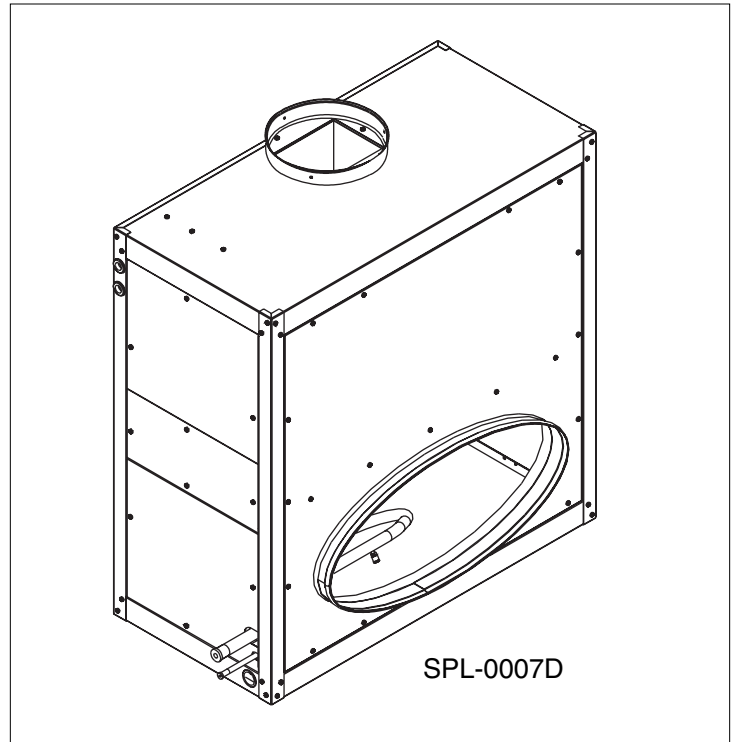




MODEL ESP-V SYSTEM INSTALLATION, OPERATION & MAINTENANCE MANUAL

**Central Air Conditioning Series
2 to 5 Tons
Fan Coil Unit/Air Supply
Components**



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Section 1: INTRODUCTION

The following terms are used throughout this manual to bring attention to the presence of potential hazards or to important information concerning the product:

DANGER: Indicates an imminently hazardous situation which, if not avoided, will result in death, serious injury or substantial property damage.

WARNING: Indicates a potentially hazardous situation which, if not avoided, could result in death, serious injury or substantial property damage.

CAUTION: Indicates a potentially hazardous situation which, if not avoided, may result in minor injury or property damage.

NOTICE: Used to notify of special instructions on installation, operation or maintenance which are important to equipment but not related to personal injury hazards.

SPACE-PAK SYSTEM DESIGN

Space Pak is a high velocity central air conditioning system. The Space Pak system can be used with a condensing unit to provide conditioned (heated or cooled) air. The unit provides conditioned air through the specially-designed, pre-fabricated, pre-insulated flexible duct system. The system and its basic components operate the same as any conventional air-to-air cooling or heat pump system.

The Space-Pak system is covered by the following U.S. Patents: 3,507,354; 3,575,234; 3,596,936; 3,605,797; 3,685,329; 4,045,977; 4,698,982; 926,673 and Canadian Patents: 891,292; 923,935; 923,936.

CODE COMPLIANCE

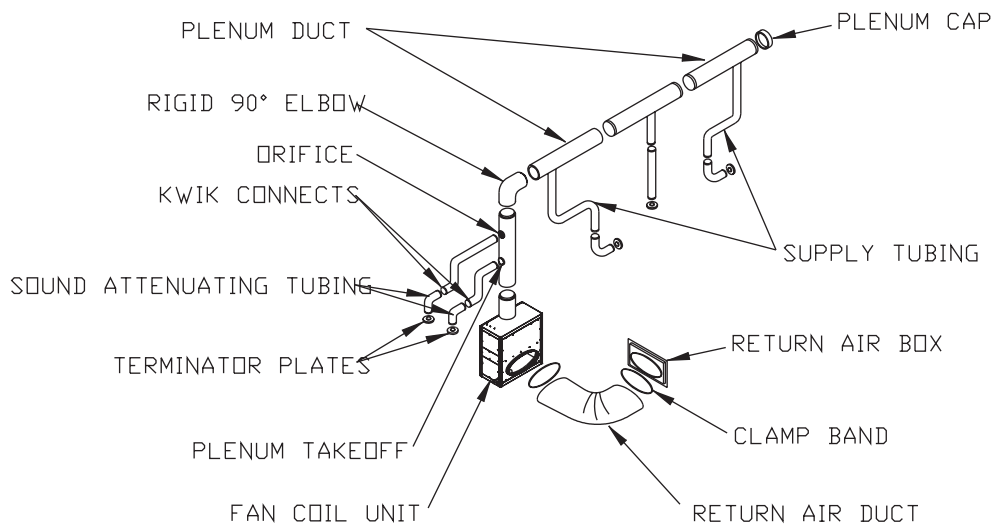
Fan coil unit installation must conform to the requirements of the local authority having jurisdiction or, in the absence of such requirements, to the National Board of Fire Underwriters regulations. Fan coil unit is UL listed.

All electrical wiring must be in accordance with the National Electrical Code ANSI/NFPA No. 70-latest edition and any additional state or local code requirements. If an external electrical source is utilized, the fan coil unit, when installed, must be electrically grounded.

AIR DISTRIBUTION SYSTEM COMPONENT REQUIREMENTS

Air distribution components installation must conform to the requirements of local authority having jurisdiction or, in the absence of such requirements, to the National Board of Fire Underwriters Code 90A or 90B.

Do not begin the installation of the system without a system layout and material take-off. If a layout plan is not already available and room terminator requirements determined, then refer to the Space-Pak Application Manual, SP9, to complete this information. A description of air distribution system components is shown in Figure 1.1.



SPL0008B

RETURN AIR BOX (SPC-1D, 2D, & 3D): Each includes filter grill with metal frame, permanent 14" x 25" x 1" (1D, 2D), 14" x 36" x 1" (3D) filter, and 2 clamp bands. SPC-1D is for ESP-2430V. SPC-2D is for ESP-3642V and SPC-3D is for ESP-4860V.

RETURN AIR DUCT (SPC-4, 5, & 6): Flexible duct, sound deadening insulated with round shape. SPC-4 (15" dia.) for ESP-2430V. SPC-5 (19" dia.) for ESP-3642V and SPC-6 (24" dia.) is for ESP-4860V.

PLENUM DUCT (SPC-13-6): Rigid, 9" I.D., 11" O.D. coated fiberglass with aluminum vapor barrier. Each section is 6 feet long.

PLENUM TEE (SPC-14-4A): Same construction as duct.

PLENUM ELBOW (SPC-19-4): Same construction as duct. 14" Radius. Rigid 90°.

PLENUM END CAP (SPC-16-10): Insulated metal cap.

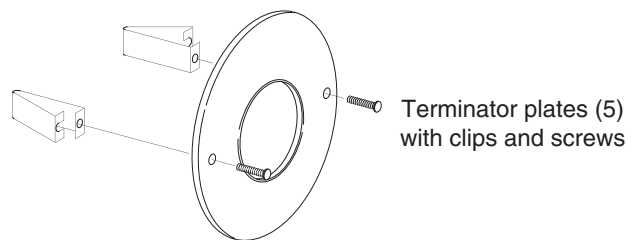
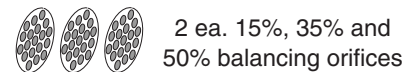
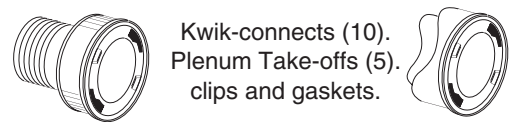
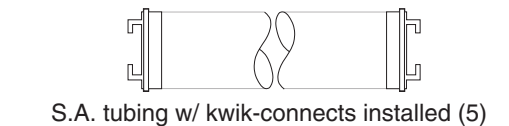
SUPPLY TUBING (SPC-25-100): Flexible, insulated, 2" I.D. and 3 1/4" O.D. Each section is 100 feet long.

INSTALLATION KIT (SPC-50-2A & 5A): Each contains appropriate amount of sound attenuating (S.A.) tubing sections, kwik-connects, plenum take-offs, terminator plates and balancing orifices to complete 2 (SPC-50-2A) or 5 (SPC-50-5A) room outlets.

ADDITIONAL COMPONENTS (not shown)

WINTER SUPPLY SHUT OFF (SPC-42-10): To keep moisture from collecting in ductwork during winter months.

INSTALLATION KIT COMPONENTS (SPC-50-5A)



PLENUM HOLE CUTTER (SPC-71-10): To cut 2" holes in plenum for plenum take-off installation.

PLIERS (SPC-72): To assure full setting of all clips (fasteners) in plenum take-off.

FIGURE 1.1: AIR DISTRIBUTION SYSTEM COMPONENTS

Plenum Duct

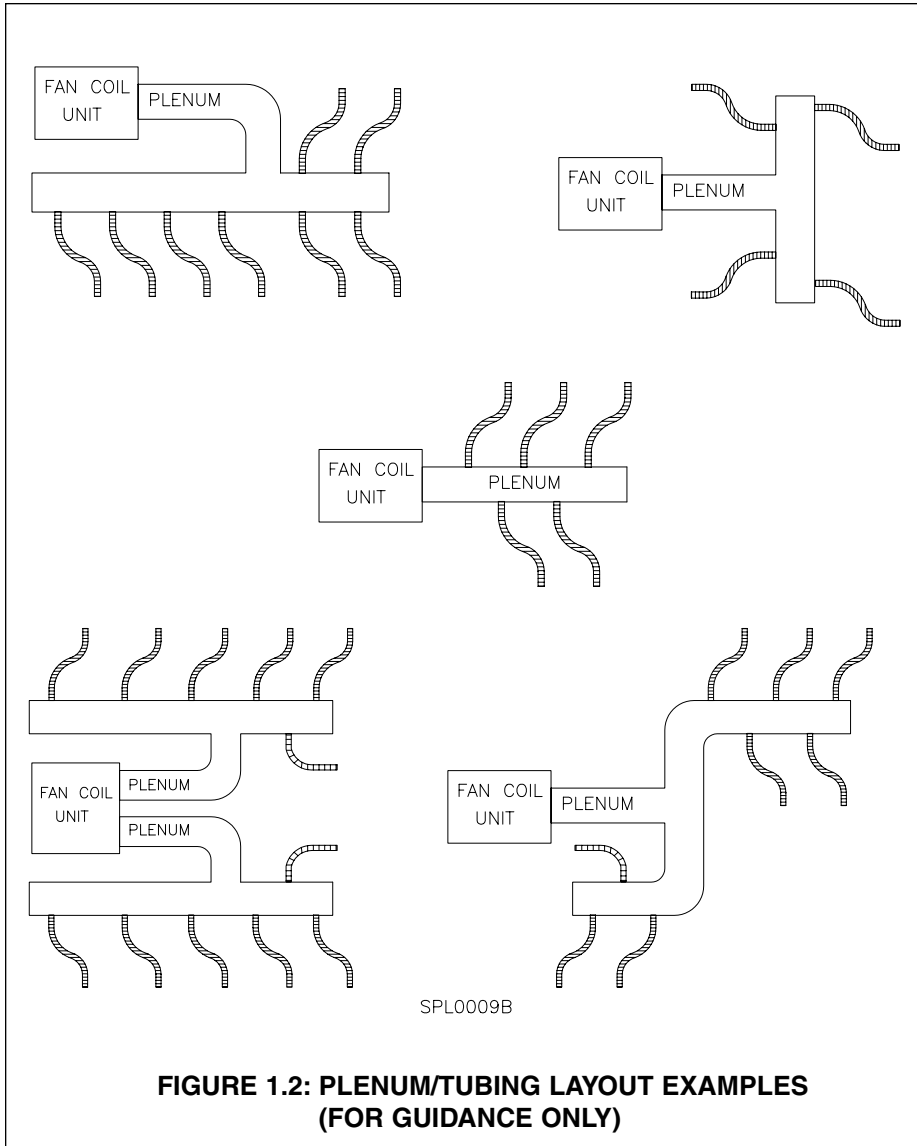
The plenum duct can be run in practically any location accessible for the attachment of the supply tubing (see suggested layouts in Figure 1.2). The plenum is normally located in the attic or basement, and it is usually more economical to run the plenum where it will appreciably shorten the lengths of two or more supply runs.

