



# AQ250 Series Hydronic Control Panels

**PRODUCT DATA**



## PRODUCT DESCRIPTION

The AQ250 easily converts a single-zone heating system into a room-by-room comfort control system, or upgrades a basic, relay-logic zoning system to intelligent Zone of Greatest Demand control. The boiler control of the AQ250 can ensure ample supply of hot water for both space heating and priority generation of domestic hot water for bathing, dishes and laundry.

## FEATURES

The AQ250 Series Hydronic Control Panels have the following features:

- **Zoning Control for up to four, single-stage zones or two, two-stage zones as shipped; can be expanded to a total of 16 zones with AQ255 or AQ257 expansion zoning panels, and up to 64 zones by using up to three AQ254 Add-a-Temperature expansion panels and additional expansion zoning modules.**
- **Controls one boiler loop.**
- **Zone synchronization through Zone of Greatest Demand control.**
- **Domestic hot water (DHW) priority and priority override protection.**
- **Use with digital non-communicating thermostats or AQ1000 2-wire polarity insensitive communicating thermostats.**
- **Automated test feature for quick start-up and simplified troubleshooting.**
- **Boiler freeze protection (in the event of network communication failure).**
- **Boiler short cycling protection, post purge, and shock prevention from cold water returning to boiler.**
- **Line or low-voltage output for zoning equipment (pumps or valves).**
- **Integral 38 VA transformer with self resetting electronic fuse.**

### IMPORTANT

*To ensure correct installation and proper operation of the control, perform the 7 installation steps in the order numbered starting with "Installation Preparation" on page 3.*

- **When using non-communicating thermostats, the following features are not available:**
  - **Outdoor temperature is not displayed on the thermostat.**
  - **Individual zone freeze protection.**



# SPECIFICATIONS

The AQ250 Control Panels and corresponding attached equipment are listed in Table 1.

**Table 1. AQ250 Series Control Panel Models.**

Control Panel	Corresponding Control Module	Corresponding Zoning Module
AQ25042B	AQ15000B	AQ15540B
AQ25044B	AQ15000B	AQ15740B

**Application:** Controls one boiler loop as well as domestic hot water (DHW) management and zoning operation in a hydronic zoning system.

**Power and Electrical Ratings:**

**Power Supply:** 120 Vac / 60Hz

**Auxiliary Pump Contact Rating:** 120/250 Vac, 5A, 1/3 HP

**Boiler (T-T) Contact Rating:** 24 Vac, 0.5A, 12 VA

**Boiler Pump Output Rating:** 120 Vac, 5A, 1/3 HP

**DHW Pump/Valve Output Rating:** 120 Vac, 5A, 1/3 HP

**B-B Communication Bus Terminals:** Low voltage, Class II, 2-wire polarity-insensitive, digital communicating link to other Control or Zoning modules.

**Electrical Connections (Line Voltage):** Wire-clamp screw terminals; maximum 2 x 14 AWG each on line voltage terminals

**Environmental Ratings:**

**Control and Zoning Panel Temperature Rating:** 32°F to 130°F (0°C to 55°C)

**Operating Humidity Range (% RH):** 5 to 90% RH, non-condensing

**Temperature Ratings:**

**Return Minimum Control Temperature:** 140°F (60°C); This is the temperature at which the bypass pump (Aux. Pump contacts) is activated.

**Sensor Temperature Rating:** -58°F to 230°F (-50°C to 110°C)

**Inputs/Outputs:**

**DHW Demand Input:** External dry contacts connection only

**Heat Demand (Thermostat R-W) Input:** External dry contacts connection only

**R-C Input (on Control and Zoning Modules):** 24 Vac Class II

**R-C Output (on transformer):** 38 VA, 24 Vac Class II

**Interface and Timings:**

**User Interface:** DIP Switch settings

**Boiler Heat Post Purge:** 30 seconds; not adjustable

**Pump/Valve exercise:** 30 seconds per 2 weeks of space heating inactivity; not adjustable

**Thermostat Compatibility:** Digital thermostats and/or AQ1000 Series 2-wire communicating thermostats

**Supply/Return Loop Sensor:** 10K ohm NTC thermistor at 77°F (25°C) ± 0.5°F (±0.3°C). Lead length: 10 ft. (3.0 m); up to 500 ft. (150 m) using 18 AWG or larger wire, beta=3892.

**Dimensions (HxWxD):**

8.0 x 13 x 3.3 in. (20.3 x 32.9 x 8.5 cm) approximate

**Weight:** 4.9 lb. (2.2 kg)

**Approvals:** Canadian Standards Association: Certified, File No. LR76030

# 1 INSTALLATION PREPARATION

NOTES: Throughout these instructions, the following terminology conventions are used:

- AQ150 refers to the AQ15000B Control Module;
- AQ155 refers to the AQ15540B Zoning Module.
- AQ157 refers to the AQ15740B Zoning Module.
- AQ250 is used when the information applies to both the AQ25042B and AQ25044B Control Panels. Where there are specific instructions or details relating to the “-42B” or “-44B” Control Panels, the full model number (i.e. AQ25044B) is used;
- AQ255 refers to all of the AQ25542B, AQ25582B and AQ25742B Expansion Zoning Panels
- AQ257 refers to the AQ25744B Expansion Zoning Panel. Where there are specific instructions or details relating to the “-42B”, “-82B”, “-42B”, or “-44B” Expansion Zoning Panels, the full model number (i.e. AQ25744B) is used;
- Control Module refers to the component within an AQ2000 Series Control Panel that performs the master control operations. See Table 1 on page 2 for specific models.
- Control Panel refers to an assembled product, consisting of a transformer, Control Module and Zoning Module, all contained within an AQ2000 panel enclosure;
- Expansion Zoning Panel refers to an assembled product, consisting of a Zoning Module and, if applicable, a transformer, contained within an AQ2000 panel enclosure. Zoning Modules are available in either 4-zone or 8-zone configurations. Refer to literature Form No. 69-1981 for more information on these products.
- Zoning Module refers to the component within an AQ2000 Series Control Panel or Zoning Expansion Panel.

## When Installing this Product...

1. Read these instructions carefully. Failure to follow them could damage the product or cause a hazardous condition.
2. Check the ratings given in the instructions and on the product to make sure the product is suitable for the application.
3. Installers must be trained, experienced, and licensed service technicians.
4. Follow local codes for installation and application.
5. After installation is complete, check out the product operation as printed in these instructions.



## WARNING

**Risk of electrical shock.**

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

Disconnect power supply before installation and before servicing.

## Check That You Have All the Necessary Equipment For a Successful Installation

- AQ2000 Series components:
  - AQ250 Control Panel
  - AQ Expansion Zoning Panels (if more than four space heating zones in the system)
  - Digital thermostats (one for every space heating zone being controlled)
- Boiler supply and return temperature sensors (included with the AQ250 Control Panel)
- Low voltage thermostat wire
- Zoning equipment (zone valves or pumps)

## Read All Instructions Carefully Before Proceeding

The AQ250 Control Panels are a part of a totally new series of hydronic controls. And although they - and other AQ2000 system components - are very easy to install and operate, they are different than other hydronic controls that you have previously installed. So take a moment to read through this quick installation guide before beginning the installation. Failure to follow them could damage the product or cause a hazardous condition.

## Familiarize Yourself With the AQ250 Control Panel Layout

Refer to Fig. 1 on page 4. All AQ250 Control Panels consist of three functional components:

1. AQ10X38 transformer (power supply module), which connects to 120 Vac power and supplies 24 Vac power to the Control Module and Zoning Modules
2. AQ15000B boiler / DHW Control Module, which controls the boiler and domestic hot water (DHW) functions as well as coordinating the overall operation of the hydronic system.
3. One of two different 4-zone Zoning Modules:
  - **AQ15740B (part of the AQ25044B Control Panel) for zoning with 24 Vac zone valves with end switches.**
  - **AQ15540B (part of the AQ25042B Control Panel) for zoning with either line voltage circulators or 24 Vac zone valves without end switches.**

AQ250 Control Panels can control a maximum of 16 zones by connecting additional Expansion Zoning Panels to the AQ250 Control Panel. Each Expansion Zoning Panel is configured with its own bank of DIP switches, located in the left-most section of each Zoning Module. To expand the capacity of an AQ250 Control Panel beyond 16 zones, an AQ254 Add-A-Temperature Expansion Control Panel is required. The hydronic system can be expanded by 16 zones for each AQ254 connected to the AQ2000 network. A maximum of three (3) AQ254 Panels may be connected to an existing AQ2000 Control Panel for a maximum of 64 zones connected on the AQUATROL® network

NOTE: If an AQ254 Add-A-Temperature Expansion Control Panel is used for controlling the temperature in a mixed loop, it can reset the mixed loop tem-

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perature using LOAD reset, but not OUTDOOR reset, as the AQ250 panel does not have input terminals for an outdoor sensor.

In general, the top terminals of the AQ2000 Series components carry low voltage (24 Vac) power and the bottom terminals carry line voltage (120 Vac) power. This is illustrated in Fig. 1. The two exceptions to this are:

1. AQ15740B Zoning Module for use with zone valves with end switches.
2. AQ15540B Zoning Module when used with low voltage zone valves without end switches.

