09AZ091-182
Remote Air-Cooled Condensers
90 to 200 Tons

Installation, Start-Up and Service Instructions

CONTENTS

SAFETY CONSIDERATIONS

Installing, starting up, and servicing air-conditioning equipment can be hazardous due to system pressures, electrical components, and equipment location. Only trained, qualified installers and service mechanics should install, start-up, and service the 09AZ equipment (Fig. 1).

When working on the equipment, observe precautions in the literature and on tags, stickers, and labels attached to the equipment. Follow all safety codes. Wear safety glasses and work gloves. Keep quenching cloth and fire extinguisher nearby when brazing. Use care in handling, rigging, and setting bulky equipment.

⚠ WARNING

Separate power sources (main and control power circuits) are used for these units. Be sure **both** main and control power circuits are disconnected before servicing. Electrical shock could cause personal injury.

→ **⚠ WARNING**

DO NOT USE TORCH to remove any component. System contains oil and refrigerant under pressure.

To remove a component, wear protective gloves and goggles and proceed as follows:

a. Shut off electrical power to unit.
b. Recover refrigerant to relieve all pressure from system using both high-pressure and low pressure ports.
c. Traces of vapor should be displaced with nitrogen and the work area should be well ventilated. Refrigerant in contact with an open flame produces toxic gases.
d. Cut component connection tubing with tubing cutter and remove component from unit. Use a pan to catch any oil that may come out of the lines and as a gage for how much oil to add to the system.
e. Carefully unsweat remaining tubing stubs when necessary. Oil can ignite when exposed to torch flame.

Failure to follow these procedures may result in personal injury or death.

→ **⚠ CAUTION**

DO NOT re-use compressor oil or any oil that has been exposed to the atmosphere. Dispose of oil per local codes and regulations. DO NOT leave refrigerant system open to air any longer than the actual time required to service the equipment. Seal circuits being serviced and charge with dry nitrogen to prevent oil contamination when timely repairs cannot be completed. Failure to follow these procedures may result in damage to equipment.

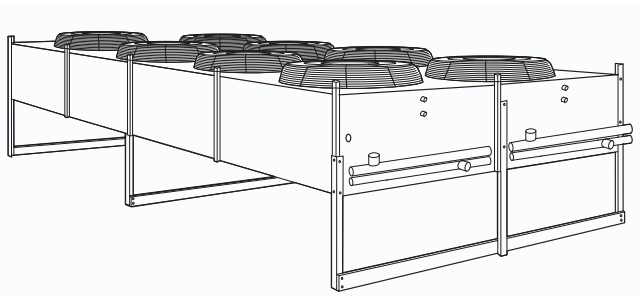


Fig. 1 — Typical 09AZ102 Unit

GENERAL

These units are remote air-cooled condensers for use with vertical package units, liquid chilling packages, or other air-cooled compressor and remote condenser units. Models are available for either vertical or horizontal airflow. The 09AZ units have been optimized for use with the 30HX remote package units. Refer to Fig. 2 for model number nomenclature.

Units are remote air-cooled condensers with direct drive axial flow condenser fan. These units are available in nominal heat rejection capacity from 90 to 200 tons. Inlet and discharge are on opposite sides of the unit. Units may be mounted in any area having unobstructed air circulation. Low silhouette permits installation on varied ground, roof, or suspended applications.

Each unit consists of direct-drive motor(s), propeller fan(s), fan guards, motor mounts, condenser coil with integral subcooling circuit, and electrical junction box. Factory options that extend the capability and features of the unit are available.

Check space requirements, service clearances, floor strength, location of piping, size of power supply, and airflow clearances before installing. See Fig. 3A and 3B for unit dimensions and Tables 1A and 1B for unit operating weights. See Tables 2A and 2B for corresponding chiller and condenser sizes.

INSTALLATION

Step 1 — Complete Pre-Installation Checks —

Examine unit for damage incurred during shipment. File claim immediately with transit company if damage is found. Check the shipment for completeness. Verify that the nameplate electrical requirements match the available power supply.

Step 2 — Rig and Place Unit

LOCATION — If roof installation is specified, make certain that roof structure can support condenser weight. Refer to Table 1.

Locate condenser where an adequate supply of inlet outdoor air is available. Do not locate where the possibility of air recirculation exists, such as under a roof overhang. Locate in an area free from airborne dirt or other foreign material that could clog condenser units.

RIGGING — Leave the units in the carton or on the skid until they are as close to the installation location as possible. The method of rigging depends on the unit size. Never lift the unit by the header or the return bends. Unit legs must be unbolted and positioned while the unit is rigged.

The preferred method is with spreader bars from above the unit. Lifting lugs are provided to aid in lifting the unit. Use 2-in. OD pipe and hooks in lifting eyes. Rig with 4 cables and spreader bars. All panels must be in place when rigging. See Table 3 and Fig. 4 for details concerning shipping weights, distance between lifting holes, center of gravity, and spreader bar dimensions.

If overhead rigging is not possible, place unit on skid or pad for rolling or dragging. When dragging, pull the pad. Do not apply force to the unit. When in final position, raise from above to lift unit off skid.

⚠ CAUTION

To avoid damage to units, do not forklift them unless they are attached to skids designed for forklifting. Forklift trucks used to lift units on skids must have forks a minimum of 48 in. long.

PLACING UNIT — The 09AZ units are designed for outdoor applications. If the unit is mounted indoors, provisions must be made to ensure that discharge air is not recirculated into the unit. If the unit is ducted, the duct must not add more than 0.1 in. wg to the static pressure imposed on the fans.

Vertical units 09AZV should be located no closer than the width of the unit to an obstruction such as a wall or another unit. Keep the area around each unit clear to avoid restricting the airflow to the unit. There must be 4 ft for service and for unrestricted airflow on all sides of the unit and a minimum of 8 ft clear air space above units. For multiple units, allow 8 ft separation between units for airflow and service.

MOUNTING UNIT — Units must be level to ensure proper drainage of liquid refrigerant and oil. When units are installed on a roof, they must be mounted on support beams that span load walls. Ground mounted units should be installed on concrete pads of sufficient size to prevent grass and brush from blocking the unit inlet. When unit is level and in proper location, use mounting holes in legs for securing unit to supporting structure. Fasteners for mounting unit must be field supplied. If unit is to be mounted on vibration isolators, use mounting holes in bottom of support legs as support points, and locate isolators at those points.

Step 3 — Complete Refrigerant Piping —

Refer to Fig. 5 for typical piping details.

