OPERATING AND INSTALLATION INSTRUCTIONS KCU/KCI CONDENSING UNITS

RECEIPT OF EQUIPMENT

All equipment should be carefully checked for damage as soon as it is received. If any damage is evident a notation must be made on the delivery receipt before it is signed and a claim should then be filed against the freight carrier. Consequently the product should not be removed from the crate or the position altered in the crate without the permission of the carrier's inspector.

Each condensing unit is evacuated to remove moisture, leak tested, and then shipped with a gas holding charge. Absence of this charge indicates a leak has developed in transit.. The system should not be charged with freon until the source of the leak is located.

Carefully check nameplate voltage and current characteristics to be sure unit is compatible with power supply.

HANDLING

The unit must be moved by the following methods:

1. Lift by means of a fork lift under the shipping skid.
2. Hoist the unit only from the 2" holes provided in the unit base.

NOTE: A spreader bar must be used and arranged to prevent damage by contact to the unit when using chains or cables.

INSTALLATION

Secure condensing unit to a solid level base through mounting holes in unit base. A level installation allows proper oil lubrication of the compressor.

REFRIGERATION PIPING

Use ACR grade copper tubing, or conform otherwise to local and national codes. Piping methods must meet these codes and result in acceptable piping practice.

SUCTION LINE

Design and sizing of the suction line is critical to maintain:

1. Proper refrigerant velocity.
2. Practical pressure drop (usually equiv. to 2 deg. F.)
3. For proper oil return all horizontal lines should be sloped downwards toward compressor at 1" per 10 ft. Horizontal lines may be increased one or two sizes in very long runs.

Suction line risers must be trapped at the bottom of the rise and at every 20' increment for proper oil return.The proper balance is to design suction lines for approximately 1200 feet per minute velocity in risers and approximately 600 feet per minute velocity in horizontal lines.

Table 1 lists common suction line sizing which can be used with, but not instead of, ASHRAE guidelines.

Suction lines should not be exposed to heat unless insulated. Insulation also prevents sweating and subsequent damage to goods

LIQUID LINE

Avoid excessive liquid line pressure drop by using Table 1 and ASHRAE guidelines to size the liquid line. Install a liquid line solenoid valve

ahead of the expansion valve and upstream of heat exchanger (when supplied) on the evaporator. If the liquid line frosts or sweats , or passes through a warmer area, it should be insulated.

RECOMMENDED LINE SIZES

TABLE 1

MODEL	BTUH	MAX VERT. RISER	HORIZ. SUCTION LINE					LIQUID LINE		
			25'	50'	100'	150'	200'	50'	100'	200'
R-22										
KC 020*H2	15000	7/8	7/8	7/8	7/8	7/8	1 1/8	3/8	3/8	1/2
KC 030*H2	24300	7/8	7/8	7/8	7/8	1 1/8	1 1/8	3/8	1/2	1/2
KC 050*H2	43000	1 1/8	1 1/8	1 1/8	1 1/8	1 3/8	1 3/8	1/2	5/8	5/8
KC 075*H2	69450	1 3/8	1 3/8	1 3/8	1 3/8	1 5/8	1 5/8	1/2	5/8	5/8
KC 100*H2	100000	1 3/8	1 3/8	1 3/8	1 5/8	1 5/8	1 5/8	5/8	7/8	7/8
KC 150*H2	141150	1 5/8	1 5/8	1 5/8	2 1/8	2 1/8	2 1/8	7/8	7/8	7/8
R-502 MEDIUM										
KC 020*M5	19500	7/8	7/8	7/8	1 1/8	1 1/8	1 1/8	1/2	1/2	1/2
KC 030*M5	32500	1 1/8	1 1/8	1 1/8	1 3/8	1 3/8	1 3/8	1/2	5/8	5/8
KC 050*M5	50000	1 3/8	1 1/8	1 1/8	1 3/8	1 3/8	1 5/8	5/8	5/8	5/8
KC 075*M5	70400	1 5/8	1 3/8	1 3/8	1 5/8	1 5/8	1 5/8	5/8	7/8	7/8
KC 100*M5	102000	1 5/8	1 3/8	1 3/8	1 5/8	1 5/8	2 1/8	7/8	7/8	7/8
KC 150*M5	133000	1 5/8	1 5/8	1 5/8	2 1/8	2 1/8	2 1/8	7/8	7/8	1 1/8
R-502 LOW										
KC 020*L5	9200	1 1/8	1 1/8	1 1/8	1 1/8	1 1/8	1 1/8	3/8	1/2	1/2
KC 030*L5	14500	1 1/8	1 1/8	1 1/8	1 1/8	1 1/8	1 1/8	3/8	1/2	1/2
KC 050*L5	25200	1 3/8	1 1/8	1 1/8	1 3/8	1 3/8	1 5/8	1/2	5/8	5/8
KC 075*L5	36000	1 5/8	1 3/8	1 3/8	1 5/8	1 5/8	2 1/8	1/2	5/8	5/8
KC 100*L5	49000	1 5/8	1 5/8	1 5/8	2 1/8	2 1/8	2 1/8	5/8	5/8	7/8
KC 150*L5	66000	1 5/8	1 5/8	1 5/8	2 1/8	2 5/8	2 5/8	5/8	7/8	7/8
KC 200*L5	85000	1 5/8	2 1/8	2 1/8	2 5/8	2 5/8	2 5/8	5/8	7/8	7/8

