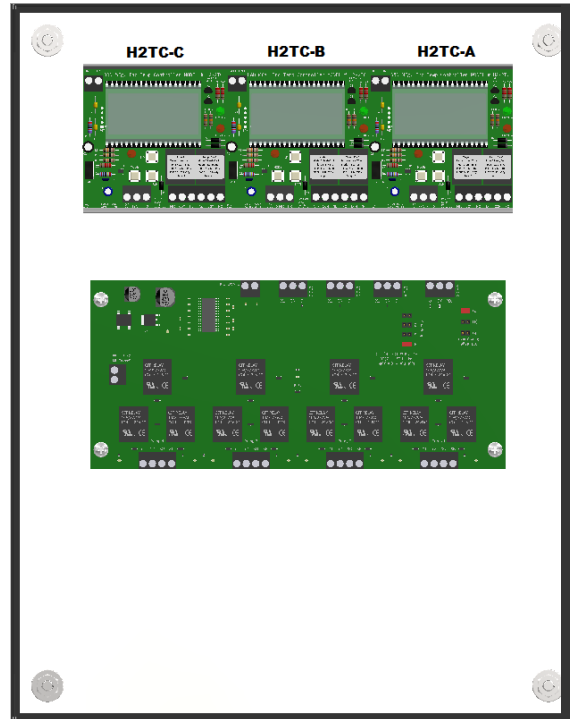
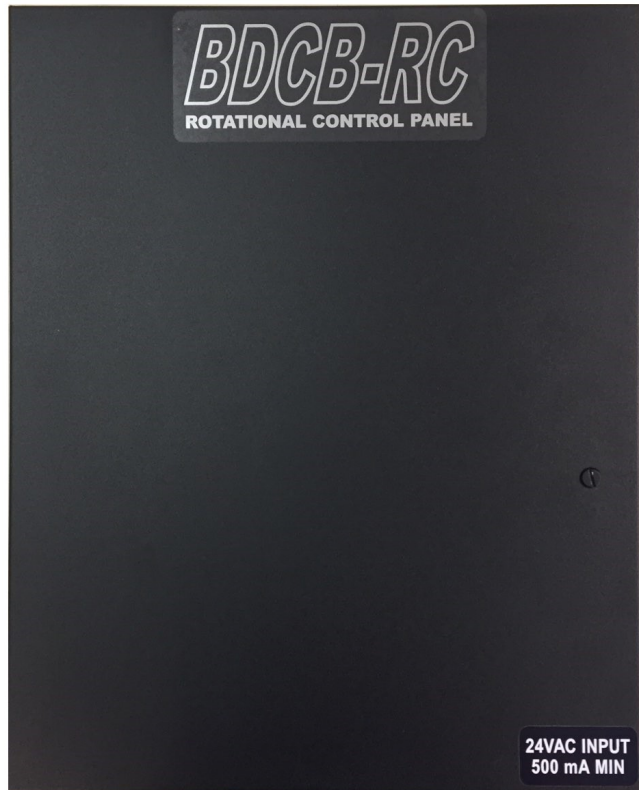


# ROTATIONAL CONTROL

BY B&D MFG., INC.



LET US MAKE YOUR HYDRONICS SYSTEM EASIER



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**INSTALLATION MANUAL**

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# ROTATIONAL CONTROL

BY B&D MFG., INC.

**NOTE:** *Read the entire instruction manual before starting the installation.*

## GENERAL

B&D Mfg., Inc. assumes no responsibility for equipment installed in violation of any code requirement. These instructions give information relative to the installation of the Rotational Control (BDCB-RC4HP) only. For other related equipment refer to the proper instructions.

Altering the product or replacing parts with non-authorized factory parts voids all warranty or implied warranty and may result in adverse operational performance and/or a possible hazardous safety condition to service personnel and occupants. Company employees and/or contractors are not authorized to waive this warning.

Material in this shipment has been inspected at the factory and released to the transport agency in good condition. When received, a visual inspection of all BDCB-RC4HP Rotational Control should be made immediately. Any evidence of apparent damage should be noted on the delivery receipt and the material inspected in the presence of the carrier's representative. If damage is found, a claim should be filed against the carrier immediately.

B&D Mfg., Inc. reserves the right to discontinue, make changes to, and add improvements upon its products at any time without public notice or obligation. The descriptions and specifications contained in this manual were in effect at printing. Some illustrations and info in the installation guide may not be applicable to your unit.

## WARRANTY

B&D Mfg., Inc. warrants for a period of three (3) years from date of purchase that all Rotational Control (BDCB-RC4HP) circuit boards are free from defects in materials and workmanship. B&D Mfg., Inc. warrants for a period of one (1) year from date of purchase that all other parts are free from defects in materials and workmanship. No allowance for labor or property damage is implied.

You must contact the Warranty Department at B&D Mfg., Inc. for a Return Authorization Form. The alleged defective product must be returned to B&D Mfg., Inc., for inspection via prepaid freight. Defective parts will be repaired or replaced at the manufacturer's discretion. No allowance for labor or property damage is implied.

This warranty applies only to the B&D Mfg., Inc. and does not include any other products or materials furnished by the installer. This warranty does not cover defects caused by adhere to local building codes and following good industry standards. The manufacturer does NOT WARRANT equipment subjected to abuse. Any abuse can void warranties. All warranty products must be returned within 30 days of receipt of replacement to receive credit.

