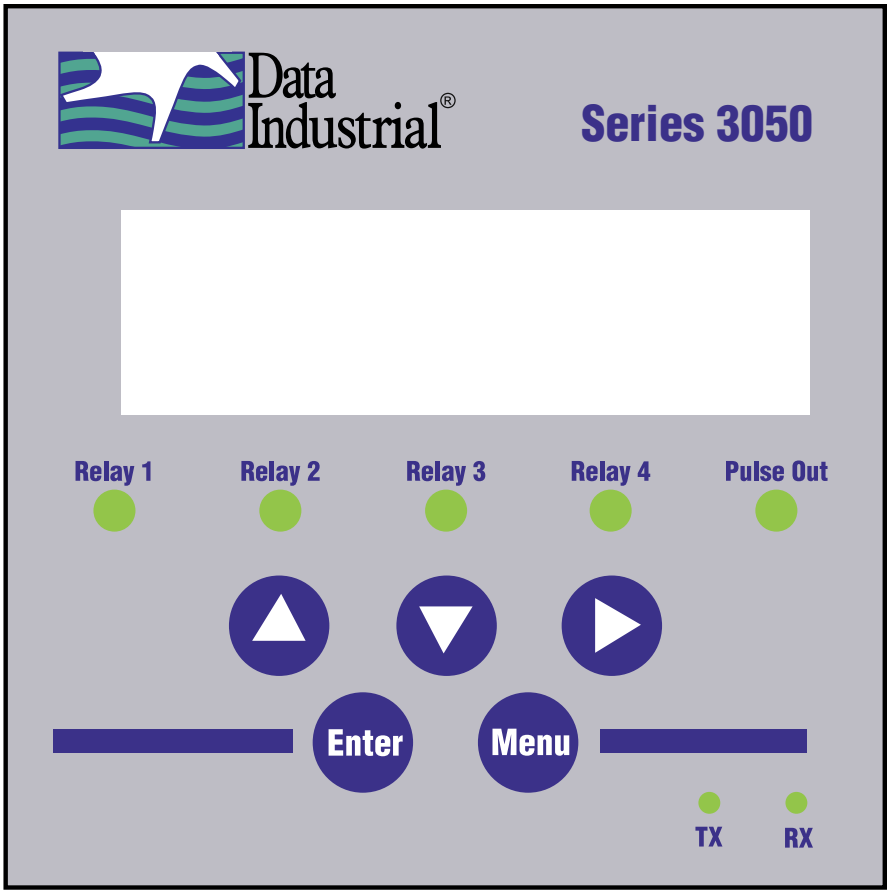
Badger® Data Industrial® Series 3050	Btu Monitor	Installation & Operation Manual



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INTRODUCTION

The Badger® Data Industrial® 3050 Energy Monitor is an economical full-featured compact unit designed for sub-metering applications. The two line x 16 character alphanumeric displays any combination of Energy Rate, Energy total, Flow Rate or Flow Total. Both pre-programmed and user defined units of measure can be configured by the user.

The Series 3050 accepts pulse, sine wave, or linear analog input signals. Like all Data Industrial flow monitors, the Series 3050 may be field calibrated by the user. For Data Industrial sensors “K” and “offset” numbers are entered, while other pulse or frequency output sensors may use a “K” factor only. Analog inputs are fully programmable for slope and intercept.

The unit requires two temperature units and can accept 10 K ohm thermistors, 100Ω Three Wire RTD’s or user defined custom thermistors or RTD’s.

The panel meter has a NEMA 4X rated front panel and conforms to DIN Standard dimensions,
96 mm X 96 mm, for meter sizes and panel cutouts. Optional NEMA 4 wall mount also available.

The user can program the flow sensor from the front panel by entering a "K" and offset or only a "K" factor, depending on the flow sensor used.

Programming is menu driven. All data is entered using the LCD/keypad interface. A password gate is included to prevent unauthorized access to programming parameters. Programming flexibility is extended to units of measure. In addition to several factory units of measure, the Series 3000 software permits the custom units for rate and total to be created by the installer.

The Series 3050 provides one Form C solid-state relay, and one solid-state switch output. Both are fully programmable as either Pulse/Volume, or Set-point control based Flow Rate, Flow Total, Energy Rate, Energy Total, Temperature 1, Temperature 2, or Delta T. For pulse output, the installer can program both the resolution, and the pulse width. Set-Point control is extremely versatile with fully independent set and release points each with its own time delay.

LED’s located on the front panel indicate status of both the Relay and Pulse Outputs.
All calibration information, units of measure and flow totals are stored in a non-volatile memory that does not require battery backup for data retention.

3050 Series Ordering Matrix

	Example:	3050	-	x	x
Series					
	Btu Monitor	3050	-		
Outputs	No Option			0	
	Analog Output, plus RS485 with BACnet and Modbus, and USB			1	
Mounting					
	Panel Mount, NEMA 4x Front Panel				0
	Wall Mount, NEMA 4x				1

Options available:
- Analog Output
- USB
- RS485
- BACnet
- Modbus
- Wall Mounting

INSTALLATION

Mechanical Installation:
The Series 3050 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. However, prolonged direct sunlight can damage the front panel so some level of shading is recommended, especially if installed in a tropical climate.

Panel Mount Installation
The Model 3050 Panel Mount is designed for through panel mounting, which allows access to the back of the unit. The 3050 is secured to the panel by two draw brackets shown in Figure 1 on the next page. Refer to Figure 1 for flow monitor and panel cutout dimensions.

Wall Mount Installation
The Badger® Data Industrial® Model 3050 Wall Mount is designed to mount onto a wall with four bolts or screws. The mounting hole pattern and box dimensions for the Model 3050 NEMA 4 wall mount are shown in Figure 2.

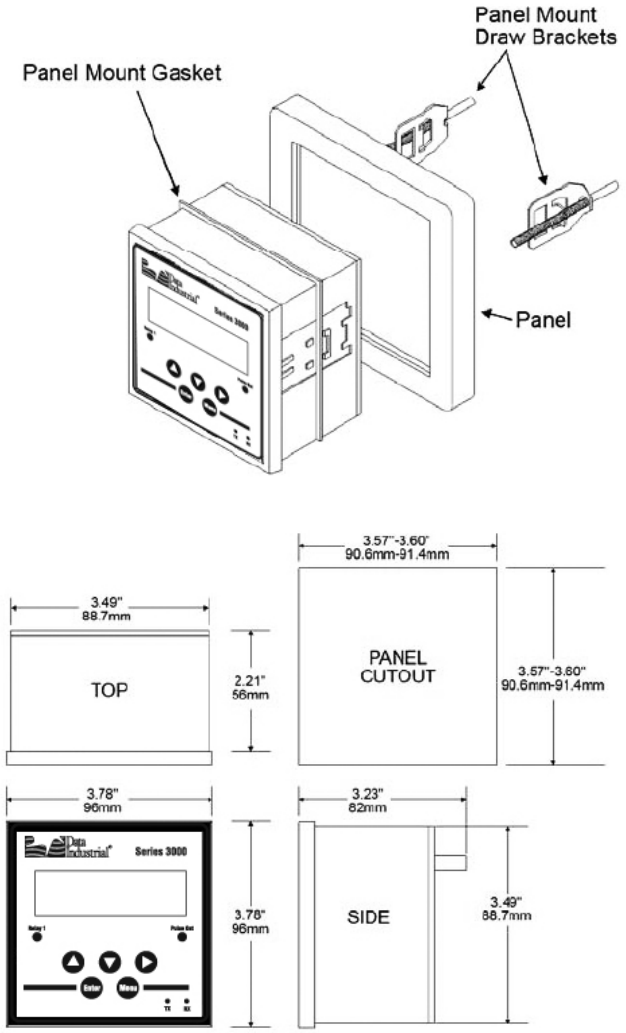


Figure 1: Panel Mounting Dimensions

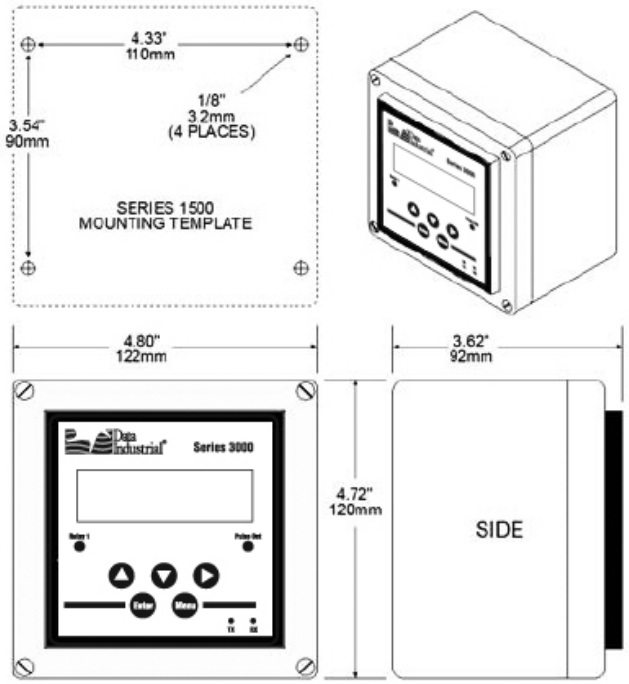


Figure 2: Wall Mounting Dimensions

ELECTRICAL INSTALLATION:

Power Supply Wiring

The Badger® Data Industrial® Series 3050 requires 12-24 VDC/VAC to operate. Check specifications page for DC current draw, and AC Volt-Amp requirements. A fused circuit is always recommended.