U = OUTDOOR I = INDOOR
* = A 208/230-1 PH
= K 208/230-3 PH
= M 460-3 PH
M2= R-22 MEDIUM TEMP +25 THRU -5°F
L5 = R-502 LOW TEMP +0 THRU -40°F
M5= R-502 MEDIUM TEMP +30 THRU -10°F

NOTE: BTUH based on 95°F ambient, +25°F suction for M2, & M5 , -20°F suction for L5. The lengths shown are for equivalent feet of lines. Receiver size should be checked on longer runs.

If the horizontal suction line is smaller than the maximum riser size shown, the riser should be the same size as the horizontal run. To insure oil return to the compresor **Do Not Allow The Riser To Exceed Value Shown In The Table.**

BRAZING PROCEDURE

Solder Must Be Silver Bearing Solder High Temperature or equivalent alloy suitable for this application. (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 while the joints are being soldered. All flux must be removed from the joints after brazing.

LEAK TESTING

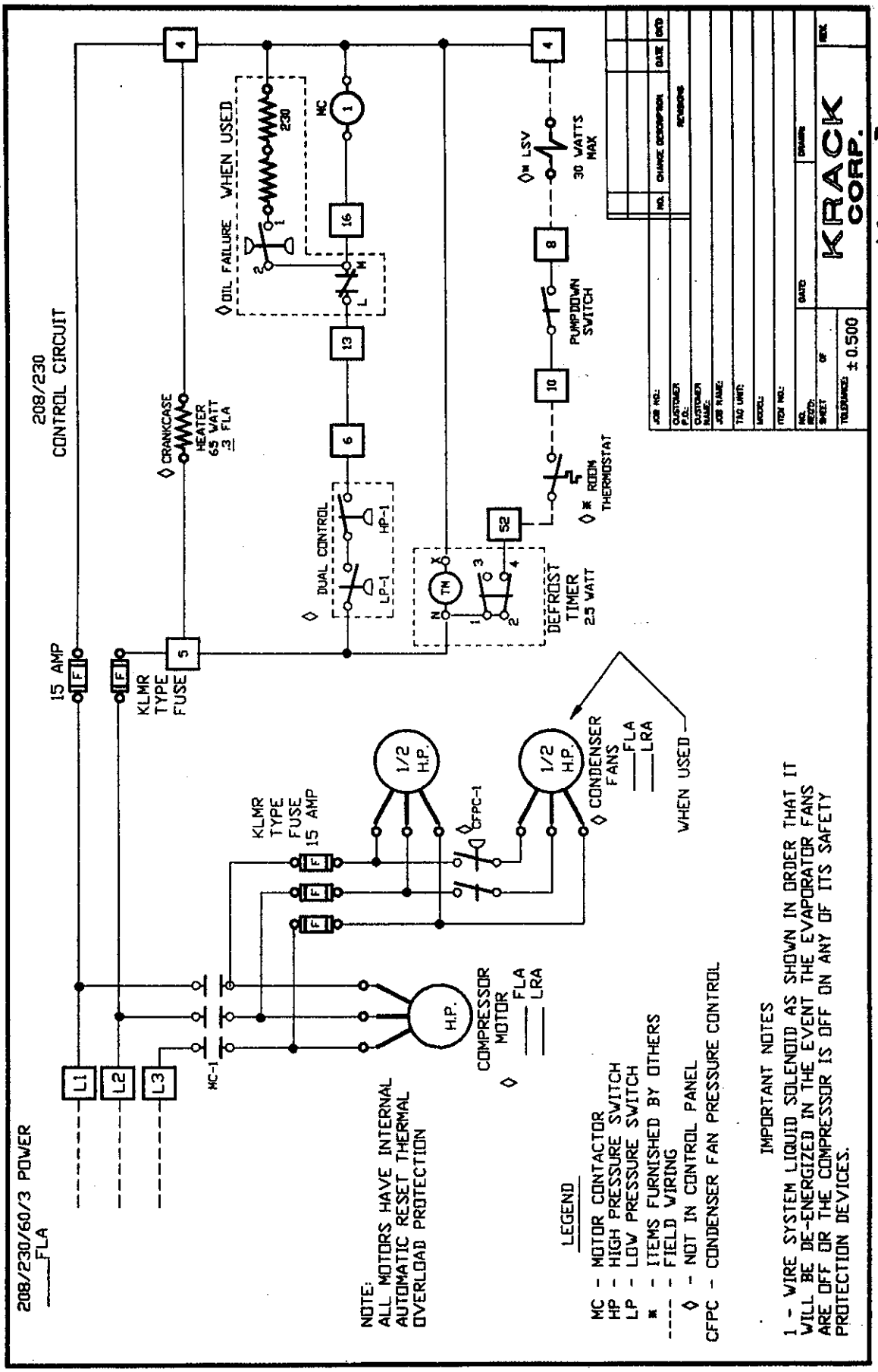
When all refrigeration connections have been completed, the entire system should be tested for leaks. Test pressures should not exceed 75% of the relief valve setting. A mixture of freon and nitrogen may be used to raise the pressure if desired. It is recommended that an electronic tester be used to test all factory and field joints. If any leaks are found , isolate the defective area, remove the gas, and repair the leaks, repeat test. When testing is completed release all pressure.

