

# AquaCal®

## Installation Manual

### HEATWAVE SUPERQUIET®

### **tropiCal**® SWIMMING POOL / SPA HEAT PUMPS

### **TropiCool**® WATER CHILLER

#### Important

Read this document before operating / installing this product

For additional product manuals and operation / installation procedures, please visit [www.AquaCal.com](http://www.AquaCal.com)

[ \_\_\_\_\_ ]  
MODEL / SERIAL NUMBER



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## Contacting AquaCal AutoPilot, Inc.

For further assistance, please contact the distributor or installer of this product.

If unavailable, please contact AquaCal® for a partner in your area. To better assist you, please have the heat pump model and serial number available.

- See "Identifying Model Specifications" on page 79.

| Product Information: |                                            |
|----------------------|--------------------------------------------|
| Website              | www.AquaCal.com                            |
| Phone                | (1) 727-823-5642                           |
| Hours                | 8-5 pm, Eastern M-F                        |
| Service Information: |                                            |
| Website              | www.AquaCal.com/request-heat-pump-service/ |

## SAFETY INSTRUCTIONS

- For personal safety, and to avoid damage to equipment, follow all safety instructions displayed on the equipment and within this manual. Repair and service of heat pump must be performed by an authorized service center.
- Warranties may be voided if the equipment has been improperly installed, maintained or serviced.
- If service is deemed necessary, please contact AquaCal. See "Contacting AquaCal AutoPilot, Inc." above.

### SAFETY SIGNALS

*Throughout this document, safety signals have been placed where particular attention is required.*



Failure to heed the following will result in injury or death.



Failure to heed the following may result in injury or death.



Failure to heed the following may result in damage to equipment.

When installing and using your heat pump basic safety precautions must always be followed, including the following:



Failure to heed the following will result in injury or death.

- The heat pump utilizes high voltage and rotating equipment. Use caution when servicing.
- RISK OF ELECTRICAL SHOCK FROM ENERGY STORED IN CAPACITORS - MODELS EQUIPPED WITH VARIABLE FREQUENCY COMPRESSOR DRIVES STORE ELECTRICITY EVEN AFTER THE POWER HAS BEEN DEACTIVATED AT THE POWER BREAKER. **Wait for 2 minutes after the shut down of equipment before servicing.**
- Follow all National Electric Codes (NEC) and/or State and Local guidelines.

 **WARNING**

Failure to heed the following may result in injury or death.

- Installation and repairs must be performed by a qualified technician.
- The heat pump contains refrigerant under pressure. Repairs to the refrigerant circuit must not be attempted by untrained and/or unqualified individuals. Service must be performed only by qualified HVAC technicians. Recover refrigerant before opening the system.
- Improper water chemistry can present a serious health hazard. To avoid possible hazards, maintain pool/spa water per standards as detailed in the product's operation manual.
- Prolonged immersion in water warmer than normal body temperature may cause a condition known as Hyperthermia. The symptoms of Hyperthermia include unawareness of impending hazard, failure to perceive heat, failure to recognize the need to exit the spa, and unconsciousness. The use of alcohol, drugs, or medication can greatly increase the risk of fatal Hyperthermia. People having an adverse medical history, or pregnant women should consult a physician before using a hot tub or spa. Children and the elderly should be supervised by a responsible adult.
- Prolonged immersion in water colder than normal body temperature may cause a condition known as Hypothermia. The symptoms of Hypothermia include shivering (although as hypothermia worsens, shivering stops), clumsiness or lack of coordination, slurred speech or mumbling, confusion and poor decision-making, drowsiness or low energy, lack of concern about personal welfare, progressive loss of consciousness, weak pulse and slow or shallow breathing. Persons having an adverse medical history, or pregnant women, should consult a physician before immersing in a cold body of water. Children and the elderly should be supervised by a responsible adult.

**NOTICE**

Failure to heed the following may result in damage to equipment.

- Maintain proper water chemistry to avoid damage to the pump, filter, pool shell, etc.
- Water flow exceeding the maximum flow rate requires a bypass. Damage due to excessive water flow will void the warranty.

**SAVE THESE INSTRUCTIONS**

## 1 - Installation



### WARNING

Failure to heed the following may result in injury or death.

- Installation of this equipment by anyone other than a qualified installer can result in a safety hazard.
- The information contained throughout the "Installation" section is intended for use by qualified installation technicians familiar with the swimming Pool/Spa safety standards.

### NOTICE

Failure to heed the following may result in damage to equipment.

- Failure to protect equipment against corrosive conditions will adversely affect the life of the equipment and will void equipment warranty.

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## 1.1 Positioning Equipment

### NOTICE

Failure to heed the following may result in damage to equipment.

- Do not install equipment inside of a building.

## Outdoor Use Only

### Do not install equipment inside of a room or building.

- Heat Pumps require unobstructed airflow for proper operation. Heat Pumps should never be installed indoors or in a location where airflow is restricted.
- See "*Clearances*" on the facing page.

## Controlling Irrigation and Rainwater Runoff

- Irrigation water may damage heat pump components. Direct irrigation water away from the heat pump.
- The heat pump will withstand normal rainfall. Do not allow a roof slope to direct rainwater onto the heat pump. Have a gutter installed on the roof edge to direct this water away from the heat pump. Or install the heat pump in another location.

## Planning for Condensation

The heat pump can produce a large amount of condensation. The amount of water depends on air temperature and humidity.

- Install the heat pump with enough height to allow for water drainage.
- Plan for water drainage as needed.
  - See "*Condensation Drain Kit (# STK0202)*" on page 82.

## Mounting Pad Requirements

- The heat pump's base must be installed on a flat and level surface that completely supports the entire base.
- Build the heat pump pad out of concrete or other code-approved material.
- Confirm the pad can support the weight of the heat pump. See "*Weights*" on page 81.
- Elevate the pad enough to allow for drainage.
- Make sure the pad is flat and level.
- Have the pad support the entire heat pump base in all directions.
- Do not install the heat pump on soil or grass.
- Do not allow the heat pump base to touch the building's foundation.
- Do not place the heat pump directly on a concrete floor. This can cause noise to be transmitted to an occupied space. If necessary install vibration dampers between the heat pump base and floor.
- Equipment pad must meet all requirements of authorities having code-related jurisdiction.

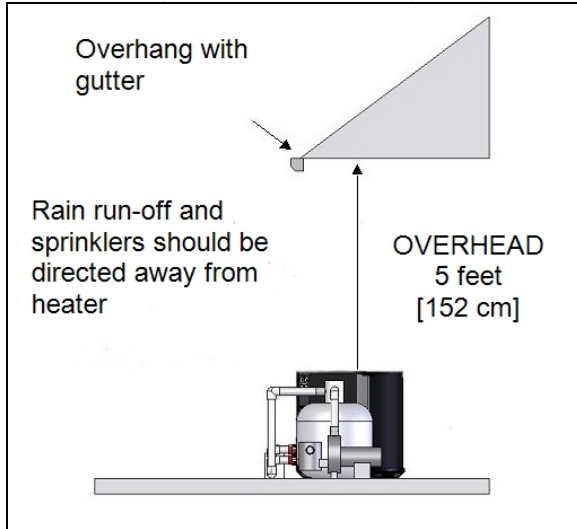
## Anchoring to Pad

- Follow all applicable local, state, and national requirements regarding wind load anchoring.
- The shipping brackets used to secure the heat pump to the pallet are approved mounting (hurricane) brackets. They should be used to anchor the heat pump to the pad.
- If needed, contact AquaCal® to obtain anchoring kit information. Please have the heat pump model number and serial number when requesting support. See "*Identifying Model Specifications*" on page 79.

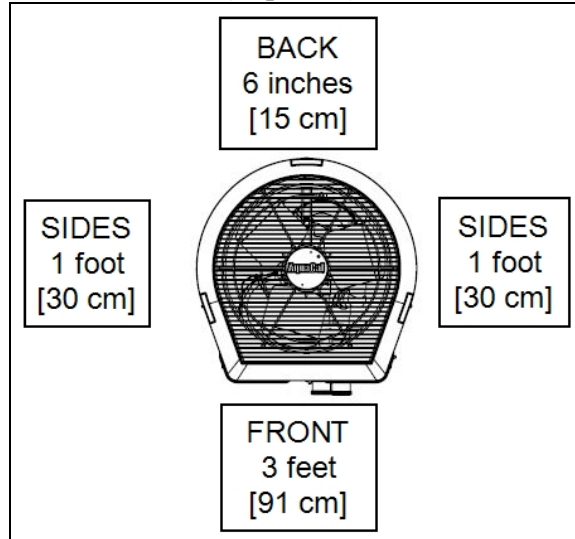
## 1.2 Clearances

- Proper air circulation is required for the heat pump to operate efficiently. The following diagrams show the minimum clearances required for the proper operation of the heat pump.
- Avoid storing chemical containers near the heat pump. The chemicals can cause equipment damage.
- Avoid placing objects near or on top of the heat pump. This includes shrubbery and lawn furniture. These objects will reduce performance and efficiency and hinder maintenance access.

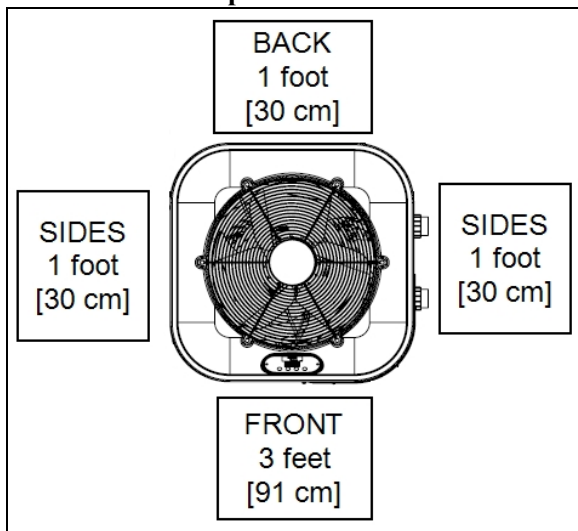
(Overhead Clearance)



(Top View)



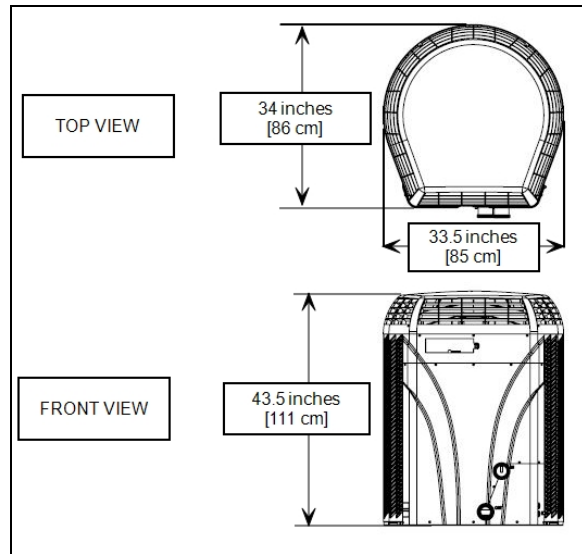
(Top View)  
TropiCal® T170



### 1.3 Dimensions

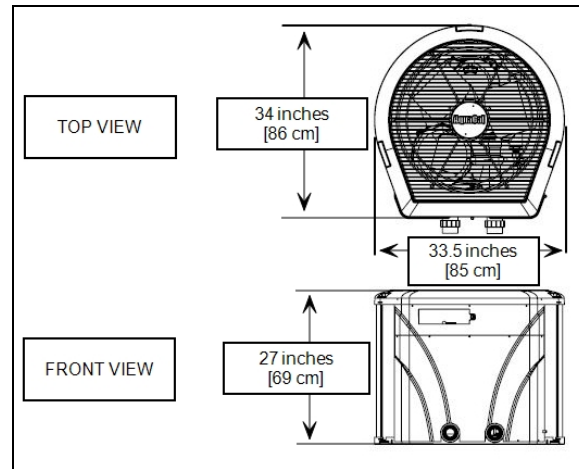
**(HeatWave SuperQuiet® SQ120R, SQ125, SQ145, SQ166R and SQ225)**

**(TropiCool® TC1500)**



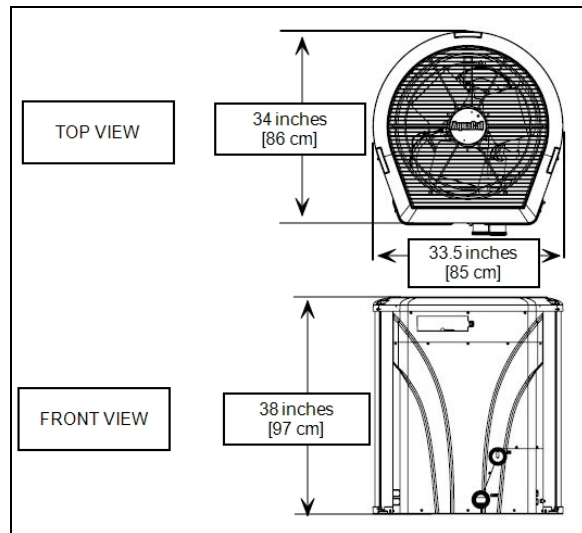
**(TropiCal® T035, T055 and T075)**

**(TropiCool® TC500)**

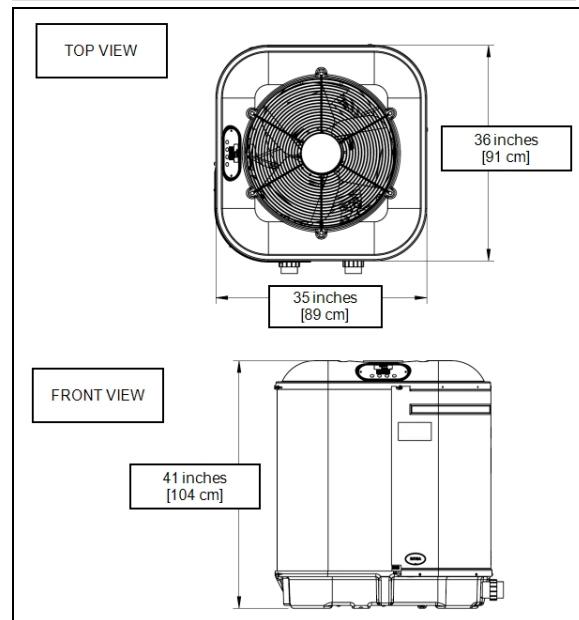


**(TropiCal® T090, T115 and T135)**

**(TropiCool® TC1000)**



**(TropiCal® T170)**



## 1.4 Plumbing

### 1.4.a Plumbing Requirements

#### NOTICE

Failure to heed the following may result in damage to equipment.

- Do not use glue on the threaded portion of the equipment's unions. A glued-in-place union will prevent the equipment from being properly winterized.
- The heat pump must receive water flow within the specified minimum ranges under worst-case conditions such as a fouled water filter.
- Failure to provide clean filtered water to the heat pump can void the product warranty.
- Water flow exceeding maximum flow rates will negatively affect the total pool filtration performance and may damage the heat pump. This will not be covered under the equipment warranty. See "*Water Flow Rates*" on page 11.
  - Install a bypass valve whenever water-flow may exceed the maximum rating.
    - See "*Bypass Valve Kit (# STK0135)*" on page 82.
    - For additional guidance testing water flow rates, please contact AquaCal®.
- A safety-enhancing "Over Temperature Alarm" kit is strongly recommended for all spa applications. See "*Over Temperature Alarm Kit*" on page 83.

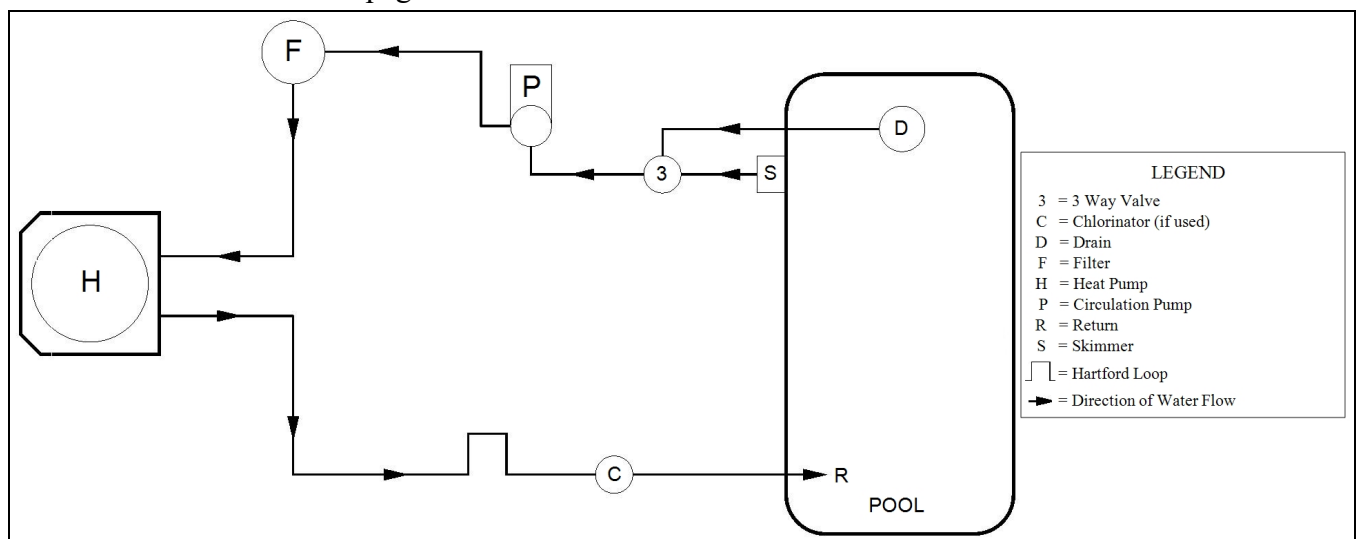
### 1.4.b Plumbing Diagrams

Plumbing diagrams are provided in this section as a planning guide to the sequence of equipment, valves, and fittings.

- The basic plumbing configurations for typical installations are shown.
- If the installation does not closely follow any of the supplied plumbing diagrams, AquaCal® Technical Support is available for installation advice and guidance.
- Confirm water provided to the heat pump is clean and filtered.

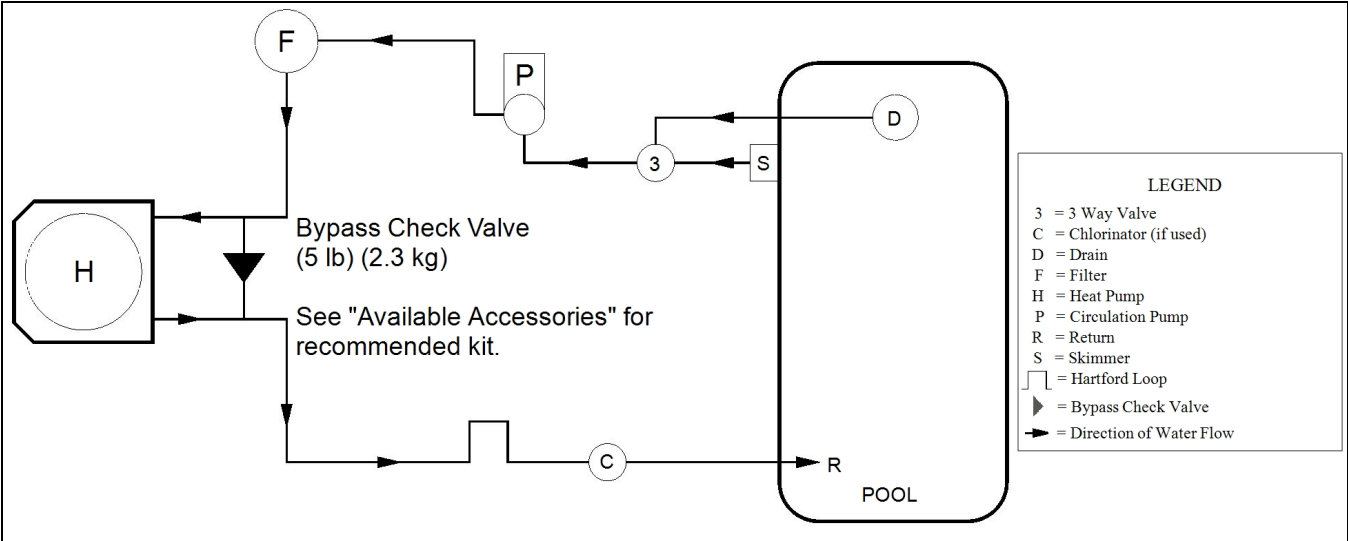
#### Heat Pump with water flows equal or less than the maximum listed flow rate

See "*Water Flow Rates*" on page 11.

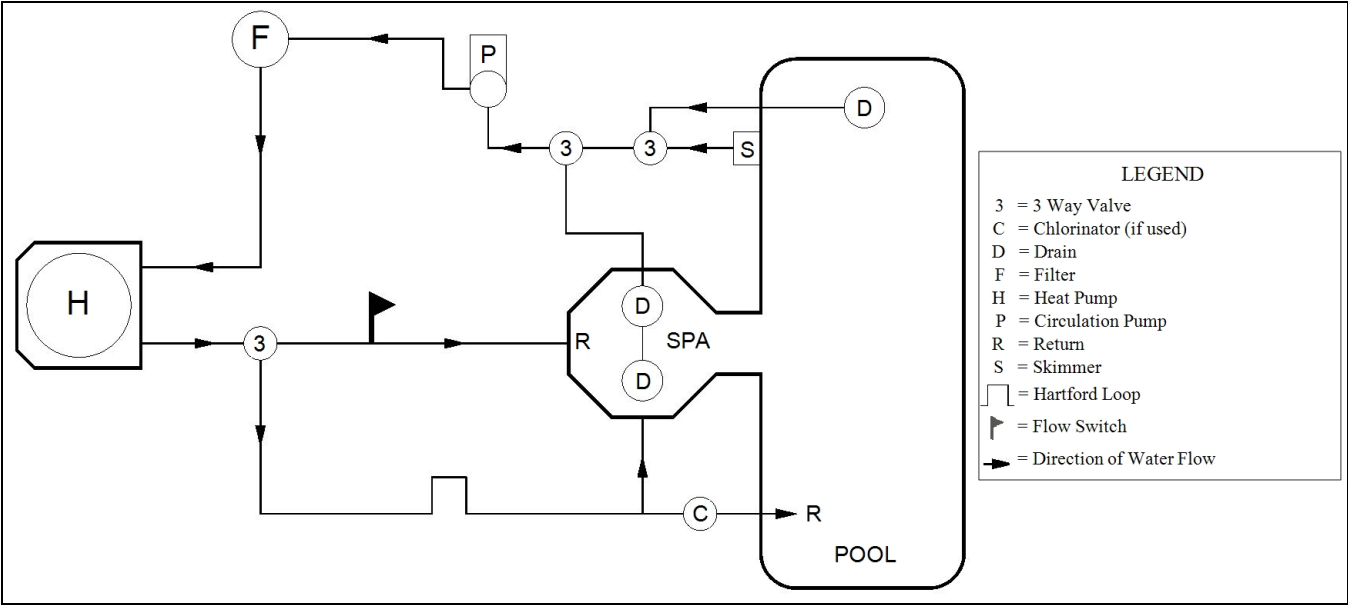


Heat Pump with water flows greater than the maximum listed flow rate

See "Water Flow Rates" on page 11.

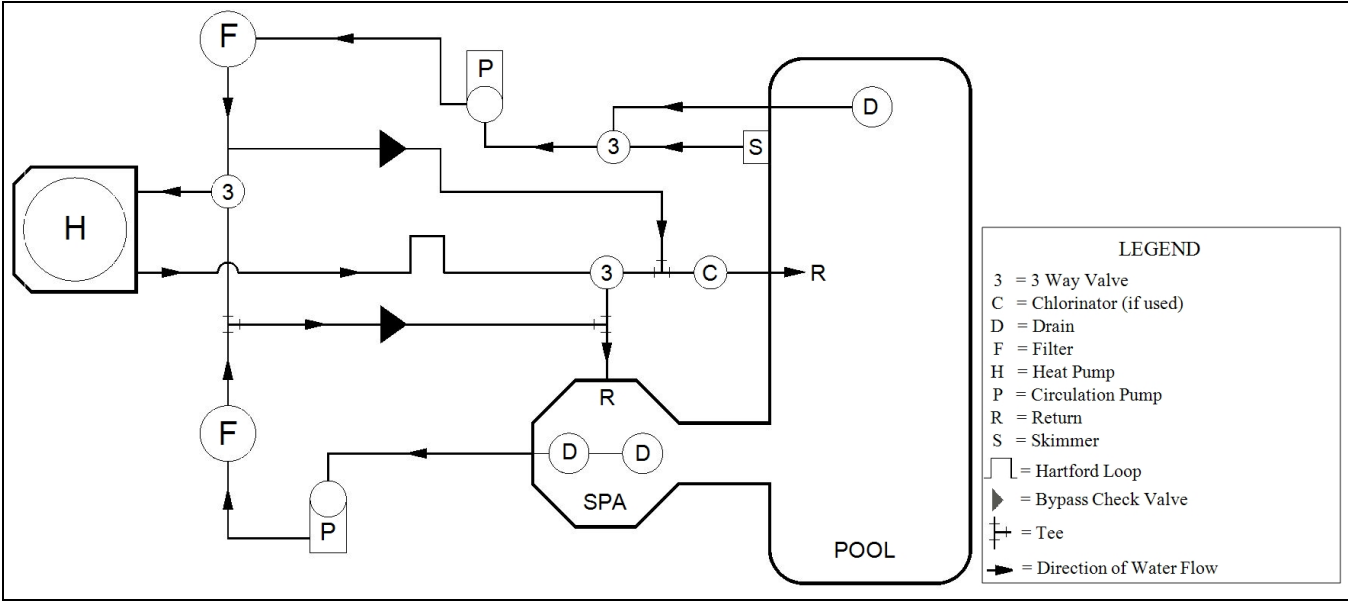


Heat Pump with Spillover Spa (One filter Pump)

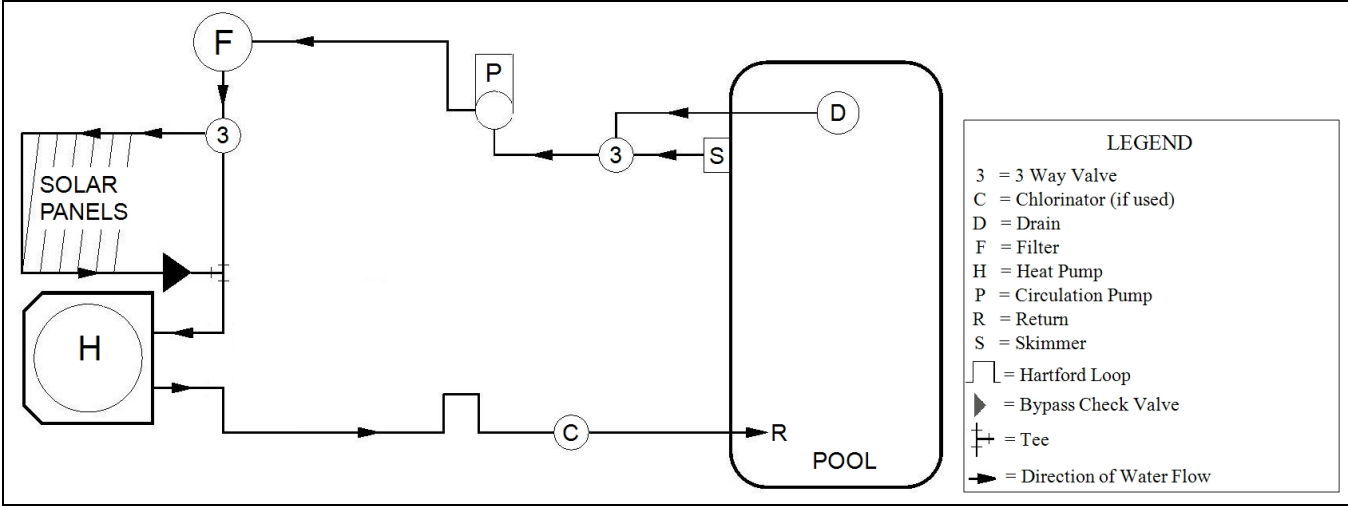




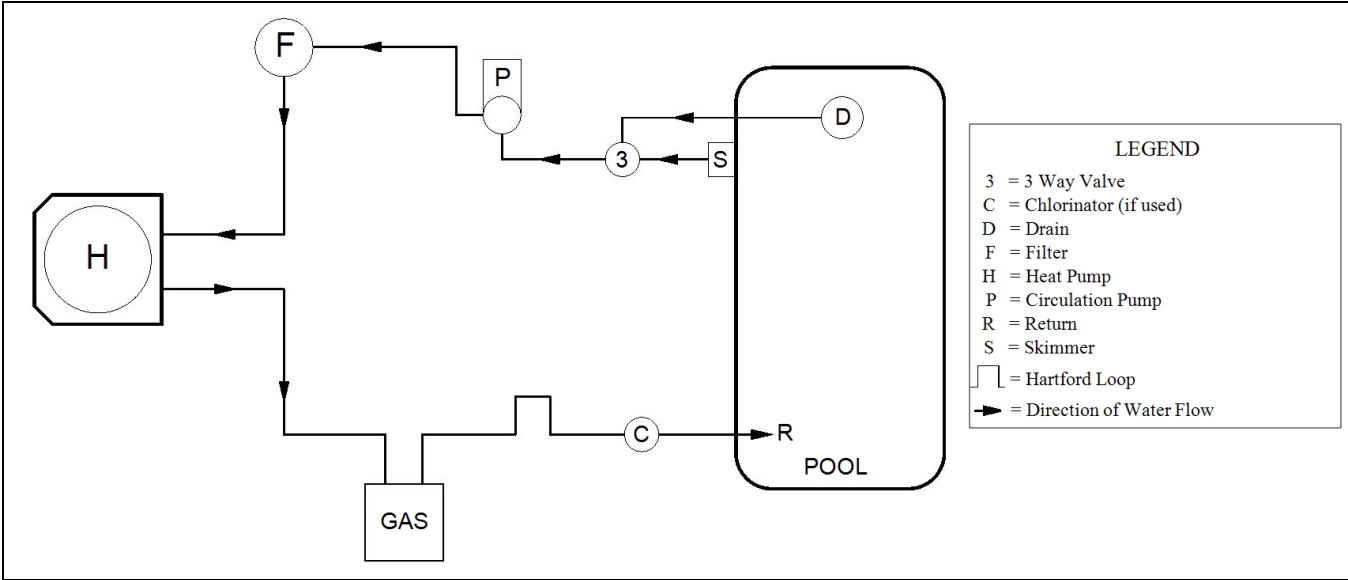
Heat Pump with Spillover Spa (Two filter Pumps)



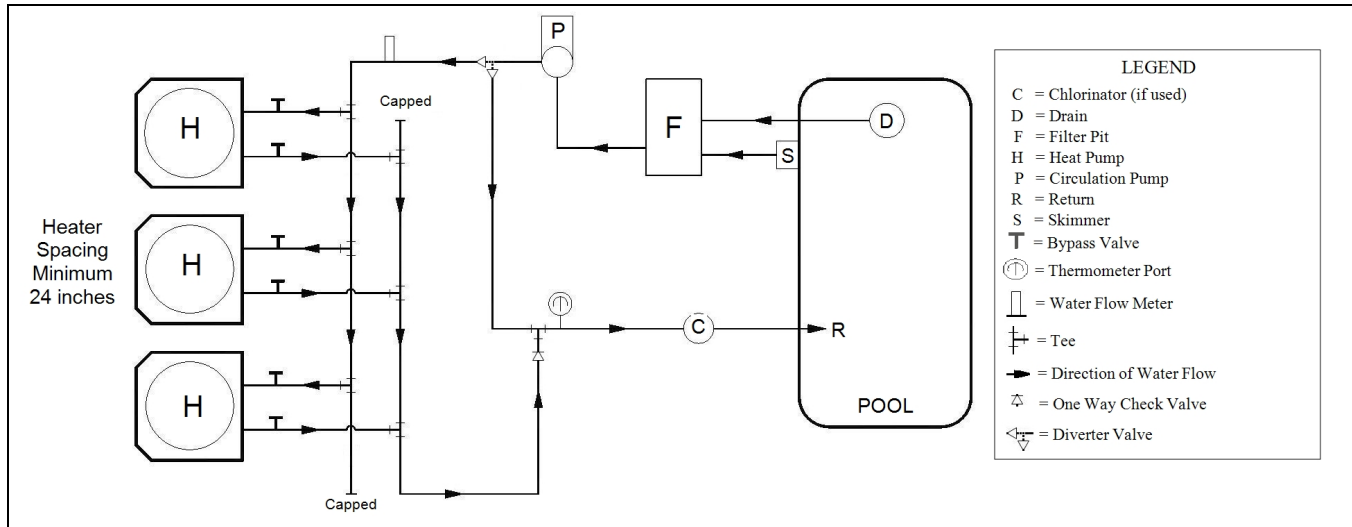
Heat Pump with Solar Panels in Plumbing Circuit



Heat Pump with Gas Heater backup



## Multiple Air Source Heat Pumps



### 1.4.c Water Connections to Heat Pump

- Heat Pump union sizes are specified on diagrams.
- Connections to site plumbing are made via PVC solvent cement to the female slip socket of the plumbing unions.
- Plumbing unions are available from AquaCal®.

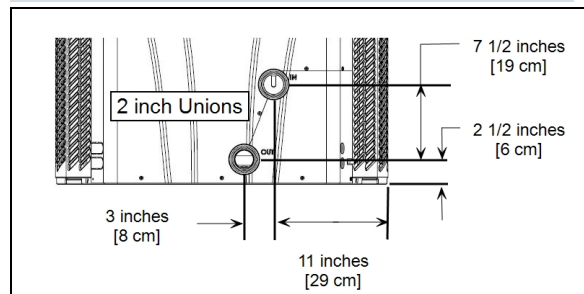
#### NOTICE

Failure to heed the following may result in damage to equipment.

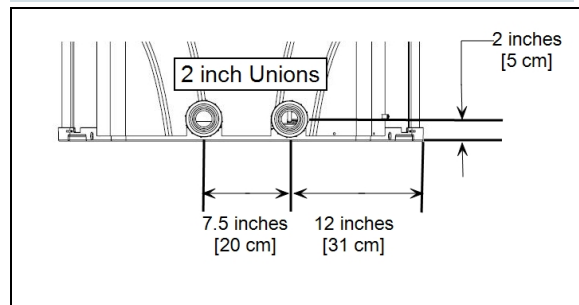
- Do not use glue on the threaded portion of the equipment's unions. A glued-in-place union will prevent the equipment from being properly winterized.

#### HeatWave SuperQuiet® SQ120R, SQ125, SQ145, SQ166R, SQ225

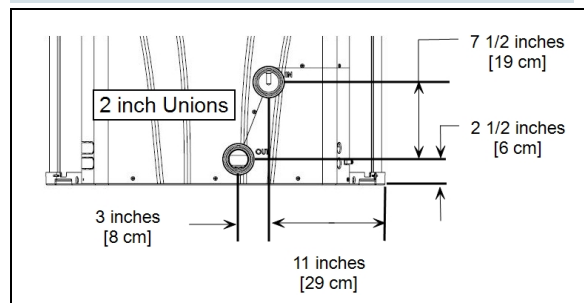
#### TropiCool® TC1500



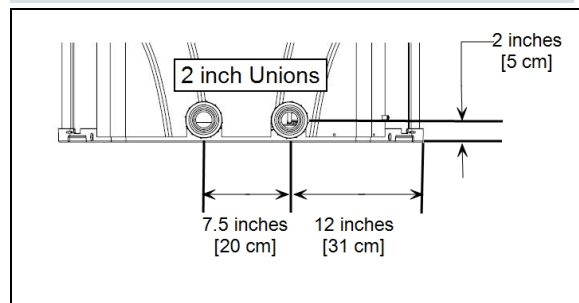
#### TropiCool® TC500

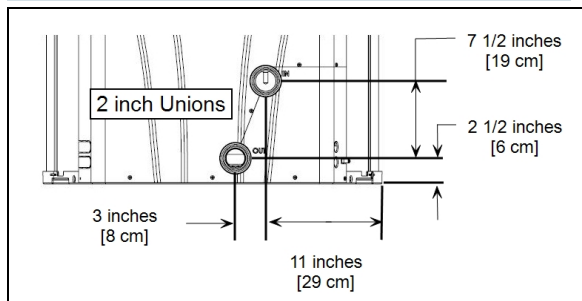
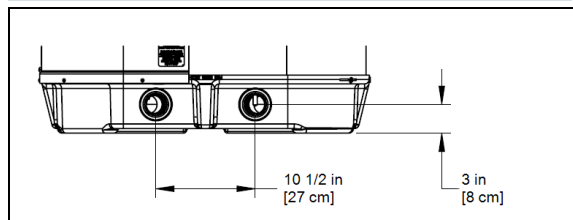


#### TropiCool® TC1000



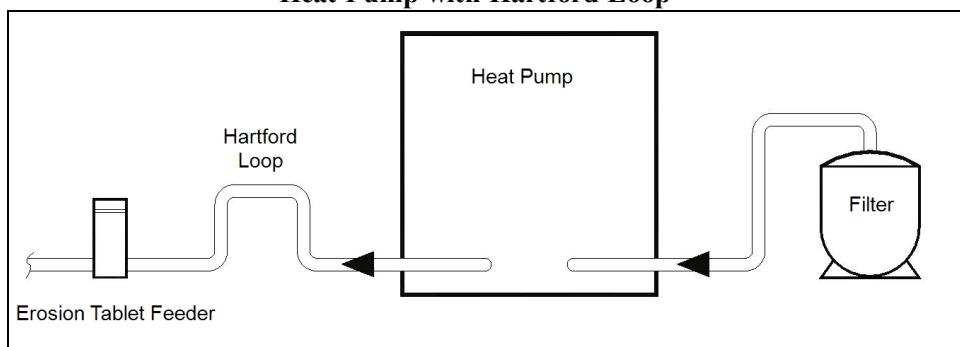
#### TropiCal® T035, T055, T075



**TropiCal® T090, T115, T135****TropiCal® T170****1.4.d In-Line Chlorine Feeders**

Place in-line chlorinators downstream from the heat pump and as low in elevation as possible.

- If an erosion type feeder is used, it is recommended that a Hartford Loop be installed to protect internal heat pump components.
- A Hartford Loop is not necessary with a Salt Chlorine Generator.

**Heat Pump with Hartford Loop****1.4.e Water Flow Rates**

Maintain water flow rates as indicated. Please note, these specifications relate to the heat pump only. Code-specified whole system turnover rates must be satisfied.

**NOTICE**

Failure to heed the following may result in damage to equipment.

- Water flow exceeding maximum flow rates will negatively affect the total pool filtration performance and may damage the heat pump. This will not be covered under the equipment warranty.

| MODEL   | HEAT EXCHANGER TYPE   | FLOW RATES           |                    |
|---------|-----------------------|----------------------|--------------------|
|         |                       | MINIMUM              | MAXIMUM            |
| SQ120R  | Titanium ThermoLink®  | 30 GPM (113.6 L/min) | 70 GPM (265 L/min) |
| SQ125   | Titanium ThermoLink®  | 30 GPM (113.6 L/min) | 70 GPM (265 L/min) |
| SQ145   | Titanium ThermoLink®  | 30 GPM (113.6 L/min) | 70 GPM (265 L/min) |
| SQ150VS | Titanium ThermoLink®  | 30 GPM (113.6 L/min) | 70 GPM (265 L/min) |
| SQ166R  | Titanium ThermoLink®  | 30 GPM (113.6 L/min) | 70 GPM (265 L/min) |
| SQ225   | Titanium ThermoLink®  | 30 GPM (113.6 L/min) | 70 GPM (265 L/min) |
| T035    | Titanium Tube-in-Tube | 20 GPM (75.7 L/min)  | 45 GPM (170 L/min) |

| MODEL  | HEAT EXCHANGER TYPE              | FLOW RATES           |                    |
|--------|----------------------------------|----------------------|--------------------|
|        |                                  | MINIMUM              | MAXIMUM            |
| T055   | Titanium Tube-in-Tube            | 20 GPM (75.7 L/min)  | 45 GPM (170 L/min) |
| T075   | Titanium Tube-in-Tube            | 20 GPM (75.7 L/min)  | 45 GPM (170 L/min) |
| T090   | Titanium ThermoLink <sup>®</sup> | 30 GPM (113.6 L/min) | 70 GPM (265 L/min) |
| T115   | Titanium ThermoLink <sup>®</sup> | 30 GPM (113.6 L/min) | 70 GPM (265 L/min) |
| T135   | Titanium ThermoLink <sup>®</sup> | 30 GPM (113.6 L/min) | 70 GPM (265 L/min) |
| T170   | Titanium Tube-in-Tube            | 30 GPM (113.6 L/min) | 70 GPM (265 L/min) |
| TC500  | Titanium Tube-in-Tube            | 20 GPM (75.7 L/min)  | 45 GPM (170 L/min) |
| TC1000 | Titanium ThermoLink <sup>®</sup> | 30 GPM (113.6 L/min) | 70 GPM (265 L/min) |
| TC1500 | Titanium ThermoLink <sup>®</sup> | 30 GPM (113.6 L/min) | 70 GPM (265 L/min) |

**PLEASE NOTE -**

If minimum flow rates are not met, heat pump performance is reduced and performance will suffer. Internal safety devices may deactivate the heat pump with the following errors:

- **HIGH PRESSURE FAULT**
- **HP5 SYSTEM LOCKOUT**
- **LOW PRESSURE FAULT**
- **LP5 SYSTEM LOCKOUT**

- Operate water filtration devices per manufacturer's specifications. Dirty filters can cause a reduction of water flow to the heat pump. An increase of 7-10 psi (48 to 69 kPa) higher than the clean filter pressure typically reduces flow rates. This requires the filter to be cleaned or back-washed.
- Keep baskets free of debris. A large quantity of debris in the pump and skimmer baskets can reduce water flow.
- Check for improper valve settings. A partially closed valve after the filter, or a full-open bypass around the heat pump, will cause insufficient water flow through the heat pump.
- The maximum static pressure (or operating pressure) is 50 psi (345 kPa). These specifications relate to the heat pump only.
- Code-specified whole system turnover rates must be satisfied.

#### 1.4.f Adjusting Water Flow Using $\Delta T$ (Delta-T)

The Delta-T is the temperature difference between the water temperatures entering and leaving the heat pump. The equipment can be fine-tuned for maximum performance by balancing water flow rates to maintain an ideal  $\Delta T$ .

**The adjustment procedure must be completed with the unit in heating mode.**

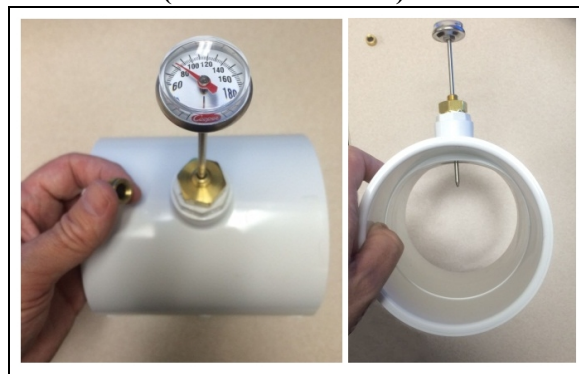
- Installed temperature ports are required to perform the following procedures.
- These ports are typically located on the pool in and pool out water lines approximately six inches away from the heat pump.

**PLEASE NOTE -**

- The installation of temperature ports is required for all commercial applications.
- The installation of temperature ports is strongly recommended for residential installations.
  - See "Temperature Port Kit (# STK0096)" on page 84.

1. Adjust the thermostat to its lowest setting with the unit in heating mode.
2. Deactivate the water filtration pump.
3. Confirm that the filters leading to the heat pump are clean.
4. Adjust the valves controlling water headed towards the heat pump to the half-open position.
5. Adjust the valves controlling water leading away from the heat pump to a fully open position.
6. Activate the pool water filtration pump.
7. Slowly raise the thermostat temperature until the heat pump activates.
  - After a three-minute delay, the heat pump's compressor will start.
8. With the heat pump running, confirm the filtration pump is operating properly with adequate flow and no short cycling.
9. Wait for water temperatures to stabilize (approximately 5 minutes).
12. Adjust valves in the following order using the temperature chart provided.
  - a. Adjust the valve that controls water exiting the heat pump until the correct temperature differential is achieved. Match the temperature measured with a temperature probe to the chart.
  - b. Wait for water temperatures to stabilize. Then check the temperature again. Re-adjust the valve as needed.
13. Mark valves at these positions for future reference.

**Temperature Port  
(Shown with Probe)**



| HEAT EXCHANGER TYPE  | MODEL  | TEMPERATURE                      |
|----------------------|--------|----------------------------------|
| Titanium ThermoLink® | SQ120R | 3° to 7° F<br>(1.7° C to 3.9° C) |
| Titanium ThermoLink® | SQ125  | 3° to 7° F<br>(1.7° C to 3.9° C) |

| HEAT EXCHANGER TYPE   | MODEL   | TEMPERATURE                      |
|-----------------------|---------|----------------------------------|
| Titanium ThermoLink®  | SQ145   | 3° to 7° F<br>(1.7° C to 3.9° C) |
| Titanium ThermoLink®  | SQ150VS | 3° to 7° F<br>(1.7° C to 3.9° C) |
| Titanium ThermoLink®  | SQ166R  | 3° to 8° F<br>(1.7° C to 4.4° C) |
| Titanium ThermoLink®  | SQ225   | 4° to 9° F<br>(2.2° C to 5° C)   |
| Tube-in-Tube          | T035    | 1° to 4° F<br>(.5° C to 2.2° C)  |
| Tube-in-Tube          | T055    | 2° to 5° F<br>(1.1° C to 2.8° C) |
| Tube-in-Tube          | T075    | 3° to 7° F<br>(1.7° C to 3.9° C) |
| Titanium ThermoLink®  | T090    | 3° to 6° F<br>(1.7° C to 3.3° C) |
| Titanium ThermoLink®  | T115    | 3° to 7° F<br>(1.7° C to 3.9° C) |
| Titanium ThermoLink®  | T135    | 4° to 8° F<br>(2.2° C to 4.4° C) |
| Titanium Tube-in-Tube | T170    | 3° to 7° F<br>(1.7° C to 3.9° C) |
| Titanium Tube-in-Tube | TC500   | 2° to 5° F<br>(1.1° C to 2.8° C) |
| Titanium ThermoLink®  | TC1000  | 2° to 5° F<br>(1.1° C to 2.8° C) |
| Titanium ThermoLink®  | TC1500  | 3° to 7° F<br>(1.7° C to 3.9° C) |

Table 1 - Temperature Chart

**PLEASE NOTE -**

- Temperature differences are based on pool water temperatures of 69° to 75° F. (20.5° to 23.8° C)
- For water temperatures outside this range, contact AquaCal®. See "*Contacting AquaCal AutoPilot, Inc.*" on page 1.

#### 1.4.g Maintaining Ability to Winterize

Do not glue the threaded portion of the unions. The unions are used to decouple the heat pump from the plumbing system during hard freeze conditions.

##### **NOTICE**

Failure to heed the following may result in damage to equipment.

- Do not use glue on the threaded portion of the equipment's unions. A glued-in-place union will prevent the heat pump from being properly winterized.

#### 1.4.h Adjusting Water Pressure Switch

Adjust the water pressure switch when heat pump attempts to operate without water flow.

Before attempting any adjustments confirm the following :

- The filter is clean.
- Filter pump is operating.
- The valves are set to direct the appropriate amount of water through the heat pump. See "*Water Flow Rates*" on page 11.
- "**NO POOL/SPA WATER FLOW**" is displayed (or displays intermittently).



##### **DANGER**

Failure to heed the following will result in injury or death.

- RISK OF ELECTRICAL SHOCK FROM ENERGY STORED IN CAPACITORS - MODELS EQUIPPED WITH VARIABLE FREQUENCY COMPRESSOR DRIVES STORE ELECTRICITY EVEN AFTER THE POWER HAS BEEN DEACTIVATED AT THE POWER BREAKER. ***Wait for 2 minutes after the shut down of equipment before servicing.***
- Deactivate power while routing wiring to control board.
- Follow all National Electric Codes (NEC) and/or State and Local guidelines.



##### **WARNING**

Failure to heed the following may result in injury or death.

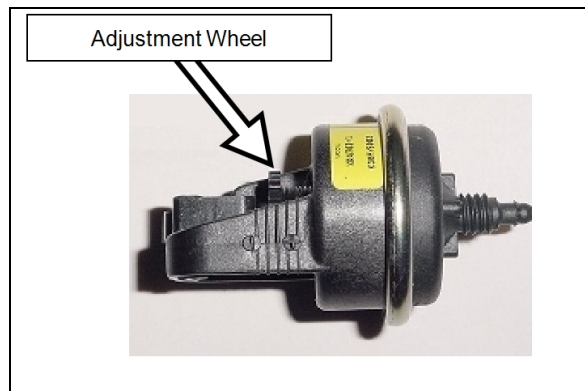
- Water Pressure Switch adjustment procedure to be performed by experienced service personnel only; procedure must not be attempted by individuals lacking adequate electrical and mechanical experience.

##### **NOTICE**

Failure to heed the following may result in damage to equipment.

- If the heat pump continues to operate after a water pressure switch adjustment, deactivate equipment and perform additional troubleshooting.

1. Remove heat pump access panel.
2. Locate the water pressure switch. It will be outside and along the bottom edge of the electrical enclosure. The exact location varies by model.
3. Activate the filter pump.
4. Apply power to heat pump.
5. Slowly rotate the adjustment wheel on the switch. Keep turning the wheel until the heat pump indicates it is receiving water. The display will no longer indicate "**NO POOL/SPA WATER FLOW**".
6. Deactivate filter pump. If correctly adjusted, the heat pump will deactivate and the display will show "**NO POOL/SPA WATER FLOW**".
7. Re-install heat pump access panel.
8. If the heat pump continues to operate without water flow, the installation of a grid flow switch may be required.
  - This can become necessary if the heat pump is installed below the elevation of the body of water to be heated or cooled. The standing pressure from the water can cause the water pressure switch to activate when the circulation pump is off. Therefore a water flow switch must be used in place of a water pressure switch to determine if incoming water is being sent to the heat pump. See "*Grid Flow Switch (# 0040S)*" on page 83.
9. If the heat pump continues to operate without water flow, contact AquaCal®.



## 1.5 Electrical

### 1.5.a Electrical Requirements

#### **DANGER**

Failure to heed the following will result in injury or death.

- RISK OF ELECTRICAL SHOCK FROM ENERGY STORED IN CAPACITORS - MODELS EQUIPPED WITH VARIABLE FREQUENCY COMPRESSOR DRIVES STORE ELECTRICITY EVEN AFTER THE POWER HAS BEEN DEACTIVATED AT THE POWER BREAKER. *Wait for 2 minutes after the shut down of equipment before servicing.*
- Deactivate power while routing wiring to control board.
- Follow all National Electric Codes (NEC) and/or State and Local guidelines.

#### **WARNING**

Failure to heed the following may result in injury or death.

- The information contained in this section is intended for use by qualified electricians familiar with electrical service-industry safety standards and methods.
- Locate the equipment disconnect as near to the heat pump as possible. Always satisfy applicable codes and standards.
- Never mount power-disconnects directly to the heat pump.
- In sizing power wiring, be especially aware of up-sizing requirements necessary due to wiring distances. Always satisfy applicable codes and standards.
- AquaCal® heat pumps are designed to use copper conductors, only. Do not use aluminum wire.
- If multiple heat pumps are on-site, confirm that the multiple heat pump configuration has been utilized. See "*Connecting Multiple Heat Pumps (Master / Slaved)*" on page 39. This will prevent multiple heat pumps attempting to start at the same time, causing an excessive power drop at start-up.



## Electrical Standards

| Standards                                 | Title                                                                                                                                         |
|-------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------|
| <b>NFPA 70, Nat'l Elec. Code 2017</b>     | The electrical installation must conform to the current version of the National Electric Code (NEC), and all applicable local and state codes |
| <b>IEC 60335-1</b>                        | Household and similar electrical appliances - Safety - General Requirements                                                                   |
| <b>IEC 60335-2</b>                        | Household and similar electrical appliances - Safety – Particular requirements for electrical heat pumps, air-conditioners, and dehumidifiers |
| <b>UL 1995 &amp; CSA C22.2 No. 236-15</b> | Standard for Safety - Heating and cooling equipment                                                                                           |

Table 2 - Standards

## Grounding and Bonding

Follow local code requirements for proper grounding and bonding of heat pump equipment.

- A bonding lug has been provided on the lower right-hand corner of the front access panel.

## Surge Suppression

The use of approved commercial surge protectors is strongly recommended.

## Sizing the Electrical Service

Refer to equipment data plate for specific information required to size electrical service and over-current protection of the heat pump. Sizing is based on data plate information, wire size, wiring devices, and over-current protection per applicable local codes and standards. See "*Identifying Model Specifications*" on page 79.

## Minimum and Maximum Operating Voltage

The heat pump must operate within specified voltages.

### NOTICE

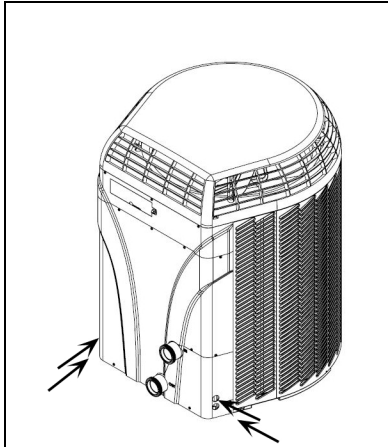
Failure to heed the following may result in damage to equipment.

- Operating equipment under higher or lower voltage conditions may result in damage to your compressor, motors or other electrical components. This damage will not be covered by the product warranty.
1. Measure site voltage. The site voltage **MUST** be measured under “FULL LOAD” conditions. Activate all equipment using the same electrical panel as the heat pump.
  2. If measured site voltage is outside listed ranges, immediately deactivate equipment until site conditions have been corrected. If unsure of heat pump equipment rating, please see "*Identifying Model Specifications*" on page 79.

