

INSTALLATION INSTRUCTIONS

4SHP16LS SERIES

Split System Heat Pump

This manual must be left with the homeowner for future reference.



This is a safety alert symbol and should never be ignored. When you see this symbol on labels or in manuals, be alert to the potential for personal injury or death.

WARNING

The equipment covered in this manual is to be installed by trained and experienced service and installation technicians. Improper installation, modification, service, or use can cause electrical shock, fire, explosion, or other conditions, which may cause personal injury, death, or property damage. Use appropriate safety gear, including safety glasses and gloves, when installing this equipment.

Table of Contents

Installation	2
Electrical Wiring.....	3
Start-Up	14
Operation.....	16
7-Segment Alert and System Status Codes	18
Maintenance.....	24
Homeowner Information.....	25
Wiring Diagrams.....	28

WARNING

Installation and servicing of air conditioning equipment can be hazardous due to internal refrigerant pressure and live electrical components. Only trained and qualified service personnel should install or service this equipment. Installation and service performed by unqualified persons can result in property damage, personal injury, or death.

WARNING

Sharp metal edges can cause injury. When installing the unit, use care to avoid sharp edges.

WARNING

Risk of electrical shock. Disconnect all remote power supplies before installing or servicing any portion of the system. Failure to disconnect power supplies can result in property damage, personal injury, or death.

Manufactured By
Allied Air Enterprises LLC
A Lennox International, Inc. Company
215 Metropolitan Drive
West Columbia, SC 29170



506860-03

Save these instructions for future reference

Installation

General

Read this entire instruction manual, as well as the instructions supplied in separate equipment, before starting the installation. Observe and follow all warnings, cautions, instructional labels, and tags. Failure to comply with these instructions could result in an unsafe condition and/or premature component failure.

These instructions are intended as a general guide only for use by qualified personnel and do not supersede any national or local codes in any way. The installation must comply with all provincial, state, and local codes as well as the National Electrical Code (U.S.) or Canadian Electrical Code (Canada). Compliance should be determined prior to installation.

This condensing unit uses R410A, which is an ozone-friendly HFC refrigerant. The unit must be installed with a matching indoor coil and line set. A filter drier approved for use with R410A is installed in the unit.

IMPORTANT: *This product has been designed and manufactured to meet ENERGY STAR criteria for energy efficiency when matched with appropriate coil components. However, proper refrigerant charge and proper air flow are critical to achieve rated capacity and efficiency. Installation of this product should follow the manufacturer's refrigerant charging and air flow instructions. Failure to confirm proper charge and airflow may reduce energy efficiency and shorten equipment life.*

When servicing or repairing HVAC components, ensure the fasteners are appropriately tightened. Table 1 shows torque values for fasteners.

Fastener	Torque
Stem Caps	8 ft. lbs.
Service Port Caps	8 ft. lbs.
Sheet Metal Screws	16 in. lbs.
#8 Machine Screws	16 in. lbs.
#10 Machine Screws	28 in. lbs.
Compressor Bolts	90 in. lbs.

Table 1. Torque Table

Inspection of Shipment

Upon receipt of equipment, carefully inspect it for possible shipping damage. If damage is found, it should be noted on the carrier's freight bill. Take special care to examine the unit inside the carton if the carton is damaged. Any concealed damage discovered should be reported to the last carrier immediately, preferably in writing, and should include a request for inspection by the carrier's agent.

If any damages are discovered and reported to the carrier **DO NOT INSTALL THE UNIT**, as claim may be denied.

Check the unit rating plate to confirm specifications are as ordered.

Location of Unit

Outdoor units operate under a wide range of weather conditions; therefore, multiple factors must be considered when positioning the unit. The unit must be positioned to give adequate clearances for sufficient airflow and servicing.

Refer to Figure 1 for installation clearances.

- Place a sound-absorbing material, such as Isomode, under the unit if it will be installed in a location or position that will transmit sound or vibration to the living area or adjacent buildings.

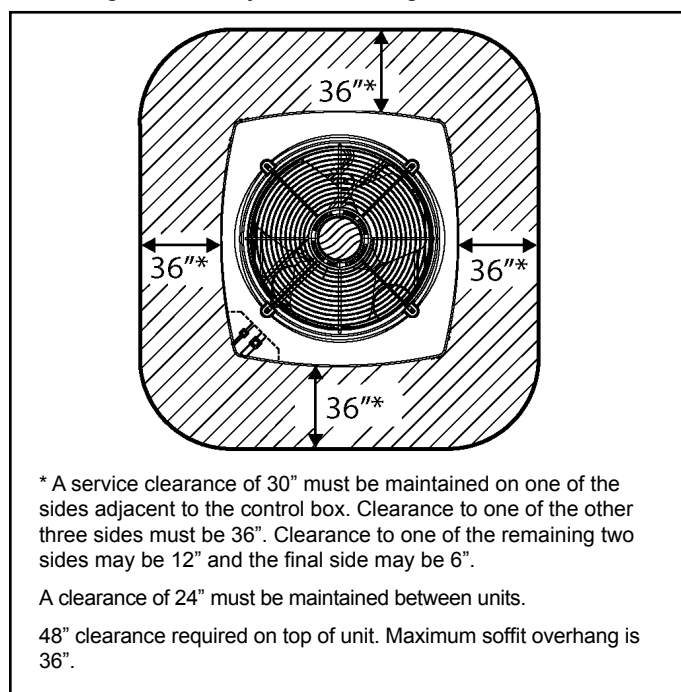


Figure 1. Installation Clearances

- Install the unit high enough above the ground or roof to allow adequate drainage of defrost water and prevent ice buildup.
- In heavy snow areas, do not locate the unit where drifting snow will occur. The unit base should be elevated above the depth of average snows.

NOTE: *Elevation of the unit may be accomplished by construction a frame using suitable materials. If a support frame is constructed, it must not block drain holes in unit base.*

- When installed in areas where low ambient temperatures exist, locate unit so winter prevailing winds do not blow directly into outdoor coil.
- Locate unit away from overhanging roof lines, which would allow water or ice to drop on, or in front of, coil or into unit.

Slab Mounting

When installing a unit at grade level, install on slab high enough above grade so that water from higher ground will not collect around the unit (see Figure 2). Slab should have a slope tolerance away from the building of 2° or 2" per 5'. This will prevent ice from building up under the unit during a defrost cycle. Refer to following roof mounting section for barrier construction if unit must face prevailing winter winds.

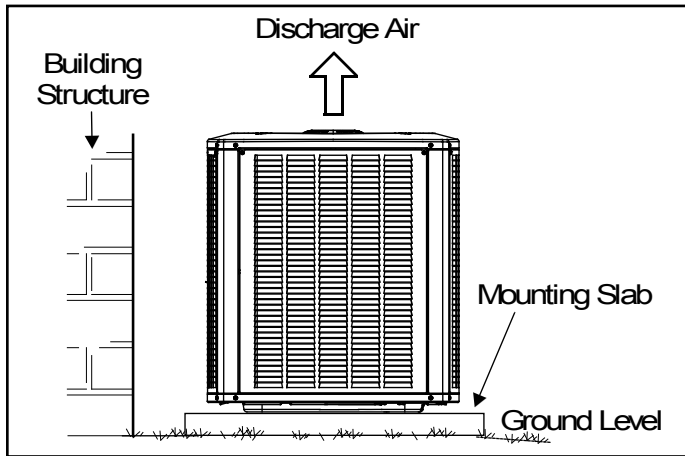


Figure 2. Slab Mounting

Roof Mounting

Install unit at a minimum of 6" above surface of the roof to avoid ice buildup around the unit. Locate the unit above a load bearing wall or area of the roof that can adequately support the unit. Consult local codes for rooftop applications.

If unit coil cannot be mounted away from prevailing winter winds, a wind barrier should be constructed (see Figure 3). Size the barrier at least the same height and width as the outdoor unit. Mount barrier 24" from the sides of the unit in the direction of the prevailing winds.

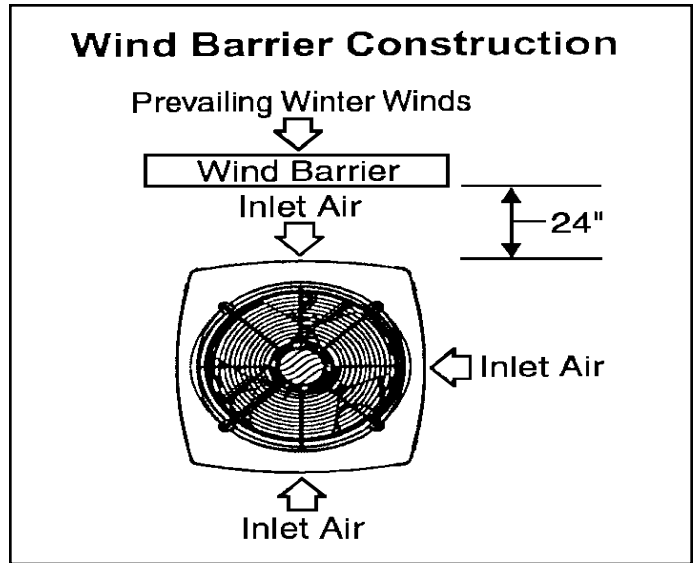


Figure 3.

Electrical Wiring

All field wiring must be done in accordance with the National Electrical Code (NEC) recommendations, Canadian Electrical Code (CEC) and CSA Standards, or local codes, where applicable.

Refer to the furnace or blower coil installation instructions for additional wiring application diagrams and refer to unit rating plate for minimum circuit ampacity and maximum overcurrent protection size.

⚠ WARNING

Unit must be grounded in accordance with national and local codes. Failure to ground unit properly can result in personal injury or death.

⚠ WARNING

Line voltage is present at all components when unit is not in operation on units with single pole contactors. Disconnect all remote electric power supplies before opening access panel. Unit may have multiple power supplies. Failure to disconnect all power supplies could result in personal injury or death.

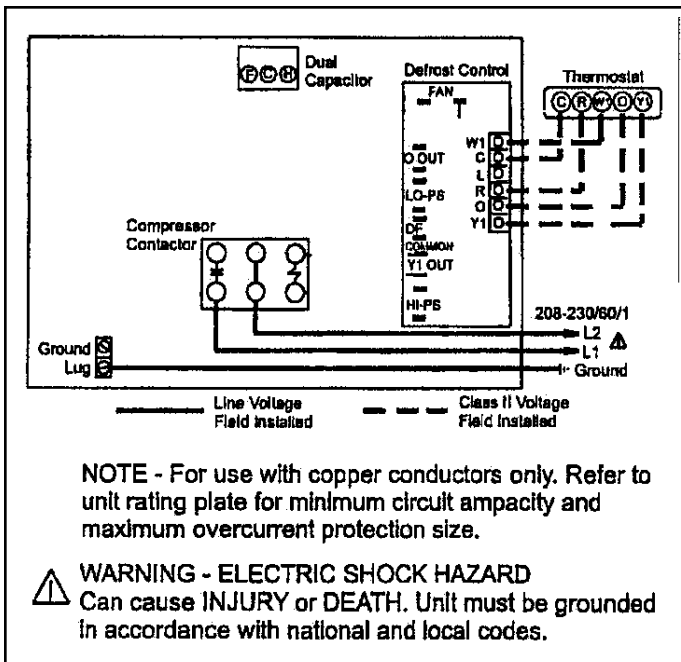


Figure 4. Typical Field Wiring Diagram Non-Communicating

1. Install line voltage power supply to unit from a properly sized disconnect switch. Any excess high voltage field wiring should be trimmed or secured away from the low voltage field wiring.
2. Ground unit at unit disconnect switch or to an earth ground. To facilitate conduit, a hole is in the bottom of the control box. Connect conduit to the control box using a proper conduit fitting. Units are approved for use only with copper conductors. 24V Class II circuit connections are made in the low voltage junction box. Refer to Figure 4 for high voltage field wiring diagram. A complete unit wiring diagram is located inside the unit control box cover and in the back of this document.
3. Install room thermostat on an inside wall that is not subject to drafts, direct sunshine, or other heat sources.
4. Install low voltage wiring from outdoor to indoor unit and from thermostat to indoor unit. (See wiring diagrams beginning on Page 28.)
5. Do not bundle any excess 24V control wire inside control box. Run control wire through installed wire tie and tighten wire tie to provide low voltage strain relief and to maintain separation of field-installed low and high voltage circuits.