In some two-story split level homes, it may be advantageous to go from one level to another with the plenum duct. Whenever necessary, either between floors or along the ceiling, the small size of the plenum makes it easy to box in.

The blower coil unit is designed to operate with a total external static pressure of 1.5 inches of water column (minimum 1.0 - maximum 1.5). Excessive static pressure increases the air flow in individual runs and may cause some or all terminators to be noisy.

For systems with a tee installed as on Unit No. 1 (Figure 1.3), the best results are obtained if not more than 60% of the total number of system outlets are attached to any one branch of the tee. For systems with a tee installed as on Unit No. 2 (Figure 1.3), not more than 30% of the total number of system outlets should be attached to the perpendicular branch of the tee.

The ESP-4860V has some additional plenum installation requirements that the smaller systems do not. This is due to the twin blower arrangement. The ESP-4860V plenums can be considered and installed as if they were attached to two separate units, but it is important that both plenums have about the same number of supply runs and that the supply runs be of similar length. If the unit can not be installed in this manner, then an "H" plenum (BM-2506) should be used, as in Figure 1.4. This corrects flow imbalances between the two plenums. Static readings should be taken on both plenums 18" after the crossover of the "H" plenum. No supply runs should be installed between the unit outlet and the crossover.



**FIGURE 1.2: PLENUM/TUBING LAYOUT EXAMPLES
(FOR GUIDANCE ONLY)**

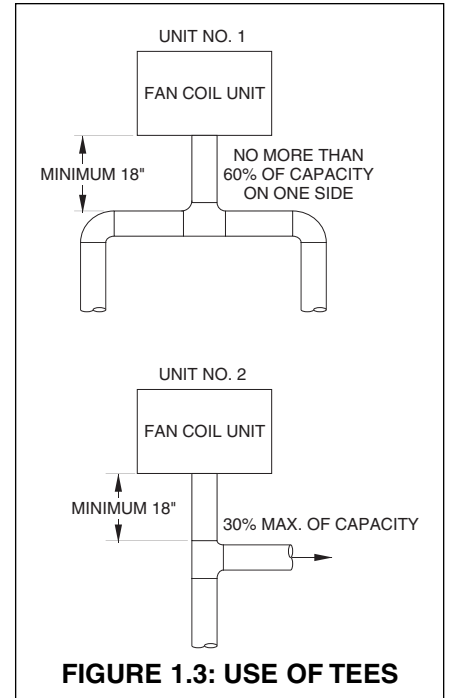


FIGURE 1.3: USE OF TEES

Supply Tubing

In the case of two-story or split-level applications, supply tubing may run from one story to another. It is small enough to go in stud spaces, but this is often difficult in older homes because of hidden obstructions in stud spaces. It is more common to run the supply tubing from the attic down through second story closets to the first story terminators.

Supply tubing runs in the corners of the second story rooms can be boxed in and are hardly noticeable since overall diameter is only 3¼".

Room Terminators

Terminators should be located only in the ceiling or floor for vertical discharge. Horizontal discharge is acceptable, but is sometimes more difficult to install. Two excellent spots for horizontal discharge are in the soffit area above kitchen cabinets (see Figure 1.4) and in the top portion of closets (see Figure 1.5).

Terminators should always be out of normal traffic patterns to prevent discharge air from blowing directly on occupants. And they should not be located directly above shelves or large pieces of furniture. Outside wall or corner locations are recommended if the room has more than one outside wall. Locating terminators away from interior doors prevents short cycling of air to the return air box.

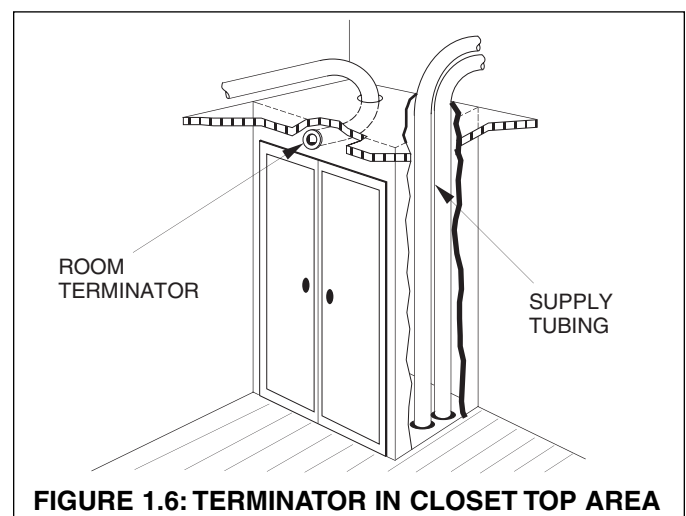
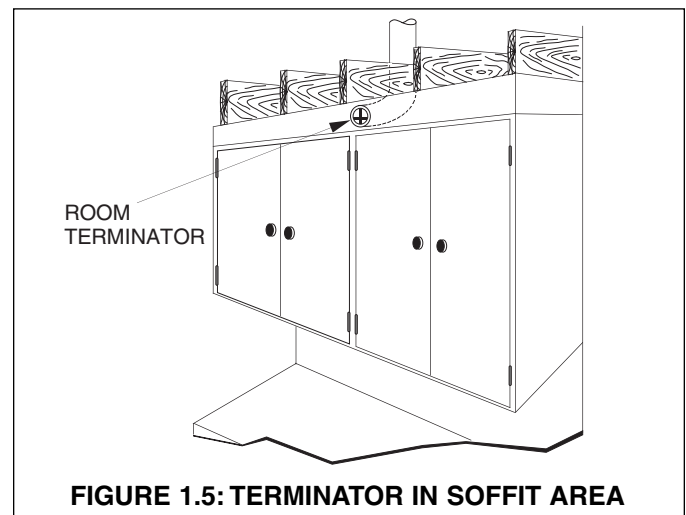
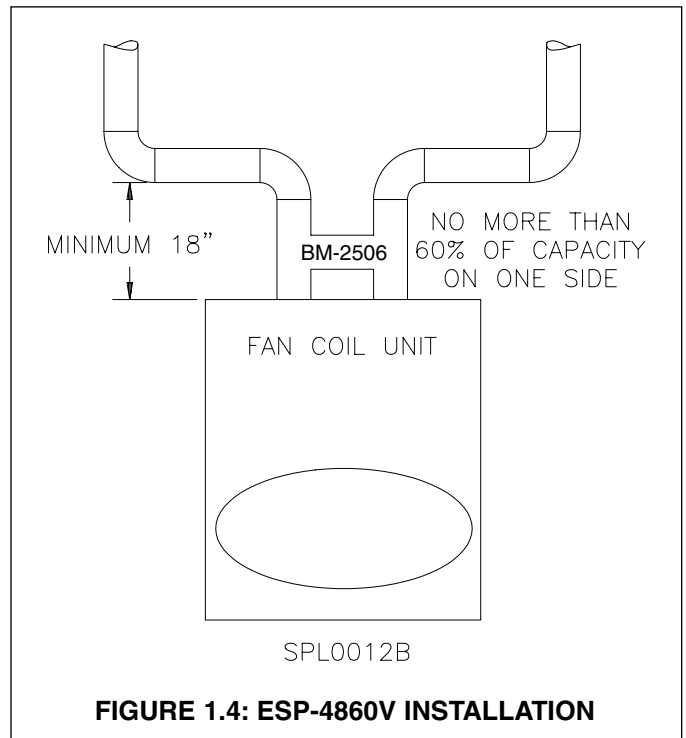
WARRANTY INFORMATION

Refer to the Limited Warranty published on the back page of this manual.

SHIPMENT OF UNIT

Each fan coil unit is shipped in a single carton. Packed with the unit, there is a supply air plenum flange with gasket, vibration isolation pads, a condensate trap assembly and a length of 6" wide foil faced fiberglass insulation.

Each unit comes from the factory charged with nitrogen. When the unit is unsealed, a slight "pop" or "hissing" noise should be heard. This guarantees that the unit is properly sealed.



SECTION 2: SYSTEM INSTALLATION

NOTE: Before proceeding with the installation, we recommend reading through this section of the manual for an overall understanding of the air conditioning fan coil unit and air distribution system component installation procedures.

When selecting a location, consider the location of the unit in relation to the return air box as shown in Figures 2.3, 2.4. The return air duct should have at least one 90° bend to avoid unnecessary sound feedback to the living space from the fan coil unit.

STEP 1: LOCATING THE UNIT

The fan coil unit may be installed in an unconditioned space (as long as it is protected from the weather) or a conditioned space such as a basement, closet or utility room. Please refer to Figure 2.2 for unit sizes and recommended service clearances.

When locating the unit, consider the layout of the plenum duct, supply tubing, refrigerant lines and condensate drain line.

When installing the unit above a finished ceiling or living space, install a secondary drain pan or optional float switch. Always follow local code requirements.

Model	System Capacity (Nom. Tons)	Electrical Characteristics	Connections					Recommended Condensing Unit	
			Suction Line	Liquid Line	Cond. Drain (NPT)	Return Inlet (Dia.)	Supply Outlet (I.D.)	Capacity (MBH)	Min SEER
ESP-2430V	2 & 2-1/2	208-230/1/60	7/8"	3/8"	3/4"	15"	9"	24 to 30	12+
ESP-3642V	3 & 3-1/2	208-230/1/60	7/8"	3/8"	3/4"	19"	9"	36 to 42	12+
ESP-4860V	4 & 5	208-230/1/60	7/8"	3/8"	3/4"	24"	9"	48 to 60	12+

Model	System Capacity (Nom. Tons)	Blower					Coil			Ship. Wt. (lbs)
		Std. CFM @ 1.5" W.C.	Wheel Dia. and Width	Motor HP	Motor Type	F.L. Amps	No. of Rows Deep	Holding Charge (Dry Nitrogen)	Flow Control Type	
ESP-2430V	2 & 2-1/2	550	9" x 5"	1/3	PSC	1.8	6	7 oz	Exp. Valve	112
ESP-3642V	3 & 3-1/2	850	9" x 5"	1/2	PSC	2.8	6	7 oz	Exp. Valve	134
ESP-4860V	4 & 5	1150	(2) 9" x 5"	1	PSC	3.6	6	7 oz	Exp. Valve	171

