O&I MAC-7V
April 94
Part # 25000501

READ CAREFULLY

BEFORE STARTING

INSTALLATION INSTRUCTIONS

FOR

MAC-7V Refrigeration System Dual Compressor Condensing Unit
MCQ1301 — Low Temperature Walk-In Freezer
MCM1021 — Medium Temperature Walk-In Cooler
R22 — Environmentally Safe

Bohn Refrigeration Products
Heatcraft Inc. Refrigeration Products Division
Danville, Illinois 61832 • (217) 446-3710
FAX: (217) 446-2484

INSPECTION

During or immediately after delivery, check all items carefully for possible shipping damage. All damage to or loss of items while in transit is the responsibility of the carriers.

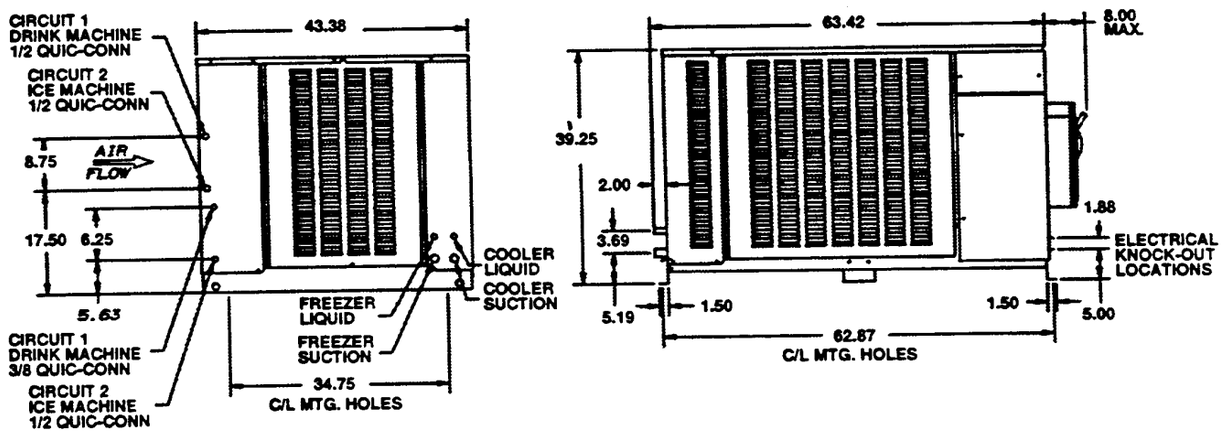
Necessary claims for the reimbursement of such damages or loss should be filed promptly in every case. Any visual damage or loss should be noted on the delivery receipt, and inspection by the delivering carrier should be requested.

In the event that concealed damage is found, a claim should be immediately placed with the delivering carrier. An inspector should be summoned to examine the products so that it can be determined exactly how damage occurred. The product should not be removed from the crate or the position where the concealed damage has become apparent without the permission of the inspector.

All products damaged while in transit, whether it was concealed or otherwise, will not be repaired by BOHN except on the placing of a bona fide repair order by the Kitchen Equipment Supplier. At no time shall such products be considered the property of BOHN.

Report the loss and/or damage and the action that you have taken to the Kitchen Equipment Supplier.

CONDENSING UNIT SPECIFICATIONS



MODEL*	LOC.	COMPR.	REF	VOLTS	NO FANS	PH	UNIT KW	UNITS AMPS	UNIT MCA
MAC7V	Freezer	LAHA-0310	R22	208/230	2	3	4.5	24.5	27
	Cooler	CRA1-0150							

Net Weight All Models Approx. 825 Lbs.

* All condensing units have two equal remote citcuits with quick connect fittings.

EVAPORATORS:

The SME and SM units blow air through the coil and draw through the fans. For best operation, the units should be mounted in the center of the room with the air blowing toward the door.

Make sure the units are flush mounted to the ceiling to insure proper drainage for defrost water. Refer to Figure 1 for proper location of evaporators.

ELECTRICAL WIRING

All Wiring must be done in accordance with National Electrical Codes and all applicable lacal codes. All wring runs to terminal boards on electrical panel inside evaporator. See wiring diagram on page 6 for further details

