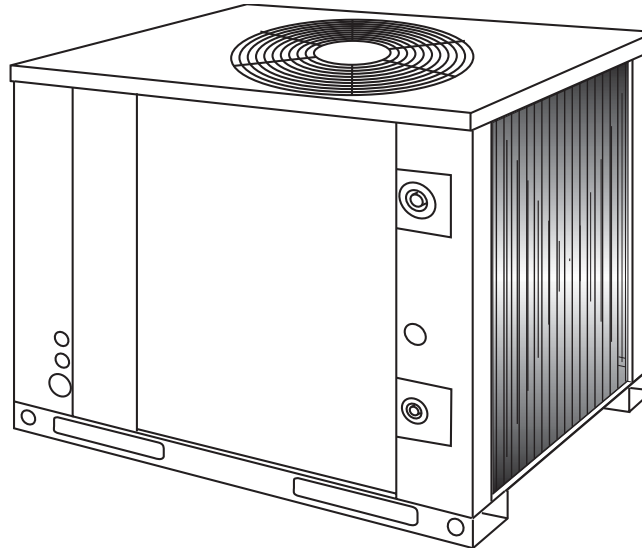


MODELS H5CE090, H3CE120 & H1CE150  
8.9 - 9.5 EER



### GENERAL

These condensing units are designed for outdoor installation on a roof or at ground level. Every unit is completely piped and wired at the factory and is shipped ready for immediate installation. Only the liquid and suction lines to the evaporator coil, the control wiring and the main power wiring are required to complete the installation. Each unit is dehydrated, evacuated, leak tested and pressure tested at 450 psig before being pressurized with a holding charge of refrigerant-22 for shipment and/or storage.

All controls are located in the front of the unit and are readily accessible for maintenance, adjustment and service. All wiring (power and control) can be made through the front of the unit.

Refer to Table 7 for condenser cooling capacities and power requirements.

### REFERENCE

This instruction covers the installation and operation of the basic condensing unit. For information on the installation and operation of the evaporator blower units, please refer to the matching air handler installation manual.

Additional information on the design, installation, operation and service of this equipment is available in the following reference form.

- 550.23-N1.1V- Low Ambient Accessory

#### Replacement Parts:

- Refer to Parts Manual for complete listing of replacement parts on this equipment.

All forms may be ordered from:

Standard Register  
Toll Free Telephone: 877-318-9675  
Toll Free Fax: 877-379-7920

### INSPECTION

As soon as a unit is received, it should be inspected for possible damage during transit. If damage is evident, the extent of the damage should be noted on the carrier's freight bill. A separate request for inspection by the carrier's agent should be made in writing. See Form 50.15-NM for more information.

#### CAUTION

THIS PRODUCT MUST BE INSTALLED IN STRICT COMPLIANCE WITH THE ENCLOSED INSTALLATION INSTRUCTIONS AND ANY APPLICABLE LOCAL, STATE, AND NATIONAL CODES INCLUDING, BUT NOT LIMITED TO, BUILDING, ELECTRICAL, AND MECHANICAL CODES.

#### WARNING

INCORRECT INSTALLATION MAY CREATE A CONDITION WHERE THE OPERATION OF THE PRODUCT COULD CAUSE PERSONAL INJURY OR PROPERTY DAMAGE.

Installer should pay particular attention to the words: *NOTE*, *CAUTION* and *WARNING*. *Notes* are intended to clarify or make the installation easier. *Cautions* are given to prevent equipment damage. *Warnings* are given to alert installer that personal injury and/or equipment damage may result if installation procedure is not handled properly.

# TABLE OF CONTENTS

General.....1  
 Reference.....1  
 Inspection.....1  
 Nomenclature.....2

## INSTALLATION

Limitations.....3  
 Location.....3  
     Roof-Top Locations.....3  
     Ground Level Locations.....3  
 Rigging and Handling.....3  
 Clearances.....4  
 Power and Control Wiring.....4  
     Power Wiring.....4  
     Control Wiring.....4  
 Compressor.....4  
 Compressor Crankcase Heater.....4  
 Refrigerant Piping.....7  
     General Guidelines.....7  
     Line Sizing.....7  
     Service Valves.....7  
 Extending The Service Ports.....9  
 Installation.....9  
 Evacuation and Charging.....10

## START-UP

Crankcase Heater.....14  
 Pre-Start Check.....14  
 Initial Start-Up.....14  
 Secure Owner’s Approval.....14

## OPERATION

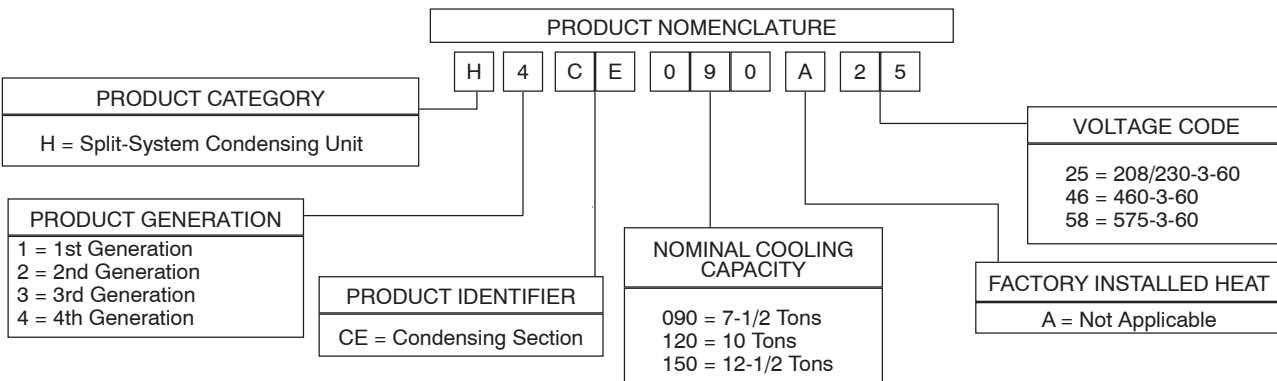
Unit Operation - 7-1/2, 10 & 12-1/2 Ton.....14  
 Safety Features.....15  
 Maintenance.....15  
     Cleaning Condenser Surface.....15  
     Lubrication.....15  
     Compressor Replacement.....15

## TABLES

No.	Description	Page
1	Unit Application Data.....	3
2	Physical Data.....	4
3	Electrical Data.....	5
4	Suction Lines.....	8
5	Liquid Lines.....	8
6	Refrigerant Line Charge.....	8
7	Cooling Cap's. & Power Requirements.....	9

## FIGURES

No.	Description	Page
1	Center of Gravity.....	3
2	Typical Rigging.....	4
3	Typical Field Wiring with KES/KEU.....	5
4	Typical Field Wiring with PUC.....	5
5	Unit Dimensions and Clearances.....	6
6	Four Point Loads.....	7
7	Extending the Service Ports.....	11
8	Charging Curve HCE090.....	12
9	Charging Curve HCE120.....	12
10	Charging Curve HCE150.....	13



## INSTALLATION

### LIMITATIONS

These units must be installed in accordance with all national and local safety codes. If no local codes apply, installation must conform with the appropriate national codes. See Table 1 for Unit Application Data. Units are designed to meet National Safety Code Standards. If components are to be added to a unit to meet local codes, they are to be installed at the dealer's and/or the customer's expense.

### LOCATION

**TABLE 1 - UNIT APPLICATION DATA**

MODEL	HCE090,120 & 150
208/230-3-60	187 / 252
Voltage Variation <sup>1</sup> Min. / Max.	460-3-60 432 / 504
	575-3-60 540 / 630
	380/415-3-50 342 / 456
Ambient Air on Condenser Coil Min. / Max.	45°F / 115°F <sup>2</sup>
Suction Pressure at Compressor and Corresponding Temp. at Saturation Min. / Max.	57.5 psig / 90.0 psig 32.0°F / 53.5°F

<sup>1</sup>Rated in accordance with ARI Standard 110, utilization range "A".

