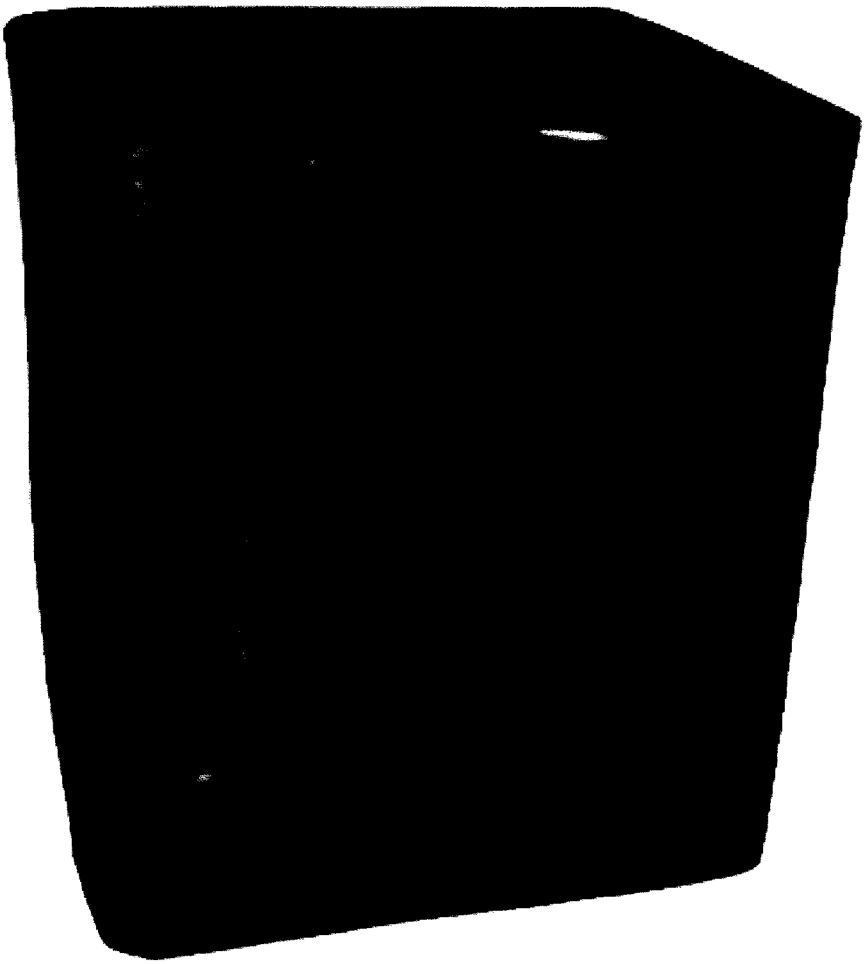
INSTALLATION & OPERATING INSTRUCTIONS



7-1/2 & 10 TON SPLIT SYSTEM HEAT PUMP

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2550 North Loop West, Suite 400
Houston, Texas 77092
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IO-229

12/02

I General Warnings

WARNING

Before servicing or installing this equipment, the electrical power to this unit **MUST** be in the "OFF" position. **CAUTION:** more than one disconnect may exist. Failure to observe this warning may result in an electrical shock that can cause serious personal injury or death.

WARNING

The unit **MUST** have an uninterrupted, unbroken electrical ground to minimize the possibility of personal injury if an electrical fault should occur. The electrical ground circuit must consist of an appropriately sized electrical wire connecting the ground lug in the unit control box wire to the building electrical service panel. Other methods of grounding are permitted if performed in accordance with the "National Electric Code" (NEC)/"American National Standards Institute" (ANSI)/"National Fire Protection Association" (NFPA) 70 and local/state codes. In Canada, electrical grounding is to be in accordance with the Canadian Electric Code CSA C22.1. Failure to observe this warning can result in electrical shock that can cause serious personal injury or death.

Due to high system pressure and electrical shock potential, installing and the servicing air conditioning systems can be hazardous. ONLY TRAINED AND QUALIFIED PERSONNEL ARE PERMITTED TO INSTALL OR SERVICE THIS EQUIPMENT. Observe ALL warnings contained in this manual and labels/tags attached to the equipment.

When installing or servicing this equipment, safety clothing including hand and eye protection is strongly advised. If installing this equipment in an area that has special safety requirements (hard hats etc.) observe these requirements. To protect the unit when welding close to the painted surfaces the use of a quenching cloth is strongly advised to prevent scorching or marring of the equipment finish.

Read these instructions before performing this installation or servicing this unit. All installations must be in accordance with all national, state, or local building codes.

II Model Identification

CPLE 090 - 3

Electrical Designation
3 - 208-230/3/60
4 - 460/3/60

Nominal Cooling Capacity
090 - 7 ½ Tons
120 - 10 Tons

Series Identification
CPLE - Louvered Series Heat Pump

III Product Description

When matched with the appropriate airhandler(s) or evaporator coil(s) the CPLE090/120 heat pump complies with the minimum efficiency requirements found in ASHRAE 90.1-1999. See the Goodman CPLE090/120 specification sheet for the indoor model selection recommendation.

The CPLE090/120 product operates in the same manner as most residential heat pumps. However, unlike some residential heat pumps, these products use a TXV in lieu of a flowrater/piston system for refrigerant management.

The CPLE series are intended for use with a single stage room thermostat. This thermostat is not supplied with this equipment. Only thermostats that use 24 VAC control circuitry are to be used.

Table 1.

	CPLE090	CPLE120
Net Weight (Lbs.)	365	415
Shipping Weight (Lbs.)	390	440
Refrigerant	R22	
Compressor Type	Scroll	
Quantity	1	
Oil Charge Initial/Recharge	85/81	110/106
Condenser Fan Type	Propeller	
Fan Diameter (in)	26	
Fan Motor Type	Direct Drive PSC	
Fan Motor (HP)	1	
Fan Motor (RPM)	1100	
Nominal Cond. Airflow (CFM)	6600	
Condenser Coil Material	Riffled Copper Tubes / Al Fins	
Face Area (Ft^2)	30	
Refrigerant Connections	Sweat Type	
Suction Line Connection (in)	1-3/8	
Liquid Line Connection(in)	5/8	
High Pressure Control (PSIG)	425 Cut-out / Manual Reset	
Low Pressure Control (PSIG)	7 Cut-out / 25 Cut-in	
Thermal Expansion Valve	1	

IV Ductwork Considerations

To ensure correct performance the indoor ductwork is to be sized to accommodate 375-425 CFM per ton of cooling with the static pressure not to exceed .5" WC. Inadequate ductwork that restricts airflow can result in improper cooling performance and compressor failure.

