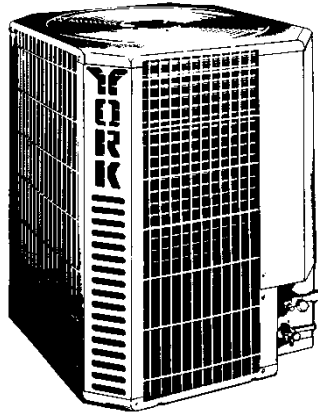


### MODELS E1FC024 thru E1FC036



### GENERAL

This instruction covers the installation of the following outdoor units: E1FC024S06, E1FC030S06 and E1FC036S06.

The outdoor units are designed to be connected to a matching indoor coil with either quick or sweat connect lines. Quick connect units are factory charged with refrigerant for a matching indoor coil and factory charged line sets are available in various lengths. Sweat connect units are factory charged with refrigerant for a matching indoor coil plus 15 feet of field supplied lines.

Matching indoor coils are available with a thermal expansion valve or an orifice liquid feed (YORKMATE flow control device) sized for the most common usage. The orifice size and/or refrigerant charge may need to be changed for some indoor-outdoor unit combinations, elevation differences or total line lengths. Refer to Application Data covering "General Piping Recommendations and Refrigerant Line Length".

### 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 delivery receipt. A separate request for inspection by the carrier's agent should be made in writing. See Local Distributor for more information.

### REFERENCE

Use this instruction in conjunction with the instructions for the appropriate indoor unit, air moving system and accessories.

Installer should pay particular attention to the words: *NOTE*, *CAUTION* and *WARNING*.

*NOTES* are intended to clarify or make the installation easier.

*CAUTIONS* identifies procedure which, if not followed carefully, could result in personal injury, property damage or product damage.

*WARNINGS* are given to alert the installer that severe personal injury, death or equipment damage may result if installation procedures are not handled properly.

### NOMENCLATURE

	E	1	FC	024	S	06
<b>Product Category</b>	_____					
E = Outdoor Split System Heat Pump						
<b>Product Generation</b>	_____					
1 = Design Level						
<b>Product Identifier</b>	_____					
FC = 11 SEER Heat Pump						
<b>Nominal Cooling Capacity</b>	_____					
024 = 2 Tons                      036 = 3 Tons						
030 = 2.5 Tons						
<b>Refrigerant Line Connections</b>	_____					
S = Sweat Fittings						
<b>Voltage Code</b>	_____					
06 = 208/230-1-60						

### LIMITATIONS

The unit should be installed in accordance with all national and local safety codes.

**TABLE 1 - APPLICATION LIMITATIONS**

AIR TEMPERATURE °DB ON OUTDOOR COIL				AIR TEMPERATURE ON INDOOR COIL			
Min.		Max.		Min.		Max.	
Cool	Heat	Cool	Heat	°WB Cool	°DB Heat	°WB Cool	°DB Heat
50	-10*	115	75	57	50**	72	80

\* If ambient will be below this, Accessory Kit 2LT06700224 must be installed to cutoff heat pump.

\*\* Operation below this temperature is permissible for a short period of time, during morning warm-up.

Limitations for the indoor unit, coil and appropriate accessories must also be observed.

The outdoor unit must not be installed with any ductwork in the air stream. The outdoor fan is the propeller type and is not designed to operate against any additional external static pressure.

The maximum and minimum conditions for operation must be observed to assure a system that will give maximum performance with minimum service.

### LOCATION

Before starting the installation, select and check the suitability of the location for both the indoor and outdoor unit. Observe all limitations and clearance requirements, see Figure 2.

NOTE: For multiple unit installations, units must be spaced a minimum of 18 inches apart (Coil face to coil face).

The outdoor unit must have sufficient clearance for air entrance to the condenser coil, for air discharge and for service access.

If the unit is to be installed on a hot sun exposed roof or a black-topped ground area, the unit should be raised sufficiently above the roof or ground to avoid taking the accumulated layer of hot air into the outdoor unit.

Provide an adequate structural support.

The unit may be installed at ground level on a solid base that will not shift or settle, causing strain on the refrigerant lines and possible leaks. Maintain the clearances shown Figure 2 and install the unit in a level position. Isolate the base from the building structure to avoid noise or vibration transmission.

When installing units on a roof, the structure must be capable of supporting the total weight of the unit, including a pad, lintels, rails, etc., which should be used to minimize the transmission of sound or vibration into the conditioned space.

Isolate the unit from rain gutters to avoid any possible wash out of the foundation.

Normal operating sound levels may be objectionable if the unit

is placed directly under windows of certain rooms (bedrooms, study, etc.).

Condensate will drain from beneath the coil of the outdoor unit during the defrost cycle. Normally this condensate may be allowed to drain directly onto the ground. A gravel bed may be used to prevent mud splashing.

**WARNING:** *The outdoor unit should not be installed in an area where mud or ice could cause personal injury. Remember that condensate will drip from the unit coils during heat and defrost cycles and that this condensate will freeze when the temperature of the outdoor air is below 32° F.*

Elevate the unit sufficiently to prevent any blockage of the air entrances by snow in areas where there will be snow accumulation. Check the local weather bureau for the expected snow accumulation in your area.

**INSTALLATION PROCEDURES**

The following sequence of installation steps is suggested.

1. Inspect unit and set in place.
2. Make electrical power connections.
3. Check orifice size and replace with correct size if necessary.

