AzfpLink

Version 1.0.45 Users Guide

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1 Introduction

This software manual is for the AzfpLink PC software Version 1.0.10 or higher and Acoustic Zoo-plankton and Fish Profiler sonar units running Firmware version 3.02 and later.

The AZFP implements a Large Dynamic Range Detector which provides instantaneous dynamic range in the receiver of between 80 and 90 dB, and does not require time-varying gain.

The following is a summary of the functions performed by the software:

- The software provides a graphical user interface to operate your AZFP using a Windows PC.
- The software communicates with the AZFP via RS232 communications protocol.
- The program can retrieve the units parameters and display status and available data storage capacity.
- If the unit is programmed to transmit data over the RS232 the program the software can act as a data logger saving the data on a drive connected to the PC. The program has the ability to display the real time data in both text and graphical form as it is transmitted by the AZFP unit to the PC.
- The program can retrieve data that is stored on the AZFP's Compact FLASH (CF) memory over the RS232 port. Note that this is not a recommended method of data retrieval except for relatively small amounts of data as this can take several of hours if there are large volumes of data. The CF has a PC compatible file system which allows retrieval of the data using a standard compact FLASH card reader.
- The program can set the AZFP unit's internal date and time clock.
- The program can plot data files that have been retrieved from the units CF or the real time data files that were created by AzfpLink while monitoring in real time mode. Both individual pings and series of pings plotted as an echogram are available. For data retrieved from a calibrated instrument the program can display or export Sv and/or Ts quantities.
- The program can decode and export the pings to formats compatible with other analysis and display programs such as Echoview.
- If the AZFP is connected to the ASL Data Logger the unit can be operated over an internet/intranet connection including acquisition of real time data as it is being transmitted by the unit. The data files acquired by the ASL Data Logger can be viewed and retrieved as well.

2 Minimum System Requirements

The following list describes the minimum system requirements recommended for hardware and software you need to run AzfpLink software. The program may run on machines with less resources.

- 1 GHz Pentium or higher processor, with at least 512 MB of RAM and at least 5 MB of free disk space for the software.
- 1024x768 SVGA
- Windows XP/VISTA/7
- Sufficient free disk space is required to up load the data from a unit's compact FLASH disk and/or real time data.
- 1 RS232 port
- A USB-RS232 is provided with your unit for computers that do not have a RS232 port.

This software requires firmware Version 3.00 or higher.

Variable speed RS232 communications requires firmware Version 3.12 or higher.

3 Installation

Installation of this software requires that the users account have administrative privileges.

3.1 Program Installation

The software is provided in a self extracting and executing WinZIP file named as follows:

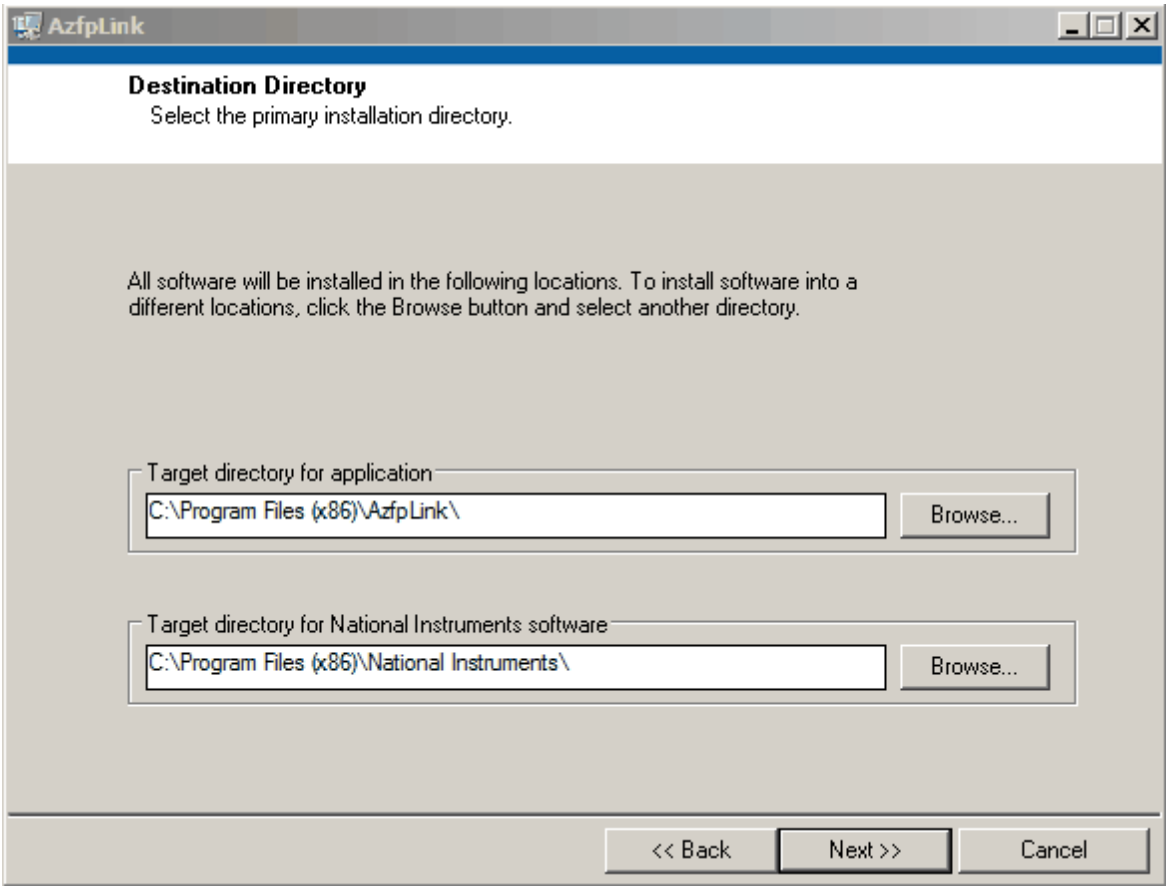
AzfpLink_A_B_CC_YYYYMMDD.exe

Where:

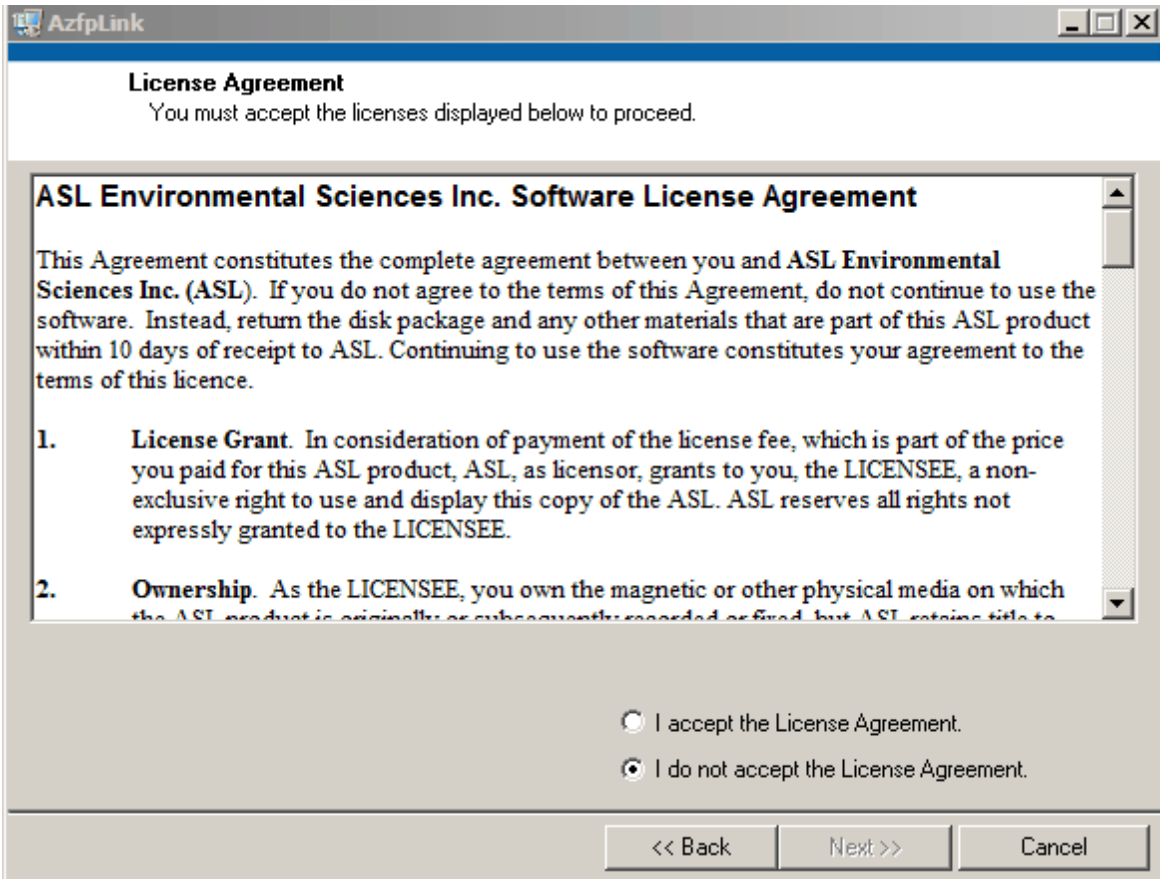
A - is the software's Major version number
B - is the software's Minor version number
CC - is the software's Sub Minor version number
YYYYMMDD is the software build date.

This file can be found on the CD-ROM provided with your instrument or via Internet download.

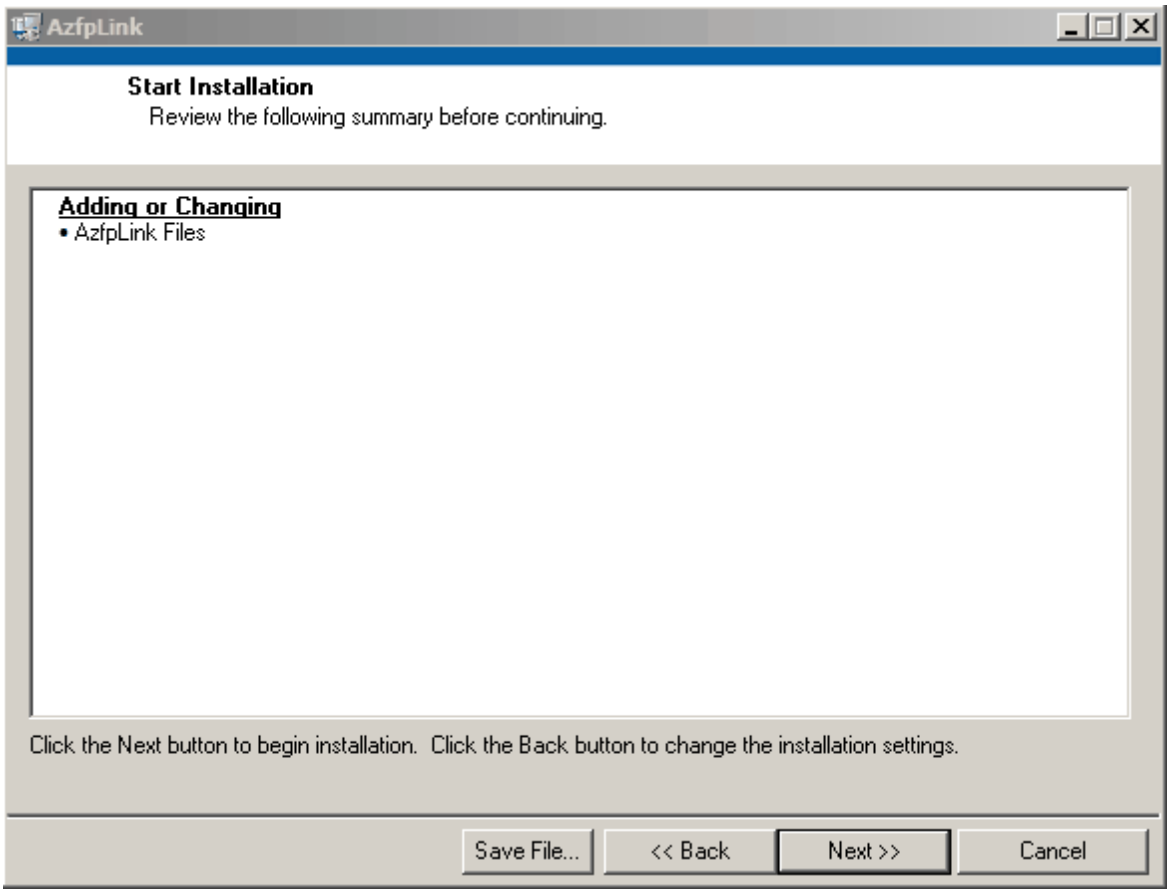
Click on the AzfpLink_A_B_CC_YYYYMMDD.exe to begin the installation.



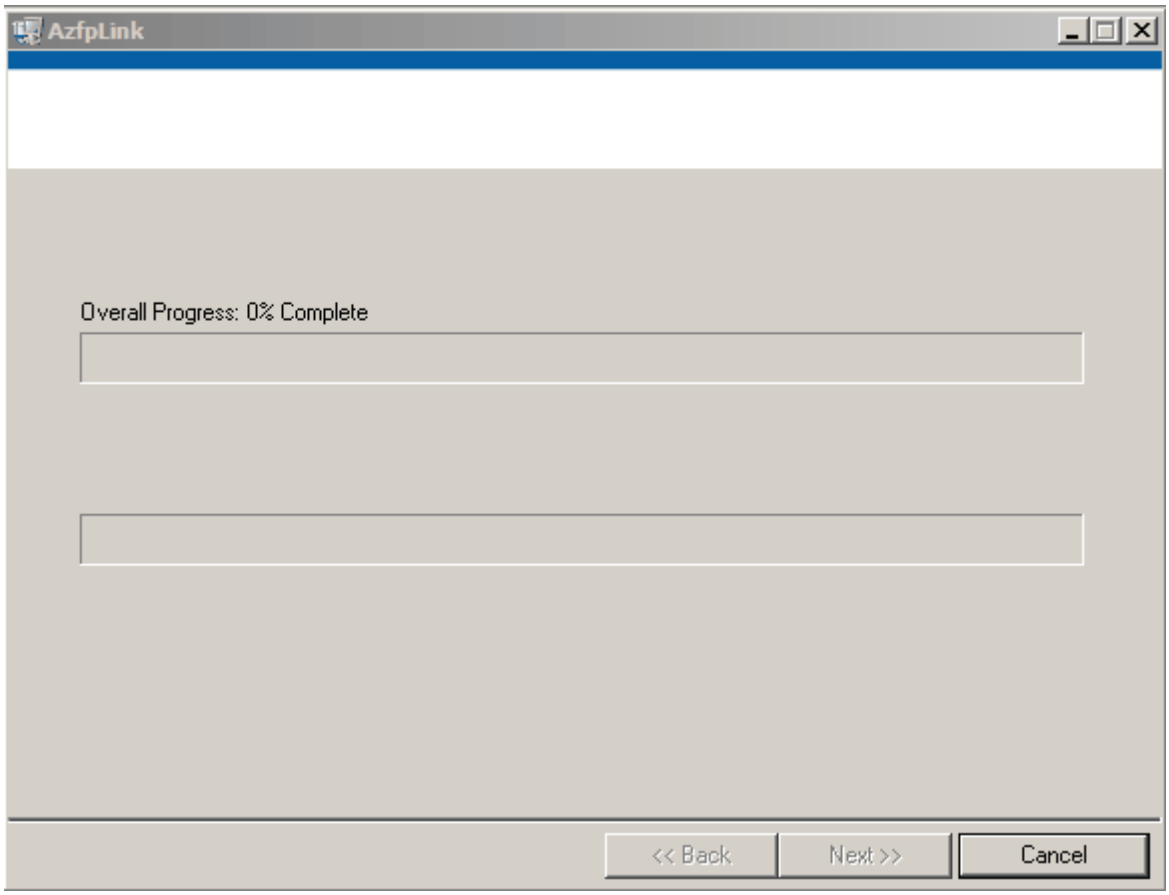
Click Next.

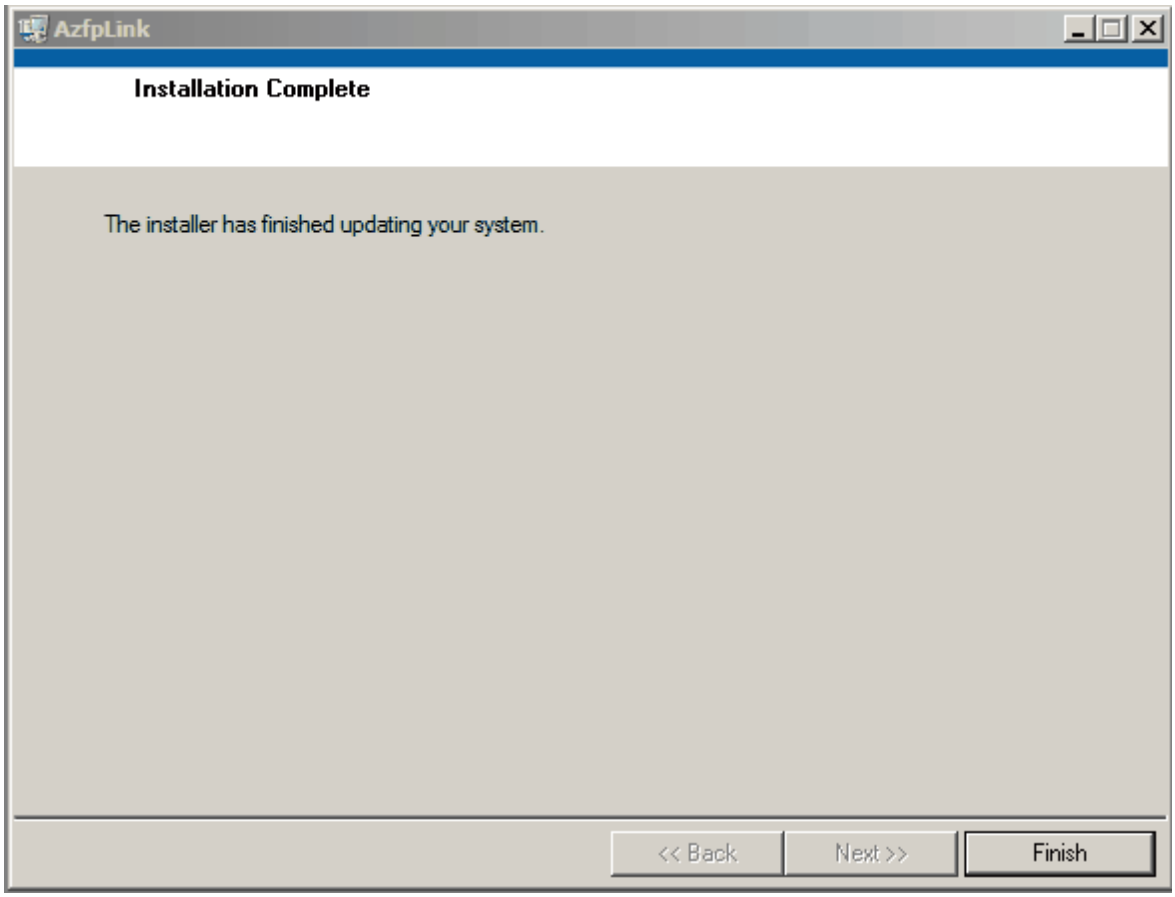


Click I accept and then the Next button.



Click Next.





Click Finish to complete the installation.

Start the program by selecting it on the Start->All Programs->AzfpLink->AzfpLink menu.

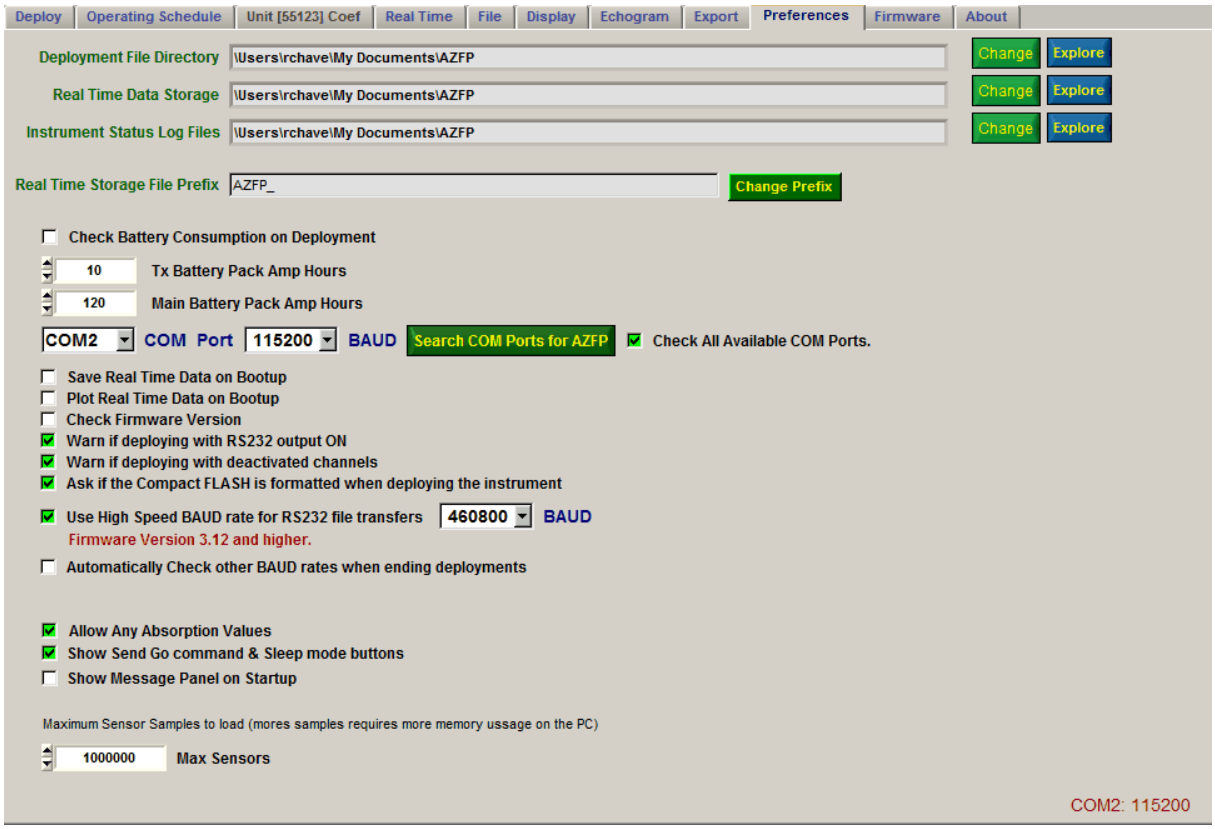
The first function when running the program is to set the correct COM port in the Preferences tab.

3.2 Setting Up AzfpLink Communications

After installation connect your AZFP to the PC's serial port.

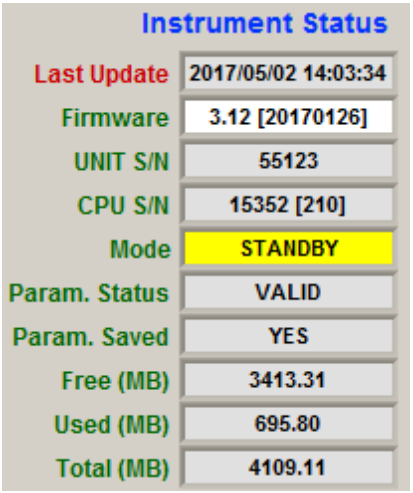
Start AzfpLink.

Go to the preferences panel and select the COM port the instrument is connected to.



Check your connection by going to the AZFP tab and click on the 

command button. This will end AZFP deployment if it is deployed and return status information.



If you are unsure of the COM port on the PC that is connected to the instrument there is an option to have AzfpLink attempt to find it by clicking on the 

command button. AzfpLink will search through the available RS232 communications ports on the PC attempting to locate the AZFP.

If the Check All Available COM Ports. checkbox is checked then the program checks all COM ports. Otherwise it only checks the currently selected port.

3.3 Setting Up Terminal Emulation Communications

A terminal emulator called Motocross is included with this software package. The purpose of the emulator is to gain direct RS232 communications to the unit. This can be useful for trouble shooting communications problems.

Follow the instruction found in the Terminal Emulator Command Button section for setting up the Motocross Terminal Emulator communications settings.

The terminal emulator can be used to for trouble shooting functions.

Note that for firmware versions 3.12 and higher it is possible to set the AZFP to operate at a BAUD rate that is not compatible with the Terminal Emulator. See section RS232 Communications .

4 Theory of Operation

The AZFP software system consists of two software packages, the AZFP Firmware that controls and operates the unit and the AzfpLink PC based software used to program the AZFP and monitor the unit during real time data acquisition. The two software packages communicate with each other over a RS232 serial interface.

A third software package called Motocross is included in the installation. This is a terminal emulator program that allows the users to communicate with the AZFP with the keyboard for special operations or just to check communications. More information on the Terminal Emulator can be found in section Terminal Emulator

The AZFP transmits a pulse of sound, digitizes the returning signals and stores the data to solid state memory (Compact FLASH), transmits the data to a PC over RS232 or both. The AZFP has the capability of averaging the returns both spatially and in time. It has the capability of digitizing the returns at 64000, 40000 or 20000 samples per second.

The AZFP has the capability of acquiring data from 1 to 4 different transducers depending on the unit's configuration. The number of frequencies is configured at the factory based on the clients purchasing decision.

Data is stored on Compact FLASH (CF) ranging in size from 16 MB to 16 GB and/or transmitted to a PC in real-time via RS232.

The AZFP stores operating parameters, configuration and auxiliary sensor coefficient parameters in internal non-volatile memory that remains intact after power off/on cycles. Configuration and coefficient information is typically set by the manufacturer and remains the same for any type of deployment.

Operating parameters are set by the end-user and are programmed to the instrument when it is deployed.

The AZFP unit is capable of running a number of different operating parameters over selected periods of time. These periods of time are called phases. Each phase is defined by a start time and duration. When the duration of one phase is complete the instrument switches to the next phase. If a unit is on the last phase it continues to collect data using the operating parameters of this phase until either the unit runs out of battery power or the CF is full.

Phases and their parameters are described in more detail in a section below.

When the unit is equipped with more then one frequency the data is collected sequentially and then stored to CF and/or transmitted over the RS232 link.

When more than one frequency is available the instrument transmits and collects data on each channel with the highest frequency collected first followed by the next highest and to the lowest frequency. This is done regardless of the physical board layout of the frequencies in the instrument.

4.1 Phases

The AZFP has the capability of acquiring data with specific data acquisition parameters for specific intervals of time: these intervals of time are called "Phases". The AZFP has the capability of being programmed up to 12 Phases. When a Phase is complete the unit moves on to the next Phase and collects data with the parameters for that Phase. When the final Phase is complete the unit continues collecting data with the final phase parameters until the Compact FLASH is filled or the battery is exhausted.

The AZFP has three different types of Phases: Normal, Sleep and Repeat. A Normal Phase is a Phase with normal parameters. A Sleep Phase is a Phase in which no data collection is performed, this can be useful to save energy for period where no data is required. A Sleep phase can not be programmed as final phase. A Repeat Phase is a special phase that causes the unit to reset the start date of the first phase to the current date and time, thus repeating the sequence of phases. Only the final phase can be a Repeat phase.

The start date and time of the first phase is determined by the acquisition start date which is set by the end user. The end date of the first phase is its start date/time plus its "Duration Time:. The "Start Date" for the next phase is the start date of the previous phase plus the duration of the previous phase.

For example:

Phase 1 start date: 2008/01/01 12:00:00
Duration: 2 days

Phase 2 start date: 2008/01/03 12:00:00

4.2 Time Intervals and Data Acquisition

The AZFP is driven by a one second clock chip that wakes the units CPU from a low power sleep mode. This clock guarantees that data is acquired on even time intervals and conserve battery power by putting the CPU and electronics into a low power sleep mode. On each second interval the CPU wakes up, determines if its time for a phase change and/or determines if it is time to acquire data. When finished it goes back to sleep and is then reawakened on the next second to repeat the sequence.

When the unit is in a data acquisition phase (see definition of phases), it keeps a number of software counters to determine when it is time to acquire Bursts of pings. A Burst is a number of averaged or individual pings. The pings can be averaged in time (series of pings) and/or spatially averaged in range. A Ping is the transmission of an acoustic pulse and the digitization of the return for each frequency channel; the channels are sampled sequentially; once digitization for one channel is completed, the transmission for the next occurs.

If the unit is busy performing a function that takes longer than a one second to complete, such as computing and/or storing large quantities of data, the unit keeps track of the missed wake up calls (one second intervals) so it can resume the timed intervals described below.

Based on the one second time interval, there are 3 periods to keep track of for acquisition of ping data. They are the Ping Rate, the Burst Interval and the Burst Length.

The Burst Interval is the interval of time for which to start acquiring and averaging pings for each available frequency. Note that the AZFP allows the storage of all the pings in a burst instead of averaging the pings into one averaged ping. The start of the Burst Interval is always the start of the Ping Rate regardless of where the Ping Rate counter was for the previous Burst (i.e. the Ping Rate reset to 0) . Pings are only acquired when they fall on a Ping Rate and the Ping Rate falls within the Burst Length. The Pings that are acquired within the Burst Length can be averaged in time by summing the acquired digital values at the same index position for each channel in the data array. These summed up values are defined as bins. For example, averaging of all the samples that fall within one meter bins. Single Pings that are stored with no averaging in either space or time can be stored as well.

Once the number of seconds in the Burst Length is reached, the averaged ping is stored to CF and/or sent to a PC via RS232. If the pings are not being averaged then each ping is stored/transmitted as they occur and there is no averaged ping at the end of the Burst. Below is a table illustrating a Ping Rate of two seconds, a Burst Interval of 7 seconds, and a Burst Length of 5 seconds or with 3 pings (the figure applies to an instrument with any number of installed frequency channels since all frequencies are sampled on each ping).

Seconds																												
Ping Period																												
Burst Interval																												
Burst Length																												
Ping Acquired	X		X		X			X		X		X			X		X		X			X		X		X		
Averaged Ping Stored *					S							S							S							S		

(*) If pings are averaged. If not then all the pings are stored.

The storage/transmission of the final ping in a burst may take longer then the free period after the Burst Length depending on the amount of data to be stored. If this is the case then the Burst Interval is extended to fulfill the storage/computational requirements. This may cause uneven Burst Intervals and

the instrument will flag these pings as over-runs. The software gives the user an estimate of the amount of time it should take to process a burst of pings and whether over runs are likely.

If acquisition/processing and storage time take longer than one second the processing of a ping must be complete at least a full second before the start of the next ping or an over run occurs. For averaged pings an over run means the last ping was not processed before the next burst of pings was due to begin. This will change the interval of time between bursts of pings which may not be deterministic.

Even if there is enough time between the Burst Intervals to perform all the required storage and computational functions there may be an impact on the energy requirements of the unit since it is not going to sleep while performing those functions. The user must choose parameters to balance the storage and power requirements with the desired data requirements.

Continuous storage of pings with no averaging is available but will consume the CF storage relatively quickly depending on the number of samples required for each ping, the size of the CF and the length of the deployment.

4.3 Internal Data Storage

The AZFP unit stores data on Compact FLASH (CF). The units are capable of accepting CF up to 32 Gigabyte; larger units are yet to be approved. Certain standards of CF are required for proper operation. Larger CF's may become available in the future.

The AZFP unit on power up creates a data directory called DATA. As data is stored to the CF the unit creates sub-directories using the current year and month. The names of these subdirectories are YYYYMM where YYYY is the year and MM is the month. Any data file created for that year and that month will reside in this subdirectory.

There are 4 types of files created in the directories; XML, LOG, DPL and data files for which the file type is set to the phase number. For example, type .01A is data created from phase 1, .02A from phase 2 through .12A for phase 12. The 3rd character of the type is A unless the instrument has been stopped and restarted within the same hour. If this is the case the instrument detects that the A file exists and the next character 'B' is used.

The XML files are created when the unit is deployed. All parameters including operating mode and instrument coefficients are stored in a XML format in these files. These files are suitable for future processing programs to read. An example file name is "07011212.XML".

The DPL files are created when the unit is deployed. These files contain deployment parameters in a more user readable format for reference. An example file name is "07011212.DPL".

The LOG files are created when a unit writes a to indicate a boot up, phase change or error. These message are in a ASCII readable form for user reference. An example file name is "20070112.LOG". Note only one log file is created per day.

4.4 Terminal Emulator

A terminal emulator called Motocross is included with this software package. The purpose of the emulator is to allow direct RS232 communications to the unit. This can be useful for trouble shooting communications problems.

The Terminal Emulator and AzfpLink cannot run at the same time. When the Terminal Emulator is run from the AzfpLink software, the AzfpLink is suspended and the emulator software starts up and takes over the serial port.

When the Terminal Emulator is first invoked it must be programmed with the correct RS232 COM port in its preferences menu. This is described section Terminal Emulator Command Button.

4.5 ASL Data Logger Connection

Version 1.0.00 of the AzfpLink software contains a panel called "Logger" that provides the functionality to have the software connect to the ASL Data Logger and any AZFP link unit that is connected to the logger over the TCP/IP. This connection can be a local area network or the internet.

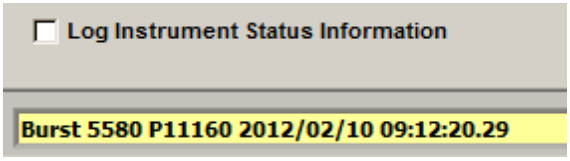
This connection allows AzfpLink to program the units, retrieve data files on either the ASL Data Logger or the connected units. It also allows the retrieval of real time data being transmitted by a AZFP.

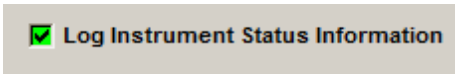
4.6 Status Information After a Deployment

After a deployment the instrument sends out status information over the RS232 for 24 hrs before turning of this feature.

The 24 hour count restarts after any deployment.

This information is shown in the status line at the bottom of the main panel.



To enable the logging of the information to log files enable the 

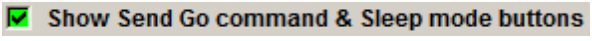
check box. The log files are stored with the log directory specified in the Preference tab.

The purpose of this status information is to verify that the instrument is deployed.

4.7 Go and Sleep Mode

For some applications where the AZFP is connected to AzfpLink and battery life is to be conserved and/or it is advantages to break up the acquisition files for specific periods the Go and Sleep mode of operation can be used.

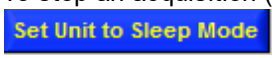
The Go and Sleep command buttons can be activated from the preference panel using the following option;



The button will show up on the deployment panel.

To restart an acquisition (create a new file) click on the 

button.

To stop an acquisition (close the file) and put the AZFP in a low power sleep mode click on the 

button.

To leave sleep mode and start a new acquisition click on the 

button.

4.8 RS232 Communications

Version 3.12 and higher of the AZFP firmware allows the RS232 communications to be set to other BAUD rates other than the default set for the underlying OS PicoDOS. They are the standard 9600, 115200 with the additional 230400 and 460800 BAUD rates. Previous versions of the AZFP firmware defaulted to be the same BAUD rate as the PicoDOS OS rate. It was set by variable SYS.BAUD to either 115200 or 9600 BAUD. In Version 3.12 or later the default for the OS is still SYS.BAUD and the AZFP application unless a different operating rate is desired that can set in the Firmware tab. The new firmware and AzfpLink allows the default boot up rate to be set to different speeds without having to manually program the BAUD rate in the PicoDOS OS. Additional commands have been provided to program these rates through the command line interface thus avoiding going into the PicoDOS OS to change them.

This feature has been added for systems that need faster upload of data from the FLASH or for real time applications. The introduction of a real time scrolling echogram requires faster upload speeds to allow for faster ping rates.

Another new feature for Version 3.12 of the firmware and higher is that the AZFP can temporarily increase it BAUD rate. For example, if the AZFP is running at Operating mode speed of 115200, it can be set to increase its speed to a higher rate such as 460800 BAUD temporarily. This allows the downloading of files or receiving directory information at a higher speed than the default operating speed.

The new feature of allowing variable communications speed can cause some issues such as:

1. Communications using the built-in Terminal Emulator is not possible at speeds above 230400 BAUD. It is possible to use a third party terminal emulators to provide terminal communications with the AZFP at the higher BAUD rate. However, AzfpLink must be shut down first due to COM port conflicts (only one program can access any one COM port at one time).
2. Long cable lengths can cause communications problems at the higher BAUD rates.
3. Windows RS232 drivers may not work at the higher BAUD rates. The drivers for the uPort1110 USB - RS232 device that is provided with each unit have been tested and work at the higher BAUD rates.

There is the possibility of confusion on how an AZFP's communications speed has been setup when the PC is first connected to the AZFP. AzfpLink now contains a the search facility for the COM ports in the preferences panel to locate the AZFP on available COM ports. Although this was available in previous

versions, AzfpLink not only cycles through the available COM ports, it also cycle through the 4 possible BAUD rates.

Setting the default BAUD rate of the operating software can be done easily through the Firmware tab..

Setting the file download speed to higher rates can be set in the Preferences panel.

If the AZFP is going to be deployed in non-real-time operations it is best to leave the default of SYS.BAUD set to 115200 BAUD rate.

4.9 Scrolling Echogram

New in AzfpLink version 1.0.18 and higher is the ability to view data transmitted over the RS232 in a set of scrolling echograms. One graph is available for each of the channels being transmitted. If the firmware is version 3.12 and higher the user can select higher BAUD rates for the transfer and exclude specific channels to allow the AZFP to operate at higher ping rates. Excluded channels can be stored to FLASH but are not transmitted over RS232.

Details of this option are available in the Scrolling Echogram section under Real Time Tab.

4.10 Preventing Secondary Surface Echoes from Channel Cross-talk

The inter-channel sensitivity of the AZFP is large enough that the second surface reflection from the preceding channel can appear in the data, causing interference in the echogram. The effect can be prevented by introducing an additional delay between the channel transmissions.

The required delay can be calculated as follows, using information that is either already in AZFPLink, or that the user can enter.

Required parameters:

C: sound speed (m/s)

R_L: max range (m)

D: water depth at high tide (m)

d: instrument depth at high tide (m) if looking upward; if looking downward, distance to bottom

Then the additional delay in msec between channel transmissions can be calculated as

$$\delta = [2000(D+d) - 1900R_L]/c - \Delta + 1$$

where $\Delta = 0.51 \cdot R_L + 8.37$ if the digitization rate is 64 ksamples/sec and bin averaging has been selected; otherwise $\Delta = 10$.

Conditions on the result:

If the formula returns a negative number for δ, then set $\delta = 0$, as this means that the listening range has been set long enough that the second surface reflection will arrive before the next channel transmits.

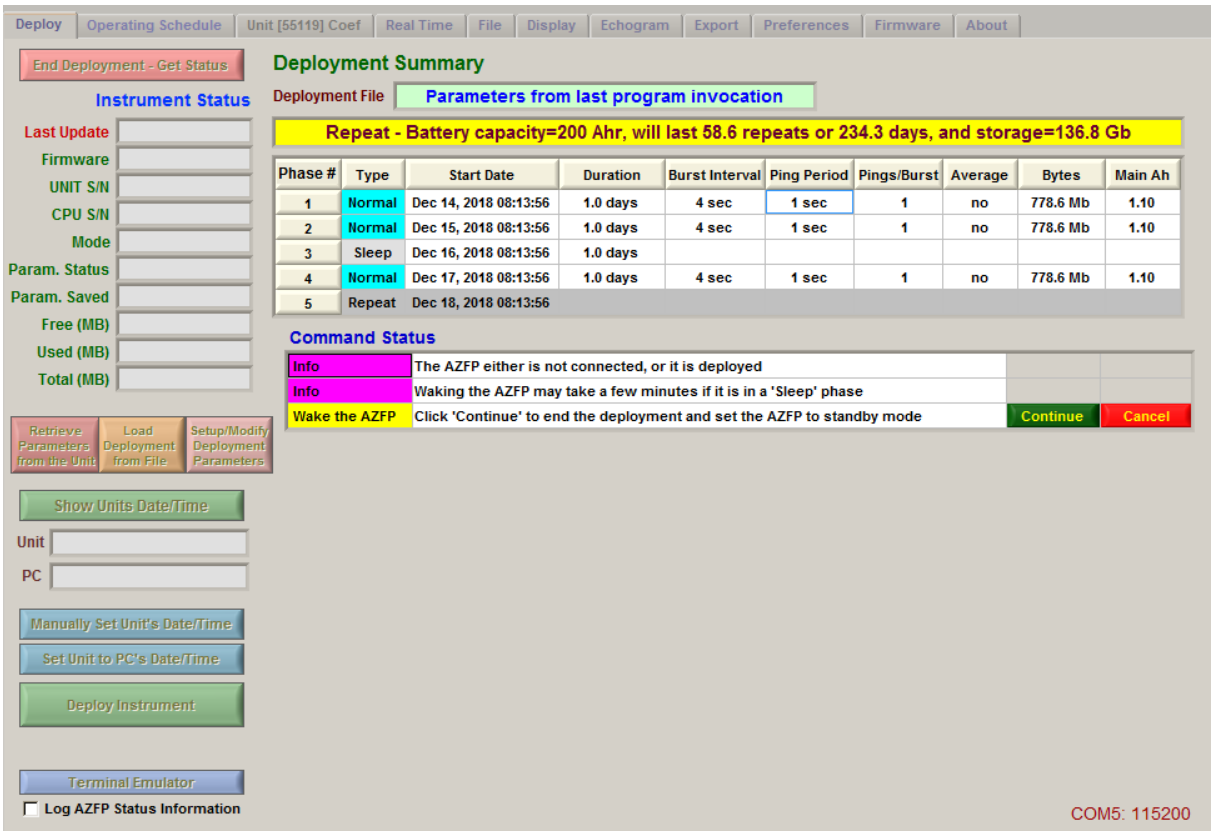
If $D + d > 2R_L + c\Delta/2000$ then set $\delta = 0$, as the time for the second surface reflection to arrive is longer than the direct surface reflection form the following channel and it won't appear in the echogram.

5 AzfpLink

This section describes the operation of the AzfpLink software.

5.1 Overview

The AzfpLink software consists of a number of tabs as shown below.



The tab labeled 'Deploy' contains a number of command buttons and sub tabs used to program the unit.

The tab labeled 'Operating Schedule' is used to set up the data acquisition parameters for a deployment.

The tab labeled "Unit [55034] Coef" displays the coefficients retrieved from the unit or loaded from a file. The '55034' will change to the units serial number that is either connected or whose coefficients have been loaded into the program.

The tab labeled 'Real Time' displays real time data sent over the RS232 port to the PC if the unit has been programmed to send the data over the RS232.

The tab labeled 'File' is used to retrieve data stored on the unit's CF, remove files from the CF and to format the CF.

The tab labeled 'Display' is used to display data obtained from AZFP instruments.

The tab labeled 'Echogram' is used to display data files retrieved from the unit's CF or files created by 'AzfpLink' when data is sent to it in real-time by the unit.

The tab labeled 'Export' is used to export data files retrieved from the unit either from the units Compact FLASH or files created by 'AzfpLink' when data is sent to it in real-time by the unit.

The tab labeled 'Preferences' is used to set some program parameters for AzfpLink.

The tab labeled 'Firmware' is used to upgrade the units firmware if required.

The tab labeled 'About' shows program and contact information.

5.1.1 Help

At the bottom of the main tab is the 

command button. Click on the button to get the program help.

5.1.2 Communications Indicator

At the bottom of the main panel is and indicator that is GREEN if the PC's communications port was successfully opened 

. If the communications port is not present or used by another program it is RED 

. If the indicator is RED then you must terminate any program that is using the port or change the port setting in the Preferences Panel.

5.1.3 Cursor Help

The 

check box is used to enable or disable Cursor Help. If enabled 

the program provides some information on the controls and indicators that the cursor is focused on.

In the example above the cursor is focused on the Ping Processing Time. Note that the cursor must be focused on the panel and controls that it hovers above.

5.1.4 PC Files and Directories

When AzfpLink starts it creates the following directories if they do not already exist. The location of these directories can be changed by the user if desired. The 'account' is the login account of the user.

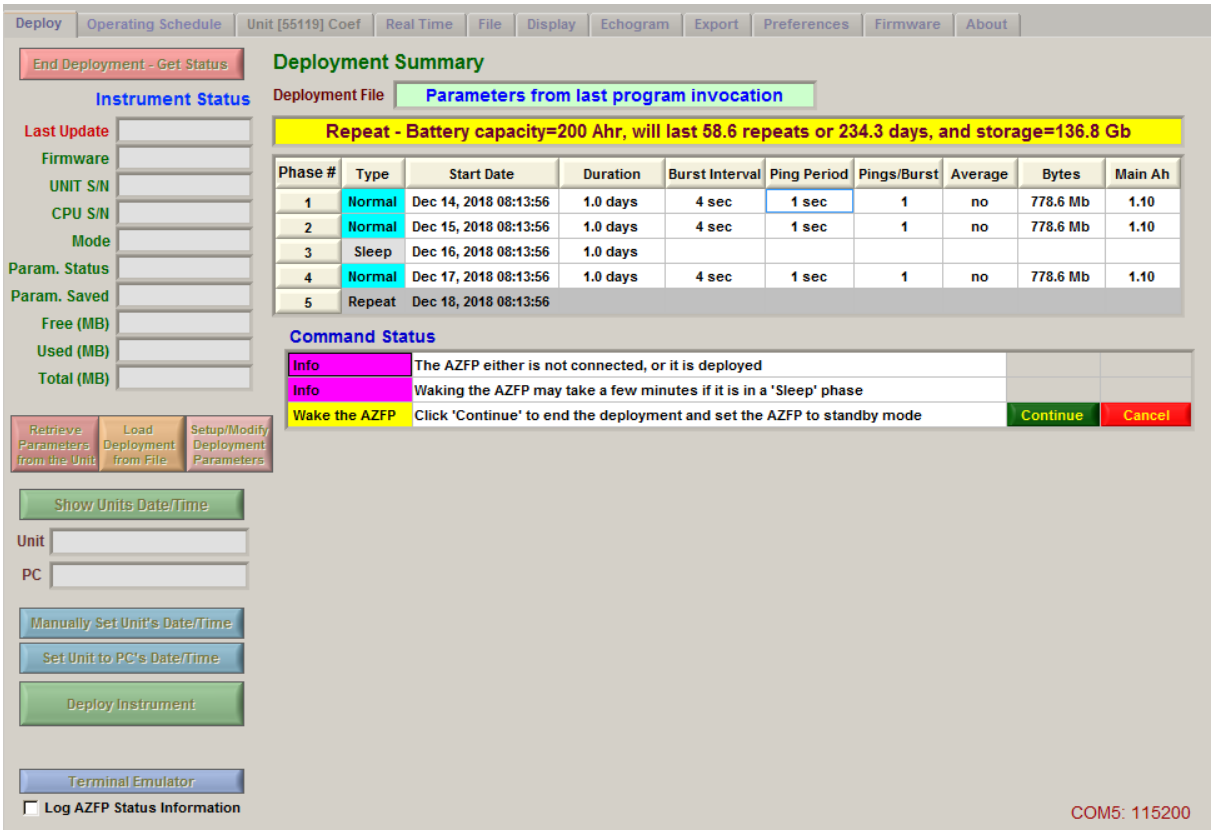
c:\Documents and Settings\account\My Documents\AZFP\Deployments
c:\Documents and Settings\account\My Documents\AZFP\Realtime
c:\Documents and Settings\account\My Documents\AZFP\DownLoad
c:\Documents and Settings\account\My Documents\AZFP\Parameters
c:\Documents and Settings\account\My Documents\AZFP\Log

Whenever the AzfpLink deploys an instrument a deployment file is written to c:\Documents and Settings\account\My Documents\AZFP\Deployments. These files contain information about the deployment.

If the real time data is being transmitted to the PC from the AZFP, it is stored in the c:\Documents and Settings\account\My Documents\AZFP\Realtime directory.

5.2 Deploy Tab

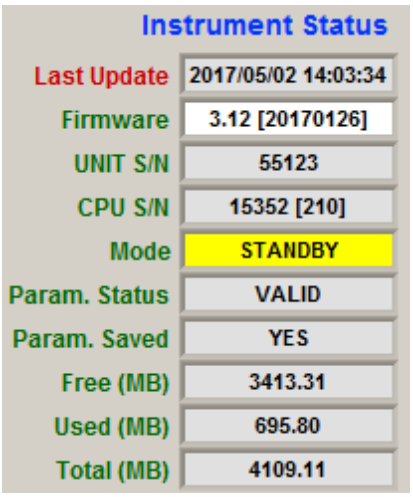
The Deploy tab is used program the control and program the unit. The tab contains a number command buttons for deploying the instrument, terminating the deployment, setting the units date, entering the terminal emulator, displaying the status of a deployment and other functions.



5.2.1 Instrument Status Indicators

The Deploy tab contains a number of instrument status indicators. These show status information sent up by the unit when it is either deployed or a deployment is terminated. Below is an example of the status indicators after a deployment is terminated and or it was already terminated and the

command button is clicked.



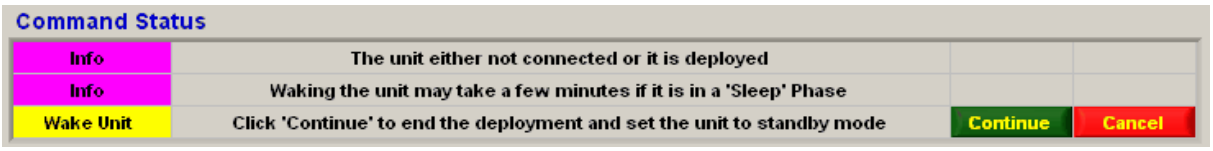
- The Last Update indicator shows the date/time of the status information.
- The Version is the AZFP units firmware version.
- The UNIT S/N is the serial number assigned to the unit by the manufacturer.
- The CPU S/N is the serial number of the AZFP's CPU.
- The Mode indicator will either indicate "STANDBY" or "DEPLOYED".
- The Param. Status indicator shows the status of the configuration parameters as checked by the firmware.
- The Param. Saved indicator shows whether or not the configuration parameters are saved to the internal non-volatile memory contained within the CPU (note this is not the CF memory).
- The Free (MB) is the amount of free space left on the CF.
- The Used (MB) is the amount of used space on the CF.
- The Total (MB) is the total space available on the CF.

5.2.2 Command Status

The command status appears when deploying the unit or terminating the deployment.

In the example below the user has click on the 

command button. The unit was deployed so it needs to be told to end the deployment.

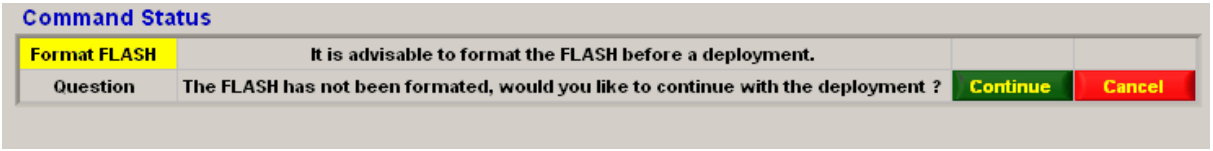


The user at this point can click 'Continue' to end the deployment or 'Cancel' the command.

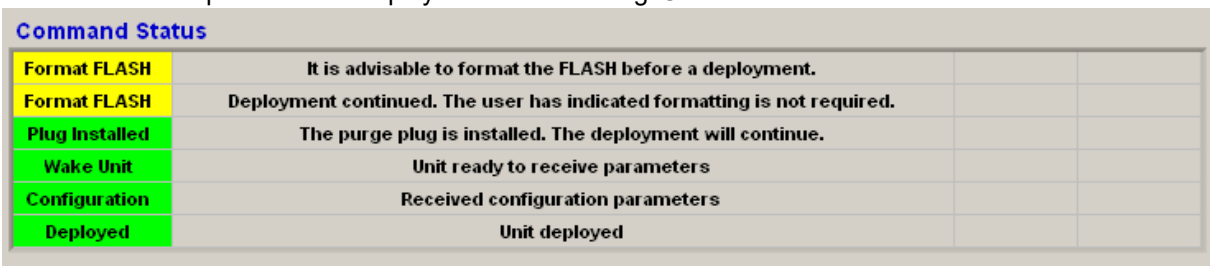
After clicking on the 

the user is asked questions about the deployment as shown below.

Clicking 'no'.

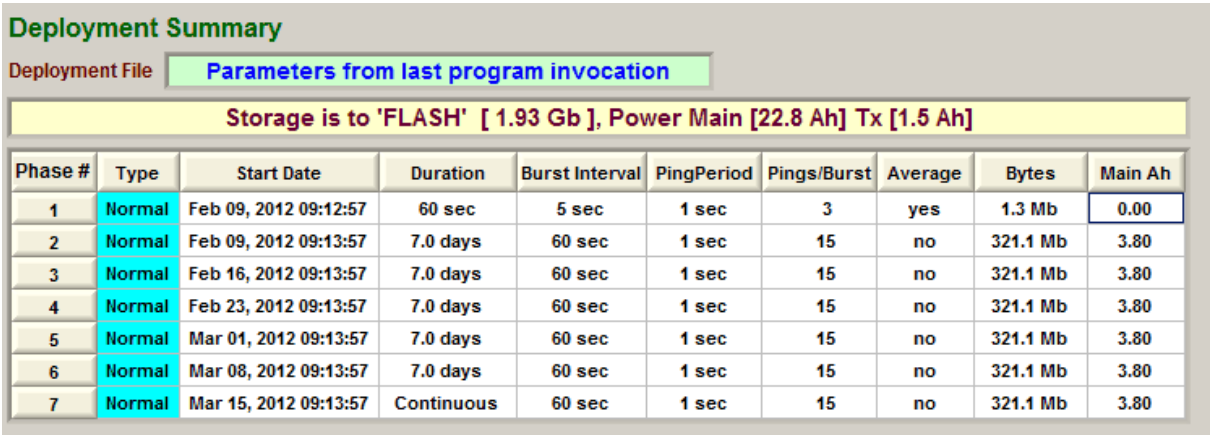


Below is an example of the full deployment after clicking 'Continue'.



5.2.3 Deployment Summary

The 'Deployment Summary' is a set of controls that gives the user a quick indication of the operating schedule being used to deploy the instrument.



Phase #	Type	Start Date	Duration	Burst Interval	PingPeriod	Pings/Burst	Average	Bytes	Main Ah
1	Normal	Feb 09, 2012 09:12:57	60 sec	5 sec	1 sec	3	yes	1.3 Mb	0.00
2	Normal	Feb 09, 2012 09:13:57	7.0 days	60 sec	1 sec	15	no	321.1 Mb	3.80
3	Normal	Feb 16, 2012 09:13:57	7.0 days	60 sec	1 sec	15	no	321.1 Mb	3.80
4	Normal	Feb 23, 2012 09:13:57	7.0 days	60 sec	1 sec	15	no	321.1 Mb	3.80
5	Normal	Mar 01, 2012 09:13:57	7.0 days	60 sec	1 sec	15	no	321.1 Mb	3.80
6	Normal	Mar 08, 2012 09:13:57	7.0 days	60 sec	1 sec	15	no	321.1 Mb	3.80
7	Normal	Mar 15, 2012 09:13:57	Continuous	60 sec	1 sec	15	no	321.1 Mb	3.80

The 'Deployment File' indicator shows the last deployment file loaded or saved by the user. If the user has entered some new values then it indicates the operating schedule contains manually edited values as shown above.

The operating mode is shown.

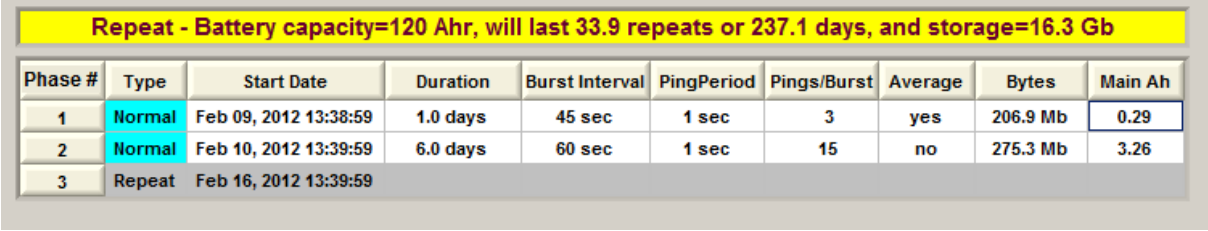
The type of data storage is shown.

A Phase summary table is shown. This table show the Phase number, the Phase type, the Phase start date, the Phase duration and other values .

The user can quickly move the the Phase editing tab for any of the displayed Phases by clicking on the specific 'Phase #'.

5.2.4 Deployment Summary with a Repeat Phase

Below is an example of the Deployment Summary if the last phase is a repeat phase.
The program estimates the number of repeats and the number of days the deployment will last with the the specified Amp Hrs for the main battery. This value is set in the Preferences tab.



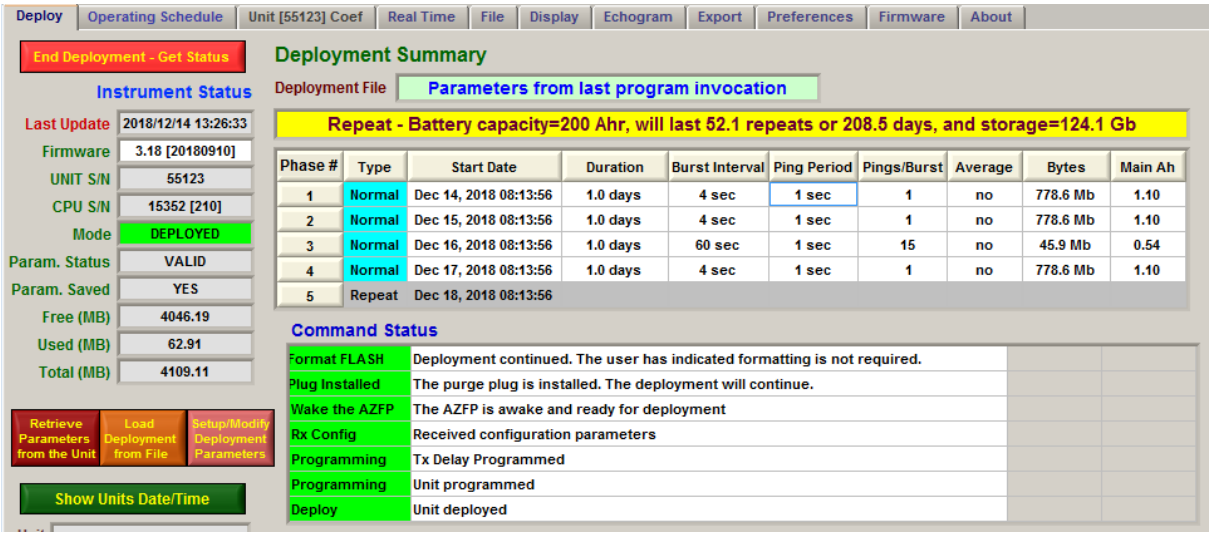
Repeat - Battery capacity=120 Ahr, will last 33.9 repeats or 237.1 days, and storage=16.3 Gb

Phase #	Type	Start Date	Duration	Burst Interval	PingPeriod	Pings/Burst	Average	Bytes	Main Ah
1	Normal	Feb 09, 2012 13:38:59	1.0 days	45 sec	1 sec	3	yes	206.9 Mb	0.29
2	Normal	Feb 10, 2012 13:39:59	6.0 days	60 sec	1 sec	15	no	275.3 Mb	3.26
3	Repeat	Feb 16, 2012 13:39:59							

5.2.5 Deploy Instrument Command Button

The 

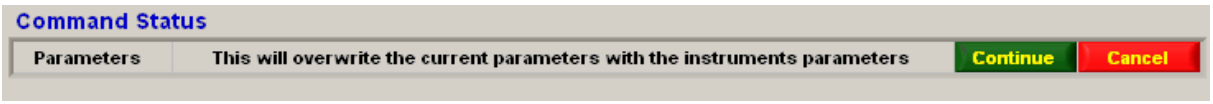
command button causes AzfpLink to deploy the instrument with the operation parameters. After a successful deployment the status information will look like the figure shown below.



5.2.6 Retrieve Parameters from Unit Command Button

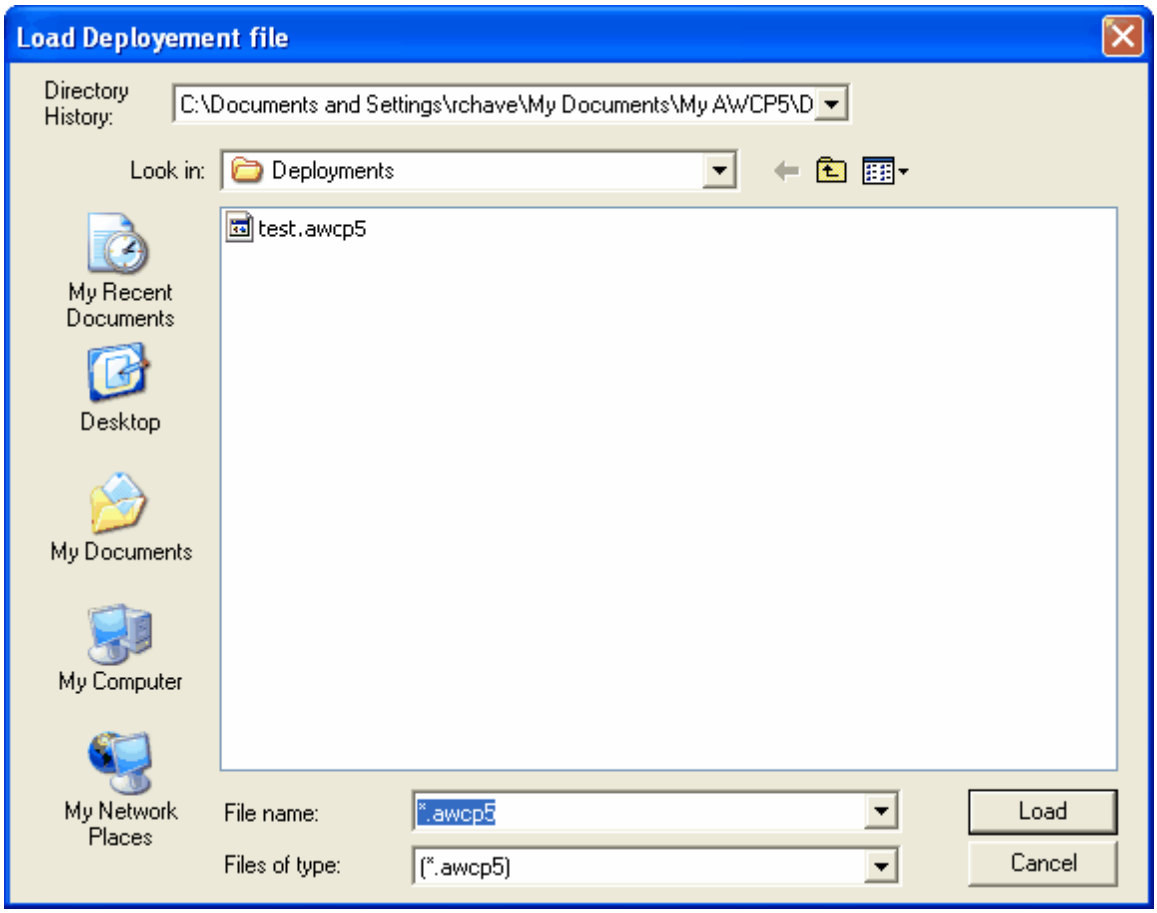
The command button causes the AzfpLink to retrieve both Operational Parameter and Configuration Parameters from the unit and replace those currently displayed.

A warning is issued first.