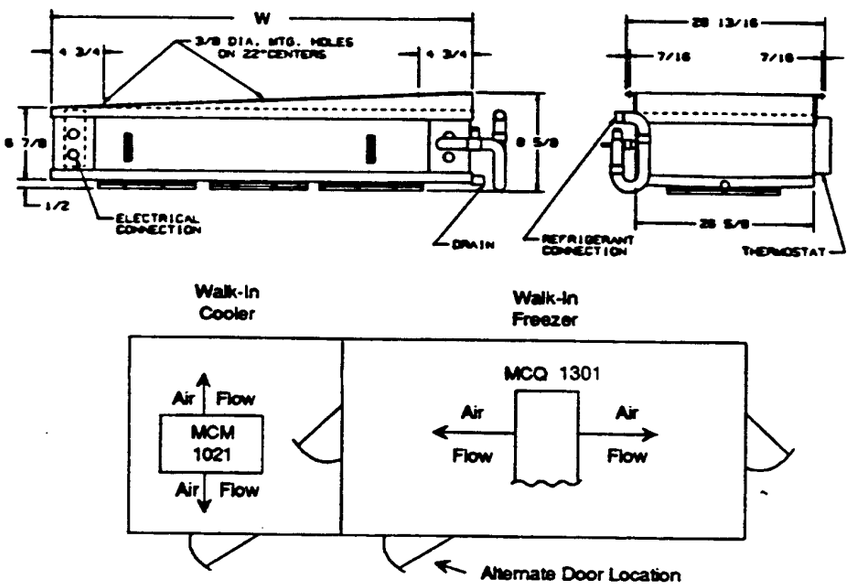
EVAPORATORS SPECIFICATIONS

Model	Description	Performance @ 95°F. Amb.				Electrical					Approx. Shipping			
		Comp. Match	Ref.	Room Temp.°F.	BTUH	Volts	Hz	Ph	Amps		Weight		Volume	
									Motor	Htrs.	Lbs.	Kg	Ft^3	M^3
MCQ1301	Freezer Coil	3 H.P.	R-22	0	13000	208-230	60	1	1.4	15.7	155	70	20	.56
MCM1021	Cooler Coil	$1^1/_2$ H.P.	R-22	+35	10200	208-230	60	1	0.9	–	104	47	14	.40

Model	Connections (In.)			Dimensions (In.)	No. of
	Suction	Inlet	Drain	W	Fans
MCQ1301	7/8 IDS	1/2 ODS	3/4 FPT	75-1/2	3
MCM1021	7/8 ODS	1/2 ODS	3/4 FPT	53-1/2	2

Includes: Bohnmizer valve and bulb tee factory pre-piped liquid line solenoid room thermostat.

FIGURE 1



REFRIGERANT PIPING

Remote refrigeration will be installed to satisfy all local and national codes in accordance with good practice and common sense for proper performance.

Copper tubing must be refrigeration grade, ACR or in accordance with local codes. If soft copper is used, sufficient pipe hanger hand straps, etc., should be installed to produce a neat clean installation. No precharge lines should be used for walk-in coolers or freezers.

Refrigeration line must be sized (See Table 1) to avoid excessive pressure drop. All horizontal suction lines must be sloped toward the compressor at the rate of one (1) inch to every ten (10) feet for good oil return.

All vertical risers of more than five (5) feet must be trapped at the bottom. Some installations will require multiple risers of P-Traps, place one for every twenty (20) foot rise.

All suction lines must be insulated with 3/4" thickness of Armaflex insulation or equal.

All liquid lines must be insulated with 3/8" thickness of Armaflex insulation or equal.

Support piping with hangers to prevent transmission of vibration to the building.

Refrigeration line sizes are expressed in "equivalent" terms; that is, the line size takes into account bends, turns and some rises; all figures below are O.D.; the maximum line run should not exceed 200 feet.

Recommended Line Size in Equivalent Lengths

Table 1

System Model No.	Max.	Max. Suction Horizontal Line						Liquid Line				
MAC-7V	Riser*	25'	50'	75'	100'	150'	200'	25'	50'	100'	150'	200'
3 H.P.-MCQ1301 (LAHA-0310)	1 1/8	7/8	7/8	7/8	1 1/8	Consult Factory		3/8	3/8	3/8	Consult Factory	
1-1/2 H.P.-MCM1021 (CRA1-0150)	7/8	5/8	5/8	7/8	7/8			3/8	3/8	3/8		

NOTE: The riser size indicated is the maximum size. However, the riser size should never be larger than any adjacent horizontial line.

DRAIN LINE & HEATERS

Installation of Drain Line:

1. Drain line must be copper — no plastics are to be used.
2. Drain line must be pitched one (1) inch per each twelve (12) inches downward, and must exit from the cooler or freezer room as quickly as possible.
3. **Drain lines on coolers and freezers must be trapped, and the trap must be outside of the walk-in.**
4. Wrap drain line heater on entire drain line inside the freezer and then extend that heater tape through the freezer wall up to and including the trap. (Coolers do not require heater tapes on drain line.)
5. Use two (2) feet of heater tape per one (1) foot of drain line. However, do not overlap.
6. 1-1/8" I.D. x 3/4" wall Armaflex-type insulation on entire length of drain line inside the cooler and freezer.

REMOTE PRECHARGED CIRCUITS

The remote precharged circuits are provided with a factory holding charge only. The system charge is located in the appropriate soda(s) and ice machines. Schrader valve fittings are provided for liquid line charging at the condensing unit. See Precharged Line Connection Procedure on Page 6 for proper installation of remote liquid and suction precharged lines (not supplied by BOHN).

PRECHARGED LINE CONNECTION PROCEDURE

STEP 1:
Remove valve port cap. (Check valve for pressure on remote condenser circuits and each precharged line. Do not connect up to any circuit or line that is not pressurized until leak is repaired.)

STEP 2:
Connect solid end lines with valve ports to **Condenser Only.**

Flexible ends with 90° bends are to be installed at ice machine.

STEP 3:
Remove dust caps and plugs and lubricate the threads with refrigeration oil.

STEP 4:
Carefully thread, by hand, the female hose fitting to the male fitting on the remote **Condenser Only**. Using the proper size wrench, tighten the couplings until you feel them bottom out (usually less than one thread showing). Then add an additional 1/4 turn to insure proper seal, if a torque wrench is used, follow these torque values. For 1/4" to 3/8" fittings with 5/8 - 18 thread size, the torque value is 10-12 ft. lbs. For 1/2" fittings with 1-1/16" - 12 thread size, the value is 35-45 ft. lbs.

STEP 5:
Leak test connection joints. If connections are leak-free, connect up the precharged line to the appropriate machine using procedure indicated in Steps 2 and 3.

NOTE:
Once the refrigerant lines are connected, the seal is broken in the fittings and if removed from the soda factory, cuber or remote condenser, the refrigerant charge will be depleted.

