

The Unico System[®]



**Unichiller Installation
And
User's Guide**

Customer Service

If you have questions about Installation, operation and Maintenance of the Unichiller or would like to order replacement parts please use the following contact information.

Customer Service and Technical Support (7 A.M. to 5 P.M. – Central Time)

Phone: 800-527-0896 • 314-481-9000

Fax: 314-457-9000

Web Site

Visit www.unicosystem.com to find information about Unico Products

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General Instructions

The Unichiller is manufactured to meet US and European electrical requirements.

Installation and service must be performed by qualified installer or service agency, and must conform to all national, state, and local codes of the country where it is to be operated.

Unichillers have self contained factory charged and tested refrigeration systems containing either R-22 or R407C refrigerants. The type of refrigerant and quantity is listed on the factory information label located on the back panel. It is not necessary to access the refrigeration system for system installation and start-up.

All Unichillers are tested through a full cooling and heating cycle prior to shipment from the factory.



Before operating, be sure the unit is properly grounded to prevent injury or death from electrical shock!



Disconnect electrical supply before wiring unit to prevent injury or death from electrical shock!



Do not handle the top half of the scroll compressor as it operates at a temperature high enough to cause serious injury. Operation of the chiller without proper freeze protection shall void the warranty.



Do not operate this system for long periods of time with water alone. A minimum of 10% propylene or ethylene glycol is essential to prevent freezing. Higher concentrations of glycol are required to prevent heat exchanger from rupturing in cold climates.



Recommended operating temperatures are 115°F for hot water and 40°F for chilled water. Contact Customer Service if you wish to operate at water temperatures outside of the recommended range.

Do not use any liquid solution other than the solution of water and propylene or ethylene glycol in the piping system. The solution must be mixed in accordance with the guidelines in the Unichiller Design Manual.

Pump must be primed (free of air and suction pipe full of liquid) before starting. If pump is run dry, rotating parts will seize and mechanical seal will be damaged.

All electrical wiring should be in accordance with all local codes and regulations. A field provided electrical disconnect shall be installed. The units are safety certified to safety codes of the country they are sold in (refer to Unichiller Specifications Bulletin for further details).

All piping must be in accordance with all local codes and ordinances.

Installation should be in accordance with all local codes and regulations.

These units are designed to operate with R-22 or R-407C in a self-contained, pre-charged refrigerant system. Do not access the closed refrigerant system for any reason other than after-sale, after installation component replacement. Such service is to be conducted by qualified personnel only.

Placement of the Unichiller

Location

- ✓ Always locate the chiller outdoors. Never install inside a room.
- ✓ Installing the unit in a pit will reduce performance
- ✓ Locate chiller so that ground water will not enter cabinet.
- ✓ In areas with heavy snow fall it is recommended that the unit be elevated.
- ✓ Do not attach duct work to the chiller. If air deflectors are necessary contact Unico Customer Service for instructions.

Clearances

The chiller must be placed to provide clearances on all sides for maintenance and inspection.

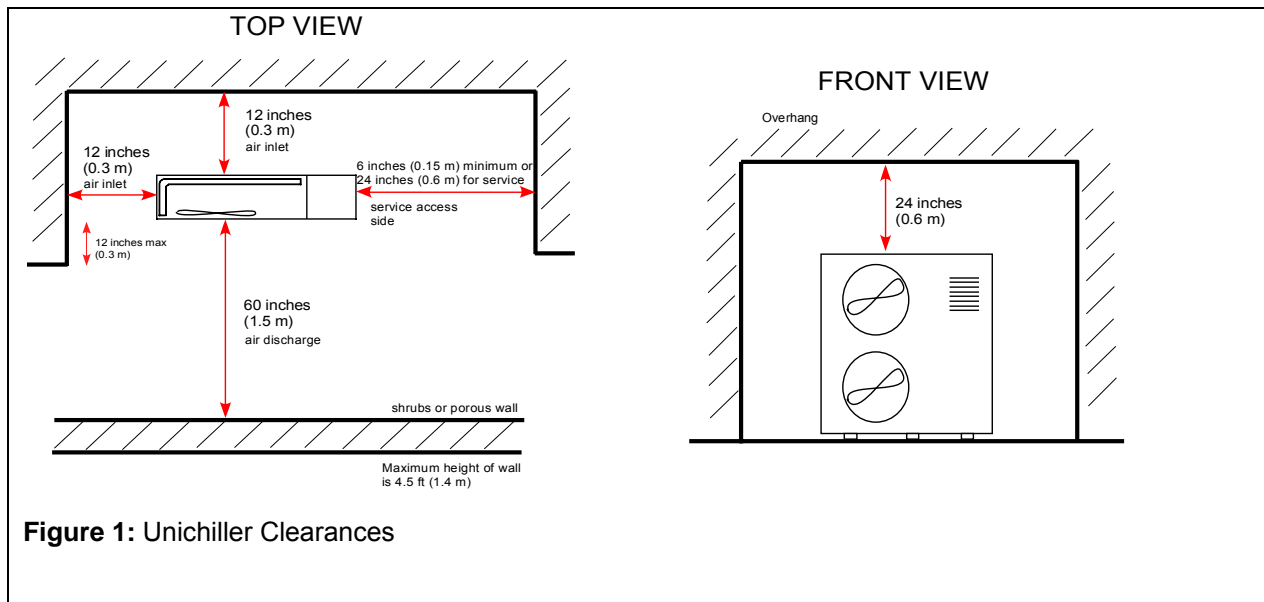


Figure 1: Unichiller Clearances

1. At least 24" must be available on the side of the chiller that accesses the control box, pump and compressor. See Figure 1.
2. Allow at least 60" on the fan side.
3. The remaining two sides should have a minimum clearance of 12"

Roof Run-off

The Unichiller should not be located where large amounts of water may run-off from a roof onto or into the unit. Best practices dictate that the chiller be protected from large amounts of run-off.

Equipment Pad

Place the chiller on a flat solid surface such as a concrete or fabricated slab. The slab should be slightly tilted so that condensation from the chiller will run off the slab and not pool around the chiller.

Lawn Irrigation

Make sure that there are absolutely no sprinkler heads near enough to the chiller that will spray water directly on or into the unit. Keep in mind that prevailing winds may carry mist from sprinklers into the chiller causing damage to electrical connections and mechanical parts.

Additional information regarding pump characteristics are given in Table 1.

Table 1. Pump characteristics based on flow rates and voltage for each of the chiller models. Bolded lettering indicates optimum system values.

(English Units)

UCHR0364													
Options:	-**0	-1*2, -2*2 @ 230V				-3*2 @ 265V				-6*2, -7*2, -8*2 @ 240V			
GPM	ISP (psi)	ESP (psi)	SP(psi)	Watts	Amps	ESP (psi)	SP(psi)	Watts	Amps	ESP (psi)	SP(psi)	Watts	Amps
4	2.5	26.2	27.6	465	2.00	24.9	27.7	515	2.12	24.7	27.4	540	2.26
6	4.6	23.6	27.0	495	2.12	22.2	27.1	540	2.20	21.7	26.5	565	2.36
7.2	6.0	21.8	26.6	510	2.18	20.4	26.7	555	2.24	19.8	26.0	580	2.40
8	7.0	20.6	26.4	520	2.22	19.2	26.4	565	2.28	18.4	25.6	585	2.44
10	9.9	17.4	25.8	550	2.34	15.9	25.8	590	2.36	14.8	24.7	610	2.54
12	13.0	13.8	25.3	575	2.46	12.3	25.2	610	2.44	10.9	23.8	630	2.62
14	16.4	9.9	24.7	600	2.58	8.4	24.6	635	2.54	6.7	22.9	650	2.72
16	20.0	5.8	24.1	630	2.70	4.2	24.0	660	2.62	2.2	22.0	675	2.80

UCHR0604													
Options:	-**0	-1*2, -2*2 @ 230V				-3*2 @ 265V				-6*2, -7*2, -8*2 @ 240V			
GPM	ISP (psi)	ESP (psi)	SP(psi)	Watts	Amps	ESP (psi)	SP(psi)	Watts	Amps	ESP (psi)	SP(psi)	Watts	Amps
4	0.6	27.9	27.6	465	2.00	26.5	27.7	515	2.12	26.3	27.4	540	2.26
6	1.4	26.3	27.0	495	2.12	24.9	27.1	540	2.20	24.4	26.5	565	2.36
8	2.4	24.5	26.4	520	2.22	23.0	26.4	565	2.28	22.3	25.6	585	2.44
10	3.6	22.5	25.8	550	2.34	21.0	25.8	590	2.36	19.9	24.7	610	2.54
12	5.1	20.2	25.3	575	2.46	18.7	25.2	610	2.44	17.3	23.8	630	2.62
14	6.9	17.8	24.7	600	2.58	16.2	24.6	635	2.54	14.6	22.9	650	2.72
16	8.8	15.1	24.1	630	2.70	13.5	24.0	660	2.62	11.5	22.0	675	2.80
20	13.5	9.1	23.0	685	2.92	7.4	22.7	705	2.78	4.9	20.2	720	2.98

