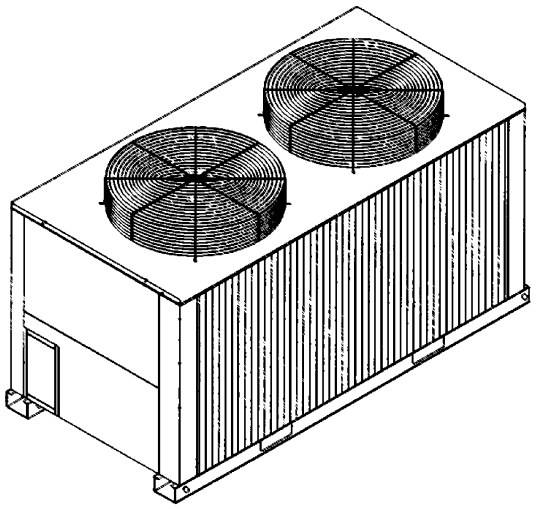
Installation, Start–Up, and Service Instructions



Models
CHS180H000B CHS180L000B

Split System Heat Pump
Three Phase – 208/230, 460 Volt

Save This Manual for Future Reference

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7/22/05

Installation/ Startup Information

These instructions must be read and understood completely before attempting installation.

WARNING

Installation or repairs made by unqualified persons can result in hazards to you and others. Installation MUST conform with local building codes or, in the absence of local codes, with the the National Electrical Code NFPA 70/ANSI C1-1999 or current edition and Canadian Electrical Code Part 1 CSA C.22.1.

The information contained in this manual is intended for use by a qualified service technician familiar with safety procedures and equipped with the proper tools and test instruments.

Failure to carefully read and follow all instructions in this manual can result in equipment malfunction, property damage, personal injury and/or death.

After uncrating unit, inspect thoroughly for hidden damage. If damage is found, notify the transportation company immediately and file a concealed damage claim.

Top skid assembly should be left in place until after the unit is rigged into its final location.

CAUTION

Improper installation, adjustment, alteration, service or maintenance can void the warranty**.**

The weight of the condensing unit requires caution and proper handling procedures when lifting or moving to avoid personal injury. Use care to avoid contact with sharp or pointed edges.

Safety Precautions

1. Always wear safety eye wear and work gloves when installing equipment.
2. Never assume electrical power is disconnected. Check with meter and disconnect.
3. Keep hands out of fan areas when power is connected to equipment.
4. R-22 causes frost-bite burns.
5. R-22 is toxic when burned.

Locating The Outdoor Unit:

Check local codes covering zoning, noise, platforms.

If practical, avoid locating next to fresh air intakes, vent or windows. Noise may carry into the openings and disturb people inside.

Placement of the unit should be in a well drained area or unit must be supported high enough so runoff will not enter the unit.

Do not locate where heat, lint or exhaust fumes will be discharged on unit (as from dryer vents).

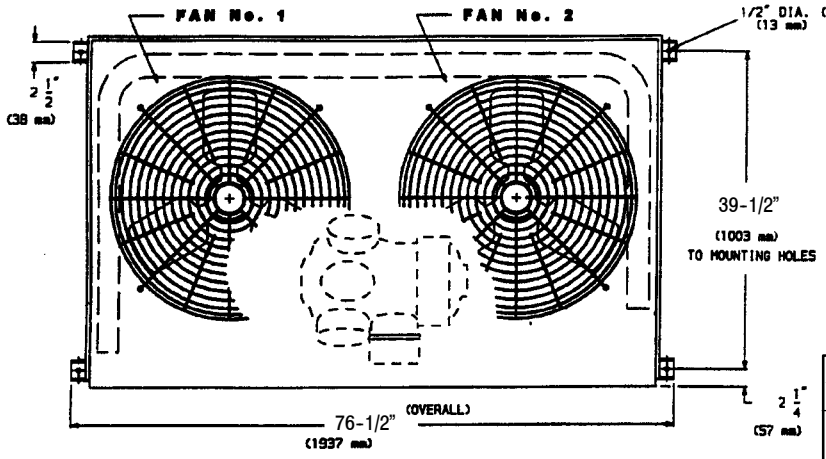
Roof top installations are acceptable providing the roof will support the unit and provisions are made for water drainage and the noise or vibration through the structure.

Do not install the unit in a recessed or confined area where recirculation of discharge air may occur.

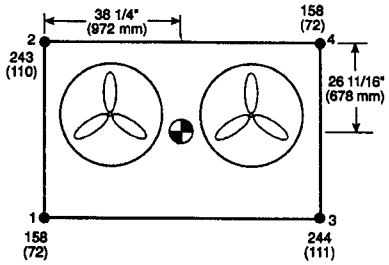
Allow sufficient space for airflow clearance, wiring, refrigerant piping, and servicing unit.

Figure 1

CHS180 UNIT DIMENSIONS and CLEARANCES

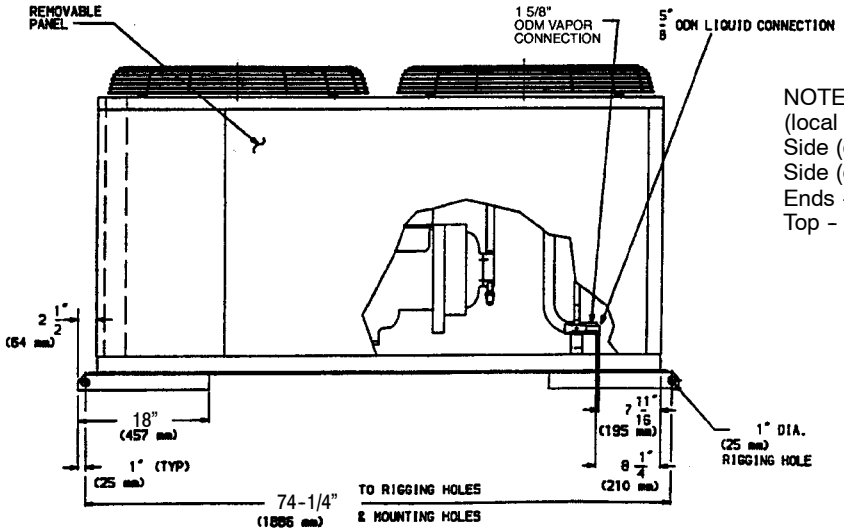


TOP VIEW



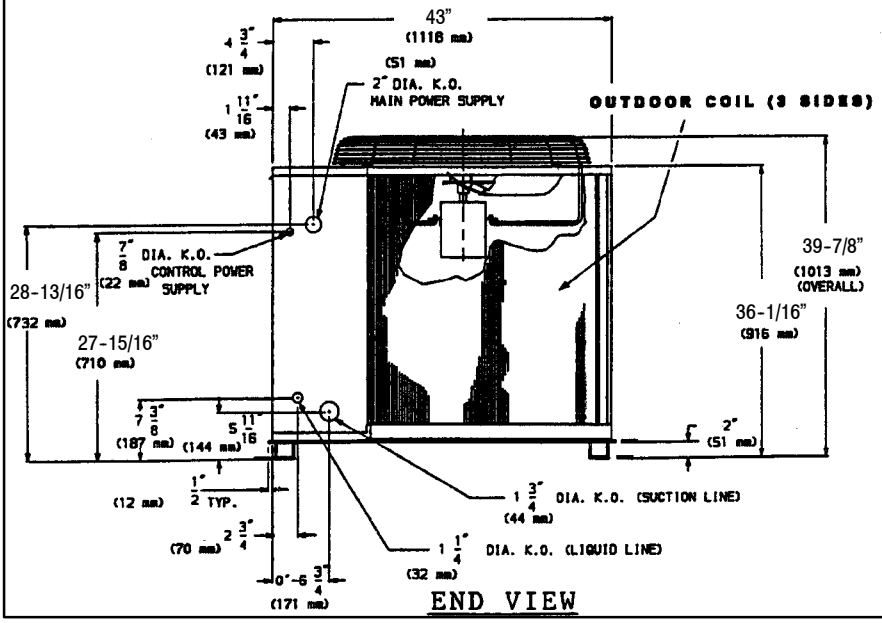
WEIGHT DISTRIBUTION

		Support Point			
Unit	Total Weight	1	2	3	4
CHS180	803	158	243	244	158
	(365)	(72)	(110)	(111)	(72)



SIDE VIEW

NOTE: Recommended service clearances are as follows (local codes or jurisdictions may prevail):
Side (compressor) – 3–1/2 ft. (1067 mm)
Side (opposidte compressor) – 3 ft. (914 mm)
Ends – 2 ft. (616 mm)
Top – 5 ft. (1524 mm)



END VIEW

Rig and Mount the Unit:

CAUTION

Be sure unit panels are securely in place prior to rigging.

RIGGING – See Figure 2. These units are designed for overhead rigging. Refer to rigging label for preferred rigging method. Spreader bars are not required if top crating is left on unit. All panels must be in place when rigging. As further protection for coil faces, plywood sheets may be placed against sides of unit, behind cables. Run cables to a central suspension point so that angle from the horizontal is not less than 45 degrees. Raise and set unit down carefully.

