



Operator Manual for A-Series Panels

Version: 12/3/2020

Panel Name & Operator Password: _____



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Section 1: Panel Overview

The ATCOM panel is an independent control system for heat-trace applications (both freeze-protection and process-maintain). Functionalities include Power Distribution, Sensor Monitoring, Alarming, and Data Delivery.

The panel is microprocessor based, controlling up to 48 circuits at 120-480VAC. A weather-proof touchscreen allows users to select between various control methods: Line-Temperature based, Ambient based, or Manual. Up to 4 field RTDs can be assigned to each circuit, providing a thorough overview of the application status.

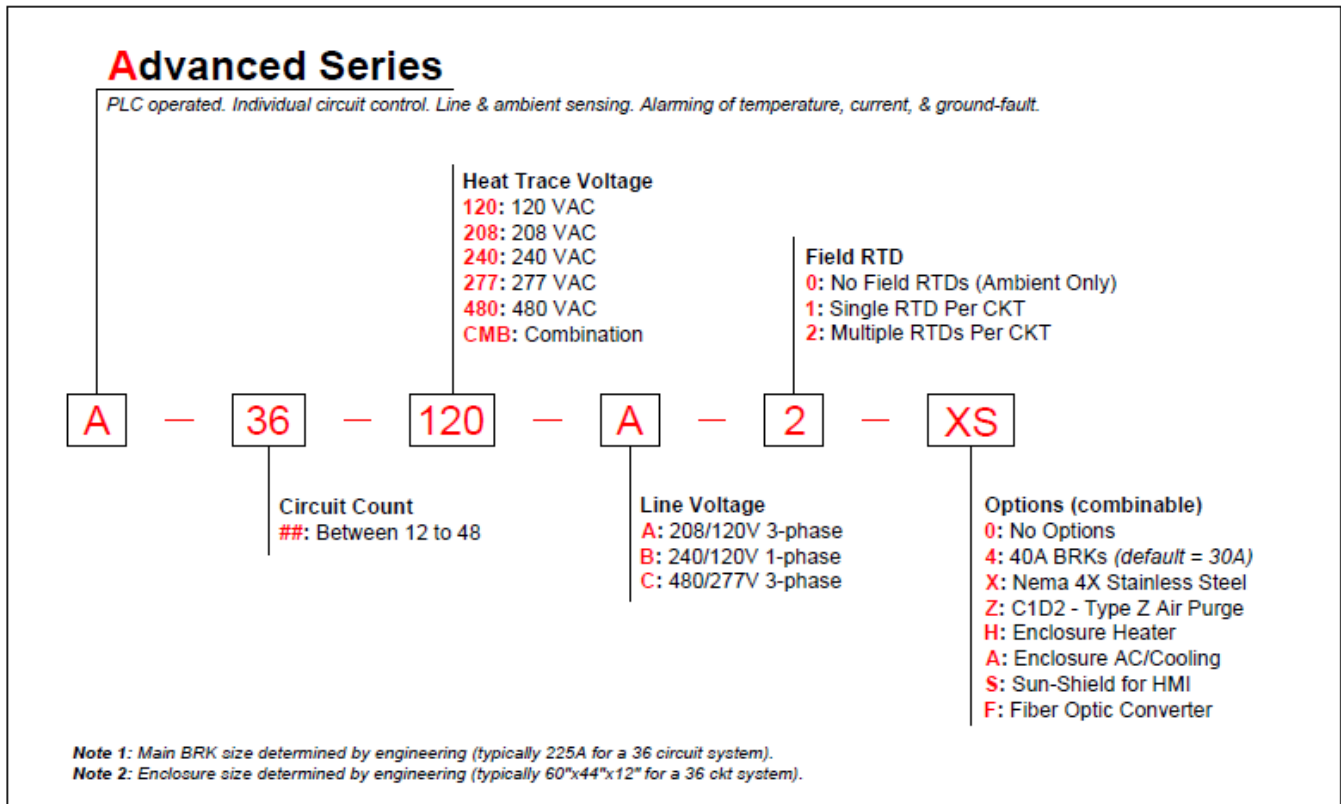
Alarms are generated for temperature, current, and ground fault leakage. Users can modify setpoints and other circuit data via the touchscreen. Project-specific setpoints are conveniently preassigned to each panel, in a true turn-key nature.

A Remote-Access software is also provided, allowing users to access the touchscreen directly from their computer. Communications with the plant DCS is also available for full data delivery.

1.1: Main Features

- **NEMA 4/4X Enclosure**
- **Power Distribution**
 - *Main Breaker*
 - *Panel Board*
 - *Circuit Breakers*
- **Circuit Count: 12-48**
- **Circuit Rating: 30-40A @ 120-480VAC**
- **Ground Fault Tripping**
- **Through-Door Main Disconnect**
- **Solid State Relay Control**
 - *Line-Temperature Based*
 - *Ambient Based*
- **16" Industrial Touchscreen HMI**
- **Sensor Mapping, Monitoring, & Alarming**
 - *Current (A)*
 - *Ground Fault Leakage (mA)*
 - *Temperature (°F)*
- **System Audit Test Feature**
- **Remote Access Software & Phone App**
- **DCS Data Delivery & Dry Contact Alarm**
 - *Optional Fiberoptic Converter*
- **Optional Enclosure Heating/Cooling**
- **UL 508A Listed**
- **Optional HazLoc Rating**
 - *Type Z Air Purge & Pressurization*

1.2: Model Numbers



Section 2: Installation & Startup

The ATCOM panel is a true turn-key system, where most of the startup process is done by our engineering team, so the consumer can proceed to standard operation as quickly as possible.

