

*Beckett*

PARTS & ACCESSORIES

# AquaSmart™

## Model 7600

Advanced Microprocessor Boiler Control



**AquaSmart®**

### Description / Applications

The Beckett AquaSmart™ is an advanced boiler control designed for use on residential and light commercial boiler systems. All models include the option of enabling Beckett HeatManager™ dynamic temperature reset that, when selected, provides up to 20% fuel consumption savings. The control includes a backlit LCD digital display with touch pad to easily program temperature limits, differentials, and other advanced options. The AquaSmart™ also has memory storage of system history for help with diagnostics and troubleshooting.

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## Features

- HeatManager™ dynamic temperature reset for additional energy savings
  - **DOE 2012 Compliant**
  - **Meets NR CAN proposed 2012 requirements**
- Advanced microprocessor-based design
- Backlit LCD digital display with installer programming touch pad
- Quick access to system cycle history
- Onboard power disconnect switch (optional)
- High/Low limit and High/Low differential adjustments
- 24Vac Thermostat compatible
- Circulator control - 120Vac
- Zone Control - 120Vac (programmable priority override for domestic hot water)
- Temperature sensor mounts in standard immersion wells
- Compatible retrofit for most standard boiler temperature controls
- Programmable circulator-on and -off delays
- Helps prevent freeze-up by energizing circulator and ZC if an error condition is detected.
- Periodically exercises circulator pump to help prevent sieze-up.
- Cold-start compatible
- 6-pin vent damper receptacle on 7500B for easy wiring to most vent dampers.



### WARNING

**Electrical Shock, Fire, Explosion and Burn Hazards**

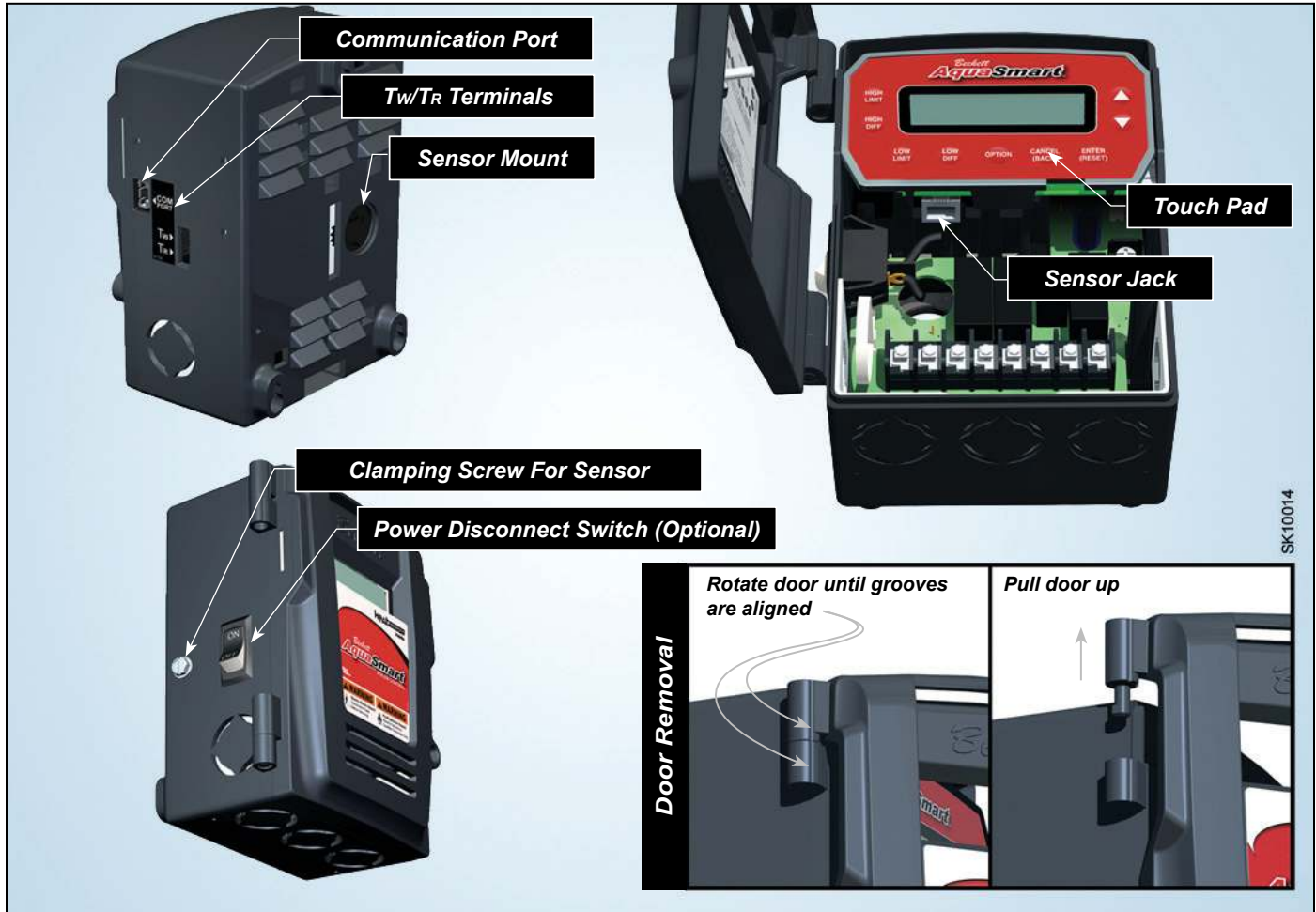
*This control must be installed, adjusted and put into operation only by a trained, licensed, qualified professional or service agency in accordance with the National Electric Code ANSI/NFPA 70 (Canada CSA C22.1) state, local codes and authorities having jurisdiction.*

- The installer must carefully read and follow the installation and service instructions contained in this manual and make them available to the equipment owner, so they can be kept for future reference.
- This product is not suitable for temperature control of pools, spas, or Jacuzzis.
- This product is not to be used as a step or a shelf.

Figure 1 - Getting to know the AquaSmart 7600 Series Control

**⚠ WARNING** Electrical Shock Hazard

The AquaSmart control should only be operated with the door attached and securely closed.



## Technical Specifications

**⚠ CAUTION** Do Not Use This Control in an Application that is Not Within the Ratings Listed in This Section. Improper Control Operation May Result.

### Electrical Ratings

**Input Voltage:** 120 Vac - 50/60 Hz.

**Input Current:** 0.1 A + B1 + C1 + ZC

**MAX Input Current:** 20A (Reduce to 15A if optional power disconnect switch is used)

**24 Vac Thermostat Anticipator Current:** 0.1 Amp.

**Burner Current Rating (B1):**

7600A (oil): 7.4 A at 120 Vac FLA; 44.4 A inrush LRA.

7600B (gas): 1.25 A at 24 Vac; 30 VA (total load).

**Circulator Current Rating (C1):** 7.4 A at 120 Vac FLA; 44.4 A inrush LRA.

**Zone Control Current Rating (ZC):** 7.4 A at 120 Vac FLA; 44.4 A inrush LRA.

### Temperature Ranges and Differentials

- High Limit Setting Range: 100 to 220°F (37 to 104°C)
- High Limit Differential Range: 5 to 45°F (2 to 25°C)
- Low Limit Setting Range: 100 to 205°F (37 to 96°C)
- Low Limit Differential Range: 10 to 45°F (5 to 25°C)
- Factory Range Stops available - consult factory

### Environmental Ratings

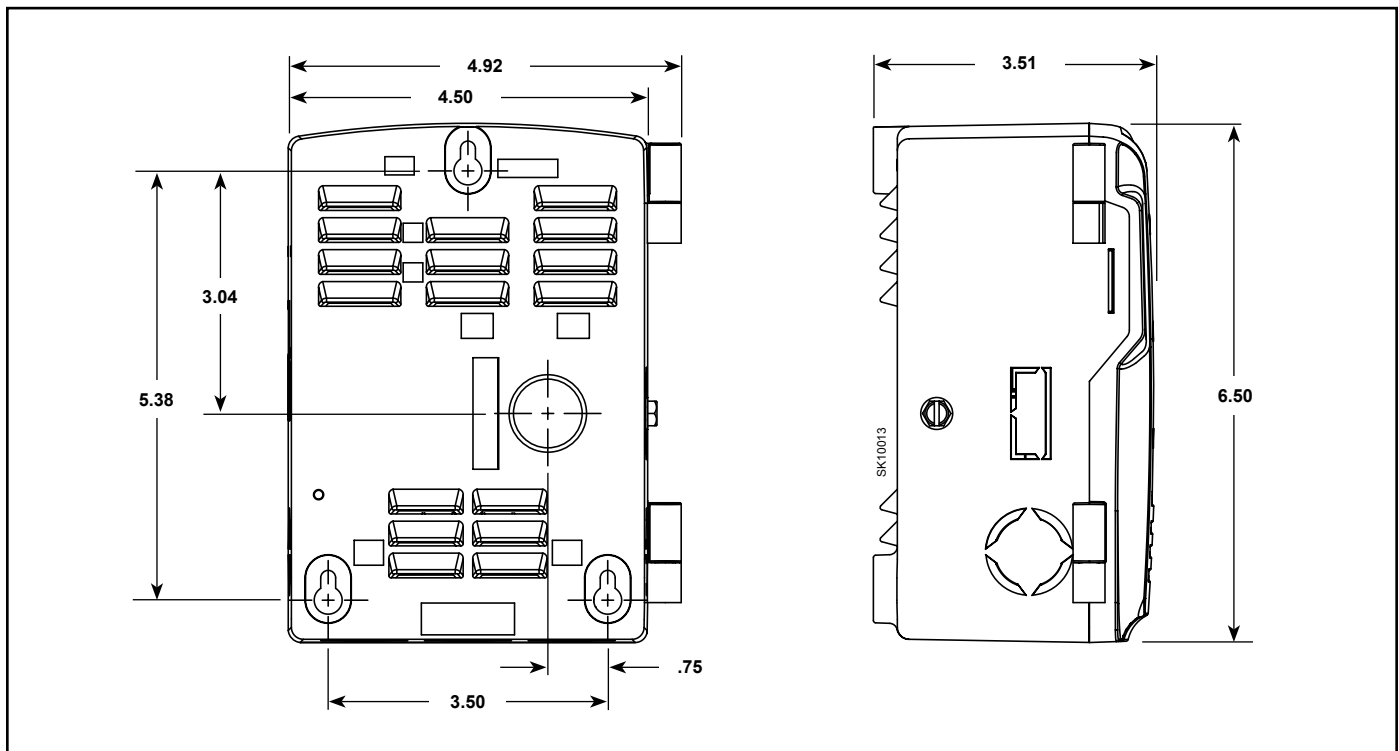
- Storage Temperature: -40 to +150°F (-40 to +65°C)
- Operating Temperature: -4 to +150°F (-20 to +65°C)  
7600B at 50 Hz: -4 to +140°F (-20 to +60°C)
- Maximum Sensing Element Temperature: 250°F (121°C)
- Relative Humidity: 5 to 85% RH, non-condensing and non-crystallizing



### Approvals

Underwriters Laboratories Listed to UL353, UL1998 for U.S. and Canada; CSA C22.2 No. 24

Figure 2 - Basic Dimensions (inches)



## Installation

### Mounting

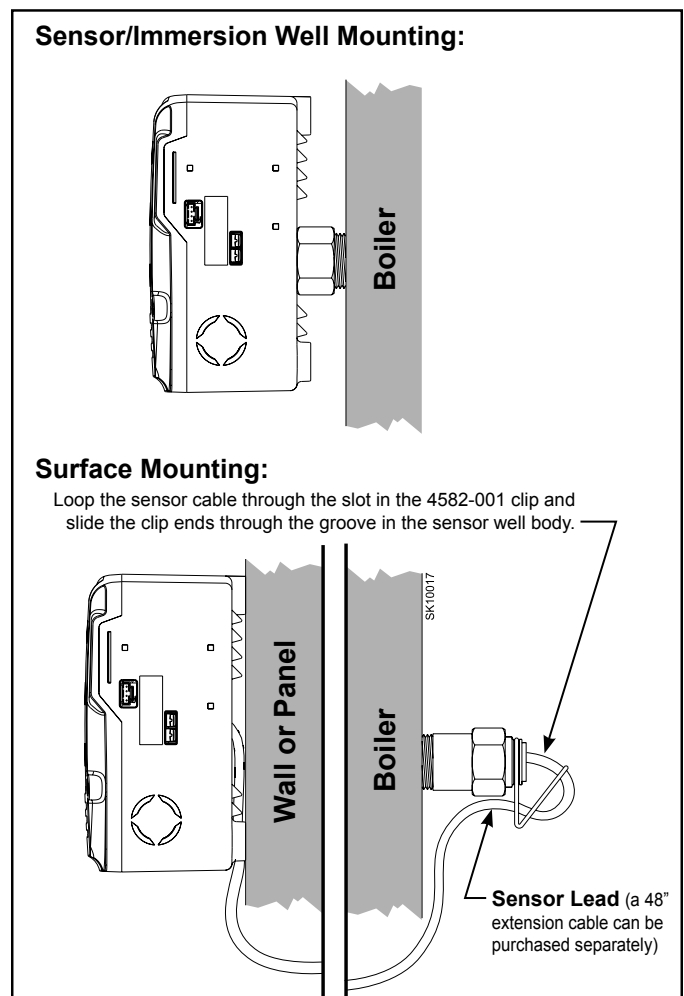
**OEM Installation:** When replacing an OEM-installed AquaSmart, consult the appliance manufacturer's wiring diagrams and instructions for additional information.

**Retrofit Installation:** The AquaSmart can be used to replace most standard boiler temperature controls. For a cross-reference of compatible replacements, refer to **Table 1**.

There are two basic methods for mounting the AquaSmart to the boiler as outlined in **Figure 3**.

1. **Sensor/Immersion Well Mounting** – This is the most common method. If the existing well is not suitable for any reason, a standard design aftermarket immersion well with the proper dimensions can be purchased from a HVAC distributor. The AquaSmart can then be mounted in the typical way.
2. **Surface Mounting** – This is sometimes required and is part of the AquaSmart base design. The base has adequate clearance built-in to accommodate the temperature sensor lead exiting the back of the control. A remote mounting kit (Pt. No. 7600RMU) that includes a 48" extension cable and mounting screws can be purchased separately for applications where needed.

Figure 3 - Mounting Options



# AquaSmart Models and Cross-Reference Guide

**Table 1a - Direct Replacements**

| Honeywell  | Beckett Replacement | Notes   |
|--|---------------------|---|
| L7148F (All)<br>L8148E (All)   | <b>7600B</b>        | Must confirm that 7600 VA rating is adequate to meet VA requirements of system.<br>Make sure 7600 B1 output does not exceed 1.25A @ 24VAC (30 VA).<br>7600 outputs are not rated for 240 VAC.<br>B2, Tw and Tr terminals replace TV, T and Z, respectively. |
| L8124A (All)<br>L8124C (All)   | <b>7600A</b>        | 7600 outputs are not rated for 240 VAC.   |
| L7124A/C (All)<br>L7148A (All)<br>L7224A/C/U (All)<br>L7248A/C (All) | <b>7600A</b>        | The 7600 has no Honeywell EnviraCOM™ Communications port.<br>The diagnostic LED lights are replaced by the 7600's display.  |
| L8148A (All)   | <b>7600A</b>        | 7600 outputs are not rated for 240 VAC.<br>B1 terminal on 7600 utilizes a 1/4" quick connect.<br>Set low limit on 7600 to OFF.  |
| L8124E 1016<br>L8148E 1265   | <b>7600B</b>        | 7600 outputs are not rated for 240 VAC.<br>B2, Tw and Tr terminals replace TV, T and Z, respectively.   |
| L8124M (All)   | <b>7600A</b>        | For replacement with the 7600: Turn low limit off so the circulator is controlled directly by the thermostat and ZC is constantly powered.  |
| L8151A   | <b>7600A</b>        | 7600 outputs are not rated for 240 VAC.<br>Remote mount sensor cable needed (Part No. 52120)  |
| Hydrolevel   | Beckett Replacement | Notes   |
| 3100   | <b>7600B</b>        | Not a suitable replacement if Low Water Cutoff (LWCO) functionality of the 3100 is used.  |
| 3150   | <b>7600A</b>        | Not a suitable replacement if Low Water Cutoff (LWCO) functionality of the 3150 is used.  |
| Carlin   | Beckett Replacement | Notes   |
| 90524A   | <b>7600A</b>        | Make sure 7600 outputs do not exceed 7.4A.<br>Available operating limit and differential ranges are not equivalent. Compare the settings to the AquaSmart ranges before replacing.<br>The diagnostic LED lights are replaced by the 7600's display.         |
| White Rodgers  | Beckett Replacement | Notes   |
| 11C15-11   | <b>7600A</b>        | Make sure 7600 outputs do not exceed 7.4A @ 120 VAC. 7600 outputs are not rated for 240 VAC.  |
| 8B48A-217  | <b>7600A</b>        |   |
| 11C30-3<br>11B54-4   | <b>7600A</b>        | Make sure 7600 outputs do not exceed 7.4A @ 120 VAC. 7600 outputs are not rated for 240 VAC.<br>Available operating limit and differential ranges are not equivalent. Compare the settings to the AquaSmart ranges before replacing.                        |
| 8F48A-351<br>8B43A-601   | <b>7600B</b>        |   |
| 11C61-12   | <b>7600A</b>        | Not a suitable replacement if SPDT switch action is required; only break-on-rise available on 7600.<br>Make sure 7600 outputs do not exceed 7.4A @ 120 VAC. 7600 outputs are not rated for 240 VAC.   |



## **WARNING** Burn, Scald, Explosion, and Equipment Malfunction Hazard

**Replacement of the following controls must be done only by a qualified service agency or technician who is trained and experienced in the use of boiler controls.**

Carefully follow these guidelines and the directions provided by the manufacturer of the control being replaced.

