INSTALLATION AND OPERATION MANUAL

Wall Mounted Packaged Air Conditioners

Models

3R1C1	**9E1C2**
5R1C1	**13E1C3**
7E1C2	**18E1C4**

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AIRSYS Refrigeration Engineering Technology (Beijing) Co.,Ltd

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Chapter 1: Overview

Thank you for choosing a unit manufactured by AIRSYS REFRIGERATION ENGINEERING TECHNOLOGY (BEIJING) CO., LTD.

The AIRSYS line of wall mounted HVAC systems is optimized for energy efficiency. These systems are uniquely designed for the efficient removal of heat generated by electronics from enclosed shelters. The supply air of the AIRSYS system is delivered from the bottom of the machine and the exhaust is at the top, the opposite of a traditional HVAC system. This "bottom throw" is designed to take full advantage of the fact that hotter air rises. With the exhaust located higher within the shelter, every rotation of the fan removes more heat. The cooler air supplied at the bottom accelerates this natural process. This is just one of many design features that makes the AIRSYS HVAC systems among the most energy efficient in the world.

Another feature that promotes energy efficiency is the robustly designed integrated economizer, described as "free cooling". This feature combines with the powerful controller to provide 100% cooling capacity of the wall pack unit (WPU), consuming ~ 1kW or less whenever the outdoor temperature is a few degrees lower than a predetermined set point. This feature alone can save telecom operators significant utility cost, especially in cool weather climates.

Along with the energy efficiency, these systems are simple to operate, maintain, and service. The AIRSYS design team is committed to listening and responding to the customer community. As a result, these systems have continuously evolved with customer-defined features that have improved the overall quality and the user experience.

Usability features include:

- A functional step test that facilitates complete operational verification in less than 5 minutes

- Simple unobstructed access to all key components for Preventive Maintenance (PM) and servicing

- No need to define compressor orientation as the units can be easily serviced with as little as an 8 inch clearance on either side

- A high level of redundancy in the precision lead/lag controller to enhance reliability

- Completely selectable alarm relays (NC or NO) to enable the system to adapt to the customer's requirements

The AIRSYS WPUs are available in cooling capacities from 1.0 ton through 5.0 ton; however, the sensible cooling capacity of these machines is as much as 40% higher than a traditional machine. An available ordering guide helps to properly match the capacity of the HVAC system to the heat load in the shelter.

Heating elements can also be included per customer requirements in a range from 1.5 kW through 5.0 kW.

With a suite of best in class components from around the globe, the AIRSYS WPU delivers quality and reliability while substantially reducing cost of operation.

Using this Manual

Before attempting to install or start the unit, you should read this manual carefully. Retain this manual for reference for the entire operational life of the unit. This manual provides information on the following general topics:

- Product overview

- System installation including preparation, physical and electrical installation of WPUs and the controller box, and commissioning the system

- System operation, including system alarms, program menus, and advanced troubleshooting

- Preventive maintenance

Documentation Conventions

For safety and to achieve the highest levels of performance, always follow the warnings and cautions in this manual when handling and operating the AIRSYS unit.

🚫**Danger.** Emphasizes hazardous conditions that could cause personal injury or death.

🛈**Warning.** Indicates where the operator must proceed with caution to avoid personal injury or damage to property.

⚠ **Important.** Indicates technical information critical for proper installation or operation.

Table 1 lists symbols and their meaning that may appear on the external packaging.

Table 1: Packaging Symbols

Symbol	Meaning	Symbol	Meaning
⬆⬆	THIS SIDE UP Shows the orientation of the unit.		NO HOOKS Do not use hooks to lift the packed unit.
⟙	FRAGILE Handle with care.		KEEP AWAY FROM HEAT The unit must be kept away from heat sources.
☂	PROTECTAGAINST RAIN: The packaged unit must be stored in a dry place.		DO NOT STACK

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Model Identification

Each unit is identified by a model number, such as M-OD.13E1C3DR410.230/1/60.DC. The elements in the number are explained in

Table 2.

Table 2: Model Number Nomenclature

M-OD.13E1C3DR410.230/1/60.AC
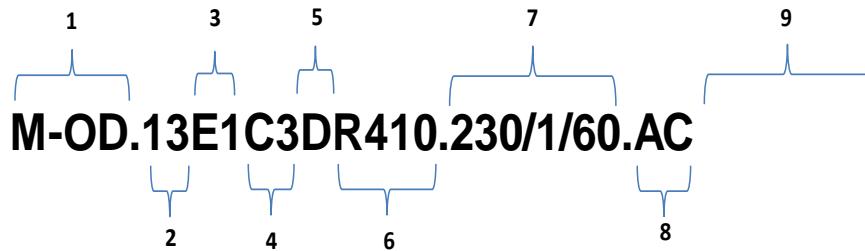
1	M-OD	Product series name: M-OD = MOBILECOOL-OUTDOOR；Packaged air conditioner with fresh air free cooling.
2	13	Unit nominal total cooling capacity in kW
3	E1	Compressor type & number: E1 = Hermetic scroll compressor qty 1; R1= Rotary compressor qty 1
4	C3	Cabinet size code: There are 4 cabinet sizes: C1, C2, C3 & C4.
5	D	Control configuration: D = Unit is designed to operate in a Dual control environment (aka Lead/Lag operation)
6	R410	Refrigerant: R410 = R410a.
7	230/1/60	Power source: Voltage/Phase/Frequency; 230V/1φ/60Hz, 230V/3φ/60Hz, 460V/3φ/60Hz.
8	AC	Supply Fan configuration: DC = DC EC fan; AC = AC EC fan. (EC = Electronically commutated variable speed fan)
9		Special code: Utilized to designate unit customization (non-standard configuration)

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Acronyms and Abbreviations

Table 3 lists acronyms and abbreviations used in this manual.

Table 3: Acronyms and Abbreviations

Term	Meaning
AIRSYS	AIRSYS Refrigeration Engineering Technology (Beijing) Co., Ltd
AAST	AIRSYS Authorized Service Technician
Amp	Ampere, unit of electric current, or rate of flow of electricity
AUT/MAN	Automatic/Manual
BMS	Building Monitoring System
CFM	Cubic Feet per Minute
Com	Common
Comp	Compressor
Cond	Condenser
DC	Direct Current
Gen Run	Generator Run Signal
EC	Electronically Commutated (Referes to variable speed evaporator/supply fan)
Evap	Evaporator
FC	Free Cooling
HVAC	Heating, Ventilation, and Air Conditioning
Humid	Humidity
I/O	Input/Output
IPU	Indoor Packaged Unit
kW	Kilowatt
LED	Light Emitting Diode
MC	Mechanical Cooling
N.C.	Normally Closed
N.O.	Normally Open
pLAN	PCO controller Local Area Network
PLD	Programmable LED Display
PSI	Pounds per Square Inch
PWM	Pulse Width Modulation
R	Read Only
RoHS	Restriction of Hazardous Substances Directive
R/W	Read/Write
Temp	Temperature
VAC	Voltage in Alternating Current
VDC	Voltage in Direct Current
WPU	Wall Packaged Unit

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Product Overview

Unit Operation

The air conditioning system has three key components:

1. The free cooling system

2. The mechanical cooling system

3. The control system

The control system determines the unit's mode of operation: free or mechanical, as shown in Figure 1.

Free Cooling Mode   Mechanical Cooling Mode
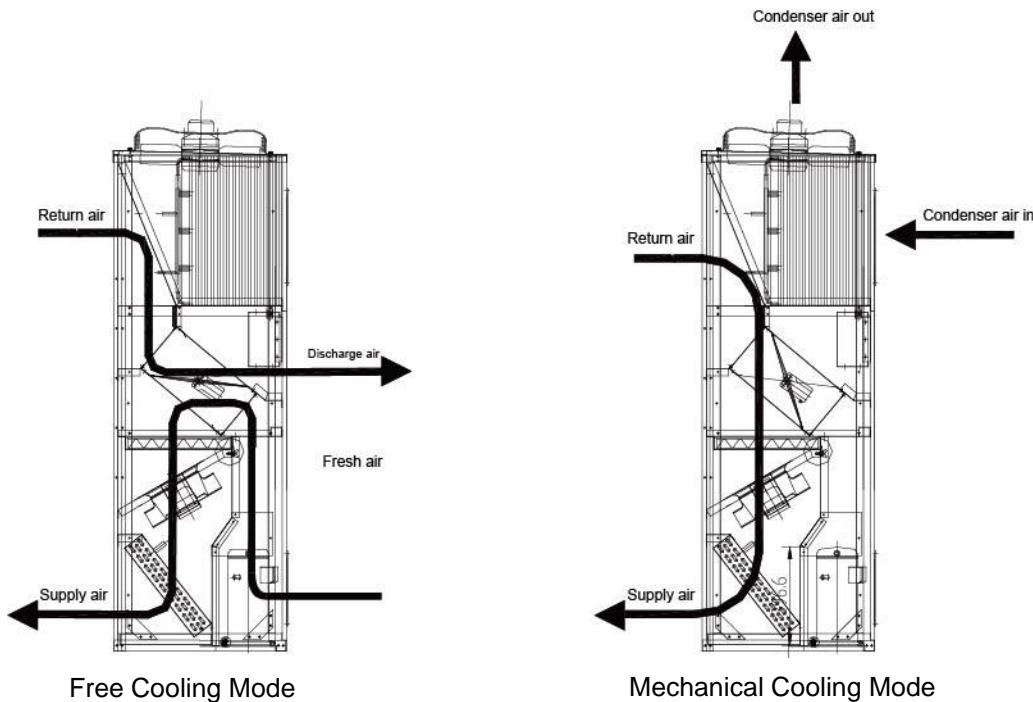
Figure 1: Basic Operating Modes

Free Cooling System

When the operating conditions for free cooling are met, the control system switches the air damper to the free cooling position. Cooler air from outside is delivered to the shelter by the supply air fan. At the same time, hot air in the shelter is discharged to the outdoor environment.

Mechanical Cooling System

When the operating conditions for mechanical cooling are met, the control system switches the air damper to the mechanical cooling position. The compressor compresses the refrigerant gas and sends it to the condenser. The condenser is a heat exchanger, removing heat from the hot compressed gas and allowing it to condense into a liquid.

The liquid refrigerant is then routed to the thermal expansion valve, which acts as a restriction device by forcing the refrigerant to go through a small hole. This causes the pressure to drop. Then the liquid refrigerant is routed to the evaporator. The evaporator is also a heat exchanger, absorbing heat from the indoor hot air causing the liquid refrigerant to change back into gas. The refrigerant gas is then routed back to the compressor to complete the cycle.

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The refrigerant is used over and over again, absorbing heat from the indoor environment and discharging the condenser heat to the outdoor environment.

The Control System (Controller Box)

The AIRSYS controller box is designed to operate a fully or partially redundant air conditioning system for equipment shelters or enclosures. Two variations of the **A**IR**S**YS **L**ead **L**ag **C**ontroller are available: ASLLC.2 & ASLLC.2.48.

ASLLC.2 is standard for HVAC equipped with an AC EC evaporator fan.

ASLLC.2.48 is standard for HVAC equipped with a DC EC evaporator fan.

The controller box is factory programmed with standard industry set points but can be configured on-site to meet specific needs. Settings are retained indefinitely in the event of a power loss.

Ease of Control and Configuration

The controller box has a convenient **P**rogrammable **L**ED **D**isplay (PLD). The PLD and button actions are explained in more detail in Chapter 3 starting on page 48. This three-button PLD is the user interface by which an operator can do the following:

- Check current status of the HVAC system, such as sensor readings and operating mode

- Change factory set points

- Place the system temporarily into *comfort mode*

- Review alarms and alarm history

Labeling on the outside of the controller box provides a convenient guide on how to access the most common functions.

Many of these same functions can be accessed remotely via an RS485 communication interface built into the controller.

Lead and Lag Roles

When mechanical cooling (MC) is required to maintain site temperature, only one unit is called upon to provide the cooling. The unit that has this primary role during MC is referred to as the *lead* unit. The unit functioning in a backup role during periods of MC is referred to as the *lag* unit. After a set period of time, the lead and lag units switch roles. This scheduled change of roles ensures an extended and balanced operational life for each unit. The factory default for the scheduled switch of roles is 168 hours (seven days); however, this can be adjusted using the PLD (1 to 999 hours).

The lag unit will provide MC if the lead unit is unable to maintain site temperature on its own. This MC assistance will occur if the heat load at the site is higher than the cooling capacity of a single WPU or if the system in the lead role is functioning at a reduced capacity. A system in this state should be serviced as soon as possible.

During periods of free cooling (FC), both the lead and the lag units work together. This ensures longer periods of FC which minimizes compressor run time. This design extends the life of the system and reduces energy consumption.

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Chapter 2: Installation

Installation Preparation

Unpack the unit carefully. A number of parts are packed loosely and will be free moving as the packaging is opened. Before discarding the box, check the packaging carefully for any parts or documents inside. Refer to Table 4 on page 9 for the complete list of material shipped with each unit.

Check that:

- The supply voltage meets the requirements as designated:

    AC part: 230 VAC±15%;

    (DC Supply fan only) DC part: 36VDC~57VDC.

- The shelter to be conditioned is clean on the inside, and free of excess dirt and dust.

A minimum clearance of 61 cm (24") between supply air and any equipment/rack or other obstruction is recommended since any interference with the airflow will adversely affect the efficiency of the machine.

Also verify that you have all of the items that the installer must provide, listed in Table 5 on page 10.

Installation and startup must be performed by an AIRSYS Authorized Service Technician (AAST).

For more information about the AAST program, please contact:

<div align="center">

Tempest Telecom Solutions
w. http://tempesthvac.com/
ph. 805-879-5432
e. HVACSupport@tempesttelecom.com
136 W. Canon Perdido Street, Suite 100 Santa Barbara CA 93101

</div>

🚫**Danger.** All the installation work must be done by a skilled professional. Installation that does not comply with the instructions herein can result in the loss of warranty coverage. AIRSYS shall not be held liable for any damage caused to persons or objects due to incorrect installation or incorrect operational use of the units.

⚠**Warning.** All the wiring installation must comply with the local compulsory safety standards and building codes under all circumstances.

⚠**Warning.** Outdoor use. Risk of electric shock can cause injury or death: disconnect all remote electric power supplies before servicing

When no longer in use, disposal of equipment and materials must be compliant with the local relevant laws and standards.

Delivery

When your units are delivered, be sure to inspect them to verify that they have not been damaged during transport. Also verify that all requested accessories listed on the purchase order have been included.

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⚠ **Important.** If packages show **any** signs of shipping damage or potential shipping damage, it is very important to annotate *shipping damage* on the Bill of Lading **prior** to signing for the freight. In order to recover for any damage, please take detailed photographs of all the packaging **before** the external packaging is removed. Once detailed photos of the external packaging have been taken, then the external packaging may be removed so the items can be inspected further. Please document with photos any damage to the equipment that relates directly to the damage observed to the external packaging.

Without the detailed photos, it will be very difficult to recover equipment loss.

Warranty

The warranty duration is 12 months from the date of installation. AIRSYS warrants that its products will be free from defects in materials and workmanship for a period of 12 months after installation.

The compressor is to be free from defect in material or workmanship for a period of 60 months from date of installation.

⚠ **Important.** For sites equipped with a generator, when the generator switches to the primary source of power, the instantaneous voltage may become lower. At this time, the compressor may run at a lower voltage which may decrease the compressor's working life. Make sure **the wiring of Gen-Run signal input is connected** which can protect the compressor. The warranty does not cover damage to the compressor caused by repetitive out of specification condition of the supply voltage during compressor operation.

AIRSYS will furnish free of charge replacement parts for any component failures that occur within the warranty period. Customer is responsible for the cost of shipment of replacement material from the US distributor, Tempest Telecom Solutions LLC.

Note: Warranty assumes that an AAST performs the installation and submits the warranty registration card that accompanied the units in shipment. If the warranty registration card was not filled out and returned to the supplier, then the warranty will be assumed to expire 12 months from the date of shipment for all components except the compressor, which will be assumed to expire 60 months from date of shipment.

This warranty does not cover damage to the systems caused by misuse or abuse of the systems such as physical damage due to mishandling. The warranty does not cover damage caused by force majeure.

⚠ **Important.** Any mishandling of the equipment or modifications to the equipment, unless agreed upon in writing by AIRSYS, will void the warranty.

Moving the Unit

Forklifts are recommended for moving, loading, unloading, and positioning the WPU for installation. If bands or ropes are used to create a sling, make sure that excessive force is not applied to the upper edges of the machines or the package to avoid cosmetic or material damage. When using spacing bars, protective materials are required around the units to prevent damage.

To avoid damage to the units while moving or transporting, ensure the units always remain in the upright position.

General Safety Rules

🚫 **Danger.** Do not carry out any operation on the machines if you do not have sufficient knowledge of the operating principles and have not taken all the precautions that permit the system to operate in safe conditions.

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🛑**Warning.** Work on the electric board only after verifying prime power is disconnected. Do not apply power to the machine with the covers removed.

⚠️ **Important.** Before carrying out inspections, maintenance operations, and safety checks, follow all accident-prevention standards such as wearing goggles, gloves, and an appropriate uniform.

Required Materials

AIRSYS Supplied Materials

Table 4 lists all the material supplied by AIRSYS. After opening the package, verify that all items are accounted for. If any material is missing, please contact an AIRSYS distribution center using the following information:

Tempest Telecom Solutions, LLC
Web: http://tempesthvac.com/
Email: HVACSupport@tempesttelecom.com
Phone: 805-879-5432

Table 4: Material Supplied by AIRSYS

Item	Model # or Part #	Qty	Item Description	Comments
Wall Pack Unit Assembly: Two per Shelter				
1	Example: M-OD.13E1C3DR410.230/1/60.AC	1	Wall pack unit	**refer to Table 2: Model Number Nomenclature**
2	2030104200	1	Return air grill	Only included for models 3/5R1C1
	2030104190	1	Supply air grill	
2	8255504110	1	Return air grill	Only included for models 7/9E1C2
	8255504120	1	Supply air grill	
2	8255503240	1	Return air grill	Only included for models 13E1C3
	8255503230	1	Supply air grill	
2	8255504090	1	Return air grill	Only included for models 18E1C4
	8255504100	1	Supply air grill	
3	8553703300	24	Self-tapping screw ST4.2*25	For the supply and return air grill installation
Controller Box Assembly: One per Shelter				
4	2040303110 or 2040307640	1	Controller box	Model: ASLLC.2 or ASLLC.2.48
5	9000000357	1	Indoor temperature sensor	One end connected inside the controller box
6	9000000357	1	Backup Indoor temperature sensor	One end connected inside the controller box
7	9000000357	1	Outdoor temperature sensor	One end connected inside the controller box
8	8454020720	1	Humidity sensor	One end connected inside the controller box
9	8458716820	1	Sensor box	For housing outdoor temperature sensor and mounting on outside wall
10	1170104040	1	Installation and Operation Manual	
11	1110212510	1	Registration card	Must be returned according to instructions on page 39

Item	Model # or Part #	Qty	Item Description	Comments
12	1110212560	2	Compressor removing bracket sticker	To remind the service technician to remove the compressor bracket before turning on the HVAC unit.
13	9000000357	2	Supply air temperature sensor	
14	8458716650	4	Temp sensor hold connector	
15	1050500720	2	Right angle supply air temp sensor mounting bracket	

Installer Supplied Material

Table 5 lists items required for installation that must be supplied by an AIRSYS Authorized Service Technician (AAST). The wire length and gauge depends on site-specific conditions. However, recommendations are provided.

Table 5: Materials Supplied by the Installer

No.	Item	Qty	Description	Comments
1	AC power supply cable to two WPUs	2	2 cables for two WPUs, AC part (compressor & heater)	Refer to Summary Electrical Ratings
2	DC power supply cable to two WPUs (If the HVAC is equipped with DC EC supply fan)	2	2 sets of three –wire cable for two WPUs DC part (supply fan).	Refer to Summary Electrical Ratings
3	DC power supply cable to controller box	1	A set of two-wire cable for WPU controller box	Max current capacity 0.5 Amps; 18 gauge recommended
4	Control harness from controller box to WPU	2	Control harnesses with 13 wires from controller box to each WPU	Terminals recommended but not required. 18 gauge recommended
5	Alarm wiring harness	5	1 cable with 2 wires, length as needed	Alarm connection to controller box, 3 alarm inputs and 4 alarm outputs; all alarm connections are optional
6	Supply air frame	2	Refer to Figure 23: Frame Dimensions on page 78 for size details for each model	Built inside wall to facilitate air flow
7	Return air frame	2	Refer to Figure 23: Frame Dimensions on page 78 for size details for each model	Built inside wall to facilitate air flow
8	Adhesive tape	A/R	With single-sided adhesive	Used to line the return and supply air frames
9	Silicone sealant	A/R	Commercial grade outdoor silicone sealant	
10	Weather stripping	A/R	Commercial grade neoprene weather stripping or equivalent Recommend a minimum of 25 mm (~1") wide and 20 mm (~0.8") thick	Used to frame the WPU outlet and inlet to create a weather tight seal
11	Terminals	52		Recommended for ease of terminal block installation; however, not required
12	Crimping pliers	A/R		Only needed when using terminals
13	Nylon zip-tie	1	Small nylon zip tie	For properly dressing cables and harnesses
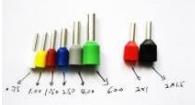
No.	Item	Qty	Description	Comments
14	Breakers for AC power panel	3	One **10** amp circuit breaker for ASLLC.2; One circuit breakers each for the two WPUs AC part, amperage based on model number	Refer to Table 6: WPU Electrical Ratings on page 11
15	Breakers for DC power panel (only if ASLLC.2.48 is chosen and the HVAC is equipped with DC EC supply fan)	3	One **10** amp circuit breaker for ASLLC.2.48; One circuit breaker each for two WPUs DC part, amperage based on model number	Refer to Table 6: WPU Electrical Ratings on page 11

Summary Electrical Ratings (Wire Sizing)

Table 6: WPU Electrical Ratings

ELECT. HEAT		1.5 KW				2.4kW				5 KW			
		AC		48VDC		AC		48VDC		AC		48VDC	
Model		MCA	MFS	MCA	MFS	MCA	MFS	MCA	MFS	MCA	MFS	MCA	MFS
AC Supply Fan, Single Phase AC Power Supply													
M-OD	3R1C1DR410.230/1/60.AC	10	15	--	--	15	20	--	--	--	--	--	--
	5R1C1DR410.230/1/60.AC	11	15	--	--	15	20	--	--	--	--	--	--
	7E1C2DR410.230/1/60.AC	--	--	--	--	17	25	--	--	31	35	--	--
	9E1C2DR410.230/1/60.AC	--	--	--	--	--	--	--	--	31	35	--	--
	13E1C3DR410.230/1/60.AC	--	--	--	--	--	--	--	--	32	40	--	--
	18E1C4DR410.230/1/60.AC	--	--	--	--	--	--	--	--	37	55	--	--
DC Supply Fan, Single Phase AC Power Supply													
M-OD	9E1C2DR410.230/1/60.DC	--	--	--	--	18	30	7	10	28	35	7	10
	13E1C3DR410.230/1/60.DC	--	--	--	--	--	--	--	--	28	40	14	20
DC Supply Fan, Three Phase AC Power Supply													
M-OD	13E1C3DR410.230/3/60.DC	--	--	--	--	--	--	--	--	17	25	14	20

Note: This chart should be used as a general guideline for estimating the conductor size and over-current protection. Always refer to the data label on the unit for sizing the conductors and over-current protection.
MCA = Minimum Circuit Ampacity (Wire Size Amps). MFS = Maximum Fuse Size or HACR circuit breaker.