Connect the positive of the power supply to the Series 3050 terminal marked (ACL/DC+), and connect the negative of the power supply to the Series 3050 terminal marked (ACC/DC-).

If a Badger Data Industrial plug-in power supply (Model A1026, A-503) is being used connect the black-white wire to the terminal marked (ACL/DC+) and the Black wire to the terminal marked (ACC/DC-).

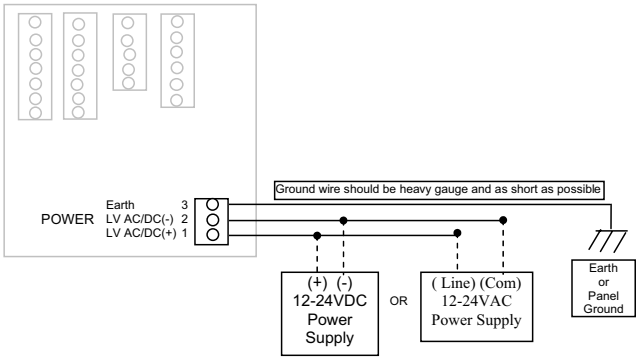


Figure 3: Power Supply Wiring

Flow Sensor Wiring
The Badger® Data Industrial® Series 3050 Flow Sensor Inputs are extremely versatile, designed to accept either two wire or three wire pulse inputs (Data Industrial 200 Series, SDI, or 4000 Series), zero crossing sine wave inputs, or Analog inputs. Although different rear panel terminals are used, all parameters are set with the LCD/ keypad interface. There are no internal or external jumpers, switches, or potentiometers to move or adjust.

Four types of Pulse Input Types are accommodated.
1. Pulse-DI: Used for all Badger Data Industrial Flow Sensors.
   Provides an internal Pull-Up resistor and uses “K” and “Offset” values for calibration.
2. Pulse –K Factor:
   Accepts non Zero Crossing inputs but provides no internal pull-up, classical “K” (Pulses/Gal) values for calibration.
3. Pullup-K Factor:
   Provides an internal Pull-Up resistor and uses classical “K” (Pulses/Gal) values for calibration.
4. Sine-K Factor:
   Accepts Zero Crossing low voltage sourcing devices, with classical “K” (Pulses/Gal) calibration.

All the above wire the same as shown in Figure 4. See Programming Flow Chart for required input configuration.

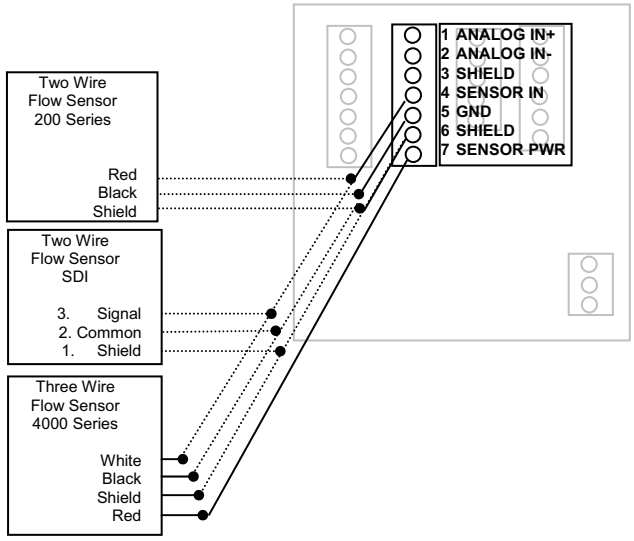


Figure 4
Data industrial Flow Sensor Wiring Examples (Two and Three Wire Pulse Types)

Analog Input
As an alternative to the Pulse Inputs the Series 3050 can accept a Analog input. The input is non-isolated, but can accept 0-1VDC ; 0-5VDC; 0-10VDC; 0-20mA; and 4-20mA with both factory defined, and custom units of measure. Low impedance 100 Ohm input for current inputs optimizes performance and flexibility or loop power supplies. Both the Low and High end scaling are independent, and field configured by the installer.

See Programming Flow Chart for required input configuration.

Analog Flow Sensor Input Wiring

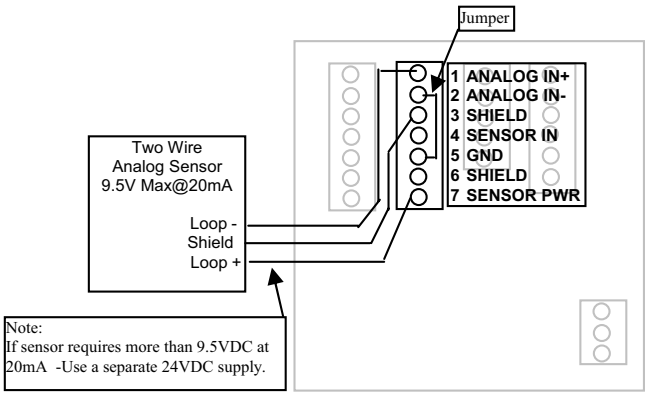


Figure 5
4-20mA Analog Loop Powered Wiring

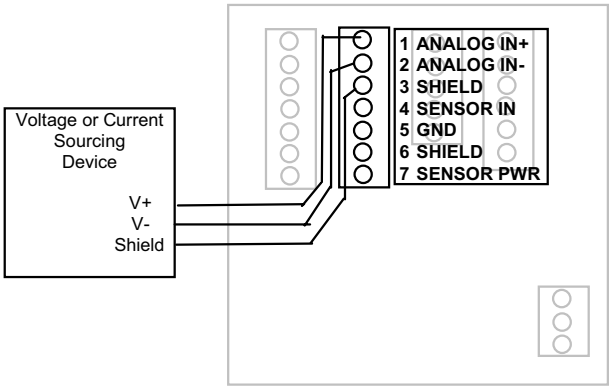


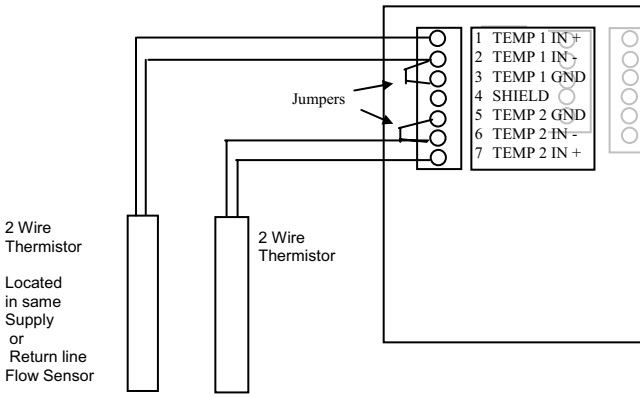
Figure 6
Voltage or Current Sourcing Analog Inputs

TEMPERATURE INPUT:
The Badger® Data Industrial® Series 3050 can accept inputs from either a pair of thermistors or RTD’s. The inputs are labeled T1 and T2. Since the T1 sensor is used to convert the volumetric flow (Example: GPM) to the mass flow (Example: Lbs/Hr) used in the Btu Calculations, the sensor connected to T1 should be in the same supply or return line as the Flow Sensor.

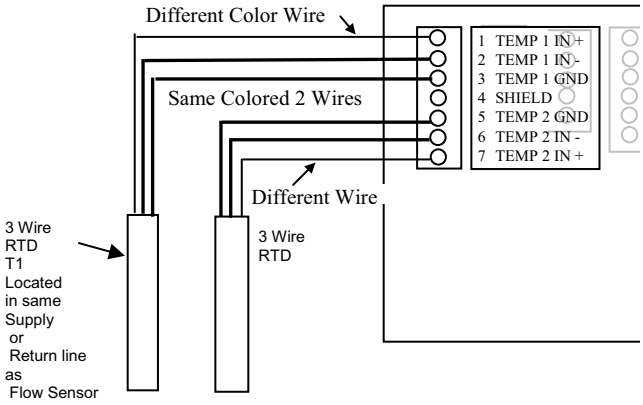
The temperature inputs of the 3050 are extremely versatile. In addition to the factory default two wire10k @77°F Type II Thermistors, and three wire 100 ohm Platinum RTD’s, the unit can be programmed in the field

for a wide variety of custom RTD's and thermistors. Refer to Programming Flow Charts. Contact the factory for assistance for any custom inputs.

