Instrument Setup (IS) Software User Manual

(IS Version 3.5.4)

Intertek
4006497

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2. INSTRUMENT SETUP (IS) SOFTWARE OVERVIEW

Overview

Instrument Setup (IS) software is a PC based Windows graphical user interface (GUI) with pull-down menus that can be used as an alternative to front panel programming to set up Laureate panel mounted instruments (digital panel meters, counters and timers). It is required to program Laureate DIN-rail mounted transmitters. It saves time and avoids errors when multiple instruments need to be programmed the same way.

Laureate instruments, whether panel mounted or DIN rail mounted, are set up for specific applications using a combination of internal jumper settings and software selections, as explained in their respective user manuals. The jumpers open or close circuit board traces to change the electrical circuit. Their presence cannot be sensed by the instrument's microcontroller, which must then be told about jumper settings through programming. For example, in a Laureate process meter, jumpers are used to select one of nine available input ranges, such as ±20.000 Vdc, and the meter's software must then be told that this range was selected. The software must also be told of the desired scaling, for example that 0-10V is to be displayed as 0-500.0. Programmable features include the display, scaling, filtering, alarms, communications, analog output, and front panel lockouts.

Use with panel mounted instruments

If only one or two panel mounted instruments (or meters for short) are to be programmed, this is typically done by using the meter's four front panel buttons and the meter's digital display, as explained in the instrument's user manual. The programmed selections are then stored in EEPROM in the instrument and are retained in the absence of power.

If a larger number meters are to be programmed in the same way, a first meter can be programmed from its front panel, and IS software running on a PC can retrieve the setup data using the GET command. The setup data can then be viewed using the "View Setup" command and be changed by IS software. Or the setup data can be generated directly on the PC using IS software. At the option of the user, the setup data can be saved to disk as a .CT2 file. The setup data can then be downloaded into a single meter or sequentially into multiple meters by IS software using the PUT command.

Setup files can be generated by IS software in an offline mode without communication to a meter, so IS software is of benefit whether or not the PC is connected to a meter. For the GET and PUT commands to work, each meter must be equipped with a communication board. If so desired, a single communication board, such as a USB board, can be moved from meter to meter for setup purposes, and the meter electronics assembly can be programmed outside of the meter case. Warning: High voltages may be present when the electronics are exposed. Always remove power before handling electronic parts.

Use with DIN-rail mounted instruments

IS software is the only means to program Laureate LT or LTE series DIN rail transmitters, which do not have front panel buttons or a display. LT transmitters come standard with screw terminals for discrete wiring to an RS232 or RS485 data line. LTE transmitters come standard with an RJ45 connector to an Ethernet cable.

Laureate meters and transmitters accept the same signal conditioner boards and work in the same way as Laureate panel mounted instruments. While transmitters do not have a display, their analog output, relay operation, and data output are based on an internal reading that can be scaled and filtered. The scaled transmitter reading can be displayed by IS software, as explained later in this manual.

3. IS SOFTWARE COMPATIBLE HARDWARE

1. Instruments

Instrument Setup (IS) software can be used with the following Laureate instruments:

- **Laureate 1/8 DIN size instruments** (called meters for short) whose model number begins with L1 to L8 and includes a communication interface option.
- **Laureate LT transmitters** whose model number begins with LT2, LT4, LT6, LT8 or LTS. These instruments include a serial data interface which can be jumpered for RS232 or RS485.
- **Laureate LTE transmitters** whose model number begins with LTE2, LTE4, LTE6, LTE8 or LTSE. These instruments include an Ethernet data interface.

2. Communication Cables

Please see our web page at https://www.laurels.com/cables.php for cables to connect Laureate meters to a PC that runs IS software.

- **Meters with USB** (LUSB board, ordering option 5). Use a standard USB cable with USB Type A and B connectors, like our CBL05 USB cable.
- **Meters with RS232 (**L232 board, ordering option 1). Use the combination of cables CBL01 and CBL02, which plug into each other via mating DB9 connectors. CBL02 incorporates an FTDI RS232-to-USB adapter chip which is compatible with all versions of Windows.
- **Meters with RS485 with dual RJ11 connectors** (L485 board, ordering option 2). Use our adapter cable CBL06, which incorporates an FTDI RS485-to-USB adapter chip that is compatible with all versions of MS Windows.
- **Meters with RS485 with dual RJ45 connectors** (LMOD board, ordering option 4). Laurel does not offer an adapter cable to a PC USB port. Please refer to our meter or counter manuals for pinout.
- **Meters with an LNET or LNET485 Ethernet board** (ordering options 7 or 8). Use a standard Ethernet cable with RJ485 connectors.
- **Meters with an LNET1 or LNET1-485 Ethernet board** (ordering options A or B). Use an USB cable with Type A and mini-B connectors, like our cable CBL07.
- **Meters with an LWIFI or LIFIX Wifi board** (ordering options C or D). Use an USB cable with Type A and mini-B connectors, like our cable CBL07.
- **LT or LTS transmitters jumpered for RS232.** Use the combination of cables CBL04 and CBL02, which plug into each other. CBL02 incorporates an FTDI RS232-to-USB adapter chip which is compatible with all versions of Windows.

- **LT or LTS transmitters to be used with RS485.** For programming using IS software, jumper the transmitter for RS232 so that you can used cables CBL04 and CBL02. Once programmed, you can revert to RS485 to run the transmitter.
- **Meters, LTE or LTSE transmitters with an Ethernet.** Use a standard Ethernet cable with RJ45 connectors to connect the instrument to an Ethernet router, Ethernet switch, or directly to the Ethernet port of a PC.

4. IS SOFTWARE INSTALLATION & LAUNCH

1. Getting your computer ready

Set User Account Control (UAC) of your version of Windows to "Never notify" so that the installation can create directories. Use Google for instructions on how to change UAC. Power down and restart your computer for the UAC change to take effect. Following installation of IS software, you may return UAC to its previous setting.

2. Getting your instrument ready

a. Ensure that a communication board is installed and is connected to your PC via a cable, as detailed in the previous section.

b. Set up meters or counters other than those with an LWIFI series board or an LNET1 series cached Ethernet board to their factory default communication settings, as shown below. These are 9600 baud, Custom ASCII protocol, no parity, 8 data bits, 1 stop bit (N81), address 1. You can change these settings later using the meter front panel or IS software.

SEr 1: 151
SEr 2: 0011
SEr 3: 00000
SEr 4: 000
Addr: 000

c. Set up meters or counters with an LWIFI series board or LNET1 series cached Ethernet board to their different factory default communication settings, as shown below. These are 19200 baud, Custom ASCII protocol, no parity, 8 data bits, 1 stop bit (N81), address 1. These are also required for the Network Setup (NS) application to work, except that the meter address can be changed. The baud rate has to be 19200.

SEr 1: 160
SEr 2: 0111
SEr 3: 00000
SEr 4: 000
Addr: 000

d. Reset LT and LTE series transmitters to their factory default communication settings (9600 baud, command mode, Custom ASCII protocol, Address 1) if these have been changed. To reset to factory defaults, place a jumper at E1, turn power on and off, remove the jumper, and restart the transmitter. For specifics, open the appropriate transmitter user manual in pdf format and do a pdf search for “reset communications.”

3. Instrument Setup (IS) software installation

a. Click on https://www.laurels.com/downloadfiles/IS3_5_4.exe to download the compressed file IS3_5_4.exe from our website.

b. Copy IS3_5_4.exe into a directory of your choice.

c. Double-click on IS3_5_4.exe to unzip three files into your directory.

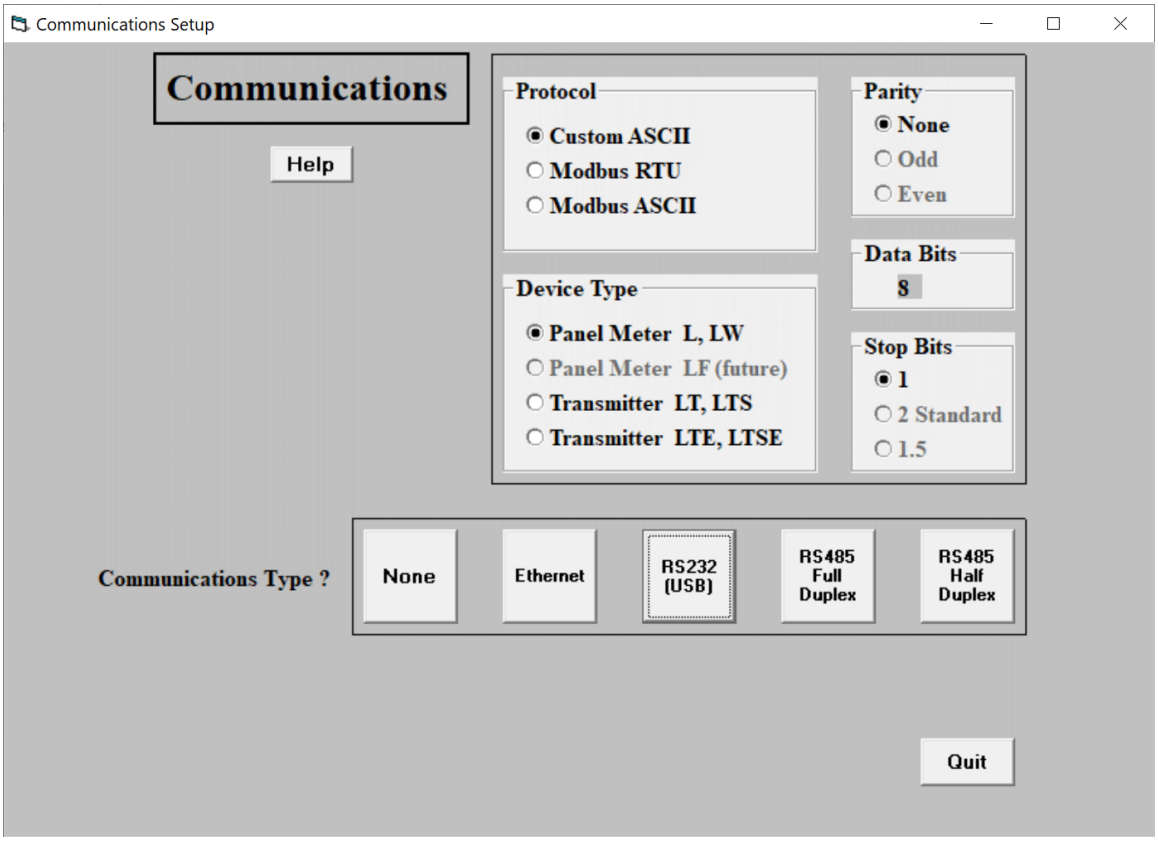
d. Double-click on setup.exe and follow the prompts to install. The executable file will be placed in C:\Program Files (x86)\IS2\Instrument Setup.exe. If you get an error message, you may not have the required permissions to install or run a .exe program. Call in you IT department for assistance.

e. Create a desktop shortcut icon to the executable file on your desktop or in your taskbar.

5. ESTABLISHING COMMUNICATIONS FIRST LEVEL SCREENS

1. Launch IS software

Click on the shortcut icon that you may have created, or click on Start => Programs => IS2 => IS2. A splash screen will be displayed for a few seconds. Verify that your IS software version is 3.5.4. This will be followed by the Communications Setup screen below:



2. Protocol

a. Select the Custom ASCII protocol for most RS232, USB or RS485 applications, and for all Ethernet applications that use the LWIFI or LNET1 Ethernet boards. Please see our separate Custom ASCII Serial Communications Manual. When selected for our LNET1 Ethernet or LWIFI boards (ordering options A-D), the Custom ASCII protocol is only used for internal meter communications. External communications need to be via the Modbus protocol, as explained in our separate LNET1 Manual and LWIFI & LWFIX Manual.

b. Select the Modbus RTU protocol if your device is a meter with an LNET or LNET485 Ethernet communication board (ordering options 7 or 8), if your transmitter is an LTE or LTSE Ethernet model, if your application has other Modbus devices on the same RS485 line, or if you are already familiar with the Modbus protocol and prefer that protocol. For use with Ethernet, Modbus RTU is seam-

lessly converted to Modbus TCP/IP. The commands are the same. Please see our Modbus Communications Manual, Analog Input or our Modbus Communications Manual, Pulse Input.

c. **Do not select the Modbus ASCII protocol,** which is now obsolete and is no longer documented by our company.

3. **Parity, Data Bits, Stop Bits**

   a. **For the Custom ASCII protocol,** automatic settings are no parity, 8 data bits, 1 stop bit (N81).

   b. **For the Modbus RTU protocol,** user selections are 1) no parity, 8 data bits, 2 stop bits; or 2) odd parity, 8 data bits, 1 stop bit; or 3) even parity, 8 data bits, 1 stop bit.

4. **Device Type**

   a. **Panel Meter L, LW.** Select this for digital panel meters or counters with model numbers starting with L2-L8, and for scale/weight meters with model numbers starting with LW.

   b. **Transmitter LT, LTS.** Select this for LT series transmitters or the LTS serial-to-analog transmitter. These come with an RS232/RS485 serial interface.

   c. **Transmitter LTE, LTSE.** Select this for LTE series transmitters or the LTSE Ethernet transmitters. The main board of these transmitters has an Ethernet interface that is programmed the same as for the LNET Ethernet board in Laureate meters or counters (ordering code 7).

5. **Communications Type**

   Clicking on one of the choices below will take you to one of three screens:

   a. **None.** This will take you to the Non-Device Application screen, as documented in the File Operations, Top Menu Bar section of this manual. Select “None” if you want to develop a setup program for a meter or transmitter on a PC that is not connected to the instrument. “None” is a useful tool that allows you to learn programming without an actual instrument. It also allows you to save setup data to disk by executing a File => Save Setup for later downloading into an actual instrument using the PUT command.

   b. **Ethernet.** This will take you to the Node Setup screen and from there to the Node Discovery tab and the Device Discovery tab, as detailed below. Select Ethernet if your instrument is a meter with an LNET or LNET485 Ethernet board (ordering codes 7 or 8), or an LTE or LTSE Ethernet transmitter. You also need to select the Modbus RTU protocol for LNET or LNET485 Ethernet boards (ordering codes 7 or 8). The RTU protocol is seamlessly converted to Modbus TCP/IP by our Nodes.

   c. **RS232 (USB).** This will take you to the Establish Communications screen as detailed below. Select “RS232 (USB)” if your instrument is a meter with an

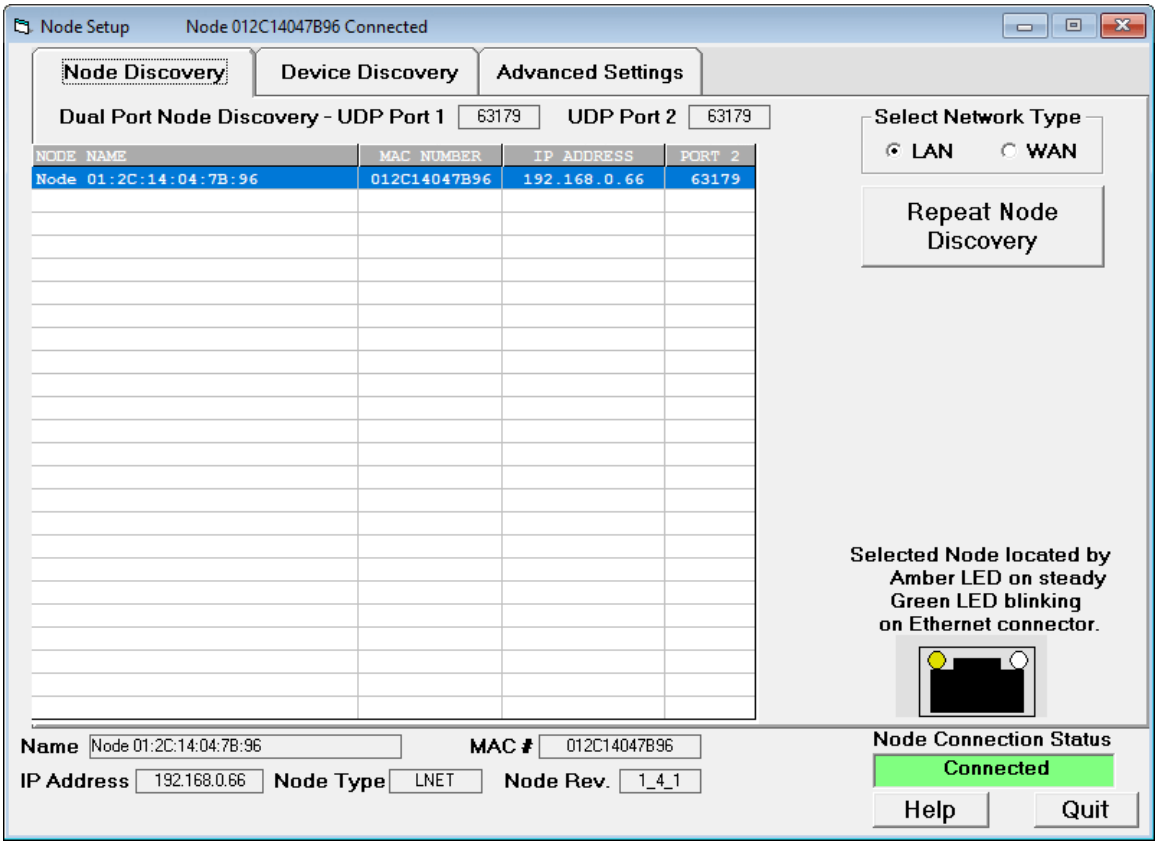
RS232 or a USB interface, or if it is an LT or LTS transmitter jumpered for RS232. To connect an LT or LTS transmitter to the USB port of a PC, use the combination of cables CBL02 and CBL04, which plug into each other. CBL02 is an RS232-to-USB converter which works with all versions of Windows.

d. **RS485 Full Duplex.** This will take you to the Establish Communications screen as detailed below. Select this if your instrument is a meter with an RS485 interface, or an LT or LTS transmitter set up for RS485. Make this full duplex software selection even if your wiring is half duplex, since full duplex works just as well and is more robust than half duplex with our instruments.

e. **RS485 Half Duplex.** Do not select even if your wiring is for half duplex.

6. ESTABLISHING COMMUNICATIONS SECOND LEVEL SCREENS

1. Ethernet Node Setup Screen for LNET, LNET485, LTE, LTSE



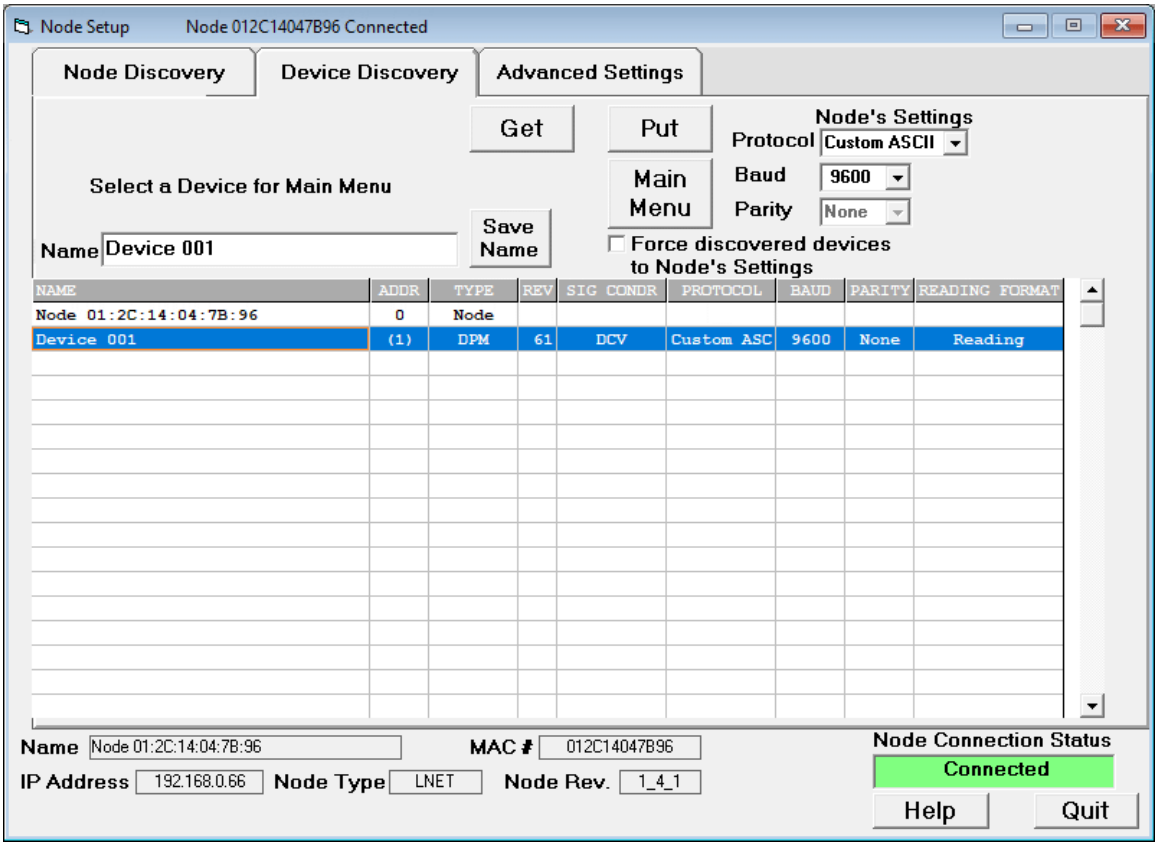
The Node Setup screen with the "Node Discovery" tab open will be presented after clicking on Ethernet in the Communications Setup screen. All Laureate Nodes on the same LAN (local area network) as the PC will be automatically discovered and listed. If the Nodes are on a WAN (wide area network or Ethernet), you will be asked to enter the IP address of the remote router, and any Laureate Nodes on the remote network will then be listed.

