

INSTALLATION and START-UP INSTRUCTIONS

Split System Heat Pumps

Three Phase, 10 SEER

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

Safety Labeling and Signal Words

DANGER, WARNING, CAUTION, and NOTE

The signal words **DANGER**, **WARNING**, **CAUTION**, and **NOTE** are used to identify levels of hazard seriousness. The signal word **DANGER** is only used on product labels to signify an immediate hazard. The signal words **WARNING**, **CAUTION**, and **NOTE** will be used on product labels and throughout this manual and other manuals that may apply to the product.

DANGER - Immediate hazards which **will** result in severe personal injury or death.

WARNING - Hazards or unsafe practices which **could** result in severe personal injury or death.

CAUTION - Hazards or unsafe practices which **may** result in minor personal injury or product or property damage.

NOTE - Used to highlight suggestions which **will** result in enhanced installation, reliability, or operation.

Signal Words in Manuals

The signal word **WARNING** is used throughout this manual in the following manner:



WARNING

The signal word **CAUTION** is used throughout this manual in the following manner:



CAUTION


Signal Words on Product Labeling

Signal words are used in combination with colors and/or pictures on product labels.

SAFETY CONSIDERATIONS

Improper installation, adjustment, alteration, service, maintenance, or use can cause explosion, fire, electrical shock, or other conditions which may cause death, personal injury, or property damage. Consult a qualified installer, service agency, or your distributor or branch for information or assistance. The qualified installer or agency must use factory-authorized kits or accessories when modifying this product. Refer to the individual instructions packaged with the kits or accessories when installing.

Follow all safety codes. Wear safety glasses, protective clothing, and work gloves. Use quenching cloth for brazing operations. Have fire extinguisher available. Read these instructions thoroughly and follow all warnings or cautions included in literature and attached to the unit. Consult local building codes and National Electrical Code (NEC) or International Electrotechnical Commission (IEC) for special requirements.

Recognize safety information. This is the safety-alert symbol . When you see this symbol on the unit and in instructions or manuals, be alert to the potential for personal injury.



WARNING

ELECTRICAL SHOCK HAZARD

Failure to turn off the main (remote) electrical disconnect device could result in personal injury or death.

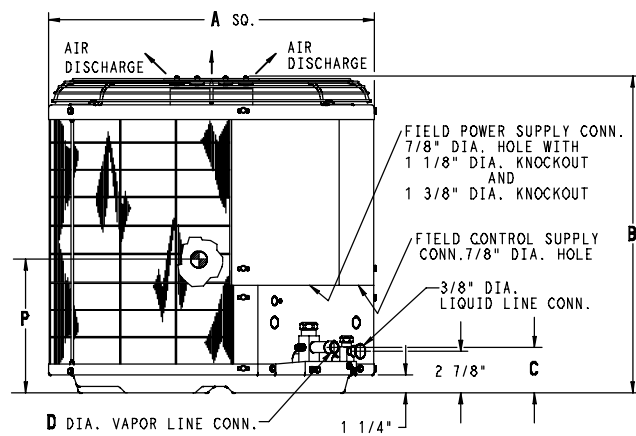
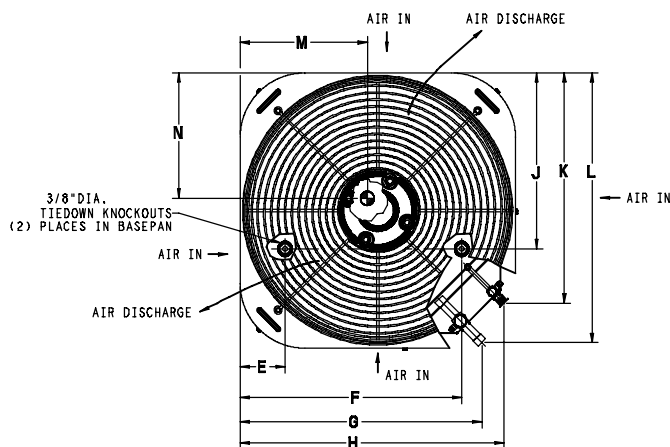
Before installing, modifying or servicing system, turn OFF the main (remote) electrical disconnect device. There may be more than one disconnect device.

Figure 1

Dimensions

NOTES

1. Allow 30 inches (762 mm) clearance to service end of unit, 48 inches (1219 mm) above unit, 6 inches (152 mm) on one side, 12 inches (305 mm) on remaining side, and 24 inches (610 mm) between units for proper airflow.
2. Minimum outdoor operating ambient (cooling mode) is 55 °F (13 °C)
Maximum outdoor operating ambient (cooling mode) is 125 °F (52 °C)
Maximum outdoor operating ambient (heating mode) is 66 °F (19 °C).
3. Dimensions in parentheses are in millimeters.
4. Series designation is the 10th position of the unit model number.



