Pool Heater Digital Controller
Operation Manual

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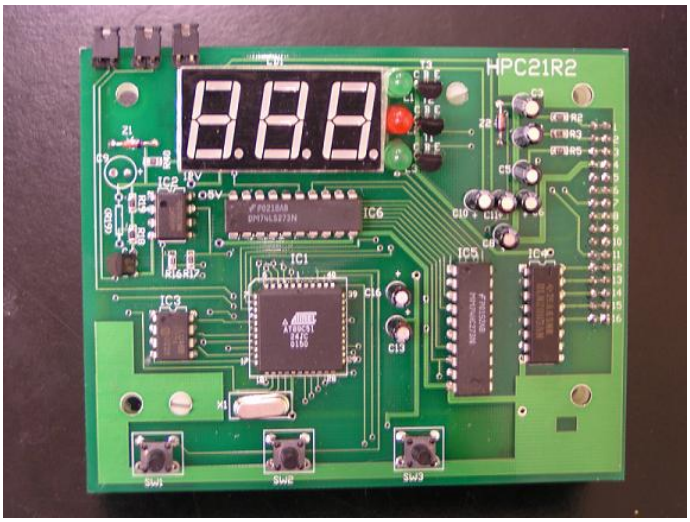


Version 1.1

1. Product Introduction

The Pool Heater Digital Controller utilizes advanced microprocessor technology in its design that enables users to control their outdoor units through a variety of user-specified programs.

With the use of 3-digit display and 3 operation keys, this controller is capable of displaying both temperature and parameter, prompting, changing, and setting all operation parameters.

This Pool Heater Controller has smart memory system. User does not need to reset each parameter every time after shutting the pump off. Controller will default to the previously used parameter for the new operation.

This Pool Heater Controller automatically displays error message in order to assist any installation, calibration and troubleshooting procedures. Furthermore, controller's improved software allows the unit to return to its previous operating mode once troubleshooting procedure is successful by simply pressing any key on the panel without the presence of the service personnel.

This Pool Heater Controller also has the maximum corrosion protection. The main printed circuit board (PCB) is coated with silicone to protect majority of the PCB board components against humidity, chlorine vapor and air pollutants.

In order to lower the output relay malfunction rate, relay protection circuit has been added in the design of the overall circuit.

In order to protect the heat exchanger when no flow is detected, the pool heater will be automatically shut off without delay.

2. Controller Performance

Specification

- Display: 3-digit display
- LED status indication：
  - Pool mode LED
  - Spa mode LED
  - Heater mode LED
- Diagnostic Error Messages
- Power Input：24 Vac ± 10%, 50/60 Hz
- Physical Dimension: 4 ¼ x 3 3/8 x 2 inch (length x width x high)
- Weight: 1.51lb
- Protective Coating: PCB is sprayed with Silicone to protect against humidity (exclude all connectors and terminals)
- Connectors: 1/4"fast-on connectors; screw terminals for field connections.

Operating Condition

- Rated Operating temperature and humidity: 33-120 ºF，0-100％, non-condensing
- Storage Temperature and humidity: 40-120 ºF，0-100％, non-condensing

Performance

- Accuracy: ±1.8 º F
- Resolution: ±1 digit

Inputs

Pool Water Return Temperature: thermistor sensor (0 ºF to 120 ºF)