**TABLE 2 - PHYSICAL AND ELECTRICAL DATA**

UNIT MODEL E1FC...		024	030	036
UNIT SUPPLY VOLTAGE		208/230-1-60		
NORMAL VOLTAGE RANGE <sup>1</sup>		187 to 252		
MIN. CIRCUIT AMPACITY		15.2	19.2	
MAX. OVERCURRENT DEVICE AMPS <sup>2</sup>		20	25	
COMPRESSOR AMPS	RATED LOAD	9.7	12.3	
	LOCKED ROTOR	60	73	
CRANKCASE HEATER		YES	YES	
FAN MOTOR AMPS	RATED LOAD	0.8	0.8	
	LOCKED ROTOR	1.9	1.9	
MIN. FIELD WIRE SIZE AWG. COPPER CONDUCTORS	60°C	12	12	
	208V	99	81	
MAX. WIRE LENGTH ( FEET) BASED ON 3% VOLTAGE DROP	230V	110	90	
FAN DIAMETER INCHES		18	18	
FAN MOTOR	RATED HP	1/8	1/4	
	NOMINAL RPM	1075	1075	
	NOMINAL CFM	1900	2200	
COIL	FACE AREA SQ. FT.	14.1	14.1	
	ROWS DEEP	2	2	
	FINS/INCH	13	13	
LIQUID LINE CONNECTION		5/16 ?	5/16 ?	
VAPOR LINE CONNECTION		5/8	3/4	
OPERATING WEIGHT LBS.		170	172	

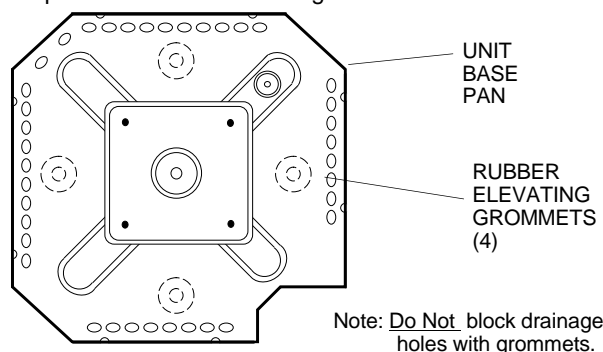
<sup>1</sup> Utilization range "A" in accordance with ARI standard 110.

<sup>2</sup> Dual element fuses or HACR circuit breaker.

4. Route the vapor and liquid lines.
5. Connect tubing and leak test.
6. Make electrical control connections.
7. Charge system.
8. Instruct owner.

### UNIT PLACEMENT

1. Provide a base in the pre-determined location.
2. Remove the shipping carton and inspect for possible damage.
3. Compressor tie-down bolts should remain tightened.
4. Position the unit on the base provided.
5. To reduce noise and to enhance drainage, sit unit on (4) rubber elevating grommets provided in bulk packed accessory kit model number 1SG0601. Grommets should be positioned as shown in Figure 1.



**FIGURE 1 - POSITIONING OF RUBBER ELEVATING GROMMETS**

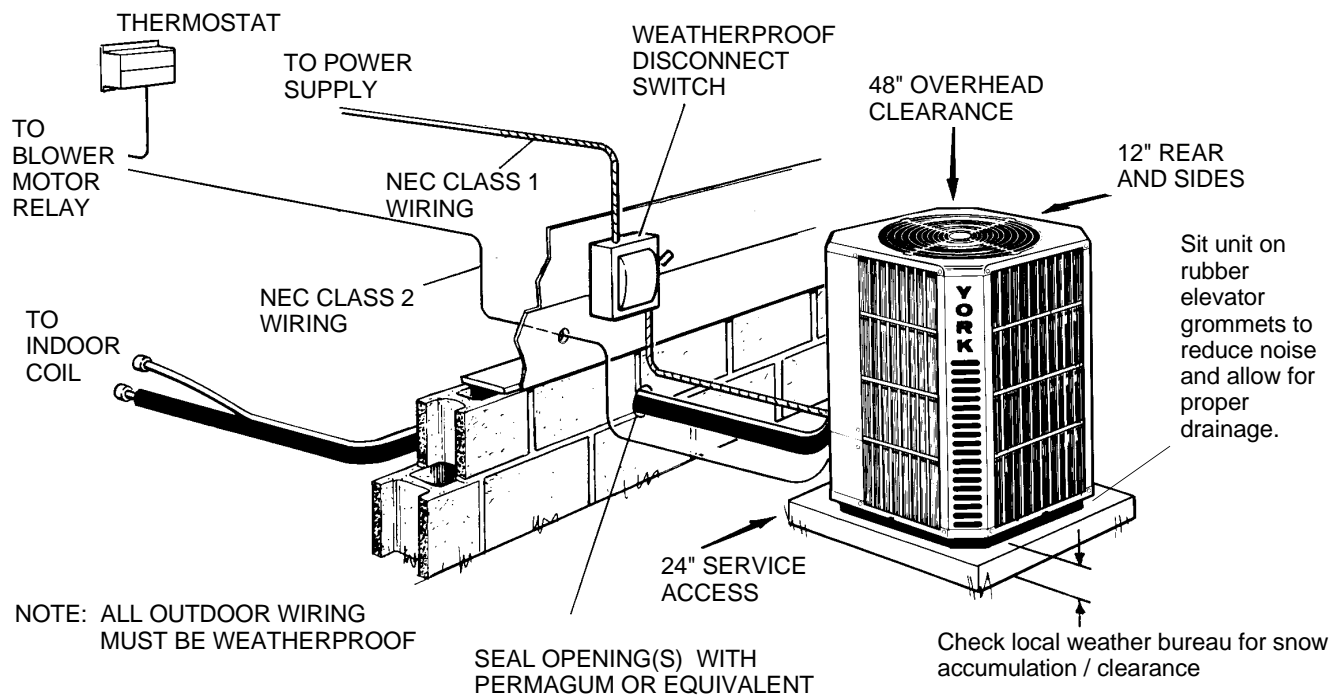
6. Make a hole(s) in the structure wall large enough to accommodate the insulated vapor line, the liquid line and the wiring.

### ELECTRICAL CONNECTIONS

1. Check the electrical supply to be sure that it meets the values specified on the unit nameplate and wiring label.
2. Remove proper low voltage knockout. Remove plastic snap bushing from instruction packet and insert in low voltage knockout hole.
3. The complete connection diagram and schematic wiring label is located on the inside surface of the unit electrical box cover. Typical Field Wiring is shown in Figure 3.
4. All field wiring to be in accordance with national electrical code (NEC) and/or local city codes.

