Form I-COND (01-12-18)
Obsoletes I-COND (01-18)

Installation/Operation/Maintenance

Applies to: **Model MASA**

Air Cooled Condensing Unit

Designed for Split Systems

R-410A Refrigerant Only

IMPORTANT: Check, Test, and Startup **MUST** be followed, as documented in this manual. A completed Condenser Startup Form (page 38) may be required for validation of any warranty claims.

The factory reserves the right to deny warranty without completed Condenser Startup Form.

This booklet includes operation, maintenance, and service information. Before beginning any procedure, carefully review the information, paying particular attention to the warnings. All installation procedures including handling of refrigerant must be in compliance with all codes and requirements of authorities having jurisdiction.

Installer should complete information on page 40.

Condenser Startup Form on page 38 should be completed on initial startup.

Owner should keep this booklet for future reference.

Table of Contents

1.0 General

1.1 Hazard Labels and Notices

There are warning labels on the condensing unit and throughout this manual. For your safety, read the definitions below and comply with all boxes labeled CAUTION, WARNING, and DANGER during installation, operation, maintenance, and service of this system.

Definitions of Hazard Intensity Levels in this Manual

HAZARD INTENSITY LEVELS

DANGER: Failure to comply will result in severe personal injury or death and/or property damage.

WARNING: Failure to comply could result in severe personal injury or death and/or property damage.

CAUTION: Failure to comply could result in minor personal injury and/or property damage.

WARNING

Improper installation, adjustment, alteration, service, or maintenance can cause property damage, personal injury, or death. A qualified installer or service agency must perform installation and service.

DANGER

This condensing unit is designed to use R-410A high pressure refrigerant only. Hazards exist that could result in personal injury or death. Installation, maintenance, and service should only be performed by an HVAC technician qualified in R-410A refrigerant and using proper tools and equipment. Due to much higher pressure of R-410A refrigerant, DO NOT USE service equipment or tools designed for R22 refrigerant.

DANGER

Never use oxygen to pressurize a refrigeration system. Oxygen can explode on contact with oil and result in personal injury or death. When using high pressure gas such as nitrogen for pressurizing a refrigeration system, ALWAYS USE A PRESSURE REGULATOR that can control the pressure down to 1 or 2 psig.

SAFETY WARNINGS

For your safety, wear eye protection, gloves, and protective clothing when handling R-410A refrigerant or POE oil and when brazing. Have a fire extinguisher nearby when brazing.

1.0 General (cont'd)

1.1 Hazard Labels and Notices (cont'd)

WARNING

Before installing or servicing, always turn off the main power to the system and install a lock out on the disconnect switch.

CAUTION

Do not leave system open to the atmosphere any longer than minimum required for installation. Exposure for more than five minutes may contaminate the system. POE oil in the compressors is extremely susceptible to moisture absorption. Always keep ends of tubing sealed during installation.

1.2 General Information

This booklet includes operation, maintenance, and service information. Before beginning any procedure, carefully review the information, paying particular attention to the warnings. All installations must be in compliance with all codes and requirements of authorities having jurisdiction.

A Model MASA outdoor condensing unit operates on R-410A refrigerant and has two independent refrigeration circuits configured in an approximate 1/3-2/3 arrangement. The Model MASA condensing unit is designed for use with a PreevA® air handler unit with a 1/3-2/3 two-circuit cooling coil. PreevA® indoor Models are PDH or SDH; outdoor Model is RDH. The Model MASA condensing unit may also be matched to a field-supplied 1/3-2/3 two-circuit evaporator coil. An air handler used with a Model MASA condensing unit must be properly matched; the evaporator coil must have freeze protection and must be equipped with properly sized thermostatic expansion valves.

CAUTION

The condensing unit must be matched to an approximate 1/3-2/3 two-circuit, R-410A refrigerant evaporator coil with properly sized thermostatic expansion valves. Failure to properly match and/or equip the split system components will prevent the system from operating correctly and will void the manufacturer's warranty. See Hazard Levels, page 3.

1.3 Warranty

Refer to limited warranty information on the Warranty Form in the "Literature Bag" shipped with this system.

A completed Condenser Startup Form on page 39 may be required for validation of any warranty claim. Proper Check, Test, and Startup procedures **MUST** be followed, as documented in this manual. The factory reserves the right to deny warranty without a completed Condenser Startup Form.

1.4 Installation Codes

All installations must be in compliance with the National Electric Code ANSI/NFPA No. 70 (latest edition) or, in Canada, the Canadian Electrical Code, Part I-C.S.A. Standard C 22.I. Check any local ordinances or utility company requirements that apply. The installation must be in compliance with all authorities having jurisdiction. Local code requirements supersede national requirements.

2.0 Location

Model MASA condensing unit must be mounted outdoors on a level surface. The supporting structure must be able to support the operating weight of the unit and maintain a level plane during continued operation. Water should drain away from the unit. Location must comply with free space clearances for unrestricted airflow (See Paragraph 4.1) and the refrigerant piping requirements (See Paragraph 6.1.3). Avoid facing condenser coils into the prevailing wind.

3.0 Receiving, Moving, and Uncrating

3.1 Receiving

Check for any damage that may have been incurred during shipment. If damage is found, document the damage with the transporting agency and immediately contact your Factory distributor. If you are an authorized Distributor, follow the FOB freight policy procedures.

3.2 Moving

The heavy gauge base of the condensing unit has forklift openings in both sides. To move a unit, use a forklift with forks that have a minimum length of 24" (610mm).

3.3 Uncrating

Immediately upon uncrating, check the electrical characteristics to verify that the unit is suitable for the installation site. This condensing unit is designed for R-410A refrigerant only; verify that the split system air handler is for use with R-410A refrigerant.

3.3.1 Shipped-Separate Items

Before beginning installation, be sure that all shipped-separate options ordered are available at the site. Shipped-separate options could have been ordered with the condensing unit or the matching PreevA® air handler.

NOTE: Two liquid line filter driers are shipped loose with the condensing unit for field installation.

4.0 Clearances and Dimensions

4.1 Clearances

The condensing unit must have unrestricted airflow on the coil side and above the unit. A service clearance is required on the control side of the cabinet.

FIGURE 1 - Minimum Clearances (Top View)

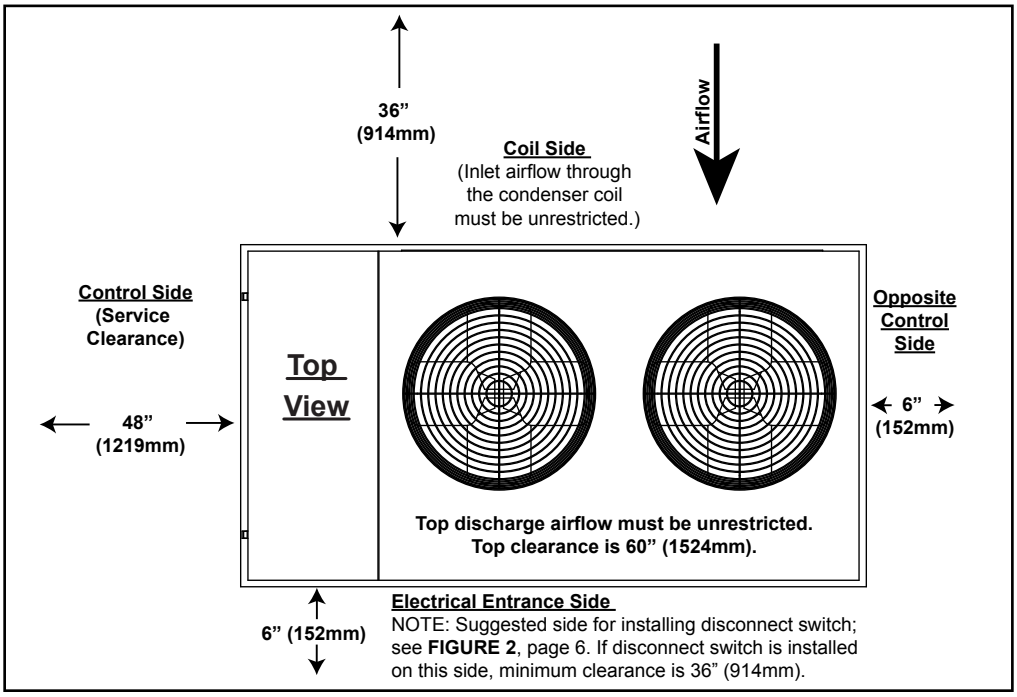


FIGURE 2A - Model MASA 60 and 90 Dimensions

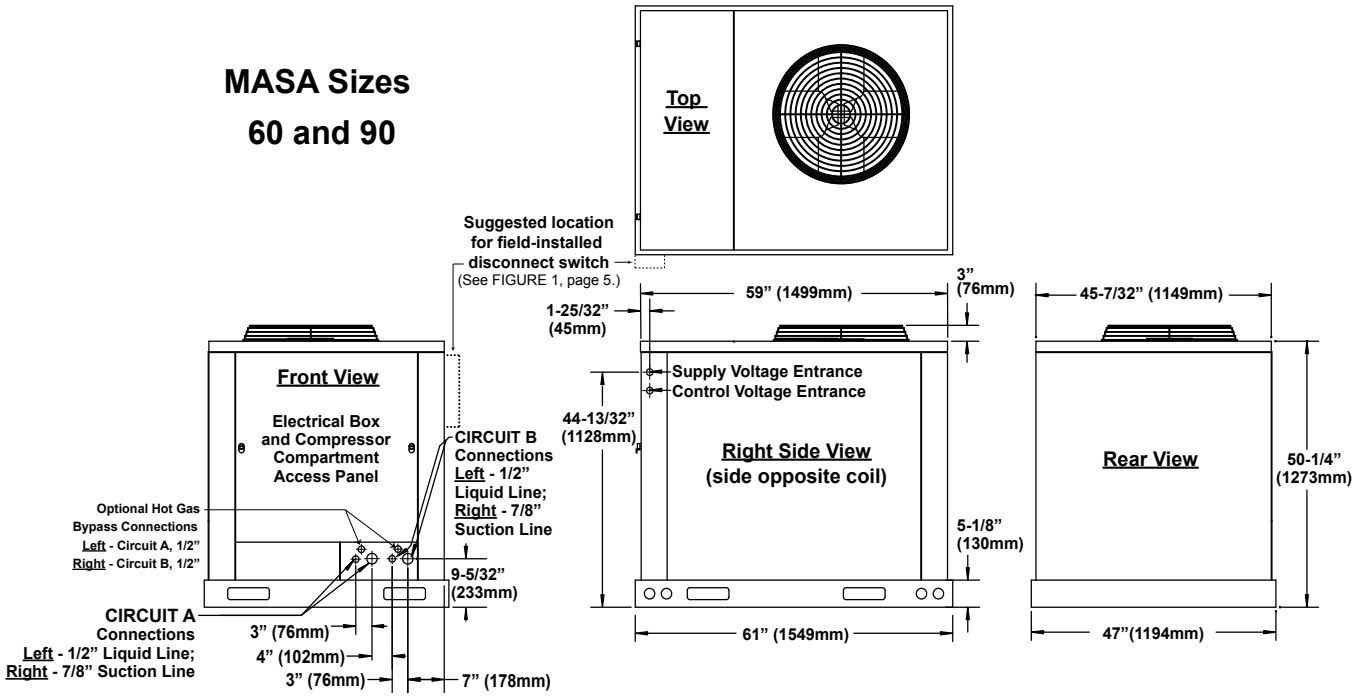
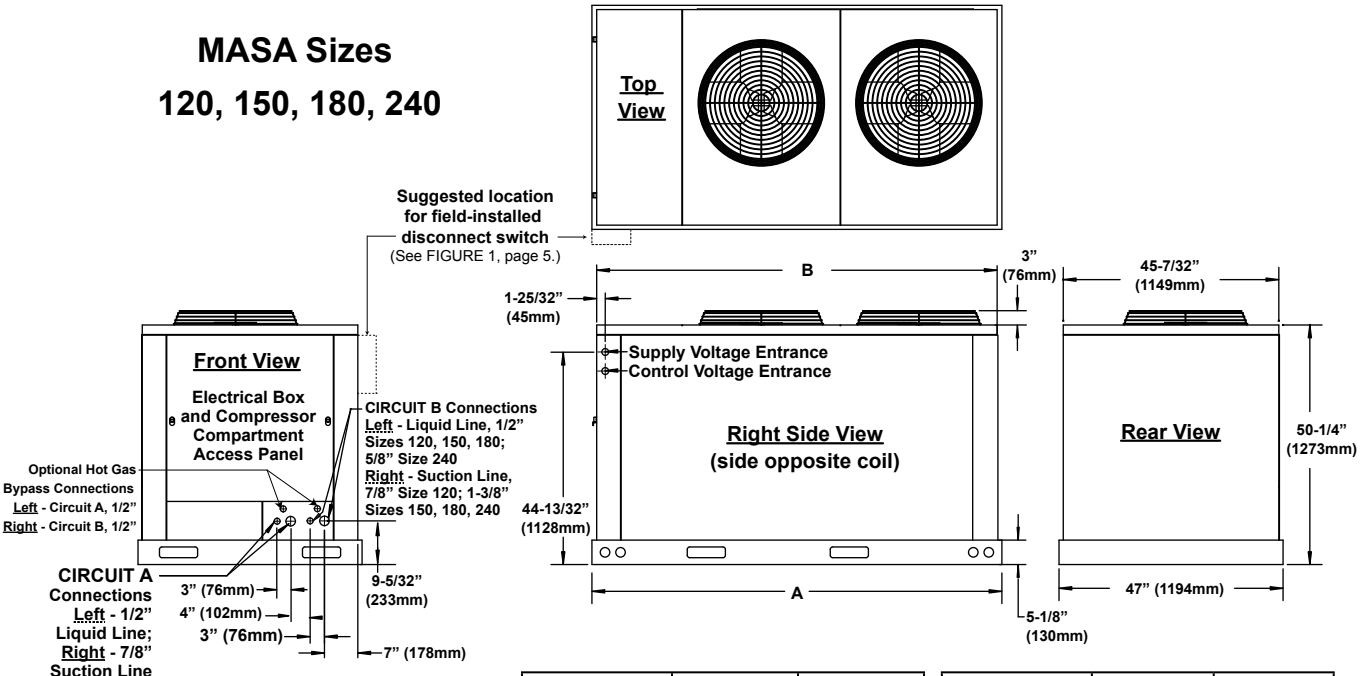


FIGURE 2B - Model MASA 120, 150, and 180 Dimensions



MASA Sizes	A	B
	Dimensions (inches)	
120,150	86	84
180,240	110	108

MASA Sizes	A	B
	Dimensions (mm)	
120,150	2184	2134
180,240	2794	2743

5.0 Mounting

5.1 Weights

Before installing, check the supporting structure to be sure that it has sufficient load-bearing capacity to support the operating weight of the unit. Mounting is the responsibility of the installer.

TABLE 1 - Weights

Approximate Operating Weight of Condensing Unit

MASA Size	060	090	120	150	180	240
lbs	440	461	632	699	749	771
kg	200	209	287	317	340	350

5.2 Lifting

The heavy gauge base of the condensing unit has fork lift holes and a pair of lifting holes on each corner for rigging. If lifting with a forklift, forks must have a minimum length of 24” (610mm). If attaching rigging, insert a clevis in each set of holes for the rigging **and lift using spreader bars**. **Lift the unit straight up with vertical force.**

Test lift the unit to be sure that it is secure and then lift slowly following safe lifting procedures. Lifting and rigging are the responsibility of the installer.