Unit	A	B	C	D	E	F	G	H	J	K	L	M	N	P
N2H036	30	27-15/16	3-3/16	3/4	6-1/2	23-1/2	27-1/4	29-1/8	2	26-3/8	29-9/16	16-3/4	15	12
N2H042	30	33-15/16	3-1/4	7/8	6-1/2	23-1/2	27-1/4	29-1/8	20	26-3/8	29-9/16	15	15-3/4	13-1/2
N2H048	30	39-15/16	3-1/4	7/8	6-1/2	23-1/2	27-1/4	29-1/8	20	26-3/8	29-9/16	15	15-3/4	15-1/2
N2H060	30	39-15/16	3-1/4	7/8	6-1/2	23-1/2	27-1/4	29-1/8	20	26-3/8	29-9/16	13-3/4	15-5/8	15

INSTALLATION

STEP 1 - CHECK EQUIPMENT AND JOB SITE

UNPACK UNIT

Move to final location. Remove carton, taking care not to damage unit.

INSPECT EQUIPMENT

File claim with shipping company prior to installation if shipment is damaged or incomplete. Locate unit rating plate on unit service panel (see Figure 1). It contains information needed to properly install unit. Check rating plate to be sure unit matches job specifications.

STEP 2 - INSTALL ON A SOLID, LEVEL MOUNTING PAD

If conditions or local codes require the unit be attached to pad, tie-down bolts should be used and fastened through knockouts provided in unit base pan. Refer to unit-mounting pattern in Figure 1 to determine base-pan size and knockout-hole location.

On rooftop applications, mount on level platform or frame. Place unit above a load-bearing wall. Arrange supporting members to adequately support unit and minimize transmission of vibration to building. Consult local codes governing rooftop applications.

Roof mounted units exposed to winds above 5 mph (8 km/h) may require wind baffles to achieve adequate defrost.

NOTE: Unit must be level to within $\pm 2^\circ$ per compressor manufacturer specifications.

STEP 3 - CLEARANCE REQUIREMENTS

When installing, allow sufficient space for airflow clearance, wiring, refrigerant piping, and service. Allow 30 inches (762 mm) clearance to service end of unit and 48 inches (1219 mm) above unit. For proper airflow, a 6 inch (152 mm) clearance on 1 side of unit and 12 inches (305 mm) on all remaining sides must be maintained. Maintain a distance of 24 inches (610 mm) between air conditioners.

On rooftop applications, locate unit 6 inches (152 mm) above roof surface.

STEP 4 - OPERATING AMBIENTS

The minimum outdoor operating ambient in cooling mode is 55 °F (13 °C), and the maximum outdoor operating ambient in cooling mode is 125 °F (52 °C). The maximum outdoor operating ambient in heating mode is 66 °F (19 °C).

STEP 5 - CHECK INDOOR AND OUTDOOR PISTONS

Check indoor coil piston to see if it matches the required piston shown on outdoor unit rating plate. If it does not match, replace indoor coil piston with piston shipped with the outdoor unit. The piston shipped with outdoor unit is correct for any approved indoor coil combination.

Check outdoor unit piston. Remove retainer on liquid service valve and check piston size with matching number listed on unit rating plate.

STEP 6 - REFRIGERANT TUBING CONNECTIONS

Outdoor units may be connected to indoor sections using accessory tubing package or field-supplied refrigerant grade tubing of correct size and condition. For tubing requirements beyond 80 feet (24.4 m), or more than 20 feet (6.1 m) vertical differential, consult Long-Line Application Guideline which is available at your local distributor.

NOTE: In some cases, noise in the living area has been traced to gas pulsations from improper installation of equipment.