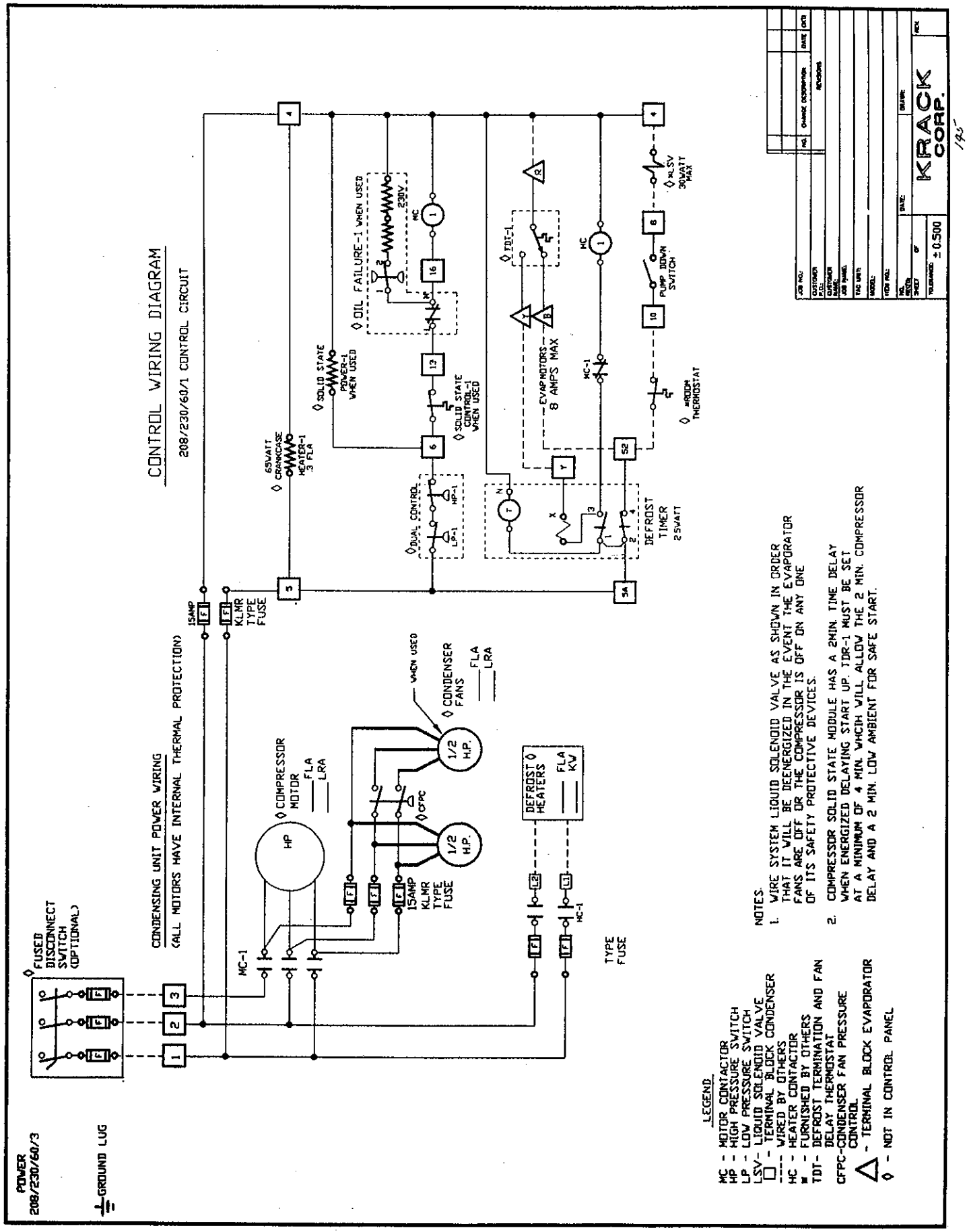
ELECTRICAL WIRING

A wiring diagram showing the factory wiring of the condensing unit is included within the electrical box of the unit.Typical diagams are shown on next page.

