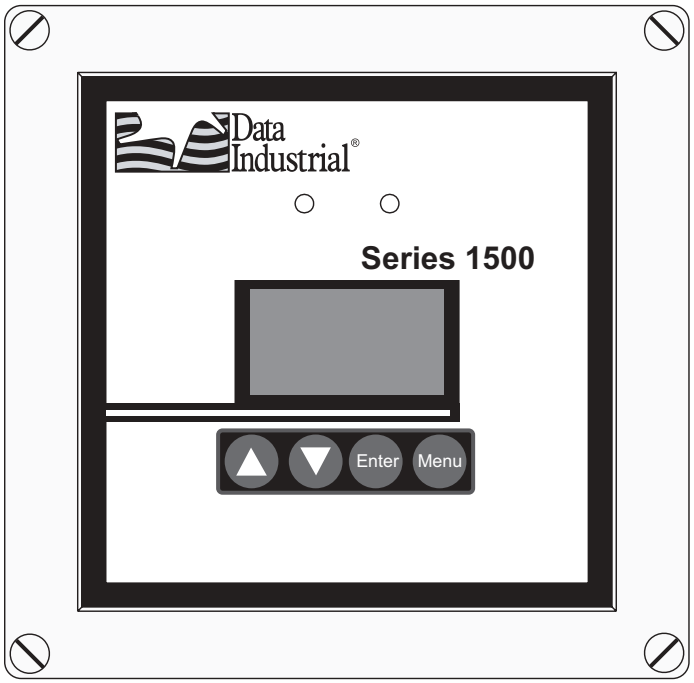

Series 1550

Btu Meter
by Data Industrial
Owners Manual

Introduction

The Data Industrial 1550 Energy Monitor is an economical full featured compact unit designed for sub-metering applications.

The 1550 provides a display of energy rate, energy total, or flow rate on a two line x 8 character alphanumeric LCD. The 1550 display can be configured by the user to display energy rate in kBtu/hr or kW, energy total in Btu, kBtu, MBtu, kWh, MWh, or kJ, and flow rate in gpm or lpm.

The unit requires two 10 kΩ thermistors for temperature input. The flow sensor input can be any Data Industrial sensor or any other pulse or sine wave signal flow sensor.

The user programs the flow sensor from the front panel by entering a “K” and offset or only a “K” factor, depending on the flow sensor used.

All user programming is menu driven by the 1550. Following displayed directions, the user enters all data from the four button front panel. A password lockout feature is standard on all units. This lockout restricts access to calibration and troubleshooting routines. The lockout routines include (a.) totalizer reset, (b.) flow sensor, energy pulse and analog output calibrations, (c.) a feature allowing zero calibration of the two temperature inputs to any equilibrium temperature and (d.) display of the two temperature inputs (in user selected °F or °C units of measure).

The 1550 uses an Infinite Impulse Response Filter (IIRF) feature to smooth the calculation of flow, temperature and energy. Data Industrials use of this proprietary smoothing software provides the most accurate energy calculations considering the wide variety of application variables.

Standard output is a 50mS to 5 second pulse, user programmed to transmit energy total.

Optional energy total outputs include a relay contact closure or opto-isolated open collector signal. Additional options include analog energy rate outputs, either a 0-10vdc non-isolated signal or an isolated 4-20mA loop powered signal. All output options are also user programmable from the front panel.

An additional feature of the 1550 is its permanent storage of the last calculated energy total in the event of a power failure. This total can be read out of the unit before restarting the system.

Like the Data Industrial Series 1500 Flow Monitor, the Series 1550 Energy Monitor operates from a 12 to 24 VDC supply. As a panel meter the unit has a NEMA 4X rated front panel and conforms to DIN standard 96mm x 96mm dimensions, for meter sizes and cutouts. The 1550 is also available in a NEMA 4X wall or sensor mount version.

Series 1550 Ordering Matrix

EXAMPLE:	1550	-	x	x	x
SERIES					
Btu Meter	1550				
OPTION-TRANSMITTER ENERGY RATE					
No Option			0		
Analog Output- Isolated 4-20mA Loop			1		
Analog Output- Non-Isolated 0-10 VDC			2		
OPTIONS-PULSE ENERGY TOTAL					
No Relays- Open Collector Output				0	
1 Relay				1	
1 Totalizer Opto-Isolater				2	
MOUNTING					
Panel Mount, NEMA 4X Front Panel					0
Wall Mount, NEMA 4X					1

Options

- Control relay- SPST mechanical relay, 1 available: Programmable for energy totalization.
- Opto-isolator - Open collector programmable for energy totalizator.
- Analog outputs- isolated current sinking 4-20 mA or non-isolated 0-10 VDC, programmable from the keypad for energy rate.