5.3 Mounting

Condensing unit may be set directly on a roof or slab. Unit must be level. Be sure to comply with clearances in **FIGURE 1**, page 5.

6.0 Mechanical

6.1 Refrigerant Piping

6.1.1 Location of Piping Connections at the Condensing Unit

Remove the control compartment door panel. Locate the refrigerant connections in the lower right corner. See **FIGURE 3,** page 8. Each circuit is shipped with a nitrogen charge and has a shutoff valve. Do not open the valves until after the lines are connected and the condenser circuits are leak tested.

The entrances for the two main refrigerant circuits are identified as Circuit A and Circuit B (See **FIGURE 3**). Circuit A is the smaller (approximate 33%) condenser circuit; Circuit B is the larger (approximate 67%) circuit. Also indicated, are the entrances for optional hot gas bypass circuits. If the condensing unit is equipped with a hot gas bypass on only one circuit (Option CUG2), only one entrance will be used. If equipped with a hot gas bypass on both circuits (Option CUG3), both entrances will be used. **When connecting refrigerant lines to the condensing unit and the air handler, it is very important to make all connections so that each individual circuit is maintained.**

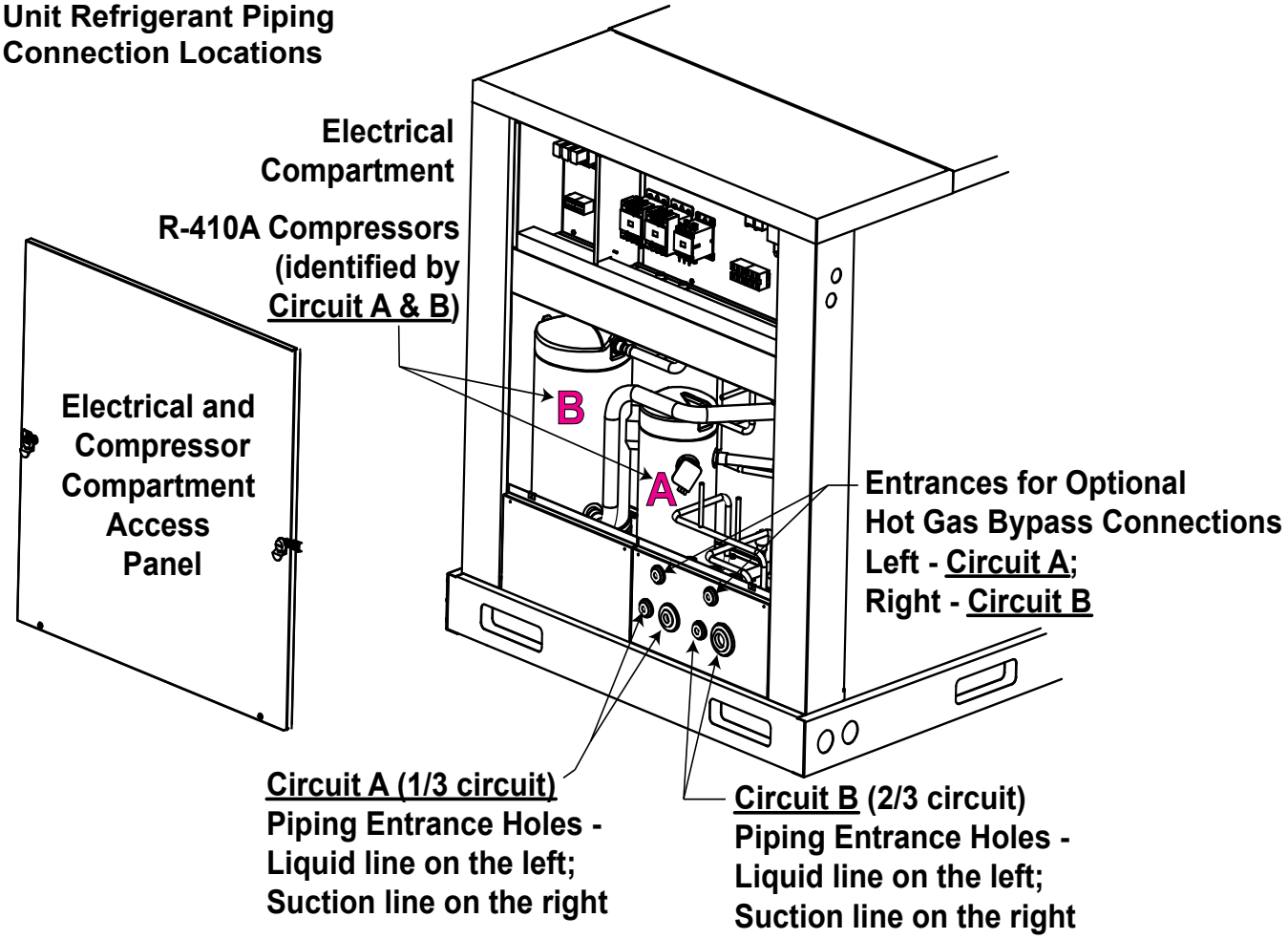
CAUTION

Do not remove seal caps from refrigerant connections or open the service valves until ready to make permanent connection. Exposure to the atmosphere for longer than five minutes may allow moisture and dirt to contaminate the system. See Hazard Levels, page 3.

6.0 Mechanical (cont'd)

6.1.1 Location of Piping Connections at the Condensing Unit (cont'd)

FIGURE 3 - Condensing Unit Refrigerant Piping Connection Locations



6.1.2 Location of Piping Connections at the Split System Evaporator Coil

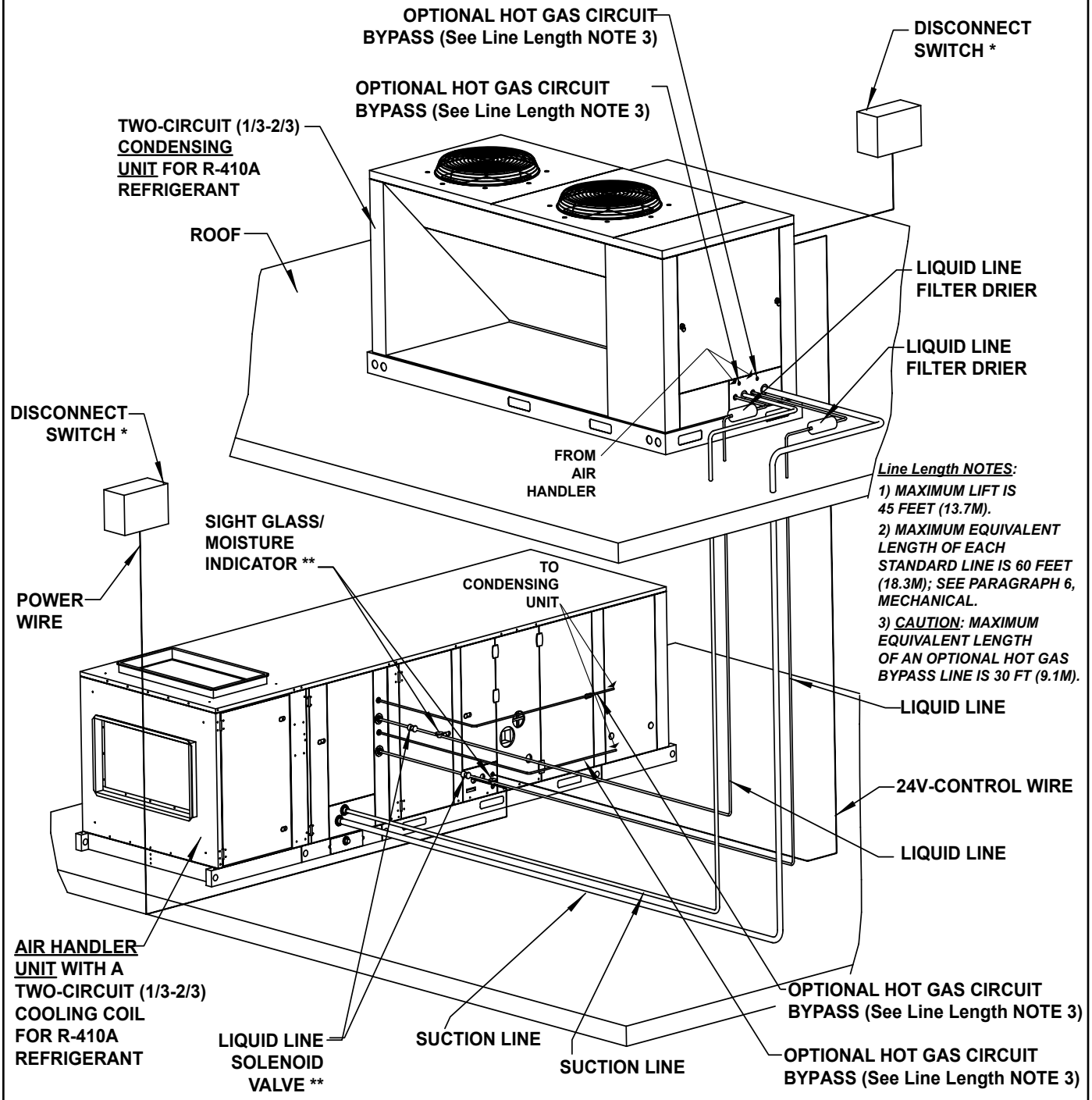
It is important to identify the Circuit A and Circuit B connections at the evaporator coil before running the refrigerant lines.

Circuit A on the condenser (**FIGURE 3**) is the smaller (33%) circuit and should be connected to the 33% circuit of the evaporator coil. Circuit B on the condenser (**FIGURE 3**) is the larger (67%) circuit and should be connected to the 67% circuit of the evaporator coil.

On the evaporator coil, identify the liquid line connection at the distributor for the smaller circuit (Circuit A). Force nitrogen into the Circuit A connection and check which suction line connection corresponds to it. If the suction line connection is not identified, mark it as Circuit A. For verification, repeat the process with the larger circuit and mark the suction line connection as Circuit B.

Refer to **FIGURE 4A or 4B** for illustration of a split system refrigerant piping system connecting a MASA condensing unit to a PreevA® evaporator coil. In **FIGURE 4A**, the condensing unit is higher than the evaporator coil. In **FIGURE 4B**, the condensing unit is lower than the evaporator coil.

FIGURE 4A - Refrigerant Piping on a PreevA® Split System with the Condensing Unit Installed at a Higher Level than the Air Handler Unit



LEGEND
NEC - National Electric Code
TXV - Thermostatic Expansion Valve

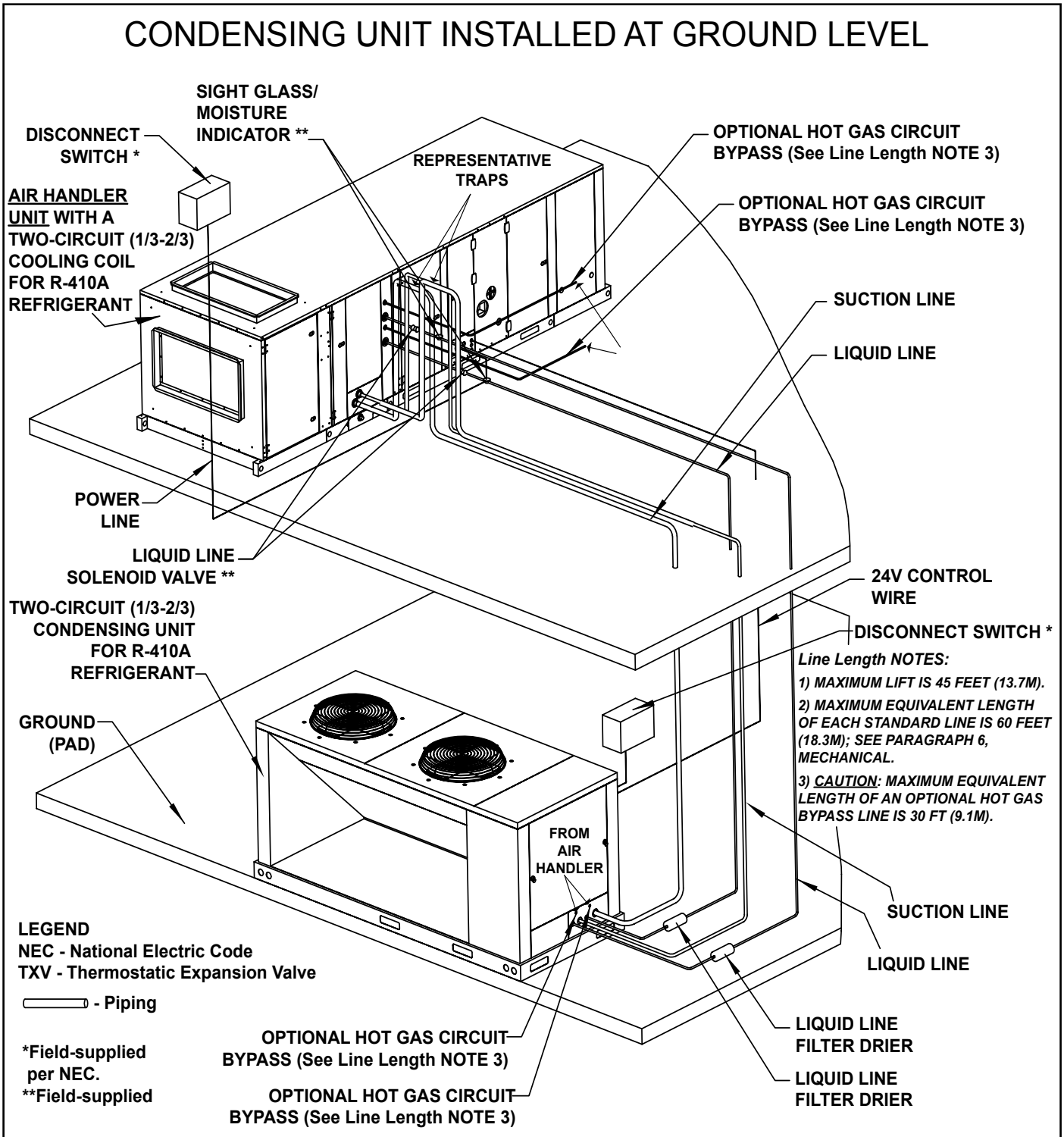
- Piping

*Field-supplied per NEC.
**Field-supplied

NOTES:
1. All piping must follow standard piping techniques for R-410A refrigerant. Refer to ASHRAE Guide and ASME Informational Standards for piping information. Comply with CSA Mechanical Refrigeration Code CSA B52, ASHRAE Guide Section 15, all municipal codes, and state or provincial requirements.
2. All wiring must comply with all applicable local and national codes.
3. Wiring and piping shown are general points-of-connection guides only and are not intended to apply to or include all details for a specific installation. Refer to ASHRAE Guide Section 15 for piping details.
4. Internal factory-supplied TXV's on PREEVA air handler unit are not shown. (Air handler must have properly sized thermal expansion valves.)
5. Both condenser and evaporator must have two refrigerant circuits that are approximately 1/3-2/3.
6. Evaporative coil must have freeze protection.