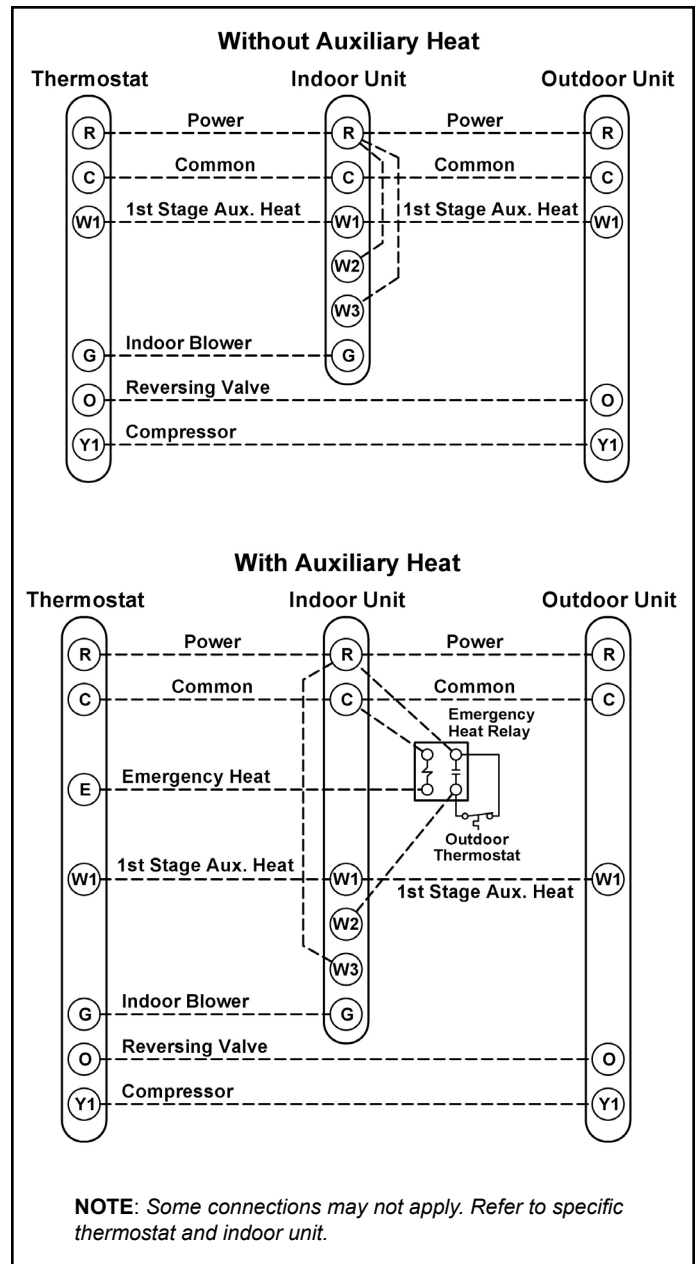
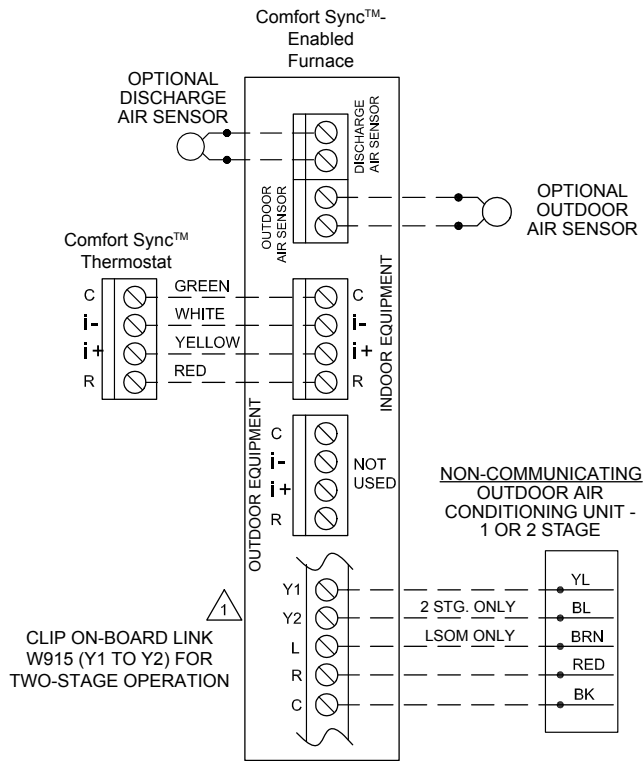


Figure 5. Non-Communicating Thermostat Designations

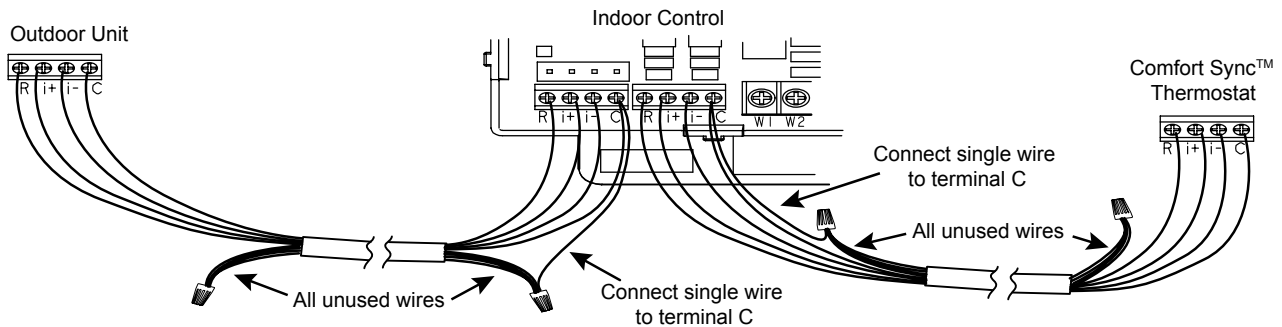
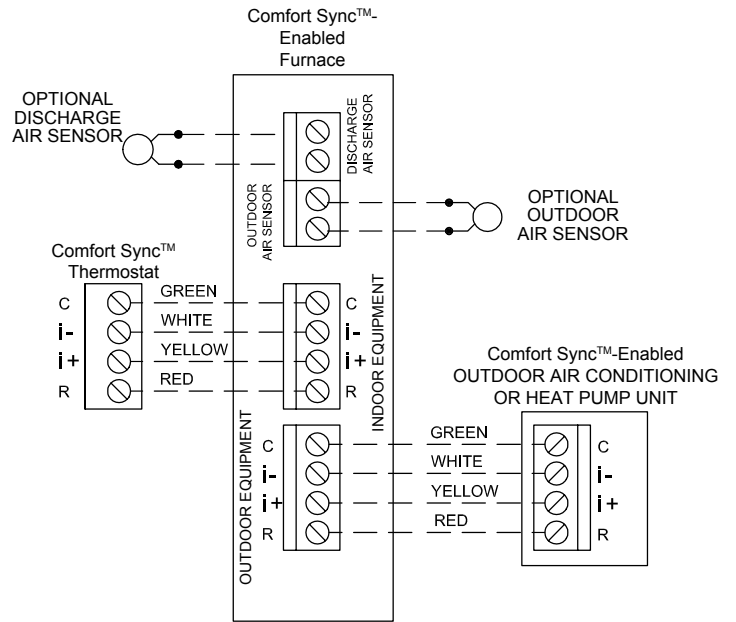
Field Wiring and Routing - Communicating Controls

Maximum length of wiring (18 gauge) for all connections on the RSBus is 1500 feet (457 meters). Wires should be color coded, with a temperature rating of 95°F (35°C) minimum, and solid core (Class II Rated Wiring). All low voltage wiring must be connected through the low voltage grommet in the control box.

Comfort Sync™ Thermostat with Comfort Sync™-enabled Furnace and Non-Communicating Outdoor Unit



Comfort Sync™ Thermostat with Comfort Sync™-enabled Furnace and Comfort Sync™-enabled Outdoor Unit



NOTE: On communicating systems, extra wires must terminate on the indoor "C" Comfort Sync™ terminal strip (RSBus). Use an additional wire to connect all unused wires to "C" terminal on the indoor control ONLY.

Figure 6.

Placement

Be aware that some localities are adopting sound ordinances based on how noisy the unit is at the neighbor's home, not at the original installation. Install the unit as far as possible from the property line. When possible, do not install the unit directly outside a bedroom window. Glass has a very high level of sound transmission. Figure 7 shows how to place the outdoor unit and line set to reduce line set vibration.

Line Set Isolation

Illustrations on Page 7 and Page 8 demonstrate procedures that ensure proper refrigerant line set isolation. Figure 8 shows how to install line sets on horizontal runs. Figure 9 shows how to make a transition from horizontal to vertical. Figure 10 shows how to install line sets on vertical runs.

Model	Liquid Line	Suction Line
24	3/8	3/4
36	3/8	7/8
48	3/8	7/8
60	3/8	1-1/8

For installations exceeding 50', refer to long line set guide lines

Table 2. Refrigerant Line Set Diameters (in.)

Brazing Connection Procedure

1. Cut ends of refrigerant lines square (free from nicks or dents). Deburr the ends. The pipe must remain round; do not pinch end of line.
2. Before making line set connections, use dry nitrogen to purge the refrigerant piping. This will help to prevent oxidation and the introduction of moisture into the system.
3. Use silver alloy brazing rods (5% or 6% silver alloy for copper-to-copper brazing or 45% silver alloy for copper-to-brass or copper-to-steel brazing) that are rated for use with R410A refrigerant.
4. Remove the Schrader core assemblies before brazing to protect them from damage due to extreme heat. Replace the cores when brazing is complete.
5. Remove light maroon washers from service valves and shield light maroon stickers to protect them during brazing. Wrap a wet cloth around the valve body and copper tube stub to protect it from heat damage.
6. Braze the line set to the service valve. Quench the joints with water or a wet cloth to prevent heat damage to the valve core and opening port. The tube end must stay bottomed in the fitting during final assembly to ensure proper seating, sealing, and rigidity.

7. Install the thermal expansion valve, which is sold separately and which is approved for use with R410A refrigerant, in the liquid line at the indoor coil (see the Refrigerant Metering Device section).

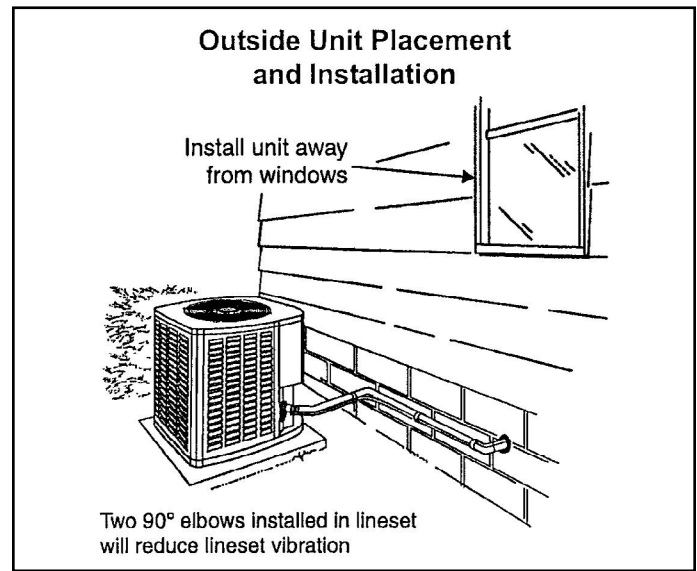


Figure 7.

Refrigerant Piping

If the unit is being installed with a new indoor coil and line set, the refrigerant connections should be made as outlined in this section. If an existing line set and/or indoor coil will be used to complete the system, refer to this section as well as the section that follows, entitled "Flushing Existing Line Set and Indoor Coil."

If this unit is being matched with an approved line set or indoor coil that was previously charged with R-22 refrigerant, the line set and coil must be flushed prior to installation. If the unit is being used with an existing indoor coil that was equipped with a liquid line that served as a metering device (RFCI), the liquid line must be replaced prior to the installation of the unit.

Field refrigerant piping consists of liquid and suction lines from the outdoor unit (sweat connections) to the indoor coil (flare or sweat connections).

Select line set diameters from Table 2 to ensure that oil returns to the compressor. Size vertical suction riser to maintain minimum velocity at minimum capacity. Recommended line length is 50' or less. If more than 50' line set is required, refer to long line set guide lines. Table 2 shows the diameters for line sets up to 100', although vertical lift applications and trapping requirements need to be reviewed for line sets over 50'; refer to long line set guide lines

Installing Refrigerant Line

During the installation of an air conditioning system, it is important to properly isolate the refrigerant line to prevent unnecessary vibration. Line set contact with the structure (wall, ceiling, or floor) may cause objectionable noise when vibration is translated into sound. As a result, more energy or vibration can be expected. Close attention to line set isolation must be observed.