Data Industrial®
A BadgerMeter, Inc. Company

PN# 72013
REV B2 08/20/03

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Installation

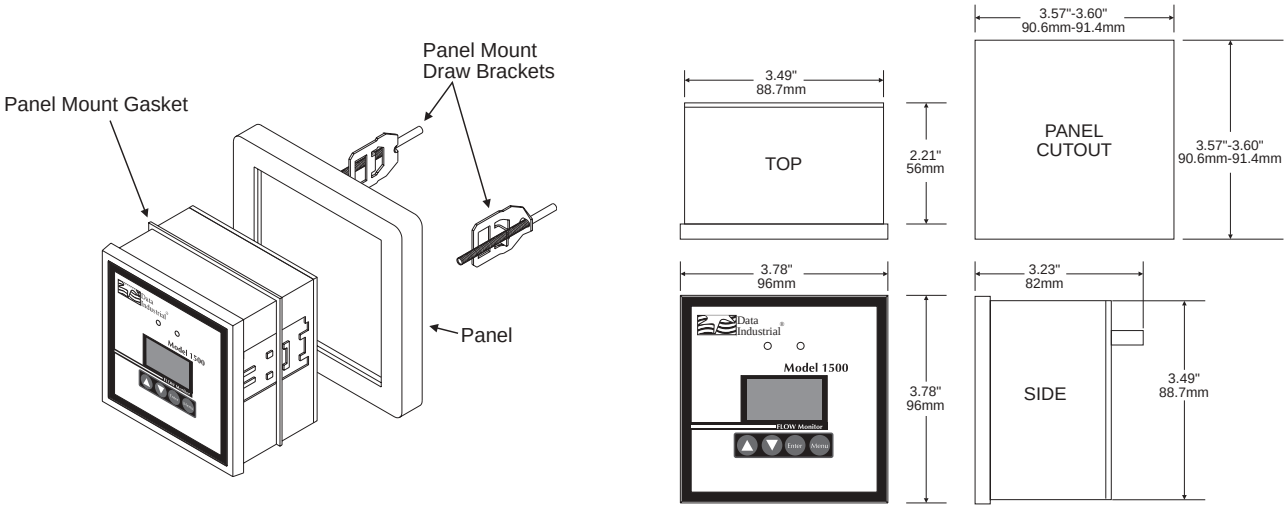
Mechanical Installation

The Series 1550 can be either panel mounted or wall mounted.

Location

In any mounting arrangement, the primary concern is easy viewing and convenient operation of the keypad. The unit generates very little heat, so no consideration need be given to cooling or ventilation.

Figure 1: Panel Mounting Dimensions For Series 1550 Installation



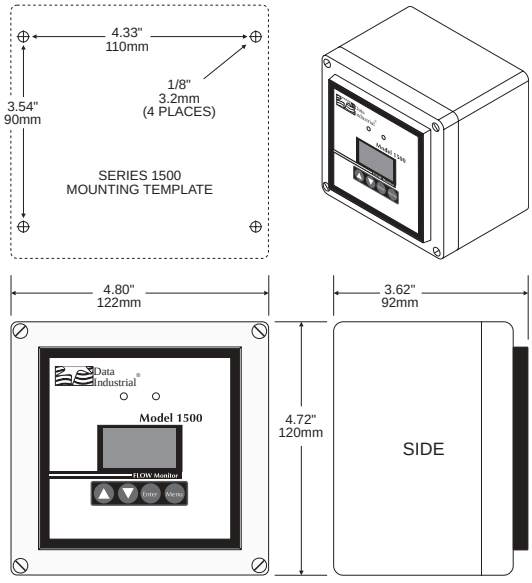
Panel Mount Installation

The Model 1500 Panel Mount is designed for through panel mounting, which allows access to the back of the unit. The 1500 is secured to the panel by two draw brackets shown in Figure 1 below. Refer to Figure 1 for flow monitor and panel cutout dimensions.

Wall Mount Installation

The Model 1500 Wall Mount is designed to mount onto a wall with 4 bolts or screws. The mounting hole pattern and box dimensions for the Model 1500 NEMA 4x wall mount are shown right in Figure 2.

Figure 2: Wall Mounting Dimensions For Series 1500 Installation



Electrical Installation

Power Supply Wiring

The Series 1500 requires 12-24 VDC to operate. Refer to Figure 3 on page 3 for location of power supply input on terminal strip.

