PoolPak®
DEHUMIDIFICATION THAT WORKS

Installation, Operation and Maintenance

ClimatePak® VHR

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SUPERCEDES: SVW04-VHRIOM-20180702

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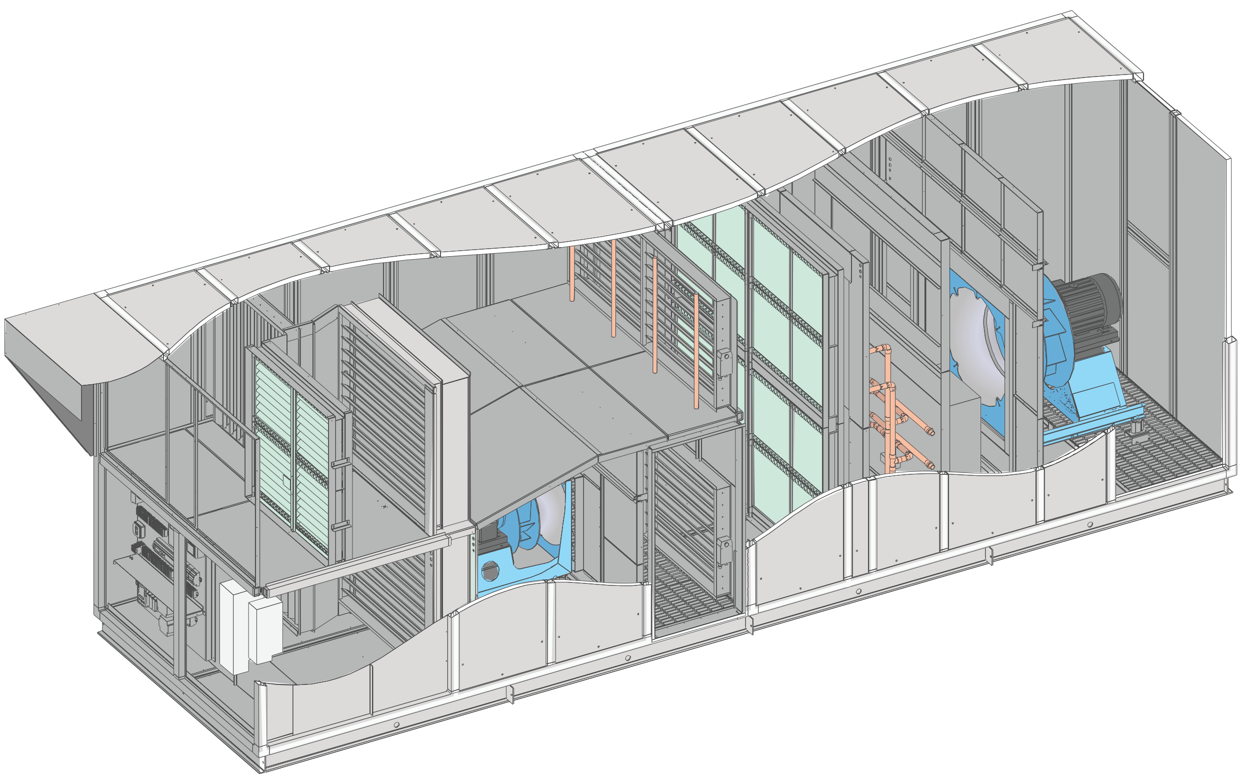

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PoolPak®
DEHUMIDIFICATION THAT WORKS

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 SVW04-VHRIOM-20190305

PoolPak®

FIGURES

TABLES

IMPORTANT

This product has been thoroughly tested before leaving the PoolPak factory.

However, please check at the earliest opportunity that the product has arrived in good condition and that no damage occurred during shipping. If any damage is suspected, contact the carrier to file a claim.

If the product is to sit in storage for a length of time before installation, contact PoolPak Service department for proper storage guidelines.

Warning

Only suitably qualified personnel who thoroughly understand the operation of this product and any associated machinery should install, start-up or attempt maintenance of this product. Non-compliance with this warning may result in personal injury or equipment damage.

PoolPak Service department must be contacted at least 2 weeks prior to equipment startup. A PoolPak authorized service technician will perform startup and provide training for owner and site personnel.

PoolPak recommends that all troubleshooting, service, and maintenance be completed by an authorized service technician for the best service experience with the equipment. If a labor or parts warranty claim is expected, PoolPak service must be contacted before any work is to be performed. Refer to the standard ClimatePak® VHR warranty for complete details.

Intended Users

This manual is to be made available to all persons who are required to install, operate or service the product or any other associated operation. Please ensure that a copy of this manual is presented to the end customer. Additional copies of this manual are available on request and on the PoolPak website, www.PoolPak.com.

SECTION I: INDOOR POOL APPLICATION

Introduction

Creating an Ideal Environment for Indoor Pool Facilities

Indoor pool facilities are unlike any other structure in design, construction and maintenance requirements. Humidity, air and water temperatures are especially difficult to control, and improper management usually results in an uncomfortable environment, excessive operating costs and possibly serious structural damage. Effectively controlling these special conditions requires control hardware and control sequences specially engineered for large commercial indoor pool applications. The ClimatePak® System utilizes an environmental control package designed to meet all special needs of the indoor pool environment, while reducing energy usage and building maintenance costs.

Operating Cost

Energy consumption is a direct function of the variables necessary to satisfy the occupant and protect the facility. These variables include space heating and cooling, water heating, humidity removal and ventilation. Maintaining ideal and precise environmental conditions has a fairly high cost of operation. A majority of the indoor pools, regardless of geographic location, require water and space heating 70% to 90% of the year.

Application

Moisture Loads

An indoor swimming pool produces large quantities of water vapor through evaporation, which accounts for roughly 95% of the pool water heat loss, making the water colder. This excessive humidity will form damaging condensation unless removed from the building. In the past, the method of removing this water vapor was by ventilating an otherwise energy efficient building, exhausting the humid air and the energy it contained. Additional energy was used to bring in and heat the make-up air and to heat the pool water.

More cost effective technologies offer an alternative method adding heat exchangers and mechanical heat recovery systems with many useful options. The ideal solution to removing the water vapor from the pool area is to convert the latent (wet) heat contained in the moist air back into sensible (dry) heat, placing it back into the pool water and air.

Effects of Moisture

Excess humidity in natatorium structures may be readily apparent as condensation on cool surfaces such as windows and outside doors, the growth of mildew or mold, and, when coupled with poor pool chemistry, the accelerated corrosion of metals. In its less obvious forms, moisture may penetrate walls and ceilings and cause rot that becomes noticeable only when large scale structural failure occurs. Humidity levels are also a major factor in the comfort of pool users.

Indoor Air Quality

Pools and water parks with water features have a higher evaporation rate than a standard pool because of the increased water surface area. Chloramines (See *Pool Water Chemistry* on the next page), which are present in the water, become more concentrated in the air as the "water to air" interactions increase, affecting the indoor air quality. A strong "chlorine" odor is an indicator of poor pool water chemistry, and is generally offensive to the occupants. Higher levels of chloramines can cause skin/eye irritation and respiratory problems commonly known as "lifeguard lung". Most poolrooms are designed with a minimum ventilation rate to dilute the airborne pollutants generated from the chemical interactions in the pool water. Typically these rates are based on ASHRAE standard 62.1 and dictated by local codes at about 0.5 CFM per square foot of pool and deck area, but depending on the pool water chemistry the ventilation rate may not always be adequate for good poolroom indoor air quality.

However, increasing ventilation rates can significantly add to the cost of operation. Energy conservation strategies, such as heat recovery, airflow measurement, and CO2 based ventilation control help control costs while improving indoor air quality. Depending on the geographic location and season of the year, treating the outside air has a direct effect on energy consumption. Some facilities prefer higher than minimum ventilation rates, up to 100% of OA, to maximize indoor air quality, but the cost of treating this air can be significant.

Occupant Comfort

Occupant comfort in a natatorium is easy to understand. If you ever swam in an outdoor pool on a cold, windy day or exited a pool in a dry, desert location you will probably notice an immediate chill. The opposite is true where high humidity is not adequately controlled either through ventilation or by mechanical means. The moisture level can reach such a state where it is oppressive or stuffy. Common complaints are difficulty in breathing and the room being perceived to be warmer than the actual dry bulb temperature would suggest.

Regardless of the source of discomfort, users will not enjoy the facility if water/air temperatures and humidity levels are not within a narrow range. Ideal water temperature is around 82°F with the air temperature about 2°F higher to prevent chilling when exiting the pool and to minimize evaporation from the pool surface. Here are some recommended temperatures for poolrooms, which can be adjusted to meet specific needs of bathers. In general, "active" poolrooms are maintained at lower temperature ranges so the users don't overheat, warmer temperatures are more common for seniors or children or less active pools.

The desirable humidity range is generally between 50 and 60% (see Table 1-1). Greater than 60% creates a sticky feeling and/or difficult breathing. Low humidity results in evaporative cooling on the bather's skin, resulting in a chill. Poor air movement caused by improper duct placement within the poolroom will also lead to occupant discomfort. Excessive supply air blowing on bathers can create drafts, while uneven air distribution may create stagnant zones within the space.

Table 1-1. Typical Pool Water & Air Temperature Set-Points

POOL TYPE	WATER TEMP (°F)	AIR TEMP (°F)	ROOM RH %
Recreational Pool	80 to 85	Water Temp + 2	55 to 60
Therapy Pool	86 to 92	86[1]	55 to 60
Whirlpools	99 to 104	86[1]	55 to 60

[1] Normally max 86°F to minimize overheating of occupants

Pool Water Chemistry

Proper water chemistry (Table 1-2) in swimming pools is critical for the health of the bathers and the condition of the enclosure and components. An enclosure with poor water chemistry has a noticeable “chlorine” smell, which is an indication of high chloramine levels in the air. Not only does this have an effect on the water, but it affects the bathers and the air they breathe.

Table 1-2. Recommended Pool Water Chemistry

	POOL			SPA		
	IDEAL	MIN	MAX	IDEAL	MIN	MAX
Total Chlorine (ppm)	1.0 - 3.0	1	3	3.0 - 5.0	1	10
Free Chlorine (ppm)	1.0 - 3.0	1	3	3.0 - 5.0	1	10
Combined Chlorine (ppm)	0	0	0.3	0	0	0.3
Bromine (ppm) if applicable	2.0 - 4.0	2	4	3.0 - 5.0	2	10
pH	7.4 - 7.6	7.2	7.8	7.4 - 7.6	7.2	7.8
Total Alkalinity (ppm)	80 - 100	80	180	80 - 100	60	180
TDS (ppm)	1000 - 2000	300	3000	1000 - 2000	300	3000
Calcium Hardness (ppm)	200 - 400	150	1000	200 - 400	150	1000
Calcium Acid (ppm)	30 - 50	10	100	30 - 50	10	100

Dehumidification/ventilation equipment is not designed to remedy the effects of poor pool chemistry, but is designed to deliver prescribed ventilation to manage smaller amounts of pollutants generated from normal pool activity. Pool water chemistry is a part of daily maintenance and it is recommended that the users follow the current National Spa and Pool Institute standards. For more information, see the PoolPak® Educational Library article *Indoor Pool Water Chemistry*.

SECTION II: PRINCIPLES, FUNCTIONS AND FEATURES

Outside Air Dehumidification System

Moisture removal through dilution with outside air can be very effective. If Outside air has less moisture in it than pool hall, mixing the OA with pool hall air can reduce overall humidity. OA brought in to manage the humidity must be heated up to the pool hall temp to make it comfortable for bathers. To make room for this incoming air, the air already in the pool hall must be extracted.

The conventional heating and ventilation units are constant volume (once through) system that delivers a 100% of OA. A 100% of the pool hall air is exhausted to make room for the OA. When water is evaporated from the surface of the pool, heat is taken from the remaining water in the form of water vapor. A mechanical dehumidification system through a vapor compression cycle recovers and recycles this energy. A heating and ventilation unit exhausts and loss the heat with the escaping vapor. It is important to know that evaporation increases as the indoor dew point decreases and large quantity of low temp OA decreases the dew point of the room. OA quantity shall be minimized to avoid increased evaporation, which increases pool heating requirement.

The ClimatePak® relies on a sophisticated control system along with air measuring stations and air management system to maintain setpoint conditions through dilution with outside air. The ClimatePak® dramatically reduces energy costs by ensuring that the incoming outside air is monitored and controlled to the minimum consistent for avoiding condensation while recovering the waste heat from the exhaust air through its integral heat pipe and bypass damper heat recovery system. The ClimatePak® automatically performs the following functions:

- Dehumidification/Humidity Control
- Natatorium Space Heating with Auxiliary Heat
- Proper Ventilation
- Recovery of Reusable Heat from the Exhaust Air Stream
- Optional Natatorium Space Cooling
- Wall Condensate Prevention

A VHR unit, with the outside air dryness and quantity matched correctly to the evaporation rate of the pool water, will efficiently maintain the pool air at relative humidity levels between 50 and 60%. However, there are times in all but the driest climate areas where the outside air humidity rises to levels such that the air will not provide enough dehumidification to completely meet desired conditions. In case such as these, operable windows, louvers, and/or supplemental exhaust fans are used to augment the ClimatePak® unit's airflow.

ClimatePak® VHR Operation

The primary function of the VHR unit is to provide environmental control of an enclosed space through the use of dry outside air, heat pipe technology, and a sophisticated control system. Valuable heat in the return air (RA) air stream coming from a warm, humid enclosed space (such as an indoor swimming pool) is recovered for reuse. This return air is either exhausted (exhaust air- EA) or becomes recirculation air, is re-mixed with the pre-heated fresh outside air (OA), filtered and becomes usable supply air (SA) to the space thereby completing the cycle.

Air Management Operation

Dry outside air in the winter months for example, can at times be very dry. While high humidity is a problem with occupant comfort and protecting the building enclosure, poolroom humidity that is too low is also a problem. The pool evaporation rate will increase as the humidity drops which increase the cost of heating the pool water. Comfort becomes an issue as well because of the added evaporation from the bathers skin makes them feel colder than the actual water or air temperatures should make them feel.

The ClimatePak® measures the space humidity levels and can reduce outside air to match the dehumidification airflow as required for the space. The reduction in unnecessary outside air reduces the air heating load and fan energy, while controlling space humidity to desired levels. The Variable Frequency Drives (VFD) change the supply and exhaust fan volumes as needed based on operator adjustable setpoints, while maintaining desired room pressure.

Another design issue with poolrooms is containing the poolroom smell within the poolroom enclosure so it does not infiltrate to other spaces. The best way to control odors is to keep the poolroom enclosure under a slight negative pressure relative to the other spaces. One approach requires that the exhaust air fan be slightly larger than the supply fan. While this simple approach works well for most situations, there are times when wind pressure, open doors, or system deficiencies will compromise the pressurization strategy.

Another approach is to measure and control airflows using the pressure differential between the spaces. This approach has some limitations. Pressure control only work wells when you have tight spaces. Wind pressure on the building and open doors can contribute to a loss of room "tightness" which will signal a change to the fan supply and exhaust rates. Also finding a representative pressure for inside ad outside of the building is extremely difficult. The pressure differential measurement approach lacks the realtime airflow readings which could lead to over or under control of system airflow rates.

The ClimatePak® VHR is equipped with active airflow monitoring and control; a combination of digital airflow measuring stations and software controlling the fans to assure proper airflows and room pressure. As before, the VFD change the supply and exhaust fan volumes as needed based on operator adjustable setpoints. One of the advantages of this approach is that the airflows can be modulated to control differential airflow volumes while managing outside air to control humidity.

Vertical Heat Pipe Energy Recovery Operation

The ClimatePak® VHR (Ventilation and Heat Recovery) product provides a passive method of recovering wasted heat from the exhaust air stream. The passive energy recovery system is a closed thermo-siphon refrigerant cycle which efficiently exchanges heat without the need for pumps or compressors. The temperature difference between the two air streams is the engine that powers the system.

HOW IT WORKS:

Exhaust air is blown through the lower portion of the heat pipe coil where the cooler liquid refrigerant is "boiled" by the warmer exhaust air (This section of the heat pipe is referred to as the evaporator region). Vaporized refrigerant migrates up through the heat pipe into the upper portion where colder outside (ventilation) air cools the refrigerant vapor, condensing it to a liquid, in the process releasing reclaimed heat into the air (This section of the heat pipe is referred to as the condensing region. The heat pipe coils are stacked in a near vertical arrangement where gravity moves the refrigerant back to the starting position where the process continues. The arrangement raises the heat transfer efficiency because the refrigerant is returned to the evaporator section quicker because of the gravity.

As described before, the ventilation air heating load for a poolroom is significant, and so transferring much of the wasted exhaust air heat back into the outside air greatly reduces the cost of heating the outside air.

HEAT PIPE DAMPER CONTROL:

WINTER Heat Recovery

The warm exhaust air is filtered before entering the heat recovery section of the heat pipe coil and exhausted through the heat recovery damper bank. The liquid refrigerant in the sealed heat pipe is vaporized and migrates vertically up to the heat reclaim section of the heat pipe coil. The cooled exhaust air is then dumped to the outside.

The cold outside air enters through the heat recovery damper bank and is filtered before entering the heat reclaim section of the heat pipe coil. The refrigerant gas in the sealed heat pipe is condensed and drains vertically down to the heat recovery section of the heat pipe coil. The warmed outside air is then mixed with the poolroom return air in the unit.

Damper Positions:

- Exhaust Air Heat Pipe Recovery Section Damper is open.
- Exhaust Air Bypass Damper is closed.
- Recovery Air Heat Pipe Recovery Section Damper is open.
- Recovery Air Bypass Damper is closed.

WINTER Defrost

The warm exhaust air is filtered before entering the heat recovery section of the heat pipe coil and exhausted through the heat recovery damper bank. The liquid refrigerant in the sealed heat pipe is vaporized and migrates vertically up to the heat reclaim section of the heat pipe coil. The cooled exhaust air is then dumped to the outside.

The cold outside air enters through the heat recovery damper bank and bypasses the heat reclaim section of the heat pipe coil to melt any accumulated frost on the heat reclaim coil. The refrigerant gas in the sealed heat pipe is condensed and drains vertically down to the heat recovery section of the heat pipe coil. The cold outside air is not tempered with the heat pipe and is then mixed with the poolroom return air in the unit.

Damper Positions:

- Exhaust Air Heat Pipe Recovery Section Damper is open.
- Exhaust Air Bypass Damper is closed.
- Recovery Air Heat Pipe Recovery Section Damper is closed.
- Recovery Air Bypass Damper is open.

Summer Bypass

The warm exhaust air is filtered before entering the heat recovery section of the heat pipe coil and exhausted through the heat recovery damper bank. The liquid refrigerant in the sealed heat pipe does not vaporized or migrate vertically up to the heat reclaim section of the heat pipe coil because the heat reclaim section is warmer than the recovery section. The untreated exhaust air is then dumped to the outside.

The warm outside air enters through the heat recovery damper bank and bypasses the heat reclaim section of the heat pipe coil. The refrigerant gas in the sealed heat pipe does not condense or circulate down to the heat recovery section of the heat pipe coil. The untreated outside air is then mixed with the heat reclaim coil bypass air in the heat reclaim coil bypass air section. There is no recirculated air being mixed with the outside air.

Damper Positions

- Exhaust Air Heat Pipe Recovery Section Damper is open.
- Exhaust Air Bypass Damper is open.
- Recovery Air Heat Pipe Recovery Section Damper is closed.
- Recovery Air Bypass Damper is open.

CommandPak Control System Functions

Overview

The ClimatePak® is controlled by the CommandPak Control System (CPCS), a microprocessor-based system that incorporates all of the functions necessary to maintain correct natatorium space temperature and humidity. The ClimatePak® controls automatically operate the dehumidification, heating, cooling economizer and heat recovery system in response to the natatorium requirement while adjusting unit outputs to maintain building conditions. The ClimatePak® controls are capable of providing proportional control of dehumidification and cooling by modulating open or close the outside air damper and exhaust fan speed as necessary.

All ClimatePak® operating and logic controls are factory mounted and wired. The control sequences are designed specifically to control swimming pool environmental conditions. The following is a brief description of the control functions available with the CPCS. For more detail or finding this information in the controller, see the VHR installation and Operation Manual (IOM).

Air Flow Monitoring and Control

The best way to control building pressure is by measuring and controlling airflow rates. The ClimatePak® system employs the active airflow monitoring and control. Factory mounted VFD on the supply and exhaust fan to modulate airflow. The controller receives feedback from fan inlet measuring stations and outdoor air measuring stations to continuously monitor the outside air, exhaust air and supply airflow.

By tracking the airflow rate of the exhaust fan and outdoor air intake, a consistent building pressure can be maintained. See Figure 2-2 for reference. The CPCS controller takes the outside air flow measurement and controls the speed of the exhaust fan. This control maintains a constant return airflow to supply airflow differential whether the system is operating at the minimum outdoor airflow or maximum outdoor airflow rate. Factory mounted and calibrated airflow measuring stations and control system provide another benefit which is that it can deliver precisely the airflow needed for balancing the dehumidification system which saves time. The air flow measuring system allows for easy and accurate verification and documentation for the amounts of air coming into and out of the building.

