SYSTEM-1000

FLOW AND ENERGY MEASUREMENT SYSTEM

Installation and Operation Guide



ONICON
Flow and Energy Measurement

DOC-0005327 Rev.C

SAFETY INFORMATION

The System-1000 BTU Meter was calibrated at the factory before shipment. To ensure correct use of the system, please read this manual thoroughly.

Regarding this manual:

- This manual should be passed on to the end user.
- Before use, read this manual thoroughly to comprehend its contents.
- The contents of this manual may be changed without prior notice.
- All rights reserved. No part of this manual may be reproduced in any form without ONICON Incorporated's written permission.
- ONICON Incorporated makes no warranty of any kind with regard to this material, including, but not limited to, implied warranties of merchantability and suitability for a particular purpose.
- All reasonable effort has been made to ensure the accuracy of the contents of this manual. However, if any errors are found, please inform ONICON Incorporated.
- ONICON Incorporated assumes no responsibilities for this product except as stated in the warranty.
- If the customer or any third party is harmed by the use of this product, ONICON Incorporated assumes no responsibility for any such harm owing to any defects in the product which were not predictable, or for any indirect damages.

SAFETY PRECAUTIONS:

The following general safety precautions must be observed during all phases of installation, operation, service, and repair of this product. Failure to comply with these precautions or with specific WARNINGS given elsewhere in this manual violates safety standards of design, manufacture, and intended use of the product. ONICON Incorporated assumes no liability for the customer's failure to comply with these requirements. If this product is used in a manner not specified in this manual, the protection provided by this product may be impaired.

The following messages are used in this manual:

WARNING
Messages identified as "WARNING" contain information regarding the personal safety of individuals involved in the installation, operation or service of this product.

CAUTION
Messages identified as "CAUTION" contain information regarding potential damage to the product or other ancillary products.

IMPORTANT NOTE
Messages identified as "IMPORTANT NOTE" contain information critical to the proper operation of the product.

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SECTION 1.0 GENERAL INFORMATION

We at ONICON Incorporated would like to thank you for purchasing our quality American made System-1000 BTU Meter. As our valued customer, our commitment to you is to provide fast reliable service, while continuing to offer quality products to meet your growing flow measurement needs.

1.1 PURPOSE OF THIS MANUAL

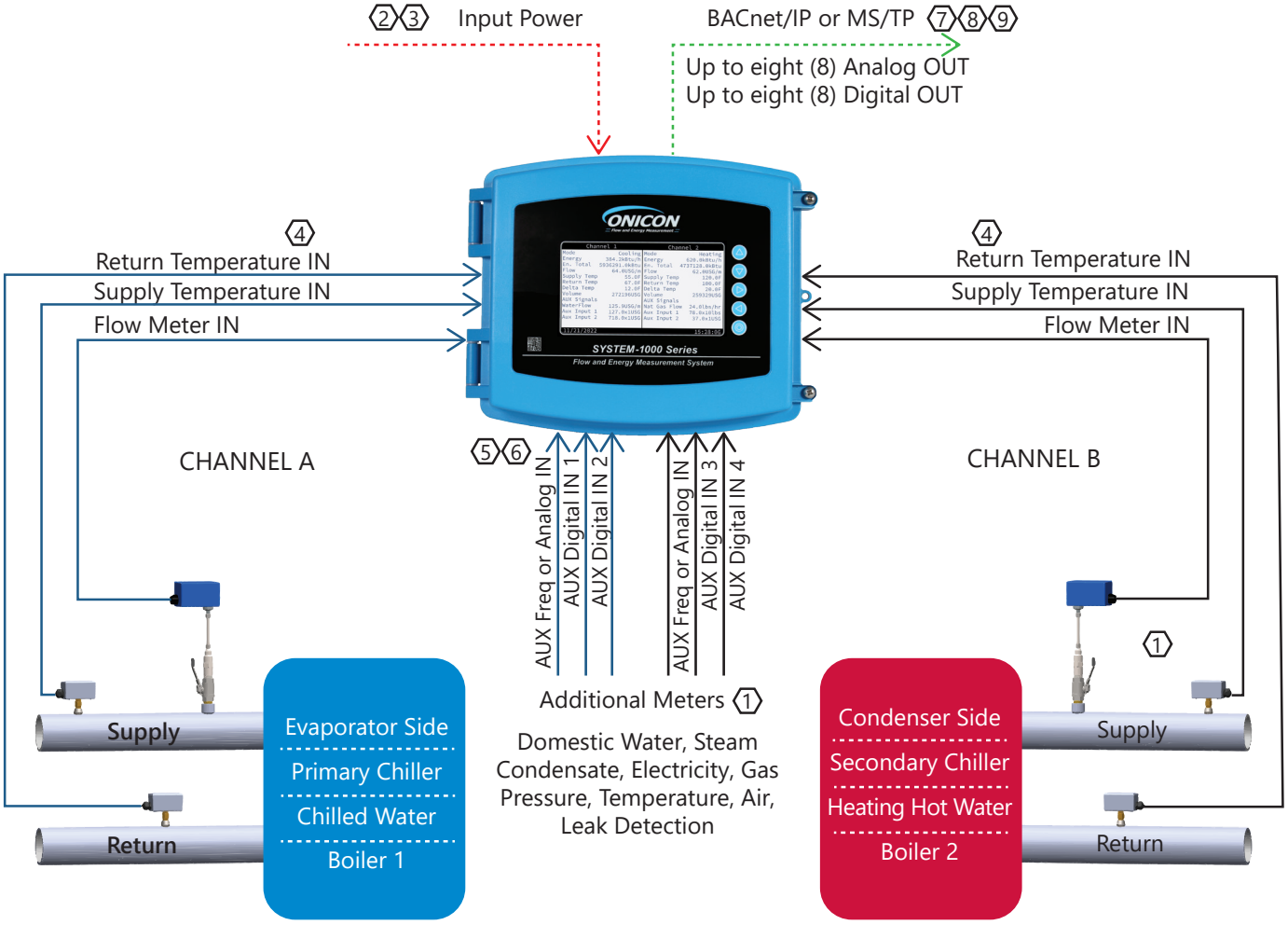
The purpose of this guide is to provide installation and commissioning procedures and basic operating and servicing instructions for the ONICON System-1000 BTU Meter.

WARNING

Only qualified service personnel should attempt to install or service this product. Serious injury may result from the improper Installation or use of this product.

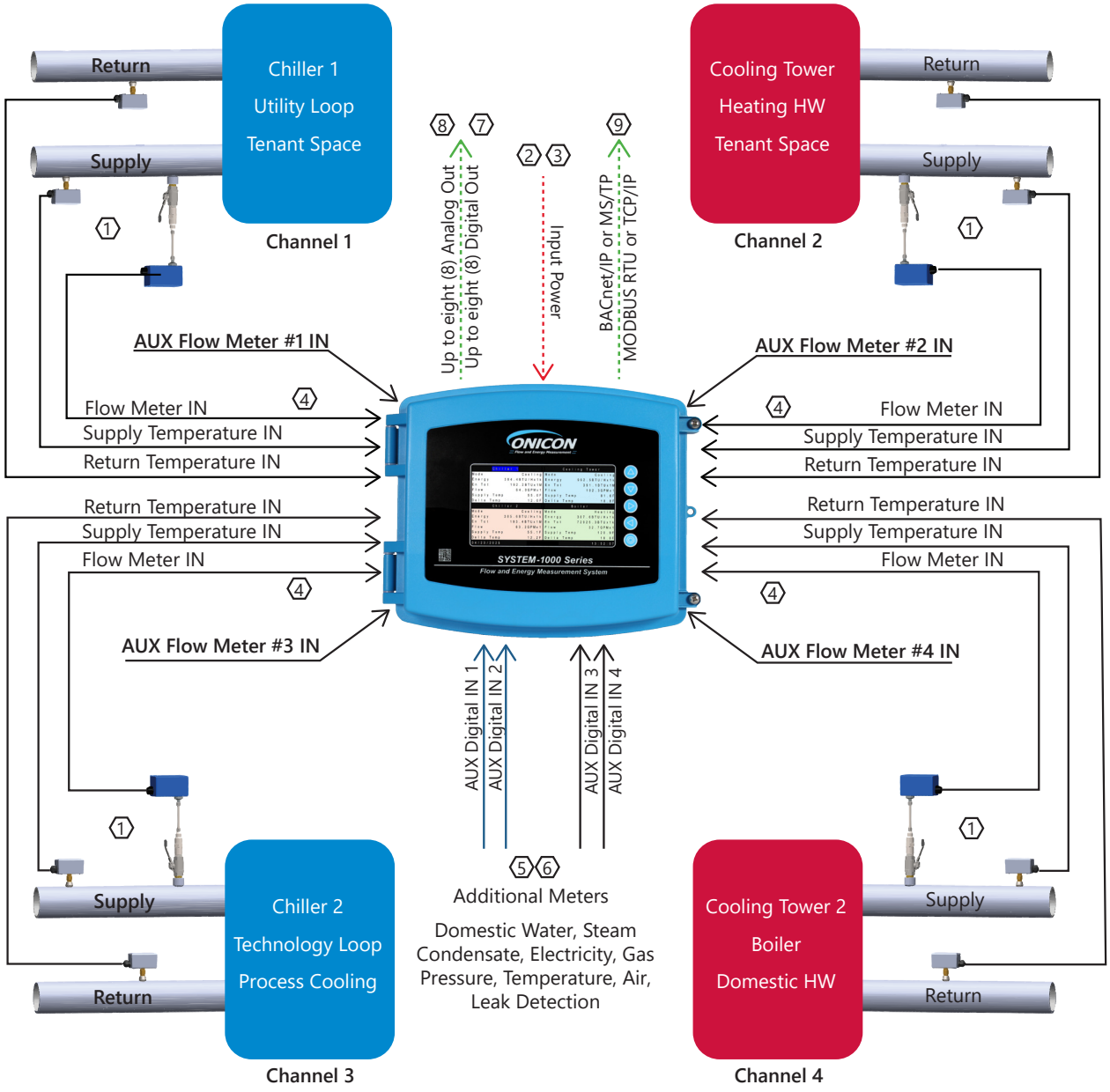
1.2 TYPICAL SYSTEM-1000 BTU METER INSTALLATION

TYPICAL ONE or TWO CHANNEL INSTALLATION



1. ONICON Flow Meters and Temperature Sensors are provided separately
2. Provide a Power supply 24VAC/DC, 100VA Class II or 120/230 VAC 50/60 Hz, 200VA
3. Provide sufficient power supply when the combined current of all devices connected to the SYS-1000 exceeds 1 Amp
4. Flow Meter and Temperature sensors used for thermal energy calculations
5. Auxiliary Digital Inputs are available for close contact alarm signals and totalization
6. Auxiliary Digital Inputs designed for Dry or Wet Contact and Open Collectors
7. Digital Outputs are available for Energy Totals, Flow Totals, Operating Modes, and Alarms
8. Analog outputs are available for Energy Rate, Flow Rate, Supply Temp, Return Temp, Efficiency, and Aux Inputs
9. BACnet® IP or MS/TP OR MODBUS RTU or TCP/IP

TYPICAL FOUR CHANNEL INSTALLATION



1. ONICON Flow Meters and Temperature Sensors are provided separately
2. Provide a Power supply 24VAC/DC, 100VA Class II or 120/230 VAC 50/60 Hz, 200VA
3. Provide sufficient power supply when the combined current of all devices connected to the SYS-1000 exceeds 1 Amp
4. Flow Meter and Temperature sensors used for thermal energy calculations
5. Auxiliary Digital Inputs are available for close contact alarm signals and totalization
6. Auxiliary Digital Inputs designed for Dry or Wet Contact and Open Collectors
7. Digital Outputs are available for Energy Totals, Flow Totals, Operating Modes, and Alarms
8. Analog outputs are available for Energy Rate, Flow Rate, Supply Temp, Return Temp, Efficiency, and Aux Inputs
9. BACnet® IP or MS/TP OR MODBUS RTU or TCP/IP

1.3 STANDARD FEATURES AND SPECIFICATIONS*

SYSTEM-1000 TRANSMITTER			
PERFORMANCE	CALCULATOR ACCURACY	Computing nonlinearity within ±0.05%	
	TEMPERATURE ACCURACY / AVAILABLE OPTIONS	Precision solid state current based sensors. Signal (mA) is unaffected by wire length. Overall differential temperature measurement uncertainty of ±0.15°F over the application range. Liquid temperature range: 32°F to 200°F	
		1000Ω platinum RTDs calibrated to a differential measurement uncertainty of ± 0.18°F over the stated range	
	FLOW RATE	See accuracy statement provided with the flow meter (ordered separately)	
MECHANICAL	DIMENSIONS	13.96" W x 12" H x 6.04" D	
MATERIALS	ENCLOSURE	ADC12 Die Cast Aluminum	
ENVIRONMENTAL	OPERATING TEMPERATURE RANGE	-13°F to 140°F	
	ENCLOSURE RATING	NEMA 13	
POWER SUPPLY REQUIREMENTS	24 VAC/DC	22 - 28 V DC/AC, 50/60Hz, 100VA	
	120-240 VAC	99 - 126 VAC or 196 - 253 VAC, 50/60Hz, 200VA	
I/O SIGNALS	ONE CHANNEL CONFIGURATION	Frequency Inputs	Two (2) Active Frequency Inputs
		Analog Inputs	Two (2) Active Analog Inputs
		Digital Inputs	Two (2) Open Collector / Isolated Dry Contact for totalization or alarm
		Temperature Sensor Inputs	Two (2) Passive Analog Inputs or Two (2) 1000 Ω RTD Inputs
		Analog Outputs	Four (4) Active Analog Outputs
		Digital Outputs	Four (4) Isolated Dry Contact Inputs for Totalization or Alarm
	TWO AND FOUR CHANNEL CONFIGURATION	Frequency Inputs	Four (4) Active Frequency Inputs
		Analog Inputs	Four (4) Active Analog Inputs
		Digital Inputs	Four (4) Open Collector / Isolated Dry Contact for totalization or alarm
		Temperture Sensor Inputs	Four (4) Passive Analog Inputs or (4) 1000 Ω RTD Inputs
		Analog Outputs	Eight (8) Active Analog Outputs
		Digital Outputs	Eight (8) Isolated Dry Contact Inputs for Totalization or Alarm
NETWORK CONNECTIONS	Isolated RS485 serial interface or IP ethernet port connection		
COMMUNICATION PROTOCOLS	BACnet MS/TP, BACnet UDP/IP, MODBUS RTU, MODBUS TCP/IP		

* SPECIFICATIONS subject to change without notice.
** Installation hardware are provided separately.

1.3 STANDARD FEATURES AND SPECIFICATIONS (CONTINUED)*

SYSTEM-1000 TRANSMITTER (CONTINUED)			
NETWORK CONFIGURATION & ADDRESSING	BACnet MS/TP	BAUD RATES	9600, 19200, 38400, 57600, or 76800 (Default: 38400)
		DEVICE ADDRESS RANGE	1 – 127 (Default: 017)
		DEVICE INSTANCE RANGE	1 – 4,194,302 (Default: 57017)
		Max Master	1-127
	BACnet/IP	IPV4 Address	Programable (Default: 192.168.1.24)
		Instance Number	1 – 4,194,302 (Default:57017)
		Subnet Mask	Programmable (Default:255.255.255.0)
		Gateway Address	Programmable
		UDP port:	Programmable (Default:47808)
		DHCP	Available
	MODBUS RTU	Address Range	1 - 247 (Default: 017)
		Baud Rate	9600, 19200, 38400, 57600, or 76800 (Default: 19200)
		Data Format	8 Bit (Stop Bits: 1)
		Parity	Even, Odd, None (Default: Even)
		Byte Order	ABCD
	MODBUS TCP/IP	IPV4 Address	Programmable (Default: 192.168.1.24)
		Subnet Mask	Programmable (Default: 255.255.255.0)
		Gateway Address	Programmable
		Port	Programmable (Default: 502)
		DHCP	Available
APPROVALS	FCC	Part 15, Subpart B	
	UL	UL 61010	
	CE		

* SPECIFICATIONS subject to change without notice.

1.4 MODEL NUMBERING SYSTEM

Meter Model Number Coding = SYS-1X00-ABC

X = System Configuration
- 1 = Single Channel System
- 2 = Dual Channel System
- 4 = Four Channel System

A = Electronics Enclosure
- 1 = NEMA 13 enclosure with LCD display

B = Input Power
- 1 = 24 VAC/DC, 100 VA
- 2 = 120 / 230 VAC, 200 VA

C = Network Communications
- 0 = No communications
- 1 = RS-485 & IP Communications. BACnet, MODBUS

1.5 ADDITIONAL REQUIRED HARDWARE

ONICON offers a wide variety of flow meters to satisfy most hydronic energy metering applications.

Type of Meter	Flow Meter Model	Line Sizes	Installation Type
Chilled Water, Hot Water, Water/Glycol Solutions	**F-1100 Single Turbine Flow Meter**	1¼" and larger	Insertion
	F-1200 Dual Turbine Flow Meter	2½" and larger	Insertion
	F-11XX Turbine Flow Meter	¾" and 1"	Inline
	FT-3400 Insertion Mag Flow Meter	1¼" and larger	Insertion
	FT-3000 Series Electromagnetic Flow Meter	¼" and larger	Inline
	F-4300 Ultrasonic Flow Meter	½" and larger	Clamp-on
	F/FT-4600 Ultrasonic Flow Meter	½"- 2½"	Inline
Steam	**F-2600 Vortex Flow Meter**	½" - 8"	Inline
	F-2700 Vortex Flow Meter	3" - 16"	Insertion
	F-1500 Turbine Flow Meter	3" - 36"	Insertion
Gas	**F-5400/F-5500 Thermal Mass Flow Meters**	¾" - 24"	Inline/Insertion

Please refer to ONICON's flow meter IOM, or contact ONICON for help in selecting the flow meter that will best fit your requirements.

1.6 WORKING ENVIRONMENT

The System-1000 was designed for installation and use in typical industrial environments that are free of corrosive liquids and fumes, direct liquid exposure, temperature extremes and vibrations. Do not expose the meter to direct sunlight.

The operating ambient air temperature range is -13°F to 140°F. The electrical power should be relatively clean, free of high frequency noise, large voltage transients, and protected from power surges and brown outs.

1.7 SERIAL NUMBER

The System-1000's serial number is a unique identifier for the product, and is located outside of the enclosure and within the meter data screens. Please have this number available when contacting ONICON for assistance.

SECTION 2.0 UNPACKING

2.1 CHECKING THAT YOU HAVE RECEIVED EVERYTHING

IMPORTANT NOTICE

Flow and BTU meters will be configured and programmed for use together as a system. The flow meter(s) serial number(s) will be shown on the System-1000 configuration sheet.

CAUTION

Please open the package with caution to avoid damaging its contents. If any item is damaged upon receipt, notify the shipping company immediately and alert the ONICON customer service department. Most products are shipped insured unless the customer specifically requests otherwise.

CHECK THAT YOU HAVE RECEIVED EVERYTHING

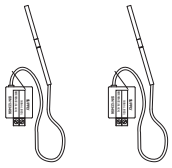
Each box comes with a label identifying the ONICON job number, Model Number, Serial Number, and Tag Information. (Use tags to identify the meter location.)



Typical order includes:

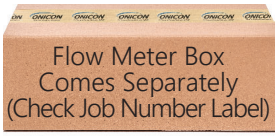
1





System-1000 with temperature sensors located inside of the enclosure

2



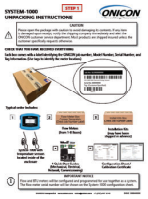
Flow Meters (from 1-8 Boxes)

3



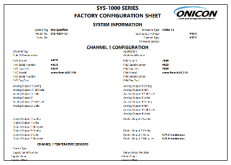
Installation Kits (may have been shipped in advance)

4



4 Quick Start Guides (Mechanical, Electrical, Network, Commissioning)

5





Configuration Sheet / Calibration Certificate

SECTION 3.0 INSTALLATION

The System-1000 BTU Meter should be installed by experienced contractors with related knowledge and experience in hydronic heating and cooling systems, and fluid metering applications in general. Contact ONICON for installation assistance.

The installer should use good trade practices and must adhere to all state and local building or other applicable codes.

3.1 SITE SELECTION

Careful attention to the site selection for the system components will help the installers with the initial installation, reduce start-up problems, and make future maintenance easier.

When selecting a site for mounting, consider the criteria under Section 1.6 WORKING ENVIRONMENT, as well as the following.

IMPORTANT NOTE
Proper site selection is critical to the performance of this BTU meter. Both the flow meter and the two temperature sensors must be properly located within the piping system in order to ensure an accurate energy measurement.

3.1.1 The System-1000 BTU Meter

Find an easily accessible location where wire connections can be made and meter readings can be taken from floor level. Mount the System-1000 enclosure on a vibration free surface. Avoid locations such as the plenum of a fan coil, heat exchanger or any housing that may contain electric motors or other strong sources of electrical interference.

3.1.2 The Flow Meter

When properly installed, the flow meter will only measure flow associated with that portion of the piping system for which the energy measurement is being made. The flow meter may be installed in either the supply or return line. Choose the location with the longest straight run of unobstructed pipe. Please refer to 1.5 ADDITIONAL REQUIRED HARDWARE and to the flow meter IOM for specific information regarding the straight run requirements.

3.1.3 The Temperature Sensors

The four temperature sensors must be located in such a manner as to accurately measure only the temperature of the supply line entering and the return line leaving the portion of the piping system for which the energy measurement is being made. If the System-1000 is configured as a dual-channel system, it can be paired with two sets of temp sensors for two independent energy measurements. If the System-1000 is configured as a four-channel system, it can be paired with four sets of temp sensors for four independent energy measurements.

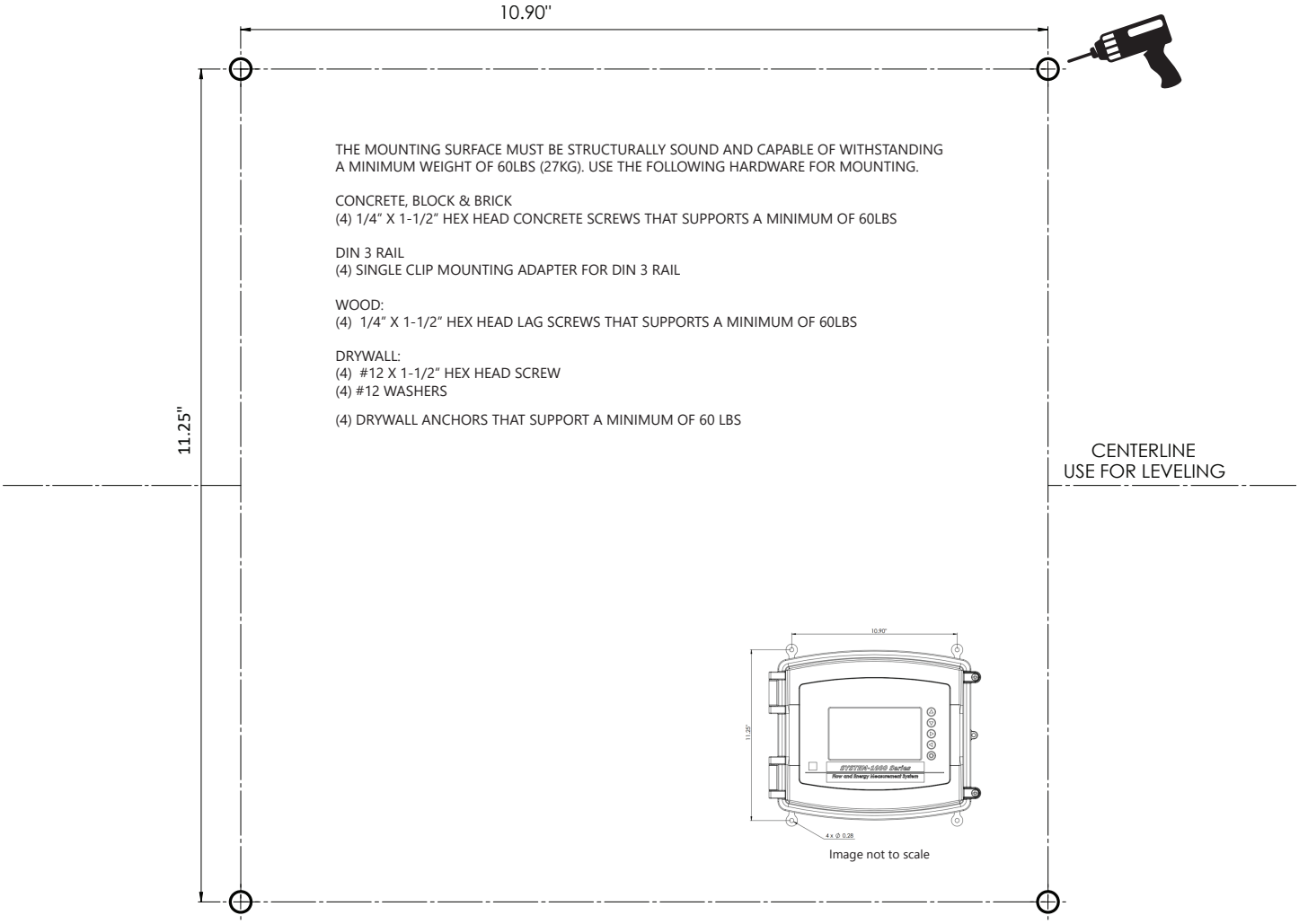
If possible, find an easily accessible location where wire connections can be made from floor level. This will facilitate any future service. Place the temperature sensors away from strong sources of electrical noise that might affect the performance of the sensors.

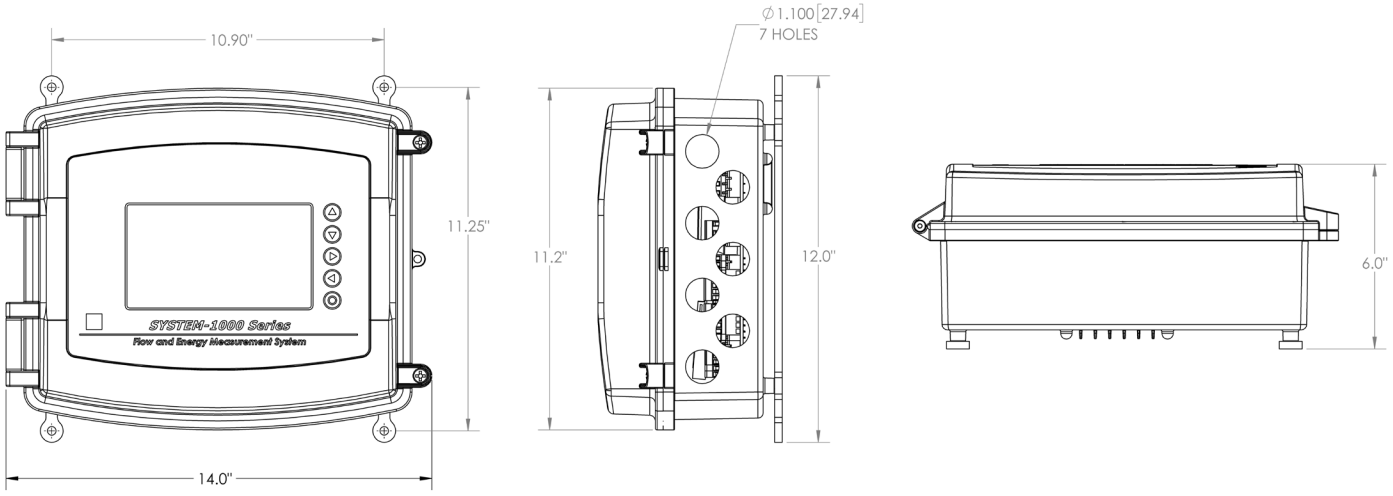
One temperature sensor thermowell will need to be placed in the same pipe with the flow meter. It should be located on the downstream side of the flow meter. The downstream distance between the thermowell and flow meter should be at least five pipe diameters, leaving enough clearance to remove either sensor from the pipe without interference from the other sensor.

Two types of thermowells might be provided with the unit and depending on the condition of the system. For empty pipes, the kit must be installed prior to filling the system, or into pipe sections that are isolated from pressure and flow. For pressurized pipes, a hot tap drilling machine is used to create a ⅞" opening in the pipe wall. Once installed, each kit allows for the insertion and removal of the thermowell without a system shutdown.

These kits are supplied for use with a specific pipe diameter and with the thermowell length matched to the temperature sensor length. Matching the thermowell to the pipe diameter ensures that the thermowell will be fully immersed in the flow stream. Matching the sensor length to the thermowell ensures that the temperature sensor will contact the bottom of the well and provide accurate, responsive temperature measurement.

3.2 MECHANICAL INSTALLATION





CAUTION
DO NOT drill holes in the enclosure. Use only the openings that are provided.

