Installation, Operation and Maintenance Manual For Heating Systems on Poly Processing Company Storage Tanks

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Chapter One

System Overview

SPX Tank Heating Systems are specifically designed for temperature maintenance on polyethylene tanks. SPX Tank Heating Systems maintain the desired product temperature, not to exceed 100°F. Each heating system consists of tank heating pad(s) and a temperature controller.

The type and quantity of SPX Tank Heating Pads required is determined by the size of the tank, desired temperature maintenance and environmental conditions. Tanks are available with standard heating systems with a ΔT of 30, 60 and 100°F. The ΔT is the difference between the product temperature and the minimum ambient temperature. For example if you wanted to maintain 60°F in a 0°F ambient a heating system with a 60°F ΔT would be selected. If the exact ΔT required is not available select the next size up system.

Tanks are typically supplied with the heating pads and a controller installed by Poly Processing. The only field connection required is supply power to the heating system.

Chapter Two

General Information

2.1 System Design

SPX Tank Heating Systems are manufactured by HTD Heat Trace specifically for use on polyethylene storage tanks. Each tank heating system is specifically designed to suit a specific tank size based on desired maintenance temperature and environmental conditions.

2.2 Thermal Insulation

All tanks must be thermally insulated for SPX Tank Heating Systems to be effective. Tanks supplied by Poly Processing Company are normally provided to the end user with 2" of polyurethane insulation installed at the factory.

Chapter Three

Heating Pad Installation

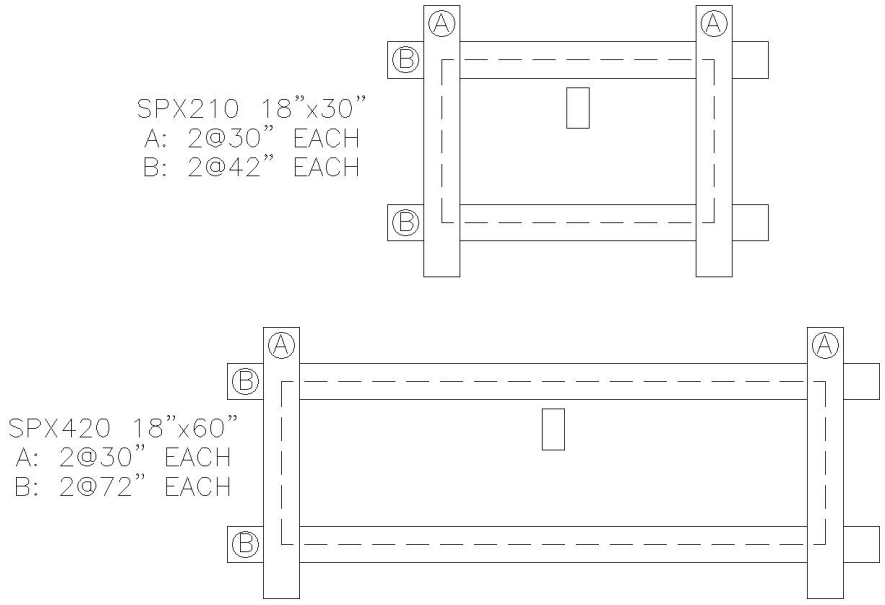
Heating pad and controller installation is normally completed by Poly Processing prior to supply to the end user. Installation information is provided only to give an overview of the total heating system.

3.1 Preparation

1) Determine the heating panel locations for the style and type of tank. Heaters should be located towards the bottom of the tank approximately 6" up from the bottom on a vertical tank.
2) Determine control package location, making sure heating pad cold leads reach the control package.
3) Ensure that the tank surface is clean, dry and free of dirt, grease, oil, or any other substance that may interfere with the self-adhesive bonding material on the heating pad.

3.2 Installation Tasks

1) Remove a heating pad from the shipping box and carefully peel back the protective backing to expose adhesive surface.
2) Affix the heating pad to the tank surface in the position determined in step 1.
3) Beginning at the end of the heating pad, carefully press the heating pad to the surface of the tank. Apply sufficient pressure to the back of the heating pad so the first 6 to 8" of the heating pad adheres to the tank surface.
4) With continuing pressure and smooth hand strokes to the back of the heating pad, adhere the next several inches of the heating pad to the tank. Use firm pressure to ensure that no creases, bubbles, or air gaps are present between the heating pad and surface of the tank. Repeat this process until the total inner pad surface is bonded to the tank surface.
5) Use 3" aluminum wide tape to secure cold leads to the tank, and seal the outer edges of the heating pad to prevent ingress of dirt, moisture and other contaminants. Cut the tape in the required lengths as shown on figure 1.



Aluminum Tape Requirements for Heating Pad Installation

Figure 1

6) Apply the aluminum tape as shown.
7) Repeat Steps 1 through 6 for each additional heating pad.

Chapter Four

Heating System Controller

4.1 Overview

SPX Tank Heating Systems are available with a choice of two controllers. The 2XTC is for use in electrically unclassified (non-hazardous) areas and the 2HSPCP controller for use in electrically classified (hazardous) areas.

The controller is provided mounted on the tank with the heaters connected. The installer/end user must provide power to the controller.

4.2 Control Location

Both the 2XTC and 2HSPCP are rated NEMA4 and suitable for outdoor installation. Where possible the controller should be mounted out of direct sunlight to provide maximum visibility for the indicating lights and display.

4.3 Unclassified (Non-hazardous) Areas

The 2XTC controller is for use in ordinary, non-hazardous areas. The controller has two temperature settings one for process temperature control and one for high limit (over temperature) protection. The process set value should be set to the desired tank temperature, but limited to a maximum of 100°F.

The high limit (over temperature) setting protects the tank or product from high heater temperatures. If the heating pad reaches the over temperature setting the heating system is shut off to avoid high tank or product temperatures. The over temperature setting is factory limited to 150°F, 175°F for double wall SAFE-Tanks ®.

4.4 Classified (Hazardous) Areas

The 2HSPCP controller is suitable for use in hazardous Class I, Division 2, Groups B, C, D and Class II, Division 2 areas. The 2HSPCP uses two explosion-proof thermostats one for process temperature and one for over temperature with a general purpose junction box for heater connection.

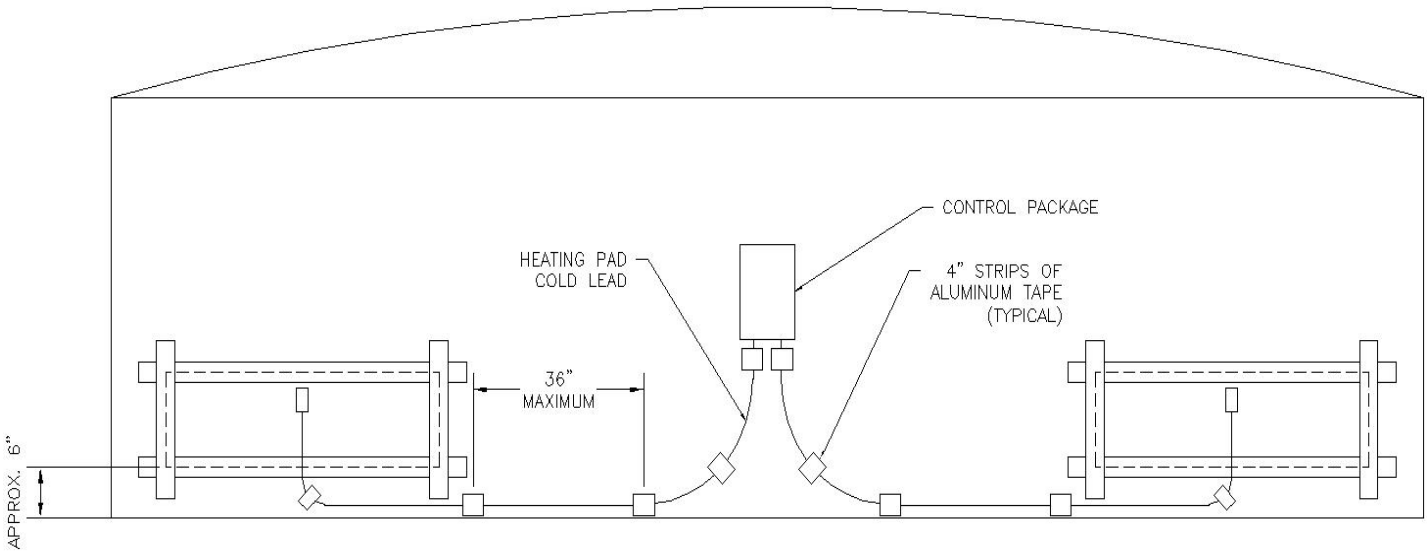
The 2HSPCP controller is provided with the process temperature thermostat factory set to 60°F. The process temperature thermostat should be set to the desired product temperature. The over temperature thermostat is factory set to 150°F, 175°F for double wall SAFE-Tanks ®. Do not set the over temperature thermostat above these values.

Chapter Five

Controller Installation

5.1 Physical Installation

1) Mount the control package in the location determined during the heating pad installation.
2) Run the cold leads from each heating pad to a common point below the control package. Cold leads should be secured to the tank with 4" long strips of aluminum tape as shown in fig 2.



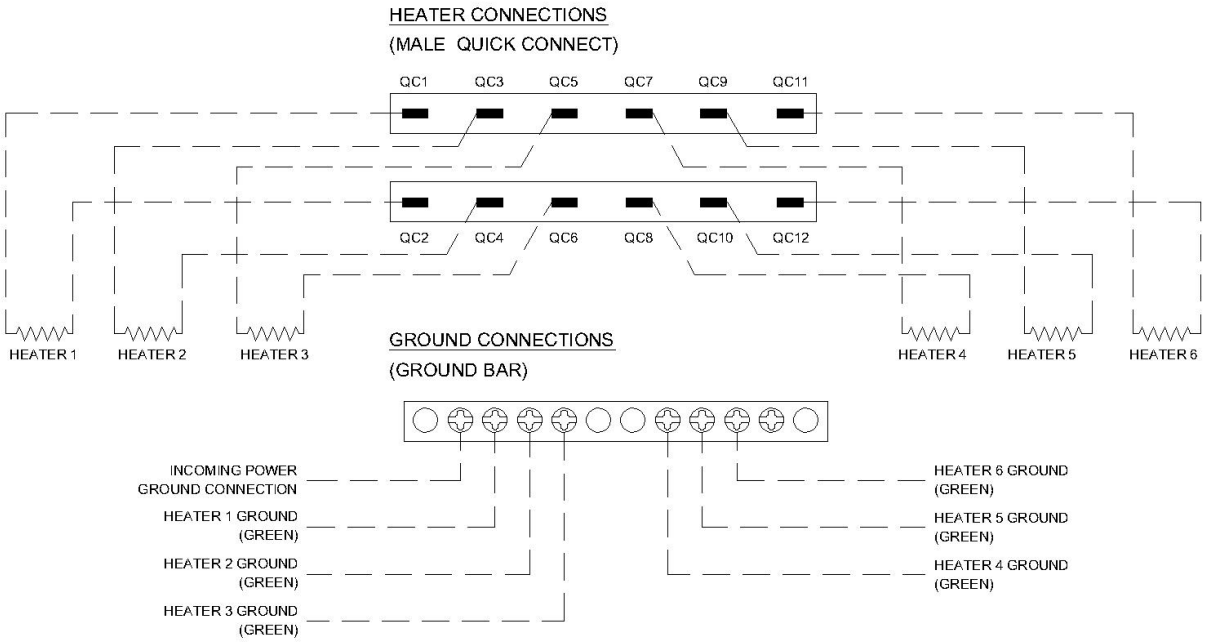
Cold Lead Routing

Figure 2

3) Use one cord entry fitting for each heater cold lead. Route heater lead into the controller so the heater serial number is showing. Make sure any unused holes are sealed.

5.2 2XTC Heater Connection

1) For heaters having the same voltage rating as the power supply complete heater connections as shown in figure 3 below. For 240 VAC heating systems with 120 VAC heaters connected in series contact HTD Heat Trace for the appropriate wiring diagram.



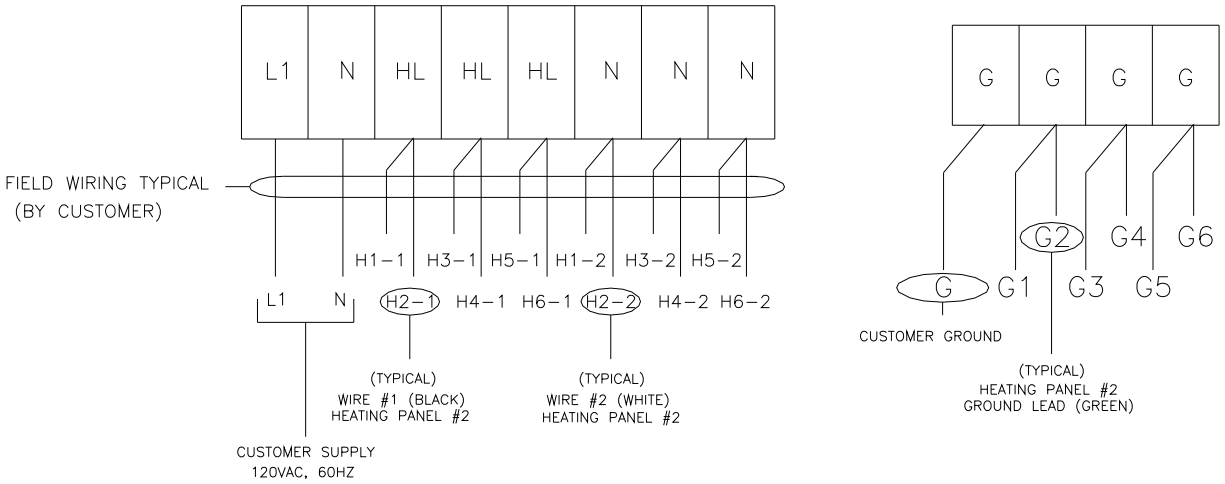
2XTC Heater Connection

Figure 3

2) Connect the black lead and the white leads on each heater using fully insulated quick connect terminals. Factory installed terminals are provided with the heaters for connection directly to the quick disconnect terminals. For field installed heater terminals use fully insulated terminals for 16AWG wire and ¼" wide x 1/32" thick tab. Black heater leads should be connected to the odd numbered tabs and white leads to the even numbered tabs. To aid in troubleshooting connect heaters as shown in Figure 3. The green (ground) leads must be connected to the grounding bar as per wiring diagram. A wiring diagram is also included with the 2XTC controller in the controller manual.
3) After connecting customer supply in Chapter 6, test the heaters as shown on Chapter 8.

5.3 2HSPCP Heater Connection

1) Connect each heating pad into the heater terminal blocks as shown in figure 4 using ring terminals. If the ring terminals are field installed use insulated ring terminals for a #8 screw and 16 AWG wire. A wiring diagram is also included inside each control box. Ensure all connections are tight.