To determine the desired airflow rates, the controller must be programmed with setpoints for the desired supply air flow, the desired return airflow, the minimum outdoor airflow and, minimum mixed air temperature allowed. During minimum outdoor air ventilation, the controller controls the outside air and recirculation damper to maintain the minimum ventilation air requirement. During economizer mode or if maximum dehumidification is required, the controller modulates the outside air flow and exhaust airflow to maintain space conditions.

Humidity Control

The primary function of the CPCS is humidity control. The CPCS accomplishes humidity control by using the outside air or chilled water coil.

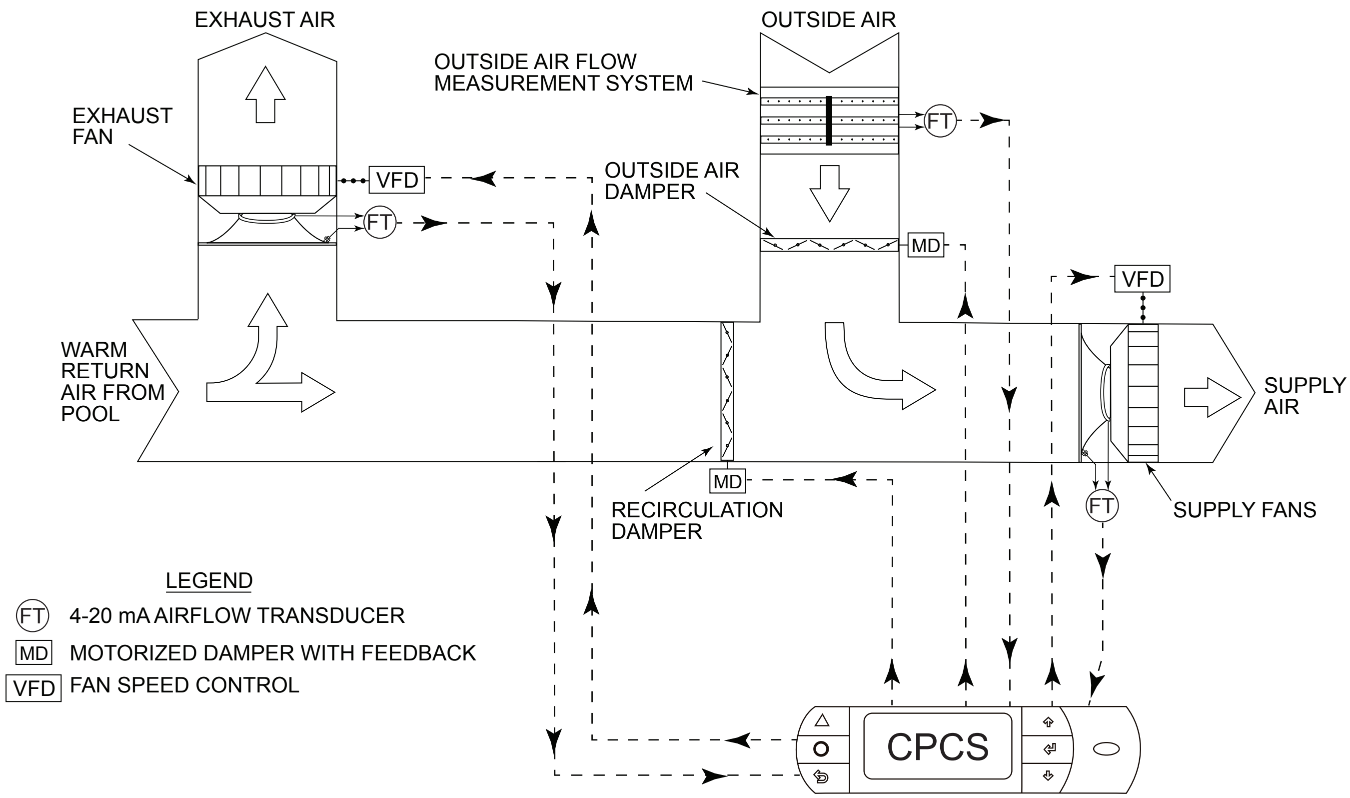
DEHUMIDIFICATION WITH OUTSIDE AIR

Dehumidification is dependent on the outside air condition in relation to the natatorium space condition. Control algorithms in the unit control system monitor the difference and the rate of change in the difference between the natatorium space dew point, space dew point set point and outside air dew point to calculate and deliver the correct amount of outside air to maintain the desired space dew point.

DEHUMIDIFICATION WITH CHILLED WATER COIL

When active, the capacity of the chilled water coil will be controlled by a three way valve in response to the output of the control loops for the return air dew point. If the return air temperature or dew point continues to rise, the control valve will continue to open. If the dew point control routine continues to request chilled water coil operation and the dry bulb control routine begins to request heating, the chilled water coil will remain active and the hot water coil control valve will be opened as required by the heating need.

Figure 2-1. Active Airflow Control with Direct OA Measurement Schematic



Fan Control

By comparing airflow and temperatures the CPCS control logic will select the optimum airflow rate for the conditions. Each fan is controlled by a VFD providing the ability to reduce the air quantities without compromising indoor conditions. During unoccupied periods outside air can be greatly reduced, saving the cost of conditioning the outside air as well as unnecessary exhaust fan energy. During unoccupied periods, the supply air quantity may also be reduced further saving fan energy, but reducing supply air too much can create condensation problems in stagnant zones. A standard feature by PoolPak® is the Cold surface sensor which provides a reliable method of protecting cold walls and windows from condensation.

Cold Surface Temperature Humidity Reset

The CPCS includes a sensor that measures the temperature of the coldest surface in the pool enclosure usually an exterior window or door frame. When the temperature of this surface approaches the dewpoint temperature of the space, the controller lowers the humidity setpoint to activate dehumidification. This function helps to prevent condensation on the cold surface. Typical locations for this condensate prevention surface temperature sensor are north facing exterior walls, windows, window/door frames, and skylights.

Space Heating

The ClimatePak® VHR unit contains a heat recovery system that allows heat to be transferred from the exhaust air stream to the outside air stream. The heat recovery is enabled when space heating is required. If additional heating is needed, the CPCS controller then turns on the auxiliary heat system. The ClimatePak® automatically controls the output of the optional factory-installed auxiliary air-heating system which can be hot water, electric or gas.

Space Cooling

The unit provides space cooling in one of two ways. If the outside air conditions are suitable, the unit can use this to cool the space. If equipped with an auxiliary cooling system, the unit can activate it to cool the space as needed.

Occupied/Unoccupied Control Mode

The ClimatePak® VHR unit time clock allows 7-day, 24 hour scheduling of operational control for both occupied and unoccupied times during the year. During unoccupied times, if the dehumidification load diminished, the OA damper will go to the close position until either a cooling or dehumidification need arises and OA can be use to satisfy the needs. The unit is configured to reduce the amount of air supplied to the space during unoccupied period to save energy (Night Fan Setback). During occupied times, the ClimatePak® VHR unit will deliver outside at the amount required to satisfy the condition but never less than the minimum OA set point. The high limit for the maximum outside in percentage is determined by the capability of the unit.

Purge Mode

The ClimatePak® VHR unit has a purge cycle to bring in the maximum amount of outside air for which it is capable. The purge cycle is programmable by the owner as necessary to ventilate the natatorium after shocking the pool. Unit control provides completely automatic operation by controlling the supply and exhaust fan and by opening the outside air damper for the programmed time intervals.

Event Mode

The event mode changes the ventilation air quantity to meet the demands of an event or situation where additional outside air is needed. The schedule can store up to 14 unique events per week, which are user adjustable at the remote interface unit (RIU). During a scheduled event, the minimum outside air set point is raised to a value higher than the minimum damper set point. For each event, the screen shows the day of the week, the hour in 24-hour format, the minute, and the event type.

CO2 Based Demand Ventilation (Optional)

The amount of outside air ventilation is controlled by the PoolPak unit based on the CO2 level sensors in the return air stream.

SECTION III: INSTALLATION

VHR Installation

Introduction

Installation requires the unit to be placed on a roof mounted curb, in a mechanical room or outside on an equipment housekeeping pad. Isolation pads should be placed under the unit to minimize transmission of noise due to unit operation. The following section identifies the installation items required to properly install the VHR unit.

Unit Dimensions and Weights

Always refer to the project specific product drawings for dimensions and weights. Generic drawings are available on the website. In addition, the below sizing information is provided for reference only.

Figure 3-1. VHR Dimensional Isometric View

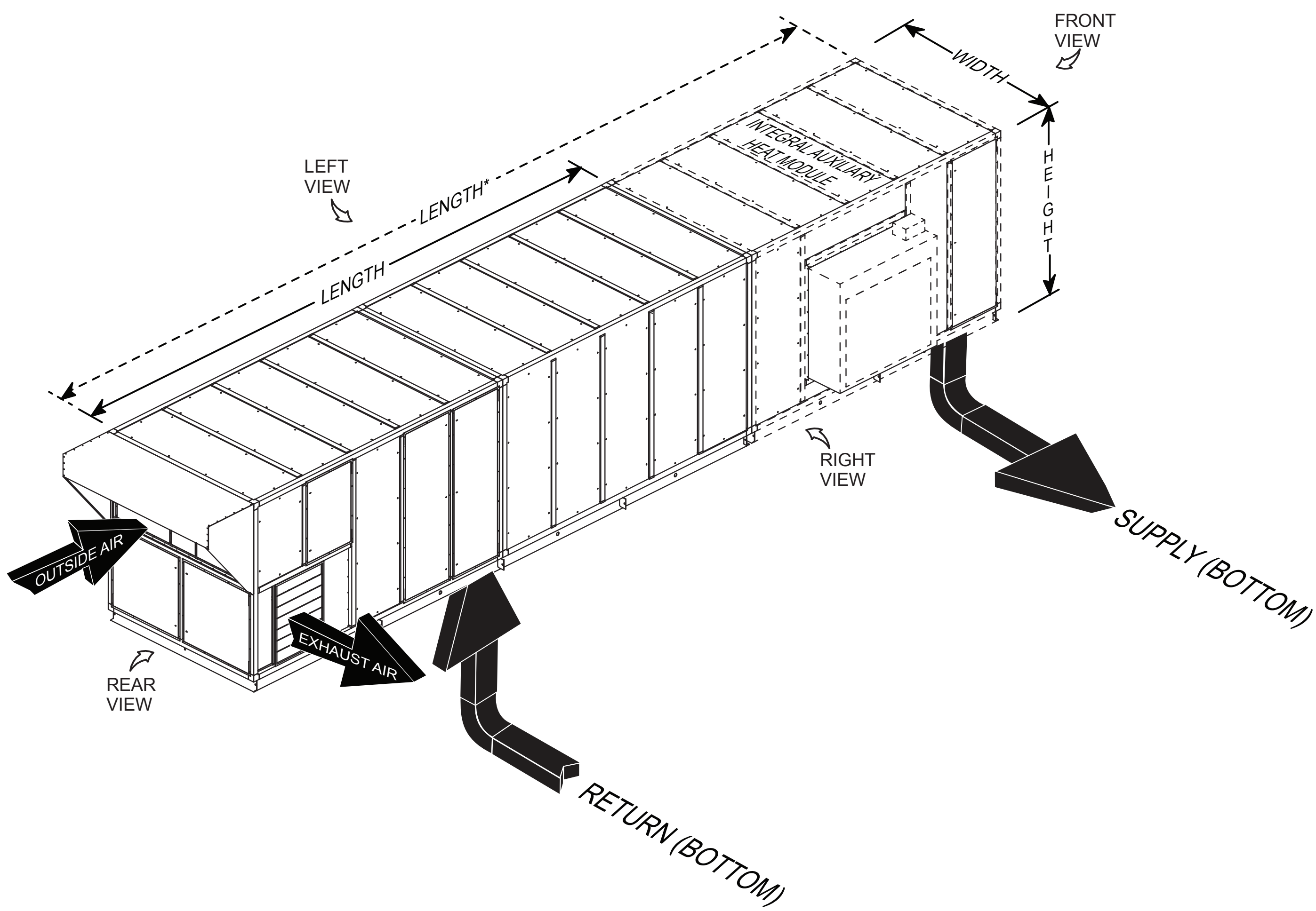


Table 3-1. VHR Dimensions and Weights

MODEL	BASE UNIT (INCHES, LBS)				W/ GAS FURN MODULE	
	WIDTH	HEIGHT	LENGTH	WEIGHT[1]	LENGTH	WEIGHT[2]
VHR015	66	96	264	6,400	331.5	7,800
VHR020	96	102	328.7	8,000	438.7	13,000
VHR030	96	114	328.7	10,800	438.7	15,000
VHR040	101	138	458	13,800	Contact Factory	
VHR050	132	138	458	16,400		

[1] Weight is approximate and includes largest heat pipe, 2-row hot water coil & typical fans/motors.

[2] Weight including gas furnace module is approximate, contact factory.

Inspection

Immediately upon receiving the unit, inspect it for damage which may have occurred during transit. If damage is evident, note it on the carrier's freight bill. A written request for inspection by the carrier's agent should be made at once.

Clearance

The clearance for service and repair must be 4 feet on all sides. For less than 4-foot clearances, consult your local PoolPak® representative or the factory. The ClimatePak® MUST NOT be installed with the outside air intake near or downstream in the prevailing wind from chimney, flue, or fume hood exhausts of any kind.

Handling

Care should be taken during handling to avoid damage to panels, drain piping, etc. The PoolPak® can be moved into position using pipe rollers underneath the base of the unit or it can be lifted using a crane or a hoist attached through the lifting points provided on the unit base frame. If the unit is set temporarily, the unit must be supported under each lifting point.

Use suitable spreaders or a frame to prevent damage to the PoolPak®. Cables must be adjusted to keep the unit level during the lift.

⚠ CAUTION

Lifting hooks must be blocked away from the side of the unit to prevent damage to the door panels while lifting. Do NOT walk on top of the unit or serious damage may result.

Failure to follow these directions will result in serious damage to the unit. **PoolPak® will not accept responsibility or liability for repairing any resulting damage.**

Rigging

PoolPak® units require the use of spreader bars that are at least as wide as the unit. Care must be taken to prevent damage from the chains or slings used in rigging. For outdoors units, take special care to avoid damaging the TPO roofing membrane on the top of the unit during rigging.

Refer to project drawings for illustration of lifting points. All provided lifting points must be used to prevent unit damage.

Mounting

The ClimatePak® VHR unit can be designed for either indoor or outdoor locations, either ground-level or roof-top. The location must allow for free condensate drainage (without freezing), ventilation, supply, and return ducts, and sufficient clearance for servicing the unit.

For ground-level installation, precautions should be taken to protect the unit from tampering by or injury to unauthorized personnel. Safety precautions such as a fenced enclosure or additional locking devices on the panels or doors are advisable. Check with local authorities for safety regulations.

Foundation

The unit must be mounted on a flat and level foundation capable of supporting the entire operating weight of the equipment. The PoolPak® unit **MUST BE** raised at least 6 inches to allow for sufficient height to adequately trap the condensate lines and to allow for electrical service entrance. The unit must be supported at each lifting point and all corners. Each support should be at least 12 inches long. The unit must be level to ensure proper condensate drainage. If the unit is elevated beyond the normal reach of service personnel, a catwalk capable of supporting service personnel, their equipment, and the scroll compressor(s) (about 1,000 lb.) must be constructed around the unit.

For ground-level installation, a one-piece concrete slab with footers that extend below the frost line is highly recommended as long as provisions for condensate traps is included. The unit must be supported with adequate space to allow for a condensate line trap. Additionally, the concrete slab should not be tied to the main building foundations to prevent noise transmission.

For roof-top installation, choose a location with adequate structural strength to support the entire weight of the unit and service personnel. For non-curb mounted units, provide spring vibration isolation to minimize vibration transmission to the roof structure. The unit must be situated with adequate height for a condensate line trap. The VHR unit may be mounted on equipment rails with spring vibration isolation. For any alternative mountings not discussed here, contact the factory for additional guidance. Care must be taken not to damage the roof. If the roof is bonded, consult the building contractor for allowable installation procedures.

Unit Hookup

Avoid tearing or damaging unit insulation while working on or around the unit. Do not stack access panels. Stand them upright with the insulation away from traffic.

DUCT CONNECTION

The supply and return air ducts are connected to their respective locations on the unit. For indoor units, the outside air and exhaust air duct should also be connected. Duct connections over 5 feet in length must be properly supported. All guidelines per the latest SMACNA guidebook should be followed.

GAS FURNACE AUXILIARY HEAT OPTION

When using a gas furnace, power venting is provided for all unit sizes. External vent piping and cap is required. **Please refer to the furnace manufacturer's manual for piping and venting instructions.** Install, leak test, and properly regulate piping for the gas-fired heater. Pressures should be regulated to the entering pressures as shown on the furnace manufacturer's data plate or manual.

POWER SUPPLY

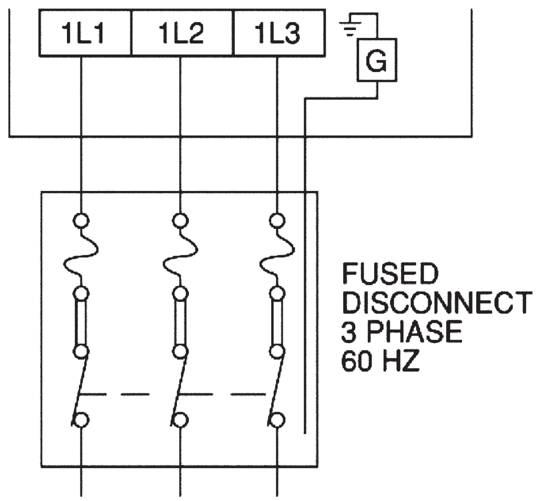
The contractor is required to supply (unless supplied as an option by PoolPak®) and install separate fused disconnect(s) within easy accessibility of the PoolPak® unit. Use the minimum circuit capacity listed on the unit's data plate to determine the minimum wire size for incoming electrical power. The ground connection for the unit is located in the unit control panel. The power supply to the unit must be adequate for the compressor starting amperage (LRA).

All field wiring must be done according to the wiring diagram provided with the unit and in conformance to the National Electrical Code (NEC) and any other applicable local electrical code. Conduits connected to outdoor units must be sealed in accordance with NEC 300.7 (A).

If a remote air-cooled condenser is required, a separate power feed must be provided for the air-cooled condenser. When an auxiliary electric heater option is provided, another power connection point is provided in the electric heat compartment. This power connection feeds the auxiliary electric heating coil. With this option, the contractor is required to supply and install a second fused disconnect.

ClimatePak® VHR units are available in single point power only.

Figure 3-2. Single Point Power Diagram



Copper Conductors Only

CONTROL WIRING

All control wiring field connections are described in the Controls Field Wiring information in this section. The wiring diagram is also furnished in the control cabinet section of the VHR.

CONDENSATE PIPING

The condensate may be piped to a drain or returned to the pool if local codes allow. If returned to the pool, the condensate should be piped to the skimmer. PoolPak® LLC recommends neither for, nor against, the practice of returning condensate to the pool. The installer should review the local codes prior to making the decision of where to dispose of the condensate.

WATER PIPING

When using a hot water auxiliary heating system or chilled water auxiliary cooling system, additional field installation of water piping is required. Follow proper local plumbing codes in making these connections.

REFRIGERANT PIPING AND REMOTE CONDENSING UNIT INSTALLATION

When using a direct expansion (DX) coil and remote condensing unit for auxiliary cooling, additional field installation of refrigerant piping and the remote condensing unit is required. Refrigerant lines must be leak checked and evacuated through installer provided Schrader valves. Refer to manufacturer’s instructions to properly size and charge the refrigerant piping.

The manufacturer instructions will also describe correct placement and installation of the condensing unit to allow proper airflow for heat rejection. Failure to follow these instructions will result in poor equipment performance.

