

Installation

S59-5000 Series

Navigator® Digital Mixing Valves (DMV)

S59-5075 3/4" NPT Valve

S59-5100 1" NPT Valve

S59-5125 1 1/4" NPT Valve

S59-5150 1 1/2" NPT Valve

S59-5200 2" NPT Valve



Certified for Compliance to the Following Standards:

- ASSE 1017 – Performance Requirements for Temperature Actuated Mixing Valves for Hot Water
- CSA B125.3 – Plumbing Fittings
- ANSI/NSF/CAN 372 – Drinking Water System Components (Lead content)



[Scan or click code to view
Installation Guide \(English\)](#)



[Scan or click code to view
Installation Guide \(French\)](#)



[Scan or click code to view
Installation Guide \(Spanish\)](#)



Read the instructions in this manual before beginning installation. Save these instructions and refer to them for inspection, maintenance, and troubleshooting information.

For questions regarding the operation, installation or maintenance of this product, visit bradleycorp.com or call 800.BRADLEY (800.272.3539). Product warranties and parts information may also be found under “Resources” on our website at bradleycorp.com.



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The Navigator® S59-5000 Series Digital Mixing Valve is intended to be but one component in an overall risk management plan as described by ANSI/ASHRAE Standard 188, "Legionellosis: Risk Management for Building Water Systems". When installed and used as designed and intended, the Navigator digital mixing valve can help reduce bacteria in domestic hot water recirculation systems. However, due to system-dependent variables, 100% eradication cannot be guaranteed. Bradley Corporation is not responsible for any consequential damages that may arise from Legionella illness when using the digital mixing valve.

Safety Information

Installation

Failure to comply with proper installation and maintenance instructions could contribute to a valve failure resulting in severe bodily injury including scalding, chilling, and/or death depending upon system water pressure changes and/or supply water temperature changes.

Use this digital mixing valve in accordance with ASSE standard 1017.

When installed in accordance with ASSE standard 1017, the valve is designed to be installed at or near the boiler or water heater. When installed as an ASSE 1017 valve, the valve does not function as an ASSE 1016, ASSE 1069 or ASSE 1070 valve.

This valve should not be used where ASSE standard 1016 devices are required.

This valve should only be installed in temperatures that are above freezing.

This valve does not provide protection from pipe freezing.

Installation of this system must be completed by qualified personnel in compliance with all national and local codes. Compliance and conformity to local codes and ordinances is the responsibility of the installer. Should these codes differ from the information in this manual, follow the local codes. Inquire with governing authorities for additional local requirements.

Inspection

Periodic inspection and yearly maintenance by a licensed contractor is required. Corrosive water conditions and/or unauthorized adjustments or repairs could render the valve ineffective for its intended service. Frequency of cleaning and inspection depends upon local water conditions.

Output temperature of the valve must be checked and adjusted at initial installation and on a quarterly basis.

Water Temperature

Final temperature adjustment is the responsibility of the installer.

⚠ WARNING Safety measures must be in place before engaging the Disinfection mode. Verify the anti-scald protection devices (certified to ASSE 1016 or ASSE 1070) at all of the downstream fixtures are installed. Failure to comply may result in personal injury and/or property damage.

⚠ WARNING When making water connections, make sure the pipework connecting the Navigator® digital mixing valve is not mechanically overstressed. Over time, this could cause breakages with consequent water losses that may result in personal injury and/or property damage.

⚠ WARNING RISK OF SHOCK! The back panel and mixing valve contain live circuits. Verify the electrical supply is shut off before performing work. Failure to comply may result in personal injury and/or property damage.

CAUTION To prevent any damage that will cause the digital mixing valve to operate incorrectly, treat highly aggressive water before entering the digital mixing valve. Be sure water hardness is less than 10 grains.

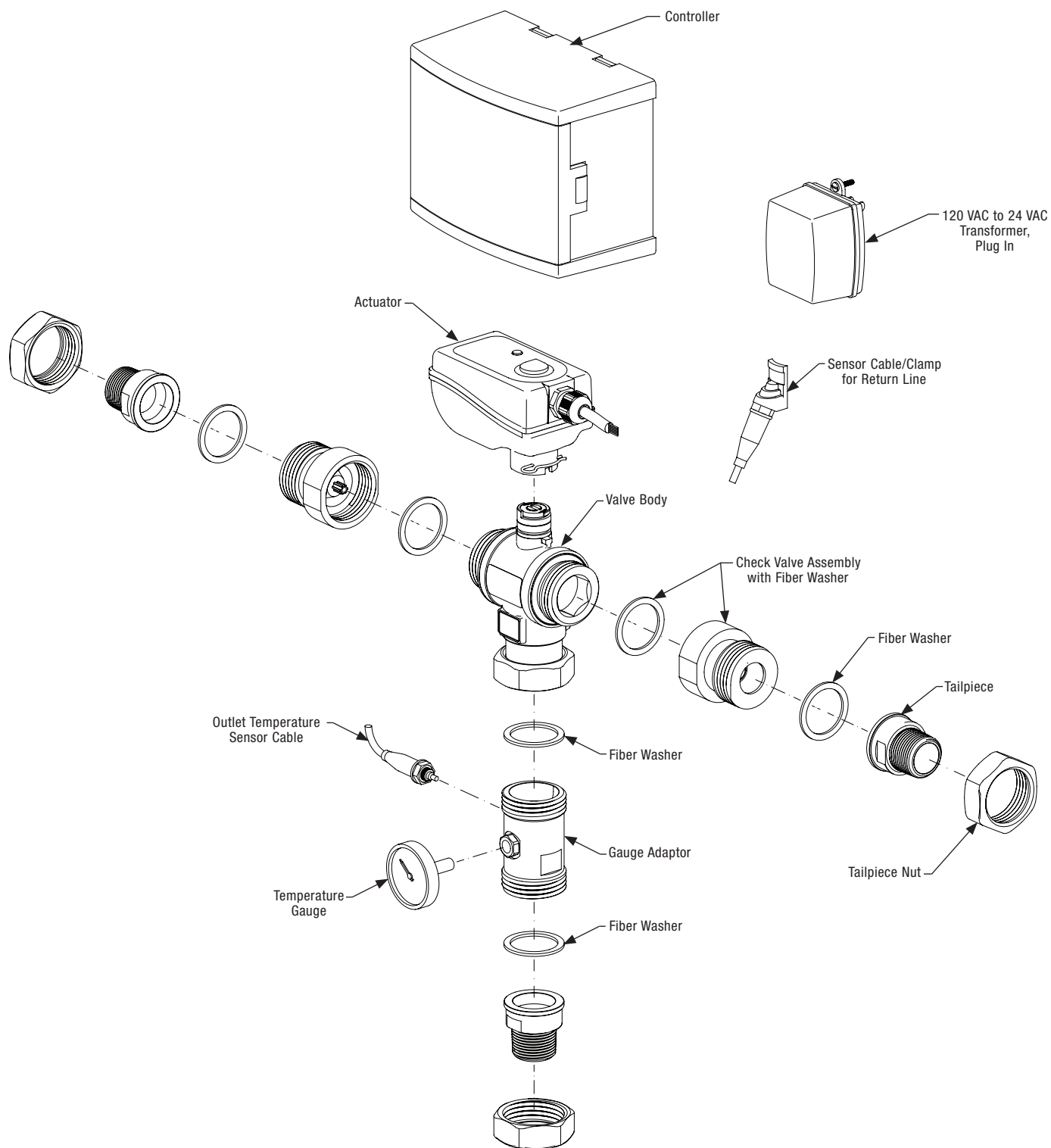
Supplies Required for Installation

- Shut-off valve for the outlet if tempered water is supplied to a remote location
- Shut-off valve for the inlets/supplies
- 120 VAC power for 24 VAC transformer
- Cold water supply
- Hot water supply
- Fasteners for drywall or cement wall installation

Tools Required for Installation

- Adjustable wrench
- Pipe wrench
- Screwdriver
- Electrician tools to make wire connections inside the controller

Components



Product Performance & Specifications

Mixing Valve Performances

Accuracy: $\pm 3^{\circ}\text{F}$ ($\pm 2^{\circ}\text{C}$)

Max. Operating Differential Pressure (Dynamic): 20 PSID (1.4 bar)

Valve Only Assembly

Maximum Pressure: 150 PSI

Maximum Inlet Temperature: 212°F (100°C)

Ambient Temperature: 33–120°F (1–50°C)

Temperature Gauge Scale: 32–176°F (0–80°C)

Outlet Temperature Setting Range: 68–185°F (20–85°C)

Minimum Temperature Differential (between hot supply & valve set point): 2°F

Maximum Water Hardness: 10 grains

Actuator, 3-Wire Floating Fail-In-Place

Electric Supply: 24 VAC, 50/60 Hz

Power Consumption: 6VA

Protection Cover: Self-extinguishing V0 flame-rated material

Protection Class: IP 65 (NEMA 4/4X)

Ambient Temperature Range: 33–120°F (1–50°C)

Electric Supply Cable Length: 31-1/2" (.8 m)

Max. Distance for Control Signal Wire:

500 ft (150 m) cable 2 conductor x AWG 18

800 ft (250 m) cable 2 conductor x AWG 16

Controller, LCD User Interface/Display

Electric Supply: 24 VAC (min. 21.6, max. 26.0 VAC), 50/60 Hz

Power Consumption: 6.5VA

Adjustment Temperature Range: 68–185°F (20–85°C)

Disinfection Temperature Range: 104–185°F (40–85°C)

Ambient Temperature Range: 33–120°F (1–50°C)

Protection Class: IP 54 (wall mounting) (Class II appliance)

Mounting Bracket: DIN rail

Contact Rating (R1, R3, R4): 10(2)A / 24V

Mixing Valve Control: 1A / 24V

Alarm Relay (R2): 5(2)A / 24V *Note: 50VA, Class II, 120/24 VAC plug-in transformer is included.*

Fuse 1 (Main): 400 mA

Fuse 2 (Mixing Valve): 1A

Charge Reserve: 15 days in the event of electric supply failure, with a 3-cell rechargeable 3.6V, 140 mAh battery

Battery Recharging Time: 72 hours

Approvals: CE, FCC part 15

Temperature Sensors

Body Material: Stainless steel

Type of Sensitive Element: NTC

Working Temperature Range: 14–260°F (-10–125°C)

Resistance: 10,000 Ohms @ 77°F (25°C)

Time Constant: 2.5

Max. Distance for Mixed Outlet or Return (recirculation) Sensor:

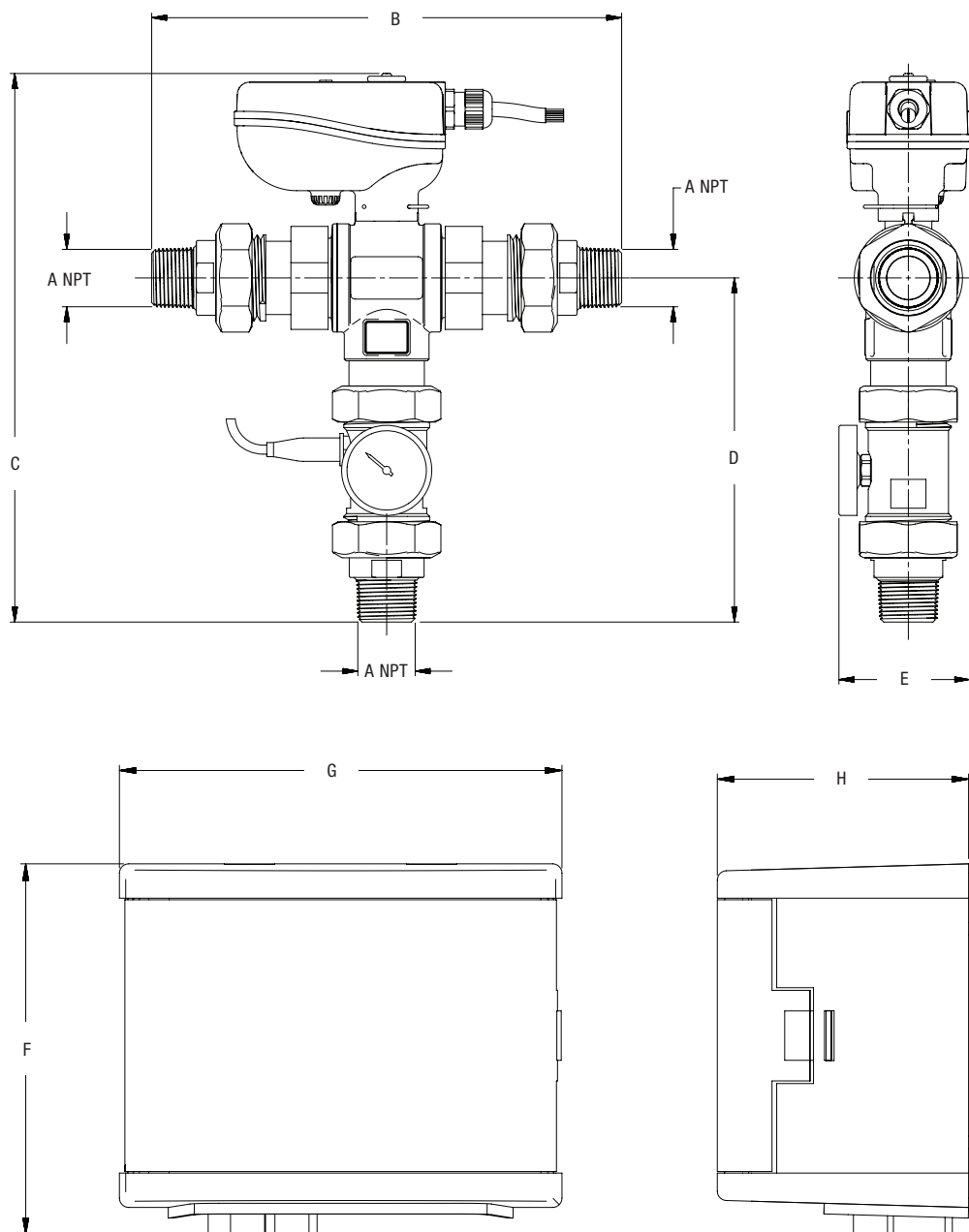
500 ft (150 m) cable 2 conductor x AWG 18

800 ft (250 m) cable 2 conductor x AWG 16

Mounting Dimensions

Model	Inlets/Outlet	Dimensions - Inches (mm)							Weight ¹ lb (kg)
	A NPT	B	C	D	E	F	G	H	
S59-5075	3/4	5-3/4" (146.1)	9-5/8" (244.5)	5-5/8" (142.9)	2-7/8" (73)	6" (152.4)	7" (177.8)	4" (101.6)	7.2 (3.27)
S59-5100	1	10-1/4" (260.4)	12" (304.8)	7-1/2" (190.5)	2-7/8" (73)	6" (152.4)	7" (177.8)	4" (101.6)	12.4 (5.62)
S59-5125	1-1/4	10-1/2" (266.7)	12-1/8" (308)	7-5/8" (193.7)	2-7/8" (73)	6" (152.4)	7" (177.8)	4" (101.6)	12.4 (5.62)
S59-5150	1-1/2	14" (355.6)	14-5/8" (371.5)	9-3/4" (247.7)	3-1/2" (88.9)	6" (152.4)	7" (177.8)	4" (101.6)	25.4 (11.52)
S59-5200	2	14-1/8" (358.8)	14-3/4" (374.7)	9-3/4" (247.7)	3-1/2" (88.9)	6" (152.4)	7" (177.8)	4" (101.6)	26.4 (11.97)

¹ Includes controller weight—2.7 lb (1.22 kg) and actuator weight—1.5 lb (0.68 kg)



1 Plumbing Installation

A Flush pipes prior to installing mixing valve.

B Install isolation valves at inlets and outlet to comply with applicable codes.

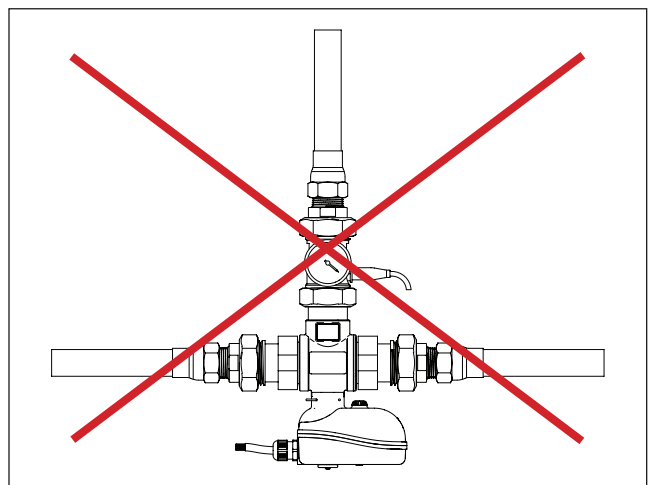
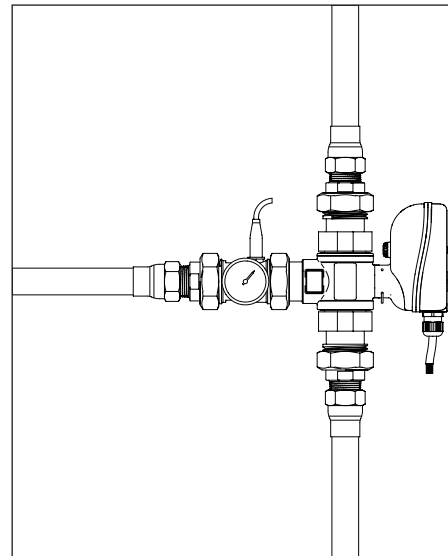
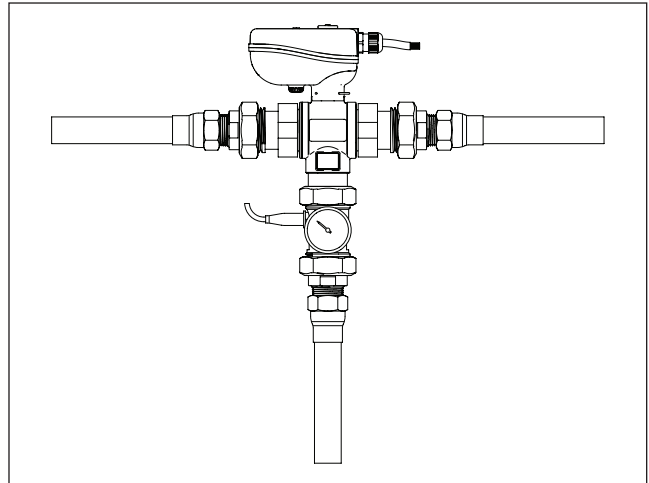
C When necessary, install strainers at the inlets.

D Install check valves (2 included) at the inlets to comply with applicable codes. Refer to “Components” on page 4 for check valve assembly.

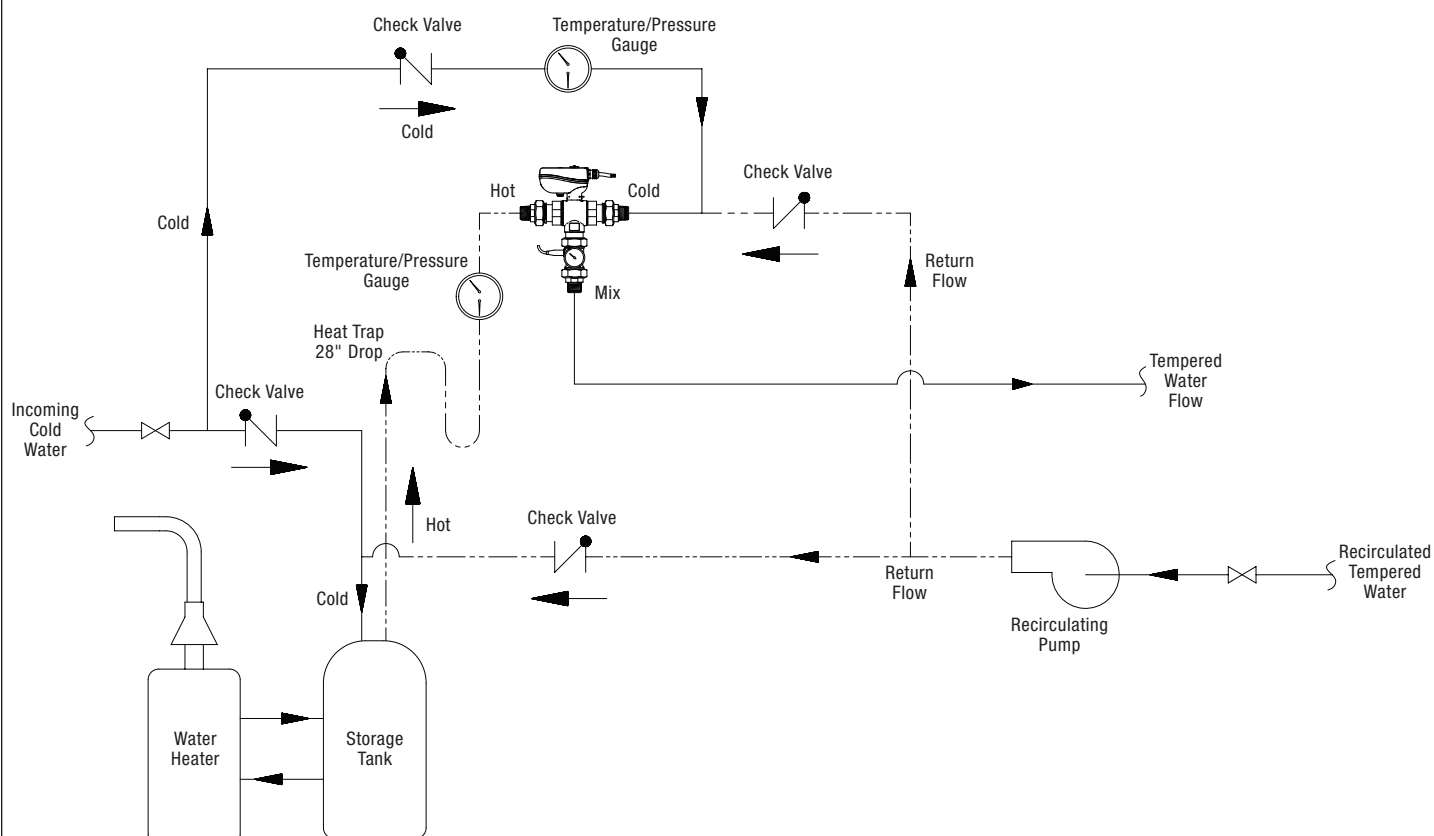
E Install the mixing valve with the outlet facing downward or facing to the side.