For these the two exceptions, the bottom terminals of the Transformer and Control Module carry line voltage (120 Vac), but the bottom terminals of the Zoning Module will carry low voltage (24 Vac) power.

The powered terminals on the bottom of the AQ2000 Series Control Modules and Zoning Modules are connected internally, as shown in Fig. 2. The voltage supplied to the N and L terminals is also available at the adjacent terminal pairs when the hot (⊕) relays are switched.

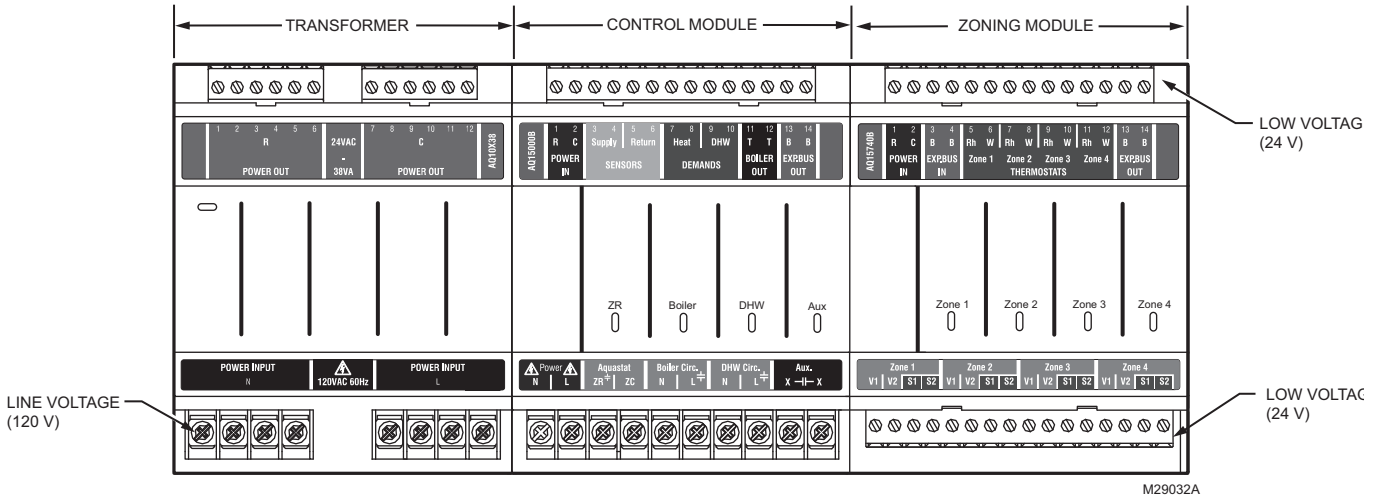


Fig. 1. AQ250 Control Panel layout (AQ25044B shown).

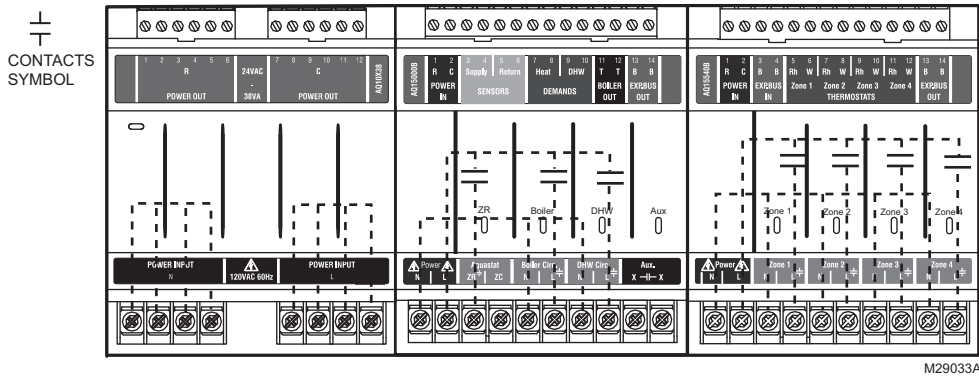


Fig. 2. Internal wiring for AQ2000 Series components line voltage relays.

## 2 MOUNTING

This section describes how to mount the Control Panel, Expansion Zoning Panels, and the Thermostats.

### Mount AQ250 Control Panel

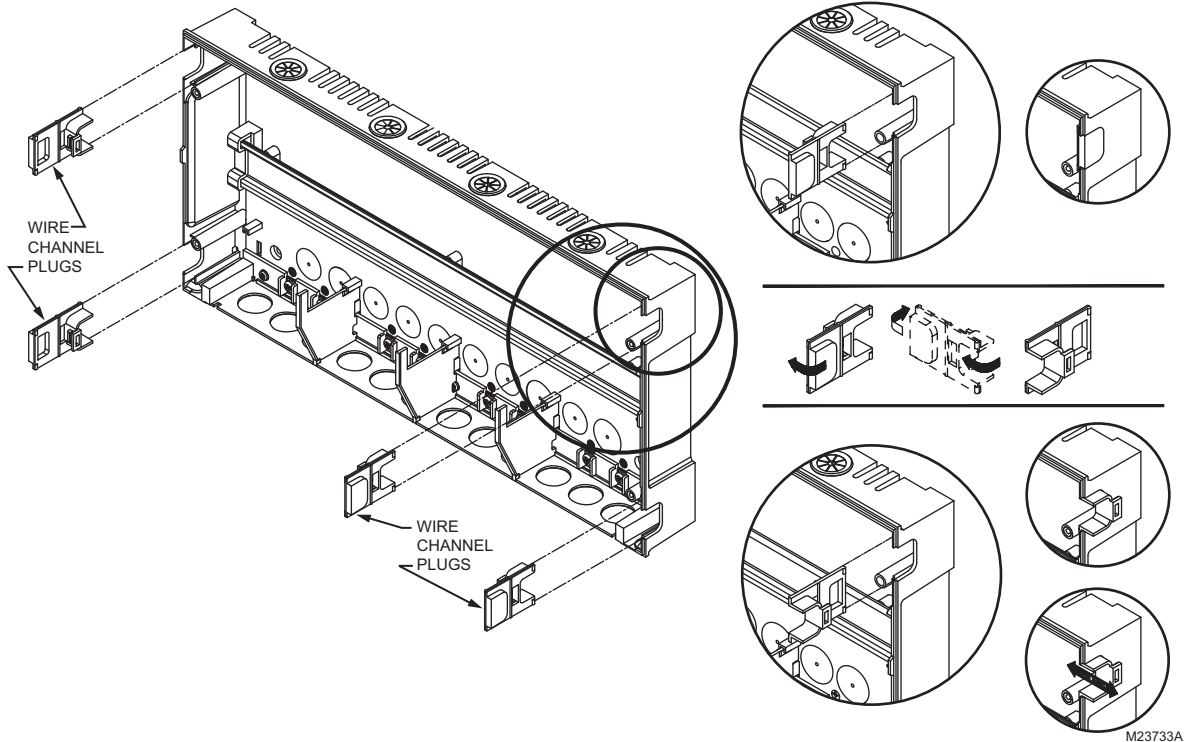
Mount the control panel on the wall:

1. Use the template supplied with the AQ250 Series Control Panel to mark the four mounting holes for the panel.
2. Install two top screws, mount the panel, and install the two lower screws.

### Mount Expansion Zoning Panels

If there are Expansion Zoning Panels to install, mount them to the wall now:

1. Remove wire channel plugs from the AQ250 Control Panel and any Expansion Zoning Panels (see Fig. 3 on page 5).
2. Mount Expansion Zoning Panel on the right-hand end of the AQ250 Control Panel. Install two top screws of the Expansion Zoning Panel, ensuring it is level with the adjoining Control Panel, and install two lower screws.
3. Reverse wire channel plugs and re-insert them into their slot, to form a wiring channel between the Control Panel and the Expansion Zoning Panel (see Fig. 3 on page 5) and to connect the two panels together.
4. For any additional Expansion Zoning Panels, repeat steps 1–3



**Fig. 3. Orientation of wire channel plugs for creating pass-through wire channel and for joining Control Panel to Expansion Zoning Panels.**

### Mount and Wire Thermostats in the Zones

Install the thermostats on the walls in the zones that are to be controlled by the AQ250 Control Panel.

When using AQ1000 thermostats refer to the installation instructions included with the AQ1000 thermostats.

If not done already, run low voltage thermostat wire (24 gauge or heavier) from the thermostats back to the Zoning Modules connected to the AQ250 Control Panel.

**NOTES:** If not otherwise specified, low voltage wiring should be run with 18 gauge thermostat wire and line voltage wiring should be run with 14 gauge wire. AQUATROL line voltage screw terminals are only approved for use with 22 to 12 gauge copper conductors.

Several wiring diagrams are included in this document. For additional information, refer to <http://customer.resideo.com> or your local distributor.

### 3 WIRING PROCEDURE

The AQ250 Control Panel is pre-wired at the factory, making for faster installation.

For all models, the low voltage output terminals located at the top of the transformer secondary are wired to the R and C input terminals of the Control Module, as well as the R and C inputs of the Zoning Module. The B-B Exp. Bus terminals (13 and 14) of the Control Module are wired to the B-B Exp. Bus IN terminals of the Zoning Module.