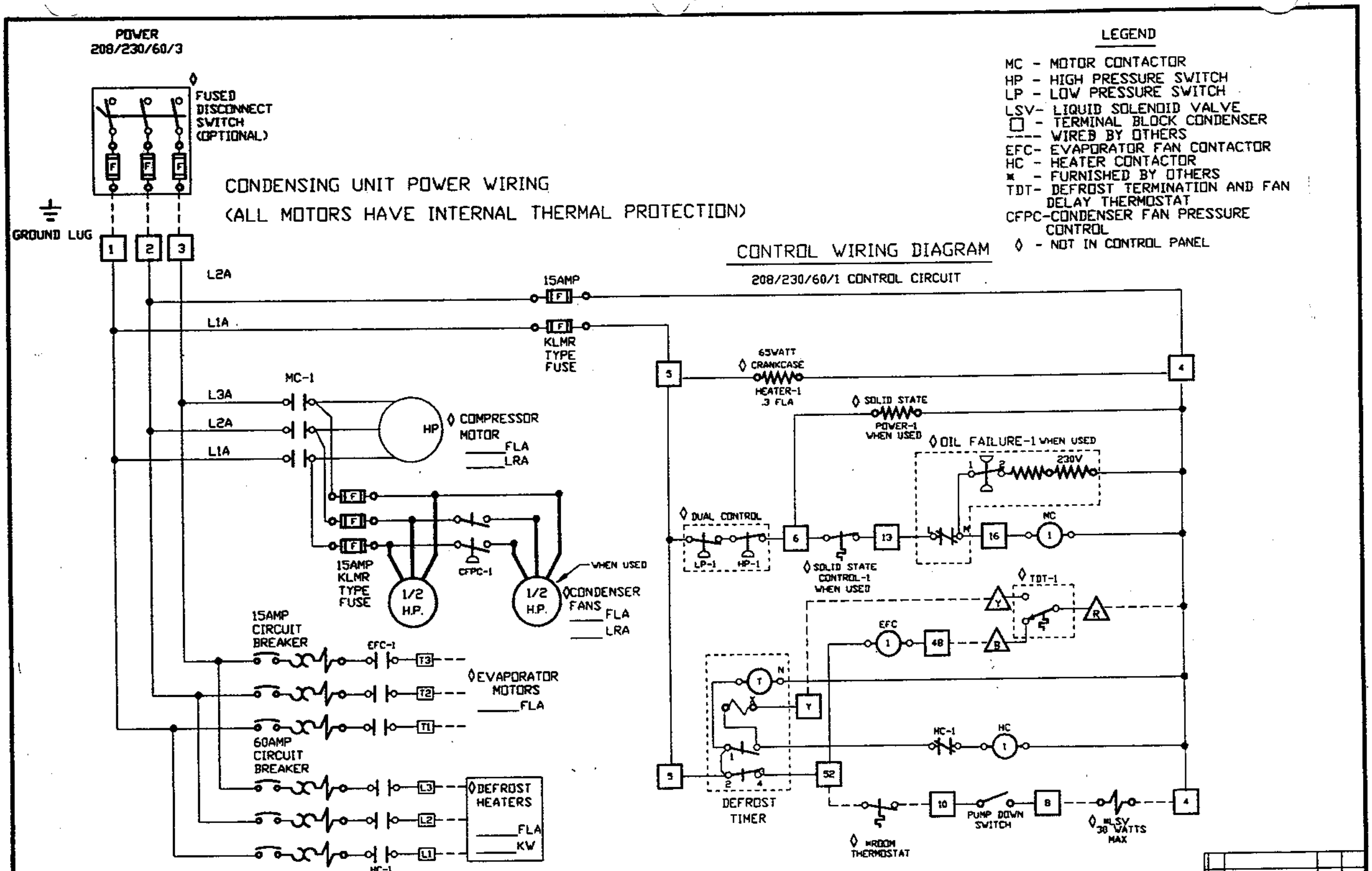
All wiring should be done in accordance with all applicable codes and ordinances.