CAUTION

If ANY refrigerant tubing is required to be buried by state or local codes, provide a 6 inch vertical rise at service valve.

CAUTION

When flushing existing line set and/or indoor coil, be sure to empty all existing traps. Residual mineral oil can act as an insulator, preventing proper heat transfer. It can also clog the thermal expansion valve, reducing system performance and capacity. Failure to properly flush system as explained in these instructions will void warranty.

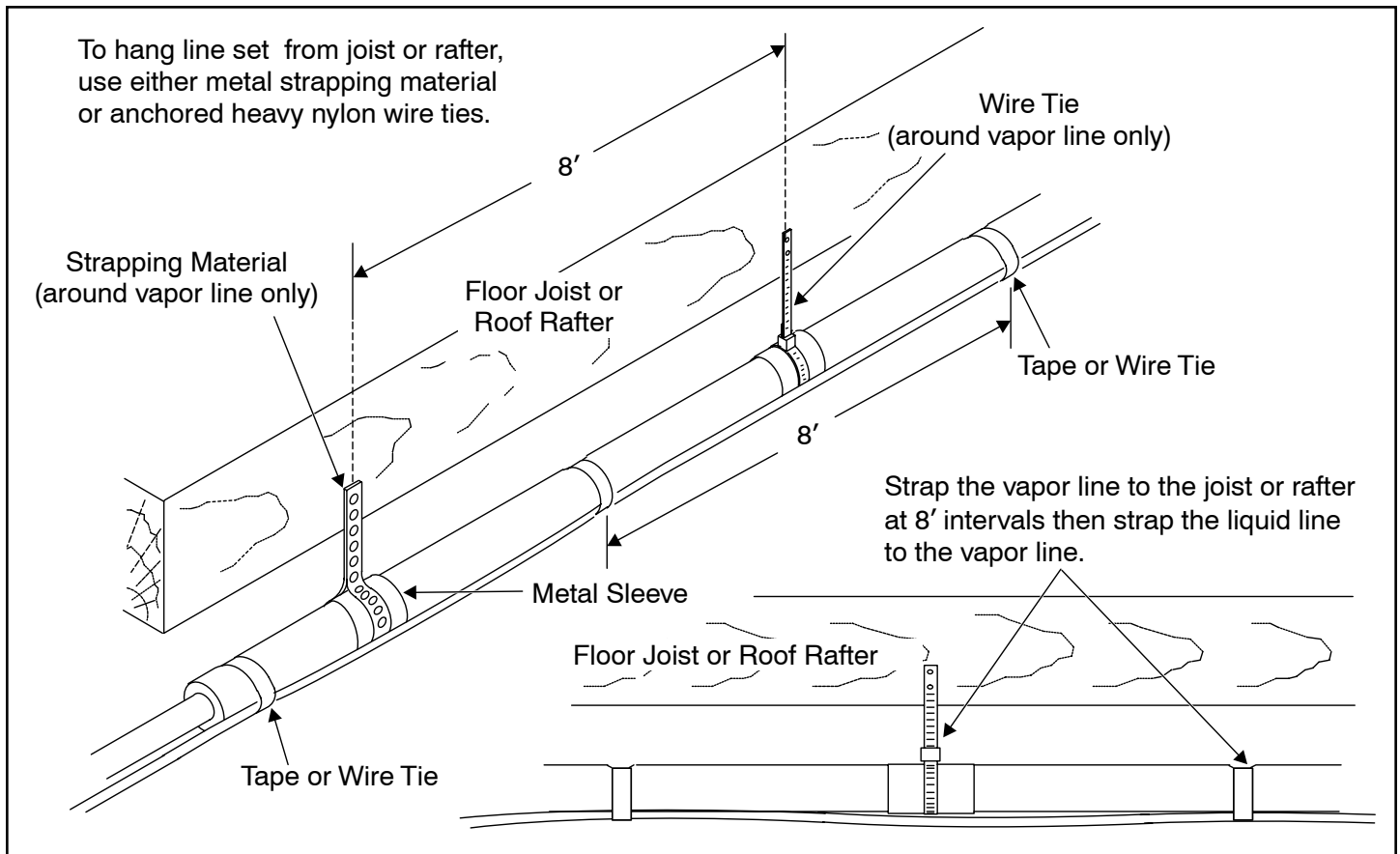


Figure 8. Refrigerant Line Sets: Installing Horizontal Runs

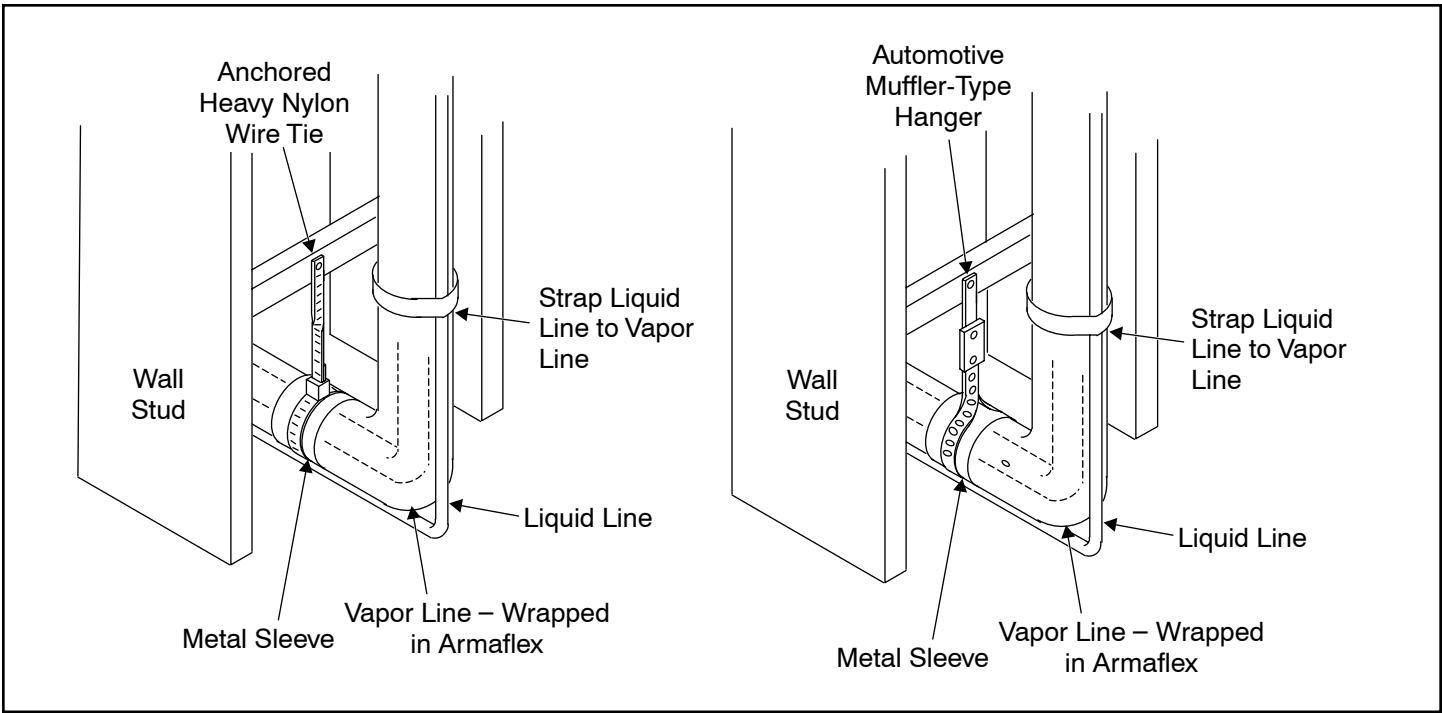


Figure 9. Refrigerant Line Sets: Transition from Horizontal to Vertical

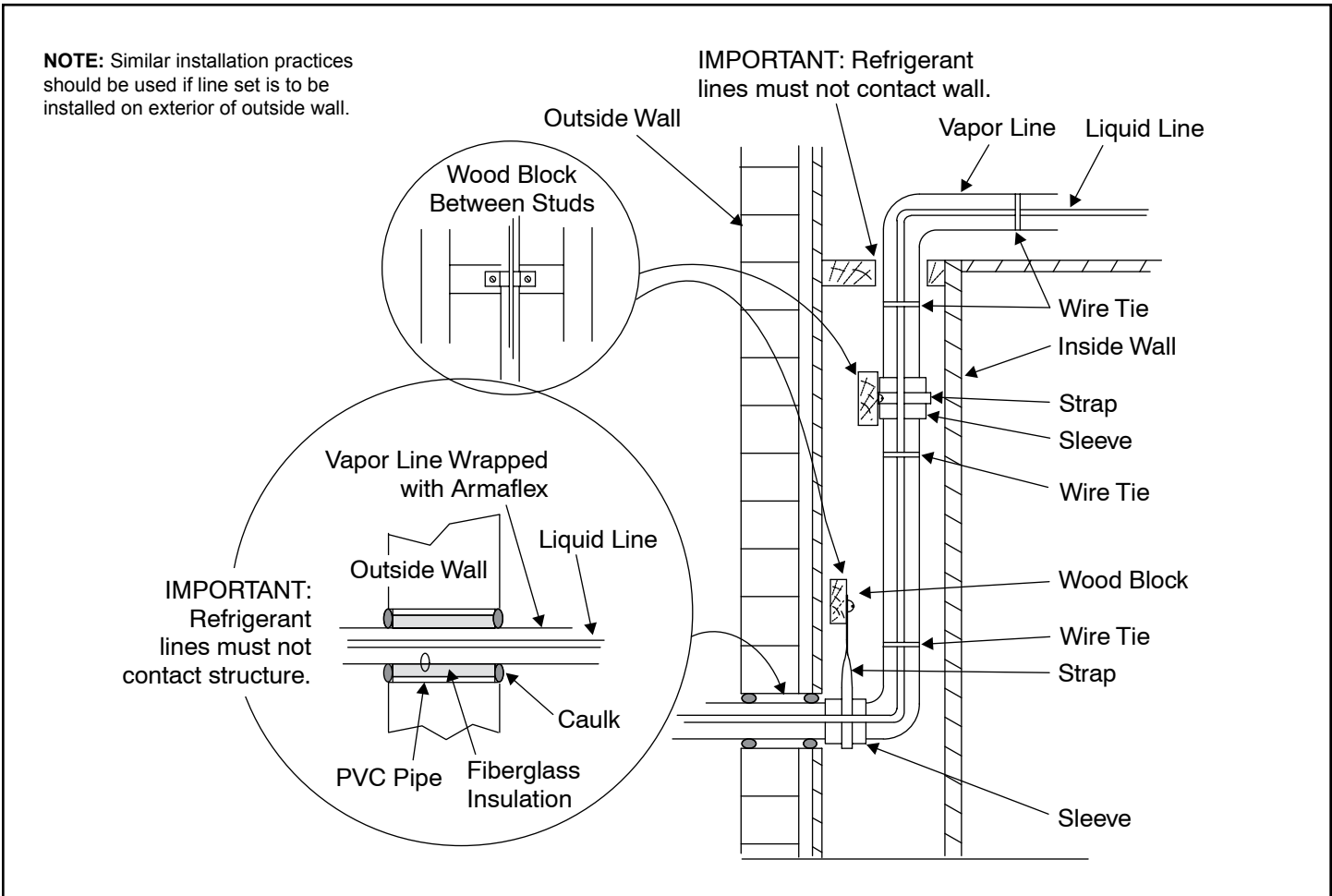


Figure 10. Refrigerant Line Sets: Installing Vertical Runs (new construction shown)

Flushing Existing Line Set and Indoor Coil

This procedure should not be performed on systems that contain contaminants, such as compressor burn out.

Required Equipment

The following equipment is needed to flush the existing line set and indoor coil (see Figure 11): two clean R-22 recovery bottles, an oil-less recovery machine with a “pump down” feature, and two sets of gauges (one for use with R-22 and one for use with R-410A).

Flushing Procedure

IMPORTANT: *The line set and/or indoor coil must be flushed with at least the same amount of refrigerant that previously charged the system. Check the charge in the flushing cylinder before flushing the unit.*

1. Remove existing R-22 refrigerant using the appropriate procedure.

If the existing outdoor unit is not equipped with shutoff valves, or if the unit is not operational AND the existing R-22 refrigerant will be used to flush the system:

Disconnect all power to the existing outdoor unit. Connect the existing unit, a clean recovery cylinder, and the recovery machine according to the instructions provided with the recovery machine. Remove all R-22 refrigerant from the existing system. Refer to the gauges after shutdown to confirm that the entire system is completely void of refrigerant. Disconnect the liquid and suction lines from the existing outdoor unit.

