TEMPTRAC INTERFACE GUIDE, GATEWAY SETUP AND POINTS LIST

Installation and interface must be performed by a qualified controls technician.

IMPORTANT: THIS MANUAL CONTAINS INFORMATION REQUIRED FOR INSTALLATION, INTERFACE AND CONFIGURATION OF THIS EQUIPMENT. READ AND FOLLOW THE INFORMATION IN THIS MANUAL AND ALL OTHER PROVIDED INSTRUCTIONS, LABELS AND MARKINGS BEFORE INSTALLING, OPERATING OR SERVICING THIS UNIT.

Contents

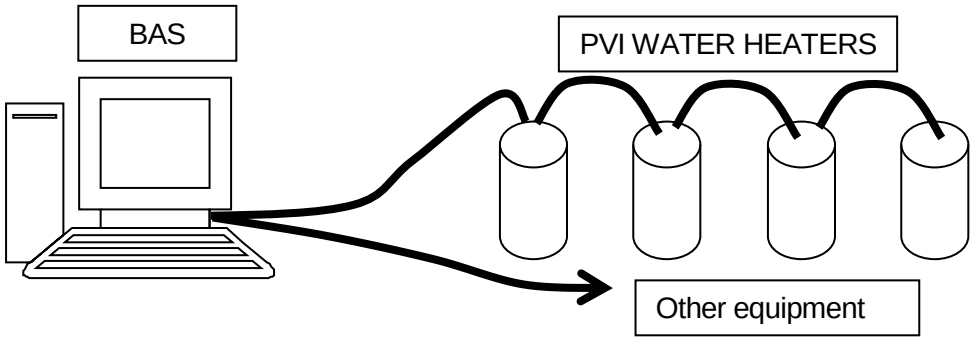
TO THE INSTALLER / CONTROLS INTEGRATOR: After installation and integration, these instructions must be given to the equipment user or left near the appliance.

SPECIAL INSTRUCTIONS TO THE OWNER: Retain this manual for future reference. These instructions contain important integration information that will help you in maintaining and operating this appliance.

OVERVIEW OF INTERFACE METHODS:

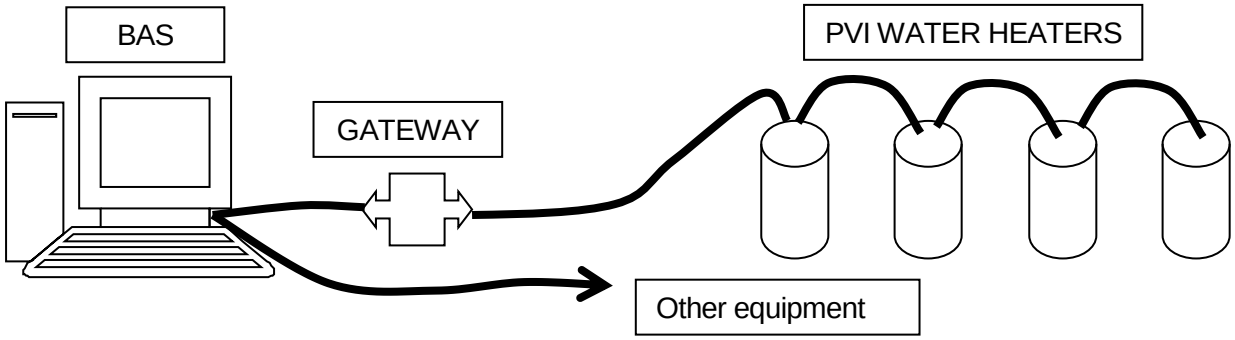
This document is a quick reference for connecting the TempTrac water heater / boiler control to a Building Automation System (BAS). Direct connection via MODBUS RTU or using a gateway to interface to protocols other than MODBUS RTU are the methods covered in this manual.

BAS to Heaters direct, using MODBUS RTU:



Building Automation System (BAS) connecting directly to water heaters using MODBUS RTU twisted pair wire. (Wiring is RS-485 physical layer.)

BAS to heaters using a Protocol Gateway:



Building Automation System (BAS) connecting to a PVI gateway. This can provide interface to BACNET MSTP, BACNET IP, LONWORKS, and MODBUS TCP.
(Wiring from gateway to heaters is RS-485 physical layer. Wiring from BAS to gateway will depend on Protocol.)

BAS to heaters using discrete connections:

This is simply control of the heater using the external ENABLE/DISABLE contacts, remote equipment contacts and the alarm contacts. See wiring diagram of equipment for details.

TempTrac Heater MODBUS fixed settings:

Most of the MODBUS RTU and Port settings are not adjustable
Baud Rate: 9600bps (Not adjustable)
Data Length: 8 bit (Not adjustable)
Parity: None (Not adjustable)
Stop Bits: 1 (Not adjustable)
Start/Stop: Silent interval of 3 characters minimum
Minimum Time Between Retry: 500 msec.
Maximum read command is 5 words

Steps to change the TempTrac MODBUS address:

Editing parameters should be done without any device trying to communicate through the MODBUS port. To avoid interference from a gateway or BAS, you should unplug the MODBUS adapter port on the back of the TempTrac at the white header, while making changes to the TempTrac parameters.
The first step to interfacing with a TempTrac or group of TempTracs will be the assignment of the address number for each boiler. The default for TempTrac is Address #1. You can assign any number in the range of 1-247. This is the limitations of the MODBUS RTU standard.
The MODBUS address is the **Adr** parameter, and it is in the **Pr2** menu.

Enter the Programming mode by pressing the **SET** and **DOWN** key for more than 3 seconds. (Lead with the **SET** key.)

Pressing the **DOWN** key, parameters will display in top, and value in bottom.
Select **Pr2** / **PAS** (parameter / value), and press the **SET** key.
The lower display will show the value **0 - -** with a flashing zero.

Use **UP** or **DOWN** keys to input the security code in the flashing digit; confirm each digit by pressing **SET**. The security code is **321**.
After hitting **SET** on the last digit, you will be in the **Pr2** menu.
Once you have entered the **Pr2** menu press the **DOWN** key to move through the parameters until the **Adr** parameter appears on the top display.

Now press the **SET** key once and the value number will begin to blink. Use the arrow key to set the address and then hit the **SET** key.
After hitting the **SET**, it will automatically go to the next parameter. Let it time out, or cycle power to the TempTrac.
Each TempTrac on a RS-485 network must have a unique MODBUS address.

The TempTrac MODBUS adapter port:

The MODBUS adapter is an orange dongle with 2 green screw terminals attached to an 8 inch cable that plugs into the back of the TempTrac at a white header. This can be an option installed on heater, or it may be a separate line item part. When the option is available, it is MBUSC option code. As a standalone part, it is PN: 11807.

PV7069-T 03/17
Part number 129209

TEMPTRAC PROTOCOL

The MODBUS RTU protocol is well established industry protocol and technical references for this are readily available on the Internet.

Data Types Used

The TempTrac only uses one data type
Holding Registers (40001 – 49999) Read/Write

Other data types such as Coils are not implemented in the TempTrac control.
Only the data points in the POINTS LIST should be accessed.

Physical Layer RS-485

MODBUS RTU uses the physical layer RS-485.
RS-485 (EIA-485): A 2 wire (twisted pair) multi drop network. Each device can send data by holding positive and negative voltage on the line and reversing polarity on the 2 wires. When no devices are transmitting, the line will be tristate. The recommended arrangement of the wires is as a connected series of point-to-point (multi-dropped) nodes, i.e. a line or bus, not a star, ring, or multiply connected network. The number of devices that can be connected to a single line is defined in the RS-485 standard by the input impedance of 32 UNIT LOADs. The wire and circuits interfacing on this 2 wire connection is considered the PHYSICAL LAYER. (RS-485 is the same physical layer as used with BACNET MSTP.)

No provisions for biasing resistors or termination resistors are provided on the control. If required, this will need to be provided externally.
The PVI gateway does provide optional biasing (default) and can provide a termination resistor, if required.

ITEMS REQUIRED FOR GATEWAY INTERFACE:

One or more water heaters with a TempTrac control (red/orange LED display with 6 tactile buttons) including the RS-485 adapter.

Protonode Gateway with Power supply adapter (when ordering, please specify what protocol is required; BACNET MSTP, BACNET IP, LONWORKS or MODBUS TCP).

Protonode Gateway Manual (Covers general information for the gateway).

PV7069-T.PDF Interface manual that covers specifics for interfacing with the TempTrac system. Also includes the points list for the TempTrac control system. (This document).

120VAC power outlet for the power supply.

Computer with web browser and Ethernet connection capability to configure gateway.

ITEMS REQUIRED FOR MODBUS DIRECT INTERACE:

One or more water heaters with a TempTrac control (red/orange LED display with 6 tactile buttons) including the RS-485 adapter.

PV7069-T.PDF Interface manual that covers specifics for interfacing with the TempTrac system. Also includes the points list for the TempTrac control system. (This document).