6.0 Mechanical (cont'd)

FIGURE 4B - Refrigerant Piping on a PreevA® Split System with the Condensing Unit Installed at a Lower Level than the Air Handler Unit



NOTES:

1. All piping must follow standard piping techniques for R-410A refrigerant. Refer to ASHRAE Guide and ASME Informational Standards for piping information. Comply with CSA Mechanical Refrigeration Code CSA B52, ASHRAE Guide Section 15, all municipal codes, and state or provincial requirements.
2. All wiring must comply with all applicable local and national codes.
3. Wiring and piping shown are general points-of-connection guides only and are not intended to apply to or include all details for a specific installation. Refer to ASHRAE Guide Section 15 for piping details.
4. Internal factory-supplied TXV's on PREEVA air handler unit are not shown. (Air handler must have properly sized thermal expansion valves.)
5. Both condenser and evaporator must have two refrigerant circuits that are approximately 1/3-2/3.
6. Evaporative coil must have freeze protection.

6.1.3 Refrigerant Piping Guidelines (R-410A Refrigerant)

The information in this section is a guideline and is not intended to provide all of the instructions needed for designing and installing the R-410A refrigerant lines. The installer is responsible for designing the refrigerant connecting system and for complying with standard refrigerant piping procedures. Refer to ASHRAE Guide and ASME Informational Standards for piping information. Comply with CSA Mechanical Refrigeration Code CSA B52, ASHRAE Guide Section 15, all municipal codes, and state or provincial requirements.

Read all information in Section 6.1.3 before beginning installation of refrigerant piping. In addition to the information in the following paragraphs, these general requirements apply.

- **IMPORTANT:** Do not bury refrigeration lines.
- Pitch refrigerant lines in the direction of flow at approximately 1/2” per 10 ft (12mm per 3 M).
- To prevent possible noise or line vibration, isolate refrigerant lines from building structure and ductwork.
- Use long radius “L” for all 90° bends.
- Isolate suction and liquid lines from each other and from the unit cabinet.

CAUTION

Do not leave system open to the atmosphere any longer than minimum time required for installation. POE oil in the compressors is extremely susceptible to moisture absorption. Keep ends of tubing sealed during installation. See Hazard Levels, page 3.

6.1.3.1 Type of Refrigerant Piping

Refrigerant piping is field supplied. Use only clean, dehydrated refrigeration grade Type L scheduled or ACR Hard Drawn (ASTM B 280) copper tubing. Size of refrigerant line segments depends on the condensing unit size and the length and configuration of the lines. Do not determine the size of the piping by the size of the connections at the condenser or evaporator; follow the line sizing instructions in Section 6.1.3.2 below.

6.1.3.2 Refrigerant Piping Length and Size

Design the refrigerant circuit for a minimum pressure loss by keeping the actual length to a minimum, with a minimum number of bends and fittings, and with a minimum amount of line exposed to the outdoors. Excessive suction line pressure drop will result in decreased thermal efficiency and increased power requirements. Excessive liquid line pressure drop can cause the refrigerant to flash resulting in faulty expansion valve operation. Typically, each segment of the refrigerant line should be sized for pressure loss of 2°F or less.

Lift must also be considered when determining location and piping length. Maximum lift of the refrigerant circuit is 45 ft (13.7M).

Tubing size is determined separately for each of the four segments of the refrigerant piping - Circuit A liquid line; Circuit A suction line; Circuit B liquid line; and Circuit B suction line. The size of the tubing required for each segment is determined by its equivalent length. The equivalent length is the actual length of the line segment plus any fittings or accessories.

If accessories (see Paragraphs 6.1.3.3 and.4 for required accessories) have equivalent lengths provided by the manufacturer, use that information. If equivalent length is not provided and for fittings, use the equivalent lengths in **TABLE 2**.

6.1 Refrigerant Piping (cont'd)
6.1.3 Refrigerant Piping Guidelines (R-410A Refrigerant) (cont'd)
6.1.3.2 Refrigerant Piping Length and Size (cont'd)

TABLE 2 - Fitting Pressure Loss in Equivalent Length of Straight Copper Tubing

Equivalent Length of Fittings and Accessories													
Line Size OD	Globe/ Solenoid Valve	Angle/ Check Valve	90ºSR Elbow	90ºLR Elbow	45º Elbow	TeeLine /Sight Glass	Tee Branch	Coupling to Enlarge OD by			Coupling to Reduce OD by		
								1/4"	1/2"	3/4"	1/4"	1/2"	3/4"
	Equivalent Length (in Feet of Pipe)												
1/2"	9	5	1.4	0.9	0.4	0.6	2.0	1.4	0.8	0.3	0.7	0.5	0.3
5/8"	12	6	1.5	1.0	0.5	0.8	2.5	1.8	1.1	0.4	0.8	0.7	0.4
3/4"	14	7	1.9	1.3	0.6	0.9	3.0	2.5	1.5	0.5	1.2	1.0	0.5
7/8"	15	8	2.3	1.5	0.7	1.0	3.5	3.2	2.0	0.7	1.6	1.2	0.7
1-1/8"	22	12	2.7	1.8	0.9	1.5	4.5	4.7	3.0	1.0	2.3	1.8	1.0
1-3/8"	28	15	3.6	2.4	1.2	1.8	6.0	5.8	3.6	2.9	2.9	2.2	1.2
	Equivalent Length (in Meters of Pipe)												
1/2"	2.7	1.5	0.4	0.3	0.1	0.2	0.6	0.4	0.2	0.1	0.2	0.2	0.1
5/8"	3.7	1.8	0.5	0.3	0.2	0.2	0.8	0.6	0.3	0.1	0.2	0.2	0.1
3/4"	4.3	2.1	0.6	0.4	0.2	0.3	0.9	0.8	0.5	0.2	0.4	0.3	0.2
7/8"	4.6	2.4	0.7	0.5	0.2	0.3	1.1	1.0	0.6	0.2	0.5	0.4	0.2
1-1/8"	6.7	3.7	0.8	0.6	0.3	0.5	1.4	1.4	0.9	0.3	0.7	0.6	0.3
1-3/8"	8.5	4.6	1.1	0.7	0.4	0.6	1.8	1.8	1.1	0.9	0.9	0.7	0.4

NOTE: Liquid line filter driers provided have 1/2" connections. Add equilvalent length for filter driers plus, if liquid line is not 1/2", add equilvalent for fittings.

TABLE 3 - Recommended Size of Refrigerant Piping for each Segment determined by the Equivalent Length

Use the worksheet on page 13, and the information in **TABLE 2** and **TABLE 3 to determine the line segment and circuit equivalent lengths and the size of tubing required for each line segment.**

IF AN APPLICATION REQUIRES MORE THAN 60 FEET (18.3M) OF EQUIVALENT LENGTH OF TUBING (LIQUID LINE OR SUCTION LINE) BETWEEN THE CONDENSER AND THE AIR HANDLER, CONTACT THE FACTORY DISTRIBUTOR FOR APPROVAL.

*Minimum Recommended Refrigerant Piping Size							
MASA Model	Circuit	Suction Line Tubing Size (OD)			Liquid Line Tubing Size (OD)		
		**Equivalent Length of the Suction Line - Ft (M)			**Equivalent Length of the Liquid Line - Ft (M)		
		Up to 25 Ft (Up to 7.6M)	> 25 to 50 Ft (> 7.6 to 15.2M)	> 50 to 60 Ft (>15.2to18.3M)	Up to 25 Ft (Up to 7.6M)	> 25 to 50 Ft (> 7.6 to 15.2M)	> 50 to 60 Ft (>15.2to18.3M)
60	A	1/2	5/8	3/4	1/2	1/2	1/2
	B	3/4	3/4	7/8	1/2	1/2	1/2
90	A	5/8	3/4	3/4	1/2	1/2	1/2
	B	7/8	7/8	1 1/8	1/2	1/2	1/2
120	A	3/4	3/4	7/8	1/2	1/2	1/2
	B	7/8	1 1/8	1 1/8	1/2	5/8	5/8
150	A	7/8	7/8	1 1/8	1/2	1/2	1/2
	B	1 1/8	1 1/8	1 3/8	1/2	5/8	5/8
180	A	7/8	7/8	1 1/8	1/2	1/2	1/2
	B	1 1/8	1 1/8	1 3/8	1/2	5/8	5/8
240	A	7/8	1 1/8	1 1/8	1/2	5/8	5/8
	B	1 1/8	1 3/8	1 3/8	5/8	3/4	3/4

*Based on copper tubing type L; a 2°F loss; and a maximum of 65ºF suction line (return gas) temperature and liquid line temperature of 105ºF.

Equivalent Line Segment Length = length of field-installed tubing in line segment **plus equivalent length of all field-installed fittings and accessories in line segment. For both liquid line and suction line segments, maximum recommended equivalent length is 60 ft (18.3M).

CAUTION: Maximum equivalent length of a hot gas bypass line is 30 ft (9.1M).

WorkSHEET for calculating the equivalent length of each of the four line segments.

Circuit (field-installed Liquid Line Segment and Suction Line Segment)	**CIRCUIT A (1/3 Circuit)**				**CIRCUIT B (2/3 Circuit)**			
Line Segment (field-installed refrigerant tubing)	**Liquid Line**		**Suction Line**		**Liquid Line**		**Suction Line**	
	Tubing Size _____		**Tubing Size _____**		**Tubing Size _____**		**Tubing Size _____**	
Equivalent Lengths of All Accessories and Fittings in the Line Segment	**Component**	**Length**	**Component**	**Length**	**Component**	**Length**	**Component**	**Length**
Subtotal of Equivalent Lenghts of Accessories/ Fittings								
Plus Actual Length of Line Segment								
Equals Equivalent Line Segment Length								

IMPORTANT Note: Recommended maximum total equivalent standard line length between the condenser and evaporator coil is 60ft (18.3M). For line segments longer than 60ft (18.3M) equivalent length, consult the Factory Distributor for approval. CAUTION: Maximum total equivalent length of a hot gas bypass line is 30 ft (9.1M).

6.1.3.3 Liquid Line Piping

Design the liquid lines (a line for each circuit from the condenser to the thermostatic expansion valve on the appropriate distributor at the evaporator coil) so that the pressure drop in the liquid refrigerant will not be greater than that corresponding to an approximate 1 to 2°F of subcooling. Pressure loss of 5 psi results in a 1°F loss of subcooling temperature with R-410A refrigerant. The total loss is the pressure drop loss through the piping and fittings plus any additional for lift or accessories (shutoff valve, filter, etc). Pressure loss due to lift is approximately 0.5 PSI per foot.

Each liquid line requires field installation of one of the filter driers supplied with the unit (see instructions below and **FIGURE 4A or 4B**). Filter driers are sized for each circuit; see **TABLE 4** to match the filter drier with the circuit. Also, it is highly recommended that each liquid line include a field-supplied solenoid valve and a sight glass with a moisture indicator. (NOTE: Do not rely on the sight glass for determining amount of refrigerant charge; see Paragraph 6.4 and subcooling and superheat checks in Paragraph 9.2.3 for determining refrigerant charge. A sight glass with a moisture indicator is important because moisture is very detrimental to an R-410A refrigerant circuit.) Install the recommended field-supplied sight glass with moisture indicator downstream of the filter drier and upstream of the thermostatic expansion valve.

Liquid Line Filter Driers - Two liquid line filter driers are shipped loose for field installation. Match the filter drier to Circuit A or Circuit B as listed in **TABLE 4**. Follow the filter drier manufacturer's instructions and install the correct filter drier in each liquid line close to the condensing unit. The arrow on the drier

6.0 Mechanical (cont'd)

6.1 Refrigerant Piping (cont'd)

6.1.3 Refrigerant Piping Guidelines (cont'd)

6.1.3.3 Liquid Line Piping (cont'd)

must be pointing toward the evaporator coil. If liquid line piping is not the same size, use a field-supplied fitting. Protect the filter drier from excessive heat when brazing.

TABLE 4 - Two Liquid Line Filter Driers are Shipped Loose in the Condensing Unit

MASA		Refrigerant Circuit		R410A Liquid Line Filter Driers Shipped in the Condensing Unit for Field Installation		
Size	Tons	Circuit	Tonnage	Model	P/N	Connection Size
60	5	A	2	C-084-S	177378	1/2
		B	3	C-164-S	177379	1/2
90	7.5	A	2.5	C-084-S	177378	1/2
		B	5	C-304-S	216408	1/2
120	10	A	3.3	C-164-S	177379	1/2
		B	6.6	C-304-S	216408	1/2
150	12.5	A	4.2	C-164-S	177379	1/2
		B	8.3	C-304-S	216408	1/2
180	15	A	5	C-304-S	216408	1/2
		B	10	C-414-S	216409	1/2
240	20	A	6.6	C-304-S	216408	1/2
		B	13.4	C-415-S	216410	5/8

Thermostatic Expansion Valves - The thermostatic expansion valves are field-supplied or ordered as options with the air handler. **The valves must be designed for R-410A refrigerant and sized correctly for each circuit. A thermal expansion valve with an external equalizer is required. To ensure the correct pressure is signaled to the valve, the external equalizer line must be installed immediately downstream of the thermal expansion valve.**

CAUTION:

The thermostatic expansion valves must be sized to match the circuit. Failure to properly size the thermostatic expansion valves will prevent the system from operating properly and will void the manufacturer's warranty. See Hazard Levels, page 3.

If the thermostatic expansion valves are not pre-installed on the air handler, install the outlet of the valve to the distributor connection on the evaporator coil. (Exception **NOTE**: If there is an optional hot gas bypass line in the circuit, it must be allowed to connect directly into the distributor downstream of the thermostatic expansion valve; see Paragraph 6.1.3.6.)

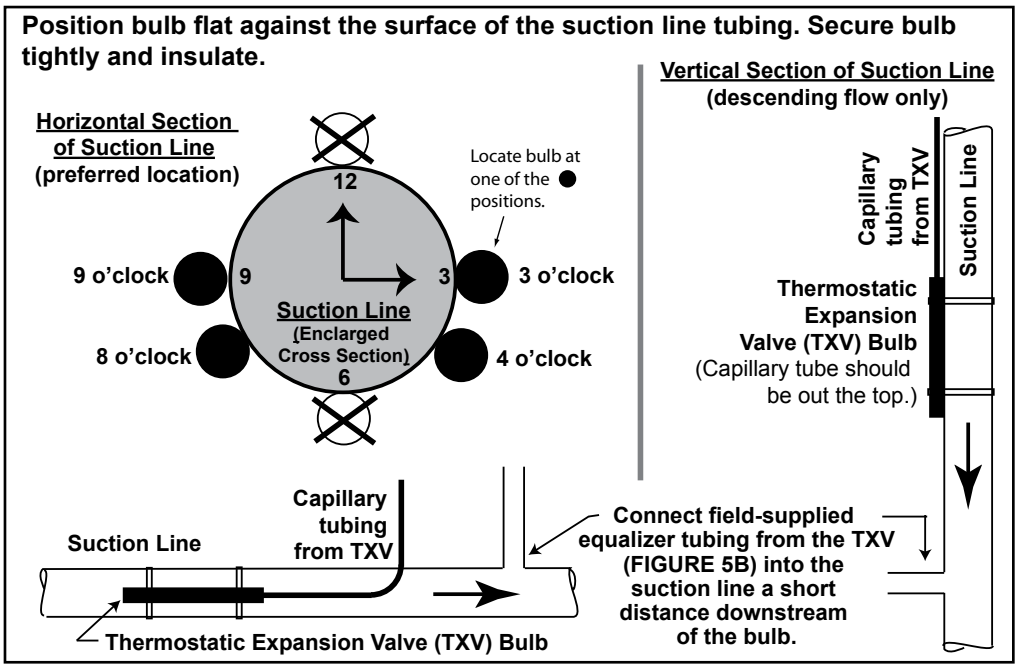
Thermostatic expansion valves are sized for the capacity of the circuit so be careful to match the valve to the correct circuit. Always wet wrap the valve body when brazing, but do not allow moisture to enter the tubing. Braze with the flame pointed away from the valve. Follow the instructions supplied from the valve manufacturer.

