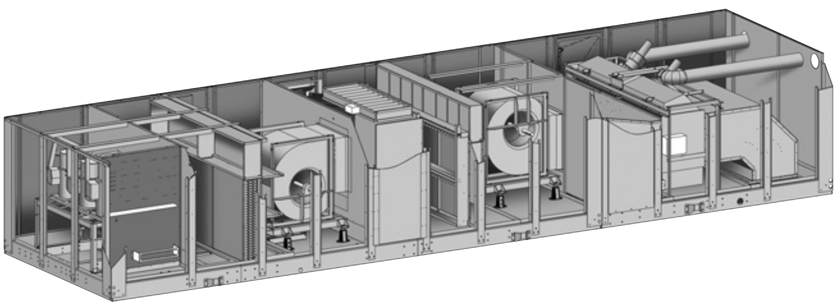
POOLPAK R-410A
SWHP SERIES

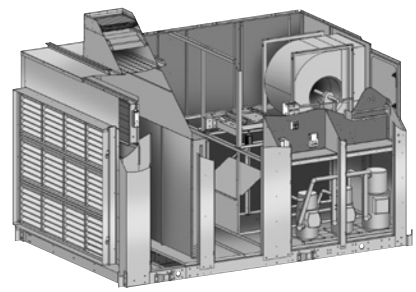
(MODELS SR, S, SE, SEP)

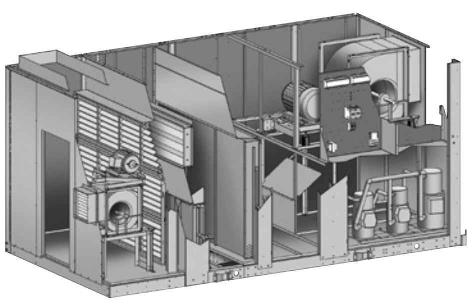
Engineering Guide

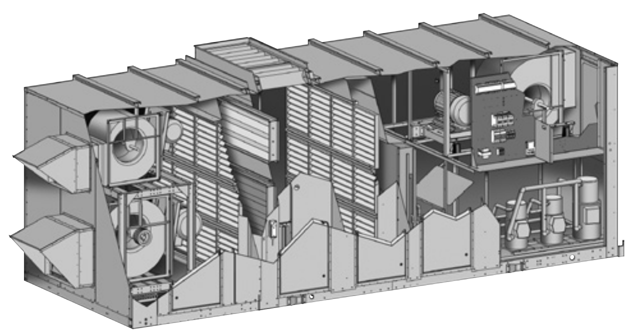
EGW05-SWHPEG-20151015

Packaged Natatorium Environment Control System









PoolPak™ SWHP Series
Natatorium Dehumidification Unit

For unit weights and dimensions, see PoolPak SWHP Weights and Dimensions Guide.

The Leader in Indoor Pool Dehumidification

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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 require control hardware and control sequences specially engineered for large commercial indoor pool applications. The PoolPak™ 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 below), which are present in the water, become more concentrated in the air as the "water to air" interactions increase, affecting the indoor air quality. To control the buildup of chloramines and gases in an enclosed poolroom, the space must have an adequate supply of outside air or ventilation circulating through the structure at all times.

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/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 IAQ.

However, increasing ventilation rates can significantly add to the cost of operation. Energy conservation strategies such as heat recovery, airflow measurement and CO2 based control help control costs while improving IAQ. 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. Refer to Table 1 for 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, while warmer temperatures are more common for seniors or children or less active pools.

The desirable humidity range is generally between 50 and 60%. A humidity level greater than 60% can create a sticky feeling and difficulty breathing. A humidity level lower than 50% will result in evaporative cooling on the bather's skin, creating 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 and Air Temperature Set-Points

	Water Temp. °F	Air Temp. °F	Room RH %
Recreational Pools	80-85	Water Temp + 2	55-60
Therapy Pools	86-92	86[1]	55-60
Whirlpools	99-104	86[1]	55-60

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

POOL WATER CHEMISTRY

Water chemistry 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 chloramines in the air. Not only does this have an effect on the water, but it affects the bathers and the air they breathe. 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. See "Indoor Pool Water Chemistry – Controlling Chloramines with Proper Chlorine Management," MK2-BROPOOLCHEM, for more information on pool water chemistry.

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

EQUIPMENT CHOICES

OVERVIEW

There are several methods for controlling humidity, temperature and ventilation in poolrooms. Each method offers some level of control, but there can be significant differences in first cost and operating cost of each method. Geographic location, degree of comfort, unit cost and operational cost must be evaluated in the selection of the correct system.

Ventilation with Heating

- Moisture removal is accomplished through the dilution with dryer outside air
- High cost of operation (air reheating)
- Lowest first cost
- No opportunity to recover energy in the ventilation airstream
- No opportunity to recover energy into the pool water
- No integral cooling capability
- Summer space conditions can be unbearably hot and humid

Ventilation with Heating and Energy Recovery

- Moisture removal is accomplished through the dilution with dryer outside air
- Significant heat recovery from ventilation air stream
- Cost-effective method but with modest operating cost
- Performance limitations in humid areas or during summer peaks
- No opportunity to recover energy into the pool water
- No integral cooling capability

Mechanical Dehumidification

- Moisture removal is accomplished through mechanical refrigeration
- Significant heat recovery using “heat pump” technology
- Recovers the most energy from the ventilation airstream
- Offers an opportunity to recover energy into the supply airstream
- Offers an opportunity to recover energy into the pool water
- Higher first cost with lower operating cost
- No performance limitations based on location
- Tightest control of setpoint conditions
- Integral cooling capability
- Can be integrated to include appropriate ventilation strategies

Hybrids

- Combines various technologies to increase efficiency and capability
- Utilizes ventilation as primary dehumidification method
- Switches to heat pump method when conditions require better environmental control

Other Technologies

Desiccant technology can be adapted to provide super dry air which is injected into the poolroom to dilute the moisture load. The regeneration phase of the desiccant is typically driven by waste heat from refrigeration cycle or other fossil fuel.

Wheels are sometimes considered because of their wide acceptance as heat recovery devices. Latent or Enthalpy wheels are not suitable for pools, but sensible wheels may have application.

ROOM AIR DISTRIBUTION

All PoolPak™ models provide continuous air recirculation, and with a good air distribution system, will promote uniform space conditions. To remove the required moisture and maintain controlled conditions, it is essential that there be adequate air movement and distribution in the natatorium. The unit must remove the humid air from the pool area and discharge the dehumidified air back into it. The supply air should be distributed over areas subject to condensation (windows, outside walls, support trusses, skylights, etc.).

AIRSIDE DESIGN

The supply air volume and external static pressure capability of the fan is given for each model in the Performance Section. It is recommended that an experienced engineering or mechanical contracting firm do the design, sizing and layout of the duct system.

The recommended volume of supply air should provide three to eight air changes an hour. However, in larger waterparks or spaces with high sensible heat gain, higher airflows may be appropriate. Lower air volumes require more care to avoid short cycling the air between the return and supply, air stratification and pockets of high humidity.

The most even control of space conditions occurs with proper air distribution and a proper air flow rate. This provides space control without excessive loading and unloading of refrigerant-based dehumidification equipment.

Supply Air

After dehumidification, dry air is supplied back to the room. Supply air should be distributed from ducting around the perimeter (see Figure 1-1) of the space. The two options for perimeter supply air distribution are overhead (see Figure 1-2) or below grade (see Figure 1-3).

Figure 1-1. Perimeter Air Distribution

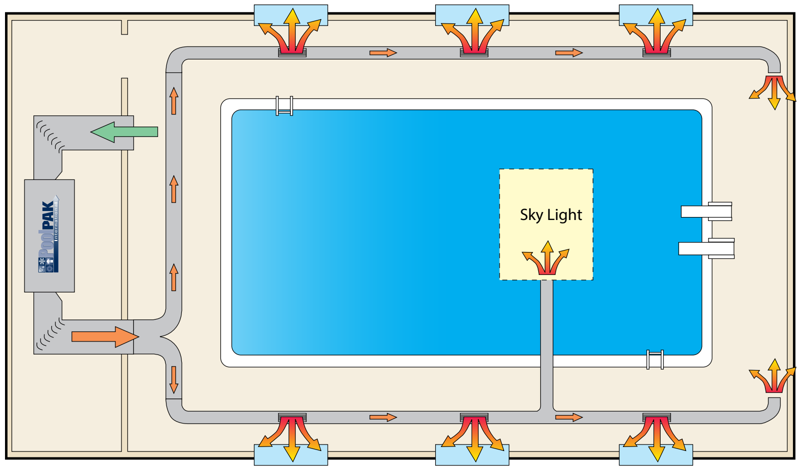


Figure 1-2. Overhead Air Distribution

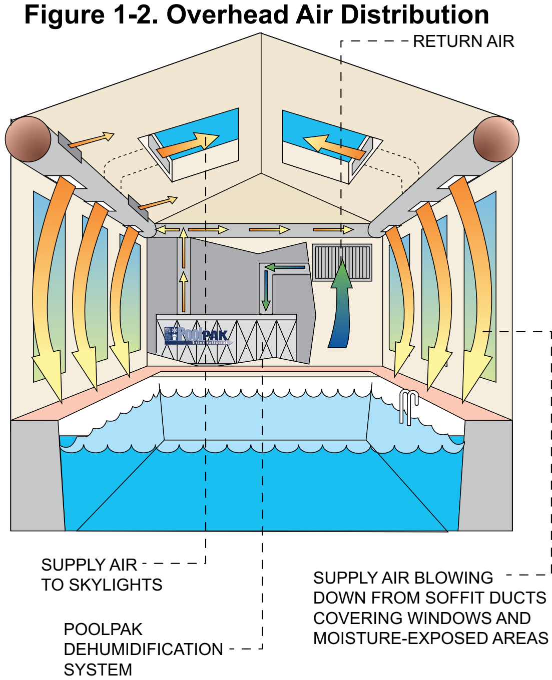
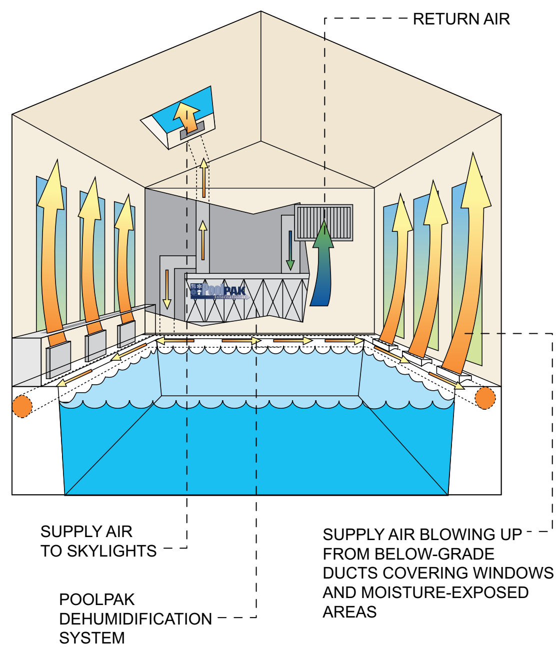


Figure 1-3. Below Grade Air Distribution



The warm, dry air should be directed over outside walls, windows and other surfaces susceptible to condensation. Supply ducts should be as short and with as few turns as possible. Use turning vanes to minimize air noise and static pressure drop.

Recommended maximum supply duct air velocity is 1000 FPM. The recommended velocity from diffusers is 300 to 500 FPM. Air velocities in ducts should be kept as low as is reasonable to avoid excessive noise in the ducts. In multiple unit installations, supply air from each unit may go into a common supply duct or into a plenum. The duct should be attached with a flexible connection to minimize vibration transmission.

Return Air

The unit will operate most efficiently in a natatorium where the supply and return openings are placed diagonally opposite each other. All ducting should be done in accordance with acceptable practices. Return air ducts in the section just prior to entering the unit return air opening and elbows in both the return and supply air ducts must comply with the guidelines set forth in SMACNA HVAC Duct Construction Standards Metal and Flexible – Third Edition, Chapter 4.

Ductwork Design

All supply and return duct work to the unit should be installed such that no condensate occurs on the duct work. Duct turns and transitions must be made carefully to keep friction losses to a minimum. Duct elbows should contain splitters or turning vanes and avoid short radius fittings.

Duct work that is connected to the fan discharge should run in a straight line with proper transitions, and minimum distances to elbows as recommended by SMACNA and should not be reduced in cross-sectional area. Never deadhead the fan discharge into the flat side of a plenum.

Duct work attached to the PoolPak™ unit return air connection must be done in accordance with SMACNA recommended standards and /or generally accepted industry practice.

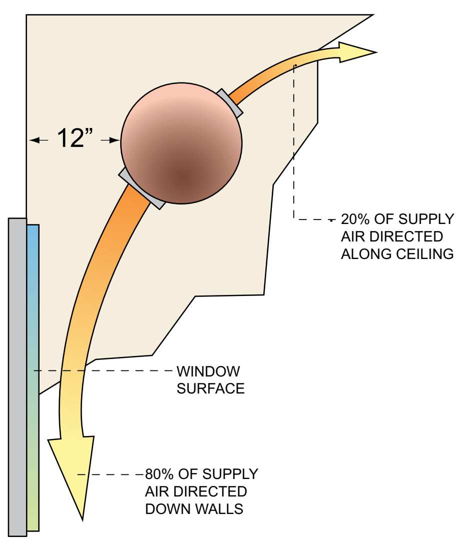
Supply and return duct work should have all seams sealed before applying insulation to the exterior of the duct work. The insulation's seams must be sealed, wrapped, and mastic coated. Use of pre-insulated duct work (interior) is acceptable if it meets local codes; however, all seams must be sealed prior to startup.

Air Distribution

Supply outlets and return grilles should be carefully placed to avoid short-circuiting in the space. Short-circuiting creates stagnant areas where humidity and temperatures may build up to undesirable levels, reducing the effectiveness of the PoolPak™ System. Return grilles can be placed high in the space to reduce return ductwork, however removal of chloramines from the occupied area has become much more of a design consideration and so low returns are favored by poolroom designers.

Supply air should be directed 45 degrees up and down (most of the air will be directed downward) toward exterior walls, windows, skylights, and other areas where stagnant conditions could cause humidity buildup and condensation problems or drafts (see Figure 1-4). The end result of the supply air ducts is to wash the surfaces of the pool room that are prone to condensation with the warm, dry supply air.

Figure 1-4. Supply Air Proportions



Diffusers for supply ducts located overhead (as opposed to under the deck) must be sized such that the supply air will be thrown all the way to the deck and wash the entire wall surface from supply duct to the floor.

As a rule, directing the supply air at or across the pool surface increases the evaporation rate. To control the buildup of chloramines at the surface of the pool, some air may be directed at the pool surface. Supply outlets should not discharge directly onto surfaces where drafts may be created that will blow on swimmers walking along the edges of the pool. Spectators should have supply air directed toward their faces.

Air Connections to PoolPak™

PoolPak™ outside air intake and exhaust air openings may have rain hoods if the unit is mounted outdoors. Rain hood locations are illustrated on the unit arrangement drawings. The intake and exhaust should be screened to prevent the entrance of foreign matter and arranged to avoid recirculation of exhaust and outside air. Also, when auxiliary gas heat is selected (in an outside installation), a combustion air louver or rain hood is provided.

Supply, return, outside, and exhaust air ductwork connections over 5 feet long must be supported to avoid damage to unit. Short, flexible connections of rubber or canvas can be made between the return duct and the unit to eliminate vibration transmission through the duct.

PoolPak™ International does not recommend the use of equipment rooms or locker rooms as return or supply air plenums due to the potential of corrosion for components installed in the room. The return air duct should always connect the pool enclosure to the return air connection of the PoolPak™ unit(s).

Other Air-side Considerations

A duct heater (hot water coil, electric, or gas) may be installed in the supply duct to provide auxiliary space heating. Be sure that the additional air pressure drop across the heater is accounted for in the unit fan selection. These heating components must be designed for use in swimming pool environments.

Maintain the poolroom at a slightly negative pressure. This will minimize moisture and chemical odor migration to other spaces. The exhaust fan should be sized for about 5-10% greater CFM than the amount of outside air being introduced into the space. Ducts can be fabric, aluminum, PVC, or galvanized steel. Even though "dry air" is being supplied back to the pool, do not use duct board or similar materials. If the PoolPak™ unit is installed in an area that is below the natatorium's dew point temperature, the ducts may require insulation, pitching and drainage.

Continuous vapor barriers are required between the poolroom and all other interior and exterior spaces because of the high dewpoint in the poolroom all the time. Care must be taken during design and installation to avoid gaps in the vapor barriers or building damage may result. For more information, see the PoolPak™ Educational Library articles "Efflorescence, What Causes It and How Do You Remove It?" and "Vapor Barriers In Natatoriums".

Windows and exterior doors must be selected with adequate thermal insulation (including thermal breaks) to minimize condensation on their interior surfaces even if the supply air is directed across these components. Doors and windows must also have as low an air leakage as possible. Although the space will be maintained at a slightly negative pressure, cold air leaking into the space from poorly sealed openings will negate all of the effects of good thermal insulation.

SECTION II: POOLPAK PRINCIPLES, FUNCTIONS, AND FEATURES

PRINCIPLES OF OPERATION

The PoolPak™ System is a complete environmental control system designed expressly for indoor swimming pool enclosures. It takes into account two important factors: the swimming pool occupant (personal comfort) and the swimming pool environment (the physical structure and surrounding furnishings).

The swimming pool enclosure can be a hostile environment for equipment, decor and building structures. A PoolPak™ System's major function is to dehumidify the pool enclosure air through a vapor compression cycle. During this cycle the PoolPak™ System recycles the sensible and latent heat and places it back into the pool water and air as needed. This recycling process saves money and keeps your pool environment efficient and safe.

Solid state microprocessor technology, working in conjunction with sensors, continually monitors water and air conditions to provide superior occupant comfort. Unlike typical outside air ventilation systems, a PoolPak™ System recycles energy and blankets the walls and windows with warm, dry air.

PoolPak™ dehumidification systems reduce the energy input required to maintain pool water and air temperatures. By dehumidifying the air and recycling the latent energy back into the pool air and water, the unit will reduce operating costs when compared to conventional heating and ventilating systems. Pool water and enclosure heating are still needed but with greatly reduced requirements.

A PoolPak™ unit, when matched correctly to the evaporation rate of the pool water and overall dehumidification requirements, will efficiently maintain the pool air at relative humidity levels between 50% and 60%. It should be noted that a lower evaporation rate occurs when the pool enclosure's air temperature is maintained above the pool water temperature. Evaporation losses, and the energy required to maintain desired room conditions, will dramatically increase if the air temperature is allowed to fall below the pool water temperature. It is recommended that the continuous dry bulb temperature entering the evaporator of the PoolPak™ unit not fall below 75°F.

PoolPak™ International recommends that backup heating equipment for both pool water and pool enclosure air is capable of carrying the full system heating requirements. This makes for a well-designed system that will provide the least amount of pool down time if unforeseen system problems occur. Building conductive loads and other losses must be taken into consideration.

AUTOMATIC CONTROL OF AIR TEMPERATURE AND HUMIDITY

An integral part of any PoolPak™ System is a proven microprocessor control system which automatically senses and maintains comfort conditions. Sensors detect changes in humidity and air temperature in the indoor pool environment and quickly regulate supply air conditions to meet set point comfort levels, even during periods of unusually heavy pool use.

To prevent condensation on walls and windows, the PoolPak™ System automatically adjusts humidity in response to changes in wall or window surface temperatures. As the seasons and weather conditions change, the PoolPak™ System changes its own mode of operation. Throughout the year, PoolPak™ thinks "efficiency" and automatically selects the least expensive energy source for the poolroom conditions.

