ESPK2-0625

W30-WG1708-01

SPACE PAK®

MODEL ESP-K & ESP-KV INSTALLATION, OPERATION & MAINTENANCE MANUAL

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

C ETL LISTED US
Intertek

AHRI CERTIFIED™ www.ahridirectory.org
Unitary Small AC
AHRI Standard 210/240
Certification applies only when the complete system is listed with AHRI.

IN UNITED STATES: 260 NORTH ELM ST. WESTFIELD, MA 01085 (413) 564-5530
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MADE IN THE USA

A MESTEK COMPANY

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 an imminently hazardous situation which, if not avoided, could result in death, serious injury or substantial property damage.

⚠ CAUTION Indicates an imminently 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.

SPACEPAK SYSTEM DESIGN

SpacePak is a hi-velocity central air conditioning system which utilizes a conventional outdoor condensing unit matched with the indoor Model ESP-K fan coil unit to provide conditioned air through the specially-designed, pre-fabricated, pre-insulated flexible duct system. The system and its basic components operate the same as in any conventional air-to-air cooling system.

The SpacePak 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 meets ETL listing requirements.

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.

NOTICE: It is a requirement of the International Mechanical Code (307.2.3) to install a secondary drain or an auxiliary drain pan where damage to any building components will occur as a result of over-flow from the equipment drain pan or stoppage in the condensate drain piping from a cooling or an evaporator coil. Follow local code requirements.

⚠WARNING The appliance is not to be used by persons (including children) with reduced physical, sensory or mental capabilities, or lack of experience and knowledge, unless they have been given supervision or instruction.

⚠WARNING Children being supervised are not to play with the appliance.

⚠WARNING The unit is not to be installed above 15,000 ft/ 4572 m.

⚠WARNING Risk of fire. Flammable refrigerant is used. System repairs are to be made only by properly trained service personnel. Do not puncture refrigerant tubing. Recover and dispose of waste refrigerant properly in accordance with federal or local regulations.

⚠WARNING Risk of fire. Auxiliary devices which may be an ignition source shall not be installed in the ductwork, other than auxiliary devices for use with the specific appliance.

⚠WARNING Do not use means to accelerate the defrosting process or to clean, other than those recommended by the manufacturer. The appliance shall be stored in a room without continuously operating ignition sources (for example: open flames, an operating gas appliance or an operating electric heater. Do not pierce or burn. Be aware that refrigerants may not contain an odour

Technical Service Guidelines

Prior to beginning work on systems containing FLAMMABLE REFRIGERANTS, safety checks are necessary to ensure that the risk of ignition is minimized.
Before conducting any repairs or maintenance activities, review the following pages and ensure that all instructions are followed, as well as communicated to all personnel who may enter the area.

Work Procedure
Work shall be undertaken under a controlled procedure so as to minimize the risk of a flammable gas or vapor being present while the work is being performed.

General Work Area
All maintenance staff and others working in the local area shall be instructed on the nature of work being carried out. Work in confined spaces shall be avoided.

Checking for the Presence of Refrigerant
The area shall be checked with an appropriate refrigerant detector prior to and during work, to ensure the technician is aware of potentially toxic or flammable atmospheres. Ensure that the leak detection equipment being used is suitable for use with all applicable refrigerants, i. e. non-sparking, adequately sealed or intrinsically safe.

Presence of Fire Extinguisher
If any hot work is to be conducted on the refrigerating equipment or any associated parts, appropriate fire extinguishing equipment shall be available to hand. Have a dry powder or CO2 fire extinguisher adjacent to the charging area.

No Ignition Sources
No person carrying out work in relation to a REFRIGERATING SYSTEM which involves exposing any pipe work shall use any sources of ignition in such a manner that it may lead to the risk of fire or explosion. All possible ignition sources, including cigarette smoking, should be kept sufficiently far away from the site of installation, repairing, removing and disposal, during which refrigerant can possibly be released to the surrounding space. Prior to work taking place, the area around the equipment is to be surveyed to make sure that there are no flammable hazards or ignition risks. “No Smoking” signs shall be displayed.

Ventilated Area
Ensure that the area is in the open or that it is adequately ventilated before breaking into the system or conducting any hot work. A degree of ventilation shall continue during the period that the work is carried out. The ventilation should safely disperse any released refrigerant and preferably expel it externally into the atmosphere.

Checks to the Refrigeration Equipment
Where electrical components are being changed, they shall be fit for the purpose and to the correct specification. At all times the manufacturer’s maintenance and service guidelines shall be followed. If in doubt, consult the manufacturer’s technical department for assistance.

The following checks shall be applied to installations using FLAMMABLE REFRIGERANTS:
- the actual REFRIGERANT CHARGE is in accordance with the room size within which the refrigerant containing parts are installed;
- The ventilation machinery and outlets are operating adequately and are not obstructed;
- If an indirect refrigerating circuit is being used, the secondary circuit shall be checked for the presence of refrigerant;
- marking to the equipment continues to be visible and legible. Markings and signs that are illegible shall be corrected;
- Refrigerating pipe or components are installed in a position where they are unlikely to be exposed to any substance which may corrode refrigerant containing components, unless the components are constructed of materials which are inherently resistant to being corroded or are suitably protected against being so corroded.

Checks to Electrical Devices
Repair and maintenance to electrical components shall include initial safety checks and component inspection procedures. If a fault exists that could compromise safety, then no electrical supply shall be connected to the circuit until it is satisfactorily dealt with. If the fault cannot be corrected immediately but it is necessary to continue operation, an adequate temporary solution shall be used. This shall be reported to the owner of the equipment so all parties are advised.
Sealed electrical components shall be replaced. (UL 60335 2 40)
Intrinsically safe components must be replaced. (UL 60335 2 40)

Initial safety checks shall include:
- That capacitors are discharged: this shall be done in a safe manner to avoid possibility of sparking;
- That no live electrical components and wiring are exposed while charging, recovering or purging the system;
- That there is continuity of earth bonding.

Cabling
Check that cabling will not be subject to wear, corrosion, excessive pressure, vibration, sharp edges or any other adverse environmental effects.
The check shall also take into account the effects of aging or continual vibration from sources such as compressors or fans.

Detection of Flammable Refrigerant
Under no circumstances shall potential sources of ignition be used in the searching for or detection of refrigerant leaks. A halide torch (or any other detector using a naked flame) shall not be used. The following leak detection methods are deemed acceptable for all refrigerant systems. Electronic leak detectors may be used to detect refrigerant leaks but, in the case of FLAMMABLE REFRIGERANTS, the sensitivity may not be adequate, or may need re-calibration. (Detection equipment shall be calibrated in a refrigerant-free area.)
Ensure that the detector is not a potential source of ignition and is suitable for the refrigerant used. Leak detection equipment shall be set at a percentage of the LFL of the refrigerant and shall be calibrated to the refrigerant employed, and the appropriate percentage of gas (25 % maximum) is confirmed. Leak detection fluids are also suitable for use with most refrigerants but the use of detergents containing chlorine shall be avoided as the chlorine may react with the refrigerant and corrode the copper pipe-work.

Removal and Evacuation
When breaking into the refrigerant circuit to make repairs – or for any other purpose – conventional procedures shall be used. However, for FLAMMABLE REFRIGERANTS it is important that best practice is followed since flammability is a consideration.

The following procedure shall be adhered to:
- Safely remove refrigerant following local and national regulations;
- Evacuate;
- Purge the circuit with inert gas (optional for A2L);
- Evacuate (optional for A2L);
- Continuously flush or purge with inert gas when using flame to open circuit; and
- Open the circuit.

The refrigerant charge shall be recovered into the correct recovery cylinders if venting is not allowed by local and national codes. For appliances containing flammable refrigerants, the system shall be purged with oxygen-free nitrogen to render the appliance safe for flammable refrigerants. This process might need to be repeated several times. Compressed air or oxygen shall not be used for purging refrigerant systems. For appliances containing flammable refrigerants, refrigerants purging shall be achieved by breaking the vacuum in the system with oxygen-free nitrogen and continuing to fill until the working pressure is achieved, then venting to atmosphere, and finally pulling down to a vacuum (optional for A2L). This process shall be repeated until no refrigerant is within the system (optional for A2L). When the final oxygen-free nitrogen charge is used, the system shall be vented down to atmospheric pressure to enable work to take place. The outlet for the vacuum pump shall not be close to any potential ignition sources, and ventilation shall be available.

Charging Procedures
In addition to conventional charging procedures, the following requirements shall be followed.

- Ensure that contamination of different refrigerants does not occur when using charging equipment.
- Hoses or lines shall be as short as possible to minimize the amount of refrigerant contained in them.
- Cylinders shall be kept in an appropriate position according to the instructions.
- Ensure that the REFRIGERATING SYSTEM is earthed prior to charging the system with refrigerant.
- Label the system when charging is complete (if not already).
- Extreme care shall be taken not to overfill the REFRIGERATING SYSTEM.

Prior to recharging the system, it shall be pressure-tested with the appropriate purging gas. The system shall be leak-tested on completion of charging but prior to commissioning. Follow up leak test shall be carried out prior to leaving the site.

Decommissioning
Before carrying out this procedure, it is essential that the technician is completely familiar with the equipment and all its detail. It is recommended good practice that all refrigerants are recovered safely. Prior to the task being carried out, an oil and refrigerant sample shall be taken in case analysis is required prior to re-use of recovered refrigerant. is essential that electrical power is available before the task is commenced.

A. Become familiar with the equipment and its operation.
B. Isolate system electrically.
C. Before attempting the procedure, ensure that:
   a. mechanical handling equipment is available, if required, for handling refrigerant cylinders;
   b. all personal protective equipment is available and being used correctly;
   c. the recovery process is supervised at all times by a competent person;
   d. recovery equipment and cylinders conform to the appropriate standards.
D. Become familiar with the equipment and its operation.
E. If a vacuum is not possible, make a manifold so that refrigerant can be removed from various parts of the system.
F. Make sure that cylinder is situated on the scales before recovery takes place.
G. Start the recovery machine and operate in accordance with instructions.
H. Do not overfill cylinders (no more than 80 % volume liquid charge).
I. Do not exceed the maximum working pressure of the cylinder, even temporarily.
J. When the cylinders have been filled correctly and the process completed, make sure that the cylinders and the equipment are removed from site promptly and all isolation valves on the equipment are closed off.
K. Recovered refrigerant shall not be charged into another REFRIGERATING SYSTEM unless it has been cleaned and checked.

Labeling
Equipment shall be labelled stating that it has been de-commissioned and emptied of refrigerant. The label shall be dated and signed. For appliances containing FLAMMABLE REFRIGERANTS, ensure that there are labels on the equipment stating the equipment contains FLAMMABLE REFRIGERANT.

Recovery
When removing refrigerant from a system, either for servicing or decommissioning, it is recommended good practice that all refrigerants are removed safely. When transferring refrigerant into cylinders, ensure that only appropriate refrigerant recovery cylinders are employed. Ensure that the correct number of cylinders for holding the total system charge is available. All cylinders to be used are designated for the recovered refrigerant and labelled for that refrigerant (i. e. special cylinders for the recovery of refrigerant). Cylinders shall be complete with pressure-relief valve and associated shut-off valves in good working order. Empty recovery cylinders are evacuated and, if possible, cooled before recovery occurs. The recovery equipment shall be in good working order with a set of instructions concerning the equipment that is at hand and shall be suitable for the recovery of the flammable refrigerant. If in doubt, the manufacturer should be consulted. In addition, a set of calibrated weighing scales shall be available and in good working order. Hoses shall be complete with leak-free disconnect couplings and in good condition. The recovered refrigerant shall be processed according to local legislation in the correct recovery cylinder, and the relevant waste transfer note arranged. Do not mix refrigerants in recovery units and especially not in cylinders. If compressors or compressor oils are to be removed, ensure that they have been evacuated to an acceptable level to make certain that flammable refrigerant does not remain within the lubricant. The compressor body shall not be heated by an open flame or other ignition sources to accelerate this process. When oil is drained from a system, it shall be carried out safely.

ESP-K - MODEL NUMBER DESCRIPTION

1,2,3, - Unit Type [UT]

ESP - Vapor Cycle Fan Coil Unit

4,5,6,7 - Capacity [CA]

2430 - 24,000 to 30,000 BTU/Hr. (2-2 1/2 tons)

[7.03 to 8.79 kW]

3642 - 36,000 to 42,000 BTU/Hr. (3-3 1/2 tons)

[10.55 to 12.31 kW]

4860 - 48,000 to 60,000 BTU/Hr. (4-5 tons)

[14.07 to 17.58 kW]

8 - Series [SE]

K - "K" series

9 - Cabinet Type [CT]

H - Horizontal

V - Vertical

10 - Refrigerant Type [RT]

Z - Other

11 - Cabinet Feature [CF]

M - Modified

12 - Revision [RV]

A -A2L protection (red board)

1	2	3	4	5	6	7	8	9	10	11	12
UT			**CA**				**SE**	**CT**	**RT**	**CF**	**RV**

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 Fire Protection Association 90A or 90B.

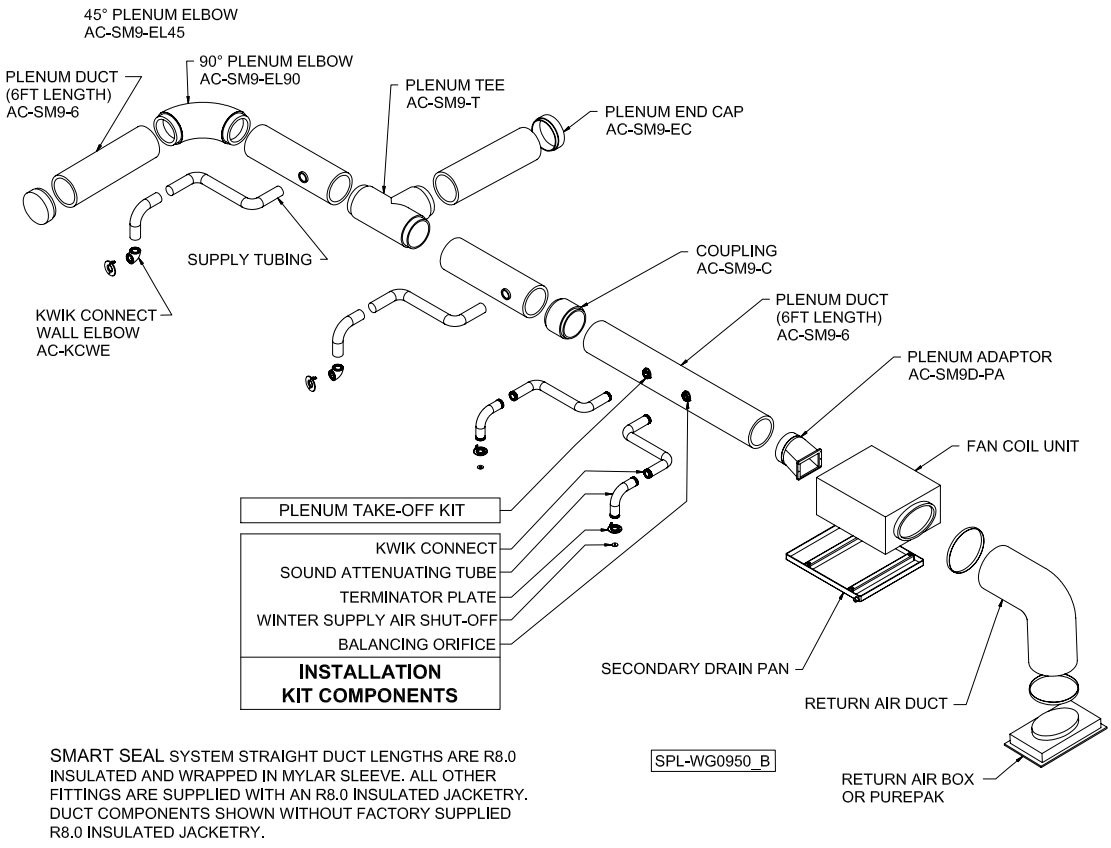
⚠WARNING This appliance uses A2L refrigerants and is connected via an air duct system to one or more rooms. Only auxiliary devices approved by the appliance manufacturer or declared suitable with the refrigerant shall be installed in the connecting ductwork. The following devices have been approved by the manufacturer:

Only products designed exclusively for use as HVAC dutwork may be used to transfer conditioned air, either supplied from or returned to the Air Handler. False ceilings, joist bays, crawl spaces etc. MAY NOT be used as air plenums.

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

Manufacturer	Description	Model Number
SpacePak	ZonePak Pro, 2-Zone, Fiberboard Duct	45AC-ZPFS-2PRO
SpacePak	ZonePak Pro, 3-Zone, Fiberboard Duct	45AC-ZPFS-3PRO
SpacePak	ZonePak Pro, 2-Zone, Metal Round Duct	45AC-ZMPR-2PRO
SpacePak	ZonePak Pro, 3-Zone, Metal Round Duct	45AC-ZMPR-3PRO
SpacePak	PurePak Air Cleaner, Size 2430	45AC-RBC-2
SpacePak	PurePak Air Cleaner, Size 3642	45AC-RBC-3
SpacePak	PurePak Air Cleaner, Size 4860	45AC-RBC-5
SpacePak	WaterPak Hydronic Heat, Size 2430	45AC-WPAK-60
SpacePak	WaterPak Hydronic Heat, Size 3642	45AC-WPAK-90
SpacePak	WaterPak Hydronic Heat, Size 4860	45AC-WPAK-120
SpacePak	Direct Mount Electric Heaters, 2 kW	45AC-EEH-020
SpacePak	Direct Mount Electric Heaters, 5 kW	45AC-EEH-050
SpacePak	Direct Mount Electric Heaters, 5 kW	45AC-EEH-075
SpacePak	Direct Mount Electric Heaters, 10 kW	45AC-EEH-100
SpacePak	Direct Mount Electric Heaters, 15 kW	45AC-EEH-150
SpacePak	Direct Mount Electric Heaters, 20 kW	45AC-EEH-200

FIGURE 1.1: AIR DISTRIBUTION SYSTEM COMPONENTS



SMART SEAL SYSTEM STRAIGHT DUCT LENGTHS ARE R8.0 INSULATED AND WRAPPED IN MYLAR SLEEVE. ALL OTHER FITTINGS ARE SUPPLIED WITH AN R8.0 INSULATED JACKETRY. DUCT COMPONENTS SHOWN WITHOUT FACTORY SUPPLIED R8.0 INSULATED JACKETRY.

RETURN AIR BOX (BM-9149, AC-RBF-3, BM-9169): Each includes filter grill with metal frame, permanent filter, and 2 clamp bands. BM-9149 is for ESP-2430K. AC-RBF-3 is for ESP-3642K and BM-9169 is for ESP-4860K.

RETURN AIR DUCT (BM-6808-10, BM-6809-10, BM-6839-10): Flexible, 10 ft / 3.05 m long with round shape. BM-6808-10 (15 in/ 381 mm diameter) for ESP-2430K. BM-6809-10 (19 in/ 483 mm diameter) for ESP-3642K and BM-6839-10 (24 in/ 610 mm diameter) is for ESP-4860K.

PLENUM ADAPTER: 9 in/ 229 mm round or 10 x 10 in/ 254 x 254 mm square metal component to attach plenum duct to fan coil unit.

PLENUM DUCT & COMPONENTS: May be 9 in/ 229 mm round sheet metal or 10 x 10 in/ 254 x 254 mm (O.D.) square, fiberboard duct types as specified by the installing contractor. Above layout is shown as an illustrative Smart Seal assembly reference only.

R6 SUPPLY TUBING (AC-ST6-100): Flexible, R6 insulated, 2 in/ 51 mm I.D. and 3.25 in/ 83 mm O.D. Each section is 100 ft/ 30.48 m feet long.

R8 SUPPLY TUBING (AC-ST8-75): Flexible, R8 insulated, 2 in/ 51 mm I.D. and 5.38 in/ 137 mm O.D. Each section is 75 ft/ 22.86 m long.

INSTALLATION KITS: Contains a specified amount of sound attenuating tubes, kwik-connects, terminator plates (incl. spring clips & screws), winter supply air shut-offs and a balancing orifice set to complete installation of room outlets. Supplied in (2) [AC-IKLT-2] and (5) [AC-IKLT-5] outlet boxed quantities.

PLENUM TAKE-OFF KIT: Contains a specific amount of plenum take-offs, gaskets and fasteners to complete installation of room outlets. Take-offs available for round sheet metal or square fiberboard duct as specified by installing contractor. Supplied in (2) [AC-TKMR-2] and (5) [AC-TKMR-5] outlet boxed quantities for round sheet metal and (2) [AC-TKFS-2] and (5) [AC-TKFS-5] outlet boxed quantities for square fiberboard.

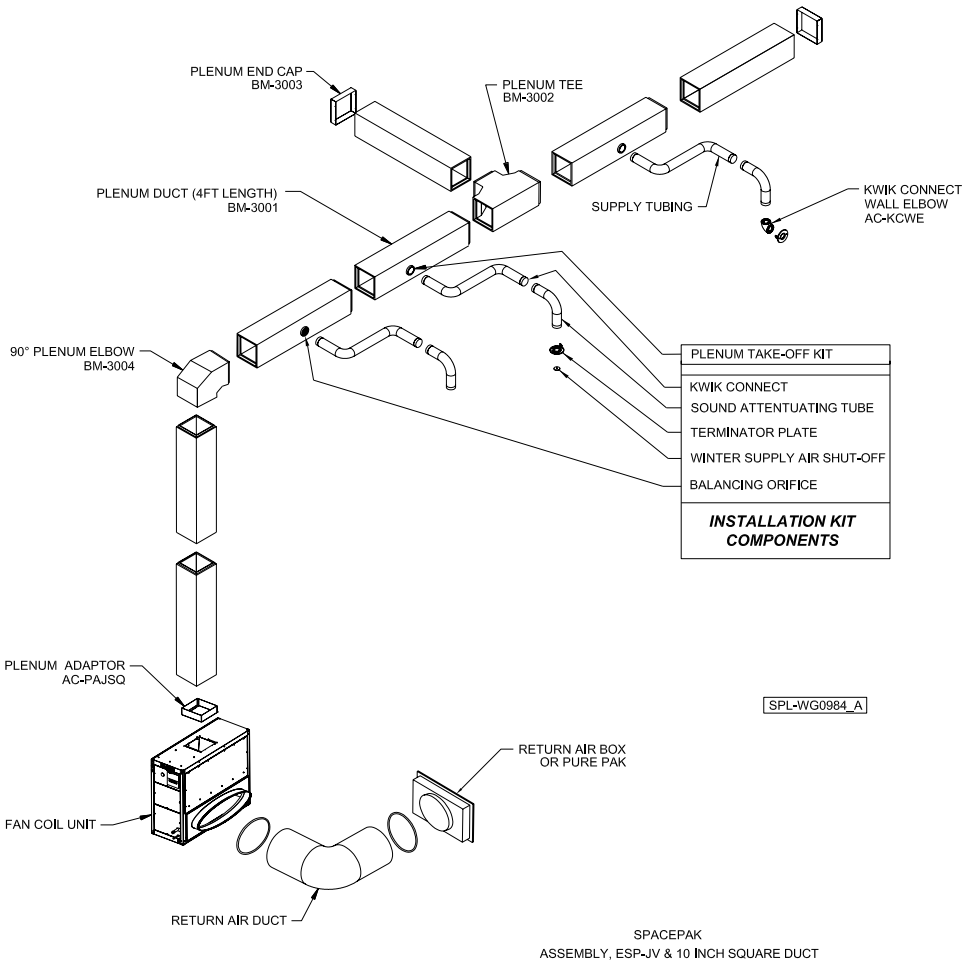
KWIK CONNECT 90º WALL ELBOW (AC-KCWE): To allow for wall terminations in 2 x 4 in/ 51 x 102 mm stud spaces.

SECONDARY DRAIN PAN: Specifically sized for SpacePak horizontal fan coil units. Constructed of durable polyethylene. Fan coil unit sets directly on top and can be installed with threaded rod.

PLIERS (SPC-72): To assure full setting of all clips (fasteners) in plenum take-off (not shown).

PLENUM HOLE CUTTER (SPC-71-10): To cut 2 in/ 51 mm hole in fiber board for plenum take-off installation (not shown).

FIGURE 1.2: AIR DISTRIBUTION SYSTEM COMPONENTS



RETURN AIR BOX (SPC-1D, AC-RBF-3, SPC-3D): Each includes filter grill with metal frame, permanent filter, and 2 clamp bands. SPC-1D is for ESP-2430KV. AC-RBF-3 is for ESP-3642KV and SPC-3D is for ESP-4860KV.

RETURN AIR DUCT (SPC-4,5, & 6): Flexible, 10 ft/ 3.05 m long with round shape. SPC-4 (15 in/ 381 mm diameter) for ESP-2430KV. SPC-5 (19 in/ 483 mm diameter) for ESP-3642KV and SPC-6 (24 in/ 610 mm diameter) is for ESP-4860KV.

PLENUM ADAPTER:9 in/ 229 mm round or 10 x 10 in/ 254 x 254 mm square metal component to attach plenum duct to fan coil unit.
Plenum Adapter - 9 in/ 229 mm Round - AC-PAJ
Plenum Adapter - 10 x 10 in/ 254 x 254 mm Square - AC-PAJSQ

PLENUM DUCT & COMPONENTS: May be 9 in/ 229 mm round sheet metal or 10 x 10 in/ 254 x 254 mm (O.D.) square, fiberboard duct types as specified by the installing contractor. Above layout is shown as an illustrative assembly reference only.

SUPPLY TUBING (SPC-25-100): Flexible, insulated, 2 in/ 51 mm I.D. and 3.25 in/ 83 mm O.D. Each section is 100 ft/ 30.48 m long.

R6 SUPPLY TUBING (AC-ST6-75): Flexible, R6 insulated, 2 in/ 51 mm I.D. and 5.38 in/ 137 mm O.D. Each section is 75 ft/ 22.86 m long.

INSTALLATION KITS: Contains a specified amount of sound attenuating tubes, kwik-connects, terminator plates (incl. spring clips & screws), winter supply air shut-offs and a balancing orifice set to complete installation of room outlets. Supplied in (2) [AC-IKLT-2] and (5) [AC-IKLT-5] outlet boxed quantities.