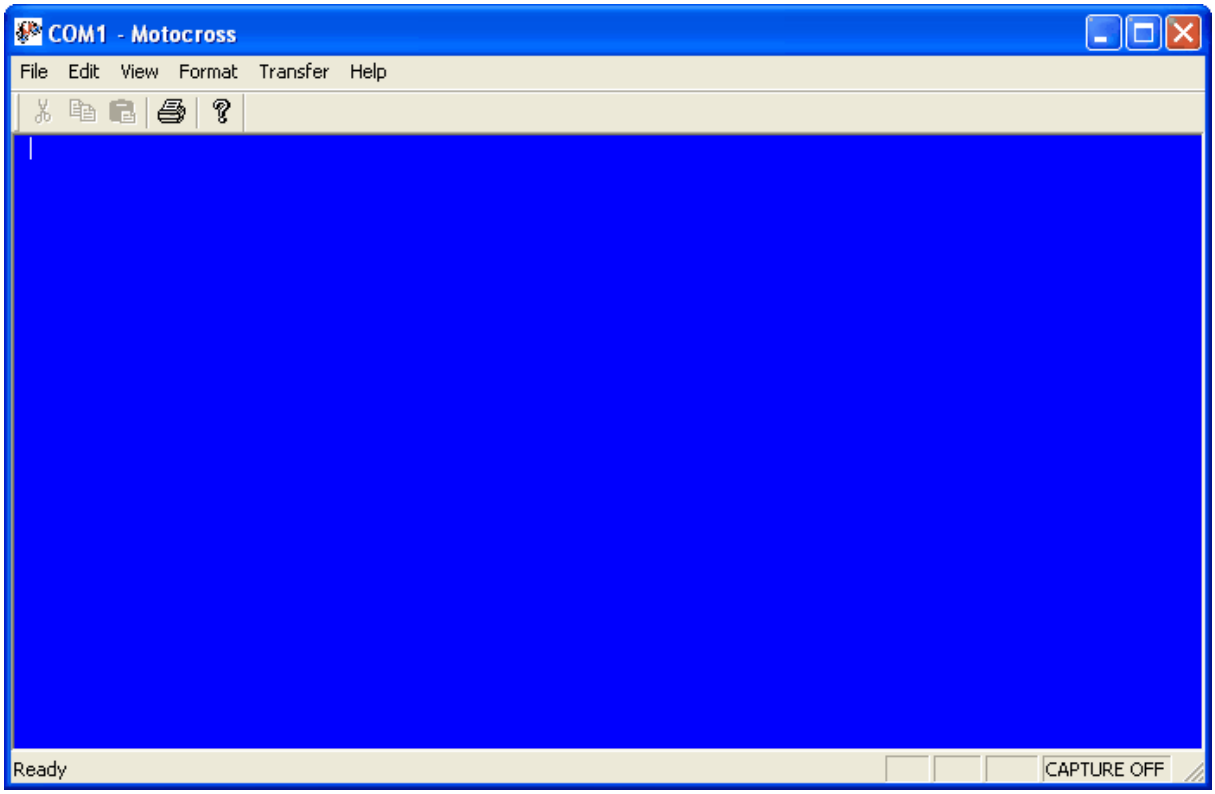
5.2.7 Load Deployment from File

The command button is used to the load a deployment from a file on the PC. A file select popup panel is shown for the user to select a storage directory and file.

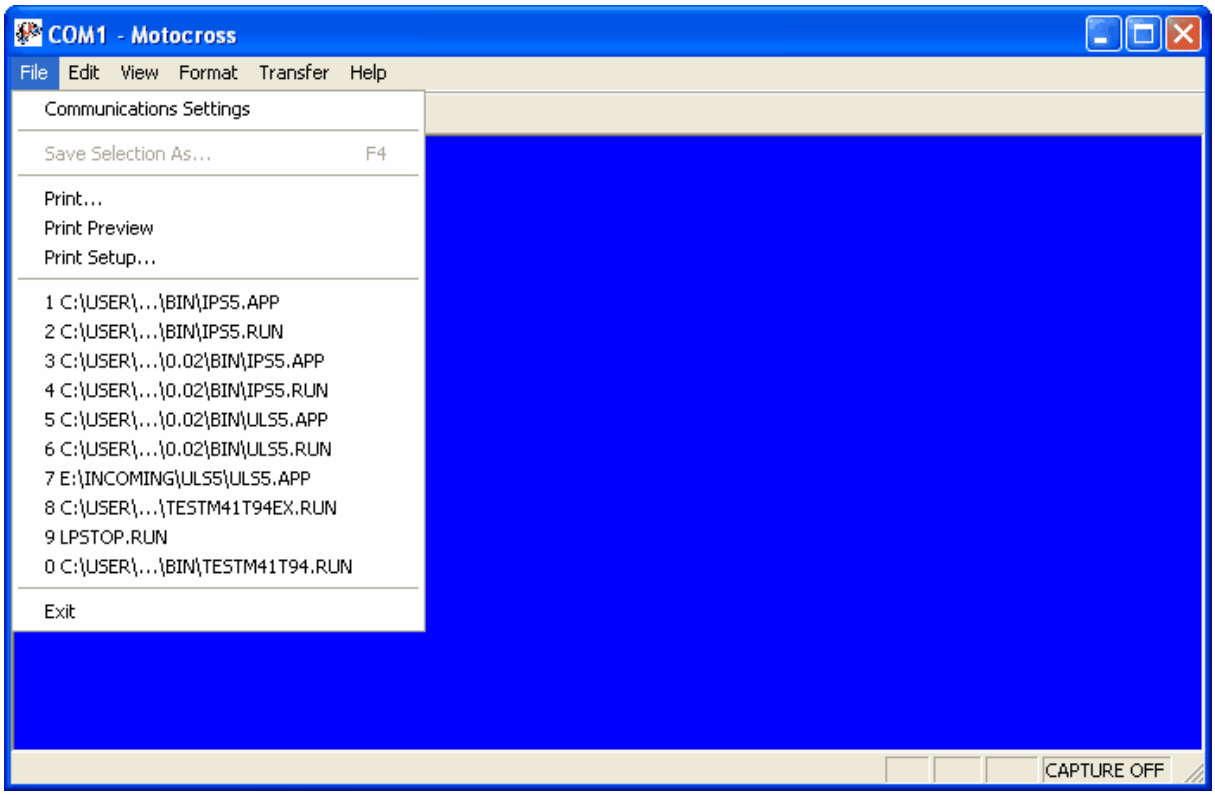


5.2.8 Terminal Emulator Command Button

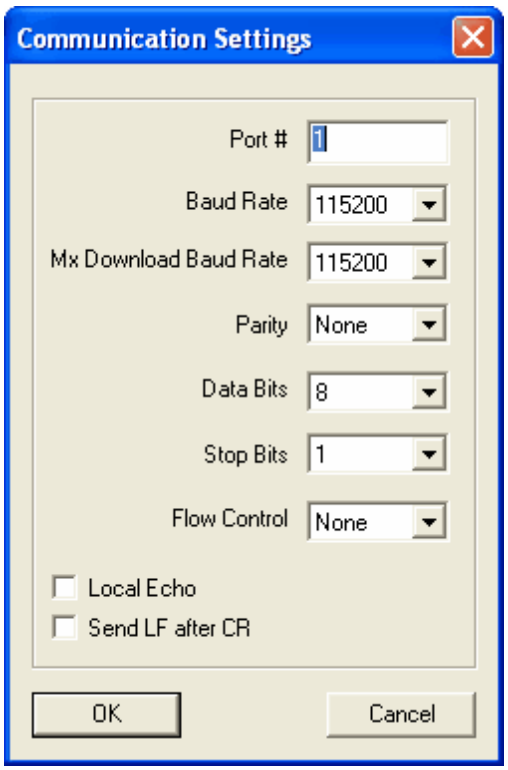
The Terminal Emulator command button causes AzfpLink to launch the Motocross terminal emulator program that is installed with AzfpLink. AzfpLink closes its connection to the RS232 port before it launches Motocross because only one program can access a serial port at one time. The AzfpLink interface disappears and the Motocross interface appears as shown below.



Note in the top left hand corner of the window "COM1 - Motocross" this indicates that the Motocross program is linked to RS232 communications port 1. If this is not the correct port and/or this is the first time Motocross has been launched then the COM port must be set up in the preferences menu. To do so click on the File pull down menu.

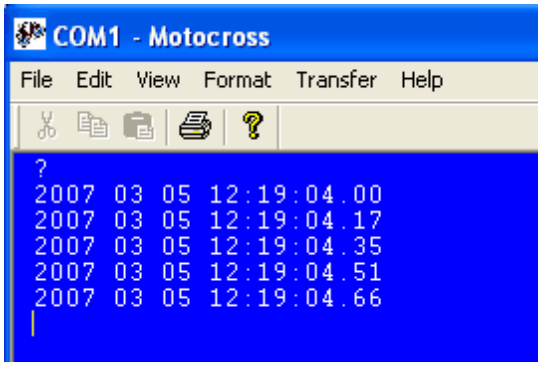


Select "Communications Settings".



Enter the correct port number. The rest of the settings must be set as shown above.

If the unit is not deployed then the pressing the "Enter" key on the keyboard will cause the Firmware to display the date and time.



If the unit is deployed you can end the deployment manually by continually pressing the 's' key.

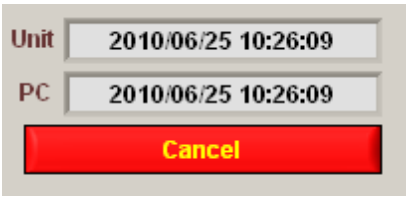
Functions that can be performed in the Motocross Terminal Emulator are described in later sections.

To exit the program and return to "AzfpLink" click on the  button in the top right hand corner.

5.2.9 Show Units Date and Time

The 

command button is to display the units date and time as well as the PC date and time. Note the unit must be in STANDBY mode for this command to work.

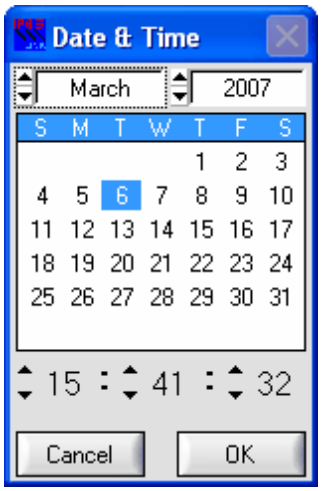


Click on the 'Cancel' command button to terminate the displaying of the date and time.

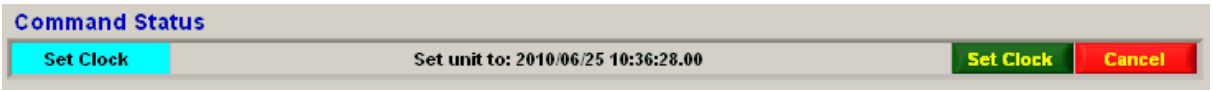
5.2.10 Set Units Date

Use the 

command button to set the units date and time manually from another clock.

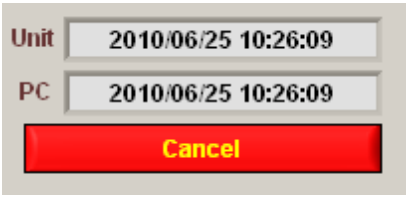


Set the date and time to a desired value and then click ok



The unit is ready to be programmed with the selected date and time. Click the 'Set Clock' button on the Command Status bar to program the unit with the new date and time.

After programming the unit the program starts showing the units and PC time.



Click on the 'Cancel' to terminate the displaying of the data and time.

Click yes to program the unit.

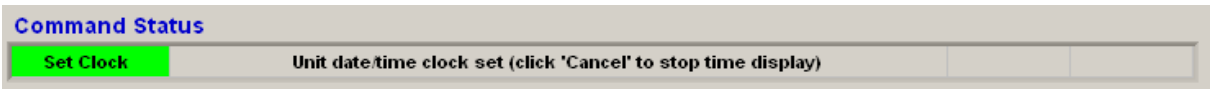
5.2.11 Set Unit to PC Date

The 

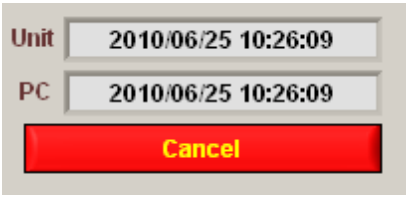
command button causes Ips5LinkE to set the units date and time to the PC's date and time.

The unit is programmed with the PC's data and time.

After the programming you should see the date and time that was programmed on the command status bar.



After programming the unit the program starts showing the units and PC time.

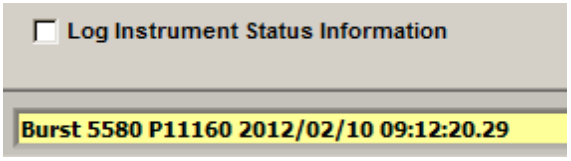


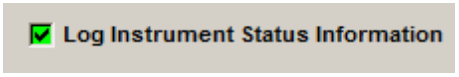
Click on the 'Cancel' button to terminate the displaying of the data and time.

5.2.12 Log Status Information

After a deployment the instrument sends out status information over the RS232 for 24 hrs before turning of this feature.

This information is shown in the status line at the bottom of the main panel.

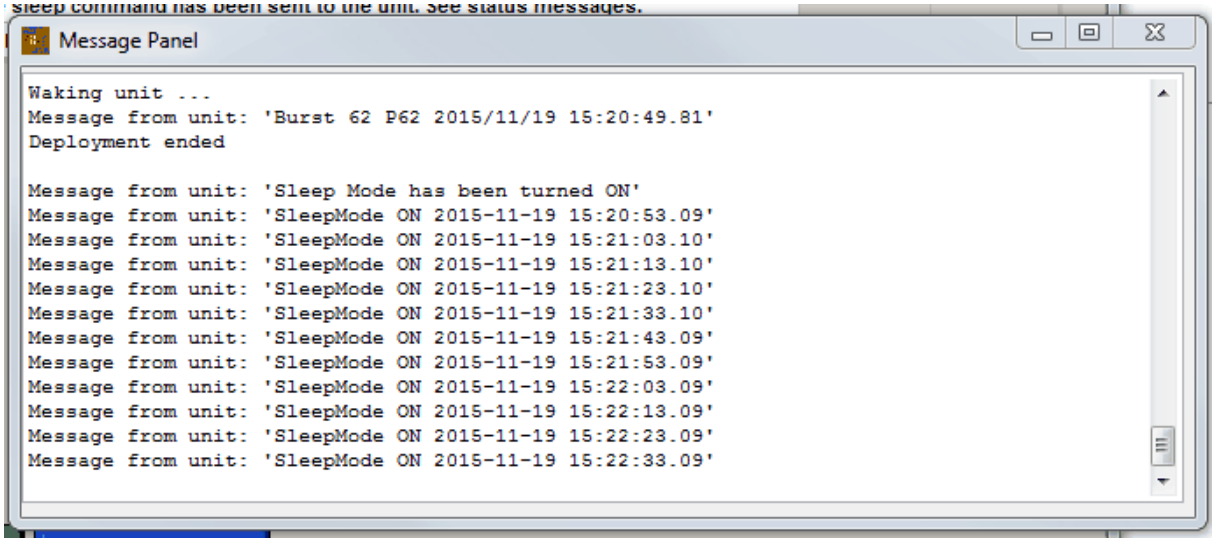


To enable the logging of the information to log files enable the 

check box. The log files are stored with the log directory specified in the Preference tab.

5.2.13 Message Panel

The message panel provides information sent by the AZFP in a text format.



5.2.14 Send Go command or Sleep command

For Go and Sleep operations the following buttons are displayed in the deployment panel.

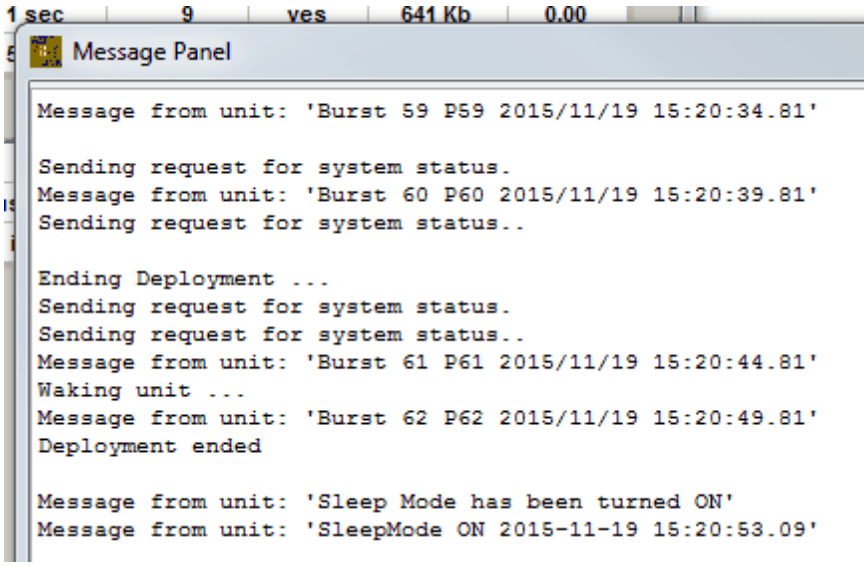
Once the buttons are active either can be selected.

If the AZFP is acquiring data clicking on the 

is clicked it will cause the unit to stop the data acquisition and then restart the acquisition. This will cause the AZFP to create a new file.

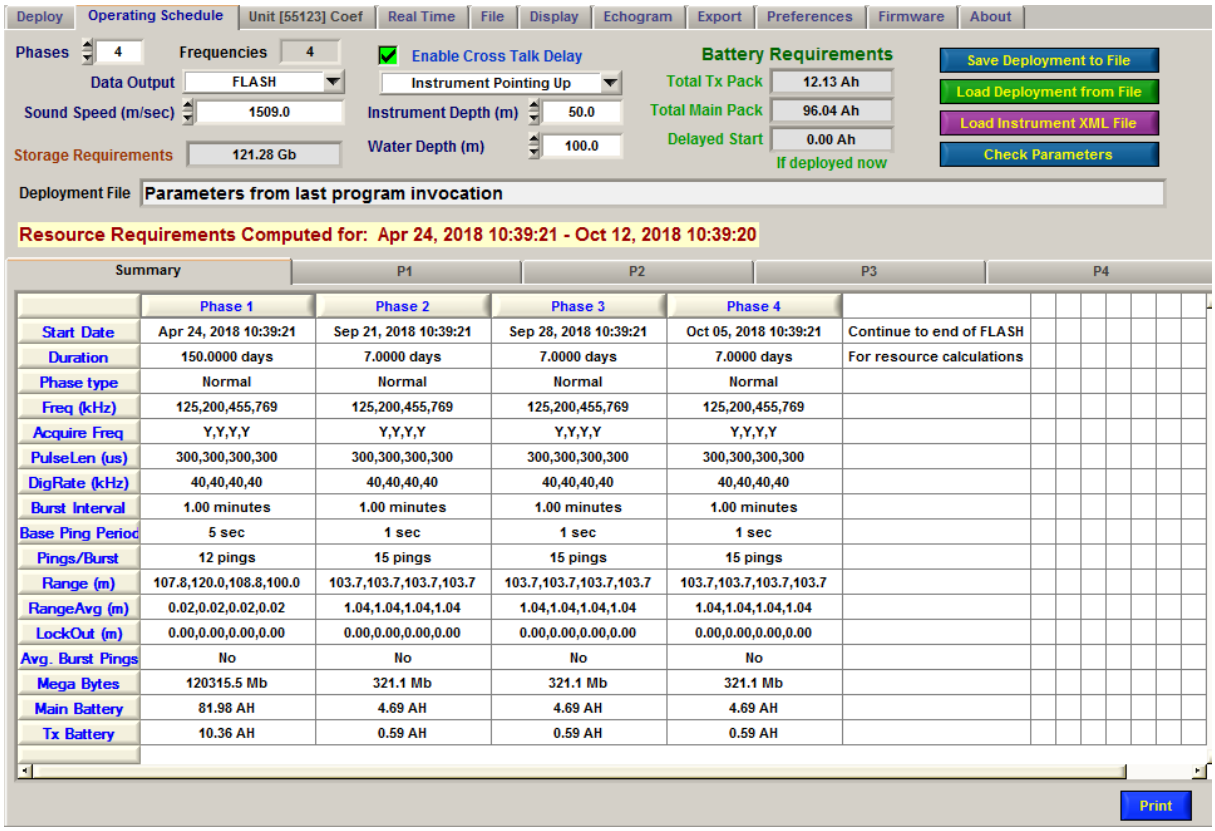
If the AZFP is acquiring data and the is 

clicked the AZFP will terminate the acquisition and go into a low power sleep more.



5.3 Operating Schedule Tab

The Operating Schedule on the AZFP tab is used to set the operational parameters for the deployment of the AZFP unit. This tab contains a number of controls, indicators and sub tabs.

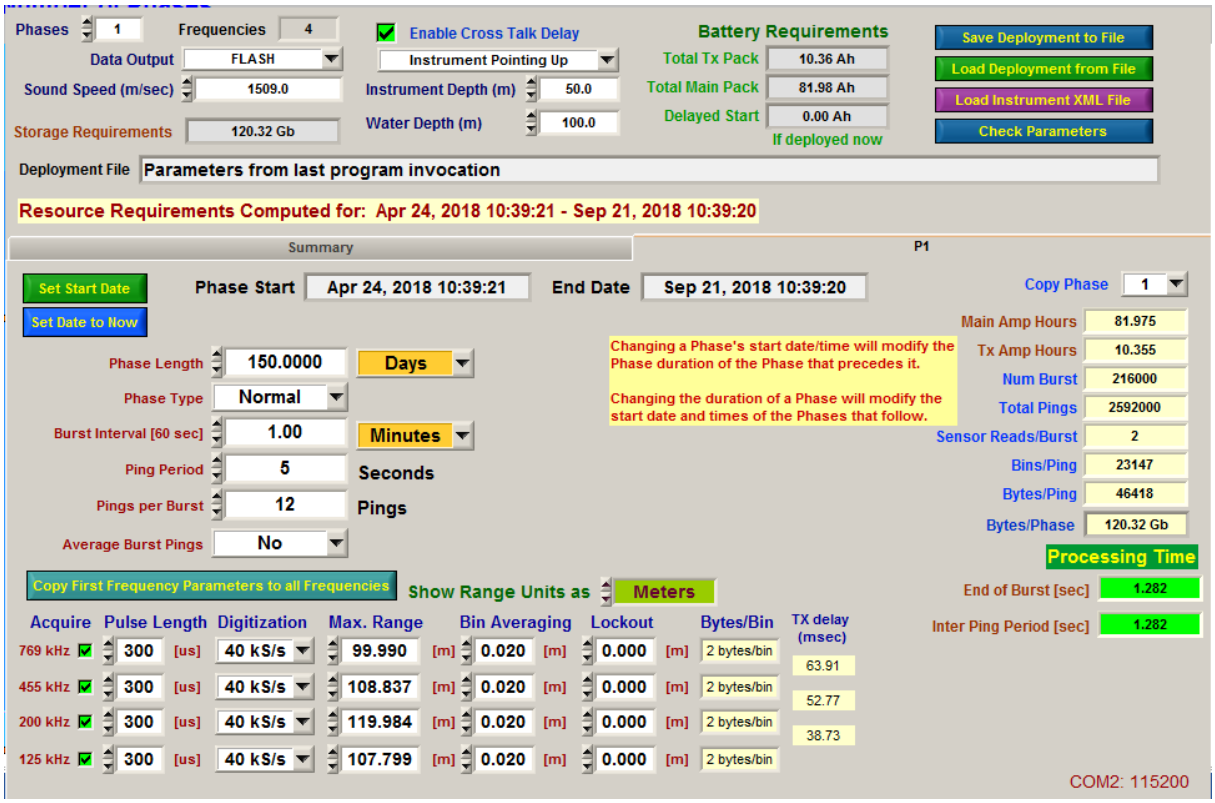


	Phase 1	Phase 2	Phase 3	Phase 4	
Start Date	Apr 24, 2018 10:39:21	Sep 21, 2018 10:39:21	Sep 28, 2018 10:39:21	Oct 05, 2018 10:39:21	Continue to end of FLASH
Duration	150.0000 days	7.0000 days	7.0000 days	7.0000 days	For resource calculations
Phase type	Normal	Normal	Normal	Normal	
Freq (kHz)	125,200,455,769	125,200,455,769	125,200,455,769	125,200,455,769	
Acquire Freq	Y,Y,Y,Y	Y,Y,Y,Y	Y,Y,Y,Y	Y,Y,Y,Y	
PulseLen (us)	300,300,300,300	300,300,300,300	300,300,300,300	300,300,300,300	
DigRate (kHz)	40,40,40,40	40,40,40,40	40,40,40,40	40,40,40,40	
Burst Interval	1.00 minutes	1.00 minutes	1.00 minutes	1.00 minutes	
Base Ping Period	5 sec	1 sec	1 sec	1 sec	
Pings/Burst	12 pings	15 pings	15 pings	15 pings	
Range (m)	107.8,120.0,108.8,100.0	103.7,103.7,103.7,103.7	103.7,103.7,103.7,103.7	103.7,103.7,103.7,103.7	
RangeAvg (m)	0.02,0.02,0.02,0.02	1.04,1.04,1.04,1.04	1.04,1.04,1.04,1.04	1.04,1.04,1.04,1.04	
LockOut (m)	0.00,0.00,0.00,0.00	0.00,0.00,0.00,0.00	0.00,0.00,0.00,0.00	0.00,0.00,0.00,0.00	
Avg. Burst Pings	No	No	No	No	
Mega Bytes	120315.5 Mb	321.1 Mb	321.1 Mb	321.1 Mb	
Main Battery	81.98 AH	4.69 AH	4.69 AH	4.69 AH	
Tx Battery	10.36 AH	0.59 AH	0.59 AH	0.59 AH	

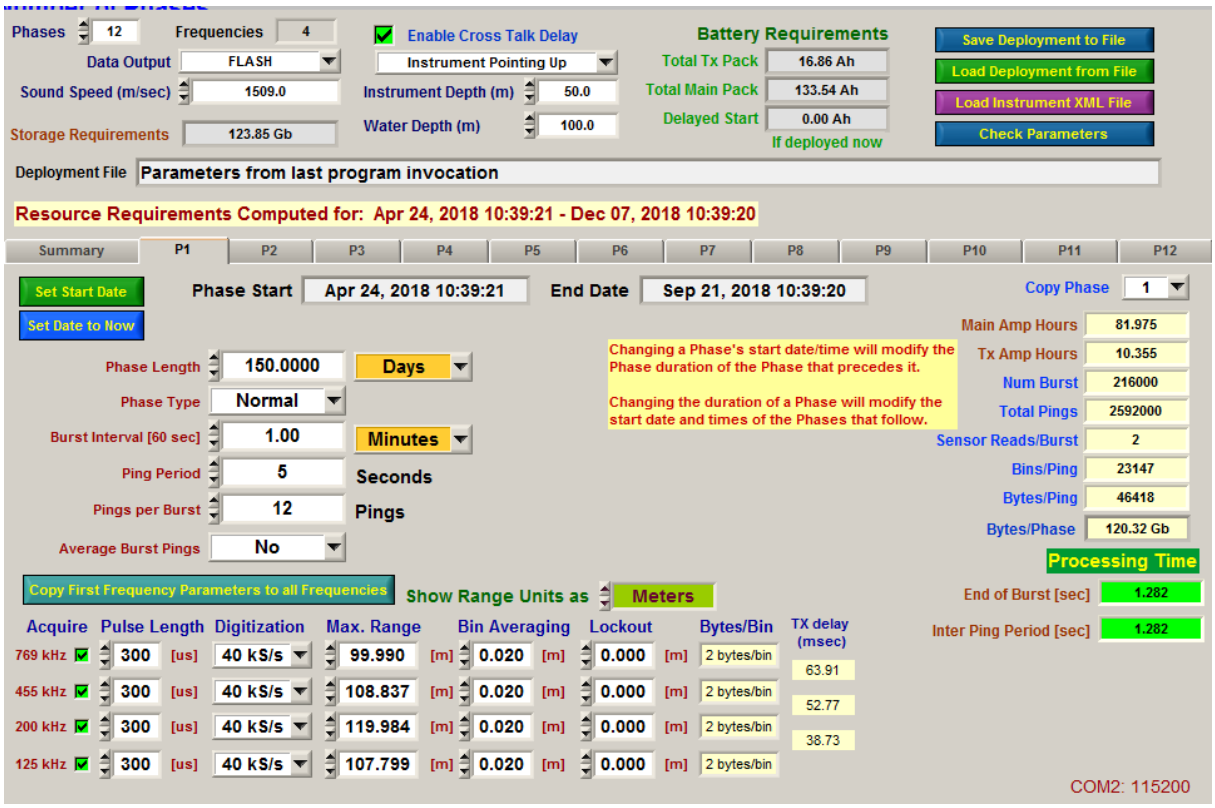
5.3.1 Number of Phases

The 

numeric control determines the number of phases to program. The example below shows the Operations tab with 1 phase.



The example below shows the Operation tab with 12 phases. Note the tabs P1, P2 .. P12. These tabs contain the settings for the individual phases. These are described in a later section.



5.3.2 Data Output

The Data Output selection control allows Three different selections.

*** Unless there is a PC connected to the unit for real time applications do not set the parameter for one of the RS232 output options as this consumes more battery power.

5.3.2.1 Data Output FLASH

The Data Output FLASH selection causes the unit to store data only to the CF memory.

5.3.2.2 Data Output FLASH & RS232

The Data Output FLASH & RS232 selection causes the unit to store data to Compact FLASH and send it over the RS232 serial port.

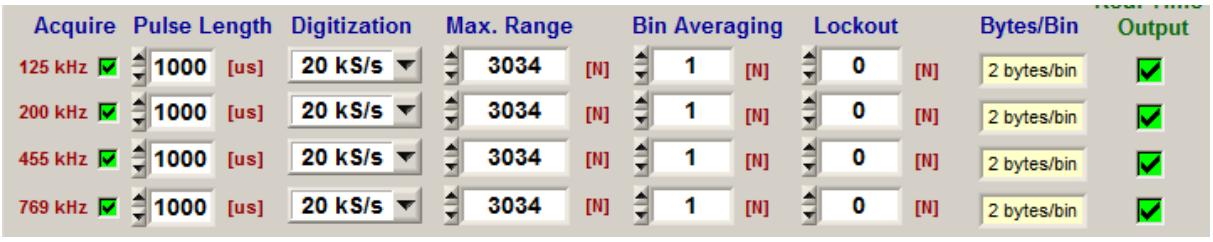
5.3.2.3 Data Output RS232 (new)

The Data Output RS232 selection causes the unit send it over the RS232 serial port and not to store it to Compact FLASH.

A warning is given about this setting because data is not stored to CF in this setting. The control is set to YELLOW as a warning.

Typically this setting is used for real time applications where it is not required that the data be written to the internal CF.

When data is to be output to the RS232, the user can select which channels to output over the RS232. A checkbox for each channel appears on the phase interface.



Note that the exclusion of channels from the output will only work for Firmware version 3.12 and higher. Older firmware version can only send out all active channels.

Excluded channels are stored to FLASH if the option to store to FLASH is set but are not sent up the RS232 port.
This allows faster output and thus faster ping rates for viewing portions of the data in AzfpLink.

5.3.3 Sound Speed

The 

numeric control is the sound speed used to compute values such as the number of samples to collect for a particular Range setting and the number of samples to ignore for the Lock Out etc.

Make sure the sound speed that is selected is valid for the area where the instrument will be deployed. Users should use a nominal value to make sure the unit will sample enough of the water column regardless of water temperature.

If the sound speed is set to a value less than 1400 m/s or greater than 1650 m/s the value is shown in RED to warn the user that the sound speed being used may be invalid.

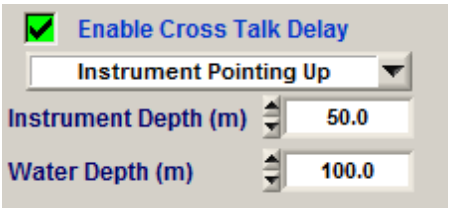
Invalid sound speeds might be used when doing tests in air.

The sound is used to compute ranges as well as values for the prevention of surface echoes if enabled.

5.3.4 Preventing Secondary Surface Echoes

In some cases it is necessary delay the transmission of a previous channel to avoid secondary echos from the bottom or surface.

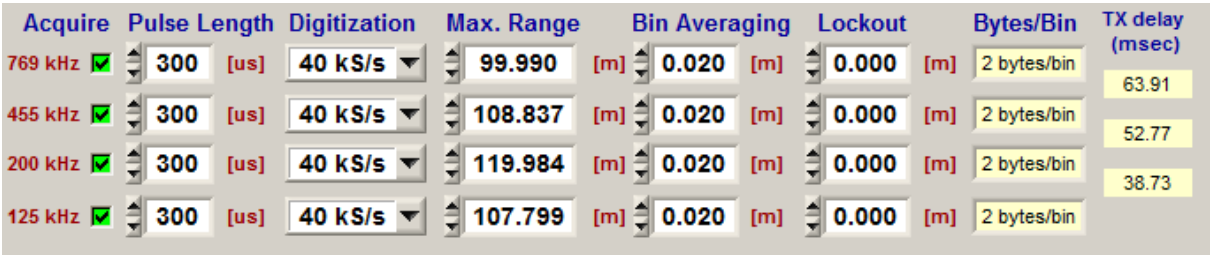
The following parameters are used to compute those delays.



To enable secondary echos from a previous channel to interfer with the next channel you must enable the function by clicking on the Enable Cross Talk Delay.

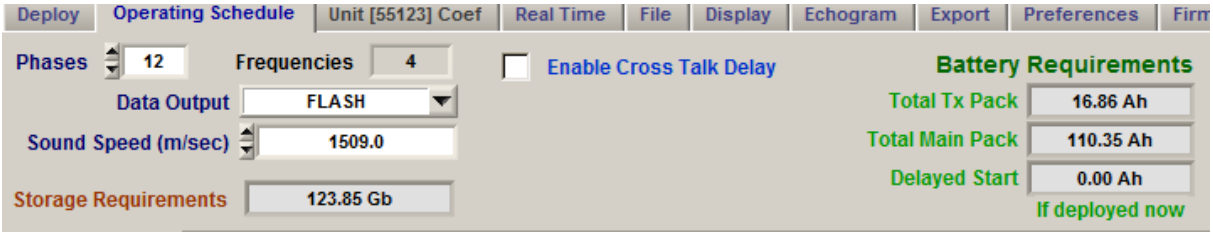
Select the direction the instrument is pointing, the instruments depth in meters at high tide and the depth of the water at high tide.

If this option is selected the computed delays are shown between the channels.

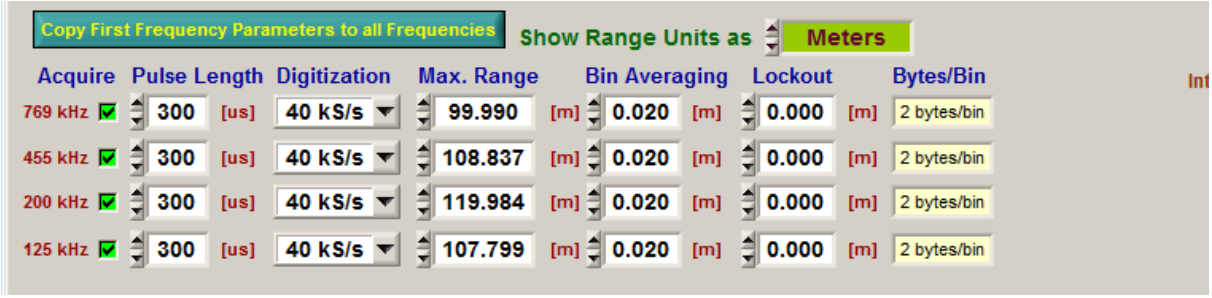


In the above example a 63.91 ms delay is performed after the transmission of the 769 kHz channel, then a 52.77 ms delay after the transmission of the 455 kHz channel and finally a 38.73 ms delay after the 200 kHz channel. Note that the channels are transmitted with the highest frequency first to the lowest frequencies last.

If the delays are disabled then the panels appear as follows:



The indicators for the delays do not appear.



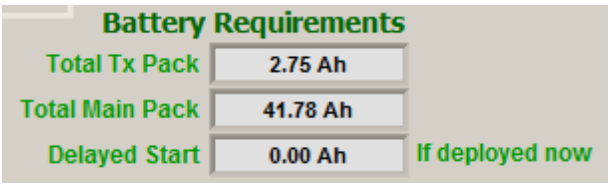
5.3.5 Storage Requirements

The storage requirements numeric indicator 

shows the number of MB required for the storage of data for all the specified phases. Note that this value should be less than or equal to the size of the installed Compact FLASH (listed in the status panel).

5.3.6 Battery Requirements

There are three controls that show the battery requirements for the current parameters.



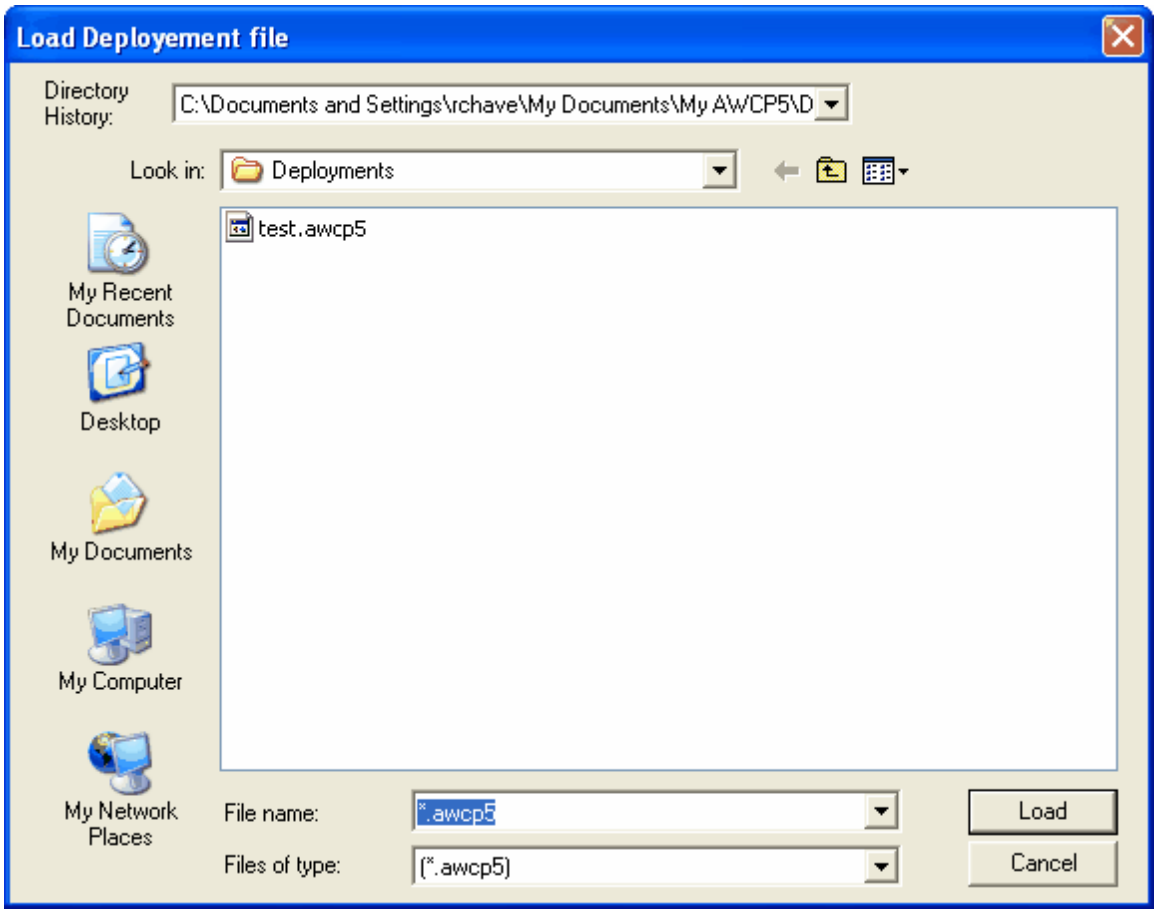
The values are the total aggregate power requirements for all the phases up to the end of the last phase.

If there is a delayed start the 'Delayed Start' shows the amount of power required while the instrument is waiting to start the first phase as there is a base level of power required even when the instrument is not collecting data.

5.3.7 Save Deployment to File

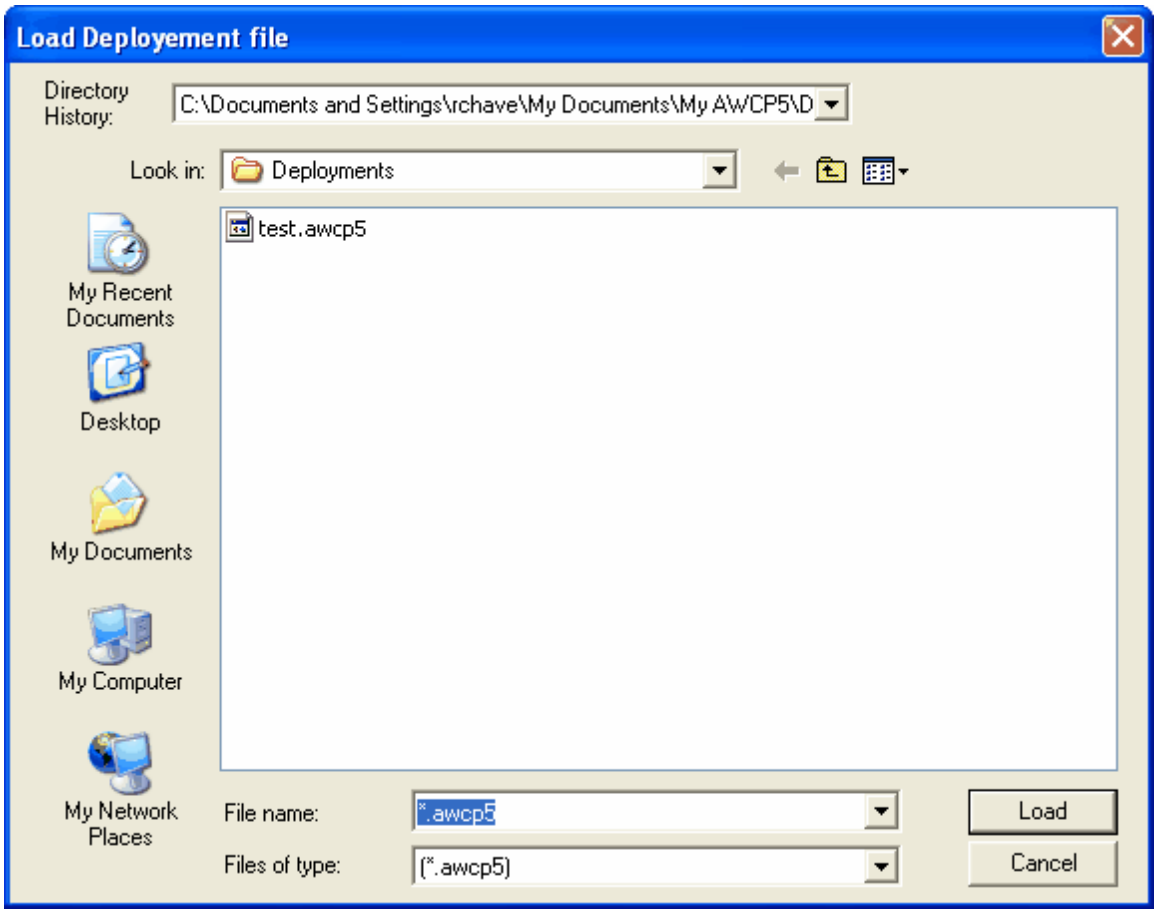
The 

command button is used to the save the deployment parameters to a file on the PC. A file select popup panel is shown for the user to select a storage directory and set a file name.



5.3.8 Load Deployment from File

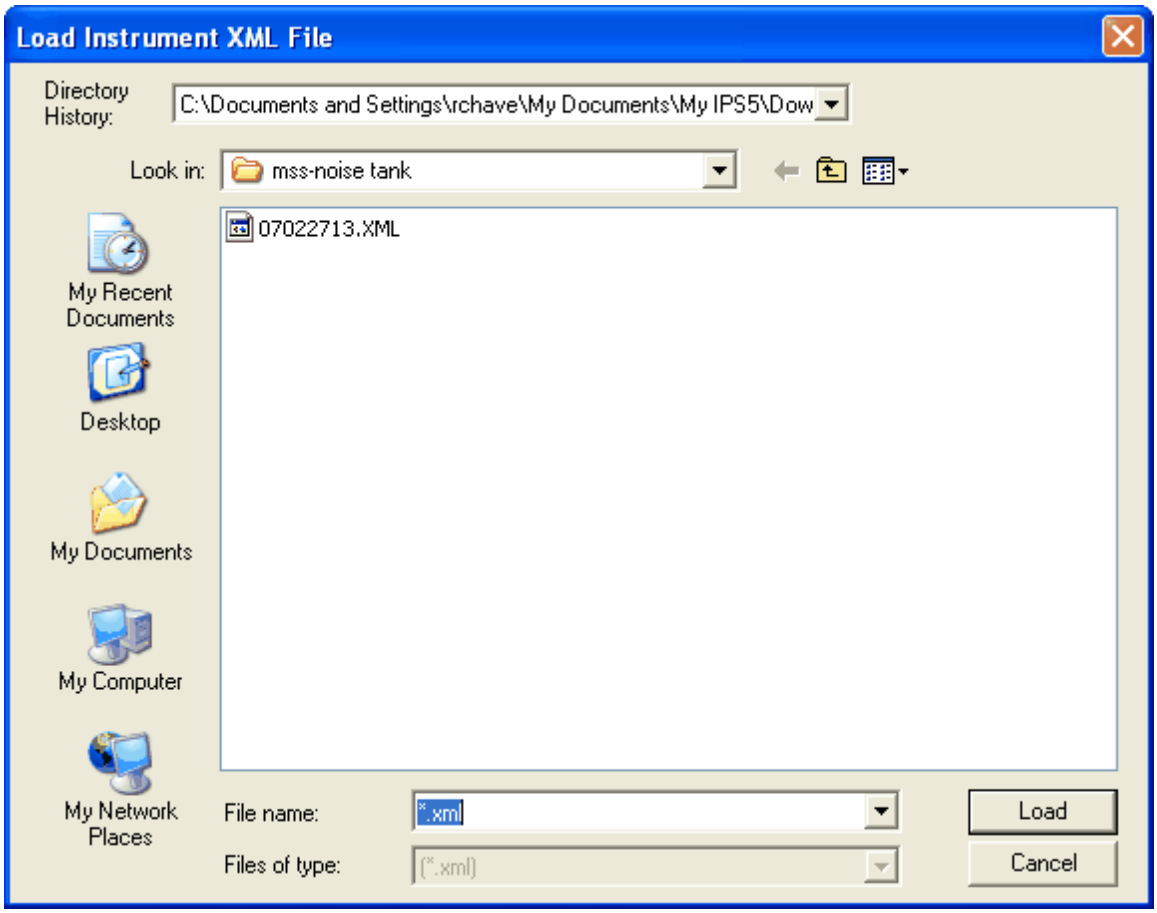
The **Load Deployment from File** command button is used to the load a deployment from a file on the PC. A file select popup panel is shown for the user to select a storage directory and file.



5.3.9 Load Instrument XML File

The Load Instrument XML File command button is used to load an instrument's deployment XML file created by an AZFP unit. These files are created by the instruments when they are deployed and contain the operational parameters as well as the instrument configuration parameters. Using this command button will cause the operational parameters and configuration parameters to be replaced by the contents of the file that is loaded.

When the button is clicked a file select popup appears as shown below.



5.3.10 Check Parameters

The 

is used to check the parameters. This check is done automatically before the instrument is deployed when the 

button is pressed.

5.3.11 Deployment File

The Deployment file indicator shows the last file that was loaded or saved.

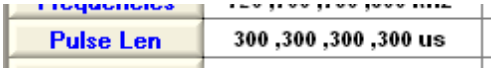
The example below shows that no file has been loaded and the parameters that where loaded in the last invocation of the program are being used.

5.3.12 Summary Tab

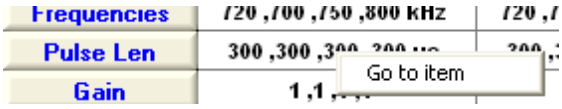
The sub-tab called 'Summary' consists of a table with all the phase values displayed. Up to 6 phases can be viewed at one time with a scroll slide at the bottom; slide to left or right to view other phases. The example below shows the Summary Tab for a deployment with three phases.

Summary	P1	P2	P3	P4	P5	P6	P7	P8	P9	P10	P11	P12
	Phase 1		Phase 2		Phase 3		Phase 4		Phase 5		Phase 6	
Start Date	Feb 09, 2012 13:38:59		Feb 09, 2012 13:39:59		Feb 16, 2012 13:39:59		Feb 23, 2012 13:39:59		Mar 01, 2012 13:39:59		Mar 08, 2012 13:39:59	
Duration	1.00 minutes		7.0000 days		7.0000 days		7.0000 days		7.0000 days		7.0000 days	
Phase type	Normal		Normal		Normal		Normal		Normal		Normal	
Freq (kHz)	125,200,400,740		125,200,400,740		125,200,400,740		125,200,400,740		125,200,400,740		125,200,400,740	
Acquire Freq	Y,Y,Y,Y		Y,Y,Y,Y		Y,Y,Y,Y		Y,Y,Y,Y		Y,Y,Y,Y		Y,Y,Y,Y	
PulseLen (us)	300,300,150,150		300,300,300,300		300,300,300,300		300,300,300,300		300,300,300,300		300,300,300,300	
DigRate (kHz)	40,40,40,40		40,40,40,40		40,40,40,40		40,40,40,40		40,40,40,40		40,40,40,40	
Burst Interval	5 sec		1.00 minutes		1.00 minutes		1.00 minutes		1.00 minutes		1.00 minutes	
Base Ping Period	1 sec		1 sec		1 sec		1 sec		1 sec		1 sec	
Pings/Burst	3 pings		15 pings		15 pings		15 pings		15 pings		15 pings	
Range (m)	90.7,99.7,99.7,99.7		99.7,99.7,99.7,99.7		99.7,99.7,99.7,99.7		99.7,99.7,99.7,99.7		99.7,99.7,99.7,99.7		99.7,99.7,99.7,99.7	
RangeAvg (m)	0.02,0.02,0.02,0.02		1.00,1.00,1.00,1.00		1.00,1.00,1.00,1.00		1.00,1.00,1.00,1.00		1.00,1.00,1.00,1.00		1.00,1.00,1.00,1.00	
LockOut (m)	0.00,0.00,0.00,0.00		0.00,0.00,0.00,0.00		0.00,0.00,0.00,0.00		0.00,0.00,0.00,0.00		0.00,0.00,0.00,0.00		0.00,0.00,0.00,0.00	
Avg. Burst Pings	Yes		No		No		No		No		No	
Mega Bytes	1.3 Mb		321.1 Mb		321.1 Mb		321.1 Mb		321.1 Mb		321.1 Mb	
Main Battery	0.00 AH		3.80 AH		3.80 AH		3.80 AH		3.80 AH		3.80 AH	
Tx Battery	0.00 AH		0.25 AH		0.25 AH		0.25 AH		0.25 AH		0.25 AH	

The values in these tables can not be changed on this table. To get to the tab value parameter you want to change select the item by right clicking on it. For example the Pulse Len on Phase 1.



Now right click on the item. This will bring up a menu "Go To Item".



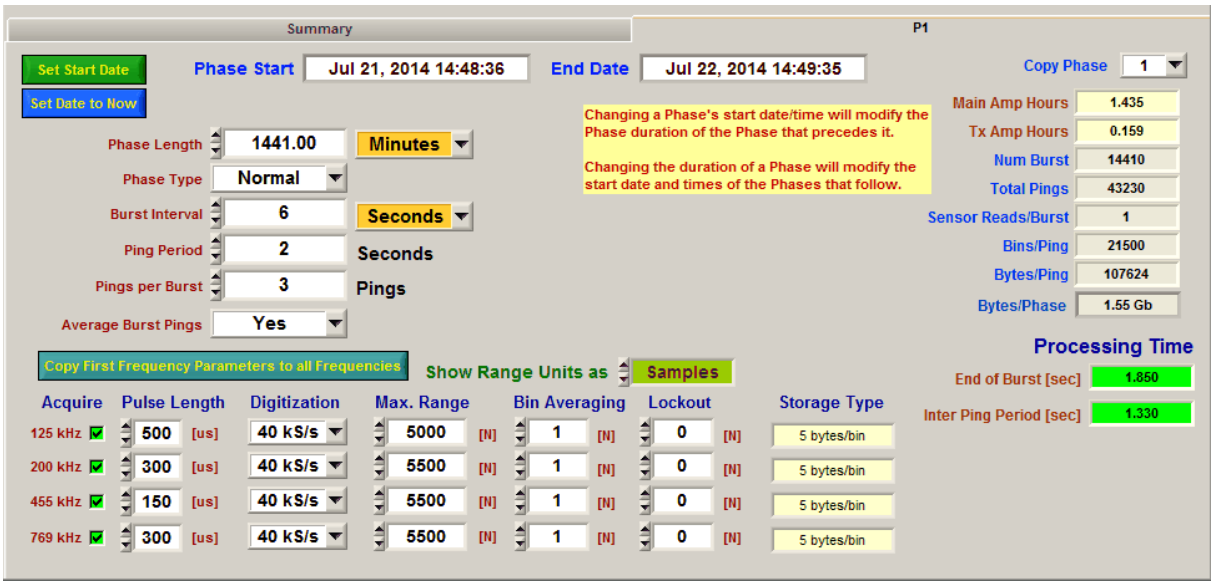
Select the "Go to item" and the program will switch to the Phase and the item you wish to change.

5.3.13 Phase Tabs

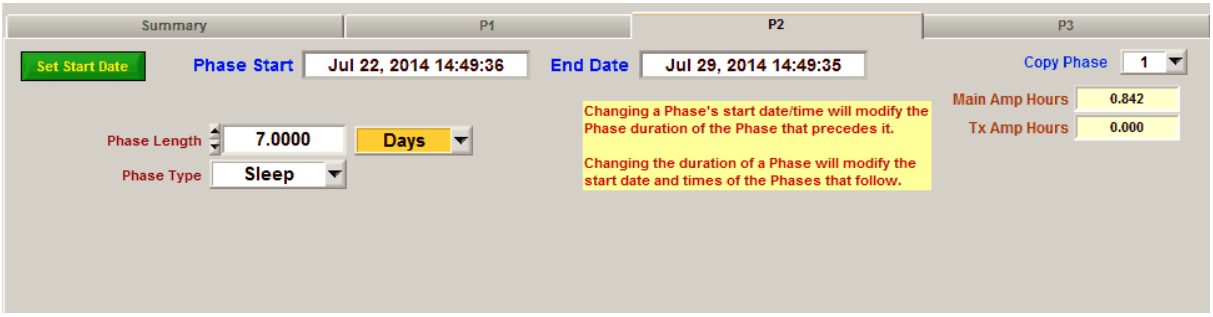
In this section we describe the Phase Tabs and their parameters. A Phase Tab is a tab corresponding to a tab containing the parameters for one phase. A phase is a period of time to acquire data using a particular set of parameters. The AZFP has the capability operating up to 12 phases.

There are 3 types of phases.

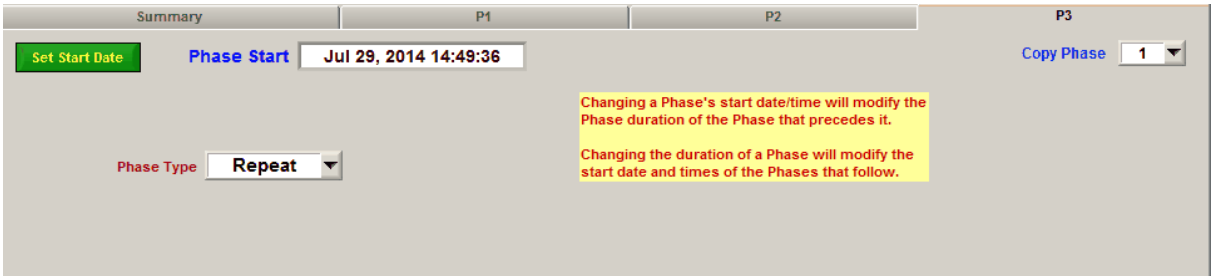
Normal phases are used to collect targets for the detection of Ice flows. Below is an example.



Sleep phases cause the program to end data acquisition and restart it at a later time. The first or last phase cannot be a sleep phase.



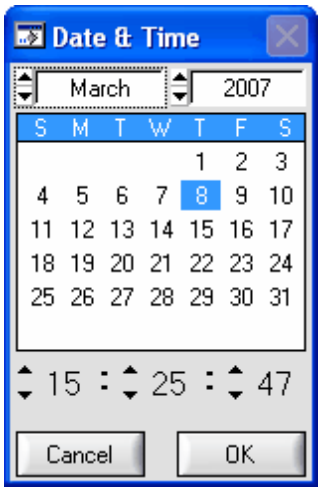
Only the last phase can be a repeat phase. A repeat phase is a phase which switches back to the first phase. Below is an example of a repeat phase.



5.3.13.1 Set Start Date

The Phase start date and time can be set using the Set Start Date command button.

A date selection pop-up appears.



Use this date panel to set the desired Start Date. Simply use the up or down arrows to set Month, Year, Hour, Minute and Second and click on the date. Double clicking on a day exits the panel with the new date or you can click on the OK button.

The Phase start dates and times are summarizes on the Deploy tab.

Deployment Summary

Deployment File: Parameters from last program invocation

Storage is to 'FLASH' [1.93 Gb], Power Main [22.8 Ah] Tx [1.5 Ah]

Phase #	Type	Start Date	Duration	Burst Interval	PingPeriod	Pings/Burst	Average	Bytes	Main Ah
1	Normal	Feb 09, 2012 09:12:57	60 sec	5 sec	1 sec	3	yes	1.3 Mb	0.00
2	Normal	Feb 09, 2012 09:13:57	7.0 days	60 sec	1 sec	15	no	321.1 Mb	3.80
3	Normal	Feb 16, 2012 09:13:57	7.0 days	60 sec	1 sec	15	no	321.1 Mb	3.80
4	Normal	Feb 23, 2012 09:13:57	7.0 days	60 sec	1 sec	15	no	321.1 Mb	3.80
5	Normal	Mar 01, 2012 09:13:57	7.0 days	60 sec	1 sec	15	no	321.1 Mb	3.80
6	Normal	Mar 08, 2012 09:13:57	7.0 days	60 sec	1 sec	15	no	321.1 Mb	3.80
7	Normal	Mar 15, 2012 09:13:57	Continuous	60 sec	1 sec	15	no	321.1 Mb	3.80

Note that if the selected date is greater than the following Phase the following Phase start date and time is shifted.

Selecting a date and time that is before the next Phase's start date and time will cause the current Phase and the previous Phase durations to change.

Examples 1:

Phase 2 is shifted to two days later.

Before shift.

Phase 1 is 2010 5 10 00:00:00 duration 10 days
Phase 2 is 2010 5 20 00:00:00 duration 10 days
Phase 3 is 2010 5 30 00:00:00 duration 10 days

After Phase 2 is shift by two days later.

Phase 1 is 2010 5 10 00:00:00 duration 12 days
Phase 2 is 2010 5 22 00:00:00 duration 8 days
Phase 3 is 2010 5 30 00:00:00 duration 10 days

Examples 2:

Phase 2 is shifted to two days earlier.

Before shift.

Phase 1 is 2010 6 10 00:00:00 duration 10 days
Phase 2 is 2010 6 20 00:00:00 duration 10 days
Phase 3 is 2010 6 30 00:00:00 duration 10 days

After Phase 2 is shift by two days earlier.

Phase 1 is 2010 6 10 00:00:00 duration 8 days
Phase 2 is 2010 6 18 00:00:00 duration 12 days
Phase 3 is 2010 6 30 00:00:00 duration 10 days

Examples 3:

Phase 1 is shifted 11 days later.

Before shift.

Phase 1 is 2010 6 10 00:00:00 duration 10 days
Phase 2 is 2010 6 20 00:00:00 duration 10 days
Phase 3 is 2010 6 30 00:00:00 duration 10 days

After Phase 1 is shifted 11 days later.

Phase 1 is 2010 6 21 00:00:00 duration 8 days
Phase 2 is 2010 7 01 00:00:00 duration 12 days
Phase 3 is 2010 7 11 00:00:00 duration 10 days

Examples 4:

Phase 1 is shifted 20 days earlier.

Before shift.

Phase 1 is 2010 6 10 00:00:00 duration 10 days
Phase 2 is 2010 6 20 00:00:00 duration 10 days
Phase 3 is 2010 6 30 00:00:00 duration 10 days

After Phase 2 is shift by two days earlier.

Phase 1 is 2010 5 21 00:00:00 duration 30 days
Phase 2 is 2010 7 01 00:00:00 duration 10 days

Phase 3 is 2010 7 11 00:00:00 duration 10 days

5.3.13.2 Set Start Date Now

The 

command button is only available in the first Phase. The command sets the Phase 1 start date and time to the PC's date and time when the command button is pressed.

If the PC's start date and time is greater then the current start date of the second phase a warning is given that following Phases will have their start date and time pushed forward.

If the Phase 1 start date and time is greater than the PC's date and time, the Phase 1 duration will change.

5.3.13.3 Phase Period

At the top of each phase type is the duration of the phase.

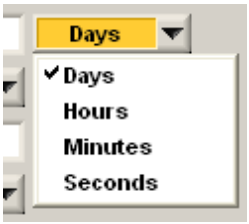
This shows the start and stop date time of the phase.

5.3.13.4 Duration

The Duration of the Phase specifies how long the Phase is from the start date.

The user can enter the number of day, hours, minutes or seconds specified by the two controls shown below.

The type of time being entered is selected by the control to the right.



*** This method of setting the duration of the Phase will reset the start date and time of all the following Phases.

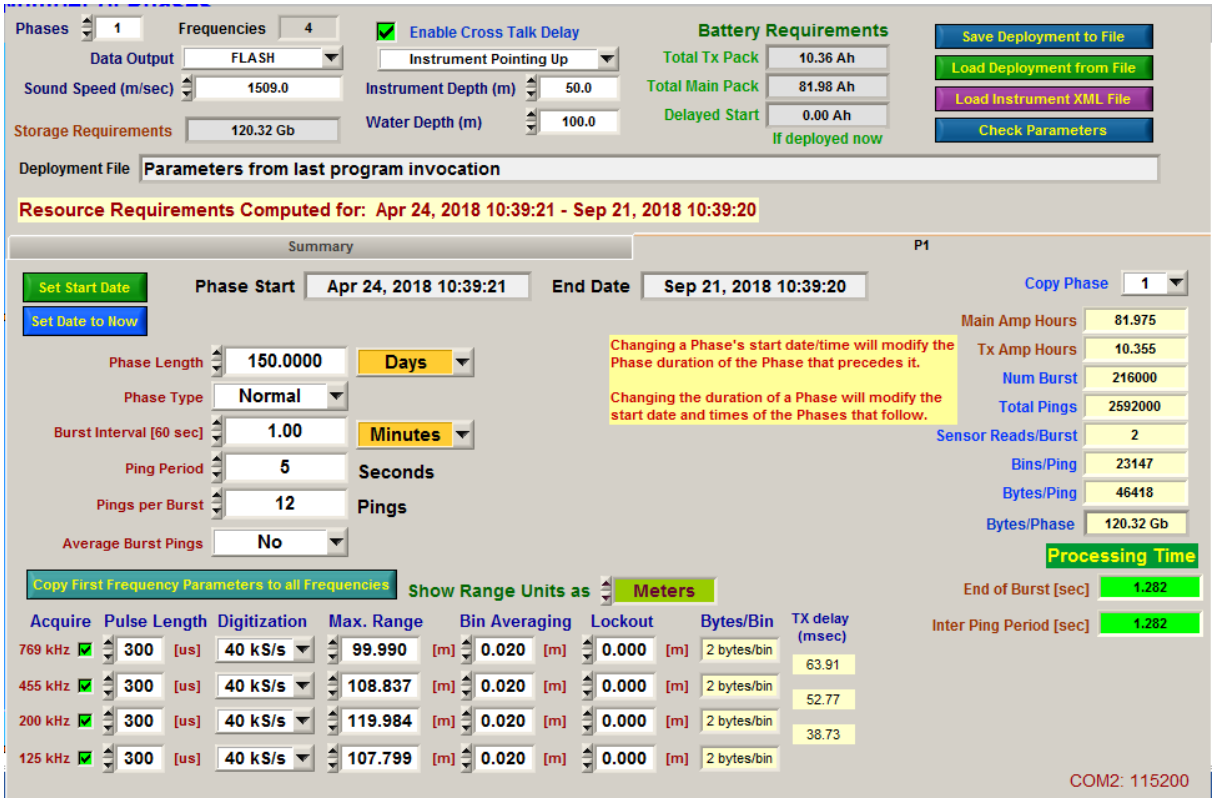
5.3.13.5 Phase Type

The 

sets the type of phase. There are three phase types of phases, Normal, Sleep and Repeat.

