



**MRS / MRSW SERIES
CONDENSING UNIT
INSTALLATION & OPERATIONS MANUAL
R448/R449 Refrigerants**



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INTRODUCTION

Thank you for purchasing Master-Bilt® refrigeration equipment. This manual contains important instructions for installation, use and service. Read this entire manual carefully before installing or servicing your Master-Bilt® equipment.



NOTICE

Installation and service of the refrigeration and electrical components must be preformed by a refrigeration mechanic or licensed electrician.



DANGER

Equipment MUST be properly grounded. Improper or faulty hook-up of electrical components of the refrigeration units can result in severe injury or death. All electrical wiring hook-ups must be done in accordance with all applicable local, regional or national standards.



NOTICE

Read this manual before installing your refrigeration equipment. Keep the manual and refer to it before doing any service. Failure to do so could result in personal injury or equipment damage.

The portions of this manual covering refrigeration and electrical components contain technical instructions intended only for persons qualified to perform refrigeration and electrical work.
This manual cannot cover every installation, use, or service situation. If you need additional information, call or write us:

**Parts and Technical Service Department
Master-Bilt Products
908 Highway 15 North
New Albany, MS 38652
Phone: 800-684-8988
Email: service@refsg.com**

WARNING LABELS AND SAFETY INSTRUCTIONS

 This is the safety-alert symbol. When you see this symbol, be alert to the potential for personal injury or damage to your equipment.

Be sure you understand all safety messages and always follow recommended precautions and safe operating practices.

NOTICE TO EMPLOYERS

You must make sure that everyone who installs, uses, or services your refrigeration equipment is thoroughly familiar with all safety information and procedures.

Important safety information is presented in this section and throughout the manual. The following signal words are used in the warnings and safety messages:

DANGER: Severe injury or death WILL occur if you ignore the message.

WARNING: Severe injury or death CAN occur if you ignore the message.

CAUTION: Minor injury or damage to your refrigeration can occur if you ignore the message.

NOTICE: This is important installation, operation or service information. If you ignore the message, you may damage your refrigeration.

The warning and safety labels shown throughout this manual are placed on your Master-Bilt® refrigeration system at the factory. Follow all warning label instructions. If any warning or safety labels become lost or damaged, call your customer service department at (800) 684-8988 for replacements.

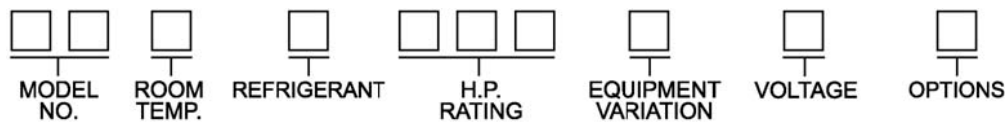


This Label is located on the condensing unit

MRS SERIES CONDENSING UNIT FEATURES

- Generously sized individual copper aluminum condenser for each compressor sized for high efficiency. Sized to operate efficiently in high Ambient
- Hermetic, semi-hermetic, and Scroll compressors in any combination the customer chooses
- Reliable Ball Bearing Fan Motors
- Spring Mounted Semi-Hermetic Compressors, Hermetic and Scroll Compressors use Vibration Absorbing Grommet Mounts
- Generously sized receivers with isolation valves
- Compressor Suction Service Valves with Access Ports, and Discharge Line Service Valves with Access Ports on Semi- Hermetic Compressors only
- Pre-wired and mounted Dual Pressure Controls with each Compressor
- Units leak and electrical tested
- U.L. listed
- Easy accessibility for service
- Pre-wired for easy installation with Single Point Electrical Connection with individual Circuit Breakers for each Compressor and Through Door Main Disconnect Switch and Circuit Breaker Installed
- Suction and discharge line vibration eliminators pre-piped and mounted (semi-hermetic only)
- Crankcase Heater Installed for each Compressor
- Refrigeration line pre-piped to edge of unit
- Pre-piped and mounted refrigerant sight glass and filter drier
- Pre-installed inverted traps on all roof top MRS series Condensing units
- Flooded Head Pressure Controls on each System
- Stainless Steel Housing
- Engineered Refrigeration Drawing Available for Specified Projects, or with Purchase Order (Contact Factory for Additional Details)
- LogiTemp[®] Electronic Refrigeration Controls for Maximum Energy Efficiency are Optional for most Systems. Patented Reverse Cycle Defrost Technology that saves up to 27% on Operational Energy Cost of the System it Controls Depending on Ambient Temperatures.

REFRIGERATION MODEL NOMENCLATURE



MODEL NUMBER EXPLANATION

CH = Hermetic Condensing Unit

CS = Scroll Condensing Unit

WH = Water-Cool Hermetic Condensing Unit

WS = Water-Cool Scroll Condensing Unit

ROOM TEMPERATURE EXPLANATION

L = 0° F. Thru -30° F. Room Temperature

M = 0° Thru +55° F. Room Temperature

REFRIGERANT EXPLANATION

D = R448A/R449A

V = R-407A

HORSEPOWER RATING EXPLANATION

005 = ½ H.P.	017 = 1¼ H.P.	040 = 4H.P.	100 = 10 H.P.	250 = 25 H.P.
007 = ¾ H.P.	020 = 2 H.P.	045 = 4 1/2H.P.	120 = 12 H.P.	270 = 27 H.P.
010 = 1 H.P.	025 = 2½ H.P.	050 = 5 H.P.	150 = 15 H.P.	300 = 30 H.P.
012 = 1 1/4 H.P.	030 = 3 H.P.	060 = 6 H.P.	200 = 20 H.P.	
015 = 1 1/2 H.P.	035 = 3 1/2 H.P.	075 = 7 1/2 H.P.	220 = 22 H.P.	

EQUIPMENT VARIATION EXPLANATION

A = STANDARD UNIT

R= REVERSING VALVE

H = HEATED AND INSULATED RECEIVER

E = ELECTRIC DEFROST

M = FLOATING HEAD (MC)

VOLTAGE EXPLANATION

A = 115/60/1

F = 200-220/50/3

B = 230/60/1 or 208-230/60/1 (As Applicable)

G = 380-420/50/3

C = 208-230/60/3

J = 380/50/1

D = 460/60/1

K = 200-220/50/1 or 220/50/1

E = 460/60/3

PRE-INSTALLATION INSTRUCTIONS

I. GENERAL INFORMATION

Please read this manual prior to installing your Master-Bilt® equipment. This information is based on good refrigeration practice and should be used as a guide for installation and operation.

II. DELIVERY INSPECTION

You are responsible for filling all freight claims with the delivering truck line. Inspect all cartons and crates for damage as soon as they arrive. If damage is noted to shipping crates or cartons or a shortage is found, note this on the bill of lading (all copies) prior to signing.

If damage is discovered when the cabinet is uncrated, immediately call the delivering truck line and follow up the call with a written report indicating concealed damaged to your shipment. Ask for an immediate inspection of your concealed item. Crating material **MUST** be retained to show the inspector representing the truck line.

INSTALLATION INSTRUCTIONS

I. HANDLING AND PLACEMENT OF MULTIPLE RACK SYSTEM

To minimize damage to the unit housing, it is recommended that the crate not be removed until the rack system is moved to its final location.

There should be a minimum of 3 feet around the perimeter of the Rack System that should be unobstructed. This allows for proper air flow through the condenser. Likewise, this will also make servicing the equipment much easier.

Holes are provided in the base supports for mounting bolts and for bridle lift rods.

For indoor mounting, motor rooms should be provided with fans designed to move 100 CFM of air per one ton of refrigeration capacity.

II. HANDLING AND PLACEMENT OF WALK-IN EVAP(S)

To minimize damage to the evaporator coil, it is recommended that the carton (or crate) not be removed until the evaporator coil is moved close to its final location. When the container is removed from the evaporator coil, extreme care must be used when lifting and mounting to the ceiling, to prevent sheet metal damage

Evaporator coils will be mounted the appropriate distance from the cooler wall to allow proper air return to evaporator coils. Minimum distance shall be greater than or equal to the vertical height of the evaporator coil or as specified in applicable Installation and Operation Manuals.

III. ELECTRICAL SPECIFICATIONS

Electrical power supply must match the condensing unit power requirements indicated on the unit data plate. **A WIRING DIAGRAM IS LOCATED ON THE INSIDE OF THE ELECTRICAL BOX COVER.** For best results, it is suggested that power supply for MRS Rack systems be applied as illustrated below in Figure 1. All field wiring should be done in a professional manner, in accordance with all governing codes. All wiring (including factory terminals) should be double checked before start-up.

The refrigeration installer will be responsible for the inter-connect wiring between Medium temperature timers and solenoids and Low temperature evaporators and timers. **MASTER-BILT WILL GLADLY SHIP ANY TIMER LOOSE WITH PROPER ENCLOSURE SO THAT THEY MAY BE PLACED IN A MORE SUITABLE LOCATION IF REQUESTED AND APPROVED BY FEC OR CONSULTANT.**

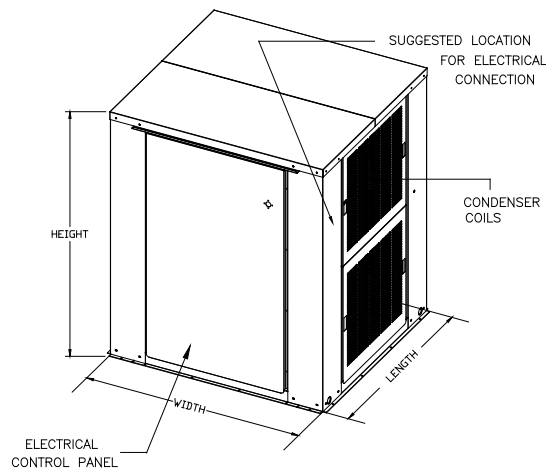


Figure 1: Suggested Field Wiring Location for MRS Units.

Evaporator drain line heaters will be installed on any application with a room temperature less than 34°F. A 6 ft. drain line heater (208-230V) will be provided with each low temperature coil.



NOTICE!

Systems with scroll compressors must be checked for proper power phasing. Improper power phasing will result in improper compressor rotation causing compressor to pump incorrectly. An optional phase monitor may be purchased for this purpose.

Three phase scroll compressors are directional dependent, i.e., they will only compress in one rotational direction and will rotate in either direction depending on power phasing. Verification of proper rotational direction is made by observing that suction pressure drops and discharge pressure rises when the compressor is energized. Reverse rotation also results in an elevated sound level over correct rotation, as well as substantially reduced current draw compared to data tag values.



NOTICE!

Check phase alignment on all incoming power.

IV. REFRIGERANT PIPING

Use only refrigeration grade copper tubing, (ACR), type "L", bright annealed, dehydrated, and properly sealed against contamination. Soft temper tubing may not be used for field interconnection of refrigeration components (condensing unit to evaporator assembly). Take extreme care to keep refrigeration tubing clean and dry prior to installation. Use an appropriate size tube cutter. Remove any burring that may occur when cutting the tubing. Use dry nitrogen to purge the system of any foreign objects that may have come about during any pipe cutting.

All suction lines will be insulated with not less than $\frac{3}{4}$ " Armaflex or acceptable substitute as determined by Master-Bilt personnel. Armaflex insulation must be properly glued or taped as approved by insulation manufacturer to prevent refrigeration lines from "sweating".

Appropriate oil must be added to systems with refrigeration line exceeding 50 ft horizontal or 10 ft vertical as per Compressor manufacturer specifications.

Suction lines should be sloped down $\frac{1}{2}$ " for each 10 feet of horizontal run towards the compressor. This will facilitate good oil return to the compressor.

Refrigeration lines will be sized appropriately to facilitate proper oil return to the compressor and reduce refrigerant line pressure drop. Table 1 and Table 2 depict proper line sizing options. Use this as a guideline for your selection. Any fittings used may be accounted for in the Table to the right.

Fitting Size	90° Ell	45° Ell	Tee (Line)	Tee (Branch)
1/2"	0.9	0.4	0.8	2
5/8"	1	0.5	1	2.5
7/8"	1.5	0.7	1.5	3.5
1-1/8"	1.8	0.9	1.5	4.5
1-3/8"	2.4	1.2	1.8	6
1-5/8"	2.8	1.4	2	7
2-1/8"	3.9	1.8	3.8	10

**Equivalent Length Allowances for Pipe Fittings
(length in feet)**

Liquid Lines

Liquid lines should be sized for a minimum pressure drop to prevent "flashing". Flashing in the liquid lines would create additional pressure drop and poor expansion valve operation. If a system requires long liquid lines from the receiver to the evaporator or if the liquid has to rise vertically upward any distance, the losses should be calculated to determine whether or not a heat exchanger is required. The use of a suction to liquid heat exchanger may be used to subcool the liquid to prevent flashing. This method of subcooling will normally provide no more than 20°F subcooling on high pressure systems. The amount of subcooling will depend on the design and size of the heat exchanger and on the operating suction and discharge pressures. An additional benefit from the use of the suction to liquid type heat exchanger is that it can help raise the superheat in the suction line to prevent liquid return to the compressor via the suction line. Generally, heat exchangers are not recommended on R-22 lowtemperature systems. However, they have proved necessary on short, well insulated suction line runs to provide superheat at the compressor.

Refrigerant Piping

Install all refrigerant components in accordance with applicable local and national codes and in accordance with good practice for proper system operation. The thermostatic expansion valve must be the externally equalized type. It can be mounted inside the unit end compartment. Mount the expansion valve bulb on a horizontal run of suction line as close as possible to the suction header. Use the clamps provided with the valve to fasten the bulb securely so there is a tight line-to-line contact between the bulb and the suction line. Suction and hot gas connections are made on the outside of the unit.

Suction lines should be sloped towards the compressor at the rate of one (1) inch per ten (10) feet for good oil return. Vertical risers of more than four (4) feet should be trapped at the bottom with a P-trap. If a P-trap is used, the expansion valve bulb should be installed between the unit and the trap.

Unit Cooler Piping

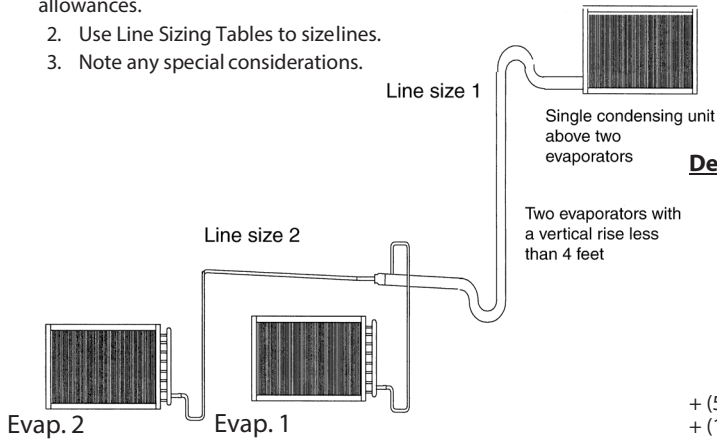
Pipe size example:

Given: -10°F Freezer with one system having (2) evaporators

- One condensing unit rated at 24,000 BTUH's @ -20°F SST R404A refrigerant.
- Two evaporators each rated at 12,000 BTUH's @ 10°F TD.
- 100 feet of actual line run between condensing unit to first evaporator and 20 feet of actual line run between the first evaporator and the second evaporator (see figure below).

How to figure line sizes:

1. Determine equivalent line run = actual run + valves and fitting allowances.
2. Use Line Sizing Tables to size lines.
3. Note any special considerations.



Fittings in this system:

- (6) 90° elbows in main line plus a 90° turn through a tee.
- (5) additional 90° elbows to first evaporator.
- (4) additional 90° elbows to second evaporator.

Determine line size 1 (main line from condensing unit):

1. Main line from the condensing unit to be sized for the total capacity (balance) of the whole system of 24,000 BTUH's (Table 8).
2. Refer to 24,000 @ 100 feet at -20°F SST R404A on the chart. You will find the suction line to be 1-3/8" and 1/2" liquid line.
3. Refer to Table 5. For every 1-3/8" 90° elbow you must add 4 equivalent feet of pipe and 2.5 equivalent feet of pipe for each 1-3/8" tee.