PLENUM TAKE-OFF KIT: Contains a specific amount of plenum take-offs, gaskets and fasteners to complete installation of room outlets. Take-offs available for round sheet metal or square fiberboard duct as specified by installing contractor. Supplied in (2) [AC-TKMR-2] and (5) [AC-TKMR-5] outlet boxed quantities for round sheet metal and (2) [AC-TKFS-2] and (5) [AC-TKFS-5] outlet boxed quantities for square fiberboard.

KWIK CONNECT WALL ELBOW (AC-KCWE): To allow for wall terminations in 2 x 4 in/ 51 x 102 mm stud spaces.

PLIERS (SPC-72): To assure full setting of all clips (fasteners) in plenum take-off (not shown).

PLENUM HOLE CUTTER (SPC-71-10): To cut 2 in/ 51 mm hole in fiber board for plenum take-off installation (not shown).

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 1.3). 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 advanta-geous 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 fan coil unit is designed to operate with a total external static pressure of 1.3 in./ 323Pa of water column. Excessive static pressure increases the air flow in individual runs and may cause some or all terminators to be noisy.

For systems designed with a bullhead tee installed as on Unit No. 1 (Figure 1.4), 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 branch tee installed as on Unit No. 2 (Figure 1.4), not more than 30% of the total number of system outlets should be attached to the perpendicular branch of the tee.

NOTE: For installations replacing B or C series units refer to retrofit instructions in Section 2, Step 8.

FIGURE 1.3: COMMON DUCTING LAYOUT. FOR REFERENCE ONLY. ALL SPACEPAK DUCTING RULES FOR SIDE BRANCHES, BULL HEAD TEES ETC., SHOULD BE FOLLOWED

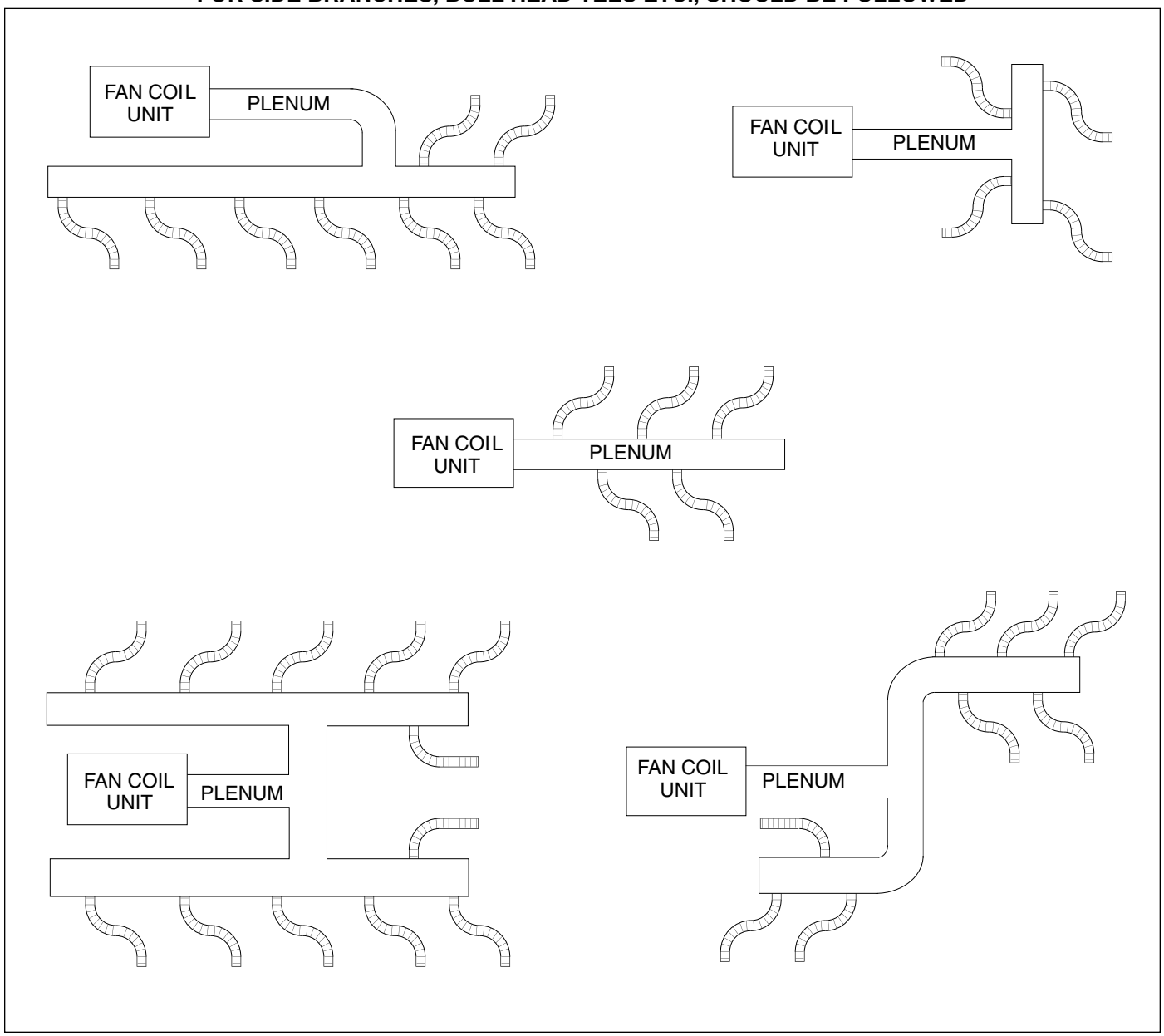
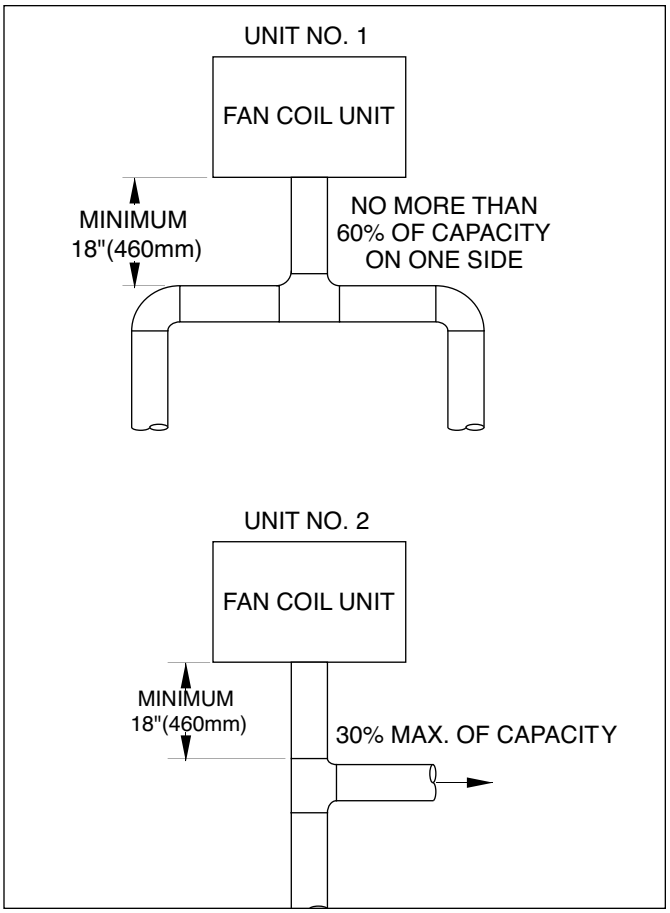


FIGURE 1.4: ESP-3642/4860 INSTALLATIONS



The larger system capacities (ESP-3642/4860) are affected more by higher system static pressure than the smaller systems. Installation of the plenum tee closer than the minimum indicated in Figure 1.4 will reduce performance of the system. No supply runs should be installed between unit outlet and this tee. Static readings on system should be taken before tee.

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 3.25 in/ 83 mm.

Room Terminators

Terminators should be located primarily in the ceiling or floor for vertical discharge or high on a wall for horizontal discharge. Installation of horizontally discharged terminators is assisted with the SpacePak 90˚ wall elbow. Two excellent spots for horizontal discharge are in the soffit area above kitchen cabinets (see Figure 1.5) and in the top portion of closets (see Figure 1.6).

FIGURE 1.5: TERMINATOR IN SOFFIT AREA

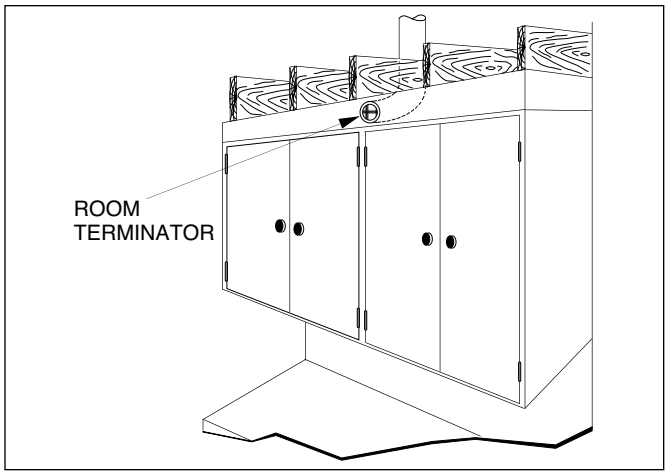
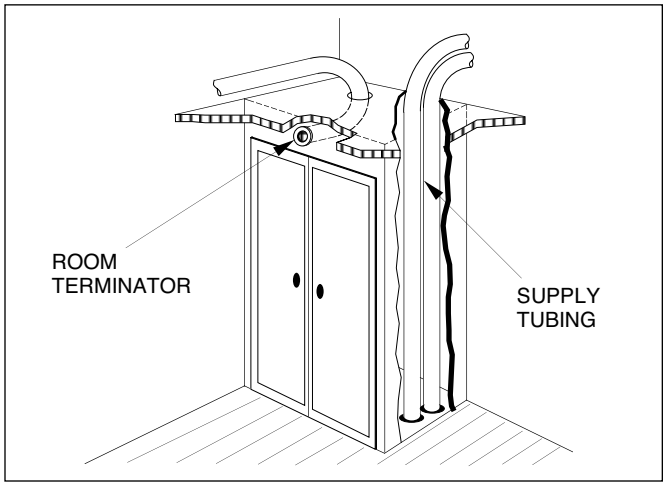


FIGURE 1.6: TERMINATOR IN CLOSET TOP AREA



Terminators should always be out of normal traffic patterns to prevent discharge air from blowing directly on occupants. They also 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.

SHIPMENT OF UNIT

Each fan coil unit is shipped in a single carton. Packed with the unit, there are vibration isolation pads, a condensate trap assembly and a factory installed primary float switch.

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.

NOTICE: For high altitude systems use the following chart as a guideline for number of outlets.

ALTITUDE	MINIMUM NO. OF OUTLETS PER TON
5000 - 6500 ft/ 1525m - 1980m	8
6500 ft/ 1980m and above	9

SECTION 2: SYSTEM INSTALLATION

NOTICE: 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.

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) such as an attic, garage or crawlspace, or a conditioned space such as a basement, closet or utility room (see dimensions in Figures 2.3, and 2.4).

NOTICE: Air handlers must be installed in open space with area no less area than the TA value shown in Figure 2.2 below. Ductwork must be designed for airflow no less than the Qmin Value shown in figure 2.2 below under design conditions.

When selecting a location, consider the location of the unit in relation to the return air box or filter box as shown in Figure 2.5. 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.

When selecting a location, 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. Always follow local code requirements.

A flame-producing device may be installed in the same space as the SpacePak Air Handler if the device is provided with an effective flame arrest.

FIGURE 2.1: MODEL ESP-K SPECIFICATIONS

							Connections				Recommended Condensing Unit				
Model	System Capacity (Nom. Tons)	Electrical Characteristics*	Maximum Current Ampacity (230V)	Maximum Current Ampacity (115V)	Rating of Over Current Protective Device (230V)	Rating of Over Current Protective Device (115V)	Suction Line (.O.D.)	Liquid Line (.O.D.)	Cond. Drain (FPT)	Return Inlet (in/ mm)	Nominal Capacity (MBH)	Nominal Capacity (kW)	Min SEER	Short Circuit Current Rating	Maximum Allowable Pressure for Refrigerent Circuit
ESP-2430 (K,V)	2 - 2 1/2	230/60/1	9.5 A	13.25 A	15 A	20 A	7/8"	3/8"	3/4"	15/381	24 - 30	7.03 - 8.79	13+	5 kA	700 PSI
ESP-3642 (K,V)	3 - 3 1/2	230/60/1								19/483	36 - 42	10.55 - 12.31			
ESP-4860 (K,V)	4 - 5	230/60/1								24/610	48 - 60	14.07 - 17.58			

*Unit Includes Optional Conversion Kit to 115V

Model	System Capacity (Nom. Tons)	Blower				Coil		Ship. Wt. (lbs/kg)	
		Std. CFM @ 1.2" W.C.	Wheel Dia. and Width	Motor HP	115V/230V F.L. Amps*	No. of Rows Deep	Flow Control Device	K	KV
ESP-2430(K,V)	2 - 2 1/2	440, 550	10" x 6"	3/4	5.6/2.8	6	TXV	105 / 47.63	135 / 61.24
ESP-3642(K,V)	3 - 3 1/2	660, 850	10” x 6”	3/4	7.6/4	6	TXV	123 / 55.79	170 / 77.11
ESP-4860(K,V)	4 - 5	880, 1150	10” x 6”	3/4	10.6/5.4	6	TXV	144 / 65.32	210 / 95.25

*Unit Includes Optional Conversion Kit to 115V

FIGURE 2.2: MINIMUM AREA AND AIRFLOW

Model (H or V)	Refrigerant	TA m²	TA ft²	Qmin m³/hr	Qmin CFM	m_{max} kg	m_{max} lbs.
ESP-2430K	R32	9.5	102	312	529	3.2	7.0
ESP-3642K		12.8	138	423	718	4.3	9.5
ESP-4860K		18.2	196	607	1021	6.1	13.5
ESP-2430K	R454B	9.8	105	322	547	3.2	7.0
ESP-3642K		13.3	143	437	743	4.3	9.5
ESP-4860K		18.9	203	621	1055	6.1	13.5

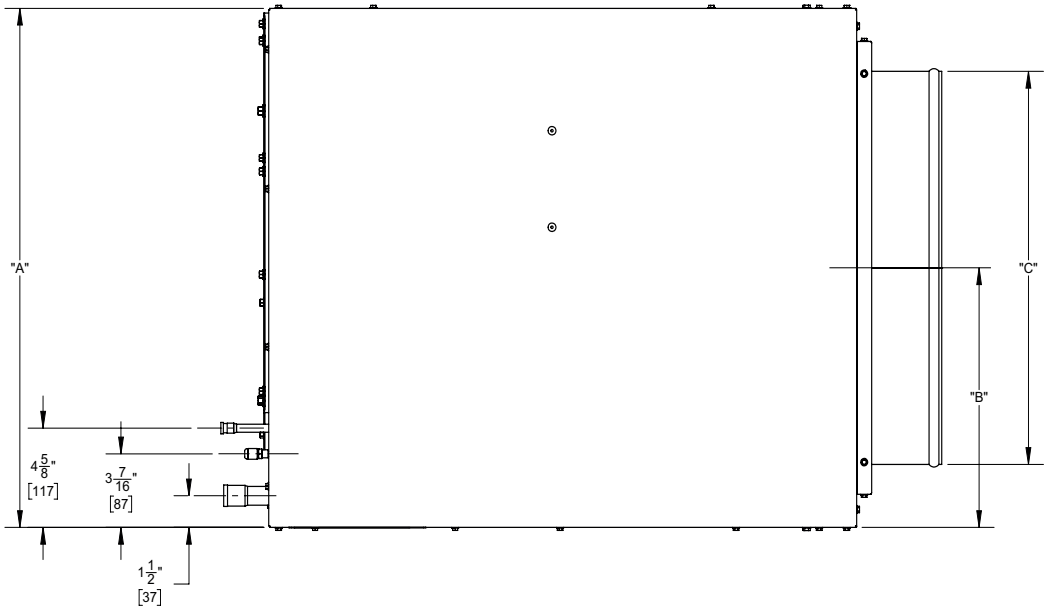
m_{max} is the maximum mass of refrigerant allowed in the system

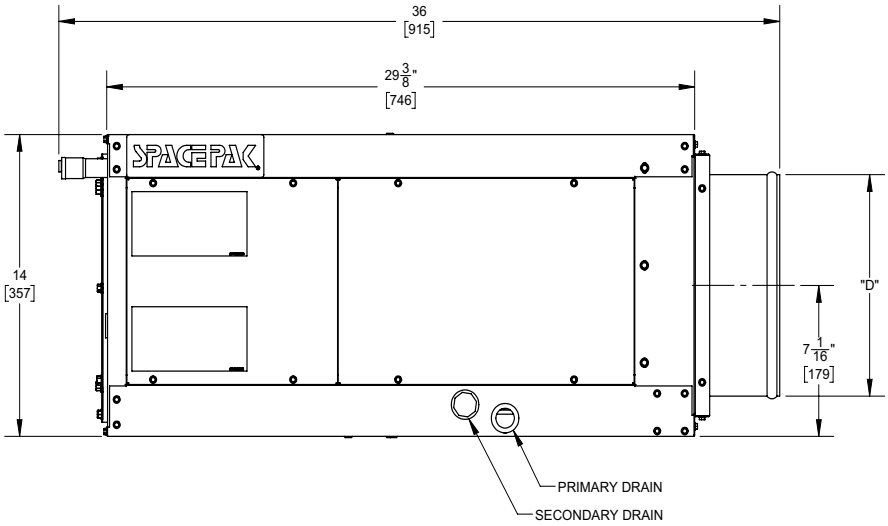
When installing at elevations over 2,000 feet, 609 meters, multiply the TA_{min} value by the TA_{min} Factor shown below

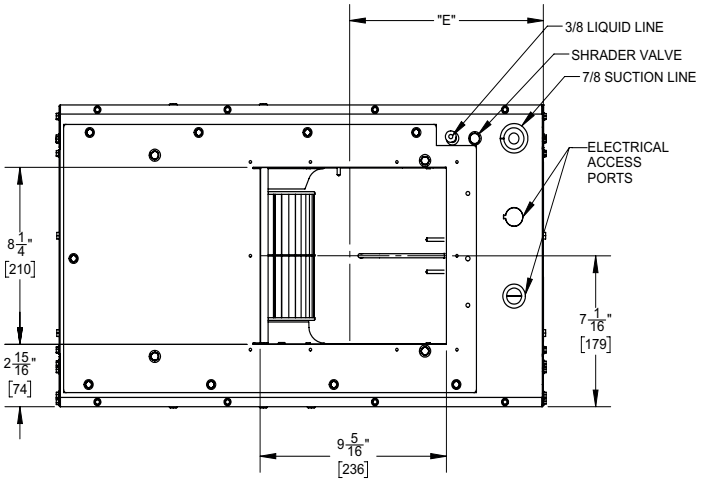
Altitude	Ft.	0-2,000	2,001-4,000	4,001-6,000	6,001-8,000	8,001-10,001	10,001-12,000
	meter	0-609	610-1219	1220-1829	1830-2439	2440-3049	3050-3660
TA_{min} Factor		1.00	1.05	1.11	1.17	1.24	1.32

Auxiliary devices which may be a POTENTIAL IGNITION SOURCE shall not be installed in the duct work. Examples of such POTENTIAL IGNITION SOURCES are hot surfaces with a temperature exceeding 1360°F, 740°C and electric switching devices.

FIGURE 2.3: UNIT DIMENSIONS AND CLEARANCES - Inches [mm]

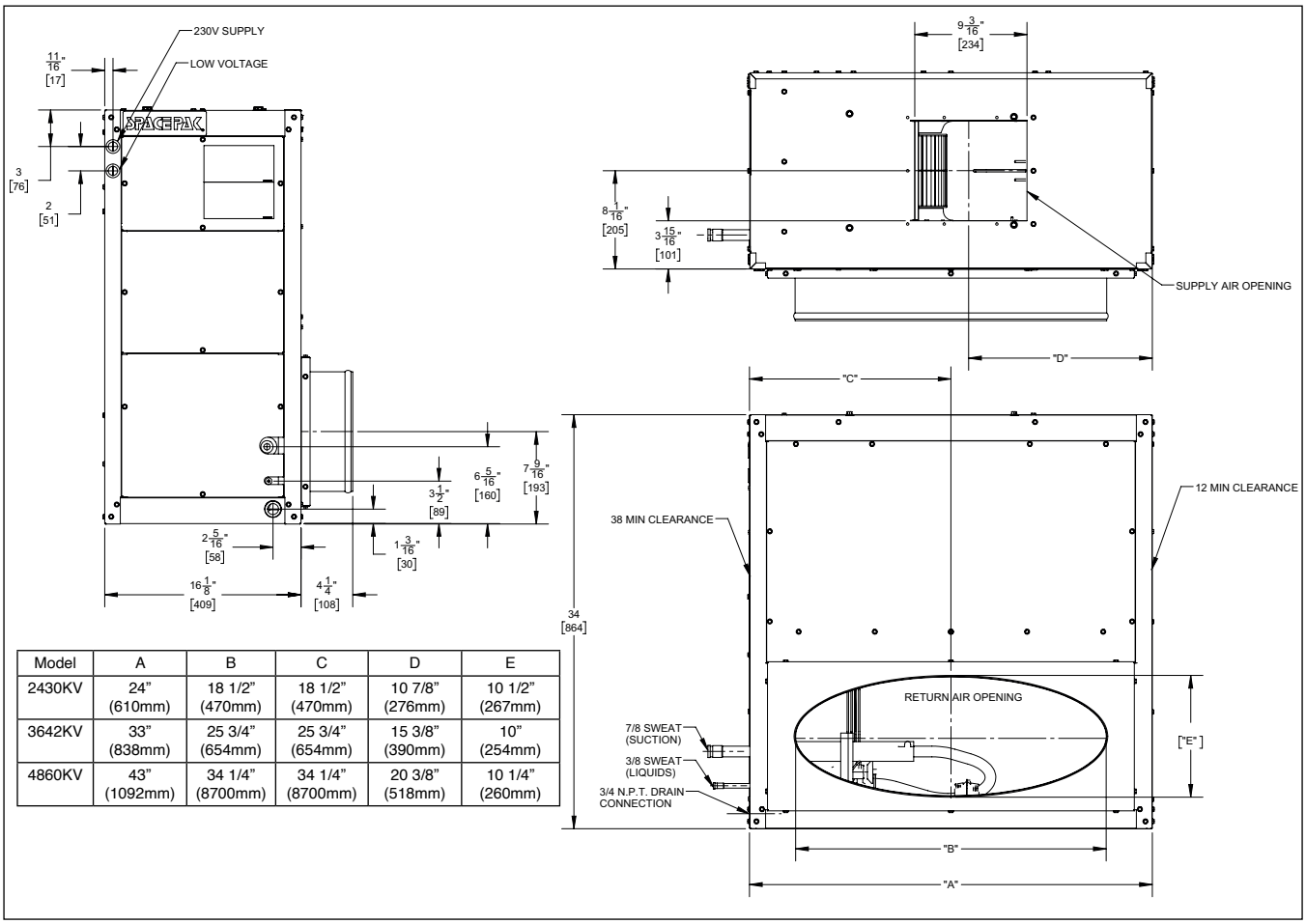






Model	A	B	C	D	E
2430K	24 1/4" (616mm)	12 1/8" (308mm)	18 1/2" (470mm)	10 1/2" (267mm)	9 1/2" (240mm)
3642K	33 1/4" (845mm)	16 5/8" (423mm)	25 3/4" (654mm)	10" (254mm)	14" (356mm)
4860K	43 1/4" (1100mm)	21 5/8" (550mm)	34 1/4" (8700mm)	10 1/4" (260mm)	19" (483mm)

FIGURE 2.4: VERTICAL UNIT DIMENSIONS AND CLEARANCES - Inches [mm]



Model	A	B	C	D	E
2430KV	24" (610mm)	18 1/2" (470mm)	18 1/2" (470mm)	10 7/8" (276mm)	10 1/2" (267mm)
3642KV	33" (838mm)	25 3/4" (654mm)	25 3/4" (654mm)	15 3/8" (390mm)	10" (254mm)
4860KV	43" (1092mm)	34 1/4" (8700mm)	34 1/4" (8700mm)	20 3/8" (518mm)	10 1/4" (260mm)