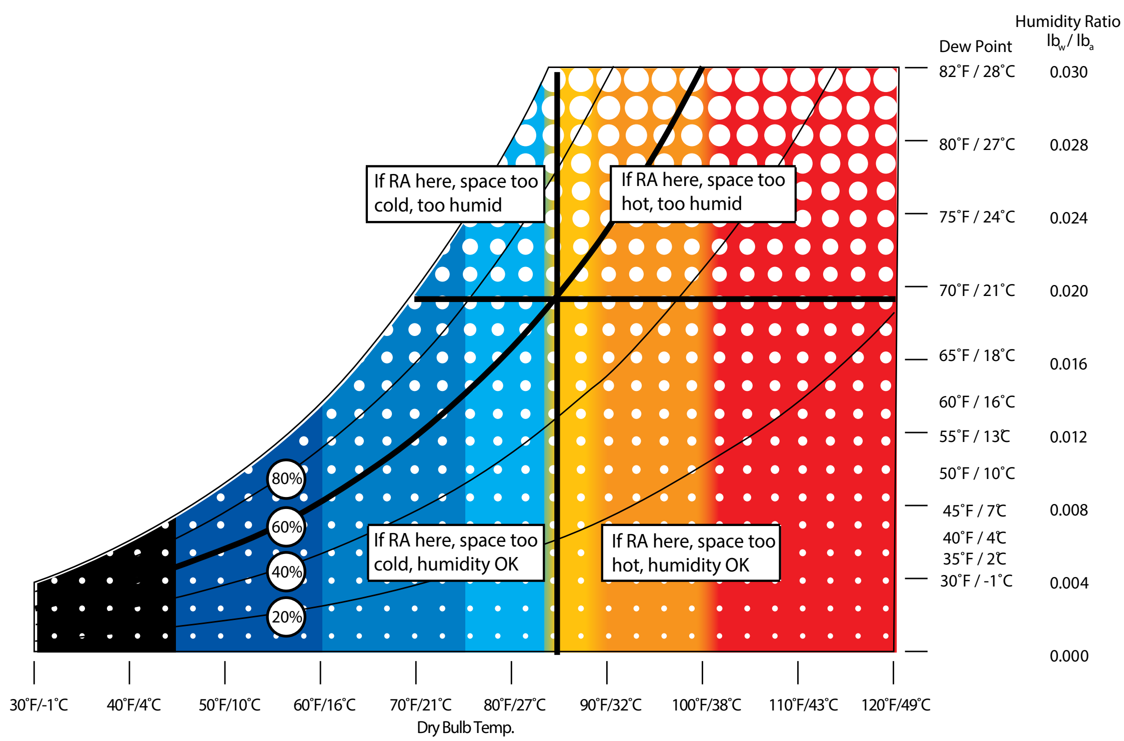
PoolPak™ models include a factory mounted and wired space temperature and humidity sensor at the return air opening of the unit. Refer to the installation section for mounting location. Caution should be exercised. When the outside air is to be introduced into the space for ventilation, adequate exhaust capacity via an integral (or a separate external fan) must be specified to ensure the poolroom remains slightly negative. An inadequately sized exhaust system may result in damage to the structure and pool odors may be forced into other areas of the building.

ROOM DEW POINT CONTROL

PoolPak™ units with the ECC controller operate using an advanced type of control utilizing dew point and dry bulb temperature control. This method of control is more accurate than conventional relative humidity control. The main purpose of a dehumidification system is to maintain the amount of moisture in the pool area below a level that would cause damage to the building. Relative humidity is a measurement of the percentage of moisture which is in the air at a given dry bulb temperature in proportion to the maximum amount of moisture that could be contained at this particular dry bulb temperature. Warmer air can hold more moisture than colder air, therefore, changes in dry bulb temperature will change the relative humidity reading without any change in the actual amount of moisture in the air. The amount of moisture in the air is expressed as “grains of moisture per pound of dry air” and is directly related to the dew point temperature.

The ECC uses dew point control to operate the PoolPak™ unit and maintain the moisture level below the setpoint (see Figure 2-1). The space dry bulb temperature and relative humidity determine the dew point temperature. By varying the space temperature and space relative humidity set points, the dew point set point is changed. When the space dew point temperature rises more than 1/2 degree Fahrenheit above the space dew point temperature set point, the ECC controller energizes the compressor for dehumidification. As the dew point temperature drops more than 1/2 degree Fahrenheit below the dew point temperature set point, the controller de-energizes the compressor.

Figure 2-1. Dew Point Control Psychrometric



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POOLPAK™ OPERATION

The PoolPak™ fan draws in warm, moist air from the pool enclosure. This air passes through the evaporator (dehumidification) coil and gives up heat energy to the refrigerant which is in a cool, liquid state. This exchange of energy causes the air temperature to fall below its dew point, resulting in moisture condensation on the evaporator coil. The moisture formed falls into the unit's condensate drain pan. After passing through the evaporator coil, the refrigerant becomes a cool gas.

The refrigerant enters the unit's compressor, where it is compressed into a hot gas. While in the compressor, the refrigerant absorbs the energy used to operate the compressor. This hot gas refrigerant then travels either through an air reheat coil, the pool water condenser or to an optional auxiliary air conditioning condenser, which may be either air or water cooled. If air heating is called for, the air reheat coil is used. The hot refrigerant exchanges energy with the cooler, dehumidified air coming from the evaporator coil. This causes the temperature of the air to rise for heating.

If pool water heating is required the hot gas flows into a pool water condenser, where it adds energy to the incoming pool water. This heats the pool water while the refrigerant is condensed into a warm liquid. If space cooling is called for, the refrigerant flows to the auxiliary air conditioning condenser bypassing the air reheat coil and pool water condenser and allowing cool air from the evaporator coil to provide space cooling.

The SR series includes a return fan that allows for economizer operation and up to 100% outside air as shown in the SR typical schematic, Figure 2-2.

The S series can include a factory mounted exhaust fan (SE), an exhaust and purge fan (SEP) or just an outside air damper (S). A typical SEP series unit is shown in Figure 2-3. This series does not have a return fan so that the outside air is limited to about 30% under normal operation.

Standard Items Factory Mounted

- Evaporator (dehumidification) coil
- Air reheat coil (hot gas reheat coil)
- Bottom, top (for indoor installations) or horizontal supply air configuration
- Filters and filter rack
- Air temperature and relative humidity sensor
- Compressor suction and discharge pressure transducers
- Compressor suction temperature

Standard Items Factory Supplied for Field Installation

- Remote Interface Unit (RIU)
- Cold surface temperature sensor
- Outside air temperature and humidity sensor
- Pool Water Temperature Sensor

System Options

- Remote air-cooled condenser for space air conditioning
- Flywheel air conditioning (SR and SEP)
- Water-cooled condenser
- Capability of introducing outside air
- Economizer control (SR and SEP)
- Network multiple units
- Remote monitoring via Internet
- Weatherproofing for outdoor installation

Figure 2-2. SWHP SR System Schematic

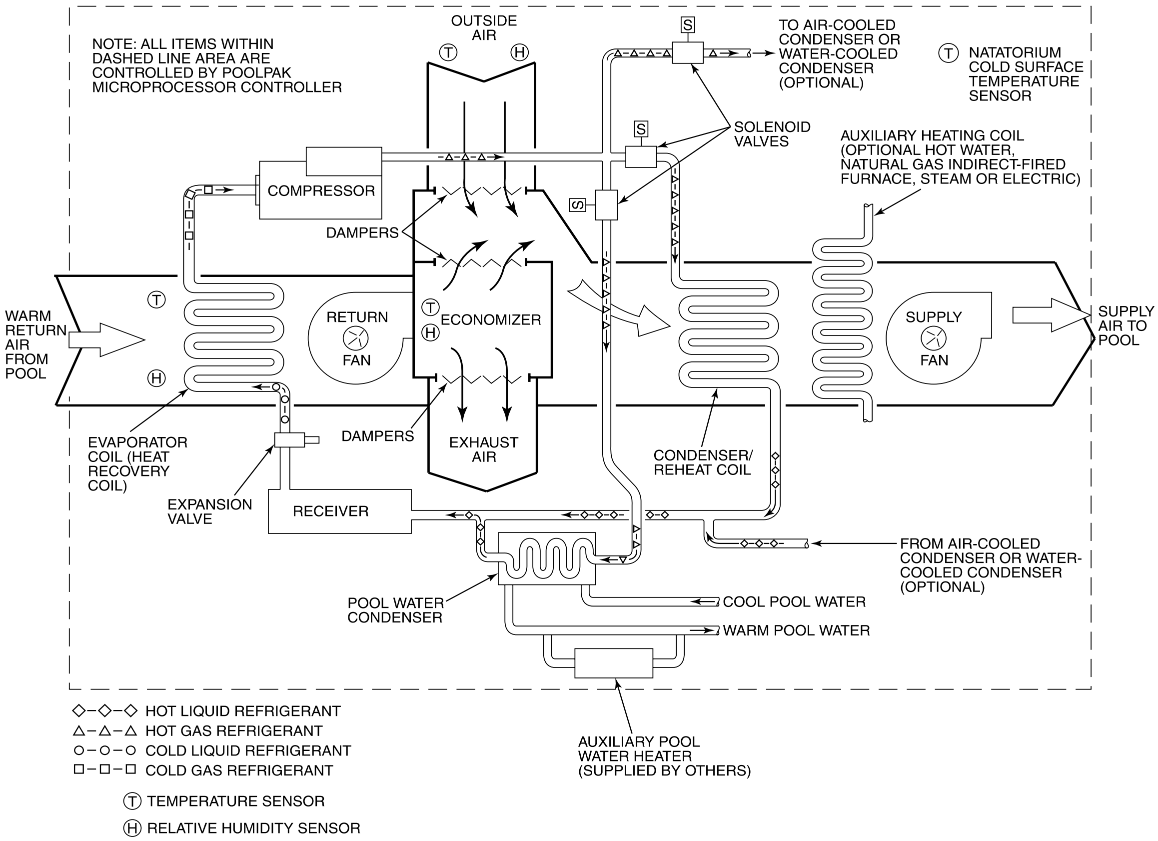
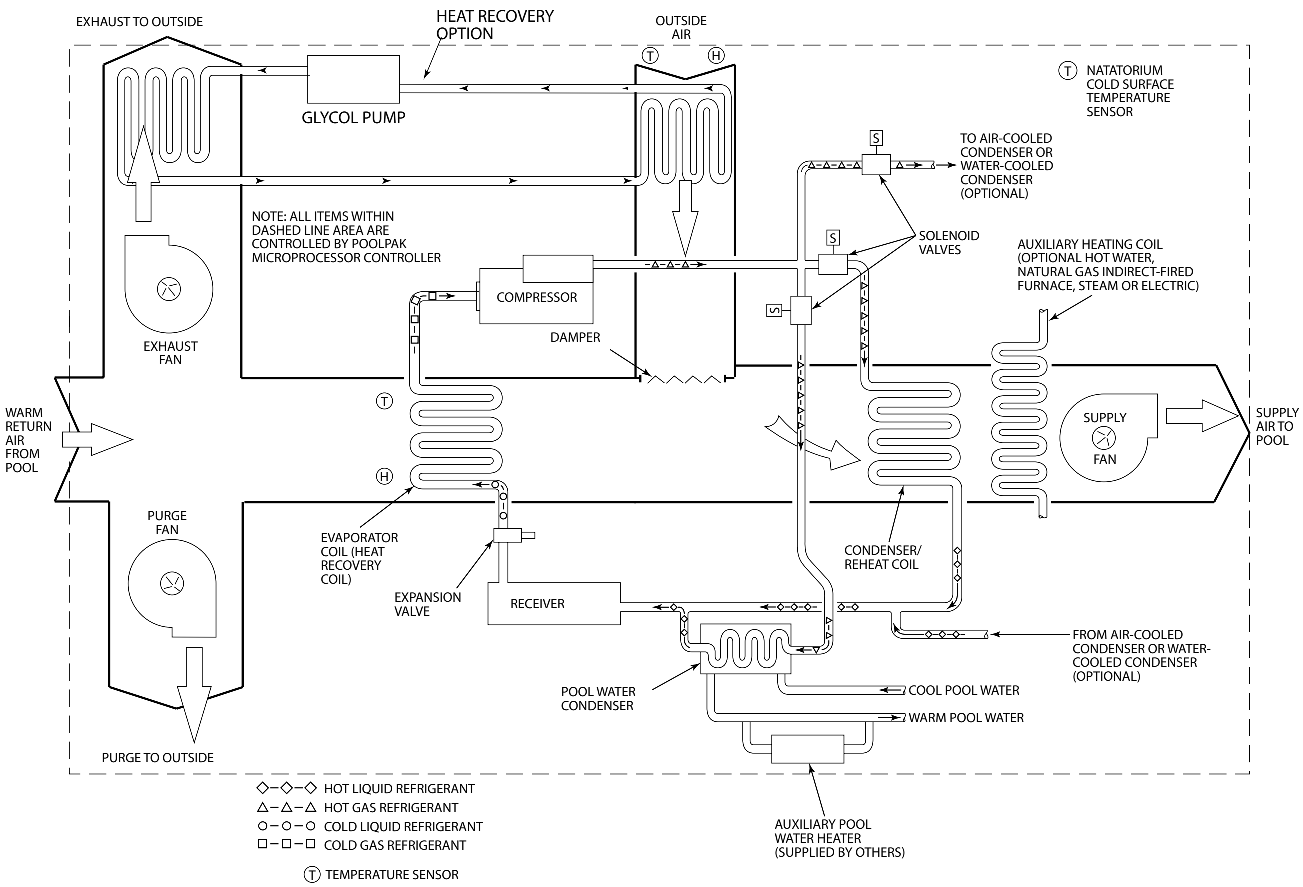


Figure 2-3. SWHP SEP System Schematic



ECC CONTROL SYSTEM

OVERVIEW

The PoolPak™ is controlled by the Electronic Control Center (ECC III), a microprocessor-based system that incorporates all of the functions necessary to maintain correct natatorium space temperature and humidity and control pool water temperature. The ECC is designed to work with the PoolPak™ dehumidification system to provide an environment that is both comfortable and cost effective. It controls unwanted humidity in the pool enclosure and helps to prevent unsightly condensation from forming on surfaces.

System parameters and/or system status readouts are provided on the remote-mounted display/keypad panel, Remote Interface Unit (RIU). Set points may be changed easily and may be password protected. Set points are saved in the memory of the ECC and are not erased in the event of a power failure. Critical operating data can be easily accessed by a qualified service technician for the purpose of system operation and evaluation.

The ECC III controller has a fault code history log that records the last 50 faults in the order of their occurrence. Each fault code is recorded along with the date and time and the values of the critical system parameters. This fault code history log is accessible at the control panel via the ECC III controller and at the remote display/keypad panel (Remote Interface Unit, RIU). The fault code history log is also accessible with the optional Remote Access Package (RAP). This Remote Access Package is available only with a BACnet/IP based Building Automation System (BAS).

The PoolPak™ ECC III also has the option to be directly connected to several different BAS options. The ECC III can be connected to either a LonWorks based BAS or a Modbus RTU based BAS, BACnet/IP and BACnet MS/TP.

All PoolPak™ operating and logic controls are factory mounted and wired. The control sequences are designed specifically to control swimming pool environmental conditions.

As a minimum, the PoolPak™ control system provides full modulation of the heat recovery/heating system by proportional control of dry bulb temperature, relative humidity, interior building-skin-temperature-based humidity reset, and outside air volume.

The PoolPak™ controls automatically operate the heating, dehumidification, and heat recovery system in response to the greatest requirements while adjusting unit outputs to maintain building conditions. The PoolPak™ controls are capable of providing full heating capacity to either air or water and of providing proportional control of heating and dehumidification by loading stages of compressor capacity as necessary. As building requirements are satisfied, the compressor unloads.

The PoolPak™ System provides outside air ventilation to satisfy minimum air ventilation requirements per ASHRAE 62.1 ventilation standard.

HUMIDITY CONTROL

When equipped, the economizer is activated if dehumidification is required, air temperature is satisfied, the absolute humidity of the outside air is lower than the absolute humidity of the pool room air and the outside air temperature will not adversely affect the pool room air temperature.

The PoolPak™ provides full proportional control of relative humidity by staging unit capacity. The humidity controller energizes the compressor. The moist air from the pool room is drawn over the evaporator coil, where the air is cooled below its dew point. In this cooling process, the moisture in the return air is condensed onto the evaporator coil. The heat recovered in the refrigerant from the dehumidification process is directed to the air reheat condenser if the space needs heating or to the pool water condenser if pool water temperature is below the set point.

COLD SURFACE TEMPERATURE HUMIDITY RESET

The ECC control system 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

Space heating via heat recovery uses full proportional control of the space dry bulb temperature by staging compressor loading of unit capacity with humidity override. Heat is recovered automatically from the pool room return air. The PoolPak™ automatically controls the output of the optional factory-installed auxiliary air-heating coil which can be hot water, steam, electric or gas.

NETWORKING MULTIPLE UNITS

ECC networking allows multiple units to be connected together. The units will work with each other to control water temperature, air temperature and relative humidity. Networked units have all the features of standard units plus the ability to control water temperature in multiple pools. All units on the network are accessible from a single remote interface unit for convenience.

SMART ECONOMIZER (SR)

The Smart Economizer utilizes the simultaneous operation of the heat recovery and economizer control sequence. When the PoolPak™ compressor is operating in the heating and/or dehumidifying heat recovery mode, return air passes through the evaporator. The sensible and latent heat in the return air is transferred to the refrigerant. Air leaving the evaporator is cold and saturated. The exact temperature and dew point of the air leaving the evaporator is monitored and compared to outside air temperature and dew point. If the outside air is warmer and/or dryer than the air leaving the evaporator, all the air leaving the evaporator is exhausted and 100% outside air is drawn into the PoolPak™. All the heat recovered in the PoolPak™ unit refrigerant is transferred to the supply air in the air reheat condenser. The Smart Economizer saves more energy than a standard mixing box and economizer.

SPACE COOLING (OPTIONAL)

If space cooling is required and the unit is equipped with an auxiliary refrigerant condenser (air-cooled or water-cooled), the ECC will activate the space cooling mode of operation. In this mode, the heat removed from the space air will be directed to the auxiliary condenser. The air cooling mode of operation is independent of the need for dehumidification.

The PoolPak™ SR and SEP units are equipped with economizer sections. The ECC will automatically select the most economical method for space cooling. An economizer utilizes outside air rather than the refrigeration system to achieve space cooling. A sensor connected to the ECC monitors the outside air temperature. When appropriate, the controller will disable the compressor and bring in cool outside air for economical operation.

Air Conditioning with Air-Cooled Condenser

The PoolPak™ can be equipped with a properly sized remote air-cooled condenser. This remote condenser can be “piggyback-mounted” on the PoolPak during installation or installed on a separate pad.

Air Conditioning with Water-Cooled Condenser

The PoolPak™ unit can be equipped with a factory-mounted or remote-mounted air conditioning water condenser. This condenser can be either cleanable or non-cleanable. Sensible and latent heat recovered in the air conditioning mode is rejected to the water condenser if pool water temperature requirements are satisfied.

Air Conditioning with Chilled Water Coil

When chilled water is available, a chilled water coil can be factory-installed upstream of the supply fan. The coil has a factory-installed and wired two-way flow control valve and is controlled by the PoolPak™ control system.

POOL WATER HEATING

If the space temperature is at or above the set point and the pool water temperature is below the set point, hot gas is directed to the pool water condenser when the compressor is running. During times when the pool water requires more heat than is available from the pool water condenser, the PoolPak™ activates the auxiliary pool water heater. An auxiliary pool water heater must be supplied as part of the pool water pump and filter system.

NOTE

Contact factory for pool water temperature set points greater than 87° F

SMART PUMP CONTROL

Smart Pump control allows the ECC to control operation of the PoolPak™ water loop pump. When the ECC determines that pool heating and space cooling are required, a contact closure signal activates the remote pump. The pump will be deactivated when the pool heating or space cooling requirement is satisfied.

OCCUPIED/UNOCCUPIED CONTROL MODE

The PoolPak™ unit time clock allows 7-day, 24-hour scheduling of operational control for both occupied and unoccupied times during the year. During unoccupied times, the outside air and exhaust dampers are kept in the closed position to minimize the air-heating load. During occupied times, the PoolPak™ operates to maintain programmed natatorium parameters.

PURGE MODE (SR AND SEP)

The PoolPak™ has a purge cycle to fully ventilate the natatorium at the airflow (CFM) specified for the unit's supply fan. The purge cycle is programmable by the owner as necessary to ventilate the natatorium after shocking the pool. Unit controls provide completely automatic operation by controlling the supply fan and return (or purge) fan and by opening the outside air and exhaust air dampers for the programmed time intervals.