DO NOT install mixing valve with outlet upward!





2 Optional Water Recirculation Setup



When using the Navigator Digital Mixing Valve, a circuit setter is not required in the building recirculation system. The positive shutoff design of the valve mitigates the issue of temperature creep where the system will eventually reach the temperature within the storage tank (non-digital valves also employ the use of an aquastat to control this occurrence)

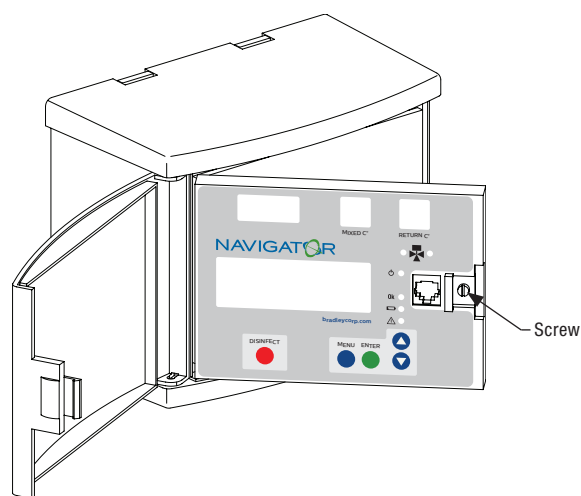
3 Electrical Wiring

 The Controller can be mounted to a suitable surface using the DIN Rail, fasteners and anchors included with the valve hardware prepack.

 The Controller can be remotely located if desired. For distances up to 500 feet, 18 AWG wire should be used. For distances up to 800 feet, 16 AWG is recommended.

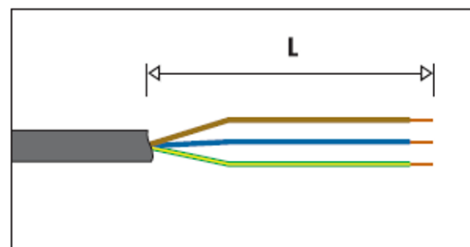
Cable Preparation

A Open front cover and loosen screw on front of display. Carefully remove the electrical wiring base from the housing.



B Route cables through the cord grips based on the cable size. Strip the cable sheath according to the table below.

Cord Grip No.	Cable Type	Sheath Strip Amount "L" (in / mm)
1	2 x AWG 16	5 / 130
2	6 x AWG 18	6 / 150
3	2 x AWG 18	8.25 / 210
4	2 x AWG 18	8.25 / 210
5	3 x AWG 18	8.25 / 210
6	2 x AWG 16	6.25 / 160
7	2 x AWG 16	6.25 / 160
8	2 x AWG 16	7 / 180
9	2 x AWG 16	6.25 / 160



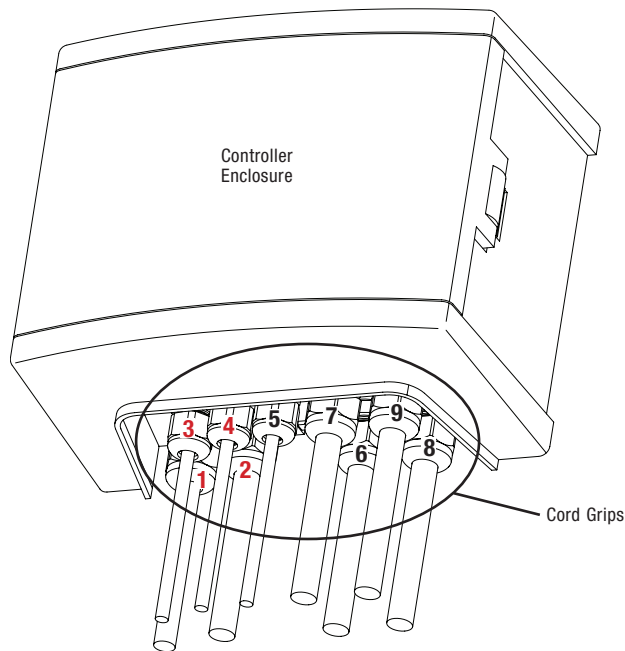


The Cord Grip No. represents the locations of cable openings at the bottom of the controller enclosure. See the diagram below for the cord grip numbers and locations. The plastic caps are provided with different seals for the corresponding cable types.

CAUTION The cable type must match the cord grip. Otherwise, the seal caps will NOT seal the moisture out of the enclosure.



Route all wires into enclosure through bottom cord grips. Replace unused cord grips with the provided plastic plugs. Strain relief cord connectors are provided for all 9 controller housing holes.



Connect the power, controller, actuator, sensors, and relay with proper sequence.

Follow the sequence below under the control box to connect cables to the terminals and tighten the seals.

1. Power supply, 24 VAC from transformer output to terminals 9 and 10 in controller. Ground on terminal 11. Refer to the diagram on page 12 for all terminal locations.
2. Mixing valve actuator
- C** 3. Mixed outlet temperature sensor
4. Return temperature sensor
5. RS485
6. Relay 3
7. Relay 1
8. Relay 4
9. Relay 2



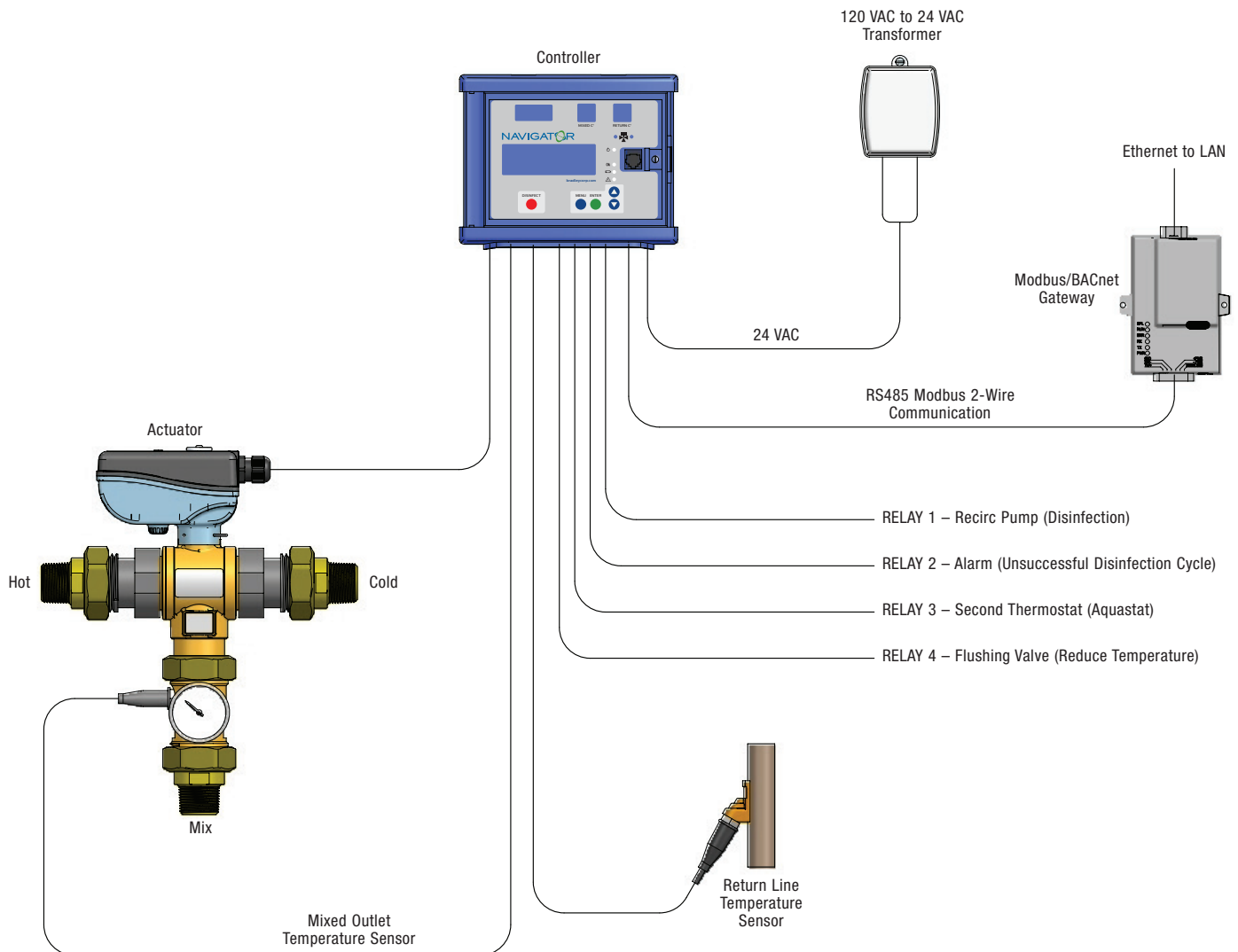
Refer to "Relay Functions & Wiring" on page 25 for the functions for each relay.

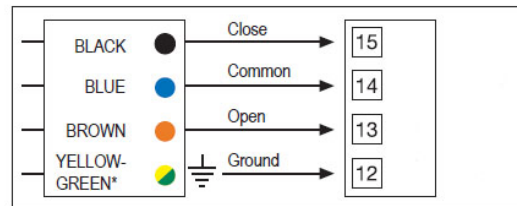
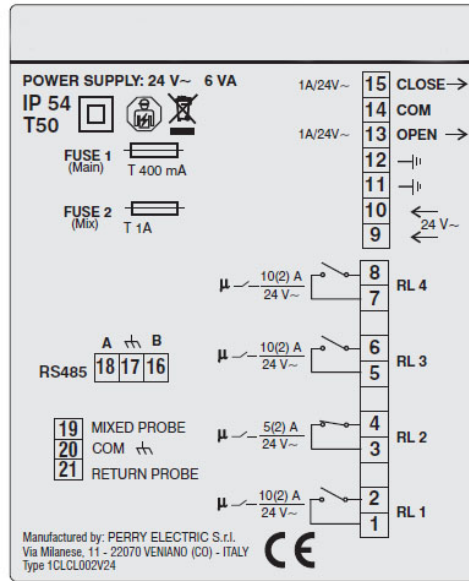
CAUTION Connections must NOT create pull stresses on the circuit board.