If the existing outdoor unit is equipped with manual shutoff valves AND new R-22 refrigerant will be used to flush the system:

Start the existing R-22 refrigerant system in cooling mode and close the liquid line valve. Pump all the existing R-22 refrigerant back into the outdoor unit.

(It may be necessary to bypass the low pressure switches to ensure complete refrigerant evacuation.)

When the low side system pressures reach 0 psig, close the suction line valve. Disconnect all power to the existing outdoor unit. Refer to the gauges after shutdown to confirm that the valves are not allowing refrigerant to flow back into the low side of the system. Disconnect the liquid and suction lines from the existing outdoor unit.

2. Remove the existing outdoor unit. Set the new R-410A unit and follow the brazing connection procedure outlined previously to make line set connections. **Do not install the R-410A thermal expansion valve at this time.**
3. Make low voltage and line voltage connections to the new outdoor unit. **Do not turn on power to the unit or open the outdoor unit service valves at this time.**
4. Remove the existing R-22 refrigerant flow control orifice or thermal expansion valve before continuing with flushing procedures. R-22 flow control devices are not approved for use with R-410A refrigerant and may prevent proper flushing. Use a field-provided fitting to reconnect the lines.

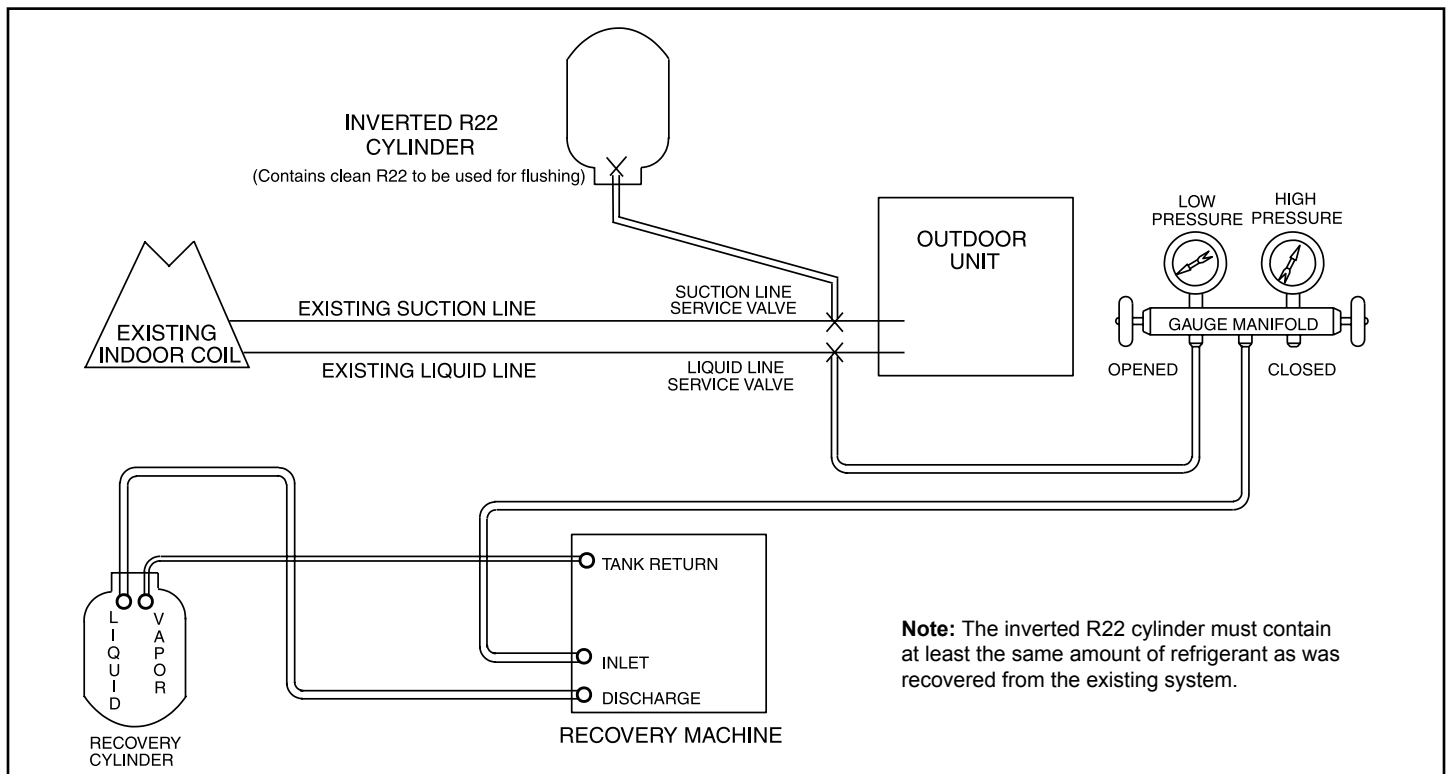


Figure 11. Flushing Connections

5. Remove the pressure tap valve cores from the unit's service valves. Connect an R-22 cylinder with clean refrigerant to the suction service valve. Connect the R-22 gauge set to the liquid line valve and connect a recovery machine with an empty recovery tank to the gauge set.
 6. Set the recovery machine for liquid recovery and start the recovery machine. Open the gauge set valves to allow the recovery machine to pull a vacuum on the existing system line set and indoor coil.
 7. Invert the cylinder of clean R-22 and open its valve to allow liquid refrigerant to flow in to the system through the suction line valve. Allow the refrigerant to pass from the cylinder and through the line set and the indoor coil before it enters the recovery machine.
 8. After all of the liquid refrigerant has been recovered, switch the recovery machine to vapor recovery so that all of the R-22 vapor is recovered. Allow the recovery machine to pull a vacuum on the system.
- NOTE:** A single system flush should remove all of the mineral oil from the existing refrigerant lines and indoor coil. A second flushing may be done (using clean refrigerant) if insufficient amounts of mineral oil were removed during the first flush. **After each system flush, allow the recovery machine to pull a vacuum on the system at the end of the procedure.**
9. Close the valve on the inverted R-22 cylinder and the gauge set valves. Pump the remaining refrigerant out of the recovery machine and turn the machine off.
 10. Use nitrogen to break the vacuum on the refrigerant lines and indoor coil before removing the recovery machine, gauges, and R-22 refrigerant drum. Re-install pressure tap valve cores into the unit's service valves.
 11. Install the fixed orifice (or thermal expansion valve approved for use with R-410A refrigerant) in the liquid line at the indoor coil.

Refrigerant Metering Device

This unit is designed for use with TXV systems. Refer to the appropriate following section for information on installing the chosen refrigerant metering device.

NOTE: An R410A system will not operate properly with an R-22 metering device.

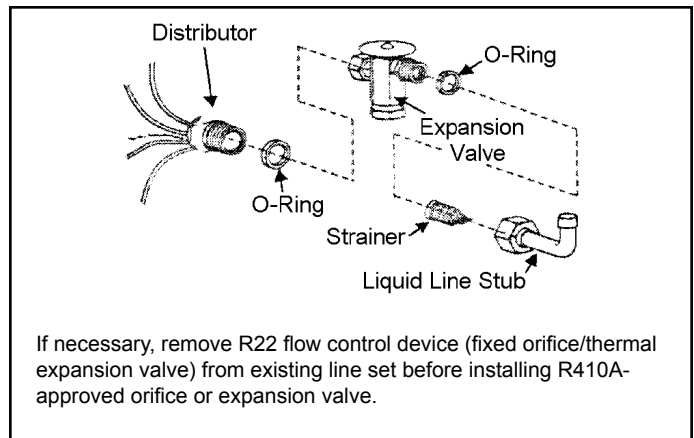


Figure 12. Metering Device Installation

Install the refrigerant metering device as shown in Figure 12. Do not twist cap tubes when loosening the seal nut from the orifice housing. Use wrench to back up the distributor.

Expansion Valve Systems

Expansion valves equipped with Chatleff-type fittings are available from the manufacturer. See Table 3 for proper TXV for each unit.

Model	Part Number
4SHP16LS-24	H4TXV01
4SHP16LS-36, -48	H4TXV02
4SHP16LS-60	H4TXV03

Table 3. TXV Data

To install an expansion valve (see Figure 12):

1. Separate the distributor assembly and remove the piston orifice and used Teflon seal. Insert nozzle end of the expansion valve along with a new Teflon seal into the distributor and tighten to 20 - 30 ft. lbs. Use backup wrench on all wrench flats. Overtightening will crush the Teflon seal and may cause a leak.
2. Attach liquid line portion of distributor assembly along with new Teflon seal to the inlet of the expansion valve. Tighten to 20 - 30 ft. lbs. Use backup wrench on all wrench flats. Overtightening will crush the Teflon seal and may cause a leak.
3. Connect the external equalizer line to the equalizer port on the suction line and tighten to 8 ft. lbs.
4. Strap the superheat sensing bulb to the suction header.

If installing an expansion valve on an indoor coil that previously used a fixed orifice, be sure to remove the existing fixed orifice. Failure to remove a fixed orifice when installing an expansion valve to the indoor coil will result in improper operation and damage to the system.

Manifold Gauge Set

Manifold gauge sets used with systems charged with R410A refrigerant must be capable of handling the higher system operating pressures. The gauges should be rated for use with pressures 1 - 800 on the high side and a low side of 30" vacuum to 250 psi with dampened speed to 500 psi. Gauge hoses must be rated for use at up to 800 psi of pressure with a 4000 psi burst rating.

Liquid and Suction Line Service Valves

The liquid line and suction line service valves (see Figure 13) and service ports are used for leak treating, evacuation, charging, and checking charge.

Each valve is equipped with a service port which has a factory-installed Schrader valve. A service port cap protects the Schrader valve from contamination and serves as the primary leak seal.

To Access the Schrader Port:

1. Remove the service port cap with an adjustable wrench.
2. Connect gauge to the service port.
3. When testing is completed, replace service port cap. Tighten finger tight, then an additional 1/6 turn.

To Open Liquid or Suction Line Service Valve:

1. Remove stem cap with an adjustable wrench.
2. Use service wrench with a hex-head extension to back the stem out counterclockwise as far as it will go. Use a 3/16" hex head extension for liquid line service valves and a 5/16" extension for suction line service valves.
3. Replace the stem cap. Tighten finger tight, then tighten an additional 1/6 turn.

To Close Liquid or Suction Line Service Valve:

1. Remove the stem cap with an adjustable wrench.
2. Use a service wrench with a hex-head extension to turn the stem clockwise to seat the valve. Tighten firmly.
3. Replace the stem cap. Tighten finger tight, then tighten an additional 1/6 turn.

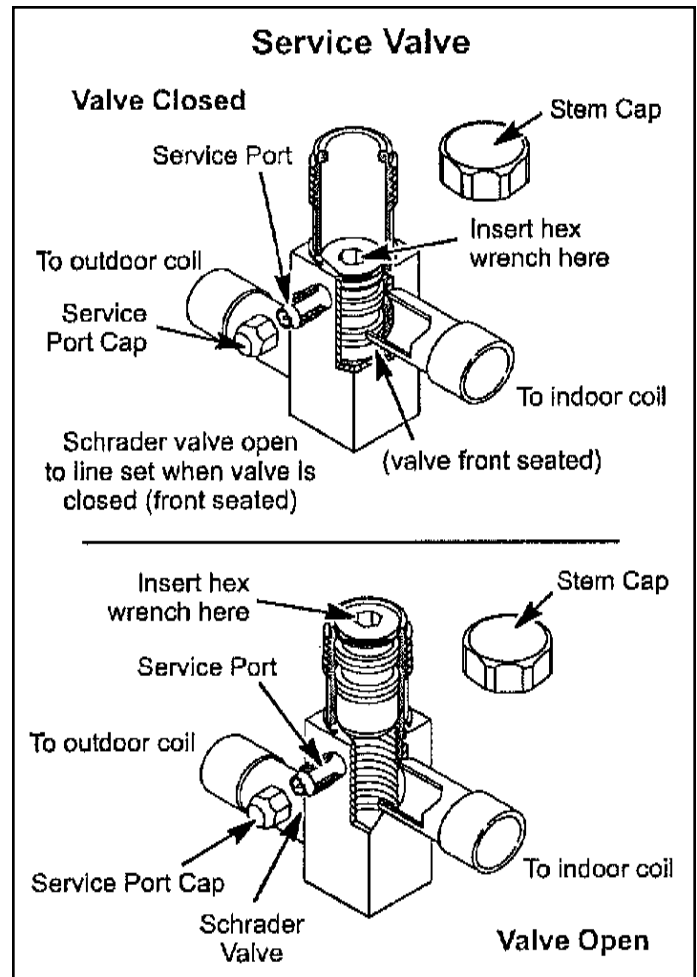


Figure 13.