Beginning with the top left of Fig. 4 on page 6 and moving clockwise around the panel, wire components to the AQ250 Control Panel and Expansion Zoning Panels (if installed) in the following six steps:

- “Step 1 – Transformer Wiring” on page 6
- “Step 2 – Control Panel Wiring” on page 6
- “Step 3 – Thermostats Wiring” on page 8
- “Step 4 – Zoning Equipment Wiring” on page 8
- “Step 5 – Line Voltage System Outputs” on page 10
- “Step 6 – Connection To Line Voltage Power” on page 13

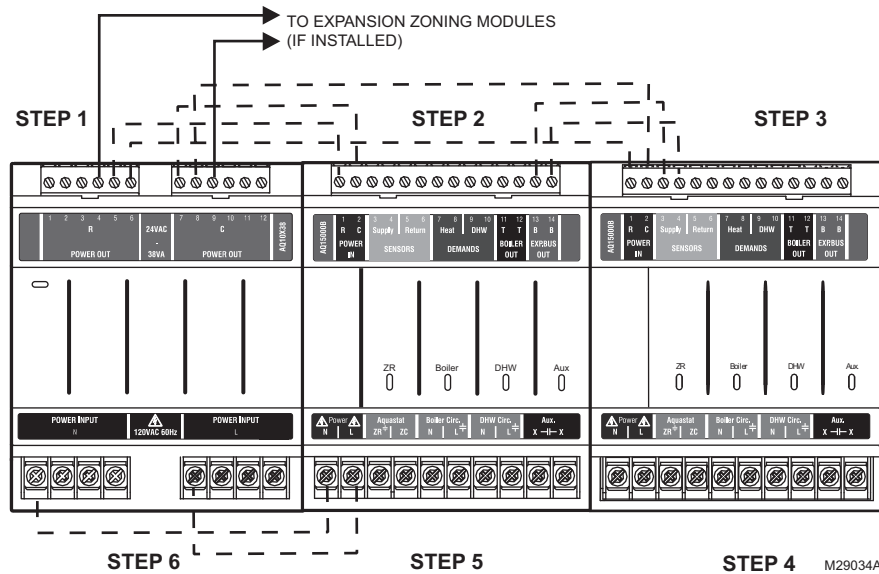


Fig. 4. Wiring sequence.

#### Step 1 – Transformer Wiring

Factory pre-wiring of the Control Panels is shown as dotted lines in Fig. 4.

In addition to the pre-wiring, run low voltage jumper wires from available R and C terminals on the secondary of the transformer to the R and C terminals of any Expansion Zoning Panel.

#### Step 2 – Control Panel Wiring

Wire the Temperature Sensors, System Demands, Low Voltage Outputs, and Communication Bus (Refer to Fig. 5 for wiring terminals on the top of the AQ250):

- “Temperature Sensor Wiring”
- “System Demands Wiring” on page 7
- “Low Voltage Outputs Wiring” on page 7
- “Communication Bus Wiring” on page 7

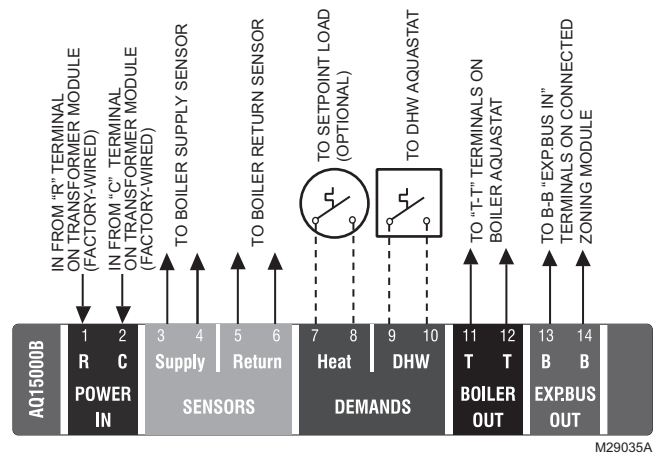


Fig. 5. Low voltage wiring for the AQ1520M0 Control Module.

#### Temperature Sensor Wiring

Connect the lead wires of each sensor to the corresponding terminals on top of the AQ15000B Control Module. See Fig. 5.

The Boiler Supply and Return sensors can be installed either as strap-on sensors or inserted into an immersion well that is packed with thermally-conductive paste.

### BOILER SUPPLY AND RETURN SENSORS

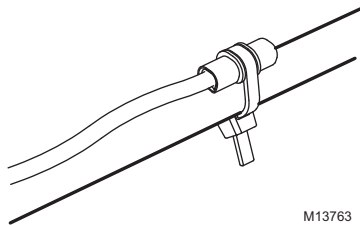
Both the Supply and Return Sensors should be installed on the supply and return piping of the boiler for proper operation of the AQ250 Control Panel. Even if the AQ250 is connected to a modulating condensing boiler with its own supply and/or return sensors, the AQ250's sensors should still be installed for the control to operate.

The Boiler Supply water sensor should be installed on the supply piping close to the exit port of the boiler, using one of the AQ12C11 strap-on sensors supplied with the AQ250. See Fig. 6 on page 7.

The Boiler Return sensor should be installed on the return piping as close to the entrance port to the boiler as practical, using the other AQ12C11 strap-on sensor supplied with the AQ250. The correct location is one that will measure the temperature of all combined sources of water returning back to the boiler.

Insulate strap-on sensors with pipe wrap to ensure accurate boiler temperature sensing.

The Boiler Supply and Return water sensors come with 10 ft. (3m) of wire to minimize the need for splicing.



**Fig. 6. Strap-on temperature sensor installation.**

### IMPORTANT

*Do not run sensor wires parallel, or close, to telephone, Ethernet, or power cables. Cross all power, Ethernet, and telephone wiring at right angles.*

*If sensor wires are located in an area with strong sources of electromagnetic interference, or EMI, (e.g., if sensor wires are run in the same electrical chase as line voltage wiring) use twisted pair, shielded cable, or run wires in a grounded metal conduit.*

*This is important because the calculated temperature - based on the sensor's resistance reading - can be distorted by high EMI, potentially causing the AQ250 to not operate properly.*

*If using shielded cable or conduit, connect the shield wire to earth ground only at the AQ250 panel. Do not ground the shield or conduit at any other location or electromagnetic shielding will be ineffective. If shielded cable is used, Resideo recommends the use of shielded cable with a continuous ground plane, such as foil, with an integral drain wire for bonding to earth ground.*

## System Demands Wiring

### HEAT DEMAND

Wire the Heat Demand (terminals 7 and 8) to a system setpoint demand (dry contact closure), such as a pool or spa Aquastat®.

### DOMESTIC HOT WATER (OPTIONAL)

If used, wire the DHW (terminals 9 and 10) to the Aquastat or thermostat on the domestic hot water tank.

DHW priority allows only DHW heat for the first 30 minutes of a call for DHW and then allows the space heating needs to be added in for the next 30 minutes. This cycle continues until the call for DHW is satisfied.

NOTE: If the AQ250 is connected to a modulating condensing boiler with built-in DHW management, the DHW tank's Aquastat should be connected to the AQ250's DHW (terminals 9 and 10). In this case, the Aux Out contacts should be programmed (in Installer Mode settings) to close when there's a call for DHW [EQUIPMENT SETUP>AUXILIARY IO>AUX.OUT>DHW]

## Low Voltage Outputs Wiring

### BOILER

Wire the Boiler dry contact output (terminals 11 and 12) to the T-T terminals on the boiler Aquastat or the boiler's control panel. See Fig. 14 on page 11 for wiring connections to a typical boiler Aquastat.

It is not necessary to use the T-T terminals if connecting to a Triple Aquastat, since the signal to the Aquastat is received from the ZR/ZC terminals. See Fig. 14 and Fig. 15 beginning on page 11 for line voltage connection to boiler Aquastats.

These contacts are made any time the system has a request for boiler operation. When this occurs, the system's primary boiler pump comes on.

## Communication Bus Wiring

All AQ2000 components communicate with each other on the AQUATROL network using communication bus wiring. This wiring must connect all AQ2000 components. Otherwise, features that depend on this networked communication (e.g., zone synchronization) will not function.

The communication bus wiring is polarity insensitive. The installer does not need to worry about a +ve or -ve orientation of the wires. If there are two wires connected between the B-B Bus Exp. In on one module and B-B Bus Exp. Out on another module, there will be communication. See example in Fig. 7 for how this wiring is to be installed.

The communication bus connections for AQ250 Control Panels are pre-wired at the factory.