If it is necessary to roll the unit into position, mount the unit on field–supplied rails placed lengthwise under the unit using a minimum of 3 rollers. Apply force to the rails, not the unit. If the unit is to be skidded into position, place it on a large pad and drag it by the pad. Do not apply any force to the unit.
Raise from above to lift unit from the rails or pad when unit is in final position.
After unit in position, remove all shipping materials and top crating.

NOTE: Before mounting unit, remove holddown brackets and release skid. If conditions or local codes require unit to be fastened to pad, use the mounting holes in the base rails.

Clearances:

Locate unit so that outdoor coil (condenser) airflow is unrestricted on all sides and above. See Figure 1 for unit clearances, weight, and clearance data.

Unit Support:

The unit must be level, and supported above grade by beams, platform or a pad. Platform or pad can be of open or solid construction but should be of permanent materials such as concrete, bricks, blocks, steel or pressure treated timbers approved for ground contact. Refer to Unit Clearances and weights to help determine size of supports etc. Soil conditions should be considered so the platform or pad does not shift or settle excessively and leave the unit only partially supported.

CAUTION

Inadequate support could cause excessive vibration and noise or binding and stress on refrigerant lines resulting in equipment failure.

To minimize vibration or noise transmission, it is recommended that supports not be in contact with the building structure. However, slabs on grade constructions with an extended pad are normally acceptable.

A. Ground Level Installation:

If beams or an open platform are used for support it is recommended that the soil be treated or area be graveled to retard the growth of grasses and weeds.

B. Roof Top Installation:

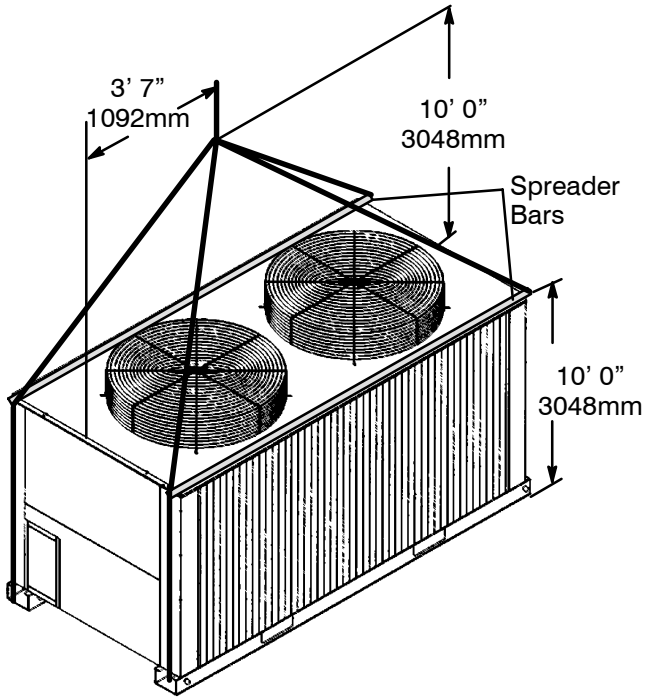
This type of installation is not recommended on wood frame structures where low noise levels are required.

Supporting structure or platform for the unit must be level. If installation is on a flat roof the unit should be 4 inches (10cm.) above roof level. Four by four posts placed over a load bearing wall make a suitable mounting platform.

If possible, place the unit over one or more load bearing walls. If there are several units, mount them on platforms that are self–supporting and span load bearing walls. These suggestions are to minimize noise and vibration transmission through the structure.

Figure 2

NOTICE TO RIGGERS
All Panels Must Be In Place When Rigging



NOTICE TO RIGGERS: Rig by inseting hooks into unit base rails as shown. Maintain a distance of 120 inches (3048mm) from top of unit to eyehook. Use corner post or top board from packaging to protect coil of unit from damage by rigging cable. Use bumper boards for spreader bars.

Installing Refrigerant Lines

Complete Refrigerant Piping Connections

Refrigerant lines must be carefully designed and constructed to ensure equipment reliability and efficiency.

Line length, pressure drop, compressor oil return, and vertical separation are several of the design criteria that must be evaluated. See Table 1.

IMPORTANT: Piping must be properly sized and installed for the system to operate efficiently.

CHECK VERTICAL SEPARATION – If there is any vertical separation between the indoor and outdoor units, check to ensure that the separation is within allowable limits. Relocate equipment if necessary. See Table 2.

SIZE REFRIGERANT LINES – Consider the length of the piping required between the outdoor and indoor units. The maximum allowable line length is 100 ft (30.5 m). See Table 1. Refrigerant suction piping should be insulated.

Carefully evaluate any vapor risers at minimum load conditions to ensure proper compressor oil return. If the indoor unit is above the outdoor unit, the riser will function as a hot gas riser. If the outdoor unit is above the indoor unit, the riser is a suction riser. Use a reduced diameter riser design and construct a double riser if necessary.

Table 1 - Refrigerant Piping Sizes

	Linear Length of Interconnecting Piping - Ft. (mm)						
	0 - 25 (0 - 7.5)		25 - 60 (7.5 - 18)		61 - 100 (18.3 - 30)		Maximum Liquid Line
	Line Size (in. OD)						
Unit	L	S	L	S	L	S	3/4
CHS180	5/8	1-5/8	3/4	1-5/8	3/4	1-5/8	

LEGEND
L – Liquid Line, S – Suction Line
*Maximum length of interconnecting pipe is 100 ft (30.5 m).

NOTES:

1. Pipe sizes are based on a 2° F (1° C) loss for liquid and suction lines.
2. Pipe sizes are based on the maximum linear length, shown for each column, plus a 50% allowance for fittings.
3. Charge units with R-22 in accordance with unit installation instructions.
4. Maximum line length must not exceed 100 ft (30.5 m).

Table 2 - Max. Vertical Separation Between Indoor & Outdoor Units

	Unit Evap.	Distance ft (m)
Unit	Above Unit Evap.	
CHS180	BHC180	80 (24.4)

INSTALL FILTER DRIER(S) AND MOISTURE INDICATOR(S) – Every unit should have a filter drier and liquid-moisture indicator (sight glass). In some applications, depending on space and convenience requirements, it may be desirable to install 2 filter driers and sight glasses. One filter drier and sight glass may be installed at A locations in Fig. 3. Or, 2 filter driers and sight glasses may be installed at B locations.

Select the filter drier for maximum unit capacity and minimum pressure drop. Complete the refrigerant piping from indoor unit to outdoor unit before opening the liquid and suction lines at the outdoor unit.

WARNING

Recover R-22 holding charge before removing runaround liquid piping loop. Failure to recover holding charge before removing piping loop could result in equipment damage and severe injury.

MAKE PIPING CONNECTIONS

1. Open service valves in sequence:
   a. Discharge service valve on compressor.
   b. Suction service valve on compressor.
   c. Liquid line valve.
2. Remove 1/4 -in. flare cap from liquid valve Schrader port.
3. Attach refrigerant recovery device and recover holding charge.
4. Remove runaround loop.
5. Connect system liquid line from liquid connection of outdoor unit(CHS) to indoor unit liquid line connections. Select proper field- supplied bi-flow filter driers and install in the liquid line. See Fig. 2. Install a field-supplied liquid moisture indicator between the filter drier(s) and the liquid connections on the indoor unit. Braze or silver alloy solder all connections.

Pass nitrogen or other inert gas through piping while making connections to prevent formation of copper oxide. (Copper oxides are extremely active under high temperature and pressure. Failure to prevent collection of copper oxides may result in system component failures.)

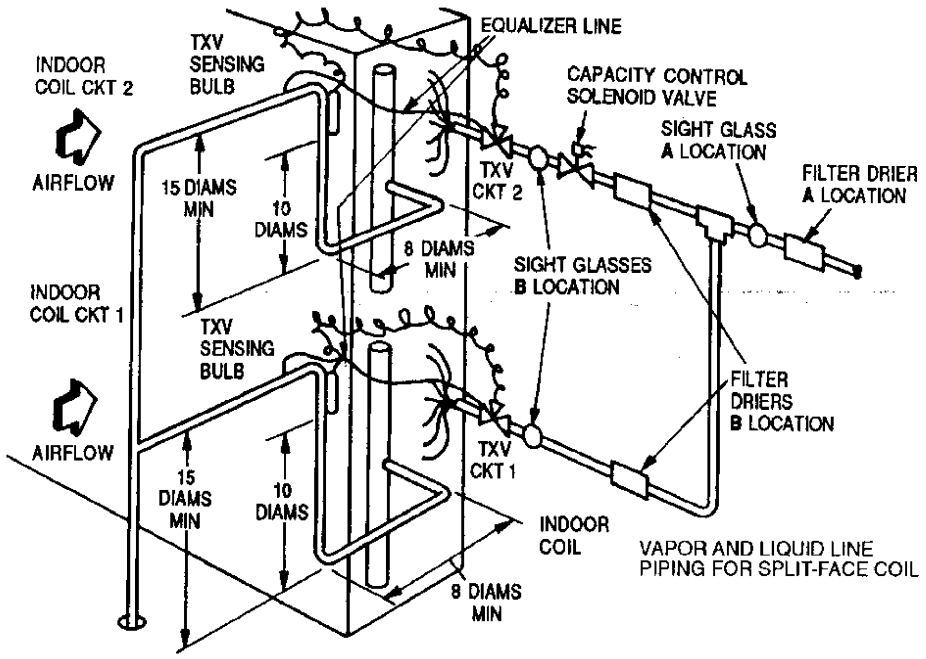
VAPOR LINE PIPING PROCEDURE – Connect system vapor line to the vapor line stub on the outdoor unit and the vapor stubs on the indoor unit. At the indoor unit, construct vapor piping branches as shown in Fig. 3 for good mixing of the refrigerant leaving the indoor coil during cooling. This will ensure proper TXV (thermostatic expansion valve) bulb sensing. Where vapor line is exposed to outdoor air, line must be insulated. See Table 3 for insulation requirements.