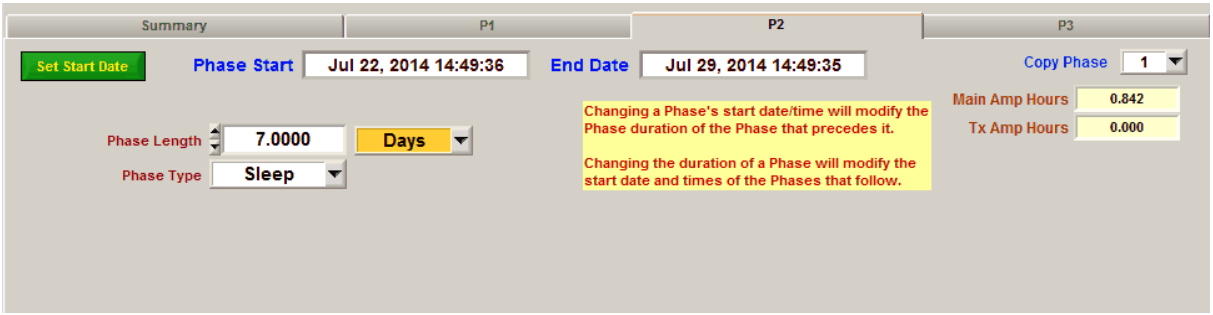
5.3.13.5.1 Normal Phase

A 'Normal' phase is a phase with parameters that are used for the data acquisition during a specified period of time.



5.3.13.5.2 Sleep Phase

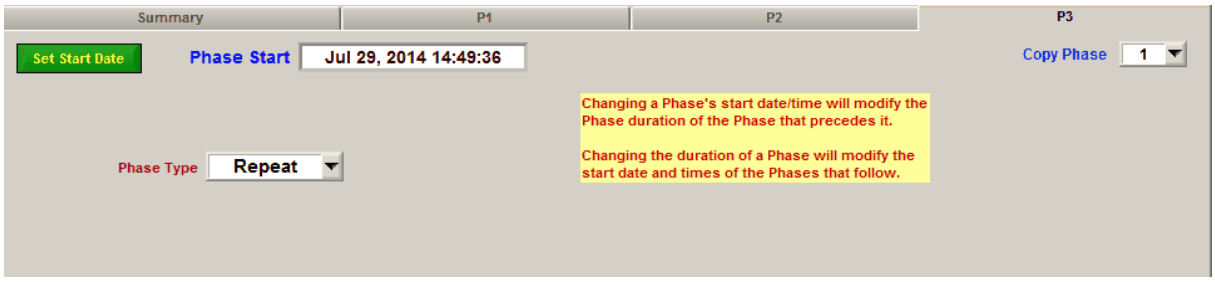
A sleep phase is a phase where the instrument will not collect any data for the period of the phase. Below is an example of a sleep phase.



A sleep phase can not be the final phase. AzfpLink will not allow programming of the unit if it is.

5.3.13.5.3 Repeat Phase

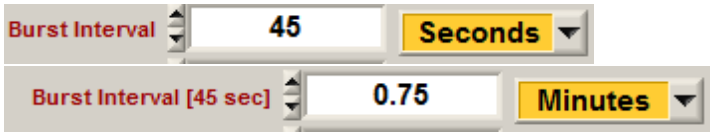
A repeat phase is a phase which switches back to the first phase. Below is an example of a repeat phase.



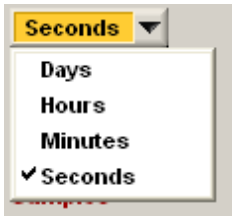
This is accomplished by resetting the Acquisition Start Date to the start date of the repeat phase and then resetting all the start dates of the other phases.

5.3.13.6 Burst Interval

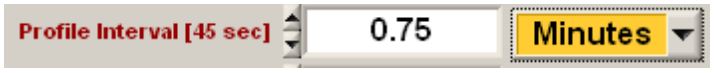
The Burst Interval is the length of time between the collection of one or more pings. Two controls are used to set the Burst Interval as shown below.



The interval can be entered in several different time types.



Below is an example of the 45 seconds shown in Minutes.



5.3.13.7 Ping Period

The Ping Period is the number of seconds between pings.

.

5.3.13.8 Pings per Burst

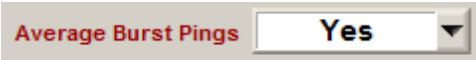
The Pings per Burst is the number of pings to acquire at the start of each Burst at the specified Ping Period. These ping may or may not be averaged depending on the Average Burst Pings setting.

The label to the left of the control shows the same value in seconds.

Note that increasing the Pings per Burst to a period longer than the current Burst Interval causes the Burst Interval to be increased.

5.3.13.9 Average Burst Pings

This controls is set to 'Yes' or 'No' to determine if the pings in a burst will be averaged.



If the pings are averaged then the program stores one averaged ping after the completion of a burst.

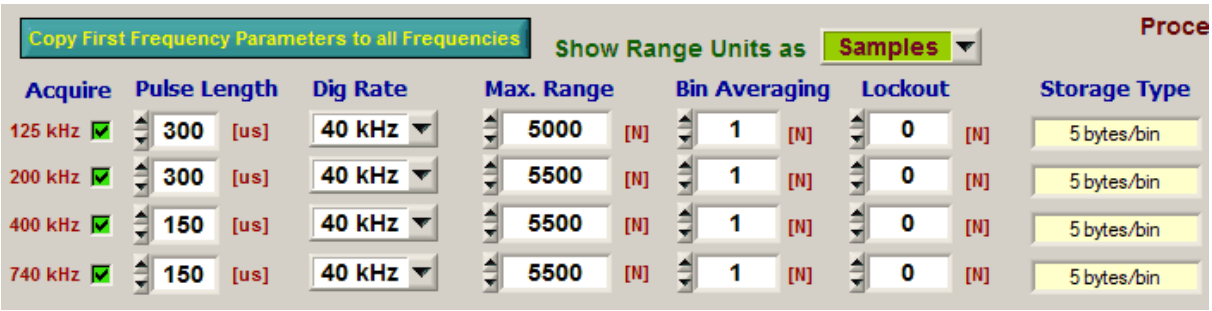
If the pings are not averaged then all the pings in the burst are stored.

Pings that are not averaged can still have spacial averaging in the water column.

5.3.13.10 Channel Parameters

The bottom portion of the Phase tab contains a number of controls to set the following parameters for each channel.

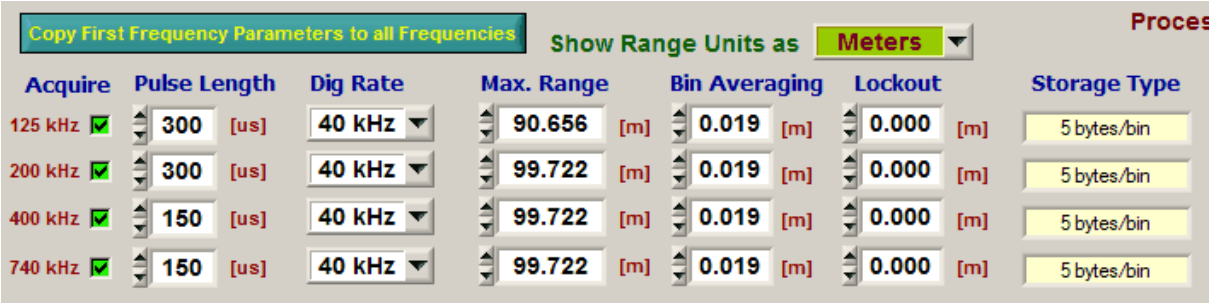
Acquire - acquire a channel.
Pulse Length - The transmit pulse length in microseconds.
Dig Rate - The digitization rate for the channel.
Max Range - The maximum range to digitize and store.
Bin Averaging - The bin averaging for the channel.
Lockout - To reduce data the lockout is the number of samples or meters to discard from the beginning of the ping.
Storage Type - This shows the number of bytes per bin the channel will require to store per ping.



The 

command button causes the settings of the first channel to be copied to the rest of the channels.

There is a units command button that allows the user to change the view from samples to meters or meters to samples. 

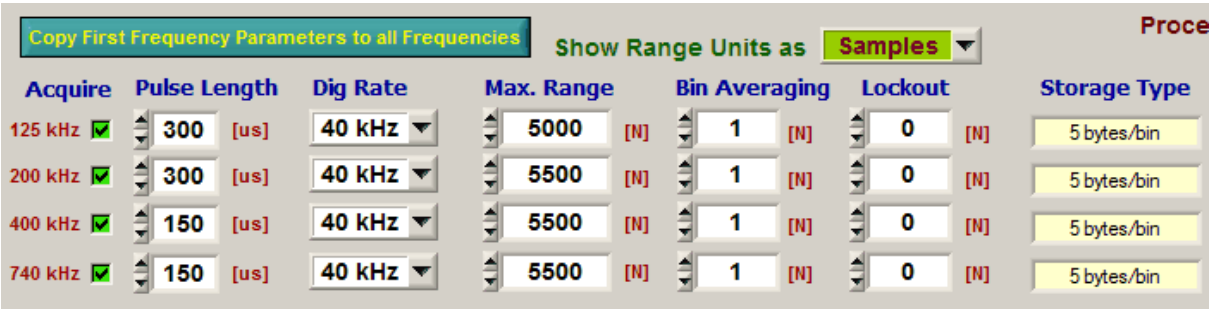


The computation to Meters uses the user selected Sound Speed at the top of the Operating Schedule tab.

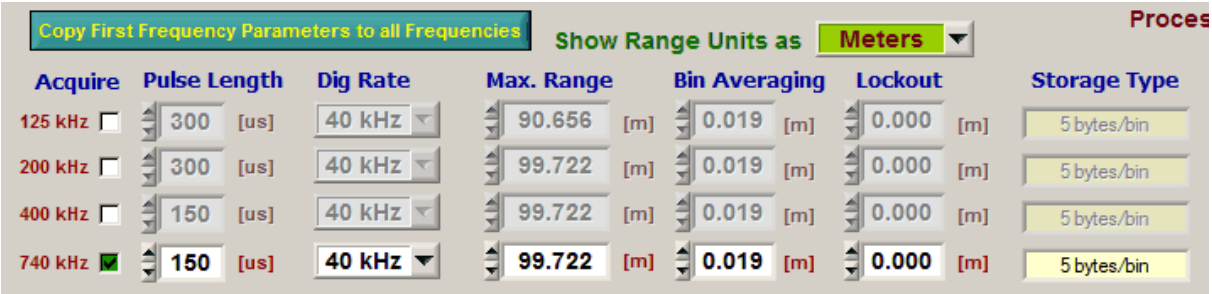
5.3.13.10.1 Acquire Channel

Check or uncheck the checkbox's to enable or disable the acquisition of the specific frequencies.

Acquire all channels.



Acquire only the 4 th channel.



5.3.13.10.2 Pulse Length

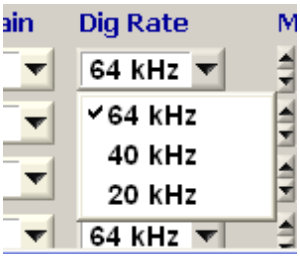
Each frequency can have its own specific pulse length.

Units for pulse length is in microseconds.

Enter the pulse length in the numeric control for each channel.

5.3.13.10.3 Digitization Rate

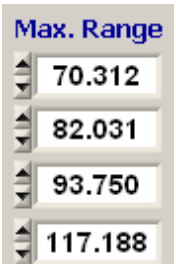
The Digitization Rate is the rate at which the received signal is digitized. Three rates are available: 64 kHz, 40kHz and 20 KHz.



5.3.13.10.4 Max Range

The Maximum Range sets the maximum range from which samples are digitized.

Set the value using the numerical controls for Maximum Range for each channel.



The controls are shown in sample or meters depending on the units control 

When the units are set to Meters, the distance that is being sampled is calculated using the Sound Speed and Digitization Rate.

R = Distance in Meters
D = Digitization Rate
S = Sound Speed
N = Number of Samples

R = N/D* (S/2);

5.3.13.10.5 Bin Averaging

Bin Averaging is the spatial averaging of echoes over Range. For example, if the Maximum Range is 100 meters the echoes could be averaged into 100 one meter bins.

Set the value using the numerical controls for Bin Averaging for each channel.

The controls are shown in sample or meters depending on the units control 

When the units are set to Meters, the distance that is being averaged is calculated using the Sound Speed and Digitization Rate.

For:

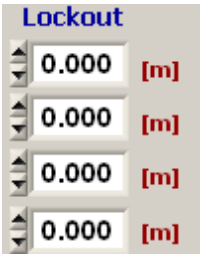
R = Averaging Distance
D = Digitization Rate
S = Sound Speed
N = Number of Samples

R = N/D* (S/2);

5.3.13.10.6 Range Lockout

The Range Lockout sets the lockout time from the start of the transmission during which the digitized data is not stored or transmitted to the PC.

Set the value using the numerical controls for Range Lockout for each channel.



The controls are shown in sample or meters depending on the units control 

When the units are set to Meters, the distance that is being is calculated using the Sound Speed and Digitization Rate.

For:

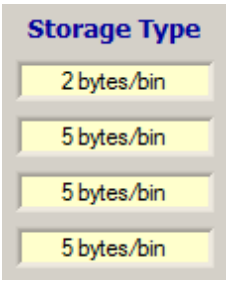
R = Range Lockout Distance in Meters

D = Digitization Rate
S = Sound Speed
N = Number of Samples

R = N/D* (S/2);

5.3.13.10.7 Storage Type

This shows the number of bytes per bin the channel will require to store per ping.
Note that non averaged data in either space or time (burst ping averaging) takes two bytes per bins and averaged data 5 bytes per bin.



5.3.13.11 Copy Phase

The 

pull down allows the user to copy the parameters in other phases. If you have a number of similar phases this speeds up the setup time.

Below is an example of the pull down when 5 phases are available.

5.3.13.12 Tx Amp Hours

The 

indicator shows the number of amp hours required to execute the phase.

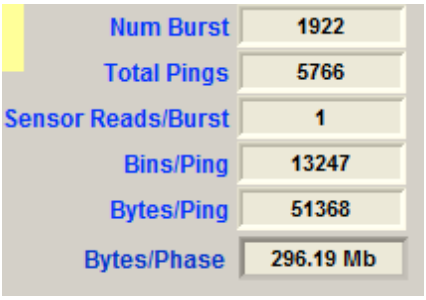
5.3.13.13 Main Amp Hours

The 

indicator shows the number of Amp Hours required for acquiring, processing and storing the pings for the current phase.

5.3.13.14 Phase Statistics

A number of indicators showing some statistics for the phase.



Number of Burst - The total number of bursts for the phase.

Total Pings - The total number of pings for the phase.

Sensor Readings Per Burst - The number of auxiliary sensor readings (temperature, tilt etc.) within each Burst for the phase.

Bins/Ping - The number of bins for each ping.

Bytes/Ping - Bytes required for the storage of one ping..

Bytes/Phase - The number of bytes required to store all the pings that will be acquired by the phase.

5.3.13.15 Profile Processing Time

The 

is the estimated amount of time required to process the last ping in a Burst, where processing means data acquisition, storage to Compact FLASH and/or transmission over RS232.

When the control is GREEN it is estimated that there should be time available to process the ping with no over runs. An over run means that there is insufficient time to process the final ping before the next Burst is due to be acquired.

If the control is YELLOW then some ping overruns may occur especially during a change in data storage files. A new file is created every hour on the unit.

If the control is RED then it is very likely that some data overruns will occur.

Overruns cause the start of the following ping to shift in time and cause loss of data.

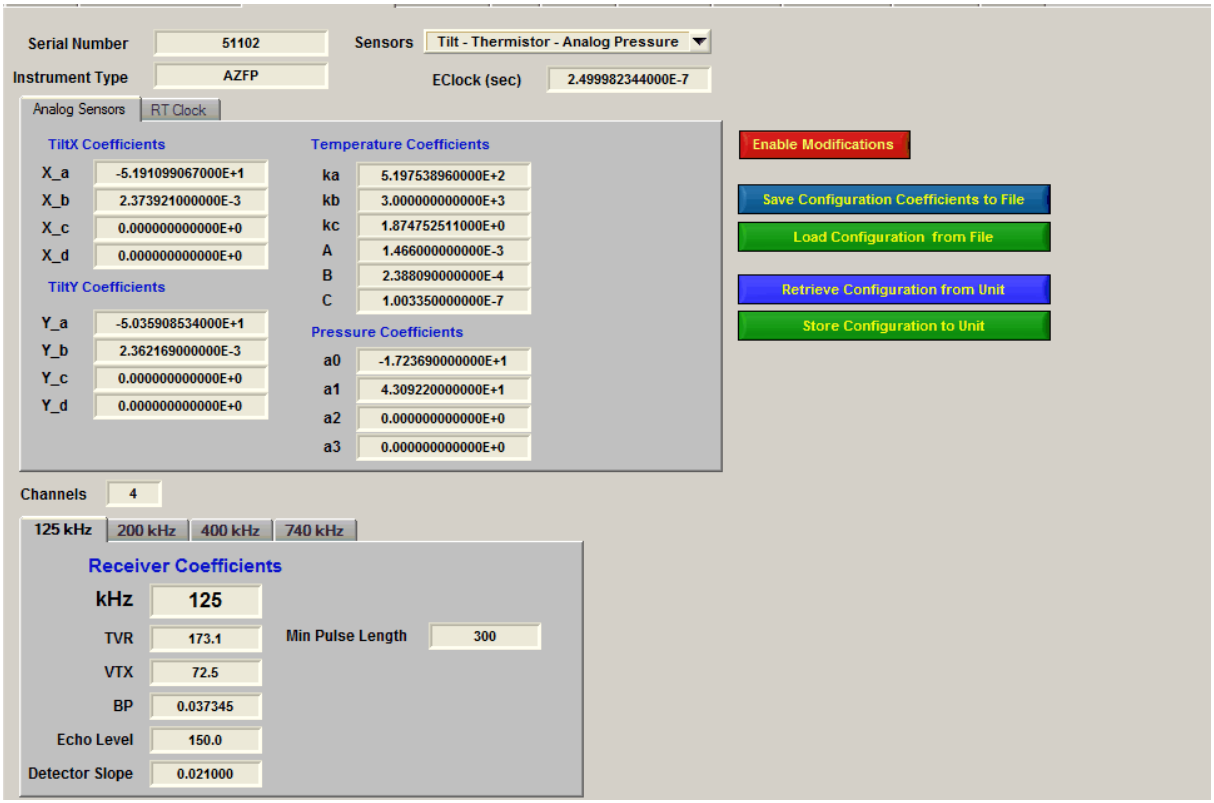
5.4 Coefficients Tab

The Coefficient tab shows the units configuration in terms of the sensors it contains as well as the coefficients required to convert the sensor data into engineering units. This information can be retrieved from the instrument when it is connected to the PC, saved to a file, loaded from a file or if required stored to the instrument. Do not store a configuration to the instrument unless advised to do so by ASL as the values are typically set at the factory .

Unlike previous versions of the AzfpLink software and firmware the AzfpLink Coefficients tab now includes acoustic coefficients for a calibrated instrument. The coefficients are used to convert the digitized returns to volume backscatter (Sv) and/or target strength (Ts) in dB.

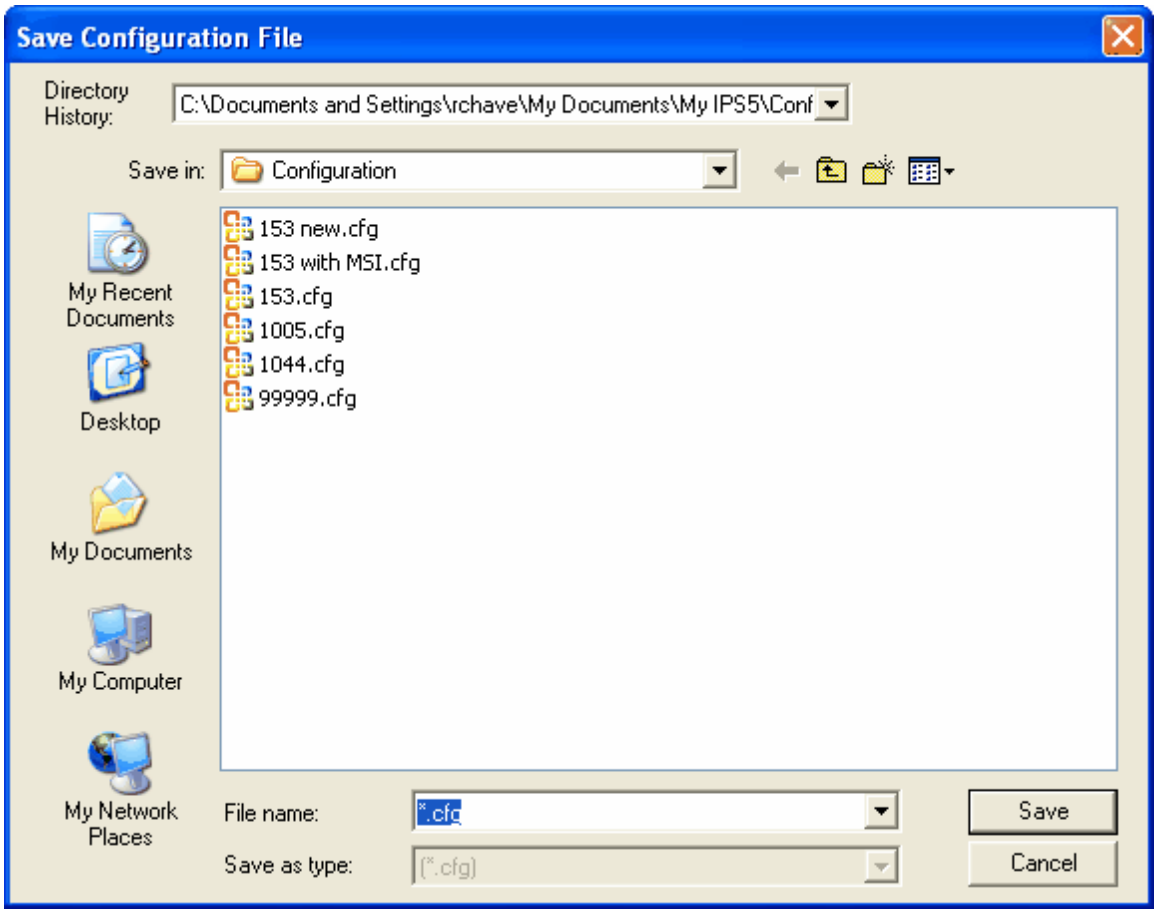
Below is an example of the panel for an instrument with four acoustic channels and an analog pressure sensor.

An instrument's configuration should not be changed unless authorized by ASL Environmental Sciences. The coefficients are set in manufacturing



5.4.1 Save Configuration to File

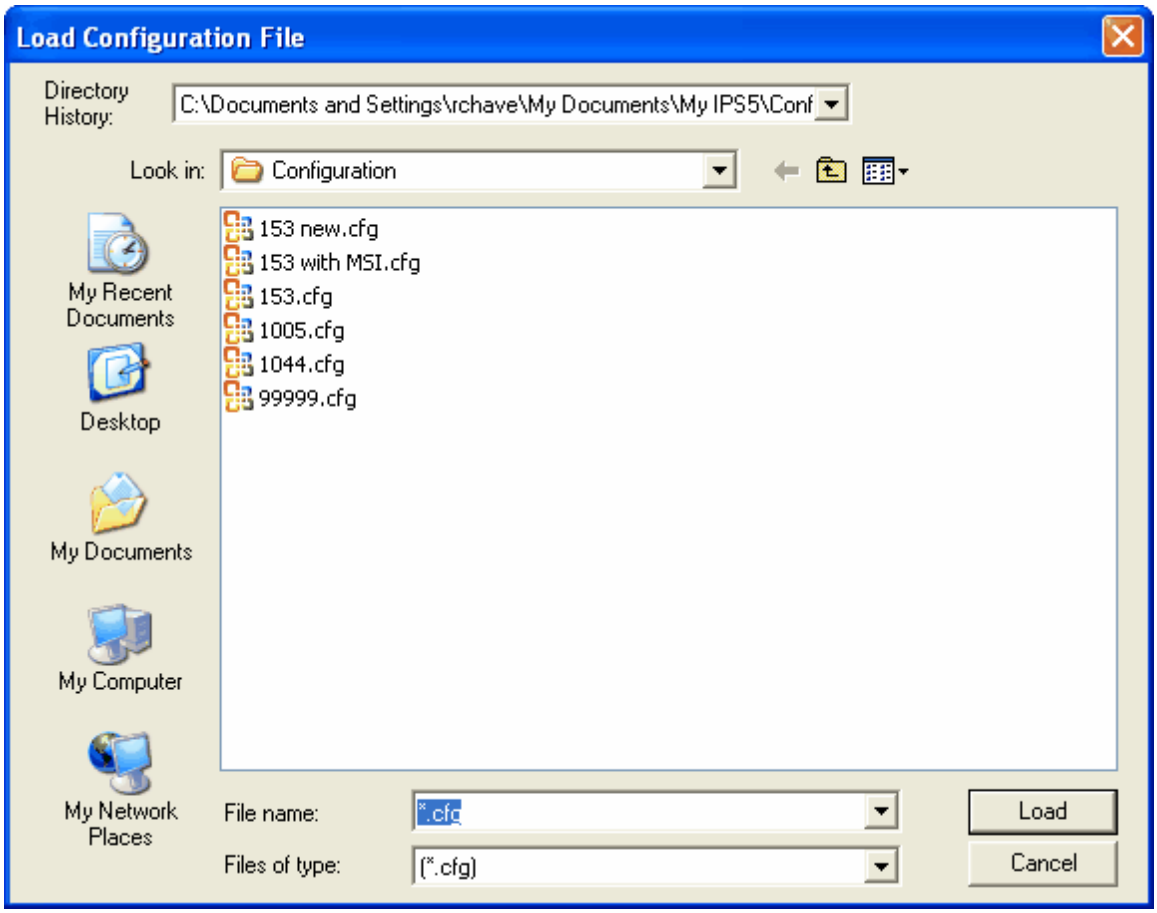
The Save Configuration to File command button is used to save configuration information to a file. When clicked, a file selection popup appears.



Enter a file name and then click on the Save button.

5.4.2 Load Configuration from File

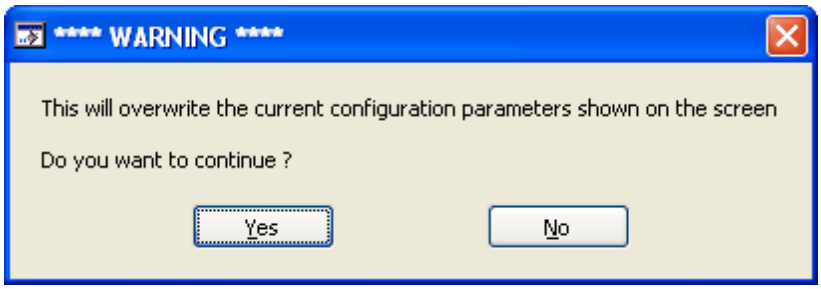
The Load Configuration from File command button is used to load a configuration from a configuration file. A file select popup appears.



The configuration is loaded and displayed on the Configuration tab.

5.4.3 Retrieve Configuration from Unit

The **Retrieve Configuration from Unit** command button is used to retrieve configuration parameters from a unit. The unit must be in STANDBY mode for this function to work. Click on the button to start the process and a warning message appears.



Click Yes to continue.

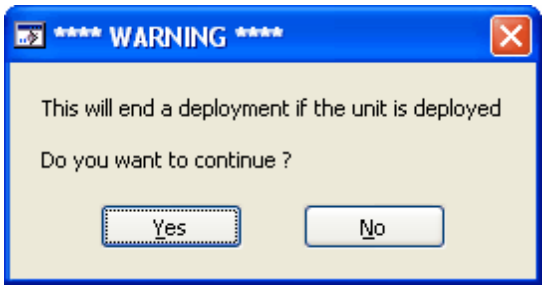
5.4.4 Store Configuration to Unit

The 

command button is used to program the configuration information to the unit.

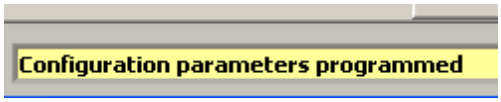
*** Great care should be taken when making these changes as wrong configuration parameters will cause problems in future data processing.

When the button is clicked a warning message appears.



Click yes to continue.

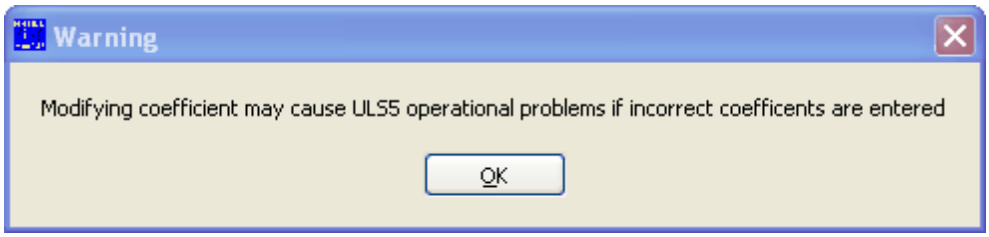
If the programming is successful a message in the yellow status bar at the bottom of the main panel will appear as follows:



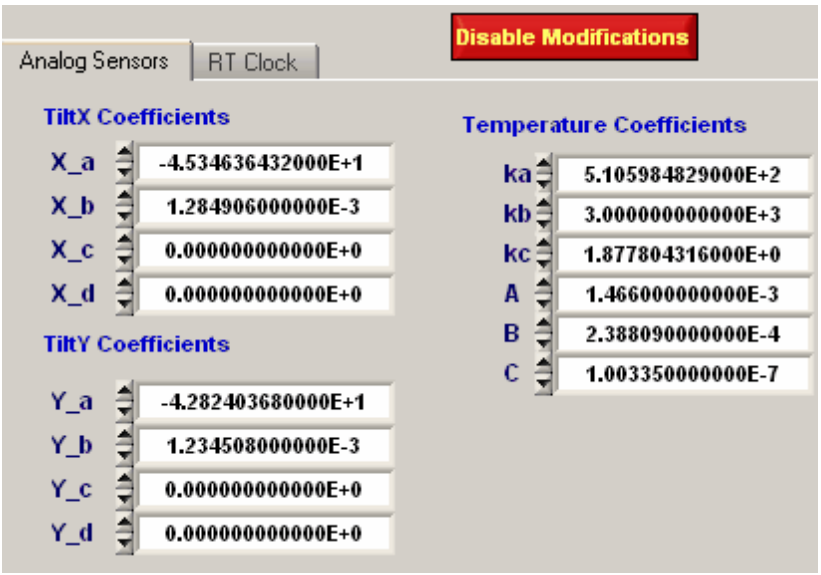
5.4.5 Enable Modifications

The 

command button is used to enable the modification of all parameters found on the Configuration tab.
A message will appear.



Note the addition of decrement and increment arrows on the numeric controls.



The command button changes to "Disable Modifications" to disable modifications.

*** DO NOT CHANGE PARAMETERS UNLESS INSTRUCTED TO BY THE MANUFACTURER ***

5.4.6 Instrument Type

The instrument type validates that the coefficients for the correct type of instrument are installed.

5.4.7 Serial Number

The Serial Number is the AZFP the serial number for which the configuration parameters are designed for. Attempting to program these configuration parameters to another unit will not work.

5.4.8 Sensors

The Sensors pull down control shows the sensors that are installed in the unit.

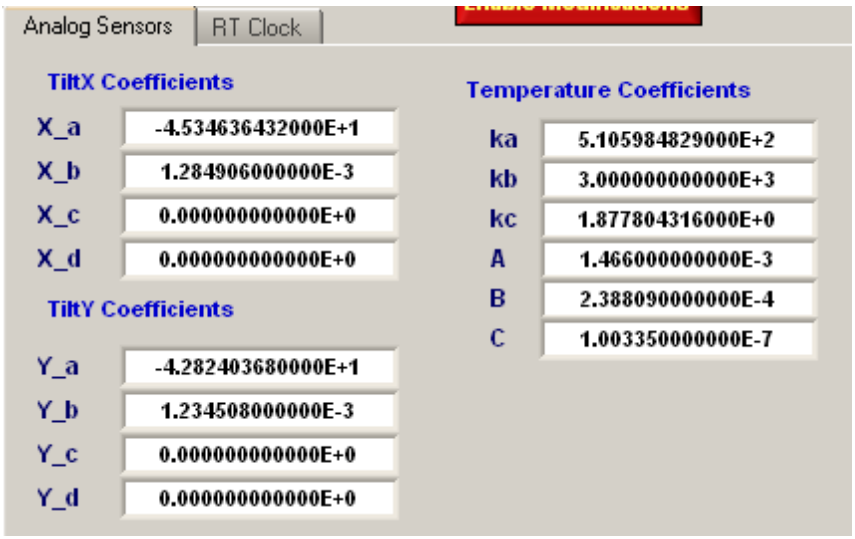
The example below shows an analog pressure sensor is installed.

5.4.9 E-Clock

The clock that runs the CPU is used for driving counters and timers for the measurement of some sensor parameters. The clock is divided down by 4 and that period is used in the measurements. The nominal value for the E-Clock should be 1/4000000 or 0.00000025. The value input to this control is the actual measured period.

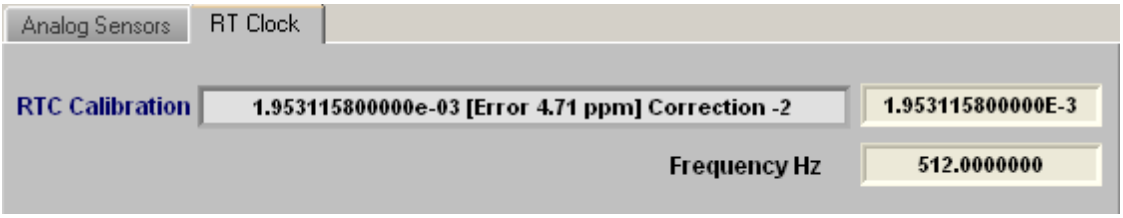
5.4.10 Analog Sensors Tab

The Analog Sensor tab is a tab that contains the coefficients for the analog sensors installed on the instrument. The coefficients are used to convert sensor raw counts to engineering units. These values are provided by the manufacturer and should not be changed unless instructed to do so.



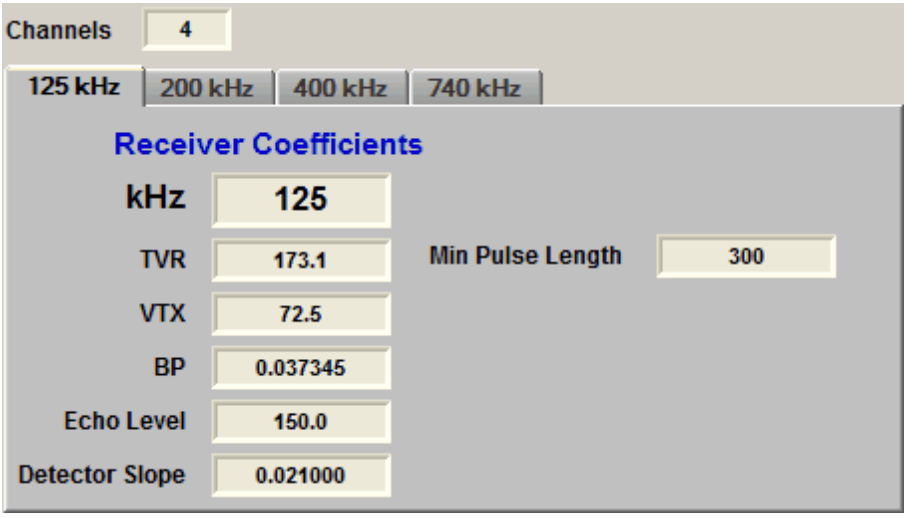
5.4.11 RT Clock Tab

The RT Clock tab contains a calibration parameter for the units Real Time Clock. These values are provided by the manufacturer and should not be changed unless instructed to by the manufacturer.



5.4.12 Acoustic Coefficients

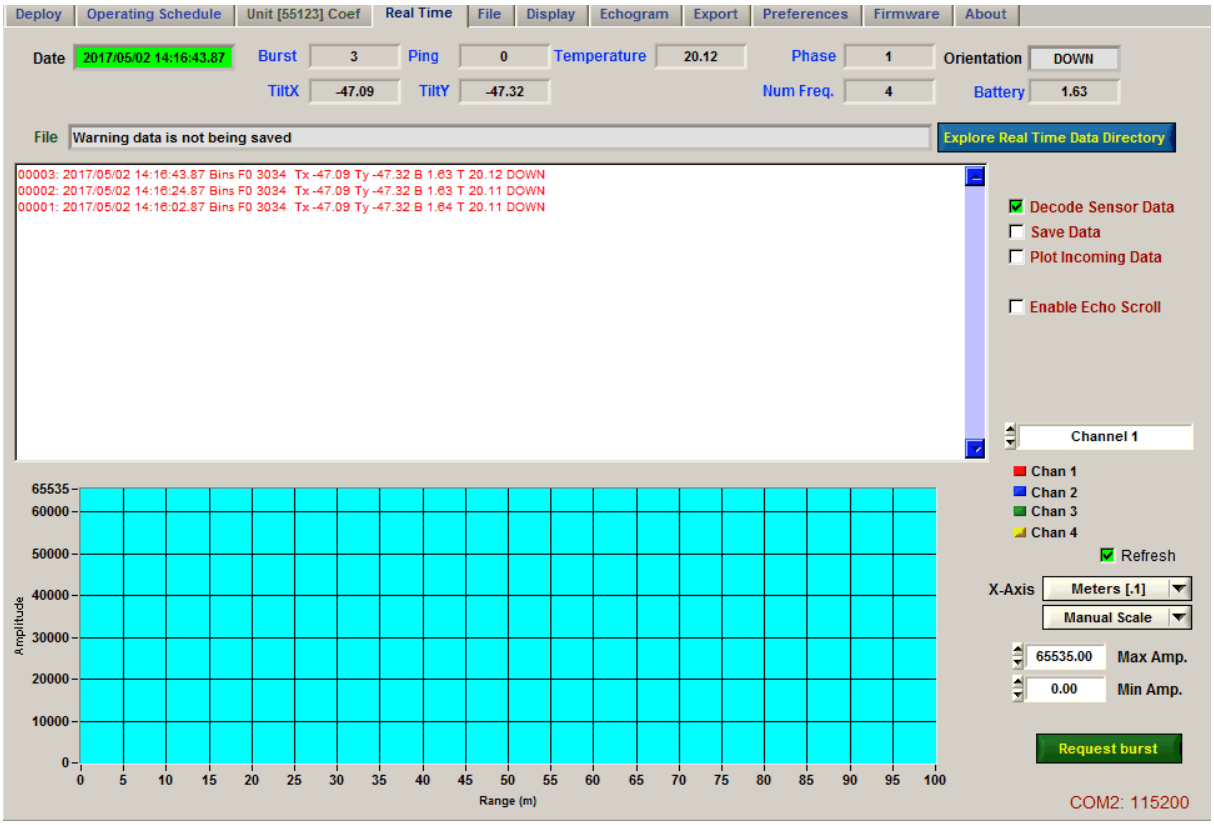
The indicators and controls shown below provide information for the acoustic channels including frequencies and calibration coefficients. These values are provided by the manufacturer and should not be changed unless instructed to by the manufacturer.



The channels indicator shows the number of acoustic channels installed. There is a corresponding tab for each channel showing the frequency and the calibration coefficients for the channel.

5.5 Real Time Tab

If the AZFP unit is programmed to upload target and ping data over the RS232 port, the Real Time tab displays and plots the data as it is received.



The 

enables or disables an option to view the profiles being captured by AzfpLink in a scrolling echo-gram.

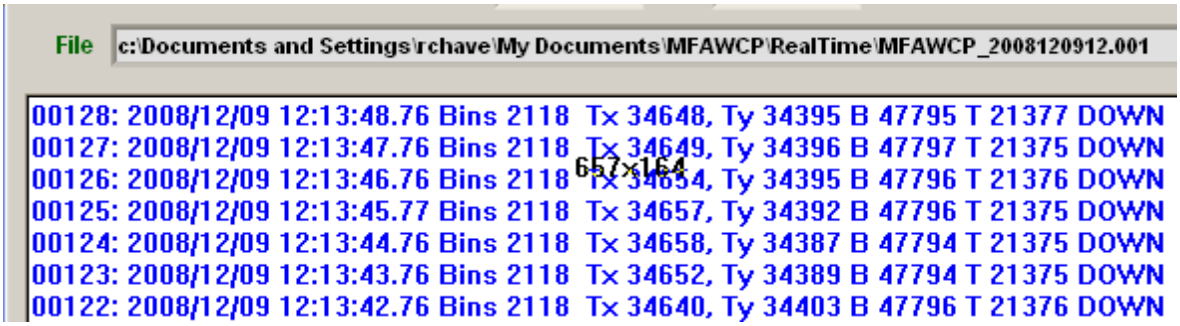
The panel above shows the headers as the data is acquired and plots it if the 

checkbox is enabled.

The 

checkbox enables or disables the decoding of sensor data for display as the data comes in.

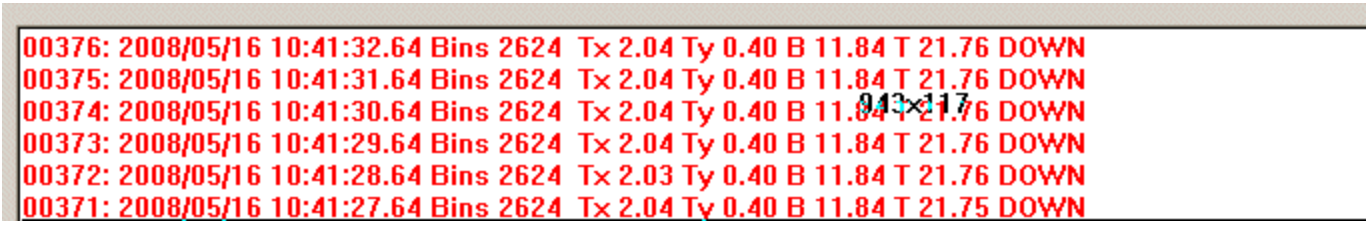
Below is an example of the headers with raw sensor data.



The 

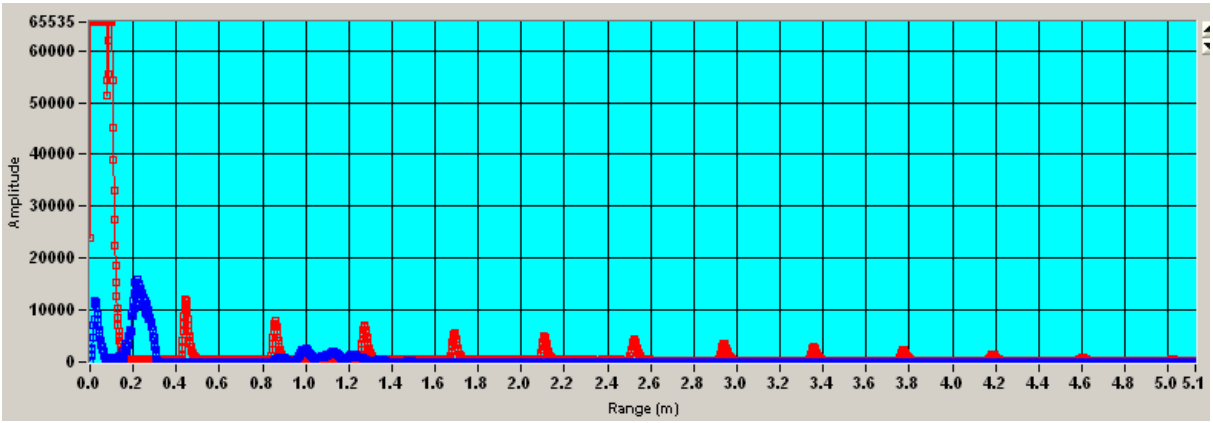
checkbox enables or disables the saving of the ping data as it is received by AzfpLink.

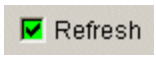
If data is not saved the header information is shown in RED.



The 

control allows the user to select which frequencies to display for each ping. All frequencies can be shown at once.



The 

checkbox enables or disables the refresh of the graph for every new ping that comes in.

The 

pull down is used to sent the x-axis to meters or 

(bins).

The 

pull down selector allows the user to auto-scale or manually scale the y-axis.

If manual scale is chosen the 

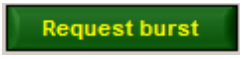
numeric controls are used to select the axis range.

Note that the header information for each ping is shown as the ping are received.

Note the Battery control shows the battery voltage. The Orientation indicates if the unit is pointed up (shown as "UP") or is upside down or on its side (shown as "DOWN").

The file being written is shown and a command button allows you to explore the data directory.

5.5.1 Request Burst Command

The 

command button sends the #PG command to the unit requesting a burst of data. The unit must not be deployed for this command to work. The command causes the AZFP to acquire one profile and send it up the RS232 if RS232 transmission is enabled.

5.5.2 Scrolling Echogram (new)

A new feature in AzfpLink is the ability to view real-time data received on the RS232 in a scrolling echogram. This feature will plot profiles transmitted by the the AZFP as counts, Sv or Ts. The Sv and Ts values are computed by AzfpLink as the data is received.

To allow the instrument to ping as fast as possible the following changes have been made to the AZFP beginning with Firmware version 3.18.

- The operating BAUD rate can be boosted by up to 4 times the standard 115200 BAUD to 460800 BAUD.
- The AZFP can be programmed to only send up specific channels while still acquiring data on all channels and storing them on the AZFP's internal storage system or Compact FLASH card. Programming the channels to be sent up the RS232 is done in the Operating Schedule tab.

It should be noted that testing in a lab environment should be done before field work to confirm that the higher BAUD rates will work on the cable lengths being used. The PC should also be tested to confirm it has the speed to compute and plot the echograms.

This Echo Scroll feature is activated by setting the checkbox 

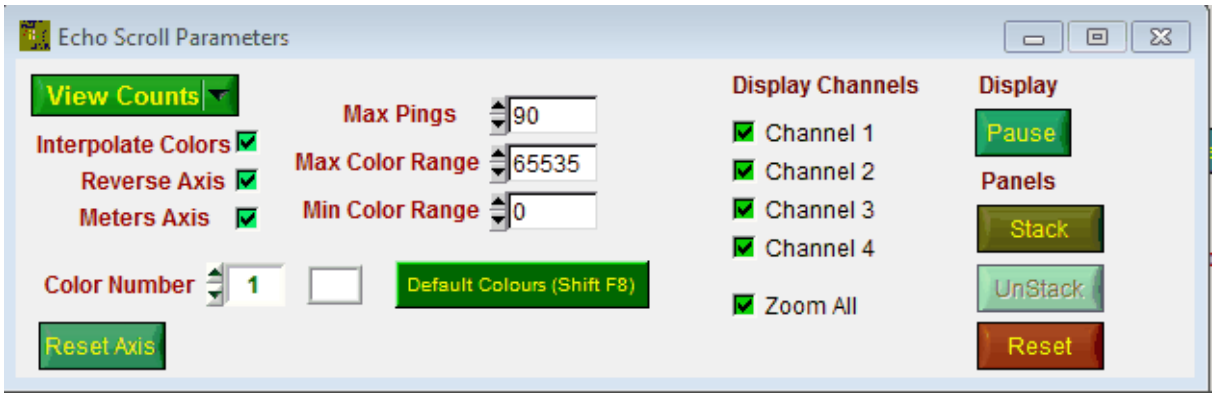
in the Real-Time tab.

Start the AZFP before activating the Echo Scroll. Once data is being retrieved click on the 

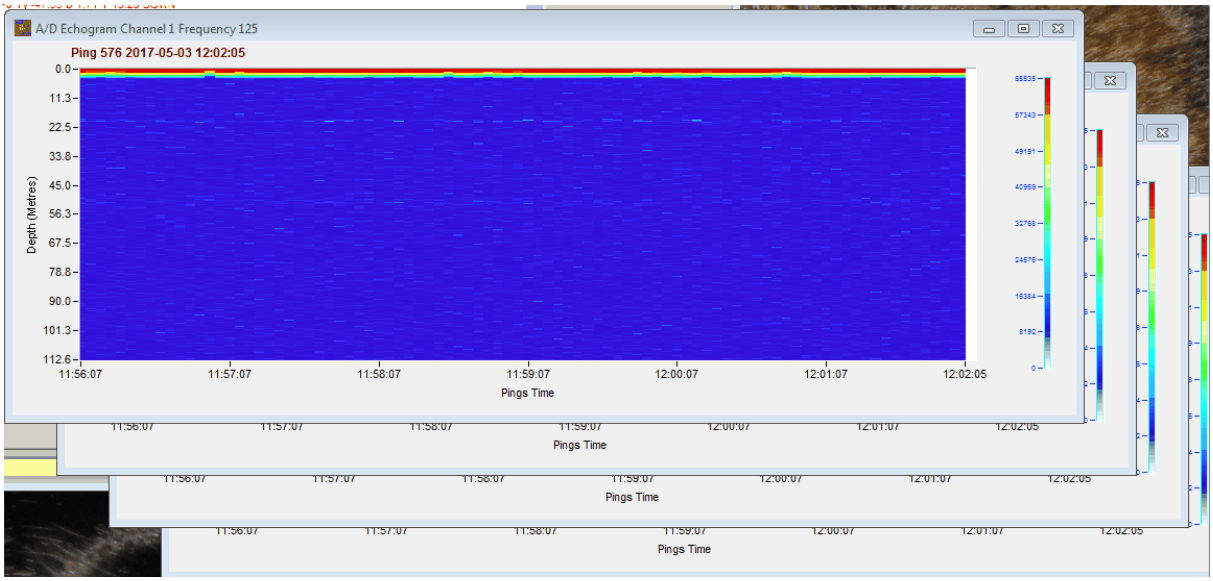
check box.

This following panels appears.

The echo scroll parameters panel.

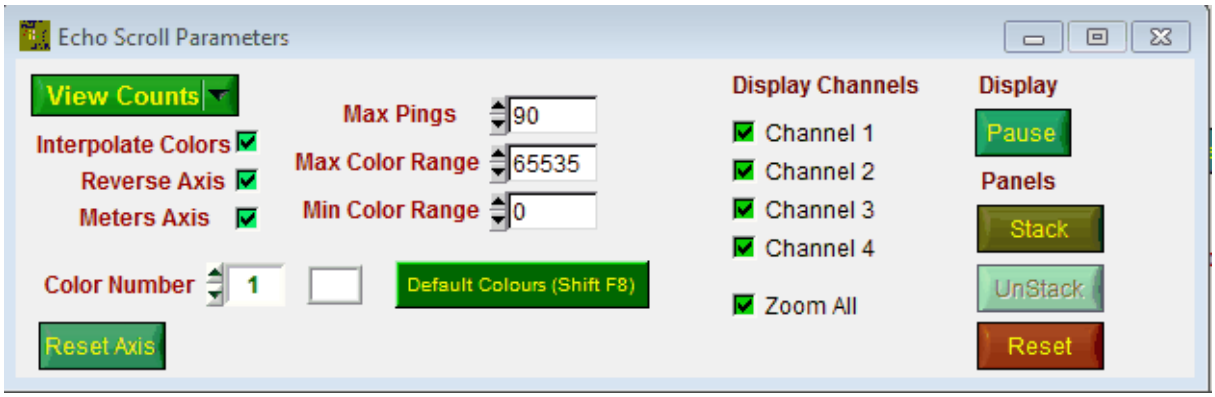


Up to four graphs one for each channel of data being transmitted by the AZFP.

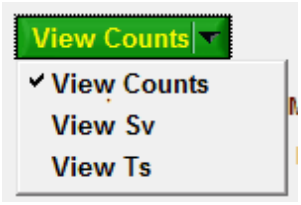


5.5.2.1 Scrolling Echogram Control Panel

The scrolling echogram control panel contains a number of command and selection control.



5.5.2.1.1 Data Type

Select the data type using the pull down selector 

you want to plot.

5.5.2.1.2 Interpolate Colors

The 

checkbox allows the user to turn on or off the interpolation of color values.

5.5.2.1.3 Reverse Axis

This toggle 

reverses the Y axis of the graph.

5.5.2.1.4 Meter Axis

The 

checkbox is used to change the y axis graph from bins to meters.

5.5.2.1.5 Max Pings

The 

numeric control sets the maximum number of profiles that plotted per graph.

5.5.2.1.6 Color Range

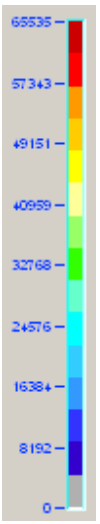
The 

is the color range when plotting counts. When Sv or Ts is plotted the ranges are in Db.

5.5.2.1.7 Default Colours

The 

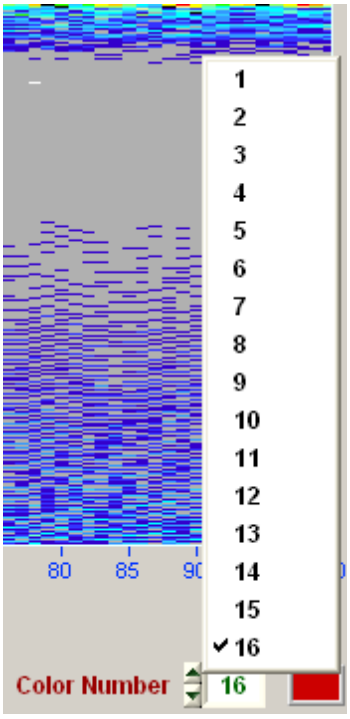
command button resets the colors to the program default.



5.5.2.1.8 Setting Colours

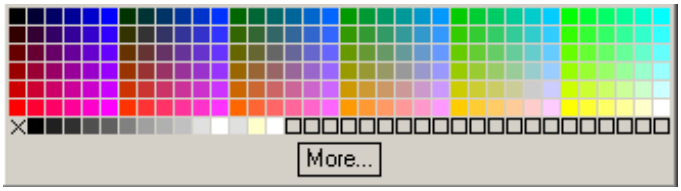
The numerical values for the 16 colors that make up the color range can be set by the user.

Select the color you wish to change by selecting the color number pull down control.



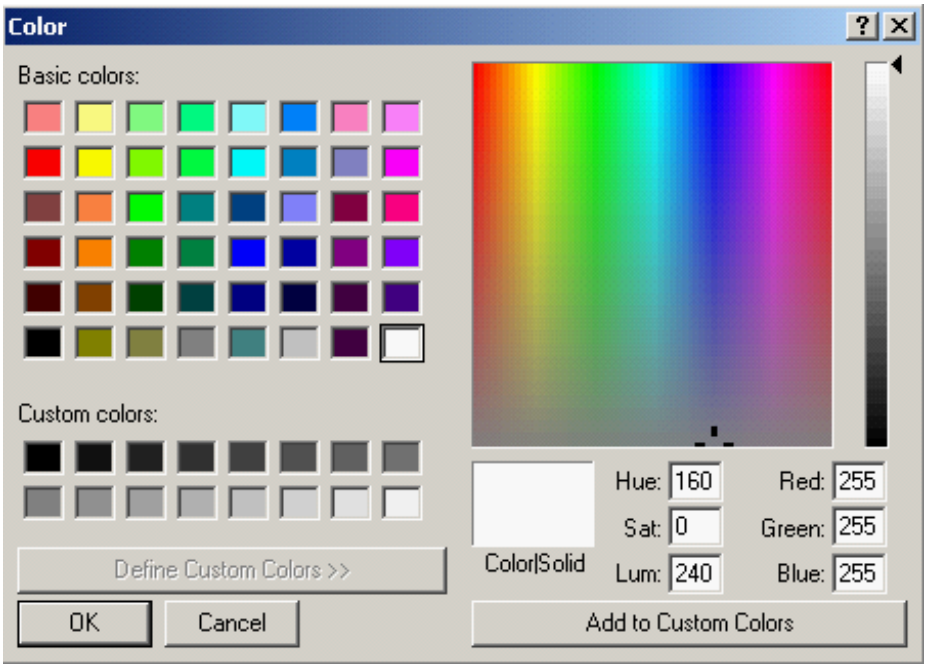
Select any of the 16 colors. The colors are numbered from 1 to 16.

To change the color click on the color control and select a color.



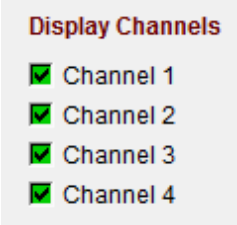
Clicking the 

button in the color popup allows the operator to select a wider range of colors.

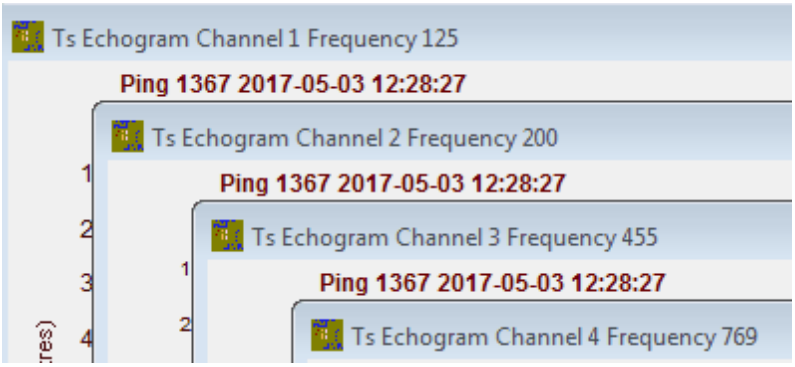


5.5.2.1.9 Display Channels

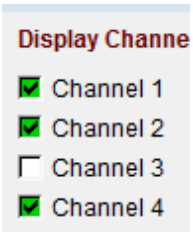
You can select or deselect channels to view.

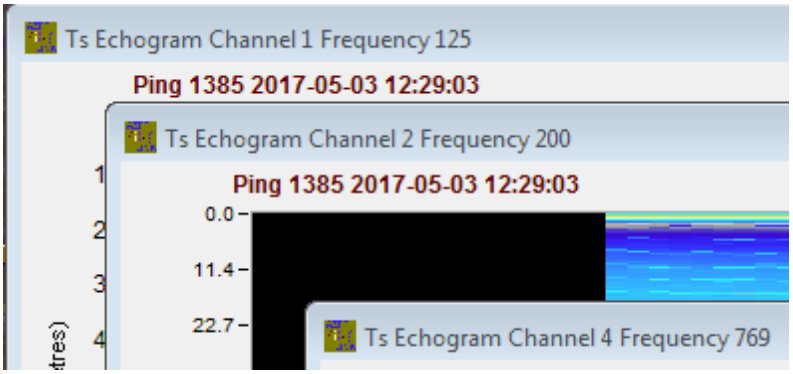


shows all graphs.



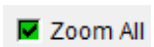
Deselecting a channel causes its graph to be hidden.



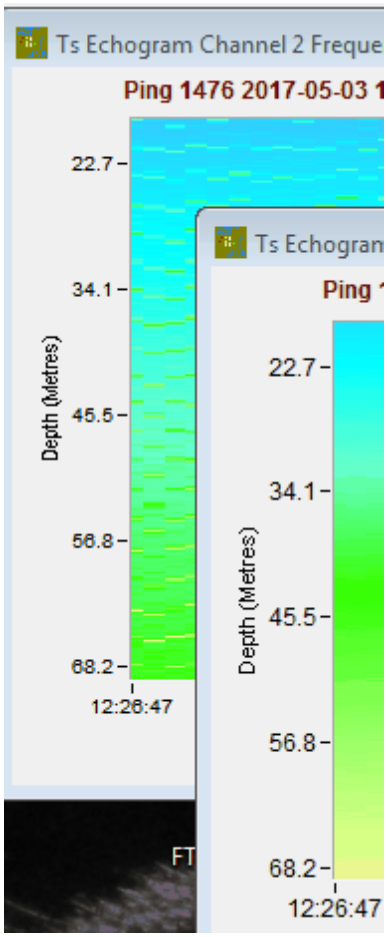


5.5.2.1.10 Zoom All

Any graph can be zoomed into by pressing the Ctrl key and the left mouse button while the mouse is focused on a graph.

If 

is selected all the graphs are zoomed in the same way when one graph is zoomed.



5.5.2.1.11 Reset Axis

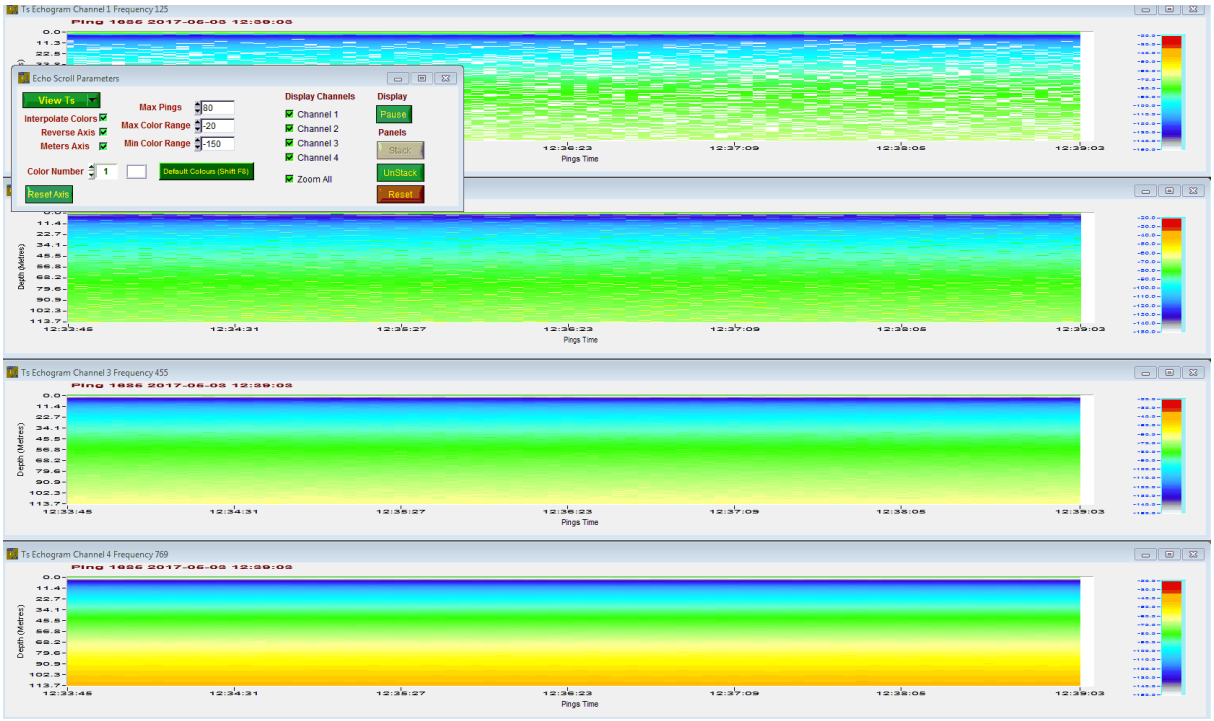
If the graphs have been zoomed the Reset Axis command button resets the graphs to their original settings.

5.5.2.1.12 Pause

The Pause command button causes the plotting of the data to be paused. A Go command button appears to continue the plotting. No data is lost during this and the graph is updated to include all pings that have come in during the pause. If the pause is too long then some data will not appear.

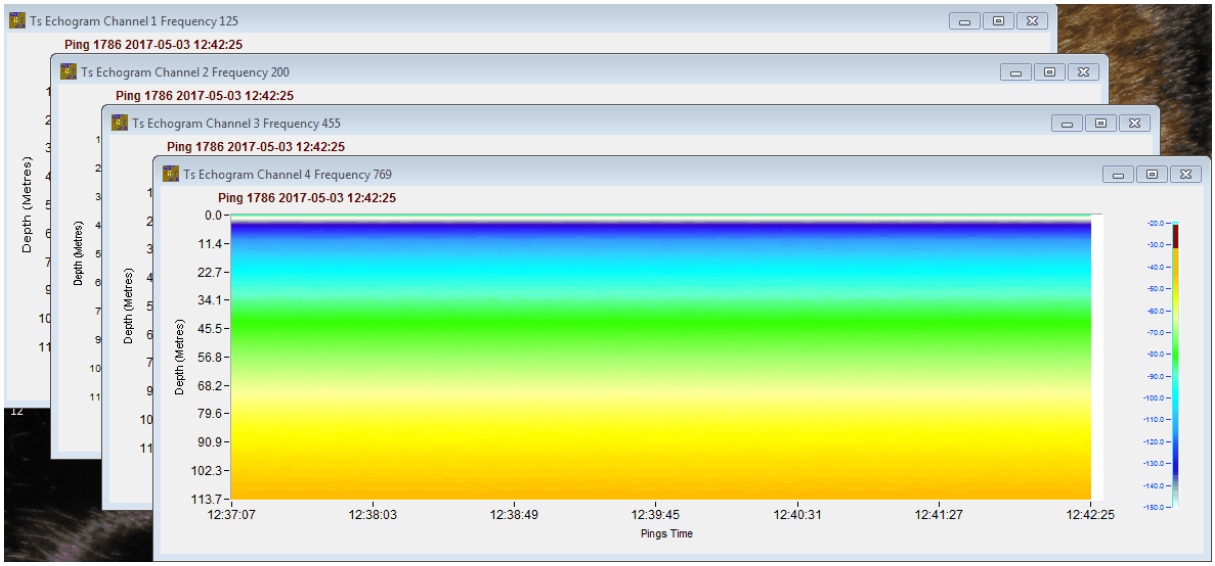
5.5.2.1.13 Stack

The Stack command button causes all the active graphs to be stacked on top of each other in the window. The UnStack command button becomes active to unstack the graphs.