Suction Line (Ball Type) Service Valve

Suction line (ball type) service valves function the same way as the other valves; the difference is in the construction (see Figure 14).

The ball valve is equipped with a service port with a factory-installed Schrader valve. A service port cap protects the Schrader valve from contamination and serves as the primary seal.

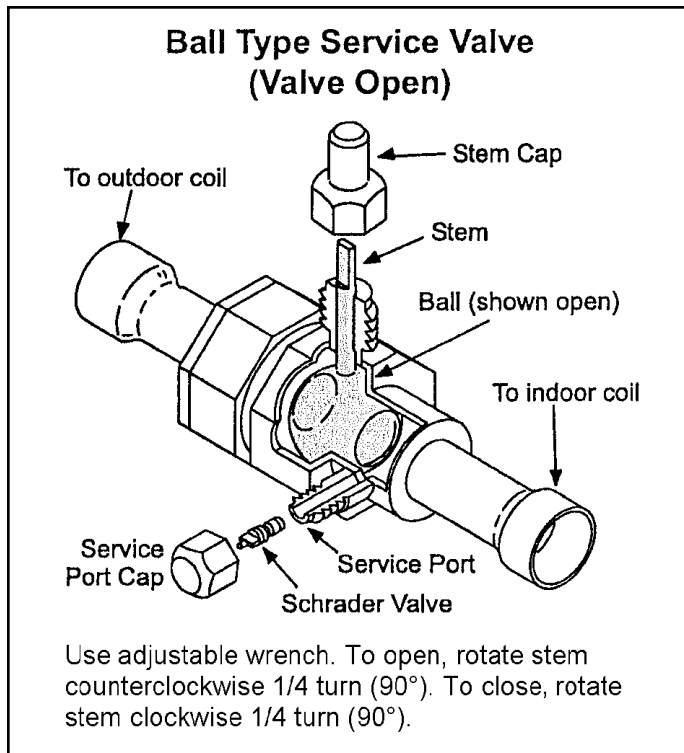


Figure 14.

Leak Testing

After the line set has been connected to the indoor and outdoor units, the line set connections and indoor unit must be checked for leaks.

⚠ WARNING

Refrigerant can be harmful if inhaled. Refrigerant must always be used and recovered responsibly. Incorrect or irresponsible use of refrigerant can result in personal injury or death.

⚠ WARNING

Never use oxygen to pressurize refrigeration or air conditioning systems. Oxygen will explode on contact with oil and could cause personal injury or death.

Using an Electronic Leak Detector

1. Connect the high pressure hose of the manifold gauge set to the suction valve service port. (Normally the high pressure hose is connected to the liquid line port; however, connecting it to the suction ports helps to protect the manifold gauge set from damage caused by high pressure.)
2. With both manifold valves closed, connect the cylinder of R410A refrigerant. Open the valve on the R410A cylinder (vapor only).
3. Open the high pressure side of the manifold to allow R410A into the line set and indoor unit. Weigh in a trace amount of R410A (a trace amount is a maximum of 2 oz. of refrigerant or 3 lbs. pressure). Close the valve on the R410A cylinder and the valve on the high pressure side of the manifold gauge set. Disconnect the R410A cylinder.
4. Connect a cylinder of nitrogen with a pressure regulating valve to the center port of the manifold gauge set. When using high pressure gas, such as nitrogen, for this purpose, be sure to use a regulator that can control the pressure down to 1 or 2 psig.
5. Adjust nitrogen pressure to 150 psig. Open the valve on the high side of the manifold gauge set to pressurize the line set and the indoor coil.
6. After a short period of time, open a refrigerant port to make sure that an adequate amount of refrigerant has been added for detection (refrigerant requirements will vary with length). Check all joints for leaks. Purge nitrogen and R410A mixture. Correct any leaks and recheck.

Evacuation

Evacuating the system of non-condensables is critical for proper operation of the unit. Non-condensables are defined as any gas that will not condense under temperatures and pressures present during operation of an air conditioning system. Non-condensables and water vapor combine with refrigerant to produce substances that corrode copper piping and compressor parts.

**WARNING**

Do Not use a compressor to evacuate a system. Avoid deep vacuum operation. Extremely low vacuums can cause internal arcing and compressor failure. Danger of equipment damage. Damage caused by deep vacuum operation will void warranty.

Use a thermocouple or thermistor electronic vacuum gauge that is calibrated in microns. Use an instrument that reads down to 50 microns.

1. Connect the manifold gauge set to the service valve ports as follows:
 - Low pressure gauge to suction line service valve
 - High pressure gauge to liquid line service valve
2. Connect micron gauge.
3. Connect the vacuum pump (with vacuum gauge) to the center port of the manifold gauge set.
4. Open both manifold valves and start vacuum pump.
5. Evacuate the line set and indoor unit to a minimum of 500 microns or lower. During the early stages of evacuation, it is desirable to close the manifold gauge valve at least once to determine if there is a rapid rise in pressure. A rapid rise in pressure indicates a relatively large leak. If this occurs, the leak testing procedure must be repeated.
6. When 500 microns or lower is maintained, close the manifold gauge valves, turn off the vacuum pump, and disconnect the manifold gauge center port hose from the vacuum pump. Attach the manifold gauge center port hose to a nitrogen cylinder with pressure regulator set to 150 psig and purge the hose. Open the manifold gauge valves to break the vacuum in the line set and indoor unit. Close the manifold gauge valves.
7. Shut off the nitrogen cylinder and remove the manifold gauge hose from the cylinder. Open the manifold gauge valves to release the nitrogen from the line set and indoor unit.
8. Reconnect the manifold gauge to the vacuum pump, turn the pump on, and continue to evacuate the line set and indoor unit until 500 microns is maintained within a 20 minute period after shutting off the vacuum pump and closing the manifold gauge valves.
9. When the requirements above have been met, disconnect the manifold hose from the vacuum pump. Open the service valves to break the vacuum in the line set and indoor unit.

Start-Up

CAUTION

If unit is equipped with a crankcase heater, it should be energized 24 hours before unit start-up to prevent compressor damage as a result of slugging.

1. Rotate fan to check for frozen bearings or binding.
2. Inspect all factory and field-installed wiring for loose connections.
3. After evacuation is complete, open liquid line and suction line service valves to release refrigerant charge (contained in outdoor unit) into system.
4. Replace the stem caps and secure finger tight, then tighten an additional 1/6 of a turn.
5. Check voltage supply at the disconnect switch. The voltage must be within the range listed on the unit nameplate. If not, do not start equipment until the power company has been consulted and the voltage condition corrected.
6. Set thermostat for cooling demand, turn on power to indoor blower, and close the outdoor unit disconnect switch to start the unit.
7. Recheck unit voltage with unit running. Power must be within range shown on unit nameplate.

Refrigerant Charging

This system is charged with R-410A refrigerant, which operates at much higher pressures than R-22. The liquid line drier provided with the unit is approved for use with R-410A. Do not replace it with one designed for use with R-22. **This unit is NOT approved for use with coils that use capillary tubes as a refrigerant metering device.**

R410A refrigerant cylinders are rose-colored. Refrigerant should be added through the suction valve in the liquid state.

Certain R-410A cylinders are identified as being equipped with a dip tube. These allow liquid refrigerant to be drawn from the bottom of the cylinder without inverting the cylinder. Do not turn this type of cylinder upside down to draw refrigerant.

Units are factory charged with the amount of R410A refrigerant indicated on the unit rating plate. This charge is based on a matching indoor coil and outdoor coil with 15' line set. For varying lengths of line set, refer to Table 4 for refrigerant charge adjustment. A blank space is provided on the unit rating plate to list the actual field charge.

Liquid Line Set Diameter	Oz. Per 5 ft. adjust from 15 ft. line set*
3/8 in.	3 oz. Per 5 ft.
* If line length is greater than 15 ft., add this amount. If line length is less than 15 ft., remove this amount.	

Table 4. Refrigerant Charge Adjustment

IMPORTANT

Mineral oils are not compatible with R-410A. If oil must be added, it must be a polyolester oil.

If the system is void of refrigerant, clean the system using the procedure described below.

1. Use dry nitrogen to pressurize the system and check for leaks. Repair leaks, if possible.
2. Evacuate the system to remove as much of the moisture as possible.
3. Use dry nitrogen to break the vacuum.
4. Evacuate the system again.
5. Weigh the appropriate amount of R-410A refrigerant (listed on unit nameplate) into the system.
6. Monitor the system to determine the amount of moisture remaining in the oil. Use a test kit to verify that the moisture content is within the kit's dry color range. It may be necessary to replace the filter drier several times to achieve the required dryness level. **If system dryness is not verified, the compressor will fail in the future.**

The outdoor unit should be charged during warm weather. However, applications arise in which charging must occur in the colder months. The method of charging is determined by the unit's **refrigerant metering device and the outdoor ambient temperature.**

Measure the liquid line temperature and the outdoor ambient temperature as outlined below:

1. Connect the manifold gauge set to the service valve ports as follows (see Figure 15):
 - Low pressure gauge to suction line service valve
 - High pressure gauge to liquid line service valve
2. Close manifold gauge set valves. Connect the center manifold hose to an upright cylinder of R-410A.
3. If room temperature is below 70°F, set the room thermostat to call for heat. This will create the necessary load for properly charging the system in the cooling cycle.

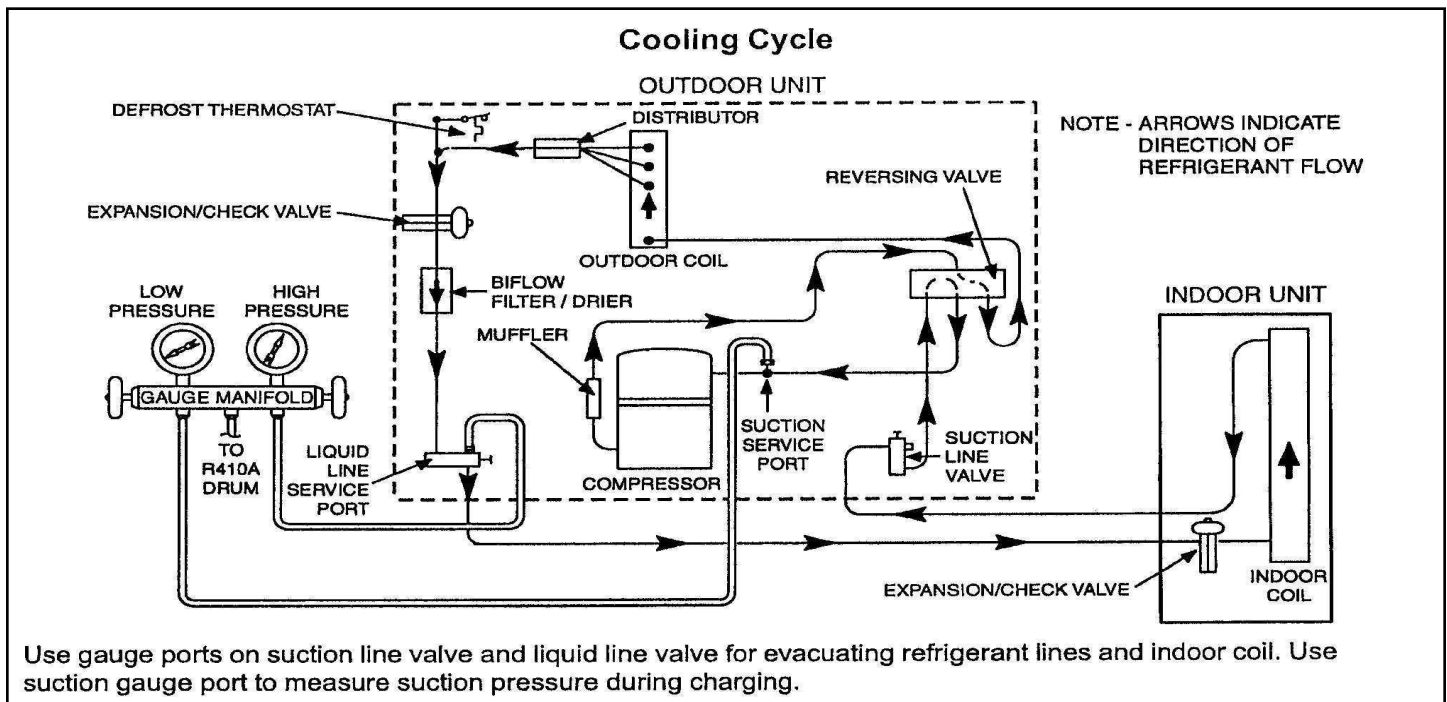


Figure 15.

