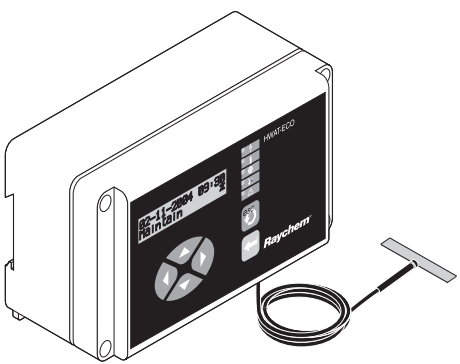
nVent

RAYCHEM

HWAT-ECO

INSTALLATION AND OPERATION MANUAL FOR HOT WATER TEMPERATURE MAINTENANCE SYSTEM ELECTRONIC CONTROLLER



Important Safeguards and Warnings

⚠ WARNING: FIRE AND SHOCK HAZARD

nVent RAYCHEM HWAT Systems must be installed correctly to ensure proper operation and to prevent shock and fire. Read these important warnings and carefully follow all the installation instructions.

- **To minimize the danger of fire from sustained electrical arcing if the heating cable is damaged or improperly installed, and to comply with nVent Thermal Management requirements, agency certifications, and national electrical codes, ground-fault equipment protection must be used on each heating cable branch circuit. Arcing may not be stopped by conventional circuit breakers.**
- **Approvals and performance are based on the use of nVent Thermal Management parts only. Do not substitute parts or use vinyl electrical tape.**
- **Bus wires will short if they contact each other. Keep bus wires separated.**
- **Connection kits and heating cable ends must be kept dry before and during installation.**
- **The black heating cable core is conductive and can short. They must be properly insulated and kept dry.**
- **Damaged bus wires can overheat or short. Do not break bus wire strands when preparing the cable for connection.**
- **Damaged heating cable can cause electrical arcing or fire. Do not use metal attachments such as pipe straps or tie wire. Use only nVent Thermal Management approved tapes and cable ties to secure the cable to the pipe.**
- **Do not attempt to repair or energize damaged cable. Remove damaged cable at once and replace with a new length using the nVent RAYCHEM RayClic-S splice kit. Replace damaged connection kits.**
- **Use only fire-resistant insulation which is compatible with the application and the maximum exposure temperature of the system to be traced.**

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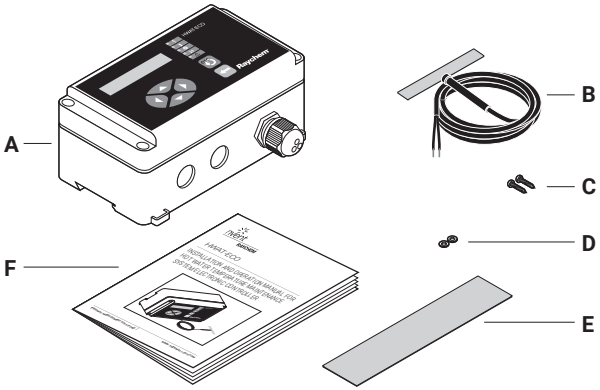
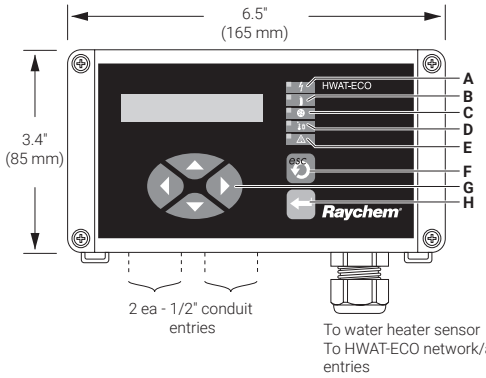


Item	Qty	Description
A	1	HWAT-ECO controller
B	1	Temperature sensor with 13 ft (4 m) cable
C	2	Mounting screws
D	2	Mounting washers
E	1	Aluminum tape
F	1	Manual

Figure 1: Kit contents



A		Power supply (green LED)
B		Power to heating cable (green LED)
C		Heat-up cycle (green LED) - increased risk of scalding
D		Pipe Temperature alarm (requires installed sensor) (green LED)
E		Alarm (red LED)
F	esc	Escape, backspace; NO; or display maintain temperature setpoint
G		Arrow keys: to change menu selection or position the cursor
H		Confirm selection, new value or YES

Figure 2: HWAT-ECO controller

1 General Information

1.1 Use of the Manual

This manual covers the installation and operation of the nVent RAYCHEM HWAT-ECO controller and must be used with the following additional documents:

- HWAT System Product and Selection Design Guide (H57538)
- HWAT System Installation and Operation Manual (H57548)

 **Important: For the nVent warranty and agency approvals to apply, the instructions included in this manual and product packages must be followed.**

1.2 Features

The HWAT-ECO controller is designed for operation with nVent RAYCHEM HWAT-Y2 and HWAT-R2 self-regulating heating cables. The HWAT-ECO controller provides the following features:

- Flexible temperature control of hot water temperature maintenance systems.
- Integrated function that lowers the maintain temperature during low use hours to save energy.
- Heat-Up cycle function that increases the water temperature in a stagnant pipe.

1 General Information

- Building Management System (BMS) interface that receives a DC voltage to set the maintain temperature.
- Alarm relay to signal power, temperature, or communication problems.
- Pipe temperature monitoring, low temperature alarm and high temperature cut-out.
- Master/slave function that allows one HWAT-ECO to control up to eight additional HWAT-ECO controllers.
- 9 pre-defined programs that can be customized by the user.