V Unit Inspection

Upon delivery, the unit is to be inspected for damage. Any damage must be reported immediately to the carrier. Do not install this equipment if it is determined that the integrity or safety has been compromised by freight damage.

Using the "Model Identification" section, check the equipment model number to ensure the following:

- Correct Size and Model
- Correct Voltage

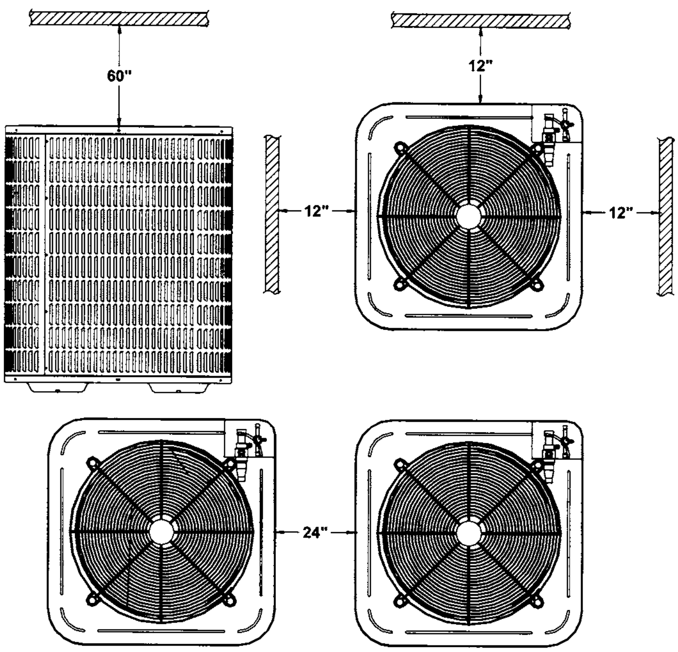
If an incorrect unit is supplied, it must **NOT** be installed and it is to be returned to the supplier. The manufacturer assumes no responsibility for the installation of incorrect delivered units.

VI Site Selection

This unit is designed for outdoor installations only.

Air Supply. The CPLE products are air-cooled heat pumps. To ensure the optimum unit performance, the installation site should provide unobstructed airflow. See Figure 1 for minimum clearances from other air-cooled condensers/heat pumps and obstructions such as walls or overhangs. ***Note:*** It is recommended that adequate service clearances also be considered.

Fiqure 1.



Refrigerant System Requirements. The selected site should be no greater than 50' below or 70' above the evaporator section. For optimum performance, the minimum length interconnecting tubing is preferred. When possible minimize the amount of bends and turns.

Wiring and Tubing Protection. Electrical wiring and refrigerant tubing is to be protected from damage due to incidental contact such as being walked upon.

Vibration and Sound Control. The CPLE series is engineered to produce the minimum sound and vibration. To minimize the possibility of either sound or vibration issues, the CPLE condenser is to be securely mounted to a surface that is:

- Solid
- Greatest practical mass
- Ridged
- Minimum radiating surface

When possible the slab for a ground level unit should not be connected to the wall or the building.

Prohibited Locations. Do not locate this unit in the following locations:

- Inside a building
- Directly under a vent termination from a gas appliance
- Within 3 feet of a clothes dryer vent
- Where water may rise into the unit

VII Typical Installations

The typical locations for the CPLE unit are slab mounted and roof mounted. For unit weight data, see the "Product Description" section of this manual.

Slab Mounting. The slab **MUST** be capable of supporting the weight of the unit. The slab should be a minimum of 6" wider than the unit in all directions. If required, the slab should be elevated to protect the unit from water damage due to flooding. Before installing the unit onto a slab, the wooden shipping skid **MUST** be removed.

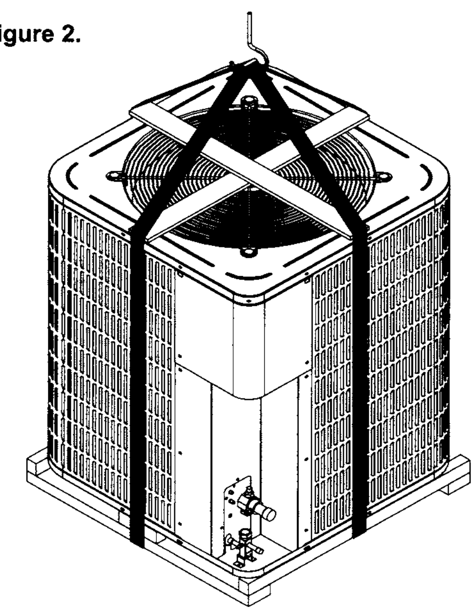
Roof Mounting. Give careful consideration to the load carrying capability of the roof. If possible, locate the unit where walls or partitions can offer additional support. If doubt exists regarding the integrity of the roof or its supporting structure, consult a structural engineer.

VIII Rigging

WARNING

All panels **MUST** be in position and secured before lifting this equipment.

Figure 2.



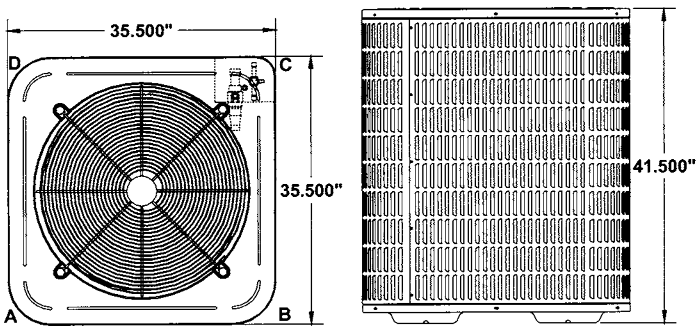
When lifting the unit, use spreader bars (field supplied). This practice will minimize the possibility of lifting cable/straps damage. Also, to protect the cabinet louvers, the use of protective material such as plywood behind the cables/straps is recommended.