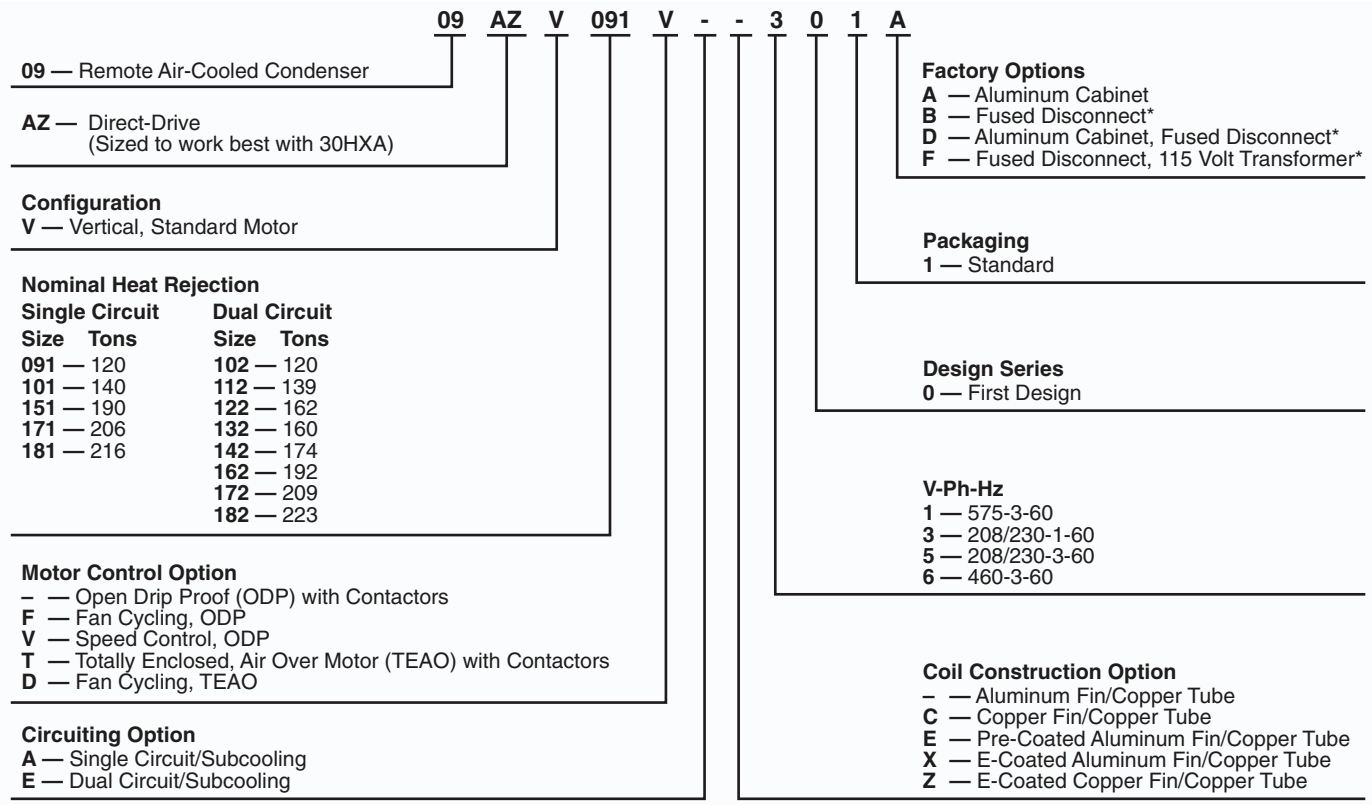
GENERAL — All field leak and pressure testing should be in accordance with local code requirements. If no local code exists, follow American National Standards Institute (ANSI), American Society of Heating, Refrigeration and Air Conditioning Engineers (ASHRAE) Safety Standard 15, latest revision.

For leak testing procedures, refer to the Carrier Refrigerant Service Techniques manual. Perform Phos-copper brazing on all field-made connections while protecting adjacent points from heat.

COIL CIRCUITING — The 09AZV091-181 single circuit models require field assembly of gas and liquid manifolds (see Fig. 6). Dual circuit units require no field assembly and piping.

⚠ CAUTION

To prevent unit damage, never connect two separate compressor-evaporator circuits together on the same condenser circuit.



*Fused disconnect available on 3-phase units only.

Fig. 2 — Model Number Nomenclature

Table 1A — Physical Data Single Circuit

09AZV SIZE	091	101	151	171	181
WEIGHT (lbs)					
Operating Weight	2300	2590	3081	3730	3770
Shipping Weight	2510	2800	3450	4040	4090
REFRIGERANT					
Type	134a				
FAN					
Type	Direct Drive, Vertical Discharge				
Quantity	8	8	10	12	12
Diameter (in.)	26	26	26	26	26
No. of Blades	4	4	4	4	4
Max Rpm	1140	1140	1140	1140	1140
Total Airflow (Cfm)	124,000	124,000	155,000	186,000	186,000
Motor Hp	$1^1/_2$	$1^1/_2$	$1^1/_2$	$1^1/_2$	$1^1/_2$
COIL					
Arrangement	Horizontal, Aluminum Fin, Copper Tube				
Rows (per circuit)	3	4	4	4	4
Fins per inch	14	14	14	10	12
Total Coil Face Area (sq ft)	120.6	120.6	150.6	180.6	180.6
No. of Refrigerant Circuits	1	1	1	1	1
Subcooler Circuit	Standard				
CONNECTIONS (in.)					
Discharge Gas In	$3^1/_8$	$3^1/_8$	$3^1/_8$	$3^1/_8$	$3^1/_8$
Liquid Out	$2^5/_8$	$2^5/_8$	$2^5/_8$	$2^5/_8$	$2^5/_8$

Table 1B — Physical Data Dual Circuit

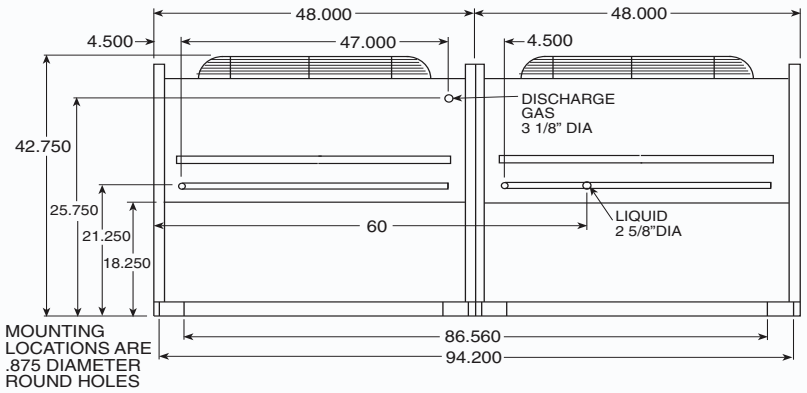
09AZV SIZE	102	112	122	132	142	162	172	182
WEIGHT (lbs)								
Operating Weight	2495	3164	2590	4032	3110	3081	3730	3820
Shipping Weight	2705	3374	2800	4242	3370	3450	4040	4130
REFRIGERANT								
Type	134a							
FAN								
Type	Direct Drive, Vertical Discharge							
Quantity	8	10	8	10	10	12	12	12
Diameter (in.)	26	26	26	26	26	26	26	26
No. of Blades	4	4	4	4	4	4	4	4
Max Rpm	1140	1140	1140	1140	1140	1140	1140	1140
Total Airflow (Cfm)	124,000	155,000	124,000	155,000	155,000	186,000	186,000	186,000
Motor Hp	$1^1/_2$	$1^1/_2$	$1^1/_2$	$1^1/_2$	$1^1/_2$	$1^1/_2$	$1^1/_2$	$1^1/_2$
COIL								
Arrangement	Horizontal, Aluminum Fin, Copper Tube							
Rows (per circuit A/B)	4/3	3/3	4/4	4/3	4/4	4/3	4/4	4/4
Fins per inch	14	14	14	14	10	12	10	14
Total Coil Face Area (sq ft)	120.6	150.6	120.6	150.6	150.6	180.6	180.6	180.6
No. of Refrigerant Circuits	2	2	2	2	2	2	2	2
Subcooler Circuit	Standard							
CONNECTIONS (in.)								
Discharge Gas In	$2^5/_8$	$2^5/_8$	$2^5/_8$	$2^5/_8$	$2^5/_8$	$2^5/_8$	$2^5/_8$	$2^5/_8$
Liquid Out	$2^1/_8$	$2^1/_8$	$2^1/_8$	$2^1/_8$	$2^1/_8$	$2^1/_8$	$2^1/_8$	$2^1/_8$

Table 2 — Corresponding Chiller and Condenser Sizes

30HXC Chiller Size	09AZV Condenser Size
106	102
116	112
126	122
136	132
146	142
161	162
171	172
186	182
206 Circuit A*	101
206 Circuit B*	091
246 Circuit A*	151
246 Circuit B*	091
261 Circuit A*	171
261 Circuit B*	091
271 Circuit A*	181
271 Circuit B*	091

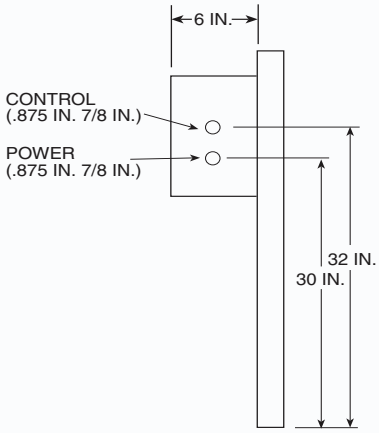
*Indicates duplex units.