1 General Information

1.3 Technical Data

Use	Only for HWAT-Y2 and HWAT-R2 heating cables
Maintain temperature setpoint	105˚F (40˚C) to 140˚F (60˚C)
Hot water piping ambient temperature	60˚F (15˚C) to 80˚F (25˚C)
Controller ambient temperature	40˚F (5˚C) to 105˚F (40˚C) ambient
Switching capacity	24 A 208/240 Vac max.
Operating voltage	208/240 (±10%), 60 Hz
Internal power consumption	2.5 W
Circuit protection (not provided with HWAT-ECO controller)	Max. 30 A with 30 mA ground-fault protection
Power terminal block	16–10 AWG (1.5–4 mm^2) Use copper conductors only
Internal temperature alarm	150˚F (65˚C)
BMS control voltage	0–10 Vdc
BMS cable maximum length	328 ft (100 m)

1 General Information

Alarm contacts	Max. 24 Vdc or 24 Vac, 1A, SPST, voltage free, NO/NC
Alarm events	• Loss of power • Controller reinitialized • Internal controller temperature too high • Lost date and time settings • Internal failure • Pipe temperature too high (optional) • Pipe heater temperature too low (optional) • Network error
Power correction factor	To increase or decrease your actual pipe maintain temperature or adjust for plastic pipe.
Pipe temperature sensor	Thermistor with 13 ft (4 m) lead provided. A PT100 RTD may be optionally used. Max length is 328 ft (100 m)

1 General Information

Electromagnetic	Complies to EN 5014-1 Compatibility (EMC) for emission and 60730-1 for immunity
Real time clock	Leap year correction
Clock accuracy	±10 minutes per year
Enclosure rating	NEMA 12 (IP54) – indoor use only
Enclosure material	ABS
Mounting	Wall mount with two screws or optional DIN rail
Conduit entries	2 ea – 1/2 in conduit entries
Cable gland	3-hole grommet Maximum cable size: • 2-wire: 20 AWG (0.5 mm^2) • 4-wire: 24 AWG (0.2 mm^2)
Default programs	9 pre-defined programs that can be customized by user
Program settings	48 1/2-hour time blocks of the following program settings: Off, Economy, Maintain and Heat-Up cycle

1 General Information

Password	4-digit password protection
Master/slave	Master is selectable in the controller, up to 8 slaves can be connected
Master/slave cable	2-wire, min. 24 AWG (0.2 mm^2) twisted pair and insulation of 300 V, Max length cable is 100 m
Parameters in memory	All parameters are stored in nonvolatile memory, except time and date
Clock backup time	Rechargable Lithium battery. Battery will retain time and date for up to 30 days when power is lost
Approvals	c UL us LISTED 91EJ Type 12 **Energy Management Equipment** (for use with HWAT-R2 and HWAT-Y2 heating cables only.)
Weight	2 lbs (1 kg)
Size	6.5 in x 3.4 in x 2.8 in (165 mm x 85 mm x 71 mm)

1 General Information

1.4 Care and Maintenance

To clean the HWAT-ECO use a damp cloth. Do not use solvents. Do not pour water directly on the device. Do not use a water hose or high pressure cleaner.

Important: In case of questions or product failure, please contact your nVent representative, or call nVent at 800-545-6258.

1.5 HWAT Heating Cables

Maintain temperature

Depending on the ambient temperature and voltage, HWAT-Y2 is designed to maintain temperatures up to 125˚F (52˚C), and HWAT-R2 is designed to maintain temperatures up to 140˚F (60˚C).

Installing the heating cables

Install the HWAT heating cable system as instructed in the HWAT System Installation and Operation Manual (H57548). The controller must be installed by a professional electrical installer familiar with electrical safety codes and practices.

1 General Information

Ground-fault protection

⚠ WARNING: To minimize the danger of fire from sustained electrical arcing if the heating cable is damaged or improperly installed, and to comply with the requirements of approvals agencies, nVent and national electrical codes, ground-fault equipment protection must be used on each heating cable branch circuit. Arcing may not be stopped by conventional circuit protection. The HWAT-ECO does not include ground-fault protection.

Pre-Installation testing

Prior to installing the HWAT-ECO controller, perform the insulation resistance (Megger) test and circuit length verification (Capacitance) test on the heating cable as detailed in the HWAT System Installation and Operation Manual (H57548).

2 Installation

2.1 Installing the Controller

Install the controller in an indoor, dry, clean, accessible location. If using the optional pipe temperature sensor, make sure you install the controller within 328 ft (100 m) of where you want to monitor the pipe temperature.

Opening the controller

⚠ WARNING: To prevent shock, always switch off the power supply (circuit breaker) before opening the controller.

The HWAT-ECO has a removable front cover. Both the cover and the box have electronic parts and are connected to each other by a 14-pin connector. First unscrew the four screws in the cover. Carefully pull the cover straight out, not sideways!

2 Installation

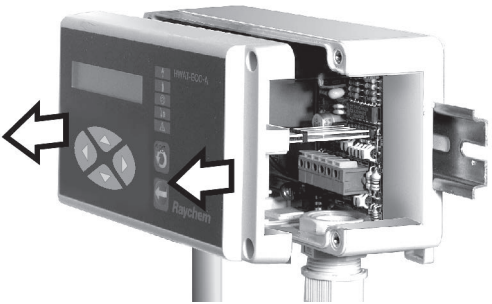


Figure 3: Opening the controller

Wall mounting the controller

Mount the controller using either of the options below:

1. You can mount the controller to the wall using the two supplied screws and sealing rings in the two holes located inside the bottom part of the controller.

2 Installation

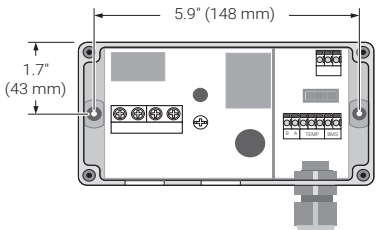


Figure 4: Hole locations for mounting with screws

2 Installation

2. Optionally you can mount the controller using DIN 35 Rail mounting.

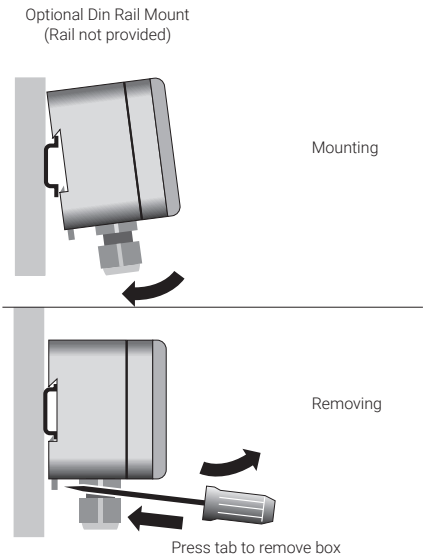


Figure 5: Mounting with DIN 35 Rail

2 Installation

2.2 Wiring the Controller

The diagram below shows the arrangement of the terminal blocks for power, alarm, pipe temperature sensor, BMS and network.

HWAT-ECO
General Arrangement

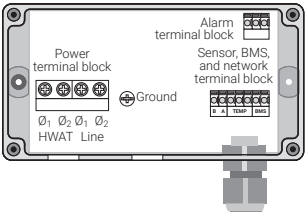


Figure 6: General arrangement for terminal blocks

2 Installation

The diagram below shows the connection of a single controller (without optional water heater sensor, BMS, network and alarm connections).