FIGURE 2.5: TYPICAL UNIT INSTALLATION

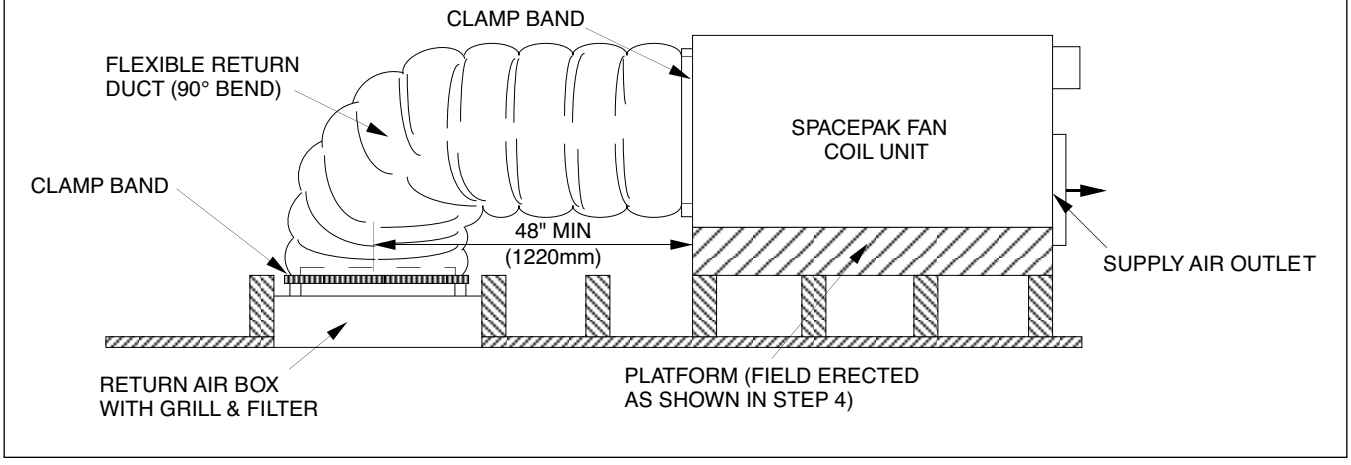


FIGURE 2.6: HORIZONTAL AIR FLOW UNIT INSTALLATION

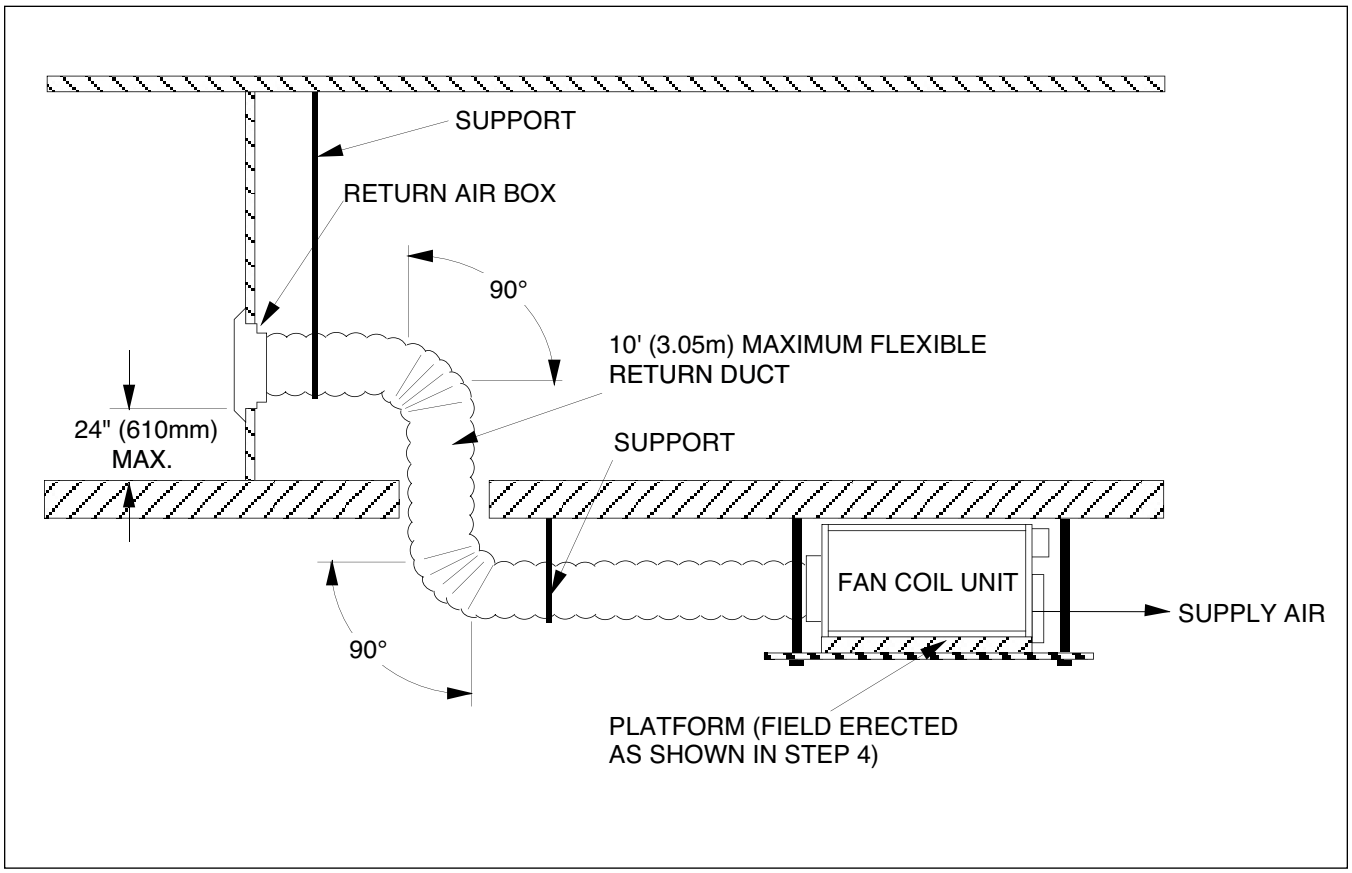
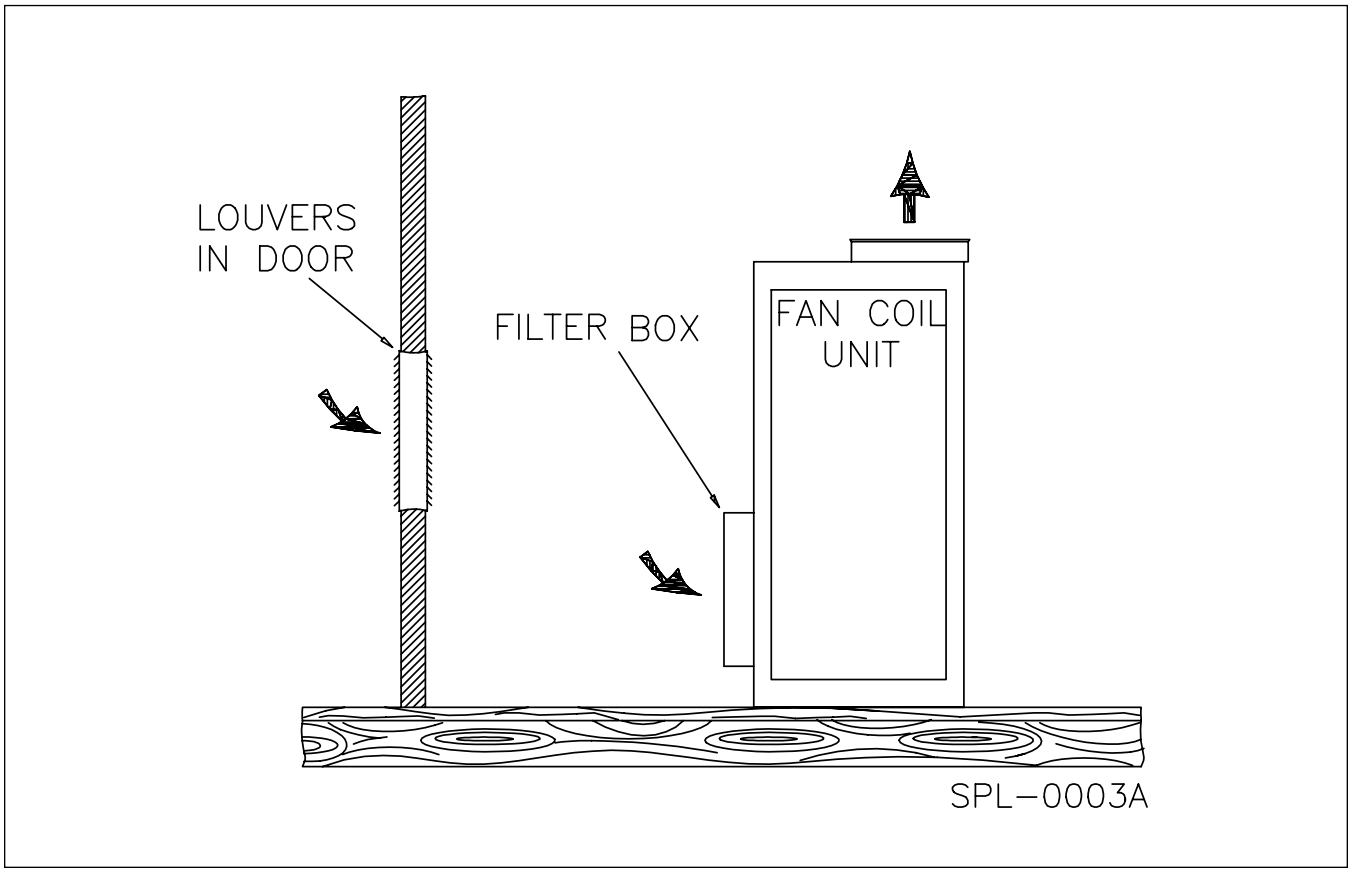


FIGURE 2.7: TYPICAL INSTALLATION WITHOUT DUCTED RETURN



Step 2: Cutting Return Air Opening

Select exact location for return air box. Avoid installing box in dining room, living room, kitchen, etc., unless return air duct can be installed with at least two 90° bends (accomplished by splicing two return air ducts together.)

For attic installations to raise fan coil unit up through opening, cut return air opening 14.5 in/ 369 mm wide by the "A" dimension (Figure 2.8) of appropriate unit size. These openings will accomodate the return air box with sufficient frame lip to cover the opening (see Figure 2.8).

NOTICE: The return air adapter may need to be removed from the unit to fit through the opening cut-out.

If joists are on 16 in/ 407 mm centers, the 14.5 in/ 369 mm width of 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 all wall return applications, cut the return air opening to accomodate the return air box according to the same dimensions. Remember, location of opening must allow for a 90° bend in the return air duct.

Check the opening for proper fit of the return air box. Do not install the return air box until the installation of the entire SpacePak system is completed, if you want to fit materials up through this hole.

FIGURE 2.8: RETURN AIR BOX FRAME DIMENSIONS

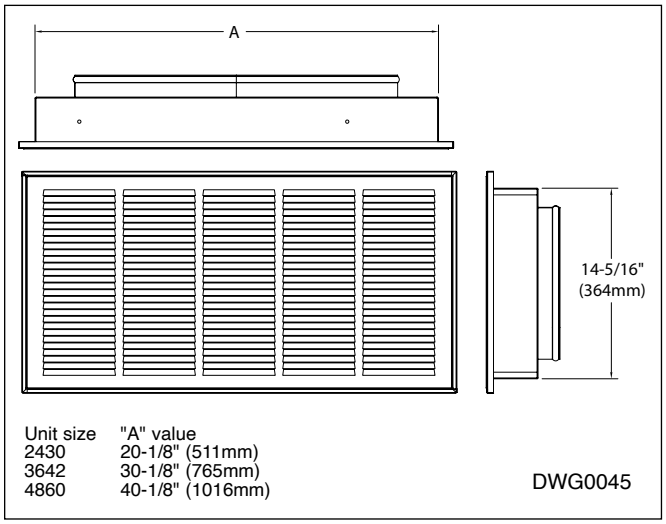


FIGURE 2.9

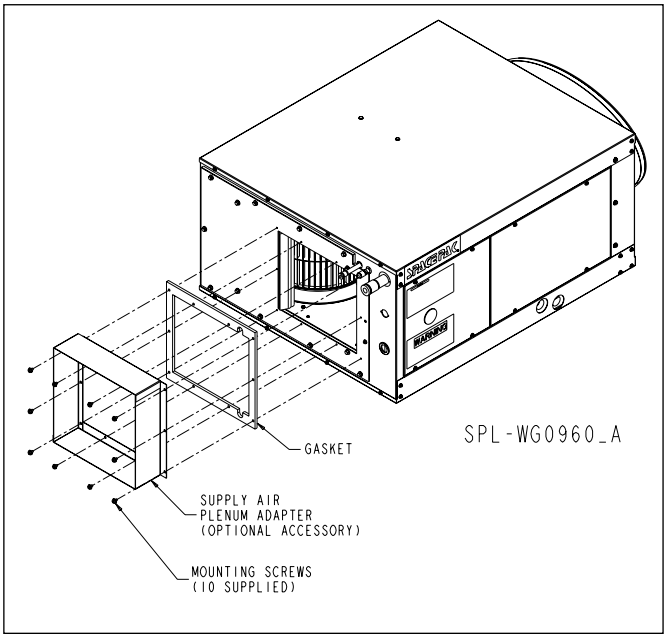
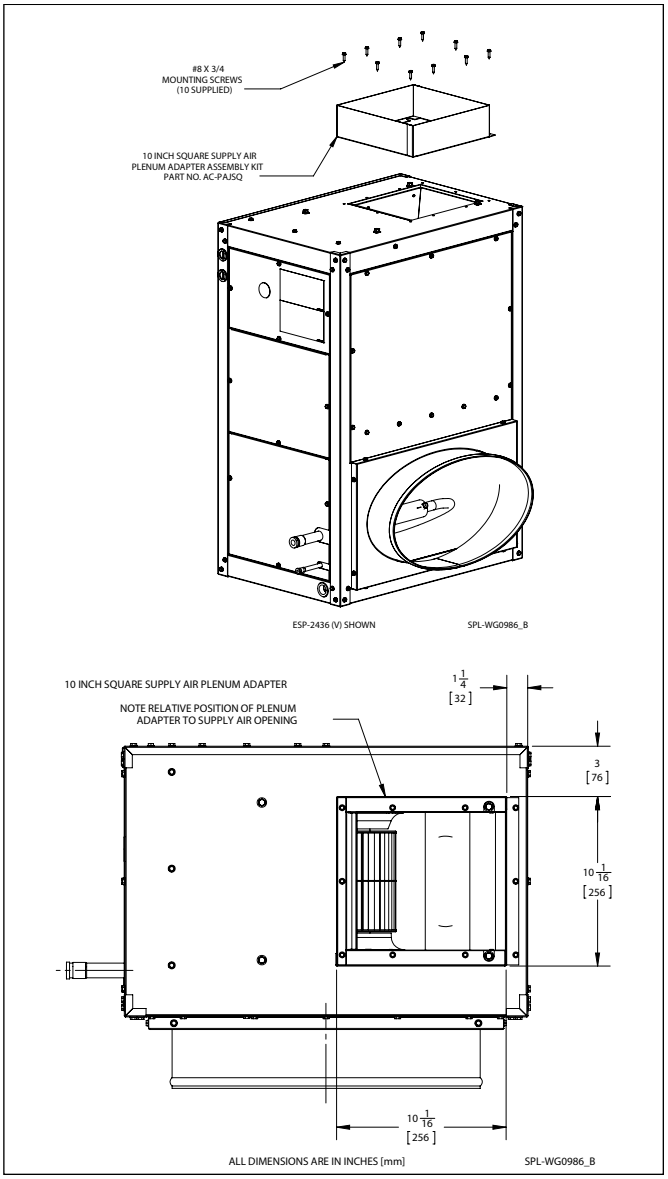


FIGURE 2.10: PLENUM ADAPTER ASSEMBLY



Step 3: Attaching Supply Air Plenum Adapter

NOTICE: If unit is to be located in the attic and installed through ceiling joists, attach supply plenum adapter in attic.

A. HORIZONTAL DISCHARGE:

Refer to Figure 2.10 and duct installation instructions supplied with fan coil unit.

NOTICE: Allow space on sides for servicing.

Step 4: Setting the Unit

Construct a platform for the fan coil unit, as shown in Figure 2.12. The platform can be constructed of 2 x 4 (minimum), 2 x 6, 2 x 8 and 2 x 10 lumber, as necessary to achieve proper pitch of 1/4 in per foot/ 20mm per meter for the condensate drain line. Figure 2.11 shows the approximate normal allowable run of condensate piping as a function of the framing lumber used for platform construction. The platform covering should be 1/2" plywood minimum.

Attach vibration isolation pads (supplied inside fan coil unit) to platform covering as shown in Figure 2.12.

If the SpacePak Secondary Drain Pan, 45AC-BASE is used (recommended) the Drain Pan should sit on the Isolation Pads, with the Fan Coil Unit sitting directly in the Drain Pad.

Secure the platform to the joist or floor, depending on location selected for the fan coil unit. Make sure platform is level.

For locations where the fan coil unit will be suspended, suspend platform from overhead by 1/4" threaded rods.

NOTICE: Allow room on sides for servicing.

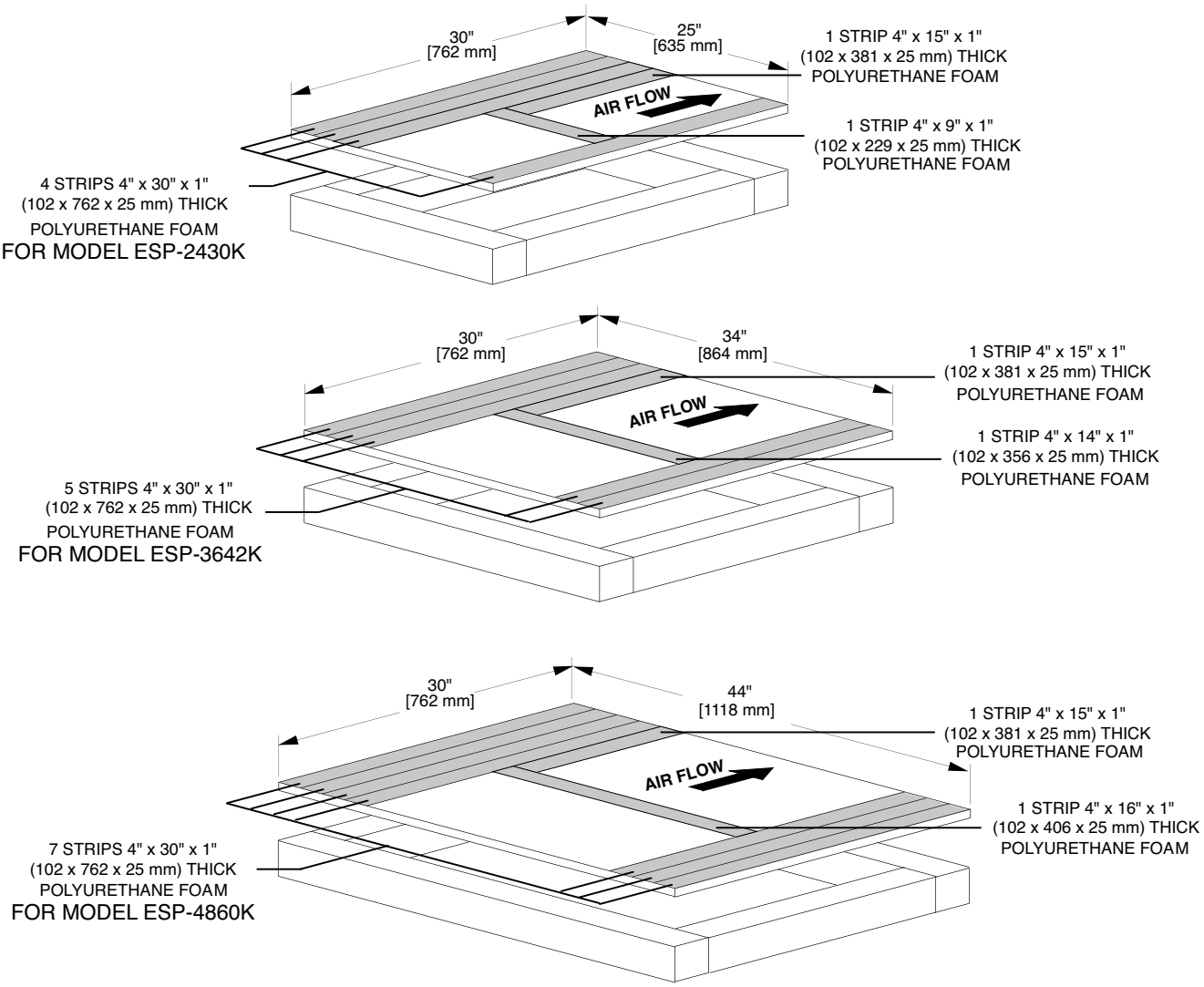
For installations with a return air box and return air duct, set fan coil unit on the platform with the elliptical opening facing in the direction of the return air box. **DO NOT** let the supply air plenum adapter support the weight of the unit.

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

FIGURE 2.11: CONDENSATE PIPING RUNS

LUMBER SIZE	2 X 4	2 X 6	2 X 8	2 X 10
MAXIMUM HORIZONTAL	8 ft/ 2.44 m	16 ft/ 4.88 m	24 ft/ 7.32 m	32 ft/ 9.75 m

FIGURE 2.12: MOUNTING PLATFORMS SHOWN WITH VIBRATION ISOLATION STRIPS



⚠WARNING -RISK OF FIRE FLAMMABLE REFRIGERANT USED. TO BE REPAIRED ONLY BY TRAINED SERVICE PERSONNEL. DO NOT PUNCTURE REFRIGERANT TUBING. DISPOSE OF PROPERLY IN ACCORDANCE WITH FEDERAL and LOCAL REGULATIONS

Step 5: 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 2 PSI/ 14 kPa 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.

⚠WARNING

This symbol means to read the instruction manual carefully.

This symbol indicates that information is provided, such as in the user manual or installation manual.

This symbol means that this appliance uses a flammable refrigerant. There is a risk of fire if refrigerant leaks and is exposed to an external ignition source.

This symbol means that service personnel must refer to the installation instructions when handling this equipment.

NOTICE: The Refrigerant Lines must be routed in a manner that they are never disturbed or displaced during normal unit operation. It is the responsibility of the installing contractor to route the refrigerant lines and provide protection so that they are not subject to mechanical damage.

During system installation, follow outdoor unit manufacturer's instructions in addition to this manual.

All refrigerant lines and pipe-work including piping material, pipe routing, and installation shall include protection from physical damage in operation and service, and be in compliance with national and local codes and standards, such as ASHRAE 15, ASHRAE 15.2, IAPMO Uniform Mechanical Code, ICC International Mechanical Code, or CSA B52. All field joints shall be accessible for inspection prior to being covered or enclosed.

After completion of field installation of all refrigerant plumbing and prior to refrigerant charging, the entire system shall be pressure tested with an inert gas to 250 PSI, and then evacuated to a vacuum of 500 microns of mercury which must hold for 20 minutes after isolated from the vacuum pump.

Field-made refrigerant joints located indoors shall be tightness tested. The test method shall have a sensitivity of 5 grams per year of refrigerant or better under a pressure of at least 160 PSI. No leak shall be detected.

Instructions for determining any additional refrigerant charge are specific to, and therefore provided with the Outdoor unit, not supplied by SpacePak.

NOTICE: When charge has been completed, the installing contractor must complete label W49-WG1706-03 (included in the accessory packet) in indelible pen or marker, reflecting the total amount by weight of refrigerant in the system (Factory charge of outdoor unit +/- adjustments made at the time of installation) and the specific refrigerant installed. The label must then be signed, dated and affixed to the outdoor unit within view of the rating label.

FIGURE 2.13: REFRIGERATION LABEL

REFRIGERATION SYSTEM HAS BEEN CHARGED WITH
_____ ☐LB ☐kG OF☐ R32☐R454B REFRIGERANT
INSTALLER_____ DATE_____

LE SYSTÈME DE RÉFRIGÉRATION A ÉTÉ CHARGÉ DE
_____ ☐LB ☐kG DE RÉFRIGÉRANT ☐ R32☐R454B
INSTALLATEUR_____ DATE_____

Step 6: Installing the Condensate Trap & Line

NOTICE: It is a requirement of the International Mechanical Code (307.2.3) to install a secondary drain or an auxiliary drain pan where damage to any building components will occur as a result of overflow from the equipment drain pan or stoppage in the condensate drain piping from a cooling or an evaporator coil. Follow local code requirements.

Refer to Figure 2.3 and 2.4 for primary and secondary condensate drain locations. Components for the PVC condensate trap are provided in a separate bag with fan coil unit (see Figure 2.14) and should be cemented together with PVC pipe cement.

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

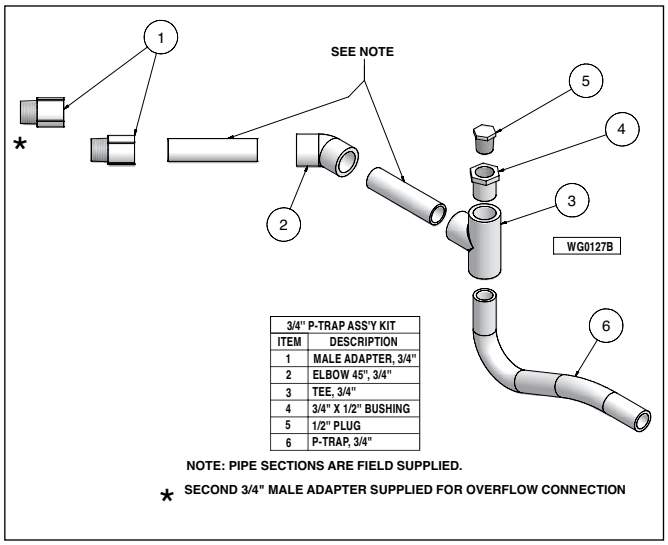
Thread male adapter (see Figure 2.14) into unit's primary condensate drain connection. Assemble and cement remaining components together. Then cement assembly to male adapter. The 45° elbow provides an offset from beneath unit suction line for access to clean-out plug.

Run a condensate line from the trap to a suitable drain that's in accordance with local codes. Make sure the line is pitched 1/4 in per foot/ 20mm per meter per foot.

NOTICE: The secondary drain connection requires field supplied components to complete installation. Follow local code requirements.

NOTICE: Never connect condensate line to a closed drain system.

FIGURE 2.14: CONDENSATE TRAP ASSEMBLY



3/4" P-TRAP ASS'Y KIT	
ITEM	DESCRIPTION
1	MALE ADAPTER, 3/4"
2	ELBOW 45°, 3/4"
3	TEE, 3/4"
4	3/4" X 1/2" BUSHING
5	1/2" PLUG
6	P-TRAP, 3/4"

NOTE: PIPE SECTIONS ARE FIELD SUPPLIED.

* SECOND 3/4" MALE ADAPTER SUPPLIED FOR OVERFLOW CONNECTION

Step 7: Installing Air Distribution Components

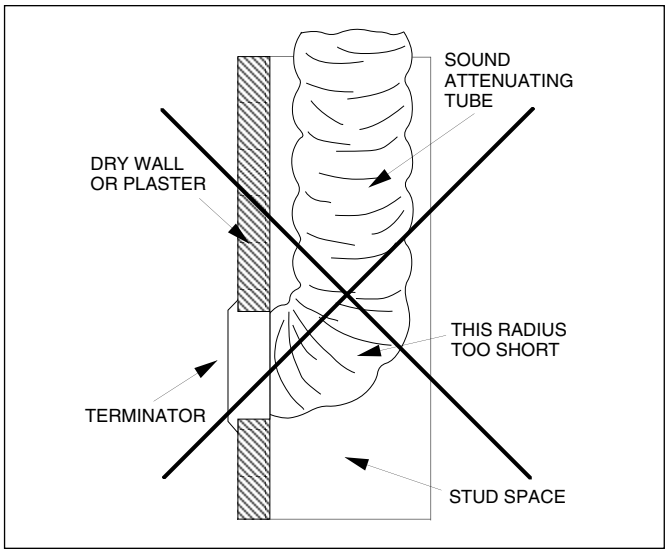
All plenum duct and supply tubing runs as well as room terminator locations must be in accordance with air distribution system requirements listed in Section 1 of this manual. Where taping of joints is required, UL181 approved tape is required.