<sup>2</sup>These units can operate at an ambient temperature of 120°F providing the wet bulb temperature of the air entering the evaporator coil does not exceed 67°F.

NOTE: Refer to page 7 for refrigerant piping limitations.

Use the following guidelines to select a suitable location for these units.

1. The condensing unit is designed for outdoor installation only. The condenser fans are the propeller type and are not suitable for use with duct work.
2. The condensing unit and the evaporator blower should be installed as close together as possible and with a minimum number of bends in the refrigerant piping. Refer to "REFRIGERANT PIPING" for additional information.
3. The condensing unit should not be installed where normal operating sounds may be objectionable. On either rooftop or ground level installations, rubber padding can be applied between the base rails and their supports to lessen any transmission of vibration.

### ROOF-TOP LOCATIONS

Be careful not to damage the roof. Consult the building contractor or architect if the roof is bonded. Choose a location with adequate structural strength to support the unit.

The condensing unit must be mounted on solid level supports. The supports can be channel iron beams or wooden beams treated to reduce deterioration.

A minimum of two (2) beams are required to support each unit. The beams should: (1) Be positioned perpendicular to the roof joists. (2) Extend beyond the dimensions of the unit to distribute the load on the roof. (3) Be capable of adequately supporting the entire unit weight. Refer to Center of Gravity and Point Load Figures and Physical Data Table for load distribution and weights.

These beams can usually be set directly on the roof. Flashing is not required.

**NOTE:** On bonded roofs, check for special installation requirements.

### GROUND LEVEL LOCATIONS

The units must be installed on a one-piece level concrete slab with a minimum thickness of 4 inches. The length and width should be at least 6 inches greater than the units overall base dimensions. Refer to Figure 4.

Footers under the slab that extend below the frost line is recommended. Any strain on the refrigerant lines may cause a refrigerant leak. The slab should not be tied to the building foundation because noise and vibration will telegraph into your structure.

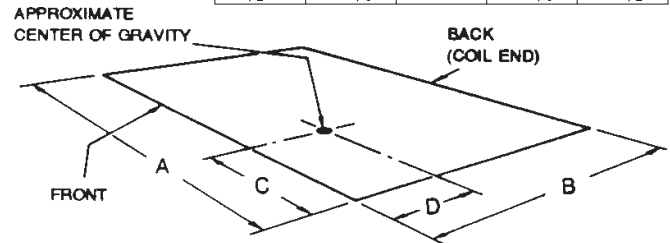
A unit can also be supported by concrete piers. These piers should (1) extend below the frost line, (2) be located under the unit's four corners, and (3) be sized to carry the entire unit weight. Refer to Figure 1 and Table 2 for the center of gravity and unit weight.

**CAUTION:** Care should be taken to protect the unit from tampering and unauthorized persons from injury. Screws on access panels will prevent casual tampering. Additional safety precautions such as fences around the unit or locking devices on the panels may be advisable. Check local authorities for safety regulations.

### RIGGING AND HANDLING

Exercise care when moving the unit. Do not remove any packaging until the unit is near the place of installation.

Unit	Dim. (in.)			
	A	B	C	D
7½ Ton	42¾	31¾	19¾	11½
10 Ton	70¾	32	30¾	15¾
12½ Ton	70¾	32	29¾	16½



**FIG. 1 - CENTER OF GRAVITY**

Rig the unit by attaching nylon straps with hooks to the lifting holes provided in the base rails. Spreaders, whose length exceeds the largest dimension across the unit, **MUST** be used across the top of the unit if the rigging height above the top of the unit is less than 5 feet. See Figure 2.

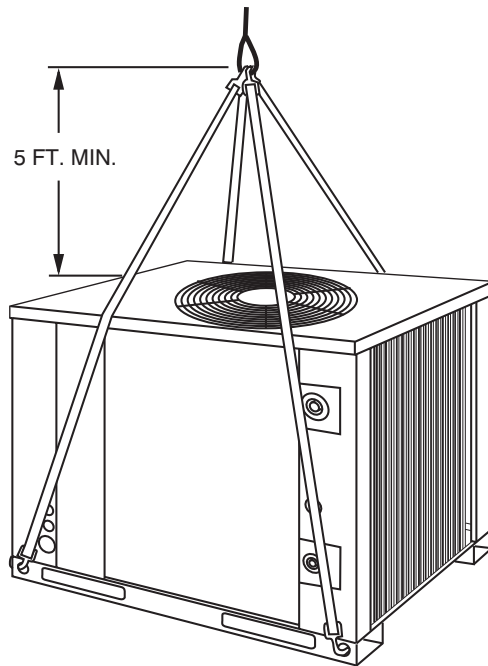
**WARNING:** Do not use straps under the unit or through the fork lift slots for lifting purposes. Sharp metal edges can damage the straps and could result in personal injury or equipment damage.

**BEFORE LIFTING A UNIT, MAKE SURE THAT ITS WEIGHT IS DISTRIBUTED EQUALLY ON THE STRAPS SO THAT IT WILL LIFT EVENLY.**

Units may also be moved or lifted with a fork-lift. Slotted openings in the base rails are provided for this purpose. The 7-1/2 ton unit may be lifted from either the LH or RH side - under the unit.

LENGTH OF FORKS MUST BE A MINIMUM OF 42" for 7-1/2 ton units or a MINIMUM OF 54" for 10 ton units when lifting across the long dimension.

Remove the nesting brackets from the four corners on top of the unit. All screws that are removed to take these brackets off must be replaced on the unit.



**FIG. 2 - TYPICAL RIGGING (7-1/2 Ton Shown)**

## CLEARANCES

All units require certain minimum clearances for proper operation and service. Refer to Figure 4 for these clearances.

**WARNING:** Do not permit overhanging structures or shrubs to obstruct condenser air discharge.

Additional height may be required for snow clearance if winter operation is expected.

## POWER AND CONTROL WIRING

Install electrical wiring in accordance with the latest National Electrical Code (NFPA Standard No. 70) and/or local regulations. The unit should be grounded in accordance with these codes.

### POWER WIRING

Check the voltage of the power supply against the data on the unit nameplate. Check the size of the power wire, the disconnect switch and the fuses against the data on Table 3.

**NOTE:** Copper conductors must be installed between the disconnect switch and the unit.

Refer to Figure 4 for the location of the power wire access opening through the front of the unit. This opening will require a field-supplied conduit fitting.

The field-supplied disconnect switch must be suitable for an outdoor location. Although it should be installed near the unit, do **NOT** secure it to the unit cabinet.

Refer to Figure 3 for typical field wiring.

### CONTROL WIRING

Refer to Figure 4 for the location of the control wire access opening through the front of the unit.

Route the necessary low voltage control wires (18 AWG min.) from the TB1 terminal block inside of the unit control box through this access opening to the room thermostat and to the evaporator blower motor controller.

The room thermostat should be located on an inside wall approximately 56" above the floor where it will not be subject to drafts, sun exposure or heat from electrical fixtures or appliances. Follow manufacturer's instructions enclosed with thermostat for general installation procedure.

Refer to Figure 3 for typical field wiring.

## COMPRESSOR

Units are shipped with compressor mountings factory-adjusted and ready for operation.

**CAUTION:** Do Not loosen compressor mounting bolts.

## COMPRESSOR CRANKCASE HEATER (7-1/2 & 10 ton units only)

The compressor is equipped with a crankcase heater to prevent refrigerant from mixing with crankcase oil during the "OFF" cycle. The heaters will be energized when the compressor is not running providing the unit disconnect switch is closed.

**CAUTION:** Do not attempt to start the compressor without at least eight hours of crankcase heat or compressor damage will occur.