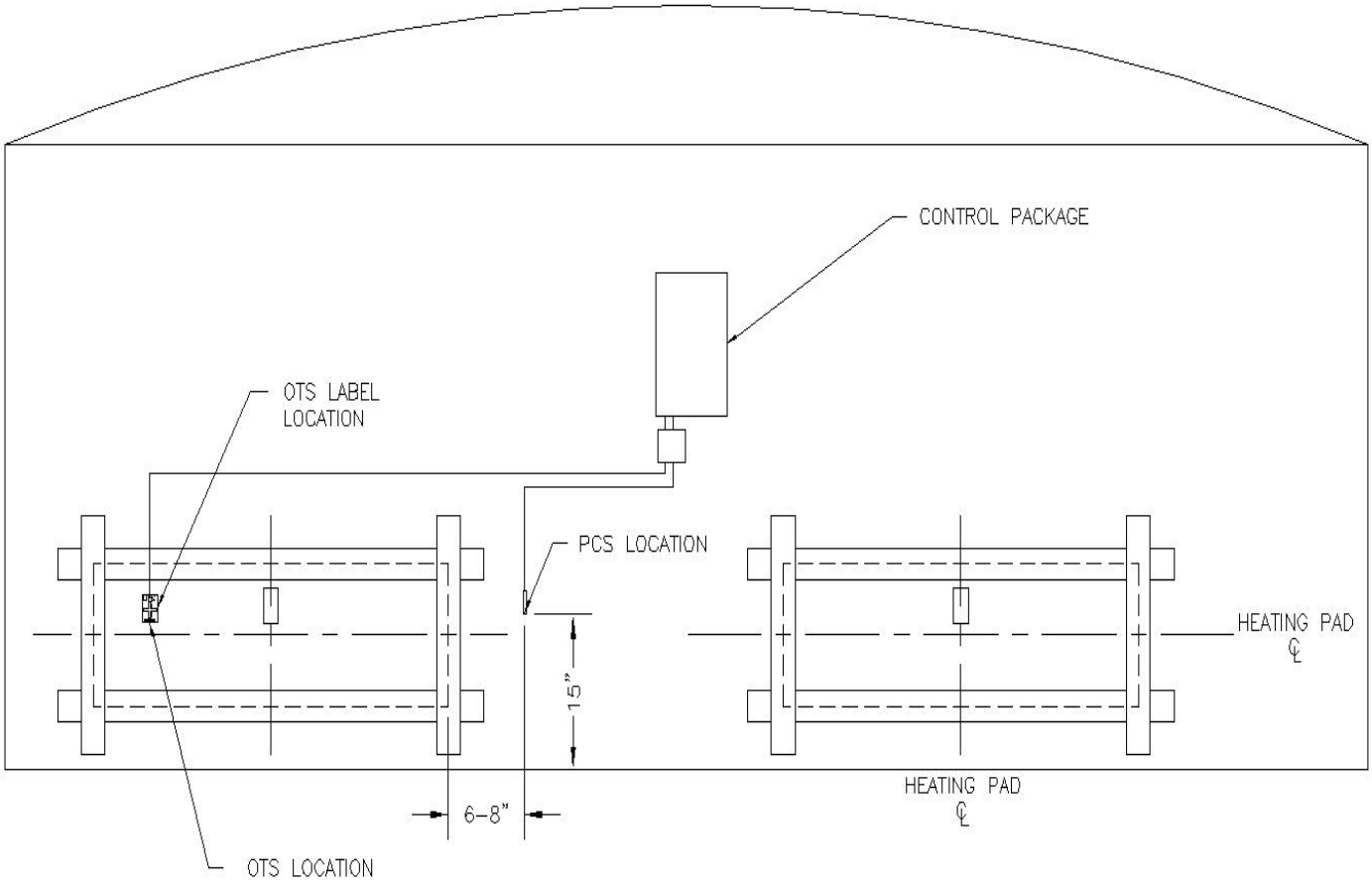
2HSPCP Heater Wiring Diagram

Figure 4

2) Connect the black (hot) lead and the white (neutral) lead on each SPX heater to the controller terminals as per the wiring diagram. The green (ground) lead should be connected to the grounding bar as per wiring diagram.
3) After connecting customer supply in Chapter 6, test the heaters as shown on Chapter 8.

5.4 Sensor Location

1) The temperature sensor designated as “PCS” inside the control package must be located as per fig 5 and installed on the tank surface using aluminum tape.



Sensor Location
Figure 5

2) The temperature sensor that is designated “OTS” or “HLS” must be located on the SPX pad that is highest up on the tank wall in the designated OTS location and installed directly onto the selected heating pad using sufficient lengths of aluminum tape. The OTS or HLS sensor must be located in the cross of the OTS sticker
3) Route the leads/capillary tubes from the sensors as shown in fig 5 using 4” strips of aluminum tape. Excess sensor lead or capillary should be coiled neatly under the control package and protected.

Chapter Six

Power Supply Connection

6.1 Power Supply Requirements

Standard heating systems use 110/120 VAC, 50/60HZ power supplies with the current sized to match the heating system. Heating systems range in size from 210 watts to 2,520 watts depending upon the heating system supplied. The 2XTC controller is labeled "120VAC, 30A" and 2HSPCP "120VAC, 22A" reflecting the maximum rating of the controller. The incoming supply should be sized to fit the specific heating system supplied as shown in "Circuit Breaker Sizing Criteria" shown below.

The heating pads are available in two wattages. The available heaters are:

SPX Pad Size	Part#	Watts	Volts
18"x30"	SPX210	210	120
18"x60"	SPX420-16	420	120

SPX Heating Pad Types

Table 1

The NEC (Section 427-22) requires that all heat tracing systems be ground fault protected. Circuit breakers are commonly available to provide ground fault protection. Circuit breakers for protection of tank heating systems should be 30 mA trip units such as Square D type QO-EPD. *GFI type breakers with a 5 mA trip are not suitable for this type of protection and can cause nuisance tripping*.

Circuit Breaker Sizing Criteria:

1. Determine the power of the heating system.
2. Divide the heating system power by 120 VAC to determine the nominal current.
3. Size the circuit breaker at a minimum 125% of the heating load minimum or as required by code.
4. Choose the circuit breaker that most closely matches the calculation, see example.

Example:

1. A heating system with 2 heating pads has a power of 840 watts.
2. By dividing the power by 120 VAC the nominal current is 7 A.
3. Sizing the circuit breaker at 125% requires a circuit breaker of 8.75 A or greater.
4. Pick the closest circuit breaker that is not less than 125% of the nominal load. The lowest commonly available circuit breaker trip rating is 15 A. Use a 15A, 120VAC, 30mA ground fault protected circuit breaker such as Square D part# QO115EPD.

6.2 Customer Connection

Each controller is provided with a cord grip for incoming power suitable for 12 AWG, SJO flexible cable. For 10 AWG incoming cable the installer must provide appropriately sized cord grip. Suitability of flexible cable should be evaluated by the installer/end user based on the specific application and applicable codes. Where required the cord grip can be removed and power supply connection completed using conduit connections supplied by the end user or installer. Conduit is recommended where physical protection is required and required by applicable code.

Chapter Seven

Controller Operation

7.1 General Information

The type 2XTC and 2HSPCP controllers have two temperature sensor and settings. The PCS sensor is for control of the process temperature and the OTS/HLS is for over temperature protection. The heating system is energized when the process temperature drops below the set point. The heating system stays energized until the process temperature exceeds the set point. In this manner the desired tank temperature is maintained by cycling the heating system on and off as required.

The OTS/HLS senor shuts off the heating system if a heating pad temperature exceeds the over temperature thermostat setting. This protects the tank and/or product from over temperature caused by upset conditions, such as low liquid level.

Heating system status indication is provided via the power on to heaters light. When heat is required and the heaters are energized the power on to heaters light is illuminated.

7.2 Temperature Settings

1) The PCS set point/thermostat is factory set to 60°F. This setting can be adjusted for the desired maintenance temperature of the specific application. The process set point in the 2XTC is factory limited to a maximum of 100°F. Under no circumstances should the process setting for the 2XTC or 2HSPCP be set in excess of 100°F without consulting Poly Processing and/or HTD Heat Trace.
2) The OTS/HLS set point/thermostat is factory set to 150°F. In the 2XTC the high limit setting is factory limited to 150°F, 175°F for double wall SAFE-Tanks ®. This setting should not be adjusted regardless of the application. *Do not operate the SPX Tank Heating System with the high limit/ over temperatuer set point higher than 150°F for single wall tanks and 175°F for double wall tanks*.

7.3 Heating System On/Off Indication

SPX Tank Heating control packages are supplied with a “Power On” indicating light. This light will stay illuminated only when the OTS/HLS temperature sensor is below the limit setting permitting safe operation of the system and the PCS set point/Thermostat is calling for heat. This light will not be illuminated when:

a. The tank and tank contents have reached the desired maintenance temperature and the PCS controller is not calling for heat.
b. The OTS/HLS controller has sensed unusually high heating pad temperatures and has switched off the heating system.
c. There is no power to the system.
d. The bulb inside the “Heat On” indicating light has failed and requires replacing.

Items “c” and “d” will require on site attention before safe operation of the system can resume.

For more detailed information on indication provided by the different controller types please consult the Appendix section of this manual with showing features of each controller type.

Chapter Eight

Post Installation Testing and Setup

Some testing requires exposure to electrically live components and should only be completed by an electrician or other qualified personnel.

8.1 Testing

1) Use an Ohmmeter to check the resistance of each heating pad. Compare your reading with the acceptable Ω range in Table 2. Do not proceed with any heating pad that is outside the tolerance bands shown on table 2.

SPX Pad Size	Part #	Watts	Volts	Nom Ω	Acceptable Ω Range
18”x30”	SPX210	210	120	68.6	61.7 to 75.5
18”x60”	SPX420-16	420	120	34.3	30.9 to 37.7

SPX Heating Pad Resistance Tolerances

Table 2

2) Using a 500 VDC Megger, measure the insulation resistance (IR) value between the heating element and the ground. All values below 20 MΩ are unacceptable. Do not proceed with any tank heating pad that has an unacceptable Megger reading.

8.2 Customer Power

Caution measurements power supply voltage requires access to the enclosure interior while power is present. These measurements should old be completed by an electrician or other qualified personnel. Failure to take appropriate precautions can cause injury to personnel. If there are any questions or concerns contact HTD Heat Trace before commencing any work.

1) Turn on customer power supply to the heating system.
2) Verify 120 VAC is present between terminals L1 & N in the controller.
3) Correct power wiring if necessary.

8.3 Controller

Caution measurements of voltage and current require access to the enclosure interior while power is present. These measurements should old be completed by an electrician or other qualified personnel. Failure to take appropriate precautions can cause injury to personnel. If there are any questions or concerns contact HTD Heat Trace before commencing any work.

1) Verify presence of customer power at the incoming power terminals then proceed to step 2.
2) Raise the process temperature setting until the "heater on" light illuminates.
3) Verify correct current is being drawn, determined by the total current for the system using the values listed below.
   1.75 Amps for each SPX210
   3.5 Amps for each SPX420 or SPX420-16
4) Decrease the process setting and verify the heater on light goes off.

8.4 Setup

1) After testing connect operation of the heating system and controller complete the following two steps.
2) Set the Process Temperature setting to the desired tank maintenance temperature.
3) Verify proper setting of the high limit/over temperature setting, not to exceed 150°F for single wall tanks or 175°F for double wall SAFE-Tanks ®.
4) The 2XTC controller has additional alarm and indication settings that can be set and enabled. See the 2XTC Controller Operation and Maintenance Manual for additional information.

Chapter Nine

System Maintenance

9.1 SPX Maintenance Schedule

Procedure	Frequency[1]	Recommendations
Visual inspection of outer coating and thermal insulation.	Monthly	Repair all damage to the outer coating and/or thermal insulation.
Resistance Check (ohmmeter)	Every 6 Months to 1 Year	Disconnect any SPX Tank Heating Pad that shows a resistance value outside the tolerance figures (table 2). Remove and replace the heating pad and the earliest opportunity.
Insulation Resistance (IR) Test or Megger® Test	Every 6 Months to 1 Year	Disconnect any SPX tank heating pad with an IR value of less than 20MΩ. Remove and replace the pad at the earliest opportunity.
Voltage Check (voltmeter)	Every 6 Months to 1 Year	a) Reduced voltages should be evaluated to determine decreased power levels and the potential impact on the performance of the tank heating system. b) Operating voltages above 130 VAC are not acceptable. De-energize the system and investigate cause of over-voltage. Do not re-energize the system until the cause of excess voltage is eliminated.
Current Check[2] (ammeter)	Every 6 Months to 1 Year	a) Any reduction in operating current should be evaluated based on the values for 2 and 4a above. Reduced current resulting from a damaged or failed heating pad(s) requires heating pad replacement. b) Increased current readings resultant from 2 and 4b may be normal and acceptable. Maximum acceptable current readings for SPX Heaters are: SPX210 - 2.0 Amps SPX420 - 4.0 Amps ***Do not operate any SPX Heating Pad Above These Values***

Table 3

1 Maintenance frequency to be determined by system type. For freeze protection systems checking once per year before cold weather arrives is normally sufficient. Process maintenance systems may require more frequent System Maintenacne.

2 Some clamp on ammeters may give unreliable readings at these operating currents.

Chapter Ten

Troubleshooting and Spare Parts

10.1 SPX Troubleshooting Guide

Problem	Probable Cause	Possible Solution
Heaters do not energize	a. No incoming power b. Incorrect Heater Connections c. Failed or damaged temperature sensor d. Failed Thermostat	Switch on/reset Correct wiring Replace Replace
"Power on to Heaters" light does not illuminate	a. Heating not required to maintain temp. b. No incoming power c. Incorrect temp. controller settings d. Burnt out light bulb e. Failed or damaged temperature sensor f. Failed Thermostat	Heat not required Switch on/reset Correct settings Replace bulb or display board Repair Replace
Low tank Temp.	a. No incoming power b. Incorrect temperature settings c. Low incoming product temp. d. Damaged/missing thermal insulation e. Low tank liquid level f. Damaged/failed heating pad g. Incorrect heater connections h. Failed or damaged temperature sensor i. Failed Thermostat	Switch on/reset Correct temperature settings Wait for product heat up (can take a very long time) Repair or replace insulation Fill Tank Repair or replace Correct wiring Replace Replace
High Tank Temp.	a. Incorrect temp. settings b. High incoming fluid temperature	Correct Allow to cool
Customer supplied breaker trips	a. Damaged wiring b. Damaged heater c. Incorrect heater connection	Repair or replace Repair replace Correct wiring

Table 4

10.2 Spare Parts List

2XTC Spare Parts

HTD Part#	Item
H05900	RTD Sensor 1000 KΩ, 10' leads, 2 wire
H01223	Cable gland sealing insert
H01210	Lever nut 32A, 600VAC, AWG 24 - 12 solid, stranded, flexible for series connections
G01221	Heater or Power Cord grip (including sealing ring and nut)
G01222	RTD Sensor Cord grip (including sealing ring and nut)
586DB-1	2XTC Display Board
586PB-1	2XTC Power board
2XTCMP	Controller mounting pad assembly
2XTC-RC	2XTX Ribbon Cable

Table 5

2HSPCP Spare Parts

HTD Part#	Item
H05703	4 pt Power Terminal
G01221	Heater or Power Cord grip (including sealing ring and nut)
G01222	RTD Sensor Cord grip (including sealing ring and nut)
H05808A	Light Bulb (120 VAC, 3W)
H05834	2SPCP Pilot Light assembly 22mm
H05808	2HSPCP 30mm Light Assembly
H01009	Silcopad Cold Lead
H05120	Thermostat, Hazardous Rated, N7, N9, 480VAC, 22A, 10' Bulb and capillary.

Table 6

Chapter Eleven

Component Details

11.1 Components

A detailed control panel parts list can be seen on drawing 2XTC for the 2XTC or 2028744 for the 2HSPCP. Each drawing includes a list with HTD part numbers. Most common spare parts are listed in Chapter 10, tables 5 & 6.