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Physical Installation

To assist in the installation process, the following figure and table provide the schematic dimensions of the units using a dimensional tolerance of ± 1/16" (2 mm).
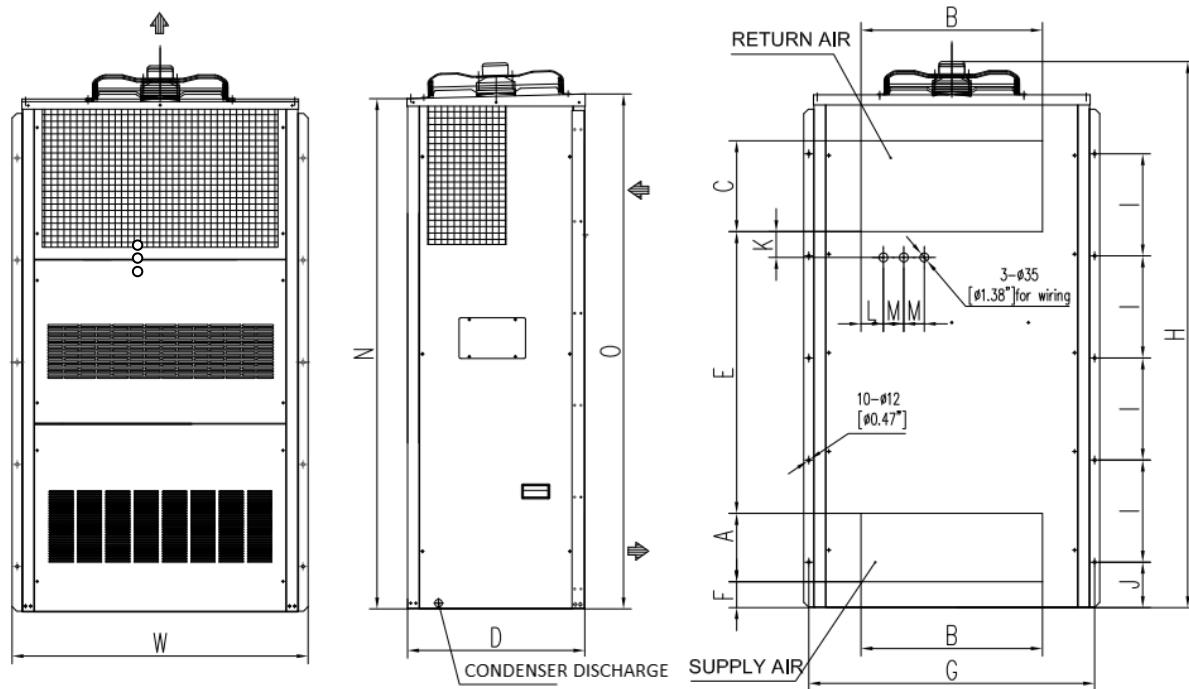
Table 7: External Dimensions of Basic Unit for Architectural and Installation Requirements (Nominal)

Cabinet Size		C1		C2		C3		C4	
Unit of measurement		mm	in	mm	in	mm	in	mm	in
Width (W)		700	27.6	1010	39.8	1160	45.7	1360	53.5
Depth (D)		620	24.4	700	27.6	700	27.6	700	27.6
Height (H)		1930	76.0	2130	83.9	2130	83.9	2130	83.9
Supply	A	200	7.9	268	10.6	268	10.6	268	10.6
	B	450	17.7	708	27.9	759	29.9	880	34.7
Return	C	300	11.8	356	14.0	356	14.0	356	14.0
	B	450	17.7	708	27.9	759	29.9	880	34.7
	E	1000	39.4	1104	43.5	1104	43.5	1104	43.5
	F	133	5.2	101	4.0	101	4.0	101	4.0
	G	660	26.0	970	38.2	1120	44.1	1320	52.0
	I	350	13.8	400	15.8	400	15.8	400	15.8
	J	226	8.9	178	7.0	178	7.0	178	7.0
	K	101	4.0	101	4.0	101	4.0	101	4.0
	L	87	3.4	87	3.4	112	4.4	112	4.4
	M	80	3.2	80	3.2	80	3.2	80	3.2
	N	1800	70.9	1999	78.7	1999	78.7	1999	78.7
	O	1815	71.5	2017	79.4	2017	79.4	2017	79.4

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Select the Wall for Installing the Unit

Select the wall where the unit will be installed. Be certain that the wall can support the weight of the unit and that sufficient space is available for easy operation and installation, both inside and outside the mounting location. Refer to Table 7 on page 12 and Table 8 below for dimensions and weights by model number.

Leave at least:

- 1200mm (47.24") free space in front of the unit

- 400mm (15.75") free space at the side of the unit (minimum of 205 mm (8")

If any protrusions will hang over the unit covering any portion of the exhaust fans, you must leave a minimum of 1000mm (39.37") free space above the unit.
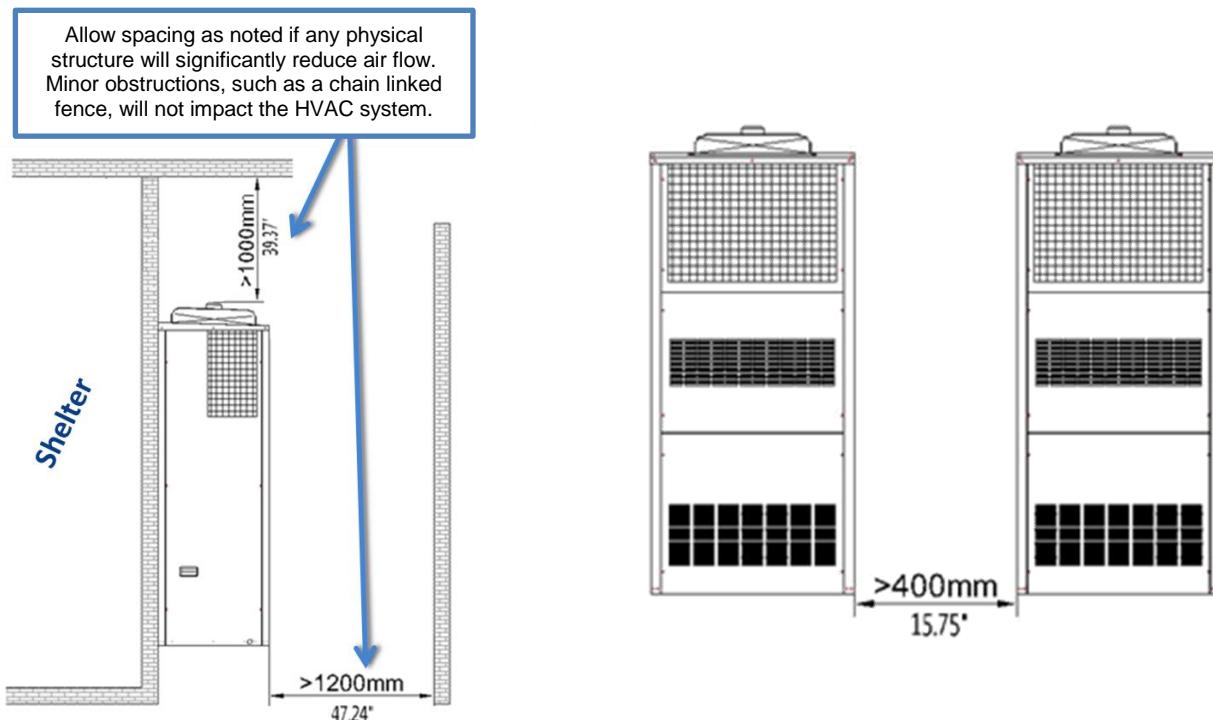
Figure 2: Working Space

Table 8: Dimensions and Weight by model number

			1 Ton	1.5 Ton	2 Ton	2.5 Ton	3.5 Ton	5 Ton
	Model		**3R1C1**	**5R1C1**	**7E1C2**	**9E1C2**	**13E1C3**	**18E1C4**
Dimensions & Weight	Width	in	27.56	27.56	39.76	39.76	45.67	53.54
	Depth	in	24.41	24.41	27.56	27.56	27.56	27.56
	Height	in	75.98	75.98	83.86	83.86	83.86	83.86
	Weight	lbs	355	370	515	530	615/635*	712
*3.5 Ton (13E1C3) AC WPU = 615 lbs / 3.5 Ton (13E1C3) AC WPU = 635 lbs

⚠ **Important.** The wall selected for the unit must be strong enough to support both the static weight of the unit and the vibration of a unit under operation.

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Make Openings and Holes

Make openings for supply and return air and cable and bolt holes in the installation wall as shown in Figure 3 and Figure 4; refer to Table 7 on page 12 for dimensions.

Figure 3: Left Side View

> **Note**: You may use template printed on the shipping carton to create wall cuts.
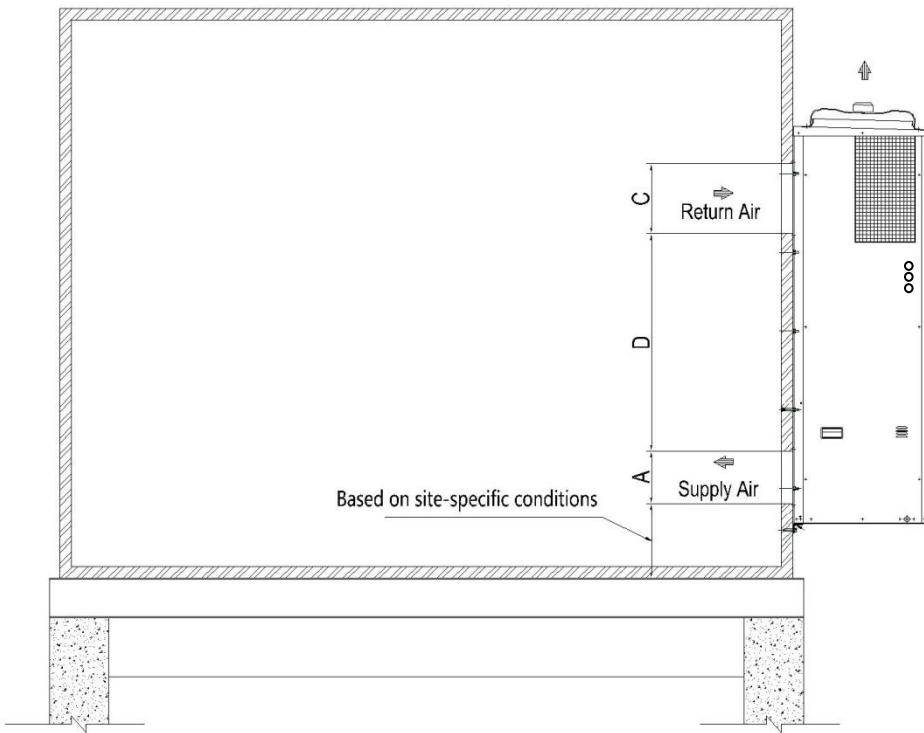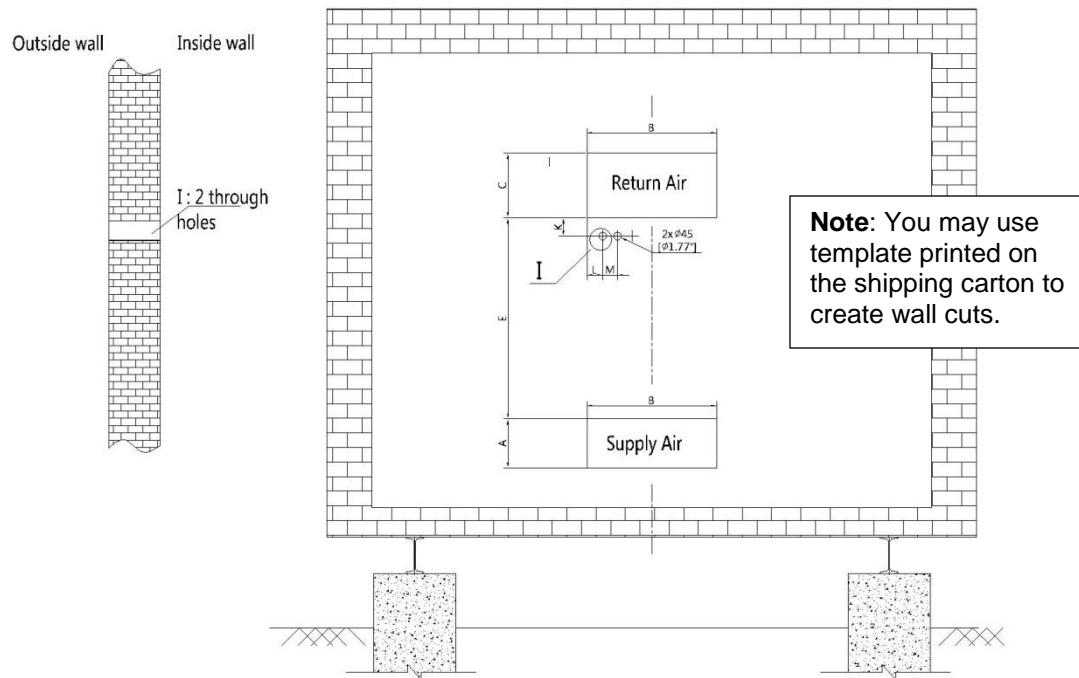
Figure 4: Openings and Holes in the Wall

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Install Weather Stripping

Before mounting the unit on the outside wall, fix the neoprene weather stripping (installer provided) around the openings of the air supply and the air return to ensure an airtight closure, as shown in Figure 5.
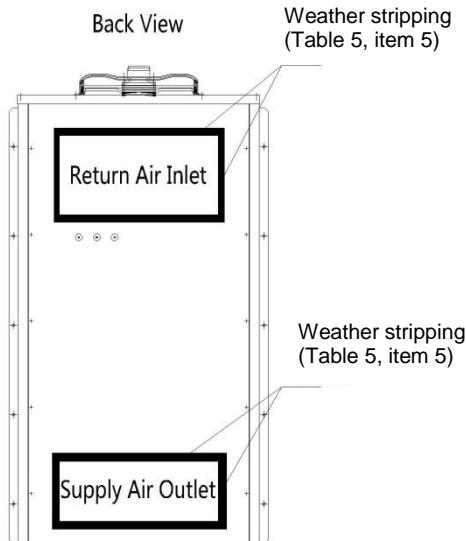
Figure 5: Install Weather Stripping

Position the Unit

⚠ **Important.** The unit is heavy. Exercise caution while putting the unit in place to prevent damage to the WPU or personnel.

The unit must be installed in a level position. An inclination of more than 6-7 mm (± 1˚) could cause the condensation tray to overflow (refer to Figure 6).
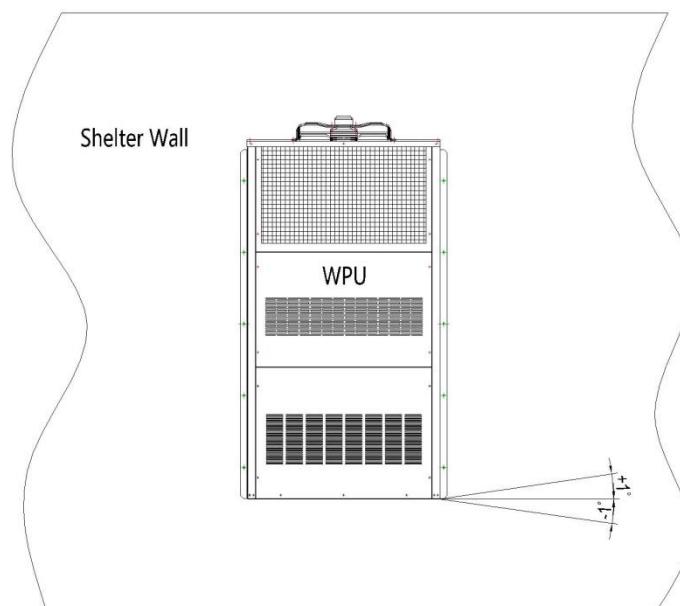
Figure 6: Inclination of Mounted WPU

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Lift the unit from below with lifting equipment or tools, and then move the unit to the wall. Use the screws (installer supplied) to affix the unit on the wall. Generally this is done by following these steps:

1. Position the unit next to the wall using a forklift or leveling system.

Use either a level system or a forklift to position the unit.
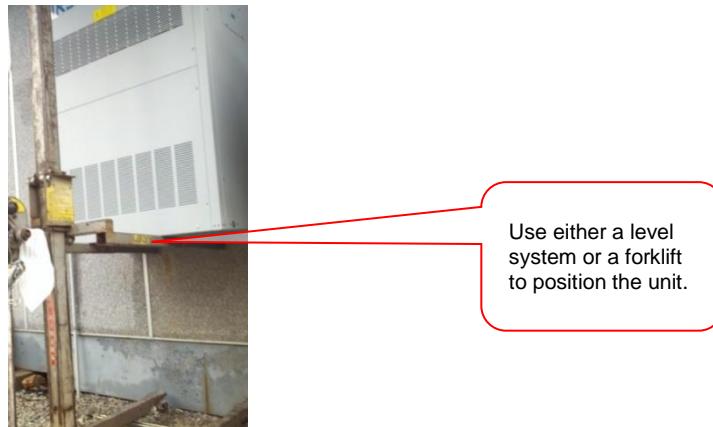
Figure 7: Position the Unit

2. Attach a single mounting screw and adjust to ensure the unit is level.

Figure 8: Verify the Unit is Level

3. After the unit is level, attach the remaining mounting screws (a quantity of 10 total for each WPU).

Remove Wooden Pallet from WPU

The WPU is bolted to a wooden pallet to facilitate safe lifting and transport of the unit. Four bolts attach the pallet to the unit, as show in Figure 9. The pallet frame is recessed under the WPU to allow for easy installation while using a forklift. Before completing the mounting of the unit to the wall, remove the pallet by removing the four bolts.

Remove the 4 bolts under the unit to remove the pallet

Figure 9: Remove Wooden Pallet

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Seal the Joints between WPUs and Wall

In order to prevent moisture from getting in and air leaking out, coat the joint between the rear panel of the unit and the wall with a layer of silicone sealant (installer provided, see Table 5, item 9) as shown in Figure 10.
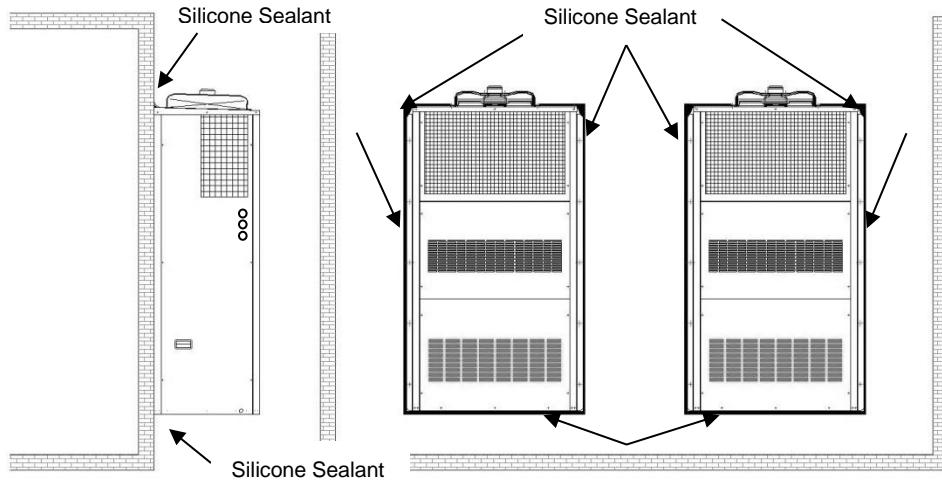
Figure 10: Seal the Joints between WPUs and Wall

Attach the Supply Air Grill and the Return Air Grill to the Wall

The supply air grill and the return air grill should be installed at the holes inside the shelter as shown in Figure 11.
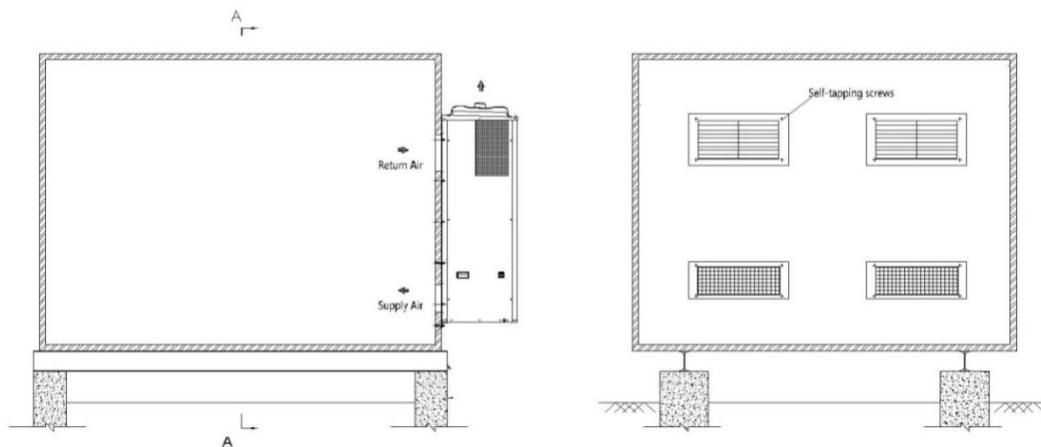
Figure 11: Install the Supply and Return Air Grills

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Tin-coated paper
(Table 5)

Return air frame and supply air frame
(Table 5)

Return air grill
(Table 4)

Supply air grill
(Table 4)

Note the following:

1. Install the supply and return air frames into their respective cutouts.

2. Use an adhesive tape to tape down the edges of the return and supply air frames on the WPU side.

3. After installing the supply air grill, adjust the angle of the fins to direct airflow away from adjacent equipment and prevent bounce-back of supply air. Adjust the fins first up and down; then, left and right.