Arrange the straps to form a central suspension point (see Figure 2 for details). When raising and setting the unit, observe all safety rules. When the unit is in position, the wooden shipping skid, all protection and lifting materials are to be removed.

IX Unit Corner Weight

The following table and sketch are to be used for determining the unit corner weight. The unit net weight and shipping weight is provided in the "Product Description" section, Page 2, of this manual.

Figure 3.



Corner	CPLE090	CPLE120
A	95 Lbs.	110 Lbs.
B	95 Lbs.	110 Lbs.
C	80 Lbs.	85 Lbs.
D	95 Lbs.	110 Lbs.

Table 2.

X Refrigerant Tubing

⚠ WARNING

To avoid overheating of the service valves, protect the valve with a wet rag or similar approved thermal heat trap. Failure to observe this practice can result in damage to the valve.

As previously noted, protective clothing and eye protection should be used when making any welded connection.

<u>Preparing the Tubing.</u> All cut ends are to be round, burr free and cleaned. Failure to follow this practice increases the chances for refrigerant leaks.

<u>Post Brazing.</u> Quench all welded joints with water or a wet rag.

<u>Piping Size</u> Use a carefully estimated length of refrigerant tubing (distance between condenser and evaporator). Apply the following table to determine the tubing diameter:

Table 3.

MODEL	0' - 24'		*25' - 49'		50' - 74'		75' - 99'	
	Outside Diameter Line Size (in.)							
	L	S	L	S	L	S	L	S
CPLE090	5/8	1-1/8	5/8	1-3/8	5/8	1-3/8	5/8	1-3/8
CPLE120	5/8	1-3/8	5/8	1-5/8	5/8	1-5/8	5/8	1-5/8

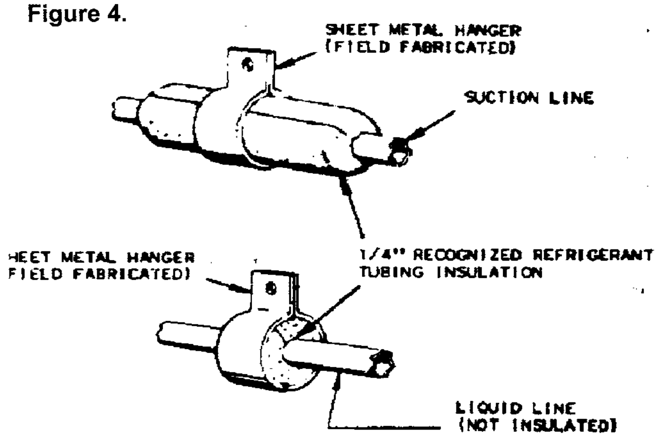
L = Liquid Line S = Suction Line * = Full Rating Line Size

<u>Suction Line Insulation.</u> All suction lines are to be insulated with a recognized tubing insulation that is a minimum of 3/8" thick.

<u>Solder.</u> Solder should consist of a minimum of 2% silver.

<u>Hangers and Isolation.</u> All refrigerant lines are to be isolated from the structure and supported with hangers. See Figure 4 below for details.

Figure 4.



<u>Inverted Suction Line Loop.</u> When the condenser is located at the same level or above the evaporator section, an inverted loop is to be employed on the suction line. This practice will prevent liquid refrigerant from migrating into the compressor during shutdown. See Figure 5.

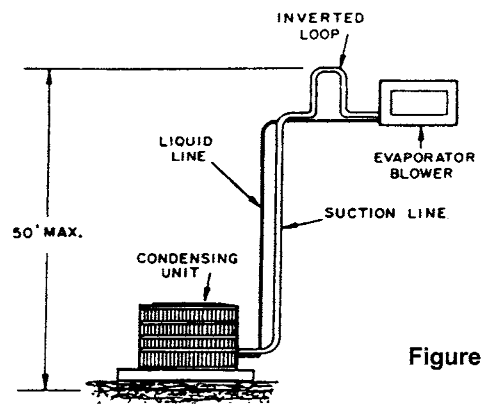
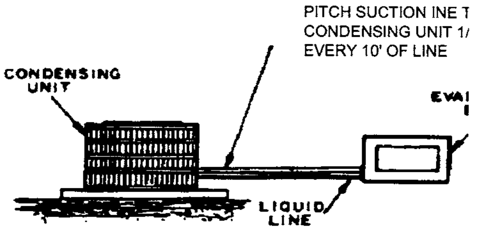


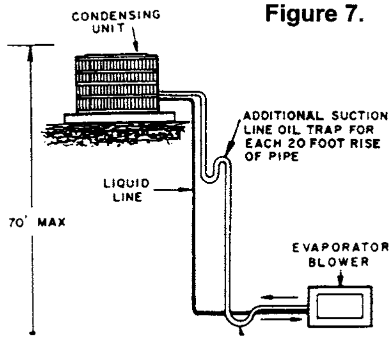
Figure 5.

<u>Oil Return.</u> To facilitate oil return to the compressor, a horizontal suction line should be pitched (1/2" per 10') toward the condensing unit.



Condenser Above the Evaporator When the condenser is located 4' or greater above the evaporator section, suction line oil trap is to be used at the base of the riser. An additional oil trap is to be added for each 20' of vertical riser. See Figure 7 below

Figure 7.



Filter Drier and Sight Glass. A bi-flow liquid line filter drier is factory installed. A Sight Glass/Moisture indicator is provided with the unit. This is to be field installed on the liquid line as close as practical to the service valve.

Holding Charge. The CPLE series is factory shipped with a 2 lb. R-22 holding charge. When welding, introduce an inert gas (i.e. nitrogen) through the tubing to prevent the formation of copper oxide inside the tubing.

Evaporator Coil TXV. For improved refrigerant management, the evaporator coil is to be equipped with a thermal expansion valve (TXV).

Liquid Line Solenoid. It is recommended that a field supplied liquid line solenoid be added to the liquid line as close as possible to the evaporator coil. The solenoid is to be wired to close when the compressor stops to prevent refrigerant migration in the "OFF" cycle.

Evacuation and Charging. See the "Evacuation and Charging" section Page 7 of this manual for these instructions.