It is expressly agreed that this shall be the sole and exclusive remedy of the buyer. Under no circumstances shall seller be liable for any costs, loss expenses damages, special damages, incidental damages of manufacture, sale, use or repair of the product whether based upon warranty, contract, negligence or strict liability. In no event will liability exceed the purchase price of the product.

## TERMS OF LIMITED WARRANTY

Limited Warranty is only applicable to products installed for use in HVAC systems using clean potable water. Complete unit replacements are not covered, defective parts will be repaired and/or replaced at the Manufacturer's discretion.

Limited Warranty shall not apply if serial number or data plates have been removed or altered. Warranty will be null and void. Limited Warranty shall not apply if products are not installed and maintained according to instructions in the product installation manual. Replacement and/or factory repaired parts are warranted only for the remainder of the original warranty period.

B&D Mfg., Inc. does not warrant products that have been modified from original design. Any product returned with design deviations will null and void any and all warranties. B&D Mfg., Inc. is not responsible for any labor, shipping and transportation costs. In no event will liability exceed the purchase price of the product.

## SAFETY CONSIDERATIONS

Installing and servicing of the Rotational Control (BDCB-RC4HP) can be hazardous due to electrical components. Only trained, qualified personnel should install, start-up and service this equipment.

When working on the equipment, observe precautions in the literature, tags, stickers and labels attached to the equipment and to any other safety precautions that apply.

When the Rotational Control (BDCB-RC4HP) is operating, some components you should not touch. Personal injury can result from touching these items with any object.

All electrical and service access panels must be returned and secured in their proper place. Clear surrounding area of all tools, equipment and debris. Check the entire unit to ensure its cleanliness.

Follow all safety codes. Wear safety glasses and work gloves.

## INSTALLATION PRECAUTIONS

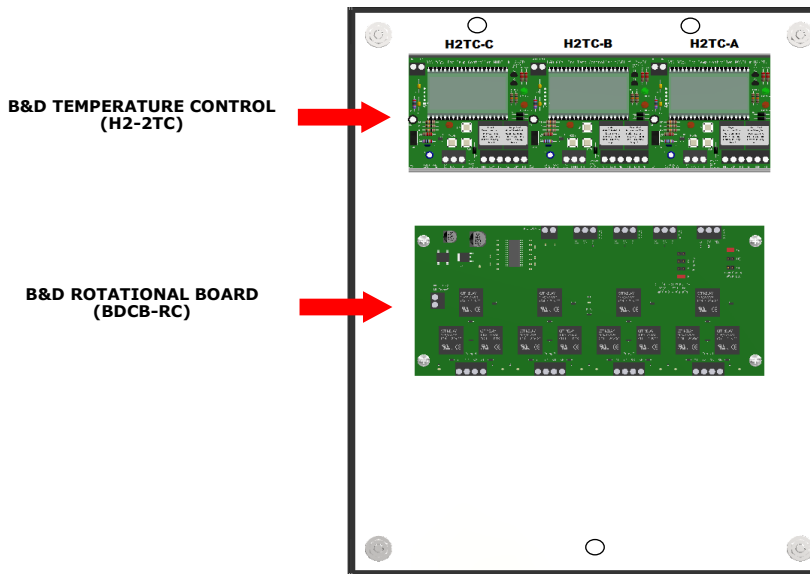
Installation of the Rotational Control (BDCB-RC4HP) should only be performed by a licensed contractor to ensure proper installation and the safety of the installer. The following are some precautions to be followed for typical installations.

- Always use proper tools and equipment
- No wiring or other work should be attempted without first ensuring that the Rotational Controls Package (BDCB-RC4HP) is completely disconnected from the power source and locked out. Always verify that a good ground connection exists prior to energizing any power sources.
- Always review the nameplate on each unit for proper voltage and control configurations. This information is determined from the components and wiring of the unit.