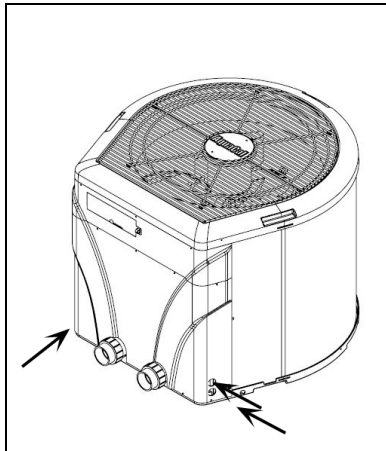
| Equipment Rating                                                | Minimum Site Voltage | Maximum Site Voltage |
|-----------------------------------------------------------------|----------------------|----------------------|
| <b>A Voltage</b><br>(208 to 230 Volts)<br>Single Phase 60 hertz | 200 Volts            | 253 Volts            |
| <b>B Voltage</b><br>(208 to 230 Volts)<br>Three Phase 60 hertz  | 200 Volts            | 253 Volts            |
| <b>D Voltage</b><br>(380 to 420 Volts)<br>Three Phase 50 hertz  | 361 Volts            | 441 Volts            |
| <b>E Voltage</b><br>(380 Volts)<br>Three Phase 60 hertz         | 361 Volts            | 399 Volts            |
| <b>G Voltage</b><br>(460 Volts)<br>Three Phase 60 hertz         | 437 Volts            | 483 Volts            |
| <b>H Voltage</b><br>(200 to 240 Volts)<br>Single Phase 50 hertz | 180 Volts            | 264 Volts            |

## 1.5.b Incoming Power Access Holes

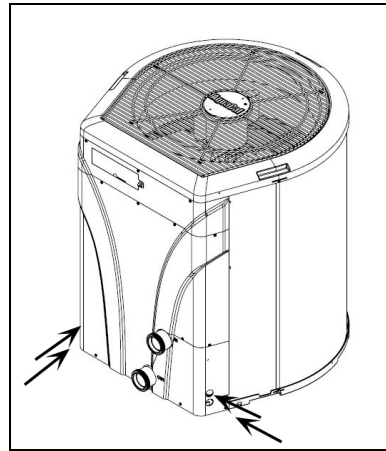
(HeatWave SuperQuiet®  
SQ120R, SQ125, SQ145,  
SQ166R and SQ225)  
(TropiCool® TC1500)



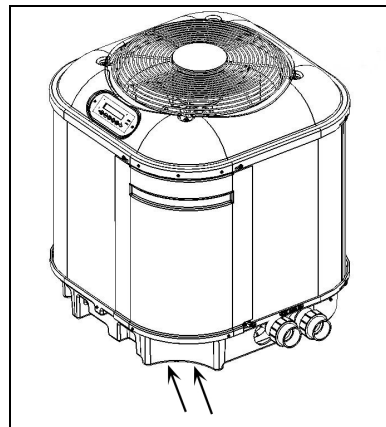
(TropiCal® T035, T055  
and T075)  
(TropiCool® TC500)



(TropiCal® T090, T115  
and T135)  
(TropiCool® TC1000)



(TropiCal® T170)



## 1.5.c Access Panels

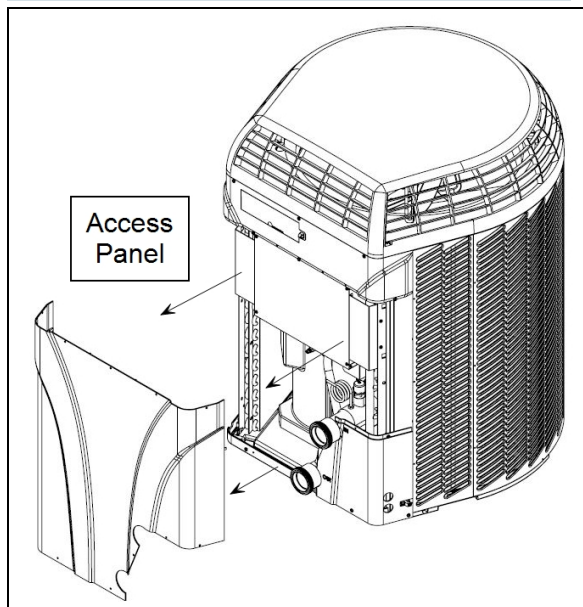
### DANGER

Failure to heed the following will result in injury or death.

- RISK OF ELECTRICAL SHOCK FROM ENERGY STORED IN CAPACITORS - MODELS EQUIPPED WITH VARIABLE FREQUENCY COMPRESSOR DRIVES STORE ELECTRICITY EVEN AFTER THE POWER HAS BEEN DEACTIVATED AT THE POWER BREAKER. ***Wait for 2 minutes after the shut down of equipment before servicing.***
- Deactivate power while routing wiring to control board.
- Follow all National Electric Codes (NEC) and/or State and Local guidelines.

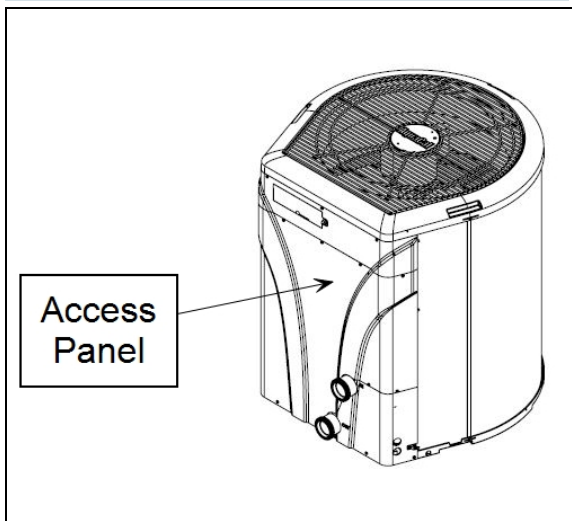
#### HeatWave SuperQuiet®

#### TropiCool® TC1500

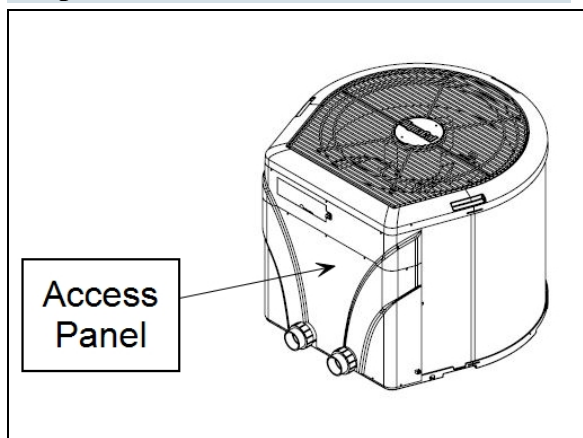


#### TropiCal® T035, T055 and T075

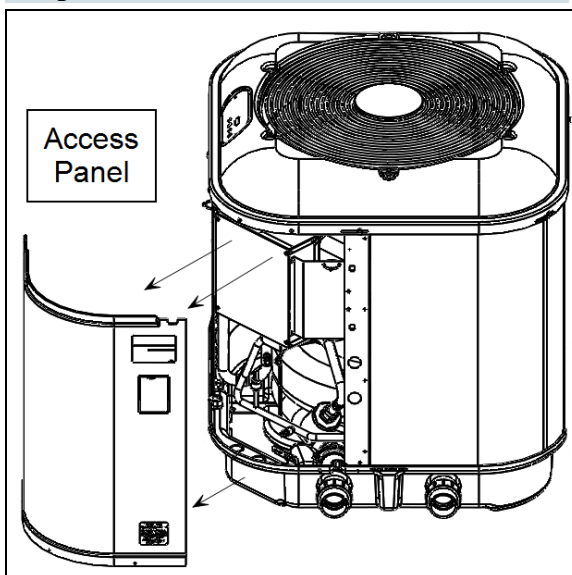
#### TropiCool® TC1000



#### TropiCool® TC500



#### TropiCal® T170



### 1.5.d Verifying Transformer Setting

Transformer voltage must be confirmed and set correctly depending on the measured voltage found on the site. Incorrect settings may cause heat pump damage. The following procedure will allow the installer to set the heat pump's transformer for the appropriate site voltage.

#### DANGER

Failure to heed the following will result in injury or death.

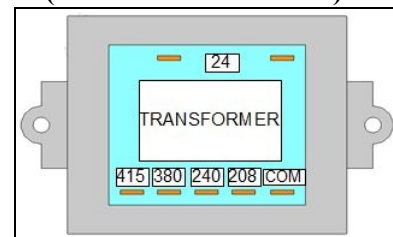
- RISK OF ELECTRICAL SHOCK FROM ENERGY STORED IN CAPACITORS - MODELS EQUIPPED WITH VARIABLE FREQUENCY COMPRESSOR DRIVES STORE ELECTRICITY EVEN AFTER THE POWER HAS BEEN DEACTIVATED AT THE POWER BREAKER. ***Wait for 2 minutes after the shut down of equipment before servicing.***
- Deactivate power while routing wiring to control board.
- Follow all National Electric Codes (NEC) and/or State and Local guidelines.

#### WARNING

Failure to heed the following may result in injury or death.

- The information contained in this section is intended for use by qualified technicians, familiar with electrical service-industry safety standards and methods.
1. Turn heat pump on by adjusting the thermostat to call for heating or cooling. If more than one heat pump is on-site, turn them all on. Allow time for all heat pump compressors to activate.
  2. Measure the running site voltage.
  3. Confirm transformer tap is set for the measured site voltage. If more than one voltage tap is shown, select the voltage nearest to the running site voltage.

**Example of heat pump transformer**  
(Varies between models)



#### **PLEASE NOTE -**

- If more than one voltage is shown on the equipment's data plate, the factory default setting is usually the higher voltage on the transformer.
- As an example, a "208/230" voltage will be set to "240" from the factory.

### 1.5.e Three-Phase Adjustment

#### DANGER

Failure to heed the following will result in injury or death.

- RISK OF ELECTRICAL SHOCK FROM ENERGY STORED IN CAPACITORS - MODELS EQUIPPED WITH VARIABLE FREQUENCY COMPRESSOR DRIVES STORE ELECTRICITY EVEN AFTER THE POWER HAS BEEN DEACTIVATED AT THE POWER BREAKER. ***Wait for 2 minutes after the shut down of equipment before servicing.***
- Deactivate power while routing wiring to control board.
- Follow all National Electric Codes (NEC) and/or State and Local guidelines.

#### WARNING

Failure to heed the following may result in injury or death.

- The information contained in this section is intended for use by qualified technicians, familiar with electrical service-industry safety standards and methods.

If a three-phase unit fails to operate at start-up, the orientation of the line voltage "field" wiring may need to be adjusted.

- The phase monitor is located inside the electrical panel.
1. Deactivate power to the unit. **Confirm that power is off to all three legs using an electrical test meter set for the correct voltage.**
  2. Switch position of the incoming power wires at each leg as follows, re-connect power and attempt to restart the unit. If the unit fails to start, disconnect power. Verify off and proceed to the next leg.
    - Switch incoming power wires at L1 and L2 on the line side to the contactor.
    - Switch incoming power wires at L1 and L3 on the line side to the contactor.
    - Switch incoming power wires at L2 and L3 on the line side to the contactor.
  3. When heat pump starts, disconnect power and verify off. Then confirm all line voltage connections are securely tightened. Reconnect power.
    - If the heat pump does not start, contact AquaCal® for further assistance. See "*Contacting AquaCal AutoPilot, Inc.*" on page 1.

**Three-Phase Monitor**



### 1.5.f Schematic Location

Schematics are located on the inside of the electrical panel.

## 1.6 External Equipment

### 1.6.a Connecting a Call Flex

To support a direct connection to a call flex accessory, AquaCal® heat pumps are equipped with optional terminal blocks on the microprocessor. The microprocessor is located on the low-voltage side of the electrical enclosure.

The call flex accessory can override a circulation pump to provide water flow to the heat pump when the set temperature is not met. For ordering information on the accessory, see "Call Flex Accessory (# 0030-LEDS)" on page 83.

#### Connecting a Call Flex



Failure to heed the following will result in injury or death.

- RISK OF ELECTRICAL SHOCK FROM ENERGY STORED IN CAPACITORS - MODELS EQUIPPED WITH VARIABLE FREQUENCY COMPRESSOR DRIVES STORE ELECTRICITY EVEN AFTER THE POWER HAS BEEN DEACTIVATED AT THE POWER BREAKER. ***Wait for 2 minutes after the shut down of equipment before servicing.***
- Deactivate power while routing wiring to control board.
- Follow all National Electric Codes (NEC) and/or State and Local guidelines.



Failure to heed the following may result in injury or death.

- This section is only for qualified installers who are familiar with the swimming pool and spa safety standards.
- The installer must be familiar with service industry techniques.

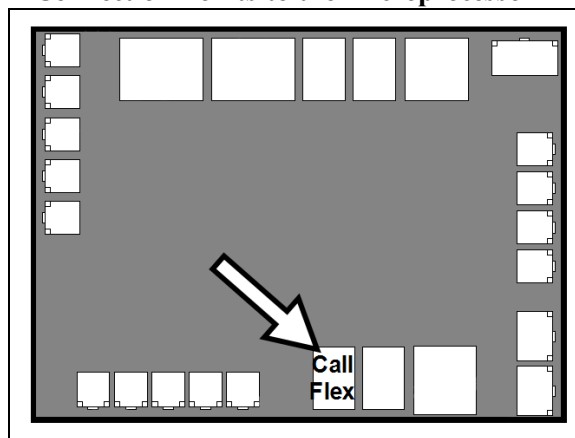
#### NOTICE

Failure to heed the following may result in damage to equipment.

- The wire size connecting the controller must be 22-gauge (minimum), 2-conductor, low-voltage wire.

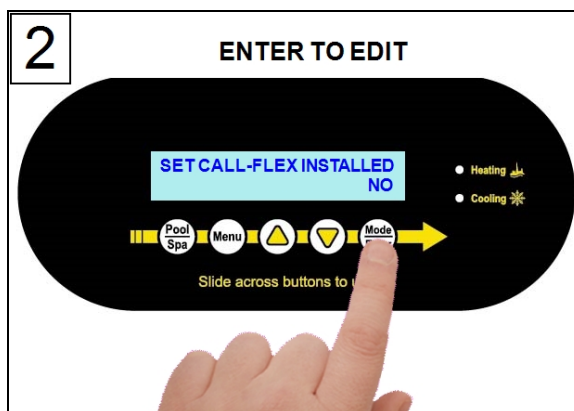
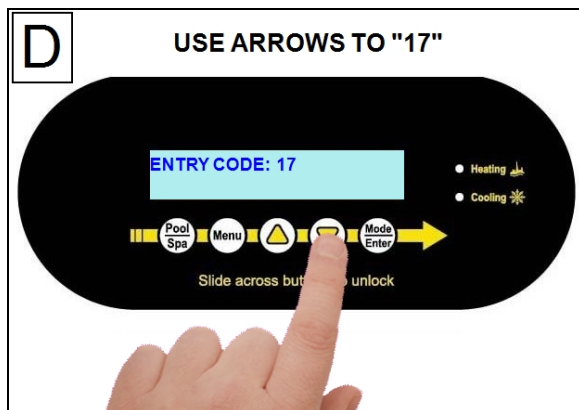
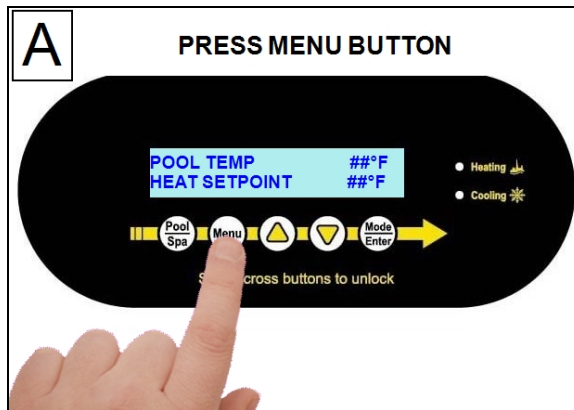
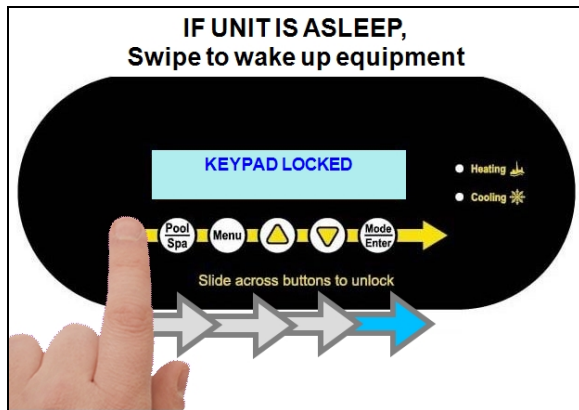
1. Deactivate power to heat pump.
2. Remove heat pump electrical access panel.
3. Route 22-gauge (minimum), 2-conductor, low-voltage wires to the low voltage side of the electrical enclosure. Follow all National Electric Codes (NEC) unless State or Local guidelines supersede.
4. Connect the controller wires to the port labeled "Call Flex" on the microprocessor as indicated.
5. Reattach heat pump access panel.
6. Apply power to heat pump.
7. Configure the heat pump to indicate an installed Call Flex. See "Configure Call Flex" on the next page.

Connection Points to the Microprocessor

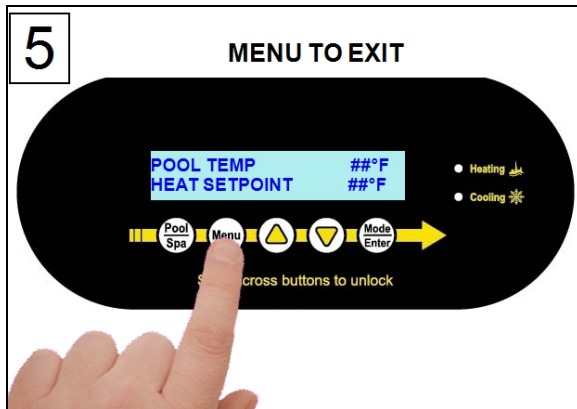
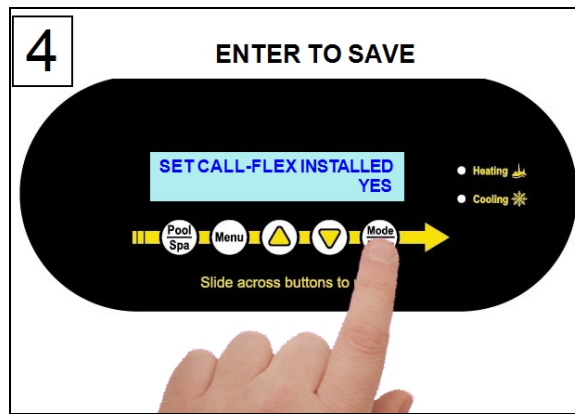
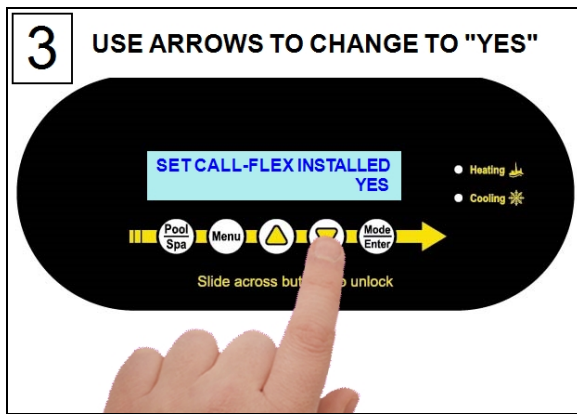


## Configure Call Flex

Enter "Installer Menu", then proceed







### 1.6.b Connecting a Chlorinator

To support an AutoPilot® ChlorSync chlorinator, select AquaCal® heat pumps are equipped with a power supply outlet on the front of the unit. The chlorination cell can be plugged directly into the heat pump without the need for a ChlorSync power supply.

#### **! DANGER**

Failure to heed the following will result in injury or death.

- RISK OF ELECTRICAL SHOCK FROM ENERGY STORED IN CAPACITORS - MODELS EQUIPPED WITH VARIABLE FREQUENCY COMPRESSOR DRIVES STORE ELECTRICITY EVEN AFTER THE POWER HAS BEEN DEACTIVATED AT THE POWER BREAKER. ***Wait for 2 minutes after the shut down of equipment before servicing.***
- Deactivate power while routing wiring to control board.
- Follow all National Electric Codes (NEC) and/or State and Local guidelines.

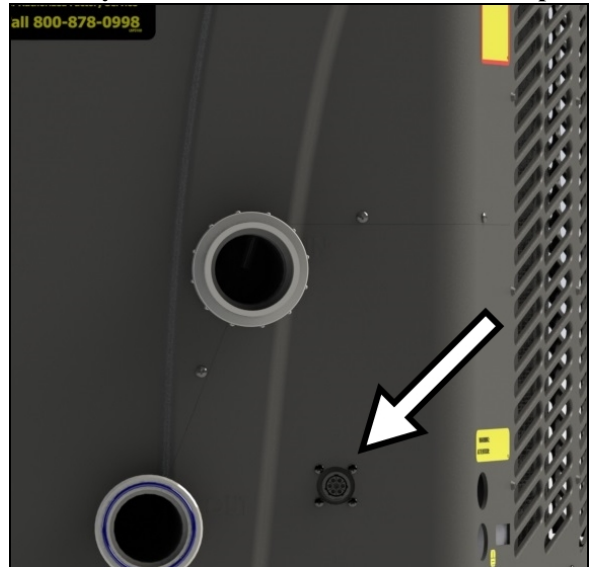
#### **! WARNING**

Failure to heed the following may result in injury or death.

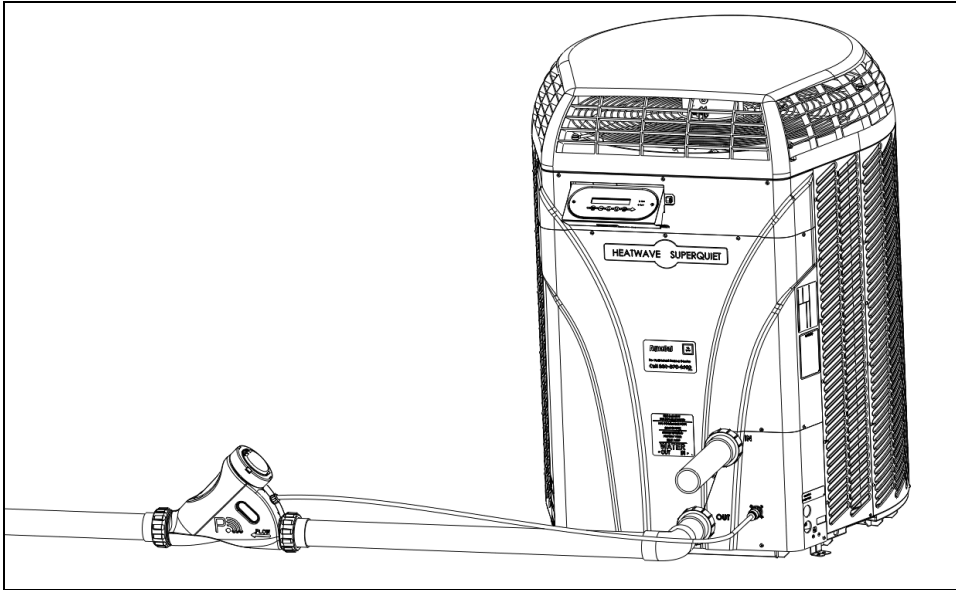
- This section is only for qualified installers who are familiar with the swimming pool and spa safety standards.
- The installer must be familiar with service industry techniques.

1. Deactivate power to heat pump.
2. Route the ChlorSync cell cord so that it is protected from possible damage by lawn equipment or foot traffic. If desired, the cord may be secured to plumbing or electrical conduit using tie wraps (not included).
3. Align and insert the six (6) pin cell cord connector to the heat pump's power supply port as indicated.
4. Turn the round nut until it locks the connector in place.
5. Apply power to heat pump.

### ChlorSync Power Connection to Heat Pump



### ChlorSync Connected to Heat Pump



### 1.6.c Connecting External Controllers to Heat Pump

To support a direct connection to an external controller, AquaCal® heat pumps are equipped with optional removable terminal blocks on the microprocessor. The microprocessor is located on the low-voltage side of the electrical enclosure.

#### **⚠ DANGER**

Failure to heed the following will result in injury or death.

- RISK OF ELECTRICAL SHOCK FROM ENERGY STORED IN CAPACITORS - MODELS EQUIPPED WITH VARIABLE FREQUENCY COMPRESSOR DRIVES STORE ELECTRICITY EVEN AFTER THE POWER HAS BEEN DEACTIVATED AT THE POWER BREAKER. ***Wait for 2 minutes after the shut down of equipment before servicing.***
- Deactivate power while routing wiring to control board.
- Follow all National Electric Codes (NEC) and/or State and Local guidelines.

## ⚠ WARNING

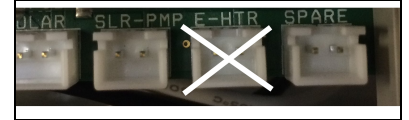
Failure to heed the following may result in injury or death.

- This section is only for qualified installers who are familiar with the swimming pool and spa safety standards.
- The installer must be familiar with service industry techniques.

## NOTICE

Failure to heed the following may result in damage to equipment.

- **Do not use an electric heater connection on external controllers for heat pump wiring.** This can cause damage to external controllers, heat pumps, and pad equipment. This damage is NOT covered by warranty.
- The wire size connecting the external controller to the heat pump must be 22-gauge, 2-conductor, low-voltage wire.
- Use the two middle data lines on the external controller's standard communication port (RS-485). Do not use the outside power or ground connection on the port.

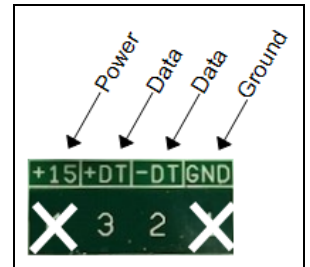


### c.1 Connecting Smart Bus Controllers

#### Wire Connections

1. Deactivate power to heat pump and external controller.
2. Remove electrical access panels on the heat pump and external controller.
3. Route 22-gauge, 2-conductor, low-voltage wires from the external controller communication port (com port) to the low voltage side of the heat pump's electrical enclosure. Do not use the power or ground wire.
4. Connect control wires to the heat pump's "Port B" of the microprocessor as indicated. See Figure 1 and Figure 2.
  - It is OK to double up wires at the external controller connection if necessary.
  - If, for example, the external controller is using the data port for an indoor controller, add wires to the existing configuration. *Connectors can be removed from terminals for ease in connecting wires. See Figure 3*

#### External Controller Communication Port



Wires from controller to microprocessor's Port "B" connector



External controller's data wires on communication port



Figure 1

Typically a smart bus controller will have four wires on its smart bus for a heat pump. The power and ground (usually the 1st and 4th wire) are not used.

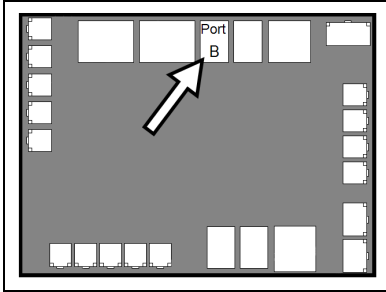


Figure 2

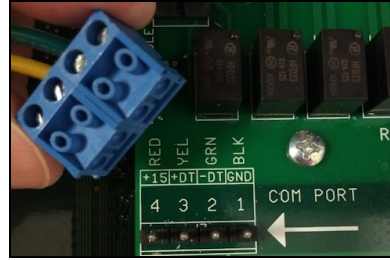


Figure 3

5. If dip-switch settings are required, configure them on the external controller now.



Failure to heed the following will result in injury or death.

- Deactivate power to the external controller while setting dip-switches

**Example - Jandy AquaLink® :**

*This external controller has dip switches. Confirm they are properly positioned to operate a heat pump.*

- Set dip-switch "S2" #1 to "ON". The solar option is to be used for the heat pump.
- Check Jandy documentation for any further dip switch settings.



6. If additional sensors are required on the external controller, install them on the external controller now.

**Example - Pentair EasyTouch® and Pentair IntelliTouch® :**

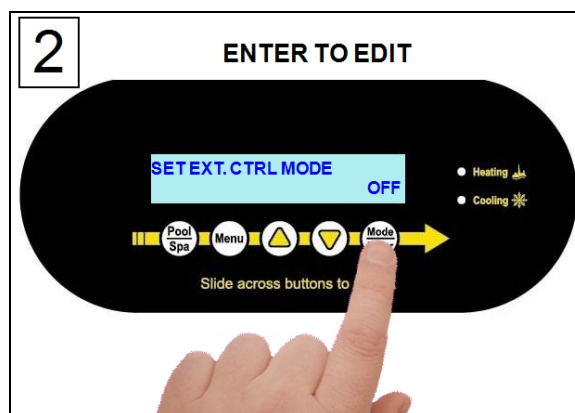
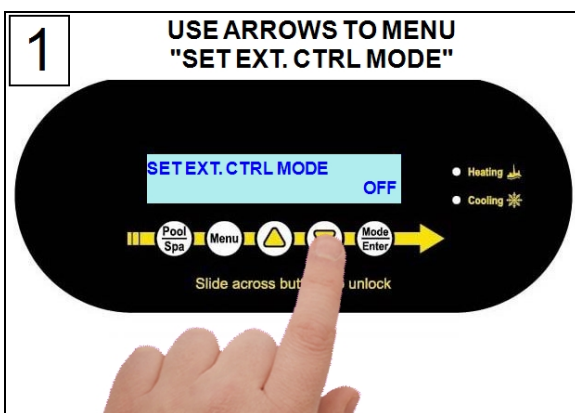
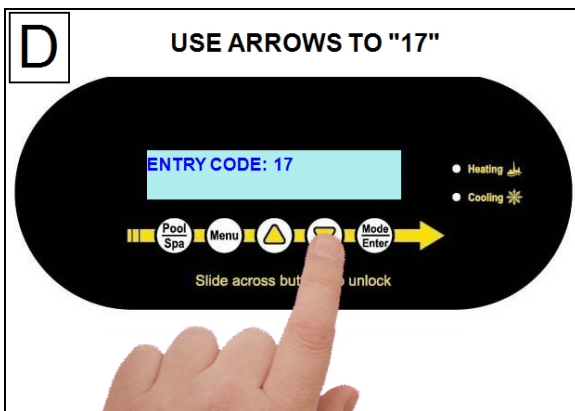
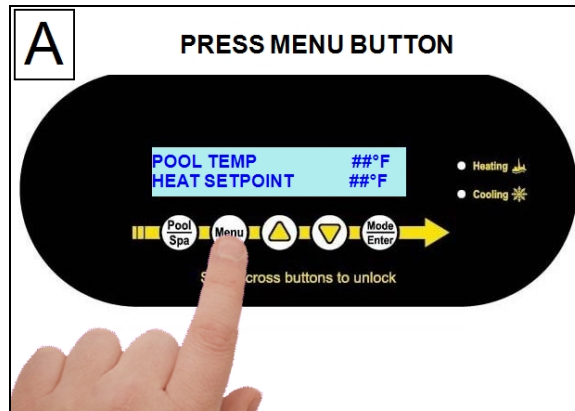
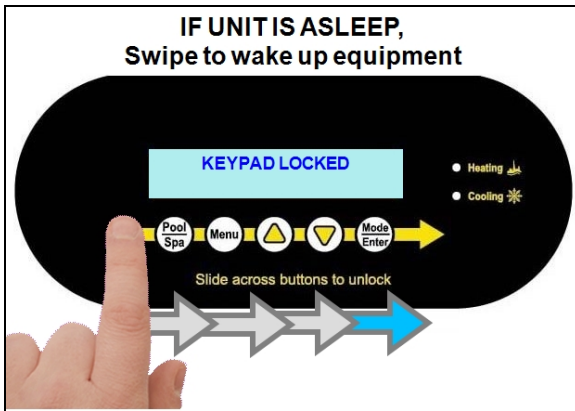
*Some controllers require an additional sensor be connected to the external controller's power supply circuit board at the solar connection point. The sensor is not used but will show an error if not connected.*

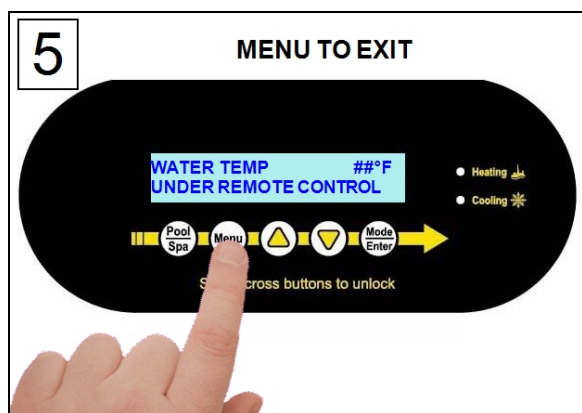
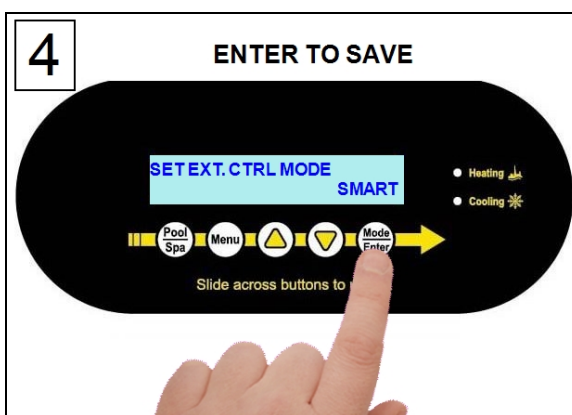
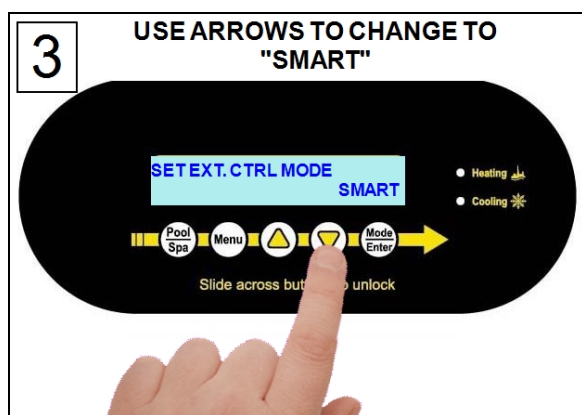


7. Reinstall electrical access panels on both the heat pump and external controller.
8. Reactivate power to heat pump and external controller.
9. Configure the heat pump to accept external controller signal. See "Configure for Smart Bus Controller" on the facing page.

## Configure for Smart Bus Controller

Enter "Installer Menu", then proceed





10. If after 45 seconds, the heat pump displays a "**SMART COMM FAULT**":

- A. **Confirm dip switches** - If external controller uses dip switches, confirm switches are in the correct position. Otherwise, proceed to confirm wiring.
    - a. Deactivate power to the external controller.
    - b. Remove access panel on external controller.
    - c. Check the external controller manual for proper dip switch positioning and confirm dip switches.
    - d. Reinstall electrical access panel.
    - e. Reactivate power to the controller.
    - f. If the fault persists, proceed to confirm wiring.
  - B. **Confirm wiring** - Confirm wires are oriented properly on the heat pump's "Port B" of the microprocessor.
    - a. Deactivate power to heat pump and external controller.
    - b. Remove the access panel on the heat pump.
    - c. Reverse wires on "Port B".
    - d. Reinstall electrical access panel.
    7. Reactivate power to the controller.
    8. Reactivate power to the heat pump.
  - C. If fault continues to occur, check with the manufacturer of the external controller for additional advice on using a heat pump with the controller.
11. After establishing a connection from the external controller to the heat pump, further programming will be required at the external controller.
- See external controller manuals or contact installer or manufacturer of that product.



### PLEASE NOTE

2-Wire controllers are not designed to control chiller operation.

For full functionality, the Heat and Cool, and Cool Only heat pumps must use an external controller that has a SMART bus connection. Check with the external controller manufacturer for more information.

### DANGER

Failure to heed the following will result in injury or death.

- RISK OF ELECTRICAL SHOCK FROM ENERGY STORED IN CAPACITORS - MODELS EQUIPPED WITH VARIABLE FREQUENCY COMPRESSOR DRIVES STORE ELECTRICITY EVEN AFTER THE POWER HAS BEEN DEACTIVATED AT THE POWER BREAKER. **Wait for 2 minutes after the shut down of equipment before servicing.**
- Deactivate power while routing wiring to control board.
- Follow all National Electric Codes (NEC) and/or State and Local guidelines.

### WARNING

Failure to heed the following may result in injury or death.

- This section is only for qualified installers who are familiar with the swimming pool and spa safety standards.
- The installer must be familiar with service industry techniques.

1. Deactivate power to heat pump.
2. Remove heat pump electrical access panel.
3. Route 22-gauge (minimum), 2-conductor, low-voltage wires from the controller to the low voltage side of the heat pump's electrical enclosure. Follow all National Electric Codes (NEC) unless State or Local guidelines supersede.
4. Connect the controller wires to the microprocessor port labeled "Ext Controller" with the terminals labeled "Y" and "Z" as follows. See Figure 4.
  - Connect one wire to "Y".
  - Connect other wire to "Z".
  - The polarity of the wire is not important.
5. Reattach heat pump access panel.
6. Apply power to heat pump.
7. Configure the heat pump to accept a 2-wire external controllers signal as shown. See "Configure 2-wire controller" on the next page.

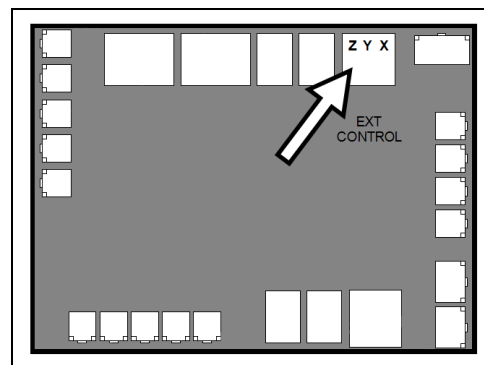
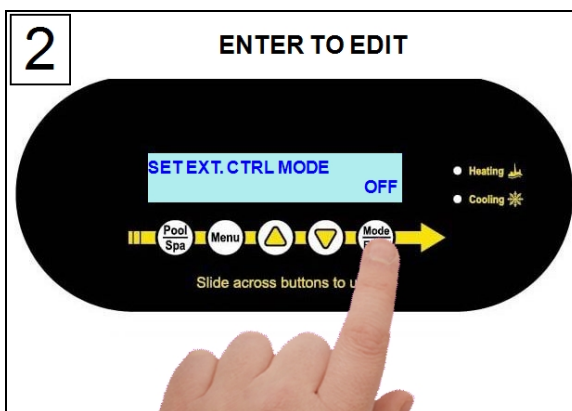
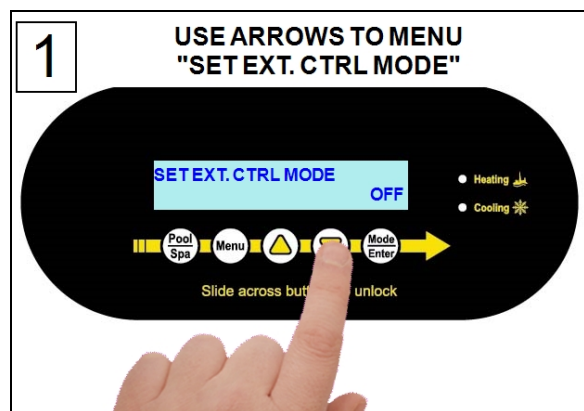
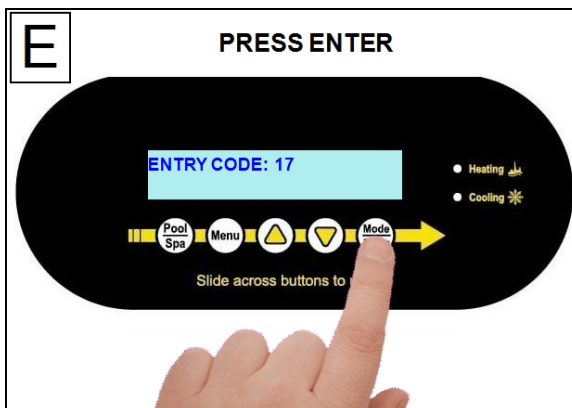
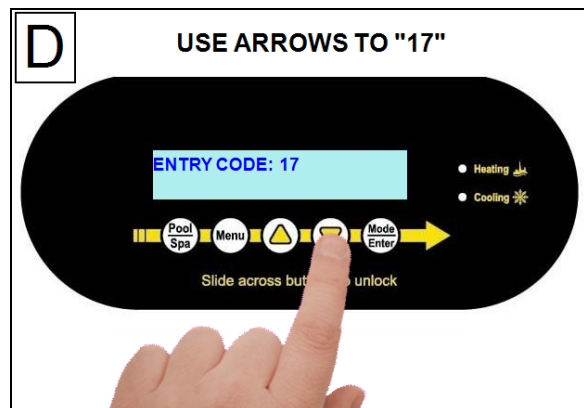
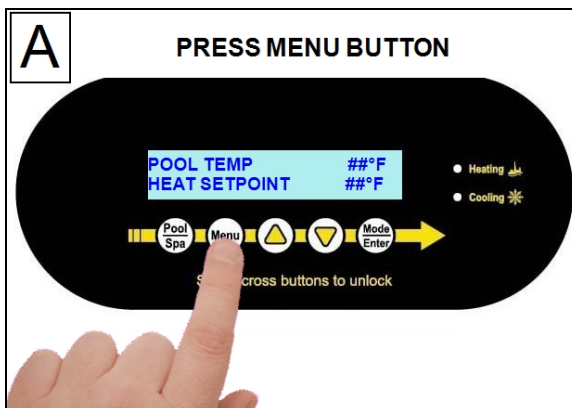
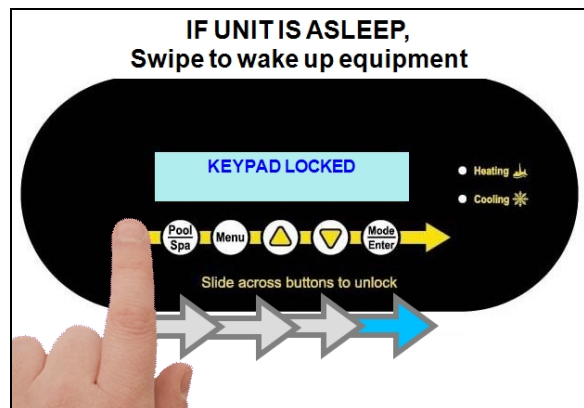


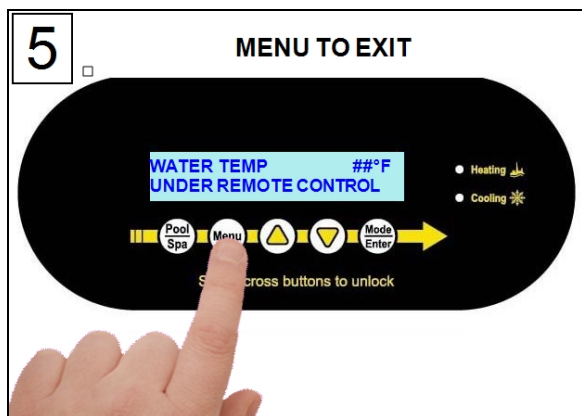
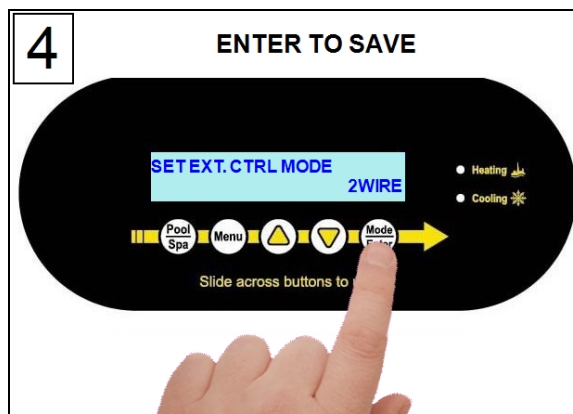
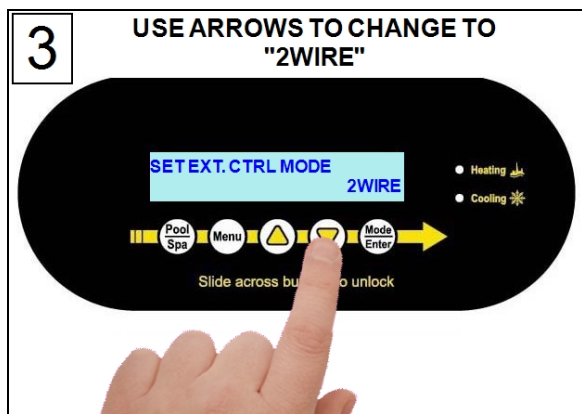
Figure 4

## Configure 2-wire controller

Enter "Installer Menu", then proceed







#### 1.6.d Connecting Gas Backup Heater to Heat Pump

To support a direct connection to a gas backup heater, AquaCal® heat pumps are equipped with optional terminal blocks on the microprocessor. The microprocessor is located on the low-voltage side of the electrical enclosure.

##### **PLEASE NOTE -**

*If the heat pump is connected and using an external controller with a SMART bus connection, the gas backup option is not available. The gas backup should be connected directly to the external controller.*

### **⚠ DANGER**

Failure to heed the following will result in injury or death.

- RISK OF ELECTRICAL SHOCK FROM ENERGY STORED IN CAPACITORS - MODELS EQUIPPED WITH VARIABLE FREQUENCY COMPRESSOR DRIVES STORE ELECTRICITY EVEN AFTER THE POWER HAS BEEN DEACTIVATED AT THE POWER BREAKER. Wait for 2 minutes after the shut down of equipment before servicing.
- Deactivate power while routing wiring to control board.
- Follow all National Electric Codes (NEC) and/or State and Local guidelines.

### **⚠ WARNING**

Failure to heed the following may result in injury or death.

- This section is only for qualified installers who are familiar with the swimming pool and spa safety standards.
- The installer must be familiar with service industry techniques.

### **NOTICE**

Failure to heed the following may result in damage to equipment.

- The wire size connecting the gas heater to the heat pump must be 22-gauge (minimum), 2-conductor, low-voltage wire.
- Use direct connection (**dry contact**) provided on the microprocessor for the gas heater.
- Failure to follow the manufacturer's installation requirements for a fireman (cool down) switch may result in damage to the gas heater.

### Connections

1. Deactivate power to heat pump and gas heater.
2. Remove heat pump and gas heater's electrical access panels. Follow all National Electric Codes (NEC) unless State or Local guidelines supersede.
3. Route 22-gauge (minimum), 2-conductor, low-voltage wires from the gas heater to the low voltage side of the heat pump's electrical enclosure. Depending on the gas heater's circuit boards, use the following connection points from the gas heater.
  - Use the "Com" and "Pool" connection points from the gas heater. See Figure 5.
  - Or replace the jumper wire from the Fireman's Switch on the gas heater with two wires leading to the heat pump. See Figure 6.

**Gas Heater's Pool and Common Connection**

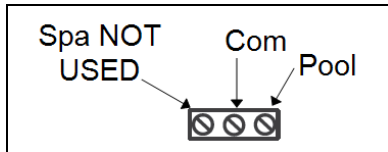


Figure 5

**Gas Heater's Fireman Switch**

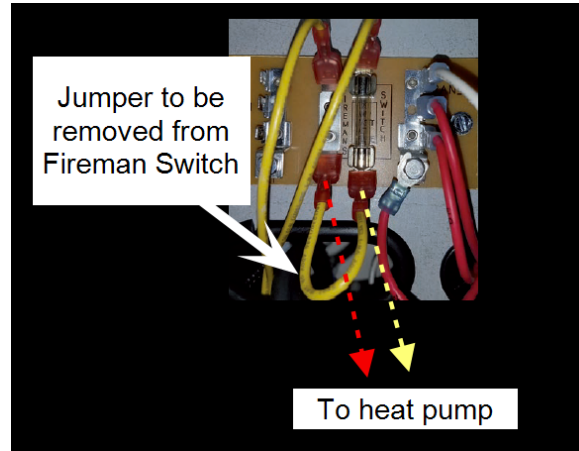


Figure 6

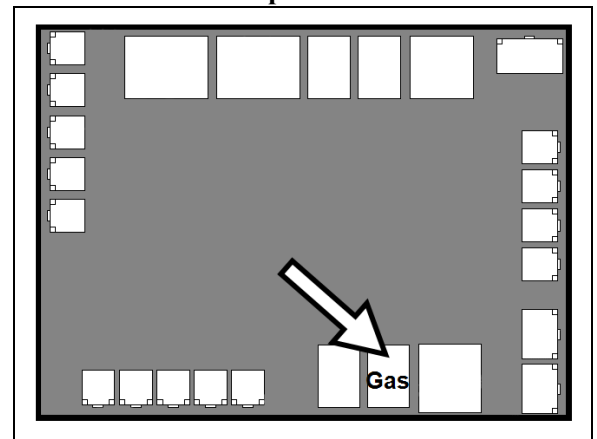
If the Gas Heater requires a fireman (cool down) switch, it is the installer's responsibility to ensure this requirement is met. Failure to follow the manufacturer's installation requirements may result in damage to the gas heater.

### **PLEASE NOTE**

*Do not use a smart connection data comm port from the gas heater.*

4. Connect the controller wires to the port labeled "Gas" on the microprocessor as indicated.
5. Reattach heat pump and gas heater access panels.
6. Apply power to heat pump and gas heater.
7. Configure gas heater to accept a two-wire remote control signal. See gas heater's manual for specifics on this procedure.
8. Configure gas backup mode on heat pump. See "*Configuring Gas Backup*" below.

### Dry Contact Connection Points to the Microprocessor



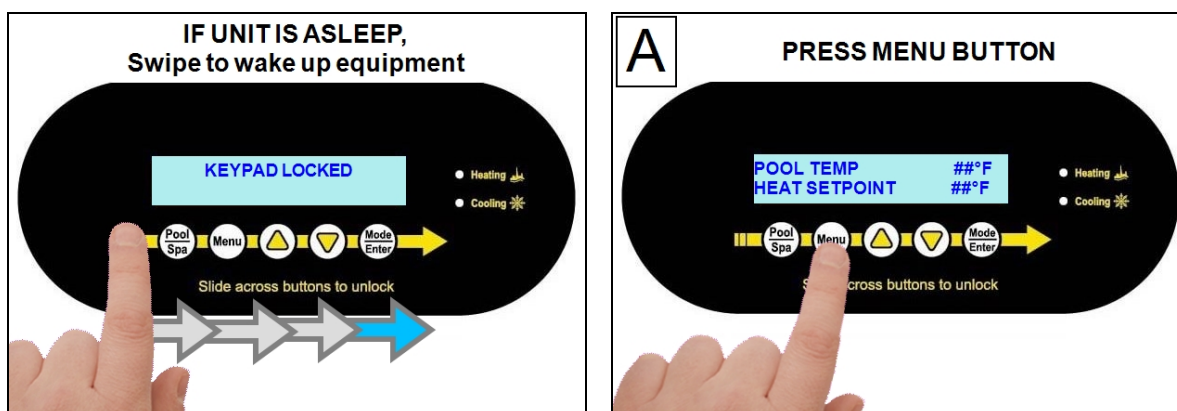
### Configuring Gas Backup

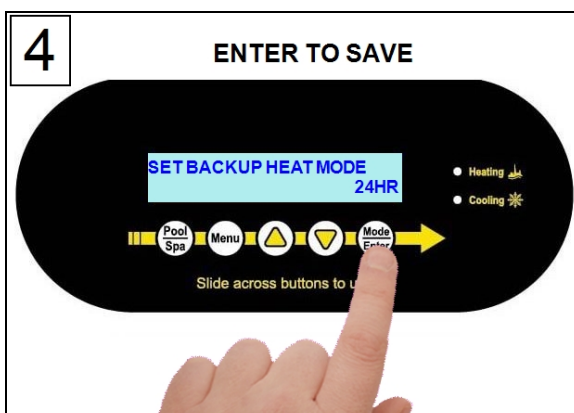
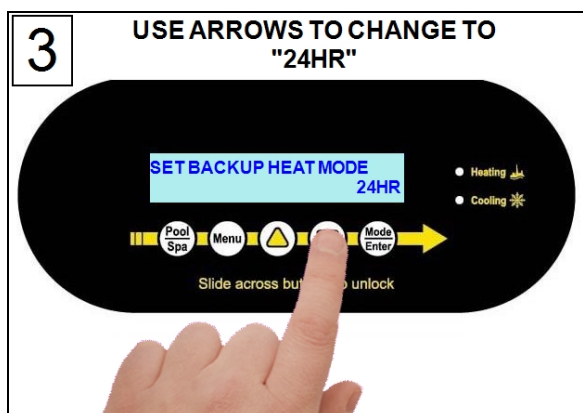
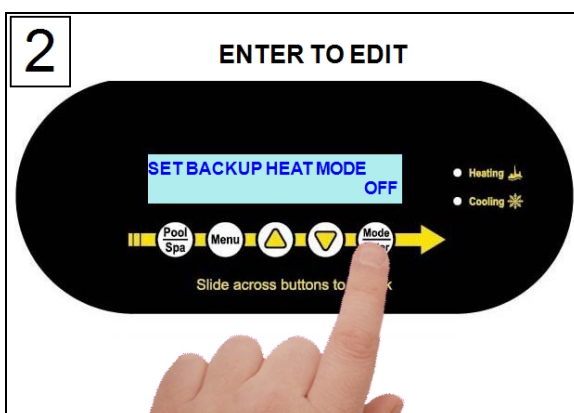
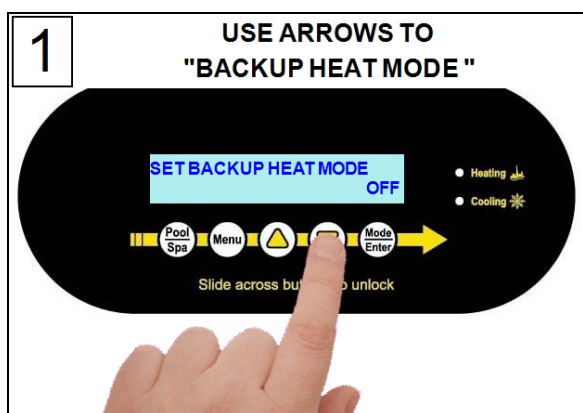
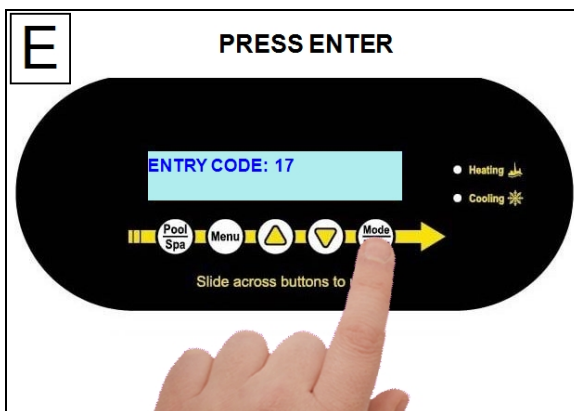
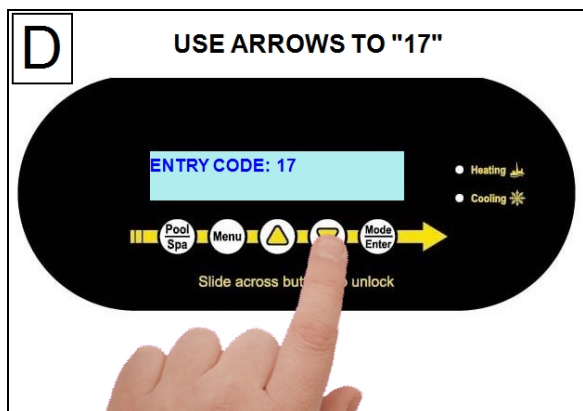
There are two different ways the gas backup heater can be configured.

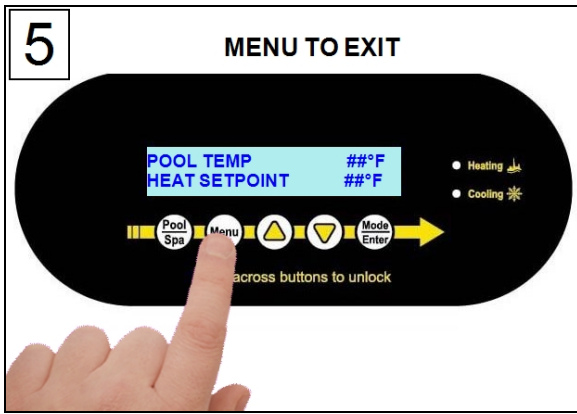
- **24-hour mode** - commonly used for commercial applications
  - The circulation pump operates continuously.
  - The gas heater will activate if the water temperature falls two degrees below the set temperature. When the set temperature is reached, the gas heater will be deactivated. See "*Configure for 24-Hour Mode*" below.
  - The Heat Pump will continue to maintain the set temperature.
- **Scheduled mode** - commonly used for residential applications
  - The circulation pump operates on the circulation pumps regular on-off schedule.
  - The gas heater will activate as needed to ensure that the desired temperature will be reached within the circulation pumps schedule. The gas heater will deactivate when the water is warm enough to allow the heat pump to finish within schedule. The heat pump will then continue to heat the water till the set temperature is reached. See "*Configure for Scheduled Mode*" on page 37.