*NOTE: Power wiring, disconnect switch, and overcurrent protection to be supplied by installer. See Physical and Electrical Data Table for proper sizes. USE COPPER CONDUCTORS ONLY. Unit must be grounded with a separate ground conductor wire.*

5. Install the proper size weatherproof disconnect switch outdoors and within sight of the unit.
6. Run power wiring from the disconnect switch to the unit.
7. Install the proper size time-delay fuses or circuit breaker, and make the power supply connections.
8. Energize the crankcase heater, if applicable, to save time by preheating the compressor oil while the remaining installation is completed.



**FIGURE 2 - TYPICAL INSTALLATION**

The crankcase heater, when furnished, is energized whenever the compressor is not running. Check for proper operation by feeling for heat on the compressor where the heater is installed. The heater should be energized for at least 8 hours before the thermostat is set to operate the compressor.

**CAUTION:** An attempt to start the compressor without at least 8 hours of crankcase heat will damage the compressor.

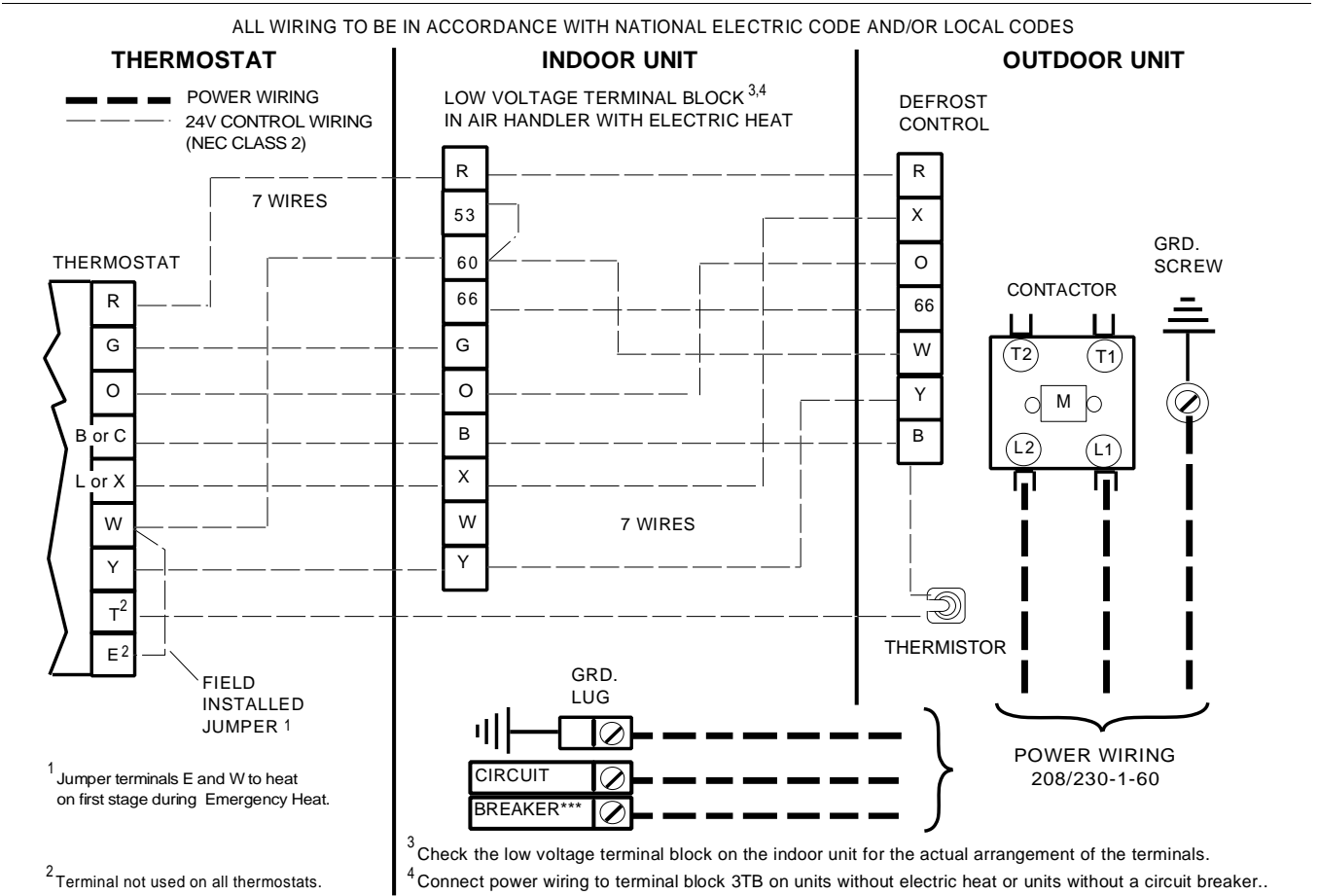
A warning label with an adhesive back is supplied in the unit installation instruction packet. This label should be attached to

the field supplied disconnect switch where it will be easily seen. See below:

**IMPORTANT**

IF POWER HAS BEEN OFF FOR 8 HOURS OR LONGER, DISCONNECT SWITCH MUST BE TURNED ON 8 HOURS BEFORE THERMOSTAT IS SET TO "HEAT", "COOL" OR "AUTO".

035-03095A



**FIGURE 3 - TYPICAL FIELD WIRING (AIR HANDLER WITH ELECTRIC HEAT)**

## DEFROST

The unit has a demand defrost control.

During troubleshooting, defrost can be initiated by shorting defrost test pins on the module. The pins are about 1/2" long and mounted on the upper right hand side of the defrost control.

## TUBING CONNECTIONS

Sweat-connect systems must use field supplied, clean, dehydrated refrigeration-grade copper tubing.

Quick-connect systems must use pre-charged refrigerant line sets (quick-connect couplings) designated for the respective unit size and available from CES. Pre-charged lines with excess tubing should be coiled horizontally in an inconspicuous location to avoid oil trapping.

Stub kits are available to field fabricate quick connect line sets or to connect mix-matched units and coils.

Unit should be installed only with approved system combinations (indoor coil/outdoor unit) specified in Technical Guide.

See Application Data, "General Piping Recommendations and Refrigerant Line Length," for vapor and liquid line sizing, calculation of liquid line pressure loss or gain, determination of vapor line velocity, elevation limitations, orifice corrections, system charging, traps, etc.