Curb Sizing

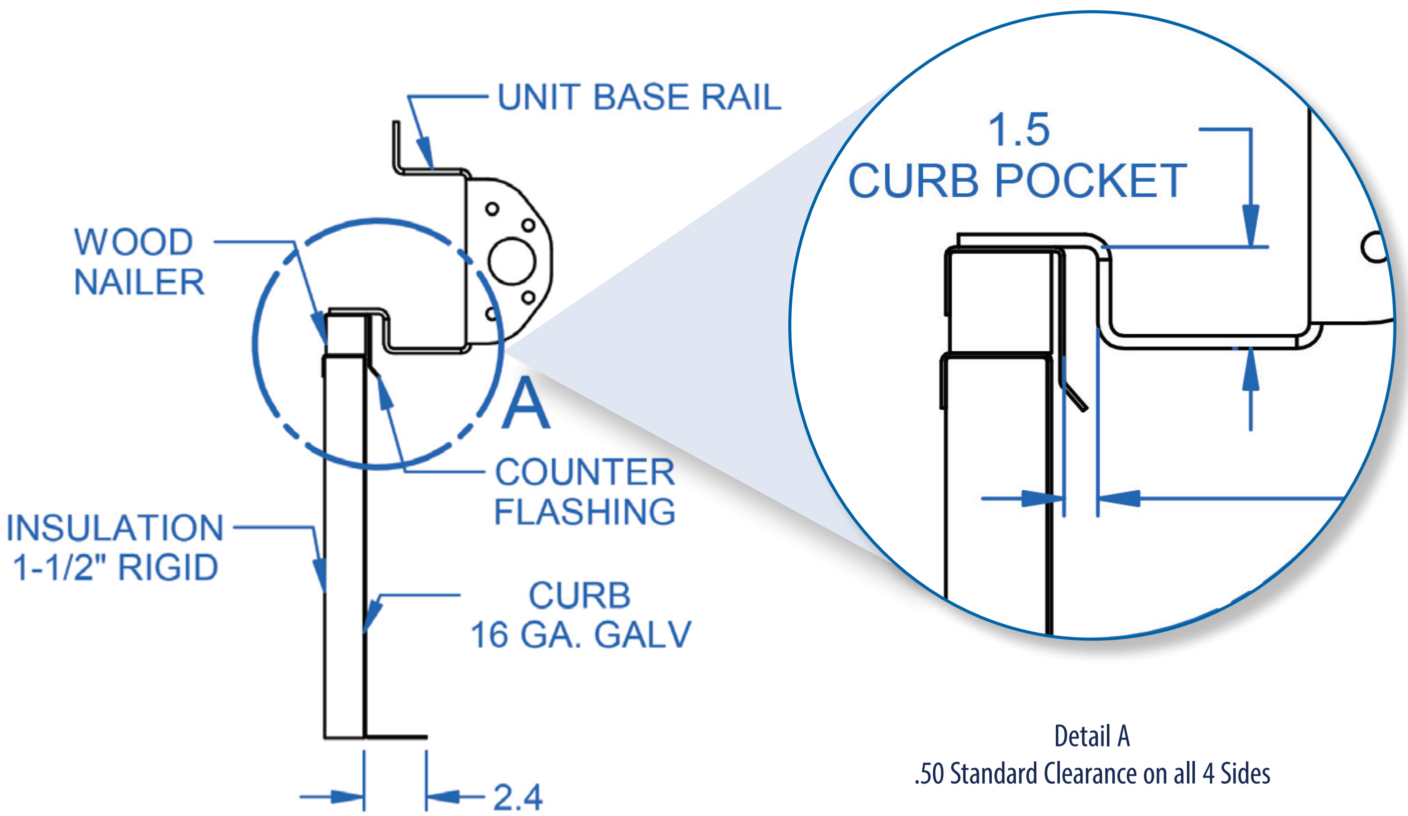
For rooftop mounting the VHR unit where a PoolPak curb is not purchased, PoolPak recommends the curb manufacturer refer to the selected-unit-specific product drawings to mate the curb to the VHR curb pocket max dimensions at acceptable design tolerances.

For VHR models, the curb pocket is flush with the bottom of the unit while providing an overhang angle for an extra drip edge to prevent water infiltration through the base. See Figure 3-3 for VHR base/curb cross section.

For curb-mounted VHR050 units shipped split or with an attached auxiliary heat module, a weather tight notch must be provided between the unit sections. Additional instructions will be provided.

Figure 3-3. Section of Curb

Figure 3-4. VHR050 Curb Notch Detail



Standard Curb Height = 16”

Detail A
.50 Standard Clearance on all 4 Sides

Curb Mounting

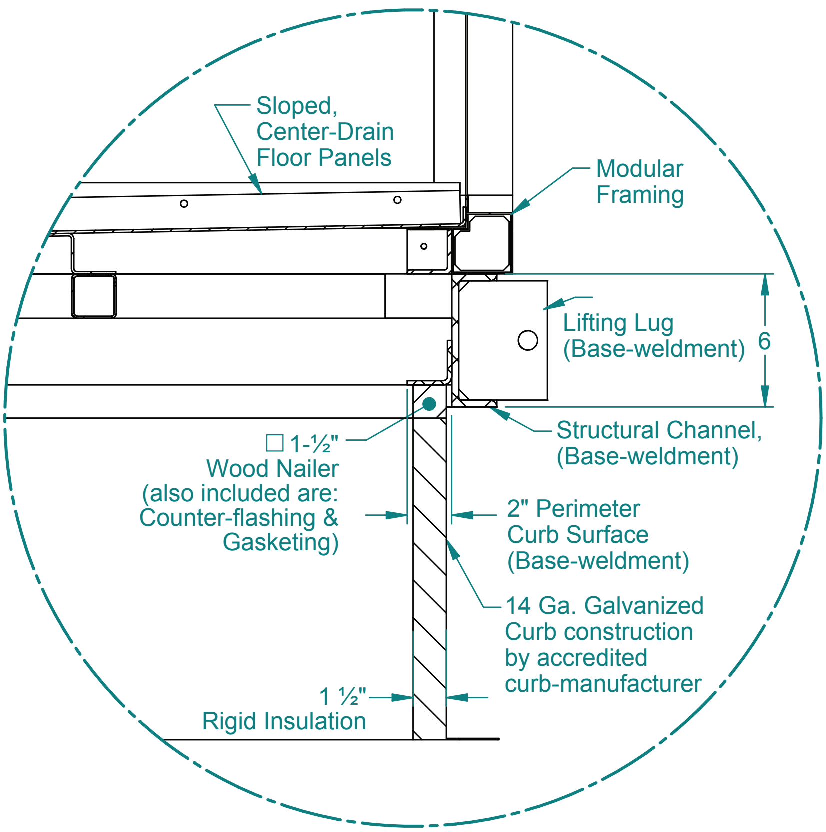
It is the installing contractor's responsibility to properly complete the following:

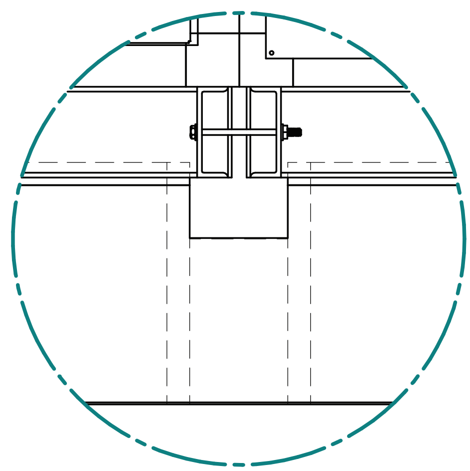
- Flash the curb into the roof
- Insulate the curb
- Connect the supply and return ducts to the ClimatePak®
- Connect condensate drain lines with appropriate traps
- Seal the curb top surface to the bottom of the ClimatePak® with supplied gasket

If specified when ordering, all water piping connections can be made through the curb. These water connections include:

- Condensate
- Auxiliary hot water coil
- Chilled water coil

If the PoolPak® is to be mounted on another manufacturer's curb, the PoolPak® factory must be notified of this at the time the PoolPak® sales order is submitted. PoolPak® units produced for curb mounting, whether on a PoolPak® curb or on another manufacturer's curb, receive special weatherizing and insulating that non-curb mounted PoolPak® units do not receive.





NOTE
If the factory is not notified that a PoolPak® is to be curb mounted, the PoolPak® base will not be watertight, it will leak, and it will not be properly insulated.

CPCS Field Wiring

Overview

The CPCS is the programmable controller designed specifically for the PoolPak® dehumidification system. It is a robust system capable of a variety of functions. The following text describes the field wiring required for proper operation of the dehumidification system in a typical PoolPak® unit installation. The field wiring diagram (see Figure 3-6) shows the location of the connections for the sensors and other required devices. The numbers following the text identify the location on the field wiring diagram showing how each field wired device is connected to the PoolPak® unit electrical panel.

Remote Interface Unit (1)

The Remote Interface Unit (RIU) allows the user to view space temperature, space relative humidity and pool water temperature. It also provides the ability to change set points, receive alarm notifications, and perform advanced diagnostic functions.

The RIU should be mounted in a convenient location, outside the natatorium, that is protected from splashing pool water and corrosive air. The ambient temperature of the mounting location must always be greater than 32°F. The maximum distance from the PoolPak® control panel is 1,000 feet. For distances greater than 1,000 feet, contact the factory.

⚠ CAUTION
Mounting the RIU inside the natatorium may cause damage to the unit. Problems occurring from mounting the RIU in the natatorium will not be covered under warranty.

The CPCS includes a 7-foot long, black RJ25 cable. If the RIU is to be mounted directly to the PoolPak® unit, this cable can be plugged directly into port J10 on control module CM1 in the PoolPak® control panel.

For remote mounting of the RIU, the installing contractor must run a six-conductor (three twisted pairs), 16-20 AWG cable from the PoolPak® control panel to the remote location. One end of this cable will terminate on terminal block T17 in the control panel. The other end will terminate on a factory-supplied RJ25 jack. The wires for terminals T17.1 and T17.2 should be from the same twisted pair. The second pair should be used for T17.3 and T17.4 and the third pair for T17.5 and T17.6. Proper polarity and connection is essential for correct operation of the RIU. Improper wiring can cause permanent damage. Please review the color code and connections to the RJ25 jack carefully.

The RIU includes a mounting bracket that is designed to fit a single gang, extra deep electrical box mounted horizontally in the wall. The RJ25 jack and most of the black cable should be placed inside the box before installing the mounting bracket. Use the screws that come with the box to secure the bracket. A ¾" hole must be drilled for the 6-conductor cable which connects the remote interface unit to the PoolPak® unit. Refer to the figure 4-4 for remote interface unit mounting dimensions.

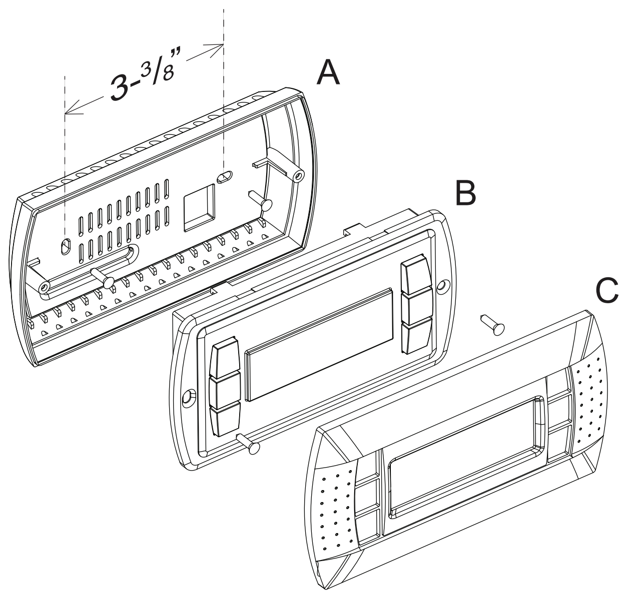
⚠ CAUTION
The Remote Interface Mounting Plate MUST be mounted on an extra deep, single gang electrical box. Do not mount flush to the wall..

The wall mounting of the terminal first requires the back piece (A) of the RIU assembly. The RIU is designed to fit a single gang, extra-deep electrical box mounted horizontally in the wall. The RJ25 jack and most of the black cable should be placed inside the box before installing the mounting bracket. A ¾" hole must be drilled for the 6-conductor cable which connects the remote interface unit to the PoolPak® unit.

The below is specific mounting instructions that correspond to Figure 3-5.

1. Fasten the back piece (A) to the gang box using the rounded-head screws supplied in the packaging. Use the screws that come with the box to secure the bracket.
2. Thread the 6-conductor cable through the back piece (A) and connect to the back of front panel (B).
3. Rest the front panel (B) on the back piece A and fasten the parts together using the flush-head screws supplied in the packaging.
4. Finally, fit the click-on frame (C).

Figure 3-5. Remote Interface Mounting Plate



Building Automation System Connection (2)

The CPCS is capable of direct connection to LonWorks, Modbus, or BACnet BAS systems. This interface allows a BAS to monitor detailed dehumidifier status information. It also allows the BAS to make set point changes, to control occupancy modes and to control purge mode. These connections should be made with 24 AWG minimum, CAT5 cable or better. Use wires from the same pair for the connection of terminals 1 and 2.

When equipped with the LonWorks interface, the CPCS utilizes an Echelon FTT10 transceiver for connection to a TP/FT-10 network channel. The Modbus RTU interface is RS485-based, with user selectable baud rates of 1,200, 2,400, 4,800, 9,600, and 19,200. When the CPCS is equipped with the BACnet/IP interface, RJ45 connection is to the serial card port on control module CM1.

A user's guide for installation and operation for each BAS interface option is available on the PoolPak® website, www.poolpak.com.

Multi-Unit Network Connection (3)

The CPCS utilizes a proprietary, private network to coordinate with other PoolPak® units operating in the same space. This allows up to five PoolPak® units to coordinate operation using a master/slave scheme. The PoolPak® units are connected to each other by daisy-chaining the three terminals of T15. The network is RS485-based. The connections should be made with 24 AWG minimum, category 5 cable. Use wires from the same pair for the connection of terminals 1 and 2. The total network length should not exceed 500 feet. For total network lengths of more than 500 feet, contact the factory.

Cold Surface Temperature Sensor (4)

This sensor measures the temperature of the coldest surface in the pool enclosure. When the temperature of the surface drops within 5°F of the space dew point, the dew point set point will automatically be reset downward to help prevent condensation on the cold surface. It should be noted that this function will not be able to compensate for lower-quality building materials, such as single-pane glass or non-thermally broken window frames.

For all PoolPak units, the cold surface temperature sensor is shipped pre-wired and mounted on to the field wiring terminals. The sensor should be re-mounted on an exterior window frame at a height where it can be easily serviced but out of reach of swimmers and spectators. In cases where there are no exterior doors or windows, the sensor should be mounted on the interior surface of an exterior wall. Avoid mounting the surface temperature sensor where it will get direct exposure from sunlight. The sensor housing has a single 1/8-inch hole for mounting.

Wire as shown on the field-wiring diagram. Electrical connection should be made with two-conductor (one shielded, twisted pair), 16-20 AWG copper cable. Connect the shield drain wire to ground at the PoolPak® control panel end only.

Outside Air Temperature and Relative Humidity Sensor (5)

The CPCS uses an outside air temperature and humidity sensor to make economizer decisions and to prevent air cooled condenser operation during low ambient conditions. This sensor is normally factory mounted and wired in the outside air intake section of the unit.

OA Remote Mounting Instructions

For an indoors unit, the sensor will ship loose for field installation. The sensor should be mounted on the exterior surface of a north-facing wall without exposure to direct sunlight. Wire entry to the sensor terminal box is provided with a compression-type fitting, suitable for cable diameters from 1/8 to 1/4 inch.

Do not connect a conduit directly to the sensor's terminal box. Use a small piece of UV-resistant cable to make the transition from the conduit to the sensor. A direct conduit connection will allow condensation to form inside the sensor, resulting in permanent damage.

Orient the sensor as shown on the included instruction sheet. Proper orientation of the sensor and radiation shields is essential. Carefully review the wiring connections shown on the field-wiring diagram.

⚠ CAUTION
Improper connection may damage the sensor or the CPCS control module. The cable should be four-conductor (two-twisted pairs), 16-20 AWG copper.

Remote Exhaust Fan Status (6)

The CPCS monitors a contact closure signal from a BAS or remote exhaust fan starter. This input must be connected to dry (voltage free) contacts only. This allows the control system to adjust the amount of air exhausted by the unit if a remote exhaust fan is providing supplemental exhaust. This field wiring should be 2 conductor, 16-20 AWG, shielded, twisted pair.

Contact factory for any remote exhaust fan application.

Purge Mode Input (7)

The VHR modulates outside air normally to maintain space conditions. If required, the user can force purge mode to bring in the maximum amount of outside air in the space. This feature is typically used to facilitate the pool shocking process.

The CPCS can receive a contact closure from a remote mounted switch or from a BAS. This input must be connected to dry (voltage free) contacts only.

During purge mode operation, the CPCS will attempt to maintain space temperature with the auxiliary heating system. If the supply air temperature drops to 40°F (adjustable), purge mode is automatically terminated to provide freeze protection. Purge mode commands sent to the CPCS through the LonWorks, Modbus, or BACnet interface take precedence over the purge mode input or previously schedule purge event.

Occupied Mode Input (8)

The CPCS can receive a contact closure from a Building Automation System (BAS) or from a time clock to override the occupancy schedule stored in the controller's memory. This input must be connected to dry (voltage free) contacts only. If the schedule is currently requesting unoccupied operation, activating this input will force the controller into occupied mode. Although this input overrides the CPCS internal schedule, it will not override commands sent to the controller via the LonWorks, Modbus, or BACnet interfaces.

Fire Trip Input (9)

The CPCS can receive a contact closure from a building fire and smoke control system. This input must be connected to dry (voltage free) contacts only. When this input is activated, the CPCS will shut down all unit-mounted fans, and will close all air dampers. The RIU will display an alarm message indicating that fire trip mode has been activated. Using the CPCS configuration menu, it is possible to set this input to be active on open or active on close.

Smoke Purge Input (10)

The CPCS can receive a contact closure from a building fire and smoke control system. This input must be connected to dry (voltage free) contacts only. When this input is activated, the CPCS will energize the exhaust fan only and will open the HOBD and HOFD air dampers to 100%, while closing all other dampers. The RIU will display an alarm message indicating that smoke purge mode has been activated. Using the CPCS configuration menu, it is possible to set this input to be active on open or active on close.

Auxiliary Air Heat Control Valve (11)

The CPCS provides a signal to control a proportional 3-way valve for an auxiliary air heating system. Terminal block T12.1-3 provides the analog signal for control of a hot water or steam valve.

Normally, this valve is factory-mounted and wired inside the PoolPak® unit. However, if a remote valve is used, it can be connected directly to the PoolPak® control panel. Terminal block T12 provides 24 VDC power and a control signal. The actuator on the external valve must consume less than 5 VA at 24 VDC. The default control signal to the actuator is 2-10 VDC. The voltage span of the control signal can be adjusted in the configuration menu.

Alarm Output (12)

The CPCS will activate the alarm output when uncleared alarms are present. This output mimics the status of the red alarm light on the RIU. The output provides form C dry contacts. The contacts may be directly connected to an external circuit, provided it is 115 VAC maximum and the current does not exceed 1A inductive.

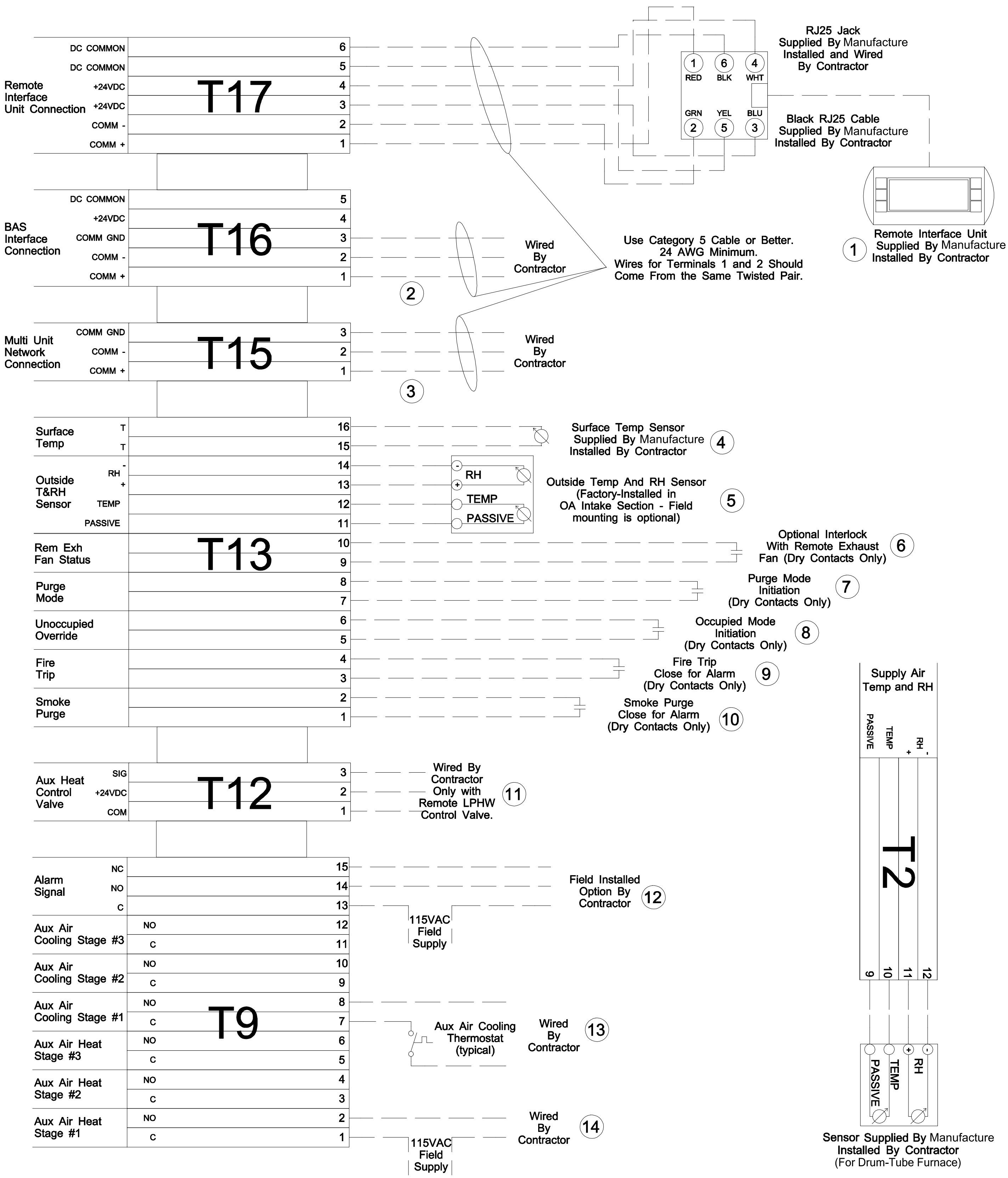
Auxiliary Air Cooling System (13)

The CPCS provides contact closure outputs for up to 3 stages of auxiliary cooling on Terminal block T9. For chilled water cooling systems, a proportional 3-way valve is factory mounted and wired.