### Configure for 24-Hour Mode

Enter "Installer Menus", then proceed

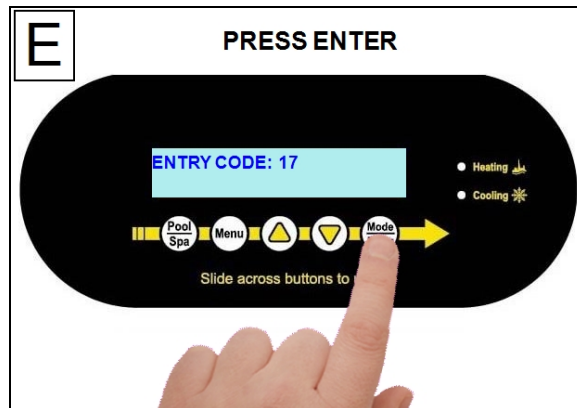
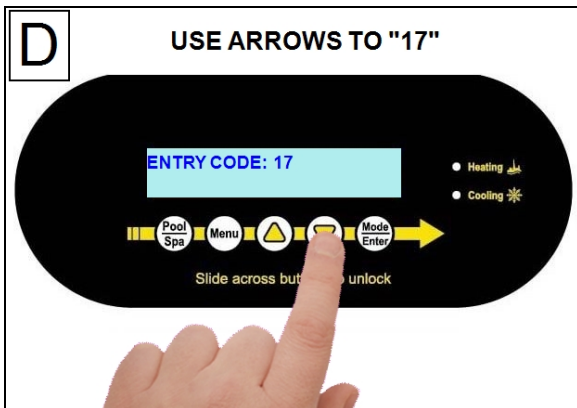
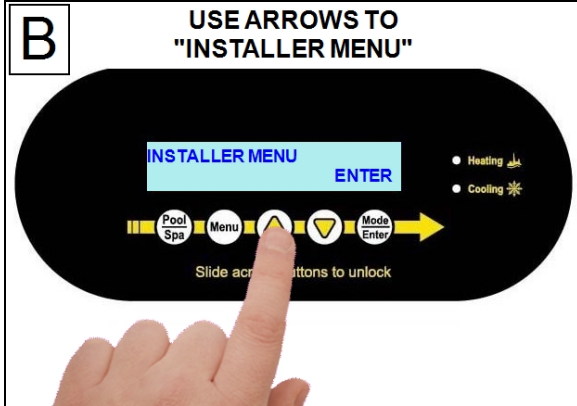
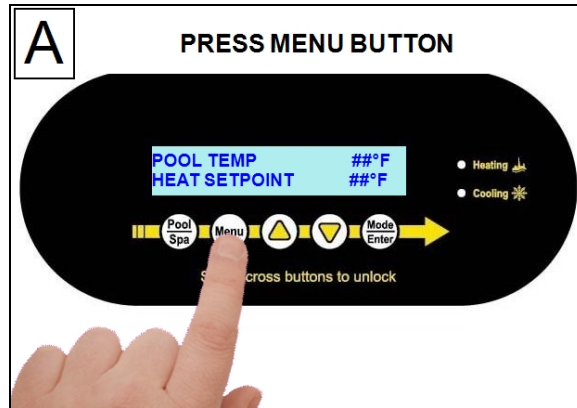
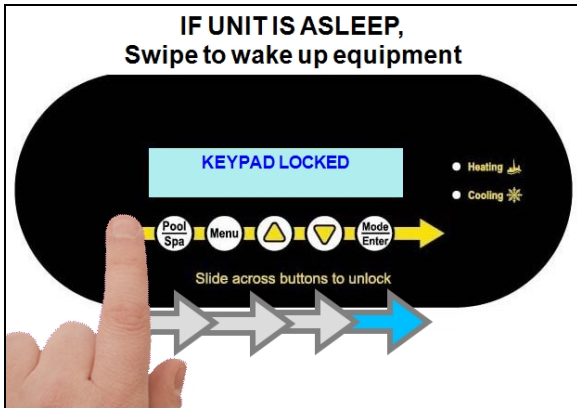


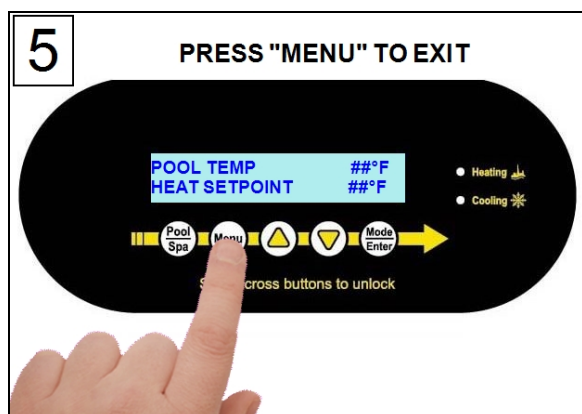
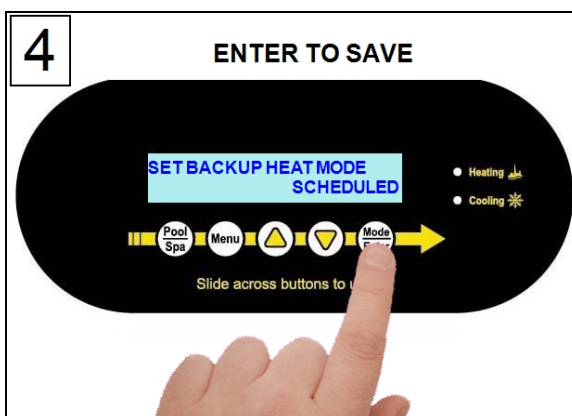
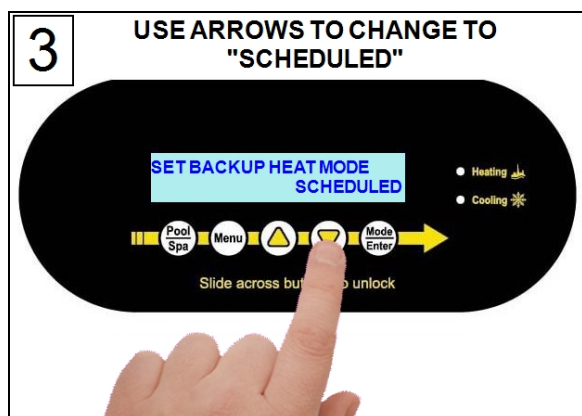
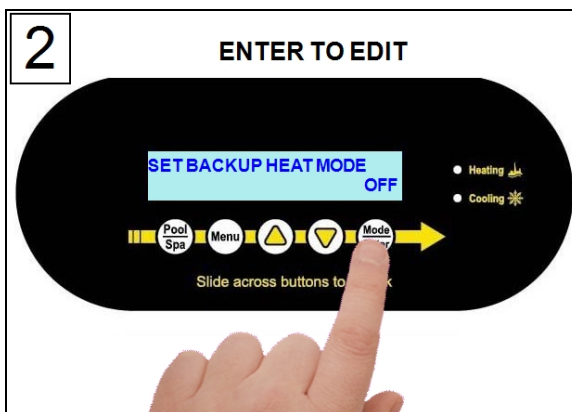
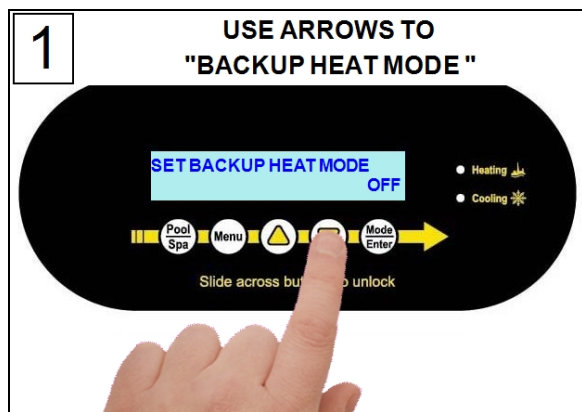




## Configure for Scheduled Mode

Enter "Installer Menus", then proceed







## 1.6.e Connecting Multiple Heat Pumps (Master / Slaved)

Up to 16 heat pumps can be connected and controlled from a primary heat pump.

There are two reasons for using a multiple heat pump configuration:

1. Controlling multiple heat pumps from one location; the master heat pump.
2. Preventing heat pumps from starting up at the same time and causing an excessive power draw on the electric circuit.

### DANGER

Failure to heed the following will result in injury or death.

- RISK OF ELECTRICAL SHOCK FROM ENERGY STORED IN CAPACITORS - MODELS EQUIPPED WITH VARIABLE FREQUENCY COMPRESSOR DRIVES STORE ELECTRICITY EVEN AFTER THE POWER HAS BEEN DEACTIVATED AT THE POWER BREAKER. ***Wait for 2 minutes after the shut down of equipment before servicing.***
- Deactivate power while routing wiring to control board.
- Follow all National Electric Codes (NEC) and/or State and Local guidelines.

### WARNING

Failure to heed the following may result in injury or death.

- This section is only for qualified installers who are familiar with the swimming pool and spa safety standards.
- The installer must be familiar with service industry techniques.

### NOTICE

Failure to heed the following may result in damage to equipment.

- The wire size connecting the heat pumps must be 22-gauge, 2-conductor, low-voltage wire. Be sure that the size of the wire will allow at least two wires per connection point.
- Do not attempt to connect heat pump equipment in multiple configurations with previous HP7 and HP7R versions of the microprocessor. See Figure 7. No onboard port is provided for heat pumps with these microprocessor versions. An Automatic Sequencing Controller (ASC) accessory is required for those types of heat pumps.

**DO NOT CONNECT  
HP7 or HP7R boards**

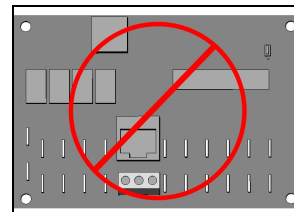


Figure 7

## Connecting Multiple Heat Pumps

1. Choose one unit to be the lead (or master) unit. This is typically a unit that can be accessed easily when temperature adjustments are needed.
  - Note - The Lead unit can be connected to an external controller via the "smart bus" connection point if desired.
2. Deactivate power to heat pumps.
3. Remove electrical access panels.
4. Route 22-gauge, 2-conductor, low-voltage wires to the low voltage sides of the electrical enclosures. Follow all National Electric Codes (NEC) and/or State and Local guidelines.
5. Connect the first slaved heat pump's wires to the unit selected as the master heat pump's.

### Dry Contact Connection Points to the Microprocessor

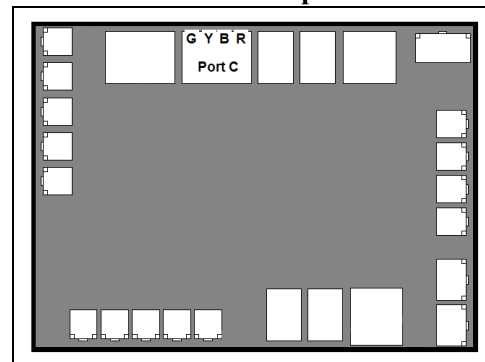


Figure 8

6. Use "Port C" on the microprocessors as indicated. Connecting the "Y" to the "Y" and the "B" to the "B" on each heat pump's port "C" connection point. The "G" and "R" connection points are not used. See Figure 8.
7. Connect any additional heat pumps as indicated, doubling up the wires as shown. See Figure 9. Confirm the same color wires connect to the same wires on each heat pump ("Y" to "Y" and "B" to "B"). Up to 16 heat pumps can be controlled by one heat pump.
8. Label the heat pumps appropriately as a master unit and slaved units (Master, Slaved 01, Slaved 02, etc.) to simplify configuration and future operation.
9. Reattach access panels.
10. Apply power to master heat pump. Confirm the mode is set to **"SYSTEM OFF"**.
11. Apply power to the next heat pump and confirm the mode is set to **"SYSTEM OFF"**. Do this for each heat pump.
12. Program heat pumps with assigned addresses. See *"Configuring Multiple Heat Pumps"* below.

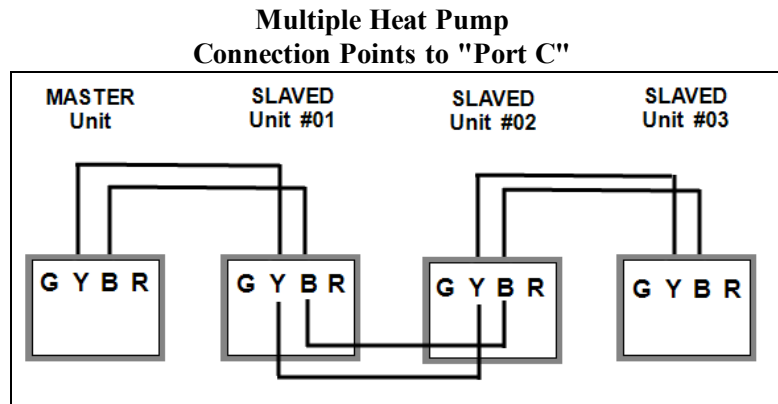


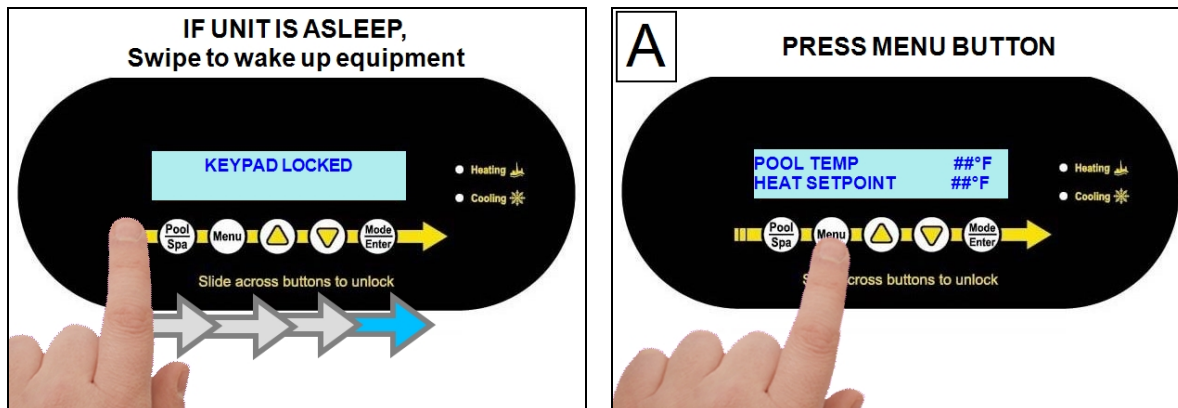
Figure 9

### Configuring Multiple Heat Pumps

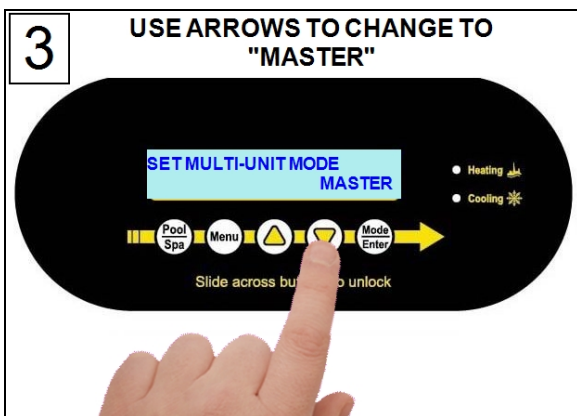
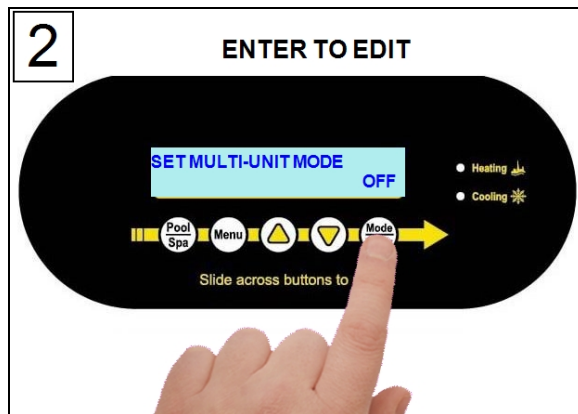
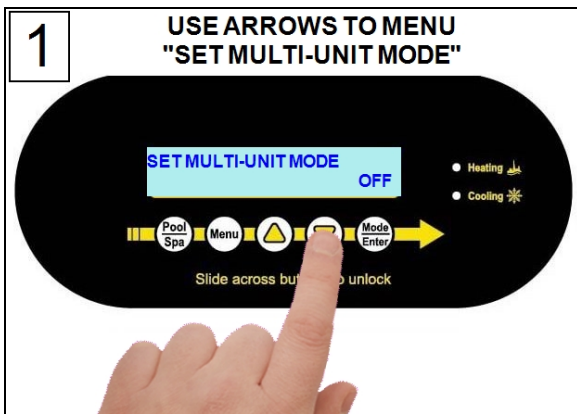
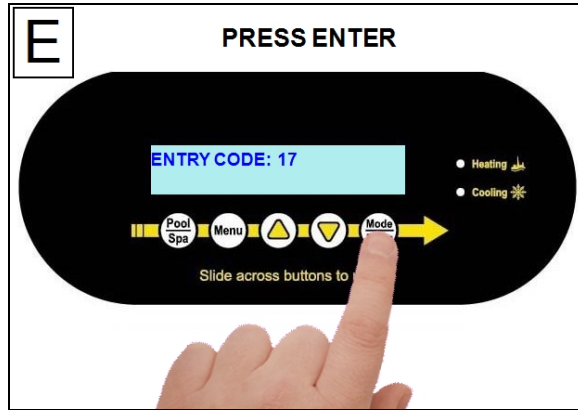
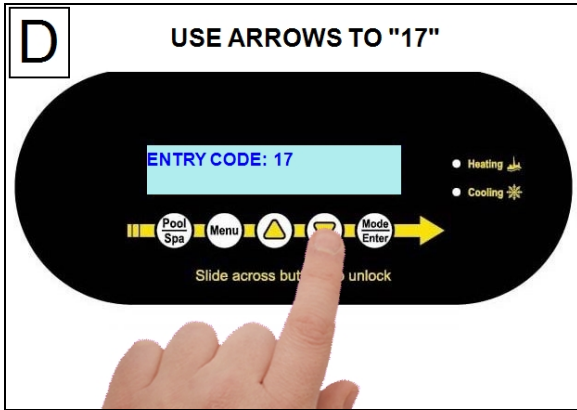
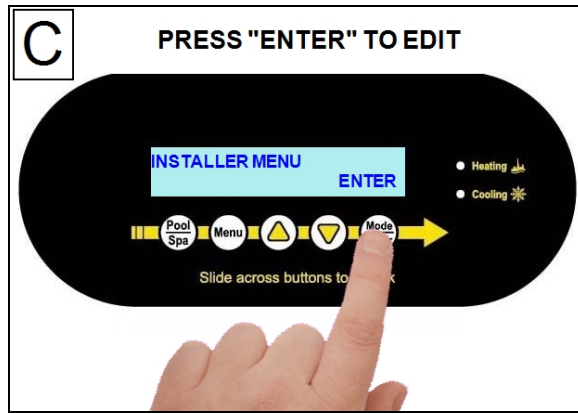
#### Master (Primary) Heat Pump

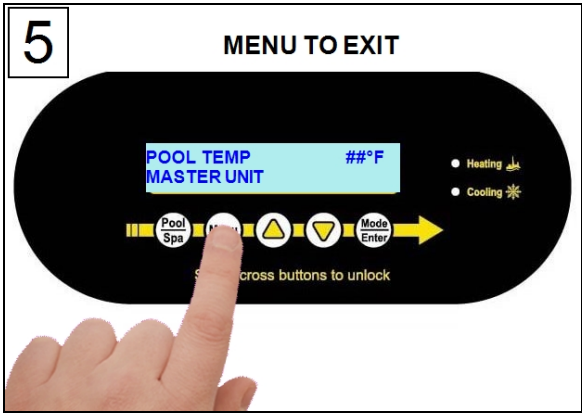
Confirm the first connected heat pump is designated as the master (primary) unit.

Enter "Installer Menu", then proceed





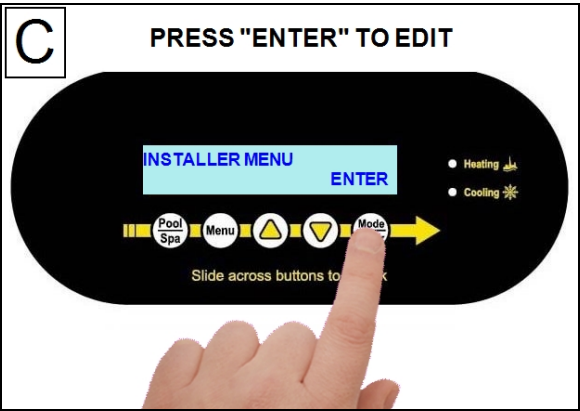
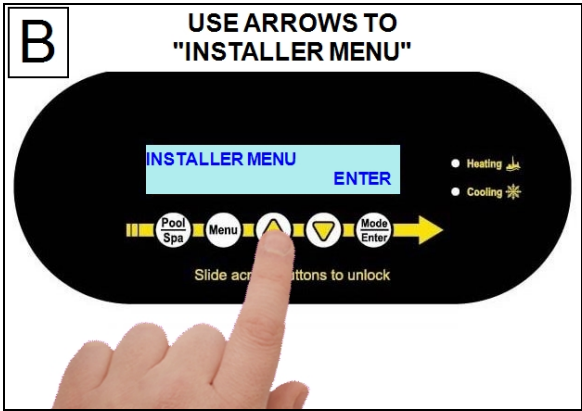
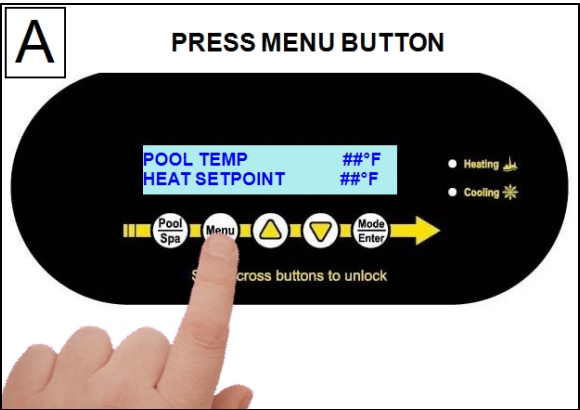
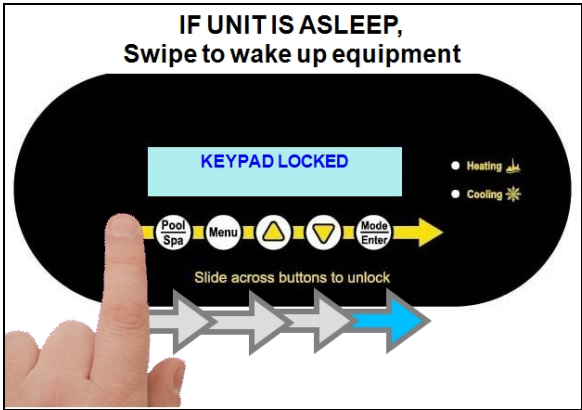


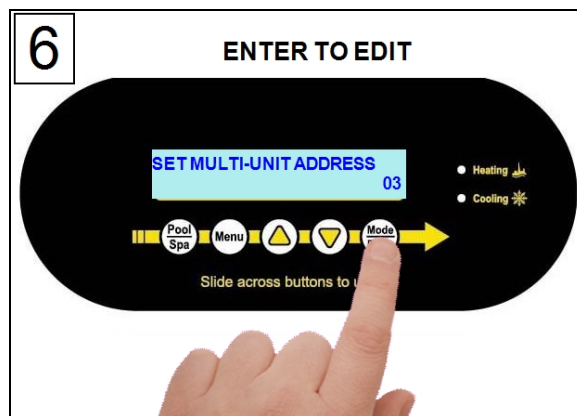
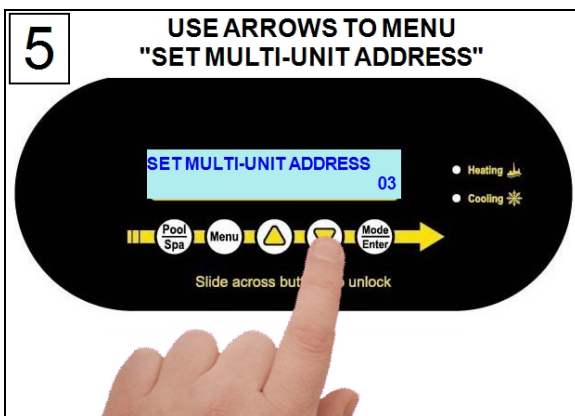
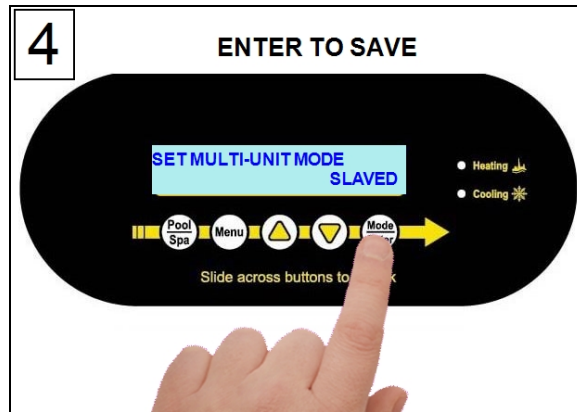
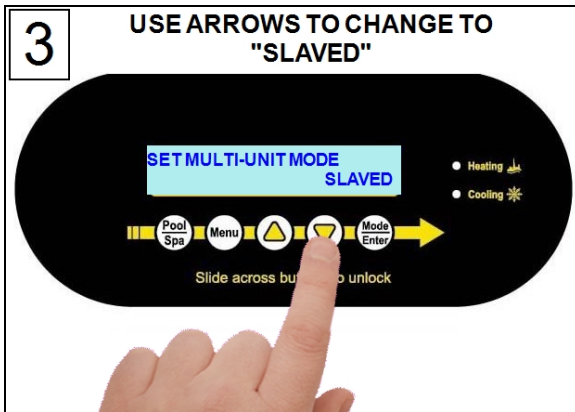
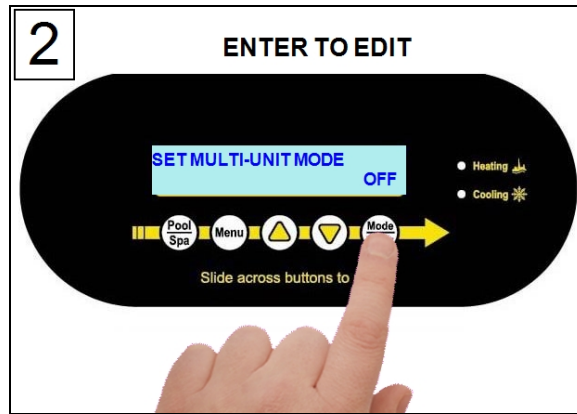
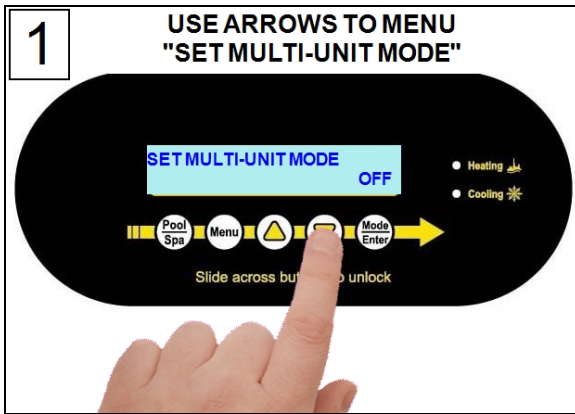
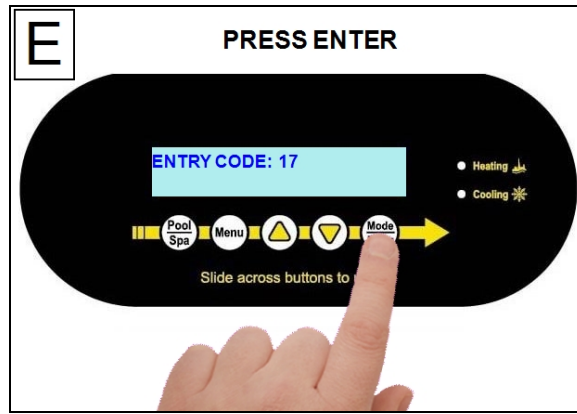
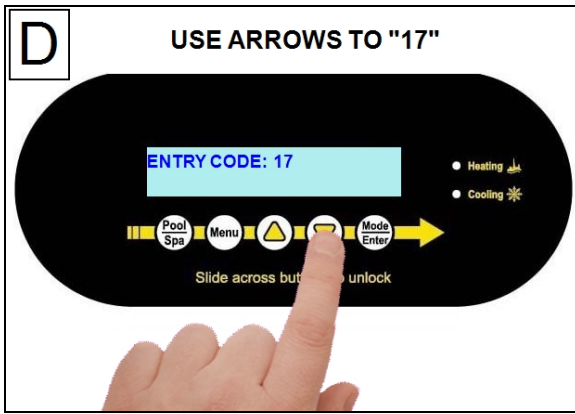


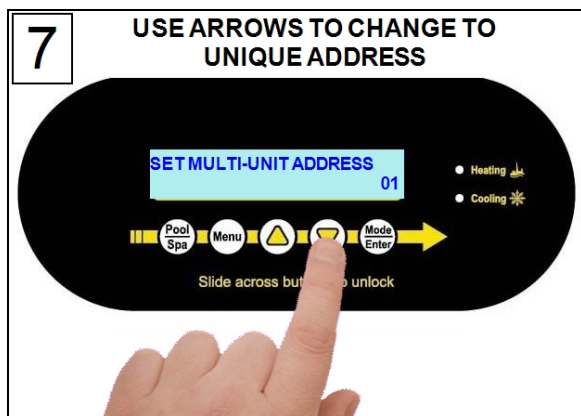
**Slaved (Secondary) Heat Pumps**

Go to the next connected heat pump and configure it as a slaved unit with a heat pump address of "01". Each additionally connected heat pump will require a unique heat pump address ("02", "03", etc.)

Enter "Installer Menus", then proceed







### 1.6.f Connecting a Pool/Spa Switching Relay

A direct connection to an external flow relay switch has been provided on the terminal microprocessor. A pool/spa relay switch will automatically change between the pool and spa thermostat depending on the position of the plumbing valves.

- When water flows to the pool, the pool thermostat will be used.
- When water flows to the spa, the spa thermostat will be used.



### DANGER

Failure to heed the following will result in injury or death.

- RISK OF ELECTRICAL SHOCK FROM ENERGY STORED IN CAPACITORS - MODELS EQUIPPED WITH VARIABLE FREQUENCY COMPRESSOR DRIVES STORE ELECTRICITY EVEN AFTER THE POWER HAS BEEN DEACTIVATED AT THE POWER BREAKER. ***Wait for 2 minutes after the shut down of equipment before servicing.***
- Deactivate power while routing wiring to control board.
- Follow all National Electric Codes (NEC) and/or State and Local guidelines.



### WARNING

Failure to heed the following may result in injury or death.

- This section is only for qualified installers who are familiar with the swimming pool and spa safety standards.
- The installer must be familiar with service industry techniques.

### NOTICE

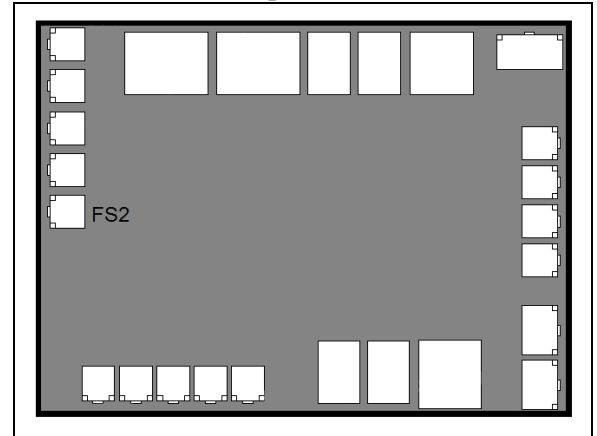
Failure to heed the following may result in damage to equipment.

- The wire size connecting the relay switch must be a minimum 22-gauge, 2-conductor, low-voltage wire.
- Use FS2 (**dry contact**) connection on the microprocessor.

## Connecting Switch

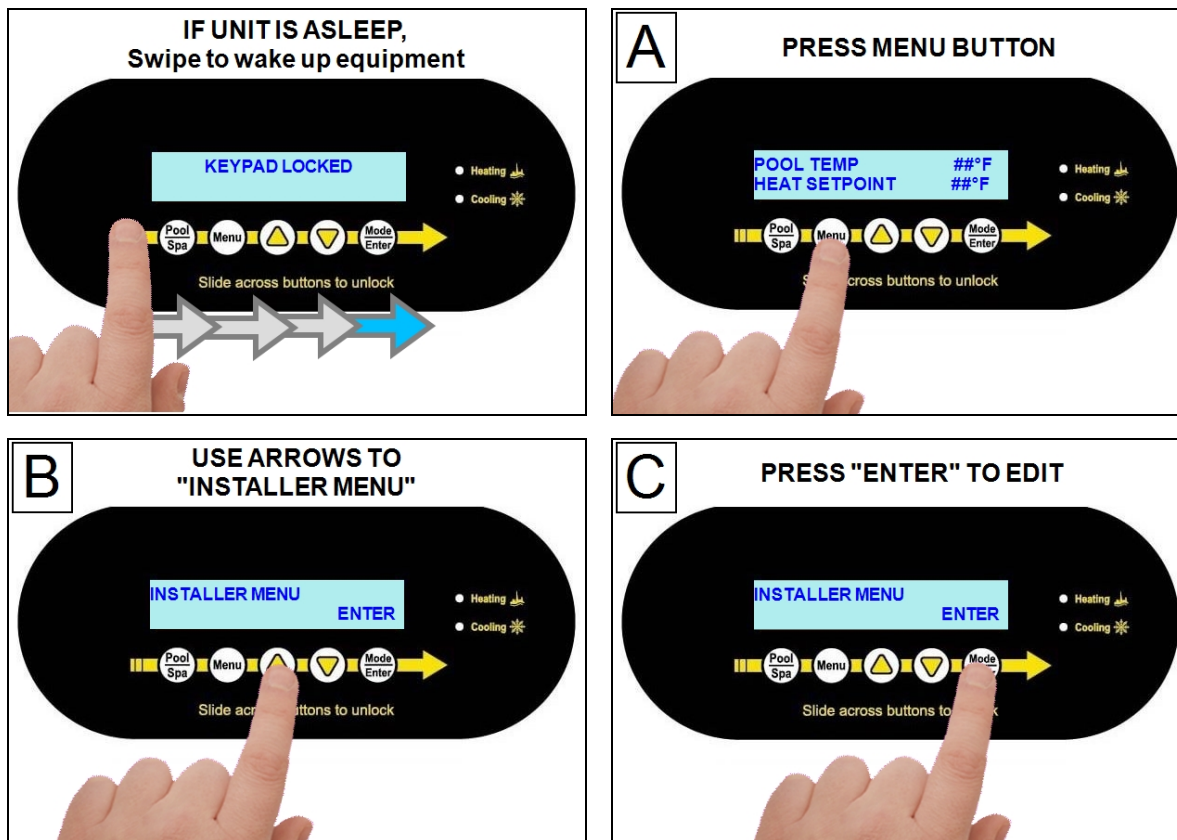
1. Deactivate power to heat pump.
2. Plumb the switch as indicated in accessories installation instructions.
3. Remove heat pump electrical access panel.
4. Using two of the three wires from the installed switch, route wires to the low voltage side of the electrical enclosure. The third wire is not used. Follow all National Electric Codes (NEC) unless State or Local guidelines supersede.
5. Connect the wires to the jumper provided. Polarity is not important.
6. Reattach heat pump access panel.
7. Apply power to heat pump.
8. Configure the heat pump to accept the pool/spa relay switch. See "Configuring Switch" below.

## Dry Contact Connection Points to the Microprocessor

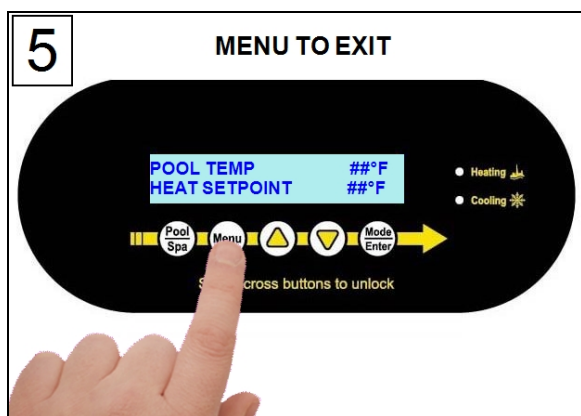
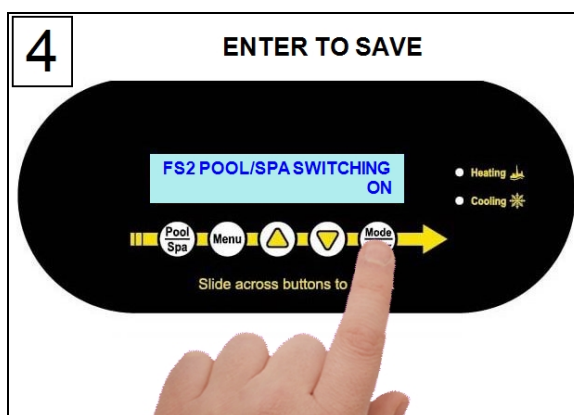
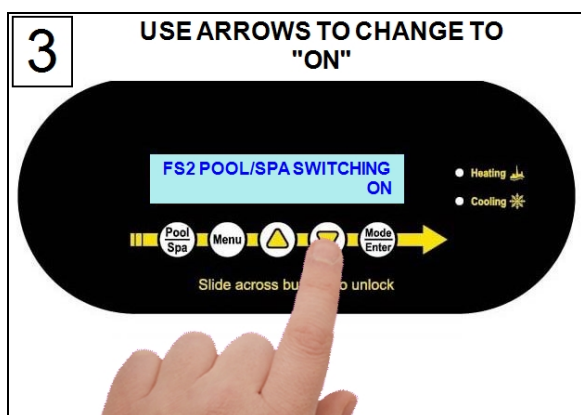
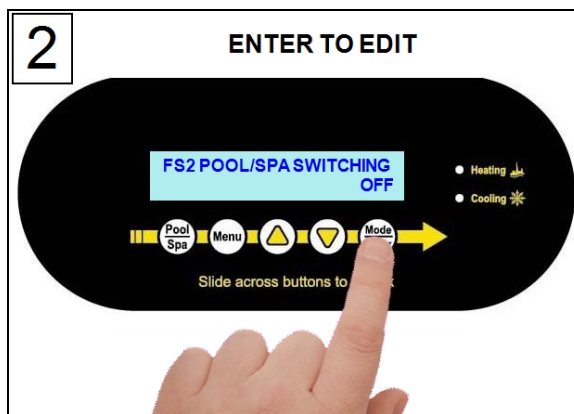
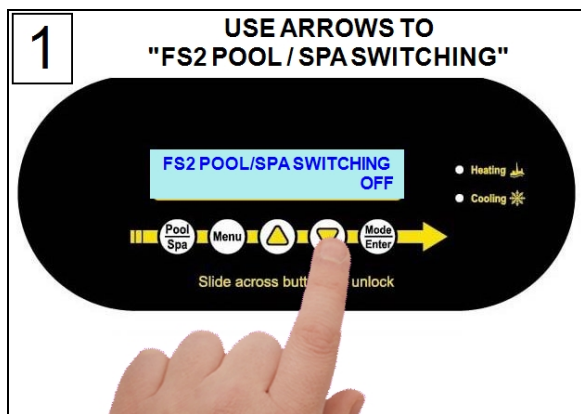
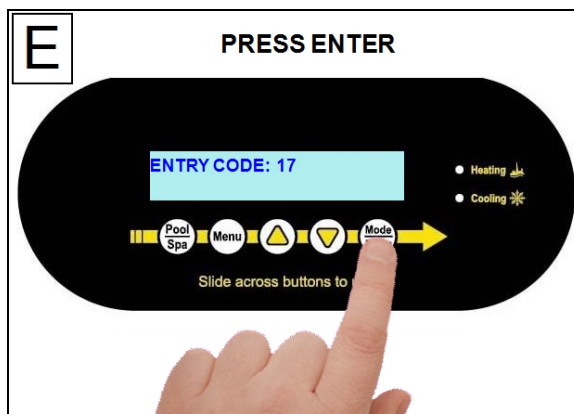
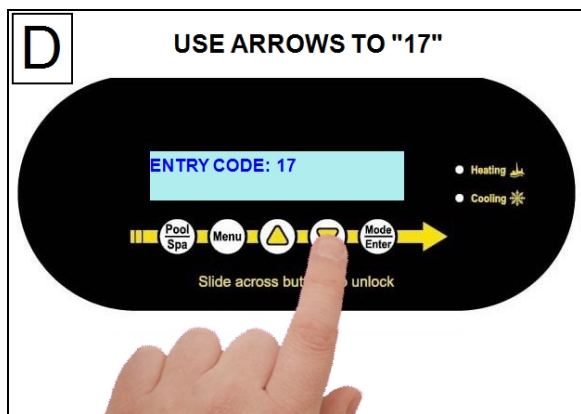


## Configuring Switch

Enter "Installer Menus", then proceed



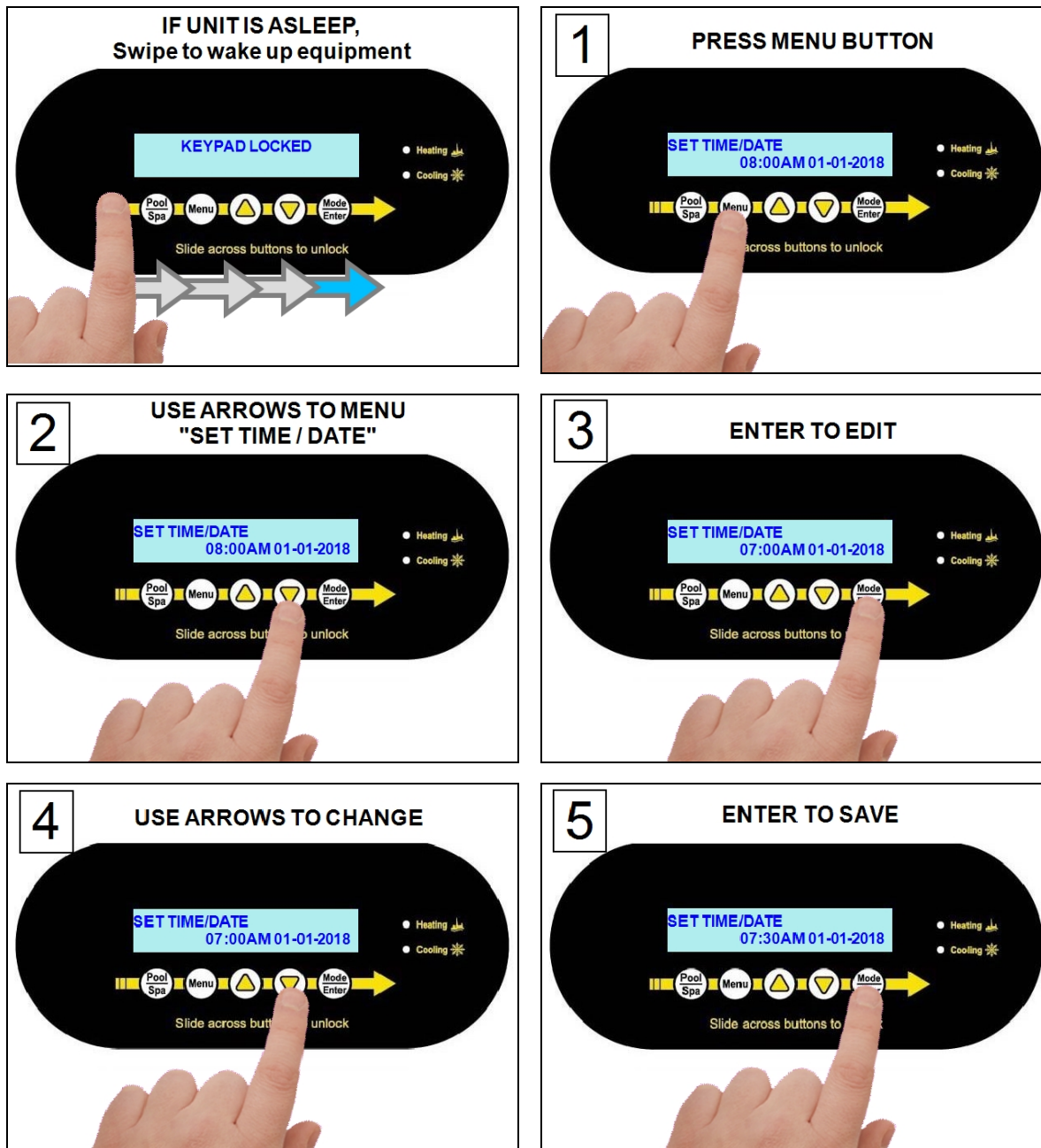


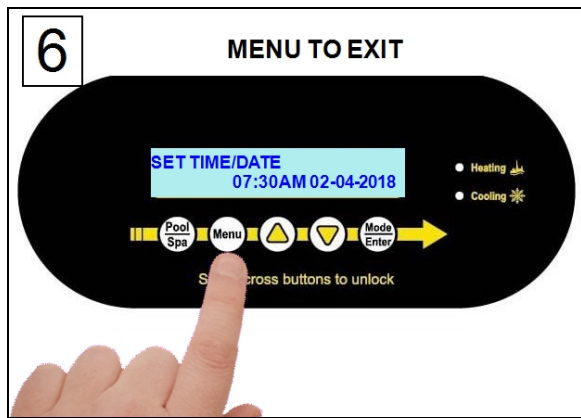


## 1.7 Program Heat Pump for the Customer

### 1.7.a Setting Date and Time

Set the heat pump's time and date using the following steps.





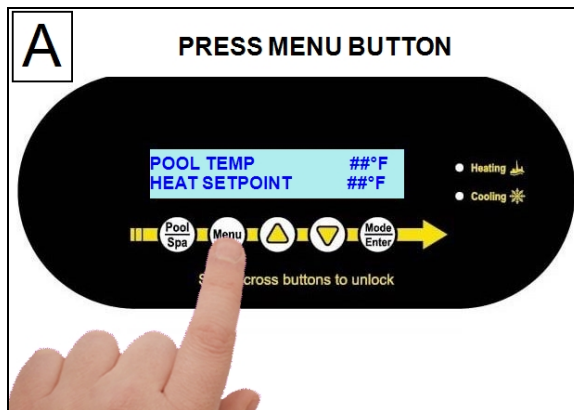
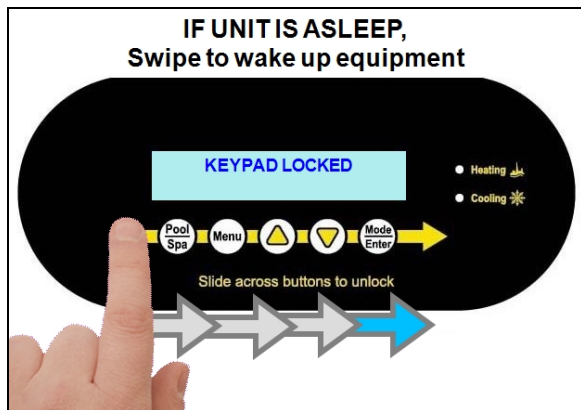
### 1.7.b Setting Time and Date Format

The heat pump's time and date format can be customized.

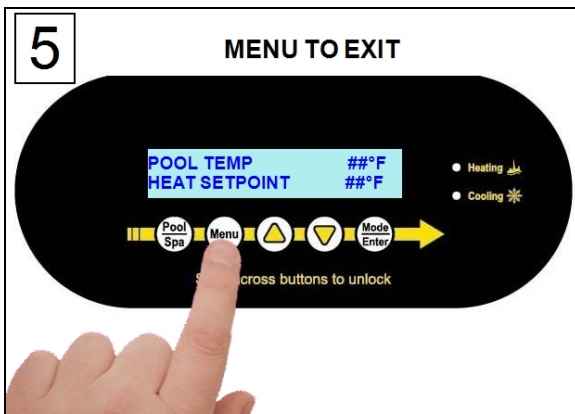
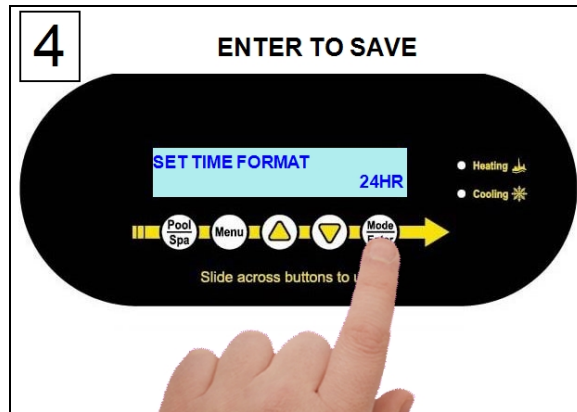
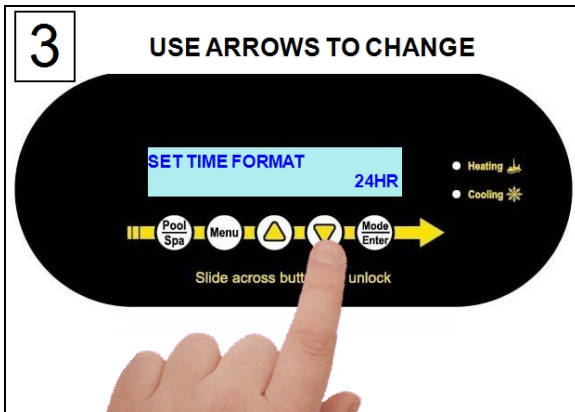
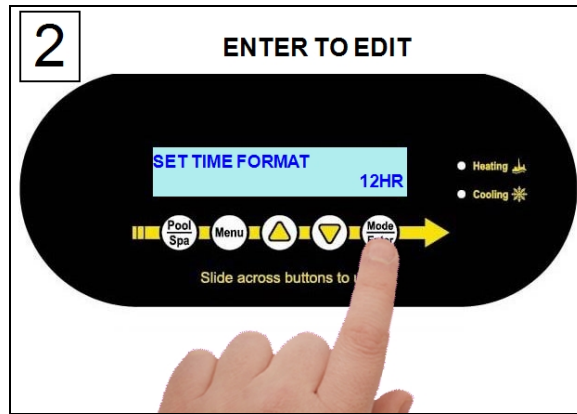
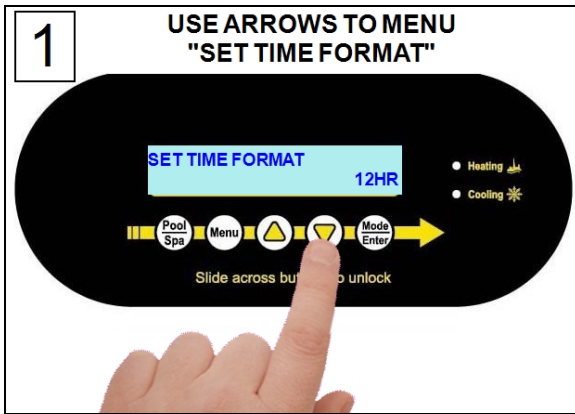
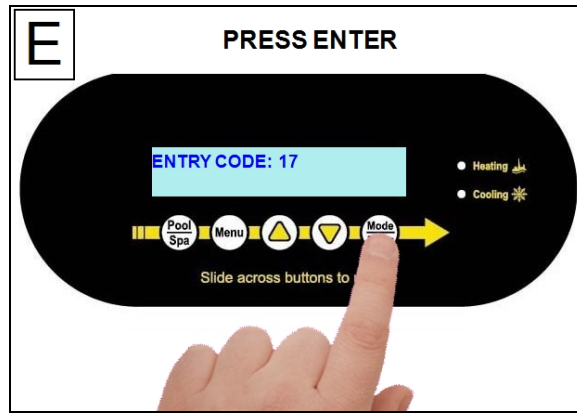
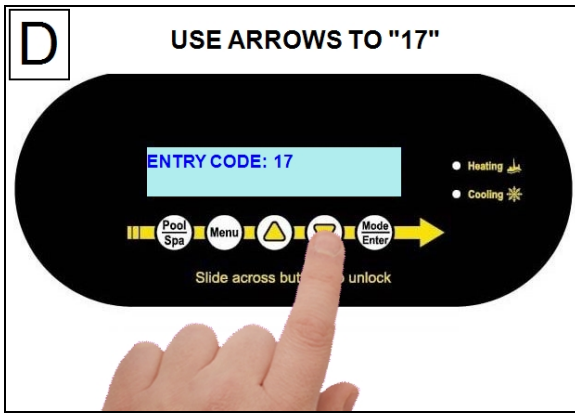
#### Customize Time

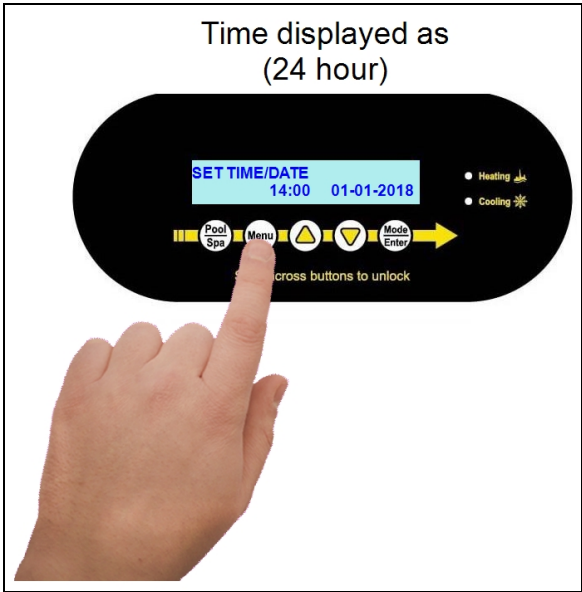
The time can be displayed in 24-hour *military* time (the default display is 12 hour).