Wiring Two Wire Thermistors and RTD's



Wiring Three Wire RTD's



Solid State Switch and Form "C" Output Wiring
The Badger® Data Industrial® Series 3050 has one Normally Open (N.O.) solid state switch, and one Solid State Form "C" Relay. Check the specifications page for maximum voltage and current ratings for each type output.

These outputs are completely independent, electrically isolated, and can be programmed as either Pulse, or Set-point outputs.

When the function "Totalizer" is selected the unit of measure and resolution are independent from the displayed units, and can be programmed where 1 pulse occurs once every 0000000.1 to 999999999.of units selected, with any pulse width from 0001 to 9999mS.

When the "Alarm" is selected the unit of measure and the resolution is independent from the displayed units, it allows the unit to be programmed as either a High or Low rate Set Point. Since the Set-point, Release Point, and there associated time delays are fully independent this output can be either a classical High Rate, or Low Rate alarm depending on the settings selected. When design-planning keep in mind that although both of these outputs can be programmed as alarm points only the Relay provides both N.O. and N.C. contacts. The switch is a simple N.O. contact.

Examples:

High Set-Point Control
The Set-Point "SETPT" must be a value greater than the Release Point "RELP."

The Relay output will have continuity between its "N.C". terminal and "COM" until the flow has exceeded the Set-Point "SETPT" for a continuous period of time exceeding the Set-Point-Delay "SDLY", at which time the N.C. connection with open, and the N.O. contact will have continuity to the "COM" terminal. When the flow has dropped below the Release Point "RELP" for a continuous period of time exceeding the "RDLY" the relay states will return to there original states. If the Latch has been set to "ON" once the set-point and set-delay have been satisfied the relay will not release until manually reset. Sources for the Set-Point Control can be Flow Rate, Energy Rate, T1, T2, or Delta T.

Low Set-Point Control
The Set-Point "SETPT" must be a value less than the Release Point "RELP."

The Relay output will have continuity between its "N.C". terminal and "COM" until the flow drops below the Set-Point "SETPT" for a continuous period of time exceeding the Set-Point-Delay "SDLY", at which time the N.C. connection with open, and the N.O. contact will have continuity to the "COM" terminal. When the flow has again risen above the Release Point "RELP" for a continuous period of time exceeding the "RDLY" the relay states will return to there original states. If the Latch has been set to "ON" once the set point and set-delay have been satisfied the relay will not release until manually reset. Sources for the Set-Point Control can be Flow Rate, Energy Rate, T1, T2, or Delta T.

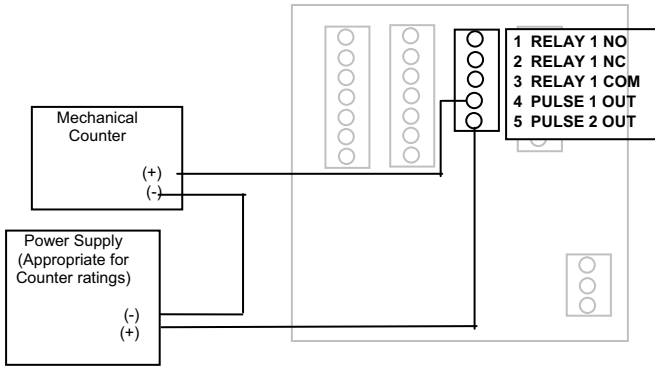


Figure 7
Relay and Switch Wiring Examples

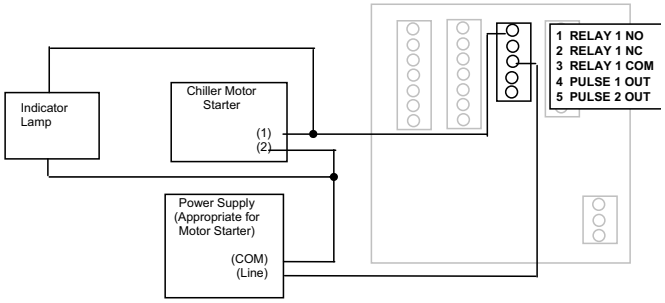


Figure 8
Relay and Switch Wiring Examples (continued)
Chiller Control based on High Energy Usage with indication

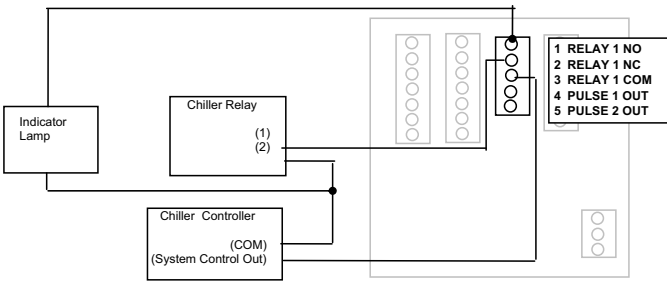


Figure 9
Chiller Control based on Low Temperature Warning with indication

OUTPUT OPTION CARD:
If the Badger® Data Industrial® Model 3050 was ordered with the Output Option card, it will have several additional outputs.
These include the following.

1. Analog Output (0-20mA; or 4-20mA) which can be converted externally to
   0-5VDC, 1-5VDC with a 250 Ohm resistor; or,
   0-10VDC or 2-10VDC with a 500 Ohm resistor.
   A 15VDC Power Supply is provided to permit current sinking or sourcing.
   The Series 3050 has special software that permits the Analog Output to be used as a PID Controller.
2. USB for direct access to a computer using a standard Mini-USB cable
3. RS-485 for fully addressable ModBus, or BACnet communication.

Analog Output Wiring

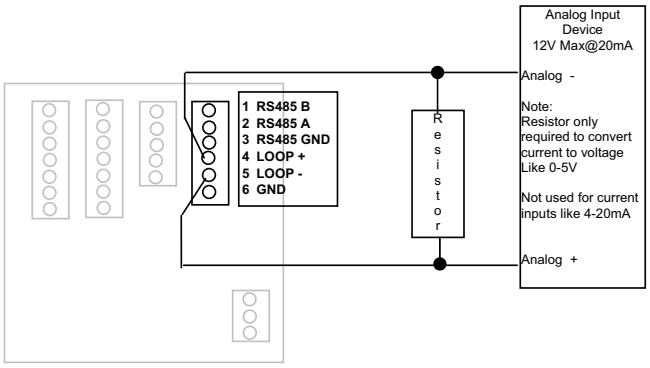


Figure 10
Current Sourcing Analog Output

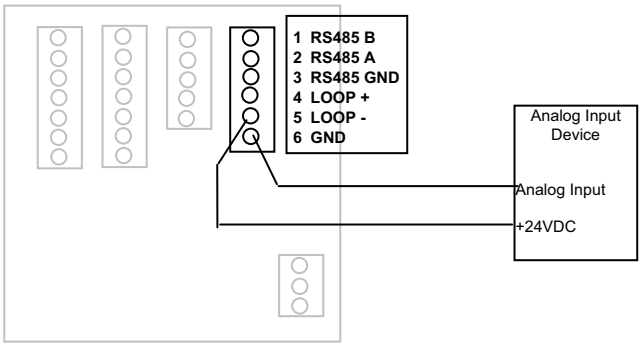


Figure 11
Current Sinking Analog Output

RS485 Communication Wiring (ModBus + BACnet)

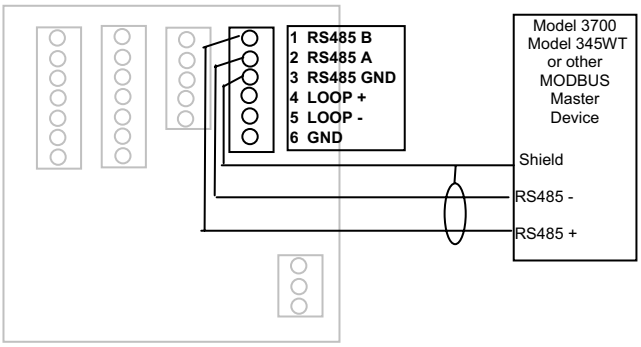


Figure 12
RS485 Communication

MODBUS points

All of these are available as Input Registers.

Addr Function

1. Flow 1 Rate (GPM)
2. Flow 2 Rate
3. Flow 1 Total (gallons)
4. Flow 2 Total
5. BTU Rate (kBTU/hr)
6. BTU Total (kBTU)
7. Batch 1 Count
8. Batch 2 Count
9. Temp 1 (deg F)
10. Temp 2
11. Temp Delta (T2-T1)

USB Port

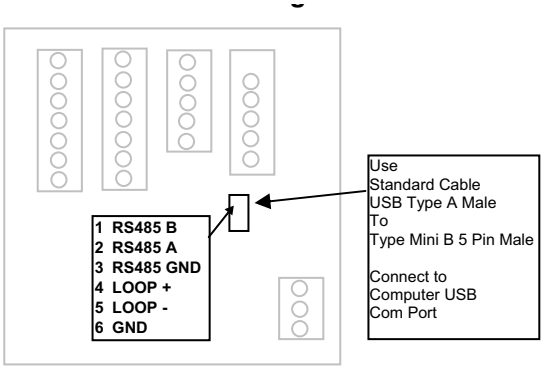


Figure 13

To communicate using the USB Port requires Windows Hyper-Terminal or other similar communications software. This Port is part of the Analog Output Option card. See the USB Communications section of PROGRAMMING for instructions on how to use this port.