Auxiliary Air Heating System (14)

The auxiliary heating system is normally factory-installed inside the PoolPak® unit. In this case, all interface wiring between the CPCS and the heater is factory-installed. If the PoolPak® is not purchased with an integral auxiliary

Figure 3-6. VHR Field Wiring Diagram - Communications



heating option, the CPCS provides contact closures to control three discrete stages of auxiliary air heating. The contacts may be directly connected to the heater's control circuit provided it is 115 VAC maximum and the current does not exceed 1A inductive. The three outputs are energized in order, by number, as heating demands dictate. These outputs operate in unison with the analog output signal as described.

Supply Temperature and RH Sensor (Furnace Only)

The supply temperature and RH sensor is normally factory mounted and wired inside the supply section of the VHR.

For units purchased with a drum and tube furnace, a supply temperature RH sensor is provided separately for field installation and wiring by the contractor approximately 5 feet downstream of the VHR unit in the supply duct. The need to field install the sensor comes from the bypass air through the furnace. To sense an accurate supply temperature, there needs to be some ductwork length to allow mixing of the air through the furnace with the bypass air.

Furnace High Limit Switch and Other

For units with a furnace, additional components may need to be field installed downstream of the equipment. Refer to manufacturer's instructions for details.

Condensate Drains

Condensate Drainage System Features

- The diamond plate floor is sloped towards a center drainage channel for each compartment.
- Each compartment has its own drain piping to either side of the unit
- For units selected with a curb, the unit can be ordered with through the curb/bottom condensate drainage. Each compartment will still require field installation of a drain trap and condensate piping.
- For units without a curb or without bottom condensate drainage, field installation of positive and negative pressure condensate drain traps is required.
- For outdoor units, these traps must also be heat-taped and insulated to protect against freezing.

Drain Trap Field Installation Instructions

- A drain trap is required on one side of each compartment. The other side should be plugged.
- Depending on the selection of the unit, a variable number of drain traps are required.
- Drain traps located upstream of the supply fans require negative pressure condensate drain traps.
- Drain traps located downstream of the supply fans (supply fan compartment, electric heat module, and gas furnace compartment) require positive pressure condensate drain traps.
- See below illustrations for more detail on the sizing of the negative and positive pressure condensate drain traps.
- Since the drain traps are vented to ambient pressure, they can be tied together and directed towards the nearest roof or floor drain.

Required Materials

- Schedule 40 (minimum) PVC plastic pipe, elbows, tees, and a removable cap for a clean out.
- For outdoor units, wrap drain lines and trap with electric heat tape (follow manufacturer's instructions) controlled by an automatic thermostat set at a minimum of 35°F to protect against freezing.
- For outdoor units, insulate all external condensate piping. Insulation must be sealed at all seams.
- For additional questions or concerns regarding installation of condensate drains, please contact PoolPak® Service.

NOTE
Power for heat tape must be supplied external to the PoolPak® unit.

Refer to figures 3-7 and 3-8 for illustration of drain traps.

Figure 3-7. Negative Pressure Condensate Drain Piping Cross Section

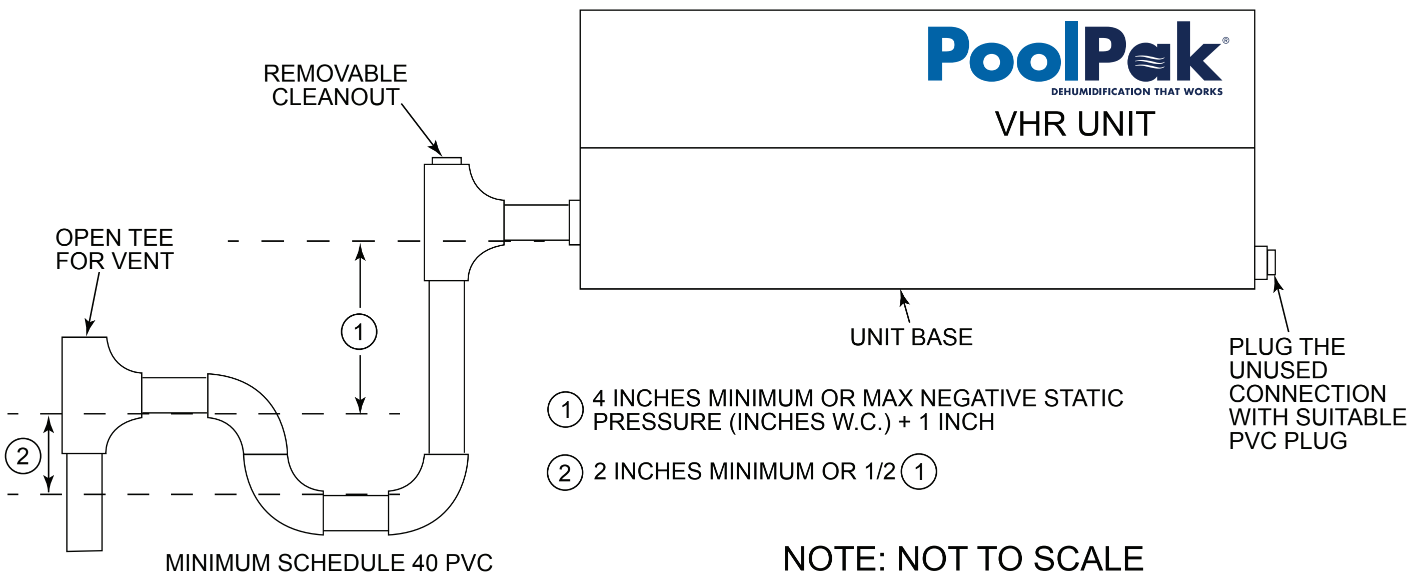
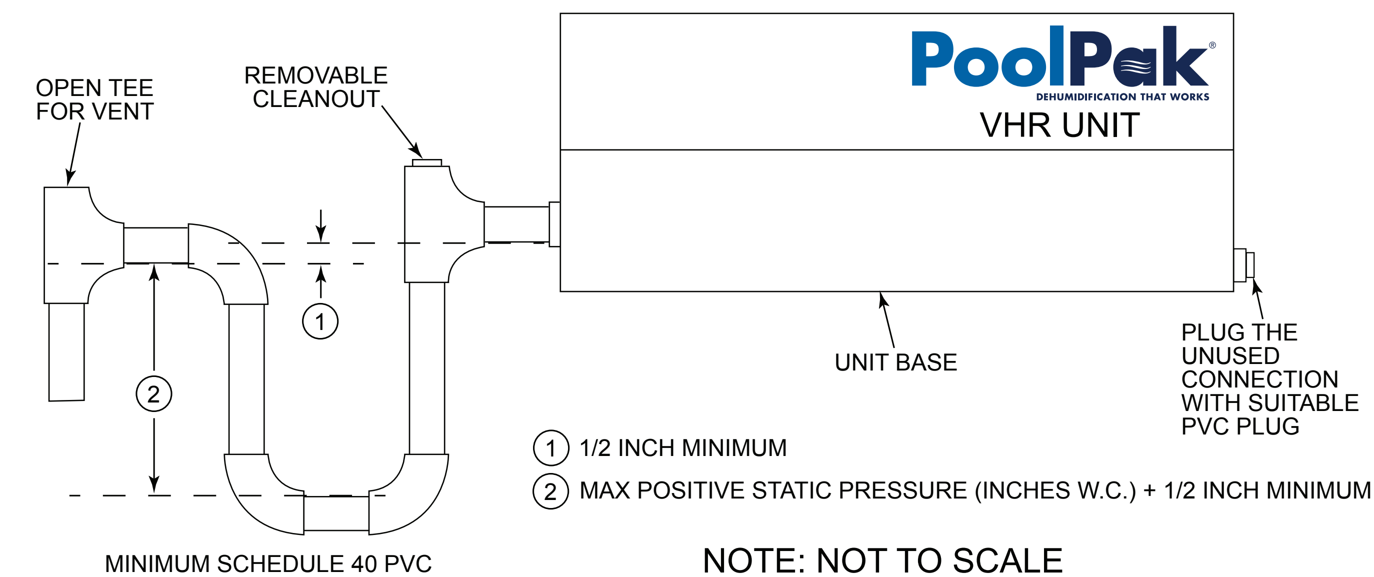


Figure 3-8. Positive Pressure Condensate Drain Piping Cross Section



SECTION IV: OPERATION

CPCS Controller Operation

Remote Interface Unit (RIU) Features

The CPCS includes a Remote Interface Unit (RIU) display/keypad panel that can be located remotely from the unit for the convenience of the owner. For wiring and installation, see the CPCS Field Wiring section.

In normal operation, the display of the RIU will automatically rotate between different screens displaying the status of the system. You can also manually browse these status screens by pressing the up or down arrows. These status screens include information on temperature and humidity, current mode of operation, occupied mode status, current air flow rates, and system status.

If an alarm occurs, the RIU will display alarm status screens for each alarm occurring. The system status information is still accessible through menu navigation.

The RIU does not have any sensors; the RIU is simply a window for viewing the controller remotely. See Figure 4-1 for physical characteristics and button call outs of the RIU.

Figure 4-1. RIU Keypad

🔔 or ⚠ ('alarm'): When an alarm occurs, this key will turn and stay red until cleared. With an alarm active, pressing this button gives the alarm status screens.

Prg or ⦿ ('program'): This key accesses the main menu of the CPCS Controller.

Esc or 🡐 ('escape'): Pressing this key moves the user back to the previous screen.

🡑 / 🡓 ('up/down'): These are directional keys for navigating the controller and configuring settings.

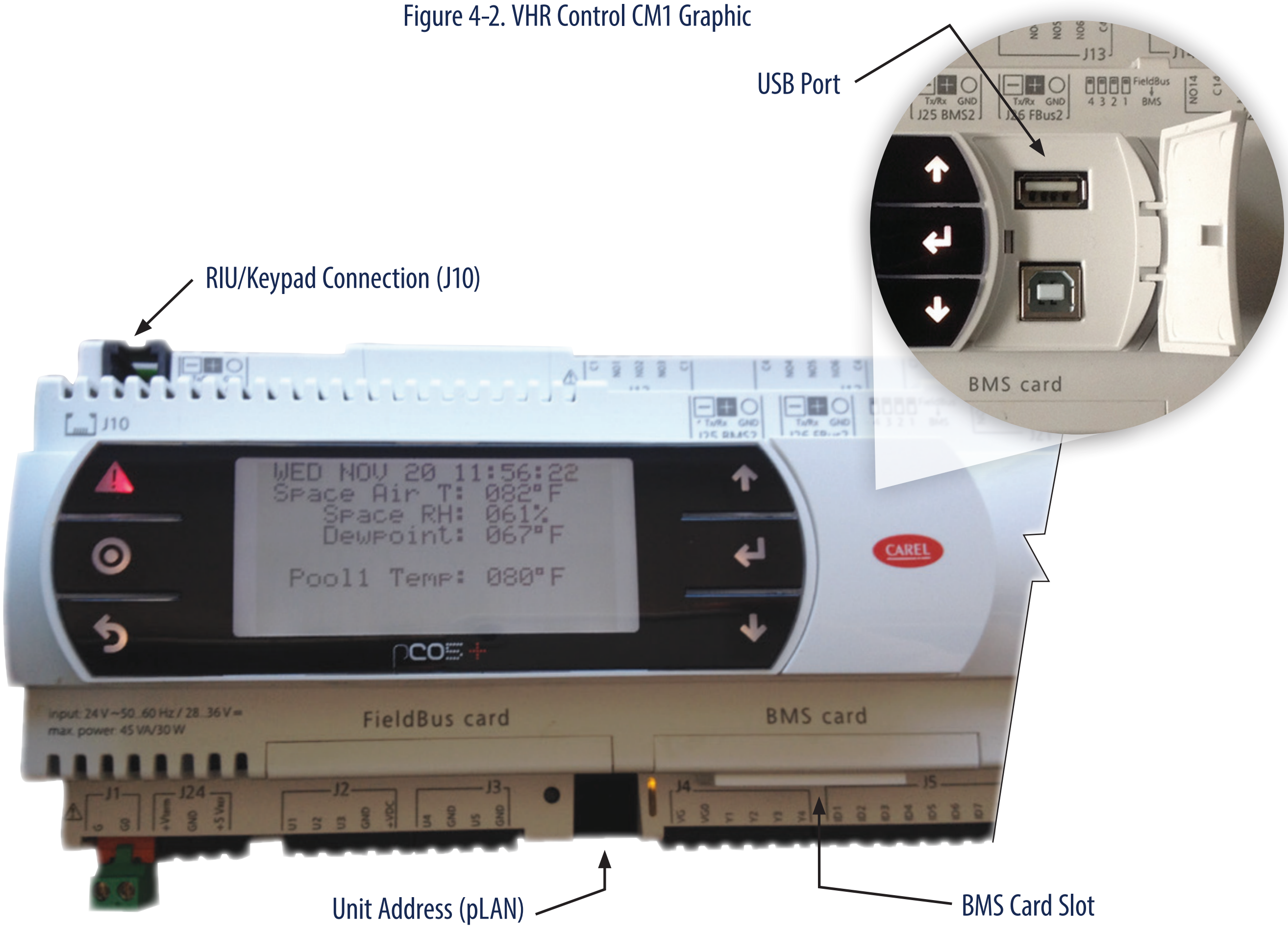
↵ ('enter'): Pressing this key moves the user to the next selection on the same screen. If any selection is made, pressing this key will save that new setting.

For Multi-Unit networking operation, while the RIU is connected to any of the units, press Esc + 🡑 at the same time to view the next unit's display within the network.

CPCS Controller Features

The CPCS-VHR Controller consists of a main control module and several I/O expansion boards. The main controller is the only controller in the main control cabinet with a display (Figure 4-2). The CM1 display has the same keys and can be operated in the same way as the remote keypad.

Figure 4-2. VHR Control CM1 Graphic



In addition to the key features for the RIU, more description of some of the physical features on the CM1 controller is below:

- RIU/Keypad connection (J10): For service convenience, there is an auxiliary RJ25 jack located on the upper left side of CPCS Control Module #1, port J10. The RIU may be removed from its remote location and connected here using the special RJ-25 cable supplied with the control system.
- USB Port: For communication with standard USB pen drives or direct connection to a PC, this port is used primarily for downloading fault history logs and other system performance parameters. Refer to the Troubleshooting section for specific instructions on using the USB Port.
- FieldBus card and BMS card slots: These slots are connection points for the Building Automation System and Virtual-Tech® Plus add-on to the CPCS Controller. See the Communications section for more details.
- Unit Address (pLAN): On the bottom terminal located between terminals J3 and J4, there is a LED screen for displaying and adjusting the Unit Address.

Multi-Unit Network Operation

When there is more than one PoolPak® unit servicing a single room, the units should be connected together. The CPCS controller allows up to five PoolPak® units to be connected together over a proprietary, private network. The networked units will then work together to maintain space conditions. Refer to the field wiring section of this manual for instructions to connect the units.

Networked units operate in a MASTER/SLAVE environment. The fuzzy logic engine in the master unit determines the heating, cooling and dehumidification requirements and broadcasts them over the network to the other units. This ensures that each unit will make control decisions based on the same information. During steady state conditions, all units networked together will operate in the same basic mode (ie. heating or cooling). Changing the setpoints on any of the networked units changes setpoints for all networked units. If a networked unit is manually disconnected from the network, this unit will revert to its local setpoint settings.

Each networked unit must contain all sensors and controls necessary for independent operation to be capable to taking over the MASTER role. Units on the network are identified by an address of one to five. The unit with the lowest address with having no uncleared alarms is the MASTER unit. In the event of a failure or uncleared alarm, the unit with the next lowest address and no uncleared alarms will become the MASTER unit. In the unlikely event that all units have uncleared alarms, each unit will function individually. Refer to CM1 Network Configuration for instructions on viewing and adjusting the unit ID.

A single RIU can be used to monitor all units on the network. While the RIU is connected to any of the units, press Esc + 🡅 at the same time to view the next unit's display within the network. Refer to the Status Screens section under Controller Navigation for more description on how to simply view network status. If separate RIUs are desired, they must be uniquely addressed on the network. Refer to RIU network configuration below.

CM1 NETWORK CONFIGURATION

The unit networking address is set by pressing the small button to the right of the CM1 plug, J3. Pressing the button one time will display the current Unit ID address setting. On single unit installations, this should be 1. On multi-unit installations, each unit should be set to a different address between 1 and 5. No two Unit IDs can be the same while connected to the same network.

To change the I/O address, press and hold the button for approximately 5 seconds until it begins flashing slowly. Once flashing, release the button and press it sequentially until the desired address is displayed (must be 1, 2, 3, 4 or 5) and release the button. After approximately 5 seconds, the displayed number will begin flashing faster to indicate the new address has been set. Cycle power at the Control Power switch to complete the address change.

RIU NETWORK CONFIGURATION

To set up multiple keypads in the same network, each keypad must be uniquely addressed. The RIU network address is set by pressing the 🡅, 🡇 and ↵ buttons simultaneously and holding them down for approximately 5 seconds. The display will show "Display address setting". Press the to move the cursor to the current address field. Use the 🡅 and 🡇 keys to change the address to either 10, 11 or 12 and press ↵.

To configure the ECC III RIU addresses, press the 🡅, 🡇 and ↵ buttons simultaneously and hold them down for approximately 5 seconds. The display will show "Display address setting". Press the key ↵ four times to move the cursor past the screens showing "Display address setting", "I/O Board address" and "Terminal config Press ↵ to continue. Use the keypad to enter the RIU configuration as follows:

P: 0x Adr Priv/Shared (x = CM1 I/O address)
Trm1 10 Sh
Trm2 11 Sh
Trm3 12 Sh   Ok? Y

When prompted "OK?", select "Y" to save the configuration and to exit. The RIU will go blank and then beep several times before bringing up the normal status display.

Communications

BUILDING AUTOMATION SYSTEM (BAS) CONNECTION

The PoolPak® CPCS provides four option Building Automation System (BAS) connection types: BACnet /IP, BACnet MS/TP, Lonworks and Modbus. Refer to the *Field Wiring section* for connecting these BAS systems. Refer to the respective *BAS User Guide* for more information on the BAS.

VIRTUAL-TECH® PLUS VHR

The ClimatePak® VHR is remotely monitored and controlled by PoolPak factory service technicians with the Virtual-Tech® Plus VHR remote access package (RAP). Remote monitoring is accomplished via an entirely factory mounted and wired cellular web server located in the dehumidifier unit control panel.

In addition to the on-board data-logging of the CPCS controller, datalogging and trending is also available via the remote server of the RAP. The RAP becomes active upon application of power at unit startup. The remote interface is then viewable by PoolPak service technicians to quickly handle any alarm conditions or to remotely troubleshoot the unit from the factory.

Normal Startup Sequence

When power to the unit is disconnected

1. All dampers are closed.
2. The hot water and chilled water control valves are in the position to send full flow through their respective coils.

Upon application of power

1. The control modules complete a self-test with duration of 20 seconds.
2. The dampers move to the following positions:
    - Outside Air Damper (OAD) set at 0% open
    - Return Air Damper (RAD) set at 100% open
    - Heatpipe Inlet Bypass Damper (HIBD) set at 100% open
    - Heatpipe Inlet Face Damper (HIFD), Heatpipe Outlet Bypass Damper (HOBD), and Heatpipe Outlet Face Damper (HOFD) set at 0% open
3. Approximately 90 seconds after power was applied:
   The Supply Fan is started at the speed required by occupancy mode. This speed is set by an entered setpoint for both Unoccupied and Occupied operation.

