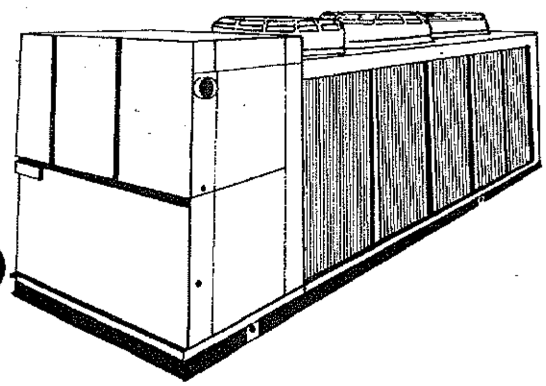
TRANE® AIR CONDITIONING	FILE INFORMATION DIVISION TAB - TRANE REFRIGERATION PRODUCTS PRODUCT TAB - LIQUID CHILLERS - RECIPROCATING Cold Generator Air-Cooled MODEL TAB - CGAA LITERATURE ITEM - Installation	LITERATURE FILE NO. **CGAA-IN-7** INSTALLATION

APRIL 1983

LIQUID CHILLER — RECIPROCATING AIR-COOLED COLD GENERATOR®



MODELS
CGAA 075, 100 — MODEL E COMPRESSOR
CGAA 080, 100, 120 — MODEL R COMPRESSOR

50-CYCLE UNITS — G DESIGN SEQUENCE
60-CYCLE UNITS — D DESIGN SEQUENCE

STANDARD, MEDIUM AND LOW AMBIENT UNITS

TABLE OF CONTENTS

COMMERCIAL AIR CONDITIONING DIVISION
LA CROSSE, WISCONSIN 54601
PRINTED IN U.S.A.

MODEL NUMBER DESCRIPTION

DIGIT 12 3 4 567 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22

CG A A 075 6 E D 5 1 C C 5 C 4 B 3 4 1 —

UNIT MODEL Digits 1,2
CG - Cold Generator®

UNIT TYPE Digit 3
A - Air-Cooled Condensing

DEVELOPMENT SEQUENCE Digit 4

COOLING CAPACITY Digits 5, 6, 7
075 - 75 Ton 100 - 100 Ton
080 - 80 Ton 120 - 120 Ton

VOLTAGE AND START CHARACTERISTICS Digit 8
1 - 460/60/3 PW 6 - 200/60/3 XL
2 - 575/60/3 PW 9 - 400/50/3 PW
3 - 230/60/3 PW S - Special
4 - 460/60/3 XL N - None
5 - 575/60/3 XL

COMPRESSOR IDENTIFICATION Digit 9
R - Model R Compressor
E - Model E Compressor

DESIGN SEQUENCE Digit 10

COMPRESSOR MOTORS Digit 11
5 - Hermetic Motor
6 - Special
7 - None

CONTROL VOLTAGE Digit 12
1 - 115 Volts
4 - None

CHILLER Digit 13
A - One Undersize
C - Standard
D - One Oversize
F - None
G - Special

CONDENSER Digit 14
A - One Undersize
C - Standard
D - One Oversize
F - None
G - Special

UNIT CYCLE CONTROL DEVICES Digit 15
1 - Anti-Recycle, 1 Compressor Circuit
2 - Anti-Recycle, 2 Compressor Circuits
3 - Periodic Pumpout with Anti-Recycle, 1 Compressor Circuit
4 - Periodic Pumpout with Anti-Recycle, 2 Compressor Circuits
5 - None
6 - Special

SYSTEM LOAD CONTROL DEVICE Digit 16
A - Load Limit, 1 Compressor Circuit
B - Load Limit, 2 Compressor Circuits
C - None
D - Special

UNIT ELECTRIC CONTROL DEVICES Digit 17
1 - Low Voltage Relay
2 - Phase Reversal Relay
3 - Phase Failure Relay
4 - None
5 - Special
6 - Single-Source Power Box with Circuit Breaker

THERMOSTAT OR UNLOADING METHOD Digit 18
C - 4-Step Electric
E - 8-Step Electric (with Sequence Panel)
H - 4-Step Pneumatic-Electric
K - 8-Step Pneumatic-Electric (with Sequence Panel)
N - None
P - Special

CONTINUOUS OPERATION CONTROL DEVICES Digit 19
1 - Hot Gas Bypass, 1 Compressor Circuit
2 - Hot Gas Bypass, 2 Compressor Circuits
3 - None
4 - Special

APPROVAL AGENCY Digit 20
1 - U.L.
2 - C.S.A.
3 - U.L./C.S.A.
4 - ARI
5 - Special
6 - None

TRANSFORMER Digit 21
1 - With 3 - Special
2 - Without

MISCELLANEOUS Digit 22
A - 0 F Ambient
C - Without Muffler
E - See Sales Order
F - Coil Guards
G - Special
J - Unit Isolators - Spring
K - Packed Stock
L - Medium Ambient
M - Copper Fin Condenser
R - Pressure Gauge Piping Kit
T - Flow Switch
9 - Submittal Drawings

GENERAL INFORMATION

UNIT INFORMATION

Trane Air-Cooled Cold Generators® are assembled, pressure-tested, dehydrated and charged before shipment. Compressors contain the correct oil charge and each refrigerant circuit contains an operating charge of R-22. All evaporator piping connections are capped. The refrigerant line service valves are closed at shipment to isolate the refrigerant charge in the condenser. **Open all service valves before operating the unit.**

UNIT NAMEPLATE AND LITERATURE LABEL

The unit nameplate for Model CGAA is mounted on the outside of the unit. See Figure 1. The nameplate contains the unit model and serial number, and a type number used to identify special units. When ordering parts or literature, be sure to furnish the full model number, serial number, and type number (if applicable).

The literature label is located on the unit near the unit nameplate. This label gives the title of the unit Operation-Maintenance manual for the unit. Refer to the manual given on this label for information concerning operation, maintenance, seasonal start-up and repair of this equipment.

NOTE: *Component nameplates are also located on the compressors, evaporators, and fans. These do not contain* ***unit*** *information.*

RECEIVING

To protect against loss from in-transit damage, the following instructions should be completed upon receipt of the unit:

1. Inspect individual pieces of the shipment before accepting it. Check for rattles, bent corners, or other visible indications of shipping damage.
2. If a carton has apparent damage, open it immediately and inspect the contents before accepting the unit. Make specific notations concerning the damage on the freight bill. (Delivery cannot be refused.)
3. Inspect the unit for concealed damage before it is stored and as soon as possible after delivery. Concealed damage must be reported within 15 days of receipt.
4. Keep damaged material in the same location as received, if possible. It is the receiver's responsibility to provide reasonable evidence that concealed damage was not incurred after delivery.
5. If concealed damage is discovered, stop unpacking the shipment. Retain all internal packing, cartons and crates. Take photos of the damaged material.
6. 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 consignee.
7. Notify a Trane sales representative of the damage and arrange for repair. Do not repair the unit, however, until damage is inspected by the carrier's representative. Trane is not responsible for shipping damage.

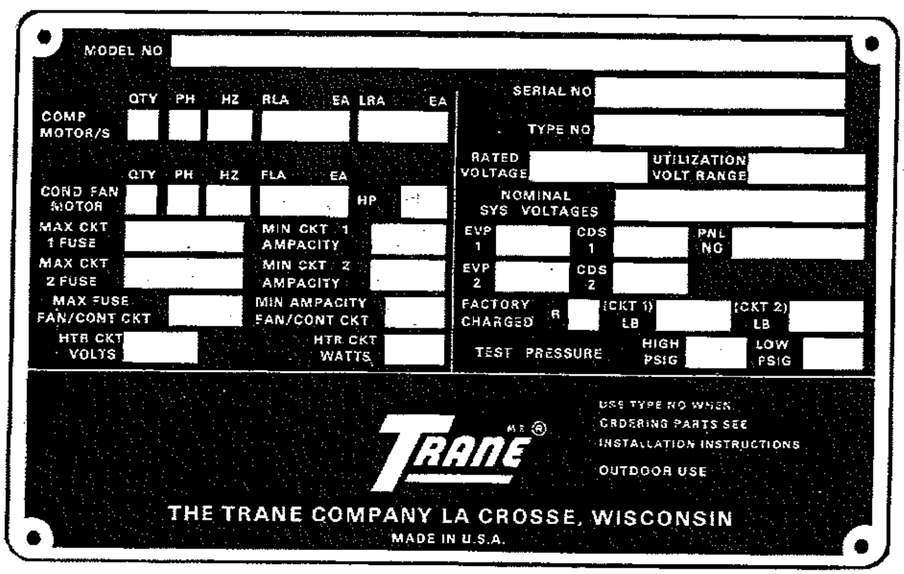


FIGURE 1 - Typical Model CGAA Nameplate and Nameplate Information

HANDLING

Air-Cooled Cold Generators® are designed specifically for outdoor installation. No protective measures are required for unit storage. The units are shipped crated and bolted to a shipping skid. Do not remove the shipping skid until the unit is at its final installation site. Use a forklift or crane of suitable capacity to lift the unit. See Table 1 for unit shipping weights.

WARNING! MOVING THE UNIT WHEN IT IS NOT PROPERLY SECURED TO THE SHIPPING SKID MAY RESULT IN INJURY, DEATH OR EQUIPMENT DAMAGE.

TABLE 1 - Unit Operating and Shipping Weights (Pounds)

UNIT MODEL	OPERATING WEIGHT[1]	SHIPPING WEIGHT[2]
75 E	7,825	7,780
80 R	7,955	7,910
100 E	8,850	8,920
100 R	9,420	9,540
120 R	10,450	10,470

NOTES:
1. Operating weight is given for unit with refrigerant and water.
2. Shipping weight includes refrigerant and skid.

INSTALLATION CHECKLIST

An Installation Checklist is provided at the end of the Installation section of this manual. The checklist should be used to verify that all necessary installation procedures have been completed. Do not substitute this checklist for more detailed and complete information given in appropriate sections of the manual. Read the entire manual thoroughly before proceeding with further installation procedures.

RIGGING

Proper rigging and hoisting procedures must be used to ensure unit and personal safety. Unit shipping weights are given in Table 1.

Four lifting brackets are provided at the base of the unit, as shown in Figure 2. Attach cables to the lifting brackets. Install a spreader bar between the cables at the top of the unit, as shown in Figure 2, to prevent unit damage. Test-lift the unit to check balance and center of gravity before hoisting it to its final installation site.

WARNING! DO NOT LIFT THE UNIT IN WINDY CONDITIONS OR OVER SERVICE PERSONNEL. ALWAYS TEST-LIFT THE UNIT FOR PROPER CENTER-OF-GRAVITY RIGGING BEFORE HOISTING. FAILURE TO EXERCISE CAUTION WHILE HOISTING THE UNIT MAY RESULT IN INJURY, DEATH OR EQUIPMENT DAMAGE.

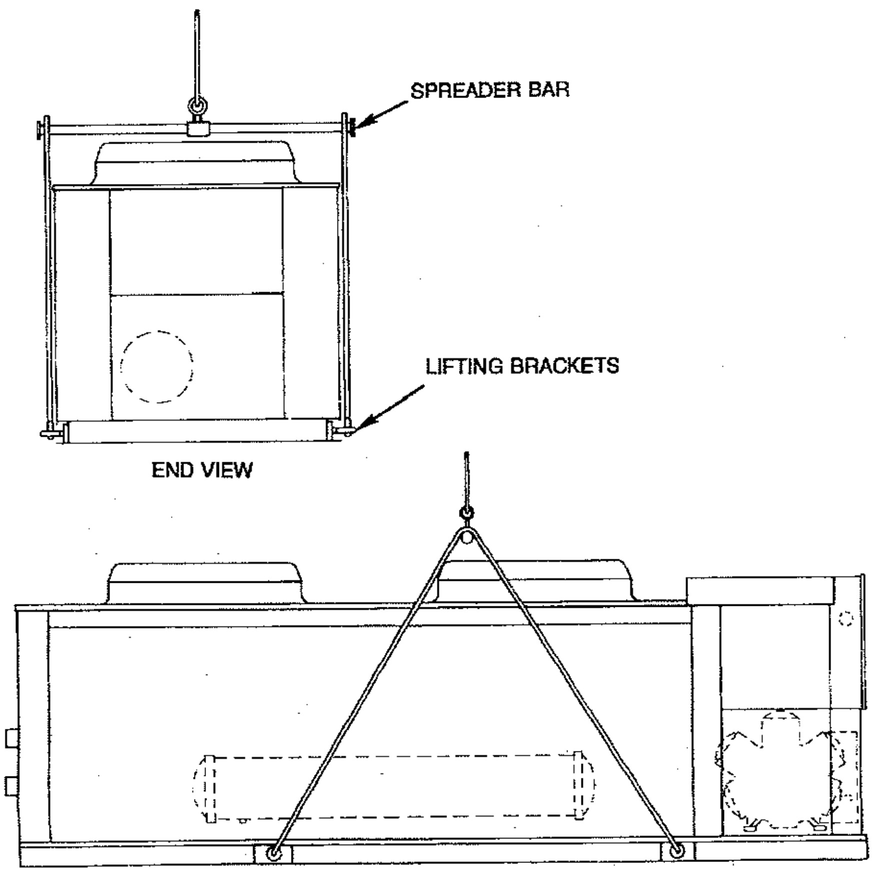


FIGURE 2 - Proper Rigging and Lifting Method

UNIT INSTALLATION

LOCATION REQUIREMENTS

CLEARANCES

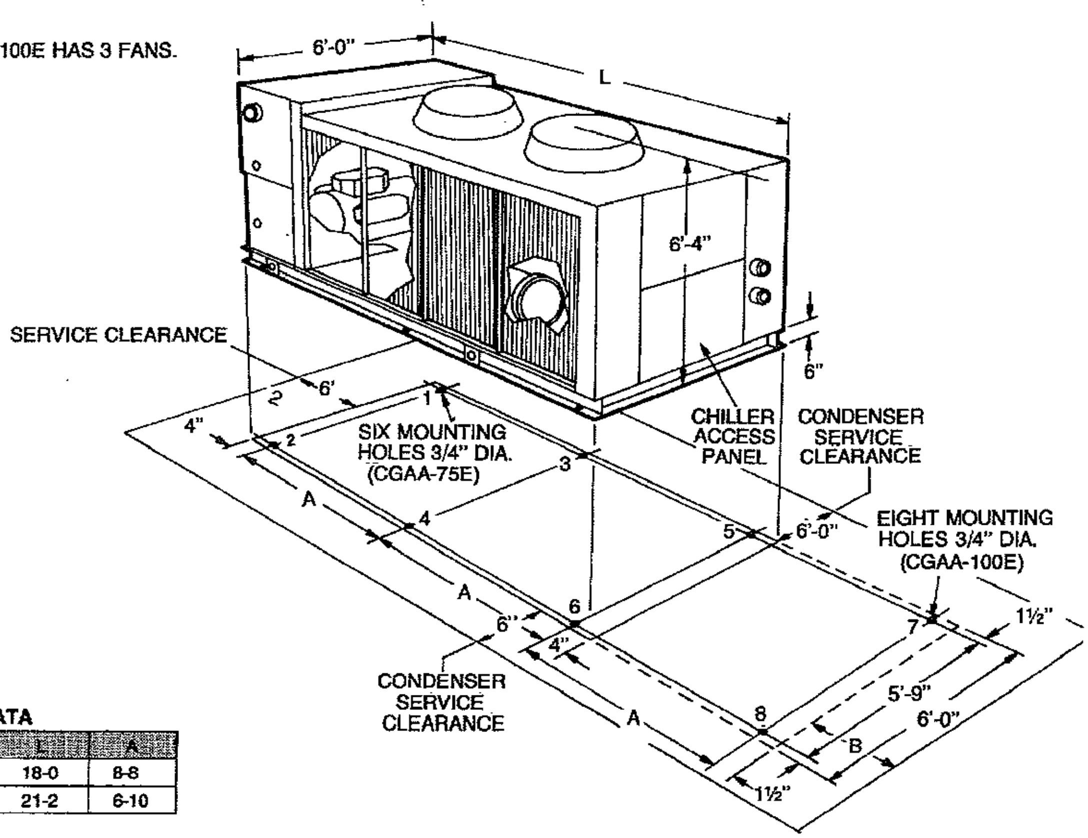
Unit dimensions and clearances are given in Figures 3 and 4.

Position the unit for unrestricted airflow to and from the condenser. Do not install the unit under an overhang or other obstruction of the vertical air discharge.

Provide enough space around each unit to allow installation crew and maintenance personnel unrestricted access to service areas. A minimum of 36 inches is required for service access at the control panel and at the compressor end of the unit. See Figures 3 and 4 for required service clearances.

Multiple-unit installations should include at least 12 feet of clearance between units, when placed side to side. If installation pits are used, the pit walls should not be higher than the unit. See Figures 5 and 6.

* NOTE: CGAA-100E HAS 3 FANS.



DIMENSIONAL DATA

MODEL	L	A
CGAA 075E	18-0	8-8
CGAA 100E	21-2	6-10

CLEARANCE DATA

MODEL	RECOMMENDED TUBE SERVICE CLEARANCE (B)	SUGGESTED SERVICE CLEARANCE	SUGGESTED AIRFLOW CLEARANCES (D)			
			SINGLE UNIT INSTALLATION	SIDE BY SIDE UNIT INSTALLATION	PIT INSTALLATION	
					MAX. PIT DEPTH	COIL CLEARANCE
CGAA 075E	7'9"	6'0"	6'0"	12'0"	6'4"	12'0"
CGAA 100E	8'0"	6'0"	6'0"	12'0"	6'4"	12'0"

FIGURE 3 - Unit Dimensions and Clearances for Models CGAA-75E and CGAA-100E

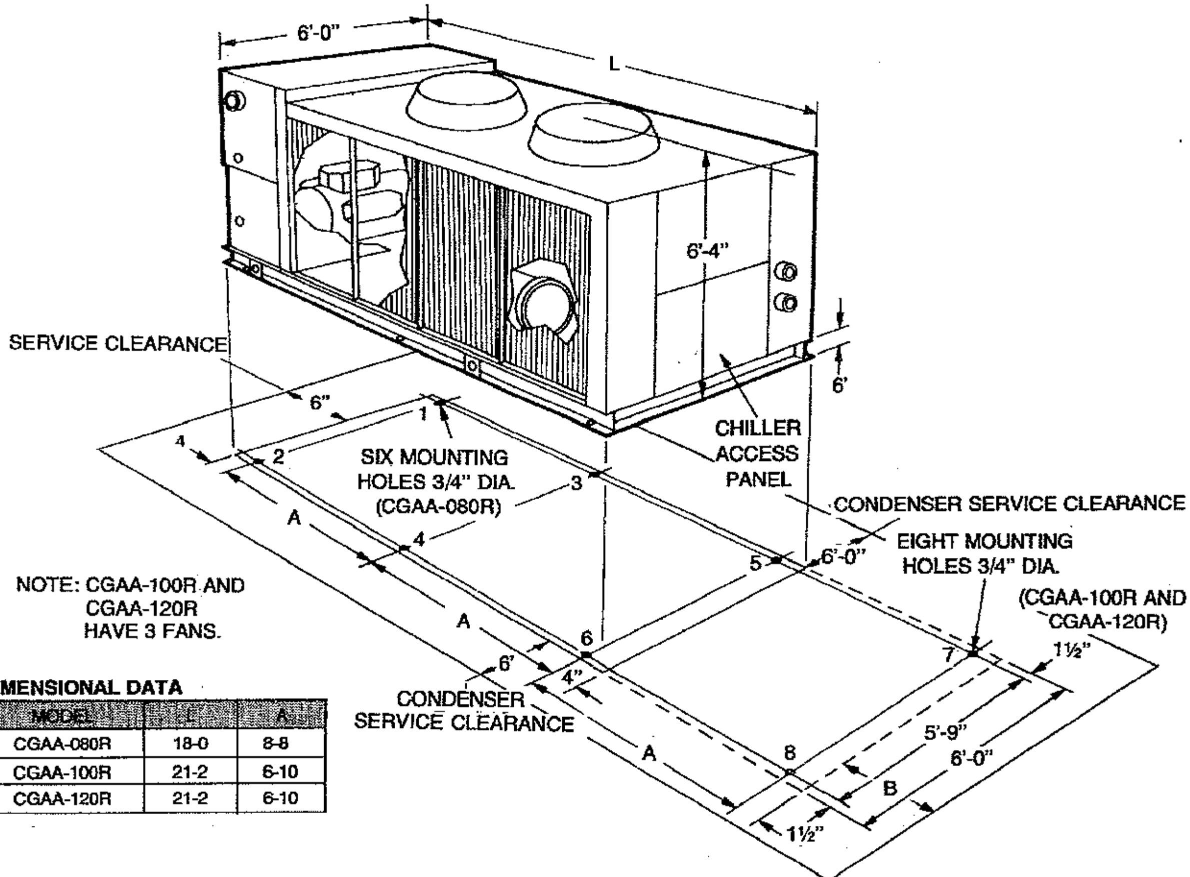
STRUCTURAL SUPPORT

The installation surface must be strong enough to support unit operating weights, as given in Table 1.

Structurally-transmitted vibration can be minimized by the use of spring or rubber-in-shear isolators, available from Trane, or a flexible, isolated foundation. See below for installation instructions for unit isolators.

DRAINAGE

Make sure that a large-capacity drain is located near the unit for system drainage during shutdown or repair. A 3/4-inch NPT drain connection is provided at the return end of the chiller. A hole is also provided in the floor of the unit for this drain connection.



