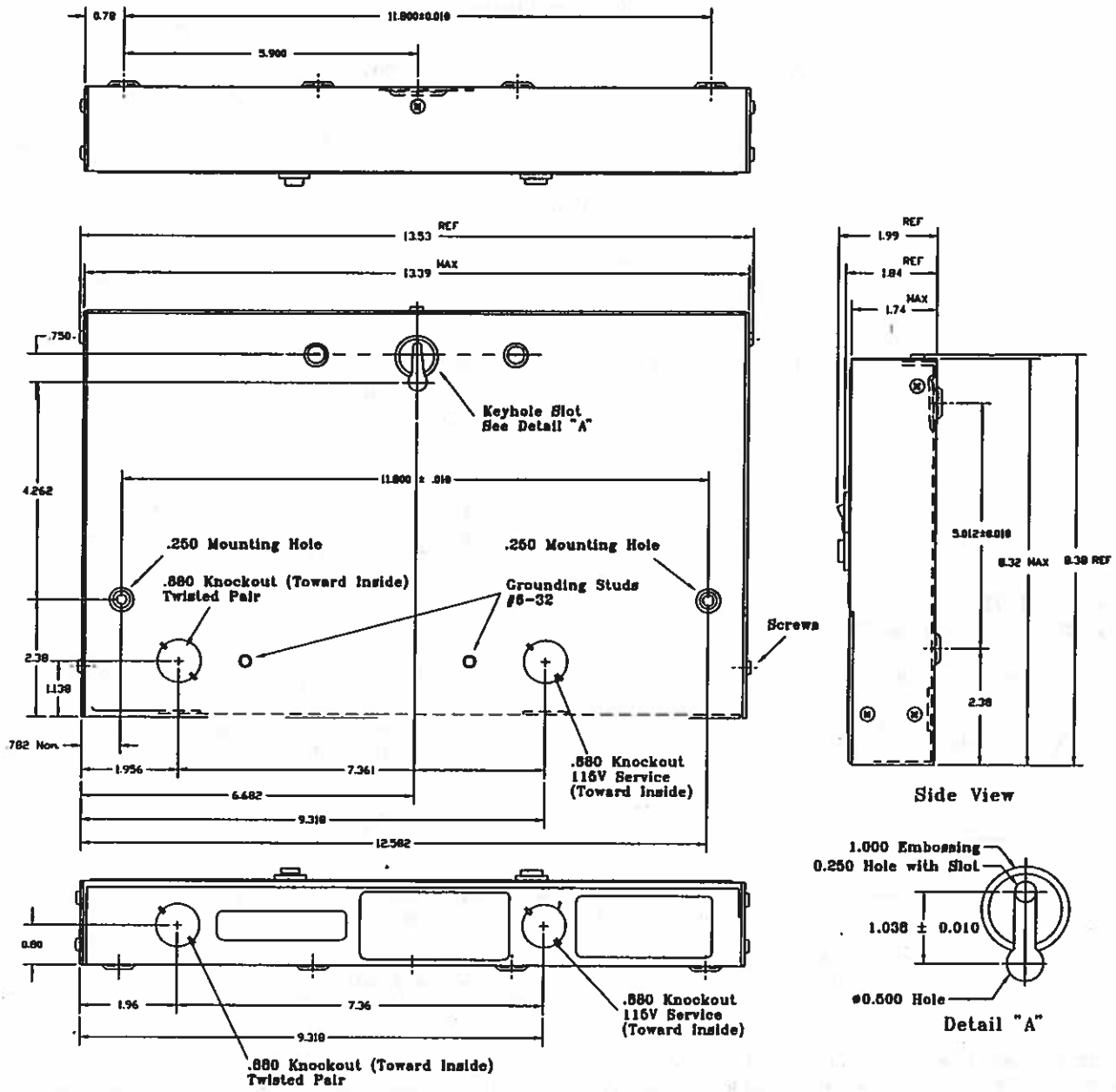
The maximum total wire length is 5,000 feet for each communication link.

The communication link cannot pass between buildings.

Only one UCM is permitted on the remote display panels' communication link at one time.