Important: Tighten the terminal screws to 6 inch-lbs. (0.68 N-m)

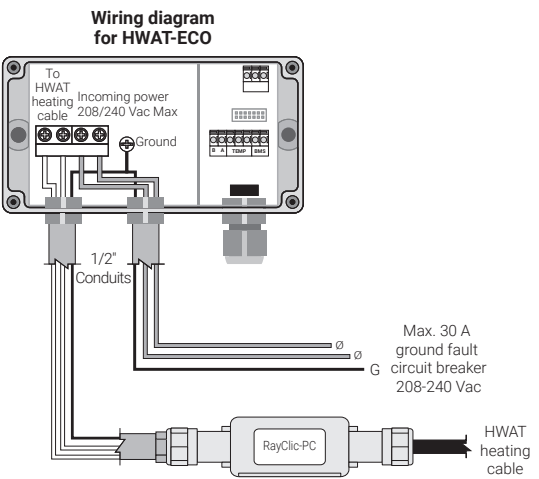


Figure 7: Connecting a single controller (w/o sensor, BMS, network and alarm connections)

2 Installation

For controlling multiple HWAT circuits with the same programming parameters (i.e. voltage, maintain temperature, ambient temperature, economy temperature), connect the heating cable output relay to an external contactor coil(s).

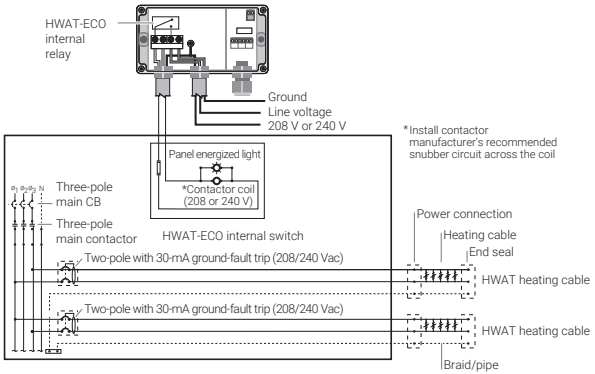


Figure 8: Multiple HWAT circuits connection

Pipe temperature sensor (optional usage)

Installation of the pipe temperature sensor is optional. If installed, the HWAT-ECO provides low temperature alarm and high temperature cut-out.

The temperature sensor should be connected to a single or master controller only. Connect both wires

of the temperature sensor to the TEMP terminal in the controller (PL4). The sensor wires do not have a special polarity. To connect a wire, use a screwdriver to push down the orange tab on the side of the terminal. Put the wire into the hole and release the orange tab.

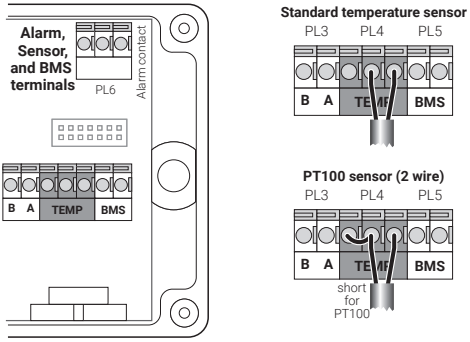


Figure 9: TEMP terminal location and sensor wiring

Optionally, PT100 RTDs from the water heater can be used. To install a PT100 sensor first connect a jumper between the terminals indicated in Figure 9, then connect the two wires from the RTD. If you are using a three wire sensor, remove the compensation lead and only connect the two measurement wires.

2 Installation

The pipe temperature sensor must be placed on 1-inch diameter pipes or larger, installed opposite from the HWAT heating cable to accurately measure the pipe temperature.

The temperature sensor cable is 13 ft 3 in (4 m) in length, however the user can extend the cable up to 328 ft (100 m) by splicing a length of 300 volt, 18 AWG (0.75 mm^2) cable.

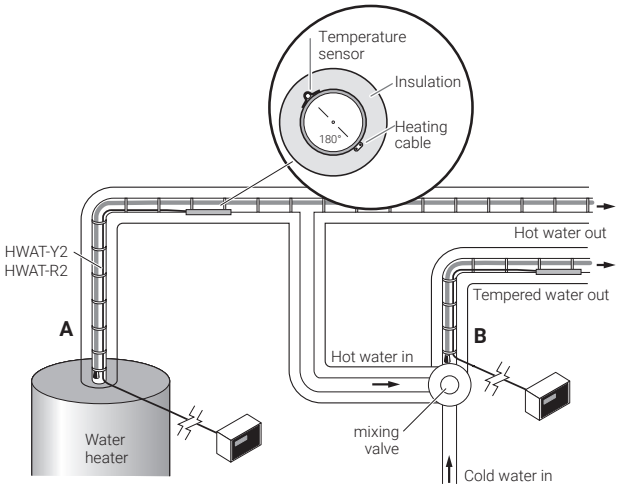


Figure 10: Positioning temperature sensor (optional)

2 Installation

Alarm wiring (optional)

The alarm contact (24 Vac, 24 Vdc, 1A) inside the controller can be used to switch an external device. The contact is closed during operation and open during an alarm or during loss of power. In a network, all alarm contacts should be connected in series.

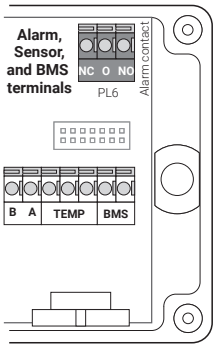


Figure 11: Connecting the alarm contact

The alarm terminal (PL6) is located in the upper right corner of the controller and has the text “alarm contact” next to it. To connect a wire, use a screwdriver to push down the orange tab on the side of the terminal. Put the wire into the hole and release the orange tab. The wires used for the alarm contact should be rated for 300 V. See “Chapter 4, Error/

2 Installation

Alarms and Troubleshooting" for more information about alarm conditions.

The alarm contact is designed as a fail safe mode and can be wired for normally open (NO) or normally closed (NC) operation. The following table summarizes the relay positions in the different controller states:

Position	NC	NO
Power Off	Open	Closed
Power On	Closed	Open
Alarm Mode	Open	Closed

Network

The Master/slave function allows one HWAT-ECO to control up to eight additional HWAT-ECO controllers. Connect all HWAT-ECO controllers to each other in parallel using the A and B inputs on terminal (PL3). This means that several controllers will have two wires in one hole. The wire should be a twisted pair and be rated for 300 V. The total maximum length of this cable between all controllers is 328 ft (100 m). Be careful not to mix A and B connections. To connect a wire, use a screwdriver to push down the orange tab on the side of the terminal. Put the wire into the hole and release the orange tab.