IDENTIFY EQUIPMENT:

The equipment should have a TempTrac mounted on the control panel. The RS-485 adapter may be installed or may ship lose. The gateway and power supply ship lose. The gateway is a grey module that has a wall wart style power supply.

TempTrac Front and side view

Protocol Gateway

TempTrac back, showing adapter dongle.

TempTrac is mounted on the control panel of the equipment. On the back side of the TempTrac is a white header. The RS-485 adapter plugs into this with a 8 inch cable. The orange adapter has 2 green terminals labeled (+) & (-).

The Protocol Gateway, if supplied, comes with a power supply and ships as a loose item.

WIRING BAS TO GATEWAY AND THEN GATEWAY TO TEMPTRAC:

Each gateway has 3 connection points.
The 6 position terminal block contains connection for power and MODBUS RTU (going to heaters).
The Ethernet port is for configuration, BACNET IP, or MODBUS TCP.
The 3 or 2 pin terminal is for the BAS interface: BACNET MSTP, or LONWORKS.

Power Connection:

Gateway power supply, 6 position terminal +PWR, -PWR.
Use supplied wall wart style power supply. 15VDC. Do not power other devices with same power supply. If power adapter has not already been connected, cut and discard the connector on the end, strip and terminate the power adapter in the proper terminals. Verify polarity. If another supply is to be used, it must be isolated. Do not use 24VAC power from heater.

Gateway Connection to Heaters:

Wiring from Gateway to the heaters, use twisted pair wire.
Connector on the orange dongle adapter that is on the end of a 8" cable plugged into the back of the TempTrac.

The wiring is standard 2 wire RS-485 wiring. You will connect all devices together in a daisy chain. We recommend the gateway to be at the start of this connection.

Gateway 6 Pos. terminal		TempTrac Orange adapter		TempTrac #2 Orange adapter
Tx/+		(+)		(+)
Rx/-		(-)		(-)
GND				

Building Automation Connection:

BAS protocol		**Connection Port on Gateway**		**Labeled**
BACNET MSTP		3 TERMINAL CONNECTOR		FIELD
BACNET IP		ETHERNET PORT		ETHERNET
LONWORKS		2 TERMINAL CONNECTOR		LonWorks
MODBUS TCP		ETHERNET PORT		ETHERNET

WIRING OF TEMPTRAC TO BAS (Direct, no Gateway):

The back side of the TempTrac has a white header with an 8 inch cable, connecting to an orange adapter module with 2 green terminals labeled (+) & (-). This is the RS-485 Modbus connection point.

Field connection for BAS		TempTrac Orange adapter		TempTrac #2 Orange adapter		Testing VDC	Results for proper hookup
RS 485 +		(+)		(+)		Positive lead	+ 0.100 To + 5.500
RS R85 -		(-)		(-)		Negative lead	
GND							

Ensure the proper polarity, check with a Digital Volt Meter set to Volts DC. Take a reading at the orange adapter from the (-) Terminal to the (+) Terminal. The (+) should be the positive lead when connected.

GATEWAY CONFIGURATION CONNECTION:

Both the LONWORKS and BACNET gateway have an Ethernet port. Connect the computer using a patch cable or cross-over cable to establish a direct connection to the gateway. Older units may require a cross-over cable or two patch cables with an Ethernet switch. If using BACNET IP or MODBUS TCP interface, connect the BAS Ethernet cable to the gateway when configuration is complete.

At this point, each heater and the gateway should all be powered, and have all wiring finished. The RUN LED will toggle every second to indicate the gateway is running.

CONFIGURE GATEWAY DIP SWITCHES:

The ON position is toward the center of the module, and OFF is toward the edge of the module. Only the BACNET gateway requires dip switch settings. The BACNET gateway is used for MODBUS TPC also.

DIP SWITCHES S0-3 PROTOCOL

Set Protocol (BACNET and MODBUS gateway only):
The gateway protocol is determined on power up by looking at the "S" dip switches.
If the protocol is changed, the configuration/profiles must be cleared and reconfigured. This is done with the HTML interface.
MODBUS RTU does not require a gateway.
LONWORKS: Configured in hardware, no need to adjust dip switches.

Protocol	S0	S1	S2	S3
BACNET IP	OFF	OFF	OFF	OFF
BACNET MSTP	ON	OFF	OFF	OFF
MODBUS TCP	OFF	ON	OFF	OFF
~~MODBUS RTU~~	ON	ON	OFF	OFF

DIP SWITCHES B0-4 BAUD

3PIN CONNECTOR TO BAS, Configure BAUD:
Default is 38400.
Configures the Baud rate for the 3 position terminal block.
This is the connection that will connect to the Building Automation System (BAS).
This is used only when the protocol is BACNET MSTP.

Baud	B0	B1	B2	B3
9600	ON	ON	ON	OFF
19200	OFF	OFF	OFF	ON
38400 *	ON	ON	OFF	ON
57600	OFF	OFF	ON	ON
76800	ON	OFF	ON	ON

A0-7 (BACNET MSTP) MAC ADDRESS:

Default is MAC address 3. Configure the MAC address for the BACNET Gateway by summing the "A" dip switches that are ON.
MAC address range: 1 – 127

1	2	4	8	16	32	64		<-sum for address	
A0	**A1**	**A2**	**A3**	**A4**	**A5**	**A6**	**A7**	**Address**	
OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	0	Invalid
ON	OFF	OFF	OFF	OFF	OFF	OFF	OFF	1	
OFF	ON	OFF	OFF	OFF	OFF	OFF	OFF	2	
ON	ON	OFF	OFF	OFF	OFF	OFF	OFF	3 *	Default
OFF	OFF	ON	OFF	OFF	OFF	OFF	OFF	4	
ON	OFF	ON	OFF	OFF	OFF	OFF	OFF	5	
OFF	ON	ON	OFF	OFF	OFF	OFF	OFF	6	
ON	ON	ON	OFF	OFF	OFF	OFF	OFF	7	
OFF	OFF	OFF	ON	OFF	OFF	OFF	OFF	8	
ON	OFF	OFF	ON	OFF	OFF	OFF	OFF	9	
OFF	ON	OFF	ON	OFF	OFF	OFF	OFF	10	
…	…	…	…	…	…	…	…	…	
ON	ON	ON	ON	ON	ON	ON	OFF	127	

CONFIGURE THE GATEWAY USING THE HTML INTERFACE:

This section will provide the parameters required for the TempTrac control. For more details of the gateway, consult the gateway manual. Connect your computer's Ethernet port to the Ethernet port of the gateway. Using a web browser, browse to the gateway at IP address: **192.168.1.24** default (If you have changed the IP address, go to the appropriate address.).
If the device IP address has been changed and is not known, a utility is available from Feildserver.com. Contact Fieldserver for more information.

Menu options vary depending on if you are configuring a LONWORKS gateway, BACNET Gateway set for BACNET IP, a BACNET gateway set for BACNET MSTP, or a BACNET gateway set for MODBUS TCP.

Using your browser, set the following and SUBMIT after each change.
MODBUS RTU Baud Rate: 9600
MODBUS RTU Parity: NONE
MODBUS RTU Data Bits: 8
MODBUS RTU Stop Bits: 1

(BACNET options)

BACNET Network Number: Must be unique network number on BACNET network
BACNET Node Offset: This will be used to create the DEVICE INSTANCE. Sum the device MODBUS Address and this number. Example 50000 Node Offset + MODBUS address 1 = 50001 Device Instance. Each MODBUS device will have its own Device Instance number.

(BACNET MSTP option)

BACNET MSTP Max Master: 127

(BACNET IP option)

BACNET IP Port: 47808 (Default)
BACNET COV: COV Disable

(BACNET MSTP option)

BACNET BBMD: - (Default "-", enabling this is an advanced feature, not recommended)
BACNET Router: NO for 1 water heater, YES for multiple water heaters

SELECT THE DEVICE TYPE (BACNET & LONWORKS):

Press the **ADD** button, under **Node ID** enter the MODBUS address of the first heater. Typically you will have the nearest heater setup as MODBUS address 1, and the next heater MODBUS address 2. All heaters ship from factory with MODBUS Address set to 1. Each heater must have a unique MODBUS address. (See previous section **Setup heater MODBUS address**)
Under **Current profile**, select the proper interface for the TempTrac control.
For BACNET Gateway: Select

BAC_IP Temptrac for BACNET IP
BAC_MSTP Temptrac for BACNET MSTP

For LONWORKS Gateway: Select **LON TempTrac Water Heater**

Press the **Submit** button.
Add additional devices as required.
After adding all devices, restart the gateway by clicking the **SYSTEM RESTART** button.

CONFIRM OPERATION:

Heater Communication:

Communication between gateway and heaters is evident by rapid flashing of the TX and RX LEDs on the gateway. If only the TX is flashing (may be as slow as 30 seconds between flashes), that will indicate no response from the heaters.

Building Automation System Communication:

Using the HTML interface, you can confirm some operations and under USER MESSAGES, confirm there are no errors messages. At this point, the BAS will need to discover the gateway and implement the points into its integration.