Wiring Diagrams & Sequences

A Connect the power, actuator, temperature sensors, relays, and battery per the illustration below.

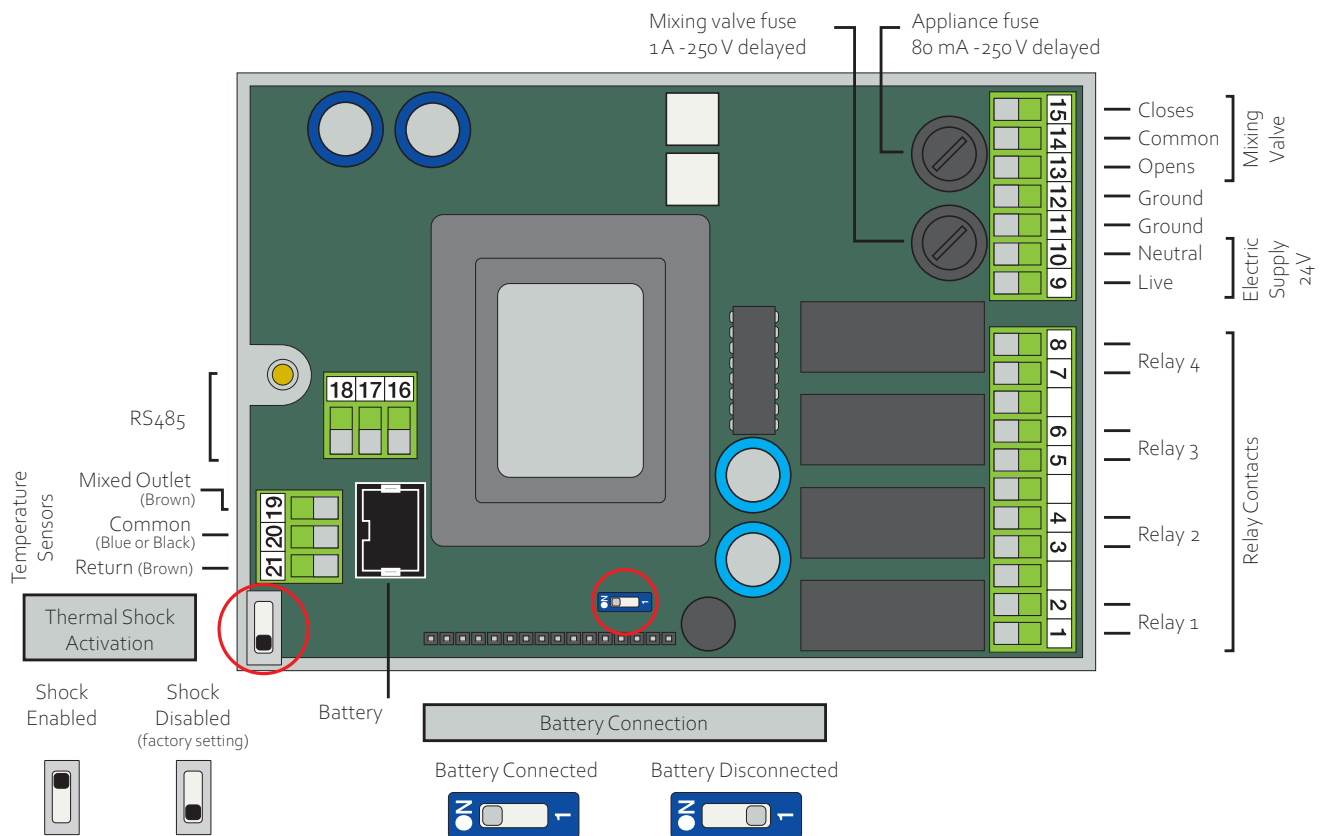
⚠ WARNING The cable connecting the mixed temperature outlet and return temperature sensors must be installed in a dedicated raceway. If the connection cable shares the raceway with other live cables, a shielded cable must be used.





Actuator-to-Control Wiring

The actuator has 6 wires. Black, blue, brown and yellow/green should be connected to terminals 15, 14, 13 and 12 respectively as shown in the diagram. The red and white wires are not used for this application and should be insulated with electrical tape.



Two wires inside "Mixed Outlet" sensor cable are connected to terminal 19 and 20. Two wires inside "Return" sensor cable are connected to terminal 21 and 20. The two wires in each sensor cable can be reversed as polarity is not relevant.

B Install the provided battery. Make sure the polarity of the battery is correctly positioned.

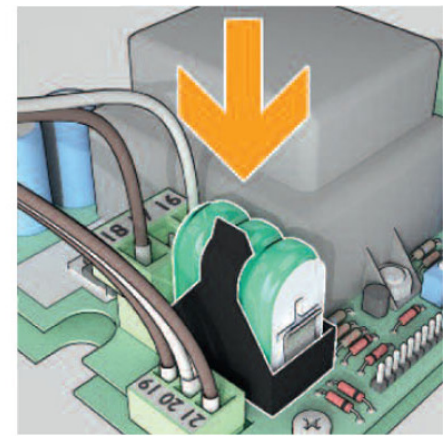
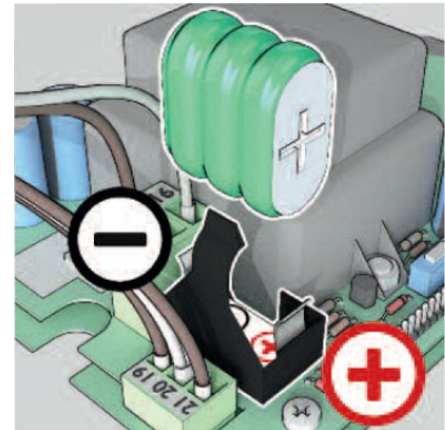
- ☒ If the battery fails or the polarity is reversed, an alarm warning will display on the controller LCD screen.
- ☒ Refer to “Appendix A: Battery Specifications” on page 32 for detailed battery specifications.
- ☒ It is normal for the battery charging sign to be present on the LCD screen for the first 24 hours after installation or replacement.

TUESDAY 01/01/2022

 Tm127°F Tr120°F
ADJUSTMENT
RUNNING

Battery Charging

C Carefully reinstall the electrical wiring base into the housing. Replace the front cover onto the display and tighten the screw to secure.



4 Unit Setup & Test



DO NOT power up until all connections have been correctly made.



If the battery is not activated, the battery alarm will be displayed on the LCD screen.

Turn on Power & Enable Thermal Shock Mode

A

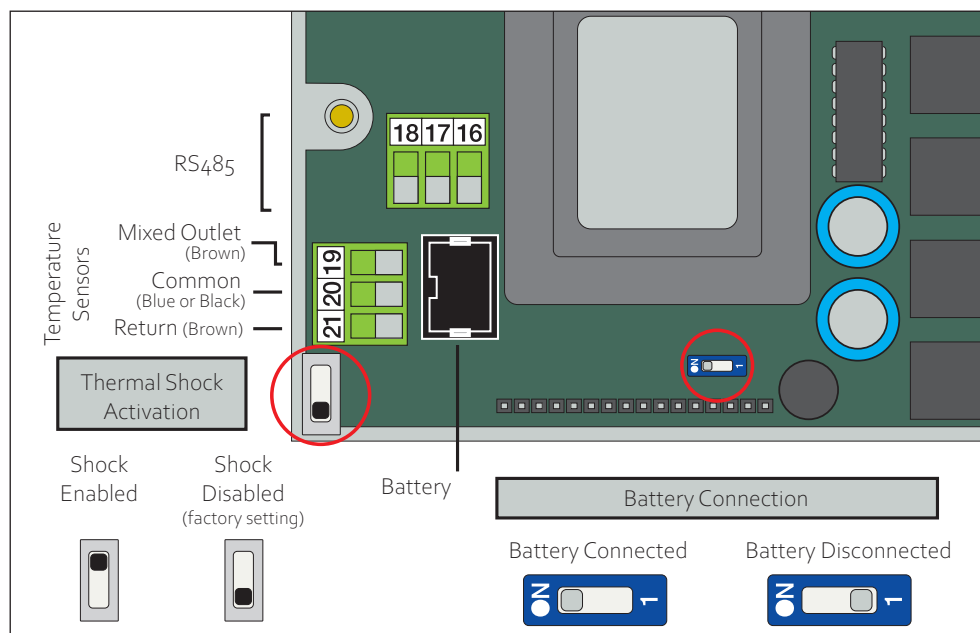
To connect the battery, slide the Battery Connected switch to On.

B

Plug the transformer into a 120 VAC power outlet and then turn the power on. Enable the Thermal Shock mode **only** if required as part of the building operation.



Do NOT connect 120 VAC power supply on the controller directly. The controller operates on 24 VAC power supply. Always connect the controller power supply to the provided 120 VAC/24VAC transformer.



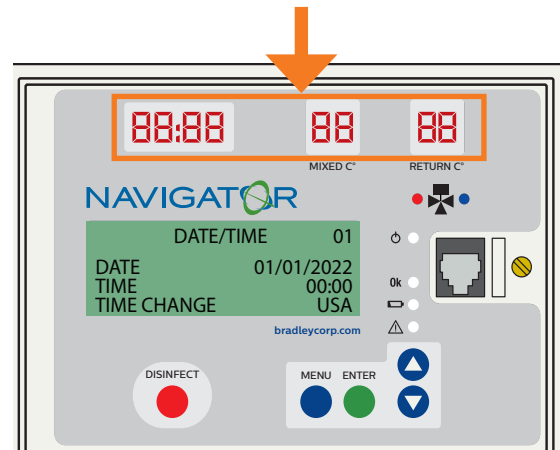
Initial Set Up of Date/Time & Mixing Temperature



For additional information, scan the QR code for a video on how to set the date, time, and mixing temperature.

A

Plug in the transformer. The controller will turn on and a count down will show on the LED lights for 10 seconds.



B

Set the Date and Time on the LCD screen using the Up, Down, and ENTER buttons. When finished, press the MENU button.



Refer to "Appendix B: Control Panel Configuration Buttons & Displays" on page 33 for detailed descriptions regarding controller panel buttons and displays.

DATE/TIME 01
DATE 01/01/2022
TIME 9:05
TIME CHANGE USA

C

The Controller will process the Anti-Clog function for approximately 8-12 minutes. The screen will say "Anti-clog RUNNING". No settings can be changed while the Anti-Clog function is running.

TUESDAY 01/01/2022
Tm073°F Tr073°F
ANTI-CLOG
RUNNING

D

When the Anti-Clog function is complete, the display will show "ADJUSTMENT RUNNING" if there are no alarms. This is the normal operating mode. Press the MENU button and use the Up, Down, and ENTER buttons to go to SETTING

SELECT LANGUAGE
DATE/TIME
SETTING
THERMAL SHOCK

E

Go to SET1 and then use the Up, Down, and ENTER buttons to set up the desired mixing valve outlet temperature. SET1 can NOT set above SET MAX.

ID bus 001 ← Modbus ID
SET MAX 149°
SET1 113° ← Outlet Adjustment Temp
SET2 140° ← Outlet Disinfection Temp

F

Press the MENU button twice. The LCD screen displays the current DMV status as shown below.