DIMENSIONAL DATA

MODEL	L	A
CGAA-080R	18-0	8-8
CGAA-100R	21-2	6-10
CGAA-120R	21-2	6-10

CLEARANCE DATA

MODEL	RECOMMENDED TUBE SERVICE CLEARANCE (B)	SUGGESTED SERVICE CLEARANCE	SUGGESTED AIRFLOW CLEARANCES (D)			
			SINGLE UNIT INSTALLATION	SIDE BY SIDE UNIT INSTALLATION	PIT INSTALLATION	
					MAX. PIT DEPTH	COIL CLEARANCE
CGAA 080R	7'9"	6'0"	6'0"	12'0"	6'4"	12'0"
CGAA 100R	8'0"	6'0"	6'0"	12'0"	6'4"	12'0"
CGAA 120R	8'0"	6'0"	6'0"	12'0"	6'4"	12'0"

FIGURE 4 - Unit Dimensions and Clearances for Models CGAA-80R, CGAA-100R, and CGAA-120R

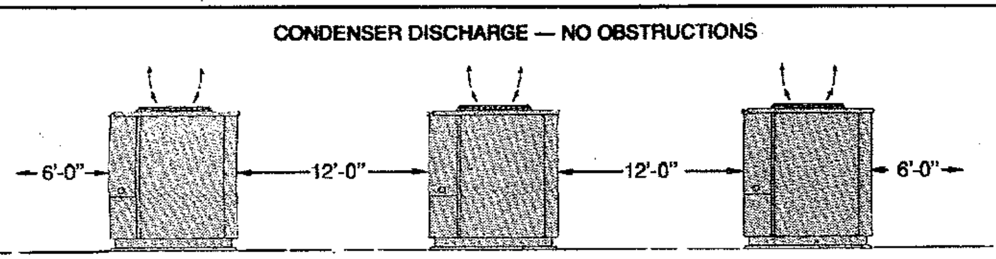


FIGURE 5 - Recommended Clearances for Typical Multiple-Unit Installation

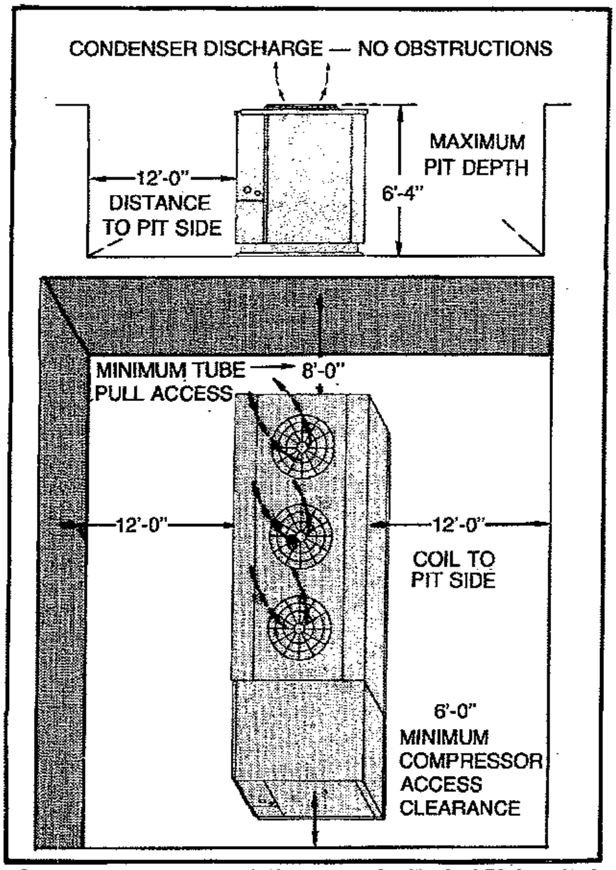


FIGURE 6 - Recommended Clearances for Typical Pit Installation

UNIT ISOLATORS

Vibration isolators are recommended for installation of Model CGAA-75 through CGAA-120. If desired, isolators can be fastened to the foundation by bolting through the isolator base slots.

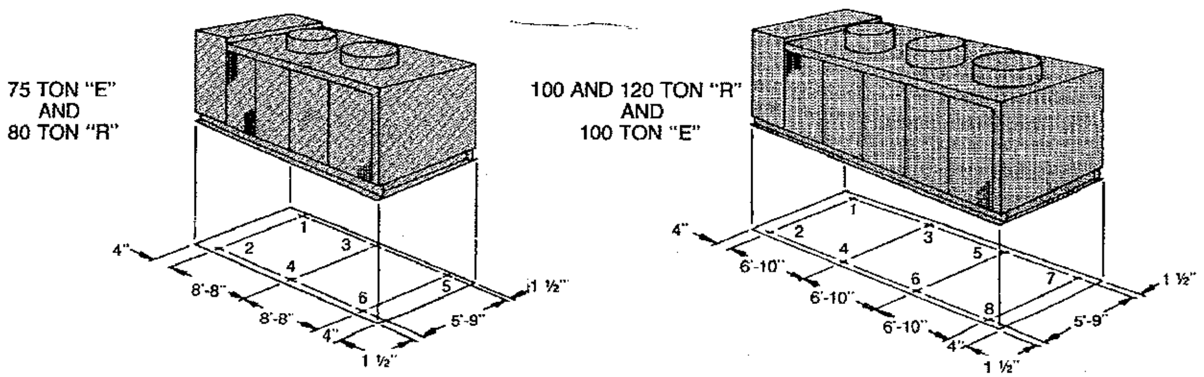
Locate the isolators in their proper positions before placing the unit. See Figure 7 for isolator weight loads and locations.

Check that the isolators provide a level surface at all mounting points. Where necessary, provide shims or grouting under the isolators, but support the full underside of each isolator base plate. Do not allow the isolator to straddle small gaps or shims. A 1/4-inch difference is the maximum variance acceptable from levelled isolators. Spring isolators are adjustable for adapting to varying weight loads.

Set the unit on the isolators with the positioning pins registered in the unit mounting holes. Unit weight will compress the isolators. The clearance between the upper and lower isolator housing, as shown in Figure 8, should be between 1/4-inch and 1/2-inch. A clearance greater than this may indicate that the isolators were not installed level and shims or grouting may be required.

To make minor adjustments to this clearance measurement for spring isolators, turn the levelling bolt clockwise to increase clearance, with the isolators supporting unit weight. Turn the levelling bolt out counterclockwise to decrease clearance between isolator housings.

Level the unit carefully before tightening the unit anchor bolts. Check the level on the compressor mounting base. Minor level adjustments may be made at the spring isolator levelling bolts.



UNIT MODEL	ISOLATOR	ISOLATOR MOUNTING LOCATION							
		1	2	3	4	5	6	7	8
CGAA	PART NO.	CP-2-32	CP-2-32	CP-2-32	CP-2-32	CP-2-31	CP-2-31	—	—
075E	LOAD WT.	1575	1655	1275	1355	930	1035	—	—
CGAA	PART NO.	CP-2-32	CP-2-32	CP-2-32	CP-2-32	CP-2-31	CP-2-31	—	—
080R	LOAD WT.	1615	1695	1300	1380	930	1035	—	—
CGAA	PART NO.	CP-2-32	CP-2-32	CP-2-31	CP-2-31	CP-2-31	CP-2-31	CP-2-26	CP-2-26
100E	LOAD WT.	1475	1475	1155	1230	1030	1105	670	710
CGAA	PART NO.	CP-2-32	CP-2-32	CP-2-32	CP-2-32	CP-2-31	CP-2-31	CP-2-26	CP-2-26
100R	LOAD WT.	1595	1595	1275	1350	1075	1150	670	710
CGAA	PART NO.	CP-2-32	CP-2-32	CP-2-32	CP-2-32	CP-2-32	CP-2-32	CP-2-28	CP-2-28
120R	LOAD WT.	1630	1630	1425	1505	1270	1365	785	840

FIGURE 7 - Unit Isolator Mounting Locations and Weight Loads (Pounds)

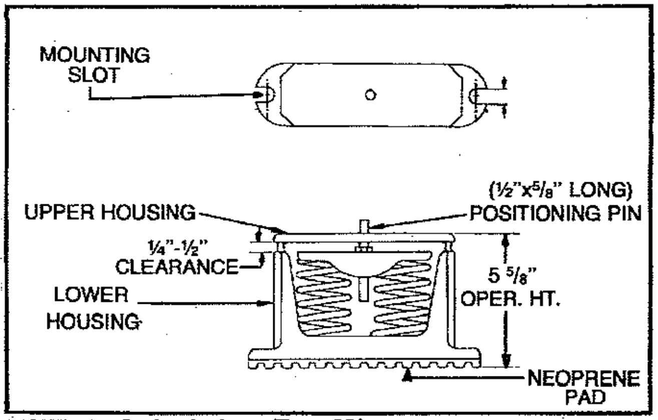


FIGURE 8 - Spring Isolator (Type CP)

COMPRESSOR ISOLATORS

As shipped, compressors are rigidly bolted to the mounting platform for protection during shipping. Shipping spacers between the compressor feet and the mounting platform prevent equipment damage during transport, but must be removed before unit operation.

MODEL R COMPRESSOR

1. Remove the cap screw from the compressor foot and isolator pad. See Figure 9.
2. Remove the angle spacer block from under the compressor foot.
3. Rotate the isolator pad under the compressor foot to line up with the foot, as shown in Figure 9.
4. Repeat steps 1, 2 and 3 for all compressor mounting points.

MODEL E COMPRESSOR

1. Loosen the hexnut on the cap screw that runs through the compressor foot and isolator pad. See Figure 10.
2. Remove the angle spacer from under the compressor foot.
3. Rotate the isolator pad under the compressor foot, as shown in Figure 9.
4. Repeat steps 1, 2 and 3 for all compressor mounting points.

NOTE: *The cap screw should remain mounted through the compressor foot to serve as a locating pin. Be sure that the entire compressor weight is resting on the isolator pad.*

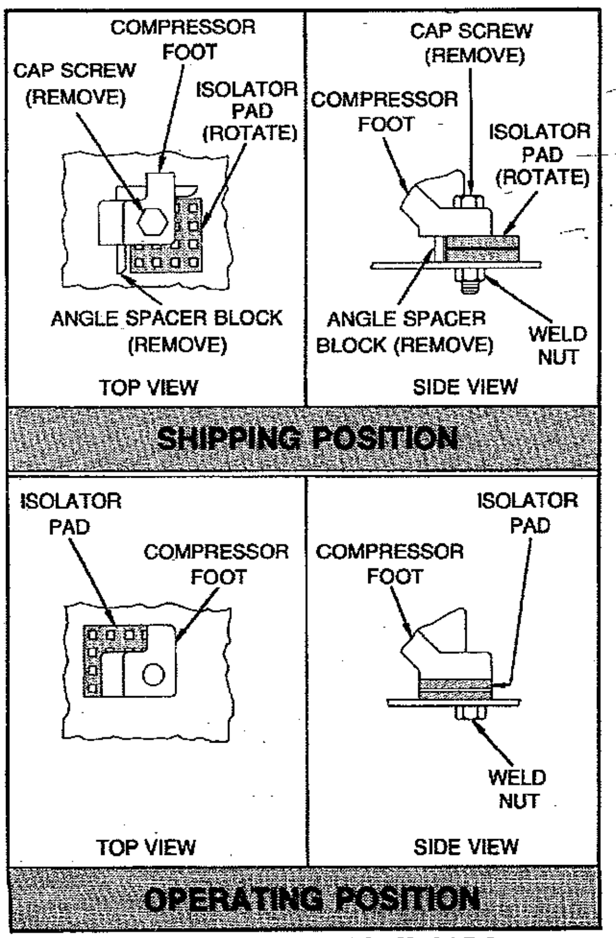


FIGURE 9 - Isolator Pad Adjustment for Model R Compressor

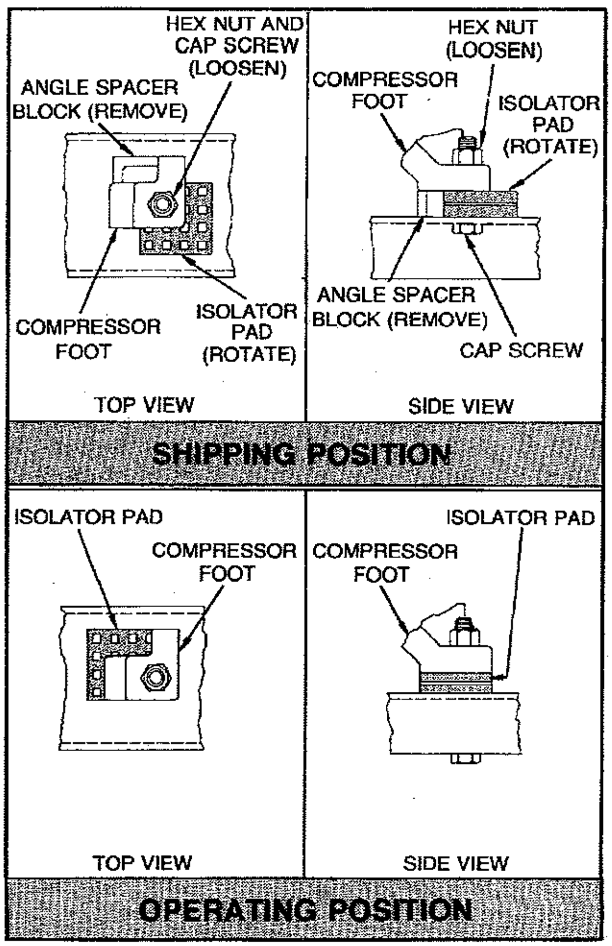


FIGURE 10 - Isolator Pad Adjustment for Model E Compressor

WATER PIPING

Chiller inlet and outlet piping connections are 4-inch NPT. See Figure 11 for chilled water connection locations. Refer to the "Trane Reciprocating Refrigeration Manual" for a complete presentation of proper water piping and pipe sizing practices. This manual is available at local Trane Sales Offices. General recommendations follow.

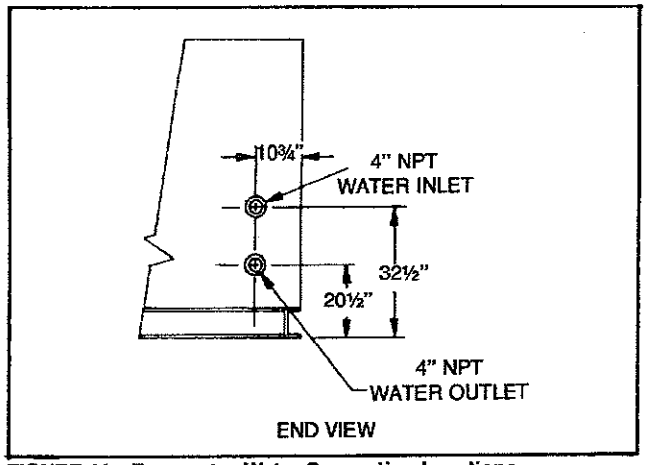


FIGURE 11 - Evaporator Water Connection Locations

COMPONENT RECOMMENDATIONS

Figure 12 illustrates typical evaporator water piping components. The following components are recommended:

Pressure Gauges — to register entering and leaving water pressure. Shutoff (gate) valves should also be provided in the connections to the gauges.

Thermometers — to register entering and leaving chilled water temperature.

Pipe Unions — to simplify removal and repair of evaporator piping.

Vibration Isolators — to prevent transmission of unit vibration through piping.

Pressure Regulating Valve — to establish and maintain proper system pressure. Set the valve to limit evaporator water supply to 150 psi.

Flow Switch — to stop compressor operation if supply water flow is greatly reduced. A flow switch is available from Trane for field installation. If ordered, the flow switch is packaged in the control panel.

Strainer — to filter foreign matter from supply water.

Balancing Cock — to establish balanced system water flow.

Drain Valves and Shutoff Valves — to isolate evaporator and circulating water pump during servicing.

Vents — to eliminate air in the system.

Pressure Tank — to accommodate thermal expansion and contraction, produce required pump NPSH, and hold a positive pressure on the system, preventing air entry.

NOTE: *If a load limit thermostat is being used, install the sensor in the field-provided return water piping. See Figure 12.*

Locate the water pump upstream of the chiller if possible, unless the NSHP (net positive suction head) is extremely high.

To promote system balance, lateral piping of each floor should be layed out, using reverse returns.

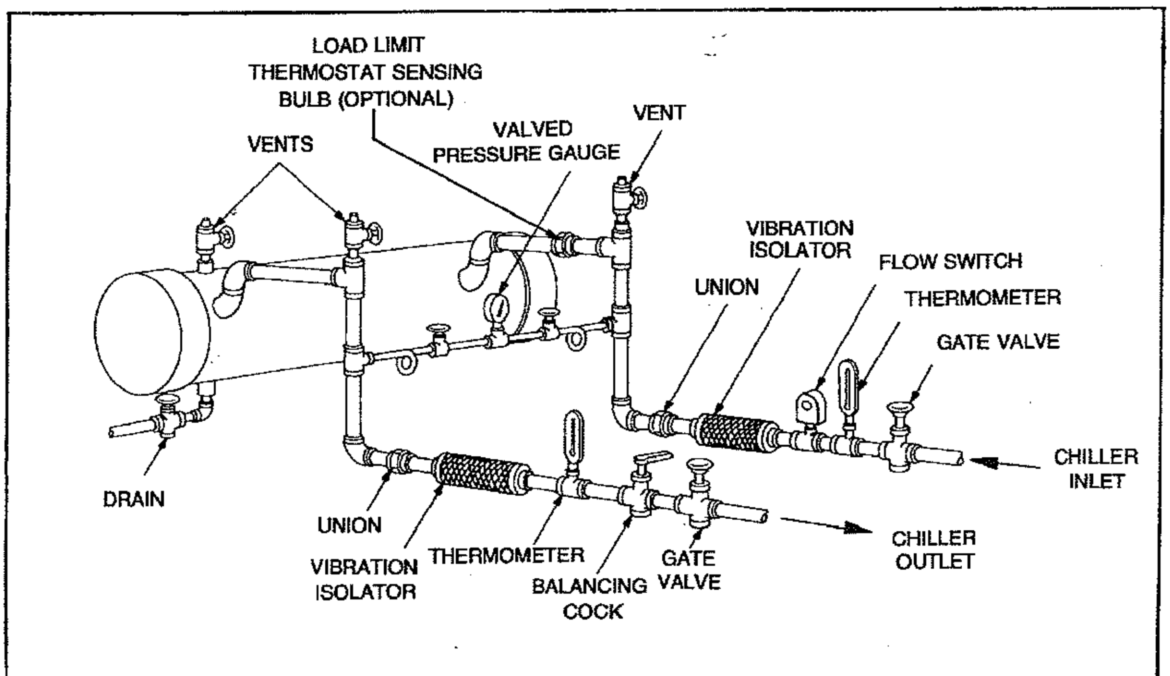


FIGURE 12 - Typical Chiller Water Piping with Recommended System Components

SYSTEM RECOMMENDATIONS

CAUTION: The use of improperly treated or untreated water in this equipment may result in scaling, corrosion, algae or slime. The Trane Company assumes no responsibility for equipment damage due to the use of improperly treated or untreated water. Engage the services of a qualified water treatment specialist to determine what treatment, if any, is required.

To achieve a constant water flow rate in a system whose heat exchangers are controlled by two-way valves, a valved bypass that connects the supply and return risers can be used. See Figure 13. The bypass valve is controlled by a differential pressure controller that senses the pressure difference between the risers. An increase in pressure drop, resulting from the closing of the two-way valves, causes the controller to modulate the bypass valve to re-establish the supply-return pressure differential that corresponds to design flow.

For those applications that may produce high return water temperatures that can overload a compressor, the bypass system shown in Figure 14 can be used to limit return water temperature to an established maximum by mixing proportions of return and bypassed chilled water. (This can also be accomplished by the use of a load-limit thermostat, available as optional equipment.)

For multiple-unit installations, control can be simplified by using a piping technique that separates the distribution pumping system from the chilled water production pumping system. See Figure 15. The distribution system consists of multiple chilled-water coils that are served by two-way valves and a water distribution pump. A flow meter (that senses flow direction and rate) starts an additional chiller-pump combination. The second flow meter stops a pump when flow rate in one direction exceeds that produced by one chilled water pump. Each chiller-pump combination operates independently of the others.

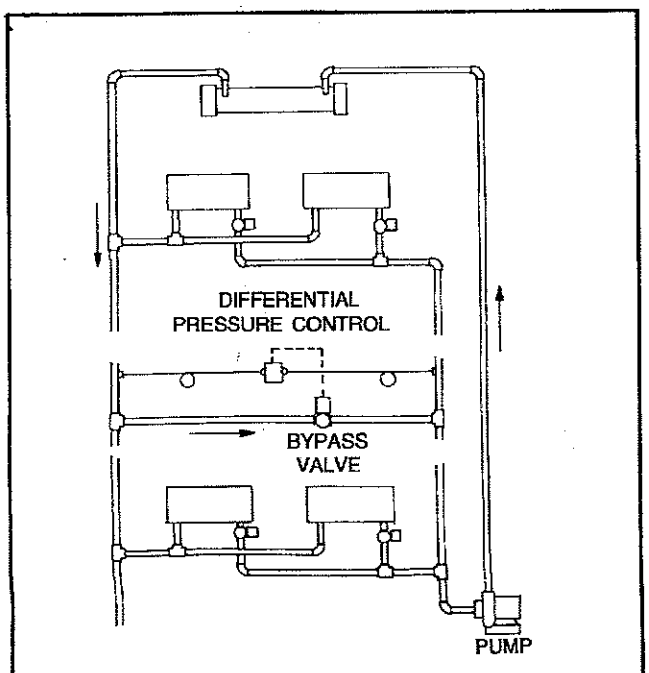


FIGURE 13 - Constant Flow Rate Control with Valved Bypass

Through your local Sales Office, Trane offers special control panels designed for multiple-unit installations. These panels are engineered to interface with the particular water chillers selected and to meet water loop requirements while operating within acceptable ranges.

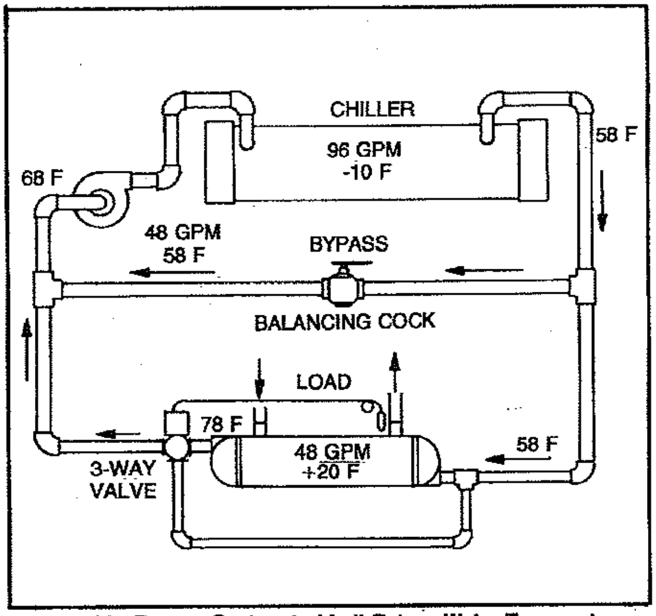


FIGURE 14 - Bypass System to Limit Return Water Temperature

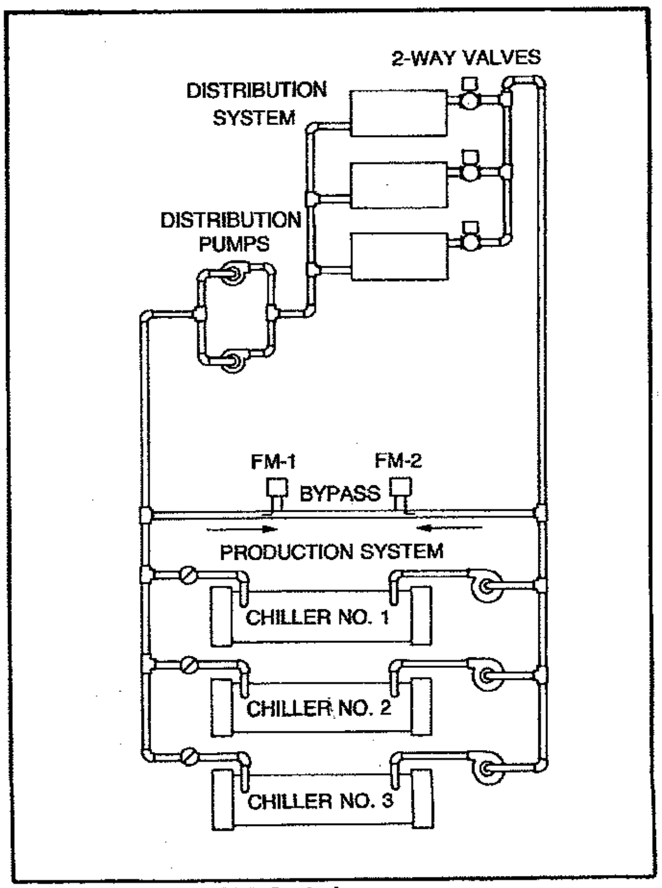


FIGURE 15 - Multiple-Unit Control

FREEZE PROTECTION

If the unit will remain operational at sub-freezing ambient temperatures, follow these procedures to obtain adequate freeze protection for the chilled water system:

1. Install chilled water piping heat tape with a fused disconnect. Refer to "Heat Tape" instructions below. Check that all exposed piping is adequately protected. Factory-installed evaporator heat tape and insulation is adequate for protection down to -20 F.
2. Freeze-proof the water system by adding a non-freezing, low-temperature heat transfer fluid to the chilled water. This solution must be strong enough to provide enough protection to prevent ice formation at the lowest ambient temperature to be encountered. Follow the manufacturer's recommendations for installation and testing procedures for the freeze-proofing solution used. Refer to Table 2 for evaporator liquid capacities.

