

ZR SERIES ZONE RELAY

INCLUDES MODELS ZR44, ZR43, ZR42, ZR41

Specifications*

- 100 - 250 VAC 50/60 Hz. Supply
- CLASS II - 5VDC On Board Power¹
- Power Consumption : 120ma
- Dimensions : 9.00" x 8.00" x 2.50"
- MultiLink : Yes
- Zone Inputs : 1, 2, 3 or 4
- Zone Outputs : 1, 2, 3 or 4
- Boiler T/T Outputs : 1 or 2
- Max Zone Amps : 3A
- Max Board Amps : 12A
- Mounting : Wall / Chassis
- IP Rating : Nema Type 1
- ROHS Compliant : YES
- Enclosure : Galvanized Steel / AL²
- Terminals : #22 - #14 Gauge
- Knockouts : 10 x 1/2" (22mm)
- Fuses : Type TE5 User replaceable
4 x 3.0A Output (Time Delay)
1 x 1.0A Control (Fast Acting)
- Operating Conditions :
Temp : 0C - 40C (32F - 104F)
Humidity³ : 85% @ 25C (77F)

1. 5VDC class II power supply for logic, input signal and limited external supply use. External devices shall not exceed 250mA(milliamps) in total current draw.
2. Standard White Polyester Powder Coat over T-6061 Aluminum enclosure cover. Galvalume coated steel enclosure base.
3. Humidity = Non-Condensing

*Specifications as of 04/01/2022, and are subject to change without notice.

Certifications

This device has been independently tested and conforms to UL Standard 873 and CSA standard C22.2. This device complies with FCC standard 15B under section #15.103



Product Description

ZR series zone relays are designed to provide simplified installation and reliable long term operation of line voltage zone circulators when used in residential and commercial atmospheric and condensing boiler applications.

The use of intelligent microprocessor based control, simplified user interface and advanced load switching technologies provide for enhanced control of up to four individual circulators based on model.

Up to four zone inputs are provided for zone call signals from devices such as thermostats, aquastats, etc.

Setup is easily accomplished using five selector switches to configure priority and primary zones, exercising and multiple controller configurations.

Installation and maintenance access to wiring and replaceable fuses is provided by simply removing two front facing screws. Individual fusing is provided for the control circuit and for each zone circulator output. The circuit board is also field replaceable without removal of the enclosure backplate. Wire terminals are also removable and replaceable.

The Thermaltech difference...

With over 25 years of experience in industrial automation, controls and systems integration, the staff at TTS Thermaltech Systems Inc. take a different approach to building control system products.

- High Quality Components
- Value Driven Design
- Simplified Installation
- Flexible Operation
- Best in Class Support

We think about the professional heating installer at every step of our design and manufacturing process.

This ensures that products are durable, flexible and exceed expectations. We believe that better value means our products must perform better, and offer more features than competitive products while remaining cost competitive.

We feel that reducing plastic usage, and promoting the use of recyclable materials in our products not only make for a better product, but also helps make for a more sustainable world.

Thank-you for purchasing our products!

Sincerely,
The Design Staff

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Burnaby, BC V5B 4Z5 CANADA

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5VDC Class II Power Supply

The ZR series zone relay contains a low standby power (0.1 Watt) 5VDC switching power supply for internal control power, logic and input signals. Up to 100mA of 5 Volt supply power is available for powering external devices.

Optional 12V / 24V External Class II Supply

Zone inputs, as well as “C” and “R” terminals may be supplied from an optional, user supplied 24VAC / 24VDC power supply or transformer. This allows for use with a wide range of thermostats or aquatats. It also allows for simplified repair, servicing and field replacement of the low voltage source.

LED Status Indicators

Nine (9) LED Indicators are provided to clearly indicate controller status to the user.

Mechanical Relay Outputs

Up to four (4) mains voltage (115VAC / 230VAC) relays are available to provide control of zone circulators or connected loads. Outputs are rated at 2.0 Amps continuous. All outputs are individually fuse protected.

Dual Boiler Call Outputs (T/T)

Up to two (2) isolated (dry contact) solid state relay outputs are available to provide for boiler calls or to signal operational state. Each output's functionality is automatically configured by the user defined program.

Pre-Purge / Post-Purge / Interlock Timers

Boiler pre-purge and post-purge timers are provided to allow for flow to stabilize through the boiler before calling for heat, and to ensure gradual boiler cool down after the call for heat completes. Interlock timing allows for smooth transitions between priority and non-priority calls.

Field Replaceable Control Module

The microcontroller and LED display are replaceable using a card slot interface. This allows for simplified field service, repair, software updates, and optional upgrade to our building automation compatible control modules.

Replaceable Terminal Blocks

All terminal blocks / connectors are removable and field replaceable in the event of damage.

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3 YEAR LIMITED WARRANTY

TTS Thermaltech Systems Inc. (TTS) will repair or replace without charge (at the company's option) any ZR series zone relay, board or board component that is proven defective under normal use within three (3) years from original date of sale / purchase from an AUTHORIZED reseller.

Any ZR series product purchased from NON AUTHORIZED resellers is warranted for a period of one (1) year from original date of sale, or eighteen (18) months from date of manufacture, whichever is shorter.

In order to obtain service under this warranty, it is the responsibility of the purchaser to promptly notify TTS in writing and promptly deliver the subject part(s), delivery prepaid to TTS, Should the subject part(s) contain no defect(s) as covered by this warranty, the purchaser will be invoiced for parts and labour charges in effect at the time of factory examination and repair.

Any TTS part not installed or operated as per detailed in these instructions, or which has been subject to misuse, misapplication, abuse or modification, will not be covered by this warranty.

TTS reserves the right to provide replacement products and parts which are substantially similar in design and functionally equivalent to the defective product or part. TTS reserves the right to make changes in details of design, construction, or arrangement of materials of its products without notification.

AN ORIGINAL PROOF OF PURCHASE / SALES RECEIPT SHOWING PRODUCT MODEL AND SERIAL NUMBER REQUIRED FOR ALL WARRANTY CLAIMS.

TTS OFFERS THIS WARRANTY IN LIEU OF ALL OTHER EXPRESS WARRANTIES. ANY WARRANTY IMPLIED BY LAW INCLUDING WARRANTIES OF MERCHANTABILITY OR FITNESS IS IN EFFECT ONLY FOR THE DURATION OF THE EXPRESS WARRANTY SET FORTH IN THE FIRST PARAGRAPH ABOVE.

THE ABOVE WARRANTIES ARE IN LIEU OF ALL OTHER WARRANTIES, EXPRESS OR STATUTORY, OR ANY OTHER WARRANTY OBLIGATION ON THE PART OF TTS.