If a unit has just been installed or the unit disconnect switch has been open for a long period of time, move the system switch on the room thermostat to the "OFF" position before closing the unit disconnect switch. Eight hours of crankcase heat are required to drive the liquid refrigerant out of the compressor before the compressor can be started.

**TABLE 2 - PHYSICAL DATA**

Model HCE	Compressor (Tandem on 150 only)		Condenser											Unit Weight (Lbs.)		Charge, Lbs.-Oz. (Refrigerant-22)		
			Fan (Propeller)				Fan Motor <sup>1</sup>				Coil <sup>3</sup>							
	Rating (Tons)	Cap. (Stages)	Qty.	Dia. (in.)	Nom. CFM	Blades		Qty.	HP	RPM	Rotation <sup>2</sup>	Face Area (Ft. <sup>2</sup> )	Finned Length (in.)	Rows High	Ship.	Oper.	Holding	Oper. <sup>4</sup>
090	7-1/2	1	1	24	4677	3	29	1	3/4	1120	CW	18.7	90	30	365	360	1 - 12	12 - 0 <sup>5</sup>
120	10	1	2	24	8034	3	27	2	1/2	1110	CCW	23.8	96	36	435	430	2 - 4	18 - 6
150	12-1/2	1	2	24	7950	3	27	2	1/2	1110	CCW	23.8	96	36	515	510	2 - 4	19 - 5

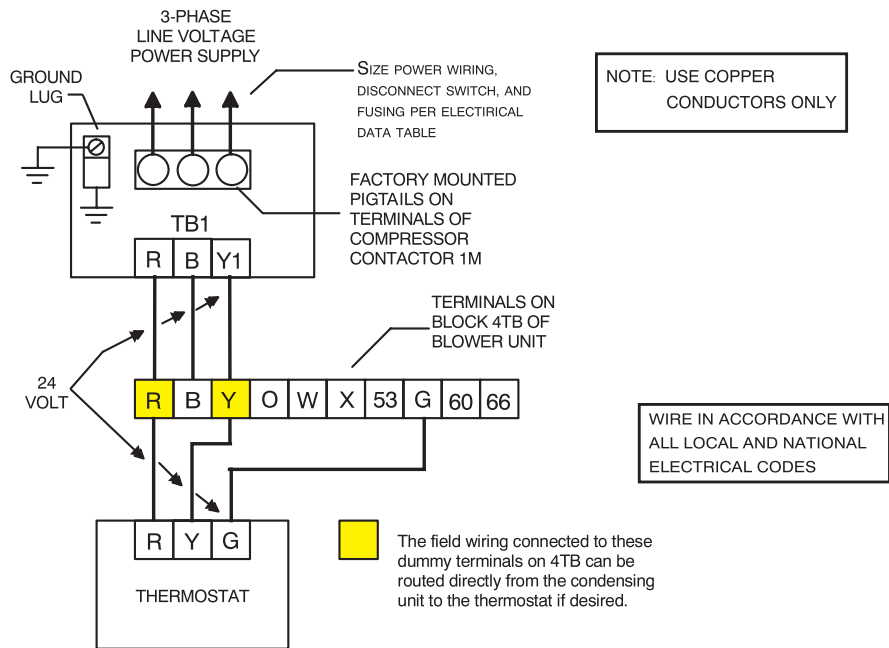
<sup>1</sup>These PSC motors are directly connected to the condenser fans and have inherent protection, ball bearings and a 48 frame.

<sup>2</sup>When viewing the shaft end of the motor.

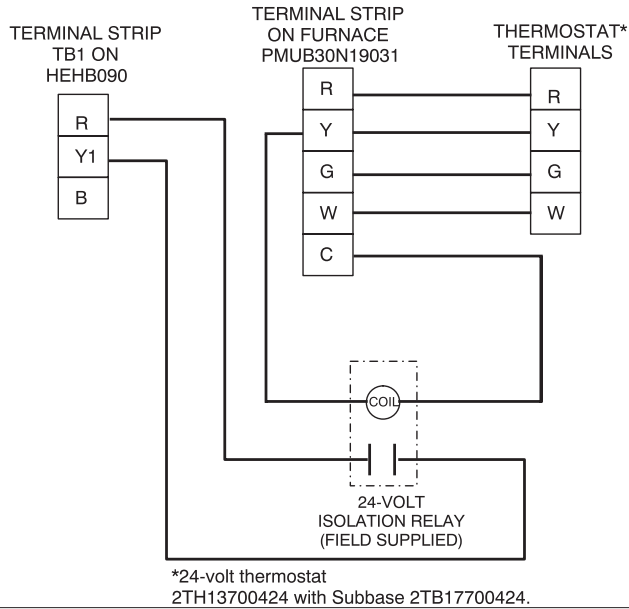
<sup>3</sup>These condenser coils have 2 rows of 3/8" OD copper tubes and 16 aluminum fins per inch.

<sup>4</sup>Includes matched indoor blower unit but no piping. Refer to Table 6 for refrigerant line charge.

<sup>5</sup>Add an additional 1 lb. charge when used with KEU120 (10 ton) indoor units.



**FIG. 3 - TYPICAL FIELD WIRING WITH KES/KEU AIR HANDLER**



**FIG. 4 - TYPICAL WIRING WITH PUC FURNACE**

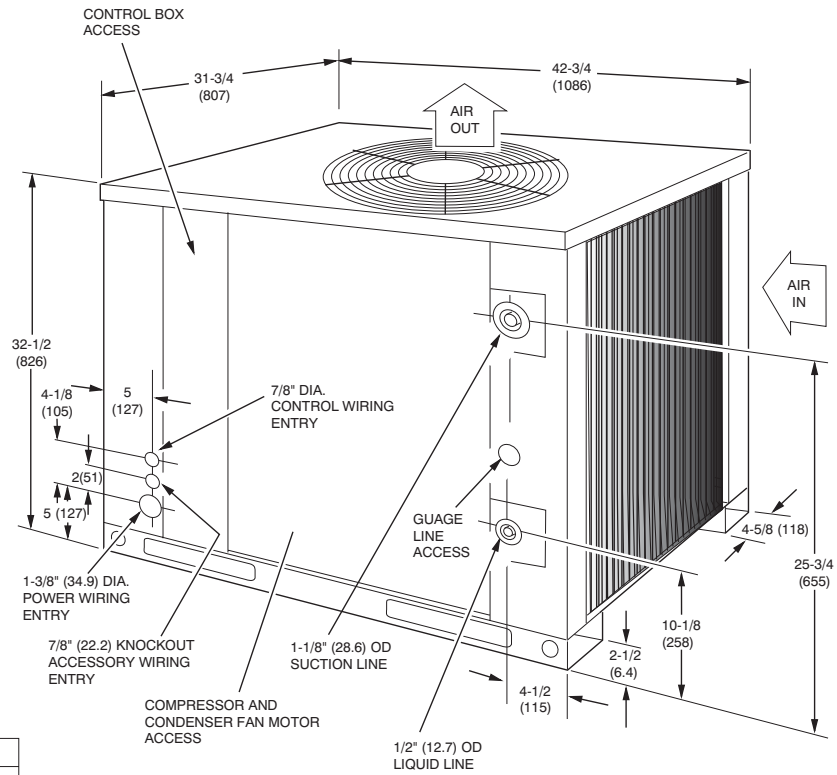
**TABLE 3 - ELECTRICAL DATA**

Model HCE	Voltage Code	Compressor			Condenser Fan Motor				Unit Ampacity (Amps)	Max. Fuse Size <sup>1</sup> (Amps)
		Power Supply	RLA	LRA	Power Supply	HP	Qty.	FLA		
090	25	208/230-3-60	25.6	190	208/230-1-60	3/4	1	3.03	35.1	60
	46	460-3-60	12.8	95	460-1-60	3/4	1	1.6	17.6	30
	58	575-3-60	10.2	75	575-1-60	3/4	1	1.8	14.6	20
120	25	208/230-3-60	42.0	239	208/230-1-60	1/2	2	2.7	51.8	70
	46	460-3-60	19.2	125	460-1-60	1/2	2	1.6	24.7	35
	58	575-3-60	13.8	80	460-1-60 <sup>2</sup>	1/2	2	1.3	18.0	25
150	25	208/230-3-60	41.4	312	208/230-1-60	1/2	2	3.0	52.6	70
	46	460-3-60	20.0	150	460-1-60	1/2	2	1.8	26.1	35
	58	575-3-60	16.4	108	460-1-60 <sup>2</sup>	1/2	2	1.8	21.3	30

<sup>1</sup>Dual element.