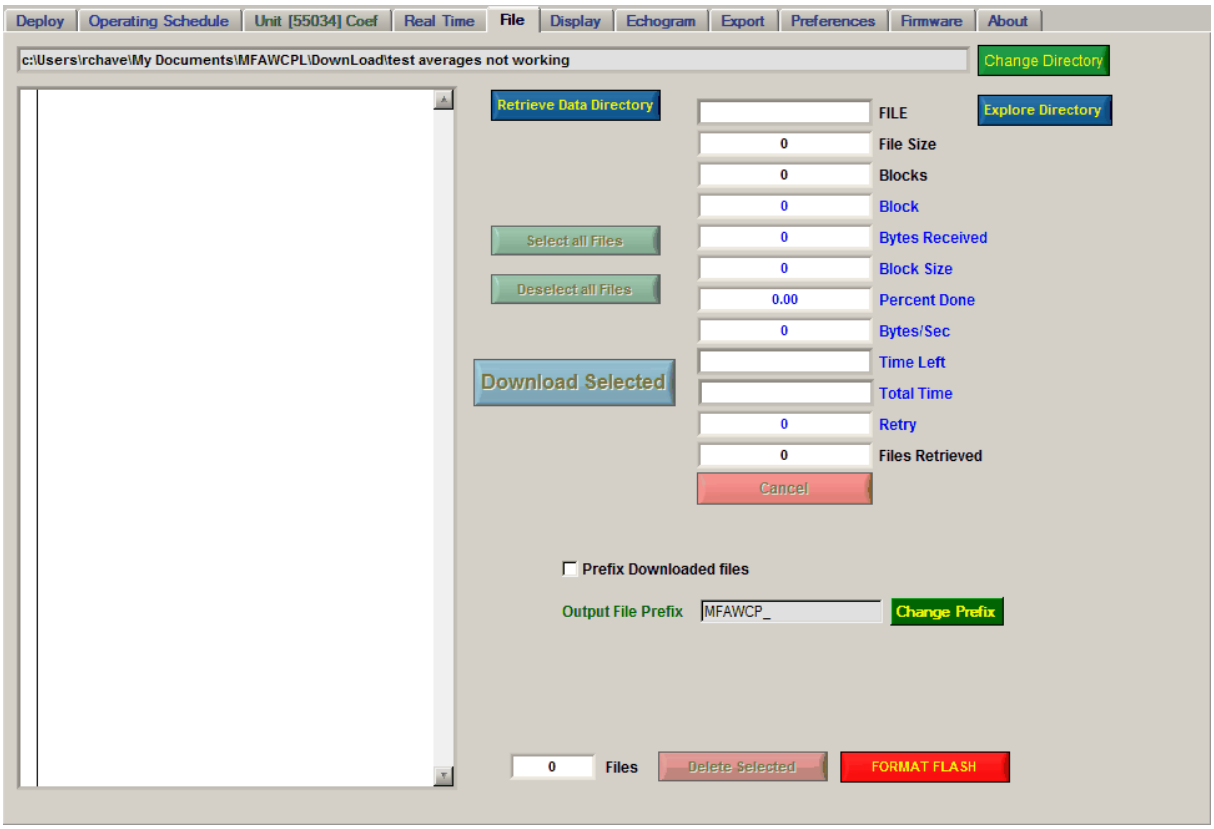
5.5.2.1.14 Reset

The  command button resets the positions of the windows to their default positions.



5.6 File Tab

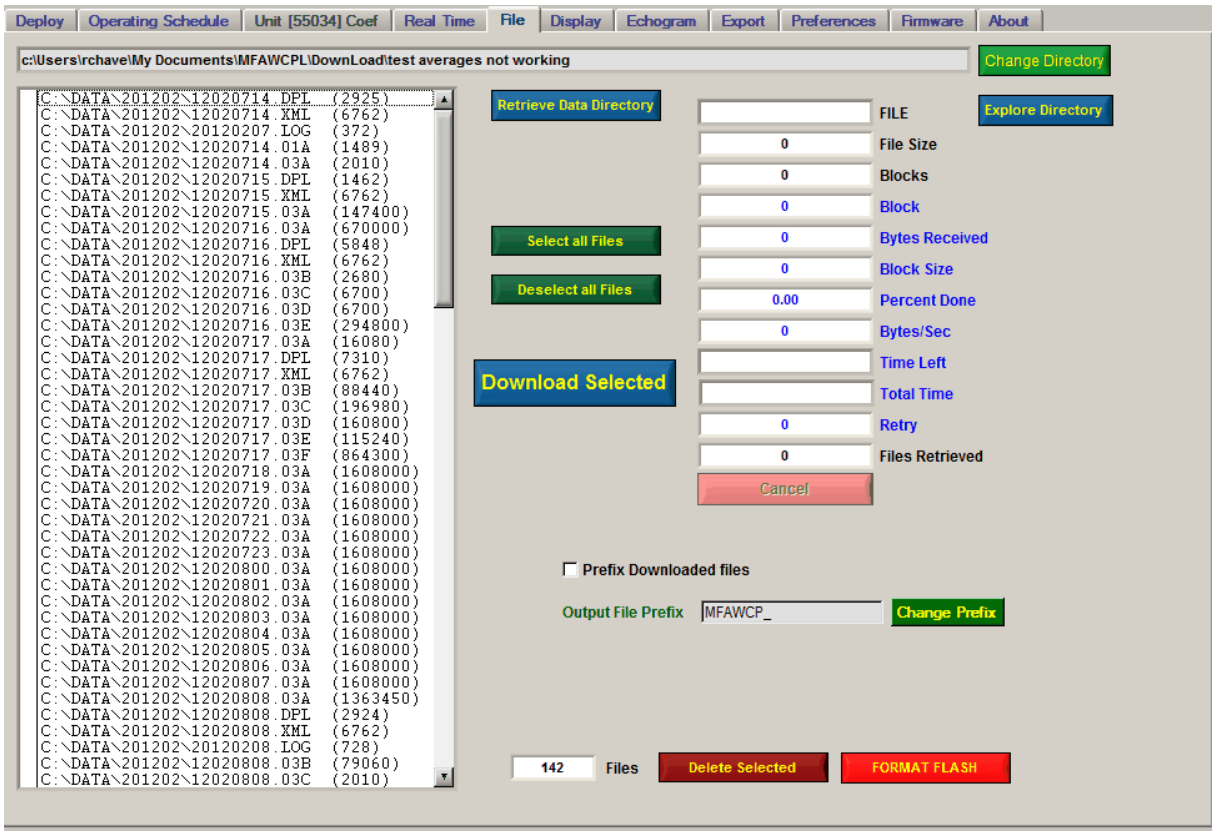
The File tab is used to retrieve data from the units memory (Compact FLASH (CF)) , delete specific files from the CF and to format the CF.



5.6.1 Retrieve Data Directory

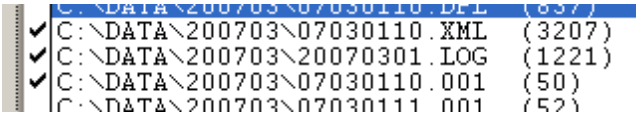
The 

command button is used to retrieve the directory of files in the AZFP unit. The unit must be in STANDBY mode for this operation to work.



5.6.2 Selecting Files to Download or Delete

Files must be selected for download or delete. The are selected by clicking on the column to the left of the file name which produces a check mark to the left of the file name.



All files can be selected by clicking on the 

command button or deselect ed by clicking on the 

command button.

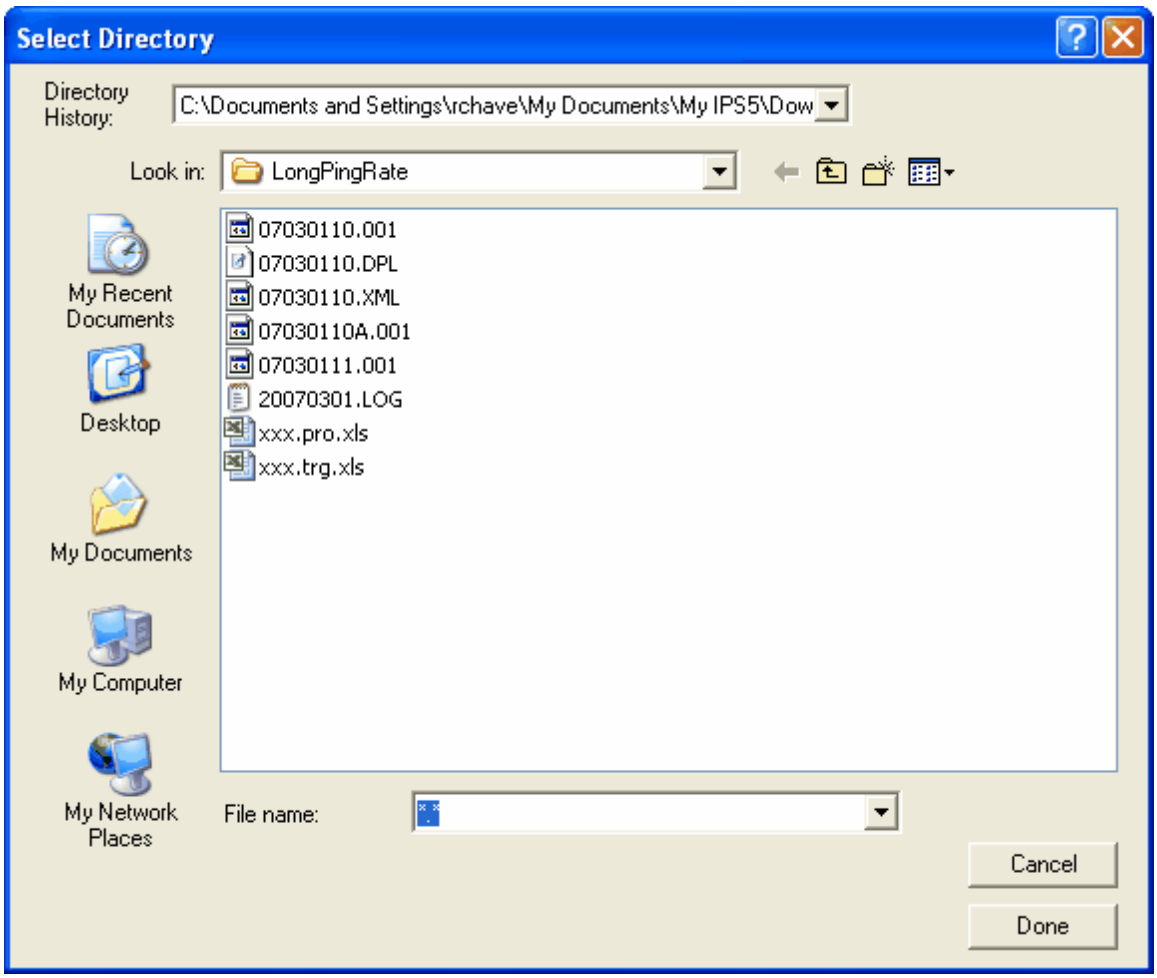
5.6.3 Download Directory

The download directory is the location that files will be stored as they are retrieved from the unit. Note that the directory structure in the unit is not maintained.

5.6.4 Changing the Download Directory

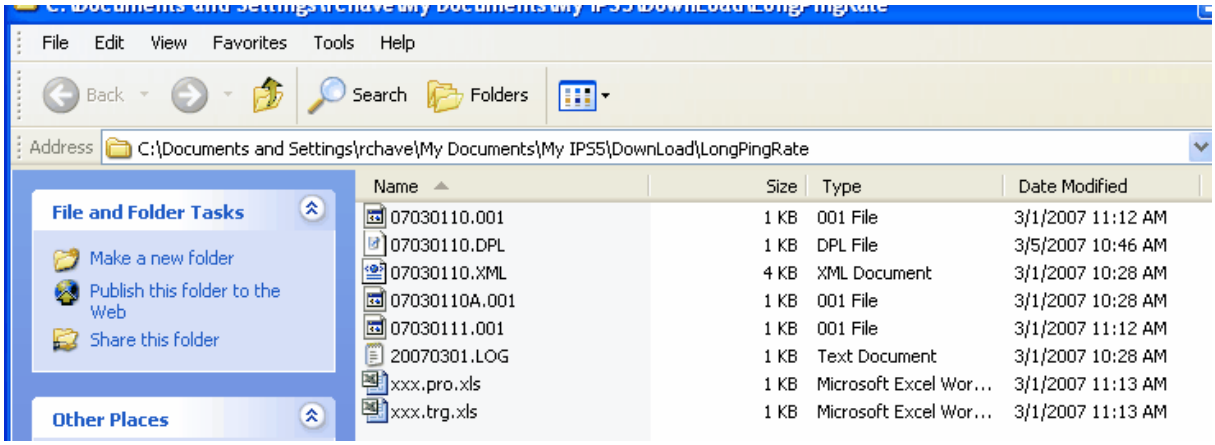
To Change the Download Directory click on the Change Directory command button.

A directory selection/creation popup appears.



5.6.5 Explore Download Directory

The Explore Directory command button causes the program to launch Windows Explorer with the contents of the Download Directory.

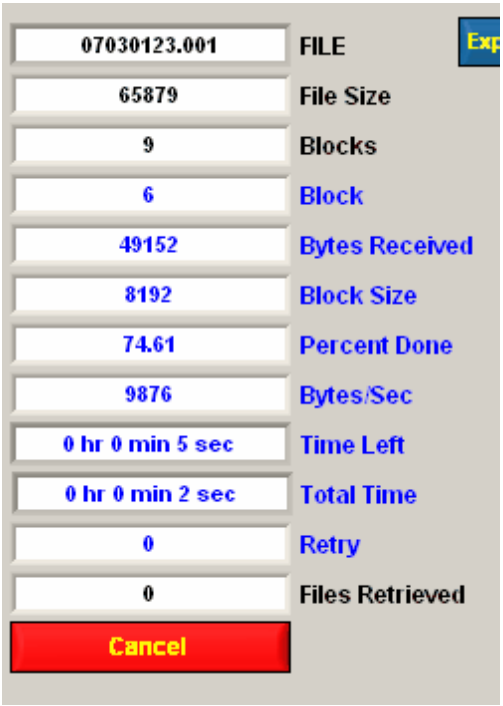


5.6.6 Downloading Files

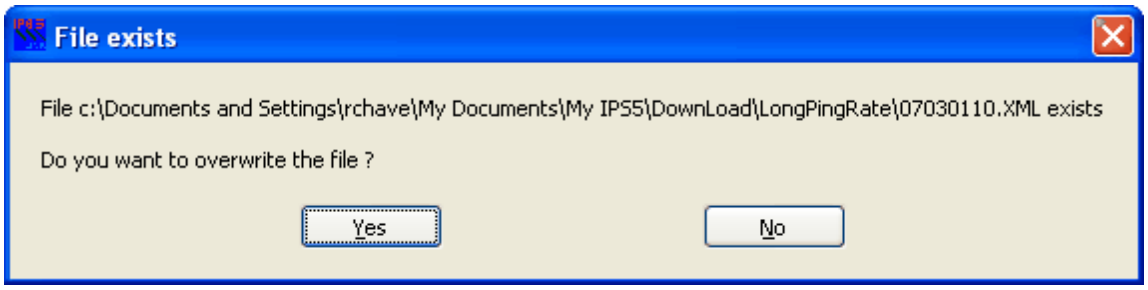
To download the selected files, click on the 

command button.

Information on the download indicators shows the progress of the download. A Cancel button is provided to cancel the download.



If a file already exists on the PC with the same name then the program displays a warning popup.



5.6.7 Prefix Download Files

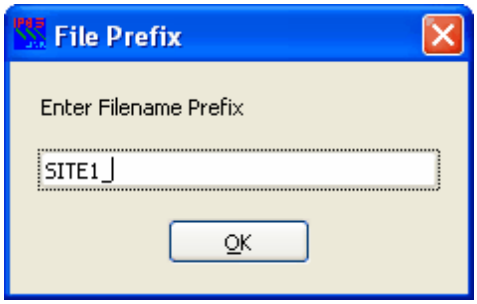
Files on the unit are of the form YYMMDDHH.PPP where YY is the year, MM is the month, DD is the day, HH is the hour and PPP is the phase the data was collected with. There is an option to prefix the name of these files with a user selected prefix. For example, you may wish to prefix all the file names with SITE1_. To do this enable the prefix by clicking on the 

to enable it 

.

Change the prefix to your selection by clicking on the 

command button.

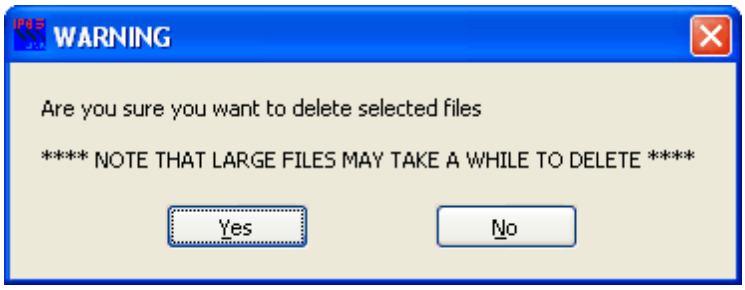


Download files will now have the SITE1_ prefix added to the file names.

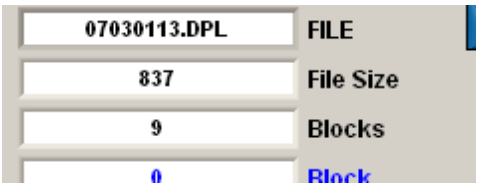
5.6.8 Deleting Selected Files

To delete selected files click on the 

command button. A popup warning comes up.



The files are deleted. These are shown in some of the indicators.



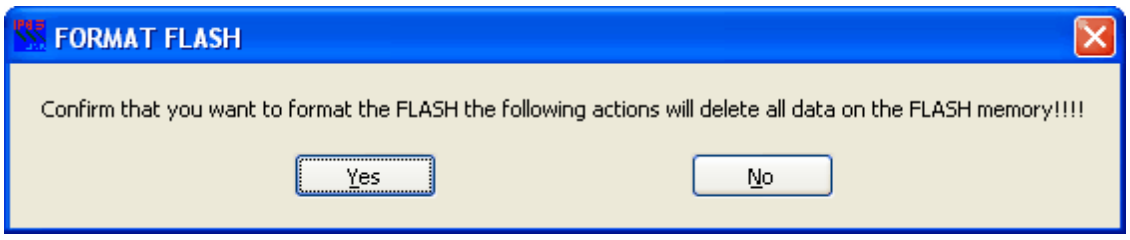
*** Formatting the CF is preferable to deleting files and quicker.

5.6.9 Formatting the CF

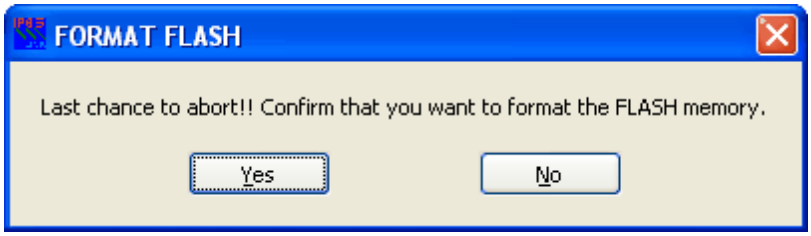
The best way to delete all the data on the CF is to format it. This starts the CF fresh in case any type of file corruption has occurred. As well, the file delete function does not delete sub directories so it is possible to have a number of sub directories with no files remaining after the files within them have been deleted.

Click on the FORMAT FLASH command button.

A warning message comes up.

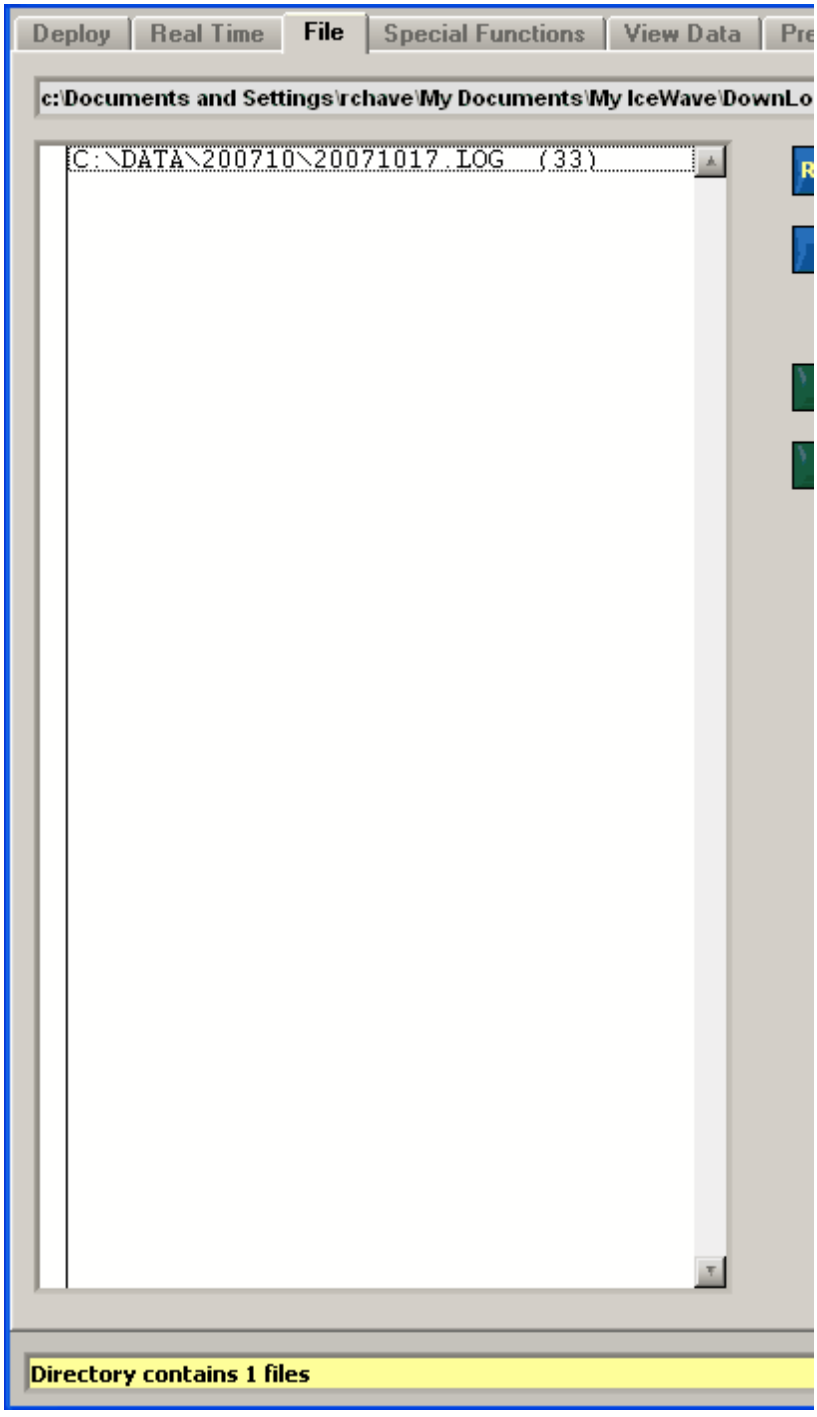


The formatting of the CF is a critical function. It is performed by placing the CPU in the unit under a DOS like O/S called PicoDOS and then executing a format c: command. When the c:> prompt is detected a second warning is provided to allow the user to abort the formatting.



Click Yes to start the format processing which can take several seconds depending on the size of the CF.

As a test the unit will write a log file to the CF.



*** Warning ***

If this command fails it is possible that the unit has remained in its native PICO DOS operating system. If this is the case you must enter the terminal emulator and enter "Reset". Alternatively you can power the instrument off and then on.

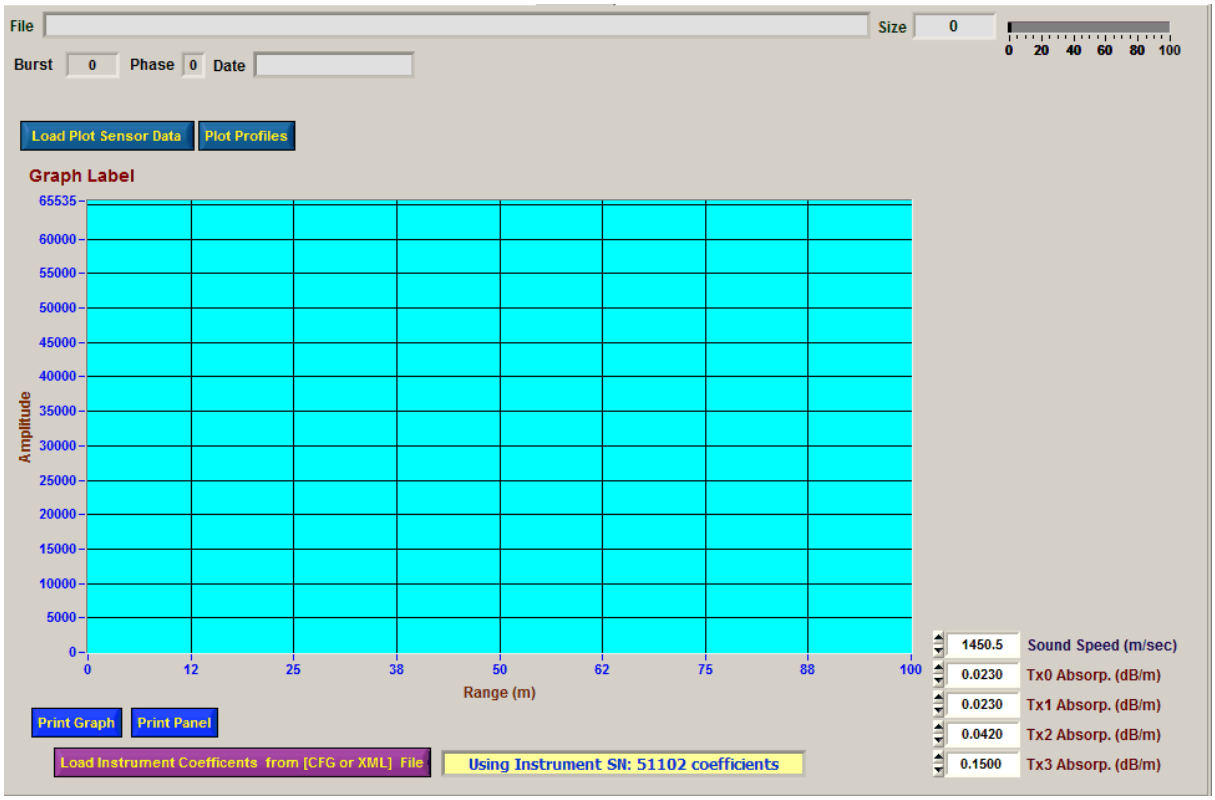
5.6.10 Compact FLASH Formated by Other Devices

Do not use compact FLASH that has been formatted by other devices such as Cameras. Using these compact FLASH will cause the unit to fail.

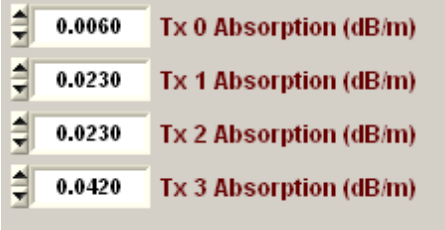
5.7 Display Tab

The Display tab is used to display the data from files retrieved from the unit and/or stored by AzfpLink when it stores real time data. The tab can display sensor or ping data. The ping data can be viewed as acoustic volume backscatter (Sv) or target strength (Ts).

The Computation of range in meters scales is based on the Sound Speed which is entered on the tab.



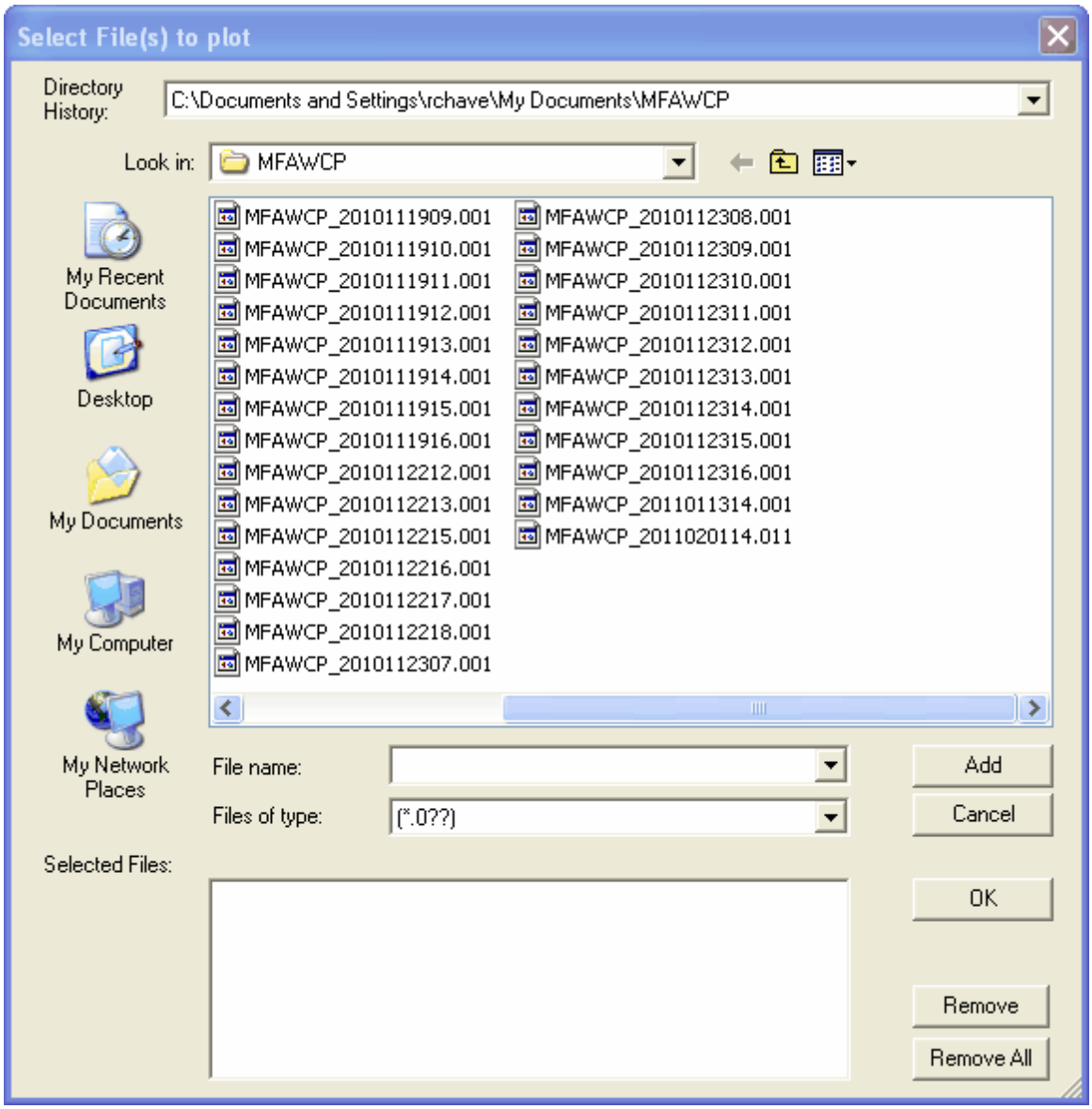
If the unit has calibration coefficients the user should set the absorption values for each channel.

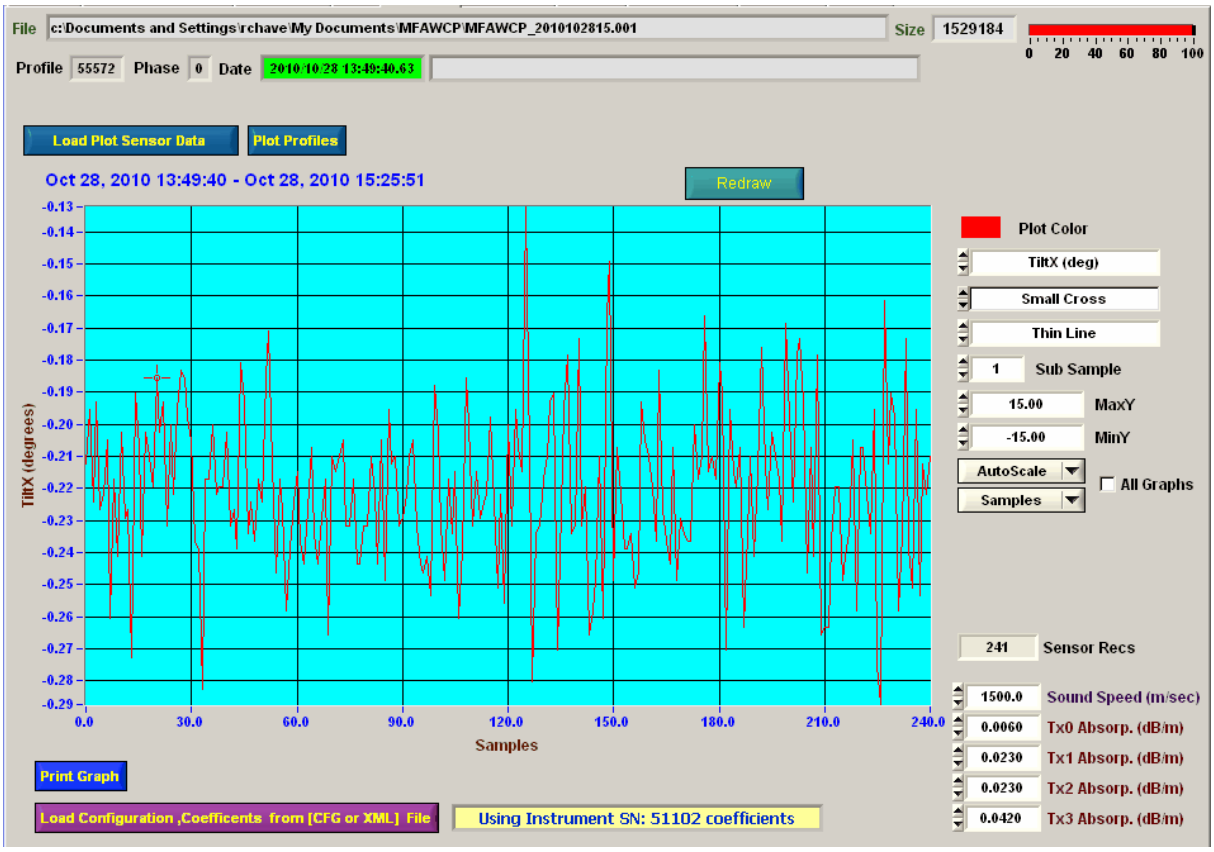


5.7.1 Load Plot Sensor Data

The 

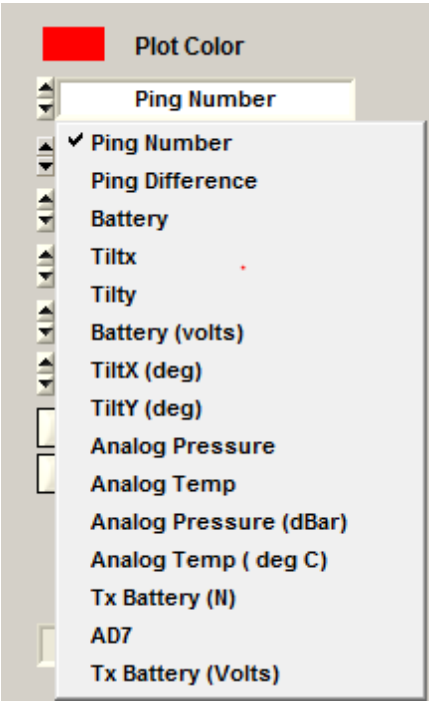
command button is used to load data into memory for display on the graph. The maximum amount of data that can be loaded is set in the Preferences tab. A popup "file select" control appears, select the files then click on the Ok button.





5.7.1.1 Selecting Data to Plot

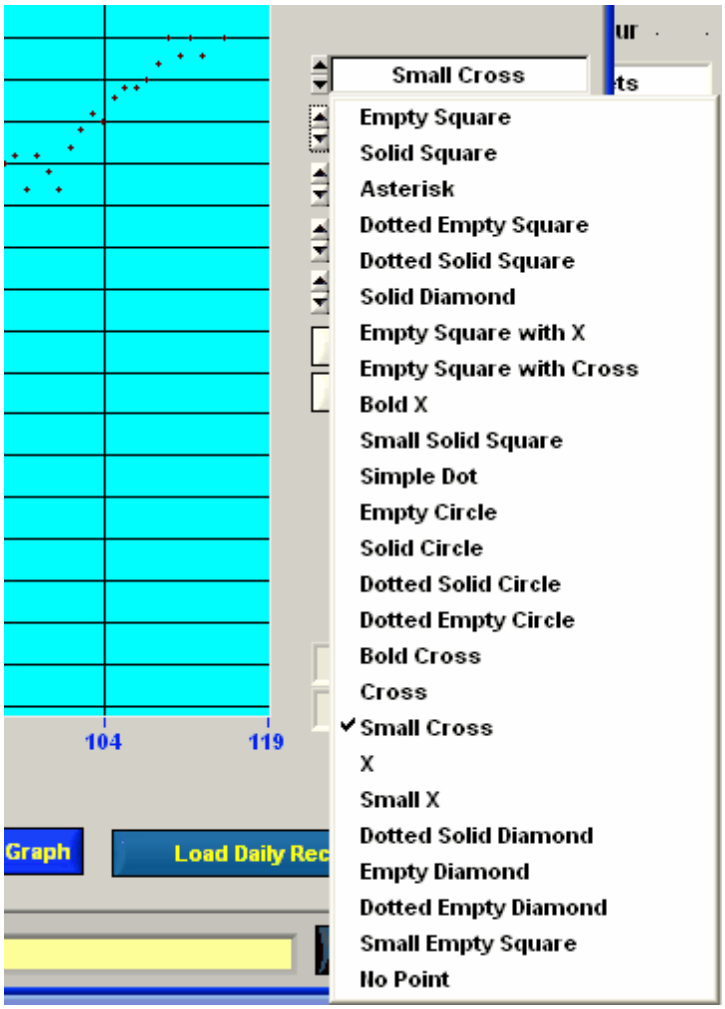
The user can select the data to plot using the data selection pull down menu command button.



Ping Number	Plot the ping number. This is the ping counter tagged to all data
Ping Difference	This is the successive difference between pings. Used to check for missing pings.
Battery	Plot the battery in A/D counts.
Tiltx	Plot the Tilt X in A/D counts
Tilty	Plot the Tilt Y in A/D counts
Battery (volts)	Plot the battery converted to volts
TiltX (deg)	Plot the Tilt X converted to engineering units (*)
TiltY (deg)	Plot the Tilt Y converted to engineering units (*)
Analog Pressure	Plot the Analog Pressure in A/D counts.
Analog Temp	Plot the Analog Temperature in A/D counts
Analog Pressure (dBar)	Plot the Analog Pressure converted to engineering units (*)
Analog Temp (deg C)	Plot the Analog Temperature converted to engineering units (*)
Tx Battery (N)	Plot the Transmit battery value A/D count
AD2	Plot spare A/D sensor A/D count.
Tx Battery (Volts)	Plot the Transmit battery value converted to engineering units (*)
(*)	Using calibration parameter found in the Configuration Tab (NOTE UNIT MUST CONTAIN THE SPECIFIC HARDWARE FOR VALID VALUES)

5.7.1.2 Symbol Type

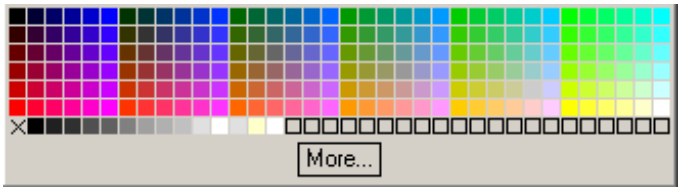
The user can select the symbol type to use in the plots. These are used if the plot type is either a scatter plot or connected point plot.



5.7.1.3 Plot Color

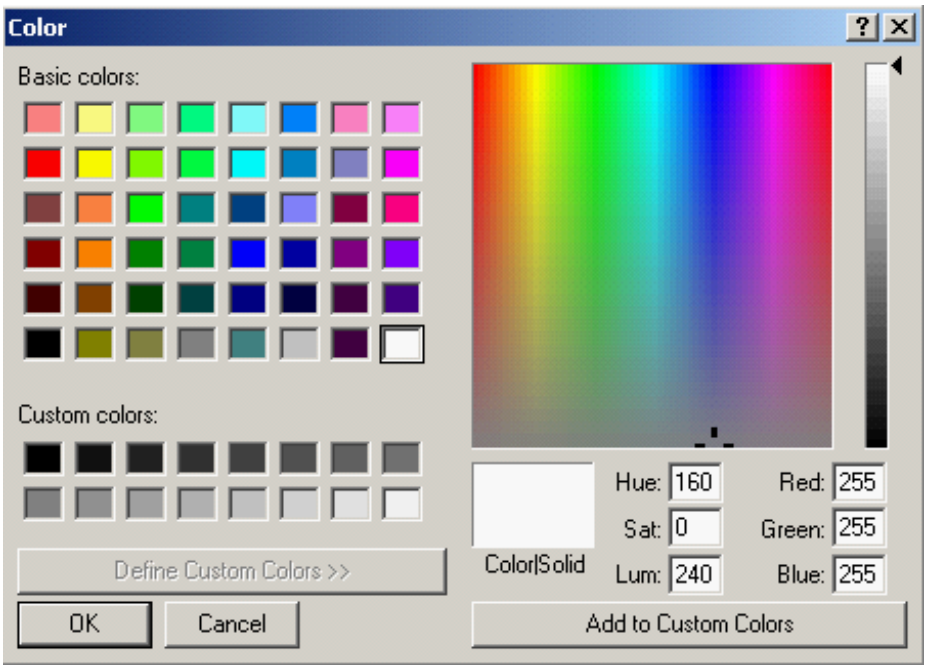
The 

color control allows the operator to set the line color. Click on the control to set the color.



Clicking the 

button in the color popup allows the operator to select a wider range of colors.

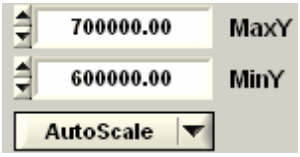


5.7.1.4 Plot Type

Select the plot type using the pull down selector below the symbol type pull down.

5.7.1.5 Y Axis Scaling

Scaling of the Y Axis is done using the following controls.



If AutoScale is used then MaxY and MinY is ignored and the graph is auto scaled.

To use the MaxY and MinY scales set the scale pull down button to 

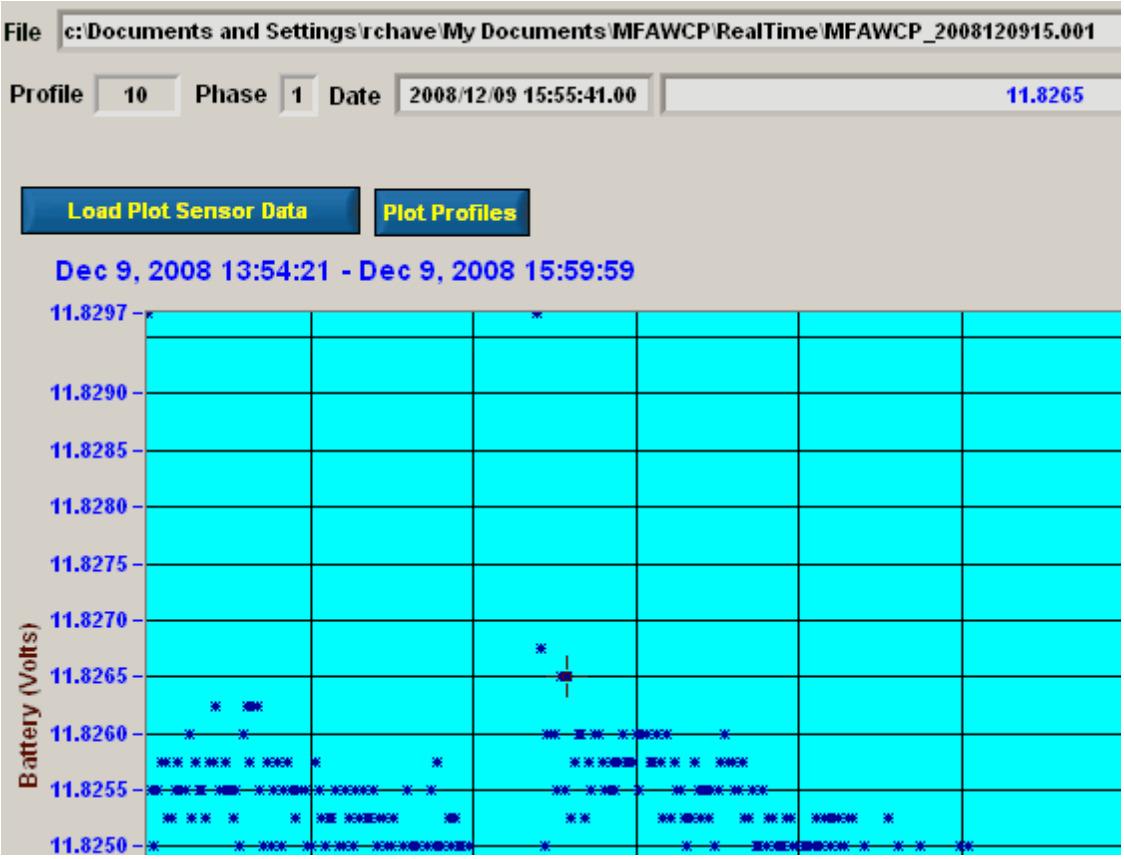
.

5.7.1.6 X Axis Scaling

The X Axis can be set to display date/time and or sample numbers using the X Scale pull down control.

5.7.1.7 Displaying Data Point Values

A left click of the mouse with the cursor near a data point causes it to snap to that point and displays its date/time, ping number and data value.

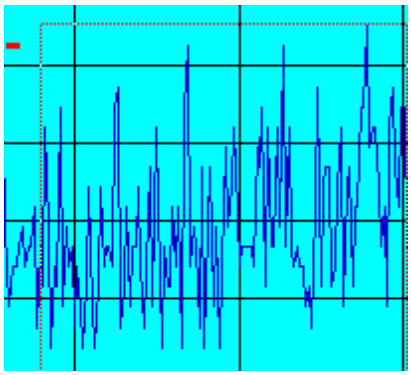


The example above shows the cursor snapped to profile 10 battery voltage data at a value of 11.8265.

5.7.1.8 Zoom

To zoom on a section of the graph, press the keyboard Ctrl key and left mouse button down at the same time.

A box will appear in the graph as you move the mouse to select an area to zoom in on.



5.7.1.9 Sub Sample

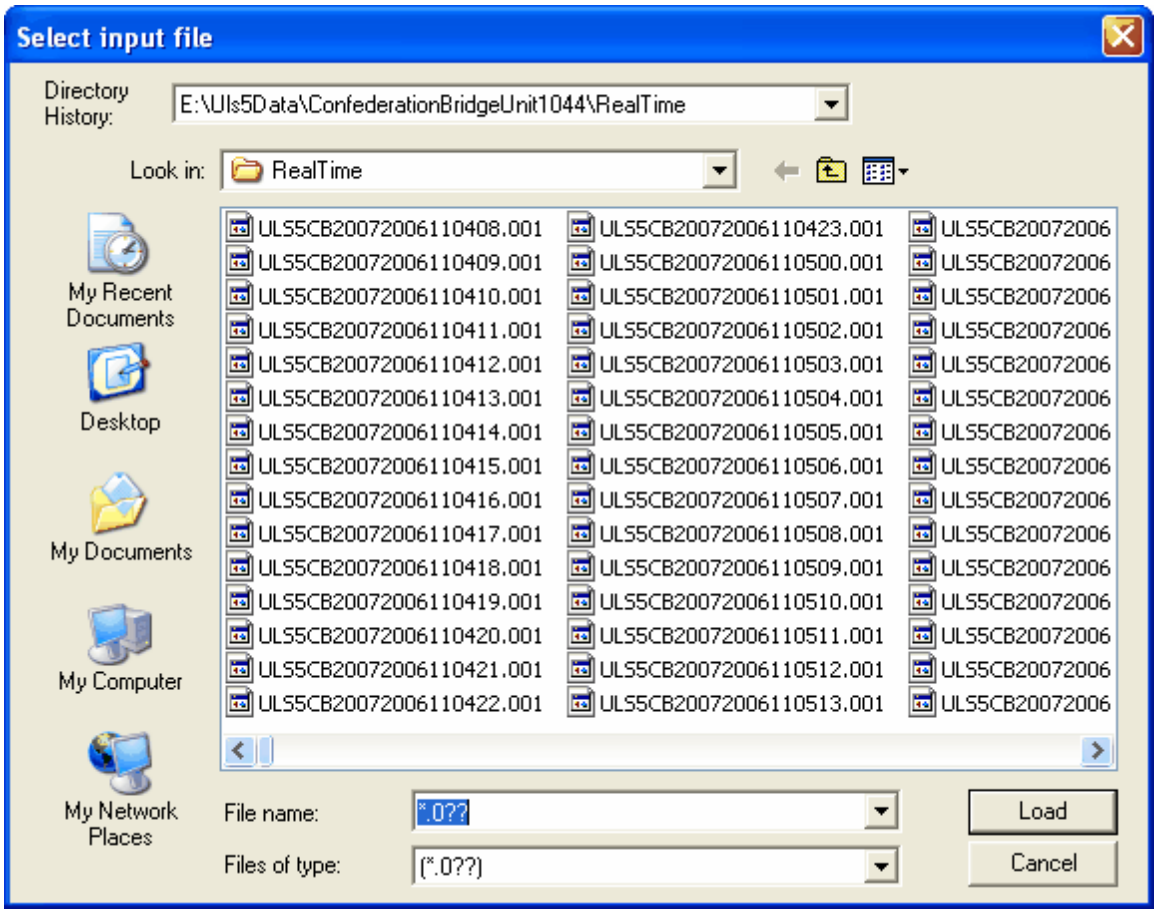
The 

is used to reduce the amount of data that is displayed if multi day amounts of data have been loaded.

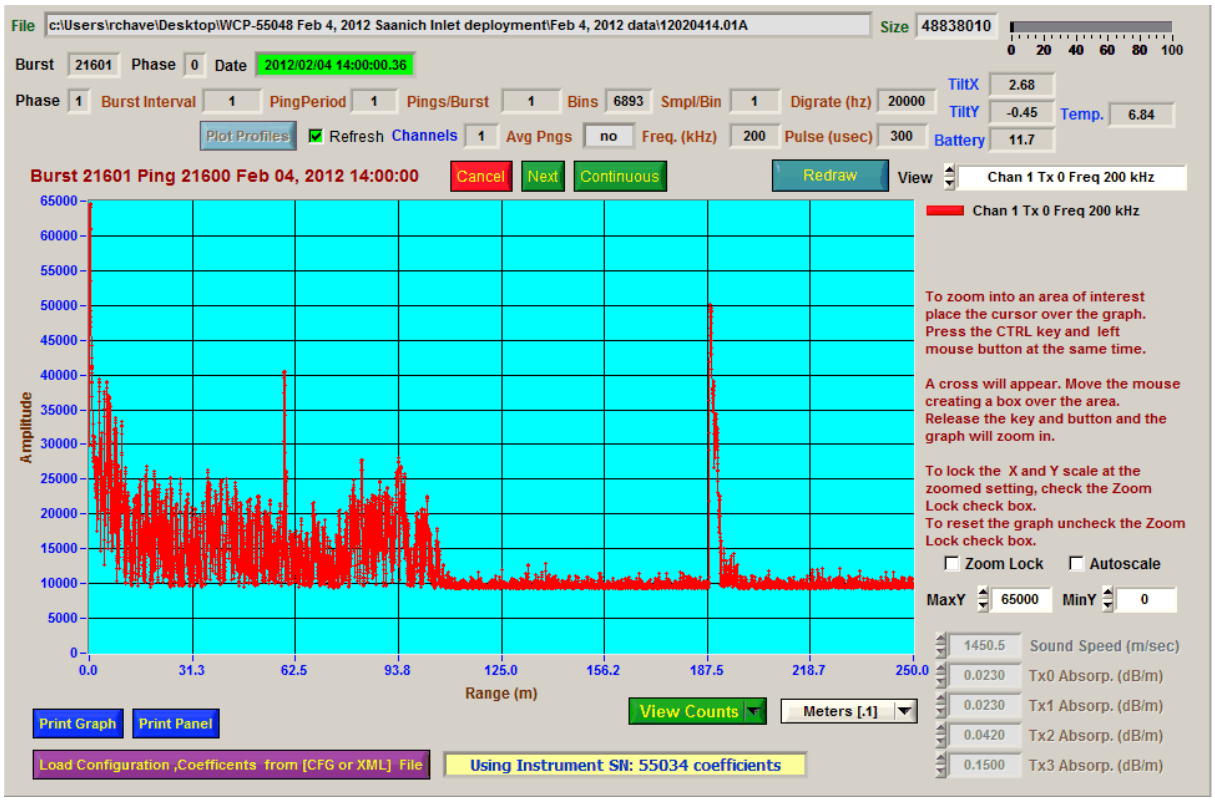
5.7.2 Plot Profiles

The 

command button is used to plot the profiles in a data file. A file select popup appears. Select the data file to plot.

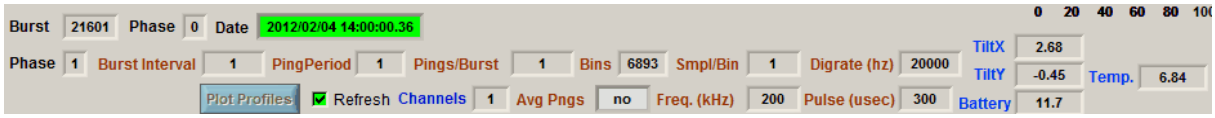


The first profile is plotted.



To plot the next profile in the data file click on the Next command button. To move quickly through the profiles click on the Continuous command button. A Pause command button appears that will stop the program from the continuous reading and display of the profiles.

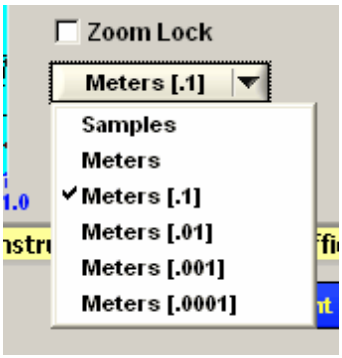
Profile information including sensor data that is contained in the profile is displayed.



Note that if the Date is shaded green the Sensor data is from the current profile being displayed.

The x-axis scale can be set to Meters or Samples.

This control has addition settings to view the X-Axis with the meter values shown to specific decimal places.

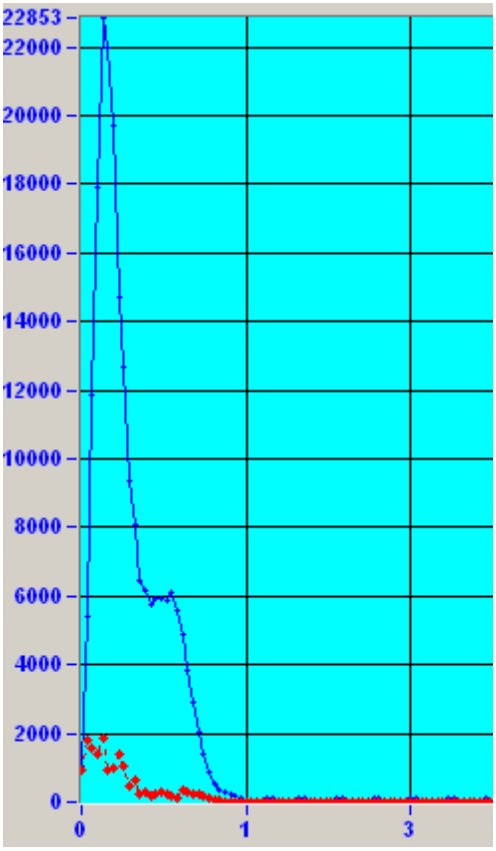


When the 

button is clicked the program closes the file.

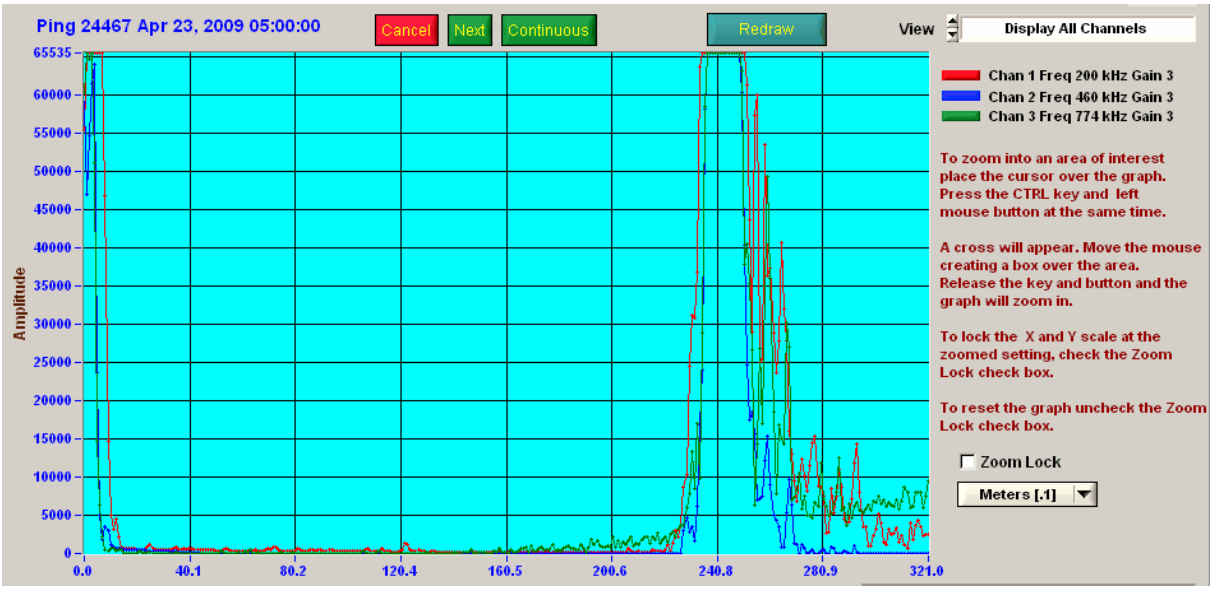
If the Standard Deviation has been stored with the data then it will be plotted in RED if the 

check box is on.



You can select which frequency to view with the frequency select pull down.

Below is an example that shows the data for all channels.



5.7.2.1 Plott Sv or Ts

If the instrument has been calibrated then the profile data can be viewed as acoustic volume backscatter (Sv) or target strength (Ts).

To view these quantities select them using the pull down control 

.

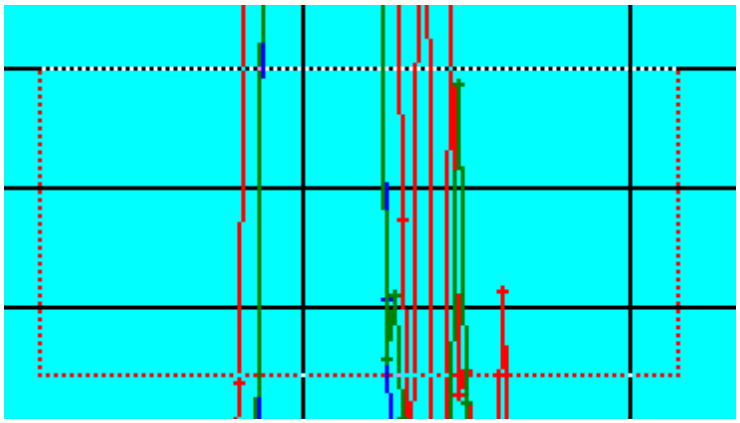
If the calibration coefficients are not available a message will appear to indicate this and the Sv or Ts quantities will not be plotted.

5.7.2.2 Zooming in on an Area of Interest

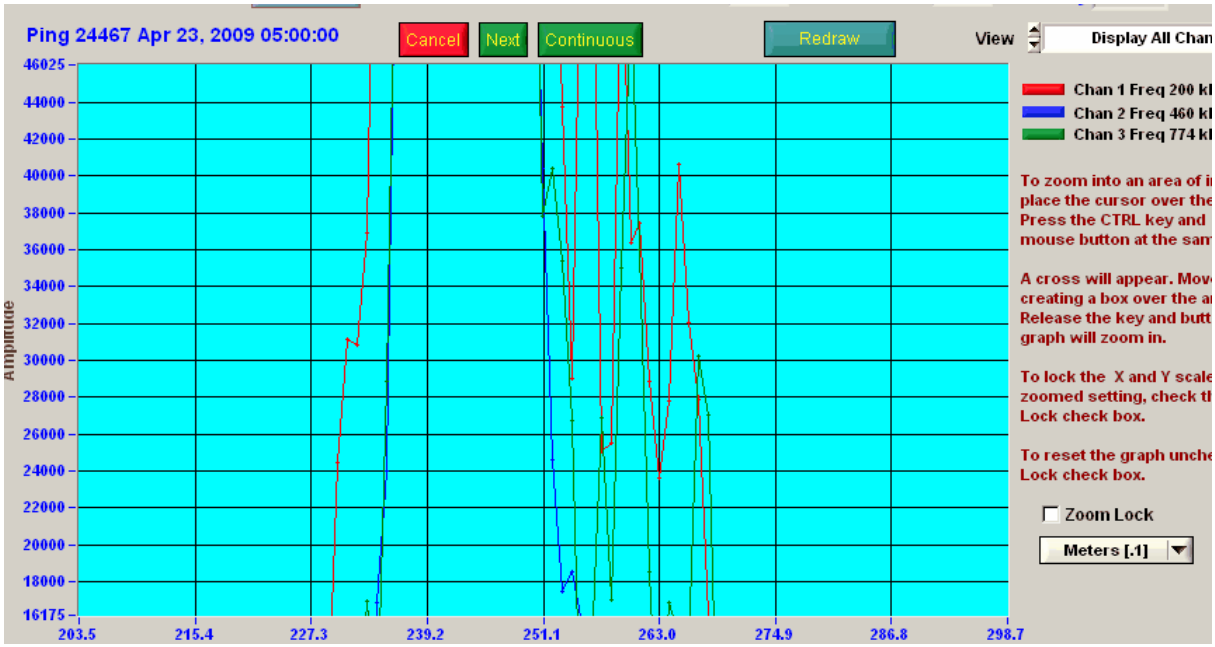
This section explains how to zoom in on an area of interest on the graph.

With the mouse hovering over the graph, hold down the keyboard CTRL key and the left mouse button at the same time.

The mouse cursor will turn into a cross. Drag the mouse while holding down the keys to form a square that defines the zoom area.



Let go of the mouse button to zoom the graph.

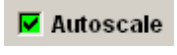


To keep the graph zoomed on subsequent profiles check the 

.

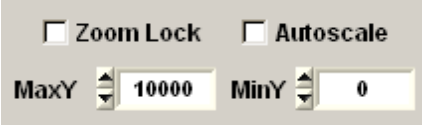
To reset the graph to a full display uncheck the box.

5.7.3 Adjusting the y axis scale

The y axis is auto scaled if the 

control is checked.

If it isn't then numerical controls are available to set the y axis.



The Zoom Lock control allows the user to lock the zoom so subsequent profiles are zoomed in at the same zoom settings.

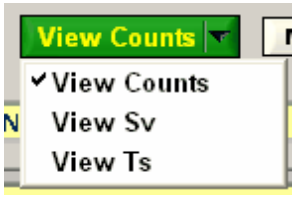
5.7.4 Print Graph

The graph can be printed to a local printer using the 

command button.