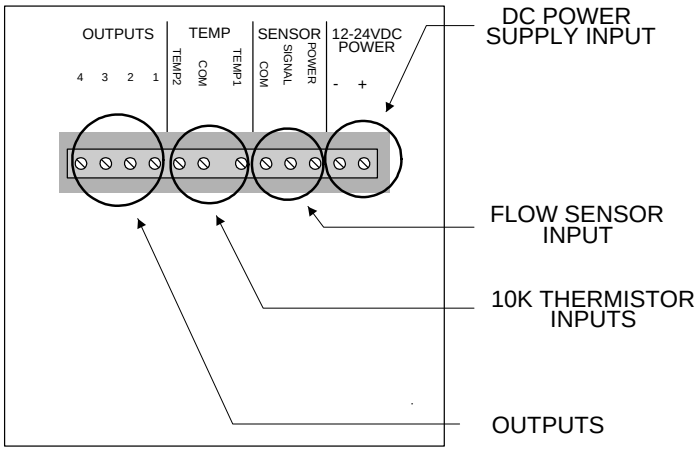
Connect the positive lead of the power supply to the Series 1500 terminal marked (+) and connect the negative lead of the power supply to the Series 1500 terminal marked (-).

If a Data Industrial plug-in power supply (Model A1026, A-503) is being used connect the positive lead to the terminal marked (+) and the negative lead to the terminal marked (-).

Sensor Location and Wiring

The temperature sensor location to the flow sensor location is important to the accuracy of the Btu calculations in the Series 1550. The T1 temperature sensor must be located downstream (approx 5 pipe diameters) of the flow sensor for greatest accuracy. The Series 1500 Flow Sensor Input can accept either a pulse input (Data Industrial 200 Series, 4000 Series) or a sine wave input (Data Industrial M Series, other magnetic sensors). All parameters are set with the LCD/keypad interface and there are no jumpers to change. Refer to Figure 3 right for sensor input connections.

Figure 3: Rear Panel Connections and Options Configuration Table



Data industrial Flow Sensor Wiring

For wiring instructions below, refer to Figure 3 for location of the sensor input on terminal strip.

OPTION TERMINAL NUMBERS

Models	Option	4	3	2	1
1550-x0x	Std Pulse	-	-	Pulse -	Pulse +
1550-x1x	Relay	-	-	Relay Com	Relay N.O.
1550-x2x	Opto-Isolat	-	-	Pulse -	Pulse +
1550-0xx	No Option	-	-	-	-
1550-1xx	4-20mA Out	Loop -	Loop +	-	-
1550-2xx	0-10VDC Out	Loop -	Loop +	-	-

200 Series:
Connect Red wire to **SENSOR SIGNAL**, Black wire to **SENSOR COM**, and Bare wire (Not Present in "IR" Sensors) to **SENSOR COM**.

4000 Series:
Connect Red wire to **SENSOR POWER**, Black wire to **SENSOR COM**, Clear wire to **SENSOR SIGNAL**, and Bare wire to **SENSOR COM**.

Temperature Element Wiring

Electrical Power to the Model 1550 must be off before the temperature elements can be connected. The Data Industrial thermistors are not polarity sensitive. The Model 1550 temperature sensor inputs are set by LCD\Keypad interface. Take note of high and low temperature thermistors before wiring. Reference Figure 3 above for sensor terminal strip location.

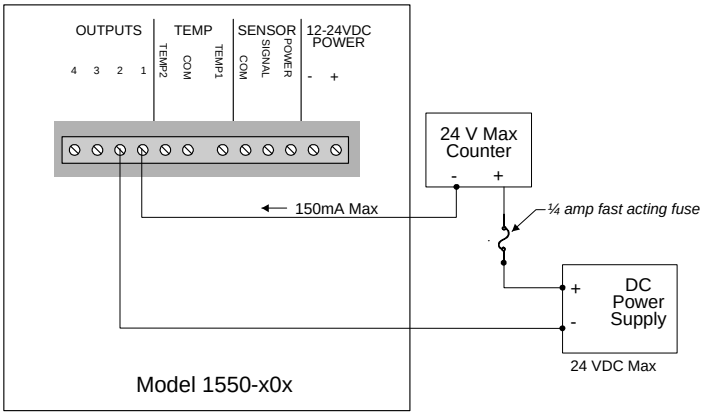
Wiring to Data Industrial 10K Thermistors

1. Disconnect power from Model 1550.
2. Connect **High Temperature Thermistor** wires to Model 1550 terminals marked **TEMP1** and **COM**.
3. Connect **Low Temperature Thermistor** wires to Model 1550 terminals marked **TEMP2** and **COM**.
4. Connect power to Model 1550 and refer to programming section of this manual Btu setup.