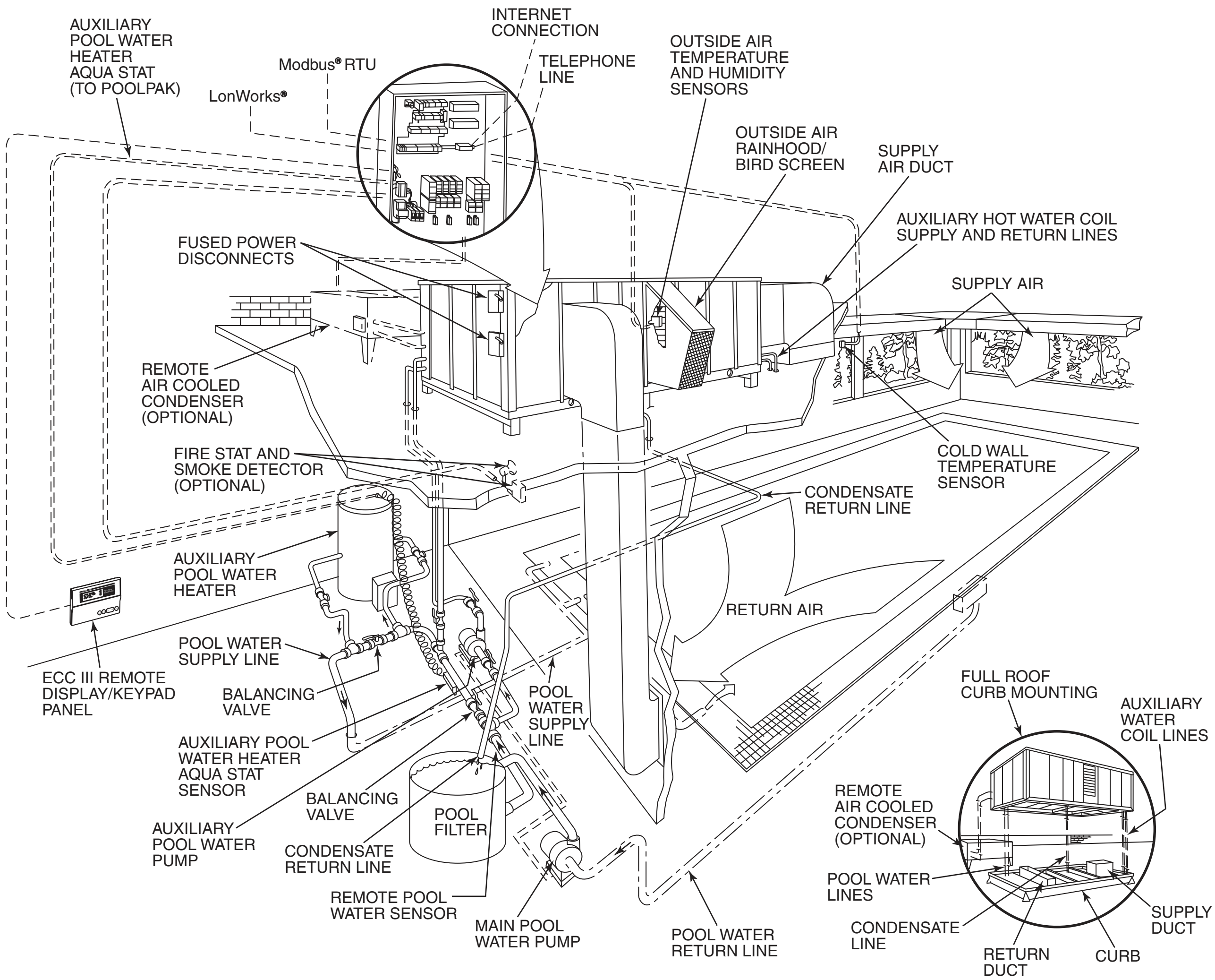
CO2 BASED DEMAND VENTILATION

The amount of outside air ventilation provided is controlled by the PoolPak™ unit based on the CO^2 level sensors in the return air stream.

EVENT MODE (SR)

The Event Mode changes the ventilation air quantity to meet the demands of an event or situation where additional outside air is needed. The unit controller can store up to 28 schedule events, which is user adjustable at the Remote User Interface (RUI). During Event Mode, the minimum damper position is raised to a value higher than the minimum damper setpoint. For each event, the screen shows the day of the week, the hour in 24-hour format, the minute, and the event type.

Figure 2-4. Typical PoolPak™ Rooftop Installation



PPK_EG_GR_SEP_3D_Installation_20100608.eps

SELECTION

OVERVIEW

The PoolPak™ system is available in several configurations. Contact your authorized PoolPak™ representative for the best configuration for your application.

Available Configurations

- Indoor and outdoor units from 15 tons to 80 tons
- SR units with integral supply and return fans, including 100% Outside Air economizer capability
- S units with integral supply fan and provision for up to 35% outside air
- SE units with integral supply and exhaust fans and provision for up to 35% outside air
- SEP units with integral supply, exhaust and purge fans and provision for up to 100% outside air during a purge cycle

UNIT SELECTION SOFTWARE PROGRAM

PoolPak™ International LLC maintains a computerized software selection program. Please contact your Exclusive PoolPak™ Sales Representative. A copy of the information required for the program can be found in publication "PoolPak Selection Input Data". A copy of this form in spreadsheet format may be obtained from the Engineering Library of the PoolPak™ website.

SECTION III: SIZING AND PERFORMANCE

POOLPAK SWHP UNIT DIMENSIONS AND WEIGHT

Refer to the PoolPak SWHP Weights and Dimensions Guide found in the Engineering Library of the PoolPak™ website.

POOLPAK SWHP UNIT CAPACITY

Table 3-1. PoolPak™ SWHP Unit Capacity

Unit Performance at 82 F and 60% RH						
SR Series	Air Flow (CFM)	Moisture Removal Rate (Lb/Hr)	Evaporator Total Capacity (MBtu/H)	Evaporator Sensible Capacity (Mbtu/H)	Compressor Input Power (KW)	Total Heat Rejection (MBtu/H)
060	6,000	90	186	91	13.6	230
080	7,000	116	238	115	19.2	300
100	10,000	126	283	149	20.3	350
120	12,000	165	364	189	27.5	450
140	15,000	189	417	217	30.9	517
190	18,000	217	470	240	36.6	590
220	20,000	252	567	300	40.6	700
260	24,000	330	729	379	55	900
300	28,000	378	834	433	61.8	1,034
340	28,000	434	941	490	73.2	1,080

Unit Performance at 82 F and 60% RH						
S, SE, SEP Series	Air Flow (CFM)	Moisture Removal Rate (Lb/Hr)	Evaporator Total Capacity (MBtu/H)	Evaporator Sensible Capacity (Mbtu/H)	Compressor Input Power (KW)	Total Heat Rejection (MBtu/H)
060S	7,000	90	180	85	13.7	233
080S	8,000	116	254	131	18.3	313
100S	10,000	126	283	149	20.3	350
120S	12,000	165	364	189	27.5	450
140S	15,000	189	417	217	30.9	517
190S	18,000	217	470	240	36.6	590
220S	20,000	252	567	300	40.6	700
260S	24,000	330	729	379	55	900
300S	28,000	378	834	433	61.8	1,034
340S	30,000	434	941	490	73.2	1,080

EGW05-PerformanceSummary-20140723.xls

POOL WATER CONDENSER PRESSURE DROP AND HEAT CAPACITY

Table 3-2. Pool Water Condenser Pressure Drop and Heat Capacity

Model	Pool Water GPM	Water (WC-ft)[1]	Water (WC-ft)[2]	Heating Cap. (Mbtu/hr)
Full Water Condenser				
SWHP 060	25	28	23	230
SWHP 080	35	32	28	310
SWHP 100	40	24	26	350
SWHP 120	50	30	25	450
SWHP 140	60	33	29	520
SWHP 190	70	32	26	600
SWHP 220	80	31	28	700
SWHP 260	100	32	27	900
SWHP 300	120	35	31	1040
SWHP 340	140	34	28	1200
Partial Water Condenser				
SWHP 060	N/A	N/A	N/A	N/A
SWHP 080	20	18	14	155
SWHP 100	25	21	16	175
SWHP 120	25	21	16	225
SWHP 140	25	21	16	225
SWHP 190	30	22	20	300
SWHP 220	40	29	26	350
SWHP 260	50	30	25	450
SWHP 300	60	33	29	520
SWHP 340	70	32	26	600

[1] Cleanable, vented condenser (double wall).

[2] Spiral, vented condenser (double wall).

POOLPAK AUXILIARY GAS FURNACE CAPACITY

Table 3-3. PoolPak™ Auxiliary Gas Furnace Capacity

			Applicable Cabinet size					
			A		B		C	
	Input Mbtu/H	Output Mbtu/H	Furnace**					
			Min CFM	Max CFM	Min CFM	Max CFM	Min CFM	Max CFM
Single Furnace	225	180	3,500	8,000				
	250	200	3,500	9,000	8,000	9,000		
	300	240	3,500	10,000	8,000	10,000		
	350	280	3,500	10,000	8,000	13,000		
	400	320	3,500	10,000	8,000	14,000		
Dual Furnace	450	360			8,000	16,000	15,000	16,000
	500	400			8,000	18,000	15,000	18,000
	600	480			8,000	18,000	15,000	20,000
	700	560			8,000	18,000	15,000	26,000
	800	640			8,000	18,000	15,000	30,000
Drum Furnace	1060	850			12,000	18,000	15,000	30,000
	1250	1000			14,000	18,000	15,000	30,000
	1560	1250			15,000	18,000	15,000	30,000

PPK_EG_TB_FurnaceSize_20100114.xls

** Actual CFM allowed is determined by the cabinet size and Model chosen

POOLPAK AUXILIARY ELECTRIC HEAT CAPACITY

Table 3-4. PoolPak™ Auxiliary Electric Heat Capacity

	Applicable Cabinet size					
	A		B		C	
Size	Heater**					
KW	Min CFM	Max CFM	Min CFM	Max CFM	Min CFM	Max CFM
20	3,500	6,500				
25	3,500	8,000	8,000	8,000		
36	3,500	9,500	8,000	9,500		
35	3,500	10,000	8,000	11,500		
40	3,500	10,000	8,000	13,000		
50	3,500	10,000	8,000	16,000	15,000	16,000
60	4,000	10,000	8,000	18,000	15,000	18,000
70	4,000	10,000	8,000	18,000	15,000	20,000
80	5,500	10,000	8,000	18,000	15,000	24,000
90	6,000	10,000	8,000	18,000	15,000	24,000
100	6,500	10,000	8,000	18,000	15,000	28,000

PPK_EG_TB_ElectricHeatSize_20100114.xls

** Actual CFM allowed is determined by the cabinet size and Model chosen

POOLPAK AIR-COOLED CONDENSER (ACC) DIMENSIONS, WEIGHT AND ELECTRICAL

Note: Below tables contain the piping sizes of the remote ACC stub-outs. Additional field piping may be needed to make the transition from the ACC connections (ACC Conns) to correct refrigeration lineset sizing (see Table 4-2).

Table 3-5. ACC - Model SWHP 0060

Ambient Air (ºF)	ACC Model	Number Fans		Refrigerant Circuits	ACC Conns (stub outs)		Weight	ACC Voltage	FLA	MCA	MOP
		wide	long		Hot Gas	Liquid	Lbs				
95/100º	ACC0273	1	2	One	1-5/8	1-1/8	580	208/230-3-60	14.0	20.0	35.0
								460-3-60	7.0	15.0	15.0
								575-3-60	5.6	15.0	15.0
								380-3-50	5.8	15.0	15.0
105º	ACC0333	1	2	One	1-5/8	1-1/8	630	208/230-3-60	14.0	20.0	35.0
								460-3-60	7.0	15.0	15.0
								575-3-60	5.6	15.0	15.0
								380-3-50	5.8	15.0	15.0
110º	ACC0453	1	2	One	2-1/8	1-3/8	690	208/230-3-60	14.0	20.0	35.0
								460-3-60	7.0	15.0	15.0
								575-3-60	5.6	15.0	15.0
								380-3-50	5.8	15.0	15.0
115º	ACC0623	1	3	One	2-1/8	1-3/8	1010	208/230-3-60	21.0	22.8	40.0
								460-3-60	10.5	15.0	20.0
								575-3-60	8.4	15.0	15.0
								380-3-50	8.8	15.0	20.0
** Dimensions - see Air Cooled Condenser dimension views with number of fans wide (end) and number long (side)											

Table 3-6. ACC - Model SWHP 0080

Ambient Air (ºF)	ACC Model	Number Fans		Refrigerant Circuits	ACC Conns (stub outs)		Weight	ACC Voltage	FLA	MCA	MOP
		wide	long		Hot Gas	Liquid	Lbs				
95/100º	ACC0333	1	2	One	1-5/8	1-1/8	580	208/230-3-60	14.0	20.0	35.0
								460-3-60	7.0	15.0	15.0
								575-3-60	5.6	15.0	15.0
								380-3-50	5.8	15.0	15.0
105º	ACC0363	1	2	One	1-5/8	1-1/8	630	208/230-3-60	14.0	20.0	35.0
								460-3-60	7.0	15.0	15.0
								575-3-60	5.6	15.0	15.0
	ACC0433	1	2	One	2-1/8	1-3/8	680	380-3-50	5.8	15.0	15.0
110º	ACC0523	1	3	One	2-1/8	1-3/8	930	208/230-3-60	21.0	22.8	40.0
								460-3-60	10.5	15.0	20.0
								575-3-60	8.4	15.0	15.0
								380-3-50	8.8	15.0	20.0
115º	ACC0773	2	2	One	2-1/8	1-3/8	1320	208/230-3-60	28.0	29.8	45.0
								460-3-60	14.0	15.0	20.0
								575-3-60	11.2	15.0	15.0
								380-3-50	11.7	15.0	20.0
** Dimensions - see Air Cooled Condenser dimension views with number of fans wide (end) and number long (side)											

Table 3-7. ACC - Model SWHP 0100

Model 0100**											
	ACC Model	Number Fans		Refrigerant Circuits	Refrigerant Line Size		Weight	ACC Voltage	FLA	MCA	MOP
		wide	long		Hot Gas	Liquid	Lbs				
95/100º	ACC0363	1	2	One	1-5/8	1-1/8	630	208/230-3-60	14.0	20.0	35.0
								460-3-60	7.0	15.0	15.0
								575-3-60	5.6	15.0	15.0
	ACC0433	1	2	One	2-1/8	1-3/8	680	380-3-50	5.8	15.0	15.0
105º	ACC0433	1	2	One	2-1/8	1-3/8	680	208/230-3-60	14.0	20.0	35.0
								460-3-60	7.0	15.0	15.0
								575-3-60	5.6	15.0	15.0
	ACC0493	1	3	One	2-1/8	1-3/8	930	380-3-50	8.8	15.0	20.0
110º	ACC0683	1	3	One	2-1/8	1-3/8	1010	208/230-3-60	21.0	22.8	40.0
								460-3-60	10.5	15.0	20.0
								575-3-60	8.4	15.0	15.0
								380-3-50	8.8	15.0	20.0
115º	ACC0963	2	2	One	2-1/8	1-3/8	1490	208/230-3-60	28.0	29.8	45.0
								460-3-60	14.0	15.0	20.0
								575-3-60	11.2	15.0	15.0
								380-3-50	11.7	15.0	20.0
** Dimensions - see Air Cooled Condenser dimension views with number of fans wide (end) and number long (side)											
PPK_R410A_ACC_Summary_20110104.xls											

Table 3-8. ACC - Model SWHP 0120

Model 0120**											
Ambient Air (ºF)	ACC Model	Number Fans		Refrigerant Circuits	Refrigerant Line Size		Weight	ACC Voltage	FLA	MCA	MOP
		wide	long				Lbs				
95/100º	ACC0433	1	2	One	2-1/8	1-3/8	680	208/230-3-60	14.0	20.0	35.0
								460-3-60	7.0	15.0	15.0
								575-3-60	5.6	15.0	15.0
	ACC0493	1	3	One	2-1/8	1-3/8	930	380-3-50	8.8	15.0	20.0
105º	ACC0553	1	3	One	2-1/8	1-3/8	930	208/230-3-60	21.0	22.8	40.0
								460-3-60	10.5	15.0	20.0
								575-3-60	8.4	15.0	15.0
	ACC0593	1	3	One	2-1/8	1-3/8	1000	380-3-50	8.8	15.0	20.0
110º	ACC0773	2	2	One	2-1/8	1-3/8	1390	208/230-3-60	28.0	29.8	45.0
								460-3-60	14.0	15.0	20.0
								575-3-60	11.2	15.0	15.0
								380-3-50	11.7	15.0	20.0
115º	ACC1163	2	3	One	2-1/8	1-3/8	2060	208/230-3-60	42.0	43.8	60.0
								460-3-60	21.0	21.9	30.0
								575-3-60	16.8	20.0	25.0
								380-3-50	17.5	21.9	30.0
** Dimensions - see Air Cooled Condenser dimension views with number of fans wide (end) and number long (side)											
PPK_R410A_ACC_Summary_20110104.xls											

Table 3-9. ACC - Model SWHP 0140

Model 0140**											
Ambient Air (ºF)	ACC Model	Number Fans		Refrigerant Circuits	Refrigerant Line Size		Weight	ACC Voltage	FLA	MCA	MOP
		wide	long		Hot Gas	Liquid	Lbs				
95/100º	ACC0493	1	3	One	2-1/8	1-3/8	930	208/230-3-60	21.0	22.8	40.0
								460-3-60	10.5	15.0	20.0
								575-3-60	8.4	15.0	15.0
	ACC0593	1	3	One	2-1/8	1-3/8	1000	380-3-50	8.8	15.0	20.0
105º	ACC0663	2	2	One	2-1/8	1-3/8	1340	208/230-3-60	28.0	29.8	45.0
								460-3-60	14.0	15.0	20.0
								575-3-60	11.2	15.0	15.0
								380-3-50	11.7	15.0	20.0
110º	ACC0923	2	2	One	2-1/8	1-3/8	1490	208/230-3-60	28.0	29.8	45.0
								460-3-60	14.0	15.0	20.0
								575-3-60	11.2	15.0	15.0
								380-3-50	11.7	15.0	20.0
115º	ACC1373	2	3	One	2-1/8	1-3/8	2210	208/230-3-60	42.0	43.8	60.0
								460-3-60	21.0	21.9	30.0
								575-3-60	16.8	20.0	25.0
								380-3-50	17.5	21.9	30.0
** Dimensions - see Air Cooled Condenser dimension views with number of fans wide (end) and number long (side)											
PPK_R410A_ACC_Summary_20110104.xls											

Table 3-10. ACC - Model SWHP 0190

Model 0190**											
Ambient Air (ºF)	ACC Model	Number Fans		Refrigerant Circuits	Refrigerant Line Size		Weight	ACC Voltage	FLA	MCA	MOP
		wide	long		Hot Gas	Liquid	Lbs				
95/100º	ACC0593	1	3	One	2-1/8	1-3/8	1000	208/230-3-60	21.0	22.8	40.0
								460-3-60	10.5	15.0	20.0
								575-3-60	8.4	15.0	15.0
	ACC0663	2	2	One	2-1/8	1-3/8	1340	380-3-50	11.7	15.0	20.0
105º	ACC0733	2	2	One	2-1/8	1-3/8	1340	208/230-3-60	28.0	29.8	45.0
								460-3-60	14.0	15.0	20.0
								575-3-60	11.2	15.0	15.0
	ACC0863	2	2	One	2-1/8	1-3/8	1440	380-3-50	11.7	15.0	20.0
110º	ACC1163	2	3	One	2-1/8	1-3/8	2060	208/230-3-60	42.0	43.8	60.0
								460-3-60	21.0	21.9	30.0
								575-3-60	16.8	20.0	25.0
								380-3-50	17.5	21.9	30.0
115º	ACC1813	2	4	One	2-1/8	1-3/8	2930	208/230-3-60	56.0	57.8	70.0
								460-3-60	28.0	28.9	35.0
								575-3-60	22.4	23.1	30.0
								380-3-50	23.3	28.9	35.0
** Dimensions - see Air Cooled Condenser dimension views with number of fans wide (end) and number long (side)											
PPK_R410A_ACC_Summary_20110104.xls											

Table 3-11. ACC - Model SWHP 0220

Model 0220**											
Ambient Air (ºF)	ACC Model	Number Fans		Refrigerant Circuits	Refrigerant Line Size		Weight	ACC Voltage	FLA	MCA	MOP
		wide	long		Hot Gas	Liquid	Lbs				
95/100º	ACC0734	2	2	Two	2@ 1-5/8	2@ 1-1/8	1340	208/230-3-60	28.0	29.8	45.0
								460-3-60	14.0	15.0	20.0
								575-3-60	11.2	15.0	15.0
	ACC0864	2	2	Two	2@2-1/8	2@1-3/8	1440	380-3-50	11.7	15.0	20.0
105º	ACC0994	2	3	Two	2@ 2-1/8	2@ 1-3/8	1990	208/230-3-60	42.0	43.8	60.0
								460-3-60	21.0	21.9	30.0
								575-3-60	16.8	20.0	25.0
	ACC1094	2	3	Two	2@2-1/8	2@1-3/8	1990	380-3-50	17.5	21.9	30.0
110º	ACC1374	2	3	Two	2@ 2-1/8	2@ 1-3/8	2210	208/230-3-60	42.0	43.8	60.0
								460-3-60	21.0	21.9	30.0
								575-3-60	16.8	20.0	25.0
								380-3-50	17.5	21.9	30.0
115º	ACC1974	2	5	Two	2@ 2-1/8	2@ 1-3/8	3410	208/230-3-60	70.0	71.8	90.0
								460-3-60	35.0	35.9	45.0
								575-3-60	28.0	28.7	35.0
								380-3-50	29.2	35.9	45.0
** Dimensions - see Air Cooled Condenser dimension views with number of fans wide (end) and number long (side)											
PPK_R410A_ACC_Summary_20110104.xls											