Therefore, total equivalent line run = Actual line run
 100 feet
 + (6) 1-3/8" elbows @ 4' 24 feet
 + (1) 1-3/8" tee @ 2.5' 2.5 feet
Total equivalent line run 126.5 feet

4. Refer to Table 8. For 126.5 total equivalent feet, the suction line size should be 1-3/8" and the liquid line stays at 1/2" line.

Note: The gray shaded areas on Table 8. For 24,000 BTUH's, the maximum suction riser is 1-1/8" to insure proper oil return and pressure drop from the bottom p-trap to the top p-trap.

Determine line size 2 (evaporators):

1. Line sizing to each evaporator is based on 12,000 BTUH's and equivalent run from condensing unit. First evaporator has an 105 ft. run and the second evaporator has a 120 ft. run.
2. Table 8 indicates 1-1/8" suction for the first evaporator and indicates 1-1/8" suction for the second evaporator.
3. Refer to Table 5. Each 1-1/8" 90° elbow adds 3 equivalent feet of pipe. Each 90° turn through a 1-1/8" tee adds 6 equivalent feet.

Actual line run (evap 1) 105 feet
 + (5) 1-1/8" elbows @ 3' 15 feet
 + (1) 90° turn through tee @ 6' 6 feet
Total equivalent line run 126 feet

Actual line run (evap 2) 120 feet
 + (4) 1-1/8" elbows @ 3' 12 feet
Total equivalent line run 132 feet

5. Table 8 indicates 1-1/8" suction line and 3/8" liquid line from main line to both evaporators.

Line Sizing

The following Tables 7 and 8 indicate liquid lines and suction lines for all condensing units for R-404A, R-507, R-407A/C/F, R-448A and R-449A

When determining the refrigerant line length, be sure to add an allowance for fittings. See Table 5. Total equivalent length of refrigerant lines is the sum of the actual linear footage and the allowance for fittings.

Table 3. Weight of Refrigerants in Copper Lines During Operation (Pounds per 100 lineal feet of type "L" tubing)

Line Size O.D. (Inches)	Refrigerant	Liquid Line	Hot Gas Line	Suction Line at Suction Temperature				
				-40°F	-20°F	0°F	+20°F	+40°F
3/8	R-407	3.8	0.25	0.02	0.03	0.04	0.06	0.09
	R-448A/R-449A	3.6	0.24	0.02	0.03	0.04	0.06	0.09
	R-507, R-404A	3.4	0.31	0.03	0.04	0.06	0.09	0.13
1/2	R-407	7.2	0.46	0.03	0.05	0.08	0.11	0.17
	R-448A/R-449A	6.7	0.44	0.03	0.05	0.07	0.11	0.16
	R-507, 404A	6.4	0.58	0.04	0.07	0.13	0.16	0.24
5/8	R-407	11.5	0.74	0.05	0.08	0.12	0.18	0.26
	R-448A/R-449A	10.8	0.71	0.05	0.08	0.12	0.18	0.26
	R-507, 404A	10.3	0.93	0.07	0.11	0.17	0.25	0.35
7/8	R-407	11.5	1.53	0.05	0.08	0.12	0.18	0.26
	R-448A/R-449A	22.5	1.48	0.10	0.16	0.25	0.37	0.54
	R-507, 404A	21.2	1.92	0.15	0.23	0.37	0.51	0.72
1-1/8	R-407	23.8	2.60	0.10	0.16	0.25	0.37	0.54
	R-448A/R-449A	38.4	2.53	0.17	0.27	0.42	0.63	0.92
	R-507, 404A	36.1	3.27	0.26	0.39	0.63	0.86	1.24
1-3/8	R-407	40.7	3.96	0.17	0.27	0.43	0.63	0.93
	R-448A/R-449A	58.4	3.85	0.25	0.41	0.64	0.96	1.40
	R-507, 404A	55.0	4.98	0.40	0.58	0.95	1.32	1.87
1-5/8	R-407	61.8	5.61	0.26	0.41	0.65	1.96	1.43
	R-448A/R-449A	82.7	5.45	0.36	0.58	0.90	1.36	1.98
	R-507, 404A	78.0	7.07	0.56	0.82	1.35	1.86	2.64
2-1/8	R-407	87.4	9.76	0.36	0.57	0.91	1.38	2.01
	R-448A/R-449A	143.8	9.48	0.62	1.01	1.57	2.36	3.44
	R-507, 404A	134	12.25	0.98	1.43	2.35	3.23	4.58
2-5/8	R-407	152	15.05	0.63	1.00	1.60	2.38	3.49
	R-448A/R-449A	222	14.62	0.96	1.56	2.42	3.65	5.30
	R-507, 404A	209	18.92	1.51	2.21	3.62	5.00	7.07
3-1/8	R-407	235	21.48	0.98	1.55	2.46	3.67	5.39
	R-448A/R-449A	317	20.86	1.37	2.22	3.45	5.20	7.57
	R-507, 404A	298	27.05	2.16	3.15	5.17	7.14	9.95
3-5/8	R-407	345	29.05	1.40	2.23	3.50	5.23	8.27
	R-448A/R-449A	428	28.22	1.86	3.01	4.67	7.04	10.24
	R-507, 404A	403	36.50	2.92	4.25	6.97	19.65	13.67
4-1/8	R-407	589	37.60	2.45	3.92	6.17	17.80	9.23
	R-448A/R-449A	554	36.53	2.40	3.89	6.05	9.11	13.25
	R-507, 404A	526	47.57	3.80	5.55	9.09	12.58	17.80

Table 4. Pressure Loss of Liquid Refrigerants in Liquid Line Risers (Expressed in Pressure Drop, PSIG, and Subcooling Loss, °F)

Refrigerant	Liquid Line Rise in Feet																	
	10'		15'		20'		25'		30'		40'		50'		75'		100'	
	PSIG	°F	PSIG	°F	PSIG	°F	PSIG	°F	PSIG	°F	PSIG	°F	PSIG	°F	PSIG	°F	PSIG	°F
R-407	4.3	1.4	6.4	2.0	8.5	2.7	10.6	3.4	12.8	4.1	17.0	5.4	21.3	6.8	31.9	10.1	42.5	13.5
R-448A,R-449A	4.3	1.1	6.5	1.7	8.7	2.3	10.9	2.8	13.0	3.4	17.4	4.5	21.7	5.6	32.6	8.3	43.5	10.9
R-507, R-404A	4.1	1.1	6.1	1.6	8.2	2.1	10.2	2.7	12.2	3.3	16.3	4.1	20.4	5.6	30.6	8.3	40.8	11.8

Based on 110°F liquid temperature at bottom of riser.

Table 5. Equivalent Feet of Pipe Due to Valve and Fitting Friction

Copper Tube, O.D., Type "L"	1/2	5/8	7/8	1-1/8	1-3/8	1-5/8	2-1/8	2-5/8	3-1/8	3-5/8	4-1/8	5-1/8	6-1/8
Globe Valve (Open)	14	16	22	28	36	42	57	69	83	99	118	138	168
Angle Valve (Open)	7	9	12	15	18	21	28	34	42	49	57	70	83
90° Turn Through Tee	3	4	5	6	8	9	12	14	17	20	22	28	34
Tee (Straight Through) or Sweep Below	.75	1	1.5	2	2.5	3	3.5	4	5	6	7	9	11
90° Elbow or Reducing Tee (Straight Through)	1	2	2	3	4	4	5	7	8	10	12	14	16

Table 6. Recommended Remote Condenser Line Sizes

Net Evaporator Capacity	Total Equiv. Length	R-407A/C/F, R-448A & R-449A		R-507 & R-404A	
		Discharge Line (O.D.)	Liquid Line Cond. to Receiver (O.D.)	Discharge Line (O.D.)	Liquid Line Cond. to Receiver (O.D.)
3,000	50	3/8	3/8	3/8	3/8
	100	3/8	3/8	3/8	3/8
6,000	50	3/8	3/8	1/2	3/8
	100	1/2	3/8	1/2	3/8
9,000	50	1/2	3/8	1/2	3/8
	100	1/2	3/8	1/2	3/8
12,000	50	1/2	3/8	1/2	3/8
	100	5/8	3/8	5/8	1/2
18,000	50	5/8	3/8	5/8	1/2
	100	5/8	3/8	7/8	1/2
24,000	50	5/8	3/8	5/8	1/2
	100	7/8	1/2	7/8	5/8
36,000	50	7/8	1/2	7/8	5/8
	100	7/8	5/8	7/8	7/8
48,000	50	7/8	5/8	7/8	5/8
	100	7/8	7/8	1-1/8	7/8
60,000	50	7/8	5/8	7/8	7/8
	100	1-1/8	7/8	1-1/8	7/8
72,000	50	7/8	7/8	1-1/8	7/8
	100	1-1/8	7/8	1-1/8	1-1/8
90,000	50	1-1/8	7/8	1-1/8	7/8
	100	1-1/8	7/8	1-1/8	1-1/8
120,000	50	1-1/8	7/8	1-1/8	1-1/8
	100	1-3/8	1-1/8	1-3/8	1-3/8
180,000	50	1-3/8	1-1/8	1-3/8	1-3/8
	100	1-5/8	1-3/8	1-5/8	1-5/8
240,000	50	1-3/8	1-3/8	1-5/8	1-3/8
	100	1-5/8	1-3/8	2-1/8	1-5/8
300,000	50	1-5/8	1-3/8	1-5/8	1-5/8
	100	2-1/8	1-5/8	2-1/8	2-1/8
360,000	50	1-5/8	1-5/8	2-1/8	1-5/8
	100	2-1/8	2-1/8	2-1/8	2-1/8
480,000	50	2-1/8	1-5/8	2-1/8	2-1/8
	100	2-1/8	2-1/8	2-1/8	2-5/8
600,000	50	2-1/8	2-1/8	2-1/8	2-1/8
	100	2-5/8	2-5/8	2-5/8	2-5/8
720,000	50	2-1/8	2-1/8	2-1/8	2-5/8
	100	2-5/8	2-5/8	2-5/8	3-1/8
840,000	50	2-1/8	2-1/8	2-5/8	2-5/8
	100	2-5/8	2-5/8	2-5/8	3-1/8
960,000	50	2-5/8	2-5/8	2-5/8	2-5/8
	100	2-5/8	3-1/8	3-1/8	3-5/8
1,080,000	50	2-5/8	2-5/8	2-5/8	3-1/8
	100	3-1/8	3-1/8	3-1/8	3-5/8
1,200,000	50	2-5/8	2-5/8	2-5/8	3-1/8
	100	3-1/8	3-1/8	3-5/8	4-1/8
1,440,000	50	2-5/8	3-1/8	3-1/8	3-5/8
	100	3-1/8	3-5/8	3-5/8	4-1/8
1,680,000	50	3-1/8	3-1/8	3-1/8	3-5/8
	100	3-5/8	3-5/8	3-5/8	4-1/