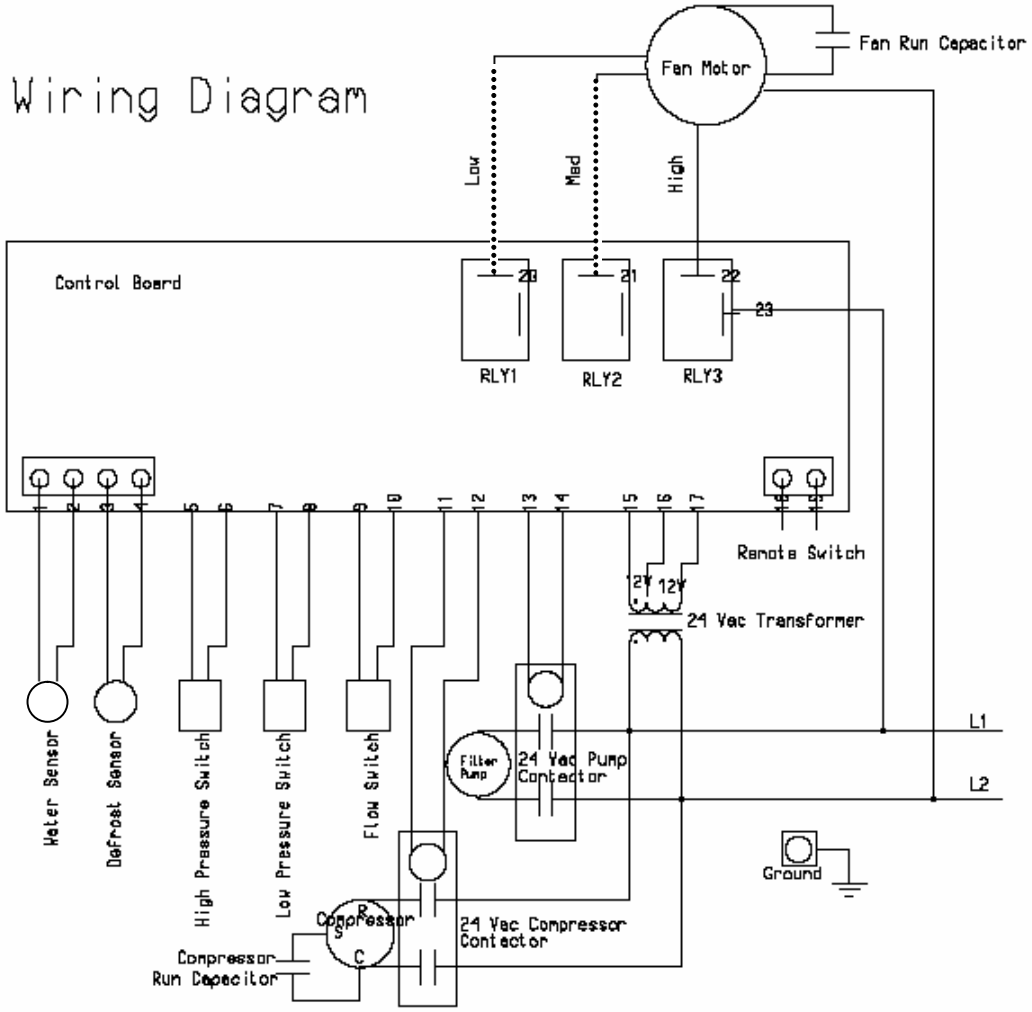
Contact from main flow switch	dry contact input
Contact from remote SPA select flow switch	dry contact input

Outputs

Circulating pump relay output: 1A/24Vac

Warning: Do not turn on pool heater when outdoor temperature is near or under freezing point to avoid unit damage! Please follow specifications posted by pool heater manufacturers.