Select a discovered Node by clicking on it. Its line with then turn blue.

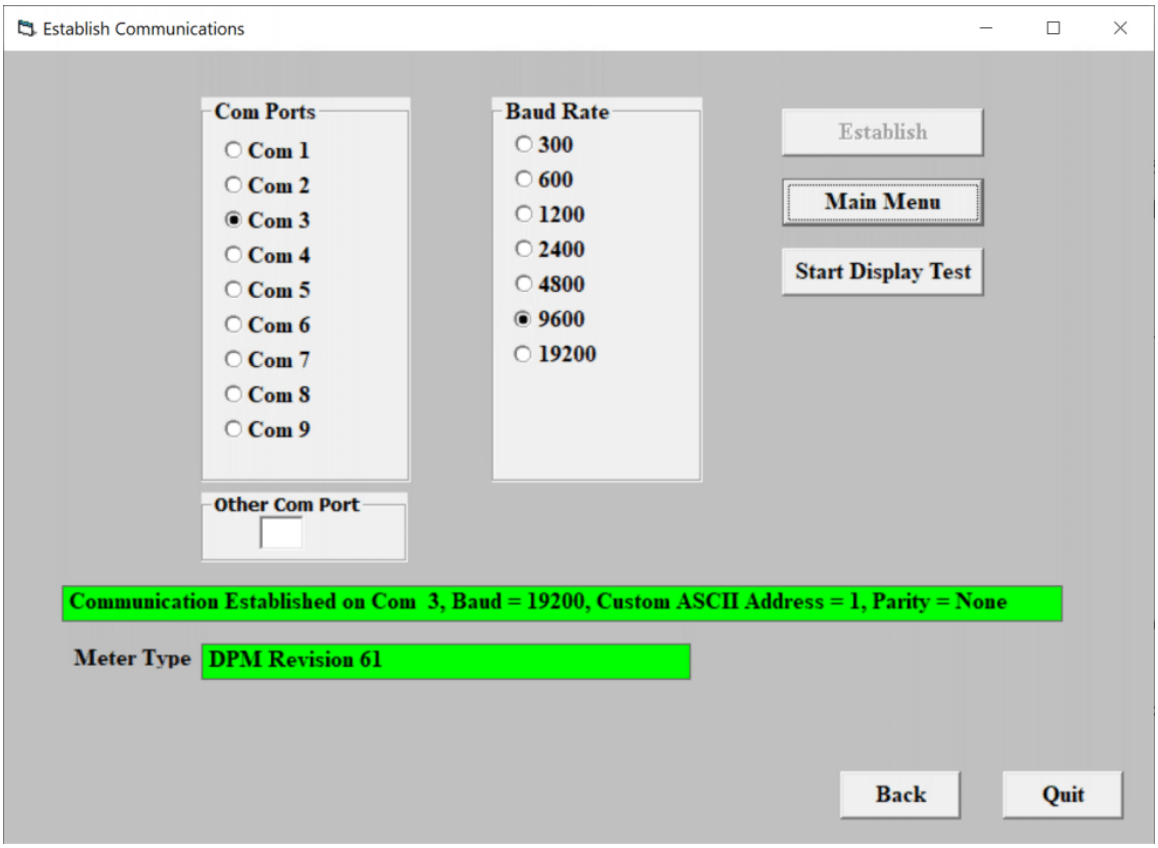
Click on the Device Discovery tab, and all devices associated with the highlighted Node will be discovered and listed. This will be the one device (or instrument) associated with an LNET or LTE Node, or up to 31 devices (or instruments) on an RS485 bus associated with an LNET485 Etherned-to-RS485 gateway node.

Select a discovered device. Its line will then turn blue. A "Main Menu" button will then also appear.

Click on the "Main Menu" button to enter the IS software Main Menu.


Node Setup
Node 012C14047B96 Connected
Node Discovery
Device Discovery
Advanced Settings
Get
Put
Node's Settings
Protocol
Custom ASCII
Select a Device for Main Menu
Main Menu
Baud
9600
Parity
None
Name
Device 001
Save Name
Force discovered devices to Node's Settings
NAME
ADDR
TYPE
REV
SIG CONDR
PROTOCOL
BAUD
PARITY
READING FORMAT
Node 01:2C:14:04:7B:96
0
Node
Device 001
(1)
DPM
61
DCV
Custom ASC
9600
None
Reading
Name
Node 01:2C:14:04:7B:96
MAC #
012C14047B96
IP Address
192.168.0.66
Node Type
LNET
Node Rev.
1_4_1
Node Connection Status
Connected
Help
Quit

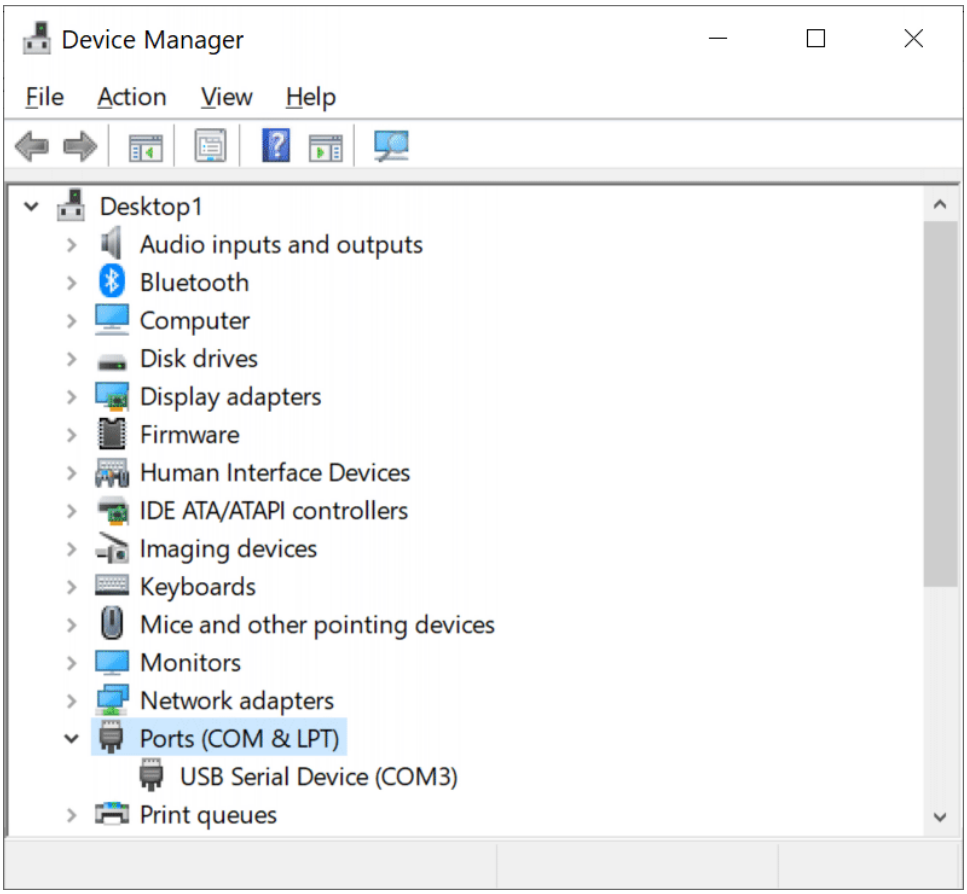
2. Establish Communications Screen for RS232, RS485, USB, LNET1, LWIFI



a. First Generation Communication Boards

These boards are RS232, RS485, USB and USB-to-RS485 gateway. Select a COM port and set the Baud Rate to 9600 or lower, then press Establish until one of the COM Port selections establishes communications, at which point “Communication Established” will be displayed against a green background. Then press “Main Menu” to enter IS software Main Menu.

One way to find the COM port is to use Device Manager, which is part of the Windows Control Panel. Enter “Device Manager” into the find field adjacent to the Control Panel icon in the lower left of your PC monitor, then click on the Device Manager Link. In the resulting screen, click on “Ports (COM & LPT) to see COM ports in use. Disconnect your instrument and see which COM port disappears from the list.

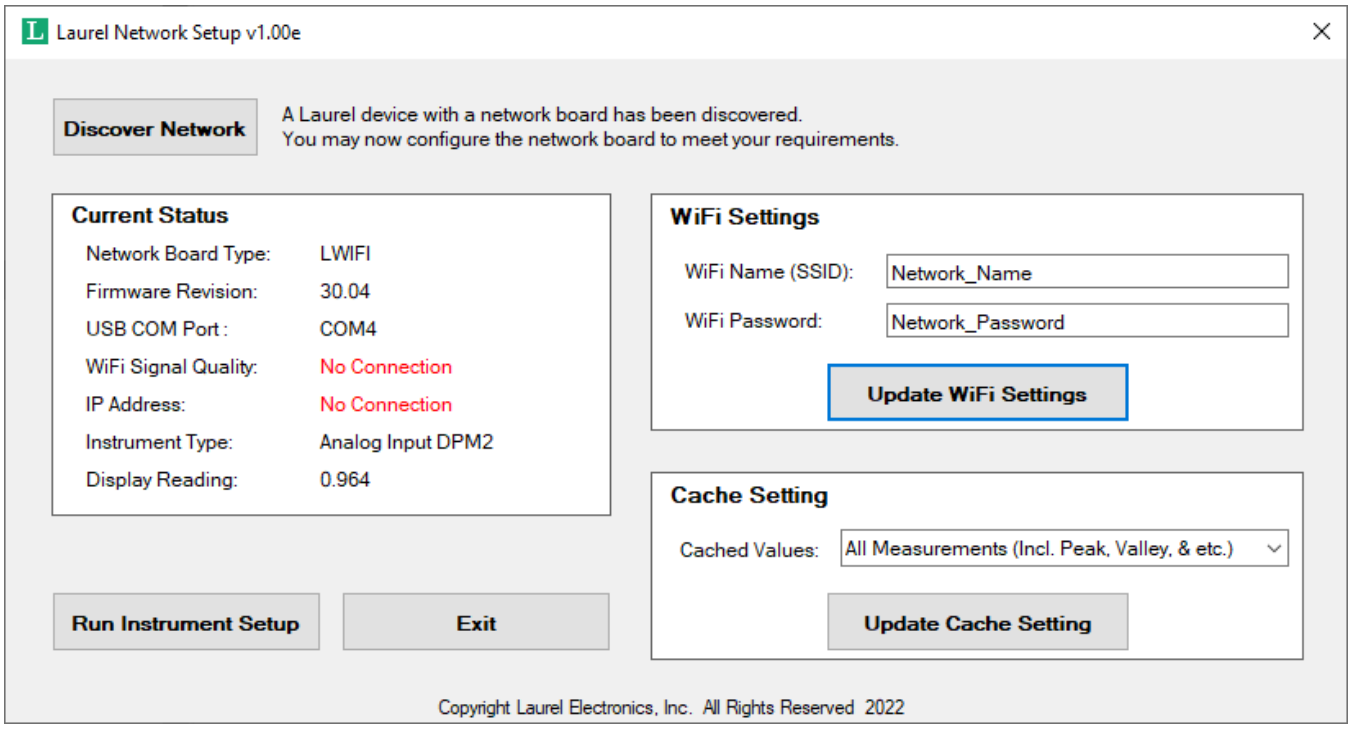


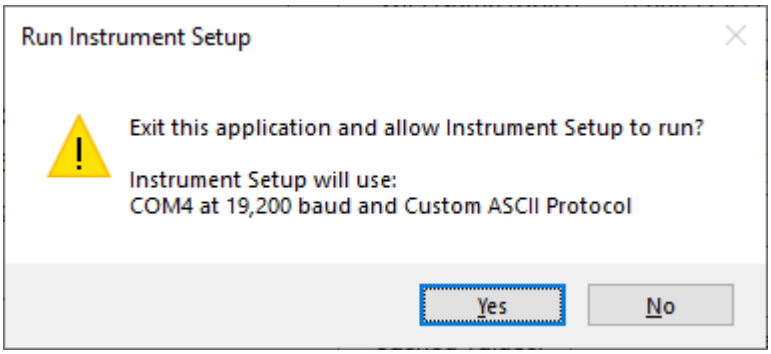
b. Second Generation Communication Boards: LNET1 & LWIFI

These boards are LNET1 (caching Ethernet, ordering code A), LNET1-485 (caching Ethernet-to-RS485 gateway, ordering code B), WIFI (WiFi with internal antenna, ordering code C) and WIFIX (WiFi with an external antenna, ordering code D).

To use IS software through the USB port of these boards, see our separate LNET1 Ethernet Communications User Manual and LWIFI & LWIFIX Wireless Communications User Manual. In summary, you must first set the meter to 19200 baud, Custom ASCII protocol, no parity, 8 data bits, 1 stop bit (N81) and address 1 through its front panel. You must install and run the Network Setup (NS) utility, a separate program. The “Laurel Network Setup” screen will display the discovered COM port, so there is no need to run the Windows Device Manager.

Click on the “Run Instrument Setup” button at the bottom of that screen. You will be prompted to exit the Network Setup (NS) utility. Click on “Yes” to do so, then Launch IS software. With these boards, you cannot run IS software without first conditioning the boards with the NS Network Setup (NS) utility.

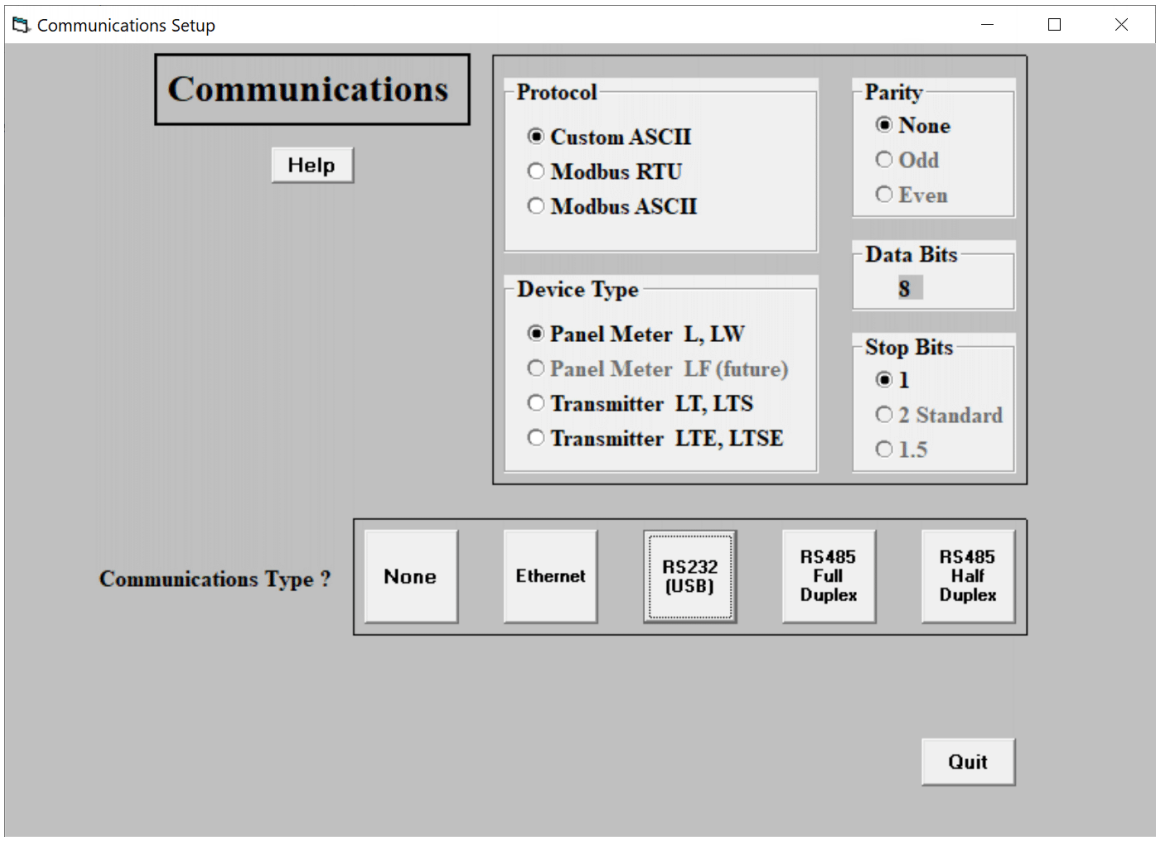


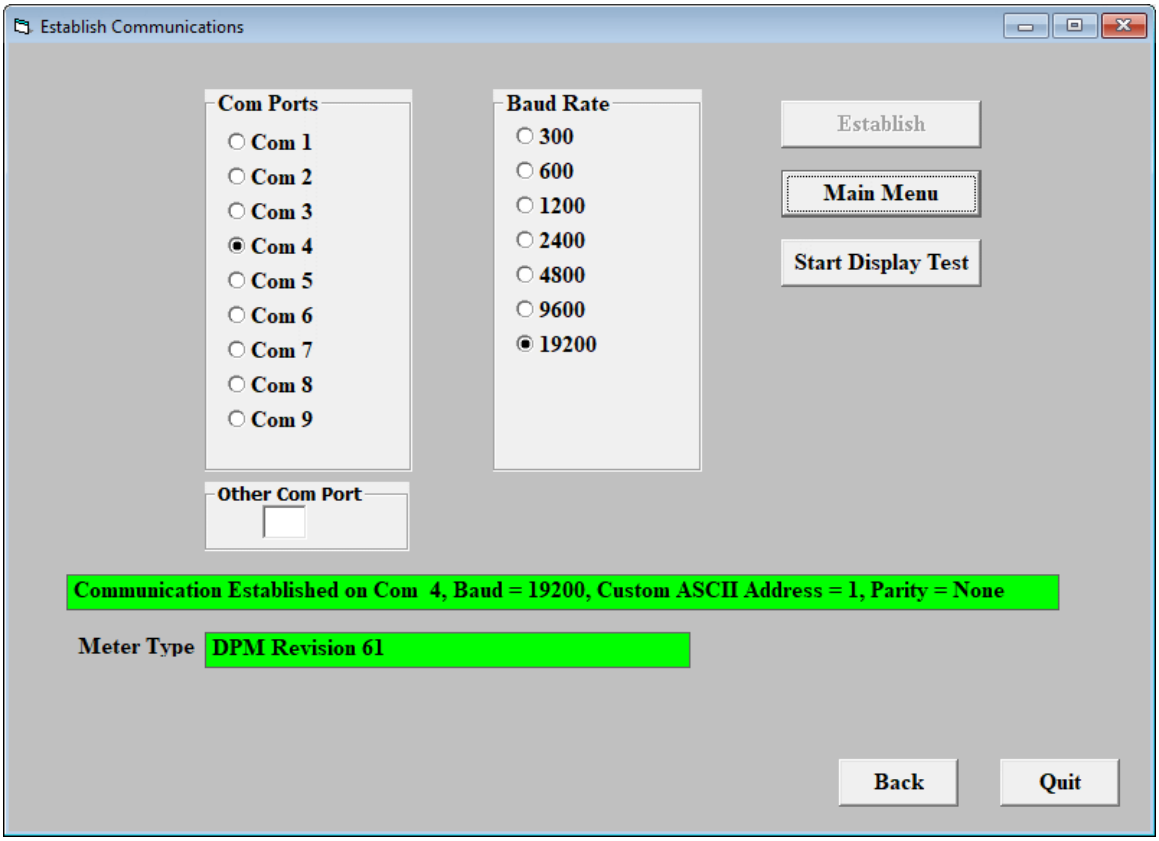


In the “Communications Setup” screen of IS software, select “Custom ASCII” as the protocol, “Panel Meter L, LW” as the device type, and “RS232 (USB)” as the communications type.