TROUBLESHOOTING GATEWAY:

- ERR Red LED on
  - Gateway is reporting an error.
  - Connect to gateway with HTML interface to view error messages
- PWR LED not on
  - Confirm power on +PWR and –PWR
- TX & RX not flashing
  - Confirm connections to heaters and MODBUS addressing
  - Confirm gateway has been configured
- TX flashing, RX not flashing
  - Gateway is talking to TempTrac, but not getting response from TempTrac. Confirm wiring, confirm TempTrac is configured to proper address, Baud, Parity, Stop bits.

Verify polarity of all connections:

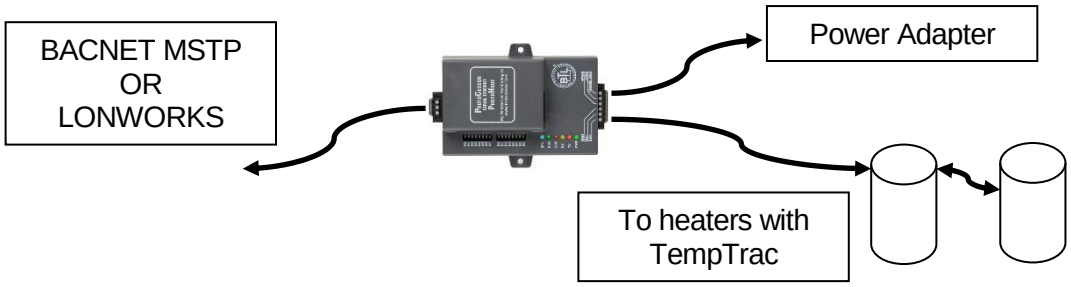
Set a Digital Volt Meter to read DC Volts. (Capable of reading less than 1.0VDC)

Pos. (red) Probe	Neg. (black) Probe	Min	Max	Actual Reading
Gateway 6 pin terminal block				
+PWR	-PWR	+9.0VDC	+30VDC	
Tx/+	Rx/-	+0.1VDC	+5.5VDC	
Gateway 3 pin terminal block (BACNET MSTP only)				
RS 485 +	RS 485 -	+0.1VDC	+5.5VDC	
TempTrac orange dongle (Each heater)				
(+)	(-)	+0.1VDC	+5.5VDC	
(+)	(-)	+0.1VDC	+5.5VDC	
(+)	(-)	+0.1VDC	+5.5VDC	
(+)	(-)	+0.1VDC	+5.5VDC	
(+)	(-)	+0.1VDC	+5.5VDC	

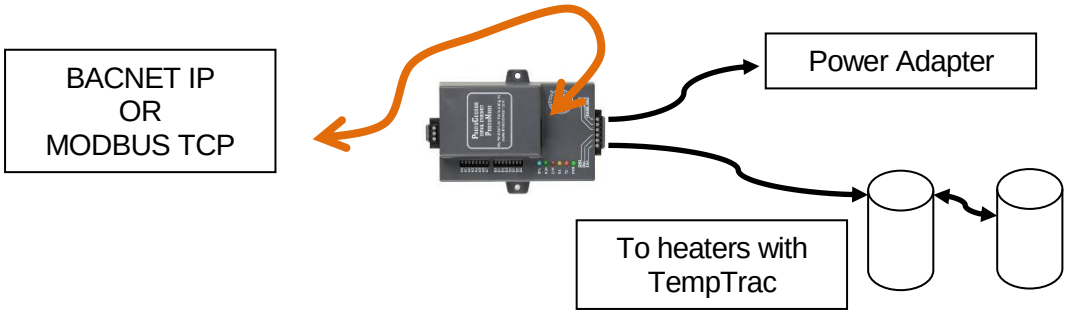
For advance gateway troubleshooting, reference the gateway manual.

HOOKUP OVERVIEW:

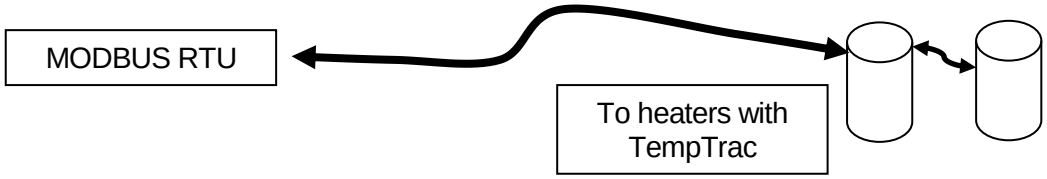
BACNET MSTP or LONWORKS



BACNET IP or MODBUS TCP



MODBUS RTU Direct Connect



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APPLICATION SPECIFICS:

Each product that uses the TempTrac control may have subtle differences. The following products address the important information regarding each device.

Conquest 100 Gallon (199 – 299) & 130 gallon 399: (Smaller Conquest)

Model Numbers: 20 L 100A-GCL, 25 L 100A-GCL, 30 L 100A-GCL, 40 L 130A-GCL

Probe 1: Is in the top of the tank, and controls the burner
Probe 2: Is in the mid-section and controls the agitator pump using **Relay3**
Probe 3: Is in the flue
Alarm_AL2: Alarm on any failure
Burner_Relay1: Burner
Relay2: Alarm dry contact
Relay3: Agitator pump

Discrete connections:
External Enable: Terminals R1 – R2, Jumper to enable. Heater ships with jumper on this. An external enable/disable can be attached to this. This is a low current, low voltage contact. It is advised to use a contact with gold plating. If not available, use 2 contacts in parallel.
Alarm: A1 & A2 (Output from Heater) Closed = ALARM.
Remote Proving: C1 & C2. Ships with factory jumper. Open will prevent burner from operating. Keeping this open will create a lockout condition that will require user intervention.
Remote Equipment / Burner ON: Contact that will close P1 – P2 during a heating cycle. Open, the heater is not calling for heat.
No Setpoint Input: There is not a discreet method to send a setpoint signal to the Conquest.

Conquest 130 Gallon (500 – 800): (Larger Modulating Conquest)

Model Numbers: 50 L 130A-GCML, 60 L 130A-GCML, 70 L 130A-GCML, 80 L 130A-GCML

Same as the smaller Conquest with the addition of modulation.
Modulation Rate: Modulation rate, Low fire = 0, High Fire = 100

Discrete connections:
Same as the smaller Conquest with the following notes:
No Modulation Input: There is not discreet way for a building automation system to control the modulation (firing rate) of the Conquest.

Centauri Boiler, Centauri Plus Boiler, VT3 Boiler:

Model Numbers: All Centauri, Centauri Plus and VT3 Boilers

Probe 1: This temperature is displayed in yellow in the lower section of the display. With SSBCO option, this probe is located in the top of the boiler. Without this option, the probe is shipped uninstalled and should be installed in the BHWR piping to read the temperature of the water entering the boiler.
Probe 2: This temperature is displayed in red in the upper section of the display. With SSBCO option, this probe is shipped uninstalled and is intended to be installed in the field in the boiler's HWR piping. Without the SSBCO option, this probe is installed in the top of the boiler providing the outlet water temperature.
Probe 3: Is an Auxiliary probe that can be used for outdoor temperature or other temperature readings. This is optional and not standard.
Alarm_AL3: Alarm on any failure
Burner_Relay1: Burner
Relay2: Not used
Relay3: Isolation Valve control when the OnTrac boiler management system is controlling.
Modulation Rate: Modulation rate, Low fire = 0, High Fire = 100

Discrete connections:
Ext Enable: Terminals R1 – R2, Jumper to enable. Heater ships with jumper on this. An external enable/disable can be attached to this. (Recommend relay at boiler, min 10A at 24VAC.)
Remote Equipment: P1 & P2, this is a contact that is driven any time a call for heat is present. Note this is only provided if the Remote Equipment or Louver options are present.
Alarm: A1 & A2 provide a 3 min alarm signal that is present after a failure to ignite burner for 4 minutes. This output will be active for 3 minute and then the communication alarm will become active dropping the call for heat and dropping this signal. It is possible to get this alarm and the alarm condition that caused this alarm can be corrected before the 3 minutes, removing the alarm and not having a lockout or alarm condition over communication. (3 min signal of alarm condition and potential lockout.)

M3 Boiler

Probe 1: Is in the top of the tank, and controls the burner. Provides outlet temperature.
Probe 2: Is wired but lose and field installed in the boiler HWR piping.
Probe 3: Is in the flue.
Alarm_AL2: Alarm on any failure.
Burner_Relay1: Burner
Relay2: Alarm dry contact, goes to terminals A1 & A2.
Relay3: Isolation Valve control, used with OnTrac group control. Terminals labeled CIRCULATOR 1 & 2.
Modulation Rate: Modulation rate, Low fire = 0, High Fire = 100.