Total line lengths are limited to 75 feet due to the storage capacity of the accumulator. Systems with total line lengths over 50 feet must be provided with a low voltage start kit.

Elevation differences are limited to:

Indoor Above Outdoor ..... 50 ft.  
Outdoor Above Indoor ..... 50 ft.

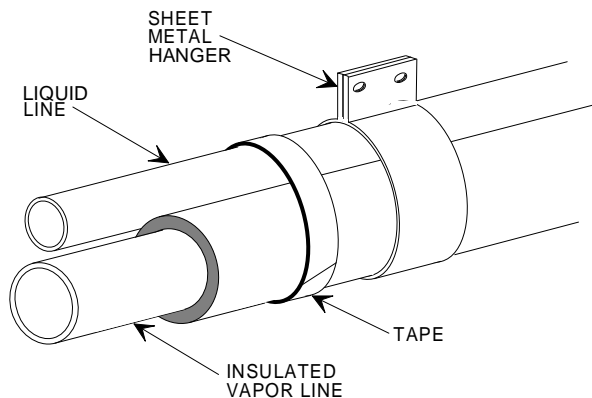
Systems with liquid line pressure loss or gain greater than 11 psi must be provided with corrected orifice size.

Inter-connecting refrigerant lines should be sized to match the factory supplied fittings. Liquid lines must **NEVER** be increased or decreased. Vapor lines may be increased one size to minimize pressure drop as long as a velocity of at least 1000 feet per minute is maintained.

Additional charge is required for inter-connecting piping greater than 15 feet for sweat units and some indoor coil matches.

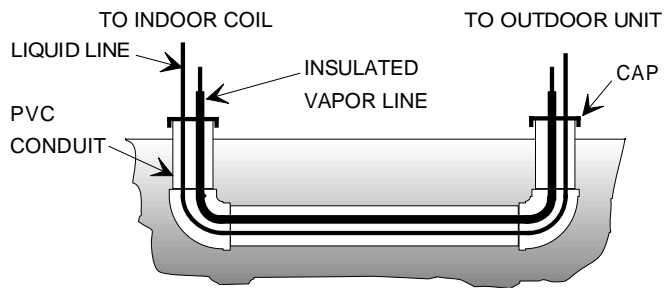
The lines should be installed so that they will not obstruct service access to the coil, air handling system or filter. Install the lines with as few bends as possible. Care must be taken not to damage the couplings or kink the tubing. Care must also be used to isolate the refrigerant lines to minimize noise transmission from the equipment to the structure.

Tape and suspend the refrigerant lines as shown. **DO NOT** allow metal-to-metal contact.



**FIGURE 4 - TUBING HANGER**

Use PVC piping as a conduit for all underground installations as shown below. Buried lines should be kept as short as possible to minimize the build up of liquid refrigerant in the vapor line during long periods of shutdown.



**FIGURE 5 - UNDERGROUND INSTALLATION**

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

Do not install a filter drier since one is factory installed in every outdoor unit.

Insulate all vapor lines with a minimum of 1/2" foam rubber. Liquid lines that will be exposed to direct sunlight and/or high temperatures must also be insulated.

**ORIFICE SELECTION**

**YORKMATE FLOW CONTROL COILS**

*NOTE: The proper orifice must be installed in the evaporator coil liquid connection prior to the connection of the refrigerant lines.*

*WARNING: Coil (whether sweat or quick connect) is under 15 PSIG pressure.*

Each quick connect coil will have an orifice installed in the fitting

between the liquid line connection and distributor. The orifice is identified on a label next to the liquid connection as shown in Figure 6.

Sweat coils are shipped with a standard orifice in a plastic bag attached to the liquid line connection.

The orifice that is shipped with the coil is based on the "most sold" combination, but it may have to be changed, depending on the capacity and efficiency of the outdoor unit, elevation differences, and/or long total line lengths. An additional orifice(s) is shipped with most outdoor units in the literature packet for the most commonly required replacement combinations. Other sizes must be ordered from the Parts Department if required.

Table 3 shows the orifice and charge adjustment for approved system combinations (indoor coil/outdoor unit). See Application Data, "General Piping Recommendations and Refrigerant Line Lengths" for long line lengths and elevation differences.

If the orifice sizes match, nothing further is required and the refrigerant lines may be connected per the outdoor unit instruc-

**TABLE 3- ADDITIONAL R-22 CHARGE/ORIFICE SIZE**

OUTDOOR UNIT		E1FC024	E1FC030	E1FC036
UNIT ORIFICE(S) <sup>1</sup>		63	69	
FACTORY R-22 CHARGE, LBS. OZ.	SWEAT	7-10	8-7	
INDOOR COIL	COIL ORIFICE <sup>2</sup>	SYSTEM ORIFICE + ADDITIONAL CHARGE, OZ.		
G3HC / G1FC018	55	-	-	
G3HC / G1FC024	61	-	-	
G3HC / G1FC030	69	63**+13	-	
G3HC / G1FC036	81	-	69*+10	
G3HC / G1FC042	78	-	-	
G3HC / G1FC048	90	-	-	
G3HC / G1FC060	96	-	-	
G3US018	55	-	-	
G3UA024	59	-	-	
G3UA030	65	63**+0	-	
G3UA036	69	63**+12	69*+0	
G3UA037	69	63**+12	69*+0	
G3UA048	87	-	-	
G3UA060	96	-	-	
G3UA061	96	-	-	
G2UT024	-	-	-	
G2UT036	-	+12	+0	
G2UT037	-	+12	+0	
G3CN030	65	63**+11	-	
G3CN042	73	-	-	
G3CN060	87	-	-	

<sup>1</sup>These orifices are packed in the instruction/warranty packet of each outdoor unit.

<sup>2</sup>These orifices are factory-mounted in the flow control device of each indoor coil.

NOTE: If orifice required is *not supplied* in coil or in the outdoor unit instruction packet, the orifice must be ordered from the Parts Department.

\*\* Orifice or 1TV0602 TXV kit.