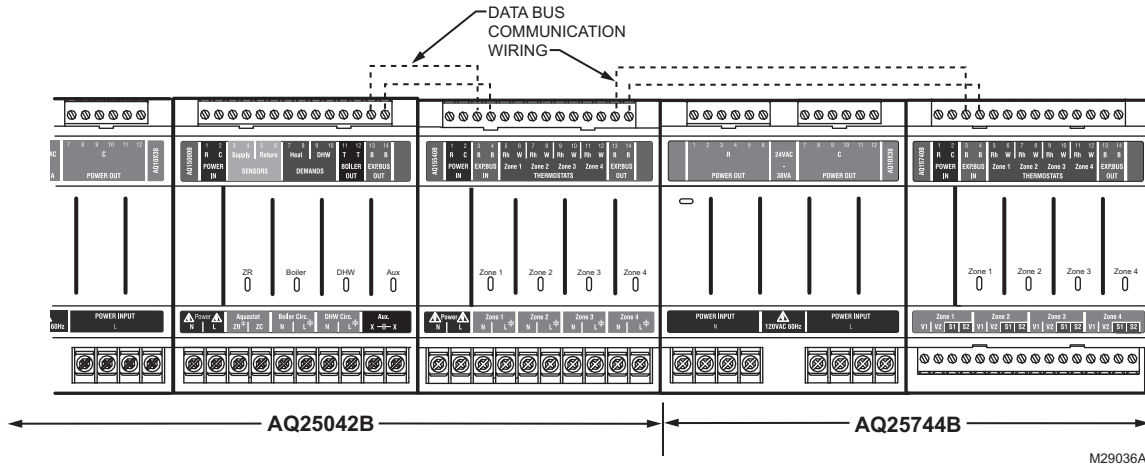


Fig. 7. Wiring for communication bus.

### Step 3 – Thermostats Wiring

NOTE: The new AQ2000 panels will work with either digital (electronic) non-communicating thermostats or AQ1000 communicating thermostats.

- Using low voltage thermostat wire, connect one thermostat from each zone to the corresponding THERMOSTATS Zone X inputs on top of the Zoning Module (see Fig. 8).
- If there are additional zones (on Expansion Zoning Panels) connected to this Zoning Module, run low voltage thermostat wiring from the B-B Exp. Bus Out connection (terminals 13 and 14) of the Zoning Module to the B-B Exp. Bus. In connection (terminals 3 and 4) on the Expansion Zoning Panel.

**IMPORTANT**

*Do not run thermostat wires parallel, or close, to telephone, Ethernet, or power cables. Cross all power, Ethernet, and telephone wiring at right angles.*

*If thermostat wires are located in an area with strong sources of electromagnetic interference, or EMI, (e.g., if thermostat wires are run in the same electrical chase as line voltage wiring) use twisted pair, shielded cable, or run wires in a grounded metal conduit.*

*This is important, because the AQ1000 thermostats are communicating thermostats which send and received data via the two wires connecting them to the Zoning Module. This data can be distorted by the EMI, potentially causing the AQ250 to not operate properly.*

- Run low voltage thermostat wiring from the R and C output terminals on the secondary of the AQ250 Control Panel's transformer to the R and C input terminals on the Expansion Zoning Panel. As an alternative, you can run low voltage thermostat wiring

from the R and C terminals on the Zoning Module to the R and C terminals on the Expansion Zoning Panel.

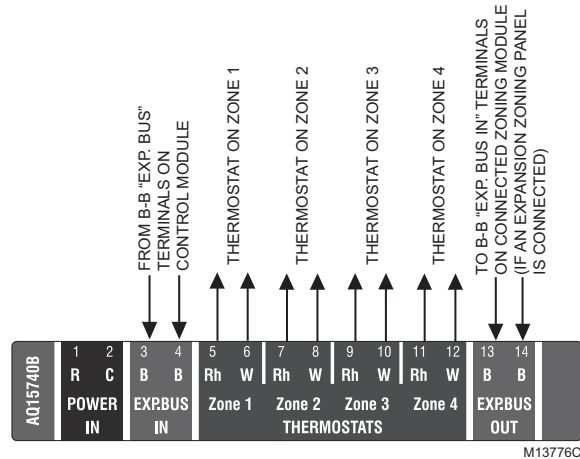


Fig. 8. Connecting thermostats.

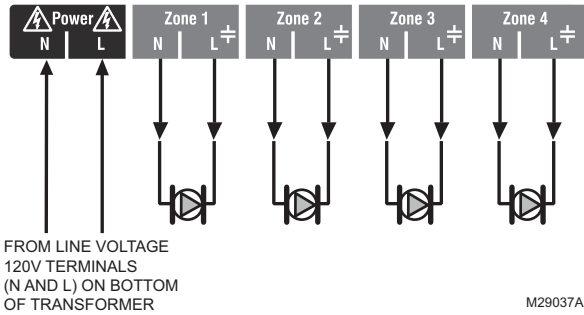
### Step 4 – Zoning Equipment Wiring

Because the Zoning Module of the AQ25042B Control Panel can be used with either line voltage pumps or valves, or low voltage zone valves (with or without end switches), field installed wiring of the correct voltage needs to be connected to the zoning equipment terminals on the bottom left portion of the Zoning Module.

#### Line Voltage – Circulators or Zone Valves

Refer to Fig. 9. Remove the plastic wiring barrier that is located in the bottom wiring channel between the AQ15000B Control Module and the Zoning Module. Run jumper wires from the N and L terminals on the bottom of the AQ250 Control Panel's transformer, through the wiring channel across the bottom of the Control Panel, and to the corresponding N and L terminals of the Zoning Module.



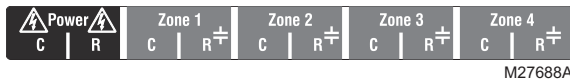


**Fig. 9. Wiring an AQ15540B Zoning Module for use with line voltage circulators.**

### Low Voltage – Zone Valves With or Without End Switches

**IMPORTANT**

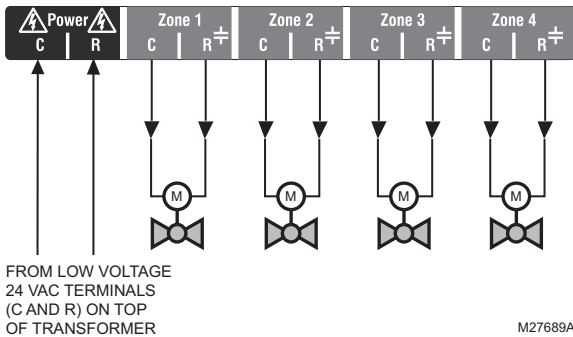
If low voltage zone valves are used with the AQ25042B Control Panel, the supplied Low Voltage Output sticker (shown in Fig. 10) must be applied over the line voltage output sticker (see Fig. 9) that is already attached to the Zoning Module.



**Fig. 10. Low voltage output sticker.**

**WIRING ZONE VALVES WITHOUT END SWITCHES**

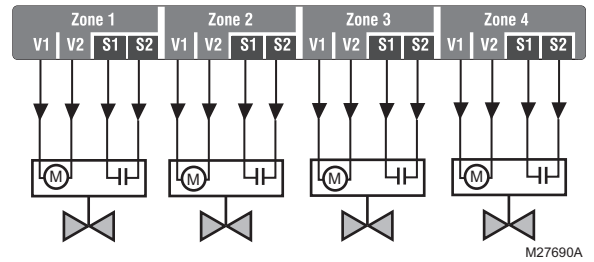
- Using Fig. 11 on page 9 as a guide, run jumper wires from the R and C terminals on the secondary of the AQ250's transformer, through the wiring channel across the top of the Control Panel, and down through the wiring channel on the right side of the panel and over to the R and C terminals on the bottom of the Zoning Module.



**Fig. 11. Wiring an AQ15540B Zoning Module for use with low voltage zone valves without end switches.**

**WIRING ZONE VALVES WITH END SWITCHES:**

- See Fig. 12. 24 Vac power is pre-wired between the transformer secondary at the top left of the AQ250's transformer and the AQ15740B Zoning Module. No field wiring is required.



**Fig. 12. Wiring an AQ15740B Zoning Module for use with low voltage zone valves with end switches.**



## CAUTION

**Equipment Damage Hazard.**  
**Can damage internal circuitry of Zoning Module.**  
The ES1 and ES2 terminals of the AQ15740B Zoning Module are powered terminals and must only be connected to a set of dry contacts, such as a zone valve motor's end switch. If power is applied to these contacts (for example, by running line voltage through the zone valves' end switches to bring on a circulator feeding those valves), the internal circuitry of the Zoning Module will be damaged, in which case the warranty for this product will be voided.

**NOTE:** When wiring zone valves with end switches, note the transformer's VA:  
If low voltage zone valves with end switches are used for zone control, make sure the selected zone valves do not draw more power (VA) than the 38 VA capacity of the AQ10X38 transformer supplied with the AQ250 Control Panel. This integral transformer has enough power to operate 4 motorized zone valves (such as V8043E valves or 4 valves using low-amperage draw, heat motor actuators, such as MV100 actuators), plus power the electronics of the AQ250's Control Module and up to 16 AQ1000 thermostats. If zone valves with high-amperage draw, heat motor actuators are used (such as Taco 500 series zone valves), additional 24 Vac transformer capacity will need to be wired to the Zoning Module to power the valves. See Fig. 13 on page 10 for recommended wiring of additional low voltage VA capacity to AQ2000 Series Zoning Modules.