Table 3-12. ACC - Model SWHP 0260

Model 0260**											
Ambient Air (ºF)	ACC Model	Number Fans		Refrigerant Circuits	Refrigerant Line Size		Weight	ACC Voltage	FLA	MCA	MOP
			long		Hot Gas	Liquid	Lbs				
95/100º	ACC0864	2	2	Two	2@2-1/8	2@1-3/8	1440	208/230-3-60	28.0	29.8	45.0
								460-3-60	14.0	15.0	20.0
								575-3-60	11.2	15.0	15.0
	ACC0994	2	3	Two	2@2-1/8	2@1-3/8	1990	380-3-50	17.5	21.9	30.0
105º	ACC1094	2	3	Two	2@2-1/8	2@1-3/8	1990	208/230-3-60	42.0	43.8	60.0
								460-3-60	21.0	21.9	30.0
								575-3-60	16.8	20.0	25.0
	ACC1294	2	3	Two	2@2-1/8	2@1-3/8	2140	380-3-50	17.5	21.9	30.0
110º	ACC1654	2	4	Two	2@ 2-1/8	2@ 1-3/8	2730	208/230-3-60	56.0	57.8	70.0
								460-3-60	28.0	28.9	35.0
								575-3-60	22.4	23.1	30.0
								380-3-50	23.3	28.9	35.0
115º	ACC2444	2	5	Two	2@ 2-1/8	2@ 1-3/8	3660	208/230-3-60	70.0	71.8	90.0
								460-3-60	35.0	35.9	45.0
								575-3-60	28.0	28.7	35.0
								380-3-50	29.2	35.9	45.0
** Dimensions - see Air Cooled Condenser dimension views with number of fans wide (end) and number long (side)											
PPK_R410A_ACC_Summary_20110104.xls											

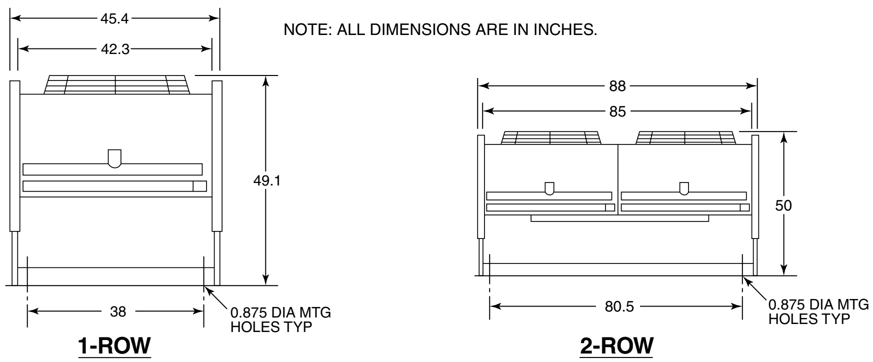
Table 3-13. ACC - Model SWHP 0300

Model 0300**											
Ambient Air (ºF)	ACC Model	Number Fans		Refrigerant Circuits	Refrigerant Line Size		Weight	ACC Voltage	FLA	MCA	MOP
		wide	long		Hot Gas	Liquid	Lbs				
95/100º	ACC0994	2	3	Two	2@ 2 1/8	2@ 1-3/8	1990	208/230-3-60	42.0	43.8	60.0
								460-3-60	21.0	21.9	30.0
								575-3-60	16.8	20.0	25.0
	ACC1184	2	3	Two	2@ 2-1/8	2@ 1-3/8	2140	380-3-50	17.5	21.9	30.0
105º	ACC1294	2	3	Two	2@ 2-1/8	2@ 1-3/8	2140	208/230-3-60	42.0	43.8	60.0
								460-3-60	21.0	21.9	30.0
								575-3-60	16.8	20.0	25.0
	ACC1464	2	4	Two	2@ 2-1/8	2@ 1-3/8	2630	380-3-50	23.3	28.9	35.0
110º	ACC1924	2	4	Two	2@ 2-1/8	2@ 1-3/8	2930	208/230-3-60	56.0	57.8	70.0
								460-3-60	28.0	28.9	35.0
								575-3-60	22.4	23.1	30.0
								380-3-50	23.3	28.9	35.0
115º	ACC2934	2	6	Two	2@ 2-1/8	2@ 1-3/8	4370	208/230-3-60	84.0	85.8	100.0
								460-3-60	42.0	42.9	50.0
								575-3-60	33.6	34.3	40.0
								380-3-50	35.0	42.9	50.0
** Dimensions - see Air Cooled Condenser dimension views with number of fans wide (end) and number long (side)											
PPK_R410A_ACC_Summary_20110104.xls											

Table 3-14. ACC - Model SWHP 0340

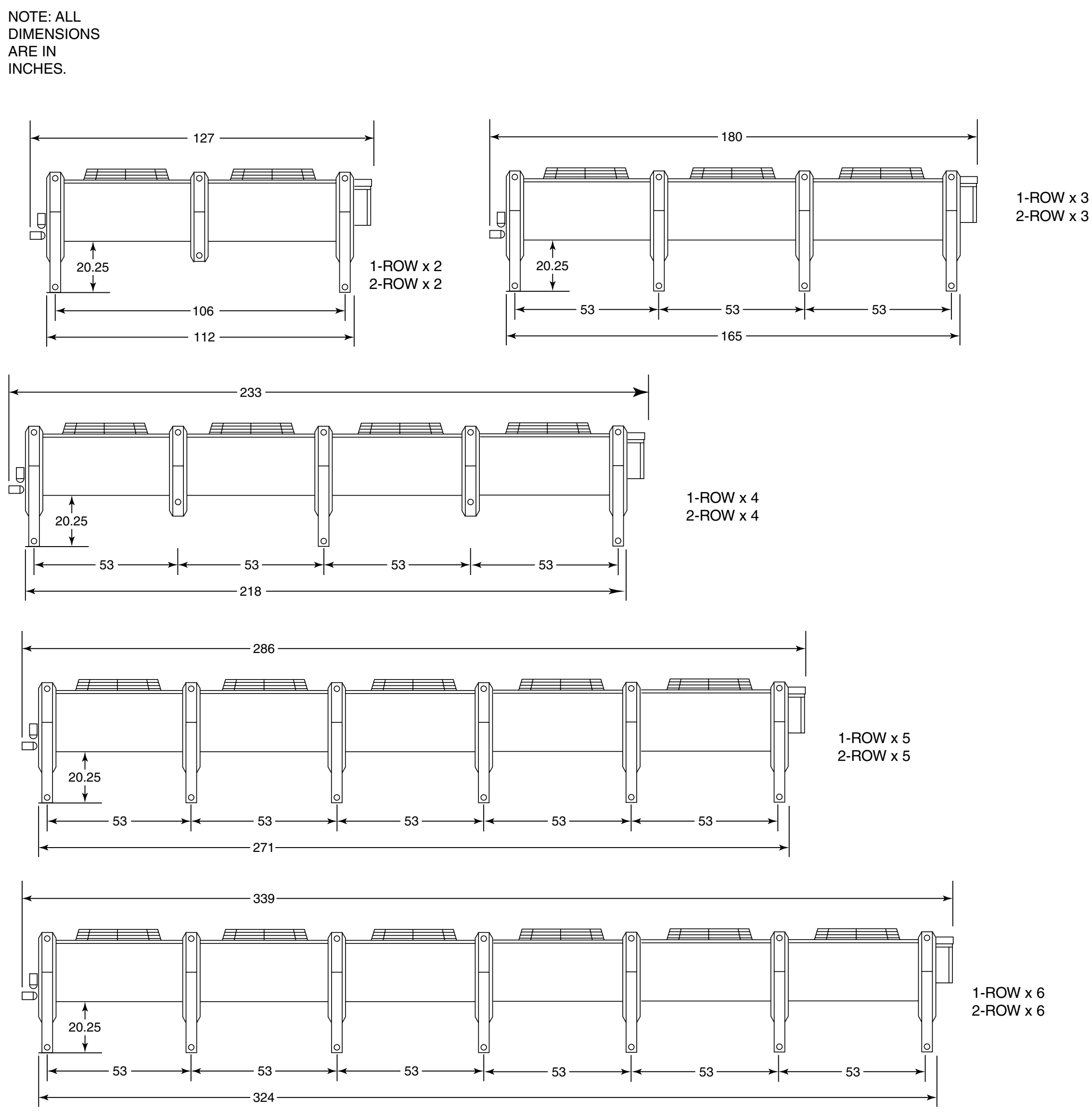
Model 0340**											
Ambient Air (ºF)	ACC Model	Number Fans		Refrigerant Circuits	ACC Conns (stub outs)		Weight	ACC Voltage	FLA	MCA	MOP
		wide	long		Hot Gas	Liquid	Lbs				
95/100º	ACC1294	2	3	Two	2@ 2 1/8	2@ 1-3/8	2140	208/230-3-60	42.0	43.8	60.0
								460-3-60	21.0	21.9	30.0
								575-3-60	16.8	20.0	25.0
	ACC1464	2	4	Two	2@ 2-1/8	2@ 1-3/8	2630	380-3-50	23.3	28.9	35.0
105º	ACC1564	2	4	Two	2@ 2-1/8	2@ 1-3/8	2630	208/230-3-60	56.0	57.8	70.0
								460-3-60	28.0	28.9	35.0
								575-3-60	22.4	23.1	30.0
	ACC1824	2	4	Two	2@ 2-1/8	2@ 1-3/8	2830	380-3-50	23.3	28.9	35.0
110º	ACC2444	2	5	Two	2@ 2-1/8	2@ 1-3/8	3660	208/230-3-60	70.0	71.8	90.0
								460-3-60	35.0	35.9	45.0
								575-3-60	28.0	28.7	35.0
								380-3-50	29.2	35.9	45.0
115º	ACC1813 x 2***	2	4	Two	2@ 2-1/8	2@ 1-3/8	2930	208/230-3-60	56.0	57.8	70.0
								460-3-60	28.0	28.9	35.0
								575-3-60	22.4	23.1	30.0
								380-3-50	23.3	28.9	35.0
** Dimensions - see Air Cooled Condenser dimension views with number of fans wide (end) and number long (side),											
***The ACC package contains 2 separate condenser units. Each condenser should be piped to each individual refrigerant circuit. Values for physical and electrical characteristics are for each individual condenser unit.											

Figure 3-1. Air Cooled Condenser Dimensions - End View



PPK_EG_GR_ACCEndView.eps

Figure 3-2. Air Cooled Condenser Dimensions - Side View

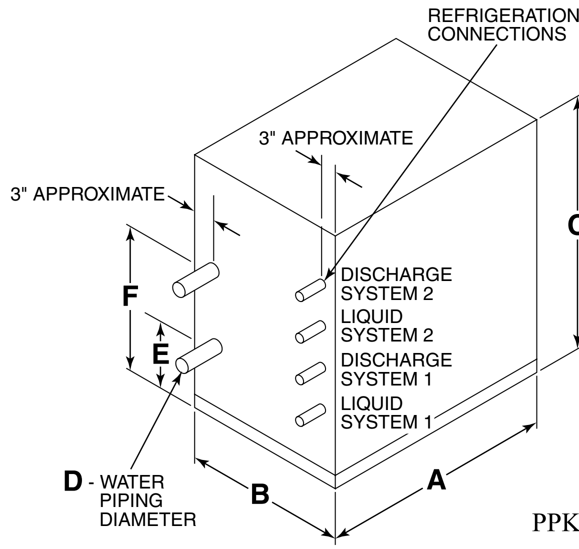


PPK_EG_GR_ACCSideView.eps

WATER-COOLED CONDENSER (WCC)

A remotely located water-cooled condenser utilizing either cooling tower water or chilled water is available. Some models may be able to have the cooling tower/chilled water condenser mounted to the side of the unit. Contact factory for specific applications.

Figure 3-3. Remote Cooling Tower Dimensions



PPK_EG_GR_CoolingTwrRemoteDim.eps

Table 3-15. Remote Water Cooled Condenser Dimensions

Cabinet Size[2]	Remote Cooling Tower and Chilled Water Cabinet Dimensions[1]					Weight (lb)
	A**	B**	C**	E**	F**	
A	79	44	63	15	55	950
B	79	44	63	15	55	1200
C	79	44	63	15	55	1500

[1]All Dimensions are rounded to the nearest Inch -- Contact factory for exact dimensions

[2]A cabinet - 060, 080, 100; B Cabinet - 100, 120, 140; C Cabinet - 140, 190, 220, 260, 300, 340

**Refer to drawing above for dimension call-outs

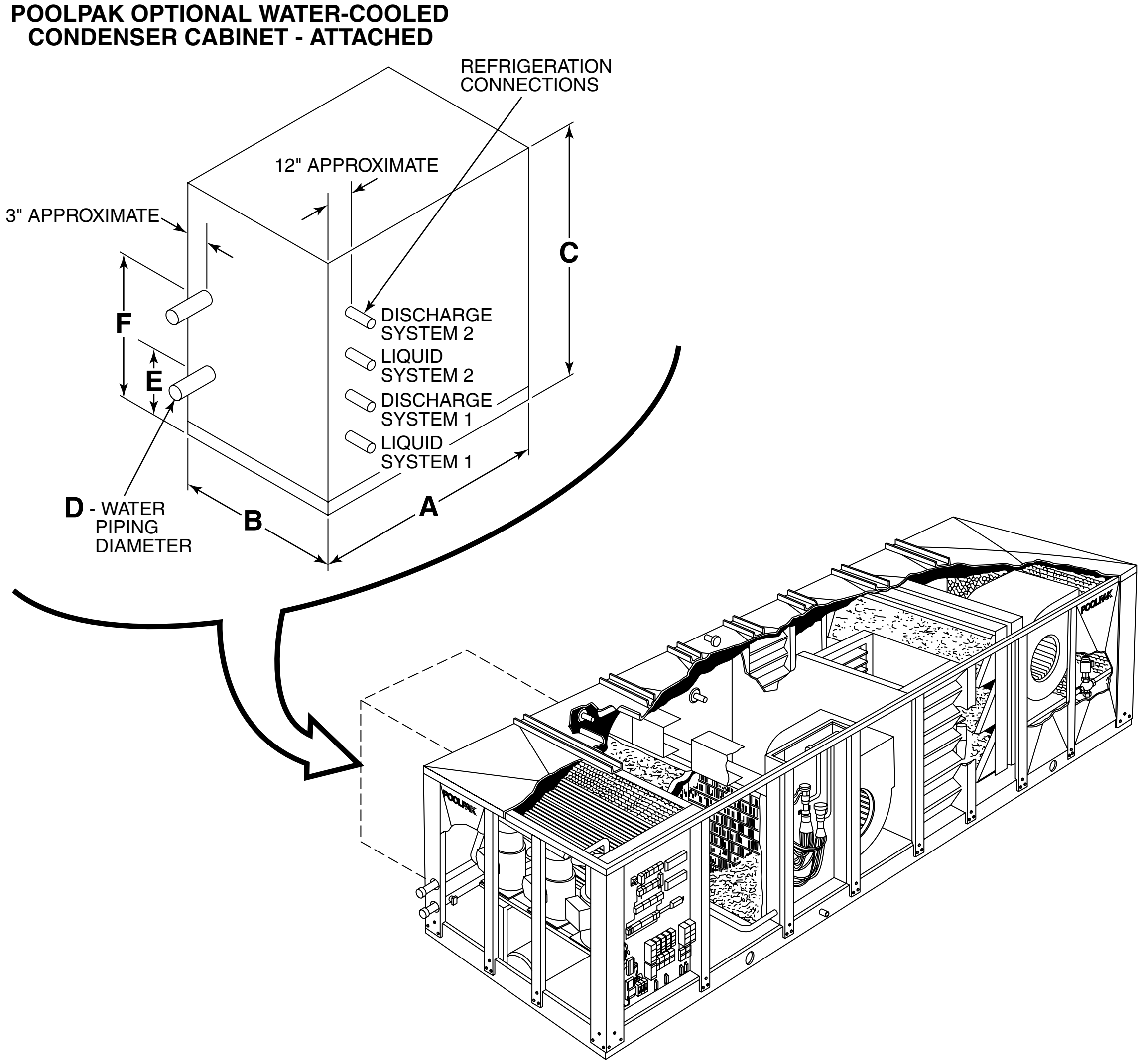
Table 3-16. WCC Piping Connections

	Water Piping[1], CPVC	WCC Connections[1] (stub outs)	
Model[2]	D	Discharge	Liquid
060	2	1-1/8	1-1/8
080/100	2	1-3/8	1-1/8
120/140/190	2	1-5/8	1-3/8
220	3	1-3/8	1-1/8
260/300/340	3	1-5/8	1-3/8

[1]Piping dimensions in inches

[2]Models 220, 260, 300, 340 have 2 refrigeration circuits piped independently

Figure 3-4. PoolPak™ Optional Water-Cooled Condenser Cabinet - Attached



PPK_EG_GR_AttachedWaterCooledCondenser.eps

Table 3-17. Water Cooled Condenser Performance

SWHP Model	Cooling Tower Water Condenser [1]		Chilled Water Condenser [2]		Heat Rejection [3]
	gpm	Water (Feet) [4]	gpm	Water (Feet) [5]	Mbtu/hr
060	25	28	25	24	230
080	35	32	25	31	310
100	40	29	35	23	350
120	50	30	40	18	450
140	60	33	50	27	520
190	70	32	60	27	600
220	80	31	70	24	350/350 [6]
260	100	32	80	20	450/450 [6]
300	120	35	100	28	520/520 [6]
340	140	34	120	28	600/600 [6]

[1] Maximum 90 °F EWT

[2] Maximum 55 F EWT

[3] Heat rejection at 120 F Condensing Temperature

[4] Cleanable, vented condenser

[5] Spiral, vented condenser

[6] Two circuit water-cooled condenser, one for each compressor

NOTE

Contact factory if water-cooled condenser line length is more than 100 ft and/or the water-cooled condenser is located more than 20 feet below the PoolPak.

SECTION IV: INSTALLATION

OVERVIEW

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. Then pool water is piped to the unit. Electrical power from a properly sized fused disconnect is connected to the unit. The supply and return air ducts are connected to their respective locations on the unit. The condensate is piped back to the pool or to the sewer. If an optional remote air-cooled condenser is used, place the condenser in a proper outdoor location. Refrigerant piping is then run from the air cooled condenser to the PoolPak™ unit. Refrigerant lines must be leak checked and evacuated through installer provided Schrader valves. Control and power wiring are run to complete the installation. If a field-furnished auxiliary space heating coil is installed, the control for this heater must be field-wired to the PoolPak™ controls shown in the field wiring diagram. Refer to Figure 2-4 for a typical installation.

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.

Use suitable spreaders or a frame to prevent damage to the PoolPak™. Cables must be adjusted to length to correct for the heavier compressor end of the unit.

⚠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 a spreader bar that is at least as wide as the unit. Care must be taken to remove all doors or openings that will interfere with the chains or slings to prevent damage to the unit. In general, two to four lifting points are provided on each side of the unit, depending on the unit size and length. All provided lifting points must be used to prevent unit damage. Proper lifting technique for each unit type is provided by a decal on that unit.

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.Mounting

The PoolPak™ unit is designed for 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. Tables of weight distribution can be found at the Engineering Library section of the PoolPak™ website.

FOUNDATION

The unit must be mounted on a flat and level foundation capable of supporting the entire operating weight of the equipment. The unit **MUST NOT** set flat on a concrete slab. The PoolPak™ unit **MUST BE** raised 6 inches to allow for sufficient height to adequately trap the condensate line and to allow for electrical service entrance. The unit must be supported at a minimum of six places, including all corners and the center points of each side. 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. Additionally, the slab should not be tied to the main building foundations to prevent noise transmission. The unit must be supported with adequate space to allow for a condensate line trap.

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 PoolPak 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.

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.

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.

Gas Furnace Auxiliary Heat (Optional)

When using a gas furnace, power venting is provided for all unit sizes. **No additional venting or caps are provided. Please refer to the furnace manufacturer's manual for piping and venting instructions.** Natural gas furnaces are available with outputs of 180,000 to 1,250,000 BTU, as determined by unit configuration and project requirements.

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(s).

If a remote or piggy-backed air-cooled condenser is required, a separate power feed must be provided for the air-cooled condenser. When the auxiliary electric heater option is provided, another power connection point (3L1, 3L2, and 3L3) is provided in the supply fan 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.

Single Point Power Supply

Refer to the "Single Point Power Wiring" diagram, Figure 6-1, in the Wiring section of this manual.
Only the following models of PoolPak™ SR units

- SWHP 60/80/100/120 – all voltages
- SWHP140/190/220/260/300 - 460V and 575V only.

All models of the PoolPak™ S, SE, SEP units

Dual Point Power Supply

See the "Dual Point Power Wiring" diagram, Figure 6-2, in the Wiring section of this manual.
All models of PoolPak™ SR Units

- S, SE, SEP units are NOT available in this configuration

Control Wiring

All control wiring field connections are described in the ECCIII Controls Field Wiring section of this manual. The wiring diagram is also furnished with the PoolPak™. All control wiring is low voltage.