Pulse Output or Relay Output Wiring

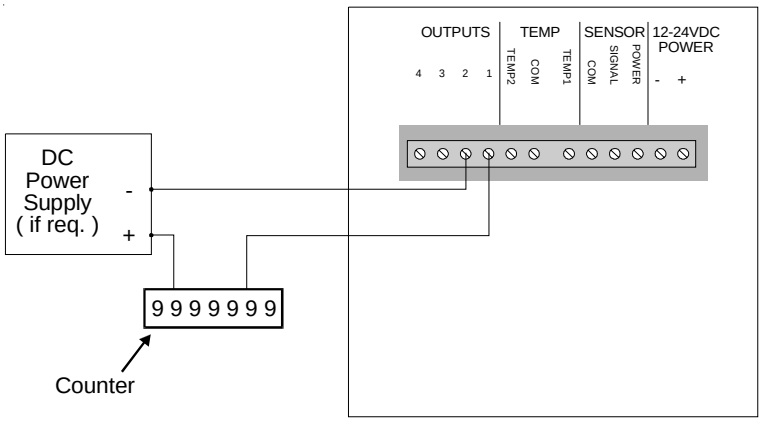
The Series 1500 has three available types of digital outputs; open collector transistor, opto-isolator, or (optional) relay closure. The base pulse function is an open collector transistor pulse with a maximum sinking current of 150 mA @ 24 VDC. The (optional) relay closure output is a SPST contact rated 2.0 amps @ 250 VAC or 30 VDC. The Totalizer output is a 100 millisecond energy pulse output. To program digital outputs reference page 7 for flow charts and page 5-6 for programming examples.

Figure 4: Pulse Output Wiring Example



Wiring to Pulse Output

1. Remove power from Model 1500 and counter power supply.
2. Locate the **OUTPUTS TERMINAL** on the Model 1500, reference Figure 3 page 3.
3. Connect negative terminal of counter to Model 1500 **OPTIONS** (PULSE +) terminal marked **1**.
4. Connect negative terminal of counter power supply to **OPTIONS** (PULSE -) terminal marked **2** of Model 1500.
5. Connect positive terminal of counter power supply to positive terminal of counter. (¼ Amp fuse recommended).
6. Reconnect power to Model 1500 and counter power supply.



Wiring to Relay Output

1. Remove power from Model 1500 and solenoid power supply.
2. Locate the **OUTPUTS TERMINAL** on the Model 1500, reference Figure 5 above.
3. Connect common of counter power supply to Model 1500 **OPTIONS** (RELAY 2) terminal marked **1**.
4. Connect one side of counter to **OPTIONS** (RELAY 2) terminal marked **2** of Model 1500.
5. Connect load of counter power supply to other side of counter.
6. Reconnect power to Model 1500 and counter power supply.

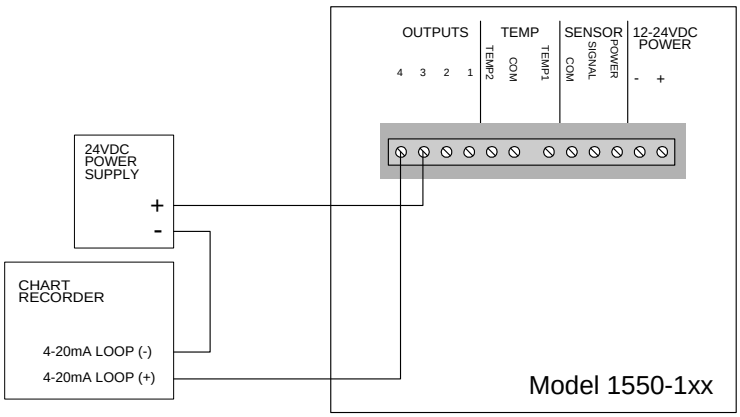
Analog Output Wiring

The Series 1500 has two optional analog outputs available. Refer to ordering matrix on page 1 for options installed. The analog ***4-20 mA output is a current sinking device so a loop power supply is required.***

Analog Output Wiring

1. Remove power from Model 1500 and loop power supply. Refer to figure 6 for wiring instructions.
2. Locate the **OPTIONS TERMINAL** on the Model 1500, reference Figure 3 on page 3.
3. Connect loop power supply positive terminal (+) to Model 1500 **OPTIONS** (loop +) terminal marked **3**.
4. Connect **OPTIONS** (loop -) terminal marked **4** of Model 1500 to positive analog terminal of input device (Chart Recorder, PLC, etc.).
5. Connect negative analog terminal of input device to loop power supply negative .
6. Reconnect power to Model 1500 and loop power supply.