<sup>2</sup>Unit includes a 575 to 460-volt transformer.

**HCE090**  
(7-1/2 TON)

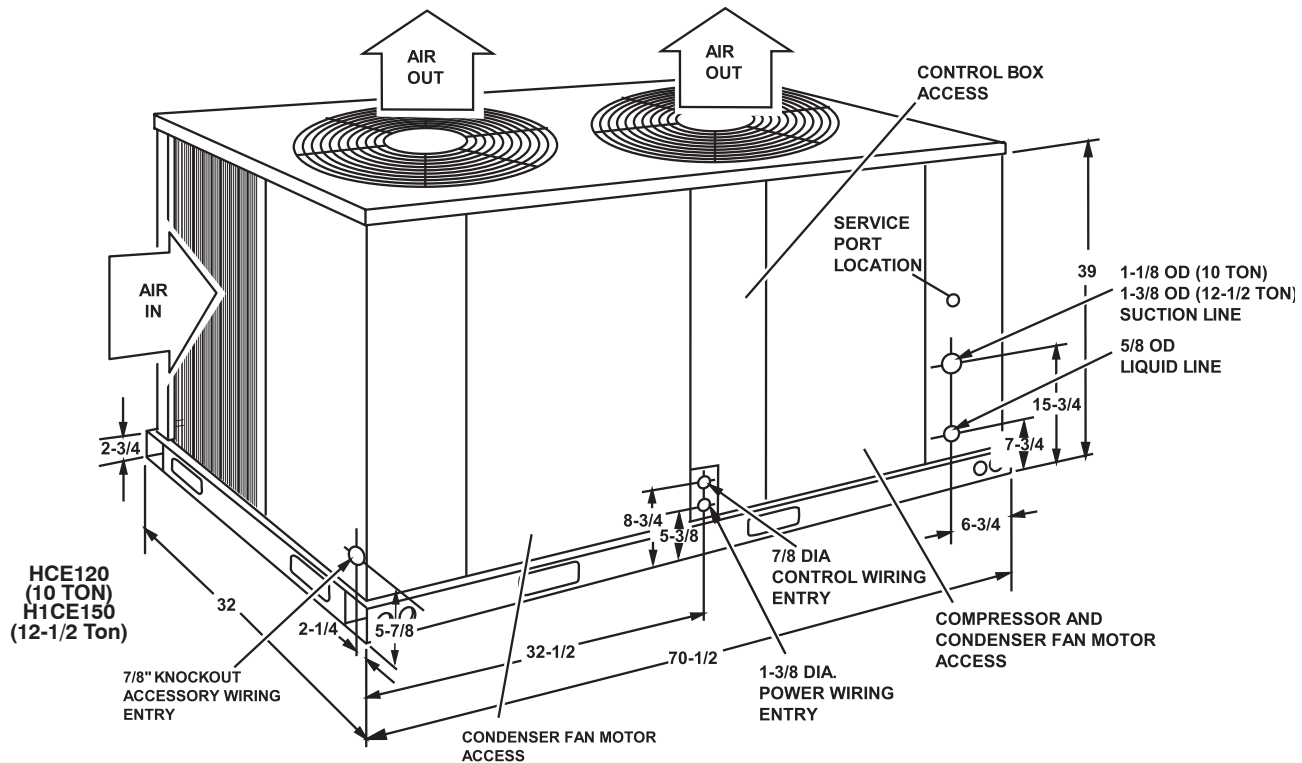


**CLEARANCES**

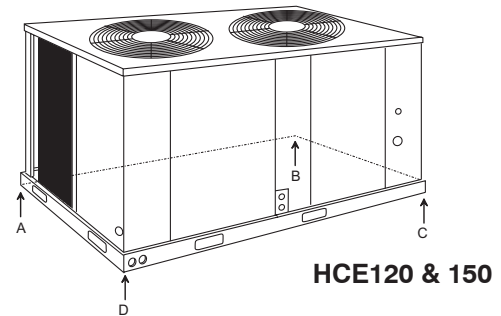
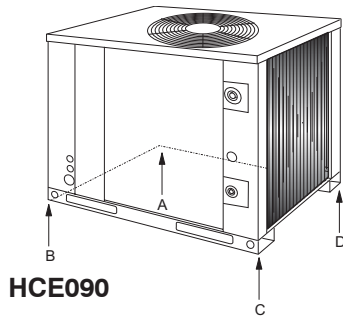
Overhead (Top) <sup>1</sup>	120"
Front (Piping and Access Panels)	30"
Left Side	24"
Right Side	24"
Rear	24"
Bottom <sup>2</sup>	0"

All dimensions are in inches. They are subject to change without notice. Certified dimensions will be provided upon request.

<sup>1</sup> Units must be installed outdoors. Overhanging structures or shrubs should not obstruct condenser air discharge.  
<sup>2</sup> Adequate snow clearance must be provided if winter operation is expected.



**FIG. 5 - UNIT DIMENSIONS AND CLEARANCES**



UNIT	4- POINT LOAD (LBS)				
	TOTAL	A	B	C	D
120	430	90	114	127	99
150	510	111	152	143	104

**FIG. 6 - FOUR POINT LOADS**

## REFRIGERANT PIPING

### GENERAL GUIDELINES

Many service problems can be avoided by taking adequate precautions to provide an internally clean and dry system and by using procedures and materials that conform with established standards.

Use hard drawn copper tubing where no appreciable amount of bending around pipes or other obstructions is necessary. Use long radius ells wherever possible with one exception—short radius ells for the traps in all suction risers. If soft copper is used, care should be taken to avoid sharp bends which may cause a restriction.

Pack fiber glass insulation and a sealing material such as permagum around refrigerant lines where they penetrate a wall to reduce vibrations and to retain some flexibility.

Support all refrigerant lines at minimum intervals with suitable hangers, brackets or clamps.

Braze all copper to copper joints with Silfos-5 or equivalent brazing material. Do not use soft solder.

Insulate all suction lines with a minimum of 1/2" ARMAFLEX or equal. Liquid lines exposed to direct sunlight and/or high temperatures must also be insulated.

Never solder suction and liquid lines together. They can be taped together for convenience and support purposes, but they must be completely insulated from each other.

A filter-drier **MUST** be installed in the liquid line of every system to prevent dirt and moisture from damaging the system. A properly-sized filter-drier is shipped with each condensing unit for field installation near the evaporator coil. The filter-drier and is taped to the top of the compressor.

**NOTE:** *Installing a filter-drier does not eliminate the need for the proper evacuation of a system before it is charged.*

A moisture indicating sight-glass may be field installed in the liquid line(s) between the filter-drier and the evaporator coil. The moisture indicating sight-glass can be used to check for excess moisture in the system or used as a visual means to verify refrigerant charge.

### LINE SIZING

When sizing refrigerant lines for a split-system air conditioner, check the following:

1. Suction line pressure drop due to friction
2. Liquid line pressure drop due to friction
3. Suction line velocity for oil return, and
4. Liquid line pressure drop due to static head.