In the “Establish Communications” screen of IS software, select the COM port discovered by the NS utility and 19200 as the baud rate.

After communications have been established, click on the “Main Menu” button to enter the IS software Main Menu.


Communications Setup
Communications
Help
Protocol
Custom ASCII
Modbus RTU
Modbus ASCII
Parity
None
Odd
Even
Data Bits
8
Device Type
Panel Meter L, LW
Panel Meter LF (future)
Transmitter LT, LTS
Transmitter LTE, LTSE
Stop Bits
1
2 Standard
1.5
Communications Type ?
None
Ethernet
RS232 (USB)
RS485 Full Duplex
RS485 Half Duplex
Quit


Establish Communications
Com Ports
Com 1
Com 2
Com 3
Com 4
Com 5
Com 6
Com 7
Com 8
Com 9
Baud Rate
300
600
1200
2400
4800
9600
19200
Establish
Main Menu
Start Display Test
Other Com Port
Communication Established on Com 4, Baud = 19200, Custom ASCII Address = 1, Parity = None
Meter Type
DPM Revision 61
Back
Quit

7. ENTRY INTO IS MAIN MENU

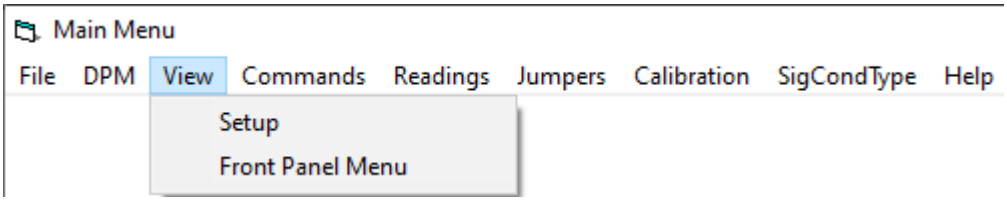
To enter the Main Menu, click on the “Main Menu” button from the “Establish Communications” after the “Communications Established” field has turned green. The “Main Menu” entry screen will open. Read the message and click on OK.

1. Get Setup and Put Setup Commands

With your instrument communicating, the second from the left item in the top ribbon will DPM or Counter, depending on whether IS software has detected an analog input instrument or pulse input instrument. Click on that heading.

- **Get Setup** uploads the setup data from a connected instrument to IS software. Normally click on this link after you have established communications.
- **Put Setup** downloads new or modified setup data from IS software into a connected instrument. Click on this link after you have made modifications that you would like to download into your instrument.

2. View Setup Command



After executing a “Get Setup,” execute a DPM (or Counter) View => Setup. This will open the main graphical user interface of IS software, which allows you to view and modify specific setup settings. This interface has clickable tabs, each of which brings up a specific setup screen. If an option board, like an analog output board, is not detected, that tab will be grayed out. Under each tab, data entry items that do not apply are grayed out or not shown. For example, only two relays are shown if the relay board has two relays, not four.

For additional technical information on each data entry item, please see our panel mount Analog Input DPM User Manual or our Pulse Input Counter User Manual. Do this even if your instrument is a DIN rail mount transmitter. Our transmitters use the same firmware as our meters, but their user manuals have less technical detail.

3. Main IS Software Graphical User Interface

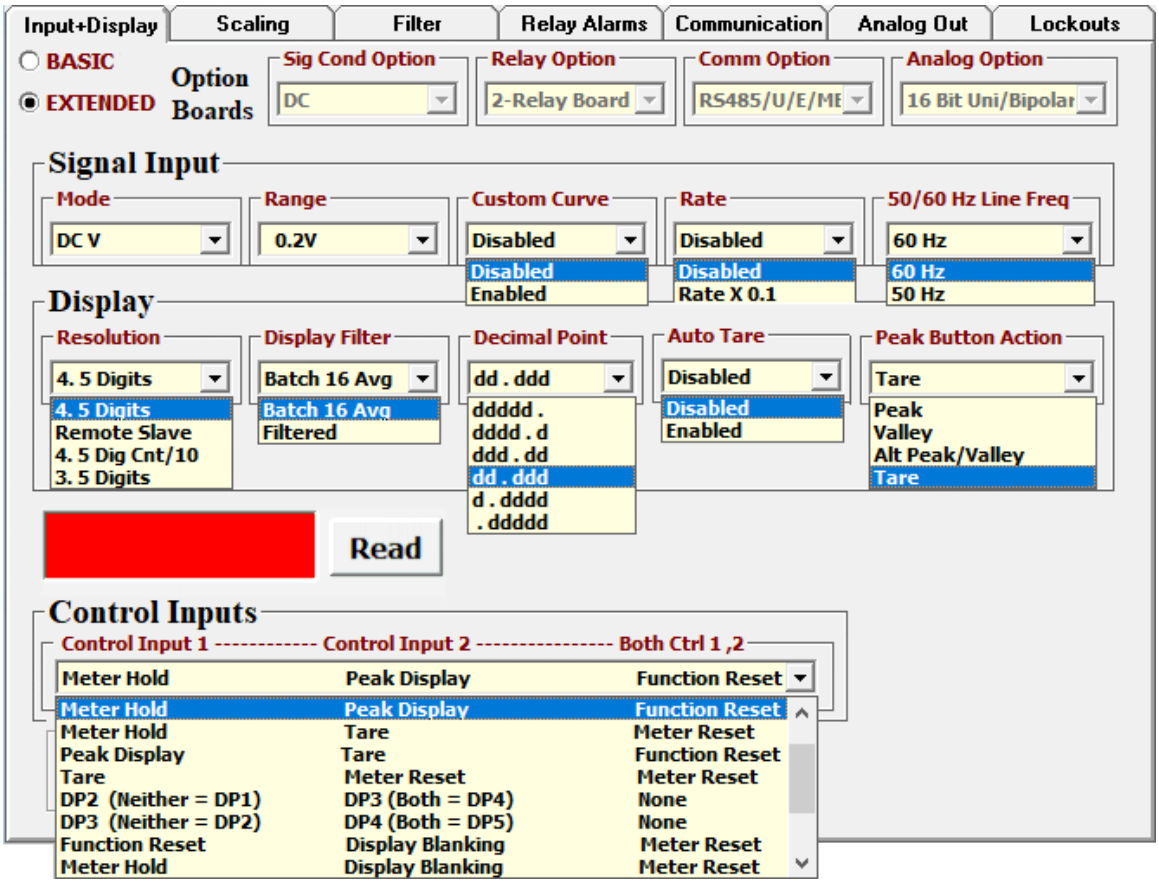
The main IS software GUI (graphical user interface) consists of six screens each under a manila folder tab. Clicking on each tab opens the screen for that tab. Some of the screens are different for analog input and pulse input instruments, some of the screens are the same. The screens may also vary based on prior selections so that specific menu items are shown or not shown.

Some of the screens presented in this user manual are photoshopped to present a large number of menu items as well as multiple pull-down menus, which cannot be opened simultaneously.

Each menu item is explained by bulleted text in this manual. For more detailed on-screen information on any item, click on that menu item, then on your PC's F1 key.

8. INPUT+DISPLAY TAB FOR ANALOG INPUT DPMS

The Input+Display screen for DPMs allows the user to specify the signal input, display format, and functions of two control inputs. This manual section shows the Input+Display tab for a DC input instrument.



- **Basic or Extended** refers to capabilities of the instrument's firmware. Discovered by IS software after doing a Get Setup. Most analog input meters or transmitters are Basic, since Extended only adds custom curve linearization and rate from successive readings. Only the factory can convert Basic to Extended.
- **Sig Cond Option** refers to type of signal conditioner board. Discovered by IS software and unchangeable after doing a Get Setup from an actual meter. Can be entered manually after doing a Default Setup.
- **Signal Input Mode** refers the operating mode of the signal conditioner board. The signal type must already have been set via jumpers on the signal conditioner board. This entry informs IS software since it cannot read jumper settings. Choices for the DC signal conditioner board are DC V for voltage, DC A for current, and Ratio. The latter mode is designed for loadcell or potentiometer follower applications, where the reference voltage to the A-to-D converter is to the excitation voltage from the meter.

Ratio is used for resistive bridge sensors and voltage dividers, such as potentiometers which track wiper position.

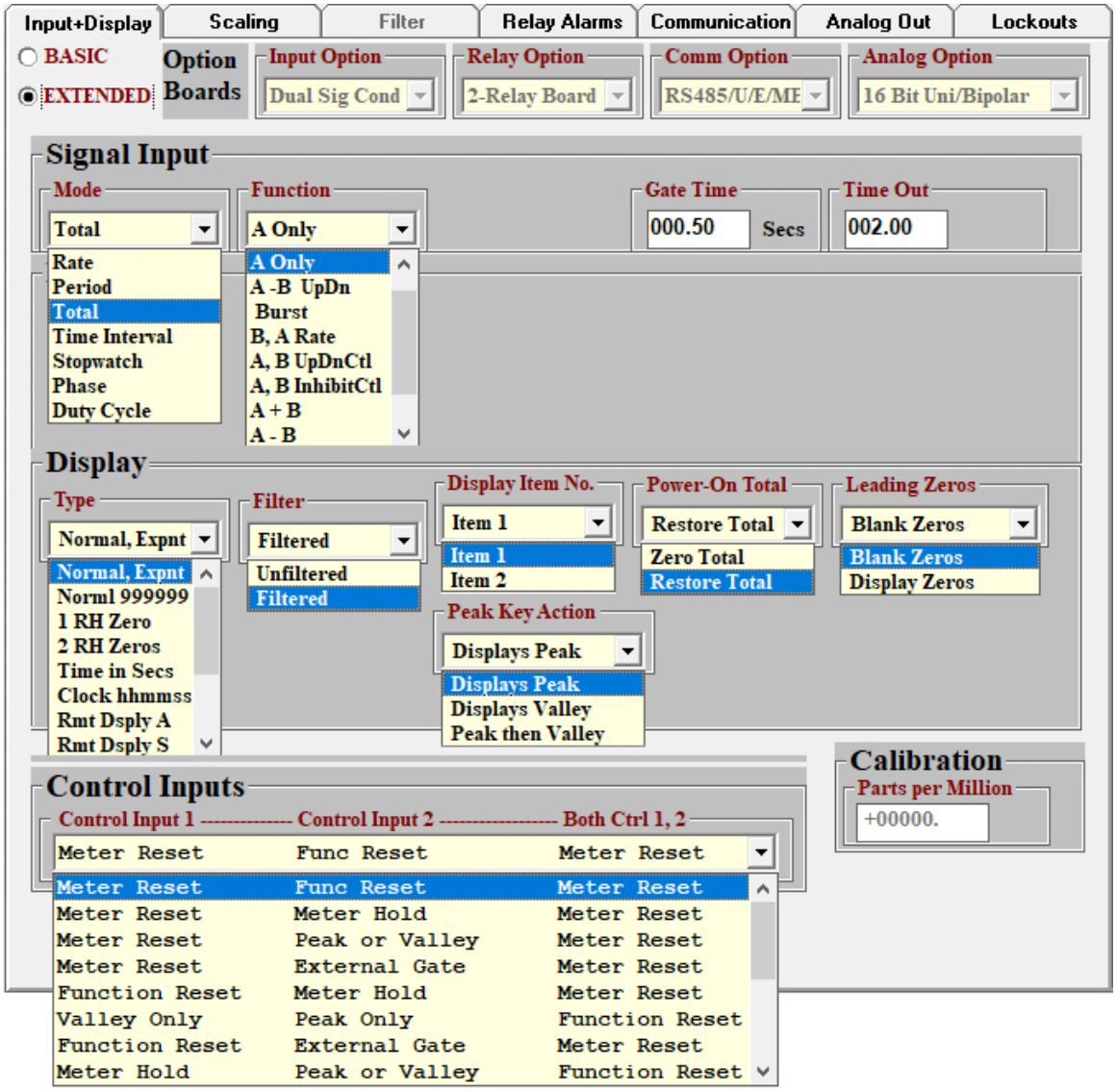
- **Signal Input Range** refers to the signal range to be applied. The range must already have been set via jumpers on the signal conditioner board. This entry tells informs IS software since it cannot read jumper settings. Choices for the DC signal conditioner board are 5 voltage ranges and 4 current ranges.
- **Custom Curve** only applies if your instrument is Extended and you wish to implement a custom nonlinear relationship between the instrument's reading and the signal input. Please see our separate Custom Curve User Manual.
- **Rate** only applies if your instrument is Extended and you wish to obtain rate from measurements taken 1 second apart.
- **50/60 Hz Line Freq** sets the A-to-D signal integration period to either 20.000 msec or 16.666 msec so that the meter rejects either 50 Hz or 60 Hz AC line noise. This setting is critical for stable readings with millivolt signals which invariably have some superimposed AC line noise.
- **Display Resolution** sets the meter resolution. Normally keep "4.5 Digits," which means ±20000 counts. The meter is still scalable to display up to ±99999 counts with scaling and filtering. If you select "4.5 Dig Cnt/10," the meter will count by 10's and replace the last digit by a 0 with proper rounding. Do not select "3.5 Digits," which reduces resolution to ±2000 counts. Do not select "Remote Slave," since such operation is better performed and better documented by our 6-Digit Remote Display and Serial Input Meter, a counter without a signal conditioner board.
- **Display Filter** can be set to "Batch 16 Avg" or to Filtered. The first choice is the default setting of a Laureate analog input instrument, which average 16 readings taken every 16.666 msec or 20 msec. The Filtered choice selects filtered action as specified under the Filter tab.
- **Decimal Point** allows you to set the decimal anywhere from .ddddd to ddddd. Meter scaling converts A-to-D input counts, an integer, to output or display counts, also an integer. To add a displayed digit, increase the scale multiplier by a factor of 10. To remove a displayed digit with proper rounding, divide the scale multiplier by 10. The decimal point is only a decoration to make the display more understandable. For example, 12400 grams can be displayed as 12.400 kg by moving the decimal point.
- **Auto Tare** tares the meter when power is first applied or when a meter Reset is executed. With tare, the weight of an empty contained is used as an offset so that the meter reads net weight of the contents, not the gross weight of the contents plus container.
- **Peak Button Action** defines what a DPM displays when the Peak button, or second button from the left, is pressed. Choices are Peak, Valley, Peak then Valley, and Tare. Pressing Tare zeroes the reading by creating an offset.

- **The Read** button and the adjacent display field are only shown for transmitters, which don't have a display. Clicking on the Read button turns the red field green and displays the reading of a similarly scaled meter. This is an important diagnostic tool to verify that the front end of transmitters is set up correctly. The displayed reading is what is transmitted as serial or Ethernet data, and it is used to control the analog output and relays of the transmitter.
- **Control Inputs** provides a pull-down menu where each selection specifies the function of Control Input 1, Control Input 2, and the combination of both Control Inputs 1 and 2. In our panel mounted meters, the two control inputs and control input return are just below the meter's power inputs. In our transmitters, the two control inputs are adjacent to the signal inputs. Momentarily shorting a control input to control input return issues a control input. The exception is LT analog input transmitters, which don't have control inputs. Note that the roles of the control inputs vary with the type of signal conditioner. Only the applicable roles are displayed.

9. INPUT+DISPLAY TAB FOR PULSE INPUT COUNTERS

The Input+Display screen for counters allows the user to specify the signal input, display format, and functions of two control inputs. This manual section illustrates the Input+Display tab for a counter with the dual-channel pulse input signal conditioner, model number suffix FR. This screen is very dynamic, as the menu selections change based on prior selections.

For additional technical information, please see our Pulse Input Counter User Manual. Do this even if your instrument is a DIN rail mounted transmitter. Our transmitters use the same firmware as our meters, but their user manuals have less technical detail.



- **Basic or Extended** refers to capabilities of the counter's firmware. Discovered by IS software after doing a Get Setup. Basic counters can do rate/frequency, totalizing and timing. Extended counters can do a lot more, hence their menu items a more complex. Only the factory can convert Basic to Extended.
- **Signal Input Mode** list the counter's main operating modes, which are illustrated here for the Extended FR counter. These are rate/frequency, period, totalizing, time interval, stopwatch, phase angle, and duty cycle.
- **Signal Input Function** is a subset of the Signal Input Mode and is illustrated here for the Totalizing Mode. For technical details, please see our Pulse Input Counter User Manual.
- **Display Type** should normally be set to "Normal 999999" for a 6-digit display with any decimal point. Select "Normal, Expnt" to go to the exponential format xxxExx, where Exx is 10^{xx}, when the reading would exceed 6 digits. Select "1 RH Zero" or "2 RH zeros" if you want the last digits of your reading to be 0 or 00 with proper rounding. Select "Time in Secs" if you want basic timing to be in seconds, not the default microseconds. Select "Clock hhmmss" if you want time displayed in HH.MM.SS format. Select one of the "Rmt" modes for remote display counter operation or LTS serial-to-analog converter transmitter operation. For an explanation of these modes, see our Serial Input Meter & Remote Display Manual and our Model LTS RS232 or RS485 Serial Input, Analog Output Transmitter Manual.
- **Gate Time** is a time in seconds over which an integral number of time intervals is averaged for frequency, rate, duty cycle, phase angle, and repetitive time interval measurements. The longer the gate time, the more stable the meter reading, but the slower the display update rate. Gate Time is also the interval at which the display is updated when totalizing.
- **Time Out** applies to rate/frequency measurements. When the meter does not get a pulse for a period longer than the Gate Time, the reading is set to zero. Time Out needs to be longer than the longest expected signal period.
- **Display Filter** can be set to Unfiltered or Filtered. The latter is specified under the Filter tab of IS software an allows the application of moving averages to consecutive readings. Normally use Unfiltered. Totals and stopwatch time measurements should not be filtered. Use Gate Time to set the time over which rate/frequency and repetitive time intervals are averaged.
- **Display Item No.** can be set to 1, 2 or 3. This is the Item # that will be displayed following the first application of power or Meter Reset. Please see our Pulse Input Counter User Manual for the definitions of Items, which change based on the Signal Input Mode and Function.
- **Peak Button Action** defines what a counter displays when the Peak button, or second button from the left, is pressed. Choices are Peak, Valley, and Peak then Valley.

- **Power-On Total** specifies if totals are zeroed or retained in the event of power loss. Choices are “Zero Total” and “Restore Total.” Choose the latter if you want totals to be retained.
- **Leading Zeros** specifies if leading zeros are blanked or displayed. Choose blanked for a normal display. Chose displayed if leading zeros are to be part of a transmitted data format.
- **Control Inputs** provides a pull-down menu where each selection specifies the function of Control Input 1, Control Input 2, and the combination of both Control Inputs 1 and 2. In our panel mounted counters, the two control inputs and control input return are just below the meter’s power inputs. In our transmitters, the two control inputs are adjacent to the signal inputs. Momentarily shorting a control input to control input return issues a control input. The exception is LT analog input transmitters, which don’t have control inputs. Note that the roles of the control inputs vary with the type of signal conditioner. Only the applicable roles are displayed.

10. SCALING TAB FOR ANALOG INPUT DPMS

1. Scaling Theory for Analog Input DPMs

Scalability is a standard feature of all Laureate analog input meters and transmitters, with the exception of thermocouple and RTD input modes. It allows electrical signals to be converted to readings in engineering units. These readings can have up to 5 digits, a user specified decimal point, and a user specified polarity. For example, a 4-20 mA signal from a pressure transducer can be scaled to display 80.00 to 120.00 psi. While they don't have a display, transmitters have an internal reading that can be transmitted as serial data and serves as the basis of the transmitter's analog output and relay action.

Three scaling methods are user selectable:

1) **Scale and Offset Method,** which specifies a straight line of the type y = mx + b
2) **Coordinates of 2 Points Method,** which fits a straight line between two entered data points (low in, low read, and high in, high read).
3) **Reading Coordinates of 2 Points Method,** which uses actual signal inputs instead of manually entered low and high input signals.