NOTE: *The use of an ethylene-glycol type of fluid will reduce system capacity. This must be accounted for in total system design.*

Heat Tape

Install heat tape on all water piping that may be exposed to freezing temperatures. Use heat tape that is recommended for low-temperature applications, 110/120-volt automatic, which dissipates 7 watts per linear foot. Heat tape should be selected at the lowest anticipated temperature including wind chill. If the heat tape is not automatic (thermostatically controlled), install an accessory thermostat. Refer to Tables 3 and 4 for heat tape characteristics.

Follow the instructions provided by the heat tape manufacturer for heat tape installation. If none are provided, use the following recommendations:

1. Wrap the heat tape around the pipe or apply it straight along the pipe, as determined by the protection required. See Tables 3 and 4.
2. Use friction tape to secure the heat tape to the pipe.
3. Place the thermostat tightly against, and parallel to, the pipe. Tape it in place at each end. The thermostat should be installed on the most exposed (coldest) portion of the pipe.
4. Wrap the pipe with weatherproof tape. On vertical pipe runs, start the wrap at the bottom and work up, as shown in Figure 16. Overlap the tape to shed moisture. If additional protection is required, insulate the pipe with fiberglass wrap before installing the outer wrap.

CAUTION: Do not install fiberglass insulation under the outer wrap for non-thermostatically controlled heat tape. This could cause generation of excessive heat, resulting in electrical failure to the tape, frozen pipes, and resultant unit damage.

5. When freezing is a potential problem, all exposed piping, pumps and other components should be similarly protected by heat tape and insulation.

TABLE 2 - Evaporator Liquid Capacities

UNIT MODEL	LIQUID CAPACITY (GALLONS)
CGAA-75E	45.0
CGAA-80R	45.0
CGAA-100E	52.0
CGAA-100R	52.0
CGAA-120R	60.0

NOTE:
Capacities are based on evaporator and unit piping.

TABLE 3 - Application of Non-Thermostatic Heat Tape with Outer Wrap and No Insulation

PIPE SIZE (IN)	APPLICATION TECHNIQUE — STRAIGHT: HEAT TAPE REQUIRED PER LINEAR FOOT OF PIPE	STRAIGHT: PROTECTION DOWN TO	SPIRALLED: HEAT TAPE REQUIRED PER LINEAR FOOT OF PIPE	SPIRALLED: PROTECTION DOWN TO
2"	12"	6 F	28"	-27 F
2½"	12"	11 F	31"	-23 F
3"	12"	15 F	35"	-20 F
4"	12"	20 F	47"	-17 F
5"	12"	22 F	54"	-15 F

NOTE:
Spiralled applications are twisted around pipe 3 turns per linear foot of pipe.

TABLE 4 - Application of Thermostatic Heat Tape with Outer Wrap and Insulation

PIPE SIZE	APPLICATION TECHNIQUE — STRAIGHT: HEAT TAPE REQUIRED PER LINEAR FOOT OF PIPE	STRAIGHT: PROTECTION DOWN TO	SPIRALLED: HEAT TAPE REQUIRED PER LINEAR FOOT OF PIPE	SPIRALLED: PROTECTION DOWN TO
2"	12"	-6 F	26"	-55 F
2½"	12"	0 F	31"	-50 F
3"	12"	3 F	35"	-45 F
4"	12"	12 F	47"	-40 F
5"	12"	16 F	54"	-1 F

NOTE:
Spiralled applications are twisted around pipe 3 turns per linear foot of pipe.

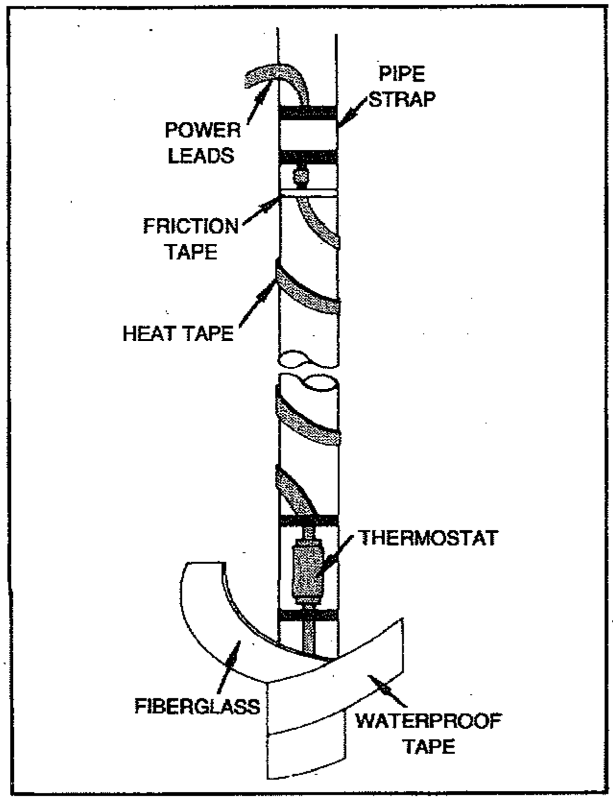


FIGURE 16 - Heat Tape Installation (Spiralled)

PNEUMATIC PIPING

Pneumatic piping is required for units with pneumatic-electric control systems. Tubing length between the receiver-controller and transmitter bulb should not exceed 300 feet when using 1/4-inch OD plastic or copper tubing. Also, the total length of tubing used to connect a gauge should not exceed 1000 feet. See Figure 17.

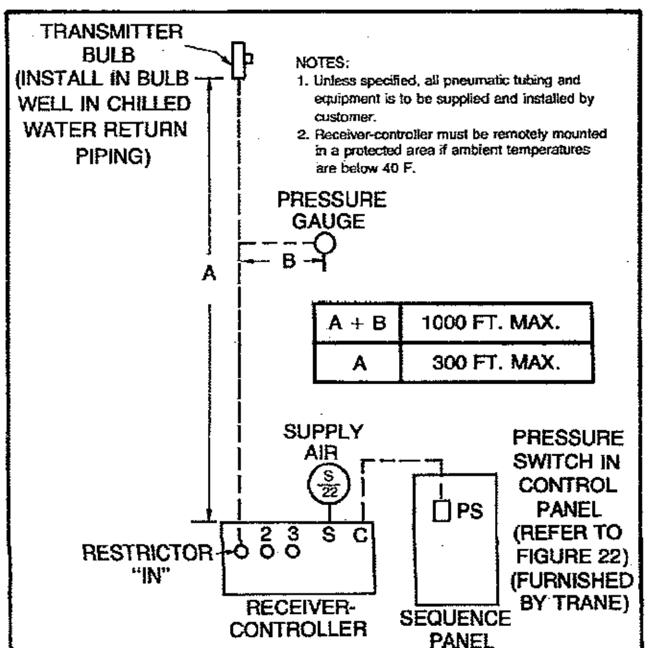


FIGURE 17 - Pneumatic Connections for Four-Step Pneumatic-Electric Temperature Control

When the transmitter is more than 300 feet from the receiver-controller, an external restrictor is required. The restrictor for the Number 1 input connection on the receiver-controller should be in the OUT position when used with an external restrictor. The restrictor cannot be more than 300 feet from the transmitter, but the receiver-controller may be a maximum of 1000 feet from the transmitter. Gauges may be placed anywhere in the transmission line, provided tubing length is not more than 1000 feet.

To complete the pneumatic connections, complete the following:

1. Insert the provided connectors on the fitting of the transmitter bulb and on Terminal 1 of the receiver controller.
2. Mount the receiver-controller, if it must be remotely mounted.

***NOTE:** When the pneumatic temperature controller-receiver and transmitter bulb are subject to ambient temperatures below 40 F, the receiver-controller must be remotely mounted in a protected space to prevent freezing of any moisture in the compressed air lines and controls.*

3. Place the transmitter bulb, in the well provided, in the chilled water return piping.
4. Using the pneumatic tubing provided, connect the transmitter bulb to Terminal 1 of the receiver controller. See Figure 17. Secure the tubing with clamps and sheet metal screws provided.
5. Connect a 22-psig air supply to Terminal S of the receiver-controller. If supply air exceeds 22 psig, install a reducing valve in the line. Average air consumption of the controller with one transmitting device is 95 scim.
6. Install an in-line air filter in the supply line to the receiver-controller.
7. Install pressure gauges in the main air supply line and the compressor air supply line.
8. Connect Terminal C to the pressure switch on the sequence panel used with 8-stage control systems.

***NOTE:** Always trim back pneumatic tubing that has been disconnected from a fitting or connector. Stretched tubing may result in leaks and faulty control.*

Because the transmitter bulb is a bleed-type instrument and there is airflow from the restrictor in the receiver-controller, a pressure drop may occur in the connecting tubing. The size of the pressure drop can be considered a function of the transmitter line pressure and the transmitter line length. This pressure drop should be checked and taken into consideration if excessive. See Figure 18.

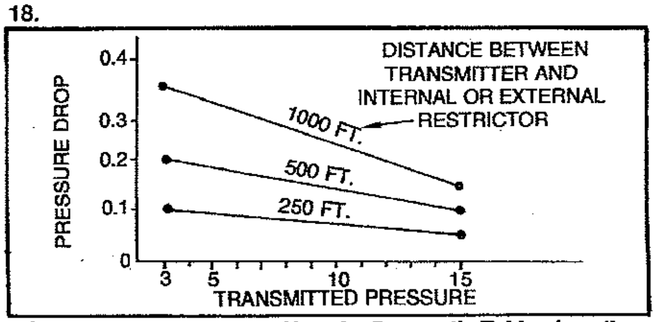


FIGURE 18 - Pressure Drop Chart for Pneumatic Tubing Length

ELECTRICAL WIRING

WARNING: DISCONNECT ELECTRICAL POWER SOURCE BEFORE COMPLETING WIRING CONNECTIONS TO THE UNIT. FAILURE TO DO SO MAY RESULT IN INJURY OR DEATH DUE TO ELECTRICAL SHOCK.

All wiring must comply with local and national electrical codes. The installer must provide system interconnection wiring and power supply wiring that is properly sized and supplied with appropriate fused disconnect switches. Type and location of fused disconnects should comply with all applicable codes.

Figures 19, 20 and 21 indicate location of electrical access points. Access for single-source power units is on top of the unit. Tables 5 through 12 provide minimum circuit ampacities, fuse sizes, and other electrical data.

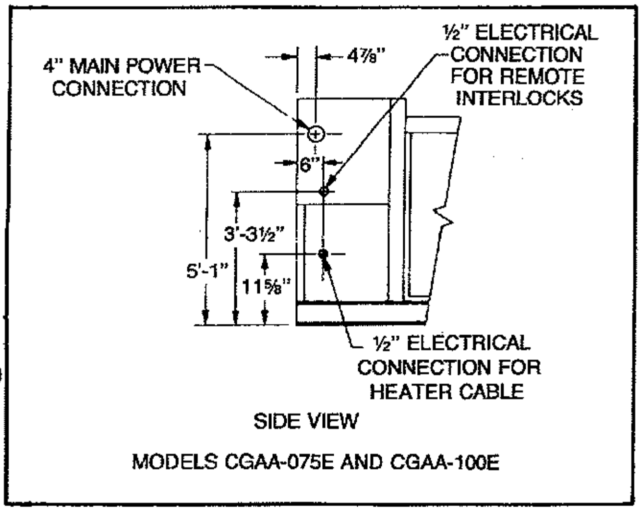


FIGURE 19 - Electrical Connection Access for Models CGAA-75E and CGAA-100E (Multiple-Point Power)

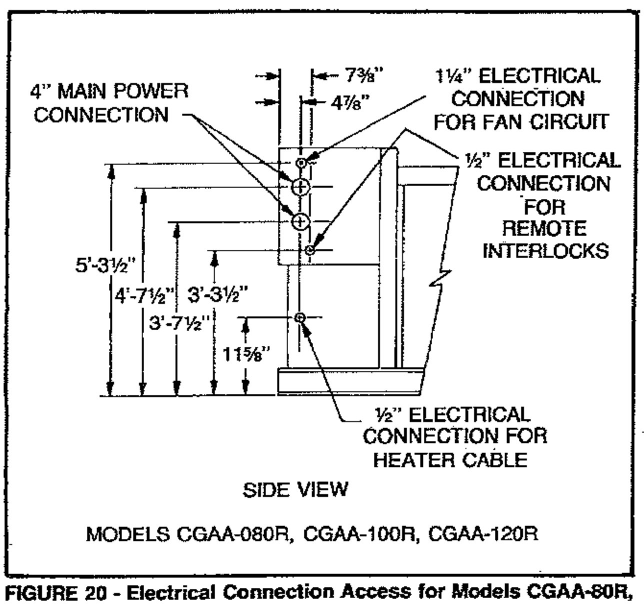


FIGURE 20 - Electrical Connection Access for Models CGAA-80R, CGAA-100R, and CGAA-120R (Multiple-Point Power)

CAUTION: Use copper conductors only. The use of other types of conductors may result in overheating or corrosion and resultant equipment failure.

SUPPLY POWER WIRING

Pump Supply Power

Provide supply power wiring with fused disconnect for the chilled water pump(s).

Unit Power (Single-Source)

If the unit is equipped with a single-source power panel and unit-mounted circuit breakers, run appropriately sized power wiring down through the top of the panel and connect it to the terminal block, as shown in Figure 21. Install necessary fused disconnects.

Unit Power (Separate-Source)

For units requiring separate-source power connections, provide properly sized power wiring with fused disconnects for each compressor. Models CGAA-80R, -100R, and -120R also require a separate fused power supply for the condenser fan circuit.

Run power wiring into the control panel as shown in Figure 21 and connect it to the appropriate terminal blocks, shown in Figure 22.

The weather-tight unit power fused disconnect switch(es) should be located in the general area of the unit to comply with NEC or local codes. The unit disconnect is not intended to be used as a normal shutdown device. Always shut the unit off by first opening the UNIT PUMPDOWN SWITCH (SW) and then opening the disconnect switch after the pumpdown cycle is complete.

Evaporator Heater Power

CAUTION: The evaporator heater (heat tape) must be energized before operating the unit or adding water to the chilled water system. Failure to do so may result in damage to the evaporator internal components or piping system due to low temperature conditions.

The evaporator shell is insulated from ambient air and is protected by a thermostatically controlled heat tape for operation during low ambient conditions. The thermostat energizes the heat tape when ambient temperature drops to approximately 38 F.

The installer must provide an independent power source with a fused disconnect switch to the evaporator heater junction box shown in Figures 19, 20, 21 and 23. Figure 23 also provides a connection schematic diagram. Wiring from the evaporator heat tape to the junction box is factory-completed.

Auxiliary Heat Tape Power

Provide power supply wiring with fused disconnect to any electrical heat tape installed on the system water piping during system construction. Refer to the Water Piping section of this manual for Heat Tape recommendations.

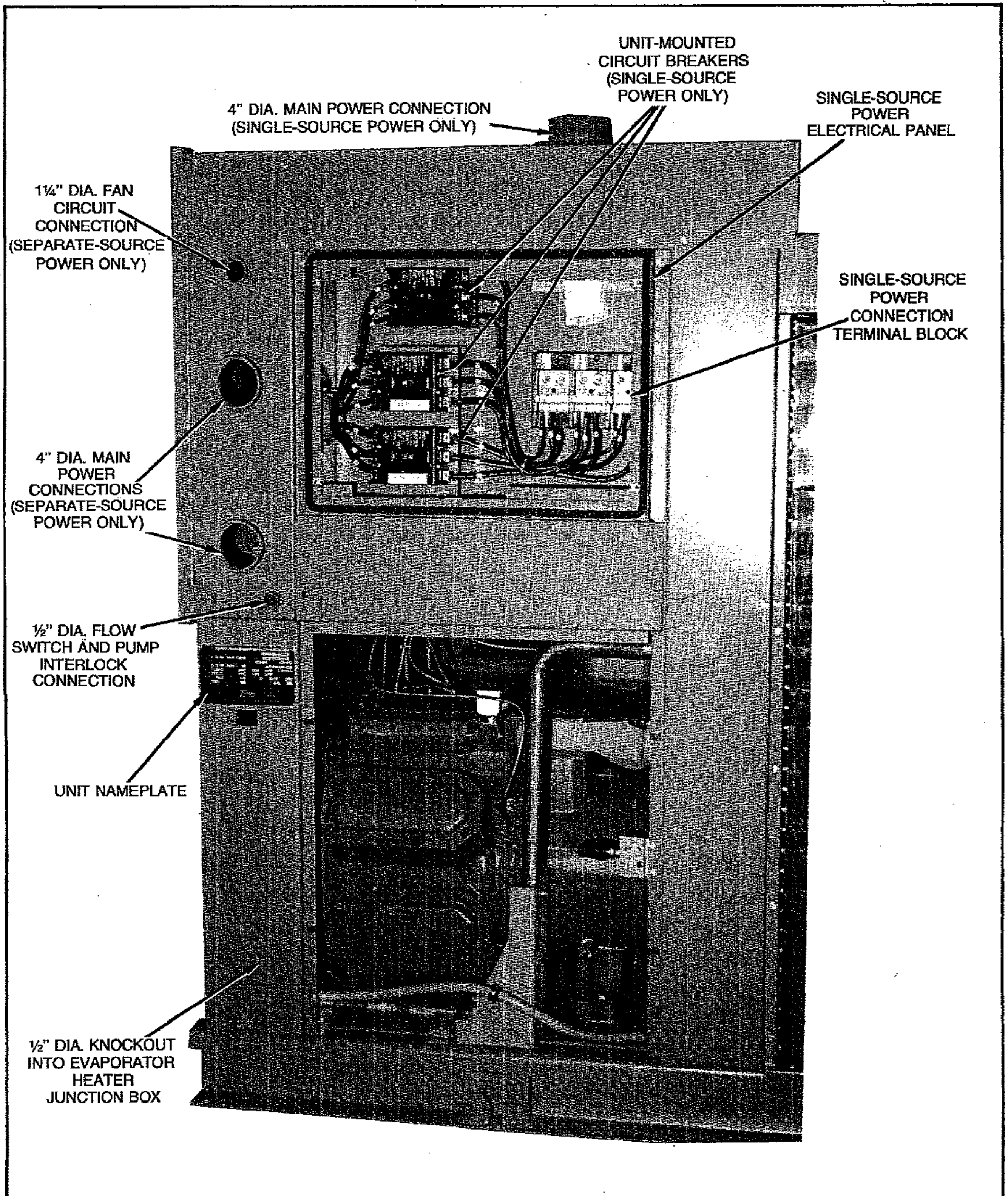


FIGURE 21 - Electrical Connection Locations for Model CGAA-120R (Single-Source or Separate-Source Power)

TABLE 5 - Electrical Data for Model CGAA-075, Model E Compressor, Single-Source Power (60 HZ)

RATED VOLTAGE	VOLTAGE UTILIZATION RANGE	EVAPORATOR MODEL	CONDENSER MODEL	COMPRESSOR MOTOR (3 PHASE) QTY	RLA (EA.)	LRA (EA.)	MINIMUM CIRCUIT AMPACITY (EA.)	MAX FUSE SIZE (EA.)	RECOMMENDED TIME DELAY FUSE SIZE (EA.)	CONDENSER FAN MOTORS (3 PHASE, 7.5 HP) QTY	FLA (EA.)
200	200-208	STD	STD	1	264.0	956	381	600	400	2	25.4
		OVERSIZE	STD		282.0		404	600	400	2	
		STD OVERSIZE	OVERSIZE OVERSIZE		282.0		429	700	450	3	
230	220-240	STD	STD	1	248.0	1100	354	600	400	2	22.0
		OVERSIZE	STD		254.0		362	600	400	2	
		STD OVERSIZE	OVERSIZE OVERSIZE		254.0		384	600	400	3	
460	440-480	STD	STD	1	124.0	550	177	300	200	2	11.0
		OVERSIZE	STD		127.0		181	300	200	2	
		STD OVERSIZE	OVERSIZE OVERSIZE		127.0		192	300	200	3	
575	550-600	STD	STD	1	101.0	400	145	225	150	2	9.0
		OVERSIZE	STD		101.0		145	225	150	2	
		STD OVERSIZE	OVERSIZE OVERSIZE		101.0		145	225	175	3	

NOTES:
1. This table applies to CGAA-075 E units of Design Sequence D, 60 HZ, single-source power supply only.
2. Refer to Digits 13 and 14 of the model number, and the model number description given on page 2 of this manual, to determine evaporator and condenser models.
3. Use copper conductors only.
4. Minimum circuit ampacity for the compressor is 125% of the compressor RLA, plus 100% of the condenser fans FLA, per NEC 440-33.
5. Maximum fuse size is 225% of the compressor RLA, plus the sum of the condenser fans FLA, per NEC 440-22.
6. Recommended time delay fuse size is approximately 150% of the compressor RLA, plus the sum of the condenser fans FLA, per NEC 440-22.
7. Compressor RLA (Rated Load Amps) is rated in accordance with UL Standard 465.
8. Compressor LRA (Locked Rotor Amps) is given in full winding.