   Unoccupied Operation
    - OAD set at 0% open
    - RAD set at 100% open
    - HIBD set at 100% open
    - HIFD, HOBD and HOFD set at 0% open

   Occupied Operation
    - OAD set at Min Damper Position Set Point
    - RAD set at 100 less Min Damper Set Point
    - HIBD set at 100% open
    - HIFD, HOBD, and HOFD set at 0% open
    - The exhaust fan is started at the speed required by the outside air damper position. At this point in the sequence, the damper position depends only on the occupancy mode.
4. After the unit warm-up sequence has ended (300 seconds after power applied), the unit enters the normal mode of operation.

Normal Operation Sequence

OCCUPANCY MODES

The VHR unit has two basic occupancy modes, unoccupied and occupied. These modes affect the amount of outside air delivered to the space and can also affect the total supply air delivered. Occupancy mode can be controlled by a schedule entered in the controller, a digital input, or the BAS. The BAS settings for occupancy mode override the internal schedule and the digital input.

Unoccupied

During unoccupied operation, the minimum amount of outside air that can be delivered to the space is 0%. This means when there is no need to cool or dehumidify the space, the outside air dampers will be completely closed and the exhaust fan will be off. If a cooling or dehumidification need arises, outside air will be used to satisfy the need if possible.

If configured to do so, the unit will also reduce the amount of air supplied to the space during unoccupied periods.

Occupied

During occupied operation, the minimum amount of outside air that can be delivered to the space is set by the minimum outside air set point. The user then enters this value, in percent outside air. This minimum amount of outside air will be delivered to the space even when it is not necessary or helpful for maintaining the space conditions. If a cooling or dehumidification need arises and the outside air can be used to satisfy this need, the amount of outside air will be increased as needed up to the maximum amount. The maximum amount of outside air in percent is determined by a set point entered by the user. For units that are not equipped for 100% outside air operation, the high limit for this set point is determined by the capability of the unit.

DEHUMIDIFICATION

The only means of dehumidification available for the VHR unit is to use outside air when the conditions are appropriate. By using the dampers and the variable speed exhaust fan, the unit can continuously vary the percentage of outside air mixed in with the supply air.

The ability to dehumidify with outside air depends on the difference between the space dewpoint and the outside air dewpoint. To accommodate the possible range of differences in dewpoint, the control routine breaks up the available range of mixing box position into a variable number of stages. As the difference between the outside air and space dewpoint increases, so does the number of mixing box dehumidification stages available.

Fuzzy logic looks at the difference and rate of change of the difference between the space dewpoint and the space dewpoint set point, based on dehumidification requirements, the control staging of the mixing box dampers.

A cold surface temperature sensor will adjust the dew point control point downward as the surface temperature approaches the dew point. The maximum adjustment based on surface temperature is 8 degrees of dewpoint.

SPACE HEATING

Because it is very unlikely that outside air will ever be able to provide any or all air heating for the space, the only means of heating from a VHR unit is the auxiliary heating system.

The control routine is setup to control up to five stages of auxiliary heating. Capacity control of an aux. heating coil is accomplished with the use of a proportional control valve that regulates fluid flow through the coil.

Like the above values, the number of stages installed can be adjusted through the user interface. These adjustments allow for fine-tuning in the field to mitigate temperature overshoots for systems with unusual auxiliary heat sizing or airflow issues.

Again, a fuzzy logic routine generates a heat/cool stage(s) required value based on the space temperature versus set point.

The routine considers the temperature difference and the rate of change of the difference and then determines when to stage up or down.

Whenever the heat/cool stages required value indicates that space heating is required, the heat pipe heat recovery system is active. Please see the Heat Pipe System Control section later in this document for more information.

SPACE COOLING

The VHR unit can provide space cooling in one of two ways. If the outside air conditions are suitable, the unit can use this to cool the space. If the unit is equipped with an auxiliary cooling system, the unit can activate it to cool the space as needed.

Cooling With the Mixing Box

The ability to cool the space with outside air depends on the difference between the space temperature and the outside air temperature. To accommodate the possible range of differences in temperature, the control routine breaks up the available range of mixing box position into a variable number of stages. As the difference between the outside air and space temperature increases, so does the number of mixing box cooling stages available.

Cooling With the Auxiliary Cooling System

This control routine is setup to control up to three stages of auxiliary cooling. Capacity control of the aux. cooling coil is accomplished with the use of a proportional control valve that regulates fluid flow through the coil. The valve position for each stage of cooling is adjustable through the control module's user interface.

Cooling Mode Selection

The total number of cooling stages available is the sum of the mixing box cooling stages available and the auxiliary cooling stages available. The control routine uses an opportunity cost algorithm to determine which method of cooling to apply first. The method with the lowest computed value of opportunity cost is used first.

The opportunity cost for each mode of cooling is calculated from a set of "rules" and a user entered base cost. The numerical values output from each rule are added together with the base cost to determine the current opportunity cost. The total cost value is limited to the range 0 to 10.

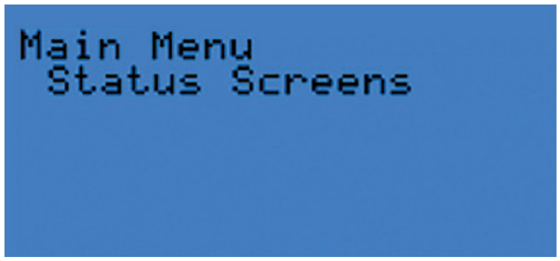
From these algorithms the best "cost opportunity" determines whether to use outside air or auxiliary cooling to maximize space-cooling effect.

Controller Navigation

Main Menu

Pressing the program key at any time gives the below screen Figure 4-3. From here, Status Screens, Detailed Status, Set Points, Schedules, and Service menus are all accessible.

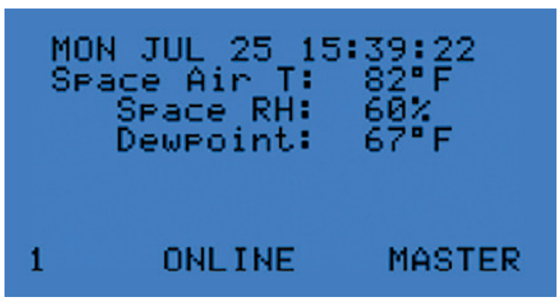
Figure 4-3. Main Menu Screen



Status Screens

Status and Detailed Status screens both contain read-only indicators of the operation of the unit. For example, these describe room conditions, airflow conditions, unit status, stages of heat or cooling requested, stages of aux heat or aux cool available, and fan motor status. All four status screens also show the weekday, month, day and 24H time.

Figure 4-4. Status Screen 1: Return Air/Pool Status



- Space Air T = Return Air Space Temperature (°F)
- Space RH = Return Air Space Relative Humidity (%)
- Dewpoint = Return Air Dewpoint calculated from space air dry-bulb T and RH (°F)
- Outside Air T = Outside Air Temperature (°F)
- Outside RH = Outside Air Relative Humidity (%)
- Dewpoint = Outside Air Dewpoint calculated from outside air dry-bulb T and RH (°F)
- Dehum = Dehumidification mode active? (Yes or No)
- Cooling = Cooling mode active? (Yes or No)
- Heating = Heating mode active? (Yes or No)
- Occupancy = Occupied mode on? (Occ or Unocc)
- Out Air Vol = Outside Air Volume (kCFM)
- Sup Air Vol = Supply Air Volume (kCFM)

If Multi-Unit Control is enabled, all Status and Detailed Status screens will indicate network status on the bottom line. To enable Multi-Unit Control, refer to the Unit Config Menu Installed Features section of Controller Navigation.

- Solid numeral indicates the unit network ID currently connected to the display
- Flashing numerals indicate units on network with uncleared alarms

- ONLINE – Unit is connected to at least one other device on the network. This could be a keypad.
- OFFLINE – Unit does not see any other network devices.
- MASTER – Unit is providing heat/cool and dehumidification stage values to all other networked units that are online. By default, the unit with the lowest unit ID with no active alarms is the MASTER. To set unit ID, refer to the Controller Features section.
- SLAVE – Unit is listening to the MASTER unit on the network and ignoring its own heat/cool and dehum stage values.

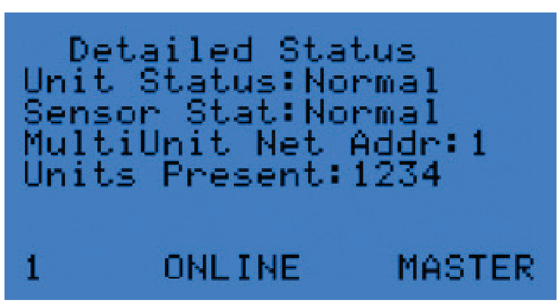
Detailed Status

Additional current operating details are found in the Detailed Status menu. This information includes:

SENSOR READINGS:

- Space Temp = Return Air Space Temperature (°F)
- Space RH = Return Air Space Relative Humidity (%)
- Space Dewpoint = Return Air Dewpoint calculated from space air dry-bulb T and RH (°F)
- Outside Temp = Outside Air Temperature (°F)
- Outside RH = Outside Air Relative Humidity (%)
- Outside Dewpt = Outside Air Dewpoint calculated from outside air dry-bulb T and RH (°F)
- Sply Air Temp = Supply Air Temperature (°F)
- Sply Air RH = Supply Air Relative Humidity (%)
- Sply Air Dewpt = Supply Air Dewpoint calculated from supply air dry-bulb T and RH (°F)
- AOHP Exh Temp = Air Off Heat Pipe Exhaust Temperature (°F)
- AOHP Exh RH = Air Off Heat Pipe Exhaust Relative Humidity (%)
- Mix Box Pos = Mixing Box Position - The percent (%) of outside air that makes up the supply air
- HP Fin Temp = Heat Pipe Fin Temperature (°F)
- Cold Surf T = Cold Surface/Wall Condensate Temperature (°F)
- Out Air Flow = Outside Air Flow, Actual kCFM
- Sup Air Flow = Supply Air Flow, Actual kCFM
- Exh Air Flow = Exhaust Air Flow, Actual kCFM
- Out Air Setp = Outside Air Flow, Setpoint kCFM
- Sup Air Setp = Supply Air Flow, Setpoint kCFM
- Exh Air Setp = Exhaust Air Flow, Setpoint kCFM

Figure 4-5. Detailed Status Screen: Status Overview



- Unit Status = Unit Status Normal or AlarmName condition
- Sensor Stat = Sensor Status Normal or SensorName. If multiple sensors are in error, this field indicates the highest priority sensor with an error.

- MultiUnit Net Addr: Multi Unit Net Address, address for current unit on the network
- Units Present: Number of Units Present in Network Refer to the Troubleshooting section for a listing and description of AlarmName and SensorName.

Refer to the *Troubleshooting* section for a listing and description of *AlarmName* and *SensorName*.

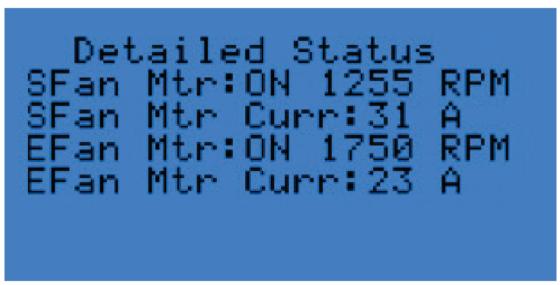
OPERATION MODE STAGES:

Stages are displayed as being required (Rqs) as determined by the ECC and as being available (Avl) as determined by installed features.

- Cool Stg = Cooling stages required and available by Economizer (Outside Air)
- Dehum Stg = Dehumidification stages required and available by Economizer (Outside Air)
- Aux Cl Stg = Cooling stages required and available by Auxiliary Cooling System
- Aux Ht Stg = Heating stages required and available by Auxiliary Heating System
- Aux DH Stg = Dehumidification stages required and available by Auxiliary Dehumidification System

FAN MOTOR STATUS:

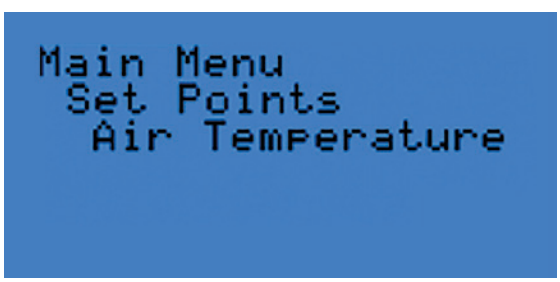
Figure 4-6. Detailed Status Screen: Fan Motor Status



- SFan Mtr = Supply Fan Motor is OFF or ON and current motor speed (RPM)
- SFan Mtr Curr = Supply Fan Motor Current (A)
- EFan Mtr = Exhaust Fan Motor is OFF or ON and current motor speed (RPM)
- EFan Mtr Curr = Exhaust Fan Motor Current (A)

Set Points

Figure 4-7. Set Points Air Temperature Screen



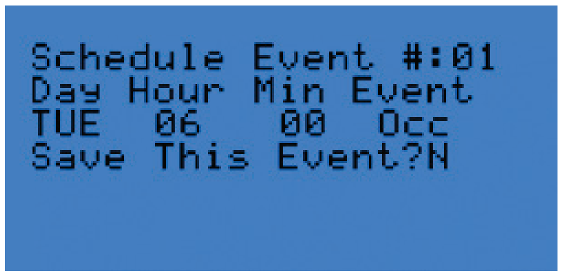
- Under the Set Points Menu, the following set points can be accessed:
- Air Temperature: default - 84°F, range: 70-95°F
- Relative Humidity: default - 55%, range: 45-65 %
- Min Out Air Amt = Minimum Outside Air Amount: default – 25%, range: 0-100%

- Max Out Air Amt = Maximum Outside Air Amount: default – 100%, range: 0 – 100%
- Timed Purge Cycle – to override the controls and start a timed purge anytime of fixed duration (min), this screen also indicates the time remaining (min) on the Timed Purge Event
- The RIU can be configured with a password on Set Point changes for additional security.

Schedules

The Schedules menu contains the setup screens for an Occupied/Unoccupied schedule, a Purge schedule, and an Event Mode Schedule.

Figure 4-8. Occupancy Schedule Screen



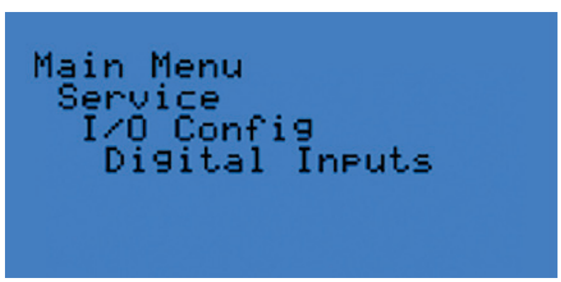
Each of these schedules has a total of 28 events that can be configured. Keep in mind that each schedule requires two events to be scheduled, a START and an END event. This allows for 14 unique schedules to be configured per week. Setting the “Save This Event?” to YES will momentarily display YES before displaying NO. Do not worry, the event has been saved. Proceed to the next event # to continue scheduling.

Service

The Service menu is the advanced diagnosis and programming menu. This menu includes Input/Output Configuration, History, Unit Configuration, Manual Mode, and Utilities. To access Service, ↵ the password 0005 at the prompt.

INPUT/OUTPUT CONFIGURATION

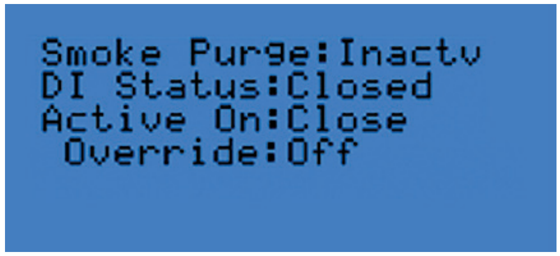
Figure 4-9. Service - I/O Config screen



This menu contains settings for digital and analog inputs and outputs. Access to any of these screens is password protected with the advanced service password 9995. Contact factory before changing these settings as **improper settings may cause equipment damage**.

Digital Inputs

Figure 4-10. Digital Inputs - Smoke Purge screen

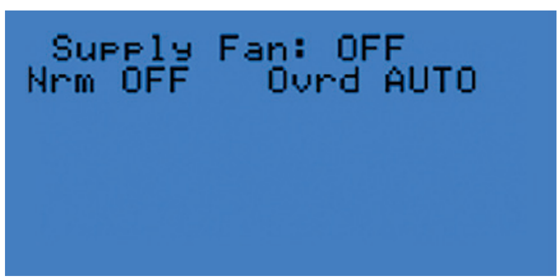


Each screen indicates the current status of the digital input, the input setting (Active on: open or close), and an override setting (default: OFF). The available digital inputs are:

- Smoke Purge – default: Active on Close
- Fire Trip – default: Active on Close
- Occ Override – default: Active on Close
- Purge Mode – default: Active on Close
- Rem Exh Fan – default: Active on Close
- Freezestat – default: Active on Open
- Sply Inv Flt – default: Active on Close
- Sply Inv Wrn – default: Active on Close
- Sply Inv Run – default: Active on Close
- Exh Inv Flt – default: Active on Close
- Exh Inv Wrn – default: Active on Close
- Exh Inv Run – default: Active on Close

Digital Outputs

Figure 4-11. Digital Outputs - Supply Fan screen



Accessing the Digital Outputs menu is typical for troubleshooting. Each screen indicates the current status at the top, the normal (NRM) operation, and an override setting (default: AUTO). The digital outputs are:

- Supply Fan
- Exhaust Fan
- Aux Air Heat 1
- Aux Air Heat 2
- Aux Air Heat 3
- Aux Air Cool 1
- Aux Air Cool 2
- Aux Air Cool 3
- Alarm Output
- Rem Exh Fan - Remote Exhaust Fan

Analog Inputs

The analog input screens are typically used to calibrate sensors. Each sensor configuration screen contains the following information:

- Current Value (Read only) – displayed in the upper right of each screen
- Fail Y (N) – indicates the read only status of the sensor with a writable failure override in parenthesis. A value of N indicates normal or non-failure. A value of Y indicates the sensor reading is outside of the expected range.
- Tol – This value is the tolerance of acceptable readings outside of the sensor's range. Therefore, for a sensor to be in failure, the reading must exceed the max or min value by more than the tolerance value.
- Offs – The offset value is useful for calibrating the sensor. For example, if the reading from the space temperature is 2°F higher than the actual value, setting the offset to -002.0 will calibrate the sensor reading.
- Min – The minimum acceptable reading for the sensor. For current loop sensors (4-20 mA), this parameter is the sensor value when the current in the loop is 4 mA. For voltage mode signals (0-10 VDC), this parameter is the sensor value when the voltage is 0 VDC. For thermistor based sensors, this parameter is the low limit value.
- Max – The maximum acceptable reading for the sensor. For current loop sensors (4-20 mA), this parameter is the sensor value when the current in the loop is 20 mA. For voltage mode signals (0-10 VDC), this parameter is the sensor value when the voltage is 10 VDC. For thermistor based sensors, this parameter is the high limit value.
- Ovrd – Setting this parameter to a non-zero value will replace the sensor reading with this value. This parameter is stored in permanent memory and will remain even if power to the controller is cycled. This parameter can be used to temporarily restore unit operation if a sensor has failed.

