

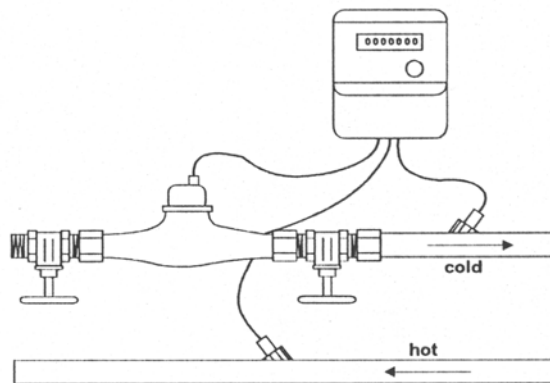
SECTION 1 - WHAT IS A BTU METER?

ISTEC BTU Meters measure energy usage by multiplying flow rate and temperature difference. As the water (or other liquid) passes through these lines, the multi-wing turbine rotates and sends flow impulses to the electronic calculating unit. The sensors of the electronic calculating unit measure the water temperature and automatically compensate for water density to more accurately calculate BTU's. ΔT and the rate of flow are calculated into BTU's and displayed onto a non-resettable LCD counter. **ISTEC** BTU Meters also indicate momentary energy rate, momentary flow rate, total flow, temperatures, etc.

$$\text{BTU's} = \text{Flow} \times \Delta T$$

Any **ISTEC** BTU Meter System consists of the following main components:

1. **Flowmeter** - Multi-wing turbine type with pulse output.
2. **Electronic Calculating Unit** - All solid state circuitry for high accuracy and reliability. Fluid density compensated calculation, non-resettable LCD and stepping switch for flow, temperature readings and BTU specifications.
3. **Temperature Sensors** - Made out of platinum for fast response time and high accuracy. Variable length of sensor cables.
4. **Power Supply** - **ISTEC** BTU Meters can operate with battery packs (1 year or 6 year), or be interconnected to a 24 Volt converter (AC to DC).
5. **Tamper-Proofing** - Special seals are included with every BTU Meter to prevent tampering.



SECTION 2 - MODEL DESCRIPTIONS

I. Wall-Mounted BTU Meter with Separate Flowmeter

DESCRIPTION: The system consists of a BTU Meter that is interconnected to a separate flowmeter having a reed contact. Separate flowmeters are used so that ALL flow ranges can be accommodated. This type of Wall - Mounted BTU Meter has two sensor cables (one for the hot temperature side and one for the cold temperature side). The flowmeter is interconnected to the BTU Meter by a two wire cable (maximum length 500 feet) that transfers the reed contact closures to the calculating unit.

The closure of the reed contact in the flowmeter represents 1 gallon, 10 gallons, 100 gallons, or 1,000 gallons, etc., depending on the flowmeter size. The flowmeter should always be installed with one stop valve on each side for easier servicing.

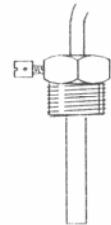
MAIN BTU METER ASSEMBLIES: A system consists of the following main parts:

1. **BTU Meter Calculating Unit** - This unit has two permanently attached temperature probe cables with sensors. The temperature probes have a red or black tape at the end where the sensor is located. The red probe goes into the well, which is inserted into the hot temperature pipe. The black probe goes into the well on the cold side. The length of the probes depends on the installation. Temperature probe cables are available in lengths of 10 feet, 15 feet, 30 feet, or specially-ordered lengths. Probes cannot be lengthened or shortened. The BTU Meter attaches to a backplate (also supplied with the BTU meter).

2. **Power supply** - **ISTEC** BTU Meters can operate with battery packs (1 year or 6 year), or can be interconnected to a 24 Volt converter (24V AC to 3V DC). A step-down transformer is also available to convert from 110 Volt AC to 24 Volt AC.

3. **Separate Flowmeter** - This separate unit is connected to the BTU Meter with a 2 wire cable that transmits flow pulses to the calculating unit.