Enter "Installer Menus", then proceed





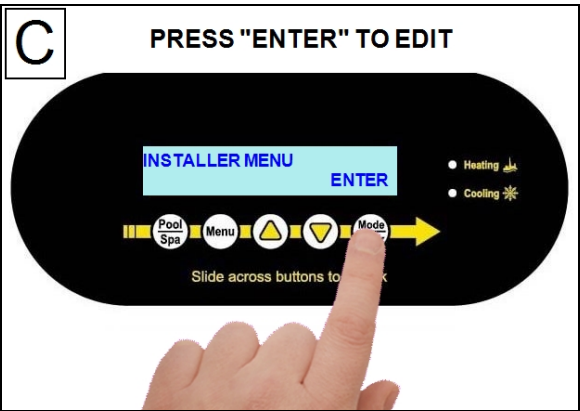
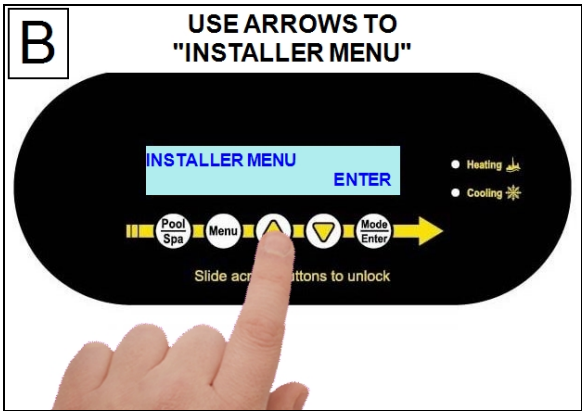
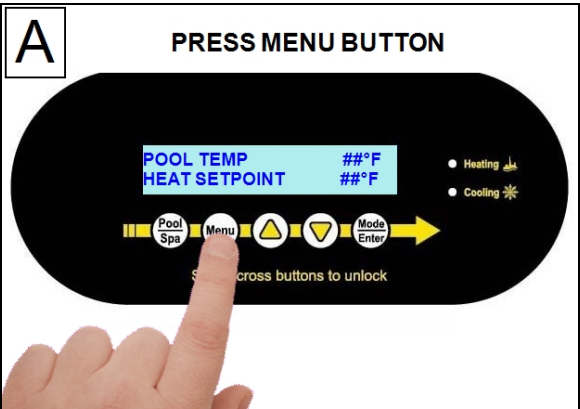
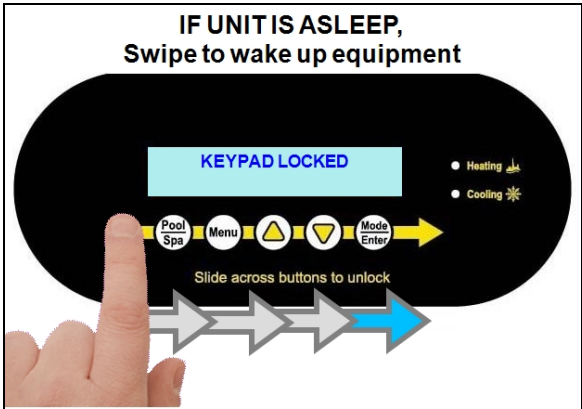


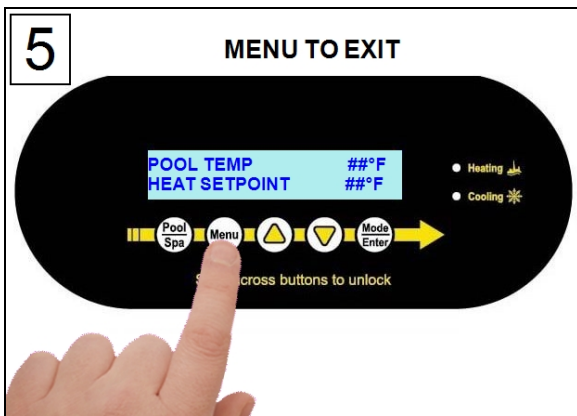
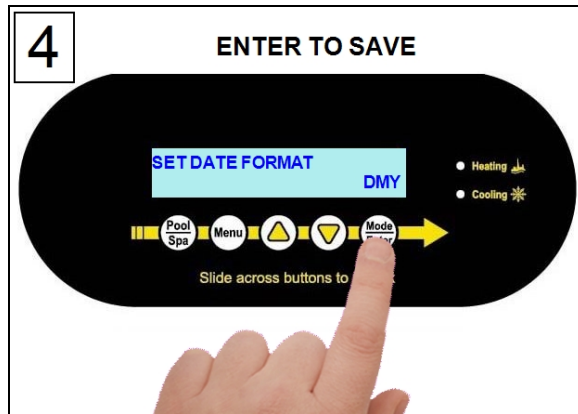
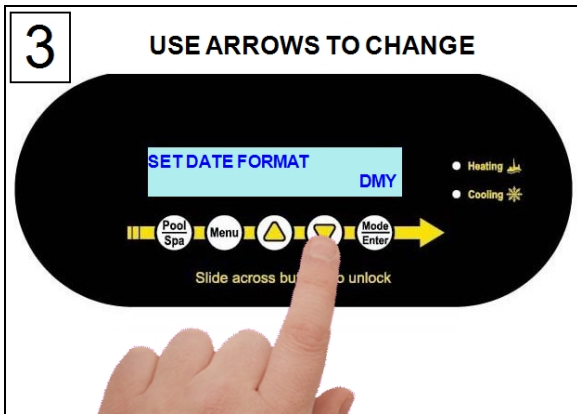
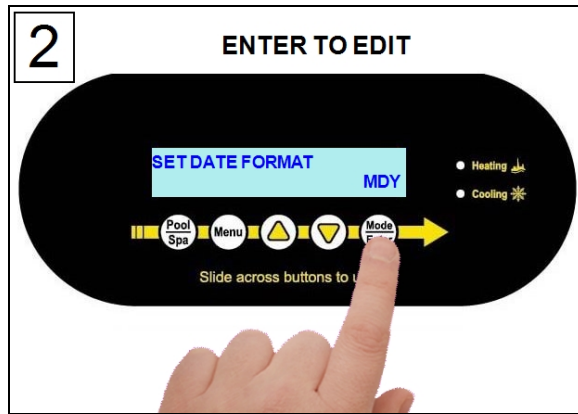
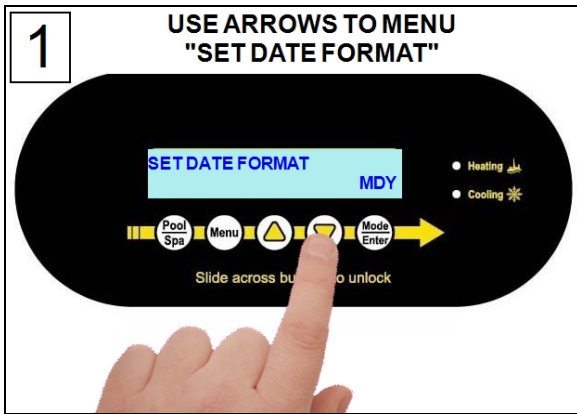
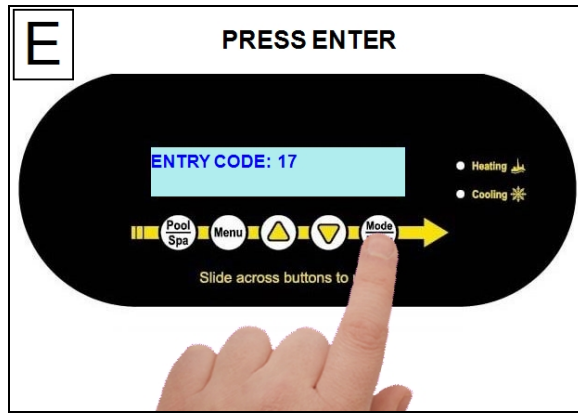
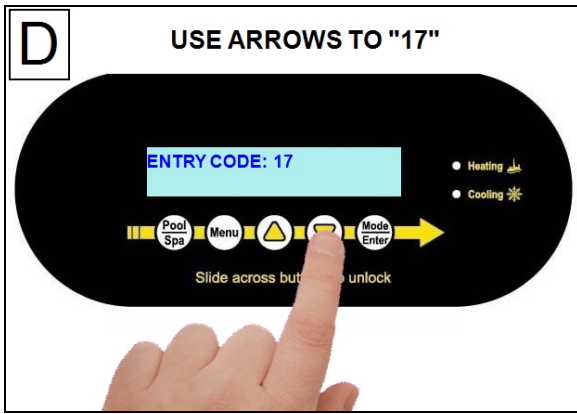


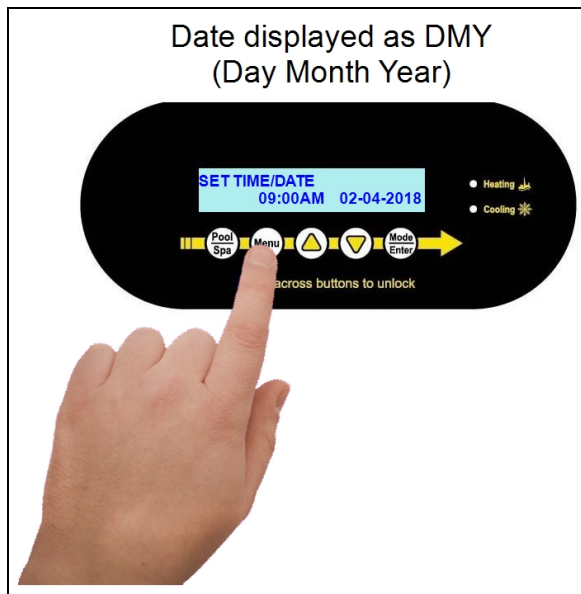
### Customize Date

The date can be displayed as Day-Month-Year (the default is Month-Day-Year).

Enter "Installer Menus", then proceed



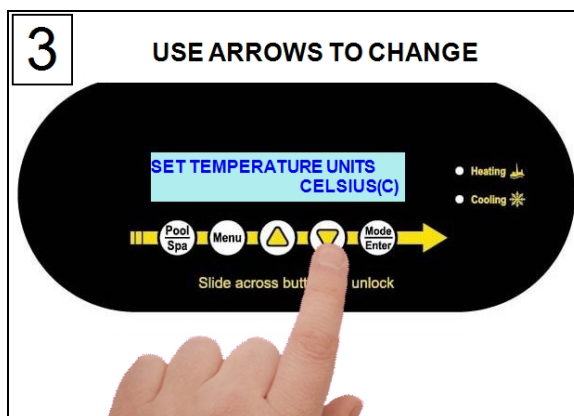
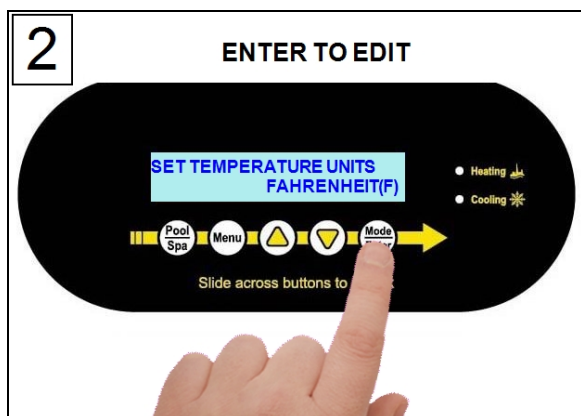
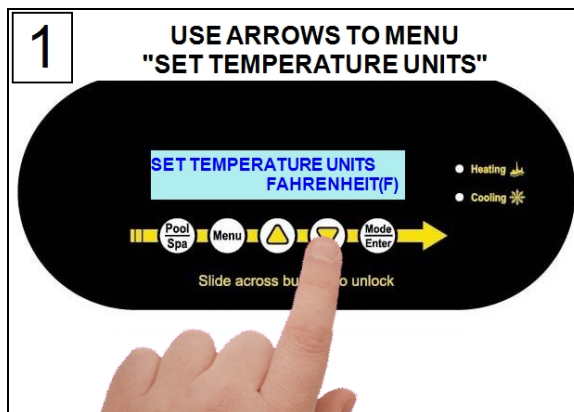
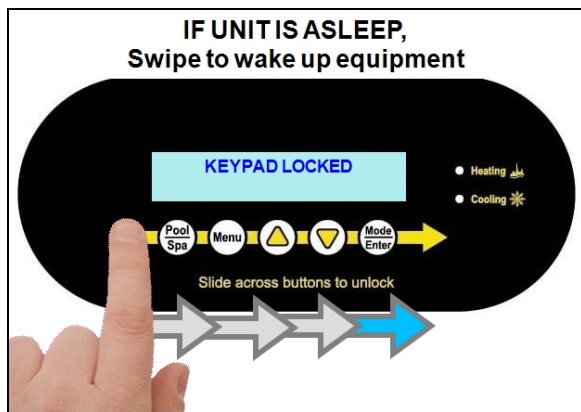


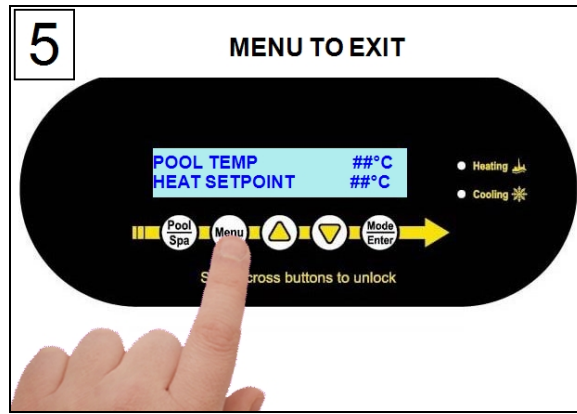
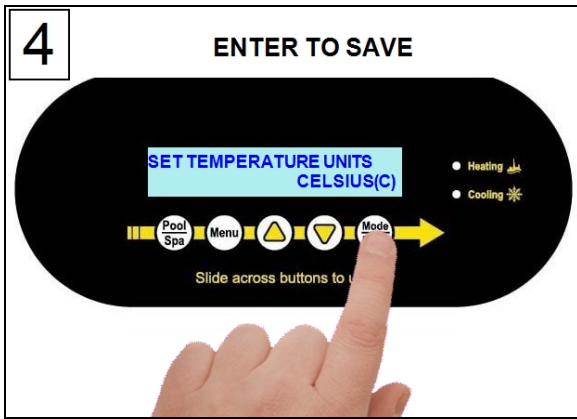


### 1.7.c Selecting Celsius or Fahrenheit

Set the water temperature to show in either Fahrenheit (default) or Celsius.

Enter "Installer Menus", then proceed





#### 1.7.d Configure Variable Speed Compressors

Selected heat pumps have variable speed compressors designed to more quickly and efficiently reach a temperature set point. The compressor's performance can be controlled using a turbo boost mode or two different types of efficiency modes.

##### Turbo Boost

Upon demand, the heat pump's compressor can be set to maximum speed to heat or cool the water quickly. This is regardless of any previously set efficiency mode settings.

- The system will heat or cool the water with the compressor speed set to maximum. This will continue until the set temperature is reached. Then the configured efficiency mode (scheduled or 24-hour) will resume.

##### Efficiency Mode - 24 Hour

When using this mode, the compressor is set to its maximum speed until the temperature set point is reached.

- The compressor speed will then lower to maintain that temperature set point. This will continue as long as there is water flow.
- See "Set Efficiency Mode to 24 Hour" on page 55.

##### Efficiency Mode - Filtration Schedule

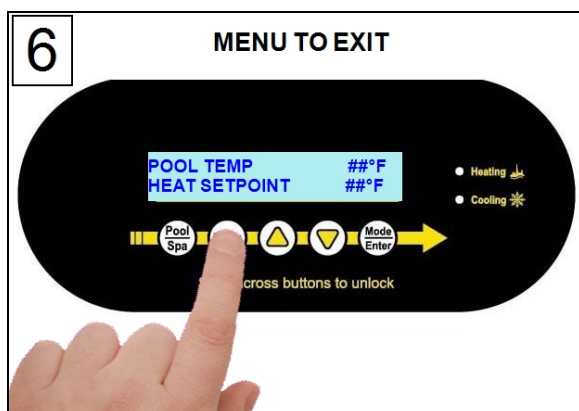
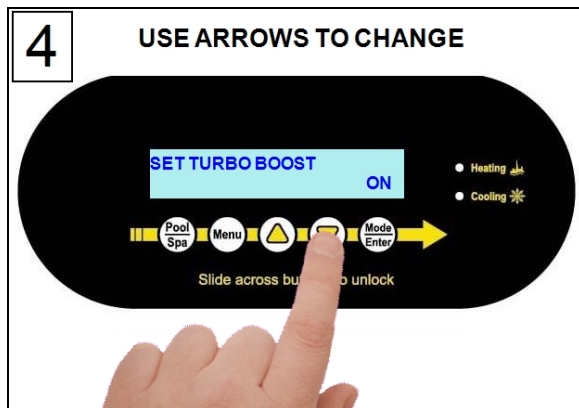
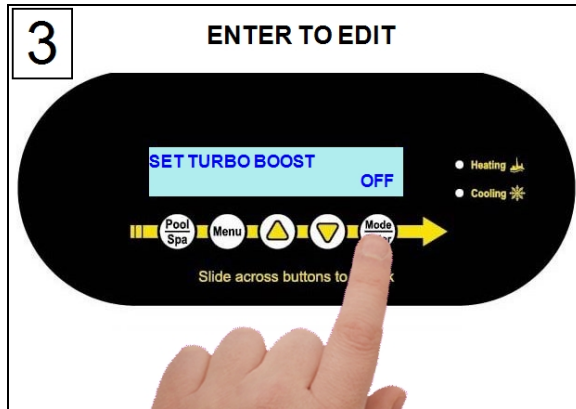
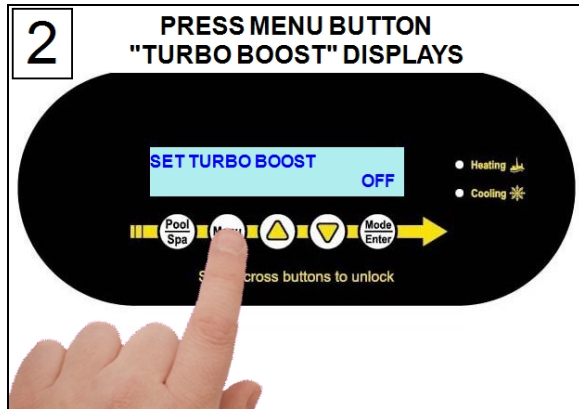
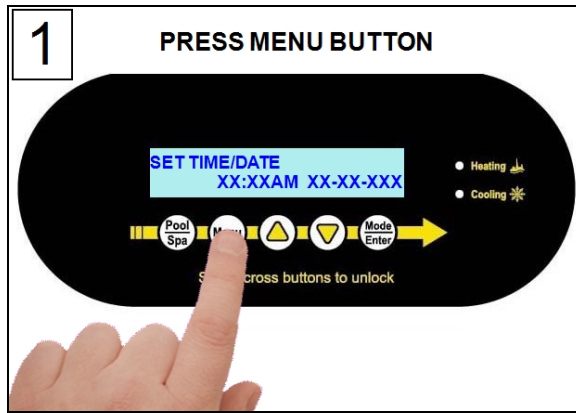
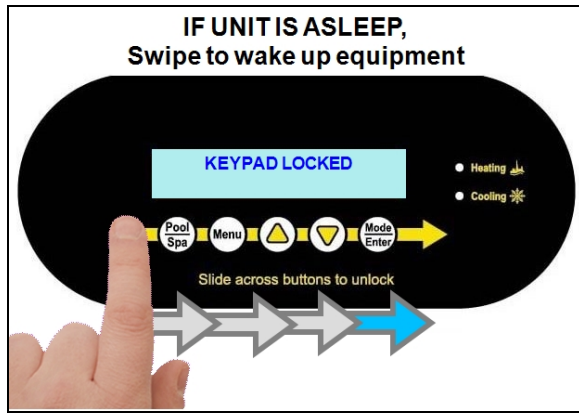
When using this mode, the compressor's speed is set to heat or cool the water within 60% of the circulation pump's filtration time period. This is the highest efficiency operational mode, providing the lowest cost of operation.

- Example - If the filtration period is set from 10:00 am to 8:00 pm, the system attempts to bring the water to set point by 4:00 pm at optimal performance.

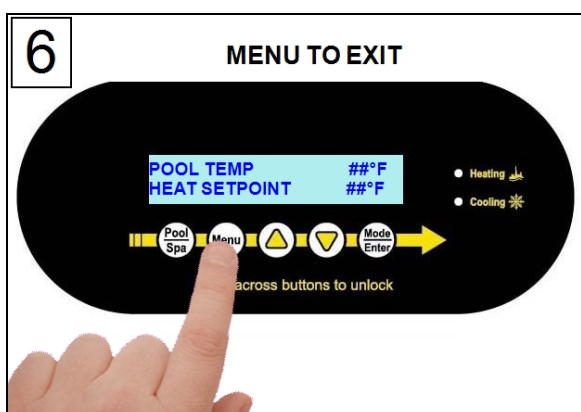
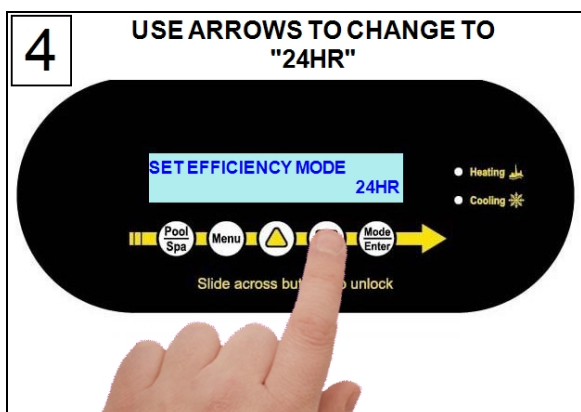
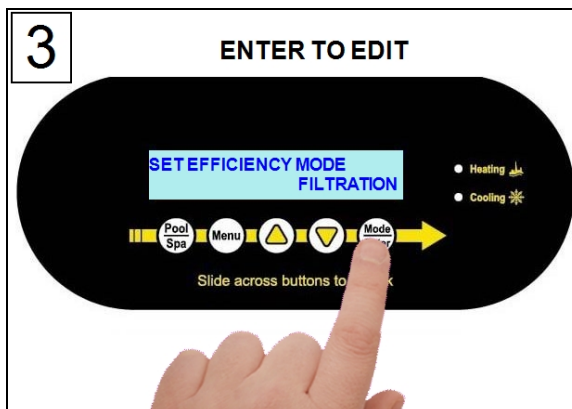
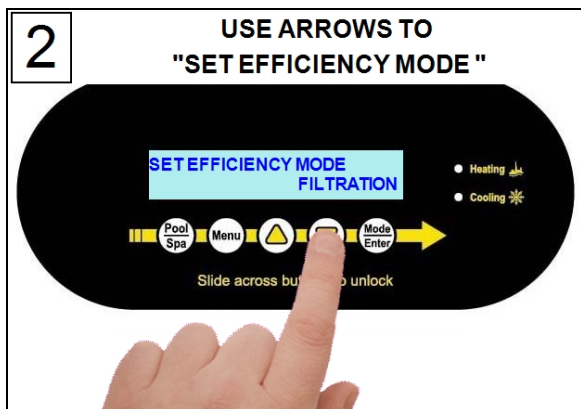
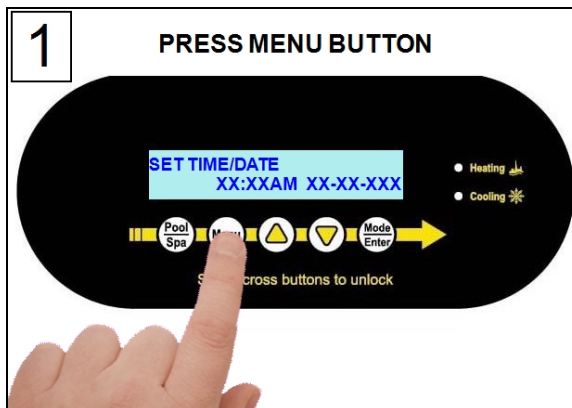
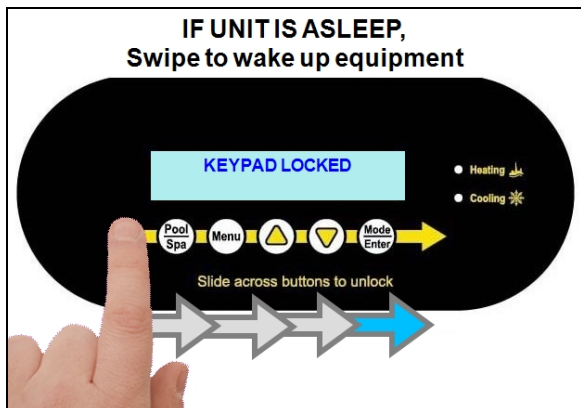
##### **PLEASE NOTE:**

*Setting a filtration schedule outside the current circulation pump's schedule will cause an incorrect efficiency mode.*

- See "Set Efficiency Mode to Filtration Schedule" on page 56.

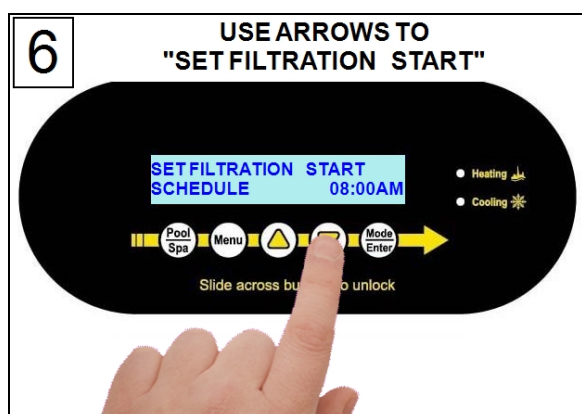
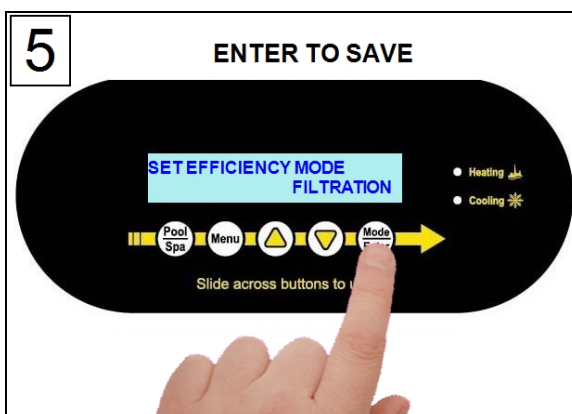
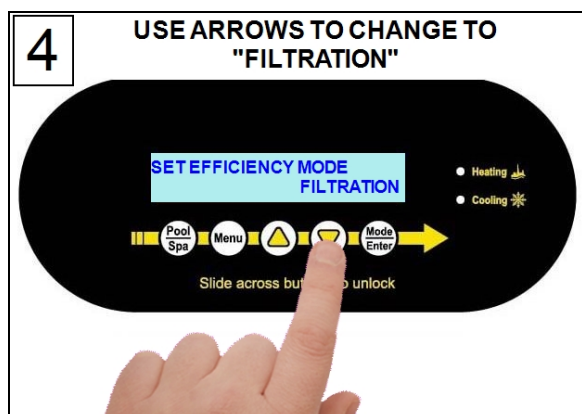
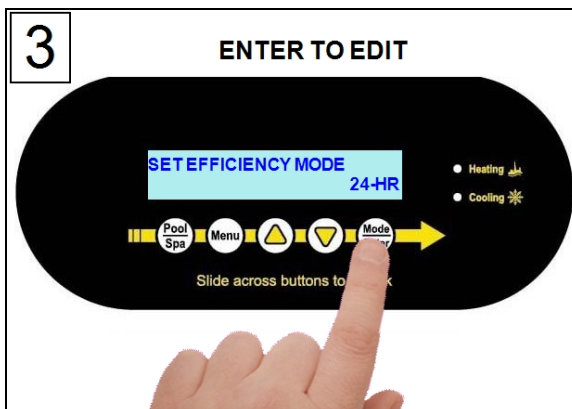
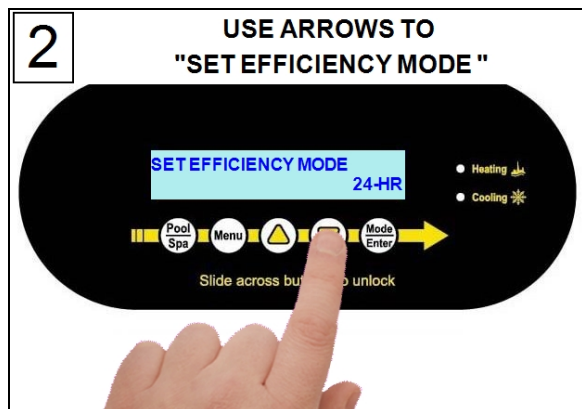
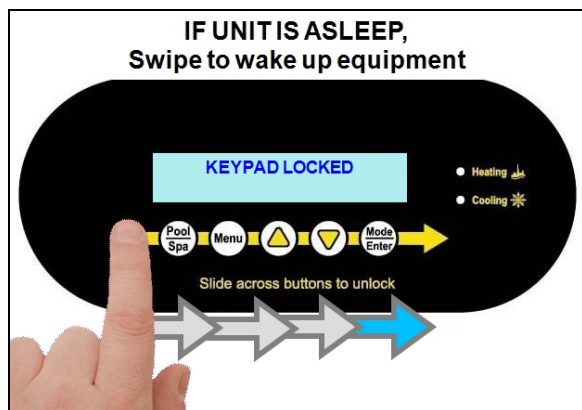


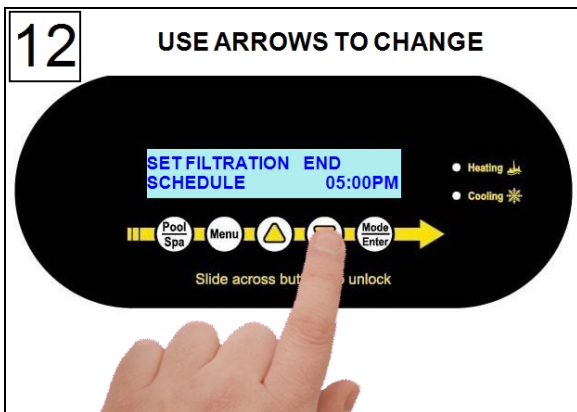
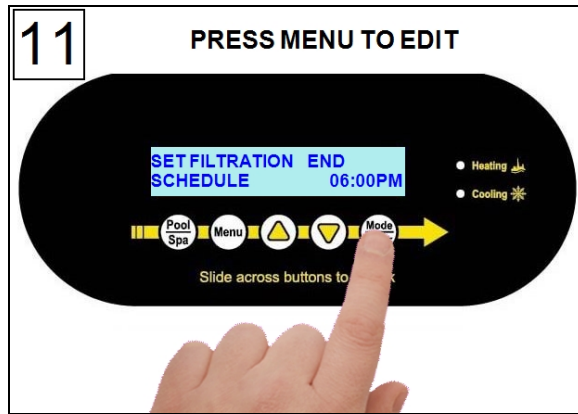
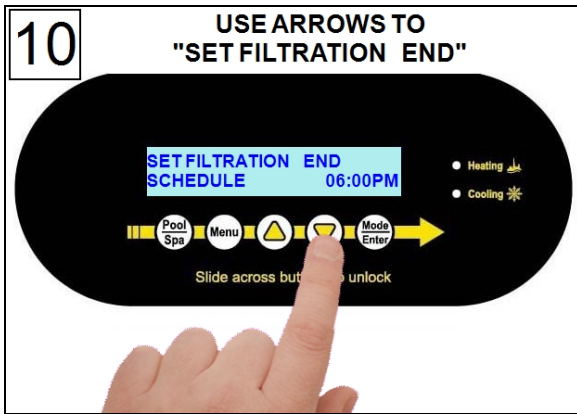
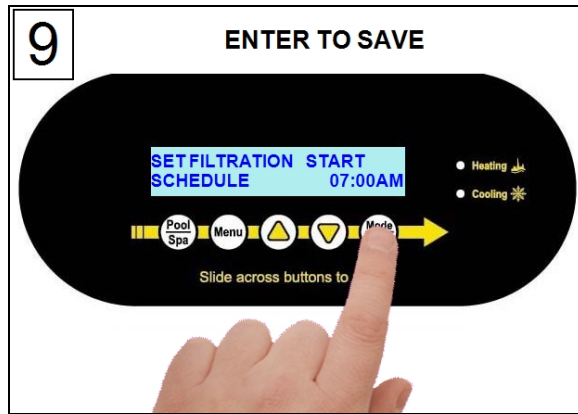
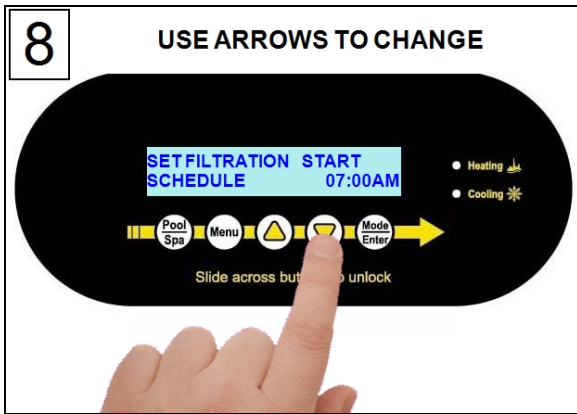






## Set Efficiency Mode to Filtration Schedule





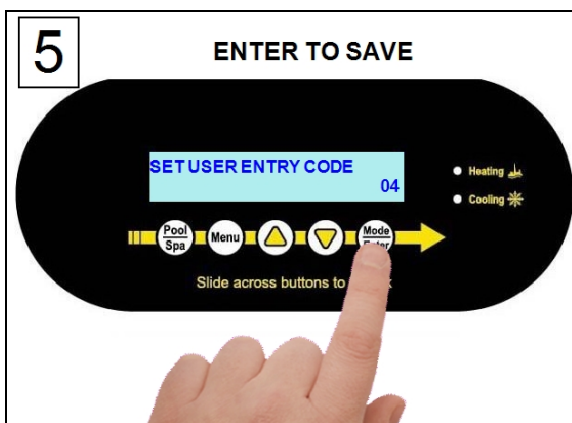
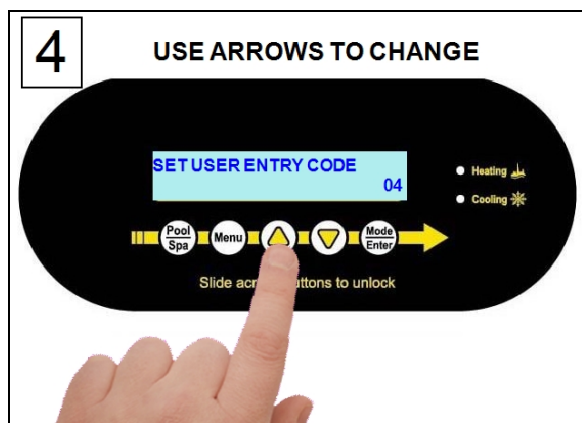
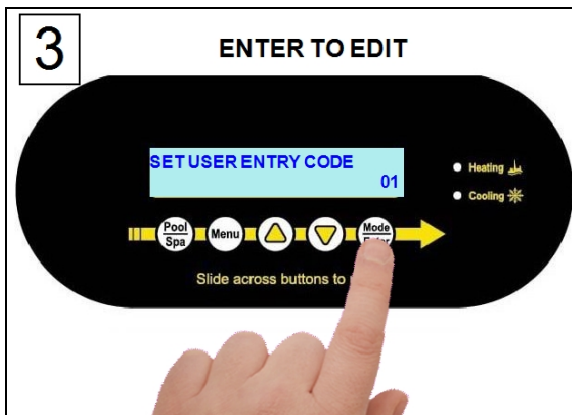
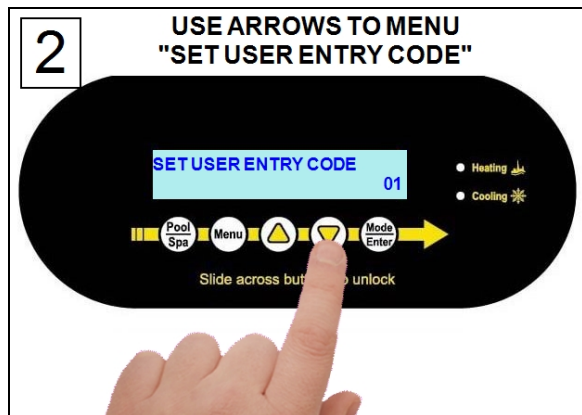
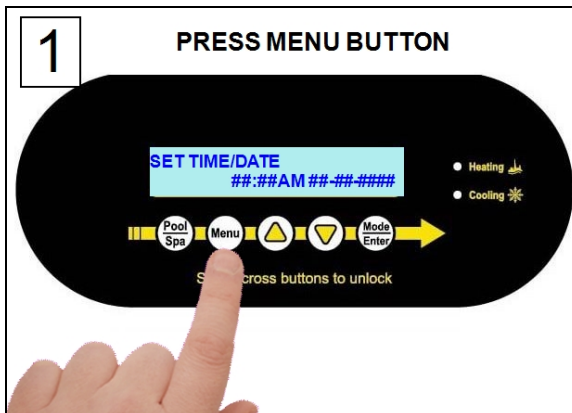
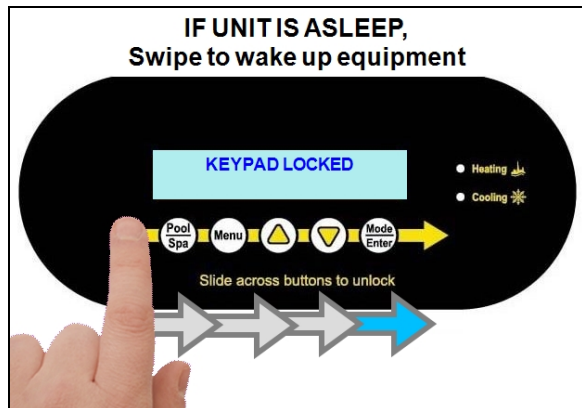
## 1.7.e Setting Entry Code Option

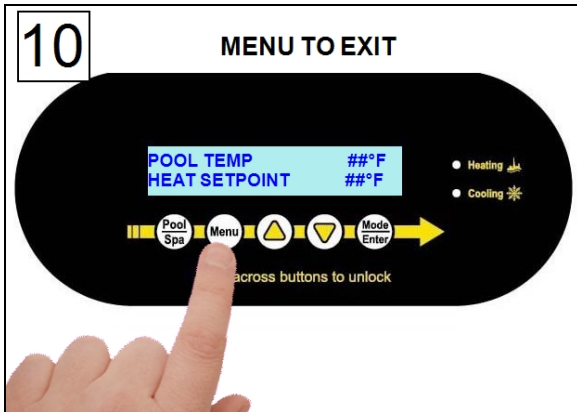
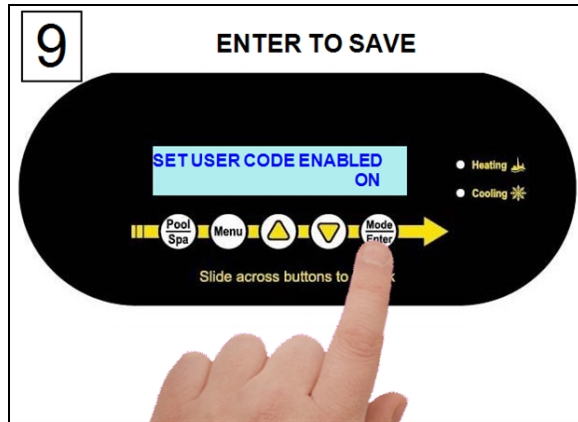
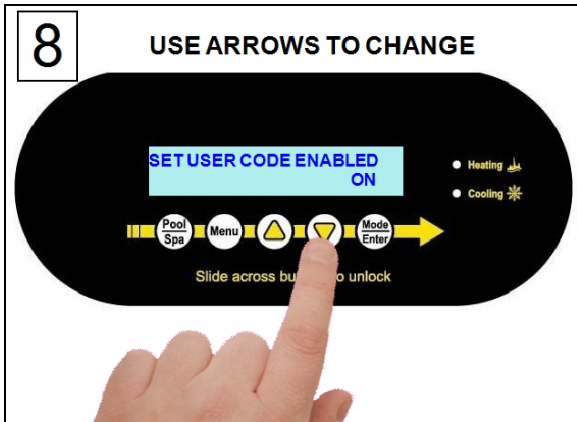
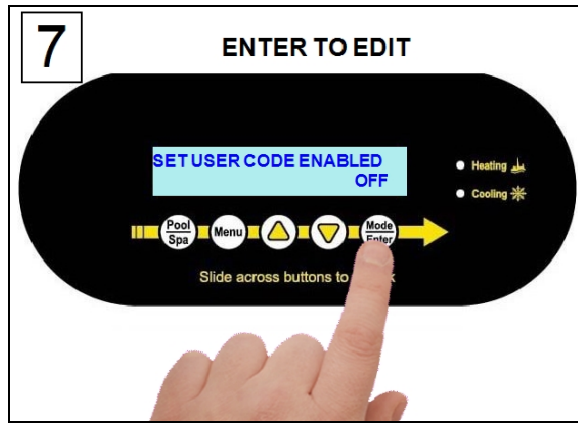
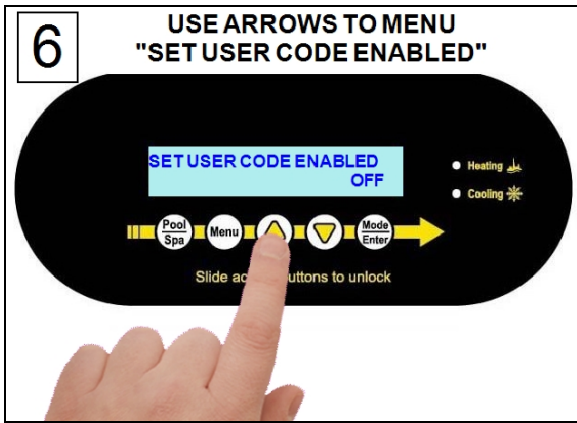
The entry code feature can prevent unauthorized temperature adjustments. This feature initiates after the heat pump goes into the sleep mode for the first time.

### NOTICE

Failure to heed the following may result in damage to equipment.

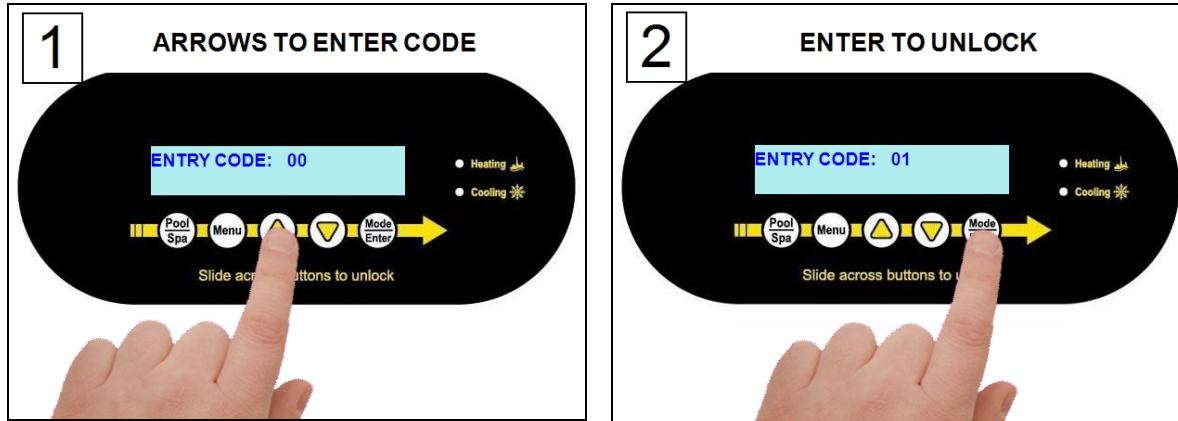
- **Before enabling the entry code feature, be sure to record the code.** If lost, the heat pump will require a program reset to regain access. This reset may require additional configuration by the installer.





### 1.7.f Using Entry Code to Access Heat Pump

If a user entry code has been enabled in the user menu, an entry code will be required to access heat pump options.



**PLEASE NOTE -**

- If the entry code has been misplaced, the heat pump will need to be reset to factory defaults.
- After three minutes of inactivity, the heat pump's sleep mode will activate.

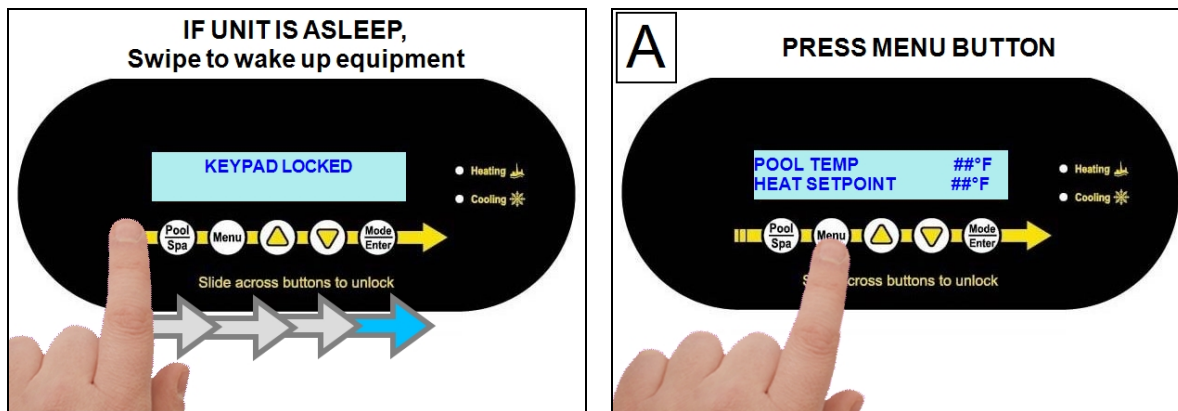
### 1.7.g Resetting Factory Defaults

If needed, the installer can reset programming to the heat pump's factory default settings. See "Factory Defaults" on page 78.

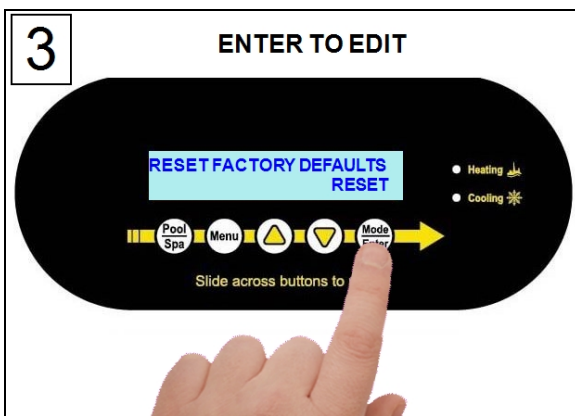
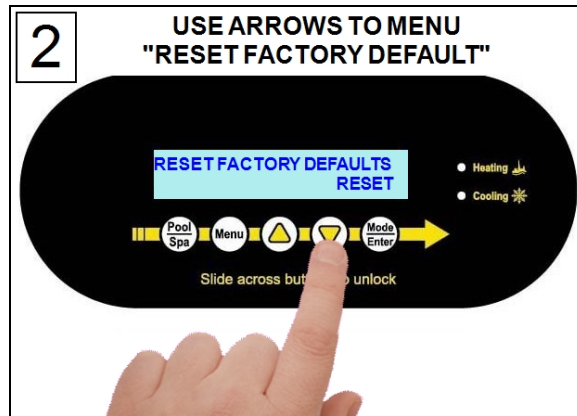
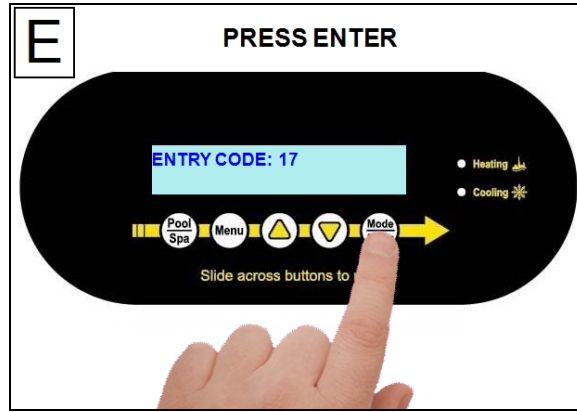
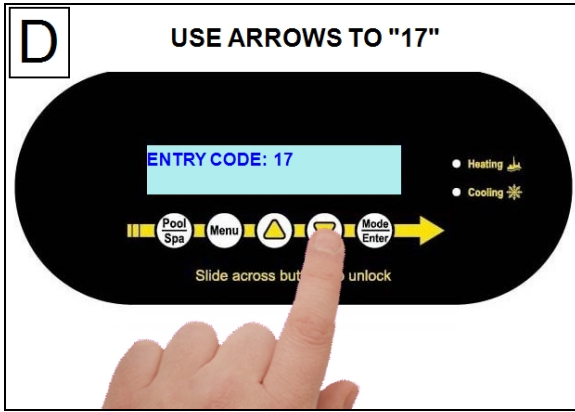
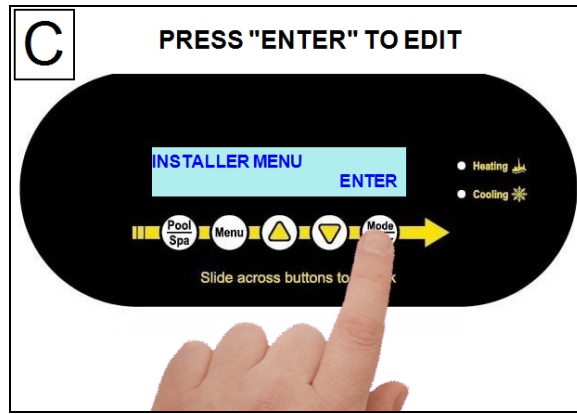
**PLEASE NOTE:**

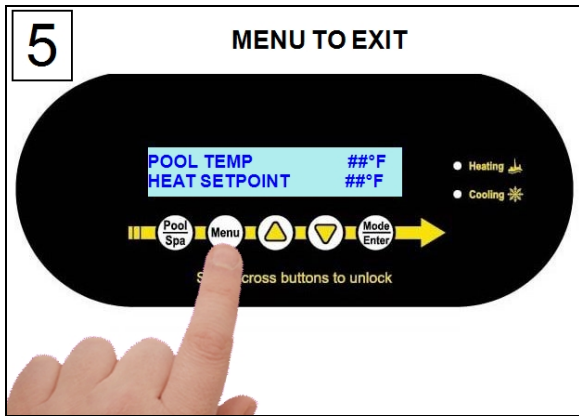
*This will reset any external device configurations.*

Enter "Installer Menus", then proceed









## 1.8 Cleaning Equipment After Installation

Installer - If you need to clean the equipment after installation, please use the following guidelines.

### WARNING

Failure to heed the following may result in injury or death.

- Possible electric shock hazard - Deactivate power to all electrical devices on the pad when washing heat pump. Do not restore electrical power until equipment is completely dry.

### NOTICE

Failure to heed the following may result in damage to equipment.

- Do not use a pressure cleaner to wash the heat pump. Damage to heat pump components may result. If using a hose-end spray nozzle adjust the spray pattern to low strength only.
- Do not spray water directly into the interior of the heat pump; damage to components may result.
- Do not use chemicals on the display panel.

## Cleaning

1. Wash cabinet using a low-pressure water hose. A high-pressure water stream will cause damage to the aluminum fins of the heat pump. This damage is not covered under the product warranty.
2. While the heat pump is still wet, use an approved cleaning agent to clean the exterior of the heat pump. **Do not use chemicals on the display panel.**
3. Use a detergent-dampened cloth to wipe the heat pump's exterior cabinet.
4. Flush all exterior with fresh water using a low-pressure water hose.
5. Dry the cabinet using a soft cloth being careful not to damage fins.

| APPROVED CLEANING AGENTS*               |
|-----------------------------------------|
| Fantastic®                              |
| Formula 409®                            |
| Cascade®                                |
| All Power Plain Detergent (3% Solution) |

Table 3 - Cleaning Agents

- \* The trademarks used in approved cleaning agents are the property of their owners and are not related to AquaCal®.



## Polishing

1. Polish the heat pump's cabinet panels using an approved polishing agent and following the manufacturer's instructions. **Do not use chemicals on the display panel.**
2. Rinse the heat pump panels with fresh water, wipe, and buff panels using a dry soft cloth.
3. Allow heat pump interior and surrounding equipment to "air-dry" for several hours prior to restoring electrical power.

| APPROVED POLISHING AGENTS* |
|----------------------------|
| Simoniz® Wax               |
| Glo-Coat®                  |
| Aarmor All® Protectant     |

Table 4 - Polishing Agents

- \* The trademarks used in approved polishing agents are the property of their owners and are not related to AquaCal®.

### IN THIS SECTION:

#### Fault Codes

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## 2.1 Fault Codes

A fault code indicates a specific issue or condition that will require action before the equipment can resume operating.

Please perform the following troubleshooting.

If the issue reoccurs, please contact AquaCal. See "*Contacting AquaCal AutoPilot, Inc.*" on page 1.

### DANGER

Failure to heed the following will result in injury or death.

- RISK OF ELECTRICAL SHOCK FROM ENERGY STORED IN CAPACITORS - MODELS EQUIPPED WITH VARIABLE FREQUENCY COMPRESSOR DRIVES STORE ELECTRICITY EVEN AFTER THE POWER HAS BEEN DEACTIVATED AT THE POWER BREAKER. *Wait for 2 minutes after the shut down of equipment before servicing.*
- Deactivate power while routing wiring to control board.
- Follow all National Electric Codes (NEC) and/or State and Local guidelines.

### WARNING

Failure to heed the following may result in injury or death.

- Repairs must not be attempted by untrained or unqualified individuals.
- The heat pump contains refrigerant under high pressure. Repairs to the refrigerant circuit must not be attempted by untrained or unqualified individuals. Service must be performed only by qualified HVAC technicians. Recover refrigerant before opening the system.

### NOTICE

Failure to heed the following may result in damage to equipment.

- Service by unauthorized personnel will void the heat pump warranty.

## AIR TEMP SENSOR OPEN or AIR TEMP SENSOR SHORT

### ISSUE

Open or shorted air sensor.

### RESOLUTION

A qualified technician should replace the air sensor.

## CLOCK LOW BATTERY

### ISSUE

The real-time clock controller indicates a low battery condition.

- The time will reset to factory default.
- If connected, a gas backup heater may start and stop at an incorrect time when set to use a "SCHEDULED" mode.

### RESOLUTION

A qualified technician should replace the battery. The date and time will need to be reset on the heat pump after replacement.

### **DEFROST1 SENSOR OPEN or DEFROST2 SENSOR OPEN**

#### **ISSUE**

Open defrost sensor.

#### **RESOLUTION**

A qualified technician should replace the defrost sensor.

### **DEFROST1 SENSOR SHORT or DEFROST2 SENSOR SHORT**

#### **ISSUE**

Shorted defrost sensor.

#### **RESOLUTION**

A qualified technician should replace the defrost sensor.

### **ERROR AT MASTER UNIT**

#### **ISSUE**

The heat pump is slaved to a master heat pump that is displaying a fault code.

#### **RESOLUTION**

The error at the master heat pump must be corrected before the slaved unit will resume operation.

### ISSUE

The refrigerant system's high-pressure switch is showing as open.

### RESOLUTION

#### Heat Only Units

Place heat pump in heating mode and perform the following troubleshooting.

Determine if an insufficient amount of water is being supplied to the equipment.

1. Confirm the filter pump is on.
2. If a multiple-speed filter pump is being used, run filter pump at a higher speed. Do not exceed the maximum flow rate for the model.
3. Confirm water is not being diverted away from the heat pump.
  - See "*Water Flow Rates*" on page 11.
  - See "*Adjusting Water Flow Using  $\Delta T$  (Delta-T)*" on page 13.
4. The water pressure switch may be incorrectly calibrated.
  - See "*Adjusting Water Pressure Switch*" on page 15.

#### Cool Only Units

Determine if an insufficient amount of air is being supplied to the equipment.

1. Check for proper fan operation. If the fan is not operating, contact AquaCal® Technical Support.
2. Check for obstructed airflow around the heat pump.
  - See "*Clearances*" on page 5.
3. Check for a dirty or blocked evaporator coil.
  - See "*Cleaning Equipment After Installation*" on page 62.

#### Heat and Cool Units (Reversing)

Place heat pump in heating mode and perform the following troubleshooting.

Determine if an insufficient amount of water is being supplied to the equipment.

1. Confirm the filter pump is on.
2. If a multiple-speed filter pump is being used, run filter pump at a higher speed. Do not exceed the maximum flow rate for the model.
3. Confirm water is not being diverted away from the heat pump.
  - See "*Water Flow Rates*" on page 11.
  - See "*Adjusting Water Flow Using  $\Delta T$  (Delta-T)*" on page 13.
4. The water pressure switch may be incorrectly calibrated.
  - See "*Adjusting Water Pressure Switch*" on page 15.

## HIGH WATER TEMPERATURE

### ISSUE

Incoming water temperature has exceeded 110° F (43° C) and the unit has been deactivated. The heat pump will not operate until the incoming water temperature drops to 100° F (38° C) or lower.

### RESOLUTION

1. Determine if a gas heater is sending water directly to the heat pump. This situation would need to be corrected before continuing.
2. If a solar heater is sending water directly to the heat pump, the water can initially be hotter than 110° F (43° C). After the water from the solar panel normalizes, the fault will no longer display and the heat pump will resume as needed.
3. If the **HIGH WATER TEMPERATURE** fault continues to display, the water temperature sensor may require replacement.

## HP5 SYSTEM LOCKOUT

### ISSUE

The heat pump has locked due to five high-pressure faults during one call for heating or cooling.

### RESOLUTION

1. Deactivate then reactivate power to the heat pump to clear error.
2. Troubleshoot the high-pressure issue causing the error.
  - See "*HIGH PRESSURE FAULT*" on the previous page.

## LOW PRESSURE FAULT

### ISSUE

The refrigerant system's low-pressure switch is showing as open.

### RESOLUTION

#### Heat Only Units

Place heat pump in heating mode and perform the following troubleshooting.

1. Check for proper fan operation. If the fan is not operating, contact AquaCal® Technical Support.
2. Check for obstructed airflow around the heat pump.
  - See "*Clearances*" on page 5.
3. Check for a dirty or blocked evaporator coil.
  - See "*Cleaning Equipment After Installation*" on page 62.
4. Check for signs of heavy ice buildup on the coil.

#### Cool Only Units

Place heat pump in heating mode and perform the following troubleshooting.

Determine if an insufficient amount of water is being supplied to the equipment.