Caution: To prevent control malfunctions do not run low voltage wiring (30V or less) in conduit with higher voltage circuits.

Figure 13 (Continued)
Remote Display Panel



24 Volt Control Power

The following UCM wiring procedures described in this portion of the manual are made only if the optional feature is ordered with the unit.

⚠WARNING: ***To prevent injury or death, disconnect electrical power source before completing wiring connections to the unit.***

All low voltage connections (30 volts or less) are made on the left side of the UCM. Refer to the "Notes" on the field wiring diagram in Figure 12 for information on proper circuit isolation and conduit requirements.

Caution: To prevent control malfunctions do not run low voltage wiring (30V or less) in conduit with higher voltage circuits.

Compressor Inhibit / KW Limit

The UCM provides auxiliary control for a customer specified/installed demand limit function. When this customer-supplied remote contact (5K6) is provided, the chiller will run normally when the contact is closed. When the contact opens, the unit will be limited to one operating compressor per circuit. When the contact recloses, normal chiller operation is restored.

Remove the jumper located between terminals 1 and 2 on 1U1A1-TB1 at the UCM. Refer to the wire selection chart provided in Figure 12 and connect the wiring labeled 401 and 402 to the field supplied normally closed contacts between terminals 1 and 2 of 1U1A1-TB1. High quality silver or gold-plated contacts are recommended. These customer-supplied contacts must be compatible with 12 VDC, 45 mA resistive load. Refer to the "field wiring" diagrams inside of the control panel door.

Setpoint Reset
If desired, a factory control option is available that enables the leaving chilled water setpoint (i.e., from the unit) to be reset in response to either indoor zone temperature, outdoor air temperature or return chilled watern temperature. Indoor zone reset is not available on units utilizing ice machine control.

External Chilled Water Setpoint
Remote Resistor and/or Potentiometer option allows a remote reset of the chilled water temperature setpoint. External resistor input values for various chilled water setpoints are shown in Table 6.

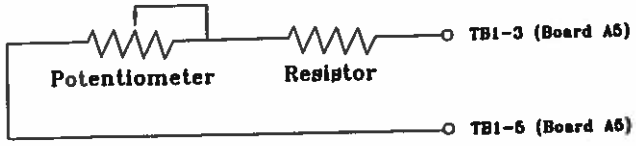
To enable the external chilled water reset input during normal operation (non ice-building), DIP switch (No.4) on switch block SW2 of the 1U1A5 board must be in the "On" or "Enabled" position.

For units with 40°-60° F LCWS range, a field-supplied 25 K-ohm potentiometer (±10%), and a fixed 5.6 K-ohm (±10%), 1/4-Watt resistor should be wired in series and connected to terminal TB1-3 and TB1-5 on the 1U1A5 board (Figure 15).

For units with 20°-39° F LCWS range, a field-supplied 25 K-ohm potentiometer (±10%), and a fixed 15 K-ohm (±10%), 1/4-Watt resistor should be wired in series and connected to terminal TB1-3 and TB1-5 on the 1U1A5 board (Figure 15).

If the potentiometer is to be remotely mounted, it and the resistor must be connected to the UCM prior to mounting. Then, with the UCM display in Operating Menu and the display advanced to "Active Chilled Water Setpoint", the UCM can be used to calibrate the positions of the potentiometer to correspond with desired settings for the leaving water temperature.

Figure 15
External Chilled Water Setpoint Resistor and



Potentiometer
Indoor Zone Temperature
To reset the unit leaving chilled water setpoint based on indoor zone temperature, factory-provided zone sensor (6RT1) must be field-connected to the UCM.

Connect wiring labeled 421 and 422 from the 6RT1 zone sensor to the proper terminals on 1U1A5-TB1 at the UCM as illustrated in Figure 12.