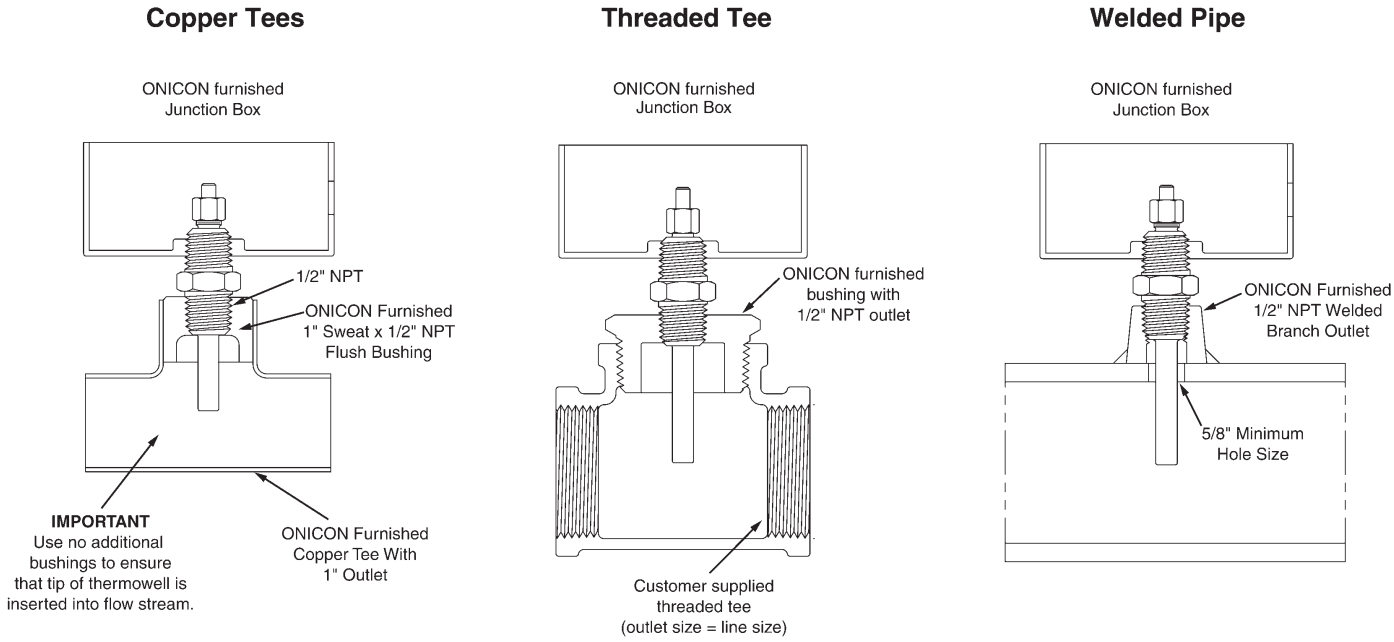
3.2.1 Thermowell Installation

Sections 3.2.1.1 - 3.2.1.3 are thermowell kits for ONICON solid state temperature sensors and high temperature RTDs with matching transmitters. See sections 3.2.1.4 - 3.2.1.5 for thermowells for 4-wire RTDs

IMPORTANT NOTE
It is important that no dirt or other foreign material be allowed into the thermowells as this could affect the thermal response of the system.

3.2.1.1 Dry Tap Thermowells

Dry tap thermowells are for new construction or scheduled shutdown. The most common installation methods are shown below. Refer to Appendix A-1 for thermal insulator installations and Appendix A-2 for high temperature (>300°F) thermowell installations. Consult ONICON for special applications.



NOTES
1. Thermowell length varies with pipe size.
2. If additional fittings are required, ensure that tip of thermowell is inserted into flow stream.

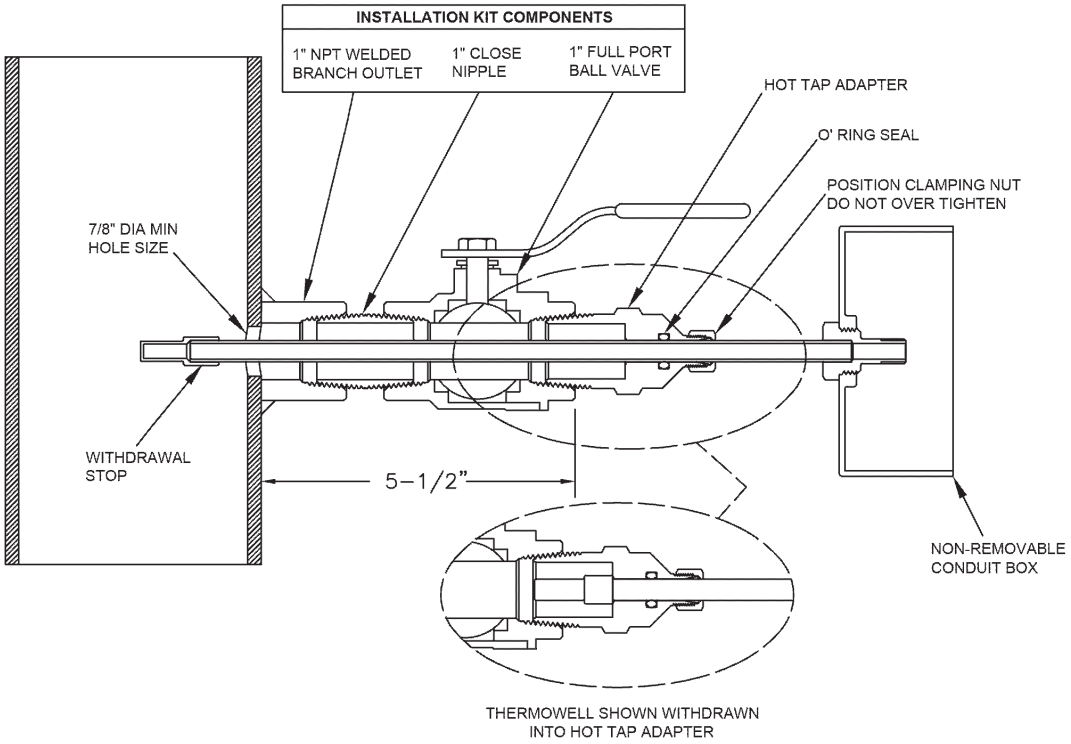
3.2.1.2 Hot Tap Thermowells

Hot tap thermowells are designed for retrofit applications where it is not practical to isolate and drain the pipe section prior to installation. The thermowell is installed through a 1" full port ball valve as shown in the drawing on the next page. A hot tap drilling machine equipped with a 7/8" drill is required to perform this type of installation.

Install the valve assembly as shown in the drawing and then drill the 7/8" hole using the hot tap drilling machine. Once the valve assembly has been installed and the hole has been drilled, the thermowell can be inserted into the flow stream without a system shutdown.

3.2.1.2 Hot Tap Thermowells (CONTINUED)

WARNING
SYSTEM MAY BE UNDER HIGH PRESSURE. Be sure to hold the conduit box firmly by hand before slowly loosening the position clamping nut when installing, adjusting or removing the thermowell. Failure to do this will allow the pressure to suddenly and rapidly force the thermowell from the pipe, potentially causing serious injury. The thermowell could also be damaged or break apart causing a break in the water seal with the resultant loss of large amounts of water.



Hot Tap Installation Detail For Thermowell In Welded Pipe

Insertion of the Hot Tap Thermowell

1. Calculate the insertion force (lbs) required by multiplying the system pressure (psig) by 0.11. The person inserting the thermowell should ensure adequate footing for the force required prior to opening the valve.
2. Thread the hot tap adapter into the valve. Firmly grasp the wiring enclosure, loosen the position clamping nut, open the valve, and carefully push the thermowell into the flow stream. Use the attached gage to set the insertion depth.
3. Carefully tighten the position clamping nut that is located at the top of the 1" NPT hot tap adapter fitting. Do not release the wiring enclosure until the position clamping nut has been tightened.

CAUTION
Excessive vibration can damage the thermowell. Insert the thermowell to the proper depth using gauge supplied as shown. Reduce the insertion depth as necessary if strong vibrations are felt during insertion, making certain that the tip of the thermowell remains fully in the flow stream.

CAUTION
DO NOT OVER TIGHTEN THE POSITION CLAMPING NUT. If fluid leaks, do not attempt to correct by tightening this nut further. An internal o-ring seals the fluid. Contact ONICON for assistance in the event of a leak.

Removal Of The Hot Tap Thermowell

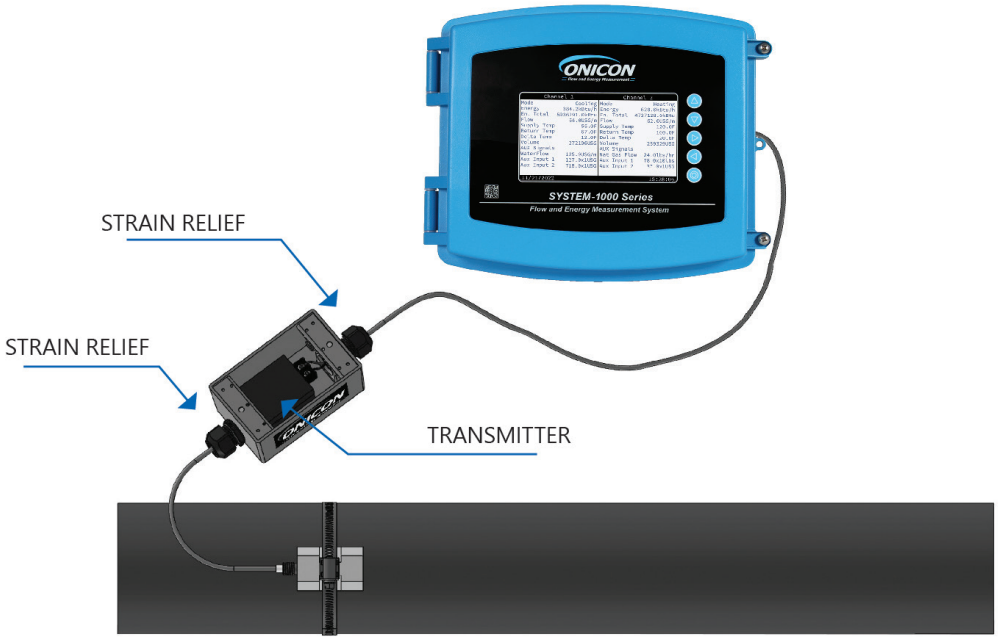
WARNING
Maintain a firm hold on the wiring enclosure until the thermowell is completely withdrawn and the valve is closed.

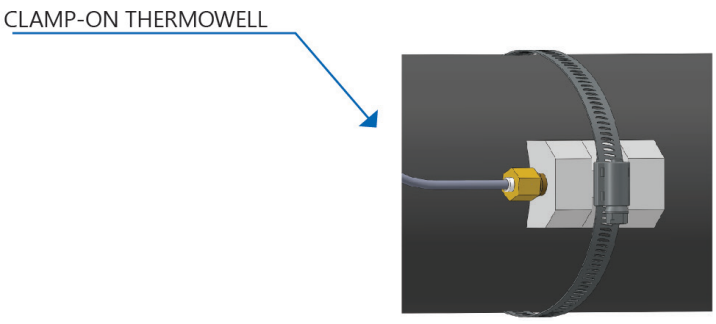
1. System pressure will try to push the thermowell out of the flow stream when the clamping nut is released. Be sure to establish safe footing prior to loosening the clamping nut. The force pushing out against the thermowell is the same as the insertion force calculated above.
2. Grasp the wiring enclosure firmly, holding the thermowell in the pipe and then loosen the position clamping nut. Slowly withdraw the thermowell from the pipe. After the thermowell is completely withdrawn, carefully close the isolation valve.

IMPORTANT NOTE
Rotating the thermowell as you slowly withdraw it through the valve will ensure that the lower tip is fully withdrawn and completely free of the valve. If resistance is felt when closing the valve, open valve fully and rotate the well as you pull it further out of the pipe.

3.2.1.3 Clamp-On Thermowell

Clamp-on thermowells are for metallic pipes ONLY and are typically used along with clamp-on ultrasonic flow meters. It is also very important to properly insulate over them. The insulation thickness (or R value) required is proportional to the difference between ambient temp and process temp.

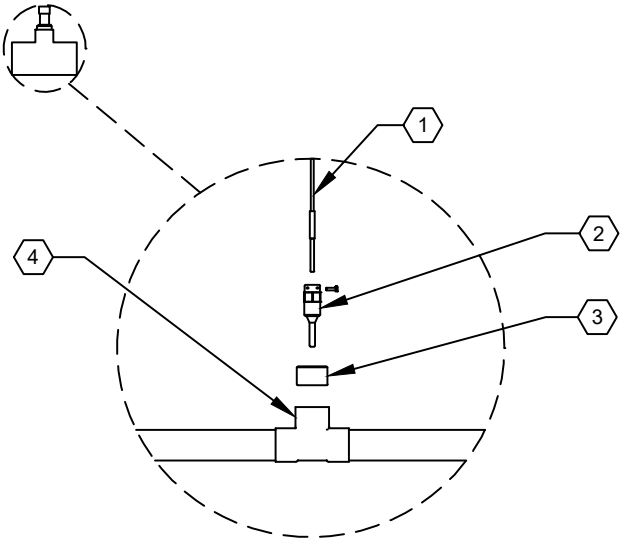




Thermowells for 4-wire RTDs

3.2.1.4 5mm Diameter Thermowell

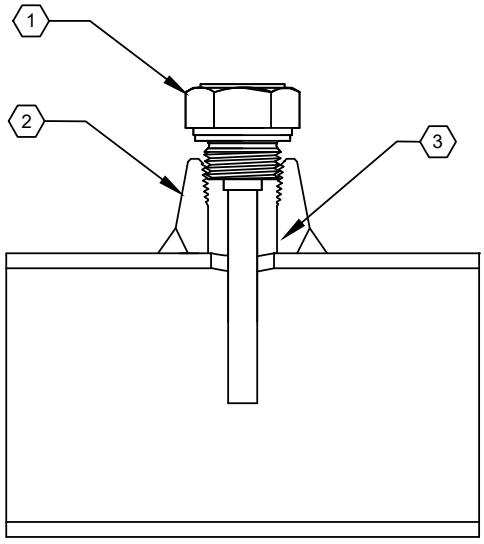
5 mm RTDs are provided with thermowells with ½" male NPT process connections. They are designed for use in ½" to 2½" line size tees provided by the customer. The RTDs are push-in type and are held in place with a set screw. Depending on the pipe material, the kit may include a copper sweat bushing or a threaded reducer bushing.



1. RTD temperature sensor – provided by ONICON.
2. 5 mm diameter thermowell – provided by ONICON.
3. 1" solder x ½" NPT bushing OR line size x ½" bushing – provided by customer or ordered from ONICON.
4. Customer supplied line size tee.

3.2.1.5 6mm Diameter Thermowell

6mm RTDs are provided with matching length thermowells with ½" male NPT process connections. They are designed for use in 3" and larger diameter pipes. The RTDs are push-in type and are held in place with a set screw. The kit includes two (2) weld-on branch outlets with ½" NPT threads.



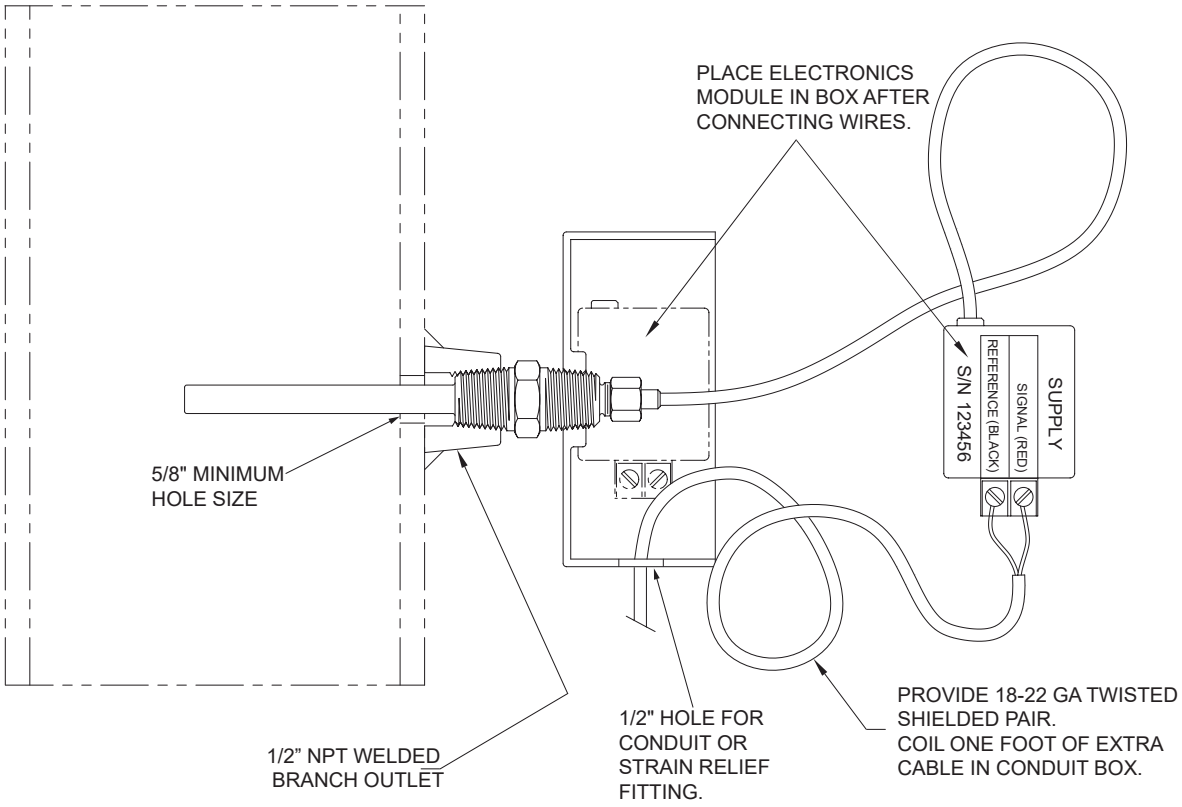
1. 6 mm diameter thermowell - provided by ONICON.
2. ½" NPT weld on branch outlet - provided by ONICON.
3. ¾" minimum hole size.

3.2.2 Temperature Sensor Installation (ONICON Solid State Sensors)

The temperature sensors are factory matched and tagged by serial number to a specific BTU meter. They are also labeled as SUPPLY and RETURN temperature sensors. Please consult ONICON before attempting to use any other temperature sensor.

- Apply a thin coat of thermal compound to the temperature sensor, and gently insert the temperature sensor all the way into the thermowell until it contacts the bottom of the cavity.
- Gently tighten the retainer nut. DO NOT OVER TIGHTEN.
- The thermowell completely seals the plumbing system without the retainer nut. The only purpose for the nut is to keep the sensor from losing contact with the bottom of the thermowell cavity.

IMPORTANT NOTE
Cable length is specified at time of order. Cable provided for temperature sensors is #22 gauge twisted shielded pair. Additional cable may be added in the field if necessary, but must be of twisted shielded pair construction. (#22 gauge minimum and #18 gauge maximum)



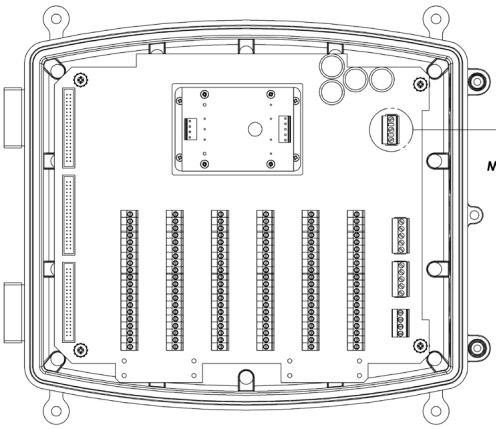
3.2.3 Flow Meter Installation

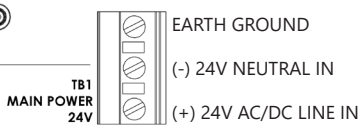
Determine which pipe (supply or return) has the longer unobstructed straight run. Install the flow meter in the longest straight pipe run available. One temperature sensor can be installed five diameters downstream of the flow meter leaving enough clearance to remove either sensor from the pipe without interference from the other sensor.

Refer to the flow meter IOM and/or other documentation that is provided with your ONICON flow meter.

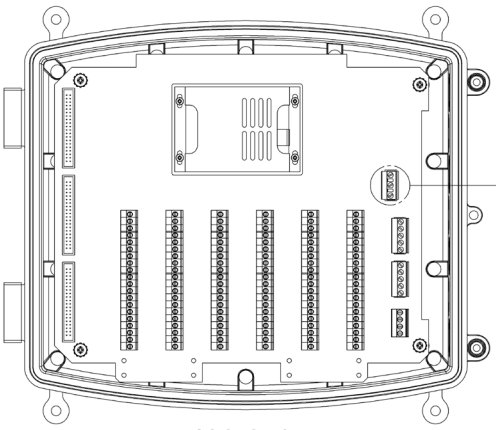
3.3 ELECTRICAL INSTALLATION

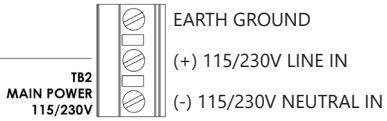
3.3.1 Input Power Requirements





24V





120-240V

1. Input voltages should be within the following ranges:
   - 22-28 VAC, 50/60Hz, 100VA or 22-28VDC, 4.6A, 100W
   - 99-253 VAC, 50/60 Hz, 200VA

IMPORTANT NOTE:
This option is not field selectable. Contact ONICON prior to installation if needed to change the input voltage rating.

WARNING
Conduit openings in the System-1000 enclosure must be closed with UL listed fittings applicable to NEMA 13 enclosures.

WARNING
Disconnect main power before proceeding.

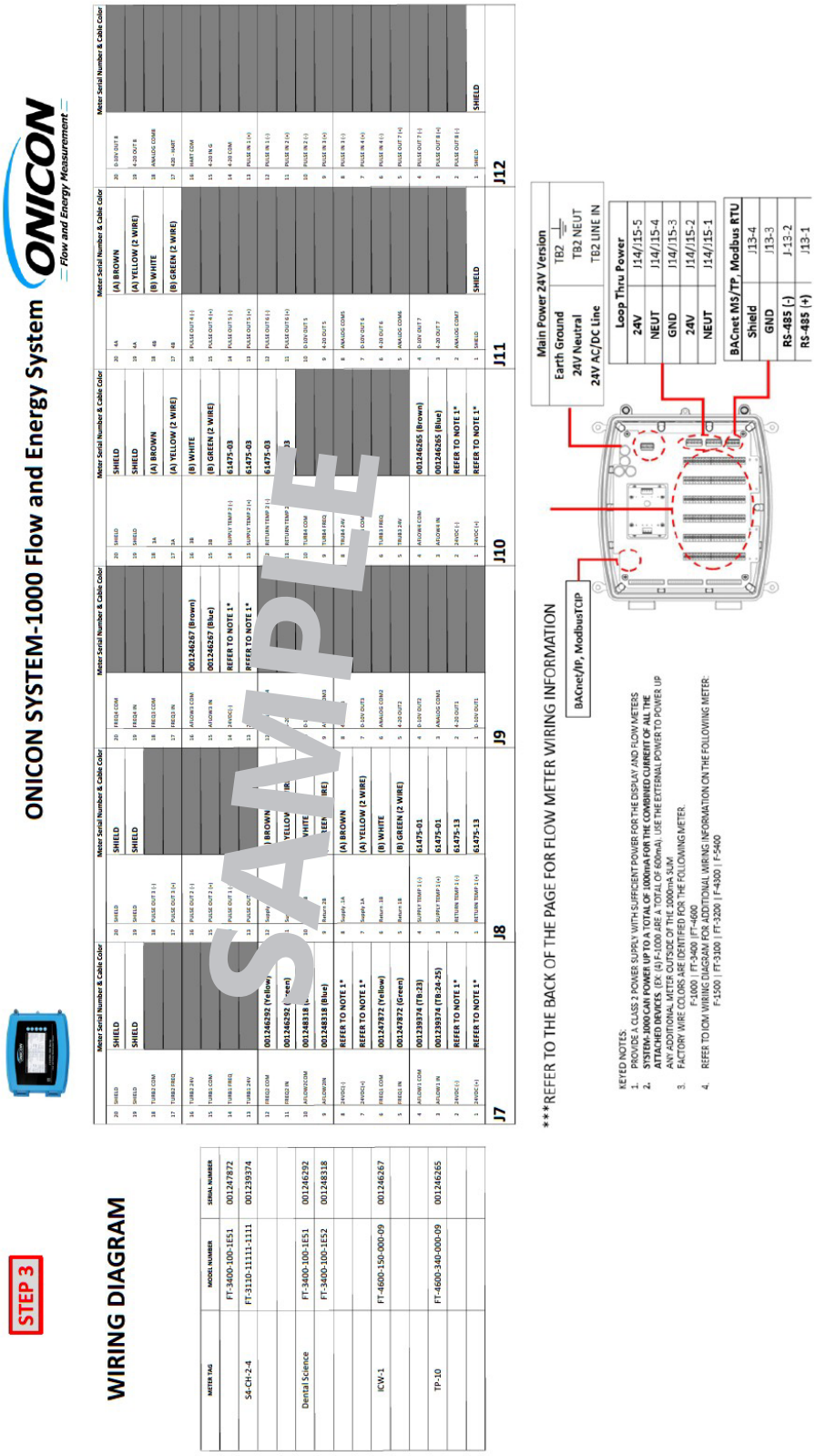
Connect the power source to the main unit through the conduit opening located on the side of the main unit. DO NOT drill holes in the enclosure. Fasten the power wires to the appropriate screw terminals as shown.

Connect the protective earth wire to the right top terminal connection of the motherboard..

CAUTION
This product must be connected to earth ground for proper operation. Failure to do so may result in erratic operation.

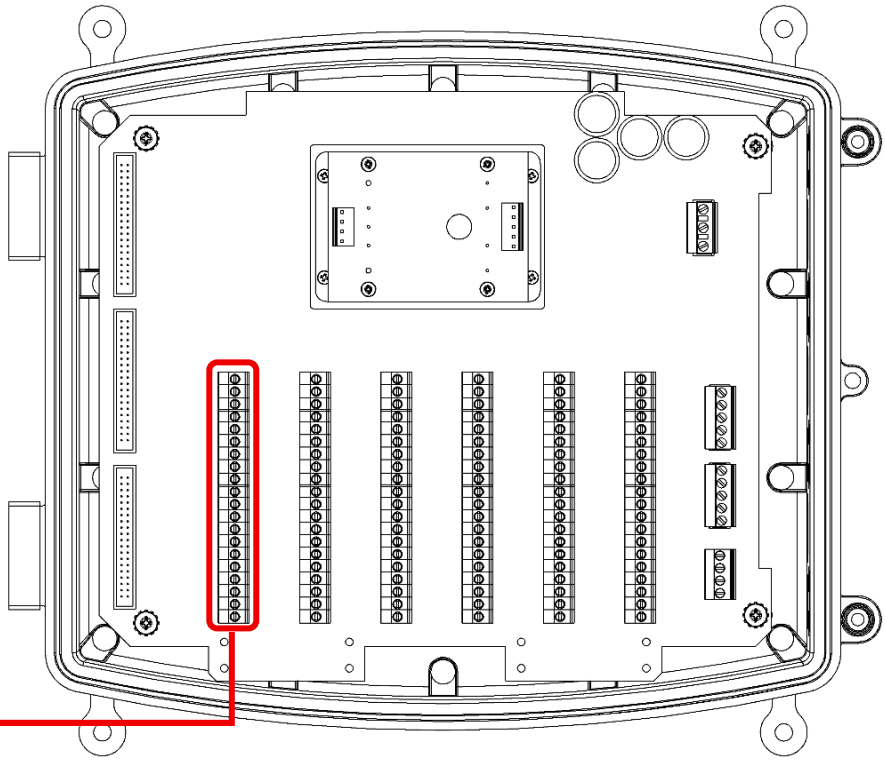
As power is initially applied to the System-1000, immediately confirm that the display is illuminated and displaying the Main Menu screen. If this does not occur, disconnect power immediately and re-verify all wiring connections. If the problem persists, contact ONICON.

3.3.2 Input / Output Connections Wiring Diagram



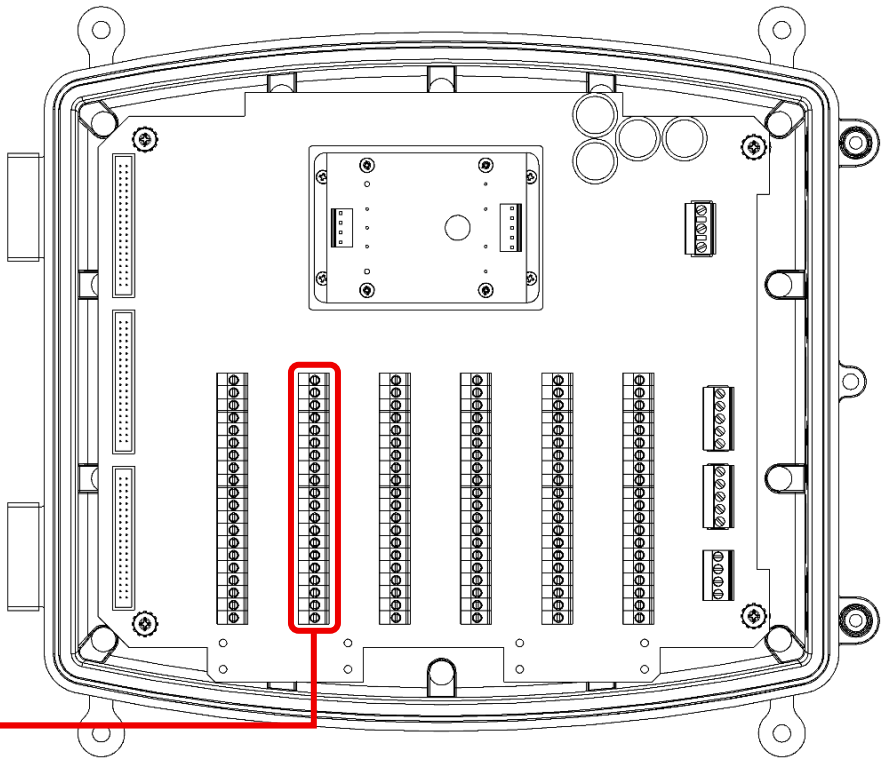
SYS-1000 comes with a custom-made wiring diagram to facilitate its installation. The schematics include the meter tag, model number, serial number, and terminal connection location on the board. Please contact the factory if a copy of the wiring diagram is needed.