(SI Units)

UCHR0364													
Options:	-**0	-1*2, -2*2 @ 230V				-3*2 @ 265V				-6*2, -7*2, -8*2 @ 240V			
L/s	ISP (kPa)	ESP (kPa)	SP(kPa)	Watts	Amps	ESP (kPa)	SP(kPa)	Watts	Amps	ESP (kPa)	SP(kPa)	Watts	Amps
0.30	22	174	189	475	2.04	165	189	525	2.14	163	187	550	2.30
0.40	34	159	185	500	2.14	150	186	545	2.22	146	182	570	2.36
0.45	41	151	184	510	2.18	142	184	555	2.24	137	179	575	2.40
0.50	48	143	182	520	2.22	133	182	565	2.28	128	177	585	2.44
0.60	63	125	179	540	2.32	115	179	580	2.34	108	172	605	2.52
0.70	79	107	176	565	2.40	96	176	600	2.42	88	167	620	2.58
0.80	97	86	173	585	2.50	76	172	620	2.48	66	162	640	2.66
0.90	116	65	170	605	2.58	54	169	640	2.54	42	157	655	2.72
1.00	136	42	167	625	2.68	31	166	660	2.62	18	152	675	2.80

UCHR0604													
Options:	-**0	-1*2, -2*2 @ 230V				-3*2 @ 265V				-6*2, -7*2, -8*2 @ 240V			
L/s	ISP (kPa)	ESP (kPa)	SP(kPa)	Watts	Amps	ESP (kPa)	SP(kPa)	Watts	Amps	ESP (kPa)	SP(kPa)	Watts	Amps
0.40	11	179	185	500	2.14	170	186	545	2.22	166	182	570	2.36
0.50	16	169	182	520	2.22	159	182	565	2.28	154	177	585	2.44
0.60	23	158	179	540	2.32	148	179	580	2.34	141	172	605	2.52
0.70	31	147	176	565	2.40	136	176	600	2.42	128	167	620	2.58
0.75	35	140	174	575	2.46	130	174	610	2.44	121	165	630	2.62
0.80	39	134	173	585	2.50	123	172	620	2.48	113	162	640	2.66
0.90	49	120	170	605	2.58	109	169	640	2.54	98	157	655	2.72
1.00	60	105	167	625	2.68	94	166	660	2.62	81	152	675	2.80
1.10	72	90	163	650	2.78	79	162	675	2.68	64	147	690	2.86

Effect of Water Temperature on Pressure Drop

The temperature of the water can affect the pressure drop on the chiller system Table 2 lists the coefficients used to calculate pressure drop due to temperature.

Table 2. Pressure Drop Correction Factor Based on Temperature (for water)

Temperature	°F	32	40	50	60	68		90	100	110	120	130
	°C	(0)	(4.4)	(10)	(15.6)	(20)		(32.2)	(37.8)	(43.3)	(48.9)	(54.4)
Factor		1.16	1.12	1.05	1.03	1.00		0.93	0.91	0.89	0.86	0.84

Use of Propylene or Ethylene Glycol

The Chiller can reach water temperatures well below freezing. Therefore it is recommended that the water system be charged with a minimum 10% glycol solution. Higher percentages of glycol will be necessary when the chiller is operated in regions of the country where outdoor temperatures fall below freezing. Table 3 gives the recommended glycol percentages depending on the expected low temperatures for the region.

Table 3. Percentage of propylene glycol solution necessary to protect chiller system in cold weather.

% Propylene Glycol		10%	20%	30%	40%	50%
Minimum Ambient Temperature	F	26	18	8	-7	-29
	C	-3.3	-7.8	-12.8	-21.7	-33.9

The percentage of propylene glycol can affect the pressure drop on the system. Table 4 lists the correction factors recommend to calculate pressure drop based on the percentage of glycol in the system.

Table 4. Pressure Drop Correction Factor Based on Percentage of Glycol

% Glycol	0	10	20	30	40	50
Propylene Glycol	1.00	1.10	1.20	1.34	1.50	1.65
Ethylene Glycol	1.00	1.00	1.06	1.16	1.25	1.36

Chiller Installation

Connecting the chiller to installed plumbing

Make sure all pipe sizing conforms to flow requirements.

1. Chiller Piping connections:
 - a. Supply – 1" NPT
 - b. Return – 1 1/4" NPT
2. Units without pumps are provided with a flow meter.
3. When attaching piping to chiller double wrench to prevent damage to chiller.
4. Install strainer (supplied to chiller) into return line.
5. Install full port isolation valves in supply and return piping.
6. On multiple chiller installations, install a check valve in supply lines of each chiller.
7. Install all piping valves flow regulators, pumps and storage tanks per system design.
8. Locate all vents at high points of piping system for easy venting.
9. Make accommodations for filling system and adding glycol to system – 10% glycol minimum required.

Electrical Installation

1. Install line voltage wiring including manual disconnect at unit per local code.
2. See wiring diagram on unit or in documentation packet for specific connection information.
3. Install low voltage control wiring – per code. See wiring diagram on unit or in documentation packet for specific information.

There are many possible control wiring variations. Consult wiring diagrams in back of bulletin for most common hook ups. Additional wiring information can be obtained by calling Unico customer service at 1-800-527-0896.

Water Side Only Start Up

1. Remove Service access panel from chiller. Remove chiller top panel.
2. Disconnect orange Jumper from terminal S1 to S1 on the printed circuit control board. This will disable the compressor control circuit.
3. Fill system with water only. Do not use a glycol solution. You may need to drain the system to repair leaks which would mean having to recover the glycol.
4. Check for leaks.
5. Turn chiller pump on using the ON/AUTO switch on the control board.
6. Bleed air out of the system and adjust flow rates. Use the charts below to set flow rate by measuring pump current draw. Design flow rate for 3-Ton chillers is 7.2 gpm and 5-Ton chillers are 12.0 gpm. If there is no flow meter in the hydronic system flow rate can be determined by the current draw on the pump. Refer to table x for amp draw on various chiller models at the recommended flow rates.
7. Check secondary pump operation and flow rates if applicable.
8. Check for leaks.
9. It is recommended that system be leak tight prior to starting full operation.
10. Once water system is free of leaks the system should be drained and the water replaced with a minimum 10% glycol mixture. Table 3 lists the percentage of propylene glycol solution recommended based on minimum ambient temperatures expected in the area the unit is installed. Unico recommends thoroughly mixing the propylene glycol with water before adding to the system.
11. Insulate piping to limit heat loss and sweating
12. Restart system and vent air.

Digital Temperature Controller (DTC)



Programming the DTC

1. Press "Set" key to enter program mode.
2. Annunciator will display either an "F" for Fahrenheit or a "C" for Celsius. Use the up or down arrow keys to toggle between the two selections. Press "Set " when the desired temperature scale has been selected. Press "Set" key to input the scale and move to the next setting.
3. Annunciator will now display "S1" heating set point. Use the up or down arrow keys to change the set point. Recommended heating set point for start up purposes is 115° F. Press "set " key to input desired temperature value and move to next setting.
4. Annunciator will now display a blinking "DIF 1" the heating differential temperature setting. Recommended setting is 10. Use the up and down arrow keys to set to 10. Press "set " key to input desired temperature value and move to next setting.
5. Annunciator will now display "C1/H1 Cooling or Heating mode. Use up or down arrow key to toggle between C1 and H1. Choose H1. Press "Set" key.
6. Annunciator will now display a blinking "S2" Cooling set point. Use up and down arrow keys to select the desired temperature. Recommended cooling temperature at start up is 44° F. Press "set " key to input desired temperature value and move to next setting.
7. Annunciator will now display a blinking "DIF 2" Cooling Differential Temperature. Recommended setting is 10. Use the up and down arrow keys to set to 10. Press "set " key to input desired temperature value and move to next setting.
8. Annunciator will now display "C2/H2" Cooling or Heating mode. Use up or down arrow key to select C2. Press "set " key to input desired temperature value. and move to next setting.
9. DTC will now be in operating mode and will display current water temperature.