09AZV---1-A Single Circuit

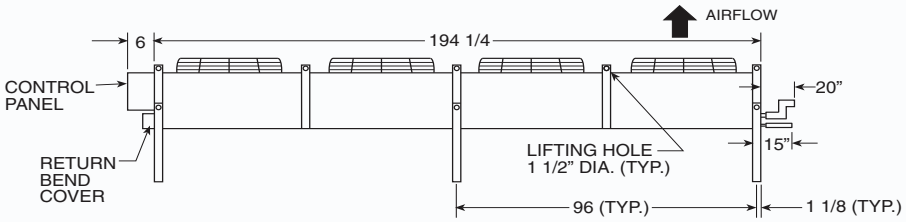


09AZV SIDE VIEW

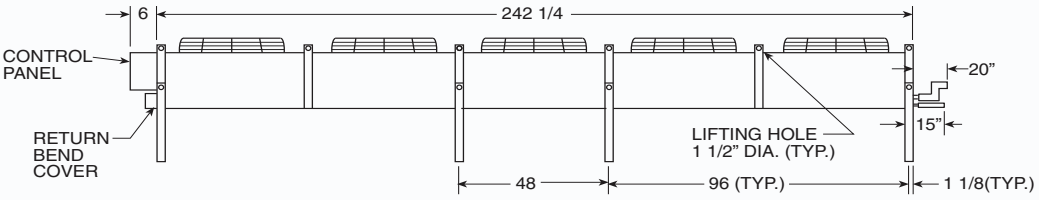
NOTES:
1. Service clearances must be at least 48 in. on all sides.
2. Field assembly of discharge/liquid headers required.



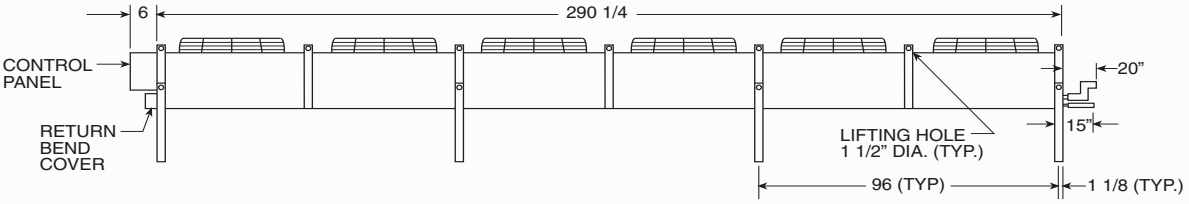
CONTROL PANEL DETAIL



09AZV091,101



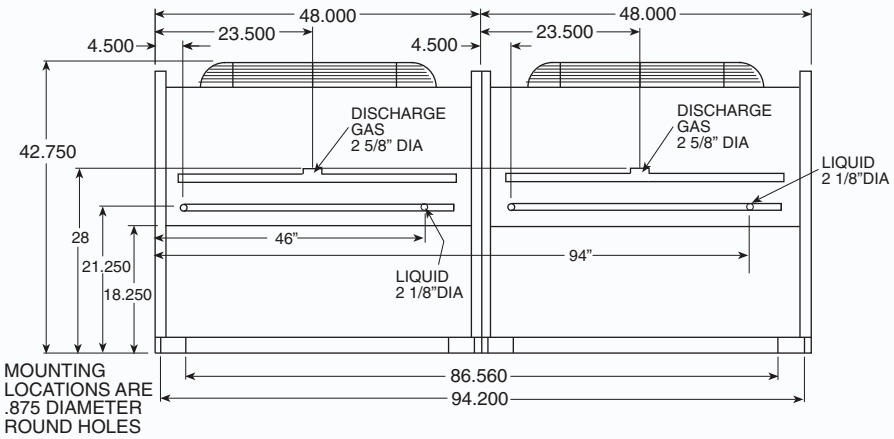
09AZV151



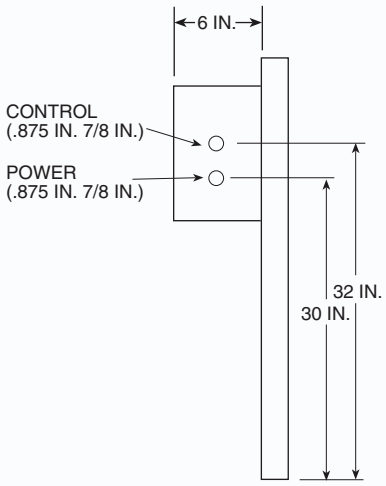
09AZV171,181

Fig. 3A — 09AZV Dimensions (Single Circuit Units)

09AZV---2-E Dual Circuit

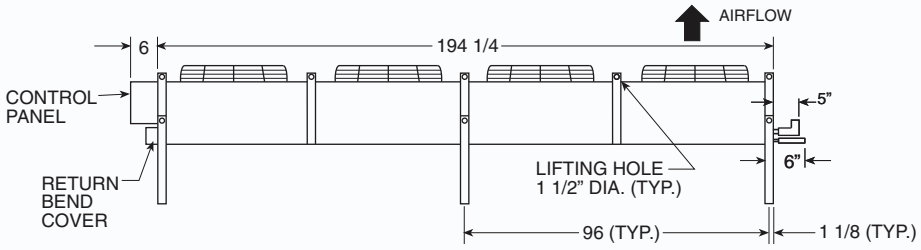


NOTE: Service clearances must be at least 48 in. on all sides.

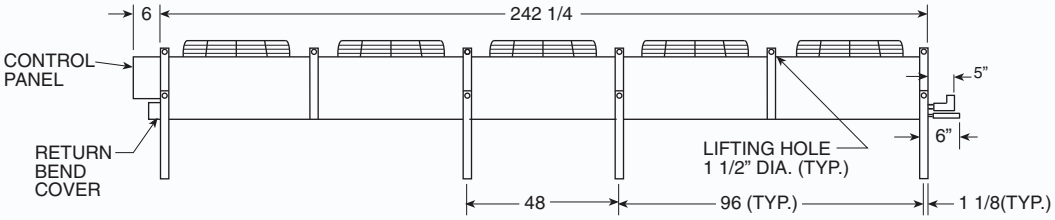


CONTROL PANEL DETAIL

09AZV SIDE VIEW



09AZV102,122



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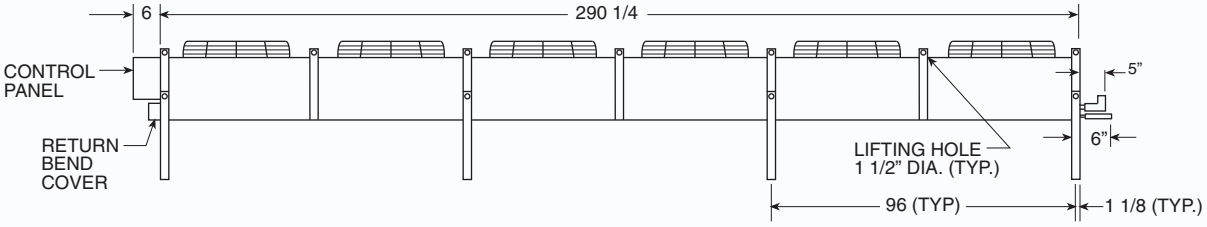
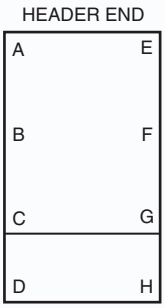