Table 7. Recommended Line Sizes for R-404A and R507*

Capacity BTUH	Suction Line Size																								Liquid Line Size				
	Suction Temperature																								Receiver to Expansion Valve Equivalent Lengths				
	+20°F Equivalent Lengths				+10°F Equivalent Lengths				-10°F Equivalent Lengths				-20°F Equivalent Lengths				-30°F Equivalent Lengths				-40°F Equivalent Lengths								
	25'	50'	100'	150'	25'	50'	100'	150'	25'	50'	100'	150'	25'	50'	100'	150'	25'	50'	100'	150'	25'	50'	100'	150'					25'
1,000	3/8	3/8	3/8	3/8	3/8	3/8	3/8	3/8	3/8	3/8	3/8	1/2	1/2	3/8	3/8	1/2	1/2	3/8	3/8	1/2	1/2	3/8	1/2	1/2	5/8	3/8	3/8	3/8	3/8
3,000	3/8	3/8	1/2	1/2	3/8	1/2	1/2	5/8	1/2	1/2	5/8	5/8	1/2	1/2	5/8	7/8	1/2	1/2	5/8	7/8	1/2	1/2	5/8	7/8	3/8	3/8	3/8	3/8	
4,000	3/8	1/2	1/2	5/8	1/2	1/2	5/8	5/8	1/2	5/8	5/8	7/8	1/2	5/8	7/8	7/8	5/8	5/8	7/8	7/8	1/2	5/8	7/8	7/8	3/8	3/8	3/8	3/8	
6,000	1/2	1/2	5/8	7/8	1/2	1/2	5/8	7/8	1/2	5/8	7/8	7/8	5/8	5/8	7/8	7/8	5/8	5/8	7/8	7/8	5/8	5/8	7/8	7/8	3/8	3/8	3/8	3/8	
9,000	5/8	5/8	7/8	7/8	5/8	5/8	7/8	7/8	5/8	7/8	7/8	7/8	5/8	7/8	7/8	1-1/8	5/8	7/8	7/8	1-1/8	5/8	7/8	7/8	1-1/8	3/8	3/8	3/8	3/8	
12,000	5/8	7/8	7/8	7/8	5/8	7/8	7/8	7/8	7/8	7/8	7/8	1-1/8	7/8	7/8	1-1/8	1-1/8	7/8	7/8	1-1/8	1-1/8	7/8	7/8	1-1/8	1-1/8	3/8	3/8	3/8	3/8	
15,000	5/8	7/8	7/8	7/8	7/8	7/8	7/8	1-1/8	7/8	7/8	1-1/8	1-1/8	7/8	7/8	1-1/8	1-1/8	7/8	7/8	1-1/8	1-1/8	7/8	7/8	1-1/8	1-1/8	3/8	3/8	3/8	1/2	
18,000	7/8	7/8	7/8	1-1/8	7/8	7/8	1-1/8	1-1/8	7/8	7/8	1-1/8	1-1/8	7/8	1-1/8	1-1/8	1-3/8	7/8	1-1/8	1-1/8	1-3/8	7/8	1-1/8	1-1/8	1-3/8	3/8	3/8	1/2	1/2	
24,000	7/8	7/8	1-1/8	1-1/8	7/8	1-1/8	1-1/8	1-1/8	7/8	1-1/8	1-1/8	1-3/8	1-1/8	1-1/8	1-3/8	1-3/8	1-1/8	1-1/8	1-3/8	1-3/8	1-1/8	1-1/8	1-3/8	1-3/8	3/8	3/8	1/2	1/2	
30,000	7/8	7/8	1-1/8	1-1/8	7/8	1-1/8	1-1/8	1-3/8	1-1/8	1-1/8	1-3/8	1-3/8	1-1/8	1-1/8	1-3/8	1-3/8	1-1/8	1-1/8	1-3/8	1-3/8	1-1/8	1-1/8	1-3/8	1-3/8	3/8	1/2	1/2	1/2	
36,000	7/8	1-1/8	1-1/8	1-3/8	1-1/8	1-1/8	1-3/8	1-3/8	1-1/8	1-1/8	1-3/8	1-3/8	1-1/8	1-1/8	1-3/8	1-3/8	1-1/8	1-1/8	1-3/8	1-3/8	1-1/8	1-1/8	1-3/8	1-3/8	1/2	1/2	1/2	1/2	
42,000	1-1/8	1-1/8	1-3/8	1-3/8	1-1/8	1-1/8	1-3/8	1-3/8	1-1/8	1-1/8	1-3/8	1-3/8	1-1/8	1-1/8	1-3/8	1-3/8	1-1/8	1-1/8	1-3/8	1-3/8	1-1/8	1-1/8	1-3/8	1-3/8	1/2	1/2	1/2	5/8	
48,000	1-1/8	1-1/8	1-3/8	1-3/8	1-1/8	1-1/8	1-3/8	1-3/8	1-1/8	1-1/8	1-3/8	1-3/8	1-1/8	1-1/8	1-3/8	1-3/8	1-1/8	1-1/8	1-3/8	1-3/8	1-1/8	1-1/8	1-3/8	1-3/8	1/2	1/2	5/8	5/8	
54,000	1-1/8	1-1/8	1-3/8	1-3/8	1-1/8	1-1/8	1-3/8	1-3/8	1-1/8	1-1/8	1-3/8	1-3/8	1-1/8	1-1/8	1-3/8	1-3/8	1-1/8	1-1/8	1-3/8	1-3/8	1-1/8	1-1/8	1-3/8	1-3/8	1/2	1/2	5/8	5/8	
60,000	1-1/8	1-1/8	1-3/8	1-3/8	1-1/8	1-1/8	1-3/8	1-3/8	1-1/8	1-1/8	1-3/8	1-3/8	1-1/8	1-1/8	1-3/8	1-3/8	1-1/8	1-1/8	1-3/8	1-3/8	1-1/8	1-1/8	1-3/8	1-3/8	1/2	1/2	5/8	5/8	
66,000	1-1/8	1-1/8	1-3/8	1-3/8	1-1/8	1-1/8	1-3/8	1-3/8	1-1/8	1-1/8	1-3/8	1-3/8	1-1/8	1-1/8	1-3/8	1-3/8	1-1/8	1-1/8	1-3/8	1-3/8	1-1/8	1-1/8	1-3/8	1-3/8	1/2	1/2	5/8	5/8	
72,000	1-1/8	1-1/8	1-3/8	1-3/8	1-1/8	1-1/8	1-3/8	1-3/8	1-1/8	1-1/8	1-3/8	1-3/8	1-1/8	1-1/8	1-3/8	1-3/8	1-1/8	1-1/8	1-3/8	1-3/8	1-1/8	1-1/8	1-3/8	1-3/8	1/2	5/8	5/8	5/8	
78,000	1-1/8	1-1/8	1-3/8	1-3/8	1-1/8	1-1/8	1-3/8	1-3/8	1-1/8	1-1/8	1-3/8	1-3/8	1-1/8	1-1/8	1-3/8	1-3/8	1-1/8	1-1/8	1-3/8	1-3/8	1-1/8	1-1/8	1-3/8	1-3/8	5/8	5/8	5/8	5/8	
84,000	1-1/8	1-1/8	1-3/8	1-3/8	1-1/8	1-1/8	1-3/8	1-3/8	1-1/8	1-1/8	1-3/8	1-3/8	1-1/8	1-1/8	1-3/8	1-3/8	1-1/8	1-1/8	1-3/8	1-3/8	1-1/8	1-1/8	1-3/8	1-3/8	5/8	5/8	5/8	7/8	
90,000	1-3/8	1-3/8	1-3/8	2-	1-3/8	1-3/8	1-3/8	2-	1-3/8	1-3/8	1-3/8	2-	1-3/8	1-3/8	1-3/8	2-	1-3/8	1-3/8	2-	2-	1-3/8	1-3/8	2-	2-	5/8	5/8	7/8	7/8	
120,000	1-3/8	1-3/8	2-	2-	1-3/8	1-3/8	2-	2-	1-3/8	1-3/8	2-	2-	1-3/8	1-3/8	2-	2-	1-3/8	1-3/8	2-	2-	1-3/8	1-3/8	2-	2-	5/8	5/8	7/8	7/8	
150,000	1-3/8	1-3/8	2-	2-	1-3/8	1-3/8	2-	2-	1-3/8	1-3/8	2-	2-	1-3/8	1-3/8	2-	2-	1-3/8	1-3/8	2-	2-	1-3/8	1-3/8	2-	2-	5/8	7/8	7/8	7/8	
180,000	1-3/8	2-	2-	2-	1-3/8	2-	2-	2-	1-3/8	2-	2-	2-	1-3/8	2-	2-	2-	1-3/8	2-	2-	2-	1-3/8	2-	2-	2-	7/8	7/8	7/8	1-1/8	
210,000	1-3/8	2-	2-	2-	1-3/8	2-	2-	2-	1-3/8	2-	2-	2-	1-3/8	2-	2-	2-	1-3/8	2-	2-	2-	1-3/8	2-	2-	2-	7/8	7/8	1-1/8	1-1/8	
240,000	1-3/8	2-	2-	2-	1-3/8	2-	2-	2-	1-3/8	2-	2-	2-	1-3/8	2-	2-	2-	1-3/8	2-	2-	2-	1-3/8	2-	2-	2-	7/8	7/8	1-1/8	1-1/8	
300,000	2-	2-	2-	2-	1-3/8	2-	2-	2-	1-3/8	2-	2-	2-	1-3/8	2-	2-	2-	1-3/8	2-	2-	2-	1-3/8	2-	2-	2-	7/8	1-1/8	1-1/8	1-1/8	
360,000	2-	2-	2-	3-	1-3/8	2-	2-	2-	1-3/8	2-	2-	3-	1-3/8	2-	2-	3-	1-3/8	2-	2-	3-	1-3/8	2-	3-	3-	1-1/8	1-1/8	1-1/8	1-1/8	
480,000	2-	2-	3-	3-	1-3/8	2-	2-	2-	1-3/8	2-	3-	3-	1-3/8	2-	3-	3-	1-3/8	2-	3-	3-	1-3/8	2-	3-	3-	1-1/8	1-1/8	1-1/8	1-1/8	
600,000	2-	2-	3-	3-	1-3/8	2-	2-	3-	1-3/8	2-	3-	3-	1-3/8	2-	3-	3-	1-3/8	2-	3-	3-	1-3/8	2-	3-	3-	1-1/8	1-1/8	1-1/8	1-1/8	

*** NOTES:**

- Sizes that are highlighted indicate maximum suction line sizes that should be used for risers. Riser size should not exceed horizontal size. Properly placed suction traps must also be used for adequate oil return.
- Suction line sizes selected at pressure drop equivalent to 2°F. Reduce estimate of system capacity accordingly.
- Recommended liquid line size may increase with reverse cycle hot gas systems.
- If system load drops below 40% of design, consideration to installing double suction risers should be made.

Table 8. Recommended Line Sizes for R-407*

Capacity BTUH	Suction Line Size																		Liquid Line Size					
	Suction Temperature																							
	+40°F Equivalent Lengths						+20°F Equivalent Lengths						+10°F Equivalent Lengths						Receiver to Expansion Valve Equivalent Lengths					
	25'	50'	75'	100'	150'	200'	25'	50'	75'	100'	150'	200'	25'	50'	75'	100'	150'	200'						
1,000	3/8	3/8	3/8	3/8	3/8	3/8	3/8	3/8	3/8	3/8	3/8	3/8	3/8	3/8	3/8	3/8	3/8	3/8	3/8	3/8	3/8	3/8	3/8	3/8
3,000	3/8	3/8	3/8	3/8	1/2	1/2	3/8	3/8	3/8	1/2	1/2	1/2	3/8	3/8	1/2	1/2	1/2	1/2	3/8	3/8	3/8	3/8	3/8	3/8
4,000	3/8	3/8	1/2	1/2	1/2	1/2	3/8	1/2	1/2	1/2	5/8	5/8	3/8	1/2	1/2	5/8	5/8	5/8	3/8	3/8	3/8	3/8	3/8	3/8
6,000	3/8	1/2	1/2	1/2	5/8	5/8	1/2	1/2	1/2	5/8	5/8	5/8	1/2	1/2	5/8	5/8	5/8	5/8	3/8	3/8	3/8	3/8	3/8	3/8
9,000	1/2	1/2	5/8	5/8	5/8	5/8	1/2	5/8	5/8	7/8	7/8	7/8	1/2	5/8	5/8	7/8	7/8	7/8	3/8	3/8	3/8	3/8	3/8	3/8
12,000	1/2	5/8	5/8	7/8	7/8	7/8	5/8	5/8	7/8	7/8	7/8	7/8	5/8	7/8	7/8	7/8	7/8	7/8	3/8	3/8	3/8	3/8	3/8	3/8
15,000	5/8	5/8	7/8	7/8	7/8	7/8	5/8	7/8	7/8	7/8	7/8	7/8	5/8	7/8	7/8	7/8	7/8	7/8	3/8	3/8	3/8	3/8	3/8	3/8
18,000	5/8	7/8	7/8	7/8	7/8	7/8	5/8	7/8	7/8	7/8	7/8	7/8	7/8	7/8	7/8	7/8	1 1/8	1 1/8	3/8	3/8	3/8	3/8	1/2	1/2
24,000	5/8	7/8	7/8	7/8	7/8	7/8	7/8	7/8	7/8	7/8	1 1/8	1 1/8	7/8	7/8	7/8	7/8	1 1/8	1 1/8	3/8	3/8	3/8	1/2	1/2	1/2
30,000	7/8	7/8	7/8	7/8	1 1/8	1 1/8	7/8	7/8	7/8	1 1/8	1 1/8	1 1/8	7/8	7/8	1 1/8	1 1/8	1 1/8	1 1/8	3/8	1/2	1/2	1/2	1/2	5/8
36,000	7/8	7/8	7/8	1 1/8	1 1/8	1 1/8	7/8	7/8	1 1/8	1 1/8	1 1/8	1 1/8	7/8	1 1/8	1 1/8	1 1/8	1 1/8	1 3/8	3/8	1/2	1/2	1/2	5/8	5/8
42,000	7/8	7/8	1 1/8	1 1/8	1 1/8	1 1/8	7/8	7/8	1 1/8	1 1/8	1 1/8	1 1/8	7/8	1 1/8	1 1/8	1 1/8	1 3/8	1 3/8	3/8	1/2	1/2	1/2	5/8	5/8
48,000	7/8	7/8	1 1/8	1 1/8	1 1/8	1 1/8	7/8	1 1/8	1 1/8	1 1/8	1 3/8	1 3/8	7/8	1 1/8	1 1/8	1 1/8	1 3/8	1 3/8	1/2	1/2	1/2	5/8	5/8	5/8
54,000	7/8	1 1/8	1 1/8	1 1/8	1 1/8	1 3/8	7/8	1 1/8	1 1/8	1 1/8	1 3/8	1 3/8	1 1/8	1 1/8	1 1/8	1 3/8	1 3/8	1 3/8	1/2	1/2	1/2	5/8	5/8	5/8
60,000	7/8	1 1/8	1 1/8	1 1/8	1 3/8	1 3/8	1 1/8	1 1/8	1 1/8	1 3/8	1 3/8	1 3/8	1 1/8	1 1/8	1 1/8	1 3/8	1 3/8	1 3/8	1/2	1/2	5/8	5/8	5/8	5/8
66,000	7/8	1 1/8	1 1/8	1 1/8	1 3/8	1 3/8	1 1/8	1 1/8	1 1/8	1 3/8	1 3/8	1 3/8	1 1/8	1 1/8	1 3/8	1 3/8	1 3/8	1 5/8	1/2	1/2	5/8	5/8	5/8	7/8
72,000	7/8	1 1/8	1 1/8	1 1/8	1 3/8	1 3/8	1 1/8	1 1/8	1 1/8	1 3/8	1 3/8	1 3/8	1 1/8	1 1/8	1 3/8	1 3/8	1 3/8	1 5/8	1/2	5/8	5/8	5/8	5/8	7/8
78,000	7/8	1 1/8	1 1/8	1 3/8	1 3/8	1 3/8	1 1/8	1 1/8	1 1/8	1 3/8	1 3/8	5/8	1 1/8	1 1/8	1 3/8	1 3/8	1 5/8	1 5/8	1/2	5/8	5/8	5/8	7/8	7/8
84,000	1 1/8	1 1/8	1 1/8	1 3/8	1 3/8	1 3/8	1 1/8	1 1/8	1 3/8	1 3/8	1 5/8	1 5/8	1 1/8	1 3/8	1 3/8	1 3/8	1 5/8	1 5/8	1/2	5/8	5/8	5/8	7/8	7/8
90,000	1 1/8	1 1/8	1 3/8	1 3/8	1 3/8	1 5/8	1 1/8	1 3/8	1 3/8	1 5/8	1 5/8	1 5/8	1 1/8	1 3/8	1 3/8	1 5/8	1 5/8	1 5/8	1/2	5/8	5/8	7/8	7/8	7/8
120,000	1 1/8	1 3/8	1 3/8	1 5/8	1 5/8	1 5/8	1 3/8	1 3/8	1 5/8	1 5/8	1 5/8	1 1/8	1 3/8	1 5/8	1 5/8	1 5/8	2 1/8	2 1/8	5/8	5/8	7/8	7/8	7/8	7/8
150,000	1 3/8	1 3/8	1 5/8	1 5/8	1 5/8	2 1/8	1 3/8	1 5/8	1 5/8	1 5/8	2 1/8	2 1/8	1 3/8	1 5/8	1 5/8	1 5/8	2 1/8	2 1/8	5/8	7/8	7/8	7/8	7/8	7/8
180,000	1 3/8	1 3/8	1 5/8	1 5/8	2 1/8	2 1/8	1 3/8	1 5/8	1 5/8	2 1/8	2 1/8	2 1/8	1 5/8	2 1/8	2 1/8	2 1/8	2 1/8	2 1/8	7/8	7/8	7/8	7/8	1 1/8	1 1/8
210,000	1 3/8	1 5/8	1 5/8	1 1/8	2 1/8	2 1/8	1 5/8	1 5/8	1 1/8	2 1/8	2 1/8	2 1/8	1 5/8	2 1/8	2 1/8	2 1/8	2 1/8	2 5/8	7/8	7/8	7/8	7/8	1 1/8	1 1/8
240,000	1 5/8	1 5/8	2 1/8	2 1/8	2 1/8	2 1/8	1 5/8	2 1/8	2 1/8	2 1/8	2 1/8	2 5/8	1 5/8	2 1/8	2 1/8	2 1/8	2 5/8	2 5/8	7/8	7/8	7/8	1 1/8	1 1/8	1 1/8
300,000	1 5/8	2 1/8	2 1/8	2 1/8	2 1/8	2 5/8	1 5/8	2 1/8	2 1/8	2 1/8	2 5/8	2 5/8	2 1/8	2 1/8	2 1/8	2 5/8	2 5/8	2 5/8	7/8	7/8	7/8	1 1/8	1 1/8	1 1/8
360,000	1 5/8	2 1/8	2 1/8	2 1/8	2 5/8	2 5/8	2 1/8	2 1/8	2 1/8	2 5/8	2 5/8	2 5/8	2 1/8	2 1/8	2 5/8	2 5/8	2 5/8	2 5/8	7/8	1 1/8	1 1/8	1 1/8	1 1/8	1 3/8
480,000	2 1/8	2 1/8	2 1/8	2 5/8	2 5/8	2 5/8	2 1/8	2 5/8	2 5/8	2 5/8	3 1/8	3 1/8	2 1/8	2 5/8	2 5/8	2 5/8	3 1/8	3 1/8	7/8	1 1/8	1 1/8	1 3/8	1 3/8	1 3/8
600,000	2 1/8	2 5/8	2 5/8	2 5/8	3 1/8	3 1/8	2 5/8	2 5/8	2 5/8	3 1/8	3 1/8	3 1/8	2 1/8	2 5/8	3 1/8	3 1/8	3 5/8	3 5/8	1 1/8	1 1/8	1 3/8	1 3/8	1 3/8	1 3/8

*** NOTES:**

- Sizes that are highlighted indicate maximum suction line sizes that should be used for risers. Riser size should not exceed horizontal size. Properly placed suction traps must also be used for adequate oil return.
- All sizes shown are for O.D. Type L copper tubing.
- Suction line sizes selected at pressure drop equivalent to 2°F. Reduce estimate of system capacity accordingly.
- Recommended liquid line size may increase with reverse cycle hot gas systems.
- If system load drops below 40% of design, consideration to installing double suction risers should be made.

