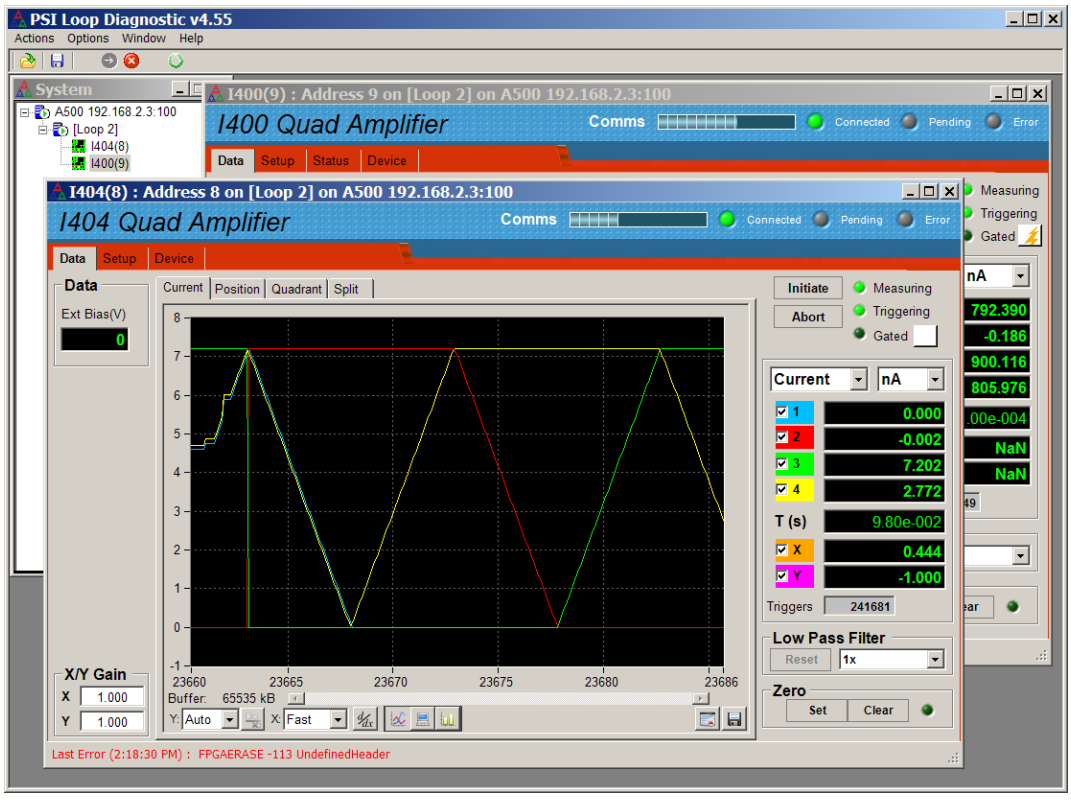
PSI Diagnostic Software

Version 4.55

User Manual



Pyramid Technical Consultants, Inc.

1050 Waltham Street Suite 200, Lexington MA 02421 USA

US: TEL: (781) 402 1700 ♦ FAX: (781) 402-1750 ♦ EMAIL: SUPPORT@PTCUSA.COM

Europe: TEL: +44 1273 493590

1 Contents

2 Introduction

The PSI Diagnostic host software allows you to connect to any Pyramid Technical Consultants, Inc. PSI-series product, and access all of its features. It can handle many devices simultaneously, over multiple interfaces.

Some users may find that the PSI Diagnostic provides all the functionality that they need for their purposes. Software developers will find it useful as a reference to illustrate the various controls and data types that they can select from when developing their own application-specific software.

The PSI Diagnostic is updated regularly to manage new product releases, and add new features to existing products. The latest version can always be found at www.ptcusa.com/PTC_Downloads.html. This user guide covers version 4.55.

Each product has a unique window that can open in the PSI Diagnostic. However, there are many common features. This guide describes those common features, and provides some pointers to more device-specific features. Consult the relevant User Manuals for more details on each device.

The PSI Diagnostic has several names, but they all refer to the same software:

- PSI Diagnostic
- PSI Loop Diagnostic
- PTC Diagnostic

3 Installation

The software requires a basic Windows PC able to run Microsoft Windows XP, Windows Vista or Windows 7. The Microsoft .NET framework must be installed, but this is standard on these versions of Windows. To install the software, simply copy the installer, called PTCDiagnosticSetup.msi, to your PC and launch it.

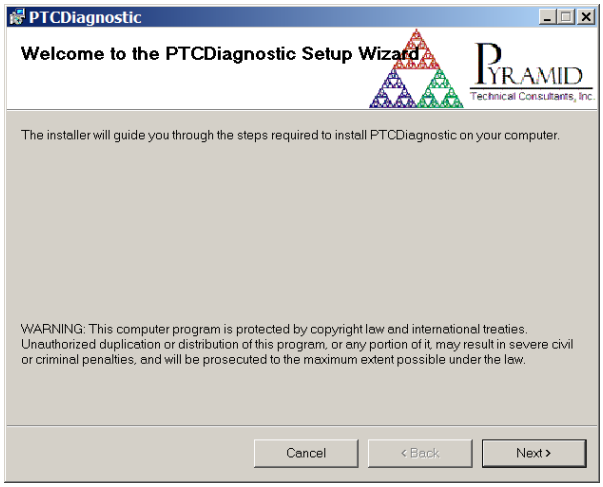
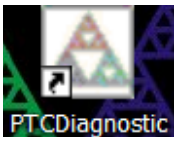


Figure 1. PSI Diagnostic setup wizard welcome screen

Follow the prompts to install the software. The process only takes a few minutes, and creates a sub-directory in the Program Files directory, where all the files are located. A shortcut icon like this



will be placed on your desktop. Double-click the icon to launch the program.

4 Running the Program and Connecting to Devices

When the PSI Diagnostic program loads, or whenever you click the discover button in the toolbar  , a device discovery window will open. This presents a list of available communication ports on your PC, plus any IP addresses for Ethernet loop controllers such as the A500 and A300. The software will search on all the checked ports to look for active devices.

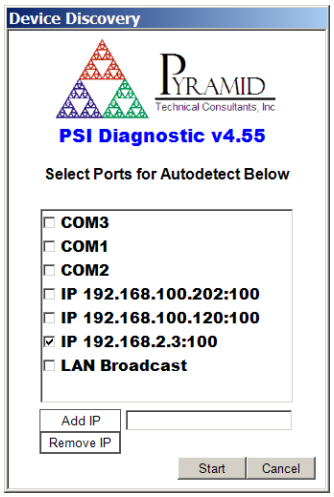


Figure 2. Device discovery window

If you have an Ethernet loop controller and know its IP address, enter into the edit box, together with the port number :100 and press Add IP. It will be added to the discovery list.

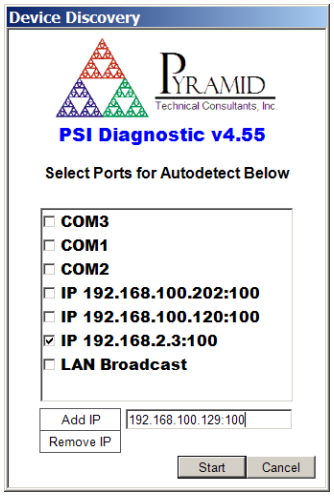


Figure 3. Adding an IP address to the discovery list

When you press the Start button, the software will search on all checked ports for devices. If it finds duplicate addresses on one fiber optic loop, unsupported devices or incompatible firmware,

it will warn you. In some cases you may be able to upload new firmware to devices at this stage to deal with any version compatibility issues. A dialog will inform you of this.

When the discovery is complete, you will see a tree structure in the system window with all the devices the software has found and connected to.

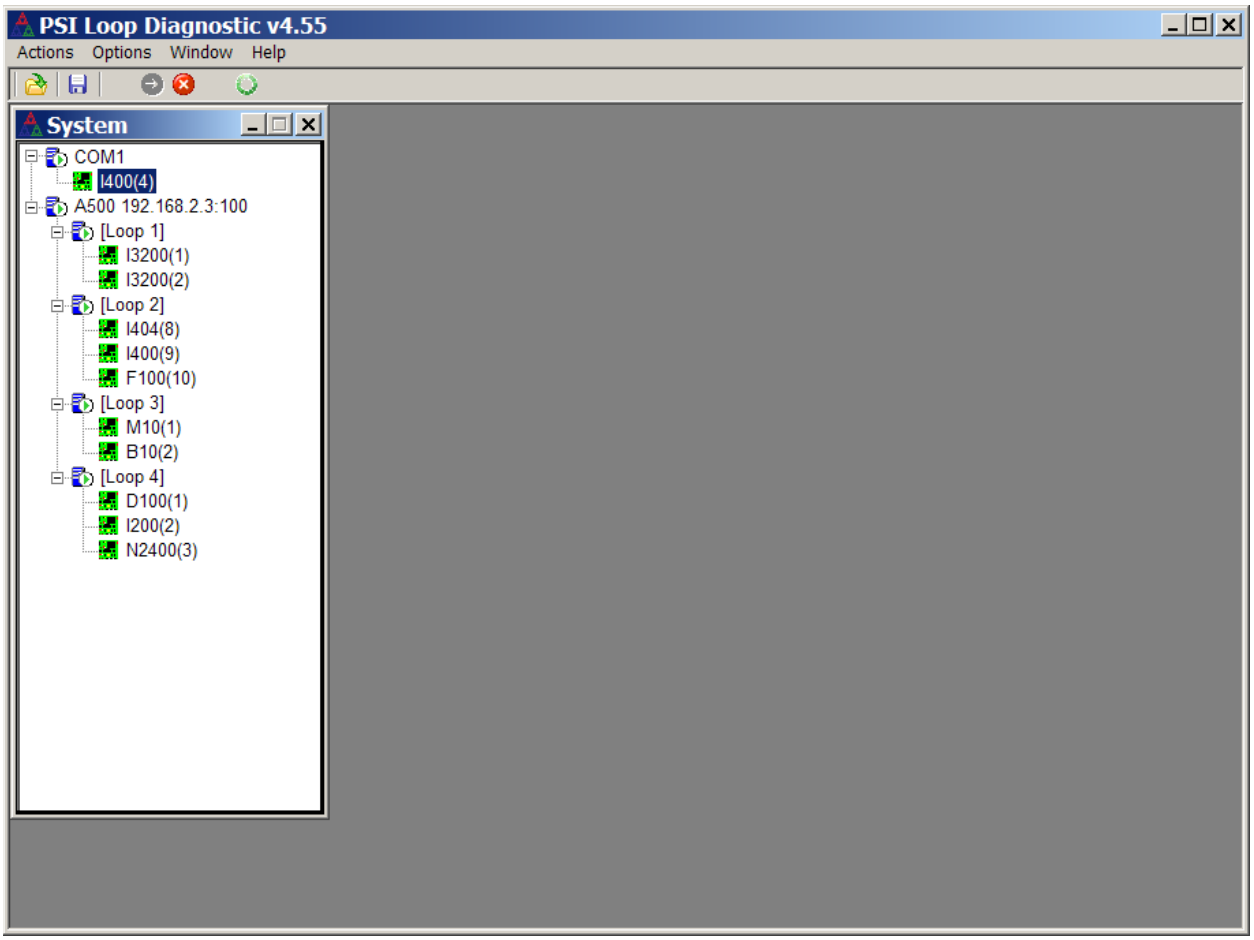


Figure 4. Device tree after discovery

The remaining buttons on the toolbar, to the left of the discovery button, are for use by software developers, so you can ignore them if you are using the software to control devices and collect data. They are described below for reference only.

	Open an xml record file.
	Save an xml record of the discovered devices.
	Start scanning all enabled devices in the tree.
	Stop scanning all devices in the tree.

You may also notice that you can start and stop individual devices and loops by right-clicking on the tree entries. This facility is also intended for use by software developers.

5 Device Windows - Common Features

When you click on an entry in the devices tree, a window opens for that device. The title bar names the device, shows its loop address and how it is connected. For example, this I3200 is connected through the Ethernet port of the PC, through and A500 loop controller with address 192.168.2.3, and it is at address 1 on the first of the five fiber optic loops.

Figure 5. Title bar for device connected through an A500

This I400 is connected through the serial port on the PC. It is set to address 4, although that is irrelevant in this case because the RS-232 connection does not support multiple devices.

Figure 6. Title bar for a device connected by RS-232

At the top of the window for every device is a communications indicator.

Figure 7. Communications indicator area

The scrolling bar indicates messages are going out to the device from the PSI Diagnostic software. The three LEDs have the following meanings.

Connected: the device has been sent a “connect” message and has not been reset since then.

Pending: the device is processing a command

Error: there is an ongoing communications error.

If the software is unable to communicate with a device, then you will see this reflected in this part of the display.

Figure 8. Communications error state

Many Pyramid Technical Consultants, Inc. PSI-series products are signal measuring devices, with acquisition configuration requirements, and some control outputs. The number of signal channels can vary, and the type of signal, but the way of displaying the data, logging the data and controlling the device has much in common, and is grouped on the following primary tabs.

Figure 9. Primary tabs

The **Data** tab is where the measured signals are displayed, in numeric and graphical format. You can apply filters and offsets to the data, and log to a csv file. Products which are primarily output devices have their output controls on the Data tab.

Some devices support computed results such as position values, or provide built-in functions such as PID controllers. In their case there are sub-tabs under the Data tab where you can view the computed data or manage the built-in functions.

The **Setup** tab is where data acquisition controls are located, such as current measurement range, control of auxiliary outputs like high voltage supplies, and triggering control. Most measurement devices support calibration to provide maximum accuracy, either using a built-in precision source, or using an external reference. Calibration parameters and controls are placed on the Setup tab.

The **Status** tab shows various internal states of the device, and is intended for use by software developers. It can be ignored if you are using the PSI Diagnostic to collect data and control devices.

The **Device** tab is where you can view and update the installed firmware in the device. You can also read back the serial number and see details of the communications between the device and its host.

6 Data tab

6.1 General features

Many Pyramid Technical Consultants, Inc. products measure some analog quantity, often current. We'll look at the I3200 Data tab as a particular example. All I-series and F-series devices will have very similar Data tabs, although the layout might differ in detail. One of the main differences is the number of channels, ranging from one in the IC101 and F100 up to thirty-two in the I3200 and F3200. We'll look briefly at the Data tabs of other types of device later in this manual.