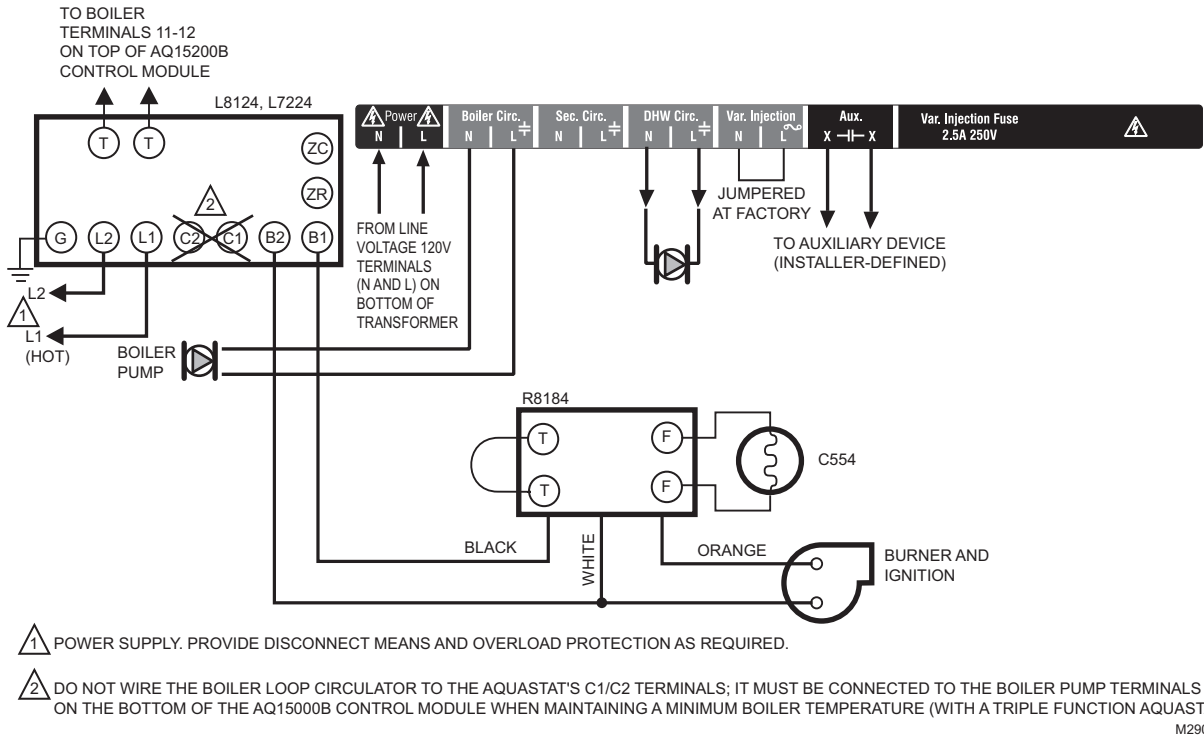


Fig. 14. Line Voltage Connections for AQ250.

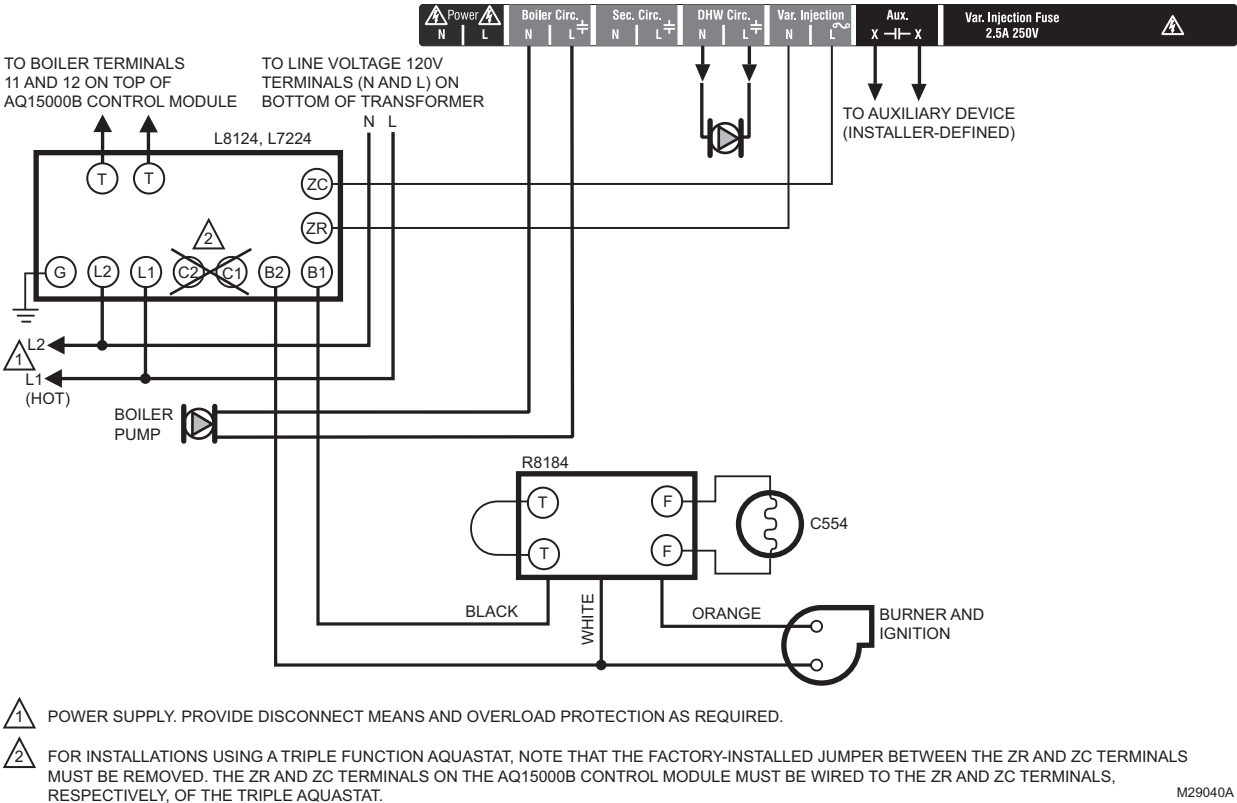


Fig. 15. Line Voltage Connections for AQ250 using triple function Aquastat.

### 1. Boiler Pump

Connect the N and L wires of the boiler loop pump to the N and switched hot (L) terminals of the line voltage Boiler output, shown in Fig. 17. The ground wire of the pump can be connected to any of the 6 ground screw terminals located on the back surface of the Control Panel enclosure.

NOTE: If the AQ250 is connected to a modulating condensing boiler, the boiler pump may need to be connected to the boiler, not the AQ250. Confirm this with the boiler's installation manual.

### 2. DHW Aquastat Device

Wire the DHW pump or line voltage zone valve to the N and switched hot (L) terminals of the DHW output, as shown in Fig. 17.

If using a low voltage zone valve, wire the primary of a spud-mounted transformer (115V to 24V) to the DHW line voltage contacts and connect the low voltage zone valve to the secondary terminals of this transformer. A spud-mounted transformer may be located in one of the conduit knockouts on the bottom of the AQ250 Control Panel.

The DHW contacts are made when the DHW inputs on terminals 9 and 10 are shorted by the controlling Aquastat. When DHW Priority is enabled, the system has a 30 minute priority over all calls for heat. After 30 minutes, calls for heat are added back in to the operation for 30 minutes and then turned off again, if the DHW demand is still active in the system. This repeats until the DHW is satisfied.

NOTE: If the AQ250 is connected to a modulating condensing boiler, the DHW pump will probably need to be connected to the boiler, not the AQ250. Confirm this with the boiler's installation manual.

### 3. Line Voltage Rated Aux Output (optional)

To connect a line voltage auxiliary device to these contacts, such as a boiler bypass pump, power the device from the N and L terminals on the bottom of the Control Module, running the hot (L) lead through the Aux. Pump contacts. See Fig. 16 for details. The exact wiring schematic will depend on what is connected to these dry contacts.

NOTE: Use of this output is optional. The Aux. pump dry contacts are line voltage-rated but unpowered. A low voltage device can be connected to these contacts, but the wire's insulation must meet applicable codes for use in line voltage enclosures.

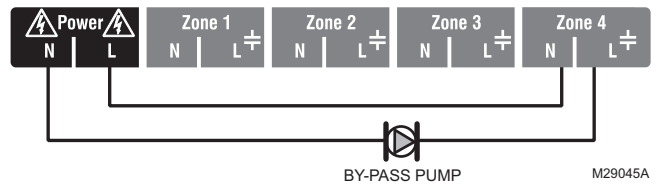
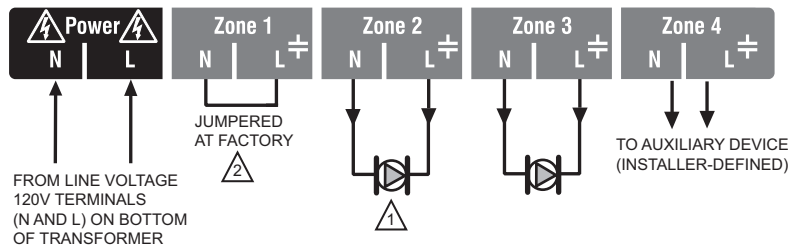


Fig. 16. Wiring of the Aux. pump line voltage rated dry contacts (example shown is a by-pass pump).