TYPICAL SYSTEM WIRING DIAGRAMS




CONTROL WIRING DIAGRAM
208/230/60/1 CONTROL CIRCUIT
CONDENSING UNIT POWER WIRING
(ALL MOTORS HAVE INTERNAL THERMAL PROTECTION)
POWER
208/230/60/3
GROUND LUG
FUSED DISCONNECT SWITCH (OPTIONAL)
15AMP KLMR TYPE FUSE
COMPRESSOR MOTOR
FLA
LRA
HP
MC-1
CONDENSER FANS
1/2 H.P.
CFPC
DEFROST HEATERS
FLA
KW
65WATT CRANKCASE HEATER-1 3 FLA
SOLID STATE POWER-1 WHEN USED
OIL FAILURE-1 WHEN USED
230V
MC
SOLID STATE CONTROL-1 WHEN USED
DUAL CONTROL
LP-1
HP-1
TDT-1
EVAP MOTORS 8 AMPS MAX
DEFROST TIMER 25WATT
PUMP DOWN SWITCH
AMBIENT THERMOSTAT
40VA 30WATT MAX
LEGEND
MC - MOTOR CONTACTOR
HP - HIGH PRESSURE SWITCH
LP - LOW PRESSURE SWITCH
LSV - LIQUID SOLENOID VALVE
TB - TERMINAL BLOCK CONDENSER
WIRED BY OTHERS
HC - HEATER CONTACTOR
FURNISHED BY OTHERS
TDT - DEFROST TERMINATION AND FAN DELAY THERMOSTAT
CFPC - CONDENSER FAN PRESSURE CONTROL
TERMINAL BLOCK EVAPORATOR
NOT IN CONTROL PANEL
NOTES:
1. WIRE SYSTEM LIQUID SOLENOID VALVE AS SHOWN IN ORDER THAT IT WILL BE DEENERGIZED IN THE EVENT THE EVAPORATOR FANS ARE OFF OR THE COMPRESSOR IS OFF ON ANY ONE OF ITS SAFETY PROTECTIVE DEVICES.
2. COMPRESSOR SOLID STATE MODULE HAS A 2MIN. TIME DELAY WHEN ENERGIZED DELAYING START UP. TDR-1 MUST BE SET AT A MINIMUM OF 4 MIN. WHICH WILL ALLOW THE 2 MIN. COMPRESSOR DELAY AND A 2 MIN. LOW AMBIENT FOR SAFE START.
KRACK CORP.

TYPICAL SYSTEM WIRING DIAGRAMS


POWER
208/230/60/3
FUSED DISCONNECT SWITCH (OPTIONAL)
GROUND LUG
CONDENSING UNIT POWER WIRING
(ALL MOTORS HAVE INTERNAL THERMAL PROTECTION)
L2A
L1A
L3A
MC-1
15AMP
KLMR TYPE FUSE
COMPRESSOR MOTOR
FLA
LRA
HP
15AMP KLMR TYPE FUSE
1/2 H.P.
CFPC-1
WHEN USED
CONDENSER FANS
15AMP CIRCUIT BREAKER
EFC-1
T3
T2
T1
EVAPORATOR MOTORS
60AMP CIRCUIT BREAKER
L3
L2
L1
HC-1
DEFROST HEATERS
KW
LEGEND
MC - MOTOR CONTACTOR
HP - HIGH PRESSURE SWITCH
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LSV- LIQUID SOLENOID VALVE
☐ - TERMINAL BLOCK CONDENSER
---- WIRED BY OTHERS
EFC- EVAPORATOR FAN CONTACTOR
HC - HEATER CONTACTOR
* - FURNISHED BY OTHERS
TDT- DEFROST TERMINATION AND FAN DELAY THERMOSTAT
CFPC-CONDENSER FAN PRESSURE CONTROL
◊ - NOT IN CONTROL PANEL
CONTROL WIRING DIAGRAM
208/230/60/1 CONTROL CIRCUIT
65WATT CRANKCASE HEATER-1 .3 FLA
SOLID STATE POWER-1 WHEN USED
OIL FAILURE-1 WHEN USED
230V
DUAL CONTROL
LP-1
HP-1
SOLID STATE CONTROL-1 WHEN USED
MC
TDT-1
EFC
DEFROST TIMER
ROOM THERMOSTAT
PUMP DOWN SWITCH
LSV 30 WATTS MAX

NOTES:

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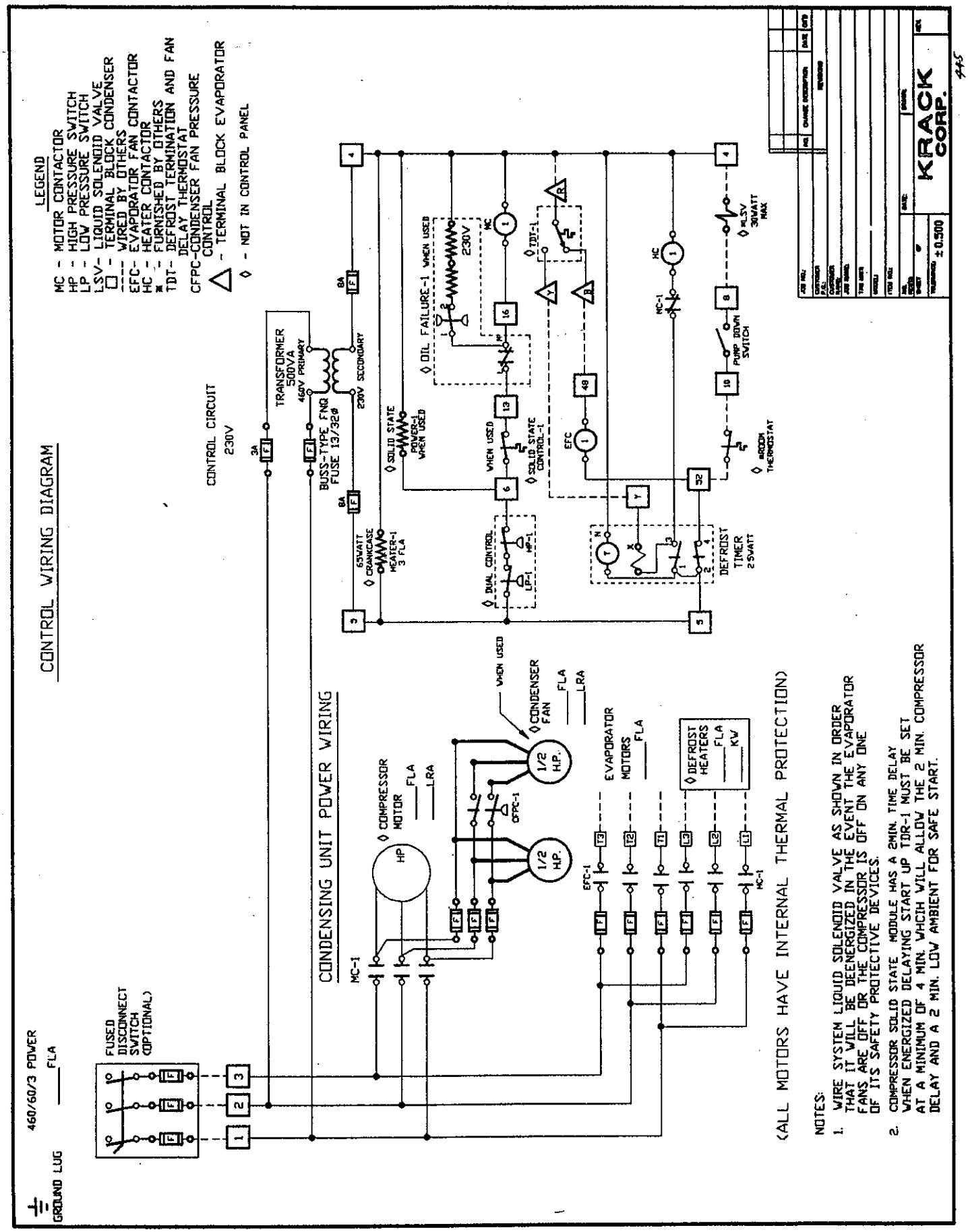
TOLERANCE ± 0.500


CONTROL WIRING DIAGRAM
LEGEND
MC - MOTOR CONTACTOR
HP - HIGH PRESSURE SWITCH
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LSV- LIQUID SOLENOID VALVE
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--- WIRED BY OTHERS
EFC- EVAPORATOR FAN CONTACTOR
HC - HEATER CONTACTOR
* - FURNISHED BY OTHERS
TDT- DEFROST TERMINATION AND FAN DELAY THERMOSTAT
CFPC-CONDENSER FAN PRESSURE CONTROL
△ - TERMINAL BLOCK EVAPORATOR
◊ - NOT IN CONTROL PANEL
460/60/3 POWER
FLA
GROUND LUG
FUSED DISCONNECT SWITCH (OPTIONAL)
CONTROL CIRCUIT 230V
TRANSFORMER 500VA 460V PRIMARY 230V SECONDARY
BUSS-TYPE FNQ FUSE 13/32Ø
65WATT CRANKCASE HEATER-1 3 FLA
SOLID STATE POWER-1 WHEN USED
DUAL CONTROL HP-1 LP-1
OIL FAILURE-1 WHEN USED 230V
SOLID STATE CONTROL-1
TDT-1
EFC
DEFROST TIMER 25WATT
NC-1
PUMP DOWN SWITCH
HC
PLSV 30WATT MAX
THERMOSTAT
CONDENSING UNIT POWER WIRING
COMPRESSOR MOTOR HP FLA LRA
CONDENSER FAN 1/2 H.P. 1/2 H.P. WHEN USED FLA LRA
CFPC-1
EVAPORATOR MOTORS FLA
DEFROST HEATERS FLA KW
MC-1
EFC-1
(ALL MOTORS HAVE INTERNAL THERMAL PROTECTION)
NOTES:
1. WIRE SYSTEM LIQUID SOLENOID VALVE AS SHOWN IN ORDER THAT IT WILL BE DEENERGIZED IN THE EVENT THE EVAPORATOR FANS ARE OFF OR THE COMPRESSOR IS OFF ON ANY ONE OF ITS SAFETY PROTECTIVE DEVICES.
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KRACK CORP.
±0.500

EVACUATION

Do Not use the compressor as a vacuum pump. **Do Not Start** the compressor while it is in a vacuum.