BRAZING PROCEDURE

Solder must be silver bearing solder high temperature of equivalent alloy suitable for this application such as Stay-Brite, Stay-silv or Silfos. No "soft solders" permissible. To avoid oxidation of the inside surface of the copper tube and fitting, dry nitrogen must be swept through the tubing when using high temperature solder while the joints are being soldered. All flux must be removed from the joints after brazing.

LEAK TESTING & EVACUATION

LEAK TESTING:
When all refrigeration connections have been completed, the entire system must be tested for leaks. With all valves in the system open the system must be pressurized to 175 PSIG (if local codes require higher test pressure, such codes must be complied with). Sufficient liquid refrigerant shall be charged into the system to raise the pressure to 35 PSIG, and dry nitrogen added to obtain the desired test pressure. Leak testing shall be performed with an electronic leak detector. If any leaks are found, isolate the defective area, recover the gas, repair the leaks, and then repeat the test. When testing has been completed, recover/recycle the refrigerant to prevent adverse effects of refrigerant on our environment.*

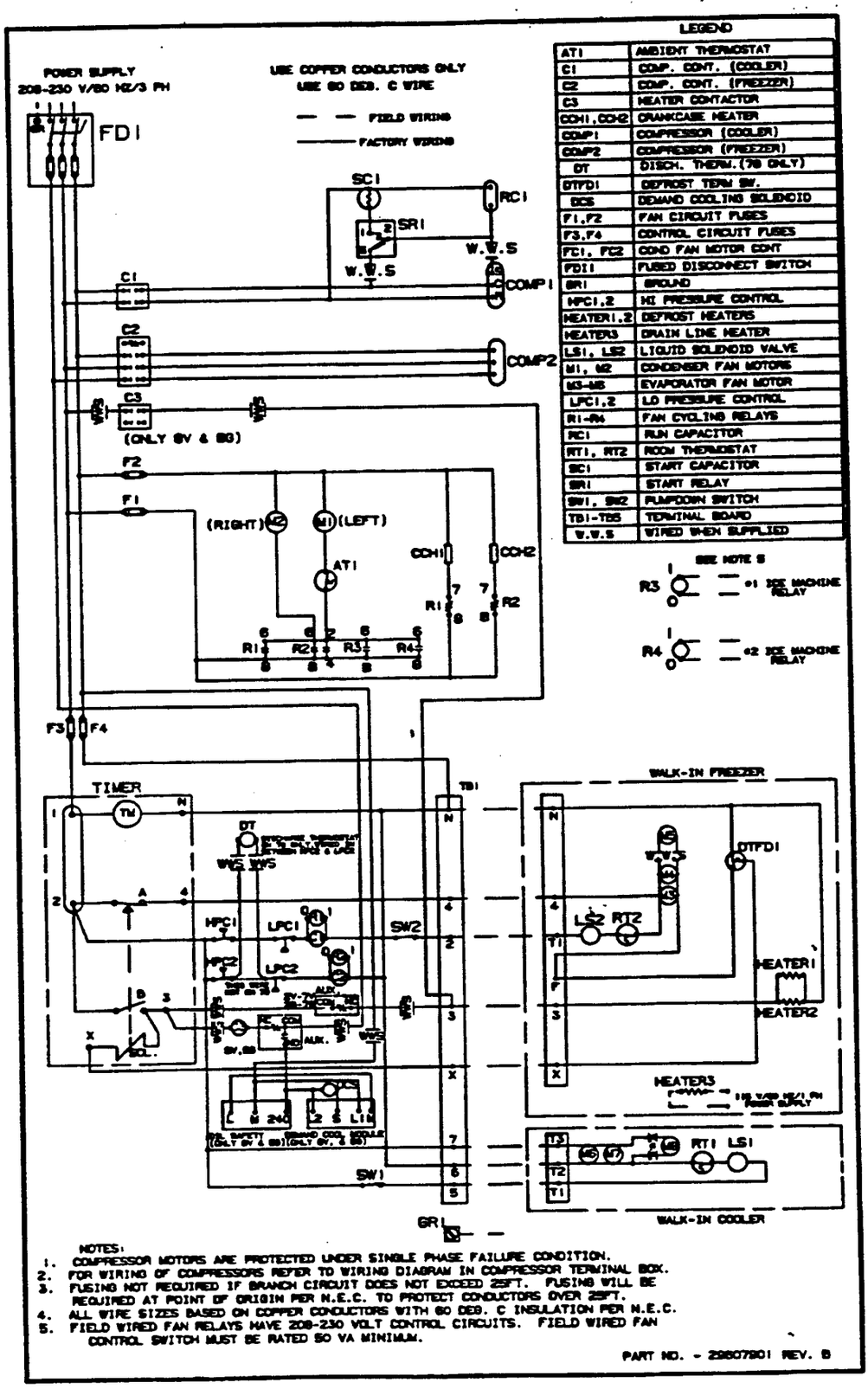
EVACUATION:
The system shall be evacuated with a vacuum pump specifically manufactured for vacuum duty, having a capability of pulling a vacuum of 50 microns or less. The pump should be connected to both the low and high pressure sides of the system with copper tube or high vacuum hoses. (1/4" I.D. minimum). A high vacuum gauge capable of registering pressure in microns should be attached to the system for pressure readings. To check system pressure a hand valve must be provided between the pressure gauge and the vacuum pump which can be closed to isolate the system and check the pressure.

Evacuate the system to an absolute pressure not exceeding 250 microns. Leave the vacuum pump running for not less than two (2) hours without interruption.

Do not use the compressor to evacuate the system. **Do not** start the compressor while it is in a vacuum.