FIGURE 2.1: MODEL ESP-D SPECIFICATIONS

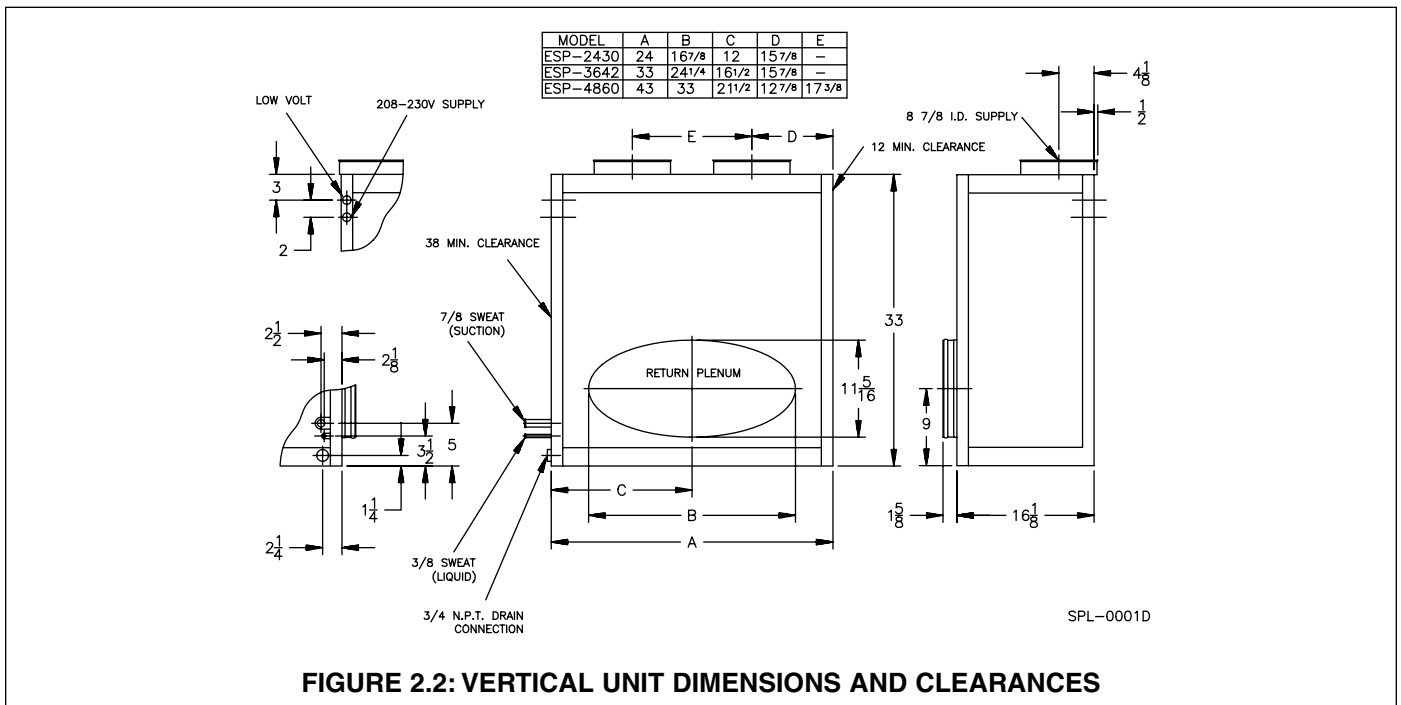


FIGURE 2.2: VERTICAL UNIT DIMENSIONS AND CLEARANCES

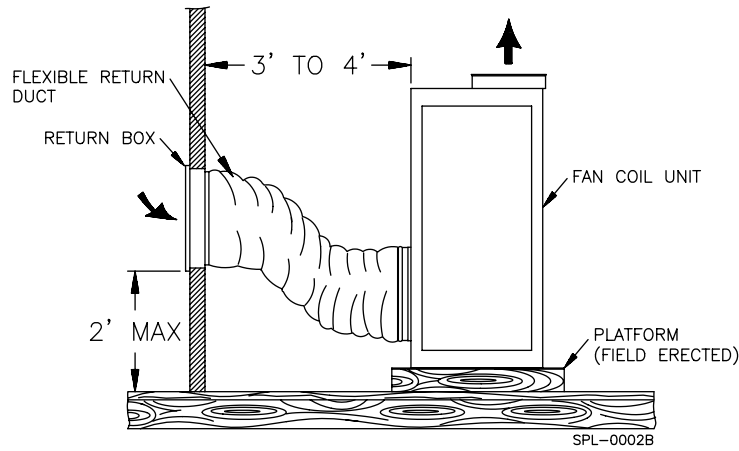


FIGURE 2.3: TYPICAL CLOSET/UTILITY ROOM INSTALLATION

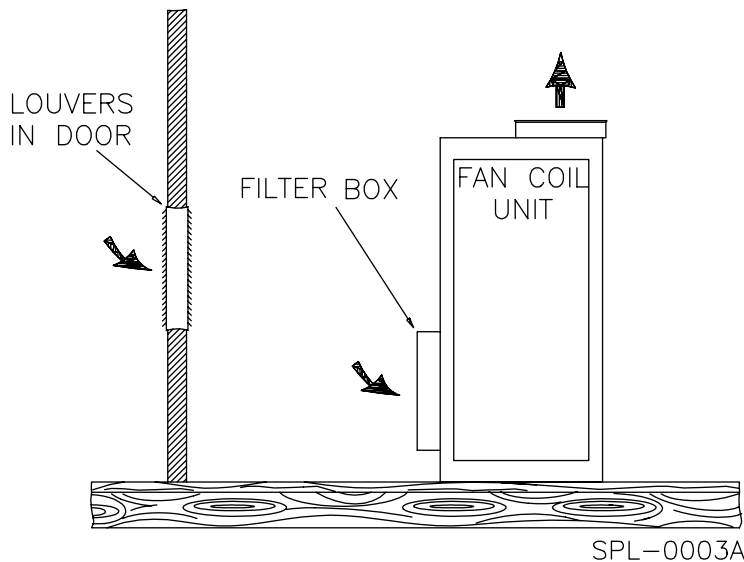


FIGURE 2.4: TYPICAL CLOSET INSTALLATION

STEP 2: CUTTING RETURN AIR OPENING

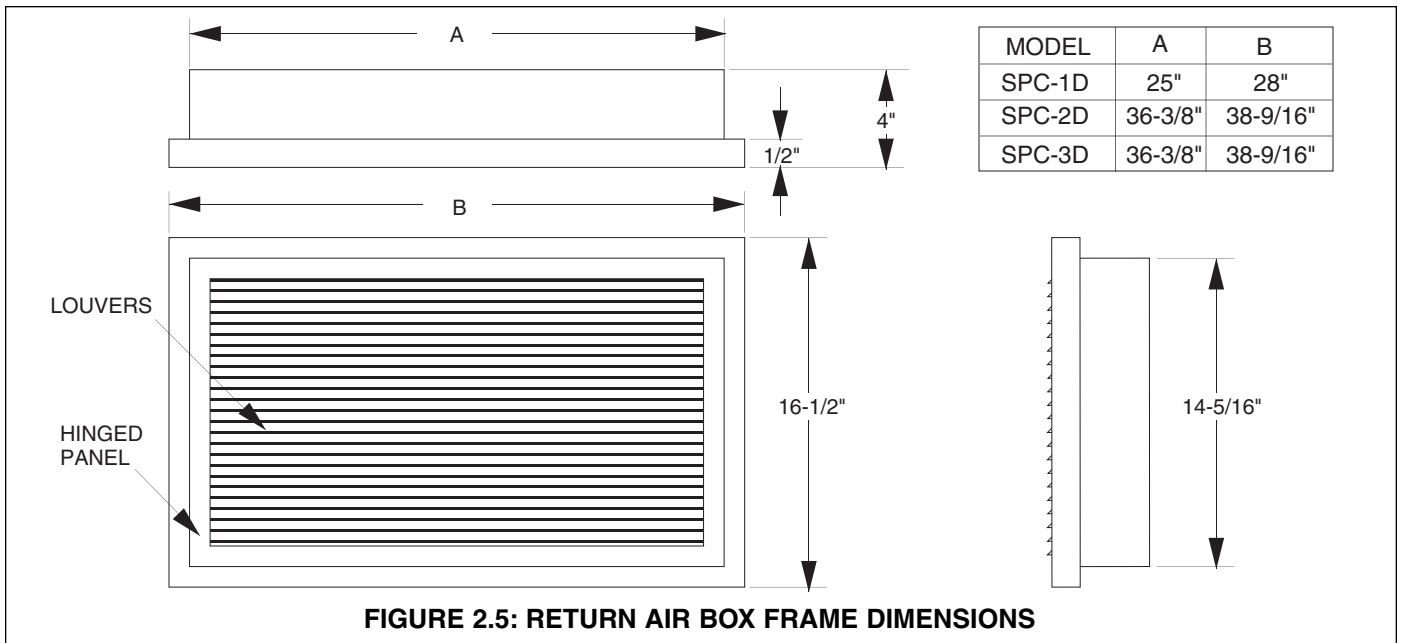
Select the exact location for the return air box. Avoid installing the box in the dining room, living room, kitchen, etc., unless the return air duct can be installed with a 180° bend or two 90° degree bends (best accomplished by joining two return air ducts together).

Cut the rough opening for the return air box 14½" wide by 26½" long for the ESP-2430 V and 14½" wide by 36½" wide for the ESP-3642V and ESP-4860 V. The return air box will fit in these openings and cover the opening completely.

Where joists are 16" on center, the return air box should fit between successive joists. Where joists run in the opposite direction, or to properly center the return, it may be necessary to cut joists and install headers.

For wall return applications, cut the return air opening to accommodate the return air box. Do not place the opening on a straight path to the return air panel. Locate the opening at a different height or at a right angle to the return air panel as shown in Figure 2.3. Alternately, units can be installed without the return air duct as long as the return air is being freely pulled from the conditioned space and filtered before the return air opening.

Check the opening for the proper fit of the return air box. Do not install the return air box until the unit is fully installed if the hole is required to get material or equipment to the installation location.



STEP 3: SETTING THE UNIT

Construct a platform for the fan coil unit, as shown in Figure 2.7. The platform can be constructed of 2x4 (minimum), 2x6, 2x8, or 2x10 lumber. The lumber should be selected based on the minimum required height to achieve proper pitch of 1/4" down per horizontal foot of condensate drain line. Figure 2.6 shows the approximate run of condensate piping as a function of the framing lumber used to construct the platform. The platform covering should be plywood of a minimum thickness of 1/2".

If the platform is to be suspended from overhead, use 1/4" threaded rods. Otherwise secure the platform to the joists or floor depending on the location selected for the fan coil unit. Make sure the platform is level.

NOTE: Allow space on sides for servicing.

Attach vibration isolation pads (supplied with the fan coil unit) to platform top as shown in Figure 2.7.

Place the unit on the fully prepared platform. Make sure that the supply air plenum flange clears any walls or structures by 1/2" minimum.

Do not secure the unit to the platform. The weight of the unit will hold it in position.

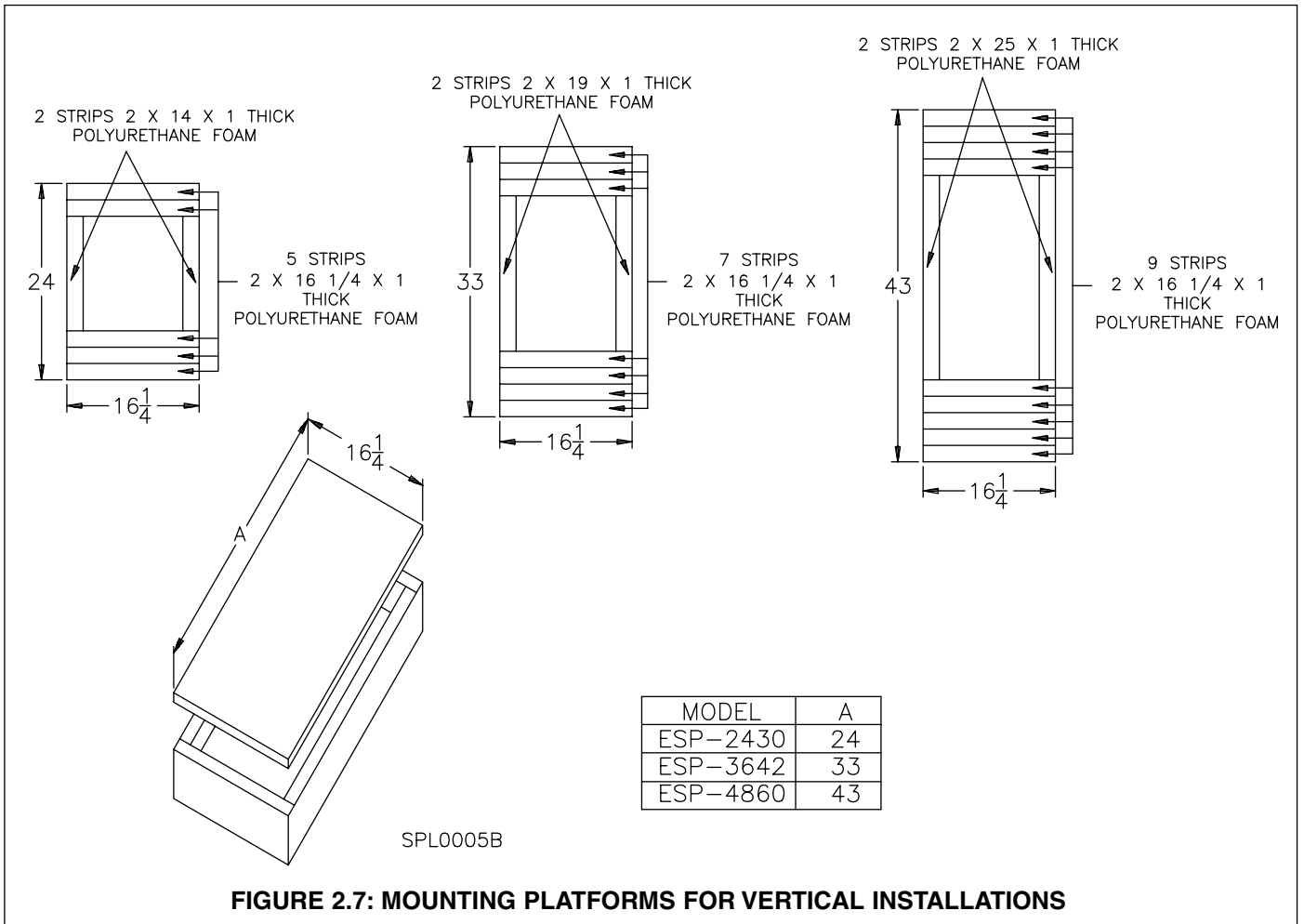
STEP 4: CONNECTING REFRIGERANT LINES

Connect refrigerant lines from the outdoor condensing unit to the fan coil unit in accordance with its manufacturer's sizing recommendations for the length of the piping run. Proper line sizing is critical to the operation of the system. Always use proper brazing procedures. A trickle flow (2PSI) of dry nitrogen to avoid scale or blockage in the piping system is recommended while brazing. Spacepak also recommends installing a sight glass on the liquid line outside of the unit as an aid for accurately charging the system.