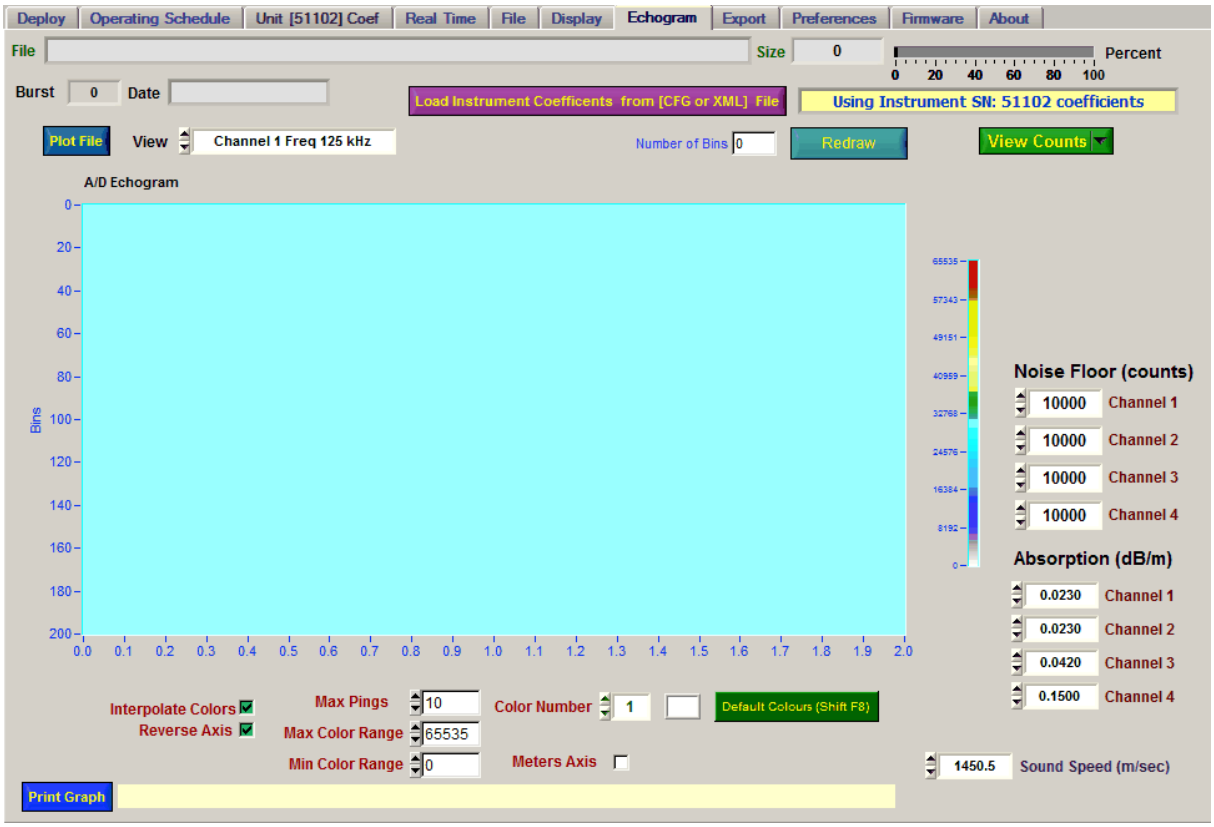
5.8 Echogram

If the instrument has been calibrated the panel can be used to display computed volume backscatter Sv and Target strength Ts.

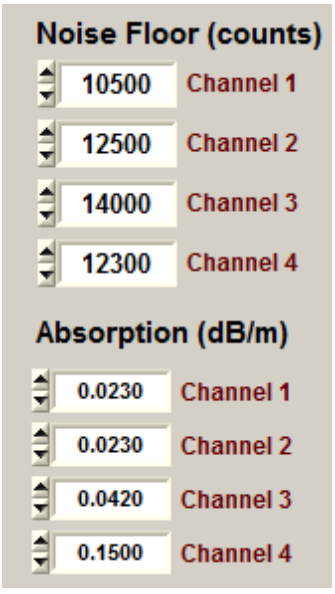
The type of data that is plotted is selected with the 

control.

Note that this function is only meant to allow the user a quick look at the data retrieved from an instrument and is not sufficient for detailed analysis of the data.



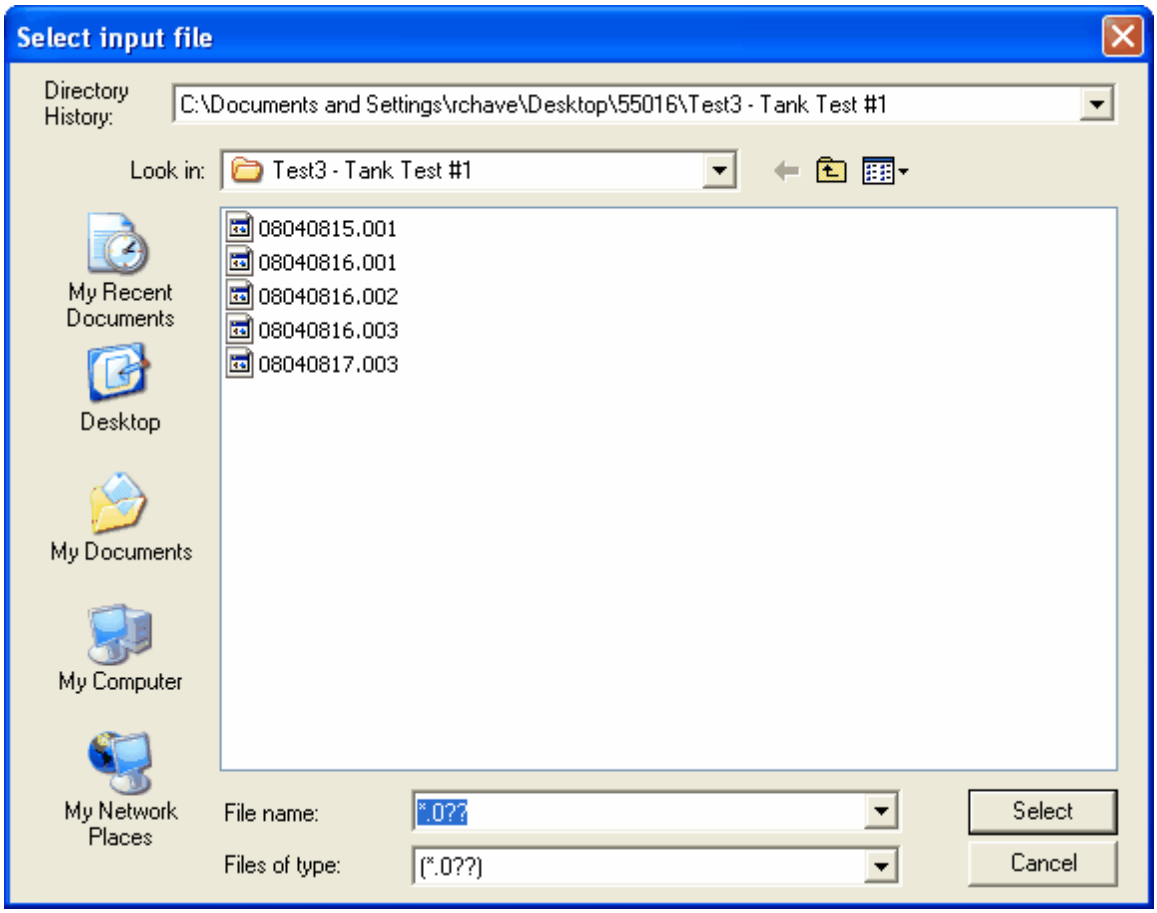
Note that the Absorption and Noise Floor values need to be set for each channel.

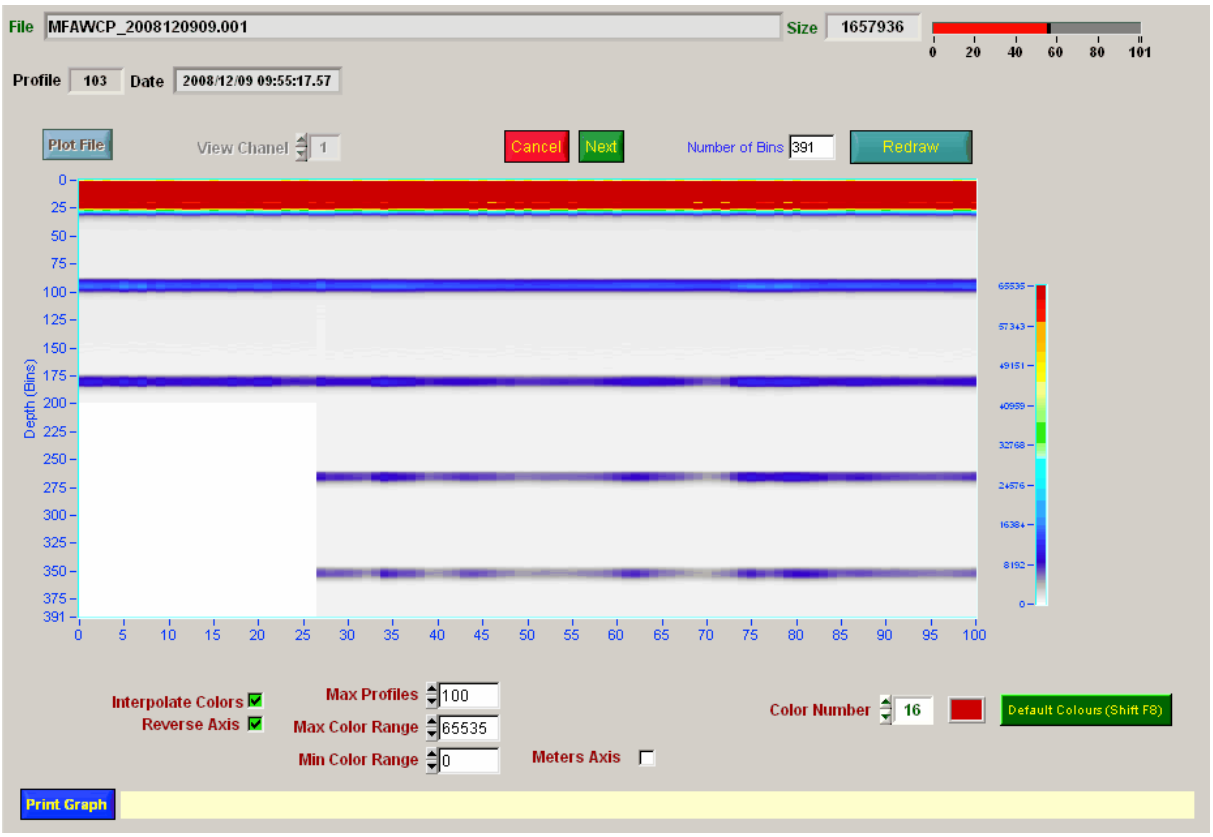


5.8.1 Plot File

Before clicking on the Plot File command button select the channel (frequency) you wish to view using the View Channel 1.

Clicking on the Plot File command button causes the file select popup to appear. Select the file to plot.





5.8.2 Interpolate Colors

The Interpolate Colors checkbox allows the user to turn on or off the interpolation of color values.

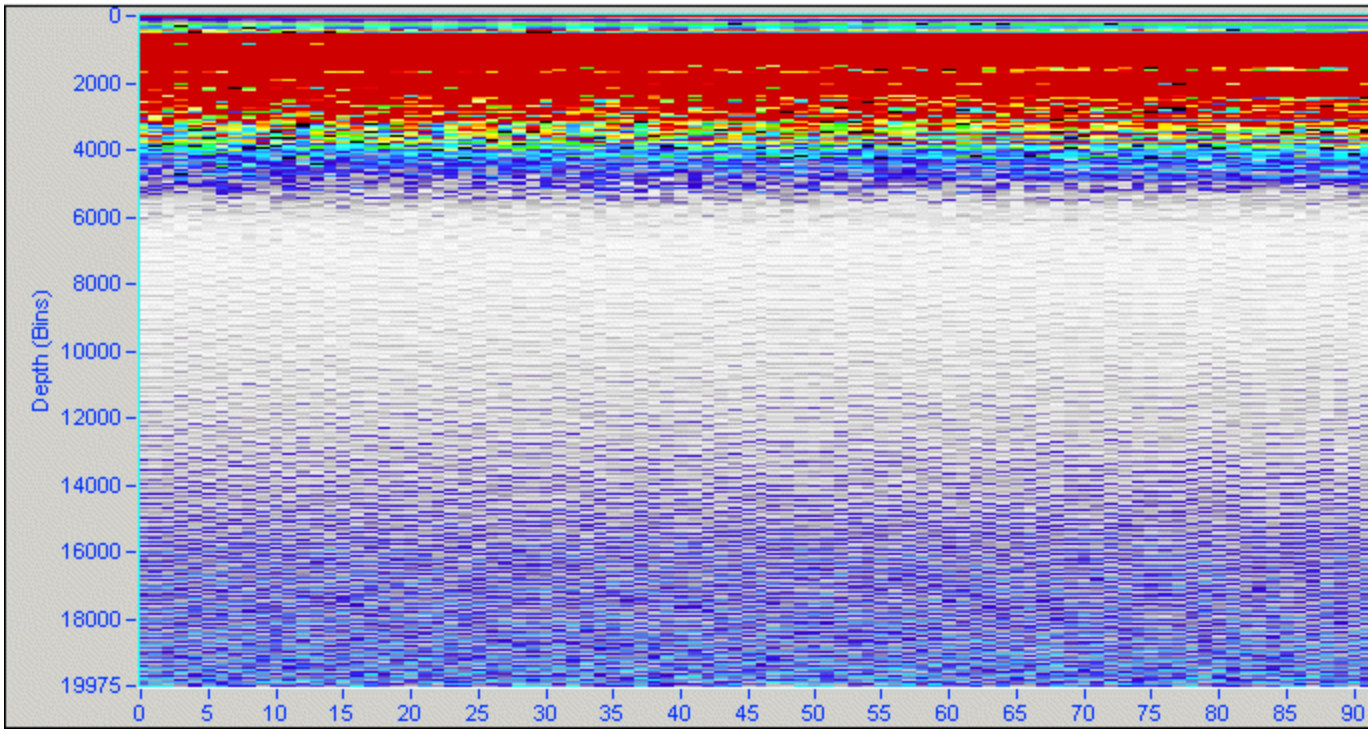
When Interpolate Colors is off, then the data value is assigned the color associated with the next higher Color Map data value.

When Interpolate Colors is on, then the data value is assigned a color computed using a weighted mean of the colors associated with the Color Map data values above and below the Z Array data value.

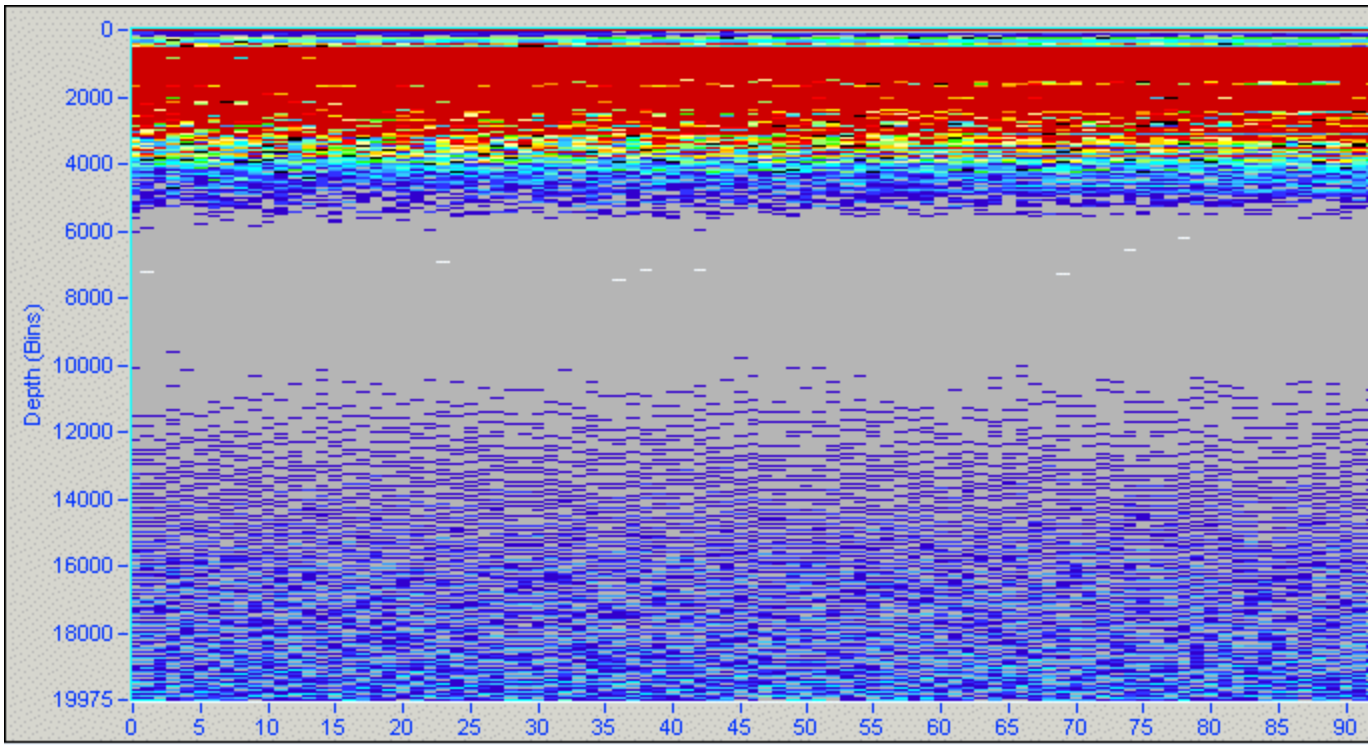
Regardless of the value of Interpolate Colors

- data values below the lowest Color Map data value are assigned the color of the lowest Color Map data value.

- data values above the highest Color Map data value are assigned the value passed in the Hi Color parameter.



Below is the same graph with color interpolation off.



5.8.3 Reverse Axis

This toggle reverses the Y axis of the graph.

5.8.4 Max. Profiles

The 

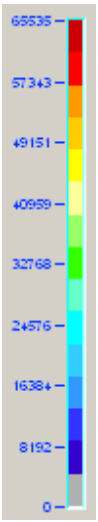
numeric control sets the maximum number of profiles that are loaded per plot. If the file contains more profiles then Max Profiles then the programs 

buttons are enabled so the user can load a new set of profiles by clicking Next or cancelling the plots by clicking Cancel. This value has minimum of 50 and a maximum of 10000.

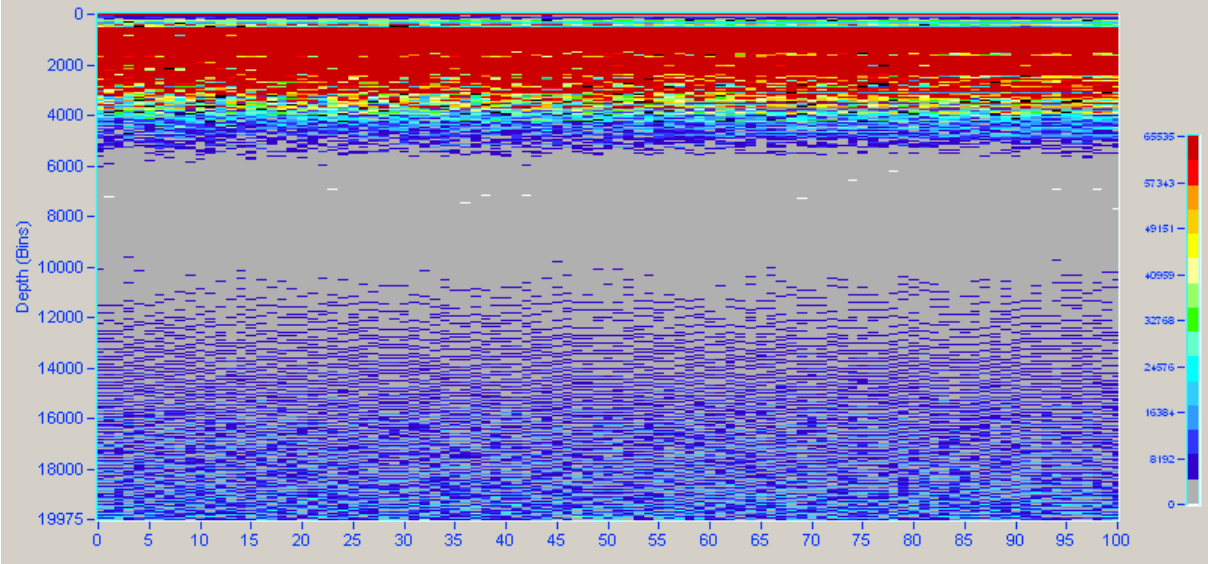
5.8.5 Color Range

Use the numeric controls shown below to set the min and max color ranges.

The Min Color Range and the Max Color Range are used to narrow the numerical range of the colors. For example the normal rainbow colors between 0 and 65535 is shown below:

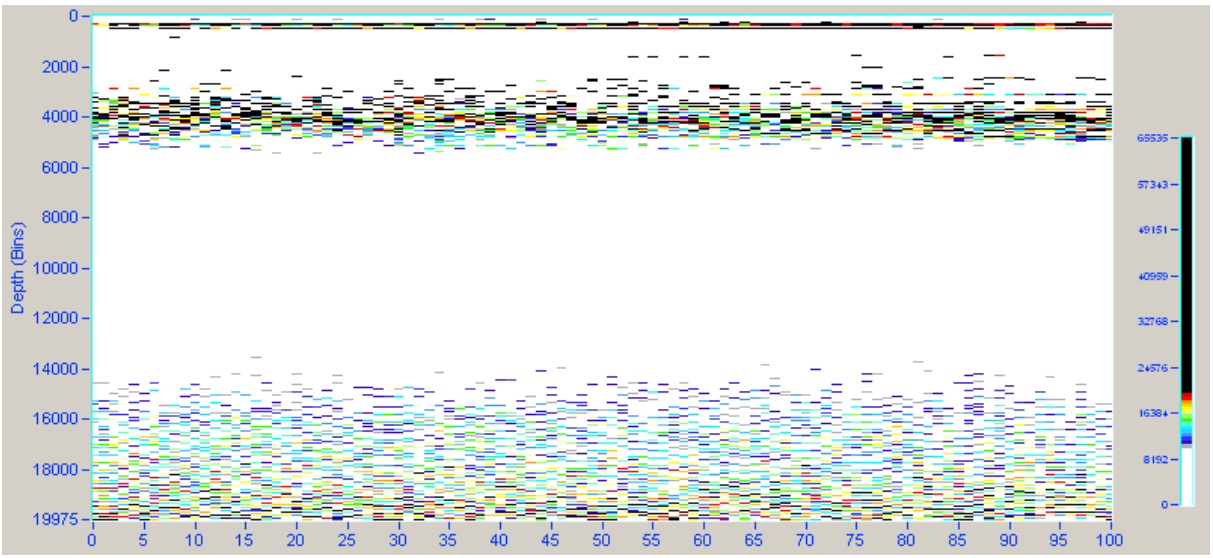


The graph plotted with this range is shown below.



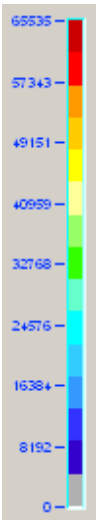
If the minimum and maximum color ranges are set to 10000 and 20000 respectively then the color map appears as shown below.

The same data plotted with this range is shown below:



5.8.6 Default colors

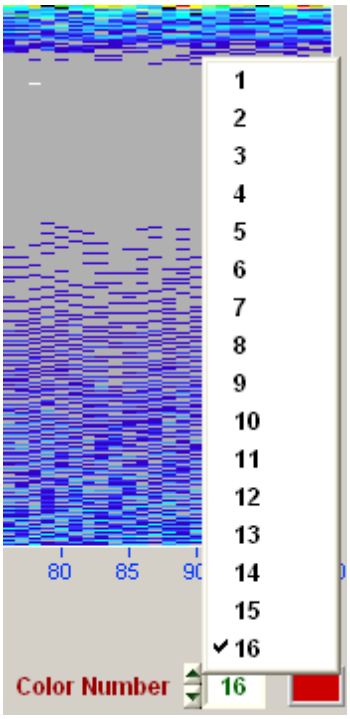
The  command button resets the colors to the program default.



5.8.7 Setting Colors

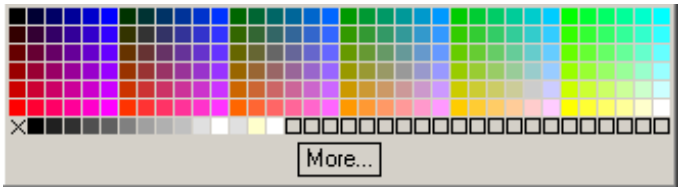
The numerical values for the 16 colors that make up the color range can be set by the user.

Select the color you wish to change by selecting the color number pull down control.



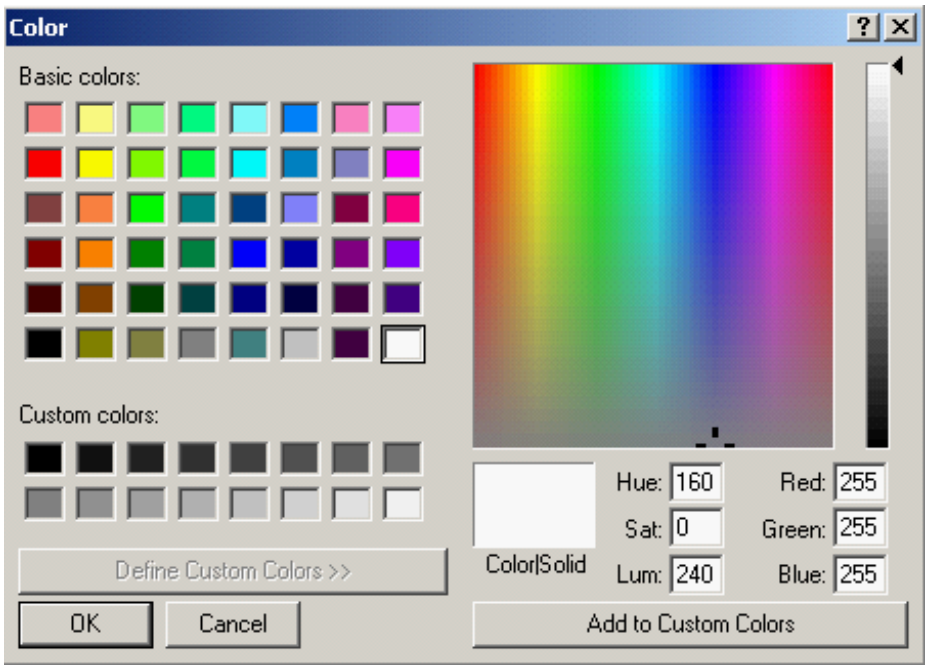
Select any of the 16 colors. The colors are numbered from 1 to 16.

To change the color click on the color control and select a color.



Clicking the 

button in the color popup allows the operator to select a wider range of colors.



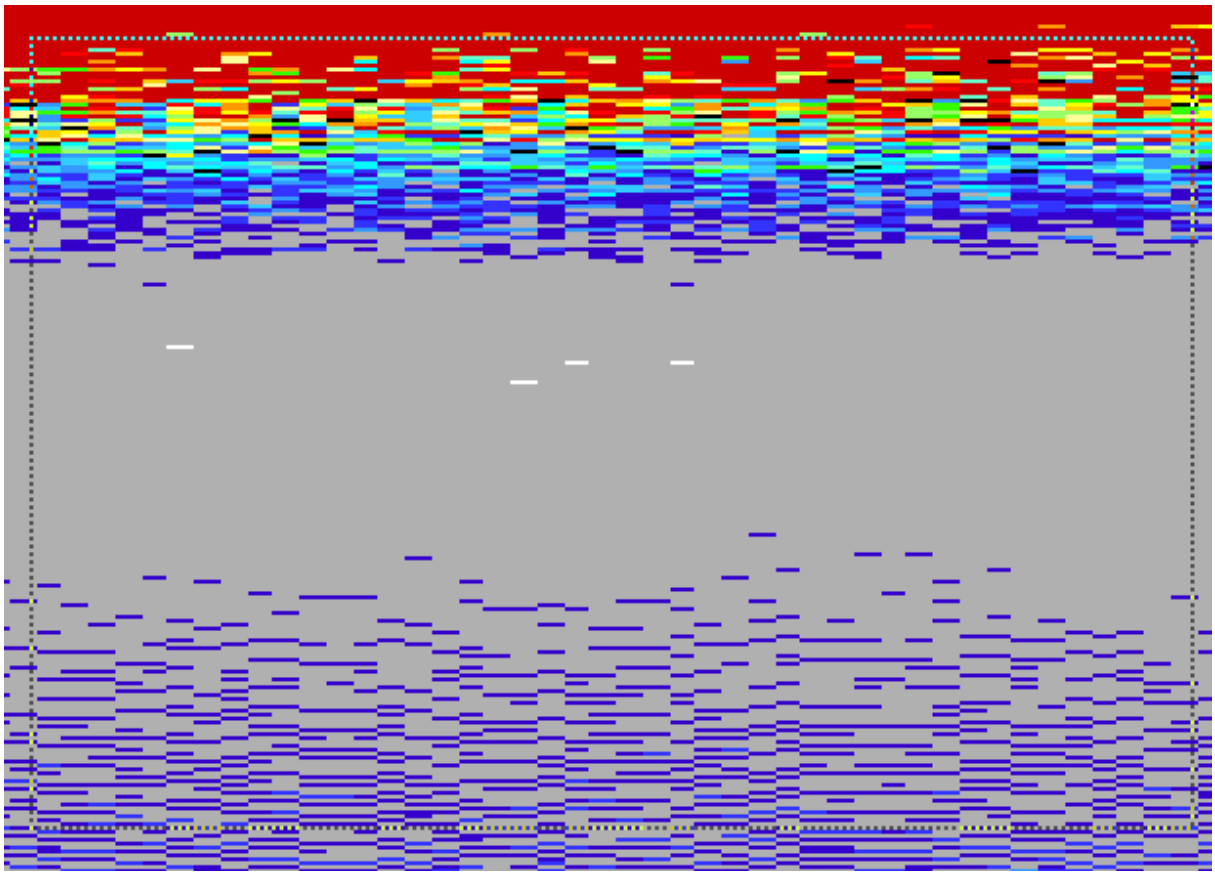
5.8.8 Meter Axis

The 

checkbox is used to change the y axis graph from bins to meters. The meters range is set using the user specified sound speed found in the deployment panel.

5.8.9 Zoom

The user may zoom in on sections of the echo gram by pressing the keyboard ctrl key and the mouse left button at the same time.
A zoom rectangle is formed by dragging the mouse. When the user lets go of the left mouse button the graph zooms in on the rectangle.



To reset the graph to its original scale click on the 

command button.

5.8.10 View Type

The default is to view digital data.

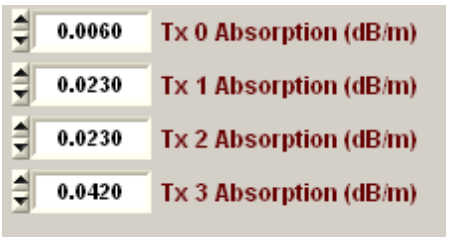
If the unit is calibrated the 

control allows the viewing of Sv and Ts values computed using the coefficients that have been retrieved from the unit or from a file.

Click on the control to view the selection 

.

Note that the absorption values need to be set for each channel.



5.8.11 Print Graph

Click on the 

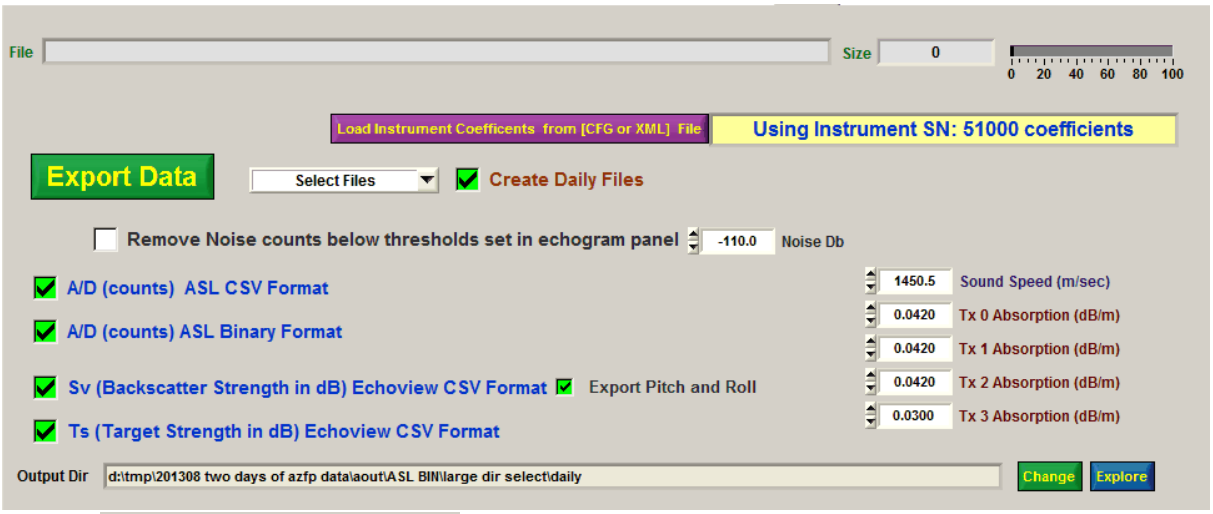
command button to print the graph.

5.8.12 Noise Floor

The Noise Floor values allows the user to remove the baseline noise from the echogram. Typically this value is around 10000 but may vary from frequency to frequency.

5.9 Export Tab

The Export tab is used to export profile data for import into 3rd party software such as Echoview™.



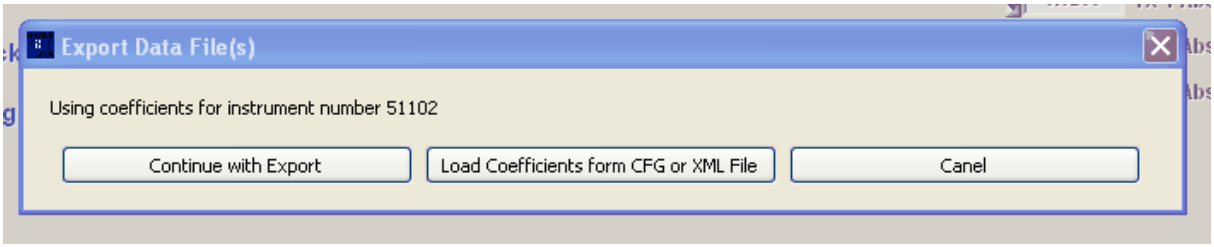
Use the 

to choose how files are selected for export. Select Directory to export all the file in a directory or Files to select specific files.

The 

indicator shows the serial number of the instrument who's coefficients are being used.
Even if this incorrect the user is given an option to load a different set of coefficients before the export takes place.

To export files click on the Export Data button.



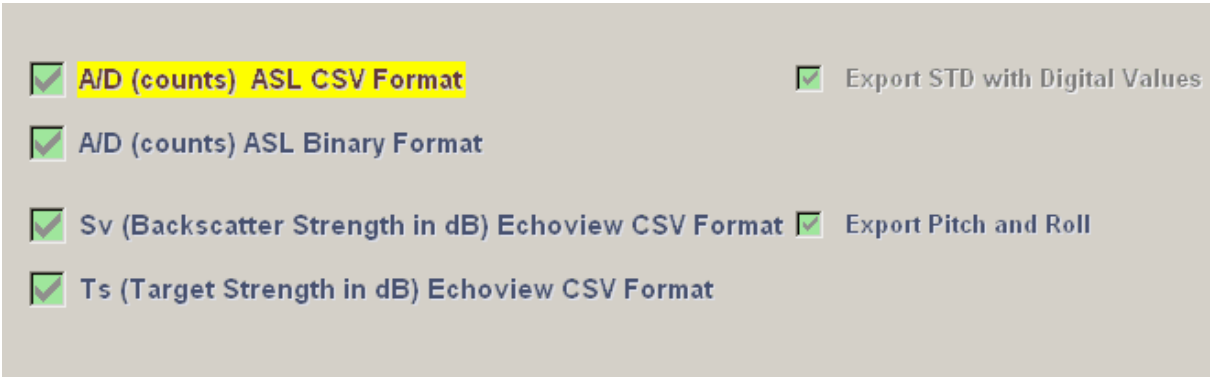
If the user chooses Load Coefficients form CFG or XML File they are asked to load an XML file (created by the instrument during acquisition) or CFG (configuration file) provided by the manufacturer.

The program will export all the data files in the selected directory unless specific files have been selected.

The exported files are exported to the Output Directory. This needs to be selected before the export.

All export types can be exported in one selection. The export functions are done one at a time.

As the export functions are being performed they are set to a yellow background.

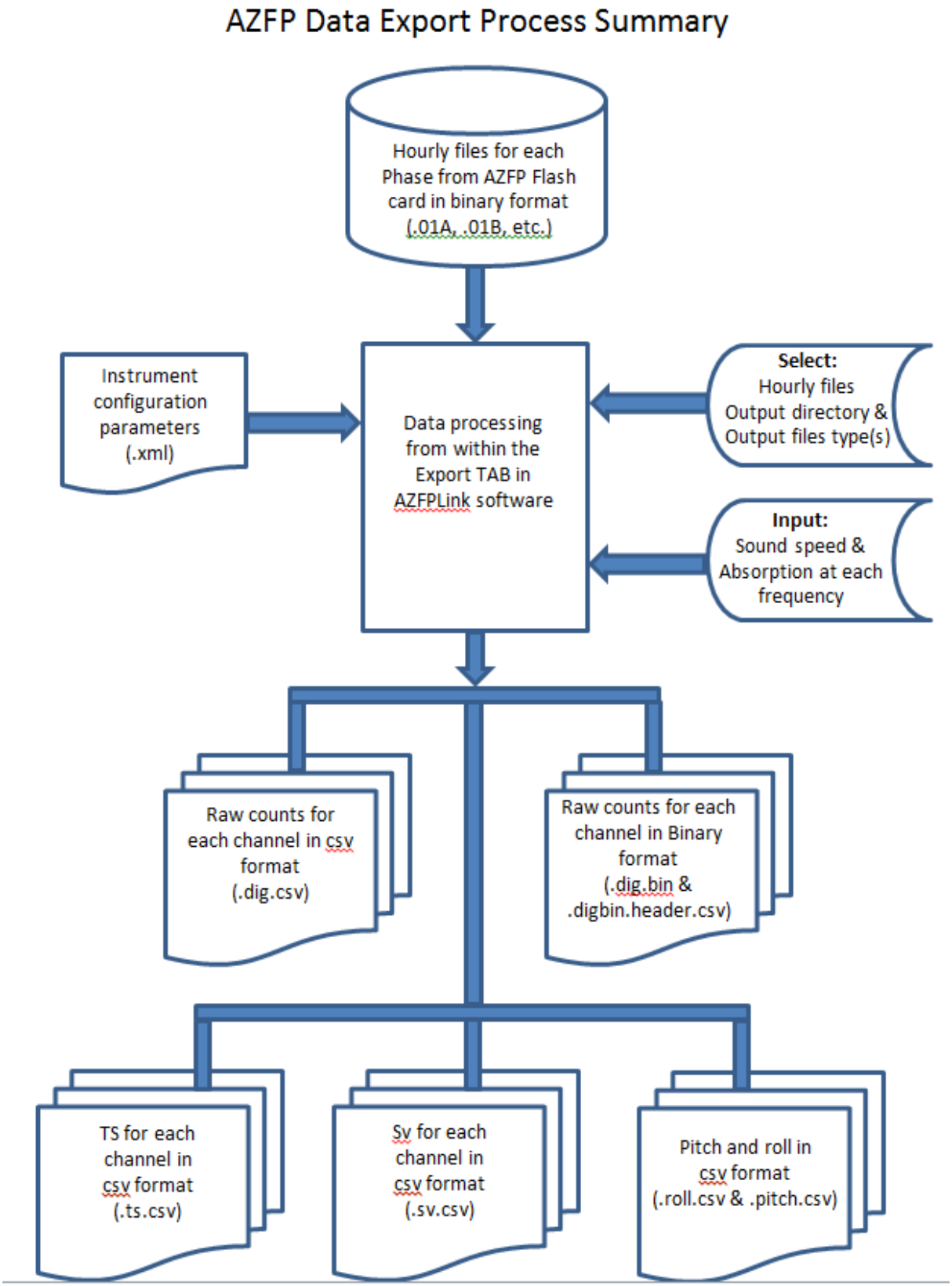


Exports can be cancelled at any time by clicking on the 

button that appears when export is started.

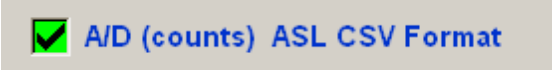
5.9.1 Export Process Summary

Below is a flowchart showing the export process.



5.9.2 Export ASL CSV Format

To export data in the ASL CSV format.



CSV format causes the program to export the data in Comma Delimited format (CSV) shown below is an example when read into Microsoft EXCEL.

Burst	Ping	Date	Time	Num_Chan	BurstInterval	PingPeriod	PingsPerBurst	AveragePings	OutPut_Chan	OutPut_Board	OutPut_Fequency	StartIndex	Num_bins	Samples_Bin	Pulse_len	Digrate	SoundSpeed	Range_start_m	Range_stop_m	Range_resolution_m	TiltX	TiltY	Bat	Temp	Pressure	AD6	AD7
1	0	02/09/2012	4:00:00	1	60	1	30	0	1	0	200	0	6844	1	300	20000	1450.5	0	248.181	0.036	1.42	-1.59	12.17	6.07	-99	54079	32199
1	1	02/09/2012	4:00:02	1	60	1	30	0	1	0	200	0	6844	1	300	20000	1450.5	0	248.181	0.036	1.42	-1.59	12.17	6.07	-99	54079	32199
1	2	02/09/2012	4:00:03	1	60	1	30	0	1	0	200	0	6844	1	300	20000	1450.5	0	248.181	0.036	1.42	-1.59	12.17	6.07	-99	54079	32199
1	3	02/09/2012	4:00:04	1	60	1	30	0	1	0	200	0	6844	1	300	20000	1450.5	0	248.181	0.036	1.42	-1.59	12.17	6.07	-99	54079	32199
1	4	02/09/2012	4:00:05	1	60	1	30	0	1	0	200	0	6844	1	300	20000	1450.5	0	248.181	0.036	1.42	-1.59	12.17	6.07	-99	54079	32199
1	5	02/09/2012	4:00:06	1	60	1	30	0	1	0	200	0	6844	1	300	20000	1450.5	0	248.181	0.036	1.42	-1.59	12.17	6.07	-99	54079	32199
1	6	02/09/2012	4:00:07	1	60	1	30	0	1	0	200	0	6844	1	300	20000	1450.5	0	248.181	0.036	1.42	-1.59	12.17	6.07	-99	54079	32199
1	7	02/09/2012	4:00:08	1	60	1	30	0	1	0	200	0	6844	1	300	20000	1450.5	0	248.181	0.036	1.42	-1.59	12.17	6.07	-99	54079	32199

The CSV columns have the following labels.

Burst	Burst number
Ping	
Burst/Ping Date	Date of the profile
Burst/Ping Time	Time of the profile
Num_Chan	Number of channels (boards or frequencies)
Burst Interval	The burst interval
Ping Period	The Ping Period
PingsPerBurst	The Pings acquired per burst
Average Pings	1 = this is an averaged ping, 0 = non averaged
OutPut_Chan	Number of the channel 1,2,3,4
OutPut_Board	Number of the board 0,1,2,3
OutPut_Fequency	Frequency of the transducer
StartIndex	Start of the range in sample number
Num_bins	Number of bins
Samples_Bin	Samples per bin
Pulse_len	Pulse Length in microseconds
Digrate	Digitization Rate in samples/second
SoundSpeed	Speed of sound as entered in AzfpLink in m/s
Range_start_m	Start of the Range in meters
Range_stop_m	End of the Range in meters
Range_resolution_m	Range resolution in meters
TiltX	Tilt in X direction
TiltY	Tilt in Y direction
Bat	Voltage of the main battery pack
Gain	Receiver gain setting: 0, 1, 2 or 3
Temp	Temperature
Pressure	Pressure
AD6	Analog channel Tx Battery N

AD7 Analog channel 7 (unused

The rest of the columns contain the digital values of the bins.

Exported file names are created by the program based on the instrument number channel and frequency. Below is an example of the names of the files created.

ASL CSV file names

5112_C1_038KHZ.dig.csv
5112_C2_038KHZ.dig.csv
5112_C3_038KHZ.dig.csv
5112_C4_038KHZ.dig.csv

5.9.3 Export ASL BINARY Format

To export data in the ASL Binary format select.

The BINARY format produces two files for each channel. One is a .BIN file with the bins written out in consecutive 16 bit binary values. The header information is written to a .CSV file with the header information in the same format as in the ASL CSV output format but doesn't include the bin data. The header file is created with the same name but with .header.csv appended.

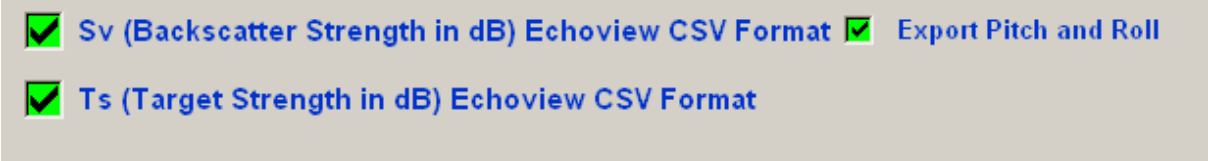
Exported file names are created by the program based on the instrument number channel and frequency. Below is an example of the names of the files created.
Example:

5112_C1_038KHZ.dig.bin
5112_C1_038KHZ.dig.bin.header.csv
5112_C2_038KHZ.dig.bin
5112_C2_038KHZ.dig.bin.header.csv
5112_C3_038KHZ.dig.bin
5112_C3_038KHZ.dig.bin.header.csv
5112_C4_038KHZ.dig.bin
5112_C4_038KHZ.dig.bin.header.csv

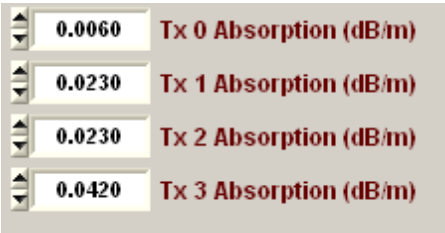
5.9.4 Export Echoview Format

To export Echoview format files the instrument must have been calibrated.

Select Sv or Ts or both to export and optionally export Pitch and Roll data which corresponds to the TiltY and TiltX of the instrument tilt sensor.



The user should set the absorption values for each channel.



Below is an example of the output file names.

5112_C1_038KHZ.sv.csv
5112_C2_038KHZ.sv.csv
5112_C3_038KHZ.sv.csv
5112_C4_038KHZ.sv.csv

5112_C1_038KHZ.ts.csv
5112_C2_038KHZ.ts.csv
5112_C3_038KHZ.ts.csv
5112_C4_038KHZ.Ts.csv

5112_X.roll.csv
5112_Y.pitch.csv

The following documentation is from the Echoview site

Data values from single beam

File format

The first line of the *.csv file lists the names of the variables that appear in subsequent lines (these will be used as column headings if the file is loaded into a spreadsheet program). No column heading is provided for the list of data values. Each subsequent line contains the value for each variable for a single ping and the data value for each sample in the ping.

The following columns are expected.

Variable	Description
Ping_date	yyyy-mm-dd
Ping_time	hh:mm:ss

Ping_milliseconds	ms (optional column, may be left out)
Range_start	m
Range_stop	m
Sample_count	Number of samples to follow
List of data values	Sample values (separated by commas)

Notes:

- If there is not the correct number of samples specified by Sample_count then the ping is considered invalid and all data for that ping are ignored (it will appear as a no data gap in an echogram).
- The start and stop range and the number of samples may change for every line of data (ping).
- In the resulting echogram, each datapoint (sample) is assigned a range so that the data is evenly spaced based over the ping, using the Sample_count, Range_start and Range_stop.

That is, the range of each datapoint (measured at the center of that datapoint) is,

Range = Range_start + (n + 0.5) * (Range_stop - Range_start) / Sample_count)

Where n = 0, 1, 2, 3, 4 … Sample_count-1

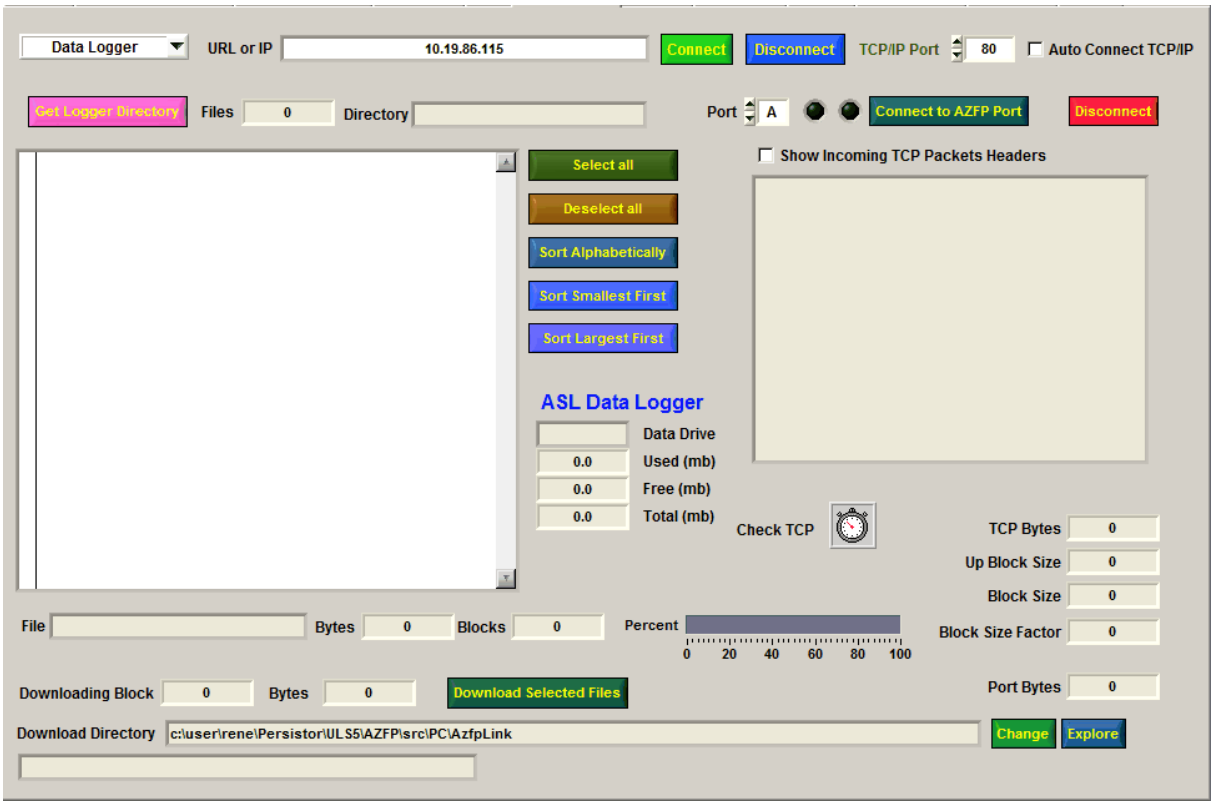
- The data values must be in units appropriate to the data type identified in the name of the data file (eg. Sv must be dB re 1m-1 and TS dB re 1m2).

5.10 Logger/TCP Tab

The Logger/TCP tab is used to connect to instruments that are connected to the an ASL Data Logger that is either on the internet or local area network.
The software supports the ASL Data Logger and the connection of the unit to a serial RS232 to Ethernet converter.

The ASL Data Logger is a device that records RS232 data from any instrument that provides data over RS232. In addition if one of the instruments is a AZFP the logger allows a pass through connection to the instrument so that AzfpLink can program the instrument, retrieve data files directly from the internal FLASH (see File tab) and/or acquire real time data being transmitted over the RS232 port.

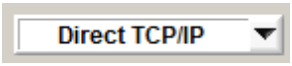
In addition the Data Logger tab provides the means to get a directory listing of the data acquired by the logger and to retrieve specific files. Note that the files acquired by the ASL Data Logger require some additional processing to create compatible data files for viewing by AzfpLink and ProfileView.



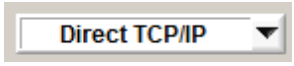
5.10.1 Connection Type Selection

The 

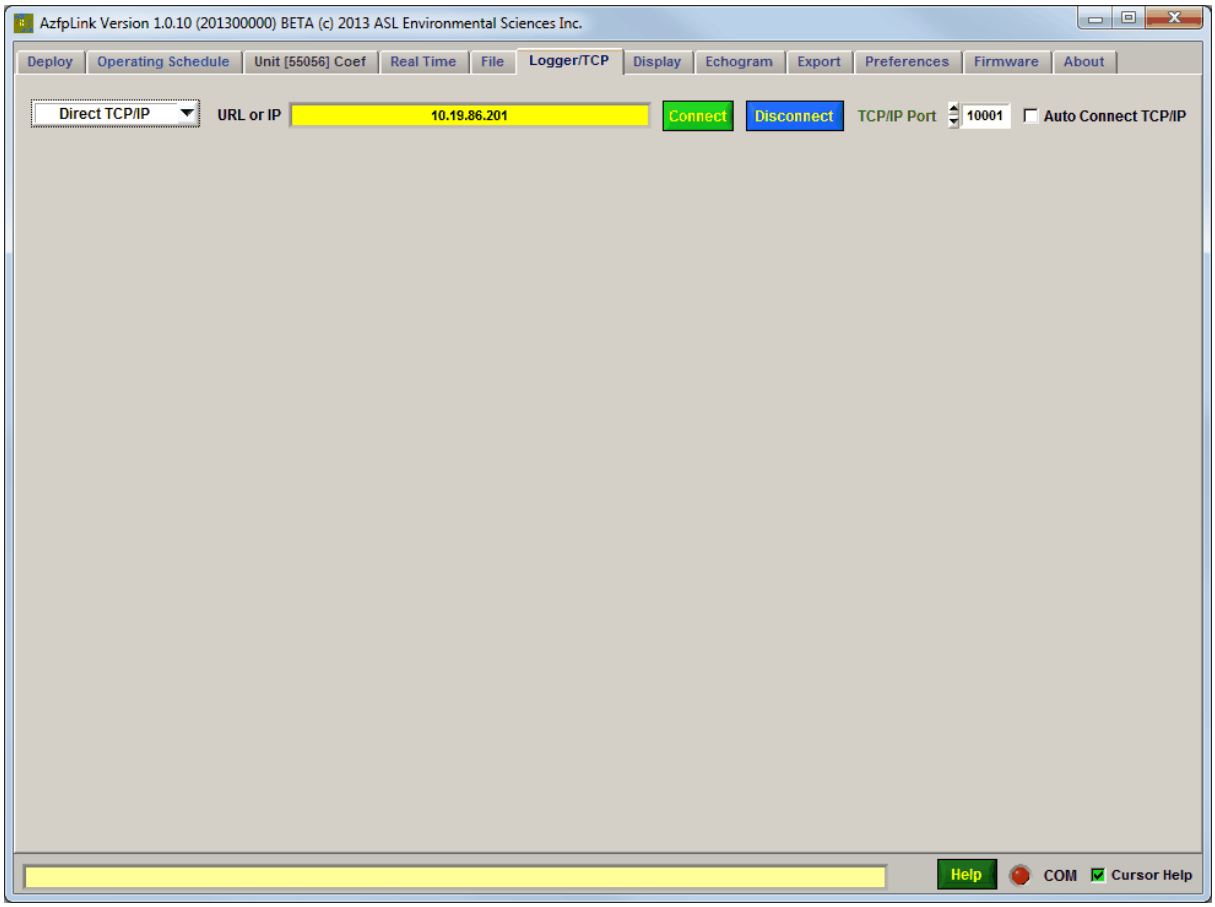
pull down is used to select either a connection to an ASL data logger or a connection to a serial to Ethernet converter that is configured for TCP/IP connection on the selected port.



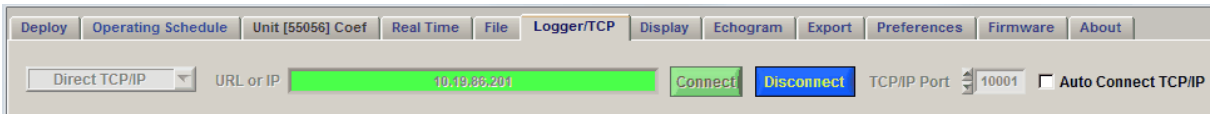
5.10.2 Connection to Serial to Etherenet Converter

When the connection type selector is set to 

the software is configured to directly talk to the AZFP istrument via TCP/IP.
The tab appears as follows:



Select the IP address and port number and click connect to connect directly to the AZFP.



You can now run most commands as if the unit is directly connected via RS232.

5.10.3 URL or IP

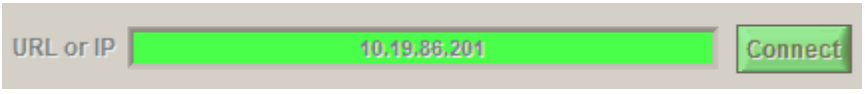
The 

control displays the URL or IP address of the ASL Data Logger or to the serial to Ethernet converter. To change this value select the control and enter a new value.

Check the connection by clicking on the 

command button.

When the TCP/IP connection is successful the Logger Url or IP display turns green and the value in it can not be changed until it is disconnected..



5.10.4 Connect

The 

command button causes the program to connect to the specified URL or IP address with the specified TCP/IP Port.

5.10.5 Disconnect

The 

command button causes the program to disconnect from the data logger if it is connected.

5.10.6 TCP/IP Port

The 

is the port that the ASL Data Logger will respond to when a connection is attempted. This port value is setup when the ASL Data Logger is installed and configured.

5.10.7 Auto Connect TCP/IP

The 

checkbox selects the auto connection when the program starts up.

Note that if this box is checked on startup the program automatically connects to the ASL Data Logger. It requests a direct connection to the AZFP port if the TCP/IP connection is successful.

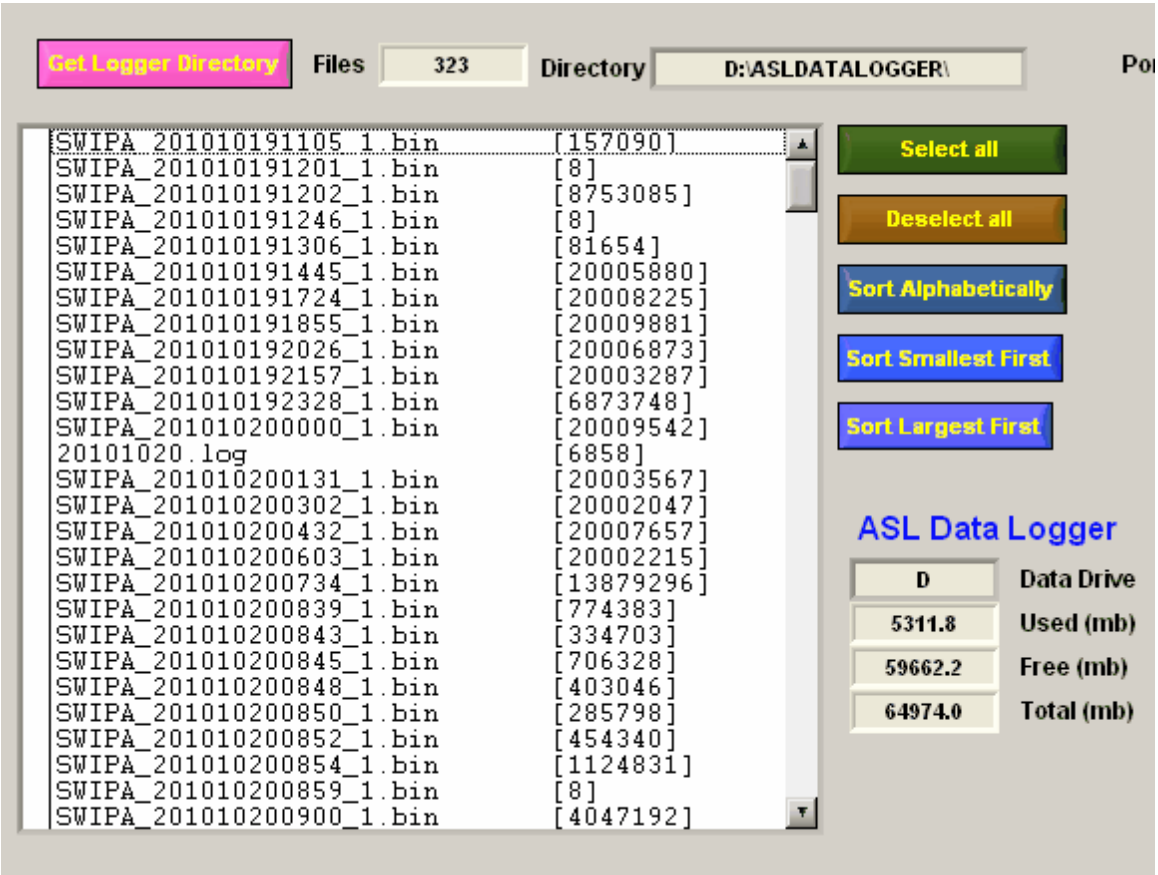
5.10.8 Get Logger Directory

The 

command button causes the program to request the ASL Data Logger file directory from the storage device. If successful the files are displayed in the list box. As well the number of files and the name of the data directory is displayed in the two controls above the list.

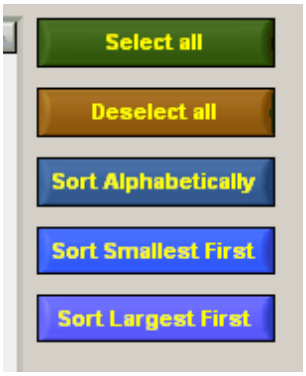
The control will connect the TCP/IP connection if it is not already connected.

A successful retrieval of the data file listing on the ASL Data Logger storage device is shown below.

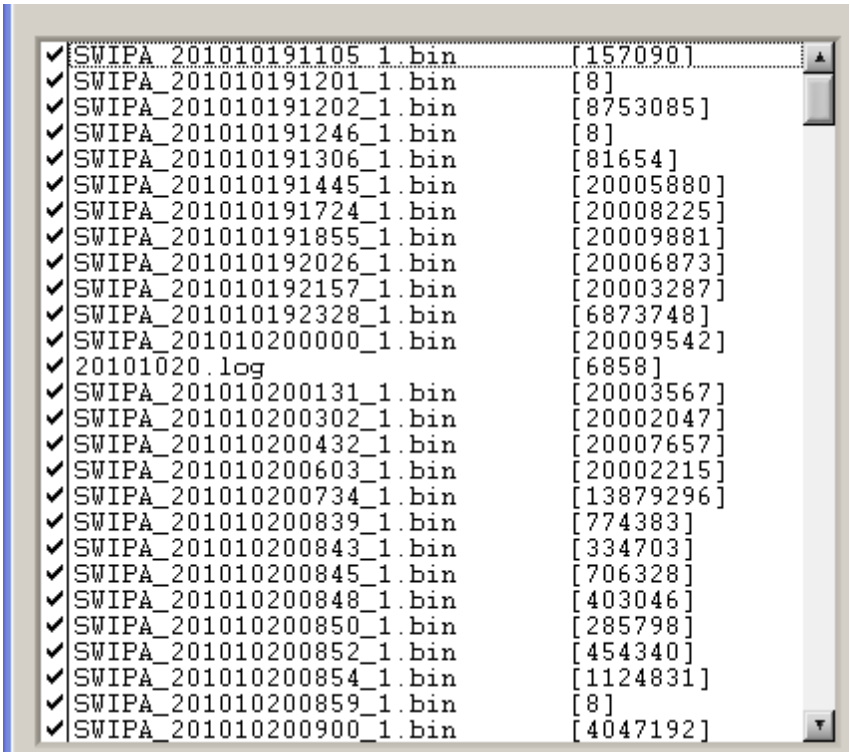


Note that ASL Data Logger Data Drive, Used, Free and Total MB are returned.

There are 5 command buttons that allow you to manipulate the file list.



The "Select all" button causes all the files to be selected.



This places a check mark to the left of the file name. Note that this can be manually done by clicking on a file name or passing over the left area with the left mouse button clicked down continually.

The "Deselect all" command button de-selects all the files in the list.

The other three command buttons allow you to sort by file size or alphabetically.

5.10.9 Connecting to the AZFP

The AzfpLink software can be connected directly to any AZFP that is connected to one of the ASL Data Logger RS232 ports. The ports are associated with a letter such as 'A', 'B' etc. The letter designation is setup on the data logger when the system is installed.

The following controls are associated with connecting to the AZFP.

Use the Port control to select the port number. Click on the 

to connect to the AZFP on the selected port.

If the connection is successful the LED to the left of the command button will turn green.

At this point you can not change the port until you disconnect.

When AzfpLink is connected like this you can use the normal command on the other panels as if the AZFP unit was connected to an RS232 port.