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™ International 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. The amount of condensate produced in a year is about equal to the volume of the pool.

Curb Mounting

Curbs have been designed specifically for the PoolPak™ product line. Contact factory for roof curb dimensions. The outside dimensions of the curb are such that the base of the PoolPak™ extends over the edge of the curb on each side. This aids in preventing rain water, running down the sides of the unit, from getting between the base of the PoolPak™ and the curb. 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 duct to the PoolPak™
- Connect condensate drain lines with appropriate traps
- Seal the curb top surface to the bottom of the PoolPak™ with supplied gasket
- For SR units, seal the pool water pipes where they go through the curb cap under the compressor compartment

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

- Pool water
- Condensate
- Auxiliary hot water coil
- Chilled water coil
- Domestic hot water
- Whirlpool water

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.

For SR series units, the compressor end of the curb must have a special weather tight pan with the weather seal under the bulkhead between the compressor and return air compartments. The pan under the compressor compartment has provisions for running the pool water lines through the cap and isolates the area under the curb from the compressor compartment and from possible pool water or oil leaks as well as from the ambient conditions present in the compressor compartment.

ECCIII CONTROLS FIELD WIRING

OVERVIEW

The ECC III is the Electronic Control Center 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 ECC dehumidification system in a typical PoolPak™ unit installation. The field wiring diagram, Figure 4-1, shows the location of the connections for the sensors and other required devices. The numbers following the text identifies 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, 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 ECC III 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 standard, single-gang box, mounted horizontally in the wall. Do not use the "through-the-wall" mounting option. 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. Using an "extra deep" box will make it easier to fit the RJ25 cable and jack inside. After the mounting bracket is secured to the wall, connect the RJ25 cable to the jack on the back of the RIU. Slide the RIU onto the bracket until it snaps into place.

An extra RJ25 cable is supplied to allow direct connection of the RIU at the PoolPak™ control panel during service or startup.

OUTSIDE AIR TEMPERATURE AND RELATIVE HUMIDITY SENSOR (2)

The ECC III uses an outside air temperature and humidity sensor to make smart economizer decisions and to prevent air-cooled condenser operation during low ambient conditions.

The sensor should be mounted on the exterior surface of a north-facing surface without exposure to direct sunlight. Wire entry to the sensor terminal box is provided with a compression-type fitting, suitable for cable diameters of 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. **Improper connection may damage the sensor and/or the ECC III control module**. The cable should be four-conductor (two twisted pairs), 16–20 AWG copper.

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

COLD SURFACE TEMPERATURE SENSOR (3)

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.

The sensor should be mounted so it is in direct contact with an exterior door, window, or skylight frame not subject to direct sunlight. Do not mount on a gang box. 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.

SMOKE PURGE INPUT (SR ONLY) (4)

The ECC III 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 ECC III will energize the return fan only and will open the exhaust air damper to 100%, while closing the outside air intake and recirculation dampers to 0%. The compressors will be disabled during this mode, and the RIU will display an alarm message indicating that smoke purge mode has been activated. Using the ECC III configuration menu, it is possible to set this input to be active on open or active on close.

FIRE TRIP INPUT (5)

The ECC III can receive a signal 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 ECC III will shut down the compressors and all unit-mounted fans, and will close the outside air and exhaust air dampers. The RIU will display an alarm message indicating that fire trip mode has been activated. Using the ECC III configuration menu, it is possible to set this input to be active on open or active on close.

OCCUPIED MODE INPUT (6)

The ECC III 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 ECC III internal schedule, it will not override commands sent to the controller via the LonWorks or Modbus RTU interfaces.

PURGE MODE INPUT (SR AND SEP) (7)

The ECC III 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. When activated, the controller will shut down the compressors. During purge mode operation, the ECC III will attempt to maintain space temperature with the auxiliary heating system. If the supply air temperature drops to 40°F, purge mode is automatically terminated to provide freeze protection. Purge mode commands sent to the ECC III through the LonWorks or Modbus RTU interface take precedence over the purge mode input.

REMOTE EXHAUST FAN INTERLOCK (S ONLY) (8)

The ECC III can provide a contact closure to enable a remote exhaust fan. These contacts will close during an occupied time period in the ECC III occupancy schedule. The contacts may be directly connected to an external circuit, provided it is 24 VAC maximum and the current does not exceed 1A inductive.

ALARM OUTPUT (9)

The ECC III 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 24 VAC maximum and the current does not exceed 1A inductive.

AUXILIARY POOL WATER HEATING SYSTEM (10)

The auxiliary pool water heating system is not provided by PoolPak™. The ECC III provides a dry contact closure that signals a need for auxiliary water heating. The contacts may be directly connected to the heater control circuit, provided it is 24 VAC maximum and the current does not exceed 1A inductive. Any other application will require the use of an additional field-provided and installed relay to interface to the heater. The auxiliary heating system must provide its own thermostat, wired in series with the output of the ECC III. Typically, the set point for this thermostat is 2°F above the pool water temperature set point in the ECC III.

AUXILIARY AIR HEATING SYSTEM (11)

The auxiliary heating system is normally factory-installed inside the PoolPak™ unit. In this case, all interface wiring between the ECC III and the heater is factory-installed. If the PoolPak is not equipped with an auxiliary heating option, the ECC III 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 24 VAC maximum and the current does not exceed 1A inductive. The three outputs are energized in order, by number, as heating demands dictate.

SYSTEM 1 REMOTE AIR-COOLED CONDENSER INTERLOCK AND CONTROL (12)

The ECC III monitors terminals T10.1 and T10.2 for 120 VAC from the remote air-cooled condenser. This 120 VAC proof signal indicates that power is on at the remote condenser. The ECC III will not select the mechanical air conditioning mode if the proof signal is inactive. When mechanical air conditioning is selected, a 120 VAC control signal is sent to the remote condenser through terminals T10.3 and T10.4. This signal energizes the fan starters in the ACC.

SYSTEM 2 REMOTE AIR-COOLED CONDENSER INTERLOCK AND CONTROL (13)

The ECC III monitors terminals T11.1 and T11.2 for 120 VAC provided by the remote air-cooled condenser. This 120 VAC proof signal indicates that power is on at the remote condenser. In most cases, a single remote condenser is used for both system 1 and system 2. For this reason, the factory installs jumpers from T10.1 and T10.2 to T11.1 and T11.2, respectively. This allows a single 120 VAC proof signal from the condenser to activate the proof input of both systems. When mechanical air conditioning is selected, a 120 VAC control signal is sent to the remote condenser through terminals T11.3 and T11.4. This signal energizes the fan starters in the ACC.

AUXILIARY AIR HEAT CONTROL VALVE (14)

The ECC III provides an analog signal to control a proportional hot water or steam valve. Normally, the 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.

BUILDING AUTOMATION SYSTEM CONNECTION (15)

The ECC III is capable of direct connection to BACnet IP or MS/TP, LonWorks, or Modbus RTU BAS systems. When equipped with the LonWorks interface, the ECC III 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.

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.

When the ECC III is equipped with the BACnet/IP interface or PoolPak™ RAP, the RJ45 connection is to the serial card port on control module CM1.

Detailed information on BAS interface operation is available on the PoolPak™ website.

MULTI-UNIT NETWORK CONNECTION (MULTI-UNIT INSTALLATIONS ONLY) (16)

The ECC III 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.

SYSTEM 1 REMOTE WATER-COOLED CONDENSER INTERLOCK (IF EQUIPPED) (17)

The ECC III monitors the entering water temperature in the remote water-cooled condenser to ensure it is below 90°F and that there will be adequate water flow to operate in the air cooling mode. Field wiring must be connected in series between the normally closed (open on rise) contacts of the system 1 temperature switch, the nornally open terminals of the flow switch located in the remote water cooled condenser enclosure, and relay 5R, terminals 11 and 14, located on the PoolPak™ control panel. The ECC III will not select the mechanical air conditioning mode if the proof signal is inactive.

SYSTEM 2 REMOTE WATER-COOLED CONDENSER INTERLOCK (IF EQUIPPED) (18)

The ECC III monitors the entering water temperature in the remote water-cooled condenser to ensure it is below 90°F and that there will be adequate water flow to operate in the air cooling mode. Field wiring must be connected in series between the normally closed (open on rise) contacts of the system 1 temperature switch, the normally open terminals of the flow switch located in the remote water cooled condenser enclosure, and relay X5R, terminals 11 and 14, located on the PoolPak™ control panel. The ECC III will not select the mechanical air conditioning mode if the proof signal is inactive.

POOL WATER TEMPERATURE SENSOR (19)

Units that will utilize the Smart Pump Technology to control the PoolPak™ secondary pool water loop pump require the installation of a factory supplied pool water temperature sensor. It must be mounted upstream of the PoolPak™ unit and the auxiliary water heater. The sensor can be threaded directly into a 1/4" FPT fitting. Electrical connections should be made with 22 AWG, copper, 2 conductor, shielded, twisted-pair cable. The wires from the factory-installed pool water temperature sensor must be removed from the bottom of T3, terminals 9 and 10, before connecting the field wires for the remote mounted sensor. Connect the shield drain wire to ground at the PoolPak™ unit end only.

SMART PUMP CONTROL OUTPUT (20)

The ECCIII provides a contact closure to activate the PoolPak™ water loop pump when pool water heating and space cooling are required. The output contacts may be directly connected to an external circuit provided it is 115VAC maximum and less than 1A inductive.

EVENT MODE (21)

The ECCIII provides a contact closure to activate the Event Mode function. During Event Mode, the minimum damper position is raised to a value higher than the minimum damper setpoint. This can be used to temporarily allow dilution of the space air during extremely high pool usage or a large number of spectators.

SUMMER VENT MODE (22)

The ECCIII provides a contact closure to activate the Summer Vent Mode function. This mode is identical to smoke purge, but it does not generate an alarm. The purpose of this mode is to accommodate a facility's desire to draw lots of air through open windows and wall louvers in the summer.

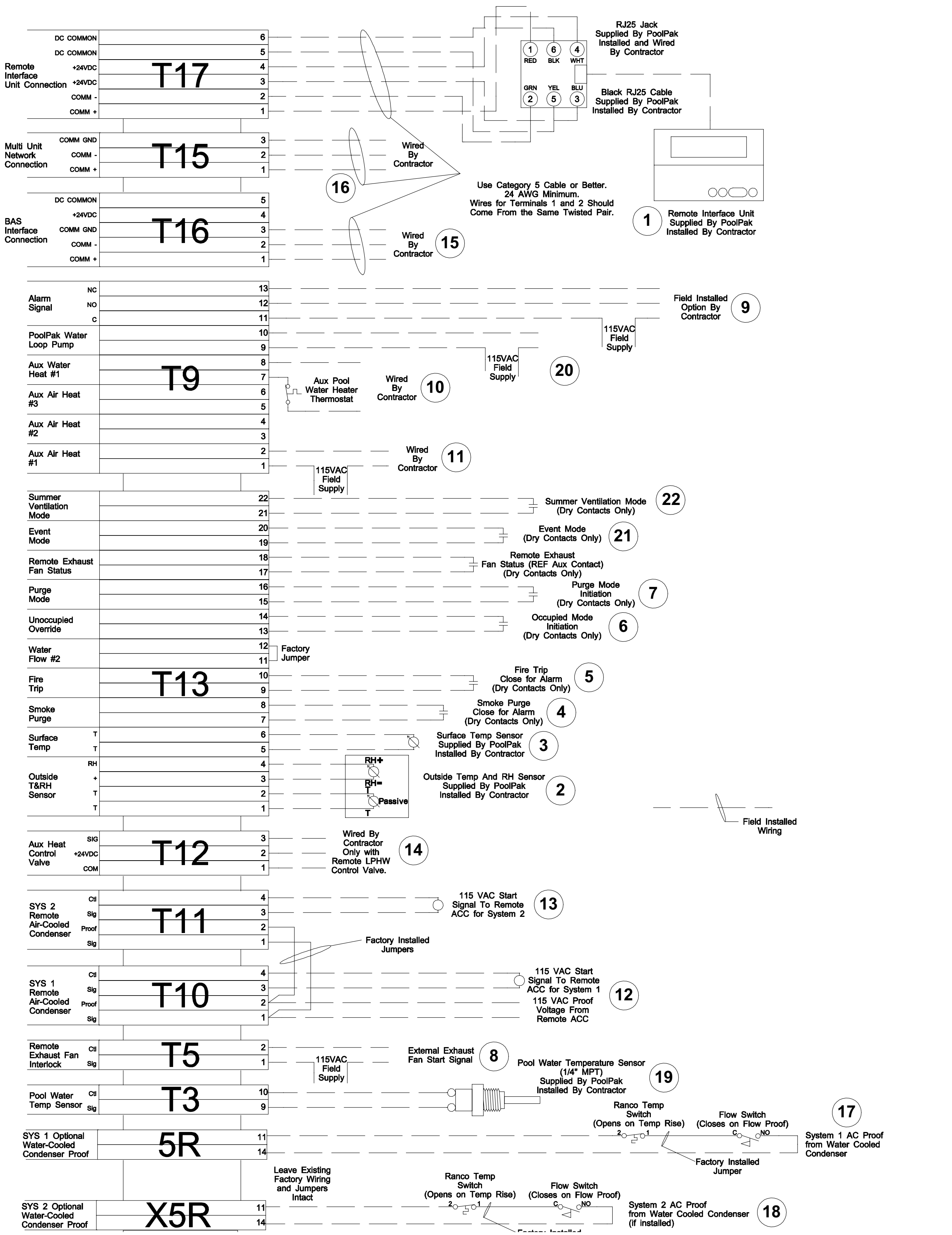
SUPPLY TEMPERATURE SENSOR (NOT SHOWN)

For units with a Jackson and Church furnace, there will be a supply sensor shipped loose in the poolpak control panel. This sensor is to be located in the supply duct at least 10 feet downstream from the unit.

Electrical connections should be made with 22 AWG, copper, 2 conductor, shielded, twisted-pair cable. The wires from the factory-installed temperature sensor must be removed and replaced on terminals 30 and TC2 in the power flame terminal block in the Jackson and Church furnace.

SWHP FIELD WIRING DIAGRAM

Figure 4-1. Field Wiring Diagram



PPK_EG_GR_FieldWiring.eps

POOL WATER PIPING AND INSTALLATION

POOLPAK POOL WATER CIRCULATION LOOP

The PoolPak™ unit pool water condenser (full or partial) must be connected to a secondary circulation loop with its own circulation pump (field-supplied) to obtain the required design water flows. See Figure 4-2 for a typical piping configuration.

The secondary pool water loop supply must come from the main pool water distribution line, downstream of the main pool water pump and the pool filter, before the take off to the auxiliary pool water heater. The discharge from this secondary loop goes back into the primary distribution line downstream of the secondary loop supply and upstream of the auxiliary pool water heater. This location is required so that the PoolPak™ unit will sense the actual pool water temperature.

The secondary circulation loop should be located near the main pool water distribution line on the supply line of the secondary loop feeding the PoolPak™ unit. The pump should be self-priming and vented. The pump should be located at the lowest point possible in this secondary circulation loop. For example, if the PoolPak™ unit is located on a mezzanine and the main pump filter are located in the basement below the mezzanine; the second pump should be located in the basement with the filter, not on the mezzanine with the PoolPak™ unit. Particular attention must be given to venting when the PoolPak™ unit is installed above the level of the main pool water system. When designing a system that has over 20 to 30 feet of vertical rise, the system should be considered to be open (size pump accordingly, assuming no gravitational assistance).

AUXILIARY POOL WATER HEATER (FIELD SUPPLIED)

The auxiliary pool water heater must be installed downstream of the PoolPak™ unit's secondary loop discharge. It is normally installed in its own secondary loop as shown in the figure. The auxiliary pool water heater is controlled by the PoolPak™ System. It is only turned on either when the heat available from the PoolPak™ is insufficient for pool water heating and pool water temperature drops to 1.5°F below set point or when the pool water flow to the PoolPak™ unit is below the minimum required water flow.

MAIN POOL WATER PUMP AND POOLPAK POOL WATER LOOP PUMP INTERLOCKS

The main pool water distribution pump and the PoolPak™ pool water loop pump must each have its own start/stop switch. Wire the main pool water pump's auxiliary contacts in accordance with the manufacturer's specifications and run the wires to the PoolPak™ unit auxiliary pool water loop pump starter. Wire the auxiliary pump so that it operates only when the main pool water pump operates. This interlocking is necessary to prevent overheating and possible damage to the pool water piping and PoolPak™ pool water loop pump.

POOL WATER ISOLATION VALVES

Hand stop valves and pressure gauge stopcocks are factory-installed in the pool water supply and return lines inside the PoolPak™ unit for servicing. A third hand valve (field-supplied) should be installed upstream of the auxiliary pool water pump so that the pump can be isolated for service. A fourth hand valve (field-supplied), installed in the main pool water line between the secondary loop supply and return, is normally required to balance the flow in the PoolPak™ unit secondary loop.

POOL WATER FLOW SWITCH

A pool water loop flow switch is factory-installed in the PoolPak™ unit. The flow switch is factory-calibrated and should not be adjusted. If the flow switch contacts are not closed when water is flowing through the PoolPak™ unit, there may be insufficient water flow. The PoolPak™ unit can be operated with inadequate water flow; however, the PoolPak™ System will not go into a water-heating mode until the water flow switch contacts are closed by sufficient water flow. Refer to Table 3-2 for design pool water flow.

POOL WATER PIPING COMPOSITION

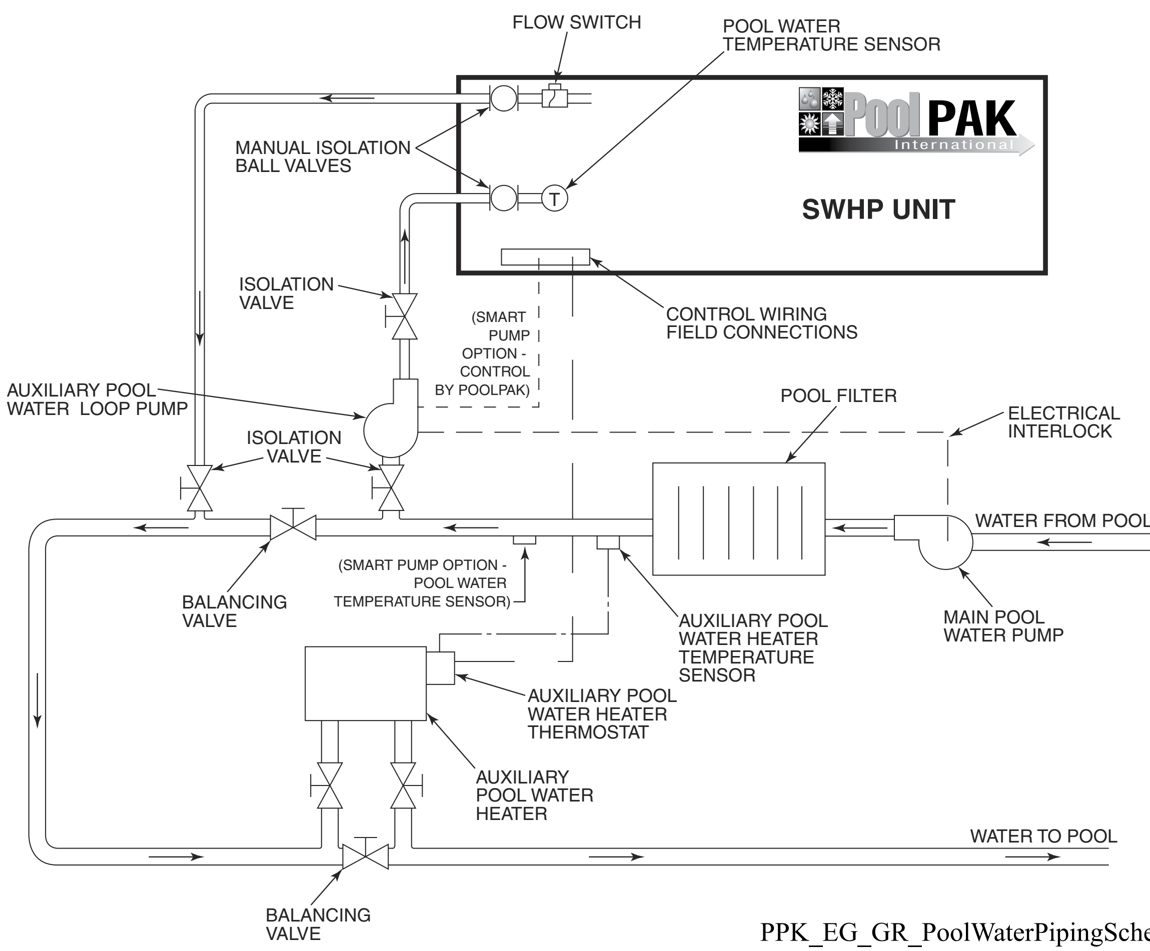
Pipe must be a suitable material such as CPVC Schedule 80 plastic pipe. PVC, copper, iron or steel pipe is **NOT** suitable. It must be kept free of all foreign matter.