Refer to Figure 23: Frame Dimensions on page 78 and Table 31 on page 79 for each model.

Remove the Compressor Brackets

Open the front, bottom panel on the WPU to locate the compressor. The two brackets at the base of the compressor are required for transport only. Loosen the four bolts, remove the two brackets, and then tighten the four bolts back down to the base of the compressor.

Remove the two brackets; then refasten the bolts

Figure 12: Remove Compressor Brackets

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Controller Box Installation

Find a suitable location inside the shelter between the two WPUs to mount the controller box. Mount the controller box so that the PLD is near eye level of the intented operator.

Mounting controller for PLD to be at "eye level"

21.69in

17.32in

16.14in

9.65in

5.41in
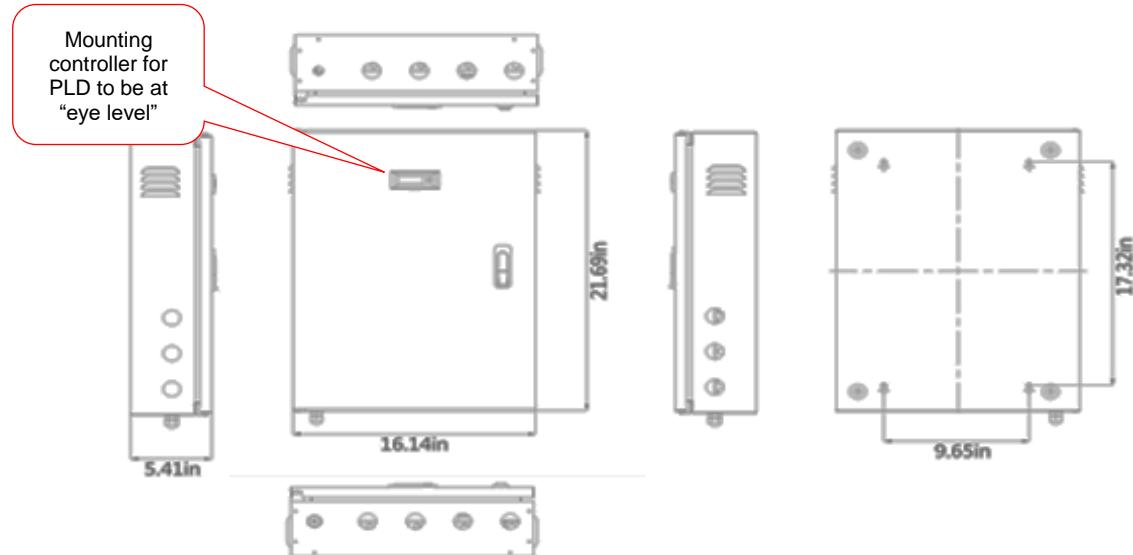
Figure 13: Controller Box Dimensions

Table 9: Key Components in the Controller Box Assembly

Humidity sensor	Outdoor temp sensor
Indoor temp sensor	PLD Cable
Backup indoor temp sensor	Supply air temp sensor

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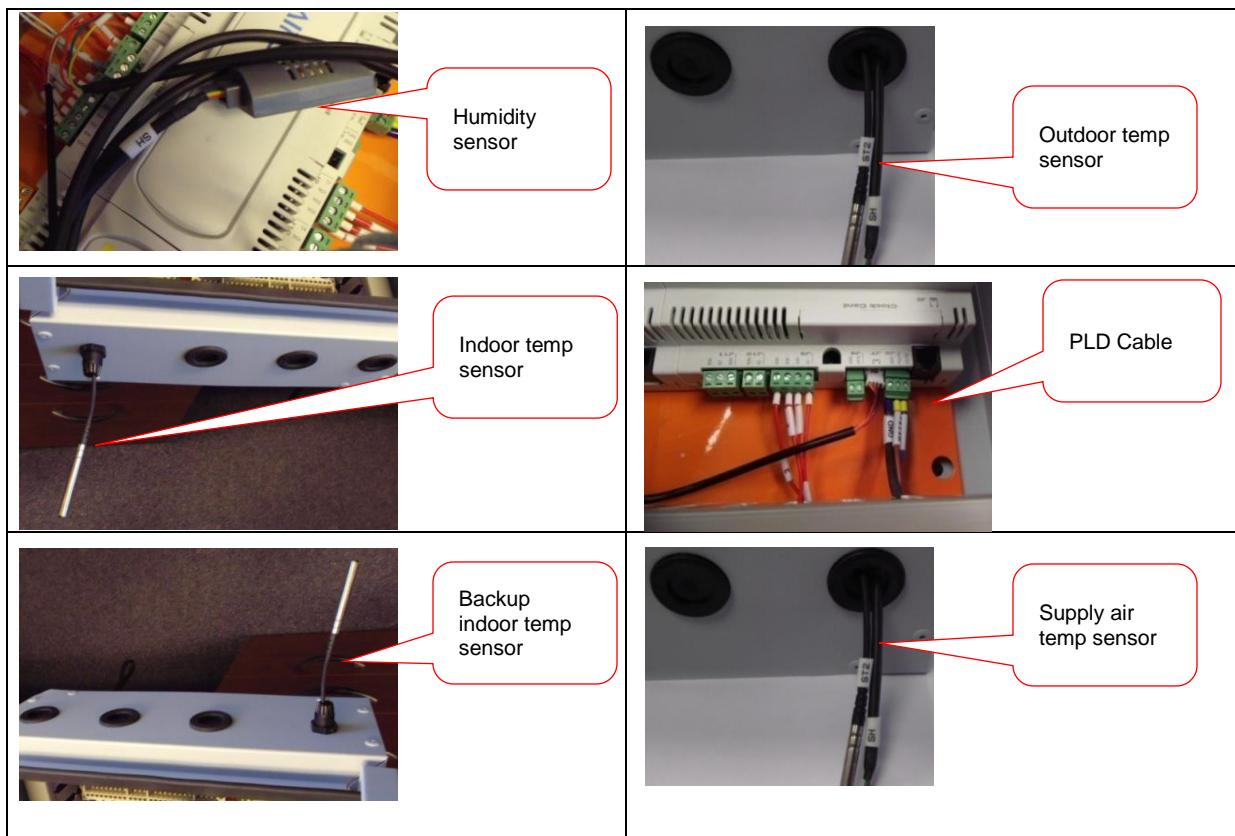
Figure 14: System Block Diagram illustrates the basic arrangement of two WPUs and the controller box.

Note: The power feed to all three components should be in parallel. Each unit should have a unique breaker/fuse connection to the main power service.

WPU with AC Supply Fan
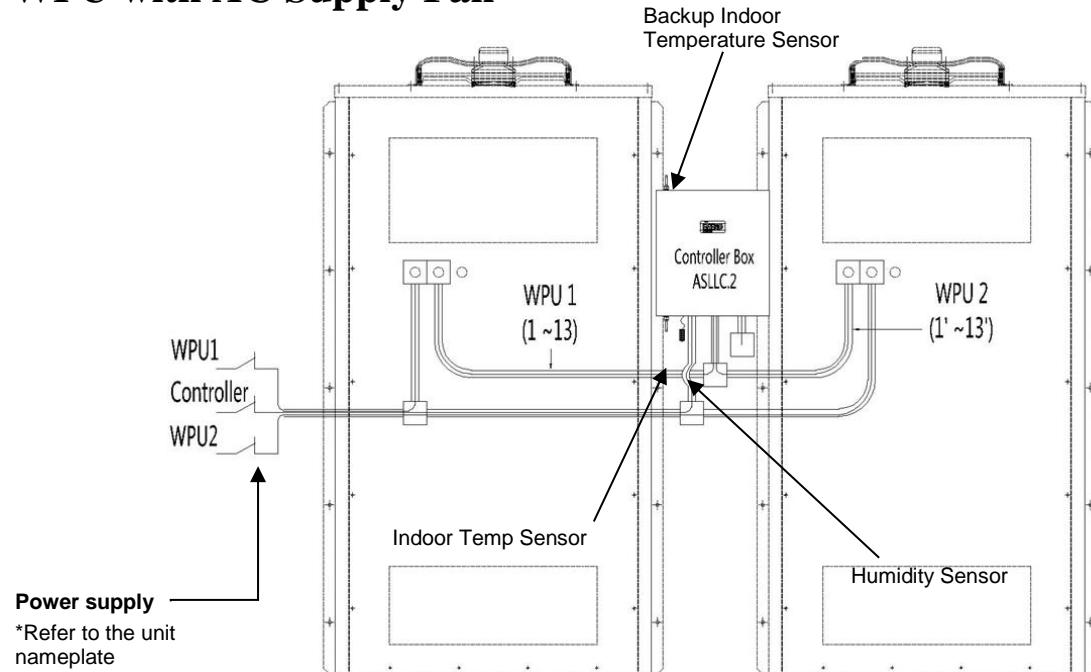
WPU with DC Supply Fan

Figure 14: System Block Diagram

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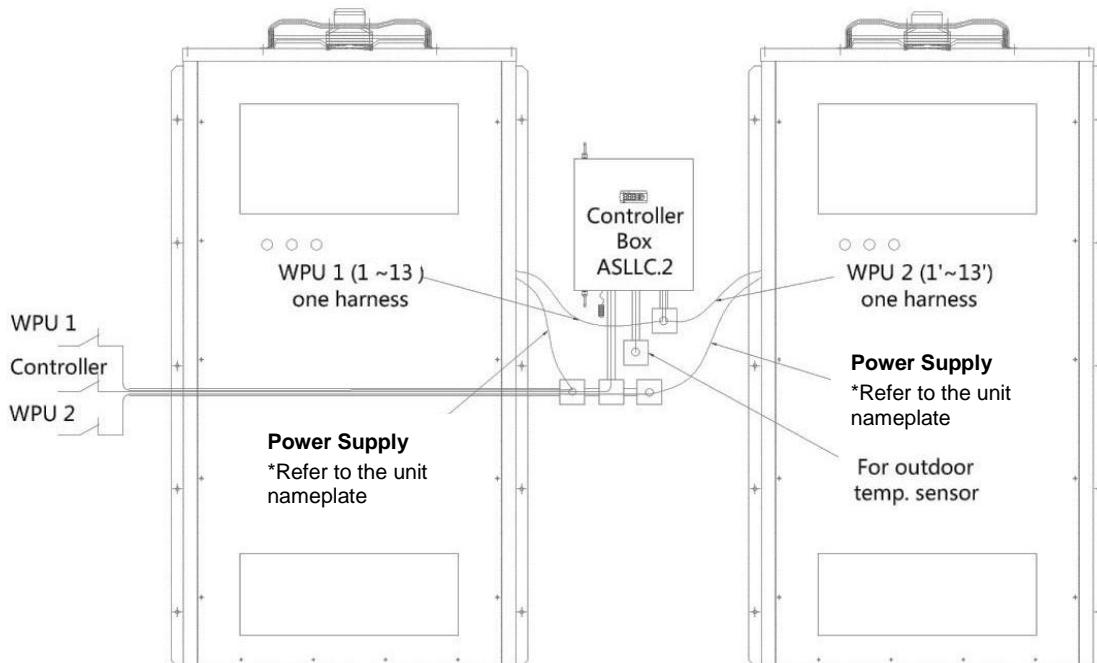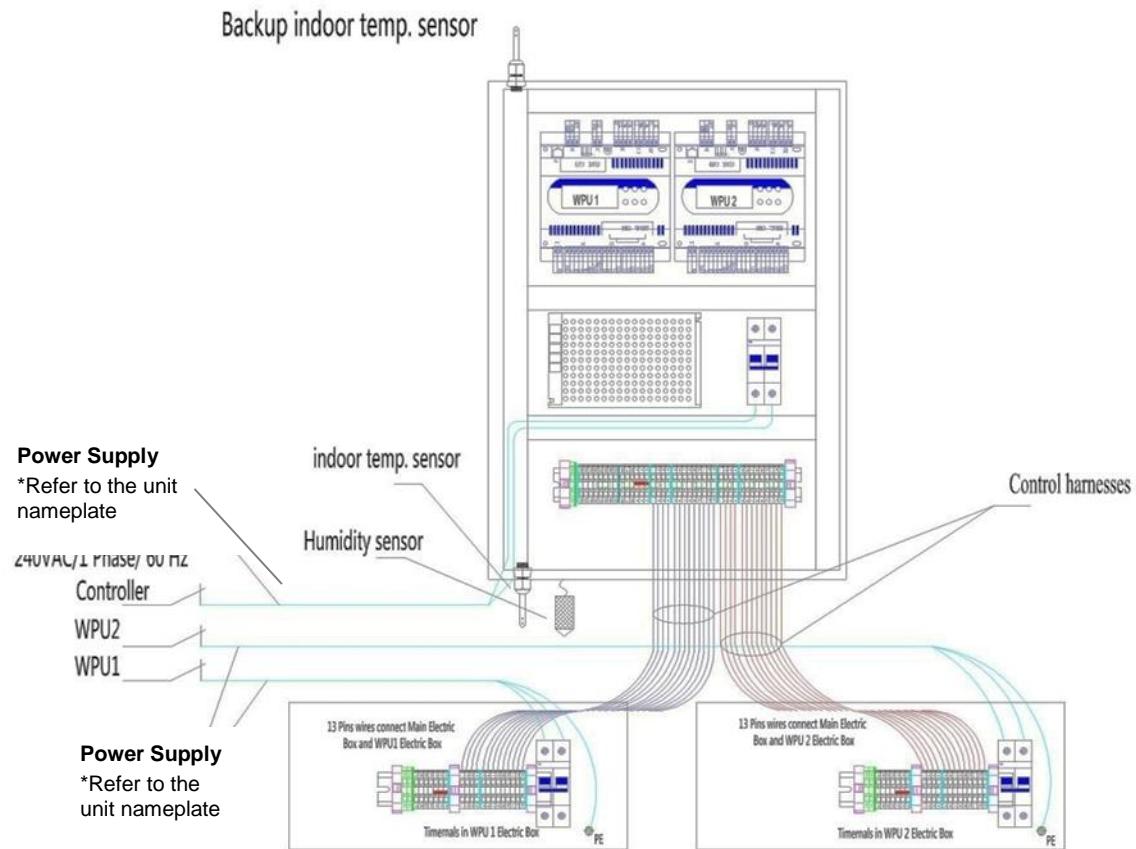
Figure 15: System Schematic Diagram

Install Outdoor Temperature Sensor

The outdoor temperature sensor that is connected to the controller box must be installed outside the shelter. Use the following steps to complete this task.

1. Select the wall where the WPU is mounted.

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2. Drill a 0.5 inch diameter hole for the outdoor temperature sensor through the shelter wall.
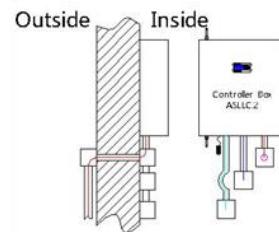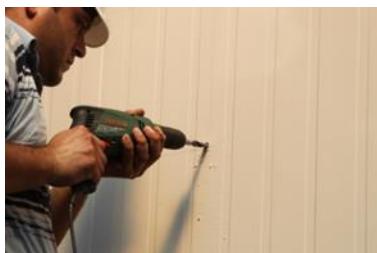
3. Open the controller box assembly and locate the outdoor temperature sensor (ST2) assembly.

4. Thread the outdoor temperature sensor through the right-hand port at the bottom of the controller box.

Outdoor Temperature Sensor (ST2)
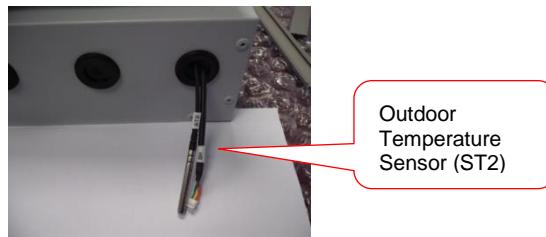
5. Punch out all holes on the bottom and both sides of the white sensor box to allow for proper airflow and drainage.

6. Thread the outdoor temperature sensor from the controller box through the hole in the bottom of the box.

7. Secure the sensor to the bottom of the box with a nylon zip-tie.

8. Secure the box to the outside wall. Snap the sensor box cover in place and use sealant along the seam between the box and the wall.

Figure 16 illustrates the relationship of the sensor to the installed WPUs
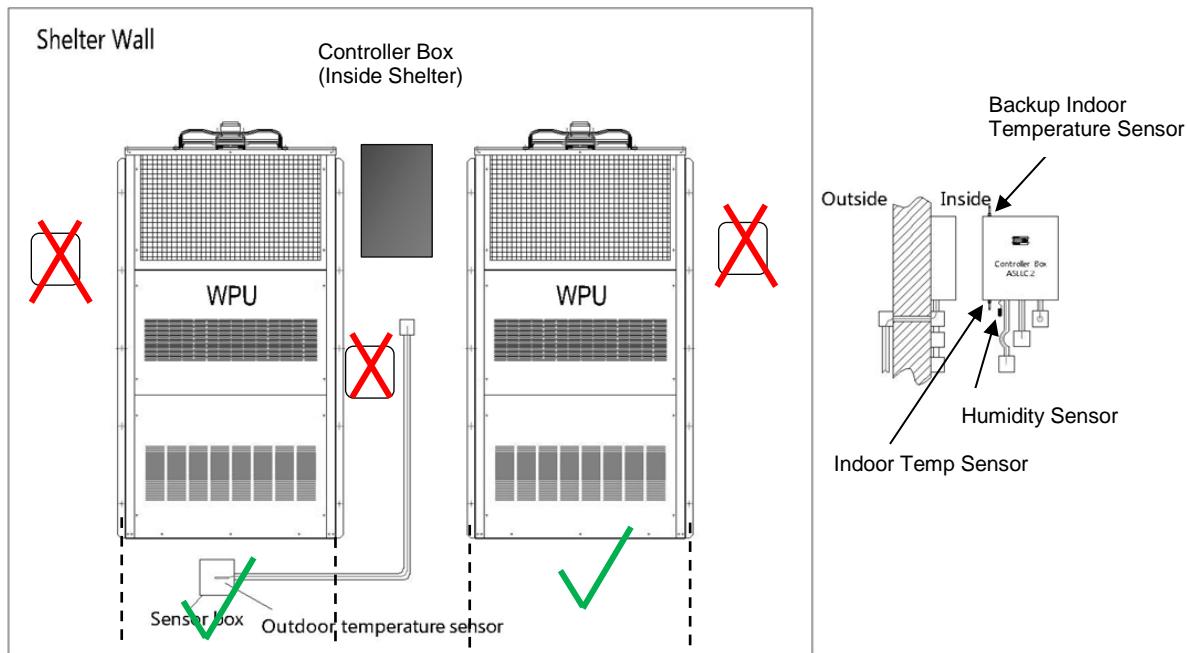
Figure 16: Location of Outdoor Temperature Sensor

Note: punching out the holes on the sides and the bottom of the sensor box is critical to allow proper airflow and to facilitate drainage from rain and dew.

⚠ **Important.** Ensure no air leakage exists from inside the shelter to the box housing the outdoor temperature sensor. Any path whereby air could exit the shelter and arrive in the sensor box will adversely affect the outdoor temperature sensor reading. The hole in the shelter wall where the outdoor temperature sensor has passed through must be 100% sealed so no air can leak out of the shelter.
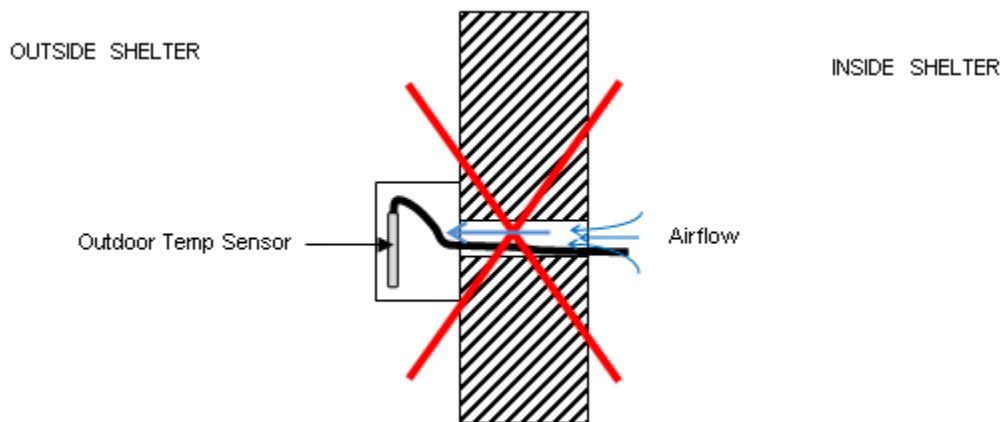
Figure 17: Ensure No Leakage

Position the Humidity Sensor

Follow these steps to install the humidity sensor that is connected to the controller box:

1. Open the controller box assembly and locate the humidity sensor (SH) assembly.

2. Remove the cover of the humidity sensor, and then unfasten the harness from the sensor.

3. Thread the harness through the hole at the bottom or top of the controller box and reattach the sensor and then the cover. Note: If further shipping is required after mounting the controller, secure the humidity sensor under the controller box with tape to protect the sensor from vibration).
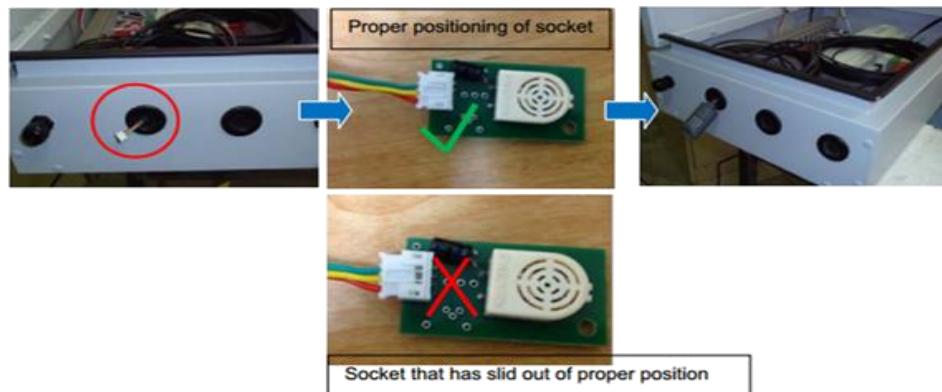
Position Indoor Temperature Sensors and Supply Air Temperature Sensors

An indoor temperature sensor is located at the bottom of the controller box and a backup temperature sensor at the top of the controller box. The sensor monitors the shelter temperature to control the WPU operation. Slide the sensor through the port on the bottom left side of the controller box. Tighten the port cover to hold the sensor cable in place. Follow the same steps to position the backup sensor at the top of the box.