Select the scaling method which is most convenient. If you know that the straight line passes through zero, you will typically use the Scale and Offset Method by entering the required scale factor and an offset of zero. If you are using a calibrated 4-20 mA transducer, you may wish to use the Coordinates of 2 Points Method by entering the desired readings for 4 mA and 20 mA. If you have a load cell meter and a known 50.000 kg weight, you may wish to use the Reading Coordinates of 2 Points Method by entering 0.0000 for no load and 50.000 for the reference weight weighed in place.

Input and output (or display) counts are properly rounded integers and are used for scaling regardless of the selected scaling method. The decimal point is not used in calculations but is only a decoration that appears in the displayed reading. For example, 1000 display counts can be shown as 1000 (grams) or 1.000 (kg).

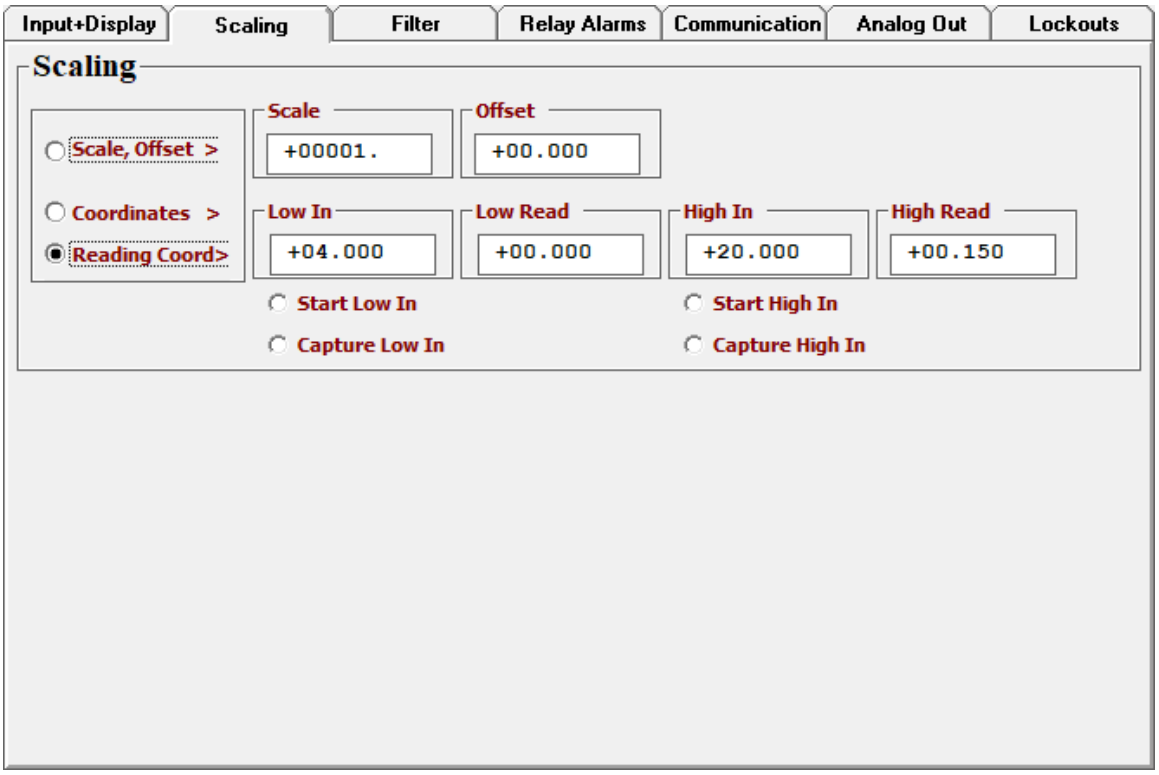
The number of inputs counts is the integer number generated by analog-to-digital conversion. The maximum is 20,000 for full scale (FS) of all analog signal types and ranges, except for the 50.000 mV load cell range, where the maximum is 50,000. This means that one count is 1 µA for the 20.000 mA range (which includes 4-20 mA), and 1 µV for the 50.000 mV load cell range. With the DC signal conditioner board, one count is 0.1V for the 300.0V and 600.0V ranges, which are a portion of the 2000.0V range. One count is 1 mA for the 5.000A range, which is a portion of the 20.000A range. Our instruments cannot be rated for the full 2000.0V and 20.000A ranges.

The number of output (or display) counts is the integer number that is displayed on the meter, is output as serial data, is used to generate the meter's analog output, and is used for relay setpoint comparisons. This is the number generated by the meter's scaling arithmetic.

To increase output resolution and add displayed digits after the decimal point, multiply the input counts by a factor of 10 for each additional digit, then move the decimal point one position to the left for each added digit. For example, if you want to display 517.13 kg instead of 517 kg from a load cell input, increase the scale factor by a factor of 100 to increase the counts to 51713, then move the decimal point to the left by two positions. This change in scaling can also be achieved by entering larger readout numbers using the Coordinates of 2 Points Method or Reading Coordinates of 2 Points Method.

To decrease resolution, for example to display 15,547 mv as 15.5V, divide the scale factor by 10 for each digit to be eliminated. For this example, apply a scale factor of 0.01 to change the counts to 155, and move the decimal point one position to the left.

2. Scaling Screen for Analog Input DPMs



- **Click on one of the 3 radio buttons** to select your scaling method. The other scaling methods will be grayed out. The decimal point in your reading and in Offset is set in the Input+Display screen. After entering your scaling values, click on Main Menu, then on DPM => “Put Setup” to download your changes into your meter.
- **Scale, Offset** selects the scaling method entered in the form of coefficients for the straight line **y = mx + b**, where **y** is output (or display) counts**, x** is native input counts**, m** is a scale factor, and **b** is an offset in output (or display) counts.
- **Coordinates** allows you to enter two data points which define the same straight line as “Scale, Offset.” The Coordinates method is convenient for 4-20 mA signals.

- **Reading Coordinates** allows you to enter the above two data points using actual signals. Enter the desired “Low Read” and “High Read” values for your two data points. Apply a “Low In” signal and click on “Capture Low In.” Apply a “High In” signal and click on “Capture High In.” The readings coordinates of 2 point method has the advantage of calibrating the transducer and the instrument as a system.
- **Scale** (more comprehensively named Scale Factor and applicable to the “Scale, Offset” scaling method), can be any 5-digit value, positive or negative, with any decimal point. For example, to convert 0-5.000V (0-5000 counts using the 20.000V range) to 100.0 PSI (1000 counts), apply a scale factor (or multiplier) of 0.2000. Keep the offset at 0 if your straight line passes through 0.
- **Offset** is an adder to output (or display) counts. The decimal point for analog input instruments will be as set under the Input+Display tab.

11. SCALING TAB FOR PULSE INPUT COUNTERS

1. Scaling Theory for Pulse Input Counters

Scaling is the process of converting native input counts to output (or display) counts in engineering units. Two scaling methods are selectable: the “Scale and Offset” method, and the “Coordinates of 2 Points” method. Both methods provide the same results. Use the method that is most convenient for you.

- **“Scale, Offset”** fits a straight line **y = mx + b**, where **y** is an integral number of display counts, **m** is a scale factor (or multiplier), **x** is a floating point number of input counts, and **b** is an offset in output (or display) counts. “Scale and Offset”
- **Coordinates** produces the same straight line as “Scale, Offset” when two data points are entered. The decimal point is set under the Scaling tab.

Calibration is different from scaling. Calibration ensures that frequency and time measurements are accurate to national calibration standards, which are NIST standards in the USA. Only one item can be calibrated in Laureate counters, namely the quartz crystal time base used for frequency and time measurements. Do not change Calibration unless you need corrections to within a few parts per million (PPM).

Native input counts vary depending on the Mode and Function specified under the Input+Display tab. They are:

- **Pulses** for totalizing
- **Hz** (or pulses/sec) for frequency or rate
- **Microseconds** for timing unless set to “Time in **Secs**” under the Input +Display tab
- **Degrees** for phase angle
- **Percent** for duty cycle

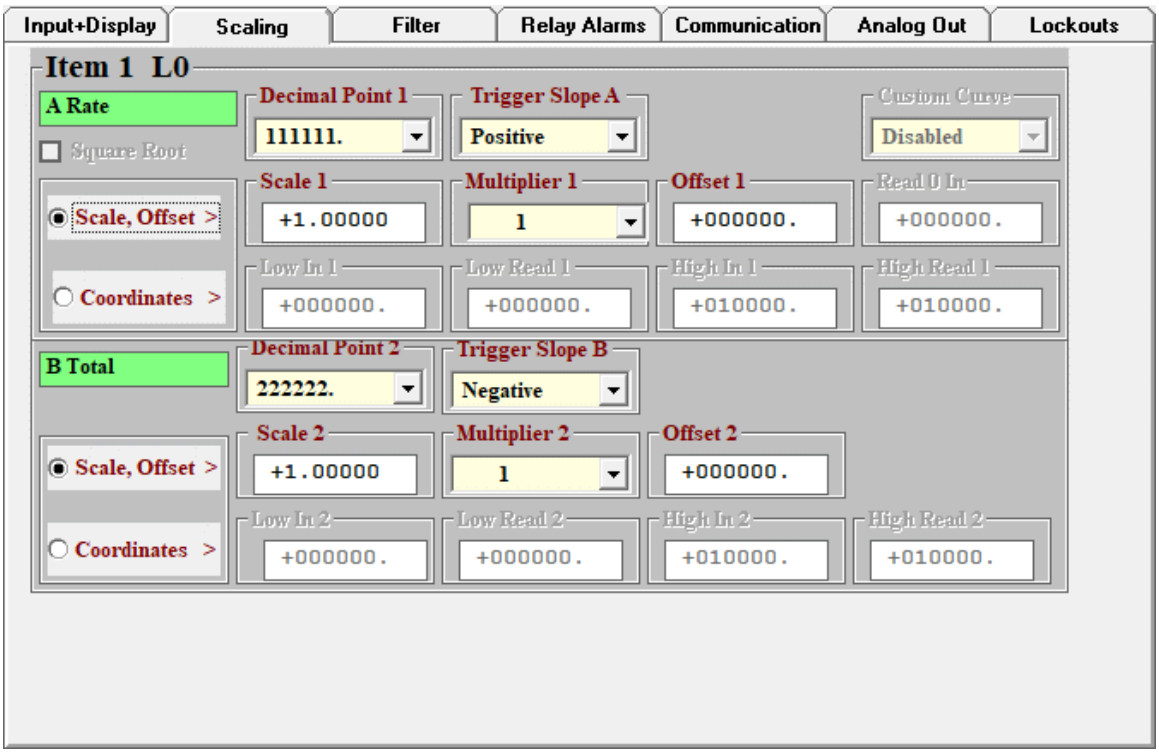
Output (or display) counts are in engineering units and are rounded integers. The decimal point is only a decoration and can be set under the Scaling tab. For a wide dynamic scaling range, Scale Factor = Scale Value (in d.ddddd format) x Scale Multiplier (in multiples of 10 from 0.00001 to 100000).

To add or remove digits after the decimal point, use the Scale Multiplier while also moving the decimal point, as illustrated by the examples below:

- If the actual time is 7.578213 sec and you have selected native timing in sec and you want to display even seconds, apply a Scale Multiplier of 1. The meter will then display the correctly rounded 8 sec.
- If you want to see three digits after the decimal point, apply a Scale Multiplier of 1000 so that you are in effect displaying correctly rounded msec, then move the decimal point three positions to the left. The meter will then display 7.578.
- If you had stayed with native timing in µsec, the meter would have like to display 7578213 µsec, but it can only display 6 digits. Apply a scale multiplier of 0.001 to convert the reading to rounded msec, then move the decima point three positions to the left. The meter will then again display 7.578.

2. Scaling Screen for Pulse Input Counters

The Scaling screen for counters will change depending on the Mode and Function selected under the Input+Display tab. The example below is for the Extended counter Rate Function "A, B Total" for rate on channel A and total on channel B. For details on available counter Modes and Functions, please see our Pulse Input Counter User Manual.



- **The 2 radio buttons** for each channel allow you to select your scaling method. The other scaling methods will be grayed out. After entering your scaling values, click on Main Menu, then on Counter => "Put Setup" to download your changes into your counter.
- **Decimal Point** is a decoration which is added to the output (or display) count value, which is a properly rounded integer.
- **Trigger Slope** allows a pulse to be triggered on a positive slope, such as 0V going to 5V, or a negative such as 5V going to 0V. For example, to use the A-to-B stopwatch method to measure the width of a negative-going pulse, apply the same signal in parallel to the A and B input channels. Start timing on a negative slope on the A channel and stop timing on a positive slope on the B channel. Note that trigger levels in volts are set by jumpers, as detailed our counter and transmitter user manuals.
- **Scale** (more comprehensively name Scale Value) is a 6-digit multiplier in d.ddddd format with the decimal point position a shown. The default value is +1.00000. Combined with a Multiplier of 1, this value is used to display unscaled native input counts.

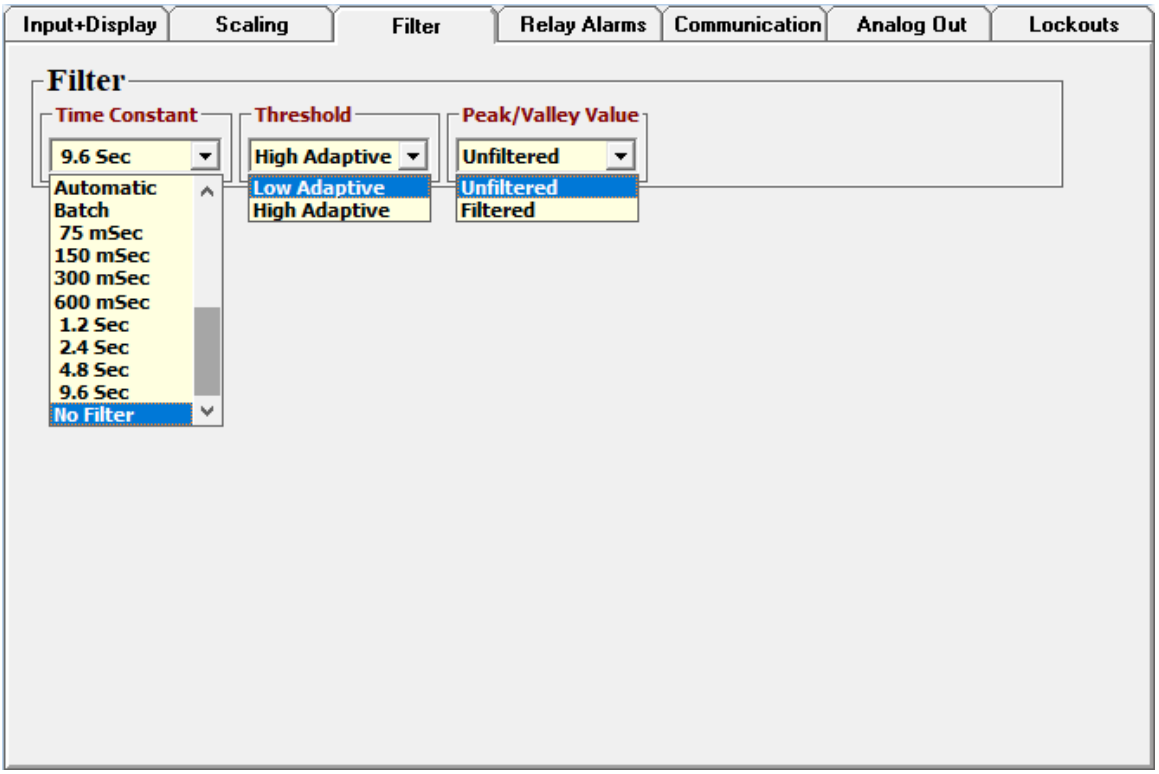
- **Multiplier** (more comprehensively named Scale Multiplier) is a value which can be selected from 0.00001 from 100000 in multiples of 10. The Scale Factor which multiplies the native input counts equals Scale Value x Scale Multiplier. Splitting Scale Factor into a 6-digit Scale Value and a Scale Multiplier allows 6-digit Scale Factor resolution. For example, if the desired Scale Factor is 0.00025678, enter a Scale Value of 2.56780 and a Scale Multiplier of 0.0001.
- **Offset** is an adder to output (or display) counts. The decimal point for pulse input instruments is as set under the Scaling tab.

12. FILTER TAB FOR ANALOG INPUT DPMS

1. Filtering Overview

Digital filtering is useful for analog signals with superimposed electrical noise. It ensures a stable display that is easier to read. Laureate meters have a unique feature called **adaptive filtering** which averages out low-level random noise, yet allows the instrument to respond to actual step functions in signal in about 30 msec, or close to instantly. A further refinement is **automatic adaptive filtering**, which optimizes the filter time constant for the encountered noise condition.

2. Filter Screen for DPMs



Filter Time Constant has 11 possible settings:

- **No Filter** removes all filtering. For Laureate analog input instruments, the display update rate will then be 50 or 60 times/sec, depending on the 50 Hz or 60 Hz noise rejection setting. The rightmost displayed digit may then be a blur. Set Filter to “No Filter” for high-speed serial data streaming using the Custom ASCII protocol, and for high-speed data readings using our WIFI and LNET1 Modbus communication boards.
- **Batch** displays the average of 16 consecutive readings taken at 50 or 60 times/sec, depending on the 50 Hz or 60 Hz noise rejection setting. Since the 17th reading is used to zero the A-to-D converter, the display will be updated every 34.0 or 28.3 msec.

- **Time constants can be set** from 75 msec to 9.6 sec to apply a moving average filter with that equivalent RC time constant. The factory default filter setting is 9.6 sec to provide rock-stable readings. RxC is the time taken by a capacitor C to reach 63.2% of its final voltage value which charged or discharged though a resistance R. The 8 selectable moving average modes are:

  Old average x 1/2 + new reading x 1/2 (equivalent to 0.08 sec RC time constant).
  Old average x 3/4 + new reading x 1/4 (equivalent to 0.15 sec RC time constant).
  Old average x 7/8 + new reading x 1/8 (equivalent to 0.3 sec RC time constant).
  Old average x 15/16 + new reading x 1/16 (equivalent to 0.6 sec RC time constant).
  Old average x 31/32 + new reading x 1/32 (equivalent to 1.2 sec RC time constant).
  Old average x 63/64 + new reading x 1/64 (equivalent to 2.4 sec RC time constant).
  Old avg. x 127/128 + new reading x 1/128 (equivalent to 4.8 sec RC time constant).
  Old avg. x 255/256 + new reading x 1/256 (equivalent to 9.6 sec RC time constant).

- **Automatic** allows the meter to set its own equivalent RC time constant based on the encountered noise environment.

- **Threshold** can be set to “Low Adaptive” or “High Adaptive.” This is the voltage threshold at which moving average filtering is reset and the meter jumps to its new value. Use “Low Adaptive” for low noise, “High Adaptive” for high noise.

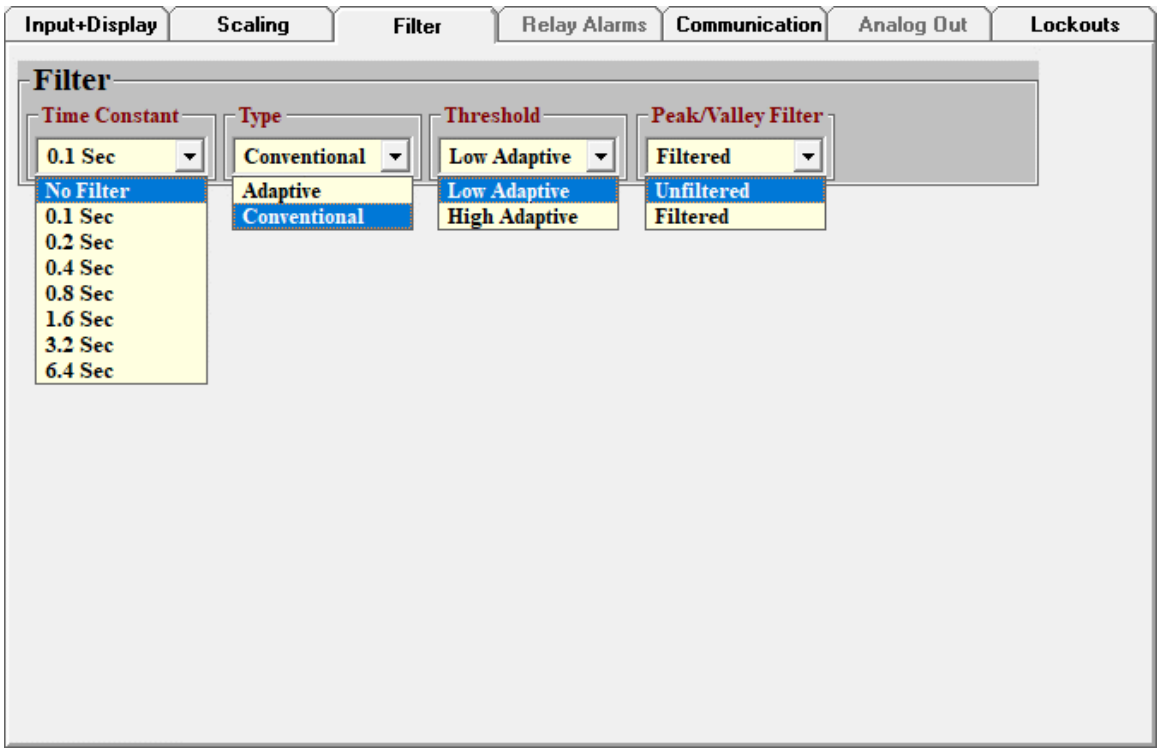
- **Peak/Valley Value** allows the Peak and Value functions to respond to the filtered or unfiltered signal.

