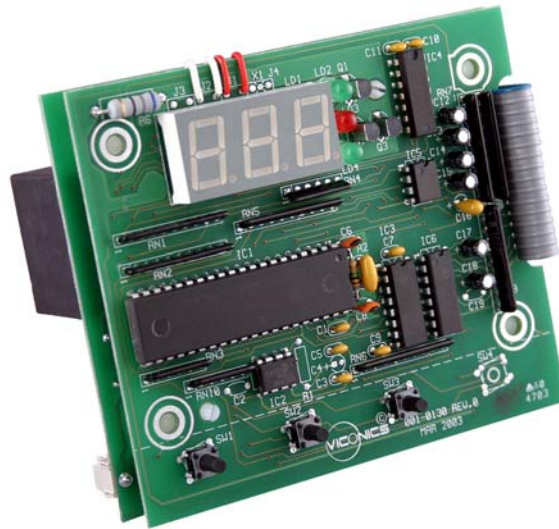




# HP727S

## Single speed swimming pool heat pump controller Operation manual



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## 1. GENERAL DESCRIPTION

The HP727SS is a powerful microcomputer control designed for use in an outdoor swimming pool heatpump. The control features 3 digit temperature display and 3 push button keys. All adjustments are performed by simple key operations. The HP727S controls the main compressor contactor, the evaporator fan, and the water circulating pump. The HP727S monitors both evaporator and water temperature using precise thermistor sensors for superior control.

The control features full diagnostics messages, simplifying both installation and service. The HP727S is an excellent alternative to electromechanical controls offering improved water temperature control accuracy, accurate defrost control, anti-short cycle timer, and solid-state reliability all in a single package.

All calibration and user parameters are stored in an EEPROM memory. There are no trimmer potentiometer adjustments. All adjustments including sensor calibrations are done through the front panel. The HP727S features full self-test diagnostic capability and sensor re-calibration if needed.

The HP727S offers maximum corrosion and vibration protection. All printed circuit board interconnections are soldered. The main PCB is dipped in silicone. This assures maximum board protection even underneath the PCB components, against humidity, air pollutants, chlorine vapors and vibrations.

## 2. VICONICS HP727S SWIMMING POOL HEATPUMP CONTROL SPECIFICATIONS

### OPERATING CONDITIONS:

Rated Operating Conditions: 33 °F to 120 °F; R.H. 0% to 100 %, Non-Condensing  
Storage: - 40 °F to 120 °F; R.H. 0% to 100 %, Non-Condensing

### PERFORMANCE:

Accuracy: ± 1.8 °F  
Repeatability: ± 0.2 °F  
Resolution: ± 1 digit

### INPUTS:

Swimming Pool Water Return Temperature	Thermistor Sensor ( 0 °F To 120 °F )
Evaporator Defrost Temperature	Thermistor Sensor ( 0 °F To 120 °F )
Contact From Remote High Pressure Switch	Dry Contact Input
Contact From Remote Low Pressure Switch	Dry Contact Input
Contact From Main Flow Switch	Dry Contact Input
Contact From Remote Spa Select Flow Switch	Dry Contact Input

### OUTPUTS:

Compressor Relay Output:	1A @ 24 Vac
Fan Relay Output:	4A @ 240 Vac
Circulating Pump Relay Output:	1A @ 24 Vac

### GENERAL:

- Complete Diagnostic Error Messages
- Display: 3 Digits Display 0.56" High
- LED Status Indicators: Pool mode LED, Spa mode LED and Heat on LED
- Power supply : 0 / 12 / 24 Vac center tap transformer ±10% 50/60 Hz
  - 5 VA required on 12 Vac for controller only
  - 100 VA maximum for 24 Vac power connection
- Dimensions: approx. 5.5" x 6.0"
- Weight: 700 gm (1.51 lb.)
- Protection Against Humidity: Unit dipped with silicone based conformal coating
- Connectors: 1/4" fast-on connectors; screw terminals for field connections
- cCSAus file # LR92123

*Important note: Heatpump unit should not be operated when outdoor air temperature is near or under freezing point; or as specified by manufacturer of heatpump.*

### 3. INSTALLATION INSTRUCTIONS

#### UNPACKING

Examine the package on reception for any signs of external damage it may have received during transit. If damage is found, notify the carrier immediately. Notify manufacturer or their agent immediately of any deficiencies.