TTS WILL NOT BE LIABLE FOR ANY SPECIAL, INCIDENTAL, INDIRECT OR CONSEQUENTIAL DAMAGES RESULTING FROM THE USE OF ITS PRODUCTS OR ANY INCIDENTAL COSTS OF REMOVING OR REPLACING DEFECTIVE PRODUCTS.

This warranty gives the purchaser specific rights, and the purchaser may have other rights which vary within their jurisdiction. Some jurisdictions do not allow limitations on how long an implied warranty lasts or on the exclusion of incidental or consequential damages, so these limitations or exclusions may not apply to you.

SAFETY WARNINGS

All work must be performed by qualified personnel, trained in the proper use, application, installation and maintenance of systems in accordance with all applicable federal, state, provincial, local and or municipal codes and ordinances.

This product utilizes a line voltage power supply that can cause property damage, severe injury or death if used improperly. Please use caution when installing, servicing or using this product. Disconnect all power sources BEFORE attempting to install or service this product. Do not attempt to open or service this product while power is applied.

Ensure that all connected wiring and connected devices are approved for use in the intended application.

The use of unapproved or non-certified wiring, devices or accessories with this product will void all warranties.

This product is designed for use in residential and commercial heating systems applications. Use of this product in alternative or unintended applications without the express written consent of the manufacturer will void all warranties.

INDICATORS / LEDs

Power LED

The Power LED visually indicates that 5 Volt DC control power is present, and should remain lit whenever mains power is applied to the controller. The Power LED will turn OFF if the control fuse is blown, or missing, or if mains power is removed. The Power LED should not be used as means of ensuring that mains power is not present at the controller, and or pump terminals. Proper electrical safety procedures should always be followed, prior to performing installation and or maintenance on the controller, or any of it's connected devices.

Feature LED's

Two (2) Feature LEDs visually indicate operational status of the Priority and Exercise requests.

Boiler Call LED's

Two (2) Boiler Call LEDs visually indicate operational status of the Domestic Hot Water (DHW) and Heating (HEAT) call outputs,

Zone LED's

Four (4) Zone LEDs visually indicate operational status of the Zone 1, Zone 2, Zone 3 and Zone 4 pump output relays.

ERRORS

A controller error is signalled by flashing the Priority status LED indicator at a frequency of 1Hz (1 Second ON / 1 Second OFF) continuously until the error has been corrected AND the power is cycled.

The following conditions will trigger an error:

- *A DHW priority request that lasts longer than 4 hours.*
- *V-EXT switch is set to OFF (Disable all zone inputs), for more than 4 hours.*
- *An internal controller error (contact TTS Thermaltech support)*

CONFIGURATION SWITCHES

V-EXT Switch

The V-EXT Switch allows for the installer to select the voltage source used for thermostat / aquastat zone input signals.

5VDC position selects the built-in 5 Volt DC supply for use with generic battery operated thermostats / capillary style aquastats with dry contact type outputs.

V-EXT position selects the external 12 to 24V AC / DC supply connected to the V-EXT terminal block. This position disconnects the 5VDC supply from the Zone 1 through Zone 4 "C", "R" and input terminals, and connects the external supply. This allows for use of a wide range of third party electronic and remote powered thermostats. An optional, external class 2 power supply or transformer is required when the V-EXT position is used.

The controller zone inputs can accept a nominal input voltage ranging from 5 Volts to 24 Volts AC/DC.

DO NOT CHANGE THE POSITION OF THE V-EXT SWITCH WHILE CONTROLLER POWER IS PRESENT!

MULTILINK Switch

The MULTILINK Switch allows for the installer to select the leader (MAIN) or follower (LINK) in a multi-controller installation. This allows for one or more ZR series controllers to be inter-connected in systems where a single ZR series controller does not provide enough zones. Three wires must be daisy-chained between controllers using the A-G-B terminals on the MULTILINK terminal block to enable this feature. Wiring may be made using LVT, or Belden type low voltage wiring.

MULTILINK provides the necessary signalling used to facilitate both priority domestic hot water (DHW) and primary circulator control across multiple controllers. See manual section MULTILINK Configuration for detailed use instructions.

PRIORITY Switch

The PRIORITY Switch allows the installer to enable the PRIORITY zone feature. The PRIORITY zone is used for allowing Domestic Hot Water (DHW) demand to supercede / get priority over normal heating calls. The PRIORITY zone defaults to ZONE 1 when the PRIMARY feature is NOT active. When the PRIMARY feature is active, the PRIORITY zone is moved to ZONE 2.

The PRIORITY feature can be set to ON (always supercedes heating), or TIMED (supercedes heating for a maximum duration of 2 hours). This ensures that a stuck / faulty aquastat, or a constant running DHW load does not prevent space the servicing of heating loads for extended periods of time. A PRIORITY timeout will lockout Domestic Hot Water (DHW) for a period of two (2) hours. At which time, a new DHW request may be made. This lockout can be reset by cycling power on the controller.

PRIMARY Switch

The PRIMARY Switch allows the installer to enable the PRIMARY zone feature. Primary / Secondary piping systems are typically used with low flow / condensing boilers that require low loss headers, and or closely spaced tees in order to limit flow in the primary circuit.

ZONE 1 is used as the Primary Zone when this feature is active. The Primary Zone is a zone which activates when any other zone(s) is / are active (ZONES 2 - 4). The PRIMARY Zone can be active when a HEAT call is made, or when either a HEAT or DHW call is made, by setting the PRIMARY switch as required.

EXERCISE Switch

The EXERCISE Switch allows the installer to enable the EXERCISE feature. The exercising (running) of pumps and circulators for short periods on a preset schedule attempts to improve longevity / lifespan. Seals, gaskets, o-rings and bearings can benefit from this feature when systems are used less often outside of heating season. When this feature is enabled, Zones will randomly and automatically activate for a period of time (1 minute) at the specified Weekly or Monthly interval. T/T Outputs (DHW or HEAT) will not activate during exercising of pumps / circulators.

ZONE INPUTS (ZONE x)

Zone inputs allow for up to four (4) thermostats / aquastats to be connected to the controller (model dependant) to facilitate control of zone pumps. Each input can accept a voltage input from 5V to 24V AC or DC. Each input is protected against short circuit, external noise, transients, and is filtered to prevent noisy signals from causing incorrect operation. Please consult the Appendix at the end of this manual for wiring diagrams for a variety of connection scenarios.

MULTILINK

Multilink allows for multiple controllers to be linked together to create larger zone control systems. One controller is configured as the leader (MAIN), and all others are configured as followers (LINK). The leader has the ability to control the PRIMARY and PRIORITY zones, and can notify all followers to wait while a priority zone is serviced. Followers can notify the leader, that a follower zone is active, and requires the PRIMARY zone to activate.