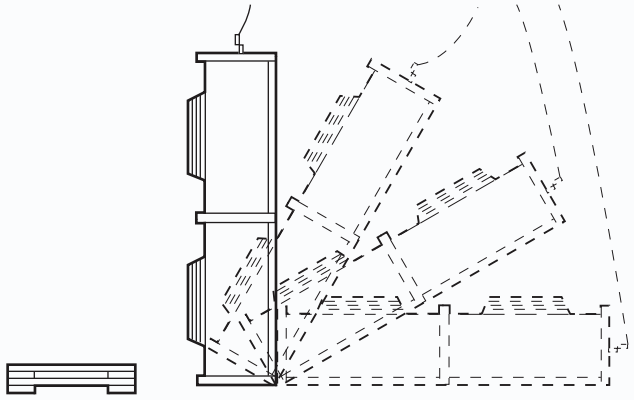
09AZV162,172,182

Fig. 3B — 09AZV Dimensions (Dual Circuit Units)

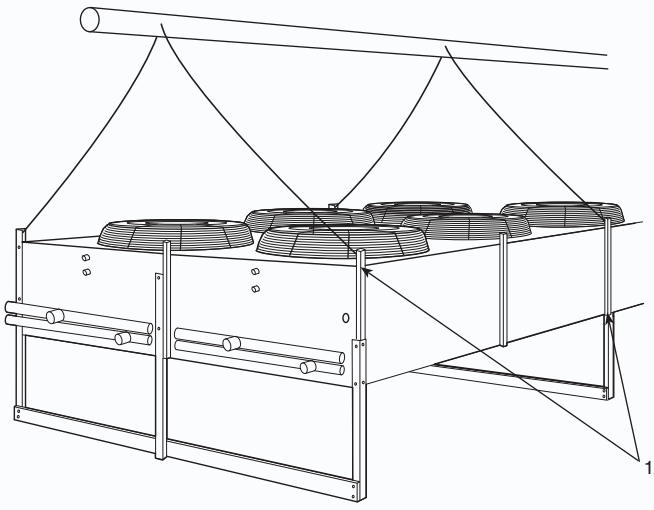
Table 3 — Leg Weight Distribution (Single and Dual Circuit Units)

09AZV	SINGLE CIRCUIT					DUAL CIRCUIT							
	091	101	151	171	181	102	112	122	132	142	162	172	182
A	268	302	308	373	377	291	316	302	403	311	308	373	382
B	613	691	462	560	566	665	475	691	605	467	462	560	573
C	268	302	462	560	566	291	475	302	605	467	462	560	573
D	—	—	308	373	377	—	316	—	403	311	308	373	382
E	268	302	308	373	377	291	316	302	403	311	308	373	382
F	613	691	462	560	566	665	475	691	605	467	462	560	573
G	268	302	462	560	566	291	475	302	605	467	462	560	573
H	—	—	308	373	377	—	316	—	403	311	308	373	382



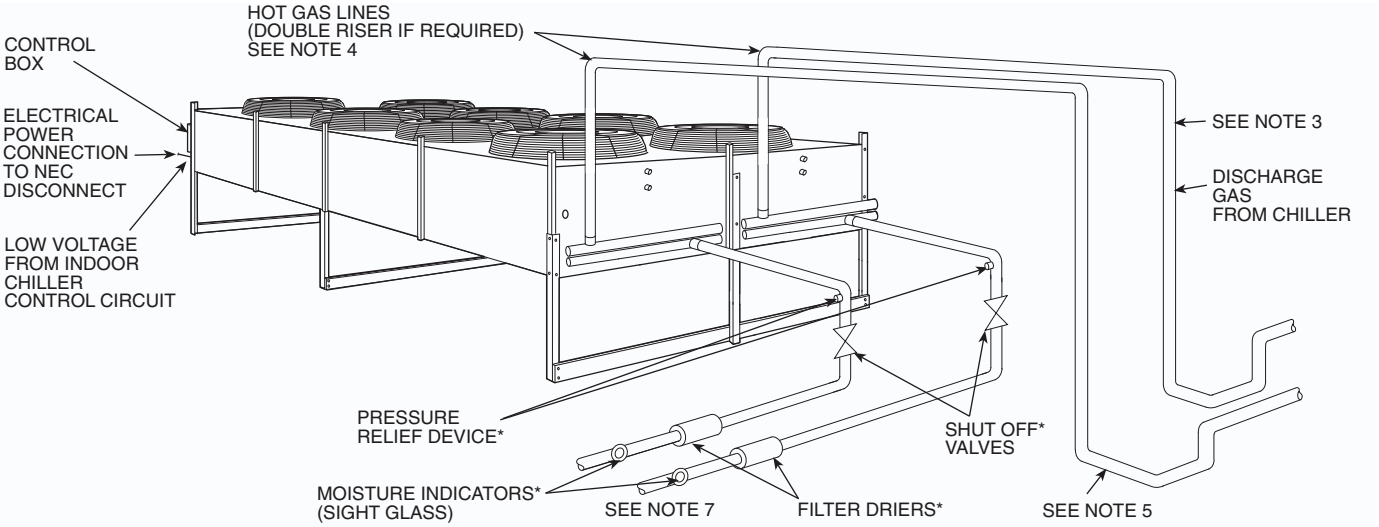


A. ROTATE UNIT FLAT
1. Gently pull top of unit over, maintaining cable tension as unit is rotated from vertical to horizontal position.



B. LOWERING LEGS INTO POSITION
1. Reattach lifting hooks into lifting eyes in the permanently attached leg channels. (One set of hooks at each leg position).
2. Remove the four $^1/_2$″ bolts that hold each leg in telescoped position.
3. Lift unit about 18″ so that each leg can drop down and be reattached with the four bolts removed in Step 2. Tighten bolts securely.
4. Continue lifting unit to its new home.

Fig. 4 — Unit Rigging



LEGEND

NEC — National Electrical Code

*Field supplied.

NOTES:

1. Wiring and piping shown are general points of connection guides only and are not intended for or to include all details for a specific installation.
2. All wiring must comply with applicable local and national codes.
3. All piping must follow standard piping techniques. Refer to Carrier System Design Manual, Part 3, or the Carrier E20-II® Software Refrigerant Piping program, for proper piping sizes and design.
4. Hot gas lines should rise above refrigerant level in condenser circuit.
5. Trap should be installed on hot gas lines to prevent condenser oil and refrigerant vapor migration from accumulating on compressor heads during off cycle.
6. For piping lengths greater than 50 ft (15.2 m), provide support to liquid and gas lines near the connections to the coil.
7. Pitch all horizontal lines downward in the direction of refrigerant flow.
8. For pressure relief requirements, see latest revision of ASHRAE (American Society of Heating, Refrigeration, and Air Conditioning Engineers) Standard 15, Safety Code for Mechanical Refrigeration.