#### INSTALLATION:

Take care in handling the Printed Circuit Board ( PCB ) so as not to damage or scratch the silicone conformal coating. Damage to this coating will affect the resistance to moisture and humidity.

Install the board to the front panel using # 6-32 screws. Push ( or remove ) the fast-on connectors at a right angle to prevent bending the board connectors.

Align and install the lexan cover membrane to the metal door.

### 4. ELECTRICAL WIRING

#### CAUTION:

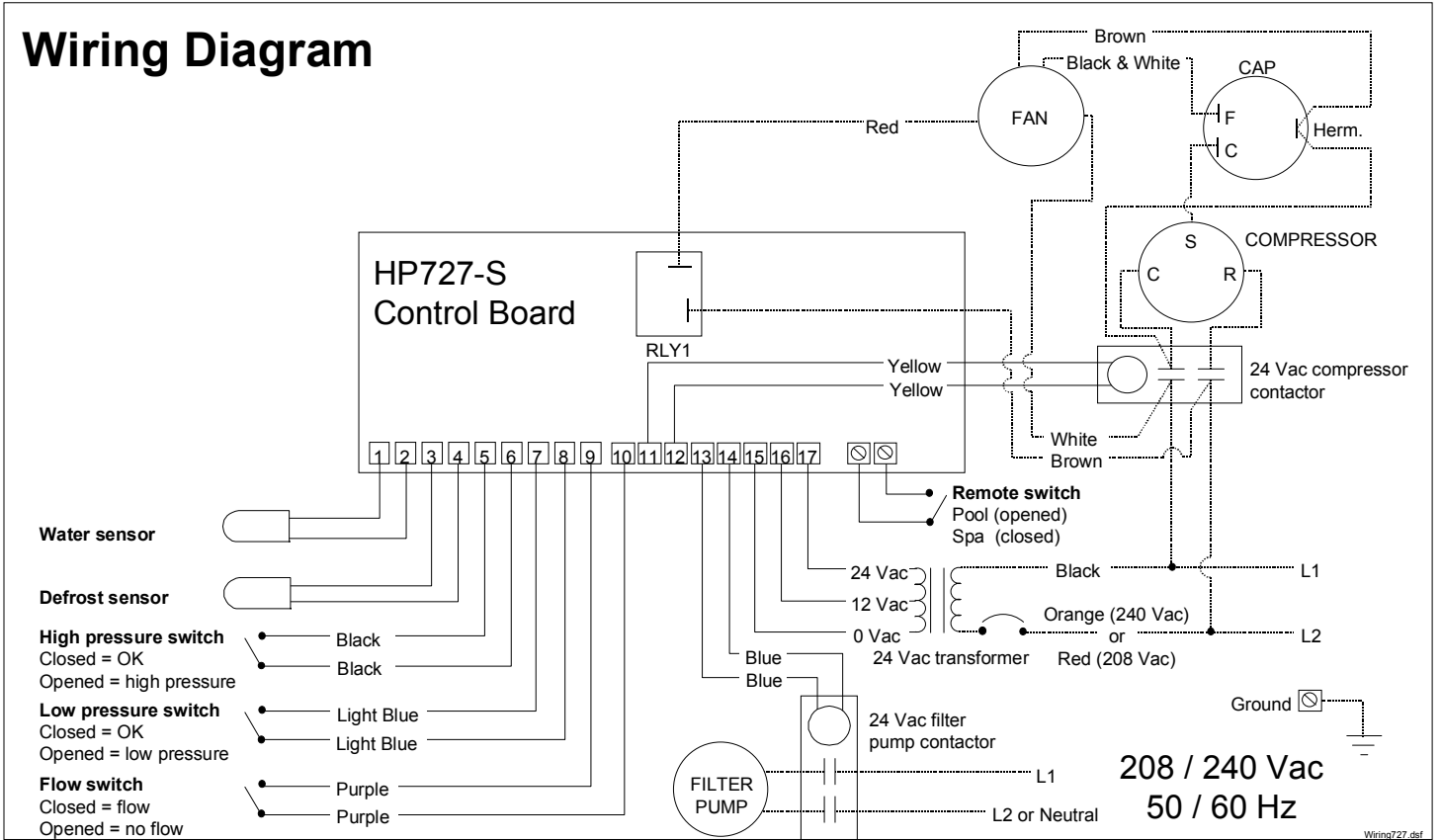
NO HIGH VOLTAGES ARE PRESENT ON THE TERMINALS OF THIS INSTRUMENT (**EXCEPT AT THE FAN RELAYS TERMINATIONS**) PLEASE READ ALL THE INSTRUCTIONS IN THIS MANUAL CAREFULLY, AND HAVE THE WIRING DONE BY A SKILLED PROFESSIONAL.