Three wires (A, G, B) on the Multilink terminal block must connect between all controllers in the system for Multilink operation to work. The Leader must have its Multilink switch set to MAIN, and all followers must have their Multilink switch set to LINK.

In a controller configured as the leader (MAIN):

Multilink terminal A is automatically configured as an input, which activates the primary pump in a primary / secondary configured system.

Multilink terminal B is automatically configured as an output, which notifies followers (LINK) to wait while a priority heating load is serviced.

In a controller configured as a follower (LINK):

Multilink terminal A is automatically configured as an output, which notifies the Leader (MAIN) controller that a call for heat is in progress and it requires the use (activation) of the the primary pump on the Leader (MAIN) controller in a primary / secondary configured system.

Multilink terminal B is automatically configured as an input, which pauses all zone activity on the Follower (LINK) controller while a priority heating load is serviced on the Leader (MAIN) controller

AC POWER INPUT (AC IN)

The AC IN terminals supply mains power to the controller. Terminals are provided for Ground (G), Neutral (N) and Line (L). A suitable voltage input range of 100VAC to 250VAC may be connected based on local / geographic voltage supplied by the utility and based on rated voltage of connected pumps / circulators.

DO NOT CONNECT A SUPPLY VOLTAGE THAT DIFFERS FROM CONNECTED PUMP / CIRCULATOR VOLTAGE. PERSONAL INJURY AND / OR DAMAGE TO THE CONTROLLER / CONNECTED DEVICES MAY OCCUR.

ZONE OUTPUTS (Zx OUT)

Zone outputs allow for up to four (4) pumps or circulators to be connected to the controller (model dependant). Zone outputs can deliver up to 2 Amps (240watts @ 120VAC / 480 watts @ 240VAC) to each connected device based in AC Power Input voltage. The corresponding Zone LED will illuminate when a Zone is active. A flashing Zone LED indicates that a Zone is in a pre-purging or post purging state. Exercising Zones will flash their respective Zone LED as well as the Exercising LED will illuminate.

DO NOT CONNECT A PUMP / CIRCULATOR THAT DIFFERS IN VOLTAGE RATING FROM THE SUPPLY VOLTAGE. PERSONAL INJURY AND / OR DAMAGE TO THE CONTROLLER / CONNECTED DEVICES MAY OCCUR.

T/T OUTPUTS (T/T OUT)

DHW Output

The DHW T/T Output activates when PRIORITY mode is active (ON or TIMED), and the PRIORITY ZONE Input is ON (HIGH). The DHW Output will wait for the Pre-Purge timer to expire before activating, and will remain on until the Post-Purge timer expires after the Zone input has turned OFF (LOW).

When PRIORITY mode is NOT active, the DHW T/T Output works in parallel with the HEAT T/T Output. This output may be used for any suitable purpose that complies with the output electrical specifications.

T/T DHW OUTPUT IS RATED FOR MAXIMUM 24V AC/DC @ 250mA (milliamps)

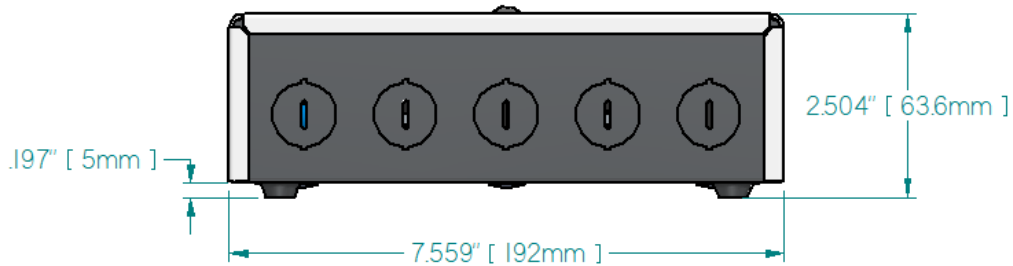
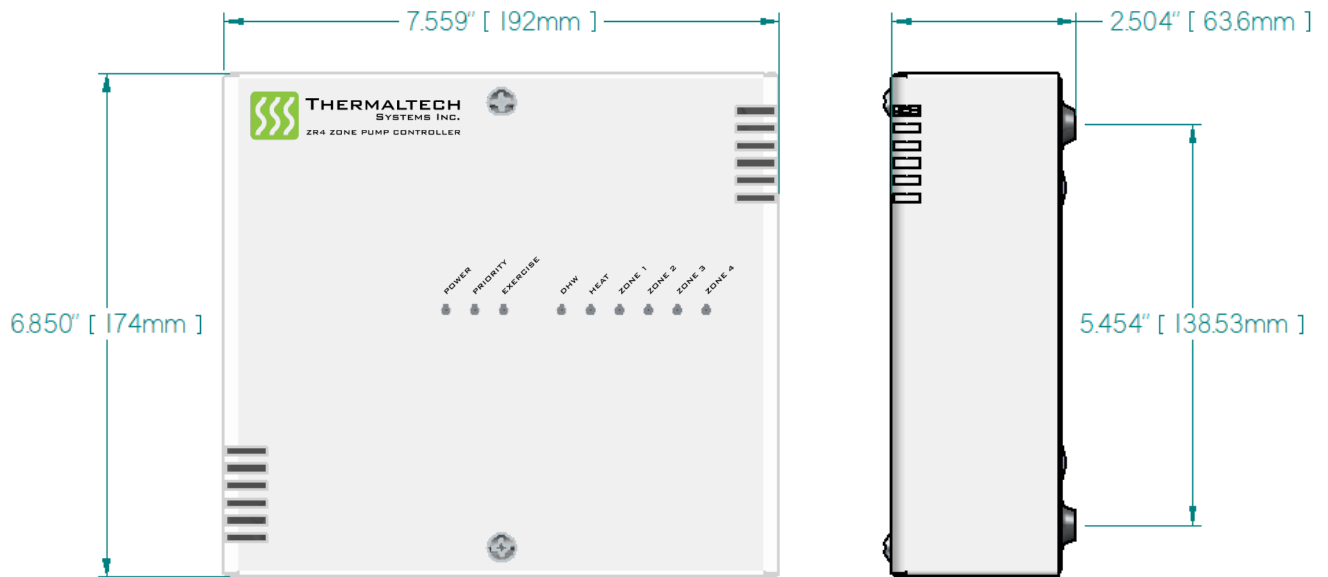
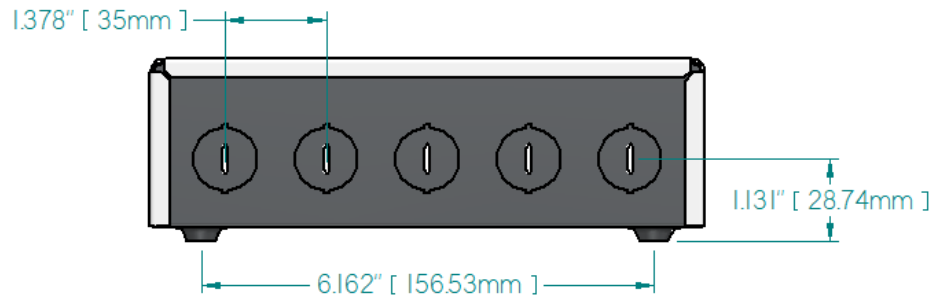
HEAT Output

The HEAT T/T Output activates when any Zone Input is ON (HIGH). The HEAT Output will wait for the Pre-Purge timer to expire before activating, and will remain on until the Post-Purge timer expires after the Zone input has turned OFF (LOW).