Use dry nitrogen to pressurize the system after brazing all joints for leak checking. Then evacuate the system and charge with refrigerant as per the condenser unit's installation instructions.

LUMBER SIZE	2 X 4	2 X 6	2 X 8	2 X 10
MAXIMUM HORIZONTAL	8'	16'	24'	32'

FIGURE 2.6: CONDENSATE PIPING RUNS



STEP 5: INSTALLING THE CONDENSATE TRAP & LINE

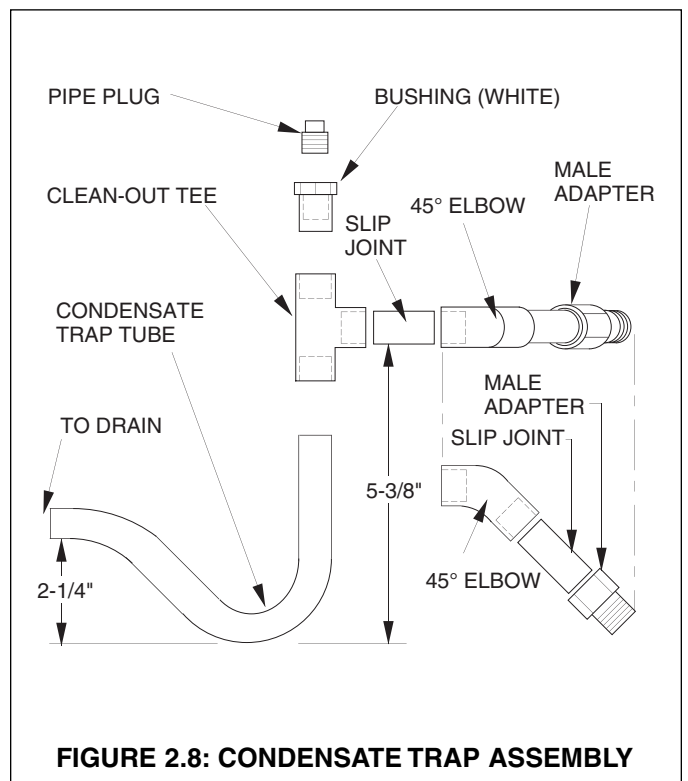
Refer to Figure 2.2 for condensate drain location. All components for the PVC condensate trap are provided in a separate bag with fan coil unit (see Fig. 2.8) and should be cemented together with PVC pipe cement.

CAUTION: Do not use substitute trap. Do not cut off or alter trap components.

Screw male adapter (see Fig. 2.8) into unit condensate line connection. Assemble and cement remaining components together. Then cement assembly to male adapter. The 45° elbow provides an offset from beneath unit suction line for access to clean-out plug.

Run a condensate line from the trap to a suitable drain that is in accordance with local codes. Make sure the line is pitched 1/4" per foot.

NOTE: Never connect condensate line to a closed drain system. When installing unit above a finished space, recommend installing a secondary drain pan or optional float switch.



STEP 6: WIRING THE UNIT

DANGER: Lockout/tagout electrical power supply before servicing. Contact with live electric components can cause shock or death.

All electrical and control wiring must be installed in accordance with the codes listed in Section 1 of this manual. Wiring diagram is provided in Figure 2.9. A separate 208-230/1/60 power supply is recommended for the unit. Use standard 15-amp fuse and 14-gauge wire from power supply to unit.

Connect power supply to Terminals L1 (hot) and L2 (hot) on the high voltage terminal block. Connect a ground wire to the equipment ground terminal located next to the high voltage terminal block.

The low voltage transformer in the unit has a 208 volt tap in the primary winding (color coded RED). If unit is to be operated with 208 volt electrical service, remove the 230 volt ORANGE lead from the L2 terminal and connect the 208 volt RED lead to the L2 terminal. Be sure to insulate the end of the unused ORANGE lead.

Locate the room thermostat on a wall near the return air box, between 40" to 48" from the floor. Connect the low-voltage thermostat wiring from the room thermostat to the low voltage control block in the unit.

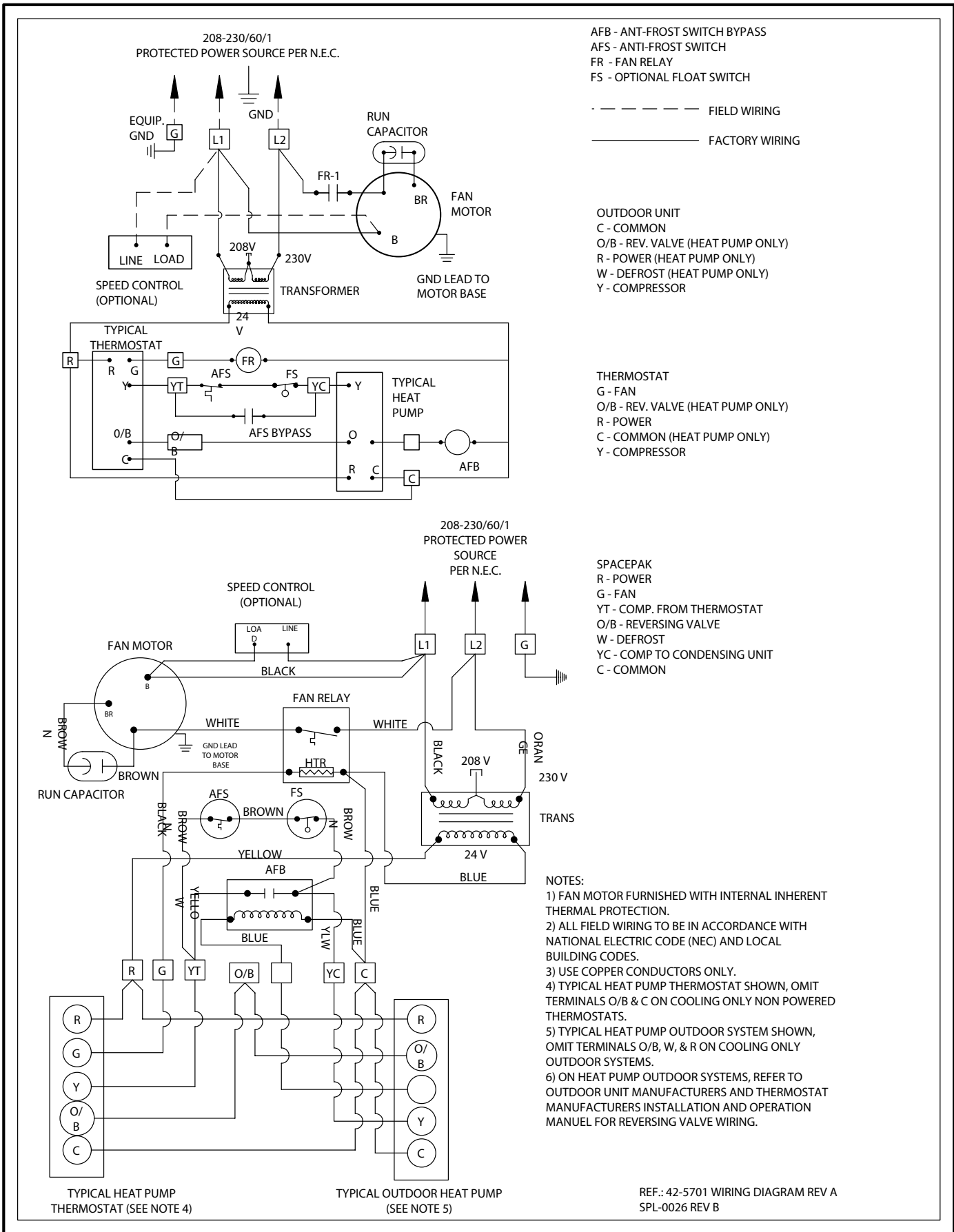


FIGURE 2.9: MODEL ESP-V/E WIRING SCHEMATIC

STEP 7: INSTALLING AIR DISTRIBUTION COMPONENTS

All plenum duct and supply tubing runs as well as room terminator locations must be in accordance with air distribution system requirements listed in Section 1 of this manual. Use a tape that meets UL-181 requirements on all joints.

Plenum Duct Installation

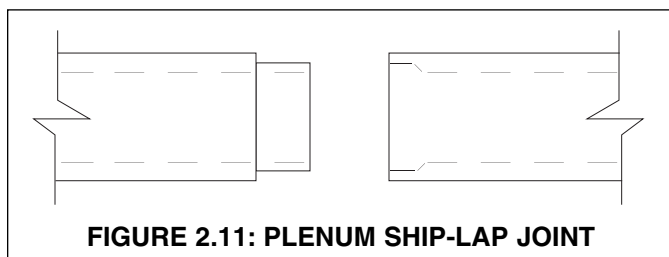
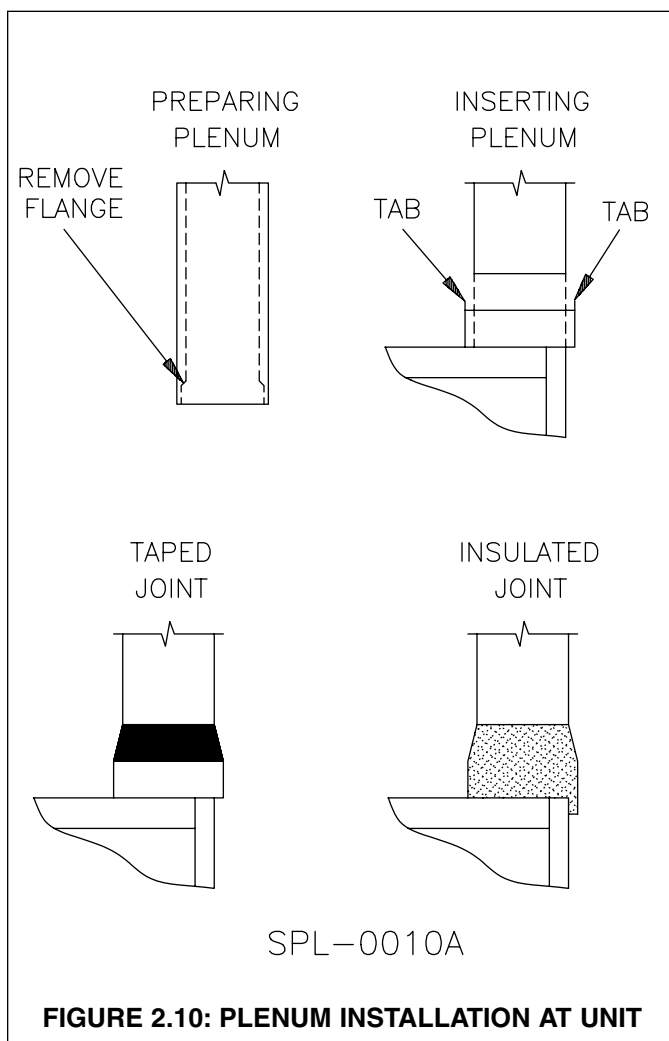
All tees, elbows and supply runs must be a minimum of 18" from the fan coil unit or any other tee, elbow or supply run. Keep all tees and elbows to a minimum to keep system pressure drop on larger layouts to a minimum. Plenum duct comes in 6-foot sections and may be cut to length.