Wiring diagrams are provided with the panel, located in the inner-door pouch. For most projects, the ATCOM team will coordinate the on-site location for the panel, conduit runs, and the wiring of the actual heat trace & RTD sensors. However, if the consumer will be the one installing the panel, the following instructions are mandatory:

- **Panel Location** must be on leveled industrial concrete or equivalent slab, being able to withstand at least 1,000 lbs. The panel must be drilled into the platform to prevent falling
 - If the consumer wishes to have Remote Access via Ethernet Cat5e/6, the panel must be no more than 300 feet away from the LAN port, otherwise a fiberoptic system must be installed
- **Conduit Connections** to the enclosure must be NEMA4 rated (water tight), or C1D2

- **Panel Wiring** – Refer to the official wiring diagrams for exact details. Below is a (typical) summary of mandatory connections:
 - 3 Hot & 1 Neutral wire must be brought from the power transformer (line voltage)
 - Connect this to the panel Main Breaker & Panelboard
 - A Ground wire must be brought from a copper earthing rod (or equivalent)
 - Connect this to the panel Ground Bar #1
 - A Hot, Neutral, and Ground wire must be brought from each heat trace field-circuit
 - Connect this to the panel Field Terminal Blocks (TB-1) & Ground Bars
 - All associated field RTDs must be brought in
 - Connect this to the panel PLC RTD-Input Blocks
 - (optional) A Cat5e/6 Ethernet wire must be brought from the LAN port
 - Connect this to the panel Ethernet Switch
 - (optional) A dry contact alarm from the DCS must be brought in
 - Connect to Icecube Relay #1

- **Ambient RTD** is provided and wired in each panel. It will sit at the bottom of the panel until the installer is ready to drill it out, at a location of their choosing. The RTD must protrude out of the panel (by at least 4”) in order to collect outdoor air temperature. A NEMA4 rated (water tight) seal must be used at the point of protrusion. If the panel is indoors, the customer must replace the RTD with a longer version, in order to reach a proper outdoor area.

The PLC will be pre-programmed with the circuit parameters for each individual project. This includes temperature control setpoints, alarm setpoints, and enabling/disabling of circuits. These parameters will match the heat-trace based on the information available at the time of construction. The consumer must check these circuit parameters via the HMI, and adjust them as necessary; see sections 3 & 4. To have remote access, the installer must setup the IP address of the PLC, in addition to installing an Ethernet connection. In order to do this, you will have to consult with the plant IT department, and have them assign an IP address for the PLC. The PLC communication port number is 5900. Once you have the IP Address, Subnet, and Default Gateway, go to the Advanced Configuration screen of the PLC, and type the IP addresses in the Panel IP field. There is a picture of this screen in Section 3.4 of this manual.

2.1: Torque Ratings

Below is a list of torque ratings for the (typical) equipment that is worked on during installation:

- Main Breaker (Square D JDL36225): 25 N/m
- Panelboard Neutral Lug (Square D NQ442L2C): 11.3 N/m
- Field Terminal Blocks (A.B. 1492-J10): 2.3 N/m
- Ground Bar (Schneider PK12GTA): 2.82 N/m
- RTD Input Module (Unitronics UIS-04PTN): 0.5 N/m
- Dry Contact Relay (Schneider 782XBXC-24D): 1 N/m

2.2: Safety Precautions

WARNING: High Voltage is used in the operation of this equipment.

Any installation involving control equipment must be performed by a qualified person and must be effectively grounded in accordance with the National Electrical Code to eliminate shock hazard.

To avoid electrical shock or injury, always remove power before servicing a circuit. Personnel working with or near high voltages should be familiar with modern methods of resuscitation.

For Class1Div2 areas that are Z-Purged:

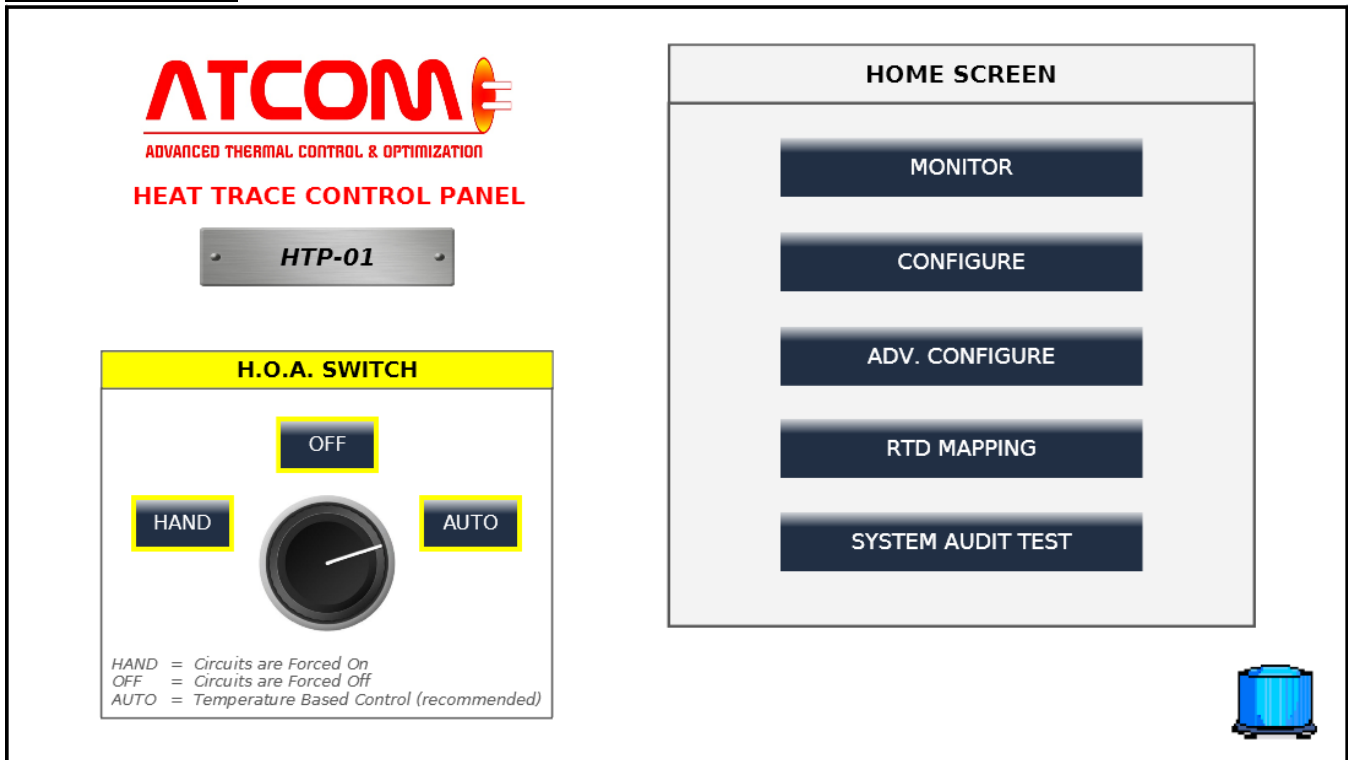
Air of normal instrument quality, nitrogen, or other nonflammable gas shall be used as the source of the protective gas.