4. Use a digital thermometer to record the outdoor ambient temperature.
5. When the heating demand has been satisfied, switch the thermostat to cooling mode with a set point of 68°F. When pressures have stabilized, use a digital thermometer to record the liquid and suction line temperatures.
6. The outdoor temperature will determine which charging method to use. Proceed with the appropriate charging method.

Charge Using Weigh-In Method (Fixed Orifice/TXV Systems) - Outdoor Temperatures Below 65°F

If the system is void of refrigerant, or if the outdoor ambient temperature is cool, use the weigh-in method to charge the unit. Do this after any leaks have been repaired.

1. Recover the refrigerant from the unit.
2. Conduct a leak check, then evacuate as previously outlined.
3. Weigh in the charge according to the total amount shown on the unit nameplate.

If weighing facilities are not available or if unit is being charged during warm weather, use one of the following procedures.

Charge Using Subcooling Method (Fixed Orifice/TXV Systems) - Outdoor Temperatures 65°F or Above

If charging a fixed orifice or TXV system when the outdoor ambient temperature is 65°F or above, the subcooling method can be used to charge the unit.

1. With the manifold gauge hose still on the liquid service port and the unit operating stably, use a digital thermometer to check the liquid line temperature. For best results, use the same digital thermometer to check both the outdoor ambient and the liquid line temperatures.
2. At the same time, record the liquid line pressure reading.
3. Use the temperature/pressure chart to determine the saturation temperature for the liquid line pressure reading.
4. Subtract the liquid line temperature from the saturation temperature (according to the chart) to determine subcooling.

$$\text{_____}^\circ \text{ Saturation Temperature } ^\circ\text{F}$$

$$- \text{_____}^\circ \text{ Liquid Line Temperature } ^\circ\text{F}$$

$$= \text{_____}^\circ \text{ Subcooling Value } ^\circ\text{F}$$

5. Compare the subcooling value with those shown on the charge label, on the back of the control cover. If subcooling is greater than shown, recover some refrigerant. If subcooling is less than shown, add some refrigerant.

Operation

The outdoor unit and the indoor blower cycle on demand from the room thermostat. When the thermostat blower switch is moved to the ON position, the indoor blower operates continuously.

Filter Drier

The unit is equipped with a large capacity bi-flow filter that keeps the system clean and dry. If replacement is necessary, replace with one of similar design and capacity. The replacement filter drier must be suitable for use with R410A refrigerant.

Crankcase Heater

If unit is equipped with a crankcase heater, it should be energized 24 hours before unit start-up to prevent compressor damage as a result of slugging.

Emergency Heat Function (Room Thermostat)

An emergency heat function is designed into some room thermostats. This feature is applicable when isolation of outdoor unit is required or when auxiliary electric heat is stage by outdoor thermostats. When the room thermostat is placed in the emergency heat position, the outdoor unit control circuit is isolated from power and the field-supplied relays bypass the outdoor thermostats. An amber indicating light simultaneously comes on to remind the homeowner that the unit is operating in the emergency heat mode.

Emergency heat is usually used during an outdoor shutdown, but it should also be used following a power outage if power has been off for over an hour and the outdoor temperature is below 50°F. System should be left in the emergency heat mode at least 6 hours to allow the crankcase heater sufficient time to prevent compressor slugging.

Heat Pump Control-Defrost Operation

The defrost termination pins must be set on the heat pump control prior to starting the system to ensure proper defrost operation.

The heat pump control measures differential temperatures to detect when the system is performing poorly because of frost buildup on the outdoor coil. The heat pump control self-calibrates when the defrost system starts and after each system defrost cycle. The heat pump control monitors ambient temperature, outdoor coil temperature, and total run time to determine when a defrost cycle is required. The coil temperature sensor is designed with a spring clip to allow mounting to the outside coil tubing. The location of the coil sensor is important for proper defrost operation.

NOTE: *The heat pump control accurately measures the performance of the system as frost accumulates on the outdoor coil. This typically will translate into longer running time between defrost cycles as more frost accumulates on the outdoor coil before the heat pump control initiates defrost cycles.*

Defrost Operating Modes

The heat pump control operational modes are:

- Defrost calibration and operation
- Defrost test

Defrost Termination Temperature (J1)

The heat pump control can be set to terminate the defrost cycle at 50, 70, 90, or 100°F (10, 21, 32 and 38°C) (see Figure 16). The termination jumper is factory set at 50°F (10°C). If the termination jumper is not installed, the default termination temperature is 90°F (32°C).

NOTE: *Colder climates may require a higher defrost termination temperature setting to maintain a clear coil.*

Second Stage Lock-In (J2)

For second-stage heat pumps, if the outdoor ambient temperature is below the selected compressor lock-in temperature, the second-stage compressor solenoid will be energized even without a Y2 thermostat input. If the jumper is not connected to one of the temperature selection pins (40, 45, 50, 55°F) (see Figure 16), the second-stage lock-in feature will not be activated. Factory default is 40°F.

Fan Cycling (J3)

When the jumper is "ON," the fan will cycle (see Figure 16) for five minutes if the outdoor ambient air temperature is between 15°F and 35°F and the compressor has been OFF for 25 to 30 minutes. This option helps reduce the potential for ice build-up on the orifice ring during OFF cycles greater than 25 to 30 minutes.

Shift Delay (J4)

During the defrost cycle, if the jumper is in the "ON" position, there will be a compressor start delay of 30 seconds to reduce the shifting noise of the reversing valve.

Time Delay

The timed-off delay is 5 minutes long. The delay helps to protect the compressor from short cycling in case the power to the unit is interrupted or a pressure switch opens.

Pressure Switch Circuit

The defrost control includes two pressure switch circuits. A high pressure switch is connected to the board's HI-PS terminals (see Figure 16). The low pressure, or loss-of-charge pressure, switch is connected to the LO-PS terminals.

During a single demand cycle, the defrost control will lock out the unit after the fifth time that the circuit is interrupted by a pressure switch wired to the control board. In addition, the diagnostic LEDs will indicate a locked-out pressure switch after the fifth occurrence of an open pressure switch.

The unit will remain locked out until power to the board is interrupted, then re-established, or until the error is cleaned.

NOTE: The defrost control board ignores input from the low pressure switch terminals as follows:

- During the TEST mode
- During the defrost cycle
- During the 90 seconds start-up period
- For the first 90 seconds each time the reversing valve switches heat/cool modes

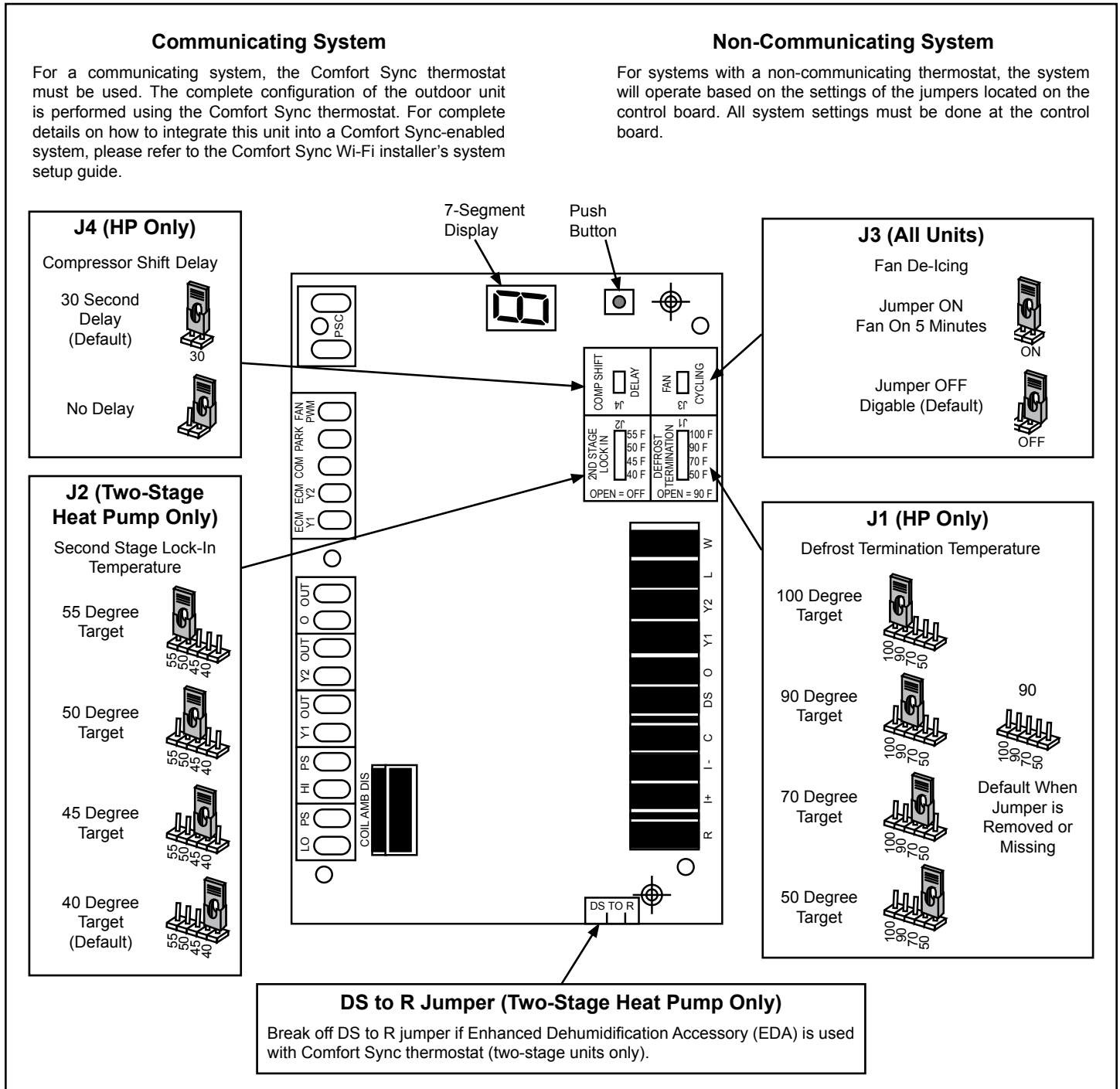


Figure 16. Defrost Control Board

7-Segment Alert and System Status Codes

Alert codes are displayed using the 7-segment display located on the outdoor control.

NOTE: System fault and lockout 7-segment display alarm codes take precedence over system status codes (cooling, heating stages or defrost/dehumidification). Only the latest active fault or lockout alarm code, if present, will be displayed. If no fault or lockout codes are active, then system status codes are routinely displayed.

The 7-segment will display an abnormal condition (error code) when detected in the system. A list of the codes are shown in Table 5.

Resetting Alert Codes

Alert codes can be reset manually or automatically:

Manual Reset

Manual reset can be achieved by one of the following methods:

- Disconnecting R wire from the main control's R terminal.
- Turning the indoor unit off and back ON again. After power up, all existing codes will display for 60 seconds and then clear.

Automatic Reset

After an alert is detected, the main control continues to monitor the unit's system and compressor operations. When/if conditions return to normal, the alert code is turned off automatically.

Code	Diagnostic Codes / Status of Equipment	Action Required to Clear and Recover
E105	Device communication problem - No other devices on RS BUS (Communication system).	Equipment is unable to communicate. Indicates numerous message errors. In most cases, errors are related to electrical noise. Make sure high voltage power is separated from RSBus. Check for mis-wired and/or loose connections between the stat, indoor unit, and outdoor unit. Check for a high voltage source of noise close to the system. Fault clears after communication is restored.
E120	Unresponsive device (Communicating systems only).	Usually caused by delay in outdoor unit responding to indoor unit polling. Recycle power. Check all wiring connections. Cleared after unresponsive device responds to any inquiry.
E124	Active communicating thermostat signal missing for more than 3 minutes (Communicating systems only).	Equipment lost communication with the thermostat. Check four wiring connections, ohm wires, and cycle power at the thermostat. Alert stops all services and waits for heartbeat message from thermostat (subnet controller). Cleared after valid thermostat (subnet) message is received.
E125	Control failed self-check, internal error, failed hardware. Will restart if error recovers, Integrated control not communicating Covers hardware errors (flame sense circuit faults, pin shorts, etc).	Hardware problem on the control. Cycle power on control. Replace if problem prevents service and is persistent. Cleared 300 seconds after fault recovered.
E126	Control internal communication problem.	Hardware problem on the control. Cycle power on control. Replace if problem prevents service and is persistent. Cleared 300 seconds after fault recovered.
E131	Corrupted control parameters (Verify configuration of system) (Communicating systems only).	Reconfigure the system. Replace control if heating or cooling is not available. Only applicable in the communicating mode not in startup. Exit from Commissioning and Execute Se+ factory Default mode. Control will still operate on default parameter settings.