Discrete connections:
External Enable: Terminals R1 – R2, Jumper to enable. Heater ships with jumper on this. An external enable/disable can be attached to this. This is a low current, low voltage contact. It is advised to use a contact with gold plating. If not available, use 2 contacts in parallel.
Alarm: A1 & A2 (Output from Heater) Closed = ALARM.
Remote Proving: C1 & C2. Ships with factory jumper. Open will prevent burner from operating. Keeping this open will create a lockout condition that will require user intervention.
Remote Equipment / Burner ON: Contact that will close P1 – P2 during a heating cycle. Open, the heater is not calling for heat.
No Setpoint Input: There is not a discreet method to send a setpoint signal to the M3 boiler.
No Modulation Input: There is not discreet way for a building automation system to control the modulation (firing rate) of the Conquest.

Quickdraw Steam to Water Storage

Probe 1: Lower Sensor
Probe 2: Upper Sensor
Relay1: Control valve
Reference wiring diagram for more details. Options vary greatly on this product.

Discrete connections:
External Enable: Terminals
Remote Equipment / Heating: E1 & E2 terminals are closed when heating, and open when not. This is an option REMEQ.
Alarm: A1 & A2 terminals are closed when in Alarm. This is an option REMAL.

Quickdraw Steam to Water Instantaneous

Probe 1: Lower Sensor
Probe 2: Upper Sensor
Relay1: Control valve
Reference wiring diagram for more details. Options may vary on this product.

Discrete connections:
External Enable: Terminals
Remote Equipment / Heating: E1 & E2 terminals are closed when heating, and open when not. This is an option REMEQ.
Alarm: A1 & A2 terminals are closed when in Alarm. This is an option REMAL.

Other Equipment and Equipment Custom features:

Reference supplied wiring diagram and the I & O Manual. Contact PVI for additional information. Below is a list of other products that can use the TempTrac controller:

Quickdraw Water to water Storage
EZ PLATE STORAGE
TURBOPOWER 99
TURBOPOWER
POWER VT PLUS
TRICON
MAXIM 3
DURAWATT (With TTRAC option)
MAXIM (With TTRAC option)
COBREX STORAGE

POINTS LIST:

The gateway will provide a full points list, including typical points and advanced points. Normal interface will only require the TYPICAL POINTS. Many points are provided as ADVANCED POINTS and not advised to be used in normal integration. The Advanced Points are present for the purpose of future development and custom applications. Please consult factory if any points not in the TYPICAL POINTS are required.

Key:

LONWORKS shows multiple devices connected with a device number suffix, (#) represent the device. MODBUS address with ":" to designate single bit usage of register. Number following colon represents bit location, 0 is the least significant bit.

Point Name	Read/Write	Short Description	
MODBUS	Register Type	Address Offset	MODBUS Address
BACNET	BACNET Name	Object Instance	BACNET Units
LONWORKS	Lon Read name_#	Lon Write name_#	Lon Units
NOTES			

TYPICAL POINTS:

The points that are typically used to interface with the heater. Most integrations only require points from this list.

TYPICAL POINTS:

Control_CNT	Write	Enable Heater 257=on 1 = off	
MODBUS	Holding Register	1280	41281
BACNET	Enable	128100	
LONWORKS	nvoCtrl_CNT_#		
This can be used to prevent the heater from heating via communication. 257 or 0X0101 = on, 1 or 0x0000 = off The resister cannot be read. The register should only be written to with the values 257 and 1, as it has other undocumented functions.			

Setpoint_St1	Read/Write	System Setpoint	
MODBUS	Holding Register	768	40769
BACNET	Setpoint_St1	76900	Deg-F
LONWORKS	nvoSP_St1_#	nviSP_St1_#	Deg_F
This is the setpoint for the heater.			

Probe 1	Read Only	Controlling Probe Degrees F	
MODBUS	Holding Register	256	40257
BACNET	Probe1	25700	Deg-F
LONWORKS	nvoProbe1_#		Deg_F
Probe that provides control of heating. Location can vary depending on equipment and application. See section that discussed the various equipment to determine actual location of probe. Connection on TempTrac is green screw terminals 14 and common 17.			

TYPICAL POINTS:

Probe 2	Read Only	Probe 2 in degrees F	
MODBUS	Holding Register	258	40259
BACNET	Probe2	25900	Deg-F
LONWORKS	nvoProbe2_#		Deg_F
Optional probe on some devices, usually installed on most devices. If installed and enabled, returns the temperature of the probe in degrees F. Connection on TempTrac is green screw terminals 15 and common 17.			

Probe 3	Read Only	Probe 3 in degrees F	
MODBUS	Holding Register	260	40261
BACNET	Probe3	26100	Deg-F
LONWORKS	nvoProbe3_#		Deg_F
Optional probe on some devices, not usually installed on most devices. If installed and enabled, returns the temperature of the probe in degrees F. Connection on TempTrac is green screw terminals 16 and common 17.			

Burner Runtime	Read/Write	Burner Runtime Hours 0-65535	
MODBUS	Holding Register	848	40849
BACNET	BURNER_HOURS_ou1	84900	Hours
LONWORKS	nvoBrnHr_ou1_ #	nviBrnHr_ou1_#	Hours
NOTE: Number of hours the burner has been enabled. Once it reaches 9999. This can be written to, as a way to reset it.			

Modulation Rate	Read Only	Monitor the modulation signal	
MODBUS	Holding Register	262	40263
BACNET	Modulation_FR	26300	
LONWORKS	nvoMod_FR_#		
Modulation rate on the analog output 4-20ma is represented as 0-100. This feature was introduced in Firmware 0.5 (5) and is not available from older TempTrac modules already in the field.			

Burner_Relay1	Read Only	Status of burner, Relay1 (Output 1)	
MODBUS	Holding Register	2049	42050:0
BACNET	Burner_Relay1	205050	
LONWORKS	nvoBrn_Rel1_#		
This is Bit 0 of the Relay status word. It is the relay that controls the main heating output. Typically the Burner Status. BACNET and LONWORKS have this broke out into state logic points. MODBUS, you will have to break it out yourself. Read value, BITWISE AND with 0x0001, if result = 0, relay is off. If result = 1, relay is on.			

Alarm_AL2	Read Only	Status of digital input #2 Alarm	
MODBUS	Holding Register	3328	43329:11
BACNET	Alarm_AL2	332961	
LONWORKS	nvoAlarm_AL2_#		
Digital Input #2 alarm. On some products, this is a general failure to operate alarm. See product specific information. This is Bit 11 of the ALARM STATUS ALL word. Flashes 'AL2' or 'LP' on TempTrac display. In BACNET and LONWORKS, this is broken out into a state logic point. For MODBUS ALARMS && 0x0800 = 0x0800 Alarm is active. = 0x0000 Alarm is not active.			

TYPICAL POINTS:

Alarm_AL3	Read Only	Status of digital input #3 Alarm	
MODBUS	Holding Register	3328	43329:12
BACNET	Alarm_AL3	332962	
LONWORKS	nvoAlarm_AL3_#		
Digital Input #3 alarm. On some products, this is a general failure to operate alarm. See product specific information. This is Bit 12 of the ALARM STATUS ALL word. Flashes 'AL3' or 'HP' on TempTrac display. In BACNET and LONWORKS, this is broken out into a state logic point. For MODBUS ALARMS && 0x1000 = 0x1000 Alarm is active. = 0x0000 Alarm is not active.			

Com Status	Read Only	Communication Status bit	
MODBUS	Input Register	NA	NA
BACNET	Gateway_TT_Com_OK	200	
LONWORKS	nvoGwyTTCmOK_#		
NOTE: This point is not generated by the heater; it is generated internally by the gateway. It is a status of the communication connection between the gateway and the heater. If active (GOOD), the gateway is talking to the heater. If inactive (NOT_PRESENT) then the gateway does not have good communication with the heater. This point may take up to 3 minutes to register properly after communication is established or interrupted. If this value if reading NOT_PRESENT, then no all over values are suspect, as the device is not communicating. Generally the Gateway will hold the last value received. The only way to ensure you have the current values from the heater is to verify this point is ACTIVE as well.			

ALL POINTS INCLUDING ADVANCED:

Points listed below that are not in the TYPICAL POINTS are provided for advanced interface and for custom applications. Contact factory for additional information.

ALL POINTS INCLUDING ADVANCE:

Control_CNT	Write	Enable Heater 257=on 1 = off	
MODBUS	Holding Register	1280	41281
BACNET	Enable	128100	
LONWORKS	nvoCtrl_CNT_#		
This can be used to prevent the heater from heating via communication. 257 or 0X0101 = on, 1 or 0x0000 = off The resister cannot be read. The register should only be written to with the values 257 and 1, as it has other undocumented functions.			

Setpoint_St1	Read/Write	System Setpoint	
MODBUS	Holding Register	768	40769
BACNET	Setpoint_St1	76900	Deg-F
LONWORKS	nvoSP_St1_#	nviSP_St1_#	Deg_F
This is the setpoint for the heater.			

Setpoint_St1 C	Read/Write	System Setpoint	
MODBUS			
BACNET	Setpoint_St1_C	76900	Deg-C
LONWORKS			
Special BACNET point that converts the Setpoint value to degrees C in the gateway. Not available in LONWORKS or MODBUS.			