Figure 18: Position Indoor Temperature Sensor

The supply air temperature sensors should be installed at the middle-front of the supply air grill as shown in **Figure 19.**
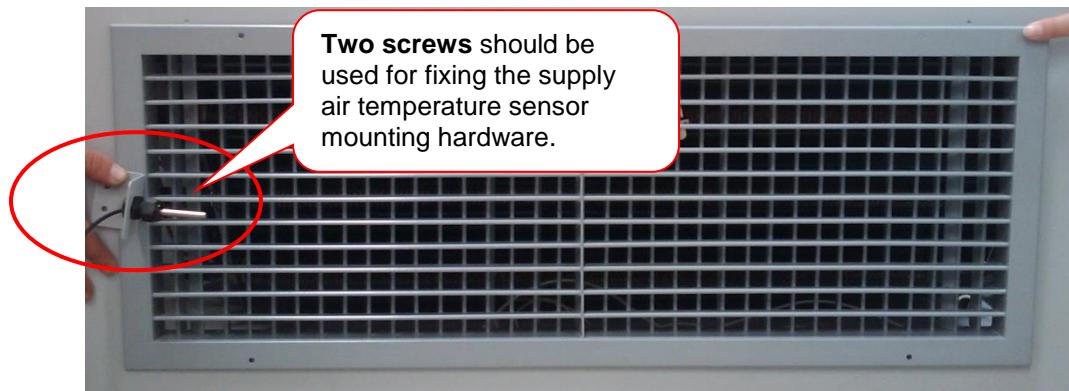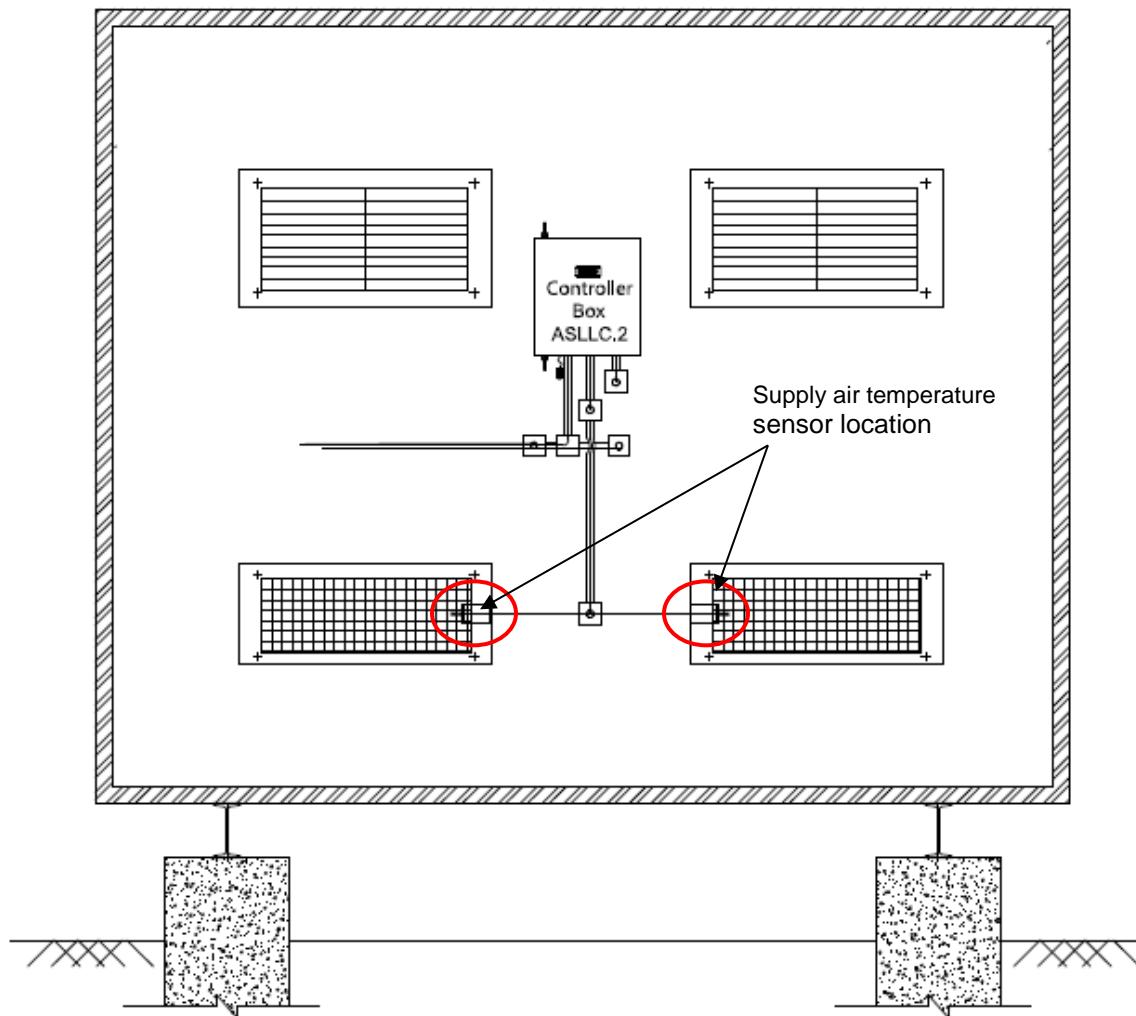
Figure 19: Position Supply Air Temperature Sensors

Complete Electrical Connections

Cautions

🚫**Danger.** Only an authorized service technician should make the electrical connections to the WPUs and the controller box.

⚠️ **Important.** The electrical wiring of the unit must be in compliance with IEC standards or with appropriate national standards.

🚫**Danger.** The power supply must be disconnected or turned off before working on the unit.

⚠️ **Important.** Noncompliance with these instructions may cause damage to the WPU or the controller box. Not following instructions can void the warranty.

⚠️ **Important.** No modification to the unit's electric circuit is allowed. If a change is required, it must be authorized by AIRSYS in writing.

Overview of Wiring

Figure 20 illustrates the wiring terminals in the control box. Each unit has an identical set of terminals. The terminal numbers for HVAC #2 are distinguished with a single quote (') after the number.
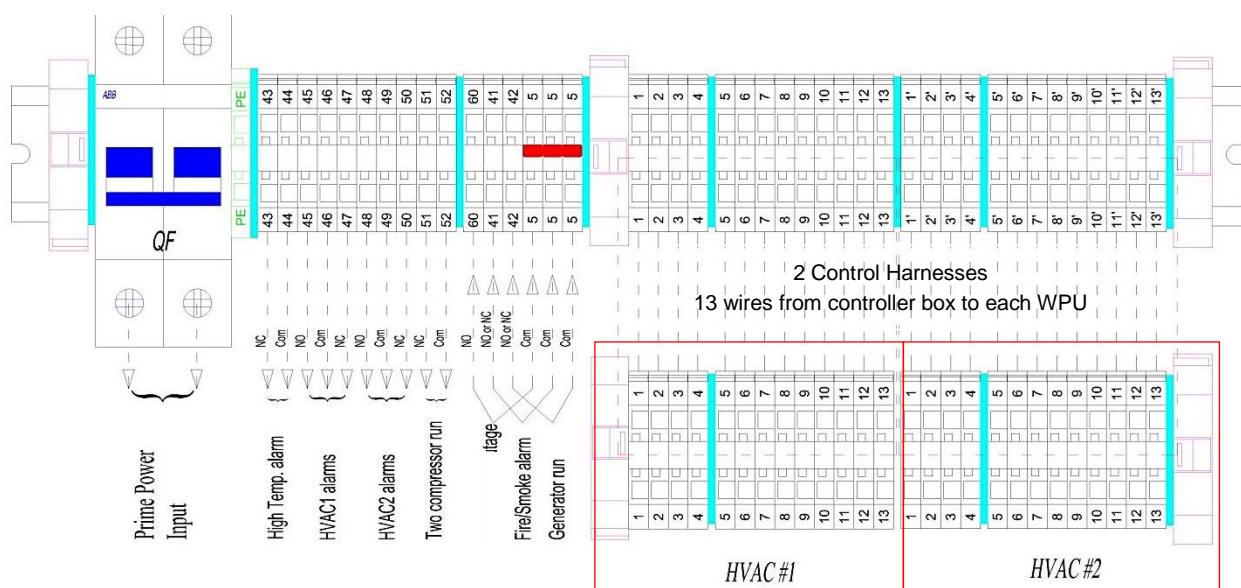
Figure 20: Field Wiring Terminals

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Table 10: Alarm Connections

	Alarm Name	Alarm Type (Input/ Output)	Severity	Default (NC or NO)	Adjustability (S=software via PLD) (HW= Hard wired)	Connections To ASLLC.2	Related Alarm codes:	Comments
Form C Contact Alarm INPUTS	Fire/Smoke alarm	Input	Critical	NC	S --> parameter SFt	41 and 5	A05 Only	Remove factory jumper prior to connecting alarm input
	Generator Run	Input	None	NO	S --> parameter dGt	42 and 5	A28 Only	Connected to Gen-Run signal from Automatic Transfer Switch or generator
	Prime Power Outage	Input	Major	NO	NA	60 and 5	A09 Only	**Only when using DC Fail-Over Box: ASPCB.2**
Form C Contact Alarm OUTPUTS	High/low temperature alarm	Output	Critical	NC	S --> parameter Htt	43 and 44	A07	Can connect in series for NC or in parallel (NO) with analog High/low Temp thermostats in many sites.
	HVAC1 alarms	Output	Major	NO	HW	45 and 46	A02, A03, A10, A29, A31	Indicates Mechanical Cooling disabled until problem addressed on site
				NC		46 and 47		
	HVAC2 alarms	Output	Major	NO	HW	48 and 49	A04, A06, A11, A30, A32	Indicates Mechanical Cooling disabled until problem addressed on site
				NC		50 and 49		
	Two compressor run	Output	Minor	NC	S → parameter $2Ct$	51 and 52	A23	Indicates compressors running in both Lead & Lag WPUs simultaneously

Alarm Input/Output detail

Inputs:
1. **Smoke/Fire Alarm:** When the Smoke/Fire alarm is active all fans will shut down and the dampers will close. This is to prevent air circulation and minimize the spread of fire.
2. **Generator Run Signal:** When the generator signal is active, the outside air dampers will close and only one HVAC system will be allowed to engage in Mechanical Cooling. The dampers close to prevent the free cooling function from potentially pulling diesel fumes into the shelter. The second HVAC system is prevented from engaging in mechanical cooling to reduce power consumption while generator is running.
3. **Prime Power Outage**: This signal is ONLY relevant when a DC Fail-over box (ASPCB.2) is part of the configuration. This signal comes from the DC fail-over system and wires directly into the ASLLC.2 controller. When this signal is received, the system will go into a low power, Supply Fan-only mode. If cool enough outside, the system will continue to cool the site with outside air.

Outputs:
1. **Temp Alarm**: Factory set to trigger 18°F above set point ($77 + 18 = 95$°F) OR 32°F below set point. Set point (StP) can be changed via the PLD user interface
2. **HVAC 1/2 Alarm:** Indicates WPU Mechanical Cooling will not come on without an on-site service visit. Acknowledging the alarm via the pLD will clear the lockout condition. Reset the breaker to the controller will also clear the lockout condition.
3. **Second Compressor Run Alarm**: Triggers whenever both the Lead & Lag units are engaged in Mechanical cooling,

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Table 11: Control harness terminal identification of ASLLC.2

AC power part	Terminal 1	MC, compressor	The voltage between terminal 1 & terminal 4 is 240Vac
	Terminal 2	MF2, supply fan	The voltage between terminal 2 & terminal 4 is 240Vac
	Terminal 3	EH1-3, electrical heater	The voltage between terminal 3 & terminal 4 is 240Vac
	Terminal 4	L, L of line voltage	Line voltage
Alarm part	Terminal 5	Common terminal	Common terminals for alarms
	Terminal 6	LP, low pressure switch	Between terminal 6 & terminal 5 is NC
	Terminal 7	HP, high pressure switch	Between terminal 7 & terminal 5 is NC
	Terminal 8	PF, air pressure differential switch	Between terminal 8 & terminal 5 is NC
	Terminal 9	MF2, output the operating status of supply	Internal overload protection, it is NC.
DC power part	Terminal 10	YE, input signal to air damper actuator	The signal voltage for damper actuator, 0~10Vdc
	Terminal 11	MF2, input signal to supply fan	The signal voltage for supply fan, 0~10Vdc
	Terminal 12	DC Ground Reference	For DC power supply and signal voltage
	Terminal 13	24 Vdc	Power supply for Damper actuator, the voltage between terminal 12 & terminal 13 is 24Vdc.

Table 12: Control harness terminal identification of ASLLC.2.48

48 VDC power part	Terminal 1	MC, compressor	The voltage between terminal 1 & terminal 12 is 48Vdc
	Terminal 2	HVAC prime power power alarm	Between terminal 2 & terminal 12 is NC
	Terminal 3	EH1-3, electric heater	The voltage between terminal 3 & terminal 12 is 48Vdc
	Terminal 4	None	
Alarm part	Terminal 5	Common terminal	Common terminals for alarms
	Terminal 6	LP, low pressure switch	Between terminal 6 & terminal 5 is NC
	Terminal 7	HP, high pressure switch	Between terminal 7 & terminal 5 is NC
	Terminal 8	PF1, air pressure differential switch	Between terminal 8 & terminal 5 is NC
	Terminal 9	PF2 or PF2&3, output the operating status	Between terminal 9 & terminal 5 is NC
24 VDC power part	Terminal 10	YE, input signal to air damper actuator	The signal voltage for damper actuator, 0~10Vdc
	Terminal 11	MF2, input signal to supply fan	The signal voltage for supply fan, 0~10Vdc
	Terminal 12	Ground	Power supply for Damper actuator
	Terminal 13	24 VDC	Power supply for Damper actuator, the voltage between terminal 12 & terminal 13 is 24Vdc.

Refer to Figure 15: System Schematic Diagram on page 21.

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Electrical Connection to Controller Box

Follow these steps to complete the connections:

1. Open the controller box.

2. Ensure the PLD cable is FIRMLY plugged into the user interface terminal located on the inside of the controller box cover.

3. Ensure the other side of the PLD cable is FIRMLY plugged into the HVAC1 controller board terminal J7 as shown below.
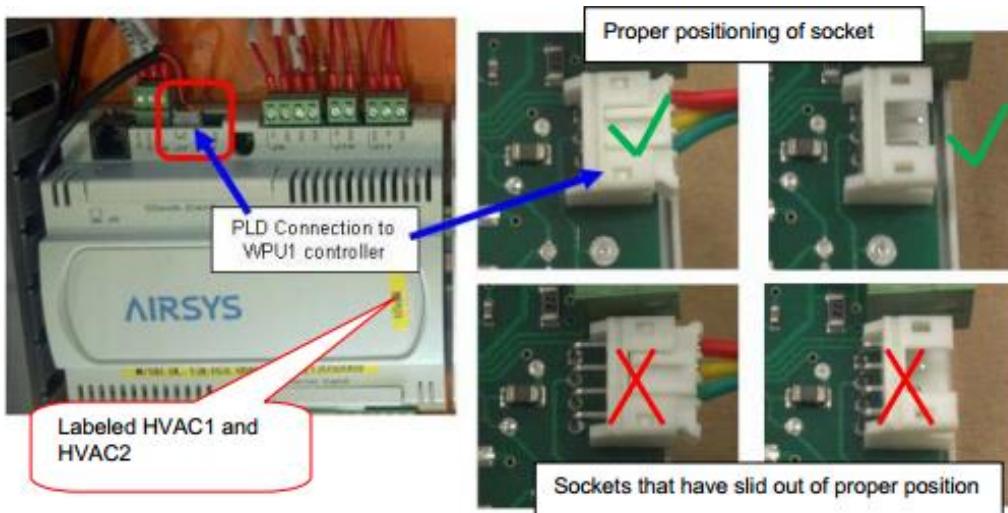
4. Connect the WPU 1 control harness in the controller box. When this is complete, do the same for the WPU 2 control harness. Refer to Fig 15. System Schematic Diagram on page 21.
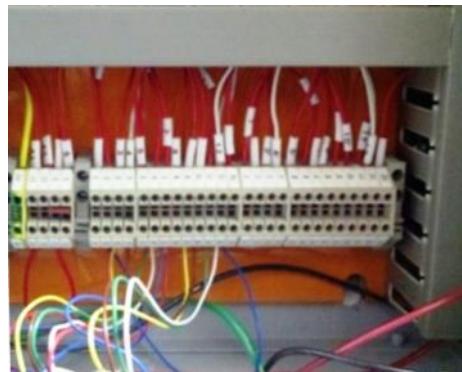
5. Connect the power cable from power plant to the controller box as shown below.

ASLLC.2	ASLLC.2.48
Connect the prime power (L1&L2, 230Vac)	Connect the 48VDC power
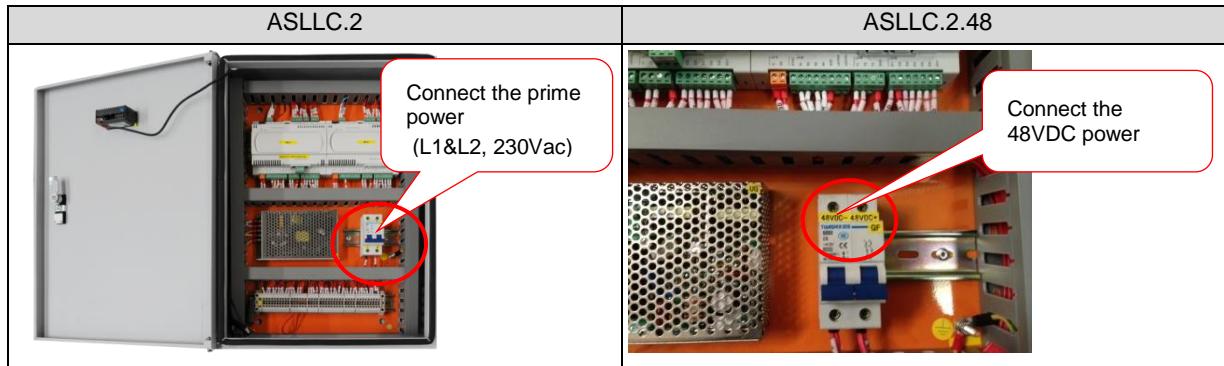
Electrical Connection to WPUs

Depending on which controller you are installing, either two or three wire harnesses are passed through the shelter wall into the WPUs:

● Control harness

● Prime power

● 48VDC power **- ONLY** if ASLLC.2.48 is installed and the HVAC is equipped with DC EC supply fan

1. There are two options for bringing the control harness and the power cables into the WPU.

    a. Make the connections from side panel.
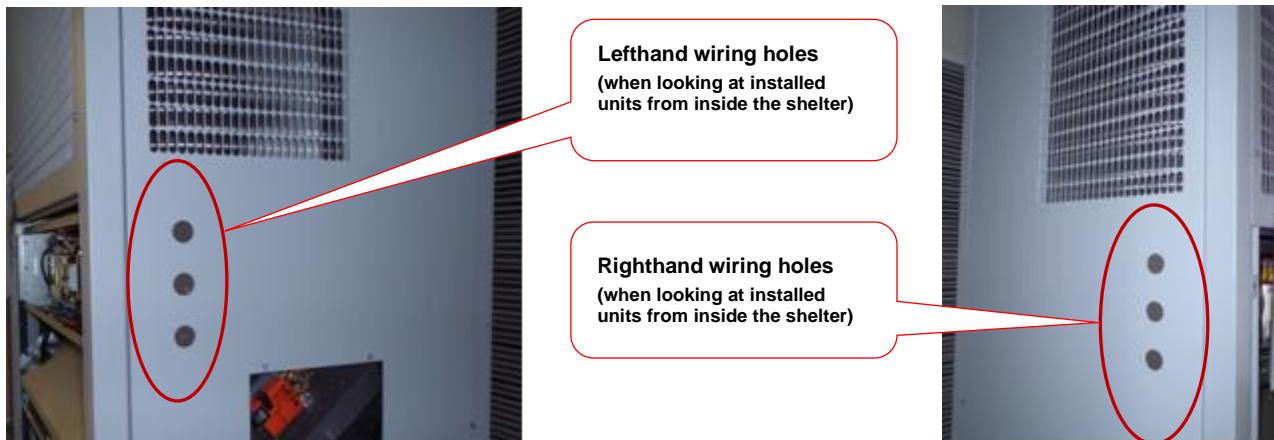
Lefthand wiring holes
(when looking at installed units from inside the shelter)

Righthand wiring holes
(when looking at installed units from inside the shelter)

Lefthand wiring holes
(when looking at installed units from inside the shelter)

Important. Ensure the wiring harnesses are dressed inside the machine in such a way that they will not interfere with the movement of the air damper.

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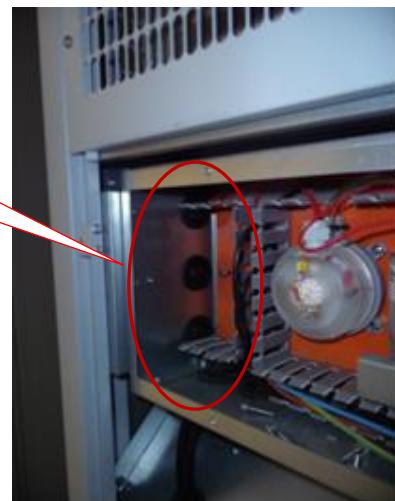
b. Make the connection from the back panel

From: here

routing through "mid-plate"

Or here

To here.