Table 3 - Insulation for Vapor Line Exposed to Outdoor Conditions			
Length of Exposed Vapor Line*		Insulation Thickness	
feet	meter	inches	mm
10	3	3/8	10
25	8	1/2	13
35	11	3/4	19
50	15	3/4	19

*Recommended vapor line insulation for piping exposed to outdoor conditions to prevent loss of heating during heating cycle. When vapor line goes through interior spaces, insulation should be selected to prevent condensation on cooling cycle. Heating capacity should be reduced 1000 Btuh (295 W) if over 35 ft (11 m) of vapor line with 3/4 in. (19 mm) insulation is exposed to outdoor conditions.

+Closed cell foam insulation with a thermal conductivity of: 0.28 Btu • in./ft 2 • h • °F (0.04W/m • °C).

Fig. 3 — Location of Sight Glass(es) and Filter Driers (Typical)



LEGEND

TXV — Thermostatic Expansion Valve

Electrical Wiring

WARNING

Electrical Shock Hazard.

Failure to shut off electric power could result in, property damage, personal injury and/or death.

Shut off electric power at fuse box or service panel before making any electrical connections.

POWER WIRING – Electrical characteristics of available power supply and power supply tolerances must agree with nameplate rating. Phase imbalance must not exceed 2%. Operation of unit on improper supply voltage or with excessive phase imbalance constitutes abuse and is not covered by warranty. See Fig. 4 to determine phase imbalance.

Unit is factory wired for voltage shown on nameplate. Provide adequate fused disconnect switch within sight from unit and readily accessible from unit, but out of the reach of children. Lock switch open (off) to prevent power from being turned on while unit is being serviced. Disconnect switch, fuses, and field wiring must comply with national and local code requirements.

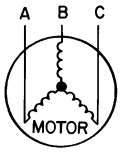
Route power wires through opening in unit end panel to connection in unit control box as shown on unit label diagram. Unit must be grounded.

Fig. 4 | Determining Phase Imbalance

Unbalanced 3-Phase Supply Voltage

Never operate a motor where a phase imbalance in supply voltage greater than 2%. Use the following formula to determine the percent voltage imbalance.

EXAMPLE: Supply voltage is 460-3-60.



AB = 452 v
BC = 464 v
AC = 455 v

$$\text{Average Voltage} = \frac{452 + 464 + 455}{3} = \frac{1371}{3} = 457$$

Determine maximum deviation from average voltage.
(AB) 457 - 452 = 5 V
(BC) 464 - 457 = 7 V
(AB) 457 - 455 = 2 V
Maximum deviation is 7 v.

Determine percent voltage imbalance.

$$\% \text{ Voltage Imbalance} = 100 \times \frac{7}{457} = 1.53\%$$

This amount of phase imbalance is satisfactory as it is below the maximum allowable 2%.

IMPORTANT: If the supply voltage phase imbalance is more than 2%, contact your local electric utility company immediately .

If unit will be operating at 208-3-60 power, remove the wire from the transformer primary connection labelled "230" and move it to the connection labelled "208". See Fig. 5. For 460v wiring and details, see Fig. 6.

CONTROL CIRCUIT WIRING – Control voltage is 24 v. See unit label diagram for field-supplied wiring details. Route control wires through opening in unit end panel to connection in unit control box.

A crankcase heater is wired in the control circuit so it is always operable as long as power supply disconnect is on, even if any safety device is open or unit stop/start switch is off.

Fig. 5 208/230 Volt Wiring Details

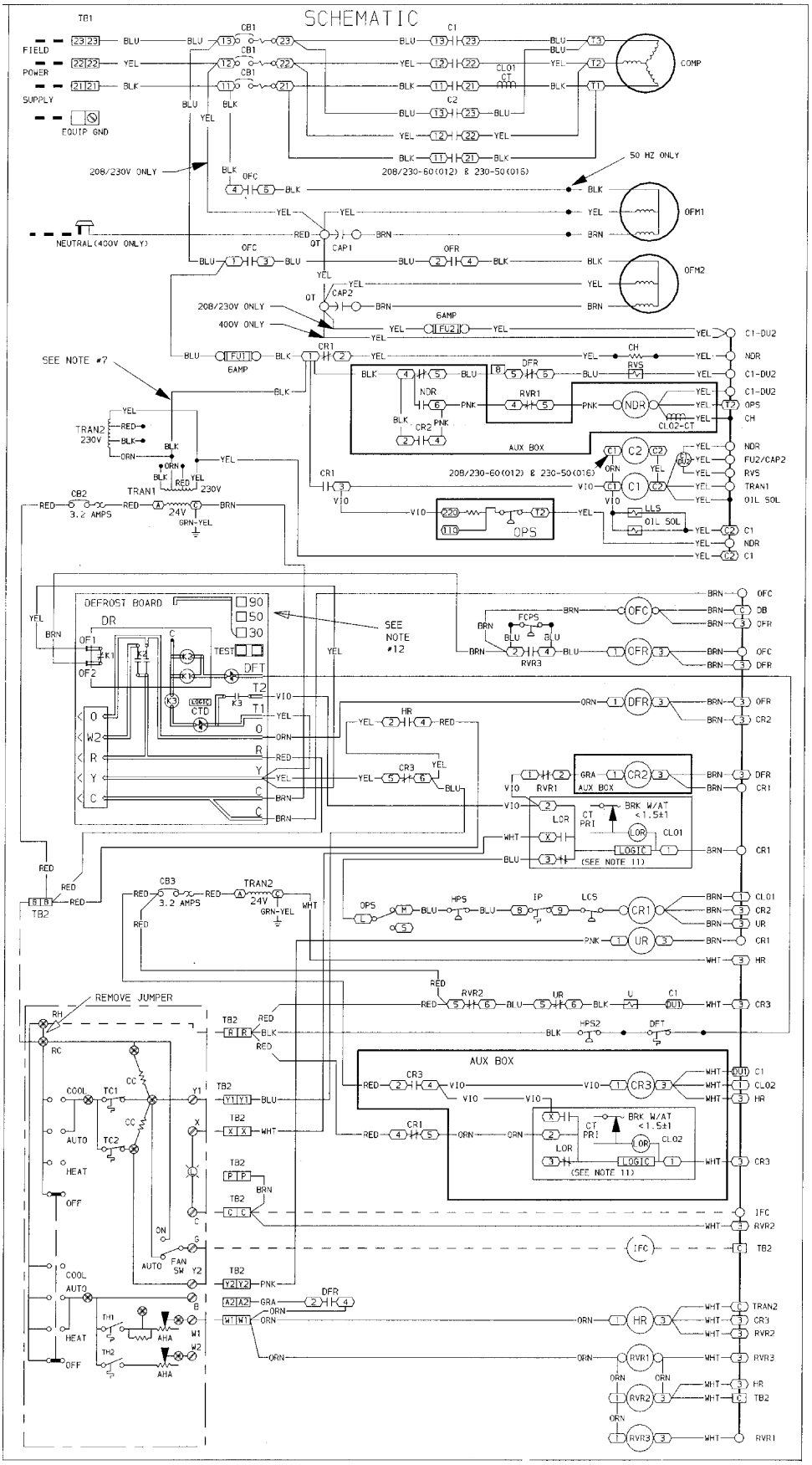
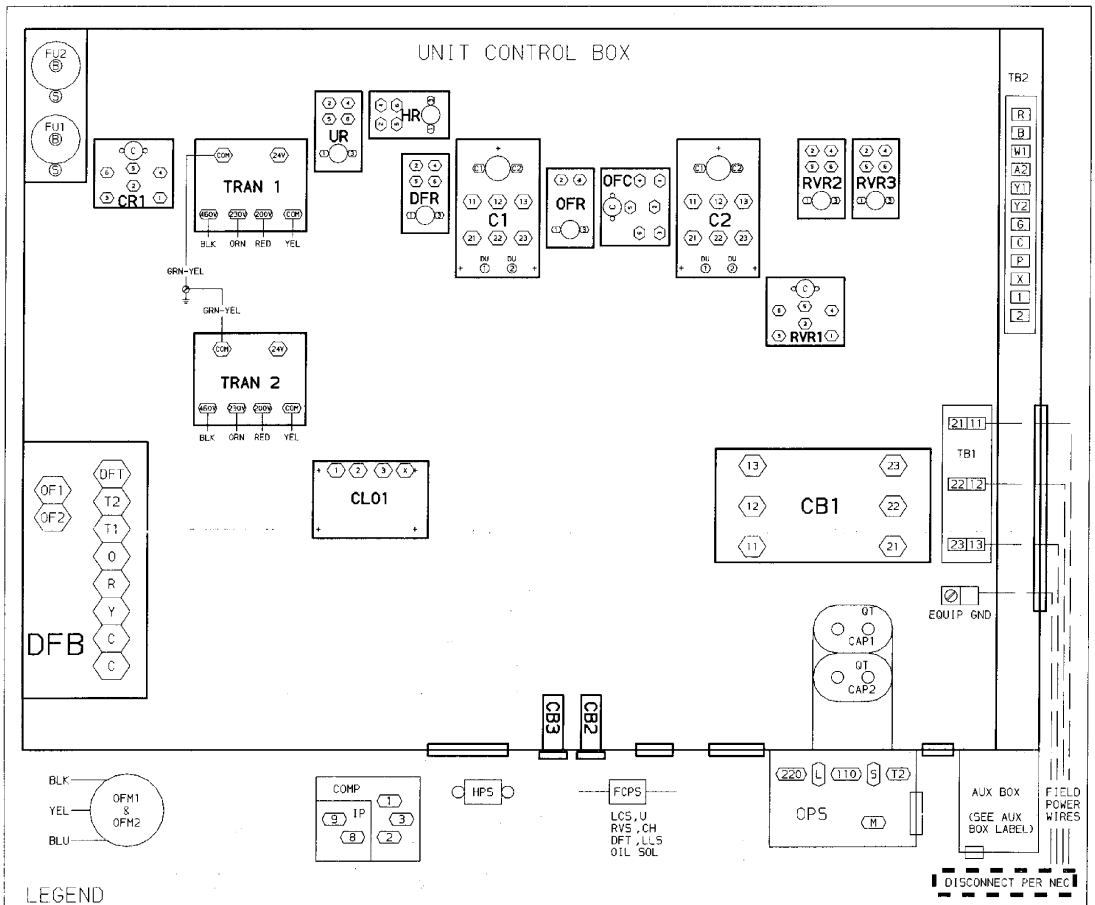