1. Confirm the filter pump is on.
2. If a multiple-speed filter pump is being used, run filter pump at a higher speed. Do not exceed the maximum flow rate for the model.
3. Confirm water is not being diverted away from the heat pump.
  - See "*Water Flow Rates*" on page 11.
  - See "*Adjusting Water Flow Using  $\Delta T$  (Delta-T)*" on page 13.
4. The water pressure switch may be incorrectly calibrated.
  - See "*Adjusting Water Pressure Switch*" on page 15.

#### Heat and Cool Units (Reversing)

Place heat pump in heating mode and perform the following troubleshooting.

1. Check for proper fan operation. If the fan is not operating, contact AquaCal® Technical Support.
2. Check for obstructed airflow around the heat pump.
  - See "*Clearances*" on page 5.
3. Check for a dirty or blocked evaporator coil.
  - See "*Cleaning Equipment After Installation*" on page 62.
4. Check for signs of heavy ice buildup on the coil.

## LP5 SYSTEM LOCKOUT

### ISSUE

The heat pump has locked due to five low-pressure faults during one call for heating or cooling.

### RESOLUTION

1. Deactivate then reactivate power to the heat pump to clear error.
2. Troubleshoot the low-pressure issue causing the error.
  - See "*LOW PRESSURE FAULT*" above.



## MULTI-UNIT COMM FAULT

### ISSUE

Slaved heat pump is not receiving a signal from the master heat pump.

### RESOLUTION

1. Confirm the master heat pump is operating correctly. If, for example, no power is supplied to the master heat pump, an error will appear on the slaved heat pumps.
2. Confirm the heat pump is properly connected and configured to a master unit.
  - See *"Connecting Multiple Heat Pumps (Master / Slaved)"* on page 39.

## OTA SYSTEM LOCKOUT

### ISSUE

A malfunction has occurred that could allow the water temperature to surpass a safe level. An installed "Over Temperature Alarm" kit has disabled the system.

- See *"Over Temperature Alarm Kit"* on page 83 for more information.

### RESOLUTION

Call for service.

## SMART COMM FAULT

### ISSUE

Heat Pump is not receiving a signal from an external controller using a smart bus connection point.

### RESOLUTION

1. Confirm a smart bus external controller is being used.
  - If not, set external controller mode to "none" instead of "SMART".
    - See *"Configure for Smart Bus Controller"* on page 29.
2. Confirm connection points from the external controller to the heat pump are correctly configured.
  - See *"Connecting Smart Bus Controllers"* on page 27.
3. If using a smart bus external controller, confirm the controller is correctly set to send signals to the heat pump. See manuals or guides provided with the external controller.

## VARIABLE DRIVE FAULT

### ISSUE

A problem was detected in the variable speed compressor.

### RESOLUTION

Deactivate heat pump at power disconnect. Wait for two minutes for the capacitors to discharge. Then reactivate heat pump's power at disconnect. If error reoccurs, call for service.

## WATER TEMP SENSOR SHORT or WATER TEMP SENSOR OPEN

### ISSUE

Shorted or open water sensor.

### RESOLUTION

A qualified technician should replace the water sensor.

## 2.2 Issues and Resolutions

### **DANGER**

Failure to heed the following will result in injury or death.

- RISK OF ELECTRICAL SHOCK FROM ENERGY STORED IN CAPACITORS - MODELS EQUIPPED WITH VARIABLE FREQUENCY COMPRESSOR DRIVES STORE ELECTRICITY EVEN AFTER THE POWER HAS BEEN DEACTIVATED AT THE POWER BREAKER. ***Wait for 2 minutes after the shut down of equipment before servicing.***
- Deactivate power while routing wiring to control board.
- Follow all National Electric Codes (NEC) and/or State and Local guidelines.

### **WARNING**

Failure to heed the following may result in injury or death.

- Repairs must not be attempted by untrained or unqualified individuals.
- The heat pump contains refrigerant under pressure. Repairs to the refrigerant circuit must not be attempted by untrained or unqualified individuals. Service must be performed only by qualified HVAC technicians. Recover refrigerant before opening the system.

### **NOTICE**

Failure to heed the following may result in damage to equipment.

- Service by unauthorized personnel will void the factory warranty.

Please perform the following troubleshooting.

For further assistance, please contact AquaCal. See "*Contacting AquaCal AutoPilot, Inc.*" on page 1.

## Blank Display

### ISSUE

The Heat Pump may have an incoming power problem.

### RESOLUTION

Confirm electrical power is being supplied to the heat pump from electrical disconnect(s).

## Display Panel Not Responding

### ISSUE

The heat pump's display panel will not respond to user input.

### RESOLUTION

1. If heat pump display shows "**UNDER REMOTE CONTROL**", use the external control device to control the heat pump.
2. If needed, check with the external controller manufacturer for further assistance using that device.

**Displays "DEFROSTING"****ISSUE**

The heat pump has sensed the coil is icing up. See *"Ice Forming on the Heat Pump"* on page 76. No action is required.

**RESOLUTION****Heat Only Units - Passive Defrost**

When ice starts to form on the coil, the compressor will stop operating while the fan continues to operate.

- The coil will begin to warm to the surrounding air temperature. When the coil's temperature rises above 38° F (3.3° C), the compressor is restarted and heating resumes.
- If the coil's temperature remains below 38° F (3.3° C), the compressor will remain off.

**Cool Only Units - Passive Defrost**

When ice starts to form on the coil, the compressor will stop operating while the fan continues to operate.

- The coil will begin to warm to the surrounding air temperature. When the coil's temperature rises above 38° F (3.3° C), the compressor is restarted and cooling resumes.
- If the coil's temperature remains below 38° F (3.3° C), the compressor will remain off.

**Heat and Cool Units - Active Defrost**

Hot refrigerant gas will be sent through the coil to rapidly remove ice or frost.

During this process, the melting of the ice may appear as steam coming off the heat pump. This is normal.

**Displays "NO SYSTEM FIRMWARE"****ISSUE**

The heat pump has encountered a software error.

**RESOLUTION**

Call for service.

**Displays "NO POOL/SPA WATER FLOW"****ISSUE**

Low or no water detected. This is normal when the circulation pump is deactivated.

**RESOLUTION**

1. Confirm the filter pump is on.
2. If a multiple-speed filter pump is being used, run at a higher speed to determine if the error persists. Do not exceed the maximum flow rate for your model.
3. Confirm water is not being diverted away from the heat pump.
  - See *"Water Flow Rates"* on page 11.
  - See *"Adjusting Water Flow Using  $\Delta T$  (Delta-T)"* on page 13.

## Displays "SET TO SWITCH REMOTELY"

### ISSUE

If when pressing the "Pool / Spa" button the display flashes the message "**SET TO SWITCH REMOTELY**", the heat pump is using a remote relay switch or a 3-wire controller.

### RESOLUTION

- The Pool and Spa thermostat automatically switch when using these modes.
- Operation manually will not be available when using these external devices. No action is required.

## Displays "SET UNIT MODEL NUMBER"

### ISSUE

The heat pump has encountered a software error.

### RESOLUTION

- The model number and serial number will need to be re-entered into the system. The system will then operate as normal.
- If the issue reoccurs, please contact AquaCal® Technical Support.

## Heat Pump Not Running

### ISSUE

The heat pump will not run.

### RESOLUTION

1. Confirm equipment is receiving power. Is the heat pump display illuminated?
  - If not, confirm the main breaker (located at the power supply panel) and the disconnect switch (located near the heat pump) are both turned on.
  - If the display still does not illuminate, it is recommended that the heat pump installer or electrician confirm the heat pump is receiving power.
2. Confirm correct mode is selected.
3. Confirm thermostat is set correctly.
  - When heating the water is desired, the thermostat should be set above the current water temperature.
  - When cooling the water is desired, the thermostat should be set below the current water temperature.
4. If an error code is displayed, diagnose and correct the cause of the code.
  - See "*Fault Codes*" on page 65.
5. If the heat pump is using an external controller, the heat pump may not be set correctly to accept the controller's signal.

## Heat Pump's Tripping Breaker

### ISSUE

The heat pump breaker(s) keeps tripping.

### RESOLUTION

1. If AquaCal® heat pumps have been connected using a multiple heat pump configuration, the configuration may be incorrect. Please confirm settings or contact installer of equipment.
  - See "*Connecting Multiple Heat Pumps (Master / Slaved)*" on page 39.
2. Have an electrician confirm breakers are correct type, in good condition, and properly sized for the heat pump.

## Heat Pump Won't Shut Off

### ISSUE

The heat pump will not deactivate.

### RESOLUTION

#### **PLEASE NOTE**

*When the heat pump is set to off, the display will show the current water temperature or no water flow indicator.*

1. Confirm the correct mode has been set on the heat pump.
2. Confirm the heat pump has reached the desired temperature set on the thermostat. The heat pump will continue to run until the set temperature is reached.
3. If the heat pump is using an external controller, it may not be set correctly. See the external controller's manual.

## Heat Pump Is Running, Not Heating

### ISSUE

The heat pump is running. But the water is not heating.

### RESOLUTION

1. If the heat pump is using an external controller, confirm it is set correctly.
  - See operation manual for operating heat pump with an external controller.
  - If the heat pump is still not running correctly with this device, contact the installer of the device or the device's manufacturer for further assistance.
2. Confirm heat pump mode is set to heat.
3. Confirm thermostat is set to the desired water temperature.
4. Confirm valves are positioned to heat the correct body of water (either the pool or the spa). If heating a spa that overflows into a pool, confirm the spa is isolated when being heated (not flowing into the pool).
5. Confirm heat pump is transferring heat into the water.
  - Measure the temperature of air discharge coming out of the heat pump fan. If discharge air is between 8° to 10° F (4.4° to 5.6° C) colder than the outside ambient air, the heat pump is moving heat into the water.
6. If an error code is displayed, diagnose and correct cause of code.
  - See "Fault Codes" on page 65.
7. Confirm that the filter pump has a sufficient run-time. The heat pump will not run (or heat the water) without water flow.
  - See "Heating Recommendations" on page 82.
8. If heating a spa, deactivate air blower or venturi (if equipped) to allow for quicker heating times. For pools, deactivate water features, such as slides, waterfalls, or fountains to allow water to retain heat. Use of a liquid pool blanket product, such as an Aqua Blanket™, can also compensate for excessive heat loss.
  - See "Liquid Blankets" on page 83.

### ISSUE

The heat pump is running. But the water is not cooling.

### RESOLUTION

1. If the heat pump is using an external controller, confirm the heat pump is programmed properly to allow for cooling.
2. Confirm the heat pump mode is set to cool.
3. Confirm the thermostat is set below the current water temperature.
4. Confirm valves are positioned to cool the correct body of water (either the pool or the spa). If cooling a spa that overflows into a pool, confirm the spa is isolated when being cooled (not flowing into the pool).
5. If an error code is displayed, determine and correct the condition causing the code.
  - See "*Fault Codes*" on page 65.
6. Confirm heat pump is transferring heat out of the water.
  - Measure the temperature of air discharge coming out of the heat pump's fan. If the air is between 8° to 10° F (4.4° to 5.6° C) warmer than the outside ambient air, the heat pump is moving heat out of the water.
7. Confirm that the filter pump has a sufficient run-time. The heat pump will not run (or cool the water) without water flow.

## Ice Forming on the Heat Pump

### ISSUE

When conditions are too cold for proper operation, the heat pump will enter a defrost mode. This prevents ice from building up on the evaporator coil.

### RESOLUTION

#### Heat Only Units:

- The heat pump may develop a fine layer of white frost on the outside coil before entering the defrost mode. This is normal.
  - See "*Displays Defrosting*" on page 72.
- If heavy ice (not frost) starts to build up, shut off the heat pump. Contact the installer or manufacturer.
- If the ambient air temperature will be falling below 32° F (0° C) for more than 8 hours, winterize equipment.

#### Cool Only Units

- The heat pump may enter defrost mode if the water flow rate falls below the acceptable range. See "*Water Flow Rates*" on page 11.
- If the ambient air temperature will be falling below 32° F (0° C) for more than 8 hours, winterize equipment.

#### Heat and Cool Units (with Active Defrost or "Icebreaker"):

- During freezing conditions, pool or spa heating will continue. Frost or ice may develop during the "countdown" to the active defrost (up to 50 minutes). This is normal. See "*Displays Defrosting*" on page 72.
- The heat pump will enter an "active defrost" stage to remove the accumulated frost and ice.
  - Be sure to observe the unit for at least 50 minutes. If it has not entered an active defrost cycle, call for service.

#### **TIP:**

*The heat pump can be manually set to defrost by temporarily switching to the cooling mode until the ice or frost melts.*

- If the ambient air temperature is (or will be) falling below 32° F (0° C) for more than 8 hours, winterize equipment.

## "Pool / Spa" Button Will Not Work

### ISSUE

The "Pool / Spa" button is disabled if the following devices have been configured on the heat pump.

### RESOLUTION

- A 2-wire external controller.
- A 3-wire external controller.
- An external flow switch.



### ISSUE

The water may be normal condensation produced as a by-product of the heat pump's refrigeration process.

The heat pump can produce up to 8 to 10 gallons (30 to 38 liters) of condensation per hour depending on the humidity of the ambient air. Determine if the water is condensation or a possible leak.

### RESOLUTION

1. Deactivate heat pump, leaving the filter pump on. After several hours, determine if the water is still coming from the heat pump.
2. If using chlorine or bromine as a pool/spa sanitizer, test the water around the heat pump using a test strip. If the test strip indicates that chlorine or bromine is present, a leak may exist.

#### **PLEASE NOTE -**

*If desired, a kit is available to re-direct condensation water away from the heat pump.*

- See "Condensation Drain Kit (# STK0202)" on page 82.

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### 3.1 Factory Defaults

Certain programming options have been preset at the factory. These options can be overwritten for site-specific conditions.

#### NOTICE

Failure to heed the following may result in damage to equipment.

- Unauthorized adjustments in Service Menus (**not shown**) may void the heat pump's warranty.

| User Menus             |             |                          |
|------------------------|-------------|--------------------------|
| MENUS                  | DEFAULT     | OPTIONS                  |
| SET GAS BOOST          | OFF         | OFF<br>ON                |
| SET TIME / DATE        | USER TO SET |                          |
| SET BACKUP HEAT MODE   | OFF         | OFF<br>SCHEDULED<br>24HR |
| SET ENTRY CODE ENABLED | OFF         | OFF<br>ON                |
| SET USER ENTRY CODE    | 01          |                          |
| SET CALL-FLEX MODE     | OFF         | OFF<br>CALL<br>FLEX      |

| Installer Menus     |         |                                |
|---------------------|---------|--------------------------------|
| MENUS               | DEFAULT | OPTIONS                        |
| SET MULTI-UNIT MODE | OFF     | OFF<br>MASTER<br>SLAVED        |
| SET EXT. CTRL MODE  | OFF     | OFF<br>SMART<br>2WIRE<br>3WIRE |

| Installer Menus         |            |                          |
|-------------------------|------------|--------------------------|
| MENUS                   | DEFAULT    | OPTIONS                  |
| SET TIME FORMAT         | 12 Hour    | 12 Hour<br>24 Hour       |
| SET DATE FORMAT         | MDY        | MDY<br>DMY               |
| SET TEMPERATURE UNITS   | Fahrenheit | Fahrenheit<br>Celsius    |
| SET BACKUP HEAT MODE    | OFF        | OFF<br>SCHEDULED<br>24HR |
| SET ENTRY CODE ENABLED  | OFF        | OFF<br>ON                |
| SET USER ENTRY CODE     | 01         |                          |
| SET CALL-FLEX INSTALLED | NO         | YES<br>NO                |
| SET CALL-FLEX MODE      | OFF        | OFF<br>CALL<br>FLEX      |

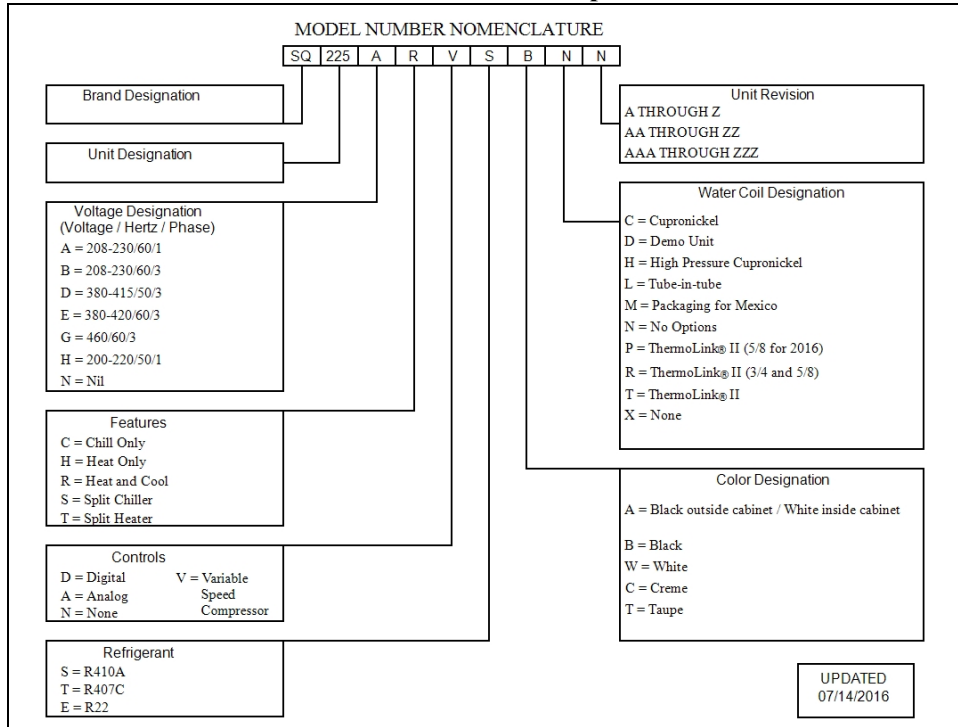
### 3.2 Identifying Model Specifications

1. Find Data Plate - The data plate is usually posted on the side of the equipment or the inside of the heat pump's access plate.
2. Find the model number on the data plate. The first letters and numbers indicate the model type.
3. The complete model number identifies the equipment's specifications.

**Data Plate Example**

|                                                                                                                                              |                             |                                                                                                                                               |  |
|----------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------|--|
| MINIMUM CIRCUIT AMPACITY <input type="text"/>                                                                                                |                             | MADE IN THE USA                                                                                                                               |  |
| ELEC. SERVICE: VOLTS <input type="text"/>                                                                                                    | PH <input type="text"/>     | HZ <input type="text"/>                                                                                                                       |  |
| MAXIMUM TIME DELAY FUSE OR HACR BREAKER <input type="text"/>                                                                                 |                             | 5                                                                                                                                             |  |
| COMPRESSOR VOLTS <input type="text"/>                                                                                                        | R.L.A. <input type="text"/> | L.R.A. <input type="text"/>                                                                                                                   |  |
| FAN MOTOR VOLTS <input type="text"/>                                                                                                         | H.P. <input type="text"/>   | F.L.A. <input type="text"/>                                                                                                                   |  |
| REFRIGERANT: Circuit - Factory charged <input type="text"/>                                                                                  |                             | Only oz/Kg <input type="text"/>                                                                                                               |  |
| Tested to <input type="text"/> psig High side / <input type="text"/> psig Low side                                                           |                             |                                                                                                                                               |  |
| AQUA CAL, INC.<br>A TEAM HORNER COMPANY<br>2737 24 <sup>TH</sup> STREET NORTH<br>ST. PETERSBURG, FL 33713<br>FACTORY SERVICE<br>727-823-9642 |                             | OUTDOOR UNIT<br>MODEL NUMBER <input type="text"/><br><b>III BAR CODE III</b><br>SERIAL NUMBER <input type="text"/><br><b>III BAR CODE III</b> |  |

## Model Number Example



### 3.3 Weights

**NOTE:**

*Specifications subject to change.*

| Model Type                  | Model Number | Install Weight           |
|-----------------------------|--------------|--------------------------|
| <b>TropiCal®</b>            | T035         | 180 Pounds<br>(81.6 kg)  |
| <b>TropiCal®</b>            | T055         | 180 Pounds<br>(81.6 kg)  |
| <b>TropiCal®</b>            | T075         | 200 Pounds<br>(90.7 kg)  |
| <b>TropiCal®</b>            | T090         | 255 Pounds<br>(115.7 kg) |
| <b>TropiCal®</b>            | T115         | 259 Pounds<br>(117.5 kg) |
| <b>TropiCal®</b>            | T135         | 287 Pounds<br>(130 kg)   |
| <b>TropiCal®</b>            | T170         | 326 Pounds<br>(148 kg)   |
| <b>HeatWave SuperQuiet®</b> | SQ120R       | 268 Pounds<br>(121.6 kg) |
| <b>HeatWave SuperQuiet®</b> | SQ125        | 268 Pounds<br>(121.6 kg) |
| <b>HeatWave SuperQuiet®</b> | SQ145        | 328 Pounds<br>(148.8 kg) |
| <b>HeatWave SuperQuiet®</b> | SQ150VS      | 350 Pounds<br>(158.8 kg) |
| <b>HeatWave SuperQuiet®</b> | SQ166R       | 328 Pounds<br>(148.8 kg) |
| <b>HeatWave SuperQuiet®</b> | SQ225        | 328 Pounds<br>(148.8 kg) |
| <b>TropiCool®</b>           | TC500        | 215 Pounds<br>(97.5 kg)  |
| <b>TropiCool®</b>           | TC1000       | 285 Pounds<br>(128.8 kg) |
| <b>TropiCool®</b>           | TC1500       | 328 Pounds<br>(148.8 kg) |

### 3.4 Heating Recommendations

The following recommendations will reduce the amount of time required to heat a pool. **If unsure of equipment heating capability, review equipment data plate.** See "*Identifying Model Specifications*" on page 79.

1. Confirm heat pump mode has been set to heating mode.
2. Set the desired temperature (set-point) for the water.
3. Temporarily set the filter pump for continuous operation.
  - This will allow the Heat Pump the time required to heat the water at start-up.
  - After the water has reached the desired temperature, reset the filter pump to normal operating time-frames.
4. Activate Turbo Boost Mode if equipped.
5. Use a pool cover or blanket to reduce heating time.

### 3.5 Cooling Recommendations

The following recommendations will reduce the amount of time required to cool a pool or cold plunge application. **If unsure of equipment cooling capability, review equipment data plate.** See "*Identifying Model Specifications*" on page 79.

1. Confirm heat pump mode has been set to cooling mode.
2. Set thermostat to desired water temperature.
3. Activate Turbo Boost Mode if equipped.
4. Temporarily set the filter pump for continuous operation.
  - This will allow the Heat Pump the time required to cool the water at start-up.
  - After the water has reached the desired temperature, reset the filter pump to normal operating time-frames.

### 3.6 Available Accessories

Accessories may be purchased through an authorized dealer of AquaCal® products.

#### Bypass Valve Kit (# STK0135)

- When high flow rates are outside recommended specifications, please use this kit or an alternative bypass valve system.
- This kit can be used to control excessive water flow through the heat pump. It provides automatic flow adjustments for most applications.



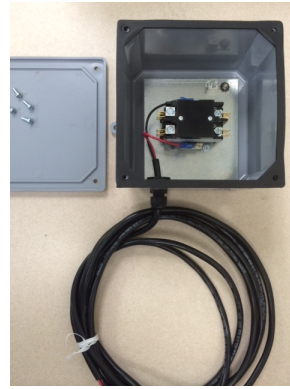
#### Condensation Drain Kit (# STK0202)

- Used when condensation water flow must be directed to a specific location.



### Call Flex Accessory (# 0030-LEDS)

- This accessory will override a circulation pump to provide water to the heat pump when the set temperature is not met.



### Grid Flow Switch (# 0040S)

- Used for automatic pool/spa thermostat switching.
- This switch can also be used in place of the water pressure switch. This may be needed when the pool/spa elevation is higher than the heat pump. A higher elevation of the water can cause a false signal to the heat pump; indicating water is flowing through the heat pump when it isn't.
- This kit is not to be used on applications exceeding 50 PSI (345 kPa).



### Liquid Blankets

- An invisible liquid heat barrier designed to retain heat and extend the swimming season.
- AquaCal® recommends [Lo-Chlor®](#) Aqua Blanket™.



### Over Temperature Alarm Kit

- This kit is an additional safety device. It disables the heat pump if any malfunction occurs that allows the water temperature to surpass a safe level.
- This kit is strongly recommended for all spa applications.
  - Single Phase Heat Pump - (# STK0221)
  - Three Phase Heat Pump - (# STK0222)

## Plumbing Unions

- 2 Inch Unions - (# PLS2627)



## Temperature Port Kit (# STK0096)

- This kit can be used to adjust water flow using Delta-T.
- The kit comes with a port, installation components, and a temperature probe.









# MASTERTEMP® POOL AND SPA HEATER

## INSTALLATION AND USER'S GUIDE

### **⚠ WARNING FOR YOUR SAFETY - READ BEFORE OPERATING**

If you do not follow these instructions exactly, a fire or explosion may result, causing property damage, personal injury or loss of life. For additional free copies of this manual; call (800) 831-7133.

**FOR YOUR SAFETY** - This product must be installed and serviced by authorized personnel, qualified in pool/spa heater installation. Improper installation and/or operation can create carbon monoxide gas and flue gases which can cause serious injury, property damage, or death. For indoor installations, as an additional measure of safety, Pentair Aquatic Systems strongly recommends installation of suitable **Carbon Monoxide detectors** in the vicinity of this appliance and in any adjacent occupied spaces. Improper installation and/or operation will void the warranty.

| 120/240 VAC NATURAL GAS/LP GAS |         |         |
|--------------------------------|---------|---------|
| Models                         | Natural | Propane |
| 175K BTU/HR                    | 460792  | 460793  |
| 200K BTU/HR (ASME)             | 461000  | 461001  |
| 200K BTU/HR                    | 460730  | 460731  |
| 200K BTU/HR (HD ASME)          | 461032  | —       |
| 250K BTU/HR                    | 460732  | 460733  |
| 250K BTU/HR (HD)               | 460806  | —       |
| 250K BTU/HR (ASME)             | 460771  | 460772  |
| 250K BTU/HR (HD ASME)          | 461020  | —       |
| 300K BTU/HR                    | 460734  | 460735  |
| 400K BTU/HR                    | 460736  | 460737  |
| 400K BTU/HR (HD)               | 460805  | —       |
| 400K BTU/HR (ASME)             | 460775  | 460776  |
| 400K BTU/HR (HD ASME)          | 461021  | —       |



**OWNER:**  
Retain For  
Future  
Reference

**⚠ WARNING** Improper installation, adjustment, alteration, service or maintenance can cause property damage, personal injury or death. Installation and service must be performed by a qualified installer, service agency or the gas supplier.

### **FOR YOUR SAFETY**

#### **WHAT TO DO IF YOU SMELL GAS**

- Do not try to light any appliance.
- Do not touch any electrical switch; do not use any phone in your building.
- Immediately call your gas supplier from a neighbor's phone. Follow the gas supplier's instructions.
- If you cannot reach your gas supplier, call the fire department.

**DO NOT** store or use gasoline or other flammable vapors and liquids in the vicinity of this or other appliances.

Pentair Water Pool and Spa, Inc.  
1620 Hawkins Ave., Sanford, NC 27330 • (800) 831-7133 or (919) 566-8000  
10951 W. Los Angeles Ave., Moorpark, CA 93021 • (800) 831-7133 or (805) 553-5000

## **Customer Service and Technical Support**

If you have questions about ordering Pentair Aquatic Systems replacement parts, and pool products, please call:

**Phone: (800) 831-7133**

**Fax: (800) 284-4151**

(8 A.M. to 4:30 PM Eastern Time/Pacific Time)

Web sites: [www.pentairpool.com](http://www.pentairpool.com) - [www.staritepool.com](http://www.staritepool.com)

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# Section 1: Heater Identification Information

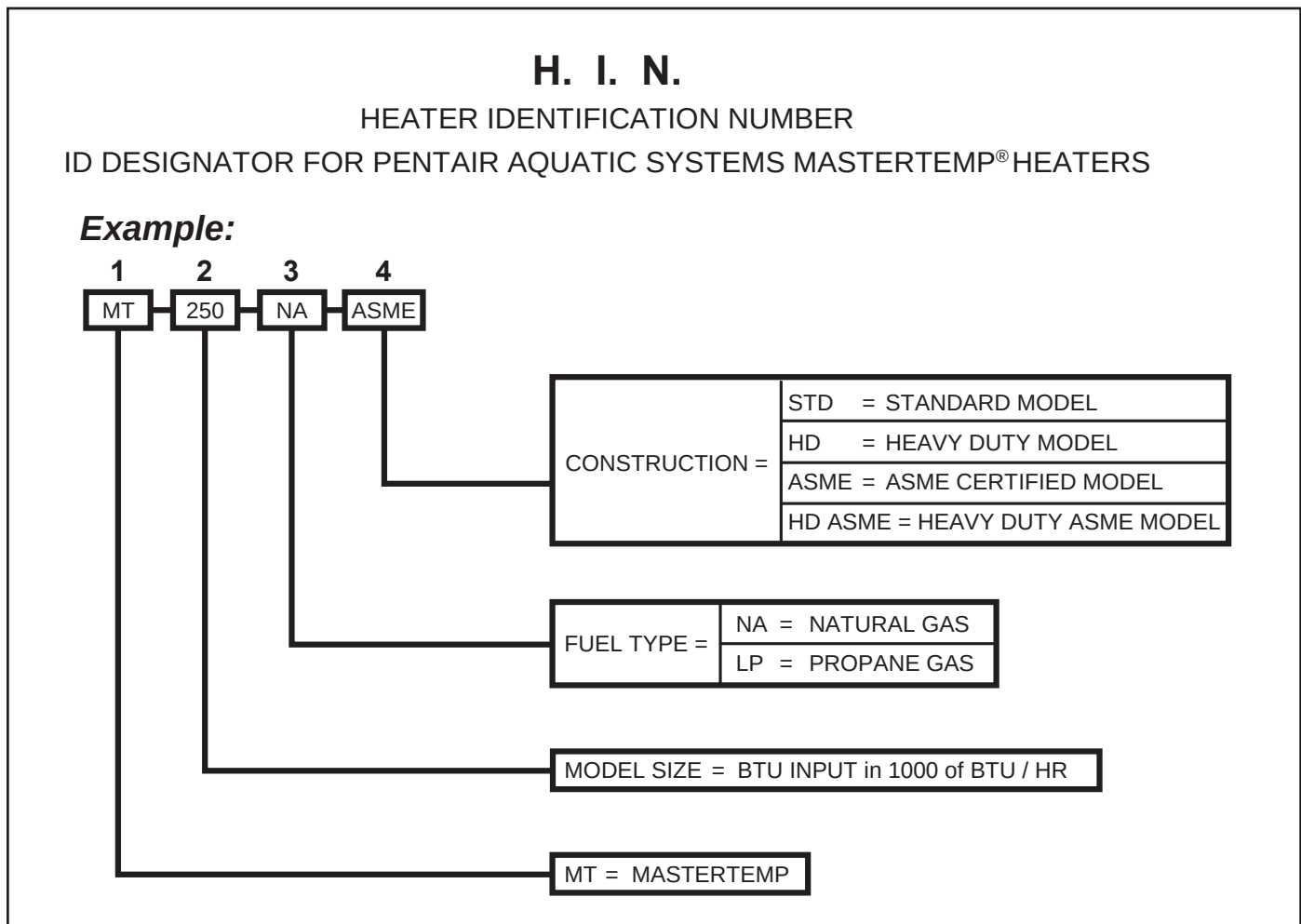
To identify the heater, see rating plate on the inner front panel of the heater. There are two designators for each heater, one is the Model Number and the other is the Heater Identification Number (HIN).

## a. Heater Identification Number (HIN)

The following *example* simplifies the identification system:

- 1) **MT** : MasterTemp
- 2) **Model Size** : (175, 200, 250, 300 or 400) : Input rating (Btu/hr) X 1000
- 3) **Fuel Type** : (LP = Propane gas or NA = Natural gas)
- 4) **Construction** : (STD = Standard Model)  
(HD = Heavy Duty Model)  
(ASME = ASME Certified Model)  
(HD ASME = Heavy Duty ASME Model)

## HEATER IDENTIFICATION INFORMATION — (HIN)



## Section 2: Warning and Safety Instructions

### IMPORTANT SAFETY INSTRUCTIONS READ AND FOLLOW ALL INSTRUCTIONS SAVE THESE INSTRUCTIONS

#### MASTERTEMP® Pool and Spa Heater

Congratulations on your purchase of the MasterTemp Pool and Spa Heater. Proper installation and service of your new heating system and correct chemical maintenance of the water will ensure years of enjoyment. The MasterTemp heater is a compact, lightweight, efficient, induced-draft, gas fired high performance pool and spa heater that can be directly connected to schedule 40 PVC pipe. The MasterTemp heater also comes equipped with the Pentair multifunction temperature controller which shows, at a glance, the proper functioning of the heater. All MasterTemp heaters are designed with a direct ignition device, HSI (hot-surface ignition), which eliminates the need for a standing pilot. The MasterTemp heater requires an external power source (120/240 VAC 60 Hz) to operate.

**SPECIAL INSTRUCTIONS TO OWNER:** Retain this manual for future reference. This instruction manual provides operating instructions, installation and service information for the MasterTemp high performance heater. The information in this manual applies to all MasterTemp heater models. **READ AND REVIEW THIS MANUAL COMPLETELY**, it is very important that the owner/installer read and understand the section covering installation instructions, and recognize the local and state codes before installing the MasterTemp heater. Its use will reduce service calls and chance of injury and will lengthen product life. History and experience has shown that most heater damage is caused by improper installation practices.

### IMPORTANT NOTICES

**For the installer and operator of the MasterTemp heater:** The manufacturer's warranty may be void if, for any reason, the heater is improperly installed and/or operated. Be sure to follow the instructions set forth in this manual. If you need any more information, or if you have any questions regarding to this pool heater, please contact Pentair Aquatic Systems at (800) 831-7133.

### WARRANTY INFORMATION

The MasterTemp pool and spa heater is sold with a limited factory warranty. ***Specific details are described on the warranty registration card which is included with the product.*** Return the warranty registration card after filling in the serial number from the rating plate inside the heater.

*Pentair Aquatic Systems high standards of excellence include a policy of continuous product improvement resulting in your state-of-the-art heater. We reserve the right to make improvements which change the specifications of the heater without incurring an obligation to update the current heater equipment.*

**These heaters are designed for the heating of chlorine, bromine or salt system swimming pools and spas or in non-stationary installations, and should never be employed for use as space heating boilers or general purpose water heaters. The manufacturer's warranty may be void if, for any reason, the heater is improperly installed and/or operated. Be sure to follow the instructions set forth in this manual.**

#### CAUTION

**OPERATING THIS HEATER CONTINUOUSLY AT WATER TEMPERATURE BELOW 68° F. WILL CAUSE HARMFUL CONDENSATION AND WILL DAMAGE THE HEATER AND VOID THE WARRANTY. Do not use the heater to protect pools or spas from freezing if the final maintenance temperature desired is below 68° F., as this will cause condensation related problems.**

## CODE REQUIREMENTS

Installation must be in accordance with all local codes and/or the latest edition of the National Fuel Gas Code, ANSI Z223.1 and the latest edition of the National Electrical Code, NFPA 70 (US).

Installation in Canada must be in accordance with the latest CAN/CGA-B149.1 or .2 and CSA C22.1 Canadian Electric Code, part 1.

The heater, when installed, must be electrically grounded and bonded in accordance with local codes, or, in absence of local codes, with the National Electrical Code, ANSI/NFPA70 (US) or in Canada in accordance with the Canadian Electric Code, part 1.as applicable.



### **⚠ DANGER**

**CARBON MONOXIDE GAS IS DEADLY** – Exhaust from this pool heater contains toxic levels of carbon monoxide, a dangerous, poisonous gas you cannot see or smell.

## CONSUMER INFORMATION AND SAFETY

### **⚠ WARNING**

The U.S. Consumer Product Safety Commission warns that elevated water temperature can be hazardous. See below for water temperature guidelines before setting temperature.

1. Spa or hot tub water temperatures should never exceed 104° F (40° C). A temperature of 100° F (38° C) is considered safe for a healthy adult. Special caution is suggested for young children.
2. Drinking of alcoholic beverages before or during spa or hot tub use can cause drowsiness which could lead to unconsciousness and subsequently result in drowning.
3. Pregnant women beware! Soaking in water above 102° F (39° C) can cause fetal damage during the first three months of pregnancy (resulting in the birth of a brain-damaged or deformed child). Pregnant women should stick to the 100° F (38° C) maximum rule.
4. Before entering the spa or hot tub, the user should check the water temperature with an accurate thermometer. Spa or hot tub thermostats may err in regulating water temperatures by as much as 4° F (2.2° C).
5. Persons with a medical history of heart disease, circulatory problems, diabetes or blood pressure problems should obtain their physician's advice before using spas or hot tubs.
6. Persons taking medication which induce drowsiness, such as tranquilizers, antihistamines or anticoagulants should not use spas or hot tubs.

### **⚠ WARNING**

**Should overheating occur or the gas supply fail to shut off, turn off the manual gas control valve to the heater. Do not use this heater if any part has been under water. Immediately call a qualified service technician to inspect the heater and to replace any part of control system and gas control which has been under water.**

## SAFETY INFORMATION

The MasterTemp® pool heaters are designed and manufactured to provide many years of safe and reliable service when installed, operated and maintained according to the information in this manual. Throughout the manual, safety warnings and cautions are identified by the “” symbol. Be sure to read and comply with all of the warnings and cautions.

### **DANGER — CARBON MONOXIDE GAS IS DEADLY**

#### **READ OWNERS MANUAL COMPLETELY BEFORE OPERATING**

THIS PRODUCT MUST BE INSTALLED AND SERVICED BY A PROFESSIONAL SERVICE TECHNICIAN, QUALIFIED IN POOL HEATER INSTALLATION. Some jurisdictions require that installers be licensed. Check with your local building authority about contractor licensing requirements. Improper installation and/or operation could create carbon monoxide gas and flue gases which could cause serious injury or death. Improper installation and/or operation will void the warranty.

Exhaust from this pool heater contains toxic levels of carbon monoxide, a dangerous, poisonous gas you cannot see or smell. Symptoms of carbon monoxide exposure or poisoning include dizziness, headache, nausea, weakness, sleepiness, muscular twitching, vomiting and inability to think clearly. IF YOU EXPERIENCE ANY OF THE ABOVE SYMPTOMS, IMMEDIATELY TURN OFF THE POOL HEATER, LEAVE THE VICINITY OF THE POOL OR SPA AND GET INTO FRESH AIR IMMEDIATELY. THE POOL HEATER MUST BE THOROUGHLY TESTED BY A GAS PROFESSIONAL BEFORE RESUMING OPERATION.

#### **EXCESSIVE CARBON MONOXIDE EXPOSURE CAN CAUSE BRAIN DAMAGE OR DEATH.**

NEVER use this pool heater indoors without specified ventilation system (and properly installed vent pipe).

NEVER use this pool heater in the home or in partly enclosed areas (such as garages), unless the specified ventilation system is used. If used outdoors, install far from open windows, doors, vents and other openings.

Pentair strongly recommends that all vents, pipes and exhaust systems be initially and periodically tested for proper operation. This testing can be accomplished by using a hand-held carbon monoxide meter and/or by consulting with a gas professional.

Pool heaters must be used in conjunction with carbon monoxide detectors installed near the pool heater. The carbon monoxide detectors must be periodically inspected for proper operation so as to insure continued safety. Broken or malfunctioning carbon monoxide detectors must be replaced immediately.

### **WARNING — FOR YOUR SAFETY**

This product must be installed and serviced by a professional service technician, qualified in pool heater installation. Some jurisdictions require that installers be licensed. Check with your local building authority about contractor licensing requirements. Improper installation and/or operation could create carbon monoxide gas and flue gases which could cause serious injury or death. Improper installation and/or operation will void the warranty.

 **WARNING — This heater is equipped with an unconventional gas control valve that is factory set with a manifold pressure of -.2 inches wc.** Improper installation, adjustment, alteration, service or maintenance can cause property damage, personal injury or loss of life. Installation or service must be performed by a qualified installer, service agency or the gas supplier. If this control is replaced, it must be replaced with an identical control.

**Do not attempt to adjust the gas flow by adjusting the regulator setting.**



## SAFETY INFORMATION, (cont'd.)

 **WARNING** — **Risk of fire or explosion from incorrect fuel use or faulty fuel conversion.** Do not try to run a heater set up for natural gas on propane gas or vice versa. Only qualified service technicians should attempt to convert heater from one fuel to the other. Do not attempt to alter the rated input or type of gas by changing the orifice. If it is necessary to convert to a different type of gas, consult your Pentair dealer. Serious malfunction of the burner can occur which may result in loss of life. Any additions, changes, or conversions required in order for the appliance to satisfactorily meet the application needs must be made by a Pentair dealer or other qualified agency using factory specified and approved parts. The heater is available for use with natural gas or LP (propane) gas only. It is not designed to operate with any other fuels. Refer to the nameplate for the type of gas the heater is equipped to use.

- Use heater only with the fuel for which it is designed.
- If a fuel conversion is necessary, refer this work to a qualified service technician or gas supplier before putting the heater into operation.

 **WARNING** — **Risk of fire or explosion from flammable vapors.** Do not store gasoline, cleaning fluids, varnishes, paints, or other volatile flammable liquids near heater or in the same room with heater.

 **WARNING** — **Risk of explosion if unit is installed near propane gas storage.** Propane (LP) gas is heavier than air. Consult local codes and fire protection authorities about specific installation requirements and restrictions. Locate the heater away from propane gas storage and filling equipment as specified by the Standard for the Storage and Handling of Liquefied Petroleum Gases, CAN/CSA B149.2 (latest edition) or ANSI/NFPA 58 (latest edition).

 **WARNING** — **Risk of fire, carbon monoxide poisoning, or asphyxiation if exhaust venting system leaks.** Only qualified service technicians should attempt to service the heater, as leakage of exhaust products or flammable gas may result from incorrect servicing.

 **WARNING** — **Risk of asphyxiation if exhaust is not correctly vented. Follow venting instructions exactly when installing heater.** Do not use a draft hood with this heater, as the exhaust is under pressure from the burner blower and a draft hood will allow exhaust fumes to blow into the room housing the heater. The heater is supplied with an integral venting system for outdoor installation. A vent conversion kit (See Page 24 for Part Numbers for Conversion Kits) is available for installations in enclosures (Canada) or indoors (U.S.). Use the specified venting, and only the specified venting, when heater is installed in an enclosure or indoors. In Canada, this pool heater can only be installed outdoors or in an enclosure that is not normally occupied and has no openings directly into occupied areas. See Page 19 for enclosure venting requirements.

 **CAUTION** — **Label all wires prior to disconnection when servicing controls. Wiring errors can cause improper and dangerous operation. Wiring errors can also destroy the control board.**

- Connect heater to **120** or **240** Volt, 60 Hz., Single Phase power only.
- Verify proper operation after servicing.
- Do not allow children to play on or around heater or associated equipment.
- Never allow children to use the pool or spa without adult supervision.
- Read and follow other safety information contained in this manual prior to operating this pool heater.

## CONSUMER INFORMATION AND SAFETY

---

### WARNING

---

The U.S. Consumer Product Safety Commission warns that carbon monoxide is an "invisible killer". Carbon monoxide is a colorless and odorless gas.

1. Carbon monoxide is produced by burning fuel, including natural gas and propane.
2. Proper installation, operation and maintenance of fuel-burning appliances in the home is the most important factor in reducing carbon monoxide poisoning.
3. Be sure that fuel burning appliances such as heaters are installed by professionals according to manufacturer's instructions and codes.
4. Always follow the manufacturer's directions for safe operation.
5. Have the heating system (including vents) inspected and serviced annually by a trained service technician.
6. Examine vents regularly for improper connections, visible cracks, rust or stains.
7. Install battery-operated carbon monoxide alarms. The alarms should be certified to the requirements of the most recent UL, IAS, CSA and IAPMO standard for carbon monoxide alarms. Test carbon monoxide alarms regularly and replace dead batteries.

## GENERAL SPECIFICATIONS

---

### NOTICE:

- Combustion air contaminated by corrosive chemical fumes can damage the heater and will void the warranty.
- The Combination Gas Control Valve on this heater differs from most appliance gas controls. If it must be replaced, for safety reasons replace it only with an identical gas control.
- The access door panels must be in place to provide proper ventilation. Do not operate the heater for more than five (5) minutes with the access door panels removed.
- This heater is design certified by CSA International as complying with the Standard for Gas Fired Pool Heaters, ANSI Z21.56/CSA 4.7, and is intended for use in heating fresh water swimming pools or spas.
- The heater is designed for the heating of chlorine, bromine or salt system swimming pools and spas. It should **NOT** be used as a space heating boiler, or general purpose water heater.
- The heater is design certified by CSA International for installation on combustible flooring. Specified minimum clearances must be maintained to combustible surfaces (see "Heater Clearances", [page 18](#)).
- The heater should be located in an area where leakage of the heater or connections will not result in damage to the area adjacent to the heater or to the structure. When such locations cannot be avoided, it is recommended that a suitable drain pan, adequately drained, be installed under the heater. The pan must not restrict air flow.
- The heater may not be installed within 5 ft. (1.5M ) of the inside surface of a pool or spa unless it is separated by a solid fence, wall or other permanent barrier.

## Section 3: Installation Instructions

### HEATER DESCRIPTION

Figure 1 is a diagram of the heater showing how it operates. Precisely matched orifice plates meter the air and gas into the mixer. The blower draws the air and gas through the mixer and forces it into the burner's flame holder. A sealed heat exchanger surrounds the flame holder, discharging exhaust gases out the flue.

Two inch PVC water piping connects directly to the manifold/header on the heat exchanger using 2" PVC slip unions provided with the heater. The outer manifold remains cool; no heat sinks are required. A thermal regulator and an internal bypass regulate the water flow through the heat exchanger to maintain the correct outlet temperature. The heater operator control panel board assembly is located on top of the heater.

### SEQUENCE OF OPERATION

An electronic temperature sensing **thermistor** in the manifold adapter inlet controls the heater operation. When the inlet water temperature drops below the temperature set on the **operating control**, the **burner controller** supplies power to the combustion **air blower** through a series of **safety interlocks**. The interlocks consist of:

- the **pressure switch (PS)**, which senses that the pump is running,
- the **high limit switch (HLS)**, which opens if the heat exchanger outlet temperature goes above 135° F (57° C), and
- the **air flow switch (AFS)**, which senses the pressure drop across the air metering orifice,
- the **automatic gas shut-off (AGS)** switch, which opens if the heat exchanger outlet temperature goes above 140° F (60° C),
- the **stack flue sensor (SFS)**, which shuts down the heater if the flue gas temperature reaches 480° F (249° C).

The air flow switch (AFS) senses the pressure drop across the air metering orifice. As soon as there is sufficient air flow, the AFS closes, closing the circuit to the **hot surface igniter (HSI)**, which ignites the fuel mixture. On a call for heat, the blower and HSI are energized. In about 20 seconds, the gas valve opens and ignition occurs. The HSI then switches to a sensing mode and monitors the flame.

The heater is equipped with a digital operating control that enables the user to pre-set the desired pool and spa water temperatures. The control enables the user to select between pool and spa heating, and features a digital display that indicates the water temperature.

### PUTTING THE HEATER INTO SERVICE

If the heater is installed below the level of the pool, or more than two feet above pool level, the pressure switch setting should be adjusted. See WATER PRESSURE SWITCH, in the SAFETY CONTROLS Section.

Before putting the heater into service for the first time, follow the instructions under "BEFORE START-UP" (page 33) in the front of this manual. Check for proper operation of the heater by following the steps under "OPERATION INSTRUCTIONS."

Damage to equipment caused by improper installation or repair will void the warranty.

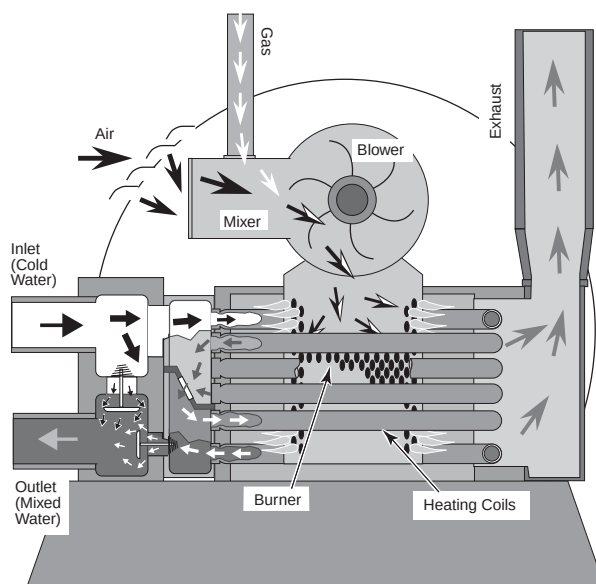


Figure 1.

## SPECIFICATIONS

These installation instructions are designed for use by qualified personnel only, trained especially for installation of this type of heating equipment and related components. Some states require installation and repair by licensed personnel. If this applies in your state, be sure your contractor bears the appropriate license. See [Figure 2](#) for Outdoor and Indoor Installations.

### DIMENSIONS IN INCHES

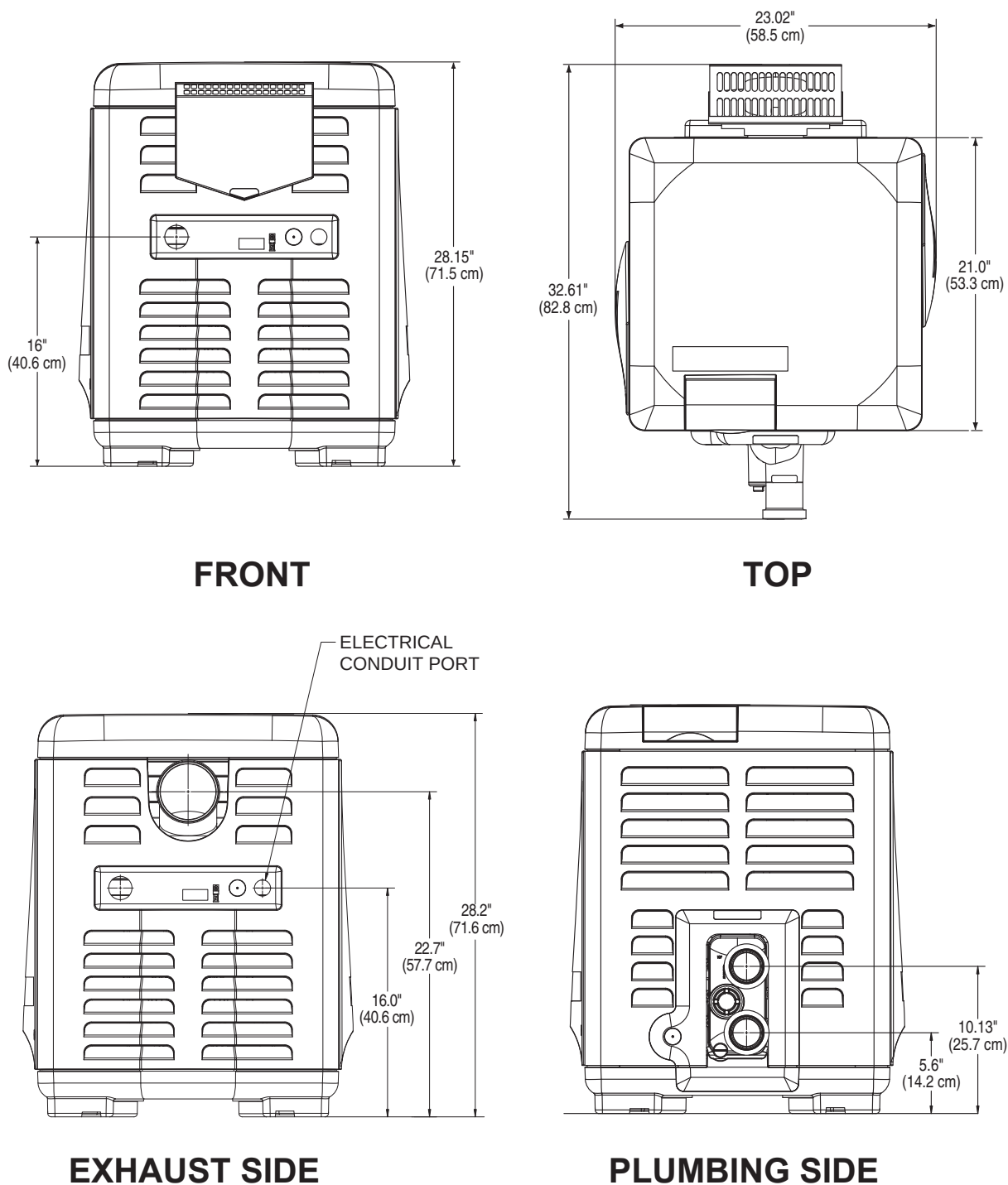


Figure 2.

## PLUMBING CONNECTIONS

The MasterTemp heater has the unique capability of direct schedule 40 PVC plumbing connections. A set of bulkhead fittings is included with the MasterTemp heater to insure conformity with Pentair's recommended PVC plumbing procedure. Other plumbing connections can be used. See [Figure 3](#) for plumbing connections.

### CAUTION

Before operating the heater on a new installation, turn on the circulation pump and bleed all the air from the filter using the air relief valve on top of the filter. Water should flow freely through the heater. Do not operate the heater unless water in the pool/spa is at the proper level. If a manual by-pass is installed, temporarily close it to insure that all air is purged from the heater.

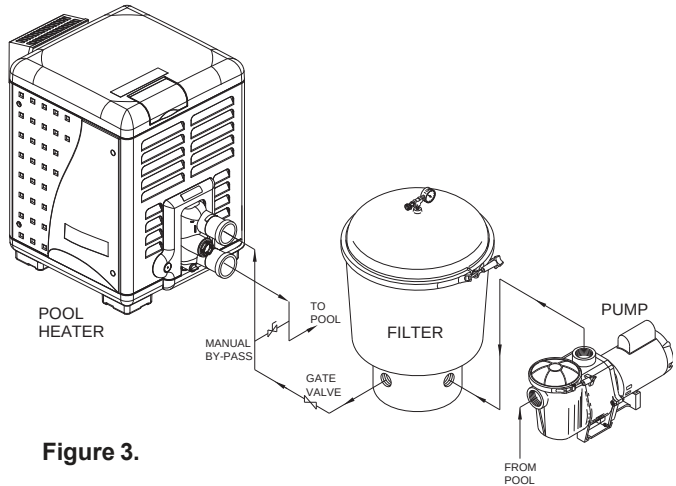


Figure 3.

## WATER CONNECTIONS

The heater requires proper water flow and pressure for its operation. See [Figure 5](#) for the recommended installation. The filter pump discharges to the filter, the filter discharges to the heater, and the heater discharges directly to the pool or spa.

A manual bypass valve should be installed across the heater when the pump flow exceeds 120 GPM (454 LPM). See "WATER FLOW RATE" on [page 13- Table 1](#) for setting of the manual by-pass valve.

Make sure that the outlet plumbing from the heater contains no shut-off valves or other flow restrictions that could prevent flow through the heater (except for pool installations as noted below, or winterizing valves where needed). To switch flow between the pool and spa, use a diverter valve. Do not use any valve that can shut off the flow.

Install the chemical feeder downstream of the heater. Install a chemical resistant one-way check valve between the heater and the chemical feeder to prevent back-siphoning through the heater when the pump is off.

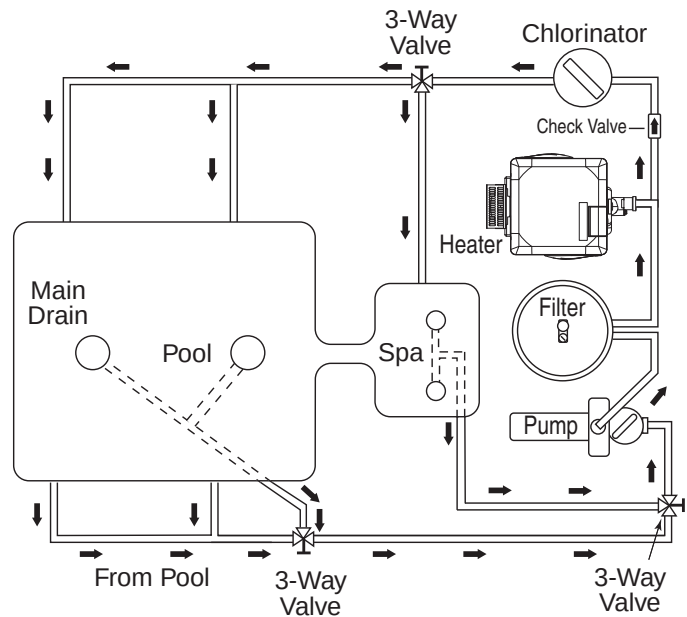


Figure 5.