SET MAX 149°
SET1 104° ← Return Disinfection Temp
SET2 140°
SET3 135°



On the LCD screen, "Tm" is the measured mixing valve outlet temperature from the temperature sensor installed at the mixing valve outlet. It should read within the specification of SET1 once water flow is established properly.

"Tr" is the measured return water temperature from the temperature sensor installed at the return line.

If setting up a disinfection program is not required and the plumbing is properly connected and watertight, the system is ready to run.

TUESDAY 01/01/2022
Tm127°F Tr120°F
ADJUSTMENT
RUNNING

G Ensure both cold and hot water supplies are properly connected and that the inlet pressure and temperature are within specifications.

H Turn on the water supplies. The Tm reading should approach SET1 within 1 minute after the inlet pressure and temperature are stabilized.



Refer to “Appendix C: Controller Setting Parameters & Ranges” on page 34 for the complete controller setting parameters and ranges.

⚠ WARNING This valve is **NOT** factory preset. Upon installation, the temperature of this valve must be checked and adjusted to ensure delivery of a safe water temperature.

Outlet Temperature Adjustment & Unit Test

⚠ WARNING Outlet temperature in excess of 110°F (43°C) may cause scalding.



Check the temperature when the minimum flow rate is reached.



This device must be checked for final temperature and adjusted as necessary.



DO NOT SKIP THIS STEP!!!



Test the system weekly by checking the hot water temperature at end user fixtures.

5 Operation Modes

Depending on the times and programs that have been selected, the controller may be in one of the following operation modes.

- **Adjustment Mode:** DMV regulates outlet temperature SET1 for daily usage
- **Disinfection Mode:** DMV regulates outlet temperature SET2 and or SET3 for disinfection
- **Flushing Mode:** Purges out hot water in pipeline after disinfection
- **Thermal Shock Mode:** DMV adjusts the mixed outlet water temperature at the set shock value (SETSH) for a selected time duration (tSH). The Thermal Shock mode warning alarm (AL4) is activated. This mode has #1 priority over other modes.

The Navigator® Digital Mixing Valve (DMV) controller is equipped with a battery that keeps the clock working and maintains selected programmed settings during loss of power. To ensure the longest battery life in the event of a blackout, the controller is inactive on Low Power.

6 Adjustment Mode

The Adjustment mode is the default DMV operating status. The DMV measures mixing water temperature at the valve outlet and adjusts the mixing valve position to maintain the desired set temperature programmed as SET1.

TUESDAY 01/01/2022
Tm127°F Tr120°F
ADJUSTMENT
RUNNING

7 Disinfection Mode



For additional information, scan the QR code for a video on how program automatic thermal disinfection cycles.

Disinfection Safety & Application

⚠ WARNING Safety measures must be in place before engaging the Disinfection mode. Verify the anti-scald protection devices (certified to ASSE 1016 or ASSE 1070) at all downstream fixtures are installed. Failure to comply could cause harm to personnel and/or cause property damage.

The Disinfection mode can be interrupted while it is in process. Follow the steps below to interrupt the Disinfection mode.

A Press the ENTER button one time on the controller front panel.

B When the display prompts "Annul Disinfection?", press the ENTER button to stop. The Disinfection mode changes to the Adjustment mode on the display.



If the ENTER button is not pressed within 3 seconds, the Disinfection mode will continue and the display will read, "disinfection running."

Set the disinfection temperature and duration of the disinfection process according to the intended system use. It is recommended that one of the following settings be run every day or once per week.

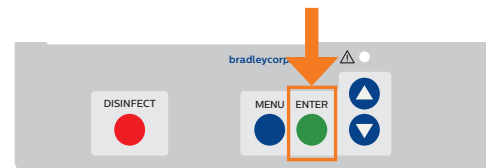
Temperature	Duration
160°F (70°C)	10 minutes
150°F (65°C)	15 minutes
140°F (60°C)	30 minutes

The DMV has four different disinfection programs available. Evaluate the factors below to determine which program is best suitable for your needs.

- Whether there a return sensor installed in the recirculation system
- Whether the valve outlet temperature or return line temperature should be specified for disinfection
- Whether an alarm warning should display on the LCD screen when disinfection is not successful
- Whether unsuccessful disinfection attempts should be recorded in the history log

Disinfection will run only when the Program Day (ProgDay) parameter has days selected (default is no days) and the Time ON and Time OFF parameters are filled in (default is 02:00 for Time On, 03:00 for Time Off).

TUESDAY 01/01/2022
Tm140°F Tr135°F
DISINFECTION
RUNNING



TUESDAY 01/01/2022
ANNUL
DISINFECTION?

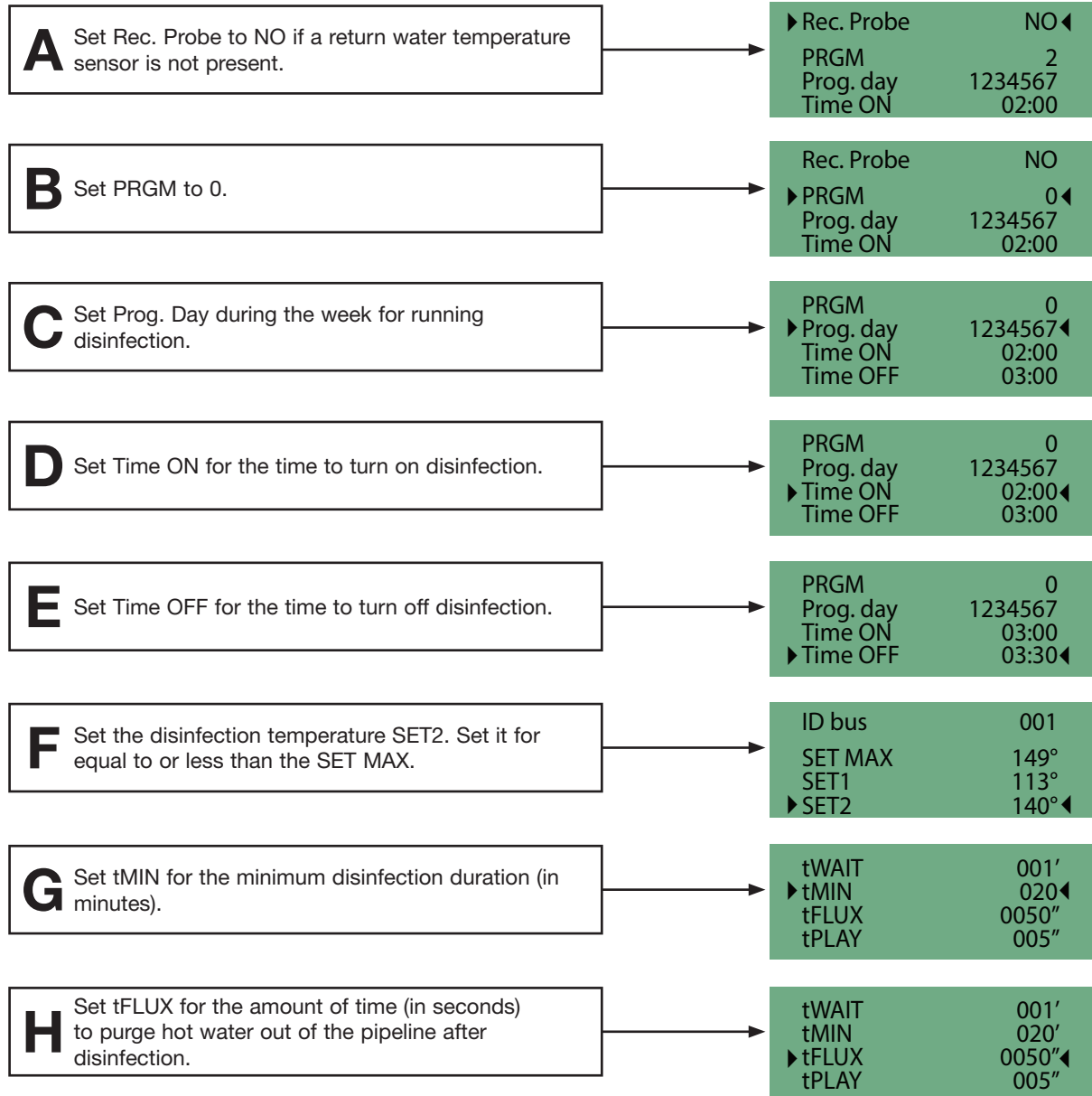
PRGM 0
► Prog. day 1234567◄
Time ON 02:00
Time OFF 03:00



The Controller by default from the factory is set to Program 2. This program is the most common setup used to control a building system. Other programs are available to customize an installation and are described in the following sections.

Program 0

Refer to “Appendix D: Disinfection Program Comparison” on page 36 for the disinfection program comparison table.



The outlet water temperature must remain above SET2 for a time tDIS at least equal to tMIN. When this occurs, disinfection has been successful and the disinfection process will stop.

If the disinfection process is unsuccessful, there will be no alarm signal. (To set an alarm signal, select another program.)

The return water temperature is not used. If the temperature displays on the LCD screen, it is used for monitoring purposes only.

Default SET_MAX is 149°F.
It can be adjusted from 122–194°F (50–90°C).

Program 1a

Refer to “Appendix D: Disinfection Program Comparison” on page 36 for the disinfection program comparison table.

A Set Rec. Probe to NO if a return water temperature sensor is not present.

► Rec. Probe	NO ◀
PRGM	2
Prog. day	1234567
Time ON	02:00

B Set PRGM to 1a.

Rec. Probe	NO
PRGM	► 1a ◀
Prog. day	1234567
Time ON	02:00

C Set SET2 for the desired disinfection water temperature. See page 18 for recommended temperatures.

ID bus	001
SET MAX	149°
SET1	113°
► SET2	140° ◀

D Set Time ON for the time to turn on disinfection.

PRGM	1a
Prog. day	1234567
► Time ON	02:00 ◀
Time OFF	03:00

E Set Time OFF for the time to turn off disinfection.

PRGM	1a
Prog. day	1234567
Time ON	03:00
► Time OFF	03:30 ◀

F Set tMIN for the minimum disinfection duration (in minutes) in which the outlet temperature is on or above SET2.

tWAIT	001'
► tMIN	020 ◀
tFLUX	0050"
tPLAY	005"



The outlet water temperature must remain above SET2 for a time tDIS at least equal to tMIN. When this occurs, disinfection has been successful and the disinfection process will stop.

If the disinfection temperature is not successful, the alarm for an unsuccessful disinfection alarm is generated. The alarm is recorded in a log. The unsuccessful disinfection alarm indications can be cleared after a button on the controller is pressed and a successful disinfection is conducted.

The return water temperature is not used. If the temperature displays on the LCD screen, it is used for monitoring purposes only.

Program 1b

Refer to “Appendix D: Disinfection Program Comparison” on page 36 for the disinfection program comparison table.

A Set Rec. Probe to YES if the return water temperature sensor is present.