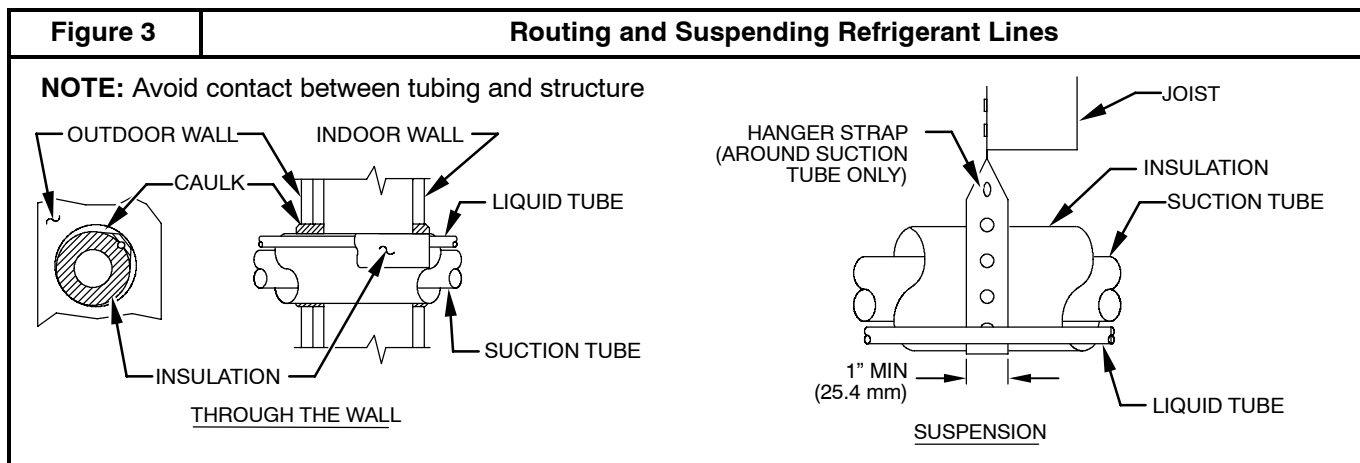
INSTALLATION RECOMMENDATIONS

1. Locate unit away from windows.

2. Ensure that vapor and liquid-tube diameters are appropriate to capacity of unit (see Figure 2).
3. Run refrigerant tubes as directly as possible by avoiding unnecessary turns and bends.
4. Leave some slack between structure and unit to absorb vibration.
5. When passing refrigerant tubes through the wall, seal opening with RTV or other pliable silicon-based caulk (see Figure 3).
6. Avoid direct tubing contact with water pipes, duct work, floor joists, wall studs, floors, and walls.
7. Do not suspend refrigerant tubing from joists and studs with a rigid wire or strap that comes in direct contact with tubing (see Figure 3).
8. Ensure that tubing insulation is pliable and completely surrounds vapor tube.
9. When necessary, use hanger straps which are 1 inch (25.4 mm) wide and conform to shape of tubing insulation (see Figure 3).
10. Isolate hanger straps from insulation by using metal sleeves bent to conform to shape of insulation.

Figure 2	Service Valve Fittings inches (mm)		Line Set Tube Diameter, inches (mm) Liquid Tube Always a (9.53) dia.
	Liquid	Suction	Suction Line Diameter
Model Size			
036 (3 ton)	3/8 (9.53)	3/4 (19.05)	3/4 (19.05)
042 (3-1/2 ton)	3/8 (9.53)	7/8 (22.23)	7/8 (22.23)
048 (4 ton)	3/8 (9.53)	7/8 (22.23)	7/8 (22.23)
060 (5 ton)	3/8 (9.53)	7/8 (22.23)	1-1/8 (28.58)

Notes: 1. For tube line sets over 80 feet (24.4 m), consult Long-Line Application Guideline.
2. Do not apply capillary tube indoor coils to these units.





CAUTION

UNIT OPERATION HAZARD

Failure to follow this caution may result in improper product operation.

Do not bury more than 36" (910 mm) of line set underground. Refrigerant may migrate to cooler buried section during extended periods of unit shut-down, causing refrigerant slugging and possible compressor damage at start-up.

If ANY section of the line set is buried underground, provide a minimum 6" (150 mm) vertical rise at the service valve.

OUTDOOR UNITS CONNECTED TO FACTORY APPROVED INDOOR UNITS

Outdoor unit contains correct system refrigerant charge for operation with indoor unit of same size when connected by 15 feet (4.55 m) of field-supplied or factory-accessory tubing. Check refrigerant charge for maximum efficiency.

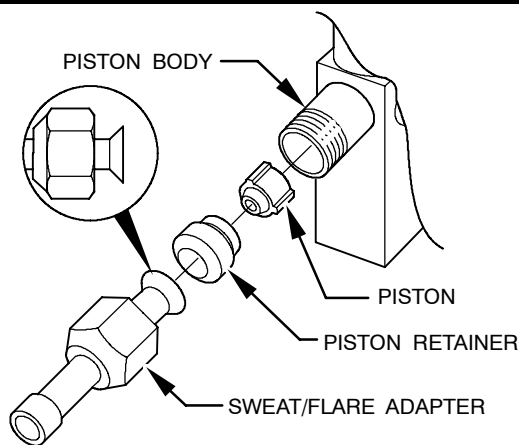
REFRIGERANT TUBING

Connect tubing to fittings on outdoor unit vapor and liquid service valves (see Figures 1 and 4).