- 1 DO NOT WIRE THE BOILER LOOP CIRCULATOR TO THE BOILER'S AQUASTAT TERMINALS C1/C2; IT MUST BE CONNECTED TO THE BOILER PUMP TERMINALS ON THE BOTTOM OF THE AQ15000B CONTROL MODULE WHEN MAINTAINING A MINIMUM BOILER TEMPERATURE (WITH A TRIPLE FUNCTION AQUASTAT).
- 2 FOR INSTALLATIONS USING A TRIPLE FUNCTION AQUASTAT, NOTE THAT THE FACTORY-INSTALLED JUMPER BETWEEN THE ZR AND ZC TERMINALS OF THE AQ15000B CONTROL MODULE MUST BE REMOVED. THE ZR AND ZC TERMINALS ON THE AQ15000B CONTROL MODULE MUST BE WIRED TO THE ZR AND ZC TERMINALS, RESPECTIVELY, OF THE TRIPLE AQUASTAT.

Fig. 17. Wiring for Boiler Pump, and DHW Device.

### Step 6 – Connection To Line Voltage Power

Connect the N and L line voltage inputs of the primary on the AQ250 transformer to the electrical distribution panel and power up the Control. A service switch should be installed on the hot (L) lead to the distribution panel.

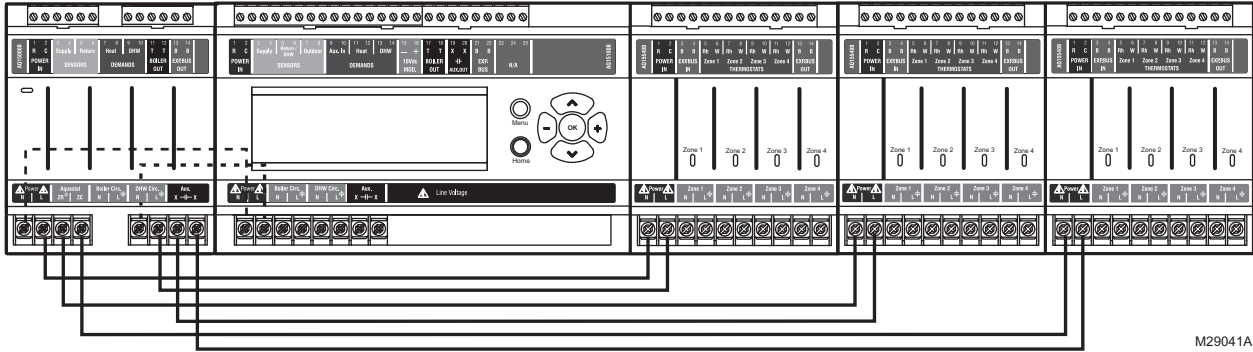
If multiple Zoning Modules are connected to the AQ250 Control Panel, the line voltage wiring can either be run directly from the N and L terminals on the primary of the transformer to each Zoning Module (Fig. 18 on page 13), or run in a daisy chain from the N and L terminals of one AQ2000 module to the N and L terminals of the next AQ2000 module (see Fig. 19 on page 13).



### CAUTION

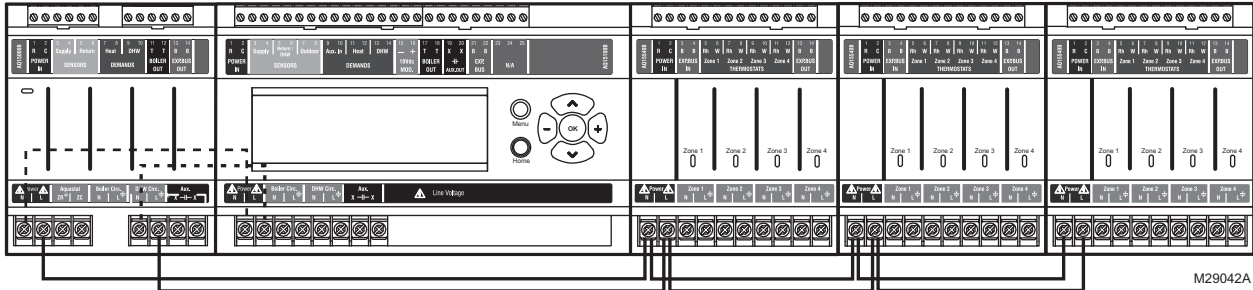
**Electrical Shock or Equipment Damage Hazard. Can shock individuals or short equipment circuitry.**

When line voltage is applied to the AQ250 Control Panel and the front cover of the Panel is removed, there is a risk of electrocution. Be careful to avoid contact with the line voltage (N and L) terminals, either with your fingers or with metal tools (such as a screwdriver) when power is applied to the Control Panel.



M29041A

**Fig. 18. Connections for multiple Zoning Panels - parallel wiring.**



M29042A

**Fig. 19. Alternate Connections for multiple Zoning Panels - daisy chain wiring.**

## 4 CONFIGURE THE CONTROL PANEL DIP SWITCHES

Only two steps are required to set up the AQ250 Series Control Panel:

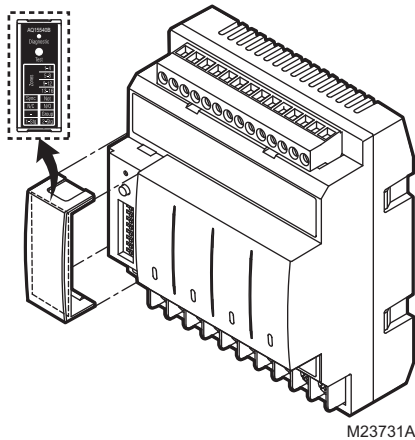
1. Check the DIP switch settings for the Control Module. (see “AQ250 Control Module DIP Switch Settings” on page 14)
2. Check the DIP switch settings for each Zoning Module. (see “Zoning Module DIP Switch Settings” on page 15)

### AQ250 Control Module DIP Switch Location

Operation of the AQ250’s Control Module is set by the positions of its DIP switches, which are located behind the blank cover in the left most section of the Control Module (beside the section labeled ZR). See Fig. 20 for location of these DIP switches.

### Zoning Module DIP Switch Location

The AQ15540B (pump Zoning Module) and AQ15740B (valves with end switches Zoning Module) both have DIP switches in 8-switch banks and are concealed behind snap-on covers, as shown in Fig. 20.



**Fig. 20. Location of concealed DIP switches for AQ15000B Control Module and the AQ155/AQ157 Zoning Modules.**

## DIP Switch Configuration

### AQ250 Control Module DIP Switch Settings

AQ250 Control Panels come from the factory with pre-defined settings for all DIP switches. These factory default settings were chosen because they are commonly-used by hydronics contractors across North America. That means that most of the settings only need to be checked by the installing contractor to make sure they’re suitable for the installation.

Although for many installations, these factory default values for the Control Module and the Zoning Module(s) are suitable, Resideo recommends that they be reviewed, and changed as necessary, to get optimal performance of the hydronic system controlled by the AQ2000 Series products.

A chart of the setting options for each DIP switch is attached to the inside of the DIP switch cover. More detailed explanations for these settings, including the pre-set factory defaults for each DIP switch, is shown in Table 2.

When you finish setting the DIP switches for the Control Panel, replace the front cover of the AQ250 Control Panel.

**NOTE:** The snap-on DIP switch cover is designed so it cannot be removed (exposing the DIP switches) when the front cover of the AQ250 Control Panel is in place.

**Table 2. AQ15000B Control Module DIP switch arrangement**

DIP Switch		Switch Description	Label and Factory Settings
			<p>The diagram shows the AQ15000B control module with a 'Test' LED and a 'Diagnostic' LED. Below them is a cover for eight DIP switches. The cover is labeled with 'DHW', 'Aux.', and 'Mass' for groups of switches. The internal switch positions are as follows:         <ul style="list-style-type: none"> <li>Switch 1: Pump (left)</li> <li>Switch 2: Valve (right)</li> <li>Switch 3: Off (left)</li> <li>Switch 4: Priority (right)</li> <li>Switch 5: Off (left)</li> <li>Switch 6: O/Ride (right)</li> <li>Switch 7: Main (left)</li> <li>Switch 8: Group (right)</li> <li>Switch 9: Main (left)</li> <li>Switch 10: Bypass (right)</li> <li>Switch 11: Lo (left)</li> <li>Switch 12: Hi (right)</li> <li>Switch 13: N/A (left)</li> <li>Switch 14: N/A (right)</li> </ul> </p>
DHW	<b>1</b>	DHW Device: Pump or Valve	
	<b>2</b>	DHW Priority: Off or Priority	
	<b>3</b>	DHW Priority Override: Off or O/Ride (override)	
	<b>4</b>	BOILER POST PURGE LOCATION: OFF = ZONES ONLY; PURGE = DHW TANK FIRST, THEN ZONES	
Aux.	<b>5</b>	Aux output: Main = default; Group = group pump	
	<b>6</b>	Aux output: Main = default; Bypass = boiler bypass pump	
Mass	<b>7</b>	Load Mass: Lo = Low mass (baseboard); Hi = High mass (radiant slab)	
	<b>8</b>	Not used at this time	

### Zoning Module DIP Switch Settings

A chart of the different settings for each DIP switch is attached to the inside of each DIP switch cover.