2 Installation

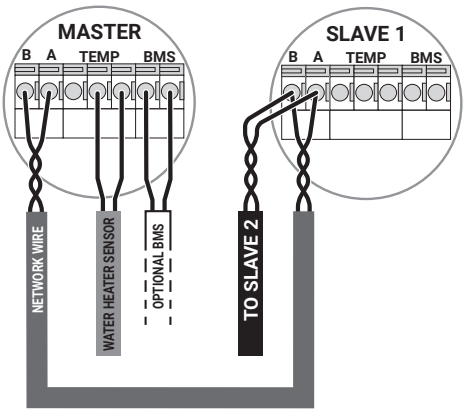


Figure 12: Networking controllers together

The diagram below shows the connection of multiple controllers (with optional RS-485 connections).

2 Installation

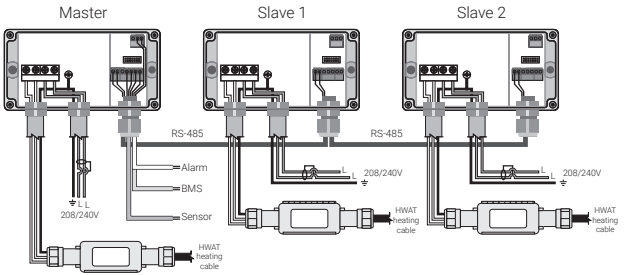


Figure 13: Connecting multiple controllers (with RS-485)

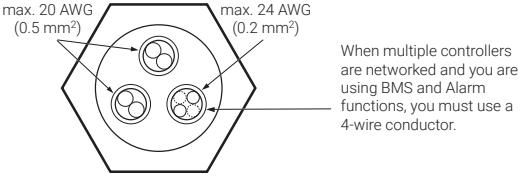


Figure 14: Combine alarm and BMS wire in 4-wire cable

Important: For master/slave combination with alarm function, the alarms are connected in series by a RS485 wire. Since the cable gland grommet has only 3 holes, you must combine the alarm wire and the BMS wire in a 4-wire cable.

2 Installation

Building Management System (BMS) (optional)

See Table 5 on page 39.

The BMS input of the HWAT-ECO is a 0 to 10-Vdc input. If the controller is programmed to have a BMS connection, the BMS controls the temperature setpoint. Using 300-V rated cable, connect the BMS signal wire to terminal (PL5). Connect the ground wire to the "–" and the 0-10 V output to the "+" terminal.

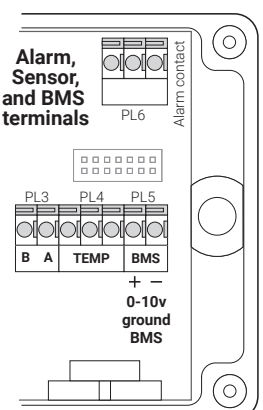


Figure 15: Connecting the BMS

2 Installation

Figure 16 shows the connection of a single controller (with optional sensor, BMS and alarm connections).

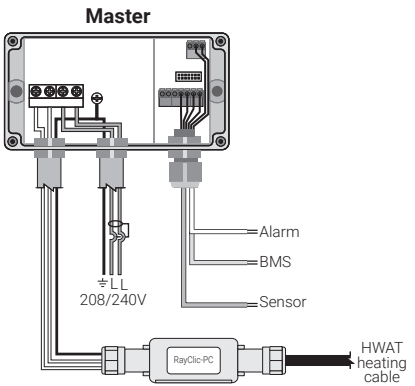


Figure 16: Single controller connection (with sensor, BMS, and alarm connections)

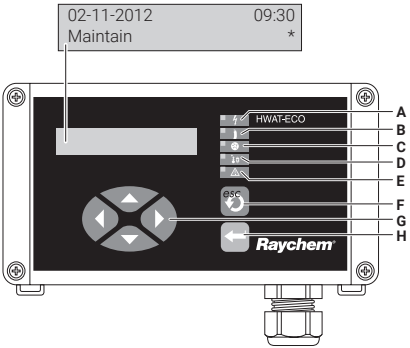
2 Installation

Closing the controller

Position the cover in front of the wall-mounted box. The separation sheet inside the controller will help guide the cover and the connector. Push the cover onto the box. Note that the connector pins will offer some resistance. Put the screws in place and tighten to 10 inch-lbs (1.13 N-m).

Figure 17: Closing the controller

2 Installation



A		Power supply (green LED)
B		Power to heating cable (green LED)
C		Heat-up cycle (green LED) - increased risk of scalding
D		Pipe temperature alarm (requires installed sensor) (green LED)
E		Alarm (red LED)
F	esc	Escape, backspace; NO; or display maintain temperature setpoint
G		Arrow keys: to change menu selection or position the cursor
H		Confirm selection, new value or YES

Figure 18: Controller display

3 Programming the Controller

3.1 Programming Overview

Display functions

Quickstart Any key to start

The display has two lines with 16 characters each. The display shows the following text on start up:

The HWAT-ECO has six buttons:


Up/Down/Left/Right arrows

Escape (ESC) button


Enter button

You can program the HWAT-ECO by simply executing the Quickstart program which is suitable for normal operations. In addition, advanced programming can be used to modify initial settings, set additional features such as BMS and Network Master, reinitialize the entire controller, or customize the pre-defined programs.

3 Programming the Controller

3.2 Initializing the Controller

The first time you power up the controller, you must execute the Quickstart program to set the initial settings. Once initialized continue to power the controller for at least 6 hours to charge the internal battery.

TABLE 1: QUICKSTART MENU

Time and date	**Year**	Select Year
	Month	Select Month
	Day	Select Day
	Hour	Select Hour
	Minutes	Select Minutes
Cable type	**HWAT-R2**	"Press Enter for this cable type."
	HWAT-Y2	"Press Enter for this cable type."
Voltage select	**208 Vac**	"Press Enter for this voltage type."
	240 Vac	"Press Enter for this voltage type."
Units	**English**	"Press Enter for this unit type."
	Metric	"Press Enter for this unit type."
Ambient temp.		"Enter ambient temp."
Maintain temp.		"Enter maintain temp. setpoint"
Economy temp.		"Enter economy temp. setpoint"

3 Programming the Controller

TABLE 1: QUICKSTART MENU

Default program	**Constant** **Apartments** **Family home** **Prison** **Hospital** **Nursing home** **Hotel** **Sports center** **Convales. home**	"Scroll to program and press Enter."