THE INSTRUMENT HAS UNDERGONE RIGOROUS TESTS AND VERIFICATIONS PRIOR TO SHIPMENT TO ENSURE PROPER AND RELIABLE OPERATION IN THE FIELD. IT IS THE RESPONSIBILITY OF THE USER OR ELECTRICAL PANEL DESIGNER TO INCORPORATE SAFETY FEATURES ( SUCH AS OVER / UNDER TEMPERATURE CUTOUT DEVICES ) TO PROTECT THE ENTIRE SYSTEM FROM GENERAL FAILURES.

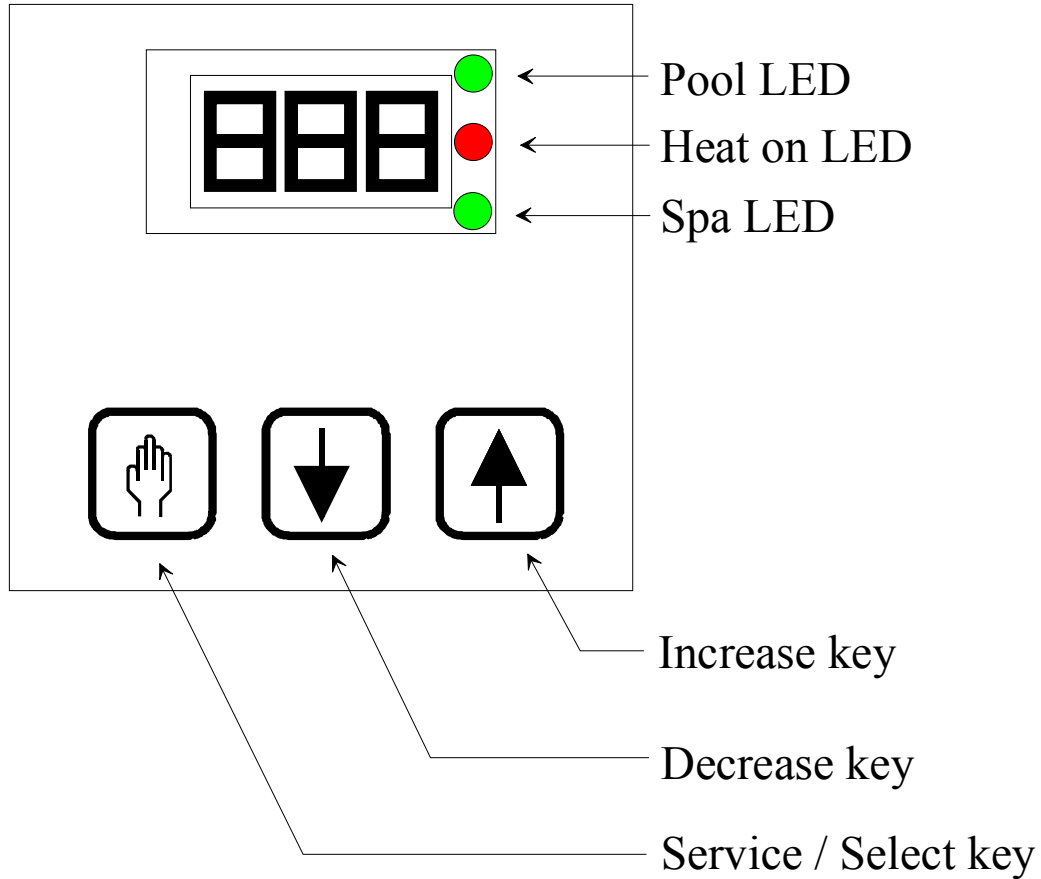
- All wiring must conform with local or national electrical code regulations.
- See fig. 2 for electrical wiring diagram
- Some wiring to the board is done using 1/4" fast-on connectors.
- The instrument should be wired before applying power !
- Power supply : 0 / 12 / 24 Vac center tap transformer  $\pm 10\%$  50/60 Hz
  - 5 VA required on 12 Vac for controller only
  - 100 VA maximum for 24 Vac power connection
- The instrument front panel needs to be splash proof, and protected against the elements.
- The HP727S electronic controller should be mounted inside the control panel is NOT waterproof. The electrical panel must therefore be properly protected against rain, dust and excessive water vapor condensation.