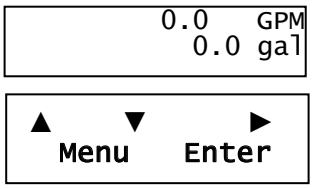
DISPLAY AND KEY PAD

The Badger® Data Industrial® Model 3050 Monitor has a two lines by sixteen character display with two modes of operation, and Five (5) keys on the front panel for programming. Two of the keys(Menu ;and Enter) serve a single function while the three remaining keys (▲;▼; and ►) serve dual purposes.

When the Model 3050 is first powered up, it runs through some internal self checks, while displaying “Badger Meter DIC Initializing”, at the end of this cycle it’s normal display will appear.

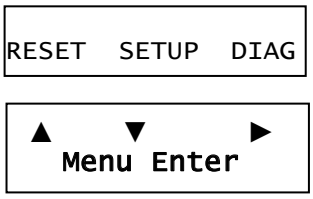
In the normal mode, if still using the factory default’s, Flow Rate will be displayed on the top line, and Flow Total displayed on the bottom. Both lines can be custom defined in the field as desired. In the normal mode the Enter key has no function.

Normal Mode Display



Program Mode Display

The other mode is the Programming Mode used to configure the unit. Enter and exit this mode by pressing the Menu key. See programming flow chart.

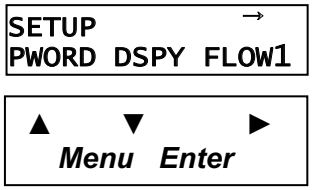


PROGRAMMING

With the normal display showing, pressing the Menu key will enter the Programming Mode. In this mode, the three arrow (▲▼►) keys are used in the Selection Screens to select the option displayed above the key, Option List Screens or used to scroll up or down a list of choices like a pull down menu. It should be noted that most screens presenting choices, show three choices, one for each arrow button. When the number of choices exceeds three, a small arrow (→) appears in the upper right side of the display indicating there are more choices on that level. Pressing the Enter key toggles to the next set of choices. Once the selection has been made, the Enter key also is used to complete the selection. Pressing the Menu key returns back towards the normal screen.

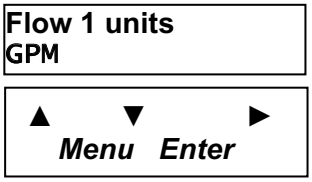
Selection Screens

Most selection screens show three choices, one for each arrow (▲▼►) button. When the number of choices exceeds three, a small arrow (→) appears in the upper right side of the display indicating there are more choices on that level. Press the Enter key to view the next set of choices. For example: pressing the Menu from the normal screen shows the “ RESET SETUP DIAG” screen Pressing the ▲key brings up the Reset Screens; the ▼key brings up the Setup Screens, and the ►key brings up the Diagnostic Screens. If the ▼key is pressed the screen would appear as follows:



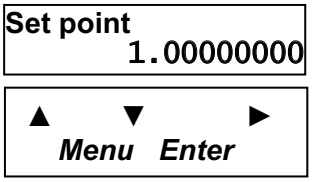
Option List Screens

Units of measure is an example of an options list.
Pressing the ▲key scrolls up the list while the ▼key scrolls down through the list.
In this case starting with GPM; gal/s; gal/hr;…LPM;….
ending in a selection of Custom units.
Pressing the Enter key completes the selection. Pressing the Menu leaves the selection unchanged.
The ►key has no function on this type screen.