After the refrigerant lines are installed and before startup, extend the bulb from the valve in Circuit A to the Circuit A suction line. Extend the bulb from the Circuit B valve to the Circuit B suction line. Comply with the valve manufacturer's instructions on bulb placement. General recommendations are listed below.

- Verify that the suction line is the correct circuit.
- Place bulb on suction line as close to the evaporator coil outlet as possible.
- Place the bulb on a straight horizontal section of suction line (if bulb must be vertical, line must be descending).
- Never place bulb in a trap or downstream of a trap.
- Position bulb as shown in **FIGURE 5A**.
- Bulb must have 100% contact with tubing.
- Secure the bulb tightly.
- Cover bulb with waterproof insulation.

6.1.3.4 Suction Line

FIGURE 5A - Suction Line showing orientation and location of the Thermostatic Expansion Valve Bulb and the Equalizer Tubing



Thermostatic Expansion Valve Equalizer Line - The Model MASA condensing unit requires thermostatic expansion valves with an external equalizer. To ensure that the correct pressure is signaled to the valve, an external equalizer line must be connected into the **suction line** immediately **downstream of the thermostatic expansion valve bulb** (See **FIGURE 5A**).

Attach the other end of the equalizer line to the stem on the thermostatic expansion valve (**FIGURE 5B**).

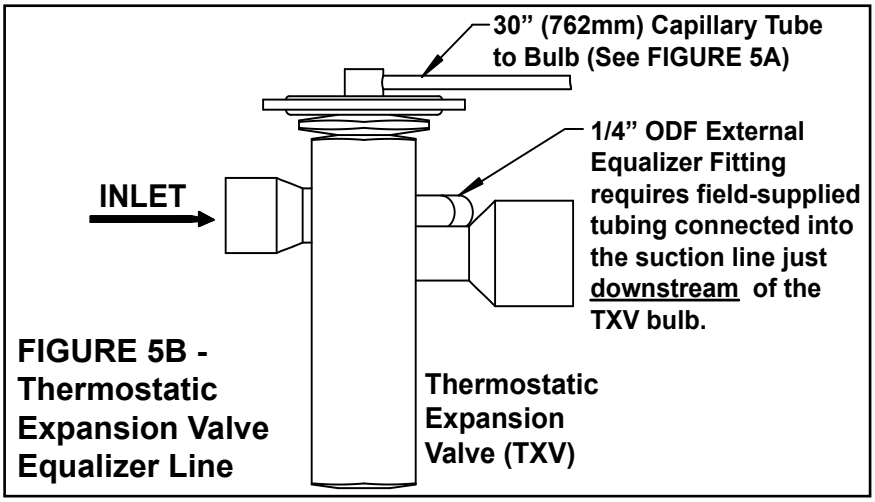


FIGURE 5B - Thermostatic Expansion Valve Equalizer Line

Suction Line Piping - The suction lines (lines carrying refrigerant vapor from the evaporator to the compressor) should be designed to provide minimum pressure drop and to return oil to the compressor under all load conditions. A suction line is normally sized to have a pressure drop no greater than an approximate 2°F of superheat.

Design and installation of the suction lines are critical to efficient operation and compressor life. Suction lines must be insulated and pitched in direction of flow. To ensure oil return, refrigerant velocity in vertical lines should be at least 1500 ft/minute and at least 750 ft/min in horizontal lines.

If the evaporator coil is above the condensing unit, a trap is required in the suction line as it leaves the evaporator. The top of the trap must be higher than the top of the evaporator. A trap is not required and should not be used when the condensing unit is above the evaporator.

Isolate the liquid lines from the suction lines. Insulate the entire length of each suction line.

6.1.3.5 Optional Hot Gas Bypass Lines

NOTE: A PreevA® evaporator coil ordered with hot gas bypass has a factory-installed side connector for attaching the hot gas bypass line.

Tubing for the optional hot gas bypass is field-supplied and installed. See the illustration in **FIGURE 4A or 4B**, page 9 or 10. Refer to **FIGURE 3**, page 6, for location of condenser unit connection(s) and Paragraph 6.1.3.6 for brazing requirements. Connect the other end of the hot gas bypass line(s) into the corresponding circuit liquid line between the thermostatic expansion valve and the distributor on the evaporator coil using a field-supplied auxiliary side connector.

CAUTION: The maximum equivalent length of a hot gas bypass line is 30 feet (9.1M).

6.0 Mechanical (cont'd)

6.1 Refrigerant Piping (cont'd)

6.1.3 Refrigerant Piping Guidelines (R-410A Refrigerant) (cont'd)

6.1.3.6 Brazing Connections

CAUTION

Do not leave system open to the atmosphere any longer than minimum required for installation. Exposure for more than five minutes may contaminate the system. POE oil in the compressors is extremely susceptible to moisture absorption. Always keep ends of tubing sealed during installation. See Hazard Levels, page 3.

Brazing materials must be able to withstand the high pressure of R-410A refrigerant. A high temperature, silver phosphate type brazing with 5% or greater alloy is recommended.

To prevent oxidation, purge tubing with 2-3 psig of regulated dry nitrogen while it is being brazed. Before brazing connections, check the condenser unit for leaks (See Paragraph 6.2.1). After the unit has been properly leak tested, the nitrogen remaining in the circuit can be used as part of the purge while brazing. Open the service valve as needed to release the nitrogen. **Do not allow moisture to enter the system.**

The installer is responsible for brazing and for complying with appropriate standard refrigerant piping procedures.

CAUTION

All brazing should be done using a 2 to 3 psig dry nitrogen purge flowing through the pipe being brazed. See Hazard Levels, page 3.

CAUTION

Do not open the service valves until after the condenser unit circuits are leak tested (See Paragraph 6.2.1.) See Hazard Levels, page 3.

CAUTION

When brazing, protect all painted surfaces and components from excessive heat. Wet wrap all valves but do not allow moisture to enter the tubing. See Hazard Levels, page 3.

6.1.3.7 Piping Support and Insulation

Comply with piping support spacing requirements in **TABLE 5**.

Insulate the entire length of each suction line and optional hot gas bypass line(s). Insulate any portion of the liquid line that is subject to extreme temperature. To prevent vibration noise, isolate all piping from the building structure or ductwork.

TABLE 5 - Maximum Spacing between Pipe Supports

Maximum Spacing Between Pipe Supports for Copper Tubing				
Nominal Diameter (OD)	5/8"	7/8"	1-1/8"	1-3/8"
Maximum Span	5 ft (1.5M)	6 ft (1.8M)	7 ft (2.1M)	8 ft (2.4M)

6.2 Leak Test the Refrigerant Circuits

6.2.1 Leak Test the Condensing Unit

The condensing unit is shipped with a 50 psi nitrogen holding charge in each circuit. Install gauges to assure that the condensing unit sections of Circuit A are

pressurized. If circuit is not pressurized, the nitrogen has escaped. Recharge with dry nitrogen to 150 psi. (Maximum test pressure is 450 psi.) Use soap bubbles or other leak-detecting method. Repair as needed to ensure a leak-free circuit in the condensing unit. Repeat with Circuit B.

NOTE: The nitrogen charge in the condensing unit circuits may be used during the brazing process as part of the purge. See Paragraph 6.1.3.6.

6.2.2 Leak Test the Field-Installed Piping

Pressurize one of the circuits with dry nitrogen to 150 psi. (Maximum test pressure is 450 psi.) Test for leaks. Repair as needed to ensure a leak-free circuit. When the circuit is successfully leak tested, allow the nitrogen to escape to the atmosphere through the pump port on the gauge manifold. Repeat with the second circuit.

6.3 Evacuate the Circuits

Evacuate one circuit at a time. Use a vacuum pump and micron gauge. Each circuit must be evacuated to hold a 500 micron vacuum. Vacuum must be pulled on both the discharge (high) and suction (low) side. Do the suction side first; and the compressor discharge side second. To establish that a circuit is leak-free and moisture-free, a standing vacuum test is recommended. Close off the valve to the vacuum pump and observe the micron gauge. If the vacuum gauge does not rise above 500 microns in one minute, the evacuation should be complete. If vacuum gauge does rise above 500 microns in one minute, evacuation is incomplete or the system has a leak. Repeat as needed until evacuation is complete. The evacuation process must be done on each circuit.

NOTE: Evacuation will not remove moisture from POE oil. Moisture must be prevented from getting in the oil.

6.4 Charge with R-410A Refrigerant

Use only R-410A refrigerant.

NOTE: Outdoor temperature must be between 70-95°F (21-35°C) for verifying superheat and subcooling. If temperature is not within this range, consult the factory service department before charging.

If equipped with an optional hot gas bypass, disable the hot gas bypass valve before charging. Remove cap and backoff spring tension until valve is disabled. (**NOTE:** See Paragraph 8.3.3 to reset.)

Estimate the refrigerant charge for each circuit. **TABLE 6** lists the weight of refrigerant required for each condenser (condenser coil and receiver) plus the amount per foot depending on size and length of the liquid line. Charge the refrigerant slowly through the gauge port on the liquid line. **R-410A refrigerant must be charged as a liquid.** R-410A cylinders are rose colored (pink) and have a dip tube for charging liquid from an upright position. If there is no dip tube, verify that the refrigerant is R-410A and turn the cylinder upside down.

TABLE 6 - Condenser Refrigerant Charge by Weight and Line Charge per Size and Length of Liquid Line

MASA Size	Circuit	60	90	120	150	180	240
Condenser Refrigerant Charge (lbs)	A	5.0	6.0	6.3	9.6	8.6	11.0
	B	5.9	9.0	9.5	11.2	11.3	14.8
PLUS **lbs listed below of R-410A refrigerant per each 50 feet (15.2M) actual length of liquid line by tubing size**							
Liquid Line Tubing Size (OD)	Lbs of R-410A Refrigerant (saturated liquid @ 77°F/25°C) per each 50 ft (15.2M) of Liquid Line						
1/2	3.4						
5/8	5.4						
3/4	8.0						

6.0 Mechanical (cont'd)

6.4 R-410A Refrigerant Charge (cont'd)

WARNING

Do not release refrigerant to the atmosphere. When adding or removing refrigerant, the qualified technician must comply with all national, state/province and local laws. See Hazard Levels, page 3.

Long Line Sets/High Refrigerant Charge

If the system charge is larger than 20 lbs, the compressor manufacturer recommends adding one fluid ounce (28ml) of oil for every 5 pounds of refrigerant over 20. Use *Copeland Ultra 22 CC POE oil.

If because of long line length, the amount of refrigerant charged exceeds the capacity of both the condenser and the receiver, the excess refrigerant will need to be reclaimed during pumpdown. Follow industry standard procedures for reclaiming. Do not release refrigerant to the atmosphere.

7.0 Electrical and Wiring

7.1 General

All electrical wiring and connections including electrical grounding must be made in accordance with the National Electric Code ANSI/NFPA No. 70 (latest edition) or, in Canada, the Canadian Electrical Code, Part I-C.S.A. Standard C22.I. Check any local ordinances or utility company requirements that apply.

Check the rating plate on the condensing unit for the supply voltage and the current requirements. A separate line voltage supply with overcurrent protection should be run directly from the main electrical panel to the unit making connections in the electrical compartment. See **FIGURE 2**, page 6, for electrical supply and control entrance locations.

7.1.1 Wiring Diagram

Each unit has a wiring diagram in the electrical compartment. **FIGURE 6,** page 21, is a typical wiring diagram.

7.2 Supply Wiring

7.2.1 Disconnect Switch

A field-supplied disconnect switch is required. When installing the disconnect switch, be careful that the conduit and switch housing are clear of all service doors. See suggested location in **FIGURE 2**, page 6. If disconnect is not mounted on the cabinet, comply with local requirements allowing at least three feet (1M) of service room between the disconnect switch and any service panels. When providing or replacing fuses in a fusible disconnect switch, use dual element time delay fuses and size 1.25 times the maximum total input amps.

7.2.2 Supply Voltage

The electric supply to the unit must meet stringent requirements for the system to operate properly. Voltage supply should be within ±10% or as stated on the rating plate. Maximum imbalance on a 3-phase system is 2%. Follow instructions below to check.

CAUTION

If this condensing unit is allowed to operate on an electric supply that is not within the specified tolerances, the product warranty shall be void. See Hazard Levels, page 3.

If the power supply is not within these tolerances, contact the power company prior to operating the system.

Check Voltage Supply - See voltage use range on the rating plate. Measure (and record) each supply leg voltage at all line disconnect switches. Readings must fall within the allowable range.

Check Voltage Imbalance - In a 3-phase system, excessive voltage imbalance between phases will cause compressor motors to overheat and eventually fail. Maximum allowable imbalance is 2%. To determine voltage imbalance, use recorded voltage measurements taken above in the following formula.

Key:	V1, V2, V3 = line voltages as measured $VA\ (average) = \frac{(V1 + V2 + V3)}{3}$ VD = line voltage (V1, V2, or V3) that deviates farthest from average (VA)
Formula:	$\%\ Line\ Voltage\ Imbalance = \frac{[100 \times (VA - VD)]}{VA}$

NOTE: If the unit is equipped with Option BF14, an over/under voltage protection device, the unit will shut down on an over or under voltage supply condition and also if there is a phase loss. This is an auto reset device and will reset when the power condition is corrected.

Compressor Wiring - A 3-phase scroll compressor must be phased correctly or compressor will operate in reverse. **Since there is a chance of unknowingly connecting the power in such a way as to cause rotation in reverse, it is important to check this on startup.**

CAUTION

Be sure to connect pressure gauges to the suction and discharge lines before startup so that compressor rotation can be checked immediately. Scroll compressors will be destroyed if operated in the wrong direction. See Hazard Levels, page 3.