Table 9. Recommended Line Sizes for R-448A/R-449A*

Capacity BTUH	Suction Line Size																							
	Suction Temperature																							
	+20°F						+10°F						-10°F						-20°F					
	Equivalent Lengths						Equivalent Lengths						Equivalent Lengths						Equivalent Lengths					
	25'	50'	75'	100'	150'	200'	25'	50'	75'	100'	150'	200'	25'	50'	75'	100'	150'	200'	25'	50'	75'	100'	150'	200'
1,000	3/8	3/8	3/8	3/8	3/8	3/8	3/8	3/8	3/8	3/8	3/8	1/2	3/8	3/8	3/8	1/2	1/2	1/2	3/8	3/8	1/2	1/2	1/2	1/2
3,000	3/8	3/8	1/2	1/2	1/2	5/8	3/8	1/2	1/2	1/2	5/8	5/8	1/2	1/2	5/8	5/8	5/8	7/8	1/2	1/2	5/8	5/8	7/8	7/8
4,000	3/8	1/2	1/2	1/2	5/8	5/8	1/2	1/2	1/2	5/8	5/8	7/8	1/2	5/8	5/8	5/8	7/8	7/8	1/2	5/8	5/8	7/8	7/8	7/8
6,000	1/2	1/2	5/8	5/8	7/8	7/8	1/2	1/2	5/8	5/8	7/8	7/8	1/2	5/8	5/8	7/8	7/8	7/8	5/8	5/8	7/8	7/8	7/8	7/8
9,000	5/8	5/8	7/8	7/8	7/8	7/8	5/8	5/8	7/8	7/8	7/8	7/8	5/8	7/8	7/8	7/8	7/8	1 1/8	5/8	7/8	7/8	7/8	1 1/8	1 1/8
12,000	5/8	7/8	7/8	7/8	7/8	7/8	5/8	7/8	7/8	7/8	7/8	1 1/8	7/8	7/8	7/8	7/8	1 1/8	1 1/8	7/8	7/8	7/8	1 1/8	1 1/8	1 1/8
15,000	5/8	7/8	7/8	7/8	7/8	1 1/8	7/8	7/8	7/8	7/8	1 1/8	1 1/8	7/8	7/8	7/8	1 1/8	1 1/8	1 1/8	7/8	7/8	1 1/8	1 1/8	1 1/8	1 1/8
18,000	7/8	7/8	7/8	7/8	1 1/8	1 1/8	7/8	7/8	7/8	1 1/8	1 1/8	1 1/8	7/8	7/8	1 1/8	1 1/8	1 1/8	1 1/8	7/8	1 1/8	1 1/8	1 1/8	3/8	3/8
24,000	7/8	7/8	7/8	1 1/8	1 1/8	1 1/8	7/8	1 1/8	1 1/8	1 1/8	1 1/8	1 1/8	7/8	1 1/8	1 1/8	1 1/8	1 1/8	1 1/8	1 1/8	1 1/8	1 1/8	1 1/8	3/8	3/8
30,000	7/8	7/8	1 1/8	1 1/8	1 1/8	3/8	7/8	1 1/8	1 1/8	1 1/8	3/8	3/8	1 1/8	1 1/8	1 1/8	3/8	3/8	3/8	1 1/8	1 1/8	1 1/8	3/8	3/8	5/8
36,000	7/8	1 1/8	1 1/8	1 1/8	3/8	3/8	1 1/8	1 1/8	1 1/8	3/8	3/8	3/8	1 1/8	1 1/8	1 1/8	3/8	3/8	3/8	1 1/8	1 1/8	3/8	3/8	3/8	5/8
42,000	1 1/8	1 1/8	1 1/8	3/8	3/8	3/8	1 1/8	1 1/8	1 1/8	3/8	3/8	5/8	1 1/8	1 1/8	1 1/8	3/8	3/8	5/8	1 1/8	1 1/8	3/8	5/8	5/8	5/8
48,000	1 1/8	1 1/8	3/8	3/8	3/8	3/8	1 1/8	1 1/8	3/8	3/8	5/8	5/8	1 1/8	1 1/8	3/8	3/8	3/8	5/8	1 1/8	3/8	3/8	5/8	5/8	5/8
54,000	1 1/8	1 1/8	3/8	3/8	3/8	5/8	1 1/8	3/8	3/8	3/8	5/8	5/8	1 1/8	3/8	3/8	3/8	5/8	5/8	1 1/8	3/8	5/8	5/8	5/8	5/8
60,000	1 1/8	1 1/8	3/8	3/8	5/8	5/8	1 1/8	3/8	3/8	5/8	5/8	5/8	1 1/8	3/8	3/8	5/8	5/8	5/8	1 1/8	3/8	5/8	5/8	5/8	1/8
66,000	1 1/8	3/8	3/8	3/8	5/8	5/8	1 1/8	3/8	3/8	5/8	5/8	5/8	1 1/8	3/8	5/8	5/8	5/8	5/8	3/8	5/8	5/8	5/8	5/8	2
72,000	1 1/8	3/8	3/8	5/8	5/8	5/8	1 1/8	3/8	5/8	5/8	5/8	5/8	1 1/8	3/8	5/8	5/8	5/8	5/8	3/8	5/8	5/8	5/8	5/8	2
78,000	1 1/8	3/8	3/8	5/8	5/8	1 1/8	3/8	3/8	5/8	5/8	5/8	1 1/8	3/8	5/8	5/8	5/8	5/8	2	3/8	5/8	5/8	5/8	1 1/8	2
84,000	1 1/8	3/8	5/8	5/8	5/8	2	3/8	3/8	5/8	5/8	1 1/8	2	3/8	5/8	5/8	5/8	5/8	2	3/8	5/8	5/8	2	2	2
90,000	1 3/8	3/8	5/8	5/8	1 1/8	1 1/8	3/8	5/8	5/8	5/8	1 1/8	1 1/8	5/8	5/8	5/8	1 1/8	1 1/8	5/8	5/8	5/8	1 1/8	1 1/8	5/8	5/8
120,000	1 3/8	5/8	5/8	1 1/8	1 1/8	2	3/8	5/8	5/8	1 1/8	1 1/8	2	5/8	5/8	5/8	1 1/8	5/8	5/8	1 1/8	2	2	2	2	2
150,000	1 5/8	5/8	2 1/8	2 1/8	2 1/8	2 1/8	5/8	2 1/8	2 1/8	2 1/8	2 1/8	2 1/8	2 1/8	2 1/8	2 1/8	2 1/8	2 1/8	2 1/8	2 1/8	2 1/8	2 1/8	2 1/8	2 1/8	2 1/8
180,000	1 5/8	2 1/8	2 1/8	2 1/8	2 1/8	2 1/8	5/8	2 1/8	2 1/8	2 1/8	2 1/8	2 1/8	2 1/8	2 1/8	2 1/8	2 1/8	2 1/8	3 1/8	2 1/8	2 1/8	2 1/8	2 1/8	2 1/8	3 1/8
210,000	1 5/8	2 1/8	2 1/8	2 1/8	2 1/8	2 1/8	2 1/8	2 1/8	2 1/8	2 1/8	2 1/8	2 1/8	2 1/8	2 1/8	2 1/8	2 1/8	3 1/8	3 1/8	2 1/8	2 1/8	2 1/8	2 1/8	3 1/8	3 1/8
240,000	1 5/8	2 1/8	2 1/8	2 1/8	2 1/8	2 1/8	2 1/8	2 1/8	2 1/8	2 1/8	2 1/8	2 1/8	2 1/8	2 1/8	2 1/8	2 1/8	3 1/8	3 1/8	2 1/8	2 1/8	2 1/8	2 1/8	3 1/8	3 1/8
300,000	2 1/8	2 1/8	2 5/8	2 5/8	2 5/8	3 1/8	2 1/8	2 5/8	2 5/8	2 5/8	3 1/8	3 1/8	2 5/8	2 5/8	2 5/8	3 1/8	3 1/8	3 1/8	2 5/8	2 5/8	2 5/8	3 1/8	3 1/8	3 1/8
360,000	2 1/8	2 1/8	2 5/8	2 5/8	3 1/8	3 1/8	2 1/8	2 5/8	2 5/8	2 5/8	3 1/8	3 1/8	2 5/8	2 5/8	3 1/8	3 1/8	3 1/8	3 1/8	2 5/8	2 5/8	3 1/8	3 1/8	3 1/8	4 1/8
480,000	2 1/8	2 5/8	5/8	3 1/8	3 1/8	3 1/8	2 5/8	2 5/8	2 5/8	2 5/8	3 1/8	3 1/8	2 5/8	3 1/8	3 1/8	3 1/8	3 1/8	4 1/8	5/8	3 1/8	3 1/8	3 1/8	3 1/8	4 1/8
600,000	2 5/8	2 5/8	3 1/8	3 1/8	3 1/8	3 1/8	2 5/8	2 5/8	3 1/8	3 1/8	3 1/8	3 1/8	3 1/8	3 1/8	3 1/8	3 1/8	4 1/8	4 1/8	3 1/8	3 1/8	3 1/8	3 1/8	3 1/8	4 1/8

*** NOTES:**

- Sizes that are highlighted indicate maximum suction line sizes that should be used for risers. Riser size should not exceed horizontal size. Properly placed suction traps must also be used for adequate oil return.
All sizes shown are for O.D. Type L copper tubing.
- Suction line sizes selected at pressure drop equivalent to 2°F. Reduce estimate of system capacity accordingly.
- Recommended liquid line size may increase with reverse cycle hot gas systems.
- If system load drops below 40% of design, consideration to installing double suction risers should be made.

Table 9a. Recommended Line Sizes for R-448A/R-449A*

Capacity BTUH	Suction Line Size												Liquid Line Size					
	Suction Temperature												Receiver to Expansion Valve Equivalent Lengths					
	-30°F Equivalent Lengths						-40°F Equivalent Lengths											
	25'	50'	75'	100'	150'	200'	25'	50'	75'	100'	150'	200'	25'	50'	75'	100'	150'	200'
1,000	3/8	3/8	1/2	1/2	1/2	5/8	3/8	1/2	1/2	1/2	5/8	5/8	3/8	3/8	3/8	3/8	3/8	3/8
3,000	1/2	1/2	5/8	5/8	7/8	7/8	1/2	1/2	5/8	5/8	7/8	7/8	3/8	3/8	3/8	3/8	3/8	3/8
4,000	5/8	5/8	5/8	7/8	7/8	7/8	1/2	5/8	5/8	7/8	7/8	7/8	3/8	3/8	3/8	3/8	3/8	3/8
6,000	5/8	5/8	7/8	7/8	7/8	7/8	5/8	5/8	7/8	7/8	7/8	1 1/8	3/8	3/8	3/8	3/8	3/8	3/8
9,000	5/8	7/8	7/8	7/8	1 1/8	1 1/8	5/8	7/8	7/8	7/8	1 1/8	1 1/8	3/8	3/8	3/8	3/8	3/8	3/8
12,000	7/8	7/8	7/8	1 1/8	1 1/8	1 1/8	7/8	7/8	7/8	1 1/8	1 1/8	1 1/8	3/8	3/8	3/8	3/8	3/8	3/8
15,000	7/8	7/8	1 1/8	1 1/8	1 1/8	3/8	7/8	7/8	1 1/8	1 1/8	1 1/8	1 3/8	3/8	3/8	3/8	3/8	3/8	1/2
18,000	7/8	1 1/8	1 1/8	1 1/8	1 3/8	1 3/8	7/8	1 1/8	1 1/8	1 1/8	1 3/8	1 3/8	3/8	3/8	3/8	3/8	1/2	1/2
24,000	1 1/8	1 1/8	1 1/8	3/8	3/8	3/8	1 1/8	1 1/8	1 1/8	3/8	3/8	3/8	3/8	3/8	1/2	1/2	1/2	1/2
30,000	1 1/8	1 1/8	3/8	3/8	3/8	5/8	1 1/8	1 1/8	3/8	3/8	3/8	5/8	3/8	3/8	1/2	1/2	1/2	1/2
36,000	1 1/8	3/8	3/8	3/8	3/8	5/8	1 1/8	3/8	3/8	3/8	5/8	5/8	3/8	1/2	1/2	1/2	1/2	1/2
42,000	1 1/8	1 3/8	3/8	3/8	5/8	5/8	1 1/8	3/8	3/8	3/8	5/8	5/8	3/8	1/2	1/2	1/2	1/2	5/8
48,000	1 1/8	3/8	3/8	3/8	5/8	5/8	1 1/8	3/8	3/8	3/8	5/8	5/8	1/2	1/2	1/2	1/2	1/2	5/8
54,000	1 3/8	3/8	3/8	5/8	5/8	2 1/8	1 3/8	3/8	3/8	5/8	5/8	2 1/8	1/2	1/2	1/2	1/2	5/8	5/8
60,000	1 3/8	3/8	5/8	5/8	5/8	2 1/8	1 3/8	3/8	5/8	5/8	5/8	2 1/8	1/2	1/2	1/2	5/8	5/8	5/8
66,000	1 3/8	5/8	5/8	5/8	5/8	2 1/8	1 3/8	5/8	5/8	5/8	5/8	2 1/8	1/2	1/2	5/8	5/8	5/8	5/8
72,000	1 3/8	1 5/8	5/8	5/8	5/8	2 1/8	1 3/8	5/8	5/8	5/8	5/8	2 1/8	1/2	1/2	5/8	5/8	5/8	5/8
78,000	1 5/8	5/8	5/8	5/8	2 1/8	2 1/8	1 5/8	5/8	5/8	5/8	5/8	2 1/8	1/2	1/2	5/8	5/8	5/8	7/8
84,000	1 5/8	1 5/8	5/8	2 1/8	2 1/8	2 1/8	1 5/8	5/8	5/8	2 1/8	2 1/8	2 1/8	1/2	5/8	5/8	5/8	5/8	7/8
90,000	1 5/8	2 1/8	2 1/8	2 1/8	2 1/8	2 1/8	1 5/8	5/8	2 1/8	2 1/8	2 1/8	2 1/8	1/2	5/8	5/8	5/8	7/8	7/8
120,000	1 5/8	2 1/8	2 1/8	2 1/8	2 5/8	2 1/8	1 5/8	2 1/8	2 1/8	2 1/8	2 5/8	2 5/8	5/8	5/8	5/8	7/8	7/8	7/8
150,000	2 1/8	2 1/8	2 1/8	2 5/8	2 5/8	2 5/8	2 1/8	2 1/8	2 5/8	2 5/8	2 5/8	2 5/8	5/8	7/8	7/8	7/8	7/8	7/8
180,000	2 1/8	2 1/8	2 5/8	2 5/8	2 5/8	3 1/8	2 1/8	2 1/8	2 5/8	2 5/8	2 5/8	3 1/8	5/8	7/8	7/8	7/8	7/8	1 1/8
210,000	2 1/8	2 5/8	2 5/8	2 5/8	3 1/8	3 1/8	2 1/8	2 5/8	2 5/8	2 5/8	3 1/8	3 1/8	7/8	7/8	7/8	7/8	7/8	1 1/8
240,000	2 5/8	2 5/8	2 5/8	3 1/8	3 1/8	3 1/8	2 5/8	2 5/8	2 5/8	3 1/8	3 1/8	3 5/8	7/8	7/8	7/8	7/8	1 1/8	1 1/8
300,000	2 5/8	2 5/8	3 1/8	3 1/8	3 1/8	4 1/8	2 5/8	2 5/8	3 1/8	3 1/8	3 5/8	4 1/8	7/8	7/8	1 1/8	1 1/8	1 1/8	1 1/8
360,000	2 5/8	3 1/8	3 1/8	3 1/8	3 1/8	4 1/8	2 5/8	3 1/8	3 1/8	3 1/8	4 1/8	4 1/8	7/8	7/8	1 1/8	1 1/8	1 1/8	1 1/8
480,000	3 1/8	3 1/8	3 1/8	4 1/8	4 1/8	4 1/8	3 1/8	3 1/8	3 1/8	4 1/8	4 1/8	4 1/8	1 1/8	1 1/8	1 1/8	1 1/8	1 1/8	1 1/8
600,000	3 1/8	3 5/8	3 5/8	4 1/8	4 1/8	5 1/8	3 1/8	3 5/8	3 5/8	4 1/8	4 1/8	5 1/8	1 1/8	1 1/8	1 1/8	3/8	3/8	1 3/8

- NOTES:** Sizes that are highlighted indicate maximum suction line sizes that should be used for risers. Riser size should not exceed horizontal size. Properly placed suction traps must also be used for adequate oil return.
All sizes shown are for O.D. Type L copper tubing.
- Suction line sizes selected at pressure drop equivalent to 2°F. Reduce estimate of system capacity accordingly.
- Recommended liquid line size may increase with reverse cycle hot gas systems.
- If system load drops below 40% of design, consideration to installing double suction risers should be made.