**Note:** Beckett assumes no liability for incorrect installation or replacement.

**Table 1b - Functional Replacement (Advanced Wiring Needed)**

*(Table continued on next page)*

| Honeywell  | Beckett Replacement   | Notes  |
|--|---|--|
| L4006A (All)<br>L4006G 1022<br>L4006H 1004<br>L4008A (All)<br>L4080B/D | <b>7600A or 7600B</b><br>(Based on System Voltage Requirements) | Make sure 7600 outputs do not exceed 7.4A @ 120 VAC. 7600 outputs are not rated for 240 VAC.<br>7600 will require an additional wire (L2) for operation. Short TW-TR terminals. C1, C2, ZC, and ZR are unused.<br>Set low limit on 7600 to OFF.<br>Available operating limit and/or differential ranges may not be equivalent. Compare the settings to the AquaSmart ranges before replacing.<br>To use with a millivolt system, an appropriate voltage relay with isolated gold plated contacts must be added to switch the millivolt circuit.  |
| L4006E (All)<br>L4008E (All)<br>L4080F/G                               | <b>7600A or 7600B</b><br>(Based on System Voltage Requirements) | Requires the addition of a manual-reset high limit.<br>Make sure 7600 outputs do not exceed 7.4A @ 120 VAC. 7600 outputs are not rated for 240 VAC.<br>7600 will require an additional wire (L2) for operation. Short TW-TR terminals. C1, C2, ZC, and ZR are unused.<br>Set low limit on 7600 to OFF.<br>Available operating limit and/or differential ranges may not be equivalent. Compare the settings to the AquaSmart ranges before replacing.<br>To use with a millivolt system, an appropriate voltage relay with isolated gold plated contacts must be added to switch the millivolt circuit. |

**Table 1b (continued from previous page)**

| Honeywell  | Beckett Replacement   | Notes  |
|--|---|--|
| L4081A/B<br>L6081A/C   | <b>7600A or 7600B</b><br>(Based on System Voltage Requirements) | Remove switching relay, if used, from the system when replacing the L4081 or L6081. Make sure 7600 outputs do not exceed 7.4A @ 120 VAC. 7600 outputs are not rated for 240 VAC.   |
| L6006A (All)<br>L6006C 1018<br>L6008A 1192<br>L6008A 1242          | <b>7600A or 7600B</b><br>(Based on System Voltage Requirements) | Not a suitable replacement if SPDT switch action is required; only break-on-rise available on 7600. To use with a millivolt system an appropriate voltage relay with isolated gold plated contacts must be added to switch the millivolt circuit. Make sure 7600 outputs do not exceed 7.4A @ 120 VAC. 7600 outputs are not rated for 240 VAC. 7600 will require an additional wire (L2) for operation. Short Tw-Tr terminals. C1, C2, ZC, and ZR are unused. Set low limit on 7600 to OFF. Available operating limit and/or differential ranges may not be equivalent. Compare the settings to the AquaSmart ranges before replacing. |
| L8124B 1039<br>L8148J 1009   | <b>7600A or 7600B</b><br>(Based on System Voltage Requirements) | To use with a millivolt system an appropriate voltage relay with isolated gold plated contacts must be added to switch the millivolt circuit. 7600 outputs are not rated for 240 VAC.  |
| Carlin   | Beckett Replacement   | Notes  |
| 90200A   | <b>7600A or 7600B</b><br>(Based on System Voltage Requirements) | Make sure 7600 outputs do not exceed 7.4A. Set low limit on 7600 to OFF. Available operating limit and differential ranges are not equivalent. Compare the settings to the AquaSmart ranges before replacing.  |
| 90000 (All)<br>90200E<br>90200EL<br>90300B                         | <b>7600A or 7600B</b><br>(Based on System Voltage Requirements) | Requires the addition of a manual-reset high limit. Make sure 7600 outputs do not exceed 7.4A. Set low limit on 7600 to OFF. Available operating limit and differential ranges are not equivalent. Compare the settings to the AquaSmart ranges before replacing.  |
| 90200D   | <b>7600A or 7600B</b><br>(Based on System Voltage Requirements) | Not a suitable replacement if SPDT switch action is required; only break-on-rise available on 7600. Make sure 7600 outputs do not exceed 7.4A. Set low limit on 7600 to OFF. Available operating limit and differential ranges are not equivalent. Compare the settings to the AquaSmart ranges before replacing.  |
| White Rodgers  | Beckett Replacement   | Notes  |
| 11B06-1<br>11D18-1<br>11B18-101<br>11B30-104<br>11B02-1<br>1145-33 | <b>7600A or 7600B</b><br>(Based on System Voltage Requirements) | Make sure 7600 outputs do not exceed 7.4A @ 120 VAC. 7600 outputs are not rated for 240 VAC. 7600 will require an additional wire (L2) for operation. Short Tw-Tr terminals. C1, C2, ZC, and ZR are unused. Set low limit on 7600 to OFF.  |
| 11B06-46<br>11B95-31<br>11B18-153                                  | <b>7600A or 7600B</b><br>(Based on System Voltage Requirements) | Make sure 7600 outputs do not exceed 7.4A @ 120 VAC. 7600 outputs are not rated for 240 VAC. 7600 will require an additional wire (L2) for operation. Short Tw-Tr terminals. C1, C2, ZC, and ZR are unused. Set low limit on 7600 to OFF. Available operating limit and/or differential ranges are not equivalent. Compare the settings to the AquaSmart ranges before replacing.  |
| 11D82-1<br>11D31-1<br>1131-102<br>1127-2<br>11A79-2                | <b>7600A or 7600B</b><br>(Based on System Voltage Requirements) | Not a suitable replacement if SPDT switch action is required; only break-on-rise available on 7600. 7600 outputs are not rated for 240 VAC. 7600 will require an additional wire (L2) for operation. Short Tw-Tr terminals. C1, C2, ZC, and ZR are unused. Set low limit on 7600 to OFF.   |
| 1127-9   | <b>7600A or 7600B</b><br>(Based on System Voltage Requirements) | Not a suitable replacement if SPDT switch action is required; only break-on-rise available on 7600. 7600 outputs are not rated for 240 VAC. 7600 will require an additional wire (L2) for operation. Short Tw-Tr terminals. C1, C2, ZC, and ZR are unused. Set low limit on 7600 to OFF. Available operating limit and/or differential ranges may not be equivalent. Compare the settings to the AquaSmart ranges before replacing.  |
| 11B27-9  | <b>7600A or 7600B</b><br>(Based on System Voltage Requirements) | Requires the addition of a manual-reset high limit. Make sure 7600 outputs do not exceed 7.4A @ 120 VAC. 7600 outputs are not rated for 240 VAC. 7600 will require an additional wire (L2) for operation. Short Tw-Tr terminals. C1, C2, ZC, and ZR are unused. Set low limit on 7600 to OFF. Available operating limit and/or differential ranges are not equivalent. Compare the settings to the AquaSmart ranges before replacing.  |
| 8J48A-209  | <b>7600A or 7600B</b><br>(Based on System Voltage Requirements) | To use with a millivolt system an appropriate voltage relay with isolated gold plated contacts must be added to switch the millivolt circuit.  |

## Removing the Control to be Replaced

### **⚠ WARNING** Electrical shock hazard.

**Disconnect all electrical power to the appliance circuit before replacing the control. There may be more than one disconnect switch.**

1. Compare the attached wires to available wiring diagrams on the control cover and to the devices to which they can be traced. If wiring diagrams have been lost they are available later in this manual.
2. Label each wire accordingly, to ensure accurate reconnection. (Masking tape works well for labeling.)
3. Remove each wire from the old control. Make sure each label is intact.
4. Loosen the control mounting arrangement and remove the control from the system.
5. Make note of the temperature settings for high limit, low limit and differentials. This will provide important reference data for the new control adjustment. Please note that differentials may be used differently in other manufacturer's controls. See **Figure 19 & 16** toward end of manual for a description of how the AquaSmart's differentials work. Consult the manual of the control being replaced for information regarding its differentials.

## Installing the Temperature Sensor

**This is very important for successful control operation.**

### **⚠ WARNING** Burn and Scald Hazard

**Excessive water temperatures could cause explosion, burns, scalding, pressure relief flooding and fitting leaks.**

- Carefully follow the outlined procedures for temperature sensor installation to ensure accurate water temperature sensing and effective control operation.
- Make sure the plumbing for domestic hot water has anti-scald valve protection.

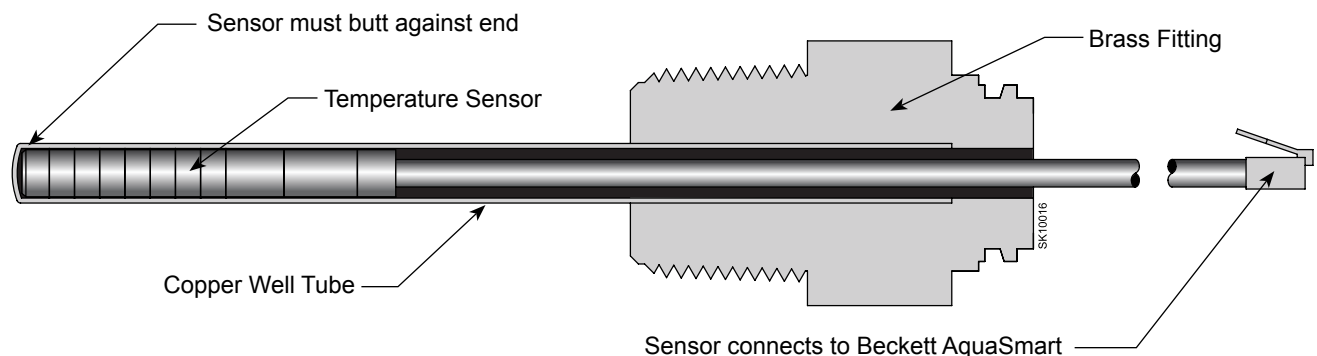
1. Make sure the immersion well is clean inside, has no leaks, is of proper length and is otherwise suitable for receiving the new control and temperature sensor.
2. Replace questionable wells with new ones and use pipe sealant to seal the threads.
3. Grasp the sensor lead, just behind the sensor probe and carefully insert it into the well until it comes to rest at the very end of the well. The sensor is designed with radial splines to provide a snug fit in most standard wells.
4. The thermal time constant of the sensor is 40 seconds. Consider using thermal grease if faster response is desired.
5. Surface mounting may require additional lead length to reach the control receptacle. *Use the extension cable (part no. 52120), found in the 7600RMU Remote Mount Kit, to extend the lead by 48".*
6. For surface mount installations, install sensor retaining clip (Part No. 4582-001) as shown in **Figure 4b**. Place cable between groove in the clip and attach clip into groove of immersion well.
7. Plug the temperature sensor lead terminal into the receptacle on the control base. See **Figure 10**.

**Note:** The sensor is not tested and approved for being mounted to the outside of a pipe. It is for use in immersion wells only.

**Figure 4b - Retaining Clip**



**Figure 4a - Installation of Temperature Sensor in Immersion Well**



## Installing the 2-in-1 Sensor

**Note:** There are two versions of the 2-in-1 sensor. The 76002N1SXX is an integrated single unit consisting of a sensor and thermowell. The 76002N1RXX consists of two components, a thermowell (7600TWXX) and a replaceable sensor probe (7600PXX). The following instructions apply to both versions unless otherwise specified.

**CAUTION** For proper operation, there must be a secure electrical bond between the green sensor wire from the sensor and the boiler metal vessel in direct contact with the boiler water. Failure to secure an electrical bond will result in the AquaSmart locking out and displaying, "LOCKOUT - LOW WATER".

**WARNING** Leak, Burn, and Scald Hazards

Incompatible thread sealants could severely damage the sensor threads.

- Only use Teflon® Tape or Rectorseal® No. 5® (soft-set).
- DO NOT use any anaerobic fast-setting sealants such as, but not limited to, Loctite®, Leak Lock®, Permatex®, or Gasoil®.
- Call RWB Technical Services at 1(800)645-2876 to confirm, if unsure.

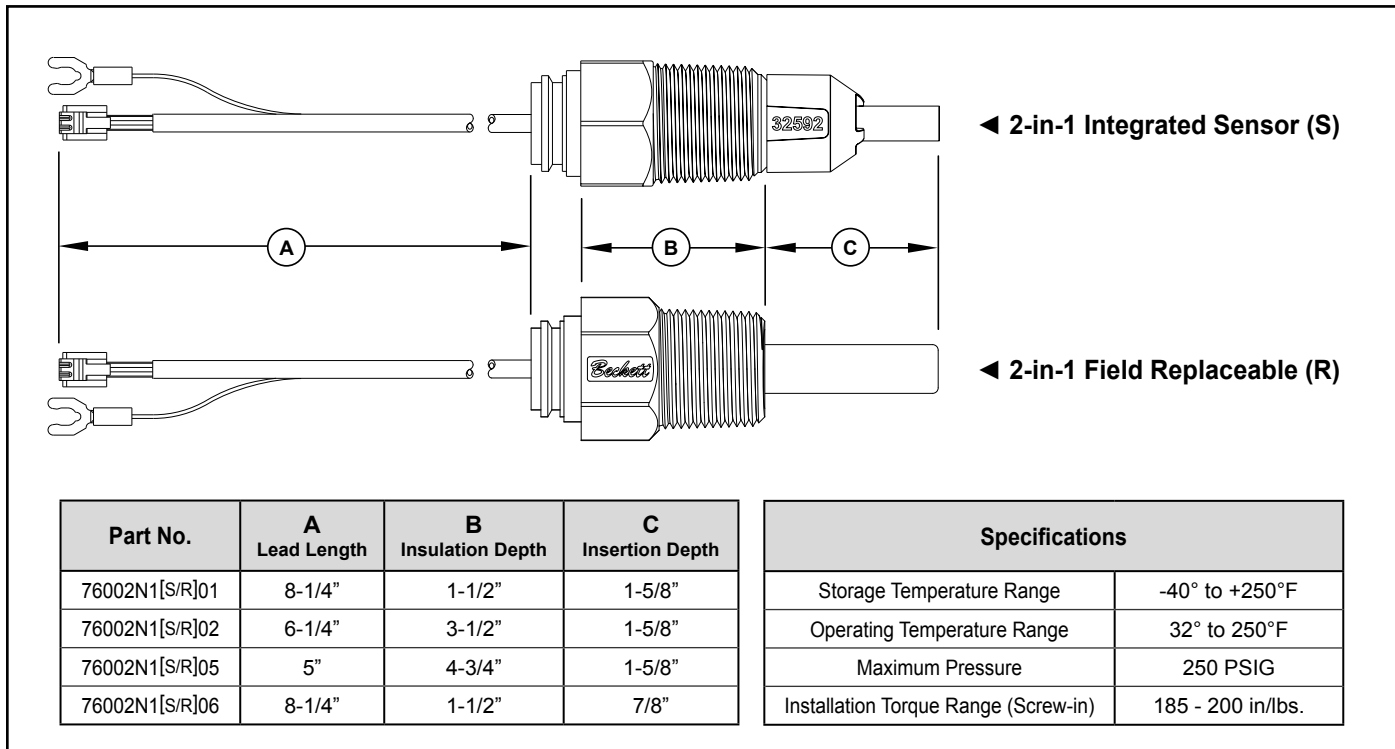
**WARNING** Do not use in steam applications. For use in hot water boilers or water heaters only. Do not use outside of the intended use and specifications.

**WARNING** Explosion, Burn and Scald Hazards

Excessive water temperatures could cause explosion, burns, scalding, pressure relief flooding and fitting leaks.

- The 2-in-1 Sensor shall only be installed by a trained professional.
- The sensor must be installed in the proper location for correct low water cut-off (LWCO) operation in accordance with the Boiler Manufacturer's instructions.
- The 2-in-1 sensor body is installed directly into the boiler wall tapped hole in place of an immersion well.
- Carefully follow the outlined procedures for temperature sensor installation to ensure accurate water temperature sensing and effective control operation.
- Make sure the plumbing for domestic hot water has anti-scald valve protection.
- Follow all applicable safety codes, rules and guidelines for installing an immersion well. Improper installation can result in the Boiler overheating.

Figure 5 - Overall Dimensions & Specifications

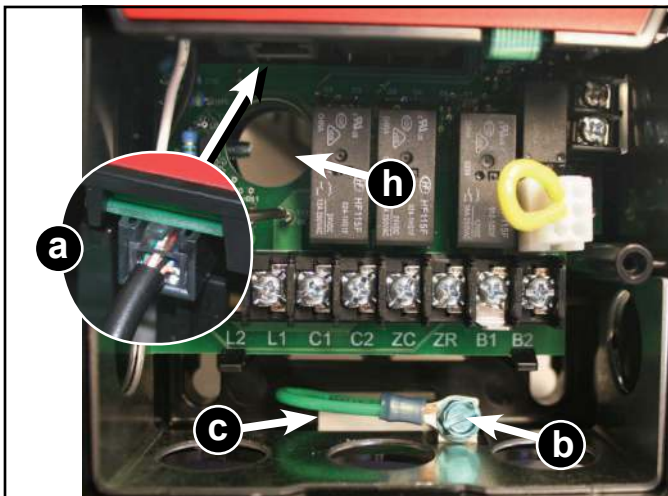


## 2-in-1 “Integrated Unit” Instructions

### This is very important for successful control operation.

1. Remove the existing immersion well. Clean the threads in the boiler port tapping. Follow all applicable safety codes, rules and guidelines for removing/installing immersion wells.
2. Apply pipe sealant to the 2-in-1 sensor threads and install it securely into the port. **BECKETT RECOMMENDS ONLY TO USE TEFLON TAPE OR RECTORSEAL NO. 5 PIPE SEALANT.**
3. Tighten with 1-1/8” open end or box wrench (torque requirement: 185 - 200 in./lbs.). Pipe wrenches, pliers, and adjustable wrenches will damage/round-off the hex.
4. Securely install the AquaSmart control to the sensor. Plug the 2-in-1 Sensor RJ connector (phone jack style) into the receptacle (Item **a**, **Figure 6a**) on the control.
5. Route the 36” green wire through the AquaSmart bottom rectangular slot (Item **c**, **Figure 6a**). Securely install the fork connector of the 36” ground wire and the ground wire from the 2-in-1 sensor under the ground screw at the bottom of the control (Item **b**, **Figure 6a**).
6. Thoroughly clean the pipe surface and securely tighten the pipe clamp on the water inlet pipe to the boiler as close to the boiler as possible.
7. Route the 36” green ground wire to the pipe clamp then cut to proper length, if necessary.
8. Strip the wire and insert the stripped end into hole on the pipe clamp (item **d**, **Figure 6b**). Tighten retaining screw against the wire making sure that you have good contact.
9. Complete control wiring and fill the appliance with water to the pressure required, according to appliance manufacturer’s instructions. Make sure all air is purged from the system and there are no leaks. Turn on power to the appliance and observe one call for heat cycle with shut off at set temperature.