Fig. 5 — Typical Piping for 09AZ Condenser with a Dual Split System

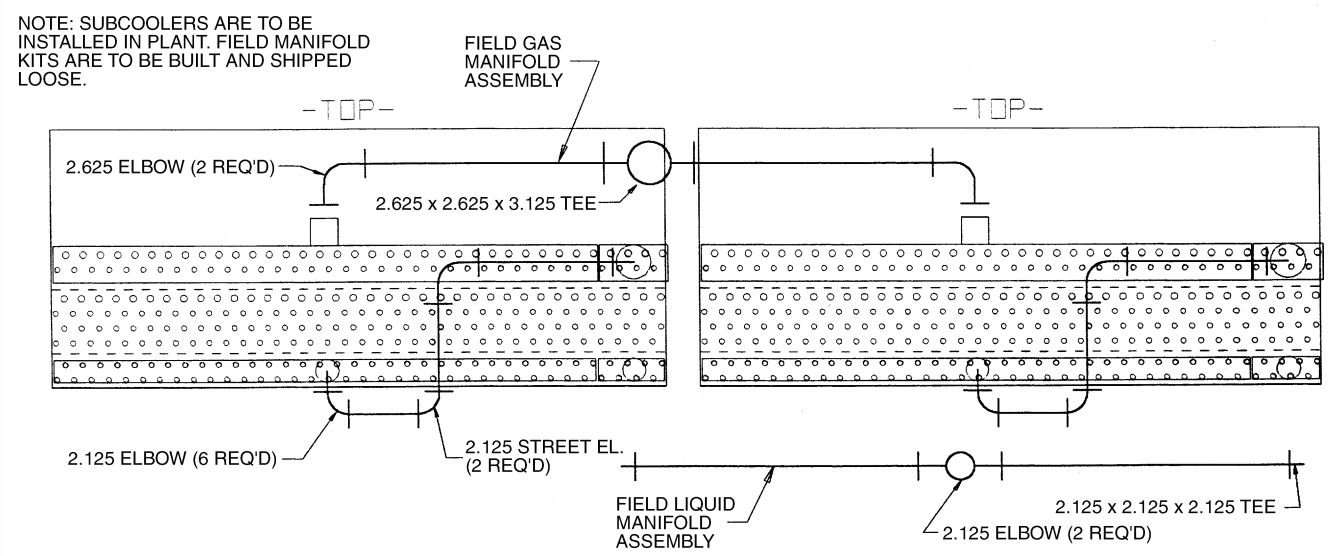


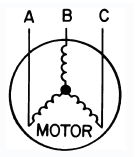
Fig. 6 — 09AZ091-181 Header Detail

Step 4 — Complete Electrical Connections

GENERAL — Verify that nameplate electrical requirements match available power supply. Voltage at condenser must be within the minimum and maximum shown in Tables 4A and 4B, and phases must be balanced within 2%. Contact local power company for line voltage corrections. Never operate a motor where a phase imbalance in supply voltage is greater than 2%. Use the following formula to determine the percentage of voltage imbalance:

$$\% \text{ Voltage Imbalance} = 100 \times \frac{\text{max voltage deviation from average voltage}}{\text{Average voltage}}$$

Example: Supply voltage is 240-3-60.



AB = 243 volts
BC = 236 volts
AC = 238 volts

$$\text{Average Voltage} = \frac{243 + 236 + 238}{3}$$

$$= \frac{717}{3}$$

$$= 239 \text{ volts}$$

Determine maximum deviation from average voltage:

(AB) 243 – 239 = 4 volts
(BC) 239 – 236 = 3 volts
(AC) 239 – 238 = 1 volt

Maximum deviation is then 4 volts. To determine the percentage of voltage imbalance.

$$\% \text{ Voltage Imbalance} = 100 \times \frac{4}{239}$$

$$= 1.7\%$$

This amount of phase imbalance is satisfactory since it is below the maximum allowable 2%.

IMPORTANT: If the supply voltage phase imbalance is more than 2%, contact your local electric utility company immediately.

Condenser operation on improper line voltage or excessive phase imbalance may be considered abuse and any resulting damage may not be covered by Carrier warranty.

All wiring must be in accordance with NEC (National Electrical Code) regulations or local codes.

CONNECTIONS — Refer to Tables 4A and 4B and Fig. 7 for field wiring details.

MAIN POWER WIRING — Install field-supplied branch circuit fused disconnect(s) of a type that can be locked OFF or OPEN. Disconnect(s) must be within sight from and readily accessible from unit in compliance with NEC Article 440-14 or local code. The units must have adequate overcurrent protection, fuses, or HACR (Heating, Air Conditioning, and Refrigeration) breakers according to the national and applicable local codes. For field power connections, all main power wiring enters the unit through a factory-punched access hole under the control box. Attach power wires to power terminal block (or the fan relay if not equipped with a power terminal block), to the 3 power connections in the unit control box. Be sure to install a ground wire. See Fig. 7.

CONTROL CIRCUIT POWER WIRING — Connect 115-v control wires to the 2 low-voltage connections at the control power terminal block.

GENERAL WIRING NOTES — Factory options including speed control, head pressure control, winter start control, fan cycling, and electrical interlock, may affect wiring connections. Refer to Fig. 7-9 for typical unit wiring.

1. Power entry is at one end only.
2. Fan motors are thermally protected. All 3-phase motors are protected against primary single-phasing conditions.
3. Replacement of factory wires must be with appliance wiring material rated 105 C or its equivalent.
4. Factory wiring is in accordance with National Electrical Code. Field modifications or additions must be in compliance with all applicable codes.

09AZ Controls — The 09AZV091-182 units are designed to operate specifically with 30HXA chillers, using R-134a refrigerant. Units with 8 fans have 2 direct controlled (applied to optional variable speed), 4 refrigerant pressure and 2 ambient temperature controlled fans. Units with 10 fans have 2 direct controlled (applied to optional variable speed), 4 refrigerant pressure and 4 ambient temperature controlled fans. Units with 12 fans have 2 direct controlled (applied to optional variable speed), 6 refrigerant pressure and 4 ambient temperature controlled fans.

Operation Sequence — All condenser fans are allowed to operate once a call for cooling comes from the chiller. Direct fans will operate while refrigerant pressure and ambient temperature control fans maintain refrigerant head pressure based on existing refrigerant pressure and ambient temperature conditions. Optional variable speed control will ramp direct fan motor speed for improved low ambient performance.

VARIABLE SPEED FAN CONTROL — All units, when ordered with fan head pressure control are furnished with the number 1 condenser motor as a single-phase motor for use with head pressure control. The optional factory-mounted motor head pressure control contains a fan head pressure control device activated by a pressure sensor. The kit controls condenser-fan motor speed in response to the saturated condensing pressure.

Table 4A — Electrical Data (Fan Motor) Single-Circuit Units

09AZV SIZE	208/230-3-60				460-3-60				575-3-60				CONTROL CIRCUIT (V-Ph-Hz)
	FLA	MCA*	MOCP*	Min/Max (Volts)	FLA	MCA*	MOCP*	Min/Max (Volts)	FLA	MCA*	MOCP*	Min/Max (Volts)	
091	6.5	53.6	60.0	187/253	3.3	27.2	30.0	414/506	2.4	19.8	20.0	518/632	115-1-60
101	6.5	53.6	60.0	187/253	3.3	27.2	30.0	414/506	2.2	19.8	20.0	518/632	115-1-60
151	6.5	66.0	70.0	187/253	3.3	33.8	35.0	414/506	2.2	24.6	25.0	518/632	115-1-60
171	6.5	79.6	80.0	187/253	3.3	40.5	45.0	414/506	2.2	29.4	30.0	518/632	115-1-60
181	6.5	79.6	80.0	187/253	3.3	40.5	45.0	414/506	2.2	29.4	30.0	518/632	115-1-60

Table 4B — Electrical Data (Fan Motor) Dual-Circuit Units

09AZV SIZE	208/230-3-60				460-3-60				575-3-60				CONTROL CIRCUIT (V-Ph-Hz)
	FLA	MCA*	MOCP*	Min/Max (Volts)	FLA	MCA*	MOCP*	Min/Max (Volts)	FLA	MCA*	MOCP*	Min/Max (Volts)	
102	6.5	53.6	60.0	187/253	3.3	27.2	30.0	414/506	2.4	19.8	20.0	518/632	115-1-60
112	6.5	66.0	70.0	187/253	3.3	33.8	35.0	414/506	2.4	24.6	25.0	518/632	115-1-60
122	6.5	56.3	60.0	187/253	3.3	27.2	30.0	414/506	2.4	19.8	20.0	518/632	115-1-60
132	6.5	66.0	70.0	187/253	3.3	33.8	35.0	414/506	2.4	24.6	25.0	518/632	115-1-60
142	6.5	66.0	70.0	187/253	3.3	33.8	35.0	414/506	2.4	24.6	25.0	518/632	115-1-60
162	6.5	79.6	80.0	187/253	3.3	40.5	45.0	414/506	2.4	29.4	30.0	518/632	115-1-60
172	6.5	79.6	80.0	187/253	3.3	40.5	45.0	414/506	2.4	29.4	30.0	518/632	115-1-60
182	6.5	79.6	80.0	187/253	3.3	40.5	45.0	414/506	2.4	29.4	30.0	518/632	115-1-60

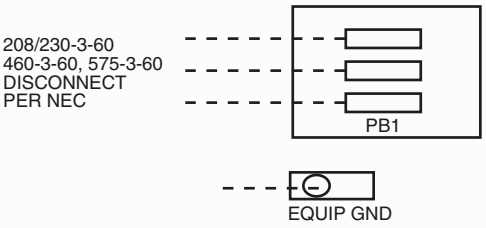
LEGEND

FLA — Full Load Amps
MCA — Minimum Circuit Amps
MOCP — Maximum Overcurrent Protective Device (see Note 1)
NEC — National Electric Code

*Min Ckt Amps and MOCP Amps values per NEC rounds to full wire size (see Note 1).