Before initial startup, connect refrigerant pressure gauges to the compressor suction and discharge lines. At startup, observe the gauges. **If the suction pressure rises and discharge pressure drops, the compressor is operating in reverse and should be shut down. (**After several minutes of operation in reverse, the compressor's internal protector will trip. If a compressor is repeatedly allowed to restart and run in reverse, the compressor will be permanently damaged.) **Turn off the power and switch the 3-phase line voltage wiring connections before restarting the unit.**

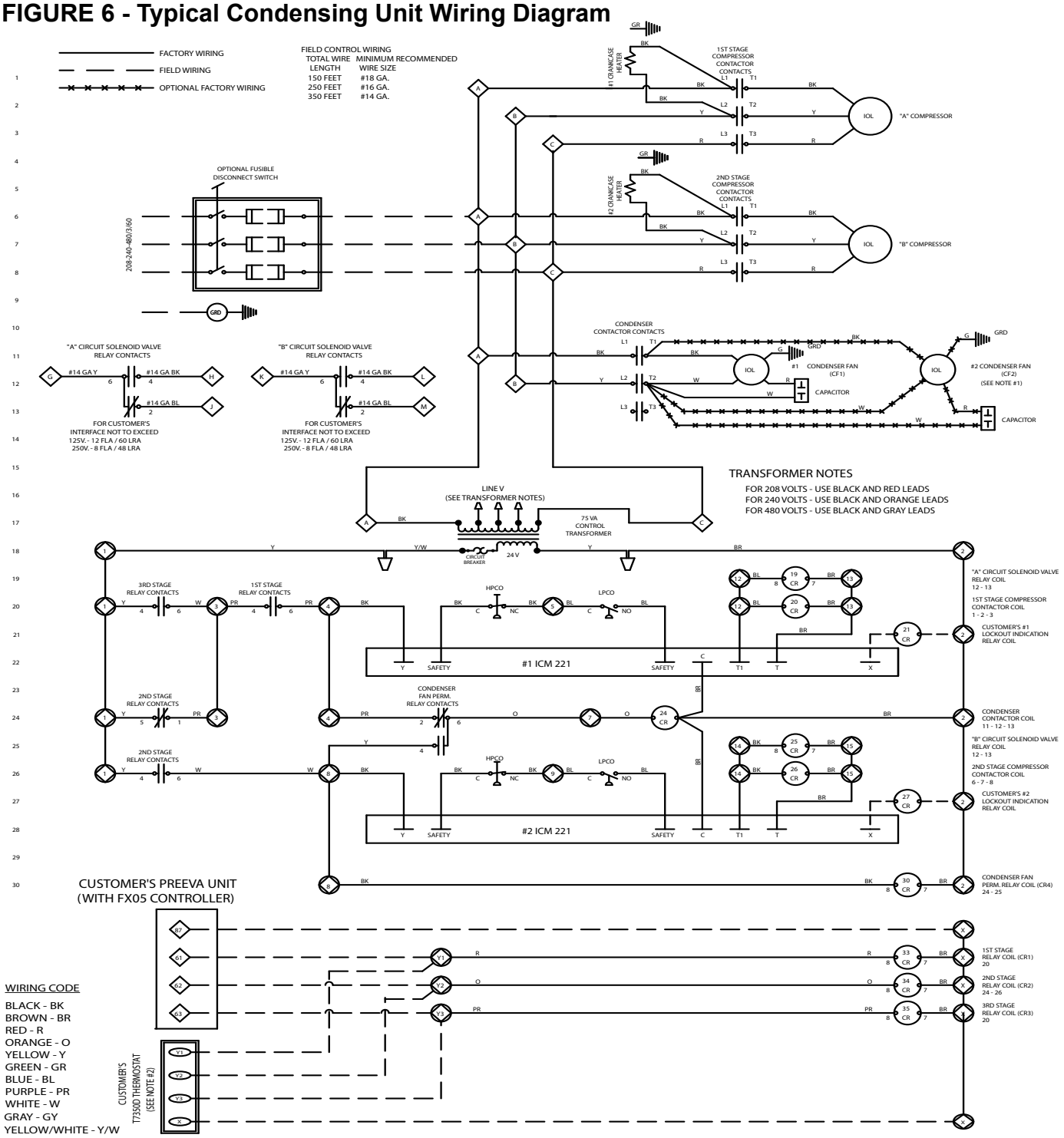
7.3 Unit Wiring Requirements

CAUTION

If any of the original wire as supplied with the appliance must be replaced, it must be replaced with wiring material having a temperature rating of at least 105°C. See Hazard Levels, page 3.

7.0 Electrical and Wiring (cont'd)

FIGURE 6 - Typical Condensing Unit Wiring Diagram



OPERATING SEQUENCE

1. FOR A TWO STAGE COOLING SEQUENCE JUMPER Y2 TO Y3. THE SEQUENCE IS #1 THEN #1 AND #2.
2. FOR A THREE STAGE COOLING SEQUENCE, THE SEQUENCE IS #1 THEN #2 THEN #1 AND #2.
3. WHEN THE ANTI-SHORT CYCLE PROTECTION MODULE IS IN A LOCKOUT CONDITION, THE LOCKOUT INDICATION RELAY COIL IS ENERGIZED.

NOTES

1. #2 CONDENSER FAN ON SIZE 120 THRU 180 UNITS ONLY.
2. THERMOSTAT IS WIRED AND POWERED PER MANUFACTURER'S LITERATURE AND IS WIRED IN SERIES WITH OPTIONAL FROSTSTATS WHEN APPLICABLE.
3. SEE RATING PLATE LABEL FOR MCA, TO DETERMINE LINE FEED COPPER WIRE SIZE.
4. USE #18 GA. WIRE FOR 24 VOLT CONTROL WIRING ON UNIT.
5. WHEN PROVIDING OR REPLACING FUSES IN THE FUSIBLE DISCONNECT SWITCH USE DUAL ELEMENTS TIME DELAY FUSES AND SIZE ACCORDING TO 1.25 TIMES THE MAXIMUM TOTAL INPUT AMPS.
6. DISCONNECT SWITCH IS FIELD FURNISHED OR AVAILABLE FROM FACTORY AS AN OPTION.
7. USE COPPER CONDUCTORS ONLY.

M SERIES - AK5, 6 or 7-CUB1 DWG. #229701 REV. #5

7.4 Control Wiring

The condensing unit is equipped with a low voltage (24V) control circuit. Depending on the air handler controls, the control system is either analog or digital.

24V wires enter the cabinet just below the line voltage entrance and must be routed over to the low voltage compartment on the left. (See **FIGURE 8**, page 28.) Connections are made at the low voltage terminal blocks.

TABLE 8 - 24V Control Wiring Size and Length

See **TABLE 8** for wiring size and length requirements.

24V Field Control Wiring Length/Gauge		
Total Wire Length	Distance from Unit to Control	Minimum Wire Gauge
150ft (46M)	75ft (23M)	18
250ft (76M)	125ft (38M)	16
350ft (107M)	175ft (53M)	14

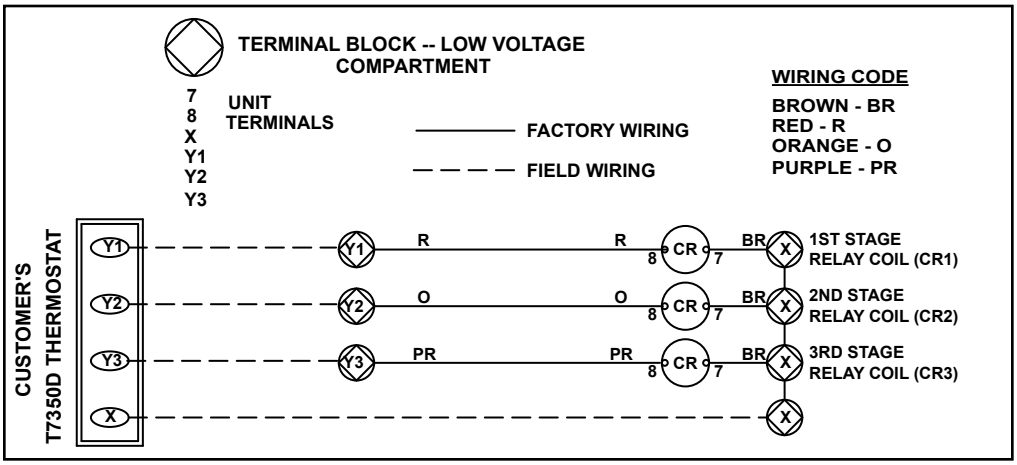
8.0 Controls and Operation

Make control connections at the 24V terminal blocks in the low voltage electrical compartment. See analog control connections in **FIGURE 7A** or digital control connections in **FIGURE 7B.**

8.1 Analog Control System

If using an analog control system, connection is to a low-voltage (24V) 3-stage thermostat. The thermostat may be field-provided or an accessory to the air handling unit.

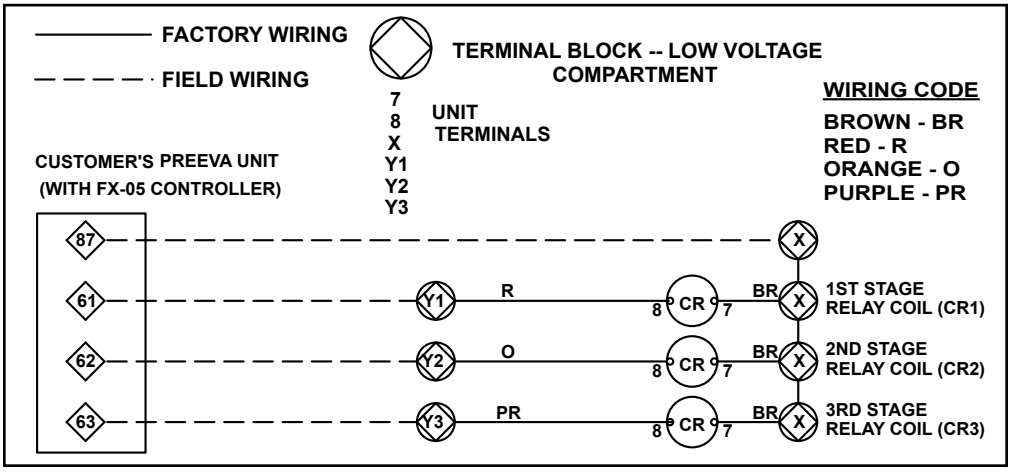
FIGURE 7A - Analog Control Connection Wiring Diagram



8.2 Digital Control System

If connecting to a PreevA® digital control system, control is from an FX05 programmable controller located in the control compartment of the PreevA® air handler (Model SDH, PDH, or RDH). Refer to the PreevA® installation manual (either Form I-PDH/SDH or Form I-RDH) for complete control information.

FIGURE 7B - Digital Control Connection Wiring Diagram for a PreevA® Split System Air Handler



8.0 Controls and Operation (cont'd)

8.3 Other Compressor and Refrigerant Controls

Check the wiring diagram on the unit to determine if it has optional controls.

8.3.1 High Pressure Cutoff

The high pressure cutoff control is located in the discharge line as it exits the compressor. If the discharge pressure exceeds the high pressure cutoff setting (600±15psi), the control will stop compressor and condenser fan operation. The high pressure cutoff control is a manual reset device. It can be reset when the pressure drops below the differential setting (400 ±15psi). Correct the problem before resetting the device to restart operation of the system.

8.3.2 Low Pressure Cutoff

The low pressure cutoff control is located in the suction line as it enters the compressor. If the suction pressure drops below the low pressure cutoff setting (35±5psi), the control will stop compressor and condenser fan operation. The low pressure cutoff control will automatically restart operation when the suction pressure goes above 50±5psi.

8.3.3 Hot Gas Bypass Valve (Option CUG2 or CUG3)

If ordered with Option CUG 2 or 3, the bypass valve will provide expanded compressor modulation at low outside air temperatures by allowing some of the gas from the discharge line to be re-routed directly to the evaporator coil. Option CUG2 has a hot gas bypass on one circuit. Option CUG3 has a hot gas bypass on both circuits.

The hot gas bypass valve is factory set. However, the factory setting should be checked at startup. To check the valve operation and/or make field adjustments, it is necessary to simulate a light load condition as described below.

Check Hot Gas Bypass Valve Setting - Connect a pressure gauge to the suction line and block the entering air to the evaporator coil. Suction pressure will drop, and the hot gas bypass valve should begin to open at approximately 115 psi and will be fully open at 95 psi. When the valve begins to open, it will be hot to the touch (see caution below).

CAUTION

Touching the operating hot gas bypass valve can cause a burn. Use caution when checking and adjusting the valve. See Hazard Levels, page 3.

If pressure needs to be adjusted, remove the cap and turn the adjusting stem clockwise to increase the pressure setting or counterclockwise to decrease the pressure setting. Make adjustments in small increments. Allow five minutes between adjustments for the system to stabilize. When finished, replace the cap on the adjustment stem and remove the pressure gauge.

8.3.4 Compressor Protection (Option CUB1)

If ordered with Option CUB1, the condensing unit has a five-minute anti-short cycle timer on compressor operation.

NOTE: Standard with PreevA® with digital FX05 controls.

8.3.5 Crankcase Heaters

Each scroll compressor in the condensing unit has a band-type crankcase heater. Crankcase heaters must always have been energized for at least 24 hours prior to operating the compressor.

9.0 Final Checks and Start-Up

IMPORTANT

On initial start-up, fill-in the CONDENSER STARTUP FORM on page 38. Completed form may be required for warranty.

9.1 General Comments

Assumptions: All connections are made; actual startup is imminent. Site is clean; all excess supplies, scraps, and debris have been removed.

WARNING:

To prevent injury or death due to electrocution or contact with moving parts, lock disconnect switch open when doing checks prior to startup. See Hazard Levels, page 3.

9.1.1 Checklist Prior to Start-up

☐ **Check Clearances**. All clearances must be as illustrated in Paragraph 4.1.

☐ **Electrical Checks**

- ☐Verify the electrical supply matches voltage rating of the unit. (Refer to the rating plate.)
- ☐Check the wiring for loose connections or damaged wire. Be sure to check the black molded plastic plug or terminal block on the compressor. Tighten plugs and connections. Replace damaged wiring. (See Paragraph 7.3 for replacement wiring requirements.)
- ☐Check all field wiring against the wiring diagram. Be sure all field-installed controls are in place. Be sure that wire gauges are as required for the electrical load. All field wiring must comply with the National Electric Code and local regulations.
- ☐Be certain that the electrical entrances are sealed against the weather.
- ☐Check that fuses or circuit breakers are in place and sized correctly.

☐ **Be certain the manual reset on the compressor high pressure cutoff switch is reset.**

☐ **Check free rotation of condenser fan(s).**

☐ **Remove all shipping supports and restraints.**

☐ **Check field-installed refrigerant lines:**

- ☐ Verify that the filter driers shipped with the unit are installed properly in the correct circuits.
- ☐ Verify that the refrigerant line for 1/3 circuit A on the condenser is connected to 1/3 circuit A on the evaporator. Check that 2/3 circuit B on the condenser is connected to 2/3 circuit B on the evaporator.
- ☐ Verify that the thermostatic expansion valve bulbs are attached properly to the correct suction line. See Paragraph 6.1.3.3.
- ☐ Verify that the system has been properly evacuated and charged with R-410A refrigerant.

☐ **In addition, verify that all startup checks in the air handling manual have been completed.**

9.0 Final Checks and Start-Up (cont'd)

9.2 Start-up

NOTE: Redo startup procedures when the cooling season begins.

CAUTION

Crankcase heaters must be allowed to warm up for at least 24 hours prior to startup. Disable cooling controls before turning on power to warmup crankcase heaters. See Hazard Levels, page 3.

Assumptions: All pre-startup checks have been made and crankcase heaters have been allowed to warmup for at least 24 hours.

9.2.1 Power Supply Voltage Phasing

☐ Connect refrigerant pressure gauges to the suction and discharge lines of the compressors and an electric meter to the power supply.

CAUTION

Be sure to connect pressure gauges to the suction and discharge lines before system start-up so that compressor rotation can be checked immediately. Scroll compressors will be destroyed if allowed to operate in the wrong direction. See Hazard Levels, page 3.

☐ Record the ambient temperature. Adjust the system controller so that a call for cooling exists.

NOTE: If the system has digital controls, outdoor ambient lockouts may prevent mechanical cooling. Temporarily override lockouts by lowering the cooling setpoint. (If installing a PreevA® air handler, refer to the digital programmable control section in the instruction manual.) When testing is complete, reset the controller.

☐ **Because it is a possible to unknowingly connect 3-phase power in such a way as to cause the scroll compressor to rotate in reverse, it is very important to check this on startup.**

Immediately at startup, observe the gauges. If the suction pressure rises and discharge pressure drops, the compressor is operating in reverse and must be shut down. Turn off the power and switch the 3-phase line voltage wiring connections before restarting the unit.

(Important NOTE: If allowed to operate for several minutes in reverse, the compressor's internal protector will trip. If a compressor is repeatedly allowed to restart and run in reverse, the compressor will be permanently damaged.)

9.2.2 Operating Sequence

- For a two-stage cooling sequence, jumper Terminal Y2 to Y3. The operating sequence is #1 (Circuit A Compressor); then #1 and #2 (both Circuit A and Circuit B Compressors).
- For a three-stage cooling sequence, the operating sequence is #1 (Circuit A Compressor); then #2 (Circuit B Compressor); and then #1 and #2 (both Circuit A and Circuit B Compressors).