## CONTROL PANEL DIMENSIONS

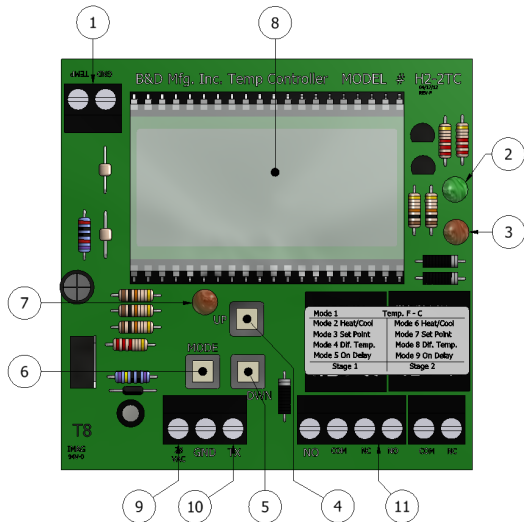


## CONTROL PANEL COMPONENTS INFORMATION



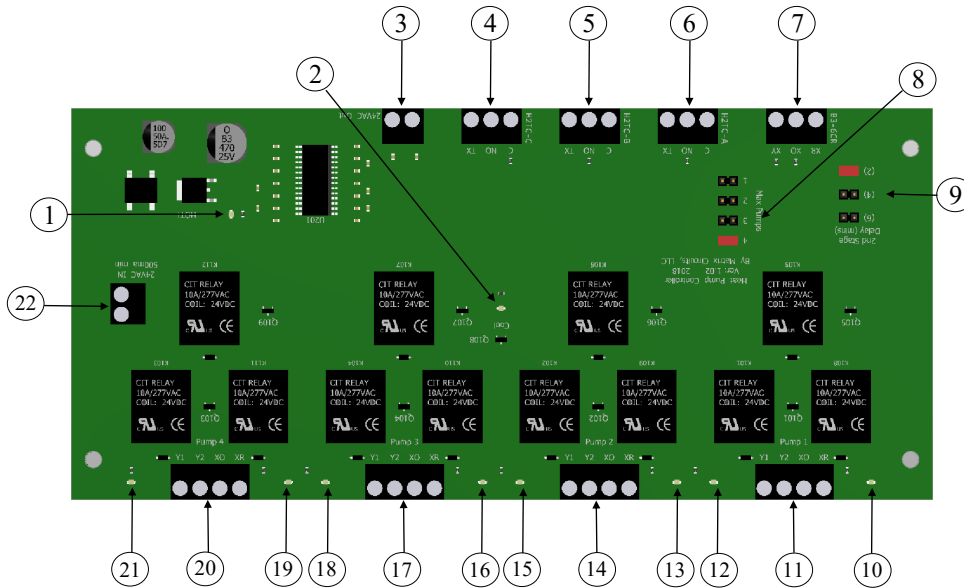
**NOTE:** All BDCB-RC4HP control panels come prewired with labels and a wiring decal mounted on the inside of the control panel door.

## BDCB-RC4HP CONTROL BOARD INFORMATION



**B&D TEMPERATURE BOARD (H2-2TC)**

| ITEM | DESCRIPTION          |
|------|----------------------|
| 1    | Thermistor Location  |
| 2    | Cooling LED          |
| 3    | Heating LED          |
| 4    | Up Button            |
| 5    | Down Button          |
| 6    | Mode Button          |
| 7    | Power Indicator LED  |
| 8    | LCD Screen           |
| 9    | 24V Power            |
| 10   | TX Sensor Signal     |
| 11   | Relay Contact (NC,C) |



**B&D ROTATIONAL BOARD (BDCB-RC)**

| ITEM | DESCRIPTION            |
|------|------------------------|
| 1    | Power Light            |
| 2    | Cooling Light          |
| 3    | 24VAC Out Terminal     |
| 4    | H2TC-C Terminal        |
| 5    | H2TC-B Terminal        |
| 6    | H2TC-A Terminal        |
| 7    | Demand Signal Contacts |

| ITEM | DESCRIPTION               |
|------|---------------------------|
| 8    | Device Number Pin         |
| 9    | 2nd Stage Pin Adjustment  |
| 10   | 2nd Stage Light Equip. #1 |
| 11   | Equip. #1 Dry Contacts    |
| 12   | 1st Stage Light Equip. #1 |
| 13   | 2nd Stage Light Equip. #2 |
| 14   | Equip.#2 Dry Contacts     |

| ITEM | DESCRIPTION               |
|------|---------------------------|
| 15   | 1st Stage Light Equip. #2 |
| 16   | 2nd Stage Light Equip #3  |
| 17   | Equip. #3 Dry Contacts    |
| 18   | 1st Stage Light Equip. #3 |
| 19   | 2nd Stage Light Equip #4  |
| 20   | Equip. #4 Dry Contacts    |
| 21   | 1st Stage Light Equip. #4 |
| 22   | 24VAC Power In Terminal   |

# ELECTRICAL

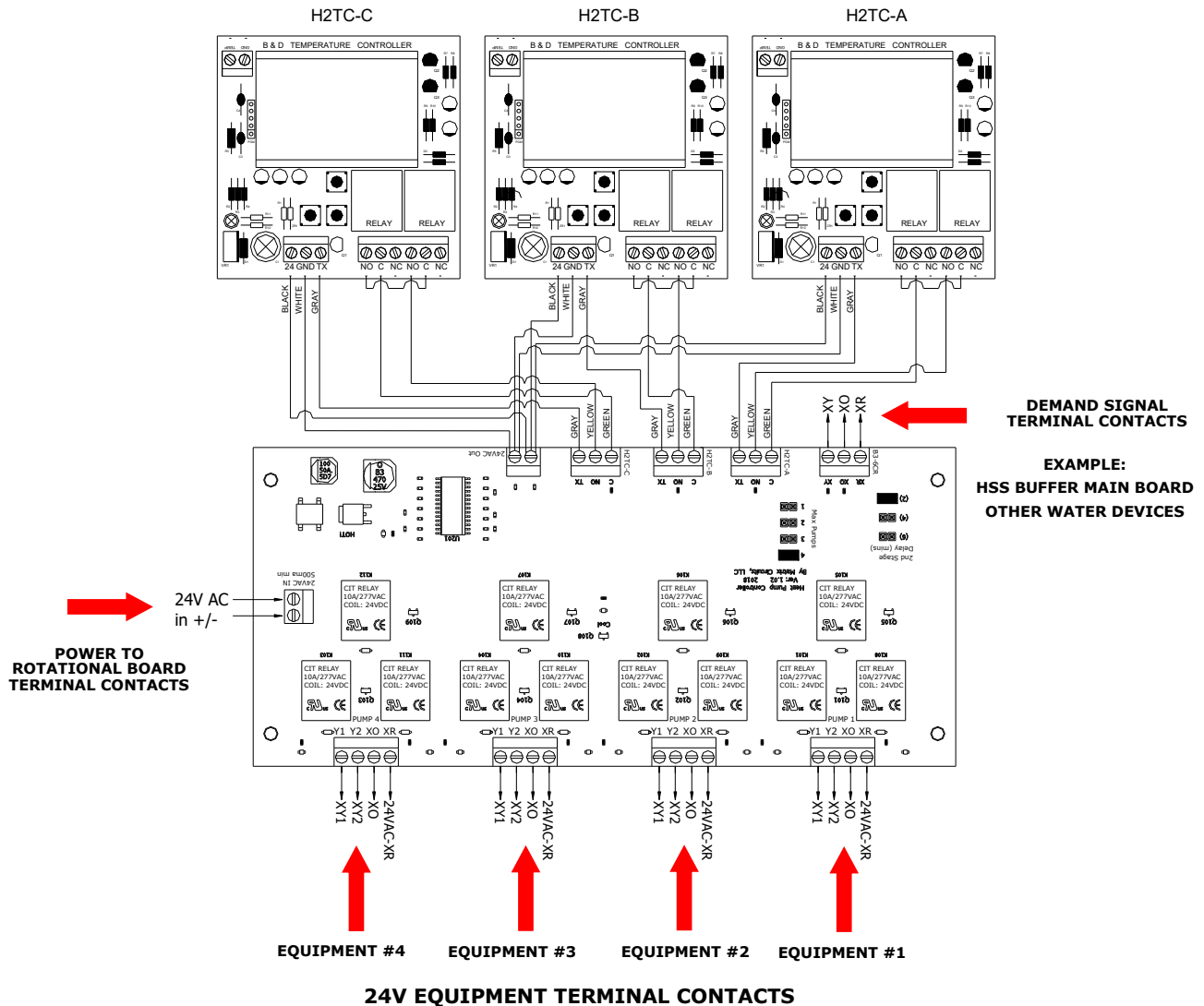
The Rotational Control (BDCB-RC4HP) requires 24VAC 500Ma minimum input. The primary wiring must be in accordance with Local Codes and that of the National Electric Code. Low voltage wiring must be isolated from primary voltage lines and connections.