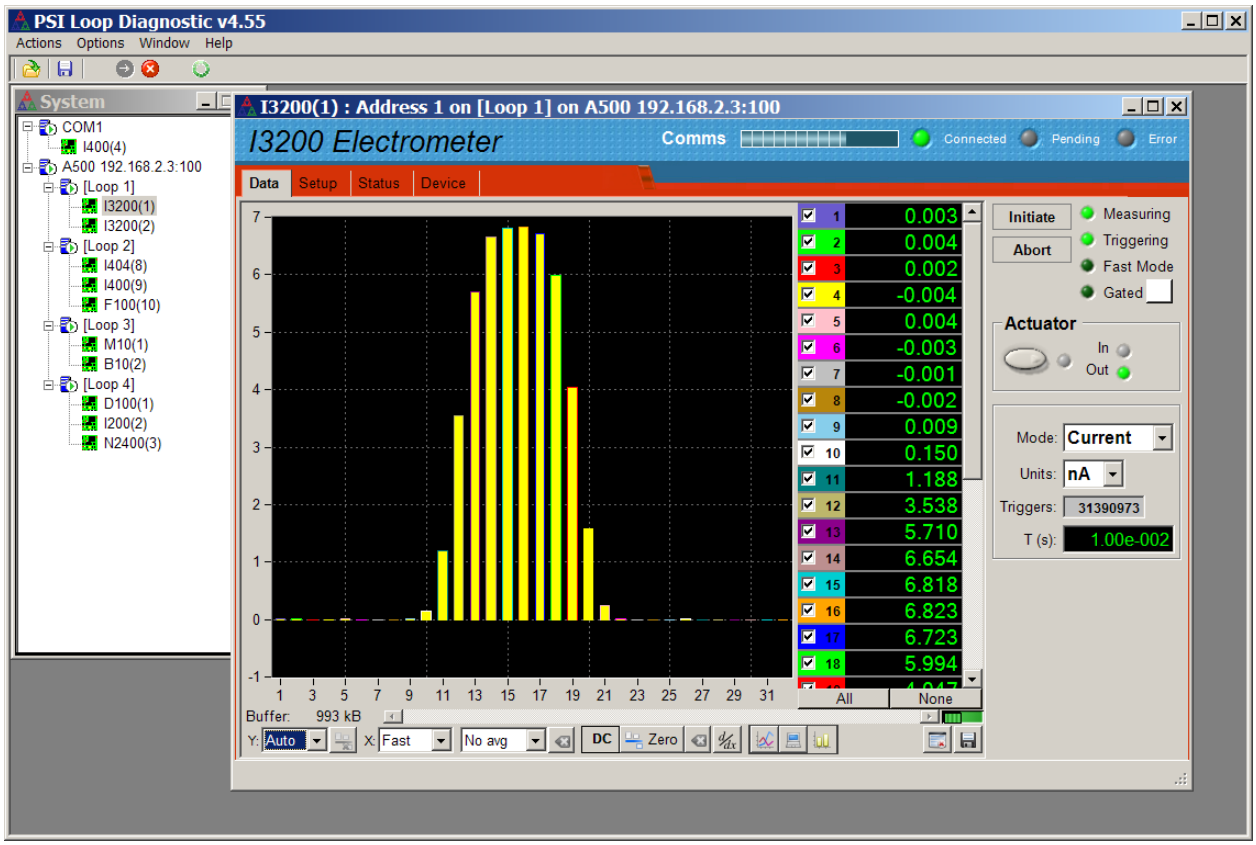


Figure 10. Typical Data tab display (histogram format)

Notice some general features of the Data tab. There is a graphic display of the signal which updates continuously if the device is taking data. There is also a numeric display for each channel. The I3200 has 32 channels, and you can't see all of these numeric values at first. You can either use the scroll bar to move up and down the list, or you can resize the window until you can see all of the channels.

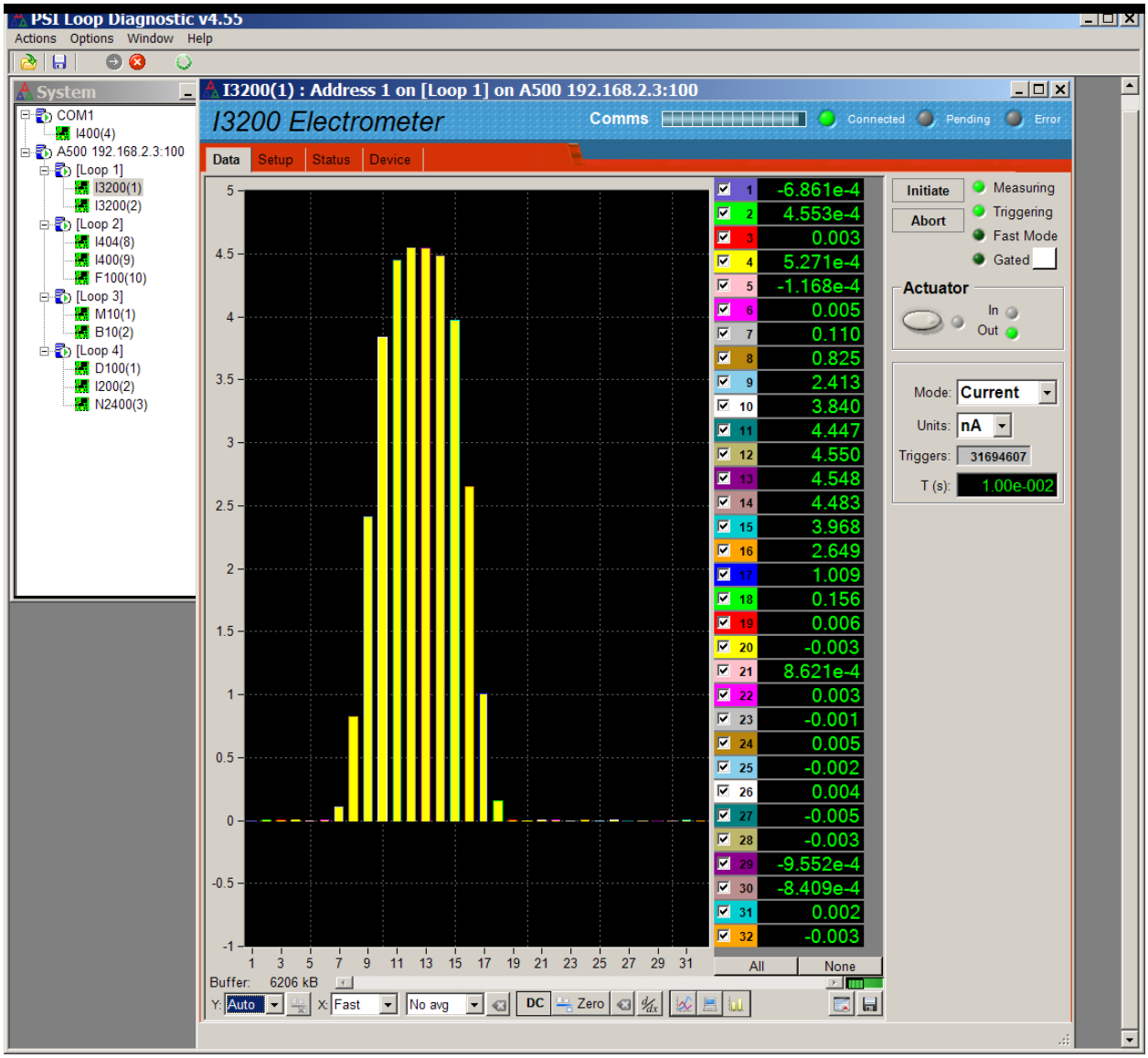


Figure 11. Data tab display (histogram format) expanded to show all channels on an I3200

If you want to highlight a particular channel, you can click on the relevant bar in the histogram to place a cursor. Click again to remove the cursor or move it to another channel.

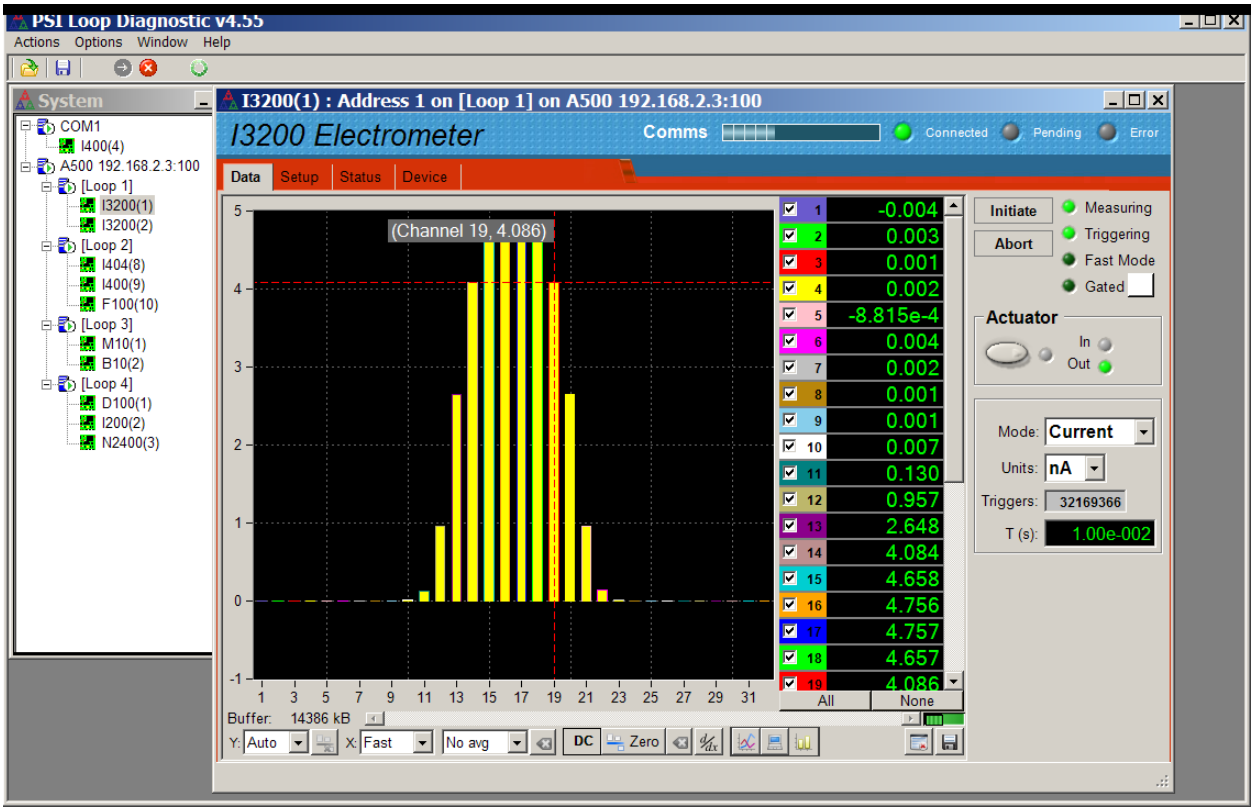


Figure 12. Adding a cursor to the Data tab display (histogram format)

If you want to remove channels from the display, uncheck their selection boxes.

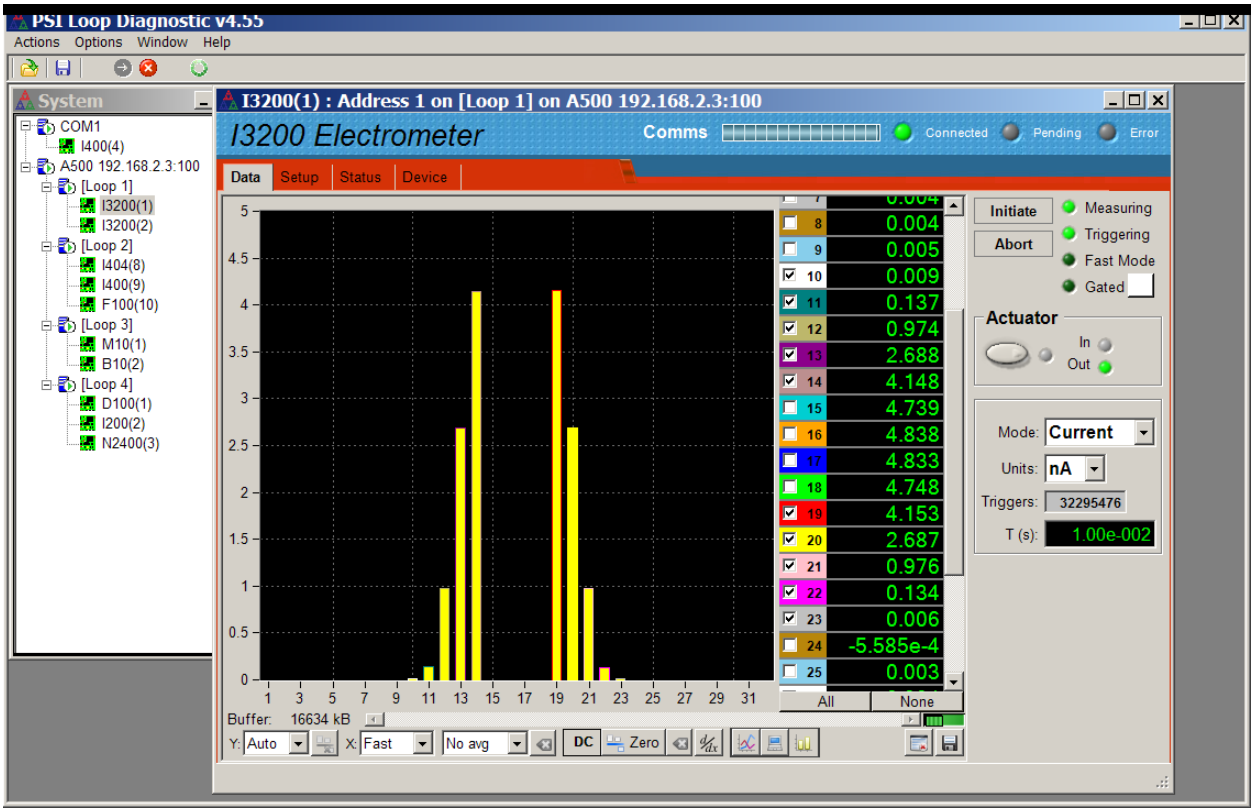


Figure 13. Masking channels from the display.

You can change the graphic to plot the signals as a function of time.