3.3.2.1 Input / Output Connections - J7 Header



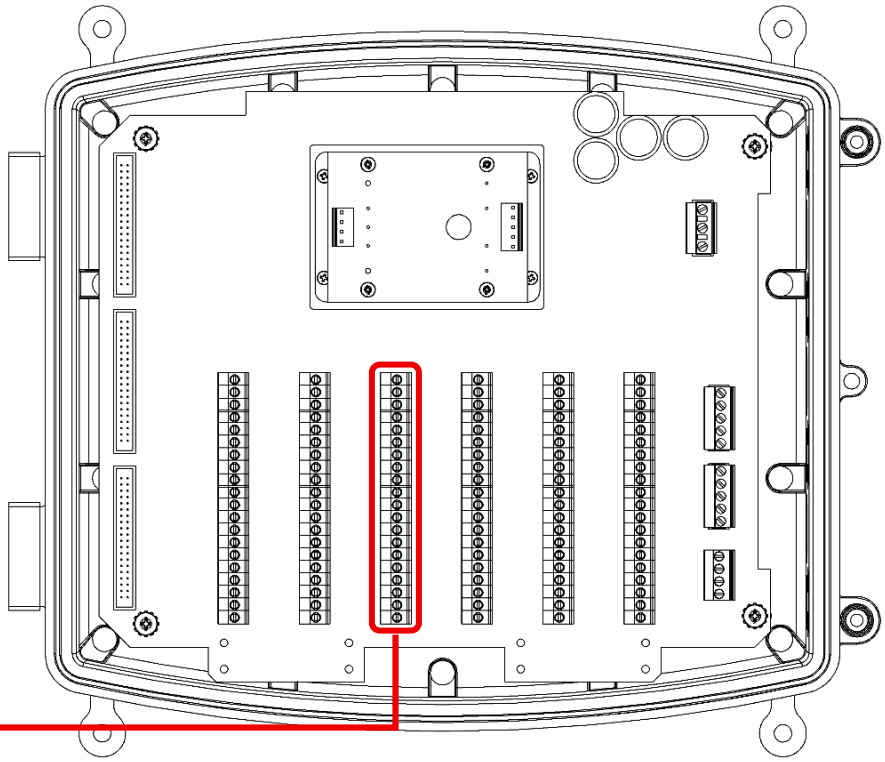
J7		Single Channel	Dual Channel	Four Channel
	J7-20	Shield		
	J7-19	Shield		
	J7-18			
	J7-17			
	J7-16			
	J7-15			
	J7-14			
	J7-13			
	J7-12	CH1 Aux FM Input - Frequency Comm		CH2 Prim/Aux FM Input - Frequency Comm
	J7-11	CH1 Aux FM Input - Frequency		CH2 Prim/Aux FM Input - Frequency
	J7-10	CH1 Aux FM Input - Analog 4-20mA (-)		CH2 Prim/Aux FM Input - Analog 4-20mA (-)
	J7-9	CH1 Aux FM Input - Analog 4-20mA (+)		CH2 Prim/Aux FM Input - Analog 4-20mA (+)
	J7-8	24VDC (-)		
	J7-7	24VDC (+)		
	J7-6	CH1 Primary FM Input - Frequency Comm		CH1 Prim/Aux FM Input - Frequency Comm
	J7-5	CH1 Primary FM Input - Frequency		CH1 Prim/Aux FM Input - Frequency
	J7-4	CH1 Primary FM Input - Analog 4-20mA (-)		CH1 Prim/Aux FM Input - Analog 4-20mA (-)
	J7-3	CH1 Primary FM Input - Analog 4-20mA (+)		CH1 Prim/Aux FM Input - Analog 4-20mA (+)
	J7-2	24VDC (-)		
	J7-1	24VDC (+)		
J7				

3.3.2.2 Input / Output Connections - J8 Header



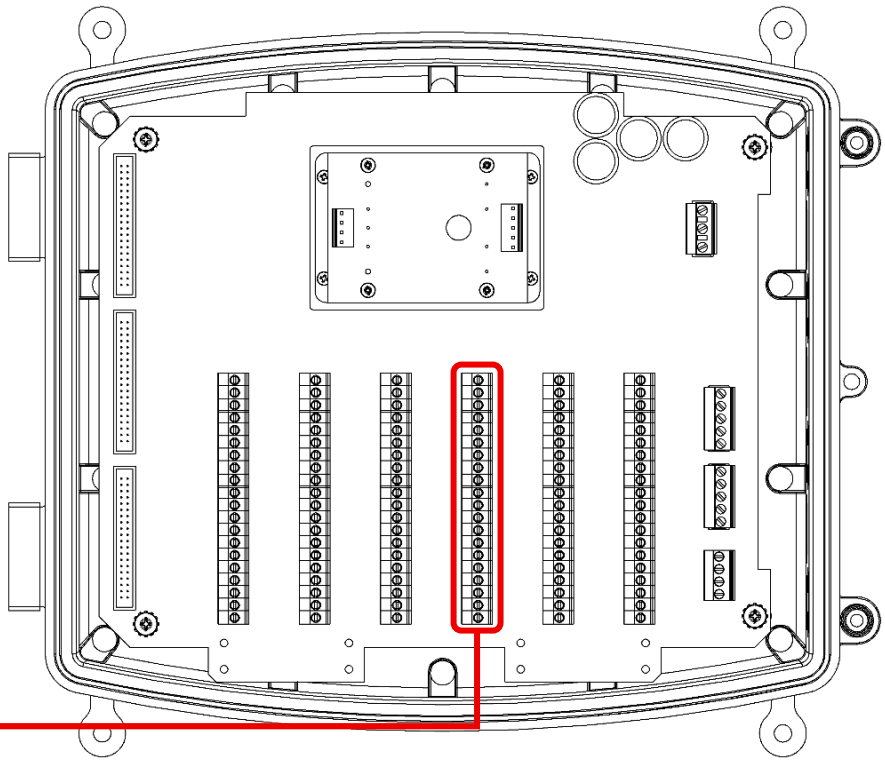
J8		Single Channel	Dual Channel	Four Channel
	J8-20	Shield		
	J8-19	Shield		
	J8-18	Pulse Out #3 (-) - CH1 #3		Pulse Out #3 (-) - CH2 #1
	J8-17	Pulse Out #3 (+) - CH1 #3		Pulse Out #3 (+) - CH2 #1
	J8-16	Pulse Out #2 (-) - CH1 #2		
	J8-15	Pulse Out #2 (+) - CH1 #2		
	J8-14	Pulse Out #1 (-) - CH1 #1		
	J8-13	Pulse Out #1 (+) - CH1 #1		
	J8-12	CH1 Return RTD Temp Sensor (A)		CH3 Return RTD Temp Sensor (A)
	J8-11	CH1 Return RTD Temp Sensor (A or 2-Wire)		CH3 Return RTD Temp Sensor (A or 2-Wire)
	J8-10	CH1 Return RTD Temp Sensor (B)		CH3 Return RTD Temp Sensor (B)
	J8-9	CH1 Return RTD Temp Sensor (B or 2-Wire)		CH3 Return RTD Temp Sensor (B or 2-Wire)
	J8-8	CH1 Supply RTD Temp Sensor (A)		CH3 Supply RTD Temp Sensor (A)
	J8-7	CH1 Supply RTD Temp Sensor (A or 2-Wire)		CH3 Supply RTD Temp Sensor (A or 2-Wire)
	J8-6	CH1 Supply RTD Temp Sensor (B)		CH3 Supply RTD Temp Sensor (B)
	J8-5	CH1 Supply RTD Temp Sensor (B or 2-Wire)		CH3 Supply RTD Temp Sensor (B or 2-Wire)
	J8-4	CH1 Supply Onicon Temp Sensor (-)		
	J8-3	CH1 Supply Onicon Temp Sensor (+)		
	J8-2	CH1 Return Onicon Temp Sensor (-)		
	J8-1	CH1 Return Onicon Temp Sensor (+)		
J8				

3.3.2.3 Input / Output Connections - J9 Header



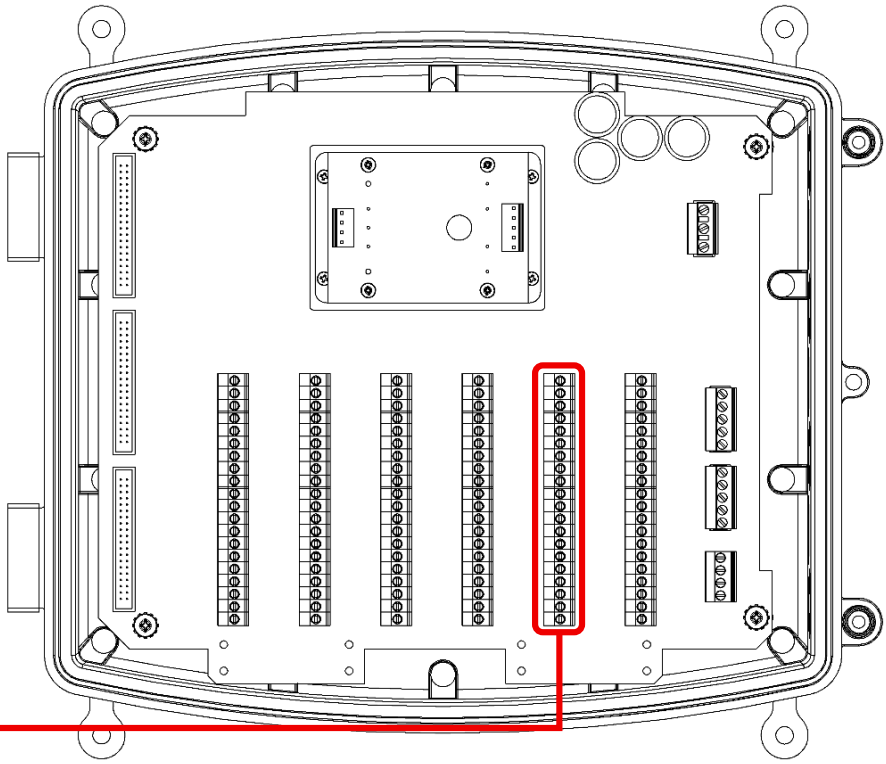
J9		Single Channel	Dual Channel	Four Channel
	J9-20	CH2 Aux FM Input - Frequency Comm		CH4 Prim/Aux FM Input - Frequency Comm
	J9-19	CH2 Aux FM Input - Frequency		CH4 Prim/Aux FM Input - Frequency
	J9-18	CH2 Primary FM Input - Frequency Comm		CH3 Prim/Aux FM Input - Frequency Comm
	J9-17	CH2 Primary FM Input - Frequency		CH3 Prim/Aux FM Input - Frequency
	J9-16	CH2 Primary FM Input - Analog 4-20mA (-)		CH3 Prim/Aux FM Input - Analog 4-20mA (-)
	J9-15	CH2 Primary FM Input - Analog 4-20mA (+)		CH3 Prim/Aux FM Input - Analog 4-20mA (+)
	J9-14	24VDC (-)		
	J9-13	24VDC (+)		
	J9-12	Analog Out #4 (-) Comm - CH1 #4		Analog Out #4 (-) Comm - CH2 #2
	J9-11	Analog Out #4 (+) 4-20mA - CH1 #4		Analog Out #4 (+) 4-20mA - CH2 #2
	J9-10	Analog Out #4 (+) 0-10V - CH1 #4		Analog Out #4 (+) 0-10V - CH2 #2
	J9-9	Analog Out #3 (-) Comm - CH1 #3		Analog Out #3 (-) Comm - CH2 #1
	J9-8	Analog Out #3 (+) 4-20mA - CH1 #3		Analog Out #3 (+) 4-20mA - CH2 #1
	J9-7	Analog Out #3 (+) 0-10V - CH1 #3		Analog Out #3 (+) 0-10V - CH2 #1
	J9-6	Analog Out #2 (-) Comm - CH1 #2		
	J9-5	Analog Out #2 (+) 4-20mA - CH1 #2		
	J9-4	Analog Out #2 (+) 0-10V - CH1 #2		
	J9-3	Analog Out #1 (-) Comm - CH1 #1		
	J9-2	Analog Out #1 (+) 4-20mA - CH1 #1		
	J9-1	Analog Out #1 (+) 0-10V - CH1 #1		
J9				

3.3.2.4 Input / Output Connections - J10 Header



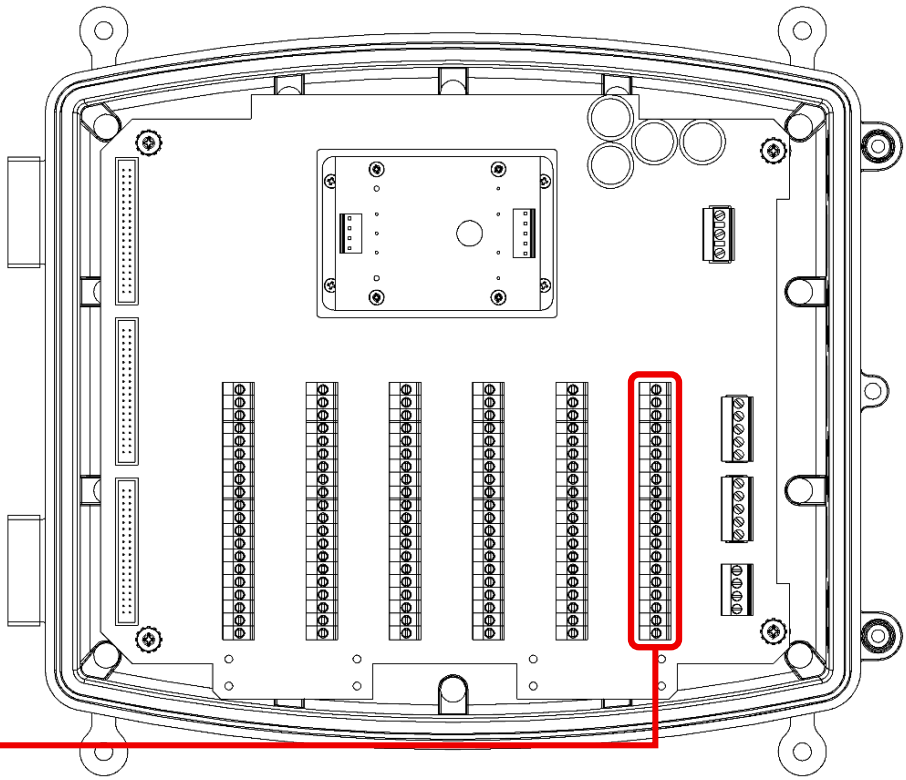
J10		Single Channel	Dual Channel	Four Channel
	J10-20	Shield		
	J10-19	Shield		
	J10-18	CH2 Supply RTD Temp Sensor (A)		CH4 Supply RTD Temp Sensor (A)
	J10-17	CH2 Supply RTD Temp Sensor (A or 2-Wire)		CH4 Supply RTD Temp Sensor (A or 2-Wire)
	J10-16	CH2 Supply RTD Temp Sensor (B)		CH4 Supply RTD Temp Sensor (B)
	J10-15	CH2 Supply RTD Temp Sensor (B or 2-Wire)		CH4 Supply RTD Temp Sensor (B or 2-Wire)
	J10-14	CH2 Supply Onicon Temp Sensor (-)		
	J10-13	CH2 Supply Onicon Temp Sensor (+)		
	J10-12	CH2 Return Onicon Temp Sensor (-)		
	J10-11	CH2 Return Onicon Temp Sensor (+)		
	J10-10			
	J10-9			
	J10-8			
	J10-7			
	J10-6			
	J10-5			
	J10-4	CH2 Primary FM Input - Analog 4-20mA (-)		CH4 Prim/Aux FM Input - Analog 4-20mA (-)
	J10-3	CH2 Primary FM Input - Analog 4-20mA (+)		CH4 Prim/Aux FM Input - Analog 4-20mA (+)
	J10-2	24VDC (-)		
	J10-1	24VDC (+)		
J10				

3.3.2.5 Input / Output Connections - J11 Header



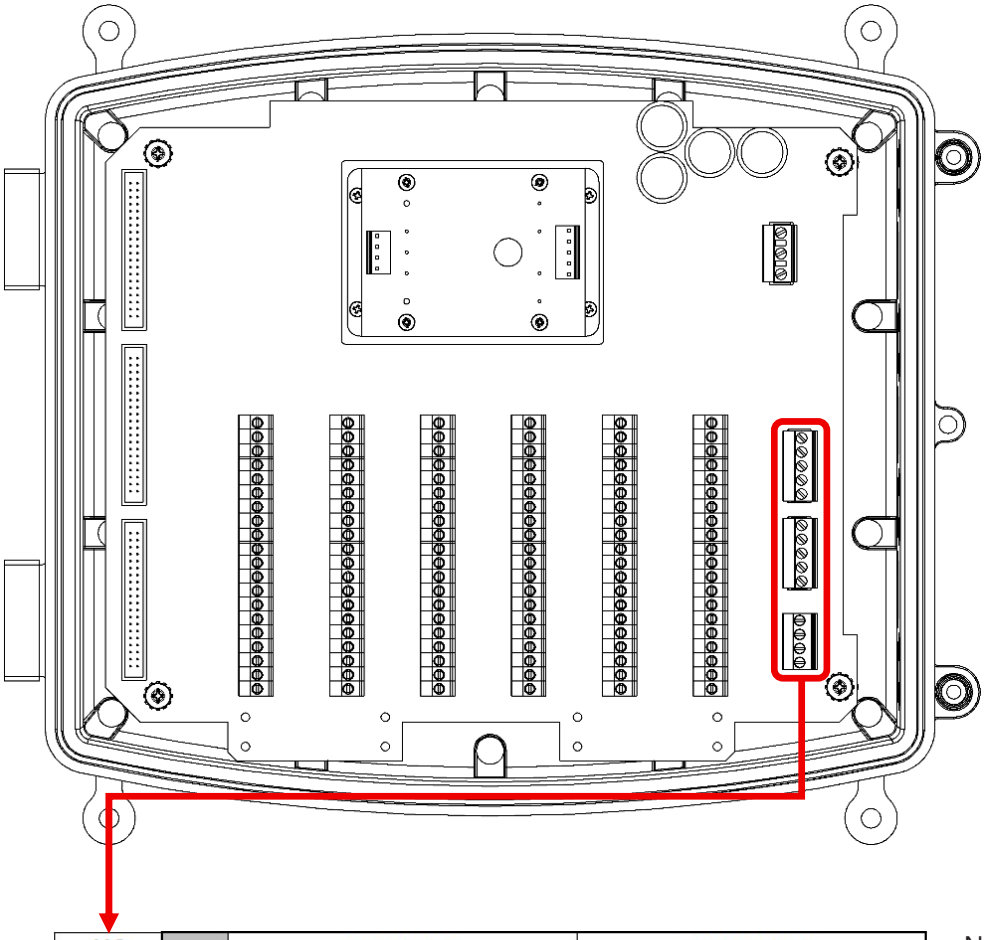
J11		Single Channel	Dual Channel	Four Channel
	J11-20	CH2 Return RTD Temp Sensor (A)		CH4 Return RTD Temp Sensor (A)
	J11-19	CH2 Return RTD Temp Sensor (A or 2-Wire)		CH4 Return RTD Temp Sensor (A or 2-Wire)
	J11-18	CH2 Return RTD Temp Sensor (B)		CH4 Return RTD Temp Sensor (B)
	J11-17	CH2 Return RTD Temp Sensor (B or 2-Wire)		CH4 Return RTD Temp Sensor (B or 2-Wire)
	J11-16	Pulse Out #4 (-) - CH1 #4		Pulse Out #4 (-) - CH2 #2
	J11-15	Pulse Out #4 (+) - CH1 #4		Pulse Out #4 (+) - CH2 #2
	J11-14		Pulse Out #5 (-) - CH2 #1	Pulse Out #5 (-) - CH3 #1
	J11-13		Pulse Out #5 (+) - CH2 #1	Pulse Out #5 (+) - CH3 #1
	J11-12		Pulse Out #6 (-) - CH2 #2	Pulse Out #6 (-) - CH3 #2
	J11-11		Pulse Out #6 (+) - CH2 #2	Pulse Out #6 (+) - CH3 #2
	J11-10		Analog Out #5 (+) 0-10V - CH2 #1	Analog Out #5 (+) 0-10V - CH3 #1
	J11-9		Analog Out #5 (+) 4-20mA - CH2 #1	Analog Out #5 (+) 4-20mA - CH3 #1
	J11-8		Analog Out #5 (-) Comm - CH2 #1	Analog Out #5 (-) Comm - CH3 #1
	J11-7		Analog Out #6 (+) 0-10V - CH2 #2	Analog Out #6 (+) 0-10V - CH3 #2
	J11-6		Analog Out #6 (+) 4-20mA - CH2 #2	Analog Out #6 (+) 4-20mA - CH3 #2
	J11-5		Analog Out #6 (-) Comm - CH2 #2	Analog Out #6 (-) Comm - CH3 #2
	J11-4		Analog Out #7 (+) 0-10V - CH2 #3	Analog Out #7 (+) 0-10V - CH4 #1
	J11-3		Analog Out #7 (+) 4-20mA - CH2 #3	Analog Out #7 (+) 4-20mA - CH4 #1
	J11-2		Analog Out #7 (-) Comm - CH2 #3	Analog Out #7 (-) Comm - CH4 #1
	J11-1	Shield		
J11				

3.3.2.6 Input / Output Connections - J12 Header



J12		Single Channel	Dual Channel	Four Channel
	J12-20		Analog Out #8 (-) Comm - CH2 #4	Analog Out #8 (-) Comm - CH4 #2
	J12-19		Analog Out #8 (+) 4-20mA - CH2 #4	Analog Out #8 (+) 4-20mA - CH4 #2
	J12-18		Analog Out #8 (+) 0-10V - CH2 #4	Analog Out #8 (+) 0-10V - CH4 #2
	J12-17			
	J12-16			
	J12-15			
	J12-14			
	J12-13	Pulse In #1 (+) - CH1 #1		
	J12-12	Pulse In #1 (-) - CH1 #1		
	J12-11	Pulse In #2 (+) - CH1 #2		Pulse In #2 (+) - CH2
	J12-10	Pulse In #2 (-) - CH1 #2		Pulse In #2 (-) - CH2
	J12-9		Pulse In #3 (+) - CH2 #1	Pulse In #3 (+) - CH3
	J12-8		Pulse In #3 (-) - CH2 #1	Pulse In #3 (-) - CH3
	J12-7		Pulse In #4 (+) - CH2 #2	Pulse In #4 (+) - CH4
	J12-6		Pulse In #4 (-) - CH2 #2	Pulse In #4 (-) - CH4
	J12-5		Pulse Out #7 (+) - CH2 #3	Pulse Out #7 (+) - CH4 #1
	J12-4		Pulse Out #7 (-) - CH2 #3	Pulse Out #7 (-) - CH4 #1
	J12-3		Pulse Out #8 (+) - CH2 #4	Pulse Out #8 (+) - CH4 #2
	J12-2		Pulse Out #8 (-) - CH2 #4	Pulse Out #8 (-) - CH4 #2
	J12-1	Shield		
J12				

3.3.2.7 Input / Output Connections - J13 Header



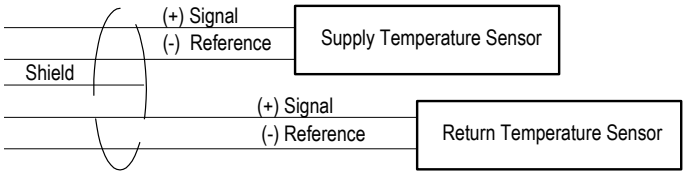
J13		24V AC/DC	120/230 VAC
	J13-14	24V AC/DC (+)	
	J13-13	24V NEUT (-)	
	J13-12	GROUND	
	J13-11	24V AC/DC (+)	
	J13-10	24V NEUT (-)	
	J13-9	24V AC/DC (+)	
	J13-8	24V NEUT (-)	
	J13-7	GROUND	
	J13-6	24V AC/DC (+)	
	J13-5	24V NEUT (-)	
		BACnet MS/TP	**Modbus RTU**
	J13-4	Shield	
	J13-3	Ground	
	J13-2	RS485 (-)	
	J13-1	RS485 (+)	
J13			

NOTE : Loop Through Power

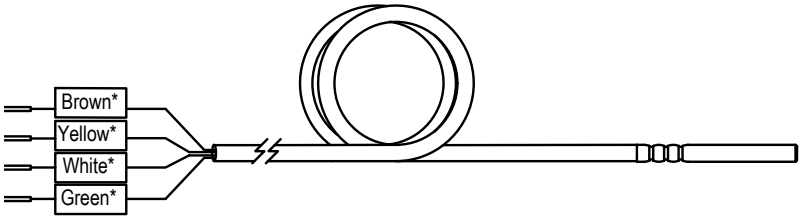
These power connections are "loop through power" that connect directly to the main 24VAC/DC power input port. They do not pass through the power supply to the meter and pass the load directly to the power supply that the SYS-1000 is wired through. Any load connected here does not count towards the 1000mA limit for connected devices, but does still add to the load placed on the power supply circuit.

3.3.2.8 Temperature Input Wiring Details

ONICON FIXED RANGE or LOOP POWERED 4-20mA SCALABLE RANGE TEMPERATURE INPUTS

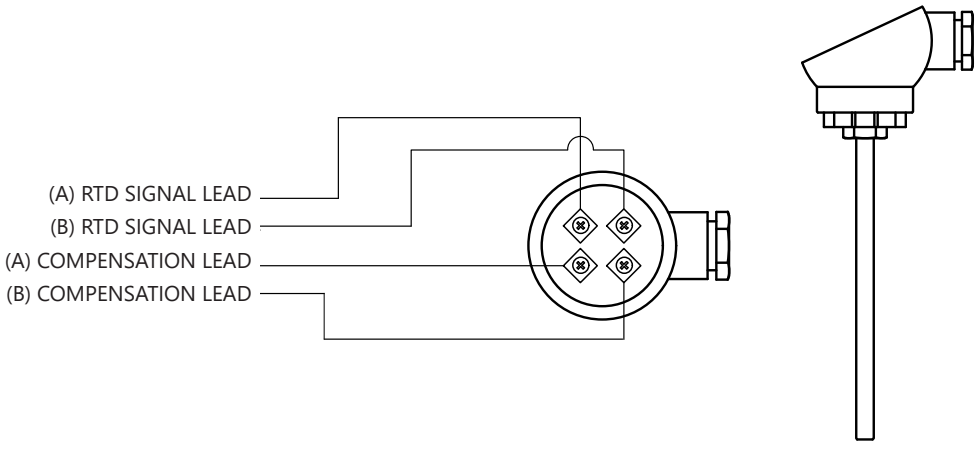


1000 OHMS 4-WIRE PLATINUM RTD TEMPERATURE INPUTS w/ ATTACHED PIGTAILS CABLE



** Cable color coding to DIN 47100*

1000 OHMS 4-WIRE PLATINUM TEMPERATURE INPUTS w/ INTEGRAL CONDUIT READY JUNCTION BOX



Refer to Temperature Sensor Connection on next page for additional details on the terminal location.

3.3.2.9 Peripheral Devices: Flow Meters

ONICON flow meters are provided with a number of different output configurations. These affect the number of wires contained in the cable attached to the flow meter. Refer to the diagram below meter.

FLOW METER WIRING DIAGRAM

F-1000



SHIELD
RED (+) 24 VAC/DC
BLACK (-) COMMON
GREEN (+) FREQUENCY
ORANGE - SCLAED PULSE
WHITE - SCALED PULSE

FT-3400



RED (+) 24 VAC/DC
BLACK (-) COMMON
GREEN/YELLOW - EARTH GROUND
GREEN (+) FREQUENCY
YELLOW (-) FREQUENCY
BLUE (+) 4-20mA OUT (IF NEEDED)
BROWN (-) ANALOG OUT COMMON (IF NEEDED)
ORANGE/BLACK - SCALED PULSE
WHITE/BLACK - SCALED PULSE
GRAY (+) DIRECTION
VIOLET (-) DIRECTION

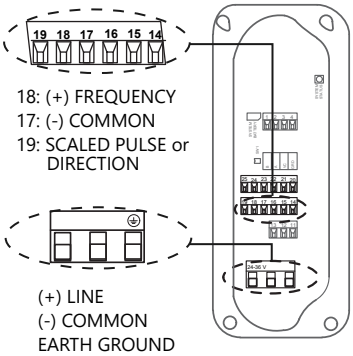
FT-4600



RED (+) 24 VAC/DC
BLACK (-) COMMON
SILVER - EARTH GROUND
BLUE (+) 4-20mA SIGNAL
BROWN (-) 4-20mA COMMON
ORANGE - SCALED PULSE
WHITE - SCALED PULSE

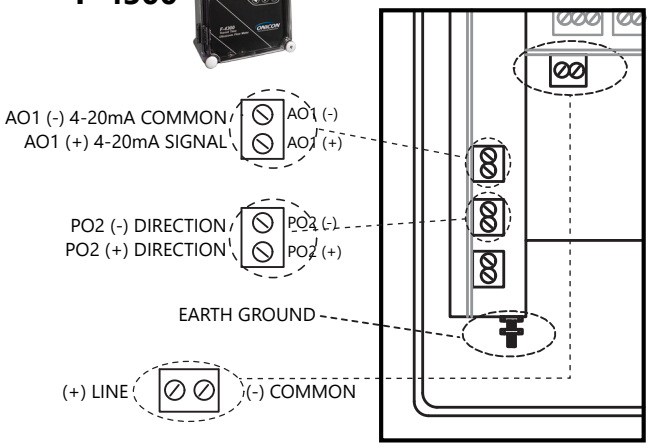
FT-3000





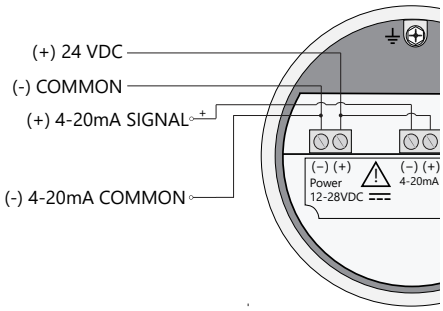
F-4300





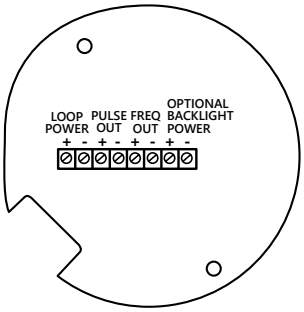
F-5400





F-2600
F-2700
F-1500



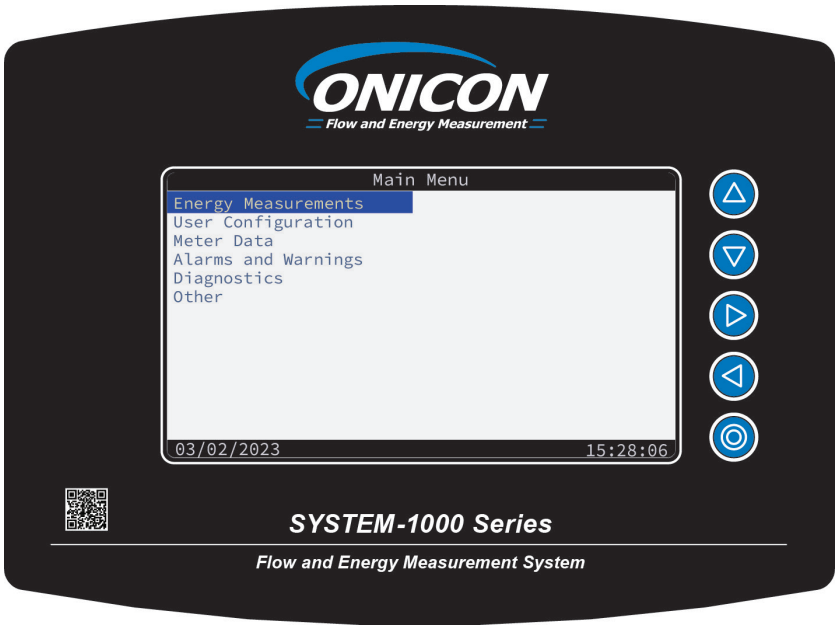


SECTION 4.0 START-UP AND COMMISSIONING

4.1 DISPLAY AND USER INTERFACE

When power is applied to the System-1000, the Main Menu screen will appear on the display.