5. INSTRUMENT WIRING DIAGRAM

# Wiring Diagram



## 6. INSTRUMENT IDENTIFICATION



### DESCRIPTION OF FRONT PANEL:

**POOL LED:** Indicates that the Pool setpoint is selected.

**SPA LED:** Indicates that the Spa setpoint is selected.

**HEAT ON LED:** Indicates that the pool heater ( heatpump compressor ) is on, heating the water.

**DIGITAL DISPLAY:** Normally displays the actual water temperature. In set mode displays other parameters.

**SERVICE / SELECT KEY:** Used to enter the service mode or select between Pool and Spa temperature setpoint.

**INCREASE KEY ↑ :** Increases the selected parameter value.

**DECREASE KEY ↓ :** Decreases the selected parameter value.

**NOTE:** The display may be changed in steps by pushing the ↑ or ↓ keys repetitively, or automatically by holding down the same key longer.

## 7. OPERATION:

### WHEN POWER IS FIRST APPLIED TO A FACTORY UNIT:

- The display will show [888] and the 3 status LED's will come on for 4 seconds and then go off for 1 second.
- The pump will go on and then the actual water temperature will be displayed.

Factory settings of main parameters:

Pool setpoint:	OFF
Spa setpoint:	OFF
Filtration time FIL:	8 hours per day

The actual temperature displayed is held in memory and displayed for 5 minutes until the water temperature sensor has sampled circulating water. After that delay of 5 minutes, the displayed temperature is automatically updated and displayed.

### CONFIGURING THE UNIT J1 JUMPER

The unit can control 2 different setpoints:

The pool temperature and the Spa temperature.

2 methods can be used to switch the unit between ( Pool setpoint Mode ) or ( Spa setpoint Mode ).

	How to activate either ( Pool setpoint Mode ) or ( Spa setpoint Mode )
J1 jumper not cut	Using the select key will active either mode manually ( press the ↑ or ↓ to switch between ( P_S )
J1 jumper cut	A remote Spa flow switch connected on CN19 will activate ( Spa setpoint Mode ) **

\*\* Notes:

- In this mode using the select key will authorize changing the Pool or Spa setpoint, but the actual mode is determined by the Spa flow switch connected on CN19.
- The Pool LED or Spa LED on the display will confirm which mode is active.

### ADJUSTING POOL & SPA SETPOINTS:

Setpoint ranges:

	Controller configured in °F	Controller configured in °C
Pool setpoint:	OFF → 61°F to 95°F	OFF → 16°C to 35°C
Spa setpoint:	OFF → 61°F to 104°F	OFF → 16°C to 40°C

- The control is shipped with setpoints at OFF in Pool and Spa mode.
- The heatpump is automatically switched OFF if a setpoint below 61 °F is selected.
- In the off mode the control will display the water temperature.
- Use the select and arrow key to enter Pool or Spa mode.
- Use the ↑ arrow to increase the setpoint above 61 °F on the selected mode.
- The pool heater ( heatpump compressor ) is automatically authorized to operate if a setpoint above 61 °F is selected.
- Adjust the setpoints to required value.

### TURNING THE POOL HEATER ON ( HEATPUMP COMPRESSOR ):

When there is a demand for heat.

In Pool mode: If the actual water temperature is lower than the desired Pool setpoint temperature.

In Spa mode: If the Spa mode is manually selected ( J1 in place )

Or if the Spa flow switch is energized ( J1 cut )

And if the actual water temperature is lower than the desired Spa setpoint temperature.

When heatpump is energized:

- The Heat On LED is energized.
- The compressor will come on.
- The fan will come on as dictated by coil temperature.
- Heat will stay on until setpoint is satisfied.

**Note that each time the compressor turns off there will be a 3 minute anti-cycling delay before it can be turned on again.**



## ADJUSTMENT OF MINIMUM FILTRATION TIME

The HP727S features an adjustable minimum filtration period. Parameter FIL.