**NOTE:** *Never base refrigerant line sizes on the O.D. of the suction and liquid connections on the unit.*

Tables 4 and 5 list friction losses for both the suction and liquid lines on the system. Table 6 shows the amount of refrigerant charge required per foot of refrigerant line.

When the evaporator coil is below the condensing unit, the suction line must be sized for both pressure drop and for oil return. For certain piping arrangements, different suction line sizes may have to be used. The velocity of the suction gas must always be great enough to carry oil back to the compressor.

When the condensing unit is below the evaporator coil, the liquid line must be designed for the pressure drop due to both friction loss and vertical rise. If the total pressure drop exceeds 40 psi, some refrigerant may flash before it reaches the thermal expansion valve. This flashing will not only cause erratic valve operation and poor system performance, but could also damage the expansion valve.

### SERVICE VALVES

These condensing units have service valves on both the compressor suction connection and the liquid line leaving the condenser coil.

The liquid and suction line service valves are shipped from the factory front-seated and closed with the valve stem in the maximum clockwise position.

Both of the service valves have a 1/4" male flare access port for evacuating, charging and pressure checking the system.

**NOTE:** *Never remove a cap from an access port unless the valve is fully back-seated with its valve stem in the maximum counter-clockwise position because the refrigerant charge will be lost. ALWAYS USE A REFRIGERATION VALVE WRENCH TO OPEN AND CLOSE THESE SERVICE VALVES.*

**TABLE 4 - SUCTION LINES** <sup>1,2</sup>

Model Designation	Nominal Capacity (Tons)	Refrigerant Flow Rate <sup>3</sup> (Lbs./Min.)	Type L Copper Tubing (Inches O.D.)	Refrigerant Gas Velocity (FT./Min.)	Friction Loss <sup>4,5</sup> (PSI/100 Ft.)
HCE090	7-1/2	22	1-1/8	2050	4.3
			1-3/8	1680	1.6
			1-5/8	1140	0.7
HCE120	10	30	1-1/8	3500	8.0
			1-3/8	2280	2.8
			1-5/8	1560	1.2
HCE150	12-1/2	37	1-3/8	2510	3.9
			1-5/8	1800	1.5

<sup>1</sup>All horizontal suction lines should be pitched at least 1 inch every 20 feet in the direction of the refrigerant flow to aid the return of oil to the compressor.

<sup>2</sup>Every vertical suction riser greater than 3 feet in height should have a "P" trap at the bottom to facilitate the return of oil to the compressor. Use short radius fittings for these traps.

<sup>3</sup>Based on Refrigerant-22 at the nominal capacity of the condensing unit, a suction temperature of 40°F and a liquid temperature of 105°F.

<sup>4</sup>Although suction lines should be sized for a friction loss equivalent to a 2°F change in saturation temperature (or approximately 3 psi), sizing the lines for the proper return of oil is more important.

<sup>5</sup>These friction losses do not include any allowances for valves or fittings.

**TABLE 5 - LIQUID LINES**

Model Designation	Nominal Capacity (Tons)	Refrigerant Flow Rate <sup>1</sup> (Lbs./Min.)	Type L Copper Tubing (Inches O.D.)	Pressure Drop <sup>3</sup>	
				Friction <sup>2</sup> (PSI/100 Ft.)	Vertical Rise (PSI/Ft.)
HCE090	7-1/2	22.0	1/2	11.0	0.5
			5/8	3.5	
HCE120	10	30	5/8	5.8	0.5
			3/4	2.3	
HCE150	12-1/2	37	5/8	8.0	0.5
			3/4	3.0	

<sup>1</sup>Based on Refrigerant-22 at the nominal capacity of the condensing unit, a liquid temperature of 105°F and a suction temperature of 40°F.

<sup>2</sup>These friction losses do not include any allowances for a strainer, filter-drier, solenoid valve, isolation valve or fittings.

<sup>3</sup>The total pressure drop of the liquid line for both friction and vertical rise must not exceed 40 PSI. If the pressure drop exceeds 40 PSI, the liquid refrigerant could flash before it reaches the expansion valve. This flashing will not only cause erratic valve operation and poor system performance, but could also damage the expansion valve.

**NOTE: Maximum line length for HCE150 is 150 feet.**

**TABLE 6 - REFRIGERANT-22 LINE CHARGE** <sup>1</sup>

Liquid Line <sup>2</sup> Inches, O.D.	1/2	0.070 lb./ft.
	5/8	0.113 lb./ft.
	3/4	0.167 lb./ft.
Suction Line <sup>2</sup> Inches, O.D.	1-1/8	0.009 lb./ft.
	1-3/8	0.013 lb./ft.
	1-5/8	0.019 lb./ft.

NOTE: Add the operating charge of the condensing unit, the evaporator coil and the refrigerant lines to determine the total refrigerant charge of the system.

<sup>1</sup>Charges are based on 40°F suction temperature and a 105°F liquid temperature.

<sup>2</sup>Type "L" copper tubing.



**TABLE 7 - COOLING CAPACITIES AND POWER REQUIREMENTS**

Model HCE	Suction Press. & Corresponding Temp. @ Saturation		Temperature of Air on Condenser Coil, °F											
			65		75		85		95		105		115	
	PSIG	°F	MBH	KW*	MBH	KW*	MBH	KW*	MBH	KW*	MBH	KW*	MBH	KW*
090	61.6	35	90	6.1	88	6.7	81	7.2	77	7.9	74	8.6	68	9.5
	68.5	40	101	6.3	96	6.8	91	7.4	87	8.1	82	8.9	77	9.7
	76.0	45	110	6.5	109	7.0	101	7.6	95	8.4	90	9.1	85	10.0
	84.0	50	120	6.6	115	7.2	109	7.8	104	8.6	99	9.4	93	10.3
120	61.6	35	123	7.7	117	8.4	112	9.1	106	9.9	100	10.8	95	11.8
	68.5	40	134	8.0	128	8.6	122	9.3	116	10.1	110	11.0	104	12.1
	76.0	45	145	8.2	139	8.8	132	9.5	126	10.4	120	11.3	113	12.3
	84.0	50	156	8.4	150	9.1	143	9.8	136	10.6	129	11.5	123	12.5
150	61.6	35	140	9.4	133	10.4	127	11.3	119	12.6	112	13.8	105	15.1
	68.5	40	151	9.6	144	10.6	137	11.5	129	12.8	122	14.1	114	15.4
	76.0	45	165	9.9	156	10.9	148	11.8	140	13.1	132	14.4	124	15.8
	84.0	50	178	10.2	169	11.2	159	12.1	151	13.4	142	14.8	134	16.1

\* Includes compressor and condenser fan motor(s).

## EXTENDING THE SERVICE PORTS

(Refer to Fig 7.)

- Loosen the screws securing the service ports in shipping position.
- Push the service ports through the corner post.
- Tighten the screws to secure the service ports for installation.

## INSTALLATION

Since the condensing units are shipped with a holding charge of refrigerant-22, they can be checked for a refrigerant leak by depressing the stem on either of the service ports that extend through the cabinet. As soon as some internal pressure is relieved release the stem. DO NOT release the entire holding charge.

If the unit has already lost its holding charge, it should be leak tested and the necessary repairs should be made. If the unit has maintained its holding charge, you can assume that it has no leaks and proceed with the installation.

**CAUTION:** Dry nitrogen should always be supplied through a connection while it is being brazed or unbrazed because the temperature required to make or break a brazed joint is sufficiently high to cause oxidation of the copper unless an inert atmosphere is provided. The flow of nitrogen should be continued until the joint has cooled.

When making a braze connection, wrap a wet rag around all tubing inside the unit to help prevent damage to other components.

**WARNING:** The dry nitrogen should always be supplied through a pressure regulating valve.

On HCE090 models only, remove the 4-1/2" x 4-1/2" patch plates from the piping access panel on the front of the unit to expose the refrigerant connections.