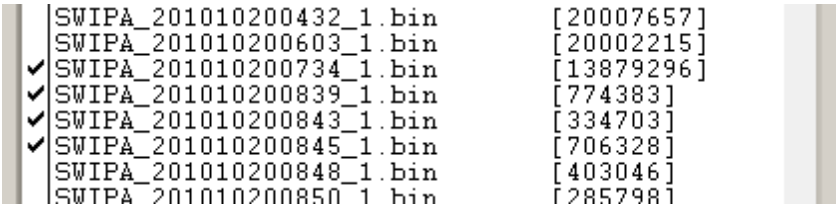
The only functions not available are the FLASH formatting and Firmware Upgrade functions.

5.10.10 Downloading Logger Data Files

Before downloading the data files make sure the download directory is where you want the downloaded files to be placed.

Use the "Change" command button to change the location.

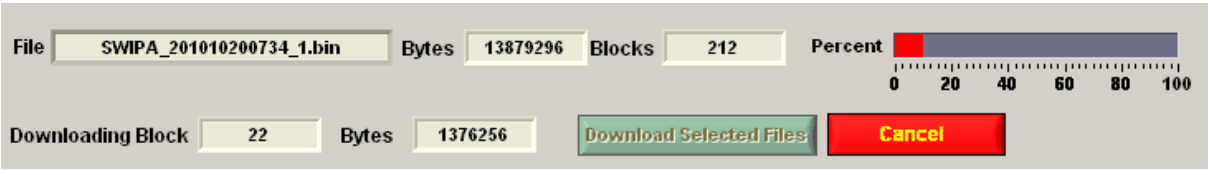
To download logger data files shown in the list you need to first get the list and then select the files you want to download.



Click the 

to start the download.

The files will be downloaded.



The download can be canceled by clicking on the "Cancel" command button.

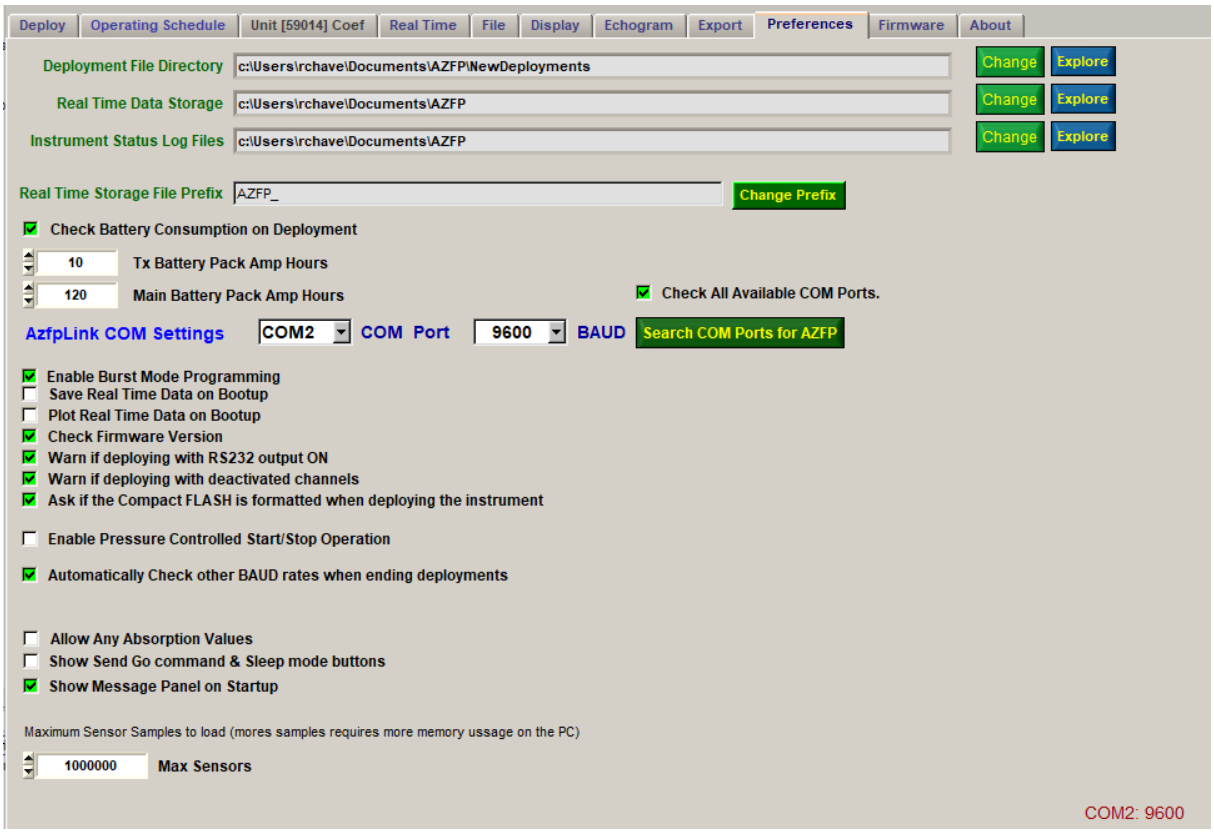
If there is an interruption in the download process the file download can be restarted without redoing the full file.

5.10.11 ASL Data Logger RS232 Files

The files retrieved from the ASL Data Logger storage device are not compatible with the AzfpLink program for viewing. These files contain raw RS232 data packets that the logger received and stored in these data files. For this reason further pre-processing are required to get these files into a format compatible with AzfpLink or ProfileView.

5.11 Preferences Tab

The preferences tab is used to set up some parameters specific to the AzfpLink program. These values are remembered between invocations of the program.



5.11.1 Deployment File Directory

These indicators display and set the location of deployment files. Deployment files are files written by AzfpLink when an instrument is deployed.

The current deployment file directory is shown in a text box.

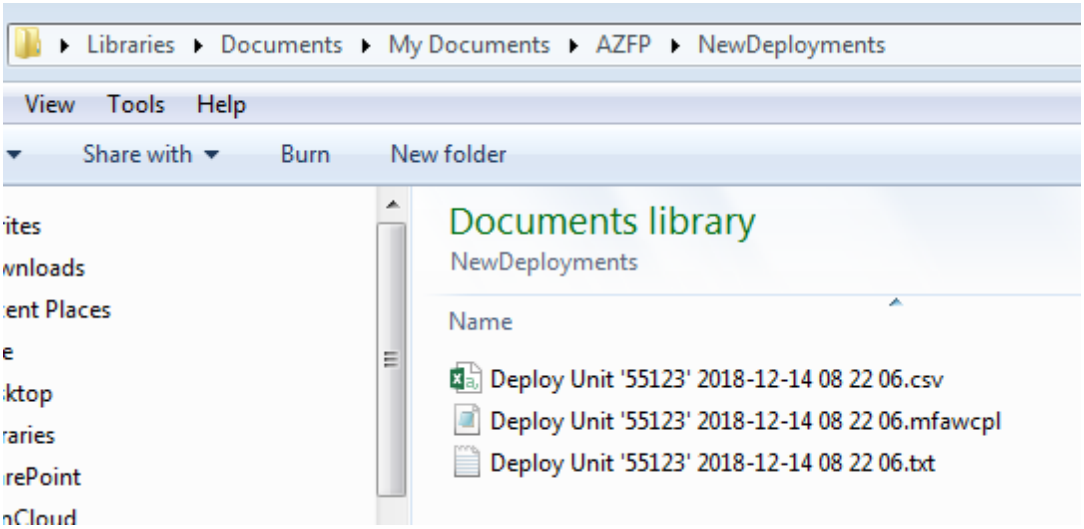
To change the location click on the 

command button to the right of the text box.

A directory select pop-up appears to select the directory.

The Explore opens Windows Explorer to the selected directory.

Three files are written when the instrument is deployed.



The files are named with the units serial number and the date and time the unit was deployed.

The .CSV file is a Microsoft EXCEL compatible comma delimited file that contains the deployment parameters used to deploy the AZFP.
This file can be easily formatted in MS EXCEL to view the deployment parameters.

The .mfawcpl file contains the deployment parameters in a form that can be reloaded into the AzfpLink program.

The .txt file provides a text based log of the parameters used to program the AZFP.

5.11.2 Real Time Data Storage Directory

These indicators display and set the location of real time data files as they are created by AzfpLink from the data received from the unit.

The name of the directory is shown in a text box.

To change the location click on the Change command button to the right of the text box.

A directory select pop-up appears to select the directory.

The Explore opens Windows Explorer to the selected directory.

5.11.3 Log File Directory

These indicators display and set the location of log files where status information from the unit is stored.

After a deployment the instrument sends out status information over the RS232 for 24 hrs before turning of this feature.
This allows the user to confirm the operation of the instrument. If the user has turned on the logging of the status records they are stored in files in the specified directory.

The name of the directory is shown in a text box.

To change the location click on the 

command button to the right of the text box.

A directory select pop-up appears to select the directory.

The 

opens Windows Explorer to the selected directory.

The log files are stored as ASCII text with the file names using the year, month, and day in the name with a .log extension.

20120209.log
20120210.log
20120211.log

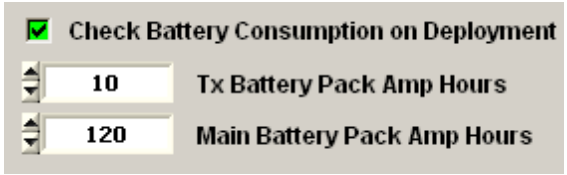
5.11.4 Real Time Storage File Prefix

As files are stored to the Real Time Data Directory there names are prefixed by a user selectable prefix.

To change the prefix click on the 

command button.

5.11.5 Check Battery Consumption on Deployment

The 

controls are used to set battery capacities and a flag to check the estimated battery consumption based on the selected phase parameters.

5.11.6 COM Port

The RS232 communications port for communicating with the AZFP is set here.

Up to 16 different ports can be selected. Once a port is selected the program tries to open the port. If an error occurs a pop-up message is displayed.

If the unit is connected to an ASL Data Logger the program can be connected to the unit using TCP/IP. To enable this functionality the Com Port must be set to TCP/IP.

The 

button causes the program to search for an AZFP on available RS232 COM ports on the computer. This function may take several minutes if the computer contains many COM ports. The program also cycles through possible BAUD rates of 9600, 115200, 230400 and 460800 BAUD to try and locate the AZFP.

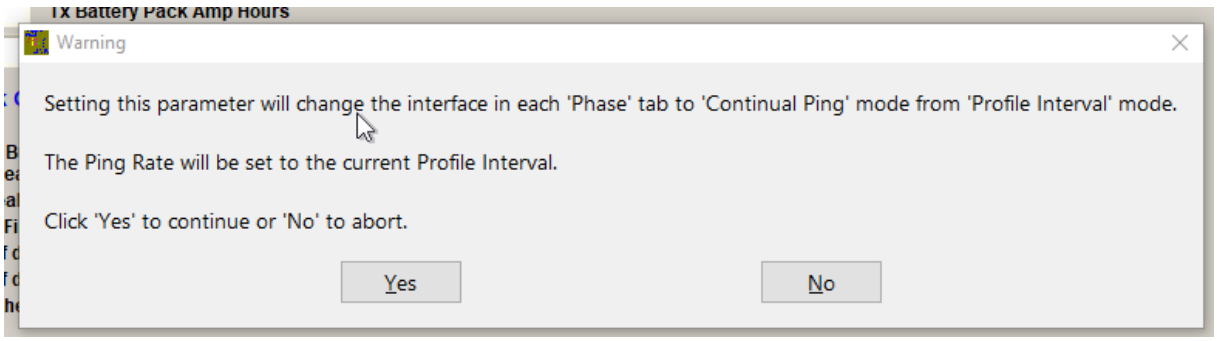
If the 

checkbox is checked then the program checks all COM ports. Otherwise it only checks the currently selected port.

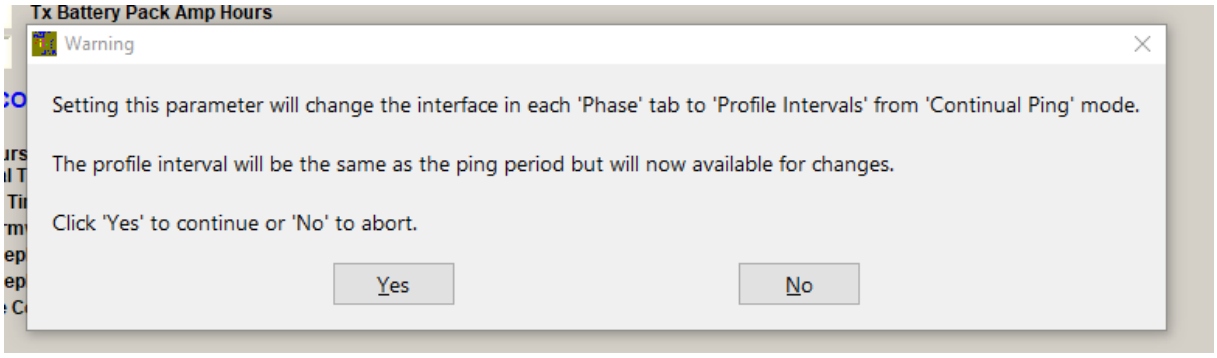
5.11.7 Enable Burst Mode Programming

If enabled the phase tabs in the "Operating Schedule" tab include parameters for burst mode operation.

Clicking on this box cause AzfpLink to show a pop up information panel.

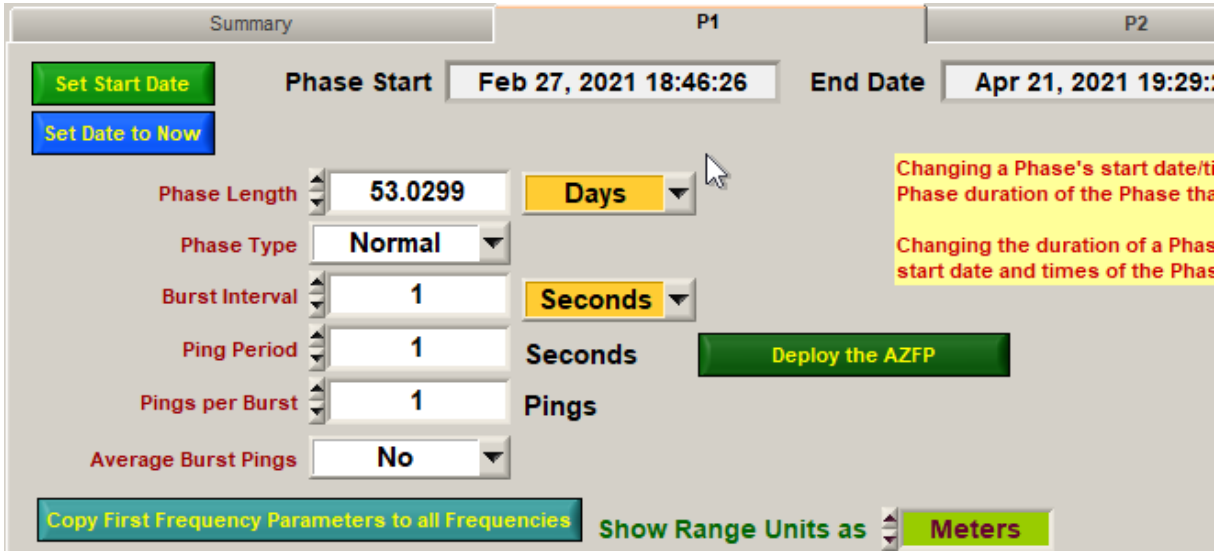


or if the Burst mode was disabled.

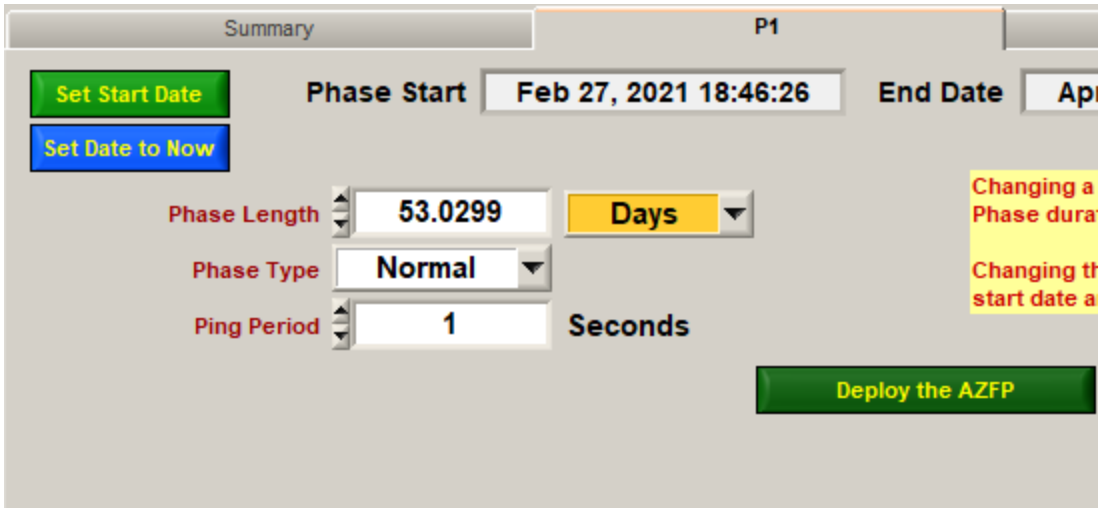


]

As an example.



If Burst Mode is not enabled then it is assumed that continual operation is set at the current Ping Period and the burst mode parameters disappear.



5.11.8 Save Real Time On Boot Up

Enable this check box if you want AzfpLink to automatically save real time data when it boots up.

5.11.9 Plot Real Time On Boot Up

Enable this check box to have AzfpLink to plot real time data automatically when it boots up.

Normally data plotting is disabled when the software is started.

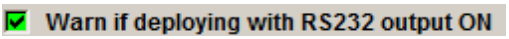
5.11.10 Check Firmware Version

The 

control enables or disables the checking of the firmware version when deploying an instrument for firmware upgrades.

5.11.11 Warn if deploying with RS232 output ON

If the AZFP is deployed with RS232 real time output set to on, AzfpLink will give the user a warning. Data acquisition with real time output on will use more power and can take a long time between pings to output the data so that the desired ping rates cannot be achieved.

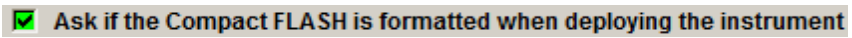


5.11.12 Warn if deploying with deactivated channels

If the AZFP is deployed with deactivated channels, AzfpLink will give the user a warning.

5.11.13 ASK if the Compact FLASH is Formatted

Before a deployment the program will ask if the Compact FLASH has been formatted if the checkbox is checked.



5.11.14 Enable Pressure Controlled Start/Stop Operation

Enable or Disable Pressure Control data acquisition.

Note that to use this option, the AZFP needs to be equipped with the optional pressure sensor.

Enable this option by setting the check mark in the box. This option enables the Pressure Controlled Start and Stop operation to collect acoustic data only when the AZFP instrument is submerged.

The AZFP pressure sensor measures the absolute pressure which includes the contribution from the atmosphere (nominally 10.1 dBar) plus the contribution from the water column (approximately 1 dbar per meter of water depth).

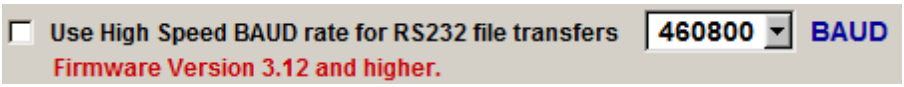
When the measured pressure exceeds the "Start" pressure, the instrument starts pinging.

The instrument stops pinging (and the data file is closed), when the measured pressure drops below the "Stop" pressure.
The minimum absolute pressure to start data acquisition is 13.0 dBar.
The minimum absolute pressure to stop data acquisition is 12.0 dBar.
These values take into account variations in air pressure and the accuracy of the pressure sensor. They have been selected to prevent pinging in air.
The user can increase these values using the up and down arrows.
When this option is selected, the instrument changes to a sensor measurement, including pressure, every 3 seconds.

5.11.15 Use High SPeed BAUD rate for RS232 file transfers

The checkbox and BAUD rate selector allows the user to specify the BAUD rate to transfer directory and files from the AZFP. This option is ignored if the AZFP's BAUD rate is already higher than 115200.

When transferring a file the AZFP and AzfpLink temporarily sets their BAUD rate to the selected speed.

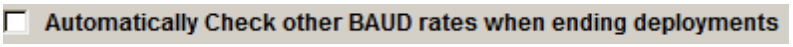


This option only works with firmware version 3.12 and higher.

5.11.16 Automatically Check other BAUD rates when ending deployments

When a deployment is ended and it fails to detect the AZFP. If this checkbox is checked, AzfpLink will attempt to detect and end the deployment of the AZFP at the currently selected COM port when the 

command button is clicked but it will try all possible BAUD rates should it fail.



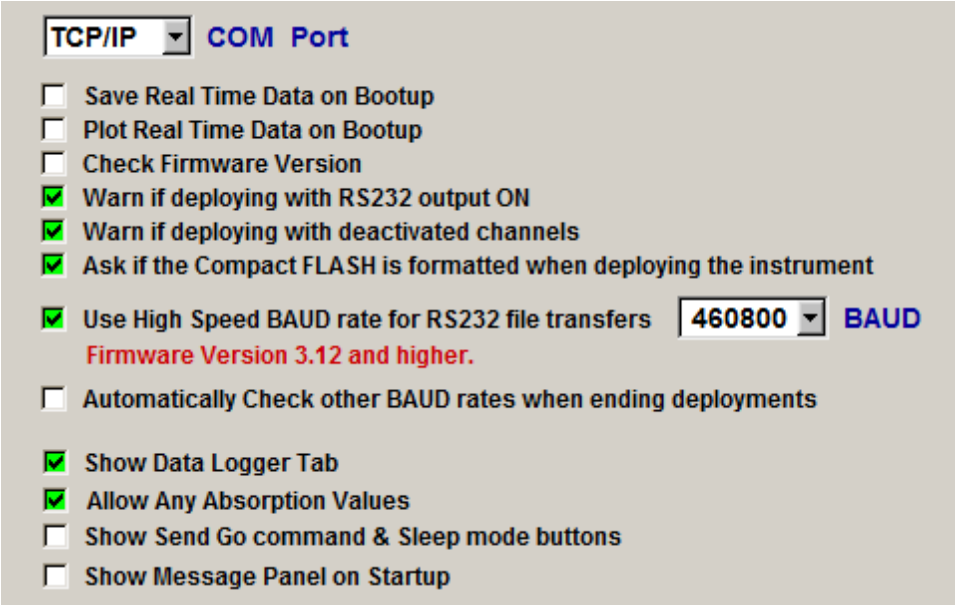
5.11.17 Show Logger Tab

The 

check box causes the program to show the Logger tab.

.

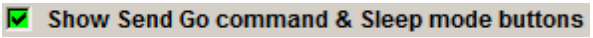
This option is only available when the COM port is set to TCP/IP.



5.11.18 Allow Any Absorption Value

To allow the entry of any absorption value for calculating SV or TS set this check box on.

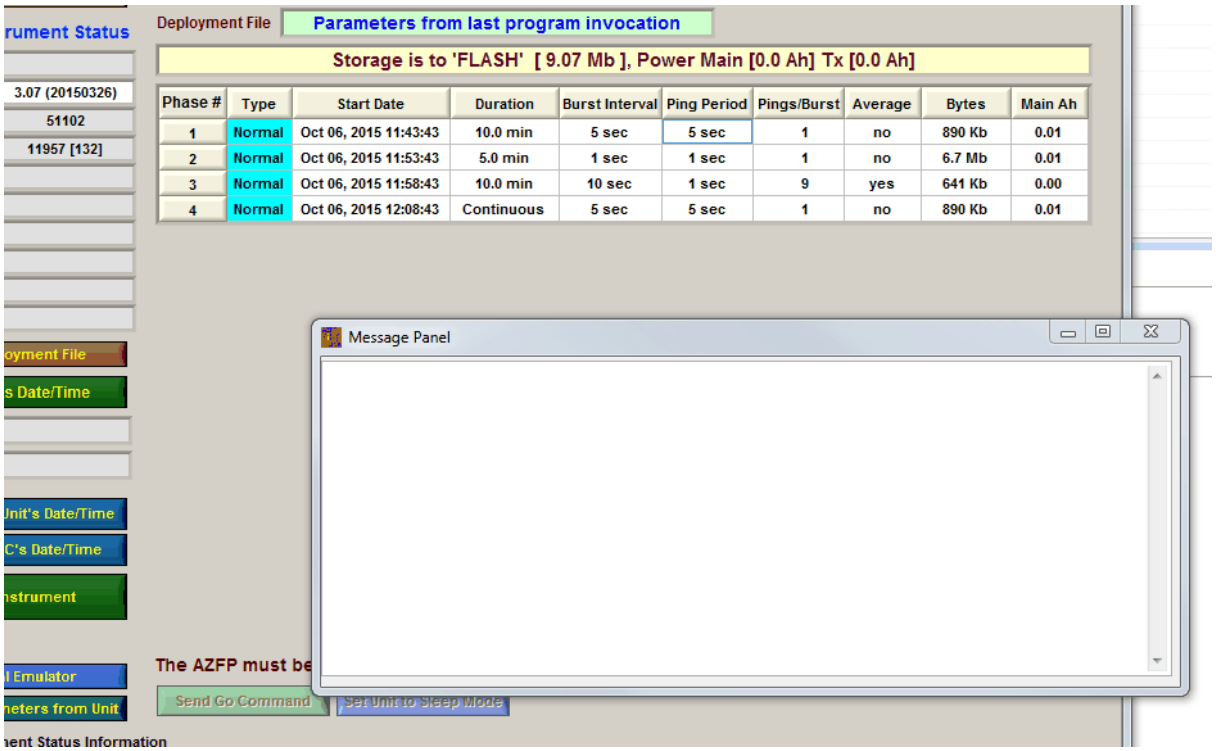
5.11.19 Show Send Go command & Sleep mode buttons

Enable 

to have the Send Go & Sleep mode buttons available in the deployment panel.

5.11.20 Show Message Panel on Startup

Enable this option to show the Message panel on the start up of the AzfpLink.



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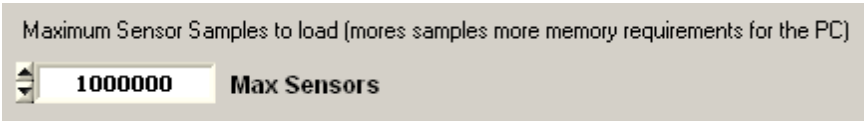
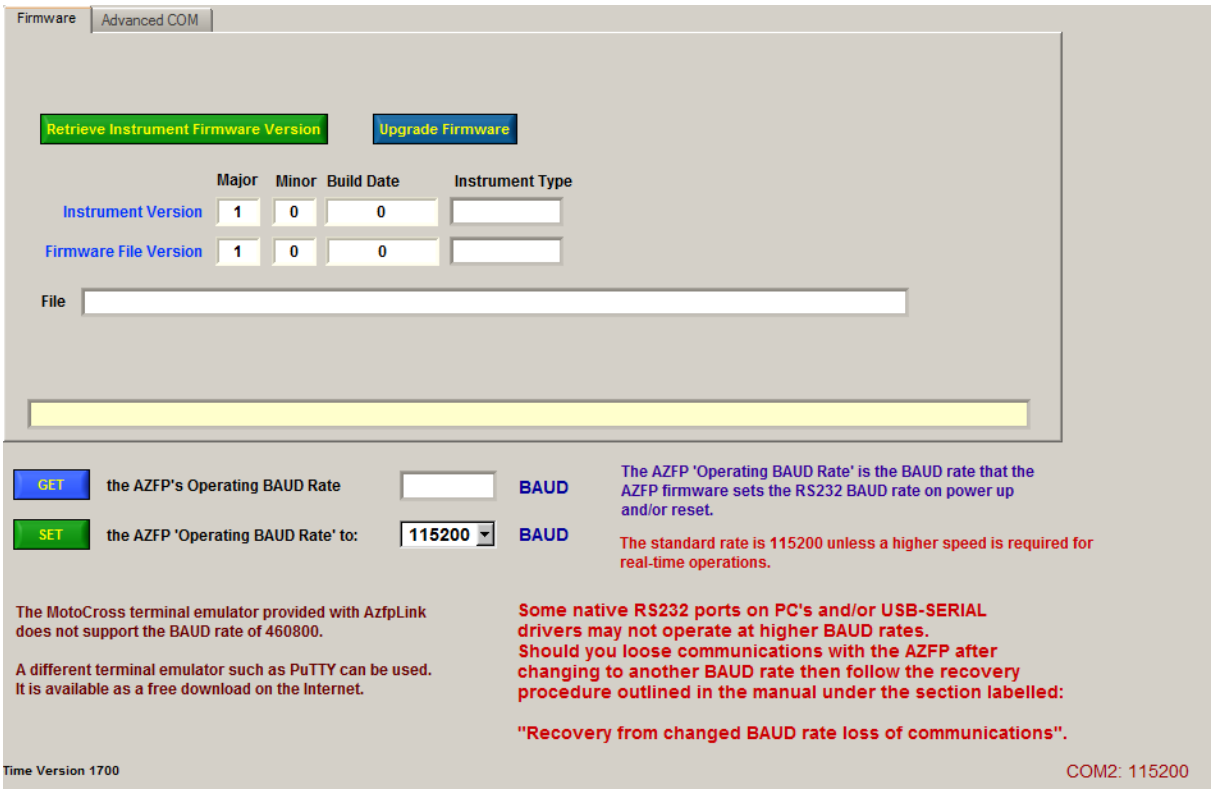
5.11.21 Maximum Sensor Samples to load



Max Sensors limits the number of samples and sensors that are loaded into memory when loading files in the Display tab. If the limit is reached the program stops loading data and displays it. Since there is no limit on the number of files to load, these controls limit the amount of memory that is used in the plotting to avoid lockup due to too much memory being used.

5.12 Firmware Tab

The Firmware tab is used to perform firmware upgrades and to set the default BAUD rates for the AZFP. An Advanced COM tab provide the ability to change some internal parameters to set the Operating System "PicoDOS" default BAUD rate or recover from a high speed BAUD rate that your PC could not accommodate due to driver or hardware issues with those rates.



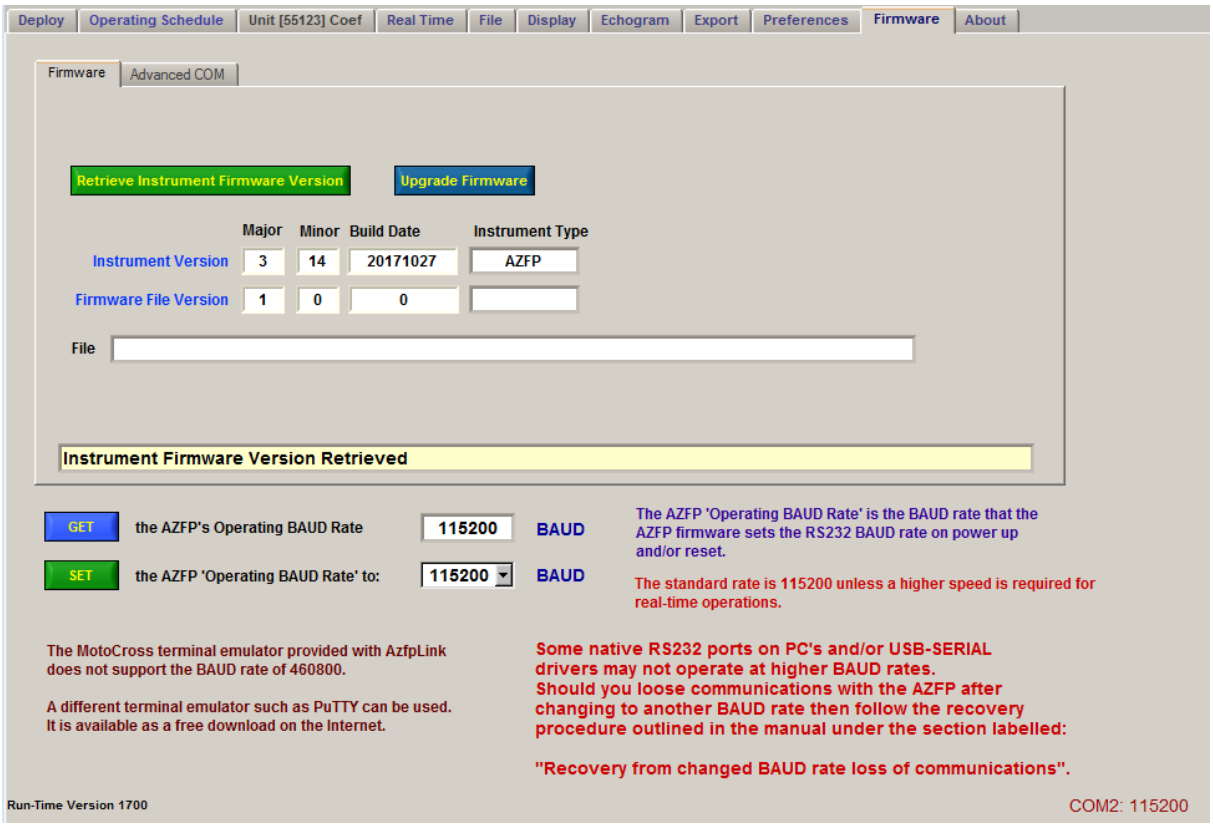
5.12.1 Upgrading the AZFP's Firmware

Before upgrading your firmware the following step is recommended to make sure the unit or the computer will not be interrupted by the loss of power during the upgrade procedure.

Make sure that the PC to unit communications is good by performing file transfers and programming with the PC you are going to do the upgrade with. Do not run other software on your PC when performing an upgrade. Performance issues have been found with some USB-RS232 adapters which make them unsuitable for upgrading units. It is recomended to use the Uport 1110 that is provided with each instrument.

5.12.1.1 Firmware Tab

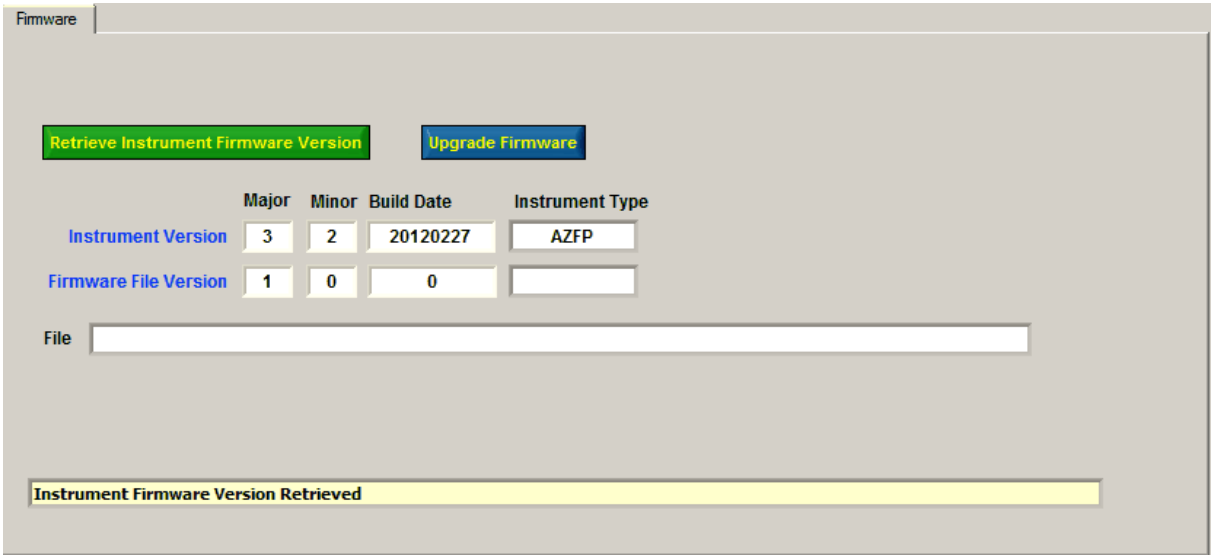
The Firmware tab is used to perform firmware upgrades and to set the 'Operating BAUD rate' for the AZFP.



5.12.1.1.1 Retrieve Instrument Firmware Version

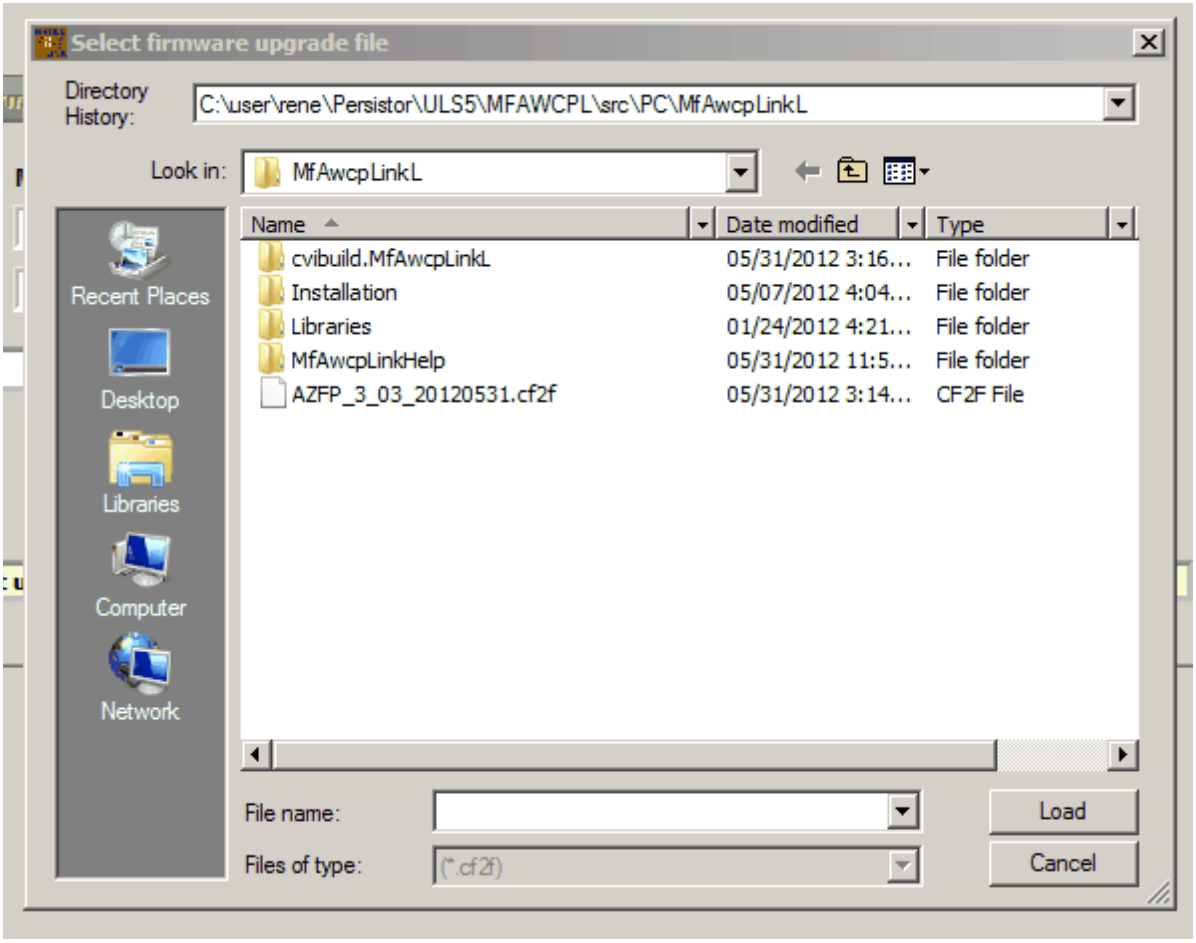
Make sure your unit is not deployed by clicking on the End Deployment - Get Status located in the Deploy tab.

Clicking on Retrieve Instrument Firmware Version command button cause the program to send a request to the instrument for its current firmware version.



5.12.1.1.2 Upgrading the AZFP Firmware

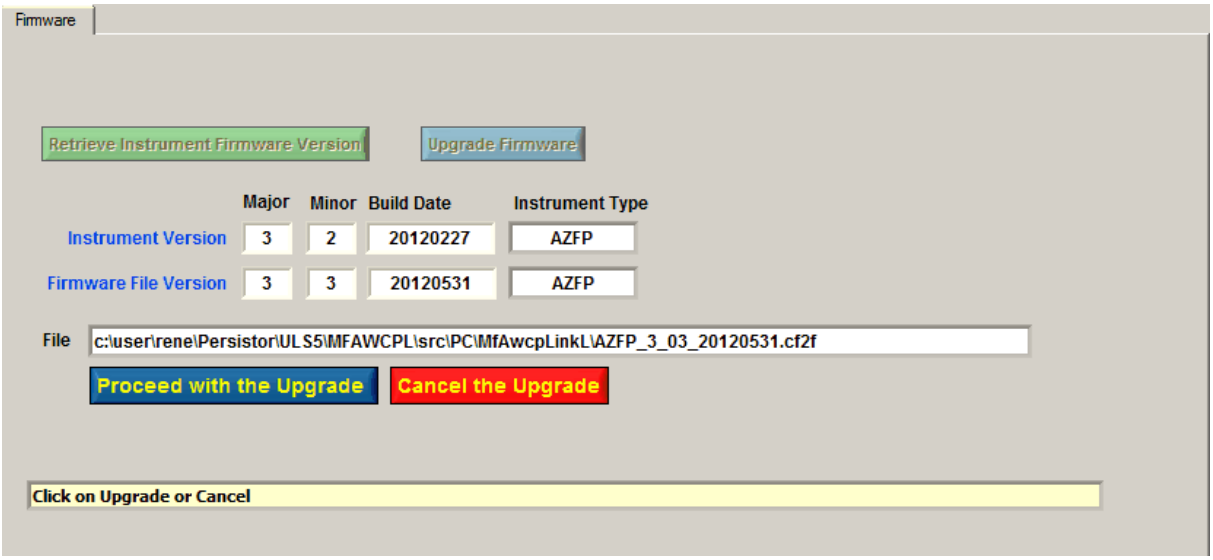
Clicking on the Upgrade Firmware command button opens a file selection box for the user to select a (*.cf2f) firmware file.



Select a .cf2f file to upgrade the unit with.

Files are always named AZFP_x_zz_yyyymmdd.cf2f where:

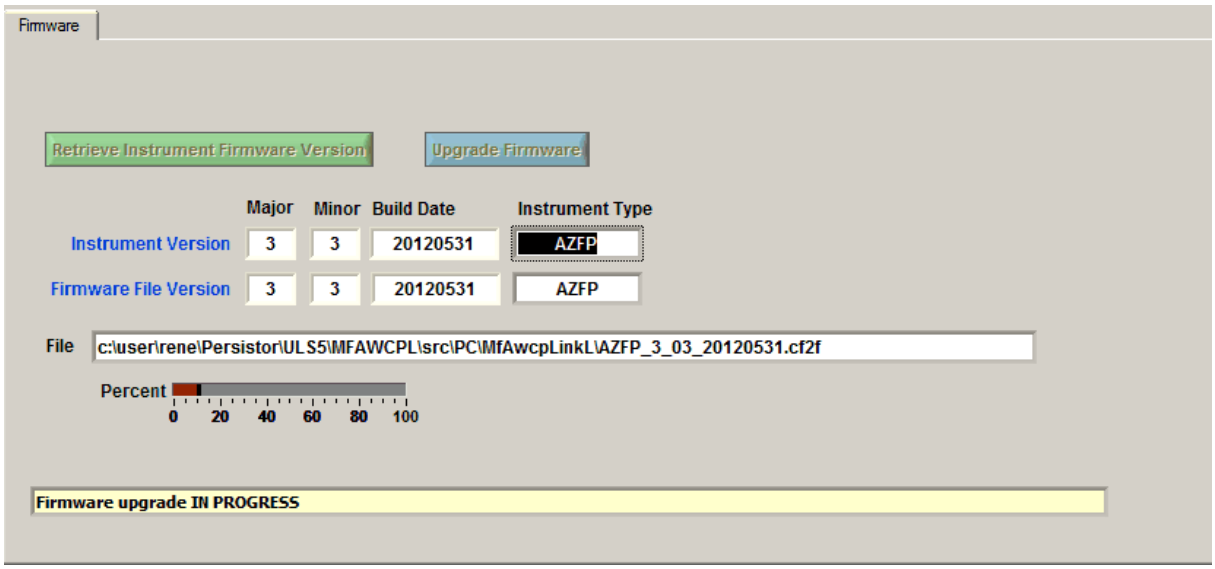
x - Firmware's major version number
zz - Firmware's minor version number
yyyy - Firmware's year
mm - Firmware's month
dd - Firmware's day



Note the firmware version of the file is now listed and there is the addition of **Proceed with the Upgrade** and **Cancel the Upgrade** command buttons.

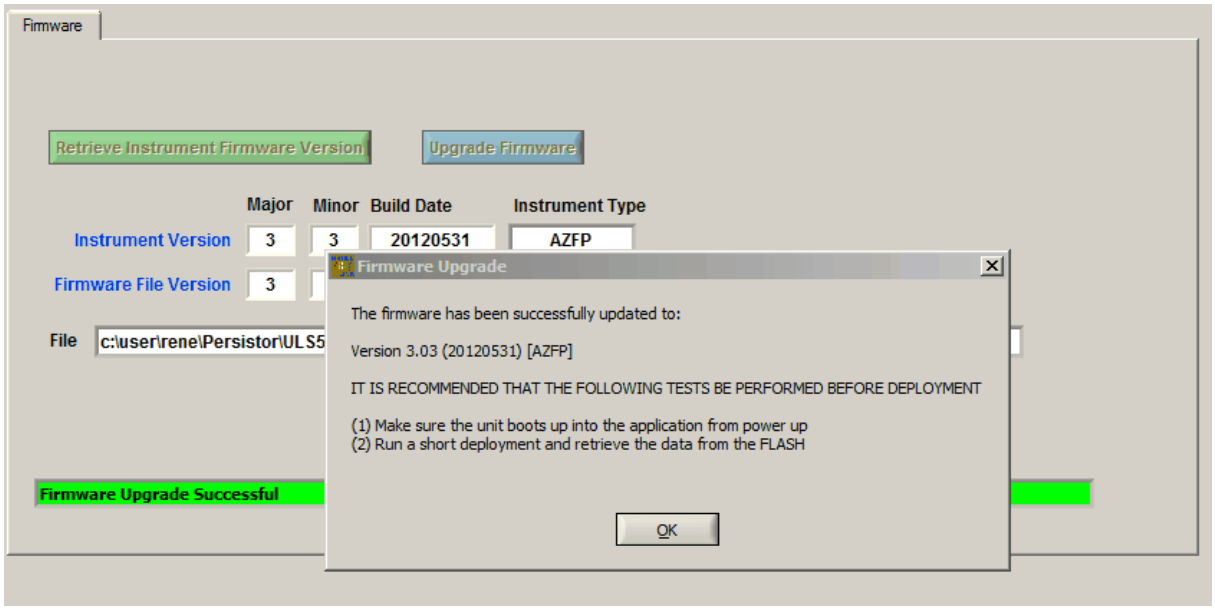
To cancel the upgrade click on the **Cancel the Upgrade** command buttons.

To continue click on the **Proceed with the Upgrade** command button.



A percentage done bar is displayed as the firmware is downloaded to the unit.

Below is an example of a successful upgrade.

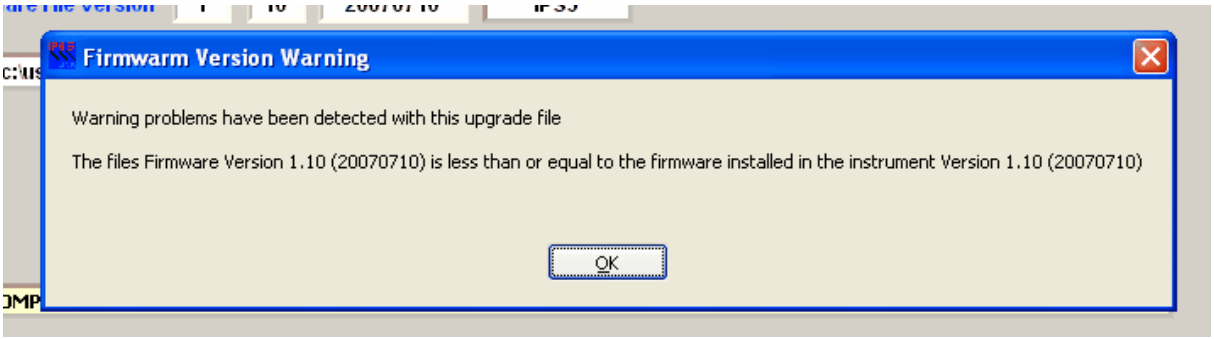


5.12.1.1.3 Firmw are Upgrade Trouble Shooting

This section is used to trouble shoot potential problems that can occur.

5.12.1.1.3.1 Firmware Version Warning

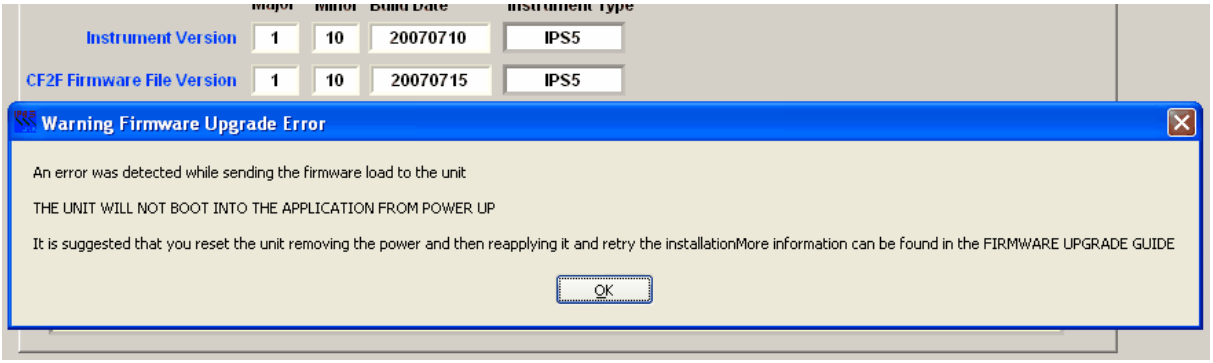
A firmware version warning is caused by trying to upgrade a unit with an older version of the firmware. This is only a warning and the software will let you do so.



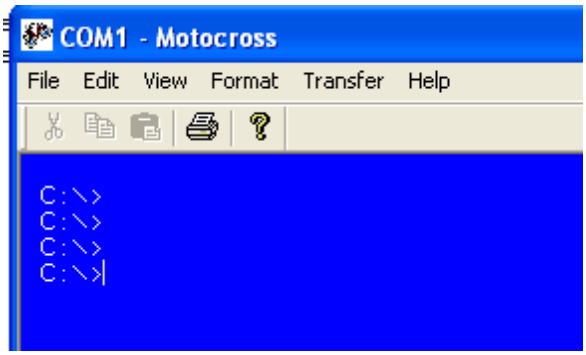
5.12.1.1.3.2 Firmware Upgrade Warning Aborted Upgrade

The following message will be caused if there is a communication error or the unit is rebooted during the download of the unit.

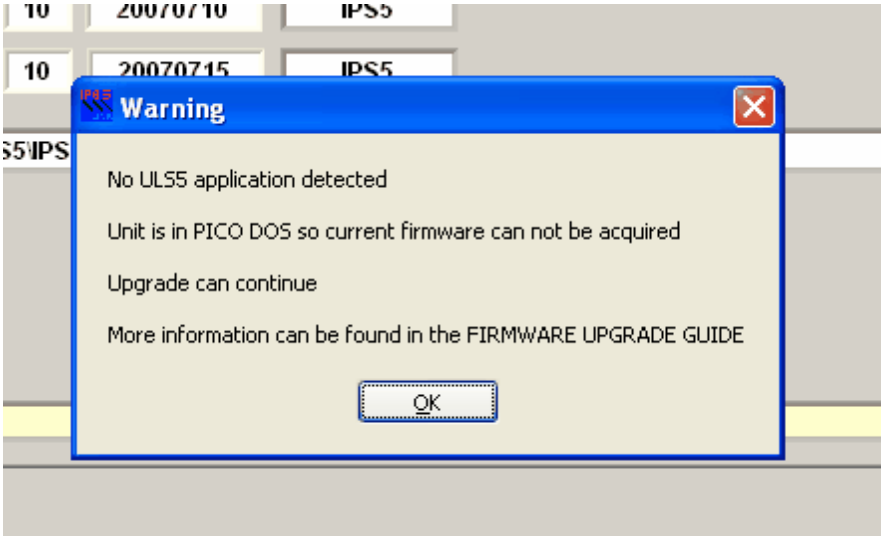
In this case the unit will not boot into the firmware as it is left in a state that boots it into its native Operating System PicoDOS.



Click on the OK button. Enter the terminal mode from the main tab by clicking on the Terminal Emulator command button.
Press the return key to confirm that you get a C:\> prompt. If it doesn't appear then reset the unit by removing and then re-applying power to the unit.



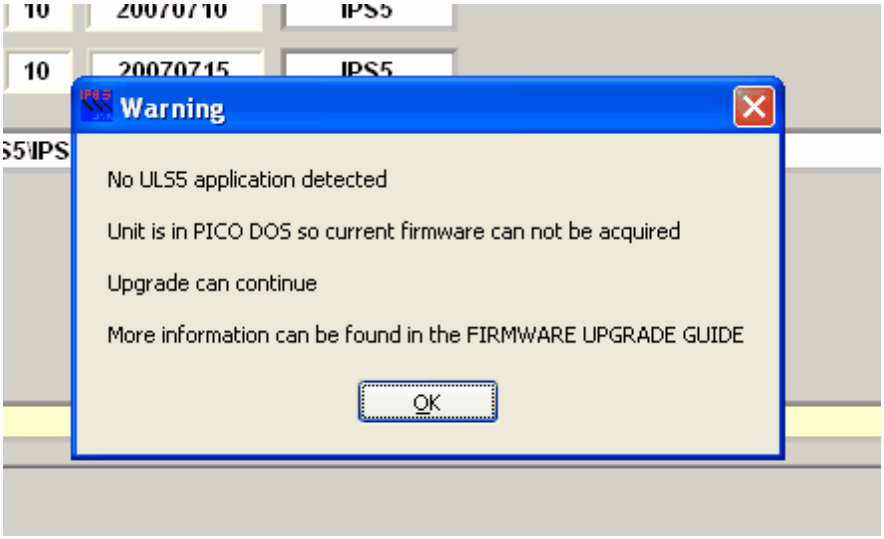
At this stage you can return to the Firmware Tab and retry the upgrade. NOTE: When you start the upgrade while the unit is in PicoDOS you will get a message that the upgrade procedure cannot confirm the units current firmware version.



5.12.1.1.3.3 Firmware Upgrade Warning Unit In PicoDOS

This warning appears if the unit was not running in the application. Instead the unit is running in the PICO does operating environment which is the native OS for the control CPU if it is not running an application. This could happen if a previous firmware upgrade was attempted and failed.

When you start the upgrade while the unit is in PicoDOS you will get a message that the upgrade procedure cannot confirm the units current firmware version.

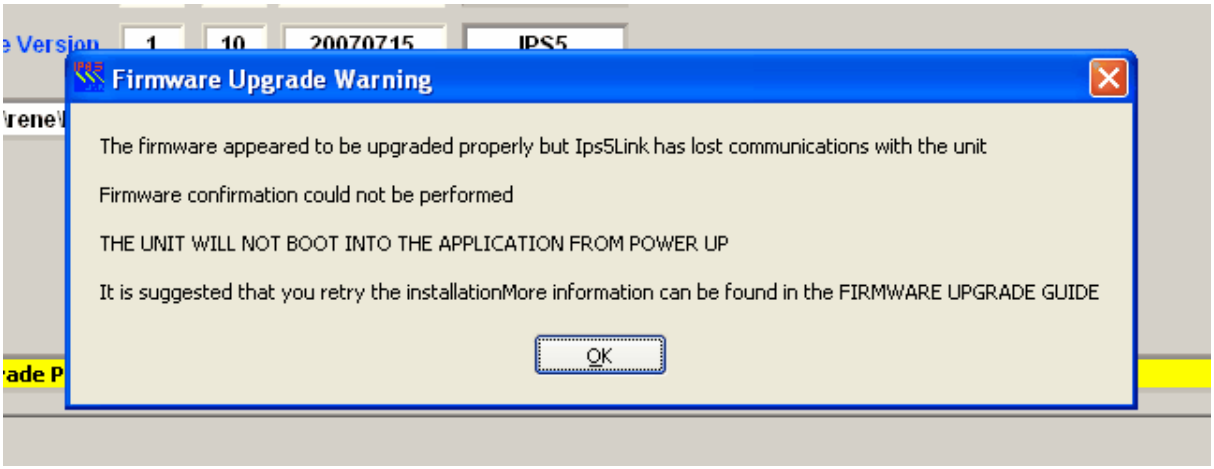


Click on the Ok button to continue and the file select option for the firmware file will appear and you can continue with the firmware upgrade.

5.12.1.1.3.4 Firmware Upgrade Warning Lost Communications

If the warning shown below shows up then the upgrade procedure lost communications with the unit after it was booted into the application or the upgrade procedure could not detect the return to PicoDOS to set the unit to boot into the application from power up.

In either case it is possible the firmware was downloaded correctly but since the version could not be confirmed the unit will boot into PicoDOS on power up which is not desirable for any deployment.

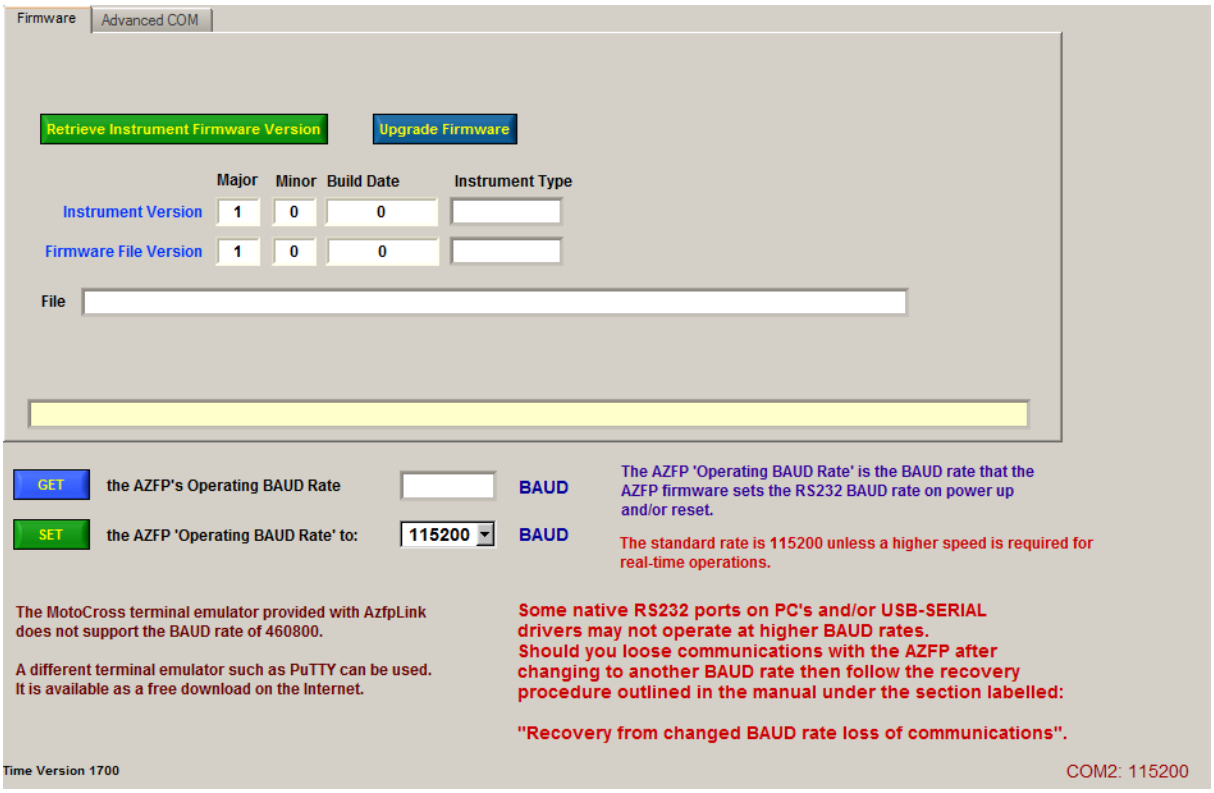


Please contact the manufacturer if this problem occurs.

5.12.2 Setting the AZFP's Default Communications

Firmware version 3.12 and higher allows setting the default communications speed of the AZFP through the AzfpLink.

The 'Operating BAUD rate' should be left at 115200 unless a change is required for real-time applications where the data is transferred via RS232 and a faster rate is desired.



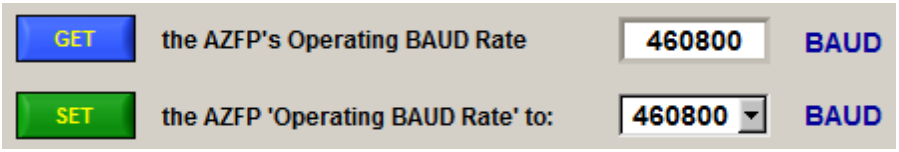
Make sure your instrument is not deployed by clicking the 

command button in the Deploy tab.

To set the 'Operating BAUD rate' to another value set the value in the pull down tab

then click on the 

.



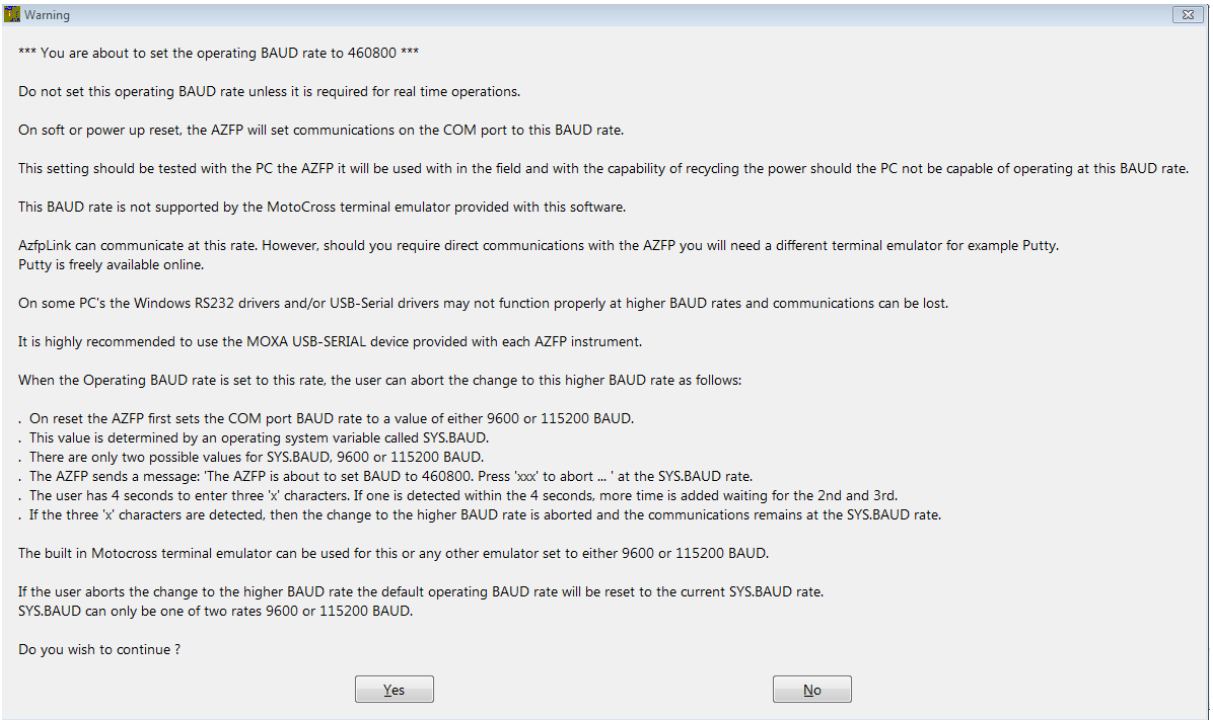
Should you lose communications with the AZFP after setting a the 'Operating BAUD rate' to a higher rate you can recover back to the original BAUD rate by following the instructions in section Recovering from High BAUD rate change.

THE STANDARD OPERATING BAUD RATE SHOULD BE SET TO 115200 FOR MOST AZFP'S AND SHOULD NOT BE CHANGED UNLESS REQUIRED FOR REAL-TIME OPERATIONS.

5.12.2.1 Warning Message for the Operating Mode BAUD rate

When setting the operating BAUD rate a warning message will show up.