Figure 6: Analog Output Wiring Example



Programming Notes
The Model 1550 Btu monitor has four keys on the front panel for programming. Two of the keys serve a single function, while the other two have a dual purpose.
When the Model 1550 is first powered up, it displays the current software revision, then defaults to the operating display. The ***Enter and DnArrow*** keys are not functional in this mode **(Operations Mode)**. Pressing the ***UpArrow*** Key while in the operations mode will allow the user to scroll through the display rate or total displays. Pushing the ***Menu*** key from the operating screen brings up the programming menu **(Programming Mode)**. In this mode, the two ***Arrow*** keys are used to toggle between the programming options. Pressing the ***Enter*** key completes the selection. The ***Menu*** key can be pressed at any time to return the display to the previous level.

TO ANSWER A "YES/NO" QUESTION:
Press the ***Up*** or ***Down Arrow*** for ***"YES"*** or ***Enter*** or ***Menu*** Keys for ***"NO"***.

TO ENTER DATA:
The display will show the existing values, with a cursor below the character to change.
Pressing the ***Up Arrow*** key increases the numerical value or the letter of the alphabet. Pressing the ***Down Arrow*** key decreases the alpha-numerical value. Pressing the ***Enter*** key moves the cursor to the next place to the right. Data entry is completed by pressing the ***Enter*** key. Decimal Points are entered in any of the positions by scrolling the value past zero.
After entering calibration data or units of measurement, a message will appear ***"STORE?"*** warning that continuing will reset the totals. The user will be asked to respond **"YES"** or **"NO"**.

TO SELECT CHOICES:
The display will show one of the choices on the bottom line. Pressing the ***Up*** or ***Down Arrows*** will scroll through the available choices. Data entry is completed by pressing the ***Enter*** key. To exit Press ***Menu*** Key.

EXAMPLES:

In order to understand the programming procedure, this section will outline the keystrokes necessary to perform several common programming steps.

To calibrate for a Data Industrial flow sensor:
The Data Industrial flow sensor is a pulse type flow sensor and the sensor "K" and "offset" must be known before programming. The "K" and "offset values are in the flow sensor owners manual. program as follows:

Press ***Menu***, then ***DnArrow — DnArrow — Enter — Enter.*** *Press the* ***Up*** or ***Down arrow*** key so the value pulse is seen on the screen then press ***Enter*** to select and press ***Menu*** to back out of the type menu. Then press the keys ***DnArrow — Enter,*** then enter the "K" number from the table in the Sensor Owner's Manual then press ***Enter*** and answer **YES** to the ***STORE?*** Question by pressing either ***UpArrow*** or ***DnArrow***. Then press the keys ***DnArrow — Enter ,*** and enter offset from the table in the Sensor Owner's Manual, then press ***Enter*** and answer **YES** to the ***STORE?*** Question by pressing either ***UpArrow*** or ***DnArrow*** to complete. Press ***Menu*** Key **2 times** to return to **operation display**.

To select the units of measurement for temperature:
Press ***Menu***, then ***DnArrow — Enter — Enter,*** Then scroll through the choices with the ***Up*** or ***Down arrow*** keys. When the chosen unit is displayed, press the ***Enter*** key to complete. Press ***Menu*** Key **3 times** to return to **operation display**.

To select the units of measurement for flow rate:
Press ***Menu***, then ***DnArrow — DnArrow — DnArrow — Enter,*** then scroll through the choices with the ***Up*** or ***Down arrow*** keys. When the chosen unit is displayed, press the ***Enter*** key to complete. Press ***Menu*** Key **two times** to return to **operation display**.

To select the units of measurement for energy rate:
Press ***Menu***, then ***DnArrow — DnArrow — DnArrow — DnArrow — Enter,*** then scroll through the choices with the ***Up*** or ***Down arrow*** keys. When the chosen unit is displayed, press the ***Enter*** key to complete. Press ***Menu*** Key **2 times** to return to **operation display**.

To select the units of measurement for energy total:
Press ***Menu***, then ***DnArrow key 5 times — Enter — Enter,*** then scroll through the choices with the ***Up*** or ***Down arrow*** keys. When the chosen unit is displayed, press the ***Enter*** key to complete. Press ***Menu*** Key **3 times** to return to **operation display**.

To select the units/pulse of totalizer pulse:
The pulse output is a function of energy total and will pulse every X amount of Btu or kWh. Press ***Menu***, then ***DnArrow key 6 times — Enter,*** then enter the desired units/pulse number, then press ***Enter*** and answer the ***STORE?*** Question. Pulse width is always 100 milliseconds. Press ***Menu*** Key to return to the **operation display**.