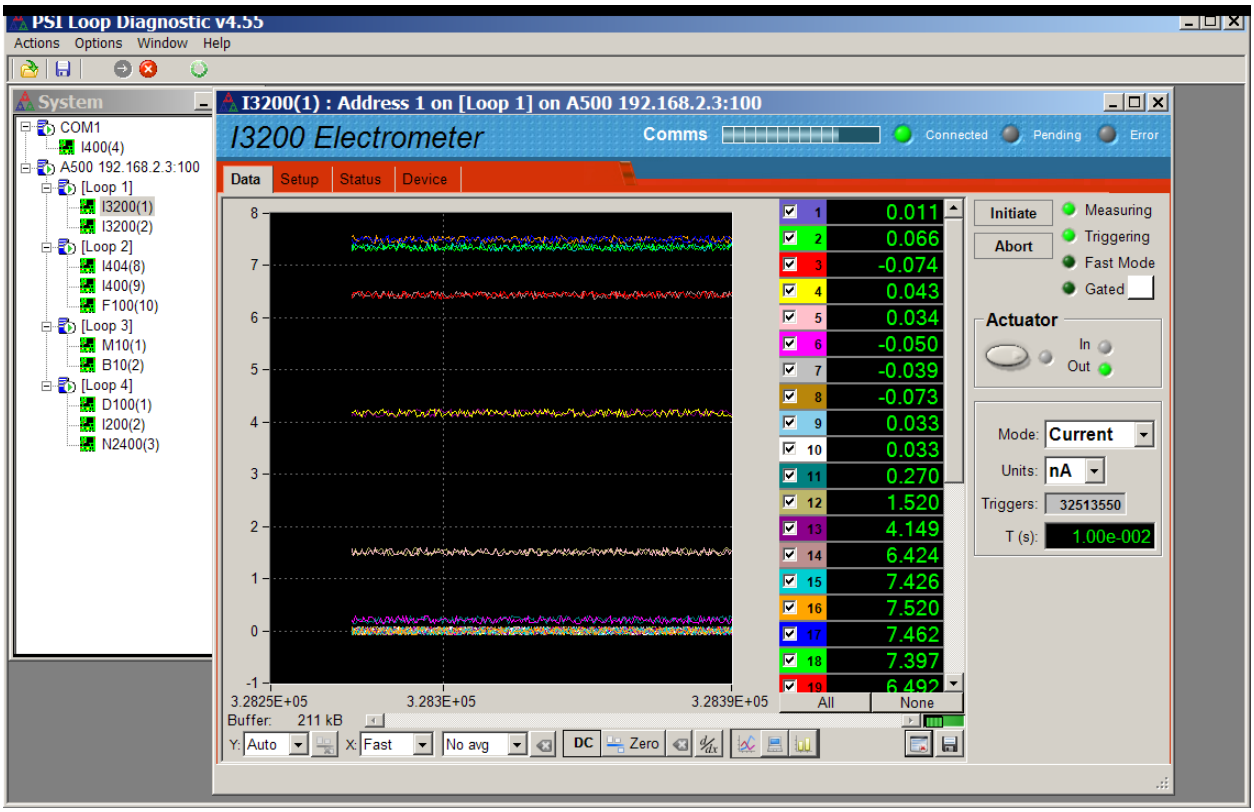


Figure 14. Data tab display (strip chart format)

When you apply display filters such as averaging or zero offset, you see the result immediately in the display. The following example from an I400 shows the averaging being changed from x1 to x10, and then to x100. Finally the zero offset button is pressed.

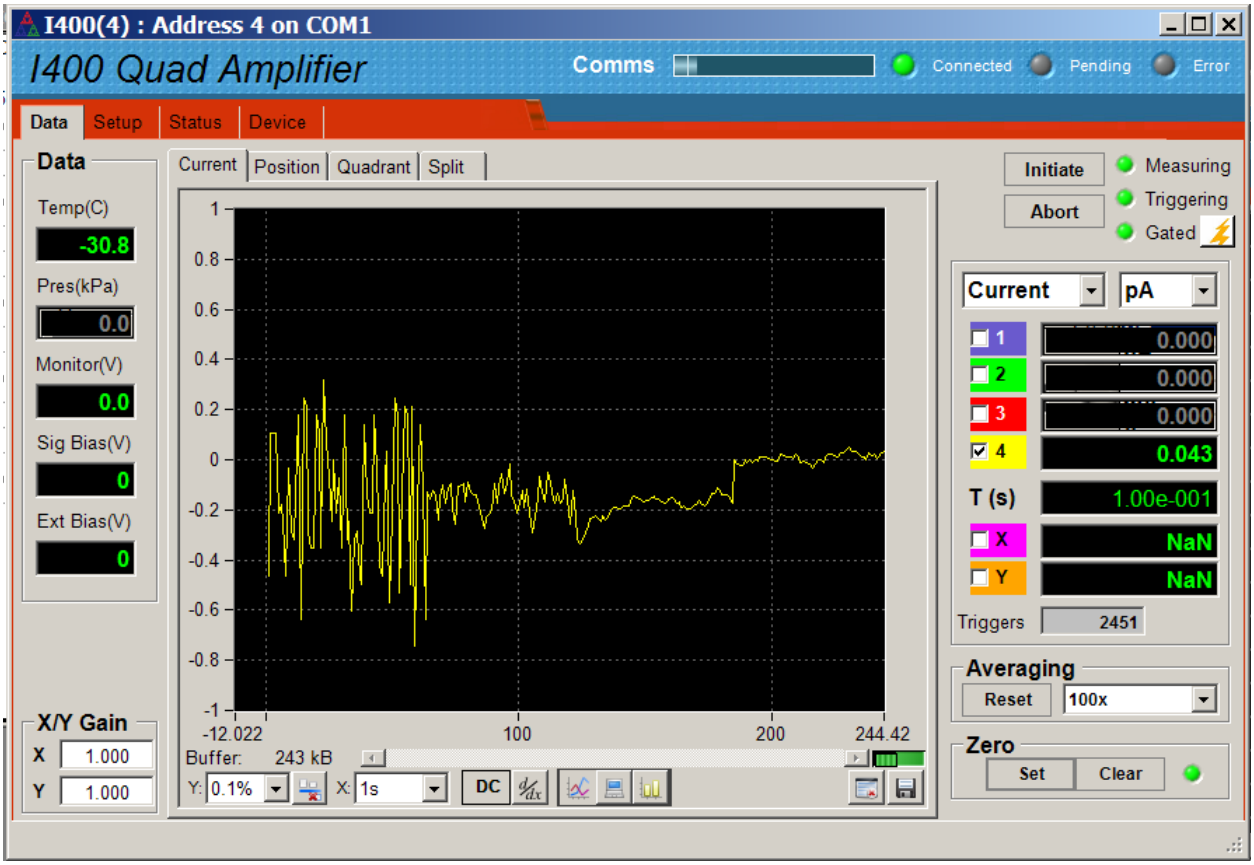


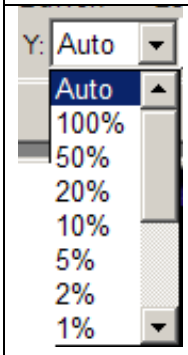
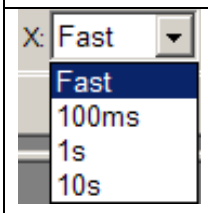
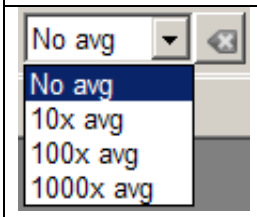
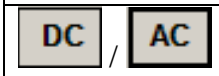
Figure 15. Effect of averaging and zero offset.

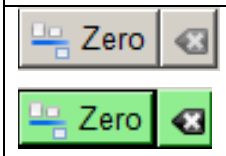
6.2 Data tab Controls and readbacks

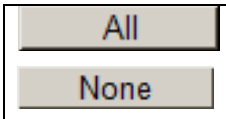
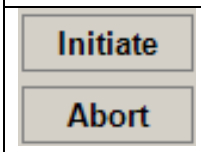
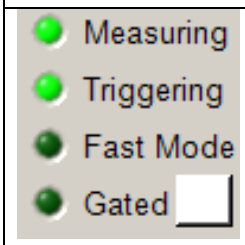
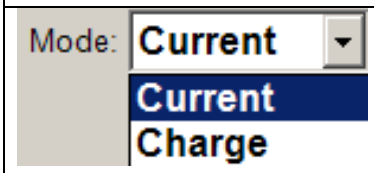
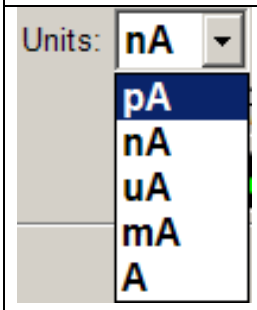
Now let's look in more detail at the function of the various buttons and controls on the screen. It is important to distinguish between what the device itself is doing with the data, and what the PSI Diagnostic is doing. The PSI Diagnostic is able to buffer and filter data independently of the device. So the data may be already filtered in the device according to parameters you send to it, but then you can apply additional filtering, zero offsets and so on in the PSI Diagnostic. The maximum rate at which readings can be streamed into the buffer and put onto the display is determined by the speed of the PC and the communications channel to the device.

The Pyramid Technical Consultants, Inc. A500 real-time controller allows contiguous fast data sets to be captured, using a combination of its own on-board memory, and memory in the devices themselves.

Buffer: 65535 kB	This readout indicates how much of the PSI Diagnostic data buffer has been used up. The maximum capacity is 65535. When the buffer is full, it is rolled (the oldest values are removed as new values are added).

	This slider control turns data streaming into the PSI Diagnostic buffer on and off. Note that this does not control data acquisition by the device itself.
	This control adjusts the vertical scale of the graphic, as a percentage of the full scale range in use on the device. When you set it to Auto, the vertical scale is adjusted continuously to keep the data for all channels maximized in the display.
	This control becomes active when the vertical scale is not set to Auto. It toggles the plot to show the positive value half only (-10% to +100% of full scale).
	This control adjusts the rate at which readings from the device are passed into the PSI Diagnostic data buffer and shown on the horizontal axis of the display. If data is arriving from the device at a higher rate, then the unused readings are discarded. The Fast setting streams the data into the buffer as quickly as the PC will allow. Generally a PC will not keep up with the data rate from a multichannel device. However every reading is time-stamped and given an index number, so if you log the data, you can see where samples were missed.
	This control allows you to filter the numeric and graphed results on the display. The filter function is a simple IIR filter: $Y_n = \frac{1}{T} X_n + (1 - \frac{1}{T}) Y_{n-1}$ where X_n is the latest reading from the device on a particular channel, Y_n is the filtered value, Y_{n-1} is the previous filtered value, and T is the averaging factor (10, 100 or 1000, or 1 for no averaging). The filter only affects the displayed data - if you log values to a csv file, they will be the unfiltered values coming directly from the device. The reset control  is active if averaging is selected. It zeroes Y_{n-1} and thus restarts the filter.
	This control toggles between the normal DC-coupled display of the data and an AC-coupled mode. In AC mode, the DC component of any waveform being displayed in chart mode is

	subtracted away, so that you can concentrate your attention on any AC components. The AC mode only affects the displayed data - if you log values to a csv file, they will be the values coming directly from the device.
 	This control performs a zero offset subtraction of the numeric and graphed results on the display. The readings on all channels are captured when you press the button, and are subtracted from all subsequent readings. This is valuable if you have a physical fixed offset that you need to remove from the data being displayed. The control is colored green when zeroing is in effect. Zero offset removal only affects the displayed data - if you log values to a csv file, they will be the values coming directly from the device. The reset control  is active if zero offset subtraction is selected. It cancels offset subtraction and discards the captured offset values.
	This control toggles a differential mode display of the readings. When it is enabled, the differences between successive readings are displayed. This can be useful when looking for small time discontinuities in the data. The differential mode only affects the displayed data - if you log values to a csv file, they will be the values coming directly from the device.
	These controls determine the way the data is graphed. The first option is a scrolling strip chart, with the individual channels color-coded. The second option is a variant on the strip chart, but without scrolling. A complete screen-full of data is accumulated and then plotted as a whole, similar to the way a digital oscilloscope works on its faster timebases. The third option is the histogram display. This is useful as a ratemeter display, for beam tuning perhaps, or as a beam shape and position display on multichannel devices.
	This control empties the data buffer and thus clears the display when you are in strip chart mode.
	This control opens a save file dialog allowing you to save the buffer contents in .csv format. See later in this section for more details on csv files.

	These buttons are short cuts to select all channels or no channels for display on devices with a large number of channels, such as the I3200 and F3200.
	These buttons send commands to the device to start a signal measurement sequence, or abort a sequence that is in progress. Note that if you have selected an external triggering mode on the Setup page, then the measurements do not start after you press Initiate, until the external trigger signal arrives.
	These indicators show the status of the data acquisition and triggering in the device. Measuring means the device has been initiated to take data. Triggering means that measurements are actually being taken. Fast mode (where supported) means that the device is operating in a fast data transfer mode under control of an A500 controller. Gated means that there is a signal present at the gate input connector. This is the incoming external trigger signal.
	This control is exposed on I-series devices, which are fundamentally charge measuring devices. It allows you to collect and display data as charge in coulombs, or, divided by integration time, as current in amps. The selected mode also controls the units of data saved to csv file.
	This control is exposed on all current/charge measuring devices (I-series and F-series). It allows you to define the units used for display. If you are working in charge mode on an I-series device, the units will be units of charge. The selection only affects the display. Logged data is always in amps or coulombs, in scientific (exponential) format.
	This display shows the number of individual measurements that the device has made since it was last initiated. Don't confuse this measurements counter with external trigger signals that have arrived at the gate input connector. The trigger number is listed against the measurement data in the csv files.
	This display is used on I-series devices to show the integration time used for the latest measurement. If you are using subsampling you can see the intermediate subsample times.

	This display is used on F-series devices to show the I-V conversion current range that is in use.

Some of the other indicators and controls you might see on Data tabs for specific devices include:

- High voltage PSU readback
- Pneumatic actuator control and readback
- Temperature readout
- Pressure readout
- Digital signal set and read
- Analog signal set and read
- Pulse scaler and encoder readout
- Conversion gain factors for position sensors
- Pulse height spectra

We'll show some examples of other Data tabs in the next section.

6.3 Other Data tab formats

Various devices have Data tabs which resemble the basic I- and F-series tabs more or less according to the function of the device. This section gives some examples. Refer to the individual User Manuals for full details.

The M10 general purpose I/O device has a similar Data tab to the I- and F-series current measuring devices, but with the addition of controls for its analog and digital outputs. It also features a control area for the pulse train feature of the device.