If refrigerant tubes or indoor coil is exposed to atmospheric conditions, it must be evacuated to 500 microns to eliminate contamination and moisture in the system.

Figure 4

Service Valve with Piston and Sweat Adapter Tube



WARNING

PERSONAL INJURY AND/OR PROPERTY DAMAGE HAZARD

Failure to relieve system pressure could result in personal injury and/or property damage.

Relieve pressure and recover all refrigerant before servicing existing equipment, and before final unit disposal. Use all service ports and open all flow-control devices, including solenoid valves.



CAUTION

PRODUCT DAMAGE HAZARD

Failure to follow this caution may result in product damage.

Use a brazing shield.

Wrap service valves with wet cloth or use a heat sink material.

SWEAT CONNECTION

Use refrigerant grade tubing. Service valves are closed from factory and ready for brazing. After wrapping service valve with a wet cloth, braze sweat connections using industry accepted methods and materials. Consult local code requirements. Refrigerant tubing and indoor coil are now ready for leak testing. This check should include all field and factory joints.

NOTE: Check factory tubing on both indoor and outdoor unit to ensure tubes are not rubbing against each other or any sheet metal. Pay close attention to feeder tubes, making sure wire ties on feeder tubes are secure and tight.

NOTE: Always install a liquid line filter drier. Refer to Product Specification literature for appropriate part number.

STEP 7 - MAKE ELECTRICAL CONNECTIONS

Be sure field wiring complies with local and national fire, safety, and electrical codes, and voltage to system is within limits shown on unit rating plate. Contact local power company for correction of improper voltage. See unit rating plate for recommended circuit protection device.

NOTE: Operation of unit on improper line voltage constitutes abuse and could affect unit reliability. See unit rating plate. Do not install unit in system where voltage or phase imbalance may fluctuate above or below permissible limits.

NOTE: Use copper wire only between disconnect switch and unit.

NOTE: Install branch circuit disconnect per local codes of adequate size to handle unit starting current. Locate disconnect within sight from and readily accessible from unit per local codes.



WARNING

ELECTRICAL SHOCK HAZARD

Failure to follow this warning could result in personal injury or death.

Before supplying power to the unit, insure that the terminal box cover is in place on the compressor.

ROUTE GROUND AND POWER WIRES

Remove access panel and control box cover to gain access to unit wiring. Extend wires from disconnect through power wiring hole provided and into unit control box (see Figure 1). Size wires per local codes, but not smaller than minimum wire size shown on unit rating plate.

CONNECT GROUND AND POWER WIRES

Connect ground wire to ground connection in control box for safety. Connect power wiring to contactor as shown in Figure 5.

⚠
WARNING

ELECTRICAL SHOCK HAZARD

Failure to establish uninterrupted or unbroken ground could result in personal injury or death.

According to NEC, IEC, ANSI/NFPA 70, and local codes, the cabinet must have an uninterrupted or unbroken ground to minimize personal injury if an electrical fault should occur. The ground may consist of electrical wire or metal conduit when installed in accordance with existing electrical codes. If conduit connection uses reducing washers, a separate ground wire must be used.

CONNECT CONTROL WIRING

Route 24V control wires through control wiring grommet and connect leads to control wiring pigtails from terminal board (see Figure 6). Use furnace transformer, fan-coil transformer, or accessory transformer for control power, 24V, 40-VA minimum.

NOTE: Use No. 18 AWG (American Wire Gage) color-coded, insulated (35 °C minimum) wire. If thermostat is located more than 100 feet (30.5 m) from unit as measured along the control voltage wires, use No. 16 AWG color-coded wires to avoid excessive voltage drop.

NOTE: Use of available 24V accessories may exceed the minimum 40-va power requirement. Determine total transformer loading and increase the transformer capacity or split the load with an accessory transformer as required.

NOTE: Check factory wires and wire connections to ensure terminations are secured properly. Check wire routing to ensure wires are not in contact with tubing, sheet metal, etc.