XI Electrical Wiring

WARNING

Before servicing or installing this equipment, the electrical power to this unit **MUST** be in the "OFF" position. **CAUTION**: more than one disconnect may exist. Failure to observe this warning may result in an electrical shock that can cause personal injury.

The unit **MUST** have an uninterrupted, unbroken electrical ground to minimize the possibility of personal injury if an electrical fault should occur. The electrical ground circuit may consist of an appropriately sized electrical wire connecting the ground lug in the unit control box wire to the building electrical service panel. Other methods of grounding are permitted if performed in accordance with the "National Electric Code" (NEC)/"American National Standards Institute" (ANSI)/"National Fire Protection Association" (NFPA) 70 and local/state codes. In Canada, electrical grounding is to be in accordance with the Canadian Electric Code CSA C22.1. Failure to observe this warning can result in electrical shock that can cause serious personal injury or death.

WARNING

To avoid the risk of fire or equipment damage use only copper conductors.

Inspection of the Building Electrical Service. This unit is designed for 3-phase operation. DO NOT OPERATE ON A SINGLE PHASE POWER SUPPLY. Measure the power supply to the unit. The supply voltage **MUST** be in agreement with the unit nameplate power requirements and within the range shown below, Table 4:

Table 4.

Model	Minimum Supply Voltage	Maximum Supply Voltage
CPLE090-3	187	253
CPLE090-4	414	506
CPLE120-3	187	253
CPLE120-4	414	506

Voltage Balance The supply voltage shall be unbalance (phase to phase) within 2%. To calculate the percentage of voltage unbalance use the following formula:

$$\text{Percentage Voltage Unbalance} = 100 \times \frac{\text{Max. Voltage Deviation From Avg. Voltage}}{\text{Avg. Voltage}}$$

Example

L1 - L2 = 220V
L2 - L3 = 216V

Ave. Voltage = *(220+216+213) / 3* = *649 / 3*

Max. Deviation from Avg. = *220 - 216 = 4*

% Voltage Unbalance = *100 x (4 / 216)* = *400 / 216*

Determine Wire Size The selection of the appropriate supply wire size is important to the operation of the equipment. When selecting the wire size, the following are important elements of the decision:

- The wire size is sufficient to carry the Minimum Circuit Ampacity (MCA). The unit MCA can be found on the equipment S&R plate and the following table.

Table 5.

Model	MCA
CPLE090-3	37.8
CPLE090-4	18.8
CPLE120-3	43.3
CPLE120-4	22.2

- The wire size is appropriately sized to allow for no more than a 2% voltage drop from the building breaker/fuse panel to the unit.
- Refer to the latest edition of the National Electric Code, or in Canada the Canadian Electric Code, when determining the correct wire size. The following table shows the current carrying capabilities for copper conductors rated at 75°C with a 2% voltage drop.

Table 6.

Max. Allowable length in Feet to Limit Voltage drop to 2%								
Wire Size (AWG)	Min. Circuit Ampacity (MCA) – CPLE Unit							
	10	15	20	25	30	35	40	45
14	75	50	37	NR	NR	NR	NR	NR
12	118	79	59	47	NR	NR	NR	NR
10	188	125	95	75	63	54	NR	NR
8	301	201	150	120	100	86	75	68
6	471	314	235	188	157	134	118	110

Based on NEC 1996

Example

A CPLE120-3 is to be installed. The distance from the building breaker box to the unit is 75'. Calculate the minimum wire size assuming no more than 2% voltage drop.

MCA for CPLE120-3 = 43.3 (from S&R plate and table).

Applying previous table wire sizes less than #8 AWG cannot be used for circuits which have a rating of 45A. The #8 wire is not suitable since the maximum length for a 45A circuit is 68'. Solution, a #6 AWG wire is suitable up to 110'. Note: It is the contractors responsibility to follow the NEC (USA) or CEC (Canada) when sizing the service wire for this unit.

Service Disconnect Box. A service disconnect box is required as per NEC.

Fuse – HACR Breakers
Protection is provided by either fuses or HACR type breakers. Refer to the unit S&R plate and Table 7 for the maximum overcurrent protection permitted.

Table 7.

Model	*Max. Fuse
CPLE090-3	60
CPLE090-4	30
CPLE120-3	60
CPLE120-4	35

* Fuse or HACR Breaker of same value.

Line Voltage Wiring ALL line voltage wiring is to be run through conduit from the service disconnect box to the unit. Refer to the NEC (in Canada CEC) for the correct size conduit based on the wire size. The conduit is to enter the control box through the hole provided in the bottom of the control box. *Note:* hole is sized for ¾" conduit. If permitted by code, flexible conduit is preferred to minimize vibration transmission from the unit to the building.

Connect the line voltage wires to the L1, L2, and L3 terminals of the definite purpose contactor (located in the unit control box). Refer to the wiring diagram attached to the unit when making these connections. *Note:* the unit wiring diagram is also included at the end of this manual.

As noted elsewhere in this manual, this unit must be grounded. The electrical ground circuit must consist of an appropriately sized electrical wire connecting to the ground lug in the unit control box and wire to the building electrical service panel. Other methods of grounding are permitted if performed in accordance with the "National Electric Code" (NEC)/"American National Standards Institute" (ANSI)/"National Fire Protection Association" (NFPA) 70 and local/state codes. In Canada, electrical grounding is to be in accordance with the Canadian Electric Code CSA C22.1.

Low Voltage Connections The CPLE requires a 5-conductor low voltage circuit from the room thermostat (without options). The wires are to be no smaller than 18 AWG. The field connection for this circuit is to be made in the unit control box using solderless connectors such as wire nuts. See Figures 8 and 9 for a typical low voltage hook-up.

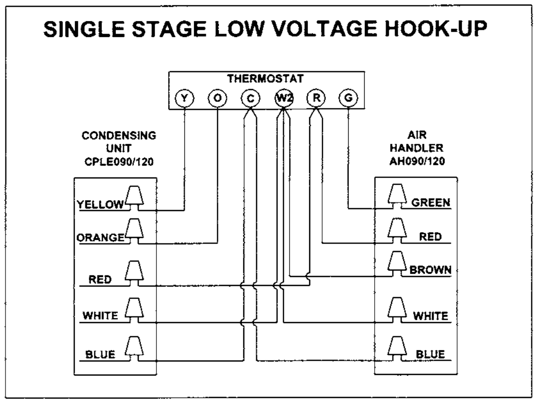


Figure 8.