Electric power for the protective gas supply shall be supplied from a separate power source, or before any service disconnects of the protected enclosure power supply.

Follow the Z-Purge operating procedures on the nameplates attached to the panel door.

Section 3: Screens & Operation

3.1: Home Screen



(Figure 1: PLC Home Screen)

The Home Screen will appear when powering the panel, and will allow you to access the other screens. Every other screen will have a 'Home' button available, allowing you to return here at any time.

On the right side of the screen are the buttons to access the other pages: Monitor, Configure, Advanced Configure, RTD Mapping, and System Audit Test, which will be reviewed in the next sections.

On the left side, is a digital **H.O.A Switch** - this is designed to function exactly the same way as a physical H.O.A. Switch. The three switch options may be toggled by pushing the corresponding button.

- **Hand:** All circuits are forced on.
 - The system is not intended to be operated in this mode, but the option is given to the customer, in case of a unique scenario.
 - The downside of operating in this mode is excess heat-trace power consumption, decreased heat-trace longevity, and possibly overheating pipe applications.
- **Off:** All circuits are forced off.
- **Auto:** All circuits are controlled by their temperature setpoint.
 - This is the recommended mode of operation.
 - The heat trace is turned on when pipe (or ambient) temperatures fall to their setpoint.

At the bottom-right, is the **alarm beacon**. This beacon is located at the same spot of every screen of the PLC. It flashes blue when there are no alarms, and flashes red when there is at least one active alarm. When pressed, it will bring you to the alarm summary page, which is further discussed in the Alarms section.

3.2: Monitor Screen

HTP-01		MONITOR SCREEN (CKT 1-12)				AMBIENT(°F): 27.2		PANEL(°F): 58.5		00 : 00 : 00	
CKT #	DESCRIPTION	AMPS	AMP LO ALRM SP	GFI (mA)	GFI TRIP SP	GFI RESET BUTTON	TEMP(°F) [LOWEST]	CONTROL TEMP SP	TEMP LO ALRM SP	TEMP HI ALRM SP	RTD TYPE
1 (ENABLED)	HT05 HP DRUM	18	16	1	30	RESET	183.5	180	170	620	LINE-SENSING
2 (ENABLED)	HT10	0	16	0	30	RESET	274.9	180	170	620	LINE-SENSING
3 (ENABLED)	HT11	13	10	2	30	RESET	178.3	180	170	620	LINE-SENSING
4 (ENABLED)	HT17 BOIL W	5	10	1	30	RESET	157.1	180	170	620	LINE-SENSING
5 (ENABLED)	HT18	9	7	3	30	RESET	181.7	180	170	620	LINE-SENSING
6 (ENABLED)	HT1 GROUND	0	10	1	30	RESET	188.9	180	170	620	LINE-SENSING
7 (ENABLED)	HT2	0	13	0	30	RESET	175.3	180	170	620	LINE-SENSING
8 (ENABLED)	HT3	16	13	1	30	RESET	184.6	180	170	620	LINE-SENSING (MULTIPLE)
9 (ENABLED)	HT4	7	5	2	30	RESET	27.2	50	-50	150	AMBIENT
10 (ENABLED)	HT6 INS37	0	7	1	30	RESET	722.8	180	170	620	LINE-SENSING
11 (ENABLED)	HT7	15	13	4	30	RESET	182.1	180	170	620	LINE-SENSING
12 (DISABLED)	HT22	0	8	0	30	RESET	27.2	50	-50	150	AMBIENT

HOME
CKT 1 - 12
CKT 13 - 24
CKT 25 - 36
CKT 37 - 48

HAND OFF AUTO

Figure 2: Sample Data (CKT 4: Some of the HT cables died. CKT 7: Unresolved GFI Trip. CKT 10: Pipe process overheat)

The Monitor Screen should be the most-used screen of the panel. As the name implies, here is where you will watch the heat trace circuits, and ensure they are operating properly.