- A daily 24 hours cycle is divided 6 daily periods of 4 hours ( 240 minutes ).
- The adjusted parameter value represent the minimum total daily hours that filtration is required.

FIL parameter adjustments:	OFF	2 hours to 23 hours	ON
	Pump is always OFF	Pump will work 2 to 23 hours daily	Pump is always ON

- In OFF mode the circulating pump needs to be always on, or energized by an external timer clock.
- In ON mode, the circulating pump is always on.

The selected minimum filtration time is divided equally into the 6 daily periods.

Ex.: Selected 4 hours ÷ 6 periods = 40 minutes per period. So the circulating pump will work 40 minutes for each period of 4 hours.

The minimum selectable filtration time is 2 hours ( 6 periods of 20 minutes each )

When the circulating pump is energized, **if there is a heating demand during a filtration period:**

- The circulating pump will stay on until the heating demand is satisfied.
- During that period the minimum filtration time counter is still active and counting.
- If the daily minimum filtration time is obtained and the heat demand is not satisfied, the circulating pump will stay on until the heating demand is satisfied.
- If the daily minimum filtration time is obtained and the heat is satisfied, there is still a 15 minutes circulating pump time per period ( every 4 hours ). This is done to sample the pool water temperature in case the water needs to be heated. ( not valid if FIL parameter = OFF )

Whenever the FIL parameter is changed, the daily counter will reset.

## BACKWASH OPERATIONS:

For backwash operation do the following:

1. Cut out power to the pump ( with line voltage switch or ( FIL = off, POL = off and SPA = off ) ).
2. Prepare system for backwash and energize the pump ( with line voltage switch or ( FIL = on ) ).
3. The circulating pump will go ON and the controller will not check for 5 minutes if water flow is present at pool flow switch.
4. You will have 5 minutes of uninterrupted water flow to do the backwash.
5. To stop the circulating pump use ( the line voltage switch or ( FIL = off ) ).

Normally, when the circulating pump is requested to operate, and there is no water flow detected at the flow switch, the pump will automatically cut off. This procedure will give a 5 minutes period of uninterrupted water flow, before the circulating pump cuts off.

## TO CHANGE THE DISPLAY BETWEEN °F OR °C:

Factory default is °F

- Touch and hold down the set key until the message POL appears
- Touch the [Service / Select ] key until the message F\_C appear.
- Touch the ↑ arrow key to select °F or touch the ↓ arrow key to select °C

## EEPROM RECOVERY:

If a flashing PLE or CSE error message appears, hold down the Service / Select key until the error message disappears ( approx. 4 seconds ). The control will be re-initiated to factory default.

Re-enter the Pool / Spa setpoints and minimum filtration time parameter.

## HEATPUMP DEFROST OPERATION:

During the defrost cycle of the evaporator coil, the display will show FS to indicates that the unit is defrosting. During this time the fan is on and the compressor is inactive. See section 10. for defrost sequence.

## 8. SERVICE AND CALIBRATION:

CALIBRATION AND RECONFIGURATION SHOULD BE DONE WITH CAUTION BY QUALIFIED PERSONNEL ONLY.

To enter the service mode, press down the Service key, for 8 seconds, until the display show the message LOC. You have 12 seconds from the time the last key was touched to make an adjustment. 12 seconds after the last key was depressed, any modified value will be stored into EEPROM memory. After that, the unit will return to normal operation mode.

Adjustable parameters:

LOC	Lock code	Adjustable from 00 to 99 ( 00 is no lock mode at all ) Factory default value is 50
dEL	Compressor anti-cycle delay by-pass	Parameter value is at 0. Adjust value to 1 and wait until control goes back in normal operation mode. 3 minutes anti-cycling delay is by-passed for 1 cycle only.
tSC	Water temperature calibration ( Shows the actual water temperature )	Adjustment is $\pm 5^{\circ}\text{F}$ ( $\pm 3^{\circ}\text{C}$ )
dSC	Evaporator defrost temperature calibration. ( Shows the actual evaporator temperature ) ( Viewable in calibration mode only )	Adjustment is $\pm 5^{\circ}\text{F}$ ( $\pm 3^{\circ}\text{C}$ )
db1	Pool / Spa setpoint hysteresis	0.2°F to 2.0°F ( 0.1°C to 1.1°C ) Factory adjustment is 0.8°F

Pressing the Service / Select key repetitively will scroll down all parameters.