DTC Trouble Shooting and Error Messages

When not working properly, the DTC will display error codes on the annunciator. A description of the error codes , what condition may cause the code to come up and how to clear the error are listed in table 5.

Table 5. DTC Troubleshooting Error Messages

Display Message	Description	To Correct
E1	Appears when either the up  or down  key is pressed when not in the programming mode.	If the E1 message appears even when no keys are being pressed, replace the control.
E2	Appears if the control settings are not properly stored in memory.	Check all settings and correct if necessary.
EP	Appears when the probe is open, shorted or sensing a temperature that is out of range.	Check to see if the sensed temperature is out of range. If not, check for probe damage by comparing it to a known ambient temperature between 30°F and 220°F. Replace the probe if necessary.
EE	Appears if the EEPROM data has been corrupted.	This condition cannot be field repaired. Replace the control.
CL	Appears if calibration mode has been entered.	Remove power to the control for at least five seconds. Reapply power. If the CL message still repairs, replace the control.

Full System Start Up

1. Shut down main power to chiller,
2. Reconnect orange wire to terminals S1 and S1 on control board.
3. Turn on main power to chillers, Air Handlers, Pumps and Controls.
4. Use “Run/Auto” switch on chiller control board to operate chiller.
5. Using Table 6 determine the correct switch positions for the desired chiller operation.

Table 6. Chiller operation as determined by control board switch positions.

Run/ Auto Switch Position	Heat /Cool Switch Position	Resulting Chiller Operation
Run	Heat	Heating mode only. Water temperature controlled by DTC.
Run	Cool	Cooling Mode only. Water temperature controlled by DTC.
Auto	Heat	Externally controlled heating only.
Auto	Cool	Externally controlled heating and cooling.

6. Check flow rates through system and adjust as necessary.
7. During normal operation there should be a 8-10F temperature difference between water going into the chiller and water coming out. Temperature differences greater or less than 8-10 may indicate a water flow problem.
8. After 24 hours run time remove strainer and clean filter screen of dirt and debris. The screen can be removed but should be retained incase it is necessary to do any major repairs or upgrades on the water system.
9. Accessing refrigerant system is not necessary under normal circumstances.
10. Fill out bulletin 30-101 unichiller service report. Leave a copy with the customer and retain one for your files.
11. If chiller does not operate properly, refer to the trouble shooting guide in this manual or contact Unico Customer service at 800-527-0896.

Unichiller Maintenance

The following are the periodic maintenance requirements of Unichillers

1. Clean the coil surfaces at least twice a year or when visibly dirty by hosing the coil with water. Using a coil cleaner is optional.



Do not use high pressure sprayer to clean the coil as this may damage or flatten the fins.

2. If there is the proper level of freeze protection in the lines, there is no need to drain the system if it will not be run over the winter months. Unico recommends using propylene glycol for freeze protection. Refer to Table 3 for required percentages of propylene glycol.
To measure the freeze protection level in the system take a sample of the fluid through the drain or storage tank and use an anti freeze tester or an anti freeze refractometer that is suitable for the glycol (ethylene or propylene) that is used in the system.
3. If the chiller is to be drained over the winter months it is important that all water is removed from the heat exchanger. Drain system from the Inlet connection. Use a wet/dry vacuum to remove residual water. Or blow the excess water out from the output water connection.
4. The Unichillers are pre-charged with R-22 or R-407C refrigerants. Only experienced licensed refrigerant service personnel should check the charge and repair leaks should they occur.

Troubleshooting Guide

The printed circuit board has test points which can be used for trouble shooting. When trouble shooting insert the common probe of the volt meter into the COM terminal on the circuit board and probe the test points for voltage readings. Table 7 lists common trouble shooting test points and what it means when they read 24V+/- 2 volts.

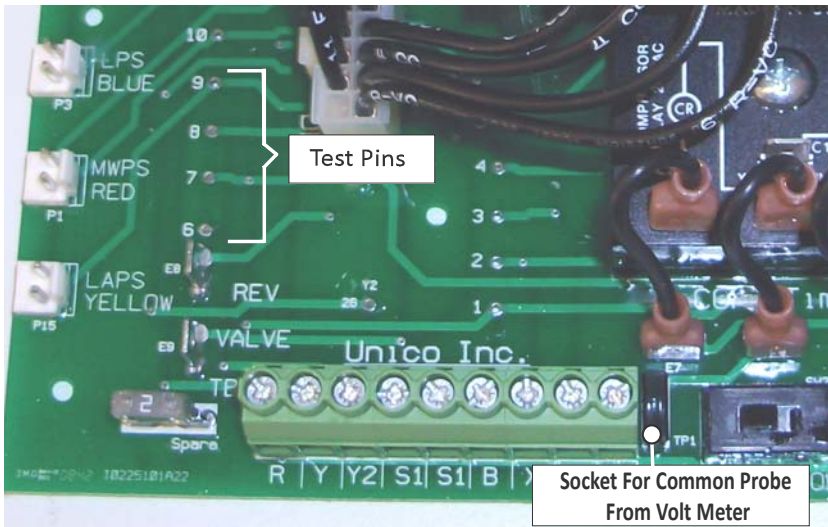


Figure 4. Close-up of lower left Hand corner of printed circuit board showing some test pins common probe socket.

Table 7. Low Voltage Test Pins at 24V AC

Test Pin Number	A reading of 24V from the test pin listed to common indicates the following:
19	Chiller has power; Transformer connected and good
6	External call for chiller; enable pump
18	Flow switch or timer is closed
14	External call for compressor
13	High Pressure Switch is closed
12	Low Pressure Switch is closed (or defrost relay is energized if in defrost)
17	Digital Temperature Controller Calling for Heating or Cooling
8	Timer Is Not In Time Delay Mode; Contactor Is Energized
7	Not in Defrost Or Defrost Pressure Switch (DPS) Is Closed Due To High Pressure
9	Pressures Normal, Low Ambient Pressure Switch (if cooling) Mild Weather Pressure Switch (if heating) are closed; Fan relay is energized
10	Fan Relay Is Energized
4	In Defrost Mode; Defrost relay is energized
1	External Call For Heat Mode

Table 8. High Voltage Test Pins

22 and 24	Unit is correctly Powered
22 and 23	Fan Relay Is Closed (Fan Should Be On)
22 and 21	Pump Relay is Closed (Pump Relay Should be On)
22 and 26	Heater Relay Is Closed (Should Be In Defrost Mode)

The following table is to be used for troubleshooting problems that may occur with the chiller. This table should be used **only** if there are no modifications to the controls.

Table 9a: Unichiller Troubleshooting Chart - Main

Problem	Probable Cause	Corrective Action
Upon start up nothing happens	Power not getting to the chiller or the control board.	Check power coming into the unit. Confirm Auto/Run Switch is set to Run. Test for 230V between TP 22 and TP24. 277V for 3p/460V chillers – unit is correctly powered. Check circuit board terminal block for 24 volts between R and C – Board powered up.
	Bypass Timer Bad	
Pump does not come on.	Water flow restricted, defective flow switch, pump relay not closed	See pump troubleshooting.
Pump does not stay on	No water in the system.	Put water in the system.
	Water temperature set point is too high/low.	Adjust the temperature controller set point (no lower than 38°F for cooling, no higher than 125°F for heating).
	Faulty temperature controller.	Check the operation of the temperature controller. If faulty, replace.
	No Low voltage	Check for 24V on transformer. Fuse on control board
Unichiller shuts down completely (including the pump).	Open flow switch (Liquid solution is interrupted or air in the system).	Check for air or debris in the system.

Table 9b: Unichiller Troubleshooting Chart - Compressor

Problem	Probable Cause	Corrective Action
Compressor and fan motors shut down before the set water temperature is reached.	Open low-pressure switch.	Check for a refrigerant leak, inoperative thermal expansion valve, low liquid solution control setting, low ambient operation, or low liquid solution flow.
	Open Compressor time delay	
	Bad Defrost Board	
	Bad DTC	
	Open high-pressure switch.	Check for a dirty condenser, inoperable fan motor(s), or the re-circulation of condenser air.