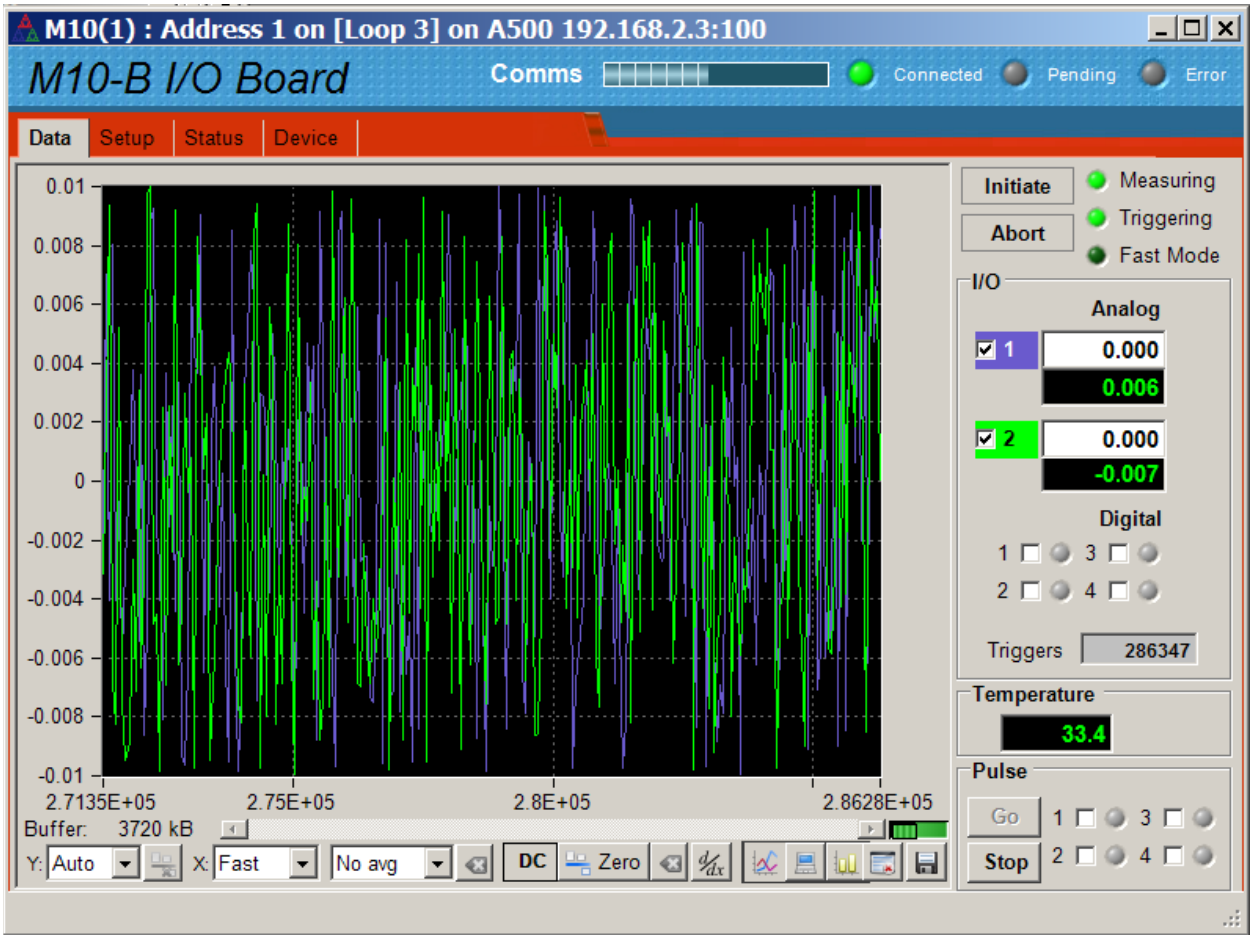


Figure 16. M10 Data tab

The B10 general purpose digital I/O device has no analog inputs, therefore no graphic display on its Data tab. There are switches and LEDs to set and read the states of the digital I/O. The digital inputs can be configured as counters, and also as position encoder readers, so there are digital displays of these values.

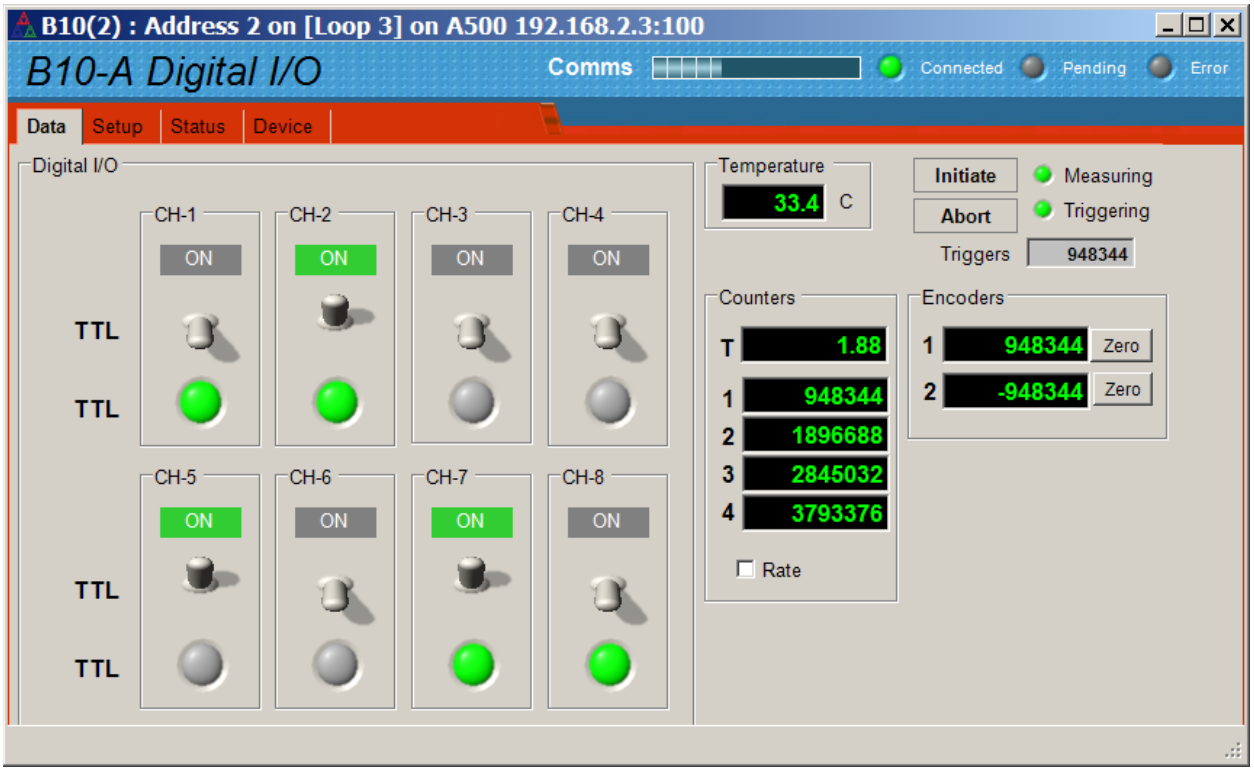


Figure 17. B10 Data tab

The D100 pulse processor performs pulse height analysis of individual pulses from photomultipliers, so its Data tab is used to display a pulse height spectrum, in the manner of a multi-channel analyzer. The cursor can be used to define peaks, set regions of interest, and you can get analysis of peak energy, resolution, background-subtracted counts and so on.

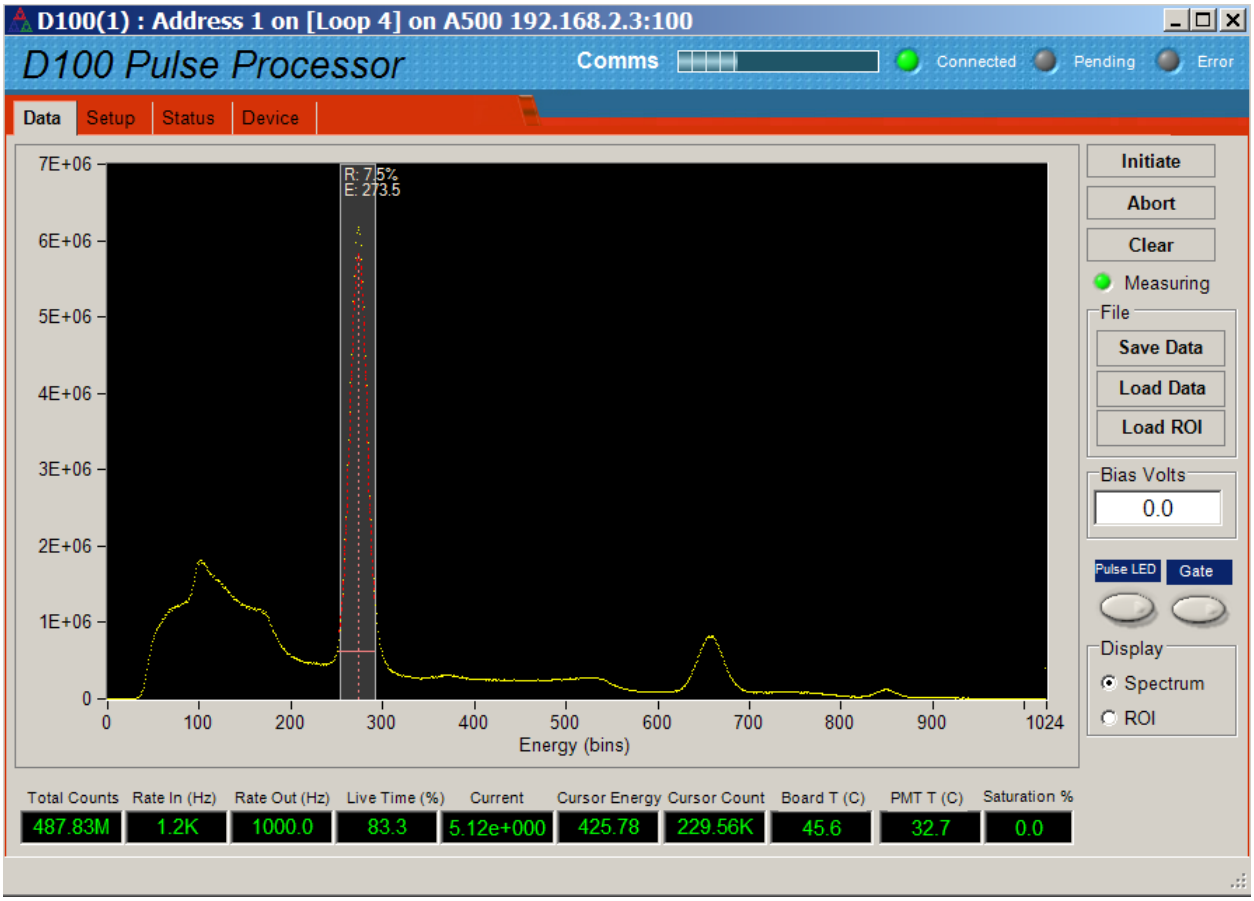


Figure 18. D100 Data tab

6.4 csv files

All devices which measure analog values can save a log of the values against time in csv format. When you click the Save Data button, a standard Save As… dialog opens where you can give a name to the file. When you select Save from the dialog, the buffer contents are captured to the file. All channels are captured, irrespective of whether they are selected to be displayed. Any filters that are in effect, such as averaging, zero offset, AC coupling or differential mode do not affect the logged data.

I-series devices can log the data as charge in coulombs or current in amps, depending on which display option you have set. The F-series devices log current in amps. The M10 logs voltage.

The following figure shows an extract from a typical csv file, captured from an I3200. Only the first seven of the 32 columns of current readings are shown. The index column shows the trigger index, or measurement sequence number. You can see that in this case the values are not contiguous because the PC host could not keep pace with the rate of data generation. In most experimental situations this is not a great problem. Using a longer integration time would have allowed contiguous data. The A500 controller allows this limitation to be overcome, so that a burst of maximum rate data can be captured without breaks.

I3200 Data (Ampere)

Index	TimeSec	Overrange	Channel1	Channel2	Channel3	Channel4	Channel5	Channel6	Channel7
4	0.00074	0	3.03E-09	4.74E-09	1.30E-08	1.42E-08	2.36E-08	2.91E-08	3.14E-08
71	0.01414	0	3.75E-09	5.28E-09	7.47E-09	1.57E-08	2.05E-08	2.70E-08	3.40E-08
131	0.02614	0	5.59E-09	5.04E-09	8.48E-09	1.41E-08	2.00E-08	2.77E-08	3.55E-08
184	0.03674	0	3.13E-09	8.48E-09	1.08E-08	1.27E-08	2.03E-08	2.92E-08	3.48E-08
240	0.04794	0	1.59E-09	6.38E-09	1.08E-08	1.79E-08	2.31E-08	2.88E-08	3.61E-08
298	0.05954	0	5.52E-09	7.87E-09	1.15E-08	1.47E-08	2.41E-08	2.80E-08	3.40E-08
355	0.07094	0	5.51E-09	5.55E-09	8.67E-09	1.38E-08	2.28E-08	2.88E-08	3.23E-08
417	0.08334	0	1.44E-09	8.65E-09	9.27E-09	1.33E-08	1.98E-08	2.74E-08	3.52E-08
472	0.09434	0	4.81E-09	7.93E-09	7.13E-09	1.35E-08	2.09E-08	2.96E-08	3.15E-08
522	0.10434	0	2.95E-09	6.92E-09	8.46E-09	1.65E-08	1.88E-08	2.95E-08	3.55E-08
578	0.11554	0	5.92E-09	4.41E-09	9.47E-09	1.50E-08	2.11E-08	2.92E-08	3.51E-08
646	0.12914	0	2.81E-09	8.43E-09	1.25E-08	1.56E-08	2.41E-08	2.62E-08	3.60E-08
713	0.14254	0	3.01E-09	7.12E-09	7.76E-09	1.73E-08	1.97E-08	2.70E-08	3.42E-08
772	0.15434	0	2.14E-09	7.70E-09	8.38E-09	1.44E-08	2.11E-08	2.61E-08	3.26E-08
833	0.16654	0	1.81E-09	8.47E-09	1.30E-08	1.40E-08	2.07E-08	2.90E-08	3.56E-08
889	0.17774	0	1.23E-09	5.17E-09	1.24E-08	1.42E-08	2.15E-08	2.50E-08	3.48E-08
943	0.18854	0	1.15E-09	4.19E-09	1.05E-08	1.84E-08	2.45E-08	2.87E-08	3.64E-08
1005	0.20094	0	1.47E-09	5.53E-09	1.13E-08	1.76E-08	2.32E-08	2.67E-08	3.60E-08

Figure 19. Example csv file

The time column reflects the time when the data was taken, starting from zero when the first measurement was triggered, and including any breaks for integrator resets in I-series devices. Therefore if you plot the channel readings against the time column, you will get the correct representation of the signal as a function of time.

Note that if you are doing subsampling with an I-series device that supports this mode, and displaying charge, then the displayed and logged data shows the charge incrementing at each subsample within an integration period. This is correct, and simply reflects the fact that the time since the integration started increases for each subsample within that integration.

If you are using an accumulation mode in an I-series device (where the charge is accumulated over multiple integrations), then there is no graphic display and you cannot log the data. There is only one result, which you can read from the numeric displays.

6.5 Data sub-tabs

Devices with built-in algorithms have sub-tabs below the data tab to show the computed data or allow control of the algorithm. Examples include the I404, which supports position readout from split or quadrant encoders, and the I200 which can be specified with a proportional-integral controller to stabilize an external device based upon the currents it measures.