Go to the desired parameter. The display will show the parameter name.

Use the  $\uparrow$  or  $\downarrow$  arrow once to display the actual value of the selected parameter.

Use the  $\uparrow$  or  $\downarrow$  arrow to adjust the parameter to the selected value

The display may be changed in steps by pushing the arrows briefly, or faster by holding down the desired arrow key.

**NOTE:** Any modified parameter value will be stored 12 seconds after the last arrow key was touched  
The new value will be stored into EEPROM memory and the unit will return to normal operation mode.

Important notes:

Any time a new parameter value is stored, the display will blank out momentarily

Any modified parameter should be stored in writing on the instrument label inside the heatpump unit.

### LOCK CODE ( Loc ):

The lock code provides security against unauthorized tampering of parameter values.

If the lock feature is enabled

Pressing the [Service / Select ] key for 8 seconds, will make the "LOC" message appear on the display.

Enter the LOC code value using the arrows.

If an incorrect code is entered, the unit will exit the service mode, and the entire process will have to be repeated.

Once the proper lock code is entered, the lock value can be modified the second time the LOC parameter appears while scrolling down the parameters.

If the LOC code is forgotten, proceed with the following procedures:

- Remove the power from the instrument.
- Press and hold the [Service / Select ] key while powering-up the instrument.
- The message dEL will appear.
- The lock function is temporarily disabled.
- Step to LOC parameter, as re-enter a new value as described in the above procedure.

## 9. TROUBLE SHOOTING:

The instrument is capable of detecting a number of malfunctions, which may occur operating conditions.

### When a malfunction occurs:

- 1) The heatpump fan and compressor are turned off.
- 2) The display flashes an error code for 5 seconds.
- 3) The instrument goes into power-up and restart sequences.

If the malfunction persists this process is repeated.

Error codes:

dPO	Evaporator temperature sensor connection opened	Check for cut or loose sensor wiring or defective evaporator sensor.
PO	Water temperature sensor connection opened	Check for cut or loose sensor wiring or defective water sensor.
dPC	Evaporator temperature sensor connection shorted	Check for a short in sensor wiring or defective evaporator sensor.
Pc	Water temperature sensor connection shorted	Check for a short in sensor wiring or defective water sensor.
LP	Low pressure	Check for refrigerant leaks or defective low pressure switch or wiring.
HP	High pressure	Check for evaporator fan operation or defective high pressure switch or wiring.
FLO	No water flow at main flow switch	Circulation pump is off, filter is clogged or on backwash. Defective flow switch or wiring.
FS	Evaporator frosted	Heatpump in defrost cycle mode.
PLE	EEPROM memory data loss	If the PLE or CSE error message appears, hold down the Service / Select key until the error message disappears ( approx. 4 seconds ). The control will be re-initiated to factory default. Re-enter the Pool / Spa setpoints and minimum filtration time parameter.
CSE	EEPROM memory data loss	
SPI	Defective controller	Remove power and re-start. If error is still present, replace the unit.

### Error management:

1. An LP error code will stop the circulating pump, other errors will not stop the pump.
2. Error codes will not prevent access to user and service mode.

### HP error code:

When HP error code becomes active, the compressor and the fan will stop.

- After 3 consecutive HP detection within an hour, the lockout mode for HP3 will be activated.
- To get out of the HP3 lockout mode, a button must be depressed.
- The unit may re-enter HP3 lockout mode if again there are 3 consecutive HP detection's within an hour.

### LP error code:

When LP error code becomes active, the compressor and the fan will stop.

- After 3 consecutive LP detection within an hour, the lockout mode for LP3 will be activated.
- To get out of the LP3 lockout mode, a button must be depressed.
- The unit may re-enter LP3 lockout mode if again there are 3 consecutive LP detection's within an hour.

### FLO error code:

- If parameter FIL = off, the FLO error message will be displayed whenever the flow switch does not register any water flow.
- If parameter FIL = on, the FLO error message will be displayed whenever the flow switch does not register any water flow.
- If parameter FIL is selected between 2 to 23 hours of operation daily:
- If the main flow switch detects no water flow when the circulating pump is requested to operate:
  - \* Pump will stop after a 5 minutes on delay and display the FLO error code.
  - \* After a 5 minutes off delay, the system will attempt to restart the circulating pump.
  - \* After 3 consecutive retry, if the pump still does not start the circulating pump lockout mode will be activated ( FL3 error code) .