Table 9c: Unichiller Troubleshooting Chart - Pump

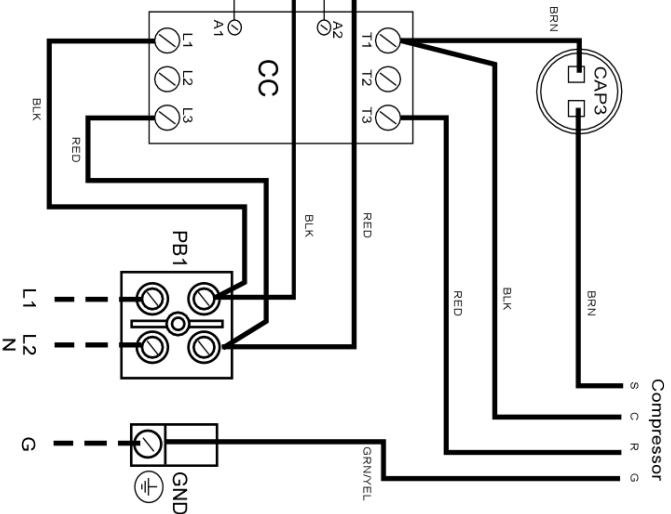
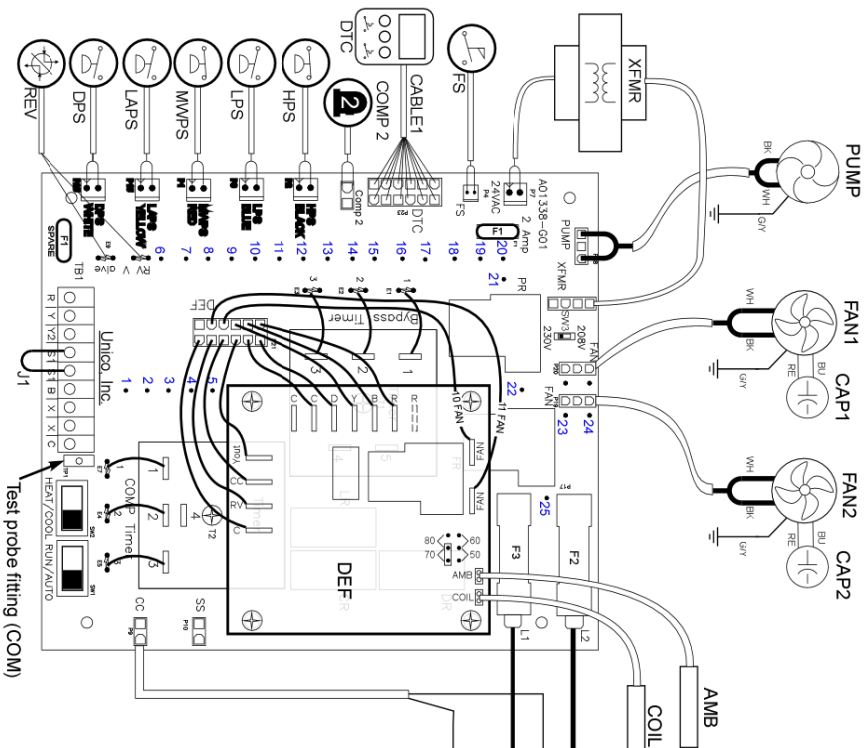
Problem	Probable Cause	Corrective Action
Pump shuts off shortly after the power is applied from the circuit breaker with switch turned to cool or heat position.	Air in the system or lack of water in the system.	Purge the air in the system by opening the vent plug on the pump. Install auto air vent. Check wye strainer.
	Low water flow.	Check pipe sizing and operation of the pump. Flow switch will open at flow rates less than 3gpm.
	Faulty flow switch.	Check continuity of the flow switch. If faulty, replace.

Table 9d: Unichiller Troubleshooting Chart - Other

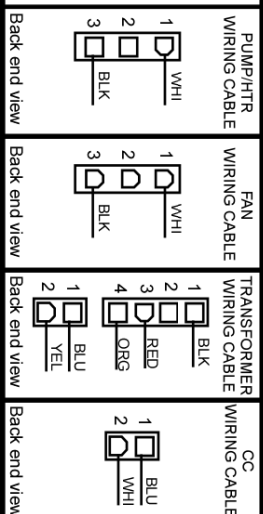
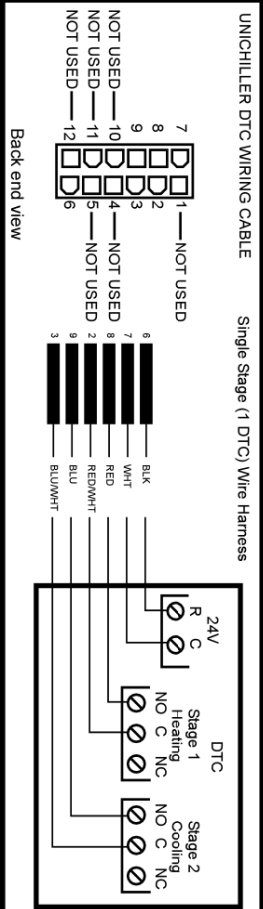
Problem	Probable Cause	Corrective Action
Air in the system or lack of water in the system.	Water leak.	Check for cracked pipe or loose fittings. Repair, if necessary.

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1P/208-230V/60Hz and 1P/220-240V/50Hz



Note:
1. Numbers that are highlighted blue are the probe points on the circuit board that are used for troubleshooting.



LEGEND

Components	LEGEND
AMB	AMBIENT TEMPERATURE PROBE
CABLE1	CABLE WIRING DTC
CAP1	CAPACITOR FAN
CAP2	CAPACITOR COMPRESSOR
CAP3	CAPACITOR COMPRESSOR (3A)
CC	COMPRESSOR CONTACTOR
COIL	COIL TEMPERATURE PROBE
COMP2	COMPRESSOR STAGE 2 HIGH CAPACITY (OPTIONAL)
CR	COMPRESSOR RELAY
DEF	DEFROST CONTROL BOARD
DR	DEFROST RELAY (A)
DTC	DIGITAL TEMPERATURE CONTROL (2-STAGE)
FAN1	FAN
FAN2	FAN
FR	FAN RELAY
FS	FLOW SWITCH
FSR	FLOW SWITCH RELAY
F1	FUSE (2 AMP ATC TYPE)
F2	FUSE (250V, 8 AMP)
F3	FUSE (250V, 8 AMP)
GND	GROUND BLOCK
HPS	HIGH PRESSURE SWITCH
HR	HEAT RELAY (20)
HTR	HEAT RELAY (20)
JAS	JUNCTION BOX
JLPS	LOW PRESSURE SWITCH
LR	LOOP (HEAT) RELAY (1A)
MWPS	MILD WEATHER PRESSURE SWITCH (OPTIONAL)
PB1	POWER RELAY (1A)
PR	PUMP RELAY (1A)
REV	REVERSING VALVE
S2	SECOND STAGE SOLENOID (OPTIONAL)
SS	SOFT START (OPTIONAL)
SW1	SYSTEM SWITCH (AUTO/ON)
SW2	SYSTEM MODE SWITCH (HEAT/COOL)
SW3	VOLTAGE SWITCH (230/208)
T1	TIMER, BYPASS, FLOW SWITCH, 10 SEC
T2	TIMER, COMPRESSOR, 5-MIN
TP1	TEMPERATURE COMMON
TP2	TEMPERATURE COMMON
XFMR	TRANSFORMER 208/230 - 24VAC, 40 VA

Terminals	LEGEND
R	PUMP 24V
Y	PUMP ENABLE
Y2	COMPRESSOR SECOND STAGE (OPTIONAL)
S1-S1	COMPRESSOR ENABLE
B	HEAT (REVERSING VALVE)
X-X	HEAT MODE DRY CONTACT OUTPUT
C	COMMON