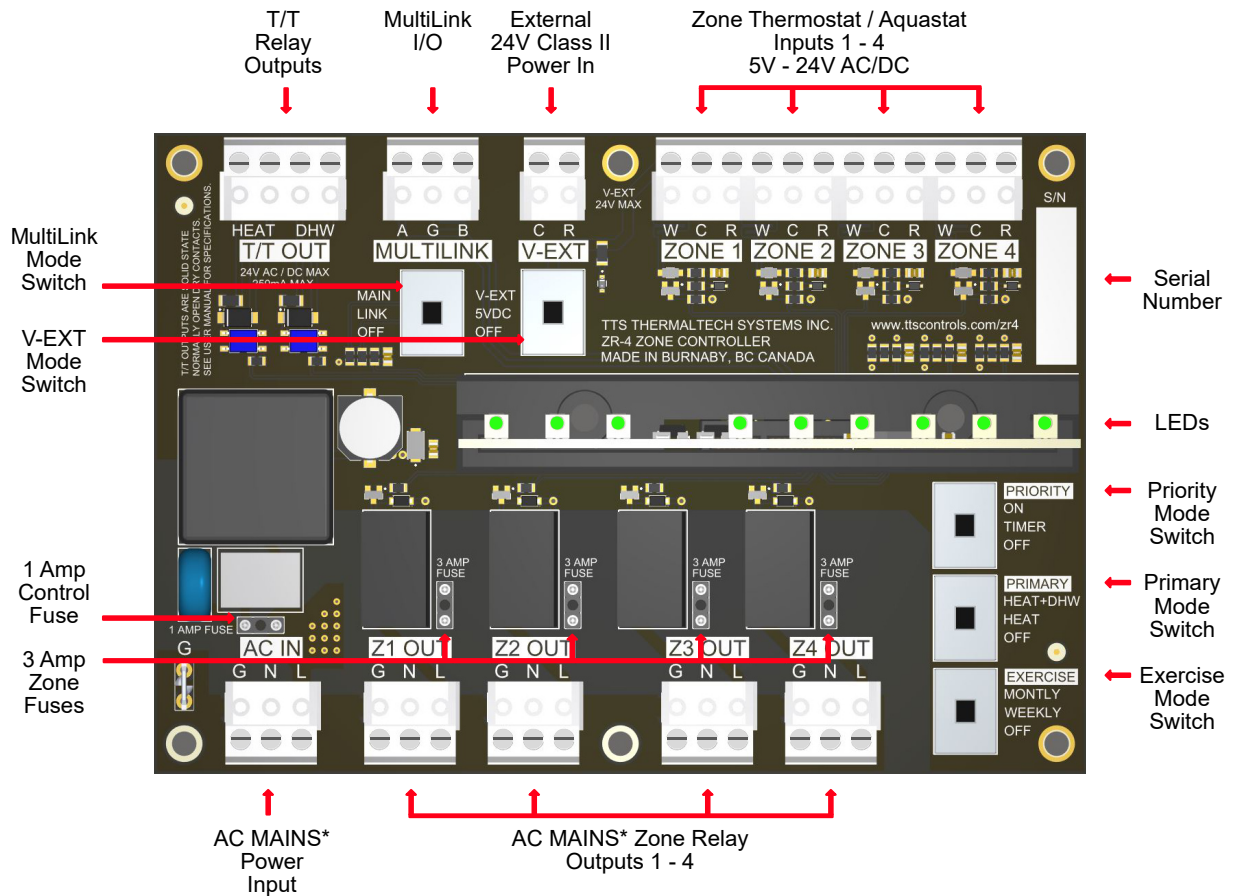
When PRIORITY mode is active (ON or TIMED), the HEAT T/T Output will not activate for PRIORITY Zone input calls.

T/T HEAT OUTPUT IS RATED FOR MAXIMUM 24V AC/DC @ 250mA (milliamps)