4. **Sensor Wells** - One sensor well is installed on the hot temperature pipe and one is installed on the cold temperature pipe. Wells are available in normal length 3/8" NPT (1½") or extra long 3/8" NPT (2½"). (The longer well is used for pipe sizes above 2").



5. **Options** - There are two output modules available which interconnect to any BTU Meter:

(a) Model # 4072 - Dry contact pulse module to transfer total BTU's into a remote reading panel, computers, etc.

(b) Model #4075 - A 4 to 20 mA output module which can transfer an analog signal on either the flow rate or the energy rate to other equipment. Either one of the modules interconnect to the back of a BTU Calculating Unit and they must be powered by a converter (not a battery).

FLOWMETER: Select the flowmeter from the chart on Page 8 based on the expected flowrange.

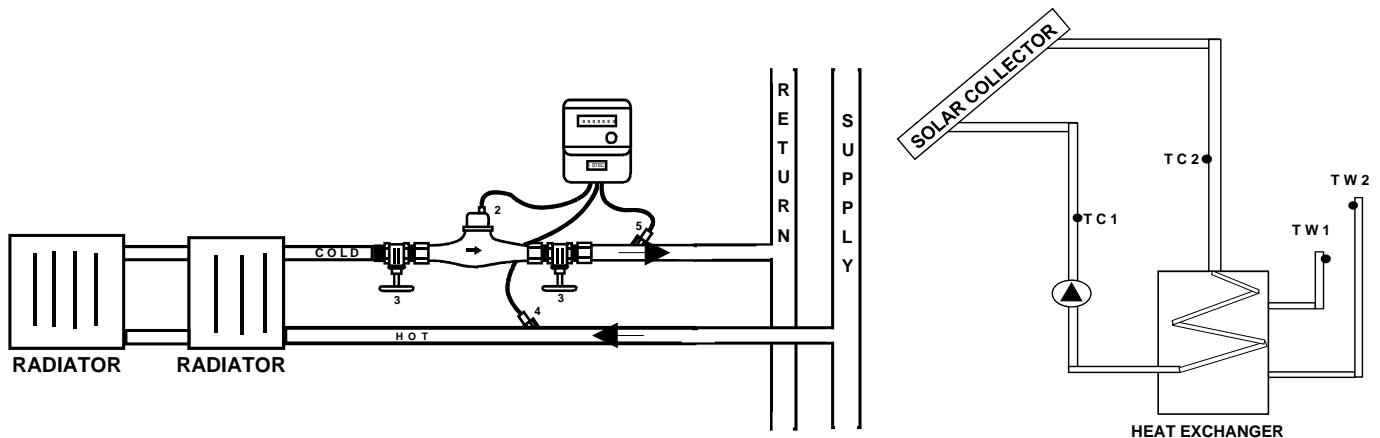
SECTION 3 - TYPICAL APPLICATIONS

ISTEC BTU Meters measure the energy used or transferred in heat or air conditioning installations. Heating or cooling can be measured on radiators, baseboards, fan coils, or any water heating or cooling system independent from the type of fuel used (oil, gas, etc.).

ISTEC BTU Meters are used with heat reclaimers or heat exchangers where heat gain or heat loss can be calculated by means of water flow and temperature difference. Our BTU Meters have been installed in District Heating Systems, Co-Generation Systems, Geo-Thermal Metering, and for product efficiency verifications.

These BTU Meters have been widely used in various apartment applications for heating and cooling cost allocation.

BTU Meters can also be used to measure the output of a Solar System. The installation can be either on the transfer fluid side, or preferably, on the hot water side (heat exchanger in and out).