**Figure 6a - Sensor lead & ground screw connections**



## 2-in-1 “Replaceable Unit” Instructions

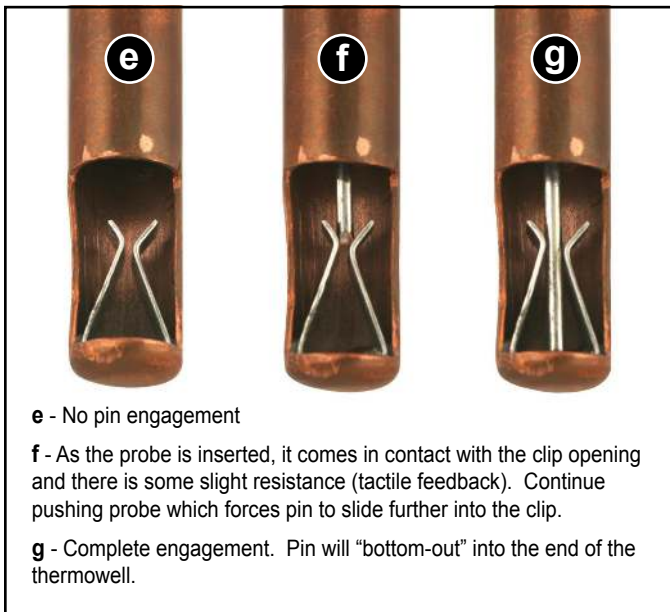
### This is very important for successful control operation.

1. Remove the existing immersion well. Clean the threads in the boiler port tapping. Follow all applicable safety codes, rules and guidelines for removing/installing immersion wells.
2. Apply pipe sealant to the 2-in-1 replaceable thermowell threads and install it securely into the port. **BECKETT RECOMMENDS ONLY TO USE TEFLON TAPE OR RECTORSEAL NO. 5 PIPE SEALANT.**
3. Tighten with 1-1/8” open end or box wrench (torque requirement: 185 - 200 in./lbs.). Pipe wrenches, pliers, and adjustable wrenches will damage/round-off the hex.
4. Insert the sensor probe into the thermowell and push it completely in until the sensor bottoms out (see **Figure 7**). Route the sensor leads through the control opening (Item **h**, **Figure 6a**) and securely install the control to the thermowell.
5. Plug the 2-in-1 Sensor RJ connector (phone jack style) into the receptacle (Item **a**, **Figure 6a**) on the control.
6. Route the 36” green wire through the AquaSmart bottom rectangular slot (Item **c**, **Figure 6a**). Securely install the fork connector of the 36” ground wire and the ground wire from the 2-in-1 sensor under the ground screw at the bottom of the control (Item **b**, **Figure 6a**).
7. Thoroughly clean the pipe surface and securely tighten the pipe clamp on the water inlet pipe to the boiler as close to the boiler as possible.
8. Route the 36” green ground wire to the pipe clamp then cut to proper length, if necessary.
9. Strip the wire and insert the stripped end into hole on the pipe clamp (item **d**, **Figure 6b**). Tighten retaining screw against the wire making sure that you have good contact.
10. Complete control wiring and fill the appliance with water to the pressure required, according to appliance manufacturer’s instructions. Make sure all air is purged from the system and there are no leaks. Turn on power to the appliance and observe one call for heat cycle with shut off at set temperature.

**Figure 6b - Ground Clamp and Grounding Wire**



**Figure 7 - Pin Engagement Cutaway**



## Test the Low Water Cut-off (LWCO) Safety Function

**WARNING! Electric Shock Hazard. Avoid touching or shorting the live terminals during this test.**

### Integrated Unit Version:

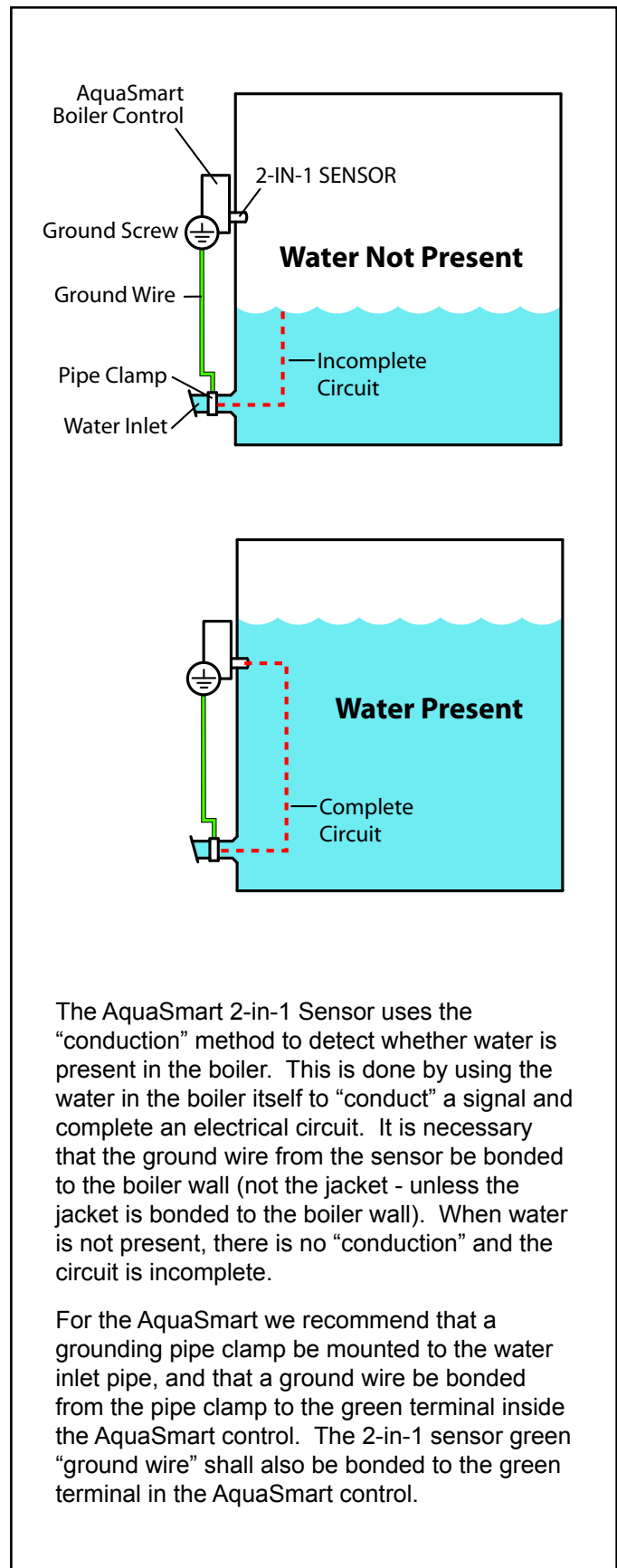
Turn electric power ON to energize AquaSmart control. Perform the following tests to verify the LWCO function.

- **For AquaSmart 7600A:** Remove the green sensor lead from the ground screw. The sensor should cause the AquaSmart display to indicate, “LOCKOUT – LOW WATER”. If it does not, replace the sensor.
- **For AquaSmart 7600B:** Remove the green sensor lead from the ground screw and remove both the B1 and B2 (24 Vac) leads from their terminals. The sensor should cause the AquaSmart display to indicate, “LOCKOUT – LOW WATER”. If it does not, replace the sensor.
- Attach wires and tighten terminal screws securely when testing is complete.

### Replaceable Version:

1. Turn electric power ON to energize AquaSmart control. Perform the following tests to verify the LWCO function.
2. Pull the sensor probe partially out of the sensor thermowell to disengage the pin from the clip inside the tube (see **Figure 7**). you should feel it when the pin disengages. The sensor should cause the AquaSmart display to indicate, “LOCKOUT - LOW WATER” after the LWCO Off Delay times out.. If it does not, replace the sensor.
3. Once testing is completed, fully insert the sensor probe into the thermowell so that the pin is fully engaged in the clip.

**Figure 8 - Sensor Water Detection Method**



## Installing the AquaSmart Control

(Refer back to **Figure 3** for appropriate mounting method).

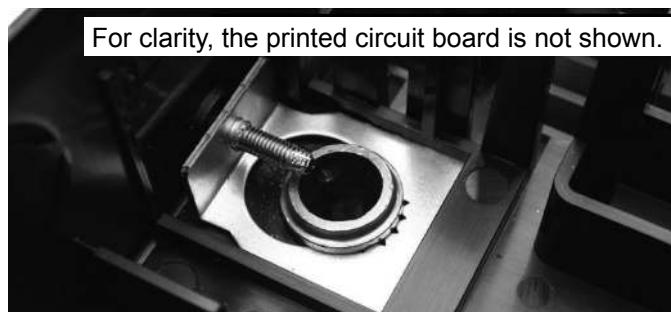
### Mounting to the Immersion Well or 2-in-1 Sensor:

1. Mount the control by aligning the 7/8" diameter hole (found on back) around the mating feature of the immersion well or 2-in-1 sensor and press into place. Position the control upright and tighten down the #10 screw located on the left side of the control. Tighten so that control is securely in place (**Figure 9**).
2. Plug the temperature sensor lead terminal into the receptacle on the control base. See **Figure 10**.

### Mounting to Appliance Surface:

1. Use the AquaSmart mounting template to locate the mounting holes in a desired location on mounting surface. The template can be found in the back of this manual.
2. Use (3) #8 x 3/4" self drilling screws (.110 hole diameter if pre-drilling) included in the installation kit. Run screws into mounting surface, leaving a 1/4" space between bottom of screw head and mounting surface.
3. Open the cover of the AquaSmart control to expose key hole locations in plastic case. Align key holes over mounting screws and secure in place.
4. Plug the temperature sensor lead terminal into the receptacle on the control base. See **Figure 10**.
5. If necessary, use the 48" cable extension to connect sensor to control base. Refer back to **Figure 3**.

**Figure 9 - Mounting Clamp and Screw for Immersion Well**



**Figure 10 - Temperature Sensor Lead/Receptacle Connection**



## Wiring



**WARNING**

**Electrical Shock, Fire, Explosion and Burn Hazards**

***This control must be installed, adjusted and put into operation only by a trained, licensed, qualified professional or service agency in accordance with the latest revision of the National Electric Code ANSI/NFPA 70 (Canada CSA C22.1) state, local codes and authorities having jurisdiction.***

- Follow the appliance manufacturer's wiring diagrams and note all safety controls.
- Typical safety controls include high temperature or pressure limits, low water cutoffs, anti-scald valves, pressure relief valves and water feed valves.
- Verify all limits and safety controls are installed and functioning correctly, as specified by the appliance manufacturer, applicable safety standards, codes and all authorities having jurisdiction.
- Provide ground wiring to the appliance, burner and controls.



**WARNING**

**Electrical Shock Hazard. Can Cause Severe Injury, Death, or Equipment Damage.**

***Disconnect power before wiring to prevent electrical shock or equipment damage.***

- All wiring must comply with local electrical codes and ordinances. The limits given in the specifications section must not be exceeded when applying this control. Terminals on the AquaSmart are approved for copper wire only.
- Refer to the label on the inside of the AquaSmart door or to Technical Specifications in this manual for Electrical ratings and maximum load information. Use manufacturer instructions when wiring controlled equipment or refer to typical hookups in **Figure 12** through **Figure 17**.
- More than one service switch may be needed to disconnect all power to the AquaSmart. The optional power disconnect switch interrupts power to the AquaSmart control. Depending on system wiring, some terminals and connections (most notably ZR and the input to the optional power disconnect switch) may still be live.



**WARNING**

**Explosion Hazard. Can Cause Severe Injury, Death or Property Damage.**

Use this product only in systems with a pressure relief valve.

## Wiring the AquaSmart Control

- Consult the appliance wiring diagrams to check the manufacturer's specifications.
- Refer to **Figure 12** through **Figure 17** for some typical wiring diagrams.
- Verify the wires are still labeled correctly and make connections to the appropriate terminals on the control wiring terminal strip.
- Provide disconnect means and overload protection as required on power supply.
- Connect control conduit bracket to earth ground using the supplied grounding screw.
- B1 terminal is a 1/4 in. tab terminal (quick connect).

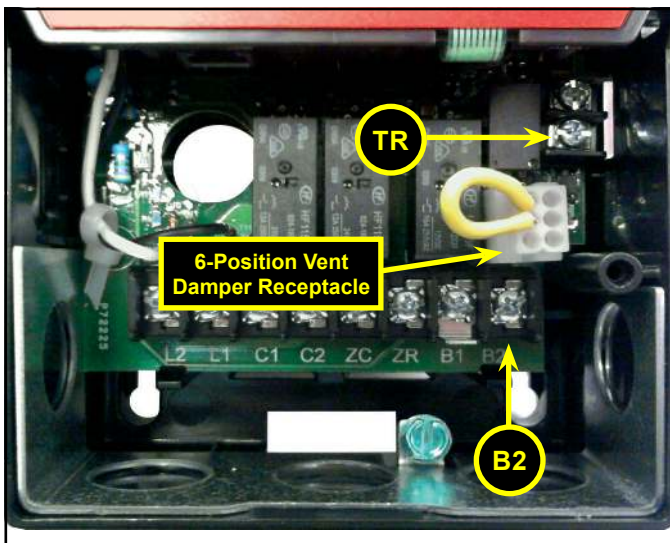


### Some Thermostats Are Polarity Sensitive

**Reversed polarity could cause erratic cycling of the boiler control.**

- Connect the red thermostat wire (from the RH or R terminal of the thermostat) to the TR terminal on the control.
- Connect the white thermostat wire (from the W terminal of the thermostat) to the Tw terminal on the control.

**Figure 11 - TR, B2, & Vent Damper Connections**



### NOTICE

**7600B only:** TERMINALS TR (Z or hot) and B2 (TV or ground) offer a 24-volt supply for operating other 24 VAC equipment on the boiler. **IMPORTANT: TO PREVENT DAMAGE TO THE CONTROL, DO NOT OVERLOAD THE TRANSFORMER.** The AquaSmart is equipped with a 30VA transformer. Make sure that the total load, including the burner circuit and TR & B2 connections do not exceed 30VA. See **Figure 11**.

**How to calculate VA** - Add all AMP ratings of 24VAC components in this circuit and multiply sum by 24 volts. (Example:  $.4 + .4 + .2 + .2 = 1.2A \times 24V = 28.8 VA$ )



**7600B only:** When being retrofitted into existing applications, the 7600B may be replacing a control that required an external transformer for operating other 24 VAC equipment (the 7600B is equipped with an internal 30VA transformer). Ensure that any existing transformers are either completely removed from the system or wired according to **Figures 14** or **17** of this manual (if additional transformers are still needed not to exceed the 7600B's 30VA rating). Otherwise, the transformers may contend with, short out, and/or damage each other.

### NOTICE

When powering multiple circulators from the C1 and C2 terminals, take extra care not to exceed the output's reading. If the sum of the full load amps of all the circulators exceeds the output's rating, use the C1 and C2 terminals to power the coil of a multiple-pole contactor; the contacts of which can be wired to switch L1 to each circulator.

### NOTICE

Observe proper polarity when wiring L1 and L2. If polarity is reversed, a call for heat on the ZR input may not be recognized.

### NOTICE

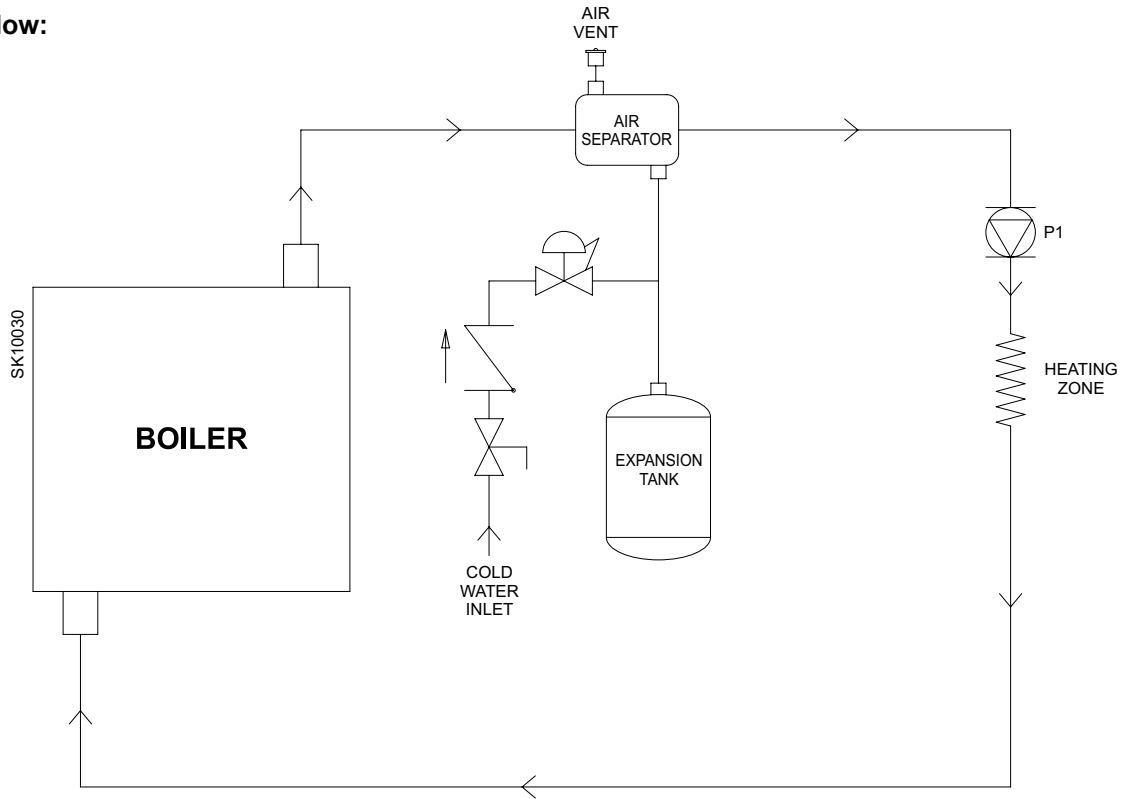
To wire a vent damper to the 7600B, first remove jumper plug from 6-position receptacle and then connect 6-pin connector of the vent damper to the receptacle. See **Figure 11**. Once the 7600B is operated with a vent damper, it will not function without one (even if the jumper plug is replaced). The first time a 7600B is operated with a vent damper, a fuse will pop. It is normal for this to be audible and even create a little smoke and does not indicate something is wrong with the control.