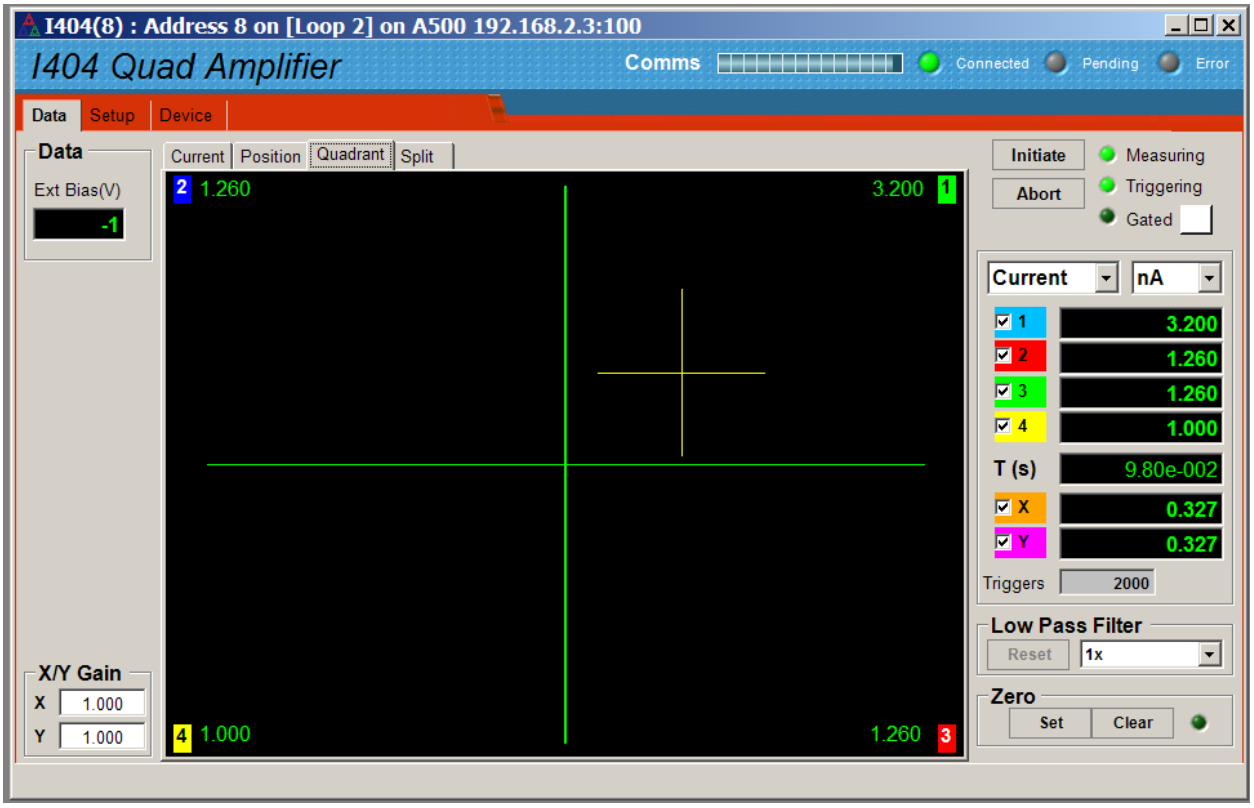


Figure 20. I404 quadrant position readout on Data sub-tab

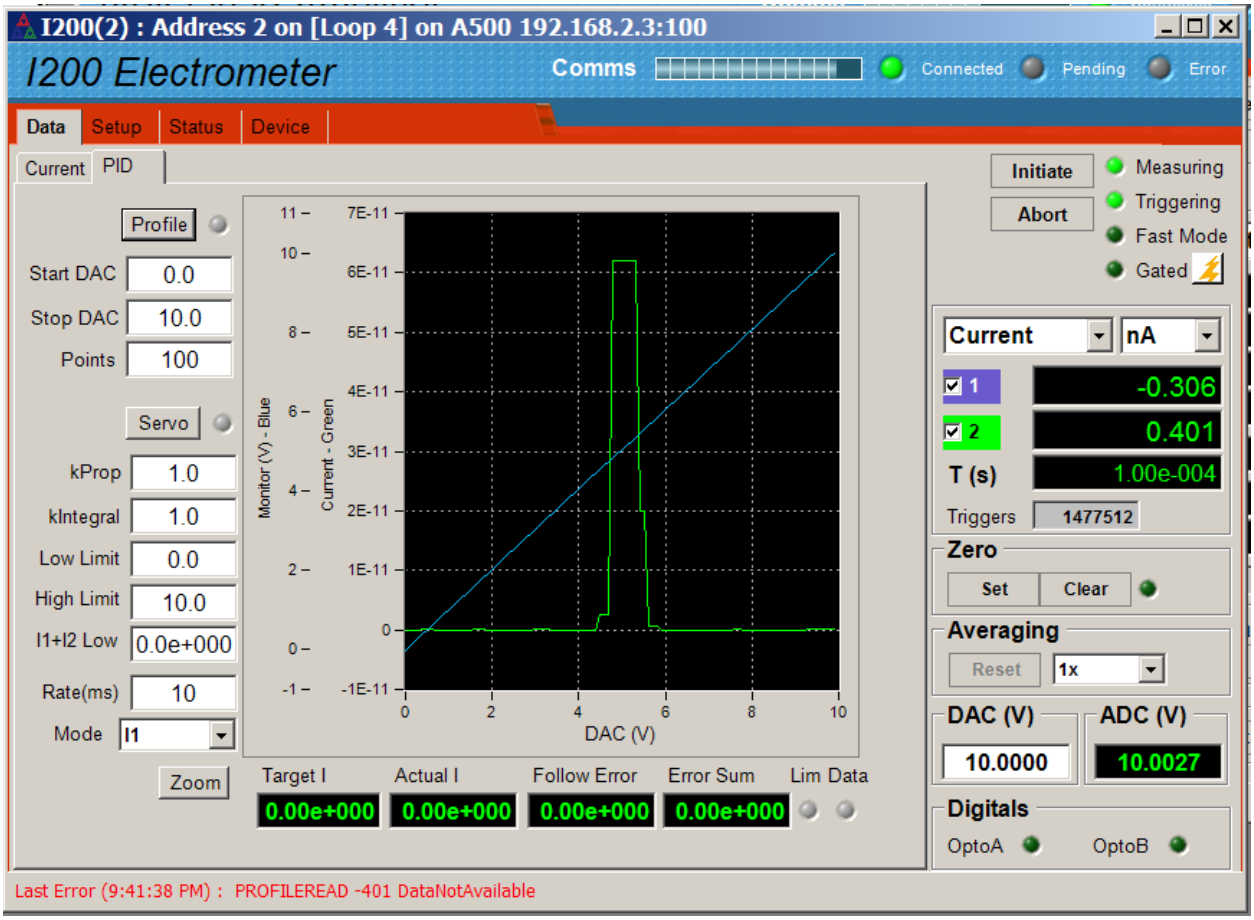


Figure 21. I200 PI control on Data sub-tab

7 Setup tab

7.1 General features

The Setup tab is where configuration and calibration controls are placed. The format for I-series all devices is very similar, as illustrated in the following figure.

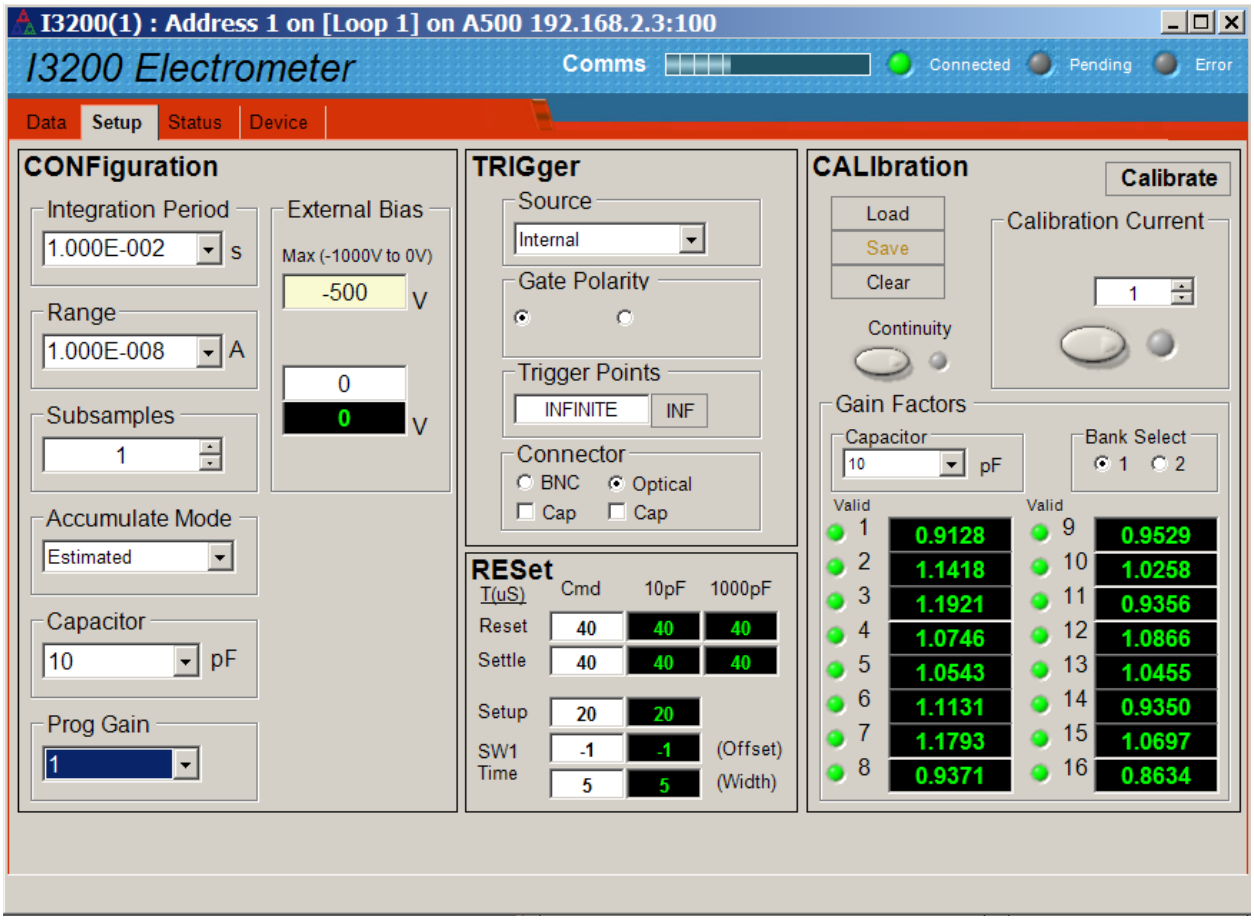


Figure 22. I3200 Setup tab

The I404 and IC101 windows in the PSI Diagnostic support an Expert mode, in which all control parameters are exposed, otherwise only the commonly-used parameters are available. To toggle Expert mode, check the Expert entry in the Options menu of the main PSI Diagnostic window.

F-series devices have many of the same features, except that details of integrator control are replaced by I-V converter range controls and averaging settings.

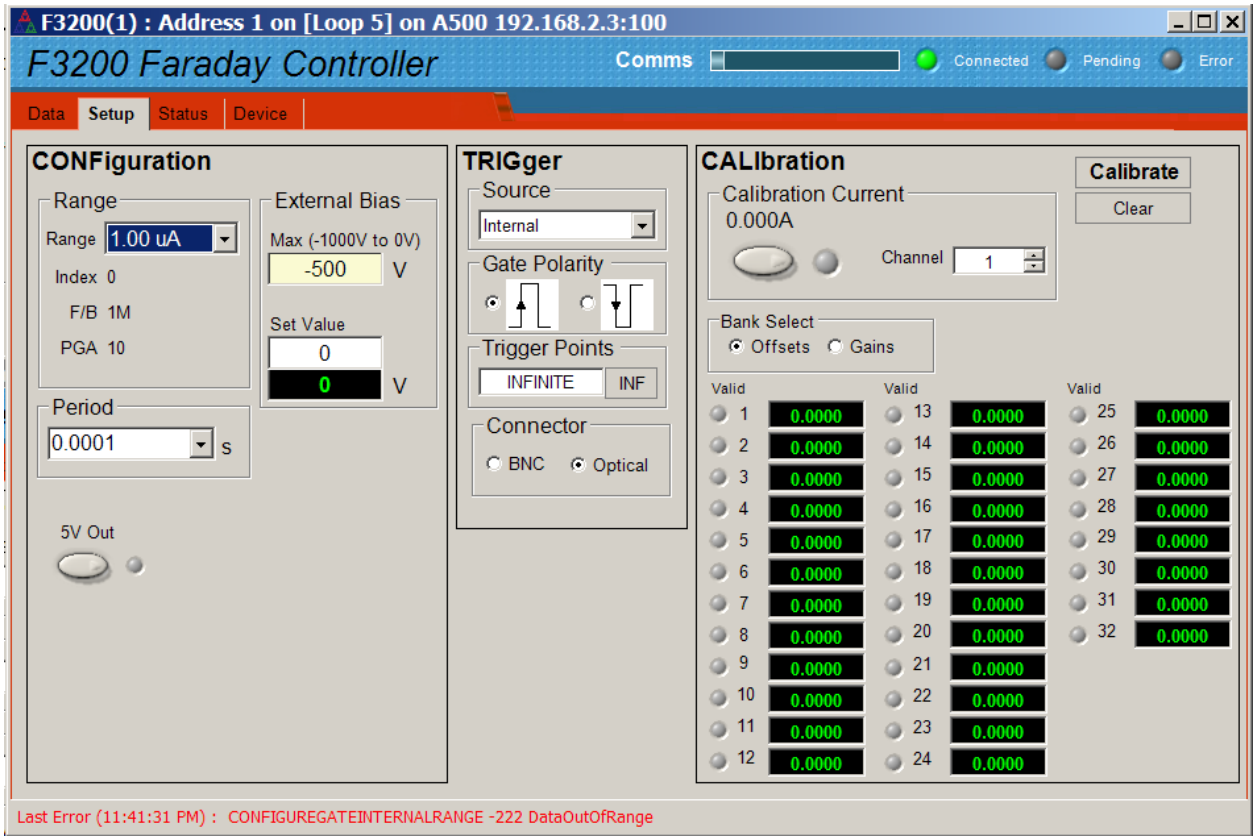


Figure 23. F3200 Setup tab

7.2 Measurement range control

On the left of the Setup window of I-series devices are the controls that determine the effective current range, namely the integration period, the feedback capacitor selection, and in the case of the I3200, a programmable amplifier gain. As an alternative to setting the range by choosing the integration period, you can enter the approximate full scale current in the Range field. This works interactively with the Integration Period field.

For F-series devices you select from the available I-V conversion ranges. You can also set the period over which ADC conversions are averaged to make up each reading.

General purpose devices like the M10 allow you to select the full scale voltage range of the analog inputs.

7.3 High voltage control

If the device supports a high voltage option, and has the option fitted, then the maximum output and polarity of the supply will be shown. The device reads these values from internal jumper settings. You have the option to set a software limit which is lower than the maximum. Both the

software limit and the HV output setting have to be entered with the appropriate polarity. For example, enter -450 to set a 450 volt output from a negative supply.

There is a delay before the readback shows that the voltage is being output, while the high voltage starts up. The readback does not match the setting exactly, but is very useful to see if there is an overload somewhere in your system.

7.4 Triggering

In the TRIGger box are the controls for the triggering. The different types of trigger available depend upon the device. The default triggering setting to ensure that you will always see data, are Internal trigger source and INFINITE Trigger points, selected by pressing the INF button. With these settings, acquisition will start as soon as you press Initiate on the Data tab, and will continue indefinitely.