**NOTICE:** If the heater is plumbed in backwards, it will cycle continuously. Make sure piping from filter is not reversed when installing heater.

Connect the heater directly to 2" PVC pipe, using the integral unions provided. Heat sinks are not required. The low thermal mass of the heater will prevent overheating of the piping connected to the pump even if the heater shuts down unexpectedly.

Occasionally a two-speed pump will not develop enough pressure on the low speed to operate the heater. In this case, run the pump at high speed only to operate the heater. If this does not solve the problem, do not try to run the heater. Instead, correct the installation.

Do not operate the heater while an automatic pool cleaner is also operating. If the circulation pump suction is plugged (for example by leaves), there may not be adequate flow to the heater. Do not rely on the pressure switch in this case.

## VALVES

When any equipment is located below the surface of the pool or spa, valves should be placed in the circulation piping system to isolate the equipment from the pool or spa. Check valves are recommended to prevent back-siphoning. Back-siphoning is most likely to occur when the pump stops, creating a pressure-suction differential. Do **NOT** sanitize the pool by putting chlorine tablets or sticks into the skimmer(s). When the pump is off, this will cause a high concentration of chlorine to enter the heater, which could cause corrosion damage to the heat exchanger.

### ⚠ CAUTION

Exercise care when installing chemical feeders so as to not allow back siphoning of chemical into the heater, filters or pump. When chemical feeders are installed in the circulation of the piping system, make sure the feeder outlet line is down stream of the heater, and is equipped with a positive seal noncorrosive “Check Valve”, (P/N R172288), between the feeder and heater.

## MANUAL BY-PASS

Where the water flow rate exceeds the maximum 120 GPM, a manual bypass should be installed and adjusted. After installing the valve, adjust the valve to bring the flow rate within the acceptable range. Then remove the valve handle or lock it in place to avoid tampering. See Figure 4.

| Model                                                                                                                         | Min. (GPM) (LPM) | Max. (GPM) (LPM) * |
|-------------------------------------------------------------------------------------------------------------------------------|------------------|--------------------|
| 175                                                                                                                           | 20 (76)          | 120 (454)          |
| 200                                                                                                                           | 20 (76)          | 120 (454)          |
| 250                                                                                                                           | 25 (95)          | 120 (454)          |
| 300                                                                                                                           | 30 (114)         | 120 (454)          |
| 400                                                                                                                           | 40 (152)         | 120 (454)          |
| * Do not exceed the maximum recommended flow rate for the connecting piping.                                                  |                  |                    |
| * Pumps 2 HP or larger can produce water pressure flow in excess of 120 GPM. For these pumps, a BY-PASS VALVE is recommended. |                  |                    |

Table 1.

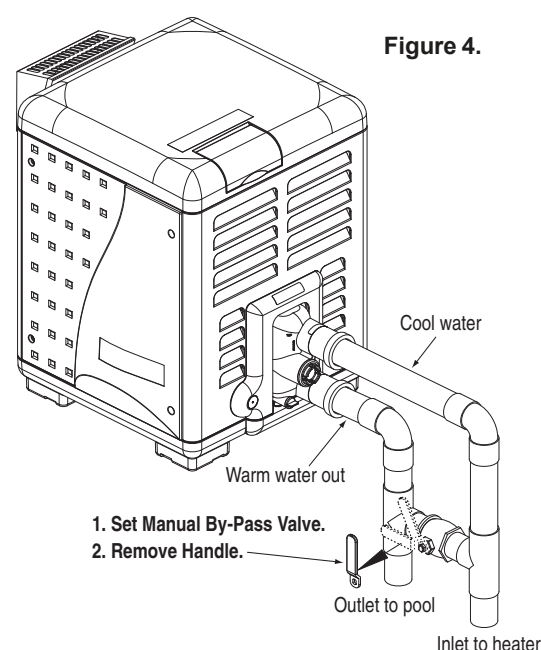


Figure 4.

**See page 46 for Pressure Relief Valve Installations.**

## BELOW POOL LEVEL INSTALLATION

If the heater is below water level, the pressure switch must be adjusted. This adjustment must be done by a qualified service technician. See following **CAUTION** before installation.

### ⚠ CAUTION

#### BELOW OR ABOVE POOL INSTALLATION

The water pressure switch is set in the factory at 3.00 PSI ( $\pm 0.75$  PSI). This setting is for a heater installed at pool level. If the heater is to be installed more than 1' above or below, the water pressure switch must be adjusted by a qualified service technician. See page 35, Figure 29.

#### FLOW SWITCH

If the heater is installed more than 5' above the pool or more than 4' below the pool level, you will be beyond the limits of the pressure switch and a flow switch must be installed. Locate and install the flow switch externally on the outlet piping from the heater, as close as possible to the heater. Connect the flow switch wires in place of the water pressure switch wires.



## GAS CONNECTIONS

### GAS LINE INSTALLATIONS

Before installing the gas line, be sure to check which gas the heater has been designed to burn. This is important because different types of gas require different gas pipe sizes. The rating plate on the heater will indicate which gas the heater is designed to burn. The Table 2, shown on [page 15](#), show which size pipe is required for the distance from the gas meter to the heater. The table is for natural gas at a specific gravity of .65 and propane at a specific gravity of 1.55.

When sizing gas lines, calculate three (3) additional feet of straight pipe for every elbow used. When installing the gas line, avoid getting dirt, grease or other foreign material in the pipe as this may cause damage to the gas valve, which may result in heater failure.

*The gas meter should be checked to make sure that it will supply enough gas to the heater and any other appliances that may be used on the same meter. The gas line from the meter will usually be of a larger size than the gas valve supplied with the heater. Therefore a reduction of the connecting gas pipe will be necessary. Make this reduction as close to the heater as possible.*

The heater requires a gas supply of not less than 4" (10.2 cm) wc and not more than 14" (35.6 cm) wc. Gas supply pressures outside of this range may result in improper burner operation. A minimum flowing or dynamic inlet pressure (while the heater is running) of 4" (10.2cm) wc is required to maintain input rating with no more than a 2" pressure drop between static and dynamic. The gas supply must be installed in accordance with the *National Fuel Gas Code, ANSI Z223.1*, or standard *CSA B149.1, Natural Gas and Propane Installation Codes*, as applicable and all applicable local codes. Install a manual shut-off valve and a sediment trap and union located outside the heater panels, see [Figure 6](#). Do not use a restrictive gas cock. The following minimum gas pipe sizes are recommended for natural gas supply piping, see [Table 2](#) on [page 15](#). For low pressure LP gas, pipe size may be reduced by 1/4", with a minimum pipe size of 1/2". Check for compliance with local codes.

The heater and any other gas appliances must be disconnected from the gas supply piping system during any pressure testing on that system, (greater than 1/2 PSI). The heater and its gas connection must be leak tested before placing the heater in operation. **Do not use flame to test the gas line.** Use soapy water or another nonflammable method.

#### NOTE

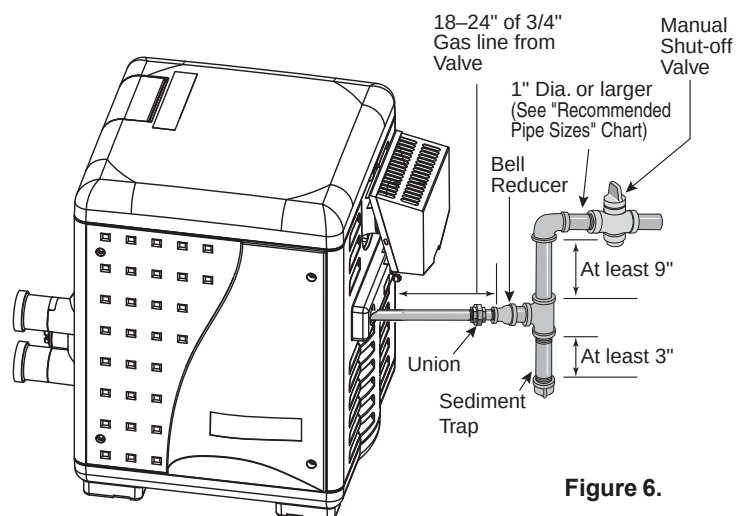
A manual main shut-off valve must be installed externally to the heater.

### ⚠ WARNING

**DO NOT INSTALL THE GAS LINE UNION INSIDE THE HEATER CABINET. THIS WILL VOID YOUR WARRANTY.**

### SEDIMENT TRAPS

Install a sediment trap and union located outside the heater panels in accordance with National code requirements. Do not use a restrictive gas cock. The sediment trap shall be either a tee fitting with a capped nipple in the bottom outlet which can be removed for cleaning, as illustrated in [Figure 6](#), or an other device recognized as an effective sediment trap. All gas piping should be tested after installation in accordance with local codes.



**Figure 6.**

## GAS PIPE SIZING

### STAGE TWO “LOW PRESSURE” GAS PIPE SIZING

| PIPE SIZING FOR GAS LINE CONNECTIONS      |      |     |      |     |      |      |        |      |        |      |      |     |        |     |
|-------------------------------------------|------|-----|------|-----|------|------|--------|------|--------|------|------|-----|--------|-----|
| MAXIMUM EQUIVALENT PIPE LENGTH (Ft.)      |      |     |      |     |      |      |        |      |        |      |      |     |        |     |
| Natural Gas at 1000 B.T.U. per Cubic Foot |      |     |      |     |      |      |        |      |        |      |      |     |        |     |
| Propane Gas at 2500 B.T.U. per Cubic Foot |      |     |      |     |      |      |        |      |        |      |      |     |        |     |
| MODEL                                     | 1/2" |     | 3/4" |     | 1"   |      | 1-1/4" |      | 1-1/2" |      | 2"   |     | 2-1/2" |     |
|                                           | NAT  | PRO | NAT  | PRO | NAT  | PRO  | NAT    | PRO  | NAT    | PRO  | NAT  | PRO | NAT    | PRO |
| 175                                       | -    | 20' | 30'  | 80' | 125' | 250' | 450'   | 600' | -      | -    | -    | -   | -      | -   |
| 200                                       | -    | 20' | 30'  | 80' | 125' | 250' | 450'   | 600' | -      | -    | -    | -   | -      | -   |
| 250                                       | -    | 10' | 20'  | 50' | 70'  | 150' | 250'   | 500' | 600'   | -    | -    | -   | -      | -   |
| 300                                       | -    | -   | 10'  | 30' | 50'  | 100' | 200'   | 350' | 400'   | 600' | -    | -   | -      | -   |
| 400                                       | -    | -   | -    | 10' | 20'  | 60'  | 100'   | 150' | 200'   | 450' | 400' | -   | -      | -   |

Table 2.

## TESTING GAS PRESSURE

Before operating the heater, the heater and its gas connections must be leak tested. **Do NOT use an open flame to test for leaks.** Test all gas connections for leaks with soapy water or another non-flammable method (see page 14).

The heater and its individual shut-off valve must be disconnected from the gas supply piping system during any pressure testing of that system at test pressures in excess of 1/2 psig (3.5 kPa).

The heater must be isolated from the gas supply system by closing its individual manual shut-off valve during any pressure testing of the gas supply at test pressures equal to or less than 1/2 psig (3.5 kPa).

### CHECKING THE GAS PRESSURE THROUGH THE COMBINATION GAS CONTROL VALVE

#### ⚠ WARNING

**Risk of fire and explosion.** Improper installation, incorrect adjustment, alteration, service, or maintenance of the Combination Gas Control Valve can lead to fire or explosion, causing loss of life, personal injury, and/or property damage. If it is necessary to adjust the gas valve, this must be done by only by a qualified service agency. **These instructions are for the use of qualified service technicians only!**

This appliance is equipped with an unconventional gas control valve that is factory set with a manifold pressure of  $-0.2''$  ( $-0.5\text{cm}$ ) wc. Installation or service must be performed by a qualified installer, service agency, or the gas supplier. If this control valve is replaced, it must be replaced with an identical control.

The combination gas

valve incorporates dual shut-off valves and a negative-pressure regulator. For proper operation, the regulated pressure at the outlet manifold of the valve must be  $-0.2''$  ( $-0.5\text{cm}$ ) wc below the reference pressure at the blower mixer inlet, and the gas valve ‘VENT’ tap must be connected to the end cap air orifice as shown in **Figure 7**.

**Do not attempt to adjust the gas input by adjusting the regulator setting. The correct gas regulator setting is required to maintain proper combustion and must NOT be altered.**

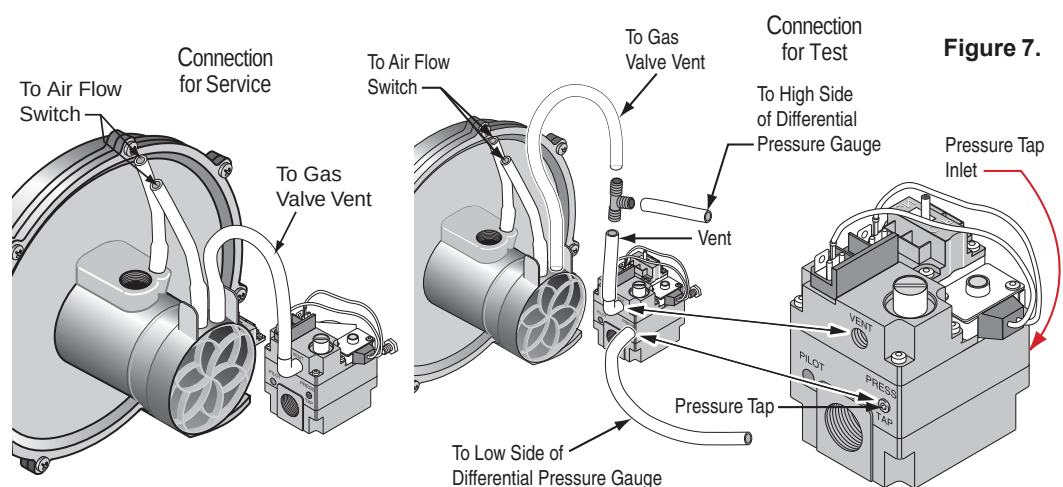


Figure 7.



**⚠ CAUTION**

The use of Flexible Connectors (FLEX) is NOT recommended unless they are properly sized according to the supplier recommendations for the heater rating.

**GAS PRESSURE REQUIREMENTS**

| Gas Pressure  | Model | Natural     | Propane    |
|---------------|-------|-------------|------------|
|               |       | Inches W.C. |            |
| Maximum Inlet | MT    | 14          | 14         |
| Minimum Inlet | MT    | 4           | 4          |
| Manifold      | MT    | -0.2 ± 0.1  | -0.2 ± 0.1 |

**NOTE:** All readings must be taken while heater is operating. Any adjustments or readings made while heater is off will result in performance problems.

Table 3.

**OUTDOOR INSTALLATION (U.S. and Canada)**

For heaters located outdoors, using the built-in stackless venting system.

**⚠ WARNING**

**Risk of explosion if a unit burning propane gas is installed in a pit or other low spot.** Propane is heavier than air. Do not install the heater using propane in pits or other locations where gas might collect. Consult your local building code officials to determine installation requirements and specific installation restrictions of the heater relative to propane storage tanks and filling equipment. Installation must meet the requirements for the Standard for the Storage and Handling of Liquid Petroleum Gases, ANSI/NFPA 58 (latest edition) in the U.S., or CAN/CSA B149.2 (latest edition) in Canada. Consult local codes and fire protection authorities about specific installation restrictions.

Locate the heater on a level surface in an open area that is protected from drainage or run-off. Install the heater in an area where leaves or other debris will not collect on or around the heater.

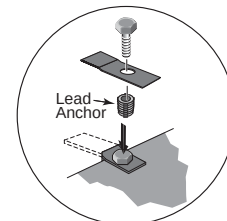
To avoid damage to the electronic components in the heater, take care to prevent prolonged exposure to driving sources of water (such as lawn sprinklers, heavy roof runoff, hoses, etc.). Avoid operation in persistent, extreme, moist or salty environments. In extreme weather, shut down the heater and disconnect the power to it until the weather has moderated. In areas subject to hurricanes or very high winds, purchase the Bolt Down Bracket Kit, P/N 460738.

**HEATER CLEARANCES – OUTDOOR****IMPORTANT!**

- In an outdoor installation it is important to ensure water is diverted from overhanging eaves with a proper gutter/drainage system. The heater must be set on a level foundation for proper drainage.
- This unit shall not be operated outdoors at temperatures below -20°F.

If the heater is located under a roof overhang, there must be at least three (3) feet (1m) of clearance between the bottom of the overhang and the top of the heater exhaust vent, see **Figure 8**. If the heater is under a roof overhang, the space around the heater must be open on three sides. **DO NOT, under any circumstances, install the heater under ANY deck.**

For Heater mounting bolts and clamps, purchase separately Bolt Down Bracket Kit, Part No. 460738.



For minimum exhaust vent clearances for all building openings, including but not limited to vented eaves, doors, windows, gravity air inlet, see **Figure 9**, show below.

In Canada, the heater must be installed with the top of the vent at least 10 feet (3m) below, or to either side of, any opening into a building.

Orient the heater for convenient access to the water connections and the gas and electrical connections.

**Note:** Check local building codes for installing the heater from any property line set back requirements (see the installation diagram below).

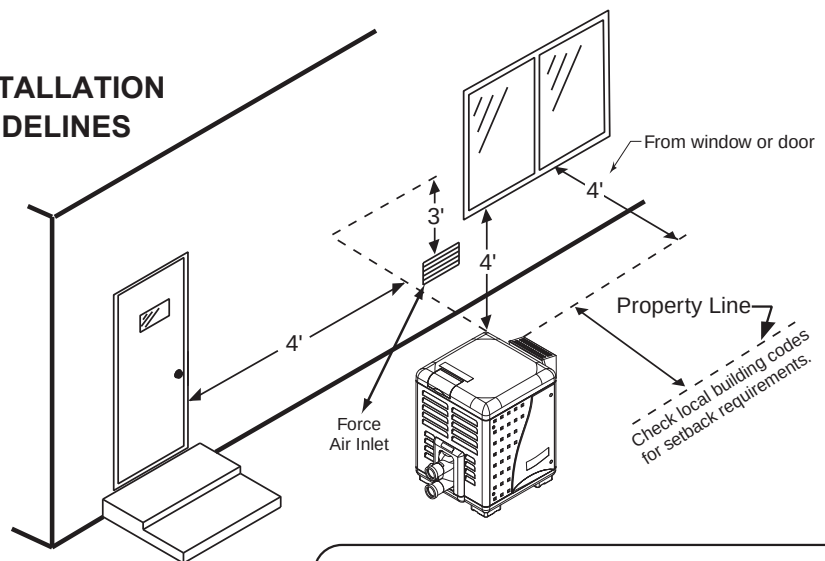
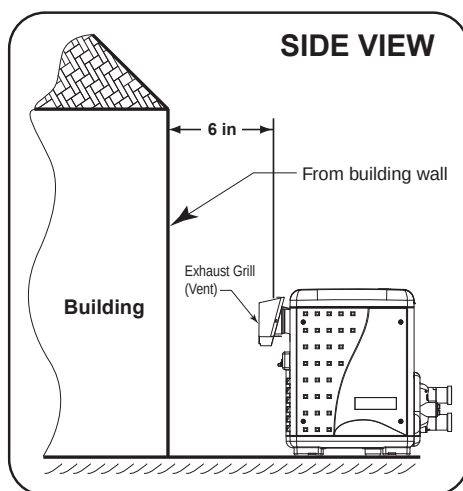
### CAUTION

If installing the heater next to or near an air conditioning unit or a heat pump, allow a minimum of 36 in. (91.4 cm) between the air conditioning unit and the heater.

3 ft. (1 M) or more

Figure 8.

### OUTDOOR INSTALLATION VENTING GUIDELINES



#### Vent Termination:

- Must be at least 3 ft. above any forced air inlet located within a 10 ft. radius.
- Must be located 6 in. away from the building wall and the following distances away from any building wall openings, included but not limited to vented eaves, doors, windows, gravity air inlet:
  - 4 ft. below,
  - 4 ft. horizontally

Figure 9.

## INDOOR VENTING — General Requirements

*The heater may be installed as a Category I or Category III appliance.*

### Vented Appliance (Category I) – Vertical only

An appliance that operates with a *nonpositive* vent static pressure and with a vent gas temperature that avoids excessive condensate production in the vent, see [pages 20-23](#).

### Vented Appliance (Category III) – Vertical or Horizontal

An appliance that operates with a *positive* vent static pressure and with a vent gas temperature that avoids excessive condensate production in the vent, see [pages 24-26](#).

If you are considering connecting this heater to a pre-existing vent system, make sure that the vent system meets the appropriate venting requirements as given in this manual on [pages 18-28](#). If not, replace the vent system. **DO NOT** use a draft hood with this heater.

The MasterTemp heaters are capable of a 270-degree discharge rotation and operate with a positive vent static pressure and with a vent gas temperature less than 400° F (204° C). The total length of the horizontal run must not exceed the length that is listed in [Table 11](#) on [page 21-22](#).

## HEATER CLEARANCES — General Requirements

### **INDOOR INSTALLATION (U.S.) OR OUTDOOR SHELTER (CANADA)**

The following clearances must be maintained from combustible surfaces:

|                           |                      |
|---------------------------|----------------------|
| <b>TOP</b> .....          | <b>6 in. (15 cm)</b> |
| <b>EXHAUST SIDE</b> ..... | <b>6 in. (15 cm)</b> |
| <b>HEADER SIDE</b> .....  | <b>6 in. (15 cm)</b> |
| <b>DOOR PANELS†</b> ..... | <b>6 in. (15 cm)</b> |

**Note** (†) For service access it is advisable to allow for sufficient clearance on at least one door panel. The heater is design certified by CSA International for installation on combustible flooring. For installation on carpeting, the heater must be mounted on a metal or wood panel that extends at least three inches (10cm) beyond the base of the heater. If the heater is installed in a closet or alcove, the entire floor shall be covered by the panel. On an outdoor shelter installation, the exhaust discharges into a vent pipe. Orient the heater so that the vent pipe does not interfere with adjustment of the operating controls. The control panel located on the top panel can be rotated to any of the three sides of the heater for easy access. However, the control panel must not be located on the side where the vent is located.

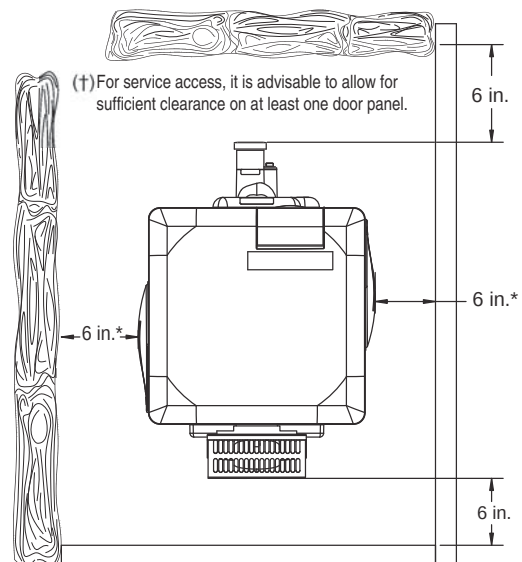


Figure 10.

### **OUTSIDE VENT COVER REMOVAL**

The heater is supplied from the factory with a built-in stackless outside vent for outdoor installation. Remove the outside vent cover for outdoor shelter installation.

## COMBUSTION AIR SUPPLY

For indoor installation, the heater location must provide sufficient air supply for proper combustion and ventilation of the surrounding area.

The minimum requirements for the air supply specify that the room in which a heater is installed should be provided with two permanent air supply openings; one within 12 inches (30cm) of the ceiling, the other within 12 inches (30cm) of the floor for combustion air, in accordance with the latest edition of ANSI Z223.1, or the National Fuel Gas code, the CSA B149.1, Natural Gas and Propane Installation Codes, as applicable, and any local codes that may apply. These openings shall directly, or through duct, connect to outdoor air.

**Note:** For indoor installations where combustion air might be insufficient, see “Direct Air Intake Duct with 3-inch PVC Pipe (Indoor Installation)” below.

### Air Supply Requirements Guide for MasterTemp Heaters

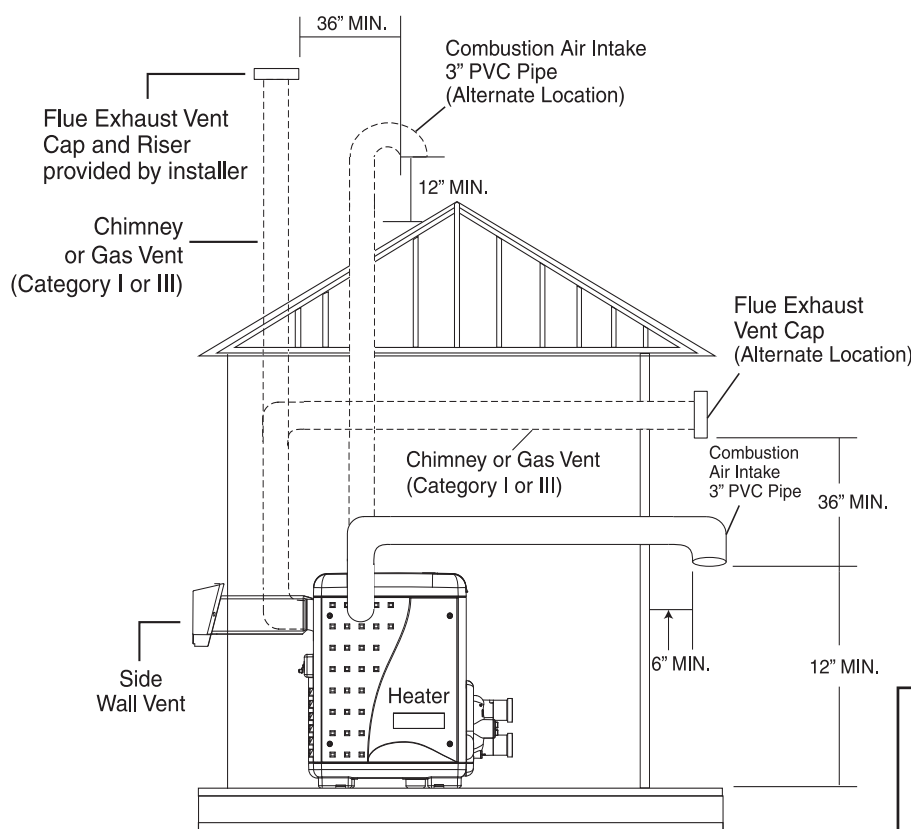
| Minimum Net Free Open Area for Each Opening*<br>(Square Inches/Centimeters)             |                              |                             |                               |                            |
|-----------------------------------------------------------------------------------------|------------------------------|-----------------------------|-------------------------------|----------------------------|
| Model                                                                                   | All Air From Inside Building |                             | All Air From Outside Building |                            |
|                                                                                         | Combustion                   | Vent                        | Combustion                    | Vent                       |
| 175                                                                                     | 200 sq. in.<br>1290 sq. cm.  | 200 sq. in.<br>1290 sq. cm. | 50 sq. in.<br>323 sq. cm.     | 50 sq. in.<br>323 sq. cm.  |
| 200                                                                                     | 200 sq. in.<br>1290 sq. cm.  | 200 sq. in.<br>1290 sq. cm. | 50 sq. in.<br>323 sq. cm.     | 50 sq. in.<br>323 sq. cm.  |
| 250                                                                                     | 250 sq. in.<br>1613 sq. cm.  | 250 sq. in.<br>1613 sq. cm. | 63 sq. in.<br>406 sq. cm.     | 63 sq. in.<br>406 sq. cm.  |
| 300                                                                                     | 300 sq. in.<br>1935 sq. cm.  | 300 sq. in.<br>1935 sq. cm. | 75 sq. in.<br>484 sq. cm.     | 75 sq. in.<br>484 sq. cm.  |
| 400                                                                                     | 400 sq. in.<br>2580 sq. cm.  | 400 sq. in.<br>2580 sq. cm. | 100 sq. in.<br>645 sq. cm.    | 100 sq. in.<br>645 sq. cm. |
| * Area indicated is for one of two openings; one at floor level and one at the ceiling. |                              |                             |                               |                            |

Table 4.

### Direct Air Intake Duct with 3-inch PVC Pipe (Indoor Installation)

For indoor heater installations where combustion air supply might be insufficient, the MasterTemp® Heater is certified for a direct air intake duct using 3-inch PVC pipe. If outside air is drawn through 3” PVC duct directly into the heater, PVC pipe can be installed in accordance with the following requirements:

The air intake opening MUST be installed at least 1 ft. above the roof line or normal snow levels for free air flow. The Category I or III exhaust vent termination cap must have at least 3 ft. minimum vertical clearance from air intake duct. (See diagram on page 20).



### Combustion 3 in. PVC Pipe Inlet Air Intake Duct Requirements\*

| Combustion Air Intake 3 in. Pipe<br>(Vertical or Horizontal) |                            |
|--------------------------------------------------------------|----------------------------|
| No. of 90° Elbows                                            | Maximum Length in Feet (M) |
| 0                                                            | 70 ft. (21.3 M)            |
| 1                                                            | 58 ft. (17.7 M)            |
| 2                                                            | 46 ft. (14.0 M)            |
| 3                                                            | 34 ft. (10.4 M)            |
| 4                                                            | 22 ft. ( 6.7 M)            |

Table 5.

### **⚠ WARNING!**

DO NOT USE PVC PIPE FOR FLUE EXHAUST VENT. FLUE EXHAUST VENT TEMPERATURES CAN BE IN EXCESS OF 400° F. FLUE EXHAUST VENT **MUST BE** CATEGORY I or CATEGORY III METAL VENT.

**Note (\*):** Combustion Air Intake Duct Connection Kit (Part Number 461031) for all MasterTemp heater models can be purchased separately. See page 52 for parts list.

### NOTE

Each 90-degree elbow reduces the maximum horizontal PVC air intake duct run by 12 feet and each 45-degree elbow in the PVC air intake duct run reduces the maximum run by 6 feet. See the Table 5 above for the maximum lengths using 90-degree elbows.

### Corrosive Vapors and Possible Causes

| Area                                                                       | Likely Contaminants                                                                                                                                      |
|----------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------|
| Chlorinated swimming pools and spas                                        | Pool or spa cleaning chemicals. Acids, such as hydrochloric or muriatic acid.                                                                            |
| New construction and remodeling areas                                      | Glues and cements, construction adhesives, paints, varnishes, and paint and varnish strippers. Waxes and cleaners containing calcium or sodium chloride. |
| Beauty parlors                                                             | Permanent wave solutions, bleaches, aerosol cans containing chlorocarbons or fluorocarbons.                                                              |
| Refrigeration plants or various industrial finishing and processing plants | Refrigerants, acids, glues and cements, construction adhesives.                                                                                          |
| Dry cleaning and laundry areas                                             | Bleaches, detergents, or laundry soaps containing chlorine. Waxes and cleaners containing chlorine, calcium or sodium chloride.                          |

Table 6.

### **⚠ CAUTION**

Chemicals should not be stored near the heater installation. Combustion air can be contaminated by corrosive chemical fumes which can void the warranty.

## VENT INSTALLATION – INDOOR INSTALLATION (U.S.) OR OUTDOOR SHELTER (CANADA)

### (Category I)

Always vent the heater to the outdoors, see Note\*.

- Vent it vertically using Type “B” double wall vent connector pipe.

Locate the heater so as to minimize the length of horizontal venting and the number of vent elbows required. Horizontal vent runs must slope up 1/4" per foot (2cm/M) from the heater to allow exhaust condensate to drain and it is recommended to have a condensate drain as described in the venting installation instructions.

### VERTICAL VENTING - NEGATIVE PRESSURE

(See Figures 11, 12 and 13)

Vent the heater vertically in a negative pressure (positive draft) system in accordance with the National Fuel Gas Code, ANSI Z223.1/NFPA 54 and/or CSA B149.1, Natural Gas and Propane Installation Codes, and local codes. Type “B” Double-wall vent connector is recommended; however single-wall pipe is allowed by the National Fuel Gas Code in some circumstances. Consult your local code official for detailed information. **Do not** use a draft hood with this heater.

To connect a negative pressure metal gas vent to the heater, order the appropriate Metal Flue Collar from the chart below:

| Metal Flue Collar | Part No.   |
|-------------------|------------|
| 4 x 6"            | 77707-0076 |
| 4 x 8"            | 77707-0077 |

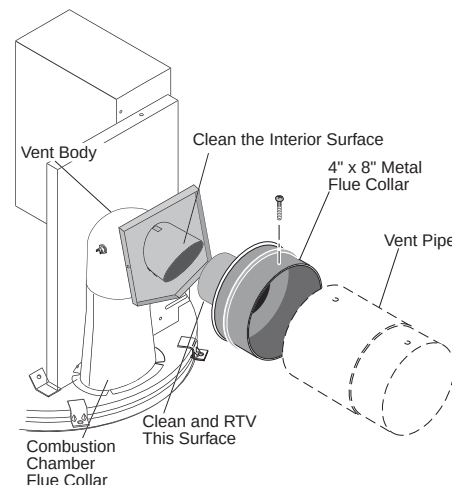


Figure 11.

1. See Table 7, to determine allowable vent sizes for your heater.

**NOTICE:** Table 7 is for installations in which the total lateral vent length (that is, the horizontal distance from the flue collar to the main vertical portion of the vent) is less than 1/2 the total vent height (the vertical distance from the flue collar to the vent termination) and which have three or less elbows in the system. For venting systems which do not meet these conditions, consult the National Fuel Gas Code, ANSI Z223.1 (U.S.), or the standards CSA B149.1 and B149.2 (Canada).

Read “VERTICAL VENTING – NEGATIVE PRESSURE” before using this table.

Table 7. – Permitted Minimum and Maximum Vent Heights By Size and Heater Model

| Type “B” Double-Wall Vent with Type “B” Double-Wall Connector in Feet (Meters) |                               |                               |                               |                               |                               |
|--------------------------------------------------------------------------------|-------------------------------|-------------------------------|-------------------------------|-------------------------------|-------------------------------|
| Vent Size                                                                      | Model 175<br>Height min./max. | Model 200<br>Height min./max. | Model 250<br>Height min./max. | Model 300<br>Height min./max. | Model 400<br>Height min./max. |
| 6 in.                                                                          | 6 ft. (1.8)/100 ft. (30.5)    | 6 ft. (1.8)/100 ft. (30.5)    | 18 ft. (5.5)/100 ft. (30.5)   | 30 ft. (9)/100 ft. (30.5)     | Not Rec.                      |
| 7 in.                                                                          | 6 ft. (1.8)/100 ft. (30.5)    | 6 ft. (1.8)/100 ft. (30.5)    | 8 ft. (2.4)/100 ft. (30.5)    | 10 ft. (3)/100 ft. (30.5)     | 15 ft. (4.6)/100 ft. (30.5)   |
| 8 in.                                                                          | 6 ft. (1.8)/100 ft. (30.5)    | 6 ft. (1.8)/100 ft. (30.5)    | 6 ft. (1.8)/100 ft. (30.5)    | 6 ft. (1.8)/100 ft. (30.5)    | 8 ft. (2.4)/100 ft. (30.5)    |
| 9 and 10 in.                                                                   | 6 ft. (1.8)/50 ft. (15.3)     | 6 ft. (1.8)/50 ft. (15.3)     | 6 ft. (1.8)/50 ft. (15.3)     | 6 ft. (1.8)/100 ft. (30.5)    | 6 ft. (1.8)/100 ft. (30.5)    |
| Type “B” Double-Wall Vent with Single-Wall Connector in Feet (Meters)          |                               |                               |                               |                               |                               |
| Vent Size                                                                      | Model 175<br>Height min./max. | Model 200<br>Height min./max. | Model 250<br>Height min./max. | Model 300<br>Height min./max. | Model 400<br>Height min./max. |
| 6 in.                                                                          | 6 ft. (1.8)/15 ft. (4.6)      | 6 ft. (1.8)/15 ft. (4.6)      | 6 ft. (1.8)/15 ft. (4.6)      | Not Rec.                      | Not Rec.                      |
| 7 in.                                                                          | 6 ft. (1.8)/8 ft. (2.4)       | 6 ft. (1.8)/8 ft. (2.4)       | 6 ft. (1.8)/8 ft. (2.4)       | 10 ft. (3)/20 ft. (6)         | 15 ft. (4.6)/50 ft. (15.3)    |
| 8 in.                                                                          | Not Rec.                      | Not Rec.                      | Not Rec.                      | 6 ft. (1.8)/20 ft. (6)        | 8 ft. (2.4)/20 ft. (6)        |
| 9 in.                                                                          | Not Rec.                      | Not Rec.                      | Not Rec.                      | Not Rec.                      | 6 ft. (1.8)/6 ft. (1.8)       |
| 10 in.                                                                         | Not Rec.                      | Not Rec.                      | Not Rec.                      | Not Rec.                      | Not Rec.                      |

**NOTE**

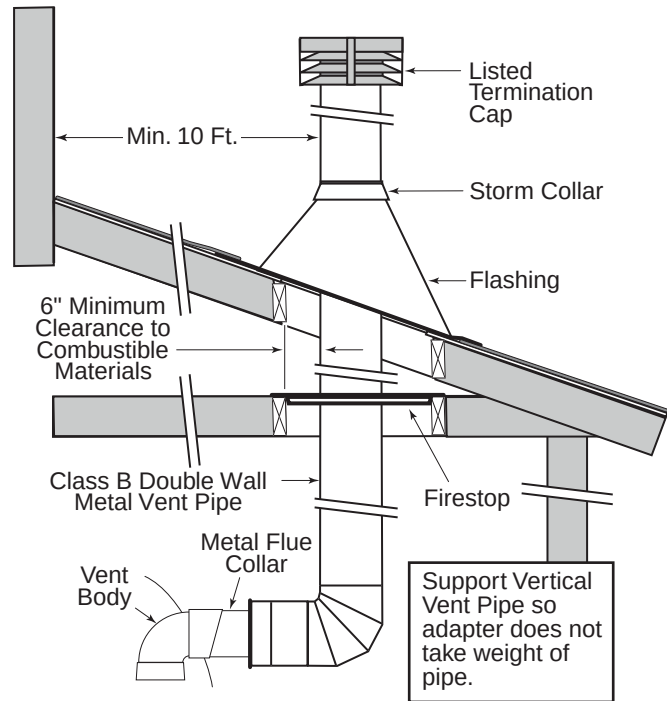
**The allowable vent runs for each vent pipe diameter are different and can not be exceeded.**

Each 90-degree elbow reduces the maximum horizontal vent run by 12 feet and each 45-degree elbow in the vent run reduces the maximum vent run by 6 feet. See Table 7 on page 21 for the maximum vent lengths using 90-degree and 45-degree elbows.

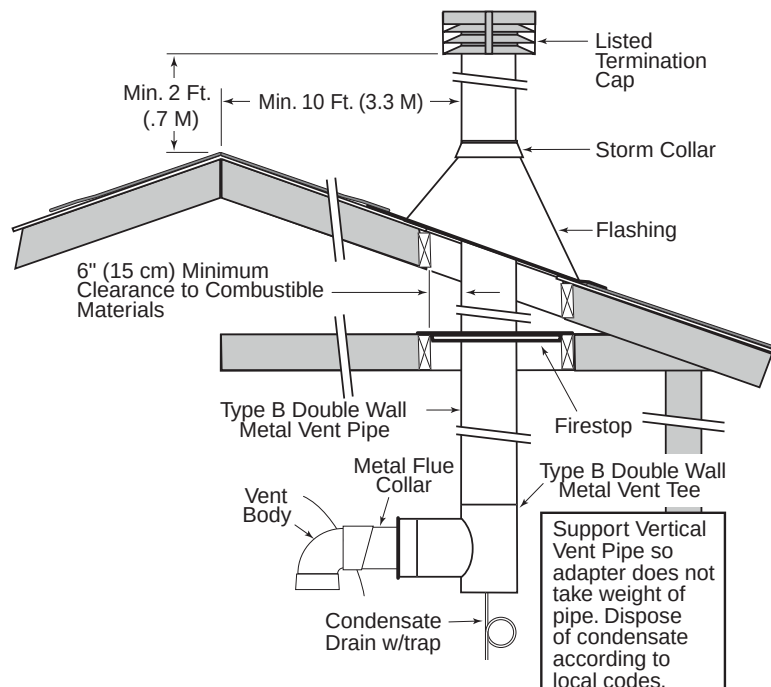
2. Install the metal Flue Collar in the Vent Body of the heater (located under the outside vent cover). Fasten the metal Flue Collar to the Vent Body with two #10 sheet metal screws. Use high temperature silicone RTV to seal the Flue Collar to the Vent Body. Before connecting the metal Flue Collar to the Vent Body, wet a clean cloth or paper towel with isopropyl alcohol (rubbing alcohol) and vigorously wipe the socket of the Vent Body. Immediately wipe the cleaned surfaces dry with a clean cloth or paper towel. Repeat for the exterior of the 4" end of the metal Flue Collar. Attach the metal Flue Collar to the Vent Body using the RTV supplied with the kit, following the vent manufacturer's instructions (included with kit).
3. Attach the vent pipe to the metal Flue Collar with sheet-metal screws.

**⚠ WARNING**

**Risk of fire or asphyxiation if vent is not assembled according to manufacturer's instructions or if vent parts from different manufacturers are mixed.** Vent parts from different manufacturers ARE NOT interchangeable. Mixing parts from more than one manufacturer may cause leaks or damage to vent. When assembling a vent, pick one manufacturer and be sure that all vent parts come from that manufacturer and are specified by the manufacturer for your system. Follow manufacturer's instructions, local code requirements, National Fuel Gas Code requirements (U.S.) or standards CSA B149.1 and B149.2 (Canada) carefully during assembly and installation.



**Figure 12. – Typical Metal Vent Pipe Installation - U.S.**  
(Vertical – Negative Pressure)



**Figure 13. – Typical Metal Vent Pipe Installation - Canada**  
(Vertical – Negative Pressure)



4. Install vent pipe so that it can expand and contract freely as the temperature changes. Support the vent pipe according to applicable codes and the vent manufacturer's instructions. Pipe support must allow the vent pipe free movement out and back, from side to side, or up and down as necessary, without putting a strain on the heater or vent body. Slope horizontal pipe runs up from the heater at least 1/4" per foot (2cm per meter). Install Listed condensate drains at low points where condensate might collect. Plumb condensate drains to a drain through hard piping or high temperature tubing such as silicone rubber or EPDM rubber – do not use vinyl or other low temperature tubing. Follow drain manufacturer's installation instructions.
5. Use Listed fire stop for floor and ceiling penetrations. Use Listed thimble for wall penetrations. Use a Listed roof flashing, roof jack, or roof thimble for all roof penetrations. Do not fill the space around the vent (that is, the clear air space in the thimble or fire stop) with insulation. The roof opening must be located so that the vent is vertical.
6. **Do not run the heater vent into a common vent with any other appliance.**

### **WARNING**

**Fire Hazard. Do not vent the heater directly into a masonry chimney.** Installation into a masonry chimney must use a chimney liner and must meet the National Fuel Gas Code, ANSI Z223.1/NFPA 54 and/or CSA B149.1, Natural Gas and Propane Installation Codes requirements and all local code requirements.

### **WARNING**

**Risk of fire, carbon monoxide poisoning, or asphyxiation.** It is recommended to use a CO Monitor and Fire Alarm in rooms that contain gas fired appliances.



## HORIZONTAL OR VERTICAL VENTING - POSITIVE PRESSURE (See Figures 14, 15, and 16)

### (Category III)

Vent the heater either horizontally or vertically using an optional vent adapter of the 4-inch special gas approved Category III vent pipes. Install the vent pipe in accordance with local codes and the provisions of the National Fuel Gas Code, ANSI Z223.1 (U.S.), or the standards CSA B149.1, Natural Gas and Propane Installation Codes (Canada), and the vent manufacturer's instructions. Do not use a draft hood with this heater. Install the vent according to the vent manufacturer's detailed instructions. **Note:** Maintain clearance between the vent pipe and combustible surfaces according to the vent manufacturer's instructions and code requirements. Do not place any insulating materials around the vent or inside the required clear air space surrounding the vent. See Table 11 for maximum permissible vent lengths.

### NOTE

**The allowable vent runs for each vent pipe diameter are different and can not be exceeded.** Each 90° elbow reduces the maximum horizontal vent run by 12 feet and each 45-degree elbow in the vent run reduces the maximum vent run by 6 ft. See the Table 8 below for the maximum vent lengths using 90° elbows.

The MasterTemp heater is a "Category III" appliance (**which requires a four (4) inch special gas approved "Category III" vent pipe**) and is a forced-draft pool and spa heater which uses positive pressure to push flue gases through the vent pipe to the outside. **Flue gases under positive pressure may escape into the dwelling with any cracks or loose joints in the vent pipe, or improper vent installation.** The vent pipe must be of a sealed-seam construction, such as those listed for use with "Category III Appliances", and for operating temperatures less than 400°F (204°C). Vent pipe construction will be of UL 1738 approved non-corrosive material, such as stainless steel. A condensate trap may be needed. The use of "Approved" thimbles, roof jacks and/or side vent terminals are required; and the proper clearances to combustible materials must be maintained in accordance with type of vent pipe employed—in the absence of a clearance recommendation by the vent pipe manufacturer, the requirements of the Uniform Mechanical Code should be met. **See page 19, for heater ventilation air requirements.** It is recommended that vent runs over 18 feet may need to be insulated to reduce condensation related problems and/or the use of a condensate trap in the vent run close to the heater may be necessary in certain installations such as cold climates. Horizontal vents 3' (1M) or less in length do not require a condensate tee. The MasterTemp heater is suitable for through-the-wall venting.

Table 8.

| 4 in. Special Gas Vent (Vertical or Horizontal)* |                            |
|--------------------------------------------------|----------------------------|
| No. of 90° Elbows                                | Maximum Length in Feet (M) |
| 0                                                | 70 ft. (21.3M)             |
| 1                                                | 58 ft. (17.7M)             |
| 2                                                | 46 ft. (14.0M)             |
| 3                                                | 34 ft. (10.4M)             |
| 4                                                | 22 ft. (6.7M)              |

\*Minimum vent length is one foot (.34M), or in accordance with vent manufacturer's instruction, and local and national codes. Horizontal vents 3'(1M) or less in length do not require a condensate tee, but must slope down toward the outlet at 1/4" to the foot (2cm/M) to allow condensate to drain.

### CAUTION

Do **NOT** combine exhaust vent pipes to a common exhaust vent in multiple unit installations. Run separate vent pipes.

## CONNECTING SPECIAL METALIC GAS VENT TO THE HEATER

1. Order an optional appliance adapter kit, (Pentair offers optional appliance adapter kits, call Customer Service at (800) 831-7133 for more information): Part No. 77707-0086 for Saf-T Vent® or Saf-T Vent® CI. Part No. 77707-0087 for Z-Vent.
2. Remove the outside vent cover.
3. Install the Appliance Adapter in the Vent Body of the heater (located under the outside Vent Cover). Before connecting the Appliance Adapter to the Vent Body, wet a clean cloth or paper towel with isopropyl alcohol (rubbing alcohol) and vigorously wipe the socket of the Vent Body. Immediately wipe the cleaned surfaces dry with a clean cloth or paper towel. Repeat for the exterior of the heater end of the Appliance Adapter. Attach the appliance adapter to the vent body using the adhesive specified by the vent manufacturer, following the vent manufacturer's instructions.

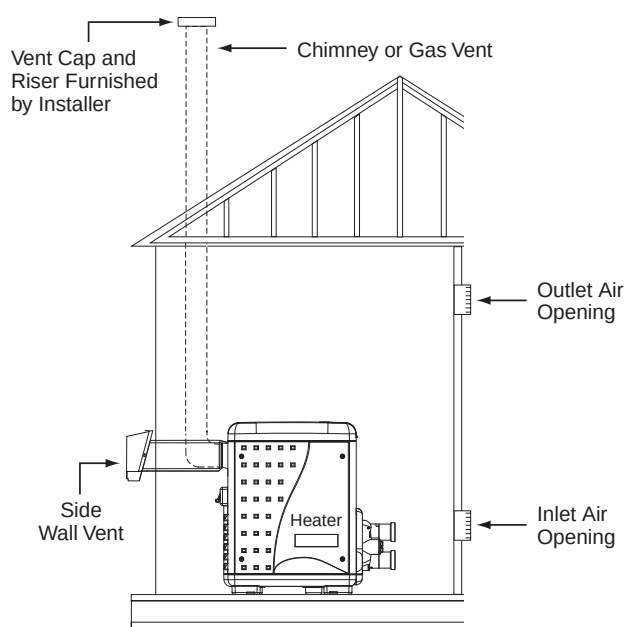
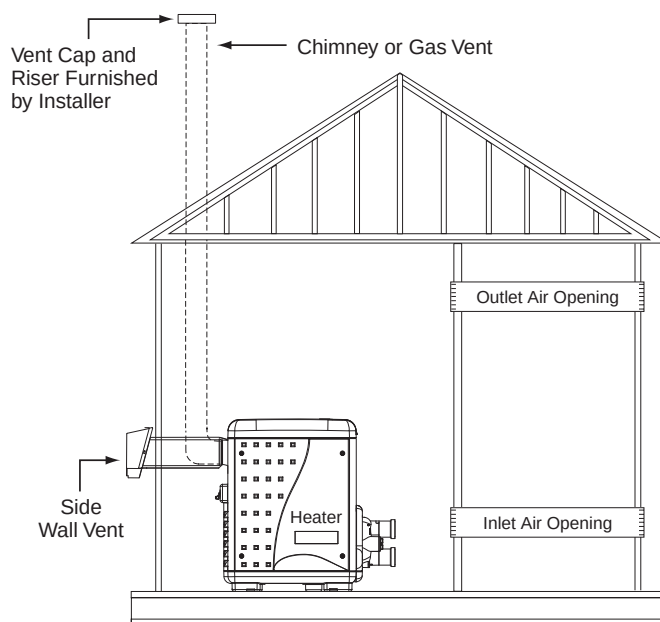
**⚠ WARNING**

**Risk of carbon monoxide poisoning if adapter is improperly attached.** Mechanical connections (such as screws) can cause cracking and leaks in the adapter. Do **NOT** drill holes or use screws to connect the appliance adapter to the heater vent body. Attach with manufacturer's specified adhesive.

**⚠ WARNING**

**Risk of fire or asphyxiation if vent is not assembled according to manufacturer's instructions or if vent parts from different manufacturers are mixed.** Vent parts from different manufacturers ARE NOT interchangeable. Mixing parts from more than one manufacturer may cause leaks or damage to vent. When installing a vent, pick one manufacturer and be sure that all vent parts come from that manufacturer and are specified by the manufacturer for your system. Follow manufacturer's instructions and local and National Fuel Gas Code (U.S.) or CSA B149.1, Natural Gas and Propane Installation Codes (Canada) requirements carefully during assembly and installation.

4. Install vent pipe so that it can expand and contract freely as the temperature changes. Support the vent pipe according to applicable codes and vent manufacturer's instructions. Pipe support must allow the vent pipe free movement out and back, from side to side, or up and down as necessary, without putting a strain on the heater or vent body. It is recommended to slope the horizontal pipe runs up from the heater at least 1/4" per foot (2cm/M). Install "Approved" condensate drains at low points where condensate might collect. Plumb condensate drains to a drain through hard piping or high-temperature tubing such as silicone rubber or EPDM rubber – do not use vinyl or other low temperature tubing. Follow drain manufacturer's installation instructions.
5. Use an "Approved" firestop for floor and ceiling penetrations. Use an "Approved" thimble for wall penetrations. Use an "Approved" roof flashing, roof jack, or roof thimble for all roof penetrations. Do not fill the space around the vent (that is, the clear air space in the thimble or firestop) with insulation. The roof opening must be located so that the vent is vertical.
6. **Vent Termination – Vertical** (See Figures 14 and 15), for height of vent termination above the roof. Use an "Approved" vent terminal specified by local and national codes and your manufacturer's instructions. A roof termination must be vertical. In Canada, the Vent Cap location shall have a minimum clearance of 4 feet (1.2M) horizontally from electric meters, gas meters, regulators, and relief openings.
7. Make sure entire installation is sealed according to approved standard.

**Figure 14.****Figure 15.**

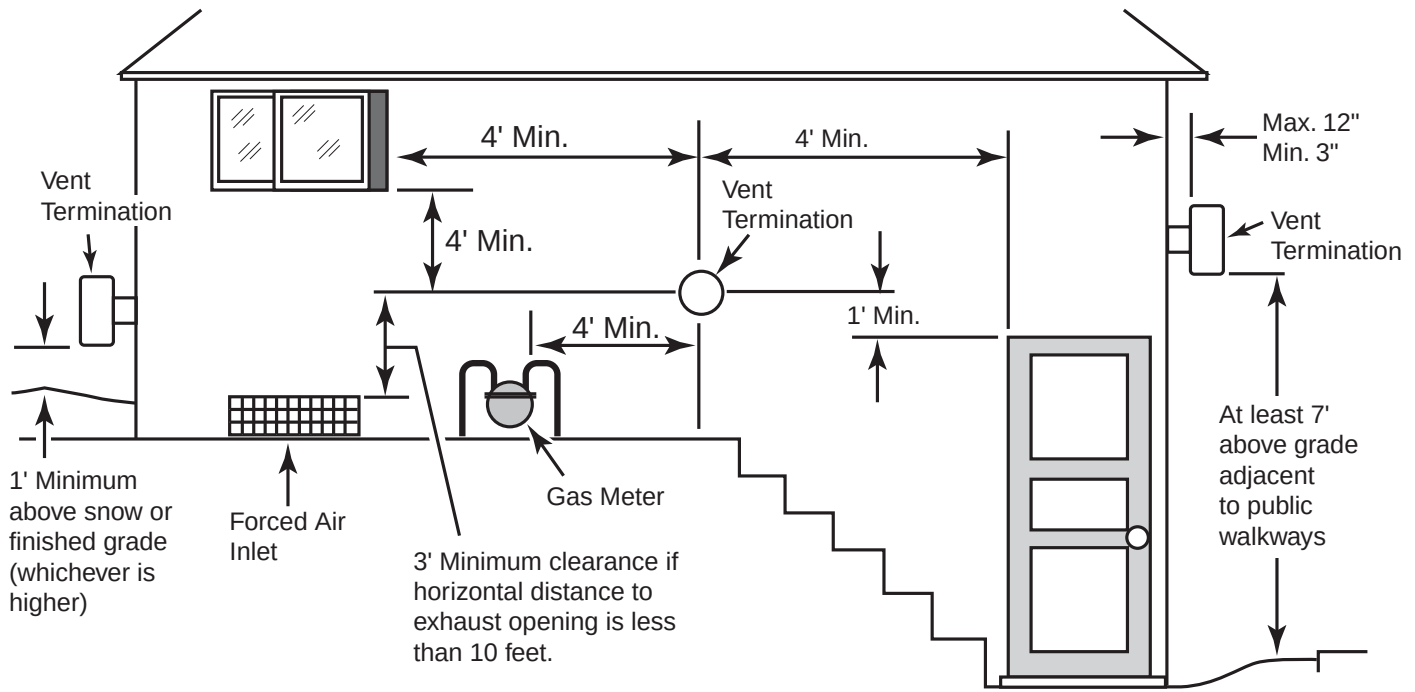


Figure 16.

### 8. Vent Termination – Horizontal

The terminal must be located (U.S. – See Figure 16):

- at least 3" and at most 12" out from the wall (see Figure 17), following the vent manufacturer's instructions
- at least 12" above finished grade or the normally expected snow accumulation level, whichever is higher
- at least 4 feet below or horizontally from, or 1 foot above, any doors or windows or gravity air inlet to a building
- at least 3 feet above any forced air inlet located within 10 feet
- at least 4 feet horizontally from electric meters, gas meters, regulators and relief equipment
- at least 7 feet above grade adjacent to walkways or similar traffic areas

The terminal must be located (Canada – See Figure 16):

- at least 10 feet (3.3M) from any opening into a building
- at least 12" (.3M) above finished grade or the normally expected snow accumulation level, whichever is higher
- at least 4 feet (1.2M) horizontally from electric meters, gas meters, regulators and relief equipment
- at least 7 feet (2.1M) above grade adjacent to walkways or similar traffic areas

Allow at least three feet (1M) vertical clearance over vent termination when terminating under an overhang.