All vertical risers will have an appropriate "P" trap at the beginning of the riser and every 20 ft above this point. If the total rise is less distance than can be evenly divided by 20, the P-traps will be located at the beginning and in the center of the distance so that the total distance between any two traps does not exceed 20 ft.

Keep the refrigeration lines as short as possible and use as few fittings as practicable, being especially careful not to "kink" the lines. Keep the layout as simple as possible and properly support the piping to absorb vibration and the normal expansion and contraction caused by temperature changes.

Liquid line filter driers, TXV, and solenoids will be installed on all systems that are single compressor per single evaporator coil and Master-Bilt has provided the evaporator coil.

The TXV sensing Bulb must be properly mounted on the horizontal portion of the refrigerant suction line and properly insulated. For systems with a suction line 7/8" OD or larger, surface temperature may vary slightly around the circumference of the tube. Because of this, Sporlan recommends that sensing bulbs be mounted at the 4 or 8 o'clock position. For smaller lines, the bulb may be mounted at any point (**other than the bottom**) on the horizontal suction line.

Add appropriate amount of oil per compressor manufacturer recommendations to compensate for longer refrigeration line runs.

When brazing, dry nitrogen **MUST** be passed through the lines at low pressure to prevent scaling and oxidation inside the tubing and fittings. All flux will be removed from the joints when brazing is complete.

MINIMIZE the amount of flux used to prevent internal contamination of the refrigeration system.

Silver brazing wire is to be utilized (high temperature alloy of minimum of 5% silver content on all copper connections, and high temperature alloy of 45% silver content on all dissimilar metal connections).

The refrigeration contractor will be responsible for providing and installing the liquid line solenoid valve and coil for all systems where multiple evaporator coils are used or for "multiplexed" systems.

V. LEAK CHECK

When all refrigeration line connections have been made, the complete system, including factory connections, should be checked.

Add the proper refrigerant to 60 psig, and then boost the 175 psig with dry nitrogen. Leak checks should be done on all joints with an electronic leak detector or halide torch. If leaks are found, relieve the pressure and make repairs as necessary and recheck.

VI. EVACUATION, DEHYDRATION, AND START-UP

A vacuum of 500 microns or less must be pulled to properly dehydrate the refrigeration system. This requires a two-stage vacuum pump with an electronic vacuum indicator.

Do not use the system compressor as a vacuum pump.

Do not operate compressor while system is in a vacuum.

Evacuation Procedure

- A. Open all condensing unit service valves and relieve system pressure. Also, open any line valves installed in the system and energize all solenoid valves to facilitate evacuation.
- B. Connect the vacuum pump to the high and low sides of the system using ¼" or larger copper lines or ¼" ID hoses with high vacuum design.
- C. Leaks or moisture will be indicated if the system pressure rises when the vacuum line is closed off.
Pull a vacuum of 1500 microns, close vacuum line and "break" vacuum to 5 psig, maximum, with refrigerant to be used in the system.
- E. Repeat step D.
- F. A final vacuum of 250 microns should be pulled before charging. When 250 microns is reached, close vacuum line and charge system with the proper refrigerant through the high side. More refrigerant will be required depending upon the lengths of refrigeration lines required. Refer to **Table 3** for additional charge requirements for a given length of refrigeration line. Gradually add refrigerant until recommended superheat values are obtained. **(See Table 10 below)**

NOTE: Never add liquid refrigerant to the suction side of the compressor.

Table 10

Applicable Temperature	Recommended Superheat
Medium	6°F - 12°F
Low	5°F - 10°F

Finishing Charging Procedures

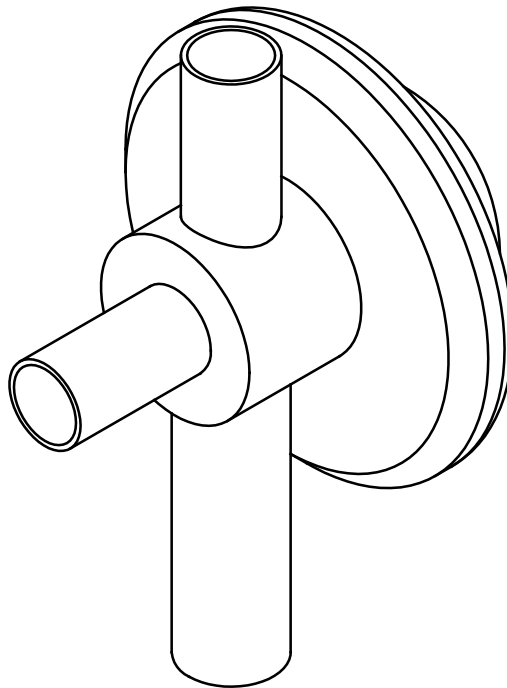
A. Preliminary

- 1. Be sure all service valves are "open".
- 2. Loosen the compressor hold-down bolts and remove shipping clips to allow compressor to float freely on the springs. (Semi-hermetic only)
- 3. Check evaporator fan motors, after start-up. Medium temperature, air defrost fans run continuously, low temperature fans and coolers provided with electric defrost will be delayed by the fan control.
- 4. Check phase alignment of incoming power on all refrigeration systems as noted in the Electrical Specifications section of this manual.
- 5. Start by "flipping on" the circuit breaker or circuit breakers in the unit electrical box.
- 6. Preset all room thermostats to the proper temperature.
- 7. Check operating pressures while charging and on initial pull down, to prevent damage if a problem occurs. If system "floods" back to the compressor, adjust thermostatic expansion valve as required for proper operation. There should be at least +30° F superheat entering the compressor. Master-Bilt recommendations for superheat values seen at the evaporator are given in Table 3.
- 8. For scroll compressors, verify power phasing and rotational direction as noted in the Electrical Specifications section of this manual.
- 9. Observe compressor amperage draw and compare to compressor nameplate to prevent damage due to high amperage. The oil sight glass, when equipped, should be between ½ and ¾ full during normal operation.

B. Low Ambient Charging Procedure

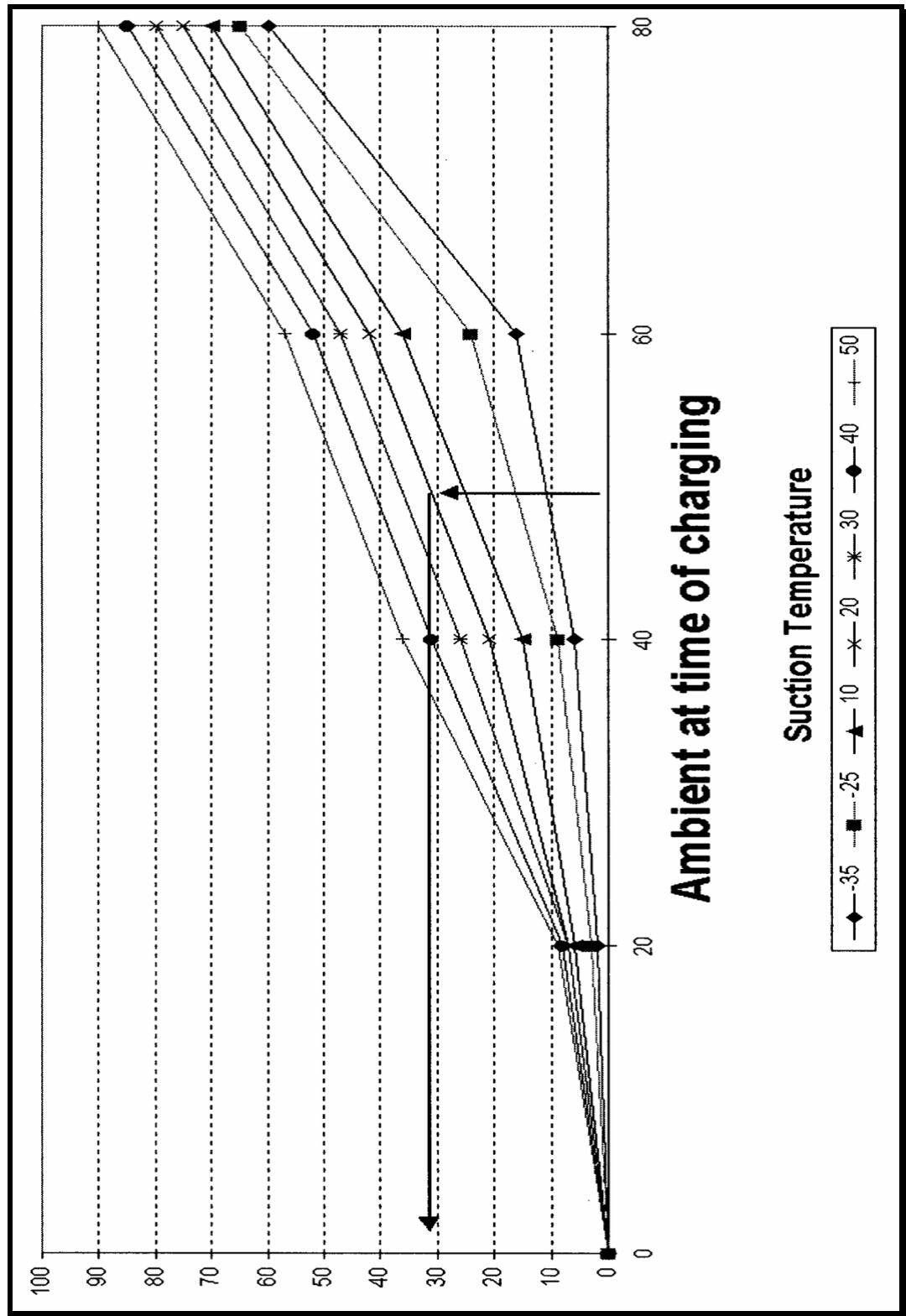
All **standard** air cooled condensers on the MRS Rack System are equipped with a head pressure control valve to maintain proper head pressure during winter conditions. These valves function by reducing the effective condenser area by flooding or “backing up” refrigerant in the condenser to reduce the amount of surface available for condensing. To operate properly, more charge is required during this flooding condition. This valve is not necessary when applying systems with the **LogiTemp® controller** and winter charges are negligible. Please contact our Customer Service Department for more about LogiTemp Technology.

To use the chart, multiply the pounds of recommended pre-charge obtained by adding the recommended pre-charge (Table 3) with the additional refrigerant required for line set length (Table 4) by the percent flooding required in Chart A to arrive at the additional charge required.



Typical Head Pressure Control Valve

Chart A:



SALE AND DISPOSAL

If you sell or give away your refrigeration equipment system or components you must make sure that all safety labels and I&O Manuals are included. If you need replacement labels or manuals, contact the parts and technical service department at Master-Bilt at (800) 684-8988

The customer service department at Master-Bilt should be contacted at the time of sale or disposal of your equipment so records may be kept of its new location.

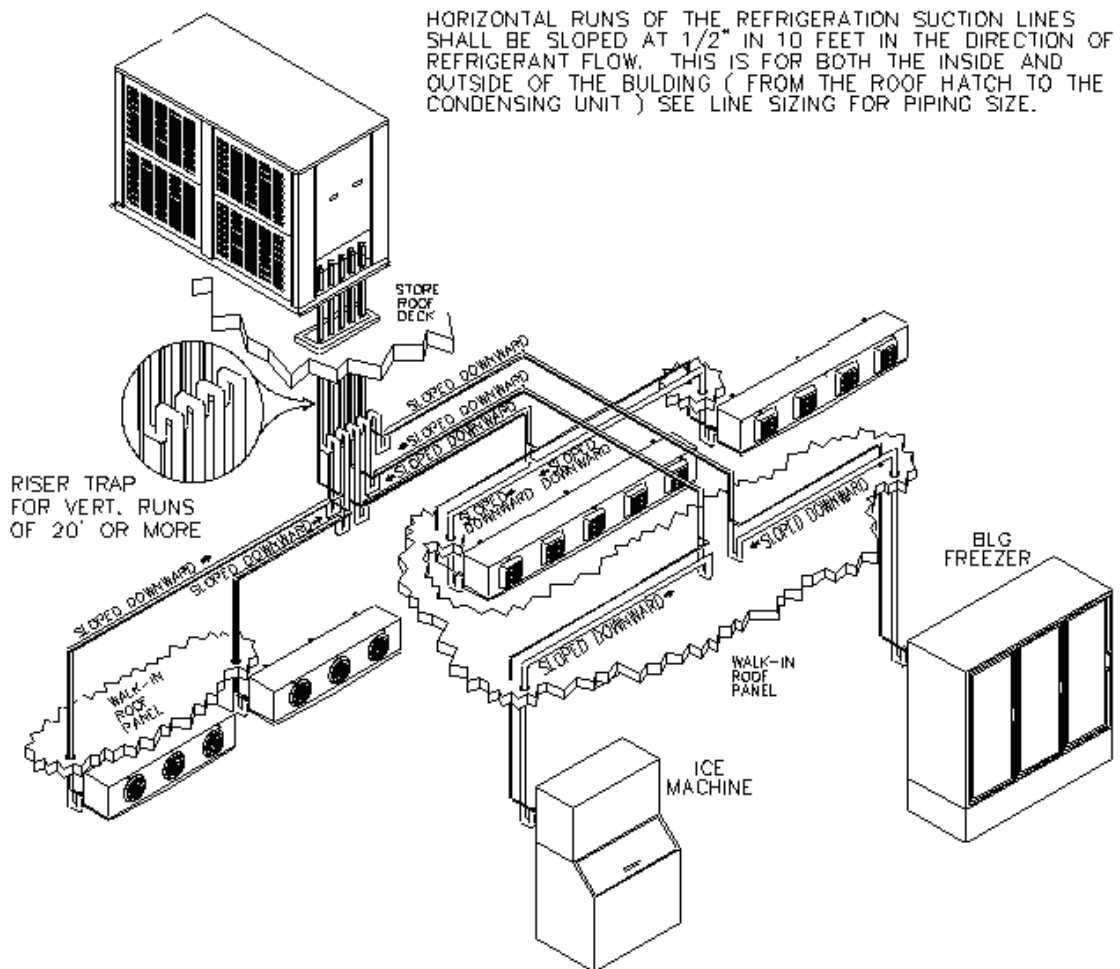
If you sell or give away your Master-Bilt[®] cabinet and you evacuate the refrigerant charge before shipping, you must evacuate the refrigerant into an approved recovery and reclaim system in order to satisfy all applicable federal and state regulations regarding release of refrigerant compounds into the atmosphere.

The release of refrigerant compounds into the atmosphere is a source of ozone depletion and regulated by state and federal laws.