Fig. 5 | 208/230 Volt Wiring Details – Cont. with control box.



LEGEND

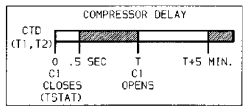
⊘	TERMINAL (PCB,FIELD)	•	SPLICE (FACTORY)
▨	TERMINAL (PCB,FACTORY)	⌓	SPLICE (FIELD)
⟨X⟩	TERMINAL (MARKED)	⟨X⟩•	SPLICE (MARKED WIRE)
○	TERMINAL (UNMARKED)		
[X]	TERMINAL BLOCK		

WIRING FACTORY					
WIRING FIELD CONTROL					
WIRING FIELD POWER					
OPTION OR ACCESSORY					
PCB RUN					
AHA	ADJUSTABLE HEAT ANTICIPATOR	FU	FUSE	OS	OIL SOLENOID
C	CONTACTOR	GND	GROUND	PCB	PRINTED CIRCUIT BOARD
CAP	CAPACITOR	HPS	HIGH PRESSURE SWITCH	QT	QUADRUPLE TERMINAL
CB	CIRCUIT BREAKER	HR	HEATING RELAY	RC	COOLING CONNECTION (THERMOSTAT)
CC	COOLING COMPENSATOR	IFC	INDOOR FAN CONTACTOR	RH	HEATING CONNECTION (THERMOSTAT)
CH	CRANKCASE HEATER	IP	INTERNAL PROTECTOR	RVR	REVERSING VALVE RELAY
CLO	COMPRESSOR LOCKOUT	L	LIGHT	RVS	REVERSING VALVE SOLENOID
COMP	COMPRESSOR	LCS	LOSS OF CHARGE SWITCH	SOL	SOLENOID
CR	CONTROL RELAY	LLS	LIQUID LINE SOLENOID	TB	TERMINAL BLOCK TERMINAL
DFR	DEFROST RELAY	NDR	NO DUMP RELAY	TC	THERMOSTAT-COOLING
DFT	DEFROST THERMOSTAT	OFC	OUTDOOR FAN CONTACTOR	TH	THERMOSTAT-HEATING
DFB	DEFROST BOARD	OFM	OUTDOOR FAN MOTOR	TRAN	TRANSFORMER
EQUIP	EQUIPMENT	OFR	OUTDOOR FAN RELAY	U	UNLOADER
FCPS	FAN CYCLING PRESSURESTAT	OPS	OIL PRESSURE SWITCH	UR	UNLOADER RELAY

NOTES:

1. COMPRESSOR AND FAN MOTOR(S) THERMALLY PROTECTED-- THREE PHASE MOTORS ARE PROTECTED AGAINST PRIMARY SINGLE PHASING CONDITIONS.
2. IF ANY OF THE ORIGINAL WIRE FURNISHED MUST BE REPLACED, IT MUST BE REPLACED WITH TYPE 90°C WIRE OR ITS EQUIVALENT.
3. TERMINAL BLOCK 2 (TB2) IS FOR FIELD EXTERNAL CONTROL CONNECTIONS. CLASS 2 WIRING: SUPPLY VOLTAGE AT TB2 IS 24VAC. MAXIMUM POWER AVAILABLE AT TB2 IS 31.5VA
4. FIELD SUPPLIED COMPONENT RATINGS, IFC SEALED COIL RATING (24VAC) 12VA MAX.
5. N/A
6. USE COPPER COPPER-CLAD ALUMINUM OR ALUMINUM CONDUCTORS FOR FIELD POWER SUPPLY ONLY.
7. INSULATE UNUSED LEAD WHEN CHANGING TAP FOR 208 VOLT USE.
8. THE CB MUST TRIP AMPS ARE EQUAL TO OR LESS THAN 140% FLA
9. SET THERMOSTAT HEAT ANTICIPATOR(S) FOR 1ST STAGE .79 FOR 2ND STAGE .63
10. THE CLO LOCKS OUT THE COMPRESSOR TO PREVENT SHORT CYCLING ON COMPRESSOR OVERLOAD AND SAFETY DEVICES. BEFORE REPLACING CLO CHECK THESE DEVICES.
11. REMOVE JUMPER BETWEEN RC & RH.
12. DEFROST CYCLE TIME IS FACTORY SET AT 30 MIN.

MODEL NUMBER	VOLTS	COMP CB		
		MFG. PT NO.		MUST TRIP AMPS
		HEINEMAN	AIRPAX	
CHS180H	208/230	47-100-91	209-3-2599-378	89