### Water Flow Symbols Key (Figures 12 through 17)

|  |                      |
|--|----------------------|
|  | - Air Vent           |
|  | - Air Separator      |
|  | - Expansion Tank     |
|  | - Isolation Valve    |
|  | - Pressure Regulator |
|  | - Zone Valve         |
|  | - Check Valve        |
|  | - Circulator         |

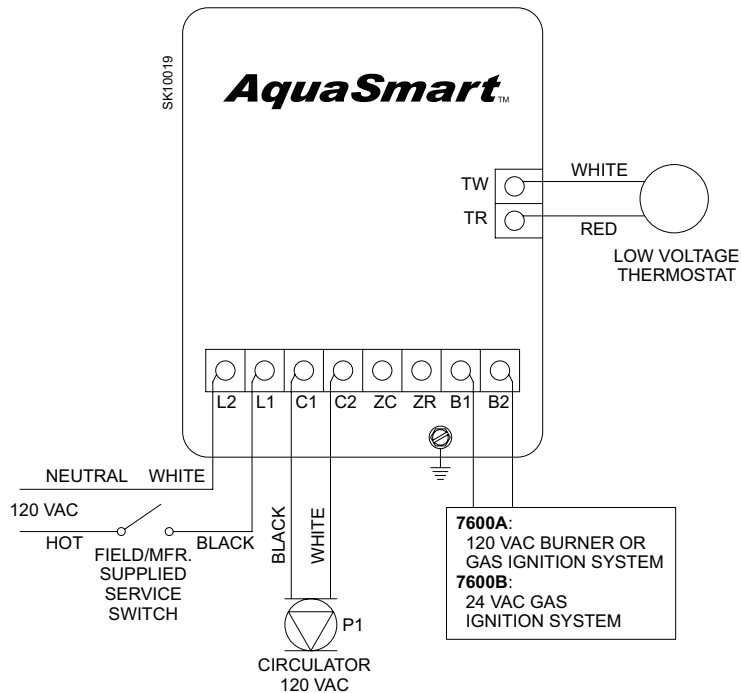
**Figure 12 - 7600A/B single-zone connections with or without a tankless coil**

**Water Flow:**



**Control Wiring:**

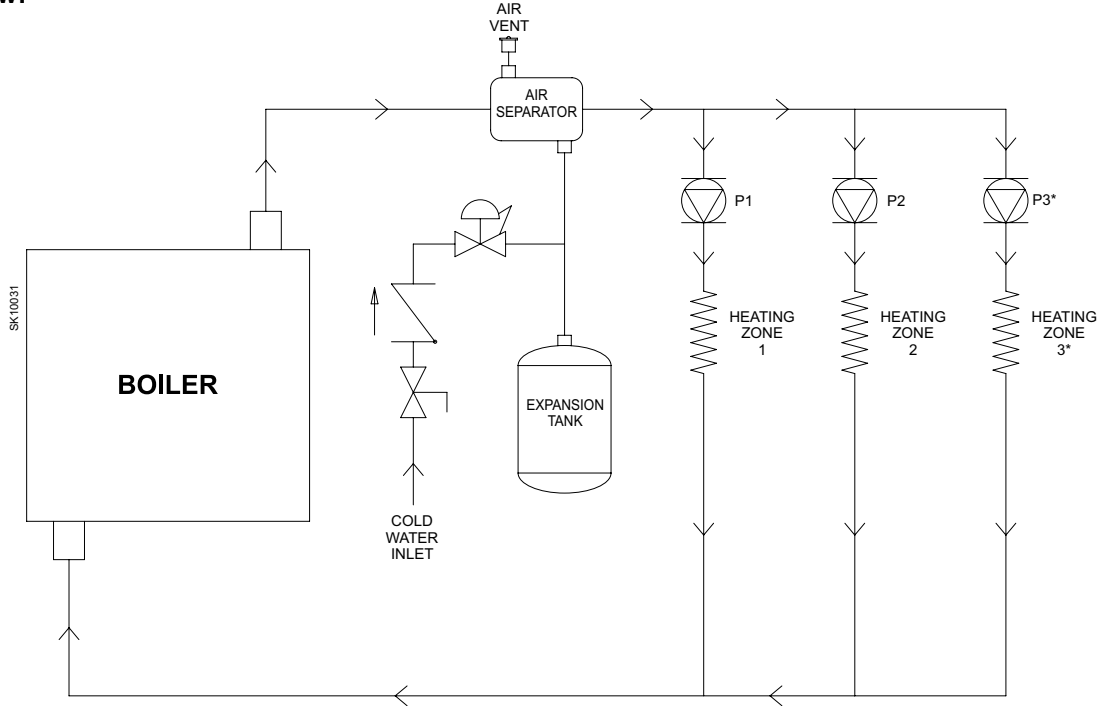
1. Set "DHWP OFF" (default, see programming section for instructions)
2. Set "C1 on TT" (default, see programming section for instructions)



**Figure 13 - 7600A/B multi-zone connections with or without a tankless coil**

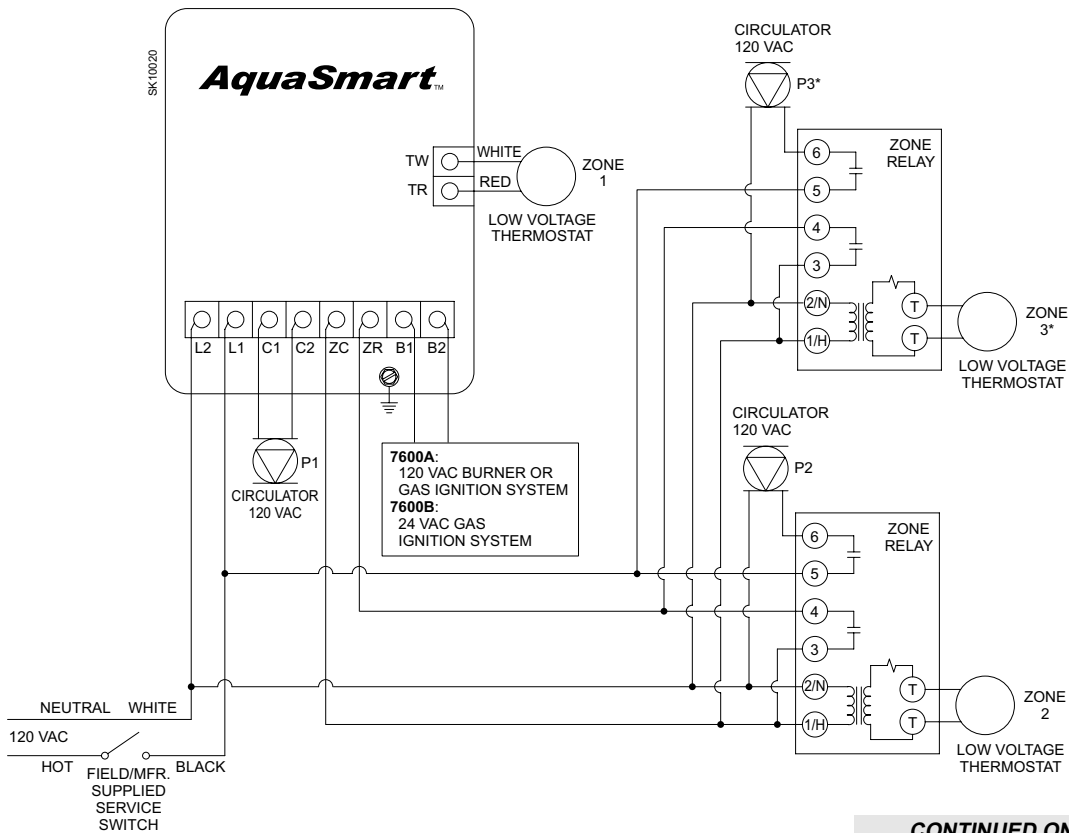
\* Additional zones can be added by duplicating the plumbing and wiring of zone 3.

**Water Flow:**



**Control Wiring (Option 1): Circulator-On and -Off Delays on Zone 1 ONLY**

1. Set "DHWP OFF" (default, see programming section for instructions)
2. Set "C1 on TT" (default, see programming section for instructions)
3. Circulator-on and -off delays will only affect zone 1



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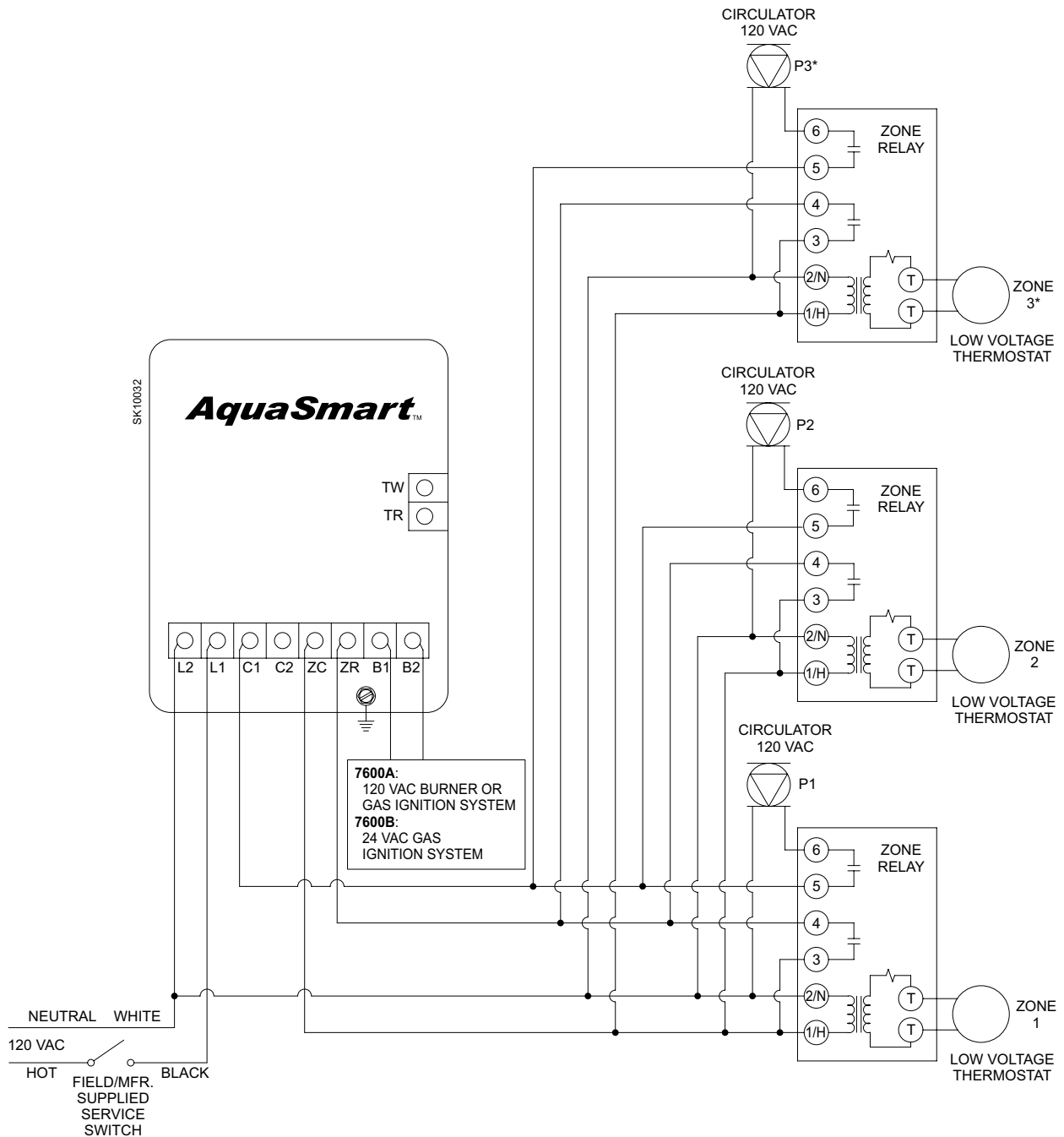
**Figure 13 (continued) - 7600A/B multi-zone connections with or without a tankless coil**

\* Additional zones can be added by duplicating the plumbing and wiring of zone 3.

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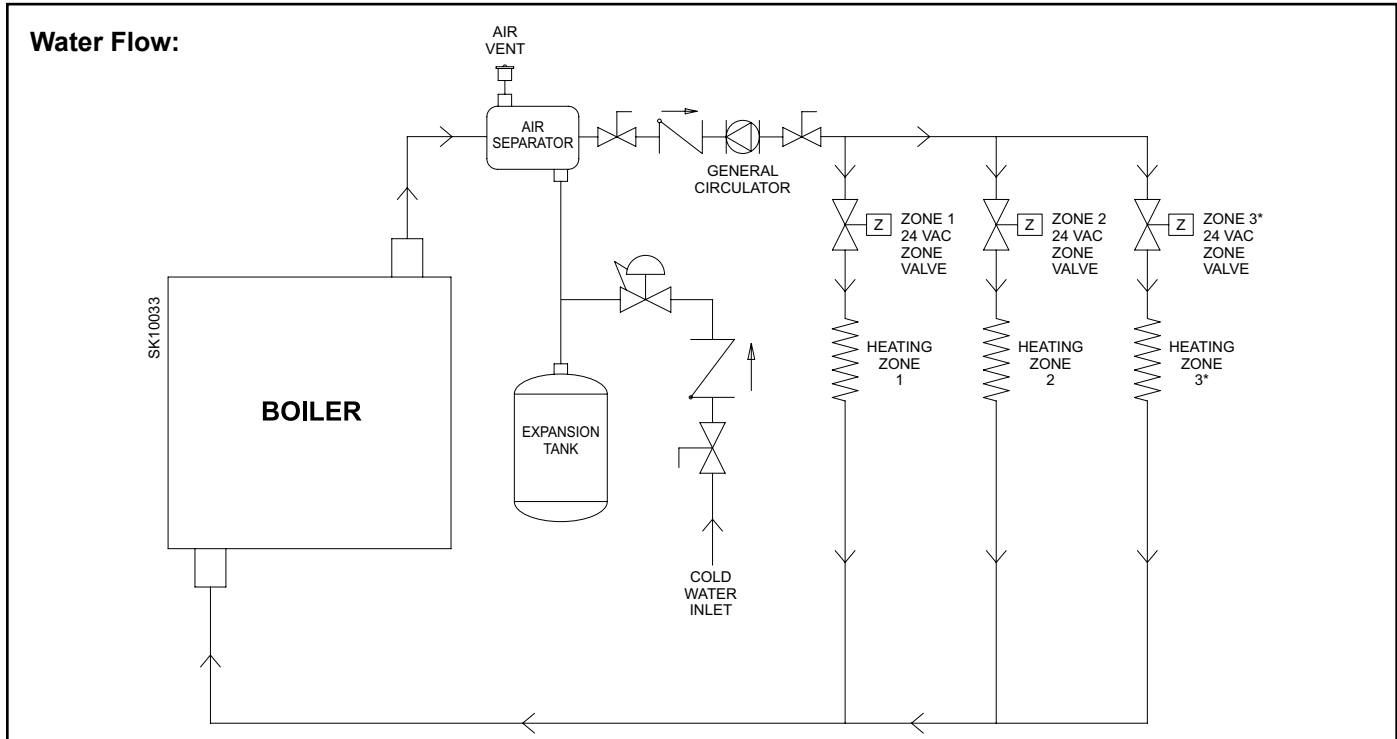
**Control Wiring (Option 2): Circulator-On Delay on All Zones**

1. Set “DHWP OFF” (default, see programming section for instructions)
2. Set “C1 on ZR” (see programming section for instructions)
3. Circulator-on delay will affect all zones. Circulator-off delay will have no effect.



**Figure 14 - 7600A/B alternate multi-zone connections with or without a tankless coil**

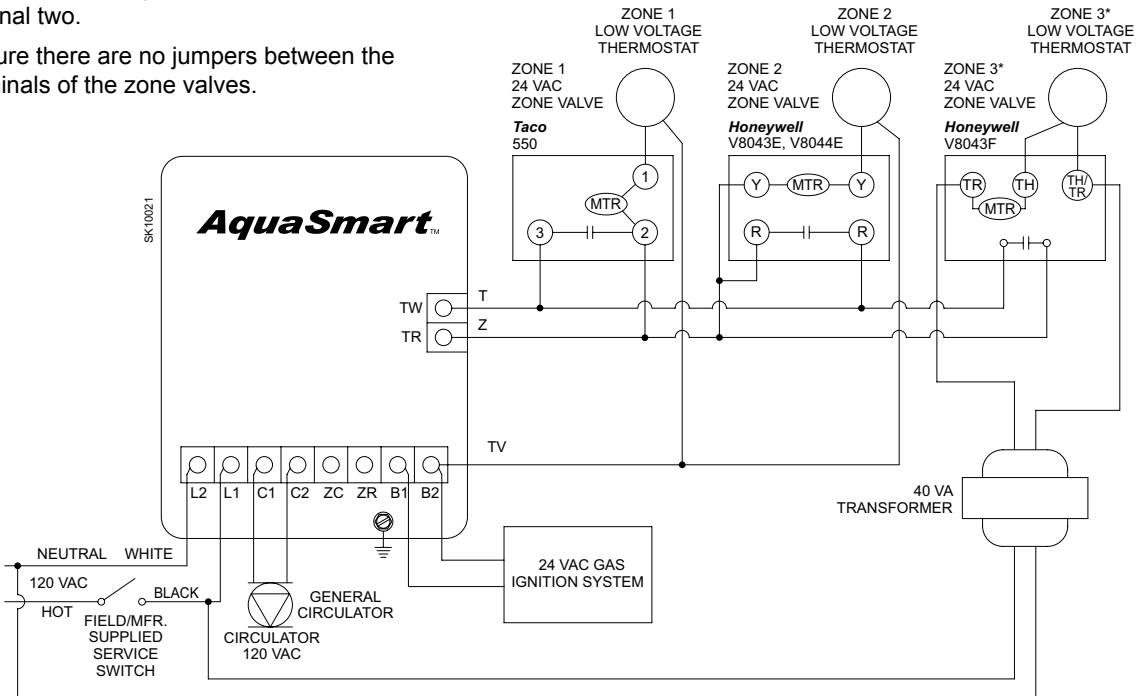
\* Additional zones can be added by duplicating the plumbing and wiring of zone 3, adding additional transformers as needed.