\* Orifice or 1TV0601 TXV kit.

tion. However, if another orifice should be used, see the coil instruction for details to change the orifice in the coil.

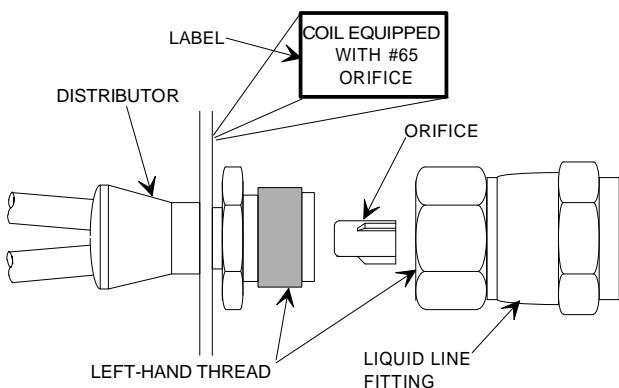


FIGURE 6 - ORIFICE LABEL

### QUICK CONNECT SYSTEMS

Indoor coils and outdoor units are to be connected with pre-charged interconnecting tubing specified for the split systems. The units and the lines are equipped with sealed one-time quick-connect couplings which, when screwed together, will have their seals broken, allowing for free passage of refrigerant. One end of the tubing contains a female fitting for connecting to the outdoor unit. The other end has a male fitting with a 90° bend on the vapor line for connecting to the indoor coil.

The outdoor end of the lines have capped service (Schrader) ports. Install the coupling in a position that will permit a Schrader tool to be attached to the service port.

Prepare and connect fittings as follows:

1. Begin at either the indoor coil or the outdoor unit. Remove only one dust cap at a time to avoid damage and to prevent dirt from getting into the other. If necessary, carefully wipe seals and threaded surfaces with a clean cloth.
2. Lubricate the male half diaphragm and the "O" ring with several drops of refrigerant oil. Thread the halves together by hand to insure proper mating of the threads. Use proper size wrenches (on both the body hex and on the union nut) and tighten until bodies "bottom" or a definite resistance is felt.
3. Using a marker or ink pen, mark a line lengthwise from the union nut to the unit panel. Then tighten an additional 1/4 turn (90° from the mark on the panel to the mark on the union nut).
4. Repeat this procedure with the other three in the system, removing the dust cap just prior to making the connection.
5. Leak test all refrigerant piping connections including the service port flare caps to be sure they are leak tight.

**DO NOT OVERTIGHTEN** (between 40 and 60 inch-lbs. maximum).

6. Do not remove the flare caps from the service ports except when necessary for servicing the system.

**CAUTION:** Do not connect manifold gauges unless trouble is suspected. Approximately 3/4 ounce of refrigerant will be lost each time a standard manifold gauge is connected.

7. The quick connect outdoor unit contains enough refrigerant charge for a matched evaporator. Refer to Table 3 for the amount of additional charge required for some mismatched indoor coils. If additional charge is required, see recommended charging methods.

### SWEAT-CONNECT SYSTEMS

The outdoor units have re-usable service valves on both the liquid and vapor connections. The total system refrigerant charge is retained within the outdoor unit during shipping and installation. The re-usable service valves are provided to evacuate and charge per this instruction.

Serious service problems can be avoided by taking adequate precautions to assure an internally clean and dry system.

Always use refrigeration-grade copper tubing that is internally clean and dry for refrigerant lines. Use clean hard drawn copper tubing where no appreciable amount of bending around obstruction is necessary. If soft copper must be used, care must be taken to avoid sharp bends which may cause a restriction. The vapor line must be insulated with a minimum of 1/2 inch insulation (Arm-A-Flex or equivalent).

**CAUTION:** Dry nitrogen should always be supplied through the tubing while it is being brazed, because the temperature required is high enough to cause oxidation of the copper unless an inert atmosphere is provided. The flow of dry nitrogen should continue until the joint has cooled. Always use a pressure regulator and safety valve to insure that only low pressure dry nitrogen is introduced into the tubing. Only a small flow is necessary to displace air and prevent oxidation.

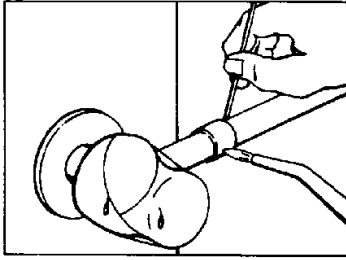
All outdoor unit and evaporator coil connections are copper-to-copper and should be brazed with a phosphorous-copper alloy material such as Silfos-5 or equivalent. **DO NOT** use soft solder.

### BASE VALVE CONNECTION PRECAUTIONS

Precautions should be taken to prevent heat damage to the fitting by wrapping a wet rag around it as shown in Figure 7. Also, protect all painted surfaces and insulation during brazing. After brazing - cool joint with wet rag.

**WARNING:** This is not a backseating valve. The service access port has a valve core. Opening or closing valve does not close service access port.

Valve can be opened by removing the plunger cap and fully inserting a hex wrench into the stem and backing out counter-clockwise until valve stem just touches retaining ring.



### FIGURE 7 - HEAT PROTECTION

**CAUTION:** If visual verification of the valve stem reaching the retaining ring is impossible, stop backing out the valve stem when the slightest increase in resistance is felt. Because of the small size and therefore the reduced resistance, back out the liquid valve 5 turns maximum to prevent going past the retaining ring.

**WARNING:** If the valve stem is backed out past the retaining ring, the O-ring can be damaged causing leakage or system pressure could force the valve stem out of the valve body possibly causing personal injury. In the event the retaining ring is missing, do not attempt to open the valve.

Replace plunger cap finger tight, then tighten an additional 1/12 turn (1/2 hex flat). Cap must be replaced to prevent leaks.