All units are provided with wiring diagrams and name plate data to provide information required for necessary field wiring. Knockouts are provided on the cabinet for connection of power supply. Follow the color-coded schematic of low voltage wiring that is located inside the BDCB-RC4HP Rotational Control Panel.



**WARNING: These panels are designed for use with 24VAC. Do not use other voltages! Use caution to avoid electric shock or equipment damage. All work should be performed to local and national codes and ordinances.**

## BDCB-RC4HP CONTROL PANEL WIRING SCHEMATIC



**WARNING: Field installation must be wired in strict accordance with the wiring diagram that is supplied with the unit. Failure to do so could result in damage to components and will void all warranties.**

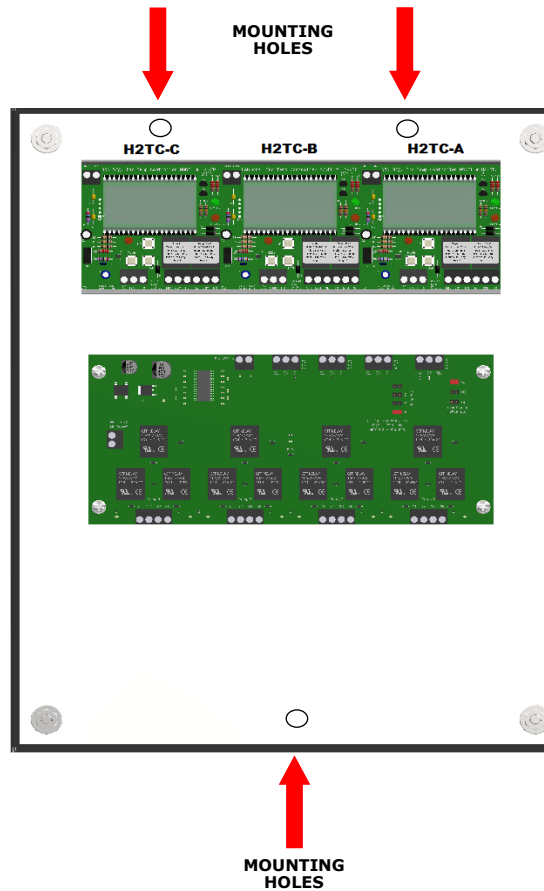
## MOUNTING THE CONTROL PANEL

Select a mounting location for the Rotational Control Panel (BDCB-RC4HP) that meets the following criteria:

- Close to the water heating equipment
- Dry, relatively clean area
- Easily accessible for service personal
- Facilitates wiring of the unit
- Mounting surface must be secure

Open the cover of the unit by turning the slot on the front of the cover one full turn counterclockwise. Position the unit on the mounting surface so that the wiring can be accomplished with minimal amount of difficulty. Mark the location of the mounting holes on the mounting surface. Remove the unit from the mounting area and drill the appropriate size pilot hole for the mounting screws.

Mount the unit by installing a screw through each of the three holes provided in the enclosure. Be sure the unit is securely fastened to the mounting surface. Close the cover on the unit after all wiring is complete.



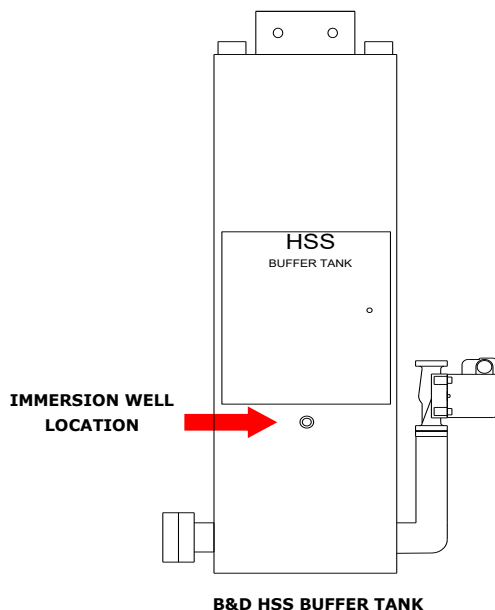
**WARNING:** Do not drill through the enclosure into the mounting surface. Doing so may cause chips to get into the electrical connections and damage the unit.