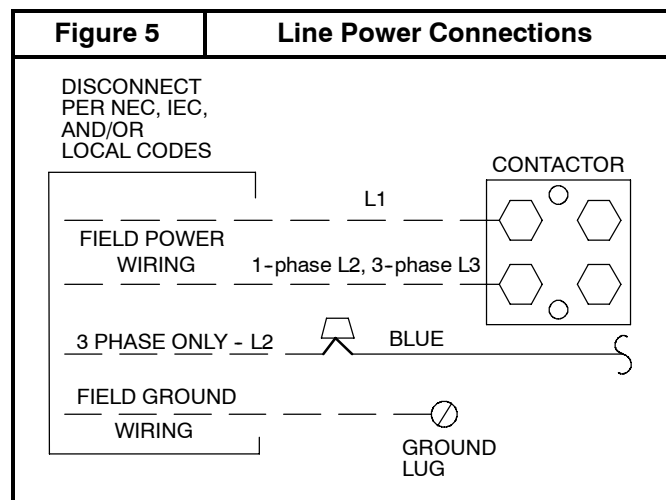


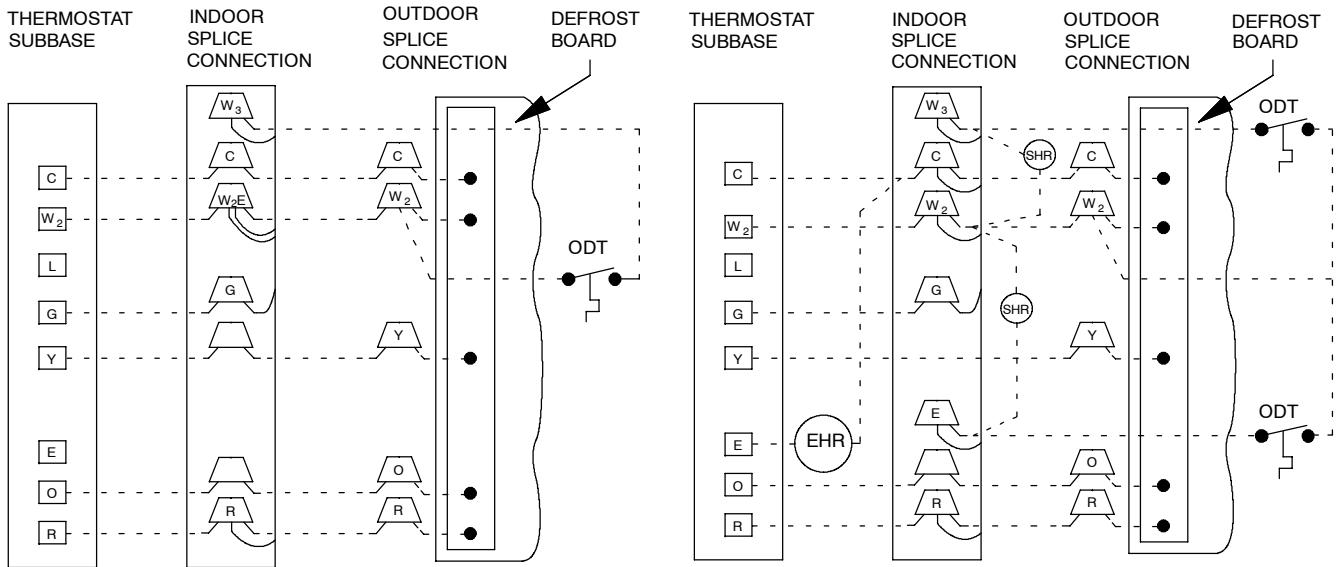
Figure 6

Typical Control Circuit Connections

NOTE: WHEN USING OUTDOOR THERMOSTATS, W₂ MUST BE ENERGIZED WHEN REQUESTING SUPPLEMENTAL HEAT.

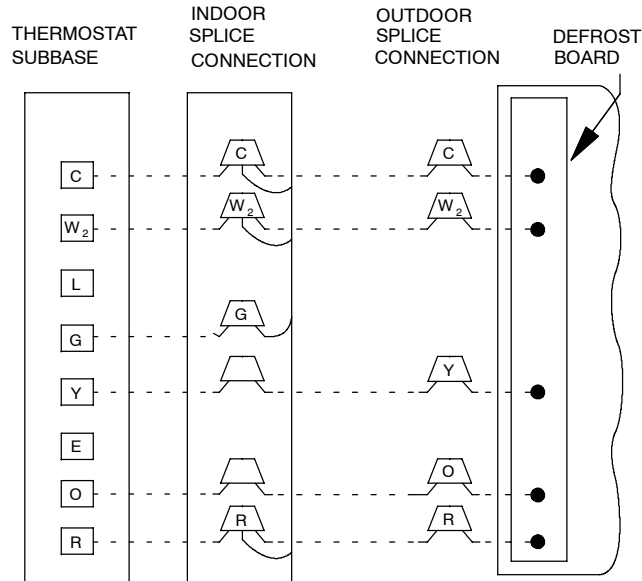
SYSTEMS WITH ONE OUTDOOR THERMOSTAT

SYSTEMS WITH TWO OUTDOOR THERMOSTATS



REMOVE WIRES FROM CRIMP NUT IN INDOOR FAN COIL WHEN INSTALLING OUTDOOR THERMOSTATS.