NOTE: Additional codes may be found in the Comfort Sync room thermostat manual.

Table 5. 7-Segment Alert and System Status Codes

Code	Diagnostic Codes / Status of Equipment	Action Required to Clear and Recover
E180	Outdoor air temperature sensor failure. Only shown if shorted or out of range (Communicating systems only)	Compare outdoor sensor resistance to temperature resistance charts in unit installation instructions. Replace sensor pack if necessary. At beginning of (any) configuration, furnace or air handler control will sense outdoor air and discharge air temperature sensor(s) If detected (reading in range), appropriate feature will be set as installed and that could be seen in 'About ' screen. In normal operation after control recognizes sensors, alarm will be sent if valid temperature reading is lost. To get rid of setting and alarm, redo configuration and make sure that temperature sensor is marked as not installed in indoor Unit 'About' screen. When indoor unit control is replaced thermostat will 'tell' new control if temperature sensor is in system or not. Clears 30 seconds after fault recovered.
E409	LSOM - Compressor low voltage.	Secondary voltages below 18VAC. After 10 minutes, operation is discontinued. Clears the code after voltage is higher than 20VAC for 2 seconds or after power reset.
E410	The outdoor unit pressure is below the required limit.	Unit pressure is below the lower limit. The system is shut down. The low pressure switch for HFC410A will open at 40 PSIG and close at 90 PSIG. Confirm that the system is properly charged with refrigerant. Check TXV, indoor unit blower motor, dirty filters or clogged refrigerant filter. Confirm that the evaporator coil is clean. The alarm clears after the pressure switch closes or after a power rest.
E411	The low pressure switch has opened 5 times during one cooling cycle. As a result, the system will shut down.	Open low pressure switch error count reached 5 strikes. The low pressure switch for R410A will open at 40 PSIG and close at 90 PSIG. Confirm that the system is properly charged with refrigerant. Check TXV, indoor unit blower motor, dirty filters or clogged refrigerant filter. Confirm that the evaporator coil is clean. The alarm clears after a power rest.
E412	The outdoor unit pressure is above the required limit. The system will shut down.	Unit pressure is above the upper limit. System is shut down. The high pressure switch for HFC410A will open at 590 PSIG and close at 418 PSIG. Confirm that the system is properly charged with refrigerant. Check condenser fan motor, TXV, indoor unit blower motor, stuck reversing valve or clogged refrigerant filter. Confirm that the outdoor unit is clean. The alarm clears after 4 consecutive normal compressor run cycles, the pressure switch closes or a power reset.
E413	The high pressure switch has opened 5 times during one cooling cycle. As a result, the Comfort Sync thermostat will shut down.	Open high pressure switch error count reached 5 strikes. System is shut down. The high pressure switch for HFC410A will open at 590 PSIG and close at 418 PSIG. Confirm that the system is properly charged with refrigerant. Check condenser fan motor, TXV, indoor unit blower motor, stuck reversing valve or clogged refrigerant filter. Confirm that the outdoor unit is clean. The alarm clears after a power reset.
E414	The discharge line temperature is higher than the recommended upper limit of 279°F.	Discharge line temperature is > 279°F. Confirm that the system is properly charged with refrigerant. Check system operating pressures and compare to unit charging charts in installation manual. Confirm that the outdoor unit is clean. The alarm clears after the discharge temperature is < 225°F.
E415	The discharge line temperature has been consistently higher than the recommended upper limit of 279°F.	Discharge line high temperature error count reached 5 strikes. Confirm that the system is properly charged with refrigerant. Check system operating pressures and compare to unit charging charts in installation manual. Confirm that the outdoor unit is clean. The alarm clears after the discharge temperature is < 225°F. The alarm clears after a power reset.
NOTE: Additional codes may be found in the Comfort Sync room thermostat manual.		

Table 5. 7-Segment Alert and System Status Codes

Code	Diagnostic Codes / Status of Equipment	Action Required to Clear and Recover
E416	The outdoor coil sensor is either open, short-circuited or the temperature is out of sensor range. As a result, the outdoor unit control will not perform any defrost tempering.	Coil sensor being detected open or shorted, or temperature is out of coil sensor range. Outdoor unit control will not perform demand or time/temperature defrost operation. System will still heat or cool. Check the resistance of the coil sensor and compare to temperature resistance chart. Replace coil sensor if needed. The alarm clears when outdoor unit control detects proper coil sensor readings or after a power reset.
E417	The outdoor unit discharge sensor is either open, short-circuited or the temperature is out of sensor range. As a result, the outdoor unit control will not perform any defrost tempering.	Outdoor unit control detects open or shorted discharge sensor, or temperature that is out of discharge sensor range. Check the resistance of the discharge sensor and compare to temperature resistance chart; replace if needed. Reset by replacing the discharge sensor. This fault is detected by allowing the unit to run for 90 seconds before checking discharge sensor resistance. If the discharge sensor resistance is not within range after 90 seconds, the board will count one fault. After 5 faults, the board will lock out. Check for proper sensor reading and attachment to line. The alarm clears after a power reset.
E418	There is a faulty W output circuit.	Faulty W output circuit. Confirm that the unit is not running. Check for mis-wiring. Disconnect thermostat lines from W and verify 24VAC on the W. If 24VAC is present, replace the board.
E419	The W output on the outdoor unit has reported more than 5 errors. As a result, the system has shut down the outdoor unit.	W output hardware fault count reached 5 strikes.
E420	The heat pump defrost cycle has taken more than 20 minutes to complete.	Defrost cycle lasts longer than 20 minutes. This alarm is applicable with non-communicating heat pump system only. Check heat pump defrost operation. The alarm is cleared after the "W1" signal is removed.
E421	The W output terminal on the outdoor unit is not wired correctly.	Voltage sensed on W and O when Y1 thermostat input is deactivated. Another device or wiring fault is energizing W check wiring. The alarm clears when wiring is corrected or after a power reset.
NOTE: Additional codes may be found in the Comfort Sync room thermostat manual.		

Table 5. 7-Segment Alert and System Status Codes

Mode	Description	Example of Display
Power Up / Reset	Unit type and number of stages is displayed. Verify configuration with information published on the unit nameplate. If the information is incorrect, refer to flow chart "Manual Configuration of Unit Type" to reconfigure control.	<p>1 Stage AC: 1AC 2 Stage AC: 2AC 1 Stage AC: 1HP 1 Stage AC: 2HP</p> <p style="text-align: center;">Power-Up 7-Segment Display String</p> <p style="text-align: center;">Unit Type / Stages No Capacity No Fan Profile</p>
Power Up / Reset following display of self-discovered configuration	Unit nominal capacity is displayed. If not programmed, then three horizontal lines and the decimal point are displayed for 2 seconds.	<p>Power up nominal capacity display of an 4SHP - LS136</p> <p style="text-align: center;">Power-Up 7-Segment Display String</p> <p style="text-align: center;">Unit Type / Stages Capacity No Fan Profile</p>
Power Up / Reset following display of nominal capacity	Fan Profile code (a single- or two-digit number).	<p>Displays the number of the selected fan profile.</p> <p style="text-align: center;">Power-Up 7-Segment Display String</p> <p style="text-align: center;">Unit Type / Stages Capacity Fan Profile</p>
Idle Mode	Decimal point blinks at 1 Hz	Idle Mode: Decimal point blinks at 1 Hz (0.5 second on, 0.5 second off). Display OFF.
Soft Disabled	Top and bottom horizontal line and decimal point blink at 1 Hz.	Soft Disabled: Top and bottom horizontal line and decimal point blink at 1 Hz (0.5 second on, 0.5 second off). NOTE: Control should be replaced.
O.E.M. Test Mode		All segments flashing at 2 Hz (unless error is detected). NOTE: Control should be replaced.
Anti-Short Cycle Delay		Middle line shall blink at 1 Hz for 2 seconds, followed by a two-second display of the rounded up number of minutes left in the timer (two minutes, one second shall be displayed as "3"). The Anti-Short Cycle Delay time remaining is displayed when the delay is active.
Cooling Stage	Shows what stage of heat pump is currently operating.	Following string is repeated if two-stage cooling is active with outdoor fan speed set at 700 RPM. NOTE: A - If available, displays outdoor ambient temperature. [2 pause F 7 0 0 pause
Heat Pump Stage	Shows what stage of heat pump is currently operating.	Following string is repeated if first-stage cooling is active with outdoor fan speed set at 600 RPM. NOTE: A - If available, displays outdoor ambient temperature. H 1 pause F 6 0 0 pause
*Information will be displayed, but does not apply to this unit.		

Table 6. Outdoor Control 7-Segment Unit Status Displays

Defrost Mode	Shown only while in an active defrost.	Following string is repeated if defrost is active while unit was in first-stage heat pump heating mode: <i>dF</i> pause <i>H 1</i> pause
Dehumidification Mode	Shows that the unit is providing dehumidification instead of straight cooling.	Following string is repeated if dehumidification is active with outdoor fan speed set at 225 RPM: <i>d</i> pause <i>F225</i> pause
Diagnostic Recall	Shows the last 10 stored diagnostic error codes.	If first error is <i>E250</i> , second <i>E23 1-E</i> pause <i>250</i> pause <i>E</i> pause <i>23 1</i> Next codes (up to 10) are shown using same method. If there are no error codes stored: <i>E</i> pause <i>000</i>
Fault Memory Clear		After the fault memory is cleared, the following string is displayed with 0.5 seconds character on/off time: <i>0000</i> pause
Active error in outdoor control idle mode	Shows all active error(s) codes.	Following string is repeated if Error E125 and E201 are present: <i>E 125</i> pause <i>E20 1</i>
Active error in run mode	Shows current status and all active error(s) codes.	Following string is repeated if Error E311 is present while blower speed at 700 RPM: <i>F700</i> pause <i>E3 11</i>
Outdoor Ambient Temperature (OAT)	Any time OAT is sensed in operating range, value is displayed if unit is in diagnostic and non-diagnostic modes.	Following string is repeated if second stage cooling is active with outdoor fan speed set at 650 RPM and OAT is 104°F: <i>⌈2</i> pause <i>F650</i> pause <i>A 104</i> pause
Outdoor Coil Temperature (OCT)	Any time OCT is sensed in operating range, value is displayed if unit is in diagnostic mode.	Following string is repeated if 2nd stage heat is active with outdoor fan speed set at 550 RPM and OCT is 25°F: <i>H2</i> pause <i>F550</i> pause <i>c25</i> pause
Discharge Line Temperature (DIS)	Any time DIS is sensed in operating range, value is displayed if unit is in diagnostic mode.	Following string is repeated if 2nd stage cooling is active with outdoor fan speed set at 650 RPM and DIS is 185°F <i>⌈2</i> pause <i>F650</i> pause <i>d 185</i> pause
*Information will be displayed, but does not apply to this unit.		

Table 6. Outdoor Control 7-Segment Unit Status Displays

Error Code Recall Mode (NOTE: control must be in Idle mode)		
Solid	<i>E</i>	To enter error code recall mode, push and hold button until solid <i>E</i> appears, then release button. Control will display up to 10 error codes stored in memory. If <i>E000</i> is displayed, there are no stored error codes.
Solid	<i>— — —</i>	To exit error code recall mode, push and hold button until three solid horizontal bars appear, then release button. NOTE: Error codes are not cleared.
Solid	<i>c</i>	To clear error codes stored in memory, continue to hold push button while the 3 horizontal bars are displayed. Release push button when solid <i>c</i> is displayed.
Blinking	<i>c</i>	Hold push button for three seconds to confirm command to delete codes. Error codes are cleared.
NOTE: Once the error history is deleted, it cannot be recovered. After the history is deleted, the unit will reset itself.		
* Information will be displayed, but does not apply to this product.		