ENCLOSURE DIMENSIONS

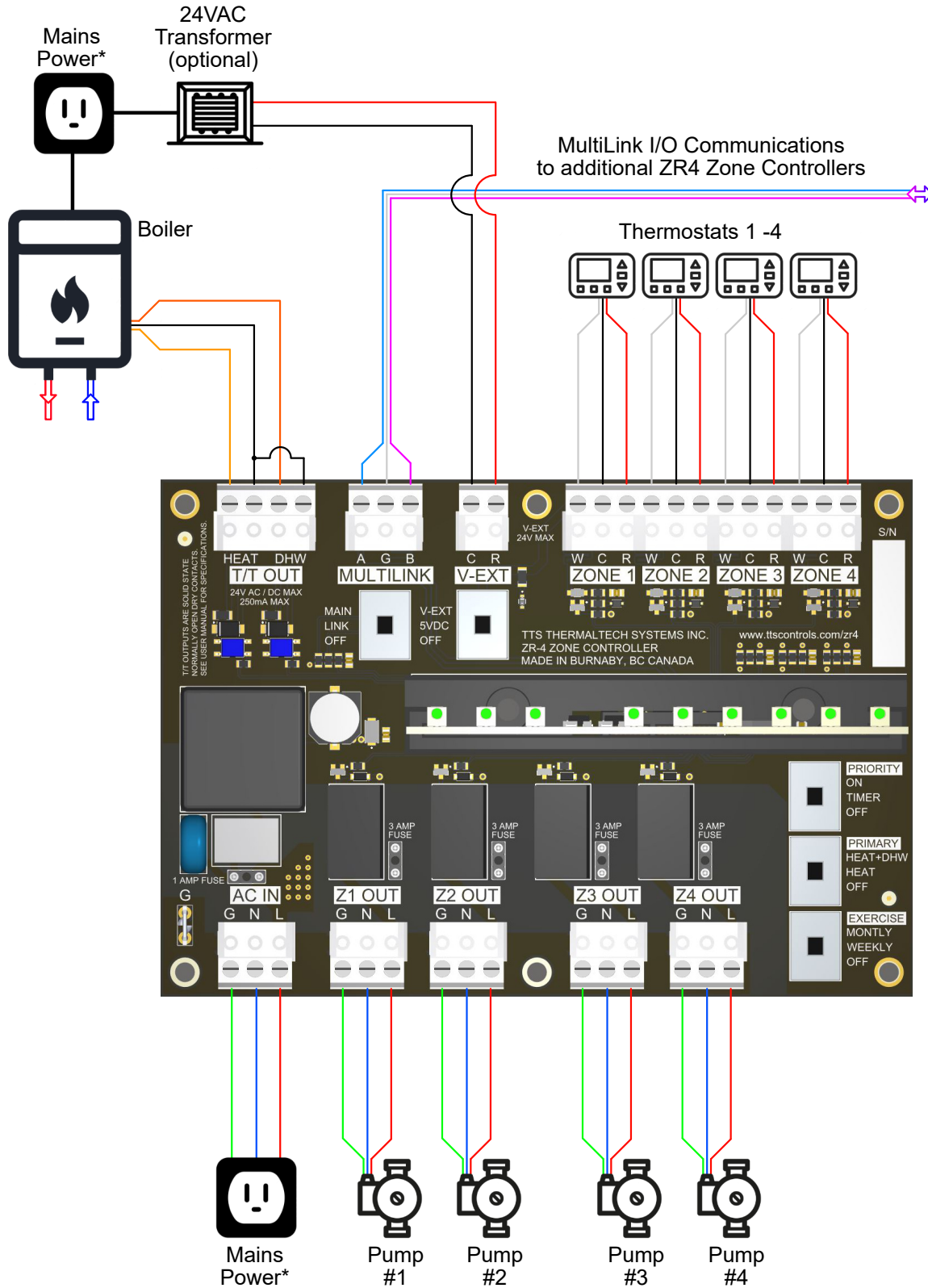


DEVICE LAYOUT



*Mains Power input voltage range from 100VAC to 250VAC based on local jurisdiction, and rated circulator pump voltage. DO NOT CONNECT A SUPPLY VOLTAGE THAT DIFFERS FROM CONNECTED PUMP / CIRCULATOR VOLTAGE. PERSONAL INJURY AND / OR DAMAGE TO THE CONTROLLER / CONNECTED DEVICES MAY OCCUR.

WIRING EXAMPLE



*Mains Power input voltage range from 100VAC to 250VAC based on local jurisdiction, and rated circulator pump voltage. DO NOT CONNECT A SUPPLY VOLTAGE THAT DIFFERS FROM CONNECTED PUMP / CIRCULATOR VOLTAGE. PERSONAL INJURY AND / OR DAMAGE TO THE CONTROLLER / CONNECTED DEVICES MAY OCCUR.

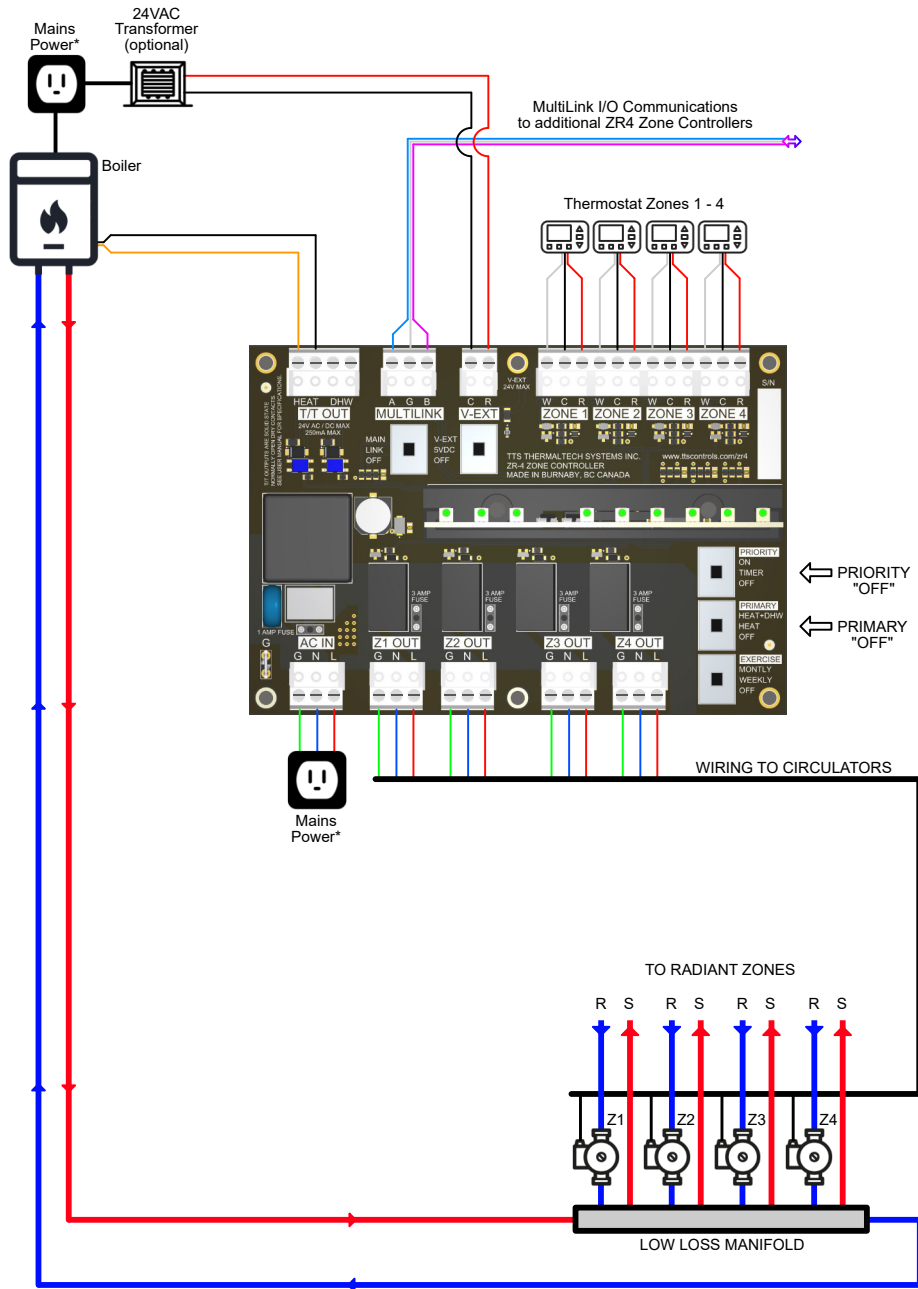
SYSTEM CONFIGURATIONS / EXAMPLES

4 Primary Heating Zones

The installed manifold can be of integrated (pipe in pipe) design as depicted, or comprised of separate supply and return manifolds. A closely spaced TEE arrangement may also be suitable depending on design.