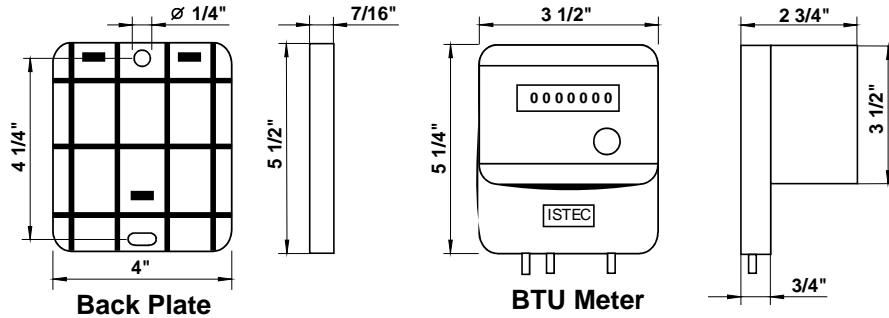
SECTION 4 - DIMENSIONS & INSTALLATION

II. Flowmeter, BTU Meter & Wells

1. Dimensions

A. Flowmeter - see Page 8 for details.

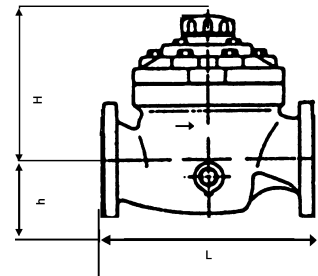
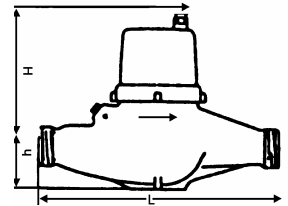
B. BTU Meter



2. Installation

a. Flowmeter

Match the arrow on the flowmeter housing to the direction of water flow in the pipe (colder side if possible). For highest accuracy, install the meter horizontally. Some flowmeters can be installed vertically (see page 8 under Flow Direction). Couplings are provided for flowmeters up to 1-1/2" in pipe size, and flanges (150 lb. ANSI B16.5) are used for flowmeters 2" in pipe diameter and larger.



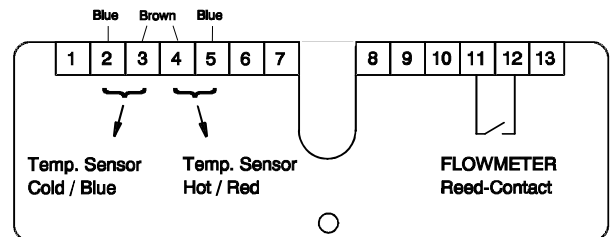
NOTE: Be sure to have 5 times the flowmeter diameter of straight piping before AND after the flowmeter.

b. BTU Meter

NOTE: To protect BTU Meters against electrical interference do not run sensor cables parallel to power lines (Minimum Distance = 1 ft.). Avoid installing BTU Meters next to switching relays, motors and neon lights. (Minimum Distance = 3 ft.)

When installing the BTU Meter, first attach the back plate onto the wall. Make sure that two mounting hooks are on the top of the back plate. After attaching the plate to the wall, push the meter IN AND UP TO FULLY ENGAGE THE TOP TWO HOOKS before engaging the bottom hook.

c. Attach the two conductor flowmeter cables (any length up to 500 Feet) to terminals 11 and 12 on the BTU Meter. The wiring in the terminal housing should correspond to the schematic on the right.

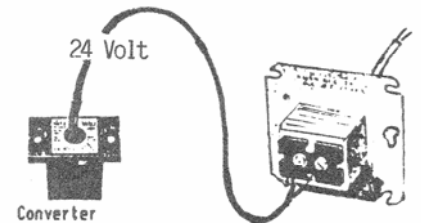


Wells

- d. Select the two proper wells based upon pipe size. For pipe sizes 1-1/2" and smaller, use 3/8" NPT regular wells (2-1/2" total length). For pipe sizes 2" and larger use 3/8" NPT long wells (3-1/2" total length).
- e. For best results angle the well at 30 to 45 degrees and make sure that the well is POINTING AGAINST the direction of water flow. Make sure the tip of the well is in the centerline of the pipe (esp. smaller pipe sizes). Install the two temperature probes into the wells: one for the hot temperature side (red tape) one for the cold temperature side (black tape). NEVER SHORTEN TEMPERATURE PROBE CABLES because sensors are calibrated in pairs.