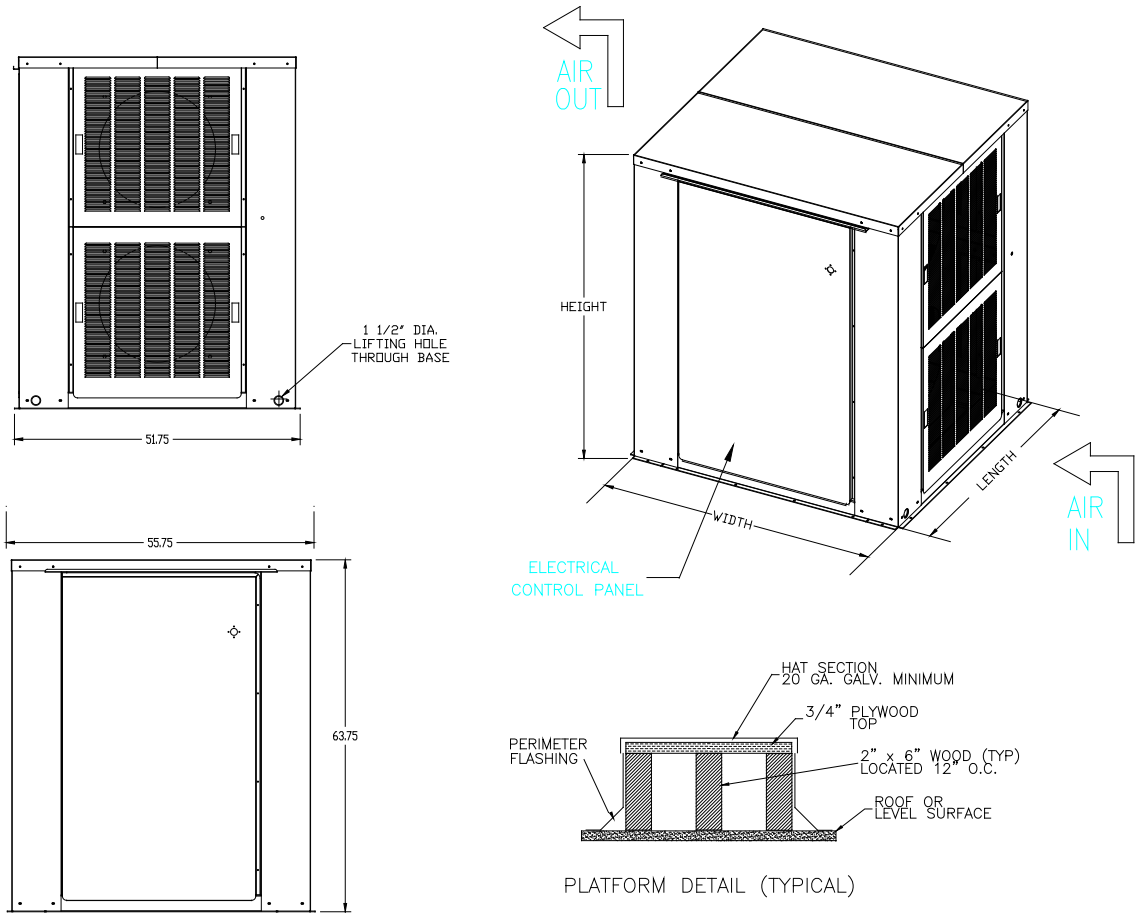
LABOR WARRANTY

- A. A 90 day labor warranty will be provided on all installer provided labor and installation.
- B. A 1 year optional Labor warranty will be quoted separate from the installation.
- C. Master-Bilt will provide a one year parts warranty on all parts that fail under normal operation conditions.

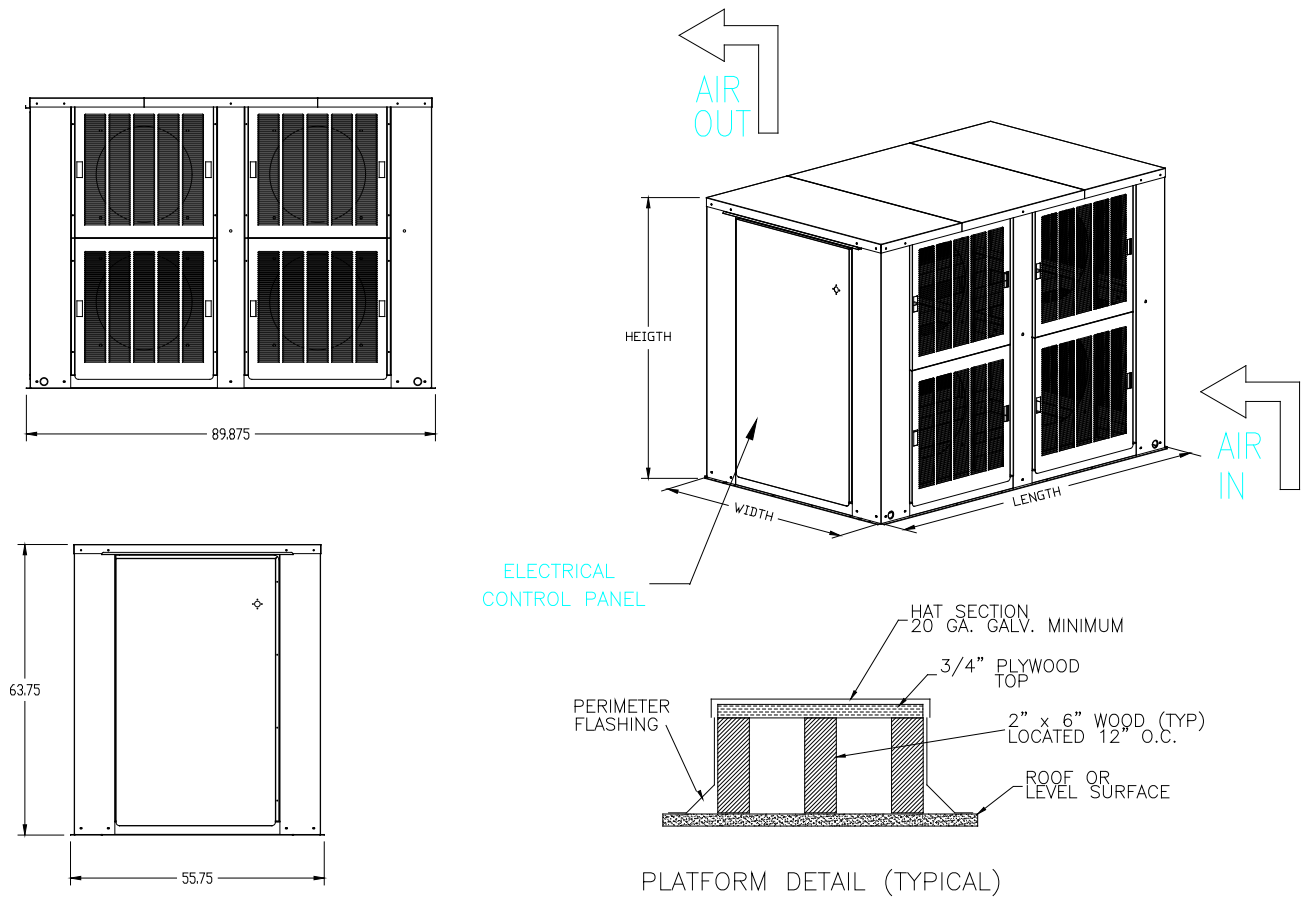
TYPICAL MRS SERIES PIPING SCHEMATIC



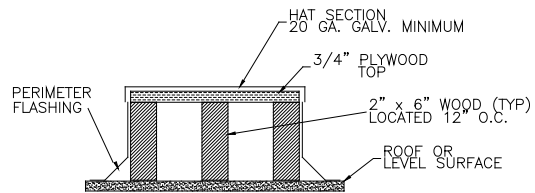
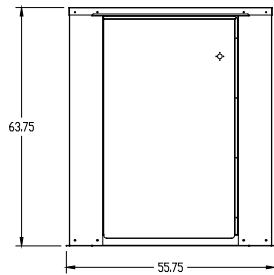
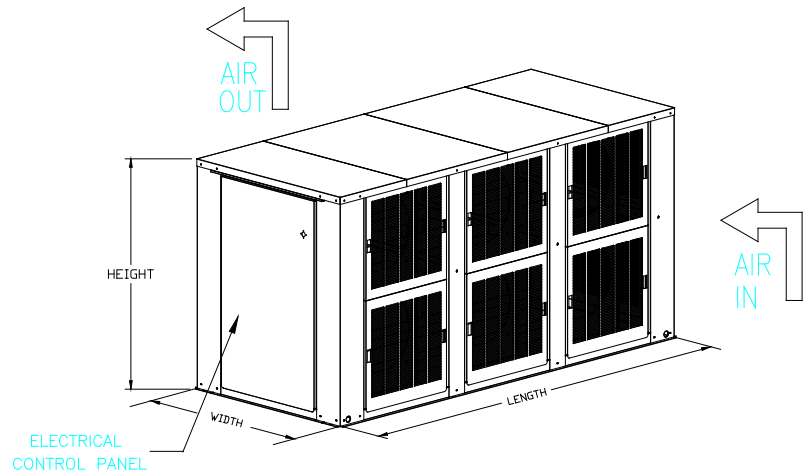
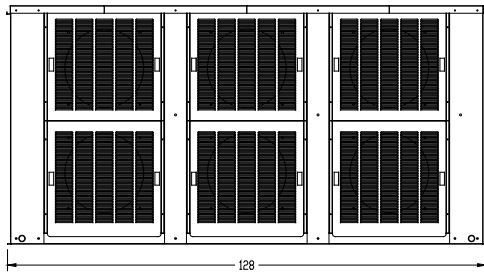
MRS-1B PHYSICAL DIMENSIONS



MRS-2B PHYSICAL DIMENSIONS

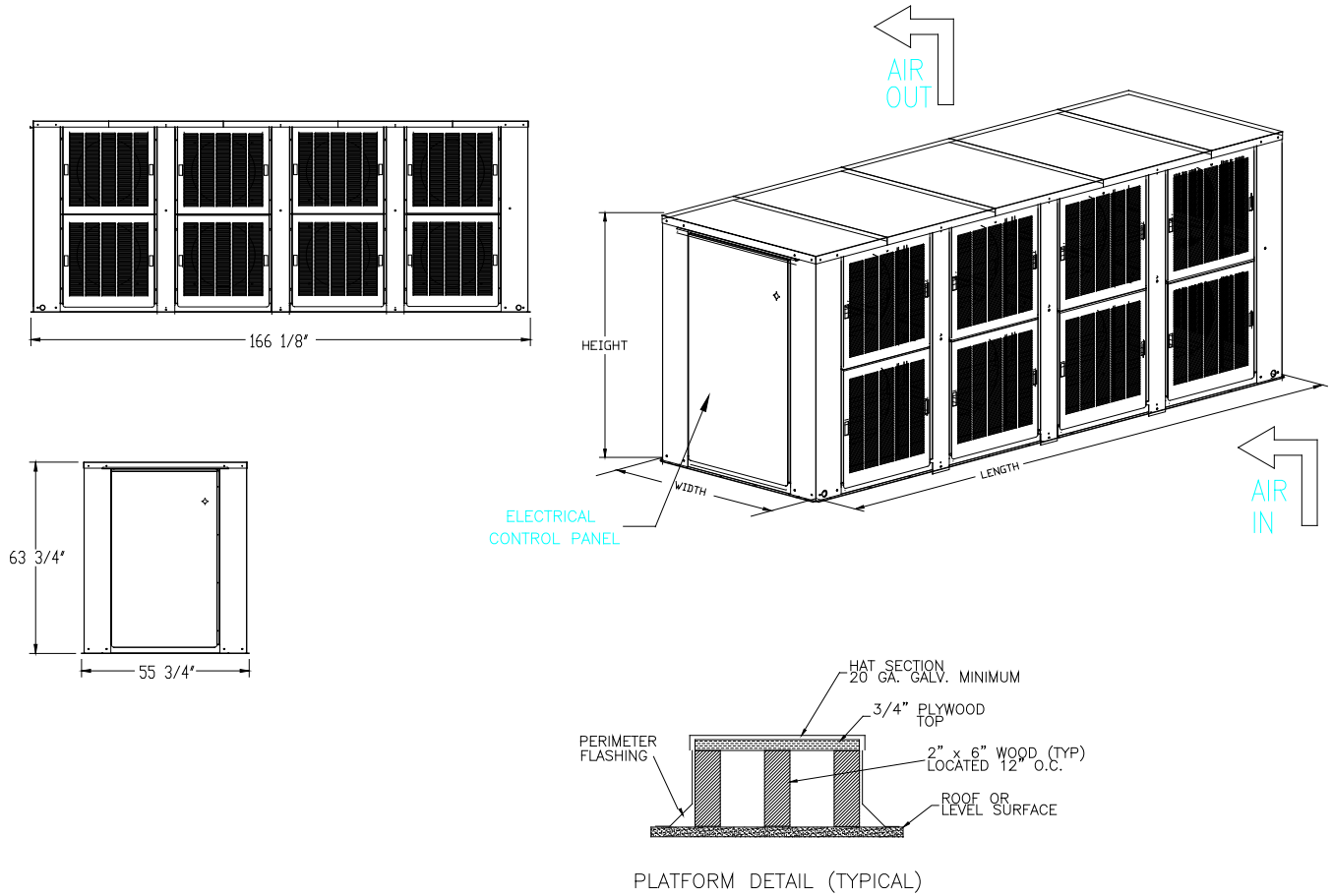


MRS-3B PHYSICAL DIMENSIONS

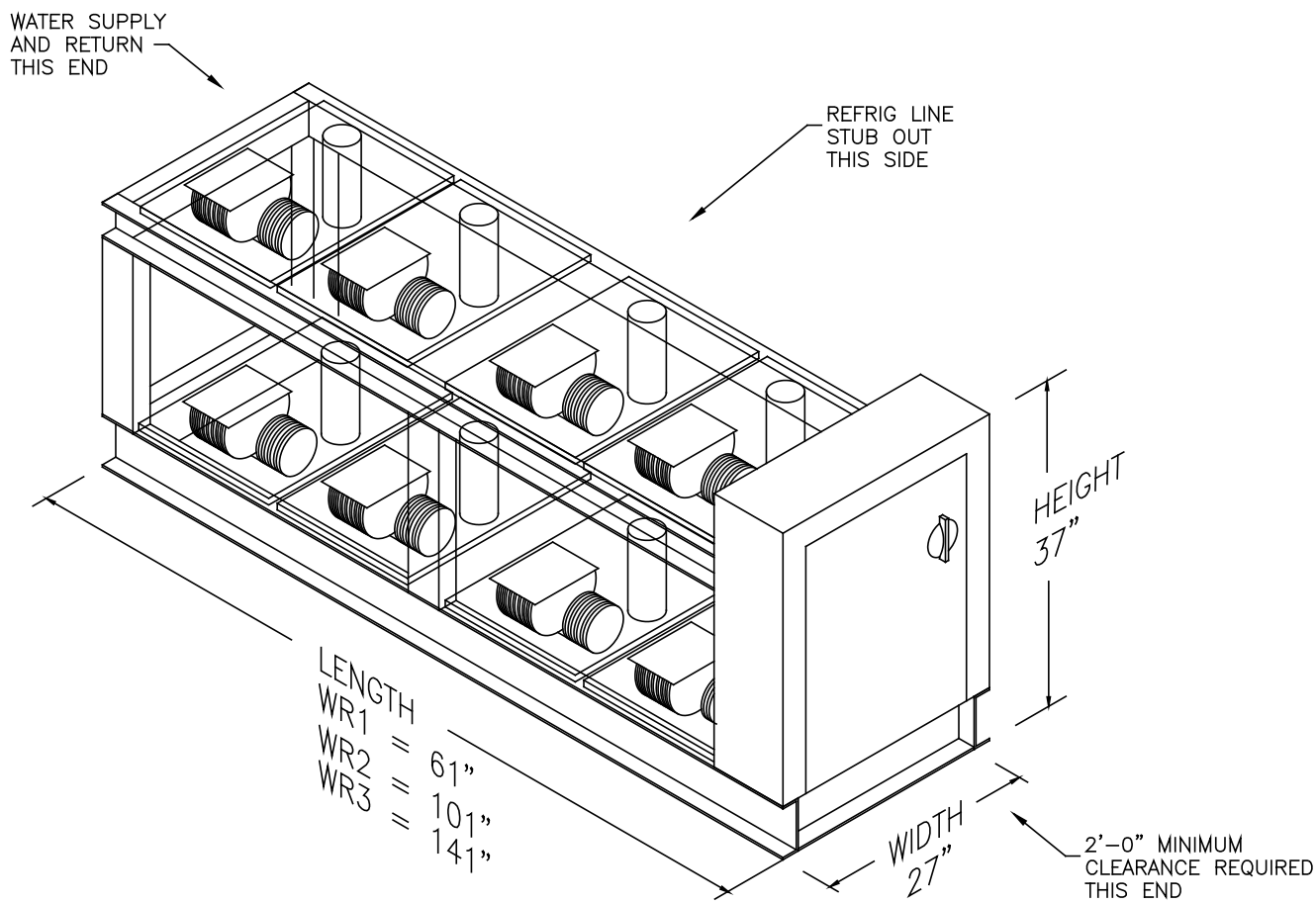


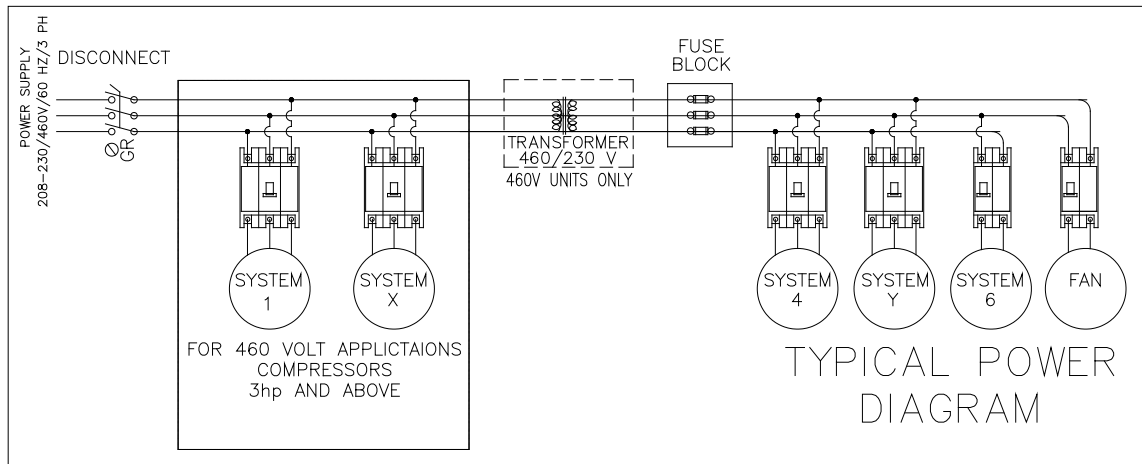
PLATFORM DETAIL (TYPICAL)