Zone Inputs 1, 2, 3, and 4 activate Zone Outputs 1, 2, 3 and 4 respectively.

Boiler T/T Output HEAT and Boiler T/T Output DHW are activated when one or more Zones are active.



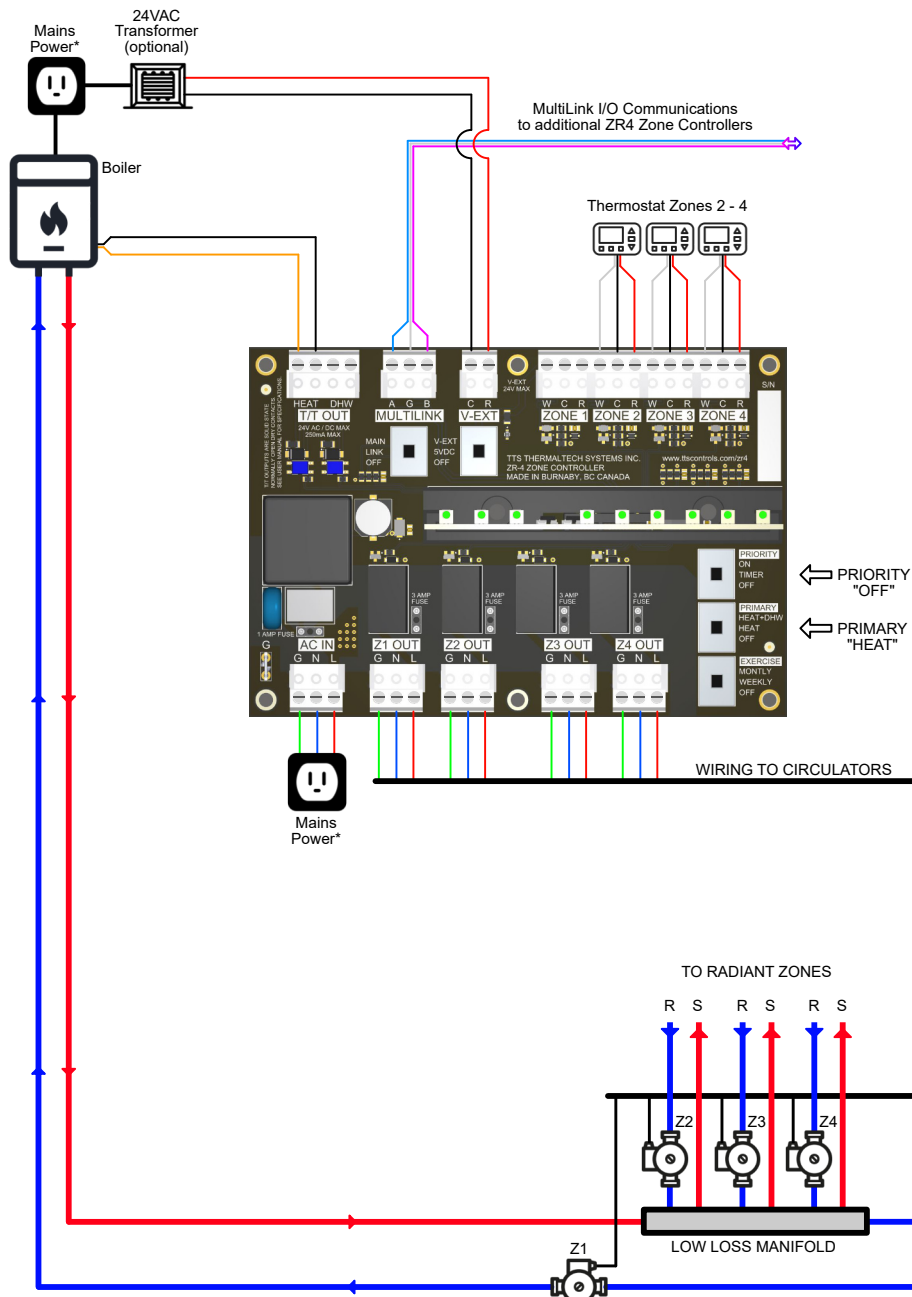
Primary / Secondary, 3 Heating Zones

The installed manifold can be of integrated (pipe in pipe) design as depicted, or comprised of separate supply and return manifolds. A closely spaced TEE arrangement may also be suitable depending on design.

Zone 1 is activated when any one or more of Zones 2, 3 or 4 are active. This is the primary circulator in a primary / secondary configuration. Zone Input 1 can be utilized in specialty / custom applications where Zone 1 requires remote / forced activation.

Zone Inputs 2, 3 and 4 activate Zone Outputs 2, 3 and 4 respectively.

Boiler T/T Output HEAT and Boiler T/T Output DHW are activated when any of Zones 2, 3 or 4 are active.



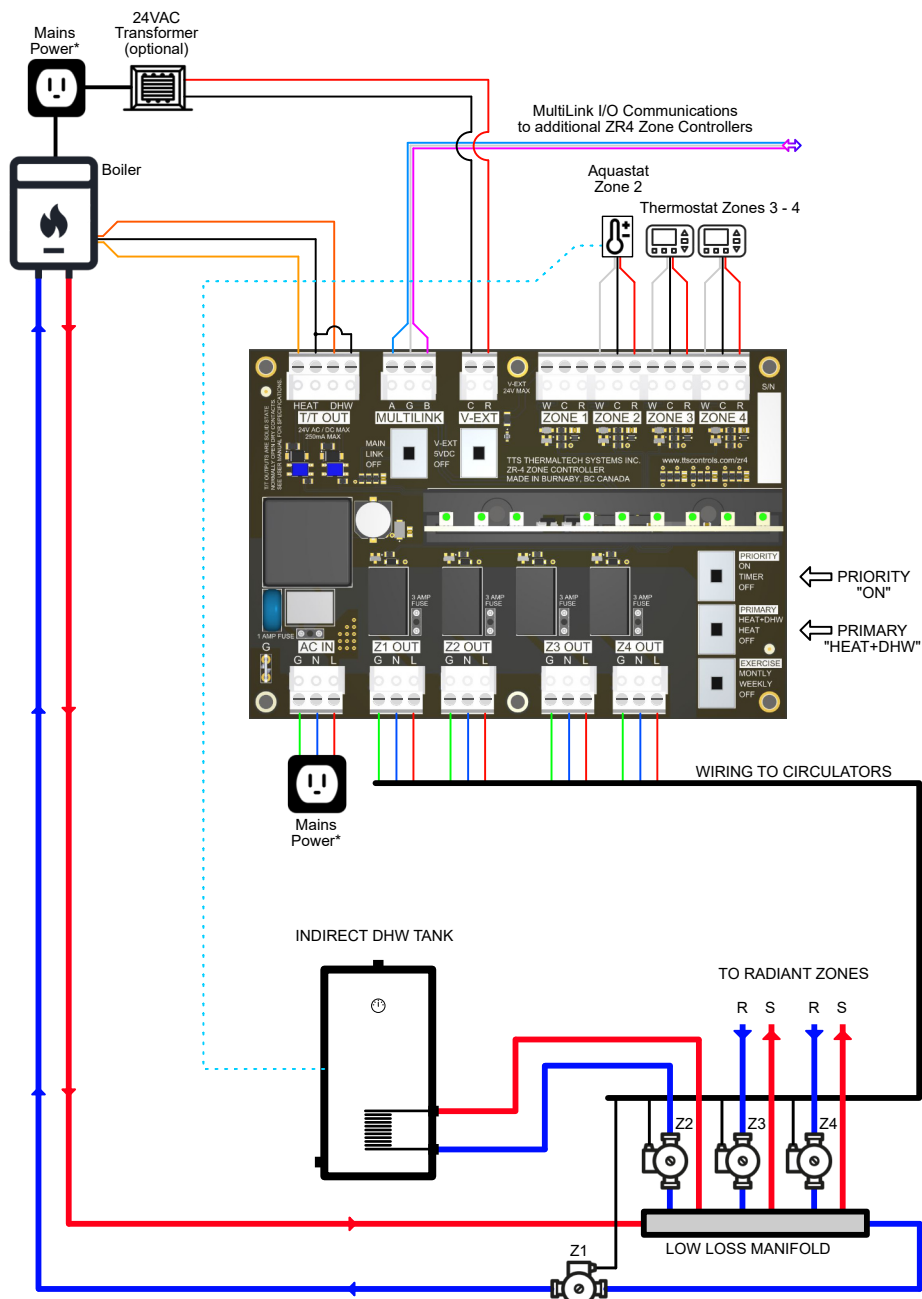
Primary / Secondary, Priority DHW + 2 Heating Zones