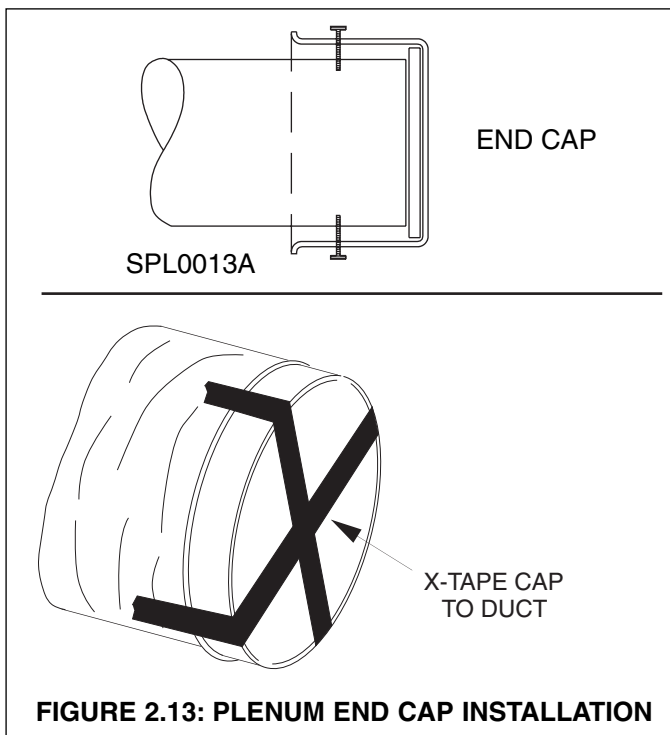
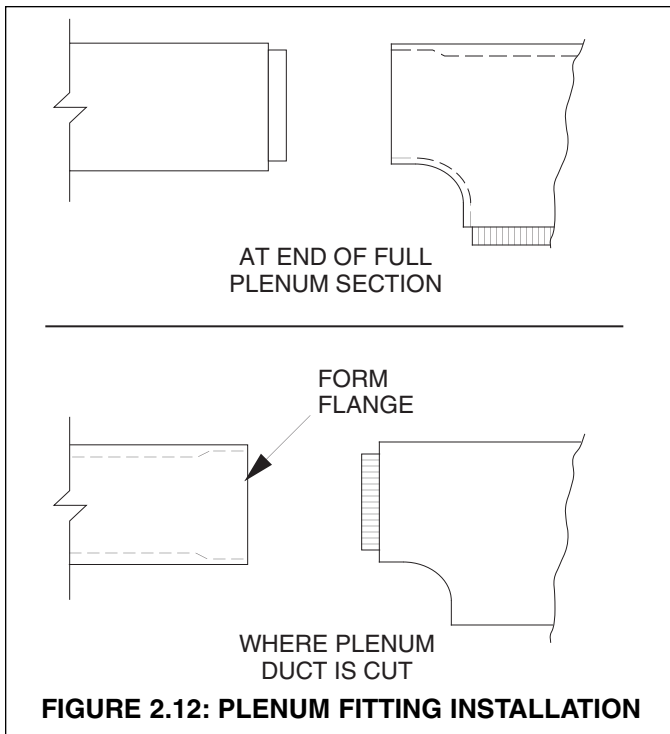
Begin installing plenum duct (see Figure 2.10). For straight or branched plenum runs cut off the female end of a plenum duct section. In the case of a bull head tee (see Unit No.1 in Figure 1.3 on page 4) cut off the male end of a plenum duct section. Then insert duct into fan coil unit receiving collar. Push duct in tight to form snug joint, flatten the sheet metal tabs against the duct and insert flat head pins. Remove paper backing on rectangular foam pieces and place over pin heads. Tape the unit/plenum joint securely. To prevent air leakage and condensation, wrap and tape in place (a) the 6" wide piece of foil faced fiberglass insulation over the taped joint and (b) the circle segment of foil faced fiberglass insulation over the rear of the supply air plenum flange. Be sure insulation is pushed up against the unit.

Continue to assemble plenum duct, making sure shiplap joints (see Figure 2.11) are snug and taped securely.

Plenum tee and elbow fittings may be installed at any point in the plenum duct run. If installing a fitting at the end of a full plenum section (see Figure 2.12), insert female end of fitting into duct. If installing a fitting at a "cut" in the plenum duct (see Figure 2.12), form a field-fabricated flange (1½" wide) in the duct and insert male end of fitting into duct. Tape the joint securely.

An end cap must be installed at the end of each duct run. The cap contains an insulating cushion which is pushed up tight against the duct end. (If installing end cap at the end of a full plenum section, remove shiplap joint first). Holding cap firmly in place (see Figure 2.13), insert flat head pins through the sheet metal tabs on the end cap. Remove paper baking on rectangular foam pieces and place over pin heads. Cross-tape cap to the plenum duct, and then tape it circumferentially to the plenum duct.





Room Terminator & Sound Attenuating Tubing Installation

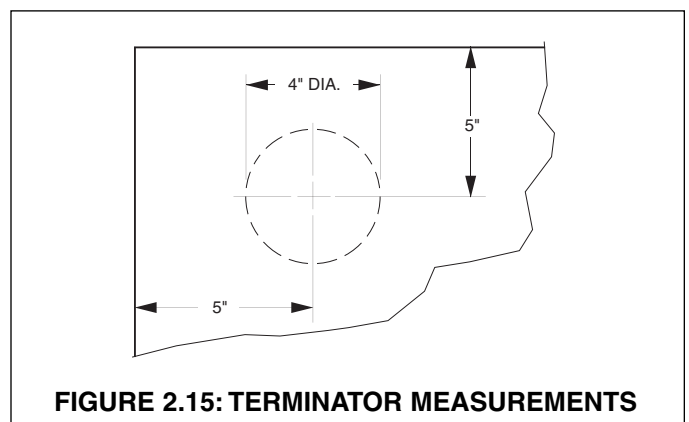
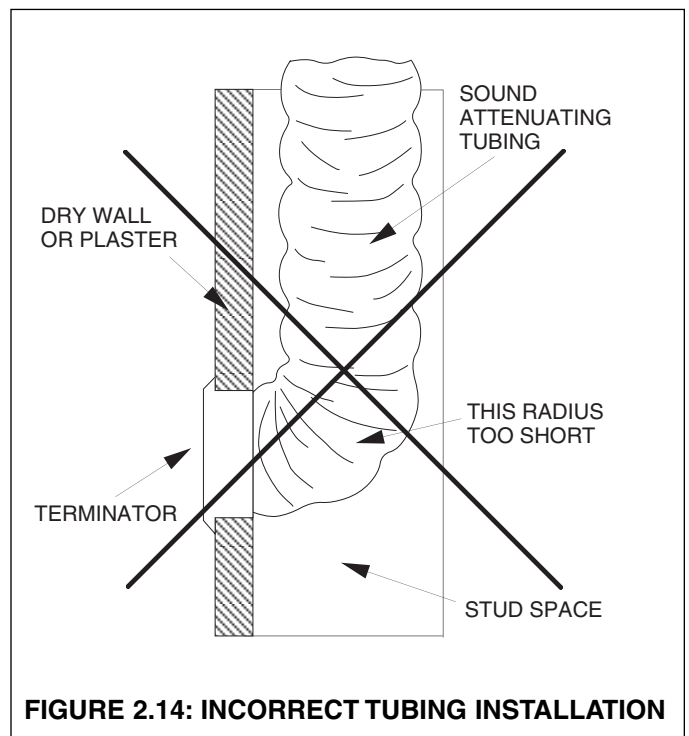
Room terminators and pre-assembled sound attenuating tubing are provided in the Installation Kits.

NOTE: Do not install terminators in a wall in which a sharp bend in the sound attenuating tubing is required (see Figure 2.14). The result would be unacceptable noise.

In marking location for room terminator (see Figure 2.15), the center of the terminator should be 5" from the wall or, when installed in the corner of a room 5" from both walls.

After marking location, drill a $\frac{1}{8}$ " diameter hole for outlet to be sure there is at least a 2" clearance all around the $\frac{1}{8}$ " hole to receive tubing and connector. Adjust direction of hole as needed, to gain this 2" clearance. After all clearances have been checked, take a 4" diameter rotary-type hole saw and cut a hole, using the $\frac{1}{8}$ " diameter hole as a pilot.

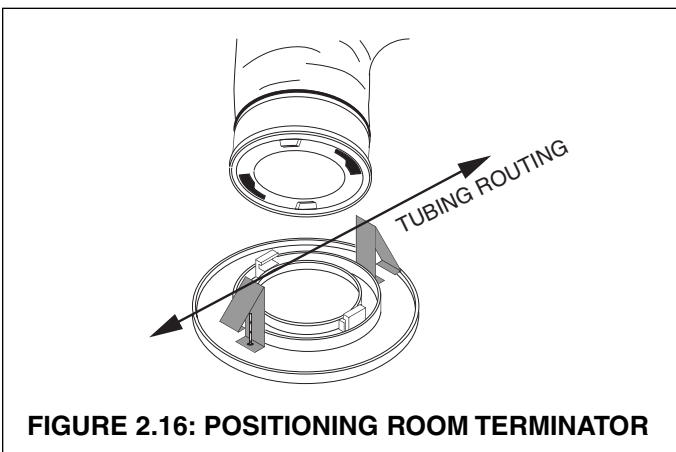
Assemble the room terminator to the sound attenuating tubing by simply fitting the two pieces together and twisting until tight (see Figure 2.16). If the terminator is to be used in a floor location, then field fabricate a small screen ($1\frac{1}{2}$ " square; $\frac{1}{4}$ x $\frac{1}{4}$ 20-gauge galvanized wire screen) and place screen over opening on the back of the terminator prior to twisting on the kwik-connect (on the sound attenuating tubing).



NOTE: Do not shorten sound attenuating tubing length. The result would be unacceptable noise.

Push the free end of the sound attenuating tubing through the 4" hole. Align the spring clips parallel with the tubing run. Push the terminator face plate against the finish surface so that the clips snap in place behind the surface. This is important since the weight of the tubing will have a tendency to cause a part of the terminator to pull away from the ceiling if the clips do not run parallel to the tubing run.

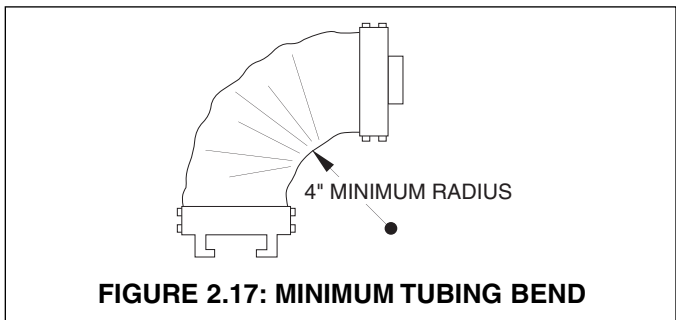
Then tighten the screws (attached to the terminator) until the terminator is snug against the ceiling or floor. **Do not overtighten.** For installations with floors or ceilings which are thicker than normal, field supplied longer toggle screws or special mounting plates may be required.