9.2.3 Refrigerant Charge

IMPORTANT

All refrigeration checks MUST be made by a refrigeration technician qualified in R-410A refrigerant. Equipment and tools MUST be designed for R-410A refrigerant.

PREPARATION:

☐ To verify superheat and subcooling, outdoor temperature must be between 70-95°F (21-35°C). If temperature is not within this range, consult the factory service department before charging.

☐ Operate for 30 minutes for system to stabilize.

☐ **Check BOTH refrigerant circuit A and circuit B**; isolate each circuit before measuring superheat and subcooling.

☐ **If the circuit has an optional hot gas bypass valve, disable it before measuring superheat and subcooling.** To disable, remove cap and backoff spring tension. Be sure to reset after checking (See Paragraphs 8.3.3 and 9.2.4).

9.2.3.1 Check SUBCOOLING

☐ Measure and record temperature and pressure of the liquid line at the condenser coil outlet.

STEP 1) Record Measurements: Temperature =

_____°F (°C) and Pressure = _____ psig

STEP 2) From **Temperature/Pressure Conversion Chart**, **APPENDIX, page 40,** convert Measured Pressure (STEP 1) to _____°F (°C)

STEP 3) Subtract Measured Temperature (STEP 1) from Temperature from Conversion Chart (STEP 2)

_____°F (°C) - _____°F (°C) = _____°F (°C) degrees of Subcooling

Recommended subcooling with outdoor temperature range of 70-95°F (21-35°C) is 14-18°F (7.8-10°C).

Too much subcooling indicates a refrigerant overcharge. To reduce the subcooling, remove excess refrigerant. Too little subcooling indicates a refrigerant undercharge. To increase subcooling, slowly add R-410A refrigerant.

WARNING

Do not release refrigerant to the atmosphere. When adding or removing refrigerant, the qualified technician must comply with all national, state/province, and local laws.

9.2.3.2 Determine SUPERHEAT

Measure and record temperature (insulate probe from surrounding air temperature) and pressure in the suction line at the compressor inlet.

STEP 1) Record Measurements: Temperature =

_____°F (°C) and Pressure = _____ psig

(continued)

9.0 Final Checks and Start-Up (cont'd)

9.2 Start-up (cont'd)

9.2.3 Refrigerant Charge (cont'd)

9.2.3.1 Check SUBCOOLING (cont'd)

STEP 2) From **Temperature/Pressure Conversion Chart**, **APPENDIX, page 40,** convert Measured Pressure (STEP 1) to _____°F (°C)

STEP 3) Subtract Measured Temperature (STEP 1) from Temperature from Conversion Table (STEP 2)

_____°F (°C) - _____°F (°C) = _____°F (°C) degrees of Superheat

Recommended superheat is 8-12°F (4.5-6.7°C).

Typically, too much superheat indicates that the evaporator coil is undercharged. Too little superheat typically indicates that the evaporator coil is overcharged and may potentially flood liquid refrigerant to the compressor. To reduce the superheat, adjust the thermostatic expansion valve by turning the adjusting stem counterclockwise. To increase the superheat, adjust the thermostatic expansion valve by turning the adjusting stem clockwise.

9.2.4 Optional Hot Gas Bypass Valve

☐ If the system is equipped with an optional hot gas bypass, check operation of the valve. Set if needed. Follow the instructions in Paragraph 8.3.3.

9.3 After Startup:

Assumptions: All checks have been successfully performed and the system is operating properly. All panels and doors are secure. The area has been cleared of any excess supplies, scrap, and debris.

☐ Check that the information on page 44 has been completed. After startup, put this manual **with completed startup form** (page 41), the warranty form, and any other instructions provided with the unit in the Literature Bag.
Return the "Literature Bag" to the low voltage compartment of the unit or give it to the building owner for safe keeping.

10.0 Maintenance and Service

WARNING

Turn off the power before performing all maintenance procedures (except to check subcooling and superheat). Lock disconnect switch in OFF position. See Hazard Levels, page 3.

10.1 General

This condensing unit will operate with a minimum of maintenance. To ensure long life and satisfactory performance, an air conditioning system that is operating under normal conditions should be inspected according to the Maintenance Schedule below. If in an environment where an unusual amount of dust or soot or other impurities are present, more frequent inspection is recommended.

The procedures in the schedule below are only for the condensing unit. Refer to and comply with the maintenance schedule for the PreevA® unit or other air handler with evaporator.

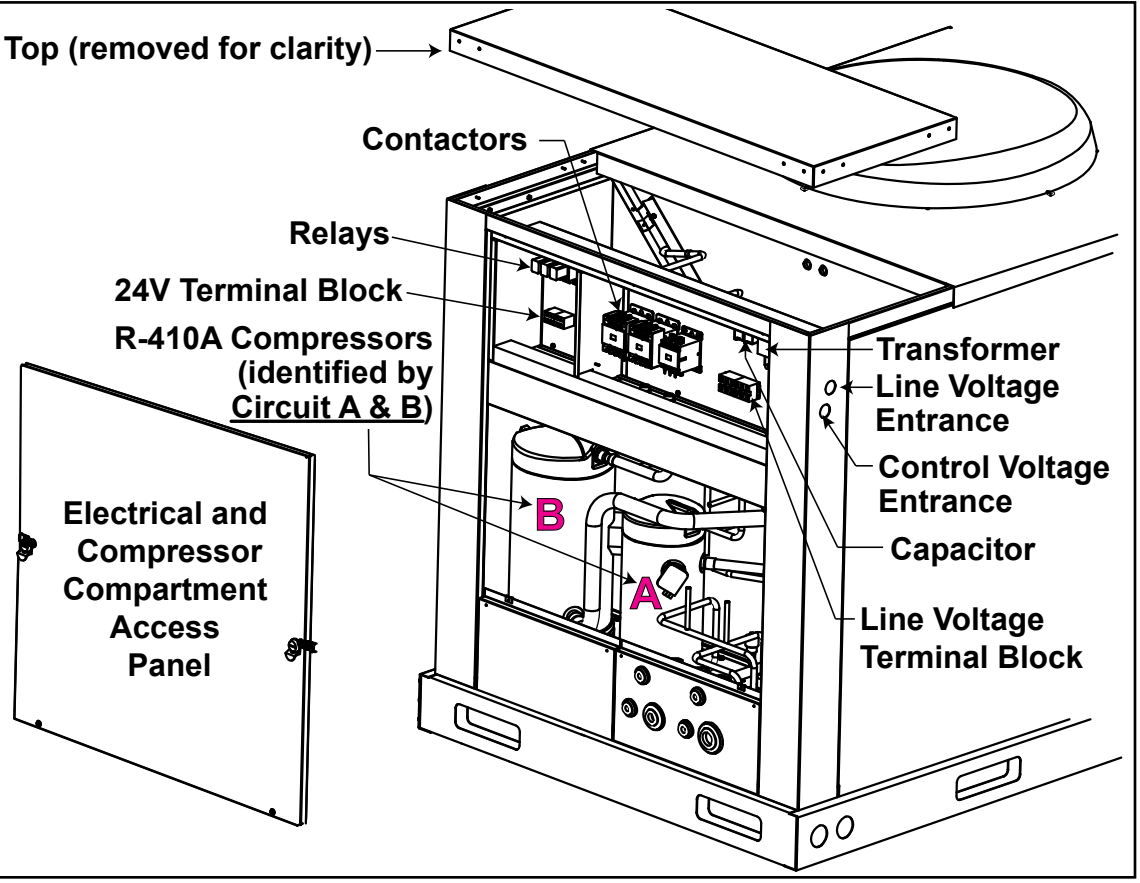
10.2 Maintenance Schedule

NOTE: If replacement parts are required, use only factory-authorized parts. For information, contact your Factory Distributor.

Beginning of the cooling season or more frequently in year-round cooling climate:

- ☐ Inspect the wiring for any damaged wire. Replace damaged wiring.
- ☐ Inspect the condenser fan. Clean as needed. See Paragraph 10.3.
- ☐ Inspect/clean condenser coil. See Paragraph 10.4.
- ☐ Check compressor operation. See Paragraph 10.5.
- ☐ Check refrigerant pressure and temperatures (both superheat and subcool). These measurements must be taken when the system is in operation. See Paragraph 10.5.

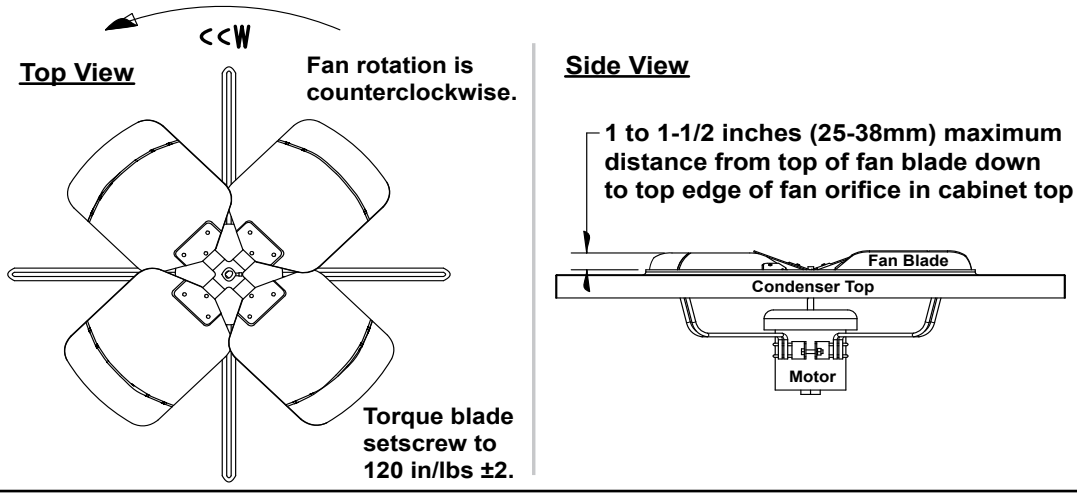
FIGURE 8 - Electrical Compartment showing Control Locations



10.3 Condenser Fan(s) Maintenance

Check condenser fans. Carefully clean debris and dirt from guards, fan blades and motors. If any parts need to be replaced, use only factory-authorized replacement parts.

FIGURE 9 - Condenser Fan Rotation and Fan Blade Spacing from Top Edge of Fan Orifice

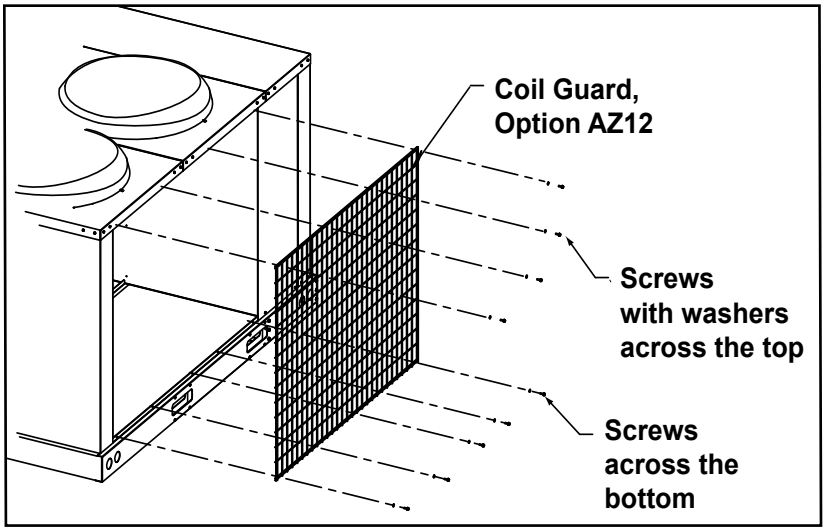


10.0 Maintenance and Service (cont'd)

10.4 Condenser Coil Maintenance

Unless equipped with an optional coil guard, the entering airflow side of the condenser coils can be reached for cleaning without removing any components. If there is a coil guard, remove the screws holding the guard (See **FIGURE 10**).

FIGURE 10 - Remove the Optional Coil Guard



Instructions for Cleaning Coil

1) Verify that the electrical power has been turned off and the disconnect switch locked.
2) Use a soft brush to remove any dirt and debris from the coil.
3) Spray with cold or warm (not hot) water and a cleaning solution (non-acid based coil cleaner is recommended). Due to possible damage to the coil, **do not use high pressure spray**.
4) When clean, rinse with cool, clean water.

If additional cleaning is required or if the coil must be removed for any reason, consult the factory. Be prepared to provide rating plate and installation information.

10.5 Compressor Maintenance and Replacement

DANGER

The refrigeration circuits are high pressure systems. Hazards exist that could result in personal injury or death. It is therefore required that the removal and installation of this scroll compressor be performed by a technician qualified in R-410A refrigerant. See Hazard Levels, page 3.

DANGER

Never use oxygen to pressurize a refrigeration system. Oxygen can explode on contact with oil and could result in personal injury or death. When using high pressure gas such as nitrogen for this purpose, ALWAYS USE A PRESSURE REGULATOR that can control the pressure down to 1 or 2 psig. Failure to use a regulator will result in extremely high pressure which could exceed the burst pressure of the compressor or other system components and result in personal injury or death. See Hazard Levels, page 3.

WARNINGS

For your safety, wear eye protection, gloves, and protective clothing when handling refrigerant and oil and when brazing. Have a fire extinguisher nearby. See Hazard Levels, page 3.

Compressor Handling

Do not lift compressor by copper tubing. To prevent internal damage, compressors ***must ALWAYS be held upright.***

The following instructions include major points of consideration that will ensure proper installation and protect you from potential personal injury. Use the following 13 steps as a checklist, taking each item in order before proceeding to the next. If more information is required, contact your Factory Distributor.

DANGER

To avoid electrical shock or damaged compressor, power to the compressor(s) MUST REMAIN OFF during performance of Steps 1 through 9 below. LOCK DISCONNECT SWITCH OFF (open). See Hazard Levels, page 3.

☐ ***Step 1*** **Replacement R-410A Compressor Application**

Verify that the replacement compressor is identical to the model being replaced. All components of the manufacturer's Model No. must be identical. System components are matched to the compressor. Replacing a compressor with a model other than the manufacturer's specified replacement will void the product warranty. See **TABLE 9**.

TABLE 9 - Replacement Scroll Compressors for R-410A Refrigerant

IMPORTANT: Model of replacement compressor and Model of factory-installed compressor that was removed must be identical.