### LINE INSTALLATION

Install the refrigerant lines using the following procedure:

1. Remove the cap and Schrader core from both the liquid and vapor fitting service ports at the outdoor unit. Connect low pressure nitrogen to the liquid line service port.
2. Braze the liquid line to the liquid fitting at the outdoor unit. Be sure to wrap the fitting body with a wet rag. Allow the nitrogen to continue flowing.
3. Carefully remove the rubber plugs from the evaporator liquid and vapor connections. Use caution, since the evaporator is pressurized.
4. Braze the liquid line to the evaporator liquid connection. The nitrogen should now be flowing through the evaporator coil.
5. Remove the grommet from the vapor connection at the coil. Braze the vapor line to the evaporator vapor connection. After the connection has cooled, replace the grommet.
6. Protect the vapor fitting with a wet rag and braze the vapor line connection. The nitrogen flow should be exiting the system from the vapor service port connection. After This connection has cooled, remove the nitrogen source from the liquid fitting service port.
7. Evacuate the vapor line, indoor coil and the liquid line. See "EVACUATION" at top of page 9.

**NOTE:** Do not use the system refrigerant in the outdoor unit to purge or leak test.

8. Leak test all refrigerant piping connections including the service port flare caps to be sure they are leak tight. DO NOT OVERTIGHTEN (between 40 and 60 inch - lbs. maximum).
9. Do not remove the flare caps from the service ports except when necessary for servicing the system.

**CAUTION:** Do not connect manifold gauges unless trouble is suspected. Approximately 3/4 ounce of refrigerant will be lost each time a standard manifold gauge is connected.

10. Release refrigerant charge into the system. Open both the liquid and vapor fittings by removing the plunger cap and with an allen wrench back out counter-clockwise until valve stem just touches retaining ring. See Base Valve Connection Precautions.
11. The sweat connect outdoor unit contains enough refrigerant charge for a matched evaporator and 15 feet of tubing. Refer to the Table 3 for the amount of additional charge required for some mix-matched evaporators. Additional charge for lines longer than 15 feet is shown in Table 4. If additional charge is required, see recommended charging methods.
12. Insulate the vapor service valve and exposed line leaving the outdoor unit. This will eliminate the outdoor sensor picking up false heat at low ambient heating conditions.

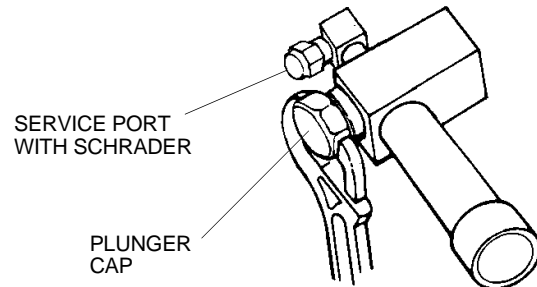


FIGURE 8 - OUTDOOR UNIT SHUT-OFF VALVE

### ROOM THERMOSTAT

Heat pump units must use one of the specific thermostats approved for use with these heat pump systems. The cooling and heating anticipators are non-adjustable in these thermostats.

The thermostat should be located about 5 ft. above the floor, where it will be exposed to normal room air circulation. Do not place it on an outside wall or where it is exposed to the radiant effect from exposed glass or appliances, drafts from outside doors or supply air grilles.

Mount the thermostat and route the 24-volt control wiring (NEC Class 2) from the thermostat to the indoor and outdoor units. To eliminate erratic operation, seal the hole in the wall at the thermostat with permagum or equivalent to prevent air drafts affecting the anticipators in the thermostat.

Route the control wiring into the outdoor unit through the hole provided. Connect the control wiring, see Figure 3 Typical Field Wiring.



## EVACUATION

It will be necessary to evacuate the system if the unit has developed a leak during shipment or was, for any other reason, opened to the atmosphere. If a leak is suspected, leak test to locate the leak. Repair the leak and test again.

**WARNING:** *Never attempt to repair any brazed connections while the system is under pressure. Personal injury could result.*

To verify if the system has no leaks, simply close the valve to the vacuum pump suction to isolate the pump and hold the system under vacuum. Watch the micron gauge for a few minutes. If the micron gauge indicates a steady and continuous rise, it's an indication of a leak. If the gauge shows a rise, then levels off after a few minutes and remains fairly constant, it's an indication that the system is leak free but still contains moisture and may require further evacuation if the reading is above 500 microns.

## SYSTEM CHARGE

**CAUTION:** *Refrigerant charging should only be carried out by a qualified air conditioning contractor with proper certification.*

The factory charge in the outdoor unit is listed in Table 3 and includes enough charge for the unit and matched indoor coils. Sweat connect units also include sufficient charge for 15 feet of lines. Pre-charged line lengths are factory charged with the correct amount of refrigerant required.

Sweat connect installations over 15 feet long and some indoor coil matches may require some additional charge. Table 4 lists the amount of any additional refrigerant required for line lengths over 15 feet.

**TABLE 4 - REFRIGERANT LINE CHARGES**

LIQUID OD	VAPOR OD	R-22 CHARGE OZ./FT.
3/8"	5/8"	0.66
3/8"	3/4"	0.68
3/8"	7/8"	0.70

The "TOTAL SYSTEM CHARGE" must be permanently stamped on the unit data plate.

Total system charge is determined as follows:

- Determine the outdoor unit charge from Table 3.
- Determine indoor coil adjustment from Table 3.
- Calculate the line charge with the factors in Table 4.
  - Calculate total length of pre-charged lines for quick connect units.
  - Calculate over 15 feet of sweat lines for sweat connect units.

**NOTE:** *The charge for pre-charged lines should be included in the system charge shown on the data plate but need not be added to the system. If sweat connect lines are used, the line charge over 15 feet should be included on the data plate and must be added to the system.*

- Total system charge = item 1 + item 2 + item 3.
- Permanently stamp the unit data plate with the total amount of refrigerant in the system.

Use the following charging method whenever additional refrigerant is required for the system charge.

### Measurement Method

A calibrated charging cylinder or accurate weighing device must be used to add refrigerant.

Check flare caps on service ports to be sure they are leak tight. **DO NOT OVERTIGHTEN** (between 40 and 60 inch-lbs. maximum).