A two stage vacuum pump is recommended if moisture is to be removed by evacuation. A single stage pump will not remove moisture. An electronic vacuum gauge calibrated in microns is reccommended for recording vacuum. Connect the vacuum meter to some point on the system, such as the purge connection on the condensor, so the actual vacuum is read rather than the vacuum at the vacuum pump. The pump should be connected to both the low and high pressure sides with copper tube or high vacuum hoses (1/2" I.D. minimum).

A vacuum of 1000 microns is recommended to effectively remove moisturefrom the system. Close the valve at the pump and watch the gauge. If the system contains moisture or a leak is present the vacuum gauge will show a rise in pressure. When there is no visible rise in system pressure for 30 minutes after the vacuum valve is shut off, evacuation is complete.

CHARGING

1. Weigh refrigerant cylinder before charging
2. Connect suction service gauge line at the compressor shut-off valve and discharge gauge line to the receiver outlet port. The third line of the charging manifold should be connected to the refrigerant cylinder.
3. **Never Charge Liquid Refrigerant Thru The Compressor Suction Or Discharge Service Valve Ports.**
4. Purge all the lines.
5. Open the cylinder liquid valve and the receiver service port. The vacuum in the system will cause liquid to flow until the system pressure is equalized with the pressure in the refrigerant cylinder.
6. Close the receiver outlet valve and start the system. Liquid refrigerant will now feed from the refrigerant cylinder to the liquid line and after passing thru the evaporator will be collected in the condenser and receiver.

TABLE 2

MODEL	REFRIG.	RECEIVER @90% (LBS)	WINTER CONTROLS COND. FLOODING CHARGE (LBS)	LIQUID LINE CHARGE		
				LINE SIZE	CHARGE FACTOR R-22	R-502
KC 020*H2	R-22	25	6	1/2"	13.5	13
KC 030*H2	R-22	35	14	5/8"	8.3	7.9
KC 050*H2	R-22	35	17	7/8"	4	3.8
KC 075*H2	R-22	59	25	1 1/8"	2.3	2.2
KC 100*H2	R-22	82	32	1 3/8"	1.5	1.5
KC150*H2	R-22	92	47			
KC 020*M5	R-502	26	6	LIQUID LINE LENGTH (FT)		
KC 030*M5	R-502	37	14	divided by CHARGE FACTOR		
KC 050*M5	R-502	37	17	equals LIQUID LINE CHARGE (LBS)		
KC 075*M5	R-502	62	17			
KC100*M5	R-502	85	32			
KC150*M5	R-502	102	32			
KC 020*L5	R-502	26	6			
KC 030*L5	R-502	37	14			
KC 050*L5	R-502	37	17			
KC 075*L5	R-502	62	17			
KC 100*L5	R-502	85	32			
KC 150*L5	R-502	102	32			
KC200*L5	R-502	102	47			

7. After proper amount of refrigerant is weighed in, shut off valve at refrigerant cylinder, **(Do Not Overcharge).**

Listed in Table 2 (pg. 4) are approximate refrigerant charges required for each system. On systems with low ambient head pressure controls, additional refrigerant is required for cold weather operation. Refer to Table 2 for approximate condensing flooding charge requirements.

8. Open the receiver outlet valve and observe the sight glass. If the sight glass is full then the charge is correct.
9. If bubbles appear in the sight glass, additional refrigerant vapor can be added thru the compressor suction service valve.

OPERATION PRE-START CHECKOUT

1. **Check all electrical and mechanical connections for looseness due to shipment and tighten any loose connections**
2. Check line fuse sizing against nameplate.
3. Compressor is mounted properly as instructed in rigging section.
4. Cooler or freezer thermostat set at desired temperature.
5. On units with positive defrost , check timer setting for correct time of day and number of defrost cycles desired.
6. Set low and high pressure settings per Table 3. Verify settings thru trial pump down cycle.
7. Low ambient flooding controls are optional on all sytems are. Condenser liquid flooding utilizes a field adjustible (225 to 65 psig) condensate holdback valve.