MASA Model	Nominal Tonnage	Voltage	Refrigerant Circuit	Nominal Tonnage	Compressor Model*	P/N
060	5	200-230/3/60	A	2	ZP20K	**216671**
			B	3	ZP39K	**216678**
		480/3/60	A	2	ZP20K	**216672**
			B	3	ZP39K	**216679**
090	7.5	200-230/3/60	A	2	ZP29K	**216674**
			B	5	ZP57K	**216686**
		480/3/60	A	2	ZP29K	**216675**
			B	5	ZP57K	**216687**
120	10	200-230/3/60	A	3	ZP39K	**216678**
			B	7	ZP83K	**216689**
		480/3/60	A	3	ZP39K	**216679**
			B	7	ZP83K	**216690**
150	12.5	200-230/3/60	A	4	ZP54K	**216682**
			B	8	ZP103K	**216692**
		480/3/60	A	4	ZP54K	**216683**
			B	8	ZP103K	**216693**
		575/3/60	A	4	ZP54K	**216684**
			B	8	ZP103K	**216694**
180	15	200-230/3/60	A	5	ZP57K	**216686**
			B	10	ZP120K	**216695**
		480/3/60	A	5	ZP57K	**216687**
			B	10	ZP120K	**216696**
		575/3/60	A	5	ZP57K	**216688**
			B	10	ZP120K	**216697**

(continued)

10.0 Maintenance and Service (cont'd)

10.5 Compressor Maintenance and Replacement (cont'd)

TABLE 9 (cont'd)- Replacement Scroll Compressors for R-410A Refrigerant

MASA Model	Nominal Tonnage	Voltage	Refrigerant Circuit	Nominal Tonnage	Compressor Model*	P/N
240	20	200-230/3/60	A	7	ZP83K	**216689**
			B	13	ZP154K	**220260**
		480/3/60	A	7	ZP83K	**216690**
			B	13	ZP154K	**220261**
		575/3/60	A	7	ZP83K	**216691**
			B	13	ZP154K	**220262**

*Model No. of replacement R410A scroll compressor must be identical to the one removed including the "**E**" (ZP39Kx**E**xxx) which indicates POE compressor oil.

☐***Step 2*. Determine Cause of Initial Failure and Remove the Compressor**

In order to prevent a second failure, the cause of the original failure must be determined. Identify the cause and make the necessary repairs.

CAUTION

DO NOT LIFT compressor by copper tubing; damage will occur. Compressor must remain upright. See Hazard Levels, page 3.

WARNING

Wear eye protection, gloves, and protective clothing when handling refrigerant, POE oil, and when brazing. See Hazard Levels, page 3.

a) ***BEFORE*** **REMOVING THE FAULTY COMPRESSOR,** remove R-410A refrigerant charge using proper recovery procedures. Call 1-800-441-9450 for the name of the nearest *Dupont authorized distributor or 1-800-ASK-KLEA (IGI) for information on their refrigerant reclaim programs. This is a scroll compressor. Be sure to remove refrigerant from both the high side and the low side.

WARNING

Do not release refrigerant to the atmosphere. When adding or removing refrigerant, the qualified technician must comply with all national, state/province, and local laws.

b) Disconnect wires. Compressor wiring is connected either using a black molded plastic plug or wire terminals. Either remove the plug from the compressor or disconnect the wires.

c) Open access ports so that pressure does not build up in the system. Before unbrazing, cut the suction and discharge tubing with a tubing cutter.

WARNING

Have a fire extinguisher near. The compressor contains oil. There is a risk of fire when unbrazing stubs. See Hazard Levels, page 3.

Use a high temperature torch to disconnect the suction line and the discharge line from the compressor.

d) Remove the mounting bolts and the compressor. Save the mounting hardware to attach the grommets and sleeves shipped with the replacement compressor.

e) To test for acid and to assure excess oil does not remain in the circuit, remove oil from the failed compressor. Measure the amount of oil.

CAUTION

In addition to the required eye protection and gloves, care should be taken in handling POE oil because it may cause damage to certain plastics and roofing materials. See Hazard Levels, page 3.

If the oil taken from the compressor and measured is found to be significantly lower than listed in **TABLE 10**, clean the excess oil through use of suction and liquid line filter driers. **Beginning in Step 4, follow the same procedure as for burnout cleanup.**

Use an acid test kit to check the oil for acid. **If acid is found, beginning in *Step 4*, follow procedures indicated for burnout cleanup**.

Dispose of oil and compressor using an approved environmentally safe disposal method.

TABLE 10 - Compressor Oil Charge

MASA Size	060		090		120		150		180		240	
Circuit	A	B	A	B	A	B	A	B	A	B	A	B
Compressor	ZP20K	ZP39K	ZP29K	ZP57K	ZP39K	ZP83K	ZP54K	ZP103K	ZP57K	ZP120K	ZP83K	ZP154K
POE Oil (oz.)	34	38	21	52	38	56	62	106	52	106	56	106

☐ ***Step 3*. Mount the Replacement Compressor**

Do not remove the dust cover or rubber shipping plugs until all other system connections are complete (i.e. new liquid line filter drier(s) installed and all tubing changes made - see *Steps 4 and 5*). The amount of time the compressor is open to the atmosphere must be kept to a minimum.

Use the new mounting grommets and sleeves that are shipped with the compressor to mount it. The sleeves will prevent over compression of the grommets. Re-use the mounting bolts from the compressor that was removed. The mounting bolts will bottom out when tight.

☐ ***Step 4*. Install New Filter Driers** (Select procedure that applies.)

IF the oil measured in Step 2 was not significantly less than the amount shown in TABLE 10 or the test for acid in ***Step 2* did NOT indicate burnout**, install a new R-410A refrigerant liquid line filter drier. The filter drier must be rated for no less than 600 psig and be the proper size for the circuit. Because R-410A refrigerant requires POE oil which absorbs moisture quickly, it is important to change the filter drier any time the circuit is opened.

It is recommended to use a tubing cutter when cutting out a filter drier as the desiccant absorbs and holds moisture better when it is cool. Heat from a torch may cause moisture to leave the filter and be absorbed in the oil.

Continue to ***Step 5***.

IF the oil measured in ***Step 2*** was significantly less than shown in TABLE 10 or the test for acid in ***Step* 2 did indicate compressor burnout**, do the following:

a) Install a liquid line filter drier. **If there is acid**, install an acid removing filter drier. Size the acid-removing filter drier at least one capacity size larger than normally required for the circuit.

☐ ***Step 4*. Install New Filter Driers (cont'd)**

b) Install a temporary filter drier in the suction line. When there is acid, a 100% activated alumina suction filter drier is recommended. The suction line drier should be sized properly for the circuit and have a service access fitting to monitor pressure drop across the drier. (NOTE: Suction line filter drier must be removed after 72 hours of operation.)
Step 12 includes the remaining procedures required for cleanup of a burnout. Continue to ***Step 5***.

☐ ***Step 5*. Braze on Suction and Discharge Lines**

Comply with the brazing instructions in Paragraph 6.1.3.6.

☐ ***Step 6*. Check Circuit for Leaks**

Comply with instructions in Paragraph 6.2.1.

☐ ***Step 7*. Evacuate the Circuit**

Comply with instructions in Paragraph 6.3.
Continue and/or repeat ***Steps 6 and 7*** until evacuation is complete.

CAUTION

Do not use the replacement compressor as an evacuation assist and *never* apply voltage to a compressor while it is in a vacuum. See Hazard Levels, page 3.

Moisture and air are harmful to the system because they increase the condensing temperature, raise the discharge gas temperature, cause formation of acids, and cause oil breakdown.

CAUTION

Do not leave a circuit open to the atmosphere any longer than minimum required for installation. POE oil in the compressor is extremely susceptible to moisture absorption. Evacuation will not remove moisture from POE oil. See Hazard Levels, page 3.

☐ ***Step 8*. Check the Electrical System**

After the system has been evacuated, reconnect the electrical plug to the compressor or the wires to the compressor terminals. It is a normal practice to replace all starting components any time a compressor is changed.

WARNING

Do not apply voltage to the compressor when the plug is removed or terminals disconnected. See Hazard Levels, page 3.

Crankcase Heater

Connect the crankcase heater. The crankcase heater is energized continuously and is extremely important to proper compressor operation and long life.

The crankcase heater must be energized for at least 24 hours before starting the unit or after a power outage of more than 8 hours. Be sure to disable cooling controls before turning on power to warmup crankcase heaters.

CAUTION

Crankcase heaters must be allowed to warm up for at least 24 hours prior to startup. Disable cooling controls before turning on power to warmup crankcase heaters. See Hazard Levels, page 3.

☐ ***Step 9*. Charge the System (R-410A refrigerant)**

Charge the circuit according to the information in Paragraph 6.4. R-410A refrigerant must be charged as a LIQUID.

☐ ***Step 10* . System Startup**

Connect refrigerant pressure gauges and electric meters. Refer to Start-Up Paragraph 9.2 and perform all procedures required prior to checking subcooling and superheat which is done in ***Step 11***.

CAUTION

Be sure to connect pressure gauges to the suction and discharge lines before start-up so that compressor rotation can be checked immediately. Scroll compressors will be destroyed if allowed to operate in reverse. See Hazard Levels, page 3.

☐ ***Step 11*. Check Subcooling and Superheat**

Refer to Start-Up Paragraph 9.2 and follow instructions for checking subcooling and superheat.

WARNING

Do not release refrigerant to the atmosphere. When adding or removing refrigerant, the qualified technician must comply with all national, state/province, and local laws.

☐ ***Step 12*. (Select the procedure that applies.)**

IF the oil measured in ***Step 2*** was significantly less than in TABLE 10 or the acid test in ***Step 2*** indicated a burnout, do the following:

a) Operate the unit for several hours. Check the pressure drop through the temporary suction line filter drier. If the pressure drop exceeds 8 psig, recover the refrigerant, replace the suction line filter drier with the same type as removed, replace the liquid line filter drier, evacuate the circuit, and re-charge with the recovered refrigerant (see Paragraph 6.4). Continue to monitor the pressure drop through the suction line filter drier and repeat the process above until the pressure does not exceed 8 psig after several hours of operation. (NOTE: System must be allowed to run no more than 72 hours with a suction line filter drier.)

b) Allow the system to operate for 4-8 hours. Recover the refrigerant and take an oil sample. Retest the oil for acid.

c) If the test for acid is negative, remove the suction line filter drier, replace the liquid line drier, evacuate, and re-charge the system with the recovered refrigerant.
If the test indicates acid, replace both the liquid line filter drier and the suction line filter drier and repeat b) and c).

10.0 Maintenance and Service (cont'd)

10.5 Compressor Maintenance and Replacement (cont'd)

☐ ***Step 12***. **(Select the procedure that applies.) (cont'd)**

CAUTION

After cleanup is complete, remove the suction line filter drier. See Hazard Levels, page 3.

d) Verify subcooling and superheat (refer to Start-Up Paragraph 9.2).

e) When the system is operating properly, remove the gauges.

IF the oil measured in ***Step 2*** was not significantly less than that shown in TABLE 10 or the acid test in ***Step 2*** did not indicate a compressor burnout, continue to the review in ***Step 13***.

☐ ***Step 13*** **. Review *ALL Steps* to ensure that nothing was overlooked.**

10.6 Troubleshooting Chart

IMPORTANT: ***Do not release refrigerant to the atmosphere!*** **If required service procedures include the adding or removing of refrigerant, the service technician must comply with all national, state or province, and local laws.**

The procedures discussed in this manual should only be performed by a HVAC technician qualified in R-410A refrigerant.

SYMPTOM	POSSIBLE CAUSE	REMEDY
A. Compressor will not start.	1. Power off, loose electrical connections, or fuse open.	1. Check disconnect switch, fuses, and wiring. Replace parts or repair as necessary.
	2. Compressor contactor not closing.	2. Check voltage to contactor coil, transformer, slave relay, and system. Replace parts as necessary.
	3. Internal compressor thermal overload open.	3. If compressor is hot, allow 2 hours to cool. See D. below.
	4. Compressor defective.	4. Check compressor for electrical failure. Compressor may be seized; check refrigerant. If necessary, replace compressor.
	5. High or low pressure switch open or defective.	5. If manual reset (high pressure), reset switch. (Switch opens at 600±15 psi and will not reset above 400±15 psi.) If auto reset (low pressure) does not reset and everything else is OK, replace switch.
B. Compressor starts but cuts out on low pressure (low pressure switch activates at 45 psig.)	1. Low refrigerant charge.	1. Check subcooling and superheat. (See Paragraph 9.2)
	2. Airflow restricted.	2. Check for dirty evaporator coil, dirty filters, closed dampers, iced evaporator coil, or improper belt. Check motor amps. Check duct design.
	3. Restriction in refrigerant line.	3. Check refrigerant pressure; check and adjust thermostatic expansion valve. If not functioning properly, check for pressure drop across the filter drier.
	4. Defective low pressure switch.	4. Check calibration of switch.
C. Compressor starts but cuts out on high pressure switch.	1. Refrigerant overcharge.	1. Check subcooling and superheat. (See Paragraph 9.2)
	2. Condenser fan motor defective.	2. Check fan motor(s).
	3. Condenser coil inlet obstructed or dirty.	3. Check coil and inlet clearances and for possible air recirculation.
	4. Air or non-condensables in system.	4. Check high side equalized pressure reading with equivalent outdoor temperature.
	5. Defective high pressure switch.	5. Check calibration of switch.
	6. Restriction in discharge or liquid line.	6. Check refrigerant line pressures, check thermostatic expansion valves.
D. Compressor cuts out on thermal overload.	1. Low voltage.	1. Check voltage.
	2. Sustained high discharge pressure.	2. Check running amperage and conditions described in H.
	3. High suction and discharge pressures.	3. Check thermostatic expansion valve setting. Check for non-condensables in the system.
	4. Defective compressor overload.	4. If compressor is hot, allow compressor to cool for two hours. Recheck for open circuit.
	5. Compressor operating in reverse.	5. Switch the 3 phase line voltage wiring connections.
	6. Improper refrigerant charge.	6. Check subcooling and superheat. (See Paragraph 9.2)
	7. Bearings or pistons too tight.	7. Check for low oil level.
	8. Allow time for compressor to cool.	8. Check dome temperature of the compressor.