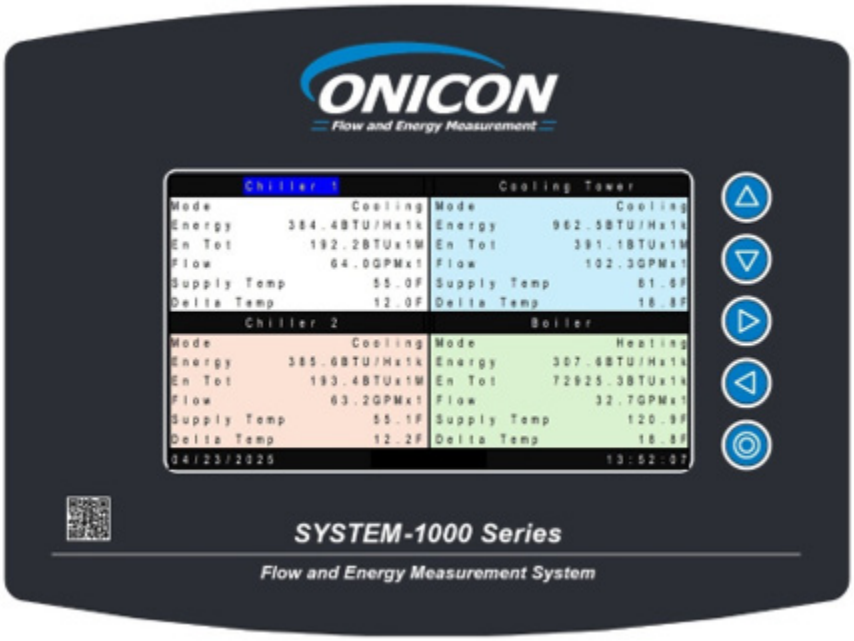
Five (5) button user interface is provided to operate and program the meter.



The main menu screen will indicate the meter is operating. Press the Energy Measurement screen to access the real-time data.



4.1.1 Energy Measurements Screen



Select Next Channel (Blue Highlight)

Select Previous Channel (Blue Highlight)

Select Channel for Expanded Details

4.1.2 Energy Details / Alarms and Warnings Screens



Next Energy Details Page (Right Side of Screen)

Previous Energy Details Page (Right Side of Screen)

Back to Energy Measurement

4.2 UNITS

4.2.1 UNITS STRUCTURE

The System-1000 units structure where the inputs, display, and outputs are all individually configurable. The main units setting is accessed via the menu structure by navigating to:

Main Menu -> User Configuration -> Units Settings

This page sets the Display and Output units (Analog & BACnet) but does NOT affect the units settings for any inputs. Inputs units are individually set in the configuration page for that connected input. If units for an output needs to be set differently from what is set in this main menu that can be set in the configuration screen for that particular output.

4.2.2 AVAILABLE UNITS

The units settings for the System-1000 are set by Data Type. The data types and their available settings are as follows:

DATA TYPE	AVAILABLE UNITS
Fluid Flow	GPM, GPH, MilGalDay, LPS, LPM, LPH, CuMtr/hr, CuFt/hr, CuFt/min
Liquid Volume	Gal, L, CuMtr, CuFt
Gas Flow	CuFt/hr, CuFt/min, CuMtr/hr, CuMtr/min
Gas Volume	CuFt, CuMtr
Air Flow	CuFt/hr, CuFt/min, CuMtr/hr, CuMtr/min
Air Volume	CuFt, CuMtr
Mass Flow	Lb/hr, Kg/hr
Mass Total	Lb, Kg
Thermal Energy Rate	BTU/hr, kBTU/hr, Ton, kW
Energy	BTU, kBTU, Ton-hr, kWh
Temperature	°F, °C
Pressure	PSI, kPa, ATM, BAR

4.3 COMMISSIONING

Upon initial installation, it is strongly recommended that the SYSTEM-1000 and its associated flow meters are commissioned to ensure that they are properly installed and functioning correctly. This process involves verifying the mechanical installation, measuring flow and temperature signals and then comparing these measurements to the specified installation and operating parameters listed on the FACTORY CONFIGURATION SHEET provided with the meter. The data collected during this initial commissioning process will then serve as baseline data for periodic revalidation of the meter operation.

COMMISSIONING PROCEDURE

Please read the entire procedure carefully before proceeding. A wiring diagram is provided with the meter. A worksheet for checking off the following steps and recording measured values is located on the next page.

IMPORTANT NOTE
Flow meters and temp sensors are matched to the System-1000.

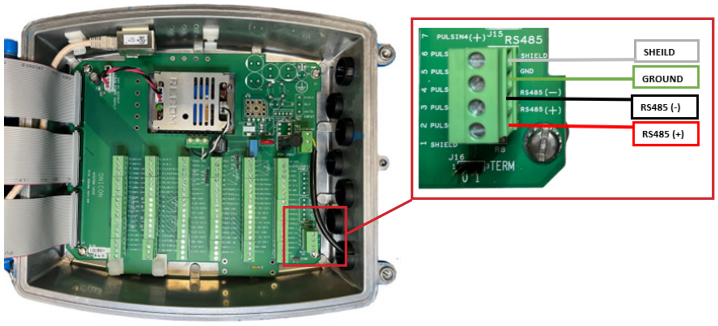
	MECHANICAL	
1	Confirm flow meter location and adequate straight pipe run to achieve desired results.	Is the flow meter located in the correct location as required by the plans? Compare actual straight pipe upstream and downstream of the flow meter location to the recommended distances identified in the flow meter installation manual.
2	Confirm pipe size & material. (for insertion meters only)	Confirm that the flow meter is tagged for the pipe diameter and material it is installed in. When in doubt, measure the circumference of the pipe. Pipe O.D. = (circumference / 3.14) – (insulation thickness x 2)
3	Confirm insertion depth and orientation (for insertion meters only).	Each insertion type flow meter comes with an attached insertion gage and instruction tag. Ensure that meter is inserted to correct depth and that the electronics enclosure is parallel with the pipe, with the arrow in the direction of flow.
4	Confirm temperature sensor thermowell installations.	Confirm that the thermowells are properly installed and the bottom of the well is in the flow stream. Make certain that only the components supplied with the installation kit were used and that additional bushings were not added.
5	Confirm temperature sensor installations.	Confirm that the temperature sensors are properly installed, and each sensor is bottomed out in the well. A small amount of thermal compound should be applied to the tip of each sensor to improve the thermal transfer.
	ELECTRICAL	
6	Confirm connection.	Using the wiring diagram, confirm that the flow meter and temperature sensor serial number matches the correct terminal connection.
7	Confirm correct supply voltage.	Verify that correct AC/DC voltage is available at the power supply input terminals per its wiring diagram. Input voltages should be within the following ranges: 24 VAC/DC 22 - 28 V DC/AC, 50/60Hz, 100VA 120-240 VAC 99 - 126 VAC or 196 - 253 VAC, 50/60Hz, 200VA
	PROGRAMMING	
8	Verify the type of fluid used in the piping system.	Confirm that the fluid specified on the BTU meter certificate of calibration matches the fluid flowing in the piping system.
In order to proceed with the following steps, the BTU meter must be operating and connected to the network. There must also be flow in pipes. Flow signal readings should be taken while holding the flow rate constant if possible. Otherwise, take the various output readings as quickly as possible.		
9	Confirm Values in the Energy Measurement Screen.	Confirm the displayed Flow Rates, Supply and Return temperature are within the expected present values of the application. Energy rate (KBTU/HR) is approximately = 500 * Delta-T * GPM/1000
10	Display/BMS Interaction.	Validate the value of the meter display match with the displayed values shown on the building control network.
End of standard commissioning. Please contact ONICON at (727)447-6140 with any questions.		

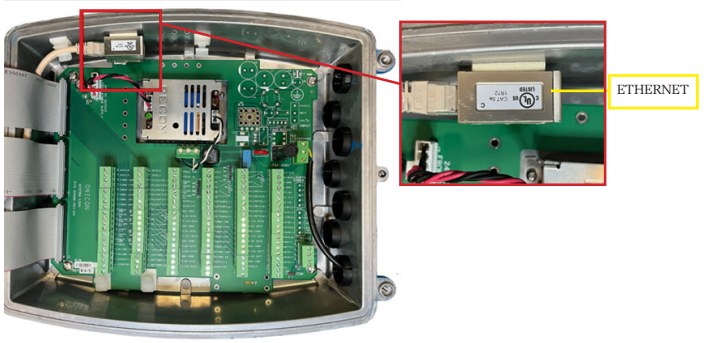
COMMISSIONING WORKSHEET

Please read all installation instructions carefully prior to proceeding with these steps. Wiring diagrams and Network Commissioning Guide are provided inside of the the SYS-1000 enclosure. Contact the factory if there is any missing documentation. Use the following worksheet for checking off the commissioning steps and recording measured values:

STEP	MEASUREMENT	S/N:	S/N:	S/N:	S/N:	S/N:	S/N:	S/N:	S/N:
1	Meter location								
2	Pipe Size								
3	Insertion depth and orientation								
4	Thermowell installation								
5	Temperature installation								
6	Terminal pin connection on the SYS-1000 (Ex: J9 Terminal 3 & 4 are Analog input 1)								
6.1	Verify flow meter and temp sensor wires match wiring diagram location								
7	Supply voltage verified (Note voltage)								
In order to proceed with the following steps, the BTU meter must be operating and connected to the network. There must also be flow in pipes. Flow signal readings should be taken while holding the flow rate constant if possible. Otherwise, take the various output readings as quickly as possible.									
8	Verify the liquid type								
9.1	Note and record the SUPPLY temperature								
9.2	Note and record the RETURN temperature								
9.3	Note and record the FLOW RATE								
9.4	Note and record the ENERGY RATE								
10.1	Measured frequency or Analog output signal from flow meter (refer to wiring diagram for terminal or wiring specific output)								
10.2	Measured frequency or Analog output signal from flow meter (refer to wiring diagram for terminal or wiring specific output) For Frequency Flow Meters: GPM = Frequency in Hz x 60 / Meter Factor (Refer to calibration tag for meter factor) For Analog Flow Meter: GPM = Full Scale * (mA DC Value - 4) / 16 (Refer to calibration tag for Full Scale output)								
10.3	Compare and record the displayed values with those shown on BTU meter certificate of calibration and the network, where appropriate.								

4.4 NETWORK CONFIGURATION





<table>
<tr><th>Connecting via BACnet MSTP</th><th>Connecting via BACnet UDP/IP</th></tr>
<tr><td>1. Power on unit to verify it is functioning properly. After verifying power down the unit.</td><td>1. Power on unit to verify it is functioning properly. After verifying power down the unit.</td></tr>
<tr><td>2. Wire MSTP cables to unit.

• The RS485 network cable connections are polarity sensitive and must be connected the same way on every device (i.e. + to + and - to -).
• Shield drain connections should be daisy chained in the same manner as the signal cables for RS485. The shield drain wire should be left unterminated at the end of the cable and connected to earth only at the network master controller. Shield wires must not be connected to the RS485 connector on the System-1000
• The maximum number of devices allowed on an RS485 network segment without a repeater is 32. Adding more than 32 devices to a single segment may reduce the transceiver output voltage to a level that is too low to be distinguished from back ground noise on the cable.</td><td>2. Connect ethernet cable to unit.</td></tr>
<tr><td>3. Connect power to unit.</td><td>3. Connect power to unit.</td></tr>
<tr><td>4. Navigate to the systems network configuration. From the main menu select:

User Configurations -> Network -> BACnet MSTP</td><td>4. Navigate to the systems network configuration. From the main menu select:

User Configurations -> Network -> BACnet UDP/IP</td></tr>
<tr><td>5. Configure device as needed. Default values are listed below.
<table><tr><td>Address</td><td>128</td></tr><tr><td>Instance Number</td><td>4194303</td></tr><tr><td>Baud Rate</td><td>38400</td></tr><tr><td>Max Master</td><td>127</td></tr><tr><td>Large AVAL Objects</td><td>Yes</td></tr></table></td><td>5. Configure device as needed. Default values are listed below.
<table><tr><td>Enable DHCP</td><td>No</td></tr><tr><td>Address</td><td>192.168.1.24</td></tr><tr><td>Net Mask</td><td>255.255.255.0</td></tr><tr><td>Gateway</td><td>0.0.0.0</td></tr><tr><td>Port</td><td>47808</td></tr><tr><td>Instance Number</td><td>4194303</td></tr><tr><td>Foreign IP</td><td>0.0.0.0</td></tr><tr><td>Foreign Port Num</td><td>47808</td></tr><tr><td>Large AVAL Objects</td><td>Yes</td></tr></table></td></tr>
<tr><td>6. Power cycle the device and it is now ready to connect to the controller or next device in the trunk.</td><td>6. Power cycle the device and it is now ready to connect to the controller or next device in the trunk.</td></tr>
</table>

Checking Network Status

Connecting via BACnet MSTP	Connecting via BACnet UDP/IP
1. From the main menu, select diagnostics • If the meter is connected to an active network, System-1000 display will show Active on the NETWORK message	1. From the main menu, select diagnostics • If the meter is connected to an active network, System-1000 display will show Active on the NETWORK message
2. Link Down: No traffic has been seen in 60 seconds Up, Active: Traffic has been seen in the last 60 seconds	2. Link Down: The ethernet hardware does not detect that it is physically connected to another ethernet interface Up, Active: The ethernet hardware has seen traffic in the last 15 seconds Up, Timeout: No traffic has been seen by the ethernet hardware in 15 seconds

Network Connection and Configuration

<table>
<tr><th>Connecting via MODBUS RTU</th><th>Connecting via MODBUS TCP/IP</th></tr>
<tr><td>1. Power on unit to verify it is functioning properly. After verification, power down the unit.</td><td>1. Power on unit to verify it is functioning properly. After verification, power down the unit.</td></tr>
<tr><td>2. Wire RTU cables to unit.

• The RS485 network cable connections are polarity sensitive and must be connected the same way on every device (i.e. + to + and - to -).
• Shield drain connections should be daisy chained in the same manner as the signal cables for RS485. The shield drain wire should be left unterminated at the end of the cable and connected to earth only at the network master controller. Shield wires must not be connected to the RS485 connector on the System-1000
• The maximum number of devices allowed on an RS485 network segment without a repeater is 32. Adding more than 32 devices to a single segment may reduce the transceiver output voltage to a level that is too low to be distinguished from back ground noise on the cable.</td><td>2. Connect ethernet cable to unit.</td></tr>
<tr><td>3. Connect power to unit.</td><td>3. Connect power to unit.</td></tr>
<tr><td>4. Navigate to the systems network configuration. From the main menu select:

User Configurations -> Network -> MODBUS RTU</td><td>4. Navigate to the systems network configuration. From the main menu select:

User Configurations -> Network -> MODBUS TCP/IP</td></tr>
<tr><td>5. Configure device as needed. Default values are listed below.

<table><tr><td>Address</td><td>17</td></tr><tr><td>Baud Rate</td><td>38400</td></tr><tr><td>Vaue Size</td><td>64-bit</td></tr><tr><td>Parity</td><td>Even</td></tr><tr><td>Stop Bits</td><td>1</td></tr></table></td><td>5. Configure device as needed. Default values are listed below.

<table><tr><td>Enable DHCP</td><td>No</td></tr><tr><td>Address</td><td>192.168.1.24</td></tr><tr><td>Net Mask</td><td>255.255.255.0</td></tr><tr><td>Gateway</td><td>0.0.0.0</td></tr><tr><td>Port</td><td>502</td></tr><tr><td>Value SIze</td><td>64-bit</td></tr></table></td></tr>
<tr><td>6. Power cycle the device and it is now ready to connect to the controller or next device in the trunk.</td><td>6. Power cycle the device and it is now ready to connect to the controller or next device in the trunk.</td></tr>
</table>

Checking Network Status

Connecting via MODBUS RTU	Connecting via MODBUS TCP/IP
1. From the main menu, select diagnostics • If the meter is connected to an active network, System-1000 display will show "Active" on the "Com Board" line.	1. From the main menu, select diagnostics • If the meter is connected to an active network, System-1000 display will show "Active" on the "Com Board" line.
2. Link Down: No traffic has been seen in 60 seconds Link Up: Traffic has been seen in the last 60 seconds	2. Link Down: The ethernet hardware does not detect that it is physically connected to another ethernet interface Up, Active: The ethernet hardware has seen traffic in the last 15 seconds Up, Inactive: No traffic has been seen by the ethernet hardware in 15 seconds

IMPORANT NOTE FOR BACnet MS/TP AND Modbus RTU CONNECTIONS

If the meter is not connected to an active network, the following electrical testing can **NOT** be performed with a multimeter.

1. Check Resistance ▪ Set multimeter to Ohms ▪ Shield (● Lead) ▪ Earth Ground (● Lead) ▪ Normal Reading: 0 Ohms	▪ Above 3 Ohms: Shield not grounded ▪ Below 3 Ohms with ground removed: Ground loop, find extra ground and disconnect it, only one ground recommended.
2. Check DC Voltage ▪ Set multimeter to DC Volts ▪ A- (● Lead) ▪ B+ (● Lead) ▪ Normal Reading: 0.2 VDC	▪ Below 0.2V DC: Short between A- and B+ ▪ Above 0.5V DC: o A- and B+ are disconnected on one end o End of Line not switched on
3. Check DC Voltage ▪ Set multimeter to DC Volts ▪ Earth Ground (● Lead) ▪ B+ (● Lead) ▪ Normal Reading: 2.0 to 2.5 VDC	▪ Below 0.7 VDC: Short between B+ and Shield ▪ Above 3.0 VDC: A device is shorted on B+ leg
4. Check DC Voltage ▪ Set multimeter to DC Volts ▪ Earth Ground (● Lead) ▪ A- (● Lead) ▪ Normal Reading: 2.0 to 2.5 VDC	▪ Below 0.7 VDC: Short between A- and Shield ▪ Above 3.0 VDC: A device is shorted on A- leg
5. Check AC Voltage ▪ Set multimeter to AC Volts ▪ B+ (● Lead) ▪ Earth Ground (● Lead) ▪ Normal Reading: Less than 2.0 VAC	▪ Above 2.0 VAC: Voltage source shorted to COMM ▪ Approx 24 VAC: Mis-phased controller
6. Check AC Voltage ▪ Set multimeter to AC Volts ▪ A- (● Lead) ▪ Earth Ground (● Lead) ▪ Normal Reading: Less than 2.0 VAC	▪ Above 2.0 VAC: Voltage source shorted to COMM ▪ Approx 24 VAC: Mis-phased controller

4.5 BACNET IMPLEMENTATION

BACnet Protocol Implementation Conformance Statement

Date: 03/02/2026
Vendor Name: ONICON Inc.
Product Name: System 1000
Product Model Number: SYS-1100-111, SYS-1100-121, SYS-1200-111, SYS-1200-121
Application Software Version: 1.26.1
Firmware Revision: 1.3.0
BACnet Protocol Revision: 16

BACnet Standardized Device Profiles Supported (Annex L):

■ BACnet Application Specific Controller (B-ASC)

BACnet Interoperability Building Blocks Supported (Annex K): DS-RP-B, DS-RPM-B, DS-WP-B, DS-WPM-B, DS-COV-B, AE-N-I-B, AE-ACK-B, AE-INFO-B, AE-CRL-B, DM-DDB-B, DM-DOB-B, DM-DCC-B, DM-TS-B, UTC-B, DM-RD-B

Segmentation Capability:

☐ Able to transmit segmented messages Window Size _____
☐ Able to receive segmented messages Window Size _____

Standard Object Types Supported:

Dynamic object creation and deletion is not supported for any object type.

Analog Input
Optionally Writable Required Properties:
Object Name
Conditionally Writable Properties:
Present Value (commandable when "Out of Service" is True)
Optional Properties Supported:
Description (W), COV Increment (W), Time Delay (W), Notification Class, High Limit (W), Low Limit (W), Deadband (W), Limit Enable (W), Event Enable (W), Acked Transition Bits, Notify Type, Event Time Stamps, Event Text Messages, Event Algorithm Inhibit Ref, Event Algorithm Inhibit

Analog Value
Optionally Writable Required Properties:
Object Name
Conditionally Writable Properties:
Present Value ("user defined" and "aux" pulse total AV objects are resettable by writing 0)
Optional Properties Supported:
Description (W), Priority Array, COV Increment (W), Relinquish Default

Binary Input
Optionally Writable Required Properties:
Object Name
Optional Properties Supported:
Description (W), Inactive Text, Active Text

Binary Value
Optionally Writable Required Properties:
Object Name, Present Value
Optional Properties Supported:
Description (W), Inactive Text, Active Text, Priority Array (W), Relinquish Default (W)

Device
Optionally Writable Required Properties:
Object Identifier, Object Name, APDU Timeout, Number of APDU Retries
Optional Properties Supported:
Description (W), Local Date (W), Local Time (W),
Max Master (W), Max Info Frames (W)

File
Optionally Writable Required Properties:
Object Name
Optional Properties Supported:
Description (W)

Multi-state Value
Optionally Writable Required Properties:
Object Name
Optional Properties Supported:
Description (W), State Text

Bit String Value
Optional Properties Supported
Reliability, Out of Service, Description, Bit Text

Notification Class
Optionally Writable Required Properties:
Object Name, Ack Required, Recipient List
Optional Properties Supported:
Description (W)

Large Analog Value
Optionally Writable Required Properties:
Object Name
Conditionally Writable Properties:
Present Value ("user defined" and "aux" pulse total AV objects are resettable by writing 0)
Optional Properties Supported:
Description (W), Priority Array, COV Increment (W), Relinquish Default

BACnet Data Link Layer Options:

■ BACnet IP, (Annex J)
■ MS/TP master (Clause 9)
■ Master ☐ Slave
☐ Non-isolated transceiver ■ Isolated transceiver
■ Local 47K ohms bias resistors ☐ None ☐ Other: _____
Transceiver unit loading: ☐ 1 ☐ ½ ☐ ¼ ■ ⅛
Data rates: ■ 9600 ■ 19200 ■ 38400 ■ 57600 ■ 76800 ☐ 115200

Device Address Binding:

Is static device binding supported? (This is currently necessary for two-way communication with MS/TP slaves and certain other devices.) ☐ Yes ■ No

Character Sets Supported:

Indicating support for multiple character sets does not imply that they can all be supported simultaneously.

■ ISO 10646 (UTF-8) ☐ IBM™/Microsoft™ DBCS ☐ ISO 8859-1
☐ ISO 10646 (UCS-2) ☐ ISO 10646 (UCS-4) ☐ JIS X 0208

4.6 BACNET OBJECT LIST

NOTE: Object population depends on configuration of the System-1000. Ex: Dual channel devices will not populate objects for channels 3 & 4.

AINP object list:		Comments
AI 1	Energy Rate CH1	Thermal energy rate for Channel 1
AI 2	Flow Rate CH1	Volumetric Flow Rate of the primary flow meter on Channel 1 OR the result of the math function if Channel 1 is used for flow addition or subtraction
AI 3	Flow Rate Primary Only CH1	Volumetric Flow Rate of ONLY the primary flow meter on Channel 1 when the channel is configured for addition or subtraction
AI 4	Supply Temp CH1	
AI 5	Return Temp CH1	
AI 6	Delta Temp CH1	
AI 7	Aux Rate Input CH1	
AI 8	Efficiency COP CH1	COP value when Channel 1 is configured for "Efficiency" and an energy input value is provided to the Channel 1 Aux Rate Input
AI 9	Energy Rate CH2	Thermal energy rate for Channel 2
AI 10	Flow Rate CH2	Volumetric Flow Rate of the primary flow meter on Channel 2 OR the result of the math function if Channel 2 is used for flow addition or subtraction
AI 11	Flow Rate Primary Only CH2	Volumetric Flow Rate of ONLY the primary flow meter on Channel 2 when the channel is configured for addition or subtraction
AI 12	Supply Temp CH2	
AI 13	Return Temp CH2	
AI 14	Delta Temp CH2	
AI 15	Aux Rate Input CH2	
AI 16	Efficiency COP CH2	COP value when Channel 2 is configured for "Efficiency" and an energy input value is provided to the Channel 2 Aux Rate Input
AI 17	Energy Rate CH3	Thermal energy rate for Channel 3
AI 18	Flow Rate CH3	Volumetric Flow Rate of the primary flow meter on Channel 3 OR the result of the math function if Channel 3 is used for flow addition or subtraction
AI 19	Flow Rate Primary Only CH3	Volumetric Flow Rate of ONLY the primary flow meter on Channel 3 when the channel is configured for addition or subtraction
AI 20	Supply Temp CH3	
AI 21	Return Temp CH3	
AI 22	Delta Temp CH3	
AI 23	Aux Rate Input CH3	
AI 24	Efficiency COP CH3	COP value when Channel 3 is configured for "Efficiency" and an energy input value is provided to the Channel 3 Aux Rate Input
AI 25	Energy Rate CH4	Thermal energy rate for Channel 4
AI 26	Flow Rate CH4	Volumetric Flow Rate of the primary flow meter on Channel 4 OR the result of the math function if Channel 4 is used for flow addition or subtraction
AI 27	Flow Rate Primary Only CH4	Volumetric Flow Rate of ONLY the primary flow meter on Channel 4 when the channel is configured for addition or subtraction
AI 28	Supply Temp CH4	
AI 29	Return Temp CH4	
AI 30	Delta Temp CH4	
AI 31	Aux Rate Input CH4	
AI 32	Efficiency COP CH4	COP value when Channel 4 is configured for "Efficiency" and an energy input value is provided to the Channel 4 Aux Rate Input

AVAL/LAVAL object list (Channel 1):		Comments
AV 1	Energy Total Mode 1 CH1	Thermal energy total - Channel 1 - Non-Resettable
AV 2	Energy Total Mode 2 CH1	Thermal energy total in rev. flow or dual mode cooling - Channel 1 - Non-Resettable
AV 3	YTD Energy Total Mode 1 CH1	Year-to-date thermal energy total - Channel 1
AV 4	YTD Energy Total Mode 2 CH1	Year-to-date thermal energy total in rev. flow or dual mode cooling - Channel 1
AV 5	Prev Year Energy Total Mode 1 CH1	Previous Year thermal energy total - Channel 1
AV 6	Prev Year Energy Total Mode 2 CH1	Previous Year thermal energy total in rev. flow or dual mode cooling - Channel 1
AV 7	Prev 30 Day Energy Total Mode 1 CH1	Previous 30 day thermal energy total - Channel 1
AV 8	Prev 30 Day Energy Total Mode 2 CH1	Previous 30 day thermal energy total in rev. flow or dual mode cooling - Channel 1
AV 9	Prev 24 Hour Energy Total Mode 1 CH1	Previous 24 hr. thermal energy total - Channel 1
AV 10	Prev 24 Hour Energy Total Mode 2 CH1	Previous 24 hr. thermal energy total in rev. flow or dual mode cooling - Channel 1
AV 11	User Defined Energy Total Mode 1 CH1	Resettable thermal energy total - Channel 1
AV 12	User Defined Energy Total Mode 2 CH1	Resettable Thermal energy total in rev. flow or dual mode cooling - Channel 1
AV 13	Volume Total Mode 1 CH1	Volume total - Channel 1 - Non-Resettable
AV 14	Volume Total Mode 2 CH1	Volume total in rev. flow or dual mode cooling - Channel 1 - Non-Resettable
AV 15	YTD Volume Total Mode 1 CH1	Year-to-date Volume total - Channel 1
AV 16	YTD Volume Total Mode 2 CH1	Year-to-date Volume total in rev. flow or dual mode cooling - Channel 1
AV 17	Prev Year Volume Total Mode 1 CH1	Previous Year Volume total - Channel 1
AV 18	Prev Year Volume Total Mode 2 CH1	Previous Year Volume total in rev. flow or dual mode cooling - Channel 1
AV 19	Prev 30 Day Volume Total Mode 1 CH1	Previous 30 day Volume total - Channel 1
AV 20	Prev 30 Day Volume Total Mode 2 CH1	Previous 30 day Volume total in rev. flow or dual mode cooling - Channel 1
AV 21	Prev 24 Hour Volume Total Mode 1 CH1	Previous 24 hr. Volume total - Channel 1
AV 22	Prev 24 Hour Volume Total Mode 2 CH1	Previous 24 hr. Volume total in rev. flow or dual mode cooling - Channel 1
AV 23	User Defined Volume Total Mode 1 CH1	Resettable Volume total - Channel 1
AV 24	User Defined Volume Total Mode 2 CH1	Resettable Volume total in rev. flow or dual mode cooling - Channel 1
AV 25	Aux Rate In Total CH1	Aux Rate-In total - Channel 1 - Non-Resettable
AV 26	YTD Aux Rate In Total CH1	Year-to-date Aux Rate-In total - Channel 1
AV 27	PrevYr Aux Rate In Total CH1	Previous Year Aux Rate-In total - Channel 1
AV 28	Prev 30D Aux Rate In Total CH1	Previous 30 day Aux Rate-In total - Channel 1
AV 29	Prev 24H Aux Rate In Total CH1	Previous 24 hr. Aux Rate-In total - Channel 1
AV 30	User Defined Aux Rate In Total CH1	Resettable Aux Rate-In total - Channel 1
AV 31	Primary Only Volume Total Mode 1 CH1	Primary Only Volume Total - Channel 1 - Primary flow meter only when in add/subtract mode - Non-Resettable
AV 32	YTD Prim Only Volume Total Mode 1 CH1	Year-to-date Primary Only Volume Total - Channel 1 - Primary flow meter only when in add/subtract mode
AV 33	Prev Year Prim Only Volume Total Mode 1 CH1	Previous Year Primary Only Volume Total - Channel 1 - Primary flow meter only when in add/subtract mode
AV 34	Prev 30 Day Prim Only Volume Total Mode 1 CH1	Previous 30 day Primary Only Volume Total - Channel 1 - Primary flow meter only when in add/subtract mode
AV 35	Prev 24 Hour Prim Only Volume Total Mode 1 CH1	Previous 24 hour Primary Only Volume Total - Channel 1 - Primary flow meter only when in add/subtract mode
AV 36	User Prim Only Volume Total Mode 1 CH1	Resettable Primary Only Volume Total - Channel 1 - Primary flow meter only when in add/subtract mode