The installed manifold can be of integrated (pipe in pipe) design as depicted, or comprised of separate supply and return manifolds. A closely spaced TEE arrangement may also be suitable depending on design.

Zone Output 1 is activated when any one or more of Zones 2, 3 or 4 are active. This is the primary circulator in a primary / secondary configuration. Zone Input 1 can be utilized in specialty / custom applications where Zone 1 requires remote / forced activation.

Zone Input 2 activates Zone Output 2. Zone 2 has priority over Zone Inputs 3 and 4. Boiler T/T Output DHW is active when Zone 2 is active.

Zone Inputs 3 and 4 activate Zone Outputs 3 and 4 respectively. The priority zone (Zone 2) will interrupt the operation of Zones 3 and 4. Boiler T/T Output HEAT is active when Zones 3 or 4 are active.



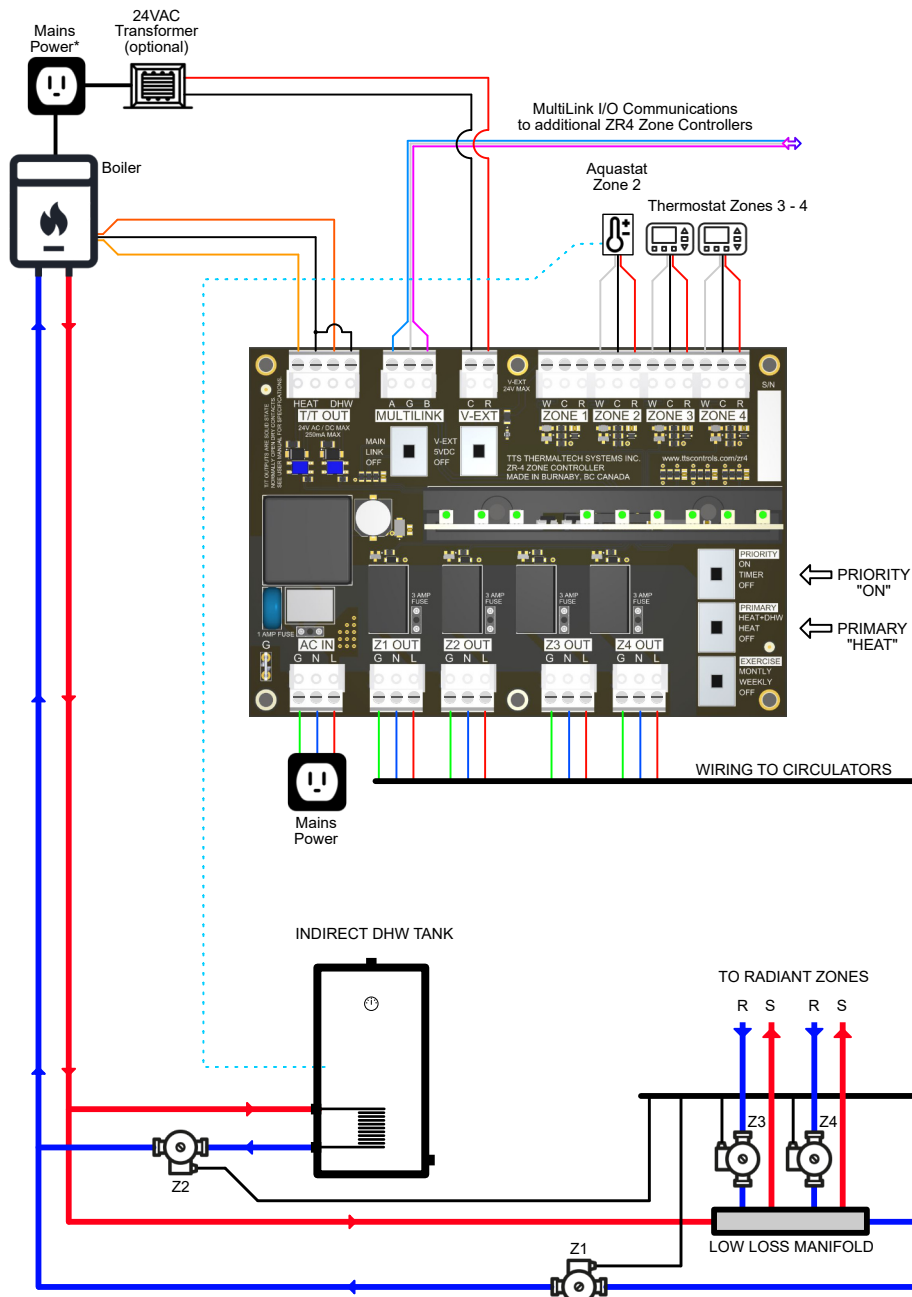
Primary Priority DHW + 2 Primary / Secondary Heating Zones

The installed manifold can be of integrated (pipe in pipe) design as depicted, or comprised of separate supply and return manifolds. A closely spaced TEE arrangement may also be suitable depending on design.