NOTES:
1. In compliance with NEC requirements for multimotor and combination load equipment (NEC Articles 430 and 440), the overcurrent protective device for the unit shall be either circuit breaker (where available) or fuse. Canadian units may be fuse or circuit breaker.
2. Wire sizing amps (MCA) are a sum of 125% of the condenser-fan motor FLA.
3. Motors are protected against primary single phasing condition.
4. Three-phase voltage imbalance must not exceed 2%

POWER WIRING



FIELD CONTROL WIRING

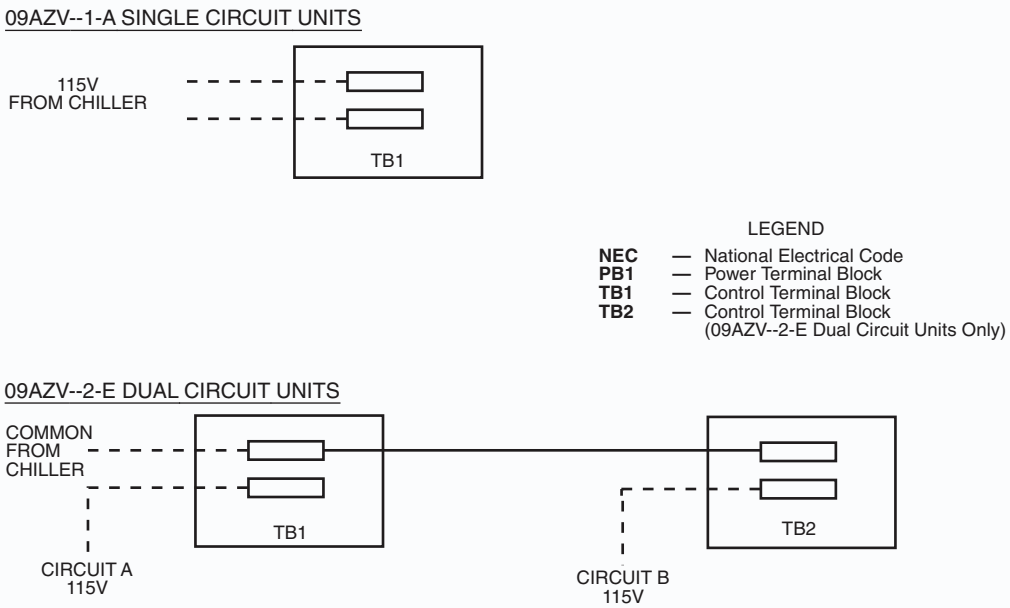


Fig. 7 — Typical Wiring Schematic

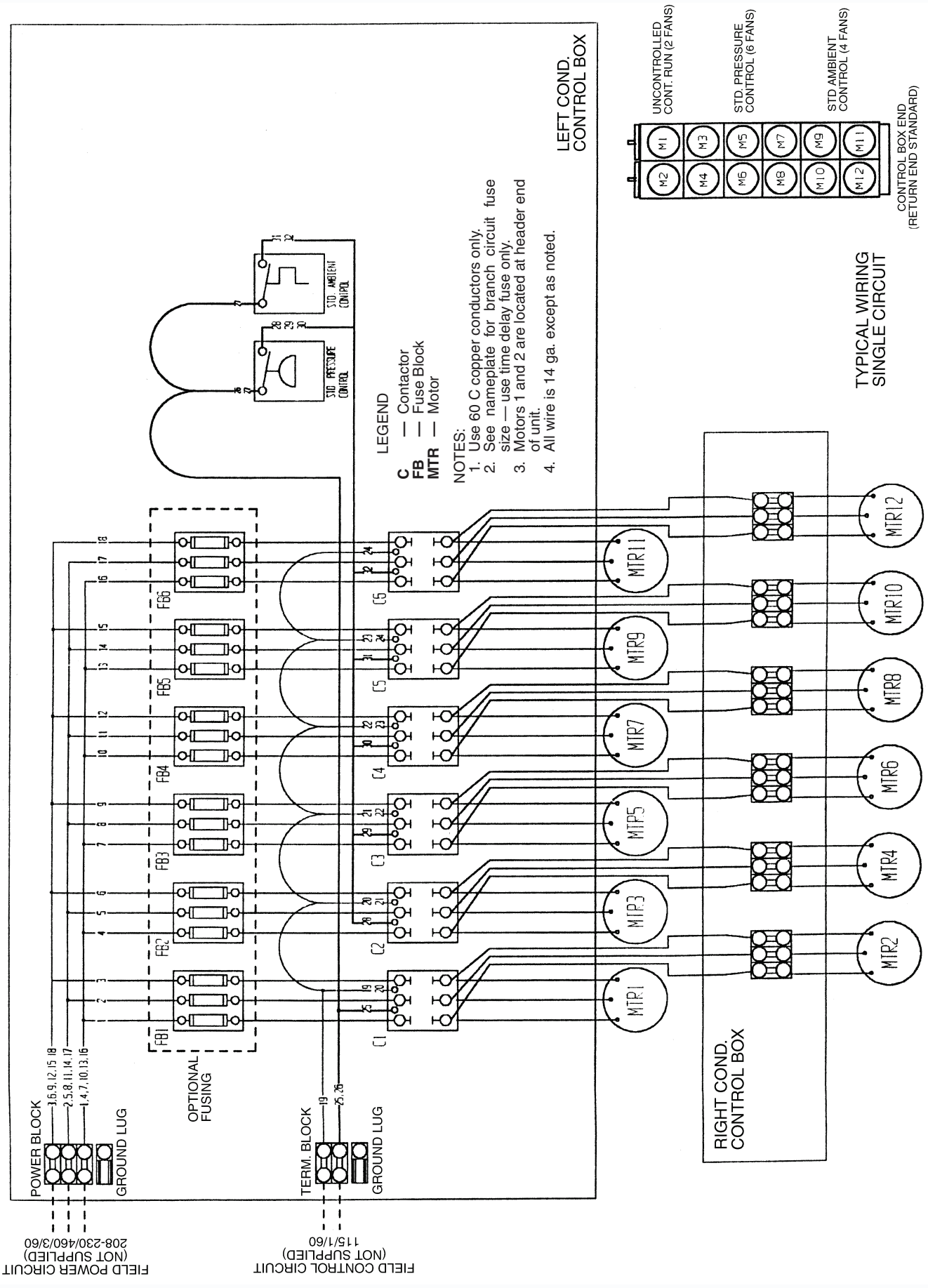


Fig. 8 — Typical Wiring Single Circuit Units

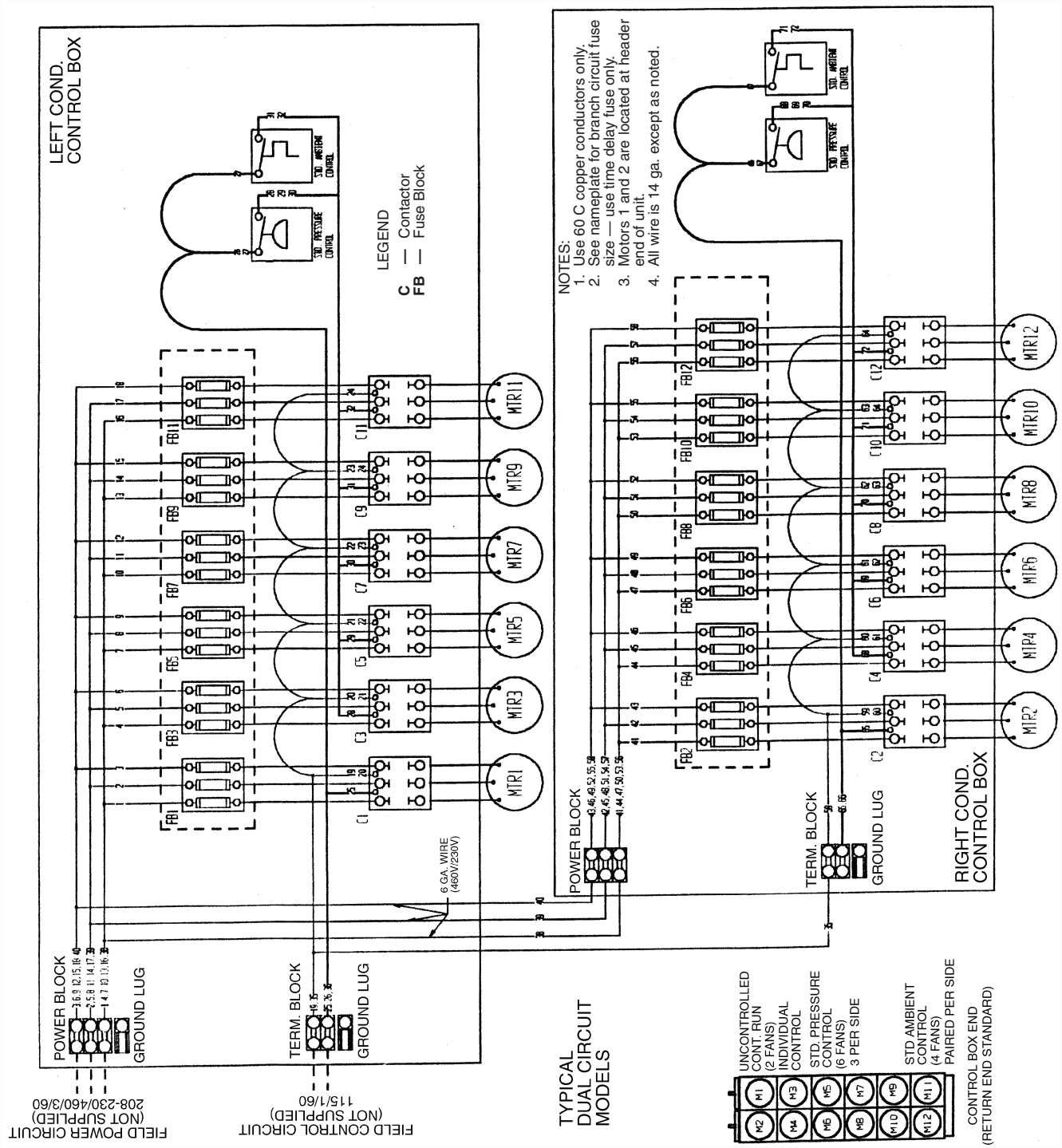


Fig. 9 — Typical Wiring Dual Circuit Units

START-UP

⚠ CAUTION

To prevent personal injury, be sure wire fan guards are secured in place over each fan discharge (or that fans are ducted), before starting the unit.

Complete Unit Start-Up Checklist on page CL-1 during initial start-up of this system.

System Evacuation and Dehydration — Refer to GTAC II, Module 4, "Dehydration for Proper Evacuation and Dehydration Techniques."

Charging Procedure — (Units Matched with 30HX Chillers)

1. An initial refrigerant charge must be added after evacuation to allow the unit to start. Add approximately 2 lb/nominal ton (0.26 kg/nominal kW) liquid refrigerant charge to the condenser. This amount of charge should be sufficient to allow the unit to start. The approximate system charges are shown in the installation manual for the 30HX chillers.
2. Raise the compressor discharge to approximately 125 F (51.7 C) saturated discharge temperature (185 psig [1276 kPa]) by throttling the condenser air (or water) intake.
3. Add liquid charge into the cooler until there is approximately 18 to 20 F (10.0 to 11.1 C) of system subcooling (saturated discharge temperature — actual temperature entering the electronic expansion device [EXD]). When adding charge, use the $^1/_4$-in. Schrader-type fitting located on the tube going into the bottom of the cooler. This fitting is located between the EXD and the cooler. When adding charge during unit operation, always use this port so that the cooler liquid level sensor can detect the additional charge and adjust the EXD valve position.