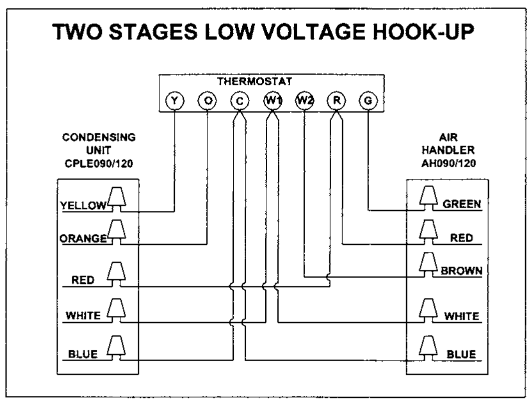
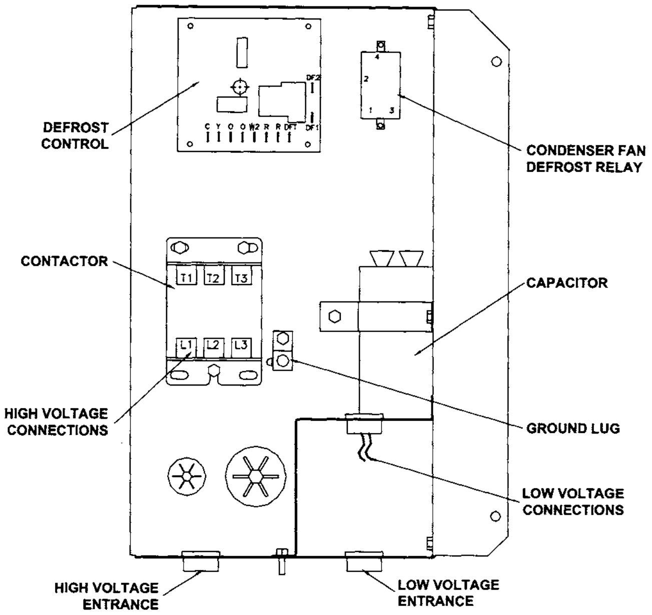


Figure 9.

Control Box Components See Figure 10 for the location of the electrical components.

Figure 10.



XII Outside Thermostat

An outside thermostat kit that includes an emergency heat relay is available as an accessory. Follow the manual provided with the OT/EHR18-60 for installation practices.

XIII System Evacuation and Charging

WARNING

To avoid possible explosion, death, or injury, practice safe handling of refrigerants.

While these items will not cover every conceivable situation, they should serve as a useful guide:

Refrigerants are heavier than air. They can "push out" the oxygen in your lungs or in any enclosed space. To avoid possible death or difficulty in breathing.

- Never sniff refrigerant.
- Never purge refrigerant.

If an indoor leak is suspected, thoroughly ventilate the area before beginning work.

Liquid refrigerant can be very cold. To avoid possible frostbite or blindness, avoid contact and wear gloves and goggles. If liquid refrigerant does contact your skin or eyes, get medical help immediately.

Always follow EPA regulations. Never burn refrigerant, as poisonous gas will be produced.

To avoid possible explosion, use refrigerant cylinders properly:

- If you must heat a cylinder for faster charging, partly immerse it in warm water. Never apply flame or steam to the cylinder.
- Store cylinders in a cool, dry place. Never use a cylinder as a platform or a roller.
- Never add anything other than R-22 to an R-22 cylinder.
- Never fill a cylinder more than 80% full of liquid refrigerant.
- When removing refrigerant from a system, use only returnable (not disposable) service cylinders. Check the cylinder for its pressure rating and hydrostatic test date. Check the cylinder for any damage, which may lead to a leak or explosion. If in doubt, do not use the cylinder.

Leak Testing

WARNING

To avoid the risk of fire or explosion never use oxygen high pressure or flammable gasses for leak testing of a refrigeration system.

1. Be sure both hand valves on the gauge manifold are closed relative to the center port (i.e., turned in all the way.) Attach this gauge manifold to the service valves on the unit.

WARNING

To avoid possible explosion, the line from the nitrogen cylinder must include a pressure regulator and a pressure relief valve. The pressure relief valve must be set to open at no more than 150 psig.

2. Connect a cylinder of dry nitrogen to the center port on the gauge manifold.
3. Open the hand valve a minimal amount on the line coming from the nitrogen cylinder.
4. Open the high pressure valve on the gauge manifold. Pressurize the refrigerant lines and the indoor coil to 150 psig (1034 kPA).

WARNING

To avoid possible explosion or equipment damage do not exceed 150 psig when pressure testing.

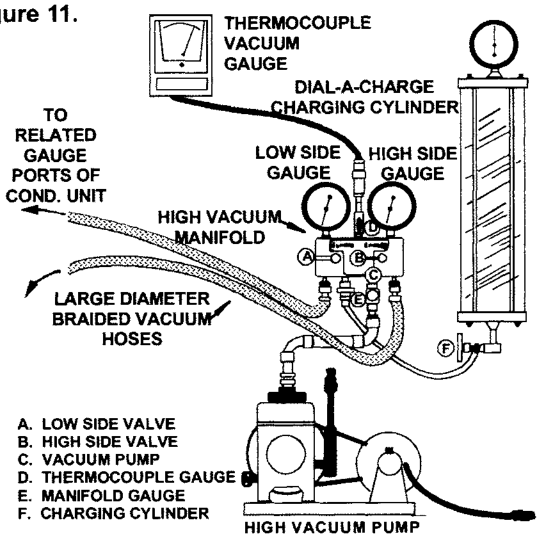
After you reach 150 psig, close the valve on the nitrogen cylinder. Disconnect it from the gauge manifold. If you plan to use an electronic leak detector, add a trace of R-22 to the system (if permitted by current EPA regulations).

5. Apply a soap solution on all connections and joints. If you see bubbles, you have a leak. Mark these locations.
6. Use the gauge manifold to carefully release the nitrogen from the system. If leaks were found, repair them. After repair, repeat the above pressure test. If no leaks exist, proceed to system evacuation.