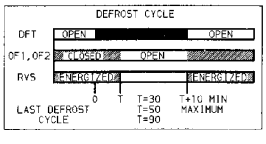


Fig. 6 460 Volt Wiring Details

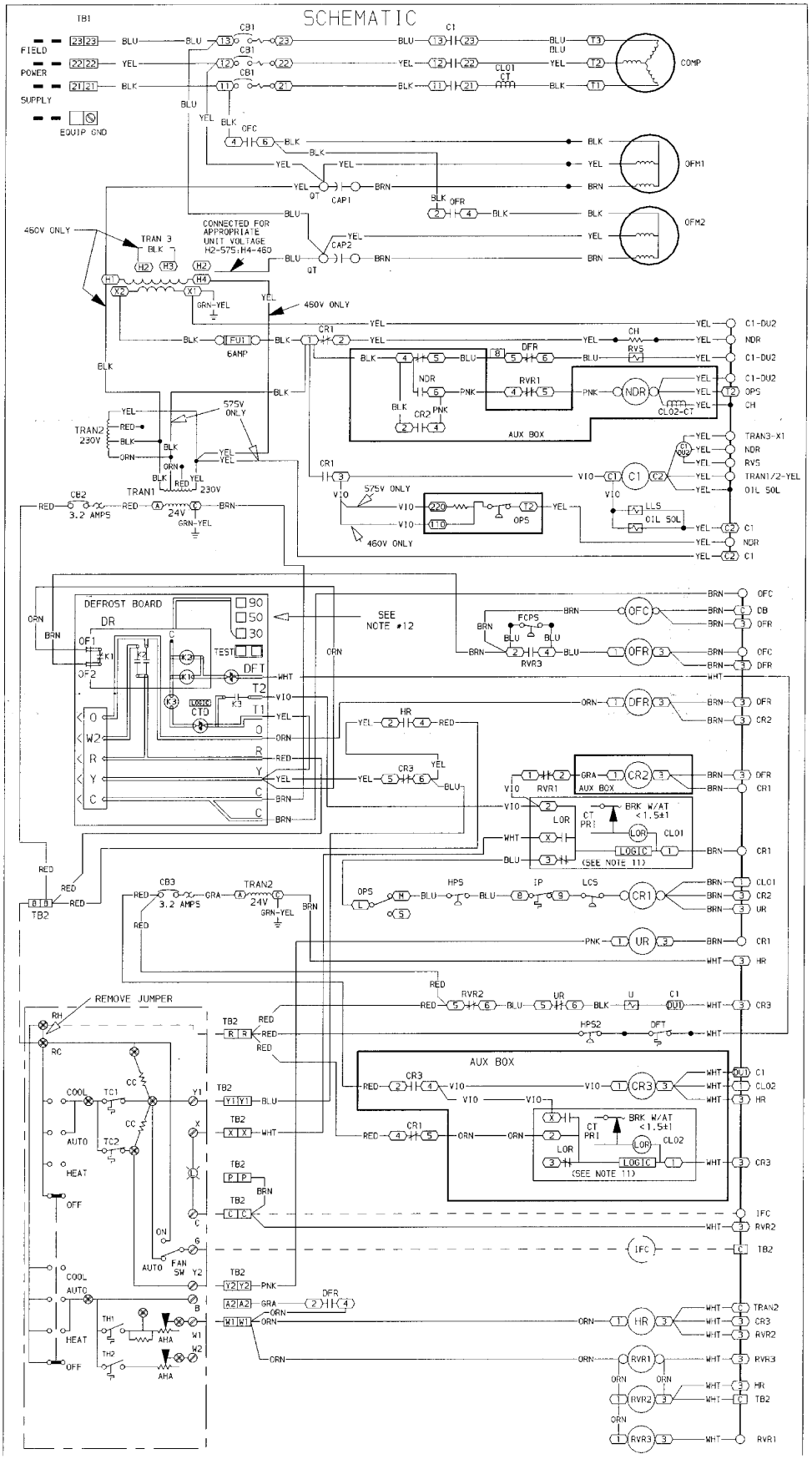
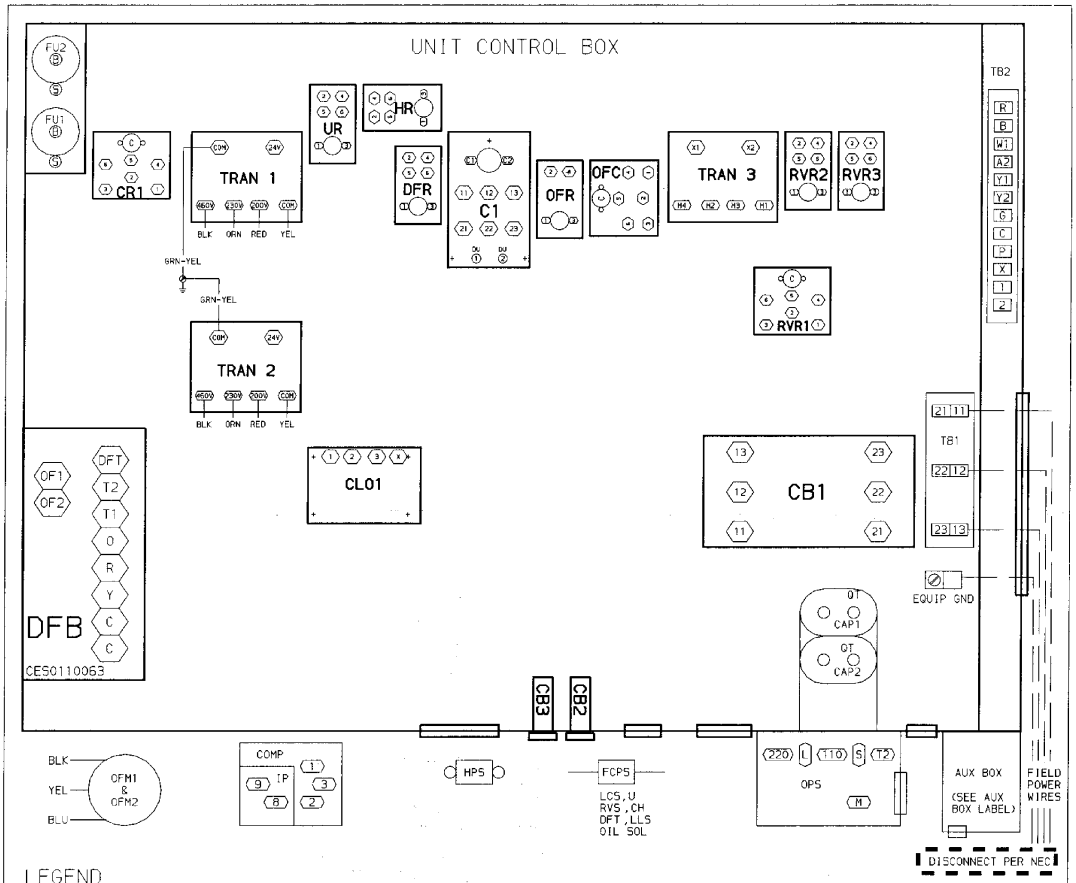


Fig. 6 | 460 Volt Wiring Details – Cont. with control box.



LEGEND

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▨	TERMINAL (PCB,FACTORY)	⊓	SPLICE (FIELD)
⟨X⟩	TERMINAL (MARKED)	⟨X⟩•	SPLICE (MARKED WIRE)
○	TERMINAL (UNMARKED)		
[X]	TERMINAL BLOCK		

———	WIRING FACTORY				
— — -	WIRING FIELD CONTROL				
——— -	WIRING FIELD POWER				
———	OPTION OR ACCESSORY				
═══	PCB RUN				

AHA	ADJUSTABLE HEAT ANTICIPATOR	FU	FUSE	OS	OIL SOLENOID
C	CONTACTOR	GND	GROUND	PCB	PRINTED CIRCUIT BOARD
CAP	CAPACITOR	HPS	HIGH PRESSURE SWITCH	QT	QUADRUPLE TERMINAL
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CLO	COMPRESSOR LOCKOUT	L	LIGHT	RVS	REVERSING VALVE SOLENOID
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DFT	DEFROST THERMOSTAT	OFC	OUTDOOR FAN CONTACTOR	TH	THERMOSTAT-HEATING
DFB	DEFROST BOARD	OFM	OUTDOOR FAN MOTOR	TRAN	TRANSFORMER
EQUIP	EQUIPMENT	OFR	OUTDOOR FAN RELAY	U	UNLOADER
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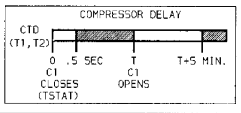
4 FIELD SUPPLIED COMPONENT RATINGS, IFC SEALED COIL RATING (24VAC) 12VA MAX.
5 N/A
6 USE COPPER COPPER-CLAD ALUMINUM OR ALUMINUM CONDUCTORS FOR FIELD POWER SUPPLY ONLY.
7 INSULATE UNUSED LEAD WHEN CHANGING TAP FOR 208 VOLT USE.
8 THE CB MUST TRIP AMPS ARE EQUAL TO OR LESS THAN 140% FLA
9 SET THERMOSTAT HEAT ANTICIPATOR(S) FOR 1ST STAGE .79 FOR 2ND STAGE .63
10 THE CLO LOCKS OUT THE COMPRESSOR TO PREVENT SHORT CYCLING ON COMPRESSOR OVERLOAD AND SAFETY DEVICES. BEFORE REPLACING CLO CHECK THESE DEVICES.
11 REMOVE JUMPER BETWEEN RC & RH.
12 DEFROST CYCLE TIME IS FACTORY SET AT 30 MIN.

MODEL NUMBER	VOLTS	COMP CB		
		MFG. PT NO.		MUST TRIP AMPS
		HEINEMAN	AIRPAX	
CHS180L	460	CF3-Z33-21	219-3-2600-422	40



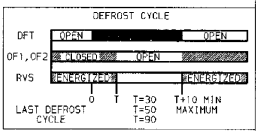
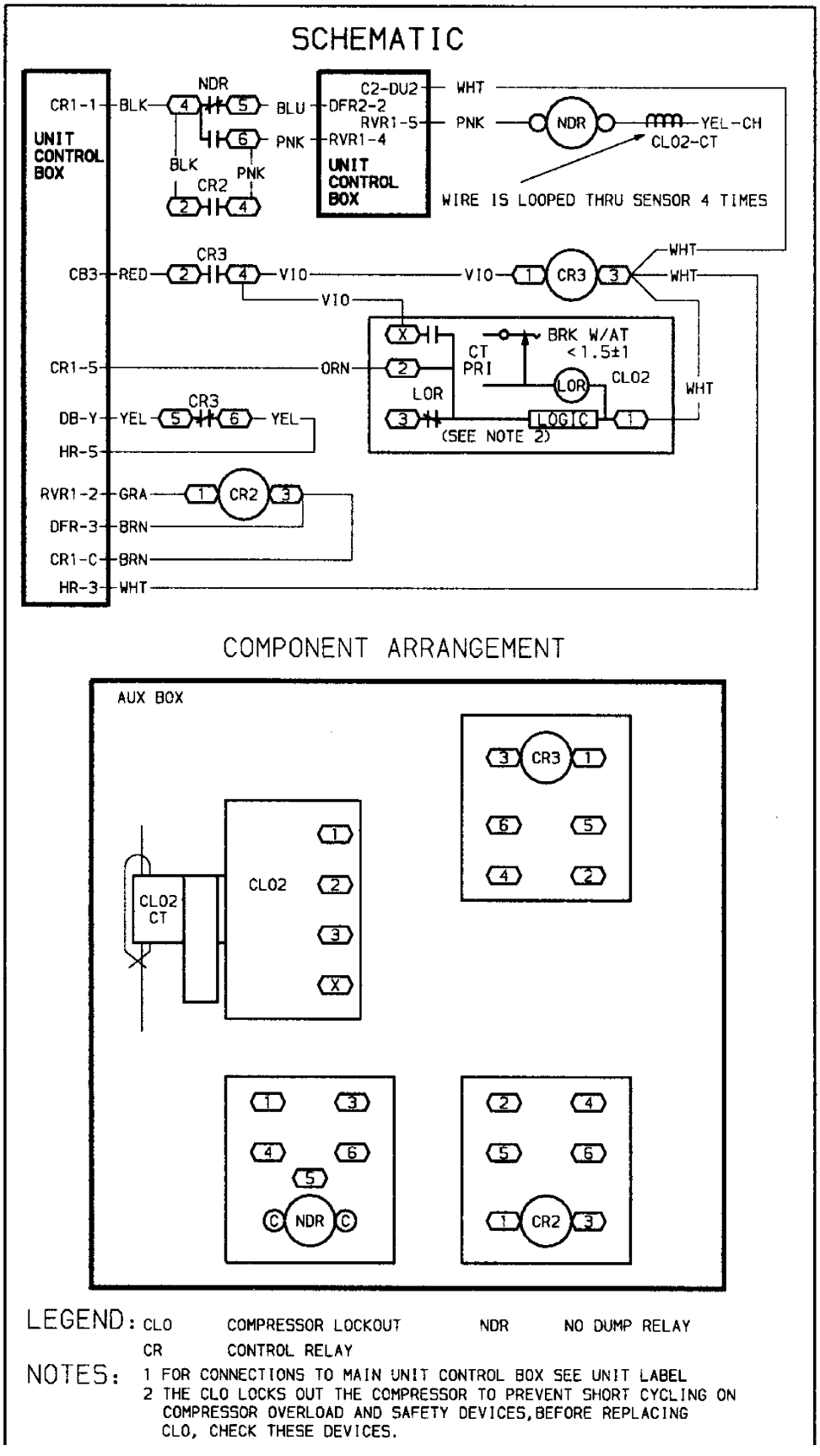