13. FILTER TAB FOR PULSE INPUT COUNTERS

1. Filtering Overview

Digital filtering is primarily used for analog signals with superimposed electrical noise. It should not be used for counters used for totalizing or for stopwatch timing. It should also normally not be used for counters used for frequency, period, repetitive timer, phase angle and duty cycle measurements. Instead, use the programmable **gate time** feature, set under the Input+Display tab, over which an integral number of events are averaged. Gate time for counters can be set from 10 msec to 199.99 sec and is automatically extended to include an integral number of events to be averaged. For example, a gate time of 0.50 sec will ensure that thirty 60 Hz AC line cycles are averaged for a display that is stable to 0.001 Hz.

2. Filter Screen for Counters



- **Time Constant** can be set to No Filter or to a moving average with an equivalent RC time constant from 0.1 sec to 6.4 sec. Please see the previous section “Filter Tab for Analog Input DPMs” for an explanation of moving average and RC time constant.
- **Type** can be set to Adaptive or Conventional. An adaptive moving average is reset to the new value when the latest reading differs from the average reading by more than a threshold, which can be set as Low or High.
- **Threshold** sets the adaptive moving average filter threshold to Low or High. Use “Low Adaptive” for low noise, “High Adaptive” for high noise.
- **Peak/Valley Filter** allows the Peak and Value functions to respond to the filtered or unfiltered signal.

14. RELAY ALARMS TAB

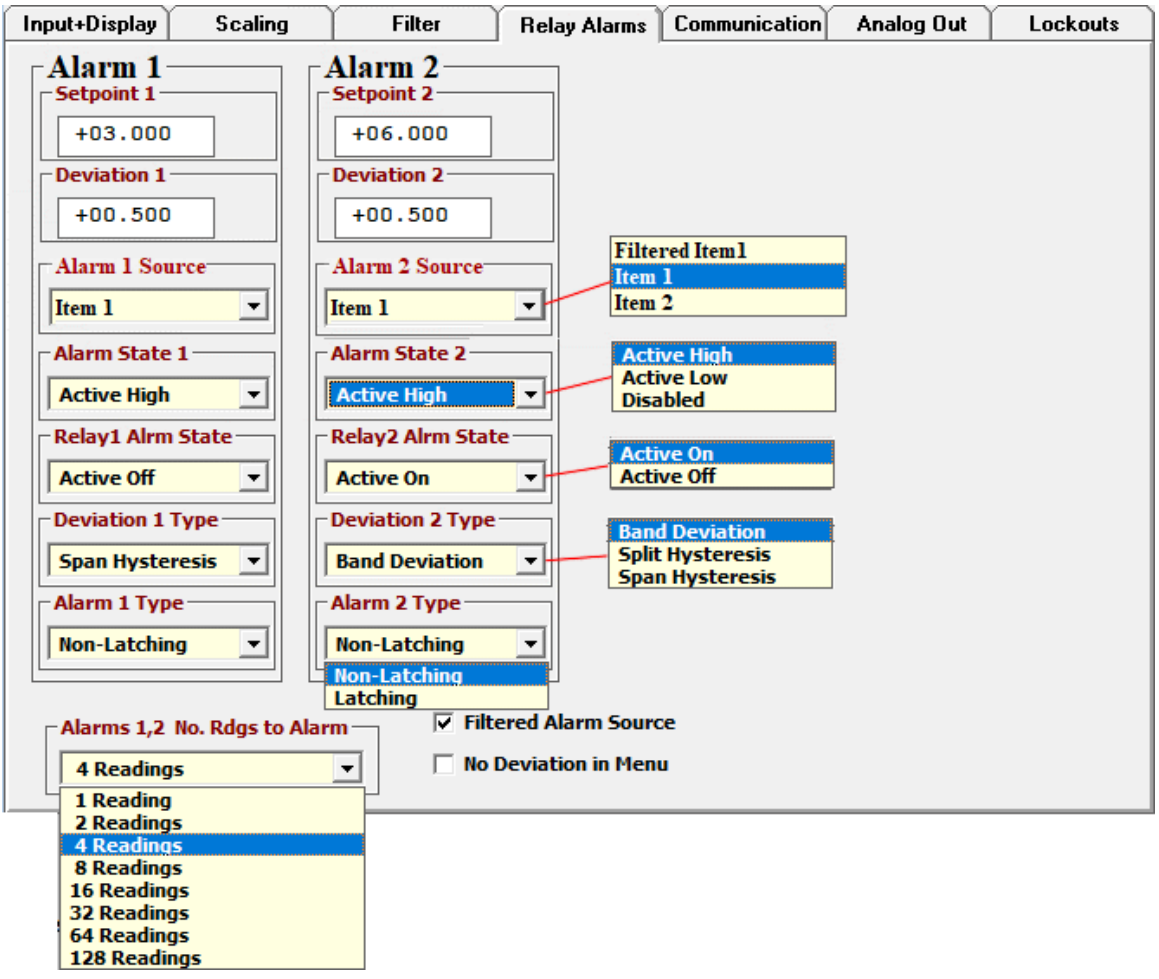
1. Relay Overview

Two or four relays are optional in Laureate panel meters and counters. These can be mechanical or solid state. Two solid state relays are standard in Laureate DIN rail transmitters. The relays can be used for alarm or On/Off control. The dual mechanical relays for panel meters and counters are Form C, where a center pin is switched to either of two contacts. Depending on how the relay is wired, a Form C relay can be normally open (NO) or normally closed (NC). All other relays are Form A, where a single contact is normally open (NO) unless active.

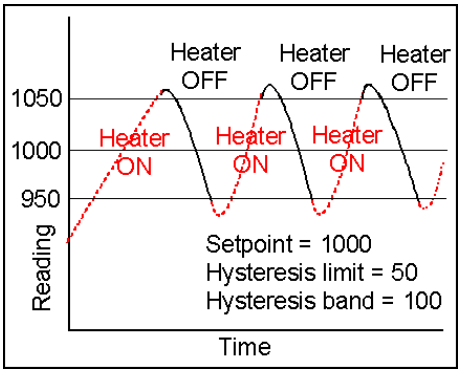
The “Relays Alarm” tab will show 2 or 4 relays, or it will be grayed out, depending on the detected hardware. Each of the 2 or 4 relays is individually programmable. This allows a single signal value to control up to 4 relays. For example, based on volume, one of the relays can be used to slow down a filling pump, and another relay can shut off the pump.

Relay setpoints can easily be changed from the front panel of a Laureate meter or counter. They can also be changed via IS software or via commands using the Modbus or Custom ASCII protocol.

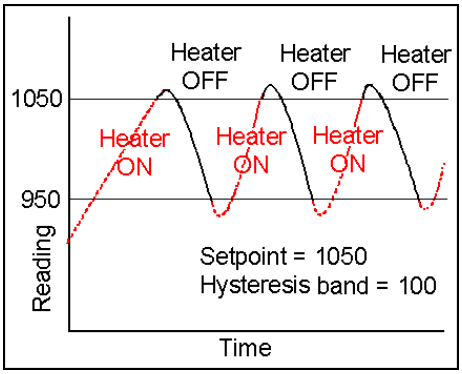
2. Relay Alarms Screen



- **Setpoint** is the numeric value that is compared to the reading to determine the state of the relay when **Deviation** is set to zero. The decimal point is the same as for the meter reading as set under the Input+Display tab for DPMs and the Scaling tab for counters. A comparison of the Setpoint to the reading is made after each reading.
- **Deviation** is a limit that is added or subtracted from **Setpoint** to determine the state of the relay.
- **Alarm Source** only appears for counters, which offer the choice of Filtered Item 1, Item 1 or Item 2. These variables take on different meaning depending on the Mode and Function selected under the Input+Display tab. Please see the Pulse Input Counter User Manual for details. For example, Item 1 can be rate and Item 2 can be total.
- **Alarm State** can be set to Active High, Active Low, or Disabled. A front panel indicator light turns on with a panel meter or counter to indicate that a relay is active. With Split Hysteresis, "Active High" means that the relay is active when the reading equals or exceeds the Setpoint plus Deviation, and "Active Low" means that that relay is active when the reading equals or falls below the Setpoint minus Deviation.
- **Relay Alarm State** can be set to "Active On," which means relay closed, or "Active Off," which means relay open.
- **Deviation Type** can be set to Band Deviation, Split Hysteresis or Span Hysteresis.

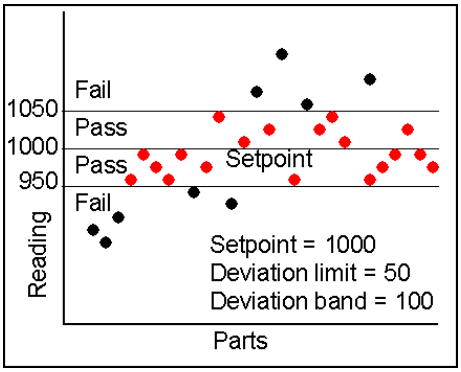


Split Hysteresis is specified in counts symmetrically around the Setpoint. The relay activates when the reading rises above the Setpoint plus one Deviation limit. The relay de-activates when the reading falls below the Setpoint less one Deviation limit. The Hysteresis band equals two Deviation limits. A narrow Hysteresis band is used to minimize relay chatter. A wide Hysteresis band can be used for On/Off control.



Span Hysteresis provides the same relay operation as Split Hysteresis, but it is specified differently and is more intuitive for some users. Here the Setpoint is the upper control limit, and the lower control limit is the Setpoint less one Deviation limit. The latter is now also the Hysteresis band.

Band Deviation defines a band that controls the alarm symmetrically around the Setpoint for Pass/Fail testing. The relay activates when the reading falls outside of the Deviation band to indicate Fail, and de-activates when the reading falls inside the Deviation band to indicate Pass. A Deviation limit, such as 50 counts, is set up around both sides of the Setpoint to create a Deviation band, such as 100 counts. The Deviation band equals two Deviation limits.



- **Alarm Type** can be set to Non-Latching or Latching. A Non-Latched alarm changes state when the reading rises above a limit and automatically changes back when the reading falls below a limit. A Latched alarm stays actuated until reset via a control input or a command sent via Modbus or the Custom ASCII protocol. Latched alarms can shut down a process when an operating limit has been exceeded until the alarm condition has been acknowledged by an operator.
- **Alarms No. Rdgs to Alarm** specifies the number of readings in the alarm zone to be specified until the alarm condition is acted upon. For example, this prevents a single spike to set an alarm. Note that Laureate analog input readings are every 20.000 or 16.666 msec depending on whether noise rejection has been set to 50 or 60 Hz.
- **Filtered Alarm Source** can checked if the alarm source is to be the filtered signal, aa set under the Filter tab, as opposed to the unfiltered signal.
- **No Deviation in Menu** grays out the “Deviation Type” menu item, thereby simplifying the Relay Alarms screen when hysteresis band or a passband are not needed.

15. COMMUNICATION TAB

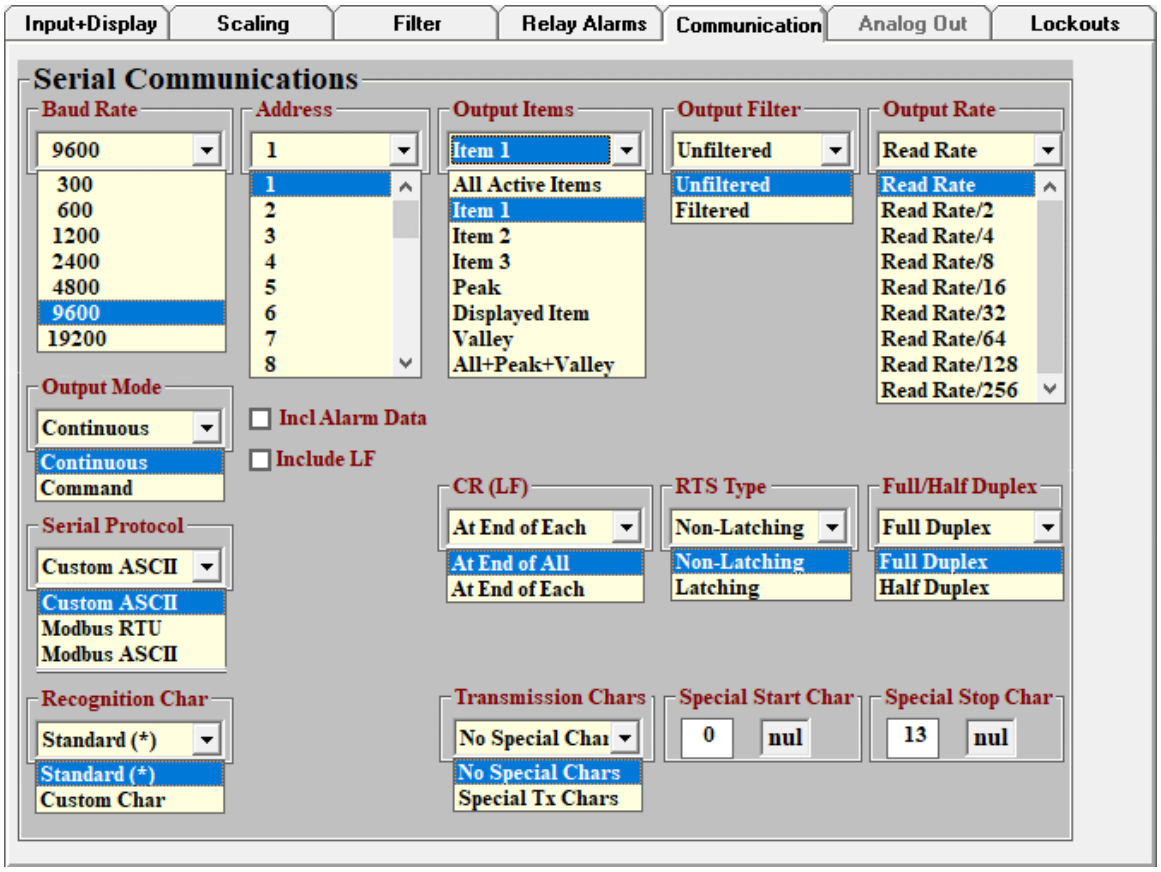
1. Communication Tab Overview

Specific settings are required for a PC and a Laureate instrument to establish communications with IS software, as explained in the Establishing Communications section of this manual. Once communications have been established, communication items can be changed using the Communication tab and be downloaded into the instrument by doing a "Put Setup."

The screen below is for the Laureate pulse input counter and the Custom ASCII protocol. The latter applies to serial (RS232, RS485, USB) communications, not Ethernet or WiFi. The screen for the analog input DPM is similar, but it has fewer selections.

For detailed online information on each pull-down item, click on that item and press the F1 key. Do a "Put Setup" to enter your changes.

2. Communication Screen for Counters and Custom ASCII Protocol



- **Baud rate** is the data rate in bits/sec. The recommended value for serial communications (RS232, RS485, USB) is **9600 baud**, which combines speed with robustness.

- **An Address** must be assigned to each instrument so that it can be addressed in command mode with the Custom ASCII protocol or Modbus RTU protocol. Only the addressed instrument will respond. Assignable addresses are **1-31** for the Custom ASCII protocol and **1-247** for the Modbus RTU protocol. The factory default address is **1** and is always used for RS232 and USB, which do not support multipoint addressing. With the Custom ASCII protocol, all instruments respond to address **0** even though their assigned address may be different; however, they do not send any data since this would result in contention.

- **Output Items** sent as data for Laureate counters can be Items 1, 2 or 3, plus the values or combination of values shown in the pull-down menu. Items 1, 2 or 3 are variables which take on different meaning depending on the Mode and Function selected under the Input+Display tab. Please see the Pulse Input Counter User Manual for details. For example, Item 1 can be rate and Item 2 can be total from the same signal.

- **Output Filter** can be set to Unfiltered or Filtered. If one of the Items to be output can be set to filtered or unfiltered, that selection can be entered here.

- **Output Rate** applies to the Custom ASCII protocol when set to the Continuous (or streaming) data output mode. If “Read Rate” is selected, data can be sent as fast as every reading, which can be as often as Gate Time for totals or Gate Time + 30 msec + 1-2 signal periods for rate. Gate Time is user programmable from 10 msec to 199.9 sec. The actual data output rate will also be paced by the length of the string to be transmitted and by the baud rate.

- **Output Mode** applies to the Custom ASCII protocol and can be set to Continuous mode or Command mode. In Continuous mode, output values are streamed without interruption. In Command mode, output values are only sent in response to specific commands. For the list of commands, see our Custom ASCII Serial Communications Manual.

- **Incl Alarm Data** applies to the Custom ASCII protocol. When checked, this item adds a character at the end of the data string before the <CR> character to indicate alarm or signal overload status. Press the F1 key for details.

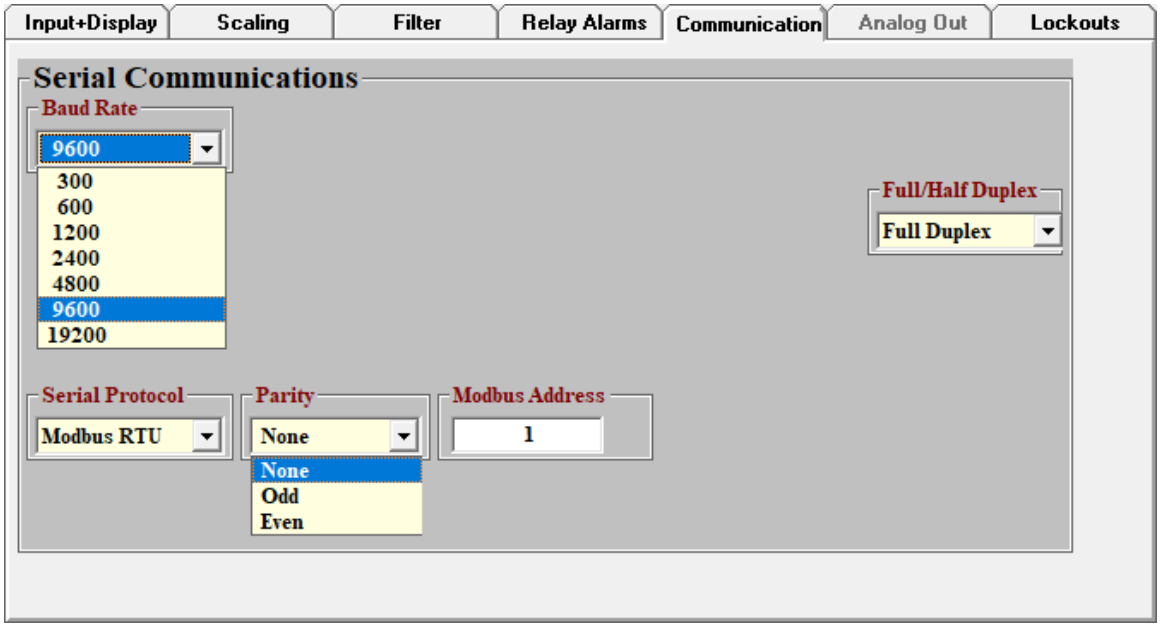
- **Include LF** applies to the Custom ASCII protocol. When checked, this item includes an <LF> character after the <CR> character. When serial data is streamed to a printer, <LF> starts a new line instead of having data appended to the same line.