AVAL/LAVAL object list (Channel 2):		Comments
AV 37	Energy Total Mode 1 CH2	Thermal energy total - Channel 2 - Non-Resettable
AV 38	Energy Total Mode 2 CH2	Thermal energy total in rev. flow or dual mode cooling - Channel 2 - Non-Resettable
AV 39	YTD Energy Total Mode 1 CH2	Year-to-date thermal energy total - Channel 2
AV 40	YTD Energy Total Mode 2 CH2	Year-to-date thermal energy total in rev. flow or dual mode cooling - Channel 2
AV 41	Prev Year Energy Total Mode 1 CH2	Previous Year thermal energy total - Channel 2
AV 42	Prev Year Energy Total Mode 2 CH2	Previous Year thermal energy total in rev. flow or dual mode cooling - Channel 2
AV 43	Prev 30 Day Energy Total Mode 1 CH2	Previous 30 day thermal energy total - Channel 2
AV 44	Prev 30 Day Energy Total Mode 2 CH2	Previous 30 day thermal energy total in rev. flow or dual mode cooling - Channel 2
AV 45	Prev 24 Hour Energy Total Mode 1 CH2	Previous 24 hr. thermal energy total - Channel 2
AV 46	Prev 24 Hour Energy Total Mode 2 CH2	Previous 24 hr. thermal energy total in rev. flow or dual mode cooling - Channel 2
AV 47	User Defined Energy Total Mode 1 CH2	Resettable thermal energy total - Channel 2
AV 48	User Defined Energy Total Mode 2 CH2	Resettable Thermal energy total in rev. flow or dual mode cooling - Channel 2
AV 49	Volume Total Mode 1 CH2	Volume total - Channel 2 - Non-Resettable
AV 50	Volume Total Mode 2 CH2	Volume total in rev. flow or dual mode cooling - Channel 2 - Non-Resettable
AV 51	YTD Volume Total Mode 1 CH2	Year-to-date Volume total - Channel 2
AV 52	YTD Volume Total Mode 2 CH2	Year-to-date Volume total in rev. flow or dual mode cooling - Channel 2
AV 53	Prev Year Volume Total Mode 1 CH2	Previous Year Volume total - Channel 2
AV 54	Prev Year Volume Total Mode 2 CH2	Previous Year Volume total in rev. flow or dual mode cooling - Channel 2
AV 55	Prev 30 Day Volume Total Mode 1 CH2	Previous 30 day Volume total - Channel 2
AV 56	Prev 30 Day Volume Total Mode 2 CH2	Previous 30 day Volume total in rev. flow or dual mode cooling - Channel 2
AV 57	Prev 24 Hour Volume Total Mode 1 CH2	Previous 24 hr. Volume total - Channel 2
AV 58	Prev 24 Hour Volume Total Mode 2 CH2	Previous 24 hr. Volume total in rev. flow or dual mode cooling - Channel 2
AV 59	User Defined Volume Total Mode 1 CH2	Resettable Volume total - Channel 2
AV 60	User Defined Volume Total Mode 2 CH2	Resettable Volume total in rev. flow or dual mode cooling - Channel 2
AV 61	Aux Rate In Total CH2	Aux Rate-In total - Channel 2 - Non-Resettable
AV 62	YTD Aux Rate In Total CH2	Year-to-date Aux Rate-In total - Channel 2
AV 63	PrevYr Aux Rate In Total CH2	Previous Year Aux Rate-In total - Channel 2
AV 64	Prev 30D Aux Rate In Total CH2	Previous 30 day Aux Rate-In total - Channel 2
AV 65	Prev 24H Aux Rate In Total CH2	Previous 24 hr. Aux Rate-In total - Channel 2
AV 66	User Defined Aux Rate In Total CH2	Resettable Aux Rate-In total - Channel 2
AV 67	Primary Only Volume Total Mode 1 CH2	Primary Only Volume Total - Channel 2 - Primary flow meter only when in add/subtract mode - Non-Resettable
AV 68	YTD Prim Only Volume Total Mode 1 CH2	Year-to-date Primary Only Volume Total - Channel 2 - Primary flow meter only when in add/subtract mode
AV 69	Prev Year Prim Only Volume Total Mode 1 CH2	Previous Year Primary Only Volume Total - Channel 2 - Primary flow meter only when in add/subtract mode
AV 70	Prev 30 Day Prim Only Volume Total Mode 1 CH2	Previous 30 day Primary Only Volume Total - Channel 2 - Primary flow meter only when in add/subtract mode
AV 71	Prev 24 Hour Prim Only Volume Total Mode 1 CH2	Previous 24 hour Primary Only Volume Total - Channel 2 - Primary flow meter only when in add/subtract mode
AV 72	User Prim Only Volume Total Mode 1 CH2	Resettable Primary Only Volume Total - Channel 2 - Primary flow meter only when in add/subtract mode

AVAL/LAVAL object list (Channel 3):		Comments
AV 73	Energy Total Mode 1 CH3	Thermal energy total - Channel 3 - Non-Resettable
AV 74	Energy Total Mode 2 CH3	Thermal energy total in rev. flow or dual mode cooling - Channel 3 - Non-Resettable
AV 75	YTD Energy Total Mode 1 CH3	Year-to-date thermal energy total - Channel 3
AV 76	YTD Energy Total Mode 2 CH3	Year-to-date thermal energy total in rev. flow or dual mode cooling - Channel 3
AV 77	Prev Year Energy Total Mode 1 CH3	Previous Year thermal energy total - Channel 3
AV 78	Prev Year Energy Total Mode 2 CH3	Previous Year thermal energy total in rev. flow or dual mode cooling - Channel 3
AV 79	Prev 30 Day Energy Total Mode 1 CH3	Previous 30 day thermal energy total - Channel 3
AV 80	Prev 30 Day Energy Total Mode 2 CH3	Previous 30 day thermal energy total in rev. flow or dual mode cooling - Channel 3
AV 81	Prev 24 Hour Energy Total Mode 1 CH3	Previous 24 hr. thermal energy total - Channel 3
AV 82	Prev 24 Hour Energy Total Mode 2 CH3	Previous 24 hr. thermal energy total in rev. flow or dual mode cooling - Channel 3
AV 83	User Defined Energy Total Mode 1 CH3	Resettable thermal energy total - Channel 3
AV 84	User Defined Energy Total Mode 2 CH3	Resettable Thermal energy total in rev. flow or dual mode cooling - Channel 3
AV 85	Volume Total Mode 1 CH3	Volume total - Channel 3 - Non-Resettable
AV 86	Volume Total Mode 2 CH3	Volume total in rev. flow or dual mode cooling - Channel 3 - Non-Resettable
AV 87	YTD Volume Total Mode 1 CH3	Year-to-date Volume total - Channel 3
AV 88	YTD Volume Total Mode 2 CH3	Year-to-date Volume total in rev. flow or dual mode cooling - Channel 3
AV 89	Prev Year Volume Total Mode 1 CH3	Previous Year Volume total - Channel 3
AV 90	Prev Year Volume Total Mode 2 CH3	Previous Year Volume total in rev. flow or dual mode cooling - Channel 3
AV 91	Prev 30 Day Volume Total Mode 1 CH3	Previous 30 day Volume total - Channel 3
AV 92	Prev 30 Day Volume Total Mode 2 CH3	Previous 30 day Volume total in rev. flow or dual mode cooling - Channel 3
AV 93	Prev 24 Hour Volume Total Mode 1 CH3	Previous 24 hr. Volume total - Channel 3
AV 94	Prev 24 Hour Volume Total Mode 2 CH3	Previous 24 hr. Volume total in rev. flow or dual mode cooling - Channel 3
AV 95	User Defined Volume Total Mode 1 CH3	Resettable Volume total - Channel 3
AV 96	User Defined Volume Total Mode 2 CH3	Resettable Volume total in rev. flow or dual mode cooling - Channel 3
AV 97	Aux Rate In Total CH3	Aux Rate-In total - Channel 3 - Non-Resettable
AV 98	YTD Aux Rate In Total CH3	Year-to-date Aux Rate-In total - Channel 3
AV 99	PrevYr Aux Rate In Total CH3	Previous Year Aux Rate-In total - Channel 3
AV 100	Prev 30D Aux Rate In Total CH3	Previous 30 day Aux Rate-In total - Channel 3
AV 101	Prev 24H Aux Rate In Total CH3	Previous 24 hr. Aux Rate-In total - Channel 3
AV 102	User Defined Aux Rate In Total CH3	Resettable Aux Rate-In total - Channel 3
AV 103	Primary Only Volume Total Mode 1 CH3	Primary Only Volume Total - Channel 3 - Primary flow meter only when in add/subtract mode - Non-Resettable
AV 104	YTD Prim Only Volume Total Mode 1 CH3	Year-to-date Primary Only Volume Total - Channel 3 - Primary flow meter only when in add/subtract mode
AV 105	Prev Year Prim Only Volume Total Mode 1 CH3	Previous Year Primary Only Volume Total - Channel 3 - Primary flow meter only when in add/subtract mode
AV 106	Prev 30 Day Prim Only Volume Total Mode 1 CH3	Previous 30 day Primary Only Volume Total - Channel 3 - Primary flow meter only when in add/subtract mode
AV 107	Prev 24 Hour Prim Only Volume Total Mode 1 CH3	Previous 24 hour Primary Only Volume Total - Channel 3 - Primary flow meter only when in add/subtract mode
AV 108	User Prim Only Volume Total Mode 1 CH3	Resettable Primary Only Volume Total - Channel 3 - Primary flow meter only when in add/subtract mode

AVAL/LAVAL object list (Channel 4):		Comments
AV 109	Energy Total Mode 1 CH4	Thermal energy total - Channel 4 - Non-Resettable
AV 110	Energy Total Mode 2 CH4	Thermal energy total in rev. flow or dual mode cooling - Channel 4 - Non-Resettable
AV 111	YTD Energy Total Mode 1 CH4	Year-to-date thermal energy total - Channel 4
AV 112	YTD Energy Total Mode 2 CH4	Year-to-date thermal energy total in rev. flow or dual mode cooling - Channel 4
AV 113	Prev Year Energy Total Mode 1 CH4	Previous Year thermal energy total - Channel 4
AV 114	Prev Year Energy Total Mode 2 CH4	Previous Year thermal energy total in rev. flow or dual mode cooling - Channel 4
AV 115	Prev 30 Day Energy Total Mode 1 CH4	Previous 30 day thermal energy total - Channel 4
AV 116	Prev 30 Day Energy Total Mode 2 CH4	Previous 30 day thermal energy total in rev. flow or dual mode cooling - Channel 4
AV 117	Prev 24 Hour Energy Total Mode 1 CH4	Previous 24 hr. thermal energy total - Channel 4
AV 118	Prev 24 Hour Energy Total Mode 2 CH4	Previous 24 hr. thermal energy total in rev. flow or dual mode cooling - Channel 4
AV 119	User Defined Energy Total Mode 1 CH4	Resettable thermal energy total - Channel 4
AV 120	User Defined Energy Total Mode 2 CH4	Resettable Thermal energy total in rev. flow or dual mode cooling - Channel 4
AV 121	Volume Total Mode 1 CH4	Volume total - Channel 4 - Non-Resettable
AV 122	Volume Total Mode 2 CH4	Volume total in rev. flow or dual mode cooling - Channel 4 - Non-Resettable
AV 123	YTD Volume Total Mode 1 CH4	Year-to-date Volume total - Channel 4
AV 124	YTD Volume Total Mode 2 CH4	Year-to-date Volume total in rev. flow or dual mode cooling - Channel 4
AV 125	Prev Year Volume Total Mode 1 CH4	Previous Year Volume total - Channel 4
AV 126	Prev Year Volume Total Mode 2 CH4	Previous Year Volume total in rev. flow or dual mode cooling - Channel 4
AV 127	Prev 30 Day Volume Total Mode 1 CH4	Previous 30 day Volume total - Channel 4
AV 128	Prev 30 Day Volume Total Mode 2 CH4	Previous 30 day Volume total in rev. flow or dual mode cooling - Channel 4
AV 129	Prev 24 Hour Volume Total Mode 1 CH4	Previous 24 hr. Volume total - Channel 4
AV 130	Prev 24 Hour Volume Total Mode 2 CH4	Previous 24 hr. Volume total in rev. flow or dual mode cooling - Channel 4
AV 131	User Defined Volume Total Mode 1 CH4	Resettable Volume total - Channel 4
AV 132	User Defined Volume Total Mode 2 CH4	Resettable Volume total in rev. flow or dual mode cooling - Channel 4
AV 133	Aux Rate In Total CH4	Aux Rate-In total - Channel 4 - Non-Resettable
AV 134	YTD Aux Rate In Total CH4	Year-to-date Aux Rate-In total - Channel 4
AV 135	PrevYr Aux Rate In Total CH4	Previous Year Aux Rate-In total - Channel 4
AV 136	Prev 30D Aux Rate In Total CH4	Previous 30 day Aux Rate-In total - Channel 4
AV 137	Prev 24H Aux Rate In Total CH4	Previous 24 hr. Aux Rate-In total - Channel 4
AV 138	User Defined Aux Rate In Total CH4	Resettable Aux Rate-In total - Channel 4
AV 139	Primary Only Volume Total Mode 1 CH4	Primary Only Volume Total - Channel 4 - Primary flow meter only when in add/subtract mode - Non-Resettable
AV 140	YTD Prim Only Volume Total Mode 1 CH4	Year-to-date Primary Only Volume Total - Channel 4 - Primary flow meter only when in add/subtract mode
AV 141	Prev Year Prim Only Volume Total Mode 1 CH4	Previous Year Primary Only Volume Total - Channel 4 - Primary flow meter only when in add/subtract mode
AV 142	Prev 30 Day Prim Only Volume Total Mode 1 CH4	Previous 30 day Primary Only Volume Total - Channel 4 - Primary flow meter only when in add/subtract mode
AV 143	Prev 24 Hour Prim Only Volume Total Mode 1 CH4	Previous 24 hour Primary Only Volume Total - Channel 4 - Primary flow meter only when in add/subtract mode
AV 144	User Prim Only Volume Total Mode 1 CH4	Resettable Primary Only Volume Total - Channel 4 - Primary flow meter only when in add/subtract mode

AVAL/LAVAL object list (Other):		Comments
AV 145	Total - Aux Pulse In 1	Pulse In total - Aux Pulse In 1 - Non-Resettable
AV 146	YTD Total - Aux Pulse In 1	Year-to-date Pulse In total - Aux Pulse In 1
AV 147	Prev Year Total - Aux Pulse In 1	Previous Year Pulse In total - Aux Pulse In 1
AV 148	Prev 30 Day Total - Aux Pulse In 1	Previous 30 day Pulse In total - Aux Pulse In 1
AV 149	Prev 24 Hour Total - Aux Pulse In 1	Previous 24 hour Pulse In total - Aux Pulse In 1
AV 150	User Defined Total - Aux Pulse In 1	Resettable Pulse In total - Aux Pulse In 1
AV 151	Total - Aux Pulse In 2	Pulse In total - Aux Pulse In 2 - Non-Resettable
AV 152	YTD Total - Aux Pulse In 2	Year-to-date Pulse In total - Aux Pulse In 2
AV 153	Prev Year Total - Aux Pulse In 2	Previous Year Pulse In total - Aux Pulse In 2
AV 154	Prev 30 Day Total - Aux Pulse In 2	Previous 30 day Pulse In total - Aux Pulse In 2
AV 155	Prev 24 Hour Total - Aux Pulse In 2	Previous 24 hour Pulse In total - Aux Pulse In 2
AV 156	User Defined Total - Aux Pulse In 2	Resettable Pulse In total - Aux Pulse In 2
AV 157	Total - Aux Pulse In 3	Pulse In total - Aux Pulse In 3 - Non-Resettable
AV 158	YTD Total - Aux Pulse In 3	Year-to-date Pulse In total - Aux Pulse In 3
AV 159	Prev Year Total - Aux Pulse In 3	Previous Year Pulse In total - Aux Pulse In 3
AV 160	Prev 30 Day Total - Aux Pulse In 3	Previous 30 day Pulse In total - Aux Pulse In 3
AV 161	Prev 24 Hour Total - Aux Pulse In 3	Previous 24 hour Pulse In total - Aux Pulse In 3
AV 162	User Defined Total - Aux Pulse In 3	Resettable Pulse In total - Aux Pulse In 3
AV 163	Total - Aux Pulse In 4	Pulse In total - Aux Pulse In 4 - Non-Resettable
AV 164	YTD Total - Aux Pulse In 4	Year-to-date Pulse In total - Aux Pulse In 4
AV 165	Prev Year Total - Aux Pulse In 4	Previous Year Pulse In total - Aux Pulse In 4
AV 166	Prev 30 Day Total - Aux Pulse In 4	Previous 30 day Pulse In total - Aux Pulse In 4
AV 167	Prev 24 Hour Total - Aux Pulse In 4	Previous 24 hour Pulse In total - Aux Pulse In 4
AV 168	User Defined Total - Aux Pulse In 4	Resettable Pulse In total - Aux Pulse In 4
AV 169	Run Hours	Total run hours for the System-1000
AV 170	Run Hours Mode 1 CH1	Total run hours for thermal energy or flow on Chan 1
AV 171	Run Hours Mode 2 CH1	Total run hours for thermal energy or flow on Chan 1 - rev flow or dual mode cool
AV 172	Run Hours Mode 1 CH2	Total run hours for thermal energy or flow on Chan 2
AV 173	Run Hours Mode 2 CH2	Total run hours for thermal energy or flow on Chan 2 - rev flow or dual mode cool
AV 174	Run Hours Mode 1 CH3	Total run hours for thermal energy or flow on Chan 3
AV 175	Run Hours Mode 2 CH3	Total run hours for thermal energy or flow on Chan 3 - rev flow or dual mode cool
AV 176	Run Hours Mode 1 CH4	Total run hours for thermal energy or flow on Chan 4
AV 177	Run Hours Mode 2 CH4	Total run hours for thermal energy or flow on Chan 4 - rev flow or dual mode cool

BINARY INPUT object list:		Comments
BI 0	Mode Indication CH1	0 = mode 1 or fwd flow, 1 = mode 2 or rev flow , heat
BI 1	Mode Indication CH2	0 = mode 1 or fwd flow, 1 = mode 2 or rev flow, heat
BI 2	Mode Indication CH3	0 = mode 1 or fwd flow, 1 = mode 2 or rev flow, heat
BI 3	Mode Indication CH4	0 = mode 1 or fwd flow, 1 = mode 2 or rev flow, heat
BI 4	Aux input 1 status (if configured for alarm)	0 = clear, 1 = active
BI 5	Aux input 2 status (if configured for alarm)	0 = clear, 1 = active
BI 6	Aux input 3 status (if configured for alarm)	0 = clear, 1 = active
BI 7	Aux input 4 status (if configured for alarm)	0 = clear, 1 = active

BINARY OUTPUT object list:		Comments
BO 0	Aux Digital Out 1 - Network Relay	0= Open, 1 = Close Relay
BO 1	Aux Digital Out 2 - Network Relay	0= Open, 1 = Close Relay
BO 2	Aux Digital Out 3 - Network Relay	0= Open, 1 = Close Relay
BO 3	Aux Digital Out 4 - Network Relay	0= Open, 1 = Close Relay
BO 4	Aux Digital Out 5 - Network Relay	0= Open, 1 = Close Relay
BO 5	Aux Digital Out 6 - Network Relay	0= Open, 1 = Close Relay
BO 6	Aux Digital Out 7 - Network Relay	0= Open, 1 = Close Relay
BO 7	Aux Digital Out 8 - Network Relay	0= Open, 1 = Close Relay

BIT STRING Value List		Comments
BSV0	System Faults	16-bit
Bit 0	Error	0 = clear, 1 = active
Bit 1	Alarm	0 = clear, 1 = active
Bit 2	CH1	0 = clear, 1 = active
Bit 3	CH2	0 = clear, 1 = active
Bit 4	CH3	0 = clear, 1 = active
Bit 5	CH4	0 = clear, 1 = active
Bit 6	EEPROM	0 = clear, 1 = active
Bit 7	RTC	0 = clear, 1 = active
Bit 8	SDCard	0 = clear, 1 = active
Bit 9	AnalogOut	0 = clear, 1 = active
Bit 10	DigitalOut	0 = clear, 1 = active
Bit 11	GrandTotal	0 = clear, 1 = active
Bit 12	YearTotal	0 = clear, 1 = active
Bit 13	PerTotal	0 = clear, 1 = active
Bit 14	SPIorI2C	0 = clear, 1 = active
Bit 15		

MULTI STATE Value List		Comments
MSV0	Errors	
1	Normal	
2	EEPROM	
3	RTC	
4	SDCard	
5	AnalogOut	
6	DigitalOut	
7	GrandTotal	
8	YearTotal	
9	PerTotal	
10	SPIorI2C	

4.7 MODBUS IMPLEMENTATION

The ONICON System-1000 (FW ver2.2.23 or later) can be configured for MODBUS communications to report device data to the building automation systems.

4.7.1 MODBUS Register Types and Data Forms

All data is formatted MSB --> LSB (Big Endian).

Function Codes Supported:

Function Code	Description
02	Read Discrete Inputs
04	Read Input Register
05	Write Single Coil
43	Read Device Indentifcation

User-configurable measurement resolution "Value Size"

Many of the Input Registers are available in 64-bit representation by default. For compatibility with software which may not be able to decode 64-bit floating point or integer values, there is a toggle on the MODBUS network configuration screens to convert all of these to 32-bit instead. The starting address of the data remains the same, but the data itself will only take up half of the length when configured as 32-bit.

4.7.2 MODBUS register groups

The following list of points in separated into categories as listed below.

- INPUT REGISTERS - Instantaneous rates and totals for the primary functions of the System-1000. These are all sorted by Channel number, then by pulse input number, followed by run hours.
- BIT FIELDS - 16 bit byte groups that are used for two pursposes. Warnings / Alarms / Errors - these fields activate based on the state of the System-1000. Units - these fields can be used to set the type of units that the BMS wants the System-1000 to deliver the value in.
- DESCRETE INPUTS - These are the mode indicators for Mode 1 / Mode 2 for each channel.
- COIL - Two functions are covered in this section. Total resets - For flow / energy totals and pulse totalizers. Network Coils - These are network controlled digital "relays".

4.8 MODBUS REGISTERS

INPUT REGISTERS - Channel 1					
Register #	**Length**	**Register type**	**Data Type**	**Description**	**Comments**
30001	4	Input Register	FLOAT64*	Energy rate CH1	
30005	4	Input Register	FLOAT64*	Flow rate CH1	
30009	4	Input Register	FLOAT64*	Flow Rate Primary Only CH1	
30013	4	Input Register	FLOAT64*	Supply temperature CH1	
30017	4	Input Register	FLOAT64*	Return temperature CH1	
30021	4	Input Register	FLOAT64*	Delta temperature CH1	
30025	4	Input Register	FLOAT64*	Aux Rate Input CH1	
30029	4	Input Register	FLOAT64*	Efficiency COP CH1	
30033	4	Input Register	UINT64*	Energy Total Mode 1 CH1	
30037	4	Input Register	UINT64*	Energy Total Mode 2 CH1	
30041	4	Input Register	UINT64*	YTD Energy Total Mode 1 CH1	
30045	4	Input Register	UINT64*	YTD Energy Total Mode 2 CH1	
30049	4	Input Register	UINT64*	Prev Year Energy Total Mode 1 CH1	
30053	4	Input Register	UINT64*	Prev Year Energy Total Mode 2 CH1	
30057	4	Input Register	UINT64*	Prev 30 Day Energy Total Mode 1 CH1	
30061	4	Input Register	UINT64*	Prev 30 Day Energy Total Mode 2 CH1	
30065	4	Input Register	UINT64*	Prev 24 Hour Energy Total Mode 1 CH1	
30069	4	Input Register	UINT64*	Prev 24 Hour Energy Total Mode 2 CH1	
30073	4	Input Register	UINT64*	User Defined Energy Total Mode 1 CH1	
30077	4	Input Register	UINT64*	User Defined Energy Total Mode 2 CH1	
30081	4	Input Register	UINT64*	Volume Total Mode 1 CH1	
30085	4	Input Register	UINT64*	Volume Total Mode 2 CH1	
30089	4	Input Register	UINT64*	YTD Volume Total Mode 1 CH1	
30093	4	Input Register	UINT64*	YTD Volume Total Mode 2 CH1	
30097	4	Input Register	UINT64*	Prev Year Volume Total Mode 1 CH1	
30101	4	Input Register	UINT64*	Prev Year Volume Total Mode 2 CH1	
30105	4	Input Register	UINT64*	Prev 30 Day Volume Total Mode 1 CH1	
30109	4	Input Register	UINT64*	Prev 30 Day Volume Total Mode 2 CH1	
30113	4	Input Register	UINT64*	Prev 24 Hour Volume Total Mode 1 CH1	
30117	4	Input Register	UINT64*	Prev 24 Hour Volume Total Mode 2 CH1	
30121	4	Input Register	UINT64*	User Defined Volume Total Mode 1 CH1	
30125	4	Input Register	UINT64*	User Defined Volume Total Mode 2 CH1	
30129	4	Input Register	UINT64*	Aux Rate In Total CH1	
30133	4	Input Register	UINT64*	YTD Aux Rate In Total CH1	
30137	4	Input Register	UINT64*	PrevYr Aux Rate In Total CH1	
30141	4	Input Register	UINT64*	Prev 30D Aux Rate In Total CH1	
30145	4	Input Register	UINT64*	Prev 24H Aux Rate In Total CH1	
30149	4	Input Register	UINT64*	User Defined Aux Rate In Total CH1	
30153	4	Input Register	UINT64*	Primary Only Volume Total Mode 1 CH1	
30157	4	Input Register	UINT64*	YTD Prim Only Volume Total Mode 1 CH1	
30161	4	Input Register	UINT64*	Prev Year Prim Only Volume Total Mode 1 CH1	
30165	4	Input Register	UINT64*	Prev 30 Day Prim Only Volume Total Mode 1 CH1	
30169	4	Input Register	UINT64*	Prev 24 Hour Prim Only Volume Total Mode 1 CH1	
30173	4	Input Register	UINT64*	User Prim Only Volume Total Mode 1 CH1	