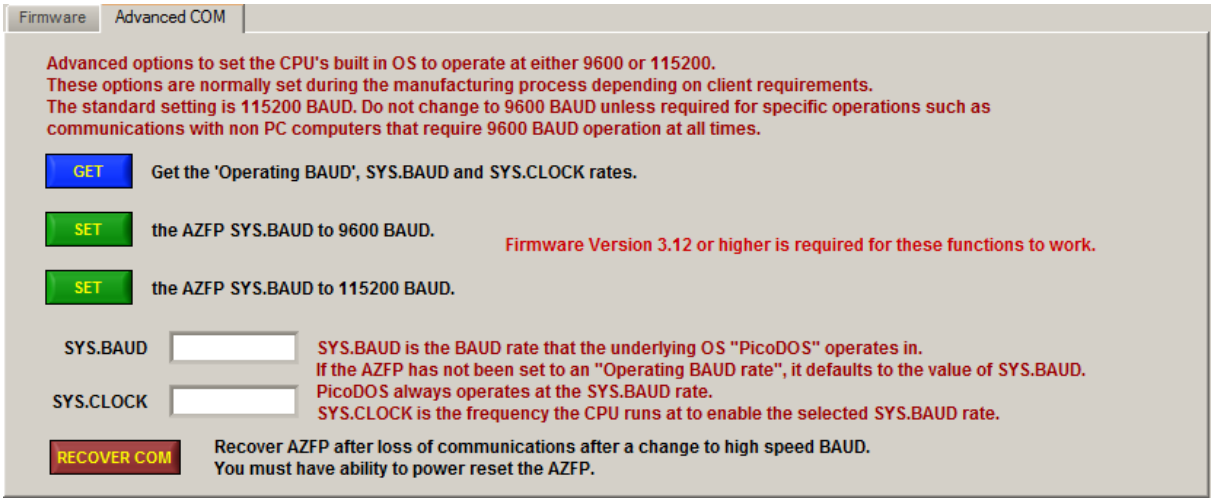
If a high BAUD rate is selected the following pop-up appears to give a warning that some system can't support high baud rates.



Click Yes to continue to set the 'Operating BAUD rate'.

5.12.3 Advanced COM tab

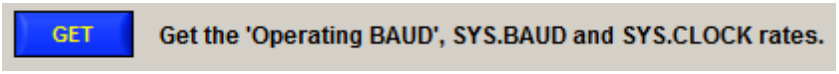
The Advanced COM tab provides the means to set the default PicoDOS the underlying OS to boot in one of two BAUD rates, 9600 or 115200 BAUD.



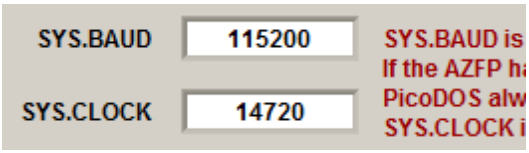
The SYS.BAUD is the default rate that the AZFP firmware will run at unless specifically set for some other BAUD rate. The SYS.BAUD is always the default operating BAUD rate of the underlying operating system PicoDOS when the OS is operating, for example if the &Pico command is invoked.

SYS.CLOCK is the underlying processor clock rate to allow the system to operate at the selected BAUD rates and **is not user selectable**.

To retrieve the SYS.BAUD click on the GET



command button.



THE STANDARD OPERATING SYS.BAUD RATE SHOULD BE SET TO 115200 FOR MOST AZFP'S.

5.12.3.1 Recovering From High Speed COM Failure

After setting an AZFP to 460800 BAUD 'Operating BAUD rate' it is possible because the PC could not run at that rate because of driver or hardware issues, it is possible to lose all communications with the AZFP.

Recover to a know BAUD rate which will be the PicoDOS operating rate of SYS.BAUD (either 115200 or 9600 BAUD) you can recover manually by following the instructions in section Loss of communications with the AZFP after setting high BAUD rate or you can click on the button in the Advanced COM tab

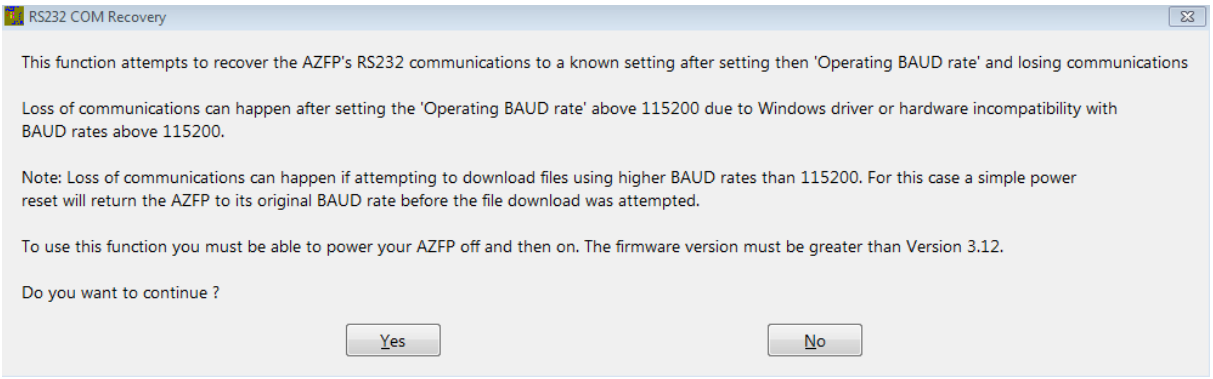
.

Clicking on this button starts a series of panels which the user should carry out the instructions to try and recover the communications.

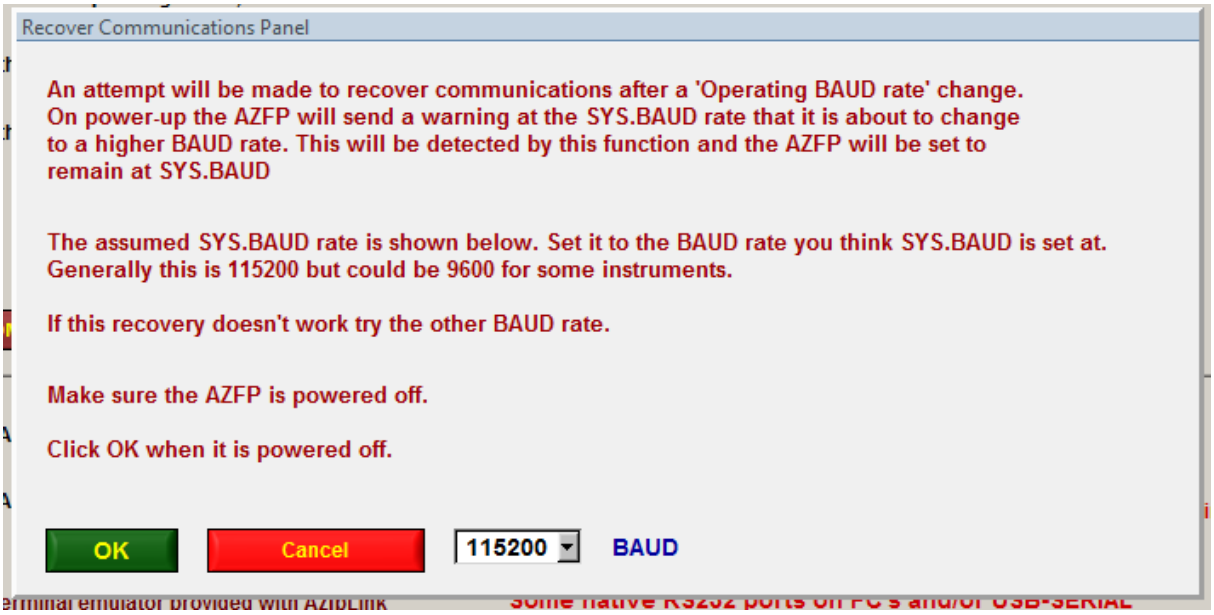
NOTE: If the loss occurred while trying to use High Speed File Downloads a simple reset of the AZFP should return the AZFP to normal communications at its original BAUD rate.

Click on the 

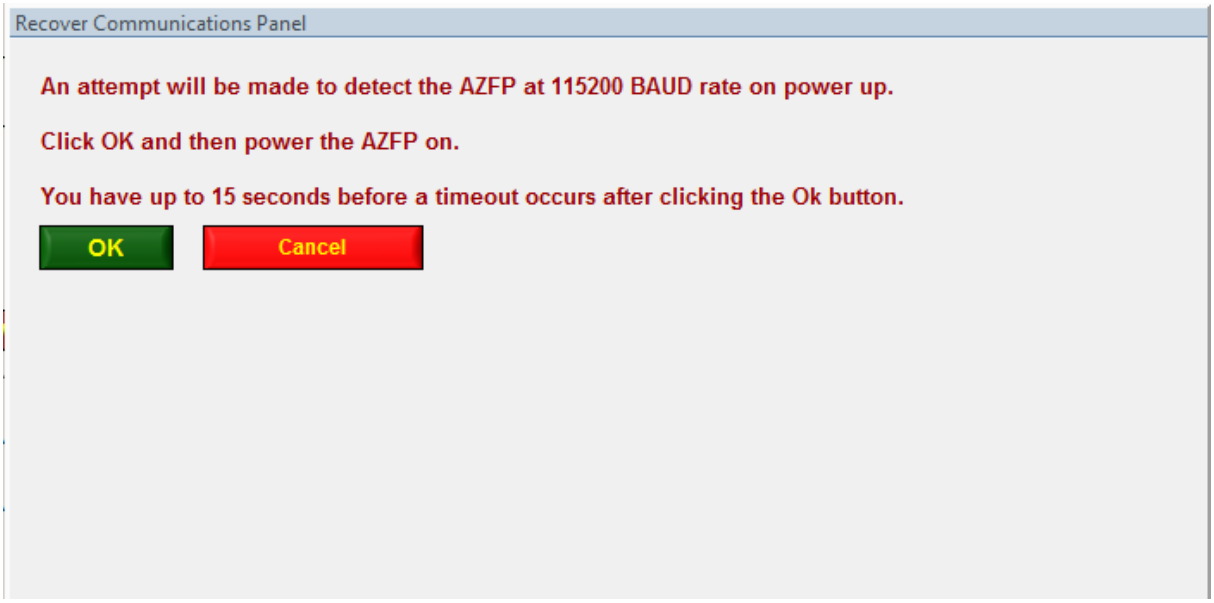
command button. The following



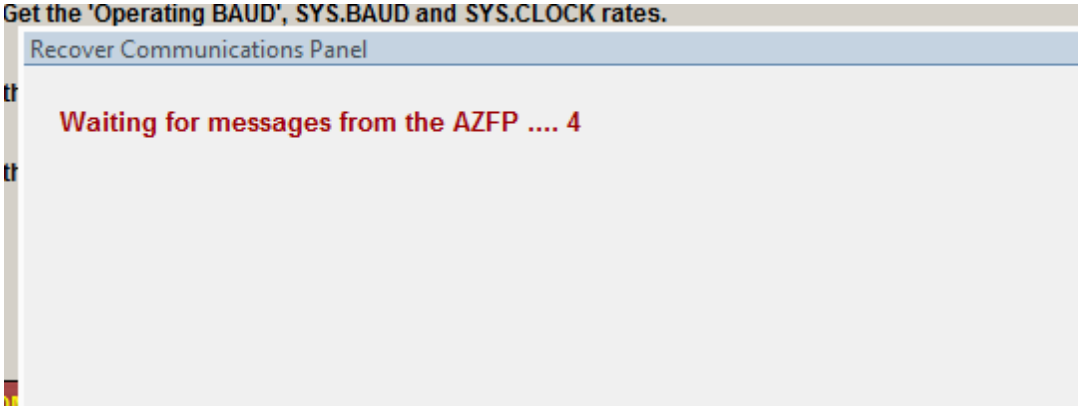
Click Yes to continue.



Make sure the power is turned off to the AZFP, select the BAUD rate you want to try 115200 or 9600 and click OK.

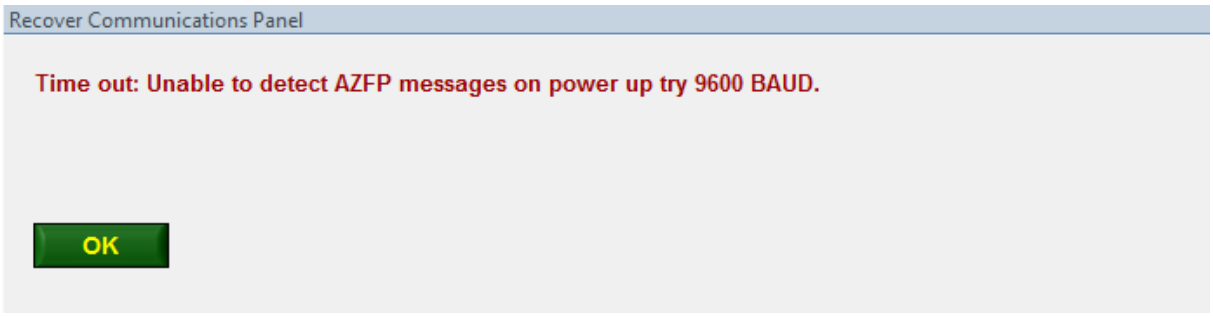


Click OK then power the unit on. You have 15 seconds after clicking to avoid a time out.

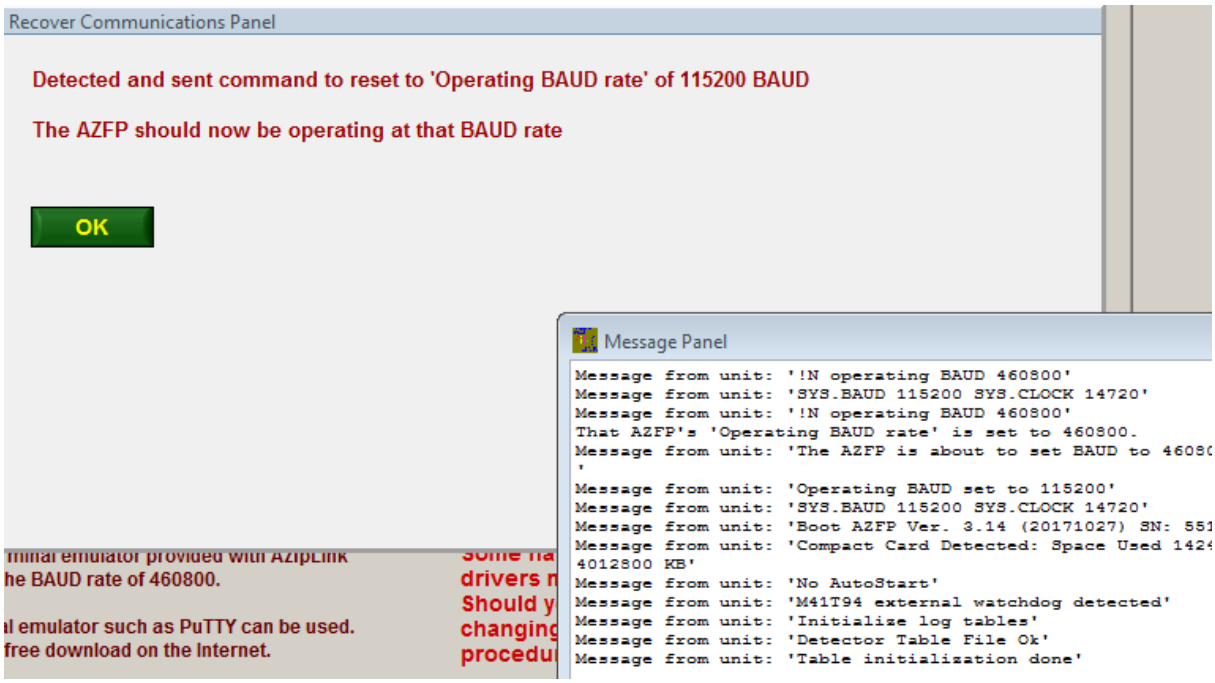


If AzfpLink detects the AZFP after you power it on you will see the following.

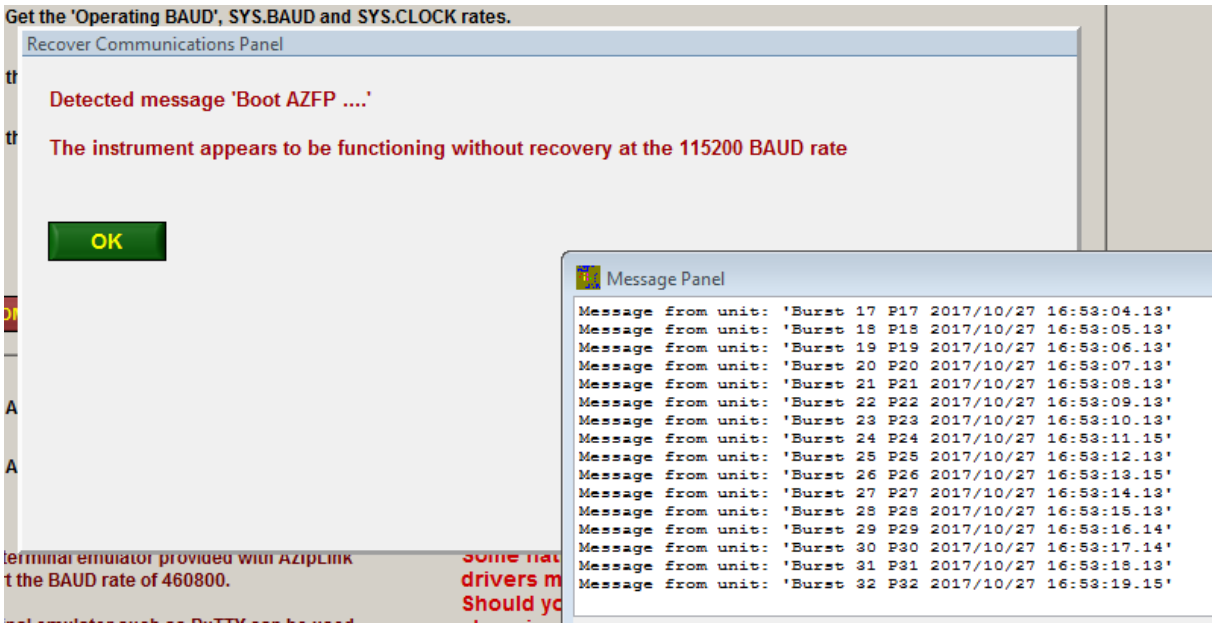
If the AZFP is not detected.



If the AZFP is detected before a high BAUD rate change warning.



If the AZFP is detected in a normal boot up you would see.



6 Deployment Steps

6.1 Clear the FLASH Memory

Clear the CF if the space will be required for the deployment and/or the data has been recovered. The best way to clear all data is found in the Formatting the CF section.

6.2 Confirm Date/Time Clock

Confirm that the units date and time is correct.

6.3 Confirm your parameters

Make sure you have the correct deployment parameters.

6.4 Inserting a New Compact FLASH card

If you are inserting a new CF card it is recommended that it be FORMATTED using AzfpLink.

Power down the unit.

Remove the old CF.

Insert the CF making sure it is properly seated.

Power the unit up.

End the deployment as the unit usually start up in DEPLOYED mode.

Format the CF using the instruction found in the Formatting the CF section.

It is recommended that you start a deployment and then stop it to make sure the unit wrote to the CF with no problem. Then either format the CF or delete the files.

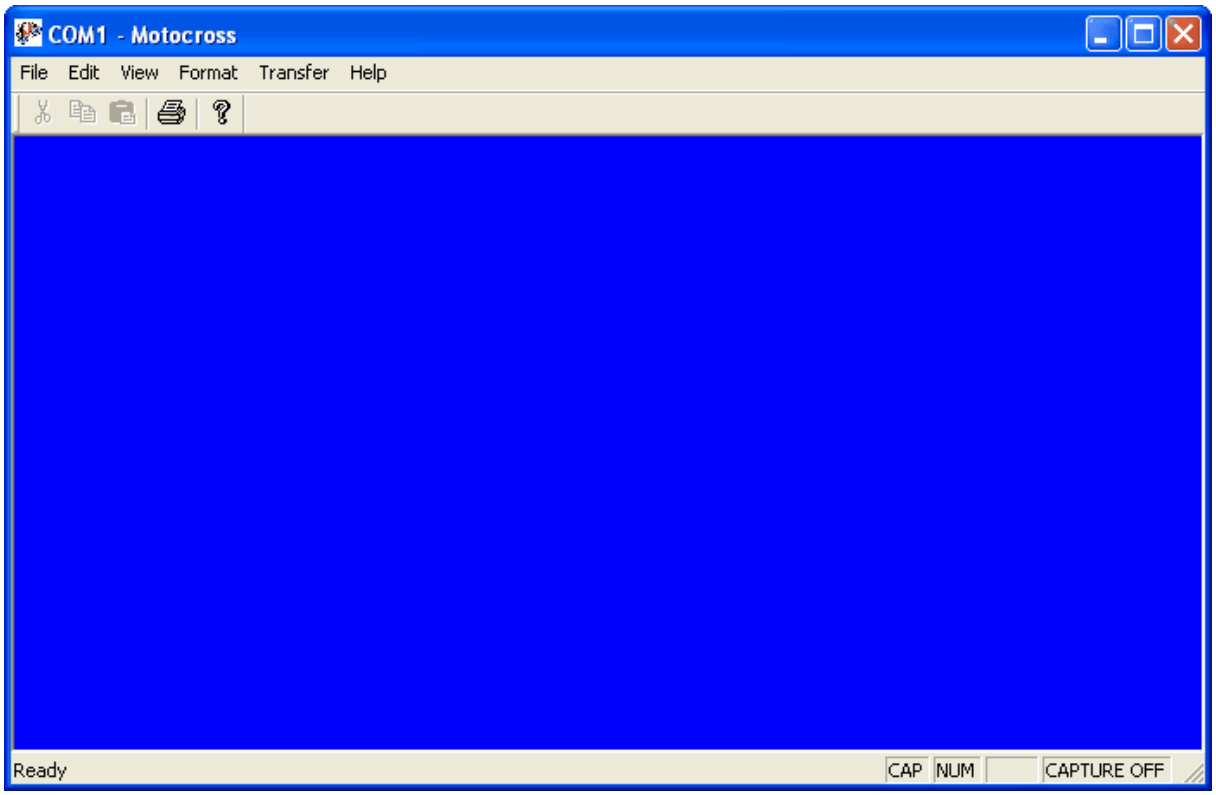
6.5 Confirming that a unit is running

6.5.1 Units connected to a cable without RS232 output

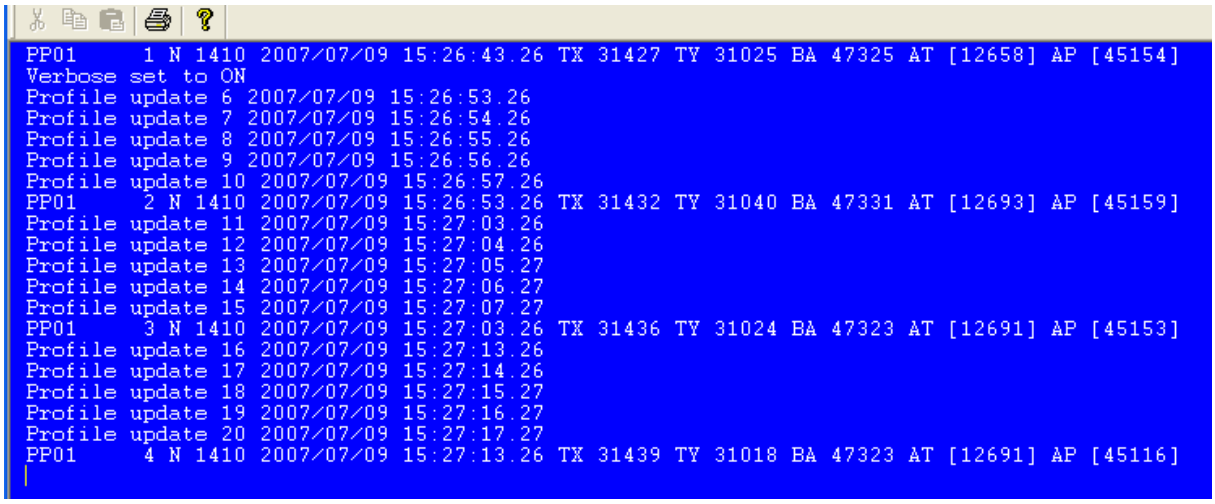
For units that are connected to a shore cable and not set to send RS232 data to the surface. A quick test can be performed to confirm operation after the deployment.

Enter terminal mode by clicking on the 

button to go into terminal mode.



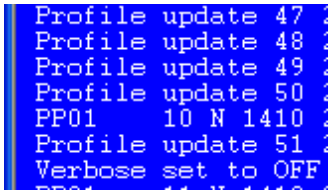
Press the 'V key (lower case v) continuously until you see the message "Verbose set to ON"



Note that lines that appear. PP01 means the profile is for Phase 1 followed by the ping number etc.

** Do not leave the unit in this mode as it uses more battery power.

Press the 'V' key (upper case V) continuously until you see "Verbose set to OFF".



7 Data Retrieval

If you have filled a CF card with data it is not recommended to retrieve the data using the RS232 serial port connection as this will take many hours depending on the volume of data. The best option is to remove the CF and retrieve the data using a generally available CF reader. These readers are generally sold with the option to read many types of CF cards.

** Be sure to end the deployment and then power the unit down before removing the CF

The data retrieval using the serial port is documented in the File Tab section. This option is useful if there is just a small amount of data or the user just wants to retrieve a small subset of data.

As of Firmware version 3.18 and later there is an option to download data of speeds up to 460800 BAUD.

8 Data Formats

The section describes output formats.

8.1 Real Time Profile Output Format

8.1.1 Packet Types

The Profile Data sent in real time over the RS232 has two possible two packet formats. These packets are a byte stream as described in the following two sections.

There are Packet Type 2, Packet Type 3.

The binary data in the payloads are in “Big-Endian” (Motorola) format byte order and needs to be converted to Intel PC’s which are little-Endian (Intel).

The packets are basically identical except that Packet Type 3 header as a byte counter for the payload data that allows more than 65535 bytes to be sent out in one packet transmission. Packet Type 3 used for profiles that have a large bin counts and have the Sum of Squares data for averaged range and ping bins. The packet headers are in ASCII so there is no Endian conversion required (see below) for the packet information.

Packet Type 5 packets are STATUS packets.

8.1.1.1 Packet Format Type 2

Field	Length	Type	Value	Value	Format	Comment
1	1	ASCII	\n	ASCII line feed	char	ASCII value 13
2	1	ASCII	$	ASCII '$'	char	Packet header
3	1	ASCII	2	ASCII '2'	char	Packet header
4	4	ASCII	XXXX	packet counter	HEX 4 bytes	Unique packet counter in hex format
5	4	ASCII	XXXX	data type	HEX 4 bytes	The type of data in the payload
6	4	ASCII	XXXX	num bytes (N)	HEX 4 bytes	The number of bytes in the payload (N)
7	5	ASCII	BHEAD	ASCII "BHEAD"	5 characters	The character string "BHEAD"
8	1	ASCII	\r	ASCII carriage return	char	ASCII Value 25
9	N	binary		packet payload	char	Character buffer containing data structures
10	1	ASCII	$	ASCII '$'	char	Packet tail
11	1	ASCII	8	ASCII '8'	char	Packet tail
12	4	ASCII	XXXX	packet counter	HEX 4 bytes	Unique packet counter in hex format should be same as field 3
13	4	ASCII	XXXX	checksum	HEX 4 bytes	checksum of payload where checksum is the sum of the payload characters into unsigned short int
14	5	ASCII	BTAIL	ASCII "BTAIL"	5 characters	The character string "BTAIL"
15	1	ASCII	\n	ASCII line feed	char	ASCII value 13

8.1.1.2 Packet Format Type 3

Field	Length	Type	Value	Value	Format	Comment

1	1	ASCII	\n	ASCII line feed	char	ASCII value 13
2	1	ASCII	$	Character '$'	char	Packet header
3	1	ASCII	3	character '3	char	Packet header
4	4	ASCII	XXXX	packet counter	HEX 4 bytes	Unique packet counter in hex format
5	4	ASCII	XXXX	data type	HEX 4 bytes	The type of data in the payload
6	8	ASCII	XXXX XXXX	num bytes (N)	HEX 8 bytes	The number of bytes in the payload (N)
7	5	ASCII	BHEAD	ASCII "BHEAD"	5 characters	The character string "BHEAD"
8	1	ASCII	\r	ASCII carriage return	char	ASCII Value 25
9	N	binary		packet payload	char	Character buffer containing data structures
10	1	ASCII	$	ASCII '$'	char	Packet tail
11	1	ASCII	8	ASCII '8'	char	Packet tail
12	4	ASCII	XXXX	packet counter	HEX 4 bytes	Unique packet counter in hex format should be same as field 3
13	4	ASCII	XXXX	checksum	HEX 4 bytes	checksum of payload where checksum is the sum of the payload characters into unsigned short int
14	5	ASCII	BTAIL	ASCII "BTAIL"	5 characters	The character string "BTAIL"
15	1	ASCII	\n	ASCII line feed	char	ASCII value 13

8.1.1.3 Packet Format Type 5

Packet type 5 is status information sent out by the instrument up to 24 hours after deployment.

Field	Length	Type	Value	Value	Format	Comment
1	1	ASCII	\n	ASCII line feed	char	ASCII value 13
2	1	ASCII	$	Character '$'	char	Packet header
3	1	ASCII	5	character '5	char	Packet header
4	4	ASCII	XXXX	Type	HEX 4 bytes	Status message type
5	4	ASCII	XXXX	Value 1	HEX 4 bytes	Status message value 1
6	8	ASCII	XXXX	Value 2	HEX 4 bytes	Status message value 2
7	5	ASCII	XXXX	N	HEX 4 bytes	The number of characters in the message not including the "STAT-" characters
8	1	ASCII	string	"STAT-" followed by a	char	string of characters

				string of characters		
8+N	N	#	'\#'	ASCII '#'	char	character after string of characters
8+N+1	4	ASCII	XXXX	checksum	HEX 4 bytes	checksum of payload where checksum is the sum of the payload characters into unsigned short int

Example: $5e020000100010021STAT-Burst 1 P1 2016/02/26 15:18:38.10#0770

8.1.2 Data Type

Below is a table showing the data types.

Data Type Number	Description
0xBBAA	Profile Data
0xADDE	Message Packet
0xAAAA	System Parameters

8.1.2.1 Profile Data

The profile byte stream is described below.

All data is in binary Big-Endian format					
Field	**Bytes**	**Name**	**Type**	**Units**	**Comment**
1	2	Burst Number	unsigned int		Profile number
2	2	Instrument Serial Number			The instrument serial number
3	2	Ping Status			status
4	4	Burst Interval	unsigned long		seconds
5	2	Year	unsigned short		year
6	2	Month	unsigned short		month 1-12
7	2	Day	unsigned short		day 1-31
8	2	Hour	unsigned short		hour 0-23
9	2	Minute	unsigned short		minute 0-59
10	2	Second	unsigned short		seconds 0-59
11	2	Hundreds	unsigned short		hundreds of seconds 0-99

12	8	Digitization Rate chan 1,2,3,4	unsigned short	samples/sec	64000, 40000 or 20000 for each channel
13	8	Lockout Index chan 1,2,3,4	unsigned short		The sample number samples skipped at the start of the ping (4 channels)
14	8	Bins (data points) 1,2,3,4	unsigned short		number of bins (data points) (4 channels)
15	8	Range Samples per Bin	unsigned short		range samples per bin (4 channels)
16	2	Ping Per Profile	unsigned short		number of pings per profile
17	2	Average pings	unsigned short		Flag to indicate if pings are averaged in time
18	2	Num Acquired Pings	unsigned short		Pings that have been acquired in this burst
19	2	Ping Period	unsigned short	Seconds	Ping Period in seconds
20	2	First Ping	unsigned short		number of the first averaged ping or the ping number if not averaged
21	2	Last Ping	unsigned short		number of the last averaged ping or same as First ping if not averaged
22	4	Data Type of each channel	char[4]		1 = Averaged Data (5 bytes) , 0 = not averaged data (2 bytes)
23	2	Data Error	short		Error number if an error occurred
24	1	Phase	unsigned char		Phase used to acquire this profile
25	1	Over run	unsigned char		1 if an over run occurred
26	1	Number of channels	unsigned char		1,2,3 or 4
27	1	Gain chan 1	unsigned char		gain 0, 1, 2, 3 (Obsolete)
28	1	Gain chan 2	unsigned char		gain 0, 1, 2, 3 (Obsolete)
29	1	Gain chan 3	unsigned char		gain 0, 1, 2, 3 (Obsolete)
30	1	Gain chan 4	unsigned char		gain 0, 1, 2, 3 (Obsolete)
31	**1**	Spare	unsigned char		spare due to structure alignment on two byte intervals
32	2	Pulse Length chan 1	unsigned short	uS	The pulse length for chan 1
33	2	Pulse Length chan 2	unsigned short	uS	The pulse length for chan 2
34	2	Pulse Length chan 3	unsigned short	uS	The pulse length for chan 3

35	2	Pulse Length chan 4	unsigned short	uS	The pulse length for chan 4
36	2	Board number for chan 1	unsigned short		The board the data came from for channel 1
37	2	Board number for chan 2	unsigned short		The board the data came from for channel 2
38	2	Board number for chan 3	unsigned short		The board the data came from for channel 3
39	2	Board number for chan 4	unsigned short		The board the data came from for channel 4
40	2	Board Frequency chan 1	unsigned short	kHz	The frequency for the channel 1
41	2	Board Frequency chan 2	unsigned short	kHz	The frequency for the channel 2
42	2	Board Frequency chan 3	unsigned short	kHz	The frequency for the channel 3
43	2	Board Frequency chan 4	unsigned short	kHz	The frequency for the channel 4
44	2	Sensor Flag	unsigned short		Sensor Flag to indicate if pressure sensor or temperature sensor available
45	2	Tilt x	unsigned short	Counts	counts
46	2	Tilt y	unsigned short	Counts	counts
47	2	Battery	unsigned short	Counts	counts
48	2	Pressure	unsigned short	Counts	counts
49	2	Temperature	unsigned short	Counts	counts
50	2	AD channel 6	unsigned short	Counts	AD channel 6
51	2	AD channel 7	unsigned short	Counts	AD channel 7
52	Bins	Data chan 1			See **Channel Storage** documentation below
53		Data chan 2 (if avail)			
54		Data chan 3 (if avail)			
55		Data chan 4 (if avail)			

8.1.2.1.1 Channel Storage

This section describes the details of how the data is stored in the profile.

The fields below are important field for defining the stored data.

Field 14 consists of four 2-byte values that indicate the number of data points stored for each channel.
Field 15 consists of four 2-byte values that indicate the number samples that were taken for each data point for each channel.
Field 16 is the number of pings collected for the profile.
Field 17 is a flag to indicate if the pings within the profile where averaged.
Field 22 consists of four 1-byte values that indicate whether a channel of data is stored as log values or summed linear values.

It is possible to have channels that are stored as log values and others as summed linear values in the same profile.
If a channel has averaging in either across pings withing the profile and/or depth, the data is stored as summed linear values.

Each channel that consists of log data is stored in consecutive two byte (unsigned short) data points. The number data points is defined by the number in field 14 of the corresponding channel.
Below is an example of how 4 channel log data (no averaging) and 1000 bins are stored;

Channel 1 1000 2 byte log values followed by
Channel 2 1000 2 byte log values followed by
Channel 3 1000 2 byte log values followed by
Channel 4 1000 2 byte log values.

Within the AZFP instrument, data can be averaged in depth and/or across pings (Bin averaging). In the instrument, this is done by converting the log values of the data that are to be averaged to a linear value. The values are then summed in a 4-byte accumulator. Because there is the possibility of the 4 byte accumulator overflowing (the largest number is 0xFFFFFFFF or 4,294,967,295), the number of overflows are kept track of in a 1-byte value for each accumulator. One byte can store up to 255 overflows and there is no possibility of more than 255 overflows.

The accumulators (array of 4-byte values) for a channel are stored first followed by the array of overflow bytes. As with the log data, the number of these data points is located in field 14. Each channel is stored consecutively. As an example, for a 4 channel system where each channel has 1000 summed accumulator values, they are stored as follows:

Channel 1 1000 4 byte accumulator values followed by
Channel 1 1000 1 byte overflow values followed by
Channel 2 1000 4 byte accumulator values followed by
Channel 2 1000 1 byte overflow values followed by
Channel 3 1000 4 byte accumulator values followed by
Channel 3 1000 1 byte overflow values followed by
Channel 4 1000 4 byte accumulator values followed by
Channel 4 1000 1 byte overflow values followed by

The following example is where channels 1 & 3 contained non summed data and channels 2 & 4 where set to have summed (to be averaged later) data.

Channel 1 1000 2 byte log values followed by

Channel 2 1000 4 byte accumulator values followed by
Channel 2 1000 1 byte overflow values followed by
Channel 3 1000 2 byte log values followed by
Channel 4 1000 4 byte accumulator values followed by
Channel 4 1000 1 byte overflow values

To compute the actual average linear values from the accumulator values, take the accumulated sum and add the corresponding overflow byte times 0xFFFFFFFF (4,294,967,295):

total_counts = accumulator sum + overflow * 0xFFFFFFFF.

The total_counts is then divided by the number of bins that were summed in both space and time:

averaged linear value (**LV**) = total_counts/(bins_space * bins_time)

where:

bins_space - is the value in field 15 (Range Samples per Bin) for the corresponding channel.
bins_time is equal to 1 if field 17 (Average pings) is zero . If field 17 for the corresponding channel is 1 then bins_time is equal to the number in field 16 (Ping Per Profile).

The averaged linear values (**LV**) can be changed back to log values using the following equation.

LogValue = (log10(**LV**)-2.5)*8*65535*DS, where DS is the detector slope that is specific to each channel and available in the instrument configuration parameters.

Please refer to the AZFP Data and Calibration (Appendix G) of the Operator's Manual for details on how to convert this data to Sv or Ts and how to convert sensor counts to Engineering units.

8.1.2.2 Message Data

This section describes the message format from the unit.

Field	Bytes	Format	Name	Comment
1	2	binary	Number	Message Number
2	2	binary	value	Message Value
3	100	ASCII Null Terminated	message	Message text

8.1.2.3 System Information

A system data packet contains information about the system. The data consists of the following 'C' data structures.
The data is stored in “Big-Endian” (Motorola) format byte order.

This packet of information is sent by the instrument when it enters data (DEPLOYED) or goes into STANDBY mode.

```
typedef struct {
        unsigned short VersionMajor;    // Major version number
        unsigned short VersionMinor;    // Minor version number
        unsigned long  VersionDate;     // Version date
```

```
        unsigned short File;                    // File Version number
        unsigned short ParameterVersion; // Parameter version
        unsigned long  CPU;                     // CPU number
        unsigned short SerialNumber;      // Serial number
        unsigned short SizeofSystemParameters; // size of this structure
        unsigned short InstrumentType;              // instrument type
        unsigned short ConfigurationVersion;        // configuration version number
        unsigned short BoardVersion;                // digital board version
        unsigned short Reserved[1];                 // reserved
} version_t;

typedef struct {

        version_t          Version;                 // Contains version information
        unsigned long FreeSectors;                  // Total free sectors on the FLASH
        unsgiend long TotalSectors;                 // Total sectors on the FLASH
        unsigned long BytesPerSector;               // Bytes per sector on the FLASH
        unsigned short Mode;                        // Mode instrument is in Usually STANDBY
        unsigned short FullDuplex;                  // Usually should be HALF DUPLEX
        unsigned short   ValidConfiguration;        // FLAG for the current parameters
        unsigned short   ParametersSaved;           // flag that the parameters is saved to VEEPROM
        unsigned short   ConfigSaved;               // flag that the configuration is saved to VEEPROM
        unsigned short Watchdog;                    // Indicator as to weather the unit was woken from
WATCHDOG timer
        unsigned short Reserved[4];
} system_t;
```

All data is in binary Big-Endian format			
Field	**Bytes**	**Name**	**Comment**
1	2	Version Major	The major version number of the firmware
2	2	Version Minor	The minor version number of the firmware
3	4	Version date	The date of the version as a numerical such as 20161201 (dec 1, 2016)
4	4	File version	The file version number (1)
5	2	Parameter version	The parameter version number (2)
6	4	CPU	CPU serial number
7	2	Size of the system parameter structure	size of the system_parameters_t structure
8	2	Instrument type	always 5 for AZFP
9	2	Configuration Version	Configuration Version (2)
10	2	Board Version	Board version * 100 (example 210 = 2.10)
11	2	Reserved	reserved
12	4	Free Sectors	Total free sectors on the FLASH
13	4	Total Sectors	Total sectors on the FLASH
14	4	Bytes per Sector	Bytes per sector on the FLASH
15	2	Mode	Mode STANDBY = 0xabcd, 1 = MODE_DEPLOYED

16	2	FullDuplex	RS232 Duplex 0=false (default and normal operation), 1 = true
17	2	ValidConfiguration	1 = true valid configuration has been received by the instrument, 0 = false
18	2	ConfigSaved	1 = configuration has been saved to VEEPROM, 0 = false no configuration saved
19	8	Reserved	reserved

8.1.3 Big Endian and Little Endian Formats

Binary data that is retrieved from the units are in Big Endian or Motorola format.

Below is a 'C' routine that is use for converting the binary data.

```
#ifndef _SWAPENDIAN_H
#define _SWAPENDIAN_H

// Macs and SGIs are Big-Endian; PCs are little endian
// returns TRUE if current machine is little endian
extern int IsLittleEndian(void);

/*****************************************************************************
  FUNCTION: SwapEndian
  PURPOSE: Swap the byte order of a structure
  EXAMPLE: float F=123.456;; SWAP_FLOAT(F);
*****************************************************************************/

#define SWAP_SHORT(Var)  Var = *(short*)         SwapEndian((void*)&Var,
sizeof(short))
#define SWAP_USHORT(Var) Var = *(unsigned short*)SwapEndian((void*)&Var,
sizeof(short))
#define SWAP_LONG(Var)   Var = *(long*)          SwapEndian((void*)&Var, sizeof(long))
#define SWAP_ULONG(Var)  Var = *(unsigned long*) SwapEndian((void*)&Var, sizeof(long))
#define SWAP_RGB(Var)    Var = *(int*)           SwapEndian((void*)&Var, 3)
#define SWAP_FLOAT(Var)  Var = *(float*)         SwapEndian((void*)&Var,
sizeof(float))
#define SWAP_DOUBLE(Var) Var = *(double*)        SwapEndian((void*)&Var,
sizeof(double))

extern void *SwapEndian(void* Addr, const int Nb);

#endif
static long _TestEndian=1;

int IsLittleEndian(void) {
       return *(char*)&_TestEndian;
}

/*****************************************************************************
  FUNCTION: SwapEndian
  PURPOSE: Swap the byte order of a structure
  EXAMPLE: float F=123.456;; SWAP_FLOAT(F);
*****************************************************************************/

void *SwapEndian(void* Addr, const int Nb) {
       static char Swapped[16];
```

```
        switch (Nb) {
               case 2:       Swapped[0]=*((char*)Addr+1);
                             Swapped[1]=*((char*)Addr  );
                             break;
               case 3:       // As far as I know, 3 is used only with RGB images
                             Swapped[0]=*((char*)Addr+2);
                             Swapped[1]=*((char*)Addr+1);
                             Swapped[2]=*((char*)Addr  );
                             break;
               case 4:       Swapped[0]=*((char*)Addr+3);
                             Swapped[1]=*((char*)Addr+2);
                             Swapped[2]=*((char*)Addr+1);
                             Swapped[3]=*((char*)Addr  );
                             break;
               case 8:       Swapped[0]=*((char*)Addr+7);
                             Swapped[1]=*((char*)Addr+6);
                             Swapped[2]=*((char*)Addr+5);
                             Swapped[3]=*((char*)Addr+4);
                             Swapped[4]=*((char*)Addr+3);
                             Swapped[5]=*((char*)Addr+2);
                             Swapped[6]=*((char*)Addr+1);
                             Swapped[7]=*((char*)Addr  );
                             break;
               case 16:Swapped[0]=*((char*)Addr+15);
                             Swapped[1]=*((char*)Addr+14);
                             Swapped[2]=*((char*)Addr+13);
                             Swapped[3]=*((char*)Addr+12);
                             Swapped[4]=*((char*)Addr+11);
                             Swapped[5]=*((char*)Addr+10);
                             Swapped[6]=*((char*)Addr+9);
                             Swapped[7]=*((char*)Addr+8);
                             Swapped[8]=*((char*)Addr+7);
                             Swapped[9]=*((char*)Addr+6);
                             Swapped[10]=*((char*)Addr+5);
                             Swapped[11]=*((char*)Addr+4);
                             Swapped[12]=*((char*)Addr+3);
                             Swapped[13]=*((char*)Addr+2);
                             Swapped[14]=*((char*)Addr+1);
                             Swapped[15]=*((char*)Addr  );
                             break;
        }
        return (void*)Swapped;
}
```

8.2 Exported Data File

The format of the exported files is described in section Export Profiles.

8.3 FLASH Data Format

Data on the CF is stored in binary “Big-Endian” (Motorola) format.

The data files consists of a profile flag followed by the profile.

Note that the FLAG is also in “Big-Endian” (Motorola) format.

FLAG binary 0xFD02
Profile
FLAG binary 0xFD02
Profile
... etc.

The profiles are in the same format as described in section Profile Data.

8.4 Real Time Data Files

This section describes the format of the profiles as they are stored by AzfpLink when they are received.

The data is stored in "little-Endian" (Intel) binary format.

The data files consists of a profile flag followed by the profile.

FLAG binary 0xFC02
Profile
FLAG binary 0xFC02
Profile
... etc.

The profiles are in the same format as described in section Profile Data but are stored in the Intel Format.

9 Command Line Commands

The AZFP firmware contains some commands to enable third party programming of the unit for real time applications. Only one phase is allowed for this type of operation.

Command line commands can be entered via the terminal emulator that comes with the AzfpLink or any other terminal emulator.

Entering a '?' (question mark without the quotes) gets the following listing of the commands.

```
------------------------------------------------------------------------
Commands are composed of one or more characters followed by one or more
parameters on one line. Commands and parameters are separated by blanks.
Command or parameter letters enclosed with braces {} are optional.
Parameters enclosed with square braces [] are mandatory.
All addresses and values are expressed in base 16, Counts are in base 10.
```

```
COMMAND  PARAMETER(S)          DESCRIPTION
&G                             Deploy unit. then send ACK
&F                             Full duplex
&H                             Half duplex
&Pico                          Jump to PICO DOS
&Reset                         BIOS Reset
&V                             Show firmware version
&Wreset                        Reset using watchdog
&S                             Place the unit into permanent sleep mode
!S      {9600,115200}                Set the SYS.BAUD variable. The SYS.CLOCK is also set
!B      {9600,115200,230400,460800}  Temporarily set the BAUD rate to specified rate
!N      {9600,115200,230400,460800}  Set the AZFP operating BAUD rate regardless of SYS.BAUD sett
!NS                                  Set the BAUD rate to the operating BAUD rate
!NR                                  Remove operating BAUD rate setting. Boot defaults to SYS.BAU
dn                             Dump system variables and parameters
ds                             Dump system variables only
dp                             Dump parameters only
di                             Display directory on FLASH
dc                             Display condense parameters
dr                             Display real time parameters
ee       [parameter]           Erase VEE parameter from VEEPROM memory         (CAUTION !!!)
es                             Show all VEE parameters                                      )
er                             Read system parameters from VEEPROM and show                 )
ed       [ERASE]               Erase all parameters in the VEEPROM except SYS. (CAUTION !!!)
ea       [NOAUTO, AUTO]        Enable or disable no auto deploy
eb       [ON, OFF]             Enable or disable backscatter pings
eo       [ERASE]               Erase old configuration data
ex       [ERASE]               List and ask to erase entries (CAUTION !!!!)
ec                             Clean up and compact VEEPROM
en       [SERIAL  serial]      View or set serial number of the instrument
ev       [BV version]          View or set board version of the instrument
#P1                            Show phase 1
#P1C  [y m d hr min sec]       Set the real time clock date and time
#P1Dy                          Set phase 1 digrate all channels where y=0,1,2 0=64000 1=40000 2=2000
#P1Ky                          Set phase 1 average pings in the burst y=1=true y=0=false
#P1FxEy                        Set phase 1 Acquire frequency x=freq(1,2,3,or 4) y=1=true y=0=false
#P1FxDy                        Set phase 1 digrate where x=freq(1,2,3,or 4) y=0,1,2 0=64000 1=40000
#P1FxP  {pulse_len}            Set phase 1 pulse length, x=freq(1,2,3,or 4)
#P1FxRA {range_averaging}      Set phase 1 range averaging x=freq(1,2,3,or 4)
#P1FxRL {range_lockout}        Set phase 1 range lockout   x=freq(1,2,3,or 4)
#P1FxRS {range_samples}        Set phase 1 range samples   x=freq(1,2,3,or 4)
#P1RA   {range_averaging}      Set phase 1 range averaging all channels
#P1RL   {range_lockout}        Set phase 1 range lockout all channels
#P1RS   {range_samples}        Set phase 1 range samples all channels
#P1Ox                          Set phase 1 x=R (RS232 only) x=F (FLASH & RS232) x=O (FLASH only)
#P1PP   {ping_period}          Set phase 1 ping period
#P1PI   {profile_interval}     Set phase 1 profile interval
#P1PN   {ping_per_profile}     Set phase 1 pings per profile
#P1S                           Set the AZFP to one phase, start date now, RS232 output, long duratio
#P1TT   [minutes]              Set the start date to the top of the next hour + optional minutes
#P1TD   [y m d hr min sec]     Set the start date to optional date entered, set to now if no date is
#P1U    [ASL]                 Save phase parameters to VEEPROM 'ASL' command line parameter require
#PI                            Initialize phase parameters (resets clock 1 second timer)
#PG                            Acquire one or more and transmit one profile
#PS                            Set the sound speed
#CE                            Condense Pings Enable
#CD                            Condense Pings Disable
#COB                           RS232 output format BINARY - standard binary packet format
#COA                           RS232 output format ASCII  - ASCII output
#COS                           RS232 output format BINARY SHORT - short binary format
```

```
#CSR                          Storage to RS232
#CSF                          Storage to FLASH
#CSB                          Storage to FLASH & RS232
#CMA                          Condense all profiles
#CMO [N]                      Enable modulus mode and condense every N profile
#CB  [C1] [C2] [C3] [C4]      Set bin averaging for each channel, min 1 max 1000
#CW                           Write condense parameters to  VEEPROM
#CR                           Load condense parameters from VEEPROM and display them
#CZD                          Disable Sea-Bird modem operation
#CZE                          Enable  Sea-Bird modem operation (condensed data output only)
#DIx                          Digital IO Mode x=1 ON, x=0 OFF, x=? report
#STx                          Enable/Disable first 24 status information x=1 ON, x=0 OFF, x=? repor
#RTx [0|1]                    Enable/disable the transmission of channel x=[1|2|3|4] over RS232, 0=
#RTS                          Save Real time output parameters
#RTE                          Reset real time output to all channels on
#B e d i w                    Enable or disable secondary bounce cross talk, e=1 enable, e=0 disabl
                              direction d=0 down, d=1 up, i=instrument depth high tide, w=water dep
```

9.1 Limitation of Command Line Operation

The command line operations only allows the programming of a single phase configuration. These commands are intended for third party software for programming the unit for real time data acquisition.

Note that changed parameters using the # commands are not permanent until the #P1U command is used to store the parameters to the units non volatile memory (VEEPROM).

The main commands to use for operating the unit are:

&G and the #P1 commands.

9.2 Terminating a Data Acquisition

Once a data acquisition is started the unit goes into a low power mode. It is woken up on the second by a real time clock trigger. When it wakes it either acquires data or goes right back to sleep. Before going to sleep the unit checks to see if it should end data acquisition by looking for the character 's' on the RS232 port.

In the low power state and during data acquisition the serial port is shut down. This offers a very small window for the unit to see any 's' characters transmitted by the PC software so many 's' characters in sequence must be transmitted to accomplish the wake up.

To terminate a deployment and set the unit to standby mode enter a consecutive set of 's' characters.

Example:

ssssssss
Standby Mode

$20000aaaa003cBHEAD

Œv$80000077aBTAIL

NOTE: The unit will deploy automatically after one hour unless the NO AUTO DEPLOY (EA command) has been enabled.

9.3 Deploy (&G)

Deploy the unit using the current parameters and then send an acknowledge message packet.

9.4 Full Duplex (&F)

Set unit to full duplex so characters entered are echoed by the unit.

Note the unit must be run in Half Duplex unless being controlled manually using the command line commands.

9.5 Half Duplex (&H)

Set unit to half duplex so characters entered are not echoed by the unit. In this mode the terminal program should be set to echo characters if this is desired.

Note the unit must be run in Half Duplex unless being manually controlled.

9.6 Enter PICO DOS (&pico)

Exit the application and enter the underlying Operation System PICO DOS.

Use with caution. Used for maintenance such as reformatting the FLASH.

To return to the applications type in 'APP' to boot into the AZFP operating firmware and start acquiring or 'APP N' to boot into the AZFP operating firmware in STANDBY mode.

9.7 RESET UNIT (&reset)

Reset the unit.

The unit resets and boots into the application.

9.8 WatchDog Reset (&Wreset)

Reset the unit using the watchdog.

9.9 Sleep (&S)

Place the unit into a permanent sleep mode.
The unit needs to be woken with a series of 's' characters to return to STANDBY mode.

9.10 Print Version Information (&V)

Send the firmware Version.

Example:

&V

AZFP Version 3.03 (20120531)
Persistor CF2 SN:6503 BIOS:4.2 PicoDOS:4.2

9.11 Dump System and Parameter Variables (dn)

Dump all system variables and parameters including phases and coefficient values.

Example:

DN
Parameters - 2011 08 31 14:30:15.99
Number of boards... 4
Board 0 BoardFreq. 38
Board 1 BoardFreq. 125
Board 2 BoardFreq. 200
Board 3 BoardFreq. 460
SoundSpeed 1500.00
Output ..... FLASH
ACQ Start Date 2011 8 26 15 31 42
NumPhases 1
P01 Start Date 2011 8 26 15 31 42
P01 Duration(days). 2.6863
P01 Phase Type..... Normal
P01 PingPeriod 1
P01 ProfileInterval. 1
P01 PingsPerProfile. 1
P01 F1 BoardFrequency.. 38
P01 F1 acquire..... 1
P01 F1 Gain..... 1
P01 F1 PulseLen 150
P01 F1 DigRate (hz).... 64000
P01 F1 RangeSamples.... 6500
P01 F1 LockOutIndex.... 0
P01 F1 RangeAvgSamples. 1
P01 F1 StoreSTD..... 0
P01 F2 BoardFrequency.. 125
P01 F2 acquire..... 1
P01 F2 Gain..... 1
P01 F2 PulseLen 150

P01 F2 DigRate (hz).... 64000
P01 F2 RangeSamples.... 6500
P01 F2 LockOutIndex.... 0
P01 F2 RangeAvgSamples. 1
P01 F2 StoreSTD..... 0
P01 F3 BoardFrequency.. 200
P01 F3 acquire..... 1
P01 F3 Gain..... 1
P01 F3 PulseLen 150
P01 F3 DigRate (hz).... 64000
P01 F3 RangeSamples.... 6500
P01 F3 LockOutIndex.... 0
P01 F3 RangeAvgSamples. 1
P01 F3 StoreSTD..... 0
P01 F4 BoardFrequency.. 460
P01 F4 acquire..... 1
P01 F4 Gain..... 1
P01 F4 PulseLen 150
P01 F4 DigRate (hz).... 64000
P01 F4 RangeSamples.... 6500
P01 F4 LockOutIndex.... 0
P01 F4 RangeAvgSamples. 1
P01 F4 StoreSTD..... 0
Coef Serial Number. 51102
Eclock (sec)..... 2.5000488e-07
Paros Installed ... NO
Gain Installed .... YES
Eclock Freq (hz) .. 3999922.00
RTC Period (sec)... 1.9531158e-03
RTC Frequency (hz). 512.002412
RTC PpmOffset (hz). 4.71
RTC Calibration.... -2
AG X_a ..... -5.2934010e+01
AG X_b 2.4242110e-03
AG X_c ..... 0.0000000e+00
AG X_d ..... 0.0000000e+00
AG Y_a ..... -5.3141287e+01
AG Y_b 2.4751040e-03
AG Y_c ..... 0.0000000e+00
AG Y_d ..... 0.0000000e+00
ANALOG Press a0.... -1.2505000e+01
ANALOG Press a1.... 3.1270000e+01
ANALOG Press a2.... 0.0000000e+00
ANALOG Press a3.... 0.0000000e+00
ANALOG Temp ka .... 2.9257143e+02
ANALOG Temp kb .... 3.0000000e+03
ANALOG Temp kc .... 1.9504800e+00
ANALOG Temp A 1.4660000e-03
ANALOG Temp B 2.3880900e-04
ANALOG Temp C 1.0033500e-07
CurPhase 1
CurPingModulus 1
Freq 0 CurFiringOrder 3

Freq 0 CurBoard 0
Freq 0 CurFreq 38
Freq 0 CurPulseLen 150
Freq 0 CurGain... 1
Freq 0 CurDigRate 64000
Freq 0 CurSamplesPerPing . 6500
Freq 0 CurBins 6500
Freq 0 CurRngSmplPerBin .. 1
Freq 0 CurPhaLockOutIndex. 0
Freq 0 CurPhaseStoreSTD... 0
Freq 1 CurFiringOrder 2
Freq 1 CurBoard 1
Freq 1 CurFreq 125
Freq 1 CurPulseLen 150
Freq 1 CurGain... 1
Freq 1 CurDigRate 64000
Freq 1 CurSamplesPerPing . 6500
Freq 1 CurBins 6500
Freq 1 CurRngSmplPerBin .. 1
Freq 1 CurPhaLockOutIndex. 0
Freq 1 CurPhaseStoreSTD... 0
Freq 2 CurFiringOrder 1
Freq 2 CurBoard 2
Freq 2 CurFreq 200
Freq 2 CurPulseLen 150
Freq 2 CurGain... 1
Freq 2 CurDigRate 64000
Freq 2 CurSamplesPerPing . 6500
Freq 2 CurBins 6500
Freq 2 CurRngSmplPerBin .. 1
Freq 2 CurPhaLockOutIndex. 0
Freq 2 CurPhaseStoreSTD... 0
Freq 3 CurFiringOrder 0
Freq 3 CurBoard 3
Freq 3 CurFreq 460
Freq 3 CurPulseLen 150
Freq 3 CurGain... 1
Freq 3 CurDigRate 64000
Freq 3 CurSamplesPerPing . 6500
Freq 3 CurBins 6500
Freq 3 CurRngSmplPerBin .. 1
Freq 3 CurPhaLockOutIndex. 0
Freq 3 CurPhaseStoreSTD... 0

9.12 Display Stored File Names (di)

This command displays the files stored on the FLASH disk under the root directory \DATA.

```
Dir c:\DATA
C:\DATA\200901 <DIR>                    2009/01/07 08:29 AM
c:\DATA\200901\20090107.LOG          4048 2009/01/07 05:35 PM
c:\DATA\200901\09010708.001        419832 2009/01/07 08:30 AM
c:\DATA\200901\09010708.DPL          2114 2009/01/07 08:30 AM
```

```
c:\DATA\200901\09010708.XML          6122 2009/01/07 08:30 AM
c:\DATA\200901\09010716.DPL          5289 2009/01/07 04:59 PM
c:\DATA\200901\09010716.XML          6123 2009/01/07 04:59 PM
c:\DATA\200901\09010716.001       1620864 2009/01/07 04:59 PM
c:\DATA\200901\09010717.001      46234672 2009/01/07 06:00 PM
c:\DATA\200901\09010717.DPL          8513 2009/01/07 05:26 PM
c:\DATA\200901\09010717.XML          6123 2009/01/07 05:26 PM
c:\DATA\200901\09010718.001      72172800 2009/01/07 07:00 PM
c:\DATA\200901\09010719.001      72172800 2009/01/07 08:00 PM
c:\DATA\200901\09010720.001      72172800 2009/01/07 09:00 PM
c:\DATA\200901\09010721.001      72172800 2009/01/07 10:00 PM
c:\DATA\200901\09010722.001      72172800 2009/01/07 11:00 PM
c:\DATA\200901\09010723.001      72172800 2009/01/08 00:00 AM
c:\DATA\200901\09010800.001      72172800 2009/01/08 01:00 AM
c:\DATA\200901\09010801.001      72172800 2009/01/08 02:00 AM
c:\DATA\200901\09010802.001      72172800 2009/01/08 03:00 AM
c:\DATA\200901\09010803.001      72172800 2009/01/08 04:00 AM
c:\DATA\200901\09010804.001      72172800 2009/01/08 05:00 AM
c:\DATA\200901\09010805.001      72172800 2009/01/08 06:00 AM
c:\DATA\200901\09010806.001      72172800 2009/01/08 07:00 AM
c:\DATA\200901\09010807.001      30914016 2009/01/08 07:25 AM
c:\DATA\200901\20090108.LOG          1282 2009/01/08 11:59 AM
c:\DATA\200901\20090109.LOG          4592 2009/01/09 01:12 PM
c:\DATA\200901\09010907.DPL          1055 2009/01/09 07:41 AM
c:\DATA\200901\09010907.XML          6120 2009/01/09 07:41 AM
c:\DATA\200901\09010907.001           296 2009/01/09 07:41 AM
c:\DATA\200901\09010910.001          2872 2009/01/09 10:52 AM
c:\DATA\200901\09010911.001          3376 2009/01/09 11:28 AM
c:\DATA\200901\09010912.001         10128 2009/01/09 00:53 PM
c:\DATA\200901\09010913.001          2676 2009/01/09 01:07 PM
1 Directories 33 Files 993658 KB
Used 997120 KB Free 3015680 KB Total 4012800 KB
```

9.13 Display FLASH space ussage (df)

df causes the AZFP to display the storage used, free and total as follows:

Used 10048416 KB Free 21957792 KB Total 32006208 KB

9.14 Dump System Variables (ds)

Dump system variables.

```
Parameters - 2009 01 09 13:13:10.08
*Serial Number......... 55027
*CPU ................... 6503
*Parameter Version..... 1
*Configuration Version. 1
*Parameters Saved ..... YES
*Configuration Saved .. YES
*Duplex................ HALF
*Mode ................. STANDBY
*Valid Config.......... YES
*CPU Speed ............ 14720
```

9.15 Dump System Parameters (dp)

Dump system parameters.

```
Number of boards... 2
Board 0 BoardFreq. 125
Board 1 BoardFreq. 200
SoundSpeed     .... 1420.00
Output ..... RS232
ACQ Start Date .... 2009  1  9 13 17 21
NumPhases ..... 1
P01 Start Date .... 2008 12  9 10 46 18
P01 Duration(days). 41.6250
P01 Phase Type..... Normal
P01 PingPeriod ..... 1
P01 DigRate (hz).... 20000
P01 ProfileInterval. 9
P01 PingsPerProfile. 1
P01 RangeSamples.... 1991
P01 LockOutIndex.... 1
P01 RangeAvgSamples. 5
P01 StoreSTD..... 0
P01 F1 BoardFrequency.. 125
P01 F1 acquire..... 0
P01 F1 Gain..... 1
P01 F1 PulseLen ..... 150
P01 F2 BoardFrequency.. 200
P01 F2 acquire..... 1
P01 F2 Gain..... 1
P01 F2 PulseLen ..... 150
Coef Serial Number. 55027
Eclock (sec)..... 2.5000516e-07
Paros Installed ... NO
Gain Installed .... YES
Eclock Freq (hz) .. 3999917.51
RTC Period (sec)... 1.9531070e-03
RTC Frequency (hz). 512.004720
RTC PpmOffset (hz). 9.22
RTC Calibration.... -5
AG  X_a ..... -4.5346364e+01
AG  X_b ..... 1.2849060e-03
AG  X_c ..... 0.0000000e+00
AG  X_d ..... 0.0000000e+00
AG  Y_a ..... -4.2824037e+01
AG  Y_b ..... 1.2345080e-03
AG  Y_c ..... 0.0000000e+00
AG  Y_d ..... 0.0000000e+00
ANALOG Press m .... 4.3092200e+01
ANALOG Press b .... -1.7236900e+01
ANALOG Temp ka .... 5.1059848e+02
ANALOG Temp kb .... 3.0000000e+03
ANALOG Temp kc .... 1.8778043e+00
ANALOG Temp A ..... 1.4660000e-03
```

ANALOG Temp B 2.3880900e-04
ANALOG Temp C 1.0033500e-07
CurPhase 0
CurPingModulus 0
CurPulseLen 1
CurDigRate 0
CurSamplesPerPing . 0
CurBins 0
CurRngSmplPerBin .. 0
CurPhaLockOutIndex. 0

9.16 Erase VEEPROM Variables (ee)

ee [parameter]

Erase VEEPROM values

(DO NOT USE WITHOUT FACTORY AUTHORIZATION)

9.17 Display VEEPROM Variables (es)

Display the variables stored in the non volatile memory.

```
VEE has 904 bytes left
SYS.BAUD        = 115200
SYS.CLOCK       = 14720
PARAM_COEF      = (binary) 212 bytes
CONFIGVERSION   = (binary) 2 bytes
SERIALNUMBER    = (binary) 6 bytes
PARAM_CONFIG    = (binary) 272 bytes
PARAMVERSION    = (binary) 2 bytes
ASLHARDWARE     = (binary) 256 bytes
PARAM_PHASE     = (binary) 624 bytes
PARAM_HEAD      = (binary) 26 bytes
--
VEE has 904 bytes left
```

9.18 Enable or disable auto deployment (ea)

WARNING!