*Protecting our environment from the impact of free refrigerants is a critical issue. We must all work together to do everything in our power to secure the quality of life for future generations. This is a Bohn commitment.

WIRING DIAGRAM



NOTES:
1. COMPRESSOR MOTORS ARE PROTECTED UNDER SINGLE PHASE FAILURE CONDITION.
2. FOR WIRING OF COMPRESSORS REFER TO WIRING DIAGRAM IN COMPRESSOR TERMINAL BOX.
3. FUSING NOT REQUIRED IF BRANCH CIRCUIT DOES NOT EXCEED 25FT. FUSING WILL BE REQUIRED AT POINT OF ORIGIN PER N.E.C. TO PROTECT CONDUCTORS OVER 25FT.
4. ALL WIRE SIZES BASED ON COPPER CONDUCTORS WITH 60 DEG. C INSULATION PER N.E.C.
5. FIELD WIRED FAN RELAYS HAVE 208-230 VOLT CONTROL CIRCUITS. FIELD WIRED FAN CONTROL SWITCH MUST BE RATED 50 VA MINIMUM.

PART NO. - 29907901 REV. B

BOHNMIZER® VALVE

INSTALLATION INSTRUCTIONS

The **BOHNMIZER** thermostatic expansion valve should be mounted in the normal position at the inlet to the unit cooler. Mount the valve outlet directly to the distributor for proper functioning. It is not required that the expansion valve be disassembled for sweating to the distributor. Direct the torch flame away from the valve body and use wet rags to keep the power element cool. Solder must be silver bearing, high temperature 1000°F. or better, for sweat connections. Exercise care to prevent solder from entering the valve body.

A thermal bulb well tee is supplied with each Bohnmizer valve and must be installed at the suction line connection of the evaporator. It consists of a well tee assembly, a neoprene ferrule, and a nut. Sweat the well tee assembly to the suction line with the opening for the thermal bulb in an upright position to 45° from upright. See Figure 1. **Do not** install bulb, ferrule, or nut until the thermal bulb well has been sweated in place.

Place ferrule and nut on thermal bulb and insert into bulb well. Leave the bulb exposed above the nut the distance specified in Table 1. Tighten the nut as tight as possible by hand, then tighten an additional 1 - 1-1/2 turns with a wrench. For leak testing purposes, 250 PSIG may be applied. Seal around the nut with refrigeration oil to prevent moisture from freezing and crushing the thermal bulb.

An external equalizer line must be used on all Bohnmizer valves.

IMPORTANT

The Bohnmizer valve can be used over a wide tonnage range. As such, it cannot be factory adjusted for superheat. The Bohnmizer valve must be set for superheat at the final design room temperature.

How To Determine Superheat

1. Using a thermocouple or thermometer, measure the temperature of the suction line at the thermal bulb well in the 3 o'clock position. Be sure to insulate the temperature measuring device.
2. Measure the pressure in the suction line at the thermal bulb well or external equalizer line at the Bohnmizer valve.
3. Convert the measured suction pressure to the equivalent saturated temperature using a pressure-temperature chart.
4. Subtract the temperature obtained in Step 3 from the temperature measured at the thermal bulb well. The difference is the superheat.

The Bohnmizer valve should be set for superheats in the 5° to 10° F. range. The superheat adjusting stem should be turned in, or clockwise, to decrease flow and increase superheat. To increase flow and decrease superheat, turn the stem out or counterclockwise.

The valve is designed to meter a sufficient quantity of refrigerant under conditions of either high or low liquid inlet pressures. As the liquid line may frost in cold ambient temperatures, it should be insulated inside the refrigerated space.

REPLACEMENT

The internal parts are of lifetime stainless steel construction and should never need replacement. Most expansion valve problems are caused by the presence of moisture, dirt, or sludge in the system. The internal parts may be removed for cleaning.

The following power elements are available through your wholesaler:

VALVE MODEL	POWER ELEMENT	VALVE MODEL	POWER ELEMENT
YM1	83-FC	WM1, VM1	33-FCP60
YL1	83-FZP	WL1, VL1	33-FZP
YH2	83-VCP100	WH2, VH2	33-VCP100
YM2	83-VC	WM2, VM2	33-VC
YL2	83-VZP	WL2, VL2	33-VZP
YL5	83-RZP	WL5, VL5	33-RZP
YM5	83-RC	WM5, VM5	33-RC

NOTE: If Bohn part numbers are required, refer to Replacement Parts Bulletin (RPB-6).

FIGURE 1

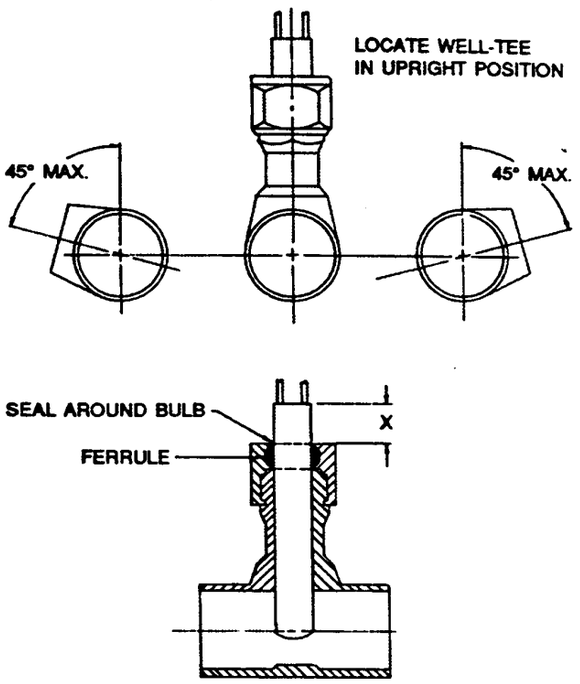
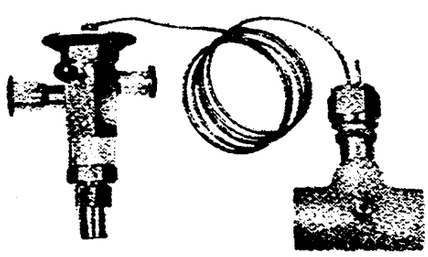