TABLE 6 - Electrical Data for Model CGAA-100, Model E Compressor, Single-Source Power (60 HZ)

RATED VOLTAGE	VOLTAGE UTILIZATION RANGE	EVAPORATOR MODEL	CONDENSER MODEL	COMPRESSOR MOTOR (3 PHASE) QTY	RLA (EA.)	LRA (EA.)	MINIMUM CIRCUIT AMPACITY (EA.)	MAX FUSE SIZE (EA.)	RECOMMENDED TIME DELAY FUSE SIZE (EA.)	CONDENSER FAN MOTORS (3 PHASE, 7.5 HP) QTY	FLA (EA.)
200	200-208	STD	STD	1	342.0	1320	505	800	500	3	25.4
		UNDERSIZE OVERSIZE	STD		364.0		532	800	600	3	
		ALL	UNDERSIZE		364.0		506	800	500	2	
		ALL	OVERSIZE		364.0		532	800	600	3	
230	220-240	STD	STD	1	310.0	1520	454	700	500	3	22.0
		UNDERSIZE OVERSIZE	STD		328.0		476	800	500	3	
		ALL	UNDERSIZE		328.0		452	700	500	2	
		ALL	OVERSIZE		328.0		476	800	500	3	
460	440-480	STD	STD	1	155.0	760	227	350	250	3	11.0
		UNDERSIZE OVERSIZE	STD		164.0		238	400	250	3	
		ALL	UNDERSIZE		164.0		227	300	250	2	
		ALL	OVERSIZE		164.0		238	400	250	3	
575	550-600	ALL	STD	1	131.0	555	191	300	200	3	9.0
		ALL	UNDERSIZE		131.0		191	300	200	2	
		ALL	OVERSIZE		131.0		191	300	200	3	

NOTES:
1. This table applies to CGAA-100 E units of Design Sequence D, 60 HZ, single-source power supply only.
2. Refer to Digits 13 and 14 of the model number, and the model number description given on page 2 of this manual, to determine evaporator and condenser models.
3. Use copper conductors only.
4. Minimum circuit ampacity for the compressor is 125% of the compressor RLA, plus 100% of the condenser fans FLA, per NEC 440-33.
5. Maximum fuse size is 225% of the compressor RLA, plus the sum of the condenser fans FLA, per NEC 440-22.
6. Recommended time delay fuse size is approximately 150% of the compressor RLA, plus the sum of the condenser fans FLA, per NEC 440-22.
7. Compressor RLA (Rated Load Amps) is rated in accordance with UL Standard 465.
8. Compressor LRA (Locked Rotor Amps) is given in full winding.

TABLE 7 - Electrical Data for Model CGAA-080, Model R Compressors, Single-Source Power (60 HZ)

RATED VOLTAGE	VOLTAGE UTILIZATION RANGE	EVAPORATOR MODEL	CONDENSER MODEL	COMPRESSOR MOTORS (3 PHASE)					CONDENSER FAN MOTORS (3 PHASE, 7.5 HP)	
				QTY	RLA (EA.)	LRA (EA.)	MINIMUM CIRCUIT AMPACITY (EA.)	MAX FUSE SIZE (EA.)	QTY	FLA (EA.)
200	200-208	STD	STD	2	168.0	729	429	500	2	25.4
		OVERSIZE	STD		172.0		438	600	2	
		STD OVERSIZE	OVERSIZE OVERSIZE		172.0		463	600	3	
230	220-240	STD	STD	2	146.0	631	373	500	2	22.0
		OVERSIZE	STD		150.0		382	500	2	
		STD OVERSIZE	OVERSIZE OVERSIZE		150.0		404	500	3	
460	440-480	STD	STD	2	73.0	315	187	250	2	11.0
		OVERSIZE	STD		75.0		201	250	2	
		STD OVERSIZE	OVERSIZE OVERSIZE		75.0		202	250	3	
575	550-600	STD	STD	2	59.0	245	151	200	2	9.0
		OVERSIZE	STD		60.0		153	200	2	
		STD OVERSIZE	OVERSIZE OVERSIZE		60.0		162	200	3	

NOTES:
1. This table applies to CGAA-080 R units of Design Sequence D, 60 HZ, single-source power supply only.
2. Refer to Digits 13 and 14 of the model number, and the model number description given on page 2 of this manual, to determine evaporator and condenser models.
3. Use copper conductors only.
4. Minimum circuit ampacity for each compressor is 125% of the largest compressor RLA, plus 100% of the second compressor RLA, plus the sum of the condenser fans FLA, per NEC 440-33.
5. Maximum fuse size for each compressor is 225% of the largest compressor RLA, plus 100% of the second compressor RLA, plus the sum of the condenser fans FLA, per NEC 440-22.
6. Compressor RLA (Rated Load Amps) is rated in accordance with UL Standard 465.
7. Compressor LRA (Locked Rotor Amps) is given in full winding.

TABLE 8 - Electrical Data for Model CGAA-100, Model R Compressors, Single-Source Power (60 HZ)

RATED VOLTAGE	VOLTAGE UTILIZATION RANGE	EVAPORATOR MODEL	CONDENSER MODEL	COMPRESSOR MOTORS (3 PHASE)					CONDENSER FAN MOTORS (3 PHASE, 7.5 HP)	
				QTY	RLA (EA.)	LRA (EA.)	MINIMUM CIRCUIT AMPACITY (EA.)	MAX FUSE SIZE (EA.)	QTY	FLA (EA.)
200	200-208	STD	STD	2	187.0	910	497	600	3	25.4
		UNDERSIZE OVERSIZE	STD STD		194.0		513	700	3	
		ALL	UNDERSIZE		194.0		488	600	2	
		ALL	OVERSIZE		194.0		513	700	3	
230	220-240	STD	STD	2	162.0	792	431	500	3	22.0
		UNDERSIZE OVERSIZE	STD STD		168.0		444	600	3	
		ALL	UNDERSIZE		168.0		424	500	2	
		ALL	OVERSIZE		168.0		444	600	3	
460	440-480	STD	STD	2	81.0	396	216	250	3	11.0
		UNDERSIZE OVERSIZE	STD STD		84.0		222	300	3	
		ALL	UNDERSIZE		84.0		211	250	2	
		ALL	OVERSIZE		84.0		222	300	3	
575	550-600	STD	STD	2	65.0	315	174	225	3	9.0
		UNDERSIZE OVERSIZE	STD STD		68.0		180	225	3	
		ALL	UNDERSIZE		68.0		171	225	2	
		ALL	OVERSIZE		68.0		180	225	3	

NOTES:
1. This table applies to CGAA-100 R units of Design Sequence D, 60 HZ, single-source power supply only.
2. Refer to Digits 13 and 14 of the model number, and the model number description given on page 2 of this manual, to determine evaporator and condenser models.
3. Use copper conductors only.
4. Minimum circuit ampacity for each compressor is 125% of the largest compressor RLA, plus 100% of the second compressor RLA, plus the sum of the condenser fans FLA, per NEC 440-33.
5. Maximum fuse size for each compressor is 225% of the largest compressor RLA, plus 100% of the second compressor RLA, plus the sum of the condenser fans FLA, per NEC 440-22.
6. Compressor RLA (Rated Load Amps) is rated in accordance with UL Standard 465.
7. Compressor LRA (Locked Rotor Amps) is given in full winding.

TABLE 9 - Electrical Data for Model CGAA-120, Model R Compressors, Single-Source Power (60 HZ)

RATED VOLTAGE	VOLTAGE UTILIZATION RANGE	EVAPORATOR MODEL	CONDENSER MODEL	COMPRESSOR MOTORS (3 PHASE) QTY	RLA (EA.)	LRA (EA.)	MINIMUM CIRCUIT AMPACITY (EA.)	MAX. FUSE SIZE (EA.)	CONDENSER FAN MOTORS (3 PHASE, 7.5 HP) QTY	FLA (EA.)
200	200-208	STD	STD	2	228.0	990	589	800	3	25.4
		UNDERSIZE	STD		236.0		607	800	3	
		STD	UNDERSIZE							
		UNDERSIZE	UNDERSIZE							
230	220-240	STD	STD	2	198.0	860	512	700	3	22.0
		UNDERSIZE	STD		204.0		525	700	3	
		STD	UNDERSIZE							
		UNDERSIZE	UNDERSIZE							
460	440-480	STD	STD	2	99.0	430	256	350	3	11.0
		UNDERSIZE	STD		102.0		263	350	3	
		STD	UNDERSIZE							
		UNDERSIZE	UNDERSIZE							
575	550-600	STD	STD	2	80.0	346	207	250	3	9.0
		UNDERSIZE	STD		82.0		212	250	3	
		STD	UNDERSIZE							
		UNDERSIZE	UNDERSIZE							

NOTES:
1. This table applies to CGAA-120 R units of Design Sequence D, 60 HZ, single-source power supply only.
2. Refer to Digits 13 and 14 of the model number, and the model number description given on page 2 of this manual, to determine evaporator and condenser models.
3. Use copper conductors only.
4. Minimum circuit ampacity for each compressor is 125% of the largest compressor RLA, plus 100% of the second compressor RLA, plus the sum of the condenser fans FLA, per NEC 440-33.
5. Maximum fuse size for each compressor is 225% of the largest compressor RLA, plus 100% of the second compressor RLA, plus the sum of the condenser fans FLA, per NEC 440-22.
6. Compressor RLA (Rated Load Amps) is rated in accordance with UL Standard 465.
7. Compressor LRA (Locked Rotor Amps) is given in full winding.

TABLE 10 - Electrical Data for Model CGAA-080, Model R Compressors, Separate-Source Power (60 HZ)

VOLTAGE	VOLTAGE UTILIZATION RANGE	EVAP MODEL	COND MODEL	COMPRESSOR MOTORS (3 PHASE) QTY	RLA (EA.)	LRA (EA.)	MIN CKT AMP (EA.)	MAX FUSE SIZE (EA.)	REC TIME DELAY FUSE SIZE (EA.)	CONDENSER FAN MOTORS (3 PHASE, 7.5 HP) QTY	RLA (EA.)	MAX FUSE SIZE (EA.)	MIN CKT AMP (EA.)	CONTROL CKT (115V) MAX FUSE SIZE (EA.)	MIN CKT AMP (EA.)
200	200-208	STD	STD	2	168.0	729	210	350	250	2	25.4	125	61	125	61
		OVERSIZE	STD		172.0		215	350	250	2		125	61	125	61
		STD	OVERSIZE		172.0		215	350	250	3		150	86	150	86
		OVERSIZE	OVERSIZE												
230	220-240	STD	STD	2	146.0	631	183	300	200	2	22.0	110	58	110	58
		OVERSIZE	STD		150.0		188	300	200	2		110	53	110	53
		STD	OVERSIZE		150.0		188	300	200	3		125	75	125	75
		OVERSIZE	OVERSIZE												
460	440-480	STD	STD	2	73.0	315	92	150	100	2	11.0	50	27	50	27
		OVERSIZE	STD		75.0		94	150	100	2		50	27	50	27
		STD	OVERSIZE		75.0		94	150	100	3		60	38	60	38
		OVERSIZE	OVERSIZE												
575	550-600	STD	STD	2	59.0	245	74	125	80	2	9.0	45	22	45	22
		OVERSIZE	STD		60.0		75	125	80	2		45	22	45	22
		STD	OVERSIZE		60.0		75	125	80	3		50	31	50	31
		OVERSIZE	OVERSIZE												

NOTES:
1. This table applies to CGAA-080 R units of Design Sequence D, 60 HZ, separate-source power supply only.
2. Refer to Digits 13 and 14 of the model number, and the model number description given on page 2 of this manual, to determine evaporator and condenser models.
3. Use copper conductors only.
4. Minimum circuit ampacity for each compressor is 125% of the compressor RLA, per NEC 440-33.
5. Maximum fuse size for each compressor is 225% of the compressor RLA, per NEC 440-22.
6. Recommended time delay fuse size for each compressor is approximately 150% of the compressor RLA.
7. Minimum circuit ampacity for each condenser or control circuit is 125% of the largest fan motor FLA, plus 100% of the sum of the fan motors FLA, plus 125% of the control circuit amp draw, per NEC 430-25.
8. Maximum fuse size for each condenser or control circuit is 400% of one condenser fan FLA, plus the sum of the remaining fans FLA, plus the control circuit power, per NEC 430-52.
9. Compressor RLA (Rated Load Amps) is rated in accordance with UL Standard 465.
10. *Compressor LRA (Locked Rotor Amps) is given in full winding.*

TABLE 11 - Electrical Data for Model CGAA-100, Model R Compressors, Separate-Source Power (60 HZ)

				COMPRESSOR MOTORS (3 PHASE)						CONDENSER FAN MOTORS (3 PHASE, 7.5 HP)				CONTROL CKT (115V)	
VOLTAGE	VOLTAGE UTILIZATION RANGE	EVAP. MODEL	COND. MODEL	QTY	RLA (EA.)	LRA (EA.)	MIN CKT AMP (EA.)	MAX FUSE SIZE (EA.)	REC TIME DELAY FUSE SIZE (EA.)	QTY	RLA (EA.)	MAX FUSE SIZE (EA.)	MIN CKT AMP (EA.)	MAX FUSE SIZE (EA.)	MIN CKT AMP (EA.)
200	200-208	STD	STD	2	187.0	910	234	400	250	3	25.4	150	86	150	86
		UNDERSIZE UNDERSIZE	STD STD		194.0		243	400	250	3		150	86	150	86
		ALL	UNDERSIZE		194.0		243	400	250	2		125	61	125	61
		ALL	OVERSIZE		194.0		243	400	250	3		150	86	150	86
230	220-240	STD	STD	2	162.0	792	203	350	225	3	22.0	125	75	125	75
		UNDERSIZE OVERSIZE	STD STD		168.0		210	350	250	3		125	75	125	75
		ALL	UNDERSIZE		168.0		210	350	250	2		110	53	110	53
		ALL	OVERSIZE		168.0		210	350	250	3		125	75	125	75
460	440-480	STD	STD	2	81.0	396	102	175	100	3	11.0	60	38	60	38
		UNDERSIZE OVERSIZE	STD STD		84.0		105	175	125	3		60	38	60	38
		ALL	UNDERSIZE		84.0		105	175	125	2		50	27	50	27
		ALL	OVERSIZE		84.0		105	175	125	3		60	38	60	38
575	550-600	STD	STD	2	65.0	315	82	125	90	3	9.0	50	31	50	31
		UNDERSIZE OVERSIZE	STD STD		68.0		85	150	100	3		50	31	50	31
		ALL	UNDERSIZE		68.0		85	150	100	2		45	22	45	22
		ALL	OVERSIZE		68.0		85	150	100	3		50	31	50	31

NOTES:
1. This table applies to CGAA-100 R units of Design Sequence D, 60 HZ, separate-source power supply only.
2. Refer to Digits 13 and 14 of the model number, and the model number description given on page 2 of this manual, to determine evaporator and condenser models.
3. Use copper conductors only.
4. Minimum circuit ampacity for each compressor is 125% of the compressor RLA, per NEC 440-33.
5. Maximum fuse size for each compressor is 225% of the compressor RLA, per NEC 440-22.
6. Recommended time delay fuse size for each compressor is approximately 150% of the compressor RLA.
7. Minimum circuit ampacity for each condenser or control circuit is 125% of the largest fan motor FLA, plus 100% of the sum of the fan motors FLA, plus 125% of the control circuit amp draw, per NEC 430-25.
8. Maximum fuse size for each condenser or control circuit is 400% of one condenser fan FLA, plus the sum of the remaining fans FLA, plus the control circuit power, per NEC 430-52.
9. Compressor RLA (Rated Load Amps) is rated in accordance with UL Standard 465.
10. Compressor LRA (Locked Rotor Amps) is given in full winding.

TABLE 12 - Electrical Data for Model CGAA-120, Model R Compressors, Separate-Source Power (60 HZ)

				COMPRESSOR MOTORS (3 PHASE)						CONDENSER FAN MOTORS (3 PHASE, 7.5 HP)				CONTROL CKT (115V)	
VOLTAGE	VOLTAGE UTILIZATION RANGE	EVAP. MODEL	COND. MODEL	QTY	RLA (EA.)	LRA (EA.)	MIN. CKT AMP (EA.)	MAX. FUSE SIZE (EA.)	REC TIME DELAY FUSE SIZE (EA.)	QTY	RLA (EA.)	MAX. FUSE SIZE (EA.)	MIN CKT AMP (EA.)	MAX. FUSE SIZE (EA.)	MIN. CKT AMP (EA.)
200	200-208	STD	STD	2	228.0	990	285	500	300	3	25.4	150	86	150	86
		UNDERSIZE ALL	STD UNDERSIZE		236.0		295	500	350	3		150	86	150	86
230	220-240	STD	STD	2	198.0	860	248	400	250	3	22.0	125	75	125	75
		UNDERSIZE ALL	STD UNDERSIZE		204.0		255	450	300	3		125	75	125	75
460	440-480	STD	STD	2	99.0	430	124	200	125	3	11.0	60	38	60	38
		UNDERSIZE ALL	STD UNDERSIZE		102.0		128	225	250	3		60	38	60	38
575	550-600	STD	STD	2	80.0	346	100	175	110	3	9.0	50	31	50	31
		UNDERSIZE ALL	STD UNDERSIZE		82.0		103	175	110	3		50	31	50	31

NOTES:
1. This table applies to CGAA-120 R units of Design Sequence D, 60 HZ, separate-source power supply only.
2. Refer to Digits 13 and 14 of the model number, and the model number description given on page 2 of this manual, to determine evaporator and condenser models.
3. Use copper conductors only.
4. Minimum circuit ampacity for each compressor is 125% of the compressor RLA, per NEC 440-33.
5. Maximum fuse size for each compressor is 225% of the compressor RLA, per NEC 440-22.
6. Recommended time delay fuse size for each compressor is approximately 150% of the compressor RLA.
7. Minimum circuit ampacity for each condenser or control circuit is 125% of the largest fan motor FLA, plus 100% of the sum of the fan motors FLA, plus 125% of the control circuit amp draw, per NEC 430-25.
8. Maximum fuse size for each condenser or control circuit is 400% of one condenser fan FLA, plus the sum of the remaining fans FLA, plus the control circuit power, per NEC 430-52.
9. Compressor RLA (Rated Load Amps) is rated in accordance with UL Standard 465.
10. Compressor LRA (Locked Rotor Amps) is given in full winding.

LEGEND		LEGEND	
TDR1, TDR2, TDR3	TIME DELAY RELAY	HPC1, HPC2	HIGH PRESSURE CONTROL
TDR4, TDR5		CS1, CS2	COMPRESSOR CIRCUIT SWITCH
F1, F2, F3, F4, F5	FUSE	MP1, MP2	MOTOR PROTECTOR
F6, F7, F8, F9		TR1, TR2	ANTIRECYCLE TIMER
MC1, MC2, MC3, MC4	MOTOR CONTACTOR	RR1, RR2	CONTROL RELAY
CR1, CR2, CR3, CR4	CONTROL RELAY	OL1, OL2	OVERLOAD
TB1, TB2, TB3	TERMINAL BLOCK	LAR1	LOW AMBIENT RELAY
TS1, TS2, TS3	TERMINAL STRIP	FTC	FAN TEMPERATURE CONTROL
FC1, FC2, FC3	FAN CONTACTOR	CPT	CONTROL POWER TRANSFORMER
TC1, TC2, TC3	TEMPERATURE CONTROL	SS	SEQUENCE SWITCH
LPC1, LPC2	LOW PRESSURE CONTROL	SW	UNIT PUMP DOWN SWITCH
LATD1, LATD2	LOW AMBIENT TIME DELAY		

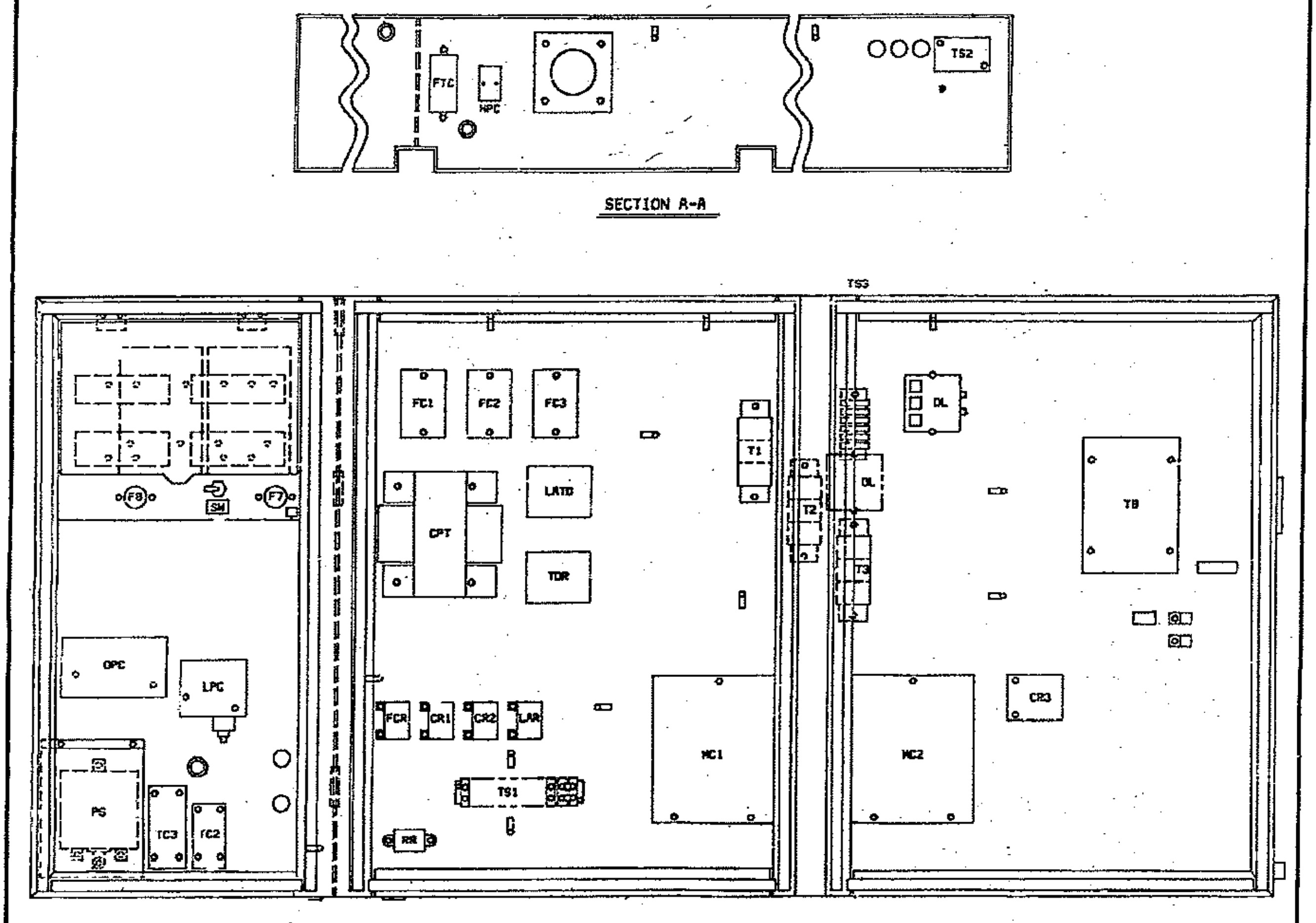


FIGURE 22 - Typical Control Panel for Separate-Source Connection (Model E Compressor Unit with Four-Step Pneumatic-Electric Control Shown)