   NOTE: Electronic Expansion Device (EXD) refers to EXV (Electronic Expansion Valve) (30HX076-146 units) or Economizer (30HX161-271 units).
4. Check for a clear sight glass. If the unit is not fully loaded, the sight glass may be flashing. This condition is normal for a partially loaded unit. If the unit is fully loaded and the sight glass is flashing, check EXV valve position. If it is greater than 60% add additional charge.

SERVICE

Fan Guard Removal — Remove the eight $^1/_4$- x $^5/_8$-in. self-tapping hex-head screws that hold the fan grille to the condenser-fan panel, and remove the grille.

Condenser Fan Adjustment

⚠ CAUTION

To prevent personal injury, be sure wire fan guards are secured in place over each fan discharge before starting the unit.

1. Be sure power is off to the condenser-fan motor.
2. Remove the fan guard.
3. Remove the cap, and set screws on the fan hub.
4. Adjust fan. See Fig. 10.
5. Tighten fan hub securely on the motor shaft with set screw that bears against the key.

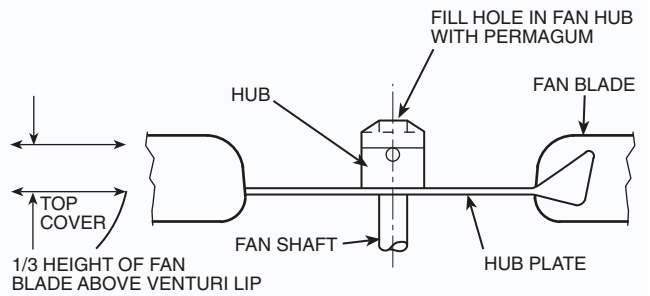


Fig. 10 — Location of Propeller on Motor Shaft from Outside of Orifice Ring

6. Replace the permagum sealing material and the rubber cap over the end of the motor shaft to prevent moisture from causing fan to rust on the shaft.
7. Replace the fan guard.

Fan Motor Removal

1. Make certain condenser power is off.
2. Remove fan guard and fan.
3. Loosen nut on the motor holding clamp that secures motor to motor support.
4. Lift motor upward. Remove the fan wheel through the fan discharge opening. Remove wire connectors.
5. Replace in opposite order. Be sure to check location of fan in orifice when replacing fan.

MAINTENANCE

Cleaning — The 09AZ units should be thoroughly cleaned inside and out. Frequency of cleaning depends on unit location and area conditions.

Cleaning Condenser Coils — Clean coils with a vacuum cleaner, fresh water, compressed air, or a bristle brush (not wire).

⚠ CAUTION

Do not use high-pressure water or air to clean condenser coils. Damage to fins may result.