The below is a listing of the Analog Inputs and their related **default** values:

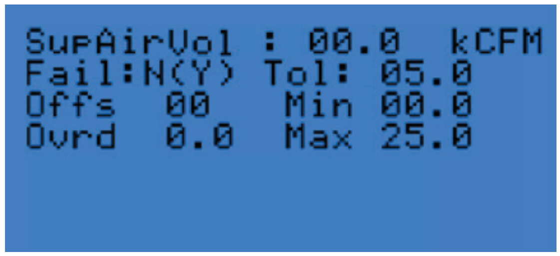
- Sply Fan Cur - Supply Fan Current - Tol = 5.0, Min = 0.0, Max* = 24.2
  *Max value must match actual maximum value on current transducer
- Exh Fan Cur - Exhaust Fan Current - Tol = 5.0, Min = 0.0, Max* = 24.2
  *Max value must match actual maximum value on current transducer
- Rtn Air Temp - Return Air Temperature - Min = 0.0, Max = 130.0
- Out Air Temp - Outside Air Temperature - Min = -- 40.0, Max = 150.0
- Surf Temp - Surface or Cold Wall Temperature - Min = 0.0, Max = 130.0
- Sply Air Tmp - Supply Air Temperature - Min = 0.0, Max = 250.0
- Off HP Exh T - Air Off Heat Pipe Exhaut Temperature - Min = 0.0, Max = 130.0
- HP Fin Temp - Heat Pipe Fin Temperature - Min = 0.0, Max = 130.0
- Off HP In Tmp - Air Off Heat Pipe Inlet Temperature - Min = 0.0, Max = 130.0

- Rtn Air RH - Return Air Relative Humidity - Tol = 10.0, Min = 0.0, Max = 100.0
- Outs Air RH - Outside Air Relative Humidity - Tol = 10.0, Min = 0.0, Max = 100.0
- Off HP Ex RH - Air Off Heat Pipe Exhaust Relative Humidity - Tol = 10.0, Min = 0.0, Max = 100.0
- Sply Air RH - Supply Air Relative Humidity - Tol = 10.0, Min = 0.0, Max = 100.0

- Rcrc Dpr Fbk - Recirculation Air Damper Feedback - Tol = 5.0, Min = -- 25.0, Max = 100.0
- Outs Dpr Fbk - Outside Air Damper Feedback - Tol = 5.0, Min = -- 25.0, Max = 100.0
- HIBD Fbk - Heat Pipe Inlet Bypass Damper Feedback - Tol = 5.0, Min = -- 25.0, Max = 100.0
- HIFD Fbk - Heat Pipe Inlet Face Damper Feedback - Tol = 5.0, Min = -- 25.0, Max = 100.0

- Rtn Air CO2 - Return Air CO2 level (PPM) - Tol = 50, Min = 0, Max = 2000
- ExhAirVol - Exhaust Air Volume - Tol = 5.0, Min = 0.0, Max = 25.0
- OutAirVol - Outside Air Volume - Tol = 5.0, Min = 0.0, Max = 30.0
- SupAirVol - Supply Air Volume - Tol = 5.0, Min = 0.0, Max = 25.0

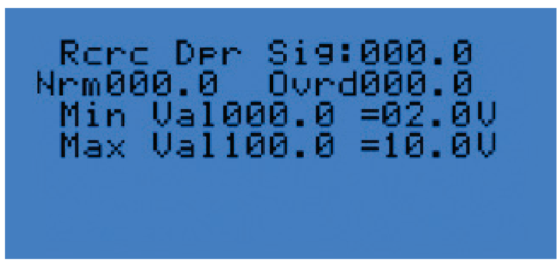
Figure 4-12. Analog Inputs - Supply Air screen



Analog Outputs

Accessing the Analog Outputs menu is typical for advanced troubleshooting. Below is a listing of the available analog outputs and **default** values for testing:

Figure 4-13. Analog Outputs - Recirculation Damper Screen



- HIFD Sig – Heat Pipe Inlet Face Damper Signal -
  Ovrd = 000.0, Min Val 000.0 = 02.0V, Max Val 100.0 = 10.0V
- Rcrc Dpr Sig – Recirculation Air Damper Signal -
  Ovrd = 000.0, Min Val 000.0 = 02.0V, Max Val 100.0 = 10.0V
- OA Dpr Sig – Outside Air Damper Signal -
  Ovrd = 000.0, Min Val 000.0 = 02.0V, Max Val 100.0 = 10.0V
- HIBD Sig – Heat Pipe Inlet Bypass Damper Signal -
  Ovrd = 000.0, Min Val 000.0 = 02.0V, Max Val 100.0 = 10.0V
- HOFD Sig – Heat Pipe Outlet Face Damper Signal -
  Ovrd = 000.0, Min Val 000.0 = 02.0V, Max Val 100.0 = 10.0V
- HOBD Sig – Heat Pipe Outlet Bypass Damper Signal -
  Ovrd = 000.0, Min Val 000.0 = 02.0V, Max Val 100.0 = 10.0V

- AuxAir Ht Sig – Auxiliary Air Heating Signal (Control Valve) -
  Ovrd = 000.0, Min Val 000.0 = 02.0V, Max Val 100.0 = 10.0V
- Sply Spd Sig – Supply Fan Speed Signal -
  Ovrd = 000.0, Min Val 000.0 = 00.0V, Max Val 1760 = 10.0V
- Exh Spd Sig – Exhaust Fan Speed Signal -
  Ovrd = 000.0, Min Val 000.0 = 00.0V, Max Val 1760 = 10.0V
- AuxAir Cl Sig – Auxiliary Air Cooling Signal (Control Valve) -
  Ovrd = 000.0, Min Val 000.0 = 02.0V, Max Val 100.0 = 10.0V

HISTORY

The History menu, also known as the Fault History Log, maintains a log of the last 100 unit faults. Each fault in the log is assigned a number from 0 to 99 (Fault #00 is the most recent). This fault number is in the upper left of each fault screen. The time and date the fault occurred is in the upper right. The Fault Condition is in the middle of the first line on each screen. See the list of Fault Conditions in the *Troubleshooting section*.

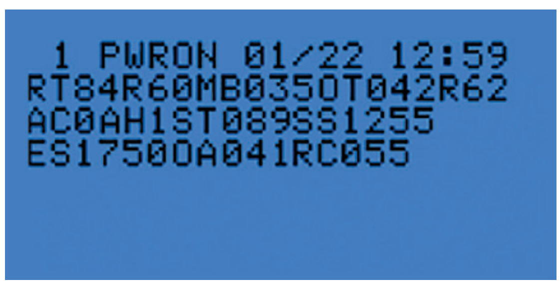
Use the ↑ and ↓ arrow keys to cycle through the faults one at a time. See Figure 4-14 for an illustration.

Fault Codes

The following are possible fault codes that can occur. See *AlarmName* for more information.

- FREEZ – Freeze alarm
- FIRTP – Fire Trip active
- SMKPU – Smoke Purge active
- EFOFF – Exhaust Fan Off
- SFOFF – Supply Fan Off
- EFINV – Exhaust VFD fault
- SFINV – Supply VFD fault
- PWRON – System Start
- EFDHD – Exhaust Fan Deadheaded
- SFDHD – Supply Fan Deadheaded
- AUXHT – Aux Heat fault
- AUXCL – Aux Cool fault

Figure 4-14. Fault Screen 1 – System Status Overview



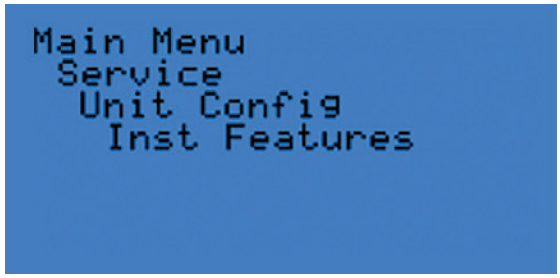
Fault Data

Each data item in a fault screen is preceded by a 1 or 2 letter code. The following data is found as listed by sequential letter codes from left to right on the fault screen:

- RT – Return Air Temperature
- R – Return Air RH
- MB – Percent Outside Air
- OT – Outside Air Temp
- R – Outside Air RH
- AC – Aux Cooling Stages
- AH – Aux Heating Stages
- ST – Supply Temp
- SS – Supply Fan Speed
- ES – Exhaust Fan Speed
- OA – Outside Air Damper Actual Position based on feedback from the actuator
- RC – Recirc Air Damper Actual Position based on feedback from the actuator

UNIT CONFIGURATION

Figure 4-15. Unit Configuration - Installed Features Menu



The Unit Configuration menu is where to access system set-up parameters. From here, the following configuration parameters can be accessed: Installed Features, Supply Fan, Exhaust Fan, Dampers, Auxiliary Air Heating System, Auxiliary Air Cooling System, Space Temperature Control, Dew Point Control, Mixing Box Control, Cost Factors and BAS Interface. Access to Unit Config is password protected with the advanced service password 9995. For all below parameters, the **default** setting is in **bold** font.

Inst Features – Installed Features

- Air Cool Type – Air Cooling Type - **None** or CHW, Chilled Water Coil
- Heatpipe Grade – Heat Pipe Size depending on model #, 012 = B, 015 = C, 020 = C or D, 030 = D or F, 040 = E, **G**, 050 = G, L or **P**
- Max Exh Vol – Max Exhaust Fan Volume (kCFM)
- RtnAir CO2 Sen Ins – Return Air CO2 Sensor Installed – **No**, set to Yes for CO2-based demand ventilation based
- MultiUnit Control – **No**, set to Yes for multi-unit networking
- Purge Min OAT – **40.0**
- Enab Prg Min OAT – **Yes**, enable minimum purge outside air temperature limit
- MaxCabFlw – **30.0** kCFM, varies based on model size
- Rem Exh Fan Ins – Remote Exhaust Fan Installed – **No**, set to Yes if connected to a remote exhaust fan
- OA Grid Temp Ins – Outside Air Grid Temperature Installed – **No**
- CW/HW DH Mode – Chilled Water Hot Water Dehumidification mode – **No**, set to Yes to use the aux cooling source for dehumidification when there is not a cooling need. The aux heat source will maintain temperature if the return air temperature drops below the setpoint.
- Sup CFM Sen Type – Sensor Type – **SQRT** or DELP
- Exh CFM Sen Type – Sensor Type – **SQRT** or DELP

Supply Fan – Supply Fan Configuration

- Run Cur Tol – Fan Proof Current – **2.5 A** (Range 0 to 999.9)
- Run Cur Dly – Time Delay to Prove Current – **5 s** (Range 0 to 99)
- Flow Ctl – Airflow Control Mode
  - **CFM Setp** – This mode indicates that the fan speed or outside air damper position will be controlled to maintain airflow at CFM set points.
  - Spd Setp – This mode indicates that the supply fan speed will be controlled by setting the supply fan RPM set points.
- If Spd Setp selected, set the below setpoints:
  - Occ Speed – Fan Speed during Occupied Mode – **1200** RPM (Range 30 to 1800)
  - Unocc Speed – Fan Speed during Unoccupied Mode – **1050** RPM (Range 30 to 1800)
  - Purge Speed – Fan Speed during Purge Mode – **1200** RPM (Range 30 to 1800)

- If CFM Setp selected, set the below setpoints:
  - Occ Flow – Occupied Mode Airflow – **30.0** kCFM (Range 0 to 70)
  - Unocc Flow – Unoccupied Mode Airflow – **24.0** kCFM (Range 0 to 70)
  - Purge Flow – Purge Mode Airflow – **30.0** kCFM (Range 0 to 70)
  - Min Ctl Spd – Minimum Control Speed – **650** RPM (Range 0 to 2000)
  - Max Ctl Spd – Maximum Control Speed – **2050** RPM (Range 0 to 3000)

Contact Factory before adjusting the below values:

- Ctl Dband – Control Deadband – **0.0** kCFM (Range 0 to 10.0)
- Ctl Gain – Control Gain – **100.0** kCFM (Range 0 to 999.9)
- Ctl Int Time – Control Integral Time – **3** s (Range 0 to 999)
- Ctl Der Time – Control Derivative Time – **0** s (Range 0 to 999)
- Ctl Upd Time – Control Update Time – **7000** ms (Range 0 to 32767)

Exhaust Fan – Exhaust Fan Configuration

- Run Cur Tol – Fan Proof Current – **2.5** A (Range 0 to 999.9)
- Run Cur Dly – Time Delay to Prove Current – **5** s (Range 0 to 99)
- Purge Speed – The speed (RPM) of the exhaust fan during purge. – **1590** RPM (Range 30 to 1800)
- Off During Unocc – **No**, if set to Yes this shuts off the exhaust fan during unoccupied periods
- Unocc Speed – **350** RPM, minimum exhaust fan speed during unoccupied mode
- Exh Fan Spd – Exhaust Fan Speed Control Setting –
  - **CFMSetp** – This mode indicates that the fan speed or outside air damper position will be controlled to maintain airflow at CFM set points.
  - OAD%/Spd – This mode indicates that the exhaust fan speed will be controlled by setting the RPM set points based on the amount of outside air in the supply air.
- Exh/OA Offs – Exhaust Air/Outside Air Offset – **5.0** % (Range -20.0 to 20.0)
- RemExhVol – Remote Exhaust Volume – **0.0** kCFM
- If CFMSetp selected, set the below set points:
  - Min Ctl Spd – Minimum Control Speed – **650** RPM (Range 0 to 2000)
  - Max Ctl Spd – Maximum Control Speed – **2050** RPM (Range 0 to 3000)

Contact Factory before adjusting the below values:

- Ctl Dband – Control Deadband – **0.0** kCFM (Range 0 to 10.0)
- Ctl Gain – Control Gain – **100.0** kCFM (Range 0 to 999.9)
- Ctl Int Time – Control Integral Time – **5** s (Range 0 to 999)
- Ctl Der Time – Control Derivative Time – **000** s (Range 0 to 999)
- Ctl Upd Time – Control Update Time – **7000** ms (Range 0 to 32767)

- If OAD%/Spd selected, set the below set points:
  - Unocc 1-7 (Unoccupied Mode Stages 1 to 7) – (Range 0 to 100%/ 0 to 2000 RPM)
    1. **000.0%/0787 RPM**
    2. **015.0%/0787 RPM**
    3. **030.0%/0787 RPM**
    4. **045.0%/0900 RPM**
    5. **060.0%/0950 RPM**
    6. **070.0%/1000 RPM**
    7. **100.0%/1100 RPM**

- Occ 1-7 (Occupied Mode Stages 1 to 7) – (Range 0 to 100% / 0 to 2000 RPM)
  1. 000.0%/0609 RPM
  2. 015.0%/0609 RPM
  3. 030.0%/0609 RPM
  4. 045.0%/0620 RPM
  5. 060.0%/0753 RPM
  6. 070.0%/1000 RPM
  7. 100.0%/1107 RPM

Dampers

HeatPipe In Byp - Heat Pipe Inlet Bypass Damper

- Min Position - 0.0% (Range 0.0 - 100.0)
- Max Position - 100.0% (Range 0.0 - 100.0)

HeatPipe In Face - Heat Pipe Inlet Face Damper

- Min Position - 0.0% (Range 0.0 - 100.0)
- Max Position - 100.0% (Range 0.0 - 100.0)

HtPipe Out Face - Heat Pipe Outlet Face Damper

- Min Position - 0.0% (Range 0.0 - 100.0)
- Max Position - 100.0% (Range 0.0 - 100.0)

HtPipe Out Byp - Heat Pipe Outlet Bypass Damper

- Min Position - 0.0% (Range 0.0 - 100.0)
- Max Position - 100.0% (Range 0.0 - 100.0)

Outside Air – Outside Air Damper

- Pos Correction – Damper Position Correction based on damper feedback readings Yes or NO
- Flow Ctl – Type of damper flow control –
  - % Open – Correlates the Mixing Box % or percent of OA that makes up supply air to the OA damper
  - CFM Setp – This mode indicates that the outside air damper position will be controlled to maintain airflow at CFM set points.
- If CFM Setp, the below default values apply:
  Contact Factory before adjusting the below values:
  - Ctl Gain – Control Gain – 50.0 kCFM (Range 0 to 999.9)
  - Ctl Int Time – Control Interval Time – 015 s (Range 0 to 999)
  - Ctl Der Time – Control Derivative Time – 0 s (Range 0 to 999)
  - Ctl Dband – Control Deadband – 0.0 kCFM (Range 0 to 99.9)
  - Ctl Upd Time – Control Update Time – 20000 ms (Range 0 to 32767)

- If % Open selected, set the below set points:
  - MB%/OA% 1-7 (Mixing Box %/ Outside Air % Stages 1 to 7) – (Range 0 to 100.0%)
    1. 000.0/000.0
    2. 015.0/020.0
    3. 020.0/027.0
    4. 030.0/040.0
    5. 050.0/055.0
    6. 075.0/075.0
    7. 100.0/100.0

Recirc Air – Recirculation Air Damper

- Pos Correction – Damper Position Correction based on damper feedback readings Yes or NO
- Flow Ctl – Type of damper flow control –
  - Lookup – If set to this, the recirculation damper refers to the outside air damper to set position.
  - CFM Setp – This mode indicates that the outside air damper position will be controlled to maintain airflow at CFM set points.
- If set to 'Lookup', set the below points:
  - Point 1 - Point 7 OAD%, RAD% - OA damper position to RA damper position Stages 1 to 7.
    1. 000.0%/100.0%
    2. 030.0%/070.0%
    3. 045.0%/055.0%
    4. 055.0%/045.0%
    5. 065.0%/035.0%
    6. 085.0%/020.0%
    7. 100.0%/000.0%
- If set to CFM Setp, refer to the below default values:
  Contact Factory before adjusting the below values:
  - Ctl Gain – Control Gain – 50.0 kCFM (Range 0 to 999.9)
  - Ctl Int Time – Control Interval Time – 020 s (Range 0 to 999)
  - Ctl Der Time – Control Derivative Time – 000 s (Range 0 to 999)
  - Ctl Dband – Control Deadband – 01.0 kCFM (Range 0 to 99.9)
  - Ctl Upd Time – Control Update Time – 30000 ms (Range 0 to 32767)

Aux Air Heating – Auxiliary Air Heating Configuration

- Sys Type – Type of Auxiliary Heating System Installed
  - None – No Aux Heat Installed
  - LPHW – Low Pressure Hot Water Heat
  - Elec – Electric Aux Heat
  - Gas – Gas Aux Heat
  - Steam – Steam Coil Aux Heat
- Frz Stat Inst – Freeze Stat Installed? Yes or No
- Stages Installed – Number of Aux Heat Stages Installed – 5 (Range 0 to 5)
- Min Sply Tmp – Minimum Supply Temperature – 40.0 °F (Range 0 to 99.9)
- FrzAlmClearDly – Freeze Alarm Clear Delay (sec) – 900 s (Range 0 to 999)

- Control Type:
  - DischTmp – Controls the auxiliary heat in stages based on the supply air temperature differential as compared to the return air temperature
  - Steps – Controls the auxiliary heat in stages based on a step % capacity out of 100%
- If set to DischTmp, refer to the below offset temperatures (Range -99.9 to 99.9):
  - Stage 1 Offset – 0.0 °F
  - Stage 2 Offset – 5.0 °F
  - Stage 3 Offset – 10.0 °F
  - Stage 4 Offset – 15.0 °F
  - Stage 5 Offset – 20.0 °F
  - Min Ctl Pct Outp – Minimum Control Percent Output – 0.0 %
  - Max Ctl Pct Outp – Minimum Control Percent Output – 100.0 %

  Contact Factory before adjusting the below values:
  - Ctl Gain – Control Gain – 65.0 °F (Range 0 to 999.9)
  - Ctl Int Time – Control Interval Time – 30 s (Range 0 to 999)
  - Ctl Der Time – Control Derivative Time – 0 s (Range 0 to 999)
  - Ctl Dband – Control Deadband – 0.0 °F (Range 0 to 10.0)
  - Ctl Upd Time – Control Update Time – 10000 ms (Range 0 to 32767)
  - Ctl Anti-Bump – No
- If set to 'Steps', use the below default values:
  - Stg 1-5 Setp – Stage 1-5 Setpoints for staging aux heat capacity (Range 0 to 100%)
    1. 20.0%
    2. 40.0%
    3. 60.0%
    4. 80.0%
    5. 100.0%
  - Sys Fail Detect – System Fail Detect Enabled? (gives an alarm if the aux system is on but does not satisfy the Minimum Temperature Rise) Yes or No
  - Failure Delay – Time delay before a failure is reported – 300 s (Range 0 to 999)
  - Min Temp Rise – Minimum Temperature Rise (°F) – 10.0 °F (Range 0 to 99.9)

Aux Air Cooling – Auxiliary Air Cooling Configuration
- Sys Type – Type of Auxiliary Cooling System – None, CHW (Chilled Water Coil), or DX (Direct Expansion)
- Frz Stat Inst – Freeze Stat Installed? Yes or No
- Stages Installed – Number of Aux Cool Stages Installed – 0 (Range 0 to 5)
- Stg 1-5 Setp – Stage 1-5 Setpoints for staging aux cool capacity (Range 0 to 100.0)
  1. 20.0%
  2. 40.0%
  3. 60.0%
  4. 80.0%
  5. 100.0%
- Min Sply Tmp – Minimum Supply Temperature – 40.0 °F (Range 0 to 99.9)
- Sys Fail Detect – System Fail Detect – No, if Yes, gives an alarm if the aux system is on but does not satisfy the minimum temperature drop

- Failure Delay – Time delay before a failure is reported – **300** s (Range 0 to 999)
- Min Temp Drop – Minimum Temperature Drop (°F) – **10.0** °F (Range 0 to 99.9)

Space Temp Ctl – Space Temperature Control Setting

- Type – ECCII Fuzzy Dly or PID Delay. Contact Factory before adjusting the below values
- If ECCII Fuzzy Dly selected:
  - Base Stg Delay – Base Stage Delay (min) – **6.0** m (Range 1.0 to 20.0)
  - Fuzzy Max Rate – A fuzzy logic parameter – **4** (Range 1 to 10)
  - Fzy Calc Period – A fuzzy logic parameter – **20** s (Range 10 to 99)
- If PID Delay selected:
  - Control Band – **250.0** °F (Range 10.0 to 999.9)
  - Int Time – **120** s (Range 0 to 3000)
  - Der Time – **300** s (Range 0 to 9999)
  - Update Time – **10000** ms (Range 0 to 32767)
  - Base Dly Tim – **6.0** m (Range 1.0 to 20.0)

Dew Point Control – Dew Point Control Setting

Type – **ECCII Fuzzy Dly**, None or PID Delay. Contact Factory before adjusting the below values