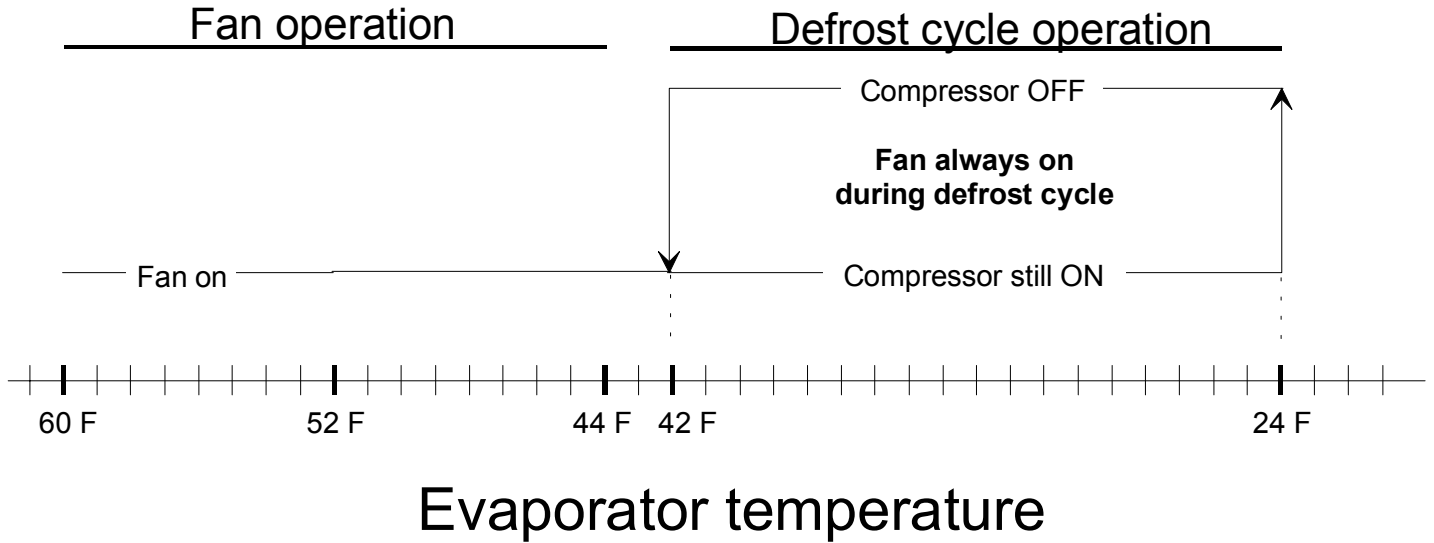
- \* To get out of the pump lockout mode ( FL3 error code), a button must be depressed.
- \* The unit may re-enter FL3 lockout mode if again there are 3 consecutive FLO error detection's within an hour.

## 10. DEFROST CYCLE SEQUENCE:

The HP727S has an evaporator temperature sensor to control the defrost cycle when the compressor operates.

Whenever the compressor starts, the evaporator fan starts also.

The fan and the defrost cycle are controlled as follow.