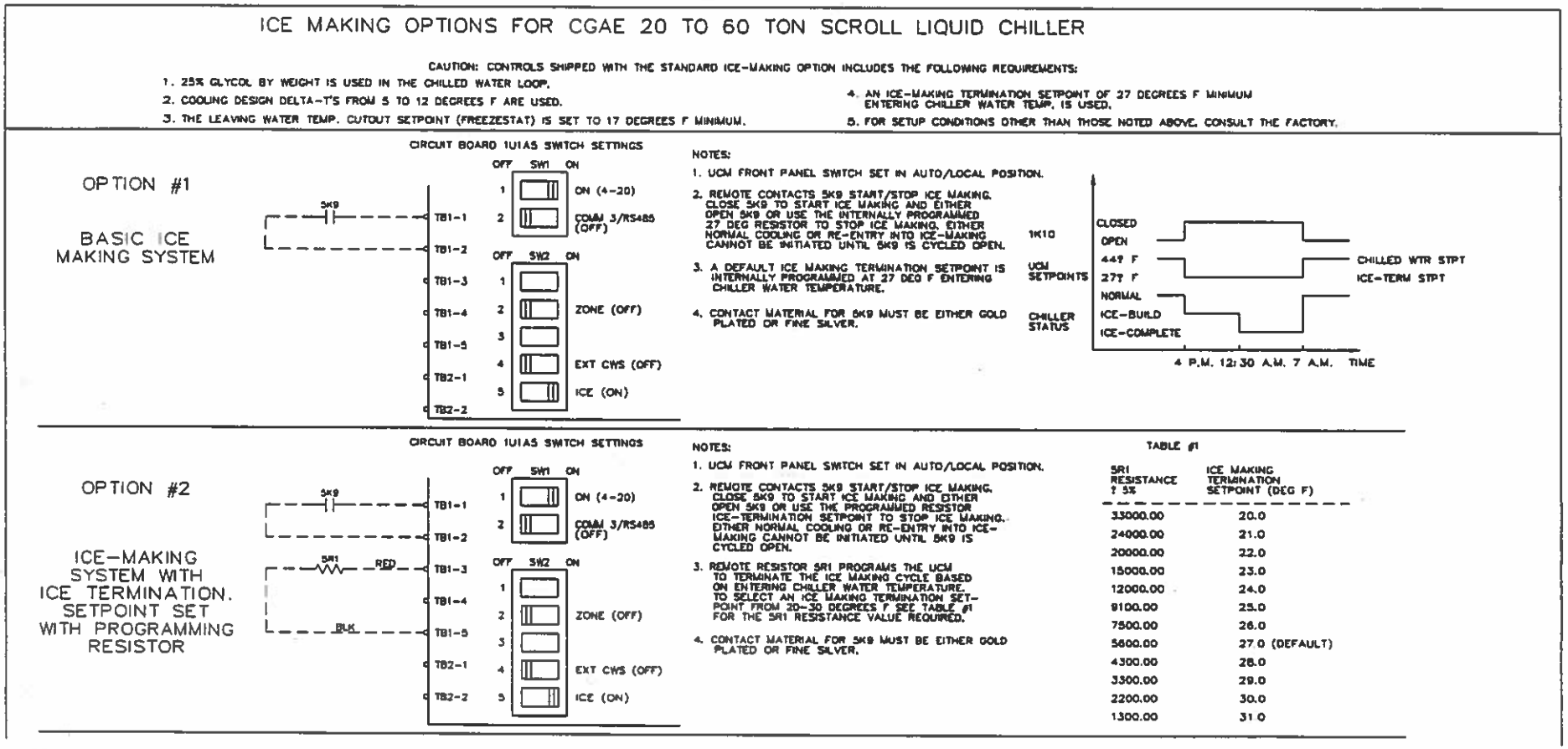
All wiring to these remote input devices must be made with shielded, twisted-pair conductors. Be sure to ground the shielding at the UCM. Refer to Figure 12 for the recommended conductor sizes.