ALL POINTS INCLUDING ADVANCE:

Hy1	Read	Setpoint Differential	
MODBUS	Holding Register	772	40773
BACNET	Hy1	77300	delta-degrees-Fahrenheit
LONWORKS	nvoHy1_#		
Differential. (if Hy1 is negative) The heater will begin heating when Probe #1 must fall this far below St1 setpoint, and stay on until the heater reaches St1 setpoint. (If Hy1 is positive) The heater will come on when Probe #1 falls to or below St1 setpoint, and will not turn off until it has reached this far above St1 Setpoint. BACNET and LONWORKS, this point is configured as a read only, with MODBUS, there is no protection from changing this value.			

St4	Read Only	Modulation Start	
MODBUS	Holding Register	792	40793
BACNET	St4	79300	No Units
LONWORKS	nvoSt4_#		
Starting point of modulation. Related to the St1 setpoint. If Probe 1 is above St1 + St4, then Modulation signal will be low fire. If Probe 1 falls below (St1 + St4) then the analog output signal will modulate based on the setting in the SR register. This is set to No Units in BACNET because it can relative to St1 or is can be independent value. Typically it is configured as relative to St1. BACNET and LONWORKS, this point is configured as a read only, with MODBUS, there is no protection from changing this value.			

SR	Read	Modulation bandwidth	
MODBUS	Holding Register	793	40794
BACNET	SR	79400	delta-degrees-Fahrenheit
LONWORKS	nvoSR_#		
Normally this is a negative number. Number of degrees of change in Probe 1 that will modulate from 0 to 100%. St1 + St4 = low fire, St1 + St4 + SR = High Fire. Temperatures above low fire will be low fire, temperatures below high fire will be high fire. In-between, the output will modulate from 4-20mA (0-100%) BACNET and LONWORKS, this point is configured as a read only, with MODBUS, there is no protection from changing this value.			

Probe 1	Read Only	Controlling Probe Degrees F	
MODBUS	Holding Register	256	40257
BACNET	Probe1	25700	Deg-F
LONWORKS	nvoProbe1_#		Deg_F
Probe that provides control of heating. Location can vary depending on equipment and application. See section that discussed the various equipment to determine actual location of probe. Connection on TempTrac is green screw terminals 14 and common 17.			

Probe 2	Read Only	Probe 2 in degrees F	
MODBUS	Holding Register	258	40259
BACNET	Probe2	25900	Deg-F
LONWORKS	nvoProbe2_#		Deg_F
Optional probe on some devices, usually installed on most devices. If installed and enabled, returns the temperature of the probe in degrees F. Connection on TempTrac is green screw terminals 15 and common 17.			

Probe 3	Read Only	Probe 3 in degrees F	
MODBUS	Holding Register	260	40261
BACNET	Probe3	26100	Deg-F
LONWORKS	nvoProbe3_#		Deg_F
Optional probe on some devices, not usually installed on most devices. If installed and enabled, returns the temperature of the probe in degrees F. Connection on TempTrac is green screw terminals 16 and common 17.			

ALL POINTS INCLUDING ADVANCE:

Probe 1 C	Read Only	Controlling Probe Degrees C	
MODBUS			
BACNET	Probe1_C	25790	Deg-C
LONWORKS			
Special BACNET point that converts the Probe value to degrees C in the gateway. Not available in LONWORKS or MODBUS.			

Probe 2 C	Read Only	Probe 2 in degrees C	
MODBUS			
BACNET	Probe2_C	25990	Deg-C
LONWORKS			
Special BACNET point that converts the Probe value to degrees C in the gateway. Not available in LONWORKS or MODBUS.			

Probe 3 C	Read Only	Probe 3 in degrees C	
MODBUS			
BACNET	Probe3_C	26190	Deg-C
LONWORKS			
Special BACNET point that converts the Probe value to degrees C in the gateway. Not available in LONWORKS or MODBUS.			

Manual Modulation	Read/Write	Force modulation to a level	
MODBUS	Holding Register	797	40798
BACNET	PS4	79800	
LONWORKS	NvoPS4_#	NviPS4_#	
Used to force a modulation rate. Typically used by service tech to make combustion adjustments at a particular firing rate. Normal setting is 101 = Auto. This allows the heater to modulate ad the load requires. If you put a value 0-100, it will force the heater to that firing rate when operating. 0=Low Fire, 100=High Fire Use with caution. Advise allowing the heater do control its own modulation.			

ALL	Read/Write	Minimum Temperature Alarm	
MODBUS	Holding Register	814	40815
BACNET	ALL	81500	Deg-F
LONWORKS	nvoALL_#	nviALL_#	Deg_F
Minimum temperature for Probe 1. Alarm will be activated if Probe 1 falls below this temperature. See Alarm points.			

ALU	Read/Write	Flame Current for proof of flame	
MODBUS	Holding Register	815	40816
BACNET	ALU	81600	Deg-F
LONWORKS	nvoALU_#	nviALU_#	Deg_F
Maximum temperature for Probe 1. Alarm will be activated if Probe 1 rises above this temperature. See Alarm points.			

Burner Runtime	Read/Write	Burner Runtime Hours 0-65535	
MODBUS	Holding Register	848	40849
BACNET	BURNER_HOURS_ou1	84900	Hours
LONWORKS	nvoBrnHr_ou1_ #	nviBrnHr_ou1_#	Hours
NOTE: Number of hours the burner has been enabled. Once it reaches 9999. This can be written to, as a way to reset it.			

ALL POINTS INCLUDING ADVANCE:

Maintenance Reminder	Read/Write	Number of burner cycles 0-9999	
MODBUS	Holding Register	851	40852
BACNET	oP1	85200	
LONWORKS	nvooP1_#	nvioP1_#	
Maintenance feature, set the value to 0.			

Output #2 Mode	Read/Write	Output #2 mode, ON, OFF, AUTO	
MODBUS	Holding Register	855	40856
BACNET	TT_2on	85600	
LONWORKS	nvoTT_2on_ #	nviTT_2on_#	
TempTrac relay output spade 6 & 7. 0= Force relay off, 1=Force relay ON, 2= Auto (operates from thermostat functions).			

Output #3 Mode	Read/Write	Output #2 mode, ON, OFF, AUTO	
MODBUS	Holding Register	856	40857
BACNET	TT_3on	85700	
LONWORKS	nvoTT_3on_#	nviTT_3on_#	
TempTrac relay output spade 8 & 9. 0= Force relay off, 1=Force relay ON, 2= Auto (operates from thermostat functions).			

Software Version	Read Only	Firmware revision	
MODBUS	Holding Register	859	40860
BACNET	VERSION_rEL	86000	
LONWORKS	nvoVer_rEL_#		
Software/Firmware revision number. At time of this manual, current version is 0.5 read as 5.			

Modulation Rate	Read Only	Monitor the modulation signal	
MODBUS	Holding Register	262	40263
BACNET	Modulation_FR	26300	
LONWORKS	nvoMod_FR_#		
Modulation rate on the analog output 4-20ma is represented as 0-100. This feature was introduced in Firmware 0.5 (5) and is not available from older TempTrac modules already in the field.			

RELAYS Status ALL	Read Only	Shows the current state of the 3 output relays	
MODBUS	Holding Register	2049	42050:0,1,2
BACNET	RELAYS	205000	
LONWORKS	nvoRELAYS_#		
This register contains the relay status for all 3 relays. Bit 0 = relay 1 (4&5), Bit 1 = relay 2 (6&7), Bit 2 = relay 3 (8&9). See below breakout of each relay.			

Burner_Relay1	Read Only	Status of burner, Relay1 (Output 1)	
MODBUS	Holding Register	2049	42050:0
BACNET	Burner_Relay1	205050	
LONWORKS	nvoBrn_Rel1_#		
This is Bit 0 of the Relay status word. It is the relay that controls the main heating output. Typically the Burner Status. BACNET and LONWORKS have this broke out into state logic points. MODBUS, you will have to break it out yourself. Read value, BITWISE AND with 0x0001, if result = 0, relay is off. If result = 1, relay is on.			

ALL POINTS INCLUDING ADVANCE:

Relay2	Read Only	Status of Relay2 (Output 3)	
MODBUS	Holding Register	2049	42050:1
BACNET	Relay2	205051	
LONWORKS	nvoRelay2_#		
This is Bit 1 of the Relay status word. It is the output #2 relay. BACNET and LONWORKS have this broke out into state logic points. MODBUS, you will have to break it out yourself. Read value, BITWISE AND with 0x0002, if result = 0, relay is off. If result = 2, relay is on.			

Relay3	Read Only	Status of Relay3 (Output 3)	
MODBUS	Holding Register	2049	42050:2
BACNET	Relay3	205052	
LONWORKS	nvoRelay3_#		
This is Bit 2 of the Relay status word. It is the output #3 relay. BACNET and LONWORKS have this broke out into state logic points. MODBUS, you will have to break it out yourself. Read value, BITWISE AND with 0x0004, if result = 0, relay is off. If result = 4, relay is on.			