During the Quickstart you can press the ESC button to go back to a previous menu. On startup the display will show the following text:

Quickstart **Any key to start**

Press a key to start, and the following menus appear:

Time and Date

Use the up/down arrows to select the year and press Enter. Then, select and enter the month, day, hour, and minutes. The time and date is contained in volatile memory, and is maintained during power outages by an internal rechargeable battery. Power the HWAT-ECO for at least 6 hours to charge the battery.

3 Programming the Controller

Cable type

Use the up/down arrows to select HWAT-Y2 or HWAT-R2 cable used in your installation. Press Enter.

Voltage

Use the up/down arrows to select 208 V or 240 V (applied voltage to the cable). Press Enter.

Units

Use the up/down arrows to select English or Metric units. Press Enter.

Ambient temperature

The ambient temperature is the air temperature surrounding the hot water piping where the heating cable is installed. Use the up/down arrow keys to select from 60˚F (15˚C) to 80˚F (25˚C). Press Enter.

If your design requires that the ambient temperature is significantly different from one location to another, you will need an HWAT-ECO controller for each ambient condition.

Maintain temperature

The maintain temperature setpoint is the water temperature that you set for normal use. Use the up/down arrow keys to select the temperature.

3 Programming the Controller

The minimum temperature is 105˚F (40˚C) or the economy temperature, whichever is higher. The maximum temperature depends on cable type, voltage and ambient temperature. The programmed maintain temperature will display if you press the ESC button once the system is in operation.

TABLE 2: MAXIMUM MAINTAIN TEMPERATURE (208-VOLT)

	Ambient temperature		
Heating cable	**60˚F (15˚C)**	**70˚F (20˚C)**	**80˚F (25˚C)**
HWAT-Y2	120˚F (49˚C)	125˚F (52˚C)	125˚F (52˚C)
HWAT-R2	140˚F (60˚C)	140˚F (60˚C)	140˚F (60˚C)

TABLE 3: MAXIMUM MAINTAIN TEMPERATURE (240-VOLT)

	Ambient temperature		
Heating cable	**60˚F (15˚C)**	**70˚F (20˚C)**	**80˚F (25˚C)**
HWAT-Y2	120˚F (49˚C)	125˚F (52˚C)	125˚F (52˚C)
HWAT-R2	140˚F (60˚C)	140˚F (60˚C)	140˚F (60˚C)

Economy temperature

The economy temperature setpoint is the water temperature for periods during which hot water is not usually used (at night) or when a lot of hot water is used (peak period). Use the up/down arrows to select

the temperature. The minimum temperature is 105˚F (40˚C) and the maximum temperature is the selected maintain temperature.

Default programs

The HWAT-ECO has 9 pre-defined programs. (See “Chapter 5, Pre-Defined Programs” for more information.) Use the up/down arrows to select a pre-defined program. Press Enter. HWAT-ECO takes a few seconds to copy the pre-defined program to the internal memory. During this time a row of dots will show in the display.

Pipe temperature

This function also ensures that the delivered water temperature is not lower than the desired maintain temperature.

Completing initialization

The controller will start automatically when you finish selecting your Quickstart options. Additional settings are available in the Setup menu for advanced installations. See section 3.3 on page 33 for more information.

Press Enter to start the controller. If you press the ESC button, you can retrace all menu items to check the settings. After starting the controller the display shows date, time, temperature setting and a “*” to

indicate that the controller is unlocked. If you wish to lock (password protect) the controller, see section 3.3.2.6 for instructions.

Displaying Maintain Temperature Setpoint

After finishing the Quickstart, the display will show the date, time, temperature mode and a star to indicate that the controller is unlocked.

02-11-2013	09:13
Maintain	

While in operating mode, press ESC to view a bar graph that shows the maintain temperature setpoint. To enter the programming menu, press any other key. The controller will exit the menu automatically after five seconds of key inactivity.

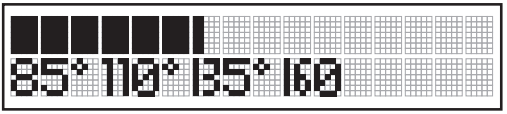


Figure 19: Bar graph

Displaying Pipe Temperature

When the optional pipe temperature sensor is connected, the controller will display date and time as above and alternate between temperature mode and pipe temperature.

3 Programming the Controller

02-11-2013	09:13
Pipe T: 110°F	*

3.3 Advanced Programming

Advanced programming options are also available. Table 4 and the remainder of this section outline the advanced programming options that include modifying initial settings, setting additional features such as BMS and Network Master, reinitializing the entire controller, or customizing the pre-defined programs.

3 Programming the Controller

TABLE 4: ADVANCED PROGRAMMING MENU

1 Time and Date	**1 Year** **2 Month** **3 Day** **4 Hour** **5 Minutes**	Select Year Select Month Select Day Select Hour Select Minutes
2 Setup (enter password if Lock is ON)	**1 Main Temp**	"Enter maintain temp. setpoint"
	2 Economy Temp	"Enter economy temp. setpoint"
	3 Ambient Temp	"Enter ambient temp."
	4 Power Correction	Selectable
	5 Lock	Lock/unlock Setup and Timer menus
	6 BMS	Select Yes/No
	7 Network Master	Select Yes/No
	8 Reinitialize	Select Yes/No
	9 Short heater	Select Yes/No
	10 LTA **(Low Temp Alarm)** 1. Set Status 2. Set Temperature 3. Set Alarm Filter Time 4. Set Deadband	 Select Yes/No Enabled or Disabled 95°F (35°C) min 5-30 Minutes 4-18°F (2-10°C)
	11 HTC **(High Tem. Cut Out)** 1. Set Status 2. Set Temperature 3. Set Alarm Filter Time 4. Set Deadband	 Enabled or Disabled Maximum 205°F 10-30 Minutes 4-18°F (2-10°C)

3 Programming the Controller

TABLE 4: ADVANCED PROGRAMMING MENU

3 Timer (enter password if Lock is ON)	**1 Default program**	Constant Apartments Family home Prison Hospital Nursing home Hotel Sports Center Convalesc. home
	2. Edit program	
	Monday	Edit timer for Monday
	Tuesday	Edit timer for Tuesday
	Wednesday	Edit timer for Wednesday
	Thursday	Edit timer for Thursday
	Friday	Edit timer for Friday
	Saturday	Edit timer for Saturday
	Sunday	Edit timer for Sunday
4 Holiday	**On** **Off** **xxDays off**	
5 Info	Show firmware version number + Cable type + Sensor temp.	