Avoid corners or alcoves where snow or wind could have an effect. Exhaust may affect shrubbery and some building materials. Keep shrubbery away from termination. To prevent staining or deterioration, sealing or shielding exposed surfaces may be required.

## ⚠ WARNING

**Fire Hazard.** Do not run the heater vent into a common vent with any other appliance. Do not run the Special Gas Vent into, through, or within any active vent such as a factory built or masonry chimney.

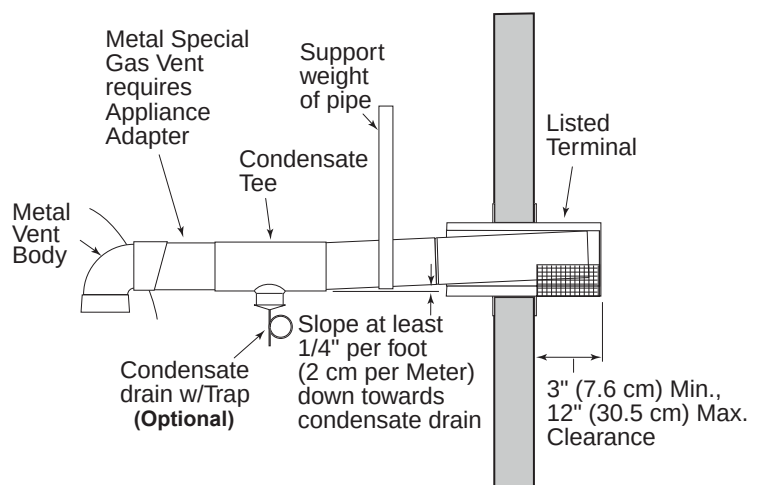


Figure 17.

## OUTDOOR SHELTER INSTALLATION

In Canada, this pool heater can only be installed outdoors or in an enclosure that is not normally occupied and has no direct openings into occupied areas.

### ⚠ WARNING

**Risk of asphyxiation if exhaust is not correctly vented.** Follow venting instructions exactly when installing heater. Do not use a draft hood with this heater, as the exhaust is under pressure from the burner blower and a draft hood will allow exhaust fumes to blow into the room housing the heater. Exhaust venting to the outdoors is required for all outdoor shelter installations.

### ⚠ WARNING

**Risk of explosion if a unit burning propane gas is installed in a pit or other low spot.** Propane is heavier than air. Do not install the heater using propane in pits or other locations where gas might collect. Consult your local building code officials to determine installation requirements and specific installation restrictions of the heater relative to propane storage tanks and filling equipment. Installation must meet the requirements for the Standard for the Storage and Handling of Liquefied Petroleum Gases, CAN/CSA B149.2 (latest edition) or ANSI/NFPA 58 (latest edition). Consult local codes and fire protection authorities about specific installation restrictions.

The heater is design certified by CSA International for installation on combustible flooring; in alcoves; basements; in closet or utility rooms (in the U.S.).

## GARAGE OR UTILITY ROOM INSTALLATION

*In Canada, the heater must be installed in a room that is not normally occupied and has no openings directly to occupied areas.*

### ⚠ WARNING

**Risk of fire and explosion if installed at floor level in an automotive garage or near gasoline or flammable liquid storage.** Gasoline fumes are heavier than air and will settle to floor level in closed spaces. Gasoline fumes and spilled gasoline or other volatile liquids (such as some paints and varnishes) will travel across the floor and can be ignited by a gas appliance.

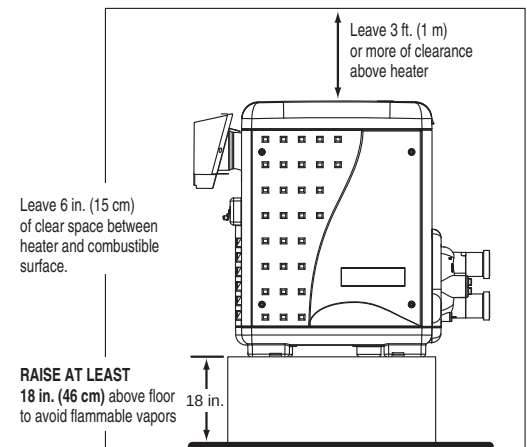
In any utility room or residential garage installation, install the heater with the base at least 18 inches (.5M) above the floor, see [Figure 18](#). In a garage, install a rail or wall to protect the heater from physical damage by a moving vehicle.

**Provide an adequate ventilation air supply** (See [Table 4, page 19](#)).  
**Choose a location that will avoid contamination by chemical fumes.**

### ⚠ CAUTION

**A Propane (LPG) fired heater must not be installed in a garage in Massachusetts, by order of the Massachusetts State Fire Marshal. For more information, call the Massachusetts State Fire Marshal's office.**

**NOTICE:** Combustion air contaminated by corrosive chemical fumes can damage the heater and will void the warranty (See [Table 6, page 20](#)).

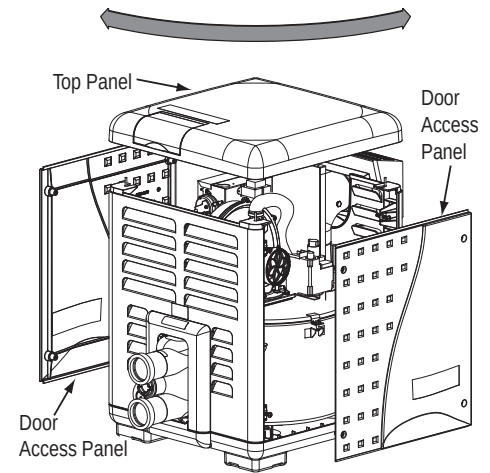


**Figure 18.**

## CONTROL PANEL INDEXING

On an outdoor shelter installation, the exhaust discharges into a vent pipe. Orient the heater so that the vent pipe does not interfere with adjustment of the operating controls. The control panel located on the top panel can be rotated to any of the three sides of the heater for easy access, see **Figure 19**.

1. Remove the bolts from the door panels. Remove both door access panels.
2. Remove the four corner wing nuts that secure the top panel. Lift the top panel upward to remove the top panel.
3. Rotate the top panel to the desired position located at 90° angles. *Note that the control panel must **NOT** be located on the side where the vent is located.*
4. Replace the top panel down onto the side panels. Be sure that there are no wires caught under the panel.
5. Secure the top panel using the four corner wing nuts.
6. Reattach the door access panels.



**Figure 19.**

## FINAL INSTALLATION CHECK

Check that horizontal vent pipe runs slope uniformly at least 1/4" per foot (2cm per meter) to condensate drain(s). No sags, no dips, no high or low spots.

Check that vent is supported at elbows, tees, and horizontal and vertical runs according to manufacturer's instructions and code requirements.

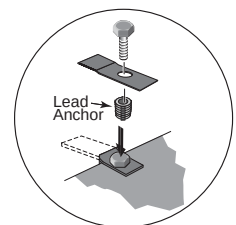
Check that vent supports and wall and ceiling penetrations allow free movements up, down, and sideways without putting any strains on the heater or vent body.

Check for at least six inch (15cm) free air clearance between the heater vent pipe and combustible materials.

Check that all joints are completely together and sealed.

In Florida, building codes require that the heater be anchored to the equipment pad or platform to withstand high wind pressures created during hurricanes. A Bolt Down Bracket Kit, P/N 460738, is available with anchor clamps designed to hold the unit to the equipment pad in high wind conditions. Installation of the anchor clamps are recommended in all installations and are required in Florida, (See Florida Building Code 301.13).

For Heater mounting bolts and clamps, purchase separately Bolt Down Bracket Kit, Part No. 460738.





## ELECTRICAL CONNECTIONS

Electrical Rating: 60 Hz 120 / 240 Volts AC, single phase

Enclose the incoming AC power line to the heater, in an approved flexible conduit connected directly to the junction box on the inside of the access door panel. Line voltage field wiring should be 14 gauge, with a circuit capacity of 15 Amps.

### ⚠ CAUTION

**This heater is designed to operate at 120 or 240 VAC. It is not recommended to be connected to OR operate on a 208 VAC.**

### NOTE

- Before making any electrical connections to the power supply, remove the access door panels, open the control box and plug in the correct plug (120 VAC or 240 VAC). See plugs below.

### ⚠ CAUTION

**The heater ships from the Factory with the 240 VAC plug installed. Installing the 120V plug and then connecting the heater to 240V line current will immediately destroy the transformer, control board and ignition control module, and will void warranty. If you install the 240V plug and connect the heater to 120 VAC line current, the heater will not operate.**

- If any of the original wiring supplied with this heater must be replaced, installer must supply (No. 18 AWG, 600V, 105° C. U.L. approved AWM low energy stranded) copper wire or it's equivalent.

Please read the boxes headed **“IMPORTANT! READ ME FIRST!”** on [pages 38](#) and [42](#) before proceeding.

1. All wiring must be in accordance with all applicable codes.
2. The heater, when installed, must be electrically grounded and bonded in accordance with local codes or, in the absence of local codes, with the National Electrical Code or the Canadian Electrical Code (as applicable). A bonding lug is provided on the outside of the panel under the vent for this purpose.
3. Electrical power circuits to the pool heater must follow local codes and National Electrical Code or Canadian Electrical Code (as applicable).
4. All wiring between the heater and devices not attached to it, or between separate devices which are installed in the field, must be “Type T” wire rated for 35°C rise.
5. All line voltage wiring shall be enclosed in approved flexible conduit, and shall be securely attached to the field wiring box located inside the access door panel. The conduit or cable connector at the field wiring box should contain an insulating bushing or its equivalent to prevent abrasion of the wires as they enter the box.
6. **The filter pump should run continuously when the heater is on, and for at least 5 minutes after the heater turns off.** Any switches in the pump circuit (including circuit breakers) that can disconnect the pump must also disconnect the heater.
7. Do not wire single-pole switches, including protective devices, into a grounded line. The heater is not sensitive to polarity.

Connect the **L1** of the power supply to the **black** wire, the **L2** or neutral lead to the **red** wire, and the **ground** wire to the **green** wire. A time clock controlling the filter pump should have a low-voltage Fireman's Switch that switches off the heater at least 15 minutes before shutting off the pump.



*Always use crimp type connectors when connecting two wires.*

**AC VOLTAGE SELECT PLUGS:**  
(120 VAC or 240 VAC)

AC Plug  
120 Volt  
or  
240 Volt

**Figure 20.**



## CONNECTION OF FIREMAN'S SWITCH OR REMOTE CONTACT

### ⚠ CAUTION

If, while there is line voltage connected to the heater, you touch either line voltage terminal with any 24VAC wire that is connected to the control board (including the Fireman's Switch jumper), you will immediately destroy the control board and void the warranty.

### REMOTE CONTROL CONNECTIONS

1. Switch off power to heater at main circuit breaker panel.
2. Unbolt and remove the access door panels.
3. Open control box cover (see [Figure 21](#)).
- 4a. To connect a 2-Wire Control (such as Pentair's IntelliTouch® or EasyTouch® Control Systems) or a timer:
  - Remove the factory installed jumper from the Fireman's Switch terminals.
  - Connect wires between the Fireman's Switch terminals on the heater and the relay. Connect wires from the controller or timer to the Fireman's Switch. Controller, timer or relay should be sized to handle 24VAC at 0.5 Amp (because it will be completing the 24VAC control board circuit on the heater as shown in [Figure 22](#)). DO NOT apply line voltage to the Fireman's Switch terminals. Use 18 gauge wire with a minimum 3/64" (1.2mm) thick insulation rated for a temperature rise of at least 105°C.
  - Knock-outs are provided to route the wires through the bottom of the control box and past the junction box.
- 4b. To connect a 3-Wire Control:
  - Connect wires between the control board terminals on the heater and the external relays, as shown in [Figure 23](#). Use at least 2 relays per heater, to allow for an "OFF setting" on each heater mode. Select relays that can handle logic level switching. DO NOT apply line voltage to control board terminals.
  - Move jumper (as shown on [Figure 23](#)) to enable external control and to disable the heater membrane pad's "Pool ON" and "Spa ON" buttons (the "OFF" key on the membrane pad remains functional).
  - Knock-outs are provided to route the wires through the bottom and the top of the control box and past the junction box.
5. Close control box cover.
6. Re-install the access door panels.

To control heaters that are operated in parallel, connect wiring at same locations on heater as 2-Wire or 3-Wire Control. It is imperative that each control circuit is isolated from the other control circuits, to avoid that current will flow from one heater to another through the control circuits.

**NOTICE:** The fuse for the Fireman's Switch is a 1.25 Amp 1¼ x ¼" fast blow fuse, which is commonly available.

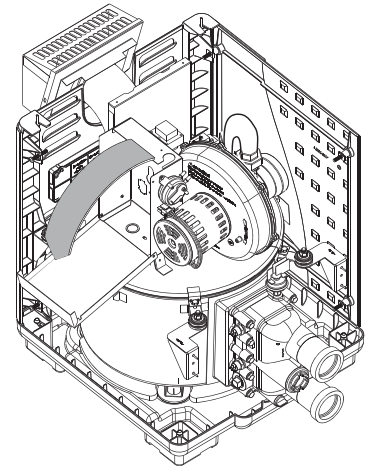


Figure 21.

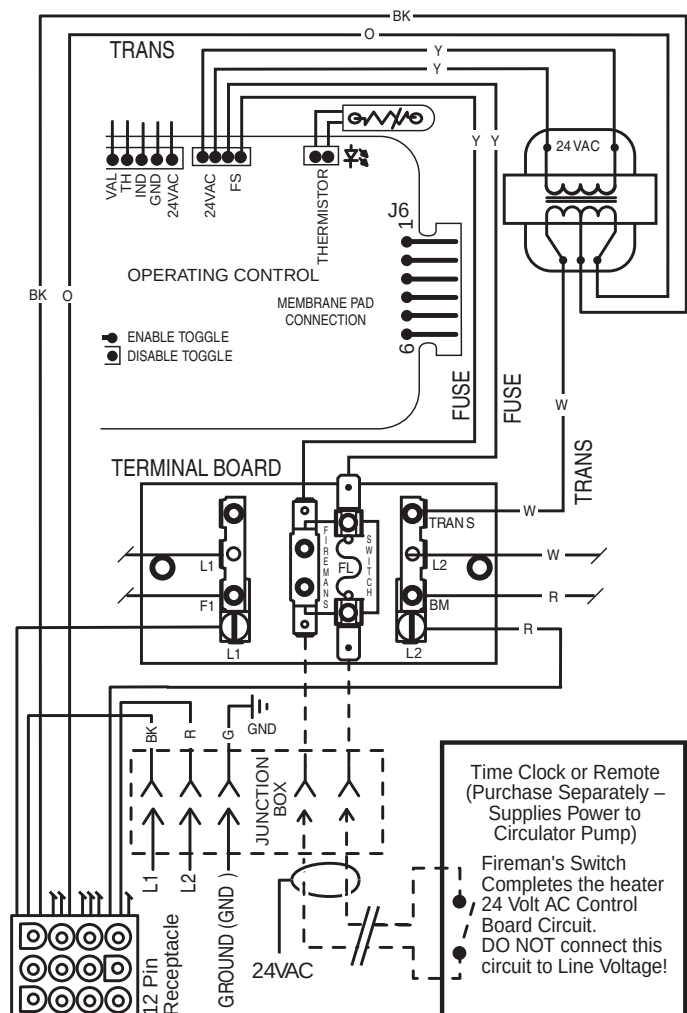


Figure 22.

# MASTERTEMP HEATER WIRING DIAGRAM

## (3-WIRE SYSTEM)

### CONNECTION DIAGRAM

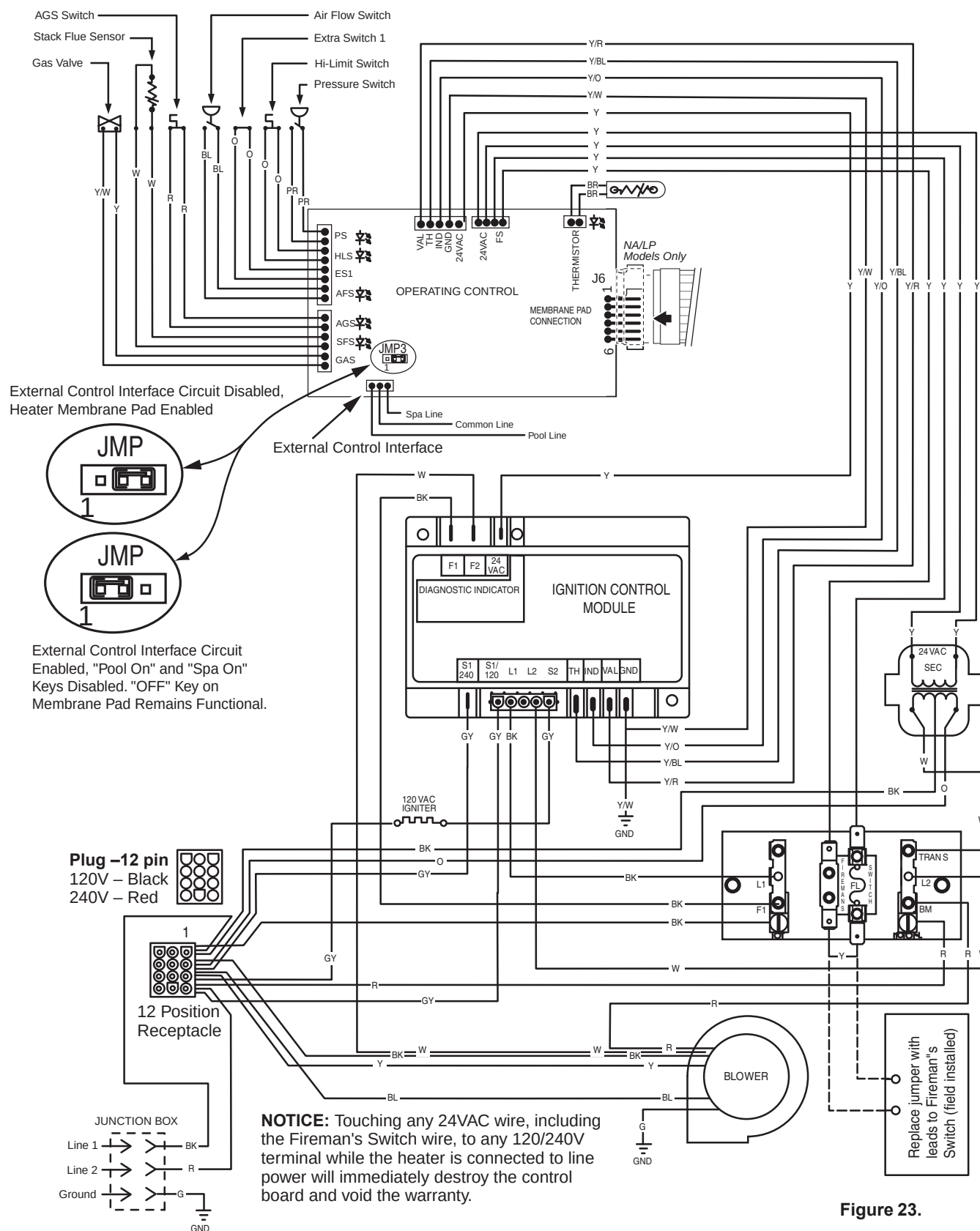
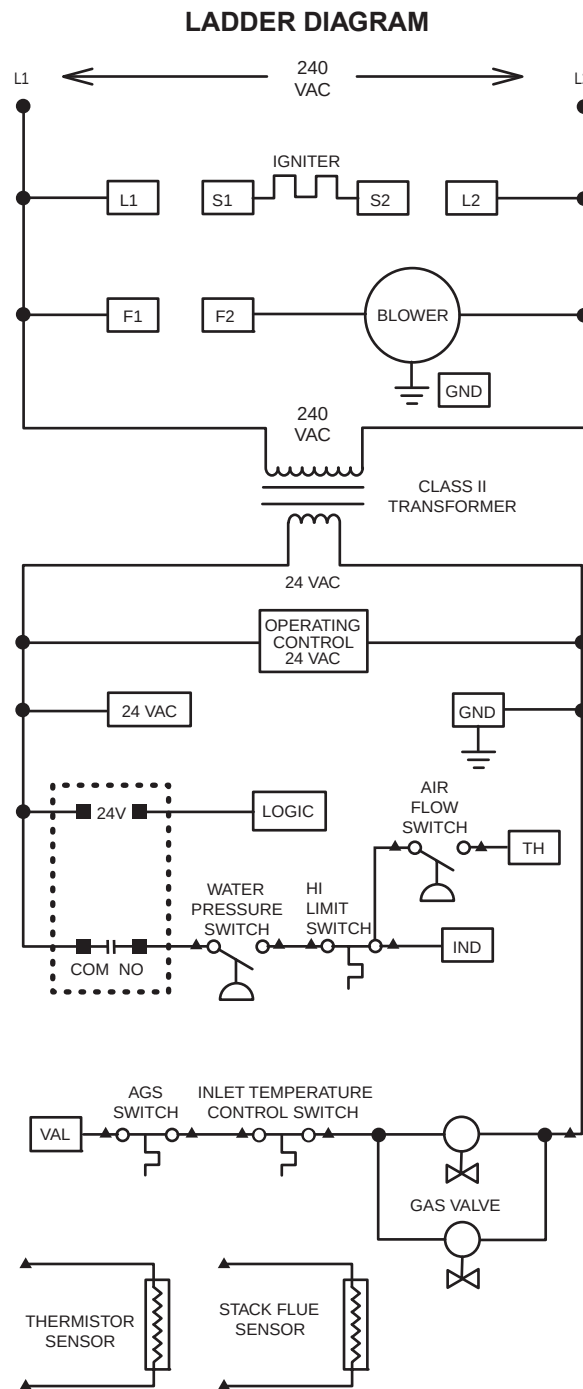


Figure 23.



# MASTERTEMP HEATER ELECTRICAL SCHEMATIC LADDER DIAGRAM



## NOTES:

- 1.) 

|    |     |     |     |     |        |
|----|-----|-----|-----|-----|--------|
| L1 | L2  | F1  | F2  | S1  | 24 VAC |
| S2 | GND | IND | VAL | AND | TH     |

  
 ARE CONNECTED ON THE IGNITION MODULE.
- 2.) ▲ PIN AND SOCKET CONNECTOR.
- 3.) IF ANY OF THE ORIGINAL WIRES AS SUPPLIED WITH THE APPLIANCE MUST BE REPLACED, THEY MUST BE REPLACED WITH TYPE 105° C OR ITS EQUIVALENT.

**Figure 24.**

# Operation Instructions

## BASIC SYSTEM OPERATION

**Start pump, make sure the pump is running and is primed, to close the water pressure switch and supply power to heater.** Be sure the pool and/or spa is properly filled with water. Follow the Lighting/Operating instructions below.

## MASTERTEMP HEATER HSI ELECTRONIC IGNITION LIGHTING/OPERATION

### FOR YOUR SAFETY: READ BEFORE LIGHTING

|  <b>WARNING</b> |                                                                                                                                                                                  |
|--------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                 | If you do not follow these instructions exactly, a fire or explosion may result causing property damage, personal injury or loss of life.                                        |
|                                                                                                  | Do not attempt to light the heater if you suspect a gas leak. Lighting the heater can result in a fire or explosion which can cause personal injury, death, and property damage. |

## START-UP AND OPERATION

**START-UP AND SHUTDOWN INSTRUCTIONS ARE ON THE LABEL ATTACHED TO THE COVER OF THE APPLIANCE CONTROL BOX.**

### BEFORE START-UP

- A. This appliance does not have a pilot. It is equipped with an ignition device which automatically lights the burners. Do not try to light the burners by hand.
- B. **BEFORE OPERATING**, smell all around the appliance area for gas. Be sure to smell next to the floor because some gas is heavier than air and will settle on the floor.
- E. Do not operate the pool heater unless the pool or spa is properly filled with water.
- F. Before operating the appliance for the first time or after it has been off for an extended time, perform the following checklist:

### WHAT TO DO IF YOU SMELL GAS

- Do not try to light any appliance.
- Do not touch any electrical switch; do not use any phone in your building.
- Immediately call your gas supplier from a neighbor's phone. Follow the gas supplier's instructions.
- If you cannot reach your gas supplier, call the Fire Department.
- C. Use only your hand to turn the gas control on or off. Never use tools. If you cannot change the ON/OFF setting by hand, don't try to repair it, call a qualified service technician. Forced or attempted repair may result in a fire or explosion.
- D. Do not use this heater if any part has been under water. Immediately call a qualified service technician to inspect the heater and to replace any part of the control system and any gas control which has been under water.
- 1. Remove debris or other articles from inside the heater and the area around the heater and its exhaust vent. Make sure the ventilation openings are clear of debris or obstruction. For installations in an enclosed space, make sure openings for combustion and ventilation air are unobstructed.
- 2. Keep heater area clear and free from combustibles, flammable liquids and chemicals.
- 3. Check that all water connections are tight.
- 4. Water must be flowing through the heater during operation. Make sure that pool/spa is filled with water and have pump operating. Check that water flow is unobstructed from the appliance. When operating for the first time or after an extended shut-down, run filter pump for several minutes to clear all air from the system.

## OPERATING INSTRUCTIONS

1. **STOP!** Read the safety information on (page 33).
2. Set both pool and spa thermostats to the lowest settings.
3. Turn off all electric power to the appliance.
4. This appliance does not have a pilot. It is equipped with an ignition device which automatically lights the burner. Do not try to light the burner by hand.
5. Remove the access door panels by unfastening the four screws located on each door, then lift up and out from the bottom of the panel to remove. If necessary, the screws may be used as handles, see Figure 25.
6. **Toggle-Style Valve:** Pull toggle toward you to turn gas off, see Figure 26.
7. Wait five (5) minutes to clear out any gas. If you then smell gas, **STOP!** Follow “B” in the “Before Start-up” instructions (page 33). If you don’t smell gas, go to the next step.
8. Push the toggle switch away from you to switch the gas on.
9. Replace the Door Access Panels. All panels must be in place when operating the heater.
10. Set 3-way valves on inlet and outlet to pool or spa, as appropriate.
11. Turn on all electric power to the appliance.
12. Press either the POOL ON or SPA ON button switch on the operating control.
13. Set the thermostat to desired setting (**NOTICE:** Setpoint must be above actual water temperature or burner will not fire). See “OPERATING the CONTROL PANEL”.
14. The blower should come on immediately, and after about 20 seconds, the burner should fire. When operating for the first time, the burner may not fire on the first try because of air in the gas line. If it does not fire at first, push the OFF switch, wait five minutes, and again push the POOL or SPA ON switch. The burner should fire after about 20 seconds. You may have to repeat this until all of the air has cleared the gas line.
15. The burner should fire until the pool/spa temperature reaches the desired temperature set on the thermostat. The blower will continue to run for about 45 seconds after the burner shuts off. If any of the safety interlocks should open during burner operation, the burner shuts off immediately, but the blower continues to run for about 45 seconds. Should overheating occur or the gas supply fail to shut off, turn off the manual gas control valve to the appliance.
16. If the appliance will not operate, follow the instructions below “TO TURN OFF GAS TO THE APPLIANCE”, and call your service technician or gas supplier.

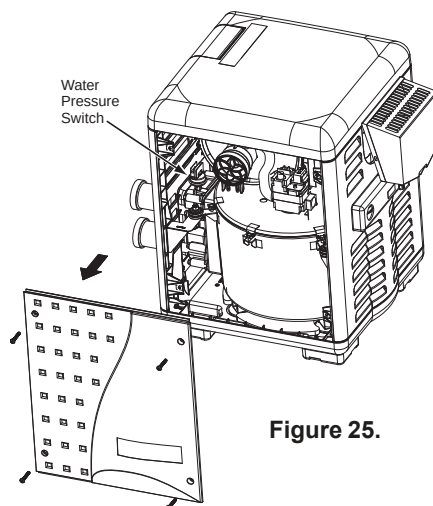


Figure 25.

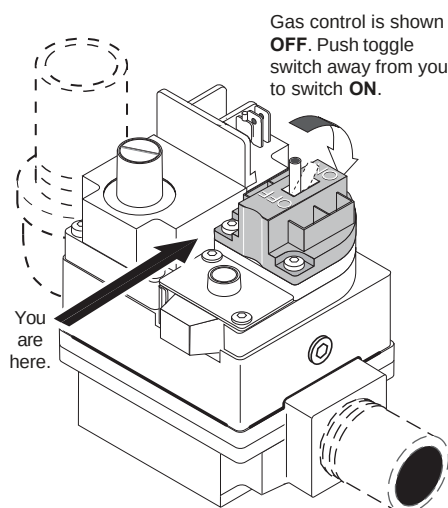


Figure 26.

## TO TURN OFF GAS TO APPLIANCE

1. Press the OFF button on operating control.
2. Switch off all electric power to the unit.
3. Remove the access door panels, see Figure 25.
4. **Toggle-Style Valve:** Pull toggle toward you to turn gas off, see Figure 26.
5. Replace the Access Door Panels.

## SAFETY CONTROLS

### AIR FLOW SWITCH (AFS)

The air flow switch, (see **Figure 27**), is a safety device used to insure that the combustion air blower (fan) is operating and has been designed to monitor the vacuum (negative) pressure within the blower housing. The air flow switch is factory set and is connected upstream of the ignition module. The ignition module does not operate unless the air pressure switch and all safety switches are closed.

### WATER PRESSURE SWITCH

#### ⚠ WARNING

**Hazardous pressure. Do not bypass the Water Pressure Switch or render it inoperable.**

The water pressure switch, (see **Figure 28**). If the water flow is restricted, the water pressure switch may prevent the burner from firing and cause the “Service System” light to go on. If the light remains on after the filter has been serviced, have a qualified service technician check the system.

For deck-level heater installations, the Water Pressure Switch is factory set at 3.00 psi (20.6 kPa). **NOTE:** See, *Below Pool Level Installation Instructions on page 13*. If the pressure switch is one foot (.3M) below or above the pool water level, reset the switch so that it is open when the pump is off and closed when the pump is running. Turn the star-wheel on the switch clockwise (↻) to raise setting (heater below the pool) and counterclockwise (↺) to lower the setting (heater above the pool – see **Figure 29**. Test the switch after resetting.

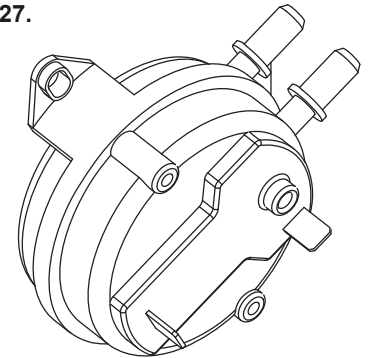
**NOTICE:** When the heater is mounted more than five feet (1.5M) above or four feet (1.2M) below the deck level, a Pressure Switch is no longer adequate. A Flow Switch must be installed instead.

**NOTICE:** Heater operation with incorrect Pressure Switch setting may cause operation with no water flow. Operation of the heater without sufficient water flow may severely damage it.

### HIGH LIMITS

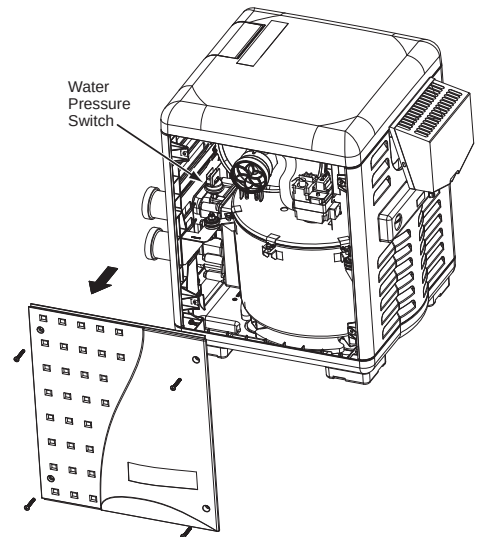
A “High Limit”, is a safety device that opens the electrical circuit and shuts off the heater based on a water temperature set point within the “High Limit Device”. The MasterTemp heater series of heaters contains two (2) high limit devices which are located on the main inlet / outlet header.

**Figure 27.**

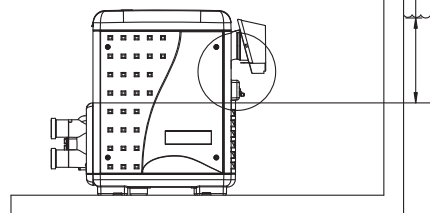


**Air Flow Switch**

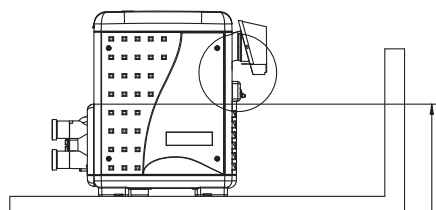
**Figure 28.**



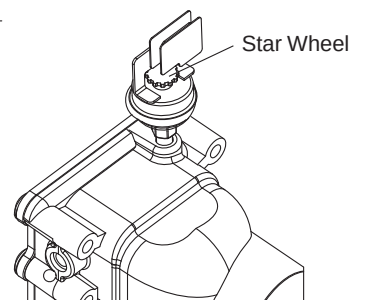
Turn star wheel **clockwise** to raise pressure set point if pressure switch is more than 4 feet (1.2M) below water level



A reference scale is on the back of pressure switch



Turn star wheel **counterclockwise** to lower pressure set point if pressure switch is more than 5 feet (1.5M) above water level



**Figure 29.**

## SAFETY CONTROLS, (cont'd.)

### OPERATION OF IGNITION MODULE

The Ignition Module, (see [Figure 30](#)), is microprocessor based and operates on 24VAC supplied by the transformer. The control utilizes a microprocessor to continually and safely monitor, analyze, and control the proper operation of the gas flame holder. The module with the presence of the flame sensor, using flame rectification, allows the heater to operate.

### OPERATING THE CONTROL PANEL

The five operating switches are:

- POOL ON** Press this button to govern heater operation by the pool temperature setting.
- SPA ON** Press this button to govern heater operation by the spa temperature setting.
- HEATER OFF** Press this button to switch off the heater.
- ▲ TEMP** Press this button to raise the temperature setting.
- ▼ TEMP** Press this button to lower the temperature setting.

To toggle the display between degrees Centigrade (°C) and degrees Fahrenheit (°F):

1. Turn the Operating Control OFF.
2. Press **▲TEMP** or **▼TEMP** for 5 seconds. The display will flash once and change modes (°C to °F or vice versa).
3. Turn the Operating Control ON.

When either the **▲TEMP** or **▼TEMP** buttons are depressed, the digital display will indicate the temperature setting. After five seconds, the display will return to the actual pool/spa temperature.

In addition to the digital temperature display, there are five indicator lights:

The **POOL ON** light indicates that the pool water temperature is governing operation of the heater.

The **SPA ON** light indicates that the spa water temperature is governing operation of the heater.

The **HEATING** light comes on and stays on when the burner is firing. This light should be on whenever the burner is on. It blinks when the heater is calling for heat but not firing. If this light is on but the burner fails to come on, one of the “service” lights should come on, indicating a fault in the system.

The **SERVICE SYSTEM** light indicates that there is insufficient water flow to the heater. If the pump is operating, this usually indicates that the filter and/or skimmers should be cleaned (some filters may require back-washing). If the light remains on after the filter/skimers have been serviced, the system should be checked by a qualified service technician.

The **SERVICE HEATER** light indicates a fault in the heater or its controls. If this light comes on, shut down the heater (See “TO TURN OFF GAS TO THE APPLIANCE” on [page 34](#)), and have a qualified service technician check the system.

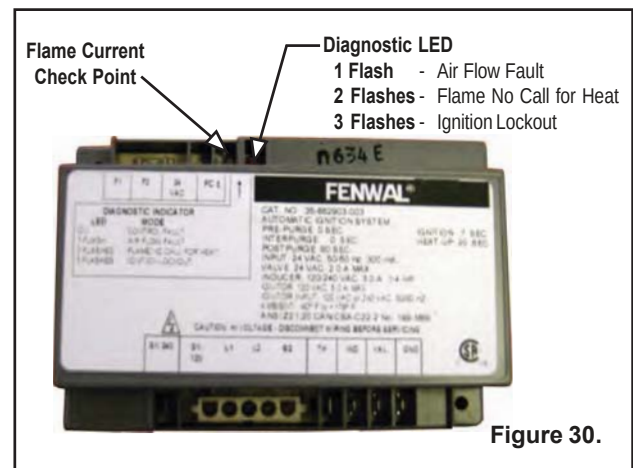


Figure 30.

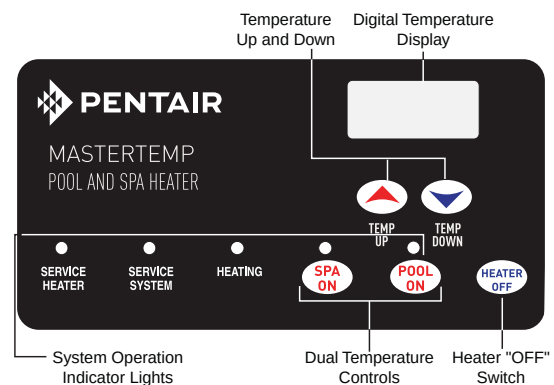


Figure 31.

## ⚠ WARNING

**Risk of explosion or fire causing burns or death if safety interlocks are disabled. DO NOT** attempt to operate heater when SERVICE HEATER light is on or if blower or burner will not start. Instead, follow instructions under “To Switch Off Gas to the Appliance,” and call a qualified service technician to repair unit.

## TEMPERATURE SETTING

The heater comes factory set at 78° F. for the pool mode and 100° F. for the spa mode. Using the up and down arrows, you can set the thermostats to a minimum temperature of 65° F., or a maximum of 104° F. If you desire to heat only one body of water, the thermostat is capable of an off mode. As an example, if you only wish to heat the spa and not the pool, simply depress and hold the pool down arrow, and the thermostat will lower its setting to 65° F. then go to an off mode.

### MAXIMUM TEMPERATURE SET POINT

1. Unbolt and remove the door panels (see [Figure 32](#)).
2. Access the control panel board on the underside of the top cover. Locate the yellow button on the corner of the control board.
3. Push the **Max. Temp. Set Point** button on the back of the control board (see [Figure 33](#)).

The following sequence should happen:

- A. The unit will come on and the **POOL ON** light will come on.
  - B. Press the **▲TEMP** or **▼TEMP** pad (on TOP of the panel) to set maximum pool temperature.
  - C. Wait up to 30 seconds; the **POOL ON** light will go off and the **SPA ON** light will come on. To override the time delay, push the **Max. Temp. Set Point** button again.
  - D. Press the **▲TEMP** or **▼TEMP** button on the control panel and set maximum spa temperature to 104°F (40°C) or less.
  - E. Wait up to 30 seconds; the **SPA ON** light will go off and the unit will shut down. To override the time delay, push the **Max. Temp. Set Point** button again.
4. Reinstall the access door panels.

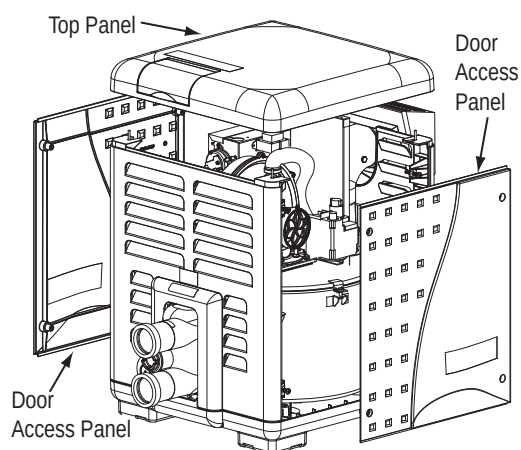


Figure 32.

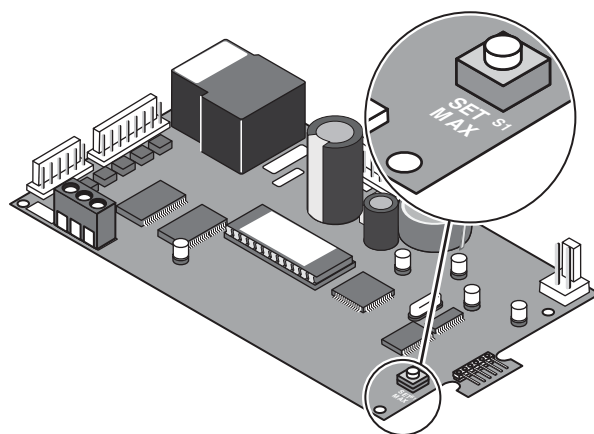


Figure 33.



# Troubleshooting Instruction

## Initial Troubleshooting

Only qualified, trained service technicians with appropriate test equipment should service the heater. Remember that all parts of the system affect heater operation. Before starting this troubleshooting procedure, make sure that the pump is running correctly, that there are no blockages in the system, that the valves are correctly set and that the time clock is correctly set and is running.

### IMPORTANT! READ ME FIRST!

**NOTICE:** Installing the **black 120 volt** plug in the control box and then connecting the heater to a **240 volt line** will **destroy the transformer, control board, and ignition control module, and will void the warranty.** If you install the red 240 volt plug and then connect the heater to a 120 volt line, the heater will not operate.

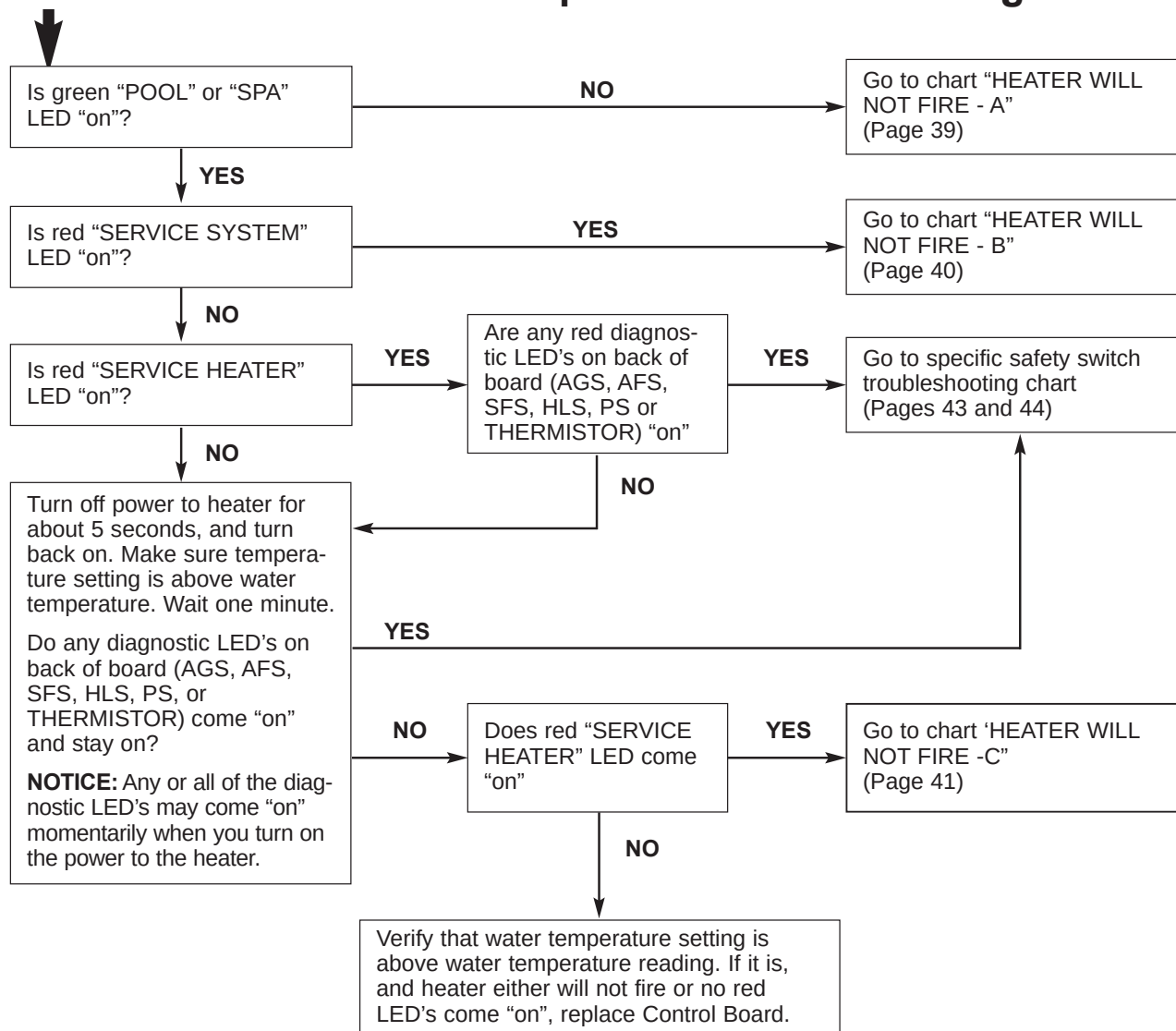
#### READ THE FOLLOWING CAREFULLY:

1. Check the line voltage to your heater. This heater will operate

on either 120 Volts AC or 240 Volts AC.

2. Remove the covers and check the 12-pin plug in the back of the control box. The plug must match the voltage in the heater circuit.
3. If the 12-pin plug is not plugged into the back of the control box, select the correct plug from the bag in the control box and plug it in. The **BLACK** plug is for **120 volts**, the **RED** plug is for **240 volts**.

## Start here for directions to specific Troubleshooting Chart



**WARNING** Hazardous voltage. Can shock, burn or kill. Disconnect power before servicing any components.

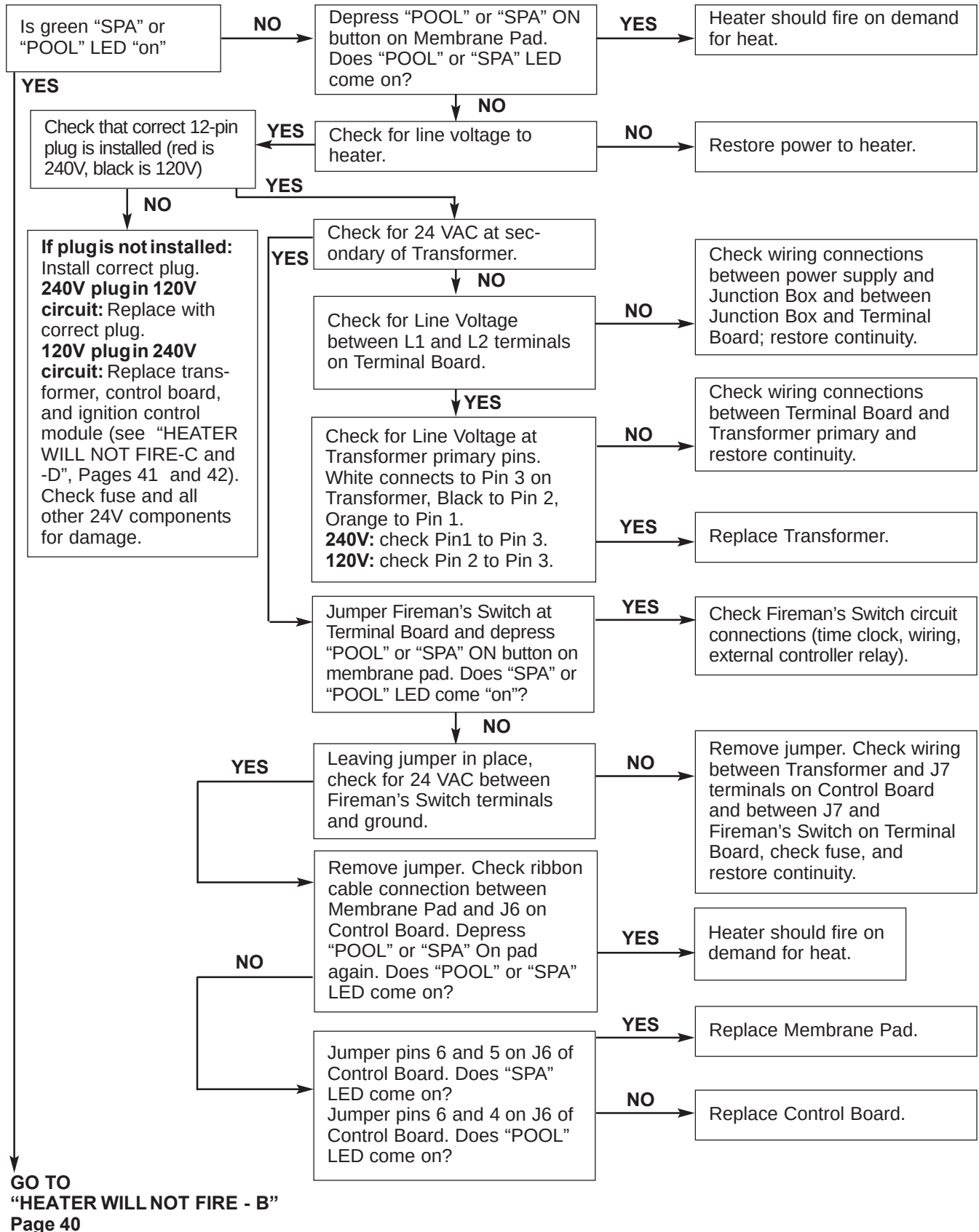


**WARNING** Fire and Explosion hazard. Do not jumper switch terminals to remedy a failed safety switch.



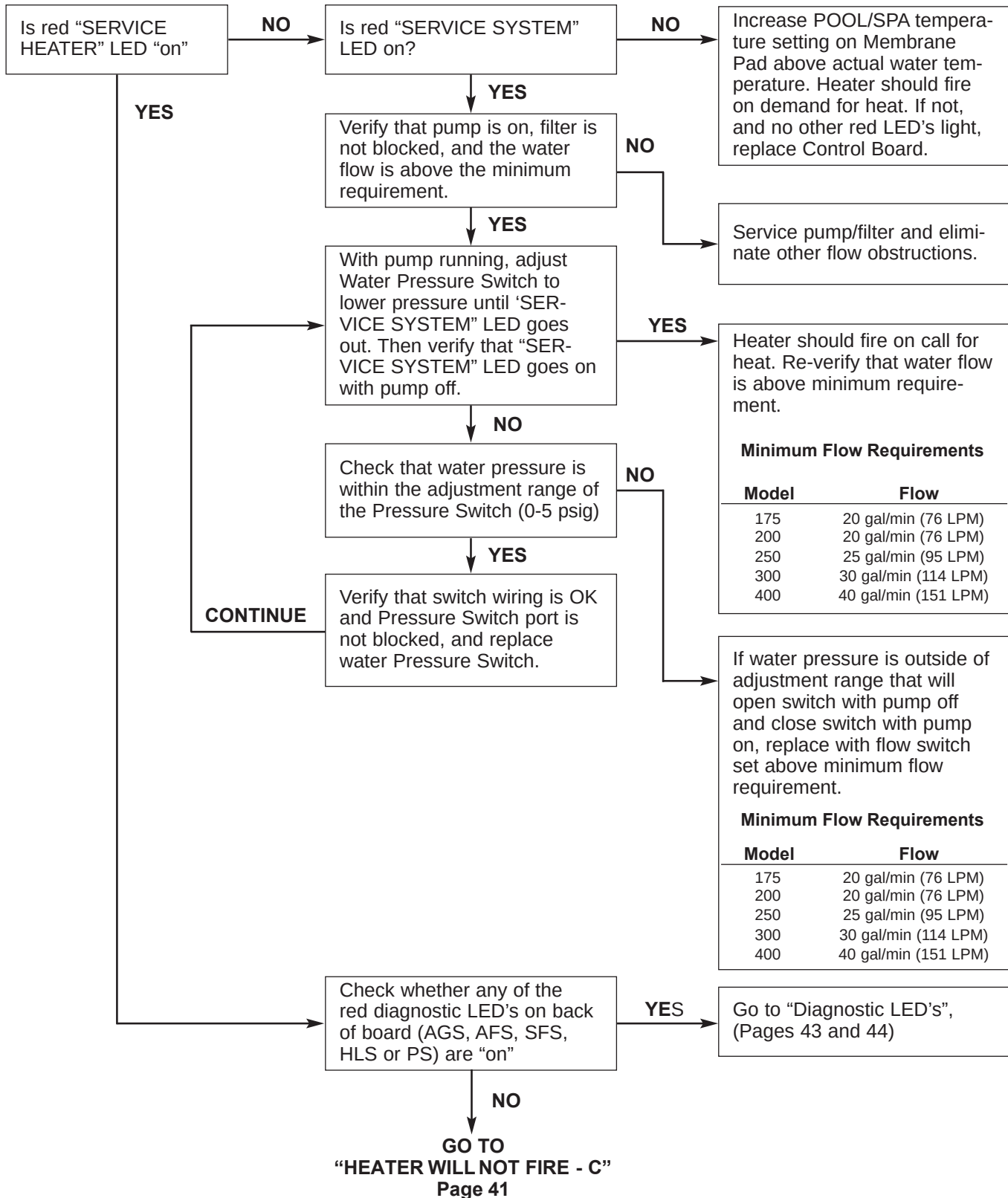
# Heater Will Not Fire - A

## Start



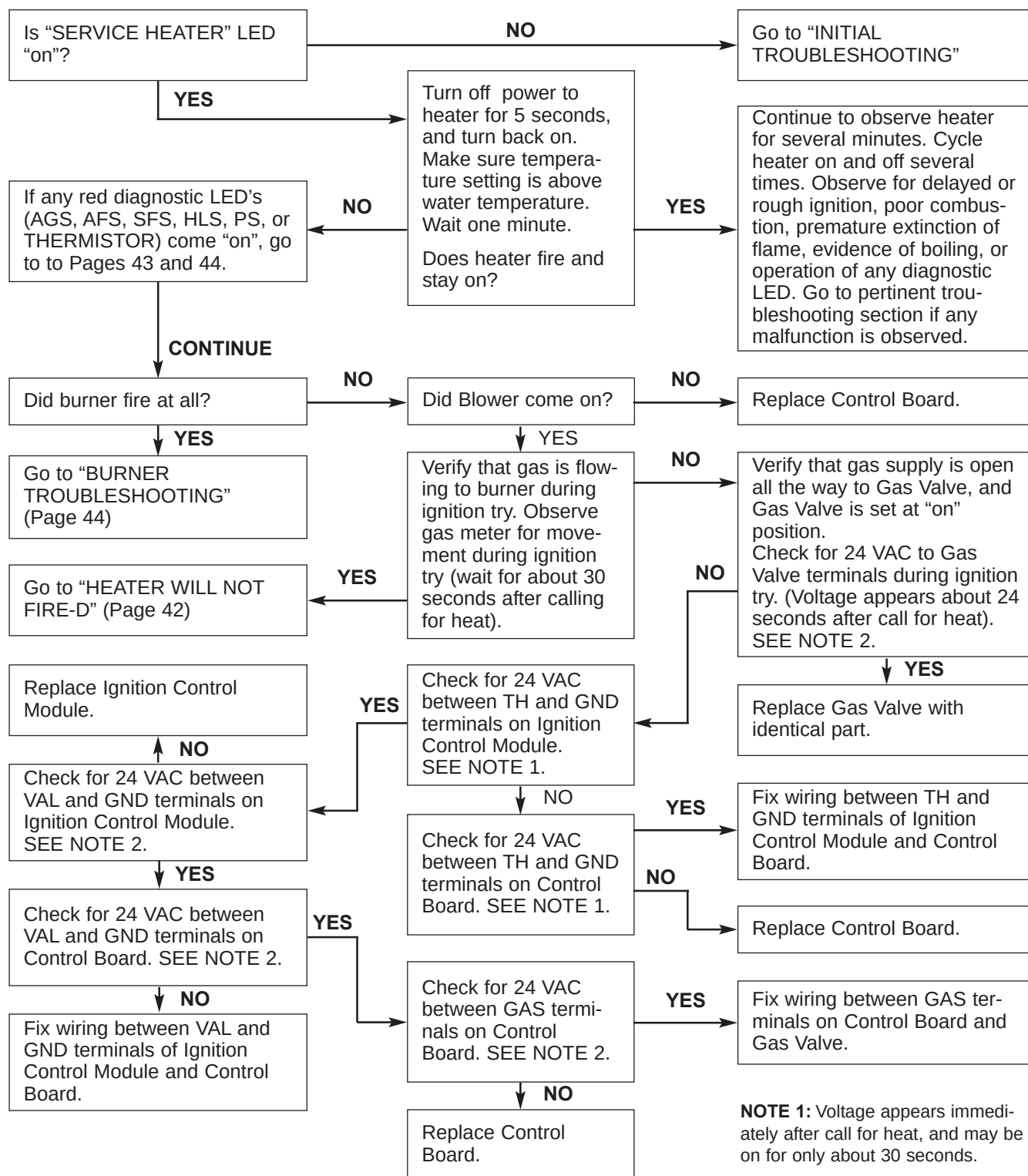
# Heater Will Not Fire - B

## Start



## Heater Will Not Fire - C

### Start



## Heater Will Not Fire - D

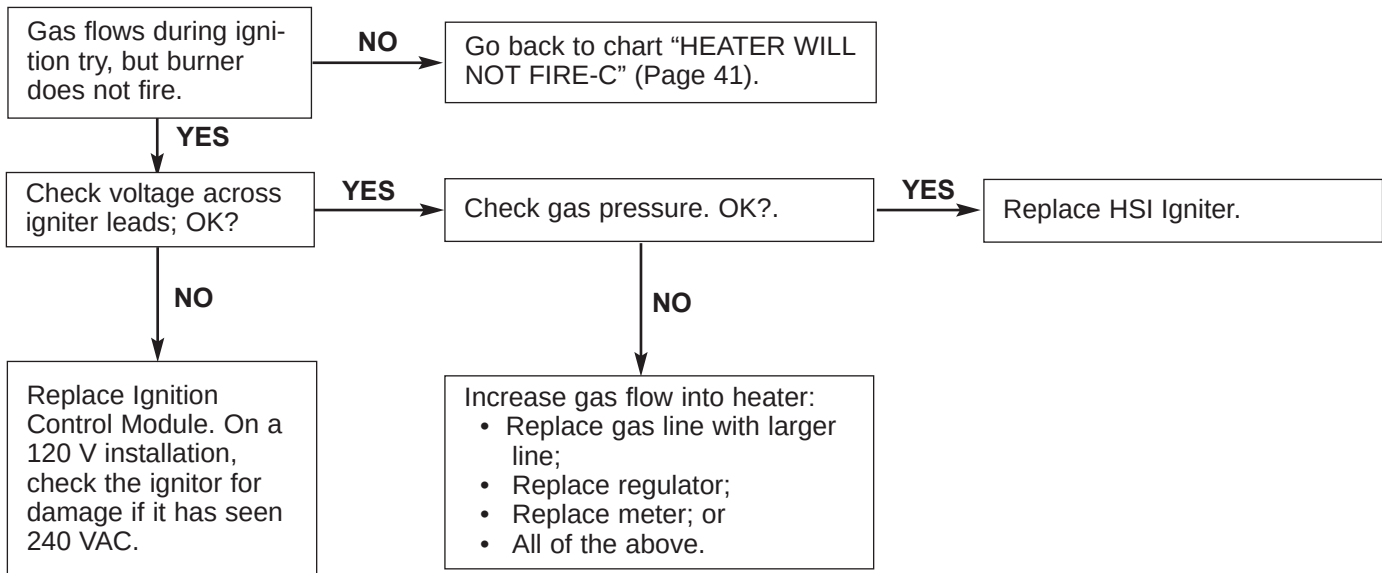
### IMPORTANT! READ ME FIRST!