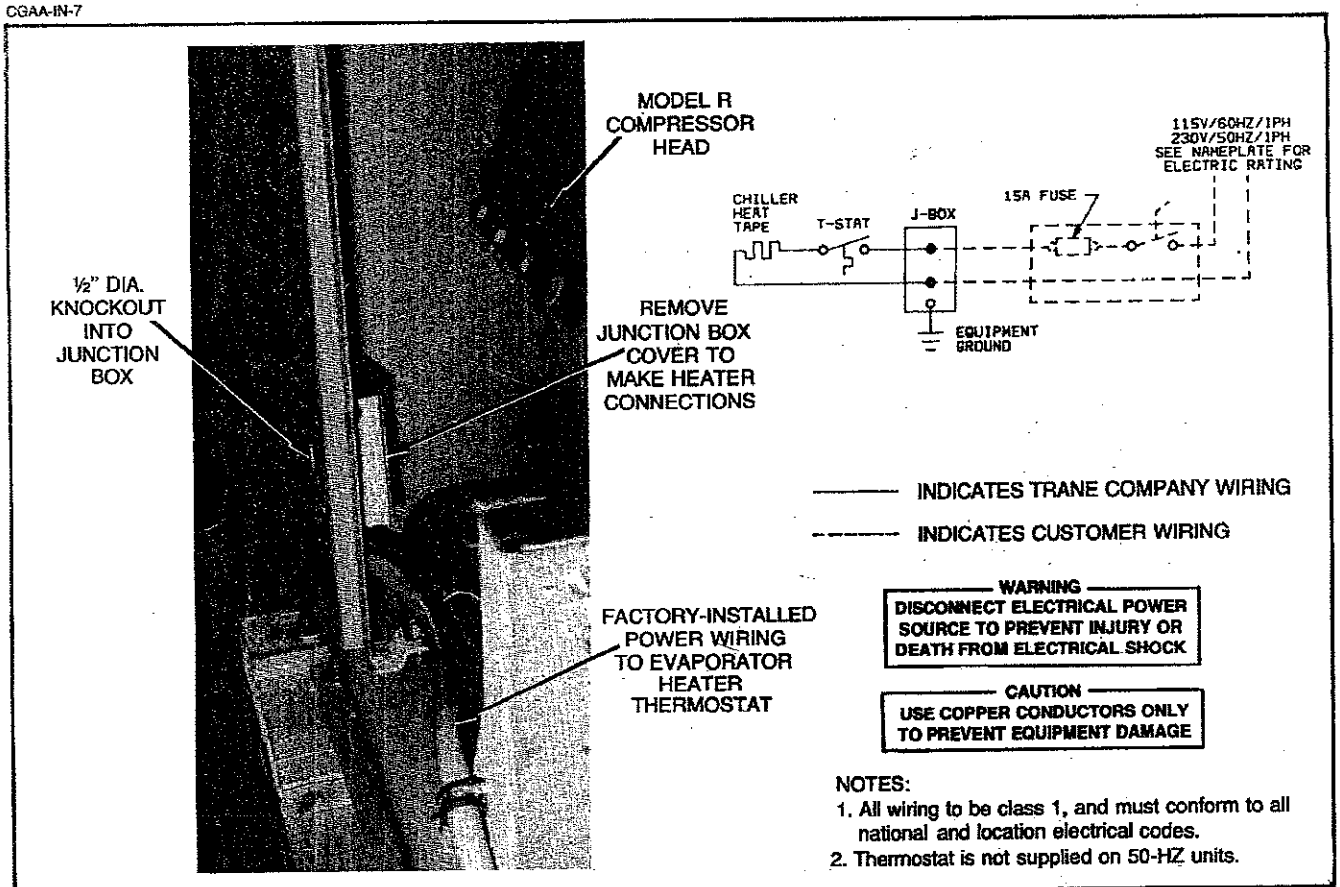


FIGURE 23 - Evaporator Heater Junction Box and Typical Wiring Diagram (Model CGAA-120R Shown)

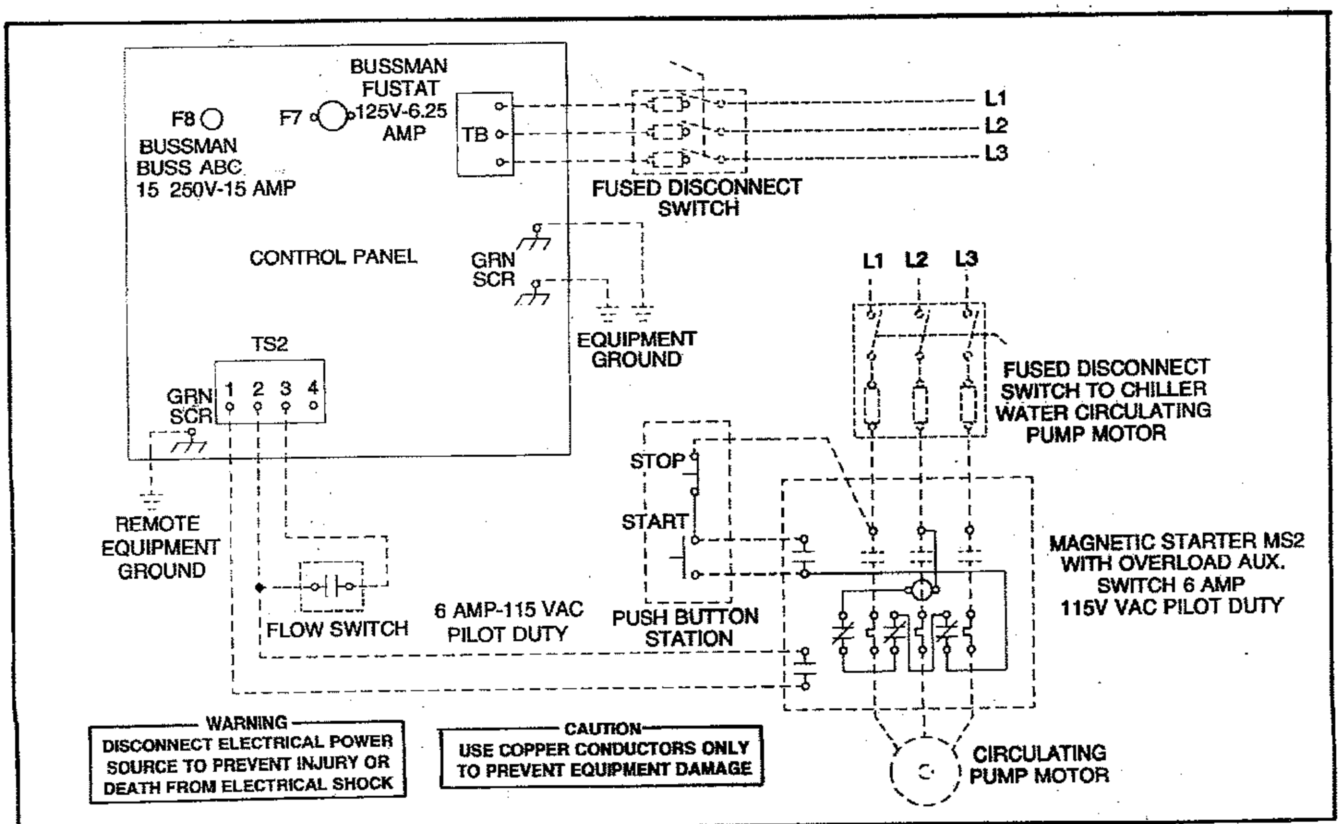


FIGURE 24 - Customer Connection Wiring Diagram for Models CGAA-075E and CGAA-100E

SYSTEM INTERCONNECTING WIRING

Circulating Pump Interlock

Provide interconnecting wiring from the chilled water pump and motor to the proper terminal strip in the unit control panel, as shown on the wiring diagrams supplied with the unit. Figures 24, 25 and 26 are typical connection diagrams. The water pump starter must have two normally-open auxiliary contacts. One contact is wired in parallel with the pump START pushbutton and the other is wired in series in the flow switch circuit, as shown.

Flow Switch Interlock

Install a flow switch in the evaporator water supply to avoid the possibility of evaporator freeze-up if water flow becomes restricted. The flow switch, an option available from Trane, should be set to stop compressor operation if return water flow to the evaporator drops below 50 percent of system design full flow rate. Provided interconnecting wiring between the unit control panel and the auxiliary contacts of the chilled water pump motor starter. Instructions are provided with the flow switch. Refer to Figures 24 through 26 for typical wiring diagrams.

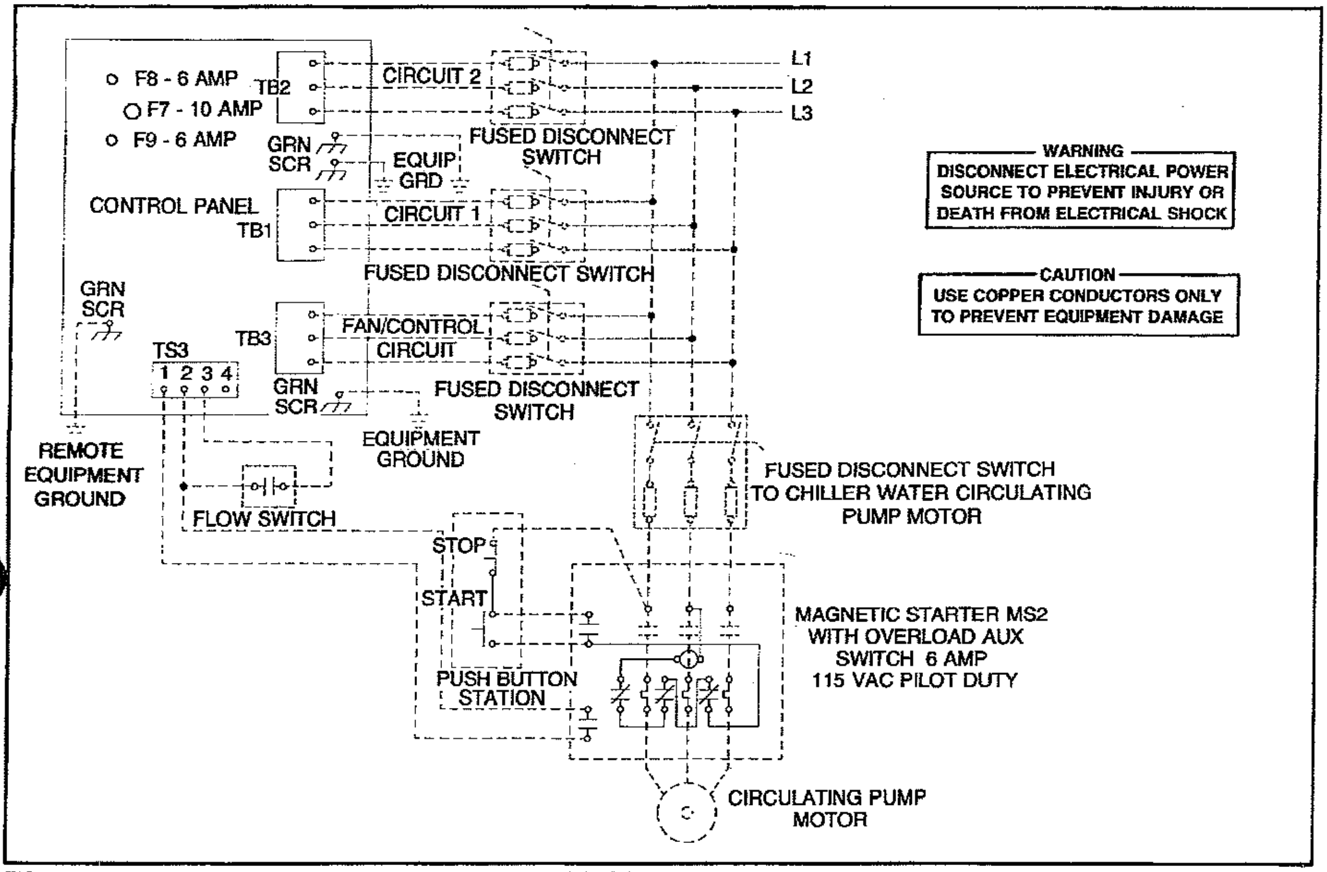


FIGURE 25 - Customer Connection Wiring Diagram for Models CGAA-080R, CGAA-100R, and CGAA-120R (Separate-Source Power)

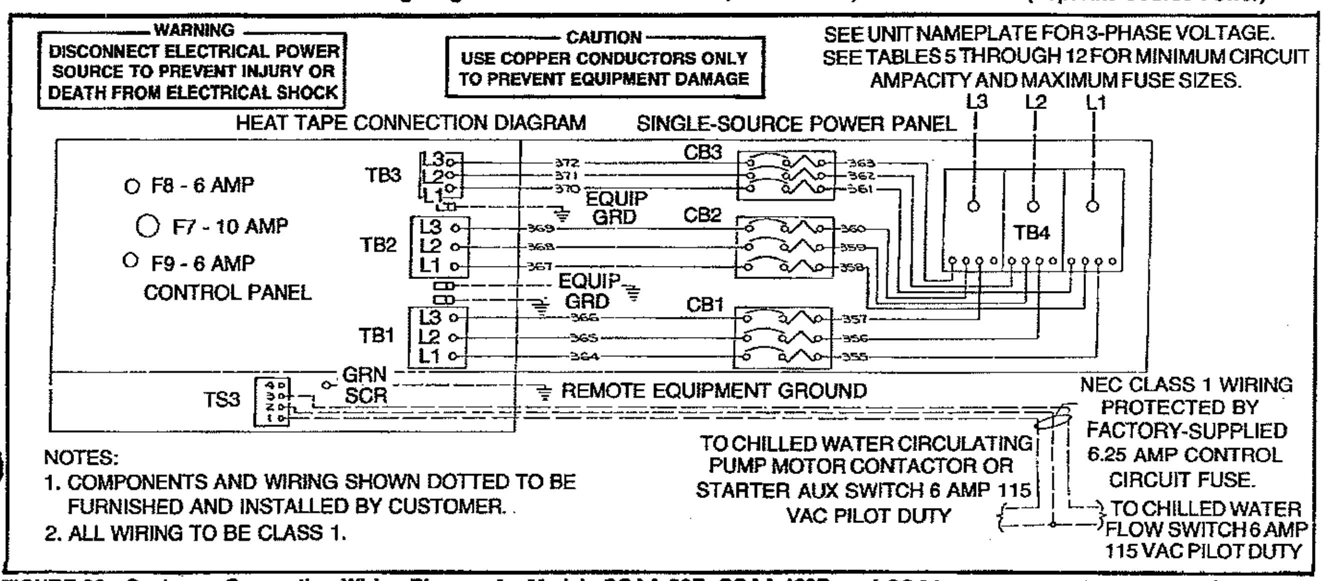


FIGURE 26 - Customer Connection Wiring Diagram for Models CGAA-80R, CGAA-100R, and CGAA-120R (Single-Source Power)

INSTALLATION CHECKLIST

Complete this checklist as the unit is installed to verify that all recommended installation procedures are accomplished before the unit is started. This checklist does not replace the detailed instructions given in the appropriate sections of this manual. Always read the entire service manual thoroughly before installing or servicing the unit.

WARNING: DISCONNECT ELECTRICAL POWER BEFORE INSPECTING THE UNIT. IF POWER MUST BE ON, EXERCISE EXTREME CAUTION NEAR ELECTRICAL WIRING. FAILURE TO DO SO MAY RESULT IN INJURY OR DEATH FROM ELECTRICAL SHOCK.

RECEIVING

- ☐ Unit nameplate data is checked against ordering information.
- ☐ Unit and components are inspected for shipping damage. Report shipping damage claims immediately to the delivering carrier.

NOTE: *Do not remove the shipping skid until the unit is at its final installation site.*

- ☐ Proper rigging and hoisting procedures are applied before lifting the unit, including lifting brackets and spreader bars.

MOUNTING

- ☐ Unit location is approved for required structural support, free air and service clearances, and drainage.
- ☐ Unit vibration isolators are positioned and secured.
- ☐ Unit isolators are level, with adequate clearance between housings. Shim if necessary.
- ☐ Unit is lifted and mounted in position on isolators.
- ☐ Unit is level. Adjust isolators, if necessary, for proper clearance.
- ☐ Compressor isolator shipping spacers are removed. Isolator pads are adjusted.

WATER PIPING

- ☐ Supply and return chiller piping is complete, with pressure gauges, vibration isolators, strainers, thermometers, balancing cock and shutoff valves.
- ☐ Load limit thermostat sensing bulb, if ordered, is installed in return piping.
- ☐ All piping is flushed and cleaned.

NOTE: *If an acidic cleaner is used, bypass the evaporator.*

- ☐ Circulating pump is installed and piped in.
- ☐ Proper water treatment is arranged to prevent formation of algae, scale, etc.
- ☐ Heat tape is applied on all exposed water piping. Freeze protection must be provided on all piping and in the water system if the unit will be operated in freezing temperatures.

NOTE: *Heat tape must be energized before adding water to the system during freezing temperatures.*

PNEUMATIC PIPING (PNEUMATIC-ELECTRIC CONTROL SYSTEM ONLY)

- ☐ Pneumatic piping is complete between transmitter bulb and controller-receiver, within tubing length limits.
- ☐ Pneumatic piping is complete between controller-receiver and pressure switch on the control panel, within tubing length limits.
- ☐ Main air is supplied to the controller-receiver (20 psig). Install a reducer if main air is greater than 22 psig.
- ☐ Pressure gauges are installed in main and compressor air supply tubing.
- ☐ Transmitter bulb (in its bulb well) is installed in return water piping.
- ☐ Controller-receiver is remotely mounted in a protected area if unit ambient temperatures could drop below 40 F.
- ☐ An in-line air filter is installed in the supply air line to the receiver-controller.

ELECTRICAL WIRING

- ☐ Supply power is routed to control panel terminal blocks and connected.
- ☐ Supply power (through fused disconnects) is routed to circulating pump.
- ☐ Supply power (through fused disconnects) is routed to the chiller heater junction box.
- ☐ Auxiliary heater tape is connected to supply power.
- ☐ Circulating pump and flow switch are interlocked with unit operation.
- ☐ Control power interconnecting wiring is complete.
- ☐ All terminal connections are secure.

START-UP

PREPARATION

Before starting the system for normal operation, check or complete the following items to ensure proper unit operation. Detailed instructions for some procedures follow this checklist.

☐ 1. Inspect all wiring connections. Connections should be tight and clean. Electrical routing should be as indicated on the wiring diagram provided on or with the unit.

☐ 2. Measure supply voltage and voltage phase balance at the compressor terminals. Voltage readings should be within the range given on the motor nameplate (usually 10 percent). Maximum voltage phase imbalance is 2 percent.

☐ 3. Measure megohm winding resistance.

☐ 4. Energize crankcase heaters by turning the unit switch (SW) to OFF and then turning supply power to ON. For dual compressor units, control switches CS1 and CS2 must also be on. Feel the compressors to verify heater operation. **The crankcase heaters must be energized for at least eight hours before unit start-up.**

CAUTION: Compressor crankcase heaters must be energized for at least 8 hours before normal operation of the unit. Failure to do so may result in severe damage to the compressor due to the presence of liquid refrigerant in the compressor.

☐ 5. Check condenser fans. The blades should move freely within the housing, in the proper direction of rotation, and should be securely attached to the shaft.

☐ 6. Check belt assembly sheave alignment.

☐ 7. Check condenser fan sheave setscrew torques. Tighten if necessary.

☐ 8. Check condenser fan belt tension. Belts should deflect approximately 1/2-inch under slight hand pressure. Tighten setscrews to the proper torques if belt tension is adjusted.

☐ 9. Check shaft bearing lubrication. If unit has been in storage for a long time, lubricate shaft and motor bearings. Motor lubrication recommendations are given in the unit Maintenance manual.

☐ 10. Check compressor oil level. Oil should be visible in the sightglass.

☐ 11. **Open compressor service discharge and suction valves.** On low-ambient units, open the liquid line access valve to open the circuit to low ambient dampers.

☐ 12. For pneumatic-electric control systems, turn on main air supply and check for air leaks.

☐ 13. Operate the chilled water pump briefly to check the entire circuit for leaks or blocked water flow. The system should already have been flushed. Stop the water pump immediately after the inspection.

☐ 14. Check the operation of solenoid valves, contactors, starters and control relays. The compressor motor leads should be disconnected for these checks.

☐ 15. Be sure all sensing bulbs are securely installed in their wells with heat transfer compound.

☐ 16. Set controls at their proper settings.

☐ 17. For low-ambient units, inspect damper blades for proper alignment, freedom from obstructions and free operation. If damper adjustment is required, adjust blades by holding them firmly in the closed position and sliding the operator to remove any slack in the actuating linkage.

☐ 18. Energize heat tape for all exposed piping.

☐ 19. Fill the water system. See Table 13 for capacities and flow rates.

☐ 20. Adjust the flow switch on the water inlet piping.

☐ 21. Check MCP settings on units with Model R compressors and Single-Source Power Option. See Table 14.

TABLE 13 - Evaporator Flow Rates and Liquid Capacities

UNIT MODEL	MINIMUM FLOW RATE (GPM)	MAXIMUM FLOW RATE (GPM)	LIQUID CAPACITY (GALS.)
CGAA-75E	96	280	45.0
CGAA-80R	96	280	45.0
CGAA-100E	120	350	52.0
CGAA-100R	120	350	52.0
CGAA-120R	144	420	60.0

NOTE:
Capacities are based on evaporator and unit piping.

TABLE 14 - MCP Trip Settings for Model R Compressors with Single-Source Power Option (60 HZ)

COMPRESSOR SIZES	RATED VOLTAGE	MCP1 SETTING	MCP2 SETTING	MCP3 SETTING
80	200	1250	1250	500
	230	1250	1250	500
	460	750	750	210
	575	750	750	210
100	200	2000	2000	725
	230	2000	2000	725
	460	750	750	320
	575	750	750	320
120	200	2000	2000	725
	230	2000	2000	725
	460	750	750	320
	575	750	750	320

VOLTAGE IMBALANCE

Voltage imbalance must not exceed 2 percent. Voltage imbalance is defined as 100 times the maximum deviation of the three phase voltages from the average, without regard to sign, divided by the average voltage. For example, if the three measured voltages are 221, 230 and 227, the average voltage would be 226, and the percent of voltage imbalance would be:

$$\frac{100 \times (226-221)}{2.2\%} = 2.2\%$$

In this case, 2.2 percent of voltage imbalance is not acceptable. Check the voltage readings at the disconnect switch to determine if the imbalance is present in the incoming power lines. If the imbalance is due to problems within the unit, check the unit electrical wiring connections.

COMPRESSOR MEGOHM RESISTANCE

To determine the insulation between each compressor motor winding and ground:

1. Open the unit electrical disconnect switch.
2. Remove the power leads from the compressor motor terminals.
3. Using a 500-volt megohm meter (motor megger), determine the resistance between each compressor motor terminal and ground. Place one of the test leads against bare metal, such as the suction or discharge line, and the other lead against one of the motor terminals.
4. Repeat step 3 for the other two terminals.

The readings on all terminal-ground combinations should be at least 1.0 megohms for 460-volt and higher motors; minimum readings for 230-volt motors and below is 0.5 megohms.

CAUTION: Do not meg or apply power to the windings of the compressor motor while it is in a vacuum. Damage to the motor windings may result.