**Control Wiring (Option 1): 7600B only**

**CAUTION - Always observe proper polarity when connecting multiple transformers in a system (connect red terminal of external transformer to TR terminal of AquaSmart).**

1. Set "DHWP OFF" (default, see programming section for instructions)
2. Set "C1 on TT" (default, see programming section for instructions)
3. Circulator-on delay will affect all zones. Circulator-off delay will have no effect.
4. Up to two 24 VAC zone valves can be powered with the 7600B. Add an additional transformer as shown for every two or less valves over the original two.
5. Ensure there are no jumpers between the terminals of the zone valves.



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**Figure 14 (continued) - 7600A/B alternate multi-zone connections with or without a tankless coil**

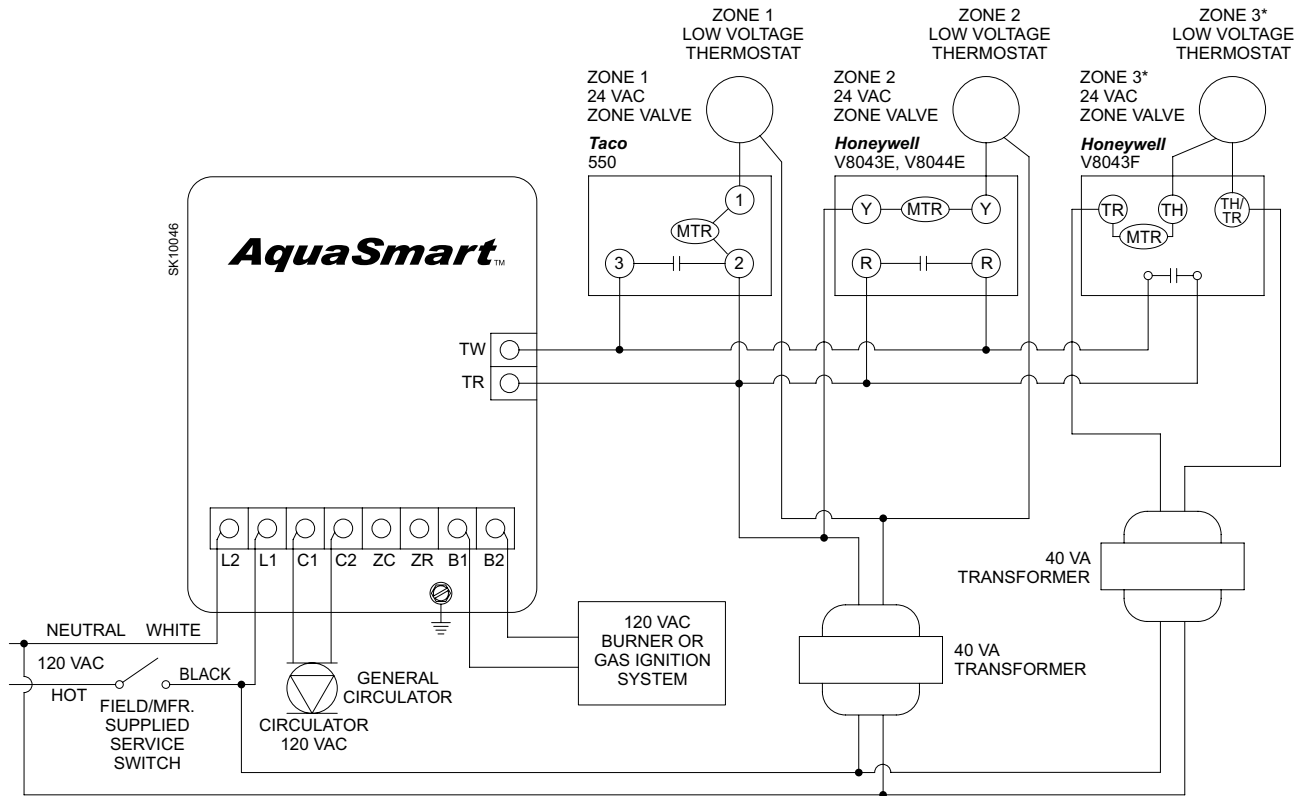
\* Additional zones can be added by duplicating the plumbing and wiring of zone 3, adding additional transformers as needed.

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**Control Wiring (Option 2): 7600A only**

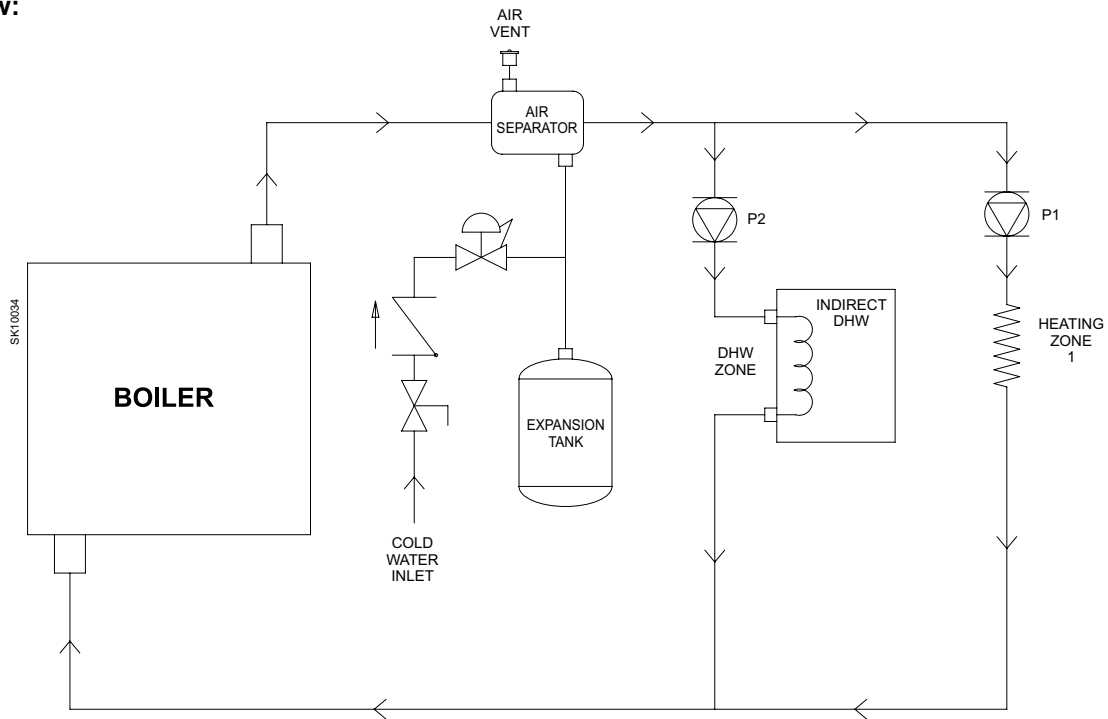
**CAUTION - Always observe proper polarity when connecting multiple transformers in a system (connect red terminal of external transformer to TR terminal of AquaSmart).**

1. Set "DHWP OFF" (default, see programming section for instructions)
2. Set "C1 on TT" (default, see programming section for instructions)
3. Circulator-on delay will affect all zones. Circulator-off delay will have no effect.
4. 24 VAC zone valves cannot be powered directly with the 7600A. Add an additional transformer for every two or less valves.
5. Ensure there are no jumpers between the terminals of the zone valves.



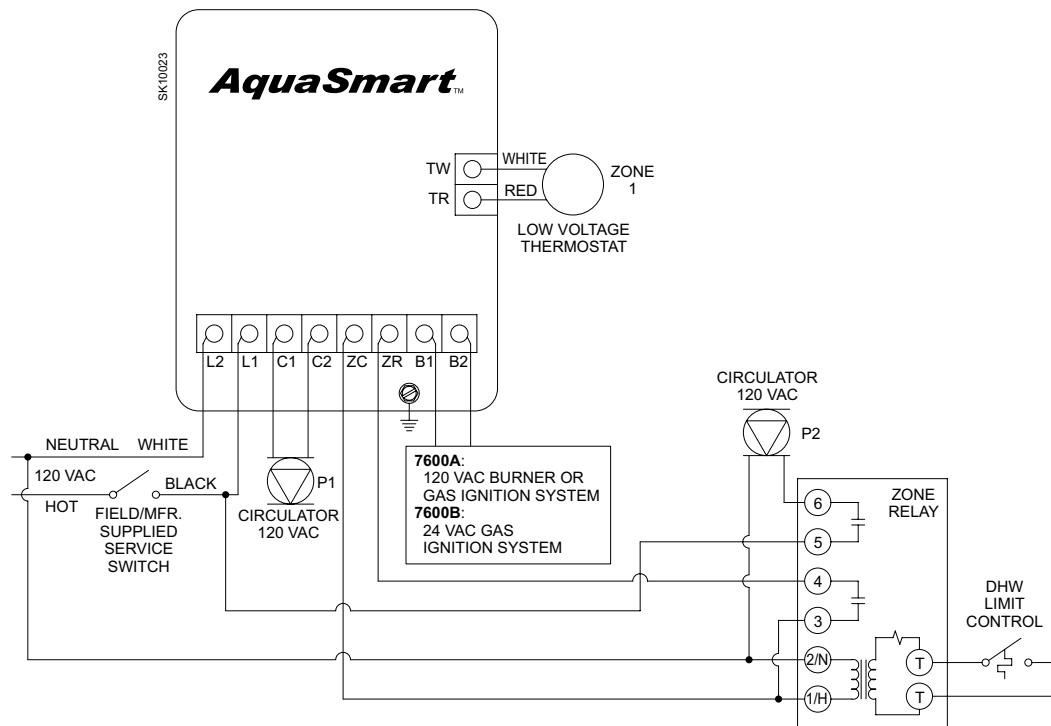
**Figure 15 - 7600A/B single-zone connections with Indirect Domestic Hot Water (DHW)**

**Water Flow:**



**Control Wiring:**

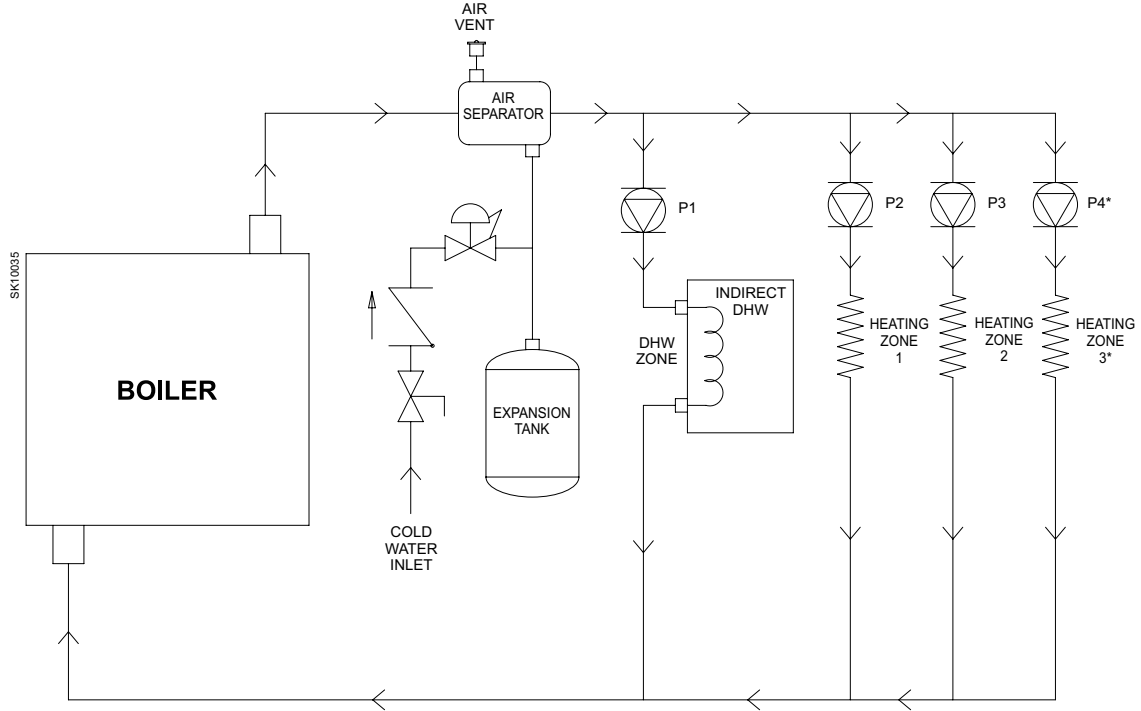
1. Set "DHWP on ZR" (see programming section for instructions)
2. Set "C1 on TT" (default, see programming section for instructions)
3. Circulator-on and -off delay will only affect zone 1.



**Figure 16 - 7600A/B multi-zone connections  
with Indirect Domestic Hot Water (DHW)**

\* additional zones can be added by duplicating  
the plumbing and wiring of zone 3.

**Water Flow:**



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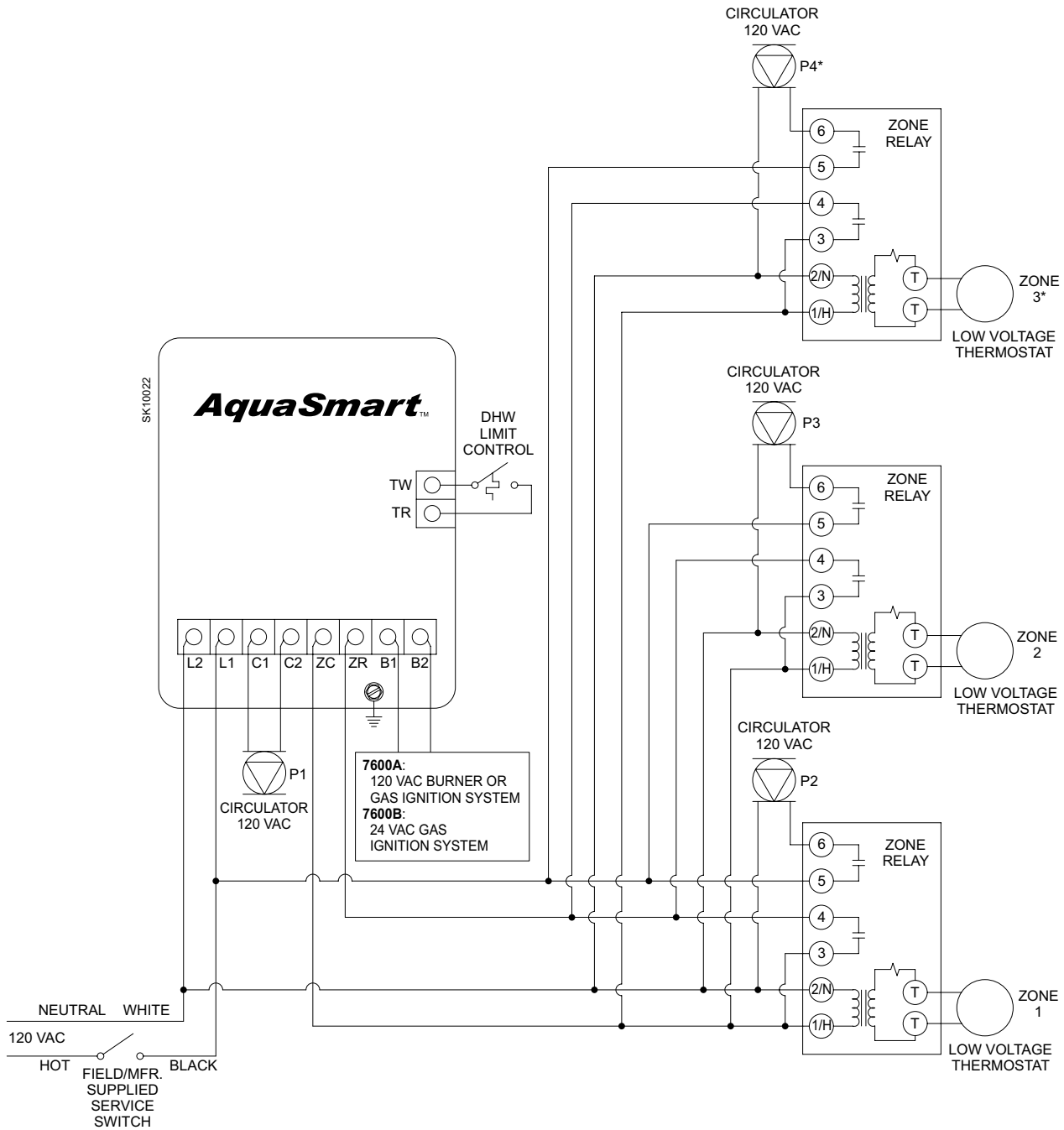
**Figure 16 (continued)- 7600A/B multi-zone connections with Indirect Domestic Hot Water (DHW)**

\* Additional zones can be added by duplicating the plumbing and wiring of zone 3.

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**Control Wiring (Option 1): Circulator-On and -Off Delays on DHW Zone Only**

1. Set "DHWP on TT" (see programming section for instructions)
2. Set "C1 on TT" (default, see programming section for instructions)
3. Circulator-on and -off delays will only affect DHW zone.