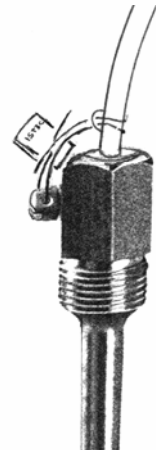
Power Source

- f. When installing a 1 or 6 year Lithium battery, insert the battery with the contoured lip next to the connector cover. Tighten the battery with two screws.
- g. When installing a 24 Volt converter, insert the converter with the contoured lip next to the connector cover. Tighten the converter with two screws. THE CONVERTER REQUIRES 24 VOLTS AC TO OPERATE. A step-down transformer 110V/24V can be used to "step-down" main voltage to 24 Volts AC (SEE DIAGRAM).



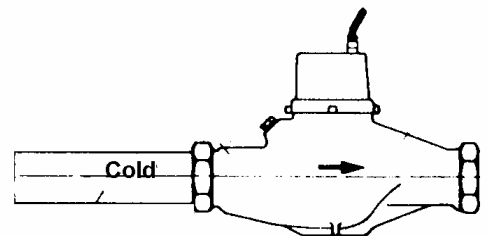
Seals

- h. Protective labels are provided to help prevent battery or converter tampering. Simply attach these labels over the two screws that hold the battery or the converter.
- i. To protect the wells and probes from tampering, insert the sensor into the well, tighten the screw on the well to hold the probe in place, and thread the safety wire around the probe (as shown). Next, thread the wire through the hole in the well screw, and fasten the wires together with the clamp. This must be done for both wells and probes.
- j. To protect the terminal BTU Meter cover, attach a label to the connector cover after tightening screw.



AFTER EACH INSTALLATION CHECK THE FOLLOWING:

1. Flow direction on flowmeter.
2. Flowmeter should be installed in lower temperature side.
3. Make sure the RED taped temperature probe is installed in hot temperature side and the Black taped temperature probe is installed in the colder temperature side.
4. Check power source.
5. Seal all connections with tamper indication seals.

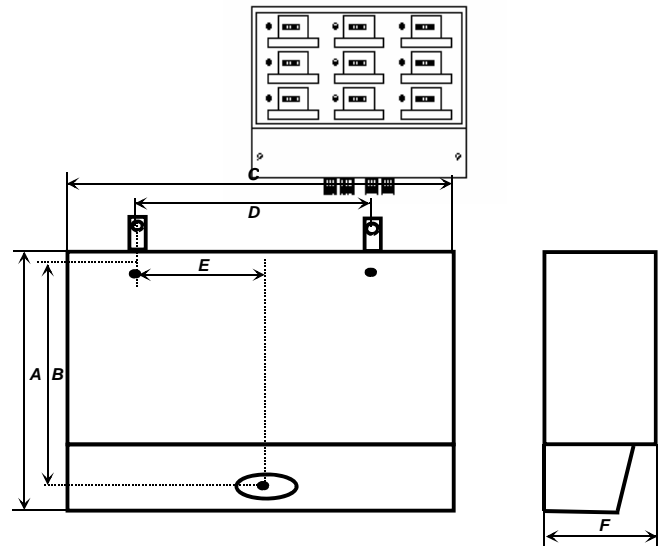


II. Central Reading Panel (FA-3, 6, 9 or 12)

1. Dimensions

CRP Measurement - Housing

A	8.5"
B	7.5"
C	10.25"
D	7.1"
E	3.5"
F	4.1"