**11. TEMPERATURE SENSORS RESISTANCE & VOLTAGE CHART:**

Temperature °F	Temperature °C	Sensor Resistance	Sensor Voltage Drop
180.0 °F	82.2 °C	0.549 Kohm	0.523 Vdc
175.0 °F	79.4 °C	0.601 Kohm	0.567 Vdc
170.0 °F	76.7 °C	0.659 Kohm	0.614 Vdc
165.0 °F	73.9 °C	0.722 Kohm	0.666 Vdc
160.0 °F	71.1 °C	0.793 Kohm	0.722 Vdc
155.0 °F	68.3 °C	0.872 Kohm	0.783 Vdc
150.0 °F	65.6 °C	0.961 Kohm	0.849 Vdc
145.0 °F	62.8 °C	1.060 Kohm	0.920 Vdc
140.0 °F	60.0 °C	1.170 Kohm	0.997 Vdc
135.0 °F	57.2 °C	1.294 Kohm	1.080 Vdc
130.0 °F	54.4 °C	1.434 Kohm	1.169 Vdc
125.0 °F	51.7 °C	1.591 Kohm	1.265 Vdc
120.0 °F	48.9 °C	1.768 Kohm	1.367 Vdc
115.0 °F	46.1 °C	1.968 Kohm	1.476 Vdc
110.0 °F	43.3 °C	2.194 Kohm	1.591 Vdc
105.0 °F	40.6 °C	2.451 Kohm	1.714 Vdc
100.0 °F	37.8 °C	2.741 Kohm	1.842 Vdc
95.0 °F	35.0 °C	3.072 Kohm	1.976 Vdc
90.0 °F	32.2 °C	3.448 Kohm	2.116 Vdc
85.0 °F	29.4 °C	3.879 Kohm	2.261 Vdc
80.0 °F	26.7 °C	4.370 Kohm	2.409 Vdc
75.0 °F	23.9 °C	4.935 Kohm	2.561 Vdc
70.0 °F	21.1 °C	5.583 Kohm	2.715 Vdc
65.0 °F	18.3 °C	6.328 Kohm	2.869 Vdc
60.0 °F	15.6 °C	7.187 Kohm	3.023 Vdc
55.0 °F	12.8 °C	8.180 Kohm	3.175 Vdc
50.0 °F	10.0 °C	9.334 Kohm	3.325 Vdc
45.0 °F	7.2 °C	10.671 Kohm	3.471 Vdc
40.0 °F	4.4 °C	12.230 Kohm	3.612 Vdc
35.0 °F	1.7 °C	14.044 Kohm	3.746 Vdc
30.0 °F	-1.1 °C	16.167 Kohm	3.874 Vdc
25.0 °F	-3.9 °C	18.655 Kohm	3.994 Vdc
20.0 °F	-6.7 °C	21.581 Kohm	4.106 Vdc
15.0 °F	-9.4 °C	25.036 Kohm	4.210 Vdc
10.0 °F	-12.2 °C	29.110 Kohm	4.305 Vdc
5.0 °F	-15.0 °C	33.950 Kohm	4.392 Vdc
0.0 °F	-17.8 °C	39.683 Kohm	4.471 Vdc

## 12. ADVANCED APPLICATIONS:

### Remote Poll / Spa mode toggle with a remote switch.

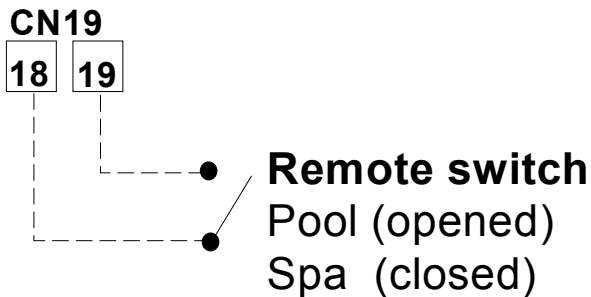
The unit can control 2 different setpoints: The pool temperature and the Spa temperature.

2 methods can be used to switch the unit between ( Pool setpoint Mode ) or ( Spa setpoint Mode ).

	How to activate either ( Pool setpoint Mode ) or ( Spa setpoint Mode )
RED J1 jumper not cut	Using the select key will active either mode manually ( press the ↑ or ↓ to switch between ( P_S )
RED J1 jumper cut	A remote Spa flow switch connected on CN19 will activate ( Spa setpoint Mode ) **

\*\* Notes:

- In this mode using the select key will authorize changing the Pool or Spa setpoint, but the actual mode is determined by the Spa flow switch connected on CN19.
- The Pool LED or Spa LED on the display will confirm which mode is active.



### Remote control of heat pump operation with a remote switch. ( On / Off operation )

For operation when the temperature is controlled by an external controller

The unit internal temperature control is by-passed to On / OFF operation from a remote switch.

- First cut the RED J1 jumper.
- Set Pool setpoint to OFF
- Set Spa setpoint to its maximum value of 104 °F or 40 °C

A remote switch connected on CN19 will now control the unit in On/Off mode.

\*\* Notes:

- In this mode, the flow switch, high pressure, low pressure and anti-cycling protections are still performed by the HP727S controller.
- A maximum temperature of 104°F ( 40°C ) can be attained by the remote controller.