Table 7. Error Recall Menu Options

Display	Display and action (normal operation)	Display and action (configuration and test mode)
Power-Up	Display string displays > number of unit stages > pause > $\overline{R\overline{C}}$ or \overline{HP} unit > pause > unit capacity in BTUs > pause > RPM setting of outdoor fan. If 3 horizontal bars are displayed during any sequence of this string, it indicates that the specific parameter is not configured.	
-	Idle mode - decimal blinks at 1 Hz > 0.5 second ON, 0.5 second OFF	
\overline{R}	\overline{R} in the display string represents the ambient temperature in °F at the outdoor sensor on the outdoor unit.	Enter \overline{R} test mode: Display will string active error code(s) \overline{E} , ambient \overline{R} , coil \overline{c} and discharge \overline{d} temperature in °F at outdoor unit.
\overline{c}	Enter A test mode: Display will string active error codes (\overline{E}), ambient (\overline{R}), coil (\overline{c}), and discharge (\overline{d}) temperature in °F at outdoor unit.	
\overline{d}	\overline{d} - dehumidification mode string > \overline{d} > pause > \overline{F} (Outdoor fan) RPM > pause > \overline{R} (ambient temp displayed) > pause > repeat mode. IMPORTANT: On 2-stage unit, R to DS link must be cut and correct RPM outdoor fan profile selected for outdoor fan to operate at lower RPM speed when EDA is active.	Enter \overline{d} test mode: Forced defrost. (System must be configured as HP. Unit must be running in heating mode). Test defrost will terminate when coil terminate temperature is reached (or 10 seconds, whichever is longer) or 14 minutes if coil temperature remains below terminate temperature or by pushing button down for less than 2 seconds. Enter \overline{R} test mode: Display will string active error codes \overline{E} , ambient \overline{R} , coil \overline{c} and discharge \overline{d} temperature in °F at outdoor unit.
\overline{dF}	\overline{dF} displays when system is in defrost mode - unit must be running in heating mode, outdoor ambient must be below 65°F and outdoor coil temperature must be below defrost termination temperature.	
\overline{F}	\overline{F} in the display string indicates RPM setting output on terminals PWM and com (used with EBM motors). RPM displayed does not apply to motor connected on ECM Y1 and ECM Y2.	Enter \overline{F} test mode: Control outputs DC Voltage onto PWM and com terminals. Outdoor fan will cycle ON for 10 minutes at 490 RPM. To exit test - Push and hold button until three horizontal bars display. Release button, outdoor fan will cycle OFF. (Test DOES NOT output DC voltage to ECM Y1 and ECM Y2 terminals)
$\overline{H1}$	Heat stage 1 string display > pause > \overline{F} outdoor fan RPM displayed > pause > \overline{R} (ambient temperature displayed > pause > repeat mode.	
$\overline{H2}$	Heat stage 2 string display > pause > \overline{F} outdoor fan RPM displayed > pause > \overline{R} (ambient temperature displayed > pause > repeat mode.	
$\overline{C1}$	Cool stage 1 string display > pause > \overline{F} outdoor fan RPM displayed > pause > \overline{R} (ambient temperature displayed > pause > repeat mode.	
$\overline{C2}$	Cool stage 2 string display > pause > \overline{F} outdoor fan RPM displayed > pause > \overline{R} (ambient temperature displayed > pause > repeat mode.	
* Information will be displayed, but does not apply to this product.		

Table 8. Field Test and Program Menu Options

Configuring Unit Capacity (NOTE: Control must be in Idle mode)		
Solid	$\overline{P\overline{C}}$	Release push button - Allows user to select Unit Capacity. IMPORTANT: Field replacement control may need to be manually configured to validate outdoor unit capacity. Refer to unit nameplate model number for capacity in 1,000 of BTUs. (18, 24, 30, 36, 42, 48, 60)
Blinking	$\overline{P\overline{C}}$	Push and hold button - Control will display unit capacity number for 3 seconds. When the correct unit capacity number is displayed, release button. Selected code will flash for a 10-second period. During that period, hold push button for 3 seconds to store code. Once code is stored, control will automatically exit Field Test Mode. If 10-second period expires or push button is held less than 3 seconds, control will automatically exit Field Test Mode and go into Idle Mode without storing unit capacity number. If this happens, configuring procedure must be repeated.

Table 9. Configuring Unit Capacity

Display	Code	Procedure
Solid	P _L	Release push button - Allows user to select type and number of stages on outdoor unit. IMPORTANT: Field replacement control may need to be manually configured to validate outdoor unit fan RPM setting is right for unit capacity. See RPM table on unit wiring diagram for proper RPM settings. Type and number of stages: 1AC, 2AC, 1HP, 2HP - AC - air conditioning and HP - Heat Pump.
Blinking	P _L	Push and hold button - Control will display type and number of stages for 3 seconds. When the correct type and number of stages is displayed, release button. Selected code will flash for a 10-second period. During that period, hold push button for 3 seconds to store code. Once code is stored, control will automatically exit Field Test Mode. If 10-second period expires or push button is held for less than 3 seconds, control will automatically exit Field Test Mode and go into Idle Mode without storing type and number of stages. If this happens, configuring procedure must be repeated.

Table 10. Configuring Type and Number of Stages

Maintenance

WARNING

Before performing maintenance operations on system, turn the electric power to unit OFF at disconnect switch(es). Unit may have multiple power supplies. Electrical shock could cause personal injury or death.

Before the start of each heating and cooling season, the following service checks should be performed by a qualified service technician.

- Inspect and clean outdoor and indoor coils. The outdoor coil may be flushed with a water hose.

NOTE: *It may be necessary to flush the outdoor coil more frequently if it is exposed to substances that are corrosive or that block air flow across the coil (such as pet urine, cottonwood seeds, etc.).*

- Visually inspect the refrigerant lines and coils for leaks.
- Check wiring for loose connections.
- Check voltage at the indoor and outdoor units (with units operating).
- Check amperage draw at the outdoor fan motor, compressor, and indoor blower motor. Values should be compared with those given on unit nameplate.
- Check, clean (or replace) indoor unit filters.
- Check the refrigerant charge and gauge the system pressures.
- Check the condensate drain line for free and unobstructed flow. Clean drain line, if necessary.
- Adjust blower speed for cooling. Measure the pressure drop over the coil to determine the correct blower CFM.
- Belt drive blowers: Check drive belt for wear and proper tensions.

If insufficient cooling is reported, the unit should be gauged and refrigerant charge checked (see the Refrigerant Charging section).

Homeowner Information

In order to ensure peak performance, your system must be properly maintained. Clogged filters and blocked airflow prevent your unit from operating at its most efficient level.

WARNING

Turn all electric power to unit OFF at disconnect switch(es) before performing any maintenance operations on system. Unit may have multiple power supplies. Electrical shock could cause personal injury or death.

Filters

Ask your dealer to show you where the indoor unit's filter is located. It will be either at the indoor unit (installed internal or external to the cabinet) or behind a return air grille in the wall or ceiling in your home. Check the filter monthly and clean or replace it as needed.

Disposable filters should be replaced with a filter of the same type and size. If you are unsure of the filter you need for your system, contact your dealer.

Many indoor units are equipped with reusable foam filters. These filters can be cleaned with a mild soap and water solution. Rinse the filter thoroughly and let dry completely before returning to unit or grille.

The filter and all access panels must be in place any time the unit is in operation.

Some systems are equipped with an electronic air cleaner, designed to remove the majority of airborne particles from the air passing through the cleaner. If your system includes an electronic air cleaner, ask your dealer for maintenance instructions.

Inspect and clean indoor coil. The indoor evaporator coil is equipped with a drain pan to collect condensate formed as the system removes humidity from the inside air. Have your dealer show you the location of the drain line and how to check for obstructions. This also applies to an auxiliary drain, if one is installed.

Inspect and Clean Outdoor Coil

Make sure no obstructions restrict airflow to the outdoor unit. Leaves, trash, or shrubs crowding the unit can cause it to work harder and use more energy. Keep shrubbery trimmed away from the unit and periodically check for debris that collects around the unit.

The outdoor coil may require frequent cleaning, depending on environmental conditions. Clean the outdoor coil with an unpressurized water hose to remove surface contaminants and debris. It may be necessary to flush the outdoor coil more frequently if it is exposed to substances that are corrosive or that block airflow across the coil (such as pet urine, cottonwood seeds, etc.).

Heat Pump Operation

Heat pump units have several characteristics you should be aware of:

Heat pumps satisfy heating demand by delivering large amounts of warm air into the living space. This is quite different from gas-fired, oil-fired, or electric furnaces, which deliver lower volumes of considerably hotter air to heat the space.

Do not be alarmed if you notice frost on the outdoor coil in the winter months. Frost develops on the outdoor coil during the heating cycle when temperatures are below 45°F. An electronic control activates a defrost cycle lasting 5 to 15 minutes at preset intervals to clear the outdoor coil of the frost. A shift in sound type does occur during the defrost mode.

During the defrost cycle, you may notice steam rising from the unit. This is a normal occurrence. The thermostat may engage auxiliary heat during the defrost cycle to satisfy a heating demand. The unit will return to normal operation at the conclusion of the defrost cycle.

In Case of Extended Power Outage

If the outdoor temperature is below 50°F and power to the outdoor unit has been interrupted for 6 hours or longer, observe the following when restoring power to the heat pump system.

Set the room thermostat selector to the "Emergency Heat" setting to obtain temporary heat for a minimum of 6 hours. This will allow system refrigerant pressures and temperatures enough time to return to a stabilized condition.

In the "Emergency Heat" mode, all heating demand is satisfied by auxiliary heat; heat pump operation is locked out. After a 6 hour "warm-up" period, the thermostat can then be switched to the "Heat" setting and normal heat operation may resume.

Thermostat Operation

Though your thermostat may vary somewhat from the description below, its operation will be similar.

Temperature Setting Levers

Most heat pump thermostats have two temperature selector levers: one for heating and one for cooling. Set the levers or dials to the desired temperature setpoints for both heating and cooling. Avoid frequent temperature adjustment; turning the unit off and back on before pressures equalize puts stress on unit compressor.

Fan Switch

In AUTO or INT (intermittent) mode, the blower operates only when the thermostat calls for heating or cooling. This mode is generally preferred when humidity control is a priority. The ON or CONT mode provides continuous indoor blower operation, regardless of whether the compressor or auxiliary heat are operating. This mode is required when constant air circulation or filtering is desired.

System Switch

Set the system switch for heating, cooling, or auto operation. The auto mode allows the heat pump to automatically switch from heating mode to cooling mode to maintain predetermined comfort settings. Many heat pump thermostats are also equipped with an emergency heat mode, which locks out heat pump operation and provides temporary heat supplied by the auxiliary heat.

Indicating Light

Most heat pump thermostats have an amber light that indicates when the heat pump is operating in the emergency heat mode.

Temperature Indicator

The temperature indicator displays the actual room temperature.

Programmable Thermostats

Your system may be controlled by a programmable thermostat. These thermostats provide the added feature of programmable time-of-day set points for both heating and cooling. Refer to the user's information manual provided with your particular thermostat for operation details.

Pre-Service Check

If your system fails to operate, check the following before calling for service:

- Check to see that all electrical disconnect switches are ON.
- Make sure the thermostat temperature selector is properly set.
- Make sure the thermostat system switch is properly set.
- Replace any blown fuses, or reset circuit breakers.
- Make sure unit access panels are in place.
- Make sure air filter is clean.
- Locate unit model number and have it available before calling.

Start-Up and Performance Checklist

Job Name: _____ Job No. _____ Date: _____

Job Location: _____ City: _____ State: _____

Installer: _____ City: _____ State: _____

Unit Model No. _____ Serial No. _____

Service Technician: _____ Nameplate Voltage: _____

Rated Load Ampacity: _____ Compressor Amperage: _____ Outdoor Fan: _____

Maximum Fuse or Circuit Breaker: _____

Electrical Connections Tight? Indoor Filter Clean? Supply Voltage (Unit Off): _____

Indoor Blower RPM: _____ S.P. Drop Over Indoor (Dry): _____

Outdoor Coil Entering Air Temperature: _____ Voltage with Compressor Operating: _____

Outdoor Fan Checked?

Cooling

Liquid Line Pressure: _____ Suction Line Pressure: _____ Refrigerant Charge Checked?

Heating

Liquid Line Pressure: _____ Suction Line Pressure: _____ Refrigerant Charge Checked?

Refrigerant Lines: Leak Checked? Properly Insulated?

Service Valves: Fully Opened? Caps Tight?

Thermostat: Calibrated? Properly Set? Level?

Sequence of Operation?

Heating Correct? Cooling Correct?