SYMPTOM	POSSIBLE CAUSE	REMEDY
E. Noisy compressor	1. Refrigerant overcharge.	1. Check subcooling and superheat. (See Paragraph 9.2)
	2. Compressor operating in reverse.	2. Switch the 3 phase line voltage wiring connections.
	3. Liquid floodback.	3. Check thermostatic expansion valve setting. Check for refrigerant overcharge. Check subcooling and superheat. (See Paragraph 9.2).
	4. Tubing rattle.	4. Dampen tubing vibration by taping or clamping. Carefully bend tubing away from contact where possible.
F. High suction pressure	1. Excessive load on evaporator coil.	1. Check for high entering wet bulb temperature. Check for excessive air.
	2. Compressor is unloaded.	2. Check head pressure; check thermostatic expansion valve if not functioning properly; check pressure drop across filter drier.
	3. Expansion valve not secured to suction line or valve defective.	3. Check operation of the thermostatic expansion valve. Ensure bulb is secure and insulated (See Paragraph 6.1.3.4).
G. High discharge pressure.	1. Thermostatic expansion valve setting.	1. Check thermostatic expansion valve and superheat.
	2. Air inlet to condenser dirty or obstructed.	2. Check for proper clearances and possible air recirculating.
	3. Refrigerant charge.	3. Check subcooling and superheat. See Paragraph 9.2.
	4. Condenser fan motor defective.	4. Check operation of condenser fan motor(s).
	5. Non-condensables in the system	5. Clean the circuit.
H. Suction pressure is too low.	1. Refrigerant undercharge.	1. Check pressures and subcooling. See Paragraph 9.2.
	2. Blower running backward.	2. Interchange any two wires of 3 phase wiring connections.
	3. Loose blower, pulley, or belts.	3. Check air handler drive pulley alignment and belt tension.
	4. Defective or improperly adjusted expansion valve.	4. Check superheat (Paragraph 9.2) and thermostatic expansion valve.
	5. Dirty filter.	5. Check filter and evaporator coil. Clean or replace as needed.
	6. Too little air flow or low entering air temp.	6. Check airflow and entering air wet bulb conditions.
	7. Restriction in suction or liquid line.	7. Check refrigerant circuit for restriction.
J. Head pressure too low.	1. Insufficient refrigerant charge.	1. Check superheat and subcooling (Paragraph 9.2). Check for a leak.
	2. Defective / improperly adjusted expansion valve.	2. Check superheat and thermostatic expansion valve.
	3. Low suction pressure.	3. See “H. Suction pressure too low” above.
	4. Defective compressor.	4. See “F. High suction pressure” above.
K. Compressor short cycles.	1. Thermostat location or malfunction.	1. Check thermostat/control.
	2. Improper refrigerant charge.	2. Check subcooling and superheat (Paragraph 9.2).
	3. Defective high or low pressure control.	3. Check high or low pressure switch. Replace as needed.
	4. Liquid floodback.	4. Possible tight bearings.
	5. Defective expansion valve.	5. Check thermostatic expansion valve and superheat.
	6. Poor air distribution.	6. Check ductwork for recirculating.
	7. High discharge pressure.	7. See “G. High discharge pressure.” above.
	8. Leaking discharge valves in compressor.	8. See “F. High suction pressure” above.
L. Running cycle is too long or unit operates continuously.	1. Refrigeration undercharged.	1. Check subcooling. (Paragraph 9.2)
	2. Dirty filter or evaporator coil.	2. Check filter, coil, and airflow.
	3. Dirty or clogged condenser coil.	3. Check coil and airflow.
	4. Air or other non-condensables in system.	4. Check equalized high side pressure with equivalent outdoor temperature.
	5. Defective compressor.	5. See “F. High suction pressure” above.
	6. Restriction in suction and liquid line.	6. Check for restrictions in refrigerant circuit.
	7. Control contacts stuck.	7. Check wiring.
M. Supply air temperature is too high.	1. Refrigerant undercharge or leak in system.	1. Check subcooling and check for leaks.
	2. Evaporator plugged with dirt or ice.	2. Check evaporator, airflow and filter.
	3. Improperly adjusted or defective expansion valve.	3. Check superheat and thermostatic expansion valve. Check thermostatic expansion valve bulb.
	4. Defective compressor.	4. Check compressor for proper operation.
	5. High discharge pressure.	5. See “G. High discharge pressure” above.
	6. Airflow is too high.	6. Check external static pressure.
N. Supply air temperature is too low.	1. Airflow is too low.	1. Check evaporator coil; check filters; check for closed dampers or grills; check drive for loose parts, belts, or misalignment; check external static pressure.
	2. Return air temperature too low.	2. Check entering air wet bulb conditions.
O. Liquid line is too hot.	1. Refrigerant undercharge.	1. Check subcooling.
	2. Dirty/plugged condenser coil.	2. Clean coil.
	3. Non-condensables in the circuit.	3. Clean the circuit.
	4. Condenser fan motor defective.	4. Check condenser fan motor(s).
	5. High discharge pressure.	5. See "G." above.

APPENDIX

IMPORTANT Reminders about R-410A Refrigerant and POE Oil

- Installation, maintenance, and service should only be performed by an HVAC technician qualified in R-410A refrigerant. The qualified technician must comply with all cautions, warnings, and dangers in these instructions and with all national, state/province, and local regulations.
- Due to higher pressure of R-410A refrigerant, use ONLY components, service equipment, and tools designed for R-410A refrigerant.
  DO NOT USE components, tools, or service equipment designed for R22 refrigerant. (R-410A operates at 50-70 % higher pressure than R22.)
- R-410A requires a different gauge set than those used for R22.
- Leak detector should be designed to detect HFC refrigerant.
- Use hoses with an 800 psig service pressure rating.
- Charge R-410A system with LIQUID refrigerant. R-410A refrigerant cylinders are rose color (pink) and have a dip tube which allows liquid to flow out of the cylinder in the upright position.
- An R-410A liquid line filter drier rated for 600 psig and sized for the circuit is required on each circuit and must be replaced any time the system is opened. Cut filter drier out with a tubing cutter.
- Model MASA R-410A compressors require Ultra 22CC POE oil.
- POE oil absorbs moisture quickly; do not expose oil to the atmosphere.
- Vacuum pumps do not remove moisture from POE oil.
- Do not vent R-410A refrigerant to the atmosphere.
- Do not use capillary tube coils with R-410A refrigerant.

Model MASA Technical Information

MASA Size			60	90	120	150	180	240
Nominal Capacity (Tons)			5	7.5	10	12.5	15	20
Stage Tonnage	Circuit A		1.6	2.4	3.4	4.1	5.1	13
	Circuit B		3.4	5.1	6.6	8.4	9.9	7
Operating Weight	lbs		440	461	632	699	749	771
	(kg)		(200)	(209)	(287)	(317)	(340)	(350)
Condenser Fan	Type		Propeller					
	RPM		1100					
	Diameter - Inches (Qty)		26 (1)		26 (2)			
	Motor HP		3/4 (1)		3/4 (2)			
	Nominal Air Flow	CFM	6,000		12,000			
		(M^3/hr)	(10,194)		(20,387)			
	Watts		345		690			
Condenser Coil	Type		Aluminum Micro-Channel					
	Rows - FPI		1-20					
	Total Face Area	Sq Ft	8.5	13.1	18.4	22.1	24.0	29.2
		M^2	(0.8)	(1.2)	(1.7)	(2.1)	(2.2)	(2.7)
Connection Outlet Sizes - Condensing Unit (inches)	Ckt A - Suction Line		7/8					
	Ckt B - Suction Line		7/8			1 3/8		
	Ckt A - Liquid Line		1/2					
	Ckt B - Liquid Line		1/2					
Filter-Drier Connection Size (inches)	Ckt A - Liquid Line		1/2					
	Ckt B - Liquid Line		1/2					5/8
Hot Gas Bypass Connections (inches)	Ckt A		1/2					
	Ckt B		1/2					

Electrical Information

MASA Size	Voltage	Voltage Range		Compressor Circuit A		Compressor Circuit B		Condenser Fan Motors		Power Supply	
	Volts-Ph-Hz	Min	Max	RLA	LRA	RLA	LRA	Qty	FLA (ea.)	MCA	MOP
060	208/230-3-60	187	253	7.1	55.4	13.1	83.1	1	4.0	27.9	40
	460-3-60	414	506	3.5	28.0	6.1	41.0		2.0	13.3	15
	220-3-50	198	242	7.0	57.0	12.6	80.7		3.8	27.0	40
	400-3-50	360	440	3.5	27.0	6.0	43.0		1.9	13.1	15
090	208/230-3-60	187	253	9.0	71.0	20.5	155.0	1	4.0	39.0	60
	460-3-60	414	506	5.6	38.0	9.6	75.0		2.0	19.8	25
	575-3-60	523	632	3.8	36.5	7.6	54.0		1.5	15.1	20
	220-3-50	198	242	9.3	78.0	20.5	170.0		3.8	39.1	60
	400-3-50	360	440	5.3	38.0	9.6	74.0		1.9	19.4	25
120	208/230-3-60	187	253	13.1	83.1	25.0	164.0	2	4.0	52.8	70
	460-3-60	414	506	6.1	41.0	12.2	100.0		2.0	25.5	35
	575-3-60	523	632	4.4	33.0	9.0	78.0		1.5	18.9	25
	220-3-50	198	242	12.6	80.7	25.0	179.0		3.8	51.9	70
	400-3-50	360	440	6.0	43.0	12.2	101.0		1.9	25.3	35
150	208/230-3-60	187	253	15.6	110.0	30.1	225.0	2	4.0	51.7	90
	460-3-60	414	506	7.8	52.0	16.7	114.0		2.0	32.8	45
	575-3-60	523	632	5.8	38.9	12.2	80.0		1.5	24.4	35
	220-3-50	198	242	15.6	110.0	30.1	231.0		3.8	61.2	90
	400-3-50	360	440	7.8	51.5	16.7	111.0		1.9	32.7	45
180	208/230-3-60	187	253	20.5	155.0	33.3	239.0	2	4.0	70.6	100
	460-3-60	414	506	9.6	75.0	17.9	125.0		2.0	36.3	50
	575-3-60	523	632	7.6	54.0	12.8	80.0		1.5	27.0	40
	220-3-50	198	242	20.5	170.0	34.6	239.0		3.8	71.8	100
	400-3-50	360	440	9.6	74.0	17.9	118.0		1.9	36.0	50
240	208/230-3-60	187	253	25.0	164.0	51.3	300.0	2	4.0	97.5	125
	460-3-60	414	506	12.2	100.0	23.1	150.0		2.0	45.2	60
	575-3-60	523	632	9.0	78.0	19.9	109.0		1.5	37.1	50
	220-3-50	198	242	25.0	179.0	46.8	295.0		3.8	91.5	125
	400-3-50	360	440	12.2	101.0	21.8	140.0		1.9	43.5	60

Pressure/ Temperature Chart for R-410A Refrigerant for Checking Subcooling and Superheat

NOTE: Information in this chart was taken from the Temperature Pressure Chart printed in Form IC-2-04 by the Sporlan Valve Company, Washington, MO 63090.

R-410A Refrigerant		
Pressure	Temperature	
PSI	°F	°C
1.8	-55	-48.3
4.3	-50	-45.6
7.0	-45	-42.8
10.1	-40	-40.0
13.5	-35	-37.2
17.2	-30	-34.4
21.4	-25	-31.7
25.9	-20	-28.9
27.8	-18	-27.8
29.7	-16	-26.7
31.8	-14	-25.6
33.9	-12	-24.4
36.1	-10	-23.3
38.4	-8	-22.2
40.7	-6	-21.1
43.1	-4	-20.0
45.6	-2	-18.9
48.2	0	-17.8
49.5	1	-17.2
50.9	2	-16.7
52.2	3	-16.1
53.6	4	-15.6
55.0	5	-15.0
56.4	6	-14.4
57.9	7	-13.9
59.3	8	-13.3
60.8	9	-12.8
62.3	10	-12.2
63.9	11	-11.7
65.4	12	-11.1

R-410A Refrigerant		
Pressure	Temperature	
PSI	°F	°C
67.0	13	-10.6
68.6	14	-10.0
70.2	15	-9.4
71.9	16	-8.9
73.5	17	-8.3
75.2	18	-7.8
77.0	19	-7.2
78.7	20	-6.7
80.5	21	-6.1
82.3	22	-5.6
84.1	23	-5.0
85.9	24	-4.4
87.8	25	-3.9
89.7	26	-3.3
91.6	27	-2.8
93.5	28	-2.2
95.5	29	-1.7
97.5	30	-1.1
99.5	31	-0.6
101.6	32	0.0
103.6	33	0.6
105.7	34	1.1
107.9	35	1.7
110.0	36	2.2
112.2	37	2.8
114.4	38	3.3
116.7	39	3.9
118.9	40	4.4
121.2	41	5.0
123.6	42	5.6

R-410A Refrigerant		
Pressure	Temperature	
PSI	°F	°C
125.9	43	6.1
128.3	44	6.7
130.7	45	7.2
133.2	46	7.8
135.6	47	8.3
138.2	48	8.9
140.7	49	9.4
143.3	50	10.0
156.6	55	12.8
170.7	60	15.6
185.7	65	18.3
201.5	70	21.1
218.2	75	23.9
235.9	80	26.7
254.6	85	29.4
274.3	90	32.2
295.0	95	35.0
316.9	100	37.8
339.9	105	40.6
364.1	110	43.3
389.6	115	46.1
416.4	120	48.9
444.5	125	51.7
474.0	130	54.4
505.0	135	57.2
537.6	140	60.0
571.7	145	62.8
607.6	150	65.6
645.2	155	68.3
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CONDENSER STARTUP FORM

Date: _____

Complete on initial startup. Completed form may be required for warranty.

Customer Name: _____ Condenser Model #: _____

Address: _____ Condenser Serial #: _____

City, State Zip: _____ Air Handler Brand: _____

Contractor Firm Name: _____ Air Handler Model #: _____

Installing Contractor: _____ Air Handler Serial #: _____

PRE-STARTUP CHECK LIST (See Section References for details.)

- ☐ Remove all shipping supports and restraints (Section 3.0)
- ☐ Check unit for damage (Section 3.0)
- ☐ Check air flow clearances (Section 9.1.1)
- ☐ Verify incoming power matches unit rating (Section 9.1.1)
- ☐ Check & tighten all electrical connections (Section 9.1.1)
- ☐ Check unit for proper field installed wiring (Section 9.1.1)
- ☐ Check free rotation of condenser fan(s) (Section 9.1.1)
- ☐ Crankcase heater ON for 24 hours (Section 9.2)
- ☐ Check manual high pressure reset switch (Section 8.3.1)
- ☐ Leak tested field-installed refrigerant lines (Section 6.2.2)
- ☐ Check refrigerant line free from rubbing
- ☐ Filter driers installed (Section 6.1.3.3)
- ☐ Trap installed (if required) (Section 6.1.3.4)
- ☐ System evacuated to 500 microns (Section 6.3)
- ☐ Proper start-up of air handling equipment (Section 9.1)
- ☐ Condenser A connected to evaporator A (B to B) (Section 6.1)
- ☐ Thermostatic expansion valves properly installed (Section 6.1.3.3)

ELECTRICAL CHECKS

Breaker & fuses rating:	_____V	_____A
Voltage imbalance:	_____%	
Compressor running forward	_____Y	_____N
Outdoor Air Temperature:	_____°F(°C)	
Compressor Amperage	_____Circuit A	_____Circuit B

PIPING CHECK

	Circuit A	Circuit B
Refrigerant line length:	____ Liquid	____ Liquid
	____ Suction	____ Suction
Hot gas bypass installed:	____ Circuit A	____ Circuit B
Leak tested PSIG:	____ Circuit A	____ Circuit B
Hold time:	____ Circuit A	____ Circuit B
Total lbs of R-410A added:	____ Circuit A	____ Circuit B

NOTES:

OPERATIONAL DATA

Operate for 30 minutes for system to stabilize	Circuit A	Circuit B
Subcooling Temperature		
Liquid line temperature leaving condenser	°F(°C)	°F(°C)
Liquid line pressure leaving condenser	psig	psig
Subcooling temperature	°F(°C)	°F(°C)
Superheat Temperature		
Suction line temperature leaving evaporator	°F(°C)	°F(°C)
Suction line temperature entering condenser	°F(°C)	°F(°C)
Suction line pressure entering condenser	psig	psig
Superheat temperature	°F(°C)	°F(°C)
Optional hot gas bypass start to open	lbs.	lbs.
Optional hot gas bypass full open	lbs.	lbs.
Test Conditions		
Condenser fan entering air temperature	°F(°C)	°F(°C)
Condenser fan leaving air temperature	°F(°C)	°F(°C)
Evaporator entering dry bulb air temperature	°F(°C)	°F(°C)
Evaporator entering wet bulb air temperature	°F(°C)	°F(°C)
Evaporator leaving wet bulb air temperature	°F(°C)	°F(°C)
Evaporator leaving dry bulb air temperature	°F(°C)	°F(°C)

INDEX

INSTALLATION RECORD - to be completed by the installer:

Installer:

Name _____

Company _____

Address _____

_____

_____

Phone _____

Distributor (company from which the unit was purchased):

Contact _____

Company _____

Address _____

_____

_____

Phone _____

Model No. _____ Serial No._____Date of Installation _____

SPECIFIC INSTALLATION NOTES: (i.e. Location, CFM, HP, Static Pressure, Amps, Gas Pressure, Temperature, Voltage, Adjustments, Warranty, etc.)

_____

_____

_____

_____

_____

BUILDING OWNER OR MAINTENANCE PERSONNEL:

For service or repair

- Contact the installer listed above.
- If you need additional assistance, contact the Factory Distributor listed above.

O'Fallon, MO I Printed in U.S.A. (01/18)

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