ALARM STATUS ALL	Read Only	ALL ALARMS STATUS	
MODBUS	Holding Register	3328	43329
BACNET	DIA	332900	
LONWORKS	nvoDIA_#		
Alarm word, each bit represent separate alarms.			

Alarm_LA	Read Only	Status of low temperature Alarm	
MODBUS	Holding Register	3328	43329:0
BACNET	Alarm_LA	332950	
LONWORKS	nvoAlarm_LA_#		
Low water temperature alarm. Probe 1 is lower than temperature in ALL point. This is Bit 0 of the ALARM STATUS ALL word. In BACNET and LONWORKS, this is broken out into a state logic point. For MODBUS ALARMS && 0x0001 = 0x0001 Alarm is active. = 0x0000 Alarm is not active.			

Alarm_HA	Read Only	Status of high temperature Alarm	
MODBUS	Holding Register	3328	43329:1
BACNET	Alarm_HA	332951	
LONWORKS	nvoAlarm_HA_#		
High water temperature alarm. Probe 1 is higher than temperature in ALU point. This is Bit 1 of the ALARM STATUS ALL word. In BACNET and LONWORKS, this is broken out into a state logic point. For MODBUS ALARMS && 0x0002 = 0x0002 Alarm is active. = 0x0000 Alarm is not active.			

Alarm_P1	Read Only	Status of Probe 1 Alarm	
MODBUS	Holding Register	3328	43329:2
BACNET	Alarm_P1	332952	
LONWORKS	nvoAlarm_P1_#		
Probe 1 alarm. This can be a disconnected, open or shorted probe. This will shut down heating operation. This is Bit 2 of the ALARM STATUS ALL word. Flashes 'P1' on TempTrac display. In BACNET and LONWORKS, this is broken out into a state logic point. For MODBUS ALARMS && 0x0004 = 0x0004 Alarm is active. = 0x0000 Alarm is not active.			

ALL POINTS INCLUDING ADVANCE:

Alarm_P2	Read Only	Status of Probe 1 Alarm	
MODBUS	Holding Register	3328	43329:8
BACNET	Alarm_P2	332958	
LONWORKS	nvoAlarm_P2_#		
Probe 2 alarm. This can be a disconnected, open or shorted probe. This is Bit 8 of the ALARM STATUS ALL word. Flashes 'P2' on TempTrac display. In BACNET and LONWORKS, this is broken out into a state logic point. For MODBUS ALARMS && 0x0100 = 0x0100 Alarm is active. = 0x0000 Alarm is not active.			

Alarm_P3	Read Only	Status of Probe 1 Alarm	
MODBUS	Holding Register	3328	43329:9
BACNET	Alarm_P3	332959	
LONWORKS	nvoAlarm_P3_#		
Probe 3 alarm. This can be a disconnected, open or shorted probe. This is Bit 9 of the ALARM STATUS ALL word. Flashes 'P3' on TempTrac display. In BACNET and LONWORKS, this is broken out into a state logic point. For MODBUS ALARMS && 0x0200 = 0x0200 Alarm is active. = 0x0000 Alarm is not active.			

Alarm_AL1	Read Only	Status of digital input #1 Alarm	
MODBUS	Holding Register	3328	43329:10
BACNET	Alarm_AL1	332960	
LONWORKS	nvoAlarm_AL1_#		
Digital Input #1 alarm. This is typically not implemented. Refer to product specific details for information on this alarm. This is Bit 10 of the ALARM STATUS ALL word. Flashes 'AL1' on TempTrac display. In BACNET and LONWORKS, this is broken out into a state logic point. For MODBUS ALARMS && 0x0400 = 0x0400 Alarm is active. = 0x0000 Alarm is not active.			

Alarm_AL2	Read Only	Status of digital input #2 Alarm	
MODBUS	Holding Register	3328	43329:11
BACNET	Alarm_AL2	332961	
LONWORKS	nvoAlarm_AL2_#		
Digital Input #2 alarm. On some products, this is a general failure to operate alarm. See product specific information. This is Bit 11 of the ALARM STATUS ALL word. Flashes 'AL2' or 'LP' on TempTrac display. In BACNET and LONWORKS, this is broken out into a state logic point. For MODBUS ALARMS && 0x0800 = 0x0800 Alarm is active. = 0x0000 Alarm is not active.			

Alarm_AL3	Read Only	Status of digital input #3 Alarm	
MODBUS	Holding Register	3328	43329:12
BACNET	Alarm_AL3	332962	
LONWORKS	nvoAlarm_AL3_#		
Digital Input #3 alarm. On some products, this is a general failure to operate alarm. See product specific information. This is Bit 12 of the ALARM STATUS ALL word. Flashes 'AL3' or 'HP' on TempTrac display. In BACNET and LONWORKS, this is broken out into a state logic point. For MODBUS ALARMS && 0x1000 = 0x1000 Alarm is active. = 0x0000 Alarm is not active.			

ALL POINTS INCLUDING ADVANCE:

Alarm_Nn1	Read Only	Maintenance Alarm for output #1	
MODBUS	Holding Register	3328	43329:13
BACNET	Alarm_Nn1	332963	
LONWORKS	nvoAlarm_Nn1_#		
Maintenance Alarm. This is enabled when the time on ou1 is greater than the value in oP1. Flashes 'Nn1' on TempTrac display. Bit #13 of Alarms. In BACNET and LONWORKS, this is broken out into a state logic point. For MODBUS ALARMS && 0x2000 = 0x2000 Alarm is active. = 0x0000 Alarm is not active.			

Alarm_Nn2	Read Only	Maintenance Alarm for output #2	
MODBUS	Holding Register	3328	43329:14
BACNET	Alarm_Nn2	332963	
LONWORKS	nvoAlarm_Nn2_#		
Maintenance Alarm. This is enabled when the time on ou2 is greater than the value in oP2. Flashes 'Nn2' on TempTrac display. Bit #14 of Alarms. In BACNET and LONWORKS, this is broken out into a state logic point. For MODBUS ALARMS && 0x4000 = 0x4000 Alarm is active. = 0x0000 Alarm is not active.			

Alarm_Nn3	Read Only	Maintenance Alarm for output #3	
MODBUS	Holding Register	3328	43329:15
BACNET	Alarm_Nn3	332963	
LONWORKS	nvoAlarm_Nn3_#		
Maintenance Alarm. This is enabled when the time on ou3 is greater than the value in oP3. Flashes 'Nn3' on TempTrac display. Bit #15 of Alarms. In BACNET and LONWORKS, this is broken out into a state logic point. For MODBUS ALARMS && 0x8000 = 0x8000 Alarm is active. = 0x0000 Alarm is not active.			

Com Status	Read Only	Communication Status bit	
MODBUS	Input Register	NA	NA
BACNET	Gateway_TT_Com_OK	200	
LONWORKS	nvoGwyTTCmOK_#		
NOTE: This point is not generated by the heater; it is generated internally by the gateway. It is a status of the communication connection between the gateway and the heater. If active (GOOD), the gateway is talking to the heater. If inactive (NOT_PRESENT) then the gateway does not have good communication with the heater. This point may take up to 3 minutes to register properly after communication is established or interrupted. If this value if reading NOT_PRESENT, then no all over values are suspect, as the device is not communicating. Generally the Gateway will hold the last value received. The only way to ensure you have the current values from the heater is to verify this point is ACTIVE as well.			

ADVANCED MODBUS LIST:

The following is the direct MODBUS interface addresses. Descriptions of most to the MODBUS parameters are listed in the correlating TYPICAL POINTS defined previously. Many MODBUS parameters are not supported in the gateway interface. This is a complete reference list and contains advanced parameters. All MODBUS points normally required for interface are represented in the TYPICAL POINTS section. If there is a need for interfacing using other parameters, consult factory to confirm proper use.