## IMMERSION WELL INSTALLATION

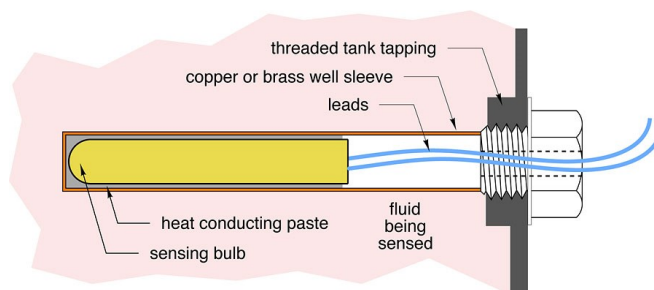
If you are using the Rotational Control (BDCB-RC4HP) with the B&D HSS Buffer Tank Controls, you will need to insert the thermistor probe that is provided with the Rotational Control Panel into the HSS Buffer Tank immersion well assembly or attach the Rotational Control Panel's immersion well probe to a location in the system to get a temperature reading.

**See below for immersion well location on the HSS Buffer Tank.**



If you choose to use the same location as the one from the HSS Buffer Tank Control Box, this will give the temperature boards located in the Rotational Control Panel the same temperature reading as the temperature controller (H2-2TC) in the HSS Buffer Tank Control Box.

If you choose to use a location other than the HSS Buffer Tank immersion well, it is recommended to use an immersion well assembly to give the best results for a temperature reading. Please see illustration below to help guide you to a proper installation to adding the Rotational Control Panel immersion well probe into your designated location.

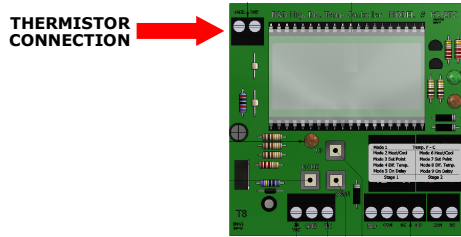


**NOTE: Prior to inserting the sensor, a small amount of thermal paste should be injected into the end of the well. The sensor body should also get coated with thermal paste as in the figure above.**

The objective is to completely fill the gap between the sensor body and inside surface of the well with thermal paste. Doing so improves conductivity and reduces the time lag between changes in water temperature and when that change is detected by the sensor.

## WIRING THERMISTOR TO THE BOARD

The sensor is connected directly to the B&D Temperature Board (H2-2TC) inside the Rotational Control Box (BDCB-RC4HP).



**B&D TEMPERATURE BOARD (H2-2TC)**

The sensor is wired into the temperature controller in the upper left hand side of the controller on the two terminal connection labeled **GND** and **TEMP**. The sensor wires are not terminal specific and can be wired into either terminal as long as both wires are wired into a separate terminal. The Rotational Control Panel comes with a six foot long 33kΩ sensor pre-wired into the temperature controller. If the sensor wire needs to be extended use a minimum 22 AWG wire to extend it up to 25 foot.

The temperature sensor can be connected to any of the 3 B&D Temperature Controllers (H2-2TC) to receive a temperature reading



**WARNING:** Be sure the power to the Rotational Control Panel (BDCB-RC4HP) is turned off at the supply source before continuing with the steps below. Serious injury or death could occur if this step is not followed.

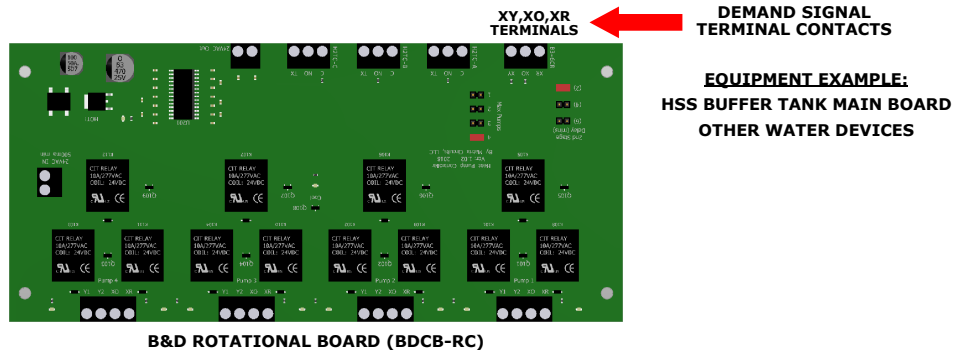
Only one temperature thermistor sensor is needed in the Rotational Control Box (BDCB-RC4HP) to sense temperature for all the displays. The temperature is distributed to the other temperature controllers via a signal generation cable wired into the **TX** terminal located in the lower left hand terminal on the temperature controller.

**WARNING:** The TX terminal is a communication port only and must only be connected to another TX communication terminal. If power is applied to this terminal the internal circuitry of the B&D Temperature Board (H2-2TC) will be damaged, in which case the warranty for this product will be voided.