SHEAVE ALIGNMENT

Before aligning the sheaves of belt-drive assemblies, check the fan and motor shafts to be sure they are level and in parallel. Recheck the shafts after the sheaves are aligned or belts are adjusted.

Check the fan and motor sheave alignment by placing a straightedge along the outside edges of both sheaves. See Figure 27. Adjust sheave alignment until the straightedge will touch the inside and outside edges of both sheaves. (A string, drawn tight, may be used in the same manner.) For uneven-width sheaves, place a string in the center groove of both sheaves and pull tight. Adjust the sheaves so that the string doesn't bend between sheaves.

Sheave alignment is adjusted by loosening the fan motor base mounting bolts and sheave setscrews, shown in Figure 27, and altering the fan motor base position until the sheaves are aligned.

When the sheaves are properly aligned, tighten all sheave setscrews and fan motor base mounting bolts to 65 inch/pounds.

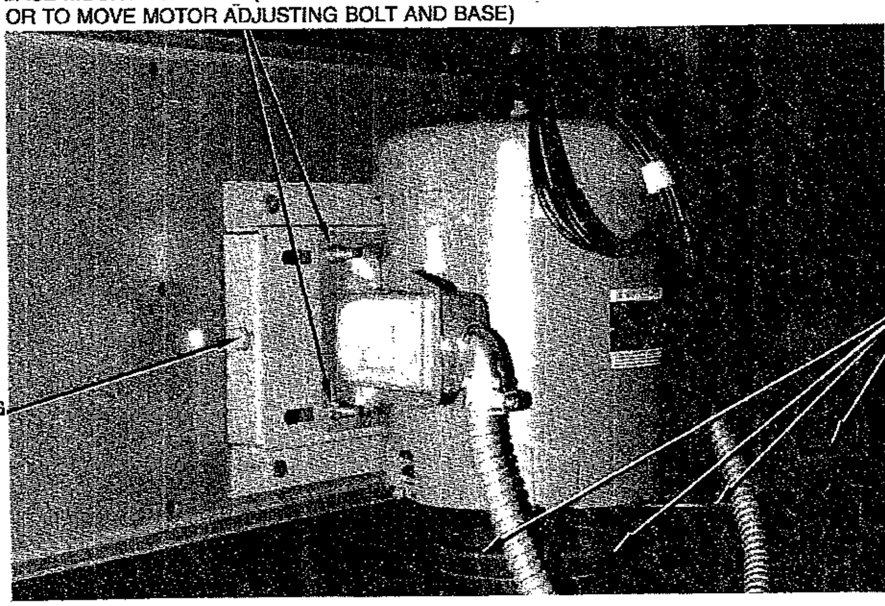


FIGURE 27 - Fan Belt Adjustment and Sheave Alignment

FAN BELT TENSION

NOTE: Fan belt tension should be checked at least twice during the first days of operation, since there is a rapid decrease in tension until belts are run in.

CAUTION: Do not over-tension the belts. Excessive tension will reduce fan and motor bearing life, accelerate belt wear and possibly cause shaft failure.

Proper belt tension is required to ensure maximum bearing and drive component life and is based on the fan brake horsepower requirement.

To measure belt tension, depress one belt with a belt tensioner and measure the belt's deflection, relative to the other belts or to the belt line. The instrument should provide a force reading and span reading, e.g., 9.6 pounds at 1/2-inch deflection. See Figure 28.

To determine proper belt tension, you must know:

1. Fan design brake horsepower per belt. (This is **not** motor horsepower.) Design bhp is given on the sales order.
2. Fan rpm. Fan rpm is given on the sales order.
3. Fan sheave pitch diameter. Pitch diameter is stamped on the sheave.
4. Type of belt cross-section. Cross-section type is stamped on the belt.

To calculate correct belt tension, use the following formula:

$$F = \frac{T + K}{16}$$

where:
F = force measured in pounds at a specific deflection,

K = constant determined by the belt cross-section type (given in Table 15),

$$T = \frac{24{,}750 \times (\text{fan hp per belt}), \text{ and}}{(\text{belt speed})}$$

$$\text{belt speed} = \frac{(\text{fan pitch diameter})}{12} \times$$

(pi or 3.14) x fan rpm (ft/min)

EXAMPLE

Fan sheave pitch diameter: 9.4 inches, three grooves
Fan brake horsepower: 18.5 bhp
Fan rpm: 1396
Belt type: BX
Sheave span: 17.1 inches

$$\text{Belt speed} = \frac{9.4}{12} \times 3.14 \times 1396 = 3435$$

$$T = \frac{24{,}750 \times (18.5 \text{ bhp}/3 \text{ belts})}{3435} =$$

$$\frac{24{,}750 \times 6.17}{3435} = 44.4 \text{ pounds}$$

$$F = \frac{44.4 + 18}{16} = 3.9 \text{ pounds}$$

$$D = \frac{\text{Belt span (inches)}}{64} = \frac{17.1}{64} =$$

0.27 = approximately 1/4-inch

Therefore, the belt tensioner should read 3.9 pounds (force) at 1/4-inch deflection. This will yield 44.4 pounds force belt tension.

Belt tensions determined by these formulas are minimum values. The correct operating tension for a V-belt drive is the lowest tension at which the belts will not slip under the peak load conditions. It may be necessary, however, to increase the tension of some drive to reduce excessive belt flopping or to reduce excessive start-up squealing.

CAUTION: Some noise at start-up is normal. Do not over-tension the belts. Excessive belt tension will reduce fan and motor bearings life, accelerate belt wear and possibly cause shaft failure.

To adjust fan belt tension, loosen the fan motor base mounting bolts, as shown in Figure 27, to move the motor adjusting bolt until tension is correct. Tighten bolts back up to 65 inch-pounds torque. Tighten sheave setscrews to 65 inch-pounds.

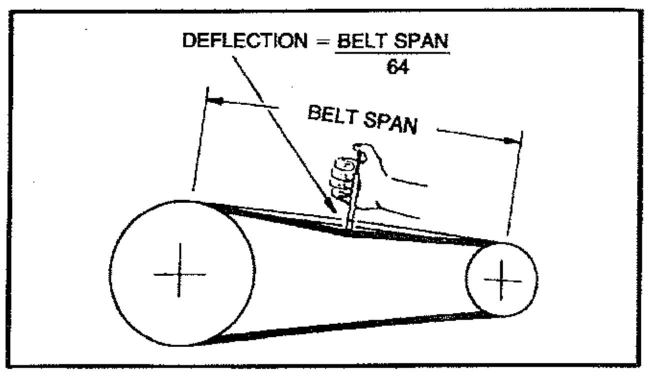


FIGURE 28 - Belt Tension Measurement

TABLE 15 - Values for K Factor (Belt Cross-Section Types)

BELT TYPE	A	B	C	D	E	3L	4L	5L	3V	5V	8V	AX	BX	CX	DX
"K" Factor	8	13	40	80	95	6	6	6	6	12	25	11	18	54	101

CONTROL SETTINGS

A typical control panel is illustrated in Figure 29. Set all adjustable controls to their required settings, as given in Table 16, or the instructions below. Design temperatures can be determined from the original sales order and must be known for the setting of controls. Refer to "Control Checks" in the TROUBLE ANALYSIS section of this manual for control checkout procedures.

Four-Stage Pneumatic-Electric Switch (PE1)

The direct-acting thermostat used with this system must be adjusted before start-up. To set the control, complete the following:

1. Place the setpoint dial at the midpoint of the design chilled water temperature range. EXAMPLE. If entering water temperature is 55 F, and leaving water temperature is 45 F, then dial setting is 50 F.

2. Set the proportional band at the difference in design entering and leaving water temperatures. See Figure 30. EXAMPLE: If entering water temperature is 55 F, and leaving water temperature is 45 F, then band setting is 10 F.

TABLE 16 - Control Settings

CONTROL TYPE	CONTROL SETTING CUT-OUT	CONTROL SETTING CUT-IN
TEMPERATURE CONTROL-TC1	2½ F Above Design Leaving-Water Temperature	
LOW TEMPERATURE CONTROL-TC2 AMBIENT THERMOSTAT-TC3	37 F	50 F
STANDARD	35 F	38 F
LOW AMBIENT	0 F	3 F
LOW PRESSURE CONTROL-LPC	45 psig	60 psig
FOUR-STAGE P-E THERMOSTAT SETPOINT DIAL	Midpoint of Design Water Temperature Range	
PROPORTIONAL BAND	Difference in Design Water Temperatures	
EIGHT-STAGE ELECTRIC THERMOSTAT	Midpoint of Design Water Temperature Range	

NOTE:
Ambient Thermostat TC3 is factory-set. If necessary, adjust setting to the minimum unit start-up temperature given in Table 17.

Ambient Thermostat (TC3)

Ambient control TC3 is factory set. However, if adjustment is necessary, setting should be the minimum unit start-up temperature, as given in Table 17.

Eight-Stage Electric Temperature Controller

This system is used only with the Trane Sequence Panel for controlling two units in parallel or in series. Set the control at the design chilled water temperature range midpoint. EXAMPLE: If design water temperature range is 10 F, entering water temperature is 55 F, and leaving water temperature is 45 F, then thermostat setting should be 50 F.

FLOW SWITCH ADJUSTMENT

With the chilled water pump operating, throttle water flow to the flow switch to approximately 50 percent fo full flow. Adjust the flow switch to open its contacts at this point. The compressor should stop. Refer to the wiring diagrams provided in this book or on the unit for flow switch interconnection.

PRESSURE GAUGES

NOTE: If the pressure gauge line kit is ordered as an option, the pressure gauges must also be ordered separately.

Discharge, suction and oil pressure gauges are available from Trane as optional equipment. Gauges are shipped in separate cartons in the control panel, and include a cloth bag with connectors and gaskets.

If ordered, pressure gauge lines from the compressor and controls extend to brackets mounted on the back of the control panel. A capped angle-type valve is installed on the end of each line. Each angle valve is labeled for DISCHARGE, SUCTION and OIL pressure. To install the gauges, complete the following:

1. Remove caps from the angle valves at the end of each line. See Figure 29.
2. Install connectors on the gauges.
3. Install each gauge and connector assembly on the angle valves. Be sure to fit flare gaskets provided between each angle valve and connector.
4. Close gauges off.

Gauges should be shut off from system pressure during normal unit operation.

TABLE 17 - Minimum Unit Start-Up Temperatures (Degrees F)

UNIT MODEL	STANDARD AMBIENT	STANDARD AMBIENT W/HOT GAS BYPASS	LOW AMBIENT	LOW AMBIENT W/HOT GAS BYPASS
75 E	30	40	0	10
80 R	30	40	0	10
100 E	30	40	0	10
100 R	30	40	0	10
120 R	25	35	0	10

NOTE:
Start-Up at minimum step of unloading. Minimum operating temperature is based on minimum compressor load and 5 mph wind across the condenser.

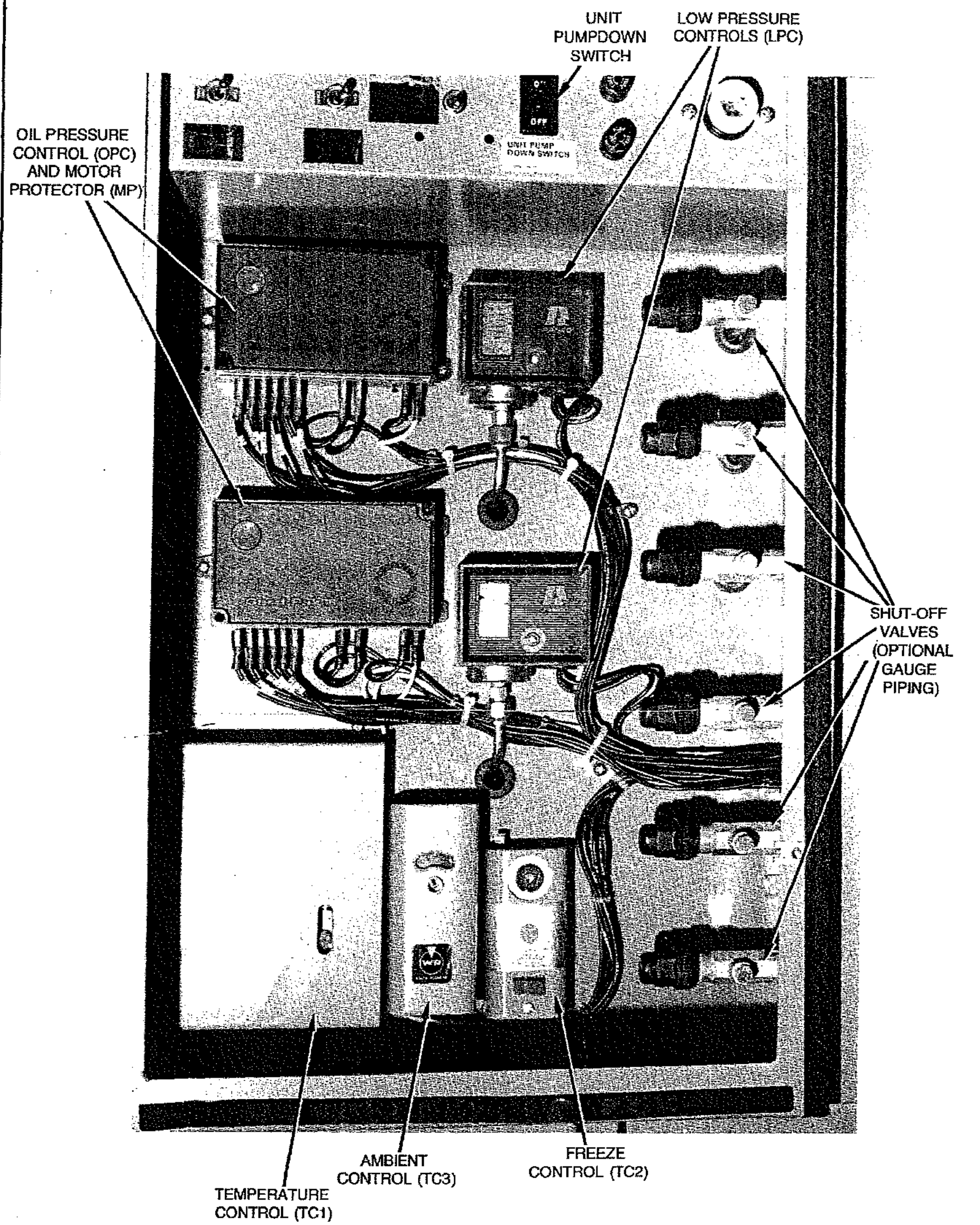


FIGURE 29 - Typical Control Panel (Dual Compressor Unit Shown)

START-UP PROCEDURE

After all start-up checks are complete, use the following procedure to start-up the unit for the first time:

1. Check the compressor service valves and liquid line valves to be sure they are open.

CAUTION: Compressor damage may occur from unit operation with closed service or liquid line valves.

2. Depress and release the reset buttons for the motor protector control (MP), oil pressure control (OP) and low temperature control (LTC).
3. Place the unit pumpdown switch (SW) in the OFF position.
4. On single-compressor units, close all unit disconnect switches. On duplex units, close all circuit switches and then close all unit disconnect switches.
5. Place all water and refrigerant valves in their operating position.
6. Start the chilled water pump.
7. Start unit operation by placing the unit pumpdown switch (SW) in the ON position.

   If the unit does not start, check each of the following:

   a. The chilled water temperature control must call for cooling.

   b. The control circuit to terminals 1 and 2 of TS3 in the control panel must be completed by the flow switch sensing a flow of chilled water. This circuit must also be completed through the auxiliary contacts of the chilled water pump starter.

   c. Ambient temperatures must be above the minimum start-up temperatures, given in Table 17.

   d. Condenser fan rotation must be correct. (Refer to Figure 44.)

   e. MCP settings must be correct. See Table 14.

8. After the unit has started, allow it to operate for at least 15 minutes to stabilize operating pressures. Then check compressor oil level, the liquid line sight glasses, oil pressure, evaporator pressure drop, suction and discharge pressures, superheat and subcooling. Procedures follow:

OIL LEVEL

Oil should be visible in the compressor, under full load, in the compressor oil level sight glass. The unit was charged with the proper amount of oil before shipping. No additional oil should be required. The proper oil level is marked on the compressor.

OIL PRESSURE

Oil pressure should be 20 to 30 psig higher than suction pressure on units with Model R compressors. Oil pressure should be 50 to 60 psig higher than suction pressure on units with Model E compressors.

LIQUID LINE SIGHT GLASS

Refrigerant flow in the sight glass should be clear without gas bubbles.

SUCTION AND DISCHARGE PRESSURES

Refer to Tables 18 through 22 for normal operating pressures.

TABLE 18 - Operating Data for Model CGAA-75E (Standard Units)

WATER TEMP. LEAVING EVAP(F)	AMBIENT TEMPERATURE																			
	75 F				85 F				95 F				105 F				115 F			
	GPM	SUBC (F)	SUCT PSIG	DISCH PSIG	GPM	SUBC (F)	SUCT PSIG	DISCH PSIG	GPM	SUBC (F)	SUCT PSIG	DISCH PSIG	GPM	SUBC (F)	SUCT PSIG	DISCH PSIG	GPM	SUBC (F)	SUCT PSIG	DISCH PSIG
40	172.9	17.9	58.5	203.8	163.0	17.6	59.2	232.4	152.7	17.1	59.9	263.7	142.2	16.6	60.7	297.7	131.5	15.9	61.4	334.5
42	178.8	18.1	60.8	205.9	168.5	17.7	61.5	234.7	158.1	17.3	62.3	266.1	147.3	16.7	63.1	100.2	136.3	16.1	63.9	337.2
44	184.7	18.2	63.1	208.1	174.2	17.9	63.9	237.0	163.5	17.4	64.7	268.6	152.5	16.9	65.5	302.8	141.2	16.2	66.3	340.0
46	190.6	18.4	65.5	210.3	179.9	18.0	66.3	239.4	168.9	17.5	67.1	271.0	157.7	17.0	68.0	305.5	146.1	16.3	68.8	342.8
48	196.7	18.5	67.9	212.6	185.7	18.1	68.7	241.7	174.5	17.7	69.6	273.6	162.9	17.1	70.5	308.1	151.1	16.5	71.4	345.6
50	202.8	18.6	70.4	214.8	191.6	18.3	71.2	244.1	180.1	17.8	72.1	176.1	168.3	17.2	73.1	310.9	156.1	16.6	74.0	348.5

NOTES:
1. Table is based on a Delta T through the evaporator (at full load) of 10 F.
2. GPM through the evaporator includes a fouling factor of .0005.
3. Discharge pressure may be given above high pressure control cut-out setting. These pressures are given for reference only.

TABLE 19 - Operating Data for Model CGAA-80R (Standard Units)

WATER TEMP. LEAVING EVAP(F)	AMBIENT TEMPERATURE																			
	75 F				85 F				95 F				105 F				115 F			
	GPM	SUBC (F)	SUCT PSIG	DISCH PSIG	GPM	SUBC (F)	SUCT PSIG	DISCH PSIG	GPM	SUBC (F)	SUCT PSIG	DISCH PSIG	GPM	SUBC (F)	SUCT PSIG	DISCH PSIG	GPM	SUBC (F)	SUCT PSIG	DISCH PSIG
40	186.3	18.6	57.3	211.8	175.2	18.2	58.0	240.5	163.7	17.7	58.9	271.7	151.7	17.1	59.7	305.5	139.1	16.5	60.6	341.9
42	192.7	18.8	59.5	214.4	181.4	18.4	60.3	243.2	169.6	17.9	61.1	274.6	157.3	17.3	62.0	308.5	144.3	16.6	63.0	345.0
44	199.2	18.9	61.7	216.9	187.7	18.5	62.5	245.9	175.6	18.0	63.4	277.5	162.9	17.4	64.4	311.5	149.6	16.7	65.4	348.2
46	205.7	19.0	64.0	219.5	194.0	18.6	64.9	248.7	181.7	18.1	65.8	280.4	168.7	17.5	66.8	314.6	155.0	16.8	67.9	351.4
48	212.3	19.2	66.3	222.1	200.4	18.7	67.2	251.5	187.8	18.2	68.2	283.3	174.5	17.6	69.3	317.7	160.5	16.9	70.4	354.7
50	219.0	19.3	68.7	224.8	206.8	18.8	69.7	254.3	193.9	18.3	70.7	286.3	180.4	17.7	71.8	320.8	166.1	17.0	72.9	358.0

NOTES:
1. Table is based on a Delta T through the evaporator (at full load) of 10 F.
2. GPM through the evaporator includes a fouling factor of .0005.
3. Discharge pressure may be given above high pressure control cut-out setting. These pressures are given for reference only.

TABLE 20 - Operating Data for Model CGAA-100E (Standard Units)

WATER TEMP LEAVING EVAP(F)	AMBIENT TEMPERATURE 75 F				85 F				95 F				105 F				115 F			
	GPM	SUBC (F)	SUCT PSIG	DISCH PSIG	GPM	SUBC (F)	SUCT PSIG	DISCH PSIG	GPM	SUBC (F)	SUCT PSIG	DISCH PSIG	GPM	SUBC (F)	SUCT PSIG	DISCH PSIG	GPM	SUBC (F)	SUCT PSIG	DISCH PSIG
40	215.9	19.5	55.5	223.8	203.8	19.0	56.3	253.6	191.1	18.5	57.2	285.9	177.6	17.9	58.1	320.7	163.4	17.2	59.1	358.3
42	222.8	19.6	57.6	226.5	210.4	19.1	58.4	256.4	197.3	18.6	59.4	288.9	183.4	18.0	60.3	323.9	168.9	17.3	61.4	361.7
44	229.7	19.7	59.8	229.2	217.0	19.2	60.7	259.3	203.5	18.7	61.6	291.9	189.3	18.1	62.7	327.1	174.4	17.4	63.8	365.1
46	236.8	19.7	62.0	232.0	223.7	19.3	62.9	262.3	209.8	18.8	63.9	295.0	195.3	18.1	65.0	330.4	180.0	17.4	66.2	368.6
48	243.9	19.8	64.2	234.9	230.4	19.4	65.2	265.3	216.2	18.8	66.3	298.2	101.3	18.2	67.4	333.8	185.6	17.5	68.6	372.2
50	251.0	19.9	66.5	237.8	237.2	19.4	67.6	278.3	222.6	18.9	68.7	301.4	207.3	18.2	69.9	337.2	191.3	17.5	71.1	375.9

NOTES:

1. Table is based on a Delta T through the evaporator (at full load) of 10 F.
2. GPM through the evaporator includes a fouling factor of .0005.
3. Discharge pressure may be given above high pressure control cut-out setting. These pressures are given for reference only.