Supply Tubing Installation

Kwik-connects, plenum take-off gaskets, plenum take-offs and balancing orifices are provided in the Installation Kits.

Avoid sharp bends in the supply tubing (as well as the sound attenuating tubing). The minimum radius bend is 4" (see Figure 2.17); however, wherever possible, hold to a larger radius.



At the plenum, all supply tubing connections must be a minimum of 18" from any plenum tee, plenum elbow, the fan coil unit or another supply tubing connection.

Individual supply tubing runs must be a minimum of 6-feet, even if the distance between the sound attenuating tubing and plenum is less than 6 feet.

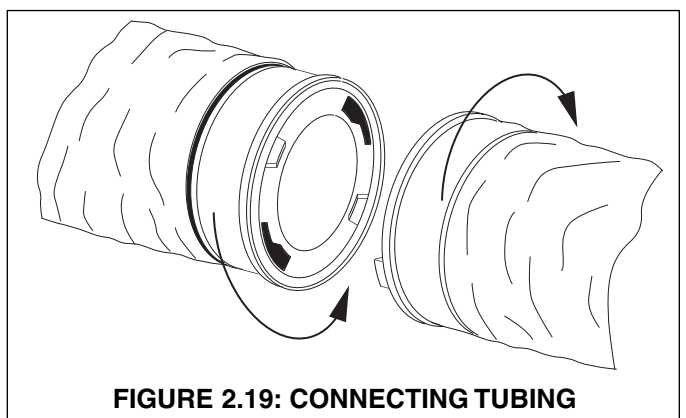
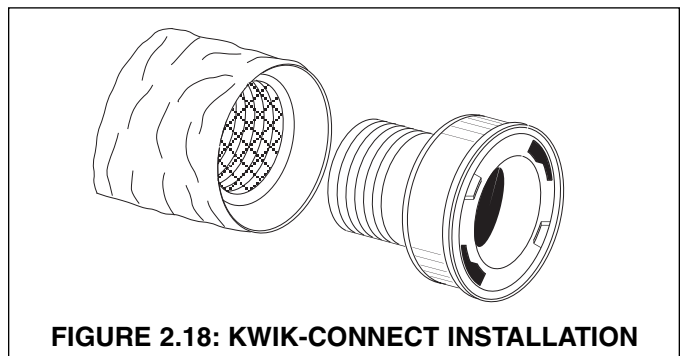
Supply tubing comes in 100-foot sections and may be cut to length with a knife or fine tooth hacksaw.

For each supply tubing run, estimate and cut the length of tubing that will be needed between the plenum and sound attenuating tubing. At the open end of the supply tubing which will attach to the sound attenuating tubing, install a kwik-connect (see Figure 2.18). First, push back the cover and the insulation exposing the inner core. Second, twist a kwik-connect into the inner core. Third, pull down the insulation and cover, and tuck it into the deep groove on the back of the kwik-connect. Fourth, wrap the connection securely with tape.

When finished, simply twist together (see Figure 2.19) the kwik-connect on the sound attenuating tubing, and wrap the connection securely with tape.

After attaching the supply tubing to the sound attenuating tubing, bring the open end of the tubing to the plenum.

At the plenum in the location selected for attaching the supply tubing, cut a 2" diameter hole in the plenum with the Space-Pak plenum hole cutter (see Figure 2.20).



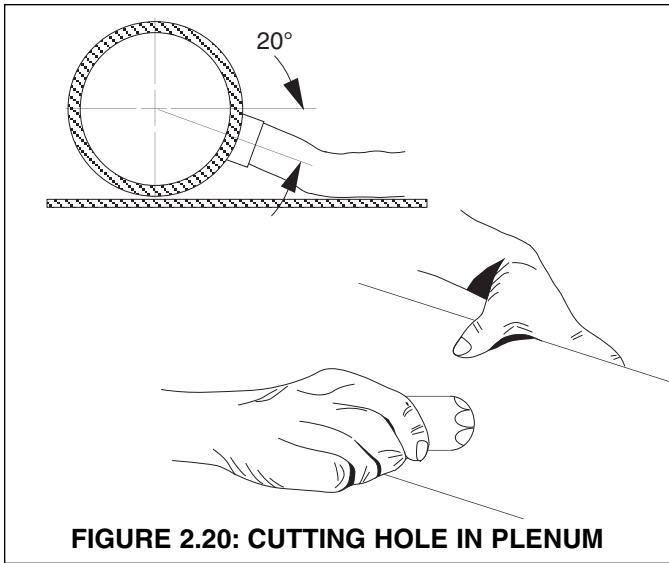


FIGURE 2.20: CUTTING HOLE IN PLENUM

This hole should be cut on the side approximately at a 20° downward angle to eliminate strain on the plenum take-off when tubing is attached. Rotate the cutter as pressure is applied to force the serrated edge through the aluminum foil and insulation. Remove the hole cut-out from the plenum. Make sure there is no “flap” left inside plenum that could block hole during operation.

Place the plenum take-off gasket on the back side of the plenum take-off and insert the assembly into the hole in the plenum (see Figure 2.21).

NOTE: Gasket must be installed to seal plenum take-off to prevent air leakage.

Orient the plenum take-off to match the curvature of the plenum duct. Note that the three ridges on the fitting will be perpendicular to the direction of the plenum run. Hand insert two of the plenum take off fasteners into the T slots of the take off. Press the take off firmly against the plenum and using the Space-Pak pliers snap the two clips in place so that they fully engage the duct material.

NOTE: All four fasteners must be installed to assure an air tight fitting between plenum take-off and plenum.

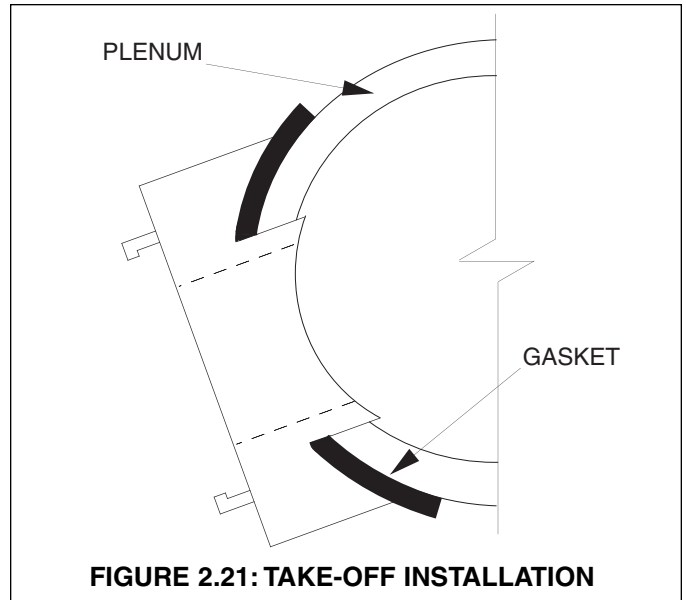


FIGURE 2.21: TAKE-OFF INSTALLATION

In accordance with your calculations as to requirements for balancing orifices, mount the orifice in the outlet of the plenum take-off (see Figure 2.23), prior to attaching the supply tubing.

Next, install a kwik-connect in the open end of the supply tubing, using the same procedures as before, and twist together kwik-connects on supply tubing and plenum take-off. Wrap connection securely with tape.

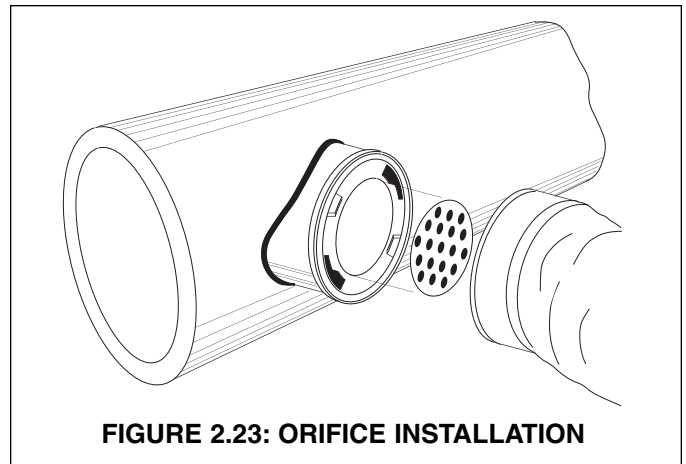


FIGURE 2.23: ORIFICE INSTALLATION

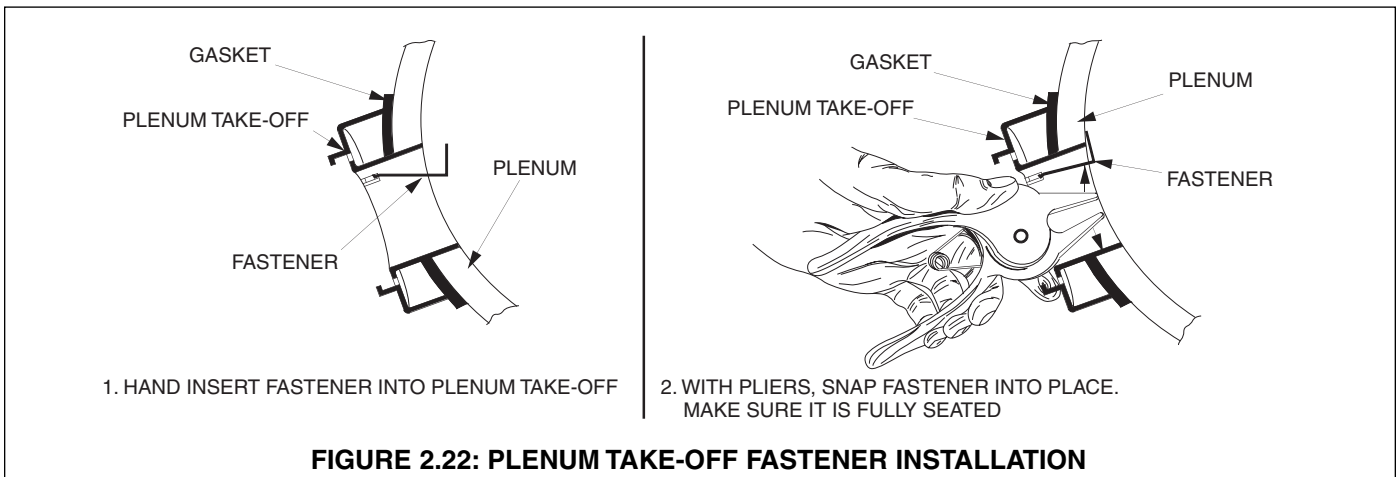


FIGURE 2.22: PLENUM TAKE-OFF FASTENER INSTALLATION

Return Air Box & Duct Installation

Remove the return air grill from the return air box and remove the air filter from the return air grill.

Insert the return box from below for ceiling installation (or from the front for wall installations) and fasten with four screws through holes provided on the long side of the box. (see Figure 2.24).

Remove the grill and the filter from the grill frame. Insert the frame into the box and mount in place with the screws provided through a hole at each corner of the frame. Finally, place the air filter into the frame and replace the grill. Turn the latches a quarter turn to lock the grille in place. Slide a clamp band (provided with return air box) over one end of the return air duct. Place that end over the elliptical flange on the fan coil unit (see Figure 2.25). Move the clamp over the flange and tighten so the clamp holds the return air duct securely to the flange.

Follow the same procedures to attach the return air duct to the return air box (see Figure 2.25).