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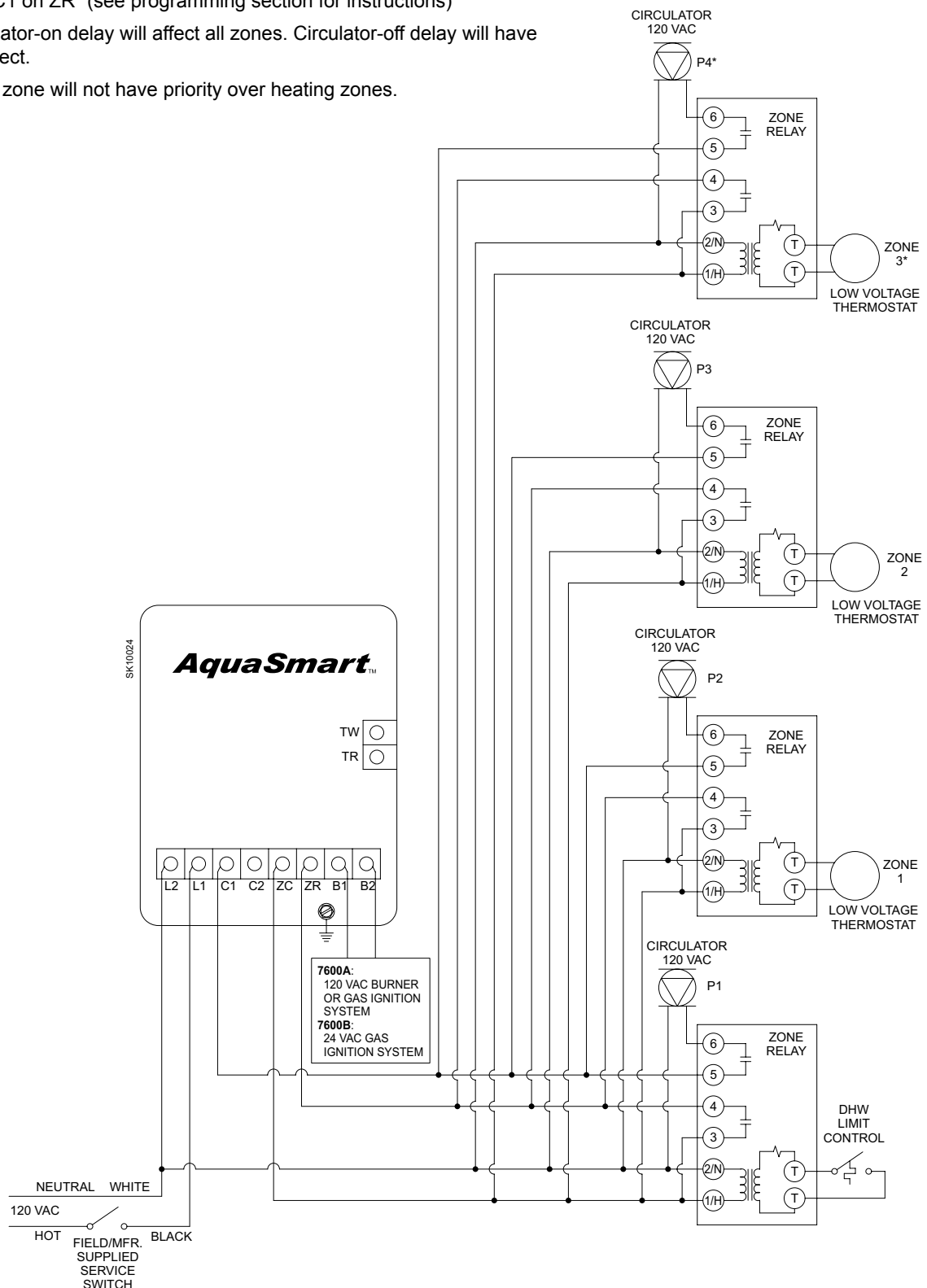
**Figure 16 (continued) - 7600A/B multi-zone connections with Indirect Domestic Hot Water (DHW)**

\* Additional zones can be added by duplicating the plumbing and wiring of zone 3.

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**Control Wiring (Option 2): Circulator-On Delay on All Zones**

1. Set "DHWP OFF" (default, see programming section for instructions)
2. Set "C1 on ZR" (see programming section for instructions)
3. Circulator-on delay will affect all zones. Circulator-off delay will have no effect.
4. DHW zone will not have priority over heating zones.



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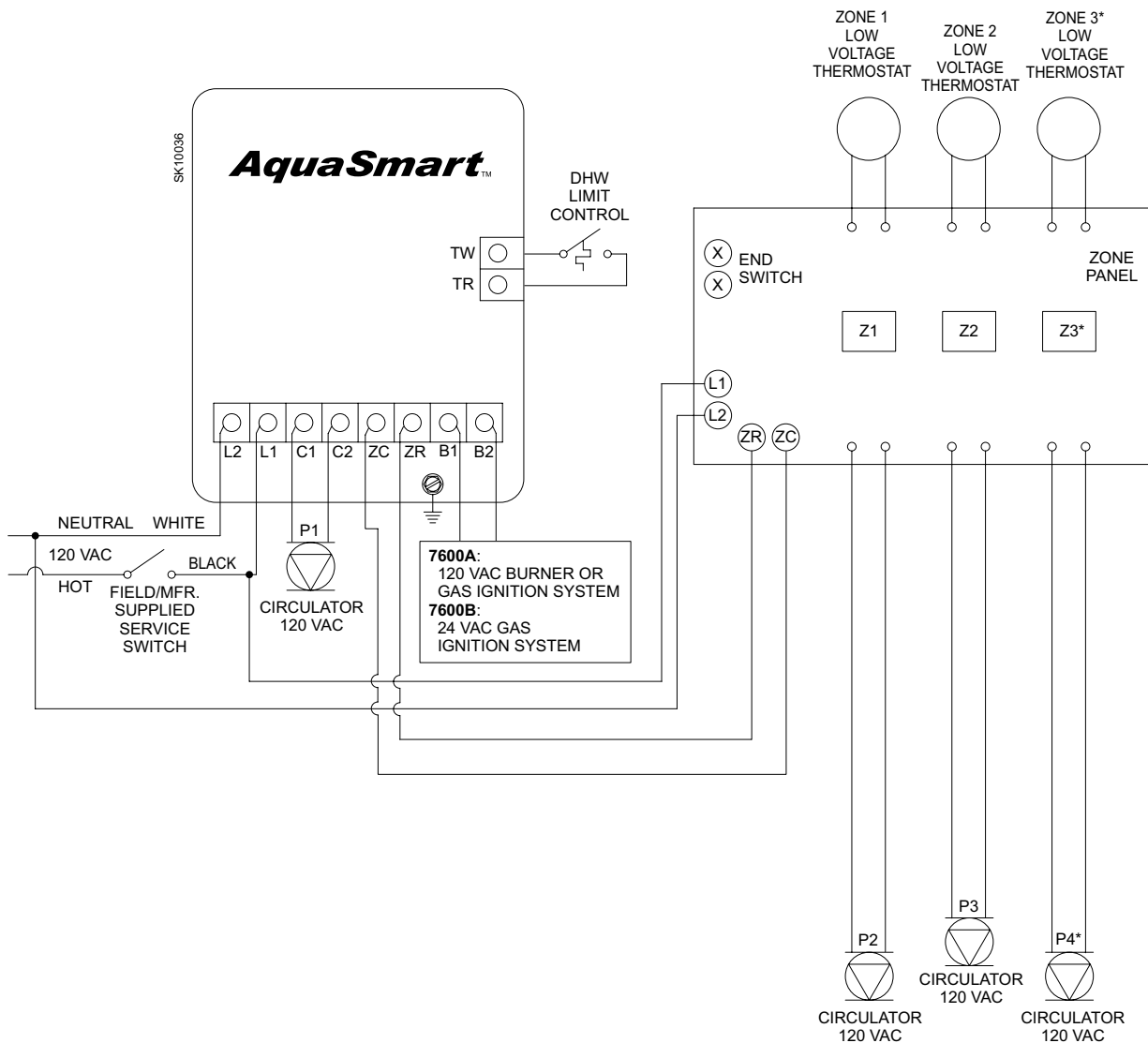
**Figure 16 (continued) - 7600A/B multi-zone connections with Indirect Domestic Hot Water (DHW)**

\* Additional zones can be added by duplicating the plumbing and wiring of zone 3.

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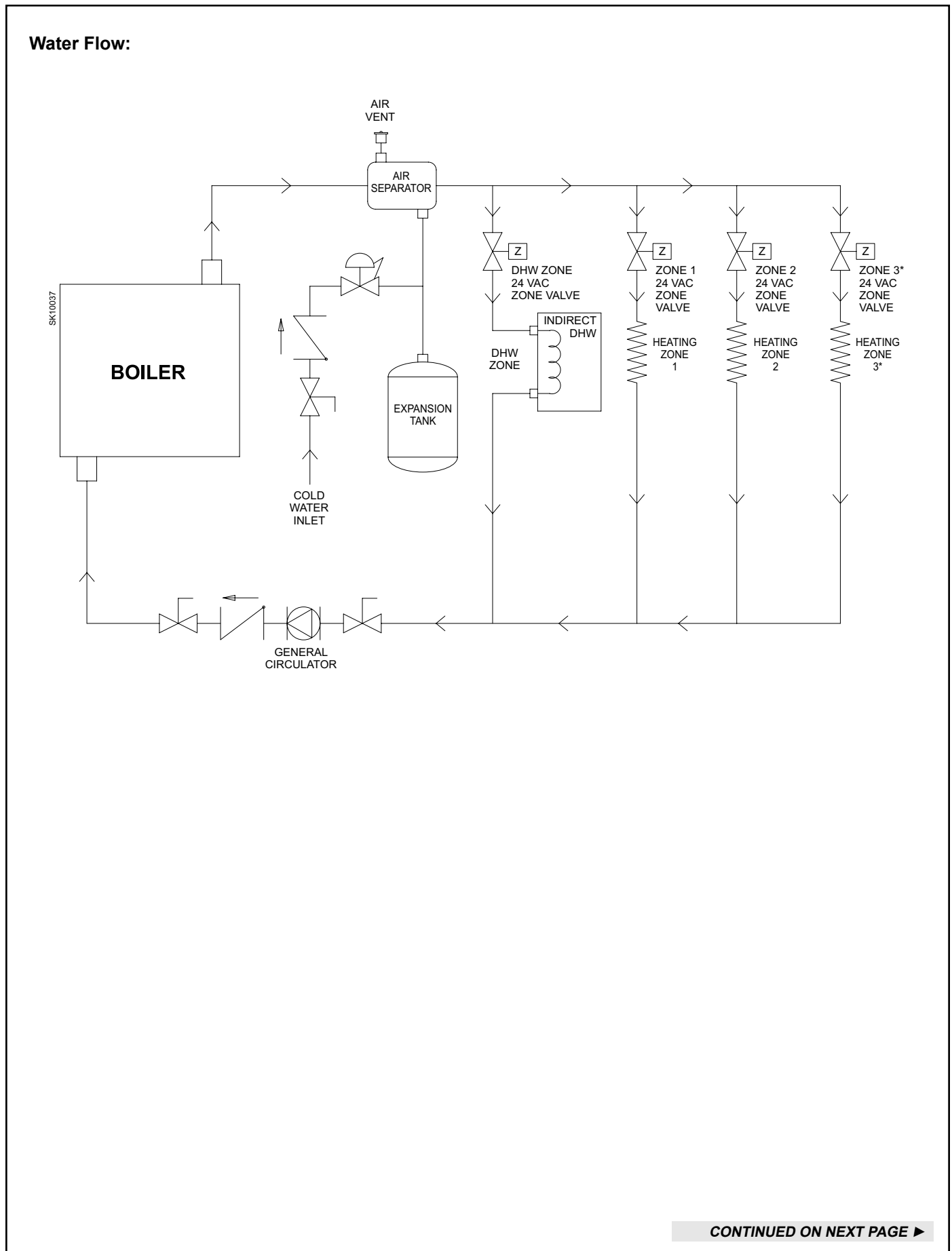
**Control Wiring (Option 3): Utilizing a Zone Panel**

1. Set "DHWP on TT" (see programming section for instructions).
2. Set "C1 on TT" (default, see programming section for instructions).
3. Circulator-on and -off delay will only effect DHW zone.
4. A call for heat on TT (from the DHW zone) will change boiler set point to the high limit. All other zones will heat to the reset temperature determined by the HeatManager.
5. Ensure that the zone panel and AquaSmart are powered from the same service switch.



**Figure 17 - 7600A/B alternate multi-zone connections with Indirect Domestic Hot Water (DHW)**

\* Additional zones can be added by duplicating the plumbing and wiring of zone 3, adding additional transformers as needed.



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**Figure 17 (continued) - 7600A/B alternate multi-zone connections with Indirect Domestic Hot Water (DHW)**

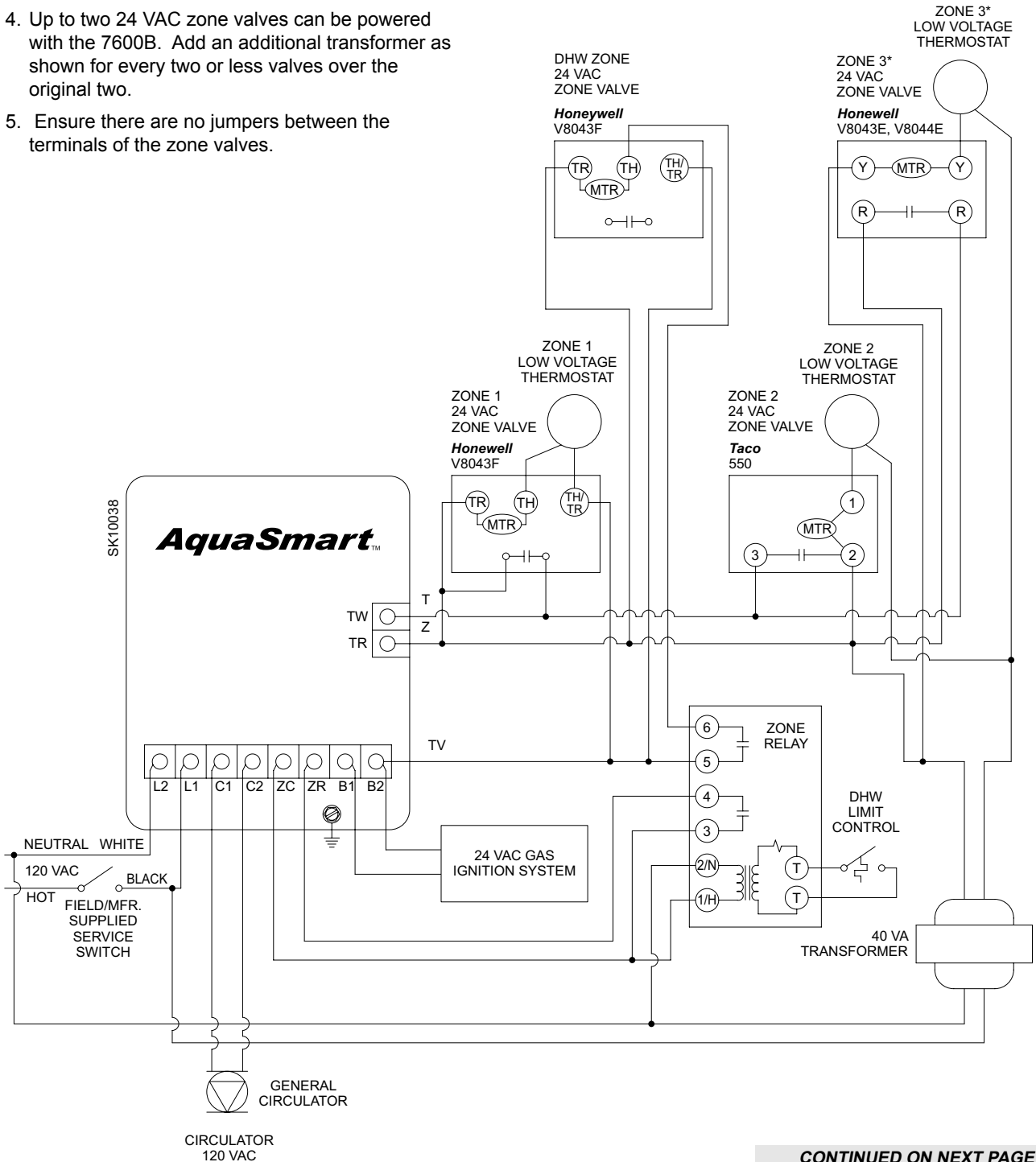
\* Additional zones can be added by duplicating the plumbing and wiring of zone 3, adding additional transformers as needed.

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**Control Wiring (Option 1): 7600B only**

**CAUTION - Always observe proper polarity when connecting multiple transformers in a system (connect red terminal of external transformer to TR terminal of AquaSmart).**

1. Set "DHWP on ZR" (see programming section for instructions)
2. Set "C1 on BOTH" (see programming section for instructions)
3. Circulator-on delay will affect all zones. Circulator-off delay will have no effect.
4. Up to two 24 VAC zone valves can be powered with the 7600B. Add an additional transformer as shown for every two or less valves over the original two.
5. Ensure there are no jumpers between the terminals of the zone valves.



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**Figure 17 (continued) - 7600A/B alternate multi-zone connections with Indirect Domestic Hot Water (DHW)**

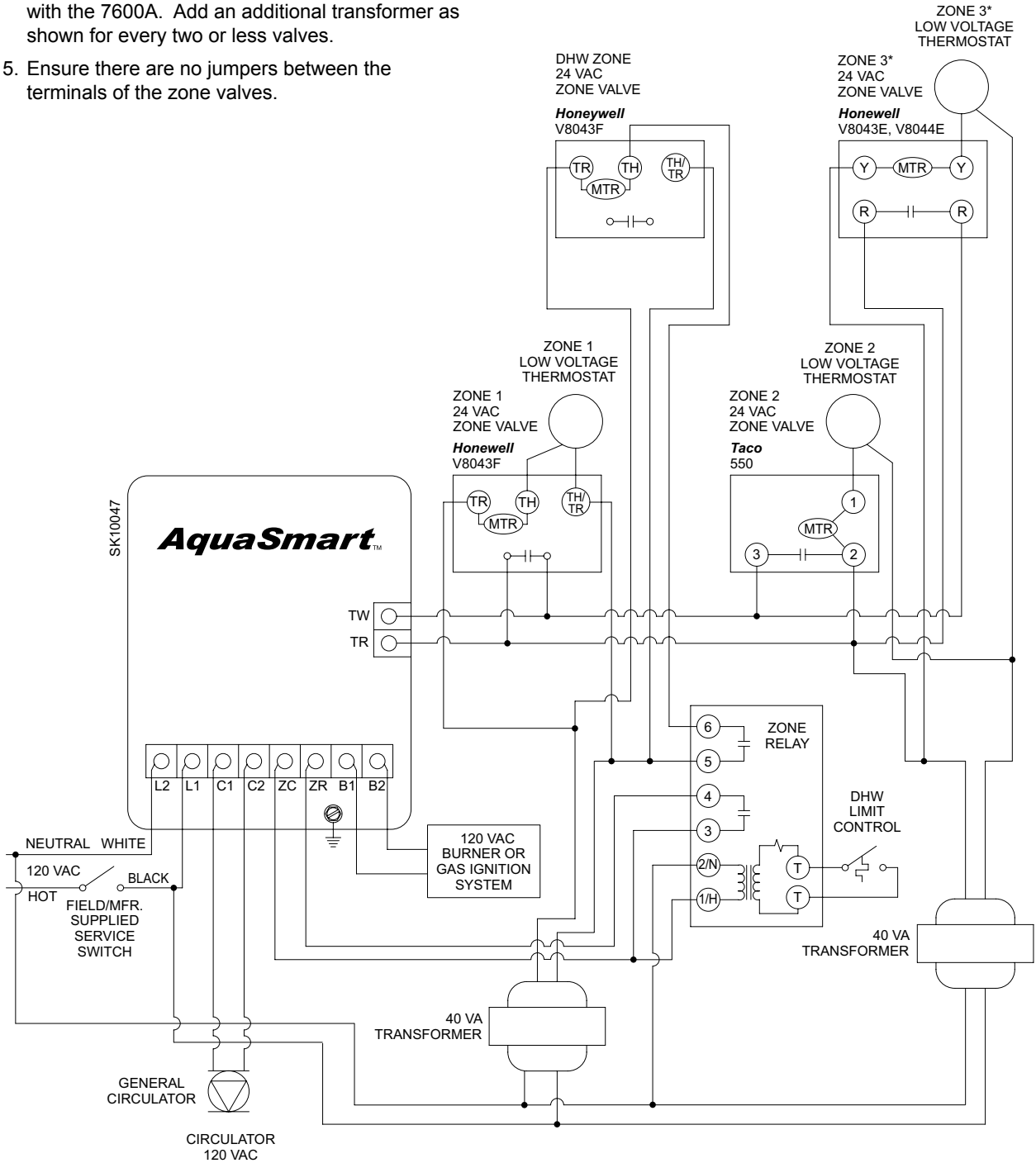
\* Additional zones can be added by duplicating the plumbing and wiring of zone 3, adding additional transformers as needed.