SYSTEM EVACUATION

1. Connect the vacuum pump, high vacuum manifold set with high vacuum hoses, thermocouple vacuum gauge and charging cylinder as shown. Begin with all valves fully closed.

Figure 11.



2. If service dill valves are used for evacuation, use a core remover to lift the valve core. It provides greater efficiency.
3. Confirm proper pump and gauge operation. Open the shutoff valve that leads to the high vacuum gauge manifold. Start the pump. When the compound gauge (low side) reading drops approximately 29 inches of vacuum, open the valve to the thermocouple vacuum gauge and evacuate until the gauge reads 250 microns or less.
4. Close the valve to the thermocouple vacuum gauge. This avoids potential gauge damage from "pegging the meter".
5. Open the high and low side valves on the gauge manifold. Keeping the valve on the charging cylinder closed, open the valve on the gauge manifold that leads to the cylinder.
6. Evacuate the system to about 29 inches Hg as measured by the compound (low side) gauge.
7. Open the valve to the thermocouple vacuum gauge. Evacuate until the gauge reads 250 microns or less.
8. Close the valve to the vacuum pump. Wait five minutes, then check the pressure on the thermocouple vacuum gauge:

- If the pressure is not more than 1500 microns, the system is leak-free and properly evacuated. Proceed to Step 9.
- If the pressure rises, but holds at about 5000 microns, moisture and non-condensibles are still present. Open the valve to the vacuum pump, and go back to Step 7.
- If the pressure rises above 5000 microns, a leak is present. Go back to "Leak Testing" section above

9. Close the valve to the thermocouple vacuum gauge. Close the valve to the vacuum pump. Shut off the pump.

PRELIMINARY CHARGE ADJUSTMENT

> **IMPORTANT:**
> See the wiring diagram or outdoor unit specification sheet to determine if this unit has a crankcase heater. If it does, you must connect electrical power to the unit for four hours before operating the compressor. Failure to do so could result in compressor damage.

> **IMPORTANT:**
> During all installation and service work, follow all regulations of the Environmental Protection Agency. (This system uses R-22 - an HCFC [Hydrogenated Chlorofluorocarbon].) It is a violation of EPA regulations to discharge HCFC into the atmosphere and doing so may result in fines or other penalties.

Use a male hex head wrench (5/16" for liquid) to carefully open the liquid valve stem on the unit. Use a service wrench or crescent wrench to open the suction ball valve. The valve is fully open with a 90° turn (i.e. the stem is inline with the valve flow direction).

The outdoor unit is factory charged with 2 lb. R-22.

> **IMPORTANT:**
> Use only refrigerant which is certified to meet ARI Standard 700. Used refrigerant may cause compressor damage, and will void the warranty. (Most portable machines cannot clean used refrigerant well enough to meet this ARI Standard.)

> **IMPORTANT:**
> When adding additional refrigerant to a system, add only refrigerant vapor (not liquid) through the suction valve (low side) on the outdoor unit. Any other practice may cause compressor damage.

FINAL CHARGE ADJUSTMENT

> **IMPORTANT:**
> Never operate the compressor with the suction valve closed to "test the compressor's pumping efficiency". In some cases, this can result in serious compressor damage and loss of warranty coverage.

For 25' of line set the 7-1/2 ton charge is approximately 19 lb.

For 25' of line set the 10-ton is approximately 26 lb. of R-22.

DO NOT start with these amounts.

For installation greater than 25' of line set, indoor unit airflow, condensing unit location and number of tubing fittings will have an impact on final unit charge amount. Start with half of the 25' line set charge and proceed.

Turn the electrical power on, and let the system run. Wait for the refrigerant pressures to stabilize.

EXPANSION VALVE INDOOR COILS:

NOTE: EXPANSION VALVE BULB, MUST BE IN PLACE ON SUCTION LINE & INSULATED.

Outdoor Temperature Over 60°F. When the outdoor temperature is above 60°F, the system is to be charged with the room thermostat set in the "Cooling" mode and the fan operating in the "Auto" position.

Outdoor Temperature Less Than 60°F. If the outdoor temperature is less than 60°F, the unit is to be charged with the room thermostat set in the "Heat" mode and the fan set in the "Auto" position.

System Charging – Cooling Mode

The following describes adjusting the refrigerant charge with the ambient temperature in excess of 60°F and the room thermostat adjusted as indicated above.

At stabilized cooling conditions and with an outdoor temperature of 60°F or higher, the system should have from 9°F to 13°F subcooling. For a proper subcooling reading, measure the refrigerant pressure and temperature at the outdoor unit's liquid line service valve. If you have less than 9°F subcooling, add charge. If you have more than 13°F subcooling, remove charge.

While reaching the proper subcooling level, it is important to know the discharge line temperature. This temperature should be at least 80°F over ambient or unit is flooding back to compressor. If flooding (i.e. low discharge line temperature) occurs, adjust valve stem on expansion valve inward (clockwise viewing end of expansion valve). This will increase the super heat.

After achieving the proper subcooling and a sufficient discharge temperature, make small adjustment to expansion valve stem to reach 8°F to 10°F of super heat. Adjusting the valve stem in (clockwise), increases super heat. Adjusting the valve stem out (counter clockwise), decreases superheat . If the system is performing properly, reinstall the service port caps and the valve bonnets. With the valve opened, the valve bonnet is the primary seal against refrigerant leaks. Apply two drops of clean oil to the cap threads, allowing the oil to run down to the inner cap seal surface. Close caps finger-tight. Then tighten cap additional two to three hex flats.

System Charging – Heating Mode

The following method can be employed as a method to check the system charge in the heating mode by measuring the hot gas discharge at the compressor.

1. Allow the system to operate for at least 20 minutes.
2. Attach and insulate an electronic thermometer to the hot gas discharge line mid way between the compressor and the reversing valve. *Note:* The thermometer is to be well insulated to prevent ambient influences.
3. Adjust the charge to maintain a clear sight glass.
4. Allow the compressor to operate for about 10 additional minutes and measure the hot gas discharge temperature.
5. Using an additional electronic thermometer, measure the ambient.
6. Adjust the charge until the hot gas temperature equals 105° F + ambient (+ or – 5°F). Remove charge to increase the temperature.