MRS-4B PHYSICAL DIMENSIONS

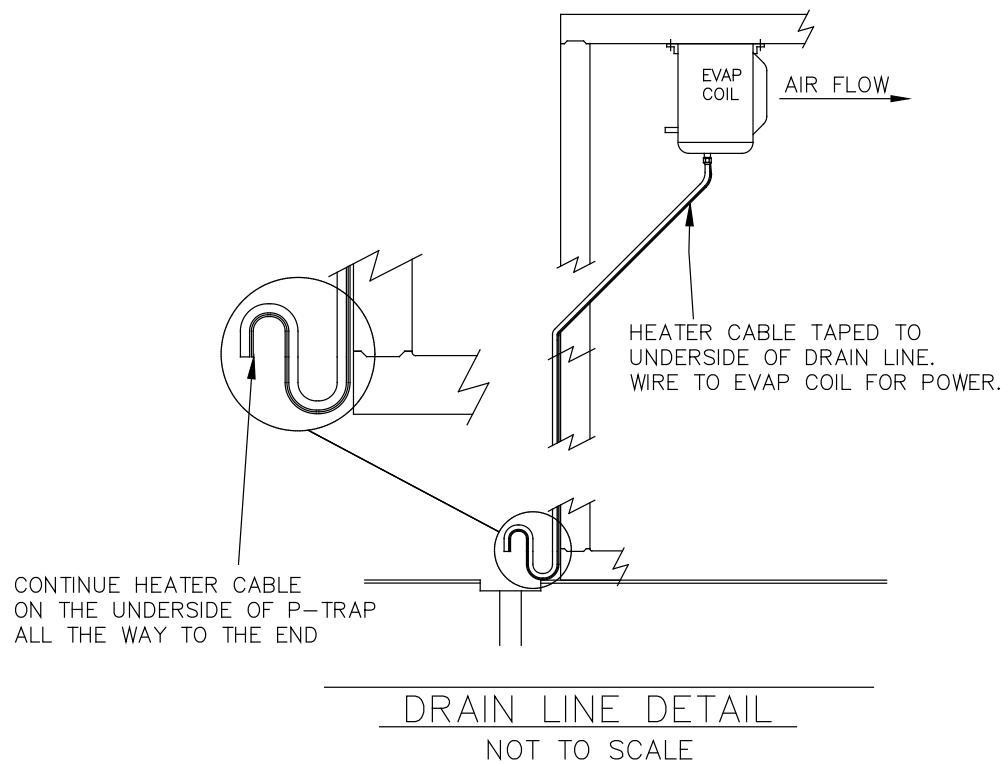


TYPICAL MRSW ENGINEERING DETAIL



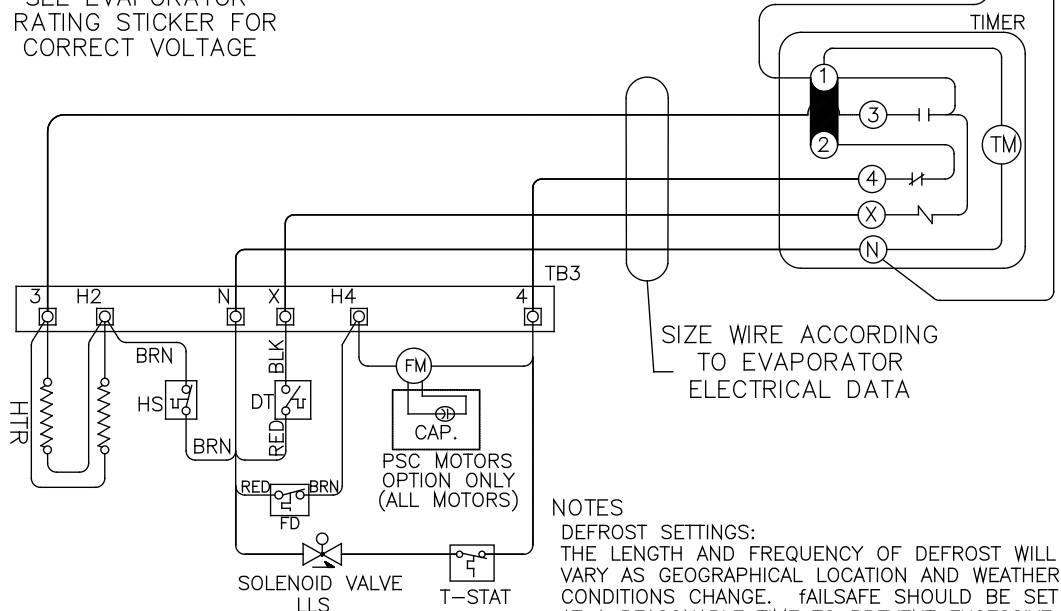


ROOM EVAPORATOR AND CONDENSATE DRAIN
TYPICAL INSTALLATION



208-230/60/1 Electric Defrost Evaporator.
SEE EVAPORATOR
RATING STICKER FOR
CORRECT VOLTAGE

SEE COMPRESSOR
CONTROL DIAGRAM FOR
CONNECTION DETAIL

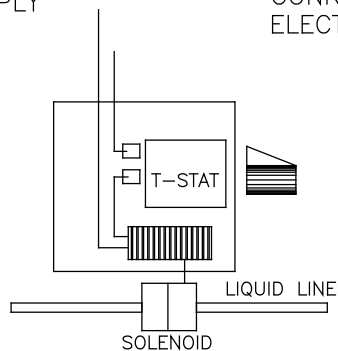


NOTES
DEFROST SETTINGS:
THE LENGTH AND FREQUENCY OF DEFROST WILL
VARY AS GEOGRAPHICAL LOCATION AND WEATHER
CONDITIONS CHANGE. failSAFE SHOULD BE SET
AT A REASONABLE TIME TO PREVENT EXCESSIVE
STEAMING AND/OR PRODUCT / EQUIPMENT DAMAGE.

THERMOSTAT AND SOLENOID FOR AIR DEFROST COILS

ELECTRICAL CONTRACTOR TO
INTERCONNECT TO 115 VOLT
POWER SUPPLY

* T-STAT AND SOLENOID WILL BE INSTALLED BY REFRIGERATION CONTRACTOR. ALL ELECTRICAL CONNECTIONS WILL BE COMPLETED BY THE ELECTRICAL CONTRACTOR AS BY T-STAT



**** SEE ELECTRIC DEFROST DIAGRAMS
FOR T-STAT AND SOLENOID CONNECTION
DETAIL FOR ELECTRIC DEFROST
EVAPORATORS

SIZE WIRE
ACCORDING TO



COMPRESSOR CONTROL WIRING DIAGRAM

208/230/3/60
AIR AND ELECTRIC DEFROST

COMPRESSOR

BLK
YEL
RED

T₁
T₂
T₃

L₁
L₂
L₃

M1

BLK

DUAL PRESS CONTROL

DISCHARGE THERMOSTAT FOR SCROLL COMPRESSOR

CRANKCASE HEATER

M1

RED

RED

BLK

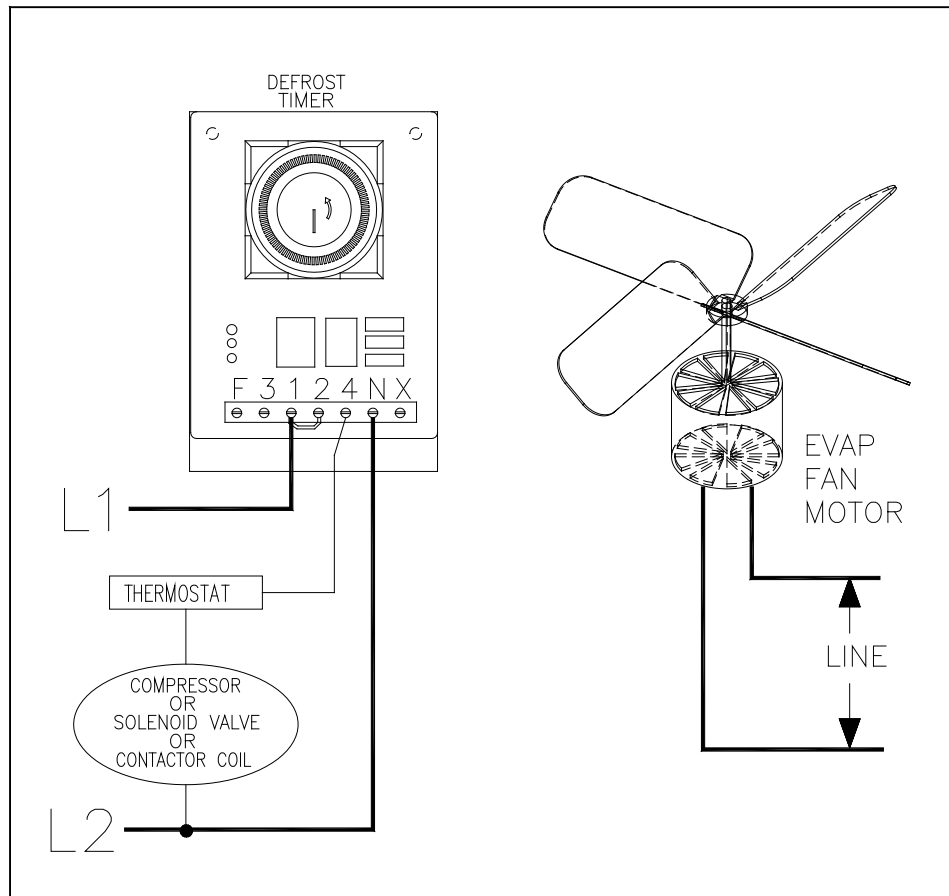
208/230/3/60

SEE DEFROST DIAGRAM FOR CONNECTION DETAIL

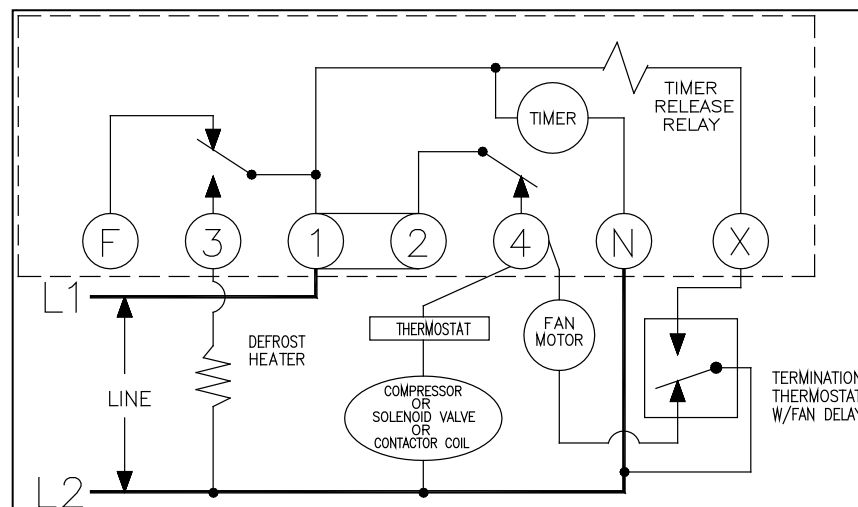
The diagram illustrates the internal wiring of a typical single-phase compressor. It includes a compressor with terminals C (Common), S (Start), and R (Run). A relay is connected to the start winding (S) and the run winding (R). A start capacitor is connected in series with the start winding. A run capacitor (when required) is connected in parallel with the run winding. The wiring is color-coded: Black for the common terminal (C), Yellow for the start terminal (S), Blue for the run terminal (R), and Red for the ground connection.