Plenum Duct Installation

All tees, elbows and branch runs must be a minimum of 18 in/ 458 mm from the fan coil unit or any other tee, elbow or branch run. Keep all tees and elbows to a minimum to keep system pressure drop on larger layouts to a minimum.

NOTICE: The following section provides with best general practices for installing SpacePak ductwork. For more details or specific duct configurations, please contact your local rep or info@spacepak.com

FIGURE 2.15: INCORRECT TUBING INSTALLATION



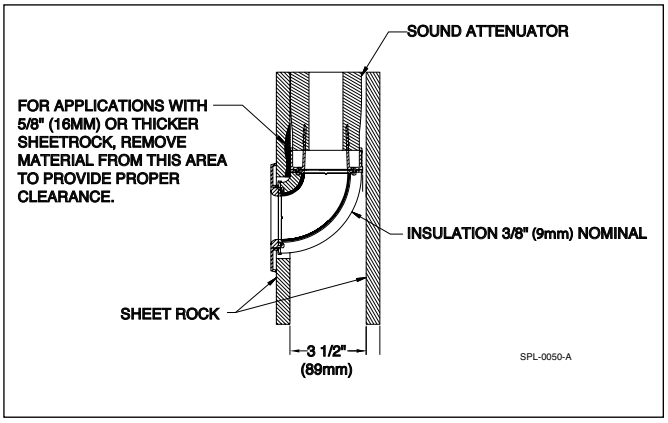
Room Terminator & Sound Attenuating Tubing Installation

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

NOTICE: Do not install terminators in a wall in which a sharp bend in the sound attenuating tube is required (see Figure 2.15). The result would be unacceptable noise.

OPTION: Using a SpacePak Kwik Connect Wall Elbow (Model Number: AC-KCWE) addresses this condition (see Figure 2.16).

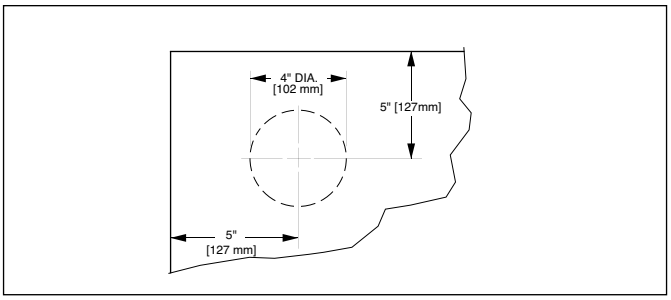
FIGURE 2.16: INSTALLATION WITH KWIK CONNECT WALL ELBOW



In marking location for room terminator (see Figure 2.17), the center of the terminator should be approximately 5 in/ 127 mm from the wall or, when installed in the corner of a room 5 in/ 127 mm from both walls.

After marking location, drill a 1/8" diameter hole for outlet. Verify there is at least 2 in/ 51 mm for tubing assembly clearance all around this hole by visual inspection or inserting a bent piece of wire to feel for obstructions. Adjust direction of hole as needed, to gain this 2 in/ 51 mm clearance. After all clearances have been checked, take a 4" diameter rotary-type hole saw and cut a hole, using the 1/8" diameter hole as a pilot.

FIGURE 2.17: TERMINATOR MEASUREMENTS



Assemble spring clips to terminator plate with screws provided in installation kit. Tighten clips until they are close to the thickness of the material they are being mounted to.

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 (1.5 in/ 38 mm square; 1/4 x 1/4 in/ 6 x 6 mm 20-gauge stainless steel wire screen) and place the screen over the opening on the back of the terminator prior to twisting on the kwik-connect (on the sound attenuating tube).

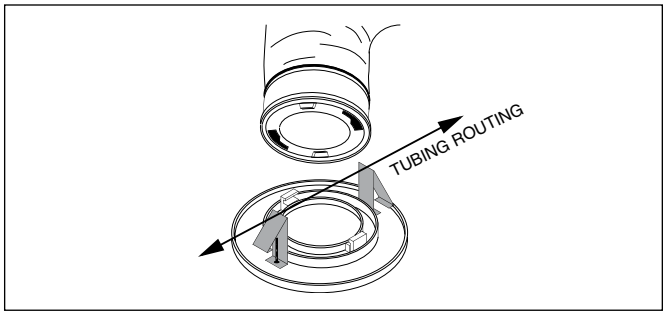
NOTICE: Do not shorten sound attenuating tube length. The result would be unacceptable noise.

Push the free end of the sound attenuating tube through the 4" hole until the two toggle springs on the room terminator snap into place.

Center the two spring clips on a line parallel to the direction of the tubing routing from the room terminator (see Figure 2.18). 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 and tubing do not run parallel.

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, longer toggle screws or special mounting plates may be required.

FIGURE 2.18: POSITIONING ROOM TERMINATOR

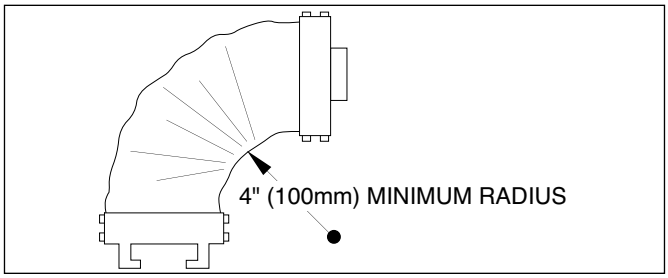


Supply Tubing Installation

Kwik-connects and balancing orifices are provided in the Installation Kits. Plenum take-offs, gaskets and fasteners are supplied in the separate plenum take-off kit.

Avoid sharp bends in the supply tubing (as well as the sound attenuating tubing). The minimum radius bend is 4 in/ 102 mm (see Figure 2.19); however, wherever possible, hold to a larger radius.

FIGURE 2.19: MINIMUM TUBING BEND



At the plenum, all supply tubing connections must be a minimum of 18 in/ 458 mm from any plenum tee, plenum elbow or the fan coil unit.

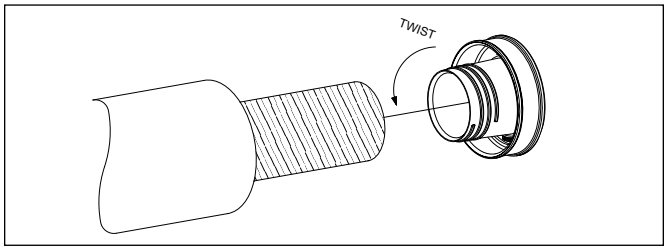
Individual supply tubing runs must be a minimum of 6 ft/ 1.83 m, even if the distance between the sound attenuating tubing and plenum is less than 6 ft/ 1.83 m.

R6 Supply tubing comes in 100 ft/ 30.48 m sections (R8 tubing comes in 75 ft/ 22.86m) 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 tube. At the open end of the supply tubing a kwik-connect will be installed (see Figure 2.20). First, push back the cover and the insulation exposing approximately 4 in/ 102 mm of the inner core. Fold in any tails or frays that may be present after cutting the supply tubing. Second, hand compress the corrugations until they are densely compacted 1.5 to 2 in/ 38 to 51 mm from the open end of the supply tube. Third, thread kwik-connect into the inner core until snug. Fourth, pull the insulation and cover forward and tuck it into the deep groove on the back side of the kwik-connect. Fifth, wrap the connection securely with UL181 approved tape.

When finished, simply twist together (see Figure 2.21) the kwik-connect on the sound attenuating tube, and wrap the connection securely with tape.

FIGURE 2.20: KWIK-CONNECT INSTALLATION



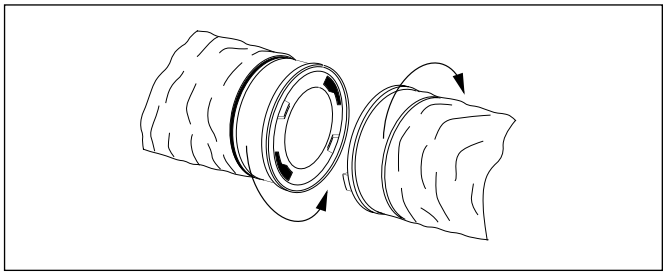
After attaching the supply tubing to the sound attenuating tube, bring the open end of the tube to the plenum.

To cut a hole in the plenum, refer to duct installation instructions supplied with fan coil unit. Sheet metal duct requires a 2-1/16" hole.

Remove the hole cut-out from the plenum. Make sure there is no “flap” left inside plenum that could block hole during operation.

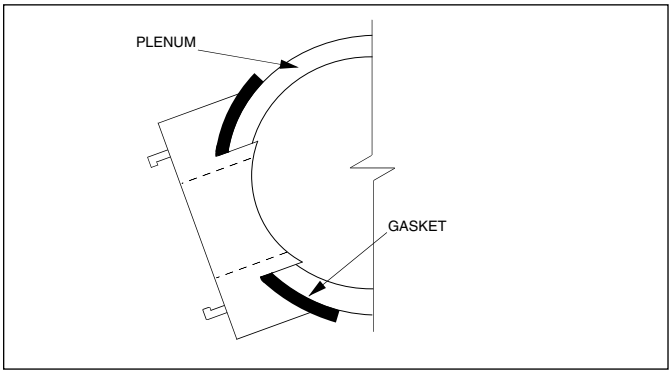
Place the plenum take-off gasket on the back side of the plenum take-off and insert the assembly into the hole in the plenum (see Figure 2.22).

FIGURE 2.21: CONNECTING TUBING



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

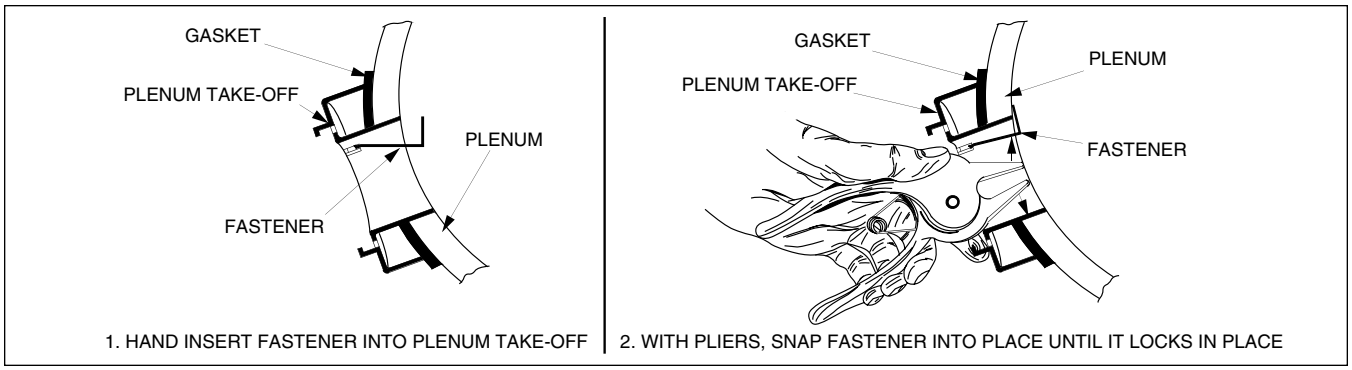
FIGURE 2.22: TAKE-OFF INSTALLATION



Position the plenum take-off to match the curvature of the plenum duct. Hand insert the four plenum take off fasteners one at a time such that each clip reaches the interior of the duct. Using the SpacePak pliers, snap the fasteners into place until they lock in place (see Figure 2.23).

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

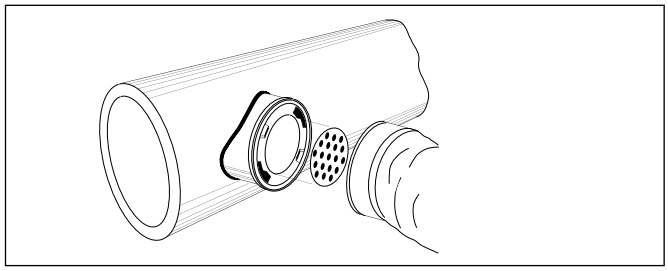
FIGURE 2.23: PLENUM TAKE-OFF FASTENER INSTALLATION



In accordance with your calculations as to requirements for balancing orifices, mount the orifice in the outlet of the plenum take-off (see Figure 2.24), 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 2.24: ORIFICE INSTALLATION



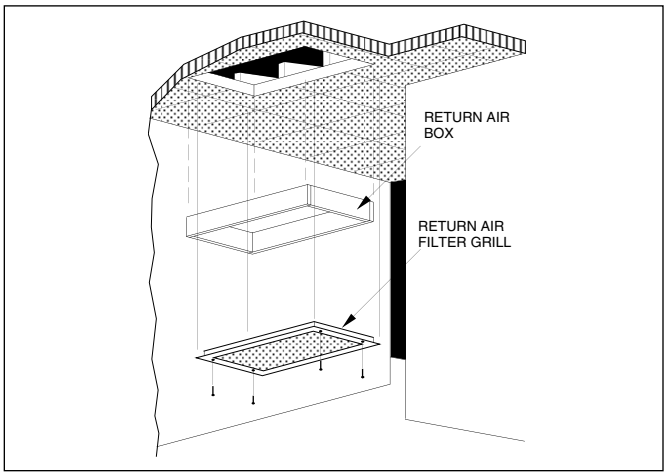
Return Air Box & Duct Installation

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 2.25).

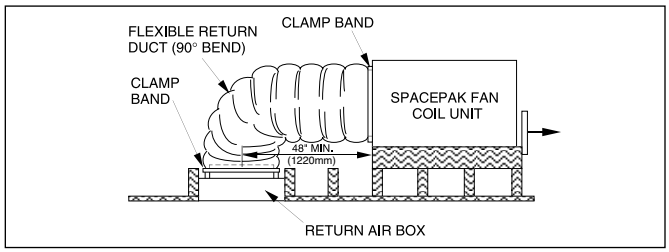
Remove the grill and the filter from the grill frame. Insert the frame into the box and mount in place with the screws provided through a hole at each corner of the frame. Finally, place the air filter into the frame and replace the grill. Turn the latches a quarter turn to lock the grill in place.

FIGURE 2.25: RETURN AIR BOX INSTALLATION



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 2.26). 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 2.26).

FIGURE 2.26: RETURN AIR DUCT INSTALLATION



Direct Mount Filter Box & Ductless Returns

Center filter box over the eliptical flange of fan coil unit (see Figure 2.27). Mark the (4) hole locations on fan coil unit and drill holes using 5/32" bit. Mount filter box to unit using screws provided and insert air filter.

FIGURE 2.27: FILTER BOX INSTALLATION

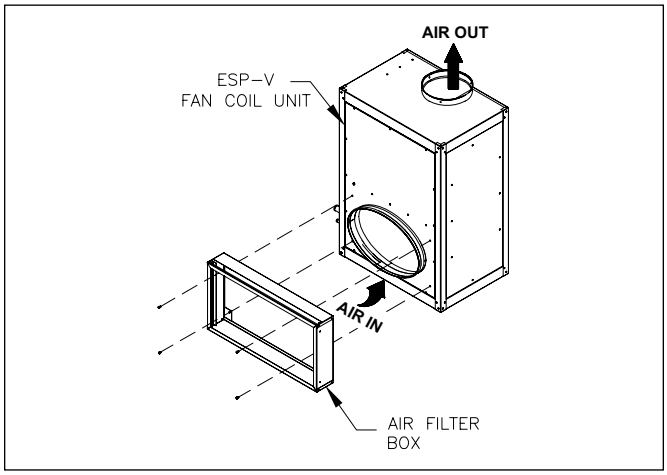


FIGURE 2.28: RETURN AIR BOX INSTALLATION

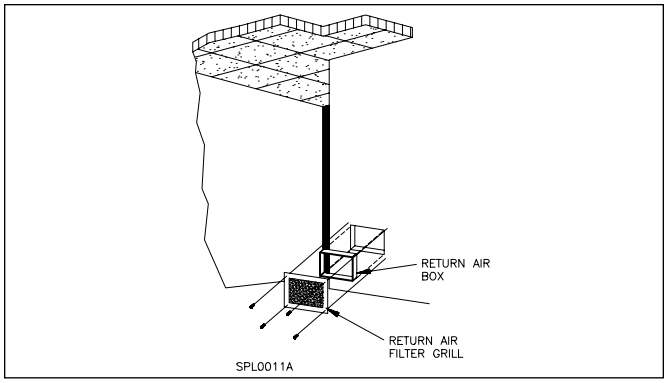
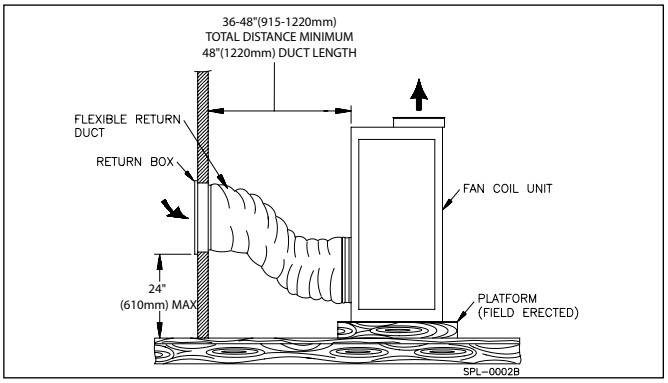


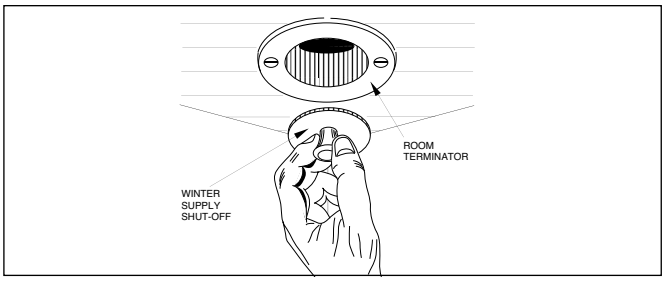
FIGURE 2.29: TYPICAL CLOSET/UTILITY ROOM



Winter Supply Shut-Off Installation

Simply insert winter supply shut-offs into the room terminator openings (see Figure 2.30). Wrap the return air filter in a plastic bag and reinstall it to block the return air opening. Winter supply shut-offs prevent moisture from collecting in ductwork during winter months. Be sure to remove the plastic bag and all winter supply shut-offs before operating the system.

FIGURE 2.30: WINTER SUPPLY SHUT-OFF



Step 8: B & C Series Unit Retrofits

For retrofitting an ESP-K series unit to an existing ESP-B or C series, some modifications will need to be made to the current system. The necessary changes are below and the extent of the changes is dependent upon the model of the unit. (Refer to Figures 2.31/2.32/2.33)

ESP-2430 Retrofits

The 7 in/ 178 mm duct can still be utilized with a transition kit (Part No. BM-6918) available from SpacePak. This kit will reduce the main plenum from 9 in/ 229 mm to 7 in/ 178 mm to adapt to the existing 7 in/ 178 mm duct.

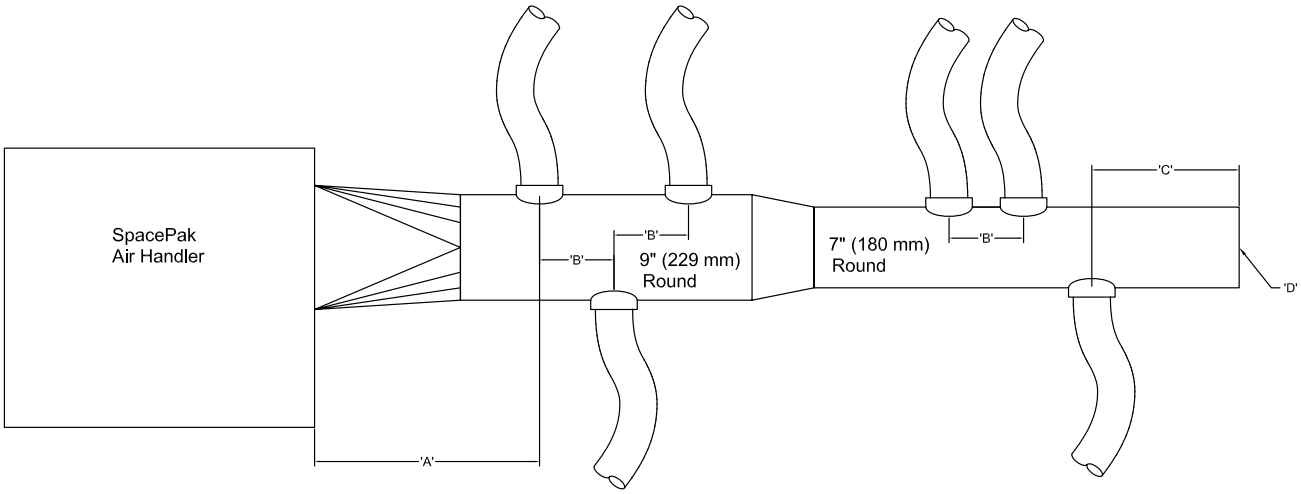
ESP-3642/4860 Retrofits

The existing plenum duct, which is typically 7 in/ 178 mm, will need to be replaced with 8 x 8 in/ 203 x 203 mm duct board or field supplied 9 in/ 229 mm round duct. The return duct and return grille will also have to be replaced with the proper parts for the replacement model. The reason for this change is the amount of air supplied by current models is 30% higher than the B & C Series models. The existing 7 in/ 178 mm duct work will reduce the air flow and cause excessive static pressures resulting in lack of performance and could possibly freeze up the coil which will result in compressor failure due to short cycling.

NOTICE FOR ALL RETROFITS

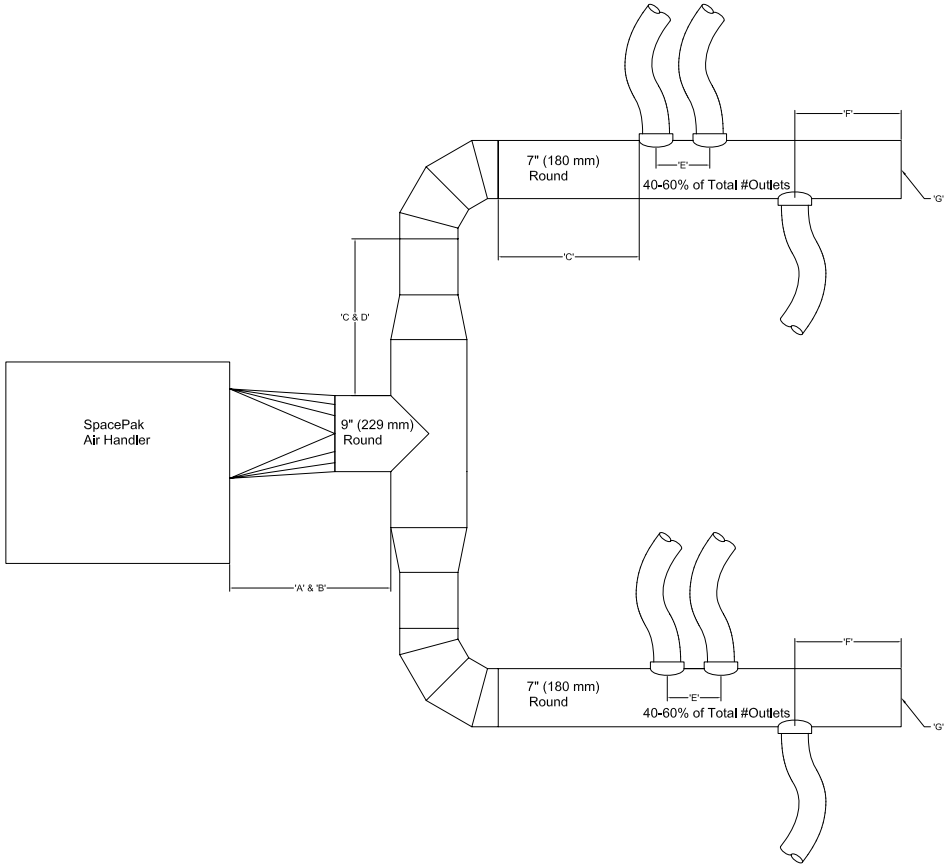
It may be necessary to add outlets to the system. The number of additional outlets will be dependent upon the external static pressure which should be measured with a manometer. This measurement should be between 1.2-1.31" W.C./ 299-324 Pa. For more details on this test procedure and location for the test, refer to the System Start Up and Adjustment section in this installation manual. If you are unsure of your application please reach out to your local rep or info@spacepak.com.