FREEZE PROTECTION

Any pool water piping (field-supplied) exposed to outdoor ambient air temperatures must be protected against freezing. Wrap pipes with electric heat tape (follow manufacturer's instructions) controlled by an automatic thermostat and set at a minimum of 35°F. Insulate all piping. Insulation must be sealed at all seams.

NOTE
Power for the field-installed heat tape must be supplied external to the PoolPak unit.

Figure 4-2. Pool Water Piping Schematic



PPK_EG_GR_PoolWaterPipingSchematic.eps

CONDENSATE DRAINS AND PIPING

The drain pans are connected to a common drain system. Connections are available on both sides of the base frame as well as under the unit. The connection underneath the unit comes temporarily plugged from the factory. Field installation of negative pressure condensate drain traps is required using one of these three connections. The non-trapped drain connections must be permanently capped with a suitable PVC plug. See Figure 4-3 for more detail on the sizing and materials of the negative pressure condensate drain trap.

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. Outdoor units also require insulation of all external condensate piping. Insulation must be sealed at all seams.

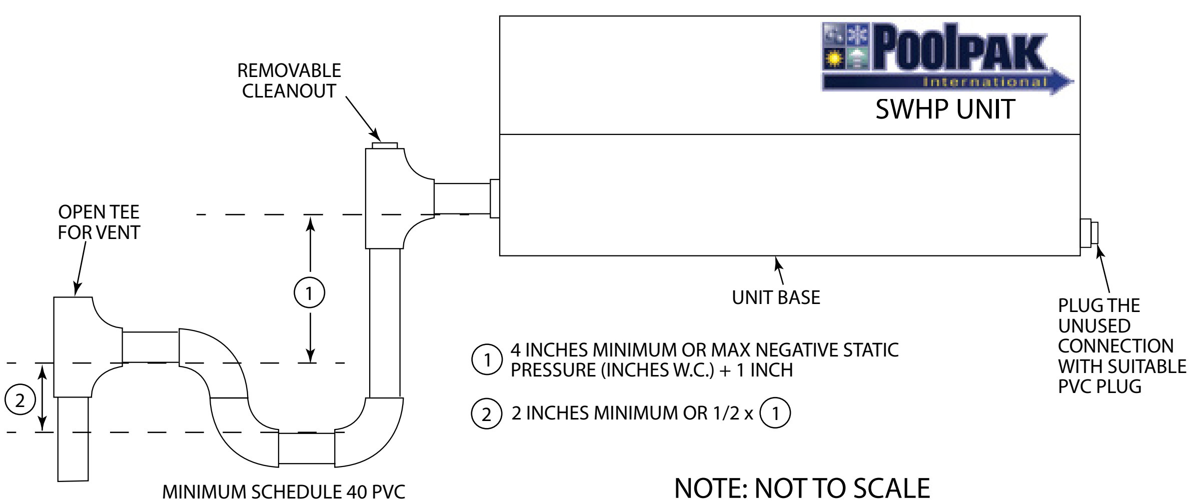
NOTE
Power for heat tape must be supplied external to the PoolPak unit.

If the drain traps are vented to ambient pressure, they can be tied together after trapping and directed towards the nearest roof or floor drain. Provisions **MUST** be made for disposal of condensate as directed by local plumbing code.

⚠CAUTION
If condensate is returned to a closed filter system that does not have a surge tank, care must be taken to ensure free flow of condensate back to the closed filter.

For additional questions or concerns regarding installation of condensate drains, please contact PoolPak™ Service.

Figure 4-3. Negative Pressure Condensate Piping Schematic



SWHP-NegPressCondPiping-20140408.eps

AIR-COOLED CONDENSER INSTALLATION

SPACE AND LOCATION REQUIREMENTS

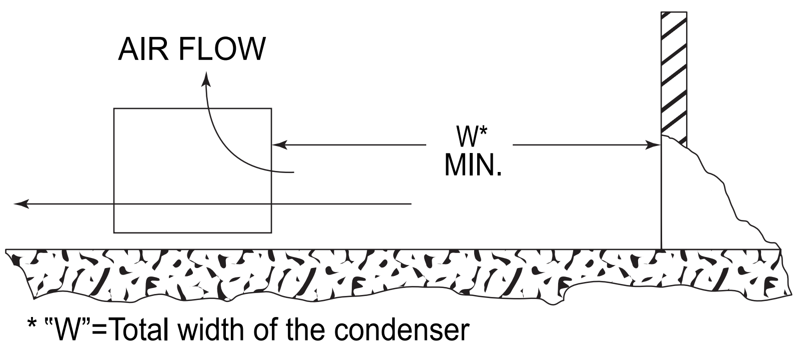
The most important consideration which must be taken into account when deciding upon the locations of air-cooled equipment is the provision for a supply of ambient air to the condenser, and removal of heated air from the condenser area. Where this essential requirement is not adhered to, it will result in higher head pressures, which cause poor operation and possible eventual failure of equipment. Units must not be located in the vicinity of steam, hot air, or fume exhausts.

Another consideration which must be taken is that the unit should be mounted away from noise sensitive spaces and must have adequate support to avoid vibration and noise transmission into the building. Units should be mounted over corridors, utility areas, rest rooms, and other auxiliary areas where high levels of sound are not an important factor. Sound and structural consultants should be retained for recommendations.

Walls or Obstructions

The unit should be located so that air may circulate freely and not be re-circulated. For proper air flow and access all sides of the units should be a minimum of “W” away from any wall or obstruction (see Figure 4-4, Figure 4-5, Figure 4-6, or Figure 4-7). It is preferred that this distance be increased whenever possible. Care should be taken to see that ample room is left for maintenance work through access doors and panels. Overhead obstructions are not permitted. When the unit is in an area where it is enclosed by three walls, the unit must be installed as indicated for units in a pit.

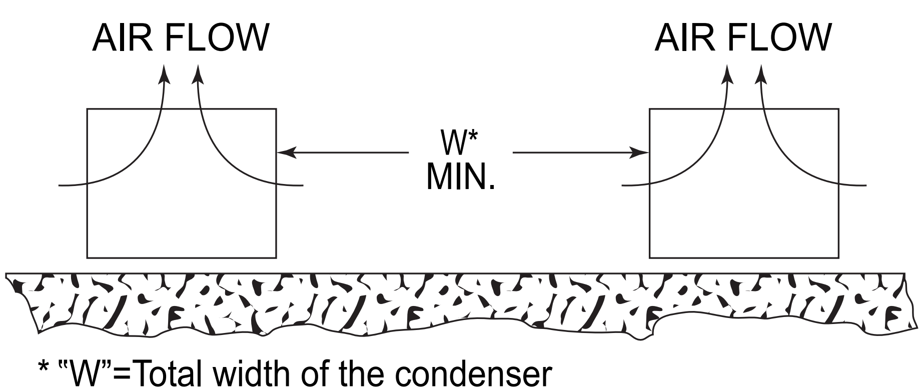
Figure 4-4. Remote ACC Installation Around Walls or Obstructions



Multiple Units

For units placed side by side, the minimum distance between units is the width of the largest unit. If units are placed end to end, the minimum distance between the units is 4 feet.

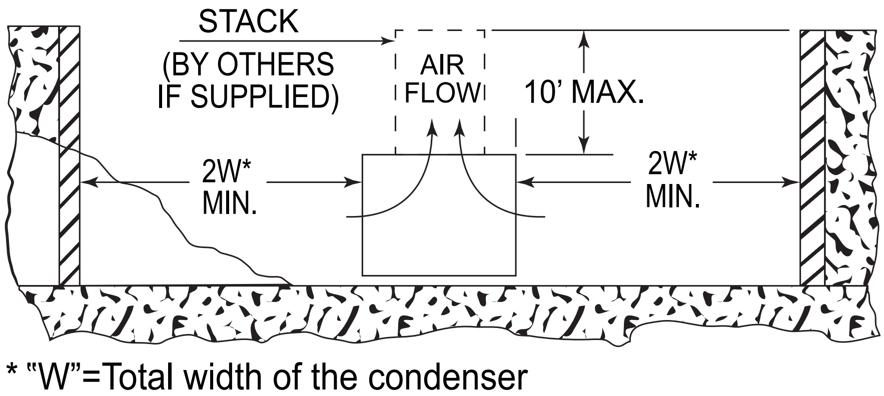
Figure 4-5. Remote ACC Installation When Installing Multiple Units



Units in Pits

The top of the unit should be level with the top of the pit and side distances increased to “2W”. If the top of the units is not level with the top of the pit, discharge cones or stacks must be used to raise discharge air to the top of the pit. This is a minimum requirement.

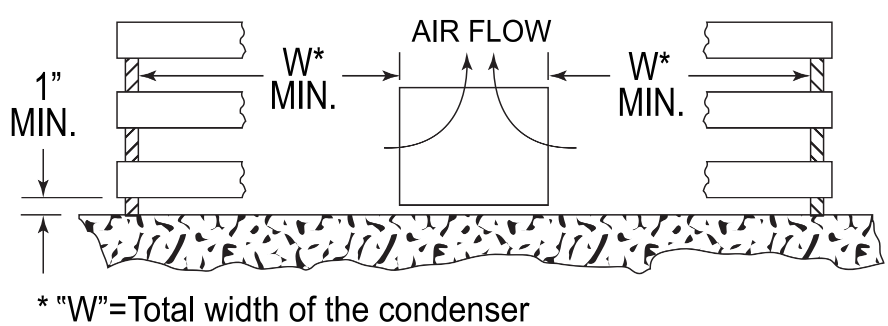
Figure 4-6. Remote ACC Installation When Installing Units in Pits



Decorative Fences

Fences must have 50% free area, with 1 foot undercut, a “W” minimum clearance, and must not exceed the tops of the unit. If these requirements are not met, the unit must be installed as indicated for “Units in Pits”.

Figure 4-7. Remote ACC Installation When Installing Units Near Decorative Fences



FIELD INSTALLED PIPING

Installation of the outdoor air-cooled condenser should only be done by a qualified refrigeration mechanic familiar with this type of work. Many service problems can be avoided by taking adequate precautions to provide an internally clean and dry system and by using procedures and materials that conform to established standards.

Piping Guidelines

The following piping recommendations are intended for use as a general guide. For more complete information, refer to the latest ASHRAE Handbook.

Materials:

- Use clean, dehydrated, refrigeration-grade copper tubing for all refrigerant lines. Hard drawn tubing should be used where no appreciable amount of bending around pipes or obstructions is necessary. If soft copper tubing must be used, care should be taken to avoid sharp bends which may cause restrictions and excessive refrigerant pressure drops.
- Use long radius elbows wherever possible with one exception - short radius elbows should be used for any traps in the hot gas riser.
- Braze all copper to copper joints with a phosphorus-copper alloy material such as Silfos 5 or equivalent. Do not use soft solder.
- During brazing operations flow an inert gas, such as nitrogen, through the lines to prevent internal oxidation scaling and contamination.
- Support refrigeration lines at intervals with suitable hangers, brackets or clamps.
- Pack glass fiber insulation and a sealing material around refrigerant lines, where they penetrate a wall, to reduce vibration and to retain some flexibility.
- The liquid line and discharge line should not be in contact with one another. If the installing contractor must tie these lines together because of an installation requirement, the contractor must insulate them from each other to prevent heat transfer. Because the discharge line is hot during system operation, precautions should be taken to avoid personnel injury.
- PoolPak™ units do not utilize compressors with unloading stages. Consequently, double hot gas risers are not needed for reduced load conditions as refrigerant flow rates will not fall below minimum velocities necessary to carry oil up through the discharge line.
- A field provided, field installed liquid line filter-drier is required in the field piping adjacent to the PoolPak™ unit.

Sizing:

- The lines must be sized and routed so that oil is carried through the system. Using smaller lines than recommended will give excessive pressure drops, resulting in reduced capacity and increased power consumption. Oversized lines could result in an oil flow problem within the system and possible compressor damage.
- Excessive pressure drops in the liquid line may cause flashing of the refrigerant and a loss of a liquid seal at the expansion valve inlet. A reduction in capacity may then occur because the presence of gaseous refrigerant will partially block the expansion valve. Using the hot gas and liquid line sizes recommended in the Air Cooled Condenser section for these units and the proper system refrigerant charge will prevent this problem.
- Discharge lines should be designed to prevent condensed refrigerant and oil from draining back to the compressor during OFF cycles. Use the following guidelines:
  - The highest point in the discharge line should be above the highest point in the condenser coil. (See Figure 4-8)
  - The hot gas line should loop toward the floor if the condenser is located above the PoolPak™ unit, especially if the hot gas riser is long.
- For refrigerant line sizing for an Air Cooled Condenser (ACC) where the lineset length is less than 100 feet or the ACC location is less than 50 feet higher or 20 feet lower than the unit, use the below Table 4-1.
- **ACC line lengths beyond the above limits will void warranty unless written approval is obtained from the factory PRIOR to installation and startup.**

Table 4-1. Pipe Sizes for Remote Refrigerant Condensers

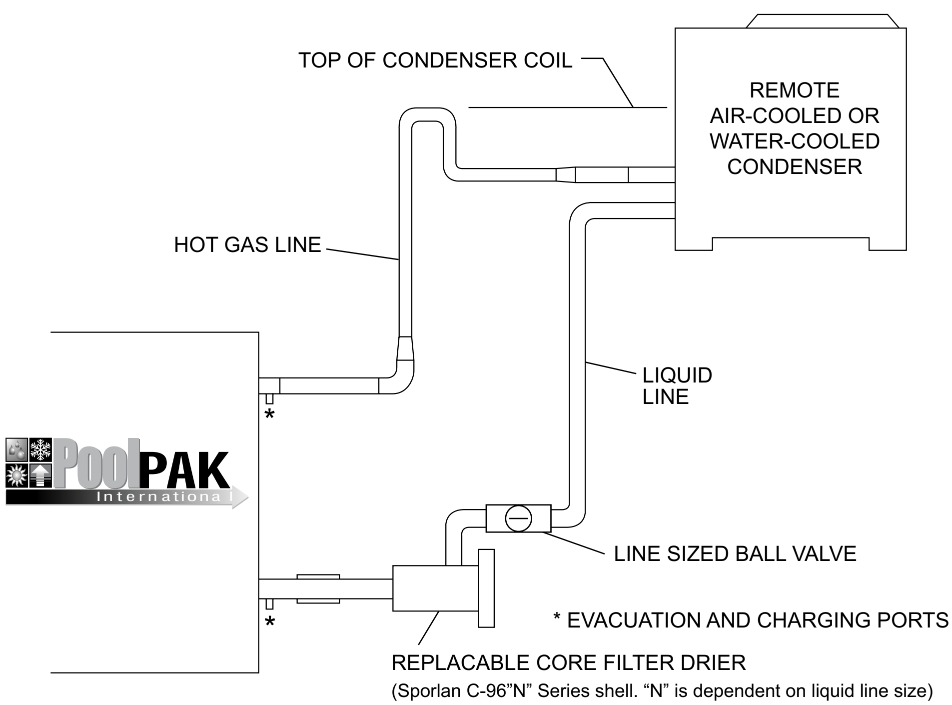
Model[1]	Hot Gas Lines[2]		Liquid Lines[2]
	Horizontal Run	Vertical Riser	
0060	1-3/8	1-3/8	7/8
0080	1-3/8	1-3/8	1-1/8
0100	1-5/8	1-5/8	1-1/8
0120	1-5/8	1-5/8	1-3/8
0140	2-1/8	1-5/8	1-3/8
0190	2-1/8	1-5/8	1-3/8
0220	1-5/8	1-5/8	1-1/8
0260	1-5/8	1-5/8	1-3/8
0300	2-1/8	1-5/8	1-3/8
0340	2-1/8	1-5/8	1-3/8

[1] Models 220, 260, 300, 340 have two refrigeration circuits piped independently.

[2] All pipe diameters are nominal OD inch sizes. Use only certified refrigeration tubing.

WARNING!
Above chart is for lineset length less than 100 ft and ACC located less than 50ft above unit or 20ft below unit. Failures due to a piping layout not within these limits nor receiving prior PoolPak Factory approval will not be covered under PoolPak™ warranty.

Figure 4-8. Remote ACC Above Unit



Refrigerant and Oil Charging:

- PoolPak™ units are shipped with the required charge for self contained operation only. The remote ACC option does NOT provide the refrigerant charge or oil required for the ACC and line sets.
- Refer to the below remote ACC and line size charging charts to calculate the additional charge required.
- For the additional oil required, multiply 2% by the total additional refrigerant charge (ACC and lineset length).
  - For Copeland compressors, use Copeland Ultra 32 CC POE refrigeration oil.
  - For Bitzer compressors, use Idemitsu FVC32D PVE refrigeration oil.
- Contact Factory for additional help or verifying the additional refrigerant charge.

Table 4-2. Remote ACC Refrigerant (R-410A) Charge

ACC Model	Single Circuit	ACC Model	Two Circuits - per circuit
ACC0273	8.4	ACC0734	12.2
ACC0333	12.6	ACC0864	16.8
ACC0363	12.6	ACC0994	18.5
ACC0433	16.8	ACC1094	18.5
ACC0453	16.8	ACC1184	24.4
ACC0493	18.5	ACC1294	24.4
ACC0523	18.5	ACC1374	24.4
ACC0553	18.5	ACC1464	43.8
ACC0593	25.3	ACC1564	43.8
ACC0623	25.3	ACC1654	43.8
ACC0663	24.4	ACC1824	58.9
ACC0683	25.3	ACC1924	58.9
ACC0733	24.4	ACC1974	53.9
ACC0773	24.4	ACC2444	72.4
ACC0863	33.7	ACC2934	85.9
ACC0923	33.7		
ACC0963	33.7		
ACC1163	37.0		
ACC1373	48.8		
ACC1813	117.8		

Table 4-3. Refrigerant (R-410A) Charge for Different Line Sizes

Tube OD (in)	Wall thickness (in)	Tubing Type	Discharge[1] lb/ft	Liquid[1] lb/ft
7/8	0.045	L	0.021	0.192
1 1/8	0.05	L	0.036	0.327
1 3/8	0.055	L	0.055	0.499
1 5/8	0.072	K	0.076	0.684
2 1/8	0.083	K	0.133	1.196

[1] Based on 120 F saturated condensing temperature.

WARNING!

Above chart is for lineset length less than 100 ft and ACC located less than 50ft above unit or 20ft below unit. Failures due to a piping layout not within these limits nor receiving prior PoolPak. Factory approval will not be covered under PoolPak™ warranty.

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SECTION V: OPERATION

The below is a summary of PoolPak™ operation, service, and maintenance features of the PoolPak™ SWHP unit and controller. For complete detail, refer to the PoolPak™ SWHP Installation and Operation Manual that can be found on the PoolPak™ website.

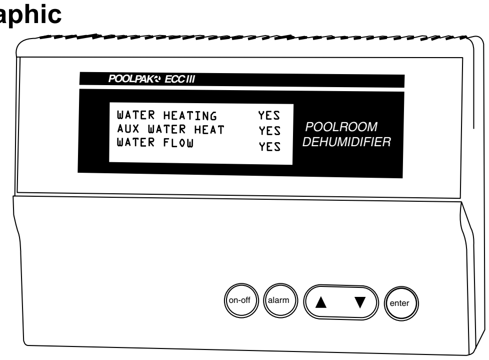
REMOTE INTERFACE UNIT (RIU)

The PoolPak™ ECC III control system includes a Remote Interface Unit (RIU) display/keypad panel that can be located remotely from the unit for the convenience of the owner. A standard three-line telephone jack connects to the control system at terminal block T17 using a six-wire cable. The RIU connects to this telephone jack using the special RJ-25 cable supplied.

Normally, the Remote Interface Unit (RIU) will automatically rotate between four different screens to display the status of the system. Pressing the HOLD/ROTATE key will stop the automatic screen rotation and will hold the presently-displayed screen. After a 10-minute delay, the screens will resume normal rotation. The user may also turn off the hold function before the delay terminates by pressing the HOLD/ROTATE key a second time.

Four set points, Space Temperature, Space Relative Humidity, Pool Water Temperature 1 and Pool Water Temperature 2, can be accessed through the RIU. To change a set point, press the corresponding set point key.

Figure 5-1. Remote Interface Unit Graphic



PPK_All_ECCIII_RIU outline dwg 20100316.eps

SERVICE DISPLAY CONNECTION

For service convenience, there is an auxiliary RJ-25 jack located on the upper left side of ECC III 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.

Extensive troubleshooting features accessible from the RIU are described in the troubleshooting section.