Do not enable NO AUTO DEPLOY unless your instrument is to be used for real time deployments where it is controlled by a PC or other computer system. This feature is useful for real time systems so the unit will only acquire data when requested to by the controlling system.

Units default to auto deployment on boot up or after one hour of inactivity on the communications port. This is to avoid no data being recorded if the user has forgotten to deploy the instrument.

The EA command allows the units auto deployment feature to be disabled. By default NO AUTO DEPLOY is disabled in the units.

ea [NOAUTO, AUTO]

display, enable or disable auto deployment.

** the unit NO AUTO DEPLOY should only be enabled for realtime operation with access to the units communications.

Examples no parameters:

EA

NO AUTO DEPLOY IS DISABLED

Example to enable NO AUTO DEPLOY

EA NOAUTO

NO AUTO DEPLOY IS ENABLED

Example to disable NO AUTO DEPLOY

EA AUTO

NO AUTO DEPLOY IS DISABLED

9.19 Read system variables form VEEPROM and display them (er)

Read the system variables from the non volatile memory and display them.

ES

Parameters - 2009 01 09 14:08:14.78
*Serial Number..... 55027
*CPU 6503
*Parameter Version..... 1
*Configuration Version. 1
*Parameters Saved ..... YES
*Configuration Saved .. YES
*Duplex..... HALF
*Mode ..... STANDBY
*Valid Config..... YES
*CPU Speed 14720
Number of boards... 2
Board 0 BoardFreq. 125
Board 1 BoardFreq. 200

SoundSpeed 1420.00
Output RS232
ACQ Start Date 2009 1 9 13 17 21
NumPhases 1
P01 Start Date 2008 12 9 10 46 18
P01 Duration(days). 41.6250
P01 Phase Type..... Normal
P01 PingPeriod 1
P01 DigRate (hz).... 20000
P01 ProfileInterval. 9
P01 PingsPerProfile. 1
P01 RangeSamples.... 1991
P01 LockOutIndex.... 1
P01 RangeAvgSamples. 5
P01 StoreSTD..... 0
P01 F1 BoardFrequency.. 125
P01 F1 acquire..... 0
P01 F1 Gain..... 1
P01 F1 PulseLen 150
P01 F2 BoardFrequency.. 200
P01 F2 acquire..... 1
P01 F2 Gain..... 1
P01 F2 PulseLen 150
Coef Serial Number. 55027
Eclock (sec)..... 2.5000516e-07
Paros Installed ... NO
Gain Installed .... YES
Eclock Freq (hz) .. 3999917.51
RTC Period (sec)... 1.9531070e-03
RTC Frequency (hz). 512.004720
RTC PpmOffset (hz). 9.22
RTC Calibration.... -5
AG X_a ..... -4.5346364e+01
AG X_b 1.2849060e-03
AG X_c ..... 0.0000000e+00
AG X_d ..... 0.0000000e+00
AG Y_a ..... -4.2824037e+01
AG Y_b 1.2345080e-03
AG Y_c ..... 0.0000000e+00
AG Y_d ..... 0.0000000e+00
ANALOG Press m .... 4.3092200e+01
ANALOG Press b .... -1.7236900e+01
ANALOG Temp ka .... 5.1059848e+02
ANALOG Temp kb .... 3.0000000e+03
ANALOG Temp kc .... 1.8778043e+00
ANALOG Temp A 1.4660000e-03
ANALOG Temp B 2.3880900e-04
ANALOG Temp C 1.0033500e-07
CurPhase 0
CurPingModulus 0
CurPulseLen 1
CurDigRate 0
CurSamplesPerPing . 0

CurBins 0
CurRngSmplPerBin .. 0
CurPhaLockOutIndex. 0

9.20 Erase VEEPROM (ed)

ed [ERASE]

This command deletes non volatile memory except for some key values.

(DO NOT USE WITHOUT FACTORY AUTHORIZATION)

9.21 Erase Old Parameters (eo)

eo [ERASE]

This command deletes parameters from previous firmware installation that are no longer used such as the HS string from non volatile memory

(DO NOT USE WITHOUT FACTORY AUTHORIZATION)

9.22 # Commands

These commands are used to program one phase for real time operation.

Using any of these commands causes the firmware to set the number of phases to 1 phase only.

Commands are not case sensitive.

Some parameters are case sensitive.

Note that the description of some of these parameters that are modified with these command can be read in the user interface portion of this manual in the section that describes phase parameters.

9.22.1 Display Phase 1 (#p1)

Display the phase 1 parameters.

Example:

#p1

response:

```
^P1 ------------------------
^P1 startdate 2015  3 26 13  0  0
^P1 NumPhases 1
^P1 NumFrequencies   4
^P1 Phase Type       normal phase
^P1 Output    FLASH only
^P1 Duration               86400
^P1 PingPeriod             3
^P1 BurstInterval          20
^P1 PingsPerBurst          3
^P1 AverageBurstPings      0
^P1 freq 1 frequency        125
^P1 freq 1 acquire          1
^P1 freq 1 pulselen         1000
^P1 freq 1 DigRate          64000
^P1 freq 1 RangeSamples     12640
^P1 freq 1 LockOutIndex     0
^P1 freq 1 RangeAvgSamples  10
^P1 freq 1 StorageFormat    linear
^P1 freq 2 frequency        200
^P1 freq 2 acquire          1
^P1 freq 2 pulselen         1000
^P1 freq 2 DigRate          64000
^P1 freq 2 RangeSamples     12640
^P1 freq 2 LockOutIndex     0
^P1 freq 2 RangeAvgSamples  10
^P1 freq 2 StorageFormat    linear
^P1 freq 3 frequency        455
^P1 freq 3 acquire          1
^P1 freq 3 pulselen         1000
^P1 freq 3 DigRate          64000
^P1 freq 3 RangeSamples     12640
^P1 freq 3 LockOutIndex     0
^P1 freq 3 RangeAvgSamples  10
^P1 freq 3 StorageFormat    linear
^P1 freq 4 frequency        769
^P1 freq 4 acquire          1
^P1 freq 4 pulselen         1000
^P1 freq 4 DigRate          64000
^P1 freq 4 RangeSamples     12640
^P1 freq 4 LockOutIndex     0
^P1 freq 4 RangeAvgSamples  10
^P1 freq 4 StorageFormat    linear
```

9.22.2 Set Date/Time (#P1C y m d hr min sec)

Set the units real time clock.

#P1C y m d hr min sec

where:

y = year

m = month
d = day
hr = hour (24 hour)
min = minute
sec = second

Example:

```
#p1c 2009 1 1 12 45 0
```

Response:

```
^P1 clock set 2009  1  1 12 45  0
```

9.22.3 Set Digitization Rate (#p1Dy)

Set the digitization rate for all channels

#P1Dy

where:

y = 0 64000 hz
y = 1 40000 hz
y = 2 20000 hz

Example:

```
#P1D1
^P1 DigRate          20000
```

9.22.4 Enable or disable the averaging of pings in a burst. (#p1Ky)

Enable or disable the averaging of pings in a burst.

#P1Ky

where:

y = 0 disable
y = 1 enable

Example:

```
#P1K1
```

Response:

```
^P1 AverageBurstPings      1
^P1 StorageFormat freq 1       linear
```

```
^P1 StorageFormat freq 2       linear
^P1 StorageFormat freq 3       linear
^P1 StorageFormat freq 4       linear
```

9.22.5 Set Enable or Disable Acquisition of channel (p1fxEy)

Enable or disable the acquisition for channel x.

#P1FxEy

x = 1,2,3 or 4;
y = 0 disable or 1 enable

Example:

#P1F2E0 Disable chanel 2
Response:
^P1 freq 2 acquire 0

NOTE: if all frequencies are disabled, frequency 1 is enabled.

9.22.6 Set channel digitization rate (#P1FxDy)

Set the digitization rate for channel x.

#P1FxDy

x = 1,2,3 or 4

y = 0 64000 hz
y = 1 40000 hz
y = 2 20000 hz

Example:

#P1F2D2 Set channel 2 to digitization rate 20000

Response:

^P1 freq 2 DigRate 20000

9.22.7 Set Channel Pulse Length (#P1FxP)

Set the pulse length for channel x.

#P1FxO [pulse length]

x = 1,2,3 or 4;

[pulse length] in micro seconds

Example:
#P1F1P 150 Set the pulse length for frequency 1 to 150 cycles.

Response:
^P1 freq 1 pulselen 150

Minimum pulse length is 0 maximum pulse length is 1000

If no value for pulse length is entered then the current value is displayed.

9.22.8 Set Channel Range Averaging (#P1FxRA)

Set the range averaging for channel x.

#P1FxRA [range_averaging]

x = 1,2,3 or 4;

[range_averaging] in samples

Example:
#P1F1RA 7 Set channel 1 to 7 sample range averaging

Response:
^P1 freq 1 pulselen 150

^P1 Warning 'Some range parameters modified'
^P1 freq 1 RangeSamples 6496
^P1 freq 1 LockOutIndex 0
^P1 freq 1 RangeAvgSamples 7

Range Samples and Range lockout may be recalculated so the range is a multiple of the averaging

9.22.9 Set Channel Range Lockout (#P1FxRL)

Set the range lockout for channel x.

#P1FxRA [range_lockout]

x = 1,2,3 or 4; channel number

[range_lockout] in samples

Example:
#P1F1RL 20 Set channel 1 range lockout to 20 samples

Response:

^P1 freq 1 RangeSamples 6495
^P1 freq 1 LockOutIndex 20

^P1 freq 1 RangeAvgSamples 7
^P1 freq 1 LockOutIndex 20
^P1 StoreSTD 1
^P1 StoreSTD 0
^P1 StoreSTD 0
^P1 StoreSTD 0

Range Samples and Range lockout may be recalculated so the range is a multiple of the averaging

9.22.10 Set Channel Range samples (#P1FxRS)

Set the range samples for channel x.

#P1FxRA [range_samples]

x = 1,2,3 or 4; channel number

[range_samples] in samples

Example:
#P1F1RS 2000 Set channel 1 range samples to 2000 samples

Response:

^P1 freq 1 Warning 'Some range parameters modified'
^P1 freq 1 RangeSamples 1994
^P1 freq 1 LockOutIndex 20
^P1 freq 1 RangeAvgSamples 7
^P1 RangeSamples freq 1 RangeSamples 1994
^P1 StoreSTD 1
^P1 StoreSTD 0
^P1 StoreSTD 0
^P1 StoreSTD 0

9.22.11 Set Range Averaging (#P1RA)

Set the Range Averaging (samples) for all channels

#P1RA [range_averaging]

Example:

#P1RA 2
^P1 RangeAvgSamples 2

Note that some parameters may be changed to accommodate other range settings.

^P1 Warning 'Some range parameters modified'
^P1 RangeSamples 1990
^P1 LockOutIndex 1
^P1 RangeAvgSamples 3

9.22.12 Set Range lockout (#P1RL)

Set the Range Lockout (samples) for all channels

#P1RA [range_lockout]

Example:

#P1RL 100
^P1 LockOutIndex 100

Note that some parameters may be changed to accommodate other range settings.

^P1 Warning 'Some range parameters modified'
^P1 RangeSamples 1990
^P1 LockOutIndex 1
^P1 RangeAvgSamples 3

9.22.13 Set Range Samples (#P1RS)

Set the Range Averaging (samples) for all channels

#P1RA [range_samples]

Example:

#P1RA 2000
^P1 RangeSamples 2000

Note that some parameters may be changed to accommodate other range settings.

^P1 Warning 'Some range parameters modified'
^P1 RangeSamples 1990
^P1 LockOutIndex 1
^P1 RangeAvgSamples 3

9.22.14 Set Output Option (P1Ox)

Set the output option to RS232 or RS232 and FLASH.

#P1Ox

Where x =R or F.

R = RS232 only.
F = RS232 and FLASH.

Example:

#P1OR
^P1 Output RS232 Only

9.22.15 Set Ping Period (#P1PP)

Set the Ping Period (seconds)

#P1PP [ping_period]

Example:

#P1PP 5
^P1 PingPeriod 5

The ping period can not be greater than the Burst Interval.

If no value in entered the current value is displayed.

9.22.16 Set Profile Interval (#P1PI)

Set the Burst Interval (seconds)

#P1PP [ping_period]

Example:

#P1PI 10
^P1 ProfileInterval 10

Changing this value may cause other values such as Ping Period. For example if the current Ping Period is 40 then entering a Burst Interval of 20 will change the Ping Period to a valid value of 20.

^P1 Warning 'ping period reset to Burst Interval'
^P1 PingPeriod 10

If no value in entered the current value is displayed.

9.22.17 Set Ping Per Profile (#P1PN)

Set the Pings per Profile (pings)

#P1PN [pings_per_profile]

Example:

#P1PN 2
^P1 PingPerProfile 2

If no value in entered the current value is displayed.

9.22.18 Set Unit to 1 Phase and Display it (#P1S)

Set the unit to 1 phase, RS232 only and the start time to now.

#P1S

```
^P1 ------------------------
^P1 startdate 2015  3 26 13  0  0
^P1 NumPhases 1
^P1 NumFrequencies   4
^P1 Phase Type       normal phase
^P1 Output    FLASH only
^P1 Duration               86400
^P1 PingPeriod             3
^P1 BurstInterval          20
^P1 PingsPerBurst          3
^P1 AverageBurstPings      0
^P1 freq 1 frequency        125
^P1 freq 1 acquire          1
^P1 freq 1 pulselen         1000
^P1 freq 1 DigRate          64000
^P1 freq 1 RangeSamples     12640
^P1 freq 1 LockOutIndex     0
^P1 freq 1 RangeAvgSamples  10
^P1 freq 1 StorageFormat    linear
^P1 freq 2 frequency        200
^P1 freq 2 acquire          1
^P1 freq 2 pulselen         1000
^P1 freq 2 DigRate          64000
^P1 freq 2 RangeSamples     12640
^P1 freq 2 LockOutIndex     0
^P1 freq 2 RangeAvgSamples  10
^P1 freq 2 StorageFormat    linear
^P1 freq 3 frequency        455
^P1 freq 3 acquire          1
^P1 freq 3 pulselen         1000
^P1 freq 3 DigRate          64000
^P1 freq 3 RangeSamples     12640
^P1 freq 3 LockOutIndex     0
^P1 freq 3 RangeAvgSamples  10
^P1 freq 3 StorageFormat    linear
^P1 freq 4 frequency        769
^P1 freq 4 acquire          1
^P1 freq 4 pulselen         1000
^P1 freq 4 DigRate          64000
^P1 freq 4 RangeSamples     12640
^P1 freq 4 LockOutIndex     0
^P1 freq 4 RangeAvgSamples  10
^P1 freq 4 StorageFormat    linear
```

9.22.19 Set the phase Start Date to the top of the next hour (#p1TT)

Set the phase Start Date to the top of the next hour + optional minutes

It may be desirable to have the AZFP start at the top of the hour plus some offset.

If the optional minutes is left out it is assumed to be zero minutes.

Minutes can be negative to start the phase earlier than the top of the next hour.

For example if the time is 10:15:00 setting the minutes to -30 will set the start phase to 10:30:00 .

#P1TT [minutes]

Example 1:
#P1TT

Response:

^P1 startdate 2015 3 26 14 0 0

Example 2:
#P1TT 15

Response:

^P1 startdate 2015 3 26 14 15 0

9.22.20 Set the phase Start Date to the a user specified value (#p1TD)

Set the phase Start Date to a specific date and time

#P1TD [year month day hour minute second]

If the optional date and time is not entered the AZFP sets the phase start date to the current date and time off the internal clock.
If an INVALID date and time is entered the AZFP sends an error message and ignores the command.

Example:
#P1TD 2015 4 1 12 0 0

Response:

^P1 startdate 2015 4 1 12 0 0

9.22.21 Save Parameters to VEEPROM (#P1U)

Save the current settings to the units VEEPROM (non volatile memory).

This save the parameters so that they are retained between power on/off cycles.

#P1U ASL

^P1 VEEPROMSAVE SUCCESSFULL

9.22.22 Initialize Phase Parameters for #PG command (#PI)

The #PI command initializes the data acquisition parameters for the use of the #PG command. When any new parameters have been programmed the command is called automatically on the first use of #PG. Besides programming the units parameters using the phase 1 parameters this command causes the real-time clock 1 second interval to be reprogrammed.

#PI

Example;

#PI

response:

P1 Initialized

9.22.23 Acquire a profile of data and transmit it over com port (#PG)

The command #PG is used to start the collection of one profile of data based on the Phase 1 programming.
The acquisition is started on the next real time clock one second trigger.

If any new parameters have been programmed the #PI command is executed before the profile is acquired.

Example:

#PG

asdf^%$^-asdassfasd asTAIL

NOTE: This command only sends data to serial port. Data is not stored to FLASH regardless of the Data Output setting.

9.22.24 Set Sound Speed (#PS)

Set the sound speed

#PS [SPEED]

Example;

#p1c 1450

response:

^PS soundspeed 1450.00

Note that sound speed is not used by the unit but the command is included in the command line set because the sound speed used by Ips5Link is programmed to the unit under normal operation. The sound speed is stored in XML and DPL files produced by the unit for information purposes.

9.22.25 #STx Enable or Disable the 24 hour status output

This command replaces the #SE and #SD command that was available in previous version although they are still functional for system that used them.

When the AZFP starts it sends status information for the first 24 hours. After 24 hours it no longer send the status information.

This setting is persistent between power reboots of the AZFP.

The #STx command is used to either enable (the default) or disable this option.

#STx

x = 0 disable or 1 enable

if x is not present the command returns the current state of the setting.

Example:

#ST1
Response:
^ST Send status is ON

or

#ST0
Response:
^ST Send status is OFF

Obsolete but still active commands that do the same thing are:

#SE same as #ST1

#SD same as #ST0

9.22.26 #DIx Enable or Disable Digital IO Mode of operation

A new feature has been added to allow the AZFP to acquire data based on the digital level of PIN 42 of the digital IO line. This line would be controlled by and external system.

When this feature is enabled during a deployment the AZFP ignores the start date and time and goes into its sleep mode where it wakes up once per second and monitors the digital input output (DIO) line. If it detects the line as being high or '1' (GO) it begins to acquire data. After each acquisition it monitors the line and when the level is set back to low it stops acquiring data and returns to the sleep mode waking up every second to monitor the line. When the DIO line is read as 0 (PAUSE) the firmware closes the data file if it is open. This allows the external system to close off the file before powering down the AZFP to avoid data loss.

This setting is persistent between power reboots of the AZFP.

In this mode of operation the AZFP always sends out the STATUS information for each profile. The 24 Hour limit is ignored.

The #DIx command is used to either enable or disable (the default) this option.

#DIx

x = 0 disable or 1 enable

if x is not present the command returns the current state of the setting.

Example:

#DI1
Response:
^DI ON
#COM

or

#DI0
Response:
^DI OFF
#COM

Below is an example of the DIO line going from GO to PAUSE.

$5e039000000000021STAT-DIO Status is OFF Waiting for DIO#0acd

$5e038000000000010STAT-DIO Status is ON#0539

$5e020000100010021STAT-Burst 1 P1 2018/09/04 11:58:57.57#0781

$5e020000100010021STAT-Burst 1 P2 2018/09/04 11:59:02.56#0778

$5e020000100010021STAT-Burst 1 P3 2018/09/04 11:59:07.56#077e

$5e020000100010021STAT-Burst 1 P4 2018/09/04 11:59:12.56#077b

$5e039000000000021STAT-DIO Status is OFF Waiting for DIO#0acd

$5e074000000000022STAT-DIO File Close 2018/09/04 11:59:14#0871

9.22.27 #RTx Enable/disable the transmission of channel

Enable or disable the transmission of a channel over the RS232 port.
If a channel is disabled it is not transmitted.

The #RTx command is used to either enable or disable (the default) this option.

#RTx [0|1]

x = is channel 1,2,3 or 4

0 = disable
1 = enable

Example:

#RT2 0

response:

^RT 1 0 1 1

Channel 2 is disabled.

9.22.28 #RTE Enable the transmission of all channels.

Enable the transmission of all channels. Any disabled channels are set to enabled.

Example:

#RTE

response:

^RT 1 1 1 1

9.22.29 #RTS Save real time transmission parameters

Save the real time transmission settings.

Example:

#RTS

response:

^RT 1 0 1 1

9.22.30 #B enable or disable TX Delays

The #B command enables or disables the transmission delays to avoid surface echos.

#B e d i w

where:

e = 0 to disable
e = 1 to enable

d = 0 instrument pointing down
d = 1 instrument pointing up

i = instrument depth at high tide in meters
w = water depth at high tide in meters

Example:

#B 0

response:

^B 1 1 I 50.00 W 100.00

Example:

#B 1 1 80.1 100.1

response:

^B 1 1 I 80.10 W 100.10

9.23 ! Commands (new)

Before reviewing this section please make sure you have read the section RS232 Communications (new) .

A new set of '!' command to set BAUD rates have been developed.

The command set is as follows:

!S	{9600,115200}	Set the SYS.BAUD variable. The SYS.CLOCK is also set
!B	{9600,115200,230400,460800}	Temporarily set the BAUD rate to specified rate
!N	{9600,115200,230400,460800}	Set the AZFP operating BAUD rate regardless of SYS.BAUD setting
!NS		Set the BAUD rate to the operating BAUD rate
!NR		Remove operating BAUD rate setting. Boot defaults to SYS.BAUD

The commands are not case sensitive.

The commands always respond using status packet format. For example:

enter !N to retrieve the operating BAUD rate

The AZFP will reply with a packet in the STAT format:

$5e161ffff00000014STAT-!N No operating BAUD#06f1

9.23.1 !S set SYS.BAUD

The !S command sets the SYS.BAUD variable that sets the boot up BAUD rate for the underlying PicoDOS OS and AZFP if a operating BAUD rate for the AZFP has not been set.

FORMAT: !S {9600, 115200}

EXAMPLE:

Set the SYS.BAUD variable to 115200.

enter: !S 115200
reply: $5e05239800000001fSTAT-SYS.BAUD 115200 SYS.CLOCK 14720#0769

9.23.2 !B temporarily set BAUD rate

The !B command sets AZFP communications temporarily to one of four possible BAUD rates.

FORMAT: !S {9600, 115200, 230400, 460800}

EXAMPLE:

Set the BAUD rate temporarily to 115200.

enter: !B 115200
reply: $5e058ffff0000001cSTAT-AZFP BAUD Set To 115200 BAUD#0721

The AZFP remains at the selected BAUD rate until either a new !B command is issued or the AZFP is reset. If the AZFP is reset it boots up at the SYS.BAUD rate. If the AZFP firmware contains a 'operating BAUD rate' different than SYS.BAUD it operates at the operating BAUD rate.

9.23.3 !N Set the Operating BAUD rate

The !N command sets AZFP 'operating BAUD rate' to one of four possible BAUD rates. The change causes the AZFP to set its communications to this BAUD rate regardless of the setting of SYS.BAUD.

FORMAT: !N {9600, 115200, 230400, 460800}

EXAMPLE:

Set the operating BAUD rate to 115200.

enter: !N 115200
reply: $5e163ffff00000018STAT-!N operating BAUD 115200#075d

This is a permanent setting until a new !N command is issued to the AZFP or the !NR command is issued.

9.23.4 !NS Set the Operating BAUD rate

The !NS command resets AZFP communications to the operating BAUD rate previously set by the !N command.

FORMAT: !NS

EXAMPLE:

Reset the BAUD rate to the operating BAUD rate

enter: !NS
reply: $5e163ffff00000018STAT-!N operating BAUD 115200#075d

9.23.5 !NR Remove Operating BAUD rate setting

The !NR command removes the operating mode BAUD rate. The AZFP will operate at the SYS.BAUD setting.

FORMAT: !NR

EXAMPLE:

Remove the operating BAUD rate setting.

enter: !NR

reply: $5e160ffff00000014STAT-!N Boot BAUD removed#06f1

10 Condensed Profiles Operation

This is a description of the Profile Condensing Feature which has been added to the operation of the instrument.

10.1 Overview

Due to a customer requirement to periodically send AZFP profiles over a slow and/or limited bandwidth device such as an inductive modem we have implemented an option in the AZFP to provide this function. The solution to provide this functionality was to implement a Profile Condensing Feature (PCF) that reprocesses standard profiles as they are acquired and to condense them down to a manageable size for output over the limited bandwidth communications link. The PCF averages bins within the profiles to further reduce them. Condensing of profiles is not a reversible process (this is not compression), therefore the original profiles should be stored to FLASH as the original data cannot be recovered from a condensed profile.

Standard profiles with bins that are averaged in either space (vertical averages) or time (consecutive pings) store the averaged bins in 5 bytes. When doing the bin averaging, the low power AZFP processor converts the log data to a linear form summing the data in a 4 byte unsigned integer and tracking any overflow in an other byte. The 4-byte sum and overflow byte are stored instead of converting back to log form to save power. The low-power processor has limited conversion capabilities. The PCF process further averages the bins and reverts the bins back to an approximation of the log form by using the inverse log table lookup.

The AZFP firmware with the PCF implementation provides all previous functions as before. However, the newly implemented features that are now included for operating an instrument with the PCF could interfere with normal operation of the AZFP if the PCF is not required. For example, if PCF is on and saving data to the FLASH in addition to the normal saving of profile data, the PCF does take a small amount of additional power to perform. At this point in time, the additional power requirements and additional processing times have not been determined.

It should be clear to the users that programming of the AZFP with PCF functionality can only be done while the instrument is in STANDBY mode.

10.2 PCF Theory of Operation

The PCF options are programmed from the Motocross Terminal Emulator in AzfpLink. Once the new condensing parameters have been set, save them on the VEEPROM (see commands below) and close the emulator to return to AzfpLink to deploy the unit. As the standard profiles are processed (stored to FLASH, sent to RS232 or both), the firmware checks to see if PCF has been enabled. If PCF is enabled, the firmware checks to see which mode of operation is enabled:

1. Condense every N^{th} profile.
2. Condense every profile.

There is also an option to command the instrument to process the next profile with PCF while the instrument is operating by sending a special character to the instrument (see section below).

Note that regardless of the mode, only profiles with a new burst number are processed by the PCF. If the bursts are made up of several pings and each ping is stored instead of averaging in time then only the first ping in the burst will be processed with PCF.

When PCF is enabled, the AZFP processes data in its standard way regardless of the mode of operation of the PCF. For example, if the AZFP has been programmed to transmit profiles over RS232, it will send the profile and then process it with PCF. Therefore it is possible to have both the standard profile and the condensed to be sent over RS232 and/or both to be stored to FLASH. Generally it is expected that the standard profiles will be stored to FLASH and the condensed version will be sent over RS232. Note that saving both to FLASH will result in a file intermixed with both the full profile and the condensed profile. The storage of condensed profiles to FLASH is for testing purposes only and normally would not be used for operations.

There are three forms of output over RS232 for the condensed profiles, BINARY, ASCII and BINARY SHORT.

The BINARY version consists of the same format as standard profiles sent over RS232 and recognized by AzfpLink if AzfpLink is being used to accept data from the RS233 line. This format has the full header information and data. This version is sent up in the packet format described in the AzfpLink manual.

The ASCII version is comma delimited data which includes some of the header information followed by the data. The data is slightly reduced by subtracting each bin by the lowest value in the profile. That value is stored in the header and needs to be added back before processing. Note that AzfpLink does not recognize the ASCII format. If the output of the PCF is requested in ASCII format, other software needs to be used.

The BINARY SHORT version is shortened binary form that includes some of the header information followed by the data. Note that AzfpLink does not recognize the ASCII format. If the output of the PCF is requested in BINARY SHORT format, other software needs to be used to view or decode the data.

The BINARY SHORT format is recommended as it provides the smallest possible output.

10.3 Limitations

The internal memory buffers for PCF are 50 times smaller than the standard profile buffer so the maximum number of bins for the condensed profile is 14000/50 or 280 bins. If a channel is collecting 14000 samples and the user specifies a condensation factor of less than 50 then the resulting condensed profile will not contain the last portion of a profile. There is no warning and it is up to the user to determine the correct values to use for the averaging so that the no data is missed. The

number of samples recorded is displayed in the Operating Schedule tab of AzfpLink (Max. Range, Show Range Units as Samples).

10.4 Power Consumption

The amount of power consumed by the condensing functions has yet to be determined.

10.5 Placing the AZFP in STANDBY mode

To program the PCF using the #C commands the unit needs to be placed in STANDBY mode (not collecting data).

The instrument can be put in STANDBY mode either from AzfpLink or from the emulator. To place the instrument into STANDBY mode (wake the instrument up) requires the transmission of the character "s" over the RS232 from the controlling PC. When the AZFP detects an 's', it stays awake a few milliseconds longer to look for another two 's' before it goes into STANDBY mode. When the AZFP is in low power mode, the RS232 port is off so there is no guarantee that one series of 's' will place it into STANDBY mode.

Sending a string of "s" characters about 6 milliseconds apart and spanning one second will normally wake it up. Further information is available in the AZFP software manual

10.6 9600 Baud Operation

The typical use of this operation is to send a limited amount of data over a lower bandwidth connection.

Although it is not required if not needed, the AZFP instrument and AzfpLink can be set to operate the RS232 at 9600 BAUD.

See section ! Commands (new) or Setting the AZFP's Default Communications.

10.7 Setting the Instrument to 9600 baud

See the section Setting the AZFP's Default Communications to set the AZFP to 9600 BAUD using AzfpLink.

This can be done manually as follows:

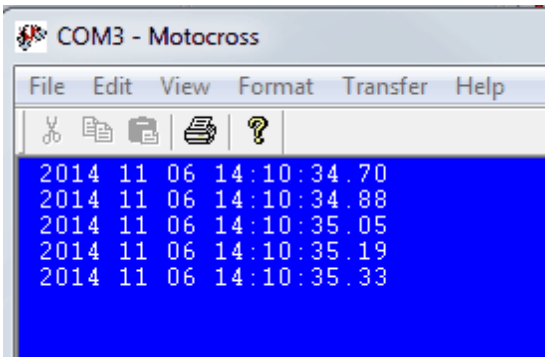
This section describes how to set the BAUD rate of the instrument to 9600 or back to the standard 115200 BAUD. The instructions below are the same for setting both BAUD rates.

Note that it is important to follow the instructions to the letter.

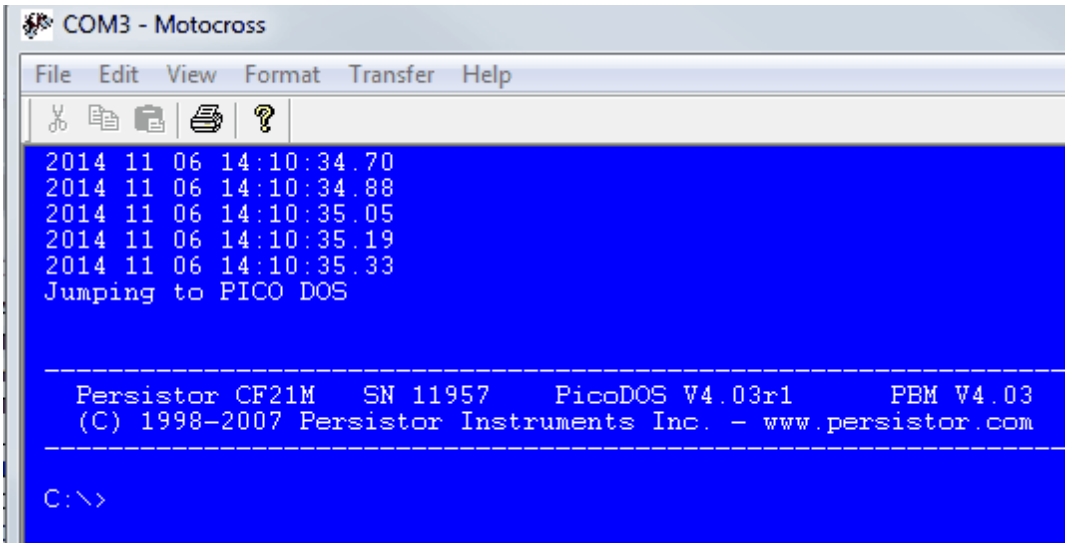
End the deployment 

Start the Terminal Emulator 

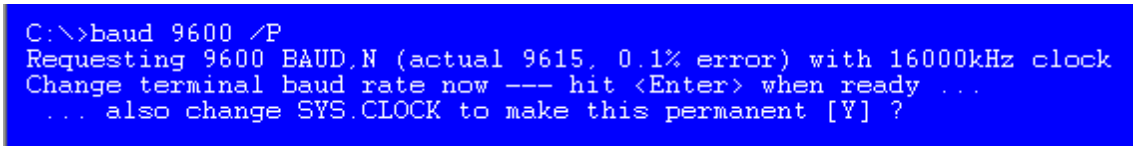
The instrument should respond with the date and time when the return key is pressed.



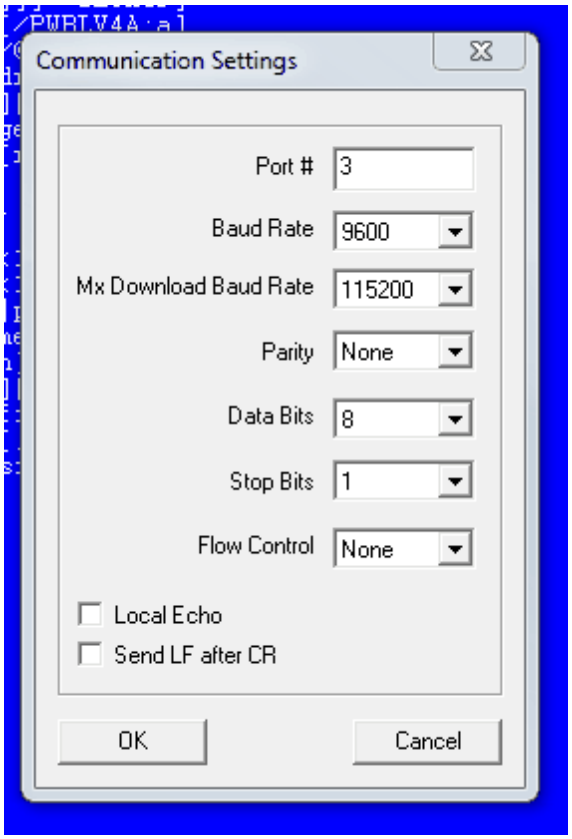
Enter '&pico' (without quotes) to place the instrument into the PICO DOS operation.



To set the BAUD rate enter 'BAUD 9600 /p'



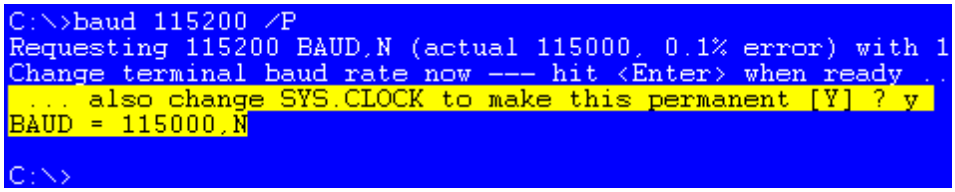
Under the "File" menu select "Communications Settings"



Set the BAUD rate to 9600 BAUD as shown above.

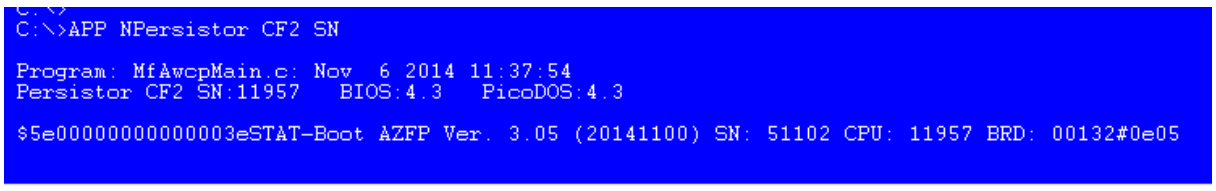
Hit the enter key.

The unit should now respond with " **... also change SYS.CLOCK to make this permanent [Y] ?**" when you press the enter key.



Enter Y.

Now return to the AZFP application by entering 'APP N' (APP space N). The N starts the unit without deploying.



Exit the Terminal Emulator and set AzfpLink by checking the 9600 BAUD box in the preference panel or un-checking it if the BAUD rate has been set to 115200 BAUD.

To return the instrument to 115200 perform the same operations stated above but use 115200 instead of 9600.

10.8 Seabird Modem

The unit can be set to transmit samples to an attached Seabird modem for retrieval at a later time by an external system attached to a companion modem.

When condensed mode is enabled and a modem is attached the unit attempts to attach to the modem and transmit the data.

The modem should be set up so it does not echo characters sent to it by the AZFP.

The modem should also be setup so that the number of allowed samples times the maximum size of each sample should be less than the 16K. This allows the modem to add records and remove the oldest so it can insert the newest.

For example, if samples are expected to be about 1 kb then allow a maximum of 15 samples although it might be best to have more of a buffer for example 12 samples.

The operation works as follows when a condensed profile is ready for transmission :

1. The unit sends '\r' (carriage return to the modem) to wake it up.
2. It looks for the 'IMM>' prompt from the modem. If it doesn't get one within 3 seconds it tries again up to 3 times.
3. If it gets the prompt it sends the "SampleAdd" command and looks for the '<Executing/>' response from the modem.
4. If it gets the '<Executing/>' response from the modem it transmits a timestamp (current date/time) and the condensed profile in the format specified by the user (ASCII or BINARY SHORT).
5. After the transmission of the profile it waits for 3 seconds for the '<Executed/> command and then send the 'PwrOff' command to power down the modem. It sends the 'PwrOff' command whether or not it finds the '<Executed/>' command.

The following is an example sequence of commands (entered commands in red) to retrieve data from external modem talking to a modem attached to the AZFP. The AZFP is sending condensed profiles in ASCII format to its attached modem.

The external modem first captures the line. It then requests the last sample.

IMM>captureline <Executing/> <Executed/>
IMM>!01samplegetlast

<RemoteReply><Executing/> <SampleData ID='0x00000024' Len='2502' CRC='0x2DF1A060'>@D20141125155600!@P1,4,4,137,137,137,137,10280,9888,13400,17344,14112515555579,-0.9,-1.2,15.2,21.5,99.0,48104,27064,1688,256,136,48,256,104,72,88,168,32,72,264,288,56,56,360,40,24,104,0,176,10152,944,104,56,584,88,72,1016,88,32,104,56,72,1392,4448,96,40,304,48,48,344,640,32,240,136,24,72,328,96,24,408,88,120,240,248,40,64,592,256,344,496,704,48,88,264,32,1208,2112,136,64,648,160,64,120,8512,24,32,288,56,64,104,216,112,5808,8200,192,112,136,56,56,168,192,24,368,120,48,64,176,0,72,920,176,32,24,112,40,728,168,320,88,176,136,48,5832,2376,40,1480,1112,8,88,112,128,24,16,3352,24,24,128,24,72,96,56,56,304,48952,26360,2984,528,112,400,1416,80,456,912,40,272,3976,1720,112,1400,1248,112,328,1768,48,264,656,2272,192,2384,3272,16,320,2728,144,808,2272,2664,96,336,2224,16,480,3640,160,640,1144,464,96,1824,1720,80,328,1600,40,424,1248,672,104,456,712,32,352,1416,40,232,2528,584,104,800,2032,64,272,1288,128,336,632,400,72,464,2936,0,640,936,80,168,440,504,48,464,1216,72,808,1240,136,248,1352,552,96,616,3512,72,360,672,48,184,1296,1568,112,992,1576,96,288,2192,184,1224,1384,1064,104,456,720,32,264,1064,72,296,1872,848,128,528,4736,96,224,648,16,648,1552,1080,56,384,1400,43464,11688,3584,1624,5520,4200,1176,5496,8784,1256,4072,8896,5312,2048,6008,6616,1552,3008,6568,1024,5616,6968,2104,3248,4712,8240,1640,6536,10984,1208,4408,6888,3888,3096,5096,8080,1040,3152,9032,552,6040,7736,4616,2496,4776,4752,1608,7240,8328,1256,4168,7368,3272,2584,7232,4632,664,3000,6576,104,4080,9768,3768,1112,6120,8200,744,5824,5696,232,4488,5504,5576,3272,6128,6744,1512,5416,6384,1296,5648,7880,2024,2664,4632,6568,1392,4632,10504,0,2832,6544,2864,3256,5704,4080,680,3208,7464,2392,3568,9640,3784,1864,4792,4416,952,5168,7680,1856,3464,8944,5888,2416,6872,5400,1192,2736,5912,1128,6080,7368,5064,1808,4824,8304,880,6064,8840,832,3400,5384,3920,3544,5800,8168,936,37112,752,2096,2568,2176,984,2400,1960,256,3168,2512,1024,1960,2184,2200,864,2800,2448,552,2536,2352,880,2256,2656,2336,936,2088,2208,264,2992,2576,1264,1616,2240,1552,992,3072,2440,496,2648,2384,904,2288,2224,2032,848,2344,2672,0,2888,2592,920,1760,2000,1928,1128,3120,2728,664,2320,2352,992,2112,2560,1984,800,2408,2480,240,2848,2704,896,1792,2048,1400,1264,3120,2568,504,2352,2328,1088,2224,2840,1728,816,2736,2384,736,3032,2656,968,1864,2432,2152,384,2864,2528,216,2344,2456,856,2160,2440,2080,1088,2432,2624,168,2768,2720,1408,1920,2152,2048,904,2832,2496,680,2376,2408,912,2152,2648,1952,576,2504,2240,752,3088,2704,1416,1848,2160,1624,752,3152! </SampleData> <Executed/></RemoteReply> <Executed/> IMM>

A listing of samples available can be gotten using the “samplegetlist” command.

```
<Executed/>
IMM>captureline
<Executing/>
<Executing/>
<Executed/>
IMM>!01samplegetlist
<RemoteReply><Executing/>
<SampleList>
<Sample ID='0x00000521' Len='2150' CRC='0x37DCF2C3'/>
<Sample ID='0x00000520' Len='2140' CRC='0x27EA7F0B'/>
<Sample ID='0x0000051F' Len='2147' CRC='0xF2AA603F'/>
<Sample ID='0x0000051E' Len='2169' CRC='0xF223CF6C'/>
<Sample ID='0x0000051D' Len='2165' CRC='0x703819E2'/>
</SampleList>
<Executed/></RemoteReply>
<Executed/>
IMM>
```

10.8.1 Modem Setup

Local echo must be disabled.

Use the setenableecho=0 command.

The modem must be setup such that the maximum number of records times the maximum size of any record is less than 16 K.

Use the setmaxnumsamples=x

10.9 #C Condense Commands

A set of commands to have the AZFP further condense profiles for output to slower devices over RS232 have been implemented as of firmware version 3.04. These commands are in beta development and testing.

A number of # commands have been implemented to control the condensing of profile. These commands are only available when the instrument is in STANDBY mode (not collecting data). It is possible to have the unit condense the next profile while operating by sending the character "c" to the instrument. This is described in a later section.

NOTE: Commands are not echoed back by the instrument.

*** Parameters do not become permanent until the #CW command is issued.

Command	Parameters	
#CE		Enable PCF
#CD		Disable PCF
#COB		Set the PCF profiles RS232 output to standard real-time profile output.
#COA		Set the PCF profiles RS232 output to ASCII output.
#COS		Set the PCF profiles RS232 output to BINARY SHORT output.
#CSR		Send PCF profiles to RS232
#CSF		Store PCF profiles to FLASH (not recommended as it will intermix with standard profiles, used for testing only)

Command	Parameters	
#CSB		Store PCF profiles to FLASH & RS232 (not recommended as it will intermix with standard profiles, used for testing only)
#CMO	[N]	Condense every Nth profile where N=X is the condense modulus
#CMA		Condense all profiles
#CB	[C1] [C2] [C3] [C4]	Set bin averaging for each channel, min 1 max 1000
#CW		Write condense parameters to VEEPROM. This make the settings permanent.
#CR		Load condense parameters from VEEPROM and display them
#CZE		Enable Sea-Bird acoustic modem output.
#CZD		Disable Sea-Bird acoustic modem output
#SE		Enable first 24 hours of status information
#SD		Disable first 24 hours of status information

10.9.1 #CE Condense Pings Enable

Enable PCF. If PCF is disabled then only the on demand PCF is available.

Enter:
#CE

Results:
^CE Condense parameters enabled

10.9.2 #CD Condense Pings Disable

Disable PCF. If PCF is disabled then only the 'on demand' PCF is available.

Enter:
#CD

Results:
^CE Condense parameters disabled

10.9.3 #COB RS232 output format BINARY - standard ping_t format

Set the compressed ping RS232 format to BINARY. This is the standard format that standard profiles are sent over the RS232 and is described in another section of the manual.
Note that this format has full header information and packet header and trailer that add many bytes to the output. It is recommended to use the BINARY SHORT format

Enter:
#COB

Result:
^COB Condense output standard BINARY packet

10.9.4 #COA RS232 output format ASCII - ASCII modem output

Set the RS232 format to ASCII. This format is described in a section below.

Enter:
#COA

Result:
^COA Condense output ASCII

10.9.5 #COS Compressed RS232 output format BINARY SHORT

Set the compressed ping RS232 format to BINARY SHORT. This is basically the same format as the ASCII output except it is in binary and there is no subtraction of the minimum values for each channel value.

This format provides the least amount of data to transmit over a low bandwidth system.

Enter:
#COS

Result:
^COS Condense output BINARY SHORT form

10.9.6 #CSR Storage to RS232

Send condensed profiles to RS232.

Enter:
#CSR

Result:
^CSR Store to RS232

10.9.7 #CSF Storage to FLASH

Store condensed profiles to FLASH.

This setting is available for testing purposes and is not recommended for operation as it will inter mingle standard and condensed data in the same file. Files with intermingled condensed profiles with standard profiles files are readable by the AzfpLink software but would require additional processing to separate the data.

Enter:
CSB

Result:
^CSR Store to FLASH

10.9.8 #CSB Storage to FLASH & RS232

Send condensed profiles to RS232 and store to FLASH
This setting is available for testing purposes and is not recommended for operation as it will inter mingle standard and condensed data in the same file. Files with intermingled condensed profiles with standard profiles files are still be readable by the AzfpLink software but would require additional processing to separate the data.

Enter:
CSB

Result:
^CSR Store to FLASH and RS232

10.9.9 #CMA Condense all profiles

Set the mode to condense every profile

Enter:
#CMA

Results:
^CMA Mode condense all profiles

10.9.10 #CMO [N] Enable modulus mode and condense every Nth profile

Enable modulus mode and set the modulus of the condensing of profiles.

Enter:
#CMO 6

Result:
^CMO Condense modulus of profile pings 6.

10.9.11 #CB [C1] [C2] [C3] [C4] Set bin averaging for each channel

Set the bin averaging for each channel (minimum is 1 maximum is 1000).

** If the full profiles are averaged then these number indicate further averaging of the bins. For example if the full profiles consist of .25 meter bins and you wish to condense to 3 meters then the condense averaging should be 3/.25 or 12.

Enter:
#CB 12 12 12 12
Result:
^CB 12 12 12 12

10.9.12 #CW Write condense parameters to VEEPROM

Write the current values of the condense parameters to VEEPROM for permanent storage. The values are retained between CPU reboots.

Enter:
#CW

Result:
^CS Condense parameters saved

10.9.13 #CR Load condense parameter's from VEEPROM

Read condense parameters from the VEEPROM and display them.

Enter:
#CR

Result:
Condense_enable..... YES
Condense_mode..... all profiles
Condense_modulus..... 6
Condense_storage ..... FLASH and RS232
Condense_RS232_format ... ASCII
Condense_bin_avg_C1 41
Condense_bin_avg_C2 42
Condense_bin_avg_C3 43

Condense_bin_avg_C4 ..... 44 .

10.9.14 #CZE Enable Sea-Bird modem operation

This command enables Sea-Bird operation whereby the AZFP attempts to communicate with an attached Sea-Bird modem before transmitting condensed pings.

If communications with the modem is not established the profile is not sent out.

Enter: #CZE

Result:

^CZ Modem status is ON

10.9.15 #CZE Disable Sea-Bird modem operation

This command disables Sea-Bird operation whereby the AZFP attempts to communicate with an attached Sea-Bird modem before transmitting condensed pings.

Condensed pings are sent over the RS232 with no attempted communications with a modem.

Enter: #CZD

Result:

^CZ Modem status is OFF

10.9.16 #SE Enable first 24 hours of status information

This setting enables the output of status information for each ping. Normal operation has the instrument send this information for the first 24 hours for deployments.

10.9.17 #SD Disable first 24 hours of status information

This setting disables the output of status information for each ping. Normal operation has the instrument send this information for the first 24 hours for deployments.

10.10 Condensed Profile Output Format

This section describes the format of the condensed profile as they are output over the RS232. Both the ASCII and BINARY SHORT formats have a timestamp (transmission) date and time preceding the profile data.

10.10.1 Transmission Time Stamp

Time stamps that precede the ASCII and BINARY SHORT formats have the following format.

@Dyyyymmddhhmmss!

Where: yyyy is the year, mm is the month, dd is the day, hh is the hour, mm is the minute and ss is the second.

The time stamp in included in the indicate the date and time the data was transmitted by unit.

10.10.2 Binary

The binary format over RS232 is identical to the standard real time format of profile data as described in an earlier section.

10.10.3 ASCII

The ASCII output consists of a string delimited by a starting '@' character followed by comma delimited, header information, data and then terminated with an '!' character and carriage return.

Field	Type	Description
1	char	Starting character always '@P'
2	uint	Instrument Serial Number
3	Int	Phase
4	int	Burst number (1 – 65535)
5	int	Number of stored frequencies 1 – 4
6	int	N1 = Number of bins for frequency 1
7 (1)	int	N2 -=Number of bins for frequency 2
8(1)	int	N3 = Number of bins for frequency 3
9 (1)	int	N4 = Number of bins for frequency 4
10	uint	Minimum value in the data subtracted out
11 (1)	uint	Minimum value in the data subtracted out
12 (1)	uint	Minimum value in the data subtracted out
13 (1)	uint	Minimum value in the data subtracted out
14	string	Date of burstYYMMDDHHMMSSHH
15	double	Tilt X
16	double	Tilt Y
17	double	Battery voltage
18	double	Temperature
19	double	Pressure (valid value if sensor is available)
20	Uchar	Channel 1 board number always 0

21	Uint	Channel 1 frequency
N1 values	uint	channel 1 values minus minimum value
N1+1	Uchar	Channel 2 board number always 1
N1+2	uint	Channel 2 frequency
N2 values	uint	channel 2 values minus minimum value (available)
N2+1	Uchar	Channel 3 board number always 2
N2+2	uint	Channel 3 frequency
N3 values	uint	channel 3 values minus minimum value (available)
N3+1	Uchar	Channel 4 board number always 3
N3+2	uint	Channel 4 frequency
N4 values	uint	channel 4 values minus minimum value (available)
Last	char	!\n

(1) If not, present the frequency is not available.

Example:

@P1,23066,1,280,12440,14072808052343,0.3,2.2,11.2,24.0,99.0,3752,360,1456,400,2280,760,792,304,440,1208,1144,1344,368,1872,424,1144,920,1048,920,2384,896,904,304,904,1424,1240,192,616,192,1600,1688,784,616,2040,896,360,616,1240,272,768,1392,808,496,1416,1288,872,1008,256,984,1648,600,1624,1160,1688,520,1384,1144,1272,536,168,1024,1616,1136,120,1328,1144,400,768,1264,1616,592,712,592,792,496,1416,1472,416,1168,896,1360,2216,168,1064,384,592,192,1144,1344,528,880,1456,592,912,384,568,536,176,88,760,472,544,656,432,104,64,920,560,448,488,992,1080,632,1736,1456,384,240,1976,624,600,552,624,640,432,1040,1064,1560,536,336,2216,528,184,2192,2040,768,1664,1368,688,1800,1592,488,704,536,320,488,1864,1320,0,144,792,360,1512,368,944,96,192,904,1272,1200,368,1408,552,680,560,3912,1560,408,216,536,720,2920,2392,464,408,232,552,504,1304,488,360,696,448,408,1064,392,728,600,88,488,2304,1688,560,1120,272,336,1432,1480,528,544,176,152,368,1480,200,808,1368,1064,688,1136,1304,136,720,1176,936,1128,1832,760,880,880,1008,760,1960,1216,744,968,1040,360,1560,1752,16,424,384,2312,1024,1032,736,624,600,424,592,328,448,1008,576,960,656,616,2688,456,576,504,1264,1216,2328,1360,720,472,520,712,1320,1112,240,816,624,600,752,1136,1624,1080,624,744,344,560,1328,296,472,640,720,440,632!

10.10.4 Binary Short

A date stamp is output before the profile.

The BINARY SHORT format is effectively the same format as the ASCII but presented in Big-Endian binary format. This provides for a reduction in the number of byte transmitted for each profile.

The data is delimited by a starting '@' character by header information, data and then terminated with an '!' character.

Field	Type	Size	Description
1	char	1	Starting character always '@'
2	char	1	Always 'B'
3	ushort	2	Total bytes in packet including header
4	ushort	2	Instrument Serial Number
5	ushort	1	Phase
6	ushort	2	Burst number (1 – 65535)
7	char	1	Number of stored frequencies 1 – 4
8	ushort	2	N1 = Number of bins for frequency 1
$9^{(1)}$	ushort	2	N2 -=Number of bins for frequency 2
$10(^{1)}$	ushort	2	N3 = Number of bins for frequency 3
$11^{(1)}$	ushort	2	N4 = Number of bins for frequency 4
12	ushort	2	Date year
13	ushort	1	Date month
14	ushort	1	Date day
15	ushort	1	Date hour
16	ushort	1	Date minute
17	ushort	1	Date second
18	ushort	1	Date hundreds
19	float	4	Tilt X
20	float	4	Tilt Y
21	float	4	Battery voltage
22	float	4	Temperature
23	float	4	Pressure (valid value if sensor is available)
24	char	1	Channel 1 board number
25	ushort	2	Channel 1 frequency
N1 Values	ushort	N1*2	channel 1 data values

N1 + 1	char	1	Channel 1 board number always 0
N1 + 2	ushort	2	Channel 1 frequency
N2 values(1)	ushort	N2*2	Channel 2 data values
N2 + 1(1)	char	1	Channel 1 board number always 1
N2 +2(1)	ushort	2	Channel 1 frequency
N3 values(1)	ushort	N4*2	channel 3 data values
N3 + 1(1)	char	1	Channel 1 board number always 2
N3 +2(1)	ushort	2	Channel 1 frequency
N4 values(1)	ushort	N5*2	Channel4 data values always 3
N4 + 1	char	1	!

The binary data is stored as Big-Endian format.

(1) Not present if frequency not acquired.

10.11 Request the Next Profile be Condensed and Transmitted

When not collecting data, the instrument goes into a low-power mode to conserve battery life. It wakes up once a second to determine if it is time to collect data. If it is time to collect data, it does the collection and then goes back to the low-power mode. Before the AZFP goes back to the low-power mode, it always checks the RS232 port for special characters to tell it to stop data acquisition mode and to go into STANDBY mode. In STANDBY mode, the AZFP is able to accept commands. NOTE: In STANDBY mode the AZFP's CPU is always on and consumes more power than when in data acquisition mode.

10.11.1 Requesting a Condensed Profile

It is possible to request the instrument to condense the next profile regardless of the modulus of the profile count. Before going to low power mode, as well as checking for the "s" character for a request to go into STANDBY mode, the instrument checks to see if the character "c" has been sent by the controlling PC. Sending a string of "c" characters about 6 milliseconds apart and spanning one second will normally cause the "c" to be detected. If a "c" is detected, the instrument responds with:

^CONR

Then the AZFP goes into low power mode. When the next profile is acquired, the AZFP will condense and transmit it according to the programmed parameters specified for storage (RS232, FLASH or BOTH) and condensing parameters.

This option is available regardless of whether or not PCF mode is enabled.

10.12 Examples of set of Commands for the three different Condensing Functions

Enter topic text here.

10.12.1 Examples of set of Commands for the three different Condensing Functions

The following set of commands can be used to condense and transmit every 8th profile:

Put the instrument in STANDBY mode with “s”es

#CE	To enable Condense Pings
#CSR	To set storage to RS232
#COA	To set output format to ASCII
#CMO 9	To condense every 9th profile
#CB 10 15 20 25	To set bin averaging for a 4-channel instrument
#CW	To write condense parameters to instrument VEEPROM
#SD	To disable first 24 hours of status information

10.12.2 Example of Condense every profile

The following set of commands can be used to condense and transmit every profile:

Put the instrument in STANDBY mode with “s”es

#CE	To enable Condense Pings
#CSR	To set storage to RS232
#COA	To set output format to ASCII
#CMA	To condense all profiles
#CB 10 15 20 25	To set bin averaging for a 4-channel instrument
#CW	To write condense parameters to instrument VEEPROM
#SD	To disable first 24 hours of status information

10.12.3 Example of Condense “On-Demand” with PCF Turned Off:

The following set of commands can be used to condense and transmit an occasional profile “on-demand:

Put the instrument in STANDBY mode with “s”es

#CD	Disable standard PCF mode.
#CSR	To set storage to RS232
#COA	To set output format to ASCII
#CB 10 15 20 25	To set bin averaging for a 4-channel instrument
#CW	To write condense parameters to instrument VEEPROM
#SD	To disable first 24 hours of status information

Request a condensed profile periodically by sending “c”

10.12.4 Operation of PCF Function

Typically the settings should be confirmed in a lab setting.

The parameters should be set and then writing to the non-volatile memory of the AZFP using the #CW command.

11 Trouble Shooting

11.1 The AzfpLink won't communicate with the unit

Check the COM port setting in the Preferences Tab section. Note that some USB to SERIAL products may not work with the unit. We recommend the MOXA UPort 1110 V1.4 USB to Serial (RS-232) that is shipped with each instrument.

11.2 The Terminal Emulator won't talk to the unit

Check that the communications parameters for the terminal emulator are correct see Setting Up Terminal Emulation Communications section.

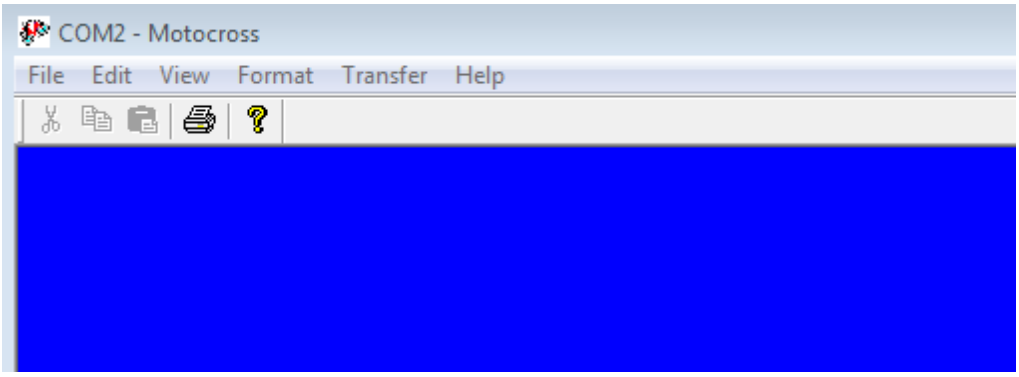
Firmware 3.12 and higher now has an option to boot up with BAUD rates that may not be compatible with the windows driver or the Terminal Emulator.

11.3 Loss of communications with the AZFP after setting high BAUD rate

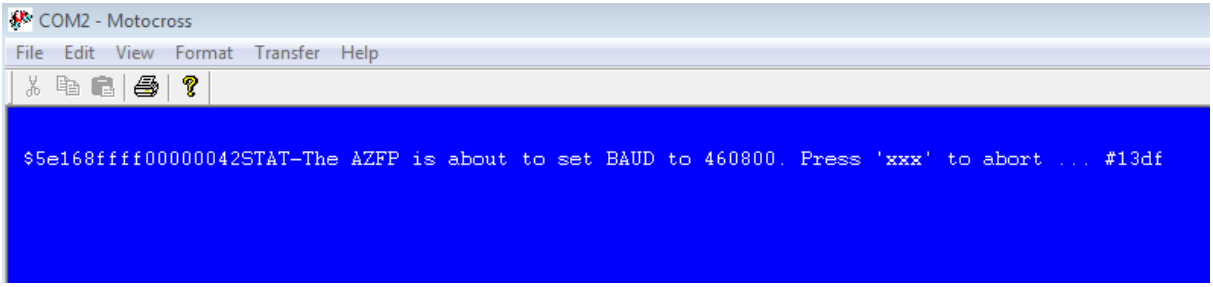
Version 3.12 of the AZFP firmware allows the user to change the BAUD rate the AZFP operates in to higher BAUD rates such as 230400 and 460800 BAUD.

Some PC's even with the recommended MOXA USB-SERIAL unit may not be able to accommodate the rate and there will be a loss of communications between the AZFP and AzfpLink. To provide a means to return the unit to a known working BAUD rate of SYS.BAUD that is set to either 9600 or 115200 the following procedure can be performed.

Start the MotoCross terminal emulator and set the correct COM port and BAUD rate (9600 or typically 115200) Terminal Emulator Command Button.

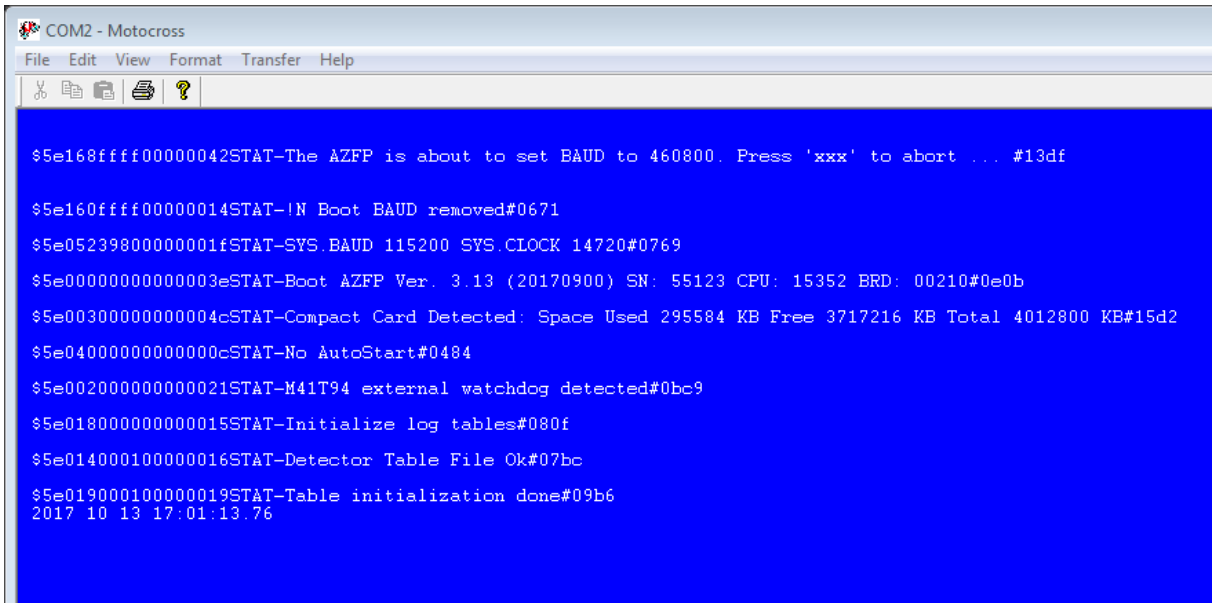


Recycle the AZFP's power. If the AZFP is in one of the higher BAUD rates and you have set the correct BAUD baud rate of 9600 or 115200 then you will see the following message.



You have 3 seconds to type in three 'x' characters to abort the change of BAUD rates to the higher BAUD rates.

If you type in the three 'x' characters the AZFP will stay in the default SYS.BAUD rate and go to Standby Mode awaiting commands.
The setting that sets the operating BAUD rate will be wiped out and the unit will boot up at the SYS.BAUD BAUD rate.



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