Table 6
External Setpoint Resistor (5R1) Inputs (Ohms)

0°	94,433.3	22°	32,436.3	44°	16,352.5
1°	88,009.8	23°	31,305.5	45°	15,899.7
2°	82,324.0	24°	30,232.2	46°	15,461.7
3°	77,255.8	25°	29,211.9	47°	15,037.7
4°	72,709.7	26°	28,240.9	48°	14,627.1
5°	68,609.1	27°	27,315.7	49°	14,229.3
6°	64,891.4	28°	26,433.2	50°	13,843.6
7°	61,505.4	29°	25,590.3	51°	13,469.5
8°	58,408.7	30°	24,784.6	52°	13,106.5
9°	55,565.7	31°	24,013.6	53°	12,754.2
10°	52,946.4	32°	23,275.1	54°	12,412.0
11°	50,525.4	33°	22,567.2	55°	12,079.5
12°	42,281.1	34°	21,887.9	56°	11,756.3
13°	46,194.7	35°	21,235.5	57°	11,442.0
14°	44,250.2	36°	20,608.5	58°	11,136.3
15°	42,433.6	37°	20,005.5	59°	10,838.9
16°	40,732.6	38°	19,425.0	60°	10,549.3
17°	39,136.6	39°	18,865.8	61°	10,267.3
18°	37,636.1	40°	18,326.9	62°	9,992.5
19°	36,222.8	41°	17,807.0	63°	9,724.8
20°	34,889.4	42°	17,305.3	64°	9,463.9
21°	33,629.1	43°	16,820.7	65°	9,209.4

Notes:
1. Connect resistor in series with a potentiometer between Terminals TB1-3, -5 on board 1U1A5 and observe Active Chilled Water Setpoint on the UCM display to fine-tune the setting.
2. External Setpoint is independent of Front Panel setpoint.

Figure 17
Ice-Making Control Configurations Available for CGAE-C20 through C60 Units



Installation Checklist

Before starting the Pre-Start procedures, complete this checklist to verify that all recommended installation procedures are accomplished before the unit is started. This checklist does not replace the detailed instructions provided in the previous sections. Verify each item in this section by placing a check mark beside the questions, before preceding.

Unit Installation:

[ ] Has the unit been installed with the recommended clearances above and around it?

[ ] Have spring or neoprene isolators, if required, been installed?

[ ] Have all compressor shipping braces been removed and the compressor rail isolator cap screws been loosened?

Chiller Water Piping

[ ] Has the chilled water piping been properly sized and installed? Refer to Figure 10 in the "Chiller Installation" section for recommended system components and guidelines. Ensure that the recommended components have been installed:

Pressure gauges (with isolation valves)
Thermometers
Chiller isolation (shutoff) valves on water inlet and outlet piping
Strainer in the water inlet piping
Balancing valve
Flow switch in the water outlet piping
Chiller drain plug, or drain piping with a shutoff valve

[ ] Has the chilled water system been flushed?

Caution: If using an acidic, commercial flushing solution, to prevent damage to the internal evaporator components, flush all chilled water piping before making the final connection to the EVP chiller barrel

[ ] Has the final chilled water piping been connected to the chiller barrel?

[ ] Has heat tape and insulation, if necessary, been installed to protect any exposed watern piping from external freezing conditions?

Electrical Wiring

Power Supply

[ ] Does the power supply meet the required power requirements of the system?

[ ] Does the field installed power wiring comply with all applicable codes?

[ ] Check compressor contactors and terminal block lugs for tightness.

[ ] Has the properly sized power supply wiring, with overcurrent protection, been connected to the line power terminal block (1TB1) or to an optional factory mounted nonfused disconnect switch (1S1) in the unit control panel and to the proper termination point in the air handling unit? (If applicable)

[ ] 230 V applications: Ensure that unit transformers 1T1, 1T2 and 1T12 have been rewired form 200V to 230V.

[ ] Has the properly sized power supply wiring, with overcurrent protection, been connected to the proper termination point for the chilled water pump?

[ ] Has all grounding wires been securely bonded to an earth ground?

115 Volt Control Wiring

[ ] Connect control panel power supply wiring (with fused disconnect) to proper terminal strip in control circuit section of control panel.

[ ] Has the interlock circuitry wiring for the chilled water pump auxiliary contacts (5K1) to the UCM been properly wired to permit compressor operation after the chilled water pump has started? (i.e., proof of flow device, pump starter station, pump starter auxillary contacts, etc). Refer to the Field Connection Diagram that shipped with the unit for interlocking information.