SYSTEMS WITHOUT OUTDOOR THERMOSTATS



LEGEND

- 24-V FACTORY WIRING
- - - - 24-V FIELD WIRING
- FIELD SPLICE
- CONNECTION
- (EHR) OUTDOOR EMERGENCY HEAT RELAY
- (SHR) THERMOSTAT SUPPLEMENTAL HEAT RELAY

STEP 8 - COMPRESSOR CRANKCASE HEATER

When equipped with a crankcase heater, energize heater a minimum of 24 hours before starting unit. To energize heater only, set thermostat to OFF and close electrical disconnect to outdoor unit. A crankcase heater is required if the refrigerant tubing is longer than 50 feet (15.24 m).

STEP 9 - INSTALL ELECTRICAL ACCESSORIES

Refer to the individual instructions packaged with the kit or accessory when installing.

STEP 10 - START-UP



WARNING

PERSONAL INJURY HAZARD

Failure to follow this warning could result in personal injury.

Wear safety glasses, protective clothing, and gloves when handling refrigerant.

Observe the following:

Back seating service valves are not equipped with Schrader valves. Fully back seat (counter clockwise) valve stem before removing gage port cap. Front seating service valves are equipped with Schrader valves.



CAUTION

PROPERTY DAMAGE HAZARD

Failure to follow this caution may result in property damage

Do not overcharge system with refrigerant.

Do not operate unit in a vacuum or at negative pressure.

Do not disable low-pressure switch.

In scroll compressor applications: dome temperatures may be hot.

NOTE: Do not vent refrigerant to atmosphere. Recover during system repair or final unit disposal.

1. If equipped with a crankcase heater, energize a minimum of 24 hours before starting unit. To energize heater only, set thermostat OFF and close electrical disconnect to outdoor unit.
2. Fully back seat (open) liquid and vapor tube service valves.
3. Unit is shipped with valve stem(s) front seated and caps installed. Replace stem caps after system is opened to refrigerant flow (back seated). Replace caps finger-tight and tighten additional 6 turn with wrench.
4. Close electrical disconnects to energize system.

5. Set room thermostat at desired temperature. Be sure set point is below indoor ambient temperature.
6. Set room thermostat to HEAT or COOL and fan to ON or AUTO mode, as desired. Operate unit for 15 minutes. Check system refrigerant charge.

STEP 11 - CHECK CHARGE

Factory charge is shown on unit rating plate. To check charge follow procedures shown below.

COOLING ONLY PROCEDURE - INDOOR UNIT EQUIPPED WITH PISTON, SUPERHEAT METHOD

Factory charge is shown on unit rating plate. To check charge in cooling mode, refer to Cooling Only Procedure on unit wiring and charging label. To check charge in heating mode, refer to Heating Check Chart Procedure.

NOTE: If superheat or subcooling charging conditions are not favorable, charge must be weighed in accordance with unit rating plate, ± 0.6 oz/ft of 3/8 in. liquid line above or below 15 ft. respectively.

COOLING ONLY PROCEDURE - INDOOR UNIT EQUIPPED WITH TXV - SUBCOOLING METHOD

Factory charge and subcooling are shown on unit information plate. To check charge, follow the procedure below.

NOTE: IF subcooling charging conditions are not favorable, charge must be weighed in accordance with unit rating plate, ± 0.6 oz/ft of 3/8 in. liquid line above or below 15 ft. respectively. Favorable conditions fall within the ranges given on the charging chart on the outdoor unit plate.

EXAMPLE:

To calculate additional charge required for a 25 ft. line set; 25 ft - 15 ft = 10 ft x 0.6 oz/ft = 6 oz of additional charge.