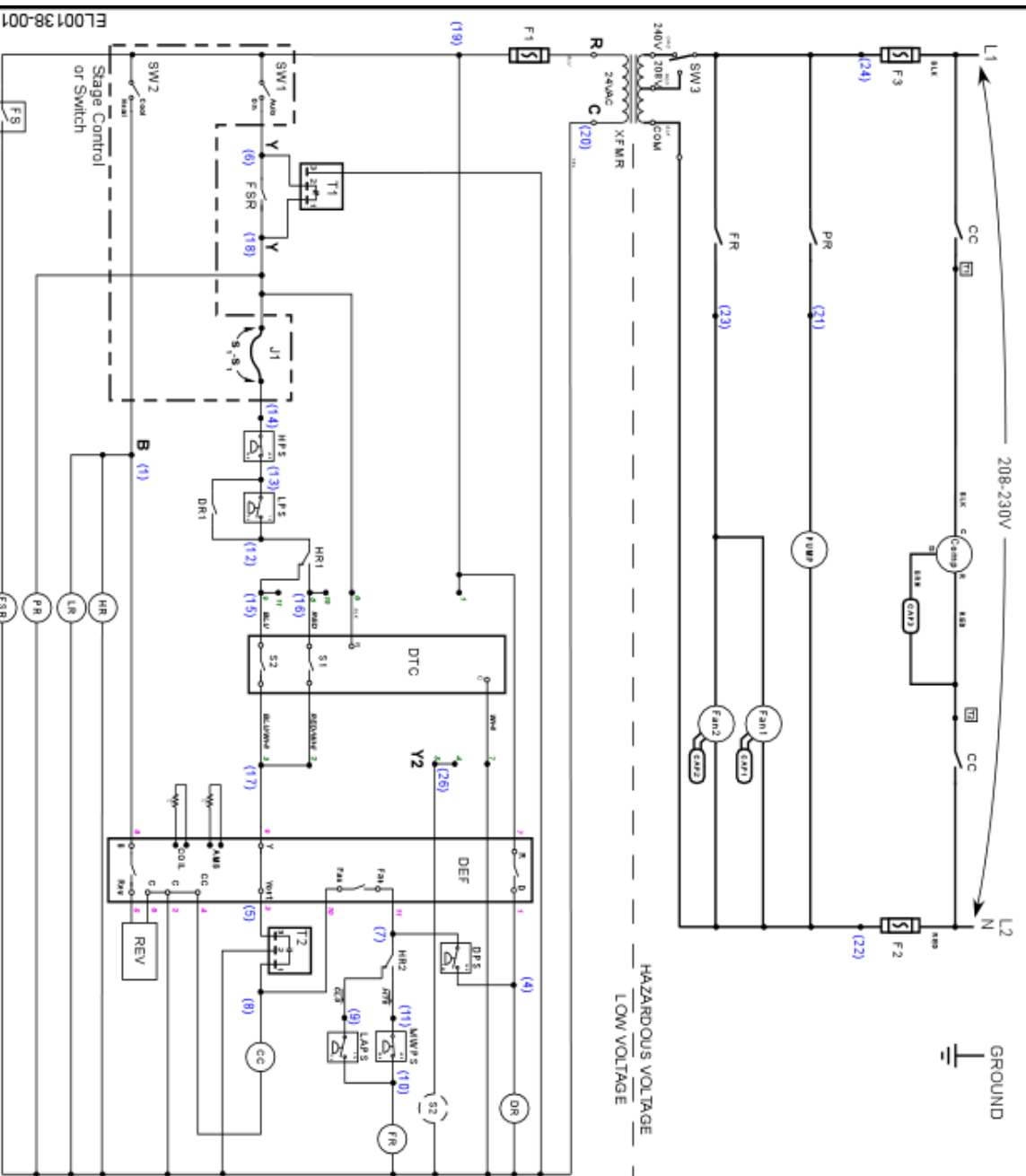
TROUBLE-SHOOTING WITH A VOLT METER
INSERT COMMON LEAD FROM METER INTO TEST PROBE FITTING (COM) AND CHECK FOR 24V AT EACH PROBE POINT. IF 24V, THEN ...

- (19) UNICHLER HAS POWER. TRANSFORMER IS GOOD
- (6) CALL FOR PUMP
- (11) FLOW SWITCH OR TIMER IS CLOSED
- (13) HPS IS CLOSED
- (11) HPS IS CLOSED
- (17) DTC IS CALLING FOR HEATING OR COOLING
- (9) TIMER IS NOT IN TIME-DELAY MODE. CONTACTOR IS ENERGIZED
- (7) NOT IN DEFROST OR DPS IS CLOSED DUE TO HIGH PRESSURE
- (9) PRESSURES NORMAL. LAPS (COOLING) OR MWPS (HEATING) ARE ENERGIZED
- (10) FAN RELAY IS ENERGIZED
- (4) DEFROST MODE. DEFROST RELAY IS ENERGIZED
- (1) CALL FOR HEAT MODE

HIGH VOLTAGE CHECK. IF 230V BETWEEN THESE POINTS, THEN ...

- (24)-(23) UNIT IS CORRECTLY POWERED
- (24)-(21) FAN RELAY IS CLOSED (FAN SHOULD BE ON)
- (24)-(21) PUMP RELAY IS CLOSED (PUMP SHOULD BE ON)
- (24)-(25) HEATER RELAY IS CLOSED (SHOULD BE IN DEFROST MODE)

1P/208-230V/60Hz and 1P/220-240V/50Hz



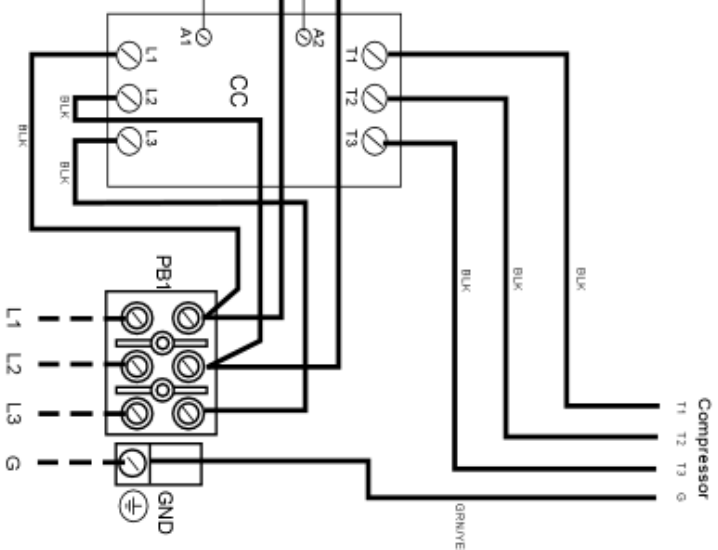
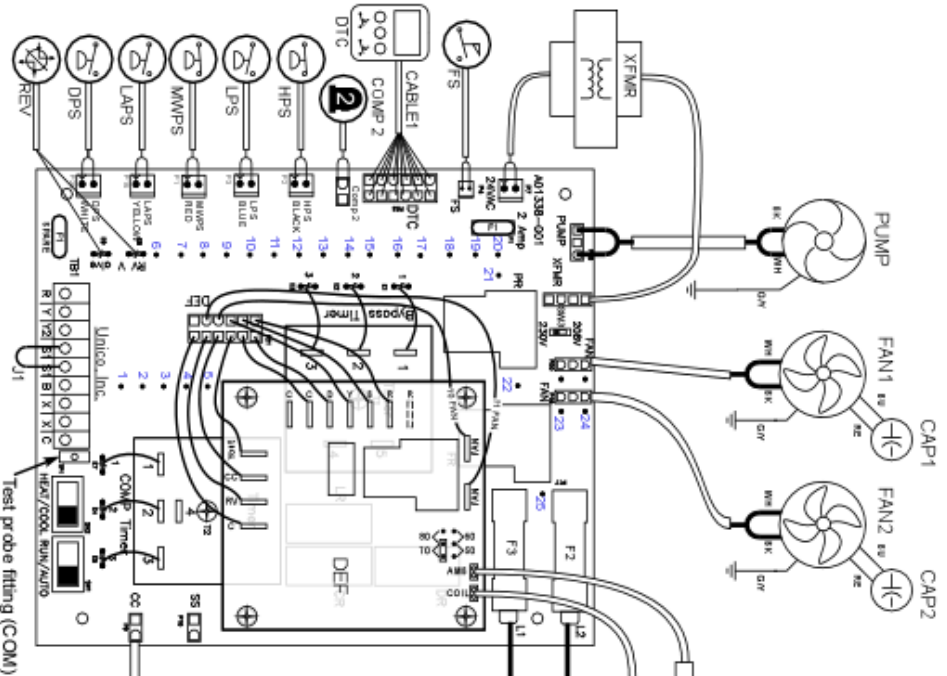
LEGEND

Components	Terminals
CAP1 CAPACITOR, FAN	R POWER, 24V
CAP2 CAPACITOR, FAN	Y PUMP ENABLE
CAP3 CAPACITOR, COMPRESSOR	Y2 COMPRESSOR SECOND STAGE (OPTIONAL)
CC COMPRESSOR CONTACTOR (3A)	31-31 COMPRESSOR ENABLE
CC COMPRESSOR	B, X HEAT (REVERSING VALVE)
CR COMPRESSOR CONTACTOR RELAY (C3)	K, X HEAT MODE DRY CONTACT OUTPUT COMMON
DEF DEFROST CONTROL BOARD	
DP5 DEFROST PRESSURE CONTROL SWITCH	
DR DEFROST RELAY (1A)	
DTG DIGITAL TEMPERATURE CONTROL (2-STAGE)	
FAN1 FAN	
FAN2 FAN	
FAN FAN RELAY	
FR FAN RELAY	
FS FLOW SWITCH	
FSR FLOW SWITCH RELAY	
F1 FUSE (2 AMP, A/C TYPE)	
F2 FUSE (250V, 8 AMP)	
F3 FUSE (250V, 8 AMP)	
F4 FUSE (250V, 8 AMP)	
HPS HIGH PRESSURE SWITCH	
HTR HEAT RELAY (2S)	
J1 BOTTOM FAN DE-ICE HEATER (OPTIONAL)	
J2 HEAT RELAY (2S)	
J3 HEAT RELAY (2S)	
J4 HEAT RELAY (2S)	
J5 HEAT RELAY (2S)	
J6 HEAT RELAY (2S)	
J7 HEAT RELAY (2S)	
J8 HEAT RELAY (2S)	
J9 HEAT RELAY (2S)	
J10 HEAT RELAY (2S)	
J11 HEAT RELAY (2S)	
J12 HEAT RELAY (2S)	
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J97 HEAT RELAY (2S)	
J98 HEAT RELAY (2S)	
J99 HEAT RELAY (2S)	
J100 HEAT RELAY (2S)	

Note:
 1. Numbers in () are probe points on the circuit board that are used for troubleshooting.
 2. Numbers in *italic* are the wiring harness pin numbers.