7.5 Integrator reset

The RESet fields control the fine details of the integrator reset process for I-series devices. You should read and understand the relevant sections of the device User Manual before making adjustments here.

7.6 Calibration

On the right of the Setup tab are the CALIbration controls. All devices which can read analog values support calibration to give maximum accuracy. In the case of I- and F-series devices, the calibration is a built-in automated function, using a precision current source. Pressing the Calibrate button invokes the calibration routine. It is generally best to have no connections to the signal inputs when you do this. The calibration can be saved in non-volatile memory on the device by pressing the Save button, and recovered from memory with the Load button. The gain factors are displayed, together with a Valid LED indicator showing whether the factor is within the allowed range. In the devices with many channels like the I3200, you need to cycle through the Bank Select buttons and Capacitor options to see all the values.

Where a device has a built-in calibration source, you can also use this for test purposes, by turning on the source, and directing the current to any channel you select.

Figure 24. Calibration current enabled and directed to channel 12 of an I3200.

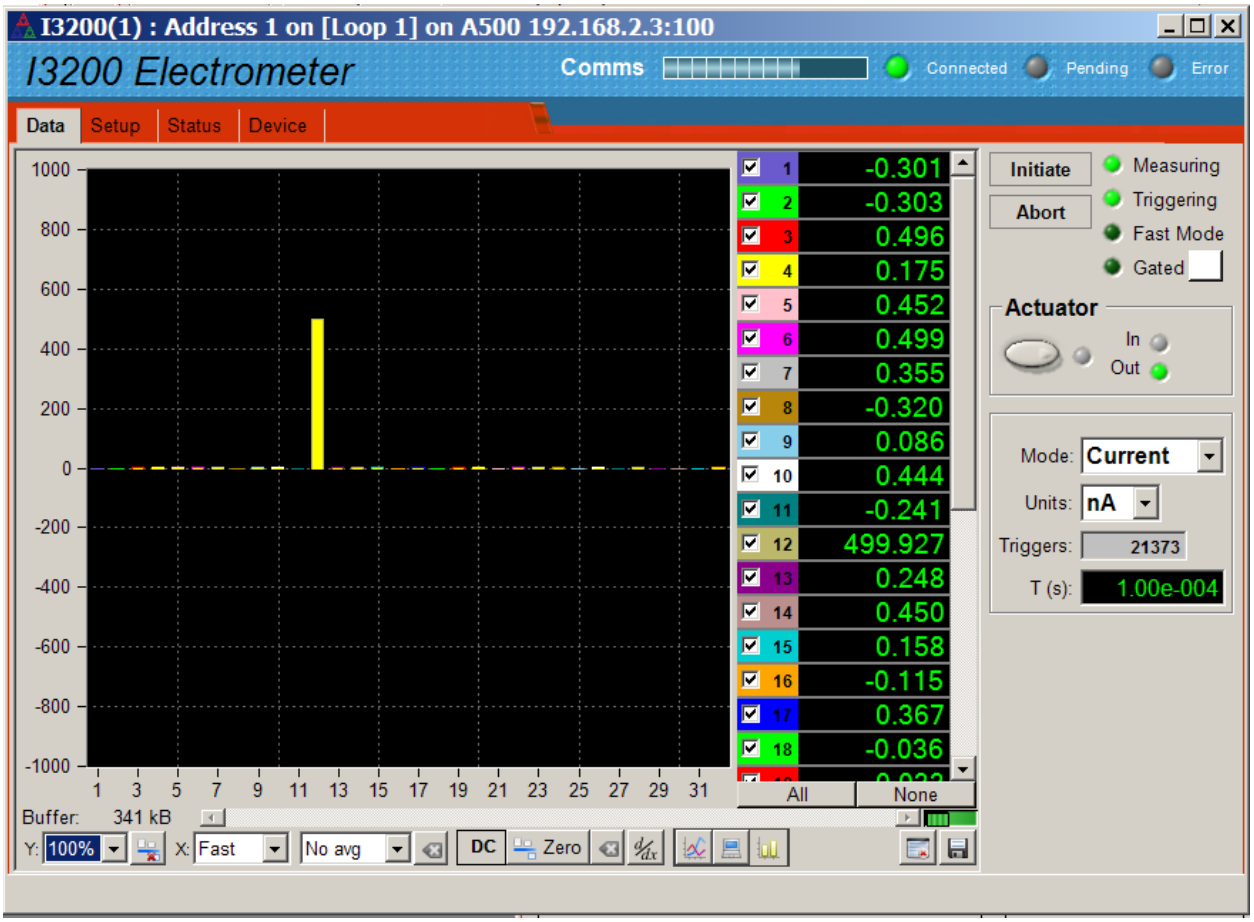


Figure 25. Calibration current showing on channel 12 of an I3200.

Devices like the M10 which do not have an internal calibration source can nevertheless have calibration factors entered, using data from external equipment. This is done at the time of manufacture, and the values are stored in non-volatile memory on the device.

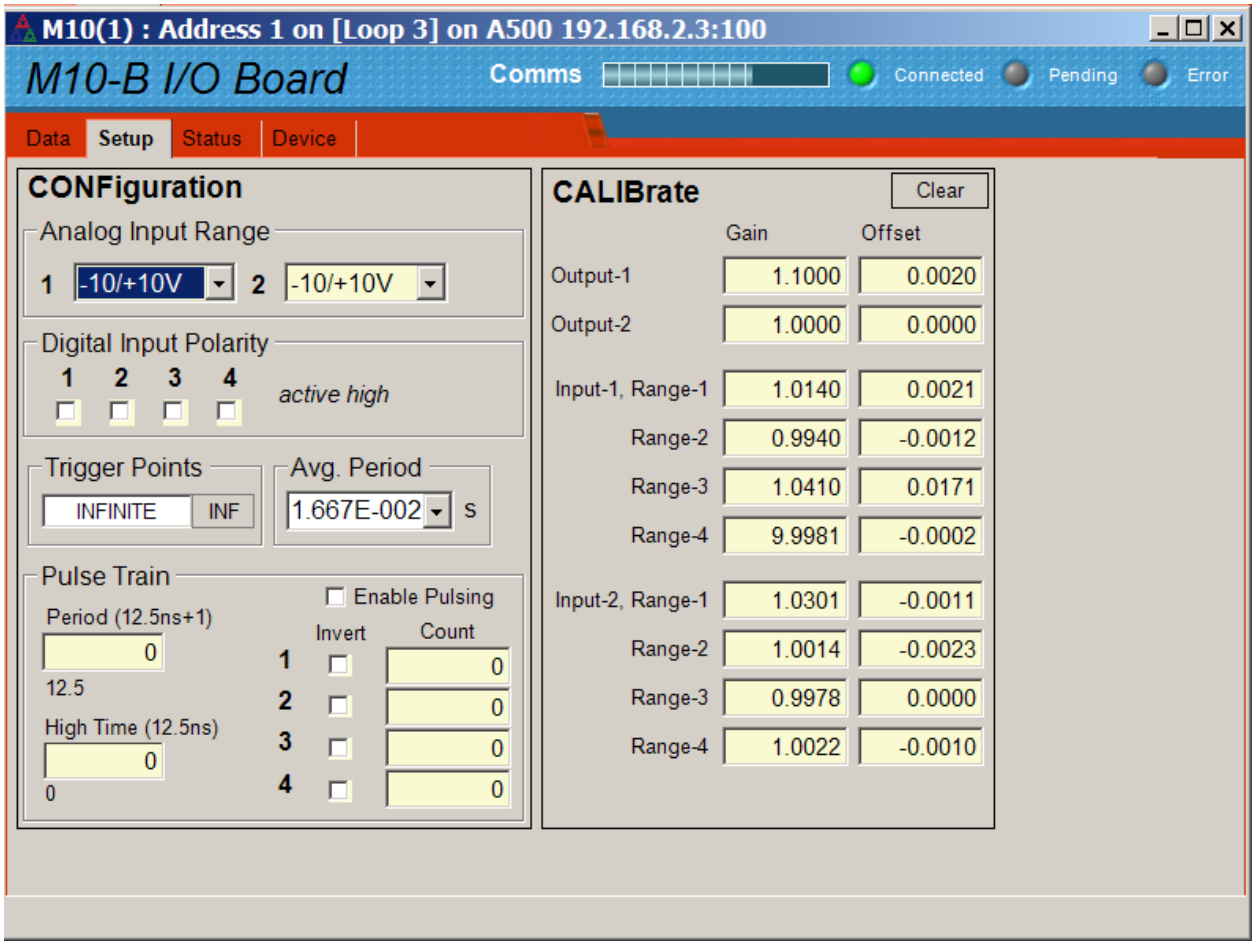


Figure 26. M10 Setup tab showing calibration parameters

7.7 Other Setup functions

Other controls are shown, as needed for the device. General purpose devices with digital I/O like the M10 and B10 allow the logic sense to be set (active high or active low).

The M10 supports a digital pulse train output feature, and the configuration controls for this are shown ion the Setup tab. You can specify a number of pulses of given period and duty cycle to be output on each of the four digital outputs.

The D100 exposes various parameters that determine the pulse discrimination process. Refer to the D100 User Manual for details.

The B10 has controls that allow its digital inputs to be configured as fast pulse scalers, or as position encoder readout.

8 Device tab

The Device tab is essentially the same for all devices apart from loop controllers.

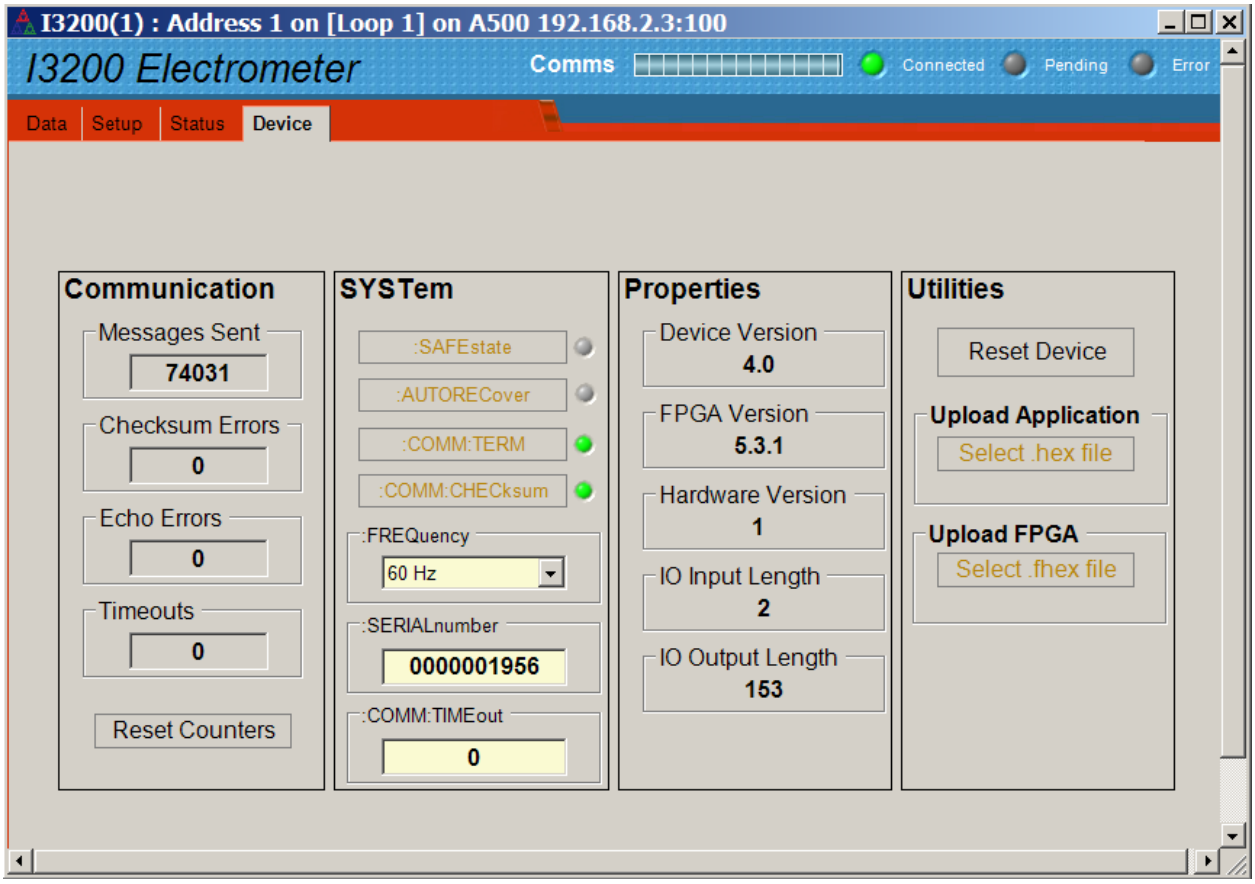


Figure 27. I3200 Device tab

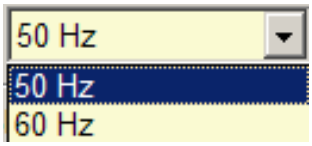
8.1 Communication

The Communication box provides information about the messages passed between the device and its host (PC or A500/A300). There should be no errors when the device and the host are working normally. If there is marginal communication for some reason, you may see Checksum Errors. If the communication channel is lost completely, then you will see timeout errors.

8.2 SYSTem, and default frequency selection

The SYSTem box shows the serial number of the device, which should match the serial number label.

The FREQuency control



allows you to tell the device the local line frequency. This is used during the automatic calibration process to minimize interference from the AC line.

The COMM:TIMEout parameter determines how the device reacts if it looses communication with its host system. A setting of 0 means it will simply continue doing whatever is was doing before communication was lost. Any other setting is the number of seconds before the device will go into a safe state if it stops receiving messages from the host system.

8.3 Properties

The Properties box displays some internal configuration details, of which the Device and FPGA firmware version numbers are most helpful to users.

8.4 Utilities and firmware updates

The Utilities box provides a Reset Device button. Pressing this will do a soft reset, aborting any measurement in progress.

Depending on the device type, there are one or two controls to start upload of new firmware to the device. All devices have an Upload Application utility. Pressing the Select hex file button opens a file dialog, and you should navigate to the location of the .hex file with new code for the PIC microcontroller. When you Open the file in the dialog, the upload will start, and a status bar will indicate progress. The device will start running the new code at the end of the upload.