MULTIPLE UNIT INTERFACING

When there is more than one PoolPak™ unit installed at a single site, the units should be connected together. This is necessary so that each PoolPak™ unit can be coordinated. It also allows the owner to access PoolPak™ operational information for all the units from a single location.

BUILDING AUTOMATION SYSTEM (BAS) CONNECTION

The PoolPak™ ECC III control system provides four optional Building Automation System (BAS) connection types; LonWorks, Modbus RTU, BACnet/IP, or BACnet MS/TP. When the optional Remote Access Package (RAP) is installed, BACnet/IP is the only option available.

When the ECC III is equipped with the BACnet/IP interface, the RJ45 connection is to the serial card port on control module CM1. All other interface options are connected to terminal block T16 in the main control panel.

POOLPAK REMOTE ACCESS PACKAGE (RAP)

The PoolPak™ Remote Access Package (RAP) is a stand-alone communication system. The system runs an embedded web server over an IEEE 802.3 10/100 BaseT Ethernet. The web server operates on TCP/IP port 80, the Internet default for web traffic. The web server port is configurable. The RAP can be accessed from either an internal network or the Internet. IP addresses and ports must be routed to the RAP for access via the Internet. Virtual Private Network Connections (VPN) to the RAP will not be supported.

SEND EMAILS – ALERTS FOR ALARMS

When a critical alarm occurs with the PoolPak™ unit, the RAP will send an email to the PoolPak™ Service Department, via a mail server maintained by PoolPak™.

ECC III NETWORK OPERATION

ECC III networking allows up to five PoolPak™ units to be connected together over a proprietary, private network. The units will work with each other to control water temperature, air temperature and relative humidity. Networked PoolPak™ units have all the features of standard PoolPak™ units plus the ability to control water temperature in multiple pools. All units on the network are accessible from any RIU (Remote Interface Unit) on the network. Refer to the Multiple Unit Interface diagram in the wiring section of this manual for multiple PoolPak unit field communication loop connections.

Networked ECC III units operate in a master/slave environment. This means that the fuzzy logic engine in one unit (master) determines heating, cooling and dehumidification requirements and broadcasts them over the network to the other units (slaves). 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 (i.e., heating or cooling). Slight discrepancies in damper position and number of stages active are normal. This is caused by slight sensor calibration differences among the units.

Each networked unit contains all sensors and controls necessary for independent operation and is capable of acting in the master role. Units on the network are identified by an address of one to five. The unit with the lowest address having no un-cleared alarms will be the master unit. If an alarm condition occurs in the master unit, it will give up the role of master. The unit with the next lowest address and no un-cleared alarms will take over the master role. The unit that experienced the alarm condition will operate in the slave role until the alarm is cleared at the RIU. In the unlikely event that all units have un-cleared alarms, they will each act individually.

A single RIU can be used to monitor all units on the network. Indicator lights beside Roman numeral buttons I through V indicate which unit is being displayed. The next unit in line can be selected by pressing the V button. If an alarm condition occurs in a unit, the corresponding light will flash and the RIU will automatically switch to the unit with the alarm. The light will continue to flash even if the RIU is displaying another unit.

For the standard configuration, all set points can be changed while the RIU is displaying any unit. The set point is automatically updated in every unit on the network. Other configurations may require the RIU to be displaying a particular unit to change the set point.

The RIU provides two network status screens. They can be accessed through the status menu accessed with key III. The first screen displays the status of units one through five as ONLINE or OFFLINE. Use this screen to verify that all units on the network are connected and communicating with each other. The second screen displays network information for the unit that is being displayed by the RIU, including network role, connection status, and network address.

CM1 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 I/O 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 I/O addresses 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 CONFIGURATION

The RIU network address is set by pressing the UP, DOWN, and ENTER buttons simultaneously and holding them down for approximately 5 seconds. The display will show "Display address setting". Press the ENTER to move the cursor to the current address field. Use the UP and DOWN buttons to change the address to either 10, 11, or 12 and press ENTER.

To configure the ECC III RIU addresses, press the UP, DOWN, and ENTER buttons simultaneously and hold them down for approximately 5 seconds. The display will show "Display address setting". Press the ENTER four times to move the cursor past the screens showing "Display address setting", "I/O Board address" and "Terminal config Press ENTER 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.

NETWORK CONFIGURATION

Using the following parameters, it is possible to configure the ECC III network to accommodate a wide variety of installation options. Press the I key to access these parameters on the configuration menu. These parameters must be set in each unit individually. Default values are shown in bold type.

Network Ctl - No (Yes or No)

Determines whether the unit will participate in the master/slave environment. Setting this parameter to **No** will cause the unit to act like a standard single ECC III unit. This unit will never become the master on the network and will not listen to the control variables broadcast by the master. Although units with this parameter set to **No** do not participate in the master/slave environment, they are still accessible through any network RIU. Like **Local** pool water control, this parameter, when set to **No**, requires this unit to be displayed on the RIU before changing any of the set points.

Water Temp Ctl - Local (Local or Net)

Determines whether the unit will control water temperature based on the master's command (Net) or its own temperature sensor(s) and set points (**Local**). If a unit set to **Local** becomes the master, other units in the network will not use the master's command for water heating. Instead, they will look at the next unit in line that is not set to **Local**. This parameter is set to **Local** only if the unit is connected to a different pool than the rest of the units on the network. Because the unit is controlling water temperature on its own, it is necessary to select the correct unit with the RIU before changing the water temperature set point.

CHANGING NETWORK SET POINTS

Each unit on the network maintains two groups of set points: network and local. If a unit has the Network Ctl parameter set to Yes and the Water Temp Ctl parameter set to Net, it will control to the network set points. Set points changed when the RIU is displaying this unit will be changed in every unit on the network with the same Network Ctl and Water Temp Ctl parameters. Units that are configured for Network Ctl and Local Water Temp Ctl will use the local water temperature, set point and the network air temperature and relative humidity set points. The water temperature set point will only be changed in the unit currently being displayed by the RIU. Units that are not configured for Network Control will use all local set points. Therefore, any set points changed while the control panel is displaying this unit will be changed only in this unit.

ECC III SERVICE TROUBLESHOOTING

TROUBLESHOOTING OVERVIEW

When properly installed according to the instructions in this manual, the PoolPak™ ECC III control system will perform as designed and will provide a pool environment that is both comfortable and cost effective. However, in the unlikely event that the system does not function properly, the ECC III has many features that will help a service technician resolve the issue.

The PoolPak™ has numerous safety devices designed to protect the system from failures. The compressor(s) will be shut down when any of the following occur:

- High Refrigerant Pressure
- Low Refrigerant Pressure
- High Compressor Motor Temperature
- Low Compressor Oil Pressure
- Fan Motors Not Operating
- Compressor Motor Overload
- Space Temperature Out of Range

Additionally, the compressor and/or fan motors will be shut down when a fire control system alerts the ECC III that a fire trip or smoke purge mode of operation is required.

Whenever a fault condition occurs, the alarm button on the RIU and CM1 will glow red and the displays will show the fault condition and a recommended course of action. After 10 compressor-related faults occur, the affected compressor system will be locked out for protection. Repetitive faults can cause compressor motor failure. When a compressor fault condition exists, it must be diagnosed and corrected before resetting the system.

After a fault has been eliminated, the control panel alarm light will remain lit. However, the alarm will no longer be shown in the normal status screen rotation. Pressing the alarm key will show any faults that have occurred since the alarm light was reset.

ALARM RESET

To reset the alarm light, press and hold key VI and then press the ALARM button. If there are currently no active fault conditions, the alarm light will go off. The alarm contact closure output of the controller operates in conjunction with the alarm light on the RIU and CM1. To reset the alarm light using the keypad on CM1, press ALARM and ESC at the same time.

The following fault conditions are detected by the ECC III control system:

Supply Fan Not Running

The controller has detected that the supply fan motor is not running even though the digital output for the contactor is energized. This condition is detected by the current transducer for the supply fan motor. The most likely cause is a motor overload condition that caused the motor protector to trip or a damper feedback issue.

Return Fan Not Running (SR only)

The controller has detected that the return fan motor is not running even though the digital output for the contactor is energized. This condition is detected by the current transducer for the return fan motor. The most likely cause is a motor overload condition that caused the motor protector to trip or a damper feedback issue.

Fire Trip Active

An external fire control system has requested fire trip operation by sending a signal to the PoolPak™ unit Fire Trip terminals.

Smoke Purge Active

An external control has requested smoke purge operation by sending a contact closure to the PoolPak™ unit Smoke Purge terminals.

Return Air Temperature Out of Range

The return air temperature is outside of the safe operating range (60°F to 105°F dry bulb, <55°F wet bulb) for the compressor(s). If the space temperature is close to the set point, the most likely cause of this alarm is a defective return air temperature sensor.

Supply and Return Fans Not Running

The controller has detected that both fan motors (SR) are not running even though the appropriate digital outputs are energized. The most likely cause is the motor protectors have been set to the OFF position or a damper feedback issue.

Freeze Danger, Low Supply Air Temperature

The supply air temperature measured by the controller is less than 40°F. This condition can potentially damage a hot water or steam coil. The ECC III will close the outside and exhaust air dampers in an attempt to protect the non-functioning coil. The most likely cause of this condition is a failure of the auxiliary heat source (e.g., hot water pump or valve) or a bad outside air damper or acuator.

Low Compressor Oil Pressure (Recip Compressors only)

The oil pressure monitor on the compressor has detected insufficient oil pressure for 2 minutes. The ECC III will shut down the affected compressor. The most likely cause of this condition is loss of power during compressor operation.

High Compressor Motor Temperature

The controller has detected that the temperature of the compressor motor winding is too high or the compressor motor is drawing too much current based on the compressor overload detection device(s).

High Refrigerant Pressure

The controller has detected that the compressor is not running even though the digital output for the compressor contactor is energized. This condition is detected with the current transducer for the compressor motor. The most likely cause is the high-pressure safety switch is open. The switch opens if the discharge pressure exceeds 585 psig on R-410A units. The most likely cause of this condition is insufficient airflow caused by dirty filters or loose belts.

Low Refrigerant Pressure

The controller has detected that the low-pressure safety switch is open. The switch opens if the suction pressure drops below 45 psig on R-410A units. The most likely cause is insufficient evaporator airflow caused by dirty filters or loose belts.

Compressor Current Transducer Failed

The controller has detected that the current transducer for the compressor has failed. Compressor operation will be disabled to prevent repetitive high pressure faults. The most likely cause of this fault is a defective compressor motor current transducer.

10 Fault Compressor Lockout

Ten compressor faults have occurred since the unit was last reset. This condition indicates that a repetitive compressor fault is present. See the history log to determine the mode of operation to assist in determining the cause of the lockout.

Sensor Failure (All Sensors)

The controller has detected that the value of a system sensor is outside of the expected range. The alarm screen will show which sensor has failed. The most likely cause is a defective sensor.

Expansion Board Comm Failure

The main control module CM1 is unable to communicate with the expansion card, CM2. The most likely cause is a blown fuse on the control module CM2.

FAULT HISTORY LOG

To assist in troubleshooting, the ECC III maintains a log of the 50 most recent faults. The log contains the date and time of occurrence, along with the fault code and a snapshot of system conditions at the time of the fault.

The fault history log is accessed from the System Status Information menu. Press the III key to access the menu and then press the UP arrow key until the fault history screens are displayed. There are two screens on SWHP60-190 units and a third screen on SWHP220-340 models.

Each fault in the log is assigned a number from 1 to 50. Fault number 1 is the most recent and 50 is the oldest. To cycle through the list of faults, move the cursor to the fault number on any of the fault history screens and then press ENTER. Use the UP and DOWN arrow keys to cycle through the fault history screens one at a time. To go to the next fault, repeat these steps.

All fault history screens display the following parameters:

Date @ Time - Date and time the fault occurred. The date is in MMDD format. The time is in 24-hour format, HHMM.

FC: - Code number assigned to the fault. The codes are as follows:

2 - Power Restored
3 - Return Fan Motor Not Running
4 - Supply Fan Motor Not Running
5 - Fire Trip Active
6 - Smoke Purge Active
7 - Space Temperature Out of Range (<60°F to >105°F dry bulb, <55°F wet bulb)
8 - Supply and Return Fan Motors Not Running
9 - Supply Temperature Less than 40°F
11 - Low Oil Pressure in Compressor System 1
13 - Low Refrigerant Pressure in Compressor System 1
14 - High Motor Temperature in Compressor System 1
15 - High Refrigerant Pressure in Compressor System 1
16 - Current Transducer Failure Compressor System 1
17 - Crankcase Heater Breaker Off on Compressor System 1
50 - 10 Fault Lockout of Compressor System 1
111 -Low Oil Pressure in Compressor System 2
113 - Low Refrigerant Pressure in Compressor System 2
114 - High Motor Temperature in Compressor System 2
115 - High Refrigerant Pressure in Compressor System 2

116 - Current Transducer Failure Compressor System 2
117 - Crankcase Heater Breaker Off on Compressor System 2
150 - 10 Fault Lockout of Compressor System 2

Fault history screen 1 also displays the following parameters:

T: - Return air temperature at the time the fault occurred.
RH: - Return air relative humidity at the time the fault occurred.
OT: - Outside air temperature at the time the fault occurred.
DP: - Outside air damper position at the time the fault occurred.
C1: - Compressor System 1 Mode at the time the fault occurred. The codes are as follows:
  0 - Off
  1 - Air Heating
  3 - Water Heating
  4 - Air Cooling
C2: - Compressor System 2 Mode at the time the fault occurred. The codes are the same as C1.
S1: - Compressor System 1 stages active at the time the fault occurred.
S2: - Compressor System 2 stages active at the time the fault occurred.
ST: - Supply air temperature at the time the fault occurred.

Fault history screen 2 also displays the following parameters:

SS1 – System Status 1. Factory use.
DP1 – Compressor System 1 Discharge Pressure
SS2 – System Status 2. Factory use.
SP1 – Compressor System 1 Suction Pressure
ST1 – Compressor System 1 Suction Temperature
LT1 – Compressor System 1 Liquid Temperature

Fault history screen 3 also displays the following parameters: (SWHP220-340 only)

SS1 – System Status 1. Factory use.
DP1 – Compressor System 1 Discharge Pressure
SS2 – System Status 2. Factory use.
SP2 – Compressor System 2 Suction Pressure
ST2 – Compressor System 2 Suction Temperature
LT2 – Compressor System 2 Liquid Temperature

MANUAL CONTROL

The ECC III contains an enhanced manual control mode for improved troubleshooting efficiency. This allows a qualified HVAC service technician to manually control all digital and analog outputs.

Digital Output

Each digital output of the ECC III 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 ECC III. 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 following manual digital output parameters are available:

- Sply Fan Outp - Supply Fan Contactor
- Rtn Fan Output - Return Fan Contactor Aux Air 1
- Output - Auxiliary Air Heating Stage 1 Relay
- Aux Air 2 Output - Auxiliary Air Heating Stage 2 Relay
- Aux Air 3 Output - Auxiliary Air Heating Stage 3 Relay
- Aux Wtr 1 Output - Auxiliary Water Heating 1 Relay
- Aux Wtr 2 Output - Auxiliary Water Heating 2 Relay
- Alarm Output - Alarm Output Relay
- S1 Cmpr 1 Output - Compressor 1A Contactor (Scrolls); Sys 1 Compressor Contactor (Recip)
- S1 Cmpr 2 Output - Compressor 1B Contactor (Scrolls); Sys 1 Stage 2 Unloader (Recip)
- S1 Cmpr 3 Output - Compressor 1C Contactor (Scrolls); Sys 1 Stage 3 Unloader (Recip)
- S1 AC Sol Output - System 1 AC Solenoid Valve
- S1 Liq #1 Output - System 1 Liquid Solenoid Valve 1
- S1 Liq #2 Output - System 1 Liquid Solenoid Valve 2
- S1 Wtr Sl Output - System 1 Water Heating Solenoid Valve
- S1 Reh 1 Output - System 1 Air Reheat Solenoid Valve 1
- S1 Reh 2 Output - System 1 Air Reheat Solenoid Valve 2
- S1 RH Sft Strt - System 1 Air Reheat Solenoid Valve 4
- S2 Cmpr 1 Output - Compressor 2A Contactor (Scrolls); Sys 2 Compressor Contactor (Recip)
- S2 Cmpr 2 Output - Compressor 2B Contactor (Scrolls); Sys 2 Stage 2 Unloader (Recip)
- S2 AC Sol Output - System 2 AC Solenoid Valve
- S2 Liq #1 Output - System 2 Liquid #1 Solenoid Valve
- S2 Liq #2 Output - System 2 Liquid #2 Solenoid Valve
- S2 Wtr Sl Output - System 2 Water Heating Solenoid Valve
- S2 Reh 1 Output - System 2 Air Reheat Solenoid Valve 1
- S2 Reh 2 Output - System 2 Air Reheat Solenoid Valve 2
- Exh Fan Output - Exhaust Fan Contactor
- Spl 1 Dig Output - Special Option Digital Output Relay 1
- Spl 2 Dig Output - Special Option Digital Output Relay 2
- S2 RH Sft Strt - System 2 Air Reheat Solenoid Valve 4
- S2 Cmpr 3 Output - Compressor 2C Contactor (Scrolls); Sys 2 Stage 3 Unloader (Recip)

Analog Output

Each analog output of the ECC III may be controlled individually by setting the corresponding parameter. The following analog output parameters are available:

- Exh Dpr Pos - Exhaust Air Damper Actuator Position
- Rcrc Dpr Pos - Recirculation Air Damper Actuator Position
- Outs Dpr Pos - Outside Air Damper Actuator Position
- AuxAirHtSig - Auxiliary Air Heating Control Valve Position
- Spl1AlgOut - Special Option Analog Output 1
- Spl2AlgOut - Special Option Analog Output 2
- Spl3AlgOut - Special Option Analog Output 3
- Spl4AlgOut - Special Option Analog Output 4

SYSTEM STATUS INFORMATION—III KEY (ESC + DOWN ON CM1'S KEYPAD)

The following system status information is available from the RIU:

01. Day Of Week - Occupancy Status - Date
02. Time - Time of Day in 24 hour format
03. Spc Air T - Space Air Temperature
04. Spc RH % - Space Relative Humidity
05. PoolWtr 1 - Pool Water Temperature 1
06. PoolWtr 2 - Pool Water Temperature 2
07. Outside T - Outside Air Temperature
08. Outside % - Outside Air Relative Humidity
09. Damper Pos - Outside Air Damper Position (SR only)
10. Compr #1 - System 1 Compressor Status
11. Compr Avl #1 - System 1 Compressor Anticycle Timer Status
12. Low Press #1 - System 1 Low Pressure Cutout Status
13. Hi Press #1 - System 1 High Pressure Cutout Status
14. Oil Press #1 - Sys 1 Compressor Oil Pressure Status (Recip Only)
15. Motor T #1 - Sys 1 Compressor Motor Temperature Cutout Status
16. Operation #1 - System 1 Compressor Control Switch Status
17. Stages #1 - System 1 Compressor Stages Active
18. Curr Flt #1 - System 1 Current Compressor Fault Code
19. Last Flt #1 - System 1 Last Compressor Fault Code
20. Compr #2 - System 2 Compressor Status
21. Compr Avl #2 - System 2 Compressor Anticycle Timer Status
22. Low Press #2 - System 2 Low Pressure Cutout Status
23. Hi Press #2 - System 2 High Pressure Cutout Status
24. Oil Press #2 - Sys 2 Compressor Oil Pressure Status (Recip Only)
25. Motor T #2 - Sys 2 Compressor Motor Temperature Cutout Status
26. Operation #2 - System 2 Compressor Control Switch Status
27. Stages #2 - System 2 Compressor Stages Active
28. Curr Flt #2 - System 2 Current Compressor Fault Code
29. Last Flt #2 - System 2 Last Compressor Fault Code
30. Supply Fan - Supply Fan Motor Status
31. Return Fan - Return Fan Motor Status (SR) Purge Fan Motor Status (SEP)
32. Smoke Purge - Smoke Purge Input Status
33. Fire Trip - Fire Trip Input Status
34. Surface T - Surface Temperature
35. Supply T - Supply Air Temperature
36. Pool Pump Outp - Pool Pump Status
37. Wtr #1 Need - Pool 1 Water Heating Requirement
38. Wtr #2 Need - Pool 2 Water Heating Requirement
39. Wtr Flow #1 - System 1 Pool Water Flow Switch Status
40. Wtr Flow #2 - System 2 Pool Water Flow Switch Status
41. Off Evap - Air Leaving Evaporator Temperature (SR only)
42. Off Evap % - Air Leaving Evaporator Relative Humidity (SR only)
43. AOE Dpt - Air Leaving Evaporator Dewpoint Temperature (SR only)
44. Space Dpt - Space Dewpoint Temperature
45. Outs Dpt - Outside Air Dewpoint Temperature
46. Ht/Cool Need - Current Space Heating and Cooling Requirements
47. Dehumid Need - Current Space Dehumidification Requirements
48. Stages - Compressor Stages Running
49. Version -ECC III Control Module 1 Software Version Number