Time and Date

Use the up/down arrows to select the year and press Enter. Then select and set the month, day, hour and minutes.

3 Programming the Controller

Setup

When Lock is on (no star in the lower right corner) enter a password to access the setup menu. The controller locks again after 60 seconds of inactivity.

When Lock is off the following menus are directly accessible.

1. Maintain temperature

The maintain temperature setpoint is the water temperature that you set for normal use. Use the up/down arrows to select the temperature. The minimum temperature is 105˚F (40˚C) or the economy temperature, whichever is higher. The maximum temperature depends on cable type, pipe diameter, insulation thickness and ambient temperature.

2. Economy temperature

The economy temperature setpoint is the water temperature for periods during which hot water is not usually used (at night) or when a lot of hot water is used (peak period). Use the up/down arrows to select the temperature. The minimum temperature is 105˚F (40˚C) and the maximum temperature is the selected maintain temperature. Press Enter.

3. Ambient temperature

The ambient temperature is the air temperature surrounding the pipes where the heating cable is

installed. Use the up/down arrows to select from 60˚F (15˚C) to 80˚F (25˚C). Press Enter to confirm.

If your design requires that the ambient temperature is significantly different from one location to another, you will need an HWAT-ECO controller for each ambient condition.

4. Power correction

The power correction factor can be selected to increase or decrease your actual pipe maintain temperature or to adjust for using HWAT heating cables on rigid plastic pipes.

The power correction factor can be adjusted from 0.6 to 1.40, increasing or decreasing the percent time the heating cable is powered during the duty cycle.

For installation on rigid plastic pipe set the power factor at:

HWAT-Y2: 1.20
HWAT-R2: 1.25

5. Lock (password)

Use the up/down arrows to select Lock On/Off and press Enter. If you select 'On', you must enter a password using the left/right and up/down arrow buttons to select a 4-digit password. Press Enter.

You will need to remember your 4-digit password whenever you wish to unlock the controller for

reprogramming. Once you unlock and reprogram, you will need to relock by entering your password.

If Lock is On, the Setup and Timer menus are protected by the password. After you enter the password, the controller remains unlocked until five minutes of key inactivity or until you select Lock 'On' again.

6. Building Management System (BMS)

You can activate the Building Management System option using this menu. When set to "Yes" the controller responds only to the voltage applied to the BMS terminal. For voltages ≤ 4 Vdc: heating cable is OFF. For voltages between 4.1 Vdc and 6.4 Vdc: maintain temperatures are set as indicated in Table 5. For voltages > 6.4 Vdc: 100% power is applied to the heating cable. See "Building Management System (BMS) (optional)" on page 22 for installation information. If Water heater is ON, it overrules the BMS temperature setting if necessary.

3 Programming the Controller

TABLE 5: BMS VOLTAGE INPUT

Temp °F (°C)	HWAT-Y2	HWAT-R2	U-BMS/U-GLT (VOLT)
>147 (>64)		X	>6.4
147 (64)		X	6.4
140 (60)		X	6
131 (55)	X	X	5.5
122 (50)	X	X	5
113 (45)	X	X	4.5
106 (41)	X	X	4.1
Off	X	X	0

7. Network Master

In large installations where more than one HWAT-ECO controllers are connected to each other, you must select one controller as the Master. This controller should be fully programmed and all slave controllers will use the Master settings.

The master controller sends commands to all slave controllers to switch them ON or OFF. The master program is used for all controllers as follows: Slave controllers on the same phase (max. three controllers) will have a delayed ON and OFF. This way the start-up current of the cable will never occur at the same moment for these controllers (A, B and C). Slave controllers connected to a different phase will switch at the same time (1, 2 and 3).

3 Programming the Controller

After selecting “Master: Yes”, the slave controllers will initialize and show:

:Slave: “x y” x= phase number (1 to 3)
y= slave identification (A, B and C)

The master controller is always 1 A, the slave controllers will get their number and identification automatically. Always check afterwards if all controllers have unique id-numbers, if not, check the RS485 cables and repeat this procedure.

8. Reinitialize

To Reinitialize all settings back to the factory settings (except time and date), set the “Reinitialize” menu to “Yes.”

9. Short Heater

This feature allows you to activate a low current alarm:

Yes: Allows low current such as when used as a demonstration, or to control a contactor. In this mode there is no low current alarm.

No: Generates low current alarm when measured current is less that 300 mA.

10. LTA (Low Pipe Temperature Alarm)

When the optional pipe temperature sensor option is installed, the HWAT-ECO controller monitors the temperature of the hot water distribution pipes

where the sensor is installed and can generate a low pipe temperature alarm.

1. Set Status: Enabled or Disabled
2. Set temperature:
   - Minimum: 95°F (35°C)
   - Maximum: < Maintain (or Economy)
3. Set Alarm filter time: 5–30 minutes
4. Set deadband: 4–18°F (2–10°C), 9°F (5°C default)

11. HTC (High Temperature Cut-Out)

When the optional pipe temperature sensor option is installed, the HWAT-ECO controller monitors the temperature of the hot water distribution pipes where the sensor is installed and a high temperature cut-out can be set.

High Temperature Cut-out:

Minimum:	> set point
Maximum:	205°F (96°C)
Alarm filter:	5–30 minutes (default 10)
Dead band:	> 5°F (3°C) default 0°F(6°C)

Timer

The Timer feature lets you re-program any of the pre-defined programs to suit your personnel requirements. Reprogramming is done graphically in ½ hour time blocks. A block can be set to Heat-Up

cycle, Maintain temperature, Economy temperature, or Off. See “Chapter 6, Heat-Up Cycle Graphs” for more information.