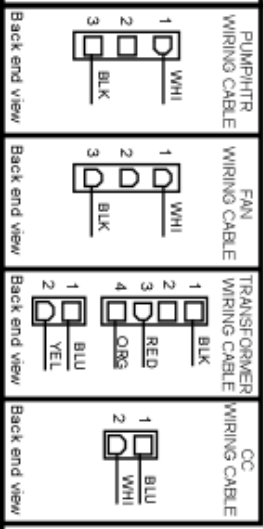


3P/208-230V/60Hz and 3P/220-240V/50Hz



Note:
1. Numbers that are highlighted blue are the probe points on the circuit board that are used for troubleshooting.

Wiring Legend
 High voltage
 Low voltage



LEGEND

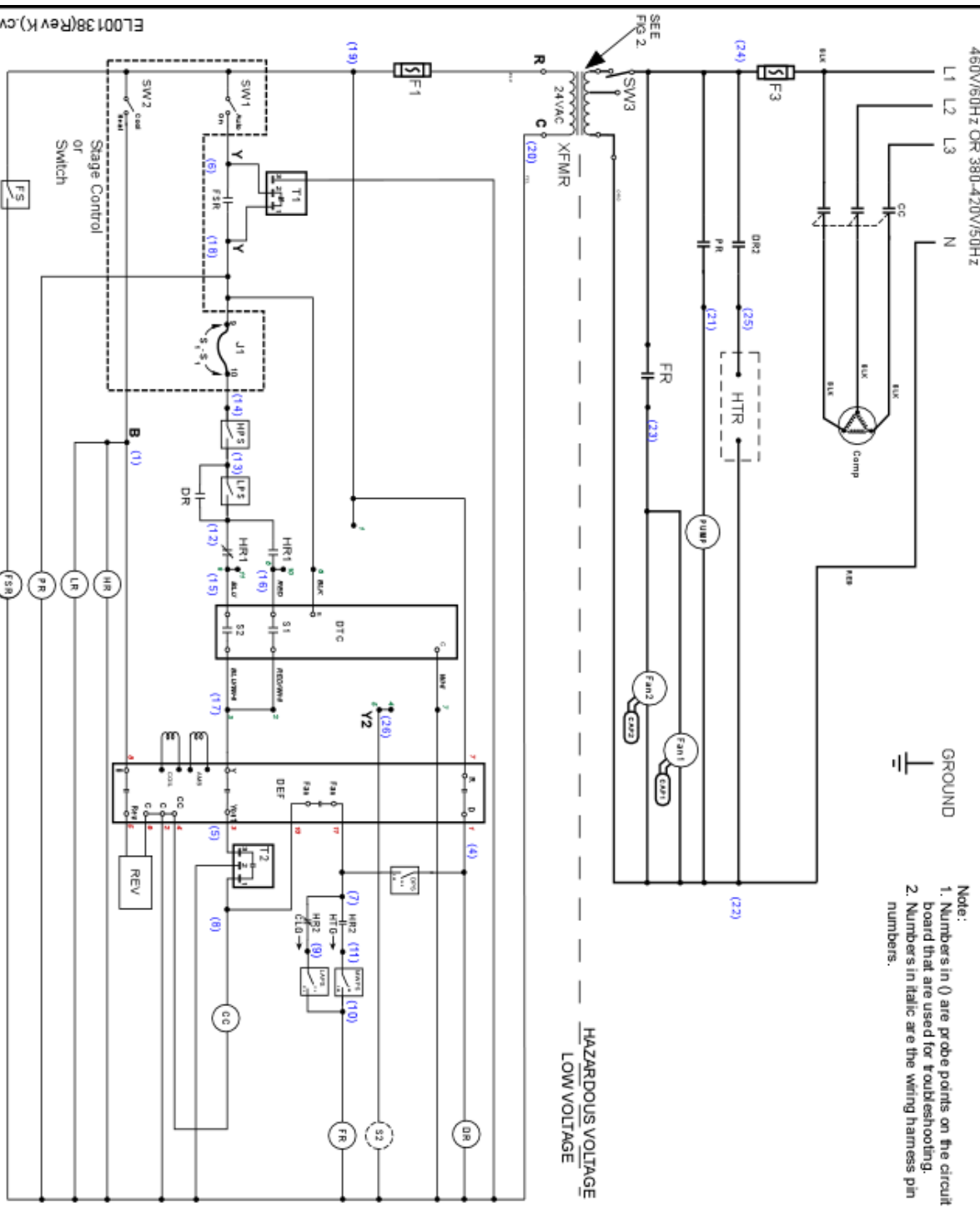
Component	Symbol / Description
AMB	AMBIENT TEMPERATURE PROBE
CABLE1	CABLE WIRING, DTC
CAP1	CAPACITOR, FAN
CAP2	CAPACITOR, FAN
CC	COMPRESSOR CONTACTOR (3A)
COIL	COIL, TEMPERATURE PROBE (OPTIONAL)
COMP2	COMPRESSOR RELAY, HIGH CAPACITY (OPTIONAL)
DEF	DEFROST CONTROL BOARD
DPS	DEFROST PRESSURE CONTROL SWITCH
DR	DEFROST RELAY (1A)
DTC	DIGITAL TEMPERATURE CONTROL (2-STAGE)
FAN1	FAN
FAN2	FAN
FR	FAN RELAY
FS	FLOW SWITCH
FSR	FLOW SWITCH RELAY
F1	FUSE (2 AMP, ATC TYPE)
F2	FUSE (250V, 8 AMP)
F3	FUSE (250V, 8 AMP)
GND	GROUND BLOCK
HPS	HIGH PRESSURE SWITCH
HTR	HEATER (OPTIONAL)
J1	BOTTOM PANEL HEATER (OPTIONAL)
LAPS	LOW AMBIENT PRESSURE SWITCH
LPS	LOW PRESSURE SWITCH
MWP	MELD WEATHER RELAY (1A)
PR	POWER RELAY (1A)
PR1	POWER RELAY (1A)
PUMP	PUMP RELAY (1A)
REV	REVERSING VALVE
S2	SECOND-STAGE SOLENOID (OPTIONAL)
SW1	SYSTEM SWITCH (AUTO/ON)
SW2	SYSTEM MODE SWITCH (HEAT/COOL)
SW3	VOLTADE SWITCH (200/208)
SW3	TIMER, REVERSE, FLOW SWITCH, 90 SEC
T1	TERMINAL BLOCK, 5-WAY
T2	TERMINAL BLOCK, 5-WAY
T3	TERMINAL BLOCK, 5-WAY
TP1	TEST POINT, COMMON
XFMR	TRANSFORMER, 208/220 - 240VAC, 40 VA

TRUBLE-SHOOTING WITH A VOLT METER
 INSERT COMMON LEAD FROM METER INTO TEST PROBE FITTING (COM) AND CHECK FOR 24V AT EACH PROBE POINT. IF 24V, THEN ...