To select the contrast:
Press ***Menu***, then ***Enter,*** Then scroll through the choices with the ***Up*** or ***Down arrow*** keys. The display will change its contrast showing a sample of what it will look like while scrolling through its choices. When the display contrast looks acceptable press the ***Enter*** key to complete. Press

Menu Key **2 times** to return to **operation display**.

To select the led function:
The front panel led can be set to monitor the sensor pulse input or the energy pulse output, set as follows:
Press ***Menu***, then ***DnArrow key 7 times — Enter,*** then scroll through the choices with the ***Up*** or ***Down arrow*** keys. When the chosen unit is displayed, press the ***Enter*** key to complete. Press ***Menu*** Key **2 times** to return to **operation display**.

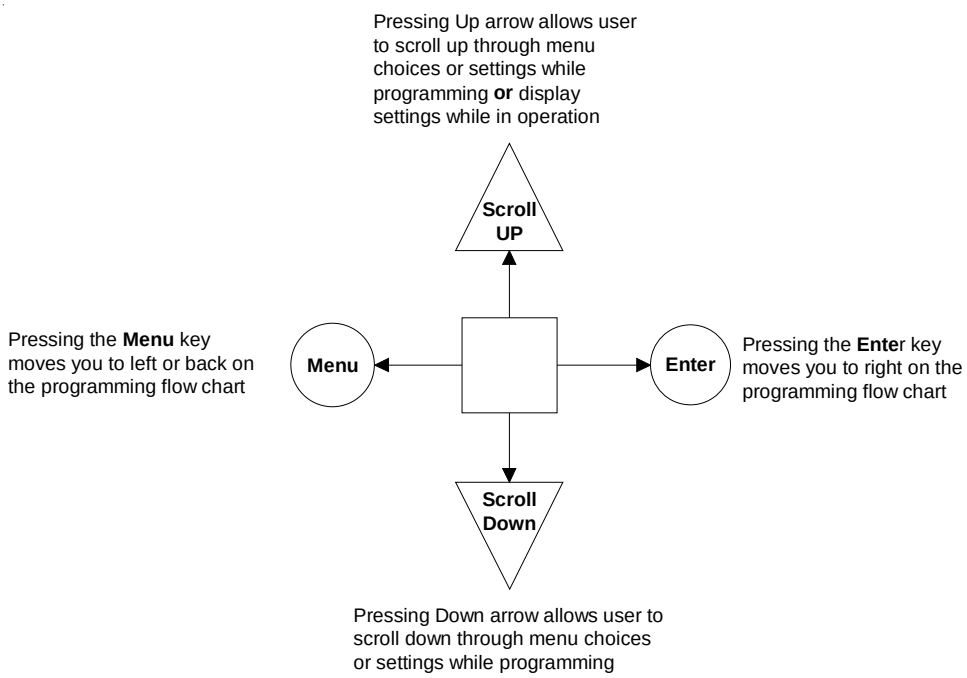
To select the display update rate:
Press ***Menu***, then ***DnArrow key 8 times — Enter,*** then scroll through the three choices with the ***Up*** or ***Down arrow*** keys. When the chosen unit is displayed, press the ***Enter*** key to complete. Press ***Menu*** Key **2 times** to return to **operation display**.