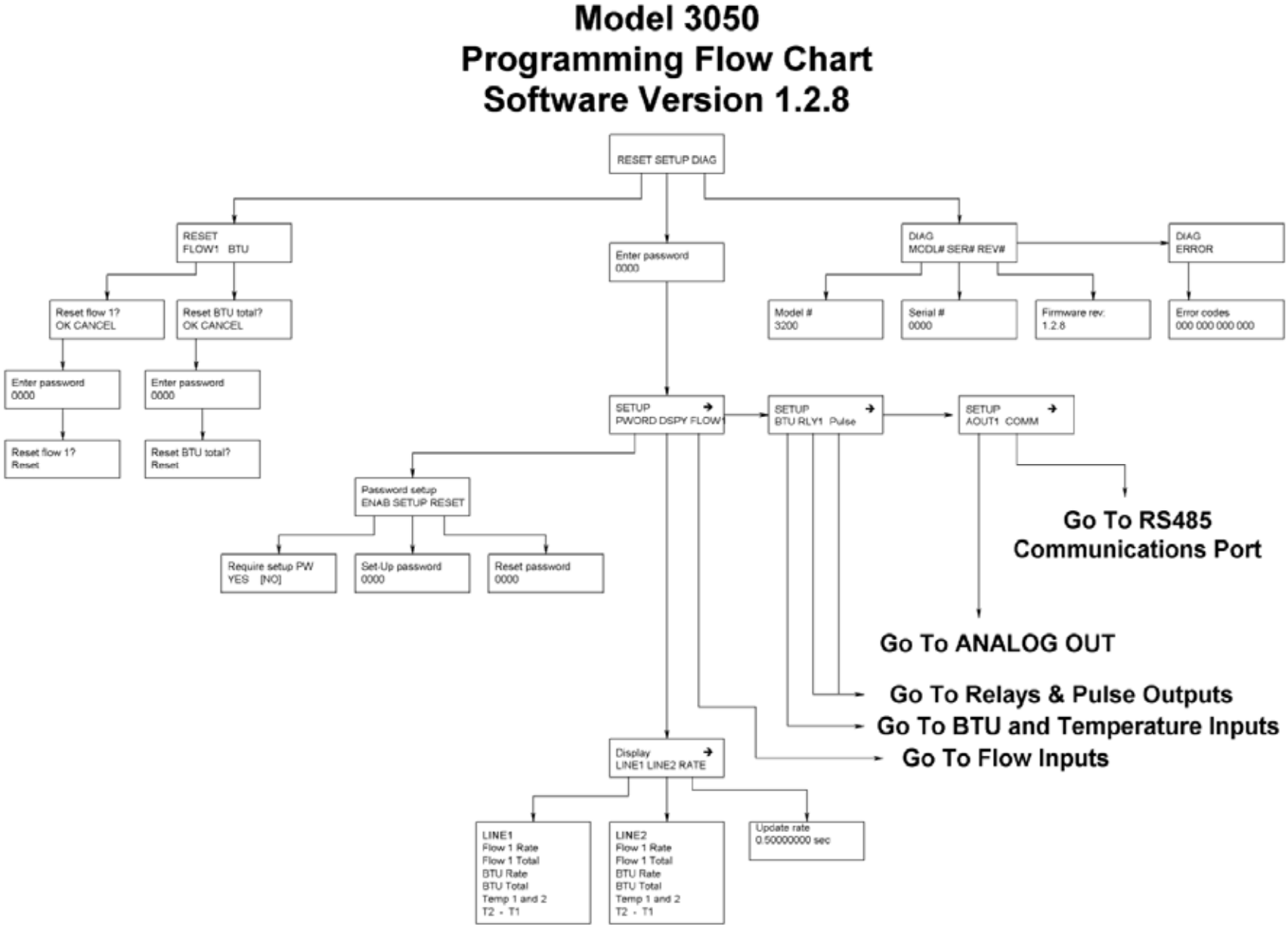


Data Screens

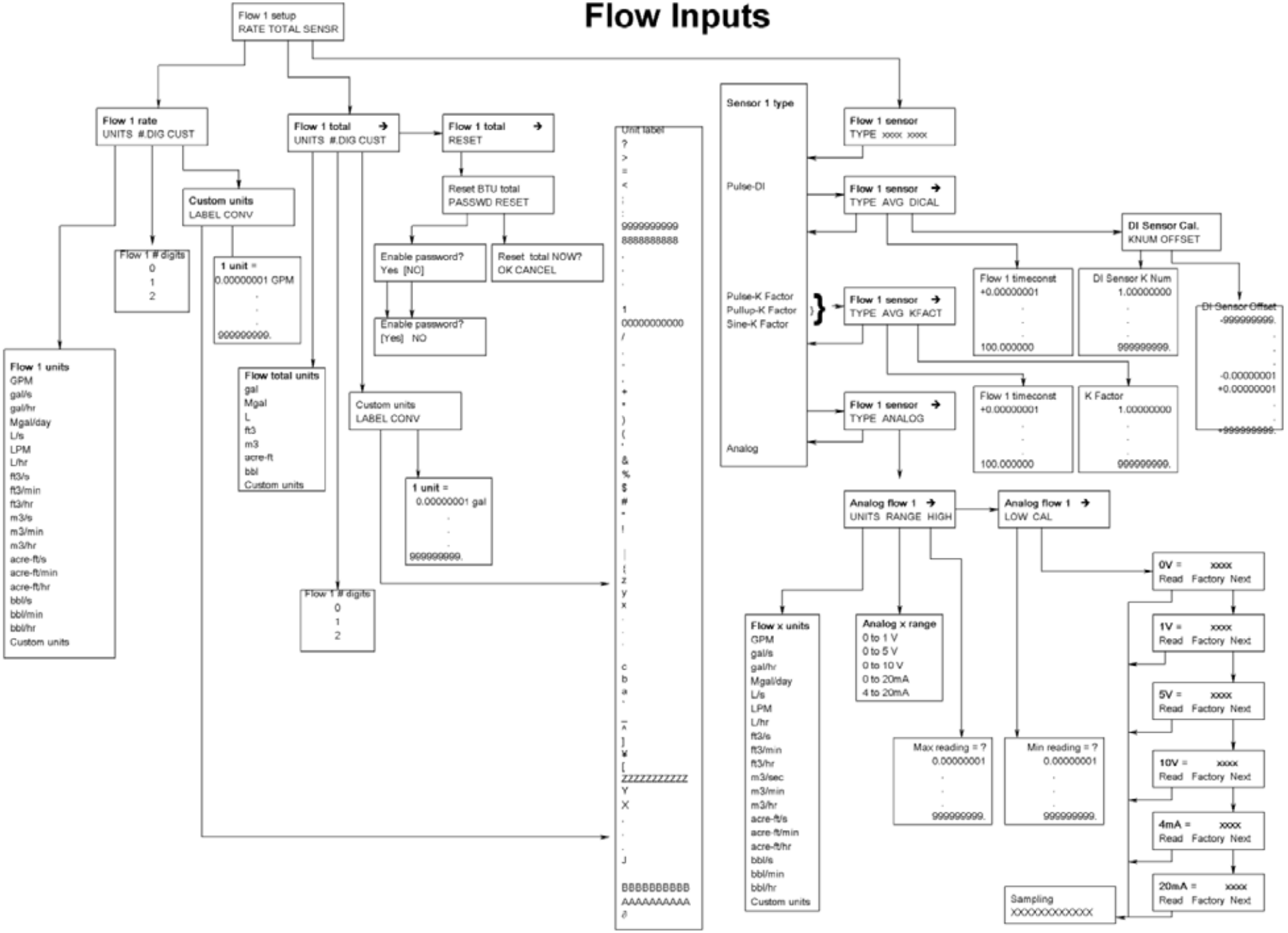
Some screens are Data Entry screens (Examples: Set-Points or Custom units). When this screen is first displayed, the current value will be displayed. The cursor will be flashing the most left hand digit. Pressing the ▲ key will increase the value, the ▼ key will reduce it. If the cursor is flashing the decimal point pressing the ▲ key will move the decimal point to the right, pressing the ▼ key will move the decimal to the left.



Programming Flow Chart



Flow Inputs


Flow 1 setup
RATE TOTAL SENSR
Flow 1 rate
UNITS #.DIG CUST
Flow 1 units
GPM
gal/s
gal/hr
Mgal/day
L/s
LPM
L/hr
ft3/s
ft3/min
ft3/hr
m3/s
m3/min
m3/hr
acre-ft/s
acre-ft/min
acre-ft/hr
bbl/s
bbl/min
bbl/hr
Custom units
Flow 1 # digits
0
1
2
Custom units
LABEL CONV
1 unit =
0.00000001 GPM
.
.
.
99999999.
Flow 1 total
UNITS #.DIG CUST
Flow total units
gal
Mgal
L
ft3
m3
acre-ft
bbl
Custom units
Flow 1 # digits
0
1
2
Custom units
LABEL CONV
1 unit =
0.00000001 gal
.
.
.
99999999.
Flow 1 total
RESET
Reset BTU total
PASSWD RESET
Enable password?
Yes [NO]
Enable password?
[Yes] NO
Reset total NOW?
OK CANCEL
Unit label
?
>
=
<
;
:
9999999999
8888888888
.
.
.
1
00000000000
/
.
-
.
+