11.2 Replacing Components

WARNING!!!!

The interior of the controller must not be accessed while energized. Remove power to the control panel using the customer supplied disconnect switch or circuit breaker.

Replacement of components or panel repair should only be attempted by qualified personnel. ***Incorrect wiring can cause injury to personnel and/or damage to components, heaters and/or the tank. If there are any questions or concerns contact HTD Heat Trace before commencing any work***.

For the 2XTC controller there are only 2 replaceable parts which are the display board and the power board. The display board has the digital display, LEDs and buttons. The power board has the incoming power, alarm, retransmission and heater connections. The two boards are electrically connected using a locking ribbon cable connection.

For the 2HSPCP controller individual components are wired together. To replace a component note all the wiring connections and the corresponding location on the component. All these connections can also be seen on the associated drawings. Disconnect the wires and remove the component from the controller. Mount the new component and reconnect the wires. Clean out any debris out of the enclosure especially around the new component. Double-check the wire connections to insure they are correct. Close the enclosure and energize the control panel. Test the operation of the new component to insure it functions correctly.

Chapter Twelve

HTD Heat Trace Contact Information

12.1 General Contact Information

HTD Heat Trace can be contacted via any of the methods listed below:

Address

HTD Heat Trace, Inc.
8 Bartles Corner Road
Flemington, NJ 08822

Phone

Telephone: 908 788-5210
Fax: 908 788-5204

E-mail: support@htdheattrace.com

12.2 Technical Support

Technical support is available from 8:00 am to 4:30 PM EST Monday through Friday at 908 788-5210 option 2.

HTD HEAT TRACE
8 Bartles Corner Road, Unit 104, Flemington, NJ 08822 • 908 788-5210 • Fax 908 788-5204

Appendix A

SPX Tank Heater Sales Literature

HTD HEAT TRACE

SPX

PLASTIC TANK HEATER PAD

WATERPROOF, ADHESIVE-BACKED HEATER PADS FOR PLASTIC AND OTHER HEAT-SENSITIVE TANKS

FM C US APPROVED

SPX SALES 9/11/14

SPX

For freeze protection and process heating applications on Plastic Tanks

PLASTIC TANK HEATER PAD

- ***Specifically designed for safe operation on polyethylene, polypropylene and other types of heat-sensitive tanks***
- ***Two sizes and power outputs fit horizontal, vertical and conical tanks***
- ***Proven epoxy-glass laminate platform performance, with thousands of major installations worldwide***
- ***Will not overheat or burn out***
- ***Adhesive backing makes installation quick, simple and effective***
- ***FM Approved for use in unclassified, hazardous and corrosive environments for the United States and Canada***

SPX heater pads are specifically designed to provide the unique product and system features essential for the safe and reliable application of heat to the surface of plastic tanks and other types of heat-sensitive, non-metallic tanks. SPX heater pads are most commonly used on polyethylene and polypropylene tanks for freeze protection and temperature maintenance applications up to 120° F(48.9°C). When used on metal or FRP tanks, SPX heating systems can be designed for temperature maintenance applications up to 150° F (65.6°C).

The total construction of the SPX heater pad is completely waterproof. Each SPX heater is supplied with a rugged, encapsulated, factory made power termination complete with over-braided cold leads in standard lengths of 10 or 16 Ft and custom lengths to suit your application from 2 to 50 feet.

The SPX heater pad uses a proprietary multi-path, parallel circuit heating element with continuously spot welded connections. This proprietary heating element is laminated into multiple layers of NEMA grade G-10 / FR-4 flame retardant, epoxy-glass composite to form a flexible, lightweight heater pad that is easily and quickly installed.

SPX tank heaters are extremely safe, reliable and cannot overheat or burnout.

The gentle heat output of 0.39 w/sq.in will not harm a plastic tank or its contents. Additional security is also incorporated into every SPX heater by the inclusion of a preset, automatic over-temperature safety switch that is built directly into the pad. This factory installed device completely eliminates all potential for over-heating the tank, even if the heating system should remain energized while the tank is empty.

The SPX heater construction also includes an internal aluminum ground shield for full compliance with the latest requirements of the National Electric Code. Factory applied adhesive backing is used to bond the heater pad directly to the tank surface, allowing one person to complete a simple and effective installation in a matter of just a few minutes.

SPX HEATER PAD

PLASTIC TANK HEATER PAD

ADVANCED
HEATING ELEMENT DESIGN

The SPX Tank Heater pad incorporates a proprietary, multi-path heating element that provides an evenly distributed flow of current across many **parallel connected paths**. See Figure 1 opposite.

If one or more element paths are broken or damaged, *the current flow is instantaneously, automatically and evenly re-routed around the damaged area into the remaining undamaged element paths*. See Figure 2 opposite.

This uniform redistribution of current prevents the development of hot spots and burn outs that would normally result in the total failure of a heater pad. Hot spots and localized overheating are also potentially disastrous failure modes that can significantly damage the structure and integrity of any heat-sensitive tank, or scald any heat-sensitive products contained within a tank.

The parallel connected, multi-path circuit design unique to the SPX heater pad offers a durable, robust, safe and *reliable heat source* that is clearly superior to all types of series circuit designs.

Thermal aging, electrical stress, mechanical stress and destruction testing of the epoxy/ glass laminate platform have shown that *over 70% of the circuit paths within the element must be completely destroyed and broken before total heater failure can occur.*

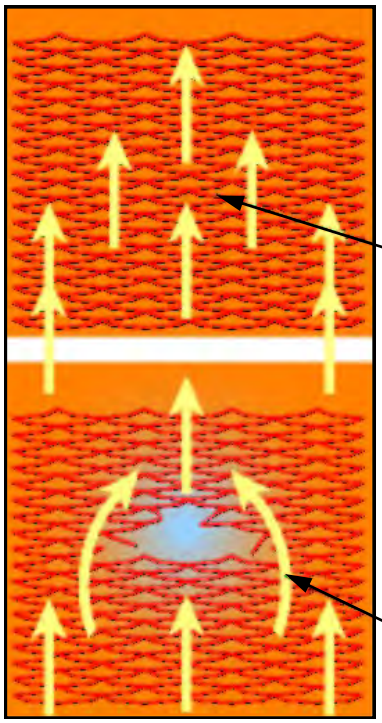


Figure 1

Multi-path heating element construction provides a uniform flow of current across many parallel connected circuit paths.

Figure 2

Current is automatically and evenly re-routed around damaged area. Integrity of the heating circuit remains intact and the heater pad continues to function normally.

SPX heater pads are the safest and most reliable form of tank heater available.

PRODUCT SPECIFICATIONS

PHYSICAL, ELECTRICAL & THERMAL

PLASTIC TANK HEATER PAD

PRODUCT FAMILY	SPX
PRODUCT REFERENCES	SPX210 & SPX420
SIZES	SPX210 18 x 30 in (457 x 762 mm) SPX420 18 x 60 in (457 x 1524mm)
PAD THICKNESS	0.05 inches (1.27 mm)
WEIGHTS	SPX210 2.2 lbs. (1 kg) SPX420 4 lbs. (1.81 kg)
POWER RATINGS	SPX210 210 watts SPX420 420 watts
POWER DENSITY	0.39 watts/inch² (605 watts/m²)
OPERATING VOLTAGE	120 VAC 240 VAC options available, contact HTD
NOMINAL CURRENT	SPX 210 1.75 A SPX 420 3.50 A
LEAKAGE CURRENT ON 120VAC	SPX 210 0.9 mA SPX 420 1.8 mA
TYPICAL MAXIMUM APPLICATION TEMPERATURES	Polyethylene 120° F (49°C) Polypropylene 120° F PVC 140° F(60°C) CPVC 150° F(65.5°C) FRP 150° F Steel 150° F

The above maximum application temperatures are only typical for the materials listed. Service temperature ratings for each tank material depend upon operating pressure and may be lower. Maximum permissible operating temperatures for each specific type of tank must be determined by the Tank Manufacturer and/or End User.

T-RATING:	T4A
MAXIMUM EXPOSURE TEMPERATURE	220° F (105°C)
MINIMUM TEMPERATURE DURING INSTALLATION	40°F (4.4°C)
MINIMUM BENDING RADIUS	15 in (381 mm)
MINIMUM TANK DIAMETER	30 in (762 mm)

ACCESSORIES

SEALING TAPE	Use type IAAT 3 adhesive backed aluminum tape to seal the four edges of each SPX heater pad to the tank surface. This simple procedure prevents infiltration of thermal insulation between the tank surface and the heater pad.

CONSTRUCTIONAL

HEATING ELEMENT	Proprietary multi-path, heating element with continuously spot-welded connections
HEATING ELEMENT DESIGN	Parallel circuit
DIELECTRIC MATERIALS	Multi-ply epoxy/glass composite
DIELECTRIC STRENGTH TEST	1.48KV for one minute
INTEGRAL GROUND PLANE	Expanded aluminum sheet
TERMINATION BOX	4.5 x 2.5 inch (114 x 65 mm) polycarbonate enclosure
COLD LEAD CABLE	3 conductor # 16 AWG tinned copper with TPE insulation and tinned copper over-braid
STANDARD COLD LEAD LENGTHS	SPX210 10 Ft (3m) SPX210 –16 16 Ft (4.88m) SPX420 10 Ft (3m) SPX420-16 16 Ft (4.88m)
INSTALLATION METHOD	Factory applied adhesive backing with release liner

APPROVALS

Factory Mutual approved to IEEE standard 515 and CSA standard C22.2 no.130-03 for use in the following areas:
Unclassified
Class I Div.2 Groups B,C,D
Class II Div.2 Group F,G
Class III Div.2

FM C US APPROVED

CONTROLS

The recommended controller for unclassified, non-hazardous area installations is type 2SPCP with dual electronic thermostats for process control and high temperature cut out.

Use type 2HSPCP controller to provide the same features on all hazardous area installations.

HTD HEAT TRACE

8 Bartles Corner Road, Unit # 104
Flemington , New Jersey
08822-5758
USA

Tel (908) 788 5210
Fax (908) 788 5204
e-mail: sales@htdheattrace.com
www.htdheattrace.com

HTD HEAT TRACE
8 Bartles Corner Road, Unit 104, Flemington, NJ 08822 • 908 788-5210 • Fax 908 788-5204

Appendix B

SPX Tank Heater Datasheet

SPX

For freeze protection and process heating applications on Plastic Tanks

PLASTIC TANK HEATING PAD

- *Specifically designed for safe, reliable operation on heat sensitive plastic storage tanks*
- *Proven epoxy-glass laminate platform performance, with thousands of major installations worldwide*
- *Ultra low watt density, high efficiency, flexible heating pads with adhesive backing.*
- *FM Approved for use in unclassified, hazardous and corrosive environments for the United States and Canada*
- *Quick, simple, low cost, one person installation*
- *Two pad sizes and power outputs for conventional, small and custom-shaped tanks.*

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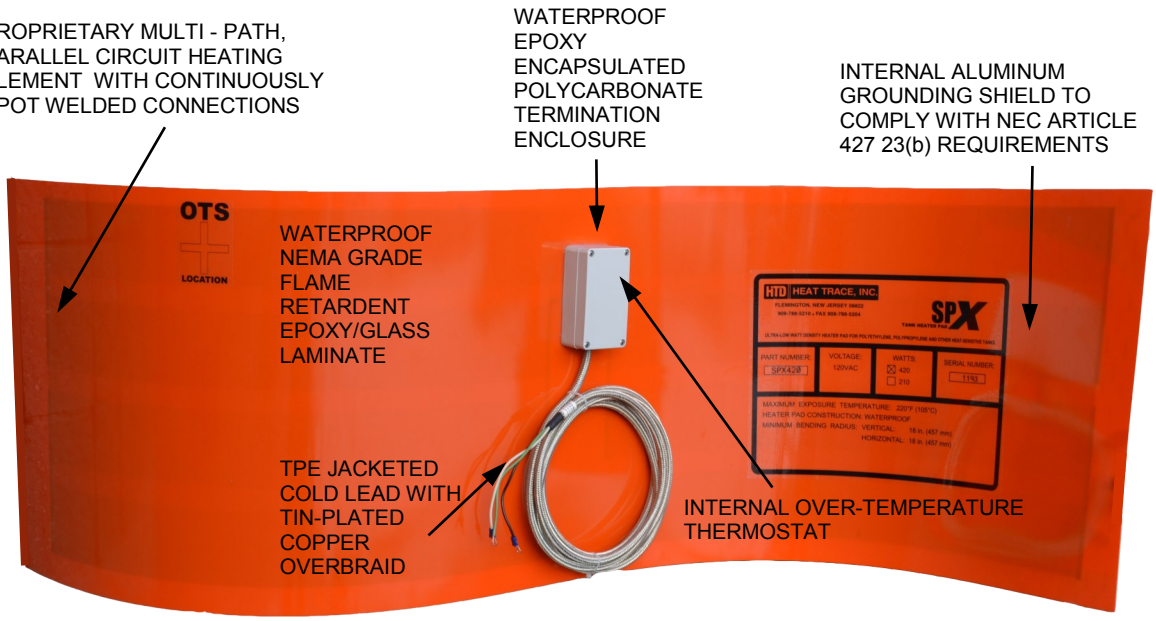

The HTD Heat Trace SPX heater pad is the latest step in the improvement of the SilcoPad range of heaters for plastic tanks.
The SPX epoxy/glass composite construction was first developed and used in the Eagle Panel range of products for heating FRP tanks. This rugged construction has been re-engineered for performance on heat-sensitive tanks, resulting in a new, ultra-low watt density, highly flexible, waterproof heating pad that includes adhesive backing for quick and simple installation.

The SPX tank heater pad has been specifically designed for temperature maintenance and freeze protection on heat-sensitive polyethylene and polypropylene tanks. These tanks require ultra-low watt density, evenly applied heat.

The SPX heater pad provides this with the added safety feature of an internal over-temperature thermostat.
This extra feature ensures that the pad cannot operate above the maximum permissible temperature of the tank.

Being completely waterproof, the new SPX heater pad will continue to operate as designed even if rain, flooding or tank overflow infiltrates between the tank and the thermal insulation.
The new HTD Heat trace SPX 210 and SPX 420**:** engineered for efficiency, long life and safety.

8 Bartles Corner Road, Unit # 104
Flemington, NJ 08822-5758 USA
Tel (908) 788-5210
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WWW.HTDHEATTRACE.COM

HTD HEAT TRACE

SPECIFICATIONS

PLASTIC TANK HEATING PAD

PRODUCT FEATURES

ULTRA-LOW WATT DENSITY	SPX Tank Heater pads have a power rating of 0.39 w/sq.in(603 w/m²) for ultra-safe operation and reliability on heat-sensitive applications
LAMINATED CONSTRUCTION WITH PEEL AND STICK APPLICATION	With its laminated, epoxy composite construction, the SPX heater pad is superbly qualified to meet the rigorous requirements for use in all industrial and climatic environments. It is extremely rugged, completely waterproof, dust-tight and corrosion-resistant.
MULTI-PATH PARALLEL CIRCUIT HEATING ELEMENT	SPX heater pads are built with unique multi-path, parallel circuit heating elements that are significantly safer and more reliable than the series type heating elements used in competitors products.