FIGURE 2.31: STRAIGHT DUCT OR SHOTGUN LAYOUT



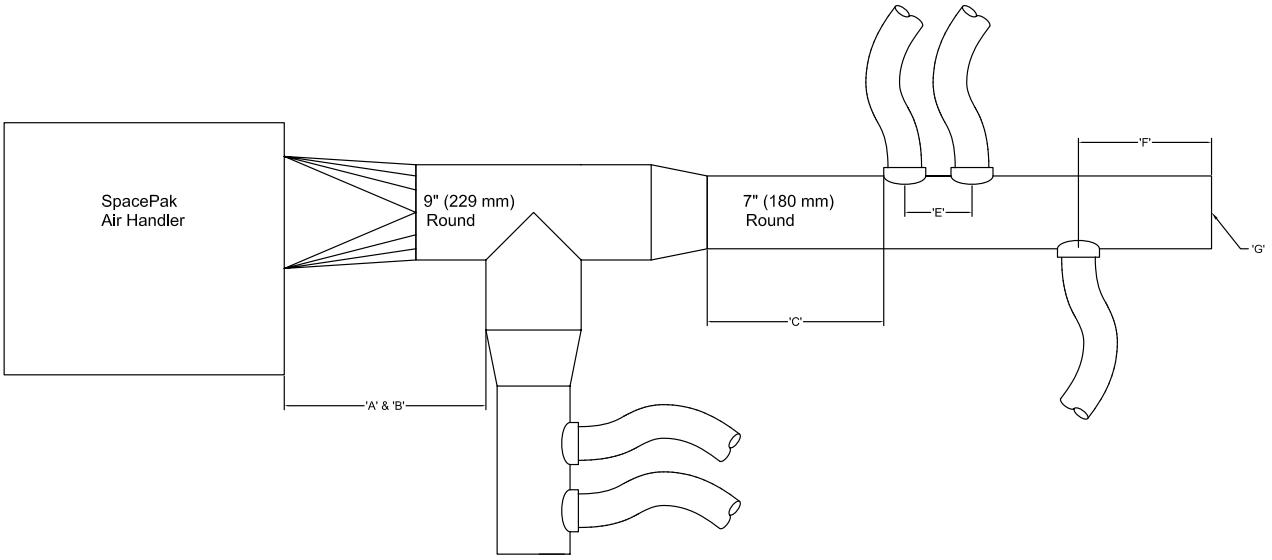
A: No outlets in the first 18" [457 mm] of straight pipe coming off the Air Handler
B: Minimum distance between outlets is 6" [153 mm] on center
C: Minimum distance when placing an outlet from end cap is 12" [305 mm]
D: NEVER place an outlet in the End Cap

FIGURE 2.32: HORSESHOE LAYOUT



A: Minimum distance from the air handler outlet to first tee or elbow is 18" [457 mm]
B: No outlets in the first 18" [457 mm] of straight pipe off of the air handler
C: Minimum distance of straight pipe after any tee or elbow is 18" [457 mm]
D: Minimum distance when placing outlet after any tee or elbow is 18" [457 mm]
E: Minimum distance between outlets is 6" [153 mm] on center
F: Minimum distance when placing an outlet from the end cap is 12" [305 mm]
G: Never place an outlet in the end cap

FIGURE 2.33: SIDE BRANCH



A: Minimum distance from the air handler outlet to first tee or elbow is 18” [457 mm]
B: No outlets in the first 18” [457 mm] of straight pipe off of the air handler
C: Minimum distance of straight pipe after any tee or elbow is 18” [457 mm]
D: Minimum distance when placing outlet after any tee or elbow is 18” [457 mm]
E: Minimum distance between outlets is 6” [153 mm] on center
F: Minimum distance when placing an outlet from the end cap is 12” [305 mm]
G: Never place an outlet in the end cap

Step 9: Wiring the Unit

⚠WARNING Turn off electrical power supply before servicing. Contact with live electric components can cause shock or death.

All electrical wiring/connections shall be performed by a licensed and certified technician and electrician. Warranty will be void if proper wiring practices are not followed.

All electrical and control wiring must be installed in accordance with the codes listed in Section 1 of this manual. Standard wiring diagram is provided in Figure 2.34. Optional wiring diagrams are provided in Figures 2.35 - 2.38. A separate 230/60/1 power supply is recommended for the unit.

⚠CAUTION When sizing for proper circuit breakers and wire size to supply the air handlers, all local and national electrical codes must be followed. The MCA and MOP are provided on the nameplate of each air handler as well as in this manual for reference. Failure to follow electrical codes will resule in void of warranty.

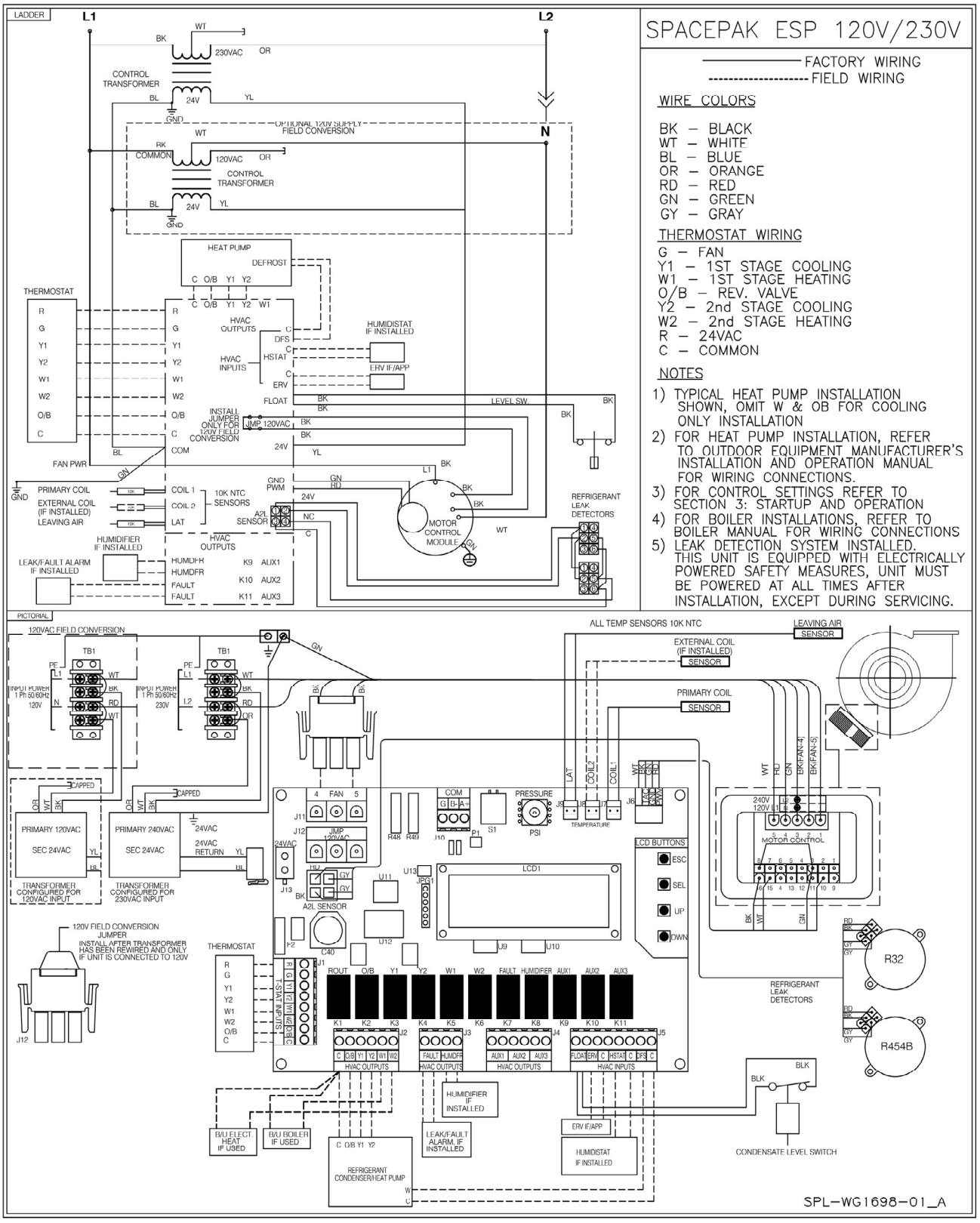
Connect power supply to Terminals L1 and L2 on the high voltage terminal block. Connect a ground wire to the equipment ground terminal located next to the high voltage terminal block.

Locate the room thermostat on a wall near the return air box. Install the selected thermostat per the thermostat manufacturer's installation instructions. Ensure the proper wiring from the thermostat to the SpacePak air handler by following the air handler diagrams found in this manual.

The air handler contains a refrigerant leak detector and mitigation logic that must be powered at all time, except when locked out for service or disconnected by a protective device such as a Circuit Breaker, Ground Fault Circuit Interrupter, or Arc Fault Circuit Interrupter.

If periodic disabling of the Air Handler is desired as a normal function, such as a Timer or Occupancy Sensor, such devices may be installed to break the low voltage thermostat inputs to the Air Handler, but must never interrupt the line voltage power.

FIGURE 2.34: MODEL ESP-K 230V STANDARD WIRING DIAGRAM*



Integral Air Handler Control

The SpacePak ESP air handlers feature a sophisticated control platform that has the ability to control fan speed by measuring static pressure and calculating airflow (CFM), as well as heat exchanger coil temperature.

The fan control logic can be configured to maintain a constant static pressure, or constant fan speed, with individual settings that can be assigned to each of five different operating inputs; Cooling Y1, Cooling Y2, Heating W1, Heating W2, and G fan only. Each set point is adjusted separately through the onscreen interface, which is an integral component of the control board.

In each mode, the fan will gradually increase to the specific set point in order to minimize perceived airflow and duct noise. In the Cooling and Heating modes, the fan will not ramp up to the desired set point until the coil reaches the appropriate temperature. Both heating and cooling fan start set points can be adjusted through the onscreen menu following the menu tree located in this section.

The screen will also display the delivered airflow, in Cubic Feet per Minute, delivered by the air handler. **CFM calculation is an approximation based upon laboratory test conditions, and may be affected by certain system construction features such as temperature and elevation. The primary setup criteria for all Small Duct High Velocity systems should always be Duct Static Pressure. CFM and static pressure displayed on screen should be used as REFERENCE ONLY.**

All delivered airflow and static pressure, for each application, should be verified upon installation with calibrated equipment to ensure proper system operation and for troubleshooting purposes. For ESP models; the control also manages output signals to the outdoor condenser or heat pump, whether single or dual stage, as well as indoor accessories such as an ERV/HRV, Humidifier, Electric Heater or Auxiliary Hydronic Heating Coil.

Refer to Section 3 for more detailed description and start-up instruction as well as the appropriate wiring diagrams located in section 2 step 9 of this manual.

All SpacePak integrated air handler control boards are configurable in the field for every model of air handler. The control will come from the factory with specific defaults (see defaults tables) and sized appropriately for that air handler. Prior to troubleshooting, the air handler model should be verified on the board as the board reacts differently based on the model of the air handler. Follow the menu tree and steps in the following section to verify proper unit commissioning.

Upon startup the initializing screen will display the firmware uploaded for that unit. The following section will describe features and functionality that may or may not be applicable to the firmware on the unit. When troubleshooting or commissioning please verify your features match the associated firmware on the unit.

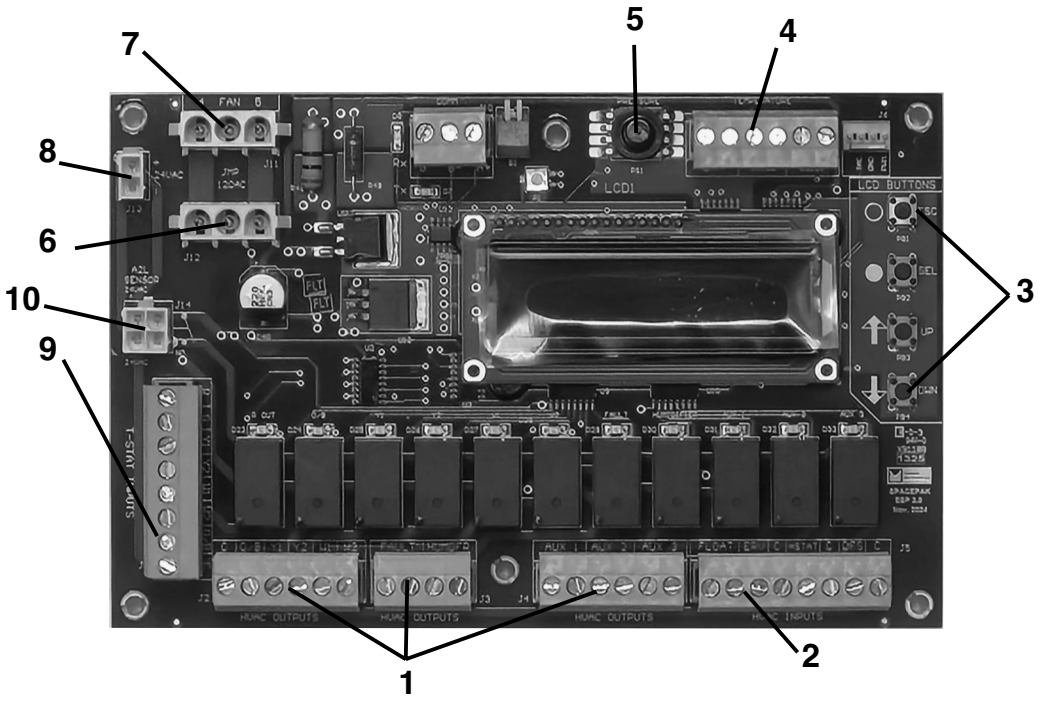
Additionally, the control board forms an integral part of the A2L Leak detection system. If a refrigerant leak is detected by the onboard sensors, at only 25% of the flammability limit, the control logic will immediately remove all calls to any external equipment, open all zone dampers that may be in the air distribution system* and turn on the fan at maximum speed. This will ensure that the non-toxic but mildly flammable refrigerant is evacuated so that it will remain far below the flammable concentration, and allow it to be dispersed.

*Only zoning devices that are expressly marked as Compatible with SpacePak ESP-K Series air handlers, and installed strictly according to the Installation & Operation Manual may be used in this system.

If you need assistance in commissioning your SpacePak air handler control board, please reach out to tech support at TechnicalService@SpacePak.com

SECTION 3: START-UP & COMMISSIONING

Controls Overview/Features/Setpoints



J+ Control Board Navigation

***IMPORTANT* When making selections the user MUST press the "SEL" key to save the desired selection. If the "SEL" key is not pressed the control will revert to the previous setpoint/selection.**

1	HVAC Outputs	C	Common
		O/B	Reversing Valve
		Y1	1st Stage Cooling
		Y2	2nd Stage Cooling
		W1	1st Stage Heating
		W2	2nd Stage Heating
		FAULT	Closes on Fault
		HUMDFR	Closes on Call
		AUX 1	Energized on heat, cool, or heat/cool (configured in field)
		AUX 2	ESP Units- Energized in cooling; WCS Units- Closed contacts during heat or cool call depending on configuration chosen in field.
		AUX 3	ESP Units- Energized in heating; WCS Units- Energize on reversing valve for heat pumps
2	HVAC Inputs	FLOAT	Float Switch (factory installed)
		ERV	24v input from ERV
		C	ERV Common
		HSTAT	24v input from Humidistat
		C	Humidistat Common
		DFS	24v input from Defrost on outdoor Heat Pump
		C	Defrost Common
3	LCD Buttons	ESC	Escape
		SEL	Select
		UP	Arrow up
		DOWN	Arrow down
4	Temperature	LAT	Leaving Air Temperature
		COIL2	Auxiliary Heating Coil
		COIL1	Pimary Evaporator Coil
5	Pressure	PS1	Delivered AIr
6	JMP	J12	120V Jumper. If field installed allows for 120V operation. (Shipped loose)
7	FAN	4	Fan Power Harness
		5	
8	24VAC	J13	24 from transformer
9	T-Stat Inputs	R	24V
		G	Fan
		Y1	1st Stage Cooling
		Y2	2nd Stage Cooling
		W1	1st Stage Heating
		W2	2nd Stage Heating
		O/B	Reversing Valve
		C	Common
10	A2L Leak Sensor Connection	A2L	24V, COM, NC Contacts

RUN SCREEN

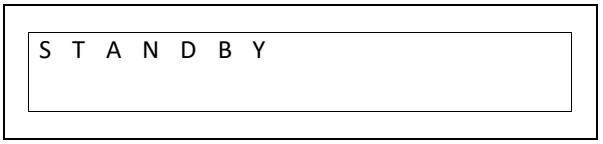
There are 5 run screens that show the current status of the unit. Pressing the UP or DOWN buttons will cycle through the 5 screens.

Run Screen #1.

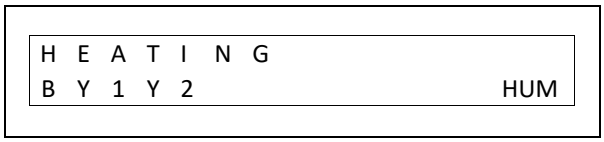
Line 1 shows the status of the unit: STANDBY, HEATING, COOLING, or FAN.

Line 2 shows the HVAC inputs currently present: O/B, Y1, Y2, W1, W2, G, HUMIDIFIER **[HUM]** and ERV. Line 2 will also display faults, warnings, and errors. Fault, warnings, and configuration errors are found in the FAULT section of this manual.

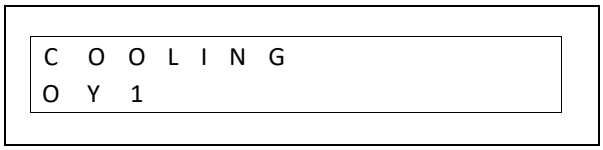
Examples:



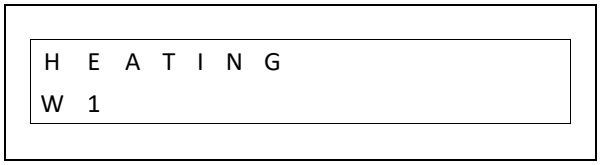
Line 1: Heating call
Line 2: B, Y1 and Y2 HVAC inputs are energized and the humidifier is running.



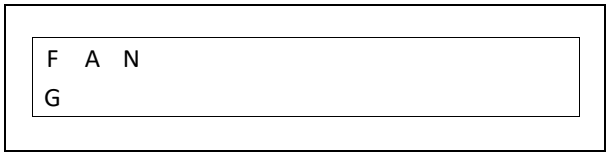
Line 1: Cooling call
Line 2: O and Y1 HVAC inputs are energized.



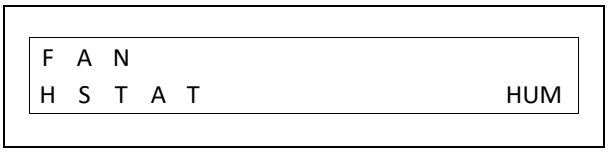
Line 1: Heating call
Line 2: W1 HVAC input is energized



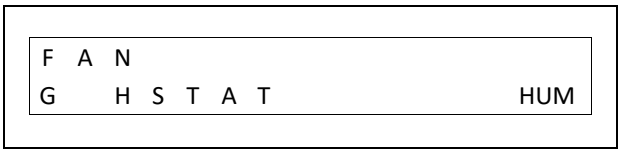
Line 1: Fan is running
Line 2: G HVAC input is energized



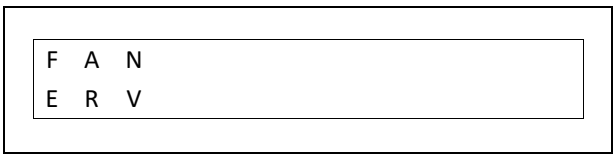
Line 1: FAN, and Humidifier are running
Line 2: Humidifier [HSTAT] HVAC input is energized



Line 1: FAN and Humidifier are running
Line 2: G, and Humidifier [HSTAT] HVAC inputs are energized

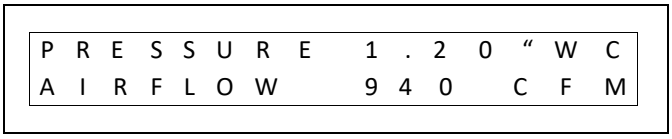


Line 1: FAN, and ERV are running
Line 2: ERV input is energized



Run Screen #2.

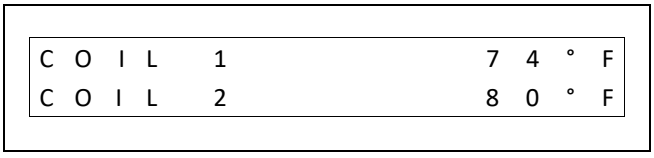
Line 1 displays the measured static pressure in Inches of water column ["WC]
Line 2 show the Airflow in cubic feet per minute [CFM]



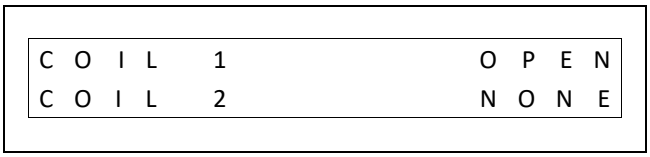
Run Screen #3, and #4.

Run screen #3 and #4 display coil temperature readings and the leaving air temperature. If a temperature sensor is not installed "NONE" will be displayed, if a temperate sensor is faulted in a shorted or open condition, SHORTED or OPEN will be displayed.
Examples:

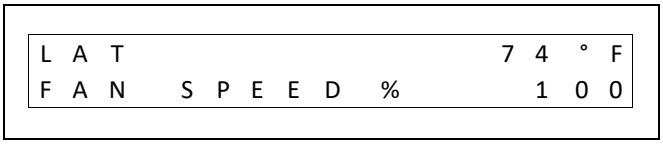
Run Screen #3.



Note: If the Secondary Hot Water Coil [SEC HW COIL] is disabled, line 2 will be blank.



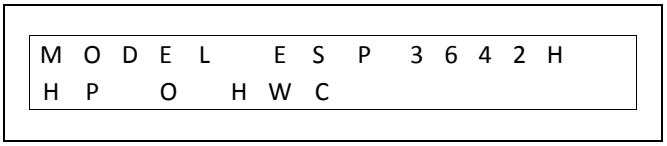
Run Screen #4.



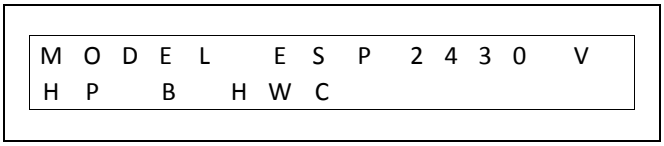
Run Screen #5.
Line 1 shows the Model and Size.
Line 2 shows the Unit type: Reverse Cycle Chiller, Heat Pump, Cooling or Heating mode only, as well as the Reversing valve setting, and the secondary heating water coil if installed.

Examples:

Unit Configuration: ESP model, size 3642K, horizontal [H] unit, configured as heat pump with its revering valve set to energize in cooling and a secondary hot water coil installed



Unit Configuration: ESP model, size 2430K, vertical [V] unit, configured as a heat pump with its revering valve set to energize in heating and a secondary hot water coil installed.



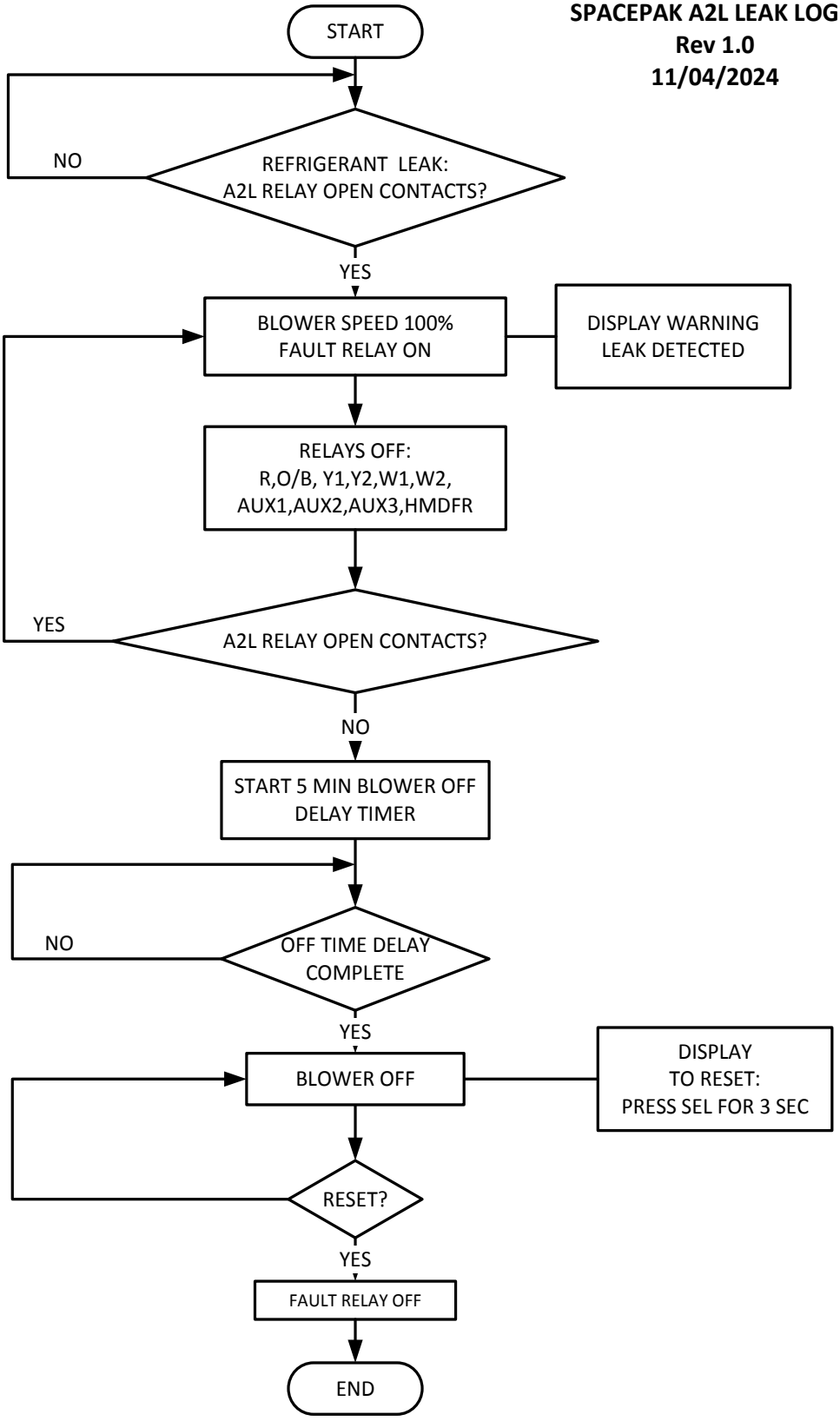
The following menu trees are accessible within the advanced control. They can be accessed by holding the "ESC" key down for 3 seconds. Within these menu trees are configurable settings for each application and unit type. Please refer to the proper menu tree per the firmware version on the control board prior to making any changes or adjustments to the unit configuration. Failure to do so can prevent proper operation and performance of the system. The defaults menu is how each unit is configured from the factory. By using the menu trees, these defaults can be adjusted.