## WIRING DEMAND SIGNAL

The Rotational Control Panel (BDCB-RC4HP) gets a request for demand for hot/cold water from a controls dry contact through the XY, XO, XR terminals in the upper right corner of the BDCB-RC board. **See image below for terminal contact location.**

The dry contact closes on demand control sending the power it receives from the rotational control XR back to the rotational controls XY terminal. This will start a water device. The water device that is started depends on where it left off in its rotational control program. (Device that is on has a light designating that it is actively running.) This then starts the rotational controls functionality.

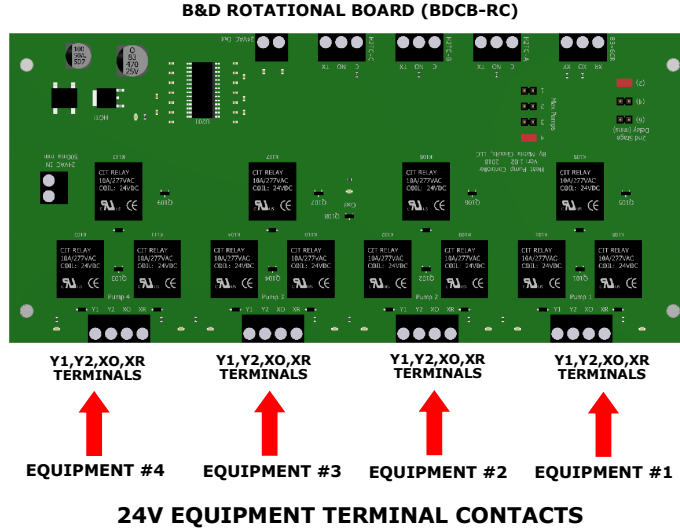


**NOTE:** XY,XO & XR Terminals are powered contacts. These contacts send out 5vDC. Has to be wired to a dry set of contacts.

## WIRING HEATING/COOLING WATER EQUIPMENT

Wire each of the water devices 24V contact to the XR terminal on the Rotational Control Board (BDCB-RC) in the lower portion of the board. Then wire the XY terminal on the Rotational Board (BDCB-RC) to the contact on the water devices that will receive the 24V signal back to start the unit. For a unit that has 2nd stage an additional wire needs be wired in the Y2 terminal. These contacts are made any time the system has a need for heat/cool. If the water device is being used to also chill water wire the XO terminal into the water devices contact for their reversing valve.

**NOTE: The equipment terminal contacts are 24V dry contacts.**



**! WARNING: Field installation must be wired in strict accordance with the wiring diagram that is supplied with the unit. Failure to do so could result in damage to components and will void all warranties.**

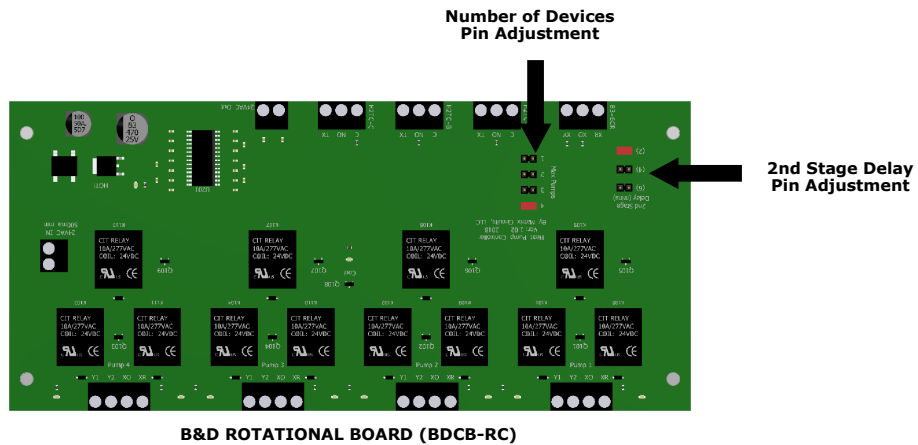
### Setting-Up Rotational Control and Staging Set Points

User places jumper on pins designated for the number of water devices they are wiring to the control board

**NOTE: User can choose between 2,3 or 4 devices.**

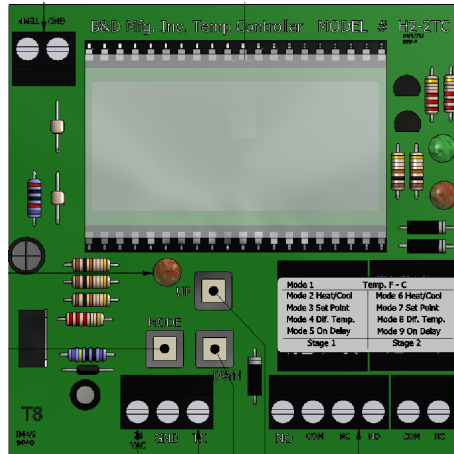
User places jumper on pins designated for the delay required for all second stages of devices.