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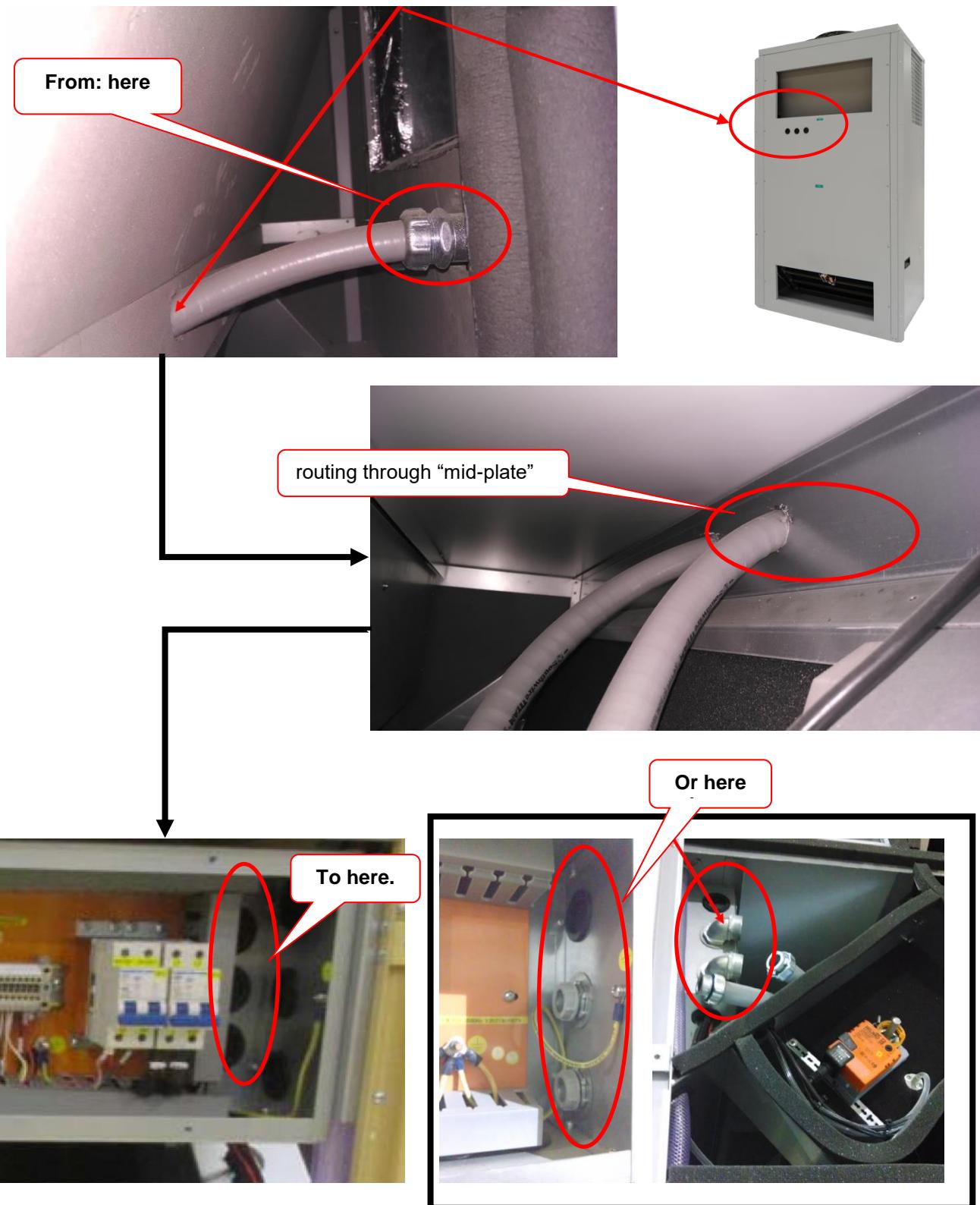
2. Bring the control harness (item 4 in Table 5 on page 10) from the controller box to the WPU by passing it through the hole in the shelter. Make the thirteen wire connections inside the WPU.

Control harness connections in the WPU

3. Connect the power cables from the power plant to each WPU.

Prime power connections to WPU

Prime power connections to WPU

48VDC power connections to WPU
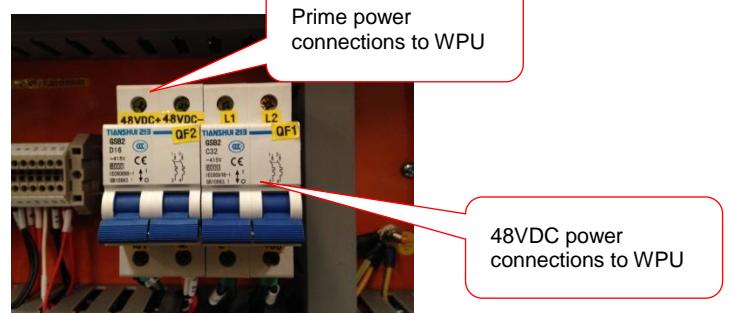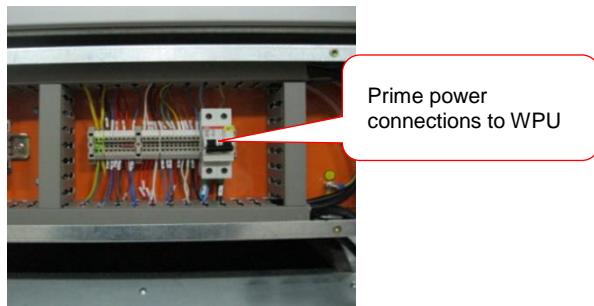
Note: If the ASLLC.2.48 is chosen and the HVAC is equipped with DC EC supply fan, connect the power cables as shown in the picture below.

4.Complete the connections.

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Complete the Installation Checklist

You should now have completed all of the physical installation steps. Prior to starting the system, ensure that no steps have been omitted by completing this installation and wiring checklist.

Date: _____ Unit Factory Number:_____(refer to the unit name plate)	
Verify Physical Installation	✓ or ✗
Weather stripping has been attached to the air inlet and outlet of the WPU at the room side.	
The entire machine is fastened.	
All the leaks are sealed with gel.	
The indoor temperature sensor, backup indoor temperature sensor, and humidity sensor have been mounted around the controller box inside the shelter.	
The aluminum grills are fastened.	
The brackets at the bottom of the compressor have been removed and the screws refastened.	
The outdoor temperature sensor is inside the sensor box and mounted outside the shelter. Sensor box drain holes are facing downward and the through hole in the shelter wall has been sealed.	
Verify Electrical Installation	
A one-to-one correspondence exists between the 1 to 13 connections from WPU to controller box.	
The 1 to 13 connections are secured.	
The main voltage connections between each WPU and the prime power panel are secured.	
The power connections between the controller box and power plant panel are secured.	
Proper clearance is allowed between the cables and air damper in the WPU to avoid interference.	

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Verify System Operation

A complete system operation verification is vital to ensure all components are operating correctly after the installation. A system commissioning checklist is available on page 41. Follow instructions in this section to complete the checklist and leave a copy on site.

Turn On Component Breakers

After completing the checklist, turn all three breakers to the on position: one in each WPU and one in the controller box. Then reattach all covers and panels before turning on the breakers in the prime power panel.

WPU Breakers

ASLLC.2 breaker
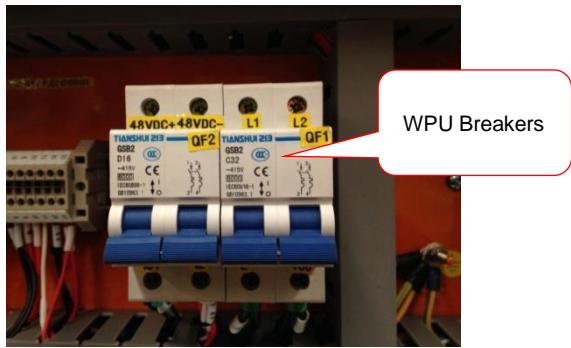
Turn on Primary Power

Turn on the primary power breakers at the breaker panel in this order; first the two WPU breakers, then the controller box.

Note: The PLD display should light up and after a brief delay will display the inside temperature. If all instructions were followed correctly, you are still likely to get a Prime Power (A09) alarm. This is normal. Press **Sel** to clear the alarm. Any other alarm should be investigated, with the most common cause being a mistake in the wiring.

Note: Use the information in "Alarm Descriptions" on page 53 to understand the meaning of any alarms. Detailed information on PLD operation and how to understand and respond to alarms is covered in Chapter 3.

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Execute the Step-Test

The step-test systematically verifies that key components of the system are operating as expected. Note the following considerations:

- The steps in the test can be executed in any order; they do not need to be sequential.

- For systems with controller software prior to revision 13B64, the test must be completed within **30 minutes**. If you cannot complete the test within this timeframe, you must re-enter the step test mode. More recent versions of software do not have a time limit.

- The system will display the main menu (indoor temperature) automatically after ten minutes when there has been no input from the technician.

- Step Test takes the system out of automatic mode. Turn the system back ON to return to automatic mode.

PLD button actions are listed in more detail on page 41. If any alarms are triggered during the test, refer to "Alarms" on page 49 for details.

> (!) **Warning.** Once a compressor has been turned on, it must be allowed to run for at least one minute before the next step to prevent compressor damage.

To complete the test, follow these steps:

1. Press **Up** and **Down** together to enter the main screen. The screen will display the indoor temperature. If the indoor temperature does not display, press both buttons again and repeat as needed.

2. When the system is on, press and hold **Up** and **Sel** together for 3 seconds. The user terminal will display

   $5 F t$. Press **Up** until $C \ O \ d$ displays. When the system is off, press **Up** and **Sel** together for 3 seconds and

   the user terminal will display $C \ O \ d$.

3. With $C \ O \ d$ displayed on screen press **Sel** to confirm. The screen will display O. Press **Up** to select appropriate step (**1-10**; see Table 13: Step-Test below). Press **Sel** to confirm selection. The user terminal

   returns to $C \ O \ d$ and the component will be engaged. Repeat these steps as needed.

4. When the step-test is complete, return to the main menu and turn the HVAC system on.

Table 13: Step-Test

	$C \ o \ d$ **Value**		
ACTION	**WPU #1**	**WPU #2**	**NOTES**
Turns on Supply Fan	1	5	
Turns on Heater	2	6	May take a few minutes before you feel warm air
Turns on Compressor	3	7	**IMPORTANT:** Let compressor run for at least one minute before going to next step
Opens Fresh Air Damper	4	8	*HINT*: With the lights off in the shelter, you can see indirect daylight via opening behind exhaust grill
Turns on Fan and Heater for both Lead and Lag WPUs	9		
Turns on Fan, Compressor, and Damper for both Lead and Lag WPUs	10		Damper will open to 100% **IMPORTANT:** Let compressors run for at least one minute

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Turn the HVAC System On

1. Press **Up** and **Down** together to enter the main screen (current room temperature will be displayed).

Press both buttons together to enter the main screen

2. Press **Down** or **Up** until the screen displays OFF.
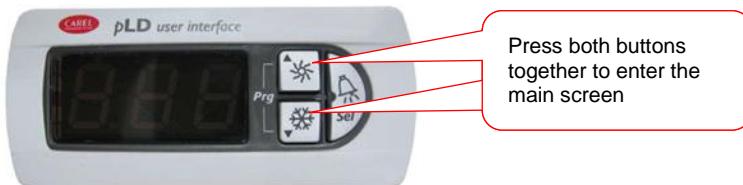
Press until screen displays OFF

3. Hold **Sel** for 3 seconds. The screen will display On, indicating that the system is turned on. Press **Down** and **Up** together again to return to the main screen and display the indoor temperature.

Press the button for 3 seconds

Note: When the system is On both the **Up** and **Down** LEDs will be lit. When the system is OFF both the **Up** or **Down** LEDs will be dark.

⚠ **Warning.** Never leave the site with the HVAC system in the off state (**Up** and **Down** LEDs dark). Your site will have no cooling, which likely will result in a high temperature alarm requiring an urgent site visit to correct. When the HVAC system is on, the PLD will display the current temperature.

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Set System Time

The system time parameters are listed in

Table 14. R/W indicates that the code can be viewed and updated.

Note: System time is based on a 24 hour clock.

Note: 24 Hour Clock
i.e., 15 = 3pm

Table 14: System Time Parameters

Display	R/W	Description	Range
n 15	R/W	Display and set the current time/date – hour	0~23
n 16	R/W	Display and set the current time/date – minute	0~59
n 17	R/W	Display and set the current time/date – year	0~99
n 18	R/W	Display and set the current time/date – month	0~12
n 19	R/W	Display and set the current time/date – day	0~31

1. Press **Up** and **Down** together to enter the main menu. The screen will display the indoor temperature. If the indoor temperature does not display, press both buttons again and repeat as needed.

2. Press **Down** until **SPt** displays. Then press **Sel**, the user terminal will display 5 t P.

3. Press **Down** until the screen displays n 15; then press **Sel** to confirm. Set the current hour; then press **Sel** to confirm.

4. Press **Down** until the screen displays n 16; then press **Sel** to confirm. Set the current minute; then press **Sel** to confirm.

5. Press **Down** until the screen displays n 17; then press **Sel** to confirm. Set the current year; then press **Sel** to confirm.

6. Press **Down** until the screen displays n 18; then press **Sel** to confirm. Set the current month; then press **Sel** to confirm.

7. Press **Down** until the screen displays n 19; then press **Sel** to confirm. Set the current day; then press **Sel** to confirm.

8. Press **Up** and **Down** together to return to the main menu.

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Verify the sensor readings

All the sensors are factory calibrated before shipping. However, it is essential to verify that all sensors are properly connected.

1. Press **Up** and **Down** together to return to the default display (indoor temperature)Press **Up** or **Down** to scroll through the main menu

2. Press **Sel** to display reading for Humidity, Outdoor Temp, and Supply Air Temp

3. Scroll to $\boxed{5P\underline{E}}$ and Press **Sel** → The pLD will display $5\ E\ P$ (temperature setpoint)

4. Press **Down** until $r\ E\ \partial$ (Room temp 2) is displayed, press **Sel** to display backup temp sensor reading

Table 15: ASLLC Main Menu

Sensor	Display	R/W	Description	Comments
ST1	$7\ 7\bullet 3$	R	**Current indoor temperature;** default display	*Press UP and DOWN together to get to the indoor temp. Press DOWN to access other menus.*
	$C\ O\ F$	R/W	Comfort mode ON/OFF	
	$C\ F\ E$	R/W	Comfort mode run time	
	$5\ P\ \partial$	R/W	Set comfort mode indoor temperature	
SH	$H\ \sqcup$	R	**Indoor Humidity**	*Hint: use the "Huff Test"*
ST2	$E\ E$	R	**Outdoor temperature**	
ST3	$5\ \sqcup$	R	**Unit 1 Supply air temperature**	**Important:** *Wrap hand around supply air sensor to verify unit 1 sensor is mounted on unit 1 and vice versa*
ST3'	$5\ \sqcup\ \partial$	R	**Unit 2 Supply air temperature**	
	$\boxed{5P\underline{E}}$		Access other menus for viewing and modifying preconfigured system parameters	
	$O\ \cap$	R/W	System On/Off	

Note: Sensors can be calibrated in the C menu. See section **Accessing the C Menu** on page 61 for detail.

Verify Input and Output Alarms

1. Verify Generator Signal (A28 alarm)

Important: Incorrect signal from generator will prevent the 2nd unit from cooling

    a. From $r\ E\ \partial$ press Down until $d\ 5\ A$ is displayed, Press **Sel** to display generator status

    b. If the generator is not running or generator signal is not wired, your screen should display **OFF**

    c. Press the **Sel** button to return to $d\ 5\ A$

2. Verify Smoke/Fire Alarm Signal (A05 alarm)

    a. Press the test bottom on the smoke/fire detector. The system should completely shut down (Fans and compressors off, damper closed, A05 alarm code will be displayed).

    b. The Smoke/fire Alarm is connected to 41 and 5 on the controller terminal. If the smoke/fire detector does not have a test bottom, disconnect the jumper on 41; the system should shut down.

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3. Verify HVAC Alarm

    a. HVAC1: Turn off the HVAC1 prime power breaker at panel or unit

    b. Verify **NC** terminal 46 and 47 is *Open*

    c. HVAC2: Turn off the HVAC2 prime power breaker at panel or unit

    d. Verify **NC** terminal 49 and 50 is *Open*

Complete the Registration Card

The information on the registration card is critical for establishing the warranty start point.

The following pictures show serial number locations for the WPU and control box. These must be recorded on the AIRSYS Product Warranty Registration Card.
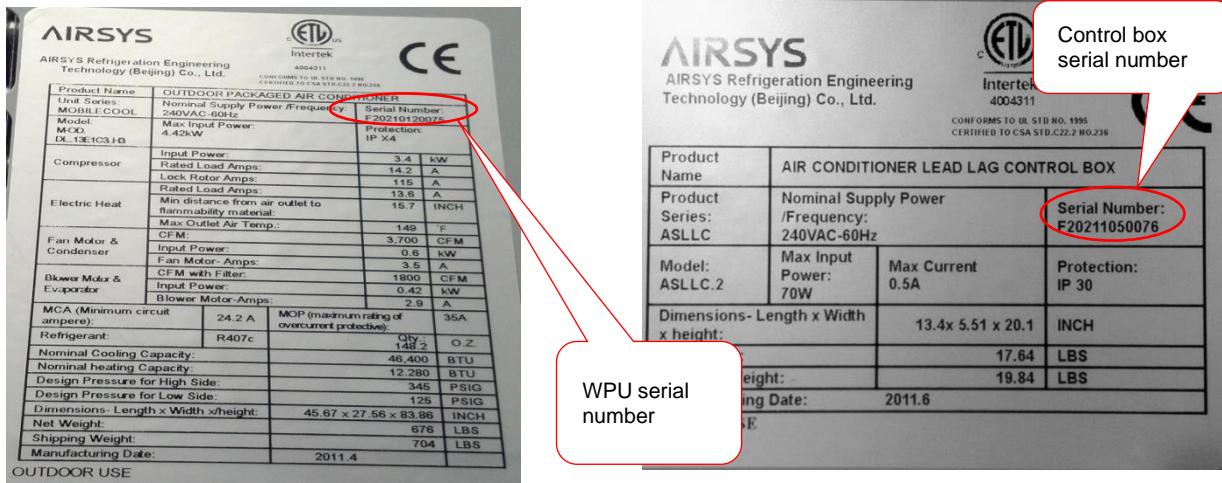
AIRSYS HVAC System
Commissioning Check List[1] (Rev 4.0)

Site name or building serial #: _____   Name of Tester: _____

ASLLC.2 Serial #: _____   Title/Position: _____

Date Tested: _____   Contact information: e. _____   ph. _____

[1] Checklist applicable for ASLLC software revision 46 and higher.

1. **Execute Step Test (verifies all four functions of each WPU)** ☐
    1.1. HVAC #1 Supply Fan ☐
    1.2. HVAC #1 Heater ☐
    1.3. HVAC #1 Mechanical Cooling ☐
    1.4. HVAC #1 Outside Air Damper ☐
    1.5. HVAC #2 Supply Fan ☐
    1.6. HVAC #2 Heater ☐
    1.7. HVAC #2 Mechanical Cooling ☐
    1.8. HVAC #2 Outside Air Damper ☐

2. **Turn ON the HVAC System** ☐

3. **Verify/Change Primary Temperature Set Point** ☐

4. **Verify Temperature and Humidity sensor reading** ☐
    4.1. Primary Indoor Temp sensor (r t) ☐
    4.2. Humidity sensor (H U) ☐
    4.3. External (outside) Temp sensor (E t) ☐
    4.4. HVAC #1 Supply Air sensor (S U) ☐
    4.5. HVAC #2 Supply Air sensor (S U 2) ☐
    4.6. Confirm indoor temperature Set Point (S t P) ☐
    4.7. Backup Indoor Temp sensor (r t 2) ☐

5. **Verify Signal from Generator** ☐

6. **Set The System Clock** ☐

7. **Verify Smoke/Fire Alarm** ☐

8. **Verify HVAC1/HVAC2 Alarms** ☐

9. **Verify DC-Failover (if installed)** ☐

AIRSYS PRODUCT WARRANTY REGISTRATION CARD

PRODUCT INFORMATION

Controller   Model #:_____   Serial #:_____

WPU #1 (left of controller)   Model #:_____   Serial #:_____

WPU #2 (right of controller)   Model #:_____   Serial #:_____

INSTALLATION INFORMATION

Site #:_____   Site Name:_____

Street address:_____   City:_____   State:_____   Zip:_____

Date Install Completed:_____/_____/_____   Installation Company:_____

Installer Name:_____   Phone #:_____   Email:_____

OWNERSHIP INFORMATION

Company:_____

Site Supervisor Name:_____   Phone #:_____   Email:_____

REGISTRATION ONLINE: www.tempesthvac.com/support/warranty-registration

BY EMAIL: Scan and send to:HVACSupport@tempesttelecom.com

By MAIL: AIRSYS Product Registration Tempest Telecom Solutions, LLC, 136 W. Canon Perdido Street, Suite 100 Santa Barbara CA 93101

Chapter 3: System Operation

This chapter describes how to use the PLD interface to execute the functions needed during standard operation. In addition, reference information is supplied on all of the factory default settings. This information may be useful during troubleshooting and in conversations with technical support.

The following topics are covered:

- Using the Main Menu to execute basic functions

- Understanding alarms that may occur and clearing alarm history

- Additional system diagnostic information

User Interface Introduction

The units are controlled using a simple interface with an LED display and three buttons.

Figure 21: PLD User Interface

Button actions are described in **Table 16: PLD Button Actions**.

Table 16: PLD Button Actions

Button and LED	Function Description
Sel	Confirm selection or display value. When the LED is on, indicates that an alarm has been triggered.
Up	Increase value or go back to previous parameter. When flashing (slow flash), there is no Mechanical Cooling on HVAC 1 (aka Lockout)
Down	Decrease value or go to next paramter. When flashing (slow flash), there is no Mechanical Cooling on HVAC 2. (aka Lockout)
Up + Down	Press together to return to the main menu. When both of these buttons are lit, the system is on. When both are dark, the system is off.
Up + Down	When both of these buttons are flashing **once every second**, the system is in comfort mode.
Up or Down	When **Up** and **Down** buttons are flashing **once every 2 seconds** and the alarm button is red, this indicates the HVAC1 & HVAC2 are in lockout. This requires manual reset. **Note**: Power cycling the controller will clear the lockout condition **Note:** Please check that the system is not in comfort mode (Up and Down button are both flashing every second).