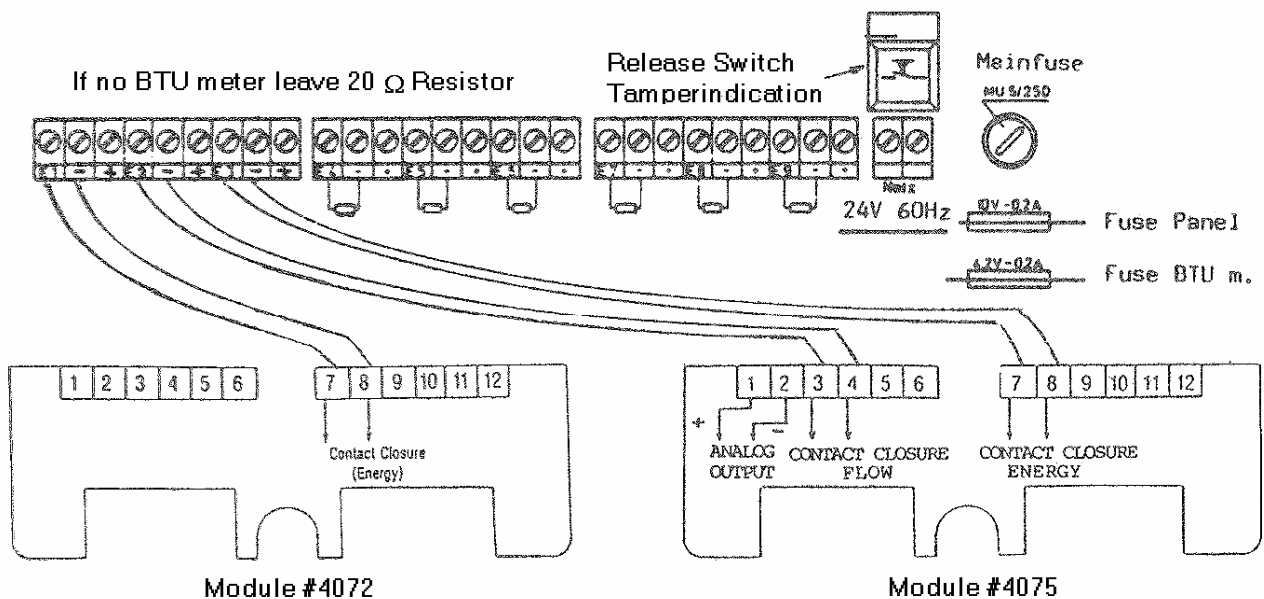
2. Installation of CRP

(a). Open lower housing cover by removing the two screws. Push the two sliding bars (located on the upper part of the back of the housing) 1/2" up. Tighten these two bars to the wall with two flat head screws and push CRP cabinet all the way up. Attach a third screw from the inside of the cabinet to the wall.

Electrical Interconnection

(b). The CRP should be powered by 24 V, 60 Hz, 5VA. In the terminal housing connect 24 Volt, 60 Hz. to the last two terminals marked "NETZ". Multiple CRP's can be interconnected to a single step-down transformer.

(c). Connect the two wires from the BTU Meter Pulse Module # 4072 to the two terminals E1 and -, or E2 and -, or E3 and -, etc.



Fuses

(d). The CRP has three fuses to protect the components of the system: a main protection fuse for the CRP, a fuse for the CRP counters, and a fuse for the BTU Meters.

Section 6 - FLOWMETER SPECIFICATIONS

MODEL	PROD #	FLOW RANGE			PIPE SIZE	INTER-CONNECTION	DIMENSIONS			WIDTH (INCHES)	PSI PRESSURE DROP	FLOW DIRECTION	WEIGHT (LBS)	BTU COUNTER (1 COUNT = X BTU'S)	VOLUME COUNTER 1 COUNT = GALLONS	FLOWMETER REED CONTACT CLOSURE
		MIN.	(GPM) CONT.	MAX.			H	h	L							
3/G	1800	0.13	6.6	13.2	1/2"	C	3.25"	.75"	5.00"	3.25"	2.90	A	2.25	1,000	1,000	1
5/G	1805	0.22	11.0	22.0	3/4"	C	3.25"	.75"	5.00"	3.25"	2.90	A	2.50	1,000	1,000	1
10/G	1810	0.40	26.4	52.8	1"	C	5.50"	1.75"	10.25"	4.00"	2.90	H	6.40	1,000	1,000	1
20/G	1815	0.70	43.9	87.2	1 1/2"	C	6.10"	2.00"	11.80"	5.25"	3.60	H	11.25	1,000	1,000	1
30/G	1820	0.88	65.8	131.6	2"	F	5.75"	3.20"	10.63"	F=6"	2.90	H	27.50	10,000	10,000	10
50/G	1825	2.64	66.05	264.2	2"	F	5.55"	3.00"	7.90"	F=6.5"	0.15	A	24.20	10,000	10,000	10
80/G	1830	11.00	141.00	396.25	3"	F	5.55"	3.70"	8.90"	F=7 1/2"	0.30	A	27.5	10,000	10,000	10
100/G	1835	5.26	263.2	790.0	4"	F	7.90"	4.30"	9.85"	F=9"	0.40	A	43.70	10,000	10,000	10
150/G	1840	26.32	657.9	1535	6"	F	8.50"	5.60"	11.80"	F=11"	0.30	A	71.60	100,000	100,000	100
200/G	1845	43.86	1096.5	2631	8"	F	8.50"	6.80"	13.75"	F=13 1/2"	0.20	A	99.20	100,000	100,000	100
250/G	1850	53.00	1761.0	4400	10"	F	11.00"	8.00"	19.75"	FL	0.20	A	260.0	100,000	100,000	100
300/G	1855	66.00	2642.0	5284	12"	F	10.25"	9.50"	19.75"	FL	0.20	A	300.0	100,000	100,000	100