**NOTE: User can choose between 2, 4 or 6 Minute Delay.**



**! WARNING: Make sure you unplug the power to the Rotational Control Panel (BDCB-RC4HP) before moving the jumper pins to avoid causing a short.**

## TEMPERATURE CONTROLLER PROGRAMMING



**B&D TEMPERATURE BOARD (H2-2TC)**

**NOTE: The BDCB Pump Control Panel temperature controllers are shipped from the factory already programmed with heating and cooling set points.**

**NOTE: For the temperature set points for this unit, please refer to your wiring schematic that is mounted inside the electrical box. The set points are displayed under the Presets Chart.**

1. Power needs to be applied to the BDCB-RC4HP Rotational Load Control Panel, the Temperature controller (s) display will turn on.
2. Press and hold the MODE button for 5 seconds and it will enter programming mode. After 2 seconds the temperature scale will show on the LCD display. By pressing the up or down button allows you to change from "FAR" or "CEN".
3. Press mode button once and enter the control type. The display will show "TY1". After 2 seconds the LCD will show "HEA" or "COL", by pressing the up and down button allows the setting change from "HEA" or "COL". The setting must be "COL".
4. Press the mode button again to change to temperature differential "SP1". After 2 seconds the LCD will display a number, by pressing up and down button allows the setting change the number setting.
5. Press the mode again and the LCD displays "HS1", after 2 seconds the LCD will show current setting. The hysteresis time, would be a built in time delay. By pressing the up and down button to set the desired time. Change to zero to disable.
6. Press mode button once and enter the control type. The display will show "TY2". After 2 seconds the LCD will show "HEA" or "COL", by pressing the up and down button allows the setting change from "HEA" or "COL". The setting must be "HEA".
7. Press the mode button again to change to temperature differential "SP2". After 2 seconds the LCD will display a number, by pressing up and down button allows the setting change the number setting.
8. Press the mode again and the LCD displays "HS2", after 2 seconds the LCD will show current setting. The hysteresis time, would be a built in time delay. By pressing the up and down button to set the desired time. Change to zero to disable.

Each controller includes a locking function that will prevent accidental reprogramming. The soft lock is enabled and disabled by pressing both the UP and DOWN buttons for five seconds. The LCD will show "LOC" to indicate the controller is locked. The LCD will show "UNL" to indicate that the controller is now unlocked. The soft lock will retain its setting through power interruptions.

There's also a factory restore option to restore the controllers to their original set points before they are programmed in the factory. Hold in the mode, up and down buttons simultaneously until the screen displays FAC.

**(Approximately 20 seconds)**

**NOTE: If you use the factory restore option, please note that the temperature set points will need to reset to your desired setting. Each system may have a different amount of temperature controllers. If you reset more than one controller, your temperature staging will be incorrect as the reset controllers will have the same set points.**

## FUNCTIONALITY OF ROTATIONAL CONTROLLER

Once the Rotational Board (BDCB-RC) is powered on, the green power light in the upper left hand side of the board should be lit up. **See page 4 for the location of the rotational board power light.**

As previously mentioned, the demand signal from the equipment connected to Rotational Board (BDCB-RC) requests demand for hot/cold water based on its current controls method. The demand signal terminal closes sending the power it receives from the Rotational Board (BDCB-RC) XR terminal back to the Rotational Board (BDCB-RC) XY terminal.

This will start a water device. The water device that is started depends on where it left off in its rotational control program. The device that is on has a light designating that it is actively running. This then starts the Rotational Controls functionality.

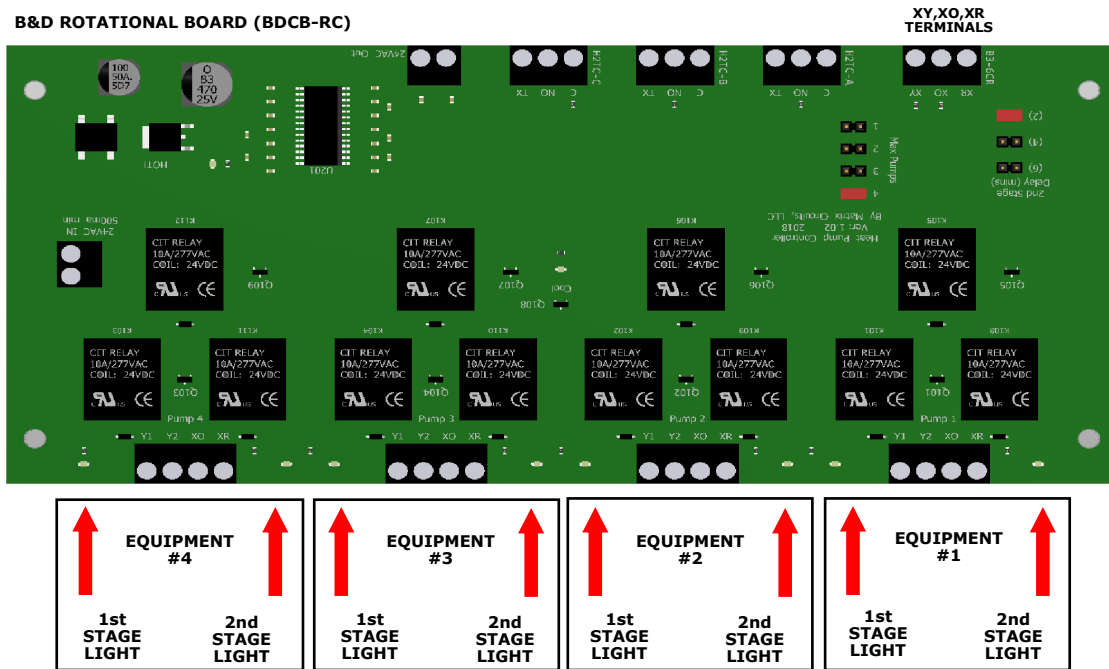
The control will then rotate which water device comes on first on a demand call. It does this by rotating to the next device in the connection series when demand goes away. Ex: 1,2,3,4; 2,3,4,1; 3,4,1,2; 4,1,2,3.