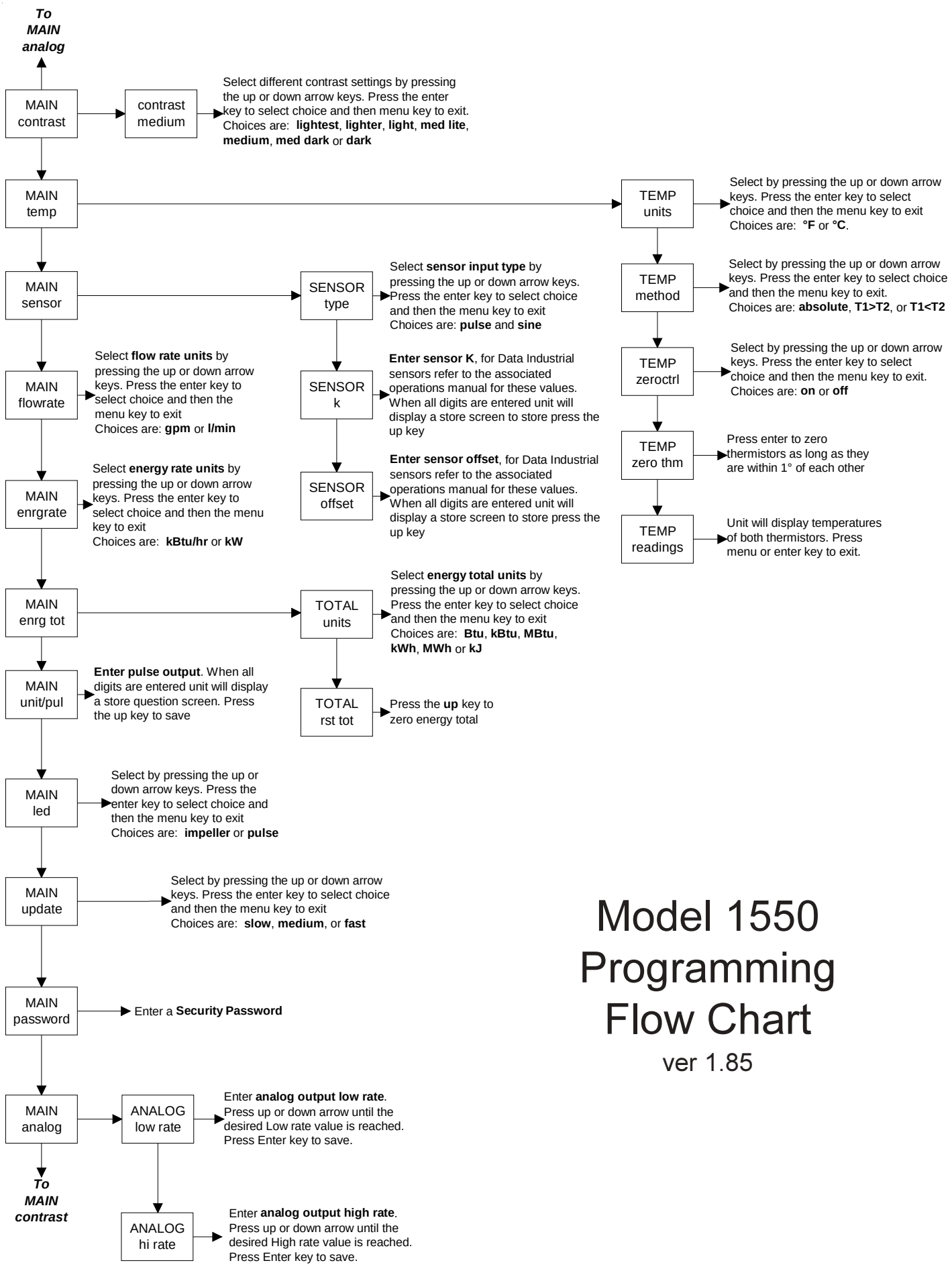
To set a password:
Press the ***Menu*** key, then the press the ***DnArrow key 9 times*** then press ***Enter,*** unit will then ask you to verify password. Enter in old password. ***By default the password is aaaa which means no password.*** Then enter in new password. If you forget password consult factory for assistance. Press ***Menu*** Key to return to **operation display**.

To set optional analog output:
Press ***Menu***, then ***DnArrow key 10 times — Enter — Enter,*** then select the low rate analog value by pressing either ***UpArrow*** or ***DnArrow*** until the desired value is displayed then press **Enter** to save then press **Menu** to back out of the analog output low rate programming. Then press the keys ***DnArrow — Enter ,*** then select the High rate analog value by pressing either ***UpArrow*** or ***DnArrow*** until the desired value is displayed then press **Enter** to save then press **Menu** to back out of the analog output high rate programming. Press ***Menu*** Key **2 times** to return to **operation display**.

Changing Operations Display:
The Model 1550 has three different display options while in the operation mode. They are flow rate, energy rate, and energy total. To change the displayed values press the UpArrow key while in the operation mode which allows the user to scroll through the rate and total units.

Figure 7: Panel Button Guide





Model 1550 Programming Flow Chart

ver 1.85

Specifications: Series 1550

Power:
- power supply :
  +12-24 VDC (10.5 to 26 VDC)
  with voltage analog output option
  +15-26 VDC
- current draw:
  basic unit / 12VDC- 50 mA
  basic unit/ 24VDC- 60 mA
  analog output option- add 30 mA
  relay output option- add 40 mA
  opto-iso output option -add 10 mA

Display:
- 8 characters by two lines, alphanumeric, dot matrix LCD display with variable contrast
- STN (Super-Twisted Nematic) display

Operating Temperature:
-4°F to +158°F (-20°C to +70°C)

Storage Temperature:
-40°F to +185°F (-40°C to +85°C)

Dimensions:
- Panel Mount
  3.78”W X 3.78”H X 3.23”D
  96mmW X 96mmW X 63mmD
- Wall Mount
  4.80”W X 4.72”H X 3.63”D
  122mmW X 120mmH X 92mmD

Weight:
- Panel Mount - 8.5 oz max.
  Wall Mount - 19 oz. max.