C = Water Meter coupling NPT with locking nuts and gaskets

F = Flanged connections with gaskets ANSI Standard B16.1 (150 lb.)

H = Horizontal flow only

A = Any flow direction (Horizontal, vertical, up or down)

Dimensions - see diagram on page 2

Flow range - see accuracy chart on page 2

Pressure drop = Pressure change at continuous flow rate

Section 7 - HOW TO SELECT A BTU METER

	<u># Pieces Per System</u>
A. Calculating Unit (includes Microprocessor, Display & 2 Sensors) - #4001 (10' Probe) OR #4002 (15' Probe) OR #4003 (30' Probe)	1
B. Power Supply for BTU Calculating Unit - #4010 (24 Volt Converter) OR #4011 (1 Year Battery) OR #4016 (6 Year Battery)	1
C. Temperature Sensor Wells - 3/8" NPT - #4020 (for flowmeter pipe sizes to 1-1/2") OR #4022 (for flowmeter pipe sizes 2" & up)	2
D. Flowmeter with Pulse - See Flowmeter Listing (above) Important Information to Check: Minimum to Maximum Flowrate, Maximum Temperature, Maximum Pressure & Pipe Size.	1

SECTION 8 - MICROPROCESSOR READINGS

WHAT YOU CAN READ ON THE MICROPROCESSOR BTU METER

THE FLEXIBILITY OF THE MICROPROCESSOR BTU METER CAN GIVE YOU NOT ONLY ACCUMULATED BTU'S BUT ADDITIONAL IMPORTANT INFORMATION ON MEASURING ENERGY. THE DISPLAY NORMALLY SHOWS ACCUMULATED BTU'S. THE STEPPING SWITCH CAN SHOW YOU ALL THE OTHER SPECIFICATIONS. ON THE UPPER EDGE THERE ARE POINTERS TO INDICATE FLOW IN GALL/H, TGALL DEGREES CENTIGRADE, AND ACCUMULATED BTU'S.

PHASE ONE -- FAST ACTIVATION OF STEPPING SWITCH

A ONE-SECOND ACTIVATION WILL DISPLAY THE FOLLOWING:

1. **ALWAYS DISPLAYED:** ACCUMULATED BTU'S (X 1000, 10,000, OR 100,000)

2. **DISPLAY SEGMENT TEST:** (THIS ALLOWS YOU TO SEE ALL THE INDIVIDUAL SEGMENTS OF THE DISPLAY TO VERIFY THAT EVERYTHING IS WORKING CORRECTLY)

(**THE FOLLOWING READINGS NEED LOCAL PROGRAMMING, OTHERWISE DO NOT APPLY)

3. ****ACCUMULATED BTU'S UNTIL NOW** (SINCE LAST PROGRAMMED READING)

4. **TIME OF ERROR** (IN CASE OF PROBLEM, NUMBER OF DAYS RECORDED)