TABLE 1

BOHNMIZER VALVE MODELS	DISTANCE "X" WELL TEE I.D.					
	7/8"	1-1/8"	1-3/8"	1-5/8"	2-1/8"	2-5/8"
Y	1-1/4	3/4	1/4	N.A.	N.A.	N.A.
W	N.A.	3/4	1/4	0	0	0
V	N.A.	3/4	1/4	0	0	0

N.A. — Tee Not Available

FIGURE 2



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CHARGING THE BOHNMIZER® SYSTEM

Assuming the sealed system has been thoroughly checked for leaks and evacuated prior to this point, proceed as follows:

1. With the compressor off, add liquid refrigerant to the system through the liquid line shut-off valve until the pressure in the system is equal to the pressure in the refrigerant cylinder.
2. Start the compressor. If any condenser fans are off due to low outdoor temperatures, install a jumper wire around fan cycling thermostat(s) to force all fans to run.

   Bohnmizer condensing units are designed to operate with the following condenser T.D.'s:

   15° T.D. - Low Temp. Units (–10° to –25° SST)

   20° T.D. - Med Temp. Units (+10° to +25° SST)

   30° T.D. - High Temp. Units (+30° to +40° SST)

   Due to the possibility of air recirculation through the condenser coil and higher than normal load conditions on the system during initial temperature pulldown, it is recommended to add approximately 5° to the rated condenser T.D. to compensate for the additional load on the condenser. As an example, when charging a low temperature R-502 system with an outdoor temperature of 30°, sufficient refrigerant vapor must be charged through the suction connection to obtain a condensing temperature of 50° (97.4# discharge pressure).

Outdoor Temperature	+30°
Design T.D. (Low Temp.)	+15°
High Load Factor	+ 5°
Condensing Temperature	+50°

   This same method would apply regardless of outdoor temperature or operating suction temperature. The additional 5° high load factor may also be used whenever re-charging an existing Bohnmizer system to account for condenser fouling due to dust and debris accumulation.
3. Complete charging by adding refrigerant vapor through the suction connection until correct condensing temperature is obtained as outlined in Step 2 above.
4. Once the desired operating head pressure has been obtained, discontinue refrigerant charging and allow the system to balance out.
5. Check the liquid line sight glass. If the glas is clear, remove the jumper wire from around the fan cycling thermostat(s) **NOTE:** During normal operation bubbles may occasionally appear in the sight glass as the Bohnmizer valve modulates open. This is not necessarily an indication of an undercharged condition.
6. Make a preliminary check of the suction line superheat at the compressor to ensure a refrigerant floodback condition does not exist. A minimum of 20° superheat should be measured entering the compressor suction service valve. If superheat is less than 20° at this point, decrease refrigerant flow to the evaporator coil by turning the Bohnmizer valve adjusting stem in (clockwise).

   NOTE: Because of its internal design characteristics and sensing bulb being placed directly into the refrigerant stream, the Bohnmizer valve is more sensitive than conventional expansion valves. Therefore, always use caution and proceed slowly when adjusting the valve to eliminate overshoot. It is recommended that no more than one (1) full turn of the valve stem be made at one time while the system is operating, allowing a sufficient amount of time between valve adjustments to let the system settle out. Always re-check the superheat after making a valve adjustment.
7. To accurately measure superheat at the evaporator outlet, attach a suction service gauge to the Schraeder fitting located on the side of the Bohnmizer tee and locate a thermocouple lead or thermometer probe on the side of the tee at the three o'clock position, being sure to adequately insulate the temperature probe.

   Also at this time, we recommend taking a temperature profile of the evaporator to confirm uniform refrigerant distribution to all coil circuits. Generally, a reasonably accurate representation of the coil temperature can be obtained by measuring the temperature at two (2) additional locations on the suction header, one near the top and at a point near the middle of the header as well as the temperature measured at the Bohnmizer tee. Normally, with the properly sized distributor nozzle installed in the coil (see RPB-12D, Replacement Parts — Distributor Nozzles for recommended nozzle selection) temperatures measured at these three (3) points should all be within two (2) to three (3) degrees of each other. If these temperatures vary widely from top to bottom, particularly with the lower portion of the coil being colder than the top, it could be an indication of poor refrigerant distribution. If necessary, to further pinpoint the flooding or starving circuits, an even more accurate temperature profile may be made by measuring the temperature of each header lead where they join the coil tubes.