[ ] Has the proper connections been made at the UCM for the remote running/alarm indication contacts (if applicable)?

[ ] Has the proper connections been made at the UCM for the external auto/stop function (if applicable)?

[ ] Has the proper connections been made at the UCM for the optional chilled water flow switch (if applicable)?

[ ] Has a 115V power source been provided to the remote display panel (if applicable)?

Low Voltage Wiring (AC & DC)

[ ] Has the proper connections been made at the UCM for the optional compressor inhibit/KW limit function (if applicable)?

[ ] Has the proper connections been made at the UCM for the optional high ambient load limit thermostat.

[ ] Has the proper connections been made at the UCM for the optional "normal trip" external interlock (if used).

[ ] Has the proper connections been made for the zone sensor(s) at the UCM for chilled water setpoint reset based on zone temperature (no ice machine control)?

[ ] If the unit is a component of an ice storage system, has the remote contact connections been made at the UCM for ice machine control (no zone reset)?

[ ] Has the proper connections been made between the UCM and the bidirectional communication link device (Tracer® or other remote device, if applicable)? Run communications link shielded, twisted-pair wire to all UCM's in the system.

[ ] Has the communication link shielded, twisted-pair wire between UCM and the remote display panel been connected (if applicable)?

System Start-up

Once the system has been filled, complete the following chilled water system start-up procedures.

1. On units with the unit-mounted control power transformer, close the disconnect switch or circuit protector switch that provides the supply power to the unit's terminal block 1TB1 or the unit mounted disconnect switch 1S1. The unit mounted disconnect switch (1S1), if applicable, must be closed.

   On units without the optional control power transformer (1T1), close the 115 VAC control power fused disconnect switch.

2. On units with the optional control power transformer (1T1), energize the evaporator heat tape by closing the separate 115 VAC heat tape power supply disconnect.

Note: If the unit is not equipped with the control power transformer (1T1), the heat tape is energized when the separate 115 VAC control circuit is energized.

3. Close the chilled water pump starter (5K1) fused disconnect switch.

4. Start the chilled water pump. With solution circulating through the system, inspect all piping connections for leakage. Make any necessary repairs.

5. To balance the flow through the evaporator, adjust the flow rates between the minimum and maximum values given in Table 7. Flow rates above or below these values can cause equipment damage or improper unit operation.

6. Check the flow device (if applicable) on the evaporator outlet piping to ensure it opens and closes properly.

7. Measure the evaporator water pressure drop at the system pressure gauge(s). Compare the readings to the pressure drop values given in Figure 18.

Note: Evaporator pressure drop is an approximation and is to be used as a tool to estimate flow rate and as an aid to waterside system piping design. If an accurate measurement of flow is required, an accurate flow meter must be installed in the system.

Table 7
Evaporator Data for C20 through C60 Ton Unit

CGAE-C20	11.7	44	24	1.5	72	4.5
CGAE-C25	10.7	40	30	1.9	90	5.7
CGAE-C30	16.3	62	36	2.3	108	6.8
CGAE-C40	13.8	52	48	3	144	9.1
CGAE-C50	21	79	60	3.8	180	11.3
CGAE-C60	37.8	143	72	4.5	216	13.6

Ethylene Glycol Adjustment Factor

The addition of ethylene glycol to the chilled water system reduces unit capacity. To determine the pressure drop of a glycol solution system, obtain the pressure drop adjustment factor from the chart in Figure 19 and multiply it times the pressure drop of a water system without glycol, i.e:

Glycol $\blacktriangle P = H_20 \blacktriangle P$ X Adjustment Factor.

Refrigeration System Start-Up

The refrigeration system start-up procedures are described in the "Operation and Maintenance" manual (CGAE-M-2) shipped with each unit.

Before attempting to operate the unit, carefully follow the start-up and configuration instructions within the CGAE-M-2 manual.

Figure 19

Performance Adjustments and Solution Freezing Points (Ethylene Glycol in Evaporator - Catalog Conditions)
(Use Only When Leaving Brine Temperature is Between 40° and 50° F)