The top area of this screen (from left to right):

- **Title**
- **Ambient Temperature**
 - This will be highlighted red if in alarm state, which will indicate an RTD problem.
- **Inner Panel Temperature**
 - Highlighted red if in alarm state, which will indicate either an RTD problem or an HVAC problem within the panel.
- **PLC Clock**
 - This does not affect operation, and is only there for reference.

The mid-section of this screen (from left to right):

- **Circuit Number**
 - This will always match the circuit number of the physical distribution panelboard.
 - This will also show if a circuit is enabled or disabled.
- **Description**
 - A 16-character description of the circuit; usually just the heat trace field number, but sometimes a locational abbreviation is also added.
- **Amps**
 - A real-time reading of the circuit amperage.
 - Highlighted red if a low-amperage alarm is active for that specific circuit.
- **Amp Low Alarm Setpoint** (as described)
- **GFI (mA)**
 - This is the electrical ground reading of the circuit, which is recorded in milli amps.
 - Highlighted in red if a GFI trip occurred, and is not reset yet.
 - When this mA value surpasses the trip setpoint, the circuit is forced off and an alarm is generated, until the trip is resolved & reset.
- **GFI Trip Setpoint** (as described)
- **GFI Reset Button**
 - Push this button to reset the GFI trip & deactivate the alarm status.
- **Temperature**
 - The circuit temperature, generated from the RTD(s) that is assigned to it.
 - If multiple RTDs are assigned to a circuit, selects either the lowest or average reading, as shown above in CKT8.
 - Highlighted red if there is a low temperature, high temperature, or an RTD issue for that specific circuit.
 - An RTD failure will force the temperature reading to about -3000F, which means the circuit will fail ON, as intended.
- **Control Temperature Setpoint**
 - When the circuit temperature drops below this value, the heat trace will turn on.
 - Note: a temperature deadband value will extend the on-time of the heat trace. The default is 5 degrees F, and is adjustable in the Advanced Configure screen.
- **Temperature Low Alarm Sepoint** (as described)
- **Temperature High Alarm Setpoint** (as described)
- **RTD Type**
 - This is automatically generated based on the RTD Tags that are assigned to the circuit (in the RTD Mapping Screen).
 - The options are None, Ambient, Line-Sensing, Multiple Line Sensing

The bottom area of this screen (from left to right):

- **Home, CKT 1-12, CKT 13-24, CKT 25-36, CKT 37-48:** Navigation Buttons
- **HOA Indicator**
 - Tells you what HOA mode of operation is selected (modifiable only at the Home Screen).
- **Alarm Beacon**

3.3: Configure Screen

When accessing this screen, the operator password will be required. This is the only password of the panel. It will be given to the site operator during installation.

This screen is a replica of the Monitoring Screen, except the following fields are now clickable & adjustable:

CKT# (enable/disable), Description, Amps Low Alarm Setpoint, GFI Trip Setpoint, Control Temperature Setpoint, Temperature Low Alarm Setpoint, Temperature High Alarm Setpoint.

After modifying a parameter, it is immediately & automatically saved.

3.4: Advanced Configure Screen

When accessing this screen, the Operator Password will be required.

HTP-01 **ADVANCED CONFIGURATION SCREEN** EDIT PANEL CLOCK: 00 : 00 : 00

GLOBAL TEMPERATURE DEADBAND (°F): **SET**
(RECOMMENDED VALUE: 5)

AMBIENT TEMPERATURE ALARM (°F): LOW : HIGH : **SET BOTH**
(RECOMMENDED VALUE: -50 LOW, 150 HIGH)

INNER-PANEL TEMPERATURE ALARM (°F): LOW : HIGH : **SET BOTH**
(RECOMMENDED VALUE: 0 LOW, 104 HIGH)

GLOBAL CONTROL TEMPERATURE SETPOINT (°F): **SET**
(RECOMMENDED VALUE: DEPENDS ON APPLICATION)

GLOBAL GFI TRIP SETPOINT (mA): **SET**
(RECOMMENDED VALUE: 30)

GLOBAL CKT TEMPERATURE ALARM (°F): LOW : HIGH : **SET BOTH**
(RECOMMENDED VALUE: DEPENDS ON APPLICATION)

PANEL NAME: **SET**
(DOES NOT AFFECT FUNCTIONALITY)

PANEL IP ADDRESS: (PROTOCOL: ETHERNET TCP/IP) IP: SUBNET: D.GATEWAY:

HOME CHANGE OPERATOR PASSWORD: **SET**

(Figure 3: PLC Advanced Configuration Screen)

Warning: Once you press the red "Set" button, there is no undo.

From top to bottom, as depicted in Figure 3:

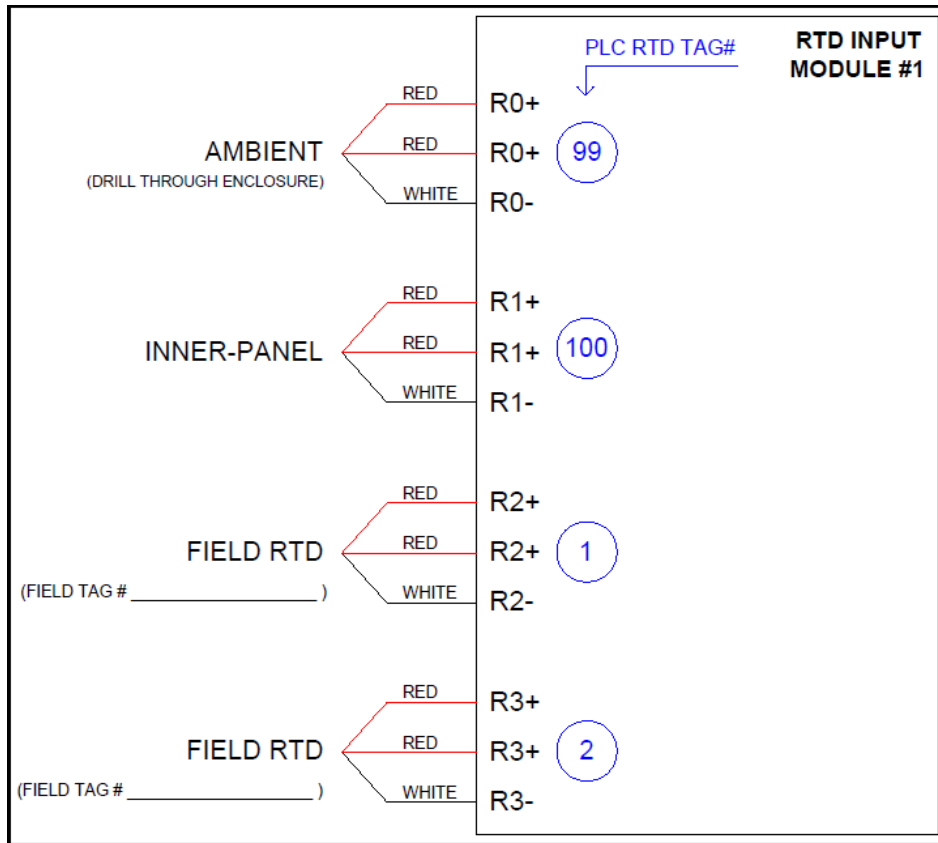
- **Global Temperature Deadband**
 - This is the offset value that the circuit will stay on, after it has heated the application past its Control Temperature Setpoint value.
 - The default and recommended value is 5 degrees (F).
 - 0-10 are acceptable.
- **Ambient Temperature Alarm Range**
 - The purpose of this range is to detect if the ambient RTD has a problem or not.
 - If the RTD wires come loose, damaged, or if an outside obstruction occurs, the temperature reading will move to an extreme value, and the alarm will trigger.
 - The default & recommended value is -50 to 150 (F).
- **Inner-Panel Temperature Alarm Range**
 - This range represents the temperature limits of the equipment inside the enclosure.
 - The default & recommended value is 0 to 104 (F).
- **Global Control Temperature Setpoint**
 - This will assign every circuit the same control setpoint.
- **Global GFI Trip Setpoint**
 - This will assign every circuit the same GFI trip setpoint.
- **Global Circuit Temperature Alarm Range**
 - This will assign every circuit the same temperature alarm setpoints.
- **Panel Name**
 - Does not affect functionality; only a reference.
- **Panel IP Address**
 - For remote access or modbus DCS Data delivery. An ethernet connection is required.
- **Change Password**
 - To change the global operator password.

3.5: RTD Mapping Screen

This screen is where the user may assign RTDs to specific circuits. Each circuit can have up to (4) RTDs assigned in columns A – D.

Once an RTD Tag# is assigned, it will immediately display its temperature. The Tag# correlates to the physical input blocks of the panel. The RTD Drawing (located in the inner-door pouch) will show which Tag#s correlate to which input slots. Below is a snippet of an example RTD Drawing. Here, you will see that there are (2) field RTD inputs available, and they are programmed for Tag# 1 and 2.

The Ambient RTD is always provided with the panel, wired to the first input slot, and programmed with Tag# 99. For each Ambient-Controlled Circuit, Tag# 99 must be assigned to its A column.



(Figure 4: snippet from RTD Wiring Diagram)

HTP-01		RTD MAPPING SCREEN (CKT 1-12)							CLICK VALUES TO EDIT		00 : 00 : 00	
CKT #	RTD(A) TAG #	RTD(A) TEMP(°F)	RTD(B) TAG #	RTD(B) TEMP(°F)	RTD(C) TAG #	RTD(C) TEMP(°F)	RTD(D) TAG #	RTD(D) TEMP(°F)	CKT TEMP(°F) [LOWEST]	<p>EACH CKT IS CONTROLLED BY (1) TEMPERATURE VALUE. THIS IS CALCULATED FROM (1-4) RTD SENSORS. SELECT THE CALCULATION METHOD BELOW:</p> <p>LOWEST (RECOMMENDED) ←</p> <p>AVERAGE</p> <p>NOTE1: MULTI-RTD CKTs MUST HAVE THEIR RTD TAGS ASSIGNED IN SEQUENTIAL ORDER (A then B then C then D).</p> <p>NOTE2: ALL AMBIENT CKTs MUST HAVE RTD TAG #99 ASSIGNED TO THEM.</p> <p>NOTE3: EMPTY SLOTS SHOULD BE KEPT WITH RTD TAG #0.</p> <p>NOTE4: REFER TO THE PANEL RTD DRAWING TO SEE WHICH TAG # CORRESPONDS TO EACH CKT. THE PHYSICAL RTDs MAY HAVE DIFFERENT TAGS THAN THE PANEL, WHICH SHOULD BE MARKED ACCORDINGLY BY THE INSTALLER / COMMISSIONER.</p>		
1 (ENABLED)	1	183.5	0	0	0	0	0	0	183.5			
2 (ENABLED)	2	274.9	0	0	0	0	0	0	274.9			
3 (ENABLED)	3	178.3	0	0	0	0	0	0	178.3			
4 (ENABLED)	4	157.1	0	0	0	0	0	0	157.1			
5 (ENABLED)	5	181.7	0	0	0	0	0	0	181.7			
6 (ENABLED)	6	188.9	0	0	0	0	0	0	188.9			
7 (ENABLED)	7	175.3	0	0	0	0	0	0	175.3			
8 (ENABLED)	8	233.5	9	184.6	10	197.1	0	0	184.6			
9 (ENABLED)	99	27.2	0	0	0	0	0	0	27.2			
10 (ENABLED)	11	722.8	0	0	0	0	0	0	722.8			
11 (ENABLED)	12	182.1	0	0	0	0	0	0	182.1			
12 (DISABLED)	99	27.2	0	0	0	0	0	0	27.2			

HOME **CKT 1 - 12** CKT 13 - 24 CKT 25 - 36 CKT 37 - 48

(Figure 5: PLC RTD Mapping Screen)

In the rare occurrence that an RTD is damaged or a wire comes loose, it will default to a temperature reading of about -3000(F), which will trigger an alarm and fail the circuit ON, as intended.