#### IMPORTANT! READ ME FIRST!!

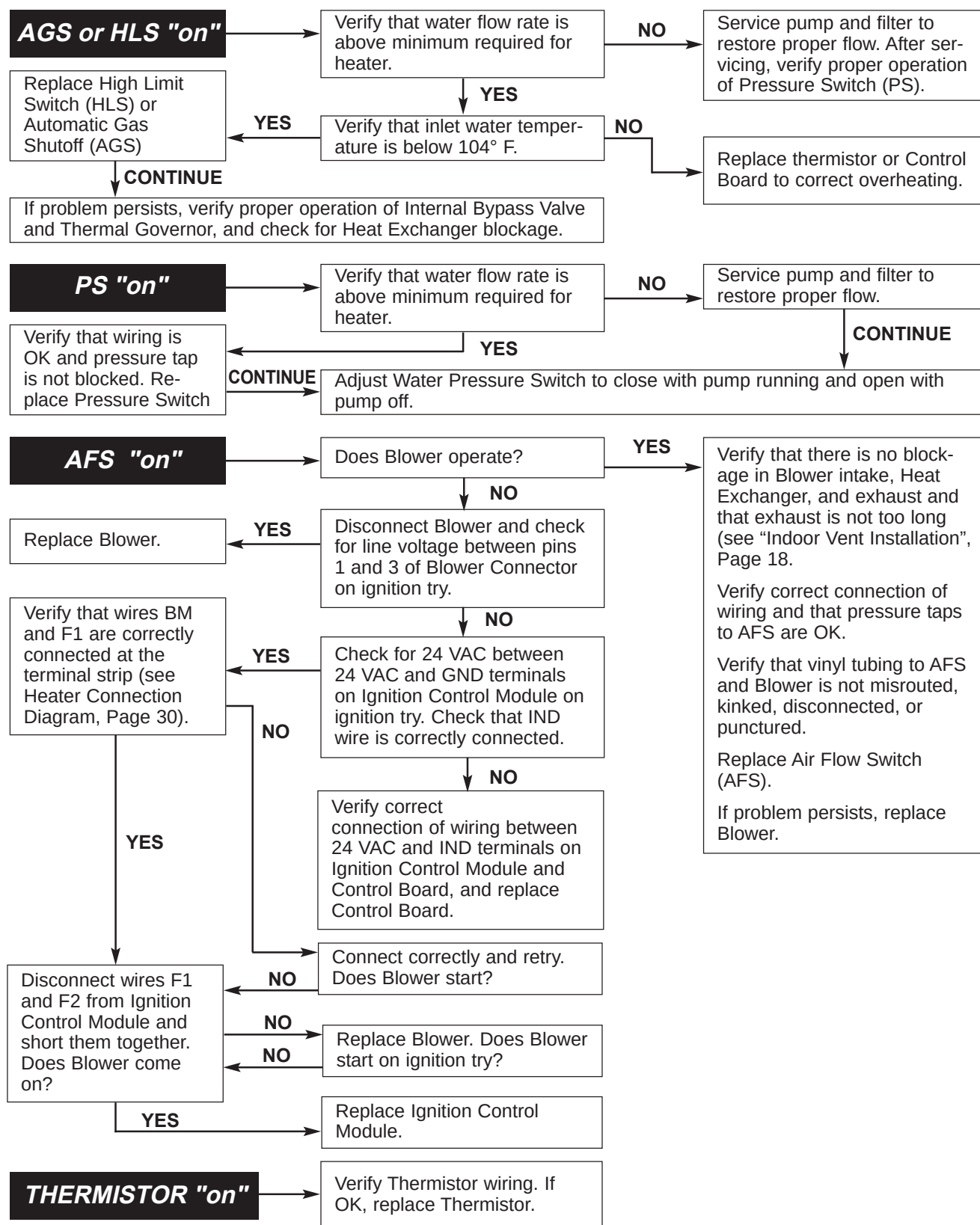
If your heater is correctly connected to **240 Volts AC**, the Ignition Control Module (ICM) will convert the 240VAC to an intermittent pulse to the ignitor. Digital meters don't read this type of signal well. (An analog meter will give a better reading than a digital meter). If the ICM is bad, your volt-

meter will read either 0 VAC or 240 VAC. If your ICM is good, your meter will read some voltage between 0 and 240 VAC. Exactly what reading you get will depend on the meter, but with a good ICM, the reading won't be 0 VAC or 240 VAC, but somewhere in between.

### Start



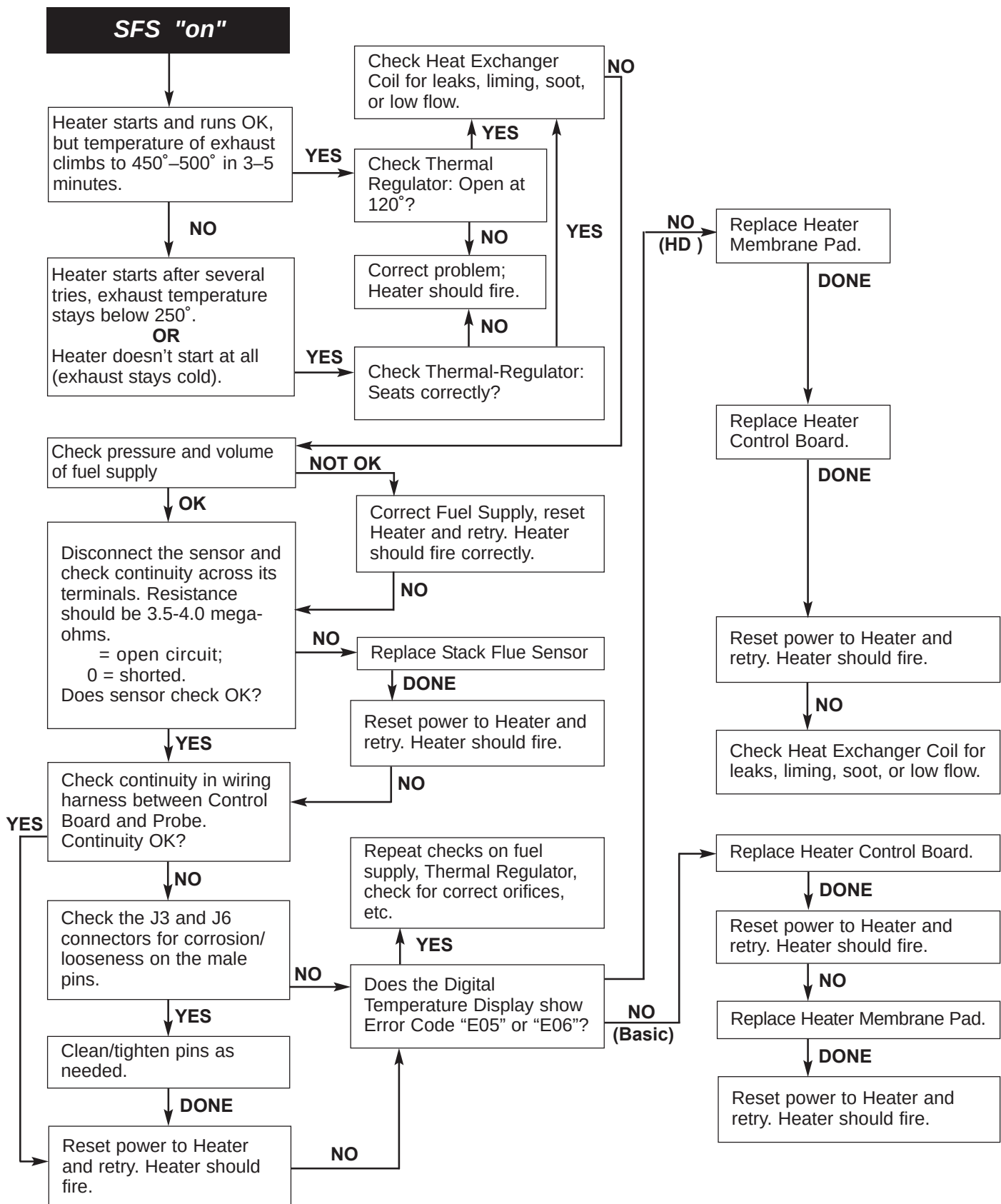
## Diagnostic LED's: AGS, AFS, HLS, PS, THERMISTOR



**CAUTION** Do not jumper a safety switch to remedy a failed switch.

**NOTE:** ES1 is a spare and should be jumpered.

## Diagnostic LED's: SFS



## Burner Troubleshooting

| SYMPTOM                                                                              | CAUSE                              | REMEDY                                                                                                                                                                                                                                       |
|--------------------------------------------------------------------------------------|------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Loud, high-pitched whine                                                             | Flame is too rich.                 | Verify pressure tap between gas valve and blower inlet.<br><br>See page 15 and verify that the gas regulator setting is $-0.2''$ ( $-0.5\text{cm}$ ) wc.<br><br>Contact a qualified technician or service agency to replace the gas orifice. |
| Flame is “fluttery.”<br>Exhaust may have acrid smell or burner may fail to stay lit. | Flame is too lean.                 | See page 16 and verify that the gas regulator setting is $-0.2''$ ( $-0.5\text{cm}$ ) wc.<br><br>Contact a qualified technician or service agency to replace the gas orifice.                                                                |
| Burner pulsates or surges, especially on ignition.                                   | Exhaust vent is too long.          | Reduce length of exhaust vent and/or number of elbows.                                                                                                                                                                                       |
| Combustion appears normal, but flame does not stay lit.                              | Flame current is not being sensed. | Check for wet or damaged igniter with low resistance to ground. Replace with new igniter.<br><br>Verify burner flameholder is properly grounded.<br><br>Replace Ignition Control Module.                                                     |

## Heat Exchanger Troubleshooting

| SYMPTOM                                                               | CAUSE                                                                                                                          | REMEDY                                                                                                                                            |
|-----------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------|
| Boiling in heat exchanger.<br>May be accompanied by “bumping” sounds. | Low water flow to heater.<br><br>Heat exchanger plugged.<br><br>Bypass valve stuck open.<br><br>Thermal governor stuck closed. | Service pump and or filter.<br><br>Service heat exchanger. Correct water chemistry.<br><br>Service bypass valve.<br><br>Replace thermal governor. |
| Sweating.                                                             | Thermal governor failed.                                                                                                       | Replace thermal governor.                                                                                                                         |



# Maintenance Instructions

## CARE AND MAINTENANCE

### ⚠ WARNING

**Risk of fire or explosion from flammable vapors.** Do not store gasoline, cleaning fluids, varnishes, paints, or other volatile flammable liquids near heater or in the same room with heater.

The following maintenance is recommended every six months and at the start of every swimming season:

1. Inspect the heater panels and venting system to make sure that there are no obstructions to the flow of ventilating air or burner exhaust. Check that room air intakes are open and clear of obstructions.
2. Keep the area in and around the heater clear and free from combustible materials, gasoline and other flammable vapors and corrosive liquids.
3. Test the operation of the pressure relief valve by lifting the valve lever (if installed).
4. Test for proper operation of the water pressure switch. (See “WATER PRESSURE SWITCH” (page 35) for testing instructions).
5. On enclosed installations with high-temperature Special Gas Vent systems, repeat the “Final Installation Check,” [page 28](#). Check for evidence of joint leakage. Make sure that joints have not slipped partially or completely apart. Check pipe and fittings for cracks or breaks. The combustion air blower is permanently lubricated, and does not require periodic lubrication. The burner does not require maintenance or adjustment by the user. Call a qualified service technician if you suspect that the burner may require maintenance.

## PRESSURE RELIEF VALVE (NOT FACTORY INSTALLED)

Canadian code requires and some U.S. local codes may require installation of a Pressure Relief Valve (PRV). Purchase separately and install (P/N 460925) a 3/4" pressure relief valve complying with the ANSI/ASME Boiler and Pressure Vessel Code, having a capacity equal to the Btu/hr rating of the heater.

The relief pressure of the valve **MUST NOT EXCEED 50 PSI**. The relief valve must be installed vertically. To install the valve, use a 3/4" x 3-1/2" brass nipple at the manifold and one brass elbow and nipple (supplied), as shown in Figure 34. No valve is allowed to be placed between the manifold adapter and the relief valve.

To avoid water damage or scalding from operation of the relief valve, install a drain pipe in the outlet of the pressure relief valve that will direct water discharging from the valve to a safe place for disposal. Do not install any reducing couplings or valves in the drain pipe. The drain pipe must be installed so as to allow complete drainage from the valve and drain line. ***The relief valve should be tested at least once a year by lifting the valve lever.***

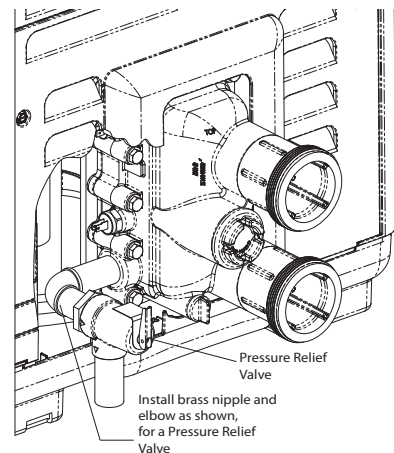


Figure 34.

### ⚠ WARNING

**Explosion hazard.** Any heater installed with restrictive devices in the piping system downstream from the heater, (including check valves, isolation valves, flow nozzles, or therapeutic pool valving), must have a relief valve installed as described above.

## AFTER START-UP

### CHECKING WATER FLOW

#### WARNING

**Fire or flooding hazard.** If the unit overheats and the burner fails to shut off, follow instructions under “To Turn Off Gas to the Appliance”, [page 34](#), and call a qualified service technician to repair unit.

After start-up, the outlet water pipe should feel slightly warmer than the inlet pipe. If it feels hot, or if you hear the water in the heater boiling, there may not be enough water flow to the appliance. Make sure that the filter is not plugged. If water temperature remains high but the unit continues to operate, turn off the appliance and call your service technician.

### SPRING AND FALL OPERATION

If the pool is only used occasionally, lower the pool thermostat to 68° F (20° C) and leave the heater on. This will keep the pool and the surrounding ground warm enough so that the heater should restore the pool to a comfortable temperature within about one day.

### WINTER OPERATION

#### CAUTION

- Operating this heater continuously at water temperatures below 68° F. (20° C) will cause harmful condensation and will damage the heater and void the warranty.
- If the heater has been drained for freezing condition, do NOT turn "ON" until the system is circulating water.
- Water trapped in the heat exchanger can result in freeze damage to the exchanger or headers. Freeze damage is specifically not covered by the warranty.
- When starting the heater for the swimming season with a water temperature below 50° F (10° C), the heater may be used to heat the water; however, make sure that the heater operates continuously until the water temperature reaches the heater's minimum setting of 68° F (20° C). During cold weather, if there is no danger of freezing, operate the filter pump continuously even if the heater is not operating. If air temperatures are expected to drop below freezing (32° F/0° C), shut down the heater and winterize it.

For outdoor heaters in freezing climates, shut the heater down and drain it for winter as follows:

1. Turn off electrical supply to the heater and pump.
2. Close main gas control valve and manual gas valve (located outside the heater). Turn switch on heater gas valve to OFF.
3. In northern climates where they may be required, open drain cock located on the bottom of the manifold adapter, and drain the heat exchanger and manifold adapter completely. If heater is below pool water level, be sure to close isolation valves to prevent draining the pool (isolation valves are not required and should not be used on heaters installed above pool water level except when needed for winterizing valves). Assist the draining by blowing out the heat exchanger through the pressure switch fitting with low pressure compressed air (less than 5 PSI or 35 kPa).

#### WARNING

**Explosion hazard.** Purging the system with compressed air can cause components to explode, with risk of severe injury or death to anyone nearby. Use only a low pressure (below 5 PSI or 35 kPa), high volume blower when air purging the heater, pump, filter, or piping.

4. Remove the Water Pressure Switch. Plug the port in the manifold to prevent bugs and dirt from getting into the manifold.
5. Drain the plastic inlet/outlet manifold through the outlet pipe. If the pipe does not drain naturally to the pool, install a drain cock in the outlet pipe to drain the manifold.
6. Cover air inlet grate with a plastic bag to prevent bugs, leaves, etc., from getting into the heater.

**NOTICE:** Water trapped in the heater can cause freeze damage. Allowing the heater to freeze voids the warranty.

To return the heater to service after winterizing:

1. Close drain cock and fittings.
2. Before starting the heater, circulate water through the heater for several minutes until all air noises stop. See also “BEFORE START-UP” ([page 33](#)) and “CARE AND MAINTENANCE” ([page 46](#)).

*(See additional notes under Important Notices in Introduction.)*

## MAINTAINING POOL TEMPERATURE

To maintain pool temperature, make sure that the heater switch and valving are reset to pool settings after using the spa.

### ENERGY SAVING TIPS

1. Keep the pool or spa covered when not in use. This will reduce heating costs, reduce water evaporation, conserve chemicals and reduce load on the filtering system.
2. Reduce pool thermostat to 78° F (25° C) or lower; reduce spa temperature to 100° F (38° C). This is accepted as being the most healthy temperature for swimming by the American Red Cross.
3. Use a time clock to start the filter pump at 6 a.m. or later. The swimming pool loses less heat after daybreak.
4. For pools used only on weekends, lower the thermostat setting by 10° F to 15° F (5° C to 8° C) during the week to reduce heat loss. A properly sized heater will restore normal temperature within one day.
5. Turn the heater off when the pool will not be used for an extended period.
6. Follow a regular program of preventive maintenance for the heater each new swimming season. Check operation of the heater and its controls.

## CHEMICAL BALANCE

### POOL AND SPA WATER

Your pool heater was designed specifically for your spa or pool and will give you many years of trouble-free service, provided you keep your water chemistry in proper condition.

Water chemistry should follow good swimming pool water chemistry practices. When using a chlorinator, install it down stream from the heater and at a lower level than the heater outlet. Install a corrosion resistant positive seal “Check Valve”, (P/N R172288), between the heater and the chlorinator to prevent concentrated chemicals from back-siphoning into the heater. Back-siphoning is most likely to occur when the pump stops, creating a pressure-suction differential. Do NOT sanitize the pool by putting chlorine tablets or sticks into the skimmer(s). When the pump is off, this will cause a high concentration of chlorine to enter the heater, which could cause corrosion damage to the heat exchanger.

Three major items that can cause problems with your pool heater are: improper pH, disinfectant residual, and total alkalinity. These items, if not kept properly balanced, can shorten the life of the heater and cause permanent damage.

### CAUTION

Heat exchanger damage resulting from chemical imbalance is not covered by the warranty.

### WHAT A DISINFECTANT DOES

Two pool guests you do not want are algae and bacteria. To get rid of them and make pool water sanitary for swimming - as well as to improve the water's taste, odor and clarity - some sort of disinfectant must be used.

Chlorine and bromine are universally approved by health authorities and are accepted disinfecting agents for bacteria control.

### WHAT IS A DISINFECTANT RESIDUAL?

When you add chlorine or bromine to the pool water, a portion of the disinfectant will be consumed in the process of destroying bacteria, algae and other oxidizable materials. The disinfectant remaining is called chlorine residual or bromine residual. You can determine the disinfectant residual of your pool water with a reliable test kit, available from your local pool supply store.

You must maintain a disinfectant residual level adequate enough to assure a continuous kill of bacteria or virus introduced into pool water by swimmers, through the air, from dust, rain or other sources.

## CHEMICAL BALANCE, (cont'd.)

It is wise to test pool water regularly. Never allow chlorine residual to drop below 0.6 ppm (parts per million). The minimum level for effective chlorine or bromine residual is 1.4 ppm.

**pH** - The term pH refers to the acid/alkaline balance of water expressed on a numerical scale from 0 to 14. A test kit for measuring pH balance of your pool water is available from your local pool supply store; see [Table 9](#).

Muriatic Acid has a pH of about 0. Pure water is 7 (neutral). Weak Lye solution have a pH of 13-14.

**RULE:** 7.4 to 7.6 is a desirable pH range. It is essential to maintain correct pH, see [Table 9](#).

### If pH becomes too high (over alkaline), it has these effects:

1. Greatly lowers the ability of chlorine to destroy bacteria and algae.
2. Water becomes cloudy.
3. There is more danger of scale formation on the plaster or in the heat exchanger tubing.
4. Filter elements may become blocked.

### If pH is too low (over acid) the following conditions may occur:

1. Excessive eye burn or skin irritation.
2. Etching of the plaster.
3. Corrosion of metal fixtures in the filtration and recirculation system, which may create brown, blue, green, or sometimes almost black stains on the plaster.
4. Corrosion of copper tubes in the heater, which may cause leaks.
5. If you have a sand and gravel filter, the alum used as a filter aid may dissolve and pass through the filter.

**CAUTION:** *Do not test for pH when the chlorine residual is 3.0 ppm or higher, or bromine residual is 6.0 ppm or higher. See your local pool supply store for help in properly balancing your water chemistry.*

**RULE:** Chemicals that are acid lower pH. Chemicals that are alkaline raise pH.

### ALKALINITY High or Low:

"Total alkalinity" is a measurement of the total amount of alkaline chemicals in the water, and control pH to a great degree. (It is not the same as pH which refers merely to the relative alkalinity/acidity balance.) Your pool water's total alkalinity should be 100 - 140 ppm to permit easier pH control.

A total alkalinity test is simple to perform with a reliable test kit. You will need to test about once a week and make proper adjustments until alkalinity is in the proper range. Then, test only once every month or so to be sure it is being maintained. See your local pool dealer for help in properly balancing the water chemistry.

## WATER CHEMISTRY PARAMETERS

Table 9.

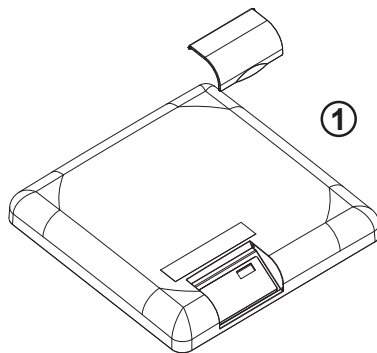
| Disinfectant levels                        | Minimum                                                             | Ideal   | Maximum                     |
|--------------------------------------------|---------------------------------------------------------------------|---------|-----------------------------|
| Free Chlorine, ppm                         | 1.0                                                                 | 2.0-4.0 | 5.0**                       |
| Combined Chlorine, ppm                     | None                                                                | None    | 0.2                         |
| Bromine, ppm                               | 2.0                                                                 | 4-6     | 10.0                        |
| Other Sanitizers                           | Levels not established. Consult local health department before use. |         |                             |
| Chemical Values                            |                                                                     |         |                             |
| pH                                         | 7.2                                                                 | 7.4-7.6 | 7.8**                       |
| Total Alkalinity (Buffering), ppm as CaCO3 | 60                                                                  | 80-100  | 180                         |
| Salt ppm                                   | 2000                                                                | 3200    | 5000**                      |
| Total Dissolved Solids, ppm                | N/A                                                                 | N/A     | 1,500 ppm > TDS at startup* |
| Calcium Hardness, ppm, as CaCO3            | 150                                                                 | 200-400 | 500-1,000                   |
| Heavy Metals                               | None                                                                | None    | None                        |
| Biological Values                          |                                                                     |         |                             |
| Algae                                      | None                                                                | None    | None                        |
| Bacteria                                   | None                                                                | None    | Refer to Local Code         |

\*Start-up TDS includes source water TDS and any other inorganic salt added at start-up.

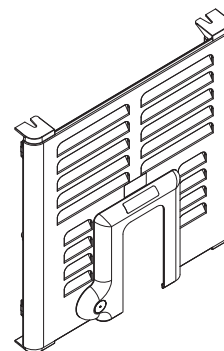
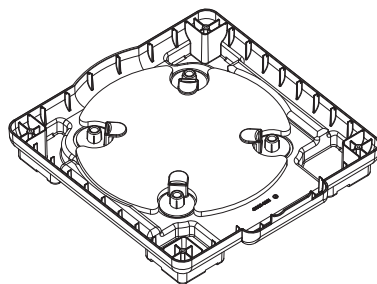
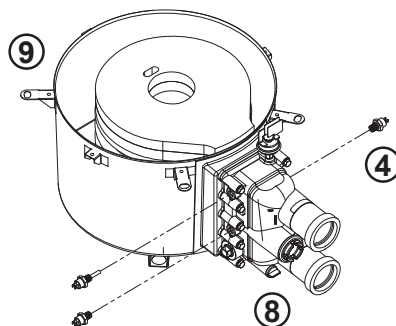
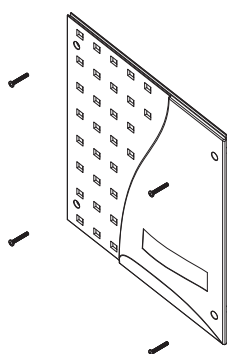
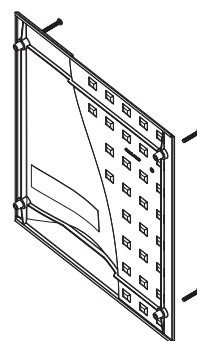
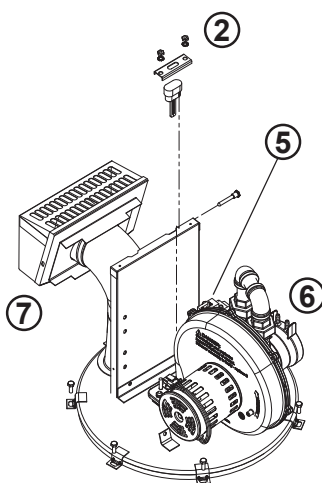
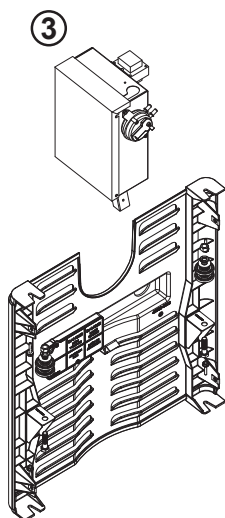
**NOTE (\*\*):** Failure to adhere to the listed water chemistry parameters may result in premature failure of the heat exchanger and will void the heater warranty.

## MASTERTEMP HEATER REPLACEMENT PARTS

For complete  
Electrical System  
parts breakdown  
(Key Nos. 1 through 4),  
See Page 53



For complete  
Burner System  
parts breakdown  
(Key Nos. 5 through 7),  
See Page 51



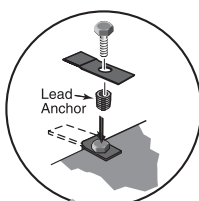
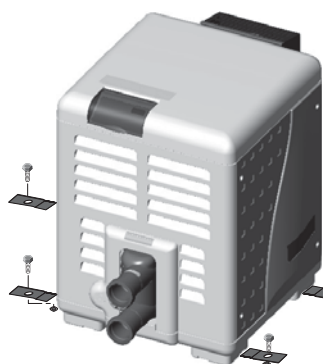
For complete  
Water System  
parts breakdown  
(Key Nos. 8 through 9),  
see Page 52

**Repair Parts are available from your Pentair dealer.**

If your dealer cannot supply you, call Customer Support at 1-800-831-7133.

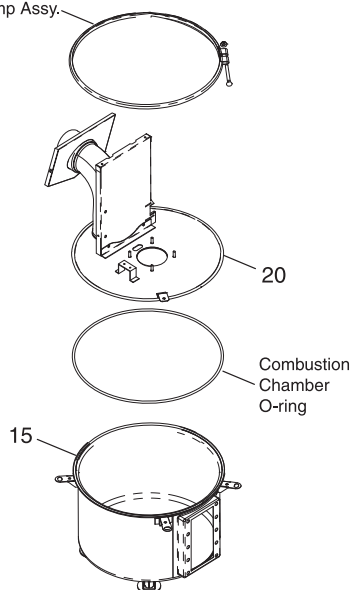
## MASTERTEMP HEATER REPLACEMENT PARTS

For Heater mounting bolts and clamps, purchase separately Bolt Down Bracket Kit, Part No. 460738.

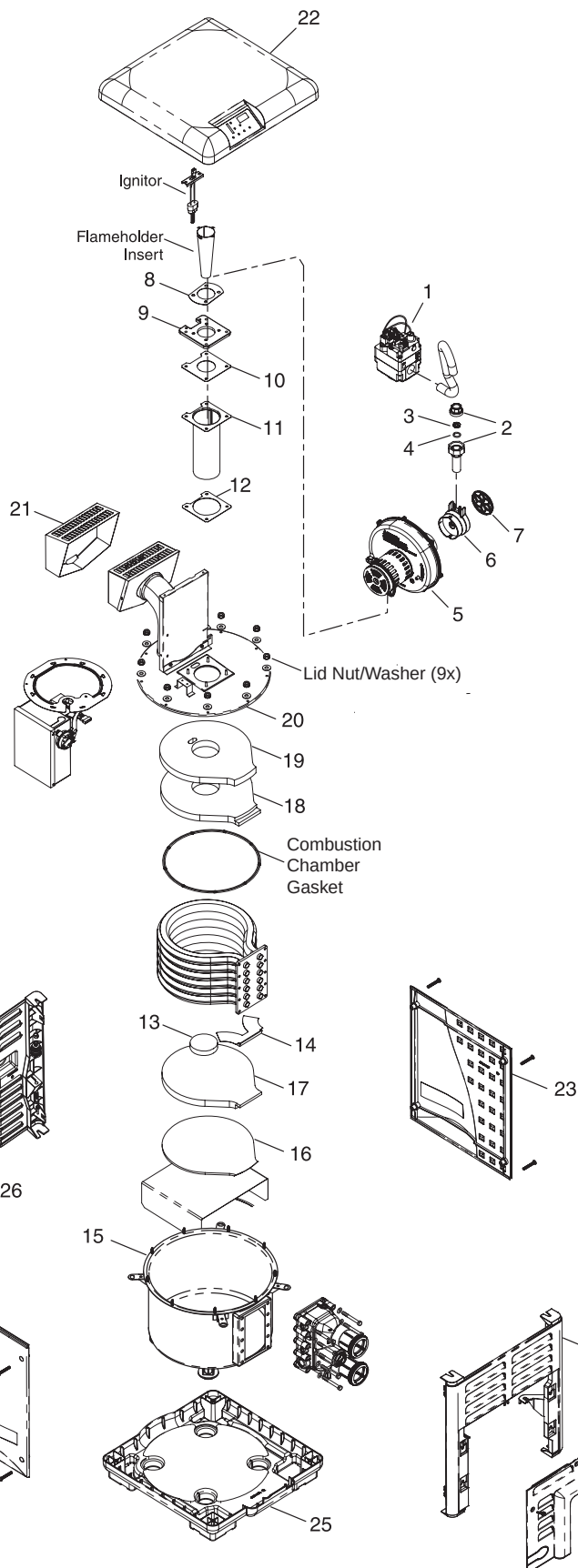


### CLAMP LID TUB DESIGN

Combustion Chamber Clamp Assy.



For heaters manufactured between 1/12/2009 and 10/31/2013 (clamp lid tub design)  
Note: Kits also include Clamp Assembly, O-Ring and Silicon Tube (see page 52)





# MASTERTEMP HEATER REPLACEMENT PARTS

## REPAIR PARTS – BURNER SYSTEM

| Key No. | Part Description                                                                                     | Qty. | Model                                                        |                                                              |                                                              |                                                              |                                                              |
|---------|------------------------------------------------------------------------------------------------------|------|--------------------------------------------------------------|--------------------------------------------------------------|--------------------------------------------------------------|--------------------------------------------------------------|--------------------------------------------------------------|
|         |                                                                                                      |      | 175NA<br>175LP                                               | 200NA<br>200LP                                               | 250NA<br>250LP                                               | 300NA<br>300LP                                               | 400NA<br>400LP                                               |
| 1       | Combination Gas Control Valve Kit                                                                    | 1    | 42001-0051S                                                  | 42001-0051S                                                  | 42001-0051S                                                  | 42001-0051S                                                  | 42001-0051S                                                  |
| 2       | 3/4" Union                                                                                           | 2    | 38404-4097S                                                  | 38404-4097S                                                  | 38404-4097S                                                  | 38404-4097S                                                  | 38404-4097S                                                  |
| 3       | Gas Orifice                                                                                          | 1    |                                                              |                                                              |                                                              |                                                              |                                                              |
| 4       | Gas Orifice O-Ring                                                                                   | 1    |                                                              |                                                              |                                                              |                                                              |                                                              |
| •       | Gas Orifice Kit – NG (Incl. Key Nos. 3 and 4)†                                                       |      | 460794                                                       | 77707-0431                                                   | 460739                                                       | 460753                                                       | 77707-0411                                                   |
| •       | Gas Orifice Kit – Propane (Incl. Key Nos. 3 and 4)†                                                  |      | 460795                                                       | 77707-0461                                                   | 460740                                                       | 460754                                                       | 77707-0441                                                   |
| •       | NG to Propane Conversion Kit (Incl. Key Nos. 3 and 4)†                                               |      | 460794                                                       | 77707-1461                                                   | 460741                                                       | 460755                                                       | 77707-1441                                                   |
| •       | Propane to NG Conversion Kit (Incl. Key Nos. 3 and 4)†                                               |      | 460795                                                       | 77707-1431                                                   | 460742                                                       | 460756                                                       | 77707-1411                                                   |
| 5       | Air Blower Kit                                                                                       |      |                                                              |                                                              |                                                              |                                                              |                                                              |
|         | Natural Gas Units                                                                                    | 1    | 77707-0251                                                   | 77707-0251                                                   | 460743                                                       | 460757                                                       | 77707-0253                                                   |
|         | Propane Units                                                                                        | 1    | 77707-0254                                                   | 77707-0254                                                   | 460744                                                       | 460758                                                       | 77707-0256                                                   |
| •       | Air Orifice Kit (Includes Key Nos. 6 and 7)                                                          | 1    | 460798                                                       | 77707-0111                                                   | 460745                                                       | 460759                                                       | 77707-0113                                                   |
| 6       | Air Orifice                                                                                          | 1    |                                                              |                                                              |                                                              |                                                              |                                                              |
| 7       | Air Orifice Grill                                                                                    | 1    | 42001-0114S                                                  | 42001-0114S                                                  | 42001-0114S                                                  | 42001-0114S                                                  | 42001-0114S                                                  |
| •       | Blower/Adapter Plate Gasket Kit (Includes Key Nos. 8, 9, 10, 12)                                     | 1    | 77707-0011                                                   | 77707-0011                                                   | 77707-0011                                                   | 77707-0011                                                   | 77707-0011                                                   |
| •       | Flameholder Kit (Includes Key Nos. 10, 11, 12, 13 and on 300 & 400 models only - Flameholder Insert) | 1    | 77707-0202                                                   | 77707-0202                                                   | 460746                                                       | 77707-0203                                                   | 77707-0204                                                   |
| 8       | Blower/Adapter Plate Gasket                                                                          | 1    |                                                              |                                                              |                                                              |                                                              |                                                              |
| 9       | Blower Adapter Plate                                                                                 | 1    |                                                              |                                                              |                                                              |                                                              |                                                              |
| 10      | Flameholder/Adapter Plate Gasket                                                                     | 1    |                                                              |                                                              |                                                              |                                                              |                                                              |
| 11      | Flameholder Assembly                                                                                 | 1    |                                                              |                                                              |                                                              |                                                              |                                                              |
| 12      | Flameholder/Combustion Chamber Gasket*                                                               | 1    |                                                              |                                                              |                                                              |                                                              |                                                              |
| 13      | Flameholder Insulation Cap                                                                           | 1    |                                                              |                                                              |                                                              |                                                              |                                                              |
| •       | Flameholder Insert                                                                                   | 1    |                                                              |                                                              |                                                              |                                                              |                                                              |
| 14      | Condensate Evaporator Plate                                                                          | 1    |                                                              |                                                              |                                                              |                                                              |                                                              |
| 15      | One Piece Metal Chamber/Combustion Chamber Assembly                                                  | 1    | 474095♦<br>474957♦♦<br>42001-0200S♦♦♦<br>77707-0008          | 474095♦<br>474957♦♦<br>42001-0200S♦♦♦<br>77707-0008          | 474095♦<br>474957♦♦<br>42001-0200S♦♦♦<br>77707-0008          | 474095♦<br>474957♦♦<br>42001-0200S♦♦♦<br>77707-0008          | 474095♦<br>474957♦♦<br>42001-0200S♦♦♦<br>77707-0008          |
| •       | Insulation Kit (Includes Key No. 13,14,16,17,18,19)                                                  | 1    |                                                              |                                                              |                                                              |                                                              |                                                              |
| 16      | Bottom Outer Insulation Blanket*                                                                     | 1    |                                                              |                                                              |                                                              |                                                              |                                                              |
| 17      | 1" Bottom Inner Insulation                                                                           | 1    |                                                              |                                                              |                                                              |                                                              |                                                              |
| 18      | 1" Top Insulation                                                                                    | 1    |                                                              |                                                              |                                                              |                                                              |                                                              |
| 19      | Top Outer Insulation Blanket*                                                                        | 1    |                                                              |                                                              |                                                              |                                                              |                                                              |
| •       | Lower Enclosure Insulation                                                                           | 1    | 42001-0074S                                                  | 42001-0074S                                                  | 42001-0074S                                                  | 42001-0074S                                                  | 42001-0074S                                                  |
| 20      | One Piece Metal Elbow/Combustion Chamber Cover Assembly                                              | 1    | 474094♦<br>474958♦♦<br>42001-0214S♦♦♦<br>474201♦<br>474952♦♦ | 474094♦<br>474958♦♦<br>42001-0214S♦♦♦<br>474201♦<br>474952♦♦ | 474094♦<br>474958♦♦<br>42001-0214S♦♦♦<br>474201♦<br>474952♦♦ | 474094♦<br>474958♦♦<br>42001-0214S♦♦♦<br>474201♦<br>474952♦♦ | 474094♦<br>474958♦♦<br>42001-0214S♦♦♦<br>474201♦<br>474952♦♦ |
| •       | Combustion Chamber O-Ring Kit                                                                        | 1    |                                                              |                                                              |                                                              |                                                              |                                                              |
| 21      | Metal Vent Cover                                                                                     | 1    | 42002-0005S                                                  | 42002-0005S                                                  | 42002-0005S                                                  | 42002-0005S                                                  | 42002-0005S                                                  |
|         | Cover Assembly                                                                                       | 1    | 42001-0214S                                                  | 42001-0214S                                                  | 42001-0214S                                                  | 42001-0214S                                                  | 42001-0214S                                                  |
| 22      | Heater Top                                                                                           | 1    | 42002-0034Z                                                  | 42002-0034Z                                                  | 42002-0034Z                                                  | 42002-0034Z                                                  | 42002-0034Z                                                  |
| 23      | Side Panel {Service Panel}                                                                           | 1    | 42002-0039                                                   | 42002-0039                                                   | 42002-0039                                                   | 42002-0039                                                   | 42002-0039                                                   |
| 24      | Side Panel {Manifold}                                                                                | 1    | 42002-0033                                                   | 42002-0033                                                   | 42002-0033                                                   | 42002-0033                                                   | 42002-0033                                                   |
| 25      | Heater Bottom                                                                                        | 1    | 42002-0031                                                   | 42002-0031                                                   | 42002-0031                                                   | 42002-0031                                                   | 42002-0031                                                   |
| 26      | Side Panel {Flue Stack}                                                                              | 1    | 42002-0032                                                   | 42002-0032                                                   | 42002-0032                                                   | 42002-0032                                                   | 42002-0032                                                   |
| 27      | J-Box Cover                                                                                          | 1    | 42002-0041                                                   | 42002-0041                                                   | 42002-0041                                                   | 42002-0041                                                   | 42002-0041                                                   |
| 28      | Screw Kit, Panel                                                                                     | 1    | 474292                                                       | 474292                                                       | 474292                                                       | 474292                                                       | 474292                                                       |
| •       | Combustion Air Intake Duct Connection Kit                                                            | 1    | 461031                                                       | 461031                                                       | 461031                                                       | 461031                                                       | 461031                                                       |

\* Not available separately.

† Not included with heater. Order separately.

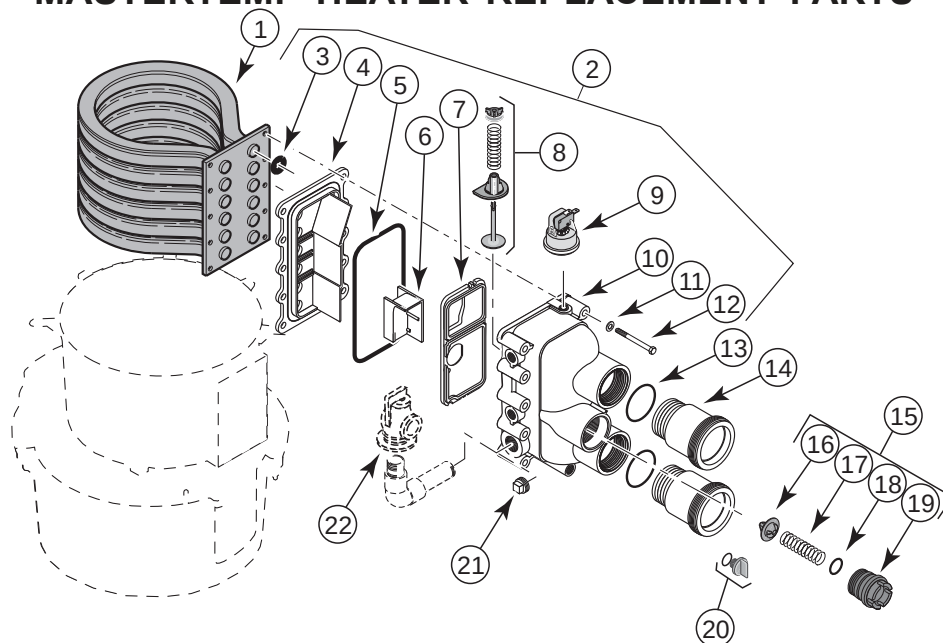
♦ For heaters manufactured between 1/12/2009 and 10/31/2013 (clamp lid tub design)  
Note: Kits also include Clamp Assembly, O-Ring and Silicon Tube.

♦♦ For heater manufactured AFTER 10/31/2013 (New 9-bolt lid tub design)

♦♦♦ For heater manufactured BEFORE 1/12/2009



## MASTERTEMP HEATER REPLACEMENT PARTS



### REPAIR PARTS – WATER SYSTEM

| Key No. | Part Description                                                                                             | Qty. | Model                          |                               |                       |                               |
|---------|--------------------------------------------------------------------------------------------------------------|------|--------------------------------|-------------------------------|-----------------------|-------------------------------|
|         |                                                                                                              |      | 175NA - 200NA<br>175LP - 200LP | 250NA<br>250LP                | 300NA<br>300LP        | 400NA<br>400LP                |
| 1       | Tube Sheet Coil Assembly Kit ( <b>NA, LP Series</b> )<br>(Includes Key No.3)                                 | 1    | 77707-0232<br>474058♦          | 460747<br>474059♦             | 77707-0233<br>474060♦ | 77707-0234<br>474061♦         |
| 1       | Tube Sheet Coil Assembly Kit ( <b>NA - HD Series</b> )<br>(Includes Key No.3)                                | 1    | —<br>—                         | 473710<br>474063♦             | —<br>—                | 77707-0244<br>474065♦         |
| 1       | Tube Sheet Coil / Combustion Chamber Kit ( <b>ASME SERIES</b> )<br>Bronze Header - Key Nos. 3-12, 15, 20-22, | 1    | —<br>472732Z                   | 460941<br>474097♦<br>474955♦♦ | —<br>—<br>—           | 460940<br>474096♦<br>474956♦♦ |
| 1       | Tube Sheet Coil / Combustion Chamber Kit ( <b>HD ASME SERIES</b> )                                           | —    | —                              | 474349, 474954♦♦              | —                     | 474350, 474953♦♦              |
| 2       | Manifold Kit (Includes Key Nos. 3-14, 21, &<br>Key Nos. 5-7 in "Electrical System", Page 53                  | 1    | 77707-0014<br>474200           | 460748<br>474200              | 77707-0015<br>474200  | 77707-0016<br>474200          |
| •       | Basic Manifold Kit (includes Key No. 3,5,10-14)                                                              | ( )  | 77707-0117(6)                  | 460749(8)                     | 77707-0118(10)        | 77707-0119(12)                |
| 3       | Coil/Tubesheet Sealing O-Ring Kit                                                                            | ( )  | 77707-0117(6)                  | 460749(8)                     | 77707-0118(10)        | 77707-0119(12)                |
| 4       | Manifold Bottom Plate                                                                                        | 1    |                                |                               |                       |                               |
| 5       | Manifold O-Ring                                                                                              | 1    |                                |                               |                       |                               |
| •       | O-Ring Kit (Incl. Key Nos. 3, 5)                                                                             | 1    | 77707-0120                     | 77707-0120                    | 77707-0120            | 77707-0120                    |
| 6       | Manifold Insert*                                                                                             | 1    |                                |                               |                       |                               |
| 7       | Manifold Baffle Plate                                                                                        | 1    |                                |                               |                       |                               |
| 8       | Manifold Bypass Valve                                                                                        | 1    | 77707-0001                     | 77707-0001                    | 77707-0001            | 77707-0001                    |
| 9       | Water Pressure Switch                                                                                        | 1    | 42001-0060S                    | 42001-0060S                   | 42001-0060S           | 42001-0060S                   |
| 10      | Manifold                                                                                                     | 1    |                                |                               |                       |                               |
| 11      | 5/16" Washer, S.S.                                                                                           | 10   |                                |                               |                       |                               |
| 12      | 5/16x18x2-3/4" Hex Cap screw                                                                                 | 10   |                                |                               |                       |                               |
| 13      | Connector Tube O-Ring                                                                                        | 2    |                                |                               |                       |                               |
| 14      | Connector Tube Kit (Includes 1 Connector Tube<br>and 1 O-Ring)                                               | 2    | 77707-0017                     | 77707-0017                    | 77707-0017            | 77707-0017                    |
| 15      | Thermal Regulator Kit<br>(Incl. Key No. 16, 17, 18, 19 and Spring Clip)                                      | 1    | 77707-0010                     | 77707-0010                    | 77707-0010            | 77707-0010                    |
| 16      | Thermal Regulator (Includes Spring Clip)                                                                     | 1    | 38000-0007S                    | 38000-0007S                   | 38000-0007S           | 38000-0007S                   |
| 17      | Thermal Regulator Spring                                                                                     | 1    |                                |                               |                       |                               |
| 18      | Thermal Regulator Cap O-Ring                                                                                 | 1    | 35505-1313                     | 35505-1313                    | 35505-1313            | 35505-1313                    |
| •       | Thermal Regulator Spring Clip                                                                                | 1    |                                |                               |                       |                               |
| 19      | Thermal Regulator Cap                                                                                        | 1    |                                |                               |                       |                               |
| 20      | Drain Plug                                                                                                   | 1    | U178-920P                      | U178-920P                     | U178-920P             | U178-920P                     |
| 21      | 3/4" Pipe Plug                                                                                               | 1    | U78-60ZPS                      | U78-60ZPS                     | U78-60ZPS             | U78-60ZPS                     |
| 22      | Pressure Relief Valve (Recommended -<br>(Purchase Separately)                                                | 1    | 38674-0719                     | 38674-0719                    | 38674-0719            | 38674-0719                    |

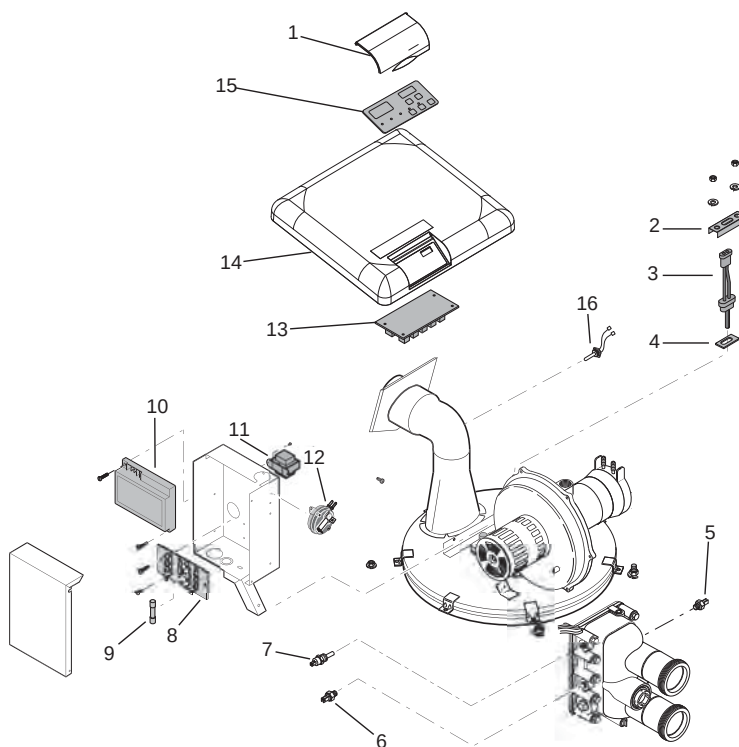
\* Not available separately. • Not illustrated.

♦ For heaters manufactured between 1/12/2009 and 10/31/2013 (clamp lid tub design) - Note: Kits also include Clamp Assembly, O-Ring and Silicon Tube.

♦♦ For ASME heater manufactured AFTER 10/31/2013 (New 9-bolt lid tub design)

♦♦♦ For heater manufactured BEFORE 1/12/2009

## MASTERTEMP HEATER REPLACEMENT PARTS



### REPAIR PARTS – ELECTRICAL SYSTEM

| Key No. | Part Description                                   | Qty. | Model                          |                |                |                |
|---------|----------------------------------------------------|------|--------------------------------|----------------|----------------|----------------|
|         |                                                    |      | 175NA - 200NA<br>175LP - 200LP | 250NA<br>250LP | 300NA<br>300LP | 400NA<br>400LP |
| 1       | Heater Display Cover                               | 1    | 42002-0035                     | 42002-0035     | 42002-0035     | 42002-0035     |
| 2       | Igniter Bracket                                    | 1    | 42001-0030S                    | 42001-0030S    | 42001-0030S    | 42001-0030S    |
| 3       | Igniter/Igniter Gasket Kit Incl. Key Nos. 3 and 4) | 1    | 77707-0054                     | 77707-0054     | 77707-0054     | 77707-0054     |
| 4       | Igniter Gasket                                     | 1    | 42001-0066S                    | 42001-0066S    | 42001-0066S    | 42001-0066S    |
| 5       | Automatic Gas Shutoff Switch (AGS)                 | 1    | 42002-0025S                    | 42002-0025S    | 42002-0025S    | 42002-0025S    |
| 6       | High Limit Switch                                  | 1    | 42001-0063S                    | 42001-0063S    | 42001-0063S    | 42001-0063S    |
| 7       | Thermistor                                         | 1    | 42001-0053S                    | 42001-0053S    | 42001-0053S    | 42001-0053S    |
| 8       | Terminal Board                                     | 1    | 42001-0056S                    | 42001-0056S    | 42001-0056S    | 42001-0056S    |
| 9       | Fireman's Switch Fuse (1.25A, 1-1/4")              | 1    | 32850-0099                     | 32850-0099     | 32850-0099     | 32850-0099     |
| 10      | Ignition Control Module                            | 1    | 42001-0052S                    | 42001-0052S    | 42001-0052S    | 42001-0052S    |
| 11      | Transformer, 120/240V                              | 1    | 42001-0107S                    | 42001-0107S    | 42001-0107S    | 42001-0107S    |
| 12      | Air Flow Switch                                    | 1    | 42001-0061S                    | 42001-0061S    | 42001-0061S    | 42001-0061S    |
| 13      | Control Board Kit (NA, LP Series)                  | 1    | 42002-0007S                    | 42002-0007S    | 42002-0007S    | 42002-0007S    |
| •       | Heater Wiring Harness - 120/240V                   | 1    | 42001-0104S                    | 42001-0104S    | 42001-0104S    | 42001-0104S    |
| •       | 120/240 Volt Plug Kit                              | 1    | 42001-0105S                    | 42001-0105S    | 42001-0105S    | 42001-0105S    |
| 14      | Heater, Top                                        | 1    | 42002-0034Z                    | 42002-0034Z    | 42002-0034Z    | 42002-0034Z    |
| 15      | Membrane Pad (NA, LP Series)                       | 1    | 472610Z                        | 472610Z        | 472610Z        | 472610Z        |
| 16      | Stack Flue Sensor                                  | 1    | 42002-0024S                    | 42002-0024S    | 42002-0024S    | 42002-0024S    |

• Not available separately.

\* Kit parts not available separately.

# NOTES

[illegible]



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