- **Serial Protocol** can be set to Custom ASCII, Modbus RTU or Modbus ASCII. The Custom ASCII protocol is proprietary to Laurel and is relatively simple. It allows instruments to be set to a Continuous streaming mode or to a Command mode which uses short ASCII string commands like *1B1 to get a reading from address 1. The Modbus RTU protocol is an industry-standard protocol and applies to RS232, RS485 or USB serial communications. It is seamlessly converted to Modbus TCP for Ethernet of WiFi. For the list of Modbus commands, see our Modbus Manual for Pulse Input Counters or our Modbus Manual for Analog Input DPMs. Do not use the Modbus ASCII protocol, which is no longer used in industry.

- **CR (LF)** applies to the Custom ASCII protocol. When “At End of All” is selected, multiple selected items, like Item 1 and Item 2, are printed per line. When “At End of Each” is selected, each item is printed on its own line.

- **RTS Type** applies to RS232 and can be set to Non-Latching or Latching. With Non-Latching, data is transmitted only when the RTS line is high or true. With Latching, the RTS input is polled ever 3.3 msec. When a high level is detected, RTS is held true even when the RTS line then goes low immediately. This allows a positive pulse to serve as a print command. Press the F1 key for details.
- **Full/Half Duplex** applies to RS485 and the Custom ASCII or Modbus protocols. Always set it to **Full Duplex** even when the wiring is for half duplex.
- **Transmission Chars, Special Start Char, Special Stop Char** applies to the Custom ASCII protocol. When "No Special Char" is selected, there is no **Start** character, and the **Stop** character is always a <CR> or a <CR> plus <LF> if selected. When "Special Tx Chars" is selected, **Special Start** and **Special Stop** ASCII characters may be entered in the form of their decimal values. For the decimal values, click on "ASCII Char Table". Press the F1 key for details.

3. Communication Screen for DPMs, Counters and Modbus Protocol



- **Serial Protocol**, when set to "Modbus RTU," greatly simplifies the IS software Communication screen. Modbus RTU is seamlessly converted to Modbus TCP for use with Ethernet or WiFi.
- **Baud Rate** is the data rate in bits/sec. The recommended value for serial communications (RS232, RS485, USB) is **9600 baud**, which combines speed with robustness. Use **19200 baud** for the LNET1 Ethernet and WIFI or WIFIX WiFi boards.
- **Parity** can be set to None, Odd or Even, as preferred for your Modus system.
- **Modbus Address** can be set to any value from 1 to 247. The factory default value is 1.
- **Full/Half Duplex** should always be set it to **Full Duplex** even when the wiring is for half duplex.

16. ANALOG OUTPUT TAB

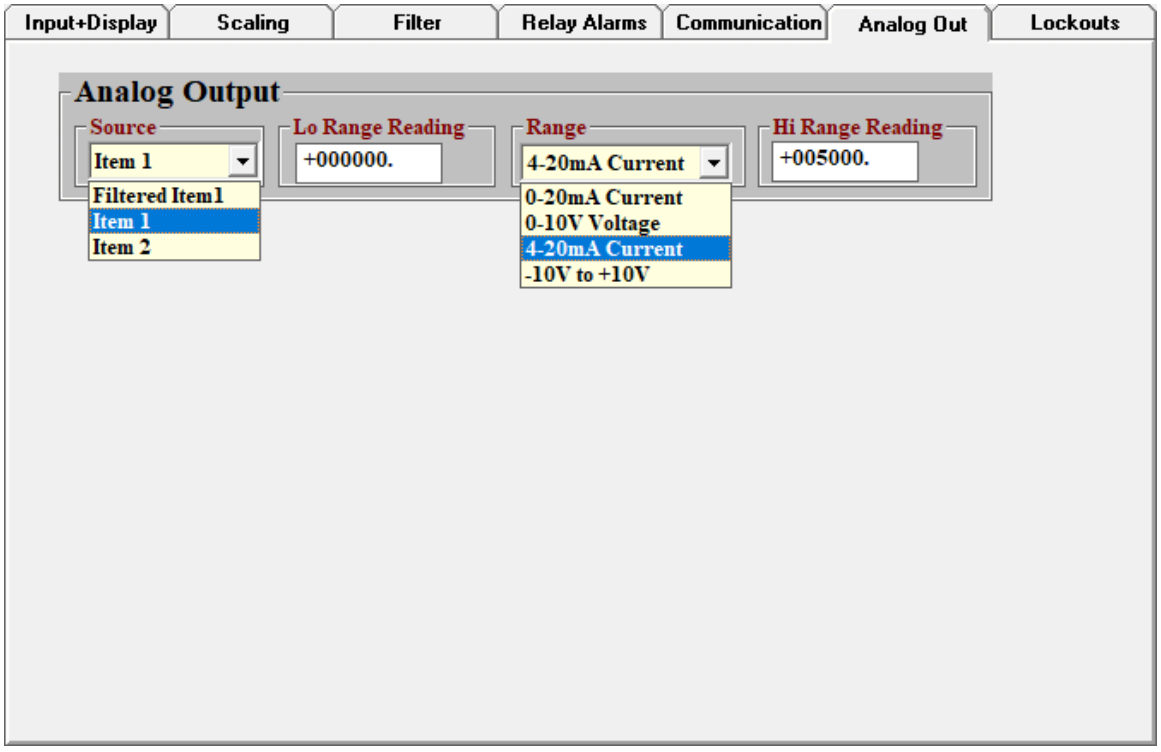
1. Analog Output Overview

A Laureate DPM our counter can have one isolated analog output, which can be a 0-20 mA, 4-20 mA or 0-10V unipolar signal with respect to isolated ground, or a bipolar -10V to +10V voltage signal with respect to a reference return line. A Laureate panel mountable counter can have two isolated analog outputs, which can only be 0-20 mA, 4-20 mA or 0-10V unipolar signals.

The selection of a unipolar voltage, unipolar current, or bipolar voltage output is made at the output connector and also via software using front panel keys or IS software. While the unipolar current and voltage outputs are both available at the same time, only the output selected via software is factory calibrated. The selection of bipolar also requires a jumper setting.

2. Analog Out Screen

Analog output scaling with IS software is straightforward. Select the Source on which the analog output is based, select the analog output range, specify the reading for the low end of the output range, and specify the reading for high of the output range. For example, if a 0-10V voltage output is to correspond to 10.0-60.0°C, first select “0-10V Voltage” as the Range, enter 10.0 for “Lo Range Reading,” and enter “60.0 for Hi Range Reading.” A common mistake is not to specify “0-10V Voltage” for a desired 0-10V voltage output, in which case the factory default range of “4-20 mA Current” will peg the voltage output above 10V.



The analog output tracks a scaled and linearized internal reading, such as temperature in °C, not the raw signal input, such mV for thermocouples or ohms for RTDs. It is possible to set the full range analog output so that it corresponds to the full range signal input. For example, to convert a 0-10V analog input to a 4-20 mA analog output, select the input range as ±20.000V, enter 0.000V as the "Lo Range Reading" and 10.000V as the "Hi Range Reading."

- **Source** selects the meter-internal reading on which the analog output can be based. Four pulse input counters, choices can be Filtered Item 1, Item 1, Item 2 or Item 3. Please see our Pulse Input Counter User Manual for the definitions of Items, which change based on the Signal Input Mode and Function. For analog input DPMs, the choices are simply Unfiltered or Filtered.

- **Range** selects the analog output range, which can be 0-20 mA Current, 0-10V Voltage, 4-20 mA Current, or -10V to +10V Voltage. Only the selected range will be associated with factory calibration.

- **Lo Range Reading** enters the reading to be tied to the bottom of the selected Range. The decimal point f will be as specified under the Input+Display tab for DPMs and the Scaling tab for Counters.

- **Hi Range Reading** enters the reading to be tied to the top of the selected Range.

- **Put Setup** from the Main Menu enters you changes in your instrument.

17. LOCKOUTS TAB

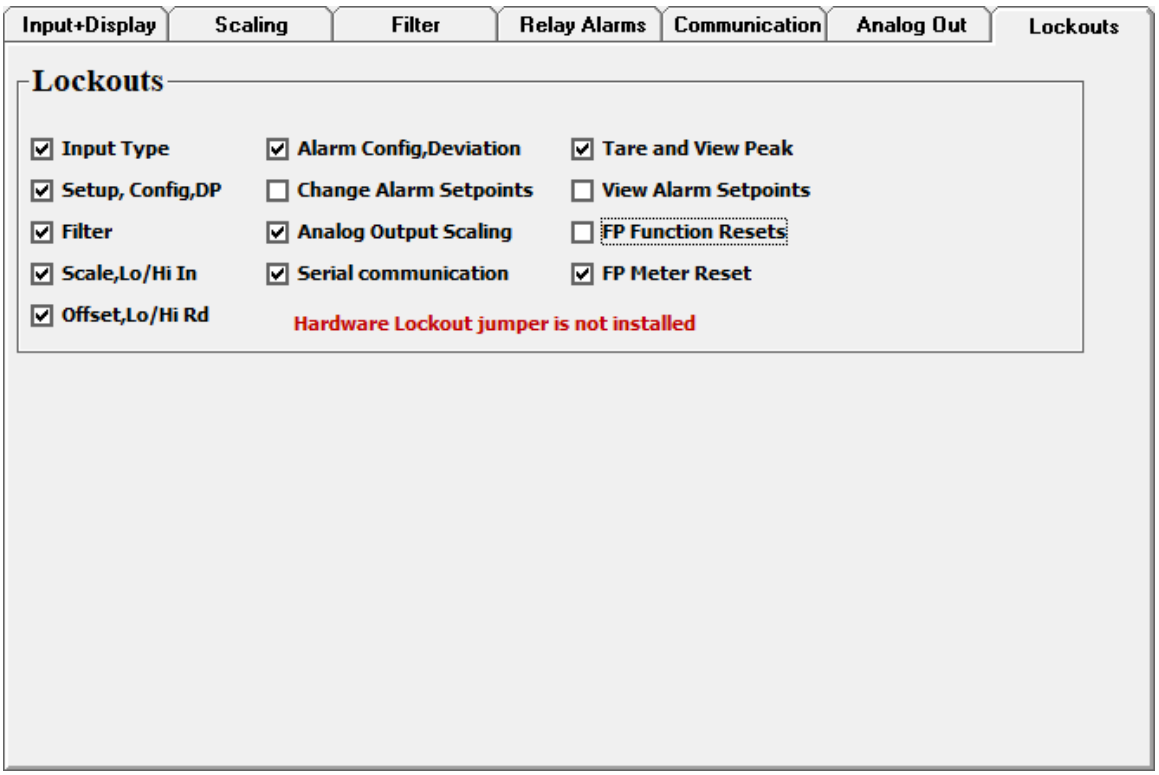
1. Lockout Feature Overview

The Lockout feature applies to Laureate panel mountable instruments with front panel keys, not to transmitters. After pressing the front panel Menu key, all of a panel mounted instrument's programmable menu items can be modified unless locked out. For security reasons and for ease of front panel programming, menu items should be locked out so that they do not appear in the menu selections. Items to be locked out are those that a production operator should not change, like meter scaling, and those for which there is no plug-in board. For example, if a meter does not have a relay board or an analog output board, menu items related to relay setpoints and to analog outputs should not appear.

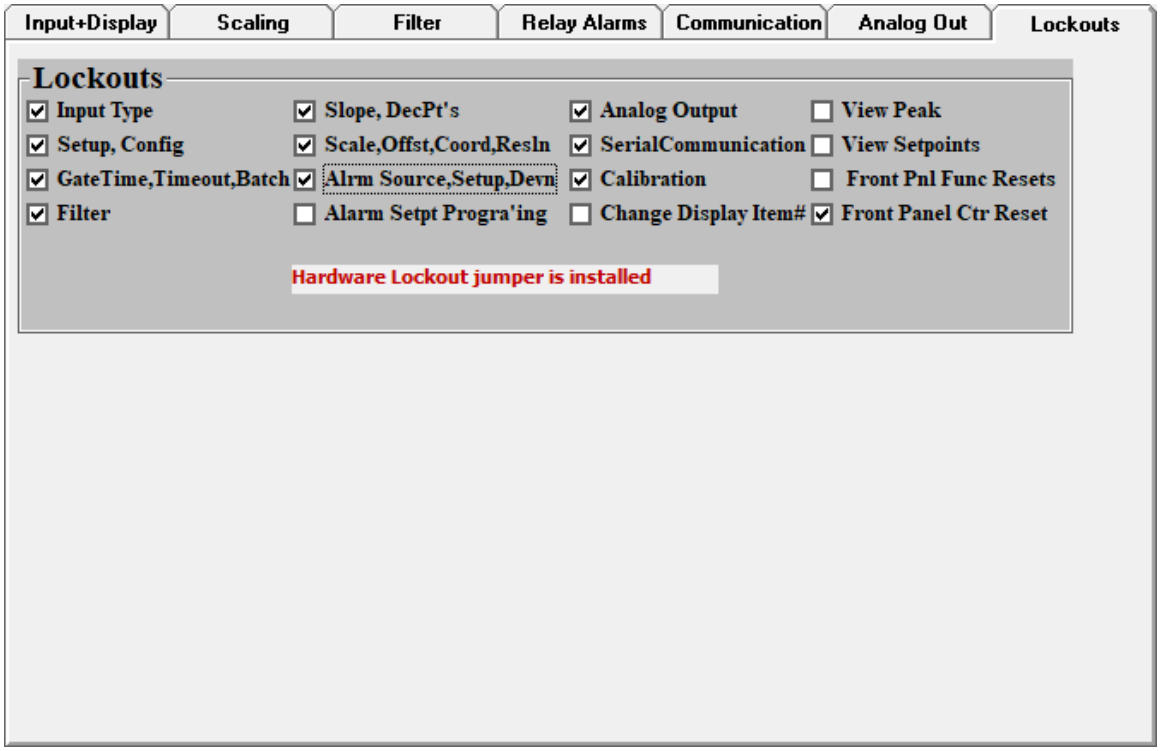
One way to lock out menu items is from the instrument front panel by going to menu items Loc 1, Loc 2 and Loc 3 and setting specific digit positions to 1 for disabled as opposed to 0 for enabled. The Loc menu items can in turn be locked out by setting a jumper "a" on the power supply board, as explained in the Lockouts section of the Analog Input DPM User Manual and the Pulse Input Counter User Manual.

Another way to lock out menu items is by using IS software. Under the Lockouts tab, place a checkmark in the box for each item to be locked out. Press the F1 key for each checked item for an explanation.

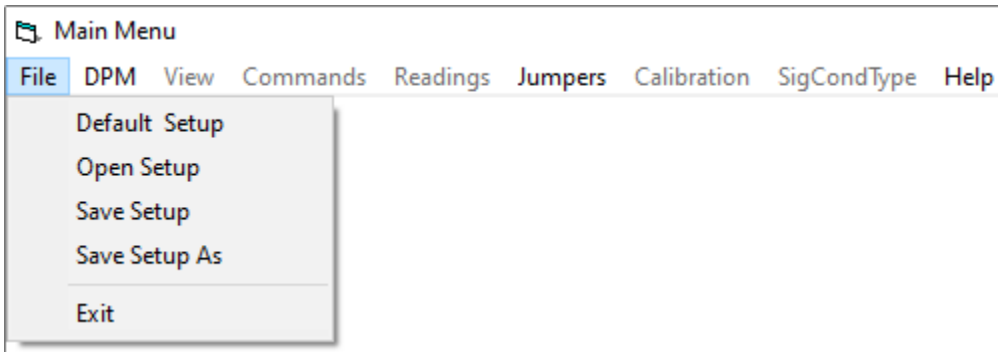
2. IS Software Lockouts for Analog Input DPMs



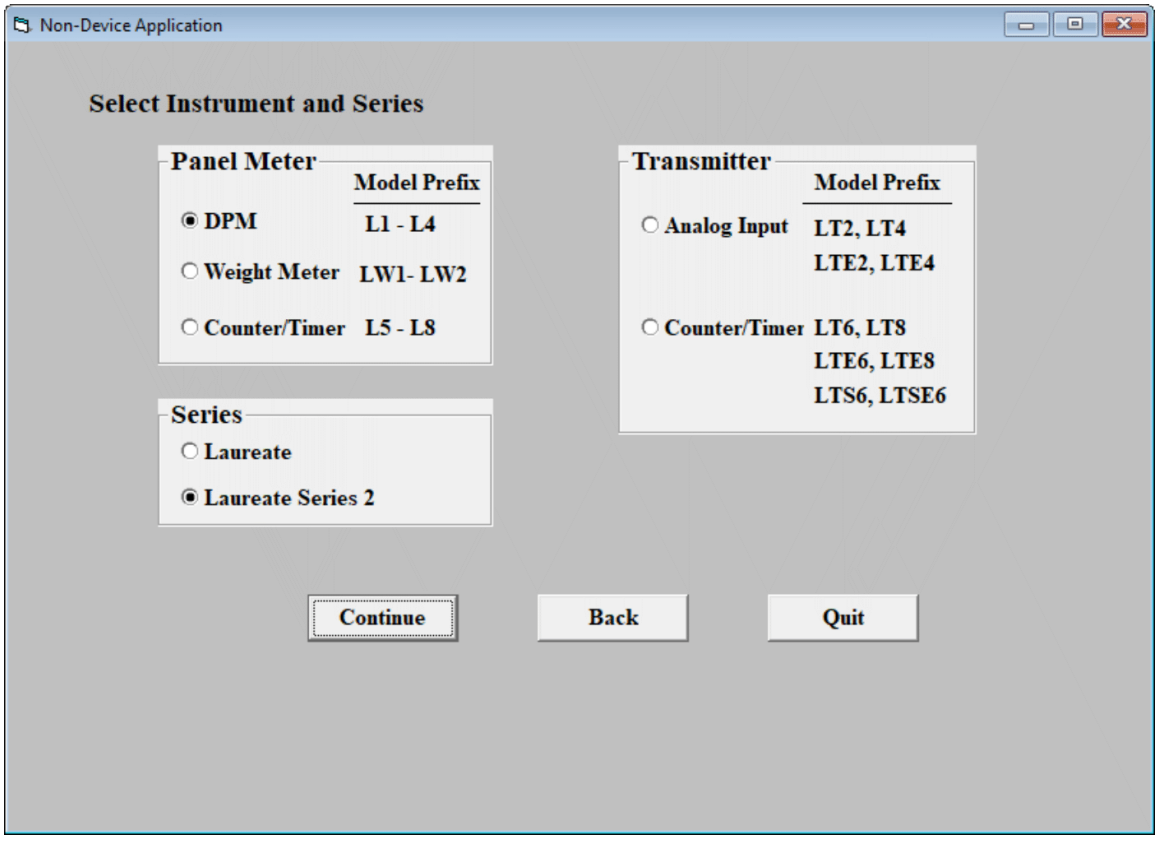
3. IS Software Lockouts for Pulse Input Counters



18. FILE OPERATIONS, TOP MENU BAR



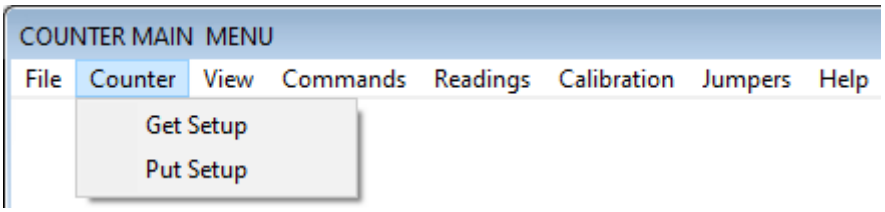
- **Default Setup** loads a default setup file into IS software even when a Laureate instrument is not connected to the PC. Click on “Default Setup” to learn IS software or to create a .DP2 setup file for a DPM or a .CT2 file for a counter for later downloading into your instrument. To select a default setup file that is appropriate for your instrument without being connected to that instrument, select “None” for “Communication Type” in the Communication screen. This will open the “Non-Device Application” screen:



If your instrument is a panel meter, select DPM, Weight Meter or Counter/Timer, and select “Laureate Series 2.” If your instrument is a transmitter, select “Analog Input” or Counter/timer. Click on Continue, the on “Default Setup” in the Counter Main Menu.

- **Open Setup** opens a .DP2 or .CT2 instrument setup file that has previously been saved to disk. You will be asked to supply the directory and name of the file. You can then view the setup data and modify it with IS software if desired.
- **Save Setup** saves an already named .DP2 or .CT2 setup file to disk.
- **Save Setup As** saves a .DP2 or .CT2 setup file to disk with a new name. You will be asked to supply the directory and name of the file.
- **Exit** exits IS software. Be sure to have only one copy of IS software running at any one time.