See Table 3 for suggested pressure settings

Table 3 lists cut-out settings, cut-in settings should be 5-10 psig or more above cut-out. These settings are for minimum conditions; the actual conditions should be equivalent to 20 to 25 °F below room design conditions. Settings may vary for high ambient conditions.

For ground mounted condensing units, add 0.5 psig to this setting for every foot the evaporator is above the ground.

8. Units that are 10 HP. and above use pressure switches to cycle one condenser fan in response to head pressure.

See following table for suggested pressure settings.

SYSTEM	CUT-IN	CUT-OUT
R-22	175 psig	150 psig
R-502 MED.	190 psig	165 psig
R-502 LOW	150 psig	125 psig

TABLE 3

SYSTEM	MINIMUM LOW PRESSURE CONTROL SETTING	MAXIMUM HIGH PRESSURE CONTROL SETTING	MINIMUM HEAD PRESSURE CONTROL SETTING
R-22 HIGH	20 psig (- 5° F)	345 psig	140 psig
R-502 MEDIUM	20 psig (-13° F)		155 psig
R-502 LOW	1.9 psig (- 45° F)		115 psig

AFTER START-UP CHECKOUT

1. Check condenser fan(s) for proper rotation. Air should be blowing toward compressor.
2. Oil level in compressor should be at center of the sight glass.
3. Check voltage and amperage of compressor circuit against values listed on specification plate.
4. After room has reached its final temperature, the expansion valve may require a final superheat adjustment.
5. After room has reached temperature and the liquid line solenoid has closed check compressor to see if it has pumped down and shut off. If the compresor continues to run check the low pressure control setting.

NORMAL MAINTENANCE

1. Check compressor oil sight glass for proper level and check visible piping for oil spots, which may indicate a refrigerant leak.
2. Check liquid refrigerant sight glass for proper charge.
3. Check inlet air side of condenser; surface should be free of foreign matter.

REPLACEMENT PARTS LIST

MODEL	MOTOR	MOTOR MOUNT	FAN BLADE	FAN GUARD
2, 3 HP	E205029	E200009	11259	E200017
5-20 HP	E205029	E200059	11285	55091

SYMPTOM	POSSIBLE CAUSES
Compressor Will Not Run	1. Low Line Voltage 2. Blown Fuse 3. Tripped Circuit Breaker 4. Open Disconnect 5. Defective Solid State Module 6. Control Circuit Open 7. Burned Motor Windings 8. Open Motor Windings 9. Shorted Motor Windings 10. Low Refrigerant Charge 11. Compressor Mechanical Damage 12. Single Phasing
Compressor Starts But Tripe On Overload	1. Low Line Voltage 2. Single Phasing 3. Shorted Or Grounded Motor Winding 4. Tight Bearings Or Grounded Motor Winding 5. Damaged Discharge Valves In Compressor 6. Defective Overload Protector 7. Excessive Suction And/Or Discharge Pressure 8. Burned Contacts On Motor Contactor 9. Loose Wiring In Power Circuit 10. Unbalanced Three Phase Voltages
Unit Short Cycles	1. Low Pressure control Differential Set To Close 2. Shortage Of Refrigerant 3. Compressor Discharge Valve Leaking 4. Liquid Solenoid Valve Leaking 5. Room Thermostat Located In Evaporator Discharge Air
High Head Pressure	1. Refrigerant Overcharge 2. Condenser Fans Off 3. Condenser Fan Rotation Reversed 4. Blocked Condensor Surface 5. Malfuntion Of Winter Flooding Control Valves 6. High Suction Pressure 7. Noncondensibles In Sytems 8. Excessive Ambient Temperature Entering The Condensor 9. Discharge Valve Partially Closed
Head Pressure Too Low	1. Low Ambient Temperatures Entering The Condensor 2. Malfunction Of Winter Control Flooding Valves 3. Refrigerant Shortage 4. Restricted Refrigerant Flow 5. Damaged Valves Or Rods In Compressor 6. Evaporator Malfunction
Refrigerated Space Temperature Too High	1. Defective Temperature Control 2. Refrigerant Shortage 3. Restricted Refrigerant Flow 4. Thermal Expansion Valve Improperly Adjusted 5. Evaporator Coil Iced Or Dirty 6. Evaporator Fan Malfunction 7. Compressor Malfunctioning 8. Higher Than Normal Load In Refrigerated Space
Low Oil Pressure	1. Loss Of Oil From Compressor Due To: A. Oil Trapping In System B. Compressor Short Cycling C. Excessively Low Suction Pressure D. Insufficient Oil In System 2. Refrigerant Floodback To Compressor Suction 3. Restriction In Oil Pump Inlet Screen 4. Malfunctioning Oil Pump 5. Excessively Worn Compressor Bearings 6. Low Refrigerant Charge 7. Insufficient Oil Charge 8. Oil Gauge Defective