- If ECCII Fuzzy Dly selected:
  - Base Stg Delay – Base Stage Delay (min) – **6.0** min (Range 1.0 to 20.0)
  - Fuzzy Max Rate – A fuzzy logic parameter – **4** (Range 1 to 10)
  - Fzy Calc Period – A fuzzy logic parameter – **20** s (Range 10 to 99)
- If PID Delay selected:
  - Control Band – **250.0** °F (Range 10.0 to 999.9)
  - Int Time – **0120** s (Range 0 to 3000)
  - Der Time – **0300** s (Range 0 to 9999)
  - Update Time – **10000** ms (Range 0 to 32767)
  - Base Dly Tim – **6.0** min (Range 1.0 to 20.0)

Mixing Box Ctl – Mixing Box Control Configuration

- Type – None or **Var Stage** (Variable Stage Control)
- Event Min Pos – Event Mode Minimum Mixing Box Position (%) – **50** % (Range 0 to 99)
- Purge Max Pos – Purge Mode Maximum Mixing Box Position (%) – **100** % (Range 0 to 100)
- Base Chg Delay – **6.0** min (Range 1.0 to 20.0)
- Fzy Calc Period – **20** s (Range 10 to 99)
- ClTD/Stg 1-7 – Mixing Box Cooling Positions for Variable Stage Control – (Range 0 to 99.9)
  1. **05.0/50.0**
  2. **10.0/36.0**
  3. **15.0/28.0**
  4. **20.0/20.0**
  5. **25.0/15.0**
  6. **30.0/10.0**
  7. **40.0/10.0**

- DPTD/Stg 1-7 – Mixing Box Dehumidification Positions for Variable Stage Control – (Range 0 to 99.9)
  1. 05.0/50.0
  2. 10.0/36.0
  3. 15.0/28.0
  4. 20.0/20.0
  5. 25.0/15.0
  6. 30.0/10.0
  7. 40.0/10.0
- Min DPT Diff – Minimum Dewpoint Difference allowed (°F) – 3.0 °F (Range -99.9 to 99.9)
- Min Tmp Diff – Minimum Temperature Difference allowed (°F) – 3.0 °F (Range -99.9 to 99.9)

Cost Factor

- Ctl Pref – Control Preference - TmpCtrl or LowCost
- MB Cool Default: 2 (-10 to 10)
- Aux Cool Default: 4 (-10 to 10)

BAS Interface – Building Automation System Interface Configuration

- Type – The BAS Type available – Carel, BACnet, LonWorks or Modbus
- Baud Rate – Transfer speed of communications – 19200, 1200, 2400, 4800, or 9600
- Unit's BAS Addr – Address of the Controller in a supervisory system network – 001 (Range 1 to 999)
- RtnTmpLims – BAS Lower _ Upper Limits on Return Temp Setpoint – 75°F 95°F (Range 0 to 99)
- RtnRHLims –- BAS Lower _ Upper Limits on Return Humidity Setpoint – 40% 70% (Range 0 to 100)

MANUAL MODE

Accessing the manual mode from the service menu may be preferable to digging through the inputs and outputs and configuration parameters. Manual mode also does not require the advanced service password for access. Manual mode has two options: Basic and Advanced. This control function is best used for unit troubleshooting for temperature and humidity control, compressor control, airflow control, and mixing box control.

Manual Mode - Basic

In 'Basic' mode, a couple tests can be performed:

- Manual Mode: No or Yes (To access 'basic' mode, set this to YES)
- AuxAir Ht Stg: 0 (Range 0 to 5) - override the requested stages to force the aux heat system to energize that number of stages
- AuxAir Cl Stg: 0 (Range 0 to 5) - override the requested stages to force the aux cool system to energize that number of stages.
- Mix Box % Open: 0.0 (Range 0 to 100.0) - override mixing box damper settings to force open or closed the outside air intake.

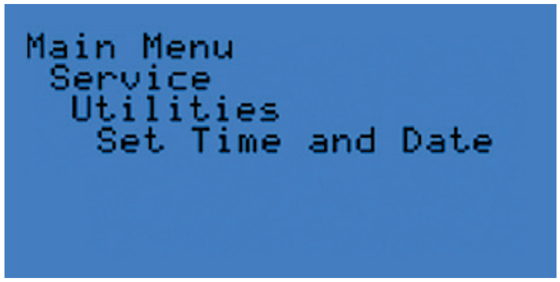
Manual Mode - Advanced

In 'Advanced' mode, an output test mode can be started:

- Manual Mode: No or Yes
- Setting this mode to YES turns OFF all Digital Outputs and forces Analog Outputs to ZERO.
- The service tech must then use the override values in the I/O Config menu to manually test each output Utilities

UTILITIES

Figure 4-16. Utilities Menu - Set Time and Date



The Utilities menu is holds the following additional system settings:

- Set Time and Date – Calibrating the local time and date for the PoolPak® unit is important since this information is used in the fault history log which gives the exact time a fault has occurred.
- Passwords – Passwords are available for protecting both setpoint changes and scheduling changes from unauthorized tampering. By default these are set to 0, which is equivalent to not having a password (Range 0 to 9999)
- Units of Measure – Use this setting to convert the readings to either SI or Eng (English) units.

Airflow Balancing

Overview

Airflow balancing is an important part of operation and unit commissioning. The design conditions especially for static pressures are not expected to meet actual conditions and thus adjustments will need to be made. The VHR unit is able to maintain a self-balancing condition with its active airflow monitoring and control but must first be properly configured.

Guidelines for Performing a Proper Airflow Balance

PoolPak® LLC recommends that the air balance be performed by an independent air balancing contractor. In addition to supplying the proper tools, a good air balancing contractor will follow the below guidelines:

- Supply a report with all the below recorded design and actual data.
- Take a representative traverse of the duct to attain good readings for supply, return, exhaust, and outdoor air flows. This may require additional traverses for a particular air inlet depending on the duct installation.
- Record the following design and actual data for all supply, return, exhaust, and outdoor air flows:
    - Air flow rates
    - Static pressure readings
    - Fan speeds and power consumption (fan amps)
    - All motorized damper set points for each set of data

- Record the above data at both the minimum and maximum operating modes:
    - Purge mode (or 100% outside air)
    - Unoccupied mode (or 0% outside air)

PoolPak® requires the above information as complete as possible. This information is needed to adequately configure the VHR unit to attain the desired ventilation.

Controller Adjustments

The controller airflow parameters can be adjusted to properly balance the airflow entering and leaving the VHR unit. PoolPak recommends that this procedure be done at unit startup and therefore a procedure is part of the PoolPak Start Up Procedure.

Troubleshooting

Overview

The below section is a brief description of general features of the CPCS-VHR Controller that can be used in troubleshooting fault conditions that arise with the PoolPak® unit.

System Status Information

To aid in troubleshooting, the CPCS controller contains all of the pertinent system status information to let the user know the current operation status of the PoolPak® unit. Many alarms can be diagnosed and resolved just by reviewing the system status menus.

The below is a list of the conditions as found in Detailed Status menu fault indicator and possible causes depending on the type of condition:

AlarmName:

- SysStart (PWRON) = System Startup Active
- Indicates that control power has recently been cycled.
- Normal indication.
- Freeze (FREEZ) = Coil Freeze Possible – Supply Temp too low (< 40F)
- Check aux air heating system.
- Check for stuck outside air damper.
- If SplyTemp sensor failure also shown, check supply air temp sensor.
- FireTrip (FIRTP) = Fire Trip active
- Check for signal from building fire and smoke control system.
- Verify that the input is correctly configured for active on open or close.
- SmkPurge (SMKPU) = Smoke Purge active
- Check for signal from fireman's switch or fire control system.
- Verify that the input is correctly configured for active on open or close.
- SFanOff (SFOFF) = Supply Fan is off – same as for EFanOff (EFOFF)
- The controller is asking the supply fan to run, but it is not.
- Check to be sure the supply fan VFD is in AUTO mode.
- Check to be sure the supply fan digital output is not forced to OFF.
- Check for fault messages on the supply VFD display.
- SFanVFD (SFINV) = Supply Fan VFD failure – same as for EFanVFD (EFINV)
- The fan VFD is indicating a fault condition.
- Refer to the VFD display for more information.
- Some Possible FanVFD Faults as displayed on VFD display:
  1. Overcurrent – Output current exceeded the limits of the VFD.
     Check to be sure that backdraft damper can open freely.
     Check to be sure motor shaft can spin freely.
  2. DC Overvolt – DC bus voltage in VFD is too high.
     Check for high incoming line voltage. Must be in range shown on dataplate.
     Check to be sure that the VFD is configured to allow the motor to coast to stop.

3. Dev Overtemp – VFD internal temperature is too high.
   Check to be sure heatsink fan can spin freely.
   Check to be sure the heatsink is free of dust and debris.
4. Short Circuit – The VFD has identified a short in the motor or wiring.
   Check for shorted motor windings.
   Check for a short in the wiring between the VFD and the motor.
5. DC Undervolt – DC bus voltage in VFD is too low.
   Check for low incoming line voltage. Must be in range shown on dataplate.
   Check for a blown fuse or open phase on the incoming power supply.

- SFDeadHd (SFDHD) = Supply Fan Dead Head Warning
  Controller has identified that recirc and outside air dampers are both almost closed.
  Check recirc and outside air dampers and actuators.
- AxHtFail (AUXHT) = Auxiliary Heat System failure
  Controller has identified that the temperature rise through the air heating system is lower than expected.
  Check aux air heating system.
  - Hot Water Coil – Check valve actuator and for presence of hot water.
  - Furnace – Check power vent fan/motor, gas supply pressure, and furnace fuses.
- AxClFail (AUXCL) = Auxiliary Cool System failure
- Controller has identified that temperature drop through the aux air cooling system is lower than expected.
- Check aux air cooling system.
  - Chilled Water Coil – Check valve actuator and for presence of chilled water.

SENSORNAME:

Below is a list of the sensor names as displayed in the Sensor Stat if in error. For troubleshooting information, refer to the respective letter code as referenced in parentheses.

- RtnTemp = Return Air Temperature (A)
- RtnRH = Return Relative Humidity (B)
- SplyTemp = Supply Temperature (A)
- OutsTemp = Outside Air Temperature (A)
- SFCur = Supply Fan current (B)
- EFCur = Exhaust Fan current (B)
- HPFinTmp = Heat Pipe Fin Temperature (A)
- AOHPExT = Air Off the Heat Pipe Exhaust Temperature (A)
- AOHPExRH = Air Off the Heat Pipe Exhaust Relative Humidity (B)
- OutRH = Outside Air Relative Humidity (B)
- SplyRH = Supply Relative Humidity (B)
- OutDprFB = Outside Air Damper Feedback (C)
- RcrDprFB = Recirculation Air Damper Feedback (C)
- HIFDFbk = Heat Pipe Inlet Face Damper Feedback (C)
- HIBDFbk = Heat Piping Inlet Bypass Damper Feedback (C)
- SurfTemp = Cold Surface/Wall Temperature (A)

A - Value from the sensor is outside of the expected range.

- If the value is a large negative number (-192°F), this indicates an open circuit to the sensor. Check the sensor and wiring connections.
- If the value is a large positive number (256°F), this indicates a short circuit to the sensor. Check the sensor and wiring connections.

B - Value from the sensor is outside of the expected range.

- If the value is negative, this indicates an open circuit to the sensor or a lack of 24VDC power. Check the sensor and wiring connections and the status of the DC power supply. The DC current in the sensor loop should be between 4 and 20 mA.
- If the value is greater than the max value in the analog input configuration screen, this indicates a failed sensor or a short circuit in the wiring. In this condition, it is also possible for the analog input to be damaged. This can happen if the sensor fails shorted or is connected improperly.

C - Feedback value from the actuator is outside of the expected range.

- Check to be sure actuator is receiving 24VDC power and is moving as requested by the position signal.

Fault History Log

To assist in troubleshooting, the CPCS controller maintains a rolling log of the last 100 faults. In addition, each compressor module also maintains a rolling log of the last 100 faults occurring at that compressor module.

The fault history log is the “History” option as selected in the “Service” menu. See the History section of Controller Navigation for more details on these screens. For reference, the possible fault codes are also duplicated in the AlarmNames in parentheses.

Manual Mode

The CPCS controller contains a basic manual control mode in the service menu for testing auxiliary system stages and damper control. This manual mode can be accessed without the advanced password to quickly check performance.

The advanced manual mode also provides an output test mode by forcing off or to zero all outputs.

Refer to the Manual Mode section of Controller Navigation for more information.

Digital and Analog Input Information

In the Input/Output Configuration (I/O Config) under the Service menu of the controller, the status and configuration of digital and analog inputs can be viewed. This information can be helpful to determine if an input is correctly configured to be received by the CPCS controller.

DIGITAL INPUT

Each digital input of the CPCS controller can be viewed in the Service menu of the controller. These screens give you a read-only indication of the status of these inputs. These inputs can be useful in confirming whether or not the CPCS controller is receiving an input from a certain component (ie. fire alarm system, smoke detectors, occupied override, manual purge mode, remote exhaust fan status, freezestat, or remote AC proof).

ANALOG INPUT

In addition to the digital and analog outputs, each analog input of the CPCS controller can be configured or adjusted. This ability is especially important when calibrating sensors or in the event of a failed sensor in order to continue normal operation.

Digital and Analog Output Information

Input/Output Configuration (I/O Config) is a selectable option in the Service menu of the Controller. With this function, the qualified HVAC service technician has access to Digitial Outputs and Analog Outputs. In conjunction with advanced manual mode (output test mode), these menus can be used to test each output.

DIGITAL OUTPUT

Each digital output of the CPCS controller may be controlled individually by setting the corresponding parameter to one of three possible values: AUTO, ON, or OFF. A setting of AUTO gives control of the digital output relay to the software in the CPCS. ON will force the output relay to energize regardless of the status requested by the software. OFF will force the output relay to de-energize regardless of the status requested by the software.

The digital outputs found in this menu are fan start signals, auxiliary heat run signals and more.

ANALOG OUTPUT

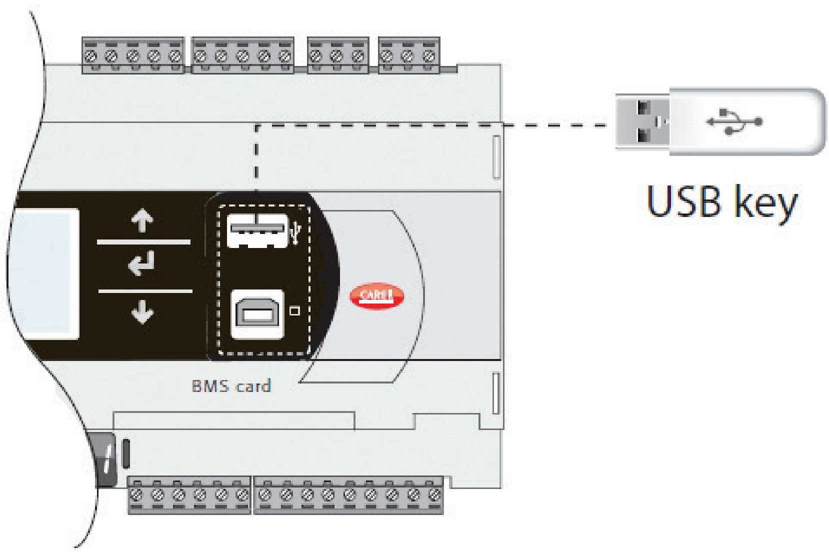
Each analog output of the CPCS controller may be controlled individually by setting the corresponding parameter. This is helpful determining functionality of auxiliary control valves or dampers.

Data Log Retrieval

The CPCS records data every minute keeping approximately 30 days of data. To aid in troubleshooting, this data can be downloaded to a USB pendrive and sent to PoolPak® Service for anlaysis.

To begin, open the door to the right of display on the CM1 control module. It is the part that has a red Carel label attached. Insert a USB pendrive with at least 3 MB of storage available into the USB slot.

Figure 4-17. Data Retrieval Using USB Key



- Press ⚠ and ↵ together and hold for 3 seconds to enter the option menu.
- Select FLASH / USB memory and press ↵ to confirm.
- Select USB pendrive and press ↵. Wait a few seconds after the pendrive has been plugged in for the drive to be recognized by the controller. If the message “No USB disk or PC connected” displays momentarily with the request to connect a pendrive key or computer USB cable, wait a few seconds until the recognition message is shown (“USB disk found”).
- Select Download LOGS and press ↵. Press ↵ key again to start the download. ‘Downloading logs. Please wait...’ will display. Once the download is completed, the screen will display “Operation complete. Data downloaded. LOG00_01”.
- Remove the pendrive and connect it to a USB port on your computer. Email the folder called LOG00_01 to **service@poolpak.com** along with the job name and serial number of the PoolPak® unit.

Advanced Troubleshooting

If equipped with Virtual-Tech® Plus VHR within two years from startup, additional logging is available via the remote access package for factory troubleshooting.

Contact PoolPak® Factory Service for more troubleshooting help at 800-959-7725.

Startup & Warranty

Pre-startup

After receiving the PoolPak® unit, there are several tasks to complete before scheduling the factory startup.

Prestartup is important to verify that unit installation was completed satisfactorily. Such tasks include but are not limited to:

- Proper mounting and support of the VHR unit
- Verifying proper connect and seal of ducts
- Installation of the surface temperature sensor complete
- Condensate drain outlets are trapped or capped
- Water Piping for Auxiliary system connected
- If Gas Aux Heat, gas piping connected, leak tested and properly regulated, flue vent piping and supply T&RH sensor installed.
- Proper Electrical disconnects and other accessories mounted and wired
- Keypad wired and mounted
- BAS wiring completed
- If Multi-Unit installation, proper wiring between units completed
- Proper electrical connections to include the correct sealing of all conduit connections and penetrations to the unit

The pool should be filled 1 to 3 days prior to startup. However, it is recommended to not overheat the pool above the space temperature or condensation inside the unit will occur. It is recommended that the pool water temperature be at least 75°F during startup.

The customer should also be made aware that they must have representatives available for the scheduled training date for unit operation and maintenance training.

Startup

PoolPak® Service requires a minimum of 2 weeks notice to allow adequate time to schedule startup. Pre-startup tasks as described above should be completed prior to scheduling startup.

In instances where the equipment start-up will be delayed, a Delayed Startup Warranty Extension may be purchased in one-month increments for up to an additional 12 months. This delayed startup can be purchased any time before the actual startup. Contact PoolPak® Service at service@poolpak.com to apply.

If special access is required to access the site, PoolPak® service must be made aware of special access requirements at the time of 2 week notice. PoolPak® Service will also ask for site contact information to provide to the startup technician.

All VHR units ship without the CPCS CM1 controller. This is done to ensure a proper startup of the equipment before regular operation. The startup technician will bring the CPCS CM1 controller, the Startup Procedure document, and any other Startup materials to the jobsite. The startup technician is expected to perform only the startup procedures as described in the Startup Procedure document. Field supplied components, such as auxiliary duct heaters or remote condensing units are expected to be installed and started up by the owner per the manufacturer's instructions.

All PoolPak® units require proper startup by a PoolPak® factory authorized service technician. PoolPak® service will arrange this startup with the previously approved and trained service technicians. For a list of current authorized service technicians in your area, please visit the Service Locator page of the PoolPak® website, **www.poolpak.com**.

If there are additional service companies that you would like to recommend to become authorized providers, please contact PoolPak® Service at **service@poolpak.com**. PoolPak® Service holds a Service Training School three times per year. See the Service section of our PoolPak website for more details.

Owner Training

As a part of the Startup procedure, the PoolPak technician will also provide a brief orientation on the PoolPak® unit, keypad operation, and recommended maintenance. In this presentation, he will refer to this VHR Installation and Operation Manual as a guide.

It is the responsibility of the facility or sales rep to schedule maintenance personnel and other interested parties to attend this training. The owner training typically occurs at the end of the Startup day. If necessary, owner training can be scheduled with the technician for a later day. Keep in mind that a second trip may require additional compensation beyond a single day startup allowance.

Warranty

PoolPak® maintains a standard labor and parts warranty on VHR units. For a description of this standard warranty, please visit the Parts & Service Downloads section of our website, **www.PoolPak.com**.

All parts and labor warranty claims require prior written authorization of PoolPak® Service department to be covered under warranty.

PoolPak® units require regular care and maintenance. Component failure due to poor pool chemistry, maintenance neglect, or customer abuse will be denied warranty coverage. For instances where pool chemistry is a suspected factor in component failure, PoolPak® Service may request the facilities' pool chemistry logs.

The all copper and Hycor® Blue coil warranties are contingent on the pool water free chlorine level being maintained in the 1.0 ppm to 3.0 ppm range and the chloramine level not exceeding 0.2 ppm. Proper documentation of chemical levels must be provided at the time of the warranty claim.

Maintenance

Overview

Periodic routine maintenance will promote extended equipment life. While PoolPak® units use components that are usually maintenance free and do not require service, a regular check-up could result in noticing possible problems before they develop into major problems.