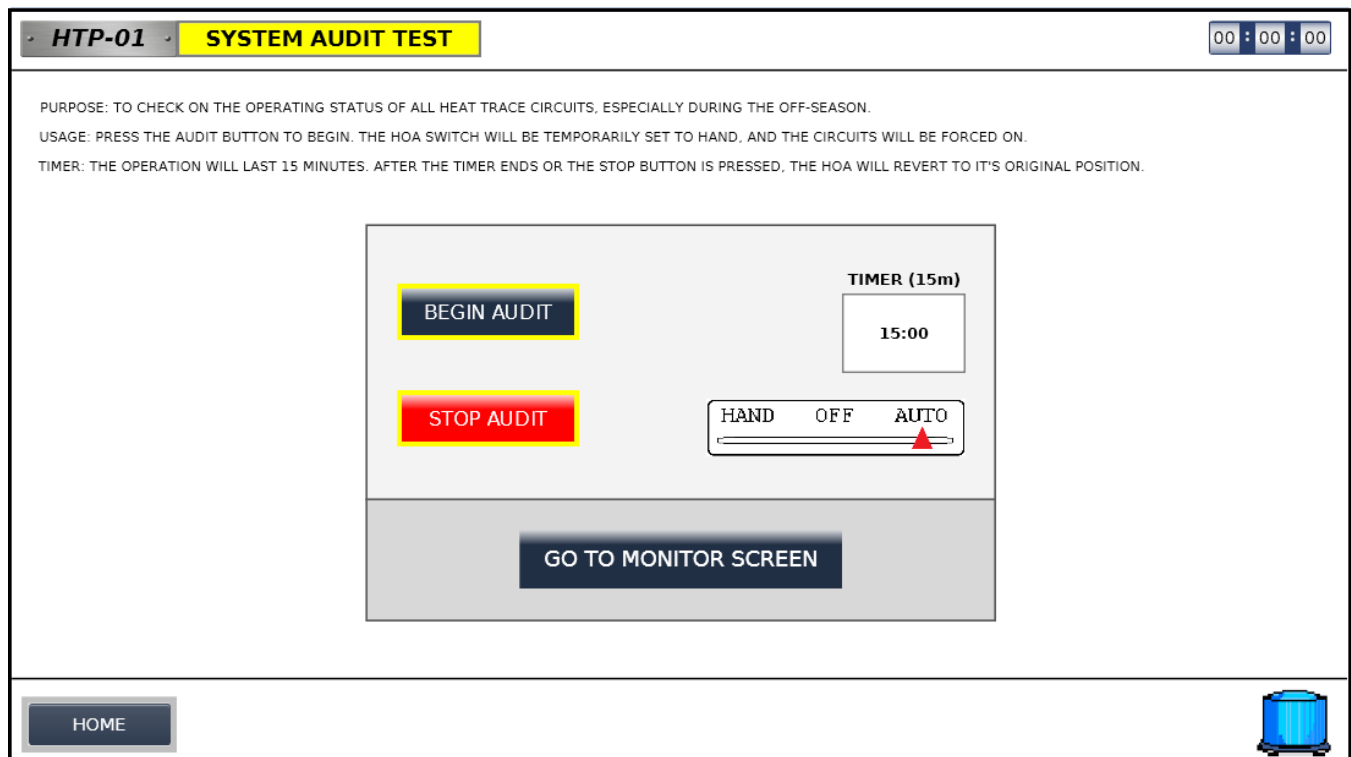
The user may select how the circuit temperature is calculated if there are multiple RTDs: Either the lowest or the average of the readings can be used.

3.6: System Audit Test

This screen will allow the user to check on the operation of all the heat trace circuits in a convenient way. It is particularly useful during the off-season, to ensure that the system is working.

The 'Begin Audit' button will temporarily set the HOA switch to Hand, forcing all the heat trace on for 15 minutes. Once the timer is finished, or if the user prematurely stops the process with the 'Stop Audit' button, the HOA switch will revert to its original position.

If the system loses power during this test, the user must manually set the HOA switch to its normal position (usually Auto). Then, they may restart the test if they wish.