(18) UNCHILLER HAS POWER, TRANSFORMER IS 0000
 (19) CALL FOR PUMP
 (20) FLOW SWITCH OR TIMER IS CLOSED
 (21) CALL FOR COMPRESSOR
 (22) HPS IS CLOSED
 (23) DTC IS CLOSED (OR JUMPED IF IN DEFROST)
 (24) DTC IS CALLING FOR HEATING OR COOLING
 (25) DTC IS CALLING FOR HEATING OR COOLING
 (26) NOT IN DEFROST OR DPS IS CLOSED DUE TO HIGH PRESSURE
 (27) PRESSURES NORMAL, LAPS (COOLING) OR MWP (HEATING) ARE CLOSED
 (28) FAN RELAY IS ENERGIZED
 (29) IN DEFROST MODE, DEFROST RELAY IS ENERGIZED
 (30) CALL FOR HEAT MODE
 (31) CALL FOR HEAT MODE

HIGH VOLTAGE CHECK: IF 230V BETWEEN THESE POINTS, THEN ...
 (24)/(22) UNIT IS CORRECTLY POWERED
 (24)/(23) FAN RELAY IS CLOSED (FAN SHOULD BE ON)
 (24)/(21) PUMP RELAY IS CLOSED (PUMP SHOULD BE ON)
 (24)/(20) HEATER RELAY IS CLOSED (SHOULD BE IN DEFROST MODE)

3P+N/460V/60Hz and 3P+N/380-420V/50Hz
(4 wire, 3 phase)



Note:
1. Numbers in () are probe points on the circuit board that are used for troubleshooting.
2. Numbers in *italic* are the wiring harness pin numbers.

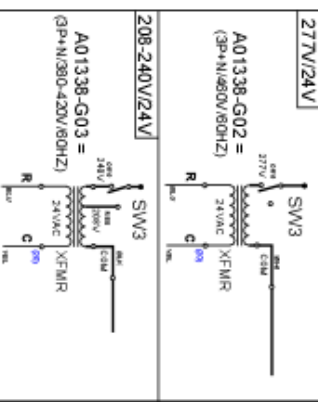
LEGEND

Components	
CP1	COMPRESSOR FAN (5 WFD)
CC	CAPACITOR FAN (5 WFD)
CC2	COMPRESSOR CONTACTOR (GA)
CC3	COMPRESSOR CONTACTOR RELAY (CC)
CC4	COMPRESSOR CONTACTOR RELAY (CC)
DEF	DEFROST CONTROL BOARD
DPS	DEFROST PRESSURE CONTROL SWITCH
DR	DEFROST RELAY (1A)
DTC	DIGITAL TEMPERATURE CONTROL (2STAGE)
FAN	FAN
FAN1	FAN
FAN2	FAN
FAN RELAY	FAN RELAY
FSR	FLOW SWITCH
FR	FLOW SWITCH RELAY
F1	FUSE 2 AMP ATC TYPE
F2	FUSE 2 AMP ATC TYPE
F3	FUSE 10 AMP 250V/50/60HZ 280V/3P+N/380-420V/50HZ
HTR	HEAT RELAY (2C)
HTR	BOTTOM PAN/DEICE HEATER (OPTIONAL)
J1	COMPRESSION ENABLE JUMPER
J2	LOW AMBIENT PRESSURE SWITCH
J3	LOW PRESSURE SWITCH
J4	LOOP (HEAT) RELAY (1A)
J5	MILD WEATHER PRESSURE SWITCH(OPTIONAL)
J6	PUMP RELAY (1A)
J7	PROTECTOR (15 AMP)
J8	RESISTOR (CAPACITOR BLEED (OHM))
J9	REVERSE RELAY
J10	REVERSE RELAY (OPTIONAL)
J11	REVERSE RELAY (OPTIONAL)
J12	SYSTEM SWITCH (AUTOMATIC)
J13	VOLTAGE SWITCH (SEE FIG. 1)
T1	TIMER, BYPASS FLOW SWITCH, 5 SEC
T2	TIMER, COMPRESSOR, 5MIN
T3	TIMER, DELAY/ON/PAUSE, 0.5 SEC
XFMR	TRANSFORMER, 24 VAC, 40VA (SEE FIG. 2)

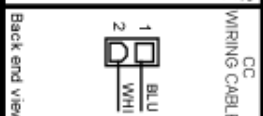
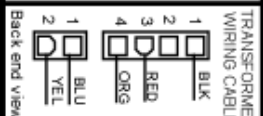
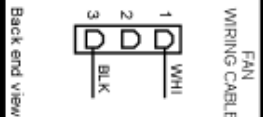
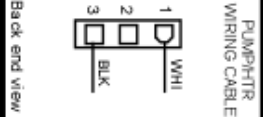
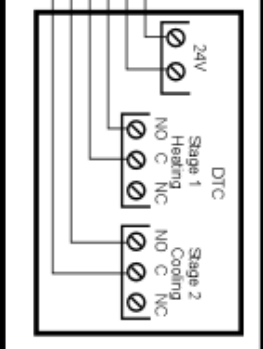
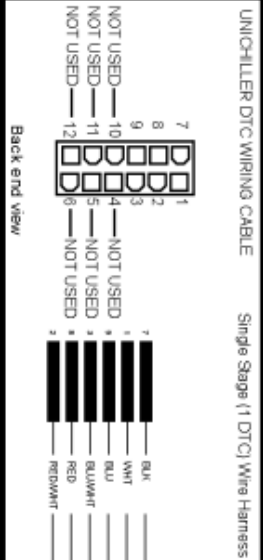
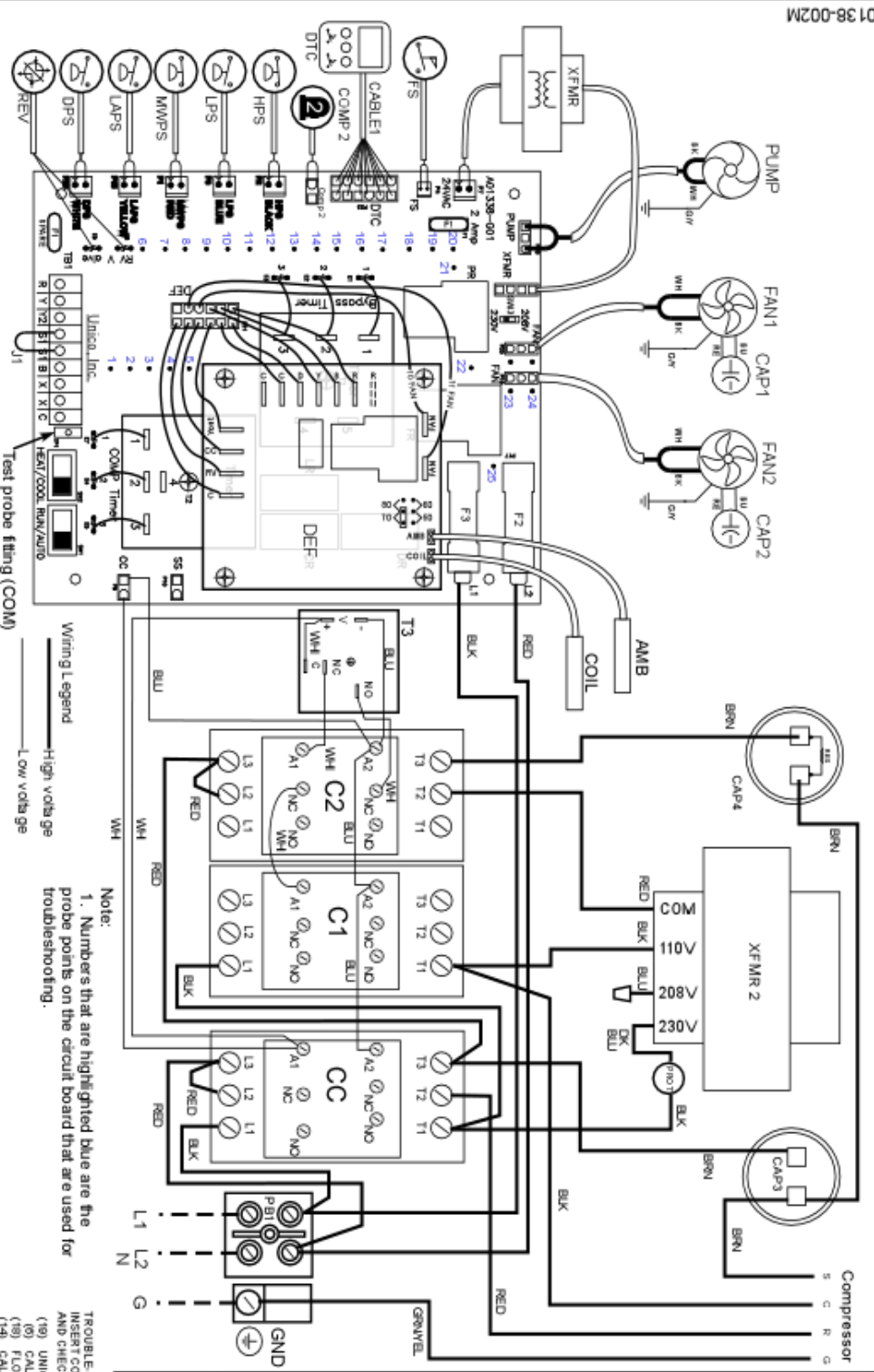
Terminals	
R	POWER 24V
Y	PUMP ENABLE
Y2	COMPRESSOR SECOND STAGE (OPTIONAL)
S1-S1	COMPRESSOR ENABLE
B	HEAT (REVERSING VALVE)
X/X	HEAT MODE DRY CONTACT OUTPUT
C	COMMON



FIG. 2



1P/208-230V/60Hz and 1P/220-240V/50Hz w/ Soft Start Kit



Note:
1. Numbers that are highlighted blue are the probe points on the circuit board that are used for troubleshooting.