► Rec. Probe	YES ◀
PRGM	2
Prog. day	1234567
Time ON	02:00

B Set PRGM to 1b.

Rec. Probe	YES
► PRGM	1b ◀
Prog. day	1234567
Time ON	02:00

C Set SET3 for the desired return water temperature.

SET MAX	149°
SET1	104°
SET2	140°
► SET3	135° ◀

D Set SET2 a few degrees higher than SET3 (not required for a successful disinfection process).

SET MAX	149°
SET1	104°
► SET2	140° ◀
SET3	135°

E Set Time ON for the time to turn on disinfection.

PRGM	1b
Prog. day	1234567
► Time ON	02:00 ◀
Time OFF	03:00

F Set Time OFF for the time to turn off disinfection.

PRGM	1b
Prog. day	1234567
Time ON	03:00
► Time OFF	03:30 ◀

G Set tMIN for the minimum disinfection duration (in minutes) in which the outlet temperature is on or above SET3. The interval between Time ON and Time OFF shall be equal to or greater than tMIN.

tWAIT	001'
► tMIN	020 ◀
tFLUX	0050"
tPLAY	005"

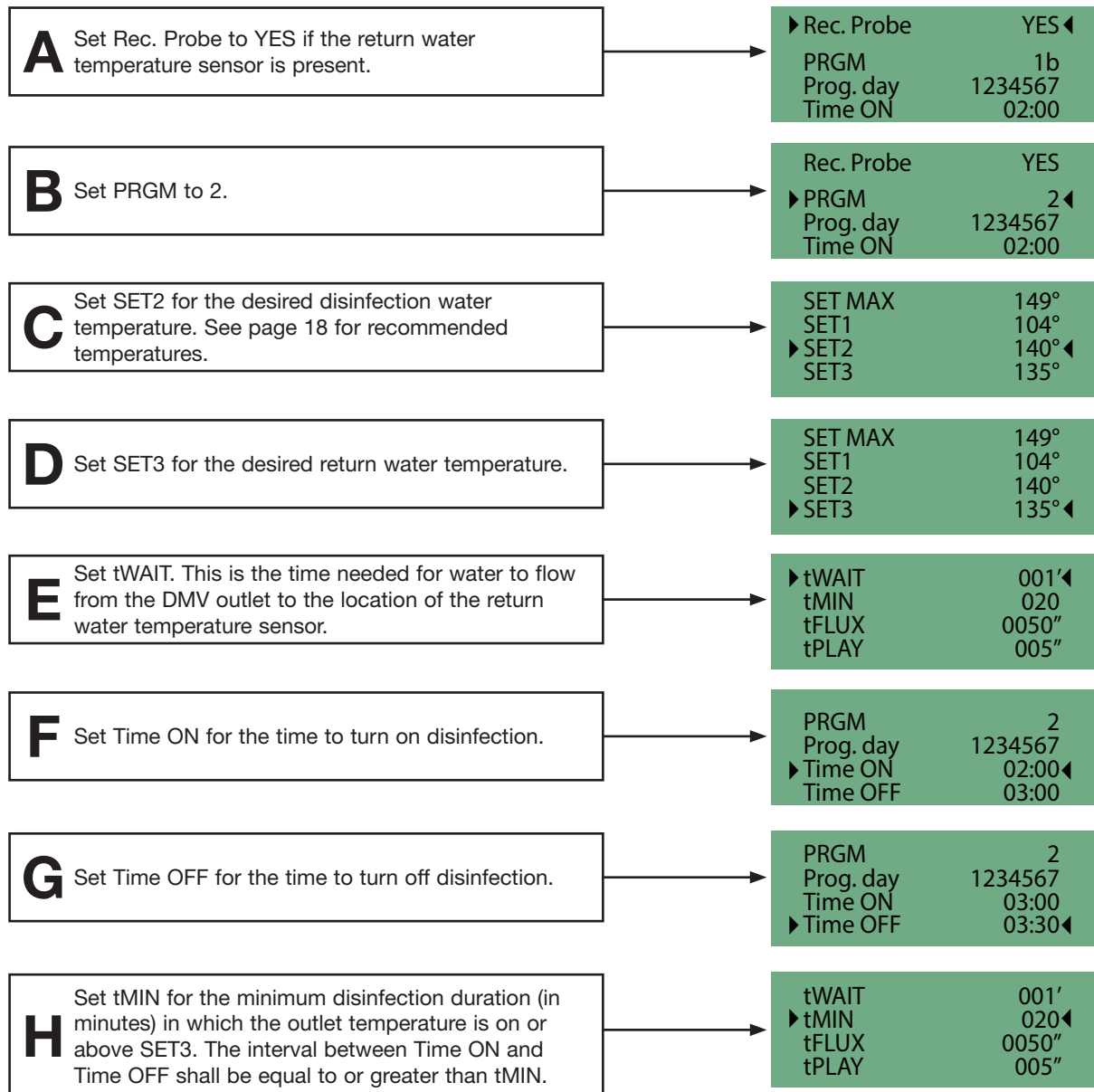


The outlet water temperature must remain above SET3 for a time tDIS at least equal to tMIN. When this occurs, disinfection has been successful. The disinfection process will stop when the set Time OFF is reached.

If the disinfection temperature is not successful, the alarm for an unsuccessful disinfection alarm is generated. The alarm is recorded in a log. The unsuccessful disinfection alarm can be cleared after a button on the controller is pressed and a successful disinfection is conducted.

Program 2 (Factory Settings - Default)

Refer to "Appendix D: Disinfection Program Comparison" on page 36 for the disinfection program comparison table.



The outlet water temperature must remain above SET3 for a time tDIS at least equal to tMIN. When this occurs, disinfection has been successful. The disinfection process will stop when the set Time OFF is reached.



Program 2 works like program 1b with one exception: if after beginning the disinfection process, the return water temperature does not reach SET3 after a wait period (tWAIT), the mixed outlet water temperature SET2 is increased by a value equal to SET3 minus Tr reached. Keep in mind that SET2 cannot at any time exceed the limit of SETMAX.

This correction in the disinfection SET is iterative. If necessary, it is repeated in the time span defined by the Time ON and Time OFF at each time interval equal to tWAIT.

If the disinfection temperature is not successful, the alarm for an unsuccessful disinfection alarm is generated. The alarm is recorded in a log. The unsuccessful disinfection alarm can be cleared after a button on the controller is pressed and a successful disinfection is conducted.

8 Flushing Mode

The DMV automatically enters the Flushing mode at the end of the disinfection process. During the Flushing mode, hot water is sent to drain and the water temperature returns to the adjustment value (SET1 value). The mode can also be used to periodically clear (or flush) the system of impurities following steps A and B below.

A Install a flushing valve in the system in the appropriate location to run hot water to drain, and verify that Relay 4 controls the valve.

B Set tFLUX to the desired flushing duration (in seconds).



Relay 1, Relay 4, and the controller return to the Adjustment mode after the flushing process is complete.

Time OFF	03:00
tWAIT	002'
tMIN	030'
▶ tFLUX	0060"◀

9 Thermal Shock Mode



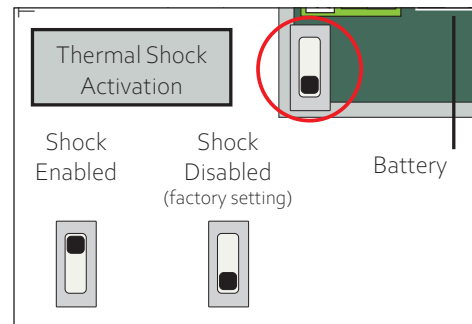
Thermal Shock mode is disabled by default. Enable the Thermal Shock mode **only** if required as part of the building operation



For additional information, scan the QR code for a video on how to run a manual thermal disinfection cycle.

The DMV can initiate thermal disinfection via the Manual mode. Follow the steps below to enable the Thermal Shock mode.

- A** Enable the Thermal Shock mode by sliding the Thermal Shock Activation switch on the circuit board.



- B** Set SETSH to the desired disinfection temperature. See page 18 for recommended temperatures.

- C** Set tSH to the desired disinfection duration.

- D** Set COUNT-DOWN to set a delay before beginning the disinfection process.

- E** Press and hold the DISINFECT button for 5 seconds to manually start the disinfection process.

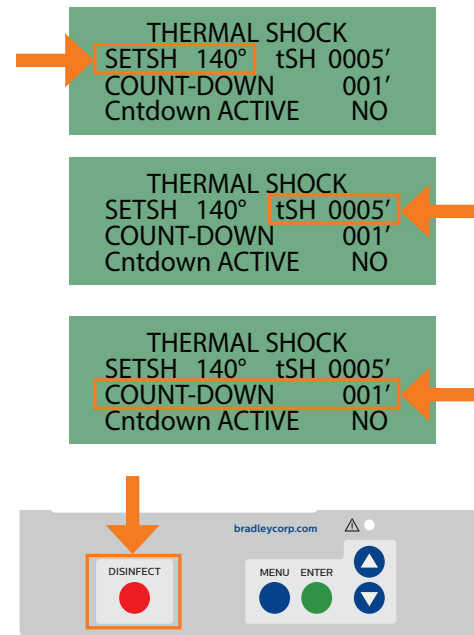


The Thermal Shock mode will activate Alarm 4 (AL4) and the alarm LED will illuminate.

The controller returns to the Adjustment mode after the Thermal Shock mode is complete.



If needed, the Thermal Shock mode can be stopped by pressing the DISINFECT button and then confirming with the ENTER button, or by using the remote control.




10

Anti-Clog Function

The controller is configured to automatically run the Anti-Clog function daily at 2:00 AM to ensure full ball operation. The Anti-Clog function occurs after the disinfection process concludes (if active), or when disinfection is not active.

The Anti-Clog function can be deactivated by following the steps below.




Deactivating the Anti-Clog function is not recommended due to the increased risk of deposits forming on the moving parts of the valve.

A

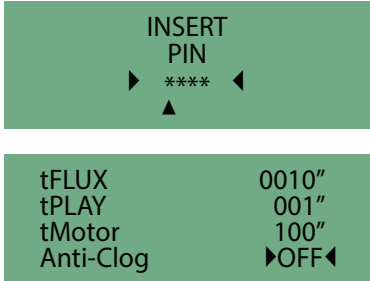
Enter the release code 5566 on the Anti-Clog setting.

B

Confirm the deactivation using ON-OFF.



After the Anti-Clog function is deactivated, the Disinfection mode can also be deactivated if desired.



11

Relay Functions & Wiring

The controller provides 4 relays to manage auxiliary equipment (provided by others) and report alarms during the Operating modes.