1. Operate unit a minimum of 10 minutes before checking charge.
2. Measure liquid service valve pressure by attaching an accurate gauge to service port.
3. Measure liquid line temperature by attaching an accurate thermistor type of electronic thermometer to liquid line near outdoor coil.
4. Refer to unit rating plate for required subcooling temperature.
5. Refer to Table 1. Find the point where required subcooling temperature intersects measured liquid service valve pressure.
6. To obtain required subcooling temperature at the specific liquid line pressure, add refrigerant if liquid line temperature is higher than indicted or reclaim refrigerant if temperature is lower. Allow a tolerance of $\pm 3^{\circ}\text{F}$.

NOTE: In long-line applications, See the Residential Split System Long-line Application Guideline for special charging requirements.

Liquid Pressure at Service Valve	Table 1 - Required Subcooling Temperature (°F)			
(PSIG)	5	10	15	20
134	71	66	61	56
141	74	69	64	59
148	77	72	67	62
156	80	75	70	65
163	83	78	73	68
171	86	81	76	71
179	89	84	79	74
187	92	87	82	77
196	95	90	85	80
205	98	93	88	83
214	101	96	91	86
223	104	99	94	89
233	107	102	97	92
243	110	105	100	95
253	113	108	103	98
264	116	111	106	101
274	119	114	109	104
285	122	117	112	107
297	125	120	115	110
309	128	123	118	113
321	131	126	121	116
331	134	129	124	119
346	137	132	127	122
359	140	135	130	125

HEATING CHECK-CHART PROCEDURE

To check system operation during heating cycle, refer to the Heating Check Chart on outdoor unit. This chart indicates whether a correct relationship exists between system operating pressure and air temperature entering indoor and outdoor units. If pressure and temperature do not match on chart, system-refrigerant charge may not be correct. Do not use chart to adjust refrigerant charge.

NOTE: When charging is necessary during heating season, charge must be weighed in accordance with unit rating plate[±] 0.6 oz/ft of 3/8 in. liquid line above or below 15 ft. respectively.

SEQUENCE OF OPERATION

With power supplied to indoor and outdoor units, transformer is energized. Defrost control board is equipped with 5-minute lockout timer which is initiated upon any interruption of power.

COOLING

On a call for cooling, the thermostat makes circuits R-O, R-Y, and R-G. Circuit R-O energizes reversing valve, switching it to cooling position. Circuit R-Y energizes contactor, starting outdoor fan motor and compressor circuit. Circuit R-G energizes indoor unit blower relay, starting indoor blower motor.

When thermostat is satisfied, its contacts open, de-energizing contactor and blower relay. Compressor and motors stop.

NOTE: If indoor unit is equipped with a time-delay relay circuit, the blower runs an additional length of time to increase system efficiency.

HEATING

On a call for heating, the thermostat makes circuits R-Y and R-G. Circuit R-Y energizes contactor, starting outdoor fan motor and compressor. Circuit R-G energizes indoor blower relay, starting blower motor. Should the temperature continue to fall, R-W2 is made through the second-stage room thermostat bulb. Circuit

R-W2 energizes a sequencer, bringing on the first bank supplemental electric heat and providing electrical potential to the second heater sequencer (if used). If outdoor temperature falls below the setting of the outdoor thermostat (field-installed option), contacts close to complete the circuit and bring on the second bank of supplemental electric heat.

When the thermostat is satisfied, its contacts open, de-energizing contactor and sequencer. Compressor, motors, and heaters stop.

THREE PHASE ROTATION

On three phase models with scroll compressors, it is important that the compressor rotate in the proper direction. To determine whether or not compressor is rotating in the proper direction:

1. Connect service gages to suction and discharge pressure fittings.
2. Energize the compressor.
3. The suction pressure should drop and the discharge pressure should rise, as is normal on any start-up. This indicates correct rotation.

If the suction pressure does not drop and the discharge pressure does not rise to normal level:

1. Turn off power to the unit.
2. Reverse any two of the unit power leads.
3. Re-apply power to the compressor, verify correct suction and discharge pressures.

QUIET SHIFT (some models)

Quiet Shift is a field-selectable defrost mode, which will eliminate occasional noise that could be heard at the start of the defrost cycle and restarting of heating cycle. It is selected by placing DIP switch 3 (on defrost board) in ON position (refer to Figure 7). When Quiet Shift switch is placed in ON position, and a defrost is initiated, the following sequence of operation will occur. Reversing valve will energize, compressor will turn off for 30 sec, then turn back on to complete defrost. At the start of heating cycle after conclusion of defrost mode, reversing valve will de-energize, the compressor will turn off for another 30 sec, and the fan will turn off for 40 sec, before starting in the heating mode.

DEFROST

The defrost control is a time/temperature control which includes a field-selectable (quick-connects located at board edge) time period between defrost cycles of 30, 60, or 90 minutes (factory set at 90 minutes).