PRODUCT REFERENCES, RATINGS AND SIZES

SPX 420	420 Watts (0.39 w/sq.in) 60" long by 18" wide (457 x 762 mm)
SPX 210	210 Watts (0.39 w/sq.in) 30" long by 18" wide (457 x 1524 mm)

APPLICATIONS AND USAGE

TANK MATERIAL	APPLICATION RANGES	SPX 420	SPX 210
Polyethylene, Polypropylene	Up to 120° F (49°C)	YES	YES
FRP	Up to 150° F (66°C)	YES	YES
Steel, Stainless Steel	Up to 150° F (66°C)	YES	YES

DESIGN RATINGS

MAX MAINTAIN TEMP	150°F (66°C)
MAX EXPOSURE TEMP	220°F (104° C)
MIN INSTALLATION TEMP	40° F (4.4°C)
MINIMUM BENDING	15" (381 mm) Do not install SPX pads on any tank that is less than 30" (762 mm) diameter
VOLTAGE RATINGS	120 VAC *Consult HTD for 240 VAC applications

CONSTRUCTION

HEATING ELEMENTS	Multi-path, parallel circuitry
CIRCUIT CONNECTIONS	Stainless steel bridge pieces continuously spot welded with triple welding passes
DIELECTRIC CONSTRUCTION	Multi-layer glasscloth composite
LAMINATE PROPERTIES	Density - 0.069 lbs/cu.in Rockwell Hardness - 115 Flexural Strength - 50,000 psi Dielectric Strength - 550 vpm Flammability Rating - UL-94.V.O
GROUND SHIELD	5 mil thick aluminum mesh
TERMINATION METHOD	Epoxy encapsulated polycarbonate termination box
COLD LEAD CABLE	3-16 AWG conductors with TPE outer jacket and Tin-Plated Copper over-braid
COLD LEAD LENGTHS	Standard lengths: SPX 210 SPX 420 10 FT (3 m) SPX 210-16 SPX 420-16, 16 FT (4.87 m) Custom cold lead lengths available to suit your application. 2 Ft. min., 50 Ft. max.

T-RATING: T4A

APPROVALS

Factory Mutual approved to IEEE standard 515 and CSA standard C22.2 no.130-03 for use in the following areas:
Unclassified
Class I Div.2 Groups B,C,D
Class II Div.2 Group F,G
Class III Div.2

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Appendix C

2XTC Controller Datasheet

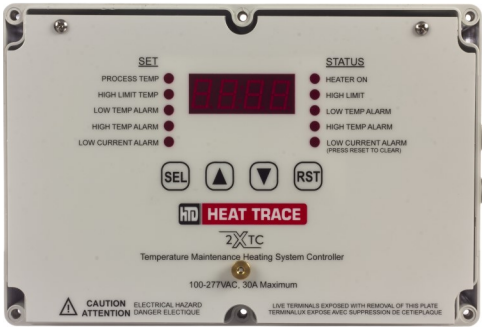
2XTC

Microprocessor Based Tank Heating Controller

The 2XTC Tank Heating Controller is the most complete and versatile tank heating controller in existence. Use this product to accurately control SPX and EGLX tank heating pads as well as WinterSafe Self-Regulating Heating Cable.

PRODUCT FEATURES

- Process temperature control with hi-limit protection
- 100-277 VAC, 50/60 HZ, 30A
- Use with up to 6 heaters
- Push-on heater connections for a quick installation
- Simple operation and customizable preset
- High temperature, low temperature, and low current alarms
- Alarm contact for communication with customer systems (NO or NC, selectable)
- NEMA4X, IP66, polycarbonate enclosure
- 4-20mA retransmission output
- Includes two RTDs
- cETLus approved for use in the USA and Canada



Contact HTD Heat Trace today to discuss your heat tracing requirements
908-788-5210
sales@htdheattrace.com
www.htdheattrace.com

Description

The HTD Heat Trace 2XTC Temperature Maintenance Heating System Controller is specifically designed for heating systems requiring process temperature control with high limit temperature protection. The most common tank heating applications using process and high limit control are non-metallic tanks, lined tanks or tanks with heat sensitive contents. This controller is designed for use with SPX heating pads, EGLX heating panels, heating cable and any other electric trace heater. The 2XTC controller is provided in a NEMA4X/IP66 polycarbonate enclosure for use indoors or outdoors

The 2XTC controller can be used on power supplies from 100 to 277 VAC for maximum versatility. The controller switches up to a 30A heating load using active arc suppression for maximum relay contact life.

The controller provides indication of process sensor temperature, over limit sensor temperature and heater current using a simple main setting menu. Indication is provided using high visibility LED number indication as well as LED lights showing set values and system status.

The 2XTC controller provides alarm and system status for use with remote monitoring such as DCS or SCADA systems. Alarms are provided for low temperature, high, temperature and low current alarm. These alarms are indicated by lights on the front of the controller and relay contacts for remote indication. Alarm relay contacts are selectable for close or open on alarm. In addition the controller offers current interval testing to periodically test for correct heating current. The current alarm can be set to off if not desired or test frequencies of 24, 168 or 720 hours. A 4-20 mA retransmission output is also provided for remote indication of the process temperature.

Technical Specifications

General

Power Input:	100-277 VAC, 50/60HZ, 30 Amps maximum
Operating Temperature:	-40°F to 113°F (-40 to 45°C)
Process Control:	On/Off with adjustable hysteresis
Process Control Output:	SPST NO Relay rated 30 Amps at 277 VAC with active arc suppression

Setting Range

Process Temperature:	0-200°F
High Limit Temperature:	0-250°F
Low Temperature Alarm:	0-200°F
High Temperature Alarm:	0-200°F
Low Current Alarm:	OFF or 0.5 to 30 Amps

Alarm and System Status

Alarms:	Low Temperature, High Temperature and Low Current
Alarm Indication:	LEDs on the controller face
Alarm Outputs:	SPST Relays rated 5 A at 277 VAC/5A at 30 VDC
Alarm Output Type:	Relay contact Selectable open or close alarm
Retransmission Output:	4-20 mA indication of process temperature with selectable span

Sensor Input

Sensor Type:	1KΩ Platinum RTD, 2 wire
Sensor α:	0.00385

Approval

UL 508

CSA 22.2 #14

HTD HEAT TRACE
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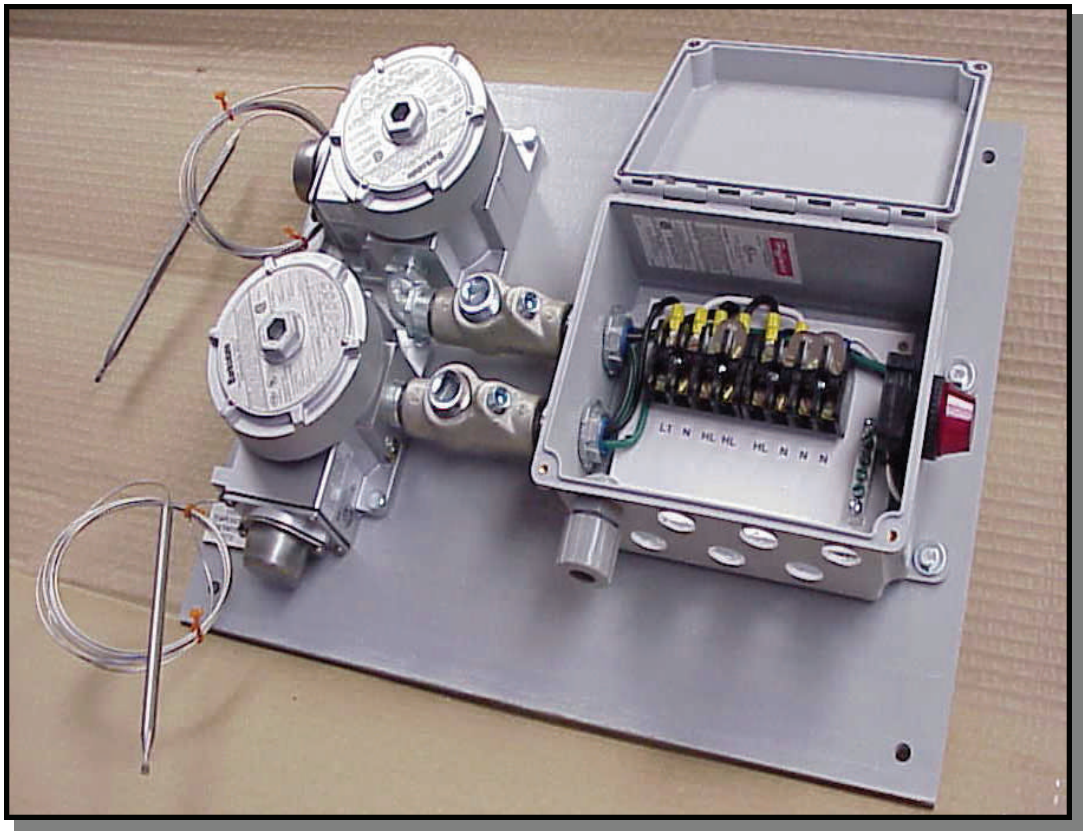
Appendix D

2HSPCP Controller Datasheet

HTD HEAT TRACE

TYPE 2HSPCP

Class 1, Div 2 hazardous area controller



The type 2HSPCP controller has been designed specifically for hazardous area tank heating applications.

The control package consists of two NEMA 7 thermostats for process temperature control and over-temperature control, factory pre wired to a NEMA 4X heater junction box that can accommodate up to 6 heaters. All inter wiring between thermostats and heater junction box is completed in rigid conduit and sealed as per NEC regulations. All components are mounted to an FRP mounting plate to form one, modular control unit that can be installed on or adjacent to the tank surface

Controller Specification.

System Capability	120Vac – 2.6 kW (240Vac also available)
Process thermostat	NEMA 7, 25 to 325º F
Over temperature thermostat	NEMA 7, 25 to 325º F
Thermostat switch rating	22A, 480 Vac
Capillary	10 ft long Stainless steel
Heater junction box rating	NEMA 4X
Enclosure size	8 x 6 x 4 inches
Terminal block	4 point, screw type, 30A 600 Vac
Heater On light	30 mm, full voltage pilot light
Mounting plate	0.375 inch thick FRP
Mounting plate size	20 x 15 inches

HTD HEAT TRACE

Tel (908) 788 5210 Fax (908) 788 5204
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Installation, Operation and Maintenance Manual for The 2XTC Tank Heating Controller

Revision 3
July 1, 2019

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Figures

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Appendices

Chapter One

Overview

1.1 System Overview

The 2XTC Controller is specifically designed for use on non-metallic tanks, lined tanks or tanks with heat sensitive contents in unclassified (non-hazardous) areas. The controller uses process temperature control and high limit temperature protection. Based on the process setting the controller cycles the heating system on and off as needed to maintain the desired temperature. In the event the high limit temperature setting is reached the controller overrides the process and shuts off the heating system to protect the tank, liner or product.

The 2XTC controller is commonly used with tank heaters provided by HTD Heat Trace such as EGLX Tank Heating Panels, SPX tank heating pads or special heaters such as heating cable.

1.2 Controller Specifications

Enclosure Rating:	NEMA4X/IP66, Outdoor
Ambient Temperature Range:	-40°F (-40°C) to 113°F (45°C)
Power Input:	100-277 VAC, 30 A maximum, 50/60 Hz
Process Control Mode:	On/Off with adjustable hysteresis
Alarm Outputs:	(3) SPST NO Relays rated 5A @ 277 VAC/3A @ 30VDC for high temperature, low temperature and low current alarms. Alarm mode selectable for closed on alarm or open on alarm.
Retransmission Output:	4-20 mA for process temperature, adjustable span, 390Ω maximum loop resistance
Qty of Temperature Sensors:	2
Temperature Sensors Type:	1000 Ω platinum RTDs, α=0.00385
Temperature Display range:	0-250°F (-18 to 121°C)
Current Display Range:	0-30 Amps

1.3 Approval

The 2XTC Controller is Intertek (ETL) approved to UL 508 and CSA C22.2 14 for use in the US and Canada. The controller is approved for use in unclassified (non-hazardous) locations.

Chapter Two

Controller Installation

2.1 Controller Location

The 2XTC is rated NEMA4X/IP66 and suitable for outdoor installation. The controller should be located at a convenient height for temperature adjustment and out of high traffic areas to minimize the possibility of physical damage. Where possible the controller should be mounted out of direct sunlight to provide maximum visibility for display and indicating lights.

2.2 General Wiring Details

To connect heaters, power and signals it is necessary to remove the clear cover of the enclosure remove the brass thumb knob to allow the hinged plate to be raised. Incoming power supply is connected to the terminal block in the lower left corner of the enclosure with ground connected to the ground bar. Heater connections are completed using the quick connect terminals in the center area. Signal connections such as RTDs, alarm relays and alarm contacts are completed on the designated terminal blocks.

All holes in the enclosure must be sealed using cord grips, conduit connections and/or hole seals to maintain the NEMA4X/IP66 enclosure rating.

2.3 Heater Connection

Heater connections are routed into the controller using cord grips, conduit fittings or other listed sealing method rated NEMA4X/IP66. Depending on the specific controller option ordered it may include ½" NPT clearance holes for connecting heaters into the controller and 3/8" NPT clearance holes for RTD connection. Any holes not used must be sealed using a listed NEMA4X/IP66 sealing fitting. See Chapter 4 section 4.1, 3 for additional details.

Heater electrical connections are made using fully insulated quick connect terminals for ¼" tabs supplied on the heater or by the installer.

2.4 Power Connection

The most common controller configuration includes a ½" NPT clearance hole (Ø0.84") provided in the lower left enclosure wall for bringing power connection into the controller. When routing power into the controller the clearance hole must be sealing using a NEMA4X/IP66 rated conduit fitting or cord grip (where allowable by Code).

2.5 Signal Connections

In the most common controller configuration a ½" NPT clearance hole (Ø0.84") is provided in the upper left enclosure wall for bringing signal connections into the controller. Signal connections into the controller the clearance hole must be sealed using a listed NEMA4X/IP66 conduit fitting or cord grip (where allowable by Code). If this hole is not used it must be sealed using a listed NEMA4X/IP66 hole seal.