Fig. 6 | **Auxiliary Box Diagram**



LEGEND: CLO COMPRESSOR LOCKOUT NDR NO DUMP RELAY
CR CONTROL RELAY

NOTES:
1 FOR CONNECTIONS TO MAIN UNIT CONTROL BOX SEE UNIT LABEL
2 THE CLO LOCKS OUT THE COMPRESSOR TO PREVENT SHORT CYCLING ON COMPRESSOR OVERLOAD AND SAFETY DEVICES, BEFORE REPLACING CLO, CHECK THESE DEVICES.

Pre-Start-Up

CAUTION

Do not attempt to start the condensing unit, even momentarily, until the following steps have been completed. Compressor damage may result.

System Check

1. Check all air handler(s) and other equipment auxiliary components. Consult the manufacturer's instructions regarding any other equipment connected to the condensing unit. If unit has field-installed accessories, be sure all are properly installed and correctly wired. If used, airflow switch must be properly installed.
2. Backseat (open) compressor suction and discharge valves. Now close valves one turn to allow refrigerant pressure to reach test gages.
3. Open liquid line service valve.
4. Check tightness of all electrical connections.
5. Be sure unit is properly leak checked, dehydrated, and charged.
6. Electrical power source must agree with nameplate rating.
7. Crankcase heater must be firmly locked into compressor crankcase. Be sure crankcase is warm (heater must be on for 24 hours before starting compressor).

Start-Up

Compressor crankcase heater must be on for 24 hours before start-up. After the heater has been on for 24 hours, the unit can be started.

COMPRESSOR OVERLOAD - This overload interrupts power to the compressor when either the current or internal motor winding temperature becomes excessive, and automatically resets when the internal temperature drops to a safe level.
This overload may require up to 60 minutes (or longer) to reset. If the internal overload is suspected of being open, disconnect the electrical power to the unit and check the circuit through the overload with an ohmmeter or continuity tester.

START UNIT - The field disconnect is closed, the fan circuit breaker is closed, and the space thermostat is set above ambient so that there is no demand for cooling. Only the crankcase heater will be energized.

Next, close the compressor circuit breaker and then reset space thermostat below ambient so that a call for cooling is ensured.

NOTE: Do not use circuit breaker to start and stop the compressor except in an emergency.

After starting, there is a delay of at least 3 seconds before compressor starts.

Refrigerant Charge

The Condensing unit is pressurized with a holding charge of refrigerant. Recover R-22 holding charge into the system.

Add charge amount as required for the total system, See Table 4.

Unit must be charged in the Cooling Mode only.

Table 4 - Refrigerant Charge	
Refrigerant Type	R-22
Operating Charge (lb. oz.)*	37 - 0

*The charge amount is related to a length of 25ft. used in liquid and suction lines. Note: Add or remove the refrigerant charge (.083lb/ft) when liquid and suction lines have different lengths than 25ft.

FINAL CHECKS - Ensure all safety controls are operating, control panel covers are on, and the service panels are in place.

Compressor crankcase heater must be on for 24 hours before start-up. To energize the crankcase heater, set the space thermostat above the ambient temperature so there is no demand for cooling. Close the field disconnect.

The crankcase heater is now energized.

After the heater has been on for 24 hours, the unit can be started. If no time has elapsed since the preliminary charge step was completed, it is unnecessary to wait the 24-hour period.

START UNIT - Close the field disconnect and set the Space thermostats above ambient temperature so that there is no demand for cooling. Only the crankcase heaters will be energized.

Place thermostat selector switch at COOL and set space set point below ambient temperature so that a call for cooling is ensured. If compressor does not start, set thermostat lower.

CHECK HEATING CYCLE OPERATION - Place thermostat selector switch at HEAT and reset the space set point above ambient temperature so that a call for heating is ensured. Compressor will start. Observe system operation.

Operating Sequence

HEATING – Place thermostat selector at HEAT and set temperature selector above room ambient.

COOLING – Place thermostat selector at COOL and set temperature selector below room ambient.

When thermostat calls for unit operation (either heating or cooling), the indoor–fan motor starts immediately. The outdoor–fan motors and compressor start within 3 seconds to 5 minutes depending on when unit was last shut off by thermostat, because unit contains a compressor time delay circuit. When first–stage cooling is required, thermostat (TC1) closes, causing the heat pump to start with an unloaded compressor. When TC2 closes, demanding additional cooling, the compressor loads to full load operation.

During heating, compressor is always fully loaded. When TH1 demands first–stage heating, the heat pump starts within 3 seconds to 5 minutes depending on when unit was last shut off by thermostat, because unit contains a compressor time delay circuit. (The defrost board has speed terminals to shorten this cycle.) When TH2 of the thermostat closes, auxiliary heat supply (electric strip heat) is energized in 1 or 2 stages depending on number of stages available and whether outdoor thermostats are closed.

Defrost Cycle

Defrost is achieved by reversal from heating to cooling cycle and deenergization of outdoor–fan motors, allowing hot refrigerant gas to defrost outdoor coil. Defrost is achieved with a timer set to initiate defrost every 30, 50, or 90 minutes (factory set at 30 minutes).

Defrost is initiated when refrigerant temperature leaving the outdoor coil is measured below 27 F (2.8 C), (typically when the outdoor ambient temperature is below 45 F [7.2 C] as sensed by the defrost thermostat [DFT]).

Defrost is terminated when: The refrigerant temperature rises to 65 F (18.3 C) (80 F [26.7 C] for CHS180) at the DFT location on the liquid line; or the refrigerant pressure rises to 280 psig (1931 kPag) at the HPS2 location on the liquid line; or the defrost timer completes the 10–minute cycle.

Air Circulation

When the fan switch is at FAN ON, the indoor–air fans operate continuously to provide ventilation. The thermostat operates the other components as described above.

Emergency Heat Cycle

If the compressor is inoperative due to a tripped safety device, the second stage of the thermostat automatically energizes the indoor–air fan and the electric resistance heaters.

If desired, the compressor can be manually locked out by setting the thermostat for emergency heat. In this instance, the emergency heat indicator light on the thermostat assembly is illuminated.

Service

Compressor Removal

1. Shut off power to unit. Remove unit access panel.
2. Recover refrigerant from system using refrigerant recovery methods in accordance with local and national standards.
3. Disconnect compressor wiring at compressor terminal box.
4. Disconnect refrigerant lines from compressor.
5. Remove screws from compressor mounting plate.
6. Remove or disconnect crankcase heater from compressor base.
7. Remove compressor from unit.
8. Clean system. Add new liquid line filter drier.
9. Install new compressor on compressor mounting plate and position in unit. Connect suction and discharge lines to compressor. Secure mounting plate with compressor to unit.
   Connect wiring. Install crankcase heater.
10. Evacuate and recharge unit.
11. Restore unit power.

Follow safety codes and wear safety glasses and work gloves.

Crankcase Heater – The heater prevents refrigerant migration and compressor oil dilution during shutdown whenever compressor is not operating.

Both compressor service valves must be closed whenever the crankcase heater is deenergized for more than 6 hours. The crankcase heater is operable as long as the control circuit is energized.

Outdoor Unit Fans – Each fan is supported by a formed–wire mount bolted to the fan deck and covered with a wire guard. Fan motors have permanently lubricated bearings. The exposed end of the motor shaft is covered with a rubber boot. In case a fan motor must be repaired or replaced, be sure the rubber boot is put back on when the fan is reinstalled and be sure the fan guard is in place before starting the unit.