DEFAULTS

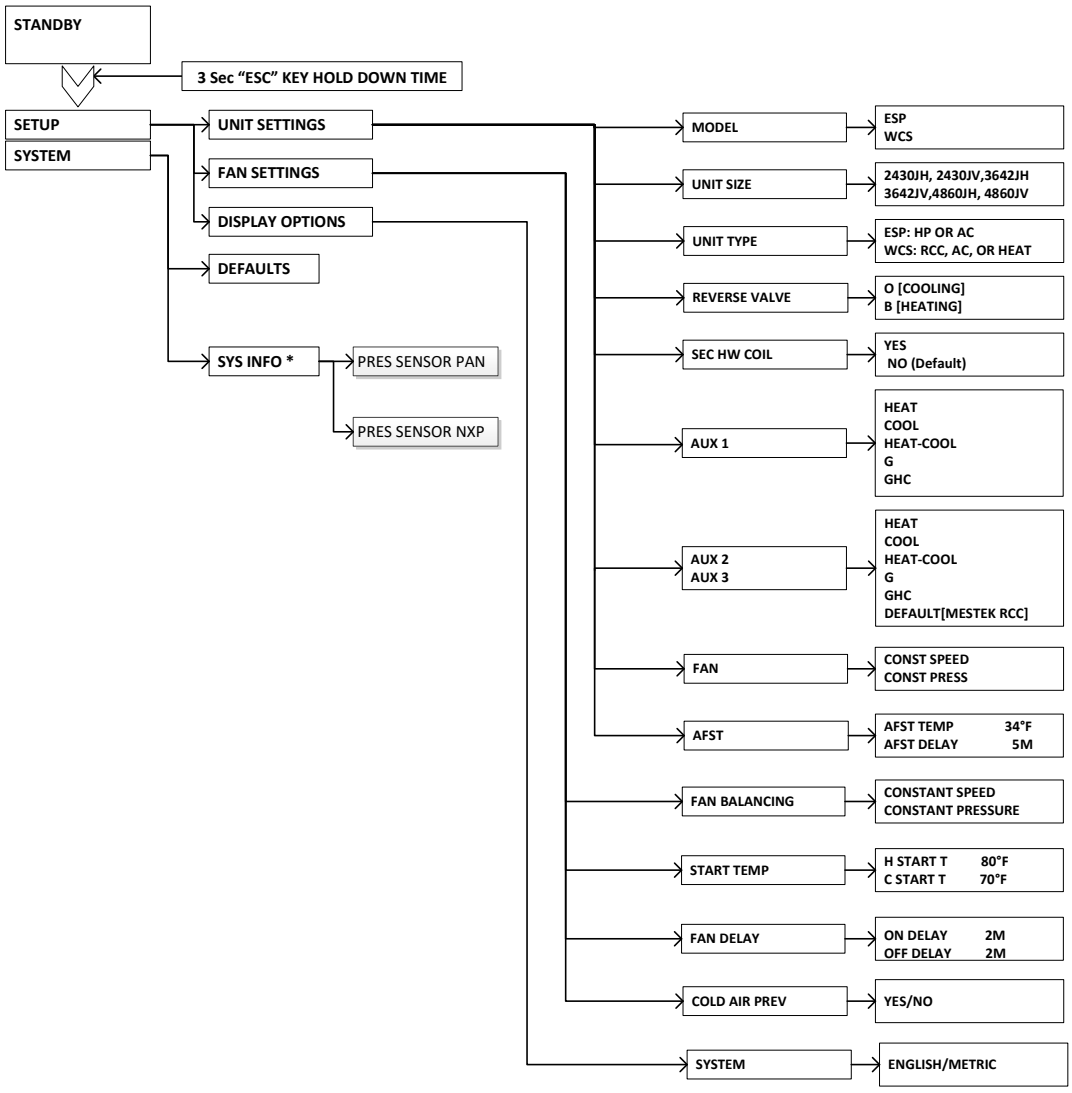
ITEM DESCRIPTION	DEFAULT	MAX	MIN
UNIT MODEL*	PER UNIT PURCHASED		
UNIT SIZE*	PER UNIT PURCHASED		
UNIT TYPE	HP		
REVERSING VALVE	O		
SEC HW COIL	NO		
AUX 1	HEAT		
FAN	CONSTANT PRESSURE		
ANTI FROST TEMPERATURE	34°F/1.1°C	50°F / 10°C	34° / 1.1°C
SPEED Y1	50%	100%	5%
SPEED Y2	50%	100%	5%
SPEED Y12	50%	100%	5%
SPEED W1	50%	100%	5%
SPEED W2	50%	100%	5%
SPEED W12	50%	100%	5%
SPEED G	50%	100%	5%
SPEED HUMIDIFIER	50%	100%	5%
SPEED ERV	50%	100%	5%
SPEED DEFROST (DFS)	30%	100%	5%
STATIC PRESSURE Y1	1.2”WC/ 299Pa	2.5”WC/ 622Pa	0.5”WC/ 125Pa
STATIC PRESSURE Y2	1.2”WC/ 299Pa	2.5”WC/ 622Pa	0.5”WC/ 125Pa
STATIC PRESSURE Y12	1.2”WC/ 299Pa	2.5”WC/ 622Pa	0.5”WC/ 125Pa
STATIC PRESSURE W1	1.2”WC/ 299Pa	2.5”WC/ 622Pa	0.5”WC/ 125Pa
STATIC PRESSURE W2	1.2”WC/ 299Pa	2.5”WC/ 622Pa	0.5”WC/ 125Pa
STATIC PRESSURE W12	1.2”WC/ 299Pa	2.5”WC/ 622Pa	0.5”WC/ 125Pa
STATIC PRESSURE G	1.2”WC/ 299Pa	2.5”WC/ 622Pa	0.5”WC/ 125Pa
STATIC PRESSURE HUMIDIFIER	1.2”WC/ 299Pa	2.5”WC/ 622Pa	0.5”WC/ 125Pa
STATIC PRESSURE ERV	1.2”WC/ 299Pa	2.5”WC/ 622Pa	0.5”WC/ 125Pa
STATIC PRESSURE DEFROST (DFS)	0.7”WC/ 174Pa	2.5”WC/ 622Pa	0.5”WC/ 125Pa
HEATING START TEMPERATURE	80°F / 26.6°C	120°F / 48.9°C	60°F / 15.6°C
COOLING START TEMPERATURE	70°F 21.1°C	80°F / 26.7°C	50°F / 10°C
FAN ON DELAY	2 MINUTES	5 MIN	1 MIN
FAN OFF DELAY	1 MINUTES	5 MIN	0 MIN

*The unit model and size will be set from the factory specific to that unit. If it is a replacement board, the default model will be "ESP" and the default size will be 2430KH. Please properly commission all replacement boards specific to that application

SPACEPAK A2L LEAK LOGIC
Rev 1.0
11/04/2024



MENU TREE
SPACEPAK K REV 1.4



Commissioning and Adjusting Paramaters

(Note: some menus will not be available depending on firmware version. Verify proper firmware version upon start up screen)

Press the ESC key for 3 seconds to enter the control menu system.

SETUP	UNIT SETTINGS
	FAN SETTINGS
	TIMERS
SYSTEM	DEFAULTS

SETUP MENU

The SETUP menu has 3 submenus: UNIT SETTINGS, FAN SETTINGS, and TIMERS.

1. UNIT SETTINGS

The UNIT SETTINGS menu consists of 8 submenus: MODEL, UNIT SIZE, UNIT TYPE, Reversing valve [REVERSE VALVE] settings, Secondary Hot Water Coil [SEC HW COIL], Auxiliary Relay 1[AUX 1], [FAN] CONSTANT SPEED or CONSTANT PRESSURE driven operation, and anti-frost temperature setting [AFST TEMP].For units with firmware versions 1.5 or higher, there is a 9th submenu option. [AFST DELAY].

UNIT SETTINGS	MODEL
	UNIT SIZE
	UNIT TYPE
	REVERSE VALVE
	SEC HW COIL
	AUX 1
	FAN
	AFST TEMP

1.1 MODEL: This menu will allow you to select the model of the unit: Only ESP is available.

1.2 UNIT SIZE: There are 6 unit sizes options: 2430H/V, 3642H/V, and 4860H/V.

1.3 UNIT TYPE: An ESP model can be configured as refrigerant heat pump by selecting [HP], or as cooling only mode available [AC] unit.

Note: These selections should only be changed by a qualified installer and should be verified for the installation.

Note: The unit model, and size will be configured specific to the purchased unit from the factory.

For ESP units:

UNIT TYPE	HP
	AC

1.4 REVERSE VALVE: The Reversing Valve [REVERSE VALVE] can be set to O [energized in cooling] or B [energized in heating]

REVERSE VALVE	O
	B

1.5 SEC HW COIL: The Secondary Hot Water Coil menu [SEC HW COIL] allows you to add a secondary heating water coil as an optional item.

SEC HW COIL	NO
	YES

1.6 AUX 1: The Auxiliary 1 Relay [AUX 1] can be set to close its contacts only during a heating call, only during a cooling call only or on both heating and cooling calls.

AUX 1, 2, 3: The auxiliary relays (AUX 1, 2, 3) can be set to close its contacts during a heating (heat) call only, cooling call (cool), heating and cooling call (Heat-Cool), a fan only call (G) or fan only, heating and cooling calls (GHC).

AUX 1	HEAT
	COOL
	HEAT-COOL

1.7 Fan Speed: The fan can be run at either a constant speed or a constant static pressure.

FAN	CONST SPEED
	CONST PRESS

When Constant Speed is selected a different speed % can be selected for each input. (Y1, Y2, W1, W2, or G). The fan will run at the set speed % for the active input. This setting can be from 5% - 100%

When Constant Pressure is selected a different static pressure setpoint can be selected for each input. (Y1, Y2, W1, W2 or G). The fan will vary its speed to maintain the static pressure target of the active input.

See section 2, FAN SETTINGS, for information on setting the speed % or static pressure setpoints.

1.8. Anti-Frost protection temperature setting:

The Anti-Frost Protection Temperature setting [AFST TEMP] controls the integrated Anti-frost feature. Th default setting is 34°F, and is adjustable up to 50°F. The temperature of the primary coil is constantly monitored. If the coil temperature drops below the Anti-Frost Protection Temperature setting the Anti-frost feature will be enabled, the fan will continue run at the called for speed, but all HVAC output will be disabled. The feature will be disabled once the primary coil temperature rises 10°F above this setting. For units that have firmware 1.6 or greater (see section on "how to check firmware level") The HVAC outputs will remain off once the primary coil reaches 20°F above setpoint AND a 2 minute time delay has expired. This will prevent short cycling of the outdoor unit. The time delay and degrees above setpoint are field adjustable. Please refer to the menu tree in this manual.

AFST TEMP	34°F

2.FAN SETTINGS

The FAN SETTINGS menu consists of 3 sub menus: FAN BALANCING, START TEMP, and FAN DELAY

FAN SETTINGS	FAN BALANCING
	START TEMP
	FAN DELAY

2.1 FAN BALANCING: The FAN MODE setting will determine the appearance of the FAN BALANCING menu. If CONSTANT SPEED has been selected, the SPEED% setting can be adjusted for each input

FAN:CONST SPEED%					
	Y1:	SPEED%	Y1%	PRESS	CFM
			50	0.4	350
	Y2:	SPEED%	Y2%	PRESS	CFM
			50	0.4	350
	Y12:	SPEED%	Y12%	PRESS	CFM
			50	0.4	350
	W1:	SPEED%	W1%	PRESS	CFM
			50	0.4	350
	W2:	SPEED%	W2%	PRESS	CFM
			50	0.4	350
	W12:	SPEED%	W12%	PRESS	CFM
			50	0.4	350
	G:	SPEED%	G%	PRESS	CFM
			50	0.4	350
	HUM:	SPEED%	HUM%	PRESS	CFM
			50	0.4	350
	ERV:	SPEED%	ERV%	PRESS	CFM
			50	0.4	350
	DFS:	SPEED%	DFS%	PRESS	CFM
			50	0.4	350

For example: If FAN: CONSTANT SPEED has been selected, then selecting “Y1: SPEED%” will display:

Y1%	PRESS	CFM
50	0.4	350

The default speed value is 50%. Line 1 displays the units, and line 2 shows the real time value of the parameters. Selecting Y1% will set the cursor at line 2 indicating real time adjustment is active. UP and Down clicks will change Y1% increasing the fan speed value up to 100% or decreasing it down to 5%. The Pressure and CFM values are constantly being updated to provide feedback to the fan speed changes. You must hit SEL to save the desired setpoint.

FAN:CONST PRESS					
	Y1:	ST PRESS	Y1 SP	PRES	CFM
			1.2	0.39	350
	Y2:	ST PRESS	Y2 SP	PRES	CFM
			1.2	0.39	350
	Y12:	ST PRESS	Y12 SP	PRES	CFM
			1.2	0.39	350
	W1:	ST PRESS	W1 SP	PRES	CFM
			1.2	0.39	350
	W2:	ST PRESS	W2 SP	PRES	CFM
			1.2	0.39	350
	W12:	ST PRESS	W12 SP	PRES	CFM
			1.2	0.39	350
	G:	ST PRESS	G SP	PRES	CFM
			1.2	0.39	350
	HUM:	ST PRESS	HUM SP	PRES	CFM
			1.2	0.39	350
	ERV:	ST PRESS	ERV SP	PRES	CFM
			1.2	0.39	350
	DFS:	ST PRESS	HRV SP	PRES	CFM
			1.2	0.39	350

If CONSTANT PRESSURE has been selected the static pressure setpoint can be adjusted for each input.The user will adjust the fan speed by pressing "select" when the cursor is above the "SP". Then the target Static Pressure ("SP") can be adjusted up or down using the up and down buttons. The fan will respond in real time during the adjustment. Once the proper static pressure has been established, the user must press "select" to save the setting. If select is not pressed, the unit will revert to it's previous set point.

For example: If FAN: CONSTANT PRESSURE has been selected, selecting “Y1: ST PRESS” will display:

Y1 SP	PRES	CFM
1.2	0.39	350

The default pressure setpoint 1.2" W.C./ 299 Pa. Line 1 shows the units. Line 2 shows the real time value of the parameters. Selecting Y1 will set the cursor to line 2, indicating real time adjustment is active. UP and Down clicks will change the static pressure setpoint, either increasing the value to up to 2.5" W.C./ 662 Pa or decreasing it down to 0.5" W.C./ 125 Pa. The fan speed will vary to maintain the selected static pressure setpoint. You must hit SEL to save the desired set-point.

2.2 FAN START TEMP: The temperature of the heating/cooling coils is constantly being monitored. When a call for heating or cooling is received the fan will not start until the coil is at the appropriate temperature (note: for firmware versions of 1.7 or greater, if the air handler is receiving a fan only call prior to the call for heat or cool, the fan will run and will speed up or down to the appropriate thermostat input's speed). This assures the coil is at the correct temperature to avoid initially delivering warm air for a cooling call or cool air for a heating call. The Fan Start Temperature **[START TEMP]** menu allows the target coil temperature to be adjusted. The default target temperature for heating is 80°F/ 26.7°C and the default target temperature for cooling is 70°F/ 21.1°C.

START TEMP	H START T	80°F
	C START T	70°F

2.3 FAN DELAY: The FAN DELAY menu contains 2 settings: ON DELAY and OFF DELAY.

FAN DELAY	ON DELAY	2 m
	OFF DELAY	1 m

The FAN ON DELAY is only used if a coil sensor is in fault. If the K board recognizes a coil temperature sensor is not installed or has faulted the FAN ON DELAY will be used to delay the fan from coming on to allow the coil time to get to the target temperature.

The FAN OFF DELAY is always used to allow the fan to optionally run for a time after a demand has been satisfied allowing time to offload the coil of any excess heat that may still be present.

SYSTEM MENU

The System menu consists of two items; Defaults and Cal pressure.

SYSTEM	DEFAULTS

The DEFAULTS menu allows all settings to be returned to factory default values indicated in Defaults Section. UNIT MODEL and UNIT SIZE are not changed when loading factory defaults.

FAULTS AND WARNINGS:
The integrated control board is equipped to identify common faults and potential warnings during the operation of the air handlers. See below table for troubleshooting details on faults and warnings. When a fault or warning is present the screen will present the associated error on the screen on Line 2 as shown in the example below.

Faults and Warnings Explained (for troubleshooting refer to troubleshooting table)

FLOAT SW FAULT- The primary drain pan float switch has faulted. A call to the outdoor unit will not be allowed. This is a hard lockout that requires a power cycle to reset.

ANTIFROST SW FAULT- The anti-frost sensor has measured a temperature lower than the setpoint (default of 32°F/ 1.1°C can be used adjusted by using the menu tree above).

The unit will reset after the coil 1 temperature is 20°F/ -6.7°C above set point AND a 2 minute time delay to prevent short cycling of the outdoor unit. Please note that the time delay and temp differential are adjustable in the menu tree.

LOW PRESS FAULT- The pressure transducer (located on the control board) is reading less than 0.1" W.C./ 25 Pa when the fan is running. During this fault, the unit will not display a calculated CFM or a static pressure reading. The blower will continue to run and the unit operation will change (automatically) from constant pressure to constant speed.

TRANSDUCER FAULT- The control board has registered that the pressure transducer has failed on the control board or the calibration has failed. The blower will continue to run during this fault.

OPEN COIL 1- The control board has recognized an open circuit on the primary coil (coil 1) terminal. When a unit has this warning, the display screen will flash the warning. The fan will not run until the warning is resolved or after a 2 minute delay.

REFRIGERANT LEAK:The control board has received a signal from on of the refrigerant leak detectors, indicating the presence of uncontained refrigerant vapors. The control will immediately remove calls from all external equipment, run the fan at full speed and pressure, and close the external Fault Contacts.

ERRORS:
Configuration - Wiring Errors.
The Control is able to recognize wiring and configuration errors. If conflicting inputs are received, the control will always prioritize heating over cooling an error message will be displayed, but the unit will continue to operate.

E	R	R	O	R		2					O	B	+	W
H	W	C						D	I	S	A	B	L	E

Based on the unit configuration the following errors can be recognized.

Unit Configuration: HP/ RCC
RV = O [REVERSE VALVE ON COOLING]
For Heating Mode: Expected inputs: Y's, Y's+W's.
For Cooling Mode: Expected inputs: Y's+OB.
RV = B [REVERSE VALVE ON HEATING]
For Heating Mode: Expected inputs: Y's+OB, Y's+OB +W's
For Cooling Mode: Expected inputs: Y's.

Detected inputs; W's+OB or OB
ERRORS:
Error 1: Unexpected OB, Configuration error. Wiring error.
Error 2: Unexpected W's+OB, Configuration error. Wiring error.

Unit Configuration: COOL ONLY FOR BOTH MODELS
Expected inputs: Y's or W's.

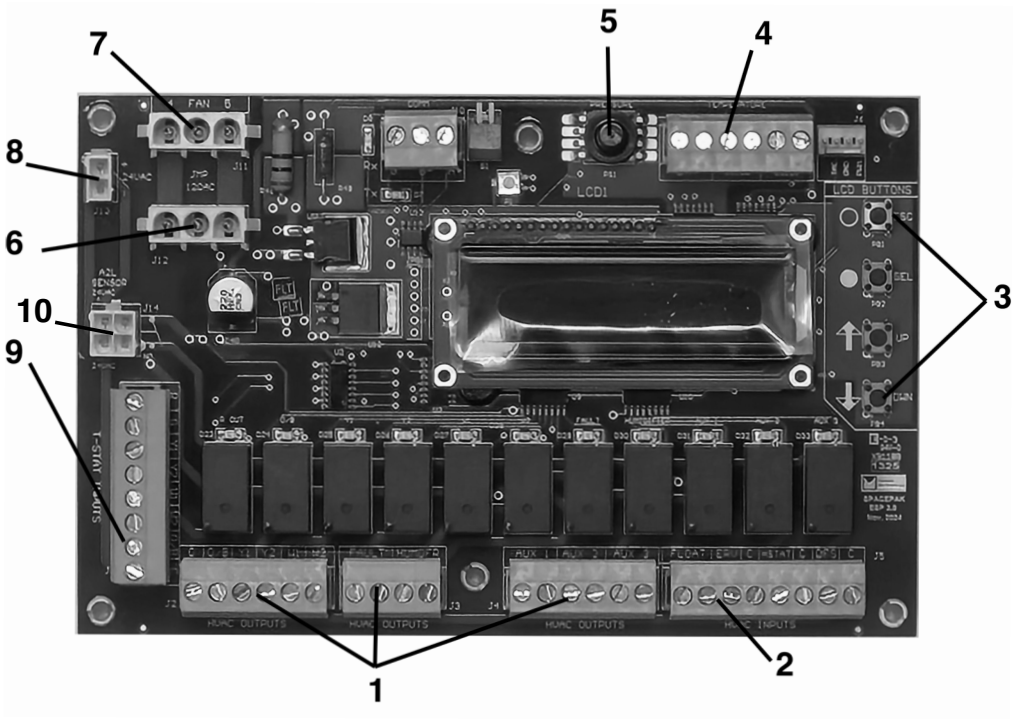
Detected input: OB
ERRORS:
Error 1: Unexpected OB, Configuration error. Wiring error.
Error 2: Unexpected W's + OB, Configuration error. Wiring error.
Error 3: Unexpected Y's + OB, Configuration error Wiring error.
Error 4: Unexpected Y's + W's, Configuration error Wiring error.

Unit Configuration: HEAT ONLY FOR WCS ONLY
Expected inputs: W's.

Detected inputs; Y's, Y's+OB, or OB
ERRORS:
Error 1: Unexpected OB, Configuration error. Wiring error.
Error 3: Unexpected Y'S + OB, Configuration error. Wiring error
Error 5: Unexpected Y'S, Configuration error. Wiring error.

ADDITIONAL SUPPLEMENTARY FEATURES OF THE CONTROL

The control has 3 inputs that can be used to interface with supplemental equipment. These inputs are enabled when 24VAC is applied.



1	HVAC Outputs
2	HVAC Inputs
3	LCD Buttons
4	Temperature
5	Pressure
6	JMP
7	FAN
8	24VAC
9	T-Stat Inputs
10	Leak Detection

Energy Recovery

An Energy Recovery Ventilator can use the [ERV] input to have the K unit run the fan. If the fan is already running, the fan will continue to run at the speed set by the active thermostat inputs. If the fan is not running the fan will run at the [ERV] fan setting.

Humidifier

The Humidifier [HUM] input can be used to have the K control enable an external humidifier by using the [HUMDFR] relay output. The [HUMDFR] relay output is a dry set of contacts. If the fan is running already the fan will continue to run at the speed set by the active thermostat inputs. If the fan is not running the fan will run at the humidifier [HUM] fan setting.

HP Defrost

The DFS terminals on the control board are designed to accept a 24v signal from an outdoor HP during it's defrost cycle. In this mode, if the fan is running already the fan will continue to run at the speed set by the active thermostat inputs. Once the delivered airflow is measured at 300 CFM/ 509.7 m³/hr or greater (verify on the display screen) the W2 relay output will be enabled. If the fan is not running the fan will run at the defrost [DFS] fan settings.

Fault Relay

The fault relay will close under the following conditions:

1. The Float Switch has tripped
2. The blower pressure is less than 0.1"WC/25 Pa
3. The antifrost protection has activated
4. The Leak Detection system senses a refrigerant leak

SYSTEM COMMISSIONING

1. Although delivered static pressure is measured with the integrated control board, it is important to verify an accurate reading, and within acceptable limits (minimum 1.2" W.C./ 299 Pa W.C., maximum 1.5" W.C./ 374 Pa) by using the following steps. You can use a U-tube manometer or calibrated digital manometer to check the external static pressure on the duct system.
   A. Puncture a ¼" diameter hole in the plenum duct at least 18 in/ 457 mm from the fan coil unit.
   B. Insert the high-side manometer tube into the hole so that the end is approximately flush with the inside wall of the plenum, and perpendicular to the direction of airflow.
   C. System static pressure should be between 1.2" and 1.5" WC.
      I. If the pressure is higher than 1.2" W.C./ 299 Pa provide additional supply runs to increase airflow or lower the fan speed by turning the fan speed adjustment for the current mode of operation counter-clockwise to reduce the static pressure.
      II. If the pressure is lower than 1.2" W.C./ 299 Pa, look for leaks in the supply plenum, restrictions in the return system (including clogged filters) If more than the recommended number of supply runs are installed, you may install flow restrictors (orifices) in these runs. If the number of runs is appropriate for the load, increase the static pressure by turning fan speed adjustment for the current mode of operation clockwise to increase the static pressure.

2. Every K series unit has the ability to adjust fan speeds through the control for each individual type of thermostat call (Y1, G, W1 etc...) through the fan balancing menus. Refer to control menus portion of this manual to access these menus. To properly ensure the delivered airflow is adequate for the system, it is recommended that the installer measure delivered CFM/ m³/hr at each outlet and then add for total CFM/ m³/hr in the system. Reference the total CFM/ m³/hr in figure 3.1 and compare for appropriate delivered CFM/ m³/hr. Once the CFM/ m³/hr has been established (adjust the fan speed up or down accordingly) then the installer can move on to properly charging the system with refrigerant. If adjusting the fan speed will not satisfy the CFM/ m³/hr requirements, please refer to the troubleshooting guide for "Improper airflow". Or reach out to technicalservice@spacepak.com for toubleshooting help. **DO NOT TRY TO CHARGE A SYSTEM WITHOUT PROPER AIRFLOW BEING ESTABLISHED.** This can severely affect the overall performance of the system, indoors and outdoors.

3. Place the thermostat in COOL position, which will start the outdoor unit. Let the system run the minimum amount of time identified by the outdoor unit's instructions to stabilize operating conditions.

4. For outdoor unit start-up, follow manufacturer's instructions.

5. Check that temperature drop across evaporator coil in the indoor unit is between 20 to 30°F/ -6.7 to -1.1°C

NOTICE: Do not introduce refrigerant liquid to system through suction port. Liquid in the suction line may damage the compressor.

NOTICE: Before adding refrigerant to system verify steps 1-3 have has been performed.

6. Verify that system refrigerant is correct by measuring subcooling at liquid service port at the outdoor unit. Subcooling should be in accordance with outdoor unit manufacturers recommendations.