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Navigating the Main Menu

Pressing **Up** and **Down** at the same time displays the PLD Main Menu. The default display is the current room temperature. Use **Up** or **Down** to scroll through the main menu. The order of the options varies depending on whether the HVAC system is currently on or off.

Table 17: Main Menu (A) with System Off lists the options on the main menu when the system is off;

Table 18: Main Menu (A) with System On lists them when the system is on.

Note: Option A-10 (SPt) lets an AAST access all of the preconfigured system parameters. Typically, only a few are ever needed during normal operation. These are described here. The remaining menus are described in "System Parameters and Default Values" starting on page 60.

In the table, the following abbreviations are used:

Ref   Reference number for the code

R   The parameter can only be viewed, not changed.

R/W   The parameter can be both viewed and updated.

Table 17: Main Menu (A) with System Off

Ref	Display	R/W	Description	Unit	Range	Default
A-1	77.3	R	Current indoor temperature; default display	˚F	33.8~ 104	
A-2	OFF	R/W	Turn the system on at the terminal		On/Off	
A-3	COF	R/W	Comfort mode ON/OFF		On/Off	Off
A-4	CFt	R/W	Comfort mode run time	Hrs	1~9	1
A-5	SP2	R/W	Set comfort mode indoor temperature	˚F	0.0～100	72.0
A-6	Hu	R	Humidity (Default: indoor)			
A-7	Et	R	Outdoor temperature	˚F		
A-8	Su	R	Supply air temperature	˚F		
A-9	SU2	R	Supply air temperature 2	˚F		
A-10	SPt		Access other menus for viewing and modifying preconfigured system parameters			

Table 18: Main Menu (A) with System On

Ref	Display	R/W	Description	Unit	Range	Default
A-1	77.3	R	Current indoor temperature; default display	˚F	33.8~ 104	
A-3	COF	R/W	Comfort mode ON/OFF		On/Off	Off
A-4	CFt	R/W	Comfort mode run time	Hrs	1~9	1
A-5	SP2	R/W	Set comfort mode indoor temperature	˚F	0.0～100	72.0

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Ref	Display	R/W	Description	Unit	Range	Default
A-6	H u	R	Humidity (Default: indoor)			
A-7	E t	R	Outdoor temperature	˚F		
A-8	S u	R	Supply air temperature	˚F		
A-9	S u 2	R	Supply air temperature 2	˚F		
A-10	SPE		Access other menus for viewing and modifying preconfigured system parameters			
A-2	O n	R/W	Turn the system off at the terminal		On/Off	

Some of the options on the main menu let you view a sensor measurement (humidity, outdoor temperature, supply air temperature). Press **Sel** to display the value; press **Up** and **Down** together to return to the main menu.

Other options let you perform the following actions:

- Turn the system on and off.

- Start comfort mode.

- Set the comfort mode temperature.

- Access other menus.

These options are described in the following sections.

Turning the HVAC System On or Off

1. Press **Up** and **Down** together to enter the main screen.

Press both buttons together to enter the main screen

2. Press **Down** or **Up** until the screen displays either *O n* or *O F F*. *O n* indicates the system has been turned on.

Press until screen displays *O F F* or

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3. If the screen displays *0 F F* , hold **Sel** for 3 seconds. The screen will display *0 n* , indicating that the system is turned on. Press **Down** and **Up** together again to return to the main screen and display the indoor temperature.

hold **Sel** for 3 seconds

If you want to turn the system off, repeat steps 1 and 2 and then press **Sel** for 3 seconds to change the *0 n* to *0 F F* . Press **Down** and **Up** together again to return to the main screen and display the indoor temperature.

Note: When the system is *0 n*   both the **Up** and **Down** LEDs will be lit. When the system is *0 F F*   both the **Up** and **Down** LEDs will be dark.

⊘**Warning.** Never leave the site with the HVAC system in the off state (**Up** and **Down** LEDs dark). Your site will have no temperature control, which likely will result in an urgent site visit to correct.

Using Comfort Mode

The settings on the HVAC system are optimized for operating efficiency and not for the comfort of people. When you need to work inside the shelter for an extended period of time, you can temporarily adjust the site temperature to your personal preference. This temporary adjustment of site temperature is referred to as *comfort mode.*

⚠ **Important.** The HVAC system must be *0 n* to enter comfort mode.

To turn comfort mode *0 n* (if it is currently off) or *0 F F* (if it is currently on), press **Sel** and **Down** together for 3 seconds.

Both the **Down** and **Up** LEDs will flash once every second to indicate the system is in comfort mode.

Note: When comfort mode has been turned on, the system will remain in comfort mode for one hour or until the operator turns comfort mode off.

To turn comfort mode on or off, press the **Sel** and **Down** buttons together for 3 seconds. (Default run time: 1 hour)

To change the comfort mode **run time** and **temperature set point**:

1. From the main menu, press **Down** until the screen displays *C F t* .

2. Press **Sel** to display the comfort mode run time set point, the default is 1 (range: 1~9 hours)

3. Change the run time setting using **Down** or **Up** and then press **Sel** to confirm the new set point.

4. From the main menu, press **Down** until the screen displays *5 P 2* .

5. Press **Sel** to display the comfort mode temperature set point; the factory default is 72°F.

6. Change the temperature setting using **Down** or **Up** and then press **Sel** to confirm the new set point.

⚠ **Important.** If the HVAC system needs to cool aggressively to reach the comfort mode set point, both WPUs may go into mechanical cooling mode which will trigger an A23 alarm.

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Sequence of Operation

Compressor and Heater Operation
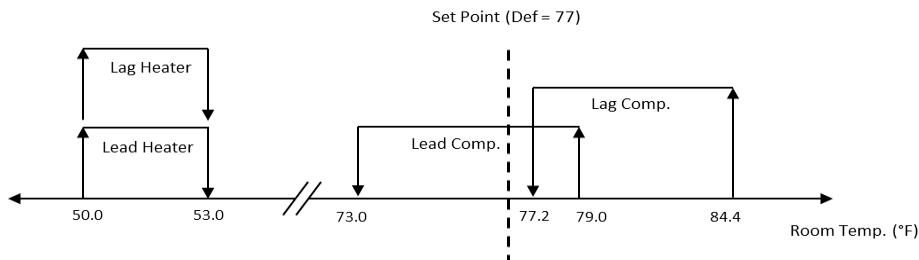
Note: Diagrams based on Main Setpoint ($5 \, t \, P$) = 77°F. For details on changing trigger points, please refer to "System Parameters and Default Values" on page 60 for detail.

Lead Compressor

The lead compressor turns on at main setpoint +2 (configurable at $C \, 0 \, 2$ under E Menu).

The lead compressor turns off at 6 degrees beblow its turn on point (configurable at $C \, 0 \, 1$ under E Menu).

Note: Compressor engages a 3 min delay when the units are powered to prevent rapid compressor cycling.
Note 2: When outdoor temp is lower than indoor temp, the lead compressor will have a delayed start ranging from 10s to 300s to gives the system a chance to use FC before turning on the compressor.

Lag Compressor

The lag compressor turns on at main setpoint + 7.4 with 1 min delay (configurable at $F \, 3 \, 8$ under L05 Menu).

The lag compressor turns off at 7.2 degrees below its turn on point -7.2 (configurable at $F \, 3 \, 9$ under L05 Menu)

Lead Heater

The lead heater turns on at setpoint -27 (configurable at $H \, 0 \, 2$ under E Menu).

The lead heater turns off 3 degrees above its turn on point (configurable at $H \, 0 \, 1$ under E Menu).

Lag Heater

The lag heater turns on at setpoint -27 with 1 minute delay (configurable at $F \, 3 \, 6$ under L05 Menu).

The lag heater turns off 3 degrees above its turn on point (configurable at $F \, 3 \, 7$ under L05 Menu).

Free Cooling (Economizer) Operation

When the Free Cooling is engaged, the damper opens to introduce cooler air from outside to be delivered to the shelter. The top exhaust design cause the exhaust air to be significantly hotter than the indoor temperature. This allows small temperature difference between indoor and outdoor temperature (minimum 3.6F, connfigurable at

$U \, 0 \, 6$ under L04 Menu) to deliver large cooling capacity.

FC starts at low fan speed when indoor temperature reaches above the lead compressor turn off point. As the indoor temperature rises, the fan speed increases to maintain the indoor temperature within 1 degree F of the main temp setpoint. If the indoor temperature cannot be maintained below the lead compressor turn on point, the compressor will start to assist FC.

Note : For shelters without a secondary pressure relief (e.g. a barometric louvre), FC can be disabled when the

compressor is running. (configurable at ⎓⎓⎓ under L05 Menu).

During cold weather, the outdoor damper modulates to keep mixed air temperature above 51.8 (configurable at

⎓⎓⎓ under L04 Menu)

Executing the Step-Test

The step-test systematically verifies that key components of the system are operating as expected. Note the following considerations:

- The steps in the test can be executed in any order; they do not need to be sequential.

- For systems with controller software prior to revision 13B64, the test must be completed within **30 minutes**. If you cannot complete the test within this timeframe, you must re-enter the step test mode. More recent versions of software do not have a time limit.

- The system will display the main menu (indoor temperature) automatically after ten minutes when there has been no input from the technician.

- Step Test takes the system out of automatic mode. Turn the system back ON to return to automatic mode.

PLD button actions are listed in more detail on page 41. If any alarms are triggered during the test, refer to **Alarms** on page 49 for details.

> ⓘ **Warning.** Once a compressor has been turned on, it must be allowed to run for at least one minute before the next step to prevent compressor damage.

To complete the test, follow these steps:

7. Press **Up** and **Down** together to enter the main screen. The screen will display the indoor temperature. If the indoor temperature does not display, press both buttons again and repeat as needed.

8. When the system is on, press and hold **Up** and **Sel** together for 3 seconds. The user terminal will display

   ⎓⎓⎓. Press **Up** until ⎓⎓⎓ displays. When the system is off, press **Up** and **Sel** together for 3 seconds and

   the user terminal will display ⎓⎓⎓.

9. With ⎓⎓⎓ displayed on screen press **Sel** to confirm. The screen will display ⎓. Press **Up** to select appropriate step (**1-10**; see Table 13: Step-Test below). Press **Sel** to confirm selection. The user terminal

   returns to ⎓⎓⎓ and the component will be engaged. Repeat these steps as needed.

10. When the step-test is complete, return to the main menu and turn the HVAC system on.

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Table 19: Step-Test

	⌐ □ ⌐ Value		
ACTION	**WPU #1**	**WPU #2**	**NOTES**
Turns on Supply Fan	**1**	**5**	
Turns on Heater	**2**	**6**	May take a few minutes before you feel warm air
Turns on Compressor	**3**	**7**	**IMPORTANT:** Let compressor run for <u>at least one minute</u> before going to next step
Opens Fresh Air Damper	**4**	**8**	*HINT*: With the lights off in the shelter, you can see indirect daylight via opening behind exhaust grill
Turns on Fan <u>and</u> Heater for both Lead and Lag WPUs	**9**		
Turns on Fan, Compressor, <u>and</u> Damper for both Lead and Lag WPUs	**10**		Damper will open to 100% **IMPORTANT:** Let compressors run for <u>at least one minute</u>

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Alarms

When a problem occurs during operation of the unit, the controller records the related information and the **Sel** button will be lit. Depending on the severity of the alarm, various components are automatically shut down. The system will restart most of these devices without human intervention after a defined delay period. However, manual reset is required when high or low pressure alarms occur three times within an hour.

If the **Sel** button is illuminated, press the **Sel** button when the screen displays indoor temperature. The code identifying the malfunction displays on the screen of the user terminal. Press **Up** to scroll through any other active alarms. You can review alarm history through a separate menu and this will be covered in the following section.

Table 20 lists the alarm codes that may display with a brief description. Table 22 on page 53 provides more detail on troubleshooting alarms should they occur during operation of the system.

Table 20: Summary of System Alarms

Code[1]	Description	Output Delay	Alarm Contact Reporting				PLD display
			High/low temp. Alarm	HVAC 1 Major Alarm	HVAC 2 Major Alarm	2nd Comp. Run	
A02[5]	Low pressure 1[5]	60/10s		X			X
A03[5]	High pressure 1[5]	2s		X			X
A04[5]	Low pressure 2[5]	60/10s			X		X
A05	Smoke/Fire	None					X
A06[5]	High pressure 2[5]	2s			X		X
A07	High temperature	300s	X				X
A08	Low temperature	300s	X				X
A09[2]	Prime power outage (Only if DC Failover is used)	40s		X	X		X
A10[2]	Supply fan overload 1	0s		X			X
A11[2]	Supply fan overload 2	0s			X		X
A15	Dirty air filter1	10s					X
A16	Dirty air filter2	10s					X
A17	pLAN alarm	30s			X		X
A18	Clock card alarm	60s					X
A19	Humidity alarm	60s					X
A20	Indoor temperature sensor defective	60s					X
A21	Backup indoor temp. sensor defective	60s					X
A20&A21	Indoor & backup indoor temp. sensors defective	60s		X	X		X
A22	Outdoor temp. sensor defective	60s					X
A23	2nd compressor run	5s				X	X
A24	Damper Failure 1	60m					X
A25	Damper Failure 2	60m					x
A26	HVAC 1 supply air temp. sensor defective	60s					X
A27	HVAC 2 supply air temp. sensor defective	60s					X
A28	Generator run	5s					X
A29[3]	HVAC1 air flow defective or DC part powered off	30s		X			X
A30[3]	HVAC2 air flow defective or DC part powered off	30s			X		X
A31[3]	HVAC1 AC part powered off alarm	30s		X			X
A32[3]	HVAC2 AC part powered off alarm	30s			X		X

1. Alarm codes listed in the table above will result in an audible tone and a red alarm light presented on the PLD.
2. A09, A10&A11 will not display if the HVAC is equipped with DC EC supply fan and ASLLC.2.48 is chosen.
3. A29, A30, A31& A32 will not display if the HVAC is equipped with AC EC supply fan and ASLLC.2 is chosen.
4. HVAC major alarm will not be cleared until manually reset or the components can work normally at the next working time.
5. If a Low pressure or High pressure alarm is triggered 3 times in one hour, the corresponding unit will LOCKOUT. This means only the supply fan will operatate with no compressor function. There are two ways to clear the alarm: a. Power

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cycle the controller or b. Access the parameters in the table: $L\,0\,4$-$u\,2\,L$ (Manual reset if low pressure) or $u\,2\,E$ (Manual reset if high pressure).

Viewing Alarm History

To review the history of alarm codes, follow these steps:

1. From the main menu, press **Up** until the screen displays **5P.t**. Press **Sel** to confirm. This will display the $5\,t\,P$.

2. Press **Up** until $A\,L\,n$ displays. Press **Sel** to confirm. This will display the most recent alarm code.

3. Then press **Up** to review the history. When you find an alarm number you want to review, press **Sel** to select it. This should display $n\,1\,P$, the first display in the alarm history menu.

4. Press **Sel** to display the code's value, for example when $n\,1\,P$ displays, press **Sel** to display the alarm sequence such as 4.

5. After viewing the value, press **Sel** again to return to the Display code (such as $n\,1\,P$).

6. Use **Up** and **Down** to review the additional details listed in Table 21 and follow the same steps to view the value and return to the code display.

7. Press **Up** and **Down** together to return to the alarm code display.

Table 21: Alarm History

Ref	Display	R/W	Description
C-40-1-1	$n\,1\,P$	R	Sequence number of the alarm (for example, 4 for the fourth alarm to be recorded)
C-40-1-2	$n\,1\,C$	R	Year of the alarm
C-40-1-3	$n\,1\,L$	R	Month of the alarm
C-40-1-4	$n\,1\,E$	R	Day of the alarm
C-40-1-5	$n\,1\,F$	R	Hour of the alarm
C-40-1-6	$n\,2\,0$	R	Minute of the alarm

Clearing Alarm History

At significant points such as during yearly preventive maintenance you may want to clear the alarm history.

⊘ **Warning.** Alarm history is collected because it can be very helpful in identifying a problem with the system. The alarm history should never be arbitrarily cleared by an operator. Only an AIRSYS authorized service technician should clear the alarm history after all the alarms stored in history have been recorded.

To clear the alarm history, you need to supply a password to access the L05 menu.

Follow these steps to enter the $L\,0\,5$ menu and erase alarm history:

1. Press **Down** and **Up** simultaneously to display the main screen.

2. Press **Up** until the screen displays **5P.t**.

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3. Then press **Down** and **Sel** simultaneously. The user terminal will display $\mathit{0}$.

4. Enter the supplied password. The user terminal will display $L\ \mathit{0}\ \mathit{1}$.

5. Press **Up** to display $L\ \mathit{0}\ \mathit{5}$. Press the **Sel** button and the terminal will display $F\ \mathit{0}\ \mathit{1}$.

6. Press the **Up** button to display $F\ \mathit{3}\ \mathit{A}$; press the **Sel** button to display $n\ o$ on the PLD.

7. Use the **Up** button to flash $Y\ E\ 5$ on the PLD and erase the alarm history.

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Alarm Descriptions

Table 22: Troubleshooting System Alarms

Code	Signal	Description	Possible Cause	Component to Check	Recommended Action	Device Actions			
						Supply Fan	Compressor/ Cond Fan	Heat	Damper
A02 *A04*	Low pressure alarm	If the alarm is triggered once or twice in an hour, it is reset automatically. If it occurs three times in an hour, the compressor and condenser fan are locked.	Lack of refrigerant	Run the unit and check if the low pressure value is in the normal range.	Reset manually using the *L04* menu, *U2L* parameter, or restart the unit to remove the alarm. Charge appropriate amount of refrigerant.		Off		
			The switch is defective	Check if the low pressure switch is OK.	If it is defective, replace it.				
			Check if the connection to the corresponding input terminal (ID3) is ok or if the controller board is defective.	Check if the connection is OK. Check if the controller board is OK.	Reconnect the cables. If the controller board is defective, replace it.				
A03 *A05*	High pressure alarm	If the alarm is triggered once or twice in an hour, it can be reset automatically. If it occurs three times in an hour, the compressor and condenser fan are locked.	Reduced condenser heat exchange	Run the unit and check if the high pressure value is in the normal range.	Reset manually using the *L04* menu *U2E* parameter or restart the unit to remove the alarm. Discharge appropriate amount of the refrigerant. Clean the condenser.		Off		
			Condenser fan has failed. The condenser fan speed controller has failed.	Check the condenser fan status while the high pressure is outside the normal setting.	Replace the condenser fan. Replace the condenser fan speed controller.				
			The switch is defective	Check if the high pressure switch is OK.	If it is defective, replace it.				
			Check if the connection to the corresponding input terminal (ID4) is ok or if the controller board is defective.	Check if the connection is OK. Check if the controller board is OK.	Reconnect the cables. If the controller board is defective, replace it.				

Code	Signal	Description	Possible Cause	Component to Check	Recommended Action	Device Actions			
						Supply Fan	Compressor/ Cond Fan	Heat	Damper
A0 5	Smoke/Fire alarm	The entire unit stops working. The alarm resets automatically.	Fire/Smoke detector is triggered.	Check the external Fire/Smoke detector WPU 1.	Replace the external Fire/Smoke detector	Off	Off	Off	Closed
			Check if the connection to the corresponding input terminal (ID1) is ok or if the controller board is defective.	Check if the connection is OK.	Reconnect the cable. If the controller board is defective, replace it.				
A0 7	High temperature alarm	Alarm is reset automatically. Occurs when the current indoor temperature is greater than the indoor temperature set point value plus the temperature alarm offset. The default is 84.4˚ F with 5 minutes delay.	The cooling capacity loss or heat load is too great.	Check for leakages in the refrigerant circuit. Check if heat load exceeds the design range.	Patch the leak. Increase the cooling capacity.				
			Compressor circuit failure	Check if components connected to the compressor are OK; Check if the compressor is OK. Check if the electric connection is OK.	Replace the defective components. Replace the compressor. Reconnect the cables.				
			Indoor temperature sensor (B1) failure.	Check if the sensor is shorted or has failed.	Replace the indoor temperature sensor.				
			Incorrect value set for the high temperature alarm.	Check if the value is correct.	Correct the value.				
A0 8	Low temperature alarm	Alarm can be reset automatically. Occurs when the current indoor temperature is less than the indoor temperature set point value minus the temperature alarm offset. The default is 59˚F with 5 minutes delay.	Heating capacity loss.	Check if the heaters are OK. Check for leaks around the unit.	If heaters have failed, replace them. Seal the leaks.				
			Indoor temperature sensor (port B2) failure.	Check for a short in the sensor or if it has failed.	Replace the indoor temperature sensor				
			Incorrect value set for the high temp alarm	Check if the value is correct.	Correct the value.				
A0 9	Prime power outage	Alarm is reset automatically	Primary power is or was turned off.			Off	Off	Off	Closed

Code	Signal	Description	Possible Cause	Component to Check	Recommended Action	Device Actions			
						Supply Fan	Compressor/ Cond Fan	Heat	Damper
A 10 *A 11*	Supply fan overload	The unit will stop working. Alarm is reset automatically.	The fan is blocked.	Check if the fan speed and operating current are normal.	Remove the blockage. If the fan is defective, replace it.	Off	Off	Off	Closed
			Main power has been lost.	Check if the main power is OK.	Turn main power on.				
			The current to the fan is higher than normal.	Check if the switch, relay or built-in fan protection is disconnected.	Close the switch, and check. If the fan is defective, replace it.				
			Check if the connection to the corresponding input terminal (ID6) is ok or if the controller board is defective.	Check if the connection is ok.	Reconnect the cable. If the controller board is defective, replace it.				
A 15 *A 16*	Dirty air filter	Alarm is reset automatically. The alarm is a warning to the replace the filter.	Filter is clogged.	Check if the filter is dirty.	Clean or replace the filter				
			Check if the connection to the corresponding input terminal (ID5) is ok or if the controller board is defective.	Check if the connection is ok.	Reconnect the cable. If the controller board is defective, replace it.				
			The value set for the air pressure diff. switch is too low.	Check the air pressure diff switch value.	Correct the value of the switch to standard value.				
A 17	pLAN alarm	Each unit continues to work separately. It can be reset automatically.	The pLAN cable is disconnected.	Check if the cable is connected or shorted.	Reconnect the cable.				
A 18	Clock card alarm	The clock function is not available. Both time display function and history alarm record function are disabled. It can be reset automatically.	Clock card is loose.	Fix the clock card on the controller board	After the clock card is fixed, check if the alarm is removed.				
			The clock card has failed.	After fixing the clock card, the alarm still exists.	Replace it.				
A 19	Humidity alarm	The free cooling damper will be closed. It can be reset automatically.	Humidity sensor (port J2-B3 on unit 1 controller) failure.	Check if the cable is connected or shorted.	Replace it.				Closed
			The humidity is higher than standard value.	Dry the sensor, and then check if the alarm is cleared.	Relocate the sensor.				