Refer to Table 3 on page 16, and check all DIP switch settings. If necessary, change the switch settings to suit the desired operation of the hydronic installation.

**NOTES:**

- To set DIP switches 1 through 4, which identify the unique address of each zone on the AQUATROL network): Refer to the descriptions in Table 3 for the correct DIP switch settings for the Pump or Valve Zoning Module. Unpredictable zone behavior may occur if more than one Zoning Module has DIP switches (1-4) set to the same address.
- DIP Switch 5 enables or disables Zone Synchronization:
  - The factory setting disables Zone Synchronization, which is an energy saving feature of the AQ2000 panels. Zone Synchronization coordinates zone demands to start at the same time when the boiler cycle begins. The AQ2000 functions as activating valves. The valve logic induces a delay before activating the boiler pump even when zone pumps are used. When Zone Synchronization is not selected, the zone demands are served whenever they call for heat.
  - The Zone Synchronization feature replaces the pump/valve selection of previous AQ2000 versions.

4. DIP Switch 8 functionality:
  - The factory setting enables 1-stage per zone thermostat. The zoning module operates as four 1-stage zones.
  - When using a 2-stage thermostat, set DIP switch 8 to 2-Stg. The 2-stage selection uses TH1 and TH2 inputs for 2-stage thermostat control. For the selected zone, TH1 is the first stage input from the thermostat and TH2 is the second stage input. Inputs TH3 and TH4 operate in same manner. The 2-stage selection reduces the zoning module to a 2 zone module from a 4 zone module.
  - When using digital 2-stage thermostats (non AQ1000 thermostats), the system set-up process changes slightly. During system set-up, create an artificial demand on the zoning module by increasing the set point on the thermostat. The artificial demand is required during the PRI/SEC setup menu to select the primary and secondary loop for each zone and stage.

Review the settings of all DIP switches for each Zoning Module connected to an AQ15000B, to ensure they are correct before system start-up.

When you finish setting the DIP switches for all the Zoning Modules, replace the cover of each Expansion Zoning Panel.

**NOTE:** The snap-on DIP switch covers are designed so they cannot be removed (exposing the DIP switches) when the front cover of the AQ250 Control Panel is in place.

**Table 3. AQ15540B Zoning Module (Pump Zoning Module) DIP Switch Arrangement.**

DIP Switch	Switch Description	Label and Factory Settings
<b>1</b> <b>2</b> <b>3</b> <b>4</b>	<p>Zone Address: The positions of these 4 DIP switches define the unique address for each zone on the AQUATROL network. For each group of 4 zones, there can be only one DIP switch in the right hand (On) position.</p> <p>The correct DIP switch settings for each zone module are:</p> <ul style="list-style-type: none"> <li>• First Zone (1-4) Module: 1 = ON position; 2, 3, and 4 = OFF position</li> <li>• Second Zone (5-8) Module: 2 = ON position; 1, 3, and 4 = OFF position</li> <li>• Third Zone (9-12) Module: 3 = ON position; 1, 2, and 4 = OFF position</li> <li>• Fourth Zone (13-16) Module: 4 = ON position; 1, 2, and 3 = OFF position</li> </ul>	
<b>5</b>	<ul style="list-style-type: none"> <li>• If set to SYNC, zone synchronization is enabled.</li> <li>• If set to NOT, zone synchronization is disabled.</li> </ul>	
<b>6</b>	<ul style="list-style-type: none"> <li>• If zone valves are normally closed (N.C.), set the NC/NO DIP switch to the Off position.</li> <li>• If zone valves are normally open (N.O.), set the NC/NO DIP switch to the On position.</li> </ul>	
<b>7</b>	<ul style="list-style-type: none"> <li>• If set to Group (ON position), the AUX Pump contacts on the Control Module are switched when any of the zones on this Zoning Module are active.<sup>a</sup></li> <li>• If set to - (OFF position), the AUX Pump contacts are not affected by activity on these zones.</li> </ul>	
<b>8</b>	<ul style="list-style-type: none"> <li>• If set to 2-Stg (ON position), then 2-stage operation is activated on thermostat inputs. The zoning module operates as two 2-stage zones or 3 zones (one 2-stage and two 1-stage).</li> <li>• If set to 1-Stg (OFF position), then operates as four 1-stage zones.</li> </ul>	

<sup>a</sup> The AQ15000B Boiler Control Module DIP switch #5 must be set to GROUP position and DIP switch #6 must be set to MAIN position.



## 5 TEST AND CHECK OUT THE INSTALLATION

### Startup

#### IMPORTANT

Apply power to the AQ250 Control Panel only after all of the AQ2000 SERIES components (Control Panel, thermostats, sensors, Zoning Modules/Panels) have been connected to the other equipment in the hydronic heating system (boiler, zone valves or pumps, DHW, Aquastat, etc.).

When powered, the AQ250 Control Panel begins its start-up routine, establishing communication with all other AQ2000 Series components on the AQUATROL network.

### Auto Test

This section describes the Auto Test functions of the Control Module and the Zoning Panel(s).

#### A) Auto Test– AQ15000B Control Module

Auto Test operation enables the installer to test the system installation by sequentially activating all of the Control Module's outputs for 15 seconds each. Each step of the Auto Test routine may be paused or skipped by pressing the Test button, which is located above the DIP switches on the AQ15000B Control Module.

#### STATUS LEDS

Every status light (ZR, BOILER pump, AUXiliary pump, DHW pump) will be turned on for 15 seconds when its corresponding output is energized during Auto Test.

#### CONTROL MODULE DIAGNOSTIC LED

This LED, which is labeled Diagnostic and is located above the DIP switches on the AQ15000B Control Module, is used by the AQ250 to communicate diagnostic data to the user:

- Constantly ON indicates that the unit is working properly.
- Constant, fast blinking indicates that the unit is in the Auto Test mode.
- Constant, slow blinking indicates that Auto Test mode has been paused.
- Coded blinking is used to communicate an error code to the user. Refer to the Troubleshooting section of these instructions for an explanation of these codes.

NOTE: The Diagnostic LED is OFF when the AQ250 Control Panel is not powered.

If this is the first time the AQ250 has been started:

1. Remove the front cover of the AQ250 by loosening the 4 captive slot-Phillips screws.
2. Remove the AQ15000B Control Module's DIP switch cover (refer to Figure Fig. 20 on page 14 for the DIP switch cover location)
3. Check to make sure that the LED, labelled Diagnostic, is steadily illuminated (no blinking).
4. To begin the Auto Test, press the Test button until you feel a click. The AQ250 now begins the Auto Test routine and the Diagnostic LED on the AQ15000B Control Module blinks quickly.

5. Pressing the Test button at any time during the Auto Test routine pauses the routine indefinitely. While paused, the Diagnostic LED blinks slowly.
6. Pressing the Test button while the Auto Test routine is paused advances the routine to the start of the next step in the routine (testing the next output) and the Auto Test routine resumes its test procedure.
7. When the Auto Test routine is completed, the Diagnostic LED returns to a constant ON status (no blinking).
8. To test each of the zone outputs (pumps or valves) individually, proceed to "B) Auto Test– AQ155/AQ157 Zoning Modules" to run the Auto Test feature for each AQ155 / AQ157 Zoning Module attached to the AQ15000B Control Module.

#### SEQUENCE OF OPERATION–AQ15000B CONTROL MODULE

1. When the Test button is pressed, ALL space heating zones connected to the Control Module are energized and remain energized for the duration of the Auto Test routine
2. At the same time, the Diagnostic LED on the AQ15000B Control Module begins to blink quickly, the ZR relay is energized for 15 seconds, then the relay shuts off.
3. Next, the BOILER relay is energized for 15 seconds, then shuts off.
4. Next, the AUX relay is energized for 15 seconds, then shuts off.
5. Next, the DHW relay is energized for 15 seconds, then shuts off.
6. Next, the Boiler T-T dry contacts are energized for 15 seconds, then re-opened.
7. Then the AQ15000B exits the Auto Test routine and the Diagnostic LED on the Module returns to steady illumination (no blinking).

#### B) Auto Test– AQ155/AQ157 Zoning Modules

Auto Test operation for Zoning Modules enables the installer to test all zones wired to the Zoning Module by sequentially activating the equipment connected to each zone output (pump or valve) for 15 seconds. Each step of the Auto Test routine may be paused or skipped by pressing the Test button.

#### ZONING MODULE DIAGNOSTIC LED

The LED, which is labeled Diagnostic and is located above the DIP switches on the AQ155/AQ157 Zoning Modules, is used for communicating diagnostic data to the Installer.

Refer to "Troubleshooting" on page 19 for a description of the Diagnostic LED error codes (blinking rates).

NOTE: The Diagnostic LED is OFF when the AQ155/AQ157 Zoning Module is not powered.