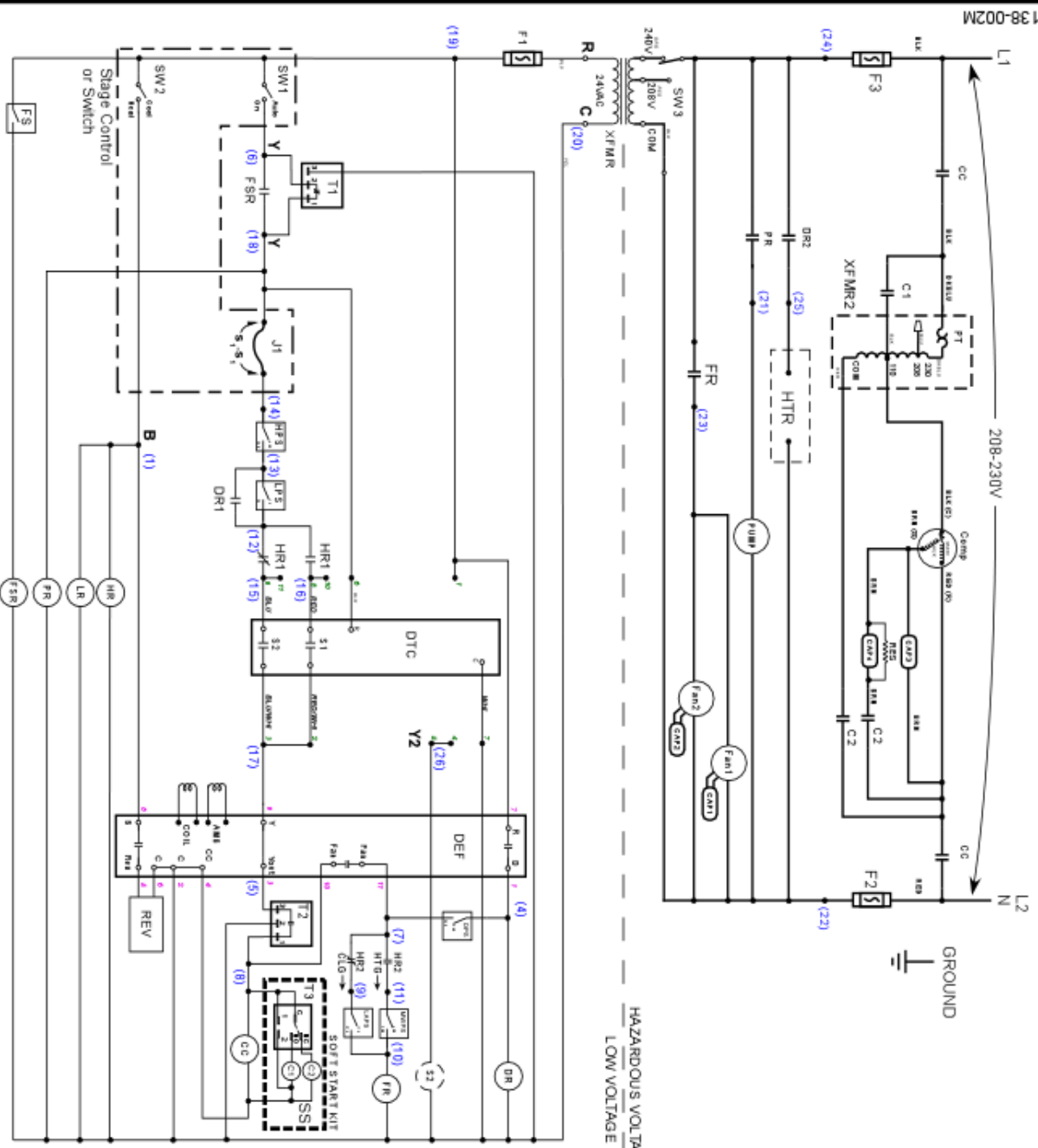
TRUBLESHOOTING WITH A VOLT METER
INSERT COMMON LEAD FROM METER INTO TEST PROBE FITTING (COM) AND CHECK FOR 24V AT EACH PROBE POINT IF 24V, THEN -

(18)	CALL FOR COMPRESSOR
(19)	FLOW SWITCH OR THERM IS CLOSED
(20)	HPS IS CLOSED (OR JUMPED IF IN DEFROST)
(21)	LPS IS CALLING FOR HEATING OR COOLING
(22)	TIMER IS NOT IN TIME DELAY MODE; CONTACTOR IS ENERGIZED
(23)	NOT IN DEFROST OR DPS IS CLOSED DUE TO HIGH PRESSURE
(24)	PRESSURES NORMAL; LAPS (COOLING) OR MWPS (HEATING) ARE CLOSED
(25)	FAN RELAY IS ENERGIZED
(26)	IN DEFROST MODE; DEFROST RELAY IS ENERGIZED
(27)	CALL FOR HEAT MODE
(28)	HIGH VOLTAGE CHECK: IF 230V BETWEEN THESE POINTS, THEN -
(29)	UNITS IS CORRECTLY POWERED
(30)	FAN RELAY IS CLOSED (FAN SHOULD BE ON)
(31)	DEFROST RELAY IS CLOSED (DEFROST SHOULD BE ON)
(32)	HEATER RELAY IS CLOSED (SHOULD BE IN DEFROST MODE)

LEGEND

Component	Description
AMB	AMBIENT TEMPERATURE PROBE
CABLE1	CABLE WIRING, DTC
CAP1	CAPACITOR, FAN
CAP2	CAPACITOR, FAN
CAP3	CAPACITOR, COMPRESSOR
CAP4	CAPACITOR, SOFT START
C1	CONTACTOR, SOFT START (1A)
C2	CONTACTOR, SOFT START (2A)
CC	CONTACTOR, SOFT START (2A)
CC1	CONTACTOR, SOFT START (2A)
CC2	CONTACTOR, SOFT START (2A)
CC3	CONTACTOR, SOFT START (2A)
CC4	CONTACTOR, SOFT START (2A)
CC5	CONTACTOR, SOFT START (2A)
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CC96	CONTACTOR, SOFT START (2A)
CC97	CONTACTOR, SOFT START (2A)
CC98	CONTACTOR, SOFT START (2A)
CC99	CONTACTOR, SOFT START (2A)
CC100	CONTACTOR, SOFT START (2A)

1P/208-230V/60Hz and 1P/220-240V/50Hz w/ Soft Start kit



HAZARDOUS VOLTAGE
LOW VOLTAGE

LEGEND

Components	Terminals
COMP1 CAPACITOR, FAN (5 MFD)	R
COMP2 CAPACITOR, FAN (5 MFD)	Y
COMP3 CAPACITOR, COMPRESSOR	Y2
COMP4 CAPACITOR, COMPRESSOR (250 MFD, 250 WAC)	3R, S1
C1 CONTACTOR, SOFT-START (1A)	B, X
C2 CONTACTOR, SOFT-START (2A)	C
CC COMPRESSOR CONTACTOR (3A)	
COMP COMPRESSOR	
CR COMPRESSOR CONTACTOR RELAY (CC)	
DEF DEFROST CONTROL BOARD	
DPS DEFROST PRESSURE CONTROL SWITCH	
DR DEFROST RELAY (1A)	
DTC DIGITAL TEMPERATURE CONTROL (2-STAGE)	
FAN1 FAN	
FAN2 FAN	
FAN3 FAN	
FAN4 FAN	
FAN5 FAN	
FAN6 FAN	
FAN7 FAN	
FAN8 FAN	
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Note:
1. Numbers in () are probe points on the circuit board that are used for troubleshooting.
2. Numbers in italic are the wiring harness pin numbers.