Edit pre-defined programs

To edit a program, switch Lock to Off. If password protected, you will need to enter the password to unlock the controller. After you enter the password, the controller remains unlocked until five minutes of key inactivity or the Lock ‘On’ is selected again

Select temperature

Use the up/down arrows to select the temperature:

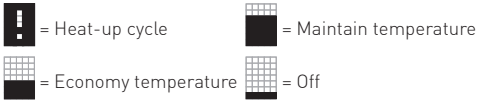
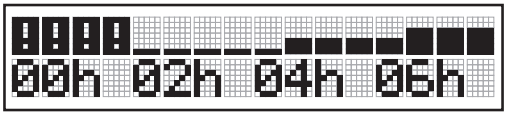


Figure 20: Timer block options

Select time block

Use the left/right arrows to select the time block. Timer programming example from 00:00 to 08:00:



3 Programming the Controller

.....	04:00 – 04:30: Off
00:00 – 00:30: Heat-up cycle	04:30 – 05:00: Economy
00:30 – 01:00: Heat-up cycle	05:00 – 05:30: Economy
01:00 – 01:30: Heat-up cycle	05:30 – 06:00: Economy
01:30 – 02:00: Heat-up cycle	06:00 – 06:30: Economy
02:00 – 02:30: Off	06:30 – 07:00: Maintain
02:30 – 03:00: Off	07:00 – 07:30: Maintain
03:00 – 03:30: Off	07:30 – 08:00: Maintain
03:30 – 04:00: Off	.....

Figure 21: Timer programming example

Heat-Up cycle

The HWAT-ECO can be programmed to power HWAT-Y2 or HWAT-R2 at full power for any selected number of hours. When hot water is not being used and the pipes are stagnant, the HWAT-ECO can raise the temperature of the water in the stagnant pipes. To determine the amount of time that is required to reach a desired temperature, refer to “Chapter 6, Heat-Up Cycle Graphs.” You must know the programmed maintain temperature, pipe sizes, system voltage and the type of heating cable to determine the amount of time that is required to reach a desired temperature. If the desired temperature can be reached in a timeframe that is less than when the pipes will be flowing again, the Heat-Up cycle can be programmed for the number of hours that are required and the desired temperature will be reached. To determine the amount of time

that is required to return back to the maintain temperature after the Heat-Up cycle is complete and the heating cable is off, refer to “Chapter 7, Cool-Down Graph.”

Holiday

This menu is used to set the controller to Off, timed-off, or to resume your timer program.

On: The controller uses the normal operation the timer program.

Off: The controller will not power the system until you select “Use timer”.

xx Days off: You can select a number of days. The controller automatically returns to timer mode when the selected number of days have passed.

Info

The display shows the firmware version number, selected cable type and the current sensor temperature. Press Enter twice to update the sensor temperature on the display.

4 Error/Alarms and Troubleshooting

Please ensure that the unit is correctly connected to the power supply and the heating cable is connected to the HWAT-ECO unit.

Error code Definitions	Cause/reasons	Remedy
Error 1:	**Internal temperature alarm;** Temperature is too high. (> 65°C)	Turn off power and allow the controller to cool and then re-energize. The controller will lock out after three occurrences. If this does not restore the controller, replace the HWAT-ECO.
Error 2:	**Pipe Sensor failure** (Only when temperature alarm "enabled" selected) • Sensor or sensor cable defect • Low temp alarm or High temperature cut-out selected and sensor is not installed.	Connect sensor to HWAT-ECO or turn off temperature alarm. Check sensor connections; replace sensor, check temperature sensor mounting
Error 3:	**Network failure** Two or more HWAT-ECO's are set as Master	Reinitialize MASTER (see "Setup" on page 36)

4 Error/Alarms and Troubleshooting

Error code Definitions	Cause/reasons	Remedy
Error 4:	**Internal Error**	Controller needs to be replaced. Contact nVent representative
Error 5:	**No/Low current alarm**	Ensure that the heating circuit is connected to power output of the HWAT-ECO. If controlling a contactor, ensure that the Short Heater Alarm is enabled.
Error 6:	**Configuration Error**	Refer to "Short Heater" menu. • If heating cable is longer that 15 ft. (4.5 m) then, Short heater = No • If heating cable is shorter than 15 ft. (4.5 m) then, Short heater = Yes
Error 7:	**Pipe temperature too high** (Only when HTC is enabled) • Boiler temperature is too high. • Pipe temperature too hot	• Verify High Temperature Cut-out (HTC) is set correctly. • Correct boiler or mixing valve setting. • Verify HWAT-ECO programming. • Verify that pipe insulation schedule is correct.

4 Error/Alarms and Troubleshooting

Error code Definitions	Cause/reasons	Remedy
Error 8:	**Time is lost** Battery is drained due to not being powered for a long time.	Input time again (will be asked by the unit when a button is pressed)
Error 9:	**Pipe temperature is too low** (Only when temperature alarm “yes” selected) Pipe temperature too low	• Correct boiler/mixing valve temperature setting • Ensure that the sensor is tight to pipe and insulated. • Verify power is connected to heating cable. • Confirm Low Temperature Alarm (LTA) setting Confirm HWAT-ECO settings Confirm insulation schedule

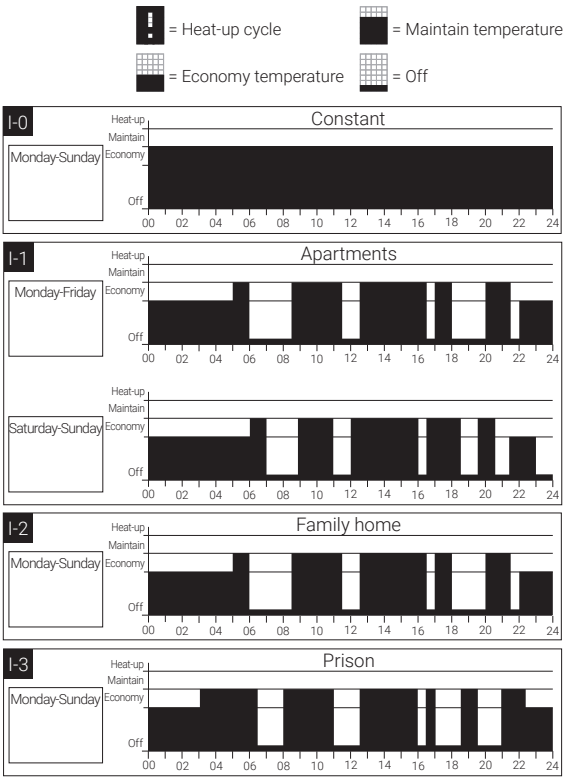
4 Error/Alarms and Troubleshooting

Indications/Trouble shooting	Cause/reasons	Remedy
Water temperature too low	**Too low water temperature** • Boiler temperature is too low • Cold water entering system • Heater used is different type than entered in program. • Entered value of ambient temperature is too high. • Insulation thickness is different than standard thickness.	• Check boiler temperature and timer program • Mixing valves and janitor sinks may be allowing cold water to cross over to the hot water side. • Change heater type in HWAT-ECO (can only be done in quick install "Setup" on page 36 - Reinitialize) • Change value of ambient temperature • Adjust power correction factor if possible (see "Timer" on page 41) • Change insulation to match required schedule in HWAT installation manual.