**SYSTEM OPERATION**

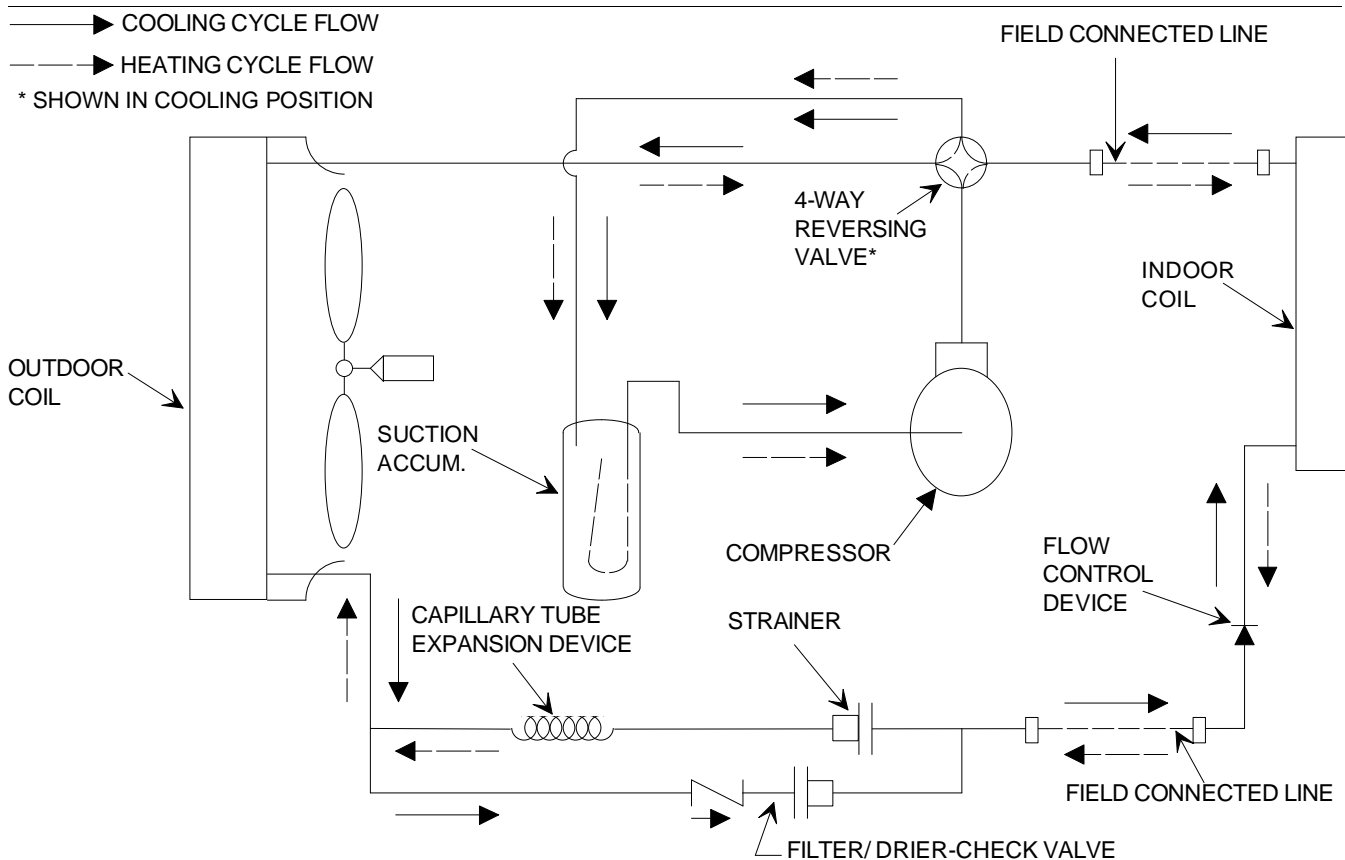
See Figure 9 to trace the flow of refrigerant through the system.

**WITH POWER TO UNIT AND THERMOSTAT IN COOLING POSITION.**

1. Reversing valve is energized through thermostat system switch to position refrigerant circuit for cooling operation. In the cooling cycle, discharge gas is pumped to the outdoor coil which is the condenser. The indoor coil is the evaporator.
2. If fan switch is in "ON" position, a circuit is made through blower relay to provide continuous blower operation.
3. When thermostat cooling contact closes, a circuit is made to energize contactor and start the system, if the compressor has been off 5 minutes. With fan switch in "AUTO" position, a circuit is made from thermostat cooling contact through blower relay to provide blower operation.
4. System will cycle with thermostat demand to provide cooling as needed.

**WITH POWER TO UNIT AND THERMOSTAT IN HEATING POSITION**

1. Reversing valve is de-energized to position refrigerant circuit for heating operation. In the heating cycle, discharge gas is pumped to the indoor coil which is the condenser. The outdoor coil is the evaporator.
2. If fan switch is in "ON" position, a circuit is made through blower relay to provide continuous blower operation.
3. When first stage of thermostat heating contact closes, a circuit is made through the control to energize contactor and start the system, if the compressor has been off 5 minutes. With fan switch in "AUTO" position, a circuit is made from thermostat heating contact through blower relay to provide blower operation.
4. The system will cycle in response to thermostat signal to provide heating as needed.
5. Supplemental electric heaters are energized by second stage of heating thermostat.

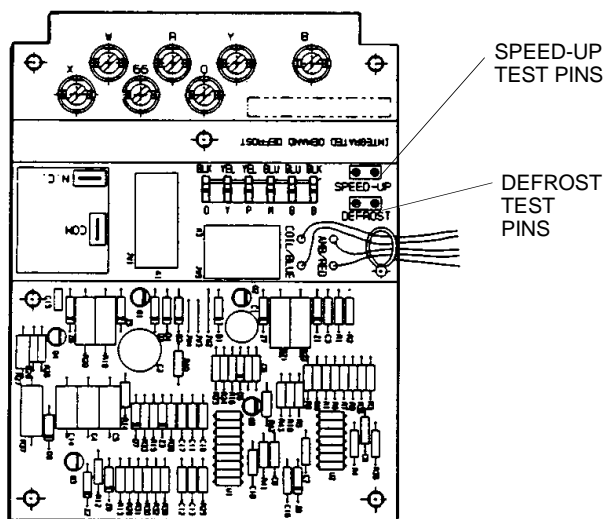


**FIGURE 9 - HEAT PUMP FLOW DIAGRAM**

## TEST PINS

The test pins labeled “speed-up” and “defrost” are provided to aid in field servicing of the E\*FB heat pump. See Figure 10. The pins are designed to be temporarily shorted together either by a screwdriver or with a 1/4" female spade connector.