Relay Functions

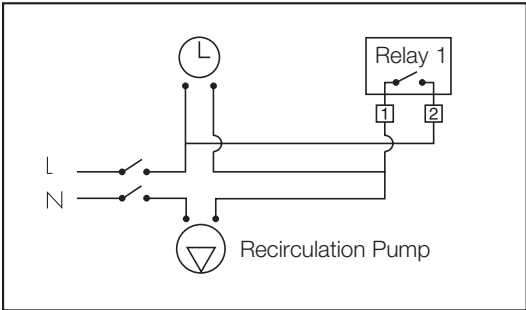
Relay No.	Function
1	Activates recirculation pump during disinfection mode. Connects in parallel to the time clock or Aquastat contacts (whichever controls the recirculation pump).
2	Activates alarm for sensor fault, battery fault, blackout, or clock failure.
3	Second thermostat for thermal disinfection, wired in parallel to High Temperature thermostat. Used to increase hot water supply temperature for thermal disinfection.
4	Flushes valve.

Relay Contact Status vs. Operating Status

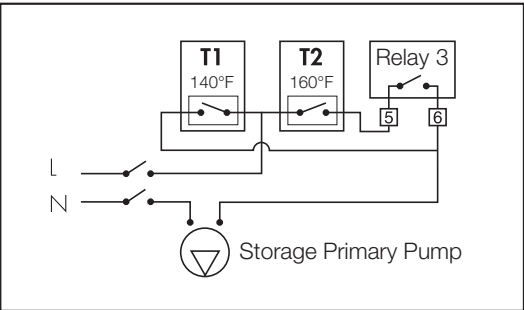
Operating Status	Adjustment	Disinfection	Flushing	Thermal Shock
Relay	Contact Status	Contact Status	Contact Status	Contact Status
Relay 1: Recirc Pump	Open	Closed	Closed	Closed
Relay 2: Alarm	Open	Open	Open	Closed
Relay 3: Second Thermostat	Open	Closed	Open	Closed
Relay 4: Flush Valve	Open	Open	Closed	Open

Relay Wiring Diagrams

Wiring diagram of Relay 1 with a clock for managing the recirculation pump times.



Wiring diagram of Relay 3 for connecting the second thermostat.

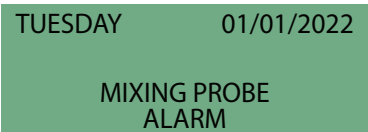
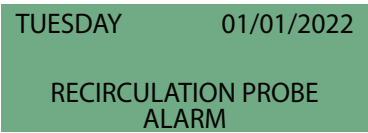
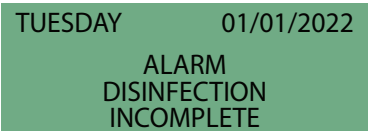
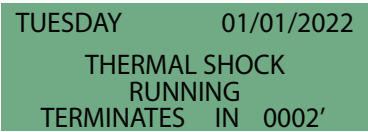

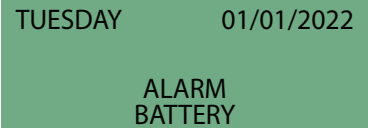



12 Alarm Management

An alarm warning will display when a fault occurs after installation and commissioning. The alarm warnings are presented in two ways.

If the alarm does not inhibit all functions, the alarm screen will alternate with controller status screen.

LCD Screen

Alarm Indicator	Description	
AL1	Mixed Outlet Water Temperature Sensor Fault	
AL2	Return Water Temperature Sensor Fault	
AL3	Disinfection Failed	
AL4	Thermal Shock In Progress	
AL5	Main Power Failure	Both LED & LCD screen are off; only the alarm connected to Relay 2 is on.
AL6	Controller Reset	Generic LED alarm is on; OK status LED is off. LCD screen time resets to 00:00. 
AL7	Battery Defaulted	 

Refer to “Appendix F: Alarms Types & LED/LCD Displays” on page 37 for more information on alarms and displays.

Alarm Signal from Relay 2

Relay 2 (provided by others) provides a connection to an external alarm that can be installed at any desired location. When the Thermal Shock function is in process, the alarm signal turns on to warn people that disinfection is in process.

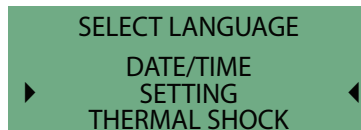
Refer to Section 11 for the details regarding Relay 2.

13 Lock Keypad (Access PIN Code)

The default setting for the keypad is Unlocked. To prevent menu navigation, an Access PIN Code can be set up to lock the keypad. To set up an Access PIN Code, follow the steps below.

Set Up Access PIN Code

A Use the Up, Down, and ENTER buttons to go to SETTING and then INSERT PIN.



B Set INSERT PIN by entering a 4 digit code. Be sure to keep code in a safe location.



Entering the 4 digit code will enable the Lock function. The keypad will now automatically lock after a timeout of 10 minutes from when the last button was pressed.

To unlock the keypad, enter the Access PIN Code.



When the keypad lock function is active, a padlock symbol appears on the LCD working screen (on the right).

If the lock function is active and a button is pressed while the working screen is displayed, the PIN code input screen appears: The code is entered by selecting the first digit using the Up and Down buttons, then confirming by pressing ENTER. The second digit is entered in the same way, etc.

When the last digit is confirmed, if the code is correct, the user can access the menus; if the code is incorrect, the PIN entry screen appears again. If the timeout elapses, the display shows the working screen again.

Lost or Misplaced Access PIN Code

If the Access PIN Code is lost or misplaced, the Lock function can be overridden (the Access PIN code is forced to 0000) by pressing a button on the back of the panel for 5 seconds or by sending a command through the RS485 interface.

14 History Log

- **Queuing Method:** FIFO (First In – First Out)
- **Data Storage Duration:** Rolling 40 days, after which the data for the first day is overwritten
- **Data Output:** The log can be viewed on the LCD screen or remotely via the RS485 serial interface

Daily Parameters Saved in the Log

Parameter	Description
Date	Day, month, year
Program	Which disinfection program was run
tDIS	Actual disinfection time (in steps of minutes) <ol style="list-style-type: none"> 1. When the Disinfection mode is set to Program 0 or 1a, then this is the time when the temperature of the mixed out water was above SET2 2. When the Disinfection mode is set to Program 1b or 2, this is the time when the temperature of the return water was above SET3 <p>Note: This parameter is helpful to understand how much greater the span of Time OFF : Time ON should be to complete the disinfection when the parameter is less than tMIN.</p>
TRMAX	Maximum temperature of the return water sensor during the disinfection process (if disinfection was completed that day)
TRMIN	Minimum temperature of the return water sensor during the disinfection process (if disinfection was completed that day). This is calculated from the time the return water sensor measured a value greater than SET3 once the disinfection process began.
ALARMS	Displays ALARMS 1–7 if they were activated
Mixed Outlet Water Temperature	24-hour average value
Return Water Temperature	24-hour average value



If the disinfection process was not completed on a day, any related fields will contain a dash.



If a fault occurs in one or both sensors, the hourly average data will be represented on the display by dashes.



If there are any gaps or unavailable data due to a change of date, time, etc., the related cells will contain dashes.

15 Remote Control

The controller can be controlled from a remote computer with the RS485 serial output connection, which can be accessed by hard-wired terminals and through the connector on the front panel.

Since the interface is the multipoint bus type, it is necessary for each controller connected on the bus to be identified by an appropriate address to avoid identification conflicts. For a detailed description of the operations and controls that are available from a remote location using this interface, refer to the gateway manufacturer's documentation.

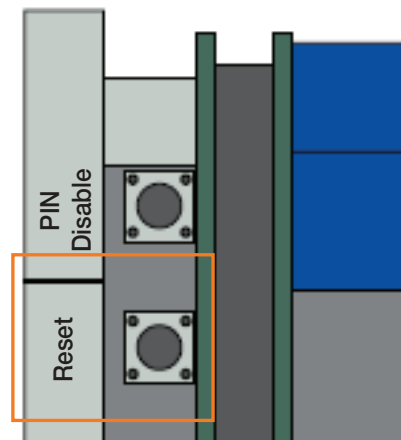
Refer to the Bradley website for a list of registers (points) for mapping the DMV information to Modbus. Configuration, mapping, hardware (routers, modem, etc.), and software are customer/user responsibility.

16 Reset Button

There is a Reset button located on the back panel of the controller. If needed, this button can be used to restore the initial settings.

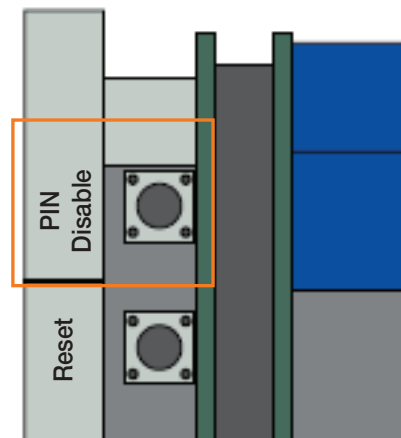


After pressing the Reset button, be sure to reset the date and time. If the time and date are not reset, the controller will operate using the factory default settings.



17 PIN Disable Button

There is a PIN Disable button located on the back panel of the controller. If needed, this button can be used to disable the PIN code.



Troubleshooting



Before troubleshooting the valve or disassembling the components, check for the following conditions.

- Be sure to properly connect the hot and cold inlet pipes. Verify there are no cross-connections or leaking valves.
- Verify the hot water inlet temperature is at least 120°F.
- Be sure to close the appropriate shut-off valves prior to disassembling the valve. Reopen the valves after inspection and any repairs are complete.

Problem	Cause	Solution
Battery Alarm Displays in LCD	Battery is installed in wrong polarity.	Install battery with correct polarity.
Mixing Probe Fault Alarm	Probe wire connection is open or is connected in the wrong terminals.	Securely connect probe wires in the correct terminals.
Disinfection Incomplete	Outlet temperature is lower than SET2.	Increase outlet temperature above SET2.
Return Probe Fault Alarm	Probe wire connection is open or is connected in the wrong terminals.	Securely connect probe wires in the correct terminals.
Outlet Temperature is Unstable	Flow rate is lower than the minimum flow.	Increase flow rate.

Maintenance

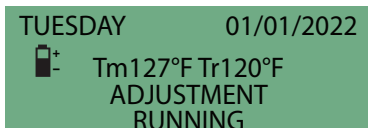
During service, regularly monitor the performance of the Navigator Digital Mixing Valve since any loss of performance may indicate maintenance is needed for the valve or the system. If the temperature of the mixed water is found to have changed significantly compared to previous recordings, refer to installation and setup sections.

The following check points are recommended periodically, at least every 12 months or more frequently, to ensure that the valve continues to deliver optimum levels of performance:

1. Check and clean any filters installed in the system.
2. Check that any check valve installed at the inlet of the Navigator Digital Mixing Valve is functioning correctly and there are no leaks caused by debris.
3. Check if the anti-clog function is disabled by accident (refer to Section 10 on page 25).
4. The internal components of the valve can be descaled by immersing in a suitable descaling fluid.
5. Follow setup procedure again after maintainable components have been checked.

Appendix A: Battery Specifications

The controller has a rechargeable battery (three 140 mAh cells) that is used to keep the internal clock running and maintain the selected settings even during a power failure. While in operation, the battery level of charge is checked periodically (about every 24 hours) and the recharge function is activated if needed. When the battery recharge function is active, the Battery icon appears in the working window (in the Adjustment mode).