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**Control Wiring (Option 2): 7600A only**

**CAUTION - Always observe proper polarity when connecting multiple transformers in a system (connect red terminal of external transformer to TR terminal of AquaSmart).**

1. Set "DHWP on ZR" (see programming section for instructions)
2. Set "C1 on BOTH" (see programming section for instructions)
3. Circulator-on delay will affect all zones. Circulator-off delay will have no effect.
4. 24 VAC zone valves cannot be powered directly with the 7600A. Add an additional transformer as shown for every two or less valves.
5. Ensure there are no jumpers between the terminals of the zone valves.



# Programming Basic Functions

## **⚠ WARNING** Electrical Shock Hazard.

**Can cause severe injury, death, or equipment damage.**

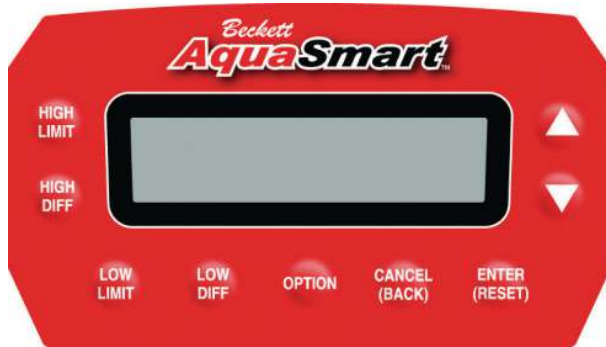
Live line voltage wires and connections will be exposed while programming the AquaSmart. Take care to touch only the AquaSmart keypad while programming the control.

## **⚠ WARNING** Fire, Explosion, and Burn Hazards.

**Can cause severe injury, death, or equipment damage.**

Do not set the operating limits of the control outside of those listed by the appliance manufacturer.

Figure 18 - AquaSmart Keypad



To ensure smooth appliance operation, the AquaSmart requires a separation between the High and Low limits no less than the greater differential plus 5°F. For example: If the HIGH LIMIT is set to 180°F, the HIGH DIFF to 20°F, and the LOW DIFF to 10°F, the control will not allow a LOW LIMIT above 155°F (180°F - 20°F [the greater of the two differentials] - 5°F = 155°F).

## A. Temperature High Limit

1. In any mode or screen other than an *OPTION* sub-menu, press the **“HIGH LIMIT”** key.
2. The following screen will be displayed:

```
HIGH LIMIT: 180F
CHANGE AND ENTER
```

The temperature displayed is the current setting. Use the ▲ and ▼ keys to select the desired setting. Tap the button to increase or decrease the temperature by 1°, or hold it to increase or decrease the temperature by 5° at a time. The control will not allow you to select out-of-range values.

3. Press the **“ENTER (RESET)”** key.
4. The control will ask you to confirm the setting with

the following screen:

```
HIGH LIMIT: 160F
ENTER OR CANCEL
```

Press **“ENTER (RESET)”** if the value is correct, or **“CANCEL (BACK)”** if it is not.

## B. Temperature Low Limit

1. In any mode or screen other than an *OPTION* sub-menu, press the **“LOW LIMIT”** key.
2. The following screen will be displayed:

```
LOW LIMIT: 140F
CHANGE AND ENTER
```

The temperature displayed is the current setting. Use the ▲ and ▼ keys to select the desired setting. Tap the button to increase or decrease the temperature by 1°, or hold it to increase or decrease the temperature by 5° at a time. The control will not allow you to select out-of-range values. For cold-start operation, turn the low limit off by pressing the down arrow key repeatedly until *OFF* is displayed.

**IMPORTANT:** To prevent flue gas condensation and reduce fatigue caused by thermal cycling on conventional (non-condensing) boilers, the LOW LIMIT set point should be 150° F or above.

**NOTE: Appliance manufacturer’s temperature requirements supersede this recommendation.**

3. Press the **“ENTER (RESET)”** key.
4. The control will ask you to confirm the setting with the following screen:

```
LOW LIMIT: 150F
ENTER OR CANCEL
```

Press **“ENTER (RESET)”** if the value is correct, or **“CANCEL (BACK)”** if it is not.

## C. Temperature High Limit Differential

1. In any mode or screen other than an *OPTION* sub-menu, press the **“HIGH DIFF”** key.
2. The following screen will be displayed:

```
HIGH DIFF: 10F
CHANGE AND ENTER
```

The temperature displayed is the current setting. Use the ▲ and ▼ keys to select the desired setting. Tap the button to increase or decrease the temperature by 1°, or hold it to increase or decrease the temperature by 5° at a time. The control will not allow you to select out-of-range values.

3. Press the **“ENTER (RESET)”** key.
4. The control will ask you to confirm the setting with the following screen:

HIGH DIFF: 30F  
ENTER OR CANCEL

Press **“ENTER (RESET)”** if the value is correct, or **“CANCEL (BACK)”** if it is not.

## D. Temperature Low Limit Differential

1. In any mode or screen other than an *OPTION* sub-menu, press the **“LOW DIFF”** key.
2. The following screen will be displayed:

LOW DIFF: 10F  
CHANGE AND ENTER

The temperature displayed is the current setting. Use the **“▲”** and **“▼”** keys to select the desired setting. Tap the button to increase or decrease the temperature by 1°, or hold it to increase or decrease the temperature by 5° at a time. The control will not allow you to select out-of-range values.

Press the **“ENTER (RESET)”** key. The control will ask you to confirm the setting with the following screen:

LOW DIFF: 30F  
ENTER OR CANCEL

Press **“ENTER (RESET)”** if the value is correct, or **“CANCEL (BACK)”** if it is not.

# Programming Additional Options

**Note:** Some additional menus may be visible that are *not* included in the following pages. Those menus are non-functional and reserved for future use.

**⚠ WARNING** Electrical Shock Hazard.  
**Can cause severe injury, death, or equipment damage.**

Live line voltage wires and connections will be exposed while programming the AquaSmart. Take care to touch only the AquaSmart keypad while programming the control.

**⚠ WARNING** Fire, Explosion, and Burn Hazards.  
**Can cause severe injury, death, or equipment damage.**

Do not set the operating limits of the control outside of those listed by the appliance manufacturer.

## A. Changing the Heat Manager Settings

1. In any mode or screen other than an *OPTION* sub-menu, press the **“OPTION”** key.
2. The following screen will be displayed:

HEAT MANAGR MENU  
ENTER TO VIEW

Press **“ENTER (RESET)”** key.

3. The following screen will be displayed:

ECONOMIZER: ON  
ENTER TO CHANGE

- a. To toggle the fuel economizer on or off: Press **“ENTER (RESET)”** key.
- b. To Adjust the Heat Manager efficiency setting: Press the **“▲”** or **“▼”** keys until the following screen is displayed:

EFFICIENCY: MED  
ENTER TO CHANGE

Press **“ENTER (RESET)”** to toggle the comfort setting between *HI*, *MED*, and *LOW*. See “HeatManager Technology” section for an explanation of the efficiency settings.

4. Press **“CANCEL (BACK)”** to exit.

## B. Viewing the Boiler Cycle History

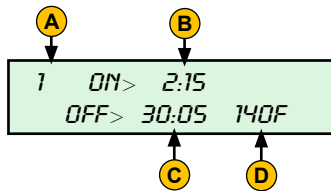
1. In any mode or screen other than an *OPTION* sub-menu, press the **“OPTION”** key.
2. The following screen will be displayed:

HEAT MANAGR MENU  
ENTER TO VIEW

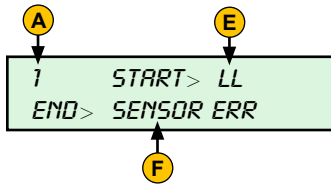
Press the **“▲”** or **“▼”** keys until the following screen is displayed:

HISTORY MENU  
ENTER TO VIEW

- Press the **“ENTER (RESET)”** key. The following screen will be displayed:



- To navigate the history menu, press **“▲”** or **“▼”** key to view additional data and cycles.
- Press the **“▼”** key to view the other data screen for the most recent cycle. The following screen will be displayed:



- Press **“CANCEL (BACK)”** to exit.

### Key (for steps B3 & B5):

A = Current cycle data being displayed (1 being the most recent cycle)

B = Burner on time in minutes:seconds

C = Burner off time in minutes:seconds

D = Average water temperature over burner off-on cycle.

E = Cycle start reason:

LL = burner turned on to maintain low limit.

TT = burner turned on to satisfy a thermostat call for heat.

ZR = burner turned on to satisfy a ZR call for heat.

F = Cycle end reason:

CFH = the call for heat (from T-T or ZR) was satisfied

HL = the boiler water temperature reached the high operating limit.

LL = the boiler water temperature reached the low limit plus low differential.

Lockout reasons (see Lockout Troubleshooting section for more details): SENSOR ERR, SELF-CHECK, CANCEL

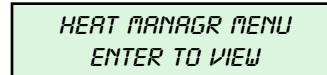
## C. Changing the Circulator Settings

The circulator-off delay keeps the C1 output energized for the set time after a call for heat ends. This helps to increase the efficiency of the system by transferring more heat into the home instead of letting it sit in the boiler.

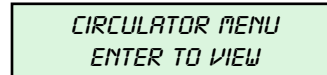
The circulator-on delay holds the C1 output off for the set time at the start of a call for heat. This helps the boiler to heat up more quickly and spend less time in the condensing range (if applicable).

Both circulator delays are selectable from 0 to 4 minutes and 15 seconds.

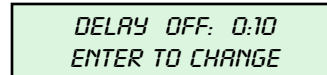
- In any mode other than an *OPTION* sub-menu, press the **“OPTION”** key. The following screen will be displayed:



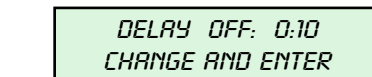
- Press the **“▲”** and **“▼”** keys until the following screen is displayed:



- Press **“ENTER (RESET)”**. The following screen will be displayed:

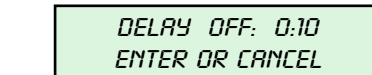


- To change the circulator-off delay after a call for heat ends, press **“ENTER (RESET)”**. The following screen will be displayed.



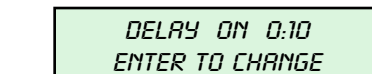
The time displayed is the current setting in minutes:seconds.

Press the **“▲”** and **“▼”** keys to select the desired setting a press **“ENTER (RESET)”**.



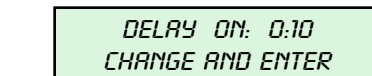
Press **“ENTER (RESET)”** if the value is correct, or **“CANCEL (BACK)”** if it is not.

- To change the circulator-on delay when a call for heat begins, press the **“▲”** and **“▼”** keys until the following screen is displayed:

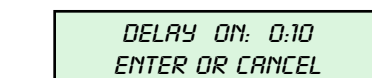


The time displayed is the current setting in minutes:seconds.

Press **“ENTER (RESET)”**. The following screen will be displayed.



Press the **“▲”** and **“▼”** keys to select the desired setting and press the **“ENTER (RESET)”** key.



Press **“ENTER (RESET)”** if the value is correct, or **“CANCEL (BACK)”** if it is not.

- c. To change the call for heat source that the circulator is activated from (see **Figures 8 - 13** for examples), press the “▲” and “▼” keys until the following screen is displayed:

```
CIRC: ON TT
ENTER TO CHANGE
```

Press “**ENTER (RESET)**” to toggle the circulator source between *ON TT*, *ON ZR*, and *ON BOTH*.

4. Press “**CANCEL (BACK)**” to exit.

## D. Changing Domestic Hot Water Priority (DHWP) Setting

The Domestic Hot Water Priority function temporarily overrides the HeatManager Dynamic Temperature Reset functionality when there is a call for domestic hot water. This ensures that hot water will be produced when needed. It also temporarily turns off either the C1 or ZC outputs (depending on the DHWP and circulator source settings) to give priority to the DHWP zone when it calls for heat. See **Figures 8-13** for examples of how to use these settings for maximum benefit.

1. In any mode other than an *OPTION* sub-menu, press the “**OPTION**” key. The following screen appears:

```
HEAT MANAGR MENU
ENTER TO VIEW
```

2. Press the “▲” and “▼” keys until the following screen is displayed:

```
MORE OPTIONS
ENTER TO VIEW
```

3. Press “**ENTER (RESET)**”. The following screen will be displayed:

```
LWCO MENU
ENTER TO VIEW
```

4. Press the “▲” and “▼” keys until the following screen is displayed:

```
DHWP: OFF
ENTER TO CHANGE
```

5. Press “**ENTER (RESET)**” to toggle between *OFF*, *ON TT*, and *ON ZR* settings. See wiring diagrams in **Figures 11 thru 13** for proper wiring with *DHWP* on.
6. Press “**CANCEL (BACK)**” to exit.

## E. Selecting Fahrenheit or Celsius Temperature Display

1. In any mode other than an *OPTION* sub-menu, press the “**OPTION**” key. The following screen appears:

```
HEAT MANAGR MENU
ENTER TO VIEW
```

2. Press the “▲” and “▼” keys until the following screen is displayed:

```
MORE OPTIONS
ENTER TO VIEW
```

3. Press “**ENTER (RESET)**.” The following screen will be displayed:

```
LWCO MENU
ENTER TO VIEW
```

4. Press the “▲” and “▼” keys until the following screen is displayed:

```
DEG (F/C): F
ENTER TO CHANGE
```

5. Press “**ENTER (RESET)**” to toggle between °F and °C.
6. Press “**CANCEL (BACK)**” to exit.

## F. Changing Low Water Cut-Off (LWCO) Setting

The Low Water Cut-off function is active when the 2-in-1 sensor is used with the AquaSmart control to prevent the burner from firing without sufficient water present in the boiler. The *DELAY OFF* time can be selected to delay the response of the control to a low-water condition. The *DELAY ON* time can be selected to delay the response of the control when the boiler water returns to a sufficient level. The *RESET* function can be set to *AUTO* or *MAN* (manual) to control how the AquaSmart will return from a *LOCKOUT LOW WATER* condition when the boiler water returns to a sufficient level. In *AUTO*, the AquaSmart returns automatically. In *MAN* (manual), the **ENTER(RESET)** button must be held for 5 seconds.

1. In any mode other than an *OPTION* sub-menu, press the “**OPTION**” key. The following screen appears:

```
HEAT MANAGR MENU
ENTER TO VIEW
```

2. Press the “▲” and “▼” keys until the following screen is displayed:

*MORE OPTIONS  
ENTER TO VIEW*

3. Press “ENTER (RESET)”. The following screen will be displayed:

*LWCO MENU  
ENTER TO VIEW*

4. Press “ENTER (RESET)”. The following screen will be displayed:

*DELAY OFF: 0:00  
ENTER TO CHANGE*

5. Use the “▲” and “▼” keys to scroll between the *DELAY OFF*, *DELAY ON*, and *RESET* functions or press “ENTER (RESET)” to change. Use the “▲” and “▼” keys to change the setting.

6. If *DELAY OFF* is displayed, Press “ENTER (RESET)” again, the following screen appears:

*DELAY OFF: 0:00  
ENTER OR CANCEL*

7. Press “ENTER (RESET)” to accept the settings or press “CANCEL (BACK)” to go to the previous screen.
8. The same steps are used to change the *DELAY ON* time setting.
9. If the *RESET* function has been selected, press “ENTER (RESET)” to change between *MAN* and *AUTO*. Press “CANCEL (BACK)” to go to the previous screen.
10. Press “CANCEL (BACK)” to exit LWCO menu.

# AquaSmart Operation

Table 4 – Typical operation with default settings (Circulator set “ON TT”)

| System Action  | AquaSmart Response   |
|--|--|
| Temperature falls below low limit  | <ul style="list-style-type: none"> <li>○ Burner is turned on until the water temperature reaches the low limit plus the low differential.</li> <li>○ ZC is turned off until the water temperature reaches the low limit plus the low differential.</li> </ul>  |
| Thermostat call for heat   | <ul style="list-style-type: none"> <li>○ Burner is turned on as long as the water temperature is below the high limit.</li> <li>○ Circulator is turned on after circulator-on delay if the low limit is satisfied.</li> </ul>  |
| Thermostat is satisfied  | <ul style="list-style-type: none"> <li>○ Burner is turned off.</li> <li>○ Circulator is turned off after circulator-off delay</li> </ul>   |
| ZR call for heat   | <ul style="list-style-type: none"> <li>○ Burner is turned on as long as the water temperature is below the high limit.</li> </ul>  |
| ZR is satisfied  | <ul style="list-style-type: none"> <li>○ Burner is turned off.</li> </ul>  |
| Temperature reaches high limit   | <ul style="list-style-type: none"> <li>○ Burner is turned off until the water temperature falls below the high limit minus the high differential.</li> </ul>   |
| Circulator is inactive for 3 days  | <ul style="list-style-type: none"> <li>○ Circulator is turned on for 2 seconds to help prevent seizure.</li> </ul>   |
| AquaSmart locks out  | <ul style="list-style-type: none"> <li>○ Burner, Circulator, and ZC are turned off until the control is reset. The lockout condition may reset automatically or require a manual reset. See lockout section for more information.</li> </ul>   |
| B1 has been energized for 1 hour or AquaSmart has been locked out for 1 hour | <ul style="list-style-type: none"> <li>○ Circulator and ZC are turned on to help prevent system freeze-up by circulating the boiler water to all zones.</li> </ul>   |
| Priority call for heat   | <ul style="list-style-type: none"> <li>○ If DHWP is set on T-T and there is a T-T call for heat, ZC is held off for up to 20 minutes to give the DHW zone priority.</li> <li>○ If DHWP is set on ZR and there is a ZR call for heat, C1 is held off for up to 20 minutes to give the DHW zone priority.</li> </ul> |

## Control Checkout Procedure

These procedures are typical for the default configuration of the control.