Code	Signal	Description	Possible Cause	Component to Check	Recommended Action	Device Actions			
						Supply Fan	Compressor/ Cond Fan	Heat	Damper
A20	Indoor temp. sensor defective	It can be reset automatically.	Indoor temperature sensor (port J2-B2 on unit1 controller) failure.	Check if the cable is connected or shorted.	Replace it.				
A21	Backup indoor temperature sensor defective	Both units stop working. It can be reset automatically.	Indoor temperature sensor (port J2-B2 on unit 2 controller) failure.	Check if the cable is connected or shorted.	Replace it.				
A20 AND A21	Indoor and backup indoor temperature sensors are both defective	Both units stop working. It can be reset automatically.	Both Indoor temperature sensors have failed.	Check if the cable is connected or shorted.	Replace it.	Off	Off	Off	Closed
A22	Outdoor temperature sensor defective	The free cooling damper will be closed. It can be reset automatically.	Temperature sensor (port J2-B3 on unit 1 controller) failure.	Check if the cable is connected or shorted.	Replace it.				Closed
A23	Second compressor run alarm	Both compressors are running at the same time.	Heat load at the site exceeds single HVAC capacity.	Check if the heat load of cell site exceeds the nominal heat load.	None				
				Check if refrigerant quantity is low.	Check for leakages in the refrigerant system.				
A24 A25	HVAC Damper failure	The alarm can be automatically reset once the alarm is removed.	HVAC damper is broken or blocked or loosen	Check if the damper actuator is broken or loose.	If loose, tighten. If the damper actuator is broken, replace it.	None	None	None	None
				Check if the damper is blocked.	If the damper is blocked, clear blockage.				
A26 A27	Supply air temp. sensor defective	Damper will stop working. It can be reset automatically.	HVAC Supply air temp. sensor failure	Check if the cable is connected to (B1&GND) or shorted.	Replace it.				Closed
A28	Generator run signal	This indicates that the generator is running. Lag compressor will be prevented from running by default.							
A29	HVAC air flow defective	The PLD will display A29/ A30	The supply fan doesn't work. The 48VDC power is	Check the supply fan.	If the supply fan is blocked or broken, please remove the object or replace the fan.	Off	Off	Off	closed

Code	Signal	Description	Possible Cause	Component to Check	Recommended Action	Device Actions			
						Supply Fan	Compressor/ Cond Fan	Heat	Damper
A 3 0			powered off or no 48VDC power input The pressure switches PF2 or 3 or both for HVAC supply fan are broken. The pressure switches PF2 or 3 or both for HVAC are disconnected.	Check the 48VDC power plant.	If the 48VDC power plant has no power, check the power source.				
				Check the 48VDC power breaker (QF2).	If the 48VDC power breaker is broken, please replace it.				
				Check the air pressure differential switch.	If the cable is loosen, secure the cable.				
					If the air pressure differential switch is broken, replace it.				
				Check the set point of the air pressure differential switch.	If the set point is not near 50 Pa, change it back.				
A 3 1 *A 3 2*	HVAC AC power powered off alarm	The PLD will display A31/A32	The AC power is powered off	Check the breaker.	If the breaker is broken, replace it.		Off	Off	
				Check the AC power source.	If the AC power plant has no power, check the power source.				
				Check the ports B3 & B4 of HVAC 2.	If the B3 or B4 or both are broken, replace the controller.				
					If the cables connected to B3 or B4 or both are loose, secure them.				

System Diagnostics

The information provided in this section may be useful during the troubleshooting of issues that arise during operation of the system. Two types of information are provided:

- A description of the input and output ports of the controller

- A description of all factory settings and how they can be viewed and modified

Port Definitions

Figure 22 is a schematic drawing of the controller module (PLC) ports.
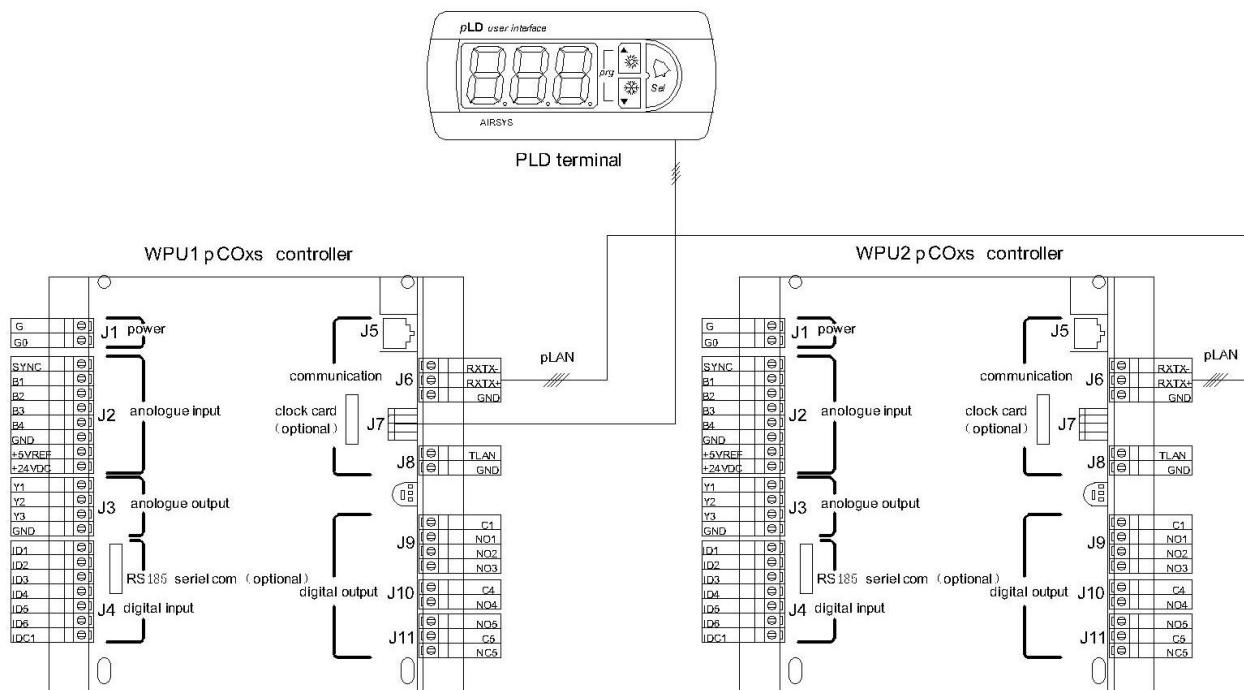
Figure 22: pCOxs Controller Hardware Structure

Table 23 lists the input and output ports of the unit.

Table 23: Port Values

Digital Input		Analog Input		Digital Output		Analog Output	
pCOxs-1 (Main, Address 1: WPU 1)							
ID1	Smoke/Fire (NC)	B1	Supply temperature	NO1	Compressor	Y1	Supply fan
ID2	Gen run (NO)	B2	Indoor temperature	NO2	Supply fan	Y2	Free cooling
ID3	Low pressure (LP)	B3	Humidity	NO3	Electrical heater	Y3	
ID4	High pressure (HP)	B4	Outdoor temperature	NO4	High/low temperature alarm (NC)		
ID5	Filter flow			NO5	HVAC1 alarms (NC/NO)		
ID6	Supply fan overload						

Digital Input		Analog Input		Digital Output		Analog Output	
pCOxs-2 (Extension, Address2: WPU 2)							
ID1	Prime power outage	B1	Supply temperature	NO1	Compressor	Y1	Supply fan
ID2	Smoke/Fire (NC)	B2	Backup indoor temperature	NO2	Supply fan	Y2	Free cooling
ID3	Low pressure (LP)	B3	HVAC1 AC power powered off alarm (If ASLLC.2.48 is chosen)	NO3	Electrical heater	Y3	
ID4	High pressure (HP)	B4	HVAC2 AC power powered off alarm (If ASLLC.2.48 is chosen)	NO4	2nd compressor run alarm (NC)		
ID5	Filter flow			NO5	HVAC2 alarms (NC/NO)		
ID6	Supply fan overload						

System Parameters and Default Values

This section describes the controller menus used for completing operations and displaying information. Using the main menu is described in "Navigating the Main Menu" on page 44. The main menu is not described here. This section describes the additional menus that let an authorized technician access factory default settings.

Table 24: Menu Overview

ID	Purpose	Description
A	Main Menu	- View current sensor readings: indoor temperature, indoor humidty, outside temperature, supply air temperature - Comfort mode setting - Turn system on/off - Launch into other menu ($\boxed{5PE}$)
C	Maintenance	- Main Temperature Setpoint - Rotate lead/lag unit immediately - Sensor Calibration - Component Status - Software Revsion - System Clock
D	Installation	- Step Test - Alarm input/output settings
E	Factory Defaults	- High/low temperature alarm setpoints - Compressor/heater turn on/off setpoints - Reset to factory default
L	Software Parameters	- Run time/start counters - Controller board input/output status - Free cooling settings - Communication settings - Advanced alarm configuration - Erase Alarm History

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To review or modify a parameter, follow these general steps:

1. Press the **Up** or **Down** button to find the code you want.

2. Then press the **Sel** button to review the value.

3. If the parameter can be modified (R/W), press the **Up** or **Down** button to modify the value. Then press **Sel** to confirm the change.

4. To review another parameter, press the **Up** or **Down** button to find its code, and repeat these steps. Press the **Up** or **Down** button together to return to the main screen.

Accessing the C Menu

When the PLD displays **SEt**, press the **Sel** button to enter the C menu. Then press the **Down** button to display the parameters in the order listed in Table 25.

Table 25: Parameters on Maintenance Menu (C)

Ref	Display	R/W	Description	Unit	Range	Default
C-1	5 ᴸ P	R/W	Main temperature setpoint	˚F	33.8~104	77.0
C-2	H ᴸ	R	High temp. alarm difference. High temp alarm occurs at Main temp. setpoint + high temp. alarm difference	˚F		18.0
C-3	L ᴸ	R	Low temp. alarm difference. Low temp alarm occurs at Main temp. setpoint - low temp. alarm difference	˚F		32.0
C-4	ᴿ ᴼ ᴸ	R/W	Lead/lag rotation. Rotates Lead/Lag once after Yes is selected		nO/YES	nO
C-5	ᴿ ᴸ ²	R	Backup room temperature sensor reading	˚F		
C-6	Aᴄ ¹	R	Unit 1 AC power status (DC EC Fan Only)		-C-/-O-	
C-7	Aᴄ ²	R	Unit 2 AC power status (DC EC Fan Only)		-C-/-O-	
C-8	d 5 ¹	R	Unit 1 Supply fan status		On/off	
C-9	d 5 ²	R	Unit 1 Compressor status		On/off	
C-10	d 5 ³	R	Unit 1 Heater status		On/off	
C-11	d 5 ⁴	R	Unit 1 Free cooling status		On/off	
C-12	d 5 A	R	Generator status		On/off	
C-13	d 5 6	R	Unit 2 Supply fan status		On/off	
C-13	d 5 7	R	Unit 2 Compressor status		On/off	
C-14	d 5 8	R	Unit 2 Heater status		On/off	
C-15	d 5 9	R	Unit 2 Free cooling status		On/off	
*C-16	U ¹ ᴸ	R	Unit 1 System Status		0~7	
*C-17	U ² ᴸ	R	Unit 2 System Status		0~7	

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Ref	Display	R/W	Description	Unit	Range	Default
C-18	b I 0	R	Bios version			
C-19	b 0 0	R	Boot version			
C-20	U E I	R	Software version 1			
C-21	U E 2	R	Software version 2			
C-22	n I 5	R/W	Display and set the current time/date - hour		0~23	
C-23	n I 6	R/W	Display and set the current time/date - minute		0~59	
C-24	n I 7	R/W	Display and set the current time/date - year		0~99	
C-25	n I 8	R/W	Display and set the current time/date - month		0~12	
C-26	n I 9	R/W	Display and set the current time/date - day		0~31	
C-27	5 t A	R	System working status		1~7	7
The following parameters with gray highlight are displayed after the system is turned off using the PLD						
C-28	n 2 I	R/W	Unit 1 Supply fan manual mode		On/off	Off
C-29	n 2 P	R/W	Unit 1 Supply fan manual mode to change the input voltage	V	0-10	0
C-30	n 2 9	R/W	Unit 1 Free cooling manual mode		On/off	Off
C-31	n 4 P	R/W	Unit 1 Free cooling manual mode to change the input voltage	V	0-10	0
C-32	n 2 6	R/W	Unit 1 Compressor manual mode		On/off	Off
C-33	n 2 3	R/W	Unit 1 Heater manual mode		On/off	Off
C-34	n 4 I	R/W	Unit 2 Supply fan manual mode		On/off	Off
C-35	n 5 P	R/W	Unit 2 Supply fan manual mode to change the input voltage	V	0-10	0
C-36	n 4 0	R/W	Unit 2 Free cooling manual mode		On/off	Off
C-37	n 6 P	R/W	Unit 2 Free cooling manual mode to change the input voltage	V	0-10	0
C-38	n 3 F	R/W	Unit 2 Compressor manual mode		On/off	Off
C-39	n 3 E	R/W	Unit 2 Heater manual mode		On/off	Off
C-40	n 2 A	R/W	Indoor temperature calibration	˚F	-99.9~99.9	0
C-41	n 2 P	R/W	Outdoor temperature calibration	˚F	-99.9~99.9	0
C-42	n 2 C	R/W	Supply air temperature calibration	˚F	-99.9~99.9	0
C-43	n 2 L	R/W	Humidity sensor calibration	%	-99.9~99.9	0

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Ref	Display	R/W	Description	Unit	Range	Default
C-44	n 42	R/W	Backup indoor temperature calibration	˚F	-99.9~99.9	0
C-45	n 43	R/W	Supply temperature sensor 2 calibration	˚F	-99.9~99.9	0
C-46	AL n	R	View history of alarm code, date, and time		---	

*Note: The range of parameters U 1t & U 2t are 0-7. The identification of the numbers is listed in the table below. The two parameters are used to check the system status.

Note: If you want to rotate the lead and lag units, please change the parameter r 0 t from NO to YES, and then check the either U 1t & U 2t to confirm that the lead and lag units have rotated successfully.

Table 26: U 1t & U 2t Parameter Range

Value	Unit status
0	Unit ON
1	OFF by Alarms
2	OFF by Supervisory
3	OFF by Time zones
4	OFF by Digital Input
5	OFF by Keyboard,
6	Manual Procedure
7	Unit Stand-by

Accessing the D Menu

After the terminal displays **SPt**, press the **Up** and **Sel** buttons at the same time to enter into the D menu. Then press the **Down** button to display the parameters in Table 27 in the listed order.

*Note:

1. The parameters t E 5 and C 0 d will display on PLD when the system is off.

2. After the parameter t E 5 is changed from o F F to o n, press **Sel** button to confirm. The parameter C 0 d will display on the PLD.

Note: If the ASLLC.2.48 has been reset to factory default, the parameter 5 F 1 shall be changed from 1 to 0.

Table 27: Installation Menu (D)

Ref	Display	R/W	Description	Unit	Range	Default
*D-1	t E 5	R/W	Device test, displays when the unit has been turned off using the PLD interface		On/off	Off
*D-2	C 0 d	R	Device test code, displays when the unit has been turned off using the PLD interface		0-8	0
D-3	5 F t	R/W	Fire/Smoke alarm input		n.C/n.O	n.C
D-4	d G t	R/W	Generator run status input		n.C/n.O	n.O
D-5	2 C t	R/W	Second compressor run status output		n.C/n.O	n.C

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Ref	Display	R/W	Description	Unit	Range	Default
D-6	P U t	R/W	HVAC1/HVAC2 lockout output		n.C/n.O	n.O
D-7	H t t	R/W	High/low temperature alarm output		n.C/n.O	n.C
D-8	C 5 t	R/W	Generator on, compressor stop time, or Power on compressor turns on with a delay time.	S	0-999	180
D-9	E 2 C	R/W	Generator on, enable second compressor turn-on.		no/YES	no
D-10	5 F 1	R/W	Supply fan configuration; 0 means DC drive supply fan; 1 means AC drive supply fan		0/1	1

Accessing the E Menu

After the terminal displays **SPt**, press the **Down** and **Sel** buttons at the same time to enter the E menu. Then press the **Down** button to display the parameters in Table 28 in the listed order.

Table 28: Protected Factory Defaults (E)

Ref	Display	R/W	Description	Unit	Range	Default
E-1	0	R/W	Input user password		0~999	000
Input Password, Press Sel button, the following parameters will display.						
E-2	5 t P	R/W	Temperature setting	°F	33.8~104.0	77.0
E-3	H t	R/W	High temp. alarm difference. High temp alarm occurs at Main temp. setpoint + high temp. alarm difference	°F	0.0~999.9	18.0
E-4	L t	R/W	Low temp. alarm difference. Low temp alarm occurs at Main temp. setpoint - low temp. alarm difference	°F	0.0~999.9	32.0
E-5	C 0 1	R/W	Lead compressor turn off difference	°F	0.0~100	6.0
E-6	C 0 2	R/W	Lead compressor turn on difference	°F	0.0~99.9	2.0
E-7	H 0 1	R/W	Lead heater turn off difference	°F	0.0~100	3.0
E-8	H 0 2	R/W	Lead heater turn on difference	°F	0.0~99.9	27.0
E-9	C 0 3	R/W	Not used	--	--	0
E-10	C A d	R/W	Controller address		1/2	1
E-11	t 5 1	R/W	Allow adjustment of supply fan speed as PI		no/ YES	YES
E-12	t 5 2	R/W	Allow 1st compressor to start with a variable delay time		no/ YES	YES
E-13	E t 2	R/W	Enable pCOxs-2 temperature sensor failure alarm and temperature sensor backup		no/ YES	YES
E-14	5 y 5	R/W	Number of units		1/2	2
E-15	F C 1	R/W	Enable FC damper alarm		no/ YES	YES
E-16	F C 2	R/W	Check △T (close)	°F	1.0~999.9	10.0
E-17	F C 3	R/W	Check △T (open)	°F	1.0~999.9	10.0
E-18	F C 4	R/W	FC damper alarm delay	s	1~999	300

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Ref	Display	R/W	Description	Unit	Range	Default
E-19	*FC 5*	R/W	FC damper alarm restart time	M	1~540	60
E-20	*FC 6*	R/W	Damper Lockout counters		1~10	3
E-21	*FC 7*	R/W	Lockout time	M	1~540	540
E-22	*dEF*	R/W	Reset the system to factory default			
E-23	*P5U*	R/W	Set password			0

Accessing the L Menus

The L menus allow authorized technical personnel access to all of the factory default settings. Accessing these parameters requires the technician to supply a password. The parameters are divided into five menus:

L01 – Temperature, humidity, and working status

L02 – Component run time and start counters, sensor calibration, manual mode, and alarm history

L03 – Input and output configuration

L04 – Cooling and heating set points, alarm delay time, free cooling damper set point

L05 – WPU factory configuration

Follow these steps to enter these menus:

1. From the main menu's temperature display, press the **Down** button until the screen displays **SPt**.

1. Then press **Down** and **Sel** simultaneously. The user terminal will display *0*.

2. Enter the supplied password. The user terminal will display *L01*.

3. Press **Sel** to review the *L01* menu. Press **Down** and **Up** simultaneously to return to the *L01* screen

4. When the terminal displays *L01*, press **Down** to display *L02*, *L03*, *L04*, and *L05*. Follow the same steps to select and view the parameters.