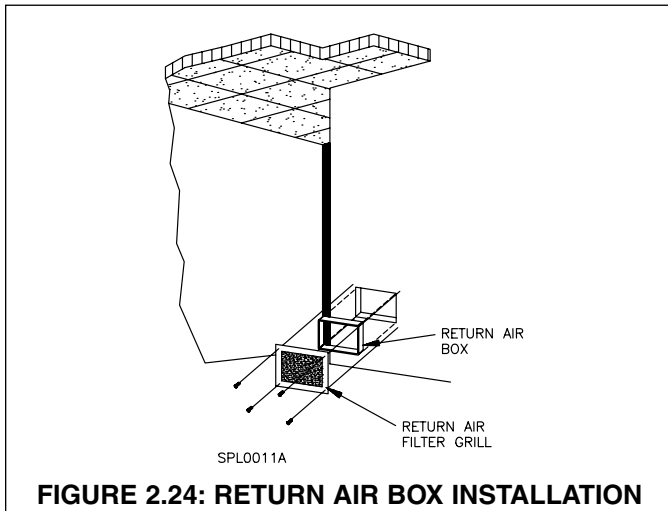


FIGURE 2.24: RETURN AIR BOX INSTALLATION

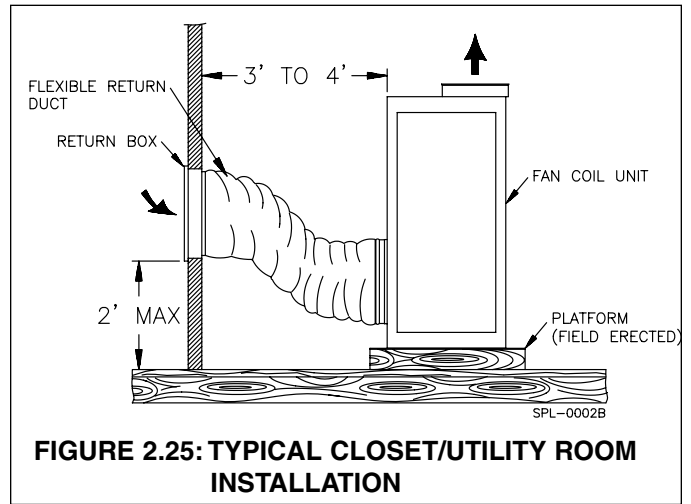


FIGURE 2.25: TYPICAL CLOSET/UTILITY ROOM INSTALLATION

Winter Supply Shut-Off Installation

Simply snap winter supply shut-offs into the room terminator openings (see Figure 2.26). Winter supply shut-offs prevent moisture from collecting in ductwork during winter months.

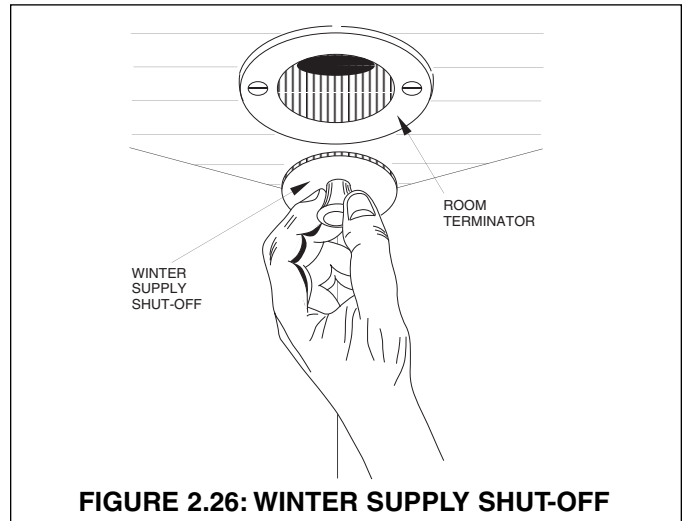


FIGURE 2.26: WINTER SUPPLY SHUT-OFF

SECTION 3: START-UP & OPERATION

SEQUENCE OF OPERATION

The fan coil unit is equipped with a protective device called an anti-frost control which will automatically stop the outdoor unit (while the indoor unit continues to run) if ice accumulates on the indoor unit evaporator coil causing abnormal operating conditions. When the accumulated ice has melted, the anti-frost control will restart the outdoor unit.

When power is turned on and thermostat fan switch is set to ON and the cooling/heating indicator is set to OFF, the indoor fan motor is energized through the normally open contact FR1 of the FR fan relay in about 30 seconds. The outdoor unit is off.

When power is turned on and thermostat fan switch is set to ON or AUTO and the cooling indicator to COOL the

indoor and outdoor units will start through the normally open contacts FR1 and FR2 of the FR fan relay.

When the power is turned on and the thermostat fan switch is set to ON or AUTO and the cooling/heating indicator to HEAT then the indoor and outdoor units will start through the normally open contacts FR1 and FR2 of the fan relay.

The reversing valve will be energized by the thermostat switch. The outdoor unit will defrost when necessary. When the outdoor unit enters the defrost mode, the reversing valve will be de-energized by the outdoor unit and the anti-frost bypass relay will be energized. This will prevent the condenser from cycling on the anti-frost switch during defrost mode.

AUTO position on the fan switch will stop and start the system when the temperature setting is satisfied. The ON position on the thermostat will stop the outdoor unit only when the temperature setting is satisfied and the indoor unit will continue to run, recirculating indoor air.

If fan coil unit is equipped with an optional float switch, the condensing unit will automatically shut down if the drain pan is full of water (condensate) and not draining. The fan coil unit will continue to operate. When the water level in the drain pan drops, the system will continue normal operation.

PRIOR TO START-UP

1. Check all electrical connections for tightness.
2. Check air filter has been installed in return air box or filter box.
3. Remove all winter supply shut-offs and store them in a safe place.

SYSTEM START-UP & ADJUSTMENTS

1. Place thermostat fan switch in ON position and cooling indicator in OFF position. In about 30 seconds, indoor unit blower will start.
2. Check blower operation for excess noise or vibration.
3. Check entire distribution system for leakage and apply additional tape where necessary.
4. Check that system static pressure is within acceptable limits (minimum 1.0" W.C. - maximum 1.5" W.C.). Static readings must be taken in the plenum a minimum of 18" (in both plenums for ESP-4860V/E) from the fan coil unit, plenum tees or elbows but before any supply run.
5. Check that blower motor amp draw compares with fan coil unit rating plate. Amp draw shown on plate is the FLA of motor (not the actual running amps) and will vary with the pressure and voltage.
6. Place the thermostat cooling indicator in COOL position, which will start the outdoor unit. Let the system run at least 30 minutes to stabilize operating conditions.
7. For outdoor unit start-up, follow manufacturer's instructions.
8. Check that temperature drop across evaporator coil in the indoor unit is between 20°F to 28°F.
9. At outdoor unit, verify system refrigerant charge is proper by checking superheat. Connect the gauge manifold to the outdoor unit ports and account for the pressure drops of the lines. Attach thermocouple leads, or surface temperature meter, to the suction line. Determine the superheat using the following example:

Suction Line Gauge Pressure 70 lb.
Corresponding Saturation Temperature 41°F
Actual Refrigerant Temperature 53°F
Superheat (Suct. Line °F minus Suct. Sat. °F) . . 12°F

Check that the superheat is between 10°F to 14°F for an outdoor temperature of 65°F to 85°F, or 8°F to 10°F for an outdoor temperature of 85°F to 105°F. If the superheat is high, check for low refrigerant charge. If the superheat is low, check for high refrigerant charge.

CHARGING THE SYSTEM

If the condensing unit includes directions for charging the system, follow them. If the condensing unit does not, then use the following instructions.

CHARGING COOLING ONLY SYSTEMS

After start-up, allow the system to operate for approximately 30 minutes in order to establish stable operating conditions. Check that the temperature drop across the evaporator coil is 20°F to 30°F. Do not attempt to adjust the charge at ambient temperatures below 65°F.

Check to see that superheat is between 10°F and 14°F for ambient temperatures between 65°F and 85°F, or 8°F to 10°F for ambient temperatures between 85°F and 105°F using the following procedure:

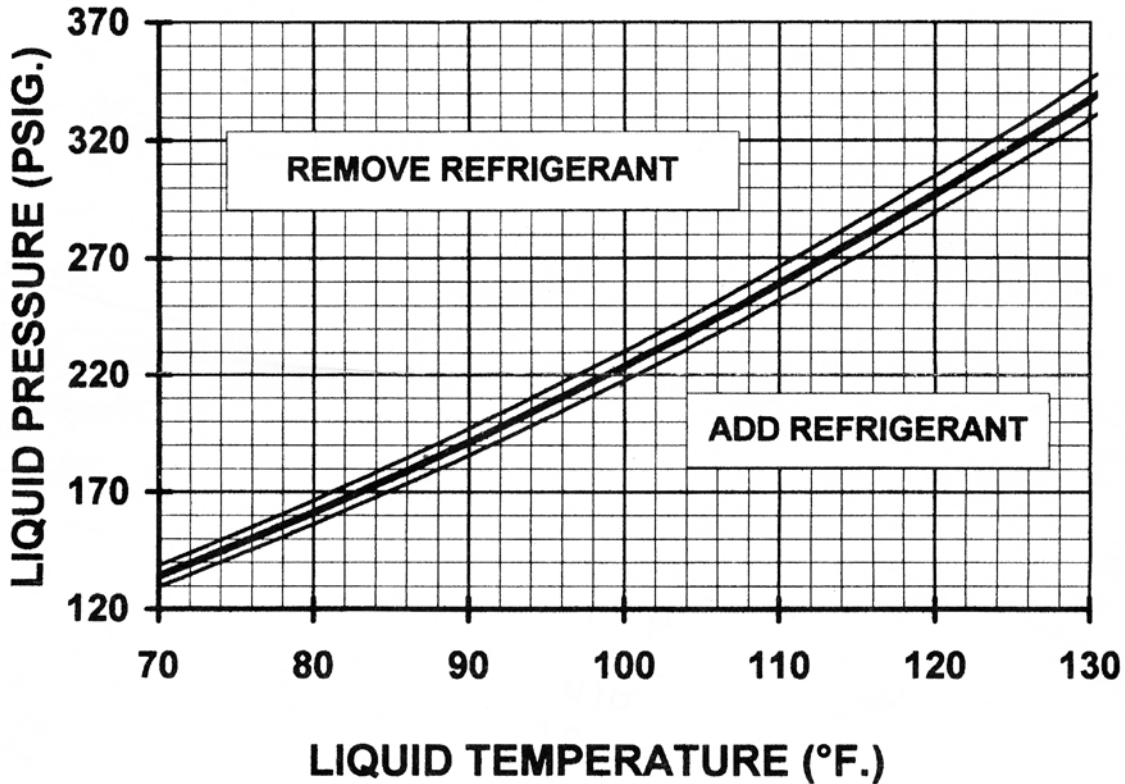
1. Use a refrigerant pressure gauge to measure liquid pressure at the service port on the liquid valve or fitting at the condensing unit.
 2. Measure the liquid line temperature at the condensing unit as close to the service valve or fitting as possible.
 3. Determine superheat from Figure 3.1.
 4. If the superheat is too high, add refrigerant gas to the suction line service port. Watch pressure gauge and thermometer for correct superheat.
- NOTE: Do not introduce refrigerant liquid to system through suction port. Liquid in the suction line may damage the compressor.**
5. If superheat is too low, slowly bleed refrigerant from suction line service port into an appropriate refrigerant recovery device. Watch pressure gauge and thermometer for correct superheat.

CAUTION: Releasing refrigerant gas into the atmosphere is a criminal offense.

It is important that the system be properly charged to avoid an overcharged system, but also to ensure that the system operates as efficiently as possible and delivers full capacity.

TXV R-22 CHARGING CURVE

For charging outdoor units at above 65 F outdoor temperature
in cooling mode and with indoor TXV .



1 Measure Liquid Line Temperature and Refrigerant Pressure at service valves.

2 Determine total refrigerant pipe length and height (lift) if indoor section is above the condenser. Plot the intersection of the two points on the Curve Selection Chart to determine which curve to use.

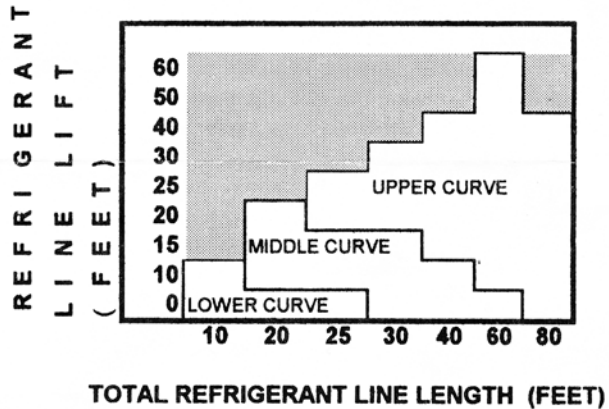
3 Plot the pressure and temperature on the TXV Charging Curve.