Label	Firm Version	Description	Range X÷Y	Rev 0.3 Level	Rev 0.5 Level	Hex Add Modbus base 0	Register
							40000+
St1	0.3 & 0.5	Set point1	LS1÷US1	Pr1	Pr1	0x300	769
St2	0.3 & 0.5	Set point2	LS2÷US2	Pr1	Pr1	0x301	770
St3	0.3 & 0.5	Set point3	LS3÷US3	Pr1	Pr1	0x302	771
St5	0.3 & 0.5	Set point5 Set point 3 alternate	-20÷70°F	Pr1	Pr1	0x303	772
HY1	0.3 & 0.5	Differential for St1	-22÷22°F	Pr2	Pr2	0x304	773
LS1	0.3 & 0.5	Minimum set point1	-40°F÷SET	Pr2	Pr2	0x305	774
US1	0.3 & 0.5	Maximum set point1	SET ÷ 230°F	Pr2	Pr2	0x306	775
AC1	0.3 & 0.5	Anti-short cycle delay for output 1	0÷30 min.	Pr2	Pr2	0x307	776
S2c	0.3 & 0.5	Configuration of St2: dependent on St1 or independent	diP; ind	Pr3	Pr2	0x308	777
HY2	0.3 & 0.5	Differential for St2	-22÷22°F	Pr2	Pr2	0x309	778
LS2	0.3 & 0.5	Minimum set point2	-40°F÷St2	Pr2	Pr2	0x30A	779
uS2	0.3 & 0.5	Maximum set point2	St2 ÷ 230°F	Pr2	Pr2	0x30B	780
AC2	0.3 & 0.5	Anti-short cycle delay for output 2	0÷30 min.	Pr2	Pr2	0x30C	781
S3c	0.3 & 0.5	Configuration of St3: dependent on St1 or independent	diP; ind	Pr2	Pr2	0x30D	782
HY3	0.3 & 0.5	Differential for set point 3 St3	-22÷22°F	Pr2	Pr2	0x30E	783
LS3	0.3 & 0.5	Minimum set point 3 St3	-40°F÷St3	Pr2	Pr2	0x30F	784
uS3	0.3 & 0.5	Maximum set point 3 St3	St3 ÷ 230°F	Pr2	Pr2	0x310	785
AC3	0.3 & 0.5	Anti-short cycle delay for output 3	0÷30 min.	Pr2	Pr2	0x311	786
o3P	0.3 & 0.5	Probe selection for output 3	Pb1 / Pb2	Pr2	Pr2	0x312	787
SSE	0.3 & 0.5	Set point shift for output 3 enable disable	No; Yes	Pr2	Pr2	0x313	788
HY5	0.3 & 0.5	Differential for set point 5	-22÷22°F	Pr2	Pr2	0x314	789
Ac5	0.3 & 0.5	Anti-short cycle delay for output 3 alternate set point	0÷30 min.	Pr2	Pr2	0x315	790
AcA	0.3 & 0.5	Time delay between the St3 to St5 set point shift	0÷15 min.	Pr2	Pr2	0x316	791

ANALOGUE OUTPUT 4÷20mA (output 4)

S4c	0.3 & 0.5	Configuration of St4: dependent on St1 or independent	diP; ind	Pr3	Pr2	0x317	792
St4	0.3 & 0.5	Analogue output set point	-100÷100°F	Pr2	Pr2	0x318	793
SR	0.3 & 0.5	Analogue output band width	-100÷100°F	Pr2	Pr2	0x319	794
Th4	0.3 & 0.5	Outlet temperature threshold for forcing to 4ma the analog output	-40°F ÷ 230°F	Pr2	Pr2	0x31A	795
HY4	0.3 & 0.5	Differential for restart working of analog output	-45 ÷ -1 °F	Pr2	Pr2	0x31B	796
Ac4	0.3 & 0.5	Anti-short cycle delay for output 4	0÷30 min.	Pr2	Pr2	0x31C	797
PS4	0.3 & 0.5	Analog output percentage (nu=101)	0÷100, nu	Pr2	Pr2	0x31D	798
PP4	0.3 & 0.5	Analog output percentage with fault probe 1 (nu=101)	0÷100, nu	Pr3	Pr2	0x31E	799

DYNAMIC RESET

tt	0.3 & 0.5	Outdoor temperature threshold for dynamic reset of St1	-40÷230°F	Pr2	Pr2	0x31F	800
rr2	0.3 & 0.5	Outdoor temperature band width	-100÷100°F	Pr2	Pr2	0x320	801

rr1	0.3 & 0.5	Maximum shift of St1	-100÷100°F	Pr2	Pr2	0x321	802
tt2	0.3 & 0.5	Outdoor temperature threshold to open all the loads	-40÷230°F	Pr2	Pr2	0x322	803
Ht2	0.3 & 0.5	Differential for restart working of controller	-45 ÷ -1 °F	Pr2	Pr2	0x323	804

DIGITAL INPUTS

i1P	0.3 & 0.5	Digital input 1 polarity	CL÷OP	Pr3	Pr2	0x324	805
i2P	0.3 & 0.5	Digital input 2 polarity	CL÷OP	Pr2	Pr2	0x325	806
i2d	0.3 & 0.5	Digital input 2 alarm delay	0÷255 min.	Pr3	Pr2	0x326	807
i3P	0.3 & 0.5	Digital input 3 polarity	CL÷OP	Pr2	Pr2	0x327	808
i3d	0.3 & 0.5	Digital input 3 alarm delay	0÷255 min.	Pr3	Pr2	0x328	809

DISPLAY

cF	0.3 & 0.5	Temperature measurement unit	°C ÷ °F	Pr3	Pr2	0x329	810
rES	0.3 & 0.5	Resolution (integer/decimal point) only for °C	in ÷ de	Pr3	Pr2	0x32A	811
dS2	0.3	Default showing for display #2 Top (red)	Pb2, Pb3	Pr2		0x32B	812
dS2	0.5	Default showing for display #2 Top (red) Pb3 will display yellow EXT, Ani will display yellow Valve/M	Pb1,Pb2,Pb3,AnI		Pr2	0x32B	812
dS1	0.3	Default showing for display #1 Bottom (Yellow)	Pb1; tiM	Pr2		0x32C	813
dS1	0.5	Default showing for display #1 Bottom (Yellow) Pb3 will display yellow EXT, Ani will display yellow Valve/M	Pb1,Pb2,Pb3,AnI, TiM		Pr2	0x32C	813

ALARMS

Alc	0.3 & 0.5	Temperature alarms configuration: dependent on St1 or independent	rE÷Ab	Pr3	Pr2	0x32D	814
ALL	0.3	minimum temperature alarm for Pb1 (Alarm LA flash only)	-40÷230°F	Pr2	Pr2	0x32E	815
ALL	0.5	minimum temperature alarm for Pb1 (Alarm LA flash and signal on 3329)	-40÷230°F	Pr2	Pr2	0x32E	815
Alu	0.3	MAXIMUM temperature alarm for Pb1 (Alarm HA flash only)	-40÷230°F	Pr3	Pr2	0x32F	816
Alu	0.5	MAXIMUM temperature alarm for Pb1 (Alarm HA flash and signal on 3329)	-40÷230°F	Pr3	Pr2	0x32F	816
AFH	0.3 & 0.5	Differential for temperature alarm recovery	1÷45°F	Pr2	Pr2	0x330	817
ALd	0.3 & 0.5	Temperature alarm delay	0÷255 min.	Pr2	Pr2	0x331	818
dAo	0.3 & 0.5	Delay of temperature alarm at start up 1 = 10 min disp 0.1	0 ÷ 23h 50 min.	Pr2	Pr2	0x332	819

ANALOGUE INPUTS

oF1	0.3 & 0.5	First probe calibration	-21÷21°F	Pr3	Pr2	0x333	820
P2P	0.3 & 0.5	Second probe presence	No; Yes	Pr2	Pr2	0x334	821
oF2	0.3 & 0.5	Second probe calibration	-21÷21°F	Pr3	Pr2	0x335	822
P3P	0.3 & 0.5	Third probe presence	No; Yes	Pr2	Pr2	0x336	823
oF3	0.3 & 0.5	Third probe calibration	-21÷21°F	Pr3	Pr2	0x337	824

TIME AND DATE

Hur	0.3 & 0.5	Current hour	0 ÷ 23	Pr2	Pr2	0x338	825
Min	0.3 & 0.5	Current minute	0 ÷ 59	Pr2	Pr2	0x339	826
dAY	0.3 & 0.5	Current day	Sun ÷ SAt	Pr2	Pr2	0x33A	827

ENERGY SAVING TIMES

E1	0.3 & 0.5	Energy saving start on Sunday	0 ÷ 23h 50 min. - nu	Pr2	Pr2	0x33B	828
S1	0.3 & 0.5	Energy saving stop on Sunday	0 ÷ 23h 50 min. - nu	Pr2	Pr2	0x33C	829
Sb1	0.3 & 0.5	Set back temperature on Sunday	-40÷40°F	Pr2	Pr2	0x33D	830
E2	0.3 & 0.5	Energy saving start on Monday	0 ÷ 23h 50 min. - nu	Pr2	Pr2	0x33E	831
S2	0.3 & 0.5	Energy saving stop on Monday	0 ÷ 23h 50 min. - nu	Pr2	Pr2	0x33F	832
Sb2	0.3 & 0.5	Set back temperature on Monday	-40÷40°F	Pr2	Pr2	0x340	833
E3	0.3 & 0.5	Energy saving start on Tuesday	0 ÷ 23h 50 min. - nu	Pr2	Pr2	0x341	834
S3	0.3 & 0.5	Energy saving stop on Tuesday	0 ÷ 23h 50 min. - nu	Pr2	Pr2	0x342	835
Sb3	0.3 & 0.5	Set back temperature on Tuesday	-40÷40°F	Pr2	Pr2	0x343	836
E4	0.3 & 0.5	Energy saving start on Wednesday	0 ÷ 23h 50 min. - nu	Pr2	Pr2	0x344	837
S4	0.3 & 0.5	Energy saving stop on Wednesday	0 ÷ 23h 50 min. - nu	Pr2	Pr2	0x345	838
Sb4	0.3 & 0.5	Set back temperature on Wednesday	-40÷40°F	Pr2	Pr2	0x346	839
E5	0.3 & 0.5	Energy saving start on Thursday	0 ÷ 23h 50 min. - nu	Pr2	Pr2	0x347	840
S5	0.3 & 0.5	Energy saving stop on Thursday	0 ÷ 23h 50 min. - nu	Pr2	Pr2	0x348	841
Sb5	0.3 & 0.5	Set back temperature on Thursday	-40÷40°F	Pr2	Pr2	0x349	842
E6	0.3 & 0.5	Energy saving start on Friday	0 ÷ 23h 50 min. - nu	Pr2	Pr2	0x34A	843
S6	0.3 & 0.5	Energy saving stop on Friday	0 ÷ 23h 50 min. - nu	Pr2	Pr2	0x34B	844
Sb6	0.3 & 0.5	Set back temperature on Friday	-40÷40°F	Pr2	Pr2	0x34C	845
E7	0.3 & 0.5	Energy saving start on Saturday	0 ÷ 23h 50 min. - nu	Pr2	Pr2	0x34D	846
S7	0.3 & 0.5	Energy saving stop on Saturday	0 ÷ 23h 50 min. - nu	Pr2	Pr2	0x34E	847
Sb7	0.3 & 0.5	Set back temperature on Saturday	-40÷40°F	Pr2	Pr2	0x34F	848