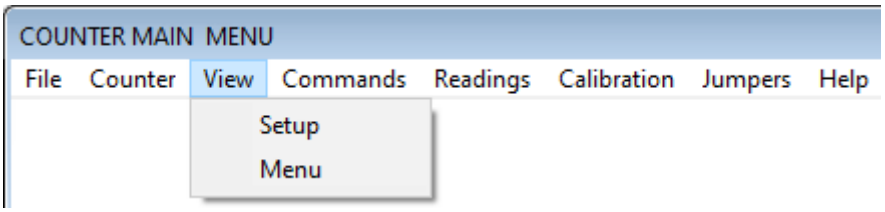
19. GET SETUP & PUT SETUP, TOP MENU BAR



DPM or Counter will be the heading in the top menu bar, depending on whether the instrument has been detected as an analog input DPM or a pulse input counter.

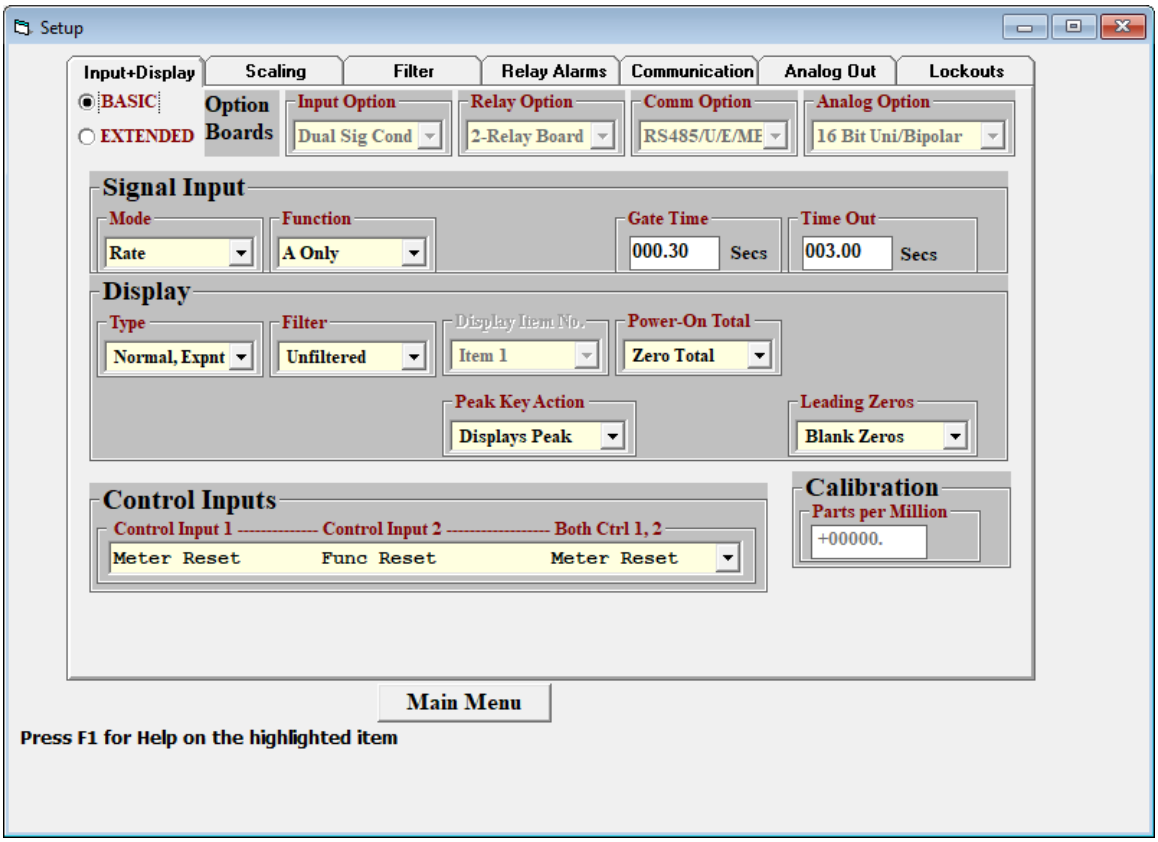
- **Get Setup** uploads the setup data from a connected instrument to IS software. Normally click on this link after you have established communications.
- **Put Setup** downloads new or modified setup data from IS software into a connected instrument. Click on this link after you have made modifications that you would like to download into your instrument.

20. VIEW, TOP MENU BAR

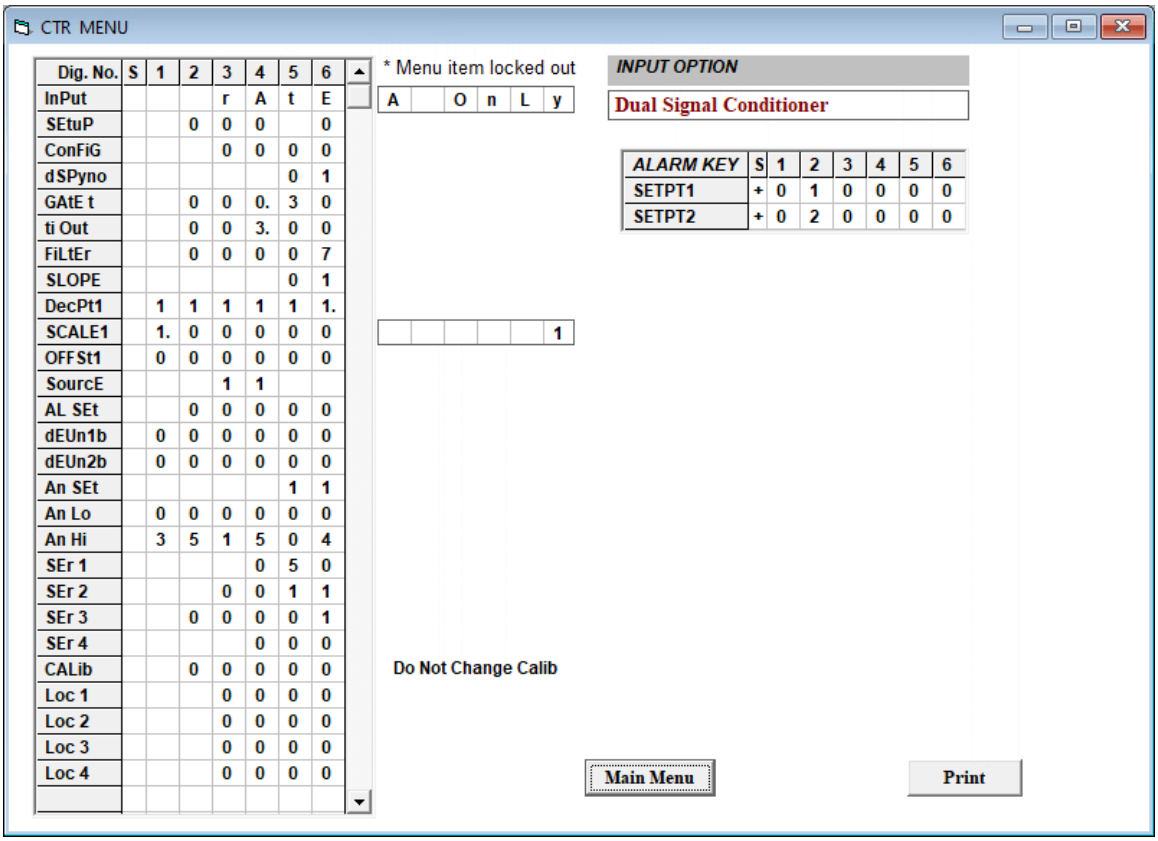


View provides two methods to view your instrument's setup data:

- **Setup** brings up the tab-based Main Menu system edited with IS software and explained earlier in this manual. The screen under the first tab is illustrated below as an example for a basic counter:



- **Menu** brings up the front panel programming steps to achieve the same meter setup as for the above tab-based Main Menu screens. To follow these steps, print our this screen by clicking on Print. Using the printout as a guide, press the Menu key of the meter and progress down from InPut to SEtuP all the way down to Loc 4. For each step, fill in the entries shown for sign S and for each digit 1 through 6 as shown. The Menu selection is an easy way to make a paper record of meter programming. It only applies to panel mountable Laureates with a display and front panel buttons, not to transmitters.



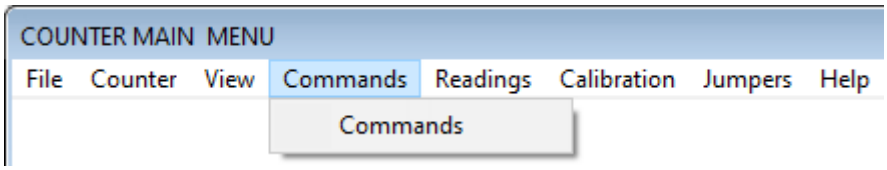
Dig. No.	S	1	2	3	4	5	6
InPut				r	A	t	E
SEtuP			0	0	0		0
ConFiG				0	0	0	0
dSPyno						0	1
GAtE t			0	0	0.	3	0
ti Out			0	0	3.	0	0
FiLtEr			0	0	0	0	7
SLOPE						0	1
DecPt1		1	1	1	1	1	1.
SCALE1		1.	0	0	0	0	0
OFFSt1		0	0	0	0	0	0
SourcE				1	1		
AL SEt			0	0	0	0	0
dEUn1b		0	0	0	0	0	0
dEUn2b		0	0	0	0	0	0
An SEt						1	1
An Lo		0	0	0	0	0	0
An Hi		3	5	1	5	0	4
SEr 1					0	5	0
SEr 2				0	0	1	1
SEr 3			0	0	0	0	1
SEr 4					0	0	0
CALib			0	0	0	0	0
Loc 1				0	0	0	0
Loc 2				0	0	0	0
Loc 3				0	0	0	0
Loc 4				0	0	0	0

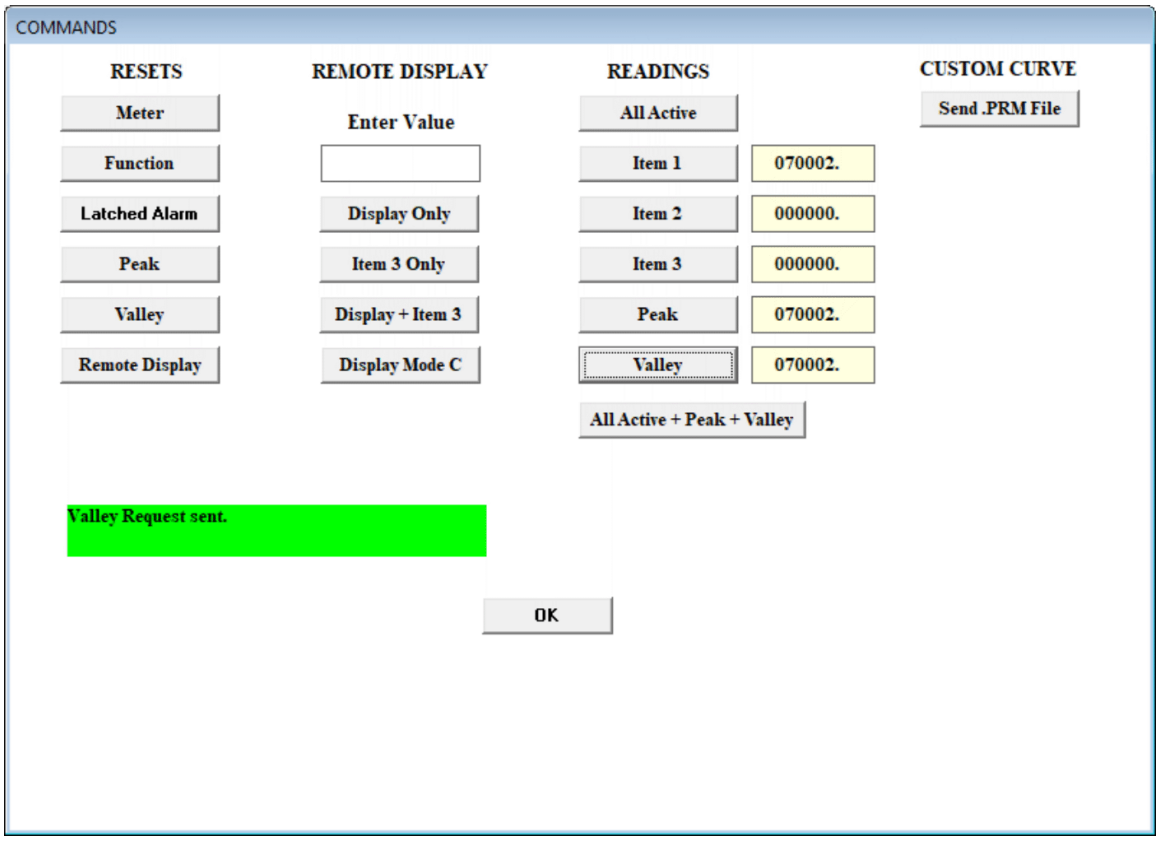
A		O	n	L	y

						1

ALARM KEY	S	1	2	3	4	5	6
SETPT1	+	0	1	0	0	0	0
SETPT2	+	0	2	0	0	0	0

21. COMMANDS, TOP MENU BAR



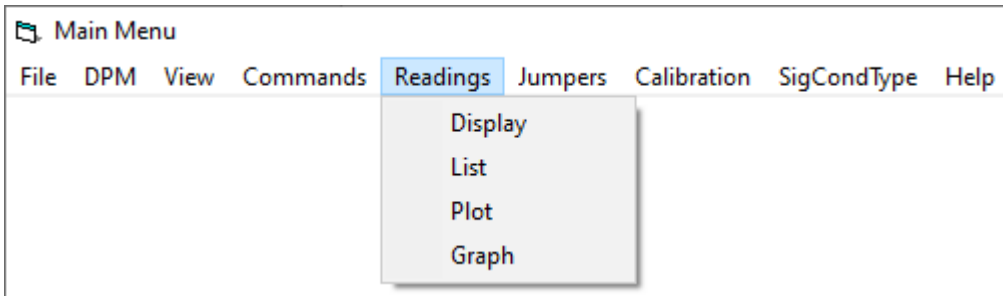


The Commands Selection, illustrated here for the Laureate counter, allows the PC running IS software to perform specific tasks at the push of a mouse button. These tasks could otherwise be performed from a meter's front panel, from external control inputs, or by sending commands with the Custom ASCII or Modbus protocol.

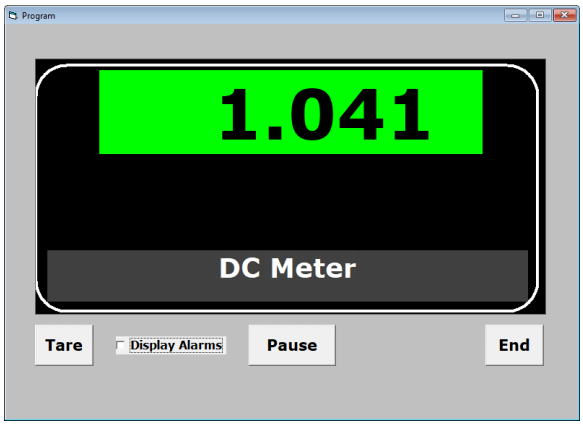
- **Resets** provides buttons for Meter Reset, Function Reset, Latched Alarm Reset. Peak Reset, Valley rest, and Remote Display Reset. Meter Reset is the same as cycling power and loads non-volatile memory into volatile memory. It takes about 2 seconds. Function Reset resets totals, latched alarms, peak and valley, and any readings loaded in the Laureate Serial Input Meter & Remote Display. It takes milliseconds. The other Reset buttons only reset the specific item shown on the button.

- **Remote Display** applies to the Laureate Serial Input Meter & Remote Display. It allows a value to be entered for display. The four buttons below the data entry field allow display of the entered value, normal display of a streamed Item 3, and normal display of a streamed item using the mode Remote C, which can extract readings from long ASCII strings. For additional information, please see the above web page and the Laureate Serial Input Meter & Remote Display User Manual.
- **Readings** allows the PC to take meter or transmitter readings at the push if a button. Four counters, the readings include item 1, Item 2, Item 3, Peak and Valley. Please see our Pulse Input Counter User Manual for the definitions of Items, which change based on the Signal Input Mode and Function. For analog input DPMs, the reading can simply be Unfiltered for Filtered.
- **Custom Curve** provides a button to send a .PRM file, which specifies a custom curve relationship between the signal input and meter reading. This file is normal sent from our Custom Curve software. Please see our Custom Curve Linearization Software web page and our Custom Curve Linearization User Manual.

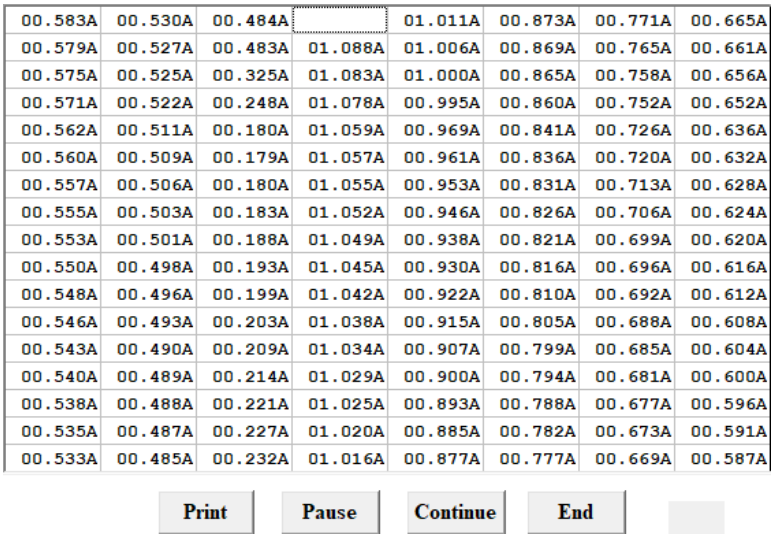
22. READINGS, TOP MENU BAR



- **Display** appears for analog input DPMs, not pulse input counters. It displays the meter reading in large digits. It can also display alarms and tare the reading if tare is enabled.



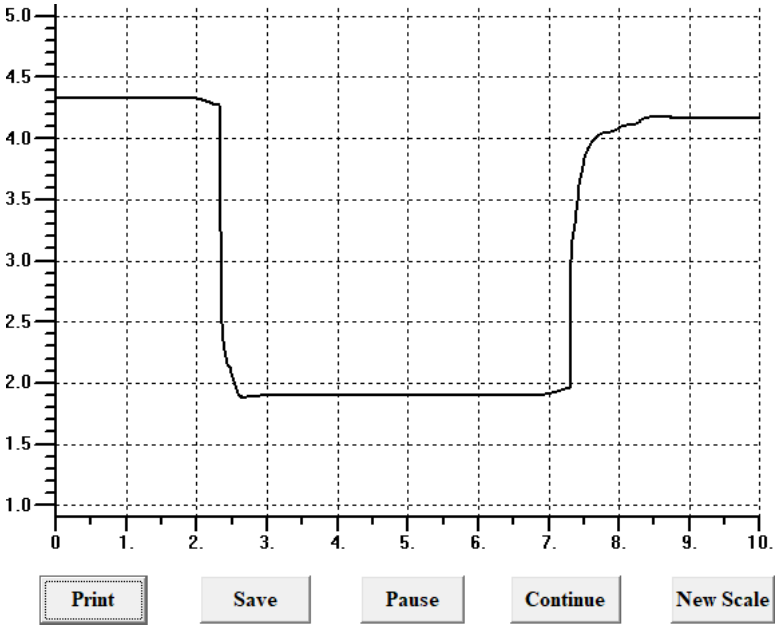
- **List** presents sequential readings in a 20-row by 8-column table. It takes 7.35 sec to write 160 analog readings with the newest data overwriting the oldest. Press Pause to freeze the display. The displayed readings are asynchronous with the latest meter readings, so List is of limited utility.