*
)
(
'
&
%
$
#
"
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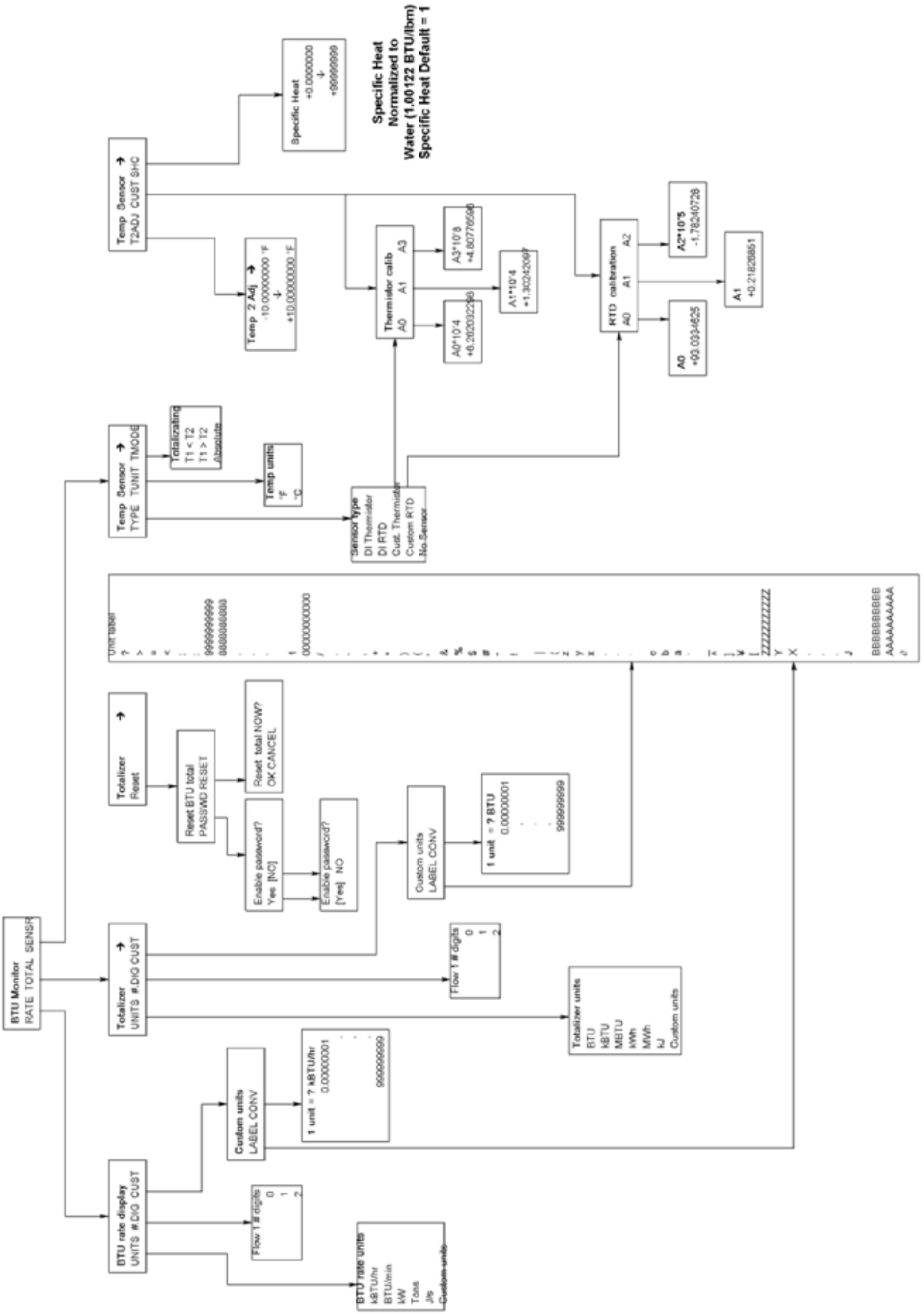
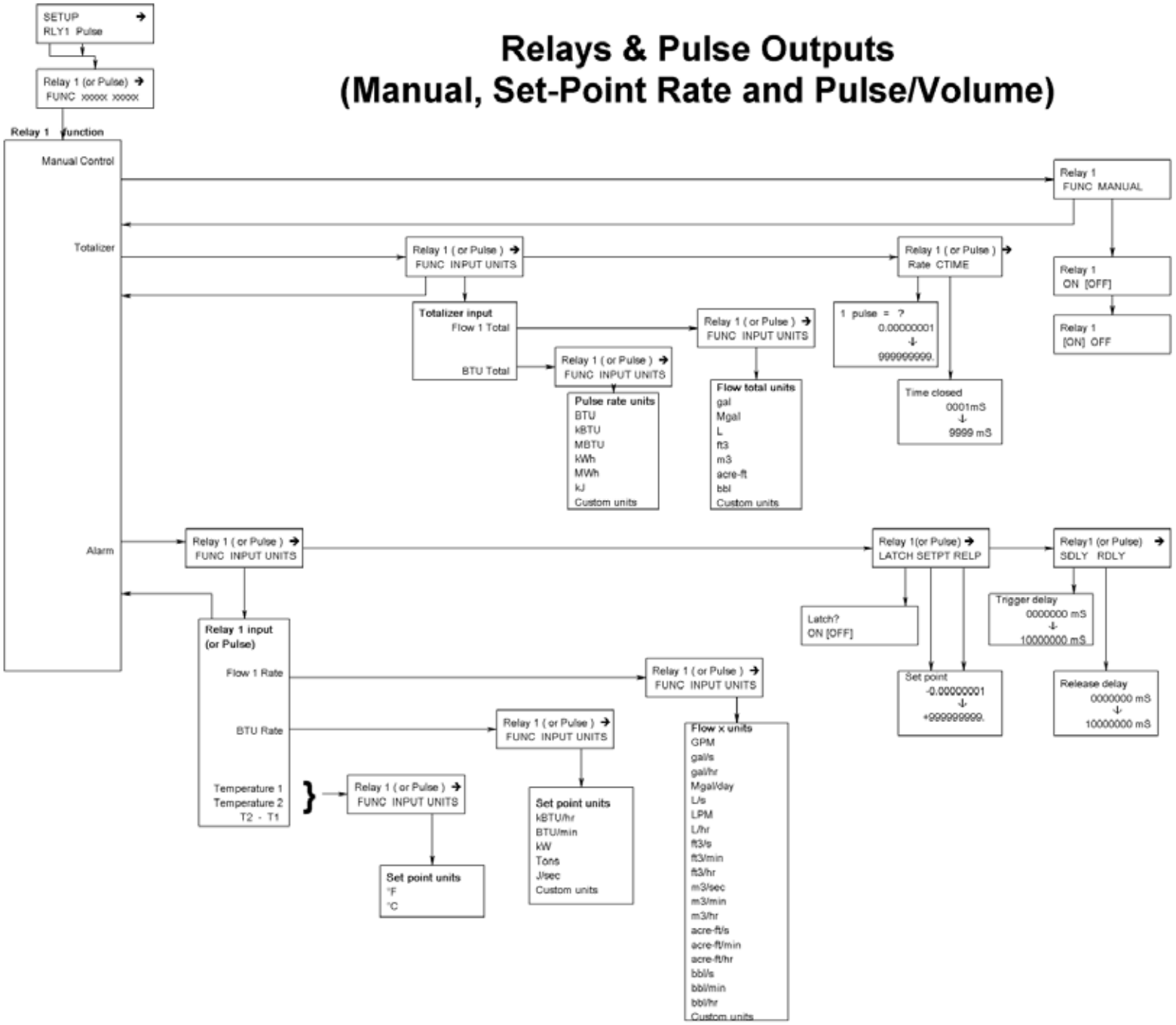
|
{
z
y
x
.
.
.
c
b
a
`
_
^
]
¥
[
ZZZZZZZZZZ
Y
X
.
.
.
J
BBBBBBBBBB
AAAAAAAAAA
@
Sensor 1 type
Pulse-DI
Pulse-K Factor
Pullup-K Factor
Sine-K Factor
Analog
Flow 1 sensor
TYPE xxxx xxxx
Flow 1 sensor
TYPE AVG DICAL
DI Sensor Cal.
KNUM OFFSET
Flow 1 timeconst
+0.00000001
.
.
.
100.000000
DI Sensor K Num
1.00000000
.
.
.
999999999.
DI Sensor Offset
-999999999.
.
.
.
-0.00000001
+0.00000001
.
.
.
+999999999.
Flow 1 sensor
TYPE AVG KFACT
Flow 1 sensor
TYPE ANALOG
Flow 1 timeconst
+0.00000001
.
.
.
100.000000
K Factor
1.00000000
.
.
.
999999999.
Analog flow 1
UNITS RANGE HIGH
Analog flow 1
LOW CAL
Flow x units
GPM
gal/s
gal/hr
Mgal/day
L/s
LPM
L/hr
ft3/s
ft3/min
ft3/hr
m3/sec
m3/min
m3/hr
acre-ft/s
acre-ft/min
acre-ft/hr
bbl/s
bbl/min
bbl/hr
Custom units
Analog x range
0 to 1 V
0 to 5 V
0 to 10 V
0 to 20mA
4 to 20mA
Max reading = ?
0.00000001
.
.
.
999999999.
Min reading = ?
0.00000001
.
.
.
999999999.
Sampling
XXXXXXXXXXX
0V = xxxx
Read Factory Next
1V = xxxx
Read Factory Next
5V = xxxx
Read Factory Next
10V = xxxx
Read Factory Next
4mA = xxxx
Read Factory Next
20mA = xxxx
Read Factory Next