2.6 RTD Connections

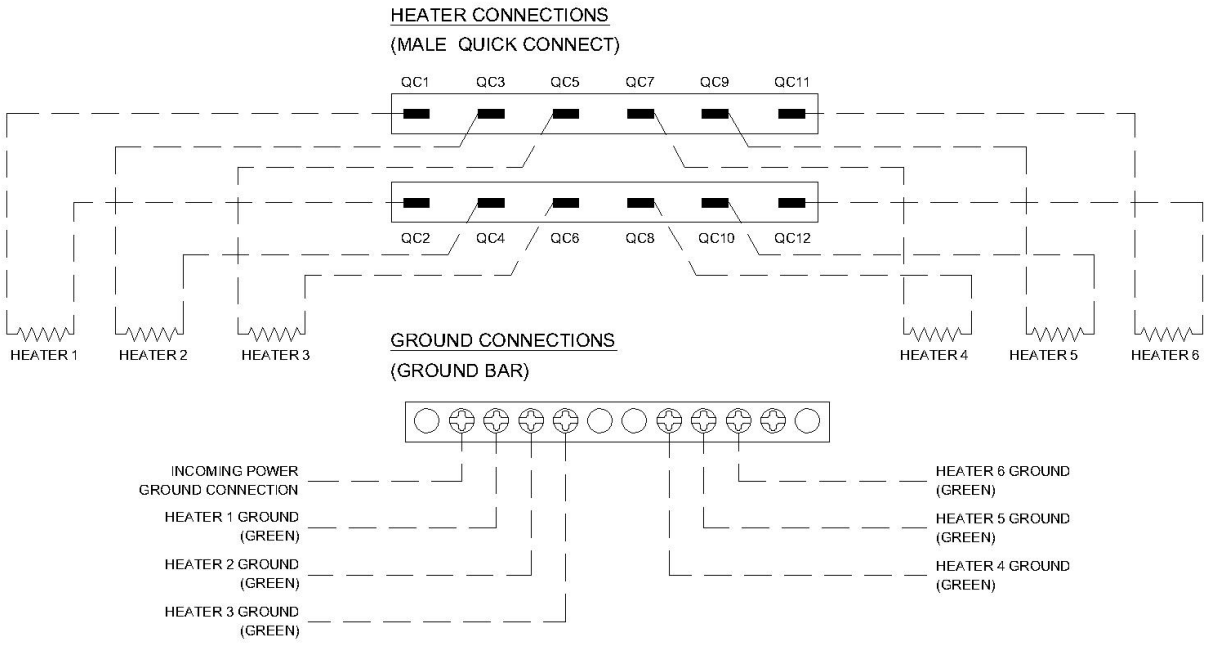
In the most common configuration the controller includes two 3/8" NPT clearance holes (Ø0.68") in the right enclosure wall for bringing the RTD wires. The RTDs are connected to the terminal blocks labelled RTD1 and RTD2. RTD1 is the process temperature sensor and RTD2 is the high limit temperature sensor. RTD connections into the controller the clearance hole must be sealing using a NEMA4X/IP66 rated cord grip. In most cases the controller is provided with RTDs and cord grips pre-wired from HTD Heat Trace with 10' long leads. When supplied by HTD the process temperature RTD is labelled PCS and high limit temperature HLS.

Chapter Three

Connection and Routing

3.1 Heater Connection

1) For heaters having the same voltage rating as the power supply complete heater connections as shown in figure 1. The controller can be used on voltages from 100 to 277 VAC however the heaters used must match the supply voltage. ***Failure to correctly match the heaters to the supply voltage can result in damage to the heated surface, the heaters, and/or 2XTC controller. For heaters requiring series connections contact HTD for wiring details.***



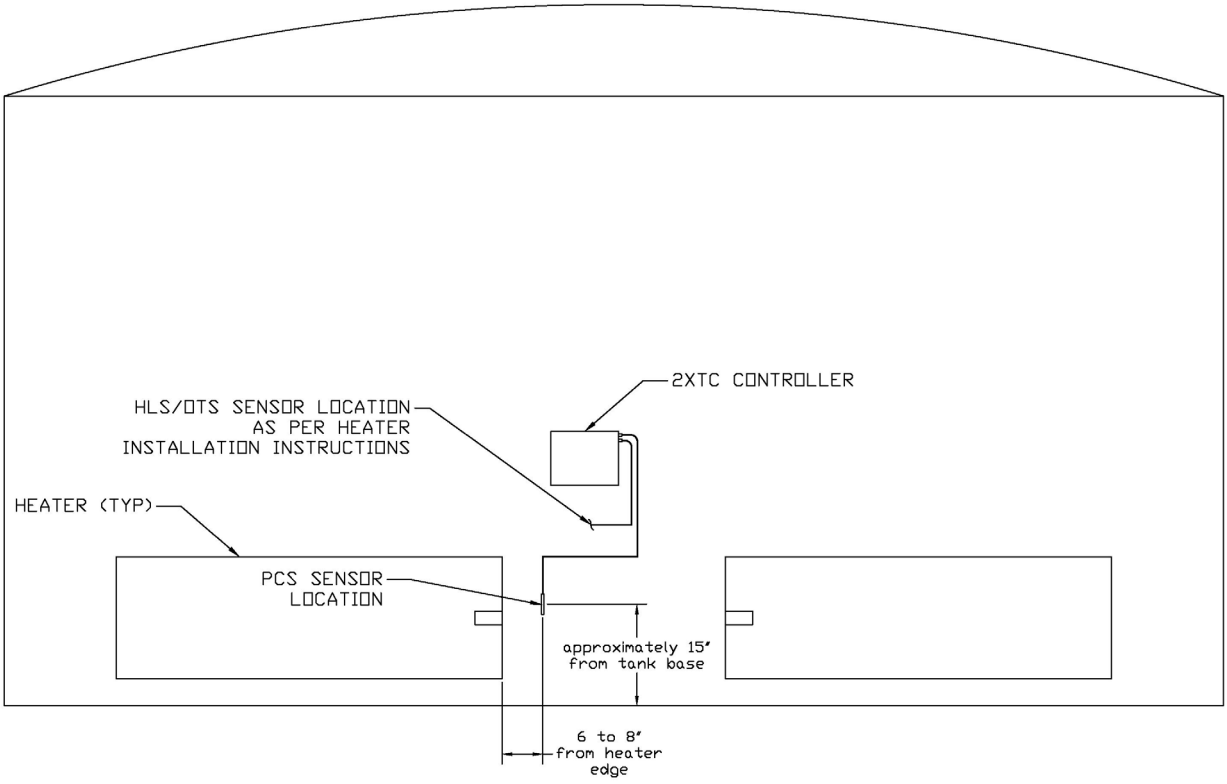
Heater Connection

Figure 1

2) Connect the black lead and the white leads on each heater using fully insulated quick connect terminals. Factory installed terminals are provided with some heaters, otherwise the heater lead connections must be accomplished with fully insulated terminals for 16AWG wire and ¼" wide x 1/32" thick tab. Black heater leads should be connected to the odd numbered tabs and white leads to the even numbered tabs. To aid in troubleshooting connect heaters as shown in Figure 1. The green (ground) leads must be connected to the grounding bar as per wiring diagram. ***Maximum current draw for any one (1) pair of heater terminals must not exceed 20 Amps.***

3.2 Sensor Location

1) The temperature sensor designated as “PCS” inside the control package must be located as per fig 2 and installed on the tank surface using aluminum tape.



Sensor Location
Figure 2

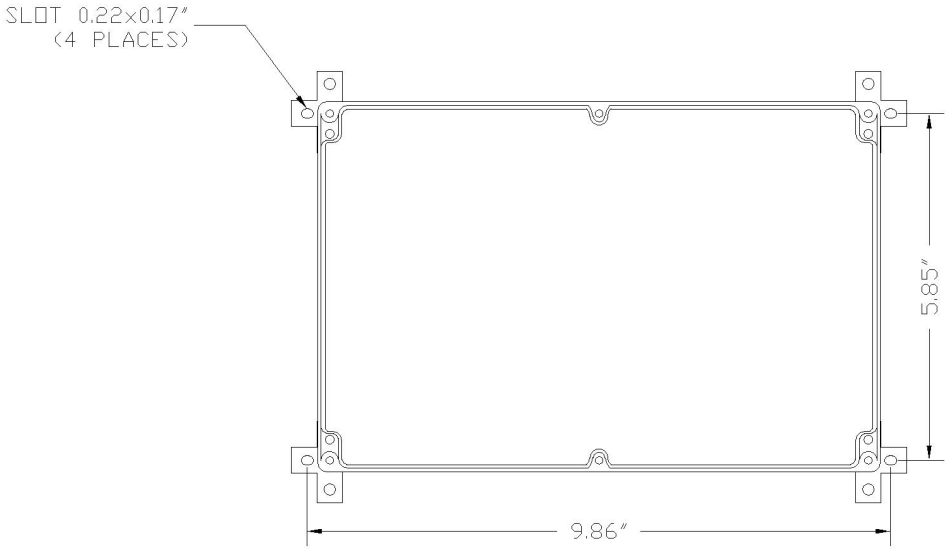
2) The temperature sensor that is designated “HLS” must be located as detailed in the specific heater installation instructions referred to as HLS or OTS [Over Temperature Sensor]. Correct location of the HLS sensor is critical to safe heating system operation.
3) Route the temperature sensor leads as shown in fig 5 using 4” strips of aluminum tape. Excess sensor lead should be coiled neatly under the control package and protected.

Chapter Four

Controller Installation

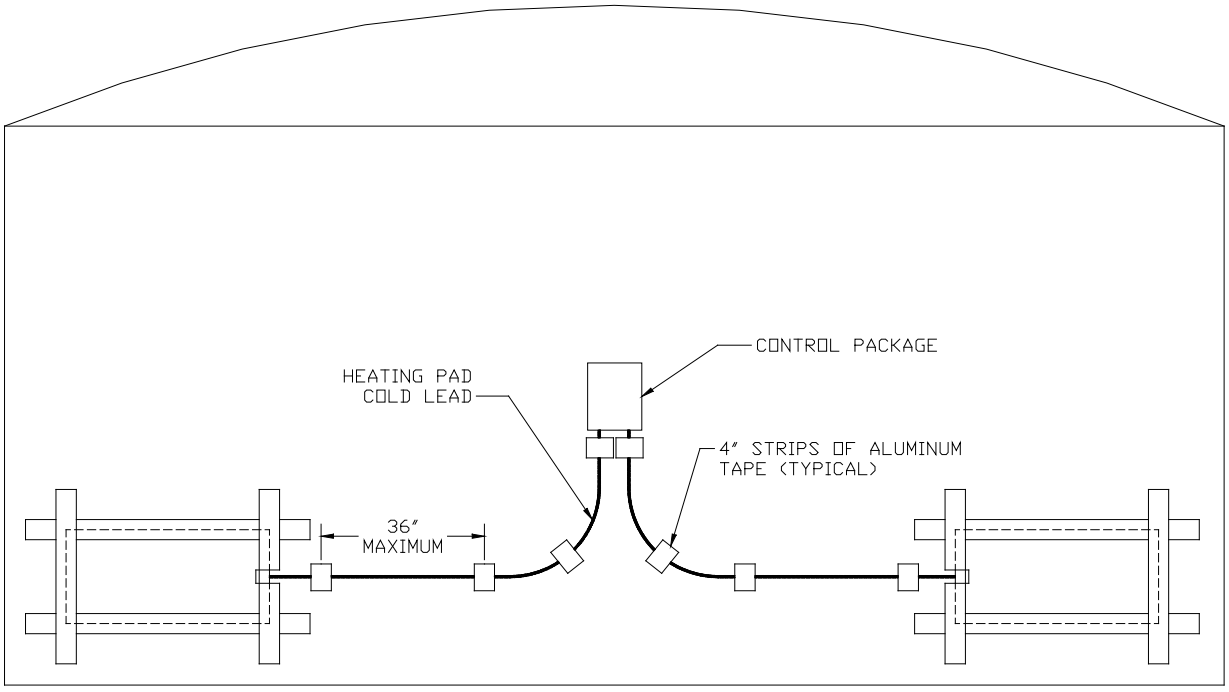
4.1 Physical Installation

1) Mount the control package in the location determined during the heater installation. Mounting dimensions using 2XTC enclosure mounting feet as show below. 2XTC controller mounting pads are available from HTD Heat Trace by contacting sales@htdheattrace.com or 908 788-5210 option 1. The mounting pad provide a quick and easy method for mounting the controller using adhesive backing.



2XTC Controller Standard Mounting Feet.
Figure 3

2) Run the cold leads from each heater to a common point below the control package. Cold leads should be secured to the tank with 4" long strips of aluminum tape as shown in fig 2.



Cold Lead Routing

Figure 4

3) Heater leads must be routed into the controller using cord grips, conduit fittings or other listed NEMA4X/IP66 sealing method. Allow approximately 6" of cold lead for termination inside the control package. Any clearance holes not used must be sealed with a listed NEMA4X/IP66 sealing method. Cord grips and hole plugs are available from HTD Heat Trace by contacting sales@htdheattrace.com or 908 788-5210 option 1.

Chapter Five

Power Supply Connection

5.1 Power Supply Requirements

The required customer supply to the controller is 100-277 VAC, 50/60HZ depending on the heaters being used. ***Supply voltage must match the heater design voltage to prevent damage to the heaters or surface being heated***. The controller has a maximum current of 30 Amps and is labeled to reflect the maximum rating of the controller. The incoming power supply should be sized to fit the specific heating system supplied.

US and Canadian Electric Codes require that all heat tracing systems have ground fault protection. Circuit breakers are commonly available to provide equipment level ground fault protection. Circuit breakers for protection of tank heating systems should be 30 mA trip units. *GFI type breakers with a 5 mA ground fault are trip designed for personnel protection are not suitable for equipment protection and can cause nuisance tripping*.

Circuit Breaker Sizing Criteria:

1. Determine the power of the heating system.
2. Divide the heating system power by system voltage to determine the nominal current.
3. Size the circuit breaker at 125% of the heating load minimum or as required by applicable code.
4. Choose the circuit breaker that most closely matches the calculation, see example.

Example:

1. A heating system with 2 – SPX420 heating pads has a power of 840 watts on 120 VAC.
2. By dividing the power by the voltage 840w/120 VAC is 7 A.
3. Sizing the circuit breaker at 125% requires a circuit breaker of 8.75 A or greater.
4. Pick the closest circuit breaker that is not less than 125% of the nominal load. The lowest commonly available circuit breaker trip setting is 15 A. Use a 15A, 120VAC, 30mA ground fault protected circuit breaker.

5.2 Customer Connection

Incoming power to the controller must be routed into the controller using a listed NEMA4X/IP66 sealing method such as a conduit fitting or cord grip (where allowable by code). Incoming power terminal blocks accept 10 AWG maximum wire size. The torque rating for the incoming power terminal blocks is 9.0 in-lb., **DO NOT OVERTIGHTEN**.

Chapter Six

Signal Connections

6.1 RTD Connections

The 2XTC controller uses 2 RTD temperature sensors one for process temperature and one for over temperature protection. Both RTDs are platinum, 1000 Ω, 2 wire sensors as per the specification in Appendix B. Both RTDs must be connected for the controller to operate.

6.2 Alarm Output

Alarm outputs are provided for low temperature, high temperature and low current. In the event of an alarm the appropriate indicating light on the front of the controller illuminates. Also in the event of an alarm the appropriate relay contacts change state. The alarms contacts are software selectable for close on alarm or open on alarm.

6.3 Retransmission Output

A retransmission output is provided to remotely indicate the process value. The signal is 4 to 20 mA with an adjustable span by setting the minimum and maximum temperature values. On sensor failure or over/under range the retransmission output goes to 23 mA. The equipment used to measure this signal must have an input resistance of ≤390Ω.