Flow Sensor Input:
Digital Sensors:
- signal amplitudes:
  2.5 VDC threshold
- signal limits:
  -24 volts < V in < V (power supply)
- frequency input range:
  0.4 to 160 Hz
- pull-up :
  2kΩ

Sine Wave Sensors:
- signal amplitude:
  10 mV p-p threshold
- signal limits:
  -24 volts < V in < V (power supply)
- frequency:
  0.4 to 160 Hz
- input impedance:
  10 KΩ

Sensor Calibration:
- Data Industrial "K" and offset

Other Flow Sensors:
- "K" or "K" and offset

Temperature Sensors:
- 10kΩ Thermistor
  2 required

Totalizer (energy total):
- range: .000001 to 9,999,999

Data Update Rate:
- **slow**, **medium**, or **fast**
  corresponding to 2 sec, 1 sec, and instantaneous.

Pulse Output: (Energy Total)
- open collector transistor pulse user configurable to any units
- 50 mS to 5S pulse width in increments of 50mS
- maximum sinking current
  150 mA @ 24 VDC

Units Of Measure:
Energy Total
- user selectable as Btu, kBtu, MBtu, kWh, MWh, or KJ with one pulse set to .000001 to 9,999,999

Energy Rate
- user selectable as kBtu/hr or kW

Flow Rate
- user selectable as GPM or LPM

Temperature
- user selectable as °F or °C

Option Specifications:
Relays (Energy Total Only):
- Relay output
  SPST 3.0 amps @ 250VAC
- Opto-isolated open collector

Analog Output: (Energy Rate Only)
- 4-20mA loop powered isolated
  Minimum voltage: 7 VDC
  Maximum voltage: 30 VDC
- 0 - 10 VDC non isolated

Factory Defaults

Listed below are the factory defaults for the Series 1500. Next to the defaults are lines so your custom settings can be recorded.

	Default Value	Customer Value		Default Value	Customer Value
Main Temp Units	°F		Main Energy Total Units	Btu	
Main Temp Method	absolute		Main unit/pulse	0	
Main Sensor "K"	1		Main Password	aaaa	
Main Sensor offset	0		Main Contrast	medium	
Main Sensor Type	pulse		Main Update	slow	
Main Flow Rate Units	gpm		Main Led	impeller	
Main Energy Rate Units	kBtu/hr		Analog Low	0	
			Analog High	10000	
Model Number					
Serial Number					

Warranty

Data Industrial Corporation ("Seller") of 11 Industrial Drive, Mattapoisett, Massachusetts 02739-0740, U.S.A., warrants to the original purchaser of its product that such product manufactured by Data Industrial Corporation shall be free from defects in materials or workmanship when installed, serviced and operated according to Data Industrial Corporation instructions or in other such normal use. This warranty is effective for a period of 12 months from the date of installation by the Purchaser or 18 months from the date of shipment by the "Seller" whichever occurs or terminates first. This limited warranty does not cover damage or loss resulting from corrosion or erosion caused by acids or other chemicals or by severe environmental conditions or negligent or improper installation or improper operation, misuse, accident, unauthorized repair or substitution of components other than those provided by the "Seller", and does not cover limited life components such as bearings, shafts, impellers where wear rate is a function of application and environment. Any component not manufactured by the "Seller" but included in its products shall not be covered by this warranty and is sold only under such warranty as the manufacturer may provide.

If Buyer or Purchaser wishes to make a claim hereunder, he shall send written notice of any defect within the warranty period, to "Seller" at the above address. "Seller" may at its sole option instruct Buyer to ship subject part, postage prepaid, to the "Seller" at above address or authorize a representative to inspect the part on site. "Seller" will at its sole option repair or replace any defective product covered by this warranty. If Buyer makes repairs or alterations to any product or part covered by this warranty without "Sellers" prior written approval, this warranty shall be null and void.

The foregoing shall constitute Buyers or Purchasers sole and exclusive remedy against "Seller", and no other remedy, including but not limited to, incidental or consequential damages for personal injury, loss of fluids, gases or other substances or for loss of profits or injury to property or person shall be available to the Buyer or Purchaser. The warranty extended herein shall be in lieu of any other implied warranty of merchantability or fitness for a particular purpose, and seller shall bear no liability for representatives or retail sellers. In no event shall Data Industrial Corporation be liable for any contingent, incidental, or consequential damage or expenses due to partial or complete inoperability of its product.

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