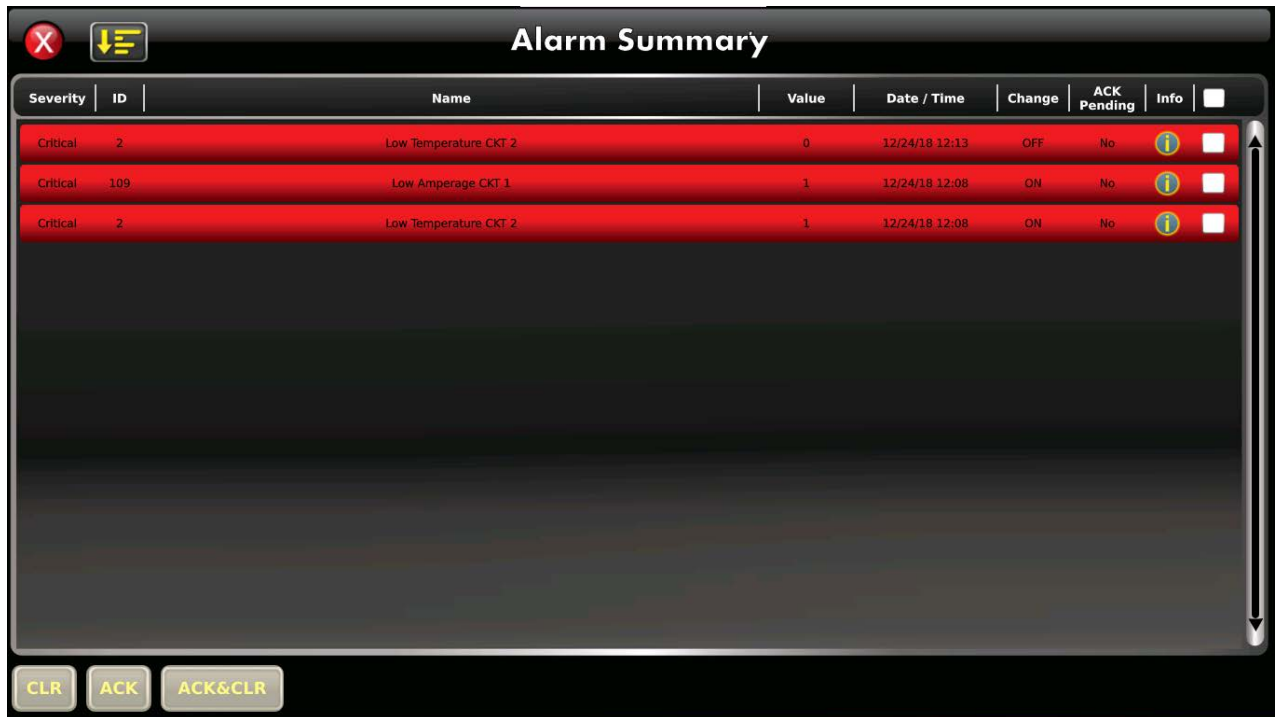
(Figure 6: PLC System Audit Test)

3.7: Alarms

The system has the following alarms:

- **Low Amperage** (per circuit)
 - Possible causes: tripped breaker, damaged heat trace cable.
- **Low Temperature** (per circuit)
 - Possible causes: damaged RTD, damaged heat trace cable
- **High Temperature** (per circuit)
 - Possible causes: pipe process overcook
- **GFI Trip** (per circuit)
 - Possible causes: heat trace moisture, heat trace ground issues
 - Must press 'GFI Reset Button' to clear alarm & turn circuit back on
- **Ambient Temperature Fail**
 - Possible causes: damaged RTD, loose RTD wire
- **Inner Panel Temperature Fail**
 - Possible causes: HVAC equipment malfunction, loose RTD wire

The Alarm Screen (shown below) is accessed by pressing the siren at the bottom-right of any screen.



(Figure 7: PLC Alarm Summary)

Column Fields (from left to right), as depicted in Figure 7:

- Severity (all alarms will be critical for this system)
- ID (internal code numbering; users please ignore)
- Name (descriptor of alarm)
- Value
 - An alarm row is created for BOTH the rise of an alarm, and the fall of an alarm. the 'Value' is 1 when it rises, and 0 when it falls.
 - In the screenshot above, Low Temp CKT 2 has resolved itself, but Low Amp CKT 1 is still active, and will thus still cause the alarm siren to flash red.
- Date/Time (as described)
- Change (same as Value)
- ACK Pending (no alarms will require acknowledgement, due to the siren; users please ignore)
- Info
 - Press this button for troubleshooting tips.
- [white box]
 - Select this box for when you want to clear inactive alarms (bottom button).
 - You can safely select-all and press clear at any time; it will not clear active alarms.

Section 4: Enable, Disable, and Expansion

The ATCOM engineering team will enable/disable the proper circuits for the customer as part of the user-friendly 'turn-key' component. For the user to enable/disable a circuit, go to the Configuration screen, and click on the 'CKT#' button of the desired circuit; it will notify you of the change by switching colors from green to gray.

'Spare' vs 'Not Installed'

If, for example, a 36 circuit panel is built, and only 18 of the circuits have heat trace info, then the following will apply:

- CKT 1-18 will be fully prepared and ready for operation immediately.
- CKT 19-36 will be labeled as 'Spare' and will have all the equipment installed, wired, and tested.
 - The user must simply enable the circuit, and assigned an RTD to it.
- CKT 37-48 will read 'Not Installed', without any associated equipment. To activate these, the engineering team will have to install new hardware in the panel, if physical space allows.