When the “speed-up” pins are shorted together, ALL timings are speeded up by a factor of 64. This reduces the anti-recycle compressor timer from 5 minutes to about 5 seconds and the defrost terminate time from 14 minutes to 13 seconds; additionally, the 39 minute minimum run time would be shortened to about 40 seconds or less if the system has operated for some period of time since last defrost.



**FIGURE 10-** DEFROST TEST PINS

When the “defrost” pins are shorted together, the control will allow the unit to go into a defrost cycle if the compressor is operating. When the short is removed, the heat pump will remain in defrost until the coil temperature reaches 75° or 14 minutes expires.

If the liquid (coil) temperature happens to be above 75°F, the short must be maintained to keep the unit in a defrost cycle. It should be noted that caution should be used since the unit WILL REMAIN in defrost until the short is removed regardless of coil temperature. This could cause a lockout due to high discharge pressure!

*NOTE: Anytime the “defrost” shorting pins are jumpered, it automatically resets all timing cycles. After a power failure, all timing cycles would also reset except one that is the 5 minute delay for compressor restart. It can be reduced, however, by jumpering the “speed-up” pins on the control board.*

## DEFROST CYCLE

Frost and ice which forms on the outdoor coil during the heating cycle must be defrosted when it blocks the air flow through the coil.

Due to the arrangement of the refrigerant circuit within the outdoor coil of these units, frost may accumulate unevenly in different sections of the coil. However, a normal defrost may occur even though the coil is not completely covered with frost.

Three requirements must be met before a defrost cycle can be initiated.

1. A minimum of 39 minutes must have elapsed since last defrost.
2. The liquid line temperature must be less than 40°F.
3. The coil temperature must be below the defrost initiation temperature for 4.5 minutes continuously.

*NOTE: Under certain low ambient conditions normal triggering of a defrost cycle could be prevented. Therefore as a precautionary measure a “Forced Defrost” is initiated every six hours to insure compressor longevity by returning oil back to the sump.*

Defrost will terminate when the coil temperature reaches 75°F or after 14 minutes defrost time.

## LOCK-OUT CONTROL

If the discharge pressure reaches 400 PSIG, during either the heating or cooling mode, a lock-out will occur. A lock-out will turn on the emergency heat light on the thermostat.

Turning the thermostat switch to “off” then back to “on” will reset the system.

## OPERATION IN EMERGENCY HEAT POSITION

When switch on thermostat is placed in emergency heat position:

1. Emergency light is energized.
2. Compressor circuit is locked out.
3. Supplemental and standby heaters (if installed) will be controlled by first stage of heating thermostat.
4. Indoor blower will operate on demand for heat and cycle off with the last heater element when in “AUTO” position.

## INSTRUCTING THE OWNER

Assist owner with processing warranty cards. Review User's Information Manual and provide a copy for the owner guidance on proper operation and maintenance. Instruct the owner or the operator how to start, stop and adjust temperature setting. The owner should also be instructed about the 5 minute off cycle timer and the defrost operation.

When applicable, instruct the owner that the compressor is equipped with a crankcase heater to prevent the migration of refrigerant to the compressor during the "OFF" cycle. The heater is energized only when the unit is not running. If the main switch is disconnected for long periods of shut down, do not attempt to start the unit for 8 hours after the switch has been connected. This will allow sufficient time for all liquid refrigerant to be driven out of the compressor.

The installer should also instruct the owner on proper operation and maintenance of all other system components.

## INDICATIONS OF PROPER OPERATION

### COOLING

Cooling operation is the same as any conventional air conditioning unit.

1. The outdoor fan should be running, with warm air being discharged from the top of the unit.
2. The indoor blower (furnace or air handler) will be operating, discharging cool air from the ducts.
3. The vapor line at the outdoor unit will feel cool to the touch.
4. The liquid line at the outdoor unit will feel warm to the touch.

### HEATING

Indications of proper Heating operation is as follows:

1. The outdoor fan should be running, with cool air being discharged from the top of the unit.
2. The indoor blower (furnace or air handler) will be operating, discharging warm air from the ducts.
3. The vapor line at the outdoor unit will feel warm to the touch.
4. The liquid line at the outdoor unit will feel cool to the touch.

## NOTICE TO OWNER:

If lockout occurs, check the following before calling a serviceman:

1. Indoor section for dirty filter.
2. Outdoor section for snow accumulation.
3. Outdoor section for leaf or debris blockage.

Eliminate problem, turn off the thermostat for 10 seconds and attempt start. Wait 5 minutes. If system does not start, call serviceman.

## MAINTENANCE

1. Dirt should not be allowed to accumulate on the outdoor coils or other parts in the air circuit. Clean as often as necessary to keep the unit clean. Use a brush, vacuum cleaner attachment, or other suitable means.
2. The outdoor fan motor is permanently lubricated and does not require periodic oiling.
3. If the coil needs to be cleaned, it should be washed with Calgon Coilclean (mix one part Coilclean to seven parts water). Allow solution to remain on coil for 30 minutes before rinsing with clean water. Solution should not be permitted to come in contact with painted surfaces.
4. Refer to the furnace or air handler instructions for filter and blower motor maintenance.
5. The indoor coil drain pan should be inspected and cleaned regularly to prevent odors and assure proper drainage.

**CAUTION: IT IS UNLAWFUL TO KNOWINGLY VENT, RELEASE OR DISCHARGE REFRIGERANT INTO THE OPEN AIR DURING REPAIR, SERVICE, MAINTENANCE OR THE FINAL DISPOSAL OF THIS UNIT.**

**WHEN THE SYSTEM IS FUNCTIONING PROPERLY AND THE OWNER HAS BEEN FULLY INSTRUCTED, SECURE THE OWNER'S APPROVAL.**



Heating and Air Conditioning