Zone Input 2 activates Zone Output 2. Zone 2 has priority over Zones 3 and 4. Boiler T/T Output DHW is active when Zone 2 is active.

Zone Output 1 is activated when Zones 3 or 4 are active. This is the primary circulator in a primary / secondary configuration. Zone Input 1 can be utilized in specialty / custom applications where Zone 1 Output requires remote / forced activation.

Zone Inputs 3 and 4 activate Zone Outputs 3 and 4 respectively. These are the secondary circulators in a primary / secondary configuration. The priority zone will interrupt the operation of Zones 3 and 4. Boiler T/T Output HEAT is active when Zones 3 or 4 are active.

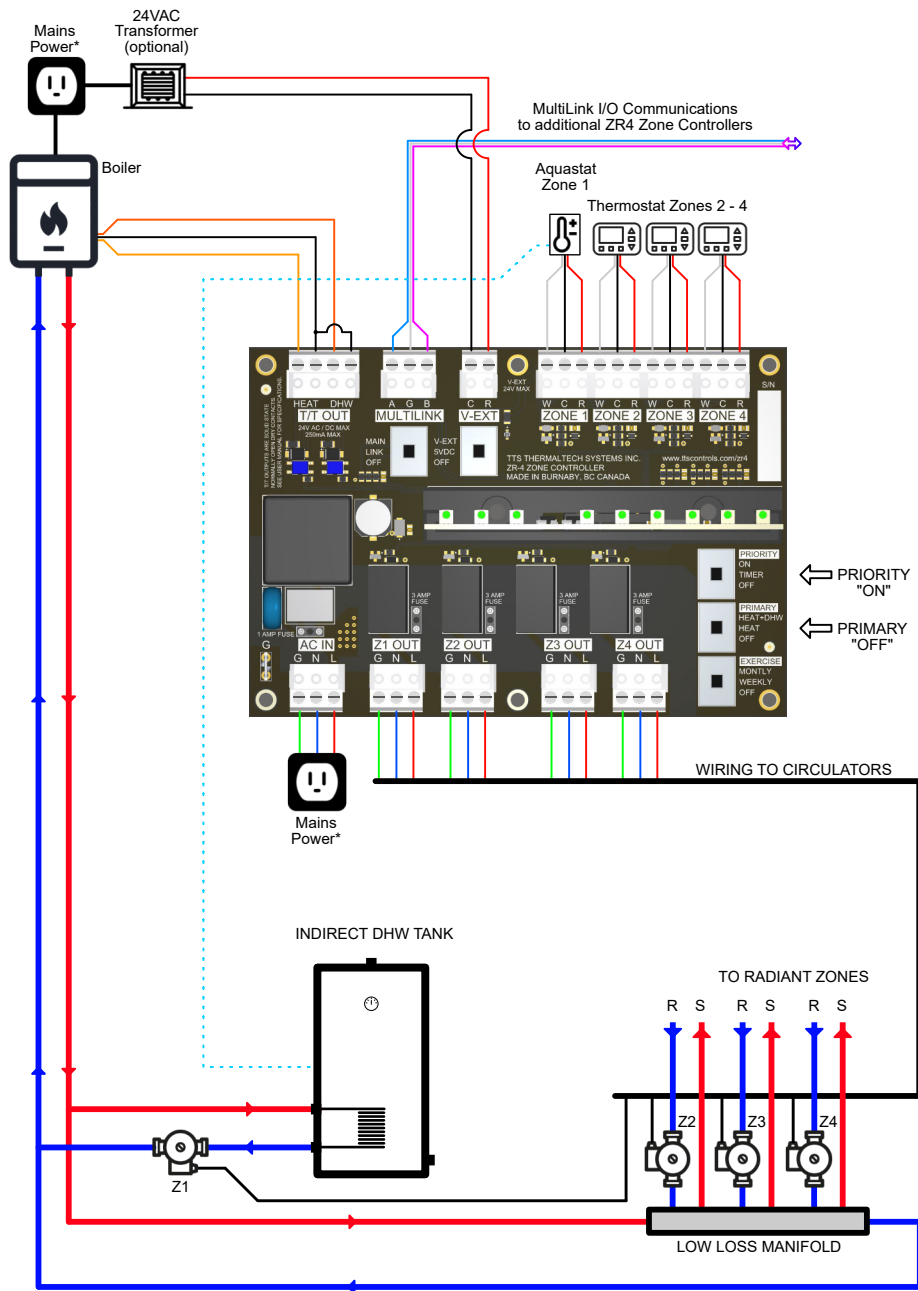


Primary Priority DHW + 3 Primary Heating Zones

The installed manifold can be of integrated (pipe in pipe) design as depicted, or comprised of separate supply and return manifolds. A closely spaced TEE arrangement may also be suitable depending on design.

Zone Input 1 activates Zone Output 1. Zone 1 has priority over Zones 2, 3 and 4. Boiler T/T Output DHW is active when Zone 1 is active.

Zone Inputs 2, 3 and 4 activate Zone Outputs 2, 3 and 4 respectively. The priority zone will interrupt the operation of Zones 2, 3, and 4. Boiler T/T Output HEAT is active when any of Zones 2, 3 or 4 are active.



SKUs

- ZR411A 1 Zone Hydronic Pump Controller with MCU-1 installed
- ZR421A 2 Zone Hydronic Pump Controller with MCU-1 installed
- ZR431A 3 Zone Hydronic Pump Controller with MCU-1 installed
- ZR441A 4 Zone Hydronic Pump Controller with MCU-1 installed

ACCESSORIES

- ZR-ACC-0001 #16AWG 6 Foot, 3 Conductor 90C 8 Amp Device Power Cord
- ZR-ACC-0002 #14AWG 6 Foot, 3 Conductor 90C 12 Amp Device Power Cord
- ZR-ACC-0003 40VA 24VAC Class II Panel Mount Transformer
- ZR-ACC-0004 75VA 24VAC Class II Wall Mount Transformer
- ZR-ACC-0005 6 Foot #18AWG Circulator Quick Connection Kit
- ZR-ACC-0006 10 Foot #18AWG Circulator Quick Connection Kit

REPLACEMENT PARTS

- ZR-0001 1A 250VAC Fuse
- ZR-0002 3A 250VAC Fuse
- ZR-0003 Device Cover (White)
- ZR-0004 Device Cover Screw Retention Inserts / Screw Kit
- ZR-0005 Terminal Block 12 Position (Zone 1 - 4 IN)
- ZR-0006 Terminal Block 4 Position (T/T)
- ZR-0007 Terminal Block 3 Position (AC IN, Zone 1 - 4 OUT, Multilink)
- ZR-0008 Terminal Block 2 Position (EXT IN)