WORKING HOURS

ou1	0.3 & 0.5	working hours actual of relay 1	0÷9999 Hours	Pr1	Pr2	0x350	849
ou2	0.3 & 0.5	working hours actual of relay 2	0÷9999 Hours	Pr1	Pr2	0x351	850
ou3	0.3 & 0.5	working hours actual of relay 3	0÷9999 Hours	Pr2	Pr2	0x352	851
oP1	0.3 & 0.5	working hours limit of relay 1, Nn1 Alarm when reached	0÷9999, 0=disabled	Pr2	Pr2	0x353	852
oP2	0.3 & 0.5	working hours limit of relay 2, Nn2 Alarm when reached	0÷9999, 0=disabled	Pr2	Pr2	0x354	853
oP3	0.3 & 0.5	working hours limit of relay 3, Nn3 Alarm when reached	0÷9999, 0=disabled	Pr2	Pr2	0x355	854

OUTPUTS SETTING

1on	0.3 & 0.5	The output 1 force ON / OFF or Temperature regulation	rEG=2; on=1; oFF=0	Pr2	Pr2	0x356	855
2on	0.3 & 0.5	The output 2 force ON / OFF or Temperature regulation	rEG=2; on=1; oFF=0	Pr2	Pr2	0x357	856
3on	0.3 & 0.5	The output 3 force ON / OFF or Temperature regulation	rEG=2; on=1; oFF=0	Pr2	Pr2	0x358	857

OTHER

Adr	0.3 & 0.5	Serial address	0÷247	Pr2	Pr2	0x359	858
Ptb	0.3 & 0.5	Parameter map code always = 1	readable only	Pr2	Pr2	0x35A	859
rEL	0.3 & 0.5	Software release 5 = V0.5, 3 = V0.3	readable only	Pr2	Pr2	0x35B	860
i1S	0.5	Analog output when Digital Input 1 is activated	4-20mA		Pr2	0x35C	861
i1t	0.5	Analog output at i1S extra time if Digital Input 1 is not activated	0÷30 sec.		Pr2	0x35D	862
i1d	0.5	Digital Input 1 Alarm Delay	0÷255 min.		Pr2	0x35E	863
i1F	0.5	If Yes, Digital Input 1 will function as Alarm. Operating only when trying to call for output 1 and Input 1 is active, subject to i1d timer	No; Yes		Pr2	0x35F	864
i2F	0.5	Digital Input 2 will function only when Output 1 is energized	No; Yes		Pr2	0x360	865
i3F	0.5	Digital Input 3 will function only when Output 1 is energized, When Edi is selected, Output 1 will open when digital input 3 is activated	No; Yes; Edi		Pr2	0x361	866
oS2	0.5	Output 2 function: either temp relay or alarm relay	Std; AL		Pr2	0x362	867
(TP1)	0.3 & 0.5	Probe 1 temperature	Degrees F/C		Pr2	0x100	257
	0.3	Probe 1 Information/Status Normal=512 or 0x0200, Fault=515 or 0x0203. Fault will, drop call for heat, buz, Flash Yellow P1, light yellow valve/M	bit (0,1 on) probe failure		Pr2	0x101	258
(TP2)	0.3 & 0.5	Probe 2 temperature	Degrees F/C		Pr2	0x102	259
	0.3	Probe 2 Information/Status Normal=512 or 0x0200, Fault=515 or 0x0203. Fault will buz, Flash Red P2	bit (0,1 on) probe failure		Pr2	0x103	260
(TP3)	0.3 & 0.5	Probe 3 temperature	Degrees F/C		Pr2	0x104	261
	0.3	Probe 3 Information/Status Normal=512 or 0x0200, Fault=515 or 0x0203. Fault will buz, Flash Red P3	bit (0,1 on) probe failure		Pr2	0x105	262
	0.5	Modulation rate output (4 to 20mA)	0÷100%		Pr2	0x106	263
	0.3 & 0.5	Statas of Relay 1,2&3	bit 0,1,2		Pr2	0x801	2050
	0.3	Input 3 Alarm, buz, ALMMB, Flashes HP= 4096 or 0x0800	bit # 12 or 13th bit		Pr2	0xD00	3329
	0.3	Input 2 Alarm, buz, Flashes LP= 4096 or 0x0800	bit # 12 or 13th bit		Pr2	0xD00	3329
	0.3	Input 2 & 3, buz, Flashed HP & LP= 4096 or 0X0800	bit # 12 or 13th bit		Pr2	0xD00	3329
	0.5	Low Temperature Alarm, beep, Flash Yellow LA= 1 or 0x0001	bit # 0 or 1st bit		Pr2	0xD00	3329
	0.5	High Temperature Alarm, beep, Flash yellow HA= 2 or 0x0002	bit # 1 or 2nd bit		Pr2	0xD00	3329
	0.5	Probe 1 error, open or shorted, Drops call for heat, yel valve/M on, Flash Yellow P1=4 or 0x0004	bit # 2 or 3rd bit		Pr2	0xD00	3329
	0.5	Probe 2 error, open or shorted, Flashing red P2=256 or 0x0100	bit # 8 or 9th bit		Pr2	0xD00	3329
	0.5	Probe 3 error, open or shorted, Flashing red P3=512 or 0x0200	bit # 9 or 10th bit		Pr2	0xD00	3329
	0.5	ALARM 1 (stops heating) Input 1, beep, Flash AL1 = 1024 or 0x0400. Will recover if Input 1 goes away, or need for call for heat goes away	bit # 10 or 11th bit		Pr2	0xD00	3329

	0.5	ALARM 2 (Lockout, stops heating) Input 2, Flash AL2 & Lguage & valve= 2048 or 0x1000	bit # 11 or 12th bit		Pr2	0xD00	3329
	0.5	ALARM 3 (Lockout, stops heating) Input 3/ALMMB/ALOAF, beep, Flash AL3 & Hguage & valve (This is ALARM ON ANY FAILURE)= 4096 or 0x0800	bit # 12 or 13th bit		Pr2	0xD00	3329
	0.5	Maintenance Relay1, beep, Flash Nn1 & wrench=8192 or 0x2000 You must reset hours ou1 or set oP1=0	bit # 13 or 14th bit		Pr2	0xD00	3329
	0.5	Maintenance Relay2, beep, Flash Nn2 & wrench=16384 or 0x4000 You must reset hours ou2 or set oP2=0	bit # 14 or 15th bit		Pr2	0xD00	3329
	0.5	Maintenance Relay3, beep, Flash Nn3 & wrench=32768 or 0x8000 You must reset hours ou3 or set oP3=0	bit # 15 or 16th bit		Pr2	0xD00	3329
	0.3 & 0.5	On/Off On=257 or 0x0101, Off=1 or 0x0001 Can be used to reset ALMMB alarm by cycling OFF, wait 30 sec , ON	Low byte is mask, Hi byte is command. Bit # 0 & #8		Pr2	0x500	1281
	0.3 & 0.5	Keyboard Lock Lock=2056 or 0x0808, Unlock=8 or 0x0008. If locked PoF is displayed when keypad edit is attempted	Low byte is mask, Hi byte is command. Bit # 3 & #11		Pr2	0x500	1281
	0.3 & 0.5	Reset audible alarm when condition is corrected, 4112 or 0x1010 does not reset alarm, just stops the beeping	Low byte is mask, Hi byte is command. Bit # 3 & #12		Pr2	0x500	1281
		Energy Savings Registers are enumerated 0 to 145 w/145=n/u 10 min each with 145=nu All other enumerations start at 0 and count up					