The 09AZ units require very little maintenance. Regular maintenance should include cleaning the surface of the coil and checking to make sure that all electrical connections are tight. All motors have permanently sealed ball bearings that do not require lubrication. Check for loose electrical connections, oil level, proper refrigerant charge, and refrigerant piping leaks.

Backflush coil to remove debris. Commercial coil cleaners may also be used to help remove grease and dirt. Steam cleaning is NOT recommended. Wash coil in the opposite direction of airflow. Units installed in corrosive environments should be cleaned as part of a planned maintenance schedule. In this type of application, all accumulations of dirt should be cleaned off the coil. Condenser-fan motors are drip-proof but not watertight.

Lubrication — Fan motors have permanently lubricated ball bearings; no additional lubrication is required.

TROUBLESHOOTING

See Table 5 for problems and possible solutions.

Table 5 — Troubleshooting

PROBLEM	POTENTIAL CAUSE	SOLUTION
Unit is tripping on high-pressure switch or high discharge pressure is noted.	1. Fan is not delivering adequate condenser air. 2. Dirty condenser coil. 3. Head pressure controls not operating correctly.	1. Check condition of condenser fan and motor. Check position of fan blade on motor shaft. 2. Check and clean coil as required. 3. Check operation of head pressure controls.
Unit is tripping on low-pressure switch or low suction pressure is noted.	Head pressure controls not installed or not operating correctly.	1. Check head pressure control, and be sure it is operating properly. Install if not provided. 2. Check wind baffles, apply if required. 3. Check operation of fan-cycling control on two-fan units.
Unit trips on low pressure at start-up with low outdoor temperatures.	1. Winterstart kit not installed or not working correctly. 2. Fan cycling control for two-fan units is not installed or not operating correctly.	1. Check operation of winterstart control. Install if not provided. 2. Check operation of fan cycling control.
Unit is low on capacity or losing capacity.	1. Dirty coil. 2. Airflow is not adequate.	1. Check and clean coil as required. 2. Check condition of condenser fan and motor. Check position of fan blade on motor shaft.
Condenser is noisy.	1. Fan blade or motor is out of alignment. 2. Proper vibration isolation has not been applied.	1. Check fan blades for bent or damaged blades. Check blade position on the shaft. 2. Isolate unit properly.

START-UP CHECKLIST

I. PRELIMINARY INFORMATION

COMPRESSOR BEARING UNIT: MODEL NO. _____ SERIAL NO. _____

09AZ UNIT: MODEL NO. _____ SERIAL NO. _____

FIELD-INSTALLED ACCESSORIES _____

_____

II. PRE-START-UP

INDOOR/COMPRESSOR UNIT

IS THERE ANY SHIPPING DAMAGE? _____ (Y/N) _____

IF SO, WHERE: _____

WILL THIS DAMAGE PREVENT UNIT START-UP? (Y/N) _____

CHECK POWER SUPPLY. DOES IT AGREE WITH UNIT? (Y/N) _____

HAS THE GROUND WIRE BEEN CONNECTED: (Y/N) _____

HAS THE CIRCUIT PROTECTION BEEN SIZED AND INSTALLED PROPERLY? (Y/N) _____

ARE THE POWER WIRES TO THE UNIT SIZED AND INSTALLED PROPERLY? (Y/N) _____

HAVE FAN AND MOTOR PULLEYS BEEN CHECKED FOR PROPER ALIGNMENT? (Y/N) _____

DO THE FAN BELTS HAVE PROPER TENSION? (Y/N) _____

HAS CORRECT FAN ROTATION BEEN CONFIRMED? (Y/N) _____

HAS WATER BEEN PLACED IN DRAIN PAN TO CONFIRM PROPER DAINAGE? (Y/N) _____

ARE PROPER AIR FILTERS IN PLACE? (Y/N) _____

CONTROLS

HAVE THERMOSTAT, INDOOR-FAN CONTROL AND CONDENSER FAN CONTROL RELAY WIRING CONNECTIONS BEEN MADE AND CHECKED? (Y/N) _____

ARE ALL WIRING TERMINALS (including main power supply) TIGHT? (Y/N) _____

HAS CRANKCASE HEATER (IF EQUIPPED) ON UNIT BEEN ENERGIZED FOR 24 HOURS? (Y/N) _____

09AZ UNIT

CHECK POWER SUPPLY. DOES IT AGREE WITH UNIT? (Y/N) _____

HAS THE GROUND WIRE BEEN CONNECTED? (Y/N) _____

HAS THE CIRCUIT PROTECTION BEEN SIZED AND INSTALLED PROPERLY? (Y/N) _____

ARE THE POWER WIRES TO THE UNIT SIZED AND INSTALLED PROPERLY? (Y/N) _____

HAS UNIT BEEN PROPERLY SECURED TO BUILDING STRUCTURE? (Y/N) _____

HAS CORRECT FAN ROTATION BEEN CONFIRMED? (Y/N) _____

PIPING

HAVE LEAK CHECKS BEEN MADE AT COMPRESSOR, CONDENSER, EVAPORATOR, TXV's (Thermostatic Expansion Valve), SOLENOID VALVES, FILTER DRIERS, AND FUSIBLE PLUGS WITH A LEAK DETECTOR? (Y/N) _____

LOCATE, REPAIR, AND REPORT ANY LEAKS

HAVE ALL COMPRESSOR SERVICE VALVES BEEN FULLY OPENED (Backseated)? (Y/N) _____

HAVE LIQUID LINE SERVICE VALVES BEEN OPENED? (Y/N) _____

IS THE OIL LEVEL IN THE COMPRESSOR CRANKCASE ON THE UNIT IN VIEW IN THE COMPRESSOR SIGHT GLASS (IF APPROPRIATE)? (Y/N) _____

HAS CONDENSER PRESSURE RELIEF BEEN PROVIDED? (Y/N) _____

CHECK VOLTAGE IMBALANCE

DOES NOT APPLY SINGLE PHASE CONDENSER MOTOR(S), APPLY TO COMPRESSOR SECTION AND 3 PHASE CONDENSER MOTORS.

LINE-TO-LINE VOLTS: AB _____ V AC _____ V BC _____ V

(AB + AC + BC)/3 = AVERAGE VOLTAGE = _____ V

MAXIMUM DEVIATION FROM AVERAGE VOLTAGE = _____ V

VOLTAGE IMBALANCE = 100 X (MAX DEVIATION)/(AVERAGE VOLTAGE) = _____

IF OVER 2% VOLTAGE IMBALANCE, DO NOT ATTEMPT TO START SYSTEM!

CALL LOCAL POWER COMPANY FOR ASSISTANCE.

III. START-UP

CHECK INDOOR (EVAPORATOR) FAN SPEED AND RECORD. _____

AFTER AT LEAST 15 MINUTES RUNNING TIME, RECORD THE FOLLOWING MEASUREMENTS:

OIL PRESSURE (Where Appropriate)		_____	_____
SUCTION PRESSURE		_____	_____
SUCTION LINE TEMP		_____	_____
DISCHARGE PRESSURE		_____	_____
DISCHARGE LINE TEMP		_____	_____
ENTERING CONDENSER-AIR TEMP		_____	_____
LEAVING CONDENSER-AIR TEMP		_____	_____
EVAP ENTERING-AIR DB (dry bulb) TEMP		_____	_____
EVAP ENTERING-AIR WB (wet bulb) TEMP		_____	_____
EVAP LEAVING-AIR DB TEMP		_____	_____
EVAP LEAVING-AIR WB TEMP		_____	_____
COMPRESSOR AMPS:			
CIRCUIT 1 (L1/L2/L3)	_____	_____	_____
CIRCUIT 2 (L1/L2/L3)	_____	_____	_____
CONDENSER FNA AMPS:			
FAN 1 (L1/L2/L3)	_____	_____	_____
FAN 2 (L1/L2/L3)	_____	_____	_____

NOTES: _____

_____

CUT ALONG DOTTED LINE

CUT ALONG DOTTED LINE