Daily Maintenance

PROPER MAINTENANCE OF YOUR POOL WATER CHEMISTRY ON A DAILY BASIS IS IMPORTANT TO PROTECT YOUR WARRANTY RIGHTS.

1. Daily logging of pool water chemistry is typically required by local state health codes and may be requested by PoolPak® in order to determine proper pool water chemistry maintenance. These logs should include both free chlorine and total chlorine measurements at a minimum.

2. PoolPak® LLC strongly recommends following the below National Spa and Pool Institute standards.

Table 4-1. Pool Water Chemistry

	POOL			SPA		
	IDEAL	MIN	MAX	IDEAL	MIN	MAX
Total Chlorine (ppm)	1.0 - 3.0	1	3	3.0 - 5.0	1	10
Free Chlorine (ppm)	1.0 - 3.0	1	3	3.0 - 5.0	1	10
Combined Chlorine (ppm)	0	0	0.3	0	0	0.3
Bromine (ppm) if applicable	2.0 - 4.0	2	4	3.0 - 5.0	2	10
pH	7.4 - 7.6	7.2	7.8	7.4 - 7.6	7.2	7.8
Total Alkalinity (ppm)	80 - 100	80	180	80 - 100	60	180
TDS (ppm)	1000 - 2000	300	3000	1000 - 2000	300	3000
Calcium Hardness (ppm)	200 - 400	150	1000	200 - 400	150	1000
Calcium Acid (ppm)	30 - 50	10	100	30 - 50	10	100

For more information on pool water chemistry, see the PoolPak® website article "*Indoor Pool Water Chemistry*".

Monthly Maintenance

NOTE
To prevent personal injury, disconnect all electrical power to the unit prior to performing any of the following maintenance procedures.

Perform the following on a monthly basis:

1. AIR FILTERS: Check and replace as necessary.
2. Direct Drive Plenum Fans & Motors: Fan motor bearings are greased from the factory. DO NOT RE-GREASE FAN MOTOR BEARINGS. For replacement of fan motors, contact PoolPak service for guidelines on removal and installation of the new component.
3. CONDENSATE LINE: Ensure that it is free of obstructions. Always keep the condensate trap and lines free and clear. The PoolPak® is capable of producing up to 60 gallons of condensate per hour.
4. UNIT INTERIOR/EXTERIOR: Check for torn insulation and repair if necessary. Check for scratches, nicks, rust, etc.
5. LOGBOOK: Check and record, in the logbook, the following actual operating values and the values read from the CPCS controller display:
   - Space Temperature
   - Space Relative Humidity
   - Pool Water Temperature
   - Pool Water pH
   - Pool Water Free Chlorine
   - Pool Water Total Chlorine
6. DAMPER OPERATION: Ensure that dampers open and close fully without binding.

Semi-Annual Maintenance

In addition to the Monthly Maintenance items, the following should be performed on a semi-annual basis:

Condenser coil cleaning:

- PoolPak® recommends that the finned surface of all integral condenser coils be cleaned approximately every six months. More frequent cleaning may be required if extreme conditions cause clogging or fouling of air passages through the coil.
- Calgon Corporation's CalClean 41352 (or equal) is acceptable for cleaning this unit.
- The cleaning solution should be applied liberally to entering air and leaving air surfaces of the coil in accordance with the cleaning solution instructions.
- For a unit specific coil cleaning procedure, please see the *Maintenance Section under Parts & Service Downloads* on the PoolPak® website, www.PoolPak.com
- Note: For non-coated copper coils, if you notice the coil surface turning green, you have a problem with pool water chemistry. Address this root issue before seeking out more destructive coil cleaning solutions to remove the green from the coil.

Annual Maintenance

Perform the following on an annual basis:

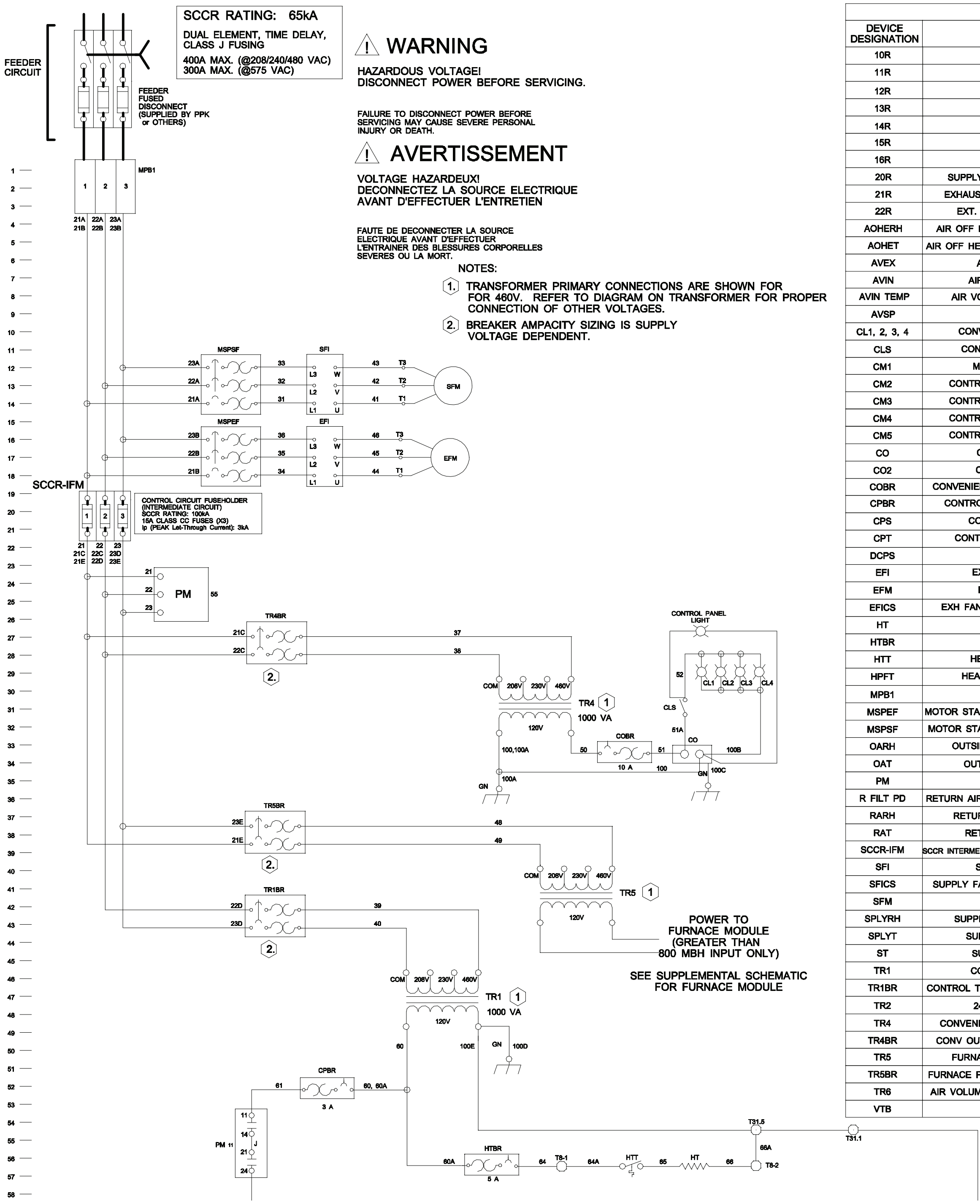
1. All items listed under MONTHLY MAINTENANCE and SEMI-ANNUAL MAINTENANCE.
2. HEATPIPE: The heatpipe should be inspected annually by a qualified service technician. At minimum, the following items should be done:
    - Complete unit operation test including log entries.
    - Inspect fan motor bearings for excessive wear and replace if necessary.
    - Touch up scratches in the paint.
    - Check electrical connections for tightness including those in the electrical box.
    - Clean debris and dirt from drain pans.
3. Variable Frequency Drives: Although typically seen as being maintenance free, there is some simple maintenance that can be done on a regular basis for VFD. The main goal of VFD maintenance is to keep it clean, keep it dry, and keep the connections tight. The below are the general PoolPak® recommended tips for maintaining your VFD. These should be done annually by a qualified service technician.
    - Check the control cabinet for any signs of moisture. If present, the cabinet joints should be re-sealed with PoolPak® approved silicone sealant.
    - With the power off, spray dry, oil-free air over the heat sink fan(s) to remove dust.
    - With the power off, carefully remove the cover and visually check for any internal damaged components.
    - Use a dry dust-catching fabric (such as Swiffer® cloths) on the outside and inside of the VFD cabinet to remove dust and debris.
    - With the cover carefully removed, check all electrical connections on each VFD for tightness. A simple "tug" test should be sufficient. Tighten any loose connections. Re-install the cover.

For additional description of advanced VFD maintenance tips, see PoolPak® Parts & Service article "*How to Maintain a VFD*".

SECTION V: WIRING

Factory Wiring Diagram

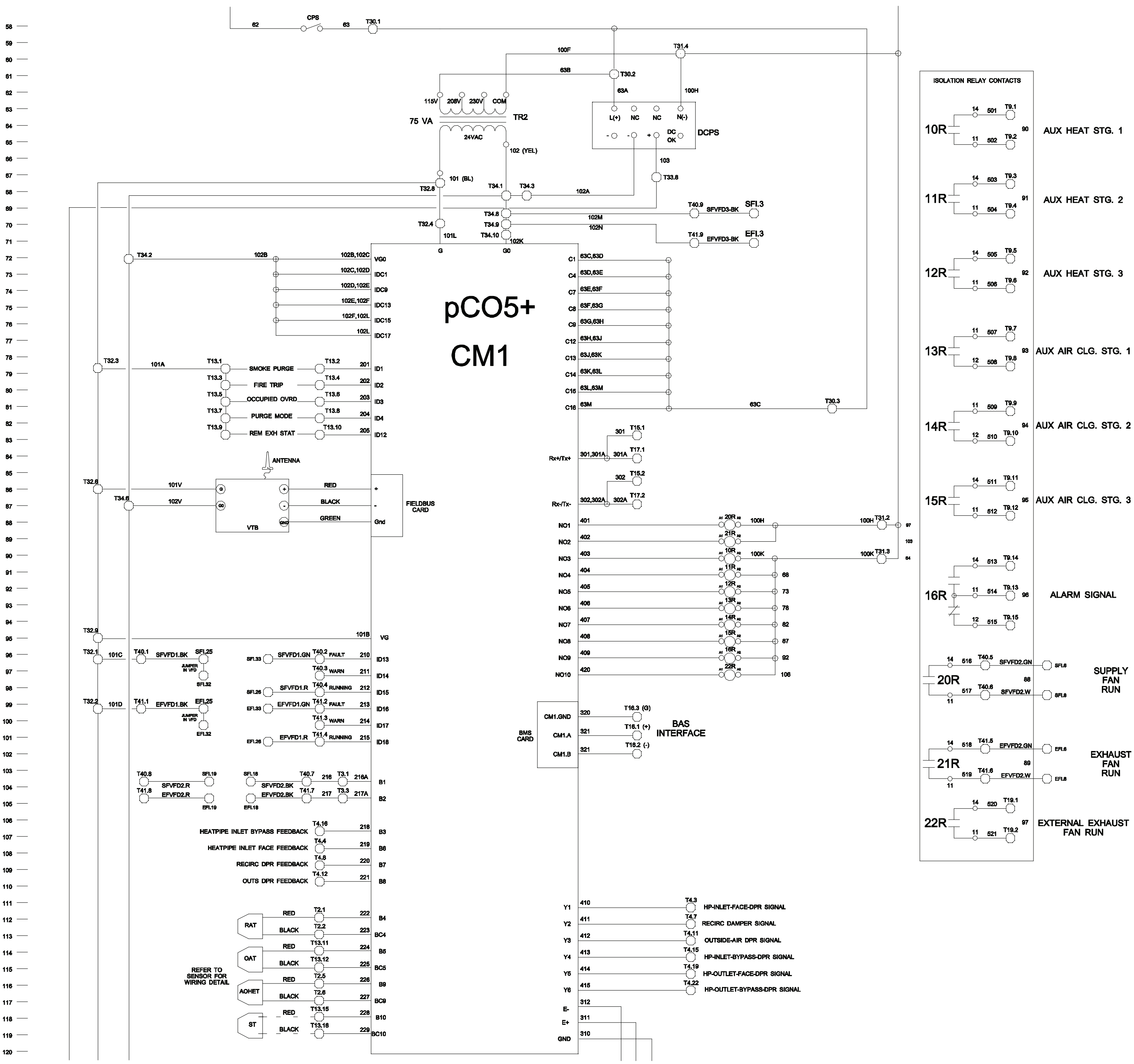
Figure 5-1. Wiring Diagram 1 of 3 - Input Power and Transformers



LEGEND		
DEVICE DESIGNATION	DESCRIPTION	LINE NUMBER
10R	AUX HEAT #1	64, 90
11R	AUX HEAT #2	68, 91
12R	AUX HEAT #3	73, 92
13R	AUX COOL #1	78, 93
14R	AUX COOL #2	82, 94
15R	AUX COOL #3	87, 95
16R	ALARM	92, 96
20R	SUPPLY FAN INVERTER RUN RELAY	88, 97
21R	EXHAUST FAN INVERTER RUN RELAY	89, 103
22R	EXT. EXHAUST FAN RUN RELAY	97, 106
AOHERH	AIR OFF HEAT-PIPE EXHAUST REL. HUM.	139
AOHET	AIR OFF HEAT-PIPE EXHAUST TEMPERATURE	116
AVEX	AIR VOLUME, EXHAUST	153
AVIN	AIR VOLUME, OUTSIDE AIR	155
AVIN TEMP	AIR VOLUME INLET TEMPERATURE	150
AVSP	AIR VOLUME, SUPPLY	154
CL1, 2, 3, 4	CONVENIENCE LIGHT 1, 2, 3, 4	29
CLS	CONVENIENCE LIGHT SWITCH	31
CM1	MAIN CONTROL MODULE	71
CM2	CONTROLLER EXPANSION MODULE	124
CM3	CONTROLLER EXPANSION MODULE	137
CM4	CONTROLLER EXPANSION MODULE	150
CM5	CONTROLLER EXPANSION MODULE	150
CO	CONVENIENCE OUTLET	33
CO2	CO2 SENSOR FOR DCV	127
COBR	CONVENIENCE OUTLET CIRCUIT BREAKER	33
CPBR	CONTROL POWER CIRCUIT BREAKER	52
CPS	CONTROL POWER SWITCH	58
CPT	CONTROL PANEL TEMP SENSOR	157
DCPS	DC POWER SUPPLY	63
EFI	EXHAUST FAN INVERTER	16, 99, 101
EFM	EXHAUST FAN MOTOR	16
EFICS	EXH FAN INVERTER CURRENT SIGNAL	105
HT	HEAT TAPE	55
HTBR	HEAT TAPE BREAKER	55
HTT	HEAT TAPE THERMOSTAT	55
HPFT	HEATPIPE FIN TEMPERATURE	130
MPB1	MAIN POWER BLOCK	1
MSPEF	MOTOR STARTER PROTECTOR EXHAUST FAN	16
MSPSF	MOTOR STARTER PROTECTOR SUPPLY FAN	12
OARH	OUTSIDE AIR RELATIVE HUMIDITY	138
OAT	OUTSIDE AIR TEMPERATURE	114
PM	PHASE MONITOR	24, 55
R FILT PD	RETURN AIR FILT PRESS DIFF TRANSMITTER	126
RARH	RETURN AIR RELATIVE HUMIDITY	141
RAT	RETURN AIR TEMPERATURE	112
SCCR-IFM	SCCR INTERMEDIATE FUSEHOLDER w/ CLASS CC FUSES	20
SFI	SUPPLY FAN INVERTER	12, 96, 97
SFICS	SUPPLY FAN INVERTER CURRENT SIGNAL	104
SFM	SUPPLY FAN MOTOR	12
SPLYRH	SUPPLY AIR RELATIVE HUMIDITY	140
SPLYT	SUPPLY AIR TEMPERATURE	128
ST	SURFACE TEMPERATURE	118
TR1	CONTROL TRANSFORMER	46
TR1BR	CONTROL TRANSFORMER CIRCUIT BREAKER	42
TR2	24 VOLT TRANSFORMER	62
TR4	CONVENIENCE OUTLET TRANSFORMER	31
TR4BR	CONV OUTLET TRANSFORMER BREAKER	27
TR5	FURNACE POWER TRANSFORMER	41
TR5BR	FURNACE POWER TRANSFORMER BREAKER	36
TR6	AIR VOLUME TRANSDUCER TRANSFORMER	154
VTB	VIRTUALTECH+ BOX	86

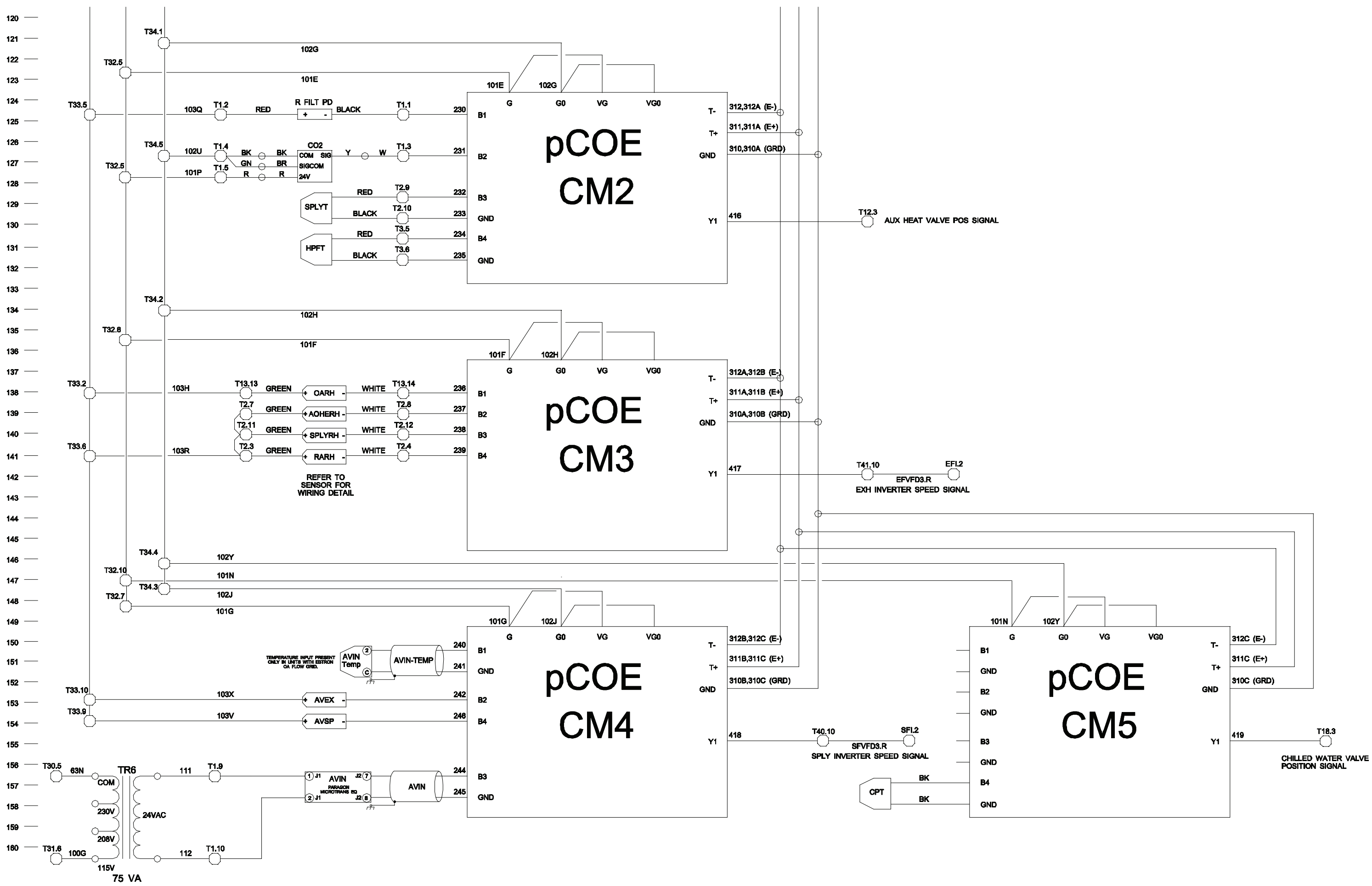
Factory Wiring (Continued)

Figure 5-2. Wiring Diagram 2 of 3 - CM1 Control Module Wiring



Factory Wiring (Continued)

Figure 5-3. Wiring Diagram 3 of 3 - Expansion Module Wiring



PoolPak is a Dehumidified Air Solutions company and member of Dehumidified Air Services, a coast-to-coast service network of local customer support specialists. Backed by real-time remote monitoring and direct access to the engineers who designed and built your dehumidifier, Dehumidified Air Services is the only organization in North America that has the scale and expertise to deliver trouble-free pool dehumidification and unparalleled customer service.

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