4 Error/Alarms and Troubleshooting

Indications/Trouble shooting	Cause/reasons	Remedy
Water temperature too high	**Too high water temperature** • Heater used is different type than entered in program. • Insulation thickness is different than standard thickness. • Entered value of ambient temperature is too low	• Change heater type in HWAT-ECO (can only be done in quick install "Setup" on page 36 - Reinitialize) • Adjust power correction factor if possible (see "Timer" on page 41) • Change value of ambient temperature
No display	**Loss of power**	**Restore power**
Can't access programming mode	Controller is password-protected	Enter your 4-digit password. If you forgot your password, enter the backup password: 6922 to unlock the controller

5 Pre-Defined Programs



5 Pre-Defined Programs

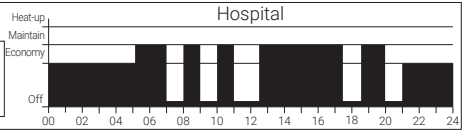
= Heat-up cycle

= Maintain temperature

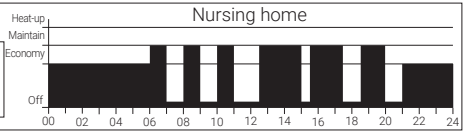
= Economy temperature

= Off

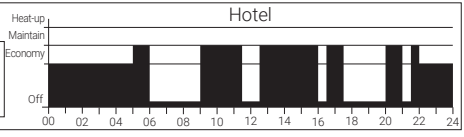
I-4



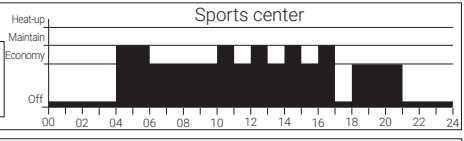
I-5



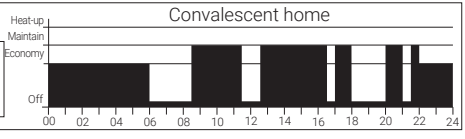
I-6



I-7

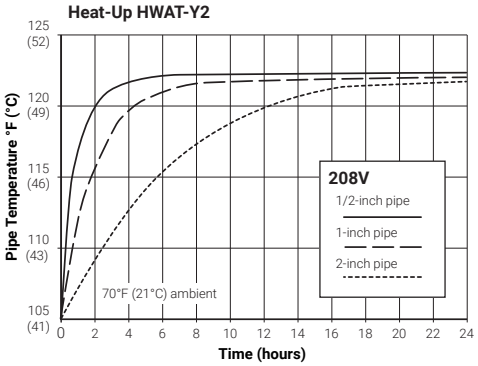


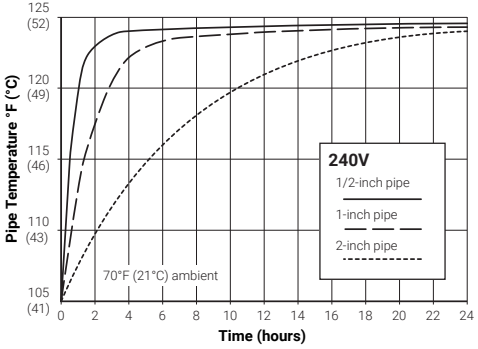
I-8



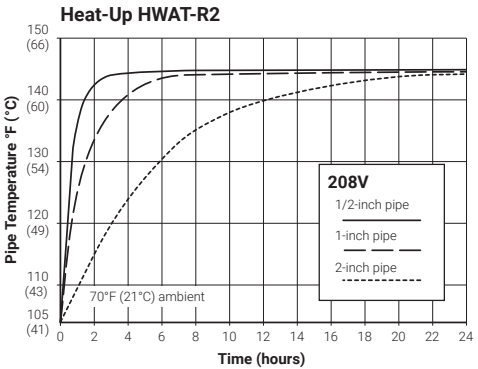
6 Heat-Up Cycle Graphs

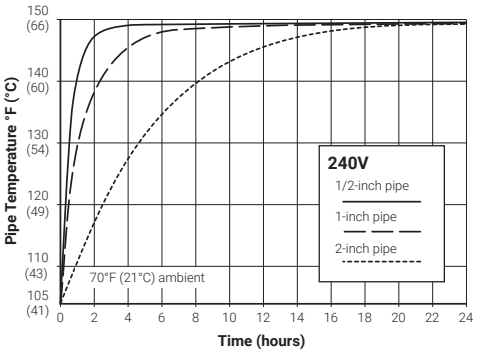
To calculate heat-up and cooldown times when heat cycle is used.





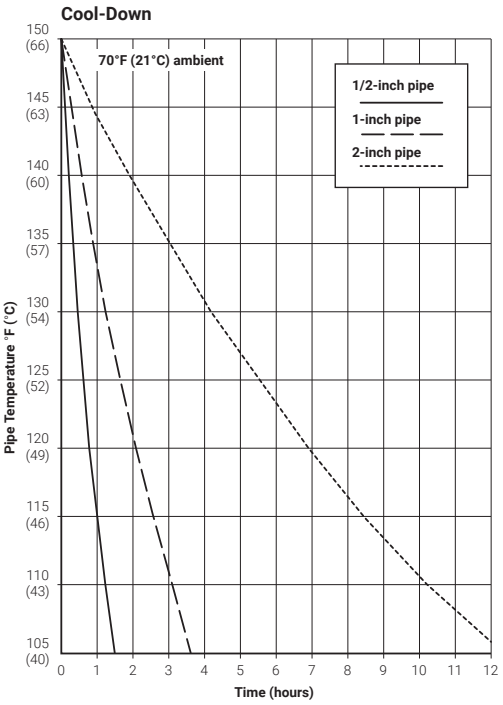
6 Heat-Up Cycle Graphs





7 Cool-Down Graph

These cool down curves represent when the heating cable is turned off.



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