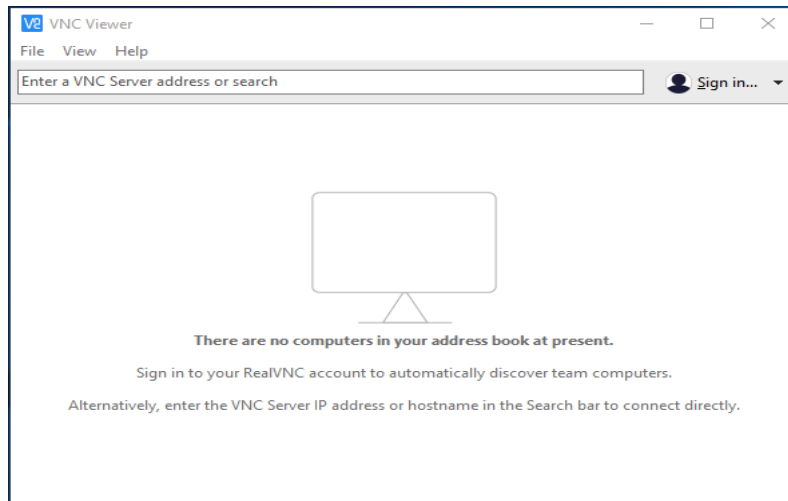
Section 5: Remote Access

Once a proper IP address has been assigned to the PLC (as discussed in Section 3.4), operators who are on the same LAN network, whether it's from a PC or smart phone, can essentially bring the HMI screens directly to their desktop, and operate the panel as if they were standing in front of it.

The Panel PLC creates a VNC Server on Port #5900 of the LAN, and the user must install a simple VNC software on their device to access it. Most VNC softwares are free and will work; the one we recommend is called VNCViewer, and can be downloaded from this link:

<https://www.realvnc.com/en/connect/download/viewer/>

Open the software, and you should see the following screen (below):



(Figure 8: VNC Viewer Software)

Enter the IP address of the PLC in the top field and press enter. It will notify you that the connection is not encrypted (which is necessary); press Continue.

Once connected, the PLC screens will appear; use your mouse & keyboard to navigate them. We recommend leaving this software running, as it does not consume much processing power, and will provide you with an active monitoring page for the heat trace system.

Section 6: DCS Data Delivery

The ATCOM panel will communicate with the plant DCS system via Modbus TCP/IP. It will act as a slave, while the DCS is a master.

Below are the Modbus Registry Addresses:

Name	Circuit #	Modbus Reg. Type	Modbus Reg. Address	Description
PLC Alarms Active	Global	Coil (read-only)	1	All possible alarms (0 = none; 1 = one or more)
Amp Alarms Active	Global	Coil (read-only)	2	Only amperage alarms (0 = none; 1 = one or more)
GFI Alarms Active	Global	Coil (read-only)	3	Only GFI alarms (0 = none; 1 = one or more)
Temp Alarms Active	Global	Coil (read-only)	4	Only temperature alarms (0 = none; 1 = one or more)
Circuit Enabled	1 - 48	Coil (read/write)	5 - 52	(0 = disabled; 1 = enabled)
Circuit Output Call	1 - 48	Coil (read-only)	53 - 100	If the CKT should have a load (0 = no call; 1 = yes call)
HOA Switch Position	Global	Holding Reg. (read-only)	101	(0 = hand; 1 = off; 2 = auto)
Circuit Amps	1 - 48	Holding Reg. (read-only)	102 - 149	Amperage (A) (expressed in 1/10th of a degree; 217 = 21.7A)
Circuit GFI	1 - 48	Holding Reg. (read-only)	150 - 197	GFI miliAmp (mA)
Circuit Temperature	1 - 48	Holding Reg. (read-only)	198 - 245	Temperature (°F) (expressed in 1/10th of a degree; 217 = 21.7°F)
Circuit RTD Type	1 - 48	Holding Reg. (read-only)	246 - 293	(0 = none; 1 = ambient; 2 = line sensing; 3 = multiple line sensing)
Mutli-Temperature Algorithm	Global	Holding Reg. (read-only)	294	How the CKT temperature is derived (0 = lowest; 1 = average)
Temperature Control Setpoint	1 - 48	Holding Reg. (read/write)	295 - 342	Temperature (°F) (expressed in 1/10th of a degree; 217 = 21.7°F)
Temperature Low Alarm Setpoint	1 - 48	Holding Reg. (read/write)	343 - 390	Temperature (°F) (expressed in 1/10th of a degree; 217 = 21.7°F)
Temperature High Alarm Setpoint	1 - 48	Holding Reg. (read/write)	391 - 438	Temperature (°F) (expressed in 1/10th of a degree; 217 = 21.7°F)
Amps Low Alarm Setpoint	1 - 48	Holding Reg. (read/write)	439 - 486	Amperage (A) (expressed in 1/10th of a degree; 217 = 21.7A)
GFI Trip Setpoint	1 - 48	Holding Reg. (read/write)	487 - 534	GFI miliAmp (mA)
Inner-Panel Temperature	Global	Holding Reg. (read-only)	535	Temperature (°F) (expressed in 1/10th of a degree; 217 = 21.7°F)
CKT Control Deadband Temperature	Global	Holding Reg. (read/write)	536	Temperature (°F) (expressed in 1/10th of a degree; 217 = 21.7°F)

(Figure 9: PLC Modbus Registry Addresses)

Section 7: Panel Specs

Operating Temperature	-4 to 104°F (enclosure heater recommended for freezing temperatures)
Area Classification	Ordinary or Class 1 Div 2
Enclosure Rating	NEMA 4 Steel or NEMA 4X Stainless Steel
Enclosure Mounting	Wall Mount or Floor Mount
Line Voltage	120 – 480VAC, 3-Phase
Main Breaker Rating	600VAC, 3-Phase, 100-250A, Thermal Magnetic
Input	RTD (100 Ohm Platinum 3-Wire)
Output	Solid State Relay (TRIAC)
Max Output Rating	40A per circuit
Short Circuit Current Rating	10kA
Alarms	Temperature (high/low), Amperage (low), Ground Fault (high/trip)
Communication	Ethernet, Modbus TCP/IP
Temperature Rating	T4
Approvals	UL (Ordinary & Class 1 Division 2 Groups A,B,C,D); File # E489368