Defrost mode is identical to cooling mode except that outdoor-fan motor stops and second-stage heat is turned on to continue warming conditioned space.

Initially, the defrost cycle timer starts when the contactor is energized and a 24V signal is present on the T1 terminal. Then the defrost cycle begins when the defrost thermostat is closed and the cycle timer times out (30, 60, 90 or minutes).

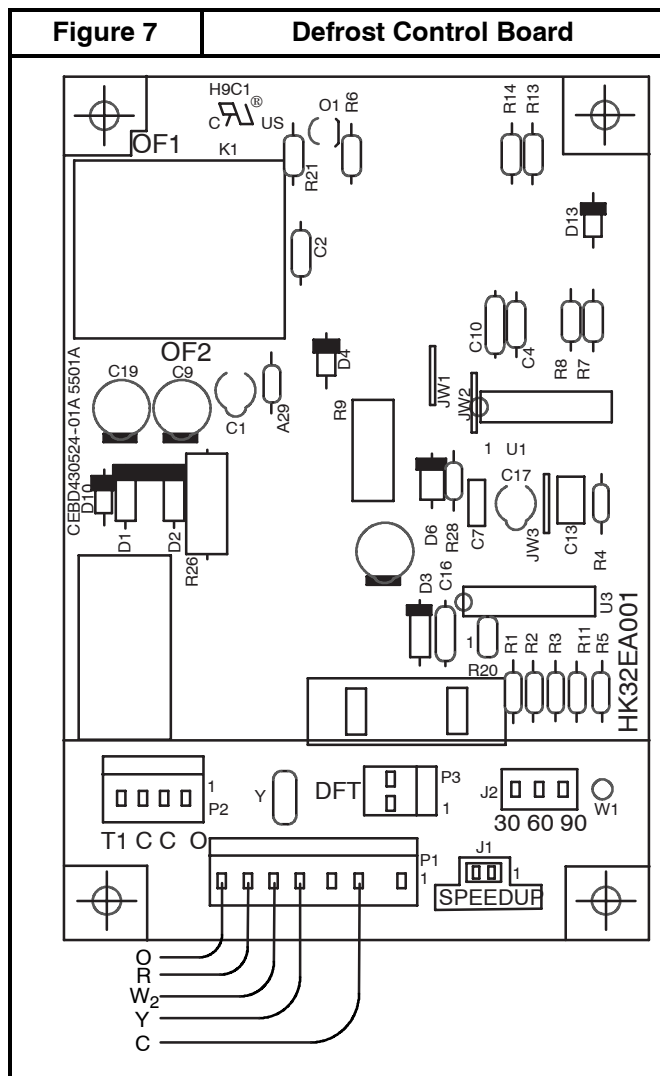
To initiate a forced defrost cycle, the defrost thermostat must be closed. This can be accomplished as follows:

1. Turn off power to outdoor unit.
2. Disconnect outdoor-fan motor lead from OF2 on control board (see Figure 7). Tape lead to prevent grounding.
3. Restart unit in heating mode, allowing frost to accumulate on outdoor coil.
4. After a few minutes in heating mode, liquid line temperature should drop below closing point of defrost thermostat (approximately 30 °F or -1.1 °C).
5. Short between speed-up terminals with a flat-bladed screwdriver (see Figure 7). This reduces the timing sequence to 7, 14, or 21 seconds (30, 60, or 90 minute defrost selection, respectively).
6. When you hear reversing valve change position, remove screwdriver immediately; otherwise, control will terminate normal 10-minute defrost cycle in approximately 2 seconds.

NOTE: Length of defrost cycle is dependent upon length of time it takes to remove screwdriver from test pins after reversing valve has shifted.

7. Unit will remain in defrost for remainder of defrost-cycle time or until defrost thermostat reopens at approximately 80 °F (26.7 °C) coil temperature of liquid line.

8. Turn off power to outdoor unit and reconnect fan-motor lead to OF2 on control board (see Figure 7).



FINAL CHECKS

Before leaving job, be sure to do the following:

1. Securely fasten all panels and covers.
2. Tighten service valve stem caps to 1/12 turn past finger tight.
3. Leave this document with owner. Explain system operation and periodic maintenance requirements outlined in manual.

CARE AND MAINTENANCE

For continued high performance and to minimize possible equipment failure, periodic maintenance must be performed on this equipment.

Explain system operation and periodic maintenance requirements with owner. Frequency of maintenance may vary depending on geographic areas, such as coastal applications which require more frequent maintenance.