Before installing the liquid line between the condensing unit and the evaporator coil, prepare as follows:

- Burnish the external surfaces of the liquid connection on the condensing unit and the end of the field-supplied piping for the liquid line.

**NOTE:** Clean surfaces are essential for a well-brazed connection.

- Carefully clean the internal surfaces of the above. Any particles left on these surfaces may lead to a future system malfunction.

**NOTE:** Use only copper tubing that has been especially cleaned and dehydrated for refrigerant use. If the tubing has been open for an extended period of time, it should be cleaned before being used.

The liquid line connections can now be brazed while maintaining a minimum flow of dry nitrogen through the piping as follows:

- Remove the cap from the 1/4" access port on the liquid line service valve.
- Connect a supply of dry nitrogen to this access port.

**NOTE:** The filter-drier should be installed in the liquid line as close to the evaporator coil as possible.

Do not allow the filter-drier to be exposed to the atmosphere for an extended period of time. Once it absorbs moisture from the atmosphere, it loses its effectiveness.

- The matched air handlers are shipped with a small R-22 charge and they should be checked for leaks before installation. Drill a small hole through the sealing cap or disc in both the liquid and suction connection. If there is a pressure release, the evaporator has no leaks and you can proceed with installation. If the charge has been lost, the coils should be leak tested and the necessary repairs made.
- Move the dry nitrogen supply from the access port on the liquid line service valve of the condensing unit to the hole through the suction disc on the evaporator coil.
- Unbrazed the coil's liquid line disc while maintaining a flow of dry nitrogen across the connection and through the hole in the liquid line disc.

**NOTE:** If the liquid line has a solenoid valve, the valve should be opened manually to permit the nitrogen to flow freely.

- After the disc has been removed, burnish the external surfaces and clean the internal surfaces as outlined above.
- Move the dry nitrogen supply back to the access port on the liquid line service valve.
- Braze the liquid line to the liquid connection on the evaporator coil while maintaining a minimum flow of dry nitrogen through the liquid line, the evaporator coil and the hole in the suction disc.
- Unbrazed the disc on the suction connection of the evaporator coil while maintaining the flow of dry nitrogen.

10. After the disc has been removed, burnish the external surfaces and clean the internal surfaces as outlined above.

The suction piping can now be brazed to the suction connection on the evaporator coil while maintaining a minimum flow of dry nitrogen.

Before brazing the suction line to the condensing unit;

1. Move the dry nitrogen supply to the access port on the suction service valve of the condensing unit.
2. Burnish the external surfaces and clean the internal surfaces of both the suction connection and the suction piping.

The suction line can now be brazed to the suction connection on the condensing unit while maintaining the flow of dry nitrogen.

After the liquid and suction lines have been installed, the system should be evacuated and charged.

## EVACUATION AND CHARGING

With the liquid and suction line service valves closed, connect a vacuum pump through a charging manifold to the access ports on both the liquid and suction line service valves.

*Note: The vacuum pump connection should be short and no smaller than 3/8" O.D.*

The refrigerant lines and the evaporator coil can now be evacuated to 500 Microns without disturbing the charge in the condenser coil or the compressor.

After proper evacuation and dehydration, charge refrigerant through the access port on the liquid line service valve allowing the vacuum to draw in as much refrigerant as possible.

**CAUTION:** Do not charge liquid refrigerant through the compressor suction connection.

**CAUTION:** Do not attempt to start the compressor without at least 8 hours of crankcase heat or compressor damage will occur.

To continue charging refrigerant, open the liquid and the suction line service valves fully. Turn the stem of the liquid service valve clockwise 1/4 turn to open its access port for reading pressure.

Start the compressor (after 8 hours of crankcase heat), turn the stem of the suction line service valve clockwise 1/4 turn to open its service port and continue to charge refrigerant gas through this suction access port until you meet the conditions shown on the charging curve, Fig. 8-10.

Open the liquid and vapor line service valves fully to close their access ports after the system has been charged.

## Alternate Charging Methods

If you are starting a unit when the ambient temperature is higher or lower than those shown in Fig. 8-10, either of the following methods may be used.

**Method 1:** Determine the total weight of the refrigerant for the total system by adding the required charge for the outdoor unit, the indoor unit and the refrigerant lines using information in Tables 2 (Physical Data) and 6 (Refrigerant Line Charge).

*Using the charging procedures outlined above, weigh the required amount of refrigerant charge into the unit.*

**Method 2:** Install a field supplied moisture indicating sight glass in the liquid line between the filter-drier and the evaporator coil.

*Using the charging procedure outlined above, charge refrigerant until the moisture indicating sight glass is clear. Add approximately 1 extra pound of refrigerant for the 090 and 120 or 3 extra pounds for the 150 to assure a liquid refrigerant seal at the expansion valve under all operating conditions. Block the flow of the condenser air, if necessary, to assure a head pressure of 280 psig during the charging procedure.*

**Note:** The installer should return to the job to verify the operating charge when the ambient temperature is within the conditions shown in Fig. 8-10.