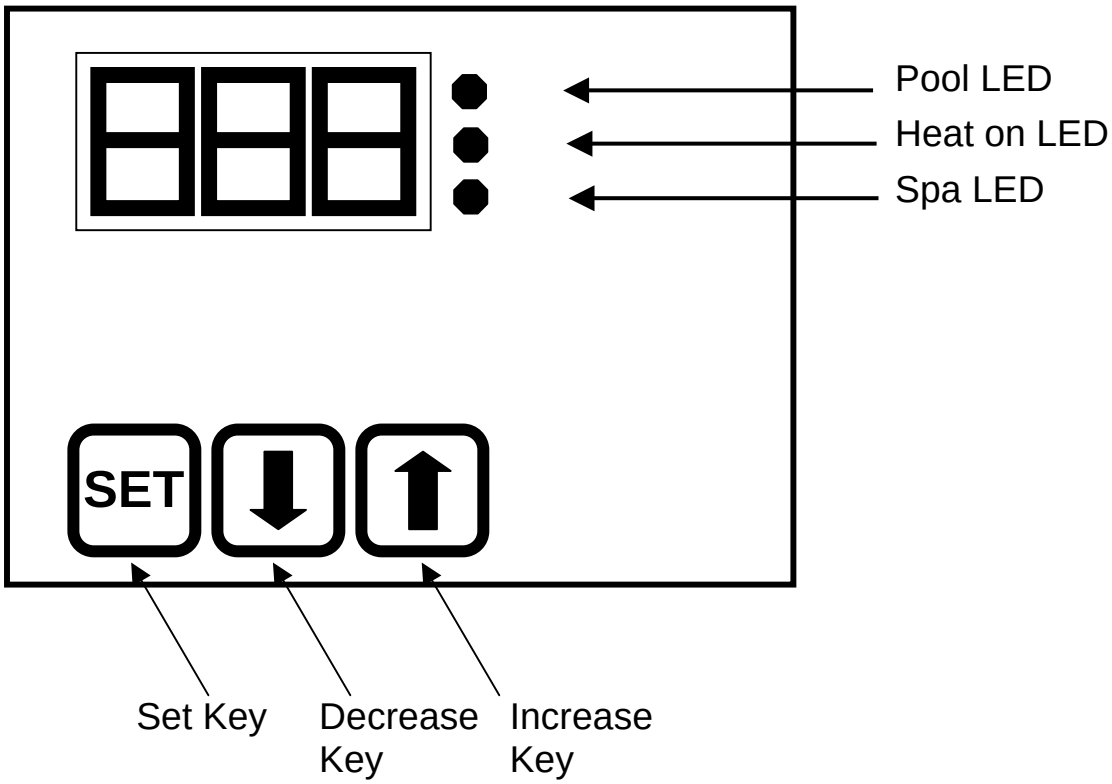
Wiring Diagram



NOTE: The following changes apply to the TK125 wiring diagram.

- Terminals 3,4 are jumped with a 4.7K Ω resistor
- Terminals 5,6 and 7,8 are jumped out
- Terminals 11,12 connect to water pump contactor
- Terminals 13,14 are field wired for pool pump operation
- Relay 1 not connected
- Fans, Capacitor and Compressor not used in this product

Panel Schematics



Instrument Panel Display Identification

POOL LED: indicates controller is in Pool mode. Pool mode parameters can be set or adjusted
SPA LED: indicates the controller is in SPA mode. SPA mode parameters can be set or adjusted
HEAT ON LED: indicates the pool heater is on and heating in progress
DIGITAL DISLAY: normally displays the actual water temperature. When in set mode, parameters can be displayed
SET KEY: used to enter either SERVICE or SELECT mode between Pool and SPA temperature set point
INCREASE KEY: increase selected parameter
DECREASE KEY: decrease selected parameter

Warning: Controller continues to execute key function if key is pressed for a prolonged period of time until it is released.

3. Operation

When power is first applied to control board, the display will show 8.8.8. for 10 seconds and then go off for 1 second. The pump will go on and then the actual water temperature will be displayed.

Factory default values for following parameters:

Pool setpoint: OFF
SPA setpoint: OFF
FIL (filtration) time: 8 hours per day

I. Definitions of the jumpers:

A. J1 is not connected: a remote SPA flow switch connected on CN19 will activate (SPA setpoint mode).
B. J1 is connected: using the select key will be active either mode manually (press the increase key or decrease key to switch between (P-S)

- In this mode using the select key will authorize changing between Pool and 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

II. Adjusting POOL and SPA setpoint:

- The controller is shipped with setpoint at OFF in Pool and Spa mode
- In P_S mode, using increase key and decrease key set point of water temperature to what you want
- In F_C mode, using increase key and decrease key select display temperature between º F and º C

III. Temperature setpoint ranges:

Mode	Controller configured in	Controller configured in
Pool setpoint	OFF – 61 ºF – 95 ºF	OFF -- 16 ºC –35 ºC
Spa setpoint	OFF – 61 ºF --104 ºF	OFF -- 16 ºC --40 ºC

IV. Turning the pool heater on:
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 is connected) or if the SPA flow switch is energized (J1 is nor connected) and if the actual water temperature is lower than the desired SPA setpoint temperature.

NOTE：that each time the circulating pump turns off there is a 3 minute anti-cycling delay before it can be turned on again.

V. Adjustment of minimum filtration time:

The controller features an adjustable minimum filtration period, parameter FIL

- A daily 24hourscycle is divided 6 daily periods of 4 hours.
- The adjusted parameter value represent the minimum total daily hours that filtration is required:

FIL Parameter	Description
OFF	Pump is always OFF or energized by an external time clock
2 hours -- 23 hours	Pump will work 2 to 23 hours daily Ex.: selected 4 hours: 4/6 periods = 40 minutes per period. So the pump will work 40 minutes for each period of 4 hours
ON	Pump is always ON

VI. Change display between ºF and ºC

The default setting for temperature display is ºF.