INPUT REGISTERS - Channel 2					
Register #	Length	Register type	Data Type	Description	Comments
30301	4	Input Register	FLOAT64*	Energy rate CH2	
30305	4	Input Register	FLOAT64*	Flow rate CH2	
30309	4	Input Register	FLOAT64*	Flow Rate Primary Only CH2	
30313	4	Input Register	FLOAT64*	Supply temperature CH2	
30317	4	Input Register	FLOAT64*	Return temperature CH2	
30321	4	Input Register	FLOAT64*	Delta temperature CH2	
30325	4	Input Register	FLOAT64*	Aux Rate Input CH2	
30329	4	Input Register	FLOAT64*	Efficiency COP CH2	
30333	4	Input Register	UINT64*	Energy Total Mode 1 CH2	
30337	4	Input Register	UINT64*	Energy Total Mode 2 CH2	
30341	4	Input Register	UINT64*	YTD Energy Total Mode 1 CH2	
30345	4	Input Register	UINT64*	YTD Energy Total Mode 2 CH2	
30349	4	Input Register	UINT64*	Prev Year Energy Total Mode 1 CH2	
30353	4	Input Register	UINT64*	Prev Year Energy Total Mode 2 CH2	
30357	4	Input Register	UINT64*	Prev 30 Day Energy Total Mode 1 CH2	
30361	4	Input Register	UINT64*	Prev 30 Day Energy Total Mode 2 CH2	
30365	4	Input Register	UINT64*	Prev 24 Hour Energy Total Mode 1 CH2	
30369	4	Input Register	UINT64*	Prev 24 Hour Energy Total Mode 2 CH2	
30373	4	Input Register	UINT64*	User Defined Energy Total Mode 1 CH2	
30377	4	Input Register	UINT64*	User Defined Energy Total Mode 2 CH2	
30381	4	Input Register	UINT64*	Volume Total Mode 1 CH2	
30385	4	Input Register	UINT64*	Volume Total Mode 2 CH2	
30389	4	Input Register	UINT64*	YTD Volume Total Mode 1 CH2	
30393	4	Input Register	UINT64*	YTD Volume Total Mode 2 CH2	
30397	4	Input Register	UINT64*	Prev Year Volume Total Mode 1 CH2	
30401	4	Input Register	UINT64*	Prev Year Volume Total Mode 2 CH2	
30405	4	Input Register	UINT64*	Prev 30 Day Volume Total Mode 1 CH2	
30409	4	Input Register	UINT64*	Prev 30 Day Volume Total Mode 2 CH2	
30413	4	Input Register	UINT64*	Prev 24 Hour Volume Total Mode 1 CH2	
30417	4	Input Register	UINT64*	Prev 24 Hour Volume Total Mode 2 CH2	
30421	4	Input Register	UINT64*	User Defined Volume Total Mode 1 CH2	
30425	4	Input Register	UINT64*	User Defined Volume Total Mode 2 CH2	
30429	4	Input Register	UINT64*	Aux Rate In Total CH2	
30433	4	Input Register	UINT64*	YTD Aux Rate In Total CH2	
30437	4	Input Register	UINT64*	PrevYr Aux Rate In Total CH2	
30441	4	Input Register	UINT64*	Prev 30D Aux Rate In Total CH2	
30445	4	Input Register	UINT64*	Prev 24H Aux Rate In Total CH2	
30449	4	Input Register	UINT64*	User Defined Aux Rate In Total CH2	
30453	4	Input Register	UINT64*	Primary Only Volume Total Mode 1 CH2	
30457	4	Input Register	UINT64*	YTD Prim Only Volume Total Mode 1 CH2	
30461	4	Input Register	UINT64*	Prev Year Prim Only Volume Total Mode 1 CH2	
30465	4	Input Register	UINT64*	Prev 30 Day Prim Only Volume Total Mode 1 CH2	
30469	4	Input Register	UINT64*	Prev 24 Hour Prim Only Volume Total Mode 1 CH2	
30473	4	Input Register	UINT64*	User Prim Only Volume Total Mode 1 CH2	

INPUT REGISTERS - Channel 3					
Register #	Length	Register type	Data Type	Description	Comments
30601	4	Input Register	FLOAT64*	Energy rate CH3	
30605	4	Input Register	FLOAT64*	Flow rate CH3	
30609	4	Input Register	FLOAT64*	Flow Rate Primary Only CH3	
30613	4	Input Register	FLOAT64*	Supply temperature CH3	
30617	4	Input Register	FLOAT64*	Return temperature CH3	
30621	4	Input Register	FLOAT64*	Delta temperature CH3	
30625	4	Input Register	FLOAT64*	Aux Rate Input CH3	
30629	4	Input Register	FLOAT64*	Efficiency COP CH3	
30633	4	Input Register	UINT64*	Energy Total Mode 1 CH3	
30637	4	Input Register	UINT64*	Energy Total Mode 2 CH3	
30641	4	Input Register	UINT64*	YTD Energy Total Mode 1 CH3	
30645	4	Input Register	UINT64*	YTD Energy Total Mode 2 CH3	
30649	4	Input Register	UINT64*	Prev Year Energy Total Mode 1 CH3	
30653	4	Input Register	UINT64*	Prev Year Energy Total Mode 2 CH3	
30657	4	Input Register	UINT64*	Prev 30 Day Energy Total Mode 1 CH3	
30661	4	Input Register	UINT64*	Prev 30 Day Energy Total Mode 2 CH3	
30665	4	Input Register	UINT64*	Prev 24 Hour Energy Total Mode 1 CH3	
30669	4	Input Register	UINT64*	Prev 24 Hour Energy Total Mode 2 CH3	
30673	4	Input Register	UINT64*	User Defined Energy Total Mode 1 CH3	
30677	4	Input Register	UINT64*	User Defined Energy Total Mode 2 CH3	
30681	4	Input Register	UINT64*	Volume Total Mode 1 CH3	
30685	4	Input Register	UINT64*	Volume Total Mode 2 CH3	
30689	4	Input Register	UINT64*	YTD Volume Total Mode 1 CH3	
30693	4	Input Register	UINT64*	YTD Volume Total Mode 2 CH3	
30697	4	Input Register	UINT64*	Prev Year Volume Total Mode 1 CH3	
30701	4	Input Register	UINT64*	Prev Year Volume Total Mode 2 CH3	
30705	4	Input Register	UINT64*	Prev 30 Day Volume Total Mode 1 CH3	
30709	4	Input Register	UINT64*	Prev 30 Day Volume Total Mode 2 CH3	
30713	4	Input Register	UINT64*	Prev 24 Hour Volume Total Mode 1 CH3	
30717	4	Input Register	UINT64*	Prev 24 Hour Volume Total Mode 2 CH3	
30721	4	Input Register	UINT64*	User Defined Volume Total Mode 1 CH3	
30725	4	Input Register	UINT64*	User Defined Volume Total Mode 2 CH3	
30729	4	Input Register	UINT64*	Aux Rate In Total CH3	
30733	4	Input Register	UINT64*	YTD Aux Rate In Total CH3	
30737	4	Input Register	UINT64*	PrevYr Aux Rate In Total CH3	
30741	4	Input Register	UINT64*	Prev 30D Aux Rate In Total CH3	
30745	4	Input Register	UINT64*	Prev 24H Aux Rate In Total CH3	
30749	4	Input Register	UINT64*	User Defined Aux Rate In Total CH3	
30753	4	Input Register	UINT64*	Primary Only Volume Total Mode 1 CH3	
30757	4	Input Register	UINT64*	YTD Prim Only Volume Total Mode 1 CH3	
30761	4	Input Register	UINT64*	Prev Year Prim Only Volume Total Mode 1 CH3	
30765	4	Input Register	UINT64*	Prev 30 Day Prim Only Volume Total Mode 1 CH3	
30769	4	Input Register	UINT64*	Prev 24 Hour Prim Only Volume Total Mode 1 CH3	
30773	4	Input Register	UINT64*	User Prim Only Volume Total Mode 1 CH3	

INPUT REGISTERS - Channel 4					
Register #	Length	Register type	Data Type	Description	Comments
30901	4	Input Register	FLOAT64*	Energy rate CH4	
30905	4	Input Register	FLOAT64*	Flow rate CH4	
30909	4	Input Register	FLOAT64*	Flow Rate Primary Only CH4	
30913	4	Input Register	FLOAT64*	Supply temperature CH4	
30917	4	Input Register	FLOAT64*	Return temperature CH4	
30921	4	Input Register	FLOAT64*	Delta temperature CH4	
30925	4	Input Register	FLOAT64*	Aux Rate Input CH4	
30929	4	Input Register	FLOAT64*	Efficiency COP CH4	
30933	4	Input Register	UINT64*	Energy Total Mode 1 CH4	
30937	4	Input Register	UINT64*	Energy Total Mode 2 CH4	
30941	4	Input Register	UINT64*	YTD Energy Total Mode 1 CH4	
30945	4	Input Register	UINT64*	YTD Energy Total Mode 2 CH4	
30949	4	Input Register	UINT64*	Prev Year Energy Total Mode 1 CH4	
30953	4	Input Register	UINT64*	Prev Year Energy Total Mode 2 CH4	
30957	4	Input Register	UINT64*	Prev 30 Day Energy Total Mode 1 CH4	
30961	4	Input Register	UINT64*	Prev 30 Day Energy Total Mode 2 CH4	
30965	4	Input Register	UINT64*	Prev 24 Hour Energy Total Mode 1 CH4	
30969	4	Input Register	UINT64*	Prev 24 Hour Energy Total Mode 2 CH4	
30973	4	Input Register	UINT64*	User Defined Energy Total Mode 1 CH4	
30977	4	Input Register	UINT64*	User Defined Energy Total Mode 2 CH4	
30981	4	Input Register	UINT64*	Volume Total Mode 1 CH4	
30985	4	Input Register	UINT64*	Volume Total Mode 2 CH4	
30989	4	Input Register	UINT64*	YTD Volume Total Mode 1 CH4	
30993	4	Input Register	UINT64*	YTD Volume Total Mode 2 CH4	
30997	4	Input Register	UINT64*	Prev Year Volume Total Mode 1 CH4	
31001	4	Input Register	UINT64*	Prev Year Volume Total Mode 2 CH4	
31005	4	Input Register	UINT64*	Prev 30 Day Volume Total Mode 1 CH4	
31009	4	Input Register	UINT64*	Prev 30 Day Volume Total Mode 2 CH4	
31013	4	Input Register	UINT64*	Prev 24 Hour Volume Total Mode 1 CH4	
31017	4	Input Register	UINT64*	Prev 24 Hour Volume Total Mode 2 CH4	
31021	4	Input Register	UINT64*	User Defined Volume Total Mode 1 CH4	
31025	4	Input Register	UINT64*	User Defined Volume Total Mode 2 CH4	
31029	4	Input Register	UINT64*	Aux Rate In Total CH4	
31033	4	Input Register	UINT64*	YTD Aux Rate In Total CH4	
31037	4	Input Register	UINT64*	PrevYr Aux Rate In Total CH4	
31041	4	Input Register	UINT64*	Prev 30D Aux Rate In Total CH4	
31045	4	Input Register	UINT64*	Prev 24H Aux Rate In Total CH4	
31049	4	Input Register	UINT64*	User Defined Aux Rate In Total CH4	
31053	4	Input Register	UINT64*	Primary Only Volume Total Mode 1 CH4	
31057	4	Input Register	UINT64*	YTD Prim Only Volume Total Mode 1 CH4	
31061	4	Input Register	UINT64*	Prev Year Prim Only Volume Total Mode 1 CH4	
31065	4	Input Register	UINT64*	Prev 30 Day Prim Only Volume Total Mode 1 CH4	
31069	4	Input Register	UINT64*	Prev 24 Hour Prim Only Volume Total Mode 1 CH4	
31073	4	Input Register	UINT64*	User Prim Only Volume Total Mode 1 CH4	

INPUT REGISTERS - Pulse Inputs & Run Hours					
Register #	**Length**	**Register type**	**Data Type**	**Description**	**Comments**
31201	4	Input Register	UINT64*	Total - Aux Pulse In 1	
31205	4	Input Register	UINT64*	YTD Total - Aux Pulse In 1	
31209	4	Input Register	UINT64*	Prev Year Total - Aux Pulse In 1	
31213	4	Input Register	UINT64*	Prev 30 Day Total - Aux Pulse In 1	
31217	4	Input Register	UINT64*	Prev 24 Hour Total - Aux Pulse In 1	
31221	4	Input Register	UINT64*	User Defined Total - Aux Pulse In 1	
31225	4	Input Register	UINT64*	Total - Aux Pulse In 2	
31229	4	Input Register	UINT64*	YTD Total - Aux Pulse In 2	
31233	4	Input Register	UINT64*	Prev Year Total - Aux Pulse In 2	
31237	4	Input Register	UINT64*	Prev 30 Day Total - Aux Pulse In 2	
31241	4	Input Register	UINT64*	Prev 24 Hour Total - Aux Pulse In 2	
31245	4	Input Register	UINT64*	User Defined Total - Aux Pulse In 2	
31249	4	Input Register	UINT64*	Total - Aux Pulse In 3	
31253	4	Input Register	UINT64*	YTD Total - Aux Pulse In 3	
31257	4	Input Register	UINT64*	Prev Year Total - Aux Pulse In 3	
31261	4	Input Register	UINT64*	Prev 30 Day Total - Aux Pulse In 3	
31265	4	Input Register	UINT64*	Prev 24 Hour Total - Aux Pulse In 3	
31269	4	Input Register	UINT64*	User Defined Total - Aux Pulse In 3	
31273	4	Input Register	UINT64*	Total - Aux Pulse In 4	
31277	4	Input Register	UINT64*	YTD Total - Aux Pulse In 4	
31281	4	Input Register	UINT64*	Prev Year Total - Aux Pulse In 4	
31285	4	Input Register	UINT64*	Prev 30 Day Total - Aux Pulse In 4	
31289	4	Input Register	UINT64*	Prev 24 Hour Total - Aux Pulse In 4	
31293	4	Input Register	UINT64*	User Defined Total - Aux Pulse In 4	
31401	4	Input Register	UINT64*	Run Hours	
31405	4	Input Register	UINT64*	Run Hours Mode 1 CH1	
31409	4	Input Register	UINT64*	Run Hours Mode 2 CH1	
31413	4	Input Register	UINT64*	Run Hours Mode 1 CH2	
31417	4	Input Register	UINT64*	Run Hours Mode 2 CH2	
31421	4	Input Register	UINT64*	Run Hours Mode 1 CH3	
31425	4	Input Register	UINT64*	Run Hours Mode 2 CH3	
31429	4	Input Register	UINT64*	Run Hours Mode 1 CH4	
31433	4	Input Register	UINT64*	Run Hours Mode 2 CH4	

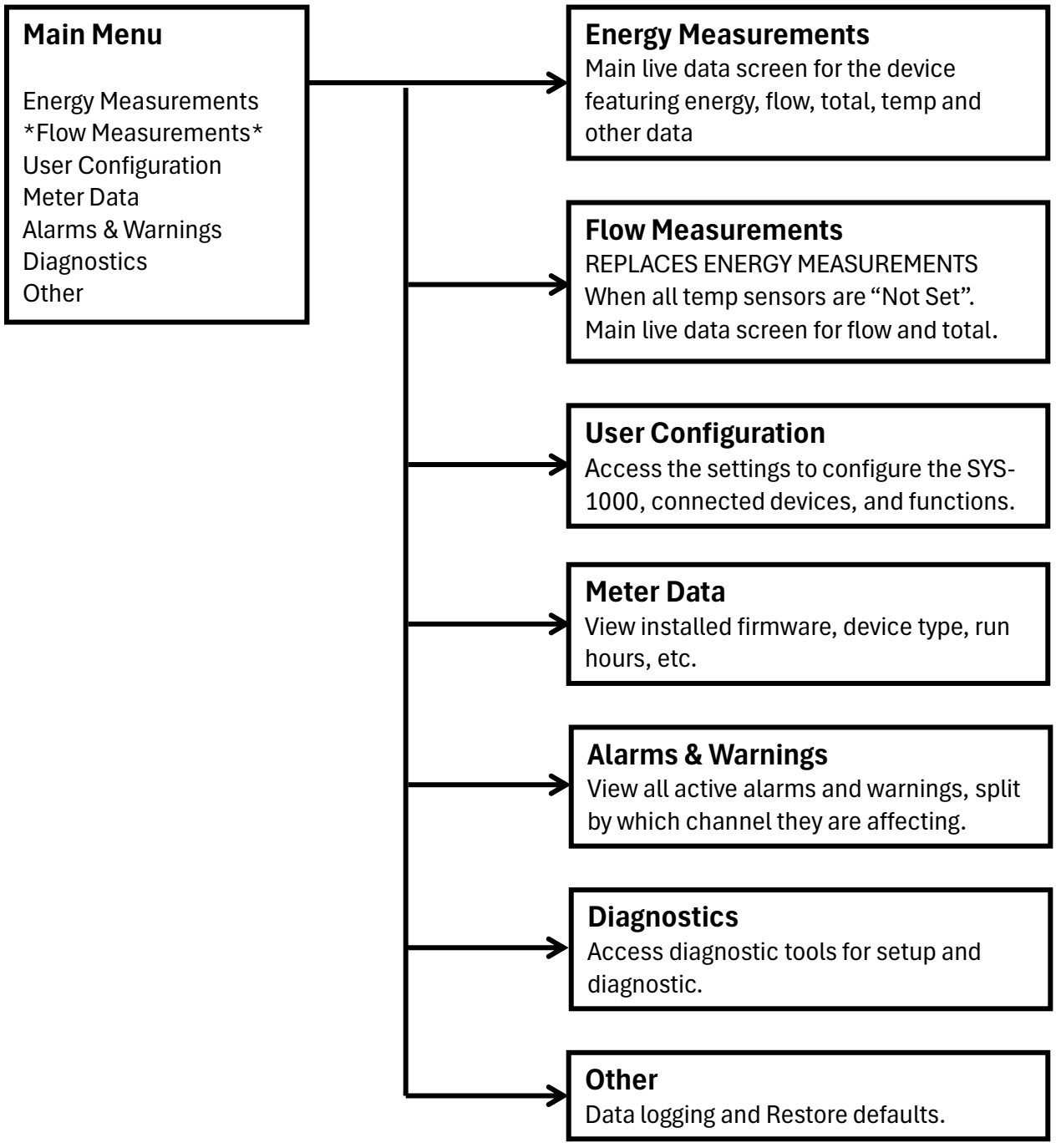
BIT FIELDS - Read/Write					
Register #	**Length**	**Register type**	**Data Type**	**Description**	**Comments**
31501	1	16 Bit Bytes		Channel 1 & 2 Alarms	See Bit #'s below
		Bit 15		Delta T > Maximum CH1	0 = Clear, 1 = Active
		Bit 14		Delta T < Minimum CH1	0 = Clear, 1 = Active
		Bit 13		High Return Temperature CH1	0 = Clear, 1 = Active
		Bit 12		Low Return Temperature CH1	0 = Clear, 1 = Active
		Bit 11		High Supply Temperature CH1	0 = Clear, 1 = Active
		Bit 10		Low Supply Temperature CH1	0 = Clear, 1 = Active
		Bit 9		Invalid Configuration CH1	0 = Clear, 1 = Active
		Bit 8		Aux input 1 status (if configure for alarm)	0 = Clear, 1 = Active
		Bit 7		Delta T > Maximum CH2	0 = Clear, 1 = Active
		Bit 6		Delta T < Minimum CH2	0 = Clear, 1 = Active
		Bit 5		High Return Temperature CH2	0 = Clear, 1 = Active
		Bit 4		Low Return Temperature CH2	0 = Clear, 1 = Active
		Bit 3		High Supply Temperature CH2	0 = Clear, 1 = Active
		Bit 2		Low Supply Temperature CH2	0 = Clear, 1 = Active
		Bit 1		Invalid Configuration CH2	0 = Clear, 1 = Active
		Bit 0		Aux input 2 status (if configure for alarm)	0 = Clear, 1 = Active
31502	1	16 Bit Bytes		Channel 3 & 4 Alarms	See Bit #'s below
		Bit 15		Delta T > Maximum CH3	0 = Clear, 1 = Active
		Bit 14		Delta T < Minimum CH3	0 = Clear, 1 = Active
		Bit 13		High Return Temperature CH3	0 = Clear, 1 = Active
		Bit 12		Low Return Temperature CH3	0 = Clear, 1 = Active
		Bit 11		High Supply Temperature CH3	0 = Clear, 1 = Active
		Bit 10		Low Supply Temperature CH3	0 = Clear, 1 = Active
		Bit 9		Invalid Configuration CH3	0 = Clear, 1 = Active
		Bit 8		Aux input 3 status (if configure for alarm)	0 = Clear, 1 = Active
		Bit 7		Delta T > Maximum CH4	0 = Clear, 1 = Active
		Bit 6		Delta T < Minimum CH4	0 = Clear, 1 = Active
		Bit 5		High Return Temperature CH4	0 = Clear, 1 = Active
		Bit 4		Low Return Temperature CH4	0 = Clear, 1 = Active
		Bit 3		High Supply Temperature CH4	0 = Clear, 1 = Active
		Bit 2		Low Supply Temperature CH4	0 = Clear, 1 = Active
		Bit 1		Invalid Configuration CH4	0 = Clear, 1 = Active
		Bit 0		Aux input 4 status (if configure for alarm)	0 = Clear, 1 = Active
31503	1	16 Bit Bytes		System Common Alarms	See Bit #'s below
		Bit 15		System Warning	0 = Clear, 1 = Active
		Bit 14		System Alarm	0 = Clear, 1 = Active
		Bit 13		System Error	0 = Clear, 1 = Active
		Bit 12		TBD	
		Bit 11		TBD	
		Bit 10		TBD	
		Bit 9		TBD	
		Bit 8		TBD	
		Bit 7		TBD	
		Bit 6		TBD	
		Bit 5		TBD	
		Bit 4		TBD	
		Bit 3		TBD	
		Bit 2		TBD	
		Bit 1		TBD	
		Bit 0		TBD	

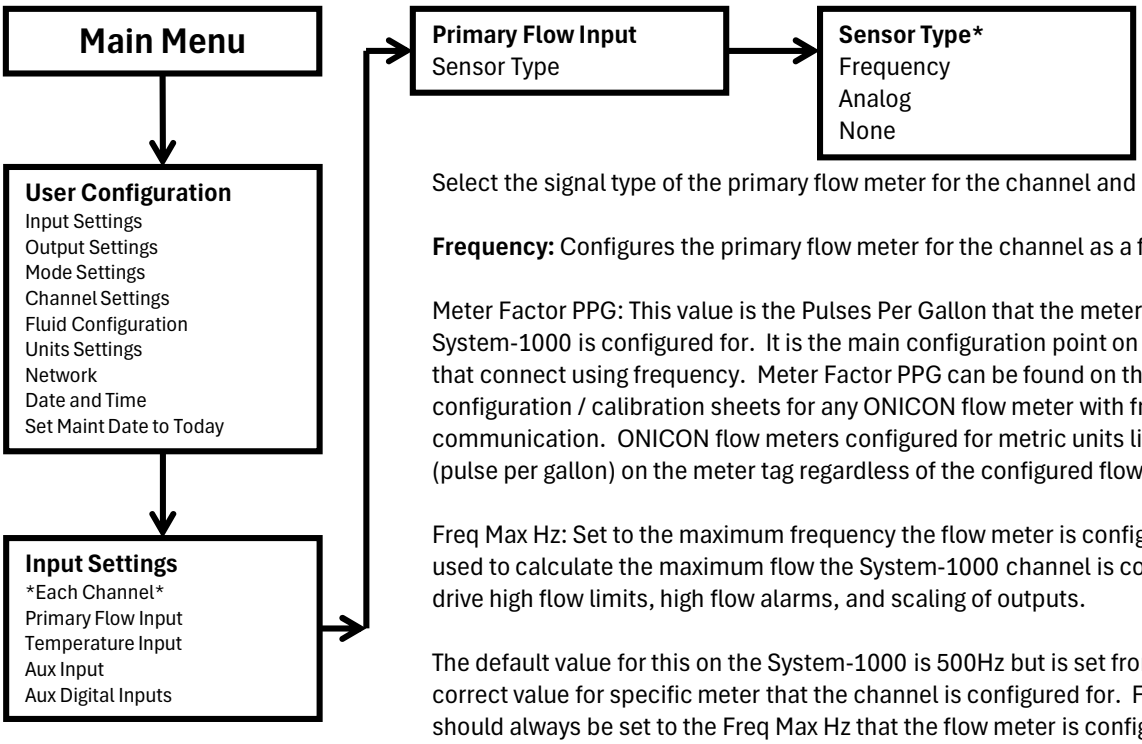
BIT FIELDS - Read/Write					
Register #	Length	Register type	Data Type	Description	Comments
31504	1	16 Bit Bytes		Units (Fluid Flow, Liquid Volume, Temperature)	See Bit #'s below
		Bit 15		Fluid Flow = GPM	0 = Clear, 1 = Active
		Bit 14		Fluid Flow = GPH	0 = Clear, 1 = Active
		Bit 13		Fluid Flow = MGD	0 = Clear, 1 = Active
		Bit 12		Fluid Flow = L/S	0 = Clear, 1 = Active
		Bit 11		Fluid Flow = L/M	0 = Clear, 1 = Active
		Bit 10		Fluid Flow = L/H	0 = Clear, 1 = Active
		Bit 9		Fluid Flow = M3H	0 = Clear, 1 = Active
		Bit 8		Fluid Flow = CFH	0 = Clear, 1 = Active
		Bit 7		Fluid Flow = CFM	0 = Clear, 1 = Active
		Bit 6		Liquid Volume = GAL	0 = Clear, 1 = Active
		Bit 5		Liquid Volume = LITER	0 = Clear, 1 = Active
		Bit 4		Liquid Volume = MTR3	0 = Clear, 1 = Active
		Bit 3		Liquid Volume = FT3	0 = Clear, 1 = Active
		Bit 2		Temperature = F	0 = Clear, 1 = Active
		Bit 1		Temperature = C	0 = Clear, 1 = Active
		Bit 0		TBD	
31505	1	16 Bit Bytes		Units (Energy Rate & Ttl, Air Flow & Ttl, Mass Ttl)	See Bit #'s below
		Bit 15		Energy Rate = BTU/H	0 = Clear, 1 = Active
		Bit 14		Energy Rate = KBTU/H	0 = Clear, 1 = Active
		Bit 13		Energy Rate = TON	0 = Clear, 1 = Active
		Bit 12		Energy Rate = KW	0 = Clear, 1 = Active
		Bit 11		Energy Total = BTU	0 = Clear, 1 = Active
		Bit 10		Energy Total = KBTU	0 = Clear, 1 = Active
		Bit 9		Energy Total = TONHR	0 = Clear, 1 = Active
		Bit 8		Energy Total = KWH	0 = Clear, 1 = Active
		Bit 7		Air Flow = CFM	0 = Clear, 1 = Active
		Bit 6		Air Flow = CFH	0 = Clear, 1 = Active
		Bit 5		Air Flow = CMM	0 = Clear, 1 = Active
		Bit 4		Air Flow = CMH	0 = Clear, 1 = Active
		Bit 3		Air Volume = CF	0 = Clear, 1 = Active
		Bit 2		Air Volume = CM	0 = Clear, 1 = Active
		Bit 1		TBD	
		Bit 0		TBD	
31506	1	16 Bit Bytes		Units (Gas Flow & Ttl, Press, Mass Flow, Power)	See Bit #'s below
		Bit 15		Gas Flow = CFM	0 = Clear, 1 = Active
		Bit 14		Gas Flow = CFH	0 = Clear, 1 = Active
		Bit 13		Gas Flow = CMM	0 = Clear, 1 = Active
		Bit 12		Gas Flow = CMH	0 = Clear, 1 = Active
		Bit 11		Gas Volume = CF	0 = Clear, 1 = Active
		Bit 10		Gas Volume = CM	0 = Clear, 1 = Active
		Bit 9		Pressure = PSI	0 = Clear, 1 = Active
		Bit 8		Pressure = KPA	0 = Clear, 1 = Active
		Bit 7		Pressure = ATM	0 = Clear, 1 = Active
		Bit 6		Pressure = BAR	0 = Clear, 1 = Active
		Bit 5		Mass Flow = PPH	0 = Clear, 1 = Active
		Bit 4		Mass Flow = KPH	0 = Clear, 1 = Active
		Bit 3		Mass Total = LB	0 = Clear, 1 = Active
		Bit 2		Mass Total = KG	0 = Clear, 1 = Active
		Bit 1		Power Rate = KW	0 = Clear, 1 = Active
		Bit 0		Power Total = KWH	0 = Clear, 1 = Active

Discrete Input					
Register #	**Length**	**Register type**	**Data Type**	**Description**	**Comments**
10001	1	Discrete Input	Binary (1-bit)	Mode indication CH1	0 = mode 1 (heat) or fwd flow, 1 = mode 2 (cool) or rev flow
10002	1	Discrete Input	Binary (1-bit)	Mode indication CH2	0 = mode 1 (heat) or fwd flow, 1 = mode 2 (cool) or rev flow
10003	1	Discrete Input	Binary (1-bit)	Mode indication CH3	0 = mode 1 (heat) or fwd flow, 1 = mode 2 (cool) or rev flow
10004	1	Discrete Input	Binary (1-bit)	Mode indication CH4	0 = mode 1 (heat) or fwd flow, 1 = mode 2 (cool) or rev flow

COIL - Read/Write					
Register #	**Length**	**Register type**	**Data Type**	**Description**	**Comments**
1	1	COIL - Read/Write	Binary (1-bit)	User Defined Energy Total M1 Reset CH1	1 = reset total
2	1	COIL - Read/Write	Binary (1-bit)	User Defined Energy Total M2 Reset CH1	1 = reset total
3	1	COIL - Read/Write	Binary (1-bit)	User Defined Volume Total M1 Reset CH1	1 = reset total
4	1	COIL - Read/Write	Binary (1-bit)	User Defined Volume Total M2 Reset CH1	1 = reset total
5	1	COIL - Read/Write	Binary (1-bit)	User Prim Only Volume Total M1 Reset CH1	1 = reset total
6	1	COIL - Read/Write	Binary (1-bit)	User Defined Aux Rate In Total Reset CH1	1 = reset total
7	1	COIL - Read/Write	Binary (1-bit)	User Defined Energy Total M1 Reset CH2	1 = reset total
8	1	COIL - Read/Write	Binary (1-bit)	User Defined Energy Total M2 Reset CH2	1 = reset total
9	1	COIL - Read/Write	Binary (1-bit)	User Defined Volume Total M1 Reset CH2	1 = reset total
10	1	COIL - Read/Write	Binary (1-bit)	User Defined Volume Total M2 Reset CH2	1 = reset total
11	1	COIL - Read/Write	Binary (1-bit)	User Prim Only Volume Total M1 Reset CH2	1 = reset total
12	1	COIL - Read/Write	Binary (1-bit)	User Defined Aux Rate In Total Reset CH2	1 = reset total
13	1	COIL - Read/Write	Binary (1-bit)	User Defined Energy Total M1 Reset CH3	1 = reset total
14	1	COIL - Read/Write	Binary (1-bit)	User Defined Energy Total M2 Reset CH3	1 = reset total
15	1	COIL - Read/Write	Binary (1-bit)	User Defined Volume Total M1 Reset CH3	1 = reset total
16	1	COIL - Read/Write	Binary (1-bit)	User Defined Volume Total M2 Reset CH3	1 = reset total
17	1	COIL - Read/Write	Binary (1-bit)	User Prim Only Volume Total M1 Reset CH3	1 = reset total
18	1	COIL - Read/Write	Binary (1-bit)	User Defined Aux Rate In Total Reset CH3	1 = reset total
19	1	COIL - Read/Write	Binary (1-bit)	User Defined Energy Total M1 Reset CH4	1 = reset total
20	1	COIL - Read/Write	Binary (1-bit)	User Defined Energy Total M2 Reset CH4	1 = reset total
21	1	COIL - Read/Write	Binary (1-bit)	User Defined Volume Total M1 Reset CH4	1 = reset total
22	1	COIL - Read/Write	Binary (1-bit)	User Defined Volume Total M2 Reset CH4	1 = reset total
23	1	COIL - Read/Write	Binary (1-bit)	User Prim Only Volume Total M1 Reset CH4	1 = reset total
24	1	COIL - Read/Write	Binary (1-bit)	User Defined Aux Rate In Total Reset CH4	1 = reset total
25	1	COIL - Read/Write	Binary (1-bit)	User Defined Total Reset - Aux Pulse In 1	1 = reset total
26	1	COIL - Read/Write	Binary (1-bit)	User Defined Total Reset - Aux Pulse In 2	1 = reset total
27	1	COIL - Read/Write	Binary (1-bit)	User Defined Total Reset - Aux Pulse In 3	1 = reset total
28	1	COIL - Read/Write	Binary (1-bit)	User Defined Total Reset - Aux Pulse In 4	1 = reset total
51	1	COIL - Read/Write	Binary (1-bit)	Aux Digital Out 1 - Network Relay	0 = Open, 1 = Close Relay
52	1	COIL - Read/Write	Binary (1-bit)	Aux Digital Out 2 - Network Relay	0 = Open, 1 = Close Relay
53	1	COIL - Read/Write	Binary (1-bit)	Aux Digital Out 3 - Network Relay	0 = Open, 1 = Close Relay
54	1	COIL - Read/Write	Binary (1-bit)	Aux Digital Out 4 - Network Relay	0 = Open, 1 = Close Relay
55	1	COIL - Read/Write	Binary (1-bit)	Aux Digital Out 5 - Network Relay	0 = Open, 1 = Close Relay
56	1	COIL - Read/Write	Binary (1-bit)	Aux Digital Out 6 - Network Relay	0 = Open, 1 = Close Relay
57	1	COIL - Read/Write	Binary (1-bit)	Aux Digital Out 7 - Network Relay	0 = Open, 1 = Close Relay
58	1	COIL - Read/Write	Binary (1-bit)	Aux Digital Out 8 - Network Relay	0 = Open, 1 = Close Relay

SECTION 5.0 MENU TREE





Select the signal type of the primary flow meter for the channel and configure the input.