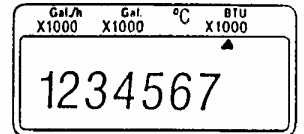
5. ****DATE OF READING**

6. **ACCUMULATED FLOW - TOTAL VOLUME**

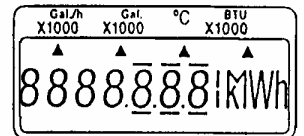
7. **ERROR INDICATION:**

- F-1 = HIGH TEMPERATURE
- F-2 = LOW TEMPERATURE
- F-3 = ELECTRONIC UNIT
- F-4 = POWER SUPPLY

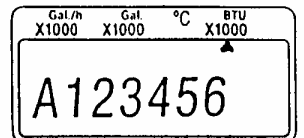
1.



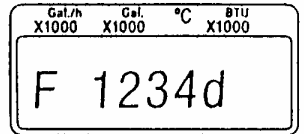
2.



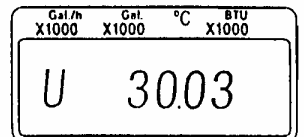
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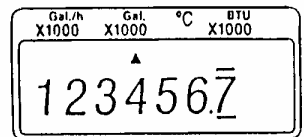
4.



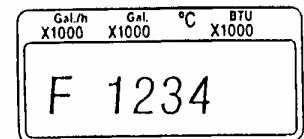
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6.



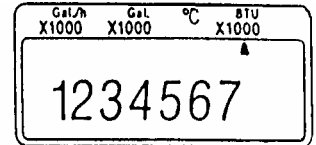
7.



PHASE TWO--SLOW ACTIVATION OF STEPPING SWITCH

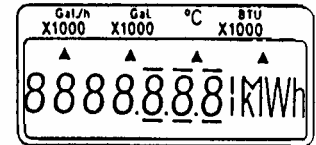
A FOUR SECOND OR LONGER CONTACT CLOSURE OF THE STEPPING SWITCH WILL DISPLAY A DIFFERENT SEQUENCE OF DETAILS WHICH ARE AS FOLLOWS:

1. **ALWAYS DISPLAYED:** ACCUMULATED BTU'S



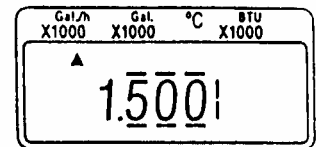
1.

2. **DISPLAY SEGMENT TEST**



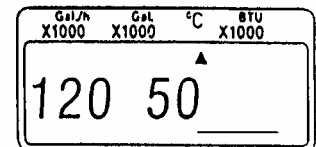
2.

3. **FLOW RATE IN GALLONS/HR**



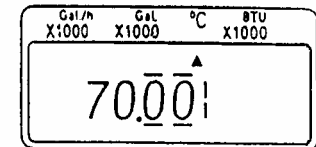
3.

4. **HIGH AND LOW TEMPERATURE MEASURED WITH SENSORS IN DEGREES CENTIGRADE**



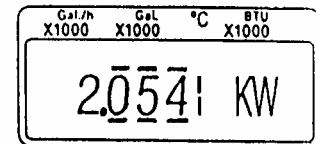
4.

5. **TEMPERATURE DIFFERENCE (BETWEEN SUPPLY AND RETURN-DELTA T) IN DEGREES CENTIGRADE**



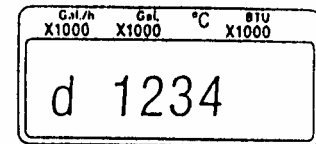
5.

6. **MOMENTARY ENERGY** (IF YOU NEED KW multiply by 3.785)
(IF YOU NEED BTU multiply by 12.92)



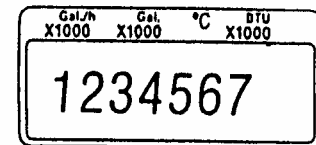
6.

7. **DAYS OF OPERATION**



7.

8. **SERIAL NUMBER OF THE BTU METER**



8.

RETURN TO ACCUMULATED BTU'S (SEE #1)

ENERGY SAVINGS ARE MEASURABLE