7. Check the super heat leaving the evaporator coil against the corresponding suction pressure from the schrader fitting at the fan coil unit. Superheat value should be between 9 to 12°F/ -12.8 to -11.1°C.

8. If a sight glass has been installed on the liquid line at the air handler check for the presence of flashing. If flashing is occuring, check and adjust subcooling by adding refrigerant.

CHARGING COOLING ONLY SYSTEMS

After start-up, allow the system to operate the minimum suggested time per the outdoor unit manufactures installation guidelines in order to establish stable operating conditions. Check that the temperature drop across the evaporator coil is 20 to 30°F/ -6.7 to -1.1°C. Do not attempt to adjust the charge at ambient temperatures below 65°F/ 18.3°C.

Verify and adjust refrigerant charge based upon outdoor unit manufacturer's published recommendations.

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

⚠ WARNING Risk of Fire. Flammable Refrigerant used. To be commissioned and repaired only by trained service personnel. Do not puncture refrigerant tubing. Dispose of properly in accordance with federal and local regulations.

FACTORS AFFECTING THE BALANCE OF THE SYSTEM

A. Room Terminators (Outlets): Based on the equipment selected, determine the recommended number of fully open outlets from Figure 3.1.

FIGURE 3.1

RECOMMENDED OUTLETS AND CFM/ m³/hr								
Model Size	Nominal Tonnage (outdoor unit)	Recommended CFM/ m³/hr per outlet	A			B		
			Number of outlets	Total CFM	Total m³/hr	Number of outlets	Total CFM	Total m³/hr
2430	2	33/ 56.1	12	396	672.8	14	462	784.9
2430	2.5		15	495	841.0	18	594	1009.2
3642	3		18	594	1009.2	21	693	1177.4
3642	3.5		21	693	1177.4	25	825	1401.7
4860	4		26	858	1457.8	28	924	1569.9
4860	5		30	990	1682.0	35	1155	1962.4

DESIRED NUMBER OF TERMINALS*	TERMINAL - ORIFICE COMBINATION
.5	(1) .5
.65	(1) .35
.85	(1) .15
1.00	(1)
1.15	(1) .5 + (1) .35
1.30	(2) .35
1.50	1) .35 + (1) .15 or (1) + (1) .5 or (3) .5
1.65	(1) + (1) .35 or (2) .5 + (1) .35
1.70	(2) .15
1.80	(2) .35 + (1) .5
1.85	(1) + (1) .15
1.95	(3) .35
2.00	(2)

*For a room with more than two (2) terminals, combinations of the above may be used to achieve the desired fractional number.

1. The minimum or recommended number of outlets means fully open outlets. Any outlet having an orifice would be only a percentage of an outlet.

2. For systems with average supply tubing lengths of 15 ft/ 4.57 m or less, use column A. For systems with supply tubing lengths greater than 15 ft/ 4.57 m, use column B.

NOTICE: The number of outlets and average length of the supply tubing has a significant effect on the overall system performance. It is highly recommended that the adjustment factors outlined in the SpacePak Application Manual are accounted for prior to any installation.

B. Orifice Combinations: Should orifices be required to balance the system (installed at plenum take-off), refer to the combinations listed in Figure 3.2.

C. Supply Tubing Length: An outlet with a supply tubing length of 15 ft/ 4.57 m is considered one, fully opened outlet. For other lengths refer to Figure 3.3 for adjustment factors.

FIGURE 3.3

2 in/ 51 mm SUPPLY TUBING LENGTH ADJUSTMENT FACTOR CHART								
RUN	6 ft/ 1.83 m	8 ft/ 2.44 m	10 ft/ 3.05 m	12 ft/ 3.66 m	15 ft/ 4.57 m	20 ft/ 6.10 m	25 ft/ 7.62 m	30 ft/ 9.15 m
FACTOR	1.18	1.14	1.11	1.06	1.0	.9	.8	.66

SECTION 4: MAINTENANCE & TROUBLESHOOTING

The SpacePak 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 SEASON

1. Check and clean air filter. The SpacePak air filter is permanent type. If the filter is the SpacePak filter, remove and clean thoroughly with soap solution and water. If the filter is a field supplied (non-SpacePak filter) follow that manufacturers instructions on how to maintain.

⚠WARNING Turn off electrical power supply before servicing. Contact with live electric components can cause shock or death.

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

   a. Inspect heat exchanger coil and blower wheel for build-up of dust and dirt. Clean with specific indoor coil cleaning products ONLY. Any deviation can void the warranty of the coil.

   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.

IF SYSTEM FAILS TO OPERATE

1. Refer to the troubleshooting guide in this manual.

2. Contact a local HVAC professional.

3. Contact SpacePak technical support.

TROUBLESHOOTING GUIDE
Faults displayed on screen

Display	Description	Possible Causes	Solutions
FLOAT SW FAULT	The primary drain pan float switch has faulted. A Y call to the outdoor unit will not be allowed. Hard lockout, requires a power cycle to reset.	Clogged drain causing float switch to trip	Identify location of clog and clear clog
		Broken float switch	Inspect for damage. Replace as needed
		Wiring disconnected at control board or switch	Use ohm meter to test leads. Manually lift float. If ohm meter is "open" then check wiring or break in wire. Replace/repair as needed.
ANTIFROST FAULT	The anti-frost sensor (located on primary coil) has gone below the "AFST" set point (see flow chart above for setting). This can be seen as "Coil 1 Temp" in the display screen.	Low-Refrigerant Charge	Ensure proper subcooling and charger per outdoor unit manufacturers recommendations
			Refrigerant leak in system. Inspect all refrigerants components to identify is a leak is present. Repair/replace as needed.
		Low airflow	Check return air filter. If dirty,clean/replace filter
			Check for restrictions in ductwork
			Check for proper airflow to the space by measuring delivered CFM/ m³/hr per outlet. CFM/ m³/hr per outlet. in space should be between 30 to 40 CFM/ 51.0 to 68.0 m³/hr per outlet.
			Increase airflow by navigating through menus (see above) and adjusting airflow for the proper input (Y1, Y2, G etc…)
		Sensor is reading incorrectly	Unplug sensor from control board. Read resistance across sensor and use resistance chart (below) to compare against a known temperature. If temperature is reading incorrectly and does not match chart, replace sensor.
LOW PRESS FAULT	The pressure transducer is registering less than 0.1" W.C./ 25 Pa when the fan is running	Hose is pinched or clogged	Verify hose and pressure tap on blower is clear. If hose is pinched, unpinch or replace. If hose/tap is clogged, unclog or replace.
		Pressure transducer has failed	Remove hose from blower port. Technician can blow into hose end that is connected to the blower and verify if display on board registers a pressure. If no pressure, replace board.
TRANSDUCER FAULT	The pressure transducer has failed	Damage	Inspect transducer for damage. Replace control board
OPEN COIL 1	The coil 1 temperature sensor is open	Damage	Inspect wiring and sensor to determine if coil one sensor has been damaged. If damaged, replace sensor
		Loose wire	The coil 1 sensor should be secured tightly to the terminals on the control board. Is loose, retighten.
SHORTED COIL 1	The coil 1 temperature sensor is shorted	Damage	Inspect wiring for knicks or cuts that could be causing a short
OPEN COIL 2	The coil 2 temperature sensor is open	Damage	Inspect wiring and sensor to determine if coil one sensor has been damaged. If damaged, replace sensor
		Loose wire	The coil 2 sensor should be secured tightly to the terminals on the control board. Is loose, retighten.
SHORTED COIL 2	The coil 2 temperature sensor is shorted	Damage	Inspect wiring for knicks or cuts that could be causing a short
OPEN LAT	The leaving air temperature sensor is open	Damage	Inspect wiring and sensor to determine if coil one sensor has been damaged. If damaged, replace sensor
		Loose wire	The coil 1 sensor should be secured tightly to the terminals on the control board. Is loose, retighten.
SHORTED LAT	The LAT temperature sensor is shorted	Damage	Inspect wiring for knicks or cuts that could be causing a short
COIL 1 NOT FOUND	If the board does not recognize a signal from the "coil 1" terminals. The unit will automatically then default and run the fan after the "fan on delay" timer has expired.	Disconnected sensor	Re-connect sensor
		No sensor	Add sensor
COIL 2 NOT FOUND	If the board does not recognize a signal from the "coil 2" terminals. The unit will automatically then default and run the fan after the "fan on delay" timer has expired.	Disconnected sensor	Re-connect sensor
		No sensor	Add sensor
HWC DISABLE	The coil 2 sensor is recognized and connected, but the SEC HW COIL is disabled	Incorrect programming	If a secondary hot water coil is installed, navigate through the menu tree to enable the "SEC HW COIL" function/feature.
		Sensor place in wrong location	A sensor is wired into the "coil 2" location incorrectly. Remove sensor and relocate to proper location.
DEFROST	The air handler has received a signal from the outdoor unit that the outdoor unit has gone into defrost	Outdoor unit has sent a defrost signal	If outdoor unit has sent a defrost signal, then normal operation. If outdoor unit has not sent a defrost signal, inspect for shorted wires from air handler to outdoor unit. Replace board if no short and unit is not sending a signal.
REFRIGERANT LEAK	One of the leak detectors has sensed a significant refrigerant leak.	The refrigerant coil or associated plumbing has failed and is leaking refrigerant.	Immediately identify the source of the leak, recover any remaining refrigerant, and conduct repairs in accordance with proper A2L Refrigerant procedures.

Project Complaints/Conditions*		
Problem	Possible Cause	Corrective Actions
Poor Cooling	Refrigerant Leak	Check for refrigerant leaks in all refrigerant components. Repair leaks (as needed) per standard refrigeration practices
	Improper charge	Check for proper refrigerant charge. Charge to proper subcooling according to condenser manufacturers instructions
	Evaporator coil dirty	Check for a dirty evaporator coil. Clean evaporator coil using only evaporator approved cleaning solutions
	Return air filter is dirty	If the return air filter is dirty. Inspect, clean or replace as needed
	Low airflow	Inspect ductwork for damage or leakage of airflow. Repair as needed
		Adjust fan speed (per this manual) for each outlet to achieve a minimum of 33 CFM/ 56.1 m³/hr per outlet
		Add more outlets if required (minimum of 7/ton)
	Improperly sized equipment.	Verify required Btu's by performing a heat loss calculation for the space. Compare to the equipment installed.
Blower Will Not Run	No call from thermostat at board	See "No Thermostat Call Displayed on Board" flowchart for troubleshooting steps
	Coil not at temps	The blower will not start unless the proper coil temp for the thermostat call (heating or cooling) See "Coil not at proper temps" flowchart for more troubleshooting steps
	Verify proper voltage	Using the wiring diagram in this manual, identify the line voltage terminals going to the blower. Using a calibrated voltmeter, verify proper voltage to blower. 240V is standard, if unit has been converted for 115V then 115V should be applied to the blower. See "Improper voltage" flowchart for more troubleshooting steps
	Static Pressure Hose may be kinked	From the main screen on the display, press the "up" or "down" keys to find "S.P" reading. If blower is not running and the screen is displaying a measure reading, then hose is kinked. Trace hose to locate the kink and repair. If hose is not kinked, replace control board
	Unit not commissioned properly	Using the menu tree in this manual, verify the unit has been commissioned properly for the application.
	Unit speed or static pressue set point set incorrectly	Using the menu tree in this manual, verify that the blower is set to the proper speed or SP set point for the appropriate thermostat input. Y1, G, Y2 etc…
Control Board not powered	Improper Voltage	Ensure all wiring is proper per wiring diagrams. The board requires 24V from transformer to power up. Repair as needed. See flowcharts "No thermostat call" and "Improper voltage" in this manual for more troubleshooting steps.
	Faulty Control Board	If wiring has been confirmed to be good, no loose connections, then replace control board.
Auxilliary terminal not closing	Improper commissioning	Using the menu tree in this manual, verify the auxilliary terminals have been commissioned to close per the desired thermostat call.
	Faulty Control Board	If board is properly commissioned, and LED light for auxilliary terminal is illuminated, then replace control board.
Coil is freezing	No airflow	See "Blower will not run" above.
	Low airflow	Measure delivered airflow to the space and compare against "Required CFM/ m³/hr table in this manual. If low, adjust accordingly
		Dirty air filter. Clean/replace as needed
		Dirty evaporator coil. Clean as required
		Inspect ductwork for damage or leakage of airflow. Repair as needed
	Refrigerant Leak	Check for refrigerant leaks in all refrigerant components. Repair leaks (as needed) per standard refrigeration practices
	Improper charge	Check for proper refrigerant charge (with proper airflow established). Charge to proper subcooling according to condenser manufacturers instructions
Sweating at Supply Outlet	Air Leak at Supply Air Plenum	Check taped joint at adapter. Tape joint properly if necessary.
	Insulation at Outlet not Installed	Check for insulation at the outlet. Make repairs if necessary.
Excessive Noise at Terminator	High Supply Air Plenum Static Pressure	Check static pressure and compare to the table provided in this manual. Check for and add flow restrictors as necessary in supply runs.
		Check static pressure and compare to the table provided in this manual. If necessary, add additional outlets.
	Sound Attenuating Tube not Installed	Check for installation of sound attenuating tube. Where necessary, install sound attenuating tube.
	Tight Radius in Sound Attenuating Tube or in Supply Tubing	Check all tubing for tight radius. Where necessary, correct radius.
	Incorrect Supply Tubing Length	Check that all supply tubing runs are 9 ft/ 2.75 m minimum (including the 3 ft/ 0.92 m sound attenuating tube). Where necessary, correct supply tubing length.
	Improperly Balanced System	Check that correct size orfices have been installed. If not, properly orfice supply tubing runs.
Excessive Noise at Return Air Grill	Return Air Duct Not Installed Properly	Check for minimum 90° bend in return air duct. If minimum requirement not met, correct the bend in the return air duct to the 90° minimum.
	Dirty Return Air Filter	Remove and inspect the return air filter. Clean or replace filter as needed.
Excessive Vibration	Foreign Matter in Blower Wheel	Check for loose or damaged blower wheel. Replace Blower Assembly of necessary.
	Blower Wheel Damaged or Unbalanced	Remove and Inspect Blower Assembly. Remove and foreight matter and retest fan vibration.

* The table above explains the most common symptoms and solutions for SpacePak troubleshooting. Please reach out to technicalservice@spacepak.com if the problem is not resolved using this table.

TROUBLESHOOTING FLOW CHARTS

The **REFRIGERANT LEAK** message indicates that a significant amount of refrigerant vapor has been detected inside the air handler. Once the vapor has been dispersed, the sensor will self reset, and the K Series control will maintain the blower operation for an additional five minutes, then stop.This sequence will repeat as many times as necessary if the sensors detect refrigerant again, therefore the unit will be prevented from restarting normal operation until the control is manually reset. At this time, it should be noted that the amount of refrigerant lost has rendered the system inoperable and any continued attempts to operate will result in equipment damage of the indoor air handler or outdoor Heat Pump, so it is imperative that the leak is identified and repaired before the system is used again.

Once the leak has been identified and repaired, and the system recharged with the correct amount of refrigerant in accordance with A2L Refrigerant procedures, the **REFRIGERANT LEAK** fault can be cleared and the unit returned to normal operation.

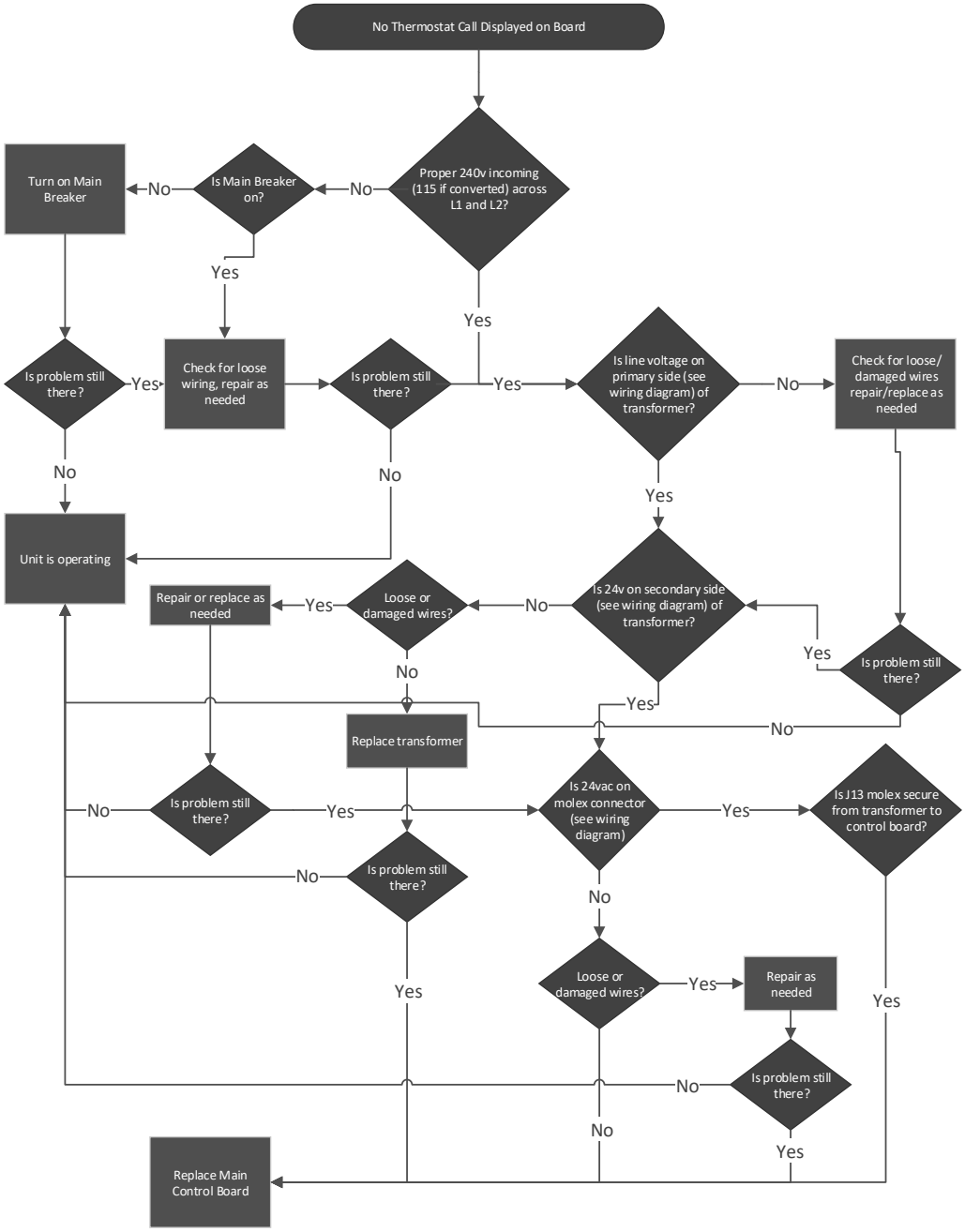
The **REFRIGERANT LEAK** message will remain, and operation will be prevented, even if all power is removed from the unit.

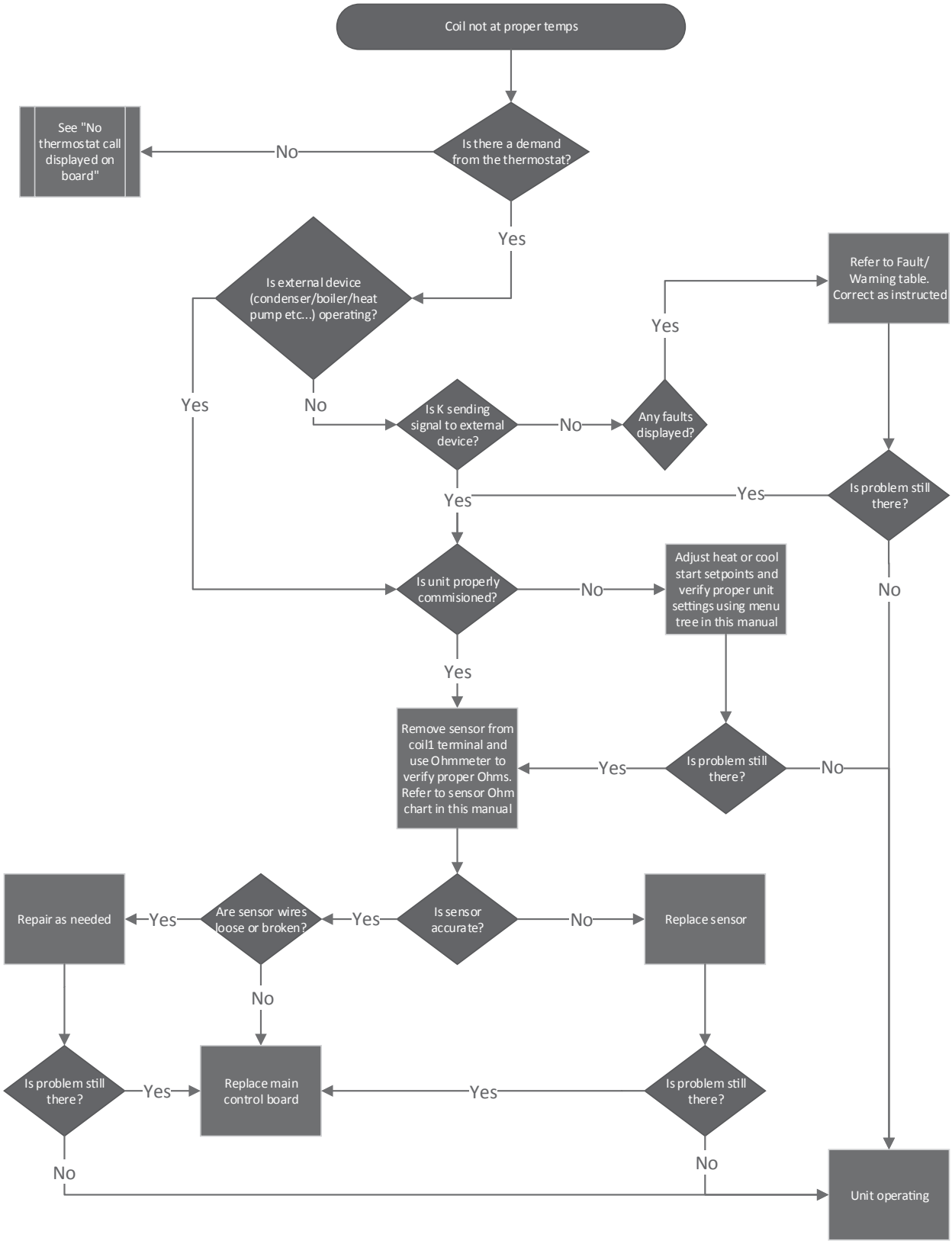
Therefore, to clear the **REFRIGERANT LEAK** fault, (after the condition has been corrected). With the unit powered and the **REFRIGERANT LEAK** message visible, press and hold the SEL button for three seconds. **RESET COMPLETED**, and PRESS ESC messages will be displayed. Press and hold the ESC key for ~1 second and the display will return to the home screen.

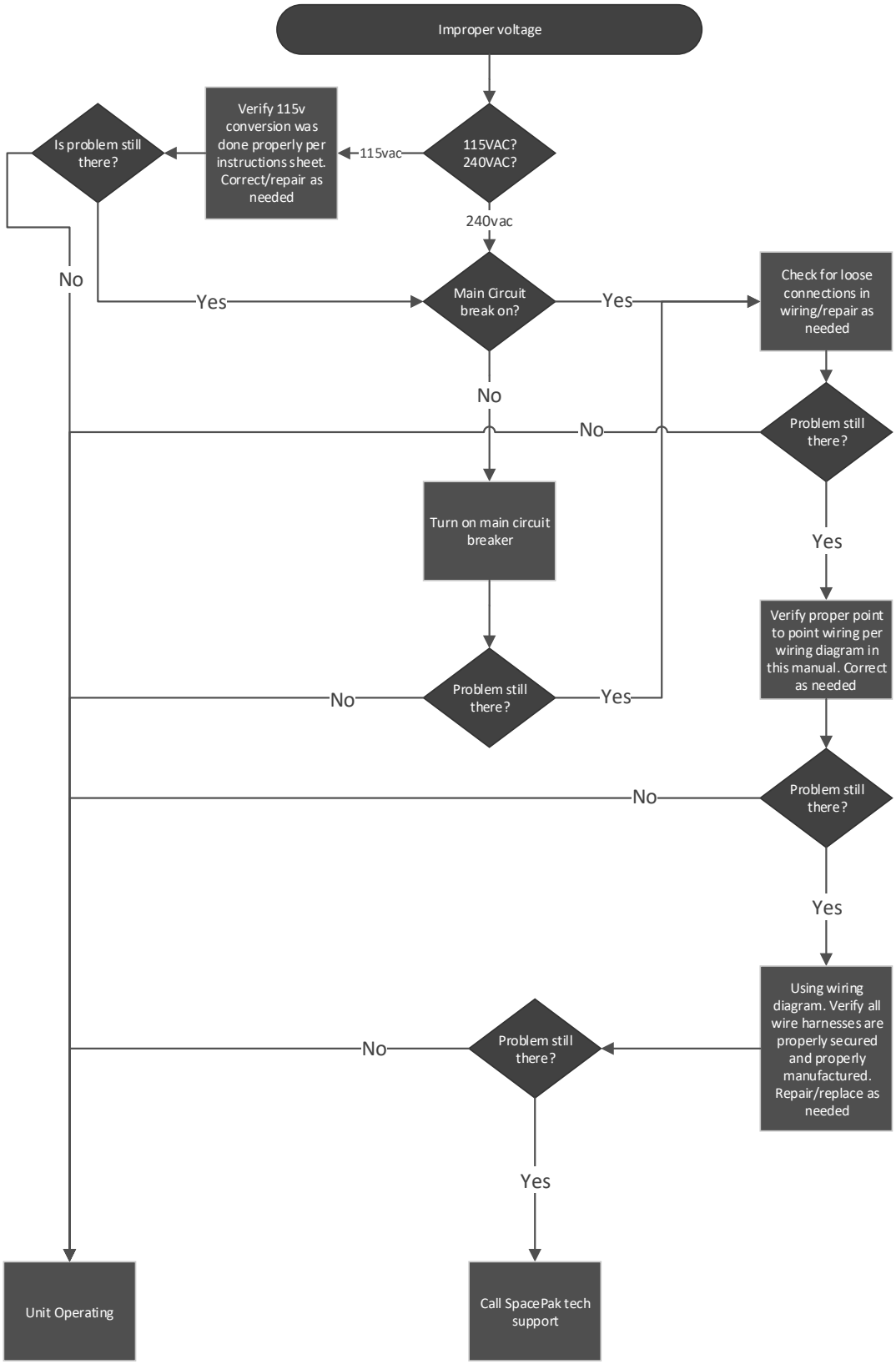
The Refrigerant Leak Detectors, one each for R32 and R454B are installed, are self calibrating devices designed for a minimum of 15 years service.