Frequency: Configures the primary flow meter for the channel as a frequency signal meter.

Meter Factor PPG: This value is the Pulses Per Gallon that the meter connected to the System-1000 is configured for. It is the main configuration point on all ONICON flow meters that connect using frequency. Meter Factor PPG can be found on the meter tag and configuration / calibration sheets for any ONICON flow meter with frequency communication. ONICON flow meters configured for metric units list this value as PPG (pulse per gallon) on the meter tag regardless of the configured flow units (L/s, L/m, M3/h).

Freq Max Hz: Set to the maximum frequency the flow meter is configured for. This value is used to calculate the maximum flow the System-1000 channel is configured for and will drive high flow limits, high flow alarms, and scaling of outputs.

The default value for this on the System-1000 is 500Hz but is set from the factory to the correct value for specific meter that the channel is configured for. For best performance this should always be set to the Freq Max Hz that the flow meter is configured for. If changing meters in the field, or field configuring a blank channel, this value is not needed for accurate flow and energy values, but it is necessary for accurately setting the scale for the input. Setting this too low will result in high flow/energy alarms being triggered too early. Setting too high will generate limits that exceed the actual scale of the connected device. Maximum allowable by the System-1000 input is 1000Hz.

Input Units: Select the units that the flow meter is configured for. This value is only used for the calculating the Full Scale Flow value on this menu page and is for display / informational purposes only.

Full Scale Flow: This is a reference only display value that helps the end user understand and verify the maximum flow that the flow meter on the channel is configured for.

Analog: Configures the primary flow meter for the channel as an analog 4-20mA signal meter.

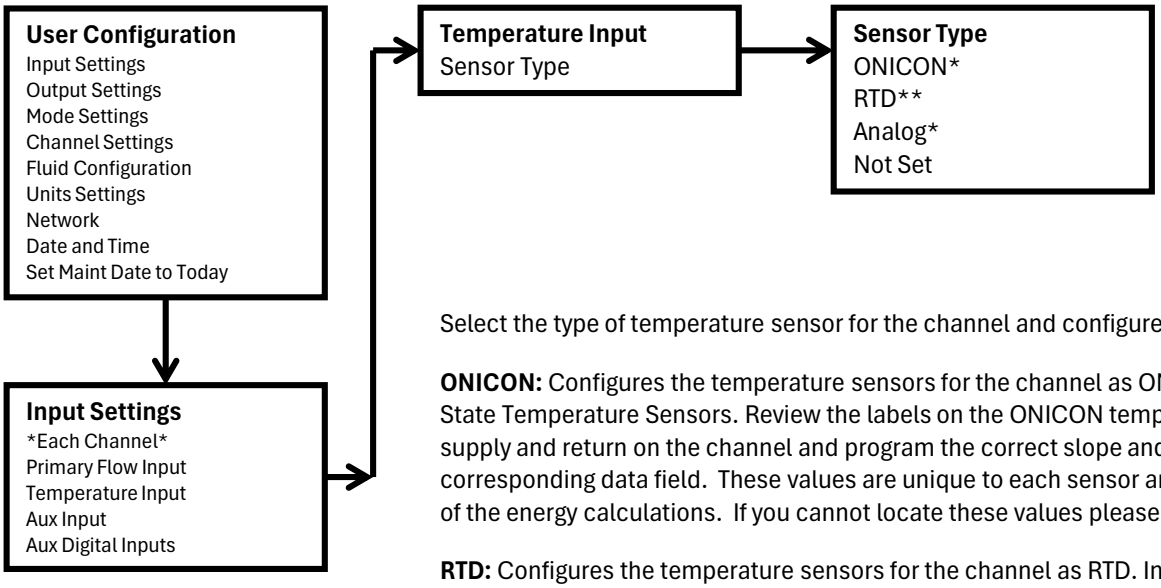
AnaIn at 4mA: Set to the minimum value for the analog out scale of the meter

AnaIn at 20mA: Set to the maximum value for the analog out scale of the meter

Input Units: Select the units that the flow meter is configured for

NOTE: Primary Flow Meter for every channel is required to be a fluid flow meter since this device is designed for hydronic and domestic water systems.

***NOTE:** In SYS-1400 models, each channel is restricted to 1 x Frequency and 1 x Analog flow meter. Changing the Sensor Type field in the primary meter will change the Sensor Type for the aux meter to the opposite type. When in 4 channel mode always verify the aux flow meter settings after adjusting the primary flow meter.



Select the type of temperature sensor for the channel and configure the input.

ONICON: Configures the temperature sensors for the channel as ONICON Precision Solid State Temperature Sensors. Review the labels on the ONICON temp sensors being used supply and return on the channel and program the correct slope and offset into the corresponding data field. These values are unique to each sensor and vital to the accuracy of the energy calculations. If you cannot locate these values please contact ONICON.

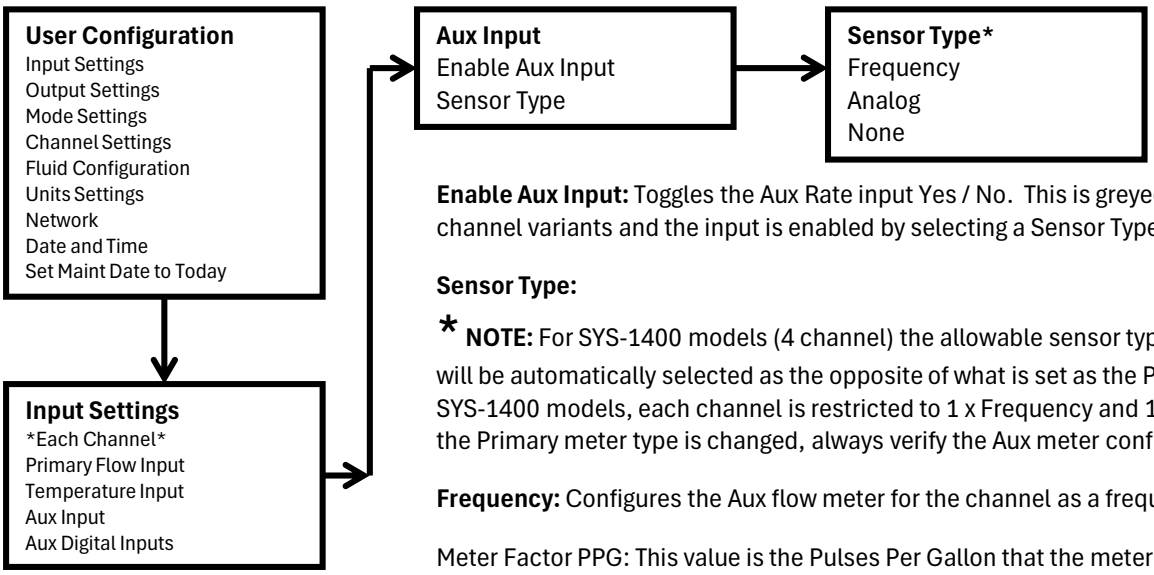
RTD: Configures the temperature sensors for the channel as RTD. Input is restricted to PT1000 RTD sensors. Matched pairs are recommended for maximum accuracy. 4-wire style is the default with 2-wire being selectable by moving the jumpers on the terminal board inside the unit.

Analog: Configures the temperature sensors for the channel as analog 4-20mA temp sensors. Enter the 4mA and 20mA values for the Supply and Return temp sensors for the channel.

Not Set: Configures the channel to be a flow only channel disabling any energy calculations. When the channel is configured as Not Set / Flow Only the display for the individual channel will not show any energy or temperature information. Warnings and Alarms for energy and temperature will also be disabled for the specific channel.

When **ALL** channels of the System-1000 have temperature sensors as Not Set the “Energy Measurements” selection in the main menu will change to “Flow Measurements”.

*** NOTE:** For SYS-1400 models (4 channel), ONICON and Analog temp sensors are only selectable on channels 1 & 2. RTD temp sensors are only selectable on channels 3 & 4. The menus for temp sensor selections are limited in 4 channel versions to reflect this limitation.



Enable Aux Input: Toggles the Aux Rate input Yes / No. This is greyed out as "Yes" in 1 and 2 channel variants and the input is enabled by selecting a Sensor Type.

Sensor Type:

* **NOTE:** For SYS-1400 models (4 channel) the allowable sensor type (Frequency / Analog) will be automatically selected as the opposite of what is set as the Primary Flow Meter. In SYS-1400 models, each channel is restricted to 1 x Frequency and 1 x Analog flow meter. If the Primary meter type is changed, always verify the Aux meter configuration.

Frequency: Configures the Aux flow meter for the channel as a frequency signal meter.

Meter Factor PPG: This value is the Pulses Per Gallon that the meter connected to the System-1000 is configured for. It is the main configuration point on all ONICON flow meters that connect using frequency. Meter Factor PPG can be found on the meter tag and configuration / calibration sheets for any ONICON flow meter with frequency communication. ONICON flow meters configured for metric units list this value as PPG (pulse per gallon) on the meter tag regardless of the configured flow units (L/s, L/m, M3/h).

Freq Max Hz: Set to the maximum frequency the flow meter is configured for. This value is used to calculate the maximum flow the System-1000 channel is configured for and will drive high flow limits, high flow alarms, and scaling of outputs.

The default value for this on the System-1000 is 500Hz but is set from the factory to the correct value for specific meter that the channel is configured for. For best performance this should always be set to the Freq Max Hz that the flow meter is configured for. If changing meters in the field, or field configuring a blank channel, this value is not needed for accurate flow and energy values, but it is necessary for accurately setting the scale for the input. Setting this too low will result in high flow/energy alarms being triggered too early. Setting too high will generate limits that exceed the actual scale of the connected device. Maximum allowable by the System-1000 input is 1000Hz.

Input Units: Select the units that the flow meter is configured for. This value is only used for the calculating the Full Scale Flow value on this menu page and is for display / informational purposes only.

Full Scale Flow: This is a reference only display value that helps the end user understand and verify the maximum flow that the flow meter on the channel is configured for.

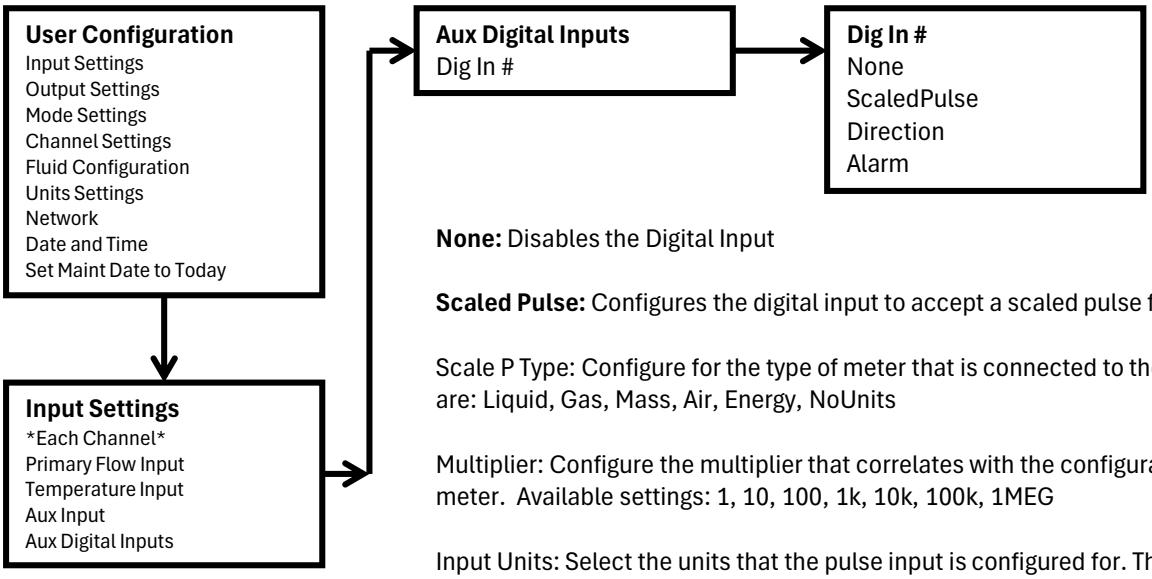
Analog: Configures the primary flow meter for the channel as an analog 4-20mA signal meter.

AnaIn at 4mA: Set to the minimum value for the analog out scale of the meter

AnaIn at 20mA: Set to the maximum value for the analog out scale of the meter

Input Type: Select the type of rate input. Available types are: Liquid Flow, Gas Flow, Mass Flow, Air Flow, Energy, Electric Power, Temp Sensor, Pressure Sensor, No Units. Not available in Frequency Aux Flow meter.

Input Units: Select the units that the flow meter is configured for. The list of available units will change depending on the "Input Type" selected above



None: Disables the Digital Input

Scaled Pulse: Configures the digital input to accept a scaled pulse from a flow meter.

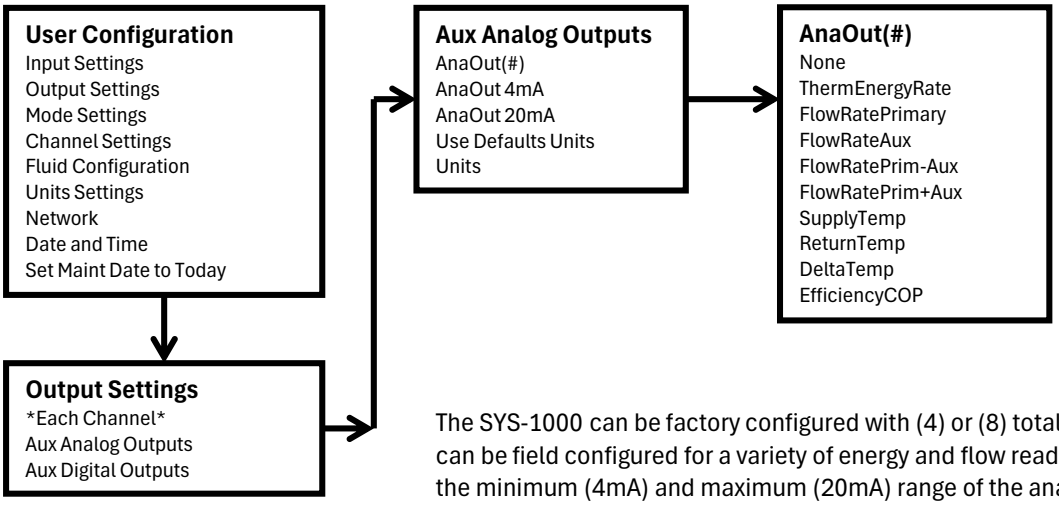
Scale P Type: Configure for the type of meter that is connected to the input. Available types are: Liquid, Gas, Mass, Air, Energy, NoUnits

Multiplier: Configure the multiplier that correlates with the configuration of the connected meter. Available settings: 1, 10, 100, 1k, 10k, 100k, 1MEG

Input Units: Select the units that the pulse input is configured for. The list of available units will change depending on the "ScaleP Type" selected above.

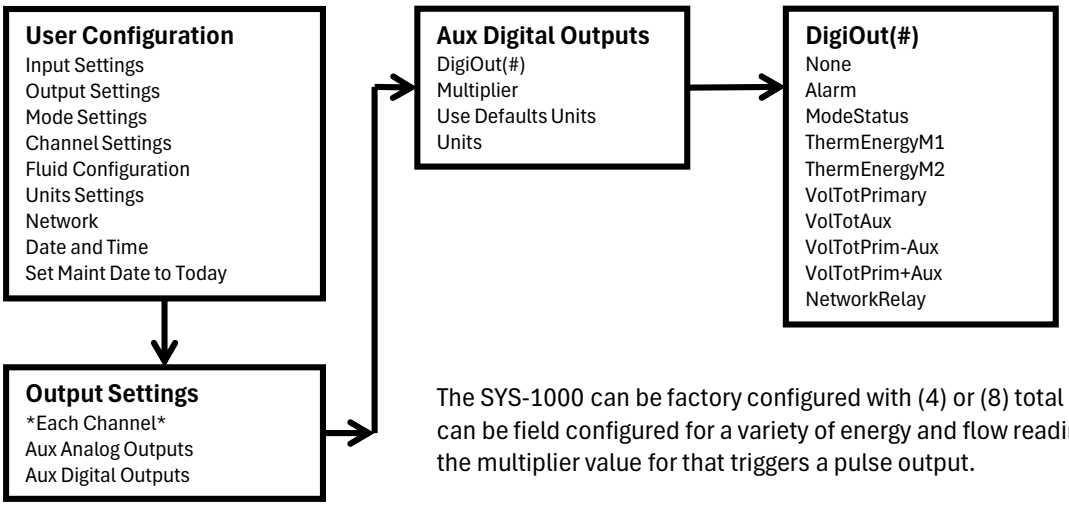
Direction: Configures the Digital Input as a directional signal from a bidirectional flow meter

Alarm: Configures the Digital Input as an alarm signal from the connected device



The SYS-1000 can be factory configured with (4) or (8) total analog outputs. Each output can be field configured for a variety of energy and flow readings. Set the desired value for the minimum (4mA) and maximum (20mA) range of the analog output

See note in the following section that describes unit settings for Analog Outputs



The SYS-1000 can be factory configured with (4) or (8) total digital outputs. Each output can be field configured for a variety of energy and flow readings. Set the desired value for the multiplier value for that triggers a pulse output.

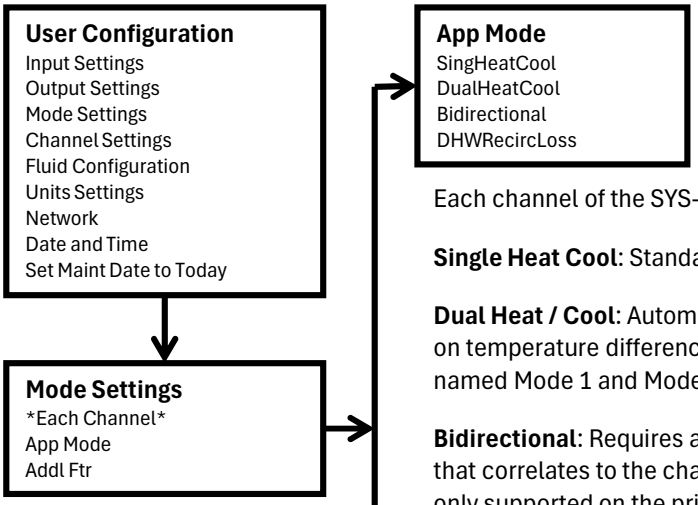
Multiplier options: 1, 10, 100, 1K, 10K, 100K, 1MEG

Network Relay: This enables the output to be opened or closed based on signal from the BMS. Used to enable or disable devices remotely.

Units Settings Note: The analog and digital outputs can be scaled to different units than the main display units on the SYS-1000. Example: the SYS-1000 is configured for thermal energy in kBTU but it is required to scale the analog out in Tons. When configured accordingly, the SYS-1000 will internally convert the kBTU value to Tons and generate the correct 4-20mA output based on the min-max scale in Tons programmed in this section. English and Metric units are available here.

Use Default Units: Yes - Uses the defaults units for the data type of the Output as set in the global units settings. No – Enables selection of units from a list of available unit types for the data type.

Units: This will be greyed out for Use Default Units = Yes and becomes selectable from a list of applicable units once Use Default Units = No



Each channel of the SYS-1000 can be configured for different functional modes

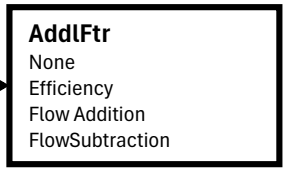
Single Heat Cool: Standard, single mode operation

Dual Heat / Cool: Automatically identifies heating vs cooling in a two pipe system based on temperature difference. Energy, flow, and run time info is stored in separate registers named Mode 1 and Mode 2

Bidirectional: Requires a directional input from the flow meter connected to a digital input that correlates to the channel where the flow meter is being read. Bidirectional meters are only supported on the primary flow meter for each channel.

DHWRecircLoss: This mode is designed to separately measure the thermal energy of usage and the thermal energy losses from recirculation for a domestic hot water system. The mode requires 2 channels (1&2 OR 3&4) and the secondary channel (2 OR 4) must be configured to Single Heat Cool. The DHWRecircLoss option does not appear in the AppMode menu for channels 2 & 4. When looking at live data on the Energy Measurements screen with this App Mode enabled, the primary channel will show Mode = DHW Recirc Supply and the secondary channel will show Mode = DHW Recirc Loss.

NOTE: App Modes Dual Heat Cool and Bidirectional, modes are not compatible with Additional Features Flow Addition and Flow Subtraction



Each channel of the SYS-1000 can be configured with different additional features

Efficiency: Enables the Efficiency (Coefficient of Performance) mode. It enables the real time reporting of unitless number that represents the real time operating efficiency of the thermal energy system. Requires an energy input to be brought in on the Aux Flow input of the same channel that the Efficiency is enabled. Available energy inputs are Electric Power, Steam Flow, Gas Flow, Thermal Energy

Electric Power COP: Configure the Aux Flow Input Type to “ElecPwr” and configure for the max and min range of the electric power meter. COP value published will represent Thermal Energy (converted to kWth) divided by Electric Power (kWe)

Steam COP: Configure the Aux Flow Input Type to “MassFlow” and configure for the max and min range of the Onicon steam meter. COP value published will represent Thermal Energy (kBTU/hr) divided by Steam Flow (Pounds/hr). Base assumption of 1000 btu/lb of steam.

Gas COP: Configure the Aux Flow Input Type to “GasFlow” and configure for the max and min range of the Onicon Gas meter. COP value published will represent Thermal Energy (kBTU/hr) divided by Steam Flow (CFH). Base assumption of 1000 btu/cf of gas.

Continued

AddlFtr
None
Efficiency
Flow Addition
FlowSubtraction

Thermal Energy COP: Configure the Aux Flow Input Type to “Energy” and configure for the max and min range of the thermal energy meter. COP value published will represent Thermal Energy (kBTU) divided by Aux in Thermal Energy (kBTU).

Pro Tip! : This can be done with two channels inside the same System-1000. Use the analog out set to Thermal Energy from another channel inside the System-1000 and loop that 4-20mA signal back into the Aux Input for the channel that you want to show the COP ratio with. This can be used on water-water heat exchangers or comparing relative thermal energies of cooling against condenser.

Flow Addition: Performs an addition function to the Primary and Aux flow meters on the channel and will report the resultant flow and total to the normal flow and total registers. Energy will be calculated on the sum of the two flows. The primary flow meter flow and total will report to the “Prim Only” registers. Aux flow meter flow and total will report to the standard registers for the Aux flow meter.

Flow Subtraction: Performs a subtraction function where the Aux flow meter is subtracted from the Primary flow meter on the channel. The resultant flow and total will be reported to the normal flow and total registers. Energy will be calculated on the resultant difference of the two flows. The primary flow meter flow and total will report to the “Prim Only” registers. Aux flow meter flow and total will report to the standard registers for the Aux flow meter.

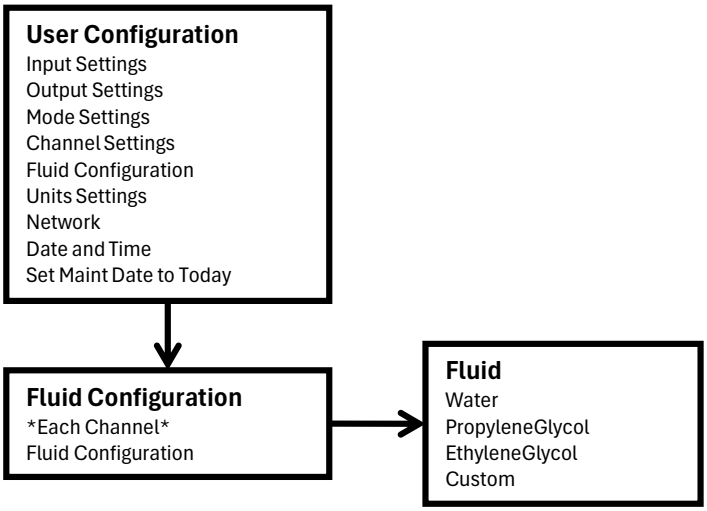
NOTE: If the Aux flow exceeds the Primary flow the reported flow will be zero. Negative flows are not supported.

User Configuration
Input Settings
Output Settings
Mode Settings
Channel Settings
Fluid Configuration
Units Settings
Network
Date and Time
Set Maint Date to Today

Channel Settings
Each Channel
Channel Name
Reset UserDef Totals

Channel Name: Enters the keyboard screen to allow the user to change the channel name for the selected channel.

Reset UserDef Totals: Reset all User Defined totals for the selected channel, does not affect totals for other channels.



Each channel of the SYS-1000 can be configured for a different fluid for the thermal energy calculation that is performed on that channel.

Water: No further configuration

Propylene Glycol: Select and set the percentage of Propylene Glycol in the fluid. Maximum allowable % is 50.

Ethylene Glycol: Select and set the percentage of Ethylene Glycol in the fluid. Maximum allowable % is 50.

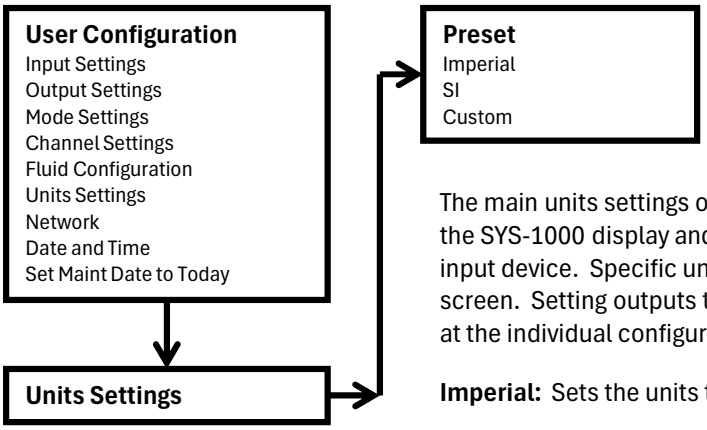
Custom: Use for fluids that cannot be configured above. This feature requires knowing the physical constants for the fluid being used.

Low / High Temperature: These are the upper and lower temp points for the fluid that the physical constants of the fluid are defined by. It also acts as limits for the range of temperatures the energy can be calculated in since the SYS-1000 cannot calculate the fluid outside of this temp range.

Low / High Density: The density of fluid at the low and high temperatures selected above. Units are lbs./cu. Ft.

Low / High Specific Heat: the specific heat of the fluid at the low and high temperatures selected above. Units are BTU/(lb. x °F)

NOTE: For PG and EG mixtures above 50% use readily available tables, calculate these values, and use Custom Fluid instead of PG / EG settings.



The main units settings of the SYS-1000 are selected in this menu. These settings apply to the SYS-1000 display and outputs but do NOT affect the units setting for any connected input device. Specific units for input devices are set at their individual input configuration screen. Setting outputs to units that are different from this main setting can be achieved at the individual configuration for that output.