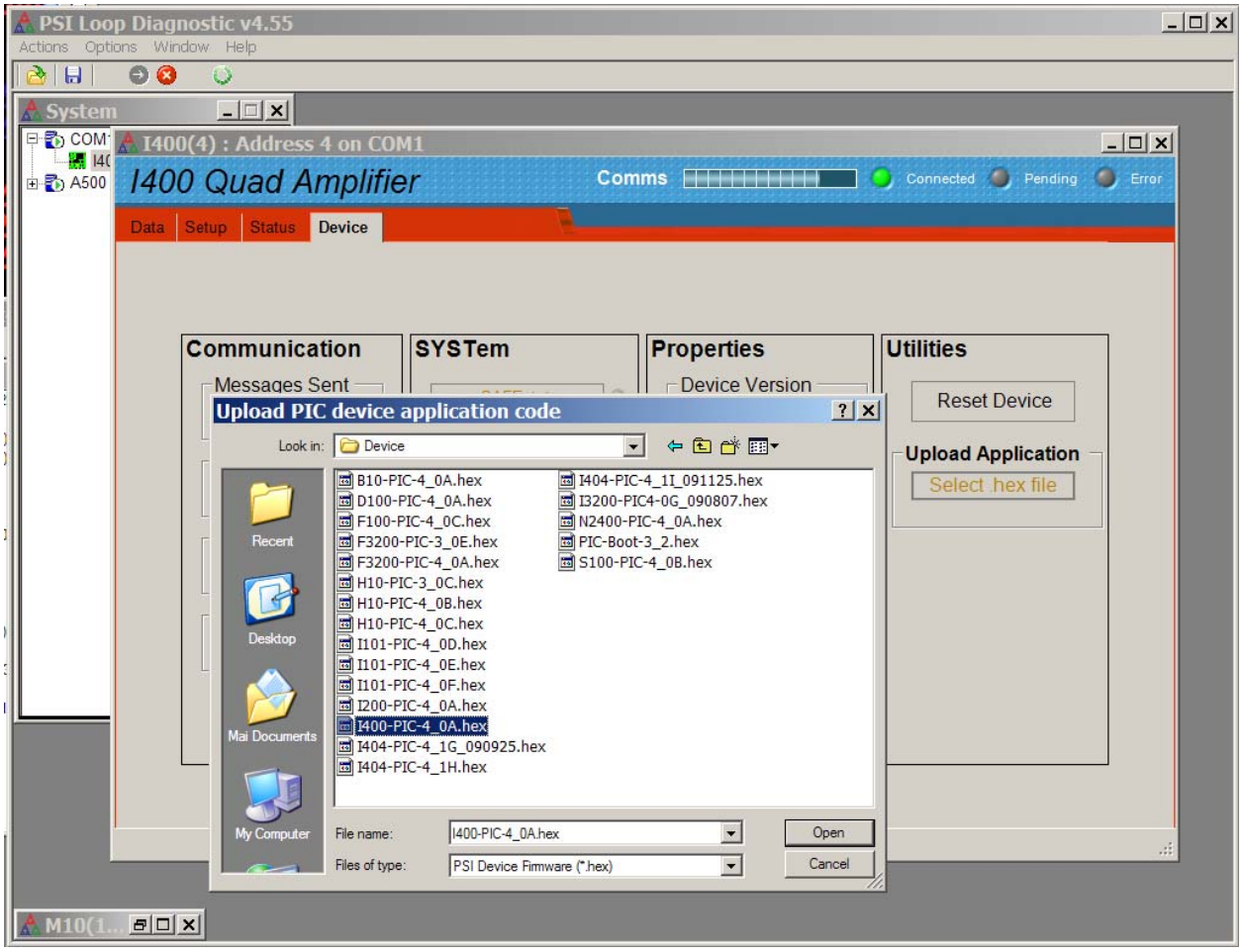


Figure 28. Selecting application code for upload

Some devices also permit you to upload new FPGA code using the Upload FPGA utility. The process is similar, except that you need to navigate to the appropriate fhex file after pressing the Select fhex file button. When the new code has loaded, you need to power-cycle the device to make it active.

8.5 Loop controller Setup tabs

On loop controllers (A500 and A300), the controls normally found on the Device tab are located on the Setup tab. In addition there are fields in the SYSTem box where you can enter the IP address of the device.

On the A500 there are three fields which provide the first three bytes of the address. The last byte is read from rear panel switches. If you change the settings, the new address becomes active when the controller next boots up.

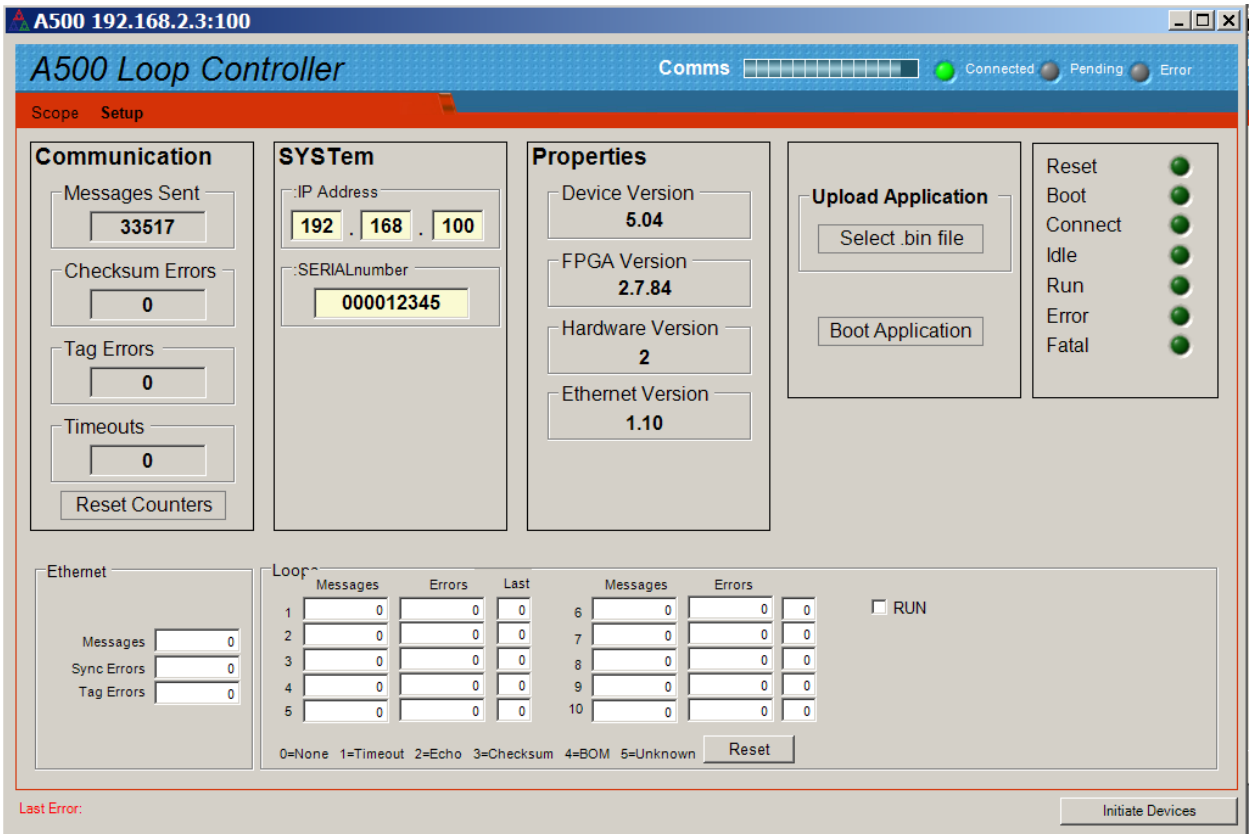


Figure 29. A500 Setup tab.

On the A300, four bytes of the IP address are entered on the Setup tab. The final byte is then modified by adding the value of the switch on the A300 to the last byte.

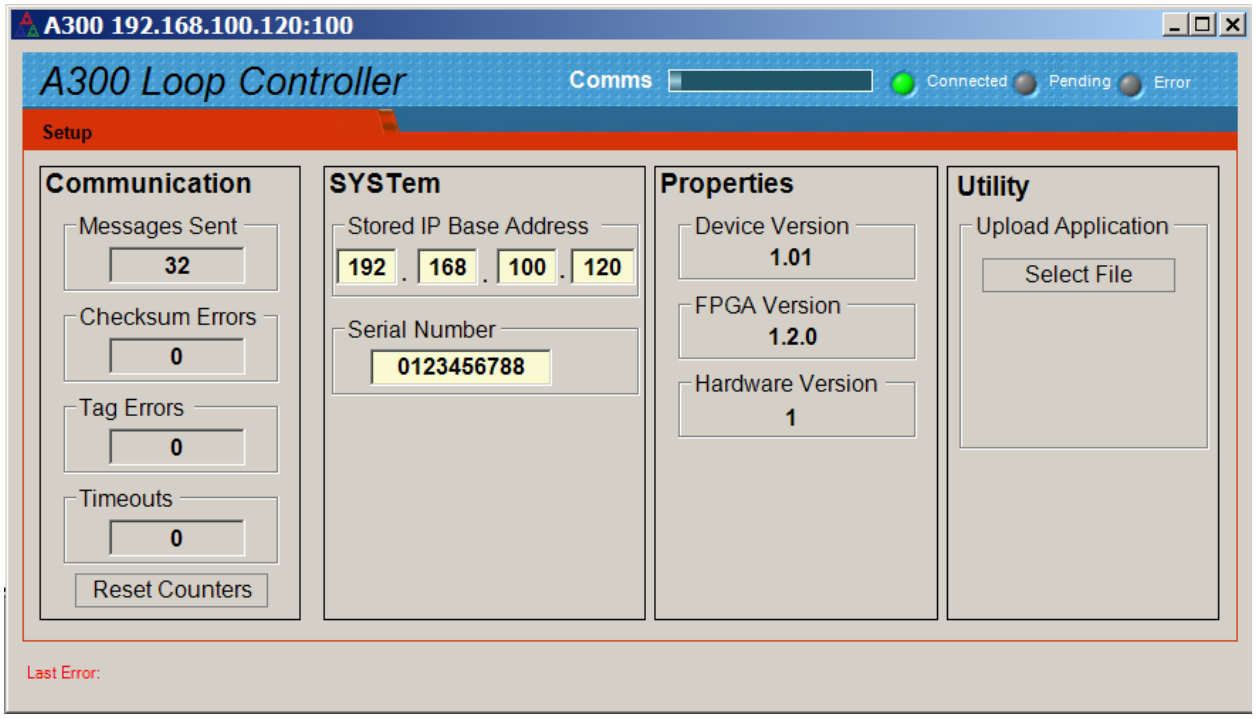


Figure 30. A300 Setup tab.

9 A500 Scope Mode

9.1 A500 Scope tab

If you have multiple devices connected via an A500 real-time loop controller, then you can use a special Scope mode to coordinate control outputs and data inputs across those devices with a common timebase. This is distinct from the scope display mode available on individual device windows. You must have a compatible A500 firmware version to use the Scope mode. Contact Pyramid Technical Consultants, Inc. if you need to check whether you have the correct version.

As an example of using A500 Scope mode, you could put out a beam scan waveform from the analog output of an M10 and, in synchronization, collect data from some or all channels of several current reading devices which are measuring the response of the beam to the waveform. The waveforms are output and the data is collected under direct control of the A500, and the resulting data files can be downloaded to the host PC at the end of the sequence.

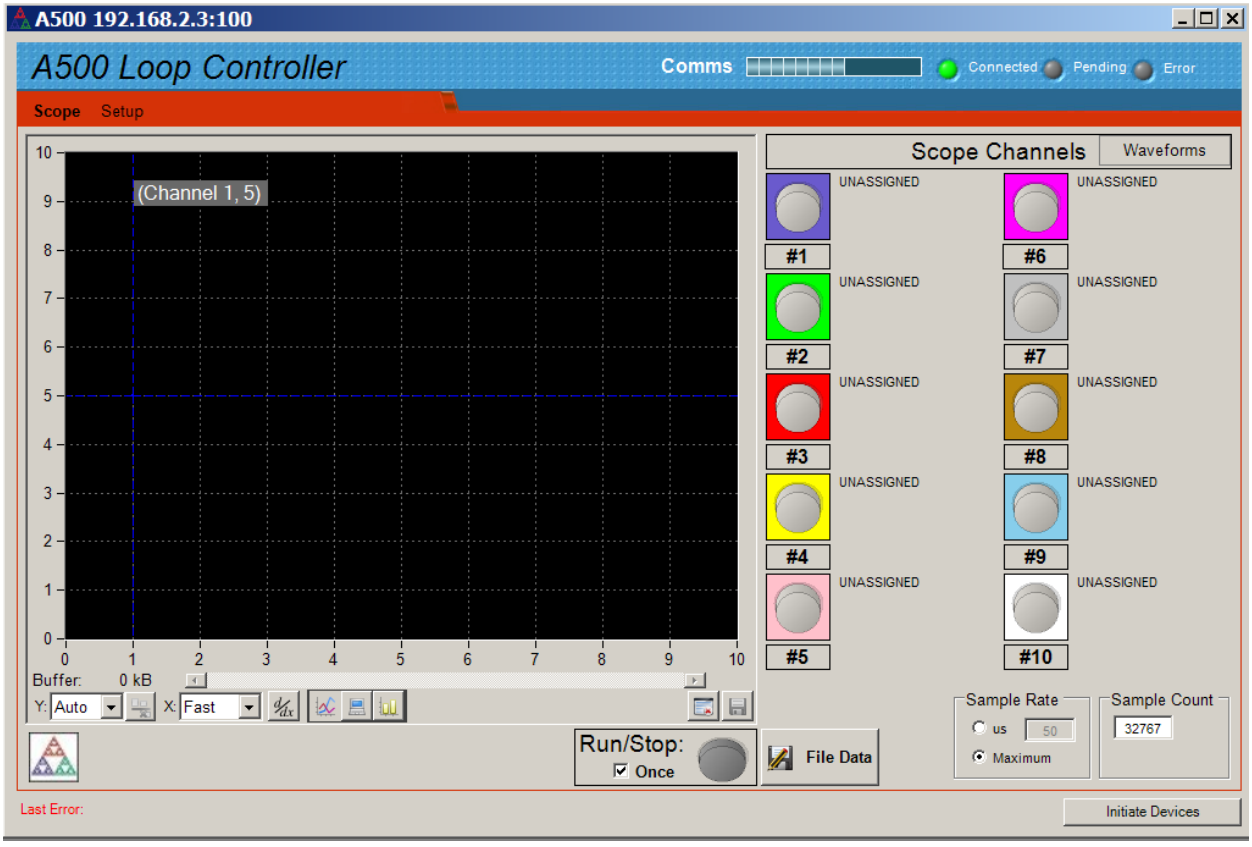


Figure 31. A500 Scope acquisition tab.

The graphic display controls are the same as those for individual devices, so we shall look at the new controls associated with the Scope mode.

9.2 Entering Waveforms

Pressing the Waveforms button brings up a Waveform Editor window, where you can select from various standard waveforms, or upload an arbitrary waveform from a csv file.