However, user can change between ºF and ºC by following procedure:

- Touch SET key until the message F_C appear
- Touch the ↑ key to select ºF or touch ↓ key to select ºC

VII. EEPROM recovery:

If a flashing PLE or CSE error message appears, hold down the set key until the error message disappears. The program will be restored to factory default value.

You have to re-enter the POOL/SPA setpoints and minimum filtration time parameter.

4. Calibration and Service

Caution: calibration and service should ONLY be done by certified personnel.

Enter service mode

Press down SET key for a few seconds until the display shows Loc and then enter Lock Code. Once enter service mode there will be 5 seconds since the time last key was pressed for any modified value to be stored into EEPROM memory and unit will subsequently return to normal operation mode.

Parameter and adjustment range

Parameter	Description	Range of Adjustment
Loc	Lock code	00-99 (00: no lock code; 50: default value)
dEL	Compressor anti-cycle delay by-pass	0, 1 (0: set parameter; 1: 3 minutes anti-cycling delay is by-passed for 1 cycle only). To adjust, set value to1 and wait for it to go back to normal operation mode.
tSC	Water temperature calibration (actual water temperature is shown)	+/- 8°F or +/- 4°C
dSC [N/A]	Evaporator defrost temperature calibration (actual evaporator temperature is show and can only be viewed in calibration mode)	+/- 8°F or +/- 4°C
db1	Pool/Spa setpoint hysterisys	0.2°F – 2.2°F or 0.1°C – 1.2°C. Default adjustment is 0.8°F

Procedure to adjust parameter

By press and release SET key to choose the desired parameter
Press either ↑ or ↓ key once to view the actual value of the parameter chosen
Use ↑ or ↓ to adjust the parameter to desired value
Tapping ↑ or ↓ key to change parameter in step and continuously holding either ↑ or ↓ key to change parameter in faster speed

Note: to adjust tSC and dSC, ↑ or ↓ key has to be hold continuously in order to make any adjustment.

Display will temporarily disappear every time a new parameter value is stored
All modified parameter should be recorded properly

Detail description of parameter display

Lock code (Loc)

This parameter is designed to protect stored parameter values. A code can be entered in the Loc code mode initially and the unit will automatically exit the service cycle if a wrong code is provided in all subsequent service.

To enable the Loc feature, press SET key for 8 seconds until "Loc" message is displayed. A Loc code can then be entered using ↑ or ↓ key.

Lock code can be modified after first time setup when Loc parameter is displayed again while scrolling down the parameters

In case you forgot the lock code, do the following:

- Shut down the power to the unit
- Press and hold the SET key while powering up the instrument
- Wait until dEL appear
- The lock function is now disabled temporarily
- Proceed to Loc parameter and enter a new code

5. Troubleshooting

This section provides the user and service personnel a list of malfunctions that the controller is able to detect. Look for following signs for possible malfunction of the unit.

- Shut off the pool heater
- Flash of error message for 5 seconds and more
- Unit enters the restart sequence

List below is a list of all error messages:

Error message	Description	Troubleshooting Procedure
CSE	EEPROM memory data loss	Hold down SET key until the error message disappears. Factory default value will be restored at that point. Then re-enter Pool/Spa setpoints and minimum filtration time parameters

dPC [N/A]	Evaporator temperature sensor connection shorted	Check for cut or loose 4.7K-ohm resistor.
dPO [N/A]	Evaporator temperature sensor connection opened	Check for cut or loose 4.7K-ohm resistor.
FLo	No water flow is detected at main flow switch	1) Water pump in off status 2) Filter is clogged 3) Defective flow switch or false flow switch wiring
FS [N/A]	Evaporator frosted	Heat pump is in defrost cycle mode
HP [N/A]	High pressure	Check for cut or loose jumper wire.
LP [N/A]	Low pressure	Check for cut or loose jumper wire.
Pc	Water temperature sensor connection shorted	Look for short circuited water sensor wiring or defective water sensor
PO	Water temperature sensor connection opened	Look for loose or broken water sensor wiring or a defective water sensor
PLE	EEPROM memory data loss	Same as CSE troubleshooting instruction. See CSE trouble shooting instruction section
SPi	Controller defective	Shut off power and restart the unit. If error still presents, replace the unit

Important notice:

1) Once FL3, LP3, HP3 errors appear and troubleshooting are successful, user can press any key to return the unit to normal operation mode without any service personnel present. This saves time for the user and provides service party with greater efficiency.

2) Except LP error, no other error will stop the running of water pump.