208/230/3/60

SEE DEFROST DIAGRAM FOR CONNECTION DETAIL



Typical Air Defrost Wiring Diagram



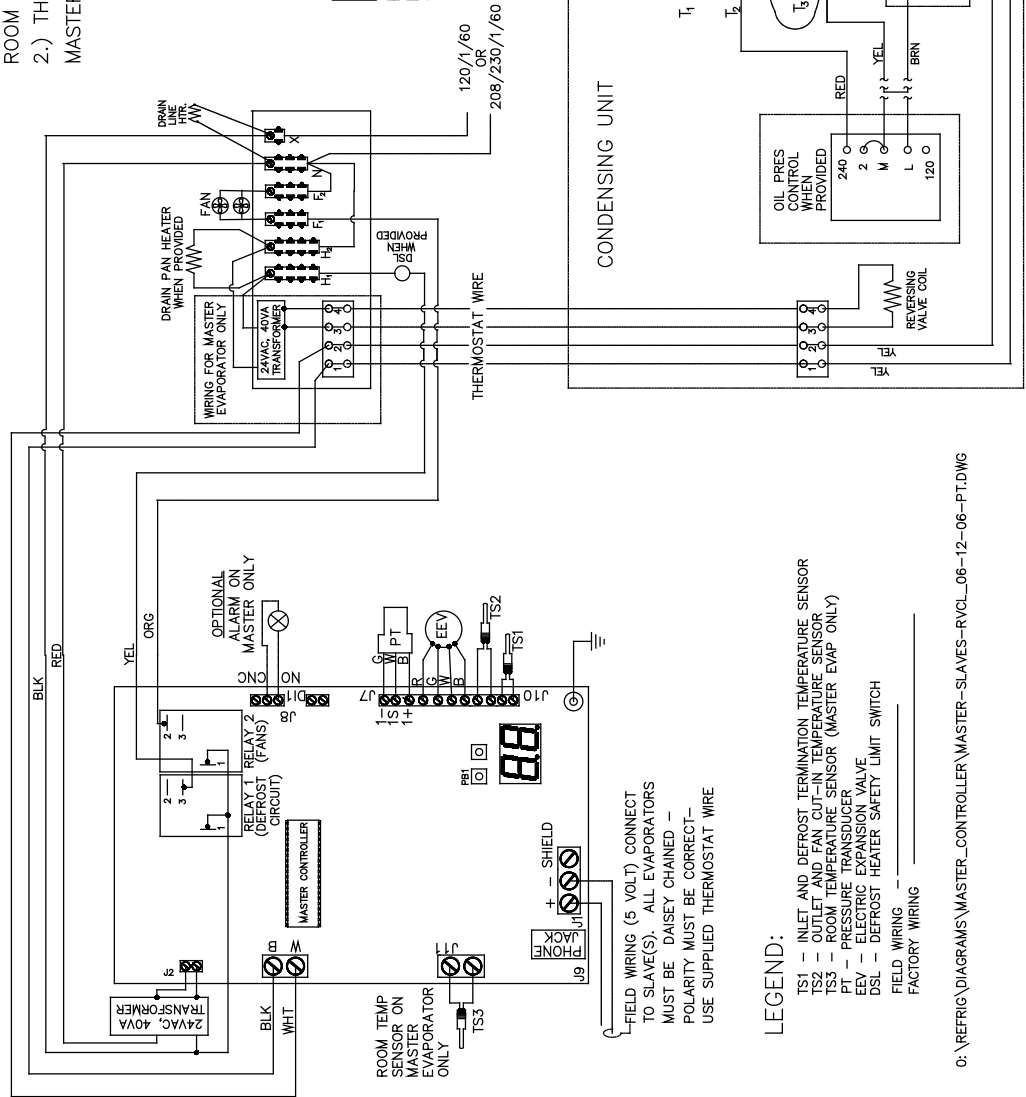
Typical Electric Defrost Wiring Diagram

MASTER CONTROLLER – EVAPORATOR WIRING 208-230/1-3/60 REVERSE CYCLE DEFROST WITH PRESSURE-TEMPERATURE SUPERHEAT CONTROL

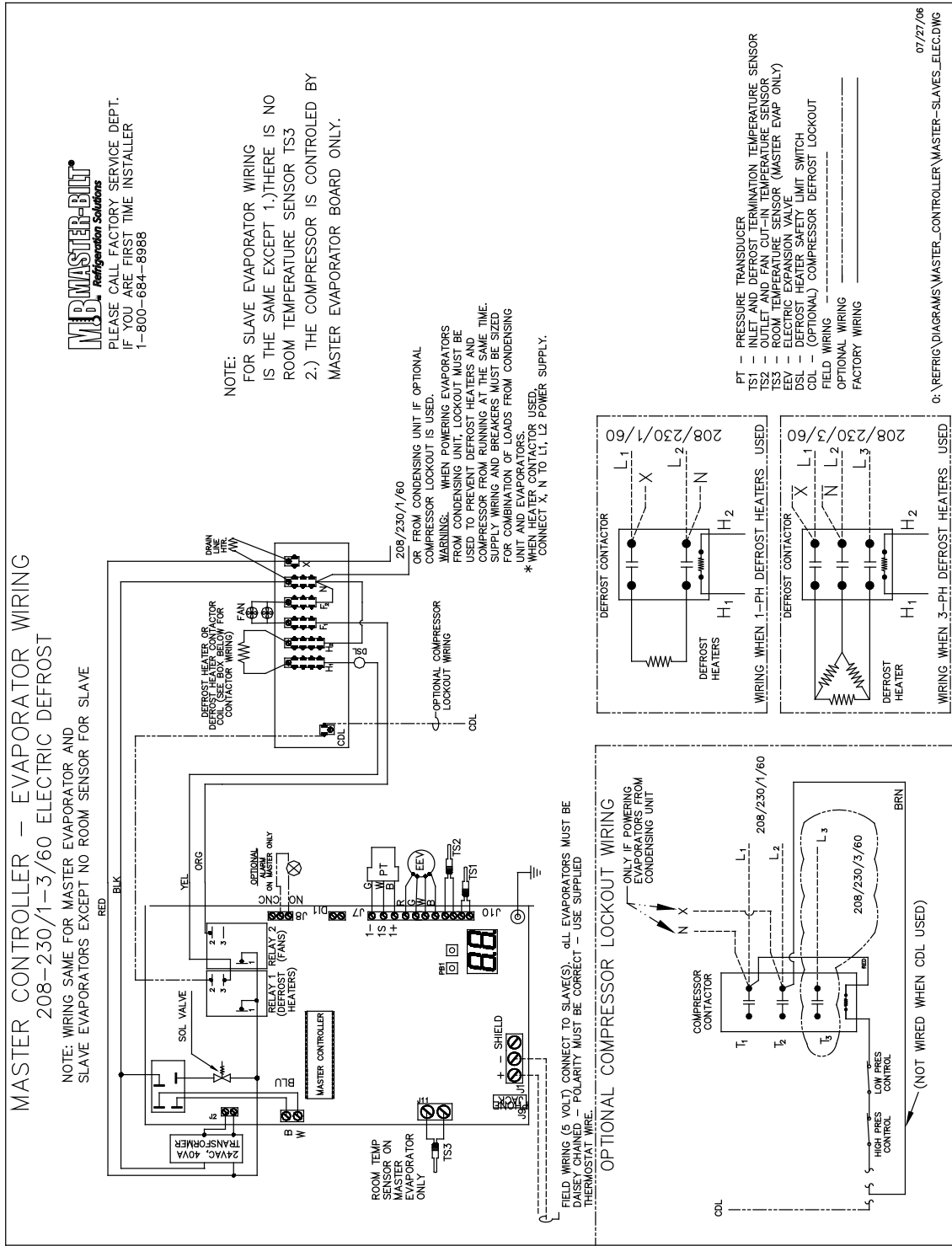
NOTE:
FOR SLAVE EVAPORATOR WIRING
IS THE SAME EXCEPT 1.) THERE IS NO
ROOM TEMPERATURE SENSOR TS3
2.) THE COMPRESSOR IS CONTROLLED BY
MASTER EVAPORATOR BOARD ONLY.

MD MASTER-BILT
Refrigeration Solutions

PLEASE CALL FACTORY SERVICE DEPT.
IF YOU ARE FIRST TIME INSTALLER
1-800-684-8988



0:\REFRIG\DIAGRAMS\MASTER_CONTROLLER\MASTER-SLAVES-RVCL_06-12-06-PT.DWG

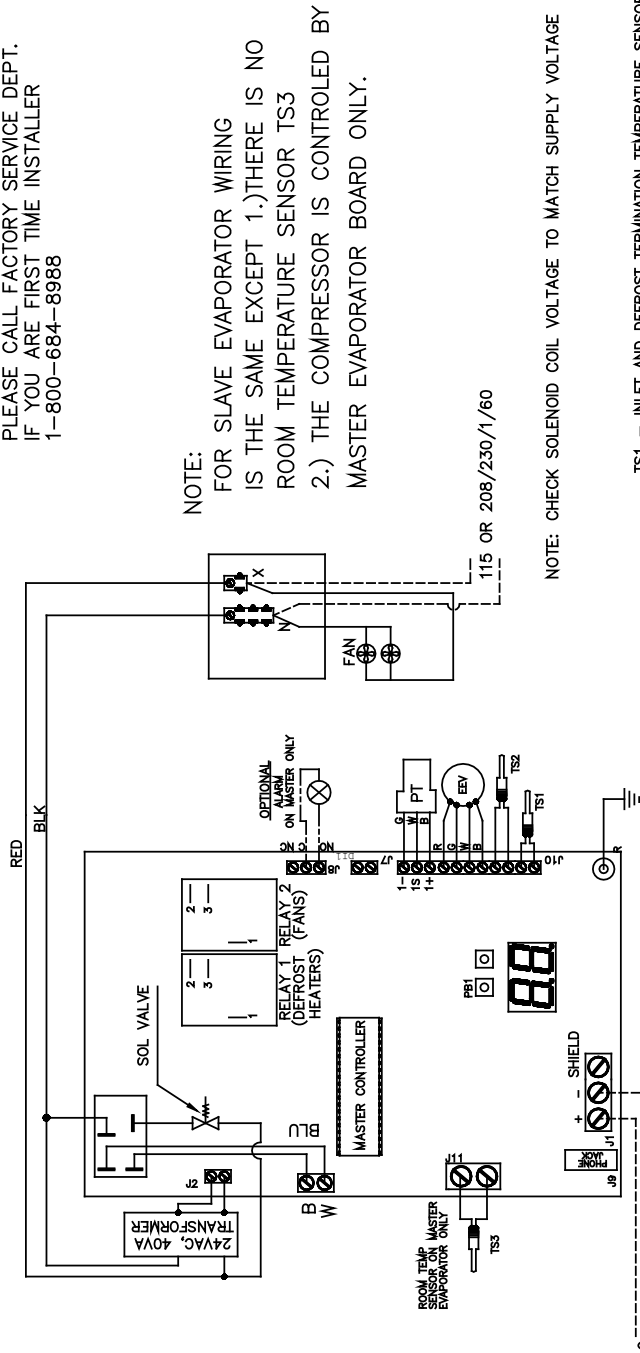


MASTER CONTROLLER – EVAPORATOR WIRING 115 OR 208-230/1-3/60 AIR DEFROST

NOTE: WIRING SAME FOR MASTER EVAPORATOR AND
SLAVE EVAPORATORS EXCEPT NO ROOM SENSOR FOR SLAVES



PLEASE CALL FACTORY SERVICE DEPT.
IF YOU ARE FIRST TIME INSTALLER
1-800-684-8988



NOTE:
FOR SLAVE EVAPORATOR WIRING
IS THE SAME EXCEPT 1.) THERE IS NO
ROOM TEMPERATURE SENSOR TS3
2.) THE COMPRESSOR IS CONTROLLED BY
MASTER EVAPORATOR BOARD ONLY.

NOTE: CHECK SOLENOID COIL VOLTAGE TO MATCH SUPPLY VOLTAGE

TS1 – INLET AND DEFROST TERMINATION TEMPERATURE SENSOR
TS2 – OUTLET AND FAN CUT-IN TEMPERATURE SENSOR
TS3 – ROOM TEMPERATURE SENSOR (MASTER EVAP ONLY)
EV – ELECTRIC EXPANSION VALVE
PT – PRESSURE TRANSDUCER

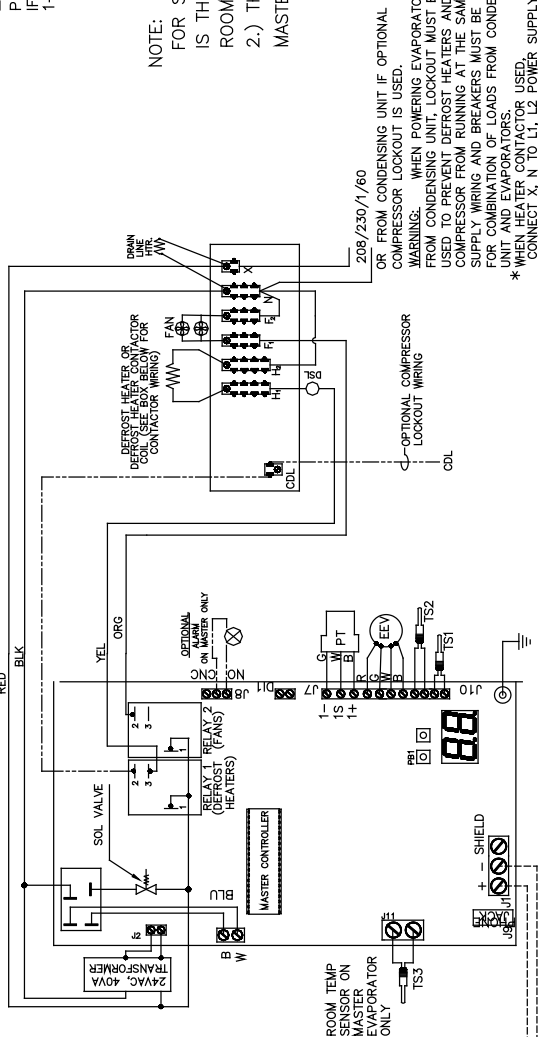
FIELD WIRING -----
OPTIONAL WIRING -----
FACTORY WIRING -----
NOTE: FOR MASTER CONTROLLER AIR DEFROST

NOTE: WIRING SAME FOR MASTER EVAPORATOR AND
SLAVE EVAPORATORS EXCEPT NO ROOM SENSOR FOR SLAVE

NOTE: WIRING SAME FOR MASTER EVAPORATOR AND SLAVE EVAPORATORS EXCEPT NO ROOM SENSOR FOR

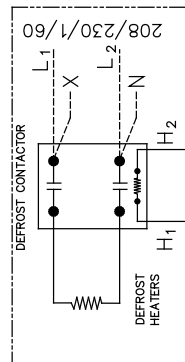
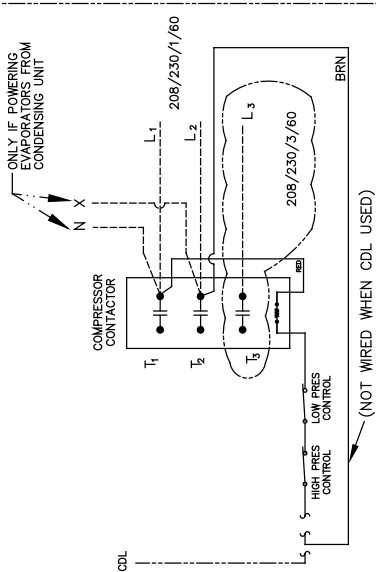


NOTE:
FOR SLAVE EVAPORATOR WIRING
IS THE SAME EXCEPT 1.)THERE IS NO
ROOM TEMPERATURE SENSOR TS3
2.) THE COMPRESSOR IS CONTROLLED BY
MASTER EVAPORATOR BOARD ONLY.

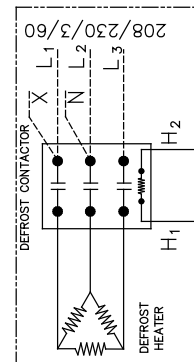


FIELD WIRING (5 VOLT) CONNECT TO SLAVE(S). ALL EVAPORATORS MUST BE DAISEY CHAINED – POLARITY MUST BE CORRECT – USE SUPPLIED THERMOSTAT WIRE.

OPTIONAL COMPRESSOR LOCKOUT WIRING



WIRING WHEN 1-PH DEFROST HEATERS USED



WIRING WHEN 3-PH DEFROST HEATERS USED

PT	—	PRESSURE TRANSDUCER
INLE	—	INLET AIR TEMPERATURE SENSOR
INLE	—	INLET FAN AIR TEMPERATURE SENSOR
TS2	—	ROOM TEMPERATURE SENSOR (MASTER EWP ONLY)
TS3	—	ELECTRIC EXPANSION VALVE
DESL	—	DEFROST HEATER SAFETY LIMIT SWITCH
CDL	—	(OPTIONAL) COMPRESSOR DEFROST LOCKOUT
FIELD	—	FIELD WIRING
OPTIONAL	—	OPTIONAL WIRING
FACTORY	—	FACTORY WIRING

07/27/06

MASTER-BILT MRS/MRSW START-UP DATA

Project Name: _____

Requested by:_____

Project Location: _____

Requested by: _____

Expected Installation time: Year_____

Quarter (1,2,3,or 4) _____

Installing Company: _____

Installer Signature: _____

[illegible]

NOTES:

PREVENTATIVE MAINTENANCE

RECOMMENDED PREVENTATIVE MAINTENANCE FOR WALK-INS & REFRIGERATION SYSTEMS

This preventative maintenance is recommended to be executed on a quarterly schedule by a certified technician from an Authorized Service Provider.

Walk-In Coolers & Freezers:

- Check door alignment, door closer and hinges.
- Check door gasket for any tears or damage.
- Check and adjust door sweep.
- Inspect heated vent ports for proper operations.
- Check lighting is in working order.
- Inspect door control, alarm and/or thermometer.

Refrigeration Systems:

- Cycle unit and check operations of refrigeration and defrost modes.
- Clean and inspect evaporator and condenser coils.
- Inspect and secure all electrical connections.
- Check relays and contactors for wear or pitting.
- Check start components.
- Inspect and clean motors, especially around rear air vents.
- Inspect fan blades, shafts, and bearings.
- Check and tighten any flair, quick connect, and roto lock fittings.
- Ensure sight glass is clear.
- Blow out and flush condensate drains/lines.
- Ensure drain pans are free of debris.
- Inspect drier for restrictions by ensuring there is no temperature drop across it.
- Ensure all covers and panels are securely fastened when completed.

**Parts and Technical Service Department
Master-Bilt Products
908 Highway 15 North
New Albany, MS 38652
Phone: 800-684-8988
Email: service@refsg.com**