TABLE 21 - Operating Data for Model CGAA-100R (Standard Units)

WATER TEMP LEAVING EVAP(F)	AMBIENT TEMPERATURE 75 F				85 F				96 F				105 F				115 F			
	GPM	SUBC (F)	SUCT PSIG	DISCH PSIG	GPM	SUBC (F)	SUCT PSIG	DISCH PSIG	GPM	SUBC (F)	SUCT PSIG	DISCH PSIG	GPM	SUBC (F)	SUCT PSIG	DISCH PSIG	GPM	SUBC (F)	SUCT PSIG	DISCH PSIG
40	220.3	19.6	55.3	226.0	206.4	19.2	56.3	255.4	191.9	18.7	57.3	287.2	177.0	18.1	58.3	321.6	161.7	17.4	59.3	358.7
42	227.4	19.7	57.4	228.8	213.2	19.3	58.4	258.3	198.4	18.7	59.4	290.4	183.3	18.1	60.5	325.0	167.9	17.4	61.6	362.3
44	234.6	19.8	59.6	231.6	220.0	19.3	60.6	261.3	205.1	18.8	61.7	293.5	189.8	18.2	62.8	328.4	174.3	17.5	63.9	366.0
46	241.8	19.8	61.8	234.5	226.9	19.4	62.9	264.3	211.7	18.9	64.0	296.7	196.3	18.2	65.1	331.8	180.7	17.5	66.3	369.8
48	249.0	19.9	64.0	237.4	233.9	19.5	65.1	267.4	218.5	19.9	66.3	300.0	202.9	18.3	67.5	335.4	187.4	17.5	68.6	373.8
50	256.3	19.9	66.3	240.3	240.9	19.5	67.5	270.5	225.3	19.0	68.7	303.3	209.7	18.3	69.9	339.0	194.2	17.5	71.1	377.8

NOTES:

1. Table is based on a Delta T through evaporator (at full load) of 10 F.
2. GPM through the evaporator includes a fouling factor of .0005.
3. Discharge pressure may be given above high pressure control cut-out setting. These pressures are given for reference only.

TABLE 22 - Operating Data for CGAA-120R (Standard Units)

WATER TEMP LEAVING EVAP(F)	AMBIENT TEMPERATURE 75 F				85 F				95 F				105 F				115 F			
	GPM	SUBC (F)	SUCT PSIG	DISCH PSIG	GPM	SUBC (F)	SUCT PSIG	DISCH PSIG	GPM	SUBC (F)	SUCT PSIG	DISCH PSIG	GPM	SUBC (F)	SUCT PSIG	DISCH PSIG	GPM	SUBC (F)	SUCT PSIG	DISCH PSIG
40	274.4	18.0	55.2	226.1	257.9	17.9	56.1	254.8	240.9	17.6	57.0	286.2	223.4	17.2	58.0	320.2	205.3	16.7	59.0	357.2
42	282.6	18.1	57.4	228.8	265.8	17.9	58.3	257.7	248.4	17.7	59.3	289.2	230.5	17.3	60.3	323.4	212.1	16.8	61.3	360.5
44	290.9	18.1	59.6	231.6	273.7	18.0	60.5	260.2	256.0	17.7	61.5	292.2	237.7	17.3	62.6	326.6	219.0	16.8	63.7	363.9
46	299.2	18.2	61.8	234.4	281.6	18.0	62.8	264.5	263.6	17.8	63.9	295.3	245.1	17.4	65.0	329.8	226.1	16.8	66.1	367.3
48	307.5	18.2	64.1	237.3	289.6	18.1	65.1	266.5	271.3	17.8	66.2	298.4	252.5	17.4	67.4	333.1	233.3	16.8	68.5	370.9
50	315.8	18.2	66.4	240.1	297.7	18.1	67.5	269.5	279.1	17.8	68.7	301.5	260.1	17.4	69.8	336.4	240.8	16.9	71.0	374.5

NOTES:

1. Table is based on a Delta T through evaporator (at full load) of 10 F.
2. GPM through the evaporator includes a fouling factor of .0005.
3. Discharge pressure may be given above high pressure control cut-out setting. These pressures are given for reference only.

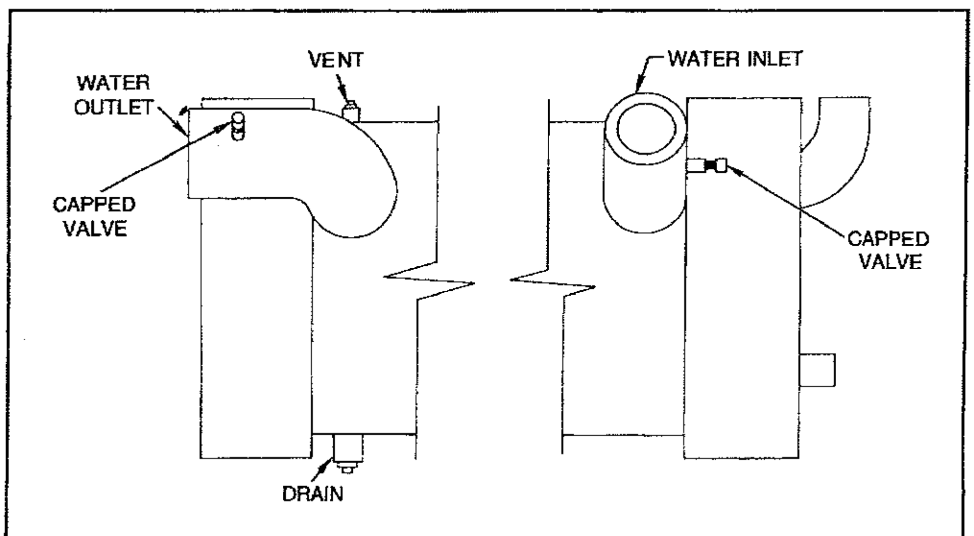


FIGURE 30 - Chiller Headers with Capped Valves

CHILLED WATER PRESSURE DROP

Capped valves are provided at the chiller supply and return headers, as shown in Figure 30, and may be used to determine actual water pressure drop across the evaporator (chiller). Pressure drop curves are given in Figure 31. Valve connection size for the capped valves is 1/4-inch SAE flared.

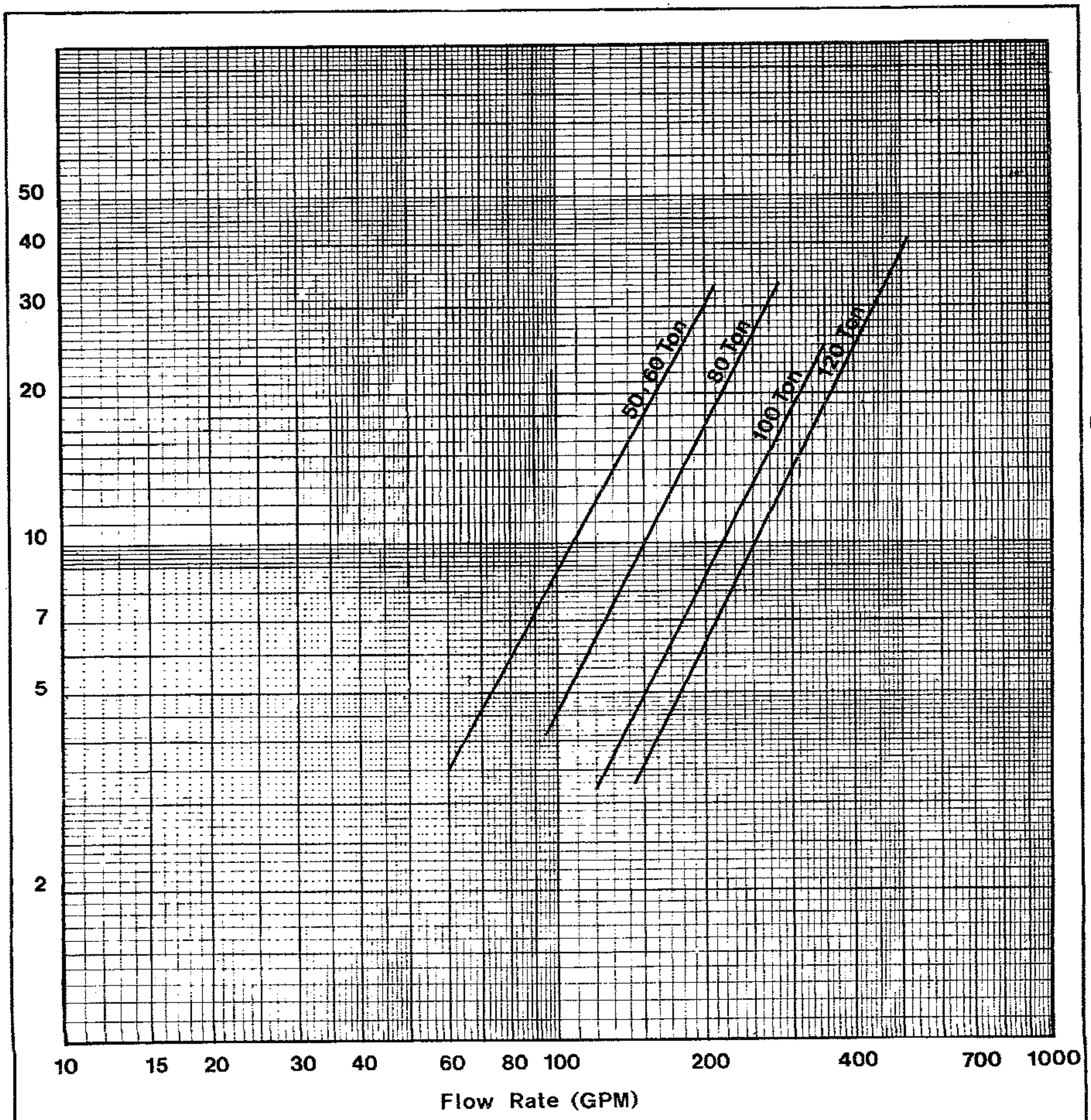


FIGURE 31 - Evaporator Pressure Drop Chart

THERMOSTATIC EXPANSION VALVE ADJUSTMENT

The importance of proper suction gas superheat cannot be overemphasized. Accurate superheat measurements should be taken with other trouble analysis procedures to monitor refrigerant flow, coil efficiency and compressor protection. **The recommended setting range for superheat on Trane equipment is 12 to 15 degrees F.** (A measurement error of 2 to 5 F can be expected within this range.)

Instruments

Because of the importance and sensitivity of superheat measurement and adjustment, the gauges used to measure suction pressure should be of the best quality available. Gauges that are permanently installed on the equipment should not be used. Trane recommends a good quality gauge on a standard refrigerant manifold set. To measure suction temperature, an electronic temperature tester is sufficient. Available manufacturers include Robinnaire, Annie, and Thermal.

Measurement

In order to determine suction gas superheat, the pressure at the evaporator outlet must be measured and converted to saturated vapor temperature. Use a Refrigerant-22 pressure/temperature conversion chart to convert pressure (psig) to temperature (degrees F). The computed saturated vapor temperature is then subtracted from the actual suction temperature, which is also measured on the suction line at the expansion valve sensing bulb location. The difference between these two temperature readings is the suction gas superheat reading.

***NOTE:** If a pressure tap is not provided at the thermal expansion valve sensing bulb location, suction pressure may be measured at the compressor, if suction line pressure loss is added to the compressor pressure reading. Suction pressure at the compressor plus estimated suction line pressure loss equals an estimate of suction pressure at the thermal expansion valve sensing bulb location.*

To determine actual superheat complete the following:

1. Cut the suction line insulation to gain access to the suction line at the sensing bulb. If Armaflex insulation is used, slit the insulation for the length of the temperature sensor.
2. Clean the line carefully and attach the electronic temperature sensor. Make ure the sensor is making good contact with the tube. Black electrical tape may be used to prevent sensor contact with ambient air.

***NOTE:** For accurate measurement, the temperature sensor **must** be properly installed and insulated. Make sure that the insulation covers the sensor completely and seal all connections to the pipe to keep ambient air from affecting the temperature readings.*

3. Install the pressure gauge to monitor suction pressure at the expansion valve sensing bulb location. If no pressure tap is provided, install the pressure gauge at the compressor and estimate the suction line pressure loss between the compressor and sensing bulb.
4. Operate the system for approximately 10 to 15 minutes in order for the expansion valve to stabilize.
5. To calculate superheat from pressure and temperature readings, compare the actual vapor temperature of the refrigerant as converted from the suction pressure reading (plus suction line pressure loss, if applicable) to the suction temperature measured by the electronic tester. Recommended superheat is 12 to 15 degrees F. See the examples given below.

EXAMPLE (R-22)

SUCTION PRESSURE = 66.0 psig (measured at expansion valve sensing bulb)
SUCTION TEMPERATURE = 52 F
SUCTION PRESSURE CONVERTED TO SATURATED VAPOR TEMPERATURE = 38 F
SUCTION SUPERHEAT = 52-38 = 14 F (within recommended range)

Adjustment

To increase the superheat reading, turn the adjusting stem of the expansion valve clockwise to close the valve and to limit the amount of refrigerant flowing into the evaporator. **Adjustment should be made at one-half turn at a time.** See Figure 32. To decrease the superheat reading, increase refrigerant flow to the evaporator. Continue with tests and adjustments, one-half turn at a time, until an acceptable reading is obtained. Allow the system to re-stabilize for 10 minutes after each adjustment.

***NOTE:** Incorrect superheat readings may be due to plugged filters or blocked refrigerant flow. Before making major adjustments to the expansion valve, check refrigerant level and filter/driers to ensure proper flow.*

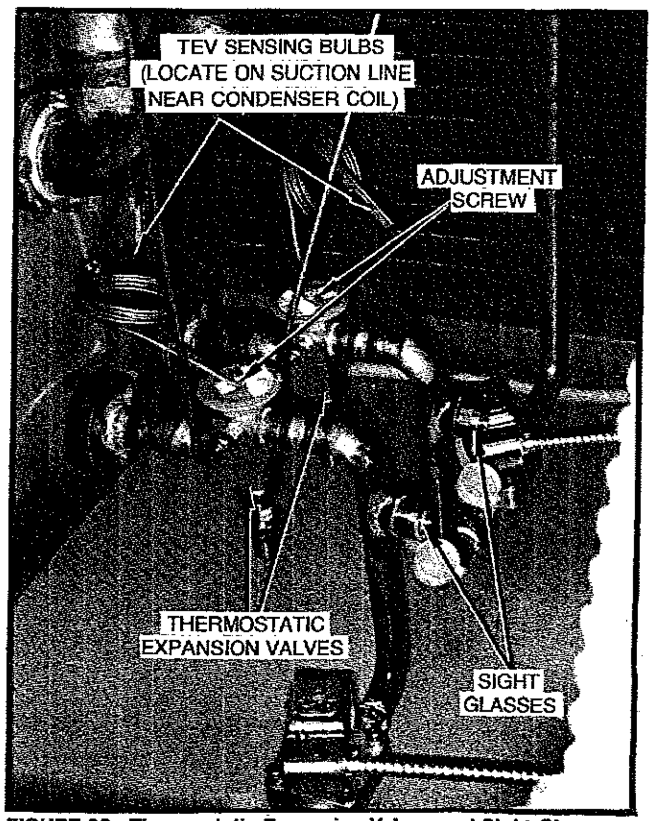


FIGURE 32 - Thermostatic Expansion Valves and Sight Glasses

SUBCOOLING MEASUREMENT

The proper setting range for liquid subcooling is 14 to 19 F. Determine the level of system subcooling as follows:

1. Measure the liquid line pressure at the liquid line access valve.
2. Convert this pressure reading to a saturated temperature F by using Table 23.
3. Measure the actual liquid line temperature on the liquid line close to the access valve. To ensure an accurate reading, clean the line thoroughly where the electronic temperature sensor will be attached. After securing the sensor to the line, wrap the sensor and line with insulation to prevent contact with ambient air.
4. Subtract the actual liquid line temperature (measured in step 3) from the saturated liquid temperature (calculated in step 2).

If the system is properly charged, subcooling at the liquid line access valve should be 14 to 19 F.

TABLE 23 - Pressure/Temperature Conversion Chart For Measuring Superheat and Subcooling (R-22)

TEMPERATURE (DEGREES F)	SUCTION PRESSURE (PSIG)	TEMPERATURE (DEGREES F)	SUCTION PRESSURE (PSIG)
0	23.961	80	143.63
2	25.613	82	148.47
4	27.318	84	153.22
6	29.079	86	158.17
8	30.895	88	163.23
10	32.768	90	168.40
12	34.700	92	173.67
14	36.691	94	179.06
16	38.742	96	184.56
18	40.855	98	190.18
20	43.031	100	195.91
22	45.271	102	201.76
24	47.576	104	207.72
26	49.948	106	213.81
28	52.387	108	220.02
30	54.895	110	226.57
32	57.473	112	232.80
34	60.122	114	239.38
36	62.844	116	246.10
38	65.640	118	252.94
40	68.510	120	259.91
42	71.457	122	267.01
44	74.481	124	274.25
46	77.584	126	281.63
48	80.767	128	289.14
50	84.03	130	296.80
		132	304.60
		140	337.2
		150	381.5

NOTE:
Apply an altitude correction table for high-altitude applications.

CONTROL CHECKOUT

See Table 25 for control settings and setpoints.

FOUR-STAGE ELECTRIC THERMOSTAT (TC1)

To check the operation of the Four-Stage Electric Thermostat, complete the following:

1. Place the control bulb and an accurate thermometer in a container of water. Water temperature should be at least 5 degrees F below the control setting.
2. Disconnect compressor from operation:
   a. On single-compressor (simplex) units, remove the wires from the relay of the temperature controller.
   b. On duplex units, open the circuit switches.
3. Start the system.
4. Raise the temperature of the water in the container to the setpoint of the control. At this temperature, the first set of control contacts should close.
5. Raise the temperature of the water in the container an additional 2-1/2 to 3 degrees F. The second control contacts should close.
6. Raise the temperature of the water an additional 2-1/2 to 3 degrees F. The third control contacts should close.
7. Raise the temperature of the water in the container an additional 2-1/2 to 3 degrees F. The fourth control contacts should close.
8. Lower the water temperature by increments to break the control contacts in series. Operation will be the reverse of steps 3 through 6.
9. Compare performance with design settings. Adjust the control settings if required and recheck operation.
10. Replace the control bulb in the chilled water return piping tee. Be sure that heat transfer compound is used in the bulb well.

The four-stage electric thermostat contacts control as follows:

1st stage — CR1, SLV1
2nd stage — CUV1
3rd stage — TDR1, SLV2, CR2
4th stage — CUV2

FOUR-STAGE PNEUMATIC-ELECTRIC SWITCH (PE1)

The pneumatic-electric switch (PS) in the control panel contains four sets of contacts. In operation, an increasing air pressure from the direct-acting receiver causes the switch contacts to close in sequence. See Table 24 and Figure 33.

A direct-acting pneumatic thermostat (shown in Figure 34) is required for the pneumatic-electric control system. In operation, the pneumatic thermostat will increase branch line air pressure to the pressure switch as the return chilled water temperature rises.

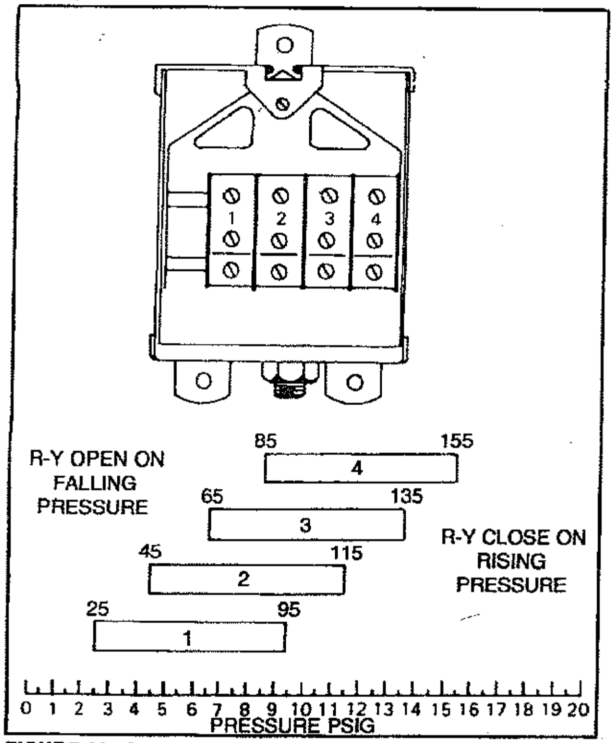


FIGURE 33 - Four-Stage Pneumatic-Electric Switch Operation

If recalibration is required, complete the following:

1. Unlock the calibration screw, shown in Figure 34.
2. Loosen the knurled knob and rotate the setpoint dial to a point that agrees with the gauge reading.
3. Tighten the knurled knob and calibration lock screw.
4. Reset the setpoint dial to the desired control point.

NOTE: *Do NOT attempt to adjust the transmitter bulb. If necessary, reset the gauge pointer.*

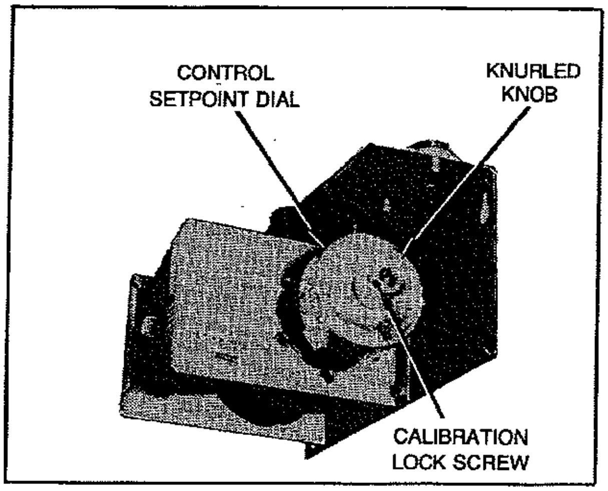


FIGURE 34 - Four-Stage Pneumatic-Electric Thermostat and Transmitter

TABLE 24 - 4-Stage Pneumatic/Electric Switch Set Points (PSIG)

CONTROL STAGE	MAKE	BREAK
1ST STAGE	9.5	2.5
2ND STAGE	11.5	4.5
3RD STAGE	13.5	6.5
4th STAGE	15.5	8.5

TABLE 25 - Control Settings and Setpoints

CONTROL TYPE	COMPRESSOR TYPE	CONTROL SETTING		RESET FUNCTION
		CUT-OUT	CUT-IN	
TEMPERATURE CONTROL-TC1	E or R	2½ F Above Design Leaving-Water Temp.		N/A
LOW TEMPERATURE CONTROL-TC2	E or R	37 F	50 F	Manual
AMBIENT THERMOSTAT-TC3	E or R	35 F (Standard)	38 F (Standard)	N/A
		0 F (Low Ambient)	3 F (Low Ambient)	N/A
LOW PRESSURE CONTROL (LPC)	E or R	45 psig	60 psig	Auto
HIGH PRESSURE CONTROL (HPC)	E	380 psig	310 psig	Auto
	R	405 psig	335 psig	Auto
OIL PRESSURE CONTROL (OPC)	E	30 psig	35 psig	Manual
OIL PRESSURE CONTROL (MP)	R	13 to 17 psig	3 to 5 psig above OPEN setting	Manual
FAN TEMPERATURE CONTROL-FTC	R or 75-Ton E	42 to 48 F (Switch B Open) 62 to 68 F (Switch A Open)		N/A
	100-Ton E	32 to 38 F (Switch B Open) 62 to 68 F (Switch A Open)		N/A

EIGHT-STAGE ELECTRIC TEMPERATURE CONTROLLER

The Eight-Stage Electric Temperature Controller is used only with the Trane Sequence Panel for controlling two units in parallel or series. See Figure 35. To test the controller, complete the following:

1. Apply power to the motor controller. Then turn power on and off. This will cause the motor to turn the cams to the start position as power is interrupted and then resumed. As the cams are turned, an audible click will be heard as each end switch closes. This occurs as the roller moves the cam rise to the high cam position. See Figure 36.
2. Full rotation of all cams is 160 degrees during a 1-1/2 minute interval. Run the cams through the entire time period and back to the start position. This is done by jumpering terminals R and W on the motor controller.