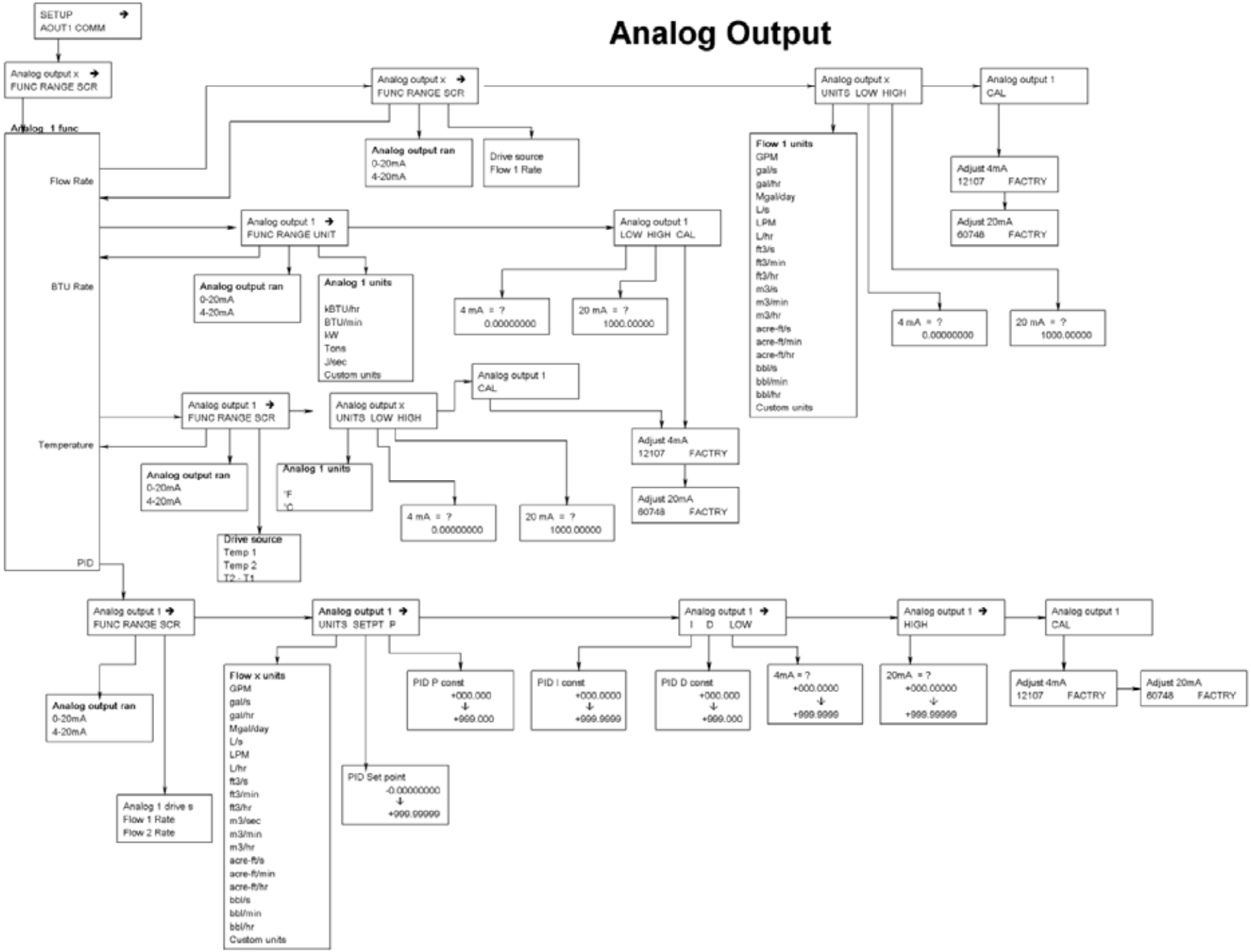
Btu and Temperature Inputs



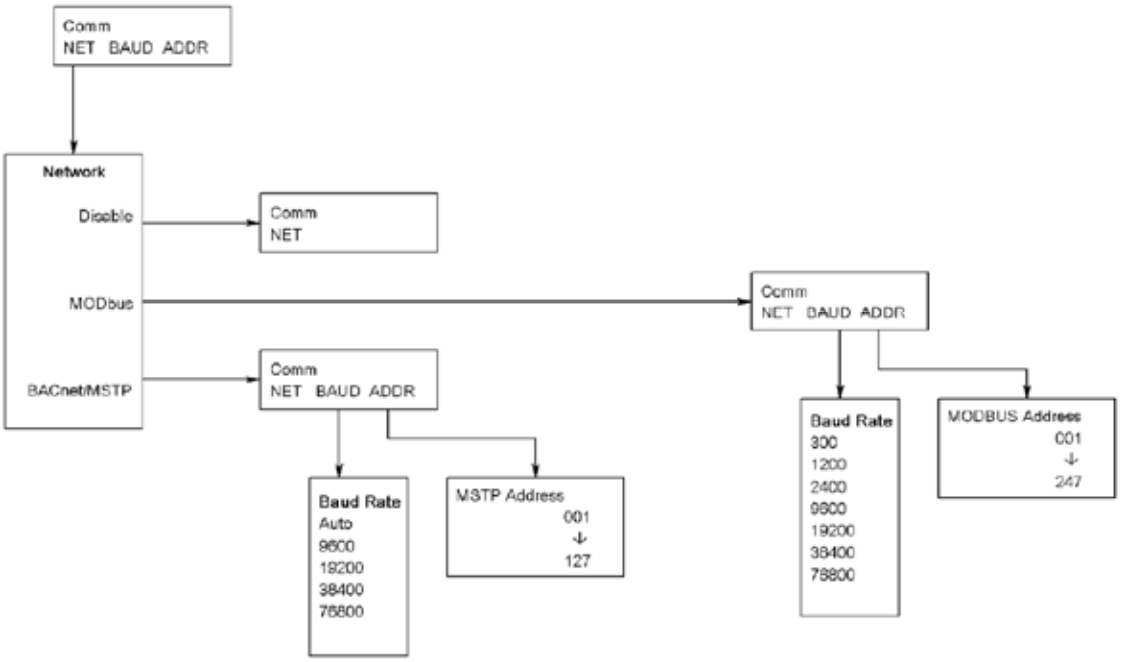
Relays & Pulse Outputs
(Manual, Set-Point Rate and Pulse/Volume)



Analog Output



RS485 Communication Port



USB Communication

If the Badger® Data Industrial® Model 3050 was ordered with an Analog Output Option Card, a five pin USB connector is also included.
As much as possible the commands mimic the use of the Front Panel controls.

To use this feature the following is required.

1. PC with USB ports, and Windows Hyper-terminal or other communications software
2. FTDI Virtual COM port Drivers http://www.ftdichip.com/Drivers/CDM/Win2000/CDM_Setup.exe
3. USB 2.0 A to Mini-B five pin cable

To communicate using Hyper-Terminal, use the following procedure.

1. Make sure that the Model 3050 has Mini-B five pin connector on the back panel. (The Model 3050 must have an Analog Output Option Card installed and will be marked Model # 3050-1x).

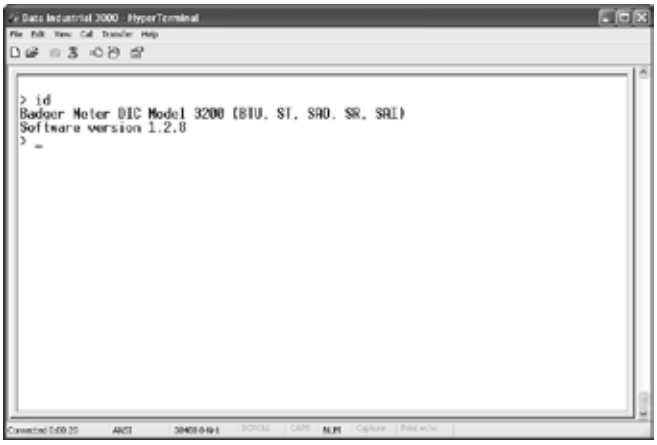
2. Be sure that the appropriate FTDI Virtual COM port Drivers are installed on you computer.

3. Plug the USB 2.0 A end of the cable into an available USB port on your computer.Plug the Mini-B five pin end into the back of the Model 3050.

4. Run Hyper-Terminal (From the Windows Start Menu) and create a new connection, with a name and ICON.

5. Configure this Port with 38400 baud, 8 data bits, 1 stop bit, no parity, and no flow control.

6. When connected a “> “ symbol will appear in the upper left corner of the main HyperTerminal display screen.Press the “Enter Key”. Both the Rx and Tx LED’s on the front of the Series 3000 should flash once, and the “Badger Meter DIC … Software Version…” text message should appear.The Badger® Data Industrial® Series 3000 is now communicating ready to take commands from the list below.



USB COMMAND LIST

In the list below, brackets indicate an argument, specifying its type and value range. For instance [0-18] stands for any number between 0 and 18 (inclusive).

Example:
“display line1 = 1” sets Line 1 of the display to display #1, which happens to be the totalizer for flow channel 1.

Diagnostics:
id -- show model number & software version
echo [on/off] -- turn on/off interactive command line:
with echo off, this interface is more amenable to scripting;
it still accepts the same commands.
Any command entered without an “ = “ sign and variable will display the current setting
Example: Typing “display line1” returns “0” which is the variable for Flow Rate

read flow [1-2] -- read the current flow on channel 1 or 2 in GPM
read flow [1-2] total -- read the current total flow on channel 1 or 2 in gallons

DISPLAY CONFIGURATION
display line1 = [0-18] -- set line 1 of the display
display line2 = [0-18] -- set line 2 of the display
valid options are:
0: flow 1 rate
1: flow 1 total
2: flow 2 rate
3: flow 2 total
4: flow 1+2 rate
5: flow 1+2 total
6: flow 1-2 rate
7: flow 1-2 total
8: flow 2-1 rate
9: flow 2-1 total
14: BTU rate
15: BTU total
16: temperature 1&2
17: temperature 1-2

display urate = [0.1-10] -- set the update rate of the display, in seconds

FLOW INPUT CHANNEL CONFIGURATION
flow [1-2] sensor type = [0-4] -- flow sensor type:
0: PulseDI,
1: PulseKFactor,
2: PullupKFactor*
3: SineKFactor*
4: Analog*
flow [1-2] sensor dical k = [x] -- DI-type flow sensor k
flow [1-2] sensor dical off = [x] -- DI-type flow sensor offset
flow [1-2] sensor kfact = [x] -- K factor for non-DI sensors
flow [1-2] sensor analog units = [0-19] -- flow units for analog input
flow [1-2] sensor analog range = [0-4] -- current range for analog input
flow [1-2] sensor analog high = [x] -- flow rate @max current
flow [1-2] sensor analog low = [x] -- flow rate @min current
flow [1-2] sensor avg = [0-100] -- averaging "time constant", in seconds:
flow [1-2] rate units = [0-19] -- flow (channel) rate units to display.
0: GPM
1: gal/s
2: gal/hr,
3: Mgal/day,
4: L/s,
5: LPM,
6: L/hr,
7: ft3/s,
8: ft3/min,
9: ft3/hr,

10:m3/s,
11:m3/min,
12:m3/hr,
13:acreft/s,
14:acreft/min,
15:acreft/hr,
16:bbl/s,
17:bbl/min,
18:bbl/hr,
19:Custom
flow [1-2] rate ndigits = [2-10] -- number of decimal places to show for flow rate
flow [1-2] rate custom label = [string] -- set the label for custom units
flow [1-2] rate custom conv = [0-100] -- conversion factor for custom units
flow [1-2] total units = [0-7] -- set the totalizer units to display.
0: gal,
1: Mgal,
2: L,
3: ft3,
4: m3,
5: acreft,
6: bbl,
7: Custom

BTU CONFIGURATION
btu rate units = [0-5] -- set the BTU rate units:
  0: kBTU/hr,
  1: BTU/min,
  2: kW,
  3: TR,
  4: J/s,
  5: Custom
btu rate ndigits = [2-10] -- number of decimal digits to display
btu rate custom label = [string] -- btu rate custom unit label
btu rate custom conv = [0-100] -- custom unit conversion factor
btu total units = [0-6] -- btu totalizer units:
  0: BTU,
  1: kBTU,
  2: MBTU,
  3: kWh,
  4: MWh,
  5: kJ,
  6: Custom
btu total ndigits = [2-10] -- number of decimal digits to display
btu total custom label = [string] -- btu totalizer custom unit label
btu total custom conv = [0-100] -- custom unit conversion factor
btu total mode = [0-2] -- totalizer mode:
  0: Heating,
  1: Cooling,
  2: Heating & Cooling
btu sensor type = [0-4] -- temperature sensor type:
  0: DI Thermistor,
  1: DI RTD,
  2: Custom Thermistor,
  3: Custom RTD,
  4: No sensor
btu sensor correct_k = [0-10] -- correction factor
btu sensor temp_unit = [0-1] -- temperature units to display
  0: deg F
  1: deg C
btu sensor t2adj = [-10-10] -- t2a