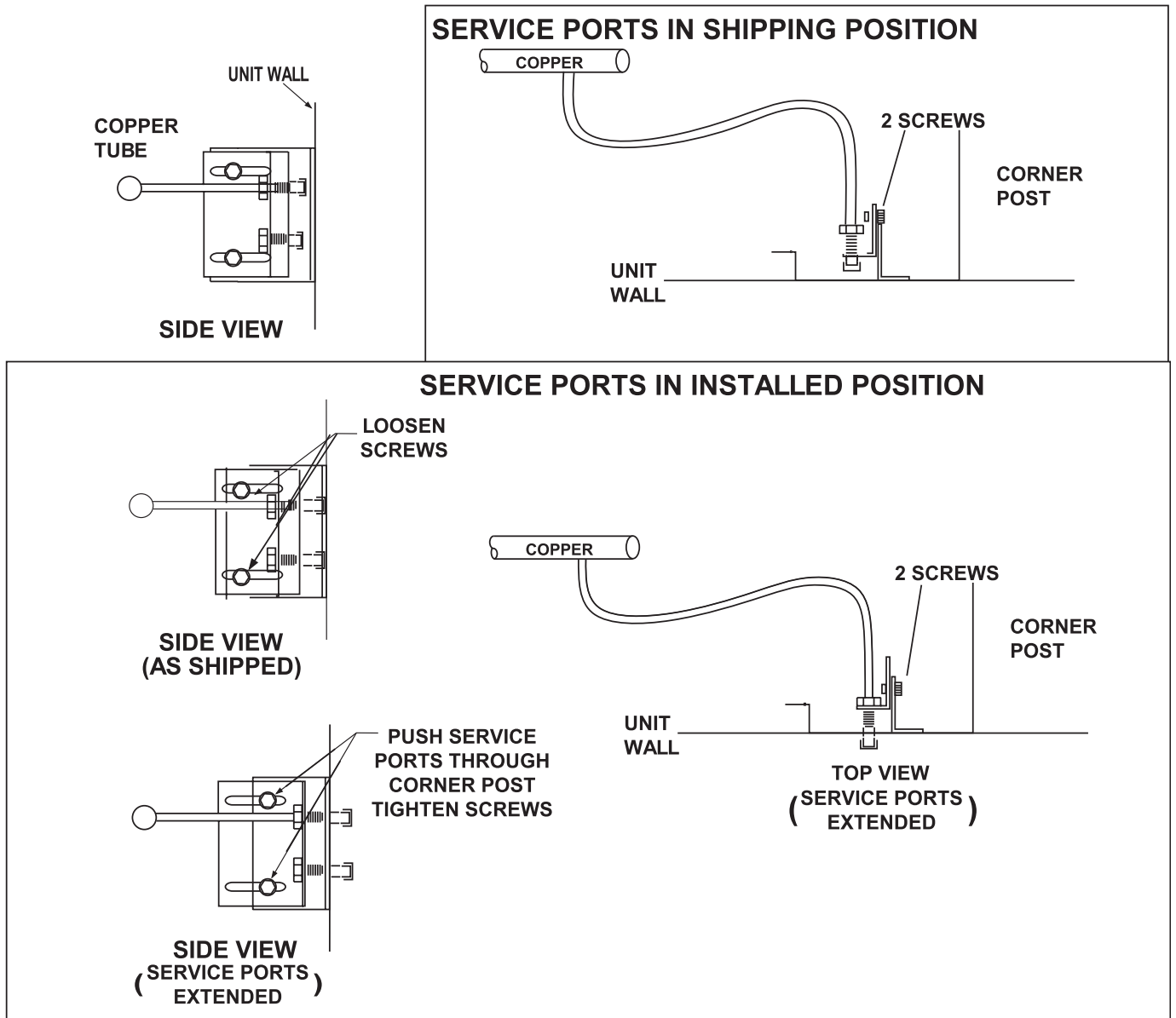


FIG. 7 - EXTENDING THE SERVICE PORTS

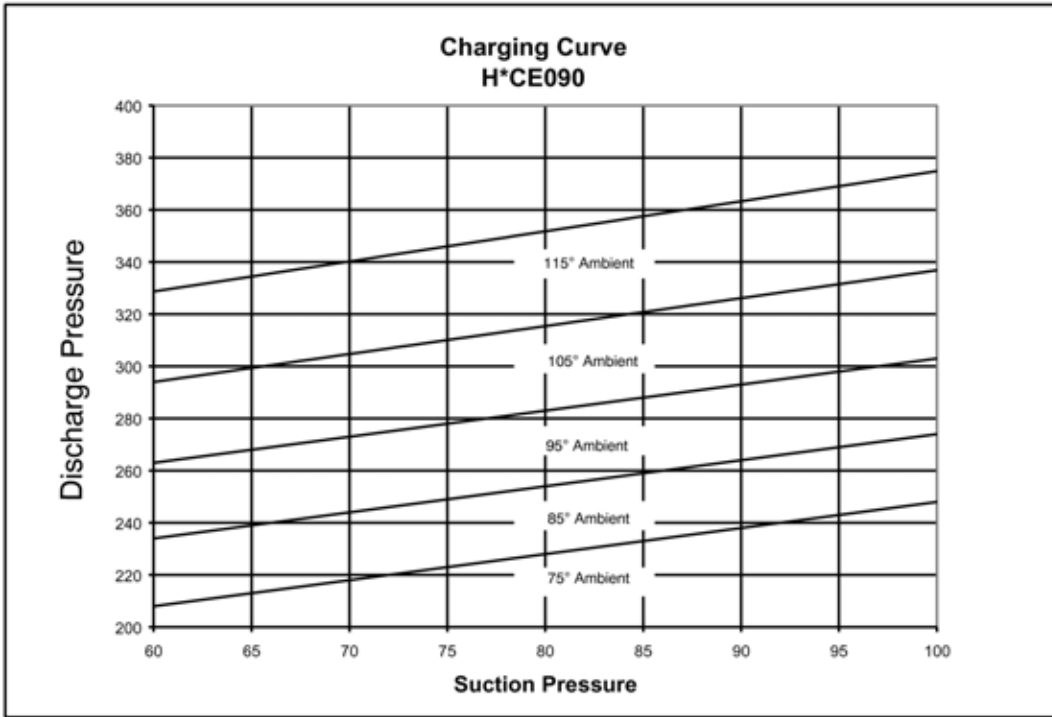


FIG. 8 - CHARGING CURVE HCE090

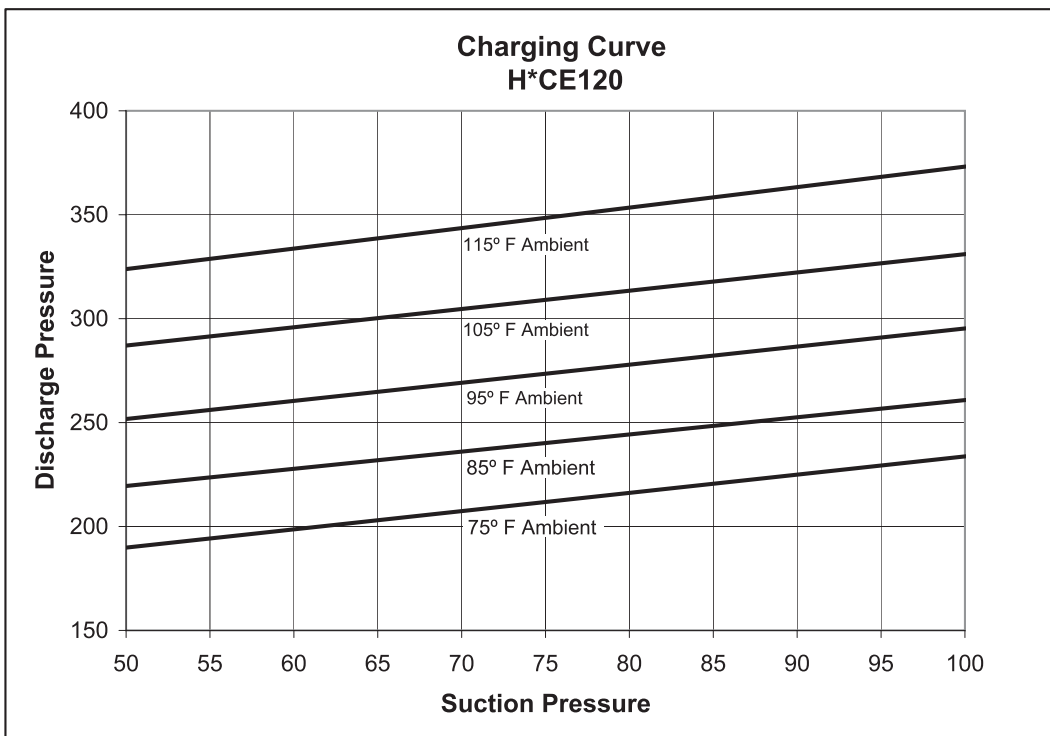


FIG. 9 - CHARGING CURVE HCE120

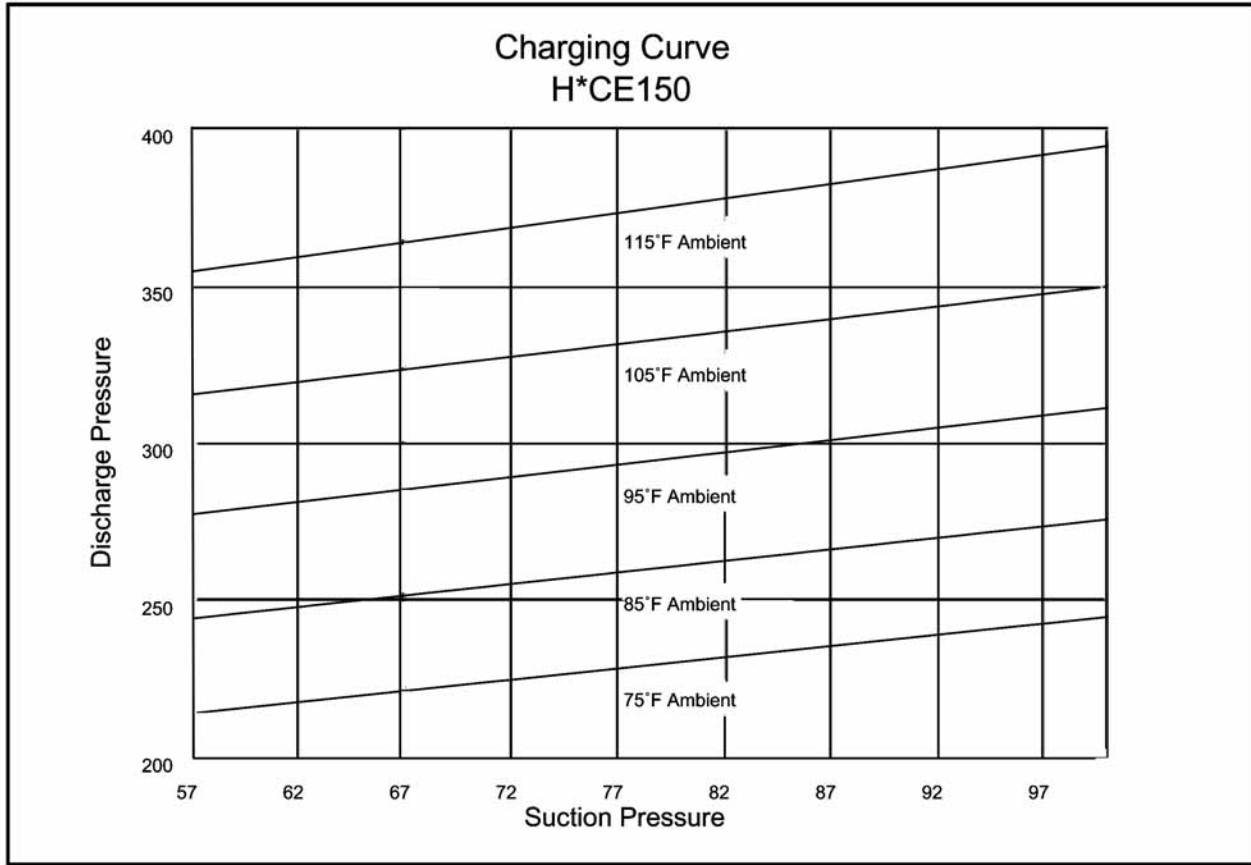


FIG. 10 - CHARGING CURVE HCE150

## START-UP

### CRANKCASE HEATER

The crankcase heaters must be energized at least 8 hours before starting the compressor. To energize the crankcase heaters, the main disconnect switch must be closed. During this 8 hour period, the system switch on the room thermostat must be "OFF" to prevent the compressor from starting.

**CAUTION: DO NOT ATTEMPT TO START THE COMPRESSOR WITHOUT AT LEAST 8 HOURS OF CRANKCASE HEAT OR COMPRESSOR DAMAGE WILL OCCUR.**

Make sure that the bottom of the compressor is warm to the touch to prove crankcase heater operation.

### PRE-START CHECK

Before starting the unit, complete the following check list:

1. Have sufficient clearances been provided?
2. Has all foreign matter been removed from the interior of the unit (tools, construction or shipping materials, etc.)?
3. Have the condenser fans been rotated manually to check for free rotation?
4. Are all wiring connections tight?
5. Does the available power supply agree with the nameplate data on the unit?
6. Is the control circuit transformer set for the proper voltage?
7. Have the fuses, disconnect switch and power wire been sized properly?
8. Are all compressor hold-down nuts properly secured?

9. Are any refrigerant lines touching each other or any sheet metal surface? Rubbing due to vibration could cause a refrigerant leak.
10. Are there any visible signs of a refrigerant leak, such as oil residue?
11. Is any electrical wire laying against a hot refrigerant line?

### INITIAL START-UP

1. Supply power to the unit through the disconnect switch at least 8 hours prior to starting the compressor.
2. Move the system switch on the thermostat to the AUTO or COOL position.
3. Reduce the setting of the room thermostat to energize the compressor.
4. Check the operation of the evaporator unit per the manufacturer's recommendations.
5. With an ammeter, check the compressor amps against the unit data plate.
6. Check for refrigerant leaks.
7. Check for any abnormal noises and/or vibrations, and make the necessary adjustments to correct (e.g. fan blade(s) touching shroud, refrigerant lines hitting on sheet metal, etc.)
8. After the unit has been operating for several minutes, shut off the main power supply at the disconnect switch and inspect all factory wiring connections and bolted surfaces for tightness.

**CAUTION: DO NOT ATTEMPT TO START THE COMPRESSOR WITHOUT AT LEAST 8 HOURS OF CRANKCASE HEAT OR COMPRESSOR DAMAGE WILL OCCUR.**

**SECURE OWNER'S APPROVAL:** *When the system is functioning properly, secure the owner's approval. Show him the location of all disconnect switches and the thermostat. Teach him how to start and stop the unit and how to adjust temperature settings within the limitations of the system.*

## OPERATION

### UNIT OPERATION - 7-1/2, 10 & 12-1/2 TON

When the external control calls for cooling at terminal Y1:

1. The system controller (SC) is energized. The system controller starts the compressors and enables the condenser fans by energizing contactor 1M (and 2M on the 12-1/2 ton, 208/230 volt models).

The single condenser fan is energized with the compressor on the 7-1/2 ton models.