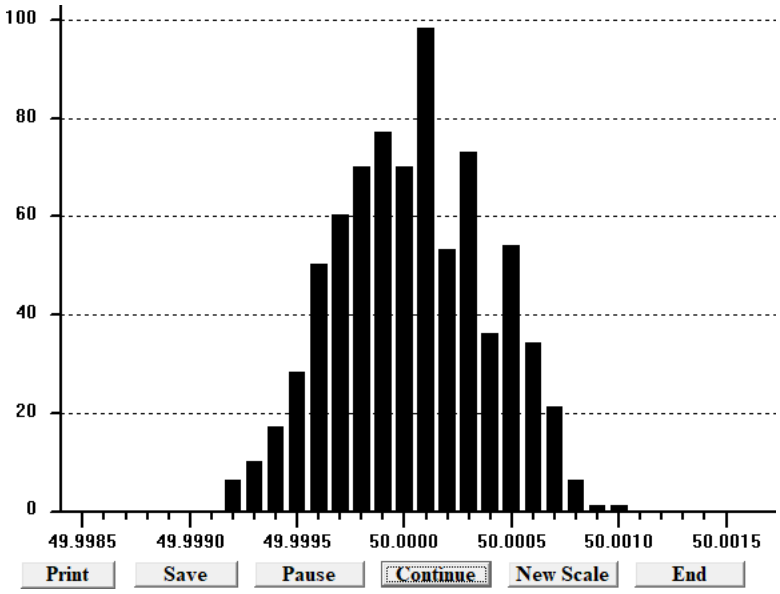
00.583A	00.530A	00.484A		01.011A	00.873A	00.771A	00.665A
00.579A	00.527A	00.483A	01.088A	01.006A	00.869A	00.765A	00.661A
00.575A	00.525A	00.325A	01.083A	01.000A	00.865A	00.758A	00.656A
00.571A	00.522A	00.248A	01.078A	00.995A	00.860A	00.752A	00.652A
00.562A	00.511A	00.180A	01.059A	00.969A	00.841A	00.726A	00.636A
00.560A	00.509A	00.179A	01.057A	00.961A	00.836A	00.720A	00.632A
00.557A	00.506A	00.180A	01.055A	00.953A	00.831A	00.713A	00.628A
00.555A	00.503A	00.183A	01.052A	00.946A	00.826A	00.706A	00.624A
00.553A	00.501A	00.188A	01.049A	00.938A	00.821A	00.699A	00.620A
00.550A	00.498A	00.193A	01.045A	00.930A	00.816A	00.696A	00.616A
00.548A	00.496A	00.199A	01.042A	00.922A	00.810A	00.692A	00.612A
00.546A	00.493A	00.203A	01.038A	00.915A	00.805A	00.688A	00.608A
00.543A	00.490A	00.209A	01.034A	00.907A	00.799A	00.685A	00.604A
00.540A	00.489A	00.214A	01.029A	00.900A	00.794A	00.681A	00.600A
00.538A	00.488A	00.221A	01.025A	00.893A	00.788A	00.677A	00.596A
00.535A	00.487A	00.227A	01.020A	00.885A	00.782A	00.673A	00.591A
00.533A	00.485A	00.232A	01.016A	00.877A	00.777A	00.669A	00.587A

Print Pause Continue End

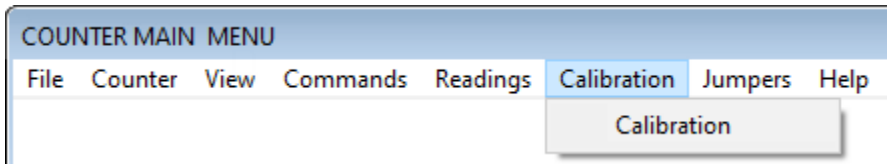
- **Plot** turns the PC screen into an oscilloscope. You will be asked to supply the Mid-Scale Value and Small Division Value for the Y axis, and Total Plot Time (Secs) for the X axis. Press Go to start plotting. Press Print for a hard copy.



- **Graph** allows the PC screen to display histograms. These are bargraphs where the Y axis height of each bar presents the number of occurrences that fall within a range of a specific X axis division. Histograms are used to visualize data distributions. You will be asked to supply the Mid-Scale Value and Small Division Value for the X axis, and an Initial Vertical Scale or the maximum Y axis bar height in number of occurrences. The histogram below is for a 50.0000 Hz sine wave taken with a gate time of 0.3 sec.



23. CALIBRATION, TOP MENU BAR



1. Calibration Overview

Calibration is different from scaling. Calibration adjusts the instrument so that it returns absolute measurements of voltage, current, temperature, time, frequency and other primary physical parameters so that these are within a specified tolerance of the true reading according to a national standard. In the USA, national standards are set by the National Institute of Standards and Technology (NIST). For example, Laureate frequency meters and timers are calibrated at the factory so that they are accurate to within ±2 PPM (parts per million) when new and at 25°C. In the USA, many organizations require that critical metrology equipment be calibrated annually by comparing its readings to those of a NIST certified standard.

Scaling is the process which converts input counts to output (or display) counts. An example of scaling is to convert a 4-20 mA process signal, which is interpreted by the Laureate process meter a 4000 to 20000 input counts, to a reading of 0.0 to 250.0 PSI, which is 0 to 2500 output counts.

2. Counter/Timer Calibration

Laureate counter/timers only have one item that can be scaled, namely the quartz crystal time base that is used for time and frequency measurements. The calibration factor resides in the microcomputer board, not in any of the available signal conditioner boards. Calibration is not required for counters that are only used in a totalizing (or counting) mode.

To calibrate a counter/timer:

a. Insert an FR dual pulse input signal conditioner board into your instrument.

b. Establish communications with IS software.

c. Do a Counter => Get Setup to load your counter's setup file into IS software.

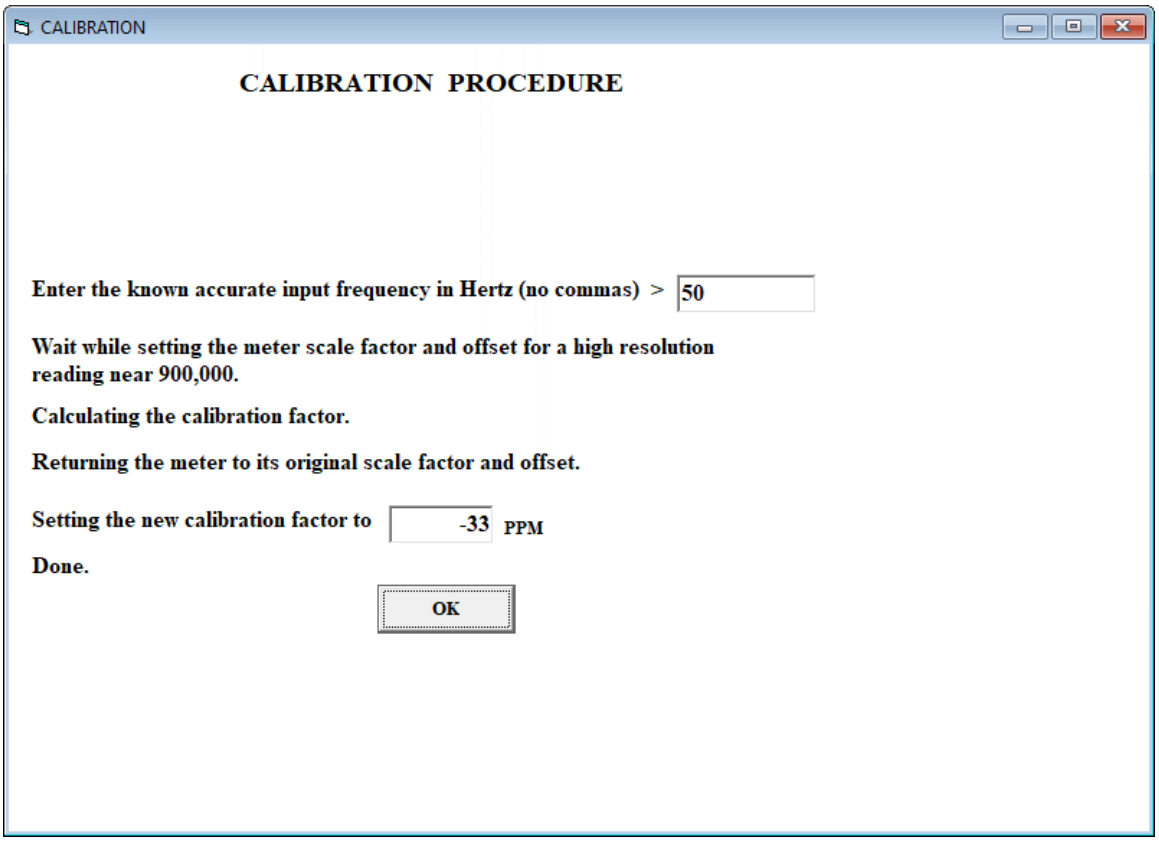
d. Set the counter Mode to "Rate" and the counter Function to "A Only."

e. Download any change into your instrument by doing a Counter => Put Setup.

f. Connect the output of a frequency standard to the FR signal conditioner's pins 5 and 6.

g. Press on Calibration in the top menu bar and follow the prompts.

h. When done, press on OK and do a Counter => Put Setup to download your calibration into your instrument.

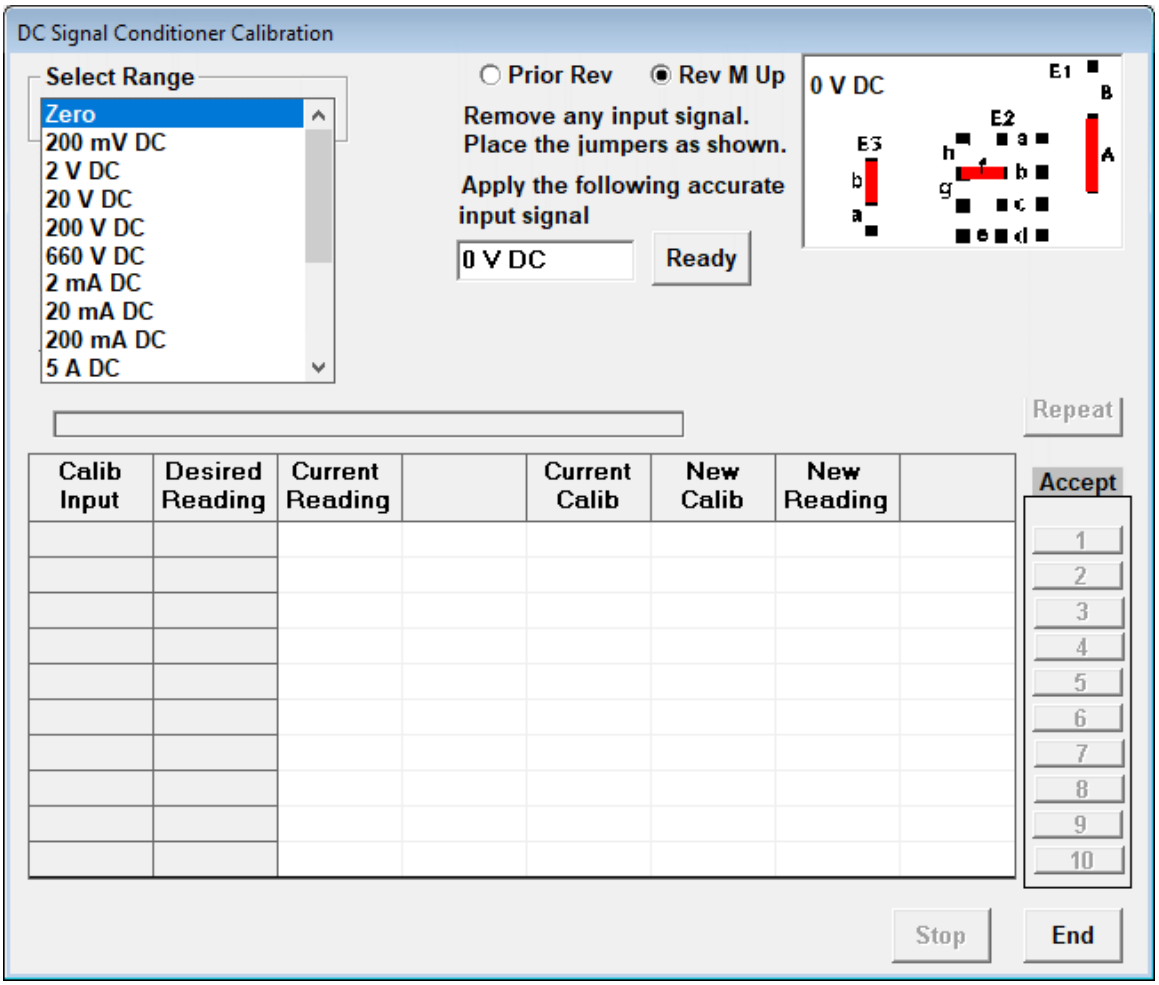


3. Analog Input Instrument Calibration

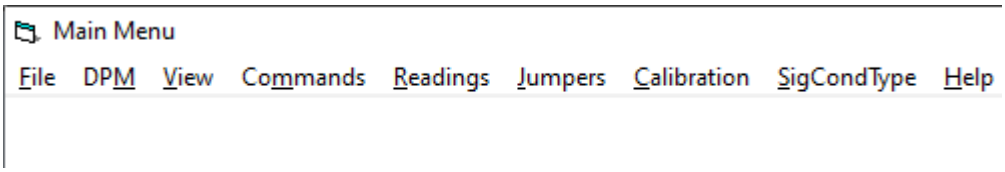
Laureate analog input instruments store calibration factors for each range in their signal conditioner board, which communicates digitally with the microcomputer board. For example, the DC and AC rms signal conditioner boards each have 5 voltage ranges and 4 current ranges, all of which need to be individually calibrated. Storing calibration for each range on the signal conditioner board is time consuming but allows ranges to be changed by jumpers and boards to be swapped in the field with no need to recalibrate the instrument at the system level.

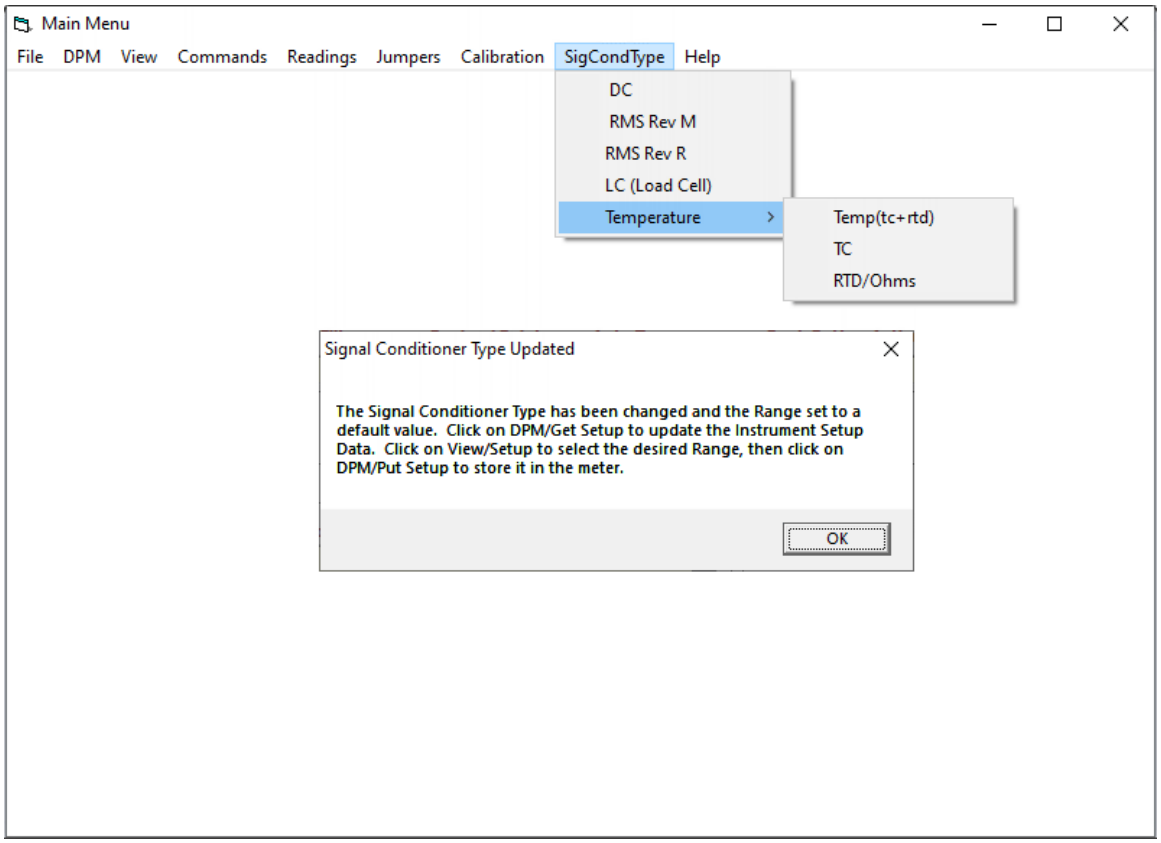
To calibrate an analog input instrument, establish IS software communications with the host PC and do a DPM => Get Setup to load your DPM's setup file into IS software. Press on Calibration and follow the prompts. In the example below, the DC signal conditioner board is recognized by IS software after doing the Get Setup. You will need to calibrate Zero plus 5 voltages and 4 currents points, each with a calibration reference. For each selection, you will be asked to set jumpers and press Ready after the reference signal has been applied. The DC signal conditioner board will then calibrate itself for that range.

Full meter calibration may not be required in all cases. In the example of a 4-20 mA signal to be converted to 0.0 to 250.0 PSI, the "Reading Coordinates of 2 Points" scaling method will give superior results if an accurate external pressure standard is available. Set the meter so that it reads 0.0 at 0 PSI and 250.0 at 250 PSI. This will calibrate the PSI pressure transducer and the instrument as a system. No need to calibrate the milliamp range or even to know the exact milliamps.


DC Signal Conditioner Calibration
Select Range
Zero
200 mV DC
2 V DC
20 V DC
200 V DC
660 V DC
2 mA DC
20 mA DC
200 mA DC
5 A DC
Prior Rev
Rev M Up
Remove any input signal.
Place the jumpers as shown.
Apply the following accurate input signal
0 V DC
Ready
0 V DC
E1
B
E2
E3
A
Repeat
Calib Input
Desired Reading
Current Reading
Current Calib
New Calib
New Reading
Accept
1
2
3
4
5
6
7
8
9
10
Stop
End

24. SIGNAL CONDITIONER TYPE, TOP MENU BAR





SigCondType in the top menu bar allows IS software to reset the signal conditioner type if the wrong signal conditioner type is brought up by IS software or by a meter's front panel buttons in Menu mode. In the above screen, simply press on the correct signal conditioner board. After the signal conditioner type has been reset you will also need to update the range to go with the signal conditioner board's jumpers. The signal conditioner type can also be reset by a meter's front panel buttons. Please contact Laurel for the required key sequence.

25. TROUBLESHOOTING IS SOFTWARE

1. **Inability to install IS software** can be due to:

   a. **Firewall that blocks installation of .exe files.** Call in your IT department or IT consultant to change permissions.

   b. **Error messages when attempting to run IS software.** Set User Account Control (UAC) of your version of Windows to "Never notify" so that the installation can create directories. Use Google for instructions on how to change UAC. Power down and restart your computer for the UAC change to take effect. Following installation of IS software, you may return UAC to its previous setting.

2. **Inability to run IS software** can be due to:

   a. **A duplicate version of IS software.** A first instance of IS software that is already running may prevent a second instance from running. This may happen if IS software has crashed due to an improper Graph or Plot setting in the top menu bar, or if another version of IS software has not been exited properly. Do a Control-Alt-Delete to enter the Windows Task Manager and delete any duplicate instances of IS software that may still be running.

   b. **When going from Ethernet to non-Ethernet communications,** it may be necessary to uninstall IS software, empty the IS2 directory, and reinstall IS2 software.

3. **Failure to establish serial communications** can be due to:

   a. **Bad RS232 cable.** Open the DB9 connector and ensure that all pins are seated properly in our CBL01 or CBL04 cables.

   b. **Improper RS232-to-USB converter.** Older converters on the market may only work with Windows XP, not with newer versions of Windows. Our CBL02 and CBL06 converters have been tested to work with all versions of Windows.

4. **Failure to discover Ethernet Nodes**

   Node Discovery may be blocked by a managed Ethernet switch if the firmware version of the Node is EtherLN1_4_1.txt or earlier. This may apply to an LT Ethernet board of a meter or to an LTE series Ethernet transmitter. In that case the Node can also not be pinged. The solution is to upgrade the Node's firmware to EtherLN1_4_3.txt, as explained under the "Firmware Upgrade Tab" of our Ethernet manual.