6.4 Signal Connections

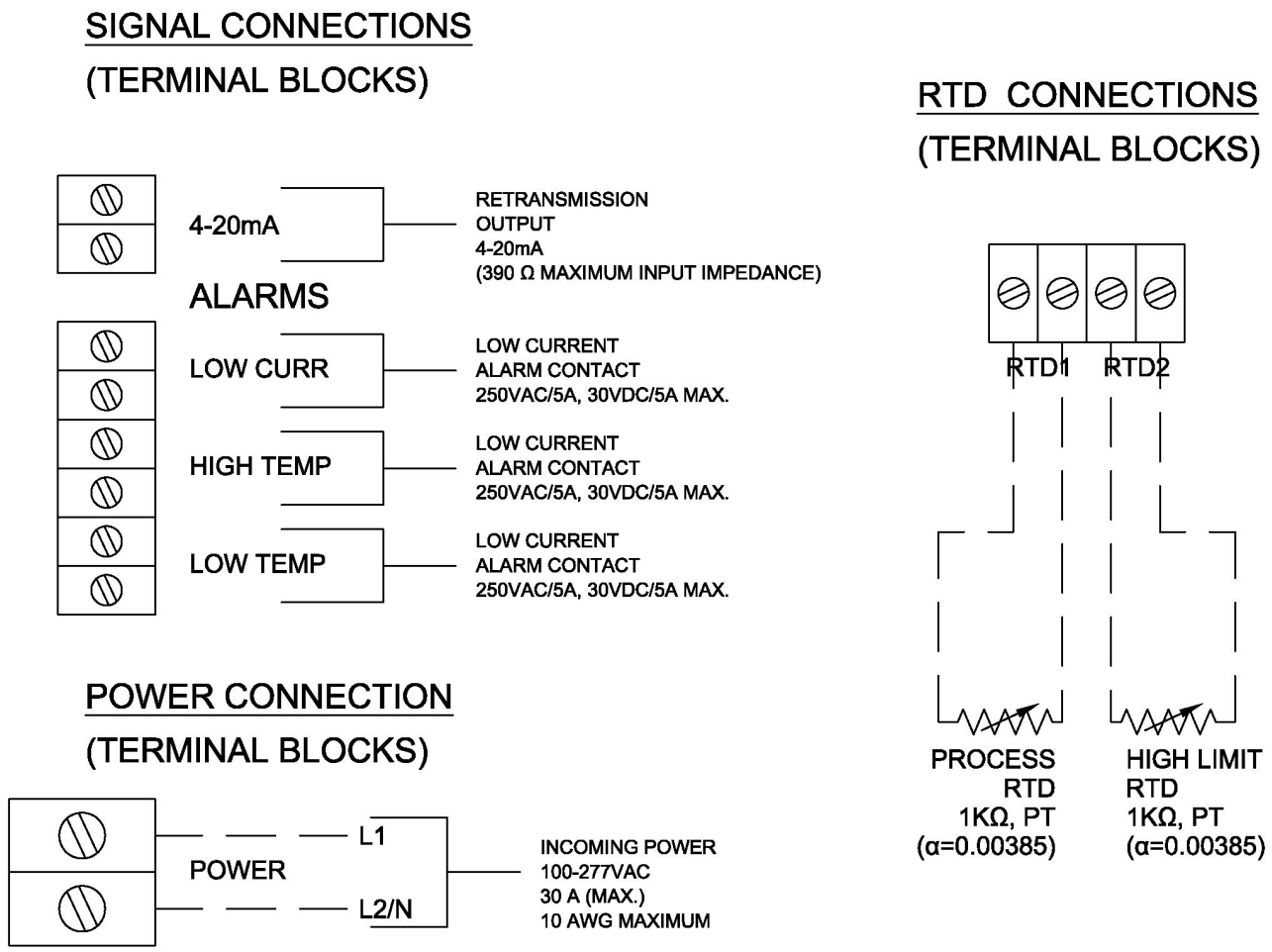


Figure 5

Chapter Seven

Controller Operation

7.1 General Information

The type 2XTC controller has two operating temperature settings. The PCS sensor is for control of the process temperature and the HLS for high limit temperature protection. The heating system is energized when the process temperature drops below the set point. The heating system stays energized until the process temperature exceeds the set point. In this manner the desired tank temperature is maintained by cycling the heating system on and off as required.

The HLS senor shuts off the heating system if a heater temperature exceeds the high limit temperature setting. This protects the tank and/or product from over temperature caused by upset conditions, such as low liquid level.

System status both set values and process values are indicated by lights on the front plate of the controller.

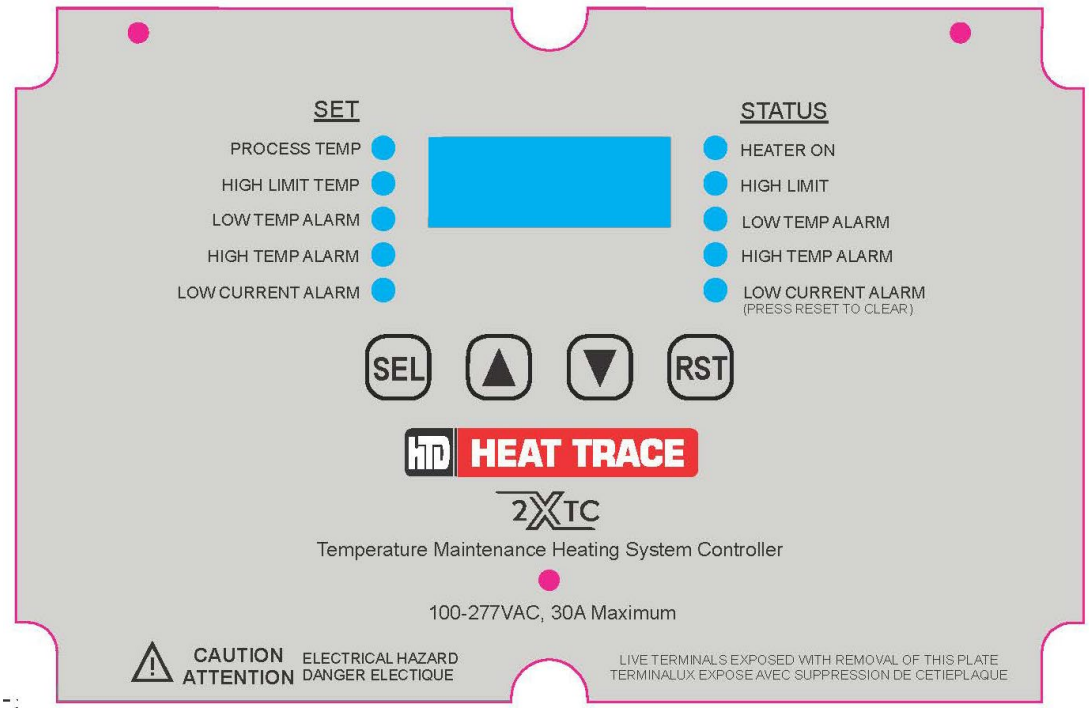


Figure 6

Values under the “SET” notation are values set by the user and also display process values. Indication under STATUS shows heating system operation and alarm status.

7.2 Main Menu Settings

The 2XTC has 5 control and alarm settings listed under the "SET" heading:

- Process Temperature (PROCESS TEMP)
- High Limit Temperature (HIGH LIMIT TEMP)
- Low Temperature Alarm (LOW TEMP ALARM)
- High Temperature Alarm (HIGH TEMP ALARM)
- Low Current Alarm (LOW CURRENT ALARM)

The values can be seen and adjusted using the keys on the hinged plate assembly. The controller defaults to displaying the process temperature indicated by the light next to "PROCESS TEMP" illuminated. When the light is solidly lit the display is showing the process temperature.

7.2.1 Process Temperature Setting

The process set value should be adjusted to the desired process temperature. Standard system designs are limited to a maximum maintain temperature of 100°F. Contact HTD Heat Trace for applications with process settings above 100°F.

7.2.2 High Limit Temperature Setting

The high limit temperature set value protects the tank, tank liner or product from high heater temperatures. If the heating pad reaches the high limit temperature setting the heating system is shut off to protect the tank or heat sensitive component. The 2XTC controller includes factory presets to cover the majority of heating applications. See Appendix C for all preset options. Default 2XTC set values are 60°F for process set value and 150°F for high limit temperature set value.

The 2XTC high limit temperature set value can be adjusted to match the application. Incorrect over-temperature setting can cause damage to the tank, tank liner, product or heater. ***Incorrect high limit temperature settings may result in damage to the tank/liner/product or effect the ability of the heating system to maintain temperature.*** The high limit temperature setting must not exceed the minimum of the following:

a. Maximum tank wall exposure temperature
b. Maximum tank liner or tank contents exposure temperature
c. Maximum heater exposure temperature

****Consult HTD for assistance in determining correct high limit temperature setting.**

7.2.3 Low Temperature Alarm setting

A low temperature alarm is generated when the process temperature drops below the low temperature alarm setting. The differential between the process temperature and low temperature alarm must be large enough to prevent an alarm during normal operation. Using default system settings a differential of 5°F is usually sufficient.

7.2.4 High Temperature Alarm Setting

A high temperature alarm is generated when the process temperature exceeds the high temperature alarm setting. The differential between the process temperature and high temperature alarm must be large enough to prevent an alarm during normal operation. Using default system settings a differential of 5°F is usually sufficient. It is also important to mention with the alarm set below the summer ambient temperatures it is possible for the tank temperature to exceed the high temperature alarm setting with no contribution from the heating system.

7.2.4 Low Current Alarm Setting

The low current alarm can be set to off or the desired current alarm point. The controller default setting is off so no current alarm is generated under any circumstance. The current alarm setting should be based on the wattage of the heating system, design voltage, actual voltage and voltage fluctuations. To get your heating system wattage take the wattage of each heater and multiply by the number of heaters to get the total wattage installed. For example if a tank has 4 each 420 watt heaters and 2 each 210 watt heaters the total system load is 4x420W+2x210W=2100 watts. If the supply voltage matches the heater rated voltage use the **Standard Low Current Alarm Calculation**. If the supply voltage is lower than the heater rated voltage use **Reduced Supply Voltage Low Current Alarm Calculation**.

Standard Low Current Alarm Calculation

If the supply voltage matches the voltage of the heaters being used the alarm setting can be set at shown below:

1) Take the total heating system wattage divided by the supply voltage to get the nominal current.
2) Multiply the nominal current by 74% to allow for supply voltage variation and heater manufacturing tolerance.
3) Set the current alarm to the setting calculated in step 2 rounded to the nearest tenth.

Example Calculation:

a) With a tank heating system using a power supply of 120 VAC and 120 VAC rated heaters consisting of 4 each 420 watt and 2 each 210 watt the total system load is 4x420W+2x210W=2100 watts. The nominal current is then 2100watts/120 VAC = 17.5 amps.
b) Multiply the nominal current of 17.5 amps x 74% = 12.95.
c) Set the current alarm setting to 13.0 amps.

Reduced Supply Voltage Low Current Alarm Calculation

If the operating voltage is below the heater rating the current draw calculation must be adjusted. Procedure to calculate the current alarm setting is shown below:

1) Take the square of the actual supply voltage divided by the heater rated voltage squared to get the power adjustment factor
2) Take the heater rated wattage multiplied by the number of heaters to get the nominal power. Take that calculated number and multiply by the power adjustment factor calculated in step 1 to get the nominal current.
3) Take the nominal current and multiply by 74% to account for supply voltage variation and heater manufacturing tolerance.
4) Set the current alarm to the setting calculated in step 3 rounded to the nearest tenth.

Example Calculation:

a) With a tank heating system with a power supply of 110 VAC and 120 VAC rated heaters the adjustment factor is $110VAC^2/120VAC^2 = 84\%$.
b) A heating system consisting of 4 each 420 watt and 2 each 210 watt the total system load is 4x420W+2x210W=2100 watts nominal power. Take the nominal wattage of 2100 watts multiplied by the power adjustment factor of 84%=1764 watts. The nominal current is 1764 watts divided by the supply voltage of 110 VAC to get 16.04 amps.
c) Take the nominal current of 16.04 and multiply x 74% = 11.87.
d) Set the current alarm setting to 11.9 amps.

*****Contact HTD Heat Trace for assistance in calculating current alarm setting***

7.2.5 System Access Code

The System Access Code (SAC) limits the allowable values for the process and over temperature settings as well as what preset values can be accessed. The factory default setting is 17 which limits the maximum process set point to 100°F and high limit maximum setting to 150°F. This default settings also allows access to Factory Presets 1 to 6. Changing the SAC can allow potentially harmful settings that could result in damage to the tank wall, tank contents, tank lining, heaters, etc. See Appendix D for additional SAC setting information.

7.3 Heating System Status Indication

The 2XTC controller has 5 lights under the "STATUS" heading on the front panel. Status indication includes:

- The heater on light is illuminated when the heaters are energized.
- The over temperature light is illuminated when the heating system operation is being limited by the over temperature set value.
- Low temperature alarm light is illuminated when the process value is below the low temperature alarm set value.
- High temperature alarm light is illuminated when the process value is above the high temperature alarm set value.
- The low current alarm light is illuminated when the operating current is below the current alarm set value. This alarm is latching and must be reset after low current alarm condition is fixed.

7.4 Adjusting Main Menu Settings

Parameter	Default
Process Temperature SP	60F
High Limit Temperature SP	150F
Low Temperature Alarm SP	40F
High Temperature Alarm SP	100F
Current Lo Current Alarm SP	oFF

Table 1 – Main Settings Menu

1. Scroll to the desired parameter using the Up/Down arrow buttons.
2. The corresponding LED to the left of the display will illuminate as each parameter value (Process or High Limit Temp, Low or High Temp Alarm Set point or Current in Amps) is displayed.
3. To view or change a set point press and hold the SEL button for 2 seconds until the LED begins blinking and corresponding set point is displayed.
4. The set point value can now be changed using the Up/Down arrow buttons.
5. Press SEL again to save the new set point value, LED will stop blinking. Menu inactivity timeout will also save changes. Pressing RST will exit the menu without saving changes.
6. Repeat steps 1 through 5 to change another set point.

7.5 System Setup Parameters

System setup parameters define the temperature units, maximum set point values, hysteresis, etc. In most cases these values do not require adjustments.

Parameter	Prompt	Adjustment Range	Default
Temperature Units	F_C	F = Fahrenheit; C = Celsius	F
Max Process SP	PrHL	0 to 200°F (-18 to 93°C) in 1°F or 1°C steps	100F
Max High Limit SP	HLHL	0 to 250°F (-18 to 121°C) in 1°F or 1°C steps	150F
Process Hysteresis	PHYS	2 to 10°F (1.0 to 5.5°C) in 1°F (0.5°C) steps	2F
High Limit Hysteresis	LHYS	5 to 20°F (3.0 to 11°C) in 1°F (0.5°C) steps	5F
Process Temp offset	PoFS	0 to +/-50°F (0 to +/-28°C)	0
High Limit Temp Offset	LoFS	0 to +/-50°F (0 to +/-28°C)	0
Alarm Relay Mode	ArLY	EN=energize on alarm; DE=de-energize on alarm	En
Current test interval (Hrs)	CtP	0=disabled, 24, 168 or 720 hours	168
Retrans Span Min	rtL	0-200°F (-18 to 93°C) for 4mA	0
Retrans Span Max	rtH	0-200°F (-18 to 93°C) for 20mA	100

Table 2 – Main Setup Menu Parameters and Default Settings

7.6 System Setup Adjustment Procedure

a. Press and hold SEL & DOWN buttons for 3 seconds until the first parameter prompt is displayed.
b. Use the Up/Down arrow buttons to scroll through the parameters – only the prompts are displayed.
c. To change a parameter value press SEL when the desired parameter prompt is displayed. The parameter value will begin flashing.
d. Use the Up/Down arrow buttons to change a parameter value.
e. Press SEL again to move to the next parameter prompt.
f. Repeat steps 2 through 5 to change additional parameter values.
g. When all desired parameter values have been changed, press and hold the SEL button for 3 seconds to save all new values and exit the menu. Menu inactivity timeout will also save changes. Press RST to exit without saving changes.

7.7 Factory Presets

Twelve (12) sets of pre-programmed controller operating parameters are available as "Factory Presets" to allow the user to quickly select an appropriate set of parameter values for a specific application. The System Access Setting (SAC) limits accessible presets. The table showing specific settings for each preset are shown in Appendix C. To select a preset # use the procedure below.

Factory Preset Loading Procedure

1. Press and hold SEL and RST buttons for 3 seconds until "fPst" is displayed.
2. Use the Up/Down arrow buttons to scroll to the Preset No. corresponding to the desired application.
3. Press SEL to load these operating parameter values and exit the Presets menu.
4. Press RST to exit with no changes.