Condenser fan motor #1 is energized with the compressors on the 10 and 12-1/2 ton models while fan #2 is enabled with compressor operation. Fan motor #2 operation is controlled through the Ambient Temperature Switch (ATS) which will de-energize the motor when the ambient temperature falls below 70°F.

2. Safety Lockout: The system controller (SC) has a lockout circuit to prevent compressor short-cycling on a safety control with automatic reset. If the high or low refrigerant pressure switches (HP or LP) open, the SC will enter lockout mode.

SC provides a 90 second bypass of the low pressure switch LP to prevent nuisance lockouts during unit start-up.

A malfunction light (24V, 2 A max. resistive load) can be energized through SC, by connecting the light between terminals X and B on TB1. Terminal X will energize when SC locks out.

3. Unit is equipped with an anti-short cycle timer to prevent two successive compressor starts within 5 minutes. If the compressor fails to start with a call for cooling and SC is not locked out, wait at least 6 minutes for the anti-cycle timer to reset.

**NOTE:** To reset the unit after a lockout:

- A. Turn the system switch on the thermostat to the "OFF" position and back to the "COOL" position.

OR

- B. Increase the set point of the room thermostat above the temperature in the conditioned space and return it to its original setting.

If the unit continues to be shut down by one of its safety controls, service should be called to determine the cause of the problem. Repeatedly resetting the lockout circuit may damage the unit.

The following accessories are available to provide low ambient operation to 0°F.

## **SAFETY FEATURES**

1. All condenser fan motors have inherent protection with automatic reset.
2. Every compressor is internally protected against over current, excessive temperature and primary single phasing.

This protection is provided by a line break motor protector that is mounted inside the compressor housing and is connected between each winding and the common terminal.

3. Every compressor (except HCE150 scrolls) is protected by crankcase heaters to prevent refrigerant from accumulating in the crankcases of the compressor during an "OFF" cycle.

4. All condenser fan motors and the secondary of every transformer is grounded.
5. Every unit is protected by both a high and a low pressure control, and these controls are self-contained. Since they are mounted directly on the access connections and wired back to the control panel, there are no capillary lines to be damaged.

## **MAINTENANCE**

### **CLEANING CONDENSER SURFACE**

Dirt should not be allowed to accumulate on the condenser coils or other parts in the condenser air circuit. Clean as often as necessary with a brush, vacuum cleaner attachment or other suitable means.

### **LUBRICATION**

The fan motors for these condensing units are equipped with factory lubricated and sealed ball bearings. They do not require any maintenance.

### **COMPRESSOR REPLACEMENT**

Contact the local UPG Distribution Center for compressor or parts.



---

Heating and Air Conditioning

Unitary Products Group  
5005 York Drive, Norman, Oklahoma 73069  
Subject to change without notice. Printed in U.S.A  
Copyright © 2004 by York International Corporation. All Rights Reserved.

035-15407-002-B-0404  
Supersedes: 035-15407-002-A-0304