4 If the lines cross above the curve remove refrigerant, if below curve add refrigerant.

5 Whenever charge is removed or added, the system must be operated for a minimum 20 minutes to stabilize before additional measurements can be made.

6 When system is correctly charged refer to System Performance Curves to verify charge and performance.

CHARGING CURVE SELECTION CHART



L155Y00
DISTR T-1
A150999P01 REV.0

Measured Suction Pressure (PSIG)	Corresponding Saturation Temperature (F)	Superheat Values (F)							
		6	8	10	12	14	16	18	20
		Measured Suction Line Temperatures (F)							
60	34	40	42	44	46	48	50	52	54
62	35	41	43	45	47	49	51	53	55
64	37	43	45	47	49	51	53	55	57
66	38	44	46	48	50	52	54	56	58
68	40	46	48	50	52	54	56	58	60
70	41	47	49	51	53	55	57	59	61
72	42	48	50	52	54	56	58	60	62
74	44	50	52	54	56	58	60	62	64
76	45	51	53	55	57	59	61	63	65
78	46	52	54	56	58	60	62	64	66
80	48	54	56	58	60	62	64	66	68
85	51	57	59	61	63	65	67	69	71
90	54	60	62	64	66	68	70	72	74
95	56	62	64	66	68	70	72	74	76
100	59	65	67	69	71	73	75	77	79

FIGURE 3.1: R-22 SUPERHEAT TABLE

CHARGING HEAT PUMP SYSTEMS

Heat pumps have different ideal charges depending on whether they are operating in the heat pump or cooling mode. Some condensers contain a compensating device that maintains the correct charge by storing excess charge in the heat pump mode. Most condensers require that a balance be found between the two different ideal charges.

The heat pump can be charged during either the cooling or heating modes. In either case, the system should be checked during the opposite mode to ensure proper operation. Allow the system to operate for approximately 30 minutes to establish stable operating conditions.

When charging during the cooling cycle, charge as directed in the cooling only section. Then check the charge and unit during the heating season.

When charging during the heating season, charge according to the condensing section manufacturer's directions. Then check the charge and unit during the cooling season.

MILD WEATHER AND LOW AMBIENT KITS

Mild weather can cause a heat pump to cycle on the high pressure switch. This is corrected through the use of a mild weather kit. These are available from most condensing unit manufacturers. The kit cycles the outdoor fan to maintain a preset compressor discharge pressure. Cycling the fan prevents the system from cycling on the high pressure switch.

Low ambient conditions can cause a similar situation to occur during the cooling cycle. The anti-frost switch may cause the unit to cycle. This is easily rectified with a low ambient kit. These are also readily available from most condensing unit manufacturers. Typically, the kit cycles the outdoor fan to maintain a preset liquid line temperature. Cycling the outdoor fan prevents the system from cycling on the anti-frost switch.

SECTION 4: MAINTENANCE

The Space-Pak system has been designed to provide years of trouble-free performance in normal installations. Examination by the homeowner at the beginning of each cooling season, and in mid-season should assure continued, good performance. In addition, the system should be examined by a qualified service professional at least once every year.

BEFORE EACH COOLING OR HEATING SEASON

1. Check and clean air filter. The air filter is permanent type. Remove and clean thoroughly with soap solution and water.

2. Check fan coil unit. Turn off unit power disconnect switch and remove service access panels.

a. Inspect evaporator coil and blower wheel for build-up of dust and dirt. Clean with solvent and/ or water as necessary.

b. Replace service access panels and turn on unit power disconnect switch.

3. Check that unit condensate drain is clear and free running, and plug is in cleanout.

4. For outdoor condensing unit, follow manufacturer's maintenance instructions.

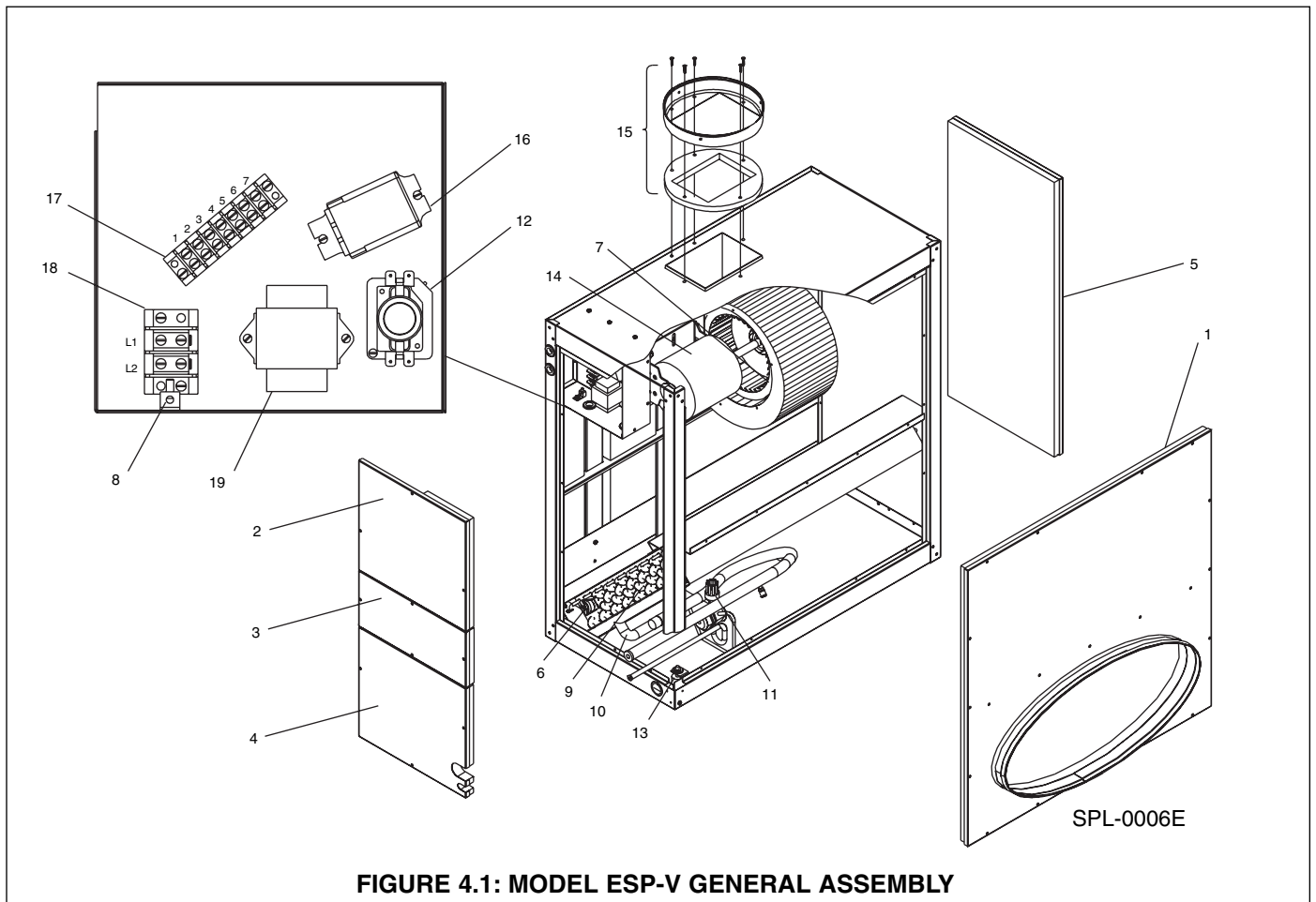
5. Follow "System Start-Up & Adjustments" procedures in Section 3 of this manual.

IF SYSTEM FAILS TO OPERATE

1. Check that thermostat switch is set for proper mode of operation and temperature selection is set appropriately.

2. Check that outdoor unit is operating.

3. Check for tripped circuit breaker or blown fuse at either the main fuse box or at unit disconnect box on or near the condensing unit. Replace blown fuse with same size and type.



REF. NO.	NAME OF PART	PART NO.	ESP-2430V	ESP-3642V	ESP-4860V
1	Front Panel	BM-2513	1		
	Front Panel	BM-2514		1	
	Front Panel	BM-2515			1
2	Access Panel	BM-2517	1	1	1
3	Access Panel	BM-2518	1	1	1
4	Access Panel	BM-2519	1	1	1
5	Access Panel	BM-2520	1	1	1
6	Anti-Frost Control	BM-7353	1	1	1
7	Blower Wheel (CW)	27-3382			1
	Blower Wheel (CCW)	27-8032	1	1	1
8	Cable Connector	27-3092	1	1	1
9	Coil Assembly	BM-2521	1		
	Coil Assembly	BM-2522		1	
	Coil Assembly	BM-2523			1
10	Drain Pan Assembly	BM-2524	1		
	Drain Pan Assembly	BM-2525		1	
	Drain Pan Assembly	BM-2526			1
11	Expansion Valve R-22	27-3415	1		
	Expansion Valve R-22	27-3410		1	
	Expansion Valve R-22	27-3411			1
	Expansion Valve 410A	BM-2538	1		
	Expansion Valve 410A	BM-2539		1	
	Expansion Valve 410A	BM-2540			1
12	Fan Relay	27-3367	1	1	1
13	Float Switch (Optional)	BM-6917	1	1	1
14	Blower Motor	27-3236	1		
	Blower Motor	27-3237		1	
	Blower Motor	27-3387			1
15	Plenum Ring Assembly	BM-2516	1	1	2
16	Relay	27-3374	1	1	1
17	Low Voltage	27-3051	1	1	1
	Terminal Block				
18	High Voltage	27-3056	1	1	1
	Terminal Block				
19	Transformer	27-3293	1	1	1

LIMITED WARRANTY

Central Air Conditioning Products

The "Manufacturer" warrants to the original owner at the original installation site that the Central Air Conditioning Products (the "Product") will be free from defects in material or workmanship for a period not to exceed one (1) year from the startup or eighteen (18) months from date of shipment from the factory, whichever occurs first. If upon examination by the Manufacturer the Product is shown to have a defect in material or workmanship during the warranty period, the Manufacturer will repair or replace, at its option, that part of the Product which is shown to be defective.

This limited warranty does not apply:

- a) if the Product has been subjected to misuse or neglect, has been accidentally or intentionally damaged, has not been installed, maintained or operated in accordance with the furnished written instructions, or has been altered or modified in any way.
- b) to any expenses, including labor or material, incurred during removal or reinstallation of the defective Product or parts thereof.
- c) to any workmanship of the installer of the Product.

This limited warranty is conditional upon:

- a) shipment, to the Manufacturer, of that part of the Product thought to be defective. Goods can only be returned with prior written approval from the Manufacturer. All returns must be freight prepaid.
- b) determination, in the reasonable opinion of the Manufacturer, that there exists a defect in material or workmanship.

Repair or replacement of any part under this Limited Warranty shall not extend the duration of the warranty with respect to such repaired or replaced part beyond the stated warranty period.

THIS LIMITED WARRANTY IS IN LIEU OF ALL OTHER WARRANTIES, EITHER EXPRESS OR IMPLIED, AND ALL SUCH OTHER WARRANTIES, INCLUDING WITHOUT LIMITATION IMPLIED WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE, ARE HEREBY DISCLAIMED AND EXCLUDED FROM THIS LIMITED WARRANTY. IN NO EVENT SHALL THE MANUFACTURER BE LIABLE IN ANY WAY FOR ANY CONSEQUENTIAL, SPECIAL, OR INCIDENTAL DAMAGES OF ANY NATURE WHATSOEVER, OR FOR ANY AMOUNTS IN EXCESS OF THE SELLING PRICE OF THE PRODUCT OR ANY PARTS THEREOF FOUND TO BE DEFECTIVE. THIS LIMITED WARRANTY GIVES THE ORIGINAL OWNER OF THE PRODUCT SPECIFIC LEGAL RIGHTS. YOU MAY ALSO HAVE OTHER RIGHTS WHICH MAY VARY BY EACH JURISDICTION.