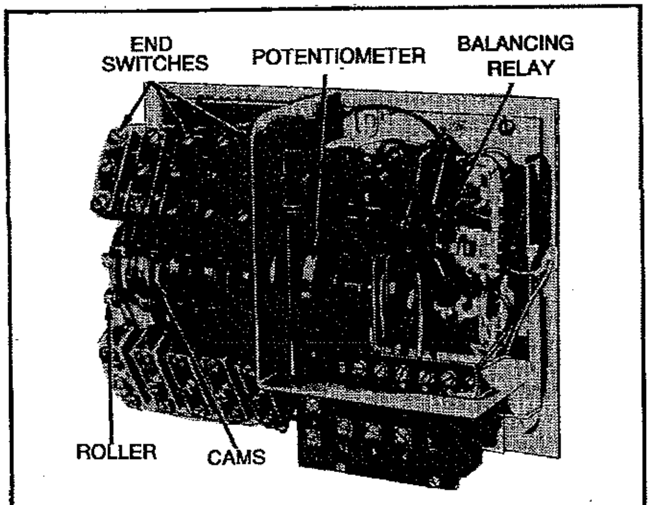


FIGURE 35 - Eight-Stage Electric Sequencer Thermostat

3. Reverse motor travel by shorting Terminals R and B. Stop the motor at 75 degrees which is the opening point of the last end switch (no. 8).
4. Move the differential cam clockwise until the roller is just on the high part of the differential cam. This is the neutral position. See Figure 36.
5. Check that the end switch is still in the closed position by lifting the roller assembly.
6. Turn the differential cam counter-clockwise until the roller drops to the low level of the cam. At this point, the end switch will open.
7. Tighten the hex screw in the cam to lock the position of the differential cam.
8. Set the balance of the differential cams in the same manner, following the travel points given in Figure 37.
9. After completion of cam adjustments, run the motor and cams through the full range of end switch closing and opening points to be sure they coincide with those given in Figure 37.

Thermostat setpoint is mid-range of design chilled water temperature range.

The sequencing for the Eight-Stage Electric Thermostat is as follows:

1st stage — CR1-A, SLV1-A
2nd stage — CUV-1A
3rd stage — TDR1-A, CR2-A, SLV2-A
4th stage — CUV2-A
5th stage — CR1-B, SLV1-B
6th stage — CUV1-B
7th stage — TDR1-B, CR2-B, SLV2-B
8th stage — CUV2-B
NOTE: Unit 1 = A; Unit 2 = B.

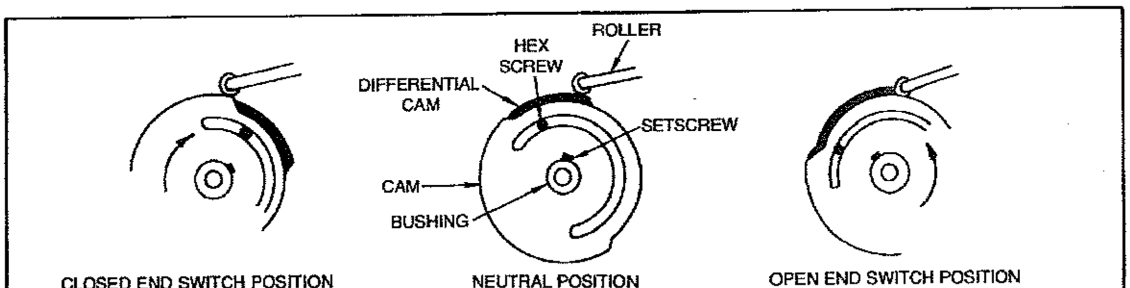


FIGURE 36 - Cam Adjustment for Eight-Stage Electric Thermostat

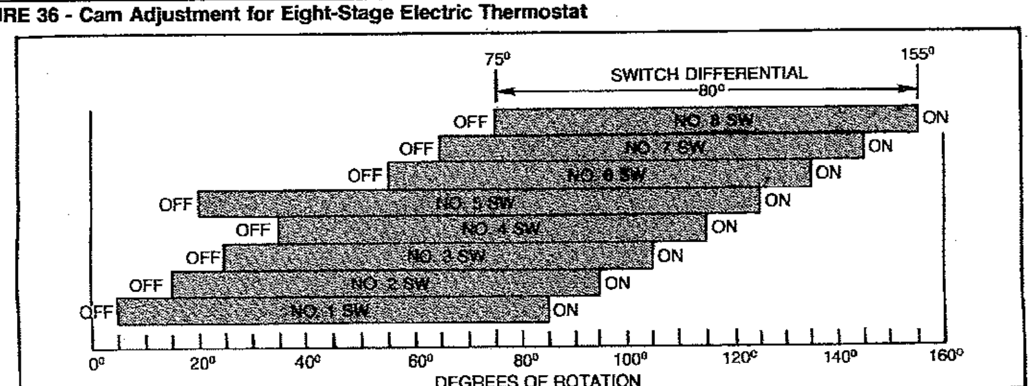


FIGURE 37 - End Switch Set Points for Eight-Stage Electric Thermostat

LOW TEMPERATURE CONTROL (TC2)

To check operation of the freeze protection TC2 control, see Figure 38 and complete the following:

1. Place the control bulb and thermometer in a container of water.
2. Lower the water temperature with chipped ice. At 37 F the control contacts should open.
3. Raise water temperature to 50 F.
4. Depress the TC2 reset button. Contacts should reset. If control fails to perform in manner described, raise or lower the setting, as required, and retest.

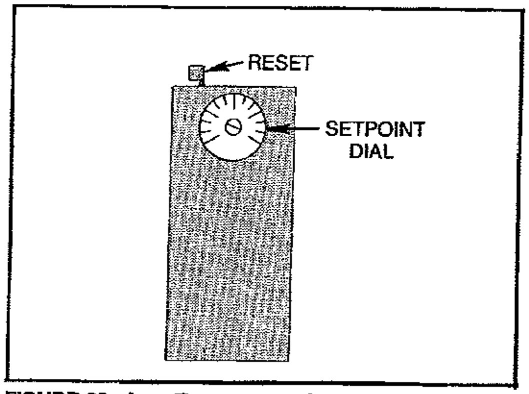


FIGURE 38 - Low Temperature Control

AMBIENT CONTROL (TC3)

The ambient control is factory-adjusted to cut out at the low limit operational temperature for each unit. Refer to Table 11 for unit minimum operational temperatures. To adjust the control, turn the dial adjustment screw until the unit minimum operational temperature (cut-out temperature) is opposite the fixed indicator dial on the face of the control. See Figure 39.

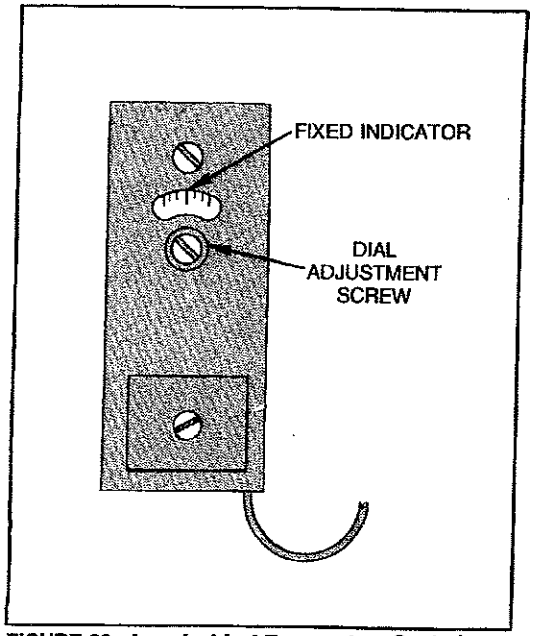


FIGURE 39 - *Low Ambient Temperature Control*

FAN TEMPERATURE CONTROL (FTC)

The fan temperature control cycles one or more of the condenser fans in response to ambient temperature in order to control condenser pressures. Ambient temperatures that control fan operation are given in Table 17. All fans should be in operation when ambient temperature is above 65 F (within 3 F). To check out the system, complete the following:

1. Operate the system. Ambient temperatures above 65 F call for all fans running.
2. Remove the sensing bulb from the side of the unit and pack in dry ice to reduce bulb temperature.
3. At 65 F, the control contacts should open to stop condenser fan operation. On units with two-step fan control, the next temperature cut-out point is 45 F (within 3 F).

NOTE: *The control should operate at the given cut-out points, within 3 F. This control is not adjustable. If it fails to operate correctly, replace the control.*

MOTOR PROTECTION — MODEL R COMPRESSOR

The motor protector/oil pressure control provides dual protection for the Model R compressor. This control will shut down compressor operation in the event of low oil pressure and/or high winding temperature. See Figure 40.

The control module is mounted in the control panel. A differential oil pressure switch (DPS) senses usable oil pressure at the compressor. If the switch contacts (P1, P2) remain open more than they are closed during any 90-second interval, the module contacts (M1, M2) will open to de-energize the compressor. These contacts will remain open until manually reset at the module.

The motor protector relay sensors are mounted inside the compressor motor windings. The sensors (S1, S2, S3 and common C) are connected to terminals on the control module. A change in motor temperature causes a change in electrical resistance through each sensor, which is relayed to the control module. As temperature rises or falls, resistance will fluctuate accordingly to actuate the control circuit relay in the module at preset openings and closings. Cut-in point is 93 ohms; cut-out points is 100 ohms.

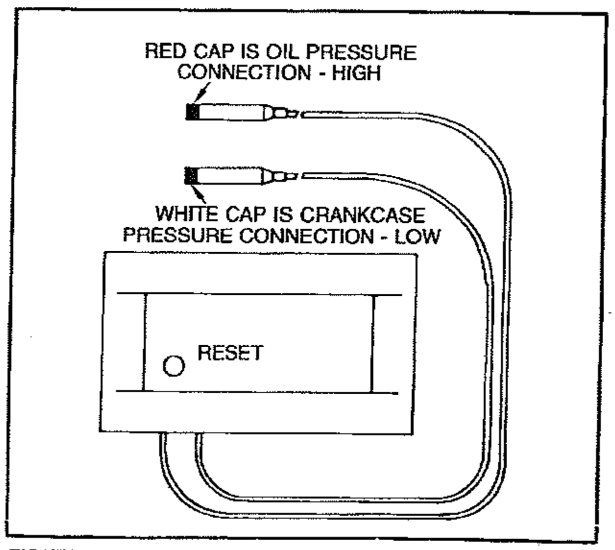


FIGURE 40 - Oil Pressure Control (Model R Compressor)

Terminals T1 and T2 are connected to 115-volt control power. Terminals M1 and M2 are connected to the operating and safety circuit of the compressor contactor (MC). If a prolonged period of low oil pressure causes contacts of the control to open, they are closed by operating the control reset pushbutton. See Figure 40. Allow a 5 to 10-minute cooling period before resetting the control contacts.

MOTOR PROTECTION — MODEL E COMPRESSOR

The Model E compressor motor is protected from overheating by thermostats imbedded in the windings.

The oil pressure control (OPC) contains a normally closed, heat-actuated time delay mechanism. When the control senses less than minimum operating oil pressure, the time delay mechanism is actuated. If normally operating pressure is not restored within the specified period, contacts of the control open, stopping the compressor.

This delay period provides time for the compressor oil pump to develop normal operating pressure at the time of starting, and to regain pressure if temporarily interrupted during normal operation of the unit.

The control is factory-set to begin time delay period at 30 psig (within 2 psig) and to stop the time delay period and resume normal operation at 5 to 7 psig above the cut-in point. The time delay mechanism opens between 85 seconds at 253 volts and 165 seconds at 208 volts.

Usable oil pressure or net pressure is the difference between suction pressure and oil pressure gauge readings.

If a prolonged period of low oil pressure causes the contacts of the control to open, they are closed by operating the control reset pushbutton. Allow a 5 to 10-minute cooling period before resetting the control contacts. If the unit continues to trip on oil failure, determine the cause of low oil pressure before continuing operation of the compressor. To check out the control:

1. Check that the motor leads are disconnected from the control panel contactors so that the compressor cannot start.

WARNING: DISCONNECT ELECTRICAL SOURCE BEFORE DISCONNECTING COMPRESSOR MOTOR LEADS FROM THE CONTACTOR TERMINALS. FAILURE TO DO SO MAY RESULT IN INJURY OR DEATH FROM ELECTRICAL SHOCK.

2. Close the fused disconnect switch in the chilled water pump starter circuit. Start the chilled water pump.
3. Lower the setting of the chilled water thermostat. This closes the contacts of the thermostat, or, in a pneumatic system, the contacts of the pressure switch.
4. Reset the contacts of the oil pressure control and low temperature control.
5. Close the unit ON/OFF switch, energizing the compressor motor contactors. Within 85 to 165 seconds, the timer switch in the control should open, de-energizing the compressor contactors.
6. Open all switches and disconnects and reconnect compressor motor leads to the contactor terminals. Reset the oil pressure control.

LOW PRESSURE CONTROL

To check out the low pressure control (LPC), complete the following:

1. With the system in operation, open the circuit ON/OFF switch (SW1). The system should pump down.
2. Permit suction pressure to fall to the switch cut-out setting given in Table 25. At this point, the switch contacts should open to stop the unit. If the unit is not stopped by the time the pressure is 10 psig below the cut-out setting, open the disconnect switch immediately.
3. Close the circuit ON/OFF switch. As suction pressure rises to the cut-in point of the control (Table 25), the control contacts should close and start the compressor.

If the control fails to function at the correct points, repair or replace the control. Repeat the checkout procedures for the second circuit on units with two compressors.

ANTI-RECYCLE/PERIODIC PUMPOUT TIMER

This control is standard on all dual compressor units. It helps prevent compressor damage due to short cycling and liquid slugging. A timer with a factory-set interval of 15 minutes must time out before the compressor can start again.

At the end of a cooling cycle, the control relay CR2 is de-energized and its contacts close when the compressor stops on pumpdown. This energizes the timer TR2 engaging the timer clutch and opening the normally closed contacts in the control circuit to the temperature control. When the timer times out, the timer clutch disengages and contacts close to allow another cooling cycle. See Figure 41.

A second set of normally closed contacts are installed in parallel with the cooling relay and auxiliary compressor motor contactor on the anti-recycle timer. This operates the periodic pumpout function. When the timer times out and the low pressure control (LPC) closes, the compressor will run and pump the system down.

The anti-recycle periodic pumpout timer may be checked for proper operation in the following manner:

1. Turn off control circuit power.
2. Remove wires from Terminals 2, 3, 6 and 8 on the Paragon Timer.
3. Connect an ohmmeter to either Terminals 2 and 3 or 6 and 8.
4. Remove the coil wires from the control relay used to energize the clutch circuit of the timer. (Typically CR3 or CR4).
5. Set timer pointer to 5 minutes.
6. With ohmmeter hooked up manually, energize the clutch circuit control relay.
7. The reading of the ohmmeter should approach infinity at energization.
8. At the end of 5 minutes, contacts 2, 3, 6 and 8 should close producing a 0 ohm reading on the ohmmeter.

CAUTION: Once the timer circuit is energized, (timing out) do not manually advance the pointer. Damage to the timer will result.

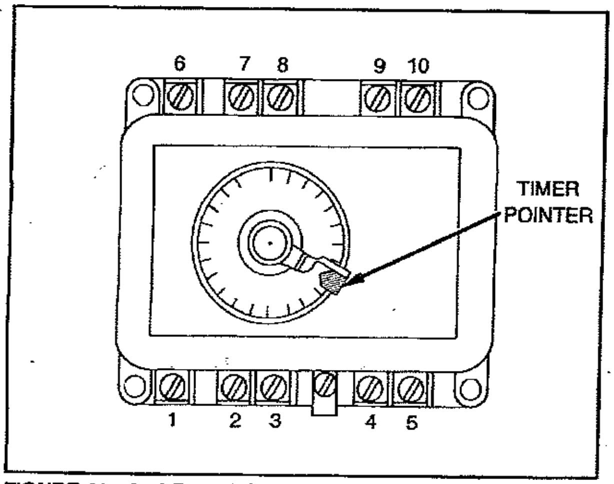


FIGURE 41 - Anti-Recycle/Periodic Pumpout Timer

HIGH PRESSURE CONTROL (HPC)

Control Checkout

1. Open the unit disconnect. Remove control wire to condenser fan contactor. Close unit disconnect and start unit.
2. Allow discharge pressure to rise. The switch contacts should open at the pressure indicated in Table 25 to stop unit operation. If the unit does not stop by the time pressure reaches 10 psig above the cut-out setting, open the disconnect immediately.
3. Start the air-cooled condenser fans to lower the discharge pressure.
4. As discharge pressure falls, depress and hold the control reset pushbutton. The unit should again start as pressure reaches cut-in point (Table 25).
5. If the switch failed to stop the unit, or stopped the unit below the cut-out setting, replace the control. **This control is non-adjustable.** Repeat the checkout procedure for the second circuit on duplex units.

RESET RELAY

The reset relay (RR) prevents compressor cycling on compressor overloads (OL) and high pressure control (HPC) which are automatic reset controls. Should the overloads or high pressure control open during compressor operation, sufficient voltage is developed across the reset relay coil to open relay contacts. The relay coil remains energized with open contacts. Sufficient load is not available for the rest of the unit control circuit. MC1, MC2 (duplex units), FC1, FC2, FC3 and SLV1 are de-energized. Reset the reset relay and restart the system by turning the unit "Off/On" switch (SW1) to "Off" and back to "On" position. This will repower control circuit, providing HPC and/or OL have had time for automatic reset.

HOT GAS BYPASS (OPTIONAL)

Hot gas bypass is used in a chilled water system to prevent the compressor from cycling at fluctuating low load conditions. At building loads smaller than the compressor's minimum step of unloading the hot gas bypass valve is energized, inducing an artificial load in the evaporator. As a result, the compressor will reload as the return water temperature rises.

Hot gas bypass is recommended for systems where building loads can fluctuate rapidly, where control is required below the unit minimum step of unloading, or where close temperatures or humidity control is necessary (as outlined in the Trane Applications Engineering manual).

The hot gas bypass valve (Figure 42 should be adjusted to maintain a minimum suction pressure of 63 psig. This setting will vary when a water ethylene-glycol solution is used. In all cases the valve should be adjusted to maintain a zero water temperature drop through the evaporator at the minimum load.

FAN OPERATION

The condenser fans are run by 7.5 hp belt-drive fan motors. See Figure 43 for fan sequencing and direction of rotation. Refer to Table 25 for fan sequencing temperatures. Fan No. 1 runs whenever the unit is operating.

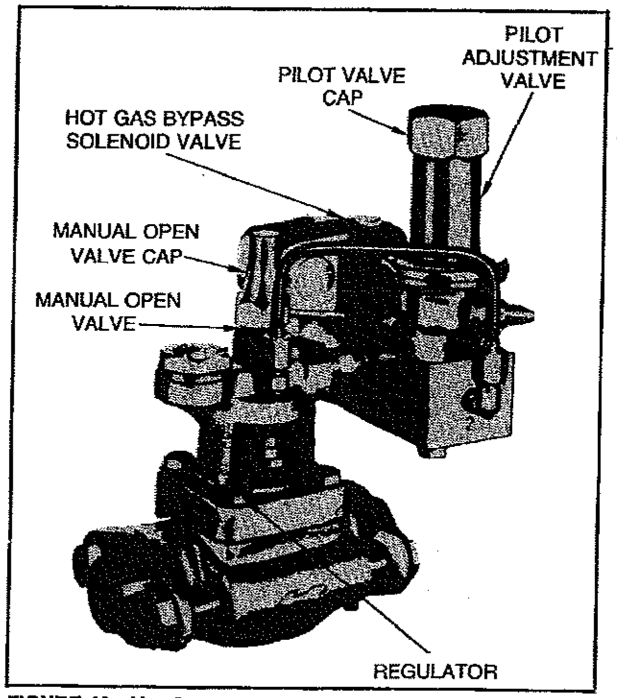


FIGURE 42 - Hot Gas Bypass Valve

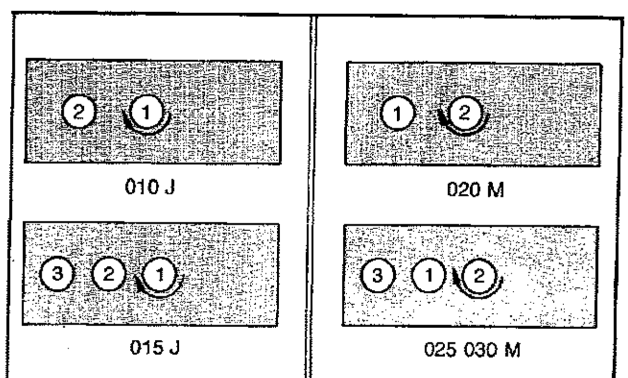


FIGURE 43 - Fan Sequences and Direction of Rotation

START-UP LOG

DATE ____________________

I. NAMEPLATE INFORMATION

Model No. ____________________ Serial No. ____________________

Voltage ____________________ RLA ____________________

II. COMPRESSOR(S)

A. VOLTAGE AT COMPRESSOR TERMINALS

Comp. No. 1: T1______ T2 ______ T3______

Comp. No. 2: T1______ T2 ______ T3______

Voltage Imbalance: __________ Comp. No. 1 __________ Comp. No. 2 __________

B. AMP DRAW

Comp. No. 1: L1______ L2 ______ L3______

III. OPERATING CONDITIONS

A. COMPRESSOR NO. 1

Discharge Pressure ____________________ Suction Pressure ____________________

Liquid Line Pressure ____________________ Suction Line Temp. ____________________

Liquid Line Temp. ____________________ Superheat ____________________

Subcooling ____________________ Evap. Entering Water Temp. __________

Ambient Temp. ____________________ Evap. Discharge Water Temp. __________

B. COMPRESSOR NO. 2

Discharge Pressure ____________________ Suction Pressure ____________________

Liquid Line Pressure ____________________ Suction Line Temp. ____________________

Liquid Line Temp. ____________________ Superheat ____________________

Subcooling ____________________ Evap. Entering Water Temp. __________

Ambient Temp. ____________________ Evap. Discharge Water Temp. __________

IV. CONTROLS

Fans Operating (Yes or No): Fan No. 1______ No. 2 ______ No. 3 ______

Crankcase Heater Operating (Yes or No): Comp. No.1______ Comp. No. 2 ______

V. COMPRESSOR OIL LEVEL

Compressor 1 ______________ Compressor 2 ______________

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