The manufactured date is noted as a 4 digit number consisting of the first two characters representing the Month (01 -12) and the last two characters the year (24 or later). When the time in service has exceed 15 years,or the device has been diagnosed as failed, it can only be replaced by the same brand and model as the original, or a direct replacement identified by the manufacturer.

For any service and repair involving the refrigerant plumbing, coil, valves or fittings, refer to the Technical Service Guidelines section following the troubleshooting flowcharts below.




Coil not at proper temps
Is there a demand from the thermostat?
No
See "No thermostat call displayed on board"
Yes
Is external device (condenser/boiler/heat pump etc...) operating?
Yes
No
Is K sending signal to external device?
No
Any faults displayed?
Yes
Refer to Fault/ Warning table. Correct as instructed
Yes
Is problem still there?
Yes
No
Is unit properly commisioned?
No
Adjust heat or cool start setpoints and verify proper unit settings using menu tree in this manual
Yes
Remove sensor from coil1 terminal and use Ohmmeter to verify proper Ohms. Refer to sensor Ohm chart in this manual
Yes
Is problem still there?
No
Is sensor accurate?
Yes
Are sensor wires loose or broken?
Yes
Repair as needed
No
Replace sensor
Is problem still there?
Yes
Replace main control board
Yes
Is problem still there?
No
No
Unit operating


Improper voltage
115VAC? 240VAC?
115vac
Verify 115v conversion was done properly per instructions sheet. Correct/repair as needed
Is problem still there?
No
240vac
Yes
Main Circuit break on?
Yes
Check for loose connections in wiring/repair as needed
No
Problem still there?
No
Turn on main circuit breaker
Yes
Verify proper point to point wiring per wiring diagram in this manual. Correct as needed
Problem still there?
No
Yes
Problem still there?
No
Yes
Using wiring diagram. Verify all wire harnesses are properly secured and properly manufactured. Repair/replace as needed
Problem still there?
No
Yes
Unit Operating
Call SpacePak tech support

Refrigerant Leak Detector behavior and troubleshooting:

All information below applies to both the R32 sensor and the R454B sensor.		
LED Indicator codes	**Cause**	**Action**
Steady Green	Warmup at power on	None, this is normal behavior at startup
Flashing Green	Normal operation	None
Steady Yellow	Power up Self Test fail	Cycle power to the entire unit. If this does not correct the condition, replace the sensor.
Flashing Green & Yellow	Sensor nearing end of life	Unit will continue to operate. Order sensor and schedule replacement.
Flashing Red, Resettable	Internal Diagnostic Fail	Cycle power to the entire unit. If this does not correct the condition, replace the sensor.
Flashing Red, Not Resettable	Sensor is at end of life	Replace sensor
Flashing Red, Not Resettable	Leak detected above min threshold	Isolate unit from refrigearant system. Begin appropriate repair protocol per secion Technical Service Guide. Identify and repair leak.
Steady Green Flashing Yellow	Sensor environment is outside of operating parameters Below -40°F (-40°C) or above 175°F(80°C)	Allow unit to return to normal conditions and fault will reset automatically.

Note: All codes with green will allow unit operation. All others will prevent normal operation.

10k OHM TEMP SENSOR RESISTANCE TABLE (LAT Sensor and Coil Sensor)

°C	°F	W
-40	-40	336,098
-35	-31	242,427
-30	-22	176,803
-25	-13	130,306
-20	-4	97,006
-15	5	72,911
-10	14	55,307
-5	23	42,317
0	32	32,651
5	41	25,395
10	50	19,903
15	59	15,714
20	68	12,493
25	77	10,000
30	86	8,056
35	95	6,530
40	104	5,325
45	113	4,367
50	122	3,601
55	131	2,985
60	140	2,487
65	149	2,082
70	158	1,752
75	167	1,480
80	176	1,256
85	185	1,076
90	194	916
95	203	787
100	212	678

SPACE PAK® **Service / Troubleshooting FORM "1A"**

Customer / Dealer Data:

Name: _____

Address: _____

_____

_____

Tel (day) _____ (eve) _____

Installing Dealer / Contractor:

Name: _____

Tel: _____

Equipment Data:

SPACEPAK Model # ESP_____

SPACEPAK Serial # _____

SPACEPAK Date of Installation: _____

Cond Unit Mfr: _____

Cond Unit Mod #: _____

Rated Capacity: _____ *BTUH/ kW*; SEER: _____

Air-side Data:

Total # of outlets: _____ ; Supply tube length:_____ ft/ m (avg)
(Please sketch duct layout on reverse side of this sheet, noting all fittings and distances, including return duct size / length)

Air Filter: Size (LxHxD) _____

Type (pleated, etc): _____

Is the filter clean? _____ (Y/N)

Static Pressure (Ps) in supply plenum: _____"WG
(Measure at approximately 3 ft/ 0.92 m downstream of blower discharge)

Ps in return duct (downstream of filter, upstream of coil) _____"WG

SpacePak Motor: Amps (measured): _____ Amps

Voltage (measured): _____ Volts

Air Temperatures:

@ Return (indoor ambient): _____°F/ °CDB; _____°F/ °CWB

@ Condensing unit (outdoor ambient): _____ °F/ °C

@ AHU (read 3 ft/ 0.92 m from fan discharge)_____ °F/ °C

@ last supply outlet _____ °F/ °C

Refrigeration-side Data:

Line sizes: Liquid _____ Suction _____

Total equivalent length of lines: _____ ft/ m; Vertical Rise: _____ ft/ m

@ Condensing Unit:

Liquid: _____ psi/ kPa; Temp: _____°F /°C; Subcool: _____°F /°C

Suction: _____ psi/ kPa; Temp: _____°F /°C; Superheat: _____°F /°C

@SpacePak:

Liquid: _____ psi/ kPa; Temp: _____°F /°C; Subcool: _____°F /°C

Suction: _____ psi/ kPa; Temp: _____°F /°C; Superheat: _____°F /°C

Approximate time running before taking readings: _____ Hrs.

Did you adjust the TXV? _____ (Y/N); (If yes, explain):

_____

_____

_____

Refrigerant Charge (if weighed-in): _____ lbs/ kg

R32 / R454B (circle one)

Installed options: (circle one)

sight glass filter/drier zone controls

Other: _____

_____

Water Data: *(where applicable)*

Line sizes: _____in/ mm; Length: _____ft/ m

Water temperatures:

Suppy: _____ °F/ °C; Return _____°F/ °C

Glycol?: _____ (Y/N); % Solution: _____

NOTES: _____

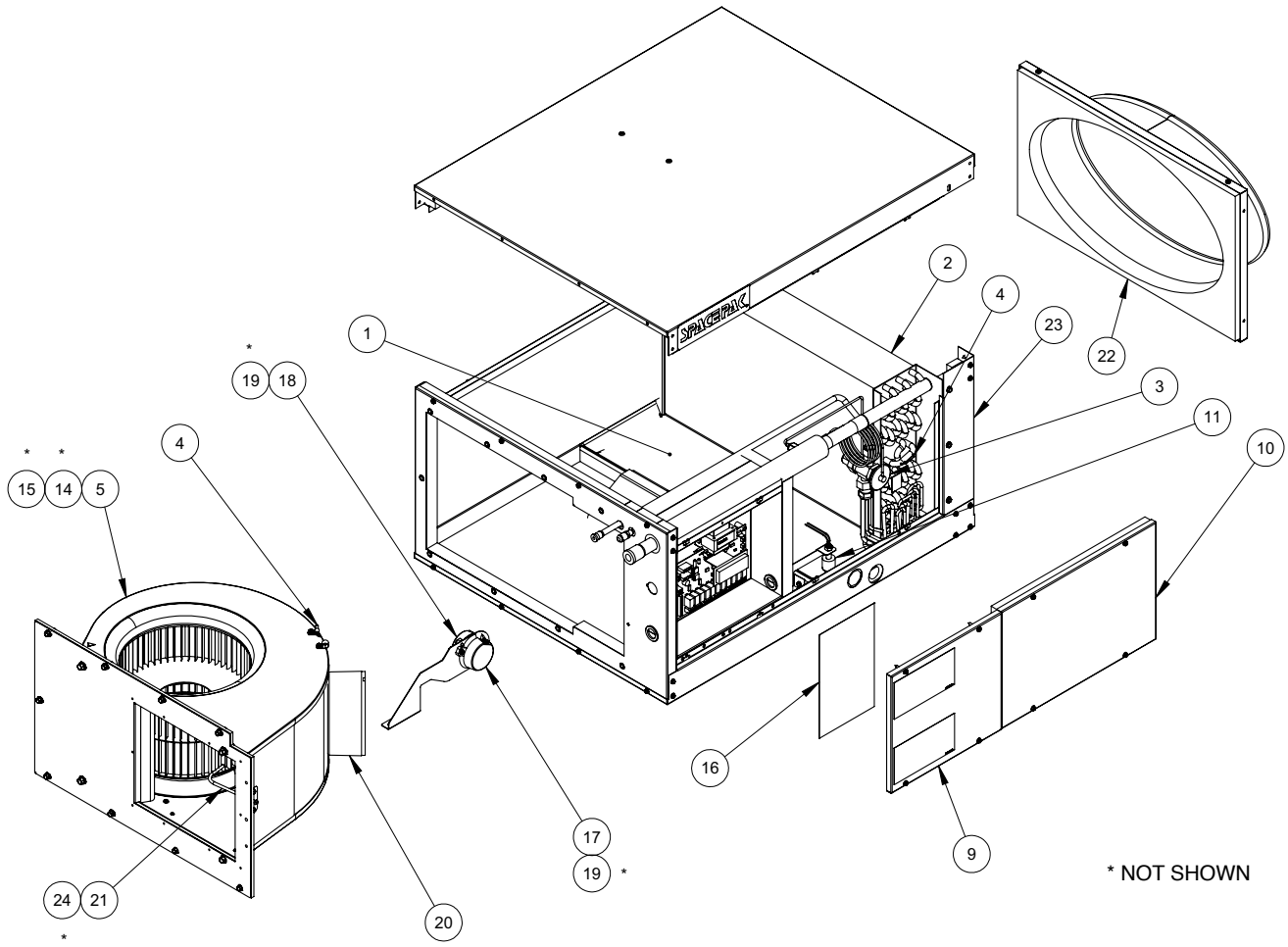
_____

_____

_____

_____

FIGURE 4.1: MODEL ESP-K GENERAL ASSEMBLY



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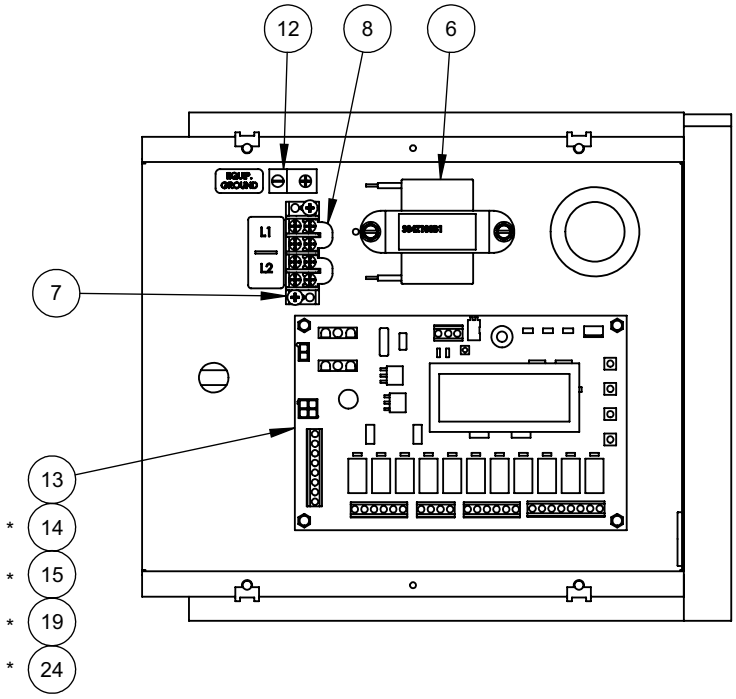
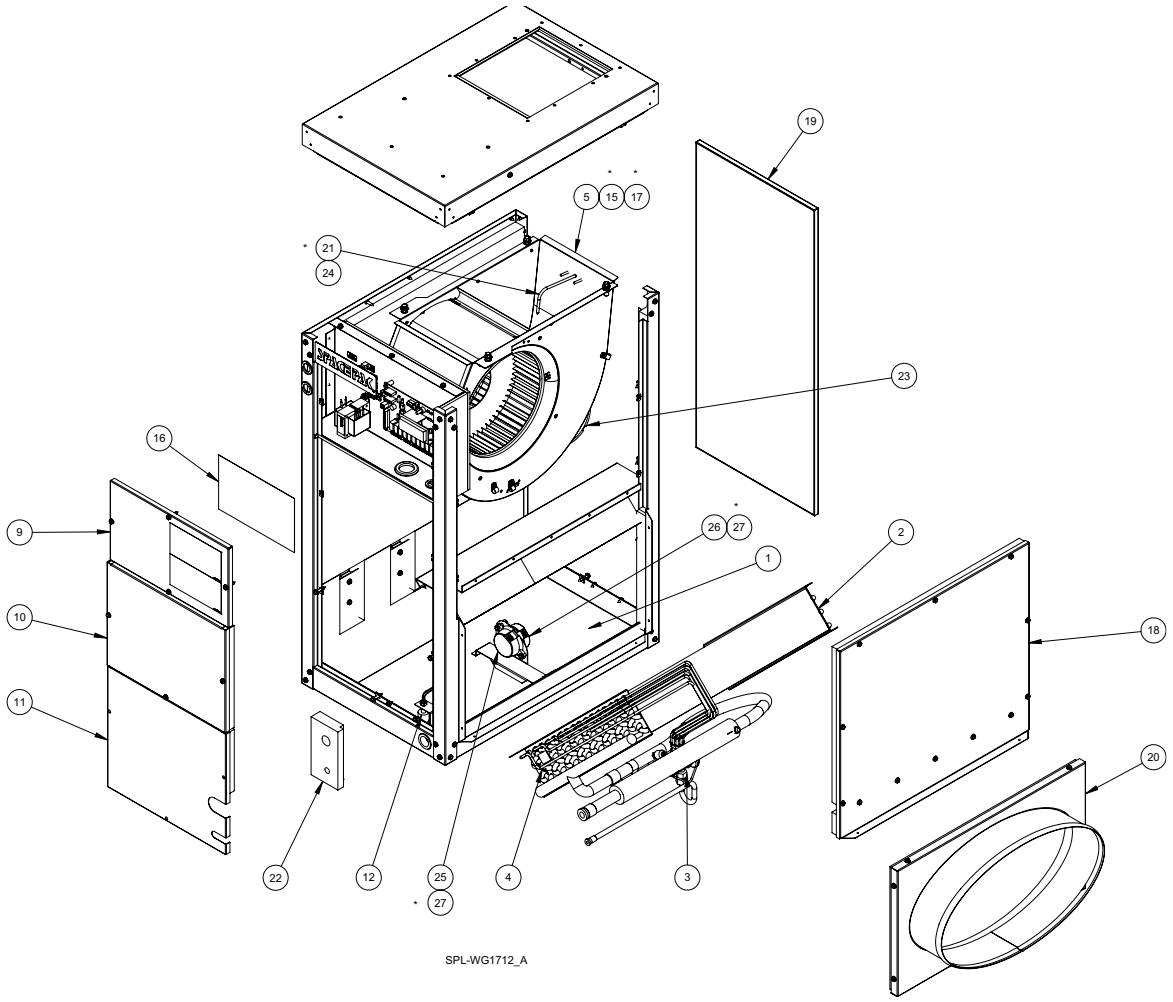


DETAIL OF INTERNAL CONTROL BOX
WITH COVER REMOVED

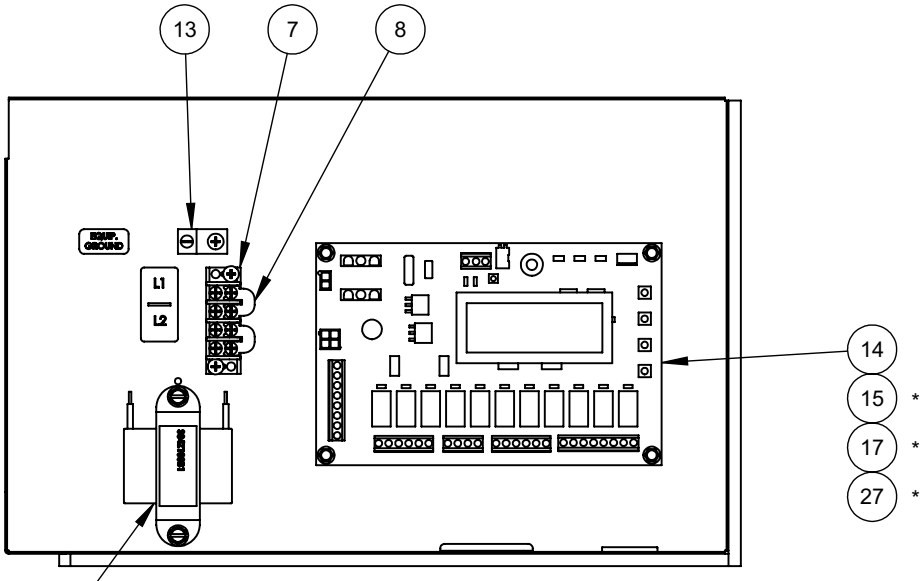
Replacement Parts - Horizontal Fan Coil Units			
Item	**Part Description**	**Unit Size**	**Part Number**
1	Primary Drain Pan	2430	45W06RWG0220-22
		3642	45W06RWG0220-23
		4860	45W06RWG0220-24
2	Refrigerant Coil Assembly	2430	45469RWG1270-02
		3642	45469RWG1270-03
		4860	45469RWG1270-04
3	Thermal Expansion Valve, Chatleff Connection	2430	45W28RWG0641-02
		3642	45W28RWG0641-03
		4860	45W28RWG0641-04
4	Temperature Sensor	All Sizes	45W09RWG1364-01
5	Blower Assembly	All Sizes	45W35RWG1539-10
6	Transformer	All Sizes	45W14RWG1234-01
7	Terminal Block	All Sizes	45W09RWG1263-04
8	Jumper, Terminal Block	All Sizes	45W09RWG1264-01
9	Electrical Control Box Cover	All Sizes	45462RWG1245-01
10	Coil Access Panel	All Sizes	45462RWG0914-01
11	Primary Float Switch*	All Sizes	45W06RWG0268-01
12	Cable Connector (Ground)	All Sizes	45W09RWG0313-01
13	A2L Series Control Board (Red)	All Sizes	45W11RWG1680-01
15	Wire Harness, Motor Control	All Sizes	45460RWG1235-01
16	Blower Speed Control Cable	All Sizes	45W11RWG0807-01
17	Wiring Diagram	All Sizes	45W49RWG1698-01
18	Refrigerant Leak Detector, R32	All Sizes	45W11-WG1676-32
19	Refrigerant Leak Detector, R54	All Sizes	45W11-WG1676-54
20	Harness Leak Detector, 2 Sensor	All Sizes	45W11-WG1679-02
21	ECM Controller**	All Sizes	45W11RWG1540-10
14	Static Pressure Tap	All Sizes	45W40RWG1192-01
22	Return Air Panel Assembly	2430	45463RWG0708-02
		3642	45463RWG0708-03
		4860	45463RWG0708-04
23	Corner Post ESP Coil	All Sizes	45462-WG0530-01
24	Silicone Tubing, 3/16ID	All Sizes	11H07R01471-002

*Switch only, for full assembly contact TechnicalService@SpacePak.com
** Separate part. Also included with the Blower Assembly

FIGURE 4.2: MODEL ESP-KV GENERAL ASSEMBLY



* NOT SHOWN



DETAIL OF INTERNAL CONTROL BOX
WITH COVER REMOVED

Replacement Parts - Vertical Fan Coil Units			
Item	**Part Description**	**Unit Size**	**Part Number**
1	Primary Drain Pan Assembly	2430	45455RWG1012-02
		3642	45455RWG1012-03
		4860	45455RWG1012-04
2	Refrigerant Coil Assembly	2430	45469-WG1696-02
		3642	45469-WG1696-03
		4860	45469-WG1696-04
3	Thermal Expansion Valve, Chatleff Connection	2430	45W28RWG0641-02
		3642	45W28RWG0641-03
		4860	45W28RWG0641-04
4	Temperature Sensor	All Sizes	45W09RWG1364-01
5	Blower Assembly	All Sizes	45W35RWG1539-10
6	Transformer Assembly	All Sizes	45W14RWG1234-01
7	Terminal Block	All Sizes	45W09RWG1263-04
8	Jumper,Terminal Block	All Sizes	45W09RWG1264-01
9	Electrical Control Box Cover	All Sizes	45456-WG1240-01
10	Center Access Panel Assembly	All Sizes	45458RWG0975-01
11	Coil Access Panel	All Sizes	45458RWG0725-01
12	Primary Float Switch	All Sizes	45455RWG1009-01
13	Cable Connector (Ground)	All Sizes	45W09RWG0313-01
14	A2L Series Control Board (Red)	All Sizes	45W11RWG1680-01
15	Wire Harness, Motor Control	All Sizes	45460RWG1235-01
16	Wiring Diagram	All Sizes	
17	Blower Speed Control Cable	All Sizes	45W11RWG0807-01
18	Blower Access Panel Assembly	2430	45462RWG0691-02
		3642	45462RWG0691-03
		4860	45462RWG0691-04
19	Side Access Panel Assembly	All Sizes	45462RWG1007-01
20	Return Air Panel Assembly	2430	45463RWG0708-02
		3642	45463RWG0708-03
		4860	45463RWG0708-04
21	Tubing, HI-Temp, 3/16” ID	All Sizes	11H07-01471-002
22	Insulation, Coil Tube	All Sizes	45Y06-WG0726-01
23	ECM Controller	All Sizes	45W11RWG1540-10
24	Static Pressure Tap	All Sizes	45W40RWG1192-01
25	Refrigerant Leak Detector, R32	All Sizes	45W11-WG1676-32
26	Refrigerant Leak Detector, R54	All Sizes	45W11-WG1676-54
27	Harness, Leak Detector, 2 Sensor	All Sizes	45W11-WG1679-02

IMPORTANT NOTICE
PRODUCT REGISTRATION & EXTENDED WARRANTY

Extended Warranty Requirements
- Project/Equipment Registration
- Active SpacePak Certified Contractor Status at Time of Installation

To visit the **Product Registration Page**, click or scan the QR code.

Are You Certified?
Check our **Contractor Locator** map to find out.

Benefits of Becoming a SpacePak Certified Contractor:
- Local Leads
- Listed on SpacePak Website
- Sales & Marketing Support
- Pre-Sale Application Support & Load Calculations
- Extended Warranty

SpacePak Offers Factory Authorized Training for Certification On:
- Small Duct High Velocity Equipment
- Air-to-Water Heat Pump & Hydronic Equipment

Available Training Certification - Methods Include:
- Online Webinar Training
- Local Field Training
- Corporate Headquarter Factory Training

For All Training Inquiries, Contact Your Local Spacepak Manufacturers Representative:
https://www.spacepak.com/RepLocator

LIMITED WARRANTY STATEMENT

SpacePak Small Duct High Velocity Air Handlers and Hydronic Fan Coils

Subject to the terms and conditions of this Limited Warranty Statement (the "Limited Warranty"), SpacePak warrants to the original purchaser of the Small Duct High Velocity Air Handlers and hydronic fan coils that:

1) The parts are warranted for a period of one (1) year to the original owner of the System (as such term is defined in part (3) below). If any parts should prove defective due to improper workmanship and/or material for a period of one (1) year from the date of installation, SpacePak will replace any defective part without charge for that part. Replacement parts are warranted for the remainder of the original 1-year warranty period. Parts used as replacement may be of like kind and quality and may be new or remanufactured. Defective parts must be available for SpacePak in exchange for the replacement parts and become the property of SpacePak.
2) Notwithstanding the foregoing, if the System is installed in a residential single-family home by a SPACEPAK CERTIFIED CONTRACTOR the parts will be warranted for five (5) years, to the original owner, so long as the original owner resides in the home. Specifically, if any parts should prove defective due to improper workmanship and/or material for the period listed above from the date of installation, SpacePak will replace any defective parts or compressor without charge for the part or compressor. The replacement parts are warranted for the remainder of the original warranty period. Parts used for replacement may be of like kind and quality and may be new or remanufactured. Defective parts must be made available to SpacePak in exchange for the replacement parts and become the property of SpacePak.
3) For purposes of this Small Duct High Velocity Air Handlers and hydronic fan coils limited warranty, as used herein, the term "System" shall mean the "SpacePak Small Duct High Velocity Air Handlers, hydronic fan coils purchased on or after February 1, 2021, (i) sold from a licensed HVAC representative of SpacePak (and not an unauthorized third party) to the original owner, (ii) installed by such contractor in accordance to local and National regulations in the continental U.S., Alaska, Hawaii, and Canada; (iii) registered on SpacePak's website located at www.SpacePak.com/warranty); and (iv) comprised of SpacePak original components or SpacePak certified components. TO THE EXTENT THAT NON-SPACEPAK OR NON-SPACEPAK CERTIFIED COMPONENTS ARE UTILIZED IN THE SYSTEM, ALL WARRANTIES SHALL NOT BE APPLICABLE.

IN UNITED STATES: 260 NORTH ELM ST. WESTFIELD, MA 01085 (413) 564-5530
IN CANADA: 7555 TRANMERE DRIVE, MISSISSAUGA, ONTARIO, L5S 1L4 (905) 670-5888