Battery Charging

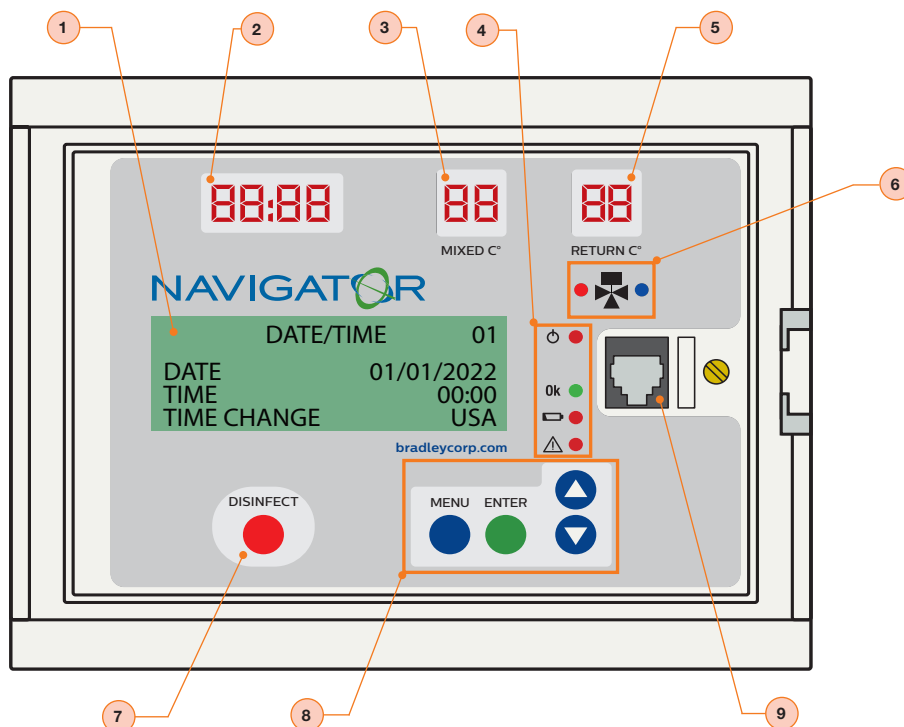


Battery Fault

If the parameter readings are not within the specified range, the battery must be replaced. If a battery fault is detected, the corresponding alarm appears. See the “Alarm Management” on page 27. In principle, a battery fault should not affect any of the controller functions, unless there is also a power supply failure.



Appendix B: Control Panel Configuration Buttons & Displays



Item No.	Description
1.	LCD Screen
2.	LED Time Display
3.	LED Tmixed Display – Mixed Outlet Water Temperature (°C only)
4.	LED Indicators: On, Status OK, Battery & Alarm
5.	LED Treturn Display – Return Water (Recirculation) Temperature (°C only)
6.	LED Mixing Valve Open/Close Display
7.	Disinfect Button
8.	Navigation Buttons: Menu, Enter, Up & Down
9.	RS 485 Front Connection

Button/Display	Description	Button/Display	Description
	Hour and minutes display (24-hour system)		Electric Power Supply LED: Red indicates power is ON
	Sensor Temperature Display (°C) Resolution 1°C		Mixing Valve LED: Red indicates when increasing hot water Blue indicates when increasing cold water
	Sensor Warning Display – "Out of Range" at top (blinking)		Controller OK Status LED: Green indicates there are no faults or active alarms
	Sensor Warning Display – "Out of Range" at bottom (blinking)		Fault Battery LED: Red indicates there is a battery fault. Default status LED is off.
	Sensor Warning Display – "Open" (blinking)		Alarm LED: Red indicates when there is an alarm (sensor fault, thermal shock in progress, reset)
	Sensor Warning Display – "Short Circuit" (blinking)		

Appendix C: Controller Setting Parameters & Ranges

Parameter	Description	Setting Range	Factory (Default) Configuration
Language	Language shown on LCD display	I-E-F-D-ES-P-NL-SL-HR-SR-RO	ENGLISH
Date/Time	For Disinfection phase and log entries	DD/MM/YY	1/1/2005
Time change	Daylight saving time setting	USA CUS NO EUR	USA
Navigator “BUS iID”	Number that identifies this appliance (device) among those connected to the BUS.	0–255	001
SET_MAX	Sets the max temperature limit: to protect the system. None of the SET values can exceed SET MAX.	122–194°F 50–90°C	149°F
SET1	Setpoint for Ta (mixed outlet temperature) during adjustment phase.	68–185°F 20–85°C	113°F
SET2	Setpoint for Ta (mixed outlet temperature) during disinfection phase.	104–185°F 40–85°C	140°F
SET3	Setpoint for Ta (return temperature) during disinfection phase, for programs 1B or 2.	104–185°F 40–85°C	135°F
Return sensor present (Rec probe)	The return sensor is analog (NTC).	NO = absent YES = present	YES
PGM program	To modify the working parameters for the disinfection phase.	PRGM 0 = 0 PRGM 1A = 1A PRGM 1B = 1B PRGM 2 = 2	2
ProgDay	Disinfection is conducted on the selected days. Day 1 is Monday.	1 2 3 4 5 6 7 or BLANK for each digit to disable disinfection	No days selected
TIME ON	Start time for the programmed disinfection.	HHMM 0000–2359	0200
TIME OFF	End time for the programmed disinfection.	HHMM 0000–2359	0300
tWAIT	Represents the time considered necessary for the system to bring the return water to a temperature above SET3	1–255 min	002 min
tMIN	The minimum time for the temperature measured by the mixed outlet water temperature sensor (program 1A) or the return water temperature sensor (programs 1B or 2) must remain above the disinfection setpoint so that disinfection will be completed successfully.	0–254 min (max 4 hour 14 min)	030 min
tFLUX	Duration of the flushing phase that will start automatically when a disinfection phase is completed.	From 0–2550 sec in 10 sec steps	000 sec

Parameter	Description	Setting Range	Factory (Default) Configuration
tPLAY	Delay due to gap in mechanical components during actuator movement, until the internal valve ball starts to move in the opposite direction.	From 0 to 2550 sec in 10 sec steps	005 sec (Factory default should not be changed)
tMOTOR	Time required for the actuator to move the valve from the full cold to the full hot position. Default setting is recommended for all applications; do not change. (This is NOT motor stroke time)	From 8 to 320 sec in 2 sec steps	100 sec
ANTI-CLOG	Ball rotation cycle to clean deposit formation for efficient operation. To deactivate enter release code 5566 and confirm with ON-OFF.	ON OFF	ON
Cels.-Fahr.	Temperature units.	°F °C	°F
Thermal Shock Mode			
SETSH	Setpoint for Ta (mixed outlet water temperature) during shock phase.	86–185°F 30–85°C	140°F
tSH	Duration of thermal shock phase to be started manually by the user	1–4320 min	005 min
Countdown	Countdown before activating thermal shock	0–999 min	0001 min
Activate countdown	Enables activation of countdown before thermal shock	NO = not active YES = active	NONE

Appendix D: Disinfection Program Comparison

Program #	0	1a	1b	1b	2
Type of Confirmation	Adjustment and simple disinfection without confirming	Adjustment and disinfection confirming on the mixed outlet water temperature	Adjustment and disinfection check on return temperature to the central heating system	Continuous disinfection (max. 4 hours)	Adjustment only (default). If scheduled, disinfection confirming.
Use of Return Sensor	NO	NO	YES	YES	YES
Return Sensor Shown on LED Display	As monitor only	As monitor only	YES	YES	YES
Adjustment Temperature	Flow*: (SET1) 68–185°F	Flow*: (SET1) 68–185°F	Flow*: (SET1) 68–185°F	--	Flow*: (SET1) 68–185°F
Disinfection Temperature	Flow*: (SET2) 104–185°F	Flow*: (SET2) 104–185°F	Recirculation: (SET3) 104–185°F	Recirculation: (SET3) 104–185°F 24-hours	Recirculation: (SET3) 104–185°F with adjustment flow" up to the max value
Alarm if Disinfection Unsuccessful	NONE	YES	YES	YES	YES
Recording in Log if Disinfection Unsuccessful	NONE	YES	YES	YES	YES

Appendix E: Thermal Shock Mode Parameters

Parameter	Description	Setting Range	Factory (Default) Configuration
SETSH	Setpoint for Ta (mixed outlet water temperature) during Thermal Shock mode	86–185°F (30–85°C)	140°F
tSH	Duration of the Thermal Shock mode when started manually	1–4320 minutes	005 minutes
Countdown	Countdown before activating Thermal Shock mode	0–999 minutes	0001 minute
Activate Countdown	Enables countdown activation before Thermal Shock mode	NO = Not Active YES = Active	NONE

Appendix F: Alarms Types & LED/LCD Displays

Type of Alarm	Program	Indication by Alarm LED	Indication by LED Display	Display on LCD	Recording in Log
AL1: Flow Probe Fault	0, 1A, 1B & 2	Alarm LED illuminates and Status OK LED goes Off	Alarm shown on LED display (HI, LO, SH or OP depending on fault)	"Flow Probe Fault" alarm displays on LCD screen	YES (AL1): Stored in the day log
Return Probe Fault	0 & 1A	The alarm LED remains Off and the Status OK LED remains On	Remains Off if program 0 and HI, LO, SH or OP is displayed (depending on case) if program is 1A	NONE	Fault is recorded in the day log
AL2: Return Probe Fault	1B & 2	Alarm LED illuminates and Status OK LED goes Off	Alarm shown on LED display (HI, LO, SH or OP depending on fault)	"Return Probe Fault" alarm on LCD screen (screen alternates with working screen)	YES (AL2): Stored in the day log
Disinfection not completed	0	The alarm LED remains Off and the Status OK LED remains On	NONE	NONE	NONE
AL3: Disinfection Not Completed	1A, 1B & 2	Alarm LED illuminates and Status OK LED goes Off	NONE	"Disinfection Incomplete" alarm on LDC screen (screen alternates with the working screen)	YES (AL3): Stored in the day log
AL4: Thermal Shock in Process	0, 1A, 1B & 2	Alarm LED illuminates and Status OK LED remains ON as long as there are no other faults	NONE	"Thermal Shock in Progress" alarm on the LCD screen	YES (AL4): Stored in the day log
AL5: Blackout (main power failure)	0, 1A, 1B & 2	Alarm flashes and the indicator LEDs remain Off	Temperature indicators and clock remain Off as temperatures are not acquired	LCD screen remains Off	Recording of log data is suspended. YES (AL5): When power is restored, it is stored in the log
AL6: Appliance Reset	1, 1A, 1B & 2	Alarm LED illuminates and the Status OK LED goes Off	Time display 00 : 00 blinking Time on the LCD screen	Entering screen displayed Date and just set Displaying of 01/01/2005 in the LCD screen Data field	YES (AL6): Stored in the day log
AL7: Battery Damaged	0, 1A, 1B & 2	BTR FAIL LED illuminates and the Status OK LED goes Off (alarm LED does not illuminate)	NONE	"Battery Damaged" appears on LCD screen (alternating with the working screen)	YES (AL7): Stored in the day log