If this is the first time the AQ250 Control Panel has been started:

1. With the front cover of the AQ250 Control Panel removed and set aside, remove the AQ Zoning Module DIP switch cover (refer to Figure Fig. 20 on page 14 for the DIP switch cover location).
2. Check to make sure that the LED, labelled Diagnostic, is steadily illuminated (no blinking).

3. To begin the Auto Test, press the Test button until you feel a click. The AQ155/AQ157 Zoning Module now begins the Auto Test routine, and the Diagnostic LED on the Zoning Module blinks quickly.
4. Pressing the Test button at any time during the Auto Test routine pauses the routine indefinitely. While paused, the Diagnostic LED blinks slowly.
5. Pressing the Test button while the Auto Test routine is paused advances the routine to the start of the next step in the routine (testing the next zoning output) and the Auto Test routine resumes its test procedure.
6. When the Auto Test routine is completed, the Diagnostic LED returns to a constant ON status (no blinking).
7. Replace the DIP switch cover on the Zoning Module.
8. For each AQ155/AQ157 Zoning Module connected to the AQ250, repeat steps 1-7

#### SEQUENCE OF OPERATION—AQ155/AQ157 ZONING MODULES

1. When the Auto Test button is pressed, Zone 1 of the Zoning Module is energized and the Diagnostic LED on the AQ155/AQ157 begins to blink quickly.
2. Zone 1 remains energized for 15 seconds, then shuts off.
3. Next, each of the remaining zones is energized, sequentially for 15 seconds, starting with Zone 2, and then shuts off.
4. After Zone 4 has de-energizes, the AQ155/AQ157 exits the Auto Test routine and the Diagnostic LED on the Module returns to steady illumination (no blinking).

#### C) End Auto Test

If no errors are detected in the Control Module or Zoning Module Auto Test routines, the AQ250 is now ready for operation. If errors are detected, refer to “Troubleshooting” on page 19.

## Checkout

1. If present, turn down the DHW Aquastat to avoid interfering with space heating control operation.
2. Turn up the setpoint of one of the AQ1000 zone thermostats.

**2.1** The zone valve or pump associated with that zone turns on.

**2.2** The Boiler and T-T relay outputs energize.

NOTE: When a setpoint is changed on an AQ1000 thermostat, the AQ250's boiler short cycle protection is disabled in favor of a faster reaction for the user.

3. Turn down the setpoint of one of the AQ1000 zone thermostats.
  - 3.1** The zone valve or pump associated with that zone should turn off.
  - 3.2** The Boiler, and T-T relay outputs should de-energize.
4. Repeat steps 2 and 3 for all zones to verify each zone is operating correctly. Thermostats may be exercised individually or all together to accelerate the check out process.
5. Turn up the DHW Aquastat to simulate a call for hot water.
  - 5.1** If the DHW device is a pump, the DHW relay output energizes immediately, and the Boiler pump relay remains off.
  - 5.2** If the DHW device is a valve, the Boiler pump relay energizes after a 15 second delay to allow the zone valve to fully open.
  - 5.3** Turn up the set point of one of the AQ1000 zone thermostats.
    - 5.3.1** If the DHW relay is configured to control a pump, and DHW Priority is selected, the Boiler and associated zone pumps relays remain off.
    - 5.3.2** If the DHW relay is configured to control a valve, and DHW Priority is selected, the associated zone relays remain off.
    - 5.3.3** If DHW Priority is disabled, space heating (zone pumps and valves) operates normally even during a call for DHW.
6. Turn down the DHW Aquastat to end the call for hot water. Space heating operation should continue (if DHW priority is disabled) or resume (if DHW PRIOrity is enabled).

## 6 PURGE AIR FROM ALL SYSTEM AND ZONE PIPING

Purging air from all zones in the hydronic system is easily accomplished with the AQ250 by using a modification to the Auto Test feature (described in “Auto Test” on page 17) as follows:

- To purge all zones on the AQUATROL network press the Test button on the AQ15000B Control Module once to begin the Auto Test routine. Quickly press it again 3 times until the Boiler relay LED illuminates and the Diagnostic LED of the AQ15000B blinks slowly (which indicates the Auto Test routine has been paused). The boiler pump now remains energized for the duration of the Purge routine (and therefore can be purging all loops of air) until the Test button is pressed again.
- The Diagnostic LED blinks slowly while in paused mode. Continue to purge the boiler loop as long as is needed to remove air from the system.
- Leaving the boiler pump operating, push the Test button on the Zoning Module for any space heating zones you wish to purge.
  - **With the first zone's output energized (the LED for Zone 1 illuminates), press the Test button again to pause the Auto Test routine.**
  - **When Zone 1 has been sufficiently purged, press the Test button again to begin purging Zone 2.**
  - **Again, press the Test button to pause the Auto Test routine while purging Zone 2.**
  - **Continue to purge all other space heating zones in the system.**

If additional purging is required for any zone, the Auto Test procedure can be activated for any individual Zoning Module by pressing the Test button located above that Zoning Module's DIP switches. Refer to “B) Auto Test—AQ155/AQ157 Zoning Modules” on page 17.

## 7 DOCUMENT AND KEEP A RECORD OF ALL SYSTEM SETTINGS

After the AQ250 Series Control Panel and any AQ255/AQ257 Expansion Zoning Panels have been set up and the entire hydronic installation is operating properly, it is important to document all the system settings for future reference.

### Job Records

All AQ2000 Series Panels are shipped with Installation Job Records<sup>a</sup> for documenting these settings. These should be filled out completely and saved in the Installing Contractor's files.

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<sup>a</sup> For the AQ250 Series, refer to AQ25042B RelayPLUS Zone Synchronizing Boiler Control, (form 69-1972) and AQ25044B RelayPLUS Zone Synchronizing Boiler Control (form 69-2030)

## TROUBLESHOOTING

The following information helps the installer correctly identify system problems, making troubleshooting much faster. Table 4 and Table 5 on page 20 describe the possible error codes that can be communicated on the diagnostic LEDs of the AQ15000B Control Module and AQ155/AQ157 Zoning Module.

### Communications Loss

Because all AQ2000 Series components communicate with each other via the dedicated AQUATROL network when controlling a hydronic system, one possible failure mode of the AQ250 would be loss of communication between the AQ15000B Control Module and any connected Zoning Modules, or between a Zoning Module and any zone thermostats connected to the AQUATROL network. In general, the Control Module:

- Periodically tries to re-establish communication with any lost components on the network.
- Initializes any component that re-establishes its communication.

### CONTROL MODULE REACTION

When the AQ15000B Control Module loses communication with any number of zones for more than one minute (as long as there is still at least one zone communicating on the AQUATROL network), the AQ250 continues to deliver heat to the other non-communicating zones.

When communication is lost with all zones, the AQ250 enters Freeze Protection mode, in which it fires the boiler and then activates the Boiler (supply) pump and zone equipment for a period of 4 minutes every hour. This should provide sufficient heat to the system to prevent a building from freezing up until communication is re-established between the AQ2000 Series components.

### ZONING MODULE REACTION

When a Zoning Module loses communication with the Control Module (as long as there is at least one other Zoning Module communicating with the Control Module), the Zoning Module operates its pumps or valves in a conventional, non-synchronized zoning fashion. That is, it operates according to the demands from the thermostats, without zone synchronization or waiting for permission from the AQ15000B Control Module to operate. This allows the zones to extract any heat provided by the boiler.

When using AQ1000 thermostats and communication is lost between a Zoning Module and one of its thermostats, that zone is invisible to the Control Module, and the Zoning Module stops serving that zone and the zone's pump or valve is de-energized.

The AQ250 provides Zoning Module diagnostic information via the Diagnostic LED located above the DIP switches on each Zoning Module.

**Table 4. AQ15000B Control Module LED Display and Error Codes.**

Diagnostic Led Status		System Condition	Action Required
Steady (no blinking)		No system problem detected	None.
Fast blinking (4 blinks per second)		Auto Test is in operation	None. Permit the control to finish Auto Test routine.
Slow blinking (2 blinks every 3 seconds)		Auto Test has been paused	Press the Test button to resume Auto Test routine.
Coded blinking = ERROR	2 blinks then pause	Freeze protection activated across AQUATROL network	All zones have lost communication with controller. <ul style="list-style-type: none"> <li>Check B-B wiring between Control Module and Zoning Module.</li> </ul>
	4 blinks then pause	Return sensor open / short	Check the return sensor wiring.
	5 blinks then pause	Supply sensor open / short	Check the supply sensor wiring.

**Table 5. AQ155/AQ157 Zoning Module LED Display and Error Codes.**

Diagnostic Led Status		System Condition	Action Required
Steady (no blinking)		No system problem detected	None.
Fast blinking (4 blinks per second)		Auto Test is in operation	None. Permit the control to finish Auto Test routine.
Slow blinking (2 blinks every 3 seconds)		Auto Test has been paused	Press the Test button to resume Auto Test routine.
Coded blinking = ERROR	• 2 blinks then pause	Freeze protection activated on the Zoning Module	Zoning module has lost communication with controller. <ul style="list-style-type: none"> <li>Check B-B wiring between Control Module and Zoning Module.</li> </ul>
	• 3 blinks then pause	Communication lost with ALL thermostats	Check thermostat wiring to Zoning Modules.

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