Table 29: L Parameters

Display	R/W	Description	Unit	Range	Default
L01 – Main Screen					
Add	R	Unit Address			1
dS 1	R	Unit 1 supply fan status		On/Off	Off
dS 2	R	Unit 1 compressor status		On/Off	Off
dS 3	R	Unit 1 heater status		On/Off	Off
dS 4	R	Unit 1 free cooling status		On/Off	Off
dS A	R	Generator status		On/Off	Off
dS 6	R	Unit 2 supply fan status		On/Off	Off

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Display	R/W	Description	Unit	Range	Default
d57	R	Unit 2 compressor status		On/Off	Off
d58	R	Unit 2 heater status		On/Off	Off
d59	R	Unit 2 free cooling status		On/Off	Off
d55	R	Supply air limit		On/Off	Off
L02 – Maintenance Menu					
ALn	R	Not used			
n01	R	Free cooling running hours *1000	Hrs	0~999	0
n02	R	Free cooling running hours *1	Hrs	0~999	0
r01	R/W	Free cooling running hours reset		no/YES	no
n03	R	Free cooling 1 start counters		0~999	0
r03	R/W	Free cooling 1 start counters reset		no/YES	no
n31	R	Free cooling 2 running hours *1000	Hrs	0~999	0
n32	R	Free cooling 2 running hours *1	Hrs	0~999	0
r31	R/W	Free cooling 2 running hours reset		no/YES	no
n33	R	Free cooling 2 start counters		0~999	0
r33	R/W	Free cooling 2 start counters reset		no/YES	no
n09	R	Compressor 1 running hours *1000	Hrs	0~999	0
n0A	R	Compressor 1 running hours *1	Hrs	0~999	0
r09	R/W	Compressor 1 running hours reset		no/YES	no
n0P	R	Compressor 1 start counters		0~999	0
r0P	R/W	Compressor 1 start counters reset		no/YES	no
n34	R	Compressor 2 running hours *1000	Hrs	0~999	0
n35	R	Compressor 2 running hours *1	Hrs	0~999	0
r34	R/W	Compressor 2 running hours reset		no/YES	no
n36	R	Compressor 2 start counters		0~999	0
r36	R/W	Compressor 2 start counters reset		no/YES	no
n0L	R	Heater 1 running hours *1000	Hrs	0~999	0

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Display	R/W	Description	Unit	Range	Default
n 0 E	R	Heater 1 running hours *1	Hrs	0~999	0
r 0 L	R/W	Heater 1 running hours reset		no/YES	no
n 0 F	R	Heater 1 start counters		0~999	0
r 0 F	R/W	Heater 1 start counters reset		no/YES	no
n 3 7	R	Heater 2 running hours *1000	Hrs	0~999	0
n 3 8	R	Heater 2 running hours *1	Hrs	0~999	0
r 3 7	R/W	Heater 2 running hours reset		no/YES	no
n 3 9	R	Heater 2 start counters		0~999	0
r 3 9	R/W	Heater 2 start counters reset		no/YES	no
n 1 1	R	Supply fan 1 start counters		0~999	o
r 1 1	R/W	Supply fan 1 start counters reset		no/YES	no
n 1 3	R	Supply fan 1 running hours *1000	Hrs	0~999	0
n 1 4	R	Supply fan 1 running hours*1	Hrs	0~999	0
r 1 3	R/W	Supply fan 1 running hours reset		no/YES	no
n 3 A	R	Supply fan 2 start counters		0~999	0
r 3 A	R/W	Supply fan 2 start counters reset		no/YES	no
n 3 P	R	Supply fan 2 running hours *1000	Hrs	0~999	0
n 3 C	R	Supply fan 2 running hours *1	Hrs	0~999	0
r 3 C	R/W	Supply fan 2 running hours reset		no/YES	no
n 1 5	R/W	Hour			
n 1 6	R/W	Minute			
n 1 7	R/W	Year			
n 1 8	R/W	Month			
n 1 9	R/W	Date			
n 1 A	R/W	Day (Monday, Tuesday, …, Sunday)		Mon~Sun	
n 2 A	R/W	Indoor temperature calibration	˚F	-99.9~99.9	0.0
n 2 P	R/W	Outdoor temperature calibration	˚F	-99.9~99.9	0.0

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Display	R/W	Description	Unit	Range	Default
n2C	R/W	Supply air temperature sensor 1 calibration	˚F	-99.9~99.9	0.0
n2L	R/W	Humidity sensor calibration	%	-99.9~99.9	0.0
n42	R/W	Backup Indoor temperature calibration	˚F	-99.9~99.9	0.0
n43	R/W	Supply air temperature sensor 2 calibration	˚F	-99.9~99.9	0.0
L03 – Controller Board Input/Output					
110	R	ID1:Fire/smoke alarm output		-C or O-	
111	R	ID2:Generator status signal		-C or O-	
112	R	ID3:Low pressure		-C or O-	
113	R	ID4:High pressure		-C or O-	
114	R	ID5:Dirty filter		-C or O-	
115	R	ID6: Supply fan overload		-C or O-	
120	R	2 ID1: Prime Power Outage			
121	R	2 ID2: Smoke/Fire			
122	R	2 ID3:Low pressure 2		-C or O-	
123	R	2 ID4:High pressure 2		-C or O-	
124	R	2 ID5:Dirty Filter 2		-C or O-	
125	R	2 ID6: Supply fan 2 overload		-C or O-	
118	R	Y1: Supply fan speed		0.0~10.0	
119	R	Y2: Free cooling damper opening		0.0~10.0	
126	R	2 Y1: Supply fan speed 2		0.0~10.0	
127	R	2 Y2: Free cooling damper opening 2		0.0~10.0	
11P	R	NO1: Compressor (MC)		-C or O-	
11C	R	NO2: Supply fan (MF2)		-C or O-	
11L	R	NO3: Heater (EH1-3)		-C or O-	
11E	R	NO4: High/low temp alarm		-C or O-	
11F	R	NO5: HVAC1 Fail		-C or O-	
128	R	2 NO1: Compressor (MC)		-C or O-	

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Display	R/W	Description	Unit	Range	Default
1 2 9	R	2 NO2: Supply fan (MF2)		-C or O-	
1 2 A	R	2 NO3: Heater (EH1-3)		-C or O-	
1 2 P	R	2 NO4: 2nd compressor run		-C or O-	
1 2 C	R	2 NO5: HVAC2 Fail		-C or O-	
L04 – User Menu					
U 0 1	R/W	Minimum temperature setting	˚F	-999.9~999.9	33.8
U 0 2	R/W	Maximum temperature setting	˚F	-999.9~999.9	104
U 4 9	R/W	Allow adjustment of temperature as PI logic		no/YES	no
U 0 3	R/W	Free cooling humidity limit		no/YES	YES
U 0 4	R/W	Free cooling humidity setting	%	50.0~99.9	85.0
U 0 5	R/W	Free cooling humidity difference	%	0.0~20.0	5.0
U 0 6	R/W	Free cooling temperature difference of indoor and outdoor temperatures	˚F	0.0~30.0	3.6
U 0 8	R/W	Auto-start after power on		no/YES	YES
U 0 9	R/W	Turn the unit on or off by software		no/YES	YES
U 0 A	R/W	Delay time of high/low temperature alarm output	S	0~999	60
U 0 P	R/W	Supply air temperature limit		no/YES	no
U 0 C	R/W	Not used	˚F	-999.9~999.9	6.0
U 0 L	R/W	Not used	˚F	0.0~999.9	4.0
U 2 L	R/W	Manual reset for low pressure lockout		no/YES	no
U 2 E	R/W	Manual reset for high pressure lockout		no/YES	no
U 3 0	R/W	Monitor system address			1
U 3 1	R/W	Communication baud rate:1 means 2400; 2 means 4800; 3 means 9600; 4 means 19200.			3
U 3 2	R/W	Communication protocol, Ca means Carel; Nod means MODBUS		Ca/Nod	Nod
U 5 4	R/W	Free cooling supply air temperature limit	˚F	-70.0~999.9	51.8
U 5 5	R/W	Free cooling supply air temperature modulating range	˚F	0.0~99.9	1.8
U 5 6	R/W	Free cooling cycle time	S	0.0~99.9	50.0
U 5 E	R/W	Alarm dry contact output on terminal 51 and 52	Alarm #	1-32	23

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Display	R/W	Description	Unit	Range	Default
U61	R/W	Enable De-humidification mode		no/YES	no
U62	R/W	De-humidification mode target	%	0.0~99.9	55
U63	R/W	De-humidification deadband	%	0.0~99.9	15
U64	R/W	Electric reheat differential when automatic dehumidification is enabled.	°F	0.0~99.9	9
U65	R/W	Max fan speed during dehumidification.	V	0.0~10.0	7.5
L05 – Manufacturer Menu					
F01	R/W	BMS network		no/YES	YES
F02	R/W	Allow clock card		no/YES	YES
F03	R/W	Allow free cooling		no/YES	YES
F04	R/W	Allow free cooling and compressor to work simultaneously		no/YES	YES
F48	R/W	Enable audible buzzer (Rev 13B64 and after)		no/Yes	no
F47	R/W	Allow free cooling ONLY in emergency ventilation mode		no/YES	no
F44	R/W	Not used		no/YES	YES
F06	R/W	Enable Major alarms output		no/YES	YES
F07	R/W	Type of Major alarm output		n.O/n.C	n.O
F3P	R/W	Unit of temperature, C means Celsius. F means Fahrenheit.		-F-/-C-	- F -
F16	R/W	Minimum speed setting of supply fan	V	0.0~10.0	0.1
F17	R/W	Maximum speed setting of supply fan	V	0.0~10.0	10.0
F46	R/W	Fan speed change during the DC-failover on	V	0.0~10.0	8.0
F18	R/W	Free cooling speed	V	0.0~10.0	10.0
F19	R/W	Startup delay time of supply fan	S	0~999	5
F1A	R/W	Stop delay time of supply fan	S	0~999	60
F3C	R/W	Startup delay time of supply fan overload	S	0~999	0
F3L	R/W	Recovery delay time of supply fan overload	S	0~999	120
F1P	R/W	Startup delay time of low pressure alarm	S	0~999	60
F1C	R/W	Recovery delay time of low pressure alarm	S	0~999	10
F1L	R/W	Low pressure alarms allowed before system (per hour)			3

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Display	R/W	Description	Unit	Range	Default
F 1E	R/W	High pressure alarms allowed before system (per hour)			3
F 20	R/W	Minimum stop time of compressor	S	0~999	180
F 21	R/W	Minimum run time of compressor	S	0~999	60
F 22	R/W	Supply fan air flow defective if the supply fan is DC fan	S		30
F 23	R/W	Delay time of filter alarm output	S	0~999	10
F 24	R/W	Shut off free cooling due to dirty filter alarm		no/YES	no
F 27	R/W	Minimum voltage input of free cooling	V	0.0~10.0	2
F 31	R/W	Number of backup units for unit rotation			1
F 32	R/W	Unit rotation time	hr	0~999	168
F 33	R/W	Force startup of the backup unit		no/YES	YES
F 34	R/W	Delay time of low temperature	M	0/1	1
F 35	R/W	Delay time of high temperature	M	0/1	1
F 36	R/W	Lag heater turn on difference	˚F	0.0~99.9	27.0
F 37	R/W	Lag heater turn off difference	˚F	0.0~99.9	3.0
F 38	R/W	Lag compressor turn on difference	˚F	0.0~99.9	7.4
F 39	R/W	Lag compressor turn off difference	˚F	0.0~99.9	7.2
F 3A	R/W	Erase alarm history		no/YES	no

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Chapter 4: Preventive Maintenance

⚠️ **Important.** The AIRSYS WPUs are designed to be among the highest performing in the world for both energy efficiency and reliability. Good preventive maintenance (PM) techniques are a crucial part of maintaining that high level of energy efficiency and reliability. It is also important to keep track of findings during each PM event so that trends can be established for future reference.

Preventive Maintenance Schedule

This section provides guidelines for the owner of an AIRSYS unit to ensure that the equipment continues to perform well. Following these guidelines for regular care will help avoid serious damage to components and expensive repairs by skilled personnel.

Table 30: Preventive Maintenance Schedule

Task	Recommended Frequency	Comments
Inspect all wiring for signs of wear	Based on local conditions	More frequently in areas with active rodent or insect populations that can damage wiring
Check general operations	12 months	Perform the Step-Test
Inspect all hardware for "snug" connection	12 months	Make note of any loose hardware so it can be checked again at next scheduled PM
Air filter inspection/cleaning and replacement if needed	Based on local conditions	Depends on the amount and frequency of airborne particulates in the area
Inspect and clean condenser coil	12 months	More frequently in areas that experience excessive airborne particulates that will collect on the condenser coil
Inspect drain pipe	12 months	
Physical Inspection of Air Damper	12 months	

🚫 **Danger.** Stop the machine and remove the power supply from the equipment before performing maintenance operations.

⚠️ **Important.** All PM should be performed by an AIRSYS Authorized Service Technician (AAST) to ensure the manufacturer's warranty is preserved.

General Operation Check

It is a good idea to compare the operation of the equipment with the results of the previous inspection. Any differences in operating characteristics can then be easily identified.

A detailed and periodic visual inspection of the equipment and a general cleaning are both important to ensure good operation. Before beginning the PM steps, you should verify the general system status by looking at the areas outlined in this section.

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Check Main Voltage

For the main voltage, check:

- The main voltage is ranging within $\pm 10\%$ of the rated voltage required by the machine (230V, 60Hz).

- The DC voltage is in normal range, if applicable. (36VDC~ 57VDC)

- The main electrical supply cable and the terminals, including the user terminal cable, are correctly hooked up.

- All cables are secured to the system.

Check Wiring and Components

For wiring and components, perform a preliminary check to verify the system is functional:

- Check that the system has been installed correctly.

- Check that the wiring cable sections meet current capacity. Report any incorrect mounting and setting to the AAST who installed the system so that the necessary modifications can be made.

- Check that the grounding cables have been installed in the controller box and unit as shown in the graphic.

Grounding cable

Perform the Step-Test

The purpose of this test is to simulate real operation without damaging components due to incorrect operation or protection failures.

Use the step-test to check that the relays, breakers, and components work normally. For details on executing this test, see "Executing the Step Test"on page 47.

Refer to "Alarms" on page 50 if any alarm occurs during the step test. Refer to wiring diagram included in the controller shipment for possible mechanical/electrical issues.

Wiring diagram is also available on tempesthvac.com.

Replace Air Filter

A dirty air filter reduces the air volume and the system capacity. This problem can be avoided by periodically and regularly cleaning or replacing filters. The frequency at which filters must be checked depends on the amount of dust in the environment. If during inspection, the filters are frequently very dirty, the frequency of checks and maintenance should be increased.

Clean the Preliminary Air Filter

Remove middle-front panel

Replace the filter

The preliminary air filter can become clogged with dust and leaves or other debris after a period of use, and should be cleaned with water or blown air.

Remove bottom-front panel

Take off the filter

Clean the filter

Inspect and Clean Condenser Coils

During times of peak usage, the condensing coils must be able to offer maximum thermal exchange.

Debris such as paper, dead leaves, and dust can be sucked in around the coils, reducing the thermal exchange rate. Remove any objects from the coil which may have accumulated and wash the system with water and commercial coil cleaner.

Dirty condenser coils may trigger the high pressure switch and cause system lockout.

You should check the coil condition more frequently if your environment experiences seasons of high dust or falling leaves.

Inspect and Clean the Drain Pipe

To avoid water overflow, ensure that the system has proper drainage for condensation discharges. The pipe and outflow should be completely free of any obstructions. If necessary, clean the drain and outflow area.

Physical Inspection of the Damper

The air damper is a critical element in the WPU. If it does not function normally, the free cooling function will fail. This can be avoided by periodically and regularly checking the following:

1. Check if the damper can fully open and close via the manual override

2. Check if the nuts are properly tightened, as shown in the following images.

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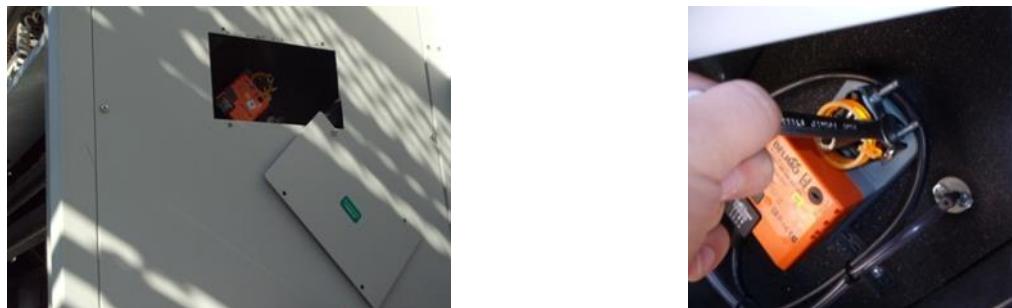
Operation Checklist

If you experience a problem with the system, use this checklist to verify the system and determine the root cause. Keep these records for future inspections.

Address: _____Site No.: _____ Date: _____

Unit Factory Number:_____ (refer to the unit name plate)

Check Items	✓ or ✗
Step-Test or Manual Operation	
Verify WPU 1 supply fan is working(1)	
Verify WPU1 heater works normally (2)	
Verify WPU 1 compressor works normally (3) At the same time, check if the WPU 1 condenser fan works normally.	
Verify WPU 1 free cooling is working (4)	
Verify WPU 2 supply fan works normally(5)	
Verify WPU 2 heater works normally (6)	
Verify WPU 2 compressor works normally(7) At the same time, check if the WPU 2 condenser fan works normally.	
Verify WPU 2 free cooling works normally (8)	
Record these values using pressure gauges or multi-meter readings **Outdoor Temperature: _____Indoor Temperature: _____**	
The WPU 1 low pressure value R410a system, normal range:8~12Bar/116~174PSI R407c system, normal range: 4-7Bar/58-101.5PSI	Bar/PSI
The WPU 1 high pressure value R410a system normal range:25~30Bar/362.5~435PSI R407c system normal range, 16-20Bar/232-290PSI	Bar/PSI
The WPU 1 current of the compressor (refer to nameplate)	Amp
The WPU 1 current of the supply fan (refer to nameplate)	Amp
The WPU 2 low pressure value R410a normal range:8~12Bar/116~174PSI R407c normal range:4-7Bar/58-101.5PSI	Bar/PSI
The WPU 2 high pressure value R410a normal range:25~30Bar/362.5~435PSI R407c normal range:16-20Bar/232-290PSI	Bar/PSI
The WPU 2 current of the compressor (refer to nameplate)	Amp
The WPU 2 current of the supply fan (refer to nameplate)	Amp

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Spare Parts

For all part requests, please contact:

Tempest Telecom Solutions LLC

Web: http://tempesthvac.com/

Email: HVACSupport@tempesttelecom.com

Phone: 805-879-5432

Address: 136 W. Canon Perdido St, Suite 100, Santa Barbara CA 93101

Appendix 1:Drawings

Figure 23: Frame Dimensions

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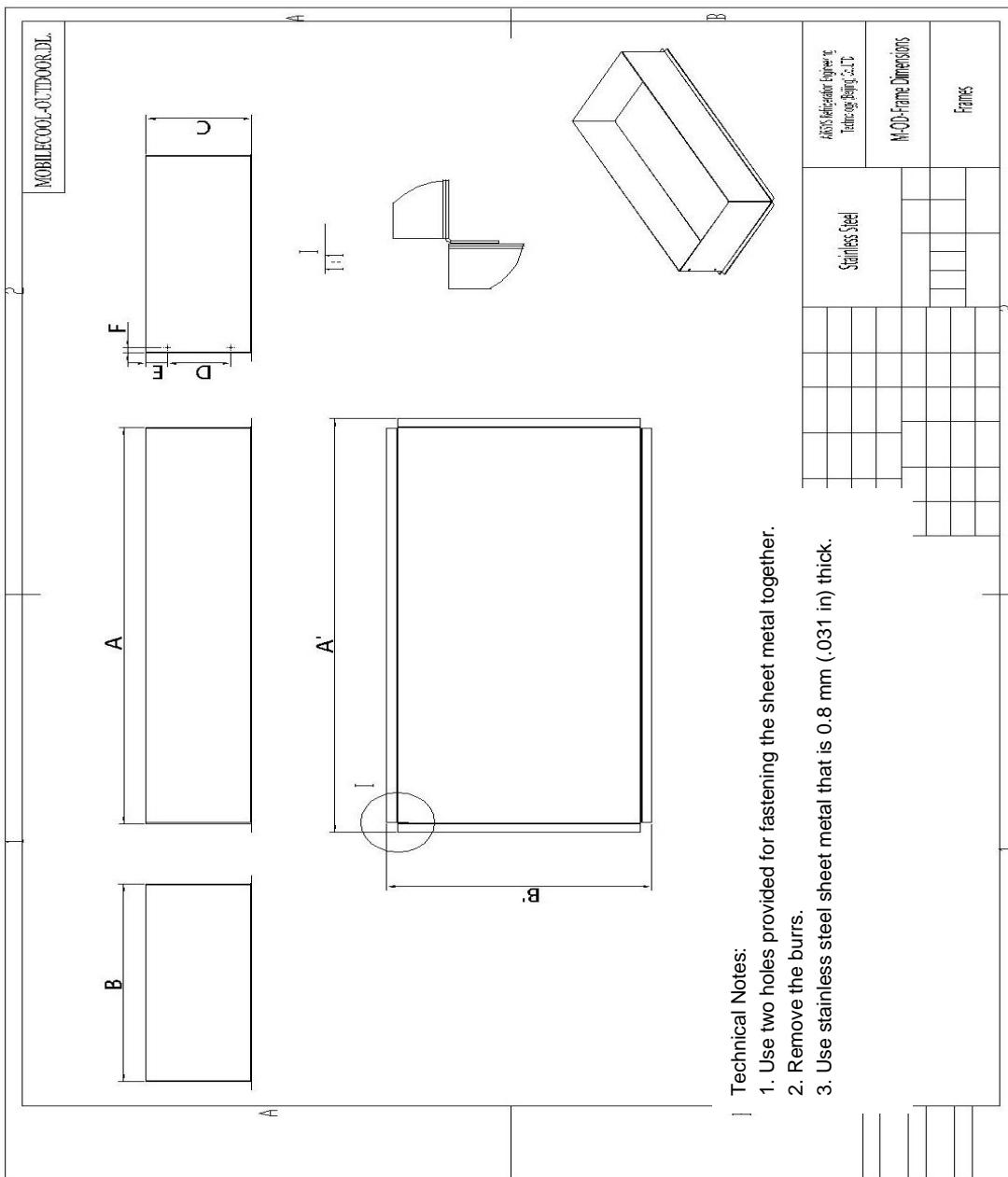
Appendix 2:Reference Tables

Table 31: Supply and Return Air Frame Dimensions

Model	3R1C1,5R1C1				7E1C2, 9E1C2				13E1C3				18E1C4			
Frame Type	**Supply**		**Return**		**Supply**		**Return**		**Supply**		**Return**		**Supply**		**Return**	
Unit	mm	in	mm	in	mm	in	mm	in	mm	in	mm	in	mm	in	mm	in
A	435	17.13	435	17.13	693	27.28	693	27.28	744	29.29	744	29.29	864	34.02	864	34.02
A'	467	18.39	467	18.39	725	28.54	725	28.54	776	30.55	746	30.55	896	35.28	896	35.28
B	200	7.87	300	11.81	254	10.00	344	13.54	254	10.00	344	13.54	254	10.00	344	13.54
B'	232	9.13	332	13.07	286	11.26	376	14.80	286	11.26	376	14.80	286	11.26	376	14.80
C	100	3.94	100	3.94	100	3.94	100	3.94	100	3.94	100	3.94	100	3.94	100	3.94
D	90	3.54	90	3.54	90	3.54	90	3.54	90	3.54	90	3.54	90	3.54	90	3.54
E	30	1.18	30	1.18	30	1.18	30	1.18	30	1.18	30	1.18	30	1.18	30	1.18
F	9	0.35	9	0.35	9	0.35	9	0.35	9	0.35	9	0.35	9	0.35	9	0.35

Table 32: WPU Filter Sizes

Model	Filter Qty	Nominal Size (in)	Exact Size (in)
3R1C1,5R1C1	1	16 x 16 x 2	15½ x 15½ x 1¾
7E1C2, 9E1C2	1	25 x 18 x 2	24½ x 17½ x 1¾
13E1C3	2	16 x 16 x 2	15½ x 15½ x 1¾
18E1C4	2	20 x 16 x 2	19½ x 15½ x 1¾

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Appendix 3:List of Tables

Appendix 4:List of Figures

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