104. Purge - Purge Mode Status (SR, SEP only)
CM2 Ver - ECC Control Module 2 Software Version Number
CM3 - ECC Control Module 3 Software Version Number
CM4 - ECC Control Module 4 Software Version Number
CM5 - ECC Control Module 5 Software Version Number
124. ACC #1 Stat - System 1 Air Cooled Condenser Status
125. ACC #2 Stat - System 2 Air Cooled Condenser Status
140. Cpr 1 Mode - System 1 Mode of Operation
141. Cpr 2 Mode - System 2 Mode of Operation
142. Occ_Flag - Occupancy Mode
170. Fault Cnt 1 - System 1 Compressor Fault Count Since Last Reset
171. Fault Cnt 2 - System 2 Compressor Fault Count Since Last Reset
172. Exh Dpr - Actual Exhaust or Purge Air Damper Position
173. Rcrc Dpr - Actual Recirculation or Bypass air Damper Position
174. Outs Dpr - Actual Outside Air Damper Position
175. Des Dpr - Desired Outside Air Damper Position (SR only)
176. Min D Alw - Minimum Damper Position Setpoint (SR only)
177. Max D Alw - Maximum Damper Position Setpoint (SR only)
178. Economiz - Economizer Status (SR & SEP only)
180. Aux Air Ht - Auxiliary Air Heating Stages Active
181. Aux Wtr 1 - Pool 1 Auxiliary Water Heater Status
182. Aux Wtr 2 - Pool 2 Auxiliary Water Heater Status
183. Flywhl Act - Flywheel Cooling Status
184. Cpr1 Remain - System 1 Anticycle Time Remaining
185. Cpr2 Remain - System 2 Anticycle Time Remaining

Sply Fan Curr - Supply Fan Motor Current
Rtn Fan Curr - Return Fan Motor Current (SR only)
Cmpr 1 Curr - System 1 Compressor Current
Cmpr 2 Curr - System 2 Compressor Current

Dpr Limit Code - Damper Position Limit Code (SR only)

FzyDprChg - Fuzzy Logic Mixing Box Control Output (SR only) 0.0 - 150.0
FzyRatCprChg - Fuzzy Logic Space Temperature Control Variable 0.0 - 200.0
FzyDptCprChg - Fuzzy Logic Dew Point Control Variable 0.0 - 200.0
SF Econo Actv – Single Fan Economizer Active? (SEP only)
Network Unit Status – Displays if unit ID 1-5 are ONLINE or OFFLINE. (Network installations only)
Network Role – Displays if the unit is operating in the master or slave role. (Network installations only)
Unit ID Number – Read only. Displays the unit ID that is currently displayed (1-5)

Run time information – The ECCIII records the number of run hours for the following components or modes: Supply Fan, Return Fan, Compressor 1A, 1B, 1C, System 1 Reheat Mode, System 1 Air Cooling Mode, System 1 Water Heat Mode, Compressor 2A, 2B, 2C, System 2 Reheat Mode, System 2 Air Cooling Mode, System 2 Water Heat Mode, Economizer Mode, Smart Economizer Mode, Occupied Mode, and Occupied & Economizer Mode.

Last Hour Averages – The ECCIII does rolling averages of the following information: Return Air Temperature, Return Air Humidity, Outside Air Temperature, Outside Air Humidity, Percent of Compressor Staging, Mixing Box % Open, Economizer Active, Smart Economizer Active, and Occupied Time.

SchedPurgeActv – Scheduled Purge Active.
BAS Purge Actv – Building Automation System Purge Active.
Timed Purge Actv – Timed Purge Active.
DigIn Purge Actv – Digital Input Purge Active.
Summer Vent Mode – Summer Vent Mode Active.
Sys Startup – Sys Startup Active.

Rtn WB Temp – Return Air Wet Bulb Temperature calculated by the ECCIII.

SysStatus1 – Factory use.
SysStatus2 – Factory use.

OA Fltr Lif Rem – Outside Air Filter Life Remaining.
RA Fltr Lif Rem – Return Air Filter Life Remaining.

Compressor Sys 1 & Compressor Sys 2 - The ECCIII displays the following information for Compressor System 1 & Compressor System 2 (SWHP220-340 only):

DP – Discharge Pressure
SP – Suction Pressure
ST – Suction Temperature
SH – Superheat
LT – Liquid Tempeerature
SC – Subcooling

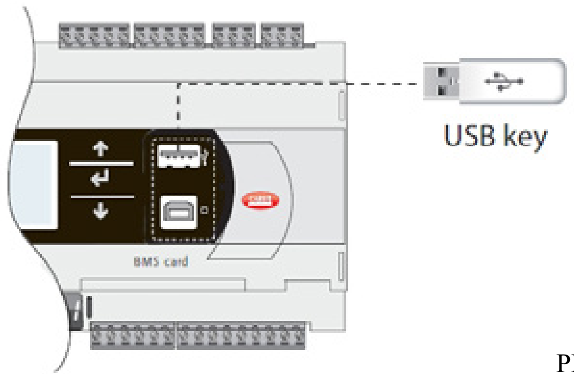
Fault History Screens – The ECCIII records information when a fault occurs. See above Fault History Log section for more detail.

DATA LOG RETRIEVAL

The ECCIII records data every minute keeping approximately 30 days of data. To aid in troubleshooting, this data can be downloaded to a USB pen drive and sent to PoolPak™ Service for analysis.

To begin, remove the cover to the right of the service buttons on the CM1 module. It is the part that has a red Carel label attached. Gently pry it off from the top. Insert a USB pen drive with at least 3MB of storage available into the USB slot.

Figure 5-2. Data Retrieval Using USB Key



PPK_USB_Key.jpg

Press Alarm and Enter together for 3 seconds to enter the option menu. Select FLASH/USB memory and press Enter to confirm.

Select USB pen drive and press ENTER. Wait a few seconds after the pendrive has been plugged in for it to be recognized by the controller. If the message "No USB disk or PC connected" is displayed 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").

Insert Password is displayed. Use the up arrow to change the password to 1943 and DOWNLOAD (pCO-pen) and press ENTER. Select Download LOGS and press ENTER. Press ENTER key to start the download. Downloading logs Please wait…. is displayed. Once the download is completed (approximately , the screen will display "Operation complete. Data downloaded. LOG00_01"

Remove the pen drive 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™.

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 simple check could result in noticing possible problems before they develop into major problems.

DAILY MAINTENANCE

Pool water chemistry is a part of daily maintenance and it is recommended that National Spa and Pool Institute standards are followed. PoolPak™ International recommends daily logging of your pool water chemistry. **MAINTENANCE AND POOL WATER CHEMISTRY ARE IMPORTANT FACTORS IN THE PROTECTION OF YOUR WARRANTY RIGHTS.**

Table 5-1. Recommended Pool Water Chemistry

	POOL			SPA		
	Ideal	Min		Ideal	Min	Max
Total Chlorine	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	10.0q
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	80 - 100	80	180	80 - 100	60	180
TDS	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

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. On average, filters need to be replaced every three months.
2. FANS AND DRIVES: Check for worn or loose belts and adjust or replace as necessary. When it is necessary to replace one belt in a set, the entire set of belts should be replaced. Fan belts can be retightened 24 to 48 hours after replacement with BX style cogged belts.
3. BEARINGS: For Comefri fans, use SHC-100 Mobil Synthetic bearing grease to lubricate the ball bearings every six (6) months, the spherical roller bearings every month. For Lau fans, use standard lithium bearing greases to lube fan bearings every month. DO NOT GREASE ANY MOTOR BEARING WITH BEARING TYPE ENDING IN "ZZ". This information can be found on the motor nameplate
4. COMPRESSOR OIL LEVEL: The ideal time for checking the oil level is during an extended period of operation because then there will be the least amount of refrigerant mixed with the oil. The compressor should have been in operation for at least 15 minutes and the crankcase should feel warm or hot to the touch. During the period of operation, the refrigerant will be pumped out of the oil until only the normal quantity remains. Each compressor system is equipped with an oil sight glass for checking oil level. Oil should be added to the system by a qualified refrigerant service technician only. The oil level in the compressor is correct when oil is visible between the bottom and two-thirds of the sight glass.

5. REFRIGERANT CHARGE: Check the two sight glasses located in the valve compartment on the end of the evaporator coil. When the refrigerant charge is correct, there should be no bubbles in the sight glasses. Intermittent bubbles are normal during the first 10 minutes of operation or following a change in stages or operating mode.
6. 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 40 gallons of condensate per hour.
7. UNIT INTERIOR/EXTERIOR: Check for torn insulation and repair if necessary. Check for scratches, nicks, rust, etc. and repaint promptly using Fox Gard Gray, Part No. 13-0008Z003.
8. LOGBOOK: Check and record, in the logbook, the following actual operating values and the values read from the ECCIII controller display:
    - Space Temperature
    - Space Relative Humidity
    - Pool Water Temperature
    - Pool Water Free and Total Chlorine
9. DAMPER OPERATION: Ensure that dampers open and close fully without binding.

ANNUAL MAINTENANCE

Perform the following on an annual basis:

1. All items listed under MONTHLY MAINTENANCE.
2. COMPRESSOR AND REFRIGERATION SYSTEM: The compressor and refrigeration system should be inspected annually by a qualified service technician. At minimum, the following items should be done:
    - Change and inspect the refrigerant filter drier (only if the system has been open).
    - Complete unit operation test including log entries.
    - Inspect fan bearings and belts for excessive wear and replace if necessary.
    - General refrigeration system inspection for possible leaks, chafing between tubing, or other items detrimental to operation.
    - Touch up scratches in the paint.
    - Check electrical connections for tightness including those in the compressor electrical box.
    - Clean debris and dirt from drain pans.

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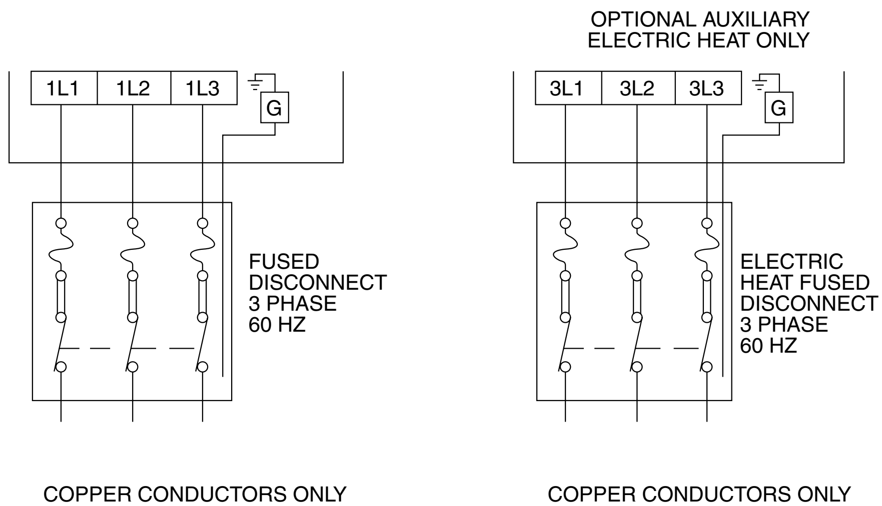
SECTION VI: WIRING

SINGLE POINT POWER CONNECTION

Figure 6-1. Single Point Power Connection

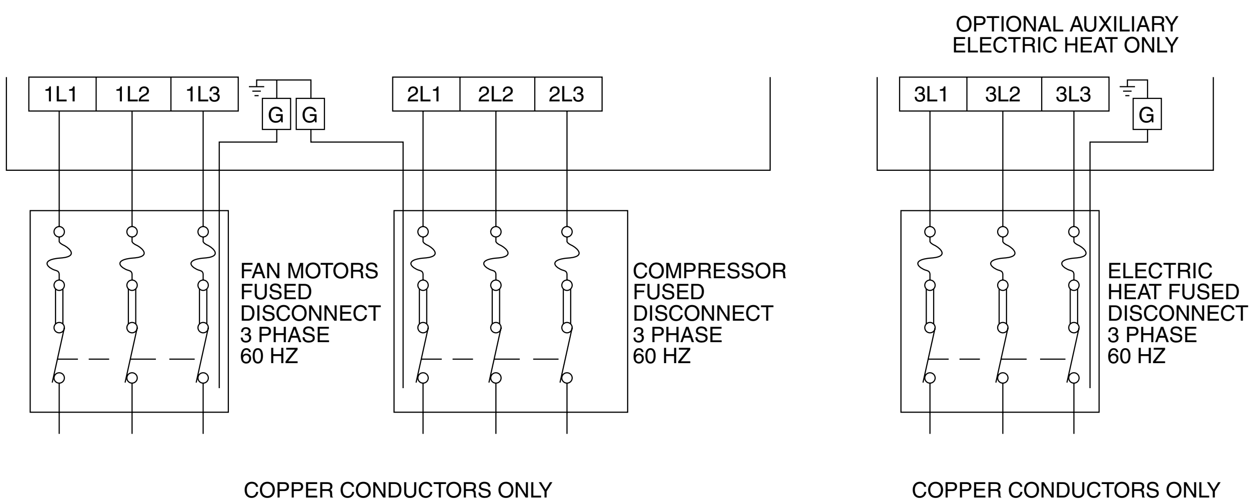


POWER WIRING - SWHP S, SE, SEP 60/80/100/120 - ALL VOLTAGES; SWHP SR 140/190/220/260/300 - 460V & 575V

PPK_EG_GR_SinglePointWiringSchematic.eps

DUAL POINT POWER CONNECTION

Figure 6-2. Dual Point Power Connection

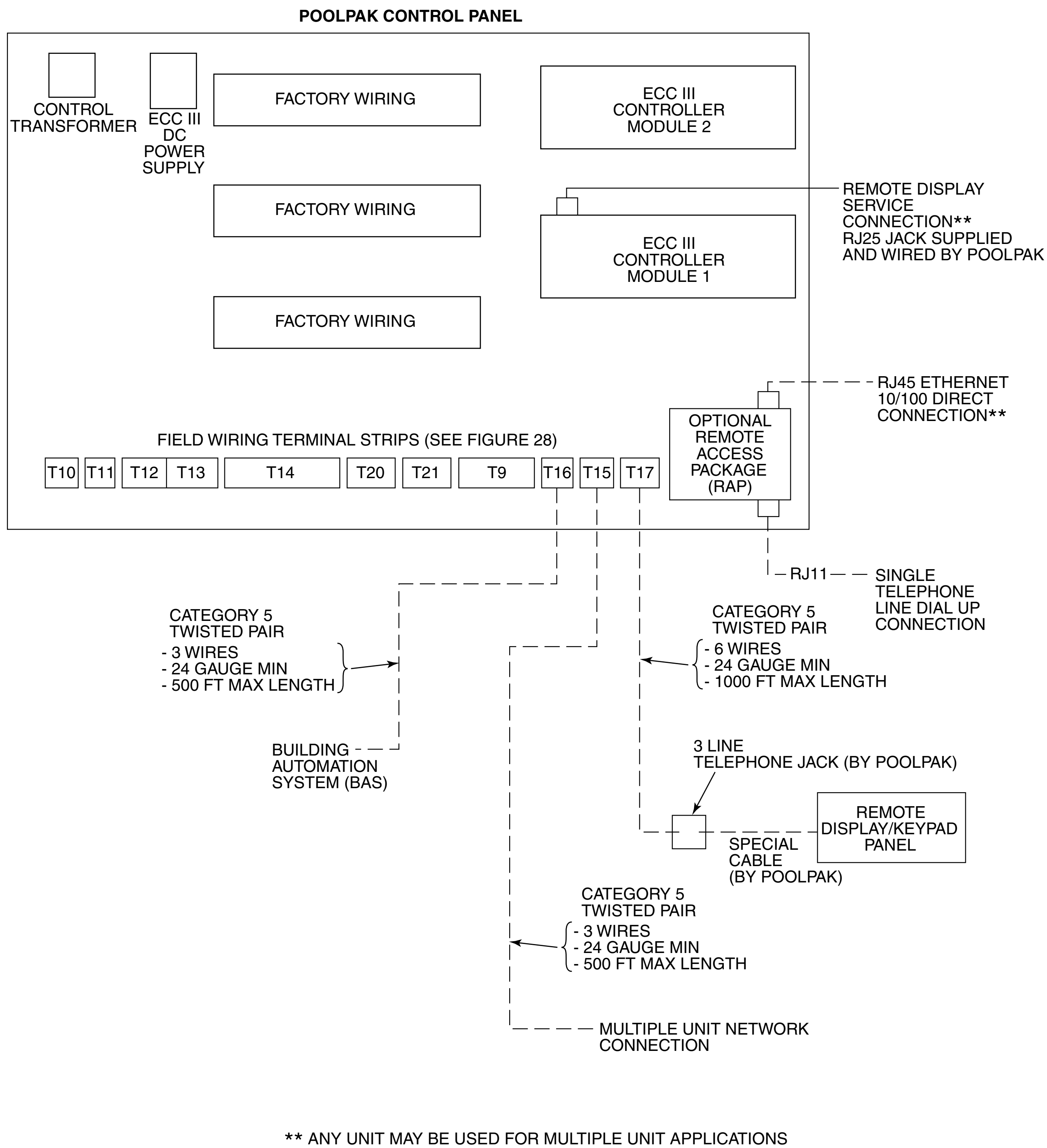


POWER WIRING - SR UNITS; ALL VOLTAGES

PPK_EG_GR_DualPointWiringSchematic.eps

REMOTE CONNECTIONS

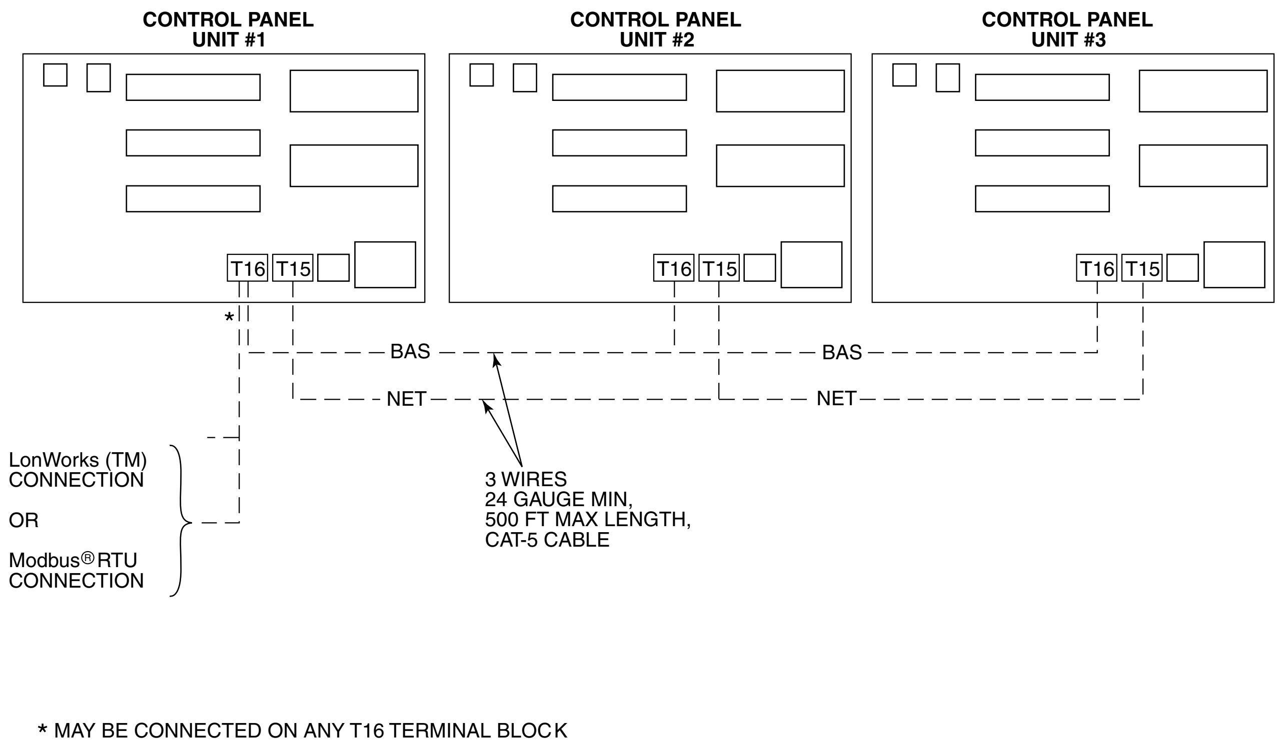
Figure 6-3. Remote Connections



PPK_EG_GR_ECCRemoteInstallationSchematic.eps

MULTIPLE UNIT INTERFACE

Figure 6-4. Multiple Unit Interface



PPK_EG_GR_ECCMultiUnitControl.eps

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