Coil Cleaning and Maintenance – This section discusses the cleaning and the maintenance of standard coils. Routine cleaning of coil surfaces is essential to minimize contamination build–up and remove harmful residue. Inspect coils monthly and clean as required.

CLEANING STANDARD COILS – Standard coils can be cleaned with a vacuum cleaner, washed out with low velocity water, blown out with compressed air, or brushed (do not use wire brush). Fan motors are dripproof but not waterproof. Do not use acid cleaners.

Clean coil annually or as required by location or outdoor air conditions. Inspect coil monthly and clean as required. Fins are not continuous through coil sections. Dirt and debris may pass through first section and become trapped, restricting condenser airflow. Use a flashlight to determine if dirt or debris has collected between coil sections.

Clean coil as follows:

1. Turn off unit power.
2. Remove screws holding rear corner posts and top cover in place. Pivot top cover up 12 to 18 in. (300 to 450 mm) and support with a board or other adequate rigid support. See Fig. 7.
3. Remove clips securing tube sheets together at the return bend end of the coil. Carefully spread the ends of the coil rows apart by moving the outer sections. See Fig. 8.
4. Using a water hose or other suitable equipment, flush down between the sections of coil to remove dirt and debris.
5. Clean the remaining surfaces in the normal manner.
6. Reposition outer coil sections. Reinstall clips which secure tube sheets, and replace top cover and rear corner posts.
7. Restore unit power.

Figure 7 – Pivot and Support Top Cover

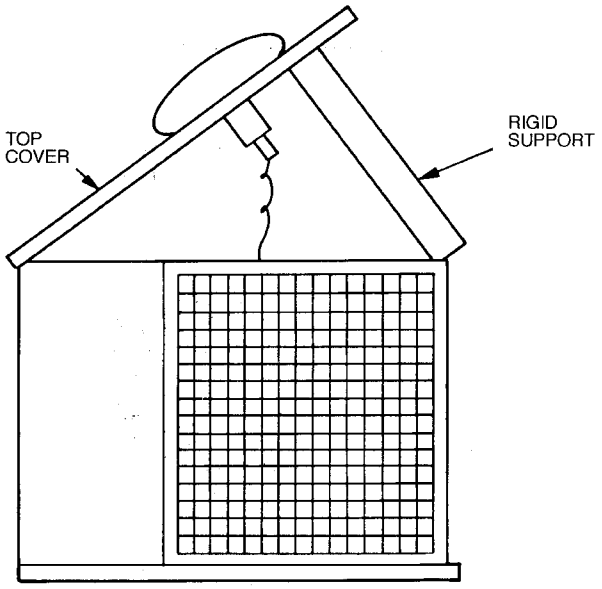
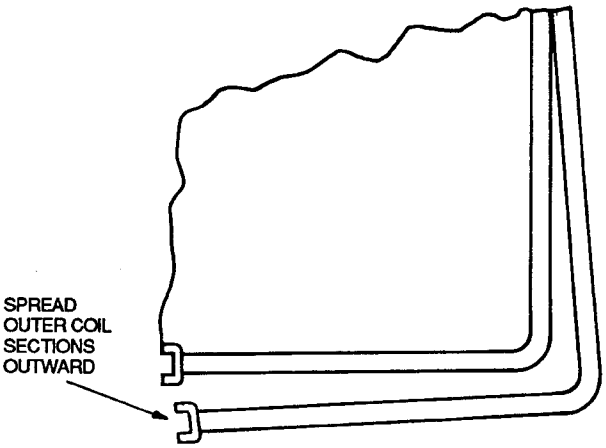
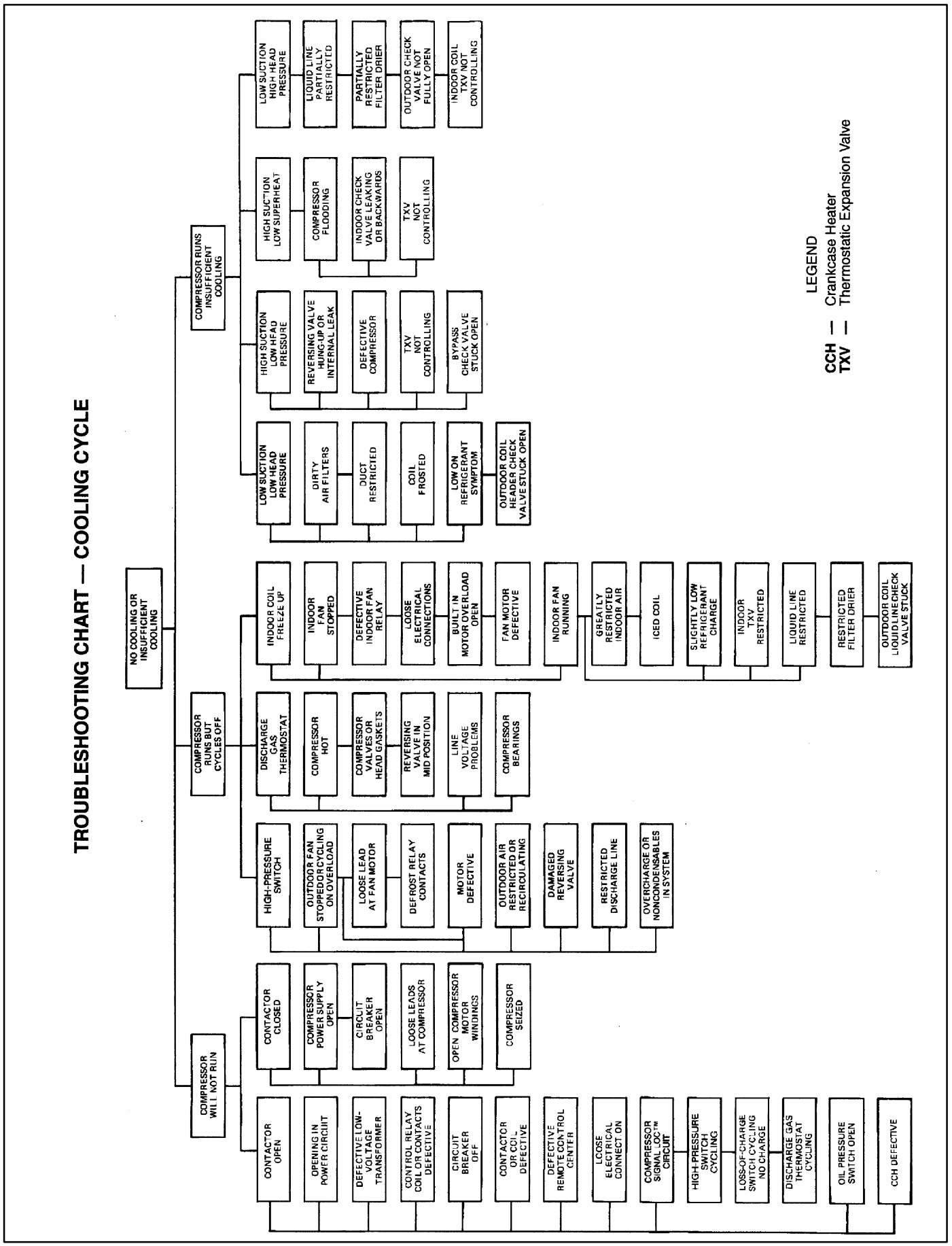
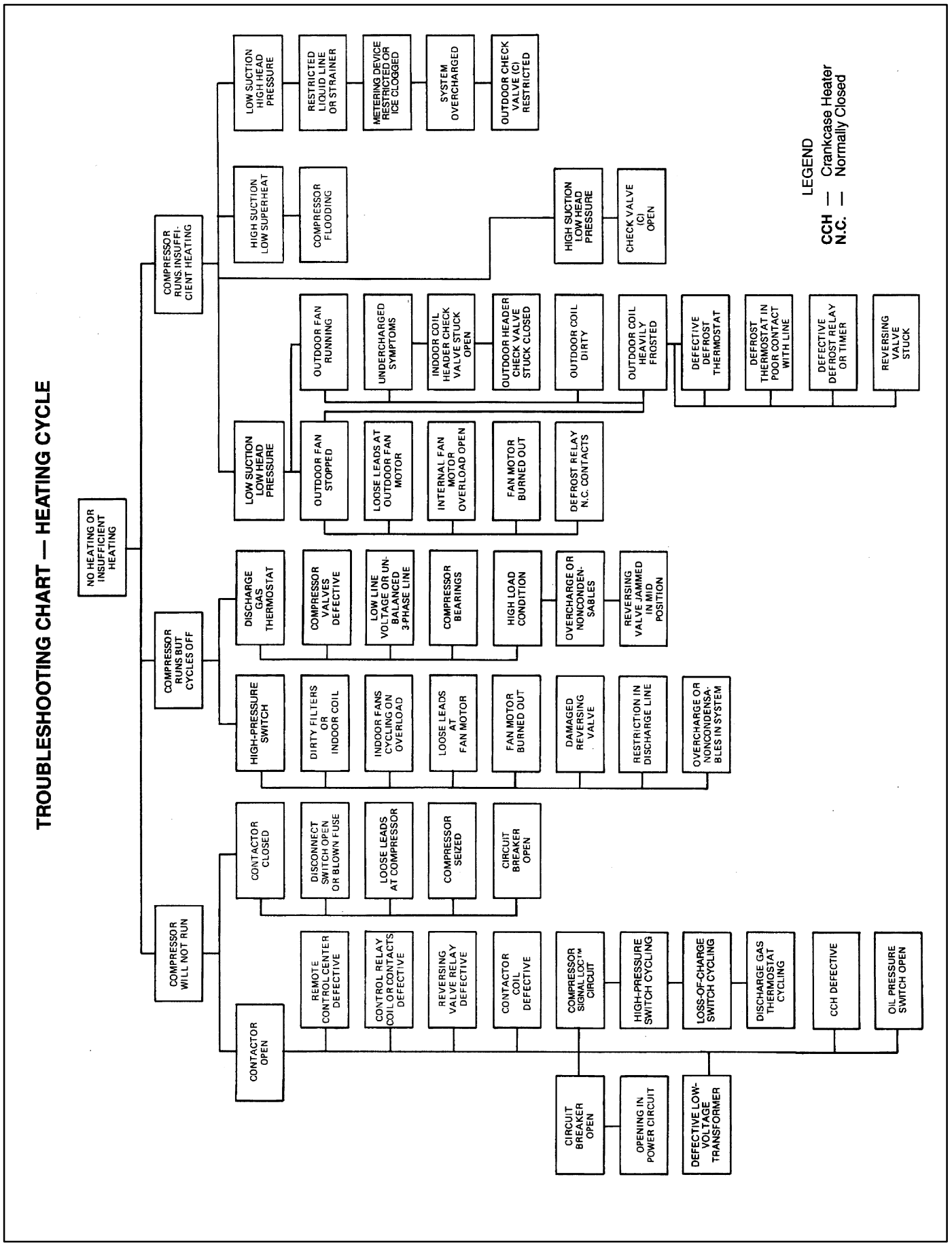