Preset #	Abbreviation	Process Temp (°F)	High Limit Temp (°F)	Low Temp. Alarm (°F)	High Temp. Alarm (°F)	Current Alarm
1	PS	60	150	40	100	OFF
2	PSL	60	130	40	100	OFF
3	PDL	60	150	40	100	OFF
4	FP	40	150	35	100	OFF
5	MSPX	60	150	40	100	OFF
6	DEF	25	150	15	100	OFF

*System Access Code (SAC) setting limit access presets 1 to 6 by factory default. See Appendix D for SAC details. Expanded factory preset values shown in Appendix C.

Table 3 – Factory Preset Value Summary

7.8 User Preset

If a specific process has unique setting requirements these values can be saved in the "User Preset" so they can be recalled in the future. The "User Preset" settings are saved to non-volatile memory that can be recalled when needed. To save the currently active parameters to memory as a "User Preset", press and hold the SEL and Up Arrow buttons until UPSt is displayed and then blinks once. The currently active parameters are now saved. Now by loading the User Preset below it is possible to return to the desired settings without having to set each individual parameter.

To recall and load the previously saved "User Preset" parameters, press and hold the Up and Down arrow buttons until "UPSt"is displayed and then blinks once. The previously saved "User Preset" operating parameters are now active.

Changing the System Access Code (SAC) can return all settings to factory defaults.

7.9 Advanced Settings

A hidden menu allows access to secondary parameters that seldom need adjustment and/or should not be changed arbitrarily. This menu is accessed by pressing the 4 buttons on the front panel in the following sequence.

SEL, RST, UP, DOWN, SEL

Parameter	Prompt		Default
Menu Inactivity Timeout	mto	10-120 Seconds	15
Current Alarm Delay	cAd	5 to 10 Seconds	5
Temp Alarm Hysteresis	tAH	1 to 10°F (0.5-5.5°C)	2F
Temp Alarm Delay	tAd	3-30 Seconds	5
Current Interval Test Duration	Ctd	15-60 Seconds	15
System Access Code	SAC	See Appendix X	17

Table 4 - Secondary Setup Menu

**After making changes press SEL to save parameter or allow menu inactivity time out. Press RST to exit without saving changes.

7.10 Power Cycle Reset

1. Remove power from the controller.
2. Press and hold the Up arrow, Down arrow and RST buttons while reapplying power to the controller.
3. Continue holding the three buttons until the software version number is displayed, then release.

Note: Resetting the controller in this way restores all the factory default values, thus requires all user modified setup parameters to be reprogrammed before using.

Chapter Eight

Post Installation Testing and Setup

Some testing requires exposure to electrically live components and should only be completed by an electrician or other qualified personnel.

8.1 Testing

1) Complete testing of the heaters as per the appropriate installation instructions. Testing should include correct heater resistance and insulation resistance (IR) values ≥20MΩ.
2) After successful heater testing connect the heaters as shown in figure 1 on page 5.

8.2 Customer Power

1) With the display plate closed turn on customer power to the heating system.
2) Verify the controller display lights up and no error codes are shown.
3) Correct power wiring if necessary.

8.3 Controller

1) Set the desired operating controller operating parameters as shown in Chapter 6.
2) Raise the process temperature setting until the “Heater On” light illuminates. Scroll down to the current set light and confirm the correct current.
3) If current is correct return process temperature setting to the original value.

Chapter Nine

System Maintenance

Maintenance Schedule

Procedure	Frequency*	Recommendations
Voltage Check (voltmeter)	Every 6 Months	a) Reduced voltages should be evaluated to determine decreased power levels and the potential impact on the performance of the tank heating system. b) Operating voltages over 10% above the heater rating are not acceptable. De-energize the system and investigate cause of over-voltage. Do not re-energize the system until the cause of excess voltage is eliminated.
Current Check	Every 6 Months	Verify correct current draw based on the size of the heating system. Verify by raising set values to energize the heater and confirm correct current using the controller current display by scrolling to the current set value.
Functional Check	Every 6 Months	Verify the controller is working correctly by adjusting the process temperature setting to turn on and off the heating system.
Physical	Every 6 months	a) Clean the controller exterior with a damp cloth to remove any dirt, dust or debris. b) Check the controller interior for dust, dirt, or moisture. Wipe out the interior using a lint free cloth to remove dust/dirt and moisture as necessary.

Table 5 – Maintenance Schedule

*Inspection frequency should be evaluated based on the process type. Freeze protection systems for example may only require inspection once a year prior to freezing temperatures in the fall. Process critical systems should be inspected more frequently.

Chapter Ten

Troubleshooting and Spare Parts

10.1 Troubleshooting Guide

Issue	Possible Cause	Possible Solution
Controller does not light up	a. Check power is present b. Correct power connections c. Check ribbon cable connection from power board to display board	Verify Correct Verify/Correct
Heaters do not energize	a. No incoming power b. Incorrect Heater Connections c. Failed or damaged temperature sensor	Switch on/reset Correct wiring Replace
"Heater on" light does not illuminate	a. Heating not required to maintain temp. b. No incoming power c. Incorrect controller settings d. Failed or damaged temperature sensor	Heat not required Switch on/reset Correct settings or Replace
Low tank Temp.	a. No incoming power b. Incorrect controller settings c. Low incoming product temp. d. Damaged/missing thermal insulation e. Low tank liquid level f. Damaged/failed heating pad g. Incorrect heater connections h. Failed or damaged temperature sensor	Switch on/reset Correct temp. controller settings Wait for product heat up (can take a very long time) Repair or replace insulation Fill Tank Repair or replace Correct wiring Replace
High Tank Temp.	a. Incorrect controller settings	Correct
Customer supplied breaker trips	a. Damaged wiring b. Damaged heater c. Incorrect heater connection	Repair or replace Repair replace Correct wiring
"LO" is displayed	a. Process or over temperature value is below 0°F (-18°C)	Raise temperature
"HI"	a. Process or over temperature value is above 200°F (93°C) for process or 250°F (121°C) over temperature	Lower temperature
PRB1	a. Process temperature sensor fault	Correct wiring, verify correct sensor type or replace sensor
PRB2	a. Over temperature sensor fault	Correct wiring, verify correct sensor type or replace sensor
ERR	a. Controller error	Power Cycle Reset the controller as described in Chapter 7, Section 10.

Table 6 - Troubleshooting

10.2 Accessory and Spare Parts List

HTD Part#	Item
H05900	RTD Sensor 1000 KΩ, 10’ leads, 2 wire
H01223	Cable gland sealing insert
H01210	Lever nut 32A, 600VAC, AWG 24 - 12 solid, stranded, flexible for series connections
G01221	Heater or Power Cord grip (including sealing ring and nut)
G01222	RTD Sensor Cord grip (including sealing ring and nut)
586DB-1	2XTC Display Board
586PB-1	2XTC Power board
2XTCMP	Controller mounting pad assembly
2XTC-RC	2XTC Ribbon Cable
2XTC-MB	2XTC Mounting bar for controller mounting using banding

Table 7

Chapter Eleven

HTD Heat Trace Contact Information

11.1 General Contact Information

HTD Heat Trace can be contacted via any of the methods listed below:

Mail and Physical Address

HTD Heat Trace, Inc.
8 Bartles Corner Rd, Unit 104
Flemington, NJ 08822

Phone

Telephone: 908 788-5210
Fax: 908 788-5204

E-mail: support@htdheattrace.com

11.2 Technical Support

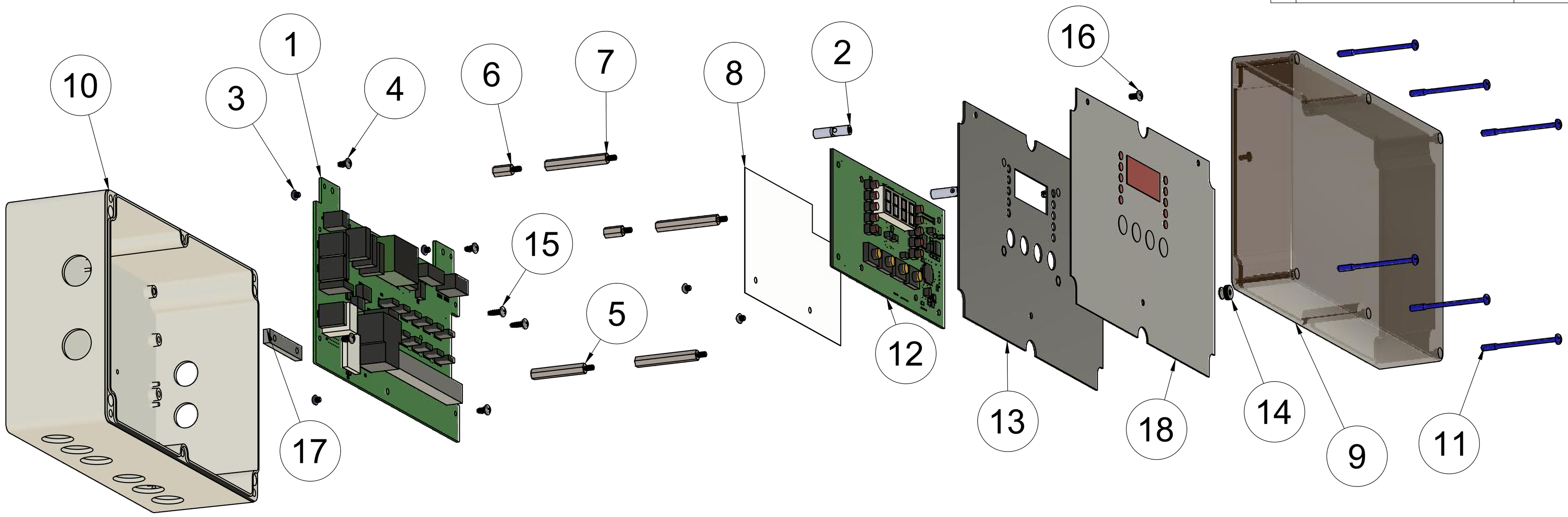
Technical support is available from 8:00 am to 4:30 PM EST Monday through Friday at 908 788-5210 option 2.

HTD HEAT TRACE
8 Bartles Corner Road, Unit 104, Flemington, NJ 08822 • 908 788-5210 • Fax 908 788-5204

Appendix A

Drawings

REVISIONS			
REV	DESCRIPTION	APPROVED	DATE
–	INITIAL RELEASE	SRB	1/28/19



PARTS LIST			
ITEM	QTY	PART NUMBER	DESCRIPTION
1	1	586PB-1	POWER BOARD ASSEMBLY
2	2	31-2210-2	HINGED STANDOFF,F/F,6-32,1.00"L
3	5	30-1002-18	PPH SCREW,6-32X5/16"LW/EXT TOOTH WASHER
4	4	30-1023	PPH THREAD-FORMING SCREW (BOPLA59006101)
5	1	31-2202-12	HEX STANDOFF,M/F,6-32,1.500"L
6	2	31-2202-4	HEX STANDOFF,M/F,6-32,0.500"L
7	3	31-2202-14	HEX STANDOFF,M/F,6-32,1.750"L
8	1	31-4037	DISPLAY BD INSULATING SHIELD
9	1	31-3162-2	ENCLOSURE COVER,CLEAR
10	1	31-3162-1	MODIFIED ENCLOSURE BASE
11	6	30-1026	COVER SCREWS,BOPLA#02243100
12	1	586DB-1	DISPLAY BOARD ASSEMBLY
13	1	31-3163-1	FRONT PANEL ASSEMBLY
14	1	30-2006	KNURLED-HEAD THUMB NUT,6-32
15	2	30-1024-6	THREAD-FORMING SCREWS
16	2	30-1002-17	COVER SCREWS

PARTS LIST			
ITEM	QTY	PART NUMBER	DESCRIPTION
17	1	31-2123	TERMINAL SUPPORT SPACER
18	1	47-1020	FRONT PANEL ASSEMBLY

CONTROLLER RATINGS

OPERATING TEMPERATURE:	-40 TO 41°C/-40 TO 105°F
ENVIRONMENTAL RATING:	NEMA4X/IP66
OPERATING VOLTAGE:	100-277VAC
MAXIMUM CURRENT:	30 A
ALARM CONTACT RATING:	250VAC/3A, 30VDC/5A

NOTES:

1) STANDARD ENCLOSURE HOLE PATTERN SHOWN.
2) CONTROL ENCLOSURE AVAILABLE IN MULTIPLE CONFIGURATIONS OF CLEARANCE HOLES CONTACT HTD HEAT TRACE (908) 788-5210 FOR ADDITIONAL INFOMRATION.
3) SEE SHEET 2 FOR WIRING CONNECTIONS.

MODEL	ITEM	QTY	PART NO.	DESCRIPTION

SIGNATURES	DATE
DWN: SRB	1/28/19
APVD:	
QA:	

DIMENSIONS ARE IN INCHES
TOLERANCES, UNLESS SPECIFIED OTHERWISE:
2 PL ±0.05 FRACTION ±1/32
3 PL ±0.020 ANGLE ± 1.0°

SCALE: NONE

HTD HEAT TRACE, INC.
FLEMINGTON, NEW JERSEY 08822

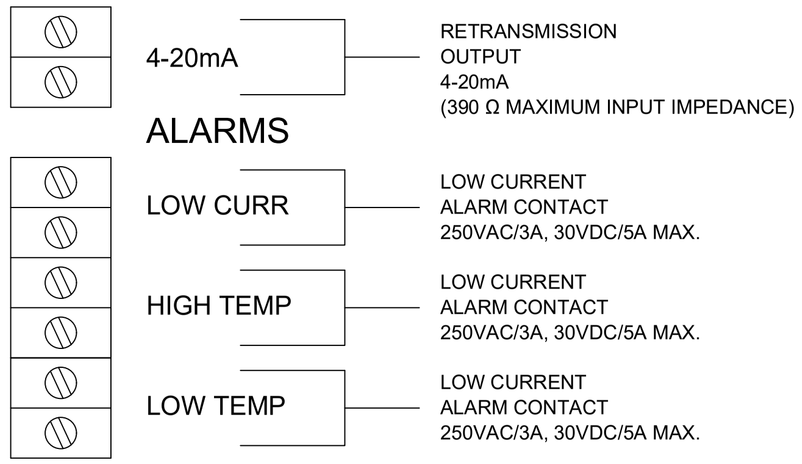
TITLE
2XTC TEMPERATURE CONTROLLER
NEMA4X, 100–277 VAC, 30 A
LAYOUT AND WIRING CONNECTIONS