   Note: When adjusting the charge, allow the compressor to operate for about 10 minutes before taking readings.

   Note: Subsequent opening and replacement of the cap will require only 1/2 to 1 hex flat. See the table below for the torque required for an effective seal on the valve bonnet (1/6 turn past finger tight.

Table 8.

Tubing Size	Torque (Foot-Pounds)
5/8	14
1-3/8	16

After closing the valve bonnet, perform a final refrigerant leak test on the valves and sweat connections. Return the room thermostat to the desired settings.

XIV DEFROST CONTROL (DC)

The CPLE uses a Time/Temperature method for defrost. A thermal sensor is attached to the condenser coil to determine the outdoor coil temperature. The coil temperature sensor is electrically "Normally Open" and is wired to the electronic defrost control that is located in the control box.

Both coil temperature and compressor run time determine defrosting of the outdoor coil. Adjustments to the defrost timing selection can be changed from the 60 minute factory setting to either 30 or 90 minutes by moving the jumper on the defrost control. To initiate a defrost, the following statements must be true:

- The defrost sensor must be closed, and
- The compressor run time must equal the timing selection on the defrost board.

Note: The compressor run time is accumulative during multiple "heating" cycles. The timer will reset to zero only when the defrost sensor returns to an open condition. If the room thermostat is operating in the "EM HT" mode, no accumulation of compressor time is recorded.

During defrost the following actions occur:

1. The reversing valve is energized and the heat pump operates in the cooling mode.
2. The airhandler auxiliary heat (if equipped) is activated.
3. The condenser fan motor is shut-off.

If the defrost cycle has not terminated after ten (10) minutes the control will override the defrost sensor and revert to a heating mode.

The defrost control has test pins which can be useful when trouble-shooting in the heating mode. These test pins accelerate the compressor run time counter. The suggested method for accessing this feature is:

A. Run unit in heat mode.

B. Check unit for proper charge.
Note: Bands of frost indicate low refrigerant charge.

C. Shut off power to unit.

D. Disconnect outdoor fan by removing the purple lead from the Condenser Fan Defrost Relay.

E. Restart unit and allow frost to accumulate.

F. After a few minutes the defrost thermostat should close. To verify the position of the thermostat check for 24V between "DFT" and "C" on the defrost board. Should the defrost thermostat fail to close after a heavy build-up of frost and the thermostat is less than 28˚, the thermostat is to be replaced.

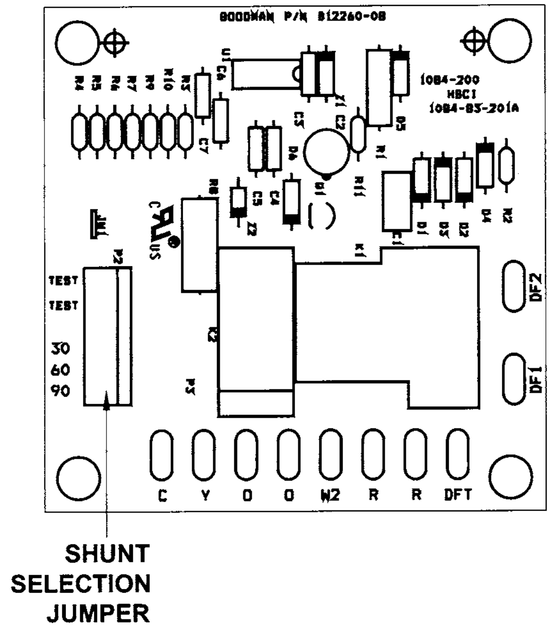
G. After the thermostat has closed, short across the test pins with the a screwdriver blade until the reversing valve shifts. This could take up to 21 seconds depending upon the position of the timing setting on the defrost board. Immediately upon the action of the reversing valve, remove the short. ***Note:*** If this short is not removed immediately, the defrost activity will last only 2.3 seconds.

H. After defrost has terminated (up to 10 minutes) check the defrost thermostat for 24V between "DFT" and "C". This reading should be 0 V (open sensor).

I. Shut off power to the unit.

J. Replace outdoor fan motor wire removed in Step D.

Figure 12.



XV TROUBLE SHOOTING

QUALIFIED INSTALLER/SERVICER ONLY

When troubleshooting, the first step should always be to check for clean coils, clean filter(s), and proper airflow. Indoor airflow should be 375 to 425 CFM per ton of cooling based on the size of the outdoor unit. The most common way of establishing indoor airflow is heating temperature rise. Indoor airflow will then be (Heating output of equipment) / (1.1 x temp. rise). In other cases, measurement of external static pressure is helpful. For details, see the Installation Operator Instructions for your indoor equipment.

⚠ CAUTION

3 Phase Scroll Compressor

The CPLE090/120 condenser is equipped with a 3-phase scroll compressor. If the unit sounds noisy and/or the suction and liquid pressures are almost equal, the compressor is operating in the reverse rotation. Reverse (2) incoming power supply leads.

TROUBLESHOOTING ANALYSIS TABLE - COOLING

COMPLAINT	PROBABLE CAUSE	REMEDY
1. High Head Pressure	1. Excessive charge of refrigerant in system. 2. Inadequate supply of air across the condenser coil. 3. Non-condensate gases in the system.	1. Purge or pump-down excessive charge. 2. Make certain that coil is not fouled in any way, or that air is not re-circulating. 3. Purge these gases from the system. Recharge system, if necessary.
2. Low Head Pressure	1. System low on refrigerant. 2. Compressor valves broken.	1. Charge system until sight glass is clear of bubbles. 2. Replace compressor.
3. Low Suction Pressure	1. Liquid line valve closed. 2. Restricted liquid line. 3. The bulb of the thermal expansion valve has lost its charge. 4. System low on refrigerant. 5. Dirty filters. 6. Coil frosted up. 7. Flash gas in the liquid line. 8. Quantity of air through evaporator not adequate.	1. Open the liquid line valve. 2. Replace filter-dryer. 3. Detach the bulb from the suction line and hold in one hand. If no liquid refrigerant goes through the valve, replace the valve. 4. Test the unit for leaks. Add refrigerant until sight glass is free from bubbles, after repairing leak. 5. Clean or replace filter. 6. Defrost and clean coil. Clean or replace filters. 7. Excessive liquid line drop. Check liquid line size. 8. Increase the blower speed.
4. High Suction Pressure	1. Expansion valve stuck open. 2. Expansion valve bulb not in contact with suction line. 3. Suction and/or discharge valve leaking or broken.	1. Correct valve action or replace the valve. 2. Fasten bulb securely to suction line. 3. Replace compressor.
5. Compressor will not start.	1. Disconnect switch open. 2. Blow fuse or fuse at disconnect switch. 3. Thermostat set too high. 4. Selector switch in "Off" position. 5. Contactor and/or relay coils burned out. 6. Loose or open electrical connection in either the control or power circuit.	1. Close the disconnect switch. 2. Check the cause of failure and replace the fuse. 3. Adjust to lower temperature. 4. Turn selector switch knob to "Cool" position. 5. Replace contactor and/or relay. 6. Inspect and secure all electrical connections.