   Some possible reasons for poor refrigerant distribution may be:

   — Incorrectly sized or missing distributor nozzle
   — Excessive frost or ice accumulation on coil
   — Insufficient air flow across portions of coil
   — Distributor leads plugged
   — Coil circuits plugged
   — Flash gas at expansion valve
8. The Bohnmizer expansion valve may be applied over a wide range of system capacities making it impractical for the valve superheat adjustment to be factory set. Therefore every Bohnmizer valve must be set on the jobsite. On new, multiple evaporator installations, it may be practical to establish a common starting point from which to adjust the valves by initially closing all valves (turn adjusting stem in, clockwise) until positive stop is reached on "W" or "V" series valves or until ratcheting (click) is heard on "Y" series valves. From this point, open the valves four (4) full turns (turn adjusting stem out, counterclockwise). This preliminary adjustment should allow enough refrigerant to flow into the evaporator coil(s) to ensure adequate gas velocity for oil return while still maintaining sufficient superheat to prevent liquid floodback to the compressor.
9. As the box temperature drops, continue to monitor the suction superheat, adjusting the Bohnmizer valve as required. During the pulldown process, your initial concern should be in maintaining an adequate superheat at the compressor (minimum 20°) and continued oil return. Once the design room temperature has been reached, the valve should be adjusted as outlined on page 1. An 8° to 10° superheat at the evaporator outlet is recommended.
10. Remove all service and testing equipment from the system being careful to replace all valve caps, panels and fasteners prior to leaving the jobsite.

CHARGING & START-UP

1. Remove the wooden shipping blocks under the compressor by removing the four (4) hold down nuts. Place the rubber grommets on top of each compressor foot and re-install the four (4) nuts. Be sure the compressor floats freely on the springs.
2. **Check all electrical and mechanical connections for looseness due to shipment and tighten any loose connections.**
3. Set the high-low pressure control as follows:

HIGH PRESSURE CONTROL SETTINGS	
R-22	
Cut In	Cut Out
275	350

LOW PRESSURE CONTROL SETTINGS	
R-22	
Cut In	Cut Out
10	0

4. Make sure that all valves in the system are open.
5. Connect the suction gauge to the suction fitting on the compressor and the high side gauge to the liquid line shut-off valve.
6. See page 8 for charging instructions.

TOTAL SYSTEM CHARGE

System Model No.: MAC-7V	Refrig.	Liquid Line Size	Length of Liquid Line (Lbs.)					
			25'	50'	75'	100'	150'	200'
3 HP — MCQ1301	R-22	3/8"	8.8	9.8	10.8	11.7	Consult Factory	
1-1/2 HP — MCM1021	R-22	3/8"	4.8	5.8	6.8	7.7		

BOHNMIZER VALVE SUPERHEAT ADJUSTMENT

After the room temperature is reached, the Bohnmizer Valve may require a slight final adjustment from factory setting to obtain the most desirable superheat. The following procedure shows how to determine superheat and adjust the Bohnmizer Valve.

1. Using a thermocouple or thermometer, measure the temperature of the suction line at the thermal bulb well tee by locating the sensing element on the side of the horizontal line. Be sure to insulate the temperature measuring device so that the surrounding air will not affect the temperature reading.
2. Measure the pressure in the suction line by connecting a pressure gauge to the pressure fitting on the side of the thermal bulb well tee.
3. Convert the pressure obtained in Step 2 above to the equivalent saturated suction temperature by using a pressure-temperature chart.
4. Subtract the temperature obtained in Step 3 from the temperature measured in Step 2. The difference is the superheat.

Example:

Step 1: Suction line temperature = -10°F.
Step 2: Suction pressure = 10 PSIG (R-22)
Step 3: Suction pressure converted to temperature 10 PSIG (R-22) = -20°F.
Step 4: Superheat = -10°F. — (-20°F.) = 10°F.

The Bohnmizer Valve should be set with a minimum superheat of 5°F. and a maximum superheat of 10°F.

To reduce the superheat and increase refrigerant flow turn the valve adjusting stem out or counter-clockwise. To increase the superheat and reduce refrigerant flow turn the valve adjusting stem in or clockwise. When adjusting the Bohnmizer Valve make no more than 1/4 of a turn of the adjusting stem at a time and observe the change in superheat closely to prevent overshooting the desired setting. As much as 30 minutes may be required for the new balance to take place after an adjustment is made.

INSTALLING CONTRACTORS RESPONSIBILITIES

It is the refrigeration installer's responsibility to check and adjust the following mechanical devices:

1. **Thermostat**

   The thermostat which is located on the evaporator panel, is to be adjusted as necessary to get the proper temperatures. The scale on the thermostat is for reference only as a thermometer is to be used for checking temperature. Freezers normally operate at 0°F. to -10°F. the cooler 35°F. to 38°F. temperature range.

2. **Timer**

   Set time clock to correct time of day by turning dial knob in direction of arrow until correct time on outer twenty-four (24) hour dial is in line with "time" pointer. Set the termination (fail-safe) by pushing down and rotating pointer on inner two (2) hour dial until it is opposite desired time. Recommended fail-safe is fifty (50) minutes. If less than fifty (50) minutes is used, the defrost time might be inadequate and the coil might ice up.

   The manufacturer has supplied four (4) defrost starter pins. Screw pins in outer dial at the time of day system is to defrost. The defrost cycle should take place when the walk-in freezer door is not constantly open and closed to remove product (Example: Midnight, 6:00 a.m., Noon and 6:00 p.m.).

3. **Superheat**

   After the room temperature is reached, the Bohnmizer Valve may require final adjustment to obtain desired superheat. See Page 9 for details.

4. **Crankcase Heater**

   This unit has been supplied with a crankcase heater on the compressor. If the power to the system has been shut off for more than one (1) hour, the crankcase heater must be energized for twenty-four (24) hours before starting the system.

5. **Receiver**

   The receivers have been sized to accommodate the refrigerant charge from 200 feet of liquid line for service purposes. If the liquid line will be more than 200 feet long, contact the factory.