SIZE	CONTRACT NUMBER	DRAWING NUMBER	REV
B	NONE	2XTC	–

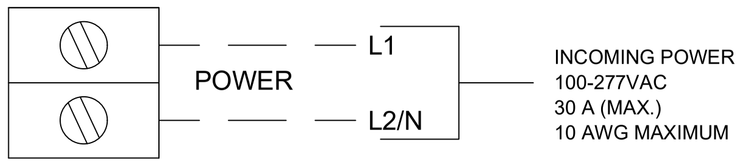
FILE: 2XTC–C

REVISIONS			
REV	DESCRIPTION	APPROVED	DATE
–	INITIAL RELEASE	SRB	1/28/19

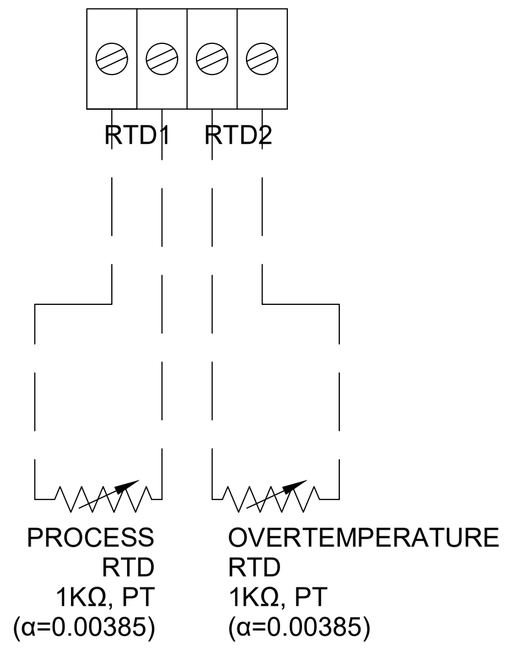
SIGNAL CONNECTIONS
(TERMINAL BLOCKS)



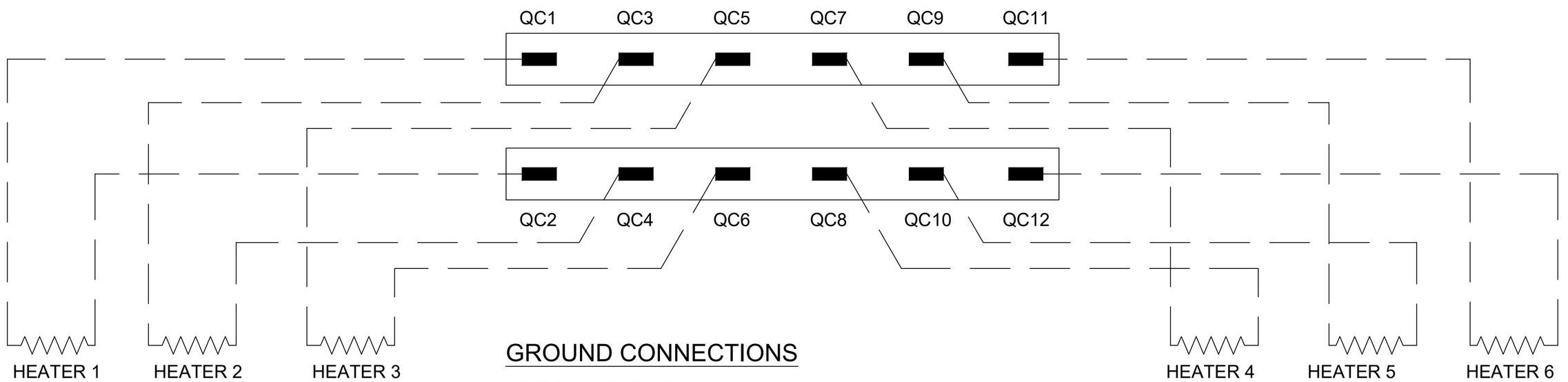
POWER CONNECTION
(TERMINAL BLOCKS)



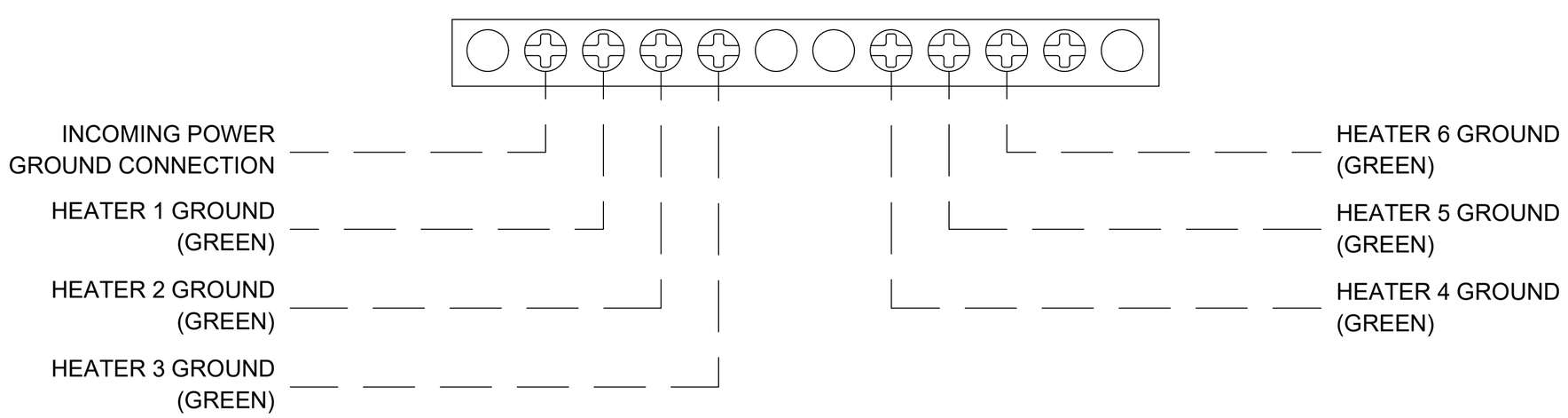
RTD CONNECTIONS
(TERMINAL BLOCKS)



HEATER CONNECTIONS
(MALE QUICK CONNECT)



GROUND CONNECTIONS
(GROUND BAR)



NOTES:

1) CONTROLLER CONSTRUCTION AND BILL OF MATERIALS SHOWN ON SHEET 1.
2) INCOMING POWER MUST MATCH HEATER VOLTAGE TO PREVENT DAMAGE TO THE HEATER(S) AND/OR HEATED SURFACE.
3) HEATER CONNECTIONS USING QUICK CONNECT/FLAG TERMINALS FOR 0.25" WIDE X 0.032" THICK TABS, FULLY INSULATED AND MUST INCLUDE NRTL LISTING FOR THE US AND CANADA.
4) SIGNAL AND RTD TERMINALS ACCEPT WIRE SIZES 12-26 AWG OR EQUIVALENT.
5) CONTACT HTD HEAT TRACE (908) 788-5210 OPTION 2 FOR TECHNICAL SUPPORT.

MODEL	ITEM	QTY	PART NO.	DESCRIPTION

SIGNATURES	DATE
DWN: SRB	1/28/19
APVD:	
QA:	

DIMENSIONS ARE IN INCHES
TOLERANCES, UNLESS SPECIFIED OTHERWISE:
2 PL ±0.05 FRACTION ±1/32
3 PL ±0.020 ANGLE ± 1.0°

SCALE: NONE

HTD HEAT TRACE, INC.
FLEMINGTON, NEW JERSEY 08822

TITLE
2XTC TEMPERATURE CONTROLLER
NEMA4X, 100–277 VAC, 30 A
LAYOUT AND WIRING CONNECTIONS

SIZE	CONTRACT NUMBER	DRAWING NUMBER	REV
B	NONE	2XTC	–

FILE: 2XTC–C–P2

HTD HEAT TRACE
8 Bartles Corner Road, Unit 104, Flemington, NJ 08822 • 908 788-5210 • Fax 908 788-5204

Appendix B

RTD Specifications

RTD Element Specifications

Parameter	Value
Element Type	RTD
Nominal Resistance:	1000Ω@0°C
α:	0.00385 Ω/Ω/°C
Element Class:	A or B
No. of Wires:	2
Maximum Temperature Exposure:	300°F/150°C

**Nominal wire size 24 AWG with 10’ long leads. For longer lead lengths and smaller wire gauge contact HTD Heat Trace for potential effects on temperature measurement.

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Appendix C

Detailed Preset Parameters

Detailed Preset Parameter List

	Preset Number*	1	2	3	4	5	6	7	8	9	10	11	12
	Reference	PS	PSL	PDL	FP	MSPX	DEF	PD	FG1	FG2	FG3	MSPXC	MEGLX
Main Setpoint Menu	Process Temp	60	60	60	40	60	25	60	60	60	60	60	60
	High Limit Temp	150	130	150	150	150	150	175	150	180	200	220	250
	Low Temp Alarm	40	40	40	35	40	15	40	40	40	40	40	40
	High Temp Alarm	100	100	100	100	100	100	100	100	100	180	200	220
	Low Curr Alarm	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF
Main Setup Menu	F/C	F	F	F	F	F	F	F	F	F	F	F	F
	SP Max	100	100	100	100	120	50	100	120	150	180	180	200
	HL SP Max	150	130	150	150	150	150	175	150	180	200	220	250
	Process HYS	2	2	2	2	2	2	2	2	2	2	2	2
	High Limit HYS	5	5	5	5	5	5	5	5	5	5	5	5
	Process Offset	0	0	0	0	0	0	0	0	0	0	0	0
	High Limit Offset	0	0	0	0	0	0	0	0	0	0	0	0
	Alarm Mode	EN	EN	EN	EN	EN	EN	EN	EN	EN	EN	EN	EN
	Current test interval (H)	168	168	168	168	168	168	168	168	168	168	168	168
	Retrans Span Min	0	0	0	0	0	0	0	0	0	0	0	0
	Retrans Span Max	100	100	100	100	120	50	100	120	150	180	180	200
Secondary Menu	Menu time out (S)	15	15	15	15	15	15	15	15	15	15	15	15
	Current Alarm Delay (S)	5	5	5	5	5	5	5	5	5	5	5	5
	Temp alarm HYS	2	2	2	2	2	2	2	2	2	2	2	2
	Temp Alarm delay (S)	5	5	5	5	5	5	5	2	5	5	5	5
	Current Test Duration (S)	15	15	15	15	15	15	15	5	15	15	15	15

Common Application Settings (See Note 1)

Preset #	Abbreviation	Description
1	PS	Common settings for single wall polyethylene tank
2	PSL	Common settings for low temperature single wall polyethylene tank
3	PDL	Common settings for low temperature double wall polyethylene tank
4	FP	Water freeze protection settings
5	MSPX	SPX Tank heating pad settings
6	DEF	Diesel exhaust fluid freeze protection settings
7	PD	Common setting for double wall polyethylene tank
8	FG1	Low temperature fiberglass tank
9	FG2	Medium temperature fiberglass tank
10	FG3	High temperature fiberglass tank
11	MSPXC	SPX-C Tank heating pad settings
12	MEGLX	EGLX Tank heating panel settings

Note 1: Caution it is the responsibility of the user/installer to verify with tank manufacturer or tank manufacturer supplied documentation that the high limit temperature setting in the preset # used does not exceed the maximum tank exposure temperature. Failure to verify the high limit temperature is below the tank wall maximum exposure temperature can damage the tank.

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Appendix D

System Access Code (SAC) Setting Details

System Access Code (SAC) Operating Description

The System Access Code limits the allowable setting limits to prevent unintended potentially harmful settings. The 2XTC Controller ships with the SAC set to 17 which limits allowable settings to prevent damage to polyethylene tanks. Before changing the SAC the user must evaluate the potential issues that could result from allowing higher temperature settings. SAC value of -34 allows high limit settings up to 175°F. Finally a SAC setting of 51 removes all restrictions and allows the full adjustable range of all setting parameters. Exact details of allowable settings for each SAC are shown below.

	System Access Code (SAC)	17	-34	51
Menu Parameter	SP Max	100°F	100°F	200°F
	HL SP Max	150°F	175°F	250°F
	Lowest High Limit Offset Setting	0°F	-5°F	-50°F

**Lowering the absolute value of the SAC will adjust settings to be within the requirements of the newly entered SAC.

Caution: ***It is the responsibility of the user/installer to verify with tank manufacturer or tank manufacturer supplied documentation that the high limit temperature setting allowed by the SAC setting does not exceed the maximum tank exposure temperature. Failure to verify the allowable high limit temperature is below the tank wall maximum exposure temperature can result in damage the tank.***

Notes:

Notes:

Notes:

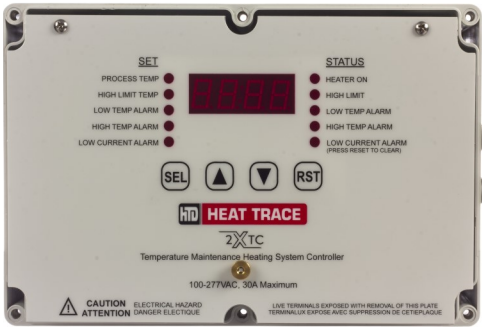
2XTC

Microprocessor Based Tank Heating Controller

The 2XTC Tank Heating Controller is the most complete and versatile tank heating controller in existence. Use this product to accurately control SPX and EGLX tank heating pads as well as WinterSafe Self-Regulating Heating Cable.

PRODUCT FEATURES

- Process temperature control with hi-limit protection
- 100-277 VAC, 50/60 HZ, 30A
- Use with up to 6 heaters
- Push-on heater connections for a quick installation
- Simple operation and customizable preset
- High temperature, low temperature, and low current alarms
- Alarm contact for communication with customer systems (NO or NC, selectable)
- NEMA4X, IP66, polycarbonate enclosure
- 4-20mA retransmission output
- Includes two RTDs
- cETLus approved for use in the USA and Canada



Contact HTD Heat Trace today to discuss your heat tracing requirements
908-788-5210
sales@htdheattrace.com
www.htdheattrace.com

Description

The HTD Heat Trace 2XTC Temperature Maintenance Heating System Controller is specifically designed for heating systems requiring process temperature control with high limit temperature protection. The most common tank heating applications using process and high limit control are non-metallic tanks, lined tanks or tanks with heat sensitive contents. This controller is designed for use with SPX heating pads, EGLX heating panels, heating cable and any other electric trace heater. The 2XTC controller is provided in a NEMA4X/IP66 polycarbonate enclosure for use indoors or outdoors

The 2XTC controller can be used on power supplies from 100 to 277 VAC for maximum versatility. The controller switches up to a 30A heating load using active arc suppression for maximum relay contact life.

The controller provides indication of process sensor temperature, over limit sensor temperature and heater current using a simple main setting menu. Indication is provided using high visibility LED number indication as well as LED lights showing set values and system status.

The 2XTC controller provides alarm and system status for use with remote monitoring such as DCS or SCADA systems. Alarms are provided for low temperature, high, temperature and low current alarm. These alarms are indicated by lights on the front of the controller and relay contacts for remote indication. Alarm relay contacts are selectable for close or open on alarm. In addition the controller offers current interval testing to periodically test for correct heating current. The current alarm can be set to off if not desired or test frequencies of 24, 168 or 720 hours. A 4-20 mA retransmission output is also provided for remote indication of the process temperature.

Technical Specifications

General

Power Input:	100-277 VAC, 50/60HZ, 30 Amps maximum
Operating Temperature:	-40°F to 113°F (-40 to 45°C)
Process Control:	On/Off with adjustable hysteresis
Process Control Output:	SPST NO Relay rated 30 Amps at 277 VAC with active arc suppression

Setting Range

Process Temperature:	0-200°F
High Limit Temperature:	0-250°F
Low Temperature Alarm:	0-200°F
High Temperature Alarm:	0-200°F
Low Current Alarm:	OFF or 0.5 to 30 Amps

Alarm and System Status

Alarms:	Low Temperature, High Temperature and Low Current
Alarm Indication:	LEDs on the controller face
Alarm Outputs:	SPST Relays rated 5 A at 277 VAC/5A at 30 VDC
Alarm Output Type:	Relay contact Selectable open or close alarm
Retransmission Output:	4-20 mA indication of process temperature with selectable span

Sensor Input

Sensor Type:	1KΩ Platinum RTD, 2 wire
Sensor α:	0.00385

Approval

UL 508

CSA 22.2 #14