TROUBLESHOOTING ANALYSIS - HEATING

The following information is intended for qualified service companies only.

Common causes for unsatisfactory operation of heat pumps in the heating mode include:

Dirty Filters
Dirty filters or inadequate airflow through the indoor coil. Failure to keep clean filters and adequate airflow (375-425 CFM/ton) will cause excessive discharge pressures that may cause the high-pressure switch to function.

Low Return Air Temperatures
Return ductwork temperatures that are less than 60°F will cause low discharge pressure, low suction pressure and excessive defrost cycling.

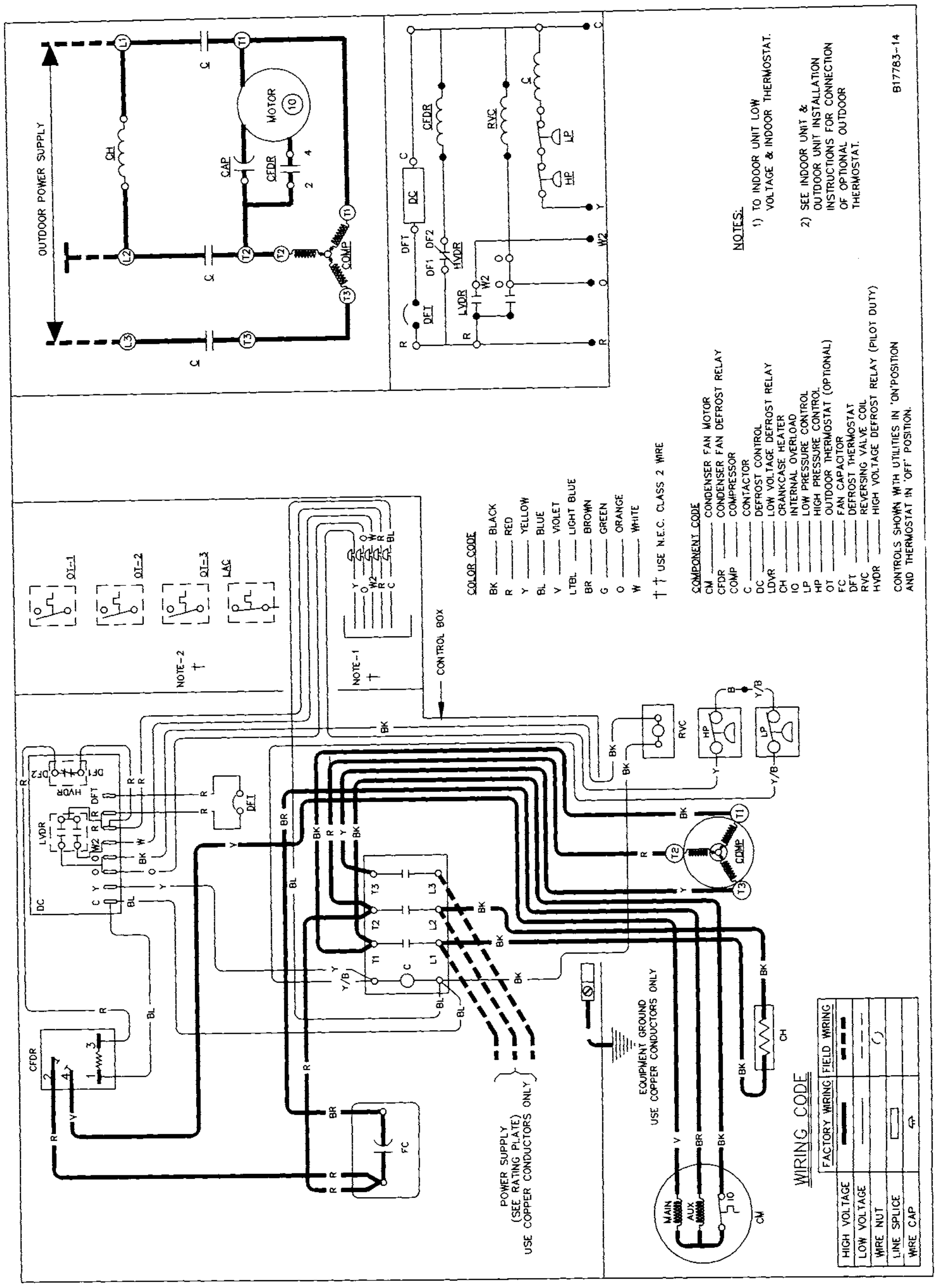
Undercharging
An undercharged system will cause low discharge pressure, low suction pressure and an accumulation of frost on the lower section of the outdoor coil.

Poor Termination of Defrost
The defrost sensor must make good contact with the outside coil return bend or a non-termination of defrost may occur.

Reversing Valve
A reversing valve may not function correctly for the following reasons:

1. Solenoid does not energize when voltage is present
   Replace the reversing valve.
2. No voltage to the solenoid
   Check the wiring.
3. The valve will not shift
   a. Undercharged
      Check for leaks
   b. Valve body damage
      Replace the reversing valve
   c. Valve sticking
      Replace the reversing valve

XVI WIRING DIAGRAM



NOTE: SPECIFICATIONS AND PERFORMANCE DATA LISTED HEREIN ARE SUBJECT TO CHANGE WITHOUT NOTICE

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