6. **Compressor Oil Level**

   Check the compressor oil level. The oil level should be 1/2 the way up on the sight glass. If the oil level is low, add Suniso 3G refrigeration oil only to the compressor. Do not overfill.

Responsibility toward other contractors is a part of a proper installation. Electricians must sometimes be helped by the refrigeration contractor in interpreting wiring diagrams, and they are to receive assistance if called for. It is always a good idea to check their work, and to advise them regarding proper wiring of controls.

OPERATION CHECKOUT

1. With the system operating check the supply voltage. It must be within ± 10% of the voltage marked on the unit nameplate.
2. Check the compressor amp draw. It must not exceed the value listed on unit spec. plate. Be sure the phase unbalance does not exceed 2%.
3. Check the liquid line sight glass for a clear sight glass. If the sight glass is bubbling check the system for leaks and add refrigerant.
4. Check the crankcase heater to see that it is operating.
5. Check the dual pressure control setting.

Pressure Settings	R-22
High Pressure Cut Out	350 PSIG
Low Pressure Cut Out	0 PSIG
Low Pressure Cut In	10 PSIG

6. **After several hours operation, check the compressor oil level.** The oil level should be 1/2 the way up the sight glass when the system is running. If the oil level is low, add Suniso 3G oil to the compressor. If the oil level is above 1/2 sight glass after the system has operated for awhile, the excess oil should be removed.
7. After the room has reached its final temperature, the Bohnmizer Valve may require a slight final superheat adjustment. Use the procedure that is outlined on Page 9.

   NOTE: Maximum return gas to the compressor should not exceed 65°F. Higher temperatures may result in severe compressor damage!

8. Check the defrost timer to see that it is set for the correct time of day and the starting pins are set at 6 hour intervals. **Fail safe should be set at 50 minutes.**
9. Check the room thermostat setting. Be sure that it is not lower than -10°F. on freezer coil and +35°F. for walk-in cooler.
10. After the coil has become frosted, manually advance the defrost timer to initiate a defrost. Observe the defrost cycle to see if all controls are functioning properly and that the coil is clear of all frost before returning to refrigeration. Check the drain pan heater and drain line heater to be sure they are operating. Reset the defrost timer to the correct time of day.
11. After the room has reached temperature and the liquid line solenoid has closed, check the compressor to see if it has pumped down and shut off. If the compressor continues to run, check the low pressure control setting as outlined in Step 6.
12. Check the system head pressure. The head pressure may be lower than experienced with other system because of the Bohnmizer Valve.

COMPRESSOR REPLACEMENT

If the motor compressor should fail and it becomes necessary to replace the compressor, the following steps should be followed:

A. Standard One Year Warranty

1. Contact the local Copeland wholesaler.
2. Provide the Copeland wholesaler with the model and serial number of the Bohn condensing unit, the model and serial number of the defective Copeland compressor, the date of installation and the date of failure. Be sure to retain for your own records the model and serial number of the Copeland compressor being returned and the date of return.
3. When the Copeland wholesaler supplies the replacement compressor, he will issue an invoice at the "Exchange Price." The Copeland factory will make the final decision as to warranty liability.
4. It will usually take four (4) to six (6) weeks before the Copeland wholesaler receives an answer from Copeland, who will advise one of the following:
    a. This is an in-warranty failure.
    b. This an out-of-warranty failure.
    c. This warranty void due to misuse.
5. Upon receipt of the report the Copeland wholesaler will issue credit in the case of disposition "A." In the case of disposition "B," the procedure for extended four (4) year warranty listed below should be followed. In the case of disposition "C" no credit will be issued as the warranty does not apply.

B. Extended Four (4) Year Warranty

After the first years warranty, the compressor will be covered by the Bohn extended four (4) year warranty if it was purchased at the time the condensing unit was purchased. The following steps should be taken:

1. Record the model and serial number of the Bohn condensing unit and the model and serial number of the defective Copeland compressor.
2. Remove the defective compressor from the unit and exchange it at the Copeland wholesaler receiving from the wholesaler an exchange price invoice plus casting credit made in the name of the user or his service contractor. (Under no circumstances shall the exchange price compressor invoice be made out to Bohn.)
3. Forward a copy of the exchange price invoice plus casting credit along with the model and serial number of the condensing unit, model and serial number of the defective compressor, serial number of the replacement compressor, McDonald's store number and opening date, to Service Department, Bohn Refrigeration Products, 1625 East Voorhees Street, Danville, Illinois 61832.

Upon receipt of this information, Bohn will:

1. Check their records for warranty verification.
2. Upon verification, reimburse the user or the service contractor full amount of the replacement compressor cost.

Bohn's warranty covers only the replacement cost of the compressor, Bohn will not honor any invoice covering labor associated with the replacement compressor.