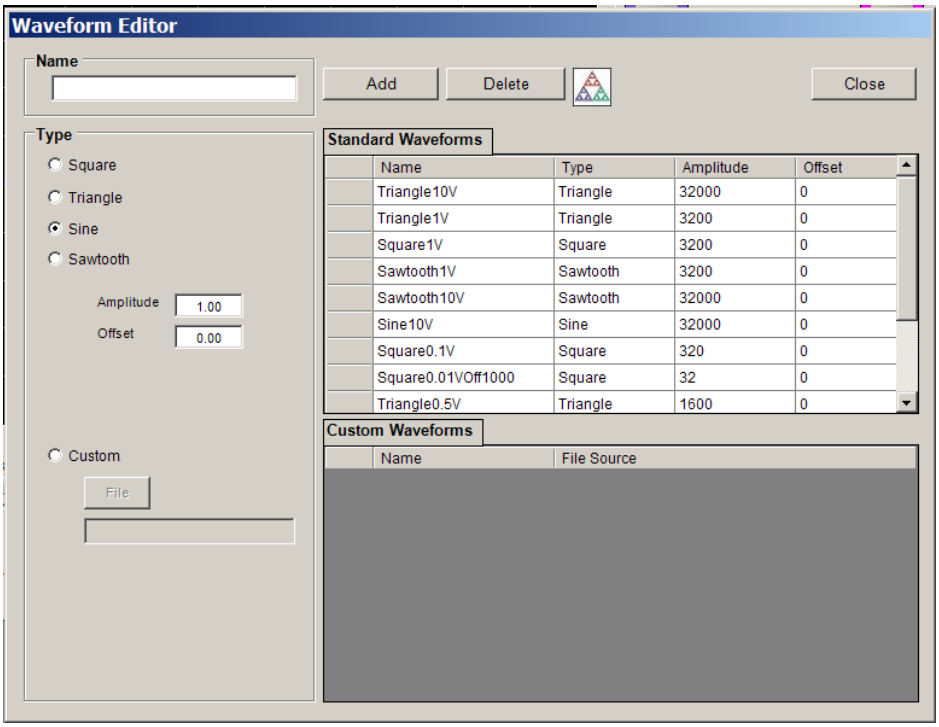


Figure 32. A500 Scope acquisition tab.

To create a new waveform, enter a suitable name, then either select one of the standard waveforms or upload your arbitrary waveform. The standard waveforms are all one period of the named waveform, and they can be scaled and have a DC offset added.

Note that the amplitude and offset, and entries in your arbitrary waveform definition, must be values in the range -32767 to +32767. If the waveform is assigned to an M10 analog output, then this binary range will be mapped onto the selected analog output span (-10 V to +10 V by default). Once you have defined your waveform, press Add to add it to the Standard Waveforms table.

9.3 Setting up waveform output conditions

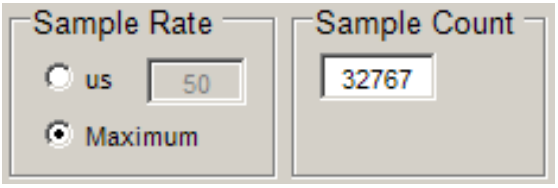


Figure 33. Waveform output rate and resolution

First you can set up the resolution and output rate of the waveform by selecting the Sample Count and the Sample Rate. The selected waveform for any Scope channel that is defined as an output is mapped onto Sample Count number of points to produce a list of values that will be output. The maximum Sample Count is 10000, although a lower number usually suffices, and gives you smaller data files.

You can select Maximum for Sample Rate if you want the A500 to output the waveform at the fastest rate it can achieve, typically around one point every 50 µsec, or you can impose a lower rate by entering the value in µsec.

Input signals will also be read at the Sample Rate, in coordination with the outputs. If your devices are configured to produce new measurements at a lower rate than Sample Rate, you will see repeat values in the results.

9.4 Configuring channels

You can configure up to ten parallel output and input channels. Each input channel can be a single signal input on a device, or all of the inputs on a device. You should be cautious of selecting more input signals than you need, as the available communications bandwidth has to be shared and the maximum Sample Rate will be degraded if you choose too many. An input channel can be an analog value such as a current reading, or a pulse scaler reading, or an encoder count.

To set up a Scope channel, press the appropriate button to open the dialog. You can then select whether it is an input or output. If it is an output, choose a suitable output device from the Device dropdown list and an output channel on that device. The Waveform dropdown list will be active, and you can choose any of the waveforms from the Waveform Table. Press Save to complete the assignment of the channel.

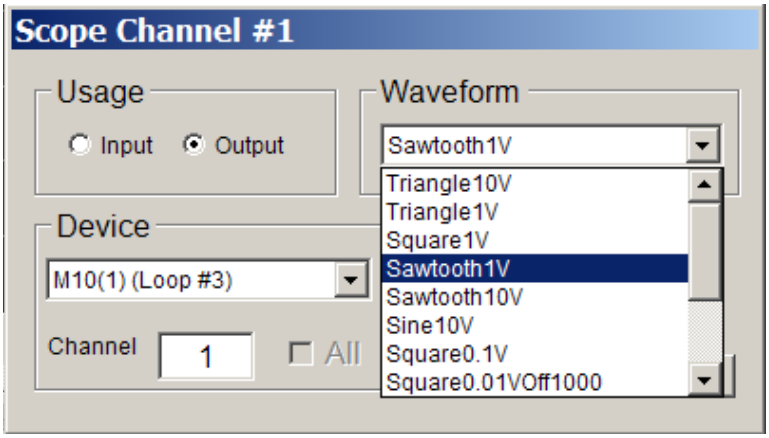


Figure 34. Defining an output Scope channel

To configure a Scope channel for input, select the Input option and choose a suitable device from the Device dropdown list. If it is a multichannel device, then you can any one of the channels to be monitored, or you can check the All box to collect all the channels on the device. Click Save to assign the Scope channel.

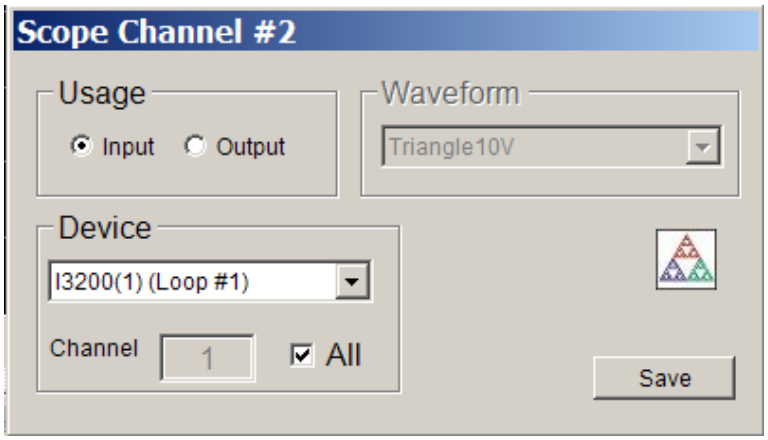
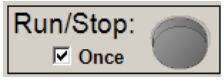


Figure 35. Defining an input Scope channel

9.5 Acquiring data

If you want a single output of the assigned waveform(s), then check the Once box. Otherwise the waveform(s) will be output repeatedly until you stop them. To prepare all the devices to acquire data, press the 

button.

Pressing the Run/Stop button 

runs the Scope acquisition you have defined. When the acquisition completes, or you press the button again to stop it, there is a short delay while the buffered results are transferred from the A500 to your PC host, at which point you will see the data, including the outputs, plotted on the graph. If you are doing multiple sweeps, the display will be updated sweep by sweep.

The vertical scale is an arbitrary 100 units, where the scaling is done device by device, based upon their full scale range settings. As an example, in the following screenshot, the F100 was measuring 5 µA on a 20 µA scale (25), and the F3200 was measuring 8.33 mA on a 10 mA scale (83).

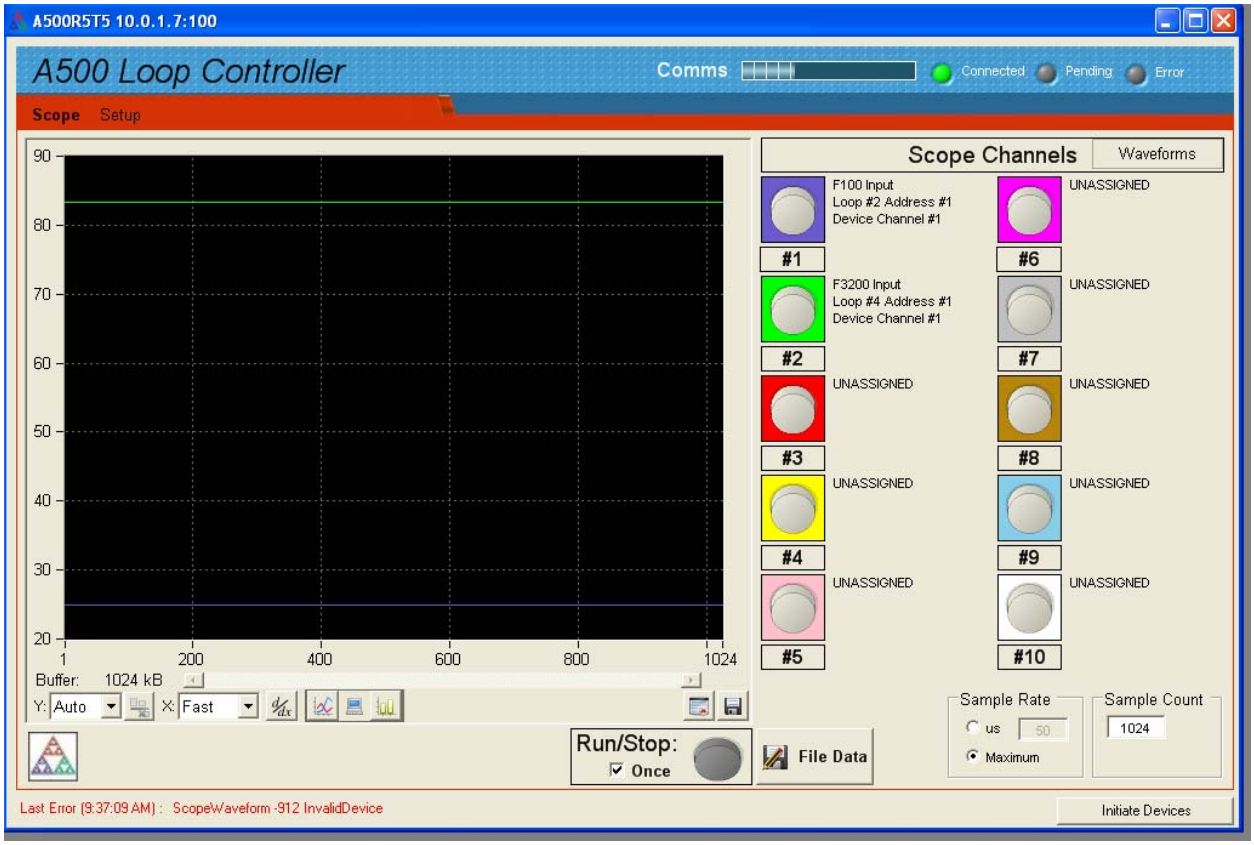
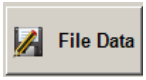


Figure 36. Vertical scaling of multiple signals on the Scope display

Press File Data  if you wish to make a csv file record of the data. The format is illustrated in the following extract. The column headers identify the device and signal channel that produced the data.

Tuesday December 1 2009 9:52:50 AM

Sample Time 358
Sample Count 2000

Time (s)	F3200 in Ch1	F3200 in Ch2	F3200 in Ch3	F3200 in Ch4	…….	F3200 in Ch29	F3200 in Ch30	F3200 in Ch31	F3200 in Ch32	F100 in Ch1
0.001633	8.69E-08	1.74E-07	2.62E-07	3.50E-07		-2.98E-11	-7.98E-11	-8.64E-11	-6.97E-11	5.00E-06
0.001992	8.69E-08	1.74E-07	2.62E-07	3.50E-07		-2.98E-11	-7.98E-11	-8.64E-11	-6.97E-11	5.00E-06
0.00235	8.69E-08	1.74E-07	2.62E-07	3.50E-07		-2.98E-11	-7.98E-11	-8.64E-11	-6.97E-11	5.00E-06
0.002708	8.69E-08	1.74E-07	2.62E-07	3.50E-07		-2.98E-11	-7.98E-11	-8.64E-11	-6.97E-11	5.00E-06
0.003067	8.69E-08	1.74E-07	2.62E-07	3.50E-07		-2.98E-11	-7.98E-11	-8.64E-11	-6.97E-11	5.00E-06
0.003424	8.69E-08	1.74E-07	2.62E-07	3.50E-07		-2.98E-11	-7.98E-11	-8.64E-11	-6.97E-11	5.00E-06
0.003783	8.69E-08	1.74E-07	2.62E-07	3.50E-07		-2.98E-11	-7.98E-11	-8.64E-11	-6.97E-11	5.00E-06
0.004141	8.69E-08	1.74E-07	2.62E-07	3.50E-07		-2.98E-11	-7.98E-11	-8.64E-11	-6.97E-11	5.00E-06
0.004499	8.69E-08	1.74E-07	2.62E-07	3.50E-07		-2.98E-11	-7.98E-11	-8.64E-11	-6.97E-11	5.00E-06
0.004857	8.69E-08	1.74E-07	2.62E-07	3.50E-07		-2.98E-11	-7.98E-11	-8.64E-11	-6.97E-11	5.00E-06
0.005215	8.69E-08	1.74E-07	2.62E-07	3.50E-07		-2.98E-11	-7.98E-11	-8.64E-11	-6.97E-11	5.00E-06
0.005574	8.64E-08	1.73E-07	2.60E-07	3.47E-07		-2.49E-11	-3.01E-11	-9.67E-11	-7.09E-11	5.00E-06
0.005931	8.64E-08	1.73E-07	2.60E-07	3.47E-07		-2.49E-11	-3.01E-11	-9.67E-11	-7.09E-11	5.00E-06
0.00629	8.64E-08	1.73E-07	2.60E-07	3.47E-07		-2.49E-11	-3.01E-11	-9.67E-11	-7.09E-11	5.00E-06
0.006648	8.64E-08	1.73E-07	2.60E-07	3.47E-07		-2.49E-11	-3.01E-11	-9.67E-11	-7.09E-11	5.00E-06
0.007005	8.64E-08	1.73E-07	2.60E-07	3.47E-07		-2.49E-11	-3.01E-11	-9.67E-11	-7.09E-11	5.00E-06
0.007364	8.64E-08	1.73E-07	2.60E-07	3.47E-07		-2.49E-11	-3.01E-11	-9.67E-11	-7.09E-11	5.00E-06
0.007722	8.64E-08	1.73E-07	2.60E-07	3.47E-07		-2.49E-11	-3.01E-11	-9.67E-11	-7.09E-11	5.00E-06

Figure 37. Scope mode data file format

10 Revision Record

The release date of a Pyramid Technical Consultants, Inc. user manual can be determined from the document file name, where it is encoded yymmdd. For example, M10_UM_080105 would be a M10 manual released on 5 January 2008.

Version	***Changes***
PS455_UM_091204	Release for PSI Diagnostic version 4.55