Figure 8 – Coil Cleaning (Typical)




TROUBLESHOOTING CHART — COOLING CYCLE
NO COOLING OR INSUFFICIENT COOLING
COMPRESSOR WILL NOT RUN
CONTACTOR OPEN
OPENING IN POWER CIRCUIT
DEFECTIVE LOW-VOLTAGE TRANSFORMER
CONTROL RELAY COIL OR CONTACTS DEFECTIVE
CIRCUIT BREAKER OFF
CONTACTOR OR COIL DEFECTIVE
DEFECTIVE REMOTE CONTROL CENTER
LOOSE ELECTRICAL CONNECTION
COMPRESSOR SIGNAL LOC™ CIRCUIT
HIGH-PRESSURE SWITCH CYCLING
LOSS-OF-CHARGE SWITCH CYCLING NO CHARGE
DISCHARGE GAS THERMOSTAT CYCLING
OIL PRESSURE SWITCH OPEN
CCH DEFECTIVE
CONTACTOR CLOSED
COMPRESSOR POWER SUPPLY OPEN
CIRCUIT BREAKER OPEN
LOOSE LEADS AT COMPRESSOR
OPEN COMPRESSOR MOTOR WINDINGS
COMPRESSOR SEIZED
COMPRESSOR RUNS BUT CYCLES OFF
HIGH-PRESSURE SWITCH
OUTDOOR FAN STOPPED OR CYCLING ON OVERLOAD
LOOSE LEAD AT FAN MOTOR
DEFROST RELAY CONTACTS
MOTOR DEFECTIVE
OUTDOOR AIR RESTRICTED OR RECIRCULATING
DAMAGED REVERSING VALVE
RESTRICTED DISCHARGE LINE
OVERCHARGE OR NONCONDENSABLES IN SYSTEM
DISCHARGE GAS THERMOSTAT
COMPRESSOR HOT
COMPRESSOR VALVES OR HEAD GASKETS
REVERSING VALVE IN MID POSITION
LINE VOLTAGE PROBLEMS
COMPRESSOR BEARINGS
INDOOR COIL FREEZE UP
INDOOR FAN STOPPED
DEFECTIVE INDOOR FAN RELAY
LOOSE ELECTRICAL CONNECTIONS
BUILT IN MOTOR OVERLOAD OPEN
FAN MOTOR DEFECTIVE
INDOOR FAN RUNNING
GREATLY RESTRICTED INDOOR AIR
ICED COIL
SLIGHTLY LOW REFRIGERANT CHARGE
INDOOR TXV RESTRICTED
LIQUID LINE RESTRICTED
RESTRICTED FILTER DRIER
OUTDOOR COIL LIQUID LINE CHECK VALVE STUCK
COMPRESSOR RUNS INSUFFICIENT COOLING
LOW SUCTION LOW HEAD PRESSURE
DIRTY AIR FILTERS
DUCT RESTRICTED
COIL FROSTED
LOW ON REFRIGERANT SYMPTOM
OUTDOOR COIL HEADER CHECK VALVE STUCK OPEN
HIGH SUCTION LOW HEAD PRESSURE
REVERSING VALVE HUNG-UP OR INTERNAL LEAK
DEFECTIVE COMPRESSOR
TXV NOT CONTROLLING
BYPASS CHECK VALVE STUCK OPEN
HIGH SUCTION LOW SUPERHEAT
COMPRESSOR FLOODING
INDOOR CHECK VALVE LEAKING OR BACKWARDS
TXV NOT CONTROLLING
LOW SUCTION HIGH HEAD PRESSURE
LIQUID LINE PARTIALLY RESTRICTED
PARTIALLY RESTRICTED FILTER DRIER
OUTDOOR CHECK VALVE NOT FULLY OPEN
INDOOR COIL TXV NOT CONTROLLING
LEGEND
CCH — Crankcase Heater
TXV — Thermostatic Expansion Valve


TROUBLESHOOTING CHART — HEATING CYCLE
NO HEATING OR INSUFFICIENT HEATING
COMPRESSOR WILL NOT RUN
CONTACTOR OPEN
CIRCUIT BREAKER OPEN
OPENING IN POWER CIRCUIT
DEFECTIVE LOW-VOLTAGE TRANSFORMER
CONTACTOR CLOSED
DISCONNECT SWITCH OPEN OR BLOWN FUSE
LOOSE LEADS AT COMPRESSOR
COMPRESSOR SEIZED
CIRCUIT BREAKER OPEN
REMOTE CONTROL CENTER DEFECTIVE
CONTROL RELAY COIL OR CONTACTS DEFECTIVE
REVERSING VALVE RELAY DEFECTIVE
CONTACTOR COIL DEFECTIVE
COMPRESSOR SIGNAL LOC™ CIRCUIT
HIGH-PRESSURE SWITCH CYCLING
LOSS-OF-CHARGE SWITCH CYCLING
DISCHARGE GAS THERMOSTAT CYCLING
CCH DEFECTIVE
OIL PRESSURE SWITCH OPEN
COMPRESSOR RUNS BUT CYCLES OFF
HIGH-PRESSURE SWITCH
DIRTY FILTERS OR INDOOR COIL
INDOOR FANS CYCLING ON OVERLOAD
LOOSE LEADS AT FAN MOTOR
FAN MOTOR BURNED OUT
DAMAGED REVERSING VALVE
RESTRICTION IN DISCHARGE LINE
OVERCHARGE OR NONCONDENSABLES IN SYSTEM
DISCHARGE GAS THERMOSTAT
COMPRESSOR VALVES DEFECTIVE
LOW LINE VOLTAGE OR UNBALANCED 3-PHASE LINE
COMPRESSOR BEARINGS
HIGH LOAD CONDITION
OVERCHARGE OR NONCONDENSABLES
REVERSING VALVE JAMMED IN MID POSITION
COMPRESSOR RUNS INSUFFICIENT HEATING
LOW SUCTION LOW HEAD PRESSURE
OUTDOOR FAN STOPPED
LOOSE LEADS AT OUTDOOR FAN MOTOR
INTERNAL FAN MOTOR OVERLOAD OPEN
FAN MOTOR BURNED OUT
DEFROST RELAY N.C. CONTACTS
OUTDOOR FAN RUNNING
UNDERCHARGED SYMPTOMS
INDOOR COIL HEADER CHECK VALVE STUCK OPEN
OUTDOOR HEADER CHECK VALVE STUCK CLOSED
OUTDOOR COIL DIRTY
OUTDOOR COIL HEAVILY FROSTED
DEFECTIVE DEFROST THERMOSTAT
DEFROST THERMOSTAT IN POOR CONTACT WITH LINE
DEFECTIVE DEFROST RELAY OR TIMER
REVERSING VALVE STUCK
HIGH SUCTION LOW SUPERHEAT
COMPRESSOR FLOODING
HIGH SUCTION LOW HEAD PRESSURE
CHECK VALVE (C) OPEN
LOW SUCTION HIGH HEAD PRESSURE
RESTRICTED LIQUID LINE OR STRAINER
METERING DEVICE RESTRICTED OR ICE CLOGGED
SYSTEM OVERCHARGED
OUTDOOR CHECK VALVE (C) RESTRICTED
LEGEND
CCH — Crankcase Heater
N.C. — Normally Closed