SERVICE DIAGNOSIS CHART

PROBLEM	POSSIBLE CAUSES	POSSIBLE CORRECTIVE ACTION
Compressor Will Not Run	1. Fused disconnect switch open	1. Close switch.
	2. Blown fuse	2. Check for reason fuse is blown. Replace fuse after problem is corrected.
	3. Compressor motor protector open holding coil	3. Motor protector is automatic reset. Allow time for compressor to cool down so protector will reset. Check unit for reason when compressor restarts.
	4. Defective compressor contractor or holding coil	4. Replace.
	5. Open thermostat	5. Check room temperature. If temperature is okay, wait for thermostat to close.
	6. Open low pressure control	6. Check low pressure control settings per Page 9.
	7. Open defrost timer	7 Check defrost timer for proper operation. Replace if defective.
	8. Liquid line solenoid valve will not open	8. Check holding coil repalce coil if it is defective.
	9. Motor problems	9. Check motor for open circuit, short circuit, grounded windings or burn out.
	10. Loose wiring	10. Check all wire terminals and tighten if necessar
Compressor Noisy or Vibrating	1. Flooding of liquid refrigerant into crankcase	1. Check Bohnmizer valve superheat setting per Page 9.
	2. Compressor hold down nuts too tight	2. Loosen compressor hold down nuts until compressor floats freely on mounting springs.
	3, Worn compressor	3. Replace.
High Head Pressure	1. Too much refrigerant	1. Remove excess refrigerant.
	2. Non-condensibles in system	2. Purge system of non-condensibles.
	3. Dirty condenser coil	3. Clean condenser coil.
	4. Condenser fan not running	4. Check electrical circuit including fuses. Note: When ambient temperature is below 40°F. only one fan will operate.
	5. Discharge valve partially closed	5. Open valve.
Low Head Pressure	1. Insufficient refrigerant	1. Check system for leaks. Repair leaks and add refrigerant.
	2. Damaged valves in compressor	2. Replace compressor.
High Suction Pressure	1. Bohnmizer valve overfeeding	1. Check Bohnmizer valve superheat setting per Page 9.
Low Suction Pressure	1. Insufficient refrigerant	1. Check system for leaks. Repair leaks and add refrigerant.
	2. Freezer coil iced up	2. Check defrost system operation and correct faulty conditions.
	3. Plugged liquid line filter drier	3. Replace filter drier.
	4. Plugged suction filter	4. Replace suction filter.
	5. Bohnmizer valve starving coil	5. Check Bohnmizer valve superheat setting per Page 9.
Loss of Oil or Loss of Oil Pressure	1. Insufficient oil in system	1. Add oil until sight glass is 1/2 full.
	2. Compressor short cycling	2. Check low pressure control settings per Page 9.
	3. Excessive liquid refrigerant in compressor crankcase	3. Check crankcase heater. Check Bohnmizer valve superheat. Check for leaking liquid in line solenoid. Check for internal rupture of heat exchanger.
	4. Worn bearings	4. Replace compressor.

REPLACEMENT PARTS

MAC-7V CONDENSING UNIT			
PART DESCRIPTION	**PART NO..**	**PART DESCRIPTION**	**PART NO..**
1/2 HP Compressor	CRAI-0150-PFV	Pressure Control High	7075207
Start Capacitor	7076960	Pressure Control Low	2890099
Run Capacitor	7076951	Crankcase Heater	7077983
3 HP Compressor	LAHA-0310-TAC	Defrost Timer	7075407
Condenser Fan Motor	7071208	Fan Cycling Thermostat	2890019
Motor Mount	4000131	Disc. Safety Switch	030393004
Fan Blade	7173156	Auxilary Contactor	034915200
Compressor Contactor	2252310	40Amp. Fuse	22510111
Compressor Contactor	1007606	Relay	22505201

EVAPORATORS (208-230 VOLT)					
PART DESCRIPTION	**MCQ1301**	**MCM1021**	**PART DESCRIPTION**	**MCQ1301**	**MCM1021**
Evaporator Fan Motor	5036PS	5036PS	Bohnmizer Valve	4551Q	5717Y
Fan Blade	5110E	5110E	Liquid Line Solenoid	4502Z	4502Z
Fan Guard	5055F	5055F	Room Thermostat	4131Y	4131Y
Drain Pan	B25198A1	B25196A1	Bulb Well Tee Nut	5098J	5098J
Defrost Fan Control	4267W	—	Bulb Well Tee Seal	5096J	5096J
Defrost Heater	4403S	—			

VENDOR CROSS REFERENCE / COMPONENT PARTS

COMPONENT	PART NO.	BOHN VENDOR DESCRIPTION	PART DESCRIPTION
Compressors	21511503	Copeland CRAI-0150-PFV	208/230/1/60 Volt 11/2 HP
	21511601	Copeland LAHA-0310-TAC	208/230/3/60 Volt 3 HP
Fan Motors	7071208	Emerson K055PZZ76	Volt RPM HP Shaft 230/1 1075 1/3 1/2"
	5036P	Fasco 7190-0248	230/1 1550 1/15 5/16"
Evaporator Defrost Heater	4403S		230/60/1 1800 W 1/4 69"
Contactors	1007606	General Electric CR353AB3AB1	208-240/50-60/1 25 AMP 3 Pole
	2252310	General Electric CR353XAAA	10A AMP AUX.
High Pressure Control	7075207	Johnson Controls P100CA10D	Pressure Range Fixed @ 240 Volt 360/270
	7075207	Ranco 071-563013-801	240 Volt 360/270
Low Pressure Control	2890099	Johnson Controls P100AA-19D	
Defrost Timer	7075407	Paragon 8145-20B	240/60/1 40 Amp Def.
Crankcase Heater	7077983	Industrial ENG. 662A30693-2-31-C	65 Watt
Condenser Fan Cycling Thermostat	2890019	Johnson Controls A19AGA-37	40-120F
Fan Blade	7173156	LAU 606470-01	22"Dia. 1/2"Bore CW Rotation
	5110E	Air Drive 12CCW24D	12"Dia. 5/16"Bore CCW Rotation
Fan Guard	5055F		$14^1/_2$ SQ 4 Legs
Defrost Termination, Fan Delay Control	4267W	Ranco 060-100-00	Defrost Close Fan Close FL-17A@ 240V 85°F 50°F
Disconnect Safety Switch	030393004	Cutler DG322NRB	60 AMP / Fuses 40 AMP

Bohn Refrigeration Products
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