Once a device has started two things happen:

1. Timer begins for the second stage of that device.
2. Built in timer for next water device to operate begins. This is a two minute timer. Each time before any device, except the original device; can operate this timer is activated.

Once this timer is satisfied it then sends power to the next temperature controller and based on its set points can turn on the next water device. The green and red LED on the temperature controller to the right of the LCD screen must be lit for the next water device to be activated. This happens until all units are running or demand is meet.

**See below for the 1st and 2nd stage lighting identification of the Rotational Board (BDCB-RC)**



**2<sup>nd</sup> Stage:** Jumper on pins designated for delay required for all second stages of devices. This stage is activated after first stage of a device is actively running and timer has been satisfied. (Light designating active for that device.)

**Cooling:** "O" call from the Equipment connected sends signal to Rotational Board (BDCB-RC) XO terminal. The Cooling light will be lit designating it is active for all devices. **See page 4 for location of the Cooling Light on the Rotational Board (BDCB-RC)**

## ROTATIONAL CONTROL CONNECTED TO HSS BUFFER TANK

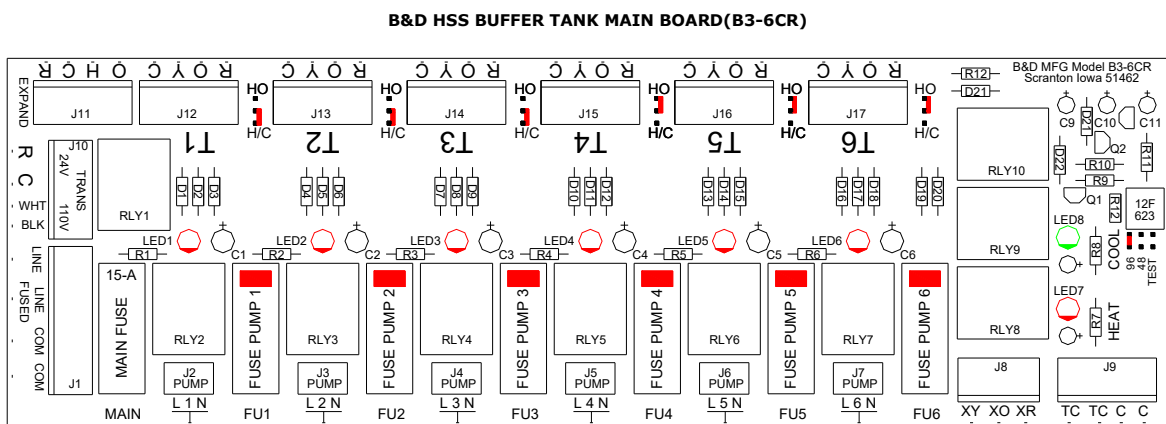
If your using the Rotational Control Panel (BDCB-RC4HP) with the B&D HSS Buffer Tank Controls, the main HSS Control Box Board (B3-6CR) XY, XR, XY terminals will need to communicate to the Rotational Control Board (BDCB-RC) demand signal contacts.

**See below for the location of the 3 wires that need to be run from the main HSS Control Box Board (B3-6CR) XY, XR, XY terminals to the Rotational Control Board (BDCB-RC) demand signal contacts.**

The main HSS Control Box Board (B3-6CR) requests demand for hot/cold water based on its current controls method. XY terminal closes on HSS B3-6CR Main Board sending the power it receives from the Rotational Board (BDCB-RC) XR terminal back to the Rotational Board (BDCB-RC) XY terminal.

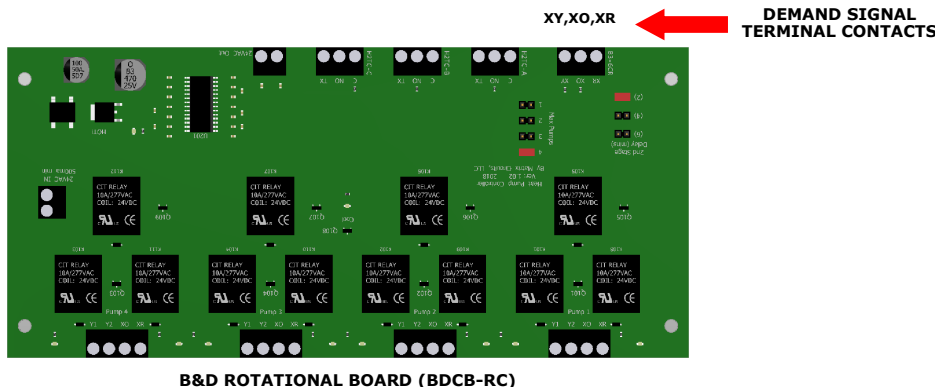
This will start a water device. The water device that is started depends on where it left off in its rotational control program. The device that is on has a light designating that it is actively running. This then starts the Rotational Controls functionality.

**See previous page 10 for the 1st and 2nd stage lighting identification of the Rotational Board (BDCB-RC)**



**XY, XO, XR  
24V DRY CONTACT  
TERMINALS**

**See below for the Rotational Board (BDCB-RC) demand signal contacts as mentioned above.**



**B&D ROTATIONAL BOARD (BDCB-RC)**



**“B & D Mfg. Inc.’s mission is to bring geothermal innovation to the forefront of green energy. Our goal is to utilize non-pressurized products, while meeting all geothermal product needs. We strive to always have the products our distributors need in stock. As one of the leaders in geothermal, B & D plans to grow with the industry and continue to push the industry with creative ideas, quality products, and great distributor service.”**

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