RELAY OUTPUT CONFIGURATION
relay [1-5] func = [0-9]   -- relay function; relay 5 is the pulse output
0: Totalizer
1: Alarm
2: Manual Control
relay [1-5] input = [0-8] -- relay input; depends on source
for totalizer:
0: Flow 1 Total
for alarms:
0: Flow 1 Rate
relay [1-5] units = [0-19] -- units on setpoints/rates; depends on src/input
flow units: same as 'flow [1-2] rate units' above
volume units: same as 'flow [1-2] total units'
relay [1-5] manual = [on/off] -- manually set relay on or off, if in manual mode
relay [1-5] rate = [x] -- totalizer rate
relay [1-5] ctime = [0-10000] -- pulse width in milliseconds
relay [1-4] latch = [on/off] -- turn on/off relay latching
relay [1-4] setpoint = [x]
relay [1-4] releasepoint = [x]
ANALOG OUTPUT CONFIGURATION
analogout [1-2] func = [0-3]
  0: Flow rate
  1: BTU rate
  2: Temperature
  3: PID control

analogout [1-2] src = [0-4]
  for flow rate:
    0: Flow 1 rate
    1: Flow 2 Rate
    2: Flow sum
    3: Flow 1-2
    4: Flow 2-1
  for BTU rate: not used
  for temperature:
    0: Temp 1
    1: Temp 2
    2: Temp Delta
  for PID control:
    0: Flow 1 rate
    1: Flow 2 rate

analogout [1-2] range = [0-1]
  0: 0-20mA

1: 4-20mA
analogout [1-2] low = [x] -- value corresponding to 0 (or 4) mA
analogout [1-2] high = [x] -- value corresponding to 20mA
analogout [1-2] setpoint = [x] -- PID setpoint
analogout [1-2] P = [x] -- PID constants
analogout [1-2] I = [x] -- PID constants
analogout [1-2] D = [x] -- PID constants

RS485 COMM PORT CONFIGURATION

comm baudrate = [0-7]
0: Auto
1: 300
2: 1200
3: 2400
4: 9600
5: 19200
6: 38400
7: 76800
comm mstpaddr = [0-127] -- BACnet/MSTP address
comm maxmaster = [0-127] -- BACnet/MSTP max master address
comm devinst = [x] -- BACnet device instance ID
comm mbslaveaddr = [0-247] -- MODBUS slave address

MODBUS

Addr Function

1 Flow 1 Rate (GPM)
2 Flow 2 Rate
3 Flow 1 Total (gallons)
4 Flow 2 Total
5 BTU Rate (kBTU/hr)
6 BTU Total (kBTU)
7 Batch 1 Count
8 Batch 2 Count
9 Temp 1 (deg F)
10 Temp 2
11 Temp Delta (T2-T1)

TROUBLESHOOTING

Trouble Codes:
Code Meaning
1 Relay 1 totalizer rate exceeded
2 Relay 2 rate exceeded
3 Relay 3 rate exceeded
4 Relay 4 rate exceeded
5 Pulse out rate exceeded
20 Error reading EEPROM on faceplate
21 Error writing EEPROM
22 Analog Input card missing
24 Temperature Input card missing
25 Invalid flow units configured
26 Invalid volume units configured
27 Bad input frequency
29 Internal error calculating flow rate
31 Error reading from analog input AD converter channel 1
32 Error reading from analog input AD converter channel 2
36 Error writing to analog input AD converter channel 1
37 Error writing to analog input AD converter channel 2
50 Error reading I2C address 0 (relays, buttons, and LEDs)
51 Error writing to I2C address 0
52 Error reading I2C address 1 (analog input card control lines)
53 Error writing I2C address 1
54 Error reading I2C address 2 (temperature input card control lines)
55 Error writing I2C address 2
71 Watchdog timer reset occurred
82 Fatal error initializing EEPROM

Series 3050 Specifications

Flow Sensor Inputs

Type	Threshold	Signal Limit	Frequency	Pull-up	Impedance	Aux. Power	Calibration
Pulse-DI	2.5 VDC	30VDC	0.4Hz to10kHz	1K to12VDC	-	12VDC@30mA	K + Offset
Pulse-K Factor	2.5 VDC	30VDC	0.4Hz to10kHz	-	-	12VDC@30mA	Pulse/Gal
Pull-up-K Factor	2.5 VDC	30VDC	0.4Hz to10kHz	1K to12VDC	-	12VDC@30mA	Pulse/Gal
Sine-K Factor	10mVPP	30VDC	0.4Hz to10kHz	-	10k Ω	12VDC@30mA	Pulse/Gal
Analog – 4-20mA	-	50mA Fused	-	-	100 Ω	12VDC@30mA	Linear
Analog – 0-20mA	-	50mA Fused	-	-	100 Ω	12VDC@30mA	Linear
Analog – 0-1 VDC	-	30VDC	-	-	100k Ω	12VDC@30mA	Linear
Analog – 0-5 VDC	-	30VDC	-	-	100k Ω	12VDC@30mA	Linear
Analog – 0-10 VDC	-	30VDC	-	-	100k Ω	12VDC@30mA	Linear

Rate Units of Measure: GPM; gal/sec; gal/hr; Mgal/day; LPS; LPM; LPH; ft3/Sec; ft3/min; ft3/hr;m3/sec; m3/min; m3/hr; acre-ft/sec; acre-ft/min; acre-ft/hr; bbl/sec; bbl/min; bbl/hr; and field programmed custom units 0.00 to 999999999

Total Units: gallons; Mgal; liters; ft3; m3; acre-ft; bbl; and field programmed custom units 0.00 to 999999999

SPECIFICATIONS

Voltage
12-24 VDC / VAC
(Limit: 8-35VDC)
(Limit: 8-28VAC)

DC current draw (~280mA)
AC power rating (~5 VA)

Display
16 character by two line alphanumeric dot matrix 7.95mm high backlit LCD

Operating Temperature
-20°C to +70°C
Storage Temperature
-30°C to +80°C

Dimensions
Panel Mount:
3.78"W x 3.78"H x 3.23"D
(96mm x 96mm x 63mm)
Wall Mount:
4.80"W x 4.72"H x 3.63"D
(120mm x 120mm x 92mm)
Weight:
panel mount 12 oz

Pulse and Relays
Both pulse and relay are fully functional as either totalizing, or set-point outputs.

Pulse Electrical
1 Amp @ 35VDC/ 30VAC
Closed: 0.5Ω @ 1 AMP Open: $>10^8\Omega$

Relay Electrical
Resistive load: 5Amp@120VAC/30VDC
Inductive load: 1Amp@120VAC/30VDC

Pulse/Unit Volume (Totalizer)
Driving Source: flow total; Btu total
Units: any predefined or custom unit
Rate: 1 Pulse per 1.0000000 to 99999999 units
Contact Time: 1 to 9999 mS

Set-Point (Alarm)
Driving Source: flow rate; Btu rate; temperature 1; temperature 2, delta T
Units: Any predefined or custom unit
Set-Point: 1.0000000 to 999999999
Delay to Set: 1 to 9999 Seconds
Release-Point: 1.0000000 to 999999999
Delay to Release: 1 to 9999 seconds

Optional Analog Output
Driving Source: flow rate; PID control
Range: 4-20mA; 0-20mA (isolated current sinking or sourcing)
Sinking: 30VDC @ 0mA maximum; 3 volts @20mA minimum
Sourcing: 600 W maximum load

USB Communication
Provides complete access to all programming and operation features.
Requirements:
USB 2.0 A to Mini-B 5-Pin Cable (example: SYSONIC model UAM56 GWT/B)

RS-485 Communication
Supports: Modbus and BACnet/MSTP

Accessories
Programming kit
Wall mount kit

	Example:	3050	-	x	x
Series					
	BTU	3050			
Option - Analog Output, RS485 (BACnet / Modbus), and USB					
	No Option			0	
	Analog Output, RS485 with BACnet and Modbus, and USB			1	
Option - Mounting					
	Panel Mount				0
	Wall Mount				1

Model 3050 Ordering Matrix

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Data Industrial®

Please see our website at **www.badgermeter.com** for specific contacts.

Due to continuous research, product improvements and enhancements, Badger Meter reserves the right to change product or system specifications without notice, except to the extent an outstanding contractual obligation exists.

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