Imperial: Sets the units to imperial / english standards used by Onicon

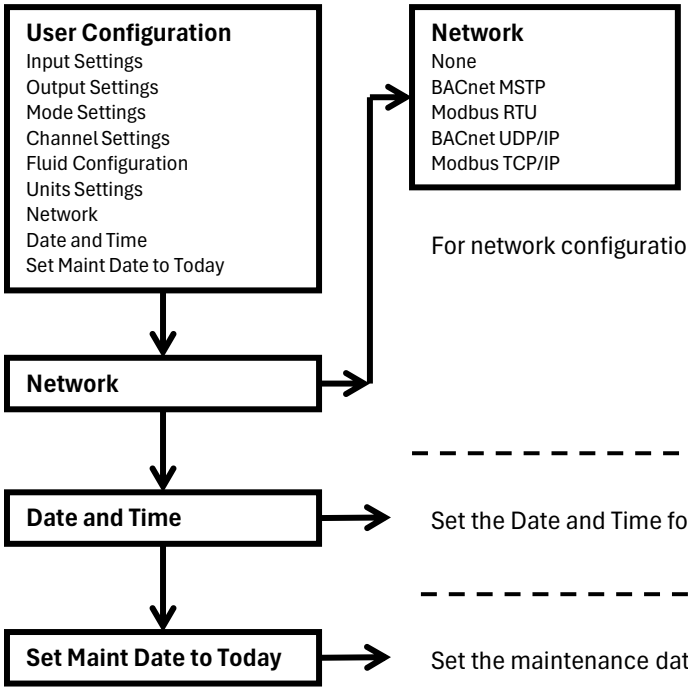
SI: Sets the units to SI / metric standards used by Onicon

Custom: Allows the user to specify their desired global units for each data type. Imperial or Metric or mixed are fully supported here.

Pro Tip!: If the plan is to use Custom Units but mostly Imperial or SI, first set the preset to SI or Imperial, then set to Custom. Custom starts with whatever preset group is selected before Custom is selected.

Units by Data Type:

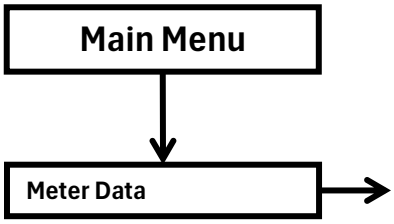
Fluid Flow	Liquid Volume	Gas Flow	Gas Volume	Air Flow	Air Volume
GPM GPH MilGalDay LPS LPM LPH CuMtr/hr CuFt/hr CuFt/min	GAL L CuMtr CuFt	CuFt/hr CuFt/min CuMtr/hr CuMtr/min	CuFt CuMtr	CuFt/hr CuFt/min CuMtr/hr CuMtr/min	CuFt CuMtr
Mass Flow	**Mass Total**	**Th Energy Rate**	**Energy**	**Temp**	**Pressure**
Lb/hr Kg/hr	Lb Kg	BTU/hr kBTU/hr Ton kW	BTU kBTU TonHr kWh	°F °C	PSI kPa ATM BAR



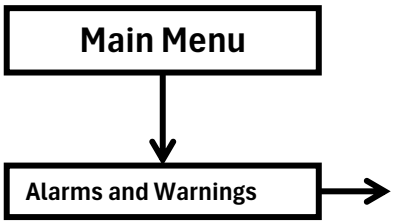
For network configuration information see Section 4.4 of this manual

Set the Date and Time for the System-1000

Set the maintenance date for the System-1000 to the current date : Yes / No



Meter Data: This menu shows the manufacturing data for the System-1000. Serial #, firmware versions, run hours, run hours per channel & per mode, manufacture date, etc...



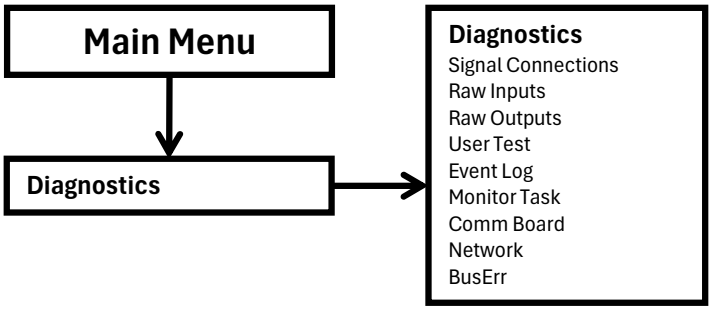
Alarms & Warnings: This menu shows the any active Warnings, Alarms, or Errors. It is separated into each of the channels with a blue highlight on the channel name. Use the left-right arrows to move the cursor between channels and use the enter/select button to expand the channel to see more listings if there are more listings than can fit in the multi-channel screen.

ONICON defines the Warnings, Alarms, Errors as follows:

Warning: An alert that the meter is approaching the limit of a setting or configuration. No outputs are disabled; alarm contact is not closed. Example: A chiller is idling and the Delta T is at 0.5 °F, warning for low delta T will appear.

Alarm: An alert that the meter has exceeded the limit of a setting or is misconfigured. No outputs are disabled; alarm contact IS closed. Example: A meter is undersized for the flow of the system and has run up to the maximum flow for that input, alarm for high flow will appear.

Error: An alert that the meter has a significant issue or a hardware issue. At least one output is disabled; alarm contact IS closed. Example: A service tech damages the wires for a supply temp sensor, error for Supply Temp Open will appear, energy output for that channel will be disabled.



Diagnostics: This menu accesses the built-in diagnostic tools for the System-1000

Signal Connections: Displays an Open / Normal for each of the I/O circuits. Use to diagnose correct connections to the board and broken wires in the system.

Raw Inputs: Displays the instantaneous raw signal be delivered to each input.

Raw Outputs: Displays the instantaneous raw signal be sent out of each output.

User Test: Allows the System-1000 to simulate operation based on the configuration. 50% would simulate 50% flow, 50% temp difference, 50% aux in, etc... The System-1000 will calculate any energy generated and add to totals for the simulated inputs. This tool is useful for ensuring that any user configurations will generate the correct result.

Mode1: 100-75-50-25-0 % - this will simulate cooling or forward flow according to the % selected.
Mode 2: 100-75-50-25 % - this will simulate heating or reverse flow according to the % selected.
Output: 100-50-0 % - this will simulate and enable all outputs.

NOTE: any totals accumulated by the user test mode will NOT be saved to the actual totals on the System-1000

Event Log: Displays a list of system events logged by the SYS-1000.

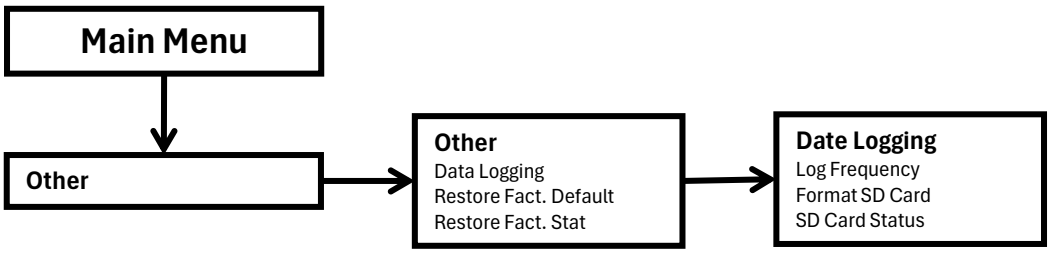
Monitor Task: Displays the active processes and their CPU load.

Comm Board: Indicates if the Comm Board is Active / Not Configured. If showing Not Configured, verify that networking is enabled through User Config -> Network.

Network: Indicates the status of the network (RS485 or IP)

RS-485: Link Down: No traffic has been seen in 60 seconds
Link Up: Traffic has been seen in the last 60 seconds
IP: Link Down: The ethernet hardware does not detect that it is physically connected to another ethernet interface
Up, Active: The ethernet hardware has seen traffic in the last 15 seconds
Up, Inactive: No traffic has been seen by the ethernet hardware in 15 seconds

Bus Err: For internal diagnostics only



Data Logging: This menu controls the Data Logging function that can be used to help in troubleshooting problems with the systems connected to the System-1000. The datalogger takes an instantaneous sampling of the parameters of the System-1000 at every time interval set. Accessing the data log requires connecting with ONICON software, contact your local rep. The SD card is not field serviceable.

WARNING: Only use the datalogger when actively troubleshooting so that the internal SD card does not exceed the maximum read/write cycles.

Log Frequency: Set the time between data log samples. Options: Disabled, 1 sec, 5 sec, 10 sec, 30 sec, 1 min, 2 min, 5 min, 10 min.

Format SD Card: Erases all the data on the SD Card and reformats the card for more use.

SD Card Status: Indicates the status of the internal SD Card.

Restore Fact. Default: Use this command to reset ALL settings on the System-1000 to how it left the ONICON factory without changing the totals.

Restore Fact. Stat: Displays the status of the Factory Defaults system.

End of Menu

SECTION 6.0 WARNINGS, ALARMS, ERRORS

6.1 ALARM MESSAGES

Message	Explanation	Possible Solutions
Warn Low Flow	The flow value for the primary flow meter on the channel is below the low flow threshold (0.2% of configured full scale flow).	Information only. If expecting flow, verify that the primary flow meter for the channel is properly configured and connected
Warn High Flow	The flow value for the primary flow meter on the channel is above the high flow threshold of the meter (95% of configured full scale flow).	Information only. If unexpected, verify the configuration of the primary flow meter for the channel.
Warn Low Energy	The energy value for the channel is at zero.	Information only. If expecting energy, verify that the flow meter and temp sensors on the channel are properly configured and connected.
Warn High Energy	The energy value for the channel is above the high energy threshold of the meter (BTU limit is set at 500*(FullScaleFlow GPM+1)*61)	It is highly unlikely that this warning will trigger. If it does, please check the configuration of the temp sensors and flow sensors on the channel. In rare cases where Delta T needs to be greater than 60°F, ONICON can assist with raising that limit with your local rep.
Warn Supply Temp Low	The supply temperature is below the minimum threshold (15°F default)	Check the configuration of the temp sensors. Validate that the loop temperature is actually this low. If the loop temp needs to be this low, the low limit can be adjusted with the help of your local ONICON Rep.
Warn Supply Temp High	The supply temperature is above the maximum threshold (250°F default)	Check the configuration of the temp sensors. Validate that the loop temperature is actually this high. If the loop temp needs to be this high, the high limit can be adjusted with the help of your local ONICON Rep.
Warn Return Temp Low	The return temperature is below the minimum threshold (15°F default)	Check the configuration of the temp sensors. Validate that the loop temperature is actually this low. If the loop temp needs to be this low, the low limit can be adjusted with the help of your local ONICON Rep.
Warn Return Temp High	The return temperature is above the maximum threshold (250°F default)	Check the configuration of the temp sensors. Validate that the loop temperature is actually this high. If the loop temp needs to be this high, the high limit can be adjusted with the help of your local ONICON Rep.
Warn Delta Temp Low	The delta temperature is below the minimum threshold (0.18°F default)	Information only. If unexpected, verify the configuration of the temp sensors for the channel.

Message	Explanation	Possible Solutions
Warn Delta Temp High	The delta temperature is above the maximum threshold (57°F default)	It is highly unlikely that this warning will trigger. If it does, check the configuration of the temp sensors on the channel. In rare cases where Delta T needs to be greater than 60°F, ONICON can assist with raising that limit with your local rep.
Warn Low Aux Flow	The flow value for the aux flow meter on the channel is below the low flow threshold (0.2% of configured full scale flow).	Information only. If expecting flow, verify the aux flow meter for the channel is properly configured and connected
Warn High Aux Flow	The flow value for the aux flow meter on the channel is above the high flow threshold of the meter (95% of configured full scale flow).	Information only. If unexpected, verify the configuration of the aux flow meter for the channel.
Warn AOUT (X) Low Flow	The flow analog out (#) is below 5% of the configured range.	Information only. If unexpected, verify the configuration of the flow analog out for the channel.
Warn AOUT (X) High Flow	The flow analog out (#) is above 95% of the configured range.	Information only. If unexpected, verify the configuration of the flow analog out for the channel.
Warn AOUT (X) Low Energy	The energy analog out (#) is below 5% of the configured range.	Information only. If unexpected, verify the configuration of the energy analog out for the channel.
Warn AOUT (X) High Energy	The energy analog out (#) is above 95% of the configured range.	Information only. If unexpected, verify the configuration of the energy analog out for the channel.
Warn AOUT (X) Low Temp	The temperature analog out (#) is below 5% of the configured range.	Information only. If unexpected, verify the configuration of the temperature analog out for the channel.
Warn AOUT (X) High Temp	The temperature analog out (#) is above 95% of the configured range.	Information only. If unexpected, verify the configuration of the temperature analog out for the channel.
Warn RTC Fail	Warning that the internal battery has failed.	Replace internal battery. The main board must be removed to access the battery. Contact ONICON for assistance in correcting this.
Warn SD Card Fail	SD card for logging data is missing or faulty. This will only effect the ability of the device to perform data loggin for system troubleshooting. It does not effect the ability of the System-1000 to store totals or configuraiton.	Disable data logging. Replace the SD card. This is not a field serviceable part. Contact ONICON to schedule service

Message	Explanation	Possible Solutions
Warn Pulse (X) Overrun Possible	The System-1000 verifies the configuration of pulse output multiplier against the configuration of the flow / energy signal to the pulse out. This verification checks if the maximum output of the flow / energy will generate a pulse that is too fast with the configured pulse multiplier. If this condition is seen the warning will appear.	Increase the multiplier for the pulse out to slow down the pulse rate at high outputs.
Warn Fact Defaults Corrupt	The factory defaults have been corrupted or not properly set at the factory.	Do not attempt to Restore Factory Defaults. If Factory defaults are needed, contact ONICON factory.
Warn Comm Board Compat Error	Incompatible FW version on Comm Board.	Contact ONICON Factory
Warn SPI/I2C Transient Error	There has been a hardware comunication malfunction between chips or devices on one of the circuit boards.	Cycle Power to the meter. If the problem persists, please contact ONICON
Warn Debug Print Enabled	Internal Developer Code	Contact ONICON Factory
Alarm High Flow	The flow value for the primary flow meter on the channel is above the maximum configured value. Flow (and energy, totals) calculations for the channel are no longer accurate because the flow has exceeded the configured limit (Hz or mA).	Reconfigure the the primary flow meter for the channel. Replace the flow meter with a properly sized flow meter.
Alarm Delta Temp High	The delta temp calulation has exceed the maximum value (default 60°F). Energy calulations may not be correct.	It is highly unlikely that this alarm will trigger. If it does, check the configuration of the temp sensors on the channel. In rare cases where Delta T needs to be greater than 60°F, ONICON can assist with raising that limit with your local rep.
Alarm Invalid Fluid Config	The temperature is is outside of the configured range for a custom fluid by less than 5°F (high or low). Energy will not be calculated and transmitted, but is not accurate.	Verify the temperatures have been properly configured for the operating range of the system. Verify the temperature sensors are properly configured and are reading properly.
Alarm AOUT (X) High Flow	The flow analog out (#) is above the configured range. The analog out is no longer accurate because it is up against the 20mA (or 10V) maximum.	Reconfigure the flow analog out for the channel and verify the flow meter configuration is correct.

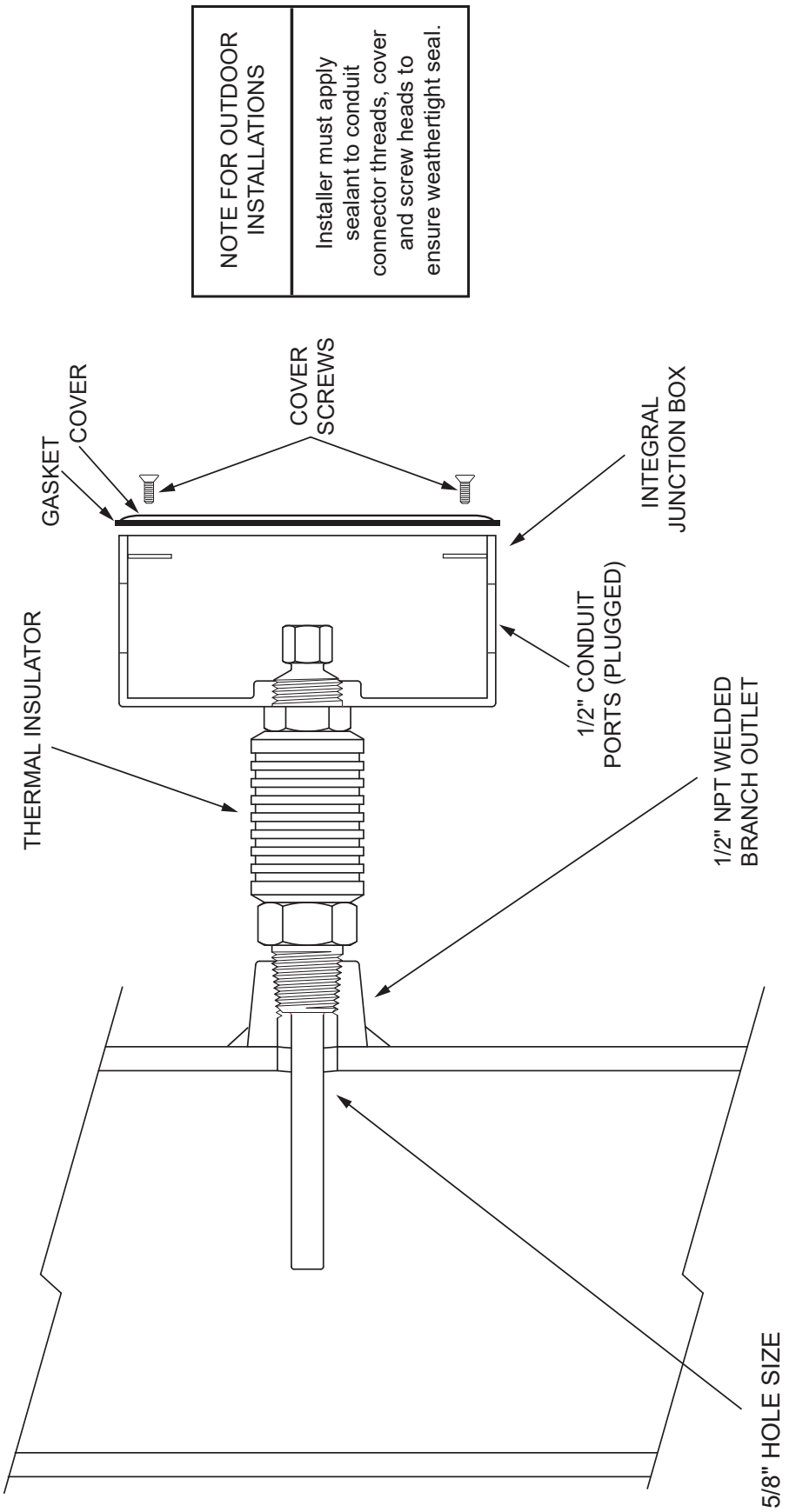
Message	Explanation	Possible Solutions
Alarm AOUT (X) High Energy	The energy analog out (#) is above the configured range. The analog out is no longer accurate because it is up against the 20mA (or 10V) maximum.	Reconfigure the energy analog out for the channel and verify the flow meter and temp sensor configurations are correct.
Alarm AOUT (X) Low Temp	The temperature analog out (#) is below the configured range.	Reconfigure the temperature analog out to match the actual range being seen. Verify the configuration of the temperature sensor.
Alarm AOUT (X) High Temp	The temperature analog out (#) is above the configured range.	Reconfigure the temperature analog out to match the actual range being seen. Verify the configuration of the temperature sensor.
Alarm Digital In (X)	A digital input configured for Alarm has been triggered by that input and is showing the appriate alarm indication.	Normal operation for the System-1000. Check the device connected to the digital in to determine why it is in alarm and resolve the issue with that specific device.
Alarm Warm Up	The device is booting and this Alarm should resolve itself in 5 seconds.	Wait for the System-1000 to finish booting. If the Alarm persists there is most likely a hardware issue. Contact ONICON factory to resolve.
Alarm SPI/I2C active failure	There is a hardware comunication malfunction between chips or devices on one of the circuit boards.	Cycle Power to the meter. If the problem persists, please contact ONICON
Alarm Networking Fail	The communication card is not able to properly talk to the network.	Verify Network configuration is correct. Verify RS485 wiring is correct. Verify IP cables are correct. If the problem persists, please contact ONICON
Alarm Comm Board Init Fail	The communication card has failed to initialize.	Cycle Power to the meter. If the problem persists, please contact ONICON
Error Supply Temp Open	The supply temperature sensor circuit for the channel is reading open.	Verify the wiring for the supply temperature sensor wiring for the channel. Replace damaged wiring or temp sensor.
Error Supply Temp Short	The supply temperature sensor circuit for the channel is reading as a short circuit.	Verify the wiring for the supply temperature sensor wiring for the channel. Replace damaged wiring or temp sensor.
Error Supply Temp Ref	There is a hardware malfunction on the supply temperature circuit for the channel.	Cycle Power to the meter. If the problem persists, please contact ONICON
Error Supply Temp Out Of Range	The supply temperature reading is outside the default range of the meter (Default range is 15°F to 200°F).	Reduce minimum temperature threshold via serial communication
Error Return Temp Open	The return temperature sensor in the is reading open.	Verify the wiring for the return temperature sensor wiring for the channel. Replace damaged wiring or temp sensor.

Message	Explanation	Possible Solutions
Error Return Temp Short	The return temperature sensor is reading as a short circuit.	Verify the wiring for the return temperature sensor wiring for the channel. Replace damaged wiring or temp sensor.
Error Return Temp Ref	There is a hardware malfunction on the return temperature circuit for the channel.	Cycle Power to the meter. If the problem persists, please contact ONICON
Error Return Temp Out Of Range	The supply temperature reading is outside the default range of the meter (Default range is 15°F to 200°F).	Reduce minimum temperature threshold via serial communication
Error Pulse (X) Overrun Flow	The pulse output configured for flow is generating pulses faster than the harware can generate them. Pulse outputs will be missed and connected devices will not be receiving accurate information.	Increase the multiplier for the pulse out to slow down the pulse rate at high outputs.
Error Pulse (X) Overrun Energy	The pulse output configured for energy is generating pulses faster than the harware can generate them. Pulse outputs will be missed and connected devices will not be receiving accurate information.	Increase the multiplier for the pulse out to slow down the pulse rate at high outputs.
Error Invalid Fluid Config	The temperature is is outside of the configured range for a custom fluid by more than 5°F (high or low). Energy will not be calculated or transmitted.	Verify the temperatures have been properly configured for the operating range of the system. Verify the temperature sensors are properly configured and are reading properly.
Error Grand Totals Corrupt	Grand Totals have been lost and are no longer accurate due to an EEPROM failure in the hardware.	This is not a field serviceable issue. Please contact ONICON for repair
Error Yearly Totals Corrupt	Yearly Totals have been lost and are no longer accurate due to an EEPROM failure in the hardware.	This is not a field serviceable issue. Please contact ONICON for repair
Error Periodic Totals Corrupt	Periodic Totals have been lost and are no longer accurate due to an EEPROM failure in the hardware.	This is not a field serviceable issue. Please contact ONICON for repair
Error EEPROM fail	This message indicates a hardware malfunction.	Cycle Power to the meter. If the problem persists, please contact ONICON
Error Comm Board Fail	This message indicates a hardware malfunction.	Cycle Power to the meter. If the problem persists, please contact ONICON

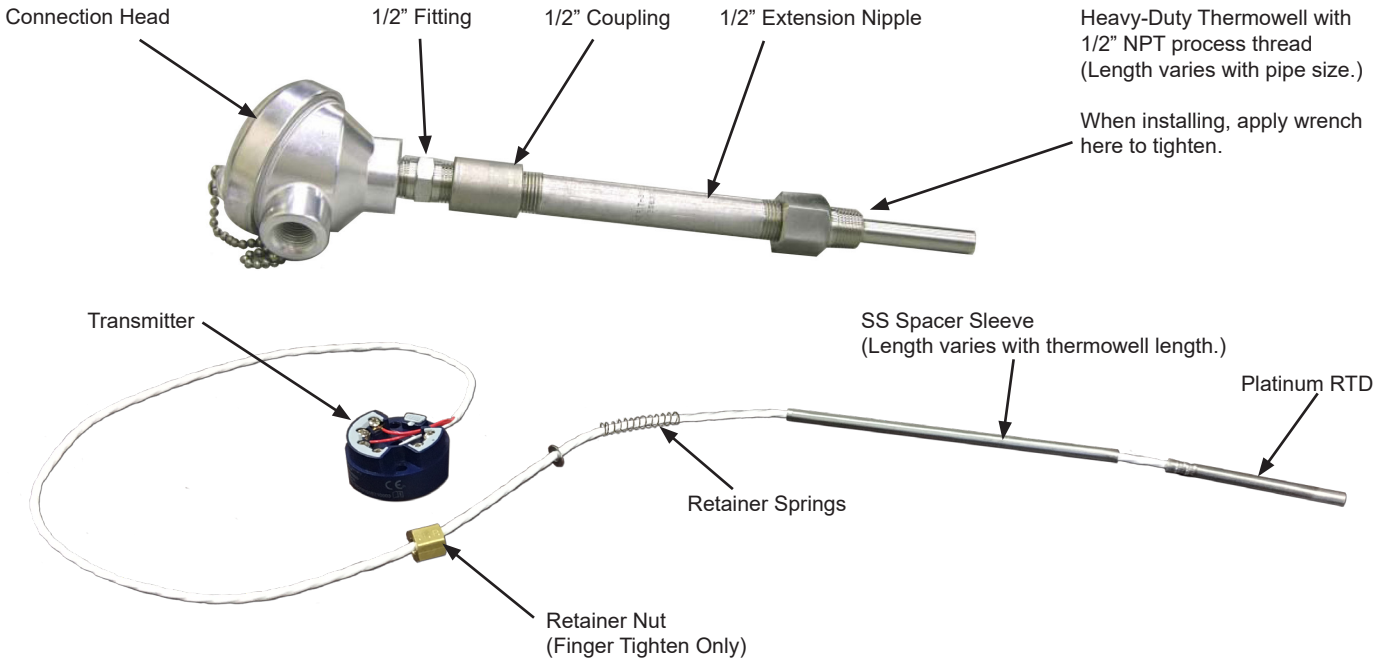
APPENDIX A – DRAWINGS

A-1 **OUTDOOR THERMOWELL ASSEMBLY**
A-2 & A-3 **HEAVY DUTY THERMOWELL FOR HIGH TEMPERATURE / PRESSURE (2 Pages)**

OUTDOOR THERMOWELL ASSEMBLY IN WELDED PIPE



HEAVY DUTY THERMOWELL ASSEMBLY FOR SYSTEM-1000 BTU METERS FOR PROCESS TEMPERATURES OVER 300°F



IMPORTANT NOTE
The thermowell, extension nipple, coupling and fitting were made to a specific length. DO NOT attempt to change the length of this assembly.



Step 1:
Drill 7/8” hole in pipe. Install thermowell using fittings supplied by ONICON.

Complete steps 2 - 4 only after all welding, brazing & soldering are complete.

IMPORTANT NOTE
Each RTD and transmitter pair are matched at the factory and calibrated for a specific BTU meter. Do not separate the RTD from the transmitter and use care to ensure that the serial number on the transmitter matches the serial number of the BTU meter.

Step 2:
Remove lid and insert RTD assembly into thermowell, ensuring that it bottoms out. Thermal compound may be used; apply only a pea-sized amount to the tip of the RTD prior to insertion.

Thread retaining nut onto fitting inside the bottom of connection head. Hand tighten the retainer nut.
DO NOT OVERTIGHTEN.

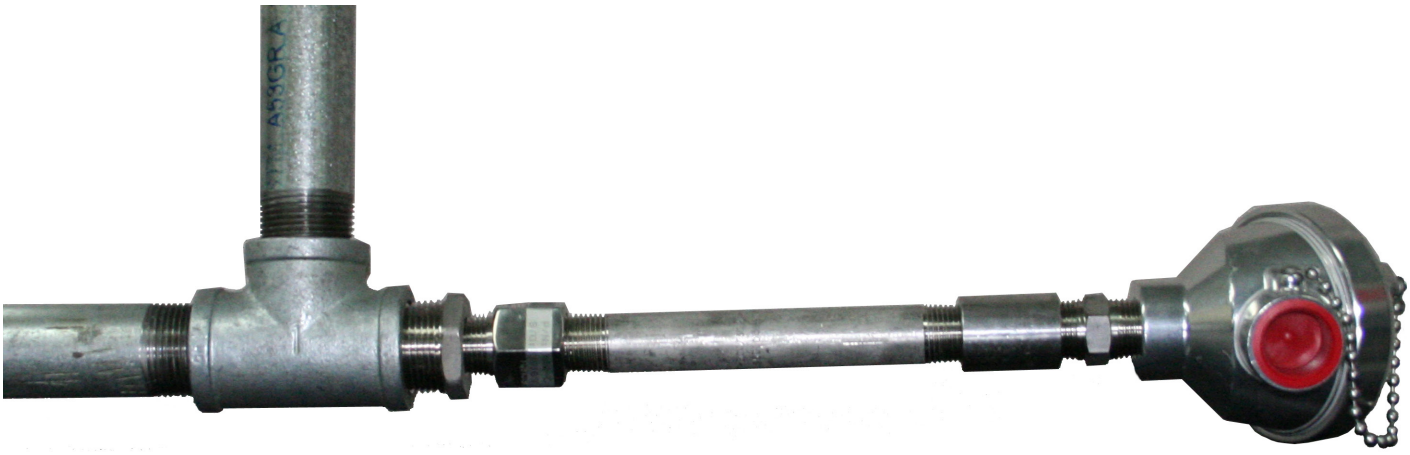


Step 3:
Place the transmitter over the retainer nut, gently guiding the excess wire through the center hole of the transmitter. Use caution to avoid pinching the wires.



Step 4:
Connect field wires from the System-10 BTU meter to the transmitter as shown. Carefully coil extra wire around the transmitter and thread the lid onto the connection head.

IMPORTANT NOTE
In 1" pipe, thermowell must be installed in a customer provided tee as shown below.



The thermowell, extension nipple, coupling and fitting were made to a specific length.

DO NOT attempt to change the length of this assembly.