1. Wire and configure the AquaSmart as required by the application.
2. **NOTE: Do not apply a thermostat call for heat to the AquaSmart at this time.** Allow the burner to heat the water to above the low limit, plus the low limit differential. The display should read “HEATING WTR” on the LCD display (B1 should be energized and C1 and ZC should be off).
3. When the water is sufficiently heated, the burner will turn off and the display should read “STANDBY”. Now ZC should be energized and B1 and C1 should be off.
4. Apply a call for heat from the thermostat. The burner and circulator should now also turn on (B1, C1, and ZC should now all be energized). Allow the AquaSmart to heat the water to the high limit. During this step the display should read “HEATING WTR” or “HEATING DHW”.
5. Once the high limit is reached, the burner should turn off (C1 and ZC should now be energized, and B1 should be off). The display should now read “CIRCULATING”.
6. Set the thermostat back, so that it is no longer calling for heat. The circulator should turn off (now ZC should be energized and B1 and C1 should be off). The display should now read “STANDBY”.



**Do not leave the installation site if the AquaSmart operation did not match the descriptions in any of the above steps. Make all necessary adjustments until the correct operation is verified. The above procedure helps to verify that the high and low limits are working properly and that the thermostat is wired correctly to the control.**

# How a Boiler Control Works

Figure 19 - Cold Start Operation (Low Limit ► OFF)

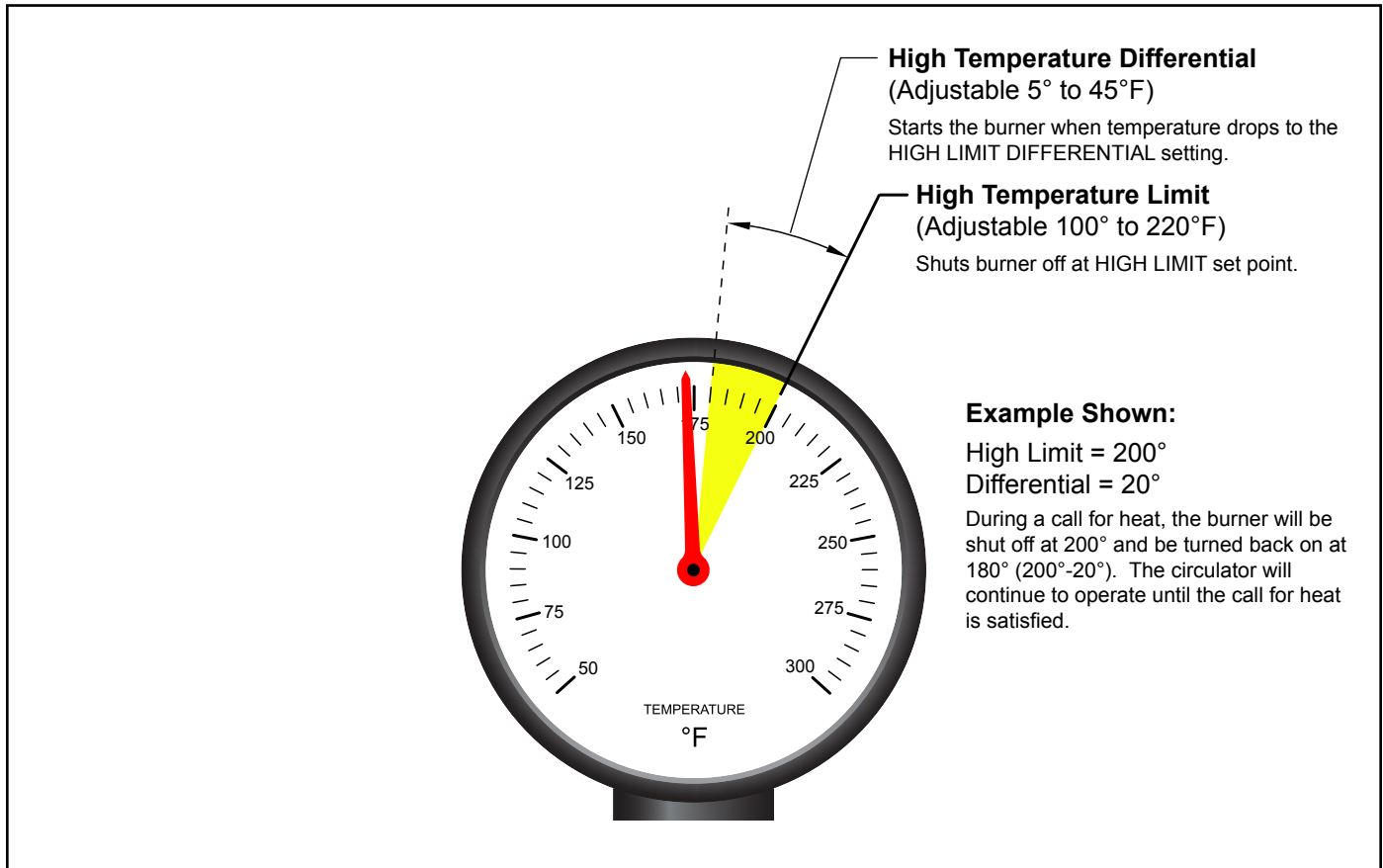
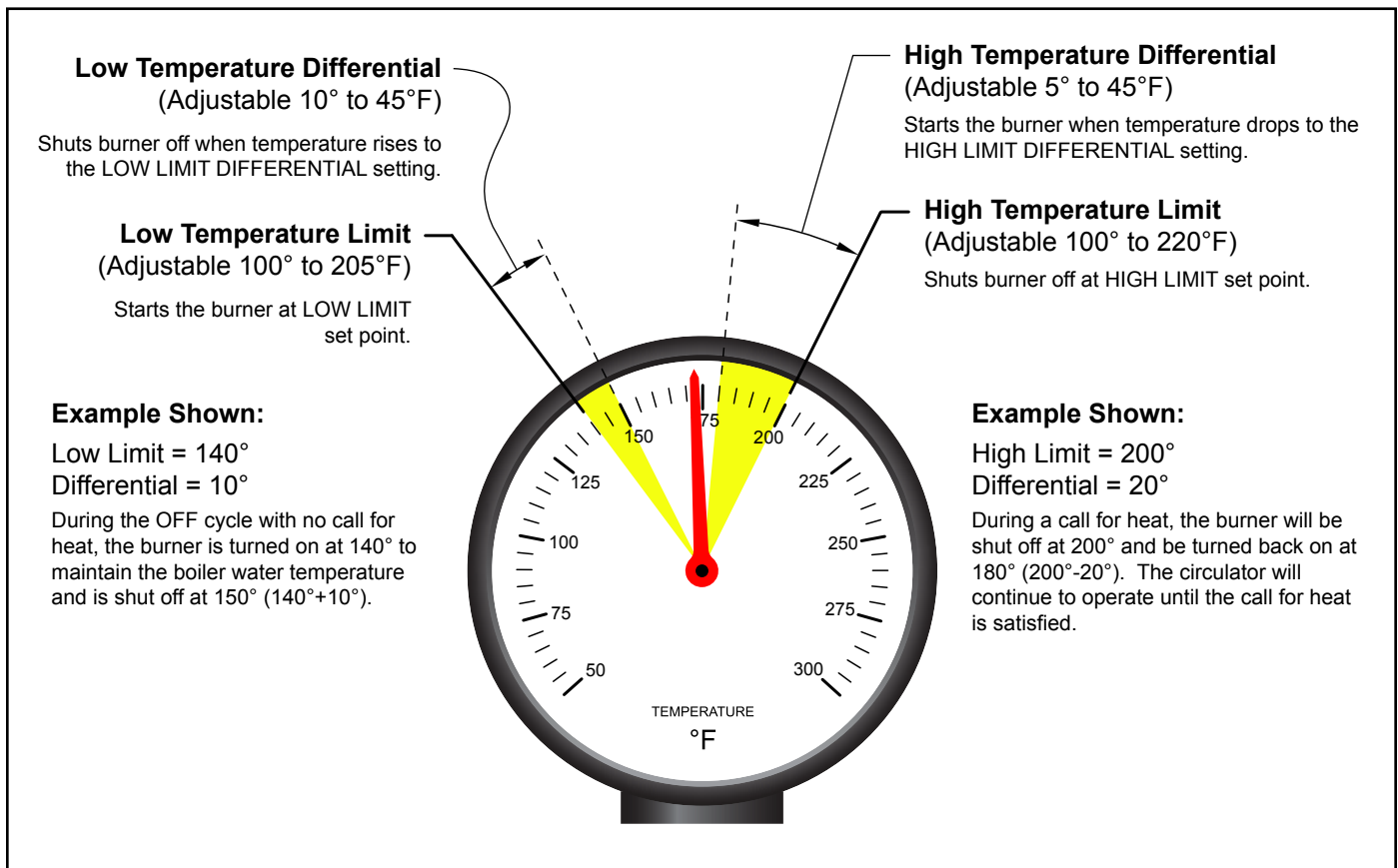
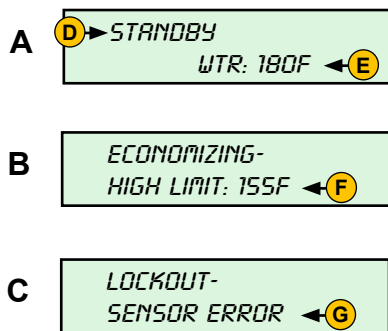


Figure 20 - Warm Start Operation (Low Limit ► ON) (To maintain domestic hot water temperature)



## Display Boiler Status Mode



NOTE: When economizing, the display will toggle between screens A and B every 5 seconds.

### KEY:

D - Current operating temperature mode of boiler.

STANDBY will be displayed if neither the burner nor circulator are energized.

CIRCULATING will be displayed if the circulator is energized but the burner is not.

HEATING WTR will be displayed if a non-priority heat call has caused the burner to be energized.

HEATING DHW will be displayed if a priority heat call has caused the burner to be energized.

FREEZE RES will be displayed if the burner has been running for 1 hour or the AquaSmart has been locked out for 1 hour.

E - Current boiler water temperature measurement

F - Adjusted high limit when economizing

G - Lockout reason (see Lockout section under "Troubleshooting".)

## Troubleshooting

### Lockout

The AquaSmart will lock out if any number of abnormal conditions are detected.



### Frozen Plumbing and Water Damage Hazard

***If the residence is unattended in severely cold weather, boiler control safety lockout, heating system component failures, power outages or other electrical system failures could result in frozen plumbing and water damage in a matter of hours.***

For protection, take preventative actions such as having a security system installed that operates during power outages, senses low temperature and initiates an effective action. Consult your qualified service technician or a home security agency.

1. **SENSOR ERR** - The sensor has either detected an internal error or is not communicating properly with the AquaSmart. The AquaSmart will not reset from this condition until it can detect a properly working sensor.
2. **SELF-CHECK** - An internal safety check, such as the check on the B1 relay contacts, has failed. Hold ENTER (RESET) key for 5 seconds to reset from this condition. If the error occurs again, replace the control.
3. **CANCEL** - The CANCEL (BACK) key was held for 5 seconds or longer, which temporarily suspends the control's operation. The control will resume normal operation once the CANCEL (BACK) button is released.
4. **LOW WATER** - A 2-in-1 sensor is installed and it does not sense water. The control will resume normal operation once water is detected and the LWCO delay on time (if used) has expired.

## HeatManager Technology

The Beckett AquaSmart comes equipped with the Department of Energy (DOE) 2012 compliant Heat Manager load-matching energy saving algorithm. The Heat Manager saves fuel by dynamically changing the temperature high operating limit to the minimum temperature necessary to meet the heating demand.

The qualified service technician can adjust the HeatManager algorithm to maximize comfort or energy savings.

The HeatManager™ algorithm is designed to operate the boiler at its lowest possible temperature while still meeting the heating demand. By dynamically changing the boiler temperature, it is designed to reduce the energy used by the system without sacrificing comfort. The default *HIGH* efficiency setting should work best for most systems. However, there are many system factors that may have an effect on its ability to react to changes quickly enough and supply adequate heat, such as amount of connected radiation, boiler size, system design temperatures, etc. The efficiency setting adjusts how aggressively the HeatManager™ algorithm attempts to reduce the boiler operating temperature. If a loss of comfort is experienced, decreasing the efficiency setting will help regain comfort at the expense of fuel savings (see section A of "Programming Additional Options" for instructions on changing the efficiency setting).

# Final Checklist

## Before Leaving the Installation Site, Verify:

- All wiring has been done correctly in a workmanlike way, is secure and meets all applicable codes.
- AquaSmart control temperature settings, differentials and optional functions are correctly set.
- The control program is functioning properly by observing at least one complete cycle.
- At shutdown, the temperature and pressure level match the recommended settings.
- The pressure relief valve operation and boiler water feed system works properly by bleeding some water and observing the refill cycle.
- The low water cutoff operation by lowering the water level until it shuts the burner off.
- The boiler passages and vent system are clear of obstructions and operating to the appliance manufacturer's specifications and all required clearance dimensions to combustible materials are met.
- With combustion test instruments the burner is set to manufacturer's specifications.
- After the system has run through a complete cycle, that all fittings are free of leaks.
- A record has been made of all service work and all temperature control settings and optional functions. Attach a label or tag to the boiler for future reference.
- The AquaSmart Installation Manual is left at a suitable location near the boiler for future reference and the equipment owner is informed of this.
- The control door is attached and securely closed.

# Service

## During Annual Maintenance or More Frequent Service Intervals, Verify the below items.

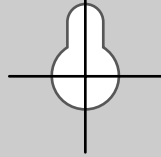
**Note:** The 7600 control has no serviceable internal parts. DO NOT attempt to repair a malfunctioning control.

- The control is clean and all vents are free of dust, lint or foreign material.
- All wiring is tight, terminals are free from corrosion and insulation is intact.
- There is no physical damage to the case or display.
- There is no evidence of water damage on the control or terminals.
- The control is securely mounted to the well or other mounting support.
- The sensor is in its place, with no evidence of tampering.
- The sensor lead on remote mounted units is in good condition and securely anchored in the immersion well with the strain relief.
- The control temperatures, differentials and optional functions are set correctly and working to established specifications. Consult the service tag or label on the boiler.
- A record of service and any adjustments are made to the service label or tag.
- The control door is attached and securely closed.

# Accessories

|  |  |
|--|--|
| <p><b>7600RMU</b><br/> <b>AquaSmart Remote Mount Unit Pack</b><br/> <i>Includes:</i></p> <ul style="list-style-type: none"> <li>○ Cable Assembly with Coupler</li> <li>○ Mounting Template</li> <li>○ Self-drilling Screws (Qty:3)</li> <li>○ Cable Ty-wrap</li> </ul> | <p><b>7600TSU</b><br/> <b>AquaSmart Temperature Sensor Unit Pack</b><br/> <i>Includes:</i></p> <ul style="list-style-type: none"> <li>○ Temperature Sensor</li> <li>○ Cable Ty-wrap</li> <li>○ Joint Compound</li> <li>○ Installation Instructions</li> </ul>  |
| <p><b>76002N1S01U</b><br/> <b>AquaSmart 2-in-1 Sensor Unit Pack</b><br/> <i>Includes:</i></p> <ul style="list-style-type: none"> <li>○ 2-in-1 Sensor</li> <li>○ 36" Ground Wire</li> <li>○ Pipe Clamp for grounding</li> <li>○ Installation Instructions</li> </ul>    | <p><b>76002N1R03U</b><br/> <b>AquaSmart 2-in-1 Replaceable Sensor Unit Pack</b><br/> <i>Includes:</i></p> <ul style="list-style-type: none"> <li>○ Thermowell</li> <li>○ Sensor Probe</li> <li>○ 36" Ground Wire</li> <li>○ Pipe Clamp for grounding</li> <li>○ Installation Instructions</li> </ul> |

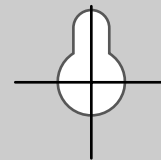
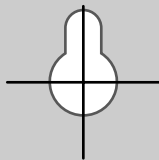
SK10029



**THIS END UP**

## **Mounting Template**

Use self-drilling screws supplied in the  
7600RMU Remote Mount Kit  
-or-  
Drill 0.110" diameter holes



## Limited Warranty Information

The R. W. BECKETT CORPORATION ("Beckett") warrants to persons who purchase its "Products" from Beckett for resale, or for incorporation into a product for resale ("Customers"), that its equipment is free from defects in material and workmanship. To qualify for warranty benefits, products must be installed by a qualified service agency in full compliance with all codes and authorities having jurisdiction, and used within the tolerances of Beckett's defined product specifications.

To review the complete warranty policy and duration of coverage for a specific product, or obtain a written copy of warranty form 61545, please choose one of the following options:

1. Visit our website at: [www.beckettcorp.com/warranty](http://www.beckettcorp.com/warranty)
2. Email your request to: [rwb-customer-service@beckettcorp.com](mailto:rwb-customer-service@beckettcorp.com)
3. Write to: R. W. Beckett Corporation, P. O. Box 1289, Elyria, OH 44036

**NOTE: Beckett is not responsible for any labor cost for removal and replacement of equipment.**

THIS WARRANTY IS LIMITED TO THE PRECISE TERMS SET FORTH ABOVE, AND PROVIDES EXCLUSIVE REMEDIES EXPRESSLY IN LIEU OF ALL OTHER REMEDIES, AND IN PARTICULAR THERE SHALL BE EXCLUDED THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE. IN NO EVENT WILL BECKETT BE LIABLE FOR ANY INCIDENTAL OR CONSEQUENTIAL DAMAGE OF ANY NATURE. Beckett neither assumes, nor authorizes any person to assume for Beckett, any other liability or obligation in connection with the sale of this equipment. Beckett's liability and Customer's exclusive remedy is limited to the cost of the product.



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